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Product Index

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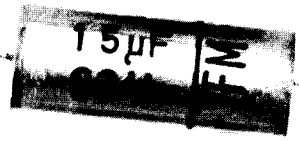
Wima Tropyfol M CAPACITORS

Metallised Polyester

WAYCOM LIMITED

- ☐ Values 0.01µF to 10µF
- ☐ Tolerances down to ±5%
- ☐ Voltages 63V d.c. to 400V d.c.



Tropyfol M metallized polyester dielectric capacitors are designed for professional and industrial applications where high volumetric efficiency and long term reliability are required.

TECHNICAL DATA

Dielectric
Polyethylene terephthalate

Electrodes
Vacuum deposited aluminium, on dielectric.

Encapsulation
Epoxy resin encapsulation or polycarbonate sleeve and epoxy resin end seals.

Temperature Range
−55°C to +100°C. From +85°C the rated voltage must be derated by 1.25% per degree.

Capacitance Tolerance
Standard ±20%, ±10% and ±5%.

Capacitance Temperature Coefficient Non linear curve.
+330ppm. per degree C within +20°C to +70°C
+770ppm. per degree C within +20°C to −40°C

Power Factor ⩽ 0.01 at 1000Hz and 20°C.

Insulation Resistance At 20°C.
C ⩽ 0.1 mfd: ⩾ 5×10^4 Megohms
C ⩾ 0.1 mfd: ⩾ 10,000 seconds (Megohms x mfd)

Temperature Cycling Test
−55°C to +100°C, 1 cycle every 12 hours: electrical data unchanged after 10 days.

D.C. Test Voltage 2 x rated Voltage

Solderability
Meets the requirement of DEF 5011 and BS 2011 Method 3—Solder Globule.

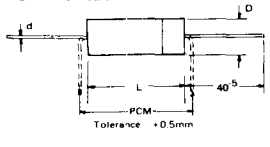
Marking
Trade Mark, capacitance, rated d.c. voltage, earth marking by outer foil band.

Other Features
Robust construction: tin coated copper wires: reliable end connections: self-heating properties and low inductance.

Endurance
When stressed at rated d.c. voltage and 85°C for 2,000 hours the mean capacitance change is 2%.

For further information ask for Waycom Ltd. Data Sheet.

OUTLINE DRAWING



Capacitance	† Dimensions in mm.*			
63V d.c.	**D**	**L**	**d**	**PCM**
1.0 µF	7.5	21	0.7	25
1.5	8.5	21	0.8	25
2.2	10.5	21	0.8	25
3.3	10.5	26.5	0.8	30
4.7	12	26.5	0.8	30
6.8	12	31.5	0.8	35
10.0	14	31.5	1.0	35
100V d.c.	**D**	**L**	**d**	**PCM**
0.47	8	21	0.8	25
0.68	8	21	0.8	25
1.0	9.5	21	0.8	25
1.5	9.5	26.5	0.8	30
2.2	11	26.5	0.8	30
3.3	13	26.5	0.8	30
4.7	14.5	31.5	1.0	35
6.8	17	31.5	1.0	35
10.0	17	41.5	1.0	45
160V d.c.	**D**	**L**	**d**	**PCM**
0.015	5.5	14	0.7	17.5
0.022	5.5	14	0.7	17.5
0.033	6	14	0.7	17.5
0.047	6	14	0.7	17.5
0.068	6	16	0.7	20
0.1	7	16	0.7	20
0.15	8	18	0.8	22.5
0.22	9	18	0.8	22.5
0.33	9	21	0.8	25
0.47	11	21	0.8	25
0.68	12	26.5	0.8	30
1.0	13	26.5	0.8	30
400V d.c.	**D**	**L**	**d**	**PCM**
0.01	5.5	14	0.7	17.5
0.015	6	14	0.7	17.5
0.022	7	14	0.7	17.5
0.033	8	16	0.8	20
0.047	9	16	0.8	20
0.068	10	19	0.8	22.5
0.1	10	19	0.8	22.5
0.15	10	19	0.8	22.5
0.22	9	26.5	0.8	30
0.33	11	26.5	0.8	30
0.47	12	31.5	0.8	35
0.68	14.5	31.5	1.0	35
1.0	17	31.5	1.0	35

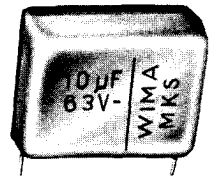
Manufactured in W. Germany by W. Westermann

WAYCOM LIMITED

Wima MKS CAPACITORS

Metallised Polyester

- Radial leads
- Values 0.01µF to 10µF
- Voltages 63V d.c. to 400V d.c.
- Tolerances down to ±5%



TECHNICAL DATA

Dielectric Polyethylene terephthalate.

Electrodes Vacuum deposited aluminium, on dielectric.

Encapsulation Epoxy resin moulding.

Temperature Range −55°C to +100°C. A voltage derating factor of 1.25% per degree C must be applied from 85°C for d.c. voltages and from 75°C for a.c. voltages.

Capacitance Tolerance
±20%, ±10% and ±5% available

Capacitance Temperature Coefficient Non-linear curve.
+330ppm per degree C within +20°C to +70°C
+770ppm per degree C within +20°C to −40°C

Capacitance Long Term Stability When stressed at rated voltage and at temperature below 85°C, the capacitance drift during life should not exceed ±3%.

A.C. Voltage Rating Refer to data sheet.

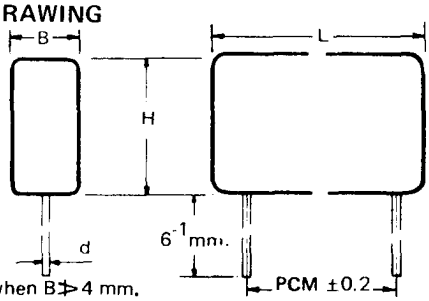
Power Factor ≯ 0.008 at 1000Hz and 20°C.

Insulation Resistance At 20°C.
≮ 3×10^4 Megohms when C ≯ 0.33 mfd.
≮ 10,000 Seconds (Megohms x mfd) when C ≯ 0.33mfd.

Maximum Pulse Rise Time
For 250V d.c.: ≯ 10V/Microsecond
100V d.c.: ≯ 2V/Microsecond
63V d.c.: ≯ 1V/Microsecond

Marking Trade Mark, capacitance, rated d.c. voltage, earth marking by outer foil band.
For further information see Waycom Ltd Data Sheet

OUTLINE DRAWING



d = 0.7 mm. when B ≯ 4 mm.
d = 0.8 mm. when B > 4 mm.

Cap.	Dimensions in mm.			
63V d.c.	**B**	**H**	**L**	**PCM**
0.22 µF	4	9	13	10
0.33	4	9	13	10
0.47	5	10.5	13	10
0.68	6	11	13	10
1.0	6	11	18	15
1.5	7	12	18	15
2.2	9	15	18	15
3.3	9.5	17	27	22.5
4.7	11	19	27	22.5
6.8	13	22	27	22.5
10.0	14	25	32	27.5
100V d.c.	**B**	**H**	**L**	**PCM**
0.01 µF	4	9	10.5	7.5
0.015	4	9	10.5	7.5
0.022	4	9	10.5	7.5
0.033	4	9	10.5	7.5
0.047	4	9	10.5	7.5
0.068	4	9	10.5	7.5
0.1	4	9	13	10
0.15	4	9	13	10
0.22	4	9	13	10
0.33	5	10	18	15
0.47	5	10	18	15
0.68	6	11	18	15
1.0	8	13	18	15
1.5	7	15	27	22.5
2.2	10	18	27	22.5
3.3	10	18	27	22.5
4.7	11	20	32	27.5
6.8	13	23	32	27.5
250V d.c.	**B**	**H**	**L**	**PCM**
0.01 µF	4	9	13	10
0.015	4	9	13	10
0.022	4	9	13	10
0.033	4	9	13	10
0.047	4	9	13	10
0.068	4	9	13	10
0.1	5	10	18	15
0.15	5	10	18	15
0.22	5	10	18	15
0.33	6	11	18	15
0.47	6	14	27	22.5
0.68	6	14	27	22.5
1.0	10	18	27	22.5
1.5	11	20	32	27.5
2.2	13	23	32	27.5
400V d.c.	**B**	**H**	**L**	**PCM**
0.01 µF	4	9	13	10
0.015	4	9	13	10
0.022	4	9	13	10
0.033	4	9	13	10
0.047	5	10	18	15
0.068	5	10	18	15
0.1	5	10	18	15
0.15	8	13	18	15
0.22	6	14	27	22.5
0.33	7	15	27	22.5
0.47	10	18	27	22.5
0.68	11	20	32	27.5
1.0	11	23	32	27.5

Manufactured in W. Germany by W. Westermann

Wima® MKS 2min CAPACITORS

Subminiature Metallised Polyester

WAYCOM LIMITED

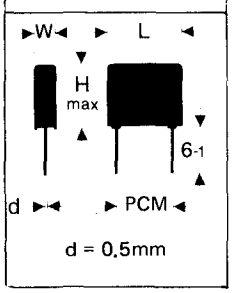
- 0.01 mfd to 0.47 mfd
- 63V d.c.
- Subminiature
- 55/100/21 Climatic Category

TECHNICAL DATA

Dielectric Polyethylene terephthalate.
Electrodes Aluminium vacuum deposited on dielectric.
Encapsulation Plastic case with resin end seal.
Leads Tinned radial copper wires.
Temperature Range −55°C to +100°C. A voltage derating factor of 1.25% per degree C must be applied from 85°C for d.c. voltages and from 75°C for a.c. voltages.
Capacitance Tolerance ± 10% standard.
Capacitance Temperature Coefficient Non-linear curve. +330 ppm per degree C within +20°C to +70°C +770 ppm per degree C with +20°C to −40°C.
Capacitance Long Term Stability When stressed at rated voltage and at temperature below 85°C, the capacitance drift during life should not exceed ±3%.
Power Factor 0.01 @ 1KHz and 20°C.
Insulation Resistance C > 0.033uF 10^4 Megohms
C ≥ 0.033uF 5000 secs (MΩ x uF).
D.C. Test Voltage 1.5 x rated voltage.
A.C. Voltage Rating Refer to data sheet.
Pulse Ratings 5V per usec. for single edged transients of peak to peak amplitude equal to the d.c. rated voltage.
Self Inductance Refer to data sheet.
The units have a low inductance construction, the whole winding length being edge contacted.
Climatic Category 55/100/21.
Vibration BS2011 Part 2Fc 10-2000Hz @ 0.75mm or 98m/sec^2.
Low Air Density BS2011 Part 2M: 2KN/m^2.
Bump BS2011 Part 2Eb 4000 bumps @ 390m/sec^2.
Solderability BS2011 Part 2T Method 3.
Solder Globule Method.
2 seconds without ageing.
3 seconds with ageing.
Marking Trade Mark Capacitance, rated d.c. voltage, earth marking by outer foil band.

RANGE Capacitance	63V d.c./40V a.c. W	H	L	PCM
0.01 µF	2.5	6.5	7.2	5
0.015	2.5	6.5	7.2	5
0.022	2.5	6.5	7.2	5
0.033	2.5	6.5	7.2	5
0.047	2.5	6.5	7.2	5
0.068	2.5	6.5	7.2	5
0.1 µF	2.5	6.5	7.2	5
0.15	3.5	8	7.2	5
0.22	3.5	8	7.2	5
0.33	4.5	9	7.2	5
0.47	5	10	7.2	5

Outline Drawing for MKS2min & MKS3



FOR FURTHER INFORMATION ASK FOR WAYCOM LTD DATA SHEET.

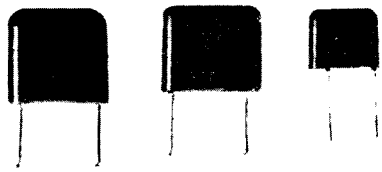
Manufactured in W. Germany by W. Westermann

WAYCOM LIMITED

Wima® FKS 2min CAPACITORS

Polyester Film & Foil

- ☐ Subminiature
- ☐ Suitable for decoupling I.C.'s
- ☐ 1000pF to 0.047mfd – 100V d.c.



TECHNICAL DATA

Encapsulation
The FKS2 min. incorporates the WIMA encapsulation process * where the capacitors are encapsulated in epoxy resin under vacuum. This provides a robust housing with greater resistance to moisture than achieved with the conventional moulded or plastic case with resin end seal radial lead capacitors.
*Patent applied for.

Dielectric
Polyethylene terephthalate

Electrodes
Aluminium foil

Encapsulation
Cast epoxy resin under vacuum.

Temperature Range
–55°C to +100°C. The rated voltage must be derated by 1% per degree C from 85° for d.c. and from 75°C for a.c.

Capacitance Tolerance
Standard +20%.

Capacitance Temperature Coefficient
+330 to +580 ppm per degree C for the extreme temperature range.(non-linear curve)

Power Factor
⩾ 0.006 at 1 KHz and 20°C.

Insulation Resistance
At 20°C. 1 x 10^6 Megohms or 20,000 seconds (Megohms x mfd) which ever is the lower.

D.C. Test Voltage
2 x rated voltage.

Maximum Pulse Rise Time
100V per microsecond.

Solderability
Meets the requirements of BS 2011, Method 3.

Humidity Category
Meets H6 in accordance with DEF 5011 and 55/100/56 category in BS 2011.

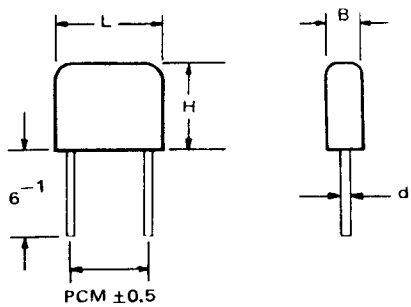
Marking
Trade Mark, capacitance, rated d.c. voltage, earth marking by outer foil band.

Manufactured by W. Westermann. W. Germany

	Capacitance	Dimensions in mm.			
	100V d.c.	B	H	L	PCM
FKS 2min	1000 pf	2.5	6.5	7.2	5
FKS 2min	1500	2.5	6.5	7.2	5
FKS 2min	2200	2.5	6.5	7.2	5
FKS 2min	3300	2.5	6.5	7.2	5
FKS 2min	4700	2.5	6.5	7.2	5
FKS 2min	6800	2.5	6.5	7.2	5
FKS 2min	0.01 mfd	2.5	6.5	7.2	5
FKS 2min	0.015	3.5	8.0	7.2	5

	Capacitance	Dimensions in mm.			
FKS 3min	0.022	3	8.5	10	7.5
FKS 3min	0.033	3	8.5	10	7.5
FKS 3min	0.047	4	9.0	10	7.5

OUTLINE DRAWING



d = 0.5mm. dia. for PCM of 5mm.
d = 0.6mm. dia. for PCM of 7.5mm.

For further information see Waycom Technical Data

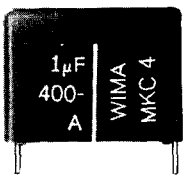
Note
0.022, 0.033 and 0.047 mfd only available in the FKS 3 range.

Wima® MKC 4 CAPACITORS

Metallised Polycarbonate

WAYCOM LIMITED

- 0.047µF to 6.8µF
- 160V d.c. & 400V d.c.
- 250V rms mains type



TECHNICAL DATA

Dielectric Polycarbonate.

Electrodes Vacuum deposited aluminium on the dielectric film.

Encapsulation Plastic case with resin end seal and stand off feet.

Temperature Range −55°C to +100°C. The rated voltage must be derated by 1% per degree C from +85°C for d.c. and from +75°C for a.c.

Capacitance Tolerance ±20%

Capacitance Temperature Coefficient ±40ppm per degree C.

Capacitance Long Term Stability ±1% for the temperature range −10°C to +50°C.

Power Factor At 1KHz and 20°C. 0.001 to 0.003.

Insulation Resistance At 20°C and 100V for 1 min.
⩾ 0.33 mfd > 10,000 mehohms
> 0.33 mfd > 3,000 sec. (MΩ mfd).

D.C. Test Voltage 1.5 x rated voltage (2 seconds).

MAXIMUM PULSE RISE TIME

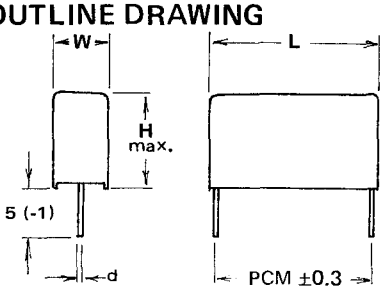
D.C. Rating	V per µ sec, for different pcm*			
	10 mm	15 mm	22.5 mm	27.5 mm
160V	10	7	4	3
400V	20	10	10	5

*pcm = printed circuit module

	Dimensions (mm)			
	W	H	L	PCM
160V d.c.	100V rms*			
0.047µF	4	9.5	13	10
0.068	5	11	13	10
0.1 µF	5	11	13	10
0.15	5	11	18	15
0.22	5	11	18	15
0.33	6	12.5	18	15
0.47	7	16.5	26.5	22.5
0.68	7	16.5	26.5	22.5
1.0 µF	8.5	18.5	26.5	22.5
1.5	9	19	31.5	27.5
2.2	11	21	31.5	27.5
3.3	13	24	31.5	27.5
4.7	17	34.5	31.5	27.5
6.8	20	39.5	31.5	27.5
400V d.c. 250V rms*				
0.022µF	4	9.5	13	10
0.033	5	11	13	10
0.047	5	11	18	15
0.068	5	11	18	15
0.1 µF	6	12.5	18	15
0.15	7	14	18	15
0.22	7	16.5	26.5	22.5
0.33	8.5	18.5	26.5	22.5
0.47	10.5	19	26.5	22.5
0.68	11	21	31.5	27.5
1.0 µF	13	24	31.5	27.5
1.5	15	26	31.5	27.5
2.2	17	34.5	31.5	27.5

*AC voltage 400Hz
1.4 x Vrms + Vd.c. Vd.c. (rated).

OUTLINE DRAWING



d = 0.70 if PCM = 10
d = 0.80 if PCM = 15 - 27.5
d = 1.0 if PCM = 27.5
⩾15 x 26 x 31.5

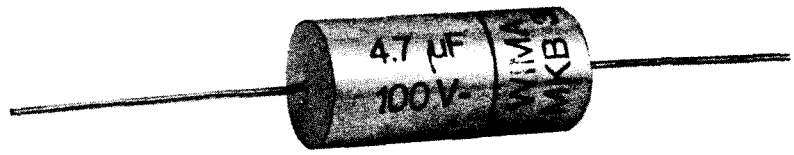
Manufactured in W. Germany by W. Westermann

WAYCOM LIMITED

Wima® MKB3 CAPACITORS

Metallized Polycarbonate

- ☐ Professional and military grade
- ☐ Temperature range –55°C to +125°C
- ☐ Robust Construction



Wima MKB3 metallized polycarbonate capacitors have been designed specifically for professional and military applications where excellent electrical characteristics and long term reliability are required.

TECHNICAL DATA

Sleeving Normally MKB3 capacitors are supplied without sleeving. For capacitors with sleeving add £0.025 per capacitor and allow 7/10 days on delivery.

Dielectric Polycarbonate.

Electrodes Vacuum deposited aluminium, on dielectric.

Encapsulation Cylindrical aluminium case with case resin sealing.

Leads Axial tin-coated copper leads, one lead being welded to the case. If required, the case is fitted with an insulating sleeve.

Temperature Range –55°C to +125°C. From +85°C the rated voltage must be derated by 1.5% per degree C. The capacitors must not be subjected to temperatures above 100°C for periods exceeding 100 hours at any one time.

Capacitance Tolerance Standard ±20%

Capacitance Temperature Coefficient 0 to 200 ppm per degree C for the entire temperature range. For the temperature range +40°C to +100°C it is 0 to 50 ppm per degree C.

Capacitance Cyclic Stability The maximum capacitance change is ±0.5% when subjected to the rapid temperature cycling test in accordance with DEF-5011.

Capacitance Long Term Stability Figs. 5 and 6 show the typical change in capacitance over a period of 10,000 hours with the capacitors stressed at their rated voltage and 85°C.

Power Factor $\leq$ 0.003 at 1000 Hz and 20°C.

Insulating Resistance At 20°C.
$\geq 1 \times 10^5$ Megohms when C < 0.1mfd
$\geq 1 \times 10^4$ Seconds (megohms x mfd) when C $\geq$ 0.1mfd.

D.C. Test Voltage Twice rated voltage.

Resonant Frequency Refer to data sheet.

Solderability Meets the requirements of DEF-5011 and E.E.A. solderability specifications.

Marking Trade Mark, capacitance, rated d.c. voltage, earth marking by outer foil band.

For further information see Waycom Ltd Data Sheet A101.

Capacitance	* Dimensions in mm.		
63V d.c.	**D**	**L**	**d**
0.22 µF	6.5	16	0.7
0.33	6.5	16	0.7
0.47	7.5	16	0.7
0.68	6.5	21	0.7
1.0	7.5	21	0.8
1.5	9.5	21	0.8
2.2	10.5	21	0.8
3.3	10.5	25	0.8
4.7	12.5	25	0.8
6.8	14	35	0.8
10.0	16	35	1.0
100V d.c.	**D**	**L**	**d**
0.01	6.5	16	0.7
0.015	6.5	16	0.7
0.022	6.5	16	0.7
0.033	6.5	16	0.7
0.047	6.5	16	0.7
0.068	6.5	16	0.7
0.1	6.5	16	0.7
0.15	6.5	16	0.7
0.22	6.5	21	0.7
0.33	7.5	21	0.7
0.47	8.5	21	0.8
0.68	9.5	21	0.8
1.0	10.5	21	0.8
1.5	12.5	25	0.8
2.2	14	25	1.0
3.3	14	35	1.0
4.7	16	35	1.0
160V d.c.	**D**	**L**	**d**
0.047	6.5	16	0.7
0.068	6.5	16	0.7
0.1	6.5	21	0.7
0.15	7.5	21	0.8
0.22	8.5	21	0.8
0.33	9.5	21	0.8
0.47	10.5	21	0.8
0.68	10.5	25	0.8
1.0	14	25	1.0
400V d.c.	**D**	**L**	**d**
0.01	6.5	16	0.7
0.015	6.5	16	0.7
0.022	6.5	16	0.7
0.033	6.5	21	0.7
0.047	7.5	21	0.8
0.068	8.5	21	0.8
0.1	9.5	21	0.8

Manufactured in W. Germany by W. Westermann

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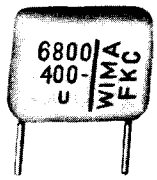
WAYCOM LIMITED

Wima® FKC CAPACITORS

Polycarbonate Film & Foil

- 100 pF to 0.047 µF – 400V d.c.
- Tolerances down to ±5%
- Low power factor
- Good insulation resistance



TECHNICAL DATA

Dielectric Polycarbonate.

Electrodes Aluminium Foil.

Encapsulation Epoxy resin moulding.

Temperature Range −55°C to 100°C. The rated voltage must be derated by 1% per degree C from 85°C for d.c. and from 75°C for a.c.

Capacitance Tolerance Standard ±20%, ±10% and ±5%

Capacitance Temperature Coefficient 0 to 200 ppm per degree C for the extreme temperature range. For the temperature range +40°C to +100°C it is 0 to 40 ppm per degree C.

Capacitance Cyclic Stability The maximum capacitance change is ±0.5% when subjected to the rapid temperature cycling test in accordance with DEF-5011.

Capacitance Long Term Stability When stressed at d.c. rated voltage over the temperature range below −10°C to +70°C the capacitance drift during life should not exceed ±1%.

A.C.Voltage Rating For frequencies greater than 400 Hz derate in accordance with Fig.5. Divide peak a.c. voltage by 1.4 for r.m.s. rating assuming sinusoidal waveform.

Power Factor ⩽ 0.002 at 1 KHz and 20°C.

Insulation Resistance At 20° C.
C ⩽ 0.02 mfd: ⩾ 5 x 10^5 Megohms
C > 0.02 mfd: ⩾ 10,000 seconds (Megohms x mfd)

D.C. Test Voltage Twice rated voltage.

Maximum Pulse Rise Time 75V per microsecond.

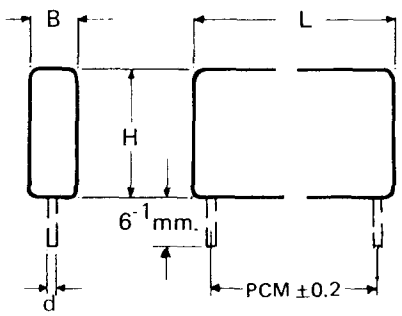
Marking Trade Mark, capacitance, rated d.c. voltage, earth marking by outer foil band.

Manufactured by W. Westermann. W. Germany

Capacitance	400 V d.c. * 220 V a.c.			
	B	H	L	PCM
100 pF	4	9	13	10
150 pF	4	9	13	10
220 pF	4	9	13	10
330 pF	4	9	13	10
470 pF	4	9	13	10
680 pF	4	9	13	10
1000 pF	4	9	13	10
1500 pF	4	9	13	10
2200 pF	4	9	13	10
3300 pF	4	9	13	10
4700 pF	5	10.5	13	10
6800 pF	6	11	13	10
0.01 µF	7	12	13	10
0.015 µF	6	11	18	15
0.022 µF	7	12	18	15
0.033 µF	9	15	18	15
0.047 µF	7	15	27	22.5

*Peak a.c. volts (1.4 x r.m.s.) + d.c. volts ⩽ rated d.c. volts.
A.C. Voltage: 400 Hz r.m.s. Tolerance: +0.5mm.
All dimensions in mm.

OUTLINE DRAWING



d = 0.7mm. when B⩽ 4mm.
d = 0.8mm. when B> 4mm.

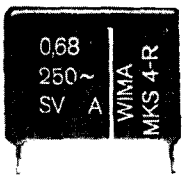
Other Features Low inductance and high resonant frequency. Suitable for high frequency low resistance circuits.

Wima® MKS 4-R CAPACITORS

Metallised Polyester

WAYCOM LIMITED

- ☐ 0.022μF to 1mfd
- ☐ 250V r.m.s. Mains Type
- ☐ Flame Retardent Plastic Case
- ☐ 55/100/56 Climatic Category



INTRODUCTION

The MKS4-R is a plastic cased metallized polyester capacitor specifically designed for 250V r.m.s. mains application. The element construction is a series metallized type which by uniformly distributing the voltage stress prevents ionisation degradation on continuous mains, even in the presence of continual transients. The structure is self healing for long term reliability and the use of a resin filled plastic case bestows both flame retarding and good humidity resistance.

TECHNICAL DATA

Dielectric Polyethylene terephthalate.

Electrodes Aluminium vacuum deposited on dielectric.

Encapsulation Plastic case with resin end seal and stand-off feet.

Leads Tinned radial copper wires.

Temperature Range $-55^{o}C$ to $+100^{o}C$.
A voltage derating factor of 1.25% per degree C must be applied from $75^{o}C$.

Capacitance Tolerance ±20%, ±10%

Capacitance Temperature Coefficient Non-linear curve. From $-20^{o}C$ to $+80^{o}C$, +330ppm to 440ppm per degree C. See data sheet.

Capacitance Long Term Stability ⊧±2% for the temperature range $-10^{o}C$ to $+70^{o}C$.

Power Factor ⊧0.008 at 1KHz and $20^{o}C$.
For temperature dependence see data sheet.

Insulation Resistance
C ⊧0.33mfd $> 3 \times 10^{4} M\Omega$
C >0.33mfd $> 10^{4}$ secs. (MΩ x mfd)

Proof Voltage 2 seconds. Class X 250V–1075V
300V–1300V Class Y 250V–2500V.

Climatic Category 55/100/56

Vibration BS2011 Part 2Fc
10–2000Hz at 0.75mm or $98 m/S^{2}$.

Low Air Density BS2011 Part 2M: $2 kN/m^{2}$.

Bump Test BS2011 Part 2Eb
4000 Bumps at $390 m/S^{2}$.

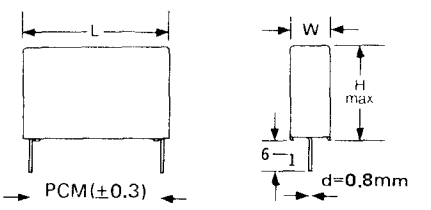
Solderability BS2011 Part 2T Method 3
Solder Globule
2 seconds without ageing
3 seconds with ageing

Marking Trade Mark, capacitance, rated d.c. voltage, earth marking by outer foil band.

Self Inductance See data sheet.
The units have a low inductance construction, the whole winding length being edge contacted.

Cap.	250V r.m.s.			
	W	H	L	PCM
0.022 μF	5	11.5	18	15
0.033	5	11.5	18	15
0.047	5	11.5	18	15
0.068	6	12.5	18	15
0.1 μF	6	12.5	18	15
0.15	8	15	18	15
0.22	7	17	26.5	22.5
0.33	9	17	26.5	22.5
0.47	9	19	26.5	22.5
0.68	11	22	31.5	27.5
1.0 μF	13	24	31.5	27.5

OUTLINE DRAWING



All dimensions in mm.

Manufactured by W. Westermann in W. Germany.

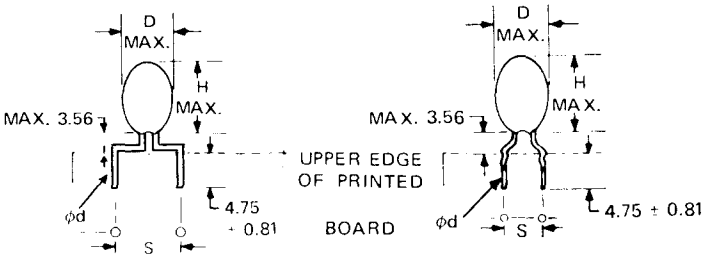
SPRAGUE

Type 499D CAPACITORS

Dipped Solid Tantalum

- Low leakage Current
- –55°C to +85°C Operating Temperature Range, With no Voltage Derating
- Strong Epoxy Coating with High Resistance to Moisture
- Standard 5mm spacing – Straight or Snap-in Leads

OUTLINES



ALL DIMENSIONS IN mm

Case Code	D Max.	H Max.	S A2 ±1.0	S G2 ±0.5	⌀d
A	4.0	7.0	5.08	5.08	0.50
B	4.5	7.0	5.08	5.08	0.50
C	5.0	8.0	5.08	5.08	0.50
D	5.0	8.5	5.08	5.08	0.50
E	5.5	9.0	5.08	5.08	0.50
F	6.0	9.5	5.08	5.08	0.50
G	6.4	10.0	5.08	5.08	0.50
L	6.5	11.5	5.08	5.08	0.50
M	10.2	14.3	5.08	5.08	0.65
N	11.2	17.3	5.08	5.08	0.65

CAP μF	STANDARD RATINGS/CASE CODES 3 V	6·3 V	10 V	16 V	20 V	25 V	35 V	50 V
0·10							A	A
0·15							A	A
0·22							A	A
0·33							A	B
0·47							A	B
0·68							A	C
1·00						A	A	D
1·50				A	A	A	B	E
2·20			A	A	B	B	C	F
3·30		A	A	B	C	C	D	G
4·70	A	A	B	C	D	D	E	L
6·80	A	B	C	D	E	E	F	N
10·00	A	C	D	E	F	F	G	N
15·00	B	D	E	F	G	L	M	
22·00	C	E	F	G	H	L	M	
33·00	D	F	G	L		M	N	
47·00	E	G	L	M		M	N	
68·00	F	G	L	M		N		
100·00	G	L	M	N				
150·00	L	M	M	N				
220·00	M	M	N					
330·00	M	N						
470·00	N							
680·00	N							

LEAD CONFIGURATION "Snap-in Type" recommended for new designs. Unless otherwise specified, Comway will supply the lead configuration currently in stock.

Indicates standard stock values. Other values may be obtained on special request.

FOR FULL DATA – REQUEST ENGINEERING BULLETIN Z3548

Solid Tantalum CAPACITORS

C Series

WAYCOM LIMITED

- ☐ Low cost
- ☐ Metal case and resin end seal
- ☐ Values 0.1μF to 33μF

C Series solid tantalum capacitors are low cost miniature devices for commercial and industrial applications where space and weight are at a premium.

TECHNICAL DATA

Construction

Polar element housed in a cylindrical metal case with a resin end seal at one end. The case is fitted with a polyester insulating sleeve. Leads are tinned nickel.

Temperature Ranges

−55°C to +85°C with derating, at 2/3rd rated voltage at +125°C.

Capacitance Tolerance ±20%

Dissipation Factor ⩽0.1

Leakage Current

Measured at rated d.c. voltage applied through a 1000 ohm resistor for 5 minutes maximum. At 25°C will not exceed 0.01uA/mfd–volt or 0.5uA, whichever, is the greater. At 85°C will not exceed 0.1uA/mfd–volt or 5uA, whichever, is the greater.

Reverse Voltage 0.5 Vd.c. maximum.

Ripple Voltage

The peak a.c. ripple voltage plus the d.c. operating voltage should not exceed the d.c. rated voltage. See data sheet for further information.

Surge Voltage

Defined as the maximum allowable short term voltage including transients and peak ripple voltage. The 'C' Series will withstand 1000 surges of 130% of rated d.c. voltage at 85°C through a 1000 ohm limiting resistor. Surge application shall be 30 secs. on 30 secs. off for 1000 cycles, D.F. and I_L shall not exceed initial limits, Capacitance change shall not exceed 5% from initial value.

Endurance Test

2,000 hours at 85°C and rated d.c. voltage. Dissipation factor and leakage current shall not exceed the initial limits. The capacitance change shall not exceed 10% from the initial value.

Shock 2,000 hours at 85°. 25,000 G's, 5m sec. duration without degradation of physical or electrical properties.

Vibration (Mil-Std-202, Method 204) 20 G's without degradation of physical or electrical properties.

For further information ask for Waycom Ltd. Data Sheet

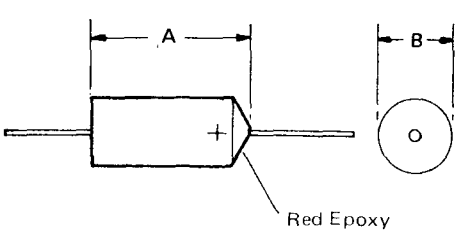
Case Size		Max. dims. in inches (mm)*		
		A	B	Lead Dia.
CT	6 to 35V	0.260(6.60)	0.095(2.41)	0.020(0.51)
CM	6 to 35V	0.320(8.13)	0.133(3.38)	0.020(0.51)
CL	6 to 35V	0.345(8.76)	0.180(4.57)	0.020(0.51)

*With insulating sleeve

SELECTION CHART

μF	6V d.c.	10V d.c.	15V d.c.	20V d.c.	25V d.c.	35V d.c.
0.1						CT35–104
0.15						CT35–154
0.22						CT35–224
0.33						CT35–334
0.47						CT35–474
0.68					CT25–684	CM35–684
1.0					CT25–105	CM35–105
1.5				CT20–155		CM35–155
2.2			CT15–225		CM25–225	CL35–225
3.3		CT10–335			CM25–335	CL35–335
4.7	CT06–475			CM20–475	CL25–475	
6.8			CM15–685		CL25–685	
10.0		CM10–106		CL20–106		
15.0	CM06–156		CL15–156			
22.0		CL10–226				
33.0	CL06–336					

OUTLINE DRAWING



Manufactured in U.S.A.

WAYCOM LIMITED

Solid Tantalum CAPACITORS

S Series

- Values 0.22μF to 330μF
- Standard tolerance ±10%
- Four standard case sizes

These solid tantalum capacitors are high grade capacitors housed in hermetically sealed metal cases.

Manufactured in four standard case sizes the range generally meets the requirements of MIL–C–390003 and DEF 5134–A–1

Case Size	D	Max. Dims. in inches (mm)* L	J max	Lead Dia.
SA	0.125 (3.18)	0.250 (6.35)	0.422 (10.72)	0.020 (0.51)
SB	0.175 (4.45)	0.438 (11.13)	0.610 (15.49)	0.020 (0.51)
SC	0.279 (7.09)	0.650 (16.51)	0.822 (20.88)	0.025 (0.64)
SD	0.341 (8.66)	0.750 (19.05)	0.922 (23.42)	0.025 (0.64)

*** With insulating sleeve**

TECHNICAL DATA

Operating Temperature –80°C to +125°C

From +85°C, the rated voltage must be derated linearly to the values given in the table.

D.C. Rated Voltage At 85°C	6	10	15	20	35	50	75	100
Derated D.C. Voltage At 125°C	4	7	10	13	23	33	50	66

Capacitance & Dissipation Factor Measurements

The polarized voltage shall be of sufficient magnitude to prevent reversal of polarity due to the a.c. component. The maximum voltage applied to the capacitors during measurements shall be 1.4 volts r.m.s. at 120 ±5Hz at 25° ±5°C.

Capacitance Tolerance Standard ±10% Code 'K'.

Reverse Voltage

1 Volt or 10% of the rated voltage at +125°C whichever is the lesser.

Surge Voltage

Defined as the maximum allowable short-term voltage including transients and peak ripple voltage. The 'S' Series will withstand 2000 surges of 130% of rated d.c. voltage at 85°C through a 1000 ohm limiting resistor. Surge application shall be 30 seconds on 5½ minutes off, D.F. and I_L shall not exceed initial limits. Capacitance change shall not exceed 5% from initial value.

Leakage Current

D.C. leakage current is measured at the specified temperature with a regulated power supply. A 1000 ohm resistor in series with each capacitor is used to limit the charging current. Leakage current should be read after the units have been stabilized at the specified temperature for one hour prior to an electrification period of five minutes at rated d.c. voltage. The leakage current at 25°C will not exceed 0.02μA/μFV.

Dissipation Factor

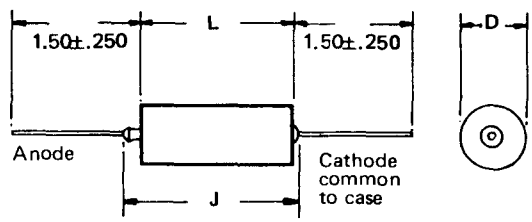
6% over the temperature range –80°C to +125°C.

Made in U.S.A.

SELECTION CHART

	6V d.c.	10V d.c.	15V d.c.	20V d.c.	35V d.c.
0.22 μF					SA-35-224
0.33					SA-35-334
0.47					SA-35-474
0.68					SA-35-684
1.0 μF					SA-35-105
1.5					SB-35-155
2.2				SA-20-225	SB-35-225
3.3			SA-15-335		SB-35-335
4.7		SA-10-475			SB-35-475
6.8	SA-6-685				SB-35-685
10.0 μF					SC-35-106
15.0				SB-20-156	SC-35-156
22.0			SB-15-226		SC-35-226
33.0		SB-10-336		SC-20-336	SD-35-336
47.0	SB-6-476			SC-20-476	SD-35-476
68.0			SC-15-686	SD-20-686	
100.0 μF		SC-10-107		SD-20-107	
150.0	SC-6-157		SD-15-157		
220.0		SD-10-227			
330.0	SD-6-337				

OUTLINE DRAWING



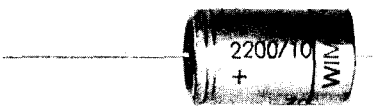
For further information ask for Waycom Ltd. Data Sheet

Wima® Printilyt 1 CAPACITORS

Aluminium Electrolytic

WAYCOM LIMITED

- ☐ Values 1µF to 10,000µF
- ☐ Voltages 6.3V d.c. to 63V d.c.
- ☐ IEC approved



TECHNICAL DATA

Temperature Range −40°C to + 85°C.

Construction Aluminium cylindrical case supplied with insulating sleeve. The electrodes are high purity etched aluminium foils with a dielectric oxide layer formed on the anode foil.

Leakage Current After 1 min. and 20°C

$I_L \leq (0.02\text{mfd} \times V \text{ rated} + 10)\mu A$

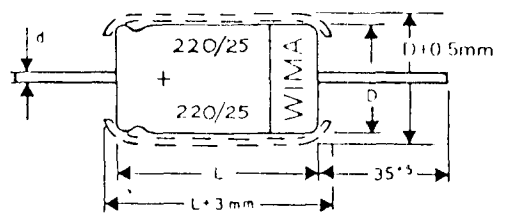
Dissipation Factor For values up to 1000µF. For greater capacitances increase the 50Hz values by 0.01 per 1000µF and the 100Hz values by 0.02µF. Measurements made at 20°C and 0.5V r.m.s.

Voltage (Volts d.c.)	Maximum Dissipation Factor	
	50Hz	100Hz
6/6.3	0.2	0.3
10	0.15	0.24
16	0.13	0.22
25	0.12	0.18
35	0.10	0.14
63	0.09	0.12

Leads Tinned copper wire. The cathode wire is welded to the case.

Marking Trade Mark, capacitance, voltage and a '+' sign, denoting the anode connection; to obviate mis-reading 6.3V as 63V these will be marked 6V.

Fig. 1 Capacitor Outline



Cap. mfd	Tolerance %	Voltage Rated Vd.c.	Voltage Peak Vd.c.	Dimensions D*	Dimensions L**	Dimensions d	Ripple Current (mA) 50Hz at 40° C
100	10	6.3	7	6.5	13	0.8	110
220	+50	6.3	7	8.5	17.5	0.8	190
470		6.3	7	10.5	21.5	0.8	320
1000		6.3	7	10.5	26.5	0.8	600
2200		6.3	7	14	31	0.8	1100
4700		6.3	7	18	31	0.8	1900
10000		6.3	7	20	41	0.8	3000
47	-10, +100	10	12	5.8	11	0.6	70
100		10	12	6.5	17.5	0.8	120
220	-10	10	12	8.5	17.5	0.8	220
470	+50	10	12	10.5	21.5	0.8	400
1000		10	12	12	26.5	0.8	650
2200		10	12	16	31	0.8	1400
4700		10	12	18	41	0.8	2300
22	-10, +100	16	18	4.5	11	0.5++	50
47	-10	16	18	6.5	13	0.8	100
100	+50	16	18	8.5	17.5	0.8	140
220		16	18	8.5	21.5	0.8	280
470		16	18	10.5	26.5	0.8	500
1000		16	18	12	31	0.8	850
2200		16	18	18	31	0.8	1600
4700		16	18	20	41	0.8	2700
22	-10, +100	25	30	5.8	11	0.6	50
47	-10	25	30	6.5	17.5	0.8	110
100	+50	25	30	8.5	17.5	0.8	160
220		25	30	10.5	21.5	0.8	340
470		25	30	12	26.5	0.8	600
1000		25	30	16	31	0.8	1100
2200		25	30	18	41	0.8	2000
4700		25	30	25	41	0.8	3200
10	-10, +100	35	40	4.5	11	0.5++	25
22	-10	35	40	6.5	13	0.8	70
47	+50	35	40	8.5	17.5	0.8	120
100		35	40	8.5	21.5	0.8	200
220		35	40	10.5	26.5	0.8	400
470		35	40	14	31	0.8	700
1000		35	40	18	31	0.8	1200
2200		35	40	20	41	0.8	2400
1	-10	63	70	4.5	11	0.5++	8
2.2	+100	63	70	4.5	11	0.5++	11
4.7		63	70	4.5	11	0.5++	30
10	-10	63	70	6.5	13	0.8	50
22	+50	63	70	8.5	17.5	0.8	90
47		63	70	8.5	21.5	0.8	150
100		63	70	10.5	26.5	0.8	280
220		63	70	14	31	0.8	550
470		63	70	18	31	0.8	950
1000		63	70	20	41	0.8	1700

‡ To obviate misreading 6.3V as 63V these will be marked 6V.
++ Anode lead 0.5mm; Cathode (can) lead 0.6mm.
* Without insulating sleeve. With sleeve add 0.5mm.
** Without insulating sleeve. With sleeve add 3.0mm.

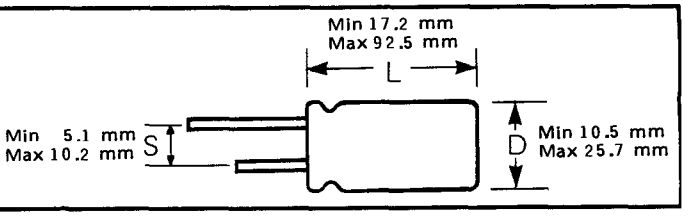
Manufactured by W. Westermann, W. Germany

SPRAGUE

Type 672D & 673D CAPACITORS

Aluminium Electrolytic

- Low ESR Limits – 10mΩ at 10kHz
- Very High Ripple Current Capability
- Very Low Inductance and Impedance Values in the 10kHz to 100kHz Range
- Extended Temperature Range –55°C to +105°C



STANDARD RATINGS/CASE CODES

Cap. µF	D-C Working Voltage (D-C Surge Voltage) 6.3V (9V)	7.5V (10V)	12V (16V)	15V (20V)	20V (30V)	25V (35V)	40V (55V)	50V (75V)	60V (85V)	75V (100V)	100V (150V)	150V (200V)	200V (250V)	250V (300V)
4.7	—	—	—	—	—	—	—	—	CC	CC	CC	—	—	—
5.6	—	—	—	—	—	—	—	—	CC	CC	CD	—	—	—
6.8	—	—	—	—	—	—	—	—	CC	CC	CD	—	—	—
8.2	—	—	—	—	—	—	—	—	CC	CC	CG	—	—	—
10	—	—	—	—	—	—	—	—	CC	CD	CG	—	—	—
12	—	—	—	—	—	—	—	—	CC	CD	—	—	—	—
15	—	—	—	**672D**	—	—	—	CC	CD	CG	—	—	—	GE
18	—	—	—	—	—	—	—	CC	CD	CG	—	—	GE	HE
22	—	—	—	—	—	—	CC	CD	CG	—	—	—	HE	HE
27	—	—	—	—	—	—	CC	CG	CG	—	DM	GE	HE	GJ
33	—	—	—	—	—	—	CC	CG	CG	DM	EK	HE	GJ	JE
39	—	—	—	—	—	—	CC	CG	DM	DM	DT	HE	GJ	HJ
47	CC	CC	CC	CC	CC	CC	CD	CG	DM	DM	DS	GJ	GL	GL
56	CC	CC	CC	CC	CC	CD	CG	—	DM	DT	ET	JE	HJ	GP
68	CC	CC	CC	CC	CD	CD	CG	—	DM	EK	ET	GL	JJ	HL
82	CC	CC	CC	CC	CD	CG	CG	DM	DT	EK	GJ	HJ	HL	HP
100	CC	CC	CC	CD	CG	CG	—	DT	EK	ET	JE	JJ	HP	JL
120	CC	CD	CD	CG	CG	—	DM	DT	DS	ET	HJ	HL	JL	JP
150	CD	CD	CG	CG	CG	—	DM	EK	ET	HE	GP	JL	JP	JS
180	CD	CG	CG	CG	—	—	DM	DS	HE	GJ	JJ	HS	JS	JT
220	CG	CG	CG	—	—	—	EK	ET	JE	JE	HL	JP	JT	—
270	CG	CG	DM	DM	DM	DM	DT	HE	GL	GL	JL	JS	—	—
330	CG	DM	DM	DM	DM	DT	ET	HE	GL	GP	HS	JT	—	—
390	DM	DM	DM	DM	DT	ET	DS	GJ	HJ	JJ	JP	—	—	—
470	DM	DM	DM	DT	EK	DS	HE	JE	JJ	HL	JS	—	—	—
560	DM	DM	DT	DT	DS	ET	GJ	GL	HL	JL	JT	—	—	—
680	DM	DT	DT	EK	ET	HE	JE	HJ	JL	HS	—	—	—	—
820	DT	ET	ET	DS	HE	JE	HJ	JJ	HS	JP	—	—	—	—
1,000	EK	ET	DS	ET	JE	JE	GP	HL	JP	JS	—	—	—	—
1,200	DS	ET	ET	HE	JE	GL	JJ	JL	JS	JT	—	—	—	—
1,500	ET	HE	JE	JE	GL	HJ	HP	JS	JT	—	—	—	—	—
1,800	HE	HE	JE	GL	HJ	JJ	JL	JP	—	—	—	—	—	—
2,200	JE	GJ	GL	HJ	JJ	HL	JP	JS	—	—	—	—	—	—
2,700	JE	JE	HJ	GP	HL	JL	JS	JT	—	—	—	—	—	—
3,300	GL	GL	JJ	JJ	HP	JS	JT	—	—	—	—	—	—	—
3,900	HJ	HJ	HL	HL	JL	JP	—	—	—	—	—	—	—	—
4,700	GP	JJ	HP	JL	JP	JS	—	—	—	—	—	—	—	—
5,600	JJ	HL	JL	HS	JS	JT	—	—	—	—	—	**673D**	—	—
6,800	HP	HP	JP	JP	JT	—	—	—	—	—	—	—	—	—
8,200	JL	HS	JS	JS	—	—	—	—	—	—	—	—	—	—
10,000	JP	JP	JT	JT	—	—	—	—	—	—	—	—	—	—
12,000	JS	JS	—	—	—	—	—	—	—	—	—	—	—	—
15,000	JT	JT	—	—	—	—	—	—	—	—	—	—	—	—

Indicates standard stock values.
Other values may be obtained on special request.

FOR FULL DATA – REQUEST ENGINEERING BULLETIN Z3452A

Type 35D Aluminium Electrolytic

SPRAGUE

- Large, IEC type 1, for power supplies etc.
- Similar to 071 & 072 series
- 22 uf to 47,000 uf
- 6.3V to 450V d.c.

GENERAL DESCRIPTION

Type 35D capacitors are purpose designed for applications in power supply filters and similar applications in instrumentation, radio communication and industrial control equipment.

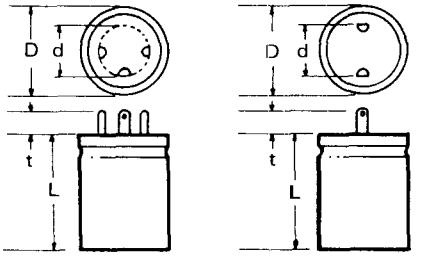
35D capacitors offer the designer ratings from 22μF to 47000μF, and DC voltages from 6.3V to 450V to meet most power supply and professional electronic requirements.

Cases sizes range from 21.5 x 51 to 40.5 x 82 mm.

Construction incorporates a pressure safety vent and solder coated terminals. PVC insulating sleeves are standard.

Case Sizes — Dimensions in mm.

Case Code	D±1*	L±2*	t	d
01	21.5	51.0	12	12
02	25.5	51.0	12	12
04	25.5	82.0	12	12
07	30.5	82.0	12	16
10	35.5	82.0	12	16
12	40.5	82.0	12	16



*Includes P.V.C. insulating sleeve

Type W 35D Mounting Clips — Dimensions in mm

Case Code	Part No.	A	B	E	J	K	L	N	Fig
01	62-4586-1A	50	32	21.5	2.0	13.0	18.0	16	1
02-/04	62-4586-1B	50	38	25.5	3.2	17.5	22.0	22	1
07	62-4586-3	60	48	35.5	3.2	17.2	22.2	19	2
10	62-4586-1D	65.5	53	41.0	4.0	24.0	29.5	19	1
12	62-4586-1E	Dimensions as per figure							1

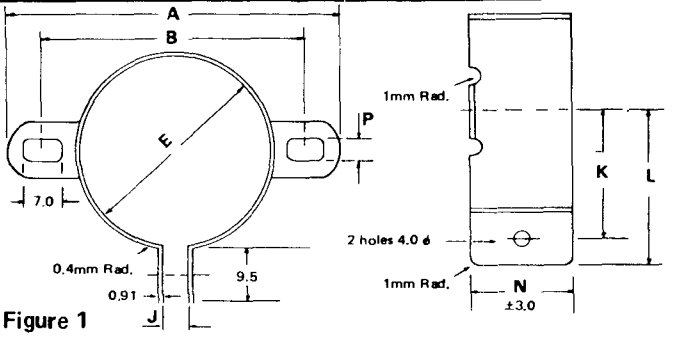


Figure 1

TECHNICAL DATA

Temperature Range

−40°C to +85°C.

DC Rated Voltage

The maximum operating voltage for continuous duty over the operating temperature range.

SurgeVoltage

The maximum voltage to which the capacitor should be subjected under any condition.

Capacitance and Tolerance

−10 +50%.

Equivalent Series Resistance

The ESR values listed are for both sections connected in parallel, where applicable, referred to 100Hz at 20°C.

DC Leakage Current

Maximum leakage current for any capacitor shall not exceed the value given by the following equation:

$$I = K \quad CV$$

where I is the leakage current in uA at +20°C
K is a constant
3 at 6.3 ... 100V
6 at 101 ... 450V
C is the rated capacitance in uF
V is the rated DC voltage

Operating Life

These capacitors are designed to meet the endurance requirements for IEC Type 1 aluminium electrolytic capacitors.

Ripple Current

All capacitors will withstand RMS ripple current at 100Hz and +70°C as listed in the standard rating tables. In the case of dual section capacitors, the maximum permissible ripple current per section is one half of the total current shown. For temperature and frequency derating contact sales office.

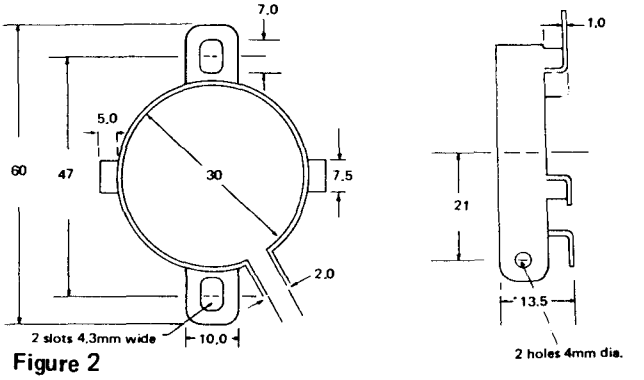


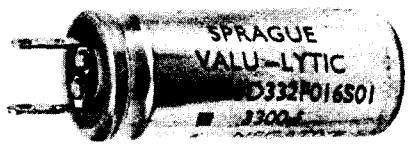
Figure 2

Manufactured in U.K.

SPRAGUE

Type 35 D Aluminium Electrolytic

- ☐ High ripple current capability
- ☐ Mounting clips available
- ☐ Operating temperature: – 40 to +85°C



Single Section Ratings

Cap Value µF	WVDC/SVDC	Case Code	Typ. ESR at +20°C 100 Hz	Max. RMS Ripple Current at + 70°C A	Part No.	Cap Value µF	WVDC/SVDC	Case Code	Typ. ESR at +20°C 100 Hz	Max. RMS Ripple Current at + 70°C A	Part No.
10 000		02	0.040	3.1	35D103F6R3S02	330		01	0.240	0.71	35D331F100S01
15 000		04	0.032	4.8	35D153F6R3S04	470		02	0.170	0.93	35D471F100S02
22 000	6.3/8	07	0.020	6.4	35D223F6R3S07	680	100/125	04	0.120	1.4	35D681F100S04
33 000		10	0.017	8.5	35D333F6R3S10	1 000		07	0.085	1.7	35D102F100S07
47 000		12	0.016	11.0	35D473F6R3S12	1 500		10	0.060	2.1	35D152F100S10
						2 200		12	0.046	2.8	35D222F100S12
4 700		01	0.058	1.9	35D472F010S01						
6 800		02	0.043	3.1	35D682F010S02	150		01	0.470	0.55	35D151F160S01
10 000		04	0.030	4.6	35D103F010S04	220		02	0.330	0.73	35D221F160S02
15 000	10/12	07	0.023	6.3	35D153F010S07	330	160/185	04	0.220	1.1	35D331F160S04
22 000		10	0.017	8.3	35D223F010S10	470		07	0.160	1.3	35D471F160S07
33 000		12	0.016	10.4	35D333F010S12	680		10	0.110	1.8	35D681F160S10
						1 000		12	0.081	2.2	35D102F160S12
3 300		01	0.063	1.9	35D332F016S01						
4 700		02	0.047	3.0	35D472F016S02	68		01	0.850	0.45	35D680F250S01
6 800		04	0.033	4.5	35D682F016S04	100		02	0.580	0.58	35D101F250S02
10 000		07	0.025	6.1	35D103F016S07	150	250/300	04	0.390	0.90	35D151F250S04
15 000	16/18.5	10	0.018	7.6	35D153F016S10	220		07	0.270	1.1	35D221F250S07
22 000		12	0.017	10.6	35D223F016S12	330		10	0.180	1.3	35D331F250S10
						470		12	0.130	1.8	35D471F250S12
2 200		01	0.067	1.7	35D222F025S01						
3 300		02	0.048	2.8	35D332F025S02	47		01	1.600	0.36	35D470F315S01
4 700		04	0.034	4.2	35D472F025S04	68		02	1.100	0.49	35D680F315S02
6 800	25/30	07	0.026	5.6	35D682F025S07	100	315/365	04	0.750	0.72	35D101F315S04
10 000		10	0.019	7.4	35D103F025S10	150		07	0.510	0.87	35D151F315S07
15 000		12	0.017	9.8	35D153F025S12	220		10	0.350	1.1	35D221F315S10
						330		12	0.240	1.3	35D331F315S12
1 000		01	0.093	1.6	35D102F040S01						
2 200		02	0.048	2.2	35D222F040S02	33		01	2.200	0.30	35D330F400S01
3 300		04	0.033	4.1	35D332F040S04	47		02	1.600	0.36	35D470F400S02
4 700	40/50	07	0.026	5.4	35D472F040S07	68	400/475	04	1.100	0.55	35D680F400S04
6 800		10	0.020	7.1	35D682F040S10	100		07	0.760	0.78	35D101F400S07
10 000		12	0.019	8.7	35D103F040S12	150		10	0.510	0.90	35D151F400S10
						220		12	0.350	1.0	35D221F400S12
680		01	0.100	1.4	35D681F063S01						
1 000		02	0.074	2.2	35D102F063S02	22		01	3.800	0.23	35D220F450S01
1 500		04	0.050	3.4	35D152F063S04	33		02	2.600	0.31	35D330F450S02
2 200	63/78	07	0.037	4.5	35D222F063S07	47	450/525	04	1.800	0.46	35D470F450S04
3 300		10	0.026	6.0	35D332F063S10	68		07	1.300	0.56	35D680F450S07
4 700		12	0.022	7.8	35D472F063S12	100		10	0.850	0.70	35D101F450S10
						150		12	0.570	0.72	35D151F450S12

Alternative Dual Section Ratings

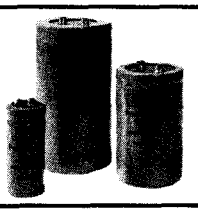
2x16 500	6.3/8	10	0.017	8.5	35D333F6R3D10	2x 750	100/125	10	0.060	2.1	35D152F100D10
2x23 500		12	0.016	11.0	35D473F6R3D12	2x 1 100		12	0.046	2.8	35D222F100D12
2x11 000	10/12	10	0.017	8.3	35D223F010D10	2x 340	160/185	10	0.110	1.8	35D681F160D10
2x16 500		12	0.016	10.4	35D333F010D12	2x 500		12	0.081	2.2	35D102F160D12
2x 7 500	16/18.5	10	0.018	7.6	35D153F016D10	2x 165	250/300	10	0.180	1.3	35D331F250D10
2x11 000		12	0.017	10.6	35D223F016D12	2x 235		12	0.130	1.8	35D471F250D12
2x 5 000	25/30	10	0.019	7.4	35D103F025D10	2x 110	315/365	10	0.350	1.1	35D221F315D10
2x 7 500		12	0.017	9.8	35D153F025D12	2x 165		12	0.240	1.3	35D331F315D12
2x 3 400	40/50	10	0.020	7.1	35D682F040D10	2x 75	400/475	10	0.510	0.90	35D151F400D10
2x 5 000		12	0.019	8.7	35D103F040D12	2x 110		12	0.350	1.00	35D221F400D12
2x 1 650	63/78	10	0.026	6.0	35D332F063D10	2x 50	450/525	10	0.850	0.70	35D101F450D10
2x 2 350		12	0.022	7.8	35D472F063D12	2x 75		12	0.570	0.72	35D151F450D12

We reserve the right to ship either single or dual section capacitors unless specified otherwise.

Type 36 D Aluminium Electrolytic

SPRAGUE

- Large, computer grade, with high ripple current ratings
- Special safety vent
- –40°C to +85°C



GENERAL DATA

Powerlytic capacitors are especially designed and rated for use in computer power supplies, industrial control equipment, energy storage applications and similar uses. Type 36D ratings are listed opposite and are also rated for continuous operation at temperatures of –40°C to + 85°C with RMS ripple currents of up to 20 amperes. In addition, they are designed to meet the requirements of EIA Standard RS-395.

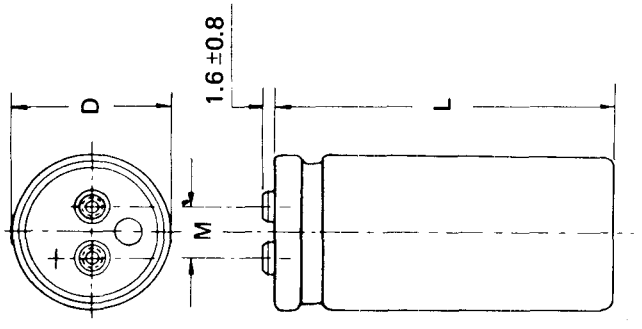
Standard Powerlytic capacitors are furnished in case sizes with diameters from 35mm to 76mm and with can heights ranging up to 219mm.

Pressure type safety vents employing silicone rubber are used on all case covers.

Powerlytic capacitors are supplied with an outer plastic-film insulation.

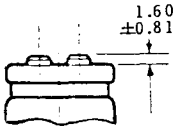
Dimensions in mm

Case Code	D ±0.8	L ±1.6	M +0.4 -2.0	Typical Weight in gr.
AA	34.9	54.0	12.7	62
AB	34.9	79.4	12.7	105
AC	34.9	104.8	12.7	140
AF	34.9	142.9	12.7	200
BB	50.8	79.4	22.2	210
BC	50.8	104.8	22.2	300
BF	50.8	142.9	22.2	410
CC	63.5	104.8	28.6	490
CF	63.5	142.9	28.6	670
DC	76.2	104.8	31.8	700
DF	76.2	142.9	31.8	1000
DJ	76.2	219.1	31.8	1400

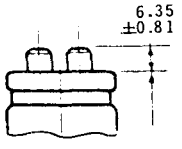


TERMINALS

Standard (A)
Low screw-insert terminal



Optional (B)
High screw-insert terminal



Option 'B' to special request only

TECHNICAL DATA

Temperature Range

–40°C to +85°C.

DC Working Voltage

The maximum operating voltage for continuous duty.

Surge Voltage

The maximum voltage to which the capacitor should be subjected under any conditions.

Tolerance

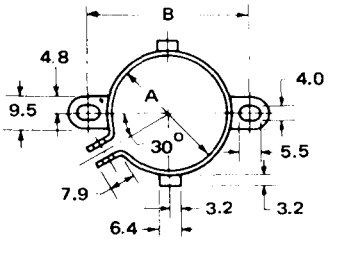
WVDC	Tolerance
3 to 100	+75 – 10%
101 to 450	+50 – 10%

Equivalent Series Resistance

The equivalent series resistance in ohms shall not exceed the values listed in the tables opposite.

Note: Contact Sales Office for capacitance values in the 36DS and 36DX ranges.

Case Code	Part Number	A	B	C	Figure Number
A	4586-97A	34.9	45.2	56.3	1
B	4586-4B	50.8	63.5	63.5	2
C	4586-1	63.5	76.2	85.7	2
D	4586-2	76.2	88.9	98.4	2



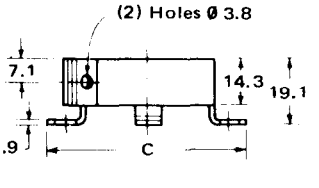
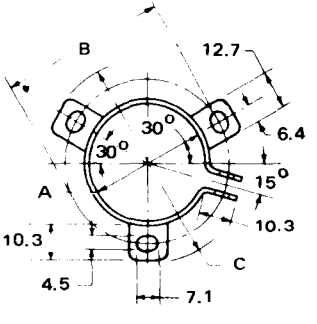


Figure 1



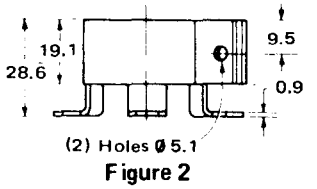


Figure 2

Manufactured in U.K.

SPRAGUE

Type 36D Aluminium Electrolytic

- Capacitance range 50uF to 160,000uF
- Voltage range: 10V to 450V D.C.
- Mounting clips available

Cap. µF	WVDC SVDC	Case Code	Max. ESR 120Hz	Max. RMS Ripple Current ±65°C 120Hz A	Part No.
6 000		AA	0.020	2.1	36D602G010AA2A
12 000		AB	0.17	3.5	36D123G010AB2A
18 000		AC	0.11	4.7	36D183G010AC2A
27 000		AF	0.074	6.8	36D273G010AF2A
28 000		BB	0.074	7.8	36D283G010BB2A
42 000	10/12	BC	0.052	8.8	36D423G010BC2A
63 000		BF	0.034	12.1	36D633G010BF2A
72 000		CC	0.034	12.2	36D723G010CC2A
100 000		CF	0.025	16.4	36D104G010CF2A
100 000		DC	0.025	16.4	36D104G010DC2A
160 000		DF	0.020	19.8	36D164G010DF2A
4 600		AA	0.34	2.1	36D462G015AA2A
9 200		AB	0.17	3.5	36D922G015AB2A
13 000		AC	0.11	4.6	36D133G015AC2A
20 000		AF	0.078	6.5	36D203G015AF2A
21 000		BB	0.076	6.5	36D213G015BB2A
31 000	15/18	BC	0.054	8.7	36D313G015BC2A
47 000		BF	0.036	12.0	36D473G015BF2A
54 000		CC	0.034	12.1	36D543G015CC2A
80 000		DC	0.029	15.0	36D803G015DC2A
81 000		CF	0.030	15.0	36D813G015CF2A
120 000		DF	0.022	18.9	36D124G015DF2A
2 700		AA	0.36	2.0	36D272G025AS2A
5 500		AB	0.18	3.3	36D552G025AB2A
8 200		AC	0.12	4.5	36D822G025AC2A
12 000		AF	0.082	6.3	36D123G025AF2A
18 000	25/30	BC	0.054	8.4	36D183G025BC2A
28 000		BF	0.036	11.8	36D283G025BF2A
32 000		CC	0.036	12.1	36D323G025CC2A
47 000		DC	0.029	15.0	36D473G025DC2A
48 000		CF	0.028	15.5	36D483G025CF2A
55 000		DD	0.027	15.6	36D553G025DD2A
71 000		DF	0.022	19.4	36D713G025DF2A
2000		AA	0.37	2.0	36D202G030AA2A
4 000		AB	0.19	3.2	36D402G030AB2A
6 000		AC	0.12	4.5	36D602G030AC2A
9 300		AF	0.084	6.1	36D932G030AF2A
9 500		BB	0.082	6.2	36D952G030BB2A
14 000	30/40	BC	0.056	8.3	36D143G030BC2A
21 000		BF	0.038	10.7	36D213G030BF2A
24 000		CC	0.036	11.8	36D243G030CC2A
36 000		DC	0.031	14.9	36D363G030DC2A
37 000		CF	0.030	15.9	36D373G030CF2A
54 000		DF	0.022	19.3	36D543G030DF2A
250		AA	1.0	1.2	36D251F200AA2A
430		AB	0.50	2.0	36D431F200AB2A
640		AC	0.34	2.7	36D641F200AC2A
950		AF	0.23	3.9	36D951F200AF2A
1 400	200/250	BC	0.15	5.1	36D142F200BC2A
2 100		BF	0.10	7.3	36D212F200BF2A
2 500		CC	0.096	7.3	36D252F200CC2A
3 700		CF	0.064	10.5	36D372F200CF2A
3 700		DC	0.064	10.5	36D372F200DC2A
5 500		DF	0.050	13.0	36D552F200DF2A
170		AA	1.2	1.2	36D171F250AA2A
350		AB	0.58	1.8	36D351F250AB2A
530		AC	0.38	2.5	36D531F250AC2A
780		AF	0.26	3.3	36D781F250AF2A
800		BB	0.26	3.5	36D801F250BB2A
1 200	250/300	BC	0.17	4.7	36D122F250BC2A
1 700		BF	0.12	6.7	36D172F250BF2A
2 000		CC	0.11	6.9	36D202F250CC2A
3 000		CF	0.072	9.8	36D302F250CF2A
3 000		DC	0.071	9.9	36D302F250DC2A
4 500		DF	0.054	12.4	36D452F250DF2A
1 800		AA	0.38	2.0	36D182G040AA2A
3 600		AB	0.19	3.2	36D362G040AB2A
5 500		AC	0.13	4.4	36D552G040AC2A
8 300		AF	0.086	6.0	36D832G040AF2A
8 400		BB	0.086	6.1	36D842G040BB2A
12 000	40/50	BC	0.058	8.2	36D123G040BC2A
19 000		BF	0.038	11.5	36D193G040BF2A
21 000		CC	0.038	11.5	36D213G040CC2A
31 000		DC	0.032	14.8	36D313G040DC2A
32 000		CF	0.032	15.6	36D323G040CF2A
48 000		DF	0.024	18.9	36D483G040DF2A
1 300		AA	0.40	1.8	36D132G050AA2A
2 600		AB	0.20	3.1	36D262G050AB2A
3 900		AC	0.13	4.3	36D392G050AC2A
5 900		AF	0.092	6.0	36D592G050AF2A
6 000		BB	0.090	6.1	36D602G050BB2A
9 000	50/65	BC	0.062	8.1	36D902G050BC2A
13 000		BF	0.040	11.2	36D144G050BF2A
15 000		CC	0.040	11.3	36D153G050CC2A
22 000		DC	0.031	14.7	36D223G050DC2A
23 000		CF	0.030	15.5	36D233G050CF2A
34 000		DF	0.024	18.7	36D343G050DF2A
850		AA	0.45	1.8	36D851G075AA2A
1 700		AB	0.23	3.0	36D172G075AB2A
2 500		AC	0.15	4.0	36D252G075AC2A
3 800		AF	0.10	5.9	36D382G075AF2A
3 900		BB	0.090	6.7	36D392G075BB2A
5 900	75/95	BC	0.068	7.5	36D592G075BC2A
8 800		BF	0.046	10.8	36D882G075BF2A
10 000		CC	0.046	10.6	36D103G075CC2A
14 000		DC	0.034	13.6	36D143G075DC2A
15 000		CF	0.034	13.4	36D153G075CF2A
22 000		DF	0.026	18.2	36D223G075DF2A
450		AA	0.62	1.5	36D415G100AA2A
900		AB	0.31	2.5	36D901G100AB2A
1 300		AC	0.21	3.5	36D132G100AC2A
2 000		AF	0.14	5.0	36D202G100AF2A
3 000	100/125	BC	0.094	6.3	36D302G100BC2A
4 500		BF	0.062	9.1	36D452G100BF2A
55 300		CC	0.060	9.2	36D532G100CC2A
7 800		CF	0.044	12.1	36D782G100CF2A
7 800		DC	0.043	12.1	36D782G100DC2A
11 000		DF	0.034	14.2	36D113G100DF2A
95		AA	2.2	0.82	36D950F350AA2A
190		AB	1.1	1.4	36D191F350AB2A
290		AC	0.73	1.8	36D291F350AC2A
420		BB	0.50	2.5	36D421F350BB2A
440		AF	0.32	3.3q	36D441F350AF2A
650	350/400	BC	0.33	3.5	36D651F350BC2A
1 000		BF	0.22	4.8	36D102F350BF2A
1 100		CC	0.20	5.1	36D112F350CC2A
1 600		DC	0.14	6.9	36D162F350DC2A
1 700		CF	0.14	7.2	36D172F350CF2A
2 500		DF	0.098	9.2	36D252F350DF2A
50		AA	5.2	0.52	36D500F450AA2A
100		AB	2.6	0.86	36D101F450AB2A
140		AC	1.7	1.2	36D141F450AC2A
210		AF	1.2	1.6	36D211F450AF2A
220		BB	1.1	1.7	36D221F450BB2A
330	450/525	BC	0.75	2.2	36D331F450BC2A
490		BF	0.50	3.2	36D491F450BF2A
570		CC	0.45	3.3	36D571F450CC2A
850		CF	0.30	4.7	36D851F450CF2A
860		DC	0.31	4.5	36D861F450DC2A
1 200		DF	0.21	6.3	36D122F450DF2A

Shows stock items

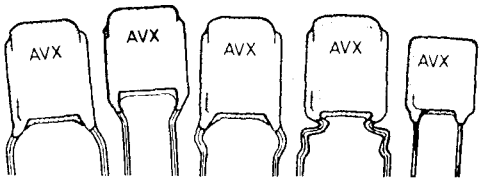
Manufactured in UK

AVX SKYCAP®

Monolithic Ceramic

WAYCOM LIMITED

- 3 Temperature Coefficients
- 10pF to 2.2uF
- 50V and 100V
- Environmental performance to MIL-C-11015 or MIL-C-20



Range and Dimensions
General Information

SkyCap AVX 3400 Series Dipped Monolithic Three Temperature Coefficients
Available in 50 Volts and 100 Volt rating. See Price List for standard stock values and rating. **Case Material:** Epoxy (Flame retardant to UL Bulletin 492, Para. 280) **Lead Material:** Copper Solder Coated

Marking is as size permits in descending order: Capacitance and Tolerance AVX Voltage Rating Temperature Coefficient

AVX Style: 3418, 3429, 3430, 3431, 3432 3439, 3440 **Voltages:** 50V=050, 100V=100 **Temp. Coefficient:** COG=A, X7R=C, Z5U=E **Sig. Fig. of Capacitance and Multiplier:** First two digits are the significant figures of capacitance. Third digit indicates the additional number of zeros. For example, order 560pf as 561. (For values below 10pf, use "R" in place of decimal point, e.g., 5R6=5.6pf). **Capacitance Tolerance:** COG: K= 10%, X7R: M= 20% Z5U: M= 20%

Capacitance Range	Temp coeff A			Temp coeff C			Temp coeff E		
	Size	Volt	Tol	Size	Volt	Tol	Size	Volt	Tol
10pF	3418	100V	10%						
47pF	3418	100V	10%						
100pF	3418	100V	10%						
470pF	3429	100V	10%						
1000pF	3429	100V	10%	3418	100V	10%			
2200pF	3429	100V	10%	3418	100V	10%			
4700pF	3430	100V	10%	3418	50V	10%			
10,000pF				3429	50V	10%	3418	50V	20%
22,000pF				3429	100V	10%	3418	50V	20%
47,000pF				3439	100V	10%	3429	100V	20%
68,000pF							3429	100V	20%
100,000pF				3429	50V	10%	3429	100V	20%
100,000pF				3430	100V	10%	3430	50V	20%
100,000pF				3439	50V	10%	3439	50V	20%
220,000pF				3430	50V	10%	3429	50V	20%
470,000pF				3432	100V	10%	3430	100V	20%
1.0 MFD							3430	50V	20%
2.2 MFD							3432	100V	20%

HOW TO ORDER

(example) 3439 050 A 56 1 M

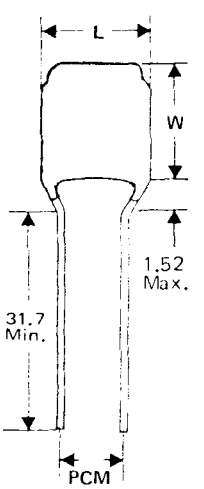
- AVX Style
- Voltage
- Temperature Coefficient
- Sig. Figures of Capacitance
- Multiplier (Additional no. of zeros)
- Capacitance Tolerance

Capacitance Change and Characteristics
COG: NPO ±30ppm/°C
X7R: ± 15% over temp, range
Z5U: +22%, −56% over +10 to 85°C

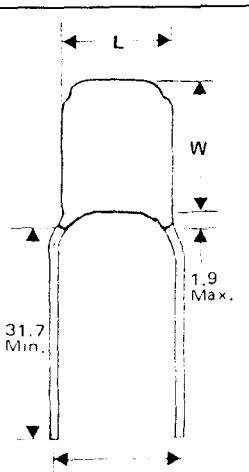
NOTE. OTHER VALUES & STYLES ARE AVAILABLE UPON REQUEST.

Style	Dimensions in mm L Max.	W Max.	T Max.	PCM ±.76	Awg Dia.
3418	3.81	3.81	2.54	2.54	24/0.5
3429	5.08	5.08	3.18	2.54	24/0.5
3430	7.62	7.62	3.81	5.08	24/0.5
3432	12.70	12.70	5.08	10.16	22/0.6
3439	5.08	5.08	3.18	5.08	24/0.5

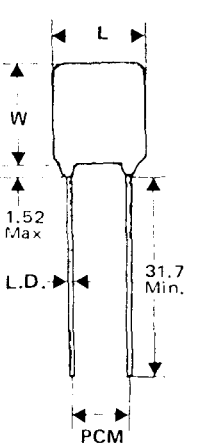
Manufactured in England.



Style 3432



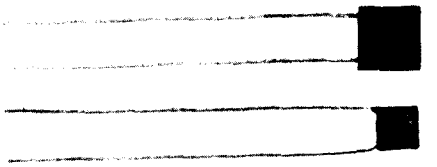
Style 3439



Styles 3418, 3429 and 3430

WAYCOM LIMITED

- ☐ Qualified to MIL-C-11015D
- ☐ 10pF to 1 mfd
- ☐ 50V, 100V & 200V d.c.

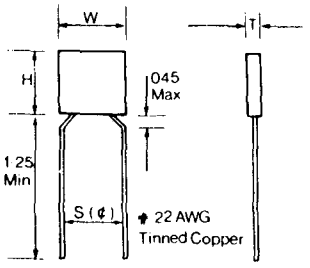


General Specifications
Capacitance Range: 10pF–1mfd

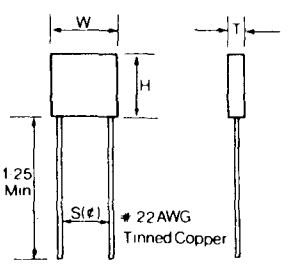
Capacitance Tolerance:
Standard ± 10%
Voltage Rating:
See table opposite

Temperature Range: –55°C to +125°C (without derating)
Note: CK05 (10–1,000 pF) and CK06 (1,200–10,000 pF) are dual-rated and have the capability of operation at –55°C to +125°C and –55°C to +150°C
Temperature Characteristic:
–15% at O.V.D.C. and + 15% – 25% at rated voltage
Recommended circuit: (CK05) .0785 in. (CK06) .0466 in., board hole diameter L (drill No.47) (drill No.56) for Flush Fitting:

CK05



CK06



MIL Type	CK05	CK06
H(±010")	.190"	.290"
W(±010")	.190"	.290"
T(±010")	.090"	.090"
S(±015")	.200"	.200"

NOTE: Items marked * are standard stock products.

Manufactured in U.K./ U.S.A.

Capacity Value (PF)	Type	D.C. Volt	Capacity Value (PF)	Type	D.C. Volt
10*	CK05BX100	200	1200*	CK06BX122	200
12	CK05BX120	200	1500	CK06BX152	200
15	CK05BX150	200	1800	CK06BX182	200
18	CK05BX180	200	2200	CK06BX222	200
22	CK05BX220	200	2700	CK06BX272	200
27	CK05BX270	200	3300	CK06BX332	200
33	CK05BX330	200	3900	CK06BX392	200
39	CK05BX390	200	4700*	CK06BX472	200
47*	CK05BX470	200	5600	CK06BX562	200
56	CK05BX560	200	6800	CK06BX682	200
68	CK05BX680	200	8200	CK06BX822	200
82	CK05BX820	200	10000*	CK06BX103	200
100*	CK05BX101	200	12000	CK06BX123	100
120	CK05BX121	200	15000	CK06BX153	100
150	CK05BX151	200	18000	CK06BX182	100
180	CK05BX181	200	22000*	CK06BX223	100
220	CK05BX221	200	27000	CK06BX273	100
270	CK05BX271	200	33000	CK06BX333	100
330	CK05BX331	200	39000	CK06BX393	100
390	CK05BX391	200	47000*	CK06BX473	100
470*	CK05BX471	200	56000	CK06BX563	100
560	CK05BX561	200	68000	CK06BX683	100
680	CK05BX681	200	82000	CK06BX823	100
820	CK05BX821	200	100000*	CK06BX104	100
1000*	CK05BX102	200	120000	CK06BX124	50
1200	CK05BX122	100	150000	CK06BX154	50
1500	CK05BX152	100	180000	CK06BX184	50
1800	CK05BX182	100	220000	CK06BX224	50
2200*	CK05BX222	100	270000	CK06BX274	50
2700	CK05BX272	100	330000	CK06BX334	50
3300	CK05BX332	100	390000	CK06BX394	50
3900	CK05BX392	100	470000	CK06BX474	50
4700*	CK05BX472	100	560000	CK06BX564	50
5600	CK05BX562	100	680000	CK06BX684	50
6800*	CK05BX682	100	820000	CK06BX824	50
8200	CK05BX822	100	1.0Mfd	CK06BX105	50
10000*	CK05BX103	100			
12000	CK05BX123	50			
15000	CK05BX153	50			
18000	CK05BX183	50			
22000*	CK05BX223	50			
27000	CK05BX273	50			
33000	CK05BX333	50			
39000	CK05BX393	50			
47000*	CK05BX473	50			
56000	CK05BX563	50			
68000*	CK05BX683	50			
B2000	CK05BX823	50			
100000*	CK05BX104	50			

Socket strips & adaptor boards

ASTRALUX

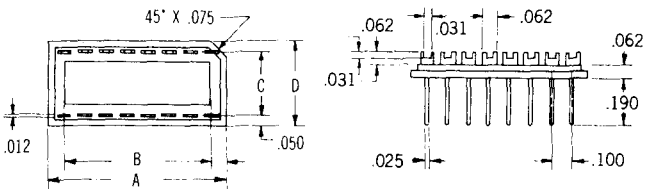
- Adaptor boards & covers
- Two piece socket strips
- Compatible with I.C. sockets

MPB SERIES—MOULDED

Header and cover material: glass filled nylon.
Pins: gold plated brass.

Adaptor wiring boards or 'headers' allow discrete components to be wired and plugged into standard D.I.L. sockets.

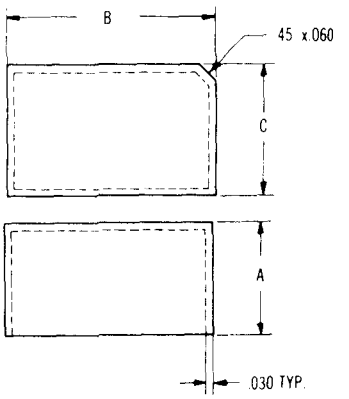
Part No.	Dim. A	Dim. B	Dim. C	Dim. D	No. of Contacts
MPB-143	.750	.600	.300	.400	14
MPB-148	.750	.600	.800	.900	14
MPB-163	.850	.700	.300	.400	16
MPB-168	.850	.700	.800	.900	16
MPB-246	1.245	1.100	.600	.795	24



MPB ADAPTOR BOARD

MPC COVERS

Part No.	A	B	C
MPC-143-1	.160	.750	.470
MPC-143-2	.400	.750	.470
MPC-163-1	.160	.850	.470
MPC-163-2	.400	.850	.470
MPC-246-1	.160	1.245	.795
MPC-246-2	.400	1.245	.795



MPC COVERS

UNIVERSAL SOCKET STRIPS

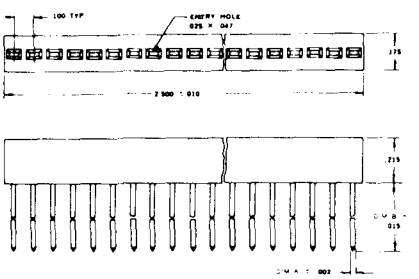
Body Moulding
One piece glass-filled nylon — 0.175" wide.

Contacts
Beryllium copper. Finish .00003" gold over nickel. Standard strip has 25 contacts with leads on 0.1" spacing and accepts leads up to .025" dia.

Mounting
Strips may be butted end-to-end maintaining 0.1" pitch over any length. Strips may also be cut to smaller sizes if required.

Solder and Wirewrap styles

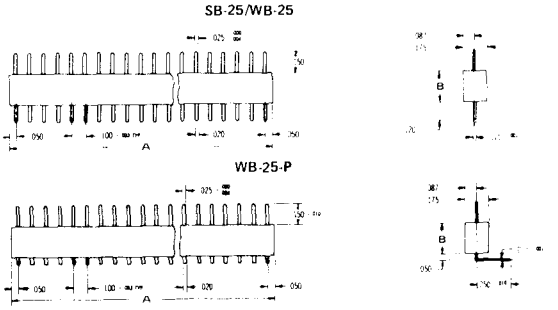
Part No.		A	B
WB-25	For Wire Wrap	.025 sq.	.625
SB-25	For Dip Solder	.005 x .025	.140



SB-25/WB-25

MATING HEADERS

Part No.		A	B
WB-25-P	Straight	2.500	.215
WB-25-PR	Right angle	2.500	.215



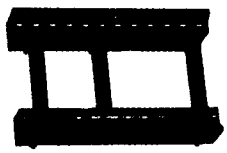
WB-25-P

WB-25-PR

Manufactured in U.S.A.

ASTRALUX

- ☐ D.I.L. sockets
- ☐ Gold or Tin plated leads
- ☐ "Side-wipe" contacts



Part No.	Detail	No. of Contacts	DIM. A	DIM. B	DIM. C	DIM. D
ICN-063-S3	A	6	.295 *(7.49)*	.300 *(7.62)*	.405 *(10.28)*	— —
ICN-083-S3	A	8	.395 *(10.03)*	.300 *(7.62)*	.405 *(10.28)*	— —
ICN-143-S3	A	14	.695 *(17.65)*	.300 *(7.62)*	.405 *(10.28)*	.113 *(2.87)*
ICN-163-S3	A	16	.795 *(20.19)*	.300 *(7.62)*	.405 *(10.28)*	.163 *(4.14)*
ICN-183-S3	A	18	.895 *(22.73)*	.300 *(7.62)*	.405 *(10.28)*	.213 *(5.41)*
ICN-203-S3	A	20	.995 *(25.27)*	.300 *(7.62)*	.405 *(10.28)*	.263 *(6.68)*
ICN-224-S4	B	22	1.095 *(27.81)*	.400 *(10.16)*	.575 *(14.61)*	— —
ICN-246-S4	B	24	1.195 *(30.35)*	.600 *(15.24)*	.775 *(19.68)*	— —
ICN-286-S4	B	28	1.395 *(35.43)*	.600 *(15.24)*	.775 *(19.68)*	— —
ICN-406-S4	B	40	1.995 *(50.67)*	.600 *(15.24)*	.775 *(19.68)*	— —
ICN-649-S5	C	64	3.195 *(81.15)*	.900 *(22.86)*	1.075 *(27.31)*	— —

NOTE: For ICY option, substitute ICY for ICN in part number, tin option only.

TECHNICAL DATA

BODY: Black polyester, glass-filled, except ICY is tan

CONTACTS: Phosphor bronze, except ICY is copper alloy #260

CONTACT FINISH: ICN series 10 μ inch *(.254 μ m)* min. gold over 50 μ inch *(1.27 μ m)* min. nickel

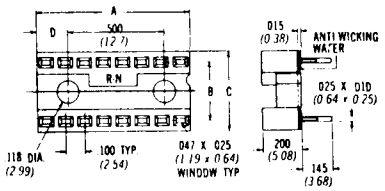
ICY series 200 μ inch *(5.08 μ m)* min. tin over copper strike

TEMPERATURE RANGE: −65°C to +125°C

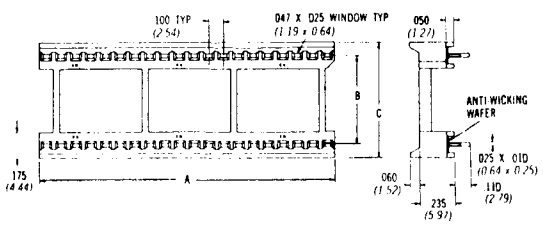
PCB HOLE: .035 ± .002" *(0.89 ± 0.05)*

LOCATION: Socket leads are offset .026" *(0.66)* from IC leads.

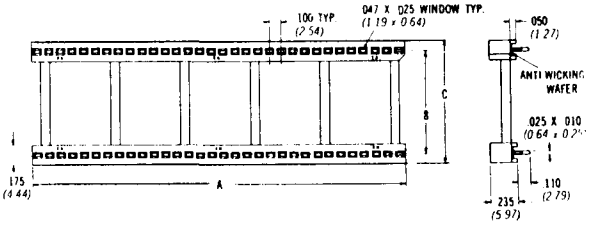
In. *(mm)* **DETAIL A**



DETAIL B



DETAIL C



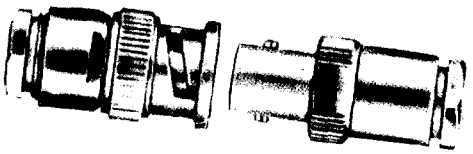
Manufactured in U.S.A.

CONNECTORS

Series BNC coaxial

GREENPAR

- Complies with DEF 5322–A
- Interchangeable with U.S. MIL-C-3608
- 50Ω and 75Ω versions



INTRODUCTION

The Greenpar Series BNC, small, bayonet-lock, coaxial connectors comply in all respects to the Ministry Specification DEF 5322-A. All items are fully interchangeable with BNC connectors made to U.S. Military Specification MIL-C-3608, Available in 50 or 75ohms impedance for use with an extensive range of British uniradio and American R.G. cables.

ELECTRICAL INFORMATION

The V.S.W.R. will not exceed 1.20 at 4000mhz
Working voltage: 500V peak **Voltage proof:** 2000V peak
Temperature range; -55^{o} to $+150^{o}$C

MECHANICAL INFORMATION

All metal parts are fully machined brass, except for female contacts, which are heat treated beryllium copper, and are bright silver-plated to Specification DTD 919B and Argalin passivated to prevent oxidisation.

All insulating parts are made from P.T.F.E. unless otherwise specified.

Sealing gaskets are made from silicone rubber.

CABLE INFORMATION

Outlet style C10	UR 43, 72, 76 RG 55B/U, 141A/u, 142A/u, 223/u BICC, T3010
Outlet style C12	UR 41, 56, 70, 84 Telecon, PTIYM
Outlet style C25	UR 90, 96, 104 RG 59B/u, 62A/u, 71B/u BICC, RPC 2896

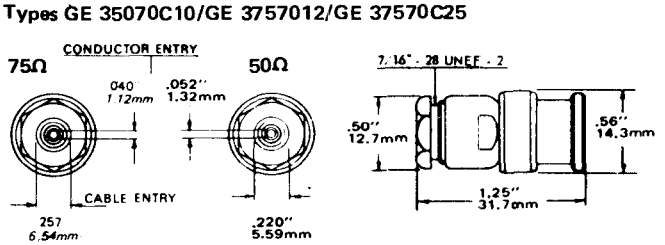
BNC 50 Ohms	Description
GE 35002C10	Elbow Plug
GE 35007H	Panel Socket
GE 35008	Bulkhead Socket
GE 35013 *	Bulkhead Socket
GE 35027	Bulkhead Socket
GE 35028 *	Elbow Adaptor
GE 35031	T – Adaptor
GE 35032 *	Straight Adaptor
GE 35034	Straight Adaptor
GE 35039C10	Bulkhead Jack
GE 35060C10	Jack
GE 35070C10	Plug
GE 35141D10	Plug (crimped)

*Limited to exsisting inventory only

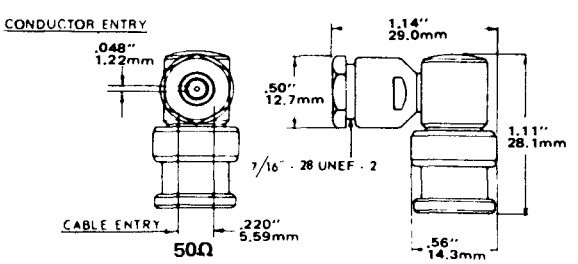
BNC 75 ohms	Description
GE 37502C10	Elbow Plug
GE 37507H	Panel Socket
GE 37527	Bulkhead Socket
GE 37560C12	Jack
GE 37570C12	Plug
GE 37570C25	Plug
BNC accessories	
GE 30001	Cap & Chain
ST 100539	Nylon Bush
ST 101503	Solder Tag

OUTLINE DRAWINGS–BNC 50Ω and 75Ω

Types GE 35070C10/GE 3757012/GE 37570C25



Types GE 35002C10/GE 37502C12/GE 37502C25



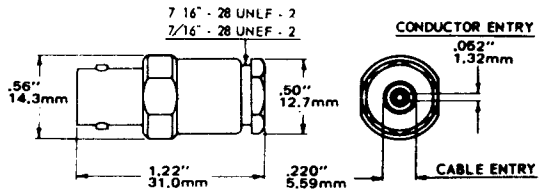
Manufactured in U.K.

GREENPAR

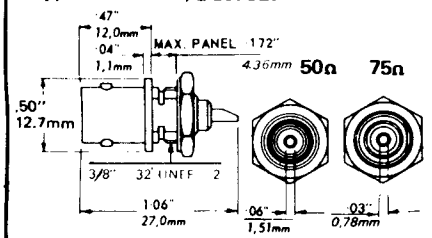
Series BNC Coaxial

- ☐ Cable information given where applicable
- ☐ Bright silver-plated to spec DTD919B
- ☐ Preferred range

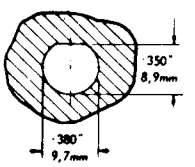
Types GE35060C10 †



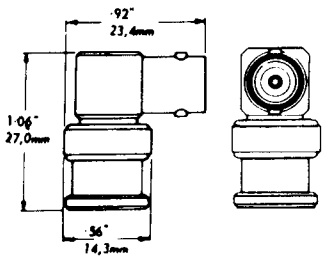
Types GE35027 /GE37527



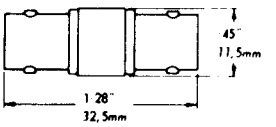
Panel Piercing



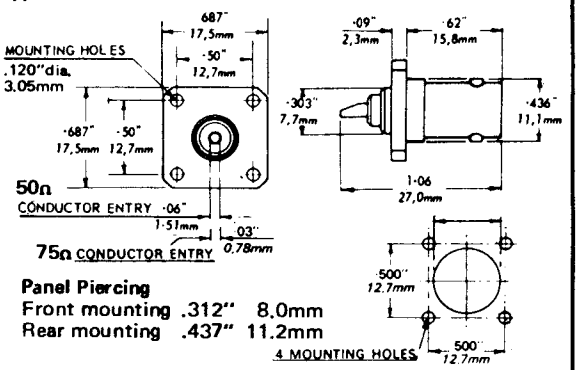
Type GE 35028



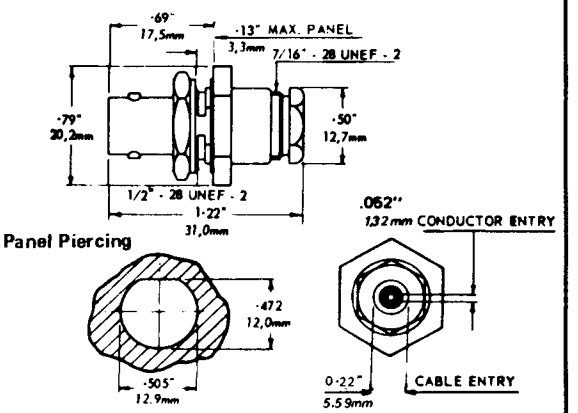
Types GE35034



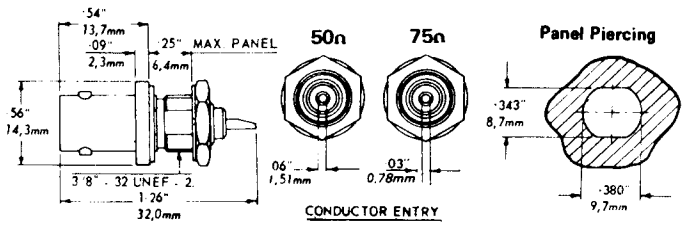
Types GE35007H/ GE37507H



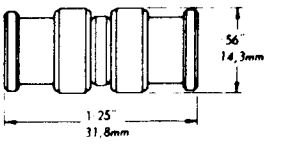
Type GE35039C10†



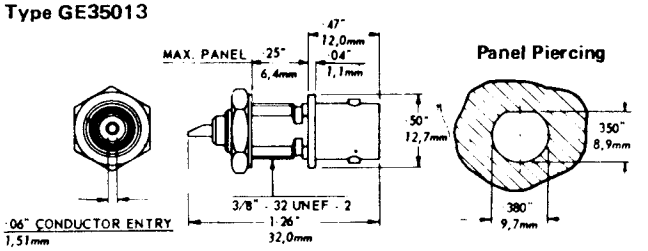
Types GE35008



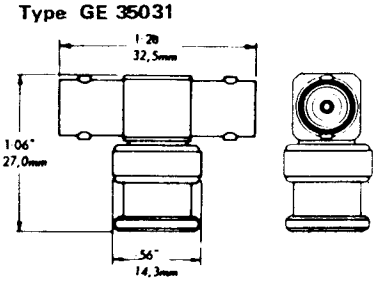
Types GE35032



Type GE35013



Type GE 35031

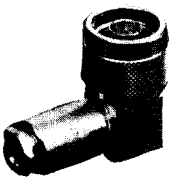


Manufactured in U.K.

Series N50Ω Coaxial

GREENPAR

- ☐ Meets U.S. MIL–C–39012
- ☐ Type V.S.W.R. of 1.05 @ 4,000 MHz
- ☐ Working voltage 1000V r.m.s.

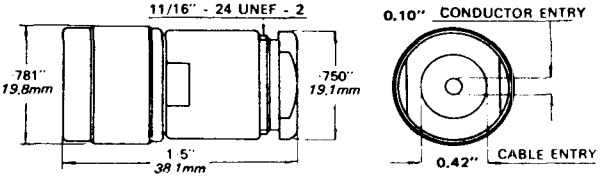


Type	Description	Type	Description
GE 15003C1	Elbow Plug	GE 15015C1	Plug
GE 15007H	Panel Socket	GE 15022C1	Jack
GE 15008 *	T Adaptor	GE 15055C10	Plug
GE 15009 *	Elbow Adaptor	GE 15074C10	Elbow Plug

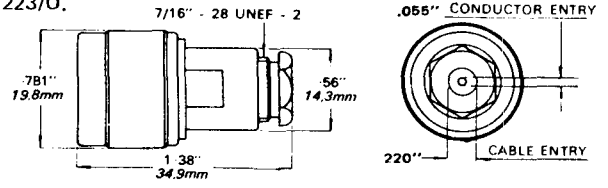
* Limited to existing inventory only

OUTLINE DRAWINGS

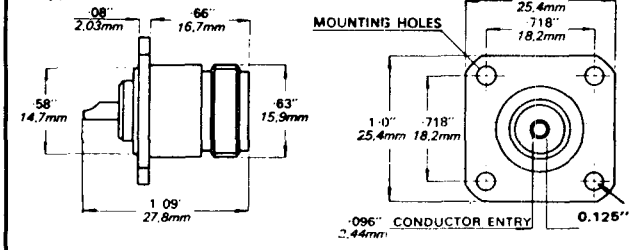
Type: GE 15015C1
Captive contact soldered–pressure sleeve cable clamp.
Cables: UR4 & 67



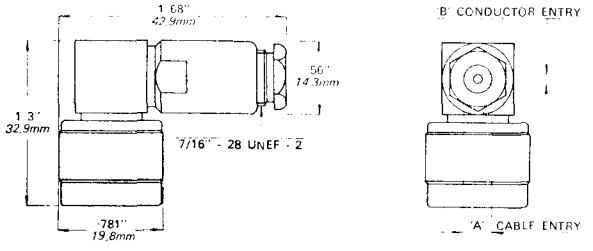
Type GE 15055C 10
Captive contact soldered–pressure sleeve cable clamp.
Cables: UR43, 76; RG55B/U, 58C/U 141A/U, 142A/U, 223/U.



Type GE 15007H



Type GE 15074C10
Captive contact soldered–pressure sleeve cable clamp.
Cables: UR43, 76; RG55B/U, 58C/U, 141A/U, 223/U; BICC T3010



INTRODUCTION

The Greenpar Series N, screw coupling co-axial connectors are fully interchangeable with N connectors made to U.S. MIL–C–39012. N Series is supplied in 50 ohm impedance for use with an extensive range of British Uniradio and American RG Cables. A selection of these cables may also be obtained from Comway.

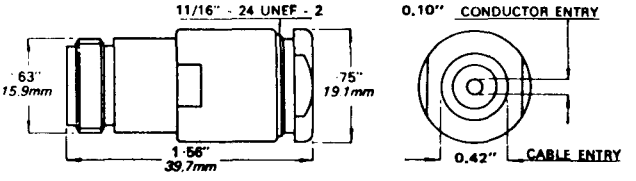
MECHANICAL INFORMATION

Details in the BNC Section also applies to N Series, (see pg. 26).

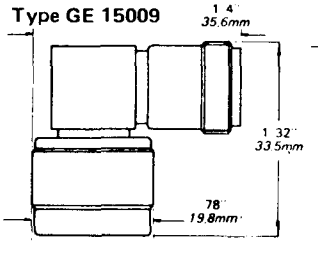
ELECTRICAL INFORMATION

Voltage Proof: 2000V.r.m.s.
Temperature Range: –55°C to +150°C

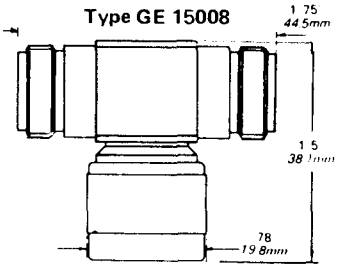
Type GE 15022C1
Captive contact soldered–pressure sleeve cable clamp.
Cables: UR4 & 67



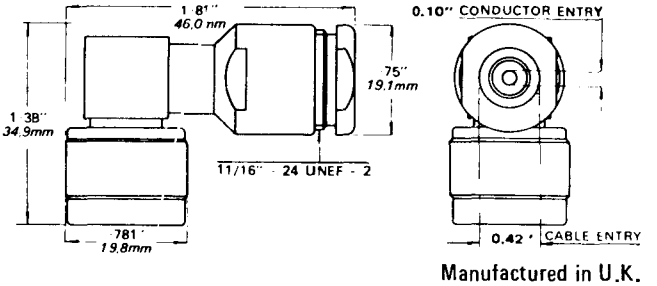
Type GE 15009



Type GE 15008

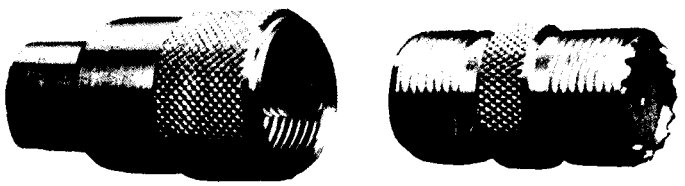


Type GE 15003C1
Captive contact soldered–pressure sleeve cable clamp.
Cables: UR4 & 67.



Manufactured in U.K.

- Low cost connector
- Satisfactory up to 200 MHZ
- Working voltage up to 500V peak



INTRODUCTION

The Greenpar UHF Series is a general purpose, low-cost range of connectors. They are generally satisfactory at frequencies up to 200MHz but can be used with caution up to 500MHz. Impedance is not constant and will, therefore, introduce some voltage reflection.

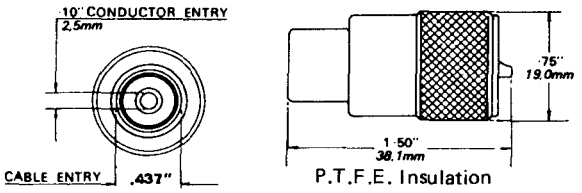
MECHANICAL INFORMATION: Details in the B.N.C. section also applies to the U.H.F. series. (See page 26).

ELECTRICAL INFORMATION

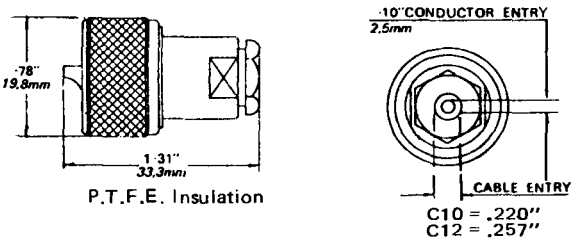
Working Voltage – 500V peak.
Voltage Proof – 3000V peak.
Temperature Range – 55°C to + 150°C

OUTLINE DRAWINGS

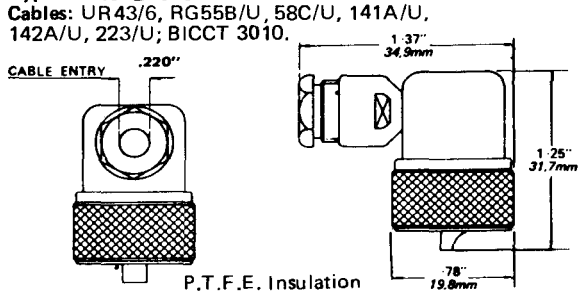
Type GE 40001
Cables: UR57, 59, 67, 81, RG8A/U, 98/U, 11A/U, 13A/U, 63B/U, 65A/U.



Types GE 40032C10/ GE 40032C12
Cables C10: UR43, 76, RG55B/U, 58C/U, 141A/U, 142A/U, 223/U;BICCT3010.
Cables C12: UR41, 56, 70, 84, TELCON PTIYM; BICC RPC 2303.

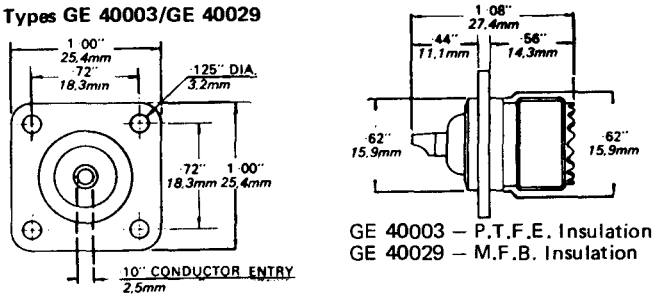


Type GE 40023C10
Cables: UR43/6, RG55B/U, 58C/U, 141A/U, 142A/U, 223/U; BICCT 3010.



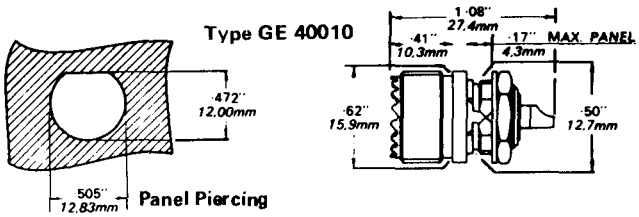
Type	Description	Type	Description
GE 40001	Plug	GE 40010	Bulkhead Socket
GE 40003 H	Panel Socket	GE 40023C10	Elbow Plug
GE 40006	Straight Adaptor	GE 40029H	Panel Socket
GE 40008	Reducing Adaptor	GE 40032C10	Plug
GE 40009	Reducing Adaptor	GE 40032C12	Plug

Types GE 40003/GE 40029

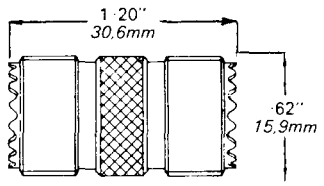


GE 40003 – P.T.F.E. Insulation
GE 40029 – M.F.B. Insulation

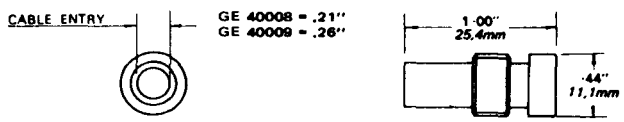
Type GE 40010



Type GE 40006



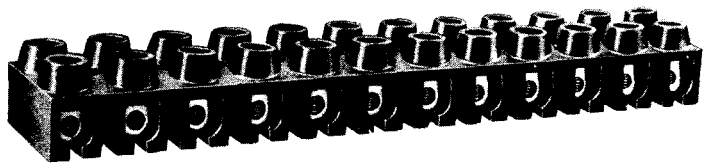
Type GE 40008/GE 40009
Used in conjuction with GE 40051 Plug.
Cables GE 40008: UR43, 72, 76; RG29/U, 55B/U, 58C/U,
Cables GE 40009: UR41, 55, 56, 70, 84; RG59B/U, 62B/U, 71B/U.



Manufactured in U.K.

WAYCOM LIMITED

- ☐ 12 pole terminal strip
- ☐ Fitted with wire protection strip
- ☐ PCB Strips consecutively numbered



TERMINAL STRIPS

The Europa range is available and can operate up to 170 C for short periods but for continuous operation at 100 C and is made from polyamide.

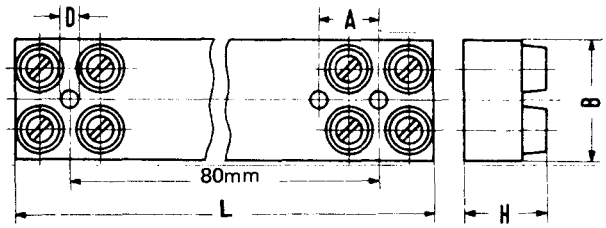
Voltage Rating — 380 Volts r.m.s.
Wire Protection
All types are available with wire protection strips, this protects the wire against damage caused by the screws. This can be ciritical when using cables with fine wires.
Materials
Metal parts — Nickel plated brass
Wire protection strip — Nickel plated phosphor bronze

Dimension	DIMENSIONS in m.m.	
	2.5mm²	4.0mm²
	Europa	Europa
A	10.0	12.0
B	20.0	23.0
H	17.5	20.0
D	3.5	3.5
L	117.0	140.0

* For V.D.E. approved applications, this range should be used as a 2.5mm²C/S area terminal at 380 Volts

TYPES AVAILABLE	BASIC TYPE NOS.	
Cross Sectional Area	2.5mm²	4mm²
Europa Range (12way)	6E/12DS	10E/12DS*
Current Rating *	10A	16A

*Nominal Rating - see data sheet



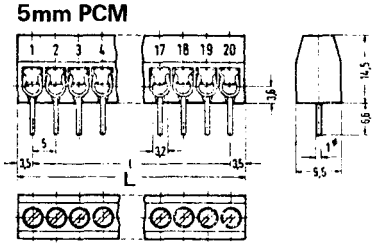
PRINTED CIRCUIT TERMINAL STRIPS

Materials
Insulator — Polyamide, Terminal Body — Tin plated brass
Terminal Pins — Brass, Tinplated
Terminal Screws — Steel, zinc plated, chromated
Wire Protection Strip — Nickel plated phosphor bronze
Max Temperature

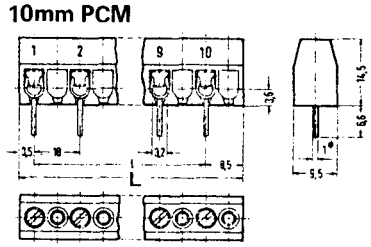
Continuous +100°C Short term +170°C

	No. of Poles	Basic Type	Dims	
			L	I
5mm PCM	8	8180/8	42	35
	12	8180/12	62	55
	16	8180/16	82	75
	20	8180/20	102	95
	24	8180/24	122	115
10mm PCM	4	8180/8/4	42	30
	6	8180/12/6	62	50
	8	8180/16/8	82	70
	10	8180/20/10	102	90
	12	8180/24/12	122	115
5.08mm (0.2") PCM	4	8281/4	20.04	15.24
	8	8281/8	40.36	35.56
	12	8281/12	60.68	55.88
	16	8281/16	81.00	76.20
	24	8281/24	121.64	116.84

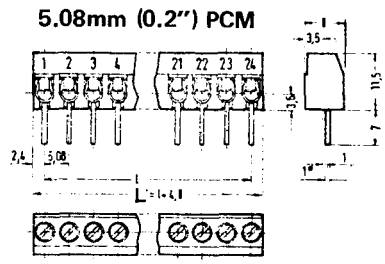
5mm PCM



10mm PCM



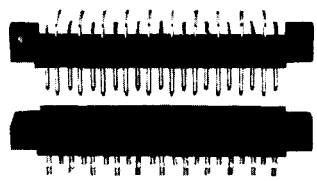
5.08mm (0.2") PCM



Manufactured by F. Wieland, W. Germany

HELLERMANN Electronic Components

- Two piece P.C.B. – 0.100" grid
- 13 to 96 way
- Meets DIN 41617 and DIN 41612



Series 211 These connectors meet the electrical and dimensional requirements of specification DIN 41617.

The female connector housings have conically shaped entries to provide guidance during engagement.

The 90° male contacts are soldered to P.C.B. with the female contacts having solder backends for direct wiring.

TECHNICAL DATA

Housing: Green glass filled polycarbonate.
Male Contact: Brass plated 5u hard silver
Female Contact: Phosphor bronze gold flashed over 5u hard silver
Operating Voltage: 250V (.D.E.0110 Group A)
Operating Current at +60°C: 5A
Operating Temperature: −55°C to 125°C
Test Voltage: 750V at 50Hz
Insulation Resistance: 10^{12} Ohm
Contact Resistance: 5M Ohm

Series 211 Dimensions in mm.

No. of Contacts	Part No. Silver Plated	l_1	l_2	e_1	e_2
Male Conn.					
13	211-116	45.8	-	30	40
21	211-124	65.8	-	50	60
31	211-134	90.8	-	75	85
Female Conn.					
13	211-114	45.8	34.2	30	40
21	211-122	65.8	54.2	50	60
31	211-132	90.8	79.2	75	85

Series 219 These high density connectors satisfy the requirements of specifications VG 95324 and DIN 41612. They are primarily designed for use in standardized 19" Rack and Panel systems with single, double sided and multi-layer boards having track pitches of 2,54mm (0.100").

The connector housing protects the male contacts during engagement and disengagement and ensures that the connectors are mated in the correct position.

The 90° male contacts are soldered to the P.C.B. with the female contacts suitable for mini-wirewrap (post size 0.63x0.63x 13mm).

TECHNICAL DATA

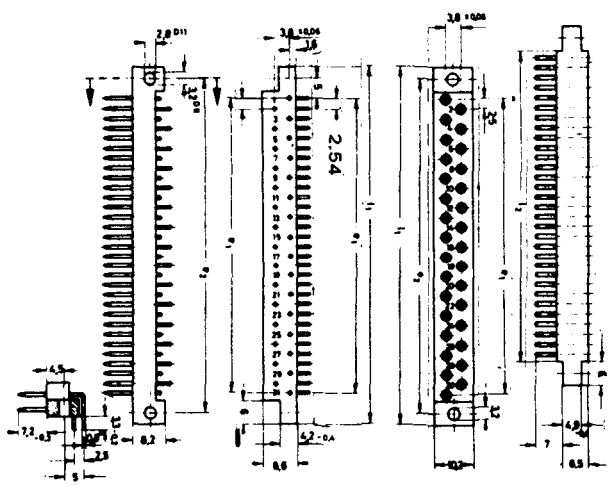
Housing: Green glass filled Noryl SE 1.
Male Contact: Brass plated 3u hard gold over 3u nickel
Female Contact: Brass plated at contact point 3u hard gold over 2u nickel otherwise 0.2u gold over 2u nickel.
Operating Voltage: 250V (V.D.E. 0110 Group A
Operating Current at +20°C: 2A
Creepage/Air minimum path: 1.5mm
Operating Current at + 70°C: 1A
Operating Temperature: 65°C to + 125°C
Test Voltage: 1000V r.m.s.
Insulation Resistance: 10^6MOhm
Durability: 1000 operations
Contact Resistance: 15 mOhm

A female contact can be replaced by a polarizing key and the male pin cut off to avoid mismating of connector pins.

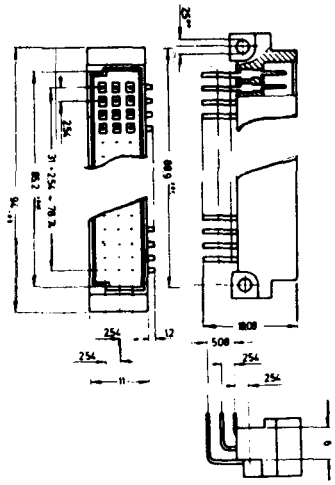
Series 219

No. of Contacts	Position of Contacts	Part No.
Male Conn.		
32	Rows a + c alternate spacing	219-132
64	Rows a + c complete	219-164
96	Rows a + b + c	219-196
Female Conn.		
32	Rows a + c alternate spacing	219-232
64	Rows a + c complete	219-264
96	Rows a + b + c	219-296
Polarizing Key		219-105

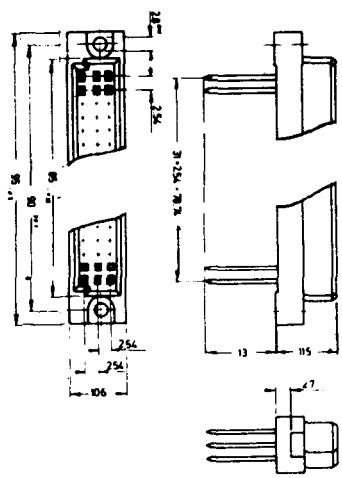
Series 211 Male · Female



Series 219–100 Male



Series 219–200 Female



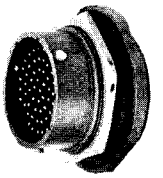
Manufactured in West Germany

HBS 07A Series CONNECTORS

Round Multiway

HELLERMANN DEUTSCH

- Miniature multiway connectors
- Seven shell sizes
- Quick positive locking



HBS SERIES

Introduction

The HBS (Hellermann Deutsch Bayonet-Solder) Series of electrical connectors has been designed to provide the equipment designer with a range of miniature multi-way connectors with inset arrangements in a variety of shell sizes compatible and intermateable with standard MIL-C-26482 layouts with solder terminations to accept 16 to 24 a.w.g. wire.

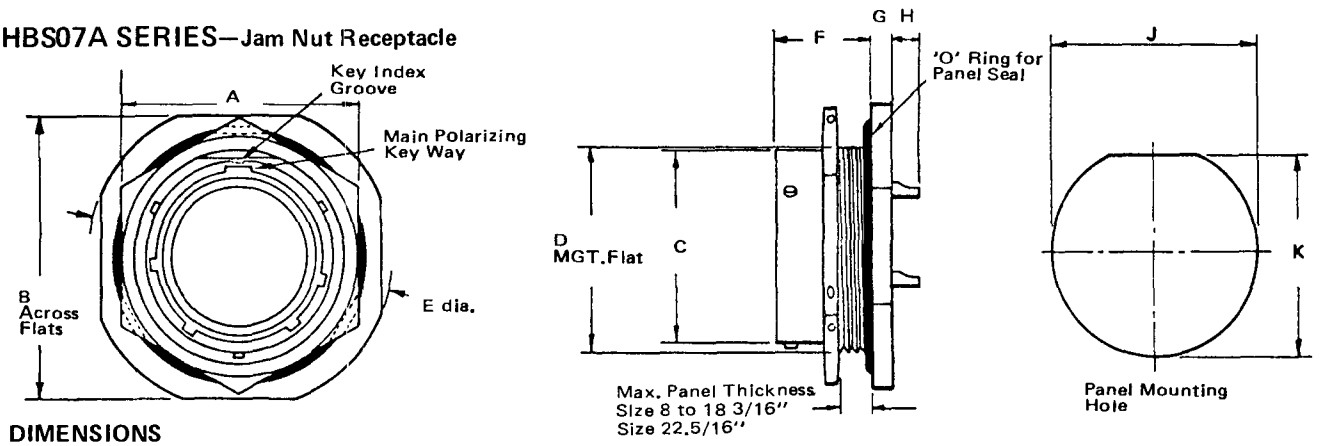
The HBS Connector bayonet coupling gives quick positive locking, visual and audible indication of correct engagement, and reliability under extremes of shock and vibration.

Designed to conform to the requirements of MIL-C-26482 and DEF-5325 pattern 105, HBS Connectors are ruggedly constructed to meet a variety of applications, military and civil.

Note: 1. All dimensions are in inches
2. Tolerances unless otherwise stated:
Fractions ±.015, decimals ±.005, angles ±0°30'0".

Note: Available with Stockists Certificate in accordance with M.O.D. stockist approval issued by D.Q.A.B. Release charge for Stockists Certificate is 5% of the order value.

HBS07A SERIES—Jam Nut Receptacle



DIMENSIONS

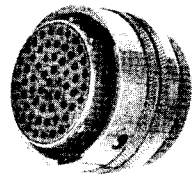
Part No.	A ±.016	B	C +.001 −.005	D +.000 −.010	E dia	F ±.005	G ±.005	H Max	J +.010 −.000	K +.000 −.010
HBS07A-8-98P HBS07A-8-4P	.750	.938	.473	.530	1.062	.711	.125	.150	.572	.542
HBS07A-10-6P	.875	1.062	.590	.655	1.187	.711	.125	.150	.697	.669
HBS07A-12-3P HBS07A-12-10P	1.062	1.250	.750	.818	1.375	.711	.125	.150	.884	.830
HBS07A-14-12P HBS07A-14-19P	1.188	1.375	.875	.942	1.500	.711	.125	.150	1.007	.955
HBS07A-16-26P	1.312	1.500	1.000	1.066	1.598	.711	.125	.150	1.134	1.084
HBS07A-18-32P	1.438	1.625	1.125	1.191	1.750	.711	.125	.150	1.259	1.208
HBS07A-22-55P	1.688	1.937	1.375	1.441	2.062	.900	.150	*	1.507	1.459

*Contacts do not protrude beyond shell in this size.

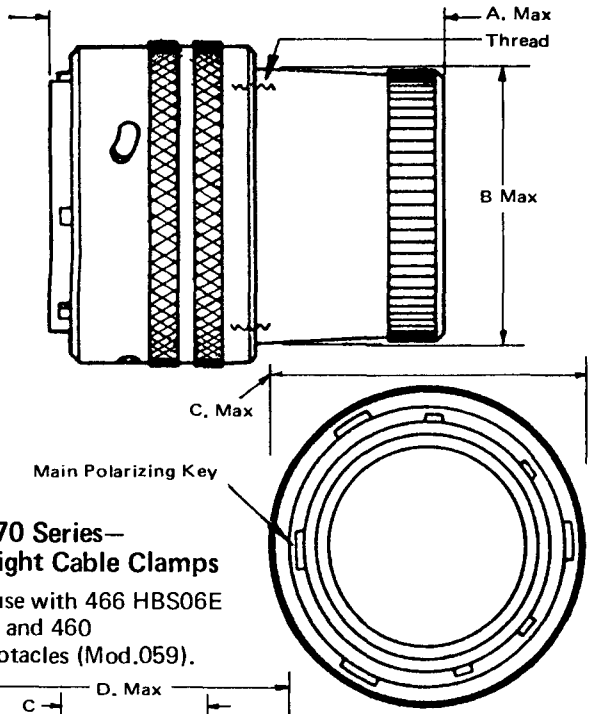
Manufactured in U.K.

HELLERMANN DEUTSCH

- Conform to DEF – 5325 pattern 105
- Rugged construction
- Accepts 16 to 24 A.W.G. wire



HBS06E Series – Straight Plug



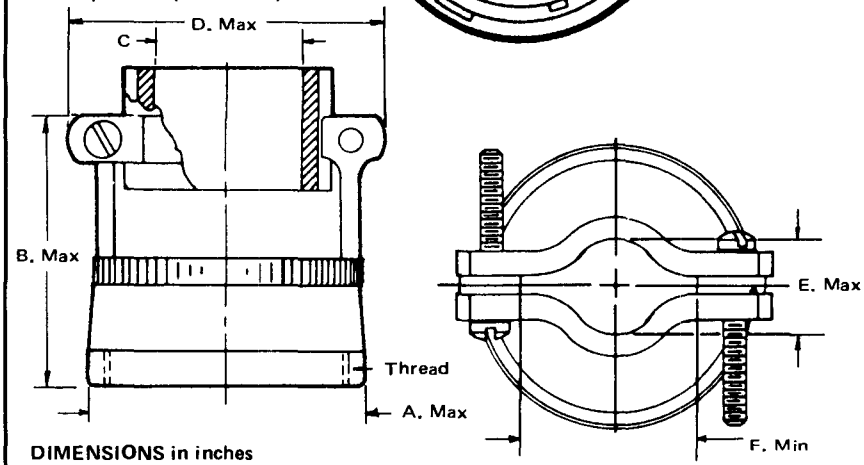
DIMENSIONS in ins.

Part No.	A Max	B Max	C Max	Thread
HBS06E-8-98S HBS06E-8-4S	.750	.560	1.280	7/16 – 28 UNEF
HBS06E-10-6S	.859	.685	1.280	9/16 – 24 NEF
HBS06E-12-3S HBS06E-12-10S	1.031	.813	1.280	11/16 – 24 NEF
HBS06E-14-12S HBS06E-14-19S	1.156	.930	1.280	13/16 – 20 UNEF
HBS06E-16-26S	1.281	1.057	1.280	15/16 – 20 UNEF
HBS06E-18-32S	1.391	1.175	1.280	11/16 – 18 NEF
HBS06E-22-55S	1.656	1.428	1.270	15/16 – 18 NEF

Note: Available with Stockists Certificate in accordance with M.O.D. stockist approval issued by D.Q.A.B. Release charge for Stockists Certificate is 5% of the order value.

41670 Series– Straight Cable Clamps

For use with 466 HBS06E Plugs and 460 Receptacles (Mod.059).



Note – HBS06E Cable Clamp
HBS06F = HBS06E + straight cable clamp. Please order as HBS06E and call up, as a separate item, 416750/shell size.

DIMENSIONS in inches

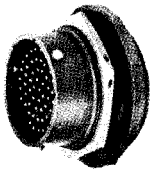
Part No.†	A max	B max	dia C free	D max	E max	F min	G max *466	G max 460 HBS06E	Thread
416750/8	0.560	1.197	0.130	0.812	0.187	0.240	1.960	1.953	7/16"x 28 UNEF
416750/10	0.685	1.197	0.220	0.891	0.187	0.297	1.925	1.917	9/16"x 24 UNEF
416750/12	0.813	1.197	0.312	1.016	0.281	0.422	1.925	1.917	11/16"x 24 UNEF
416750/14	0.930	1.197	0.437	1.141	0.325	0.547	1.925	1.917	13/16"x 20 UNEF
416750/16	1.057	1.270	0.562	1.203	0.356	0.609	2.000	1.990	15/16"x 20 UNEF
416750/18	1.175	1.270	0.625	1.469	0.456	0.734	2.000	1.990	11/16"x 18 UNEF
416750/22	1.428	1.330	0.750	1.656	0.519	0.922	2.200	2.140	15/16"x 18 UNEF

*Note: G is overall length of connector plus cable clamp.

†Note' The suffix No. refers to shell size

Manufactured in U.K.

- ☐ Complying with D.E.F. 5325 pattern 105
- ☐ Plugs and receptacles available
- ☐ Quick release multiway connectors



460 SERIES

Introduction

The Hellermann Deutsch 460 Series are simple, trouble-free, quick-release, multiway connectors with rear release crimp contacts and hard face socket inserts.

Insert arrangements compatible and intermateable with standard MIL-C-26482 layouts with contacts to accept 20 AWG wire.

Designed for use in environments encountered in aircraft, missiles and military equipments the 460 Series features the most simple assembly procedures with rear release, positive retention of the NAS 1600 type contacts. A minimum of operator training is required for safe reliable assembly of these connectors.

Plugs and receptacles are available in various shell styles to provide intermateability with connectors complying with DEF5325 pattern 105, MIL-C26482, PrL.54125, PrL. 54130, EL.2112 pattern 602 and NAS 1599. Hermetically sealed receptacles are available within the ramge (462H Series).

460 Series Connectors are manufactured in the United Kingdom and were selected for use in all airframe applications for miniature bayonet coupling connectors by the Procurement Executive (M.O.D.) as the interim standard to EL2112 pat. 602 as defined in DEF59-32 (part 2) issue 1.

Note: Available with Stockists Certificate in accordance with M.O.D. stockist approval issued by D.Q.A.B. Release charge for Stockists Certificate is 5% of the order value.

Cable Clamps

If straight cable clamps (Mod.059) are required please call up separately using the part no. 416750/shell size (see cable clamp section).

Note

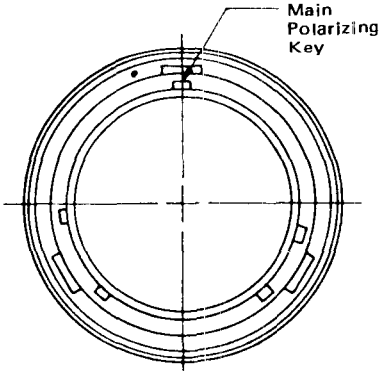
1. All dimensions are in inches
2. Tolerances unless otherwise stated:
   Fractions ±.015, decimals ±.005. angles ±0°, 30'.0 .

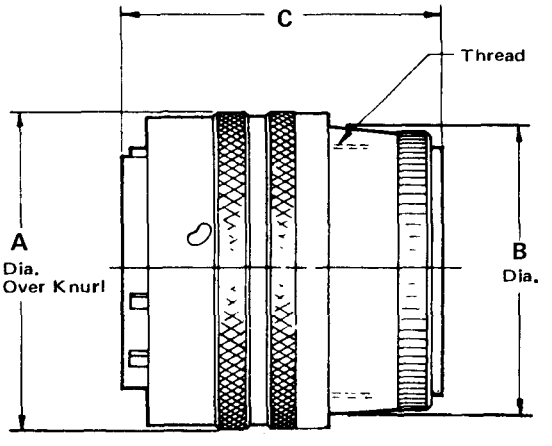
DIMENSIONS

Part No.	A Max.	B Max	C Max.	Thread
466-8-33S	.750	.560	1.404	7/16" –28UNEF
466-10-6S	.859	.685	1.404	9/16" –24UNEF
466-14-19S	1.156	.930	1.404	13/16" –20UNEF
466-16-26S	1.281	1.057	1.404	15/16" –20UNEF
466-18-32S	1.391	1.175	1.404	1 1/16" –18UNEF
466-22-55S	1.656	1.428	1.404	1 5/16" –18UNEF

466 SERIES PLUGS–BAYONET COUPLING CONNECTOR

STANDARD DENSITY

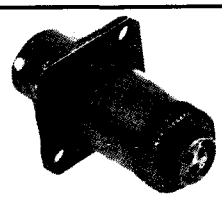




Manufactured in U.K.

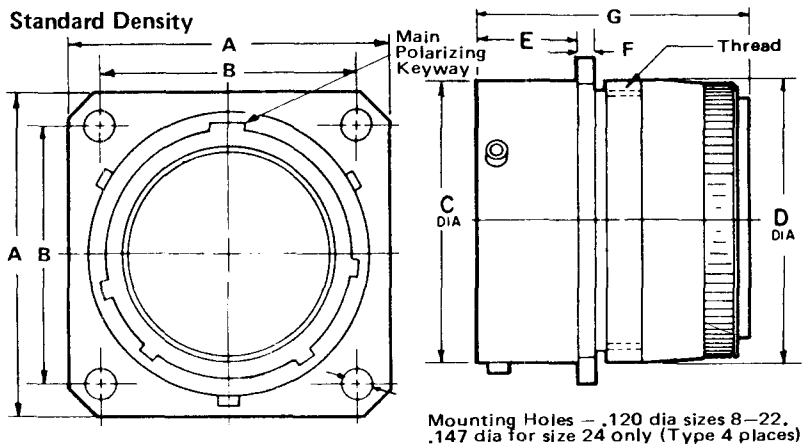
HELLERMANN DEUTSCH

- ☐ Layout conforms to MIL–C–26482
- ☐ Hermetic receptacles available
- ☐ Accepts 20 A.W.G. wire



460 SERIES RECEPTACLES – Square Flange Mounting, Bayonet Coupling connector, Crimped Contacts

Standard Density



Mounting Holes – .120 dia sizes 8–22. .147 dia for size 24 only (Type 4 places)

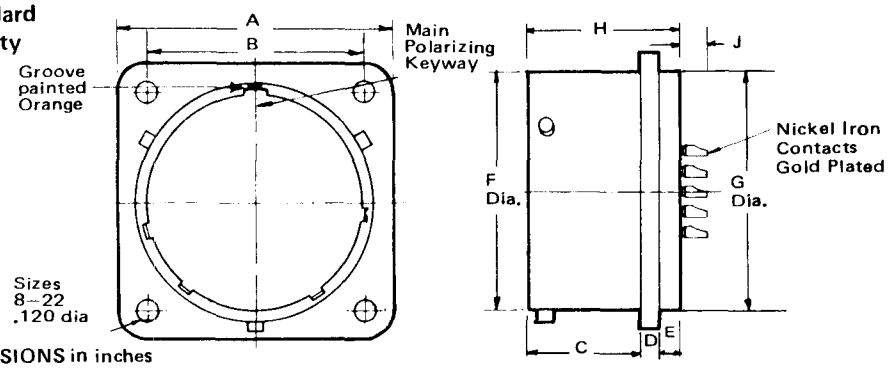
Note: Available with Stockists Certificate in accordance with M.O.D. stockist approval issued by D.Q.A.B. Release charge for Stockists Certificate is 5% fo the order value.

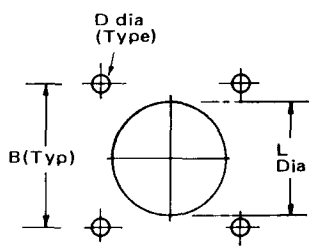
DIMENSIONS in inches

Part No.	A Max	B ±.005	C .001 ± .005	D Max	E ±.006	F ±.005	G Max.	H Thread
460-8-33P	.828	.594	.47	.560	.438	.072	1.412	7/16" –28 UNEF
460-10-6P	.954	.719	.590	.685	.438	.072	1.412	9/16" –24 UNEF
460-14-19P	1.141	.906	.875	.930	.438	.072	1.412	13/16" –20 UNEF
460-16-26P	1.234	.969	1.000	1.057	.438	.072	1.412	15/16" –20 UNEF
460-18-32P	1.323	1.062	1.125	1.175	.438	.072	1.412	11/16" –18 UNEF
460-22-55P	1.578	1.250	1.375	1.428	.563	.094	1.467	15/16" –18 UNEF

462H SERIES HERMETIC RECEPTACLES–Square Flange Mounting, Bayonet Coupling Connector, Solder Bucket Contacts.

Standard Density





Recommended panel mounting holes

DIMENSIONS in inches

Part No.	A Max	B ±.005	C ±.010	D ±.015	E ±.010	F dia ±.003	G dia. ±.003	H.Max (Ref)	J ±.030	L +.010 –.000
462H-8-33P	.860	.594	.588	.062	.115	.471	.560	.801	.148	.570
462H-10-6P	.954	.719	.588	.062	.115	.588	.670	.801	.148	.680
462H-14-19P	1.141	.906	.588	.062	.115	.873	.904	.801	.148	.914
462H-16-26P	1.234	.969	.588	.062	.115	.998	1.029	.801	.148	1.039
462H-18-32P	1.328	1.062	.588	.062	.115	1.123	1.154	.801	.148	1.164
462H-22-55P	1.578	1.250	.650	.093	.115	1.373	1.373	.895	.116	1.383

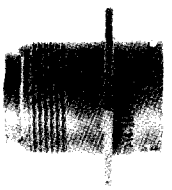
Manufactured in U.K.

PATTERN 602/RR CONNECTORS

Round Multiway

HELLERMANN DEUTSCH

- ☐ Improved contact alignment
- ☐ Hard face socket insert
- ☐ "Cork in bottle" sealing



6020

INTRODUCTION

The Hellermann Deutsch RROO series is a range of medium density, bayonet connectors, designed to meet the exacting demands of Ministry and Aerospace applications. The majority of the range is qualified to Procurement Executive, Ministry of Defence Specification EL 2112 Pattern 602, and utilise rear release contacts to specification EL 2113 Pattern 602.

The connectors are intermateable and intermountable with connectors conforming to DEF59-35 Pattern 105, MIL-C-0026482, NAS 1599, NFL54125, LN29500, MIL-C-83723 series 1 (Bayonet).

These connectors reflect the latest "State of the Art" in connector design with the following design features.

1. Improved contact alignment resulting from positive contact retention and stability.
2. Hard face socket insert ensuring the pin contacts do not penetrate the mating interface.
3. "Cork in bottle" sealing providing maximum interfacial sealing.
4. Accessory locking mechanism ensuring positive positioning of cable clamps etc.

General Specification

Current Rating

The current rating of any contact within a connector is governed by the heating effect of the current and the ambient temperature.

The performance of the RROO Series Connectors at all times exceeds the bunched ratings of the appropriate size wire having insulation equal in temperature rating to that of the connectors. Contact loading should not exceed:–

Size 20 Contacts	7.5 Amp
Size 16 Contacts	20 Amp
Size 12 Contacts	25 Amp

Temperature

Operating temperature range –65°C to +200°C.

The upper limit quoted is the maximum internal hot spot temperature resulting from any combination of ambient temperature and heating due to current.

Working Voltage

700VDC at Sea Level
500VAC r.m.s. at Sea Level

Dielectric withstanding voltage

2100VDC at Sea Level
1500VAC r.m.s. at Sea Level

Shell Material

Environmental – Aluminium Alloy

Contact Material

Environmental – Copper Alloy

Insert Materials

The resilient inserts are manufactured using fluorinated silicone rubber and are resistant to most aircraft lubricating and hydraulic oils and fuels.

Wire Sealing Range

The rear sealing grommet of RROO Series Connectors is designed to seal on wires having overall diameters within the following range:–

Size 20	0.040 to 0.083 inch*
Size 16	0.068 to 0.103 inch
Size 12	0.106 to 0.158 inch

*In the case of contact size 20, it is possible to insert and accommodate wires up to 0.090 in. overall diameter, but if these are to be removable, special contacts must be used, consult factory.

Finish

Metal Parts
Environmental
Cadmium Plate
Olive Drab
Contacts
Gold Plated

PURCHASE CONDITIONS

These connectors are stocked and supplied to Condition "B" although other Conditions can be offered on request.

PATTERN 602 – CONDITION "B"

PATTERN 602 connectors fully qualified to Spec. EL 2112 and packaged in accordance with special Conditions of Procurement, Condition 'B'.

(Condition 'B' supplements the basic 602 connector by the addition of the appropriate quantity and type of contacts, filler plugs and insertion/extraction tool but does **not** include cable accessories – which should be provisioned separately)

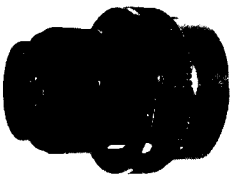
RRO*E--****-1A** connectors are the direct equivalent of Condition 'B' and the connector is identified with the appropriate Patt 602 part number.

Note. – Available with stockists Certificate in accordance with M.O.D. stockist approval issued by D.Q.A.B. Release charge for Stockists Certificate is 5% of the order value.

Manufactured in U.K.

HELLERMANN DEUTSCH

- Choice of insert arrangement
- Available in size 12, 16 & 20 contact ratings
- Orientations available on insert & shell



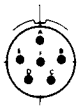
6026

8–33
3–size 20

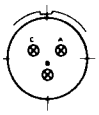
8–98
3–size 20

*

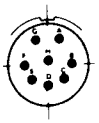
10–6
6–size 20



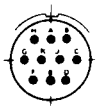
10–98
6–size 20



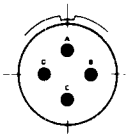
12–3
3–size 16



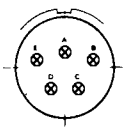
12–8
8–size 20



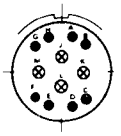
12–10
10–size 20



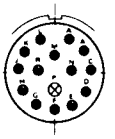
14–4
4–size 12



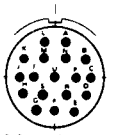
14–5
5–size 16



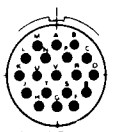
14–12
8–size 20
4–size 16



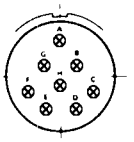
14–15
14–size 20
1–size 16



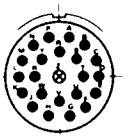
14–18
18–size 20



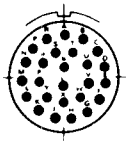
14–19
19–size 20



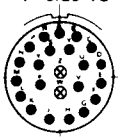
16–8
8–size 16



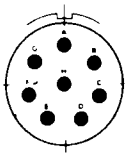
16–23
22–size 20
1–size 16



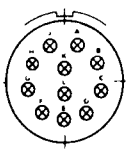
16–26
26–size 20



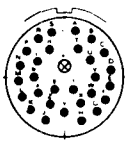
16–99
21–size 20
2–size 16



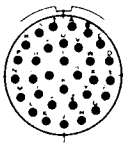
18–8
8–size 12



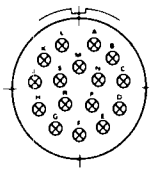
18–11
11–size 16



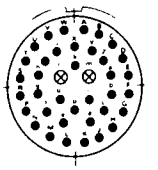
18–30
29–size 20
1–size 16



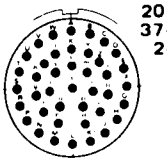
18–32
32–size 20



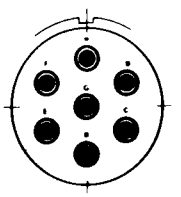
20–16
16–size 16



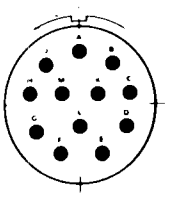
20–39
37–size 20
2–size 16



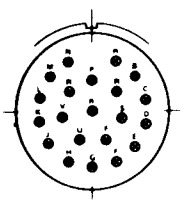
20–41
41–size 20



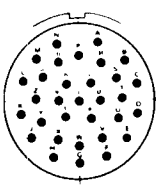
22–7
7 coax



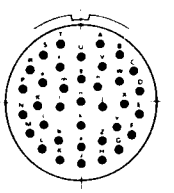
22–12
12–size 12



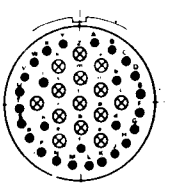
22–21
21–size 16



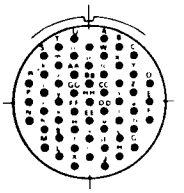
22–32
32–size 20



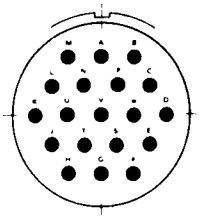
22–36
36–size 20



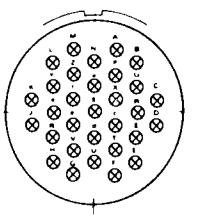
22–41
27–size 20
14–size 16



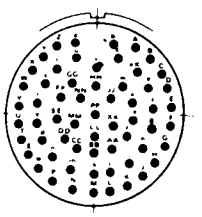
22–55
55–size 20



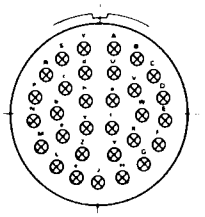
24–19
19–size 12



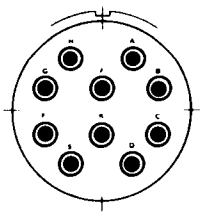
24–31
31–size 16



24–61
61–size 20



24–98
31–size 16



24–100
10 coax

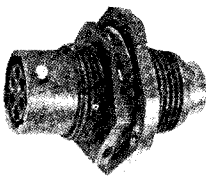
Manufactured in U.K.

PATTERN 602/RR CONNECTORS

Round Multiway

HELLERMANN DEUTSCH

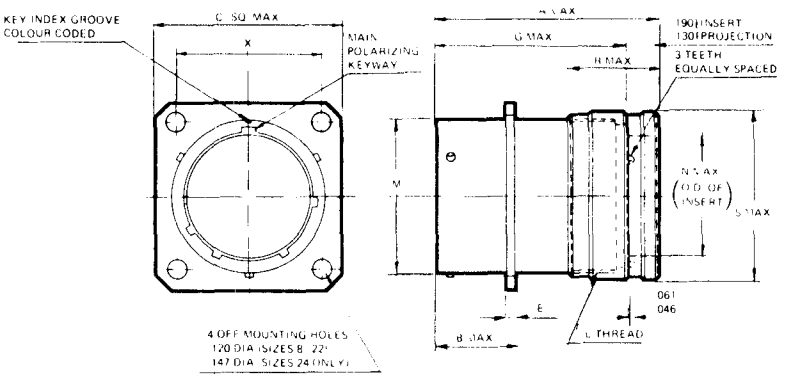
- Positive mechanical insert retention
- Contact current loads from 7.5 amps to 25 amps
- Operating temperature −65°C to + 200°C



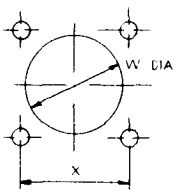
6027

RROOE

WALL MOUNTING RECEPTACLE



6020
(less backshell)

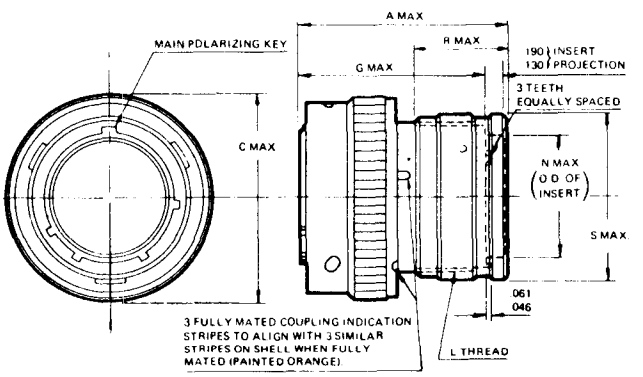


RECOMMENDED MOUNTING PANEL

PART NUMBER	A MAX	B MAX	C SQ MAX	E ±.016	G MAX	L THREAD–2A	M ±.003	N MAX	R MAX	S MAX	X ±.005	W ±.005
RROOE-08-*P/S*	1.492	.540	.828	.062	1.215	½-20 UNF	.471	.305	.540	.617	.594	.568
RROOE-10-*P/S*	1.492	.540	.954	.062	1.215	5/8-24 UNEF	.588	.405	.540	.734	.719	.685
RROOE-12-*P/S*	1.492	.540	1.047	.062	1.215	¾-20 UNEF	.748	.531	.540	.858	.812	.864
RROOE-14-*P/S*	1.492	.540	1.141	.062	1.215	7/8-20 UNEF	.873	.665	.540	.984	.906	.989
RROOE-16-*P/S*	1.492	.540	1.234	.062	1.215	1-20 UNEF	.998	.790	.540	1.112	.969	1.113
RROOE-18-*P/S*	1.492	.540	1.328	.062	1.215	1-1/16-18 UNEF	1.123	.869	.540	1.218	1.062	1.238
RROOE-20-*P/S*	1.552	.697	1.453	.094	1.275	1-3/16-18 UNEF	1.248	.994	.540	1.345	1.156	1.363
RROOE-22-*P/S*	1.552	.697	1.578	.094	1.275	1-5/16-18 UNEF	1.373	1.119	.540	1.468	1.250	1.488
RROOE-24-*P/S*	1.552	.730	1.703	.094	1.275	1-7/16-18 UNEF	1.498	1.244	.540	1.593	1.375	1.615

RRO6E

FREE PLUG WITH KNURLED COUPLING NUT



6026
(less backshell)

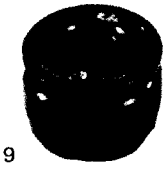
PART NUMBER	A MAX	C MAX	G MAX	L THREAD-2A	N MAX	R MAX	S MAX
RRO6E-08-*P/S*	1.507	.782	1.230	½-20 UNF	.305	.540	.617
RRO6E-10-*P/S*	1.507	.926	1.230	5/8-24 UNEF	.405	.540	.734
RRO6E-12-*P/S*	1.507	1.043	1.230	¾-20 UNEF	.531	.540	.858
RRO6E-14-*P/S*	1.507	1.183	1.230	7/8-20 UNEF	.665	.540	.984
RRO6E-16-*P/S*	1.507	1.305	1.230	1-20 UNEF	.790	.540	1.112
RRO6E-18-*P/S*	1.507	1.391	1.230	1-1/16-18 UNEF	.869	.540	1.218
RRO6E-20-*P/S*	1.507	1.531	1.230	1-3/16-18 UNEF	.994	.540	1.345
RRO6E-22-*P/S*	1.507	1.656	1.230	1-5/16-18 UNEF	1.119	.540	1.468
RRO6E-24-*P/S*	1.507	1.777	1.230	1-7/16-18 UNEF	1.244	.540	1.593

Manufactured in U.K.

HELLERMANN DEUTSCH

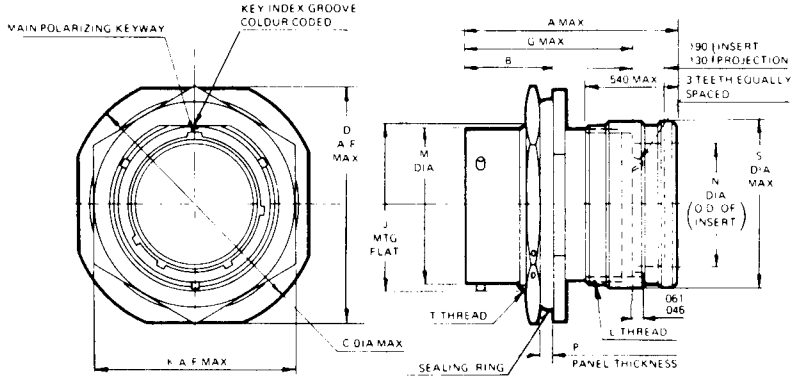
- Specification intermateable with DEF59-35 Patt 105, MIL-C-0026482 and MIL-C-83723 Series.
- Backshells available with strain relief


600026

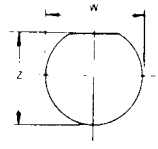

600019

RRO7E

JAM NUT RECEPTACLE



6027
(less backshell)



RECOMMENDED MOUNTING PANEL

PART NUMBER	A MAX	B	C MAX	D MAX	G MAX	J +.000 -.010	K MAX	L THREAD -2A	M ±.003	N MAX	P	S MAX	T THREAD -2A	W ±.005	Z ±.005
RRO7E-08-*P/S*	1.492	.707 .691	1.078	.954	1.215	.530	.767	½-20 UNF	.471	.305	.187 .062	.617	9/16-24 UNF	.572	.536
RRO7E-10-*P/S*	1.492	.707 .691	1.203	1.078	1.215	.655	.892	⅝-24 UNEF	.588	.405	.187 .062	.734	11/16-24 UNEF	.697	.661
RRO7E-12-*P/S*	1.492	.707 .691	1.391	1.266	1.215	.818	1.079	¼-20 UNEF	.748	.531	.187 .062	.858	-20 UNEF	.895	.824
RRO7E-14-*P/S*	1.492	.707 .691	1.516	1.391	1.215	.942	1.205	⅞-20 UNEF	.873	.665	.187 .062	.984	1-20 UNEF	1.010	.948
RRO7E-16-*P/S*	1.492	.707 .691	1.641	1.516	1.215	1.066	1.329	1-20 UNEF	.998	.790	.187 .062	1.112	1 -18 UNEF	1.135	1.072
RRO7E-18-*P/S*	1.492	.707 .691	1.766	1.641	1.215	1.191	1.455	1-1/16-18 UNEF	1.123	.869	.187 .062	1.218	1¼-18 UNEF	1.260	1.197
RRO7E-20-*P/S*	1.552	.772 .754	1.954	1.828	1.275	1.316	1.579	1-3/16-18 UNEF	1.248	.994	.250 .062	1.345	1 -18 UNEF	1.385	1.322
RRO7E-22-*P/S*	1.552	.772 .754	2.078	1.954	1.275	1.441	1.705	1-5/16-18 UNEF	1.373	1.119	.250 .062	1.468	1½-18 UNEF	1.510	1.447
RRO7E-24-*P/S*	1.552	.772 .754	2.203	2.078	1.275	1.566	1.829	1-7/16-18 UNEF	1.498	1.244	.219 .062	1.593	1 -18 UNEF	1.635	1.572

Backshells Accessories

Backshells, Straight, without strain relief	600019-**-12
Backshells, Straight, with strain relief	600026-**-12
Backshells, 90°, with strain relief	600027-**-12
Standard Bush for strain relief backshell	600036-**

(** substitute shell size, e.g. 600019-08-12)

Spares

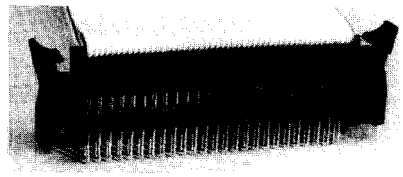
Pin Contact	0641-1-2031
Socket Contact	100503
Filler Plug	4113-4-2001
Insertion/Extraction tool	M15570-20

Manufactured in U.K.

CONNECTORS

jet-flecs™ Insulation Displacement

- ☐ No Insulation Stripping or Soldering
- ☐ Simultaneous (Gang) Termination Technique
- ☐ Reduced Labour Costs



INTRODUCTION TO "I.D.C."

The electric/electronic manufacturer, today bases terminal connections on the following requirements:

1. Space saving (density)
2. Flexibility
3. Potential, lower installed costs
4. Reliability
5. Performance
6. Versatility

These goals can be accomplished with the Molex Flat Cable Connector System.

Space saving is the end result when specifying a flat cable on .050" centres with a suitable sized terminal.

The proper design of Housing, Terminal and assembly method provides a flexible system. Any quality manufactured flat cable on .050" centres can be terminated.

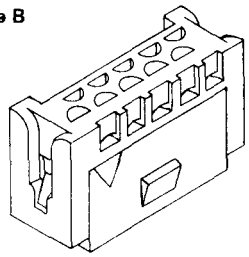
Sound concepts of terminal design and assembly techniques for mass termination lowers the installed costs.

An "engineered" terminal with properly supported cable, results in performance of (a) low contact resistance values, (b) non-overstressed contacts (dual), (c) suitable insertion/withdrawal forces and the reliability of no shorts or cut strands. All tests for shock, vibration, environmental conditions, insulation resistance and dielectric withstanding voltage are met.

The same terminal, with the properly selected housings, provides the versatility of accommodating a wide range of wire sizes and types. Available are shielded (blind) or daisy-chain (thru) cable mounting covers and housings that can mount to a header with or without a latching means. An optional strain relief can be used.

CABLE MOUNTING CONNECTORS — 4700 SERIES

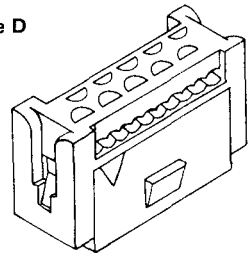
Type B



Std. lower HSG ASM (w/latch) & std. upper HSG (blind) strain relief optional

Cir. Size	Order No.	Eng. No.
10	15-25-5102	A-4700-10B551
14	15-25-5142	A-4700-14B551
16	15-25-5162	A-4700-16B551
20	15-25-5202	A-4700-20B551
26	15-25-5262	A-4700-26B551
34	15-25-5342	A-4700-34B551
40	15-25-5402	A-4700-40B551
50	15-25-5502	A-4700-50B551
60	15-25-5602	A-4700-60B551
64	15-25-5642	A-4700-64B551

Type D



Std. lower HSG ASM (w/latch) & std. upper HSG (thru) strain relief optional

Cir. Size	Order No.	Eng. No.
10	15-25-5104	A-4700-10D551
14	15-25-5144	A-4700-14D551
16	15-25-5164	A-4700-16D551
20	15-25-5204	A-4700-20D551
26	15-25-5264	A-4700-26D551
34	15-25-5344	A-4700-34D551
40	15-25-5404	A-4700-40D551
50	15-25-5504	A-4700-50D551
60	15-25-5604	A-4700-60D551
64	15-25-5644	A-4700-64D551

STRAIN RELIEF (Optional) — clips onto 4700 connector

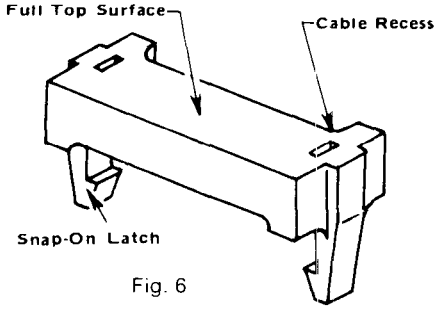


Fig. 6

Ordering Information

Cir. Size	Order No.	Eng. No.
10	15-05-6101	4704-10
14	15-05-6141	4704-14
16	15-05-6161	4704-16
20	15-05-6201	4704-20
26	15-05-6261	4704-26
34	15-05-6341	4704-34
40	15-05-6401	4704-40
50	15-05-6501	4704-50
60	15-05-6601	4704-60
64	15-05-6641	4704-64

For further information on "Jetflecs" please contact our sales desk.

MADE IN USA

molex

CONNECTORS

jet-flecs Insulation Displacement

- Cable available up to 64 circuits
- Industry compatible assembly tooling
- Current rating 1 amp. contin.

HEADERS — 7402 Series

Type C

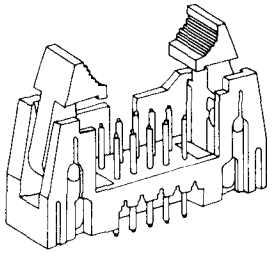
A-7402 wafer ASM is for use with the 4700 series connector w/o strain relief (types A, B, C, & D)

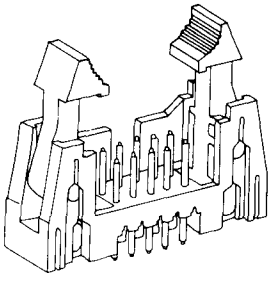
Cir. Size	Order No.	Eng. No.
10	10-56-3103	A-7402-10C503
14	10-56-3143	A-7402-14C503
16	10-56-3163	A-7402-16C503
20	10-56-3203	A-7402-20C503
26	10-56-3263	A-7402-26C503
34	10-56-3343	A-7402-34C503
40	10-56-3403	A-7402-40C503
50	10-56-3503	A-7402-50C503
60	10-56-3603	A-7402-60C503
64	10-56-3643	A-7402-64C503

Type D

A-7402 wafer ASM is for use with the 4700 series connector w/strain relief (types A thru F)

Cir. Size	Order No.	Eng. No.
10	10-56-3104	A-7402-10D503
14	10-56-3144	A-7402-14D503
16	10-56-3164	A-7402-16D503
20	10-56-3204	A-7402-20D503
26	10-56-3264	A-7402-26D503
34	10-56-3344	A-7402-34D503
40	10-56-3404	A-7402-40D503
50	10-56-3504	A-7402-50D503
60	10-56-3604	A-7402-60D503
64	10-56-3644	A-7402-64D503





HEADERS — 7404 Series

Type C

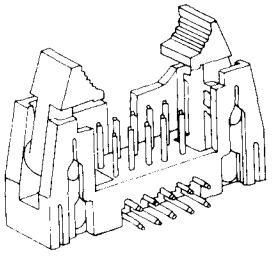
A-7404 wafer ASM is for use with the 4700 series connector w/o strain relief (types A, B, C, & D)

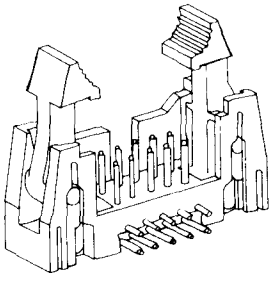
Cir. Size	Order No.	Eng. No.
10	10-55-3103	A-7404-10C503
14	10-55-3143	A-7404-14C503
16	10-55-3163	A-7404-16C503
20	10-55-3203	A-7404-20C503
26	10-55-3263	A-7404-26C503
34	10-55-3343	A-7404-34C503
40	10-55-3403	A-7404-40C503
50	10-55-3503	A-7404-50C503
60	10-55-3603	A-7404-60C503
64	10-55-3643	A-7404-64C503

Type D

A-7404 wafer ASM is for use with the 4700 series connector w/strain relief (types A thru F)

Cir. Size	Order No.	Eng. No.
10	10-55-3104	A-7404-10D503
14	10-55-3144	A-7404-14D503
16	10-55-3164	A-7404-16D503
20	10-55-3204	A-7404-20D503
26	10-55-3264	A-7404-26D503
34	10-55-3344	A-7404-34D503
40	10-55-3404	A-7404-40D503
50	10-55-3504	A-7404-50D503
60	10-55-3604	A-7404-60D503
64	10-55-3644	A-7404-64D503



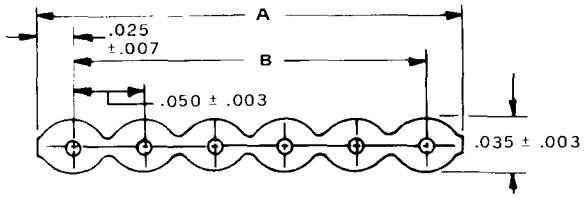


ROUND CONDUCTOR FLAT CABLE — 6800 Series

Main Features

- Error free wiring
- High flexibility
- Symetrical cable
- Zippable
- Up to 64 circuits
- #28 AWG stranded
- Industry Compatible
- 300V 1 amp
- UL listed

.050" Round Conductor Flat Cable



Ordering Tables:

Circuits	Order No.	Engineering No.
10	82-28-1710	6800G-10-100B
14	82-28-1714	6800G-14-100B
16	82-28-1716	6800G-16-100B
20	82-28-1720	6800G-20-100B
26	82-28-1726	6800G-26-100B

Circuits	Order No.	Engineering No.
34	82-28-1734	6800G-34-100B
40	82-28-1740	6800G-40-100B
50	82-28-1750	6800G-50-100B
60	82-28-1760	6800G-60-100B
64	82-28-1764	6800G-64-100B

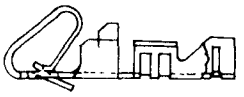
TOOLING A special bench mounting tool is available for use with these connectors. Please contact our sales desk for ordering information.

MADE IN U.S.A.

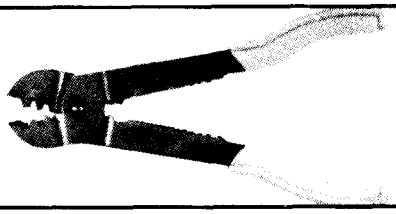
2,54 mm (.100) KK Interconnect System

molex®

- ☐ Low Cost
- ☐ Stocked in Tin Plate
- ☐ Full Range of Tooling Available



4809



100KK TECHNICAL DATA

ELECTRICAL CHARACTERISTICS

Resistance

Resistance is approximately 7.0 MV for a rigid tin-plated wire, double-cantilever termination (24 AWG). The probe on a crimp-type terminal is placed 25,4 mm (1 inch) from the crimp barrel. Gold-plated termination is about 2 mm higher.

High Voltage Dielectric Test

Terminals mounted in connector withstand 1500 volts RMS applied between adjacent terminals for 60 seconds. Capacitance when measuring adjacent terminals in housings at 1 KHZ and 120 HZ is 1.5 Pico-Farads average.

Temperature Rise/Operating Range

30°C maximum rise for all connectors at rated current. Temperature range −40° to + 105° C ambient.

Recognized Agency Approvals

UL and CSA.

Rated Voltages, Currents

Recommended 2.5 amps at 30°C temperature rise over ambient. Contact factory for higher values. Maximum voltage 250 VAC.

MECHANICAL CHARACTERISTICS

Engage/Disengage Forces

For connectors with tin-plated termination mating with 0,64 mm (.025 inch) square wire, initial engage forces are 0,199 kg (7 ounces) average per circuit. Disengage force is 0,07 kg (2.5 ounces) minimum for the first cycle.

Crimp Strength

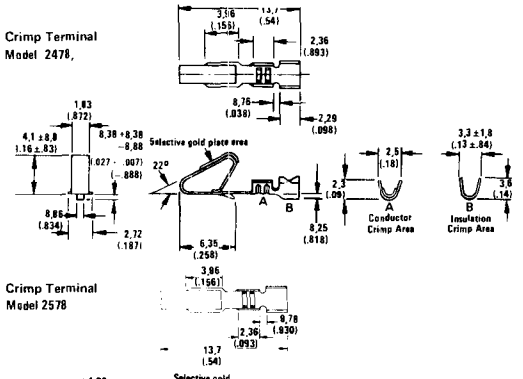
Wire Gauge (AWG)	22	24	26	28	30
Minimum Pull-out Force (kg)	4,54	3,63	2,72	1,81	1,36
(lbs.)	(10)	(8)	(6)	(4)	(3)

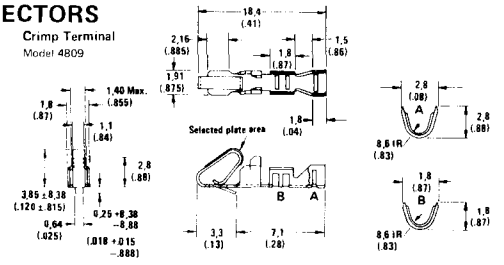
TOOLING

Various handtools are available for crimping the terminals described in the following pages, and extracting them from the appropriate housings. Use the table below to select the tools you require:

Crimp Terminal	Handtool	Description of tool	Appropriate housing
4809TL	HTR2262A	Ratchet Type Crimp Tool	6471–N or 6471–N–1
4809TL	HT155	Scissor Action Crimp Tool	6471–N or 6471–N–1
1560/61TL: 2478TL: 2578TL	HT1921	Scissor Action Crimp Tool	1625–N or 2139–N or 3001–N
1380/81TL	HT1919	Scissor Action Crimp Tool	1991–N
2478TL: 2578TL	HTR2445A	Ratchet Type Crimp Tool	2139–N or 3001–N
1380/81TL	HT2038	Extractor Tool	1991–N
1560/61TL	HT2285	Extractor Tool	1625–N
4809TL	HT2759	Extractor Tool	6471–N or 6471–N–1

CRIMP TERMINALS AND POLARIZING KEYS FOR PC CONNECTORS



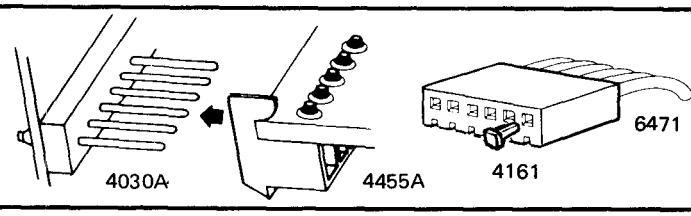


Engineering Number:	Wire Size:	Insulation Diameter	For use with housing model Numbers:
4809T Chain form	22–30 AWG	1.57 MAX (0.062)	6471–N, 6471–N–1
4809TL Loose Form	22–30 AWG	1.57 MAX (0.062)	6471–N, 6471–N–1
2478TL Loose form	18–24 AWG	2.54 MAX (0.1)	2139–N, 3001–N
2578TL Loose form	22–26 AWG	1.65 MAX (0.065)	2139–N, 3001–N

4161–1 Polarizing key without extension for 6471–N and 6471–N–1 housings
2560–1 Polarizing key without extension for 2139–N and 3001–N housings
2560–2 Polarizing key with extension for 2139–N and 3001–N housings

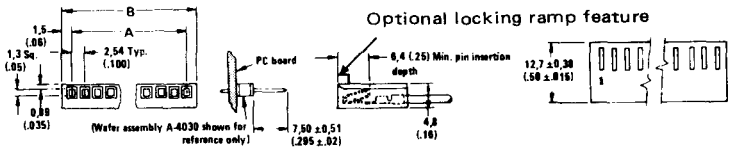
Manufactured in U.S.A. or EIRE

- 6471 Housing
- 4455-A Right Angle
- 4030-A Wafer Assembly



6471 CONNECTOR HOUSING FOR CRIMP TERMINALS, 94V-O

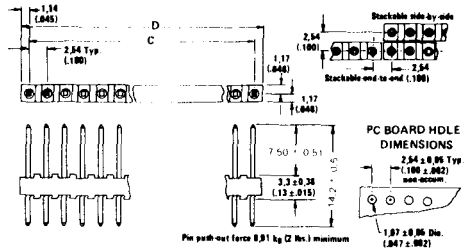
Without Locking	With Locking	No. of Circuits	Dim A mm	Dim A in.	Dim B mm	Dim B in.
6471-2	6471-2-1	2	2.54	.100	5.6	.22
6471-3	6471-3-1	3	5.08	.200	8.1	.32
6471-4	6471-4-1	4	7.62	.300	10.7	.42
6471-5	6471-5-1	5	10.16	.400	13.2	.52
6471-7	6471-7-1	7	15.24	.600	18.3	.72
6471-10	6471-10-1	10	22.86	.900	25.9	1.02
6471-12	6471-12-1	12	27.94	1.100	31.0	1.22
6471-15	6471-15-1	15	35.56	1.400	38.6	1.52



4030 WAFER ASSEMBLY, SQUARE WIRE PINS, 94V-O FOR 6471-N HOUSING AND 4455-NA PCB MOUNTING HOUSING

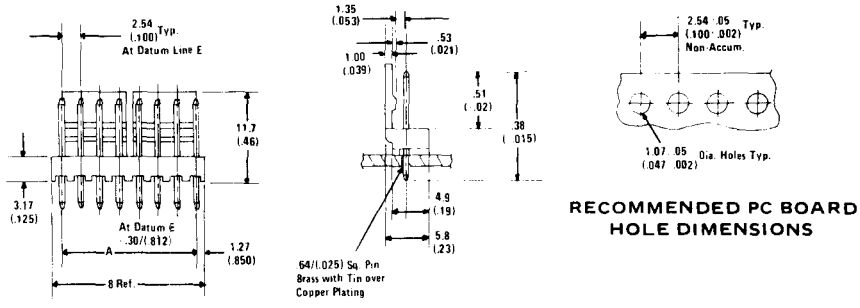
Eng. No.	No. of Circuits	Dim C mm	Dim C in.	Dim D mm	Dim D in.
A-4030-2A	2	2.54	.100	4.8	.19
A-4030-3A	3	5.08	.200	7.4	.29
A-4030-4A	4	7.62	.300	9.9	.39
A-4030-5A	5	10.16	.400	12.5	.49
A-4030-7A	7	15.24	.600	17.5	.69
A-4030-10A	10	22.86	.900	25.1	.99
A-4030-12A	12	27.94	1.100	30.2	1.19
A-4030-15A	15	35.56	1.400	37.9	1.49

Pin can be removed to achieve polarisation.



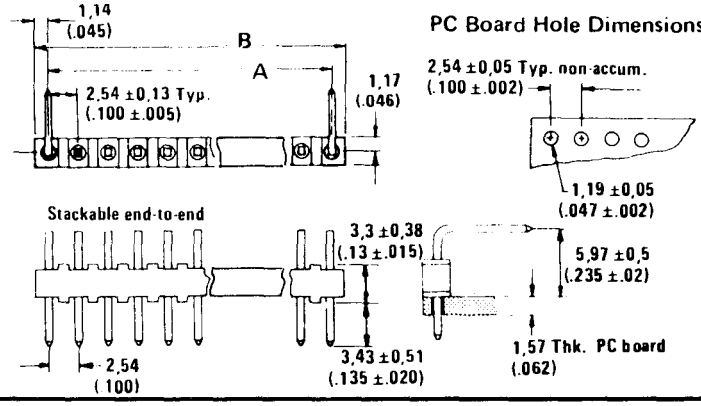
6410 POLARISING AND LOCKING WAFER ASSEMBLY FOR 6471-N-1 HOUSING

Eng. No.	No. of Circuits	Dim A mm	Dim A in.	Dim B mm	Dim B in.
6410-2	2	2.54	.100	5.08	.200
6410-3	3	5.08	.200	7.62	.300
6410-4	4	7.62	.300	10.16	.400
6410-5	5	10.16	.400	12.70	.500
6410-7	7	15.24	.600	17.78	.700
6410-10	10	22.86	.900	25.40	1.000
6410-12	12	27.94	1.100	30.48	1.200
6410-15	15	35.56	1.400	38.10	1.500



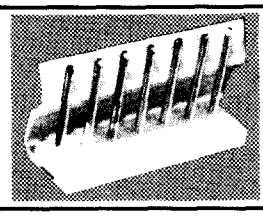
4094 RIGHT ANGLE WAFER ASSEMBLY FOR 6471–N AND 4455–NA HOUSINGS.

Eng. No.	Cir-cuit	Dim. A mm	Dim. A in.	Dim. B mm	Dim. B in.
4094- 2	2	2,54 ± 0,13	.100 ± .005	4,8 ± 0,20	.19 ± .008
4094- 3	3	5,08 ± 0,13	.200 ± .005	7,4 ± 0,20	.29 ± .008
4094- 4	4	7,62 ± 0,13	.300 ± .005	9,9 ± 0,20	.39 ± .008
4094- 5	5	10,16 ± 0,13	.400 ± .005	12,5 ± 0,20	.49 ± .008
4094- 7	7	15,24 ± 0,15	.600 ± .006	17,5 ± 0,23	.69 ± .009
4094-10	10	22,86 ± 0,18	.900 ± .007	25,1 ± 0,25	.99 ± .010
4094-12	12	27,94 ± 0,20	1.100 ± .008	30,2 ± 0,28	1.19 ± .011
4094-15	15	35,56 ± 0,20	1.400 ± .008	37,9 ± 0,28	1.49 ± .011



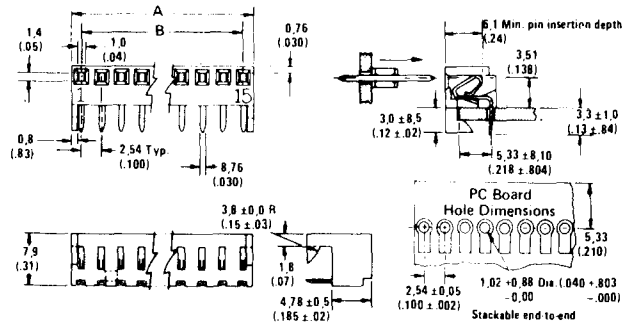
3·96mm (0·156) KK Interconnect System

- ☐ Standard U.S. Pitch
- ☐ Higher Current Capability
- ☐ Stackable Side-by-side



4455 P.C. CONNECTOR, RIGHT ANGLE, 94V-O

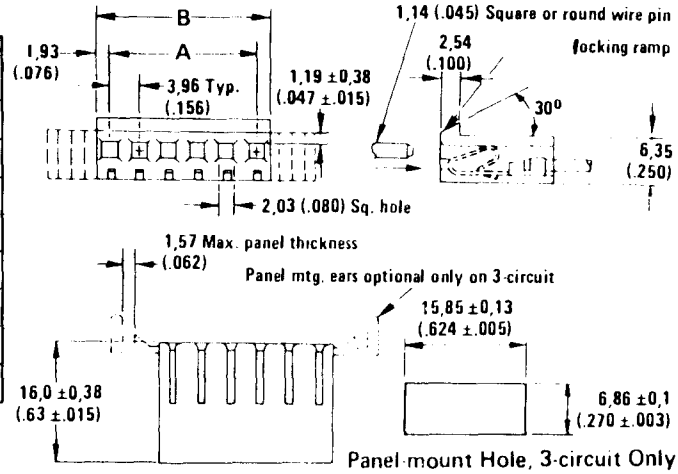
Eng. No.	Order No.	Cir-cuits	Dim A mm	Dim A in.	Dim B mm	Dim B in.
A-4455-03A	22-15-2031	3	5.08	.200	7.52	.296
A-4455-04A	22-15-2041	4	7.62	.300	10.06	.396
A-4455-05A	22-15-2051	5	10.16	.400	12.60	.496
A-4455-07A	22-15-2071	7	15.24	.600	17.68	.696
A-4455-10A	22-15-2101	10	22.86	.900	25.30	.996
A-4455-15A	22-15-2151	15	35.56	1.400	38.00	1.496



0.156" PITCH AND 0.2" PITCH INTERCONNECT SYSTEMS

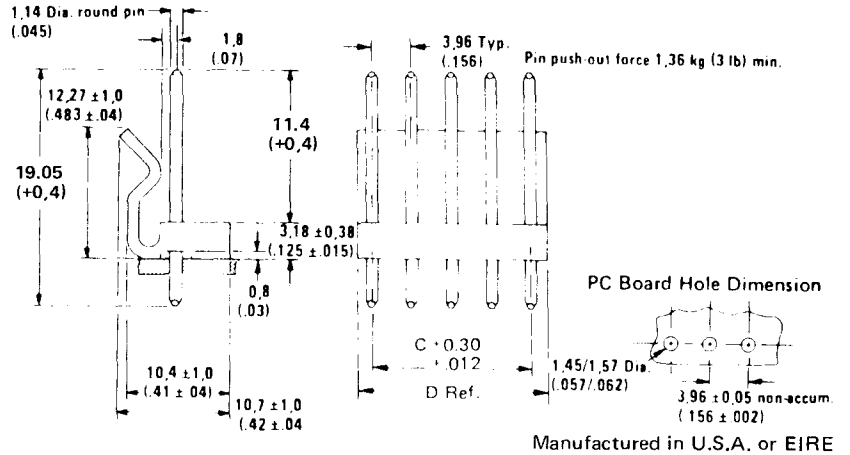
2139 - HOUSING FOR CRIMPTERMINALS FOR USE WITH 2391 WAFER ASSEMBLY 0.156" PITCH

Eng. No.	Cir-cuits	Dim A mm	Dim A in.	Dim. B mm	Dim. B in.
2139- 2A	2	3,96 ± 0,13	.156 ± .005	7,82 ± 0,18	.308 ± .007
2139- 3A	3	7,92 ± 0,13	.312 ± .005	11,79 ± 0,25	.464 ± .010
2139- 4A	4	11,89 ± 0,13	.468 ± .005	15,75 ± 0,25	.620 ± .010
2139- 5A	5	15,85 ± 0,13	.624 ± .005	19,71 ± 0,25	.776 ± .010
2139- 7A	7	23,77 ± 0,13	.936 ± .005	27,64 ± 0,30	1.088 ± .012
2139-10A	10	35,66 ± 0,25	1.404 ± .010	39,52 ± 0,30	1.556 ± .012
2139-12A	12	43,59 ± 0,25	1.716 ± .010	47,45 ± 0,30	1.868 ± .012
2139-15A	15	55,47 ± 0,36	2.184 ± .014	59,33 ± 0,36	2.336 ± .018



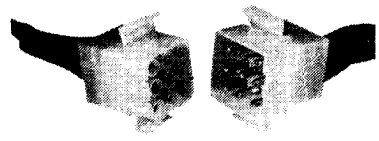
2391 LOCKING WAFER ASSEMBLY FOR 2139-N HOUSING. (0.156" PITCH)

Eng. No.	No. Circuits	Dim C mm	Dim C in.	Dim D mm	Dim D in.
2391-2	2	3,96	.156	7,31	.288
2391-3	3	7,92	.312	11,28	.444
2391-4	4	11,89	.468	15,24	.600
2391-5	5	15,85	.624	19,20	.756
2391-7	7	23,77	.936	27,13	1.068
2391-10	10	35,66	1.404	39,01	1.536
2391-12	12	43,59	1.716	46,94	1.848
2391-15	15	55,47	2.184	58,83	2.316

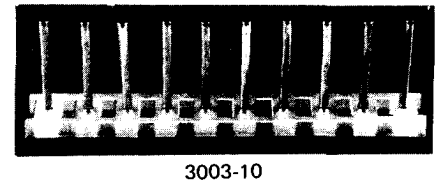


5·08mm (0·2) KK Interconnect System

- Nylon Connectors
- 2,36 mm (.093) Diameter Terminals
- Panel or Free Mounting
- Meet C.E.E. & V.D.E.



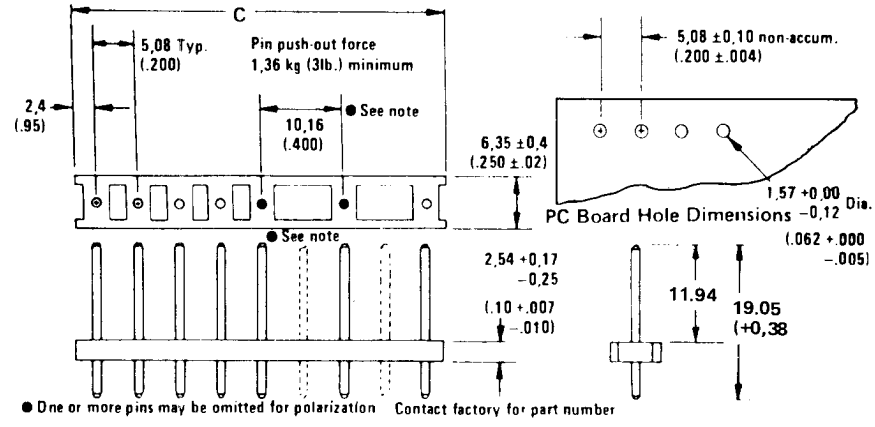
1991-9



3003-10

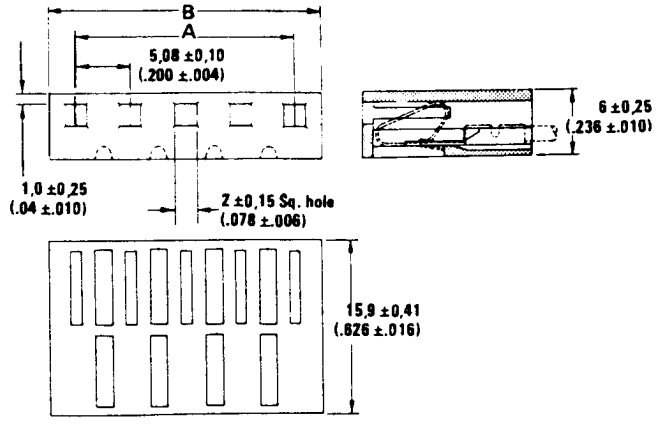
3003 WAFER ASSEMBLY WITH ROUND PINS FOR 3001 HOUSING. (0.2" PITCH)

Eng. No.	Circuits	Dim C mm	Dim C in.
3003-2	2	9,91	.390
3003-3	3	14,99	.590
3003-4	4	20,07	.790
3003-5	5	25,15	.990
3003-7	7	35,31	1.390
3003-10	10	50,55	1.990
3003-12	12	60,71	2.390
3003-15	15	75,95	2.990



3001 HOUSING FOR CRIMP TERMINAL FOR 3003 WAFER ASSEMBLY (0.2" PITCH)

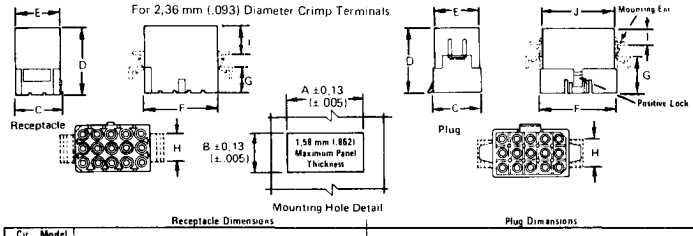
Eng. No.	No. Circuits	Dim A mm	Dim A in.	Dim B mm	Dim B in.
3001-2	2	5,08±0,10	.200±.004	$10,16^{+0,00}_{-0,15}$	$.400^{+.000}_{-.006}$
3001-3	3	10,16±0,10	.400±.004	$15,24^{+0,00}_{-0,15}$	$.600^{+.000}_{-.006}$
3001-4	4	15,24±0,10	.600±.004	$20,32^{+0,00}_{-0,15}$	$.800^{+.000}_{-.006}$
3001-5	5	20,32±0,10	.800±.004	$25,40^{+0,00}_{-0,15}$	$1.000^{+.000}_{-.006}$
3001-7	7	30,48±0,20	1.200±.008	$35,56^{+0,00}_{-0,20}$	$1.400^{+.000}_{-.008}$
3001-10	10	45,72±0,20	1.800±.008	$50,80^{+0,00}_{-0,20}$	$2.000^{+.000}_{-.008}$
3001-12	12	55,88±0,25	2.200±.010	$60,96^{+0,00}_{-0,30}$	$2.400^{+.000}_{-.012}$
3001-15	15	71,12±0,25	2.800±.010	$76.20^{+0,00}_{-0,30}$	$3.000^{+.000}_{-.012}$



LOW COST CONNECTIONS FOR PANEL AND CABLE MOUNTING

1991 INTERNATIONAL HOUSINGS

For 2,36 mm (.093) Diameter Crimp Terminals



Cir cuits	Model No.	Receptacle Dimensions A	B	C	D	E	F	G	H	I	Plug Dimensions A	B	C	D	E	F	G	H	I	J
3	1991-3	23,37 (.920)	7,87 (.310)	7,49 (.295)	28,95 (1.14)	6,35 (.25)	19,30 (.760)	11,91 (.469)	6,35 (.25)	12,95 (.51)	25,95 (1.022)	9,27 (.365)	8,89 (.35)	27,94 (1.100)	6,35 (.25)	21,89 (.862)	10,67 (.42)	6,35 (.25)	13,20 (.52)	19,30 (.76)
4	1991-4	29,57 (1.168)	7,87 (.31 8)	7,49 (.295)	28,95 (1.14)	6,35 (.25)	25,4 (1.000)	6,35 (.25)	6,35 (.25)	12,95 (.51)	32,26 (1.278)	9,27 (.365)	8,89 (.35)	27,94 (1.100)	6,35 (.25)	28,19 (1.110)	18,67 (.42)	6,35 (.25)	13,20 (.52)	25,65 (1.018)
6	1991-6	24,83 (.946)	15,44 (.608)	14,81 (.58)	28,95 (1.14)	13,67 (.54)	20,06 (.79)	11,13 (.438)	9,50 (.375)	13,70 (.54)	26,62 (1.048)	16,71 (.658)	16,25 (.64)	27,94 (1.100)	13,70 (.54)	22,50 (.886)	10,67 (.42)	9,53 (.375)	13,20 (.52)	19,96 (.786)
9	1991-9	24,03 (.946)	21,59 (.850)	21,11 (.83)	28,95 (1.14)	20,06 (.79)	20,06 (.79)	11,20 (.44)	12,78 (.50)	13,78 (.54)	26,62 (1.048)	23,11 (.910)	22,60 (.89)	27,94 (1.100)	28,86 (.79)	22,58 (.886)	18,67 (.42)	12,68 (.496)	13,20 (.52)	19,96 (.786)
12	1991-12	38,33 (1.194)	21,59 (.858)	21,48 (.84)	28,95 (1.14)	20,06 (.79)	26,26 (1.034)	11,20 (.44)	12,70 (.50)	13,70 (.54)	33,02 (1.308)	23,11 (.910)	22,60 (.89)	27,94 (1.100)	20,06 (.79)	28,95 (1.14)	16,00 (.63)	12,78 (.50)	7,87 (.31)	26,16 (1.83)
15	1991-15	36,63 (1.442)	21,59 (.858)	21,11 (.83)	28,95 (1.14)	28,06 (.79)	32,56 (1.282)	11,20 (.44)	12,70 (.50)	13,70 (.54)	39,42 (1.552)	23,11 (.918)	22,60 (.89)	27,94 (1.100)	20,06 (.79)	35,26 (1.388)	16,00 (.630)	12,70 (.50)	7,87 (.31)	32,54 (1.281)

• Dimensions subject to nominal variation ±0,25 mm (.010)

CRIMP TERMINALS

CRIMP TERMINALS

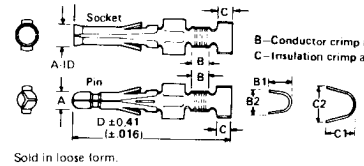
Models 1380 TL (Plug)

and 1381 TL (Socket)

Model No.	Dimensions A	B [1]	C [1]	O	E	B1 [1]	B2	C1 [1]	C2	F1 [2]	F2 [2]
1380 P	2,49/2,24 (.098/.088)	3,0 (.12)	2,3 (.09)	21,97 (.865)		3,18 (.125)	3,56/2,54 (.140/.100)	3,56 (.140)	4,06/2,54 (.160/.100)		
1381 S	2,24/2,08 (.088/.082)	3,0 (.12)	2,3 (.09)	21,97 (.865)		3,18 (.125)	3,56/2,54 (.140/.100)	3,56 (.140)	4,06/2,54 (.160/.100)		

[1] Tolerance ±0,41 (.016)

Cir cuits	Max. Amps	Max. Volts	Model No.
3	11	688	1991-3
4	9	680	1991-4
6	9	608	1991-6
9	8	608	1991-9
12	6	600	1991-12
15	6	600	1991-15



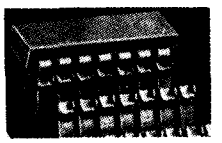
B—Conductor crimp area

C—Insulation crimp area

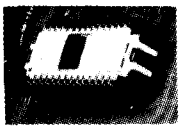
Sold in loose form.

Manufactured in U.S.A. or EIRE

- 1938 I.C. Terminal
- 4130 Dip Switch
- 2944 Zero Force LSI/MOS Socket

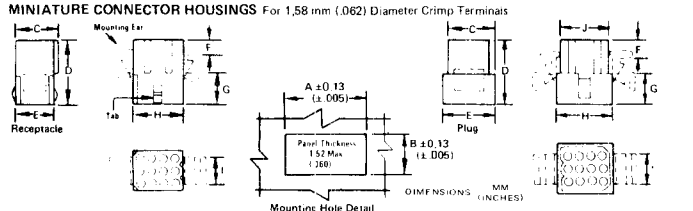


1938-4



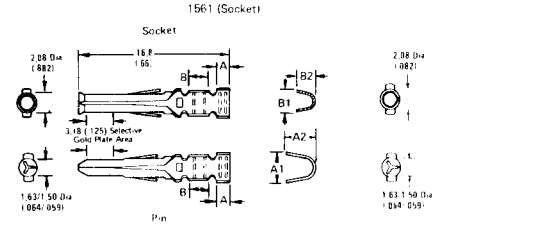
2944

MINIATURE CONNECTOR HOUSINGS For 1,58 mm (.062) Diameter Crimp Terminals



Circuits	Model No.	Receptacle Dimensions A	B	C	D	E	F	G	H	I	Plug Dimensions A	B	C	D	E	F	G	H	I	J
1	1625-1	—	—	5,1 dia. (.20)	19,8 (.78)	—	—	—	4,9 dia. (.193)	—	—	—	5,1 dia. (.20)	19,1 (.75)	—	—	—	—	—	7,6 dia. (.30)
2	1625-2	12,83 (.505)	6,73 (.265)	8,64 (.340)	20,6 (.81)	4,88 (.192)	5,3 (.21)	9,9 (.39)	8,64 (.340)	4,8 (.19)	15,47 (.609)	8,08 (.318)	5,1 (.20)	19,8 (.78)	7,6 (.30)	5,3 (.21)	9,7 (.38)	11,2 (.44)	4,8 (.19)	8,9 (.35)
3	1625-3	16,51 (.650)	6,73 (.265)	4,88 (.192)	19,8 (.78)	4,88 (.192)	5,3 (.21)	9,9 (.39)	12,30 (.484)	4,8 (.19)	19,15 (.754)	8,08 (.318)	5,1 (.20)	19,1 (.75)	7,6 (.30)	5,3 (.21)	9,7 (.38)	15,6 (.59)	4,8 (.19)	12,5 (.49)
4	1625-4	19,94 (.785)	6,60 (.260)	4,88 (.192)	19,8 (.78)	4,88 (.192)	5,3 (.21)	9,9 (.39)	16,00 (.630)	4,8 (.19)	21,97 (.865)	7,93 (.312)	7,49* (.295)	19,1 (.75)	7,49* (.295)	5,3 (.21)	9,7 (.38)	18,5 (.73)	4,8 (.19)	16,3 (.64)
6	1625-6	14,82 (.552)	12,83 (.505)	12,55 (.494)	19,8 (.78)	12,55 (.494)	5,3 (.21)	9,9 (.39)	8,74 (.344)	9,7 (.38)	15,62 (.615)	15,42 (.607)	12,5 (.49)	19,1 (.75)	15,2 (.60)	5,3 (.21)	9,7 (.38)	11,4 (.45)	9,7 (.38)	8,9 (.35)
9	1625-9	16,51 (.650)	14,02 (.552)	13,5 (.53)	19,8 (.78)	12,55 (.494)	5,3 (.21)	9,9 (.39)	12,42 (.489)	9,7 (.38)	19,18 (.752)	15,62 (.615)	13,6 (.53)	19,1 (.75)	15,00 (.590)	5,3 (.21)	9,7 (.38)	15,0 (.59)	9,7 (.38)	12,4 (.49)
12	1625-12	20,19 (.795)	14,30 (.563)	13,5 (.53)	19,8 (.78)	12,55 (.494)	5,3 (.21)	9,9 (.39)	16,10 (.634)	9,7 (.38)	22,94 (.903)	15,60 (.614)	13,7 (.54)	19,1 (.75)	15,00 (.590)	5,3 (.21)	9,7 (.38)	18,8 (.74)	9,7 (.38)	16,3 (.64)
15	1625-15	23,72 (.934)	14,30 (.563)	13,5 (.53)	19,8 (.78)	12,34 (.487)	5,3 (.21)	9,9 (.39)	19,71 (.776)	9,7 (.30)	26,47 (1.042)	15,60 (.614)	13,7 (.54)	19,1 (.75)	15,00 (.590)	5,3 (.21)	9,7 (.38)	22,4 (.88)	9,7 (.39)	19,6 (.77)

CRIMP TERMINALS Models 1560 (Plug) 1561 (Socket)



Circuits (a)	Max. Amps	Max. Volts	Model No.
1	5	250	1625-1
2	5	250	1625-2
3	5	250	1625-3
4	5	250	1625-4
6	5	250	1625-6
9	5	250	1625-9
12	5	250	1625-12
15 (d)	5	250	1625-15

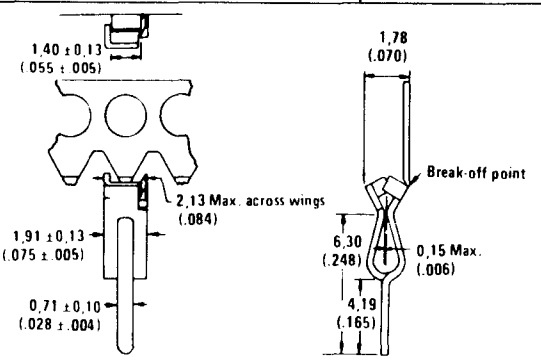
Model No.	Crimp Wire Size	Insulation Diameter
1560 P	18-24 (b)	1,52/3,05 (.060/.120)
1561 S		

Model No.	Dimensions A	B	A1	A2	B1	B2
1560 P	1,52 (.060)	2,03 (.080)	3,56/2,79 (.140/.110)	3,56 (.140)	2,92/2,16 (.115/.085)	2,0 (.08)
1561 S						

1938–4 Soldercon T.M. P.C. I.C. Terminal

1938–4–25M 25K pieces per reel

1938–4–50M 50K pieces per reel



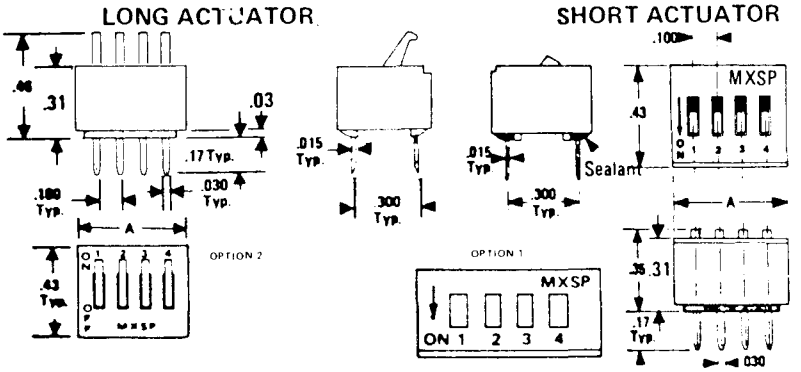
4130 Boss T.M. Switch

LONG ACTUATOR OPTION 2

10040-004-000	01-70-0104
10040-007-000	01-70-0107
10040-008-000	01-70-0108
10040-010-000	01-70-0110

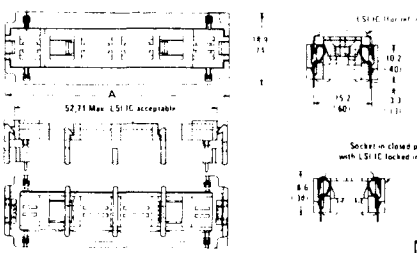
SHORT ACTUATOR OPTION 1

10040-104-000	01-70-0304
10040-107-000	01-70-0307
10040-108-000	01-70-0308
10040-110-000	01-70-0310



2944 Zero Force Socket for MOS/LSI Chips

Specifications and Order Numbers				
Number of Leads	Dim. A mm	Dim. A in.	Order Number	Model Number
24	38,9	1.53	15-24-0803	2944-3
28	43,9	1.73	15-24-0802	2944-2
40	59,2	2.33	15-24-0801	2944-1

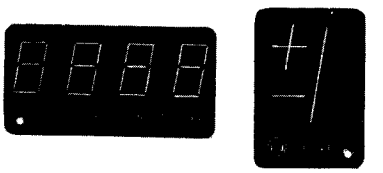


Manufactured in U.S.A. or EIRE

BECKMAN®

SP & SM Series

- Numerical and Alphanumerical Displays
- Interfaces with MOS/LSI Clock Chips
- Decoder Driver Converter and Connectors Available



INTRODUCTION

The combination of Gas Discharge Displays offered, together with their associated connectors, decoder driver and voltage converters, comprises a product family which will resolve most applications where information has to be visually displayed particularly in direct sunlight.
Displays are available from 0.330" (8.4mm) to 1.0" (2.5mm) high as numerical figures and in 0.550" (14mm) (SP 252) as alphanumeric.
Continuous "no-gap" characters make the displays most attractive to users.

TECHNICAL DATA SUMMARY

Supply Voltage	160 Volts Min	180 Volts Typ.
Viewing Angle	130°	
Colour	Orange (Neon Glow)	
Viewing Distance	In Excess of 40 Feet	

DISPLAYS

MODEL	DESCRIPTION	D.C.SEGMENT CURRENT TYP. (uA)	POWER DISSIPATION (mW)	BRIGHTNESS Ft/L @ TYP. CURRENT	HEIGHT (INS/MM)	RECOMM. CONNECTOR
SP 101	Planar numeric display	700	725	225	1.0/25.4	CS101/2
SP 102	Planar ±1 display				1.0/25.4	CS102
SP 151	Four digit clock display	300	300	200	0.50/12.7	
SP 252	Planar two digit alphanumeric	330	575	210	0.55/14.0	
SP 331	Two digit module, inclusive ±1	180	175	210	0.33/8.4	CS332
SP 332	Two digit module				0.33/8.4	CS332
SP 333	Three digit module				0.33/8.4	CS333
SP 334	Three digit module inclusive ±1				0.33/8.4	CS333
SP 351	Two digit module, inclusive ±1	330	325	210	0.55/14	CS352
SP 352	Two digit module				0.55/14	CS352
SP 353	Three digit module				0.55/14	CS353
SP 354	Three digit module, inclusive ±1				0.55/14	CS353
SP 355	Four digit module, inclusive ±1				0.55/14	CS352(2 REQ.)
SP 356	Four digit module				0.55/14	CS352(2 REQ.)
SP 357	Configured as a 12 hour clock				0.55/14	CS152/352
SP 358	Configured as a 24 hour clock				0.55/14	
SM 851	Two digit modular, inclusive ±1			210	0.55/14	
SM 852	Two digit modular				0.55/14	
SM 853	Three digit modular				0.55/14	
SM 854	Three digit modular, inclusive ±1				0.55/14	
SM 855	Two digit modular, inclusive ±1				0.55/14	
SM 856	Two digit modular				0.55/14	
SM 857	Three digit modular				0.55/14	
SM 858	Three digit modular, inclusive ±1				0.55/14	

DECODER DRIVER

Type	Description
DD–700	A monolithic I/C accepts TTL/DTL 8-4-2-1 binary coded decimal (BCD) information to direct drive the seven segment displays.

VOLTAGE CONVERTER

Type	Description
VC–525–01	This DC/DC converter is designed to give an adjustable output of 170 to 210 volts DC from 5 volts DC input.

CONNECTORS

Type	For use with the following displays
CS 101	SP 101
CS 102	SP 101 and SP 102
CS 332	SP 331 and SP 332
CS 333	SP 333 and SP 334
CS 352	SP 351 and SP 352
CS 353	SP 353 and SP 354

For further details on technical performance and pin out information please contact our Sales Office.

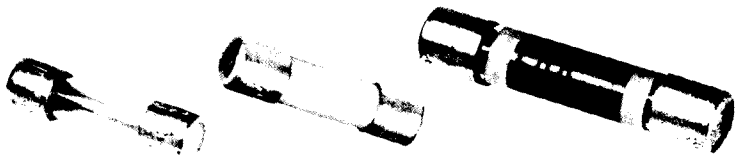
Manufactured in USA

Fuse Links

'Alert' TDC Series

Kenneth E. Beswick

- IEC & BS approved fuses
- Ceramic & glass cartridge
- Quick act; Time lag; Anti-surge

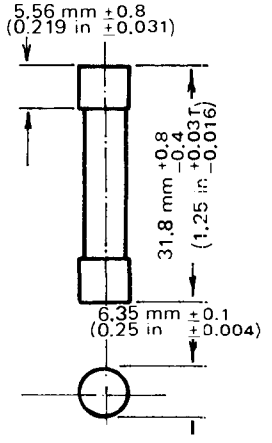


Type	Description	Ratings Available
TDC 10	1¼" x ¼" low break capacity. Quick action glass BS 2950A	60mA, 100mA, 150mA, 250mA, 600mA, 750mA, 1A, 1.25A, 1.5A, 2A, 2.5A, 3A, 5A, 7.5A, 10A, 12A, 15A, 20A, 25A
TDC 11	1¼" x ¼" low break capacity. Anti-surge glass.	150mA, 250mA, 500mA, 600mA, 750mA, 850mA, 1A, 1.25A, 1.5A, 2A, 2.5A, 3A, 5A, 7A, 10A
TDC 13	20mm x 5mm low break capacity quick action glass. IEC 127 Sheet 2 BS 4265 Sheet 2.	80mA, 100mA, 200mA, 250mA, 500mA, 1A, 1.25A, 1.5A 2A, 5A
TDC 69	5/8" x 3/16" low break capacity quick acting glass.	100mA, 250mA, 500mA, 1A, 2.5A
TDC 123	20mm x 5mm low break capacity anti-surge glass. IEC 127 Sheet 3.	100mA, 160mA, 200mA, 250mA, 300mA, 400mA, 500mA, 600mA, 800mA, 1A, 1.25A, 1.6A, 2A, 2.5A, 3.15A
TDC 134	5/8" x 3/16" low break capacity anti-surge glass.	100mA, 250mA, 500mA, 1A

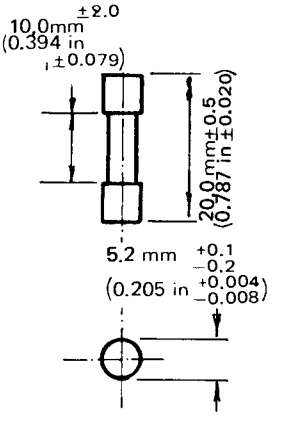
All fuse links have silvered caps. Endurance 1000 hours min. Temperature 0 to 35°C operation.

OUTLINE DRAWINGS

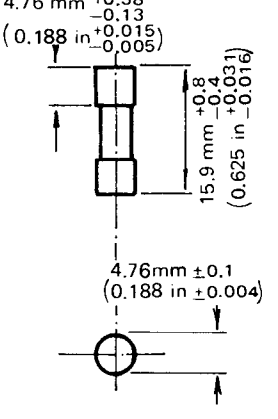
1¼" x ¼" Fuse



20mm x 5mm Fuse



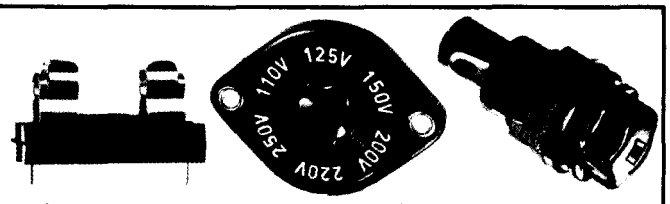
5/8" x 3/16" Fuse



Manufactured in U.K.

RADIATRON

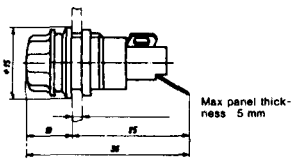
- BS rated and approved to DIN, VDE, SEMKO, UL
- Touchproof & panel sealed
- For 1¼" x ¼" and 5 x 20mm fuses
- Touchproof fuseholders with Dual Capability also Push Fit Mounting



Panel Mounting Fuseholders

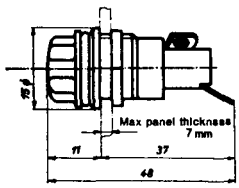
Miniature fuseholder
FEP 031.1001

For 5 x 20 mm fuses
10A/500V ≅ SEV, 6.3A/250V ≅ VDE and 7A BS
Mounting hole 13 mm ⌀
Bayonet cap fuse carrier
Solder tags 2.8 x 0.5 mm
Test voltage 4 KV, 50Hz, 1 minute



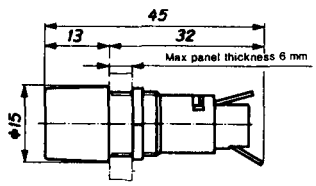
Fuseholder (UL approved)
FER 031.2001

For 1¼" x ¼" fuses
Waterproof from front
10A/500V ≅ SEV,
6.3A/250V ≅ VDE
15A/250V ≅ UL
Mounting hole 13 mm ⌀
Bayonet cap fuse carrier
Solder tag connections
Test voltage 4 KV, 50Hz, 1 minute



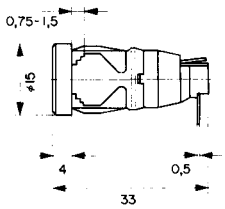
Touchproof fuseholder
To DIN 41664
FEB 031.1401

For 5 x 20 mm fuses
10A/500V ≅ SEV, 6.3A/250V ≅ VDE and SEMKO
Mounting hole 13 mm ⌀
Solder tags 2.8 x 0.5 mm
VDE/SEMKO/SEV approval
Test voltage 4 KV, 50Hz, 1 minute



Touchproof fuseholder with "push-in" mounting
FEF031.1091

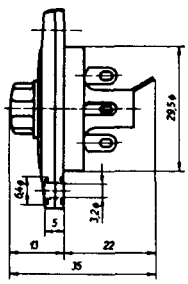
For 5 x 20 mm fuses
6.3A/250V
Mounting hole: Ø 13 mm
Test voltage 4 KV/50 Hz, 1 min



Voltage Selectors

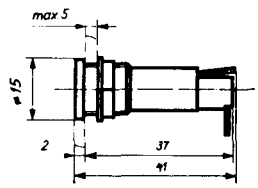
Voltage selector with built-in fuseholder
SWP 033.1000/SWR 033.2000

For 5 x 20 mm fuses
SWP 033.1000
For 1¼" x ¼" fuses
SWR 033.2000
Bayonet cap fuse carrier
6 voltages set by using Screwdriver or coin after removing the cap
Standard voltage marking
110/125/150/200/220/250V
Rating - 6.3A/250V ≅ VDE

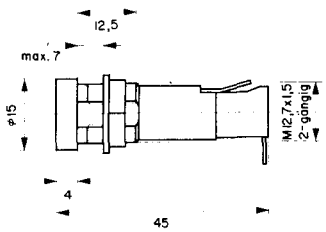


Touchproof fuseholder (Flush mounting)
FEI 031.1431

For 5 x 20 mm fuses
10A/500V ≅ SEV, 6.3A/250V ≅ VDE and SEMKO
Mounting hole 13 mm ⌀
Bayonet cap fuse carrier
Solder tags 2.8 x 0.5 mm
VDE/SEMKO/SEV approval
Test voltage 4 KV, 50Hz, 1 minute



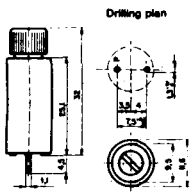
Touchproof fuseholder
For both 20mm x 5mm and 1¼" x ¼" fuses
FEU031.1673 flat black socket
FEK031.1661 carrier for 1¼"x ¼"fuses
FEK031.1663 carrier for 20 mm x 5 mm fuses
6.3A/250V to VDE, semco
12A/250V to UL,CSA
Mounting hole: Ø 13 mm
Bayonet cap fuse carriers
Test voltage 4KV, 50Hz, 1 minute.



Printed Circuit Fuseholders

Fuseholder for printed circuit mounting (Vertical)
FAP 031.3601

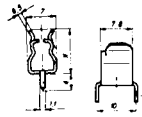
For 5 x 20 mm fuses
Vertical mounting
10/250 ≅ SEV,
6.3A/250V ≅ VDE
Bayonet cap fuse carrier
SEV, VDE approved
Test voltage 3 KV, 50Hz, 1 minute



Spring clip fuseholders for printed circuits
OG 751.0035

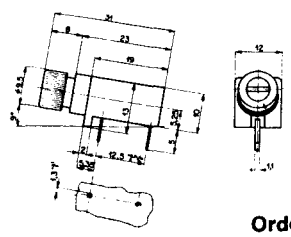
For fuses 5x20mm and 1¼"x¼"
10A/250V ≅

OG 751.0045
For fuses 5 x 20 mm



Fuseholder for printed circuit mounting (Horizontal)
FAS 031.3511

For 5 x 20 mm fuses
Angled mounting 9° from horizontal
10/250 ≅ SEV,
6.3A/250V ≅ VDE
Bayonet cap fuse carrier
SEV approved
Test voltage 3 KV, 50Hz, 1 minute



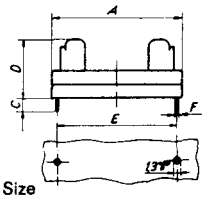
Open mounted fuseholder for printed circuits
OG 031.8001/8002

10A/250V ≅ SEV,
6.3A/250V ≅ VDE

For 5 x 20 mm fuses
OG 031.8001

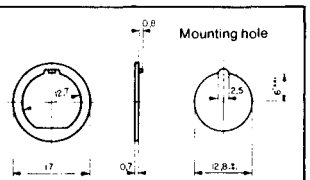
For fuses 1¼" x ¼"
OG 031.8002

Test voltage 3 KV, 50Hz, 1 minute



Anti-rotational washer

For locking fuse holders with mounting hole of 13 mm Ø without punching a complicated D-lock



Manufactured in Switzerland

Order No.	Size A	B	C	D	E		F
031.8001	29	9,5	4	16	25	+ 0,4 0	0,4
031.8002	41	14	4	18,5	37,5	+ 0,6 0	0,5

HEATSINKS

General Purpose & Power

redpoint

- ☐ Push-on for TO-5, TO-18 packages
- ☐ Chassis mounting for TO-3, TO-66, TO-92 & TO-220 packages
- ☐ Power extrusions

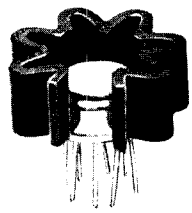
HEATSINKS FOR TO-5 PACKAGES

PUSH-ON MOUNTING

This range is free mounting and black anodise finished in three variations.

TYPE 5F

Push-on lobed radiation fin.
Thermal rating θ = 50°C/watt
Size – 0.625 in.dia. x 0.5 in.
(15.8mm dia. x 12.7mm)



TYPE 5F2

Half Height version of 5F.
Thermal rating θ = 80°C/watt

TYPE 5F-6

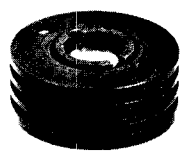
Double Height version of 5F.
Thermal rating θ = 38°C/watt
Size 0.625 in.dia. x 1.0 in.
(15.8mm dia. x 25.4mm)

CHASSIS MOUNTING

Available in two versions, both hollow clamp screw trap transistor flange against dissipation seating. The 5C version is black anodised and the 5C/HA type is hard anodised which gives insulation between the device and the chassis.

TYPE 5C & 5C/HA

Thermal rating θ = 30°C/watt
Size 0.938 in. dia. x 0.375 in.
(23.8mm dia. x 9.5mm)
Mounting 6BA at 0.71 in. (18.0mm) centres.



TYPE 5DC/HA

This device insulates between each device and from the chassis and has a hard anodised finish.
Thermal rating θ = 50°C/watt
Length x sectio n – 1.25 x 0.375 x 0.625 in.
Mounting – 6BA at 0.40 in. (10.1mm) centres

HEATSINKS FOR TO-18 PACKAGES

TYPE 18DC/HA

This device is a twin transistor flange clamping heatsink with insulation between each device and from the chassis and finished in hard anodised metal.

TYPE 18F

This is a push-on lobed radiation fin black anodised and free standing.
Thermal rating θ = 50°C/watt
Size 0.563 in.dia. x 0.50 in.
(14.3mm dia. x 12.7mm)

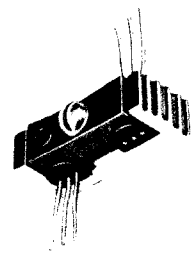
TYPE 18F-2

Half height version of the 18F type.
Thermal rating θ = 80°C/watt
Size 0.563 in. dia. x 0.25 in.
(14.3mm dia. x 6.3mm)

HEATSINKS FOR TO-92 PACKAGES

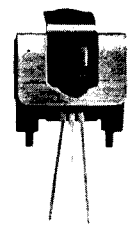
TYPE 92DC

This device dissipates power from the TO92 package in dual configuration giving temperature balance.
Thermal rating
Θ = 80°C/watt
Size 0.186 x 0.75 x 0.31 in.
(4.8 x 19.0 x 8.0mm)
Mounting 8BA finished in green anodised and red nylon.



TYPE 92F

This device is a board-mounted radiator for TO-92, E-line and lock fit devices.
Thermal rating
Θ = 36 to 50°C/watt
Dimensions 14 x 7 x 14mm high.
Use inverted for free standing mode.



Manufactured in U.K.

redpoint

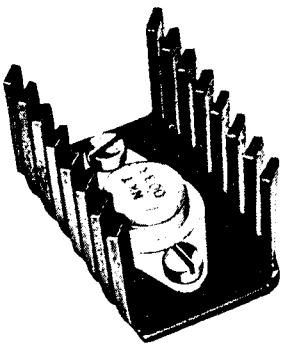
- Push-on for TO-5, TO-18 packages
- Chassis mounting for TO-3, TO-66, TO-92 & TO-220 packages
- Power extrusions

HEATSINKS FOR POWER PLASTIC DEVICES

These sinks are designed for use with packages similar to the TO126, TO220 etc.

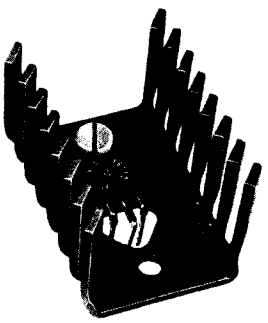
TYPE TV2

This unit is designed specifically for the TO-66 package.
Thermal rating Θ = 105° C/watt
Size 38 x 27 x 22 mm high



TYPE TV21

This unit is designed specifically for the, TO-220 package and has the following characteristics:—
Thermal rating Θ case to sink to air = 10.5°C/watt
Dimensions 38mm x 28mm x 22mm high
Finish matt black anodised.

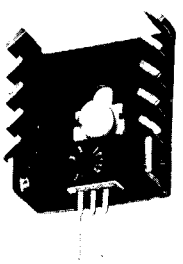


TYPE TV4 & TV5

The TV4 will accomodate most packages with the TV5 specifically covering devices having off set mounting holes.
Both heatsinks satisfy the following dissipation characteristics:—
Thermal rating
Θ = 17°C/watt
Width x length 22 x 19mm (0.866 x 0.75 in.)
Height 19mm (0.75 in.)
Finish black anodised.

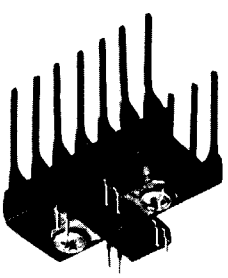
TYPE TV1500

Low headroom sink for wide range of outlines from TO-126 to TO-220
Thermal rating
Θ = 12.5°C/watt
Dimensions 12.7 x 31 x 30 mm high



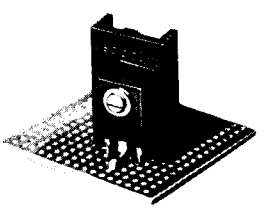
TYPE TV8

Suitable for use with I.C. amplifiers mainly in audio power applications with the TCA 940, TBA 810S and TA 7092.
Thermal rating
Θ = 16.5°C/watt
Dimensions 22 x 33 x 25mm high.
Finish black anodised.



CH 90

The CH-90 offers heatsink facility to a broad range of tab-pack semiconductors. The TO-127 outline was the package for which the CH90 was designed with the following specification.
Thermal rating
Θ = 18°C/watt. They are all black anodised and are 19mm (0.75 in.) in length and 8mm (0.31 in.) in width and 32mm (1.25 in.) in height.



Manufactured in U.K.

redpoint

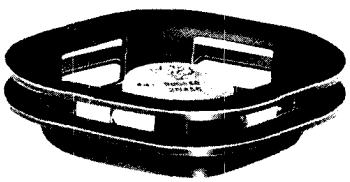
- Push-on for TO-5, TO-18 packages
- Chassis mounting for TO-3, TO-66, TO-92 & TO-220 packages
- Power extrusions

HEATSINKS FOR TO-3 PACKAGES

These two devices are mounted by means of a 4BA screw and nut coincident with the device and black anodise finished

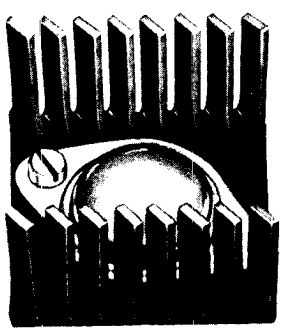
TYPE 3SA

Thermal rating θ = 8.5°C/watt on 3.5 in. (75 x 101mm) board
or thermal rating θ = 3.8°C/watt on 3 x 4 in. (75 x 101mm) aluminium
Overall Size 2.38 x 1.81 x 0.56 in.
(60.3 x 46.0 x 14.3mm)



TYPE TV3 POWERFIN

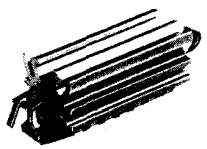
Utilising twisted vane design for maximum dissipation.
Thermal rating θ = 7.2°C/watt
length/width/height 38 x 42 x 25mm
(1.5 x 1.65 x 1.0 in.)



HEATSINKS FOR I/C PACKAGES

DIP1490

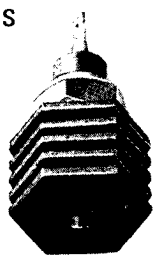
Clip-on heatsink suiting D.I.L. devices with in-line pins.
Thermal rating
Θ = 32°C/watt @ 2 watts.
Dimensions 10.5 x 31.0 length
Height above device 7.5 mm



HEATSINKS FOR POWER DIODES

TYPE DSF-1

This red anodised heatsink is designed to accept a 10.32 UNF or M.5 thread.
Thermal rating
Θ = 27°C/watt
Hexagon A/F = 0.625 in. (15.9mm)
Length 0.438 in. (11.1mm)



SEMICONDUCTOR MOUNTING COMPOUND

THERMPATH 167

Θ approximately equal to 0.05°C/watt 0.001 in. 20ml syringe 12g vial. When mounting the semiconductor, this material improves the thermal resistance by up to 40%. The minute airgaps are filled and the compound is stable over a wide temperature range and maintains insulation.

Properties
Specific gravity
2.7
Thermal Conductivity
16.7×10^{-4} cals/cm sec°C
Dielectric strength
280v/0.001 in.
Bleed
7 days at 20°C, 0.1%
24 hours at 200°C, 0.2%
Volume resistivity
At 20°C, 1.1×10^{15} ohm cm.
At 177°C, 4.3×10^{13} ohm cm.

Manufactured in U. K.

redpoint

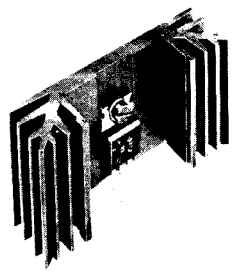
General Purpose & Power

- Push-on for TO-5, TO-18 packages
- Chassis mounting for TO-3, TO-66, TO-92 & TO-220 packages
- Power extrusions

POWER EXTRUSIONS

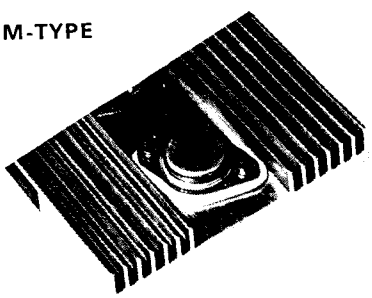
				* BLACK ANODISED	BRIGHT
M-TYPE For applications including that of printed circuit boards and suitable for external mounting on equipment.	Height 0.56" – 14mm Width 3.69" – 94mm	2M 3M 4M 6M	2" – 51mm 3" – 76mm 4" – 102mm 6" – 152mm	θ = 4.2°C/watt θ = 3.2°C/watt θ = 2.8°C/watt θ = 2.25°C/watt	4.8°C/watt 3.7°C/watt 3.2°C/watt 2.6°C/watt
W-TYPE Extremely efficient chimney sink with built-in mounting facility and transistor coverage.	Height 1.25" – 32mm Width 5.12" – 130mm	2W 3W 4W 6W	2" – 51mm 3" – 76mm 4" – 102mm 6" – 152mm	θ = 1.9°C/watt θ = 1.5°C/watt θ = 1.3°C/watt θ = 1.1°C/watt	2.2°C/watt 1.8°C/watt 1.5°C/watt 1.3°C/watt
Y-TYPE Light weight but efficient unit suited to P.C.B. application. Has acceptance slots for transistor cover chield.	Height 0.63" – 16mm Width 2.36" – 60mm	2Y 3Y 3.5Y 4Y	2" – 51mm 3" – 76mm 3.5" – 89mm 4" – 102mm	θ = 6.2°C/watt θ = 4.8°C/watt θ = 4.2°C/watt θ = 3.9°C/watt	7.2°C/watt 5.5°C/watt 4.8°C/watt 4.5°C/watt

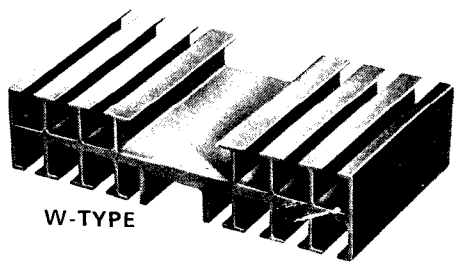
TYPE 1.25GY For TO-220. Thermal rating 8°C watt. Choice of stable vertical or horizontal mounting modes. Central groove one side prevents device rotation. Backside plain. Dimensions as Y type extrusion, 32,, long (1.25"). Fixing centres 38mm for self-tapping screws.



*Black anodised heatsinks available to special order

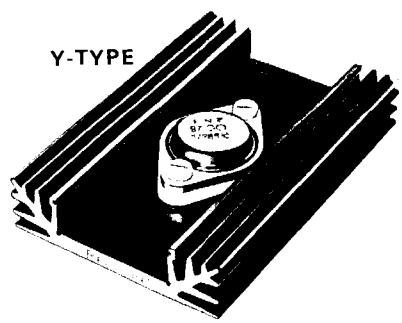
M-TYPE





W-TYPE

Y-TYPE



Manufactured in U.K.

ELMA KNOBS

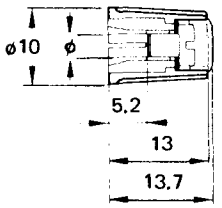
Collet Type

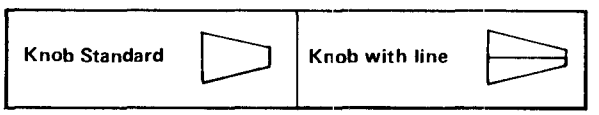
RADIATRON

- Unit construction concept
- Three collet diameters – 3mm, 4mm & 1/8"
- Plastic mouldings highly stable

KNOBS 10 MM DIAMETER

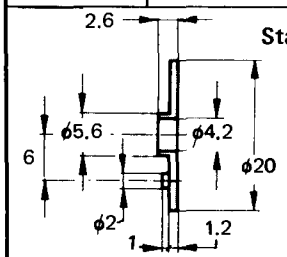
Knobs 70–10 (020 series) 71 –10 (021 series)





ORDERING INFORMATION

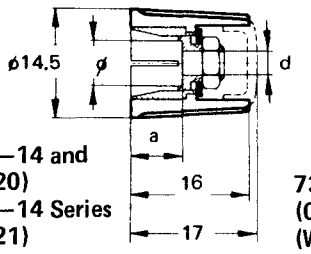
Computer Code	Old Part Number	Colour	ø
020–2210	70–10–	Grey	1/8
020–2220	70–10–	Black	1/8
020–2110	70–10–	Grey	3
020–2120	70–10–	Black	3
020–2310	70–10–	Grey	4
020–2320	70–10–	Black	4
021–2210	71–10–	Grey	1/8
021–2220	71–10–	Black	1/8
021–2110	71–10–	Grey	3
021–2120	71–10–	Black	3
021–2310	71–10–	Grey	4
021–2320	71–10–	Black	4



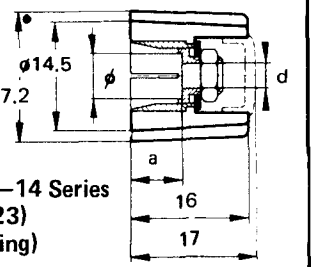
Stator (Black) 1453–10/1 (043–2220)

Owing to lack of space it is not possible for the stator to be mounted with a fixing nut,

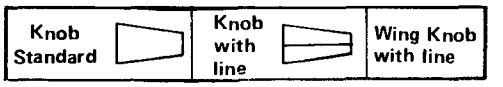
KNOBS 14.5 MM DIAMETER



70–14 and (020) 71–14 Series (021)



73–14 Series (023) (Wing)



ORDERING INFORMATION

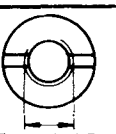
Computer Code	Old Part Number	Colour	ø	a	d
020–3110	70–14–	Grey	3	5.2	–
020–3210	70–14–	Grey	1/8	5.2	–
020–3310	70–14–	Grey	4	5.2	–
020–3410	70–14–	Grey	6	7.0	3.2
020–3510	70–14–	Grey	1/4	7.0	3.2
020–3120	70–14–	Black	3	5.2	–
020–3220	70–14–	Black	1/8	5.2	–
020–3320	70–14–	Black	4	5.2	–
020–3325	70–14–	Matt blk	4	5.2	–
020–3420	70–14–	Black	6	7.0	3.2
020–3425	70–14–	Matt blk	6	7.0	3.2
020–3520	70–14–	Black	1/4	7.0	3.2
020–3525	70–14–	Matt blk	1/4	7.0	3.2
021–3110	71–14–	Grey	3	5.2	–
021–3210	71–14–	Grey	1/8	5.2	–
021–3310	71–14–	Grey	4	5.2	–
021–3410	71–14–	Grey	6	7.0	3.2
021–3510	71–14–	Grey	1/4	7.0	3.2
021–3120	71–14–	Black	3	5.2	–
021–3220	71–14–	Black	1/8	5.2	–
021–3320	71–14–	Black	4	5.2	–
021–3420	71–14–	Black	6	7.0	3.2
021–3520	71–14–	Black	1/4	7.0	3.2
023–3110	73–14–	Grey	3	5.2	–
023–3210	73–14–	Grey	1/8	5.2	–
023–3310	73–14–	Grey	4	5.2	–
023–3410	73–14–	Grey	6	7.0	3.2
023–3510	73–14–	Grey	1/4	7.0	3.2
023–3120	73–14–	Black	3	5.2	–
023–3220	73–14–	Black	1/8	5.2	–
023–3320	73–14–	Black	4	5.2	–
023–3325	73–14–	Matt blk	4	5.2	–
023–3420	73–14–	Black	6	7.0	3.2
023–3425	73–14–	Matt blk	6	7.0	3.2
023–3520	73–14–	Black	1/4	5.2	3.2
023–3535	73–14–	Matt blk	1/4	5.2	3.2

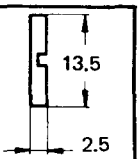
STANDARD ACCESSORIES

All dimensions in mm

Slotted Nut 1465–(046–Series)

d(Thread)	Old Code	New Code(046-)
M6 x 0.75	1465–6	–1000
M8 x 0.75	1465–8	–2000
M10 x 0.75	1465–10	–3000
3/8 – 32	1465–3/8	–4000



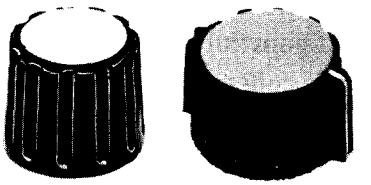


Manufactured in Switzerland

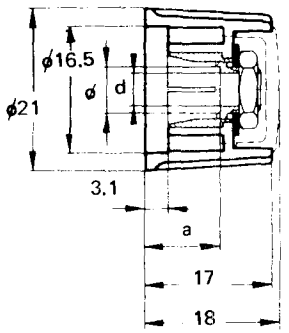
RADIATRON

Collet Type

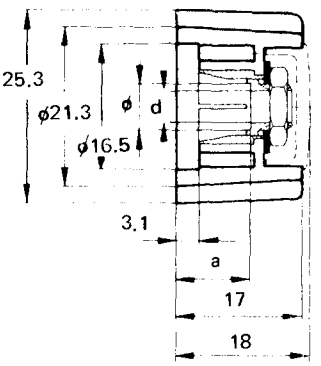
- Unit Construction concept
- Five collet diameters – 3mm, 4mm, 6mm, 1/8" & 1/4"
- Plastic mouldings highly stable
- Now available in black matt finish



KNOBS 21 MM DIAMETER



70–21 and 71–21 Series
(020-and 021-series)



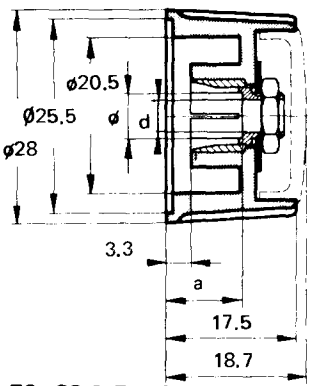
73–21 Series (Wing)
(023-series)

Knob Standard	Knob with Line	Wing Knob with line

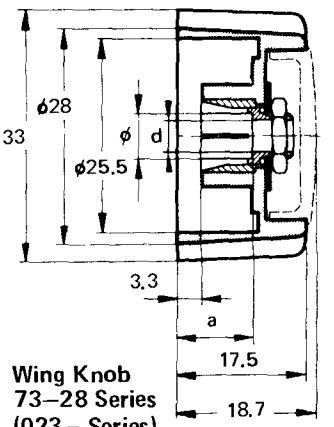
ORDERING INFORMATION

Computer Code	Old Part Number	Colour	ø	a	d
020–4310	70–21–	Grey	4	8.3	–
020–4410	70–21–	Grey	6	10.1	4.2
020–4510	70–21–	Grey	1/4	10.1	3.2
020–4320	70–21–	Black	4	8.3	–
020–4325	70–21–	Matt blk	4	8.3	–
020–4420	70–21–	Black	6	10.1	4.2
020–4425	70–21–	Matt blk	6	10.1	4.2
020–4520	70–21–	Black	1/4	10.1	3.2
020–4525	70–21–	Matt blk	1/4	10.1	3.2
021–4310	71–21–	Grey	4	8.3	–
021–4410	71–21–	Grey	6	10.1	4.2
021–4510	71–21–	Grey	1/4	10.1	3.2
021–4320	71–21–	Black	4	8.3	–
021–4420	71–21–	Black	6	10.1	4.2
021–4520	71–21–	Black	1/4	10.1	3.2
023–4310	73–21–	Grey	4	8.3	–
023–4410	73–21–	Grey	6	10.1	4.2
023–4520	73–21–	Grey	1/4	10.1	3.2
023–4320	73–21–	Black	4	8.3	–
023–4325	73–21–	Matt blk	4	8.3	–
023–4420	73–21–	Black	6	10.1	4.2
023–4425	73–21–	Matt blk	6	10.1	4.2
023–4520	73–21–	Black	1/4	10.1	3.2
023–4525	73–21–	Matt blk	1/4	10.1	3.2

KNOBS 28 MM DIAMETER



70–28 & 71–28 Series
(020– and 021– Series)



Wing Knob
73–28 Series
(023– Series)

Knob Standard	Knob with Line	Wing Knob with Line

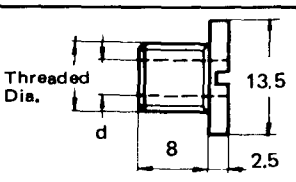
ORDERING INFORMATION

Computer Code	Old Part Number	Colour	ø	a	d
020–5510	70–28–	Grey	1/4	10.3	3.2
020–5520	70–28–	Black	1/4	10.3	3.2
020–5410	70–28–	Grey	6	10.3	4.2
020–5420	70–28–	Black	6	10.3	4.2
021–5520	71–28–	Black	1/4	10.3	3.2
021–5510	71–28–	Grey	1/4	10.3	3.2
021–5420	71–28–	Black	6	10.3	4.2
021–5410	71–28–	Grey	6	10.3	4.2
023–5520	73–28–	Black	1/4	10.3	3.2
023–5510	73–28–	Grey	1/4	10.3	3.2
023–5420	73–28–	Black	6	10.3	4.2
023–5410	73–28–	Grey	6	10.3	4.2

Threaded Bush 1466–

Supplied complete (047–Series) with hexagon nut.

d (Thread)	Old Code	New Code
M6 x 0.75	1466–3	–1000
M8 x 0.75	1466–4	–2000
M10 x 0.75	1466–6	–3000



Manufactured in Switzerland

Key Spanner 1467: Required for slotted nut 1465 and threaded bush 1466. Also for 10mm knob collet.

ELMA KNOBS

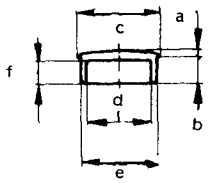
Collet Type

RADIATRON

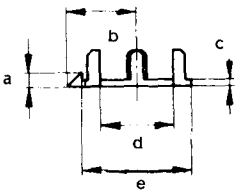
- Unit construction concept
- Three collet diameters -- 3mm, 4mm & 1/8"
- Plastic mouldings highly stable

* ACCESSORIES * ACCESSORIES * ACCESSORIES * ACCESSORIES * ACCESSORIES * ACCESSORIES *

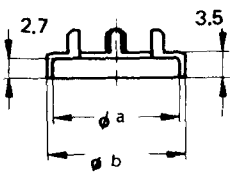
All Dim's in mm.



CAPS



POINTERS



NUTCOVERS

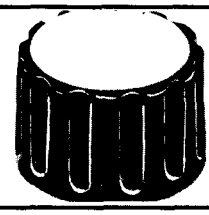
Knob Size	Comp. Code 040–	Old Part Number 1450–	COLOUR				Comp. Code 041–	Old Part Number 1450–	COLOUR				Comp. Code	Old Part Number	COLOUR			
10 mm	–1010	– 9–	Grey	0.7	a	DIMENSIONS	–2010	–10–	Grey	1.8	a	DIMENSIONS	Without Line					
	–1020	– 9–	Black	2.4	b		–2020	–10–	Black	6.8	b		044-	1454				
	–1030	– 9–	Red	7.0	c		–2030	–10–	Red	0.7	c		–2010	–10–	Grey	14.0	a	
	–1040	– 9–	Blue	5.4	d		–2040	–10–	Blue	7.0	d		–2020	–10–	Black			
	–1050	– 9–	Yellow	6.7	e		–2050	–10–	Yellow	10.0	e		With Line					
	–1060	– 9–	Green	2.3	f		–2060	–10–	Green				044-	1455–				
													–2110	–10–	Grey	15.5	b	
													–2120	–10–	Black			
14 mm	–3010	–14–	Grey	1.0	a	DIMENSIONS	–3010	–14–	Grey	2.0	a	DIMENSIONS	Without Line					
	–3020	–14–	Black	3.5	b		–3020	–14–	Black	9.3	b		044–	1454				
	–3030	–14–	Red	11.0	c		–3030	–14–	Red	0.9	c		–3010	–14–	Grey	17.0	c	
	–3040	–14–	Blue	8.5	d		–3040	–14–	Blue	9.7	d		–3021	–14–	Black			
	–3050	–14–	Yellow	9.0	e		–3050	–14–	Yellow	14.5	e		With Line					
	–3060	–14–	Green	3.2	f		–3060	–14–	Green				044–	1455				
													–3110	–14–	Grey			
													–3120	–14–	Black			
													For Wing Knob					
													044–			18.7	d	
													–3210		Grey			
													–3220		Black			
21 mm	–4010	–21–	Grey	1.0	a	DIMENSIONS	–4010	–21–	Grey	2.4	a	DIMENSIONS						
	–4020	–21–	Black	5.0	b		–4020	–21–	Black	13.2	b							
	–4030	–21–	Red	16.5	c		–4030	–21–	Red	1.0	c							
	–4040	–21–	Blue	13.6	d		–4040	–21–	Blue	16.5	d							
	–4050	–21–	Yellow	15.4	e		–4050	–21–	Yellow	21.0	e							
	–4060	–21–	Green	4.0	f		–4060	–21–	Green									
28 mm	–5010	–28–	Grey	1.2	a	DIMENSIONS	–5010	–28–	Grey	3.0	a	DIMENSIONS						
	–5020	–28–	Black	5.0	b		–5020	–28–	Black	17.0	b							
	–5030	–28–	Red	23.0	c		–5030	–28–	Red	1.1	c							
	–5040	–28–	Blue	20.0	d		–5040	–28–	Blue	20.5	d							
	–5050	–28–	Yellow	22.3	e		–5050	–28–	Yellow	28.0	e							
	–5060	–28–	Green	4.2	f		–5060	–28–	Green									

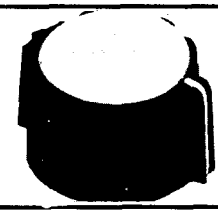
Manufactured in Switzerland

RADIATRON

Collet Type

- Unit construction concept
- Three spindle diameters
- Plastic mouldings highly stable





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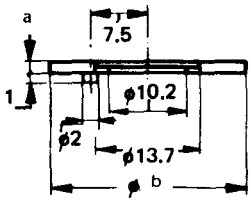


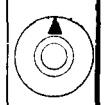
STATORS

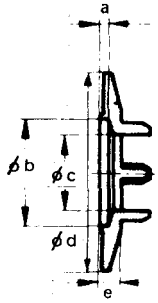
TRANSPARENT NUMBER DIALS

Series 1452/Knob diam/Ref

042–Series

Black or Grey only





Comp. Code	Old Part No.	Dim's a	Dim's b	—	30°	30°	27° 40°	36°	36°	60°	60°	—	Black / Grey		DIMENSIONS	
				0	0–11	1–12	1–13	0–0	1–10	0–5	1–6	—				
See Page 54 For 10 mm Stator				–2000	–2100	–2200		–2300	–2400	–2500	–2600	–2800	–2920 –2910	Comp. Code (042–)	—	a
															—	b
				–10/0	–10/1	–10/2		–10/3	–10/4	–10/5	–10/6	–10/8	–10/9/- Colour	Old Part No. (1452–)	7.0	c
															20.0	d
															1.8	e
043–3220	1453–14/1	1.4	26	–3000	–3100	–3200		–3300	–3400	–3500	–3600	–3800	–3920 –3910	Comp. Code (042–)	1.8	a
															14.0	b
				–14/0	–14/1	–14/2		–14/3	–14/4	–14/5	–14/6	–14/8	–14/9/ Colour	Old Part No. (1452–)	9.7	c
															26.0	d
															2.7	e
043–4220	1453 –21/1	1.8	36	–4000	–4100	–4200	–4700					–4800	–4920 –4910	Comp. Code (042–)	—	a
															—	b
				–21/0	–21/1	–21/2	–21/7					–21/8	–21/9 Colour	Old Part No. (1452–)	16.5	c
															36.0	d
															2.7	e
043 –5220	1453 –28/1	2.0	44	–5000	–5100	–5200	–5700					–5800	–5920 –5910	Comp. Code (042–)	—	a
															—	b
				–28/0	–28/1	–28/2	–28/7					–28/8	–28/9 Colour	Old Part No. (1452–)	20.5	c
															44.0	d
															2.7	e

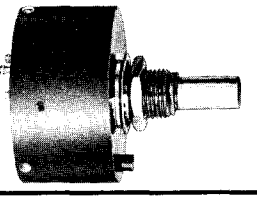
Manufactured in Switzerland

POTENTIOMETERS

Helipot Series/Dials

Beckman®

- ☐ Precision wirewound
- ☐ Choice of 1, 3 or 10 turns
- ☐ Resistance values from 5 ohms to 500Kohms
- ☐ Power ratings up to 5W at 40°C



The Helipot® range of precision potentiometers provide proven reliability wirewound units.

TECHNICAL DATA

Resistance Range and Wireturns
The tables shown below detail the standard range of resistance values.

Type	No. of Turns	Resistance Tolerance	Temp. Range	Power Rating	Independent Linearity	Noise Max.	Starting Torque max. (oz. - in.)	Running Torque max. (oz. - in.)
A	10	< 100Ω:±5% ≥ 100Ω:±3%	−65 to +85	5W at 40°C	< 100Ω:±0.5% ≥ 100Ω:±0.25%	≤ 2,614Ω=500Ω > 2,614Ω=250Ω	3.0	3.0
C	3	≤ 1kΩ:±5% > 1kΩ:±3%	−65 to +85	3W at 40°C	±0.5%	≤ 800Ω=500Ω > 800Ω=250Ω	3.0	3.0
5311	1	≤ 40Ω:±5% > 40Ω:±3%	−25 to +85	2W at 40°C	< 250Ω:±1% ≥ 250Ω:±0.5%	≤ 500Ω=250Ω > 500Ω=100Ω	1.0	0.7
7246	10	±5%	−25 to +85	2W at 70°C	±0.25%	100Ω	2.0	2.0
7276	10	±5%	−25 to +105	2W at 70°C	±0.25%	100Ω	1.5	1.5
7286	10	±5%	−55 to +125	2W at 70°C	±0.25%	100Ω	0.8	0.8

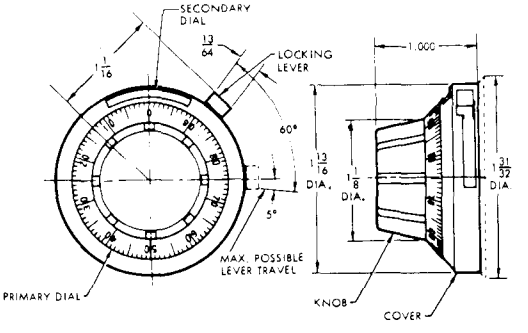
Resistance Value	Type A Wire Turns ±5%	Type C Wire Turns ±5%	Type 5311 Wire Turns ±5%	Type 7246 Wire Turns ±5%	Type 7276/7286 Wire Turns ±5%
5	–	617	–	–	–
10	1,235	794	203	1,200	–
25	2,500	–	–	1,827	–
50	3,205	813	–	2,088	–
100	2,500	1,185	449	2,496	1,685
200	3,252	–	–	3,066	2,725
500	4,252	1,959	535	3,185	3,363
1,000	5,397	1,772	666	3,584	4,161
2,000	6,386	–	–	4,072	5,043
5,000	7,221	3,135	1,107	5,090	5,563
10,000	8,842	3,711	1,362	5,479	6,024
20,000	11,020	4,780	1,512	6 236	6,209
30,000	12,311	4,942	1,617	8,168	8,137
50,000	14,709	5,900		8,620	10,022
100,000	16,475	6,557		8.765	10,770
125,000	–	–	–	9,873	–
150,000	–	6,260	–	–	–
200,000	20,377	–	–	–	–
300,000	21,946	–	–	–	–
500,000	20,868	–	–	–	–

The Duodial® models RB and 2606 turns-counting dials have applications wherever setting of multi-turn devices require accurate counting.

TECHNICAL DATA

Counting Capacity: 15 turns maximum.
Shaft Diameter: For ¼" shafts
Locking Mechanism: Positive action.

OUTLINE DRAWING MODEL RB



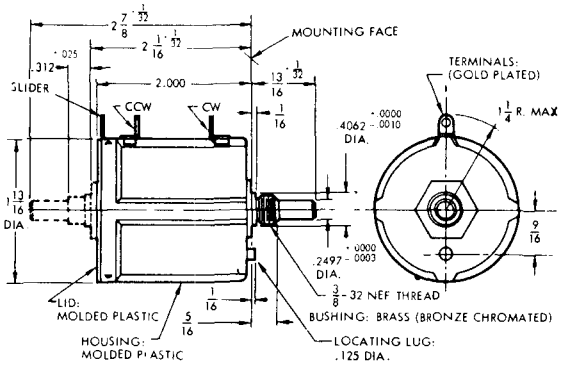
Manufactured in U.K.

- Six types – 7/8" to 1 13/16" dia.
- Matching turns-counting dials
- Outline drawings with dimensional details

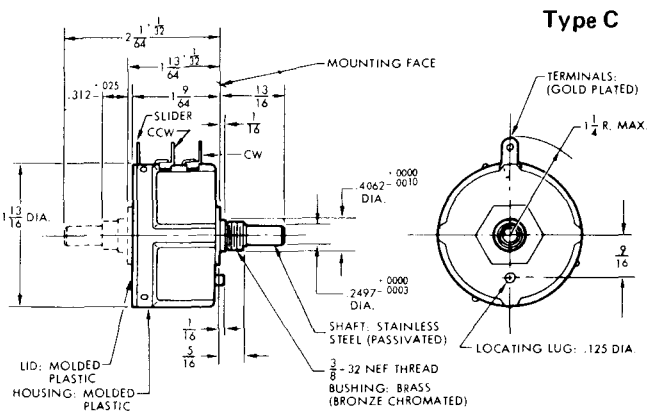
OUTLINE DRAWINGS—Precision Potentiometers

All dimensions in inches.

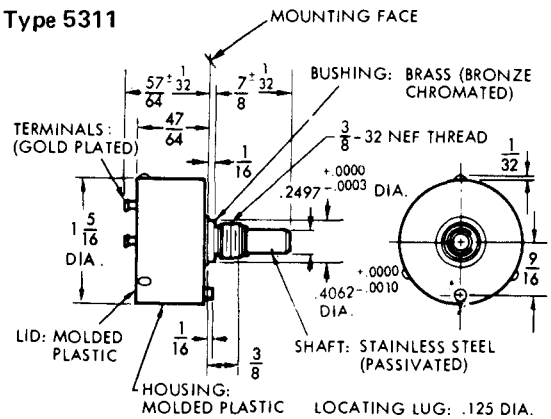
Type A



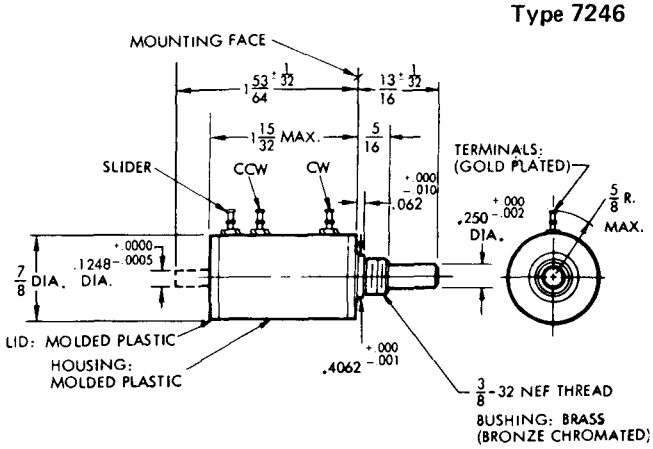
Type C



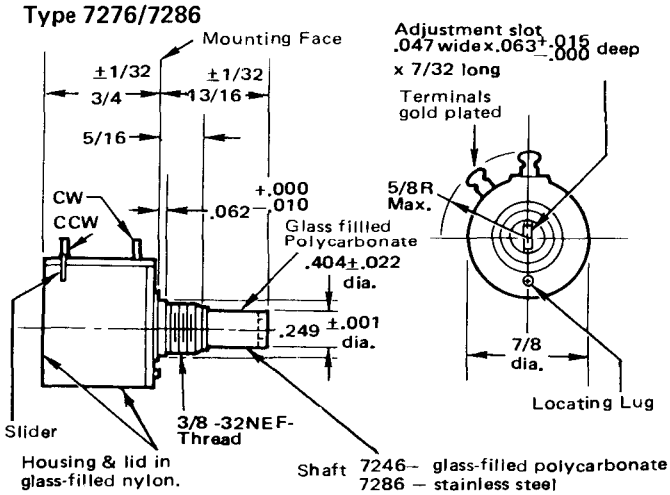
Type 5311



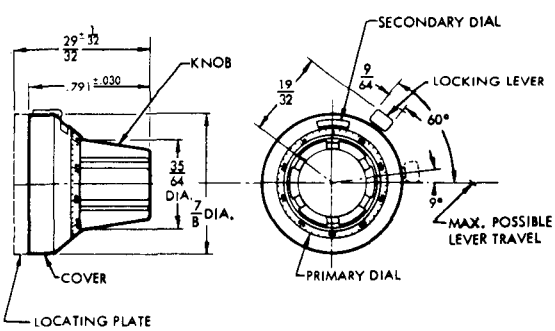
Type 7246



Type 7276/7286



Type 2606



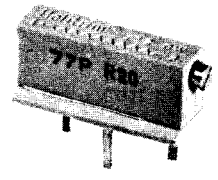
Manufactured in U.K.

POTENTIOMETERS

Cermet Trimming

Beckman®

- ☐ TO5 single turn
- ☐ 3/8" square single/multiple turn
- ☐ 3/4" rectangular — 15 turns



INTRODUCTION

Helitrim ® Cermet Trimming Potentiometers offer power resistance elements in small sizes and low cost in the following types together with mounting brackets for use with 78P and 89 series trimmers

TECHNICAL DATA

Type	Description	Resistance Range	No. of Turns	Temperature Range	Power * Rating	Temp. Coefficient
62P 82P	¼" dia. General Purpose low profile version (82P).	10Ω to 1MΩ	1	−25°C to +125°C	0.5 Watts at 70°C	±100 ppm/°C max.
68W	3/8" Square General Purpose	10Ω to 2MΩ	18	−55°C to +125°C	0.5 Watts at 70°C	±100 ppm/°C max.
72P 72PM 72X 72XW	3/8" single turn, low cost. Three mounting variations available.	10Ω to 2MΩ	1	−55°C to +105°C	0.5 Watts at 70°C	±100 ppm/°C max.
77P 79P	¾" Rectangular sealed trimmer 79P low profile version.	10Ω to 2MΩ	15 15	−55°C to +125°C	0.75 Watts at 25°C	±100 ppm/°C max.
78P	1¼" Rectangular general purpose small size. Mounting bracket also available	10Ω to 2MΩ	22	−55°C to +105°C	1.0 Watts at 70°C	±100 ppm/°C max.
89P 89W	¾" Rectangular, low cost, low profile mounting bracket also available	10Ω to 2MΩ	15	−55°C to +155°C	0.75 Watts at 25°C	±100 ppm/°C max.†

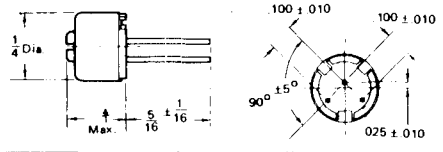
*Derating to 0 at T°C max.
†0 to 500 for 10 and 20 ohms, 0 to 250 for 50 ohms.

OUTLINE DRAWINGS (All dimensions in inches).

TO5 SINGLE TURN

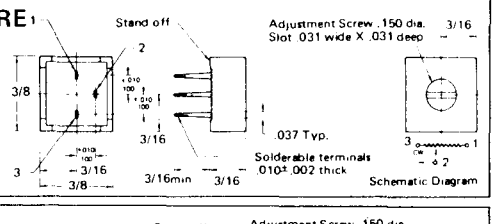
Model 62P and 82P

† 62P– .250
82P– .150

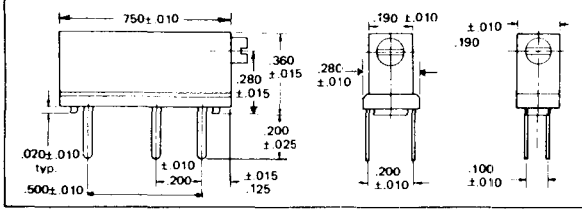


3/8" SQUARE SINGLE TURN

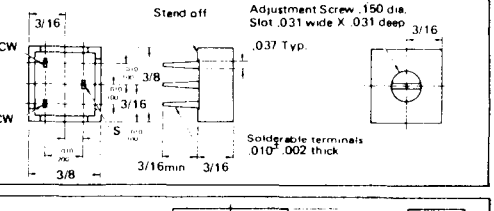
Model 72P



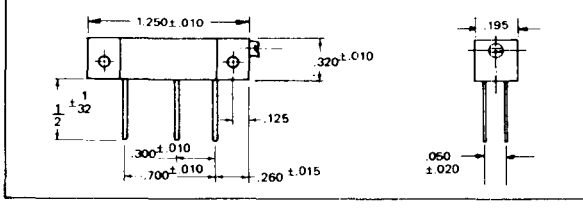
Models 77P & 79P



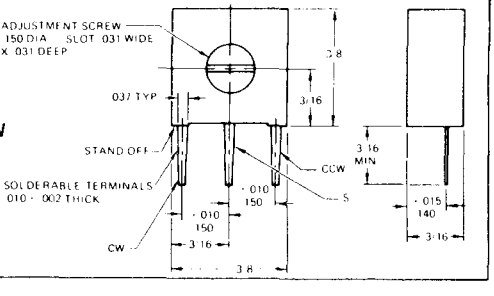
Model 72PM



Model 78P

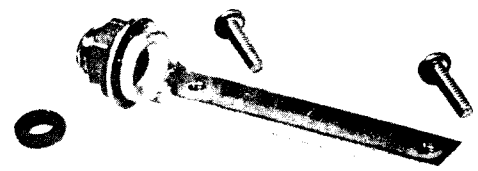


Model 72XW



Manufactured in U.K.

- ☐ 1¼" Rectangular – 22 Turns
- ☐ Low Profile Trimmers
- ☐ Various Mountings Available

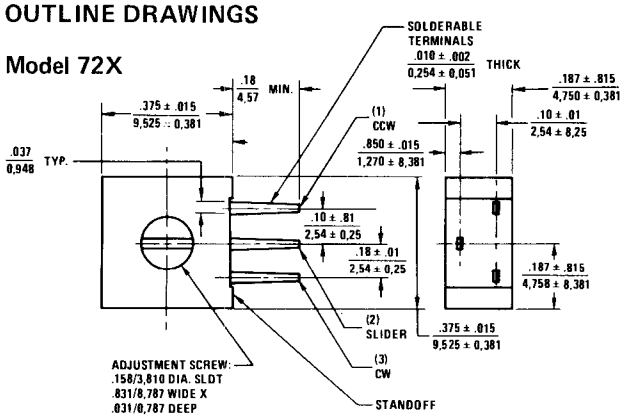


STANDARD RESISTANCE VALUES, OHMS					
10	100	1K	10K	100K	1M
20	200	2K	20K	200K	2M*
—	—	—	25K	250K	—
50	500	5K	50K	500K	—

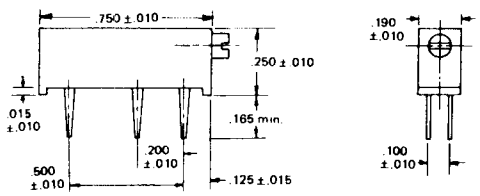
*Not available in Series 62P and 82P

OUTLINE DRAWINGS

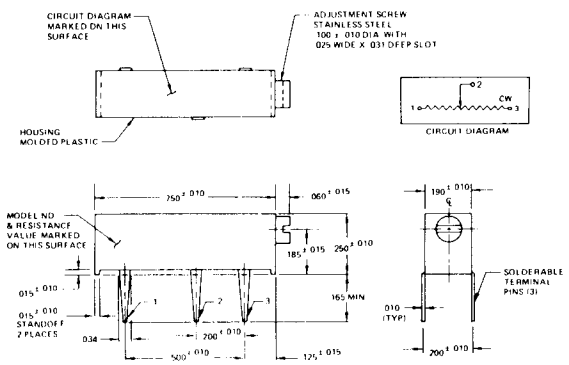
Model 72X



Model 89P

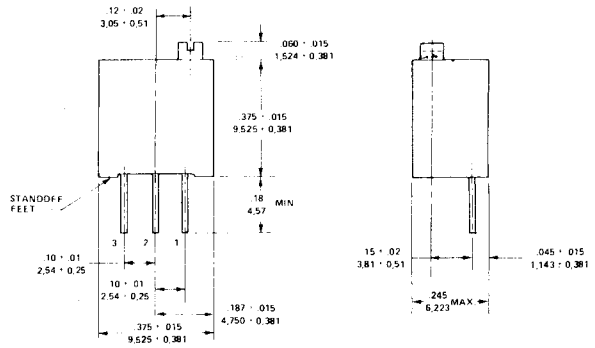


Model 89W



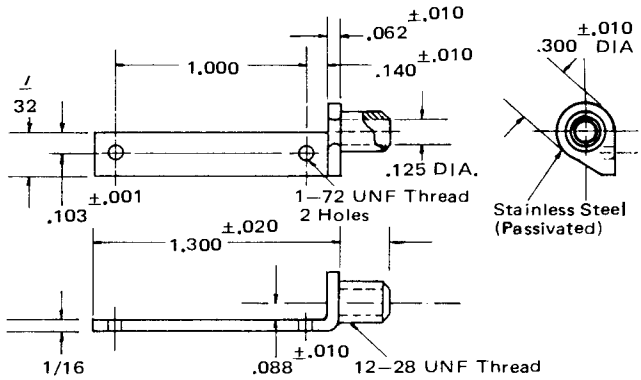
Manufactured in U.K.

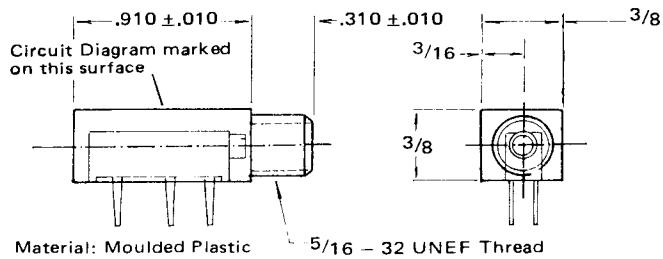
Model 68 W



56 BW Bushing Mount

(for use with 78P)





89B Bushing Mount

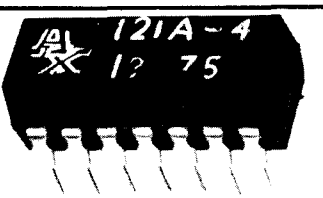
(for use with 89P/89W)

All dimensions in inches

120/130 Series D.I.L. Reed

ASTRALUX

- ☐ Choice of Form A, B, or C contacts
- ☐ Contact ratings up to 10 watts
- ☐ "Built-in" diode on some models



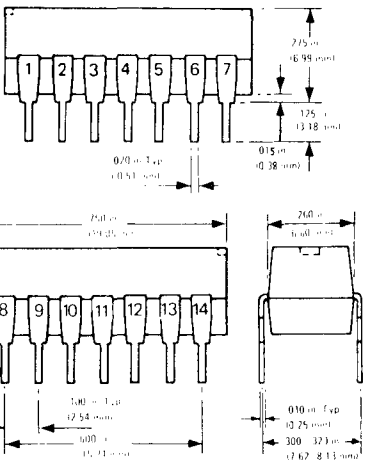
DESCRIPTION

The Astralux 120/130 series offers the most complete range of D.I.L. relays. Available in Form A, 2 Form A, Form B (magnetically biased) and Form C. The range offers contact ratings up to 10 watts in Form A and B and 4 watts in Form C. Models are suitable for automatic insertion on standard 14 pin receptacles or for p.c.b. mounting. Automatic relay testing ensures complete reliability at low cost.

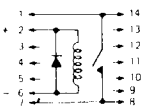
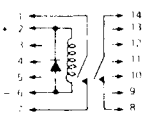
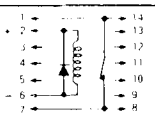
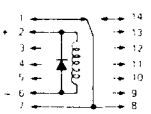
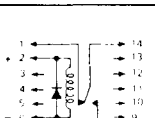
	Nominal	Must Operate	Must Release	Max Continuous
1. Coil Operating Voltages at 20°C	V d.c.	V d.c.	V d.c.	V d.c.
FORM A & C	5	3.7	0.5	7.5 (5.0)
FORM (B)	12	9.0	1.0	18.0 (12.0)
	24	18.0	2.0	36.0 (24.0)

(The Following are typical Values)

	FORM A	FORM B	FORM C
2. Operate Time (mS) at nominal voltage: (Inc. bounce)	0.250	0.10	0.500
3. Release Time (mS) (Inc. bounce)	0.15	0.60	1.3



120 Series has all pins as shown.
130 Series has pins 1,2,6,7,8,9,13,14 only
150 Series has pins 2,6,8,14 only

Form	Circuit Schematics	Type 120 14 pin	Type 130 8 pin	Nom Coil V d.c. @ 20°C	Nom Coil Ω	Diode	Maximum Switch Ratings Volts d.c.	Amps d.c.	Watts d.c.
1 FORM A		121A-3 121A-4 121A-5 121A-6	131A-3 131A-4 131A-5 131A-6	5 5 12-24 12-24	500 500 2900 2900	– Yes – Yes	100	0.50	10
2 FORM A		122A-1 122A-2 122A-3 122A-4 122A-5 122A-6	132A-1 132A-2 132A-3 132A-4 132A-5 132A-6	5 5 12 12 24 24	200 200 500 500 2150 2150	– Yes – Yes – Yes	28	0.11	3
1 FORM B		121B-3 121B-4 121B-5 121B-6	131B-3 131B-4 131B-5 131B-6	5 5 12 12	500 500 2900 2900	– Yes – Yes	100	0.50	10
1 FORM C		121C-1 121C-2 121C-3 121C-4 121C-5 121C-6	131C-1 131C-2 131C-3 131C-4 131C-5 131C-6	5 5 12 12 24 24	80 80 450 450 1750 1750	– Yes – Yes – Yes	28	0.25	3
1 FORM C		125C-1 125C-2 125C-3 125C-4 125C-5 125C-6	135C-1 135C-2 135C-3 135C-4 135C-5 135C-6	5 5 12 12 24 24	150 150 500 500 2150 2150	– Yes – Yes – Yes	100	0.20	4

Manufactured in U.K.

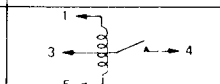
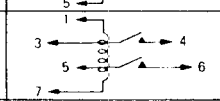
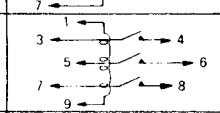
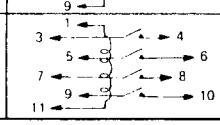
ASTRALUX

Open & Moulded Series Reed

- Open & Moulded types
- Single or multiple pole
- Choice of coil voltage

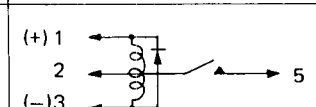
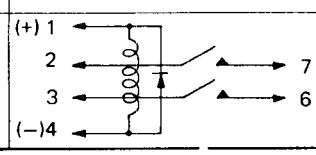
DESCRIPTION

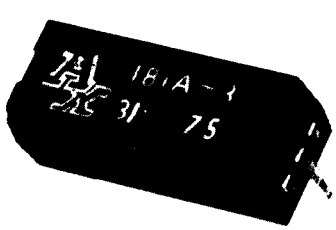
The Astralux 110/200 series of open relays are designed for economy and flexibility of application. They incorporate Form A switching single or multi-pole. Coil voltages of 5, 12 & 24V are available. Drive levels are held to a minimum. Magnetic screening is standard.

Form	Ciruit Schematics	Nom Coil V d.c. @ 20°C	110 SERIES Type	110 SERIES Nom Coil Ω	200 SERIES Type	200 SERIES Nom Coil Ω	Maximum Switch Ratings Volts d.c.	Amps d.c.	Watts d.c.
1 FORM A		5 12 24	111A-1 111A-2 111A-3	375 1000 2000	201A-1 201A-2 201A-3	150 1000 2000	110 Series 200	0.5	10
2 FORM A		5 12 24	112A-1 112A-2 112A-3	250 1000 2000	202A-1 202A-2 202A-3	125 800 1900	200 Series 400	1.0	15
3 FORM A		5 12 24	113A-1 113A-2 113A-3	125 800 2000	203A-1 203A-2 203A-3	75 275 1000			
4 FORM A		5 12 24	114A-1 114A-2 114A-3	125 800 2000	204A-1 204A-2 204A-3	75 275 1000			

DESCRIPTION

The Astralux 180 series is a complete family of moulded relays. Available in Form A & 2 Form A. All models offer coils of 5, 12 or 24 volts designed to keep drive levels to a minimum. Magnetic screening is available on all models. Automatic relay testing ensures complete reliability at low cost.

Form	Circuit Schematics	Type 180 Centres 0.100" (2.54)	Nom Coil V d.c. @ 20°C	Nom Coil Ω @ 20°C	Diode	Maximum Switch Ratings Volts d.c.	Amps d.c.	Watts d.c.
1 FORM A		—	5 5 12 12 24 24	500 500 1000 1000 2000 2000	— Yes — Yes — Yes	500	0.50	10
2 FORM A		182A-1 182A-2 182A-3 182A-4 182A-5 182A-6	5 5 12 12 24 24	375 375 1000 1000 2000 2000	— Yes — Yes — Yes	200	0.50	10



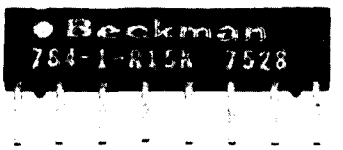
Manufactured in UK

RESISTOR NETWORKS

RESNET® SIP

Beckman®

- ☐ Thick film resistor networks
- ☐ SIL encapsulation
- ☐ Low Profile

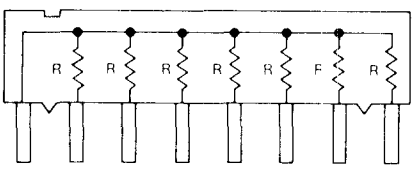


Beckman Low Profile RESNET™ SIP Resistor Networks provide multiple thick film resistor configurations packaged in standard 8–pin moulded single-in-line packaging for maximum component density application. The low profile SIP combines the close board spacing advantage of a SIP with the low profile of conventional DIPs (0.200 in./5,08 mm max.).

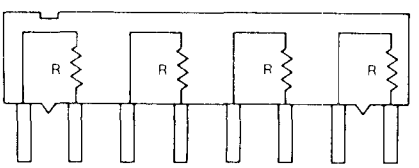
Series 764–1 Resistor Packages consist of seven equal resistors in an 8–pin SIP, each having a common terminal at pin one. Common uses for these networks include "pull-up" and/or "pull-down" applications.

Series 785–1 Resistor Packages consist of nine equal resistors in a 10 pin S.I.P., each having a common terminal at pin one. For use particularly in microprocessor data highway pullups with 8 bits plus one bit for parity.

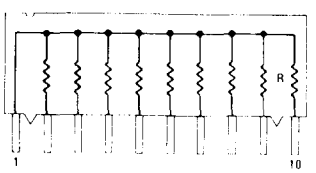
Series 764–3 Resistor Packages consist of four equal, isolated resistors. Applications typically include line termination and L.E.D. current limiting.



7 Resistors
8–Pin SIP
764–1–R (R)



4 Resistors
8–Pin SIP
764–3–R (R)



9 Resistors
10–Pin SIP
785–1–R (R)

Performance Specifications

Resistance Tolerance (+25°C) ..... ±2% max.

Resistance Voltco (+25°C) ..... –.01%/V

Power rating.....	785 –1	764 –1	764 –3
Single resistor (+25°C, still air)	0.5W	0.175W	0.2W
Total Package (+25°C, still air)	2.5W	1.5W	1.5W

Linear Derating to OW @ 150°C = Extrapolating from 125°C (max operating temp).

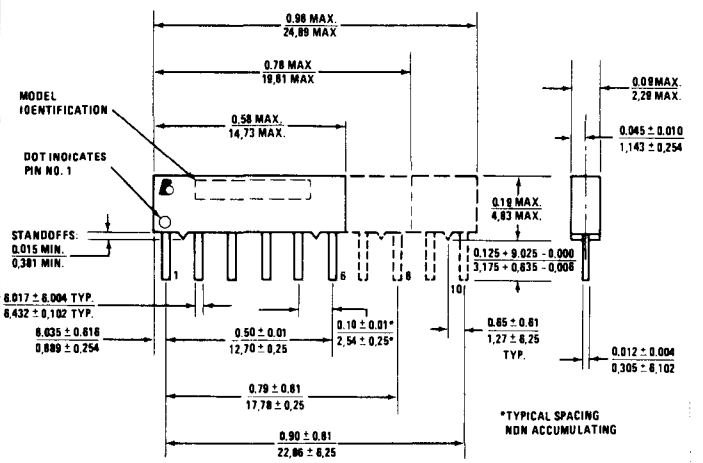
Resistance Temperature Coefficient (–55°C to +125°C): 100 ppm/°C

Resistance Tempco Tracking ..... ±50 ppm/°C max.
Operating Temperature Range ..... –55°C to +125°C
Storage Temperature Range ..... –55°C to +125°C

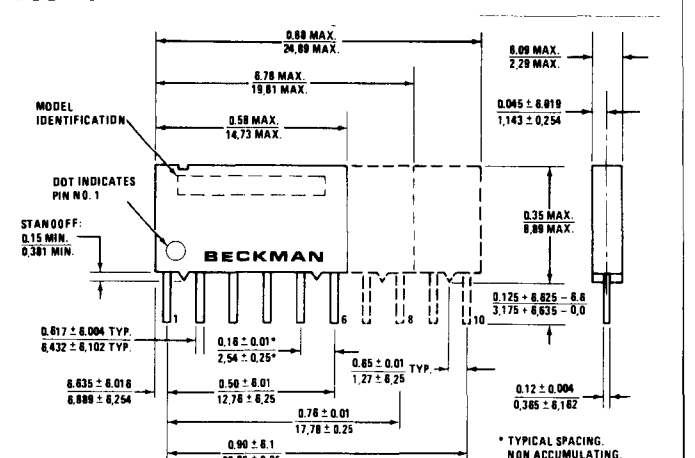
Standard Resistance Values in Ohms (±2%)			
100	330	1.5K	6.8K
120	470	2.2K	10K
150	680	3.3K	15K
220	1K	4.7K	22K

OUTLINE DRAWINGS

764–1/764–3



785–1



Manufactured in U.K.

Beckman®

RESNET® DIP

- ☐ Thick film resistor networks
- ☐ Standard DIP package
- ☐ Wide range of applications

Beckman RESNET ® DIP Resistor Networks provide multiple thick film resistor configurations packaged in standard 14-pin or 16-pin DIP packaging. The series 898/899 offer a wide range of resistance values together with significant reduction in "on the board" costs and space-saving over individual resistors.

Standard Resistance Values in Ohms (Specify in order No. i.e. 898–1–R10k					
47	220	1k	3.3k	10k	100k
68	330	1.5k	4.7k	15k	–
100	470	2k	6k	22k	–
150	680	2.2k	6.8k	47k	–

Performance Specifications

Resistance Tolerance

Series 898-1 (15 resistors)
Series 898-3 (8 resistors) R > 100 Ω = ±2%
Series 899-1 (13 resistors) R ≤ 100 Ω = ±2 Ω
Series 899-3 (7 resistors)

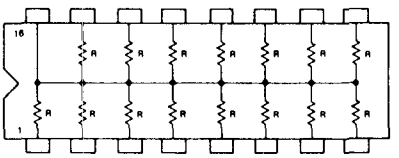
Resistance Temperature Coefficient Contact Sales Office

Package power rating (see note)	All types	1.5W
Resistor power rating (see note)	898/899 – 1	0.15W
	898/899–3	0.25W

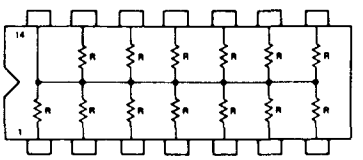
Note: Power ratings shown apply at T_A = +25°C and derate to zero at T_A = + 125°C.

Operating Temperature Range –55°C to + 125°C

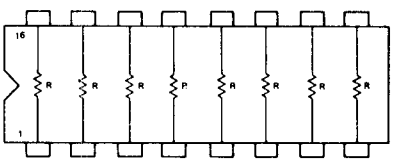
Series 898-1



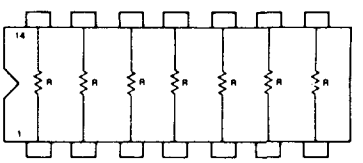
Series 899-1



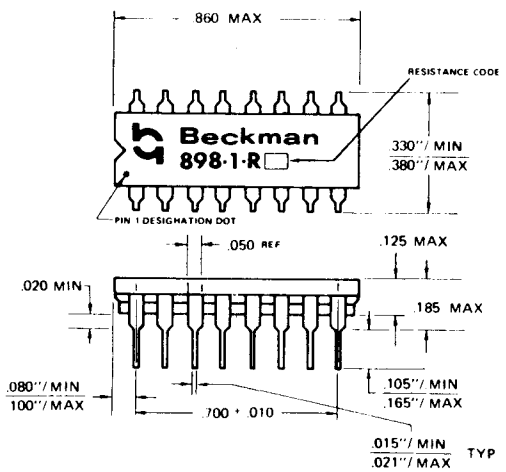
Series 898-3

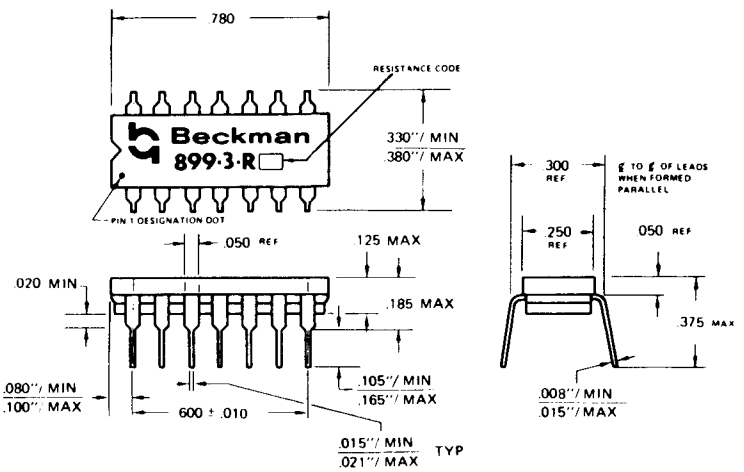


Series 899-3



Outline Drawings





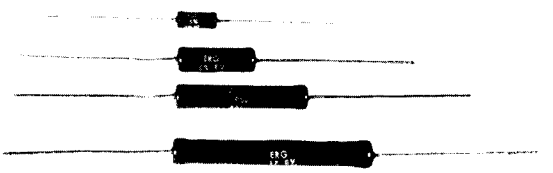
Dimensions in inches

Manufactured in U.K.

Wirewound

Erg Components

- Available in 2·5W, 6W, 9W, & 12W
- Resistance range 0.1Ω to 100K (see data)
- BS, DEF & GPO approved



Performance Data

Temperature category	T7 (−55°C to +200°C)
Humidity classification	H6
Initial tolerance	5%
Temperature coefficient*	0 ±200ppm/°C max. 0+80ppm/°C typical.
Solderability conforms to BS2011 Test T (IEC 68) requirements.	
Lead resistance	R006/25mm except on 74EV which is R01/25mm.

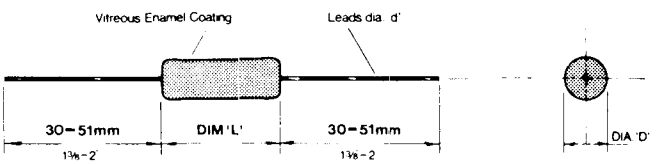
*Very low temperature coefficients are available to special order.

APPROVAL	
ERG 74EV BS 2E-56-2.5 DEF 5115-2 RFH3-2-5 P.O. 35, 35A, 35B	**ERG 16EV** BS 2E-56-9 DEF 5115-2 RFH3-9 P.O. 36
ERG 58EV BS 2E-56-6 DEF 5115-2 RFH3-6 P.O. 40, 40A, 40B	**ERG 17EV** BS 2E-56-12 DEF 5115-2 RFH3-12 P.O. 50

Ordering Method Example 74EV 82 R ±5%

- Style of Resistor
- Nominal Resistance (BS 1852 Table 3)
- Selection Tolerance

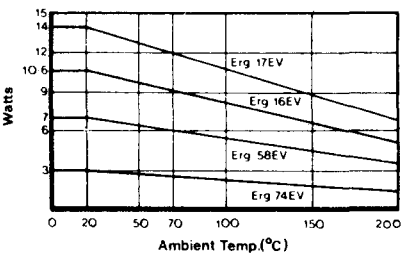
Electrical Data	Erg 74EV	Erg 58EV	Erg 16EV	Erg 17EV
BS rating at 70°C	2.5W	6W	9W	12W
BS approved range	1R0-10K	10R-20K	10R-68K	10R-100K
Erg full resistance range	R10-10K	R10-20K	R50-68K	1R0-100K
Max. Volts D.C./critical value	150/9K1	200/6K8	500/27K	750/47K



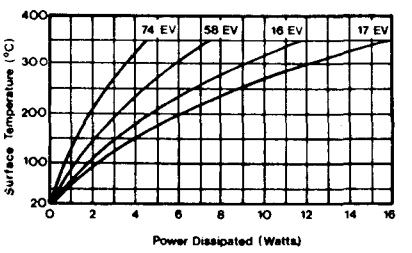
Mechanical Data	Erg 74EV	Erg 58EV	Erg 16EV	Erg 17EV
Dim. "L" maximum	12.7mm (.5")	22.2mm (.874")	38.1mm (1.499")	53.5mm (2.124")
Dia. "D" maximum	5.6mm (.220")	7.9mm (.312")	7.9mm (.312")	7.9mm (.312")
Dia. "d"	.6mm (.024")	.8mm (.032")	.8mm (.032")	.8mm (.032")
Weight approximate	1gm	3gms	5gms	6gms

Note: 1. E24 resistance values available.
2. B.S. qualified release +5% or £5.00 minimum order.
3. Resistor tolerance
   > 1 Ohm ± 5%
   < 1 Ohm ± 10%

Rating graph



Hot spot temperature graph

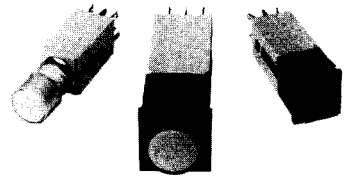


Manufactured in U.K.

WAYCOM LIMITED

Illuminated Push Button

- Single and 2 pole changeover versions
- Silver Contacts
- Up to 6A rating at 250VAC.
- Round or Square Push Button Caps.



ELECTRICAL RATINGS

Single Contact Version
Max Voltage . . . . . 250V rms
Max Current 6A
Max Switched AC Power 1000VA
Max Switched DC Power 1000W
Insulation Resistance . . . . . 2000 Mohm
Double Contact Version
Max Voltage . . . . . .250V rms
Max Current 3A
Max Switched AC Power 250VA
Max Switched DC Power 250W
Insulation Resistance . . . . . .2000 Mohm

MECHANICAL DATA

Endurance	100,000 operations
Temperature Range	−25°C to +55°C
Contact Material	
Single Contact	Silver
Double Contact	Silver, gold plated
Terminations	Solder lug, accepting standard 0.11" Faston Connectors.

Switch Basic Part Number (does not include button or lamp)		Action	No. of Poles	Mounting Method	Button Type
Single Contact	Double Contact				
P144GG74	P144DD74	Mom.	1	Bush	Round or Square
P144GG7474	P144DD7474	Mom.	2	Bush	Round or Square
P145GG74	P145DD74	Alt.	1	Bush	Round or Square
P145GG7474	P145DD7474	Alt.	2	Bush	Round or Square
Indicator only					
P035		Ind only		Bush	Round or Square

PUSH BUTTON CAPS

Round Caps, 15mm diameter or Square Caps 14mm x 14mm are available in a choice of 8 colours.
The cap ordering code should be followed by the code for the required colour as follows:-
Red: RS, Yellow: GI, Green: VF, Clear: TR, White: BI, Violet: VI,
Orange: VE, Grey: NE

PUSH BUTTON ORDERING CODES

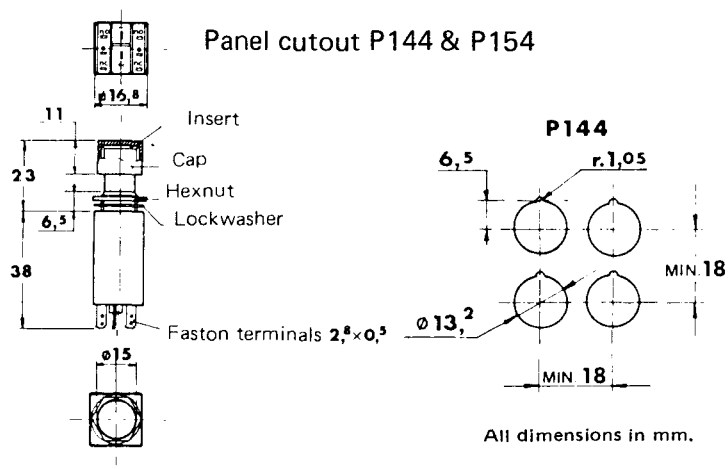
Round Caps RC15
Square Caps RC14
Typical Example: RC15-RS

LAMPS

T 1¾ flanged base lamps are available for 6, 12 and 28 volt supplies.

Manufactured in Italy.

Panel cutout P144 & P154



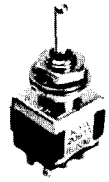
All dimensions in mm.

KTA Series SWITCHES

Subminiature

WAYCOM LIMITED

- ☐ Subminiature lever/push button
- ☐ Bias and bi-stable action
- ☐ Choice of 1, 2, 3 and 4 poles
- ☐ Gold flashed contacts as standard



TECHNICAL DATA KTA

Electrical Ratings (resistive loads)

3A @ 250V r.m.s. 50Hz
5A @ 125V r.m.s. 50Hz
4A @ 24V d.c.
5A @ 12V d.c.
6A @ 6V d.c.

Contact Resistance (initial) ⅓ 0.01 ohms at 2 to 4V d.c.1A

Lever Caps – KTA Range
Coloured plastic lever caps which fit over the KTA lever and aid identification.
Available in white, pink, yellow, blue, black red.

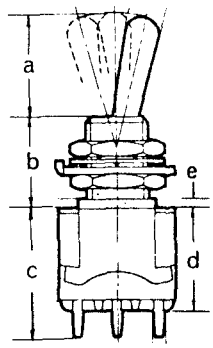
OUTLINE DRAWING – KTA RANGE

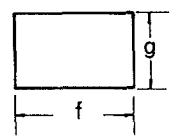
(All dimensions in mm)

Type	A	B	C	D	E	F	G
KTA 106 Series	10.5	9	13	9	1	13	8
KTA 206 Series except 206 PA and 206 TA	10.5	9	13	9	1	13	13
KTA 206 PA, 206 TA	10.5	9	15.5	11.5	1	13	13
KTA 306 Series	10.5	9	15.5	11.5	1	13	17.8
KTA 406 Series	10.5	9	15.5	11.5	1	13	22.6

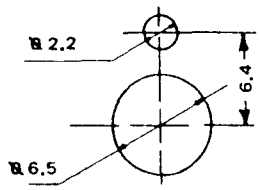
KTA Lever Range

Type	Switch Action		
	Action	Positions	Circuit
KTA 106D	SPDT	on-on	
KTA 106E	SPDT	on-off-on	
KTA 106F	SPDT	on- mom	bias
KTA 106G	SPDT	mom-off-mom	
KTA 106H	SPDT	on-off- mom	
KTA 206N	DPDT	on-on	
KTA 206P	DPDT	on-off-on	
KTA 206PA	DPDT	on-on-on	(on) (on) (on)
KTA 206R	DPDT	on- mom	bias
KTA 206S	DPDT	mom-off-mom	
KTA 206T	DPDT	on-off- mom	
KTA 206TA	DPDT	on-on- mom	(mom) (on) (on)
KTA 306D	3DPT	on-on	
KTA 306E	3PDT	on-off-on	
KTA 306F	3DPT	on- mom	
KTA 306H	3PDT	on-off- mom	
KTA 406N	4PDT	on-on	
KTA 406P	4PDT	on-off-on	





PANEL CUT-OUT



All KTA Types

Manufactured in Japan

WAYCOM LIMITED

- Push button operation
- Coloured caps available for easy identification
- Choice of 1 and 2 poles

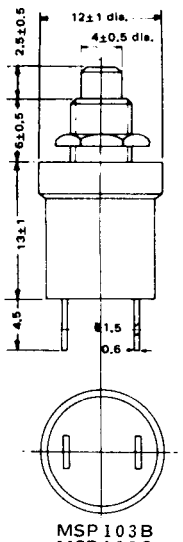
MSP and KPA Push Button Range

Type	Switch Action		
	Action	Positions	Circuit
MSP 103B	SPST	on- (mom)	bias
MSP 103C	SPST	off- (mom)	bias
KPA 106D	SPDT	on-on	alternate
KPA 106F	SPDT	on-mom	bias
KPA 206N	DPDT	on-on	
KPA 206R	DPDT	on-mom	bias
KPG 206N	DPDT	on-on	alternate
KPG 206R	DPDT	on-mom	bias

Push Button Caps
The KPG 206N and R have a chrome plated button.
The MSP 103B and C have a brown button.
All other types have a snap fit black button as standard but red, green buttons are available with these switches:
See Waycom booklet for further data.

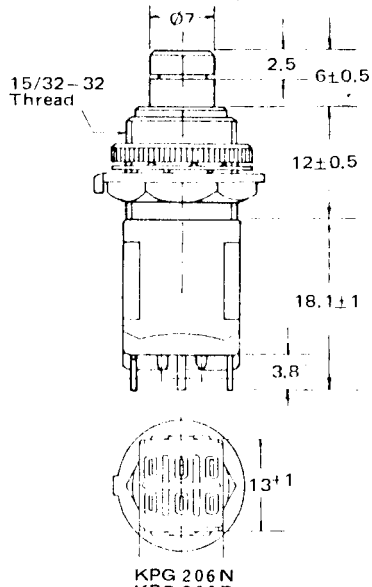
OUTLINE DRAWINGS

MSP RANGE



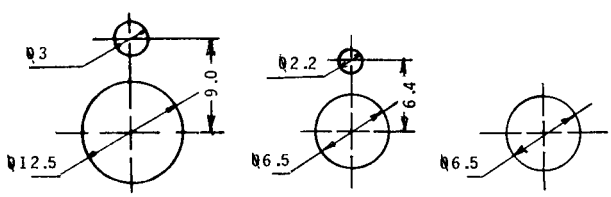
MSP 103B
MSP 103C

KPG RANGE



KPG 206N
KPG 206R

PANEL CUT-OUTS



KPG Types
All KPA Types
MSP 103 Types

TECHNICAL DATA KTA & KPA

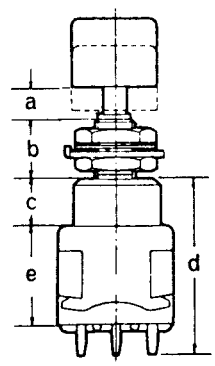
Electrical Ratings (resistive loads)

All types except MSP 103	MSP 103 B & C
3A @ 250V r.m.s. 50Hz	1A @ 250V r.m.s. 50Hz
5A @ 125V r.m.s. 50Hz	3A @ 125V r.m.s. 50Hz
4A @ 24V d.c.	2A @ 24 d.c.
5A @ 12V d.c.	3A @ 12V d.c.
6A @ 6V d.c.	3A @ 6V d.c.

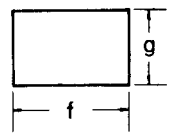
Contact Resistance (initial) ⊳ 0.01 ohms at 2 to 4V d.c.1A

OUTLINE DRAWINGS – KPA RANGE

Type	A	B	C	D	E	F	G
KPA 106D	4	7.6	5.8	21.5	11.7	13	8
KPA 106F	4	7.6	5.8	21.5	11.7	13	8
KPA 206N	4	7.6	5.8	21.5	11.7	13	13
KPA 206R	4	7.6	5.8	21.5	11.7	13	13



(All dimensions in mm)



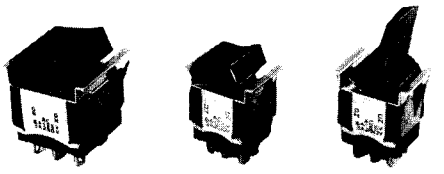
Manufactured in Japan

KLD & KLN Series SWITCHES

Miniature Rocker & Lever

WAYCOM LIMITED

- ☐ Snap-in panel fixing
- ☐ 2 Pole illuminated rockers also available
- ☐ Individual or row mounting
- ☐ Gold flashed contacts as standard



TECHNICAL DATA KLD AND KLN

Panel Mounting

The KLD AND KNL are designed for simple mounting; just push the switch into the panel cut out from the front. Stainless steel mounting clips intergral to the switch, holds the unit firmly in place. No screws or tools are required.

Electrical Ratings (resistive loads)

3A @ 250V r.m.s. 50Hz	4A @ 24V d.c.
6A @ 125V r.m.s. 50Hz	5A @ 12V d.c.
3A @ 50V d.c.	6A @ 6V d.c.

Initial Contact Resistance

⊱ 10 Milliohms (measure at 2 to 4V d.c. 1A)

KLD Lever Colours

Polycarbonate in a choice of red, black, white and grey.

KLD Rocker Colours

Polycarbonate in a choice of red, black, white, & grey.

KNL Rocker/Lens Colour

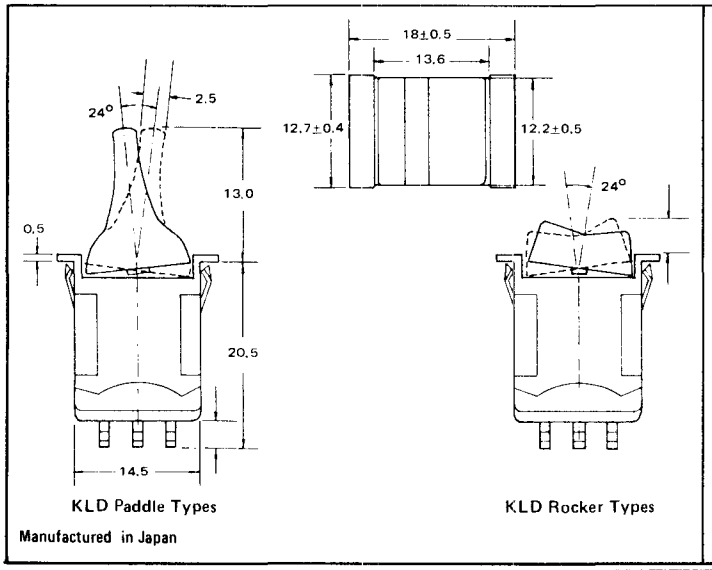
Polycarbonate in a choice of translucent red, amber, green and white.

KNL Lamp Types (T1¾, E–5 screw base)			
Lamp Ref.	**Design Volts**	**Design Current**	**Rated Life Hours**
378	6.5	200mA	50,000
362	14.0	80mA	50,000
399	28.00	40mA	25,000

For further information

See Waycom Data Booklet.

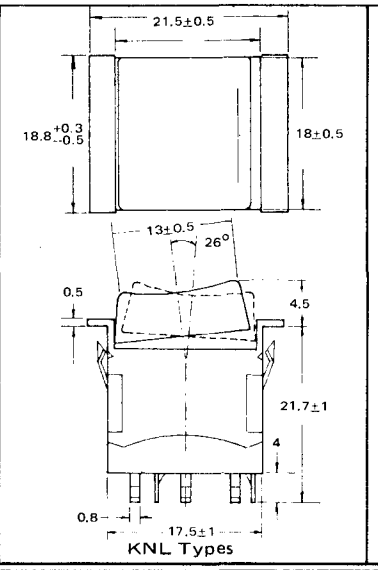
Type	Switch Action		
	Action	**Positions**	**Circuit**
KLD Lever Series			
KLD-106D	SPDT	on-on (changeover)	
KLD-106E	SPDT	on-off-on	
KLD-206N	DPDT	on-on (changeover)	
KLD-206P	DPDT	on-off-on	
KLD Rocker Range			
KLD-106D	SPDT	on-on	
KLD-106E	SPDT	on-off-on	
KLD-206N	DPDT	on-on	
KLD-206P	DPDT	on-off-on	
KNL Illuminated Rocker Range			
KNL 206N	DPDT	on-on	
KNL 206R	DPDT	on-mom	bias →
Lamp (state ref.)			
Lever/Rocker (state colour) also state lever or rocker on KLD type			



KLD Paddle Types

KLD Rocker Types

Manufactured in Japan

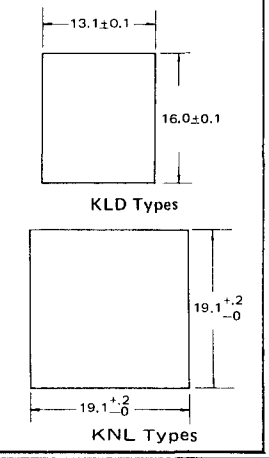


KNL Types

Panel Cut-Out

Panel Thickness 1.6 to 4mm

All dimensions in mm.

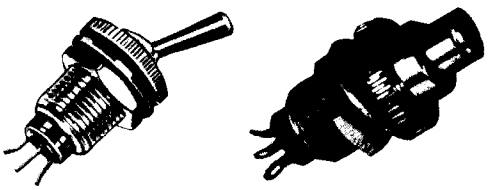


KLD Types

KNL Types

WAYCOM LIMITED

- Available as lever and push button
- Rated up to 1-5A @ 250V r.m.s. or 3A @ 12V d.c.
- Cosmetic appeal with proven reliability



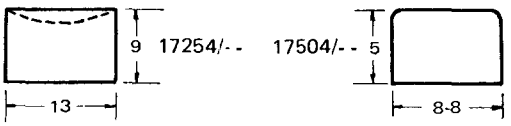
TECHNICAL DATA

Electrical Ratings (resistive)
1.5A @ 250V r.m.s. 50Hz
2A @ 120V r.m.s. 50Hz
2A @ 24V d.c.
3A @ 12V d.c.

Contact Resistance (initial)
0.01 ohm at 2 to 4V. d.c. 1A.

Push buttons
The actuating button has a chrome finish but coloured push-fit caps are available in black red, green, yellow, blue & white with the switches

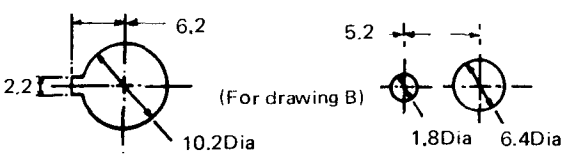
If required, please state colour. Code as shown below

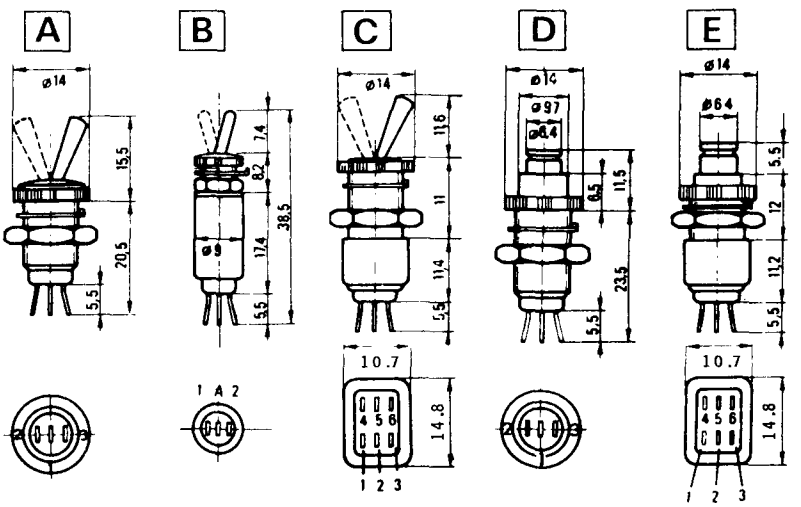


Cap Code	
01 - Black	04 - Yellow
02 - Red	05 - Blue
03 - Green	06 - White

Type	Switch Action			Dwg. Ref.
	Action	Positions	Circuit	
WLS1	Lever SPDT	on-on (changeover)		A
WLS1/S	Lever SPDT	on-on (changeover)		B
WLD1	Lever DPDT	on-on (changeover)		C
WPS1	P/B SPDT	on-on(mom)	bias→	D
WPD1	P/B DPDT	on-on(mom)	bias→	E
Push Button Cap Ref: 17254/-- each				
Push Button Cap Ref: 17504/-- each				

OUTLINE DRAWINGS (All Dimensions in mm)





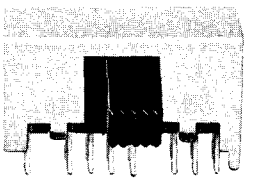
For further information:
See Waycon Data Booklet

Made in France

Slide

WAYCOM LIMITED

- Top or side operation
- Suitable for printed circuit or panel mounting
- Long life – typically 15,000 cycles



TECHNICAL DATA

Initial Contact Resistance:
SSP types ⩾0.02 ohms at 5V 1A.
MS & SW types ⩾0.03 ohms at 5V 1A.

Insulation Resistance:
SSP types ⩾100 Megohms between terminals at 500V. MS & SW types ⩾100 Megohms between terminals at 85V.

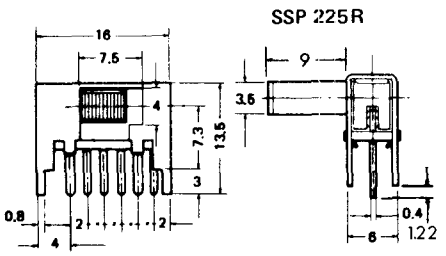
Voltage Proof:
500V r.m.s. for 1 minute

Switch Mechanism:
Snap action with self-wiping contacts. Break before make.

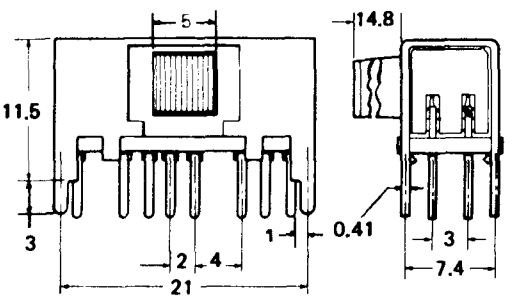
Type	Slide Position	Action	Rating		Circuit
			Voltage	Current	
SSP 22	TOP	DPDT 2 Positions	125V r.m.s. 28V d.c.	0.3A 0.5A	Position 1 Position 2
SSP 225R	SIDE		12V d.c. 6V d.c.	0.6A 1.0A	
SSP 43	TOP	4P 3 Positions	125V r.m.s. 28V d.c.	0.3A 0.5A	Common Terminals
SSP 435R	SIDE		12V d.c. 6V d.c.	0.6A 1.0A	

OUTLINE DRAWINGS

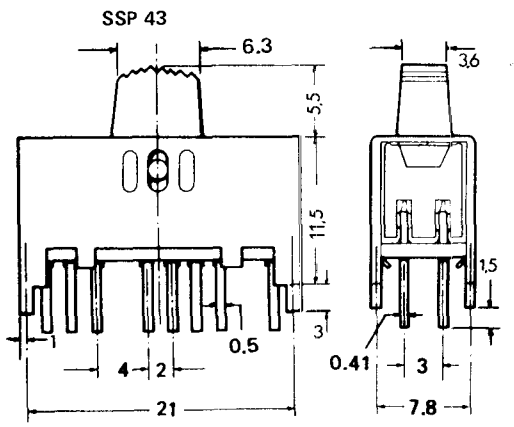
SSP 225R



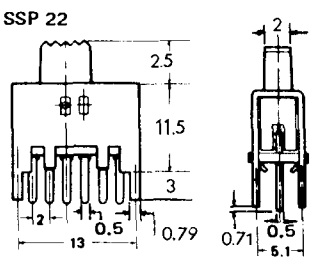
SSP 435R



SSP 43



SSP 22

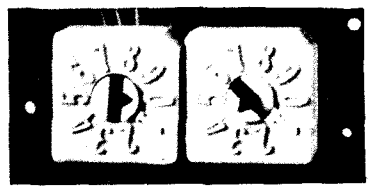


Manufactured in Japan

WAYCOM LIMITED

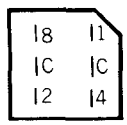
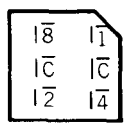
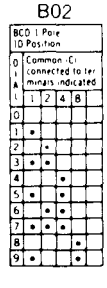
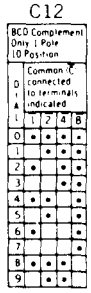
2300 Series Micro-Dip

- ☐ 10 Positions
- ☐ 0.100 x 0.300 Centres
- ☐ Binary-codes
- ☐ Low profile



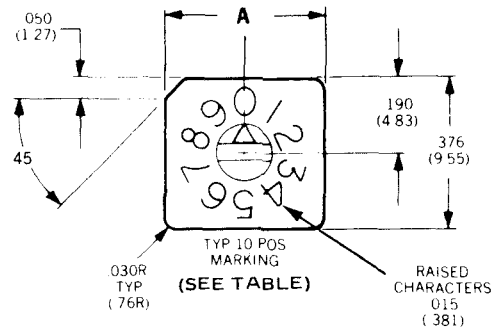
SPECIFICATIONS.

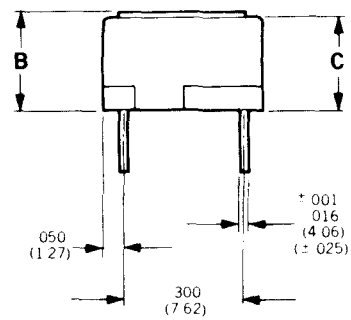
No. of Switching Positions . . . . . 10 positions
Life . . . . . 10,000 detent operations at 25°C for a resistive load of 0.010 amps at 5 VDC
Tangential Operating Force . . . . . 2.00 to 3.50 inch oz.
Operating Temperature Range . . . -10°C to +85°C
Storage Temperature Range . . . . . -25°C to +100°C
Electrical Ratings:
Max. recommended nonswitching load . . . . . 100 milliamps at 50 VDC
Max. recommended switching load . . . . . 100 milliamps at 5 VDC
Dielectric Withstanding Voltage . . . . . 250 volts peak to peak
Insulation Resistance . . . . . 1000 megohms (min. dry)
Switch Circuit Resistance . . . . . 100 milliohms max.
Seal . . . . . Dust seal
Weight . . . . . .03 oz.
Standard Colour . . . . . See Table
MATERIALS
Plastic . . . . . glass filled nylon
Metal Contacts . . . . . Copper alloy, gold plated

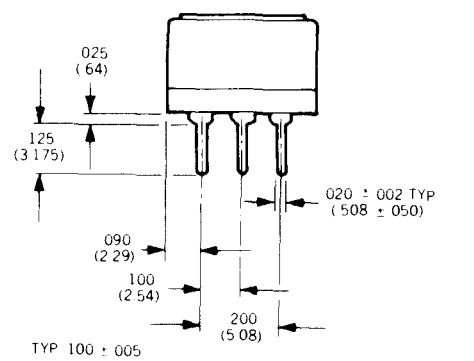
MODEL NUMBER	230002G	230012G
CODE	B02	C12
COLOR	RED	ORANGE
TERMINAL I.D. AS VIEWED FROM BOTTOM OF SWITCH		
HOUSING MARKING	0 THRU 9	0 THRU 9
NO. OF POSITIONS	10 POSITION	10 POSITION
CODE TRUTH TABLES	B02 	C12 

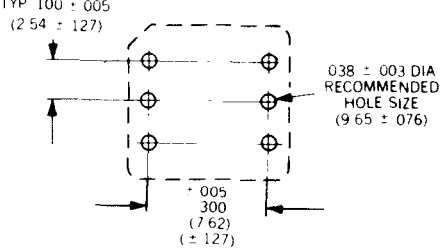
NOTES:
1. Views shown are of bottom (terminal side) of switch.
2. For all single pole codes only common terminals must be connected together external to switch.

Manufactured in U.S.A.









MOUNTING HOLE PATTERN

DIMENSION A	DIMENSION B	DIMENSION C	CODES
.396 (10.06)	.239 (6.063)	.224 (5.69)	B02, C12,

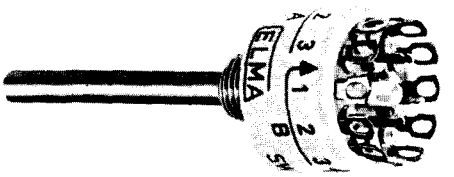
NOTES:
1. Tolerance on all dimensions ±.010 unless otherwise specified.

ELMA Type 01 SWITCHES

Rotary Wafer

RADIATRON

- ☐ Subminiature series
- ☐ 18mm overall diameter
- ☐ Silicone dipped H.F. ceramic wafers
- ☐ Precision indexing
- ☐ Series 08 P.C.B. Mounted Rotary now available on request



TECHNICAL DATA

Continuous Current Rating: 3 amps

Non-Inductive Switching Rating: 2V : 1A)
24V : 0.5A)r.m.s.
200V : 0.1A)

Contact Material: Hard silver with gold flash

Shaft: Stainless steel, 4mm diameter

Case: Glass filled polycarbonate

Contact Resistance: ⊦ 0.005 ohms (initial)

Test Voltage: 750V r,m.s. across a pair of contacts and contacts and earth

Wafer Insulation Resistance: $> 10^6$ Megohms at 20°C

Life: > 25,000 operations at rated loads

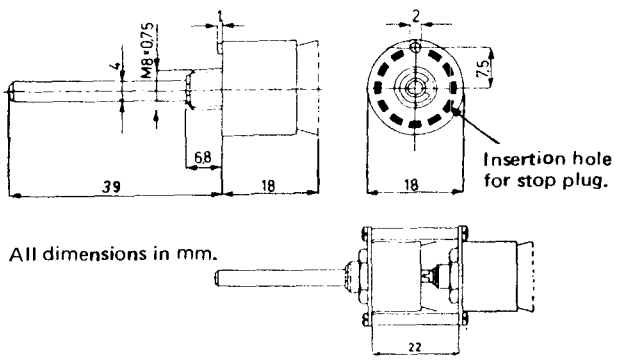
Operating Torque:: 200 cmg ±20%

Weight: One Wafer type : 14 gms
Two Wafer type : 33gms

Stop Plugs: Red plug for 10 way and 12 way. Black plug for all other stoppable switches

Special Features: For special features within the Elma Range for all rotary switches can be obtained direct from Radiatron Components Ltd,
76 Crown Road, Twickenham. Tel. 01-891-1221

OUTLINE DRAWING



Type Reference	Poles	Positions	Wafers	Wafer †† Diagram
Shorting	**Indexing Angle 30°**			
0.1–1x12 * 0.1–2x12*	1 2	12 12	1 2	
0.1–1x11 † 0.1–2x11 †	1 2	11 11	1 2	
0.1–2x 6 0.1–4x 6	2 4	6 6	1 2	
0.1–4x 3 0.1–8x 3	4 8	3 3	1 2	
Shorting	**Indexing Angle 36°**			
0.1–1x10–oA * 01–1x10–mA † 01–2x10–oA * 01–2x10–mA †	1 1 2 2	10 10 10 10	1 1 2 2	
Non-Shorting	**Indexing Angle 60°**			
o1–1x 6 u oA* 01–2x 6 u oA*	1 2	6 6	1 2	
o1–1X 6 u mA† 01–2x 6 u mA†	1 2	6 6	1 2	
01–2x 3 u 01–4x 3 u	2 4	3 3	1 2	
01–4x 2 u 01–8x 2 u	4 8	2 2	1 2	
Additional Mounting Nuts.				

* Without stop continuous rotation (oA)
† With adjustable polycarbonate plug (mA)
†† See drawing.

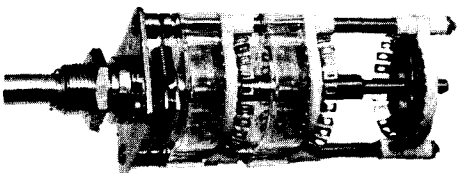
Manufactured in Switzerland

RADIATRON

ELMA Type 03 SWITCHES

Rotary Wafer

- ☐ Up to 4 wafers
- ☐ Stud contacts
- ☐ Silicone dipped H.F. ceramic wafers
- ☐ Precision indexing with adjustable stop
- ☐ Series 08 P.C.B. Mounted Rotary now available on request



TECHNICAL DATA

Continuous Current Rating: 3amps

Non-Inductive Switching Rating: 2V : 2A)
24V : 1A)r.m.s.
200V : 0.3A)

Contact Material: Hard silver with gold flash

Shaft: Nickel plated steel, 6mm diameter

Dust Covers: Each wafer is fitted with a removable dust cover

Test Voltage: 750V r.m.s. across contacts and contacts and earth

Self Capacitance: ⊅ 0.8pF between adjacent contacts

Contact Resistance: ⊅0.005 ohms (initial)

Wafer Insulation Resistance: $>10^6$Megohms at 20°C.

Life: > 25,000 operations at rated loads.

Upper Temperature Limit: 135° without dust covers 100°C with dust covers

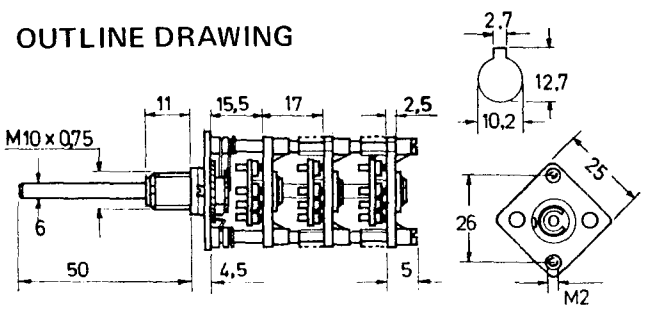
Operating Torque: 1.5 cm.kg±20%

Weight: With one wafer: 45 gms. For each additional wafer 10 gms.

Adjustable Stop: Adjustment made by rotating the lower starred wheel

Special Features: Contact Radiatron Components Ltd, for details of the many special features available

OUTLINE DRAWING



All dimensions are in mm

Type Reference	Poles	Positions	Wafers	Wafer Diagram
Shorting	**Indexing Angle 15°**			
03–1x24 oA*	1	24	1	
03–2x24 oA*	2	24	2	
03–3x24oA*	3	24	3	
03–4x24 oA*	4	24	4	
03–1x23	1	23	1	
03–2x23	2	23	2	
03–3x23	3	23	3	
03–4x23	4	23	4	
03–2x11	2	11	1	
03–4x11	4	11	2	
03–6x11	6	11	3	
03–8x11	8	11	4	
03–3x 7	3	7	1	
03–6x 7	6	7	2	
03–9x 7	9	7	3	
03–12x7	12	7	4	
03–4x 5	4	5	1	
03–8x 5	8	5	2	
03–12x5	12	5	3	
03–16x5	12	5	4	
03–6x 3	6	3	1	
03–12x3	12	3	2	
03–18x3	18	3	3	
03–24x3	24	3	4	
Non-Shorting	**Indexing Angles 30°C**			
03–1x12 μ oA	1	12	1	
03–2x12 μ oA*	2	12	2	
03–3x12 μ oA*	3	12	3	
03–4x12 μ oA*	4	12	4	
03–1x12 μ mA†	1	12	1	
03–2x12 μ mA†	2	12	2	
03–3x12 μ mA†	3	12	3	
03–4x12 μ mA†	4	12	4	
03–2x 6 μ	2	6	1	
03–4x 6 μ	4	6	2	
03–6x 6μ	6	6	3	
03–8x 6 μ	8	6	4	
03–3x 4 μ	3	4	1	
03–6x 4 μ	6	4	2	
03–9x 4 μ	9	4	3	
03–12x4 μ	12	4	4	
03–4x 3 μ	4	3	1	
03–8x 3 μ	8	3	2	
03–12x3 μ	12	3	3	
03–16x3 μ	16	3	4	
03–6x 2 μ	6	2	1	
03–12x2 μ	12	2	2	
03–18x2 μ	18	2	3	
03–24x2 μ	24	2	4	
Additional Mounting Nuts				

† With stop (mA)
* Without stop continuous rotation (oA)

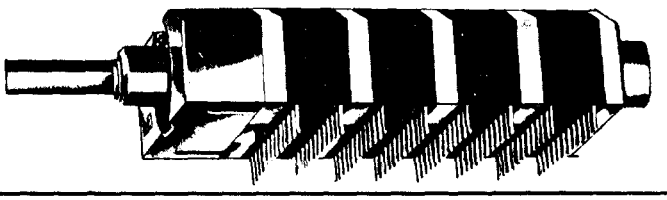
Manufactured in Switzerland

ELMA Type 08 SWITCHES

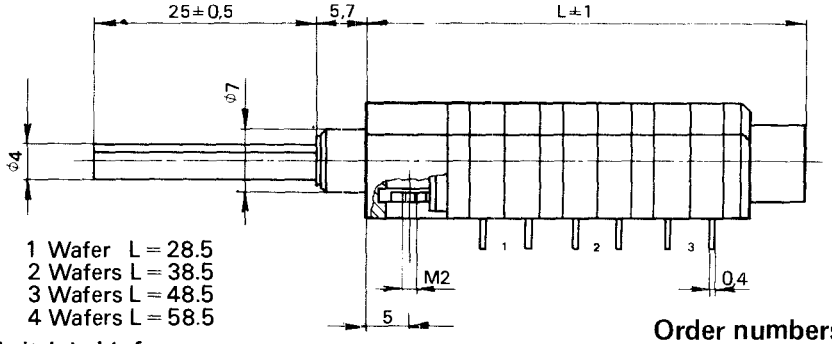
Rotary Wafer

RADIATRON

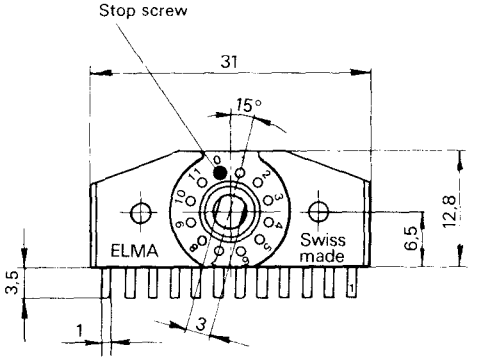
- Low profile construction
- 12 positions in shorting or non-shorting switch mode
- Subsequent stop setting possible
- Dust protected assembly



Main dimensions



1 Wafer L = 28.5
2 Wafers L = 38.5
3 Wafers L = 48.5
4 Wafers L = 58.5



Switch in kit form

☐ The availability of the switch in component parts offers design engineers many possibilities for circuit board arrangements. The geometric accuracy of the boring allows the switch to be assembled in individual parts and then be connected by the spindle.

Technical Data

Mechanical data

☐ Material
☐ Mechanism Pressure-cast
Wafers Tefzel
Spindle Niro steel
Contacts Silver plated/gold flash
Hard gold 3 um
Hard gold 5 um
☐ Mechanism
Indexing angle 30° 12 positions
Stopping adjustable at any time as required
Torque (with 1 wafer, 1 pole)
0.6 cmkp ± 20% (6 wipers)
0.9 cmkp ± 20% (6 wipers)
☐ Temperature range −40°C to +85°C
☐ Operational life min. 25000 switching cycles
☐ Number of switching circuits per wafer 1, 2, 3, 4

Electrical data

☐ Switching mode, shorting or non-shorting
☐ Permissible switching capacity under Ohmic loading
1V/1.5A
24V/0.3A
110V/0.2A
☐ Static load at 22°C max. 3A
☐ Test voltage at 60% relative humidity 1000 V rms
☐ Insulation resistance > 10^{12} Ohms or greater
☐ Contact resistance including conductor path resistance < 20 m Ohms
☐ Capacitance max. 1.5 pF

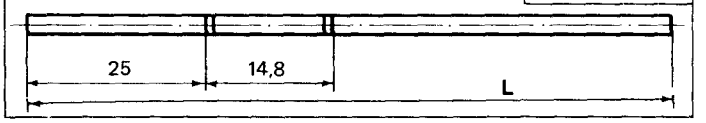
COMPLETE SWITCHES IN ASSEMBLED FORM AVAILABLE TO SPECIAL ORDER

PCB Hole Diameter = 1.3 mm for contacts
= 2.5 mm for mounting holes (M2)

Made in Switzerland

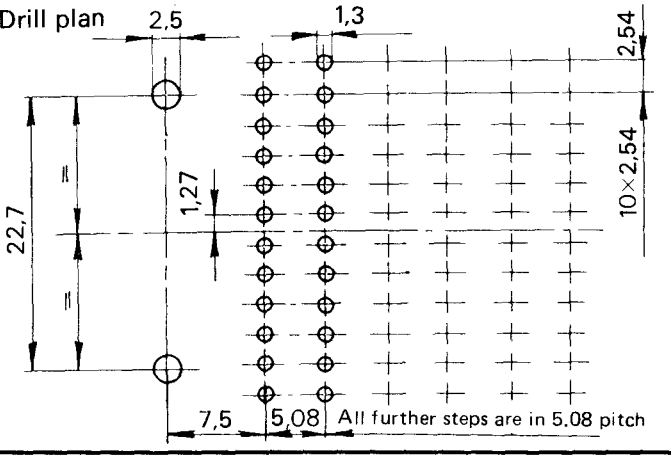
Order numbers for component parts

		Type number 08-
Mechanism	With a torque of 0.6 cmkp	4214–10
Housing	Contact material Ag 1 pole, shorting	4217–00
	Contact material Ag 2 poles, shorting	4217–01
	Contact material Ag 3 poles, shorting	4217–03
	Contact material Ag 4 poles, shorting	4217–02
Housing	Contact material Ag 1 pole, non-shorting	4218–00
	Contact material Ag 2 poles, non-shorting	4218–01
	Contact material Ag 3 poles, non-shorting	4218–03
	Contact material Ag 4 poles, non-shorting	4218–02
Spindle with mounting material consisting of 2 M2 screws, 2 securing rings, 1 spacer disc, 2 stop screws		
	Spindle length L = 75 mm	4211-05
	100 mm	4211-10
	125 mm	4211-15
	150 mm	4211-20



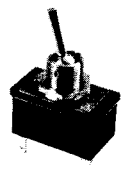
☐ Connections designed for direct mounting on printed circuit boards in 2.50 and 2.54 mm pitches (1/10").

Drill plan



ARROW

- ☐ 1 and 2 pole types
- ☐ Quick make and break
- ☐ Rugged construction



TECHNICAL DATA

Electrical Rating
3A at 250V r.m.s. 50Hz or d.c.
6A at 125V r.m.s. 50Hz or d.c. except the 81052–13 and 81352–13 which are 1A at 250V r.m.s. and 2.5A at 125V r.m.s. 50Hz or d.c.

Terminals
110 spade/solder type mounted at back

Finish
Nickel plated lever.

Hardware
1 Knurled ring and 1 hexagon nut.

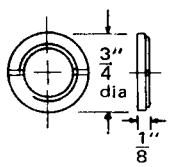
Type	Switch Action		
	Action	Positions	Circuit
Lever Type 3A 250V AC/DC			
81046–13	SPST	on-off	
81052–13*	SPDT	on-on (changeover)	
81055–13	DPST	on-off	
81058–13	DPDT	on-on (changeover)	
Biased Lever Type 3A 250V AC/DC			
81346A–13	SPST	on-off (bias on)	← bias
81346E–13	SPST	on-off (bias off)	bias →
81352–13*	SPDT	on-on (bias) (changeover)	bias →
81355A–13	DPST	on-off (bias on)	← bias
81355E–13	DPST	on-off (bias off)	bias →
81358–13	DPDT	on-on (bias) (changeover)	bias → ← bias

Large Slotted Ring Bright Nickel Finish Code No:4

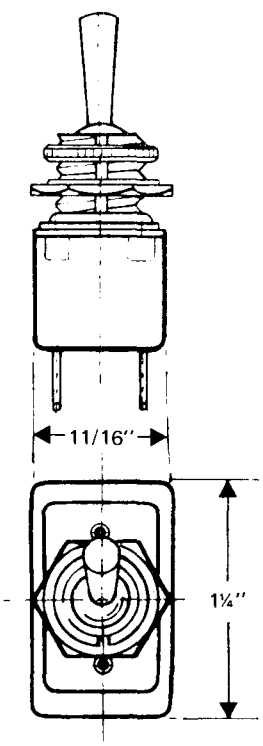
*1A 250VAC/DC for SPDT circuit

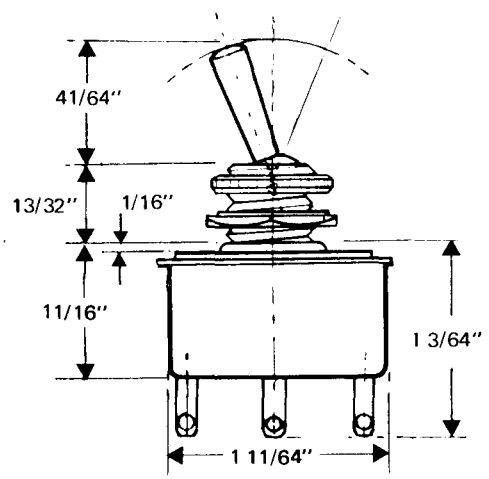
Optional Extra–Large Slotted Ring–Code No.4

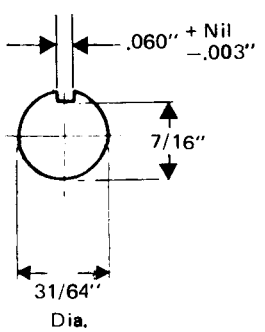
For use with Series 81 & 93 lever switches to enhance instrument front panel appearance. The standard fitting is a knurled ring and a hexagon ring.



OUTLINE DRAWING







Panel Cut-out

Manufactured in U.K.

93A & 93FM Series SWITCHES

Lever & Bias Lever

ARROW

- ☐ 10A, 250V A.C.
- ☐ 1,2,3,& 4 pole types
- ☐ Insulated lever types

TECHNICAL DATA

Electrical Rating: 10A at 250V r.m.s. 50Hz
15A at 125V r.m.s. 50Hz

Terminals: Spade type mounted at back

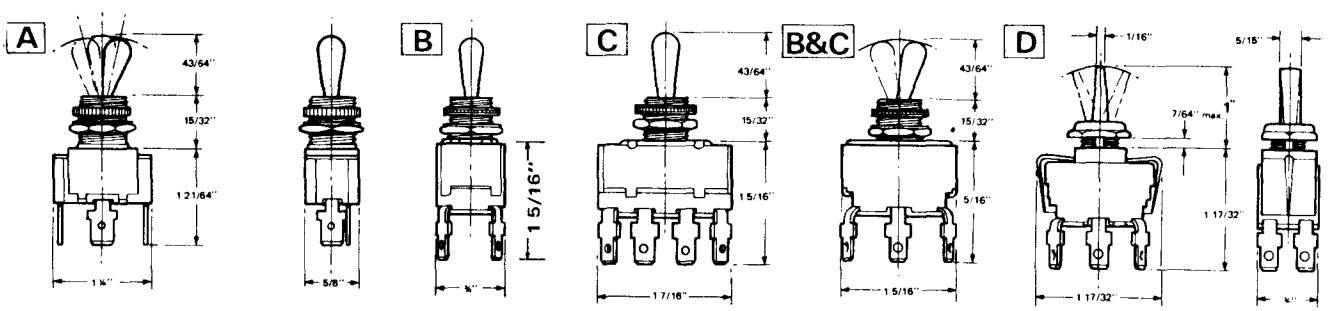
Finish: Nickel plated lever on Types 93A. Black insulated lever on Types 93FM.

Note: Optional Extra – Large slotted ring (see page 80)

Type	Action	Switch Action: Positions	Switch Action: Circuit	Drawing Ref.
Lever Type 10A 250V A.C.				
93A/403E–13	SPST	on-off		A
93A/401E–13	SPDT	on-on (changeover)		A
93A/101E–13	SPDT	on-off-on		A
93A/404E–13 *	DPST	on-off		B
93A/402E–13 *	DPDT	on-on (changeover)		B
93A/102E–13 *	DPDT	on-off-on		B
93A/416E–13	3PDT	on-on (changeover)		C
93A/116E–13	3PDT	on-off-on		C
93A/420E–13	4PDT	on-on (changeover)		C
93A/120E–13	4PDT	on-off-on		C
Insulated Lever Type 10A 250V A.C.				
93FM/402E–8A *	DPDT	on-on (changeover)		D
93FM/102E–8A *	DPDT	on-off-on		D

*During the life of this catalogue these switches will be replaced by the 91 Series 16A rating. Physical dimensions are unchanged.

OUTLINE DRAWINGS

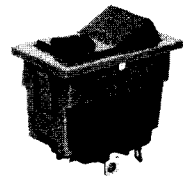


Manufactured in U.K.

ARROW

Rocker with Pilot Light

- 10A, 250V A.C.
- Incorporates neon pilot light
- Snap in panel fixing
- 1 & 2 pole types



TECHNICAL DATA

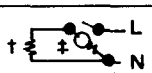
Indicator Circuit
The neon lamp and its resistor are wired in circuit so that the lamp is 'on' when the switch is 'on'.

Colours
Switch colours are available in black or white, both with red lens.

Terminals: Spade type mounted at back.

Colour Code: /11E All black switch
/22E All white switch

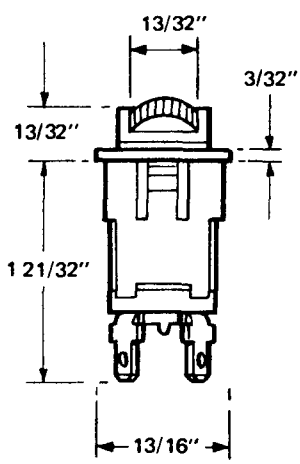
Neon pilot light
The colour code prefixed by 2/- - - indicates that a 220 neon lamp is a built-in feature of this switch.

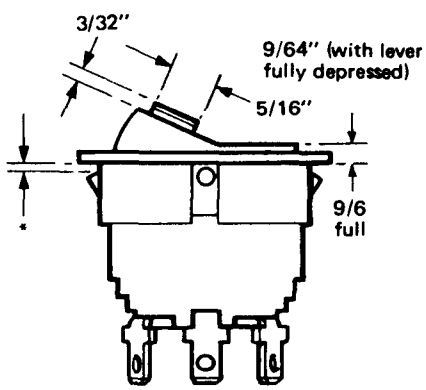
Type*	Switch Action		
	Action	Position	Circuit
93PNR/403/2/11E or 93PNR/403/2/22E	SPST SPST	on-off on-off	
93PNR/404/2/11E or 93PNR/404/2/22E	DPST DPST	on-off on-off	

* Please state switch colour when ordering.

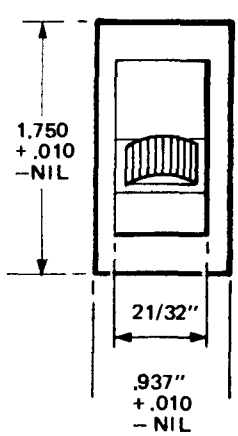
†Load
‡Neon

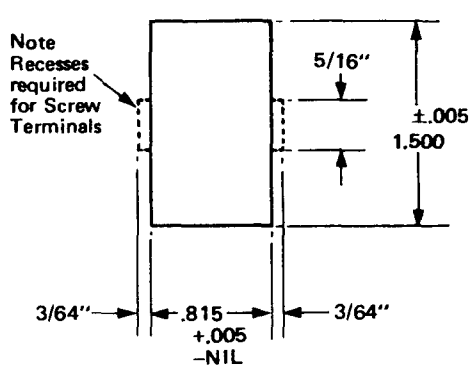
93PNR/1001E and 1004E Drawings





*Suitable for 20 SWG to 18 SWG Panels





Panel Cut-out

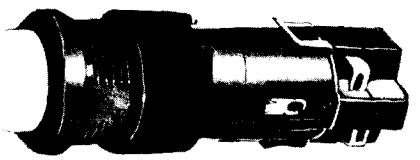
Manufactured in UK

83500 Series SWITCHES

Adapt-a-Switch

ARROW

- ☐ Snap on contact blocks
- ☐ Momentary or alternate switch actions
- ☐ Non illuminated and indicator types available



The arrow adapt-a-switch offers from a small number of component parts the maximum in design flexibility.

TECHNICAL DATA

Electrical Ratings (0.75 P.F.) 5A 125V a.c.
2A 250V a.c.
5A 28V d.c.

Dielectric Strength: 1000V r.m.s. at sea level for one minute.

Mechanical Life: A minimum of 100,000 cycles

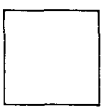
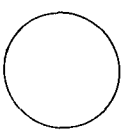
Electrical Life: A minimum of 100,000 cycles at full rating.

Lamps
T1¾ groove base incandescent in 6 volts (type 337/774) 14 volts (type 336/782) and 28 volts (type 334/787)

How to Order

Example			
Required	Round Green Lens	Round Lighted Momentary Contact Switch	3 Pole Form Z Contacts
Parts	1 pc. 83500-92	1pc. 83503	3 pcs. 83500-30

Order Reads
- 1 pc. – 83500–92 round green lens
- 1 pc. – 83503 round actuator-indicator momentary action
- 3 pcs. – 83500–30 standard duty contact blocks

Lens Unit		Colour	Type
Rectangular		White	83500–70
		Red	83500–71
		Green	83500–72
		Blue	83500–73
		Yellow	83500–74
		Amber	83500–75
		Black	83500–76
Square		White	83500–80
		Red	83500–81
		Green	83500–82
		Blue	83500–83
		Yellow	83500–84
		Amber	83500–85
		Black	83500–86
Round		White	83500–90
		Red	83500–91
		Green	83500–92
		Blue	83500–93
		Yellow	83500–94
		Amber	83500–95
		Black	83500–96

Actuator Indicator (includes Mounting Nut)		Type
Rectangular	Momentary Action	83501
	Alternate Action	83504
Square	Momentary Action	83502
	Alternate Action	83505
Round	Momentary Action	83503
	Alternate Action	83506

Contact Blocks		Type
One normally open & One normally closed	Standard Duty	83500-30
	Low Energy, Gold Plated	83600-30

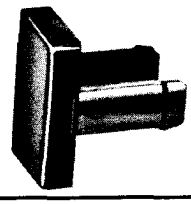
Indicator (without lens)		Type
Rectangular	Lamps not included	83507
Square	Lamps not included	83508
Round	Lamps not included	83509

Optional Features	Type
Snap-on clip to convert any actuator to indicator	83500-51

Manufactured in U.S.A.

ARROW

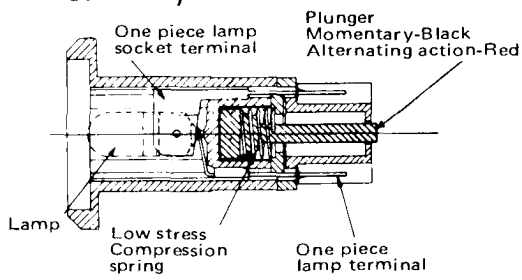
- Three lens shapes, seven colours
- Front access to lamp
- Mar-resistant lenses with uniform luminosity



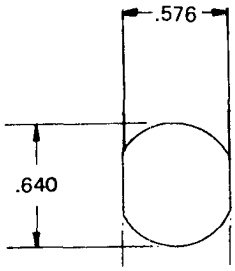
Mounting Data & Outline Drawings

The adapt-a-switch is designed for rapid, efficient and neat installation. Single hole mounting through the panel face allows the unit to slip through from the front and the moulded nylon mounting nut is threaded on the unit housing from the back of the panel. Panel thickness may be up to ¼". The bezel extends a minimum of .035" beyond the edge of the mounting hole in the panel allowing for normal tolerance in punching the mounting hole.

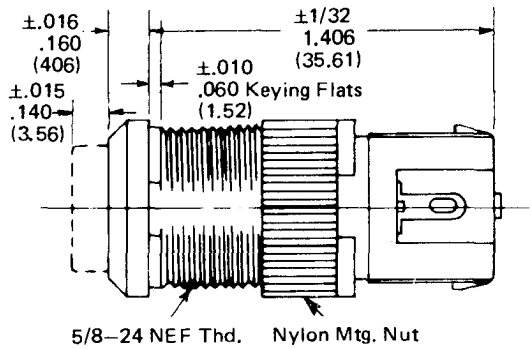
Cut Away View



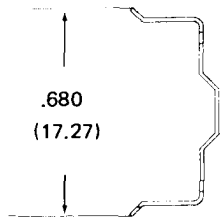
Panel Cut-out



Actuator—Indicator

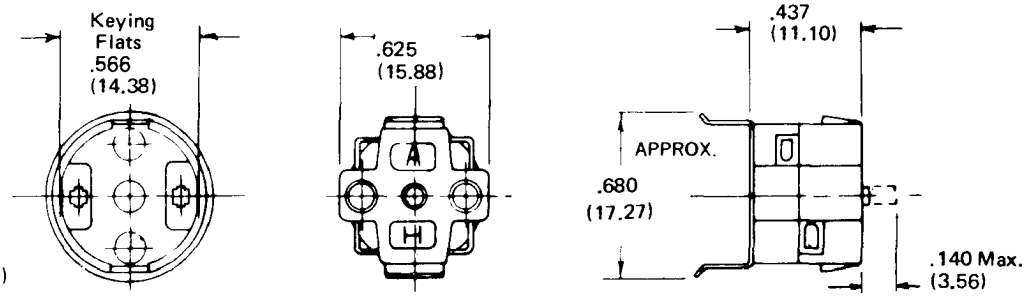


Snap on Clip

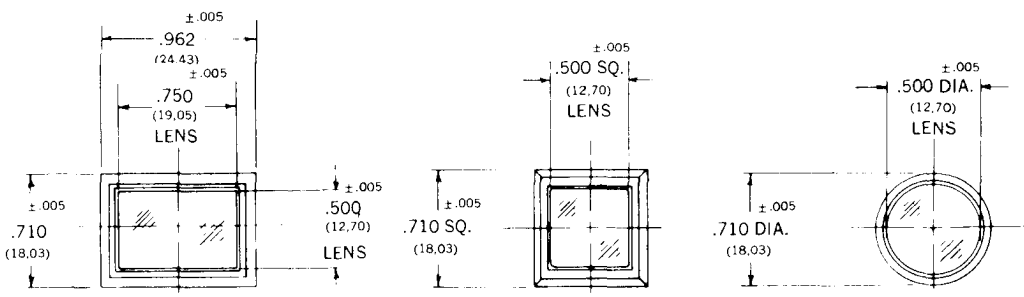


Contact Block

Dimensions in ins. and (mm)



Bezels with Lenses



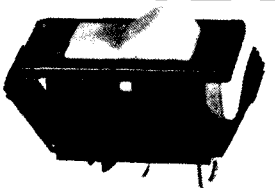
Manufactured in U.S.A.

MINIATURE SWITCHES

1600/2600 Series

ARROW

- 16A 250V rms
- 1 & 2 pole types
- Snap-in panel fixing
- Replaces 1100/1200 series



TECHNICAL DATA

Operation
Rocker lever action, 2 and 3 position, maintained or momentary, with and without illumination.

Function
1600 Series single pole, single throw (SPST) and single pole, double throw (SPDT).

Mounting Method
Through rectangular aperture by fixing legs on switch which give a "snap-in" feature.

Base
High grade type 66 nylon.

Actuator
High grade type 66 nylon.

Moving Contacts
Copper with silver alloy button.

Fixed Line Contact
Full width (with moving contact) copper silver plated.

Terminal and Fixed Load Contacts

Weight
One piece copper with fine silver on contact face.
1600 Series: 6 Grammes approx.
2600 Series: 12 Grammes approx.

Contact Rating
16A 250V Resistive.

Proof Voltage
750 volts R.M.S. (across contacts). As required for Class B disconnection controls. BS.3955 Part 3, 1972.

Insulation Resistance
50 megohms.

Electrical Life
10,000 cycles minimum at maximum rated voltage and current.

Mechanical Life
50,000 cycles minimum.

Angular Movement
2 position – 36°
3 position – 18° each side of centre.

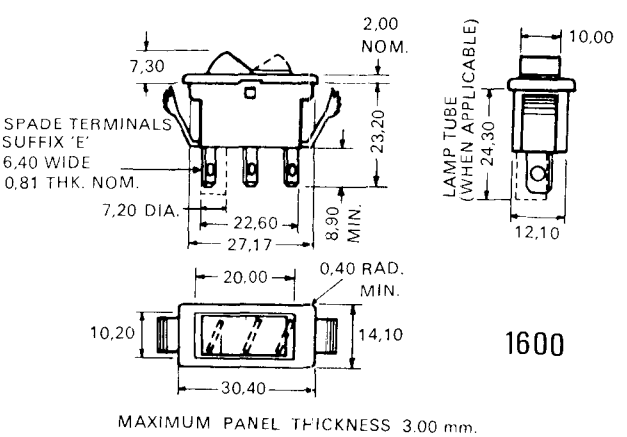
			FUNCTION	CAT NUMBER
0	-	1		1600E
1	-	2		1602E
1	0	2		1604E
0	-	1		2600E
1	-	2		2602E
1	0	2		2604E

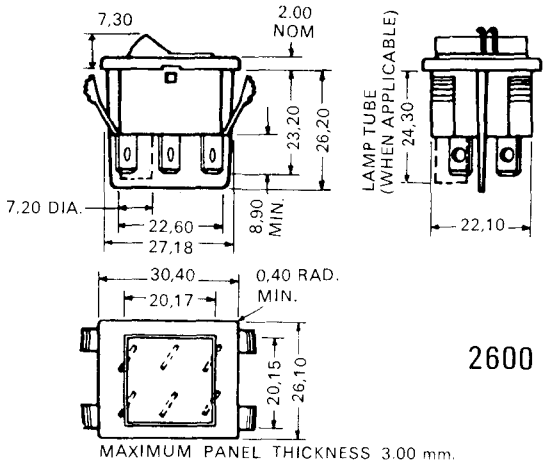
Note: Momentary action switches available to special order.
ORDERING PROCEDURE: Add suffix number for body/rocker colour

1600 11E

- Basic switch type (see table above)
- E denotes spade terminal
- Lever colour { 1 = Black
- Body colour { 2 = White

DIMENSIONS



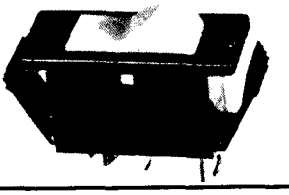


Manufactured in U.K.

ARROW

1600/2600 Series Illuminated

- Illuminated rocker/indicator
- Choice of rocket colour & lamp voltage
- Complementary to 1600/2600 series



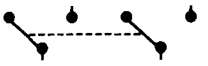
TECHNICAL DATA

Specification as for 1600/2600 series miniature switches plus Lamp Specification

Average Life
25,000 hours for neons

Resistor values for neons
27kΩ for 110V operation
110kΩ for 250V operation

Dimensions
As 1600/2600 series
except 1609 (see below)

			FUNCTION	CAT. NUMBER
0	-	1		1600E
0	-	1		2600E
MATCHING INDICATOR				
Complements the 1600 series by providing a matching indicator				1609E

ORDERING PROCEDURE

Add suffix letters and numbers to denote colour of body and rocker lamp voltage.

BASIC SWITCH TYPE
(See table above)

1600 R 2 1 E

LAMP VOLTAGE
0 = No lamp
1 = 110V Neon
2 = 240V

TRANSLUCENT ROCKER COLOURS
A = Amber.
G = Green
R = Red.

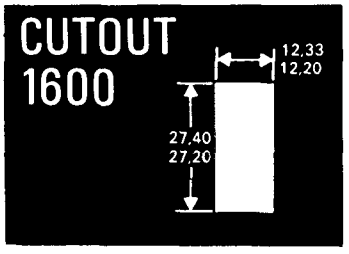
BODY COLOUR
1 = Black
2 = White

E = Spade Terminal

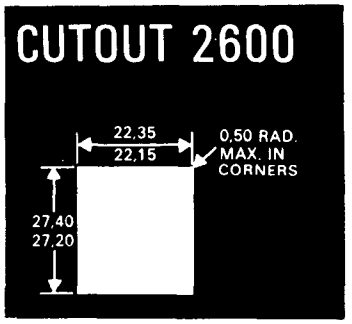
Note: All lamps are assembled integral with the base, except for a switch with Green translucent rocker which is fitted with 110V or 240V fluorescent lamp. These particular lamps are inserted into a tube at the rear of the switch base.

PANEL CUT-OUTS

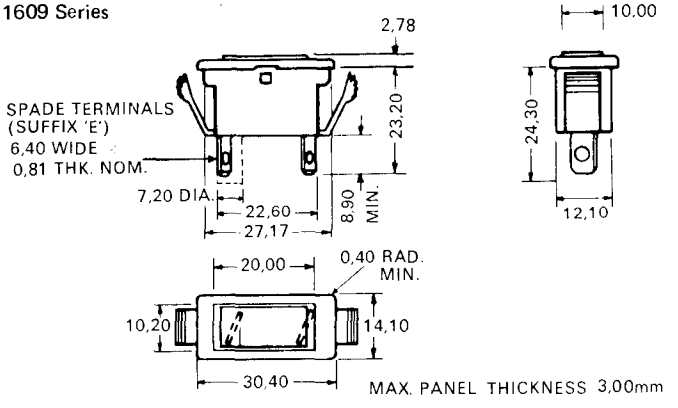
1600 series



2600 series



1609 Series



Manufactured in U.K.

FERRANTI

- ☐ Reference Diodes
- ☐ Low Leakage
- ☐ Multi Purpose, Fast Switching

DO–41

DO–7

High Stability Reference Diodes

Type No.	Nominal Reference Voltage* volts	Max. Ref. Voltage Change *† mV	Max. Slope Resistance * ohms	Max. Dissipation at 25°C mW	Operating Temperature Range °C	Jedec Outline	Comments
KS77B	9 ± 5%	15‡	35	50	0 to + 100	DO-7	Extremely stable voltage reference
KS78	9 ± 5%	30§	35	50	-55 to + 125	DO-7	
KS78B	9 ± 5%	30§	35	50	0 to + 100	DO-7	

*At reference current of 5 mA. †Over operating temperature range. ‡For this stability reference current must be controlled to within ± 0.5%. §For this stability reference current must be controlled to within ± 1.0%.

Schottky Diodes

Type No.	Power Dissipation P_{tot} (mW)	Max. Forward Current (Continuous) (mA)	Breakdown Voltage at $I_R = 10\mu A$ (volts)	Reverse Leakage Current nA @ V_R	Forward Voltage V_{F1} at $I_{F1} = 1mA$ (volt)	Forward Voltage V_{F2} at $I_{F2} = 15mA$ (volt)	Capacitance $C_T(O)$ at $V_F = 0$ (pF)	Effective Minority Carrier Lifetime at $I_R = 15mA$ (pS)
ZC2800	250	100	70	200 50	0.410	1.0	2.0	100
ZC5800	250	100	50	200 35	0.410	1.0	2.0	100

Special Quality General Purpose Diodes

A very high standard of quality control during manufacture, thermo-cycling and "burn-in" at full ratings ensure high reliability

Type No.	Maximum Ratings				Characteristics				Jedec Outline	Comments
	V_{RWM}	Mean Rectified Current mA		Recurrent Peak Forward Current	Reverse Current at 25°C µA		Max. Forward Volt Drop	Max. Capacitance at -10V		
		25°C	100°C	A	max.	mean	volts	pF		
ZS100	50	400	250	4.0	0.2	–	1.0	12	DO-7	for general purpose applications calling for high reliability
ZS101	100	400	250	4.0	0.2	–	1.0	12	DO-7	
ZS102	200	400	250	4.0	0.2	–	1.0	12	DO-7	
ZS103	300	400	250	4.0	0.2	–	1.0	12	DO-7	
ZS104	400	400	250	4.0	0.2	–	1.0	12	DO-7	
ZS106	600	400	250	4.0	0.2	–	1.0	12	DO-7	
ZS108	800	400	250	4.0	0.2	–	1.0	12	DO-7	

Multi-purpose Diodes

Type No.	Maximum Ratings and Characteristics							Jedec Outline	Comments
	V_{RWM}	Mean Rectified Current mA		Recurrent Peak F'd Current at 25°C	Operating Temperature Range	Reverse Current at V_{RWM} µA			
	volts	25°C	100°C	amp.	°C	25°C	100°C		
ZS120	50	250	–	1.25	-55 to + 100	5.0	50	DO-7	Low cost industrial applications
ZS121	100	250	–	1.25	-55 to + 100	5.0	50	DO-7	
ZS122	200	250	–	1.25	-55 to + 100	5.0	50	DO-7	
ZS123	300	250	–	1.25	-55 to + 100	5.0	50	DO-7	
ZS124	400	250	–	1.25	-55 to + 100	5.0	50	DO-7	

Very Low Leakage Planar Epitaxial

Type No.	V_{RWM}	Maximum Ratings		Characteristics					Jedec Outline	Comments
		Mean Rectified Current at 75°C	Surge Current for 5 mS. A	Max. Reverse Current at V_{RWM} at 25°C nA	Max. Reverse Current at V_{RWM} at 150°C µA	Maximum Forward Recovery Time at $I_F = 10$ mA nS	Typical Reverse Recovery Time* nS	Typical Capacitance at -1 V pF		
ZS150	50	250	3	1	1	10	250	2.5	DO-7	High temperature operation up to 200°C. Planar epitaxial construction ensures high reliablity
ZS151	100	250	3	1	1	10	250	2.5	DO-7	
ZS152	50	250	3	5	5	10	250	2.5	DO-7	
ZS153	100	250	3	5	5	10	250	2.5	DO-7	
ZS154	50	250	3	100	10	10	250	2.5	DO-7	
ZS155	50	250	3	100	10	10	250	2.5	DO-7	

*From $I_F = 600mA$ to $I_R = 100mA$.

*Maximum Duration 1 second. §At V_{RWM}

Manufactured in U.K.

FERRANTI

- ☐ Power Rectifiers
- ☐ Zener Diodes
- ☐ Choice of Package

RECTIFIERS

Peak Repetitive Reserve Voltage	General Purpose		Fast Recovery			
50V	ZS170	ZS270	IN 3879/R	IN 3889/R	IN 3899/R	IN 3909/R
100V	ZS171	ZS271	IN 3880/R	IN 3890/R	IN 3900/R	IN 3910/R
200V	ZS172	ZS272	IN 3881/R	IN 3891/R	IN 3901/R	IN 3911/R
300V			IN 3882/R	IN 3892/R	IN 3902/R	IN 3912/R
400V	ZS174	ZS274	IN 3883/R	IN 3893/R	IN 3903/R	IN 3913/R
600V	ZS176	ZS276				
800V	ZS178	ZS278				
Average Forward Current at 25°C IF (AV)	0.75A	1.5A	6A	12A	20A	30A
Non Repetitive Peak Forward Current IFSM	70A	70A	75A	125A	225A	300A
VF @ IFAV	1.2V	1.2V	1.4V max	1.4V max	1.4V max	1.4V max
Trr @ IF = 1A to VR = 30V			200nS max	200nS max	200nS max	200nS max
Package	D041	D041	D04*	D04*	D05*	D05*

*Standard product – stud cathode; reverse polarity – stud anode – suffix R.

B S PRODUCT INDEX

BS/CV Approval Number	Commercial Equivalent
BS 9300 C013	ZS104
BS 9300 C045	ZS102
BS 9300 C046	ZS106
BS 9300 C642	ZS150
BS 9300 C643	ZS151
BS 9300 C760	KS77
BS 9300 C761	KS78

BS/CV Approval Number	Commercial Equivalent
BS 9302 F001	BAW63
BS 9302 F002	BAW63A
BS 9302 F003	BAW63B
BS 9302 F004	BAW64
BS 9302 F005	BAW65
BS 9302 F006	BAW66
BS 9302 F007	BAW67
BS 9302 F008	BAW68

BS/CV Approval Number	Commercial Equivalent
BS 9330 F019	ZS100
BS 9330 F020	ZS101
BS 9330 F021	ZS102
BS 9330 F022	ZS103
BS 9330 F023	ZS104
BS 9330 F024	ZS106
BS 9330 F025	ZS108
BS 9330 F026	ZS100

BS/CV Approval Number	Commercial Equivalent
BS 9330 F027	ZS101
BS 9330 F028	ZS102
BS 9330 F029	ZS103
BS 9330 F030	ZS104
BS 9330 F031	ZS106
BS 9330 F032	ZS108
CV7040	ZS122

SILICON PLANAR REFERENCE DIODES

Package			TO 92	Micro–E	SOT–23
Dissipation			750mW @ 25°C amb.	300mW @ 25°C amb.	450mW @ 25°C amb.
Zener Voltage V_z at I_z = 5mA Volts			BZV41 Type Number	BZX88 Type Number	BZX84 Type Number
Nom.	Min.	Max.			
2.7	2.5	2.9	BZV41 C2V7	BZX88 C2V7	BZX84 C2V7
3.0	2.8	3.2	BZV41 C3V0	BZX88 C3V0	BZX84 C3V0
3.3	3.1	3.5	BZV41 C3V3	BZX88 C3V3	BZX84 C3V3
3.6	3.4	3.8	BZV41 C3V6	BZX88 C3V6	BZX84 C3V6
3.9	3.7	4.1	BZV41 C3V9	BZX88 C3V9	BZX84 C3V9
4.3	4.0	4.6	BZV41 C4V3	BZX88 C4V3	BZX84 C4V3
4.7	4.4	5.0	BZV41 C4V7	BZX88 C4V7	BZX84 C4V7
5.1	4.8	5.4	BZV41 C5V1	BZX88 C5V1	BZX84 C5V1
5.6	5.2	6.0	BZV41 C5V6	BZX88 C5V6	BZX84 C5V6
6.2	5.8	6.6	BZV41 C6V2	BZX88 C6V2	BZX84 C6V2
6.8	6.4	7.2	BZV41 C6V8	BZX88 C6V8	BZX84 C6V8
7.5	7.0	7.9	BZV41 C7V5	BZX88 C7V5	BZX84 C7V5
8.2	7.7	8.7	BZV41 C8V2	BZX88 C8V2	BZX84 C8V2
9.1	8.5	9.6	BZV41 C9V1	BZX88 C9V1	BZX84 C9V1
10	9.4	10.6	BZV41 C10	BZX88 C10	BZX84 C10
11	10.4	11.6	BZV41 C11	BZX88 C11	BZX84 C11
12	11.4	12.7	BZV41 C12	BZX88 C12	BZX84 C12
13	12.4	14.1	BZV41 C13	BZX88 C13	BZX84 C13
15	13.8	15.6	BZV41 C15	BZX88 C15	BZX84 C15
16	15.3	17.1	BZV41 C16	BZX88 C16	BZX84 C16
18	16.8	19.1	BZV41 C18	BZX88 C18	BZX84 C18
20	18.8	21.2	BZV41 C20	BZX88 C20	BZX84 C20
22	20.8	23.3	BZV41 C22	BZX88 C22	BZX84 C22
24	22.8	25.6	BZV41 C24	BZX88 C24	BZX84 C24
V_z at I_z = 2mA					
27	25.1	28.9	BZV41 C27	BZX88 C27	BZX84 C27
30	28.0	32.0	BZV41 C30	BZX88 C30	BZX84 C30
33	31.0	35.0	BZV41 C33	BZX88 C33	BZX84 C33
36	34.0	38.0	BZV41 C36	BZX88 C36	BZX84 C36
39	37.0	41.0	BZV41 C39	BZX88 C39	BZX84 C39
43	40.0	46.0	BZV41 C43	BZX88 C43	BZX84 C43
47	44.0	50.0	BZV41 C47	BZX88 C47	BZX84 C47

TO92				
750mW @ 25°C amb.				
Type Number	Zener Voltage V_z at I_z Volts			Test I_z mA
	Nom.	Min.	Max.	
IN5842B	3.3	3.1	3.5	20
IN5843B	3.6	3.4	3.8	20
IN5844B	3.9	3.7	4.1	20
IN5845B	4.3	4.0	4.6	20
IN5846B	4.7	4.4	5.0	20
IN5847B	5.1	4.8	5.4	20
IN5848B	5.6	5.2	6.0	20
IN5850B	6.2	5.8	6.6	20
IN5851B	6.8	6.4	7.2	20
IN5852B	7.5	7.0	7.9	20
IN5853B	8.2	7.7	8.7	20
IN5855B	9.1	8.5	9.6	20
IN5856B	10	9.4	10.6	20
IN5857B	11	10.4	11.6	20
IN5858B	12	11.4	12.7	20
IN5859B	13	12.4	14.1	9.5
IN5861B	15	13.8	15.6	8.5
IN5862B	16	15.3	17.1	7.8
IN5864B	18	16.8	19.1	7.0
IN5866B	20	18.8	21.2	6.2
IN5867B	22	20.8	23.3	5.6
IN5868B	24	22.8	25.6	5.2
IN5807B	27	25.1	28.9	4.6
IN5872B	30	28	32	4.2
IN5873B	33	31	35	3.8
IN5874B	36	34	38	3.4
IN5875B	39	37	41	3.2
IN5876B	43	40	46	3.0
IN5877B	47	44	50	2.7

Manufactured in U.K.

Metal Can Transistors

FERRANTI

- Metal Can Construction
- NPN/PNP Complementary Devices
- General Purpose and Switching

TO-18

NPN GENERAL PURPOSE

NPN Silicon Planar General Purpose Transistors

The devices are listed in order of decreasing Breakdown Voltages (V_{CB} and V_{CED}), decreasing Collector Current (I_C), Power Dissipation (P_{tot}) etc.

Type	V_{CB} V	V_{CEO} V	Max I_C mA	Max $V_{CE(sat)}$ at V	at I_C mA	at I_B mA	h_{FE} Min	h_{FE} Max	at I_C mA	Min f_T MHz	at I_C mA	P_{tot} at T_{amb} 25°C mW	Package	Complement
ZT92	120	100	1000	1·2	200	20	65	200	200	60	50	1000	TO-39	—
ZT91	120	100	1000	1·2	200	20	40	120	200	60	50	1000	TO-39	—
2N2405	120	90	1000	0·2	50	5	60	200	150	—	—	1000	TO-39	—
ZT93	120	60	1000	0·5	150	15	40	120	150	60	50	1000	TO-39	—
2N1893	120	80	500	1·2	50	5	40	120	150	—	—	800	TO-39	—
2N2102	120	65	1000	0·5	150	15	40	120	150	60	50	1000	TO-39	2N4036
ZT88	100	80	500	0·2	50	5	75	170	10	200	10	300	TO-18	—
ZT86	100	80	500	0·2	50	5	38	85	10	200	10	300	TO-18	—
BFX85	100	60	1000	0·35	150	15	70	—	150	50	50	800	TO-39	—
BFX84	100	60	1000	0·35	150	15	30	—	150	50	50	800	TO-39	—
BC141	100	60	1000	1·0	1000	100	40	250	100	50	50	3700†	TO-39	BC161
BC140	80	40	1000	1·0	1000	100	40	250	100	50	50	3700†	TO-39	BC160
BFY50	80	35	1000	0·2	150	15	30	—	150	60	50	800	TO-39	—
2N1613	75	50	1000	1·5	150	15	40	120	150	60	50	800	TO-39	—
2N1711	75	50	1000	1·5	150	15	100	300	150	70	50	600	TO-39	—
ZT89	70	70	500	0·2	50	5	75	250	10	200	10	300	TO-18	ZT189
ZT90	60	60	1000	0·7	200	20	60	200	200	60	50	1000	TO-39	ZT211
ZT95	60	60	1000	1·2	200	20	30	200	350	60	50	1000	TO-39	ZT211
BCY65E	60	60	100	0·35	10	0·25	120	460	2	125	10	1000†	TO-18	BCY77
2N2270	60	45	1000	0·9	150	15	50	200	150	60	50	1000	TO-39	—
ZT94	60	45	1000	0·7	200	20	20	—	10	60	50	1000	TO-39	ZT210
ZT83	60	45	500	0·2	50	5	38	85	10	200	10	300	TO-18	ZT183

PNP GENERAL PURPOSE

PNP Silicon Planar General Purpose Transistors

Type	V_{CB} V	V_{CEO} V	Max I_C mA	Max $V_{CE(sat)}$ at V	at I_C mA	at I_B mA	h_{FE} Min	h_{FE} Max	at I_C mA	Min f_T at MHz	at I_C mA	P_{tot} at T_{amb} 25°C mW	Package	Complement
2T211	90	65	1000	0·65	150	15	40	120	150	60	50	1000	TO-39	ZT90/95
2N4036	90	65	1000	0·65	150	15	40	140	150	—	—	1000	TO-39	2N2102
ZT189	70	70	500	0·2	50	5	75	250	10	150	10	300	TO-18	ZT89
BC161	60	60	1000	1·0	1000	100	40	250	100	50	50	3700†	TO-39	BC141
BCY77	60	60	100	0·25	10	0·25	120	460	2	180*	10	1000†	TO-18	BCY65E
2N2605	60	45	30	0·5	10	0·5	150	—	0·5	30	0·5	400	TO-46	—
2N2604	60	45	30	0·5	10	0·5	60	—	0·5	30	0·5	400	TO-46	—
ZT210	60	40	1000	1·4	150	15	20	100	150	60	50	1000	TO-39	ZT94
2N4037	60	40	1000	1·4	150	15	50	250	150	—	—	1000	TO-39	2N3053
BC177	50	45	200	0·2	10	0·5	120	460	2	130	10	300	TO-18	BC107
BCY70	50	40	200	0·25	10	1	100	10	250	10	350	TO-18	—
2N1131	50	35	600	1·5	150	15	20	45	150	—	—	600	TO-39	2N696
2N1132	50	35	600	1·5	150	15	30	90	150	—	—	600	TO-39	2N697

NPN SWITCHING

NPN Silicon Planar Medium and High Speed Switching Transistors

Type	V_{CEO} V	Max I_C mA	Max $V_{CE(sat)}$ at V	at I_C mA	at I_B mA	h_{FE} Min	h_{FE} Max	at I_C mA	f_T Min MHz	at I_C mA	Switching Times (Max) at t_{on} ns	t_{off} ns	I_C mA	Package	Complement
2N3262	100	1500	0·6	1000	100	40	—	500	—	—	40	750	1000	TO-39	—
ZT86	80	500	0·2	50	5	38	85	10	200	10	50*	170*	20	TO-18	—
ZT88	60	500	0·2	50	5	75	170	10	200	10	50*	170*	20	TO-18	—
ZT89	70	500	0·2	50	5	75	250	10	200	10	50*	170*	20	TO-18	ZT189
2N2102	65	1000	0·5	150	15	40	120	150	60	50	(note 1)			TO-39	2N4036
BFX85	60	1000	0·35	150	15	70	—	150	50	50	55*	360*	150	TO-39	—
BFX84	60	1000	0·35	150	15	30	—	150	50	50	55*	360*	150	TO-39	—
BCY65E	60	100	0·35	10	0·25	120	460	2	125	10	150	800	10	TO-18	BCY77
2N1613	50	1000	1·5	150	15	40	120	150	60	50	(note 1)			TO-39	—
2N2270	45	1000	0·9	150	15	50	200	150	60	50	(note 1)			TO-39	—
ZT83	45	500	0·2	50	5	38	85	10	200	10	50*	170*	20	TO-18	ZT183
ZT84	45	500	0·2	50	5	75	170	10	200	10	50*	170*	20	TO-18	ZT184
BCY59	45	200	0·35	10	0·25	120	630	2	125	10	150	800	10	TO-18	BCY79
2N2718A	40	800	0·3	150	15	40	120	150	250	20	35	285	150	TO-39	2N2904A
2N2219A	40	800	0·3	150	15	100	300	150	300	20	35	285	150	TO-39	2N2905A
2N2221A	40	800	0·3	150	15	40	120	150	250	20	35	285	150	TO-18	2N2906A
2N2222A	40	800	0·3	150	15	100	300	150	300	20	35	285	150	TO-18	2N2907A
BFY50	35	1000	0·2	150	15	30	—	150	60	50	55*	360*	150	TO-39	—
BFX86	35	1000	0·35	150	15	70	—	150	50	50	55*	360*	150	TO-39	—
ZT81	35	500	0·2	10	2	38	162	10	200	10	50*	170*	20	TO-18	ZT181
ZT82	35	500	0·2	10	2	75	250	10	200	10	50*	170*	20	TO-18	ZT182
2N3512	35	—	0·4	150	7·5	10	—	500	—	—	30	45	150	TO-39	—

Type	V_{CEO} V	Max I_C mA	Max $V_{CE(sat)}$ at V	at I_C mA	at I_B mA	h_{FE} Min	h_{FE} Max	at I_C mA	f_T Min MHz	at I_C mA	Switching Times (Max) at t_{on} ns	t_{off} ns	I_C mA	Package	Complement
BCY58	32	200	0·35	10	0·25	120	630	2	125	10	150	800	10	TO-18	BCY78
BFY51	30	1000	0·35	150	15	40	—	150	50	50	55*	360*	150	TO-39	—
2N2218	30	800	0·4	150	15	40	120	150	250	20	25*	175*	150	TO-39	2N2904
2N2219	30	800	0·4	150	15	100	300	150	250	20	25*	200*	150	TO-39	2N2905
2N2220	30	800	0·4	150	15	20	60	150	250	20	20*	213*	150	TO-18	—
2N2221	30	800	0·4	150	15	40	120	150	250	20	25*	175*	150	TO-18	2N2906
2N2222	30	800	0·4	150	15	100	300	150	250	20	25*	200*	150	TO-18	2N2907
ZT80	25	500	0·2	10	2	38	162	10	200	10	50*	170*	20	TO-18	ZT180
ZT87	25	500	0·2	10	2	75	250	10	200	10	50*	170*	20	TO-18	ZT187
BFY52	20	1000	0·35	150	15	60	—	150	50	50	55*	360*	150	TO-39	—
2N706A	20	—	0·6	10	1	20	—	10	200	10	40	75	10	TO-18	—
2N2477	20	—	0·4	150	3·75	40	—	150	250	50	25	45	150	TO-39	—
2N2476	20	—	0·4	150	7·5	20	—	150	250	50	25	45	150	TO-39	—
2N2369A	15	500	0·2	10	1	—	120	10	—	—	9	13	10	TO-18	—
2N2368	15	500	0·24	10	1	20	60	10	—	—	12	15	10	TO-18	—
2N2369	15	500	0·24	10	1	40	120	10	—	—	12	18	10	TO-18	—
BSY95A	15	200	0·35	10	0·2	50	200	10	200	10	(note 3)			TO-18	—
2N708	15	—	0·4	10	1	30	120	10	300	10	(note 2)			TO-18	—
2N2838	13	500	0·4	50	1·6	30	105*	50	500	10	30	30	50	TO-18	—
2N2475	6	300	0·4	20	0·66	30	150	20	600	20	20	15	20	TO-18	—
2N709	6	—	0·3	3	0·15	20	120	10	600	5	15	15	10	TO-18	—

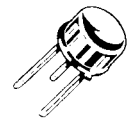
† At T_{case} = 45°C * Typical Note 1 t_{on} = 30ns Note 2 t_{stg} = 25ns Note 3 t_{stg} = 50ns

Manufactured in U.K.

FERRANTI

Metal Can Transistors

- Metal Can Construction
- NPN/PNP Complementary Devices
- Switching and Low Noise



TO–39

PNP SWITCHING — Silicon Planar Medium and High Speed Switching Transistors

The devices are listed in order of decreasing Breakdown Voltage (V_{CEO}), decreasing Collector Current (I_C), Power Dissipation (P_{tot}), etc.

Type	V_{CEO} V	Max I_C mA	Max $V_{CE(sat)}$ at V	at I_C mA	at I_B mA	h_{FE} Min	h_{FE} Max	h_{FE} at I_C mA	f_T Min MHz	f_T at I_C mA	Switching Times (Max) at t_{on} ns	t_{off} ns	I_C mA	Package	Complement
ZT1B9	70	500	0·2	50	5	75	250	10	150	10	120*	250*	20	TO-18	ZTB9
2N4036	65	1000	0·65	150	15	40	140	150	—	—	110	700	150	TO-39	2N2102
2N2904A	60	600	0·4	150	15	40	120	150	200	50	45	100	150	TO-39	2N2218A
2N2905A	60	600	0·4	150	15	100	300	150	200	50	45	100	150	TO-39	2N2219A
2N2906A	60	600	0·4	150	15	40	120	150	200	50	45	100	150	TO-18	2N2221A
2N2907A	60	600	0·4	150	15	100	300	150	200	50	45	100	150	TO-18	2N2222A
BCY77	60	100	0·25	10	0·25	120	460	2	180*	10	150	800	10	TO-18	BCY65E
ZT1B3	45	500	0·4	50	5	38	85	10	150	10	120*	250*	20	TO-18	ZTB3
ZT184	45	500	0·4	50	5	75	170	10	150	10	120*	250*	20	TO 18	ZT84
BCY79	45	200	0·25	10	0·25	120	460	2	180*	10	150	800	10	TO-18	BCY59

Type	V_{CEO} V	Max I_C mA	Max $V_{CE(sat)}$ at V	at I_C mA	at I_B mA	h_{FE} Min	h_{FE} Max	h_{FE} at I_C mA	f_T Min MHz	f_T at I_C mA	Switching Times (Max) at t_{on} ns	t_{off} ns	I_C mA	Package	Complement
2N2904	40	600	0·4	150	15	40	120	150	200	50	45	100	150	TO-39	2N221B
2N2905	40	600	0·4	150	15	100	300	150	200	50	45	100	150	TO-39	2N2219
2N2906	40	600	0·4	150	15	40	120	150	200	50	45	100	150	TO 1B	2N2221
2N2907	40	600	0·4	150	15	100	300	150	200	50	45	100	150	TO-1B	2N2222
ZT181	35	500	0·2	10	1	3B	162	10	150	10	120*	250*	20	TO-18	ZTB1
ZT1B2	35	500	0·2	10	1	75	260	10	150	10	120*	250*	20	TO 18	ZT82
BCY7B	32	200	0·25	10	0·25	120	630	2	180*	10	150	800	10	TO-1B	BCY5B
ZT180	25	500	0·2	10	1	3B	162	10	150	10	120*	250*	20	TO-18	ZTB0
ZT187	25	500	0·2	10	1	75	250	10	150	70	120*	250*	20	TO 18	ZT87
2N2894	12	200	0·15	10	1	40	150	30	400	30	60	90	30	TO-18	—

NPN LOW NOISE — NPN Silicon Planar Low Noise Transistors

The transistors shown in this table are characterised for low noise, low level amplification and are particularly suitable for audio pre-amplifiers as well as universal applications.

Type	V_{CEO} V	Max I_C mA	Max $V_{CE(sat)}$ at V	at I_C mA	at I_B mA	h_{FE} Min	h_{FE} Max	h_{FE} at I_C mA	f_T Min MHz	f_T at I_C mA	Noise Figure at N dB	I_C µA	f Hz	Package	Complement
ZT91	100	1000	1·2	200	20	40	120	200	60	50	6	300	1K	TO-39	—
ZT92	100	1000	1·2	200	20	65	200	200	60	50	6	300	1K	TO-39	—
ZT93	80	1000	0·5	150	15	40	120	150	60	50	6	300	1K	TO-39	—
ZT86	80	500	0·2	50	5	38	85	10	200	10	·6	100	1K	TO-18	—
ZT88	80	500	0·2	50	5	75	170	10	200	10	·6	100	1K	TO-18	—
ZT89	70	500	0·2	50	5	75	250	10	200	10	·6	100	1K	TO-18	ZT189
ZT90	60	1000	0·7	200	20	60	200	200	60	50	6	300	1K	TO-39	ZT211
ZT95	60	1000	1·2	200	20	30	200	350	60	50	6	300	1K	TO-39	ZT211
BCY65E	60	100	0·35	10	0·25	120	460	2	125	10	·6	200	1K	TO-18	BCY77
2N2484	60	50	0·35	1	0·1	100	500	0·01	—	—	·3	200	1K	TO-18	—
ZT94	45	1000	0·7	200	20	20	—	10	60	50	6	300	1K	TO-39	ZT210
ZT83	45	500	0·2	50	5	38	85	10	200	10	·6	100	1K	TO-1B	ZT183

Type	V_{CEO} V	Max I_C mA	Max $V_{CE(sat)}$ at V	at I_C mA	at I_B mA	h_{FE} Min	h_{FE} Max	h_{FE} at I_C mA	f_T Min MHz	f_T at I_C mA	Noise Figure at N dB	I_C µA	f Hz	Package	Complement
ZTB4	45	500	0·2	50	5	75	170	10	200	10	·6	100	1K	TO-18	ZT184
BCY59	45	200	0·35	10	0·25	120	630	2	125	10	·6	200	1K	TO-18	BCY79
2N929	45	30	1	10	0·5	40	120	0·01	—	—	4	10	1K	TO-18	—
2N930	45	30	1	10	0·5	100	300	0·01	—	—	·4	10	1K	TO-18	—
2N2219A	40	800	0·3	150	15	100	300	150	300	20	·4	100	1K	TO-39	2N2905A
2N2222A	40	800	0·3	150	15	100	300	150	300	20	·4	100	1K	TO 18	2N2907A
ZT81	35	500	0·2	10	2	38	162	10	200	10	6	100	1K	TO-18	ZT181
ZT82	35	500	0·2	10	2	75	250	10	200	10	6	100	1K	TO-18	ZT182
BCY58	32	200	0·35	10	0·25	120	630	2	125	10	6	200	1K	TO-18	BCY78
ZT80	25	500	0·2	10	2	38	162	10	200	10	·6	100	1K	TO-1B	ZT1B0
ZT87	25	500	0·2	10	2	75	250	10	200	10	·6	100	1K	TO-18	ZT187
BC109	20	50	0·2	10	0·5	180	800	2	150	10	·4	200	30-15K	TO-18	BC179

PNP LOW NOISE — PNP Silicon Planar Low Noise Transistors

Type	V_{CEO} V	Max I_C mA	Max $V_{CE(sat)}$ at V	at I_C mA	at I_B mA	h_{FE} Min	h_{FE} Max	h_{FE} at I_C mA	f_T Min MHz	f_T at I_C mA	Noise Figure at N dB	I_C µA	f Hz	Package	Complement
ZT189	70	500	0·2	50	5	75	250	10	150	10	6	100	1K	TO-1B	ZT89
BCY77	60	100	0·25	10	0·25	120	460	2	180*	10	·6	200	1K	TO-1B	BCY65E
ZT1B3	45	500	0·4	50	5	3B	85	10	150	10	6	100	1K	TO-18	ZT83
ZT184	45	500	0·4	50	5	75	170	10	150	10	6	100	1K	TO-18	ZT84
BCY79	45	200	0·25	10	0·25	120	460	2	180*	10	·6	200	1K	TO-18	BCY59
BCY71	45	200	0·25	10	1	100	400	10	250	10	·6	100	10-10K	TO-18	—
BCY70	40	200	0·25	10	1	100	—	10	150	10	·6	100	10-10K	TO-18	—
2N2605	45	30	0·5	10	0·5	150	—	0·5	30	0·5	·3	10	10-15·7K	TO-46	—

Type	V_{CEO} V	Max I_C mA	Max $V_{CE(sat)}$ at V	at I_C mA	at I_B mA	h_{FE} Min	h_{FE} Max	h_{FE} at I_C mA	f_T Min MHz	f_T at I_C mA	Noise Figure at N dB	I_C µA	f Hz	Package	Complement
2N2604	45	30	0·5	10	0·5	60	—	0·5	30	0·5	4	10	10-15·7K	TO-46	—
ZT181	35	500	0·2	10	1	38	162	10	150	10	6	100	1K	TO-1B	ZT81
ZT182	35	500	0·2	10	1	75	260	10	150	10	6	100	1K	TO-18	ZTB2
BCY78	32	200	0·25	10	0·25	120	630	2	180*	10	6	200	1K	TO 1B	BCY58
BCY72	25	200	0·25	10	1	100	—	10	250	10	·2	100	10 10K	TO-18	—
ZT180	25	500	0·2	10	1	3B	162	10	150	10	6	100	1K	TO-18	ZTB0
ZT1B7	25	500	0·2	10	1	75	250	10	150	10	6	100	1K	TO-18	ZTB7
BC179	20	50	0·2	10	0·5	180	800	2	130*	10	4	200	30 15K	TO 1B	BC109

NPN HIGH CURRENT SWITCHING — NPN Silicon Planar High Current Switching Transistors

Type	V_{CB} V	V_{CEO} V	Max I_C A	Max $V_{CE(sat)}$† V	at I_C A	at I_B A	h_{FE} Min	h_{FE} Max	h_{FE} at I_C A	Switching Times (Typ) at t_{on} ns	t_{off} ns	I_C A	P_{tot} at T_{case} 25°C W	Package	Complement
BUY82	150	60	10	1	10	1	40	—	1·5	320	245	10	30	TO-39	BUY92
							15	—	10						
BUYB1	150	60	7·5	1	7·5	0·75	40	—	1	160	430	5	24	TO-39	BUY91
							10	—	7·5						
BUY80	150	60	5	1	5	0·5	40	—	0·5	170	200	5	20	TO-39	BUY90
2N3419	125	80	5*	1	5	0·5	15	—	5						
							20	60	1	300	1200	1	30	TO-39	—
2N3421	125	80	5*	1	5	0·5	40	120	1	300	1200	1	30	TO-39	—

Type	V_{CB} V	V_{CEO} V	Max I_C A	Max $V_{CE(sat)}$† V	at I_C A	at I_B A	h_{FE} Min	h_{FE} Max	h_{FE} at I_C A	Switching Times (Typ) at t_{on} ns	t_{off} ns	I_C A	P_{tot} at T_{case} 25°C W	Package	Complement
BUX34	120	60	5	1	5	0·5	40	150	2	140	180	5	20	TO-39	—
BFX34	120	60	5*	1	5	0·5	40	150	2	140	180	5	5	TO-39	—
BSV64	100	60	5*	1	5	0·5	40	—	2	140	180	5	5	TO-39	—
2N3418	85	60	5*	1	5	0·5	20	60	1	300	1200	1	30	TO-39	—
2N3420	85	60	5*	1	5	0·5	40	120	1	300	1200	1	30	TO-39	—

PNP HIGH CURRENT SWITCHING — PNP Silicon Planar High Current Switching Transistors

Type	V_{CB} V	V_{CEO} V	Max I_C A	Max $V_{CE(sat)}$* V	at I_C A	at I_B A	h_{FE} Min	h_{FE} Max	h_{FE} at I_C A	Switching Times (Typ) at t_{on} ns	t_{off} ns	I_C A	P_{tot} at T_{case} 25°C W	Package	Complement
BUY92	100	60	7·5	1	7·5	0·75	40	—	1	—	—	—	30	TO-39	BUY82
BUY91	100	60	5	1	5	0·5	40	—	1	—	—	—	24	TO-39	BUYB1
BUY90	100	60	3	1	3	0·3	40	—	1	—	—	—	20	TO-39	BUY80

* Typical

† Pulsed 300µs

Manufactured in U.K.

Metal Can Transistors

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- ☐ Metal Can Construction
- ☐ Darlington and High Frequency
- ☐ BS Products

DARLINGTONS

NPN Silicon High Current Darlington Transistors

Type	V_{CB} V	V_{CEO} V	Max I_C A	Max $V_{CE(sat)}$ at I_C A	at I_B mA	h_{FE} at Min	Max	at I_C A	Max C_{obo} at 1 MHz pF	Max I_{CBO} at V_{CB} V	μA	V_{CB} V	P_{tot} at T_{amb} 25°C W	Package
BD320A	80	60	1	1·6	1	1K	—	0·5	6	10	1	60	5	TO-39
BD320B	80	60	1	1·6	1	5K	—	0·5	6	10	1	60	5	TO-39
BD320C	80	60	1	1·6	1	10K	—	0·5	6	10	1	60	5	TO-39
BD321A	80	60	2	1·7	2	1K	—	1	8·5	10	1	60	5	TO-39
BD321B	80	60	2	1·7	2	5K	—	1	8·5	10	1	60	5	TO-39
BD321C	80	60	2	1·7	2	10K	—	1	8·5	10	1	60	5	TO-39
BD322A	80	60	1	1·6	1	1K	—	0·5	6	10	1	60	7·5	TO-39
BD322B	80	60	1	1·6	1	5K	—	0·5	6	10	1	60	7·5	TO-39
BD322C	80	60	1	1·6	1	10K	—	0·5	6	10	1	60	7·5	TO-39
BD323A	80	60	2	1·7	2	1K	—	1	8·5	10	1	60	10	TO-39
BD323B	80	60	2	1·7	2	5K	—	1	8·5	10	1	60	10	TO-39
BD323C	80	60	2	1·7	2	10K	—	1	8·5	10	1	60	10	TO-39
2N6383	40	40	10	3	10	100	1K	20K	5	200	10	1*	40	100	TO-3
2N6384	60	60	10	3	10	100	1K	20K	5	200	10	1*	60	100	TO-3
2N6385	80	80	10	3	10	100	1K	20K	5	200	10	1*	80	100	TO-3

* Refers to I_{CEO} (in mA)

HIGH FREQUENCY

NPN Silicon Planar High Frequency Transistors

Type	V_{CB} V	V_{CEO} V	Max I_C mA	h_{FE} at Min	Max	at I_C mA	f_T Min at MHz	I_C mA	Noise Figure at N dB	I_C mA	f Hz	C_{obo} Max at 1 MHz pF	V_{CB} V	RF P_O or RF P_G at mW or dB	f MHz	Package
BFY90	30	15	50	25	150	2	1300	25	·5	2	500M	1·5	10	175mW	500	TO-72
2N918	30	15	—	20	—	3	—	—	·6	1	60M	1·7	10	15dB	200	TO-72
2N2708	35	20	—	30	200	2	700	2	8·5	2	200M	1·5	15	15dB	200	TO-18

BS PRODUCT INDEX

The Ferranti range of Metal Can transistors is available to a wide range of Quality Assurance levels linked, in the main, to the British Standards scheme (BS 9000) for the qualification of electronic components of assessed quality and as such, devices are suitable for use in military, industrial and professional equipments.

The range of available standards may be listed as:

1 **Commercial** – with factory acceptance quality levels (AQL)

2 **BS Approved** – to BS 9300 series – categories P and Q.
– to BS 9300 adopted CV 7000 series.

3 **CECC harmonized European Standard** – 50000 series approval (categories F and L).

4 **High-Rel** – to RRE specification X6487 which includes 100% pre-cap visual inspection, burn-in, etc. RRE/X6487 is to be incorporated into the BS scheme as the basis for a HIGH RELIABILITY screening procedure.

5 **Release to Defence Standard** (DEF STAN 0E-21) conditions i.e. 6/49 release.

6 **Release to Civil Aviation Authority** (CAA) conditions.

7 **CV/DEF STAN** specifications where the appropriate device is approved – until such time as they are incorporated into the BS scheme

8 **Non-Approved Types** – where Ferranti is not listed as an approved supplier or where approval is pending, we may supply devices which have been subjected to the full CV/BS etc. quality assurance procedures as 'tested to .....', subject to the basic type being available from Ferranti Ltd. Similarly, we may supply on a partial release basis such as 'released to Group A tests only' etc.

For further details of the Ferranti quality assurance programme, contact:
Product Marketing at Comway Electronics Ltd.

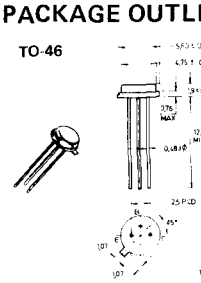
BS Number	Commercial Equivalent Type Number
BS 9300 C371	ZT83
BS 9300 C372	ZT84
BS 9300 C373	ZT86
BS 9300 C404	2N1893
BS 9300 C440	2N1613
BS 9300 C464	2N706A
BS 9300 C478	2N918
BS 9300 C492	2N929
BS 9300 C493	2N930
BS 9300 C495	2N696
BS 9300 C496	2N697
BS 9300 C554	2N2475
BS 9300 C555	2N2369A
BS 9300 C580	2N1131
BS 9300 C581	2N1132
BS 9300 C593*	2N2477
BS 9300 C594*	2N2894
BS 9300 C632	ZT91
BS 9300 C633	ZT92
BS 9300 C639	ZT90
BS 9300 C644	ZT89
BS 9300 C646	2N708
BS 9300 C648	BSY95A
BS 9300 C669	2N2904
BS 9300 C670	2N2905
BS 9300 C671	2N2904A
BS 9300 C672	2N2905A

BS Number	Commercial Equivalent Type Number
BS 9300 C673	2N2906
BS 9300 C674	2N2907
BS 9300 C675	2N2906A
BS 9300 C676	2N2907A
BS 9300 C735	2N1711
BS 9300 C738	2N2484
BS 9300 C748	2TB0
BS 9300 C749	ZT180
BS 9300 C750	ZT81
BS 9300 C751	ZT181
BS 9300 C752	ZT82
BS 9300 C753	ZT182
BS 9300 C754	2T87
BS 9300 C755	ZT187
BS 9300 C763	2N2218
BS 9300 C764	2N2219
BS 9300 C765	2N2218A
BS 9300 C766	2N2219A
BS 9300 C767	2N2221
BS 9300 C768	2N2222
BS 9300 C769	2N2221A
BS 9300 C770	2N2222A
BS 9362 F001	BUY80
BS 9362 F003	BUY81
BS 9362 F005	BUY82
BS 9365 F012	BFY50/1/2
BS 9365 F056	BFY90
BS 9365 F058	ZT180
BS 9365 F059	ZT181

BS Number	Commercial Equivalent Type Number
BS 9365 F060	ZT182
BS 9365 F061	ZT183
BS 9365 F062	2T184
BS 9365 F063	ZT187
BS 9365 F064	ZT189
BS 9365 F065	ZT180
BS 9365 F066	ZT181
BS 9365 F067	ZT182
BS 9365 F068	ZT183
BS 9365 F069	ZT184
BS 9365 F070	ZT187
BS 9365 F071	ZT189
BS 9365 F133	8FX34
BS 9365 F153	BUX34
BS 9365 F154*	2N3418
BS 9365 F155*	2N3419
BS 9365 F156*	2N3420
BS 9365 F157*	2N3421
BS 9365 F158*	2N3418
BS 9365 F159*	2N3419
BS 9365 F160*	2N3420
BS 9365 F161*	2N3421
BS 9365 F171	2T210
BS 9365 F172	2T211
BS 9365 F182	2N4036
BS 9365 F183	2N4037
BS 9365 F194	2N3053

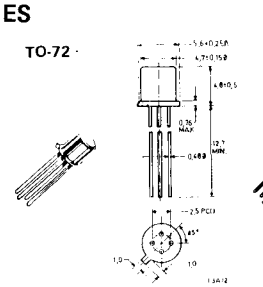
PACKAGE OUTLINES

TO-46



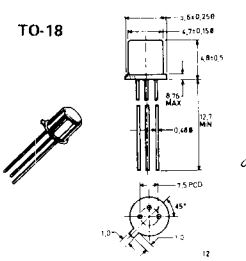
BS 3934:SO-12C
JEDEC:TO-46

TO-72



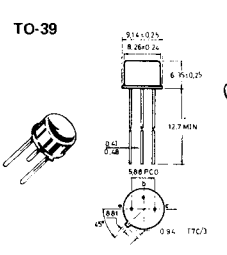
BS 3934:SO-12A
JEDEC:TO-72

TO-18



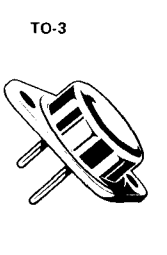
BS 3934:SO-12A
JEDEC:TO-18

TO-39



BS 3934:SO-3
JEDEC:TO-39

TO-3



BS 3934:SO-5A
JEDEC:TO-3

Manufactured in U.K.

FERRANTI

- E–Line Construction
- NPN/PNP Complementary Devices
- General Purpose and Switching

NPN GENERAL PURPOSE

NPN Silicon Planar General Purpose Transistors

The transistors are listed in order of decreasing breakdown voltages (V_{CBO} and V_{CEO}), then in order of decreasing collector current (I_C), power dissipation (P_{tot}) etc.

Type	V_{CBO} V	V_{CEO} V	Max I_C mA	Max $V_{CE(sat)}$ at V	at I_C mA	at I_B mA	h_{FE} at Min	Max	at I_C mA	Min f_T at MHz	at I_C mA	P_{tot} at T_{amb} 25°C mW	Complement
ZTX453	120	100	1000	0·7	150	15	40	200	150	150	50	1000	—
ZTX452	100	80	1000	0·7	150	15	40	150	150	150	50	1000	—
MPSA06	80	80	500	0·25	100	10	50	—	100	100	10	750	MPSA56
BC546P	80	65	200	0·25	10	0·5	75	200	2	300*	10	500	BC556P
ZTX451	80	60	1000	0·35	150	15	50	150	150	150	50	1000	ZTX551
BFS61	80	60	1000	0·35	150	15	40	160	150	150	50	500	BFS38
MPS2222A	75	45	800	1·0	500	50	100	300	150	300	20	500	MPS2907A
ZTX304	70	70	500	0·35	50	5	50	300	10	150	10	300	ZTX504
MPSA05	60	60	500	0·25	100	10	50	—	100	100	10	750	—
BCY65EP	60	60	100	0·35	10	0·25	120	460	2	125	10	1000†	BCY77P
BC182P	60	50	200	0·25	10	0·5	100	480	2	150	10	300	BC212P
ZTX107	60	50	100	0·1*	10	1	125	500	2	350*	10	300	ZTX212
ZTX450	60	45	1000	0·25	150	15	100	300	150	150	50	1000	ZTX550
MPS6565	60	45	200	0·4	10	1	40	160	10	—	—	500	—
MPS6566	60	45	200	0·4	10	1	100	400	10	—	—	500	—
BFS60	60	40	1000	0·25	150	15	100	300	150	150	50	500	BFS97
2N4401 / ZTX4401	60	40	600	0·4	150	15	100	300	150	250	20	500	2N4403 / ZTX4403
2N4400 / ZTX4400	60	40	600	0·4	150	15	50	150	150	200	20	500	2N4402 / ZTX4402
MPS6531	60	40	600	0·3	100	10	90	270	100	390	50	500	MPS6534
MPS6530	60	40	600	0·5	100	10	40	120	100	390	50	500	MPS6533
2N3904 / ZTX3904	60	40	200	0·2	10	1	100	300	10	300	10	500	2N3906 / ZTX3906
2N3903 / ZTX3903	60	40	200	0·2	10	1	50	150	10	250	10	500	2N3905 / ZTX3905
BFS59	60	30	1000	0·35	150	15	40	300	150	150	50	500	BFS96
MPS2222	60	30	800	1·6	500	50	100	300	150	250	20	500	MPS2907
MPS3416	50	50	500	0·3	50	3	75	225	2	—	—	500	—
MPS3417	50	50	500	0·3	50	3	180	540	2	—	—	500	—
BC547P	50	45	200	0·25	10	0·5	75	450	2	300*	10	500	BC557P
ZTX382	50	45	200	0·25	10	0·5	100	850	2	150	10	350	—
BC107P	50	45	200	0·2	10	0·5	120	460	2	150	10	300	BC177P
BC237P	50	45	200	0·2	10	0·5	120	460	2	150	10	300	BC307P
ZTX237	50	45	200	0·25	10	0·5	120	460	2	150	10	300	ZTX212
ZTX223	50	30	800	0·3	100	10	100	450	50	100	50	500	—
MPS3704 / ZTX3704	50	30	800	0·6	100	5	100	300	50	100	50	500	MPS3703 / ZTX3703
MPS3705 / ZTX3705	50	30	800	0·8	100	5	50	150	50	100	50	500	MPS3703 / ZTX3703

Type	V_{CBO} V	V_{CEO} V	Max I_C mA	Max $V_{CE(sat)}$ at V	at I_C mA	at I_B mA	h_{FE} at Min	Max	at I_C mA	Min f_T at MHz	at I_C mA	P_{tot} at T_{amb} 25°C mW	Complement
MPS6532	50	30	600	0·5	100	10	30	—	100	390	50	500	MPS6535
ZTX303	45	45	500	0·35	50	5	50	300	10	150	10	300	ZTX503
BCY59P	45	45	200	0·35	10	0·25	120	630	2	125	10	1000*	BCY79P
MPS3693	45	45	50	—	—	—	40	160	10	200	10	500	—
ZTX238	45	30	200	0·25	10	0·5	120	800	2	150	10	350	ZTX213
ZTX383	45	30	200	0·25	10	0·5	100	850	2	150	10	350	—
ZTX3B4	45	30	200	0·25	10	0·5	250	—	2	150	10	350	—
BC183P	45	30	200	0·25	10	0·5	100	850	2	150	10	300	BC213P
ZTX108	45	30	100	0·1*	10	1	125	900	2	350*	10	300	ZTX213
2N4123	40	30	200	0·3	50	5	50	150	2	250	10	500	2N4125
MPS3706 / ZTX3706	40	20	800	1	100	5	30	600	50	100	50	500	MPS3702 / ZTX3702
ZTX302	35	35	500	0·25	50	5	100	300	10	150	10	300	ZTX502
ZTX301	35	35	500	0·25	50	5	50	300	10	150	10	300	ZTX501
BCY68P	32	32	200	0·35	10	0·25	120	630	2	125	10	1000*	BCY78P
BC548P	30	30	200	0·25	10	0·5	75	800	2	300*	10	500	BC558P
MPS3709 / ZTX3709	30	30	200	1	10	0·5	45	165	1	—	—	500	—
MPS3710 / ZTX3710	30	30	200	1	10	0·5	90	330	1	—	—	500	—
MPS3711 / ZTX3711	30	30	200	1	10	0·5	180	660	1	—	—	500	—
MPS3708 / ZTX3708	30	30	200	1	10	0·5	45	660	1	—	—	500	—
2N4124	30	25	200	0·3	50	5	120	360	2	300	10	500	2N4126
BC108P	30	20	200	0·2	10	0·5	120	800	2	150	10	300	BC178P
BC238P	30	20	200	0·2	10	0·5	120	800	2	150	10	300	BC308P
MPS3414	25	25	500	0·3	50	3	75	225	2	—	—	500	—
MPS3415	25	25	500	0·3	50	3	180	540	2	—	—	500	—
ZTX300	25	25	500	0·35	10	1	50	300	10	150	10	300	ZTX500
MPS5172	25	25	100	0·25	10	1	100	500	10	120*	2	500	—
MPS3394	25	25	100	—	—	—	55	110	2	—	—	500	—
MPS2923	25	25	100	—	—	—	90	180	2	—	—	500	—
MPS3393	25	25	100	—	—	—	90	180	2	—	—	500	—
MPS2924	25	25	100	—	—	—	150	300	2	—	—	500	—
MPS3392	25	25	100	—	—	—	150	300	2	—	—	500	—
MPS2925	25	25	100	—	—	—	235	470	2	—	—	500	—
MPS3395	25	25	100	—	—	—	150	500	2	—	—	500	—
MPS2711	18	18	100	—	—	—	30	90	2·5	—	—	500	—
MPS2712	18	18	100	—	—	—	75	225	2·5	—	—	500	—
MPSA20	—	40	100	0·25	10	1	40	400	5	125	5	500	—

PNP GENERAL PURPOSE

PNP Silicon Planar General Purpose Transistors

Type	V_{CBO} V	V_{CEO} V	Max I_C mA	Max $V_{CE(sat)}$ at V	at I_C mA	at I_B mA	h_{FE} at Min	Max	at I_C mA	Min f_T at MHz	at I_C mA	P_{tot} at T_{amb} -25°C mW	Complement
MPSA56	80	80	500	0·25	100	10	50	—	100	100	10	750	MPSA06
BC556P	80	65	200	0·25	10	0·5	75	450	2	150*	10	500	BC546P
ZTX551	80	60	1000	0·25	150	15	50	150	150	150	50	1000	ZTX451
BFS98	80	60	1000	0·35	150	15	40	160	150	150	50	500	BFS61
ZTX504	70	70	500	0·6	50	5	50	300	10	150	10	300	ZTX304
MPS2907A	60	60	600	1·6	500	50	100	300	150	200	50	500	MPS2222A
MPSA55	60	60	500	0·25	100	10	50	—	100	100	10	750	MPSA05
BCY77P	60	60	100	0·25	10	0·25	120	460	2	180*	10	1000†	BCY65EP
ZTX212	60	50	200	0·25	10	0·5	60	400	2	200	10	500	ZTX107
BC212P	60	50	200	0·6	100	5	60	400	2	200	10	300	BC182P
ZTX550	60	45	1000	0·25	150	15	100	300	150	150	50	1000	ZTX450
BFS97	60	40	1000	0·25	150	15	100	300	150	50	150	500	BFS60
MPS2907	60	40	600	1·6	500	50	100	300	150	200	50	500	MPS2222
BFS96	60	30	1000	0·35	150	15	40	300	150	150	50	500	BFS59
BC557P	50	45	200	0·25	10	0·5	75	450	2	150*	10	500	BC547P
BC177P	50	45	200	0·2	10	0·5	120	460	2	130	10	300	BC107P
BC307P	50	45	200	0·2	10	0·5	120	460	2	130*	10	300	BC237P
MPS3703 / ZTX3703	50	30	500	0·25	50	5	30	150	50	100	50	500	MPS3704 / ZTX3704 / MPS3705 / ZTX3705
ZTX503	45	45	500	0·35	50	5	50	300	10	150	10	300	ZTX303
ZTX531	45	45	500	0·7	10	0·5	40	120	0·01	30	0·5	250	ZTX331
BCY79P	45	45	200	0·25	10	0·25	120	460	2	180*	10	1000†	BCY59P

Type	V_{CBO} V	V_{CEO} V	Max I_C mA	Max $V_{CE(sat)}$ at V	at I_C mA	at I_B mA	h_{FE} at Min	Max	at I_C mA	Min f_T at MHz	at I_C mA	P_{tot} at T_{amb} -25°C mW	Complement
ZTX213	45	30	200	0·25	10	0·5	80	550	2	200	10	500	ZTX108
BC213P	45	30	200	0·6	100	5	80	600	2	200	10	300	BC183P
2N4403 / ZTX4403	40	40	600	0·4	150	15	100	300	150	200	20	500	2N4401 / ZTX4401
2N4402 / ZTX4402	40	40	600	0·4	150	15	50	150	150	150	20	500	2N4400 / ZTX4400
MPS6534	40	40	600	0·3	100	10	90	270	100	260	50	500	MPS6531
MPS6533	40	40	600	0·5	100	10	40	120	100	260	50	500	MPS6530
2N3906 / ZTX3906	40	40	200	0·25	10	1	100	300	10	250	10	500	2N3904 / ZTX3904
2N3905 / ZTX3905	40	40	200	0·25	10	1	50	150	10	200	10	500	2N3903 / ZTX3903
MPS3702 / ZTX3702	40	25	500	0·25	50	5	60	300	50	100	50	500	MPS3706 / ZTX3706
ZTX502	35	35	500	0·25	50	5	100	300	10	150	10	300	ZTX302
ZTX501	35	35	500	0·25	50	5	50	300	10	150	10	300	ZTX301
BCY78P	32	32	200	0·25	10	0·25	120	630	2	180*	10	1000†	BCY58P
MPS6535	30	30	600	0·5	100	10	30	—	100	260	50	500	MPS6532
ZTX530	30	30	500	0·7	10	0·5	100	400	0·1	30	0·5	250	ZTX330
BC558P	30	30	200	0·25	10	0·5	75	800	2	150*	10	500	BC548P
2N4125	30	30	200	0·4	50	5	50	150	2	200	10	500	2N4123
BC178P	30	25	200	0·2	10	0·5	120	800	2	130	10	300	BC108P
BC308P	30	25	200	0·2	10	0·5	120	800	2	130*	10	300	BC238P
ZTX500	25	25	500	0·35	50	5	50	300	10	150	10	300	ZTX300
2N4126	25	25	200	0·4	50	5	120	360	2	250	10	500	2N4124

*Typical †at T_{case} 45°C

Manufactured in U.K.

- E–Line Construction
- NPN/PNP Complementary Devices
- Switching and Low Noise

NPN SWITCHING

NPN Silicon Planar Switching Transistors

The devices are listed in order of decreasing collector/emitter breakdown voltage (V_{CEO}), then in order of decreasing collector current (I_C) etc.

Type	V_{CEO}	Max I_C	Max. $V_{CE(sat)}$ at			h_{FE}		at	Min. f_T at		Max. Switching Times at			Complement
	V	mA	V	I_C mA	I_B mA	Min	Max	I_C mA	MHz	I_C mA	t_{on} ns	t_{off} ns	I_C mA	
BCY65EP	60	100	0·35	10	0·25	120	460	2	125	10	150	800	10	8CY77P
MPS3642	45	500	0·22	150	15	40	120	150	—	—	14	80	300	—
BCY59P	45	200	0·35	10	0·25	120	630	2	125	10	150	800	10	BCY79P
MPS2222A	40	800	1·0	500	50	100	300	150	300	20	35	285	150	MPS2907A
2N4401 / ZTX4401	40	600	0·4	150	15	100	300	150	250	20	35	255	150	2N4403 / ZTX4403
2N4400 / ZTX4400	40	600	0·4	150	15	50	150	150	200	20	35	255	150	2N4402 / ZTX4402
2N3904 / ZTX3904	40	200	0·2	10	1	100	300	10	300	10	70	250	10	2N3906 / ZTX3906
2N3903 / ZTX3903	40	200	0·2	10	1	50	150	10	250	10	70	225	10	2N3905 / ZTX3905
BCY58P	32	200	0·35	10	0·25	120	630	2	125	10	150	800	10	BCY78P
MPS2222	30	800	1·6	500	50	100	300	150	250	20	35	285	150	MPS2907

Type	V_{CEO}	Max I_C	Max. $V_{CE(sat)}$ at			h_{FE}		at	Min. f_T at		Max. Switching Times at			Complement
	V	mA	V	I_C mA	I_B mA	Min	Max	I_C mA	MHz	I_C mA	t_{on} ns	t_{off} ns	I_C mA	
MPS3641	30	500	0·22	150	15	40	120	150	—	—	14	80	300	—
2N4123	30	200	0·3	50	5	50	150	2	250	10	37*	136*	10	2N4125
2N4124	25	200	0·3	50	5	120	360	2	300	10	37*	136*	10	2N4126
MPS706A	20	200	0·6	10	1	20	60	10	200	10	40	75	10	—
MPS706	20	200	0·6	10	1	20	50*	10	200	10	40	75	10	—
MPS2713	18	200	0·3	50	3	30	90	2	250*	10	13	21	10	—
MPS2714	18	200	0·3	50	3	75	225	2	250*	10	13	21	10	—
ZTX314	15	500	0·2	10	1	40	120	10	500	10	12	18	10	—
ZTX313	15	500	0·24	10	1	40	120	10	500	10	12	18	10	—
ZTX311	15	500	—	—	—	50	200	10	200	10	(note 1)			—
MPS2369	15	200	0·25	10	1	40	120	10	—	—	12	18	10	—
ZTX312	12	500	0·24	10	1	40	—	10	400	10	15	20	10	—
ZTX310	12	500	0·6	10	1	20	—	10	200	10	(note 2)			—

PNP SWITCHING

PNP Silicon Planar Switching Transistors

Type	V_{CEO}	Max I_C	Max. $V_{CE(sat)}$ at			h_{FE}		at	Min. f_T at		Max. Switching Times at			Complement
	V	mA	V	I_C mA	I_B mA	Min	Max	I_C mA	MHz	I_C mA	t_{on} ns	t_{off} ns	I_C mA	
MPS2907A	60	600	1·6	500	50	100	300	150	200	50	50	110	150	MPS2222A
MPS3645	60	500	0·4	150	15	100	300	150	—	—	40	100	300	—
BCY77P	60	100	0·25	10	0·25	120	460	2	180*	10	85	150	10	BCY65EP
MPS3644	45	500	0·4	150	15	100	300	150	—	—	40	100	300	—
BCY79P	45	200	0·25	10	0·25	120	460	2	180*	10	85	150	10	BCY59P
2N4403 / ZTX4403	40	600	0·4	150	15	100	300	150	200	20	35	255	150	2N4401 / ZTX4401
2N4402 / ZTX4402	40	600	0·4	150	15	50	150	150	150	20	35	255	150	2N4400 / ZTX4400

Type	V_{CEO}	Max I_C	Max. $V_{CE(sat)}$ at			h_{FE}		at	Min. f_T at		Max. Switching Times at			Complement
	V	mA	V	I_C mA	I_B mA	Min	Max	I_C mA	MHz	I_C mA	t_{on} ns	t_{off} ns	I_C mA	
MPS2907	40	600	1·6	500	50	100	300	150	200	15	50	110	150	MPS2222
2N3906 / ZTX3906	40	200	0·25	10	1	100	300	10	250	10	70	300	10	2N3904 / ZTX3904
2N3905 / ZTX3905	40	200	0·25	10	1	50	150	10	200	10	70	260	10	2N3903 / ZTX3903
BCY78P	32	200	0·25	10	0·25	120	630	2	180*	10	85	150	10	BCY58P
2N4125	30	200	0·4	50	5	50	150	2	200	10	43*	155*	10	2N4123
MPS363BA	25	500	1	300	30	100	—	50	150	15	75	170	300	—
MPS363B	25	500	1	300	30	30	—	50	100	15	75	170	300	—
2N4126	25	200	0·4	50	5	120	360	2	250	10	43*	155*	10	2N4124
ZTX510	12	200	0·2	30	3	40	150	30	400	30	60	90	30	—

NPN LOW NOISE

NPN Silicon Planar Low Noise Transistors

Type	V_{CEO}	Max I_C	Max. $V_{CE(sat)}$ at			h_{FE}		at	f_T Min. at		Max. Noise Figure at			Complement
	V	mA	V	I_C mA	I_B mA	Min	Max	I_C mA	MHz	I_C mA	N dB	I_C µA	f Hz	
BCY65EP	60	100	0·35	10	0·25	120	460	2	125	10	6	200	1k	BCY77P
MPS24B4	60	50	0·35	1	0·1	100	500	0·01	60	0·5	3	200	30–15k	—
2N5209	50	50	0·7	10	1	100	300	0·1	30	0·5	3	200	30–15k	2N5086
2N5210	50	50	0·7	10	1	200	600	0·1	30	0·5	2	200	30–15k	2N5087
ZTX331	45	500	0·7	10	0·5	40	120	0·01	30	0·5	3*	10	1k	ZTX531
BC550P	45	200	0·25	10	0·5	200	800	2	300*	10	3	200	30–15k	BC560P
ZTX382	45	200	0·25	10	0·5	100	850	2	150	10	6	200	30–15k	—
BCY59P	45	200	0·35	10	0·25	120	630	2	125	10	6	200	1k	BCY79P
MPS6565	45	200	0·4	10	1	40	160	10	—	—	4*	200	30–15k	—
MPS6566	45	200	0·4	10	1	100	400	10	—	—	4*	200	30–15k	—
BC414P	45	100	0·25	10	0·5	200	800	2	250*	10	3	200	30–15k	BC416P
MPS3693	45	50	—	—	—	40	160	10	200	10	4*	200	1k	—
2N3904 / ZTX3904	40	200	0·2	10	1	100	300	10	300	10	5	200	30–15k	2N3906 / ZTX3906
2N3903 / ZTX3903	40	200	0·2	10	1	50	150	10	250	10	6	200	30–15k	2N3905 / ZTX3905
BCY58P	32	200	0·35	10	0·25	120	630	2	125	10	6	200	1k	BCY78P

Type	V_{CEO}	Max I_C	Max. $V_{CE(sat)}$ at			h_{FE}		at	f_T Min. at		Max. Noise Figure at			Complement
	V	mA	V	I_C mA	I_B mA	Min	Max	I_C mA	MHz	I_C mA	N dB	I_C µA	f Hz	
ZTX330	30	500	0·7	10	0·5	100	400	0·1	30	0·5	3*	10	1k	ZTX530
8C549P	30	200	0·25	10	0·5	200	800	2	300*	10	4	200	30–15k	BC559P
ZTX239	30	200	0·25	10	0·5	180	800	2	150	10	4	200	30–15k	ZTX214
ZTX383	30	200	0·25	10	0·5	100	850	2	150	10	6	200	30–15k	—
BC184P	30	200	0·25	10	0·5	250	—	2	150	10	4	200	30–15k	BC214P
ZTX384	30	200	0·25	10	0·5	250	—	2	150	10	4	200	30–15k	—
2N4123	30	200	0·3	50	5	50	150	2	250	10	6	200	30–15k	2N4125
MPS3707 / ZTX3707	30	200	1	10	0·5	100	550	0·1	—	—	5	200	30–15k	—
BC413P	30	100	0·25	10	0·5	200	800	2	250*	10	3	200	30–15k	BC415P
ZTX109	30	100	0·1*	10	1	240	900	2	350*	10	4	10	1k	ZTX214
2N4124	25	200	0·3	50	5	120	360	2	300	10	5	20	30–15k	2N4126
ZTX114	25	200	0·35	10	0·1	200	—	2	350*	10	3	30	1k	—
BC109P	20	50	0·2	10	0·5	180	800	2	300	10	4	200	30–15k	BC179P
BC239P	20	50	0·2	10	0·5	180	800	2	150	10	4	200	30–15k	BC309P

PNP LOW NOISE

PNP Silicon Planar Low Noise Transistors

Type	V_{CEO}	Max I_C	Max. $V_{CE(sat)}$ at			h_{FE}		at	f_T Min. at		Max. Noise Figure at			Complement
	V	mA	V	I_C mA	I_B mA	Min	Max	I_C mA	MHz	I_C mA	N dB	I_C µA	f Hz	
BCY77P	60	100	0·25	10	0·25	120	460	2	180*	10	6	200	1k	BCY65EP
2N5086	50	50	0·3	10	1	150	500	0·1	40	0·5	3	200	30–15k	2N5209
2N5087	50	50	0·3	10	1	250	800	0·1	40	0·5	2	200	30–15k	2N5210
ZTX531	45	500	0·7	10	0·5	40	120	0·1	30	0·5	3*	100	1k	ZTX331
BC560P	45	200	0·25	10	0·5	110	800	2	300*	10	2	200	30–15k	BC550P
BCY79P	45	200	0·25	10	0·25	120	460	2	180*	10	6	200	1k	BCY59P
BC416P	45	100	0·3	10	0·5	110	800	2	200*	10	2	200	30–15k	BC414P
2N3906 / ZTX3956	40	200	0·25	10	1	100	300	10	250	10	4	200	30–15k	2N3904 / ZTX3904
2N3905 / ZTX3905	40	200	0·25	10	1	50	150	10	200	10	5	200	30–15k	2N3903 / ZTX3903

Type	V_{CEO}	Max I_C	Max. $V_{CE(sat)}$ at			h_{FE}		at	f_T Min. at		Max. Noise Figure at			Complement
	V	mA	V	I_C mA	I_B mA	Min	Max	I_C mA	MHz	I_C mA	N dB	I_C µA	f Hz	
8CY78P	32	200	0·25	10	0·25	120	630	2	180*	10	6	200	1k	BCY58P
ZTX530	30	500	0·7	10	0·5	100	400	0·1	30	0·5	3*	100	1k	ZTX330
ZTX214	30	200	0·25	10	0·5	140	550	2	200	10	2	200	30–15k	ZTX109
BC559P	30	200	0·25	10	0·5	110	800	2	300*	10	4	200	30–15k	BC549P
2N4125	30	200	0·4	50	5	50	150	2	200	10	5	200	30–15k	2N4123
BC214P	30	200	0·6	100	5	140	600	2	200	10	2	200	30–15k	BC184P
BC415P	30	100	0·3	10	0·5	110	800	2	200*	10	2	200	30–15k	BC413P
2N4126	25	200	0·4	50	5	120	360	2	250	10	4	200	30–15k	2N4124
BC179P	20	50	0·2	10	0·5	180	800	2	130*	10	4	200	30–15k	BC109P
BC309P	20	50	0·2	10	0·5	180	800	2	130*	10	4	200	30–15k	BC239P

*Typical Note 1: t_{stg} = 60 ns. Note 2: t_{stg} = 25 ns.

Manufactured in U.K.

FERRANTI

E-Line Transistors

- E–Line Construction
- High Voltage and High Frequency
- BS Products

DARLINGTON

NPN Silicon Darlington Transistors

The transistors are listed in order of decreasing breakdown voltages (V_{CBO} and V_{CEO}), then collector current (I_C), power dissipation (P_{tot}), etc.

Type	V_{CBO} V	V_{CEO} V	Max. I_C mA	Max. $V_{CE(sat)}$ at V	at I_C mA	at I_B mA	h_{FE} at Min.	at Max.	at I_C mA	Max. I_{CBO} at nA	at V_{CB} V	P_{tot} at T_{amb} 25°C mW
BCX38C	80	60	800	1·25	800	8	10K	—	500	100	60	1000
BCX38B	80	60	800	1·25	800	8	4K	—	500	100	60	1000
BCX38A	80	60	800	1·25	800	8	1K	—	500	100	60	1000

Type	V_{CBO} V	V_{CEO} V	Max. I_C mA	Max $V_{CE(sat)}$ at V	at I_C mA	at I_B mA	h_{FE} at Min.	at Max.	at I_C mA	Max I_{CBO} at nA	at V_{CB} V	P_{tot} at T_{amb} 25°C mW
MPSA14	30	30	300	1·5	100	0·1	20K	—	100	100	30	750
MPSA13	30	30	300	1·5	100	0·1	10K	—	100	100	30	750
MPSA12	—	20	300	1	10	0·01	20K	—	10	100	15	750

HIGH FREQUENCY

NPN Silicon Planar High Frequency Transistors

The transistors marked with † are particularly suitable for use in RF and Video IF stages of television receivers where important characteristics include high frequency response, low feedback capacitance and low noise.

Type	V_{CEO} V	Max I_C mA	Max. $V_{CE(sat)}$ at V	at I_C mA	at I_B mA	Min. f_T at MHz	at I_C mA	Noise Figure N dB	at I_C µA	f MHz	Max. C_{obo} at 1 MHz pF	at V_{CB} V	RF P_o or RF P_G at mW or dB	f MHz
BF196P†‡	30	25	—	—	—	400*	4	3	4	35	—	—	—	—
BF197P†§	25	25	—	—	—	550*	5	—	—	—	—	—	—	—
ZTX320, 321, 322, 323 See note 1	15	500	0·4	10	1	600	4	<6	1	60	1·7	10	15dB	200

Type	V_{CEO} V	Max I_C mA	Max. $V_{CE(sat)}$ at V	at I_C mA	at I_B mA	Min. f_T at MHz	at I_C mA	Noise Figure at N dB	at I_C µA	f MHz	Max. C_{obo} at 1 MHz pF	at V_{CB} V	RF P_o or RF P_G at mW or dB	f MHz
ZTX325†	15	50	—	—	—	1000	2	<5	2	500	1·5	10	175mW	500
ZTX326†	12	50	—	—	—	1000	2	<6	2	500	1·5	10	—	—
ZTX327	30	400	1	100	20	800*	25	—	—	—	3	30	350mW	400

*Typical †Pin connections for these devices are: c-e-b ‡$-C_{re}$: 0·2 pF (typical)
§$-C_{re}$: 0·3 pF (typical) ‖$-C_{re}$: 0·8 pF (maximum)

Note 1. The ZTX320 series is available with gain variations - refer to data sheet for details.

HIGH VOLTAGE

NPN/PNP Silicon Planar High Voltage Transistors

Type	V_{CBO} V	V_{CEO} V	Max I_C mA	Max $V_{CE(sat)}$ at V	at I_C mA	at I_B mA	h_{FE} at Min	Max	at I_C mA	I_{CER} at µA	at V_{CER} V	P_{tot} at T_{amb} 25°C mW	Complement
NPN													
ZTX342	120	120	100	0·5	2	0·1	30	—	2	0·5	100	300	ZTX542
ZTX341	100	100	100	0·5	2	0·1	30	—	2	0·5	80	300	ZTX541

Type	V_{CBO} V	V_{CEO} V	Max I_C mA	Max $V_{CE(sat)}$ at V	at I_C mA	at I_B mA	h_{FE} at Min	Max	at I_C mA	I_{CER} at µA	at V_{CER} V	P_{tot} at T_{amb} 25°C mW	Complement
PNP													
ZTX542	120	120	100	0·5	2	0·1	30	—	2	0·5	100	300	ZTX342
ZTX541	100	100	100	0·5	2	0·1	30	—	2	0·5	80	300	ZTX341

GENERAL INFORMATION

LEAD CONFIGURATIONS

The alternative lead configurations are denoted by a suffix such as K, L, M or S at the end of the part number.

e.g. ZTX107K where the K denotes that the leads are preformed to the TO-5/39 pin circle.

The available lead formations may be listed as:

IN LINE	no suffix		
TO-5/39 pin circle	suffix K	Flat mounting	suffix M
TO-18 pin circle	suffix L	In-line wide-spacing	suffix S

GAIN GROUPINGS

Certain device families are available with selected gain (h_{FE}) groups denoted by a suffix such as A, B or C immediately following the device type number.

e.g. ZTX107A – where the A denotes a gain (h_{FE}) range of 125 to 260 at I_C 2 mA and V_{CE} 5V.

The gain group suffix is included in the device part-marking.

For full details of available gain groupings, please consult the individual device data sheet.

BS PRODUCT INDEX

It is important to note that **all** the E-LINE devices detailed in this product guide are manufactured with the same degree of care and process quality as those subject to BS 9300 qualification procedures.

The FERRANTI QUALITY ASSURANCE PROGRAMME is, in general, linked to the BRITISH STANDARDS scheme and the range of available standards may be listed as:

1. **Commercial** – with factory acceptance quality levels (AQL).
2. **BS Approved** – to BS 9300 series – categories P and Q.
3. **CECC harmonised European Standard** – 50000 series approval (categories F and L).
4. **High-Rel** – to RRE specification X6487 which includes 100% pre-cap visual inspection, burn-in, etc. RRE/X6487 is to be incorporated into the BS scheme as the basis for a HIGH RELIABILITY screening procedure.
5. **Release to Defence Standard** (DEF STAN 05-21) conditions i.e. 6/49 release.
6. **Release to Civil Aviation Authority** (CAA) conditions.
7. **CV/DEF STAN** specifications where the the appropriate device is approved – until such time as they are incorporated into the BS scheme.
8. **Non-Approved Types** – where Ferranti is not listed as an approved supplier or where approval is pending, we may supply devices which have been subjected to the full quality assurance proccdures as 'tested to . . . . . ', subject to the basic type being available from Ferranti Ltd. Similarly, we may supply on a partial release basis such as 'released to Group A tests only' etc.

If any additional information on the Ferranti Quality Assurance Programme is required contact: Product Marketing Comway Electronics Ltd.

BS Number	Commercial Equivalent Type No.
BS9365 F028(P)	ZTX107
BS9365 F029(P)	ZTX108
BS9365 F030(P)	ZTX109
BS9365 F031(P)	ZTX500
BS9365 F032(P)	ZTX510
BS9365 F033(P)	ZTX502
BS9365 F034(P)	ZTX503
BS9365 F035(P)	ZTX504
BS9365 F040(P)	ZTX310
BS9365 F041(P)	ZTX311
BS9365 F042(P)	ZTX312
BS9365 F043(P)	ZTX313
BS9365 F044(P)	ZTX314
BS9365 F054(P)	ZTX341
BS9365 F055(P)	ZTX342
BS9365 F072(P)	ZTX300
BS9365 F073(P)	ZTX301
BS9365 F074(P)	ZTX302
BS9365 F075(P)	ZTX303
BS9365 F076(P)	ZTX304
BS9365 F077(Q)	ZTX300

BS Number	Commercial Equivalent Type No.
BS9365 F078(Q)	ZTX301
BS9365 F079(Q)	ZTX302
BS9365 F080(Q)	ZTX303
BS9365 F081(Q)	ZTX304
BS9365 F082(P)	BFS96
BS9365 F083(P)	BFS97
BS9365 F084(P)	BFS98
BS9365 F085(Q)	BFS96
BS9365 F086(Q)	BFS97
BS9365 F087(Q)	BFS98
BS9365 F088(P)	ZTX320
BS9365 F089(P)	ZTX321
BS9365 F090(Q)	ZTX320
BS9365 F091(Q)	ZTX321
BS9365 F092(P)	ZTX330
BS9365 F093(P)	ZTX331
BS9365 F094(Q)	ZTX330
BS9365 F095(Q)	ZTX331
BS9365 F096(P)	BFS59
BS9365 F097(P)	BFS60
BS9365 F098(P)	BFS61

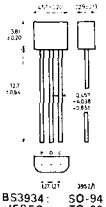
BS Number	Commercial Equivalent Type No.
BS9365 F139(Q)	ZTX450
BS9365 F140(Q)	ZTX451
BS9365 F141(P)	ZTX360
BS9365 F142(Q)	ZTX360
BS9365 F143(P)†	ZTX550
BS9365 F144(P)†	ZTX551
BS9365 F145(Q)†	ZTX550
BS9365 F146(Q)†	ZTX551
BS9365 F192(P)	ZTX541
BS9365 F193(P)	ZTX542
BS9365 F099(Q)	BFS59
BS9365 F100(Q)	BFS60
BS9365 F101(Q)	BFS61
BS9365 F102(P)	ZTX325
BS9365 F103(P)	ZTX326
BS9365 F104(Q)	ZTX325
BS9365 F105(Q)	ZTX326
BS9365 F130(P)	ZTX212
BS9365 F131(P)	ZTX213
BS9365 F132(P)	ZTX214
BS9365 F137(P)	ZTX450
BS9365 F138(P)	ZTX451

†Indicates Approval Pending. Note: (P) or (O) are BS Categories.

PACKAGE OUTLINES

STANDARD (TO-92)

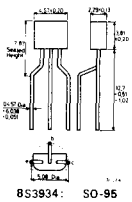
Standard Formation 'In-Line'



BS3934: SO-94 JEDEC TO-92

K(TO-5/39)

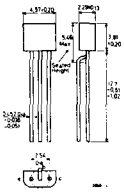
'K' Type Lead Formation for TO-5 and TO-39 Compatibility



BS3934: SO-95

L(TO-18)

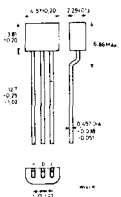
'L' Type Lead Formation for TO-18 Compatibility



BS3934: SO-97

M

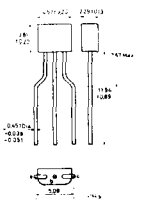
'M' Type Lead Formation for Flat Mounting



BS3934: SO-96

S

'S' Type Lead Formation In-line wide-spacing



Manufactured in U.K.

Plastic Transistors

FERRANTI

- Designed for Thick and Thin Film Hybrid Circuits
- NPN/PNP Complementary Devices
- General Purpose, Low Noise and Switching

In addition to the BS 9000 approved range of Micro-E components, Ferranti have available a further range of micro-miniature semiconductors encapsulated in the popular SOT-23 package.

These devices are designed specifically for use in thin and thick film hybrid circuits in both industrial and commercial applications.

MAXIMUM THERMAL RATINGS

Junction Temperature	150°C
Operating and Storage Temperatura	−65° to +150°C
Lead Temperature (t <10 sec)	240°C

SILICON PLANAR LOW LEVEL TRANSISTORS

Devices in this table are suitable for low level amplification, switching and low noise applications.

Ratings and characteristics at 25°C ambient temperature.

Type	Maximum Ratings V_{CBO} Volts	V_{CEO} Volts	I_C mA	P_{tot} mW	h_{FE} min/max	at I_C/V_{CE} mA/Volts	$V_{CE(sat)}$ max Volts	at I_C/I_B mA	f_T at I_C = 10mA MHz(typ)	Noise Figure at I_C = 0·2mA dB(max)
n-p-n										
BCW31/31R	30	20	200	200	110/220	2/5	0·25	10/0·5	300	10
BCW32/32R	30	20	200	200	200/450	2/5	0·25	10/0·5	300	10
BCW33/33R	30	20	200	200	420/800	2/5	0·25	10/0·5	300	10
BCW60A	32	32	200	150	120/220	2/5	0·35	10/0·25	250	6
BCW60B	32	32	200	150	180/310	2/5	0·35	10/0·25	250	6
BCW60C	32	32	200	150	250/460	2/5	0·35	10/0·25	250	6
BCW60D	32	32	200	150	380/630	2/5	0·35	10/0·25	250	6
BCW71/71R	50	45	200	200	110/220	2/5	0·25	10/0·5	300	10
BCW72/72R	50	45	200	200	200/450	2/5	0·25	10/0·5	300	10
BCX70G	45	45	200	150	120/220	2/5	0·35	10/0·25	250	6
BCX70H	45	45	200	150	180/310	2/5	0·35	10/0·25	250	6
BCX70J	45	45	200	150	250/460	2/5	0·35	10/0·25	250	6
BCX70K	45	45	200	150	380/630	2/5	0·35	10/0·25	250	6
p-n-p										
BCW29/29R	30	20	200	200	120/260	2/5	0·30	10/0·5	150	10
BCW30/30R	30	20	200	200	215/500	2/5	0·30	10/0·5	150	10
BCW61A	32	32	200	150	120/220	2/5	0·25	10/0·25	180	6
BCW61B	32	32	200	150	180/310	2/5	0·25	10/0·25	180	6
BCW61C	32	32	200	150	250/460	2/5	0·25	10/0·25	180	6
BCW61D	32	32	200	150	360/630	2/5	0·25	10/0·25	180	6
BCW69/69R	60	45	200	200	120/260	2/5	0·30	10/0·5	150	10
BCW70/70R	60	45	200	200	215/500	2/5	0·30	10/0·5	150	10
BCX71G	45	45	200	150	120/220	2/5	0·25	10/0·25	180	6
BCX71H	45	45	200	150	180/310	2/5	0·25	10/0·25	180	6
BCX71J	45	45	200	150	250/460	2/5	0·25	10/0·25	180	6
BCX71K	45	45	200	150	380/630	2/5	0·25	10/0·25	180	6

SILICON PLANAR MEDIUM AND HIGH SPEED SWITCHING TRANSISTORS

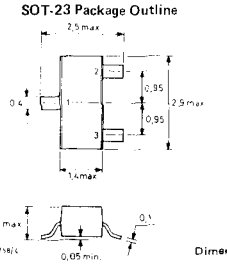
Devices in this table are suitable for general purpose, high speed switching and high frequency amplifier applications.

Ratings and characteristics at 25°C ambient temperature.

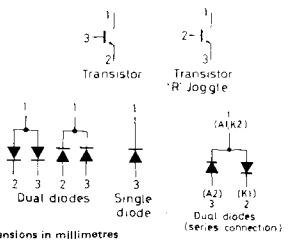
Type	Maximum Ratings V_{CEO} Volts	I_C mA	P_{tot} mW	h_{FE} min/max	at I_C/V_{CE} mA/Volts	$V_{CE(sat)}$ max at I_C/I_B (volts)	mA	f_T at I_C=10mA MHz(min)	Switching Times t_{on}/I_{off} at $I_C/I_{B1}I_{B2}$ ns(max)	mA
n-p-n										
BCW60*	32	200	150	120/630	2/5	0·35	10/0·25	125	150/800	10/1
BCW65†	32	1000	350	100/630	100/1	0·3	100/10	100	100/400	150/15
BCW66†	45	1000	350	100/630	100/1	0·3	100/10	100	100/400	150/15
BCX70*	45	200	150	120/630	2/5	0·35	10/0·25	125	150/800	10/1
BSS66/66R	40	200	200	50/150	10/1	0·20	10/1	250	70/225	10/1
BSS67/67R	40	200	200	100/300	10/1	0·20	10/1	300	70/250	10/1
BSV52/62R	12	200	200	40/120	10/1	0·25	10/1	400	12/18	10/13
p-n-p										
BCW61*	32	200	150	120/630	2/5	0·25	10/0·25	100	150/800	10/1
BCW67†	32	1000	350	100/630	100/1	0·3	100/10	100	100/400	150/15
BCW68†	45	1000	350	100/630	100/1	0·3	100/10	100	100/400	150/15
BCX71*	45	200	150	120/630	2/5	0·25	10/0·25	100	150/800	10/1
BSS65/65R	12	200	200	40/150	30/0·5	0·25	30/3	400	60/90	30/1·5
BSS69/69R	40	200	200	50/150	10/1	0·25	10/1	200	70/260	10/1
BSS70/70R	40	200	200	100/300	10/1	0·25	10/1	250	70/300	10/1

*Available in selected gain categories – see table 1.
†Available in selected gain categories – see table 2.

SOT-23 Package Outline



Pin Connections



Dimensions in millimetres

R joggle transistors are identified by a suffix R after the typa number. Devices are identified by a code stamped on the body of the device.

SILICON PLANAR MEDIUM POWER TRANSISTORS

Devices in this table are suitable for medium current, medium power switching and general purpose applications.

Ratings and Characteristics at 25°C ambient temperature.

Type	Maximum Ratings V_{CES} Volts	V_{CEO} Volts	I_C mA	P_{tot} mW	h_{FE} min/max	at I_C/V_{CE} mA/Volts	$V_{CE(sat)}$ max Volts	at I_C/I_B mA	f_T at I_C= 20 mA MHz(min)	Noise Figure at I_C = 0·2mA dB(max)
n-p-n										
BCW65A	60	32	1000	350	100/250	100/1	0·3	100/10	100	10
BCW65B	60	32	1000	350	160/400	100/1	0·3	100/10	100	10
BCW65C	60	32	1000	350	250/630	100/1	0·3	100/10	100	10
BCW66F	75	45	1000	350	100/250	100/1	0·3	100/10	100	10
BCW66G	75	45	1000	350	160/400	100/1	0·3	100/10	100	10
BCW66H	75	45	1000	350	250/630	100/1	0·3	100/10	100	10
BCX19/19R	60	45	1000	310	100/600	100/1	0·62	500/50	200†	—
BCX20/20R	30	25	1000	310	100/600	100/1	0·62	500/50	200†	—
BSS66/66R	60	40	200	200	50/150	10/1	0·20	10/1	260	6†
BSS67/67R	60	40	200	200	100/300	10/1	0·20	10/1	300	6†
p-n-p										
BCW67A	45	32	1000	350	100/250	100/1	0·3	100/10	100	10
BCW67B	45	32	1000	350	160/400	100/1	0·3	100/10	100	10
BCW67C	45	32	1000	350	250/630	100/1	0·3	100/10	100	10
BCW68F	60	45	1000	350	100/250	100/1	0·3	100/10	100	10
BCW68G	60	45	1000	350	160/400	100/1	0·3	100/10	100	10
BCW68H	60	45	1000	350	250/630	100/1	0·3	100/10	100	10
BCX17/17R	50	45	1000	310	100/600	100/1	0·62	500/50	100†	—
BCX18/18R	30	25	1000	310	100/600	100/1	0·62	500/50	100†	—
BSS69/69R	40	40	200	200	50/150	10/1	0·25	10/1	200	6†
BSS70/70R	40	40	200	200	100/300	10/1	0·25	10/1	260	4†

†Typical.

SILICON PLANAR VHF AND UHF TRANSISTORS (n-p-n)

Devices in this table are suitable for high frequency operation in amplifier, switching and oscillator circuits.

Ratings and characteristics at 25°C ambient temperature.

Type	Maximum Ratings V_{CBO} Volts	V_{CEO} Volts	I_C mA	P_{tot} mW	h_{FE} min/max	at I_C/V_{CE} mA/Volts	f_T MHz at I_C (typ)	(mA)	$-C_{re}$ at 1MHz pF at V_{CE} (typ)	Volts	C_{EC} at 1MHz pF at V_{CB} (max)	Volts
BFQ31/31A	30	15	100	200	20/100	3/1	600*	4	2·00†	0·5	1·7	10
BFS17/17R	26	15	60	200	20/150	2/1	1000	2	0·65	5	1·5	10
BFS20/20R	30	20	25	200	40/—	7/10	450	5	0·35	10	0·8‡	10

‡Typical

SILICON PLANAR HIGH SPEED SWITCHING DIODES

Devices in this table are suitable for high-speed switching and high frequency applications.

Ratings and Characteristics at 25°C ambient temperature.

Type	Description	Maximum Ratings V_R Volts	$I_{F(AV)}$ mA	I_{FRM} mA	Max I_R at V_R µA	Max. V_F at I_F= 50mA Volts	Max. Reverse Recovery Time t_{rr} at I_F = 10mA, V_R = 1V R_L 100Ω, I_R 1mA ns
BAV70	Dual diode with common cathode	70	100	200	5·0	1·1	6
BAV74	Dual diode with common cathode	50	150	200	0·1	1·0*	4
BAV99	Dual diode with series connection	70	100	200	2·5	1·1	6
BAW56	Dual diode with common anode	70	100	200	2·5	1·1	6

*I_F = 100mA

Manufactured in U.K.

- Designed for Thick and Thin Film Hybrid Circuits
- General Purpose, Switching and High Voltage
- BS Products

Ferranti Micro-E components are designed specifically for use in thin and thick film hybrid circuits where the use of a small encapsulated device of proven reliability, together with a guaranteed specification, offers advantages over the use of silicon dice or the larger conventional plastic packages.

Ferranti have been successful in achieving the standards of quality and reliability necessary for the release of Micro-E components to the appropriate British Standards Specification for electronic components of assessed quality. B.S. approved Micro-E components are available to category P*.

MAXIMUM THERMAL RATINGS

†Dissipation (All types except BFS42, 43, 44, 45)	550 mW
†Dissipation (BFS42, 43, 44, 45)	710 mW
Junction Temperature	+175°C
Operating and Storage Temperature	−55°C to +175°C
Lead Temperature (t<10 sec)	240°C

†This rating is calculated by assuming that the external thermal resistances are negligible compared with the internal thermal resistances (e.g. the device is mounted on a large substrate and encapsulated). Derate linearly to zero + 175°C.

SILICON PLANAR LOW-LEVEL TRANSISTORS

Designed for low level amplification and low noise applications
Ratings and Characteristics at 25°C ambient temperature

Type	Maximum Ratings V_{CBO} Volts	V_{CEO} Volts	I_C mA	h_{FE} Min.	Max.	at I_C mA	and V_{CE} Volts	$V_{CE(sat)}$ at I_C = 10 mA, I_B = 0·5 mA Volts (max.)	f_T at I_C = 0·5 mA MHz (min.)	Noise Figure (N) at I_C = 0·1 mA, f = 1 kHz dB (max.)
n-p-n										
BFT27	60	60	500	100	500	0·01	5	0·35*	30	4
BFS36	45	45	500	100	300	0·01	5	1·0	30	4
BFS36A	30	30	500	100	400	0·10	5	1·0	30	4
p-n-p										
BFS37	45	45	500	100	300	0·01	5	1·0	30	4
BFS37A	30	30	500	100	400	0·10	5	1·0	30	4

*I_C = 1 mA, I_B = 100 µA.

SILICON PLANAR GENERAL-PURPOSE TRANSISTORS

Designed for medium current, medium power applications
Ratings and Characteristics at 25°C ambient temperature

Type	Maximum Ratings V_{CBO} Volts	V_{CEO} Volts	I_C Amps	h_{FE} Min.	Max.	at I_C mA	and V_{CE} Volts	$V_{CE(sat)}$ at I_C mA	and I_B mA	f_T MHz (min.)	at I_C mA
n-p-n								Volts (max.)			
BFS38	45	35	0·5	100	300	10	6	0·25	50	150	10
				50	—	50	6				
BFS38A	25	25	0·5	50	300	10	6	0·35	10	1	150	10
BFS39	60	45	0·5	40	120	10	6	0·25	50	5	150	10
BFS42	60	30	1·0	40	120	150	10*	0·4	150	15*	60	50
				15	—	500	10*					
BFS43	60	60	1·0	60	200	150	10*	0·4	150	15*	60	50
				25	—	500	10*					
p-n-p											
BFS40	45	35	0·5	100	300	10	6	0·25	50	5	150	10
				50	—	50	6					
BFS40A	25	25	0·5	50	300	10	6	0·35	10	1	150	10
BFS41	45	45	0·5	40	120	10	6	0·25	50	5	150	10
BFS44	60	30	1·0	40	120	150	10*	0·4	150	15*	60	50
				15	—	500	10*					
BFS45	60	60	1·0	60	200	150	10*	0·4	150	15*	60	50
				25	—	500	10*					

*Measured under pulsed conditions.

SILICON PLANAR HIGH-SPEED SWITCHING TRANSISTORS

Designed for high-speed switching and high frequency amplifier applications
Ratings and Characteristics at 25°C ambient temperature

Type	Maximum Ratings V_{CBO} Volts	V_{CEO} Volts	I_C mA	h_{FE} Min.	Max.	at I_C mA	and V_{CE} Volts	$V_{CE(sat)}$ at I_C = 10mA, I_B = 1mA Volts (max.)	f_T MHz (min.)	at I_C mA	Switching Characteristics t_{on} ns (max.)	t_{off} ns (max.)	at I_C mA	and I_{B1} mA	I_{B2} mA
n-p-n															
BSV35	40	15	500	40	120	10	1·0	0·24	500	10	12	18	10	3	1·5
BSV35A	25	12	500	20	—	10	1·0	0·6	300	10	40	75	10	3	1·5
BSV36	15	6	500	30	150	20	0·4	0·25	600	20	20	15	10	3	1·5
p-n-p															
BSV37	12	12	500	40	150	30	0·5	0·15	400	30	60	90	30	1·5	1·5

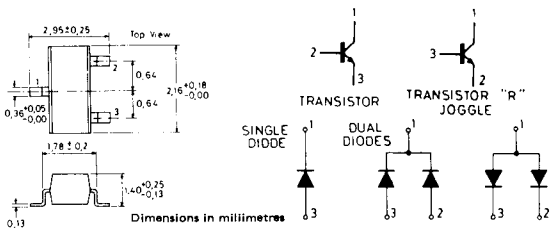
B.S. MICRO-E PRODUCT LIST

Where approval for military use has been obtained the appropriate British Standards number is indicated under B.S. number.

Transistors

Type	Device marking	Nearest metal can or E-line equivalent	B.S. number*	Type	Device marking	Nearest metal can or E-line equivalent	B.S. number*
BFS36	L1	2N930	BS9365 F014	BFS44	P3	ZT210	BS9365 F023
BFS36A	L2	2N929	BS9365 F013	BFS45	P4	ZT211	BS9365 F024
BFS37	L3	2N2605	BS9365 F026	BFS46	H1	2N918	BS9365 F047
BFS37A	L4	2N2604	BS9365 F025	BFS46A	H2	ZTX321	BS9365 F048
BFS38	C2	ZT82	BS9365 F016	BFS85	H3	ZTX326	BS9365 F045
BFS38A	C1	ZT80	BS9365 F015	BFS88	H4	BFY90	BS9365 F046
BFS39	C3	ZT83	BS9365 F017	BFT27	L5	2N2484	
BFS40	C5	ZT182	BS9365 F021	BSS47	L6	ZTX342	BS9365 F027
BFS40A	C4	ZT180	BS9365 F020	BSS56	L7	ZTX341	
BFS41	C6	ZT183	BS9365 F022	BSV35	S2	2N2369	BS9365 F037
BFS42	P1	ZT92	BS9365 F018	BSV35A	S1	2N706	BS9365 F036
BFS43	P2	ZT90	BS9365 F019	BSV36	S3	2N2475	BS9365 F038
				BSV37	S4	2N2894	BS9365 F039

Manufactured in U.K.



Dimensions in millimetres

SILICON PLANAR HIGH-VOLTAGE TRANSISTORS (n-p-n)

Designed for driving numerical indicator tubes, neon lamps and other high voltage applications
Ratings and Characteristics at 25°C ambient temperature

Type	Maximum Ratings V_{CBO} Volts	V_{CEO} Volts	I_C mA	h_{FE} Min.	at I_C mA	and V_{CE} Volts	$V_{CE(sat)}$ at I_C mA	and I_B mA	I_{CER} µA (max.)	at V_{CE} Volts
							Volts (max.)			
BSS47	120	120	500	30	2	1	0·5	2	0·1	0·5	100
BSS56	100	100	500	30	2	1	0·5	2	0·1	0·5	80

SILICON PLANAR VHF AND UHF TRANSISTORS (n-p-n)

Designed for high-frequency operation. Application areas include amplifiers, switches and oscillators
Ratings and Characteristics at 25°C ambient temperature

Type	Maximum Ratings V_{CBO} Volts	V_{CEO} Volts	I_C mA	h_{FE} at V_{CE} = 1V Min.	Max.	at I_C mA	f_T MHz (min.)	at I_C mA	C_{ob} at f = 1 MHz and V_{CB} = 10V pF (max.)	RF Power Output or Power Gain dB	mW	at f MHz	Noise Figure (N) dB	at I_C mA	and f MHz (max.)
BFS46	30	15	500	20	—	3	600	4	1·7	15	—	200	6	1	60
BFS46A	30	15	500	20	—	3	600	4	1·7	15	—	200	6	1	60
BFS85	25	12	50	25	150	2	1000	2	1·5	—	175	500	6	2	500
BFS88	30	12	50	25	150	2	1300	25	1·5	—	175	500	5	2	500

SILICON PLANAR SCHOTTKY BARRIER DIODES

Designed for use in pulse switching and shaping, low noise mixer, limiter and discriminator, large and small signal applications
Ratings and Characteristics at 25°C ambient temperature

Type	Min. V_{BR} at 10µA Volts	Max. i_R at V_R nA	Volts	Max. V_F at 1 mA mV	Max. C_j at V_R = 0V pf	Effective minority lifatime at I_F = 20mA ps
ZC2800C	70	200	50	450	2·0	100
ZC2810C	20	100	15	450	1·2	100
ZC2811C	15	100	10	450	1·2	100
ZC5800C	50	200	35	450	2·0	100

SILICON PLANAR HIGH-SPEED SWITCHING DIODES

Ratings and Characteristics at 25°C ambient temperature

Type	Description	Max. V_{RWM} Volts	Max. Forward Current per diode mA	per common lead* mA	Max. I_R at V_{RWM} µA	Max. V_F at I_F = 10 mA Volts	Max. Reverse Recovery Time t_{rr} at I_F = 10 mA, V_R = 5V, R_L = 50Ω ns
BAW63	Single diode	60	200	—	1·0	0·9	4
BAW63A	Single diode	30	200	—	1·0	0·9	4
BAW63B	Single diode	15	200	—	1·0	0·9	4
BAW64	Common cathode diode pair	60	200	250	1·0	0·9	4
BAW65	Common cathode diode pair	30	200	250	1·0	0·9	4
BAW66	Common anode diode pair	30	200	250	1·0	0·9	4
BAW67	Common cathode diode pair	15	200	250	1·0	0·9	4
BAW68	Common anode diode pair	15	200	250	1·0	0·9	4

*Based on maximum dissipation. †Time to recover to 10% of I_R peak.

B.S. MICRO-E PRODUCT LIST

Diodes

Type	Device marking	BS/CECC number		Type	Device marking	BS/CECC number
BAW63	D1	BSE9302 F001*		BZX88-C12	Y2	
BAW63A	D2	BS9302 F002*		BZX88-C13	Y3	
BAW63B	D3	BS9302 F003*		BZX88-C15	Y4	
BAW64	D4	BS9302 F004*		BZX88-C16	Y5	
BAW65	D5	BS9302 F005*		BZX88-C18	Y6	
BAW66	D6	BS9302 F006*		BZX88-C20	Y7	
BAW67	O7	BS9302 F007*		BZX88-C22	Y8	
BAW68	D8	BS9302 F008*		BZX88-C24	Y9	
BZX88-C2V7	W4			BZX88-C27	X1	
BZX88-C3V0	W5			BZX88-C30	X2	
BZX88-C3V3	W6			BZX88-C33	X3	
BZX88-C3V6	W7			BZX88-C36	X4	
BZX88-C3V9	W8			BZX88-C39	X5	
BZX88-C4V3	W9			BZX88-C43	X6	
BZX88-C4V7	Z1			BZX88-C47	X7	
BZX88-C5V1	Z2			ZC2800C	M6	
BZX88-C5V6	Z3			ZC2810C	M7	
BZX88-C6V2	Z4			ZC2811C	M8	
BZX88-C6V8	Z5			ZC5800C	M9	
BZX88-C7V5	Z6					
BZX88-C8V2	Z7					
BZX88-C9V1	Z8					
BZX88-C10	Z9					
BZX88-C11	Y1					

- ☐ AM Receiver
- ☐ Reference Sources
- ☐ TO18 Metal Can Package

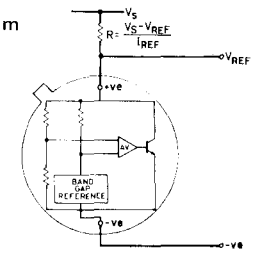
LOW COST PRECISION 2.45V REFERENCE REGULATOR — ZN404

The ZN404 is a monolithic integrated circuit providing a precise stable regulator source of 2·45V in a two lead package without the need for an external shaping capacitor.

FEATURES

- Low temperature coefficient
- Low slope resistance
- Very good long term stability
- Low noise
- Internally shaped
- Tight tolerance
- Low cost
- Two lead (TO-18) package

Circuit Diagram



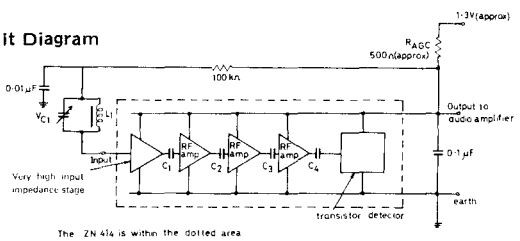
A.M. RADIO RECEIVER — ZN414

The ZN414 provides a complete RF amplifier, detector and AGC circuit in a 3 pin TO-18 package, and needs only six external components to give a high quality a.m. tuner. Effective AGC action is available and is adjusted by altering one external resistor. The ZN414 greatly simplifies the construction of a.m. receivers, both in design and assembly, without sacrificing audio quality.

FEATURES

- 1·2 to 1·6 volt operation
- 0·4 mA current consumption
- Full medium and long wave operation
- No alignment
- Effective and variable AGC action
- 20 mV r.m.s. output
- Excellent audio quality, low noise design
- 72 dB power gain
- 3 pin TO-18 metal can package
- 0 to +70°C operation

Circuit Diagram



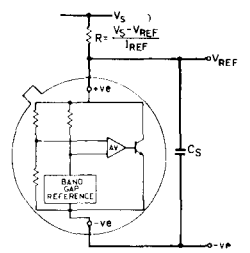
PRECISION 1.26 VOLT REFERENCE SOURCE — ZN423

The ZN423 is a monolithic integrated circuit utilising the energy band gap voltage of a base-emitter junction to produce a precise, stable, reference source of 1·26 volts. This is derived via an external dropping resistor for supply voltages of 1·5 volts upwards. The temperature coefficient of the ZN423, unlike conventional Zener diodes, remains constant with reference current. The noise figure associated with breakdown mechanisms is also considerably reduced.

FEATURES

- Low voltage
- Low temperature coefficient
- Very good long term stability
- Low slope resistance
- Low RMS noise
- Tight tolerance
- High power supply rejection ratio
- Two lead TO-18

Circuit Diagram



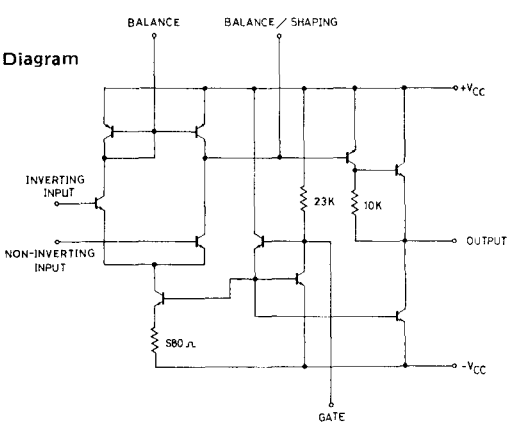
GATED LINEAR AMPLIFIER — ZN424/ZN424E/ZN424P

The Provision of the gating facility on the ZN424 allows it to be used both as a switch and as an amplifier. With the gating signal applied, isolation between inputs is provided, and each input is isolated from the output. With no gating signal applied, the device functions as a low distortion operational amplifier.

FEATURES

- 86 dB Gain
- Input-output isolation gating facility
- DTL/TTL Compatibility (5V operation)
- Logic gate current drive capability
- Low noise and open-loop distortion
- Class A output – no crossover distortion
- Choice of packages. 8 and 14 plastic D.I.L. or 8-lead TO-39.

Circuit Diagram



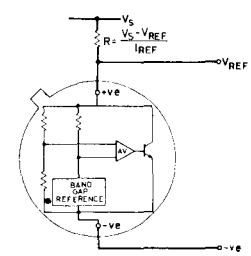
PRECISION 2.45V REFERENCE SOURCE — ZN458

The ZN458 is a monolithic integrated circuit providing a precise stable reference source of 2·45 volts in a two lead package without the need for an external shaping capacitor.

FEATURES

- Guaranteed 5 mV maximum deviation over full temperature range
- Low temperature coefficient 0·003%/°C
- Low slope resistance –0·1Ω
- Very good long term stability – 10 ppm
- Low noise – 10 μV
- Internally shaped
- Tight tolerance – ±1·43%
- Two pin TO-18 package
- Wide operating current 2 – 120 mA

Circuit Diagram



Manufactured in U.K.

- ☐ Amplifiers and Timers
- ☐ Circuits for Consumer Applications
- ☐ DIL or Metal Can Package

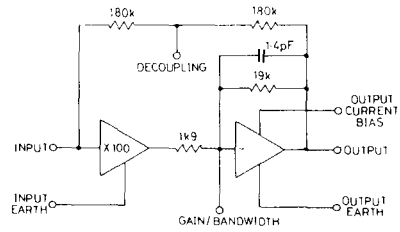
ULTRA LOW NOISE WIDEBAND AMPLIFIER ZN459/C/CP

The ZN459 is an ultra low noise amplifier with remarkable noise performance, very high gain bandwidth (15 GHz), and small package. This combination makes it exceptionally attractive for low noise applications such as thermal imaging where CMT detectors require multiple channel buffering and other imaging and sonar applications. Commercial applications include Industrial low noise applications, Multi-channel amplifiers, tachometers, general audio etc.

FEATURES

- Low input noise resistance, 45Ω equivalent or 800 pV per root cycle
- High bandwidth, 15 MHz typical
- High, well controlled gain, 60 dB ±2 dB
- Gain Variable from 60 dB to 40 dB
- Low supply current, <3 mA from 5V
- Small package, 6 lead TO-71 or 8 lead plastic D.I.L.
- Commercial and Military specifications

Circuit Diagram



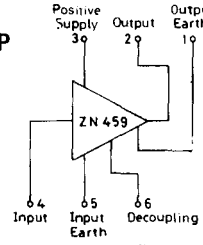
ULTRA LOW NOISE WIDEBAND PRE-AMPLIFIER ZN460/ZN460C/ZN460CP

A versatile high grade a.c. pre-amplifier designed for applications requiring ultra low noise such as infra-red imaging and low noise wide band amplifiers e.g. microphone, acoustic emission, transducer bridge amplifier. The matching of open loop gain coupled with small physical size make the ZN460 series ideal for multichannel amplification.

FEATURES

- High Controlled Gain 60 dB ±1 dB typical
- Programmable gain 50 – 60 dB typical
- Low Noise 40Ω Equivalent Noise Resistance, or 800 pV/$\sqrt{Hz}$
- Programmable Bandwidth 6 MHz
- Low Supply Current <3 mA from 5V downwards
- Available in 8-lead moulded D.I.L. or 8-lead TO-18

Circuit Diagram



PRECISION TIMER ZN1034E

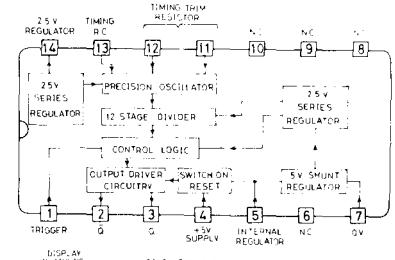
The device allows easy construction of simple but precise timing functions which will be ideal in a host of applications.

The frequency of an on-chip oscillator is determined by an externally connected capacitor and adjustable/fixed resistor. In addition, fine adjustment can be achieved by connection of a calibration timing potentiometer. Pulses from the oscillator feed through a 12 stage binary divider which times-out after 4095 counts. The I.C. incorporates its own voltage regulator and two modes of operation can be used. The device is contained in an 8 or 14 lead moulded D.I.L. or a 10 lead TO-99 package.

FEATURES

- Extremely simple, requiring only one external resistor and capacitor
- 12 stage counter provides time intervals up to 7,500 CR
- Low internal current consumption of 5 mA allows battery operation. Output current capability of 25 mA
- Excellent temperature stability <0·01%/°C
- Accurate repetitive timing 0·01% typical
- On-chip regulator or TTL supply option
- Complementary TTL compatible outputs
- 0 to 70°C operation

System Diagram



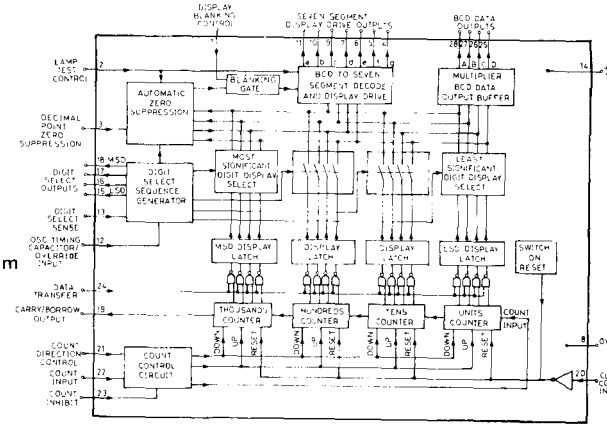
UNIVERSAL 4 DIGIT DISPLAY COUNTER ZN1040E

The counter offers such functions as up/down synchronous counting, a Schmitt trigger input, direct cascading and inhibit and clear facilities. Separate memory latches are available and the display control circuitry offers variable mark-space (*intensity*) control, blanking, lamp test, separate B.C.D. outputs as well as segment outputs, automatic zero suppression and catering for the decimal point. The internal oscillator drives a self-scanning system, but provision is made for external over-ride for synchronisation purposes. An anticipatory carry/borrow output, 'switch-on' reset and clearing counter are all internal to the ZN1040.

FEATURES

- 4 digits of synchronous reversible count, up to 5 MHz
- Multiplexed B.C.D. outputs
- Large output drive capability, 80 mA with 0·4V drop on segment outputs and 16 mA at 0·4V on others
- Direct cascading for extra digits
- Fully TTL compatible, single 5V supply

System Diagram



SWITCHED MODE POWER CONTROL CIRCUIT ZN1066E/ZN1066J

The ZN1066E/ZN1066J is a switching regulator control and drive unit which provides all the control and safety features for pulse width modulated push-pull, bridge, series and single ended switching mode power supplies.

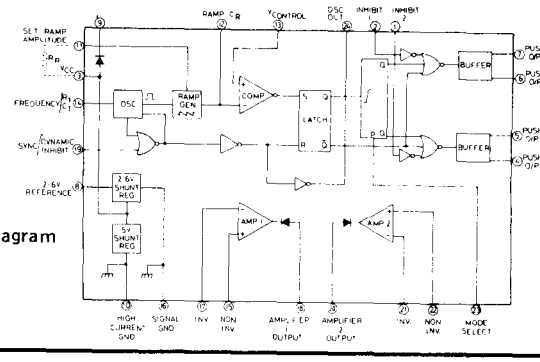
This device is designed to supply the pulse width modulated drive to the base of two external power transistors.

FEATURES

- Voltage reference
- 2 operational amplifiers
- Precision oscillator
- Pulse width modulator
- Pulse steering flip-flop
- Dual alternative output switches
- Dynamic current limiting and shut down circuitry
- All contained within a 24 D.I.L.

Manufactured in U.K.

Logic Diagram



- Circuits for Consumer Applications
- DVM
- 16 and 24 pin DIL Packages

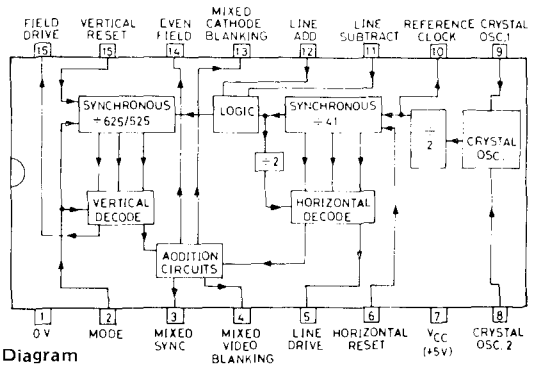
TV SYNCHRONISING PULSE GENERATOR ZNA134J

The ZNA134J integrated circuit utilises a 2·5 MHz* crystal to generate all the horizontal, vertical, mixed blanking and synchronising pulses necessary for raster generation in 625 or 525 line commercial, industrial or military television systems. The synchronous dividers and decoding logic employed within the unit ensure perfect interface, together with spike-free output waveforms having precisely defined relative positions and pulse widths. The device is contained within a 16 pin D.I.L.

*Dependent on line system used, series resonant.

FEATURES

- 625 and 525 line standards
- CCIR and EIA standard outputs
- Single 5 volt supply, fully TTL compatible
- Easy synchronising between generators
- Direct reset to vertical and horizontal counters
- Facility for adding and subtracting lines
- Automatic interlacing
- On chip oscillator (requiring external crystal)
- Can be driven with an external oscillator
- Field reference output



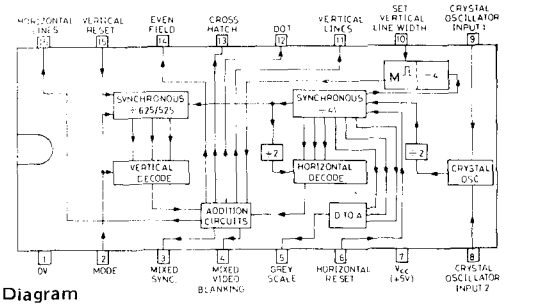
System Diagram

TV CROSSHATCH GENERATOR ZNA234E

The ZNA234 integrated circuit makes available all the waveforms necessary to produce crosshatch, dot and greyscale test patterns on a television screen. All that is required is a 2·5625 MHz crystal (or external oscillator) and a minimum of external components for mixing the video, sync and blanking pulses to give a composite video signal. This can either be injected directly into the video stages of a receiver, or used to drive a VHF modulator/oscillator for connection to the aerial socket. The device is contained within a 16 lead D.I.L. moulded package.

FEATURES

- Single 5 volt supply
- 625 or 525 line operation
- Sync and Blanking outputs to CCIR or IEA standard
- On chip oscillator or can be driven by external oscillator
- Field reference output
- Direct reset to vertical and horizontal counters
- Adjustable vertical line width
- Separate outputs for
  - Crosshatch
  - Dot
  - Vertical Lines
  - Horizontal Lines
  - Greyscale
  - Mixed Sync
  - Mixed Video Blanking



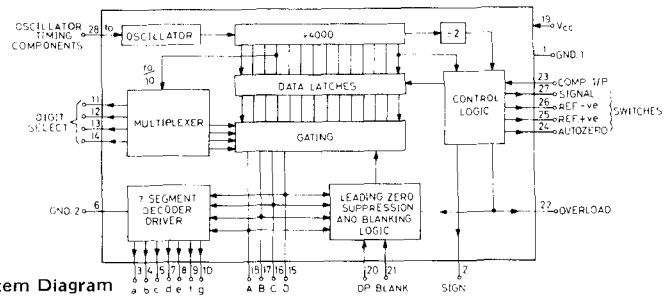
System Diagram

3½ DIGIT D.V.M. LOGIC ZNA116E

The ZNA116E allows a precision 3½ digit D.V.M. to be constructed very easily. It provides all the control logic necessary for a D.V.M. using the well known dual slope integration technique. The low power requirements of the device make it attractive for portable battery operated applications and, since it is bipolar, requires no special handling precautions. The device is contained within a 24 lead plastic D.I.L.

FEATURES

- 3½ Decade display (±1999 max. reading)
- Automatic polarity detection and indication
- Leading zero suppression
- Overload indication
- Multiplexed B.C.D. outputs capable of driving a T.T.L. decoder/ driver directly (e.g. ZN7447A)
- External input to blank display
- Internal oscillator, adjustable externally
- An output at $^{1}/_{100}$ clock frequency for under range indication, or for synchronising the clock frequency for optimum mains rejection
- Single rail, 5 volt supply operation (at 10 mA typical)



System Diagram

3¾ DIGIT D.V.M. LOGIC ZNA216E/ZNA216J

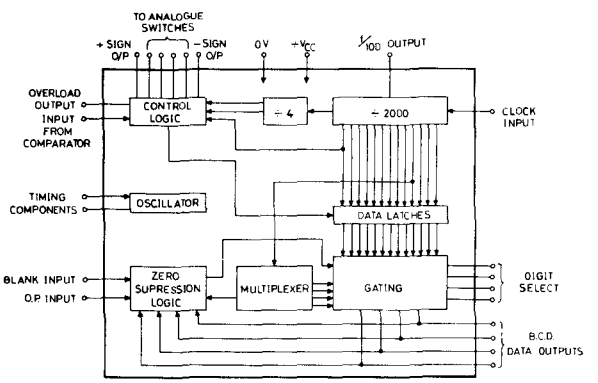
The ZNA216E provides the logic for a flexible 3¾ digit system D.V.M. using the well known dual slope integration technique with good auto zero.

Applications include read out in engineering units including non linear transducers e.g. temperature, computer interface and microprocessor compatibility, and single channel conversion for data acquisition. The device is contained within a 28 lead moulded D.I.L. package.

FEATURES

- 3¾ decade display (±3999 max. reading)
- Readout in engineering units e.g. temperature to 399·9°C
- Computer and microprocessor compatible
- Single channel data acquisition
- Single +5V supply (15 mA typ.), TTL/CMOS compatible
- Auto zero feasible with 1 μV/°C tempco. minimising flicker in final digit
- Separate 7 segment and BCD outputs. 20 mA drives to LED displays
- Straightforward extension for driving liquid crystal displays
- Flashing overload with separate overload output
- Automatic polarity detection and indication
- Suppression of leading zeros, and blanking control

Manufactured in U.K.



System Diagram

FERRANTI

- A–D, D–A converters
- 8, 7 and 6 Bit Accuracy
- 14, 16 and 18 Pin DIL Package

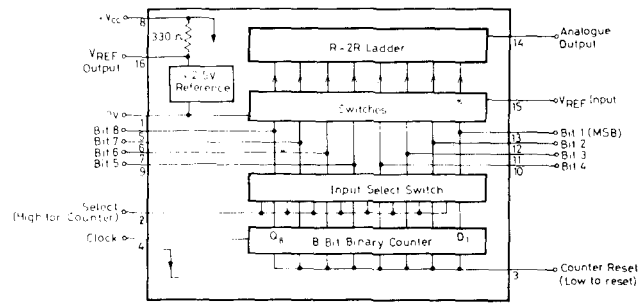
8 BIT D to A/A to D CONVERTER ZN425E/ZN425J SERIES

The ZN425E is a low cost 8-bit dual mode analogue to digital/digital to analogue converter encapsulated in a 16 lead dual in-line package. It contains an 8-bit D to A converter, using an advanced design of R – 2R ladder network and an array of precision bipolar switches, plus an 8-bit binary counter and a 2·5 volt precision voltage reference all on a single monolithic chip.

FEATURES

- Single chip monolithic construction
- Dual mode, Digital to Analogue/Analogue to Digital converter
- 8, 7 and 6 bit accuracy
- Monotonic over full temperature range
- On chip precision voltage reference
- Includes 8-bit binary counter
- Will function as self-contained precision ramp generator
- TTL and CMOS compatible, single 5V supply
- Direct voltage output
- 16 lead plastic or ceramic D.I.L. encapsulation

System Diagram



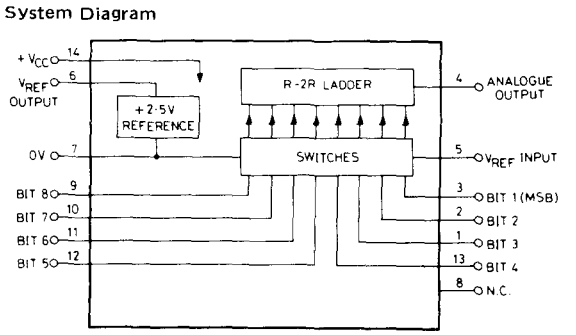
LOW COST 8 BIT D–A CONVERTER ZN426E/ZN426J SERIES

The ZN426 is a low cost bipolar monolithic multiplying 8-bit digital to analogue converter with direct voltage output, with optional 2.5V precision voltage reference. It is intended for general purpose D-A such as consumer and automotive applications.

FEATURES

- Functions - 8-bit D-A with optionally connected internal reference.
- Resolution/accuracy – 8 bits ±½ LSB linearity at 25°C.
- 8, 7 and 6 bit accuracy
- Power supply – Single + 5V TTL/CMOS compatible.
- Power consumption – 30 mW typ. without reference, 45 mW typ. with reference.
- Settling time – 1 μs typical.
- 14 lead plastic D.I.L. encapsulation.

System Diagram



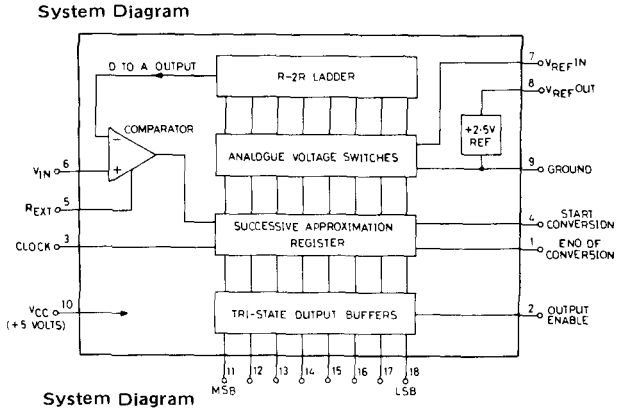
8 BIT SUCCESSIVE APPROXIMATION ADC ZN427E-8/ZN427J-8

The ZN427E/J is a microprocessor compatible 8 bit successive approximation A to D converter with tristate outputs for data bussing encapsulated in an 18 pin D.I.L. package. It contains voltage switched D – A converter based on diffused resistor ladder network (no trim), successive approximation register with tristate output buffers, 2·5 volt precision voltage reference, and comparator all on a single monolithic chip.

FEATURES

- Single chip monolithic construction
- Tristate outputs for microprocessor compatibility
- Conversion time 15 μs guaranteed
- ±½ LSB linearity, monotonic over temperature range
- Commercial or military temperature specifications
- TTL and CMOS compatible
- Direct voltage output
- 18 lead plastic or ceramic D.I.L. encapsulation

System Diagram



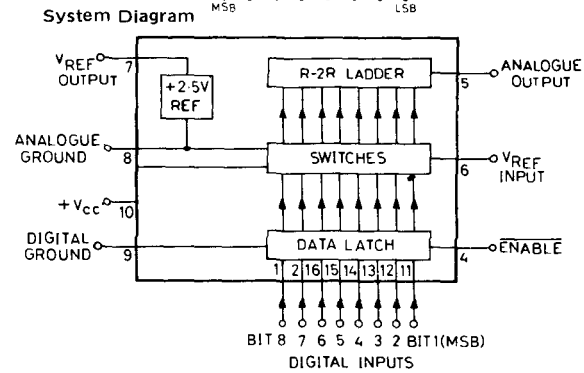
8–BIT LATCHING D–A CONVERTER ZN428E-8/ZN428J-8

The ZN428 is a microprocessor compatible 8-bit latching D-A converter suitable for distributed systems. The bipolar monolithic I.C. contains multiplying D-A with direct voltage output, latches and a 2·5V precision reference.

FEATURES

- Functions – 8-bit D-A with latches and internal reference, microprocessor compatibility with digital sample and hold.
- Resolution/accuracy – 8-bits ±½LSB linearity at 25°C, monotonic over operating temperature range.
- Power supply – single +5V, TTL/CMOS compatible
- Setting time – 0·5 μs typical.
- 14-lead plastic or ceramic D.I.L. encapsulation.

System Diagram



Manufactured in U.K.

FERRANTI

- A–D Convertors
- 28 Pin DIL Package
- BS TTL Capability

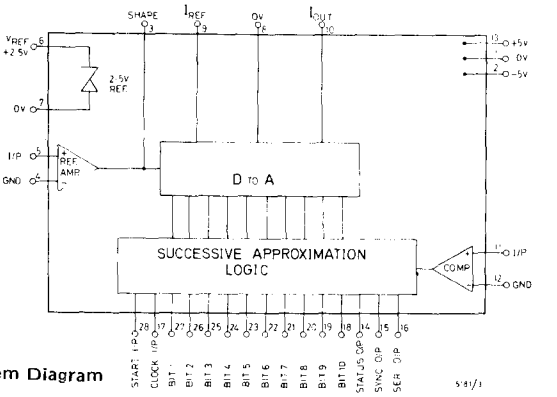
10 BIT SUCCESSIVE APPROXIMATION A to D CONVERTER — ZN432 SERIES

The ZN432 contains a complete 10 bit successive approximation analogue to digital converter on a fully monolithic silicon integrated circuit requiring no resistor trim. In addition to current sources based on diffused resistors, successive approximation register, interfaces, etc., the chip contains a 2·5V reference and a fast settling comparator.

The accuracy of the ZN432 is 10, 9 or 8 bits, with typically ±0·25 LSB linearity and ±0·5 LSB differential linearity. The conversion time is 10μs typical, and the form of logic used generates low internal noise.

FEATURES

- Fully monolithic single chip
- Contains reference and comparator
- 10 bit accuracy. 9 and 8 bits are also available
- Fast conversion time, 15 μs typical
- ±5V supplies, TTL interfaces
- 28 lead dual in-line package
- Operating temperatures –55 to +125°C, 0 to +70°C, –40 to +85°C.



System Diagram

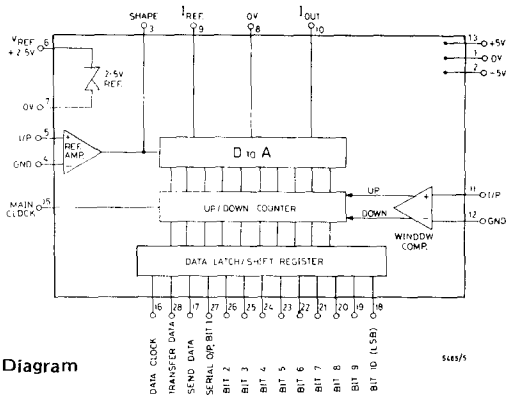
10 BIT TRACKING A to D CONVERTER — ZN433 SERIES

The ZN433 contains a complete 10 bit tracking analogue to digital converter on a fully monolithic silicon integrated circuit requiring no resistor trim. In addition to current sources based on diffused resistors, tracking logic, interfaces etc., the chip contains a 2·5V reference and a window comparator.

The accuracy of the ZN433 is 10, 9 or 8 bits, with typically ±½ LSB linearity and ±½ LSB differential linearity. The tracking principle ensures continuous up to date conversion data, at a clock rate of up to 1 MHz.

FEATURES

- Fully monolithic single chip
- Contains reference and window comparator
- 10 bit accuracy, 9 and 8 bits also available
- Fast update rate, 1 MHz
- ±5V supplies, TTL interfaces
- 28 lead dual in-line package
- Operating temperatures –55 to +125°C, 0 to +70°C, –40 to +85°C.



System Diagram

BS 9000/MILITARY APPROVALS

The Ferranti ZN 5400/ZN 7400 TTL range and ZN 54L00/ZN74L00 range of low power transistor - transistor logic circuits can be supplied against specific request. These products meet the BS9000/ military specification approvals and can be supplied also to specific requests to the appropriate BS type number and category as indicated in following tables.

FERRANTI TYPE NUMBER	BS TYPE Prefix	Full Assess.	Cat. S1	Cat. S2	Cat. S3	Adopted CN Type	CN Type Number	App. Status
ZN5400	9401	F019	F053	F058	F063	—	—	C
ZN5400E	9401	—	—	—	—	C077DP	CN77DP	C
ZN5400F	9401	—	—	—	—	C077F	CN77F	C
ZN5401	9401	F078	F117	F120	F123	—	—	C
ZN5401E	9401	—	—	—	—	C085DP	CN85DP	C
ZN5401F	9401	—	—	—	—	C085F	CN85F	C
ZN5402	9401	F087	F126	F129	F132	—	—	C
ZN5402E	9401	—	—	—	—	C087DP	CN87DP	C
ZN5402F	9401	—	—	—	—	C087F	CN87F	C
ZN5403	9401	F079	F118	F121	F124	—	—	C
ZN5404	9403	F004	F013	F015	F017	—	—	C
ZN5404E	—	—	—	—	—	—	CN361DP	C
ZN5405	9403	F005	F014	F016	F018	—	—	C
ZN5405E	—	—	—	—	—	—	CN363DP	C
ZN5408	9401	F096	F135	F137	F139	—	—	C
ZN5409	9401	F097	F136	F138	F140	—	—	C
ZN5410	9401	F020	F054	F059	F064	—	—	C
ZN5410E	9401	—	—	—	—	C079DP	CN73DP	C
ZN5410F	9401	—	—	—	—	C079F	CN73F	C
ZN5412	9401	F080	F119	F122	F125	—	—	C
ZN5413	9401	F102	F147	F148	F149	—	—	C
ZN5420	9401	F021	F055	F060	F065	—	—	C
ZN5420E	9401	—	—	—	—	C081DP	CN81DP	C
ZN5420F	9401	—	—	—	—	C081F	CN81F	C
ZN5425	9401	F088	F127	F130	F133	—	—	C
ZN5427	9401	F089	F128	F131	F134	—	—	C
ZN5428	9401	F105	F150	F151	F152	—	—	C
ZN5430	9401	F022	F056	F061	F066	—	—	C
ZN5430E	9401	—	—	—	—	C083DP	CN83DP	C
ZN5430F	9401	—	—	—	—	C083F	CN83F	C
ZN5432	9401	F108	F153	F154	F155	—	—	C
ZN5437	9401	F111	F141	F143	F145	—	—	C
ZN5438	9401	F112	F142	F144	F146	—	—	C
ZN5440	9401	F023	F057	F062	F067	—	—	C
ZN5440E	9401	—	—	—	—	C089DP	CN85DP	C
ZN5440F	9401	—	—	—	—	C089F	CN85F	C
ZN5442A	9440	F022	F049	F050	F051	—	—	C
ZN5450	9405	F010	F031	F035	F039	—	—	C
ZN5450E	—	—	—	—	—	—	CN93DP	C
ZN5450F	—	—	—	—	—	—	CN93F	C
ZN5451	9405	F011	F032	F036	F040	—	—	C
ZN5451E	—	—	—	—	—	—	CN91DP	C
ZN5451F	—	—	—	—	—	—	CN91F	C
ZN5453	9405	F012	F033	F037	F041	—	—	P
ZN5453E	—	—	—	—	—	—	CN97DP	C
ZN5453F	—	—	—	—	—	—	CN97F	C
ZN5454	9405	F013	F034	F038	F042	—	—	P
ZN5454E	—	—	—	—	—	—	CN95DP	C
ZN5454F	—	—	—	—	—	—	CN95F	C
ZN5460E	—	—	—	—	—	—	CN99DP	C
ZN5460F	—	—	—	—	—	—	CN99F	C
ZN5470	9420	F007	F025	F026	F027	—	—	C
ZN5470E	—	—	—	—	—	—	CN101DP	C
ZN5470F	—	—	—	—	—	—	CN101F	C
ZN5472	9420	F010	F028	F029	F030	—	—	C
ZN5472E	—	—	—	—	—	—	CN103DP	C
ZN5472F	—	—	—	—	—	—	CN103F	C
ZN5473	9420	F013	F031	F032	F033	—	—	C
ZN5473E	—	—	—	—	—	—	CN275DP	C
ZN5474	9420	F016	F034	F035	F036	—	—	C
ZN5474E	—	—	—	—	—	—	CN107DP	C
ZN5474F	—	—	—	—	—	—	CN107F	C
ZN5475	9420	F040	F058	F059	F060	—	—	C
ZN5476	9420	F043	F061	F062	F063	—	—	C
ZN5482	9405	F043	F079	F080	F081	—	—	P
ZN5483	9405	F121	F124	F125	F126	—	—	P
ZN5483A	9405	F046	F082	F083	F084	—	—	P
ZN5485	9405	F049	F085	F086	F087	—	—	C
ZN5486	9401	F071	F156	F157	F158	—	—	C
ZN5489	9443	F001	F007	F008	F009	—	—	P
ZN5490	9442	F211	F214	F215	F216	—	—	P
ZN5490A	9442	F016	—	—	—	—	—	P
ZN5490A	9442	—	—	F056	F056	F057	—	P
ZN5491A	9440	F025	F052	F053	F054	—	—	P
ZN5492	9442	F205	F208	F209	F210	—	—	P
ZN5492A	9442	F013	F058	F059	F060	—	—	C
ZN5493	9442	F217	F220	F221	F222	—	—	C
ZN5493A	9442	F004	F010	F011	F012	—	—	C
ZN5494	9440	F028	F055	F056	F057	—	—	P
ZN5495A	9440	F031	F058	F059	F060	—	—	C
ZN5496	9440	F034	F061	F062	F063	—	—	C
ZN54107	9420	F019	F037	F038	F039	—	—	C
ZN54107E	—	—	—	—	—	—	CN105DP	C
ZN54107F	—	—	—	—	—	—	CN105F	C
ZN54118	9420	F046	F064	F065	F066	—	—	C
ZN54119	9420	F049	F067	F068	F069	—	—	C
ZN54121	9440	F001	F004	F005	F006	—	—	C
ZN54122	9440	F013	F076	F077	F078	—	—	C
ZN54123	9440	F016	F079	F080	F081	—	—	C
ZN54150	9405	F052	F088	F089	F090	—	—	C
ZN54151A	9405	F055	F091	F092	F093	—	—	C
ZN54153	9405	F058	F094	F095	F096	—	—	C
ZN54154	9405	F061	F097	F098	F099	—	—	C
ZN54155	9405	F064	F100	F101	F102	—	—	P
ZN54157	9405	F067	F103	F104	F105	—	—	C
ZN54161	9442	F019	F037	F038	F039	—	—	P
ZN54163	9442	F022	F040	F041	F042	—	—	C
ZN54164	9440	F037	F064	FD65	F066	—	—	C
ZN54165	9440	F040	F067	F068	F069	—	—	C
ZN54166	9440	F043	F070	F071	F072	—	—	C
ZN54170	9443	F004	F010	F011	F012	—	—	C
ZN54174	9420	F052	F070	F071	F072	—	—	C
ZN54175	9420	F055	F073	F074	F075	—	—	C
ZN54180	9405	F070	F1D6	F107	F108	—	—	C
ZN54181	9405	F073	F109	F110	F111	—	—	P
ZN54184	9443	F013	F016	F017	F018	—	—	P
ZN54191	9442	F025	F043	F044	F045	—	—	P
ZN54192	9442	F028	F046	F047	F048	—	—	C
ZN54193	9442	F031	F049	F050	F051	—	—	C
ZN54194	9440	F046	F073	F074	F075	—	—	P
ZN54197	9442	F034	F052	F053	F054	—	—	P
ZN54L00J	9401	F004	F038	F043	F048	—	—	C
ZN54L01J	9401	F159	F165	F166	F167	—	—	C
ZN54L02J	9401	F162	F168	F169	F170	—	—	C
ZN54L03J	9401	F068	F171	F172	F173	—	—	C
ZN54L04J	9403	F001	F010	F011	F012	—	—	C
ZN54L10J	9401	F005	F039	F044	F049	—	—	C
ZN54L20J	9401	F006	F040	F045	F050	—	—	C
ZN54L30J	9401	F007	F041	F046	F051	—	—	C
ZN54L42J	9440	F082	F094	F095	F096	—	—	C
ZN54L51J	9405	F001	F022	F025	F028	—	—	C
ZN54L54J	9405	F002	F023	F026	F029	—	—	C
ZN54L55J	9405	F003	F024	F027	F030	—	—	C
ZN54L73J	9420	F001	F022	F023	F024	—	—	C
ZN54L74J	9420	F076	F082	F083	F084	—	—	C
ZN54L75J	9402	F079	F085	F086	F087	—	—	C
ZN54L85J	9405	F115	F118	F119	F120	—	—	P
ZN54L86J	9401	F016	F042	F047	F052	—	—	C
ZN54L90J	9442	F061	F070	F071	F072	—	—	C
ZN54L91J	9440	F085	F097	F098	F099	—	—	C
ZN54L93J	9442	F001	F007	F008	F009	—	—	C
ZN54L95J	9440	F007	F106	F107	F108	—	—	C
ZN54L96J	9440	F088	F100	F101	F102	—	—	P
ZN54L122J	9440	F091	F103	F104	F105	—	—	C
ZN54L164J	9440	F010	F109	F110	F111	—	—	C
ZN54L192J	9442	F064	F073	F074	F075	—	—	P
ZN54L193J	9442	F067	F076	F077	F078	—	—	P

C Current D Obsolete - Supplies no longer available DT Obsolescent - Not recommended for design in new equipment P Pending S Suspended

Manufactured in U.K.

WAYCOM LIMITED

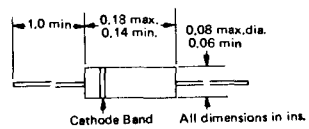
Diodes, Bridges & Transistors

- ☐ 1 Amp Rectifiers and Bridges
- ☐ NPN/PNP Small Signal Transistors
- ☐ Industry Standards

DIODES

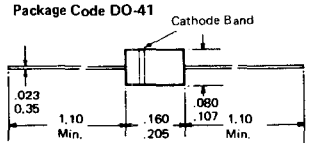
DIODES				
Type	V_{PIV} (volts)	I_R(nA) 20V_R	V_F(volts) 10mA I_F	T_{RR} nS
1N 4148	75	25	1	4.0

1N 4148 Package



RECTIFIERS				
Type	Max Average Current Amps	Max.* Surge Current Amps	Max. P.R.V. Volts	Max. I_R at P.R.V. µA
1N 4001	1.0	30	50	5.0
1N 4002	1.0	30	100	5.0
1N 4003	1.0	30	200	5.0

1N 4001 Series
Package Code DO-41

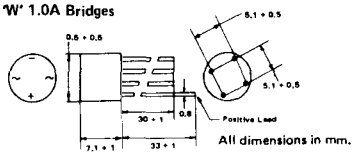


RECTIFIERS				
Type	Max Average Current Amps	Max.* Surge Current Amps	Max. P.R.V. Volts	Max. I_R at P.R.V. µA
1N 4004	1.0	30	400	5.0
1N 4005	1.0	30	600	5.0
1N 4006	1.0	30	800	5.0
1N 4007	1.0	30	1000	5.0

* Single cycle

BRIDGE RECTIFIERS				
Type	Max. Average Current Amps	Max Surge Current Amps	Max. P.R.V. Volts	Max. I_R at P.R.V. µA
W005	1.0	50	50	10.0
W01	1.0	50	100	10.0
W02	1.0	50	200	10.0

'W' 1.0A Bridges



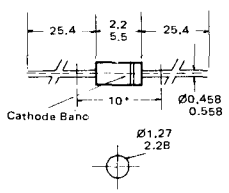
All dimensions in mm.

BRIDGE RECTIFIERS				
Type	Max. Average Current Amps	Max Surge Current Amps	Max. P.R.V. Volts	Max. I_R at P.R.V. µA
W04	1.0	50	400	10.0
W06	1.0	50	600	10.0
W08	1.0	50	800	10.0

ZENER DIODES

Type No.	Zener Voltage (V_Z) @5mA @25°C ±5% Tol.	Max. Dynamic Imp.@ Test Current 5mA (Z_z) Ohms	Max. Leakage Current (I_R @ V_R) µA	Max. Leakage Current (I_R @ V_R) Volts	Temperature Coefficient (Typ.) mV/°C
BZX83 Series					
BZX83 C2V7	2.7	90	100	1	−1.9
BZX83 C3V0	3.0	90	60	1	−2.1
BZX83 C3V3	3.3	90	30	1	−2.0
BZX83 C3V6	3.6	90	20	1	−2.5
BZX83 C3V9	3.9	85	10	1	−2.1
BZX83 C4V3	4.3	80	5	1	−1.9
BZX83 C4V7	4.7	80	2	1	−1.2
BZX83 C5V1	5.1	60	1	1	+1.0
BZX83 C5V6	5.6	40	1	1	+1.68
BZX83 C6V2	6.2	10	1	2	+2.5
BZX83 C6V8	6.8	8	1	3	+3.1
BZX83 C7V5	7.5	7	1	3.5	+3.8
BZX83 C8V2	8.2	7	1	4	+4.5
BZX83 C9V1	9.1	10	1	5	+5.5
BZX83 C10	10	15	1	6	+6.5

BZX 83 DO–35 Package



* The minimum axial length in which the device with its leads bent at right angles can be placed is 10mm.
All dimensions in mm.

Type No.	Zener Voltage (V_Z) @5mA @25°C ±5% Tol.	Max. Dynamic Imp.@ Test Current 5mA (Z_z) Ohms	Max. Leakage Current (I_R @ V_R) µA	Max. Leakage Current (I_R @ V_R) Volts	Temperature Coefficient (Typ.) mV/°C
BZX83 Series					
BZX83 C11	11	20	1	7	+7.7
BZX83 C12	12	20	1	8	+8.4
BZX83 C13	13	25	1	9	+10.0
BZX83 C15	15	30	1	11	+11.3
BZX83 C16	16	40	1	11	+12.8
BZX83 C18	18	55	1	12	+14.4
BZX83 C20	20	55	1	14	+16.0
BZX83 C22	22	58	1	15	+18.7
BZX83 C24	24	80	1	16	+20.4
BZX83 C27	27	80	1	18	+23.0
BZX83 C30	30	90	1	20	+27.0
BZX83 C33	33	90	1	22	+29.7

TRANSISTORS

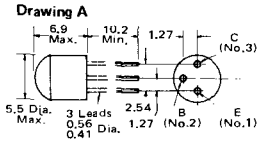
Type	Polarity	Max Ratings at T_A=25°C P_D Watts	I_C Amps	BV CEO	H_{FE} at I_C H_{FE}	I_C mAmps	Package or Drawing Ref.
Small Signal Transistors							
BC 107	NPN	0.3	0.1	45	125-500*	2	TO-18
BC 107A	NPN	0.3	0.1	45	125-260*	2	TO-18
BC 107B	NPN	0.3	0.1	45	240-500*	2	TO-18
BC 108	NPN	0.3	0.1	20	125-900*	2	TO-18
BC108A	NPN	0.3	0.1	20	125-260*	2	TO-18
BC 108B	NPN	0.3	0.1	20	240-500*	2	TO-18
BC 108C	NPN	0.3	0.1	20	450-900*	2	TO-18
BC 109	NPN	0.3	0.1	20	240-400*	2	TO-18
BC 109B	NPN	0.3	0.1	20	240-500*	2	TO-18
BC 109C	NPN	0.3	0.1	20	450-900*	2	TO-18
BC 182†	NPN	0.3	0.2	50	100-480	2	A
BC 183†	NPN	0.3	0.2	30	100-850	2	A
BC 184†	NPN	0.3	0.2	30	250 min.	2	A

Notes
*Small signal current gain
†Please specify lend configuration
Add Suffix K for centre base
Add suffix L for centre collector

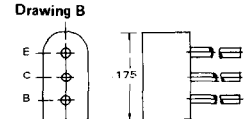
Power Transistors

BD135	NPN	6.5	1.5	45	40-250	150	C
BD136	PNP	6.5	1.5	45	40-250	150	C
BD137	NPN	6.5	1.5	60	40-160	150	C
BD138	PNP	6.5	1.5	60	40-160	150	C
BD139	NPN	6.5	1.5	80	40-160	150	C
BD140	PNP	6.5	1.5	80	40-160	150	C

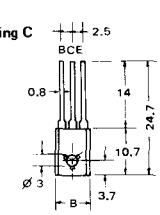
Drawing A



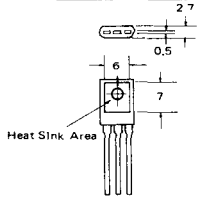
Drawing B



Drawing C



Type	Polarity	Max Ratings at T_A=25°C P_D Watts	I_C Amps	BV CEO	H_{FE} at I_C H_{FE}	I_C mAmps	Package or Drawing Ref.
Small Signal Transistors							
BC 212†	PNP	0.3	0.2	50	60-300	2	A
BC 213†	PNP	0.3	0.2	30	80-400	2	A
BC 214†	PNP	0.3	0.2	30	140-999	2	A
2N3794	NPN	0.25	0.3	20	100-600	10	B
2N4286	NPN	0.25	0.05	25	150-700	1	B
2N4287	NPN	0.25	0.1	45	150-600	1	B
2N4288	PNP	0.25	0.05	25	150-600	1	B
2N4289	PNP	0.25	0.05	45	150-600	1	B
2N4291	PNP	0.25	0.2	30	50 min	10	B



The country of origin for each product is shown on the Waycom Ltd. data sheet.

- ☐ General Purpose, Low Leakage Types
- ☐ High Voltage, Computer Types
- ☐ Rectifiers

DIODES

COMPUTER DIODES (BY ASCENDING t_{rr})

Glass Package

DEVICE NO.	t_{rr} ns Max	BV V Min	I_R nA Max @	V_R V	V_F V Max @	I_F mA	C pF Max	Package
FD700	0.70	30	50	20	1.1	50	1.0	DO-7
1N4376	0.75	20	100	10	1.1	50	1.0	DO-7
BAY82	0.75	15	100	12	1.0	20	1.3	DO-7
FD777	0.75	15	100	8.0	1.0	20	1.3	DO-7
1N5282	2.0	80	100	55	1.3	500	2.5	DO-35
1N4153	2.0	75	50	50	0.88	20	4.0	DO-35
1N4151	2.0	75	50	50	1.0	50	4.0	DO-35
1N4305	2.0	75	100	50	0.85	10	2.0	DO-35
BAY71	2.0	50	100	35	1.0	20	2.0	DO-35
1N4152	2.0	40	50	30	0.88	20	4.0	DO-35
1N4154	2.0	35	100	25	1.0	30	4.0	DO-35
1N914	4.0	100	25	20	1.0	10	4.0	DO-35
1N914A	4.0	100	25	20	1.0	20	4.0	DO-35
1N914B	4.0	100	25	20	1.0	100	4.0	DO-35
1N916	4.0	100	25	20	1.0	10	2.0	DO-35
1N916A	4.0	100	25	20	1.0	20	2.0	DO-35
1N916B	4.0	100	25	20	1.0	30	2.0	DO-35
1N4148	4.0	100	25	20	1.0	10	4.0	DO-35
1N4149	4.0	100	25	20	1.0	10	2.0	DO-35

DEVICE NO.	t_{rr} ns Max	BV V Min	I_R nA Max @	V_R V	V_F V Max @	I_F mA	C pF Max	Package
1N4446	4.0	100	25	20	1.0	20	4.0	DO-35
1N4447	4.0	100	25	20	1.0	20	4.0	DO-35
1N4448	4.0	100	25	20	1.0	100	2.0	DO-35
1N4449	4.0	100	25	20	1.0	30	2.0	DO-35
1N3604	4.0	75	50	50	1.0	50	2.0	DO-35
1N3600	4.0	75	100	50	1.0	200	2.5	DO-35
FDH600	4.0	75	100	50	1.0	200	2.5	DO-35
1N3064	4.0	75	100	50	1.0	10	2.0	DO-35
1N4150	4.0	75	100	50	1.0	200	2.5	DO-35
1N4454	4.0	75	100	50	1.0	10	2.0	DO-35
BAX13	4.0	50	200	50	1.0	20	3.0	DO-35
BAY74	4.0	50	100	35	1.1	300	3.0	DO-35
FDH900	4.0	45	500	40	1.1	100	3.0	DO-35
FDH666	4.0	40	100	25	1.0	100	3.5	DO-35
1N4450	4.0	40	50	30	1.0	200	4.0	DO-35
1N4009	4.0	35	100	25	1.0	30	4.0	DO-35
1N625	4.0	30	1000	20	1.5	4.0	—	DO-35
FDH999	5.0	35	1000	25	1.0	10	5.0	DO-35

LOW LEAKAGE DIODES (BY DESCENDING BV)

Glass Package

DEVICE NO.	BV V Min	I_R nA Max @	V_R V	V_F V Max @	I_F mA	C pF Max	Package
1N486B	250	50	225	1.0	100	—	DO-35
1N485B	200	25	180	1.0	100	—	DO-35
1N459	200	25	175	1.0	3.0	—	DO-35
1N459A	200	25	175	1.0	100	—	DO-35
FDH300	150	1.0	125	1.0	200	6.0	DO-35
1N3595	150	1.0	125	1.0	200	8.0	DO-35
FDH333	150	3.0	125	1.05	200	6.0	DO-35
1N458A	150	5.0	125	1.0	100	—	DO-35
1N484B	150	25	130	1.0	100	—	DO-35

DEVICE NO.	BV V Min	I_R nA Max @	V_R V	V_F V Max @	I_F mA	C pF Max	Package
1N458	150	25	125	1.0	7.0	6.0	DO-35
BAY73	125	5.0	100	1.0	200	8.0	DO-35
1N483B	80	25	70	1.0	100	—	DO-35
1N457	70	25	60	1.0	20	8.0	DO-35
1N457A	70	25	60	1.0	100	—	DO-35
1N482B	40	25	36	1.0	100	—	DO-35
FJT1100	30	0.001	5.0	1.05	10	1.5	DO-7
1N456A	30	25	25	1.0	100	—	DO-35
1N456	30	25	25	1.0	40	10	DO-35

HIGH VOLTAGE SWITCHING DIODES (BY DESCENDING BV)

Glass Package

DEVICE NO.	BV V Min	I_R nA Max @	V_R V	V_F V Max @	I_F mA	C pF Max	t_{rr} ns Max	Package
1N661	240	10000	200	1.0	6.0	—	300	DO-35
FDH400	200	100	150	1.0	200	2.0	50	DO-35
1N3070	200	100	175	1.0	100	5.0	50	DO-35
1N643	200	1000	100	1.0	10	3.0	300	DO-35
1N842	200	100	160	1.0	150	—	300	DO-35
1N629	200	1000	175	1.5	4.0	—	1000	DO-35
FDH444	150	50	100	1.1	200	2.5	60	DO-35

DEVICE NO.	BV V Min	I_R nA Max @	V_R V	V_F V Max @	I_F mA	C pF Max	t_{rr} ns Max	Package
1N628	150	1000	125	1.5	4.0	—	1000	DO-35
BAY72	125	100	100	1.0	100	5.0	50	DO-35
1N658	120	50	50	1.0	100	—	300	DO-35
1N660	120	5000	100	1.0	6.0	—	300	DO-35
1N627	100	1000	75	1.5	4.0	—	1000	DO-35
1N626	50	1000	35	1.5	4.0	—	1000	DO-35

Manufactured in U.S.A.

- ☐ General Purpose, Low Leakage Types
- ☐ High Voltage, Computer Types
- ☐ Rectifiers

GENERAL PURPOSE DIODES (BY DESCENDING BV)

Glass Package

DEVICE NO.	BV V Min	I_R nA Max @	V_R V	V_F V Max @	I_F mA	C pF Max	t_{rr} ns Max	Package
1N661	240	10000	200	1.0	6.0	—	300	DO-35
1S923	200	100	200	1.2	200	—	—	DO-35
1N463A	200	500	175	1.0	100	—	—	DO-35
BA129	200	10	180	1.0	50	6.0	—	DO-35
1S922	150	100	150	1.2	200	—	—	DO-35
BAX16	150	100	150	1.0	1.0	10	120	DO-35
1N660	120	5000	100	1.0	6.0	—	—	DO-35
1S921	100	100	100	1.2	200	—	—	DO-35
BA219	100	200	50	0.85	10	5.0	—	DO-35
BA128	75	100	50	1.0	50	5.0	—	DO-35
1N462A	70	500	60	1.0	100	—	—	DO-35

DEVICE NO.	BV V Min	I_R nA Max @	V_R V	V_F V Max @	I_F mA	C pF Max	t_{rr} ns Max	Package
1N659	60	5000	50	1.0	6.0	—	—	DO-35
1S920	50	100	50	1.2	200	—	—	DO-35
BA218	50	50	25	1.0	10	5.0	—	DO-35
1S44	50	50	10	1.15	10	6.0	—	DO-35
FDH900	45	500	40	1.1	100	3.0	4.0	DO-35
FDH999	35	1000	25	1.0	10	5.0	5.0	DO-35
1N461A	30	500	25	1.0	100	10	—	DO-35
BA217	30	50	10	1.0	10	5.0	—	DO-35
BA130	30	100	25	1.0	10	2.0	—	DO-35
BA164	20	2000	15	1.0	10	—	—	DO-35
BA216	10	1500	10	1.0	15	—	—	DO-35

HOT CARRIER DIODE

Glass Package

DEVICE NO.	BV V Min	I_R nA Max @	V_R V	V_F V Max @	I_F mA	C pF Max	NF dB Max	Package
FH1100	5.0	50	1.0	0.55	10	1.0	10	DO-7

VOLTAGE VARIABLE CAPACITOR DIODES

Glass Package

DEVICE NO.	BV V Min	I_R nA Max @	V_R V	C pF Max	Figure of Merit (Q) Min	C1/C4 V_{R1} = 0.1V V_{R4} = 4.0V	C3/C20 V_{R3} = 3V V_{R20} = 20V	Package
RF400	35	30	30	10	350	2.0	2.0	DO-35
RF401	35	30	30	7.0	350	2.0	2.0	DO-35

BANDSWITCH DIODES

Glass Package

DEVICE NO.	BV V Min	I_R nA Max @	V_R V	C pF Max	R_S Ω Max	V_F V Max @	I_F mA	Package
BA243	20	100	15	2.0	1.0	1.0	100	DO-35
BA244	20	100	15	2.0	0.5	1.0	100	DO-35

GENERAL PURPOSE RECTIFIERS

Glass Package

DEVICE NO.	V_R V Min @	I_R μA	V_F V Max @	I_F A	V_{FM} V Max @	I_O A	Package
1N4001	50	10	1.1	1.0	1.6	1.0	DO-41
1N4002	100	10	1.1	1.0	1.6	1.0	DO-41
1N4003	200	10	1.1	1.0	1.6	1.0	DO-41
1N4004	400	10	1.1	1.0	1.6	1.0	DO-41
1N4005	600	10	1.1	1.0	1.6	1.0	DO-41

FAST RECOVERY RECTIFIERS

Glass Package

DEVICE NO.	V_R V Min @	I_R μA Max	V_F V Max @	I_F A	t_{rr} ns Max	Package
1N4933	50	5.0	1.2	1.0	200	DO-41
1N4934	100	5.0	1.2	1.0	200	DO-41
1N4935	200	5.0	1.2	1.0	200	DO-41
1N4936	400	5.0	1.2	1.0	200	DO-41
1N4937	600	5.0	1.2	1.0	200	DO-41

Manufactured in U.S.A.

Zener Diodes

FAIRCHILD

- 400 mW, 500 mW and 1W
- Glass Package
- Standard ±5% Tolerance

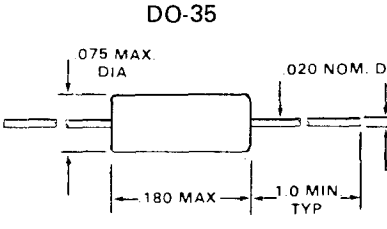
ZENER VOLTAGE	ZENER POWER DISSIPATION						
	400 mW	400 mW	400 mW	500 mW	500 mW	1 W	1 W
2.4				1N5221	BZX55C2V4		
2.5				1N5222			
2.7				1N5223	BZX55C2V7		
2.8				1N5224			
3.0				1N5225	BZX55C3V0		
3.3	BZY88C3V3	1N746		1N5226	BZX55C3V3	1N4728	BZX85C3V3
3.6	BZY88C3V6	1N747		1N5227	BZX55C3V6	1N4729	BZX85C3V6
3.9	BZY88C3V9	1N748		1N5228	BZX55C3V9	1N4730	BZX85C3V9
4.3	BZY88C4V3	1N749		1N5229	BZX55C4V3	1N4731	BZX85C4V3
4.7	BZY88C4V7	1N750		1N5230	BZX55C4V7	1N4732	BZX85C4V7
5.1	BZY88C5V1	1N751		1N5231	BZX55C5V1	1N4733	BZX85C5V1
5.6	FNC5V6	1N752		1N5232	BZX55C5V6	1N4734	BZX85C5V6
6.0		–		1N5233		–	
6.2	FNC6V2	1N753		1N5234	BZX55C6V2	1N4735	BZX85C6V2
6.8	FNC6V8	1N754	1N957	1N5235	BZX55C6V8	1N4736	BZX85C6V8
7.5	BZY88C7V5	1N755	1N958	1N5236	BZX55C7V5	1N4737	BZX85C7V5
8.2	FNC8V2	1N756	1N959	1N5237	BZX55C8V2	1N4738	BZX85C8V2
8.7		–	–	1N5238		–	
9.1	FNC9V1	1N757	1N960	1N5239	BZX55C9V1	1N4739	BZX85C9V1
10	FNC10	1N758	1N961	1N5240	BZX55C10	1N4740	BZX85C10
11	BZY88C11	–	1N962	1N5241	BZX55C11	1N4741	BZX85C11
12	FNC12	1N759	1N963	1N5242	BZX55C12	1N4742	BZX85C12
13	FNC13	–	1N964	1N5243	BZX55C13	1N4743	BZX85C13
14		–	–	1N5244		–	
15	FNC15	–	1N965	1N5245	BZX55C15	1N4744	BZX85C15
16	BZY88C16		1N966	1N5246	BZX55C16	1N4745	BZX85C16
17			–	1N5247		–	
18	FNC18		1N967	1N5248	BZX55C18	1N4746	BZX85C18
19			–	1N5249		–	
20	FNC20		1N968	1N5250	BZX55C20	1N4747	BZX85C20
22	BZY88C22		1N969	1N5251	BZX55C22	1N4748	BZX85C22
24	FNC24		1N970	1N5252	BZX55C24	1N4749	BZX85C24
25			–	1N5253		–	
27	FNC27		1N971	1N5254	BZX55C27	1N4750	BZX85C27
28			–	1N5255		–	
30	BZY88C30		1N972	1N5256	BZX55C30	1N4751	BZX85C30
33	FNC33		1N973	1N5257	BZX55C33	1N4752	BZX85C33

*TOLERANCE %			
SERIES	SUFFIX		
	NONE	A	B
1N746	10	5	–
1N957	20	10	5
1N5221	20	10	5
1N4728	10	5	–
BZY88CXX	5	–	–
BZX55CXX	5	–	–

*Fairchild supplies 5% tolerance on all zeners regardless of suffix.

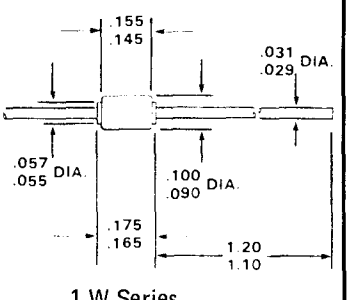
Package Outlines

DO-35



400 mW & 500 mW Series

DO-41



1 W Series

NOTES: ALL DIMENSIONS IN INCHES

Manufactured in U.S.A.

- ☐ General Purpose, Amplifier and Switching
- ☐ NPN/PNP Complements
- ☐ High Voltage Darlingtons

SMALL SIGNAL

GENERAL PURPOSE AMPLIFIER AND SWITCHING TRANSISTORS (BY ASCENDING V_{CEO})

(ALSO SEE LOW LEVEL AND HIGH VOLTAGE SECTION)

DEVICE NO. Polarity NPN	PNP	V_{CEO} (V_{CER}) V Min	h_{FE} (h_{fe}) Min/Max	@ I_C mA	$V_{CE(sat)}$ V Max	@ I_C mA	C_{ob} pF Max	f_T MHz Min	t_{off} ns Max	P_D T_C 25°C mW	T_A 25°C W	Package
2N5128		12	35/350	50	0.25	150	10	200	—	300	0.70	TO-105
	PN5139	20	-/30	10	0.20	10	5.0	300	—	625	1.0	TO-92
	2N5142	20	-/30	50	0.50	50	30	100	200	300	0.70	TO-105
	MPS6563	20	50/200	350	0.50	350	30	60	—	625	1.0	TO-92
2N5223		20	50/800	2.0	0.70	2.0	4.0	150	—	625	—	TO-92
2N5136		20	20/400	150	0.25	150	35	40	—	220	0.60	TO-105
BFY52		20	60/-	150	0.35	150	12	200	—	800	2.86	TO-39
MPS6561		20	50/200	350	0.50	150	30	60	—	625	1.0	TO-92
MPS6515		25	250/500	2.0	0.50	2.0	3.5	–	—	625	1.0	TO-92
MPS2925		25	(235/470)	2.0	—	—	12	—	—	625	1.0	TO-92
MPS3392		25	150/300	2.0	—	—	3.5	—	—	625	1.0	TO-92
MPS6514		25	150/300	2.0	0.50	2.0	3.5	—	—	625	1.0	TO-92
MPS2924		25	(150/300)	2.0	—	—	12	—	—	625	1.0	TO-92
2N4124		25	120/360	2.0	0.30	2.0	4.0	300	—	625	—	TO-92
MPS3393		25	90/180	2.0	—	—	3.5	—	—	625	1.0	TO-92
EN5172		25	100/500	10	0.25	10	12	—	—	200	0.50	TO-106
MPS5172		25	100/500	10	0.25	10	12	—	—	625	1.0	TO-92
2N5135		25	50/600	10	1.00	100	25	40	—	300	0.80	TO-105
2N5225	2N5226	25	30/600	50	0.80	50	20	50	—	625	—	TO-92
BC738	BC728	25	40/250	100	0.5	1000	45	100	—	1120	3.4	TO-92
BC738-6	BC728-6	25	40/100	100	0.5	1000	45	100	—	1120	3.4	TO-92
BC738-10	BC728-10	25	63/163	100	0.5	1000	45	100	—	1120	3.4	TO-92
PE8050	PE8550	25	55/200	100	0.5	1000	45	100	—	1120	3.4	TO-92
BC738-16	BC728-16	25	100/250	100	0.5	1000	45	100	—	1120	3.4	TO-92
MPS6560		25	50/200	500	0.50	500	30	60	—	625	1.0	TO-92
	MPS6519	25	250/500	2.0	0.50	2.0	4.0	—	—	625	1.0	TO-92
	2N4126	25	120/360	2.0	0.40	2.0	4.5	250	—	625	—	TO-92
	PN6076	25	100/500	10	0.25	10	15	—	—	721	1.47	TO-92
	BCY72	25	-/50	10	0.25	10	6.0	200	—	360	1.2	TO-18
	2N3638	25	-/30	50	0.25	50	20	100	170	300	0.7	TO-105
	MPS3702	25	60/300	50	0.25	50	12	100	—	625	1.0	TO-92
	2N3638A	25	-/100	50	0.25	50	10	150	170	300	0.7	TO-105
	MPS3638A	25	-/100	50	0.25	50	10	150	170	625	1.0	TO-92
	MPS6562	25	50/200	500	0.50	500	30	60	—	625	1.0	TO-92
2N718		28	40/120	150	1.50	150	35	50	—	400	1.5	TO-18
2N4123		30	50/150	2.0	0.30	2.0	4.0	250	—	625	—	TO-92
2N3566		30	50/160	10	1.00	100	25	40	—	300	0.80	TO-105
MPS3704		30	100/300	50	0.60	50	12	100	—	625	1.0	TO-92
BFY51		30	40/-	150	0.35	150	12	50	—	800	2.86	TO-39
BC119		30	40/120	150	0.35	150	25	40	—	800	5.0	TO-39
2N2218		30	40/120	150	0.40	150	8.0	250	—	800	3.0	TO-39
2N2221		30	40/120	150	0.40	150	8.0	250	—	500	1.8	TO-18
2N3641		30	40/120	150	0.22	150	8.0	250	—	350	0.70	TO-105
2N3300		30	100/300	150	0.22	150	8.0	250	150	800	3.0	TO-39
2N3302		30	100/300	150	0.22	150	8.0	250	150	360	1.80	TO-18
2N2219		30	100/300	150	0.40	150	8.0	250	—	800	3.0	TO-39
2N2222		30	100/300	150	0.40	150	8.0	250	—	500	1.8	TO-18
2N3643		30	100/300	150	0.22	150	8.0	250	—	350	0.70	TO-105
PN3643		30	100/300	150	0.22	150	8.0	250	—	625	1.0	TO-92
	2N4125	30	50/150	2.0	0.40	2.0	4.5	200	—	625	—	TO-92
	2N5227	30	50/700	2.0	0.40	2.0	5.0	100	—	625	—	TO-92

DEVICE NO. Polarity NPN	PNP	V_{CEO} (V_{CER}) V Min	h_{FE} (h_{fe}) Min/Max	@ I_C mA	$V_{CE(sat)}$ V Max	@ I_C mA	C_{ob} pF Max	f_T MHz Min	t_{off} ns Max	P_D T_A 25°C mW	T_C 25°C W	Package
	PN4916	30	70/200	10	0.14	10	4.5	400	150	625	1.0	TO-92
	PN4917	30	150/300	10	0.14	10	4.5	200	150	625	1.0	TO-92
	MPS3703	30	30/150	50	0.25	50	12	100	—	625	1.0	TO-92
	BC126	30	30/120	150	0.50	150	—	—	—	300	0.8	TO-105
BC737-6	BC727-6	35	40/100	100	0.75	1000	45	100	—	1120	3.4	TO-92
	PE8551	35	40/180	100	0.5	1000	45	100	—	1120	3.4	TO-92
BC737	BC727	35	40/250	100	0.75	1000	45	100	—	1120	3.4	TO-92
BC737-10	BC727-10	35	63/160	100	0.75	1000	45	100	—	1120	2.4	TO-92
BC737-16	BC727-16	35	100/200	100	0.75	1000	45	100	—	1120	2.4	TO-92
	2N1132	35	30/90	150	1.50	150	45	60	—	600	2.0	TO-39
PE8051		35	40/180	100	.75	1000	45	100	—	1120	3.4	TO-92
BFY50		35	30/-	150	0.20	150	12	50	—	800	2.86	TO-39
MPSA10		40	40/400	5.0	—	—	4.0	50	—	625	1.0	TO-92
MPSA20	MPSA70	40	40/400	5.0	0.25	5.0	4.0	125	—	625	1.0	TO-92
2N3903		40	50/150	10	0.20	10	4.0	250	225	625	—	TO-92
2N3904		40	100/300	10	0.20	10	4.0	300	225	625	—	TO-92
2N3947		40	100/300	10	0.20	10	4.0	300	450	360	1.2	TO-18
BC140	BC160	40	40/400	100	1.40	1000	25	50	—	800	5.0	TO-39
BC140-6	BC160-6	40	40/100	100	1.40	1000	25	50	—	800	5.0	TO-39
MPS6530		40	40/120	100	0.50	100	5.0	—	—	625	1.0	TO-92
BC140-10	BC160-10	40	63/160	100	1.40	1000	25	50	—	800	5.0	TO-39
MPS6531	MPS6534M	40	90/270	100	0.30	100	5.0	—	—	625	1.0	TO-92
BC140-16	BC160-16	40	100/250	100	1.40	1000	25	60	800	800	5.0	TO-39
BC140-25	BC160-25	40	160/400	100	1.40	1000	25	50	—	800	5.0	TO-39
2N3567		40	40/120	150	0.25	150	20	60	—	300	0.8	TO-105
PN3567		40	40/120	150	0.25	150	20	60	—	625	1.0	TO-92
2N2218A		40	40/120	150	0.30	150	8.0	250	285	800	3.0	TO-39
2N2221A		40	40/120	150	0.30	150	8.0	250	285	500	1.8	TO-18
2N4400		40	50/150	150	0.40	150	6.5	200	255	625	—	TO-92
2N697		(40)	40/120	150	1.50	150	35	50	—	600	2.0	TO-39
2N3559		40	100/300	150	0.25	150	20	60	—	300	0.8	TO-105
2N2219A		40	100/300	150	0.30	150	8.0	300	285	800	3.0	TO-39
PN2219A		40	100/300	150	0.30	150	8.0	300	285	625	1.0	TO-92
2N2222A		40	100/300	150	0.30	150	8.0	300	285	500	1.8	TO-18
PN2222A		40	100/300	150	0.30	150	8.0	300	285	625	1.0	TO-92
2N4401		40	100/300	150	0.40	150	6.5	250	225	625	—	TO-92
	MPS6516	40	50/100	2.0	0.50	2.0	4.0	—	—	625	1.0	TO-92
	BCY70	40	50/-	10	0.25	10	6.0	200	—	360	1.2	TO-18
	2N3250	40	50/150	10	0.25	10	6.0	250	225	360	1.2	TO-18
	2N3905	40	50/150	10	0.25	10	4.5	200	260	625	—	TO-92
	BFY64	40	80/-	10	0.30	50	10	200	120	700	3.0	TO-39
	2N3251	40	100/300	10	0.25	10	6.0	300	250	360	1.2	TO-18
	PN3251	40	100/300	10	0.25	10	6.0	250	225	625	1.0	TO-92
	2N3906	40	100/300	10	0.25	10	4.5	250	300	625	—	TO-92
	2N2904	40	40/120	150	0.40	150	8.0	200	110	600	3.0	TO-39
	PN2906	40	40/120	150	0.40	150	8.0	200	110	625	1.0	TO-92
	2N4402	40	50/150	150	0.40	150	8.5	150	255	625	—	TO-92
	2N4037	40	50/250	150	1.40	150	—	60	—	1000	—	TO-39
	BC116A	40	80/240	150	0.40	150	8.0	130	—	300	0.8	TO-39
	2N2905	40	100/300	150	0.40	150	8.0	200	110	600	3.0	TO-39
	2N2907	40	100/300	150	0.40	150	8.0	200	110	400	1.8	TO-18

Manufactured in U.S.A.

Small Signal Transistors

FAIRCHILD

- General Purpose, Amplifier and Switching
- NPN/PNP Co mplements
- High Voltage Darlingtons

SMALL SIGNAL

GENERAL PURPOSE AMPLIFIER AND SWITCHING TRANSISTORS (BY ASCENDING V_{CEO}) (Cont'd)

(ALSO SEE LOW LEVEL AND HIGH VOLTAGE SECTION)

DEVICE NO. Polarity NPN	PNP	V_{CEO} (V_{CER}) V Min	h_{FE} (h_{fe}) @ I_C Min/Max	mA	$V_{CE(sat)}$ V Max	@ I_C mA	C_{ob} pF Max	f_T MHz Min	t_{off} ns Max	P_D T_A 25°C mW	T_C 25°C W	Package
	2N4403	40	100/300	150	0.40	150	8.5	200	255	625	—	TO-92
	BCY71	45	100/600	10	0.25	10	6.0	200	—	360	1.2	TO-18
	2N3502	45	115/300	50	0.25	50	8.0	200	100	700	3.0	TO-39
	2N3504	45	115/300	50	0.25	50	8.0	200	100	400	1.3	TO-18
	2N3644	45	115/300	50	0.25	50	8.0	200	100	300	0.7	TO-105
	PN3644	45	115/300	50	0.25	50	8.0	200	100	625	1.0	TO-92
PN3693		45	40/160	10	—	—	3.5	200	—	625	1.0	TO-92
PN3694		45	100/400	10	—	—	3.5	200	—	625	1.0	TO-92
BFY56		45	30/150	150	0.30	150	2.5	40	625	600	5.0	TO-39
2N3642		45	40/120	150	0.22	150	8.0	250	—	350	0.7	TO-105
PN3642		45	40/120	150	0.22	150	8.0	250	—	625	1.0	TO-92
2N2270		45	50/200	150	0.90	150	15	100	—	1000	5.0	TO-39
2N4409		50	60/400	1.0	0.20	1.0	12	60	—	625	—	TO-92
2N915		50	50/200	10	1.00	10	3.5	250	—	360	1.2	TO-18
2N718A		(50)	40/120	150	1.50	150	25	60	—	500	1.8	TO-18
2N1613		(50)	40/120	150	1.50	150	25	80	—	800	3.0	TO-39
2N3053		(50)	50/250	150	1.40	150	15	100	—	—	5.0	TO-39
2N1711		(50)	100/300	150	1.50	150	25	70	—	800	3.0	TO-39
	BFX39	55	40/-	100	0.50	500	20	100	400	800	4.0	TO-39
	2N4354	60	50/500	10	0.15	150	30	100	—	350	0.8	TO-105
	2N3250A	60	50/150	10	0.25	10	6.0	250	225	360	1.2	TO-18
	2N3251A	60	100/300	10	0.25	10	6.0	300	250	360	1.2	TO-18
	2N4355	60	100/400	10	0.15	150	30	100	—	350	0.8	TO-105
	PN4355	60	100/400	10	0.15	150	30	100	—	625	1.0	TO-92
	2N3503	60	115/300	50	0.25	50	8.0	200	100	700	3.0	TO-39
	2N3505	60	115/300	50	0.25	50	8.0	200	100	400	1.3	TO-18
	2N3645	60	115/300	50	0.25	50	8.0	200	100	300	0.7	TO-105
	PN3645	60	115/300	50	0.25	50	8.0	200	100	300	0.7	TO-105
BC537-6	BC527-6	60	40/100	100	0.50	1000	15	100	—	625	1.0	TO-92
	2N4030	60	40/120	100	0.15	150	20	100	—	800	4.0	TO-39
BC141-6	BC161-6	60	40/100	100	1.40	1000	25	50	—	800	5.0	TO-39
BC537	BC527	60	40/400	100	0.50	1000	15	100	—	625	1.0	TO-92
BC141	BC161	60	40/400	100	1.40	1000	25	50	—	800	5.0	TO-39
	MPSA55	60	50/-	100	0.25	100	—	50	—	625	1.0	TO-92
BC537-10	BC527-10	60	63/160	100	0.50	1000	15	100	—	625	1.0	TO-92
BC141-10	BC161-10	60	63/160	100	1.40	1000	25	50	—	800	5.0	TO-39

DEVICE NO. Polarity NPN	PNP	V_{CEO} (V_{CER}) V Min	h_{FE} (h_{fe}) @ I_C Min/Max	mA	$V_{CE(sat)}$ V Max	@ I_C mA	C_{ob} pF Max	f_T MHz Min	t_{off} ns Max	P_D T_A 25°C mW	T_C 25°C W	Package
BC537-16	BC527-16	60	100/250	100	0.50	1000	15	100	—	625	1.0	TO-92
BC141-16	BC161-16	60	100/250	100	1.40	1000	25	50	—	800	5.0	TO-39
	2N4032	60	100/300	100	0.15	150	20	150	—	800	4.0	TO-39
BC141-25	BC161-25	60	150/400	100	1.40	1000	25	50	—	800	5.0	TO-39
BC537-25	BC527-25	60	160/400	100	0.50	1000	15	100	—	625	1.0	TO-92
	2N2904A	60	40/120	150	0.40	150	8.0	200	110	600	3.0	TO-39
	2N2906A	60	40/120	150	0.40	150	8.0	200	110	400	1.8	TO-18
	2N2905A	60	100/300	150	0.40	150	8.0	200	110	600	3.0	TO-39
	PN2905A	60	100/300	150	0.40	150	8.0	150	110	625	1.0	TO-92
	2N2907A	60	100/300	150	0.40	150	8.0	200	110	400	1.8	TO-18
	PN2907A	60	100/300	150	0.40	150	8.0	150	110	625	1.0	TO-92
	BC143	60	20/-	200	0.60	200	—	—	—	700	3.0	TO-39
	BC287	60	20/200	500	0.45	500	13(Typ)	200(Typ)	—	800	4.0	TO-39
2N3568		60	40/120	150	0.25	150	20	60	—	300	0.8	TO-105
PN3568		60	100/300	150	0.18	150	15	250	—	625	1.0	TO-92
PE6020		60	100/300	150	0.18	150	15	250	—	625	1.0	TO-92
SE6020		60	100/300	150	0.18	150	15	250	1000	300	0.8	TO-105
BC142		60	20/-	200	0.40	200	—	—	—	800	5.0	TO-39
BC286		60	20/180	500	0.40	500	12(Typ)	100(Typ)	—	800	4.0	TO-39
	BFX41	75	40/-	100	0.50	500	20	100	400	800	4.0	TO-39
	BFX40	75	60/-	500	0.50	500	20	150	—	800	4.0	TO-39
	2N4356	80	50/250	10	0.15	150	30	100	—	350	0.8	TO-105
	BC528-6	80	40/100	100	0.50	1000	15	100	—	625	1.0	TO-92
BC538	BC528	80	40/400	100	0.50	1000	15	100	—	625	1.0	TO-92
MPSA06	MPSA56	80	50/-	100	0.25	100	—	50	—	625	1.0	TO-92
BC538-10	BC528-10	80	63/160	100	0.50	1000	15	100	—	625	1.0	TO-92
	2N4033	80	100/300	100	0.15	150	20	150	—	800	4.0	TO-39
BC538-16	BC528-16	80	100/250	100	0.50	1000	15	100	—	625	1.0	TO-92
BC538-25	BC528-25	80	160/400	100	0.50	1000	15	100	—	625	1.0	TO-92
2N4410		80	60/400	10	0.20	1.0	12	60	—	625	—	TO-92
2N3020		80	40/120	150	0.20	150	12	80	—	800	5.0	TO-39
2N1893		80	40/120	150	5.00	150	15	50	—	800	3.0	TO-39
PE6021		80	100/300	150	0.18	150	15	250	1000	625	1.0	TO-92
SE6021		80	100/300	150	0.18	150	15	250	1000	300	0.8	TO-105
2N3019		80	100/300	150	0.20	150	12	100	—	800	5.0	TO-39
2N2405		90	60/200	150	0.50	150	15	200	—	800	2.4	TO-39

LOW LEVEL, LOW NOISE AMPLIFIER TRANSISTORS (BY ASCENDING V_{CEO})

DEVICE NO. Polarity NPN	PNP	V_{CEO} V Min	h_{FE} Min/Max	@ I_C mA	h_{FE} Min/Max	@ I_C mA	NF dB Max	@ f kHz	NF dB Max	@ f kHz	Package
2N5133		18	60/1000	1.0	—	—	—	—	—	—	TO-106
BC208		20	90 (Typ)/-	0.01	110/800	2.0	10	1.0	—	—	TO-106
BC208A		20	90 (Typ)/-	0.01	110/220	2.0	10	1.0	—	—	TO-106
BC208B	BC205B	20	150 (Typ)/-	0.01	200/450	2.0	10	1.0	—	—	TO-106
BC208C		20	270 (Typ)/-	0.01	420/800	2.0	10	1.0	—	—	TO-106
BC209		20	150 (Typ)/-	0.01	200/800	2.0	4.0	1.0	4.0	WB	TO-106
BC209B		20	150 (Typ)/-	0.01	200/450	2.0	4.0	1.0	4.0	WB	TO-106
BC209C		20	270 (Typ)/-	0.01	420/450	2.0	4.0	1.0	4.0	WB	TO-106
BC319	BC322	20	150 (Typ)/-	0.01	200/800	2.0	4.0	1.0	4.0	WB	TO-92
BC319B	BC322B	20	150 (Typ)/-	0.01	200/450	2.0	4.0	1.0	4.0	WB	TO-92
BC319C	BC322C	20	270 (Typ)/-	0.01	420/800	2.0	4.0	1.0	4.0	WB	TO-92

DEVICE NO. Polarity NPN	PNP	V_{CEO} V Min	h_{FE} Min/Max	@ I_C mA	h_{FE} Min/Max	@ I_C mA	NF dB Max	@ f kHz	NF dB Max	@ f kHz	Package
BC522		20	—	—	400/2000	2.0	3.0	1.0	3.0	WB	TO-92
BC522C		20	—	—	400/800	2.0	3.0	1.0	3.0	WB	TO-92
BC522D		20	—	—	750/1550	2.0	3.0	1.0	3.0	WB	TO-92
BC522E		20	—	—	1200/2200	2.0	3.0	1.0	3.0	WB	TO-92
BC113		20	120/-	0.1	200/-	1.0	2.5 (Typ)	1.0	—	—	TO-106
	BC205	20	80 (Typ)/-	0.01	110/500	2.0	10	1.0	—	—	TO-106
	BC205A	20	80 (Typ)/-	0.01	110/220	2.0	10	1.0	—	—	TO-106
	BC205C	20	80 (Typ)/-	0.01	400/800	2.0	10	1.0	—	—	TO-106
	BC179	20	120/460	2.0	—	—	4.0	1.0	4.0	WB	TO-18
	BC179A	20	120/220	2.0	—	—	4.0	1.0	4.0	WB	TO-18
	BC179B	20	180/460	2.0	—	—	4.0	1.0	4.0	WB	TO-18

Manufactured in U.S.A.

- ☐ General Purpose, Amplifier and Switching
- ☐ NPN/PNP Complements
- ☐ High Voltage Darlingtons

SMALL SIGNAL

LOW LEVEL, LOW NOISE AMPLIFIER TRANSISTORS (BY ASCENDING V_{CEO}) (Cont'd)

DEVICE NO. Polarity NPN	PNP	V_{CEO} V Min	h_{FE} Min/Max	@ I_C mA	h_{FE} Min/Max	@ I_C mA	NF dB Max	@ f kHz	NF dB Max	@ f kHz	Package
	BC178	25	70/460	2.0	—	—	10	1.0	—	—	TO-18
	BC178VI	25	70/140	2.0	—	—	10	1.0	—	—	TO-18
	BC178A	25	120/220	2.0	—	—	10	1.0	—	—	TO-18
	BC178B	25	180/460	2.0	—	—	10	1.0	—	—	TO-18
BC114		25	120/-	0.1	200/-	10	3.0	1.0	—	—	TO-106
2N5089		25	400/1200	0.1	400/-	10	—	—	2.0	WB	TO-92
2N3565		25	70/-	0.1	150/600	1.0	—	—	—	—	TO-106
PN3565		25	70/-	0.1	150/600	1.0	—	—	—	—	TO-92
SE4010		25	200/1000	1.0	—	—	3.0	1.0	—	—	TO-106
SE4002		25	200/1000	1.0	—	—	—	—	—	—	TO-106
SE4001		25	60/300	1.0	—	—	—	—	—	—	TO-106
BC115		30	50/-	1.0	50/-	100	—	—	—	—	TO-105
BC318	BC321	30	90 (Typ)/-	0.01	110/800	2.0	6.0	1.0	—	—	TO-92
BC318A	BC321A	30	90 (Typ)/-	0.01	110/220	2.0	6.0	1.0	—	—	TO-92
BC318B	BC321B	30	150 (Typ)/-	0.01	200/450	2.0	6.0	1.0	—	—	TO-92
BC318C		30	270 (Typ)/-	0.01	420/800	2.0	6.0	1.0	—	—	TO-92
SE4023		30	900/-	0.01	1200/2200	10	3.0	1.0	8.0	0.01	TO-106
2N5088		30	300/900	0.1	300/-	10	—	—	3.0	WB	TO-92
	BC321C	30	80(Typ)/-	0.01	400/800	2.0	6.0	1.0	—	—	TO-92
	2N5138	30	50/800	0.10	50/-	1.0	—	—	—	—	TO-106
	PN5138	30	50/800	0.10	50/-	1.0	—	—	—	—	TO-92
	BC153	40	50/-	0.10	50/-	10	1.0	1.0	—	—	TO-106
	BC154	40	160/-	0.10	160/-	10	2.5	1.0	—	—	TO-106
	2N4250	40	250/700	0.10	250/-	1.0	2.0	1.0	2.0	WB	TO-106
	PN4250	40	250/700	0.10	250/-	1.0	2.0	1.0	2.0	WB	TO-92
	2N4248	40	50/-	0.10	50/-	1.0	—	—	—	—	TO-106
	PN4248	40	50/-	0.10	50/-	1.0	—	—	—	—	TO-92
BC207	BC204	45	90(Typ)/-	0.01	50/450	2.0	10	1.0	—	—	TO-106
BC207A	BC204A	45	90(Typ)/-	0.01	110/220	2.0	10	1.0	—	—	TO-106
BC207B	BC204B	45	150(Typ)/-	0.01	200/450	2.0	10	1.0	—	—	TO-106
BC317	BC320	45	90(Typ)/-	0.01	110/450	2.0	6.0	1.0	—	—	TO-92
BC317A	BC320A	45	90(Typ)/-	0.01	110/220	2.0	6.0	1.0	—	—	TO-92
BC317B	BC320B	45	150(Typ)/-	0.01	200/450	2.0	6.0	1.0	—	—	TO-92
	BC177	45	70/220	2.0	—	—	10	1.0	—	—	TO-18
	BC177VI	45	70/140	2.0	—	—	10	1.0	—	—	TO-18

DEVICE NO. Polarity NPN	PNP	V_{CEO} V Min	h_{FE} Min/Max	@ I_C mA	h_{FE} Min/Max	@ I_C mA	NF dB Max	@ f kHz	NF dB Max	@ f kHz	Package
	BC177A	45	120/220	2.0	—	—	10	1.0	—	—	TO-18
	BC177B	45	180/460	2.0	—	—	10	1.0	—	—	TO-18
	2N3964	45	180/-	0.001	250/500	0.01	2.0	1.0	4.0	0.1	TO-18
2N930		45	100/300	0.01	600/-	10	—	—	3.0	WB	TO-18
2N5962		45	450/-	0.01	600/1400	10	3.0	1.0	3.0	WB	TO-92
SE4021		45	450/	0.01	600/1400	10	3.0	1.0	3.0	WB	TO-106
BC523		45	180/800	2.0	100/-	0.01	—	—	—	—	TO-92
BC523B		45	180/400	2.0	100/-	0.01	—	—	—	—	TO-92
BC523C		45	380/800	2.0	100/-	0.01	—	—	—	—	TO-92
BC521		45	600/1400	10	350/-	0.01	3.0	1.0	—	—	TO-92
BC521C		45	380/800	2.0	350/-	0.01	3.0	1.0	3.0	WB	TO-92
BC521D		45	1750/1500	2.0	350/-	0.01	3.0	1.0	3.0	WB	TO-92
2N5210		50	2 200/600	0.1	250/-	10	3.0	1.0	2.0	WB	TO-92
2N5209		50	100/300	0.1	150/-	10	4.0	1.0	3.0	WB	TO-92
	2N5087	50	250/800	0.10	250/-	10	2.0	1.0	2.0	WB	TO-92
	2N5086	50	150/500	0.10	150/-	10	3.0	1.0	3.0	WB	TO-92
	BC526	50	40/-	0.01	(100/600)	2.0	—	—	—	—	TO-92
	BC526A	50	40/-	0.01	(100/300)	2.0	—	—	10	WB	TO-92
	EN3962	60	60/-	0.01	100/300	0.01	3.0	1.0	10	0.1	TO-106
	2N4250A	60	250/700	0.10	250/-	1.0	2.0	1.0	2.0	WB	TO-106
	2N4249	60	100/300	0.10	100/-	1.0	3.0	1.0	3.0	WB	TO-106
	PN4249	60	100/300	0.10	100/-	1.0	3.0	1.0	3.0	WB	TO-92
	2N3965	60	180/-	0.001	250/500	0.01	2.0	1.0	4.0	0.1	TO-18
	BFX37	60	70/300	0.01	100/-	1.0	3.0	1.0	3.0	WB	TO-18
	2N3962	60	60/-	0.001	100/300	0.01	3.0	1.0	10	0.1	TO-18
2N5961		60	100/-	0.01	150/950	10	6.0	1.0	—	—	TO-92
SE4020		60	100/-	0.01	150/950	10	6.0	1.0	—	—	TO-106
2N2484		60	100/500	0.01	250/-	1.0	2.0	10	3.0	WB	TO-18
EN2484		60	100/500	0.01	250/-	1.0	2.0	10	3.0	WB	TO-106
PN2484		60	100/500	0.01	250/-	1.0	2.0	10	3.0	WB	TO-92
BC520		60	150/700	10	100/-	0.01	3.0	1.0	3.0	WB	TO-92
BC520B		60	180/460	2.0	100/-	0.01	3.0	1.0	3.0	WB	TO-92
BC520C		60	380/800	2.0	100/-	0.01	3.0	1.0	3.0	WB	TO-92
2N3117		60	250/500	0.01	400/-	1.0	1.0	1.0	1.0	10	TO-18

HIGH VOLTAGE AMPLIFIER TRANSISTORS (BY ASCENDING V_{CEO})

DEVICE NO. Polarity NPN	PNP	V_{CEO} V Min	h_{FE} Min/Max	@ I_C mA	f_T MHz Min	C_{ob} pF Max	P_D T_A 25°C mW	P_D T_C 25°C W	Package
	MPSL51	100	40/250	50	60	8.0	625	1.0	TO-92
MPSL01		120	50/300	10	60	8.0	814	1.79	TO-92
2N5830		120	80/500	25	100	40	814	1.79	TO-92
	BC530	120	40/180	10	100	6.0	625	1.0	TO-92
	2N5400	120	40/180	10	100	6.0	625	1.0	TO-92
BFY57		125	30/150	30	40	12	800	5.0	TO-39
BC532		140	60/250	10	100	6.0	814	1.79	TO-92
2N5550		140	60/250	10	100	6.0	814	1.79	TO-92
2N3114		150	30/120	30	40	9.0	800	5.0	TO-39
	BC531	150	60/240	10	100	6.0	625	1.0	TO-92
	PN4888	150	40/400	10	30	4.0	625	1.0	TO-92
	2N5401	150	60/240	10	100	6.0	625	1.0	TO-92

DEVICE NO. Polarity NPN	PNP	V_{CEO} V Min	h_{FE} Min/Max	@ I_C mA	f_T MHz Min	C_{ob} pF Max	P_D T_A 25°C mW	P_D T_C 25°C W	Package
	PN4889	150	80/300	10	40	4.0	625	1.0	TO-92
BF257		160	40/150	10	40	3.5	1000	7.0	TO-39
BC533		160	80/250	10	100	6.0	814	1.79	TO-92
MPS5551M		160	80/250	10	100	6.0	814	1.79	TO-92
2N5831		160	80/250	10	100	4.0	814	1.79	TO-92
2N5832		160	175/500	10	100	4.0	814	1.79	TO-92
2N5833		180	50/250	10	100	4.0	814	1.79	TO-92
BF336		180	20/-	30	80	(3.5)	800	—	TO-39
BD115		180	22/-	50	—	3.5	—	6.0	TO-39
BF337		200	20/-	30	80	(3.5)	800	—	TO-39
2N4926		200	20/200	30	30	(6.0)	1000	7.0	TO-39
MPSA43		200	50/200	30	50	4.0	878	2.08	TO-92

Manufactured in U.S.A.

Small Signal Transistors

FAIRCHILD

- General Purpose, Amplifier and Switching
- NPN/PNP Complements
- High Voltage Darlingtons

SMALL SIGNAL

HIGH VOLTAGE AMPLIFIER TRANSISTORS (BY ASCENDING V_{CEO}) (Cont'd)

DEVICE ND. Polarity NPN	PNP	V_{CEO} V Min	h_{FE} Min/Max	@ I_C mA	f_T MHz Min	C_{ob} pF Max	P_D T_A 25°C mW	P_D T_C 25°C W	Package
	MPSA93	200	30/150	30	50	8.0	625	1.0	TO-92
SE7055		220	40/150	10	40	(3.5)	1000	7.0	TO-39
PE7058		220	40/220	30	40	4.0	1230	4.17	TO-92
BF338		225	20/-	30	80	(3.5)	800	—	TO-39
BF258		250	40/150	10	40	3.5	1000	7.0	TO-39
2N4927		250	20/200	30	30	(6.0)	1000	7.0	TO-39
2N5059		250	30/150	30	30	10	1000	5.0	TO-39

DEVICE NO. Polarity NPN	PNP	V_{CEO} V Min	h_{FE} Min/Max	@ I_C mA	f_T MHz Min	C_{ob} pF Max	P_D T_A 25°C mW	P_D T_C 25°C W	Package
2N5058		300	35/150	30	30	10	1000	5.0	TO-39
MPSA42		300	40/200	30	50	3.0	878	2.08	TO-92
PE7059		300	40/200	30	40	4.0	1230	4.17	TO-92
BF259		300	25/-	30	90 (Typ)	4.2	1000	7.0	TO-39
	MPSA92	300	25/-	30	50	6.0	625	1.0	TO-92
SE7056		300	40/100	10	40	(3.0)	1000	7.0	TO-39

NPN RF–IF AMPLIFIER AND OSCILLATOR TRANSISTORS (BY ASCENDING FREQUENCY)

DEVICE NO.	PG @ f [GMA] (OSC POWER) dB Min	MHz	V_{CEO} V Min	f_T MHz Min	C_{ob} [C_{ce}] (C_{cb}) pF Max	NF dB Max	@ f MHz	P_D T_A 25°C mW	Package
BF160	—	—	12	400	1.2	—	—	310	TO-106
BF152	28	10.7	12	600	1.2	—	—	310	TO-106
BF159	22	40	20	600	.2	3.5 (Typ)	60	310	TO-106
BF163	22	40	40	400	0.8 (Typ)	3.0 (Typ)	40	310	TO-106
PE5025	25	45	30	300	(1.1)	—	—	425 (65°C)	TO-92
FTR118	27	45	20	300	(0.2) (Typ)	5.0	45	500	TO-92
BF167	27	45	30	300	0.22	3.0 (Typ)	45	175	TO-72
PE5030B	28	45	40	600	(0.4)	—	—	425 (65°C)	TO-92
BF222	20 (Typ)	100	50	400	0.4 (Typ)	5.0	0.1	310	TO-72
2N3563	14	200	12	600	1.7	—	—		TO-106
2N5179	15	200	12	900	(1.0)	4.5	200	250	TO-72
2N918	15	200	15	600	1.7	6.0	60	200	TO-72
PN918	15	200	15	600	1.7	6.0	60	625	TO-92
BF162	15	200	40	400	1.2	5.5	200	310	TO-106
PN3690	15	200	40	400	1.6	5.5	200	200	TO-92
FTR168	16	200	300	400	0.12 (Typ)	4.0	200	500	TO-92
2N5130	17	200	12	450	(1.7)	—	—	200	TO-106
SE5020	20	200	20	375	0.5	3.3	200	175	TO-18
FTR158	20	200	20	300	(0.20) (Typ)	3.3	200	500	TO-92
SE5035	22	200	30	600	0.3	—	—	200	TO-18
FTR129	22	200	30	600	(0.20) (Typ)	4.5	200	500	TO-92
PE5031	22	200	30	600	(0.4)	4.5	200	425 (65°C)	TO-92

DEVICE NO.	PG @ f [GMA] (OSC POWER) dB Min	MHz	V_{CEO} V Min	f_T MHz Min	C_{ob} [C_{ce}] (C_{cb}) pF Max	NF dB Max	@ f MHz	P_D T_A 25°C mW	Package
2N2857	12.5	450	15	1000	(1.0)	4.5	450	250	TO-72
2N3839	12.5	450	15	1000	(1.0)	3.4	450	250	TO-72
2N3880	14	450	15	1200	(.75)	3.5	450	250	TO-72
2N5031	14	450	10	1000	(1.5)	2.5	450	250	TO-72
FMT1090	14 (Typ)	450	14	1400 (Typ)	(1.2)	4.0	450	600	TO-92
FMT1091	15 (Typ)	450	14	1400 (Typ)	(1.2)	3.5	450	600	TO-92
FMT1190	12.5 (Typ)	450	12	1400 (Typ)	(1.2)	5.0	450	600	TO-92
FMT2060	15 (Typ)	450	14	1000	(1.0)	2.8 (Typ)	450	240	TO-120
FMT2080	13.0 (Typ)	450	14	1400 (Typ)	(0.9)	2.0 (Typ)	450	200	TO-72
FMT2085	13.0 (Typ)	450	14	1400 (Typ)	(1.0)	2.0 (Typ)	450	400	TO-92
FMT2090	13.0 (Typ)	450	14	1400 (Typ)	(0.8)	2.0 (Typ)	450	240	TO-120
2N5770	15	500	15	900	—	6.0	60	625	TO-92
PN3563	(30)	500	12	600	1.7	6.0	60	625	TO-92
PN918	(30)	500	15	600	1.7	6.0	60	625	TO-92
SE3002	(3.0)	930	12	600	1.7	—	—	200	TO-106
FMT1061	—	—	14	1000	(1.0)	3.5	450	250	TO-72
FMT1061A	13.8 (Typ)	1000	14	1300	(1.0)	3.0	450	250	TO-72
FTR129A	—	—	35	1000 (Typ)	(0.40) (Typ)	—	—	500	TO-92
2N3570	—	—	15	1500	(0.75)	7.0	1000	250	TO-72
2N3571	—	—	15	1200	(0.85)	4.0	450	250	TO-72
2N3572	—	—	13	1000	(0.85)	6.0	450	250	TO-72
2N3683	—	—	12	1000	2.0	4.0	200	250	TO-72

DUAL TRANSISTORS (BY ASCENDING V_{CEO})

DEVICE NO. Polarity NPN	PNP	V_{CEO} V Min	h_{FE} Min/Max	@ I_C mA	Matching h_{FE} %	Matching V_{BE} mV	Package
2N2920		60	150/300	0.01	10	3.0	TO-78
2N2920A		60	150/300	0.01	10	1.5	TO-78
	2N3800	60	150/450	0.1	—	—	TO-71
	2N3806	60	150/450	0.1	—	—	TO-78
	2N3802	60	150/450	0.1	20	8.0	TO-71
	2N3808	60	150/450	0.1	20	8.0	TO-78
	2N3804	60	150/450	0.1	10	5.0	TO-71
	2N3810	60	150/450	0.1	10	5.0	TO-78
	2N4025	60	250/600	0.1	10	3.0	TO-78
	2N3805	60	300/900	0.1	10	5.0	TO-71
	2N3811	60	300/900	0.1	10	5.0	TO-78
	2N4017	80	100/350	0.01	—	—	TO-78
MD2369A		15	40/120	10.	10	5.0	TO-78

DEVICE NO. Polarity NPN	PNP	V_{CEO} V Min	h_{FE} Min/Max	@ I_C mA	Matching h_{FE} %	Matching V_{BE} mV	Package
MD2369B		15	40/120	10	20	10	TO-78
MD918A		15	50/-	1.0	10	5.0	TO-78
MD918B		15	50/-	1.0	20	5.0	TO-78
MD2218A		40	40/120	150	—	—	TO-78
MD2219A		40	100/300	150	—	—	TO-78
2N2913		45	60/240	0.01	—	—	TO-78
2N2917		45	60/240	0.01	20	10	TO-78
2N2915		45	60/240	0.01	10	3.0	TO-78
2N2914		45	150/300	0.01	—	—	TO-78
2N2918		45	150/300	0.01	20	5.0	TO-78
	2N4020	45	250/600	0.01	20	5.0	TO-78
	2N4023	45	250/600	0.1	10	3.0	TO-78
2N2919		60	60/240	0.01	10	3.0	TO-39

Manufactured in U.S.A.

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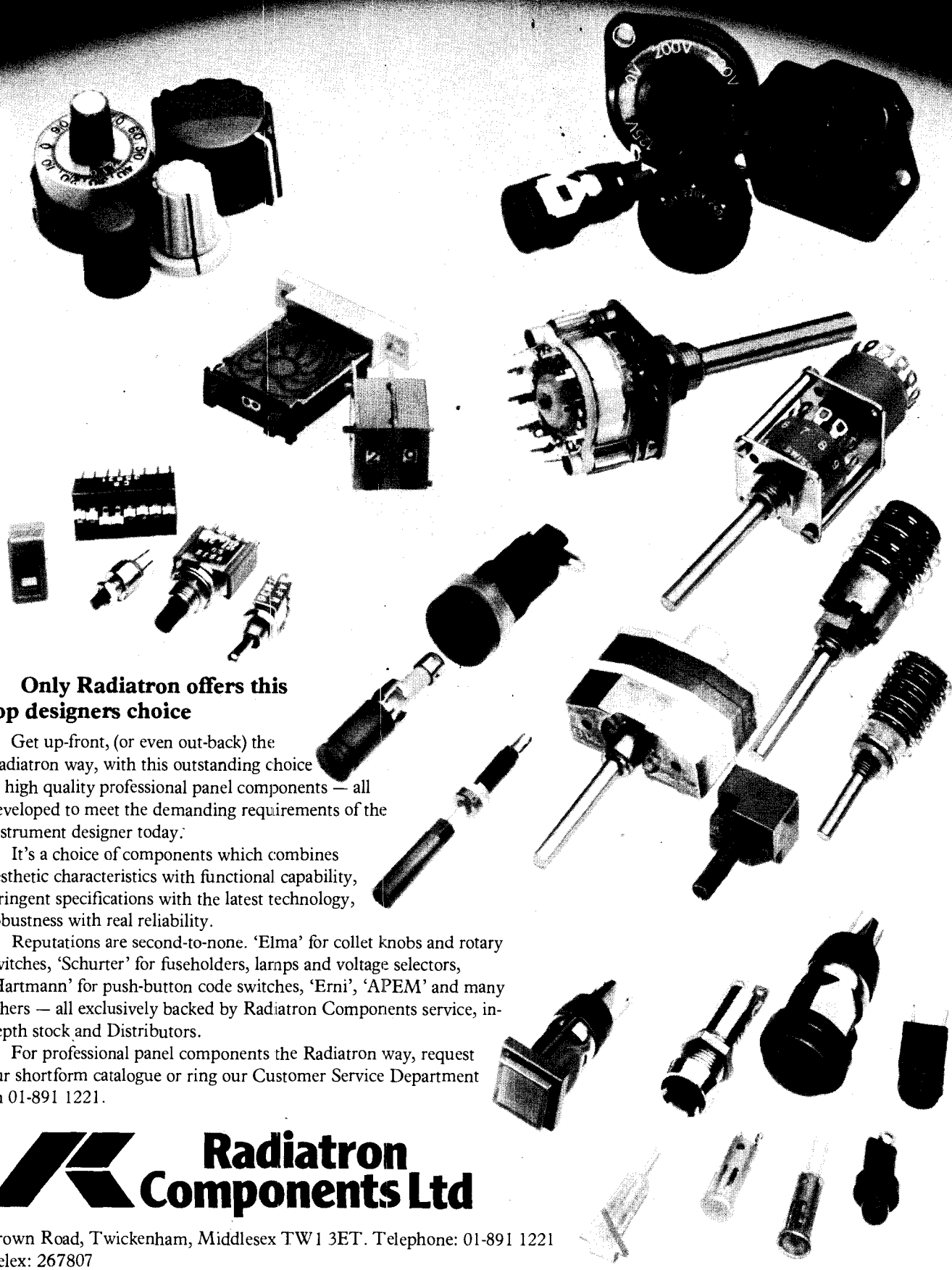

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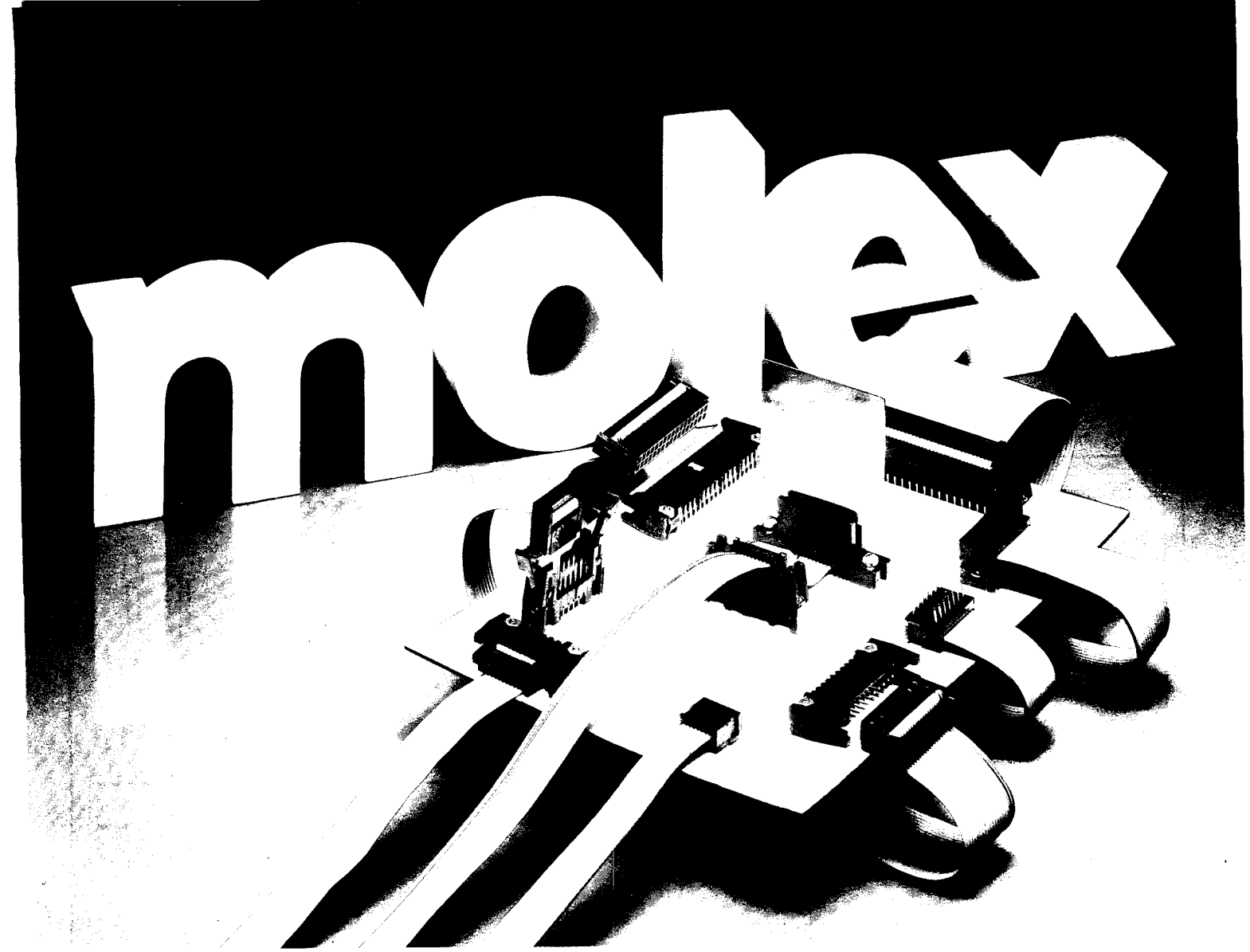

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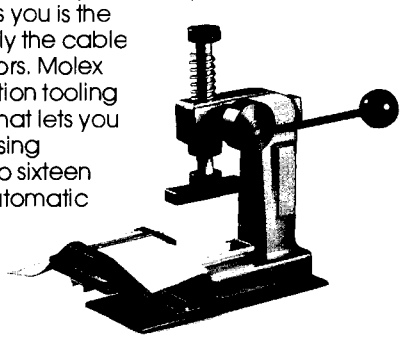

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L.E.D.'s

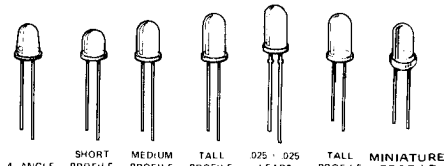
FAIRCHILD

- Available in Red, Green, Amber and Yellow
- GaAsP and GaP
- Choice of Lens and Packaged Profile

LED VISIBLE LAMP SELECTION GUIDE

Lamp Size/Pkge.		T-1¾ (8)	T-1¾ (4)		T-1¾ (5)		T-1¾ (6)		T-1¾ (7)		T-1¾ (MV) (9/10)		T1
Lens Diameter		.200	.190		.190		.190		.190		.200		.150
Lens Height		.350	.230		.285		.340		.340		.340		.210
Color	Mat'l	Pt Source	Diff.	Pt Source	Diff.	Pt Source	Diff.	Pt Source	Diff.	Pt Source	Diff.	Pt Source	Diff.
Red	GaAsP	FLV104	FLV140 **FLV150** **FLV152**		FLV110 FLV117 FLV112	FLV111 FLV118			FLV160		MV5051 MV5053 MV5054-1 MV5054-2 MV5054-3	MV5050 MV5052	TIL 209A
Red	GaP												
Green	GaP		FLV340		FLV310 FLV315	**FLV311**	FLV350 FLV355		FLV360 FLV365		MV5253 MV5254	MV5252	TIL 211
Yellow	GaP		FLV440		FLV410	**FLV411**	FLV450		FLV460		MV5353 MV5354	MV5352	TIL 213
Red	Super GaAsP		FLV540		FLV510	**FLV511**	FLV550		FLV560		MV5753 MV5754	MV5752	
Amber	Super GaAsP										MV5153 MV5154	MV5152	

PACKAGE OUTLINE NUMBER



4 ANGLE	SHORT PROFILE	MEDIUM PROFILE	TALL PROFILE	.025 □ .025 LEADS	TALL PROFILE	MINIATURE PROFILE
8	4	5	6	7	9/10	11

LED VISIBLE LAMPS

DEVICE NO.	Lens Characteristic	I_F mA Typ	Luminous Intensity I_F = 20mA mcd Typ	V_F I_F = 20mA V Typ	Package
FLV104A	Clear	100	(4.0mW/sr)	2.0	Opto-8
FLV110	Red Diffused	20	2.0	1.7	Opto-5
FLV111	Clear Point Source	20	2.0	1.7	Opto-5
FLV112	Clear Diffused	20	2.0	1.7	Opto-5
FLV117	Red Diffused	50	1.0	1.9	Opto-5
FLV140	Red Diffused	20	2.0	1.7	Opto-4
FLV150	Red Diffused	20	2.0	1.7	Opto-4
FLV152	Red Point Source	20	3.0	1.7	Opto-4
FLV160	Red Diffused	20	2.0	1.7	Opto-7
FLV310	Green Diffused	20	3.2	2.3	Opto-5
FLV311	Green Point Source	20	3.2	2.3	Opto-5
FLV315	Green Diffused	20	2.5	3.0	Opto-5
FLV340	Green Diffused	20	3.2	2.3	Opto-4
FLV350	Green Diffused	20	3.2	2.3	Opto-6
FLV355	Green Diffused	20	2.5	3.0	Opto-6
FLV360	Green Diffused	20	3.2	2.3	Opto-7
FLV365	Green Diffused	20	2.5	3.0	Opto-7
FLV410	Yellow Diffused	20	3.2	2.3	Opto-5
FLV411	Yellow Point Source	20	3.2	2.3	Opto-5
FLV440	Yellow Diffused	20	3.2	2.3	Opto-4
FLV450	Yellow Diffused	20	3.2	2.3	Opto-6
FLV460	Yellow Diffused	20	3.2	2.3	Opto-7
FLV510	Red Diffused	10	3.0	1.9	Opto-5
FLV511	Red Point Source	10	3.0	1.9	Opto-5
FLV540	Red Diffused	10	3.0	1.9	Opto-4

DEVICE NO.	Lens Characteristic	I_F mA Typ	Luminous Intensity I_F = 20mA mcd Typ	V_F V Typ	Package
FLV550	Red Diffused	10	3.0	1.9	Opto-6
FLV560	Red Diffused	10	3.0	1.9	Opto-7
MV5050	Clear Point Source	20	2.0	1.7	Opto-9
MV5051	Clear Diffused	20	1.6	1.7	Opto-9
MV5052	Red Point Source	20	2.0	1.7	Opto-9
MV5053	Red Diffused	20	1.6	1.7	Opto-9
MV5054-1	Red Semi-Diffused	20	2.0	1.7	Opto-10
MV5054-2	Red Semi-Diffused	20	3.0	1.7	Opto-10
MV5054-3	Red Semi-Diffused	20	4.0	1.7	Opto-10
MV5152	Amber Point Source	20	16.0	1.9	Opto-10
MV5153	Amber Diffused	20	4.0	1.9	Opto-9
MV5154	Amber Semi-Diffused	20	8.0	1.9	Opto-10
MV5252	Green Point Source	20	6.0	2.3	Opto-10
MV5253	Green Diffused	20	1.5	2.3	Opto-9
MV5254	Green Semi-Diffused	20	3.0	2.3	Opto-10
MV5352	Yellow Point Source	20	10.0	2.3	Opto-10
MV5353	Yellow Diffused	20	6.0	2.3	Opto-9
MV5354	Yellow Semi-Diffused	20	10.0	2.3	Opto-10
MV5752	Red Point Source	20	16.0	1.9	Opto-10
MV5753	Red Diffused	20	4.0	1.9	Opto-9
MV5754	Red Semi-Diffused	20	8.0	1.9	Opto-10
TIL209A	Red Diffused T-1	20	2.0	1.7	Opto-11
TIL211	Green Diffused T-1	20	0.5	1.7	Opto-11
TIL213	Yellow Diffused T-1	20	0.5	1.7	Opto-11

LED LAMP MOUNTING HARDWARE

DEVICE NO.	Panel Thickness	Panel Hole	Description
FLS010	.060 to .250	.265 ±.002	Single-Part Construction (Flat Black Finish)
FLS011	0.187	.250 ±.003	3-Piece Construction: Hex Nut, Threaded Barrel and Bezel (Bezel in Silver Finish)
FLS012	0.187	.250 ±.003	3-Piece Construction: Hex Nut, Threaded Barrel and Bezel (Bezel in Black Finish)
MP52	0.125	.250 ±.003	Mounting Clip for MV Series Lamps

INFRARED EMITTERS

DEVICE NO.	Description	I_F mA Max	V_F I_F = 100mA V Typ	Wave Length @ Peak Emission nm Typ	Axial Intensity I_F = 100mA mW/sr Typ
FPE104	Lead Frame Package Narrow Beam	100	1.35	890	10
FPE500	TO-18, Dome Lens	250	1.35	890	10.0
FPE510	TO-18, Flat Lens	250	1.35	890	1.0
FPE520	TO-18, Dome Lens	250	1.35	940	50
FPE530	TO-18, Flat Lens	250	1.35	940	5.0

Manufactured in U.S.A.

- Seven Segment Led Displays
- Nominal 0.375", 0.5" 0.8" Characters
- L.E.D. Display Packages

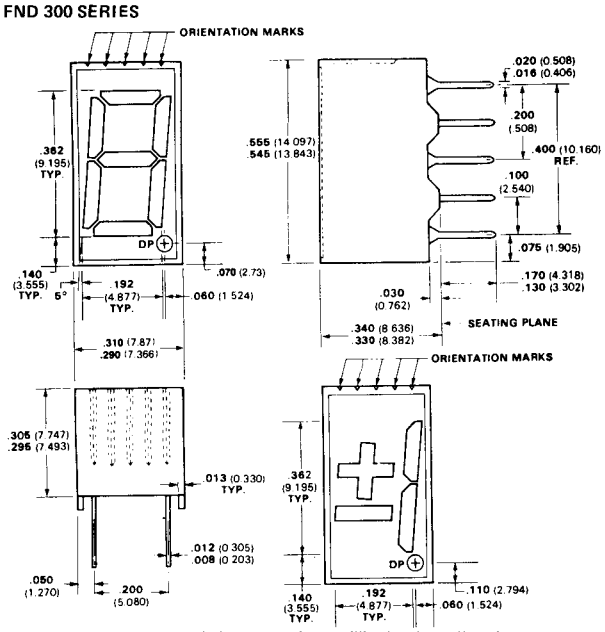
7-SEGMENT NUMERIC DISPLAYS

DEVICE NO.	Character Height Inches	Polarity	Color	Description	Decimal Point	Peak Current/Seg Pulse = 100μs mA	V_F I_F = 20mA/Seg V	Luminous Intensity/Seg I_F = 20mA μcd
FND350	0.362	CA	Red	7-Segment Display	RH	200	1.7	450
FND357	0.362	CC	Red	7-Segment Display	RH	200	1.7	450
FND358	0.362	CC	Red	Overflow ±1 Digit	RH	200	1.7	450
FND360	0.362	CA	Red	7-Segment Display	RH	200	1.7	900
FND367	0.362	CC	Red	7-Segment Display	RH	200	1.7	900
FND368	0.362	CC	Red	Overflow ±1 Digit	RH	200	1.7	900
FND500	0.500	CC	Red	7-Segment Display	RH	200	1.7	600
FND501	0.500	CC	Red	Overflow ±1 Digit	RH	200	1.7	600
FND507	0.500	CA	Red	7-Segment Display	RH	200	1.7	600
FND508	0.500	CA	Red	Overflow ±1 Digit	RH	200	1.7	600
FND530	0.500	CC	Grn	7-Segment Display	RH	80	2.2	2000
FND531	0.500	CC	Grn	Overflow ±1 Digit	RH	80	2.2	2000
FND537	0.500	CA	Grn	7-Segment Display	RH	80	2.2	2000
FND538	0.500	CA	Grn	Overflow ±1 Digit	RH	80	2.2	2000
FND540	0.500	CC	Yel	7-Segment Display	RH	80	2.2	2000
FND541	0.500	CC	Yel	Overflow ± Digit	RH	80	2.2	2000
FND547	0.500	CA	Yel	7-Segment Display	RH	80	2.2	2000
FND548	0.500	CA	Yel	Overflow ± Digit	RH	80	2.2	2000

DEVICE NO.	Character Height Inches	Polarity	Color	Description	Decimal Point	Peak Current/Seg Pulse = 100μs mA	V_F I_F = 20mA/Seg V	Luminous Intensity/Seg I_F = 20mA μcd
FND550	0.500	CC	Amb	7-Segment Display	RH	80	2.2	2000
FND551	0.500	CC	Amb	Overflow ±1 Digit	RH	80	2.2	2000
FND557	0.500	CA	Amb	7-Segment Display	RH	80	2.2	2000
FND558	0.500	CA	Amb	Overflow ±1 Digit	RH	80	2.2	2000
FND560	0.500	CC	Red	7-Segment Display	RH	200	2.2	1200
FND561	0.500	CC	Red	Overflow ±1 Digit	RH	200	1.7	1200
FND567	0.500	CA	Red	7-Segment Display	RH	200	1.7	1200
FND568	0.500	CA	Red	Overflow ±1 Digit	RH	200	1.7	1200
FND800	0.800	CC	Red	7-Segment Display	RH	200	1.7	600
FND807	0.800	CA	Red	7-Segment Display	RH	200	1.7	600
FND6710	0.560	CA	Red	Dual Digit Display	RH	200	1.7	500
FND6730*	0.560	CA	Red	1½ Digit ±18 Display	RH	200	1.7	500
FND6740	0.560	CC	Red	Dual Digit Display	RH	200	1.7	500
FND6750*	0.560	CC	Red	½ Digit ±18 Display	RH	200	1.7	500
MAN71A	0.300	CA	Red	7-Segment Display	RH	200	1.7	450
MAN72A	0.300	CA	Red	7-Segment Display	LH	200	1.7	450
MAN73A	0.300	CA	Red	Overflow ±1 Digit	None	200	1.7	450
MAN74A	0.300	CC	Red	7-Segment Display	RH	200	1.7	450

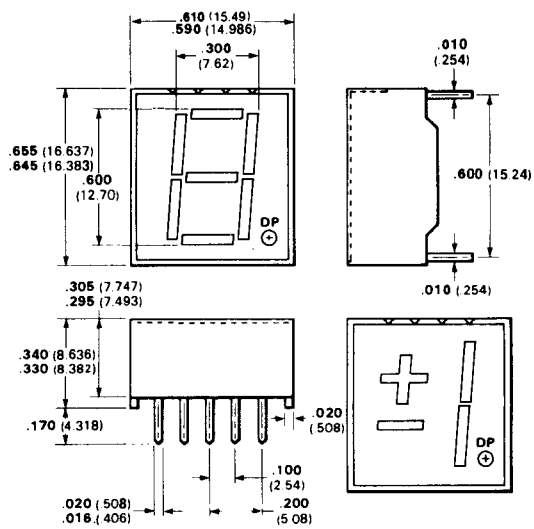
PACKAGE OUTLINE

FND 300 SERIES



NOTES: All dimensions in inches (bold) and millimeters (parentheses)
For polarity indication the top surface is ribbed.
The unit LED segments cannot necessarily be seen through the lens cap.
Lens cap colour is red for red LED.
Pins 1 and 6 are common.
All dimensions are ±.015 inch.

FND 500 SERIES



NOTES: All dimensions in inches (bold) and millimeters (parentheses)
For polarity indication the surface is ribbed.
The unilt LED segments cannot necessarily be seen through the lens cap.
Lens cap colour is red for red LED
Pins 3 and 8 are common
All dimensions are ±.015 Inch.

Manufactured in U.S.A.

Phototransistors & Sensors

FAIRCHILD

- ☐ Metal Can or Plastic Package
- ☐ Flat or Round Lens
- ☐ Darlingtons

PHOTO TRANSISTORS

DEVICE NO.	Description	V_{CEO} I_C = 1.0mA V Min	V_{CEO} I_C = 1.0mA V Typ	$I_{CE(It)}$ V_{CE} = 5.0V mA Min	$I_{CE(It)}$ V_{CE} = 5.0V mA Typ	$I_{CE(It)}$ V_{CE} = 5.0V mA Max	$V_{CE(sat)}$ H = 20mW/cm² V Min	$V_{CE(sat)}$ H = 20mW/cm² V Typ	$V_{CE(sat)}$ H = 20mW/cm² V Max	t_r/t_f µs Typ
FPT100	Plastic, Dome Lens General Purpose	30	50	H = 5.0mW/cm²	0.2	1.4 —	I_C = 500µA —	0.16	0.3	2.8
FPT100A	Plastic, Dome Lens 1:3 Sensitivity	30	50	H = 5.0mW/cm²	1.0	1.4 3.0	I_C = 500µA —	0.16	0.3	2.8
FPT100B	Plastic, Dome Lens 1:2 Sensitivity	30	50	H = 5.0mW/cm²	1.3	1.4 2.6	I_C = 500µA —	0.16	0.3	2.8
FPT101	Miniature, .080" Dia. Hermetic Package	I_C = 0.1mA, H ≤ 0.1µW/cm² 30		H = 20mW/cm²	0.8	3.5 —	I_C = 0.4mA —	0.25	0.3	2.8
FPT102	Photodiode Hermetic Package	I_R = 5.0µA, H ≤ 0.1µW/cm² 50	120	V_R = -10.0V, H ≤ 0.1µW/cm² —	0.1nA	25nA	V_R = -10V 12µA	20µA	—	0.2
FPT110	Plastic Flat Lens General Purpose	30	50	H = 5.0mW/cm²	0.2	0.88 —	I_C = 500µA —	0.16	0.33	2.8
FP110A	Plastic Flat Lens 1:3 Sensitivity	30	50	H = 5.0mW/cm²	0.6	0.88 1.8	I_C = 500µA —	0.16	0.33	2.8
FPT110B	Plastic Flat Lens 1:2 Sensitivity	30	50	H = 5.0mW/cm²	0.8	0.88 1.6	I_C = 500µA —	0.16	0.33	2.8
FPT120	Plastic, Dome Lens High Sensitivity	20	50	H = 1.0mW/cm²	0.4	1.5 —	I_C = 1.0mA —	0.25	0.55	18
FPT120A	Plastic, Dome Lens 1:3 Sensitivity	15	30	H = 1.0mW/cm²	1.5	2.4 4.5	I_C = 1.0mA —	0.25	0.55	18
FPT120B	Plastic, Dome Lens 1:1.5 Sensitivity	15	30	H = 1.0mW/cm²	2.0	2.4 4.0	I_C = 1.0mA —	0.25	0.55	18
FPT120C	Plastic Cup, Dome Lens	11	20	H = 5.0mW/cm²	16	— 25	I_C = 1.0mA —	0.35	0.55	18
FPT130	Plastic, Flat Lens High Sensitivity	20	50	H = 1.0mW/cm²	0.4	0.9 —	I_C = 1.0mA —	0.25	0.55	18
FPT130A	Plastic, Flat Lens 1:3 Sensitivity	15	30	H = 1.0mW/cm²	0.9	1.5 2.7	I_C = 1.0mA —	0.25	0.55	18
FPT130B	Plastic, Flat Lens 1:2 Sensitivity	15	30	H = 1.0mW/cm²	1.2	1.5 2.4	I_C = 1.0mA —	0.25	0.55	18
FPT131	Plastic, Dome Lens	15	50	H = 5.0mW/cm²	0.1	1.4 —	I_C = 500µA —	0.16	0.7	2.8
FPT132	Plastic, Dome Lens	10	30	H = 1.0mW/cm²	0.2	1.5 —	I_C = 1.0mA —	0.15	0.7	18
FPT136	Plastic, Flat Lens	15	50	H = 5.0mW/cm²	0.1	0.88 —	I_C = 500µA —	0.16	0.7	2.8
FPT137	Plastic, Flat Lens	10	30	H = 1.0mW/cm²	0.2	0.9 —	I_C = 1.0mA —	0.15	0.7	18
FPT220	Plastic, Dome Lens 1:2 Sensitivity	20	50	H = 1.0mW/cm²	1.0	1.5 2.0	I_C = 1.0mA —	0.25	0.55	18

DEVICE NO.	Description	V_{CEO} I_C = 1.0mA V Min	V_{CEO} I_C = 1.0mA V Typ	$I_{CE(It)}$ V_{CE} = 5.0V mA Min	$I_{CE(It)}$ V_{CE} = 5.0V mA Typ	$I_{CE(It)}$ V_{CE} = 5.0V mA Max	$V_{CE(sat)}$ H = 20mW/cm² V Min	$V_{CE(sat)}$ H = 20mW/cm² V Typ	$V_{CE(sat)}$ H = 20mW/cm² V Max	t_r/t_f µs Typ
FPT230	Plastic Flat Lens 1:2 Sensitivity	20	50	H = 1.0mW/cm²	0.6	0.9 1.2	I_C = 1.0mA —	0.25	0.55	18
FPT320	Plastic, Dome Lens 1:3 Sensitivity	20	50	H = 1.0mW/cm²	0.75	1.5 2.25	I_C = 1.0mA —	0.25	0.55	18
FPT330	Plastic, Flat Lens 1:3 Sensitivity	20	50	H = 1.0mW/cm²	0.45	0.9 1.35	I_C = 1.0mA —	0.25	0.55	18
FPT400	Plastic, Dome Lens Photo Darlington	30	50	H = 1.0mW/cm²	7.5	12 —	—	0.9	1.0	100
FPT410	Plastic, Flat Lens Photo Darlington	30	50	H = 1.0mW/cm²	5.0	8.0 —	—	0.9	1.0	100
FPT500	TO-18, Dome Lens	45	60	H = 1.0mW/cm²	1.0	— —	—	0.2	0.33	3.0
FPT500A	TO-18, Dome Lens 1:3 Sensitivity	45	60	H = 1.0mW/cm²	2.0	— 6.0	—	0.2	0.33	3.0
FPT510	TO-18, Flat Lens	45	60	H = 5.0mW/cm²	0.5	— —	—	0.2	0.33	3.0
FPT510A	TO-18, Flat Lens 1:3 Sensitivity	45	60	H = 5.0mW/cm²	1.0	— 3.0	—	0.2	0.33	3.0
FPT520	TO-18, Dome Lens	30	50	H = 1.0mW/cm²	5.0	— —	—	0.2	0.33	10
FPT520A	TO-18, Dome Lens 1:3 Sensitivity	30	50	H = 1.0mW/cm²	6.0	— 18	—	0.2	0.33	10
FPT530	TO-18, Flat Lens	30	50	H = 5.0mW/cm²	3.0	— —	—	0.2	0.33	10
FPT530A	TO-18, Flat Lens 1:3 Sensitivity	30	50	H = 5.0mW/cm²	4.0	— 12	—	0.2	0.33	10
FPT540	TO-18, Dome Lens	12	20	H = 1.0mW/cm²	8.0	— —	—	0.35	0.55	18
FPT540A	TO-18, Dome Lens 1:3 Sensitivity	12	20	H = 1.0mW/cm²	10	— 30	—	0.35	0.55	18
FPT550	TO-18, Flat Lens	12	20	H = 5.0mW/cm²	8.0	— —	—	0.35	0.55	18
FPT550A	TO-18, Flat Lens 1:3 Sensitivity	12	20	H = 5.0mW/cm²	8.0	— 24	—	0.35	0.55	18
FPT560	TO-18, Dome Lens Photo Darlington	30	50	H = 0.5mW/cm²	10	15 —	—	0.9	1.0	100
FPT570	TO-18, Flat Lens Photo Darlington	30	50	H = 0.5mW/cm²	1.0	6.0 —	—	0.9	1.0	100

REFLECTIVE SENSORS

DEVICE NO.(1)	Description	Diode I_F mA Max	Diode V_F I_F = 20mA V Typ	Photo-Transistor V_{CEO} I_{CE} = 1.0mA V Min	Combined I_{OUT} I_F = 50mA, V_{CE} = 5V distance = .40" µA Min	Combined I_{OUT} I_F = 50mA, V_{CE} = 5V distance = .40" µA Max
FPA103/106	Light Reflective Transducer	75	1.25	12	20	—
FPA104/107	Light Reflective Transducer	75	1.25	12	60	180
FPA105/108	Light Reflective Transducer	75	1.25	12	80	160

Manufactured in U.S.A.

- ☐ Up to 6KV Isolation Voltage
- ☐ Transistor Output
- ☐ 6 Pin DIL Package

COUPLERS–TRANSISTOR OUTPUT

Device No.	MAX RATINGS @ Ta = 25° C						COUPLED CHARACTERISTICS				MAX INPUT DIODE CHARACT.		MAX OUTPUT TRANSISTOR CHARACT.		
	Total Power Dissipation P_D mW	Collector Current I_C mA	Collector Emitter Voltage LV_{CEO} V	Reverse Voltage V_R V	Forward Current I_F mA	Isolation Voltage BV_{ISO} kV	Min Current Transfer Ratio I_C/I_F %	@ I_f mA	@ V_{CE} V	Typical Response Time t_r, t_f µs	Forward Voltage V_F V	@ I_F mA	Collector Saturation Voltage $V_{CE}(sat)$ V	@ I_C mA	@ I_F mA
FCD810	250	25	20	3.0	60	1.5ac	10	10	10	4.0	1.5	10	0.7	2.6	50
FCD810A	250	25	20	3.0	60	1.5	10	10	10	4.0	1.5	10	0.7	2.6	50
FCD810B	250	25	20	3.0	60	2.5	10	10	10	4.0	1.5	10	0.7	1.6	50
FCD810C	250	25	20	3.0	60	5.0	10	10	10	4.0	1.5	10	0.7	2.6	50
FCD810D	250	25	20	3.0	60	6.0	10	10	10	4.0	1.5	10	0.7	2.6	50
FCD820	250	25	30	3.0	60	1.5ac	20	10	0.4	2.5	1.5	60	0.4	2.0	10
FCD820A	250	25	30	3.0	60	1.5	20	10	10	2.5	1.5	60	0.4	2.2	15
FCD820B	250	25	30	3.0	60	2.5	20	10	10	2.5	1.5	60	0.4	2.2	15
FCD820C	250	25	30	3.0	60	5.0	20	10	10	2.5	1.5	60	0.4	2.2	15
FCD820D	250	25	30	3.0	60	6.0	20	10	10	2.5	1.5	60	0.4	2.2	15
FCD825	250	25	30	3.0	60	1.5ac	50	10	10	3.0	1.5	60	0.4	2.0	10
FCD825A	250	25	30	3.0	60	1.5	50	10	10	3.0	1.5	60	0.4	2.0	10
FCD825B	250	25	30	3.0	60	2.5	50	10	10	3.0	1.5	60	0.4	2.0	10
FCD825C	250	25	30	3.0	60	5.0	50	10	10	3.0	1.5	60	0.4	2.0	10
FCD825D	250	25	30	3.0	60	6.0	50	10	10	3.0	1.5	60	0.4	2.0	10
FCD830	250	25	30	3.0	60	1.5	20	10	0.4	1.6*	1.5	60	0.4	2.0	10
FCD830A	250	25	30	3.0	60	1.5ac	20	10	10	1.6*	1.5	60	0.4	2.2	15
FCD830B	250	25	30	3.0	60	2.5	20	10	10	1.6*	1.5	60	0.4	2.2	15
FCD830C	250	25	30	3.0	60	5.0	20	10	10	1.6*	1.5	60	0.4	2.2	15
FCD830D	250	25	30	3.0	60	6.0	20	10	10	1.6*	1.5	60	0.4	2.2	15
FCD831	250	25	30	3.0	60	1.5ac	10	10	10	1.6*	1.5	60	0.5	2.0	50
FCD831A	250	25	30	3.0	60	1.5	10	10	10	1.6*	1.5	60	0.5	2.0	50
FCD831B	250	25	30	3.0	60	2.5	10	10	10	1.6*	1.5	60	0.5	2.0	50
FCD831C	250	25	30	3.0	60	5.0	10	10	10	1.6*	1.5	60	0.5	2.0	50
FCD831D	250	25	30	3.0	60	6.0	10	10	10	1.6*	1.5	60	0.5	2.0	50
FCD836	250	25	20	3.0	60	1.5ac	6.0	10	10	1.6*	1.5	10	0.7	2.0	50
FCD836C	250	25	20	3.0	60	5.0	6.0	10	10	1.6*	1.5	10	0.7	2.0	50
FCD836D	250	25	20	3.0	60	6.0	6.0	10	10	1.6*	1.5	10	0.7	2.0	50
4N25	250		30	3.0	80	2.5	20	10	10	2.5	1.5	50	0.5	2.0	50
4N26	250		30	3.0	80	1.5	20	10	10	2.5	1.5	50	0.5	2.0	50
4N27	250		30	3.0	80	1.5	10	10	10	2.5	1.5	50	0.5	2.0	50
4N28	250		30	3.0	80	0.5	10	10	10	2.5	1.5	50	0.5	2.0	50
4N35	400	100	30	6.0	60	3.5	100	10	10	8.0	1.5	10	0.3	0.5	10
4N36	400	100	30	6.0	60	2.5	100	10	10	8.0	1.5	10	0.5	0.3	10
4N37	400	100	30	6.0	60	1.5	100	10	10	8.0	1.5	10	0.3	0.5	10
H11A1	250	100	30	3.0	60	2.5	50	10	10	2.0	1.5	10	0.4	0.5	10
H11A2	250	100	30	3.0	60	1.5	20	10	10	2.0	1.5	10	0.4	0.5	10
H11A3	250	100	30	3.0	60	2.5	20	10	10	2.0	1.5	10	0.4	0.5	10
H11A4	250	100	30	3.0	60	1.5	10	10	10	2.0	1.5	10	0.4	0.5	10

Manufactured in U.S.A.

- Up to 6KV Isolation Voltage
- Transistor and Darlington Output
- 6 pin DIL Package

COUPLERS—TRANSISTOR OUTPUT

	MAX RATINGS @ Ta = 25° C						COUPLED CHARACTERISTICS				MAX INPUT DIODE CHARACT.		MAX OUTPUT TRANSISTOR CHARACT.		
Device No.	Total Power Dissipation P_D mW	Collector Current I_C mA	Collector Emitter Voltage LV_{CEO} V	Reverse Voltage V_R V	Forward Current I_F mA	Isolation Voltage BV_{ISO} kV	Min Current Transfer Ratio I_C / I_F %	@ I_f mA	@ V_{CE} V	Typical Response Time t_r, t_f µS	Forward Voltage V_F V	@ I_F mA	Collector Saturation Voltage $V_{CE(sat)}$ V	@ I_C mA	@ I_F mA
MCT2	250		30	3.0	60	1.5	20	10	10	2.5	1.5	20	0.4	2.0	16
MCT2E	250		30	3.0	60	2.5	20	10	10	2.5	1.5	20	0.4	2.0	16
MCT26	250		30	3.0	60	1.5	6	10	10	2.0	1.5	20	0.5	1.6	60
TIL111	250		30	3.0	100	1.5	12	16	0.4	5.0**	1.4	16	0.4	2.0	16
TIL112	250		20	3.0	100	1.5	2	10	5	15.0**	1.5	10	0.5	2.0	50
TIL114	250		30	3.0	100	2.5	12	16	0.4	5.0**	1.4	16	0.4	2.0	16
TIL115	250		20	3.0	100	2.5	2	10	5	15.0**	1.5	10	0.5	2.0	50
TIL116	250		30	3.0	100	2.5	20	10	10	7.0**	1.5	60	0.4	2.2	15
TIL117	250		30	3.0	100	2.5	50	10	10	9.0**	1.4	16	0.4	0.5	10
TIL118	250		20	3.0	100	1.5	10	10	5	15.0**	1.5	10	0.5	2.0	50

* Guaranteed 2 µs Max Rise and Fall ** Max

COUPLERS—DARLINGTON OUTPUT

	MAX RATINGS @ Ta = 25° C						COUPLED CHARACTERISTICS				MAX INPUT DIODE CHARACT.		MAX OUTPUT DARLINGTON CHARACT.	
Device No.	Power Dissipation P_D mW	Collector Current I_C mA	Collector Emitter Voltage LV_{CEO} V	Reverse Voltage V_R V	Forward Current I_F mA	Isolation Voltage BV_{ISO} kV	Min Current Transfer Ratio I_C / I_F %	@ I_F mA	@ V_{CE} V	Typical Response Time t_r t_f µS	Forward Voltage V_F V	@ I_F mA	Dark Current I_D µA	@ V_{CE} V
FCD850	250	125	30	3.0	80	1.5ac	100	10	5.0	15 150	1.5	20	0.1	10
FCD850C	250	125	30	3.0	80	5.0	100	10	5.0	15 150	1.5	20	0.1	10
FCD850D	250	125	30	3.0	80	6.0	100	10	5.0	15 150	1.5	20	0.1	10
FCD855	250	125	55	3.0	80	1.5ac	100	10	5.0	15 150	1.5	20	0.1	10
FCD855C	250	125	55	3.0	80	5.0	100	10	5.0	15 150	1.5	20	0.1	10
FCD855D	250	125	55	3.0	80	6.0	100	10	5.0	15 150	1.5	20	0.1	10
FCD860	250	125	30	3.0	80	1.5ac	200	1.0	1.0	80 150	1.5	20	0.1	10
FCD860C	250	125	30	3.0	80	5.0	200	1.0	1.0	80 150	1.5	20	0.1	10
FCD860D	250	125	30	3.0	80	6.0	200	1.0	1.0	80 150	1.5	20	0.1	10
FCD865	250	125	30	3.0	80	1.5ac	400	0.5	1.0	80 150	1.5	20	0.1	10
FCD865C	250	125	30	3.0	80	5.0	400	0.5	1.0	80 150	1.5	20	0.1	10
FCD865D	250	125	30	3.0	80	6.0	400	0.5	1.0	80 150	1.5	20	0.1	10
4N29	250	125	30	3.0	80	2.5	100	10	10	10 45	1.5	50	0.1	10
4N30	250	125	30	3.0	80	1.5	100	10	10	10 45	1.5	50	0.1	10
4N31	250	125	30	3.0	80	1.5	50	10	10	10 45	1.5	50	0.1	10
4N32	250	125	30	3.0	80	2.5	500	10	10	10 120	1.5	50	0.1	10
4N33	250	125	30	3.0	80	1.5	500	10	10	10 120	1.5	50	0.1	10
H11B1	250	100	25	3.0	60	2.5	500	1.0	5.0	125 100	1.5	10	100 nA	10
H11B2	250	100	25	3.0	60	1.5	200	1.0	5.0	125 100	1.5	10	100 nA	10
TIL113	250		30	3.0	100	1.5	300	10	1.0	50 50	1.5	10	100 nA	10
TIL119	250		30	3.0	100	1.5	300	10	2.0	50 50	1.5	10	100 nA	10
MCA230	250		30	3.0	60	1.5	100	10	5.0		1.5	20	100 nA	10
MCA231	250	50	30	3.0	60	1.5	200	5	1.0		1.5	10	100 nA	10
MCA255	250		55	3.0	60	1.5	100	10	5.0		1.5	20	100 nA	10

Manufactured in U.S.A.

- ☐ Gates, Counters and Flip Flops
- ☐ Plastic and Ceramic Package
- ☐ Industry Standard

Package Codes for Integrated Circuits

The part number consists of the device type followed by a package code and a temperature code. For example:

7400PC
741TC
7805UC

Note: Products can be dual marked. The alternate code is given where applicable.

Package	Code	Temperature Range	Code
Ceramic DIP	D		
Plastic DIP	P		
Ceramic Mini DIP	R	Commercial	C
Plastic Mini DIP	T		
Metal Can TO–3	K	Military	M
Metal Can TO–5	H		
Plastic TO–220	U		
Plastic TO–92	W		

RTL MICROLOGIC AND CTL COUNTING MICROLOGIC

DEVICE NO.	Description
900	Buffer
901	Counter Adapter
902	Flip-Flop
903	3-Input NOR
904	Half Adder
905	Half Shift
906	Half Shift
907	4-Input NOR
908	Adder
909	Buffer
910	Dual 2-NOR
911	4-Input NOR
912	Half Adder

DEVICE NO.	Description
913	D Flip-Flop
914	Dual 2-NOR
915	Dual 3-NOR
921	Dual 2-Expander
923	JK Flip-Flop
926	JK Flip-Flop
927	Quad Inverter
958	Decade Counter
959	4-Bit Latch
960	BCD Decoder/Dvr
974	JK Flip-Flop
989	Binary Counter

Not recommended for new design.

DTL MICROLOGIC

DEVICE NO.	Description
930	Dual 4-Input Extendable NAND Gate
932	Dual 4-Input Extendable NAND Buffer Gate
933	Extender
935	Extendable Hex Inverter
936	Hex Inverter
937	Hex Inverter
941	Monostable Multivibrator
944	Dual 4-Input Extendable NAND Buffer Gate (Open Collector)
945	RS Flip-Flop
946	Quad 2-Input NAND Gate
948	RS Flip-Flop
949	Quad 2-Input NAND Gate
950	A-C Coupled RS Flip-Flop
951	Monostable Multivibrator

DEVICE NO.	Description
961	Dual 4-Input Extendable NAND Gate
962	Triple 3-Input NAND Gate
963	Triple 3-Input NAND Gate
9093	Dual JK Flip-Flop
9094	Dual JK Flip-Flop
9097	Dual JK Flip-Flop
9099	Dual JK Flip-Flop
9109	High Voltage Hex Inverter
9110	High Voltage Hex Inverter
9111	RS Flip-Flop
9112	High Voltage Hex Inverter
9135	Hex Inverter (Open Collector)
9157	Quad 2-Input Buffered NAND Gate
9158	Quad 2-Input Power NAND Gate

Not recommended for new design.

Manufactured in USA

54/74 Series TTL

FAIRCHILD

- ☐ Standard and Low Power Schottky
- ☐ High Speed and Schottky
- ☐ Available in Plastic or Ceramic Encapsulation

54/74 SERIES SELECTION CHART

DEVICE NO.	DESCRIPTION	54/74 TTL	54H/74H H-TTL	54S/74S S-TTL	54LS/74LS LS-TTL
00	Quad 2-Input NAND Gate	X	X	X	X
01	Quad 2-Input NAND Gate	X	X		
02	Quad 2-Input NOR Gate	X		X	X
03	Quad 2-Input NAND Gate	X		X	X
04	Hex Inverter	X	X	X	X
04A	Hex Inverter			X	
05	Hex Inverter	X	X	X	X
05A	Hex Inverter			X	
06	Hex Inverter Buffer/Driver	X			
07	Hex Buffer/Driver	X			
08	Quad 2-Input AND Gate	X	X	X	X
09	Quad 2-Input AND Gate	X		X	X
10	Triple 3-Input NAND Gate	X	X	X	X
11	Triple 3-Input AND Gate	X	X	X	X
12	Triple 3-Input NAND Gate	X			
13	Dual 4-Input Schmitt Trigger	X			X
14	Hex Schmitt Trigger Inverter	X			X
15	Triple 3-Input AND Gate			X	X
16	Hex Inverter Buffer/Driver	X			
17	Hex Buffer/Driver	X			
20	Dual 4-Input NAND Gate	X	X	X	X
21	Dual 4-Input Positive AND Gate	X	X		X
22	Dual 4-Input NAND Gate	X	X	X	X
23	Expandable Dual 4-Input NOR Gate	X			
25	Dual 4-Input NOR Gate	X			
26	Quad 2-Input NAND Buffer	X			X
27	Triple 3-Input NDR Gate	X			X
28	Quad 2-Input NOR Buffer				X
30	8-Input NAND Gate	X	X	X	X
32	Quad 2-Input OR Gate	X		X	X
33	Quad 2-Input NOR Buffer				X
37	Quad 2-Input NAND Buffer	X			X
38	Quad 2-Input NAND Buffer	X			X
39	Quad 2-Input NAND Buffer	X			
40	Dual 4-Input NAND Buffer	X	X	X	X
41	1-of-10 Decoder/Driver (Nixie)	9315			
42	1-of-10 Decoder				X
42A	1-of-10 Decoder	X			
43A	1-of-10 Decoder	X			
44A	1-of-10 Decoder	X			
45	1-of-10 Decoder/Driver	X			
46A	BCD to 7-Segment Decoder/Driver	X			
47	BCD to 7-Segment Decoder/Driver				X
47A	BCD to 7-Segment Decoder/Driver	X			
48	BCD to 7-Segment Decoder	X			X
49	BCD to 7-Segment Decoder	X			X
50	Expandable Dual 2-Wide, 2-Input AND-DR-Invert Gate	X	X		
51	Dual 2-Wide AND-OR-Invert Gate	X	X	X	X
52	Expandable 2-2-2-3-Input AND-DR Gate		X		
53	Expandable AND-OR-Invert Gate	X	X		
54	4-Wide, 2-Input AND-OR-Invert Gate	X	X		X
55	AND-OR-Invert Gate		X		X
60	Dual 4-Input Expander	X	X		
61	Triple 3-Input Expander		X		
62	3-2-2-3-Input AND-OR Expander		X		
64	4-2-3-2-Input AND-OR-Invert Gate			X	
65	4-2-3-2-Input AND-DR-Invert Gate			X	

DEVICE NO.	DESCRIPTION	54/74 TTL	54H/74H H-TTL	54S/74S S-TTL	54LS/74LS LS-TTL
70	JK Edge-Trigger Flip-Flop	X			
71	JK Master/Slave Flip-Flop		X		
72	JK Master/Slave Flip-Flop	X	X		
73	Dual JK Flip-Flop	X	X		X
74	Dual D-Type Positive Edge-Triggered Flip-Flop	X	X	X	X
75	4-Bit Bistable Latch	X			
76	Dual JK Flip-Flop	X	X		X
77	Quad D-Type Latch	X			
78	Dual JK Flip-Flop		X		X
80	Gated Full Adder	X			
82	2-Bit Full Adder	X			
83A	4-Bit Binary Full Adder	X			X
85	4-Bit Magnitude Comparator	X			X
86	Quad 2-Input Exclusive-OR Gate	X		X	X
87	4-Bit True/Complement, Zero/One Element		X		
89	64-Bit Random Access Memory	X			X
90	Decade Counter				X
90A	Decade Counter	X			
91A	8-Bit Shift Register	X			
92	Divide-by-Twelve Counter				X
92A	Divide-by-Twelve Counter	X			
93	Divide-by-Sixteen Counter				X
93A	Divide-by-Sixteen Counter	X			
94	4-Bit Shift Register	X			
95A	4-Bit Right/Left Shift Register	X			
95B	4-Bit Right/Left Shift Register				X
98	5-Bit Shift Register	X			
97	Synchronous Modulo-64 Bit Rate Multiplier	X			
101	JK Edge-Triggered Flip-Flop		X		
102	JK Edge-Triggered Flip-Flop		X		
103	Dual JK Edge-Triggered Flip-Flop		X		
108	Dual JK Edge-Triggered Flip-Flop		X		
107	Dual JK Flip-Flop	X			X
108	Dual JK Edge-Triggered Flip-Flop		X		
109	Dual JK Positive Edge-Triggered Flip-Flop			X	X
112	Dual JK Negative Edge-Triggered Flip-Flop			X	X
113	Dual JK Edge-Triggered Flip-Flop			X	X
114	Dual Negative Edge-Triggered Flip-Flop			X	X
116	Dual 4-Bit Latch	9308			
121	Monostable Multivibrator	X			
122	Retriggerable Resettable Multivibrator	X			
123	Dual Retriggerable Resettable Multivibrator	X			
125	Quad Bus Buffer Gate	X			
125A	Quad Bus Buffer Gate				X
126	Quad Bus Buffer Gate	X			X
132	Quad 2-Input Schmitt Trigger NAND Gate	X		X	X
133	13-Input NAND Gate			X	X
134	12-Input NAND Gate			X	
135	Quad Exclusive-OR/NOR Gate			X	
136	Quad 2-Input Exclusive-OR Gate				X
137	1-of-8 Decoder/Demultiplexer			X	
138	1-of-8 Decoder/Demultiplexer			X	X
139	Dual 1-of-4 Decoder			X	X

Manufactured in U.S.A.

- ☐ Standard and Low Power Schottky
- ☐ High Speed and Schottky
- ☐ Available in plastic or Ceramic Encapsulation

54/74 SERIES SELECTION CHART (Cont'd)

DEVICE NO.	DESCRIPTION	54/74 TTL	54H/74H H-TTL	54S/74S S-TTL	54LS/74LS LS-TTL
140	Dual 4-Input NAND Line Driver			X	
141	1-of-10 Decoder/Driver (Nixie)	X			
145	1-of-10 Decoder/Driver	X			
150	16-Input Multiplexer	X			
151	8-Input Multiplexer			X	X
151A	8-Input Multiplexer	X			
152	8-Input Multiplexer				X
152A	8-Input Multiplexer	X			
153	Dual 4-Input Multiplexer	X		X	X
154	1-of-16 Decoder/Demultiplexer	X			
155	Dual 1-of-4 Decoder/Demultiplexer	X			X
156	Dual 1-of-4 Decoder/Demultiplexer	X			X
157	Quad 2-Input Multiplexer	X		X	X
158	Quad 2-Input Multiplexer			X	X
160	Synchronous Presettable BCD Decade Counter	X		93S10	X
161	Synchronous Presettable Binary Counter	X			X
162	Synchronous Presettable BCD Decade Counter	X			X
163	Synchronous Presettable Binary Counter	X			X
164	Serial-In Parallel-Out Shift Register	X			X
165	8-Bit Parallel-to-Serial Converter	X			X
166	8-Bit Shift Register	X			
167	Synchronous Decade Rate Multiplier	X			
168	Synchronous Bidirectional BCD Decade Counter				X
169	Synchronous Bidirectional Modulo-16 Binary Counter				X
170	4 x 4 Register File	X			X
173	4-Bit D-Type Register	X			X
174	Hex D Flip-Flop	X		X	X
175	Quad D Flip-Flop	X		X	X
176	Presettable Decade Counter	X			
177	Presettable Binary Counter	X			
178	4-Bit Shift Register	X			
179	4-Bit Shift Register	X			
180	8-Bit Parity Generator/Checker	X			
181	4-Bit Arithmetic Logic Unit	9341		93S41	X
182	Carry Lookahead Generator	9342		93S42	
183	Dual High Speed Adder		X		
189	64-Bit Random Access Memory			X	X
190	Up/Down Decade Counter	X			X
191	Up/Down Binary Counter	X			X
192	Up/Down Decade Counter	X			X
193	Up/Down Binary Counter	X			X
194	4-Bit Bidirectional Universal Shift Register	X		X	
194A	4-Bit Bidirectional Universal Shift Register				X
195	Universal 4-Bit Shift Register	X	93H00	93S00	
195A	Universal 4-Bit Shift Register				X
196	Presettable Decade Counter	X			X
197	Presettable Binary Counter	X			X
198	8-Bit Right/Left Shift Register	X			
199	8-Bit Parallel I/O Shift Register	X			
240	Octal Buffer/Line Driver			X	X
241	Octal Buffer/Line Driver			X	X
242	Quad Bus Transceiver				X
243	Quad Bus Transceiver				X
244	Octal Buffer/Line Driver				X

DEVICE NO.	DESCRIPTION	54/74 TTL	54H/74H H-TTL	54S/74S S-TTL	54LS/74LS LS-TTL
245	Octal Bus Transceiver				X
247	BCD to 7-Segment Decoder/Driver				X
248	BCD to 7-Segment Decoder				X
249	BCD to 7-Segment Decoder				X
251	8-Input Multiplexer			X	X
253	Dual 4-Input Multiplexer			X	X
256	Dual 4-Bit Addressable Latch				X
257	Quad 2-Input Multiplexer			X	X
257A	Quad 2-Input Multiplexer				X
258	Quad 2-Input Multiplexer			X	X
258A	Quad 2-Input Multiplexer				X
259	8-Bit Addressable Latch				X
260	Dual 5-Input NOR Gate			X	X
266	Quad 2-Input Exclusive-NOR Gate				X
273	8-Bit Register				X
279	Quad Set-Reset Latch	X			X
280	9-Bit Parity Generator/Checker			X	
283	4-Bit Binary Full Adder	X			X
289	64-Bit Random Access Memory			X	X
290	BCD Decade Counter	X			X
293	Modulo-16 Binary Counter	X			X
295A	4-Bit Shift Register				X
298	Quad 2-Port Register	X			X
299	8-Input Universal Shift/Storage Register				X
322	8-Bit Serial/Parallel Register				X
323	8-Bit Universal Shift/Storage Register				X
347	BCD to 7-Segment Decoder				X
352	Dual 4-Input Multiplexer				X
353	Dual 4-Input Multiplexer				X
365A	Hex 3-State Buffer				X
368A	Hex 3-State Inverter Buffer				X
367A	Hex 3-State Buffer				X
368A	Hex 3-State Inverter Buffer				X
373	Octal Transparent Latch				X
374	Octal D-Type Flip-Flop				X
375	4-Bit Latch				X
377	Octal D Flip-Flop				X
378	Parallel D Register				X
379	Quad Parallel Register				X
384	8-Bit Serial/Parallel Twos Complement Multiplier				X
390	Dual Decade Counter				X
393	Dual Modulo-16 Counter				X
395	Shift Register				X
447	BCD to 7-Segment Decoder				X
490	Dual Decade Counter				X
502	8-Bit Successive Approximation Register				X
503	8-Bit Successive Approximation Register				X
504	12-Bit Successive Approximation Register				X
533	Octal Transparent Latch				X
534	Octal D-Type Flip-Flop				X
540	Octal Buffer/Line Driver				X
541	Octal Buffer/Line Driver				X
563	Octal D-Type Latch				X
564	Octal D-Type Latch				X
573	Octal D-Type Flip-Flop				X
574	Octal D-Type Flip-Flop				X
670	4 x 4 Register File				X

Manufactured in U.S.A.

9000 Series TTL

FAIRCHILD

- ☐ Standard and Low Power Schottky
- ☐ High Speed and Schottky
- ☐ Available in Plastic or Ceramic Encapsulation

9000 FAMILY TTL

DEVICE NO.	DESCRIPTION
9009	NAND Buffer
9012	NAND Gate
9014	Quad Exclusive-OR Gate
9015	Quad NOR Gate
9016	Hex Inverter
9017	Hex Inverter
9020	Dual JK Flip-Flop
9022	Dual JK Flip-Flop
9024	Dual JK (or D) Flip-Flop

DEVICE NO.	DESCRIPTION
9000	JK Flip-Flop
9001	JK Flip-Flop
9002	NAND Gate
9003	NAND Gate
9004	NAND Gate
9005	Extendable AND-OR-Invert Gate
9006	Extender
9007	NAND Gate
9008	Entendable AND-OR-Invert Gate

93XX FAMILY TTL

DEVICE NO.	DESCRIPTION	93XX TTL	93H H-TTL	93L L-TTL	93S S-TTL
00	4-Bit Universal Shift Register	X	X	X	X
01	1-of-10 Decoder	X		X	
02	1-of-10 Decoder	X			
04	Dual Full Adder	X			
05	Variable Modulus Counter	X			
07	7-Segment Decoder	X			
08	Dual 4-Bit Latch	X		X	
09	Dual 4-Input Multiplexer	X		X	
10	BCD Decade Counter	X		X	X
11	1-of-16 Decoder/Demultiplexer	X		X	
12	8-Input Multiplexer	X		X	X
13	8-Input Multiplexer	X			
14	Quad Latch	X		X	
15	1-of-10 Decoder	X			
16	4-Bit Binary Counter	X		X	X
17B	7-Segment Decoder/Driver	X			
17C	7-Segment Decoder/Driver	X			
18	8-Input Priority Encoder	X		X	
19	Decade Sequencer	X			
20	Decade Sequencer	X			

DEVICE NO.	DESCRIPTION	93XX TTL	93H H-TTL	93L L-TTL	93S S-TTL
21	Dual 1-of-4 Decoder	X		X	
22	Quad 2-Input Multiplexer	X		X	
24	5-Bit Comparator	X		X	
28	Dual 8-Bit Shift Register	X		X	
34	8-Input Addressable Latch	X		X	
38	8-Bit Multiple Port Register	X		X	
40	4-Bit Arithmetic Logic Unit	X			
41	4-Bit Arithmetic Logic Unit	X		X	X
42	Carry Lookahead Generator	X			X
43	4-Bit by 2-Bit Twos Complement Multiplier				X
44	Binary (4-Bit by 2-Bit) Full Multiplier	X			
46	High Speed 6-Bit Identity Comparator				X
47	High Speed 6-Bit Identity Comparator				X
48	12-Input Parity Checker/Generator	X			
62	9-Input Parity Checker/Generator				X
68	7-Segment Decoder/Driver/Latch	X			
70	7-Segment Decoder/Driver/Latch	X			
72	High Speed 4-Bit Shift Register		X		
74	7-Segment Decoder/Driver/Latch	X			
86	4-Bit Quad Exclusive-NOR	X			

96XX FAMILY TTL

DEVICE NO.	DESCRIPTION	96XX TTL	96L L-TTL	96S S-TTL	96LS LS-TTL
00	Retriggerable Resettable Monostable Multivibrator	X			
01	Retriggerable Monostable Multivibrator	X			
02	Dual Retriggerable Resettable Monostable Multivibrator	X	X	X	X
32	Address Multiplexer/Refresh Counter				X
42	Address Multiplexer/Refresh Counter				X
101	Quad 2-Input Positive NAND Buffer	X			
103	Quad Bus Transceiver	X			
106	Quad 2-Input NOR Receiver	X			

Manufactured in U.S.A.

- ☐ Standard and Low Power Schottky
- ☐ High Speed and Schottky
- ☐ Available in Plastic or Ceramic Encapsulation

SELECTION GUIDES

SSI FUNCTIONS

FUNCTION	9XXX	54/74	54H/74H	54S/74S	54LS/74LS
NAND Gates					
Hex Inverters	9016	54/7404	54H/74H04	54S/74S04 54S/74S04A	54LS/74LS04
Hex Inverters (DC*)	9017	54/7405	54H/74H05	54S/74S05 54S/74S05A	54LS/74LS05
Hex Inverter (15 V)		54/7416			
Hex Inverter (30 V)		54/7406			
Hex Schmitt Trigger		54/7414			54LS/74LS14
Quad 2-Input	9002	54/7400	54H/74H00	54S/74S00	54LS/74LS00
Quad 2-Input (DC*)	9012	54/7403		54S/74S03	54LS/74LS03
Quad 2-Input (DC*)		54/7401	54H/74H01		
Quad 2-Input (12 V)		7426			54LS/74LS26
Quad 2-Input (48 V)		54/7437			54LS/74LS37
Quad 2-Input (DC*/48 mA)		54/7438			54LS/74LS38
NOR Gates					
Quad 2-Input		54/7402		54S/74S02	54LS/74LS02
Quad 2-Input	9015				
Triple 3-Input		54/7427			54LS/74LS27
Dual 4-Input w/Strobe		54/7425			
AND Gates					
Hex Buffer (OC*/15 V)		54/7417			
Hex Buffer (OC*/30 V)		54/7407			
Quad 2-Input		54/7408	54H/74H08	54S/74S08	54LS/74LS08
Quad 2-Input (OC*)		54/7409		54S/74S09	54LS/74LS09
OR Gates					
Quad 2-Input		54/7432		54S/74S32	54LS/74LS32
Exclusive-OR Gates					
Quad 2-Input		54/7486		54S/74S86	54LS/74LS86
Quad 2-Input (OC*)					54LS/74LS136
Exclusive-NOR Gate					
Quad 2-Input (OC*)		9386 (8242)			54LS/74LS266
AND-OR Gates					
2-2-2-3 Input (Exp)			54H/74H52		
AND-OR-INVERT Gates					
Dual 2-2 Input (Exp)	9005	54/7450	54H/74H50		
Dual 2-2 Input		54/7451	54H/74H51	54S/74S51	54LS/74LS51
2-2-2-3 Input (Exp)	9008	54/7453	54H/74H53		
2-2-2-3 Input		54/7454	54H/74H54		
2-2-3-3 Input					54LS/74LS54
Gate Expanders					
Triple 3-Input			54H/74H61		
Dual 4-Input	9006	54/7460	54H/74H60		
Buffer Gates and Drivers					
Quad Buffer (3S*)		54/74125			54LS/74LS125A
Quad Buffer (3S*)		54/74126			54LS/74LS126
Hex (3S*)					54LS/74LS365A

FUNCTION	9XXX	54/74	54H/74H	54S/74S	54LS/74LS
Quad 2-Input Line Driver	96101	54/7439			
Quad 2-Input Schmitt		54/74132		54S/74S132	54LS/74LS132
Triple 3-Input	9003	54/7410	54H/74H10	54S/74S10	54LS/74LS10
Triple 3-Input (OC*)		54/7412			
Dual 4-Input	9004	54/7420	54H/74H20	54S/74S20	54LS/74LS20
Dual 4-Input Schmitt		54/7413			54LS/74LS13
Dual 4-Input (OC*)		54/7422	54H/74H22	54S/74S22	54LS/74LS22
Dual 4-Input Buffer	9009	54/7440	54H/74H40	54S/74S40	54LS/74LS40
Dual 4-Input Line Driver				54S/74S140	
8-Input	9007				
8-Input		54/7430	54H/74H30	54S/74S30	54LS/74LS30
13-Input				54S/74S133	54LS/74LS133
12-Input (3S*)				54S/74S134	
Dual 4-Input (Exp)		54/7423			
Dual 5-Input				54S/74S260	54LS/74LS260
Quad 2-Input					54LS/74LS28
Quad 2-Input (OC*)					54LS/74LS33
Triple 3-Input		54/7411	54H/74H11	54S/74S11	54LS/74LS11
Triple 3-Input (OC*)				54S/74S15	54LS/74LS15
Dual 4-Input		54/7421	54H/74H21		54LS/74LS21
Quad 2-Input OR/NOR	9014				
Quad 2-Input QR/NOR				54S/74S135	
2-2-3-4 Input				54S/74S64	
2-2-3-4 Input (OC*)				54S/74S65	
4-4 Input (Exp)			54H/74H55		
4-4 Input					54LS/74LS55
2-2-3-3 AND-QR			54H/74H62		
Hex Inverter (3S*)					54LS/74LS366A
Hex (3S*)					54LS/74LS367A
Hex Inverter (3S*)					54LS/74LS368A

SINGLE AND DUAL FLIP-FLOPS

FUNCTION	DEVICE NO.	INPUTS	CLOCK EDGE	DIRECT SET	DIRECT CLEAR	GUARANTEED CLOCK FREQ. MHz
Single JK	**9000**	3J, 3K, JK	⎍	X	X	20 (Typ)
Single JK	**9001**	2J, 2K, J, K, JK	⎍	X	X	50 (Typ)
Single JK	**54H/74H71**	(AOI) (2 + 2)J, (2 + 2)K	⎎	X		25
Single JK	**54H/74H101**	(AOI) (2 + 2)J, (2 + 2)K	⎎	X		40

FUNCTION	DEVICE NO.	INPUTS	CLOCK EDGE	DIRECT SET	DIRECT CLEAR	GUARANTEED CLOCK FREQ. MHz
Single JK	**54/7472**	3J, 3K	⎎	X	X	15
Single JK	**54H/74H72**	3J, 3K	⎎	X	X	25
Single JK	**54H/74H102**	3J, 3K	⎎	X	X	40
Single JK	**54/7470**	2J, 2K, $\overline{J}$, $\overline{K}$	⎍	X	X	20

*OC = Open-Collector, 3S = 3-State

Manufactured in U.S.A.

- ☐ Standard and Low Power Schottky
- ☐ High Speed and Schottky
- ☐ Available in Plastic or Ceramic Encapsulation

SELECTION GUIDES (Cont'd)

SINGLE AND DUAL FLIP-FLOPS (Cont'd)

FUNCTION	DEVICE NO.	INPUTS	CLOCK EDGE	DIRECT SET	DIRECT CLEAR	GUARANTEED CLOCK FREQ. MHz
Dual D	**54/7474**	D	↑	X	X	15
Dual D	**54H/74H74**	D	↑	X	X	35
Dual D	**54S/74S74**	D	↑	X	X	75
Dual D	**54LS/74LS74**	D	↑	X	X	30
Dual JK	**9020**	J, K, $\overline{J}$, $\overline{K}$, JK	↑		X	50 (Typ)
Dual JK	**9022**	J, $\overline{K}$, JK	↑	X	X	50 (Typ)
Dual JK	**54/7473**	J, K	↓		X	15
Dual JK	**54/74107**	J, K	↓		X	15
Dual JK	**54H/74H73**	J, K	↓		X	25
Dual JK	**54H/74H103**	J, K	↓		X	40
Dual JK	**54S/74S113**	J, K	↓	X		80
Dual JK	**54LS/74LS113**	J, K	↓	X		30
Dual JK	**54/7476**	J, K	↓	X	X	15
Dual JK	**54H/74H76**	J, K	↓	X	X	25

FUNCTION	DEVICE NO.	INPUTS	CLOCK EDGE	DIRECT SET	DIRECT CLEAR	GUARANTEED CLOCK FREQ. MHz
Dual JK	**54H/74H106**	J, K	↓	X	X	40
Dual JK	**54S/74S112**	J, K	↓	X	X	80
Dual JK	**54LS/74LS112**	J, K	↓	X	X	30
Dual JK	**54H/74H78**	J, K	↓	X	X	25
Dual JK	**54H/74H108**	J, K	↓	X	X	40
Dual JK	**54LS/74LS73**	J, K	↓		X	30
Dual JK	**54S/74S114**	J, K	↓	X	X	80
Dual JK	**54LS/74LS114**	J, K	↓	X	X	30
Dual JK	**9024, 54/74109**	J, K	↑	X	X	25
Dual JK	**54S/74S109**	J, K	↑	X	X	75
Dual JK	**54LS/74LS109**	J, K	↑	X	X	30
Dual JK	**54LS/74LS76**	J, K	↓	X	X	30
Dual JK	**54LS/74LS107**	J, K	↓		X	30
Dual JK	**54LS/74LS78**	J, K	↓	X	X	30

LATCHES

FUNCTION	DEVICE NO.	DATA INPUTS	COMMON CLEAR	ENABLE INPUTS (LEVEL)	MIN ENABLE PULSE WIDTH ns	MAX DELAY ENABLE TO OUTPUT-ns
4-Bit RS Latch	**9314**	4 X ($\overline{R}_1\overline{S}_1$)	L	1 (L)	18	24
4-Bit RS Latch	**93L14**	4 X ($\overline{R}_1\overline{S}_1$)	L	1 (L)	30	45
4-Bit D Latch	**9314**	4 X D	L	1 (L)	18	24
4-Bit D Latch	**93L14**	4 X D	L	1 (L)	30	45
Dual 4-Bit D Latch	**9308 (54/74116)**	8 X D	2 X L	2 X 2 AND	18	30
Dual 4-Bit D Latch	**93L08**	8 X D	2 X L	2 X 2 AND	30	45
4-Bit RS Latch	**54/74279**	4 X ($\overline{R}\overline{S}$)				
4-Bit RS Latch	**54LS/74LS279**	4 X ($\overline{R}\overline{S}$)				
4-Bit D Latch	**54/7475**	4 X D		2 (H)	20	30
4-Bit D Latch	**54/7477**	4 X D		2 (H)	20	30
4-Bit D Latch	**54LS/74LS375**	4 X D		2 (H)	20	30
Dual 4-Bit Addr. Latch	**54LS/74LS256**	8 X D	L	2 (L)	17	27
8-Bit Addr. Latch	**9334**	1 X D	L	1 (L)	17	24

FUNCTION	DEVICE NO.	DATA INPUTS	COMMON CLEAR	ENABLE INPUTS (LEVEL)	MIN ENABLE PULSE WIDTH ns	MAX DELAY ENABLE TO OUTPUT-ns
8-Bit Addr. Latch	**93L34**	1 X D	L	1 (L)	26	45
8-Bit D Latch	**54LS/74LS373**	8 X D		1 (H)	15	30
8-Bit D Latch	**54LS/74LS573**	8 X D		1 (L)	15	30
8-Bit D Latch	**54LS/74LS533**	8 X D		1 (H)	15	30
8-Bit D Latch	**54LS/74LS563**	8 X D		1 (H)	15	30
8-Bit Addr. Latch	**54LS/74LS259**	1 X D	L	1 (L)	17	27
16-Bit D Latch	**54/74170**	4 X D		2	25	45
16-Bit D Latch	**54LS/74LS170**	4 X D		2	25	35
16-Bit D Latch	**54LS/74LS670**	4 X D		2	25	35
64-Bit Memory	**54/7489**	4 X D		2 (L)	40	70
64-Bit Memory	**54LS/74LS89**	4 X D		2 (L)	25 (Typ)	30 (Typ)
64-Bit Memory	**54S/74S189**	4 X D		2 (L)	20	40
64-Bit Memory	**54LS/74LS189**	4 X D		2 (L)	25 (Typ)	30 (Typ)
64-Bit Memory	**54S/74S289**	4 X D		2 (L)	20	40
64-Bit Memory	**54LS/74LS289**	4 X D		2 (L)	25 (Typ)	30 (Typ)

MULTIPLE FLIP-FLOPS

FUNCTION	DEVICE NO.	DATA INPUTS	COMMON CLEAR	CP INPUTS (LEVEL)	GUARANTEED CLOCK FREQ. MHz
4-Bit D Flip-Flop	**54/74175**	4 X D	L	1 (↑)	25
4-Bit D Flip-Flop	**54S/74S175**	4 X D	L	1 (↑)	75
4-Bit D Flip-Flop	**54LS/74LS175**	4 X D	L	1 (↑)	30
4-Bit D Flip-Flop	**54/74298**	2 X 4 X D		1 (↓)	25
4-Bit D Flip-Flop	**54LS/74LS298**	2 X 4 X D		1 (↓)	25
6-Bit D Flip-Flop	**54/74174**	6 X D	L	1 (↑)	25
6-Bit D Flip-Flop	**54S/74S174**	6 X D	L	1 (↑)	75

FUNCTION	DEVICE NO.	DATA INPUTS	COMMON CLEAR	CP INPUTS (LEVEL)	GUARANTEED CLOCK FREQ. MHz
6-Bit D Flip-Flop	**54LS/74LS174**	6 X D	L	1 (↑)	30
8-Bit Multiple Port Register	**9338**	1 X D		1 (L)	27
8-Bit Multiple Port Register	**93L38**	1 X D		1 (L)	14
8-Bit D Flip-Flop	**54LS/74LS374**	8 X D		1 (↑)	35
8-Bit D Flip-Flop	**54LS/74LS534**	8 X D		1 (↓)	35
8-Bit D Flip-Flop	**54LS/74LS564**	8 X D		1 (↓)	35

MULTIPLEXERS

FUNCTION	DEVICE NO.	ENABLE INPUTS	TRUE OUTPUT	COMPLEMENT OUTPUT
Quad 2-Input	**9322**	1	X	
Quad 2-Input	**93L22**	1	X	
Quad 2-Input	**54/74157**	1	X	
Quad 2-Input	**54S/74S157**	1	X	
Quad 2-Input	**54LS/74LS157**	1	X	
Quad 2-Input	**54S/74S158**	1		X
Quad 2-Input	**54LS/74LS158**	1		X
Quad 2-Input	**54S/74S257**	1	3S*	

FUNCTION	DEVICE NO.	ENABLE INPUTS	TRUE OUTPUT	COMPLEMENT OUTPUT
Quad 2-Input	**54LS/74LS257**	1	3S*	
Quad 2-Input	**54LS/74LS257A**	1	3S*	
Quad 2-Input	**54S/74S258**	1		3S*
Quad 2-Input	**54LS/74LS258**	1		3S*
Quad 2-Input	**54LS/74LS258A**	1		3S*
Quad 2-Input	**54/74298**	Clocked (Edge-Trigger)	X (Latched)	
Quad 2-Input	**54LS/74LS298**	Clocked (Edge-Trigger)	X (Latched)	

*OC = Open Collector, 3S = 3-State

Manufactured in U.S.A.

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- High Speed and Schottky
- Available in Plastic or Ceramic Encapsulation

SELECTION GUIDES (Cont'd)

MULTIPLEXERS (Cont'd)

FUNCTION	DEVICE NO.	ENABLE INPUTS	TRUE OUTPUT	COMPLEMENT OUTPUT
Dual 4-Input	**9309**		X	X
Dual 4-Input	**93L09**		X	X
Dual 4-Input	**54/74153**	2	X	
Dual 4-Input	**54S/74S153**	2	X	
Dual 4-Input	**54LS/74LS153**	2	X	
Dual 4-Input	**54S/74S253**	2	3S*	
Dual 4-Input	**54LS/74LS253**	2	3S*	
Dual 4-Input	**54LS/74LS352**	2		X
Dual 4-Input	**54LS/74LS353**	2		3S*
8-Input	**9312**	1	X	X
8-Input	**93L12**	1	X	X
8-Input	**93S12**	1	X	X
8-Input	**9313**	1	X	OC*
8-Input	**54/74151A**	1	X	X
8-Input	**54S/74S151**	1	X	X
8-Input	**54LS/74LS151**	1	X	X
8-Input	**54S/74S251**	1	3S*	3S*
8-Input	**54LS/74LS251**	1	3S*	3S*
8-Input	**54/74152A**			X
8-Input	**54LS/74LS152**			X
12-Input	**96LS42**	1		X
14-Input	**96LS32**	1		X
16-Input	**54/74150**	1		X

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DECODERS/DEMULTIPLEXERS

FUNCTION	DEVICE NO.	ADDRESS INPUTS	ACTIVE LOW ENABLE	ACTIVE LOW OUTPUTS	OPEN-COLLECTOR OUTPUT VOLTAGE V
Dual 1-of-4	**9321**	2 + 2	1 + 1	4 + 4	
Dual 1-of-4	**93L21**	2 + 2	1 + 1	4 + 4	
Dual 1-of-4	**54S/74S139**	2 + 2	1 + 1	4 + 4	
Dual 1-of-4	**54LS/74LS139**	2 + 2	1 + 1	4 + 4	
Dual 1-of-4	**54/74155**	2	2 + 1	4 + 4	
Dual 1-of-4	**54LS/73LS155**	2	2 + 1	4 + 4	
Dual 1-of-4	**54/74156**	2	2 + 1	4 + 4	5.5
Dual 1-of-4	**54LS/74LS156**	2	2 + 1	4 + 4	5.5
1-of-8	**9301**	3	1	8	
1-of-8	**93L01**	3	1	8	
1-of-8	**9302**	3	1	8	5.5
1-of-8	**9334**	3	1	8	
1-of-8	**93L34**	3	1	8	
1-of-8	**54LS/74LS259**	3	1	8 H	
1-of-8	**54/7445**	3	1	8	30
1-of-8	**54/7442A**	3	1	8	
1-of-8	**54LS/74LS42**	3	1	8	
1-of-8	**54S/74S138**	3	2	8	
1-of-8	**54LS/74LS138**	3	2	8	
1-of-8	**9345**	3	2	8	15
1-of-8 w/Input Latches	**54S/74S137**	3	2	8	
1-of-10	**9301**	4 (BCD)		10	
1-of-10	**93L01**	4 (BCD)		10	
1-of-10	**9302**	4 (BCD)		10	5.5
1-of-10	**54/7445**	4 (BCD)		10	30
1-of-10	**54/7442A**	4 (BCD)		10	
1-of-10	**54LS/74LS42**	4 (BCD)		10	
1-of-10	**54/7443A**	4 (Excess-3)		10	
1-of-10	**54/7444A**	4 (Excess-3 Gray)		10	
1-of-10	**54/74145**	4 (BCD)		10	15
1-of-16	**9311**	4	2	16	
1-of-16	**93L11**	4	2	16	
1-of-16	**54/74154**	4	2	16	
1-of-10 Decade Sequencer	**9319**		Clock	10	
1-of-10 Decade Sequencer	**9320**		Clock	10	3 K Pull-up

REGISTERS

FUNCTION	DEVICE NO.	NO. OF BITS	SERIAL ENTRY	PARALLEL ENTRY NO. OF BITS[1]	CLOCK EDGE	GUARANTEED CLOCK FREQ. MHz
Parallel-in/Parallel-out Shift Right	**9300**	4	J, $\overline{K}$	4S	↑	30
Parallel-in/Parallel-out Shift Right	**93H00**	4	J, $\overline{K}$	4S	↑	45
Parallel-in/Parallel-out Shift Right	**93L00**	4	J, $\overline{K}$	4S	↑	10
Parallel-in/Parallel-out Shift Right	**93S00**	4	J, $\overline{K}$	4S	↑	70
Parallel-in/Parallel-out Shift Right	**93H72**	4	D	4S	↑	45
Serial/Parallel-in, Parallel-out, Shift Right	**54/7494**	4	D	2 X 4A (MUX)	↑	10
Parallel-in/Parallel-out Shift Right	**54/7495A**	4	D	4S	↓	25
Parallel-in/Parallel-out Shift Right	**54LS/74LS95B**	4	D	4S	↓	30
Parallel-in/Parallel-out Shift Right	**54/74178**	4	D	4S	↓	25
Parallel-in/Parallel-out Shift Right	**54/74179**	4	D	4S	↓	25
Parallel-in/Parallel-out Shift Right	**54LS/74LS195A**	4	J, $\overline{K}$	4S	↑	30
Parallel-in/Parallel-out Shift Right (3S[2])	**54LS/74LS295A**	4	D	4S	↓	30
Parallel-in/Parallel-out Shift Right (3S[2])	**54LS/74LS395**	4	D	4S	↓	30
Parallel-in/Parallel-out Bidirectional	**54/74194**	4	DR, DL	4S	↑	25
Parallel-in/Parallel-out Bidirectional	**54S/74S194**	4	DR, DL	4S	↑	70
Parallel-in/Parallel-out Bidirectional	**54LS/74LS194A**	4	DR, DL	4S	↑	30
Quad D (3S[2])	**54/74173**	4		4S	↑	25
Quad D (3S[2])	**54LS/74LS173**	4		4S	↑	30
Quad D Flip-Flop	**54/74175**	4		4S	↑	25
Quad D Flip-Flop	**54S/74S175**	4		4S	↑	75
Quad D Flip-Flop	**54LS/74LS175**	4		4S	↑	30
Quad 2-Port Register	**54/74298**	4		2 D (MUX)	↓	30
Quad 2-Port Register	**54LS/74LS298**	4		2 D (MUX)	↓	30
Quad D	**54LS/74LS379**	4		4S	↑	30
Parallel-in/Parallel-out Shift Right	**54/7496**	5	D	5A	↑	10
Hex D Flip-Flop	**54/74174**	6		6S	↑	25
Hex D Flip-Flop	**54S/74S174**	6		6S	↑	75
Hex D Flip-Flop	**54LS/74LS174**	6		6S	↑	30
Parallel D Register	**54LS/74LS378**	6		6S	↑	30
Multiport Register	**9338**	8	D		↑	25
Multiport Register	**93L38**	8	D		↑	20

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REGISTERS (Cont'd)

FUNCTION	DEVICE NO.	NO. OF BITS	SERIAL ENTRY	PARALLEL ENTRY NO. OF BITS[1]	CLOCK EDGE	GUARANTEED CLOCK FREQ. MHz
Parallel-in/Parallel-out Shift Right	**54/74199**	8	J, $\overline{K}$	8S	↓	25
Serial/Parallel-in, Parallel/Serial-out Shift Right (3S[2])	**54LS/74LS322**	8	2D	8S	↓	35
Serial-in/Parallel-out Shift Right	**54/74164**	8	2D		↓	25
Serial-in/Parallel-out Shift Right	**54LS/74LS164**	8	2D		↓	25
Parallel/Serial-in, Serial-out, Shift Right	**54/74165**	8	D	8A	↓	25
Parallel/Serial-in, Serial-out, Shift Right	**54LS/74LS165**	8	D	8A	↓	30
Parallel/Serial-in, Serial-out, Shift Right	**54/74166**	8	D	8S	↓	25
Serial-in/Serial-out Shift Right	**54/7491A**	8	2D		↓	10
Successive Approx Register	**54LS/74LS502**	8	D		↓	15
Successive Approx Register	**54LS/74LS503**	8	D		↓	15

FUNCTION	DEVICE NO.	NO. OF BITS	SERIAL ENTRY	PARALLEL ENTRY NO. OF BITS[1]	CLOCK EDGE	GUARANTEED CLOCK FREQ. MHz
Parallel-in/Parallel-out Bidirectional	**54/74198**	8	DR, DL	8S	↓	25
Parallel-in/Parallel-out Bidirectional (3S[2])	**54LS/74LS299**	8	DR, DL	8S	↓	35
Parallel-in/Parallel-out Bidirectional (3S[2])	**54LS/74LS323**	8	DR, DL	8S	↓	35
Octal D Register	**54LS/74LS273**	8		8S	↓	30
Octal D Flip-Flop (3S[2])	**54LS/74LS374**	8		8S	↓	35
Octal D Flip-Flop	**54LS/74LS377**	8		8S	↓	30
Octal D Flip-Flop (3S[2])	**54LS/74LS574**	8		8S	↓	35
Successive Approx Register	**54LS/74LS504**	12	D		↓	15
Serial-in/Serial-out Shift Right	**9326**	2 X 8	2 X 2 D (MUX)		↓	20
Serial-in/Serial-out Shift Right	**93L26**	2 X 8	2 X 2 D (MUX)		↓	5.0
Register File (OC[2])	**54/74170**	4 X 4		4A	↑	
Register File (OC[2])	**54LS/74LS170**	4 X 4		4A	↑	
Register File (3S[2])	**54LS/74LS670**	4 X 4		4A	↑	

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COUNTERS

FUNCTION	DEVICE NO.	MODULUS	PARALLEL ENTRY*	CLOCK EDGE	GUARANTEED CLOCK FREQ. MHz
Asynchronous	**54/74290**	2 X 5		↑	32
Asynchronous	**54/7490A**	2 x 5		↑	32
Asynchronous	**54LS/74LS90**	2 X 5		↑	32
Asynchronous	**54/7492A**	2 X 6		↑	32
Asynchronous	**54LS/74LS92**	2 X 6		↑	32
Asynchronous	**54/74293**	2 X 8		↑	32
Asynchronous	**54/7493A**	2 X 8		↑	32
Asynchronous	**54LS/74LS93**	2 X 8		↑	32
Asynchronous	**54/74176**	2 X 5	A	↑	35
Asynchronous	**54/74177**	2 X 8	A	↑	35
Asynchronous	**54/74196**	2 X 5	A	↑	50
Asynchronous	**54LS/74LS196**	2 X 5	A	↑	45
Asynchronous	**54/74197**	2 X 8	A	↑	50
Asynchronous	**54LS/74LS197**	2 X 8	A	↑	50
Asynchronous	**54LS/74LS290**	2 X 5		↑	32
Asynchronous	**54LS/74LS293**	2 X 8		↑	32
Asynchronous	**54LS/74LS390**	2 X 5		↑	40
Asynchronous	**54LS/74LS393**	2 X 8		↑	40
Asynchronous	**54LS/74LS490**	2 X 5		↑	40
Variable Modulo	**9305**	2 X 5, 6, 7, 8		↓	23
Synchronous	**9310**	10 (Presettable)	S	↓	30
Synchronous	**93L10**	10 (Presettable)	S	↓	13
Synchronous	**93S10**	10 (Presettable)	S	↓	70

FUNCTION	DEVICE NO.	MODULUS	PARALLEL ENTRY*	CLOCK EDGE	GUARANTEED CLOCK FREQ. MHz
Synchronous	**9316**	16 (Presettable)	S	↓	30
Synchronous	**93L16**	16 (Presettable)	S	↓	13
Synchronous	**93S16**	16 (Presettable)	S	↓	70
Synchronous	**54/74160**	10 (Presettable)	S	↓	25
Synchronous	**54LS/74LS160**	10 (Presettable)	S	↓	25
Synchronous	**54/74161**	16 (Presettable)	S	↓	25
Synchronous	**54LS/74LS161**	16 (Presettable)	S	↓	25
Synchronous	**54/74162**	10 (Presettable)	S	↓	25
Synchronous	**54LS/74LS162**	10 (Presettable)	S	↓	25
Synchronous	**54/74163**	16 (Presettable)	S	↓	25
Synchronous	**54LS/74LS163**	16 (Presettable)	S	↓	25
Up/Down	**54LS/74LS168**	10 (Presettable)	S	↓	25
Up/Down	**54LS/74LS169**	16 (Presettable)	S	↓	25
Up/Down	**54/74192**	10	A	↓	25
Up/Down	**54LS/74LS192**	10	A	↓	30
Up/Down	**54/74193**	16	A	↓	25
Up/Down	**54LS/74LS193**	16	A	↓	30
Up/Down	**54/74190**	10	A	↓	20
Up/Down	**54LS/74LS190**	10	A	↓	20
Up/Down	**54/74191**	16	A	↓	20
Up/Down	**54LS/74LS191**	16	A	↓	20
Rete Multiplier	**54/7497**	m.f./64		↓	25
Rate Multiplier	**54/74167**	m.f./10		↓	25

MONOSTABLES (ONE-SHOTS)

FUNCTION	DEVICE NO.	PULSE WIDTH VARIATION (%) vs. TEMP	PULSE WIDTH VARIATION (%) vs. V_{CC}	NO. OF INPUTS POS	NO. OF INPUTS NEG	RESETTABLE	MIN OUTPUT (t_w) ns
Single Retriggerable	**9600**	±1.5	±1.5	3	2	X	75
Single Retriggerable	**9601**	±2.7	±1.0	2	2		50
Dual Retriggerable	**9602**	±1.5	±1.5	1	1	X	72
Dual Retriggerable	**96L02**	±1.6	±1.5	1	1	X	110
Dual Retriggerable	**96S02**	±1.0	±1.0	1	1	X	27

FUNCTION	DEVICE NO.	PULSE WIDTH VARIATION (%) vs. TEMP	PULSE WIDTH VARIATION (%) vs. V_{CC}	NO. OF INPUTS POS	NO. OF INPUTS NEG	RESETTABLE	MIN OUTPUT (t_w) ns
Single Non-Retriggerable	**54/74121**	±0.25	±0.15	1	2		40
Single Retriggerable	**54/74122**	±2.7	±1.0	2	2	X	45
Dual Retriggerable	**54/74123**	±2.7	±1.0	1	1	X	45
Dual Retriggerable	**96LS02**	±1.0	±0.8	1	1	X	35

Manufactured in U.S.A.

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LINE AND BUS DRIVERS/TRANSCEIVERS/RECEIVERS

FUNCTION	DEVICE NO.	COMPANION RECEIVER	I_{OL} mA	I_{OS} mA (MIN)
Quad 2 NAND Driver	**54/7437**	Any TTL	48	-20
Quad 2 NAND Driver (DC*)	**54/7438**	96106	48	DC*
Quad 2 NAND Driver (OC*)	**96101**	96106	80	OC*
Quad 2 NAND Driver	**9009**	Any TTL	52.8	-40
Dual 2 NAND Driver	**54/7440**	Any TTL	48	-20
Dual 2 NAND Driver	**54H/74H40**	Any TTL	60	-40
Dual 2 NAND Driver	**54S/74S40**	Any TTL	60	-50
Dual 2 NAND Driver (50 Ω)	**54S/74S140**	Any TTL	60	-50
Octal Inverting Bus Driver (3S*)	**54LS/74LS240**	Any TTL	64	-40
Octal Inverting Bus Driver (3S*)	**54S/74S240**	Any TTL	64	-50

FUNCTION	DEVICE NO.	COMPANION RECEIVER	I_{OL} mA	I_{OS} mA (MIN)
Octal Non-Inverting Bus Driver (3S*)	**54LS/74LS241**	Any TTL	64	-40
Octal Non-Inverting Bus Driver (3S*)	**54S/74S241**	Any TTL	64	-50
Octal Bus Transceiver	**54LS/74LS245**	Any TTL	24	-40
Octal Inverting Bus Transceiver	**54LS/74LS540**	Any TTL	64	-40
Octal Non-Inverting Bus Transceiver	**54LS/74LS541**	Any TTL	64	-40
Quad Inverting Bus Transceiver	**54LS/74LS242**	Any TTL	24	-40
Quad Non-Inverting Bus Transceiver	**54LS/74LS243**	Any TTL	24	-40
Quad Bus Transceiver	**96103**	96103	70	-18
Quad 2-NOR Receiver	**96108**		7.8	-18

DISPLAY DECODER/DRIVERS

FUNCTION	DEVICE NO.	OUTPUT CURRENT mA	OUTPUT VOLTAGE V	ACTIVE HIGH/LOW	RIPPLE BLANKING	BLANKING ABOVE BCD 9-INPUT
1-of-10 Cold Cathode (OC*)	**9315 (54/7441)**	7.0	55	L		✓
1-of-10 Cold Cathode	**74141**	7.0	55	L		X
1-of-10 Driver (OC*)	**9302**	16	5.5	L		X
1-of-10 Driver (OC*)	**54/7445**	80	30	L		X
1-of-10 Driver (OC*)	**54/74145**	80	15	L		X
7-Seg Decoder	**9307**	12.5	5.5	H	X	
7-Seg Decoder	**54/7448**	1.3	5.5	H	X	
7-Seg Decoder (OC*)	**54/7449**	10	5.5	H	X	
7-Seg Decoder/Driver	**9317B**	40	20	L	X	X
7-Seg Decoder/Driver	**9317C**	20	30	L	X	X
7-Seg Decoder/Driver (OC*)	**54/7446A**	40	30	L	X	
7-Seg Decoder/Driver (OC*)	**54/7447A**	40	15	L	X	
7-Seg Decoder/Driver (OC*)	**54LS/74LS47**	24	15	L	X	

FUNCTION	DEVICE NO.	OUTPUT CURRENT mA	OUTPUT VOLTAGE V	ACTIVE HIGH/LOW	RIPPLE BLANKING	BLANKING ABOVE BCD 9-INPUT
7-Seg Decoder/Driver	**54LS/74LS48**	1.3	5.5	H	X	
7-Seg Decoder/Driver (OC*)	**54LS/74LS49**	8.0	5.5	H	X	
7-Seg Decoder/Driver (OC*)	**54LS/74LS247**	24	15	L	X	
7-Seg Decoder/Driver	**54LS/74LS248**	1.3	5.5	H	X	
7-Seg Decoder/Driver (OC*)	**54LS/74LS249**	8.0	5.5	H	X	
7-Seg Decoder/Driver (OC*)	**54LS/74LS347**	24	7.0	L	X	
7-Seg Decoder/Driver (OC*)	**54LS/74LS447**	24	7.0	L	X	
7-Seg LED Driver Common Cathode	**9368**	20	1.7	H	X	
7-Seg LED Driver Common Anode (OC*)	**9370**	25	5.5	L	X	
7-Seg LED Driver Common Anode (OC*)	**9374**	15	10	L	X	

ARITHMETIC OPERATORS

FUNCTION	DEVICE NO.	DESCRIPTION	NO. OF BITS
Adder	**54/7480**	Gated 1-Bit with Carry	1
Adder	**9304**	Dual 1-Bit with Carry	2
Adder	**54H/74H183**	Dual 1-Bit with Carry	2
Adder	**54/7482**	Full 2-Bit with Carry	2
Adder	**54/7483A**	Full Binary 4-Bit with Carry	4
Adder	**54LS/74LS83A**	Full Binary 4-Bit with Carry	4
Adder	**54/74283**	Full Binary 4-Bit with Carry	4
Adder	**54LS/74LS283**	Full Binary 4-Bit with Carry	4
Arithmetic Logic Unit	**9340**	ALU with Internal CLA*	4
Arithmetic Logic Unit	**9341 (54/74181)**	ALU with External CLA*	4
Arithmetic Logic Unit	**93L41**	ALU with External CLA*	4
Arithmetic Logic Unit	**54LS/74LS181**	ALU with External CLA*	4
Arithmetic Logic Unit	**93S41**	ALU with External CLA*	4
Carry Lookahead	**9342 (54/74182)**	CLA generator for 9341	
Carry Lookahead	**93S42 (54S/74S182)**	CLA generator for 93S41/9405	
Comparator	**9386 (8242)**	4-Bit Indentity Exclusive-NOR (OC*)	4
Comparator	**54/7485**	4-Bit Magnitude with Expander	4
Comparator	**54LS/74LS85**	4-Bit Magnitude with Expander	4

FUNCTION	DEVICE NO.	DESCRIPTION	NO. OF BITS
Comparator	**9324**	5-Bit Magnitude	5
Comparator	**93L24**	5-Bit Magnitude	5
Comparator	**93S46**	6-Bit Identity with Expander	6
Comparator	**93S47**	6-Bit Identity (OC*)	6
Encoder	**9318**	Priority 8-Bit with Expander	8
Encoder	**93L18**	Priority 8-Bit with Expander	8
Multiplier	**9344**	Binary 4 X 2-Bit	4 X 2
Multiplier	**93S43**	2s Complement	4 X 2
Multiplier	**54LS/74LS384**	Serial/Parallel 2s Complement	8
Parity	**54/74180**	8-Bit Parity Generator/Checker	8
Parity	**93S62**	9-Bit Parity Generator/Checker	9
Parity	**9348**	12-Bit Parity Generator/Checker	12
Parity	**54LS/74LS280**	9-Bit Parity Generator/Checker	9
True/Complement	**54H/74H87**	4-Bit True/Complement Zero/One Element	4
True/Complement	**54S/74S135**	Dual 2-Bit Exclusive OR/NOR	4

*CLA = Carry Lookahead, OC = Open-Collector

RANDOM ACCESS MEMORIES

ORGANIZATION	DEVICE NO.	DESCRIPTION	ADDRESS ACCESS TIME-ns (MAX) MIL/COM	CHIP SELECT ACCESS TIME-ns (MAX) MIL/COM	READ/WRITE CYCLE TIME COM 0°C to +70°C ns (MAX)	READ/WRITE CYCLE TIME MIL -55°C to +125°C ns (MAX)
TTL						
16 X 4	**7489**	OC[1]	60/60	50/50	115	115
SCHOTTKY						
16 X 4	**54S/74S189**	3S[1]	50/35	32/22	55	70
16 X 4	**54S/74S289**	OC[1]	50/35	25/17	55	70

ORGANIZATION	DEVICE NO.	DESCRIPTION	ADDRESS ACCESS TIME-ns (MAX) MIL/CDM	CHIP SELECT ACCESS TIME-ns (MAX) MIL/COM	READ/WRITE CYCLE TIME COM 0°C to +70°C ns (MAX)	READ/WRITE CYCLE TIME MIL -55°C to +125°C ns (MAX)
LOW POWER SCHOTTKY						
16 X 4	**54LS/74LS89**	OC[1]	37/37[2]	10/10[2]	72[2]	72[2]
16 X 4	**54LS/74LS189**	3S[1]	37/37[2]	10/10[2]	72[2]	72[2]
16 X 4	**54LS/74LS289**	OC[1]	37/37[2]	10/10[2]	72[2]	72[2]

1. OC = Open-Collector, 3S = 3-State
2. Typical Value

Manufactured in U.S.A.

74F Series

FAIRCHILD

- ☐ Speed—Faster than Schottky
- ☐ Power is 25% of Standard Schottky
- ☐ Planned 60 Functions

FAIRCHILD ADVANCED SCHOTTKY TTL
FAST GENERAL CHARACTERISTICS

- 20 mA OUTPUTS FOR BETTER LINE DRIVING CHARACTERISTICS
- HIGHER Ios FOR DRIVING CAPACITIVE LOADS
- 800 mV THRESHOLD OVER MILITARY TEMPERATURE
- INPUT LEAKAGE 20 μA MAXIMUM
- 7 V INPUT BREAKDOWN
- INPUT LOW CURRENT—600 μA
- POWER IS 25% OF STANDARD SCHOTTKY
- SPEED — FASTER THAN SCHOTTKY

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE

SYMBOL	CHARACTERISTICS		LIMITS Min	Typ	Max	UNITS	TEST CONDITIONS
V_{IH}	Input HIGH Voltage		2.0			V	Guaranteed Input HIGH Voltage
V_{IL}	Input LOW Voltage				0.8	V	Guaranteed Input LOW Voltage
V_{CD}	Input Clamp Diode Voltage				-1.2	V	V_{CC} = Min, I_{IN} = -18 mA
V_{OH}	Output HIGH Voltage	XM	2.5	3.4		V	V_{CC} = Min, I_{OH} = -1.0 mA V_{IN} = V_{IL} or V_{IH} per Truth Table
		XC	2.7	3.4			
V_{OL}	Output LOW Voltage			0.35	0.5	V	V_{CC} = Min, I_{OL} = 20 mA V_{IN} = V_{IL} or V_{IH} per Truth Table
I_{IH}	Input HIGH Current			1.0	20	μA	V_{CC} = Max, V_{IN} = 2.7 V
					0.1	mA	V_{CC} = Max, V_{IN} = 7 V
I_{IL}	Input LOW Current				-0.6	mA	V_{CC} = Max, V_{IN} = 0.5 V
I_{OS}	Output Short Circuit Current		-40		-150	mA	V_{CC} = Max, V_{OUT} = 0 V

POWER SUPPLY REQUIREMENTS (Current in mA)

	74F00	74F02	74F04	74F08	74F10	74F11	74F20	74F32	74F64
I_{CCH}	2.8	5.6	4.2	8.3	2.1	6.2	1.4	8.3	2.8
I_{CCL}	10.2	13.0	15.3	12.9	7.7	9.7	5.1	15.5	4.7

AC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE

PART	SYMBOL	C_L = 15 pF V_{CC} = 5.0 V T_A = 25°C MIN	TYP	MAX	C_L = 50 pF COMMERCIAL MIN	MAX	C_L = 50 pF MILITARY MIN	MAX	UNITS
74F00	t_{PLH}	1.5	2.9	3.9	2.0	6.0	2.0	7.0	ns
	t_{PHL}	1.5	2.6	3.6	2.0	5.5	2.0	6.5	
74F02	t_{PLH}	2.0	3.5	4.8	2.5	7.0	2.5	8.0	ns
	t_{PHL}	1.5	2.6	3.5	2.0	5.5	2.0	6.5	
74F04	t_{PLH}	1.5	2.7	3.8	2.0	6.0	2.0	7.0	ns
	t_{PHL}	1.5	2.5	3.5	2.0	5.5	2.0	6.5	
74F08	t_{PLH}	2.0	4.1	5.5	3.0	7.0	3.0	8.8	ns
	t_{PHL}	2.5	3.6	5.0	3.0	6.0	3.0	7.0	
74F10	t_{PLH}	1.5	2.9	3.9	2.0	6.0	2.0	7.0	ns
	t_{PHL}	1.5	2.7	3.7	2.0	5.5	2.0	6.5	
74F11	t_{PLH}	2.5	4.2	5.5	3.0	7.0	3.0	8.0	ns
	t_{PHL}	2.5	3.7	5.0	3.0	6.0	3.0	7.0	
74F20	t_{PLH}	1.5	2.9	3.9	2.0	6.0	2.0	7.0	ns
	t_{PHL}	1.5	2.8	3.8	2.0	5.5	2.0	6.5	
74F32	t_{PLH}	2.5	3.9	5.5	3.0	7.0	3.0	8.0	ns
	t_{PHL}	2.5	3.5	5.0	3.0	6.0	3.0	7.0	
74F64	t_{PLH}	1.5	3.6	4.8	2.0	7.0	2.0	8.0	ns
	t_{PHL}	1.5	2.8	3.8	2.0	5.5	2.0	6.5	

FAST LINE—UP

SSI GATE FUNCTIONS

DEVICE	DESCRIPTION
54F/74F00	QUAD 2-INPUT NAND GATE
54F/74F02	QUAD 2-INPUT NOR GATE
54F/74F04	HEX INVERTER
54F/74F08	QUAD 2-INPUT AND GATE
54F/74F10	TRIPLE 3-INPUT NAND GATE
54F/74F11	TRIPLE 3-INPUT AND GATE
54F/74F20	DUAL 4-INPUT NAND GATE
54F/74F32	QUAD 2-INPUT OR GATE
54F/74F64	AND/OR — INVERT GATE

MULTIPLEXERS

DEVICE	DESCRIPTION
54F/74F151	8-INPUT MULTIPLEXER
54F/74F153	DUAL 4-INPUT MULTIPLEXER
54F/74F157	QUAD 2-INPUT MULTIPLEXER
54F/74F158	QUAD 2-INPUT MULTIPLEXER
54F/74F251	8-INPUT MULTIPLEXER 3-STATE
54F/74F253	DUAL 4-INPUT MULTIPLEXER 3-STATE
54F/74F257	QUAD 2-INPUT MULTIPLEXER 3-STATE
54F/74F258	QUAD 2-INPUT MULTIPLEXER 3-STATE
54F/74F352	DUAL 4-INPUT MULTIPLEXER (INVERTED 153)
54F/74F353	DUAL 4-INPUT MULTIPLEXER 3-STATE (INVERTED 253)

FLIP-FLOPS & LATCHES

DEVICE	DESCRIPTION
54F/74F74	DUAL D-TYPE FLIP-FLOP
54F/74F109	DUAL JK TYPE FLIP-FLOP
54F/74F175	QUAD D FLIP-FLOP W/COMMON MASTER RESET
54F/74F373	OCTAL D LATCH
54F/74F374	OCTAL D FLIP-FLOP
54F/74F379	QUAD D FLIP-FLOP W/ENABLE
54F/74F533	INVERTING OCTAL D LATCH
54F/74F534	INVERTING OCTAL D FLIP-FLOP

COUNTERS

DEVICE	DESCRIPTION
54F/74F160	BCD DECADE CTR. ASYN RESET
54F/74F161	4-BIT BINARY CTR. ASYN RESET
54F/74F162	BCD DECADE CTR. SYNCH. RESET
54F/74F163	4-BIT BINARY CTR. SYNCH. RESET
54F/74F190	UP/DOWN DECADE COUNTER
54F/74F191	UP/DOWN BINARY COUNTER
54F/74F192	UP/DOWN DECADE COUNTER
54F/74F193	UP/DOWN BINARY COUNTER

REGISTERS

DEVICE	DESCRIPTION
54F/74F194	4-BIT BIDIRECTIONAL UNIVERSAL SHIFT REGISTER
54F/74F195	4-BIT PARALLEL ACCESS SHIFT REGISTER
54F/74F299	OCTAL SHIFT/STORAGE REGISTER 3-STATE
54F/74F322	OCTAL SHIFT/STORAGE REGISTER 3-STATE
54F/74F323	OCTAL SHIFT/STORAGE REGISTER 3-STATE

ARITHMETIC FUNCTIONS

DEVICE	DESCRIPTION
54F/74F182	CARRY LOOK-AHEAD GENERATOR
54F/74F280	9-BIT PARITY GENERATOR/CHECKER
54F/74F381	ARITHMETIC LOGIC UNIT
54F/74F510	4-BIT SHIFTER; 3-STATE OUTPUTS
54F/74F517	ARITHMETIC LOGIC UNIT
54F/74F521	OCTAL COMPARATOR
54F/74F524	REGISTERED COMPARATOR
54F/74F558	B X 8 MULTIPLIER
54F/74F559	8-BIT MULTIPLIER/DIVIDER

DECODER/DEMULTIPLEXERS

DEVICE	DESCRIPTION
54F/74F537	ONE-OF-EIGHT DECODER; 3-STATE OUTPUTS
54F/74F538	ONE-OF-EIGHT DECODER; 3-STATE OUTPUTS
54F/74F539	DUAL ONE-OF-FOUR DECODER; 3-STATE OUTPUTS

BUFFERS & LINEDRIVERS

DEVICE	DESCRIPTION
54F/74F240	OCTAL INV. BUS/LINE DRIVER
54F/74F241	OCTAL BUS/LINE DRIVER
54F/74F242	QUAD BUS TRANSCEIVER
54F/74F243	QUAD BUS TRANSCEIVER
54F/74F244	OCTAL BUFFER/LINE DRIVER
54F/74F545	OCTAL BUS TRANSCEIVER

MEMORIES

DEVICE	DESCRIPTION
54F/74F189	64-BIT MEMORY 3-STATE
54F/74F289	64-BIT MEMORY OPEN COLLECTOR

Manufactured in U.S.A.

- ☐ Industry Standard B Spec
- ☐ Advanced ISO Planar C Technology
- ☐ High Noise Immunity and Standardised Drive Characteristics

GATES

Function	DEVICE ND.
NAND Gates	
Quad 2-Input NAND	4011B
Triple 3-Input NAND	4023B
Dual 4-Input NAND	4012B
8-Input NAND	4068B
OR Gates	
Quad 2-Input OR	4071B
Dual 4-Input OR	4072B
Triple 3-Input OR	4075B
Schmitt Triggers	
Quad 2-Input NAND Schmitt Trigger	4093B
Dual Schmitt Trigger	4583B
Hex Schmitt Trigger	40014B

Function	DEVICE NO.
AND Gates	
Quad 2-Input AND	4081B
Triple 3-Input AND	4073B
Dual 4-Input AND	4082B
Inverters and Buffers	
Hex Inverter	4069UB
Hex Inverting Buffer	4049B
Hex Non-Inverting Buffer	4050B
3-State Hex Inverting Buffer	40098B
3-State Hex Non-Inverting Buffer	40097B
Quad True/Complement Buffer	4041B

Function	DEVICE NO.
NOR Gates	
Quad 2-Input NOR	4001B
Triple 3-Input NOR	4025B
Dual 4-Input NOR	4002B
8-Input NOR	4078B
Complex Gates	
Quad Exclusive OR	4030B
Quad Exclusive OR	4070B
Quad Exclusive NOR	4077B
Dual 2-Wide, 2-Input AND-OR-Invert	4085B
4-Wide, 2-Input AND-OR-Invert	4086B
Dual Complementary Pair Plus Inverter	4007UB

LATCHES/FLIP-FLOPS

Function	DEVICE NO.	Data Inputs	Common Clear	Enable/Clock Inputs (Level)	Required Enable/Clock Pulse Width-ns (Typ) V_{DD} 10V	Enable/Clock to Q Delay-ns (Typ) V_{DD} 10V	Logic/Connection Diagram
Dual JK Flip-Flop	4027B	JK	RS	H	35	45	C21
Dual D Flip-Flop	4013B	D	RS	H	30	38	C22
Quad D Flip-Flop	40175B	D	X	H	10	35	C23
Quad D Flip-Flop w/3-State Duptuts	4076B	D	MR	L	35	35	C110
Hex D Flip-Flop	40174B	D	X	H	10	35	C24
4-Bit Latch	4042B	D	—	H	16	66	C25
4-Bit Latch	4043B	RS	RS	H	14	30	C26

Function	DEVICE NO.	Data Inputs	Common Clear	Enable/Clock Inputs (Level)	Required Enable Clock Pulse Width-ns (Typ) V_{DD} 10V	Enable/Clock to Q Delay-ns (Typ) V_{DD} 10V	Logic/Connection Diagram
4-Bit Latch	4044B	RS	RS	H	14	30	C27
Dual 4-Bit Address Latch	4723B	D	X	L	20	50	C28
8-Bit Address Latch	4724B	D	X	L	20	40	C29
BCD-to-7-Seg Latch/Decoder/Dvr	4511B	D	X	L	14	90	C111
BCD-to-7-Seg Latch/Decoder/Dvr for Liquid Crystal	4543B	D	X	H	40	200	C112
BCD-to-7-Seg Latch/Decoder Dvr w/Ripple Blanking	4734B	D	X	L	14	90	C114

MULTIPLEXERS

Function	DEVICE NO.	Enable Inputs	True Output	Select Delay ns (Typ) V_{DD} 10V	Enable Delay ns (Typ) V_{DD} 10V	Data Delay ns (Typ) V_{DD} 10V	Logic/Connection Diagram
Quad 2-Input	4019B	—	X	37	—	37	C30
Quad 2-Input	4519B	—	X	50	—	50	C31

Function	DEVICE NO.	Enable Inputs	True Output	Select Delay ns (Typ) V_{DD} 10V	Enable Delay ns (Typ) V_{DD} 10V	Data Delay ns (Typ) V_{DD} 10V	Logic/Connection Diagram
Dual 4-Input	4539B	X	X	88	53	71	C32
Single 8-Input	4512B	X	3-State	85	45	75	C33

REGISTERS

Function	DEVICE NO.	No. of Bits	Serial Entry	Parallel Entry No. of Bits	Clock Edge	Max Clock Frequency MHz (Typ) V_{DD} - 10V	Clock To Output Delay-ns (Typ) V_{DD} - 10V	Logic/Connection Diagram
Parallel-In/Parallel-Out	4035B	4	JK	4	L→H	17	90	C39
Parallel-In/Parallel-Out Bidirectional	40194B	4	D	4	L→H	14	45	C40
Parallel-In/Parallel-Out	40195B	4	JK	4	L→H	14	45	C41
Serial-In/Parallel-Out	4015B	8	D	—	L→H	14	85	C42
Parallel-In/Serial-Out	4014B	8	D	8	L→H	14.7	68	C43
Parallel-in/Serial-Out	4021B	8	D	8	L→H	18.1	74	C44

Function	DEVICE NO.	No. of Bits	Serial Entry	Parallel Entry No. of Bits	Clock Edge	Max Clock Frequency MHz (Typ) V_{DD} 10V	Clock To Output Delay-ns (Typ) V_{DD} 10V	Logic Connection Diagram
Serial-In/Serial-Out	4006B	18	D	—	H→L	30	37	C45
Serial-In/Serial-Out	4731B	256	D	—	H→L	8.0	95	C46
Serial-In/Serial-Out	4031B	64	D	—	L→H	8.0	60	C78
Serial-In/Serial-Out Variable	4557B	1 to 64	D	—	2-H→L or L→H	10	150	C80
Parallel/Serial-Input/Output	4034B	8	D	8	L→H	8.0	155	C79

ARITHMETIC OPERATORS

Function	DEVICE ND.	Description	No. of Bits
Adder	4008B	Binary Adder	4
Adder	4560B	BCD Adder	4x2
Carry Lookahead	4582B	Carry Lookahead Block	4
Comparator	40085B	Magnitude Comparator	4
Data Path Switch	4704B	Data Path Switch	4
ArithmeticLogicRegister Stack	4705B	Arith Logic Register Stack	4
Data Access Register	4707B	Data Access Register	4

Function	DEVICE NO.	Description	No. of Bits
Register Unit	4581B	4-Bit Arithmetic Logic Register Unit	4x2
Rate Multiplier	4527B	BCD Rate Multiplier	4
Parity Checker/Generator	4531B	13-Input Parity Checker/ Generator	13
Parity Encoder	4532B	8-Input Parity Encoder	8
Complementer	4561B	9's Complementer	4
Sequencer	4708B	10-Bit Microprocessor Sequencer	10

Manufactured in U.S.A.

- ☐ Industry Standard B Spec
- ☐ Advanced ISO Planar C Technology
- ☐ High Noise Immunity and Standardised Drive Characteristics

DECODERS/DEMULTIPLEXERS

Function	DEVICE NO.	Address Inputs	Active LOW Enable	Output Configuration	Select Delay ns (Typ) V_{DD} 10V	Enable Delay ns (Typ) V_{DD} 10V
Dual 1-of-4 Decoder	**4555B**	2x2	2	H	60	60
Dual 1-of-4 Decoder	**4556B**	2x2	2	L	68	58
1-of-10 Decoder	**4028B**	4	—	H	66	—
1-of-16 Decoder	**4514B**	4	1	H	95	95
1-of-16 Decoder	**4515B**	4	1	L	95	95
Dual 4-Channel Demultiplexer	**4052B**	2	1	H	125	105
8-Channel Demultiplexer	**4051B**	3	1	H	125	105
BCD-to-7-Segment Latch/Decoder/Dvr	**4511B**	4	1	H	90	98
BCD-to-7-Segment Latch/Decoder/ Dvr for Liquid Crystals	**4543B**	4	—	H or L	200	200
BCD-to-7-Segment Latch/Decoder/ Dvr w/Ripple Blanking	**4734B**	4	1	H	90	98

COUNTERS

Function	DEVICE NO.	Modulo	Parallel Load[1]	Clock Transition	Max Clock Rate MHz (Typ) V_{DD} 10V	Clock to Q Output Delay ns (Typ) V_{DD} 10V
4-Bit Sync Count Up	**4016BI**	Decade	S	L→H	12	55
4-Bit Sync Count Up	**4161BI**	Binary	S	L→H	12	55
4-Bit Sync Count Up	**4162BI**	Decade	S	L→H	12	55
4-Bit Sync Count Up	**4163BI**	Binary	S	L→H	12	55
4-Bit Sync Count Down	**4522B**[1]	Decade	A	L→H or H→L	10	95
4-Bit Sync Count Down	**4526B**[2]	Binary	A	L→H or H→L	10	95
4-Bit Sync Count Up/Down	**4510B**	Decade	A	L→H	12	62
4-Bit Sync Count Up/Down	**4516B**	Binary	A	L→H	12	62
4-Bit Sync Count Up/Down	**40192B**	Decade	A	L→H	8.0	105
4-Bit Sync Count Up/Down	**40193B**	Binary	A	L→H	8.0	105
4-Bit Sync Count Up/Down	**4029B**	Decade or Binary	A	L→H	12	62
Dual 4-Bit Sync Count Up	**4518B**	Decade	—	L→H or H→L	10	95
Dual 4-Bit Synchronous Count Up	**4520B**	Binary	—	L→H or H→L	10	95
7-Bit Ripple Count Up	**4024B**	Binary	—	H→L	30	45
12-Bit Ripple Count Up	**4040B**	Binary	—	H→L	25	55
14-Bit Ripple Count Up	**4020B**	Binary	—	H→L	25	55
4-Bit Johnson Counter	**4022B**[2]	1-of-8	—	L→H or H→L	16	95
5-Bit Johnson Counter	**4017B**	1-of-10	—	L→H or H→L	13.8	114
5-Bit Johnson Counter	**4018B**[2]	—	—	L→H	10	115
Bit Rate Generator	**4702B**	14-Bit Rates	—	L→H	6.5	40
21-Stage Binary Counter	**4045B**	Binary	—	L→H	25	900
24-Stage Binary Counter	**4521B**	Binary	—	H→L	12	3200
Real Time 5-Decade Counter	**4534B**	Decade(x5)	—	L→H	4.5	1000
3-Digit BCD Counter	**4553B**	Decade (x3)	—	L→H or H→L	6.0	300
7-Stage Counter	**4727B**	Binary	—	L→H	8.0	90
7-Stage Counter	**4737B**	Binary	—	L→H	8.0	90
Programmable Timer/Counter	**4722B**	Binary	—	H→L	6.0	1000
Industrial Time Base Generator	**4566B**	Decade	—	H→L	3.2	400

1 A Asynchronous, S Synchronous
2 To be announced

MONOSTABLES

Function	DEVICE NO.	Typical Pulse Width Variation (%) V_{DD} 15V	No. of Inputs: Positive	No. of Inputs: Negative	Resettable	Output (t_{pw})-ns V_{DD} 5.0V
Dual Retriggerable Resettable Monostable Multivibrator	**4528B**	±3%	1	1	X	300
Low Power Monostable/ Astable Multivibrator	**4047B**	—	1	*	X	—
Dual Precision Monostable Multivibrator	**4538B**	±0.5%	1	1	X	200
Micro Power Phase Locked Loop	**4046B**	—	—	—	—	—

ANALOG DEVICES

Function	DEVICE NO.	Enable Input	Max ON Resistance-Ω V_{DD} - V_{IS} 10V	Max OFF State Leakage Current-nA V_{DD} 10V	Signal Capability V
Quad Bilateral Switch	**4016B**	X	840	125	0-15 ±7.5
Quad Bilateral Switch	**4066B**	X	520	100	0-15 ±7.5
Dual 4-Channel Multiplex/Demultiplex	**4052B**	X	600	100	0-15 ±7.5
8-Channel Multiplexer/Demultiplexer	**4051B**	X	600	100	0-15 ±7.5
Triple 2-Channel Multiplex/Demultiplexer	**4053B**	X	600	100	0-15 ±7.5
16 Channel Mux/Demux	**4067B**	X	600	100	0-15 ±7.5
4x4 Cross Point Switch	**4741B**	X	840	100	0-15 ±7.5

Manufactured in U.S.A.

- RAM's, ROM's, PROM's and FPLA
- TTL and ECL
- ISO Planar Technology

TTL RAMs

DEVICE NO.	Organization	Description[1]	Address Access Time ns (Typ)	Chip Select Access Time ns (Typ)	Read/Write Cycle Time		Power Dissipation mW (Typ)	No. of Pins	Package(s)		
					Comm 0°C to +70°C ns (Max)	-55°C to +125°C ns (Max)			PC	DC	DM
54LS/74LS89[4]	16x4	OC	—	—	—	—	—	16	†	†	†
54LS/74LS189[4]	16x4	3S	—	—	—	—	—	16	†	†	†
54LS/74LS289[4]	16x4	OC	—	—	—	—	—	16	†	†	†
7489	16x4	OC	30	30	60/55	60/55	—	16	†	†	†
9410	16x4	3S	35	25	50[2]	—	375	18	X	X	X
93410	256x1	OC	45	25	60/45	70/55	450	16	X	X	X
93410A	256x1	OC	35	20	45	—	450	16	X	X	X
93411	256x1	OC	45	25	55/45	65/55	475	16	X	X	X
93411A	256x1	OC	40	25	45	—	475	16	X	X	X
93L420	256x1	3S	40	20	45	55	250	16		X	X
93L421	256x1	3S	45	30	90/75	100/90	275	16	X	X	X
93421	256x1	3S	35	20	50/35	60/45	475	16	X	X	X
93421A	256x1	3S	30	20	40/35	—	475	16		X	X
93419	64x9	OC	35	15	45	60	725	28		X	X
93412	256x4	OC	30	20	45	60/55	475	28		X	

DEVICE NO.	Organization	Description[1]	Address Access Time ns (Typ)	Chip Select Access Time ns (Typ)	Read/Write Cycle Time		Power Dissipation mW (Typ)	No. of Pins	Package(s)		
					0°C to +70°C ns (Max)	-55°C to +125°C ns (Max)			PC	DC	DM
93L412	256x4	OC	45	20	60	75/70	250	28		X	
93422	256x4	3S	30	20	45	60/55	475	22	X	X	X
93L422	256x4	3S	45	20	60	75/70	250	22		X	X
93415	1024x1	OC	30	15	45	60	475	16	X	X	X
93L415	1024x1	OC	35	20	60	70	200	16	X	X	X
93415A	1024x1	OC	25	15	30	—	475	16		X	X
93425	1024x1	3S	30	15	45	60	475	16	X	X	X
93L425	1024x1	3S	35	20	60	70	200	16	X	X	X
93425A	1024x1	3S	25	15	30	—	475	16		X	X
93470	4096x1	OC	30	15	50/55	60/70	800	18		X	X
93471	4096x1	3S	30	15	50/55	60/70	800	18		X	X
93481	4096x1	Dynamic, 3S	90	35	120	—	45/350	16		X	
93481A	4096x1	Dynamic, 3S	80	35	100	—	45/350	16		X	

ECL RAMs

100142	4x4	—	2.7	—	3.3[3]	—	730	24	†	†	†
10145A	16x4	—	6.5	4.5	9.0/10[2]	—	500	16		X	
100145A	16x4	—	4.8	—	—	—	765	24	†	†	†
10405	128x1	—	12	5.0	15[2]	—	475	16		X	
10410	256x1	—	18	7.0	30/38[2]	—	475	16		X	
10411	256x1	—	20	7.0	35/47[2]	—	360	16		X	

10414	256x1	—	7.0	4.0	—	—	450	16		†	
100414	256x1	—	7.0	4.0	—	—	500	16		†	
10415	1024x1	—	25	7.0	35/38[2]	—	475	16		X	
10415A	1024x1	—	12	5.0	20/27[2]	—	475	16		X	
100415	1024x1	—	12	5.0	20/30[2]	—	500	16		X	
10470	4096x1	—	25	10	—	—	900	18		X	

TTL ROMs

93457	256x4	ROM,OC	25	12	45	60	425	16	X	X	X
93467	256x4	ROM,3S	25	12	45	60	425	16	X	X	X
93431	512x4	ROM,OC	30	15	50	60	475	16	X	X	X
93441	512x4	ROM,3S	30	15	50	60	475	16	X	X	X

93432	512x8	ROM,OC	35	15	55	70	650	24	X	X	X
93442	512x8	ROM,3S	35	15	55	70	650	24	X	X	X
93454	1024x8	ROM,OC	30	20	45	60	550	24	X	X	X
93464	1024x8	ROM,3S	30	20	45	60	550	24	X	X	X

TTL PROMs/FPLAs

93417	256x4	PROM,OC	25	12	45	60	425	16	X	X	X
93427	256x4	PROM,3S	25	12	45	60	425	16	X	X	X
93436	512x4	PROM,OC	30	15	50	60	475	16	X	X	X
93446	512x4	PROM,3S	30	15	50	60	475	16	X	X	X
93438	512x8	PROM,OC	35	15	55	70	650	24	X	X	X
93448	512x8	PROM,3S	35	15	55	70	650	24	X	X	X

93452	1024x4	PROM,OC	30	15	55	70	650	18	X	X	X
93453	1024x4	PROM,3S	30	15	55	70	650	18	X	X	X
93450	1024x8	PROM,OC	30	20	45	60	550	24	X	X	X
93451	1024x8	PROM,3S	30	20	45	60	550	24	X	X	X
93458	16x48x8	FPLA,OC	25	15	—	—	750	28	X	X	X
93459	16x48x8	FPLA,3S	25	15	—	—	750	28	X	X	X

ECL PROMs

10416	256x4	PROM	15	4.0	25[5]	—	650	16		X	
100416	256x4	PROM	15	4.0	25[5]	—	650	16		X	

1. OC = open collector, 3S = 3-state
2. Measured @ T_A = 25°C
3. Typical Data In to Match Out
4. To be announced
5. −30°C to +85°C

† To be announced during life of catalogue

Manufactured in U.S.A.

- Dynamic & Static RAM's
- Shift Registers & FIFO
- Consumer & Industrial

RANDOM ACCESS MEMORIES

Organization	DEVICE NO.	Description	Access Time ns (Max)	Cycle Time ns (Min)	Power Dissipation mW (Max)	Temperature[1]	No. of Pins
MOS							
1024x1	**21L02H**	Static	250	250	158/24[4]	C	16
1024x1	**21L02F**	Static	350	350	158/24[4]	C	16
1024x1	**21L021**	Static	450	450	158/24[4]	C	16
1024x1	**21L022**	Static	650	650	158/24[4]	C	16
1024x1	**2102LH**	Static	250	250	158[2]/220[3]	C,L,M	16
1024x1	**2102LF**	Static	350	350	158[2]/220[3]	C,L,M	16
1024x1	**2102L1**	Static	450	450	158[2]/220[3]	C,L,M	16
1024x1	**2102L2**	Static	650	650	158[2]/220[3]	C,L,M	16
1024x1	**2102H**	Static	250	250	289[2]/385[3]	C,L,M	16
1024x1	**2102F**	Static	350	350	289[2]/385[3]	C,L,M	16
CMOS							
16x4	**4710B**	Static	95[6]	—	0.4	C,M	18
16x4	**4725B**	Static	100[6]	—	0.4	C,M	16
256x1	**4720B**	Static	95[6]	—	0.4	C,M	16

Organization	DEVICE NO.	Description	Access Time ns (Max)	Cycle Time ns (Min)	Power Dissipation mW (Max)	Temperature[1]	No. of Pins
1024x1	**21021**	Static	450	450	289[2]/385[3]	C,L,M	16
1024x1	**21022**	Static	650	650	289[2]/385[3]	C,L,M	16
1024x1	**3542/2102S**	Static	150	150	289	C	16
1024x1	**3542A/2102R**	Static	200	200	289	C	16
1024x4	**F2114**	Static	200	200	350	C	18
16,384x1	**F16K3**	Dynamic	200	375	465/20[4]	C	16
16,384x1	**F16K4**	Dynamic	250	410	465/20[4]	C	16
16,384x1	**F16K5**	Dynamic	300	500	465/20[4]	C	16
256x4	**4721B**	Static	240[6]	—	0.7	C,M	22
1024x1	**4736B**[5]	Static	320[6]	—	0.7	C,M	16

ROMs, EPROMs AND CHARACTER GENERATORS

Organization	DEVICE NO.	Description	Access Time ns (Max)	Power Dissipation mW (Max)	Temperature[1]	No. of Pins
MOS						
64x5x7	**3257**	Character Generator	1000	715	C	24
64x7x5	**3258**	Character Generator	800	500	C	16
64x9x7	**3260**	Character Generator	1000	660	C	24
512x8	**35141**	ROM	850	580	C	24
512x8	**35142**	ROM	1000	580	C	24
512x8	**35151**	ROM	600	510	C	24
CMOS						
256x8	**4735B**	ROM	152[6]	0.7[6]	C,M	24

Organization	DEVICE NO.	Description	Access Time ns (Max)	Power Dissipation mW (Max)	Temperature[1]	No. of Pins
MOS						
512x8	**35152**	ROM	700	510	C	24
1024x8	**F2708**	EPROM	450	800	C,L,M	24
1024x8	**F27061**	EPROM	350	800	C,L	24
1024x8	**F3508**	ROM	450	330	C	24
2048x8	**F3516E**	ROM	450	330	C	24

1. C = Commercial temperature range; L = Limited military temperature range; M = Military temperature range
2. Commercial temperature range
3. Military and limited military temperature range
4. Standby power
5. To be announced
6. Typical value @ V_{DD} = 10V

SHIFT REGISTERS

Organization	DEVICE NO.	Description	Frequency MHz (Max)	Power Dissipation mW (Max)	Temperature[1]	No. of Pins
MOS						
32x6	**3348**	Static Shift Register	1.0	150	C	24
32x6	**3349**	Static Shift Register	1.0	150	C	16
64x4	**3342**	Static Shift Register	1.5	380	C	16
80x4	**3347**	Static Shift Register	1.5	380	C	16
80x4	**33571**	Static Shift Register	4.0	375	C	16

Organization	DEVICE NO.	Description	Frequency MHz (Max)	Power Dissipation mW (Max)	Temperature[1]	No. of Pins
MOS						
80x4	**33572**	Static Shift Register	2.0	285	C	16
16x4Kx1	**F464-2**	CCD Dynamic Shift Register	1.0-5.0[4]	336/66[3]	C	16
16x4Kx1	**F464-3**	CCD Dynamic Shift Register	1.0-4.0[4]	336/66[3]	C	16
16x4Kx1	**F464-4**	CCD Dynamic Shift Register	1.0-2.0[4]	336/66[3]	C	16

FIFOs AND LIFOs

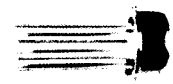
MOS						
64x4	**3341**	FIFO	0.7	450/625[2]	C,L,M	16
64x4	**3341A**	FIFO	1.0	450	C	16
40x9	**33511**	FIFO	2.0	420	C	28
40x9	**35512**	FIFO	1.0	520	C,L,M	28

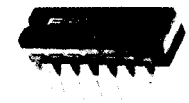
CMOS						
16x4	**4703B**	FIFO	5.3	0.5	C,M	24
16x4	**4706B**	LIFO	5.3	0.5	C,M	24
TTL						
16x4	**9403**	FIFO	10	850	C,M	24
16x4	**9406**	LIFO	10	800	C,M	24

1. C = Commercial temperature range; L = Limited military temperature range; M = Military temperature range
2. Military and limited military temperature range
3. Standby power
4. Minimum frequency specification

Manufactured in U.S.A.

- ☐ 10K 2nS ECL
- ☐ 100K Subnanosecond ECL
- ☐ Communication / Instrumentation Circuits





F10,000 SERIES INDUSTRY STANDARD 2 ns ECL

10000	4-BIT SHIFT REGISTER
10010	DECADE COUNTER
10014	ACTIVE TERMINATOR
10016	BINARY COUNTER
10100	QUAD 3 NOR
10101	QUAD OR/NOR
10102	QUAD NOR
10103	QUAD OR
10104	QUAD, AND
10105	TRIPLE OR/NOR
10106	TRIPLE NOR
10107	EXC OR/NOR
10109	DUAL OR/NOR
10110	DUAL 3/3 OR
10111	DUAL 3/3 NOR
10113	QUAD EXC OR
10114	TRIPLE LINE RECEIVER
10115	QUAD LINE RECEIVER
10116	TRIPLE LINE RECEIVER
10117	DUAL 2-WIDE OAI
10118	DUAL 2-WIDE OA
10119	4-WIDE OA
10121	4-WIDE OAI
10123	BUS DRIVER
10124	TTL-ECL TRANSLATOR
10125	ECL-TTL TRANSLATOR
10130	DUAL D LATCH
10131	DUAL D FLIP-FLOP
10132	DUAL MULTIPLEXER/LATCH
10133	QUAD D LATCH
10134	DUAL MULTIPLEXER/LATCH
10135	DUAL JK FLIP-FLOP
10136	UP/DOWN BINARY COUNTER
10137	UP/DOWN DECADE COUNTER
10141	4-BIT UNIVERSAL SHIFT REGISTER
10145A	16 x 4 REGISTER FILE (RAM)
10153	QUAD D LATCH
10158	QUAD MULTIPLEXER
10159	QUAD MULTIPLEXER (INV)
10160	12-BIT PARITY
10161	1- OF - 8 DEMULTIPLEXER/DECODE
10162	1- OF - 8 DEMULTIPLEXER/DECODE
10164	8-INPUT MULTIPLEXER
10165	PRIORITY ENCODER
10166	5-BIT COMPARATOR
10168	QUAD D LATCH
10170	9 + 2 PARITY
10171	DUAL 1-OF-4
10172	DUAL 1-OF-4
10173	QUAD MULTIPLEXER/LATCH
10174	DUAL MULTIPLEXER
10175	QUINT D LATCH
10176	HEX D FLIP-FLOP
10177	ECL TO MOS TRANSLATOR
10179	LOOKAHEAD
10180	DUAL ADDER/SUBTRACTOR
10181	4-BIT ALU
10186	HEX D FLIP-FLOP WIRESET
10192	BUS DRIVER
10210	HS 10110
10211	HS 10111
10212	HS 1-OR/2 NOR
10231	HS 10131
10405 (10144)	128 x 1 RAM
10410 (10147)	256 x 1 RAM
10415 (10146)	1024 x 1 RAM
10416 (10149)	256 x 4 PROM

F100,000 SUBNANOSECOND ECL

100101	TRIPLE 5-INPUT GATE
100102	QUINT 2-INPUT GATE
100107	QUINT EX-OR NOR
100112	QUAD DRIVER
100114	LINE RECEIVER
100117	TRIPLE AOI
100118	5 WIDE AOI
100122	9-BIT BUFFER
100123	HEX BUS DRIVER
100130	TRIPLE D LATCH
100131	TRIPLE S FLIP-FLOP
100136	MULTIPURPOSE COUNTING REGISTER
100141	8-BIT UNIVERSAL SHIFT REGISTER
100142	4 x 4 RAM
100145	16 x 4 REGISTER FILE
100150	HEX D LATCH
100151	HEX D FLIP-FLOP
100155	QUAD MULTIPLEXER LATCH
100156	MASK MERGE
100158	SHIFT MATRIX
100160	DUAL 9-BIT PARITY
100163	DUAL 8 MULTIPLEXER
100164	16-INPUT MULTIPLEXER
100165	UNIVERSAL PRIORITY ENCODER
100166	9-BIT COMPARATOR
100170	UNIVERSAL DECODER
100171	TRIPLE 4-INPUT MULTIPLEXER
100179	CARRY LOOKAHEAD
100180	DUAL ADDER/SUBTRACTOR
100181	4-BIT ALU BINARY/DECIMAL
100183	2 x 8 BIT
100194	QUINT DUPLEX BUS DRIVER
100415	1024 x 1 RAM
100416	256 x 4 PROM

F11C00 – COMMUNICATIONS/INSTRUMENTATIONS CIRCUITS

11C01	DUAL 5, 4 OR/NOR
11C05	1 GHz – 4 COUNTER
11C06	750 MHz. D FLIP-FLOP
11C24	DUAL TTL VCM
11C44	O - FREQUENCY DETECTOR
11C58	ECL VCM
11C70	650 MHz D FLIP-FLOP W/RESET
11C83	1GHz ÷ 248/256 PRESCALER
11C84	40 CHANNEL CB RADIO SYNTHESIZER
11C90	650 MHz ÷ 10/11 PRESCALER (ECL/TTL OUTPUTS)
11C91	650 MHz ÷ 5/6 PRESCALER (ECL/TTL OUTPUTS)
95H90	300 MHz ÷ 10/11 PRESCALER
95H91	300 MHz ÷ 5/6 PRESCALER

Manufactured in U.S.A.

- ☐ Image Sensors
- ☐ Analogue Shift Registers/Delay Lines
- ☐ Developmental Boards

Linear Image Sensors

Fairchild CCD Image Sensors feature high dynamic range, high sensitivity, on-chip preamplifiers with low output impedance, two-phase clocking, Isoplanar-N buried channel structures, low voltage and power requirements, and standard DIP packaging. Applications include optical character recognition, facsimile, metrology and TV.

CCD110	256 ELEMENT	DYNAMIC RANGE 500:1	18 PIN
CCD133	1024 ELEMENT	DYNAMIC RANGE 500:1	24 PIN
CCD121	1728 ELEMENT	DYNAMIC RANGE 500:1	24 PIN
CCD122	1728 ELEMENT	DYNAMIC RANGE 2500:1	24 PIN
CCD142	2048 ELEMENT	DYNAMIC RANGE 2500:1	28 PIN

Area Image Sensors

Area arrays are similar to the linear sensors except that the photosites are arranged in a matrix format and the opaque transport registers are located between the photosite columns. Applications include video cameras requiring low power, small size, high sensitivity and reliability.

CCD211	244 x 190 ELEMENT	DYNAMIC RANGE 300:1	24 PIN
CCD221	488 x 380 ELEMENT	DYNAMIC RANGE 1000:1	22 PIN

Analogue Shift Registers/Delay Lines

Fairchild CCD Analog Shift Registers/Delay Lines feature high dynamic range, wide operating frequency range, on-chip preamplifiers, 2-phase clocking, Isoplanar-N, silicon gate buried channel structure and standard DIP packaging.

Applications include variable and fixed analog delay lines and time-base correction in video systems; echo effect simulations, reverberation systems etc in audio applications.

CCD321A	455/910 ELEMENT	Can be used as two 455 or one 910 bit analog delay line and comes in four different classes.

CCD321A-1	Broadcast quality video applications	Signal BW	5 MHz min	16 PIN
CCD321A-2	Medium quality video applications	Signal BW	4.2 MHz min	16 PIN
CCD321A-3	General purpose timebase correction applications	Signal BW	4.2 MHz min	16 PIN
CCD321A-4	Audio applications	Signal BW	23 KHz min	16 PIN

Design Development Boards and Modules

Fairchild offers a series of printed circuit boards for use as construction aids for experimental systems using CCD linear and area image sensors. These design development boards are fully assembled and tested and require only power supplies and an oscilloscope to display the video information corresponding to the image positioned in front of the sensor. Power supplies required are +5V, +15V and −15V through a standard 0.156" pitch 22 pin edge connector.

Image sensor boards are	CCD110DB CCD133DB CCD121DB	CCD122DB CCD142DB
Shift Register/delay line boards are	CCD321VM video delay module which includes the CCD321A-2 analog shift register CCD321AM audio module which includes the CCD321A-4	

CCD Line-Scan Camera Subsystems

CCD1100	256 ELEMENT
CCD1300	1024 ELEMENT
CCD1400	1728 ELEMENT

Each camera model offers essentially equivalent performance except for resolution requirements. The line-scan camera can be ordered with a C–mount lens with focal length to meet specific application.

Manufactured in U.S.A.

FAIRCHILD

F8 Microprocessor

- Single and Multiple Chip Systems
- Easily Expandable
- Software/Hardware Support Available

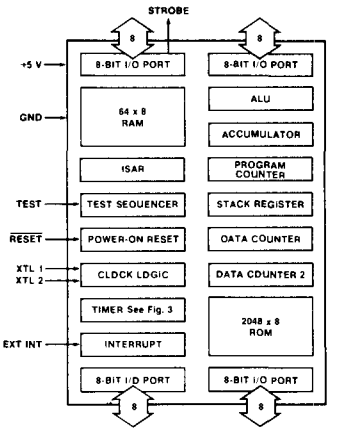
MICROMACHINE™ SERIES

MICROMACHINE™

MicroMachine™ devices are complete 8-bit microcomputers on single MOS integrated circuits. The family can execute the F8 instruction set of more than 70 commands, allowing expansion into multi-chip configurations with software compatibility. The devices feature read only memory, 64 bytes of scratchpad RAM, a programmable binary timer, 32 bits of I/O, and a single +5 V power supply requirement.

Members of the family differ in memory type and size. The F3870 has 2048 bytes of mask programmed ROM while the F38E70 has 2048 bytes of PROM. The F3872 has 3K bytes of masked ROM plus 64 bytes of RAM. The additional RAM is addressed from the program and data counters, not the ISAR. The F3874 contains 4096 bytes of masked programmed ROM.

Utilizing ion-implanted, n-channel silicon-gate technology and advanced circuit design techniques, Fairchild's single-chip microcomputers offer maximum cost effectiveness in a wide range of control and logic replacement applications.



DEVICE	RAM	ROM	I/O	POWER DOWN	POWER SUPPLY
F3870	64 x 8	2K x 8	32	NO	5 V
F3872	128 x 8	4K x 8	32	YES	5 V
F3876	128 x 8	2K x 8	32	YES	5 V
F3878	64 x 8	4K x 8	32	NO	5 V
F38E70	64 x 8	2K x 8 EPROM	32	NO	5 V
Plus	A SERIES OF DEVICES WITH SPECIAL FUNCTIONS FOR SPECIFIC MARKETS.				

Note: The F3872 has an optional power down feature that allows the 64 byte RAM to be saved with a +2 V. Supply that will dissipate 2.5 mW. Two I/O port pins are traded for this function.

DEVELOPMENT SUPPORT

The Formulator family of development equipment supports the F3870, the one-chip micromachine manufactured by Fairchild. The Formulator Operating System, Utility Programs, and the Fairbug Monitor are totally compatible with the F3870, since it shares the same instruction set with the Formulator. A Simulation (Quad I/O) Module and an In-Circuit Emulation (ICE) cable are available to extend the Formulator features to the user's prototype or production breadboard. This creates a powerful design tool for creating the user's own F3870 software. In addition, the F3870 Emulator, a single stand-alone module for emulating the final F3870 software in PROMs, is available for building prototype systems.

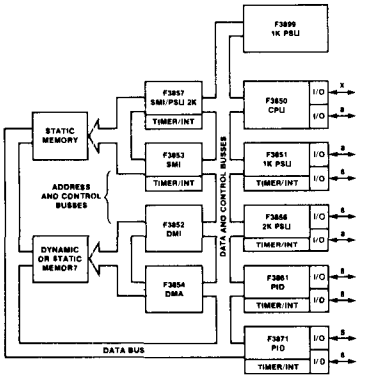
F3870 SIMULATION

The non-microprocessor elements of the user's hardware configuration can be assembled on a breadboard and connected to Mark I, II, IIFD, III or IIIFD via the ICE cable plugged into a 40-pin socket on the user's board. The cable connector on the Processor Module in the Formulator provides I/O ports 0 and 1, while the Simulation (Quad I/O) Module provides I/O ports 4 and 5. This system provides real-world simulation of the user's components in their actual environment with the vital microprocessor signals, including the complete software debugging features of the Formulator, cabled to the external breadboard.

F3870 EMULATOR

After F3870 ROM codes are frozen, a smaller, easier-to-handle and less expensive tool is required. To accomplish this design-in task, Fairchild has developed the F3870 Emulator. The F3870 Emulator contains sockets for two 2708s or two 2716 EROMs in place of the F3870 on-chip ROM so ROM codes can be verified and easily changed. The F3870 Emulator plugs directly into the F3870 40-pin socket in the production prototype using a short Emulator cable. The printed circuit module is approximately 5" by 7".

F8 MICROPROCESSOR FAMILY



FUNCTION	F3850 CPU	F3851 PSU	F3852 DMI	F3853 SMI	F3854 DMA	F3856 PSU	F3857 PSU/SMI	F3861 PIO	F3871 PIO	F3899 ROM
Arithmetic Unit	Yes									
Accumulator	Yes									
64-byte Scratchpad RAM	Yes									
Power on Detect	Yes									
Clock Circuits	Yes									
Interrupt Logic	Yes	Yes		Yes		Yes	Yes	Yes	Yes	
Instruction Register	Yes									
I/O Ports (8 lines each)	2	2				2		2	2	
ROM (K bytes)		1K				2K	2K			1K
Data Bus (8 lines)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Address Bus (16 lines)			Yes	Yes	Yes		Yes			
Control Bus (5 lines)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Program Counter		Yes	Yes	Yes		Yes	Yes			Yes
Stack Register		Yes	Yes	Yes		Yes	Yes			Yes
Data Counters		1	2	2		2	2			1
Programmable Timer		Yes		Yes		Yes	Yes	Yes	Yes	
External Interrupt		Yes		Yes		Yes	Yes	Yes	Yes	
Pulse Width Measure						Yes	Yes		Yes	
Event Counter						Yes	Yes		Yes	
Vectured Interrupts		Yes		Yes		Yes	Yes	Yes	Yes	
Memory Refresh Control			Yes							
DMA Control			Yes		Yes					
+5V required	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
+12V required	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Power mW (Typ)	330	270	330	330	280	785	785	270	270	270
Maximum # in System	1	63	1	1	4	31	1	62	62	63
Logic/Connection Diagram	P1	P2	P3	P4	P5	P6	P7	P2	P6	P8
Package(s)	6l,8P	6l,8P	6l,8P	6l,8P	6l,8P	6l,8P	6l,8P	6l,8P	6l,8P	6l,8P

Number of ports in System is limited by addressing. The maximum is 256 Port Adresses (each F8 device uses 4 Port Addresses). Maximum memory is 64K bytes RAM/ROM/PROM.

The F38T56 and F38T57 incorporate the F3871-type of timer logic and strobe logic. These devices will be available 3rd quarter 1978.

Manufactured in U.S.A.

INTEGRATED CIRCUITS

F8 Microprocessor

FAIRCHILD

- ☐ Single and Multiple Chip Systems
- ☐ Easily Expandable
- ☐ Software/Hardware Support Available

F8 MICROPROCESSOR FAMILY

PORT ADDRESSING

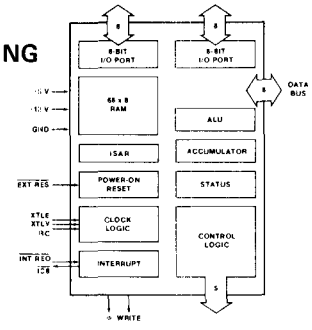
DEVICE NO.	PORT A		PORT B		PORT C		PORT D		TIMER INTERRUPT VECTOR ADDRESS	PORT TYPES
	ADDR.	FUNC.	ADDR.	FUNC.	ADDR.	FUNC.	ADDR.	FUNC.		
F3850	0	I/O	1	I/O						Standard
F3851	XXXXXX00	I/O	XXXXXX01	I/O	XXXXXX10	Control	XXXXXX11	Timer	Mask Option	Mask Option
F3851A	4	I/O	5	I/O	6	Control	7	Timer	H'0020'	Standard
F3852	H'0C'		H'0D'	Control	H'0E'		H'0F'			
F3852/ SL31116	H'EC'		H'ED'	Control	H'EE'		H'EF'			
F3853	H'0C'	Interrupt Vector Addr. Lo	H'0D'	Interrupt Vector Addr.Hi	H'0E'	Control	H'0F'	Timer	Software Programmable	
F3854	1111YY00	DMA Mem Addr. Lo	1111YY01	DMA Mem Addr. Hi	1111YY10	Control Hi Count	1111YY11	Lo Count		
F3856	XXXXXX00	I/O	XXXXXY01	I/O	XXXXXX10	Control	XXXXXX11	Timer	Mask Option	Mask Option
F38T56	XXXXXX00	I/O	XXXXXY01	I/O	XXXXXX10	Control	XXXXXX11	Timer	Mask Option	Mask Option
F3856A	8	I/O	9	I/O	H'0A'	Control	H'0B	Timer	H'0024'	Standard
F3857					XXXXXX10	Control	XXXXXX11	Timer	Mask Option	Mask Option
F3861A	4	I/O	5	I/O	6	Control	7	Timer	H'0600'	Standard
F3861B	8	I/O	9	I/O	H'A'	Control	H'B'	Timer	H'0340'	Standard
F3861C	H'20'	I/O	H'21'	I/O	H'22'	Control	H'23'	Timer	H'0320'	Standard
F3861D	H'24'	I/O	H'25'	I/O	H'26'	Control	H'27'	Timer	H'0360'	Standard
F3861E	4	I/O	5	I/O	6	Control	7	Timer	H'0020'	Standard
F3871E	4	I/O	5	I/O	6	Control	7	Timer	H'0020'	Standard
F3871F	4	I/O	5	I/O	6	Control	7	Timer	H'0020'	Direct Drive
F3871G	4	I/O	5	I/O	6	Control	7	Timer	H'0020'	Open Drain
F3871H	4	I/O	5	I/O	6	Control	7	Timer	H'0420'	Standard

1. XXXXXX is a Mask Option
2. YY is a Pin Strap Option (1111YY00)
3. The External Interrupt Address Vector is the Timer Address + H'0080'
4. Three different types of timers and control ports exist. For further detail see Figures 1, 2, and 3.
5. F38T56 and F38T57 have F3871-type timer and strobe logic.

F3850 CENTRAL PROCESSING UNIT (CPU)

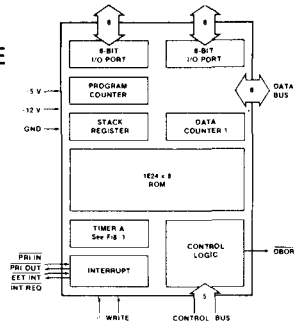
The CPU is an 8-bit arithmetic device with 70 instructions. It contains a 64-byte RAM, an instruction register, an accumulator, two parallel I/O ports, an interrupt control, power on reset and clock generation logic. The CPU provides communication control lines to the other members of the family.

The F8 offers several alternatives for connecting memory to the system. These may be used individually, or in various combinations, depending upon the requirements.



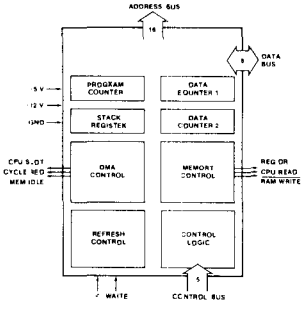
F3851 PROGRAM STORAGE UNIT (PSU)

The F3851 PSU contains 1024 bytes of mask programmable ROM, a program counter and a data counter. It also has two parallel I/O ports, an 8-bit data port, a stack register, an incrementer/adder, a programmable timer and an interrupt control. Several F3851 circuits may be put in one system, thus increasing the ROM, I/O, and interrupt capability of the system. The F3851 program storage unit may be used alone, or in combination with one of the memory interface circuits.



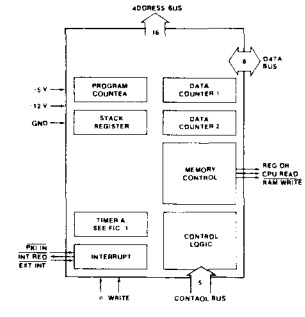
F3852 DYNAMIC MEMORY INTERFACE (DMI)

The DMI provides an appropriate interface for either static or dynamic memory components. When dynamic RAM circuits are used the DMI provides the necessary refresh controls required to maintain memory integrity. Another function of the DMI is to provide control for the F3854 DMA circuit. The dynamic memory refresh cycles and the DMA transfers are performed without slowing the central processor. The DMI also contains a program counter, data counter, an auxiliary data counter, stack register, incrementer/adder, an 8-bit data bus and a 16-bit address bus for communication with external memory. The DMI may be used solely with the CPU, or in conjunction with the F3851 PSU device.



F3853 STATIC MEMORY INTERFACE (SMI)

The SMI is the second of three alternative devices in the F8 family which may be used with the 3850 CPU for memory interface. The SMI provides the necessary control for static memory components such as the 2102 RAM, 2708 EPROM, or 93448 PROM. The SMI also contains a program counter, data counter, an auxiliary data counter, stack register, incrementer/adder, a programmable timer, an 8-bit data bus and a 16-bit address bus for communication with external memory. The F3853 may be used solely with the CPU, or in conjunction with F8 PSU devices.



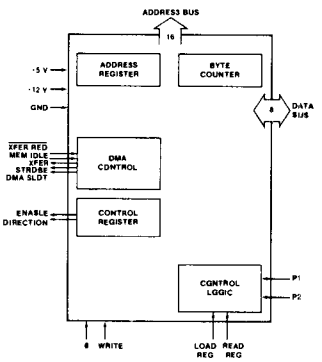
Manufactured in U.S.A.

- Single and Multiple Chip Systems
- Easily Expandable
- Software/Hardware Support Available

F8 MICROPROCESSOR FAMILY

F3854 DIRECT MEMORY ACCESS UNIT (DMA)

The DMA circuit allows memory access from an external device during periods when the CPU is not using the memory. The F3852 DMI provides a control line which indicates periods when the memory is idle. During these periods the DMA transfers data between an external device and the memory. This operation is performed without slowing the central processor. In addition, the DMA contains a 16-bit memory address bus, an 8-bit data bus, programmable address vector and data length counter.

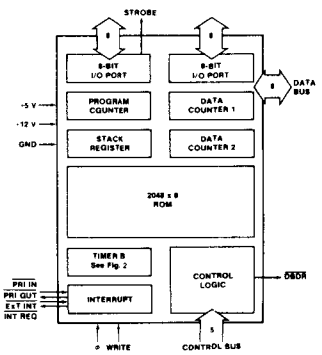


F3856 PROGRAM STORAGE UNIT (PSU)

It is important to note that Fairchild's program storage unit is not just a conventional read only memory. In addition to containing 2048 bytes of mask programmable ROM for program and constant storage, the F3856 includes the addressing logic for memory referencing, a program counter, an indirect address register (the data counter) and a stack register. A complete vectored interrupt level, including an external interrupt line to alert the central processor, is provided. All of the logic necessary to request, acknowledge and reset the interrupt is on the F3856. The 8-bit programmable timer is especially useful for generating real tima dalays. The PSU has an additional 16 bits of TTL compatible, bidirectional, fully latched I/O lines.

Systems requiring more program storage may be expanded by adding more PSU circuits. For example, one F3850 and two F3856 PSUs will produce a microprocessor system complete with 64 bytes of RAM, 4096 bytes of ROM, 48 I/O bits, two interrupt levels, and two programmable timers. This complete system will require only three IC packages.

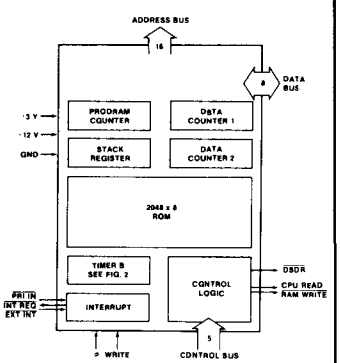
The F38T56 incorporates the F3871-type timer and strobe logic.



F3857 PROGRAM STORAGE UNIT/STATIC MEMORY INTERFACE (PSU/SMI)

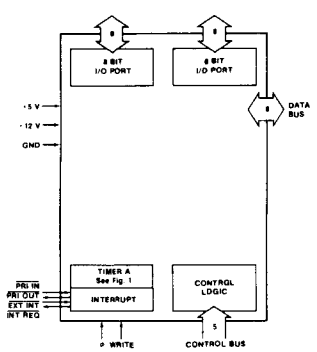
The F3857 is the third alternative device in the F8 family which may be used with the F3850 CPU for memory interface. The PSU/SMI provides the necessary control for static memory components such as the 2102 RAM or F2708 EPROM. The PSU/SMI also contains a program counter, data counter, an auxiliary data counter, stack register, incrementer/adder, a programmable timer, an 8-bit data bus and a 16-bit address bus for communication with external memory. The F3857 may be used solely with the CPU, or in conjunction with other members of the F8 family. The F3857 differs from the F3853 in that a 2048 byte mask programmable ROM is also included.

The F38T57 incorporates the F3871-type timer and strobe logic.



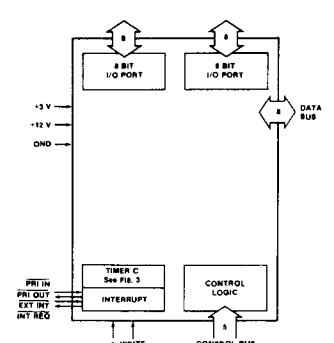
F3861 PERIPHERAL I/O DEVICE (PIO)

The PIO is an expansion unit for I/O ports, interrupts and timers. It contains two 8-bit I/O ports, one interrupt control, and one programmable timer. Depending on the application requirements, multiple PIOs may be added to the system to expand the functions at low cost.



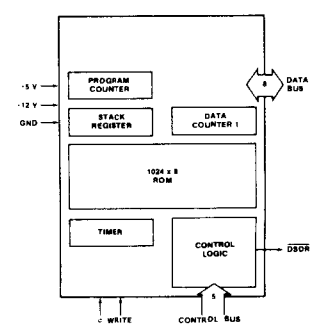
F3871 PERIPHERAL I/O DEVICE (PIO)

The PIO is an expansion unit for I/O ports, interrupts and timers. It contains two 8-bit I/O ports, one interrupt control, and one programmable timer. Depending on the application requirements, multiple PIOs may be added to the system to expand the functions at low cost. The versatile timer/interrupt circuit has the ability to measure external pulse widths, or count external pulses in addition to providing a timer with resolution of 1.0μs at 2.0MHz.



F3899 PROGRAM STORAGE UNIT (PSU)

The F3899 PSU contains 1024 bytes of mask programmable ROM, a program counter, stack register, and a data counter. The F3899 provides a low cost ROM memory to augment the F8 family.



Manufactured in U.S.A.

INTEGRATED CIRCUITS

F6800 Microprocessor

FAIRCHILD

- ☐ Directly Compatible with M6800
- ☐ Ideal for Data Processing/Communication Functions
- ☐ 9400 TTL Bit Slice Family

F6800 MICROPROCESSOR FAMILY

DEVICE NO.	Function	Power Supply V	P_D Max (Typ) mW	Cycle Time ns	Access Time ns	Memory Size
F6800	MPU, Address, Interrupt	5.0	(600)	1000		
F68A00	MPU, Address, Interrupt	5.0	(500)	667		
F68B00	MPU, Address, Interrupt	5.0	(500)	500		
F6801	Single Chip Microcomputer with 128x8 RAM	5.0	(500)	500		2Kx8 (ROM)
F6802	MPU, Address, RAM Interrupt	5.0	(600)	1000		128x8 (RAM)
F68A02	MPU, Address, RAM, Interrupt	5.0	(600)	667		128x8
F68B02	MPU, Address, RAM, Interrupt	5.0	600	500		128x8
F6809[1]	MPU, Address, Interrupt	5.0		500/1K		
F6810	Static RAM	5.0	400		460	128x8
F68A10	Static RAM	5.0	400		360	128x8
F68B10	Static RAM	5.0	400		250	128x8
F6820/21	Parallel I/O 16 lines	5.0	550	1000		
F68A21	Parallel I/O 16 lines	5.0	550	667		
F68B21	Parallel I/O 16 lines	5.0	550	500		
F68308	Mask Prog ROM	5.0	650		500	1Kx8
F68A308	Mask Prog ROM	5.0	650		360	1Kx8
F68B308	Mask Prog ROM	5.0	650		250	1Kx8
F68316	Mask Prog ROM	5.0			500	2Kx8
F68A316	Mask Prog ROM	5.0			360	2Kx8
F68B316	Mask Prog ROM	5.0			250	2Kx8
F6840	Programmable Timer	5.0	550	1000		
F68A40	Programmable Timer	5.0	550	667		
F68B40	Programmable Timer	5.0	550	500		
F6843	Floppy Disk Interface	5.0				
F6844	Direct Memory Access					
F6845	CRT Controller	5.0				
F6846	ROM, I/O, Timer	5.0	800	1000		2Kx8
F68A46	ROM, I/O, Timer	5.0	800	667		2Kx8
F68B46	ROM, I/O, Timer	5.0	800	500		2Kx8
F68488	GPIA (IEEE Bus)	5.0				
F6850	Async Data Adapter	5.0	300	1000		
F68A50	Async Data Adapter	5.0	300	667		
F68B50	Async Data Adapter	5.0	300	500		
F6852	Sync Data Adapter	5.0	300	1000		
F68A52	Sync Data Adapter	5.0	300	667		
F68B52	Sync Data Adapter	5.0	300	500		
F6854	Advanced Data Link CTL	5.0		1000		
F68A54	Advanced Data Link CTL	5.0		667		
F68B54	Advanced Data Link CTL	5.0		500		
F6860	0-600 BPS Modem	5.0	325			
F6862	2400 BPS Modulator	5.0	300			

1 F6809 supports the F6800 instruction set but also has enhanced instructions and additional hardware features.

BIPOLAR MICROPROCESSOR FAMILY

BIT SLICE MICROPROCESSORS

DEVICE NO.	Functional Description	Power Supply V	Maximum Frequency MHz (Typ)	Power mW (Typ)
9404	Data Path Switch	5.0	10	300
9405A	4-Bit Arithmetic Logic Register Stack (CPU slice with 8 Registers)	5.0	13	550
9406	16x4 push-down pop-up Program Stack	5.0	10	500
9407	Data Access Register (PC, SP and operand pointer)	5.0	10	450
9408	10-Bit Microprogram Sequencer/Controller (pipeline capability)	5.0	7.0	650
9408A	10-Bit Microprogram Sequencer/Controller (pipeline capability)	5.0	10	650
9409/ 2901A	4-Bit CPU Slice, (16 Registers)	5.0	10	800
9410	Register Stack (16x4 RAM with output latch)	5.0	25	375

LSI PERIPHERAL LOGIC ELEMENTS

DEVICE NO.	Functional Description	Power Supply V	Maximum Frequency MHz (Typ)	Power mW (Typ)
9401	16-Bit Cyclic Redundancy Generator/Checker	5.0	18	350
9403	16x4-Bit Serial/Parallel FIFO Buffer Memory	5.0	10	600
9423	64x4-Bit Serial/Parallel FIFO Buffer Memory	5.0	8.0	750

MICROPROCESSOR PERIPHERALS

Function	DEVICE NO.	Temperature[3]	No. of Pins
USART	F3843	C	28
Synchronous Protocol Communications Controller	F3846[1]	C	40

Manufactured in U.S.A.

- 16 Bit Microprocessor
- 9400 TTL Bit Slice Family
- 9440 Microcomputer

CMOS MICROPROCESSOR FAMILY

LSI PERIPHERAL LOGIC ELEMENTS

DEVICE NO.	Functional Description	Power Supply V	Frequency MHz (Typ @ 5V)	Power mW (Typ @ 5V)
4702B	Programmable Bit Rate Generator	3-15	5.0	0.05
4703B	16x4-Bit Serial/Parallel FIFO Buffer Memory	3-15	2.3	0.015
4710B	Register Stack (16x4 RAM with output latch)	3-15	6.8	0.01

16-BIT MICROPROCESSOR FAMILY

9440 16-BIT BIPOLAR MICROPROCESSOR

The 9440 I3L microprocessor is a minicomputer CPU compactly packaged in a 40-pin DIP. It requires a 5.0V power supply and dissipates 1.0 W of power. A full military temperature range version is available.

9440 features include TTL input/output levels, single static clock driven by an on-chip oscillator (up to 12MHz variable) microprogram control using a PLA (program logic array) eight 16-bit on-chip registers, priority interrupt handling with up to 16 priority levels, fast direct memory access at memory speeds, four classes of instructions allowing a total of 2192 different instructions, and 32K 16-bit words (65K byte) addressing ranges.

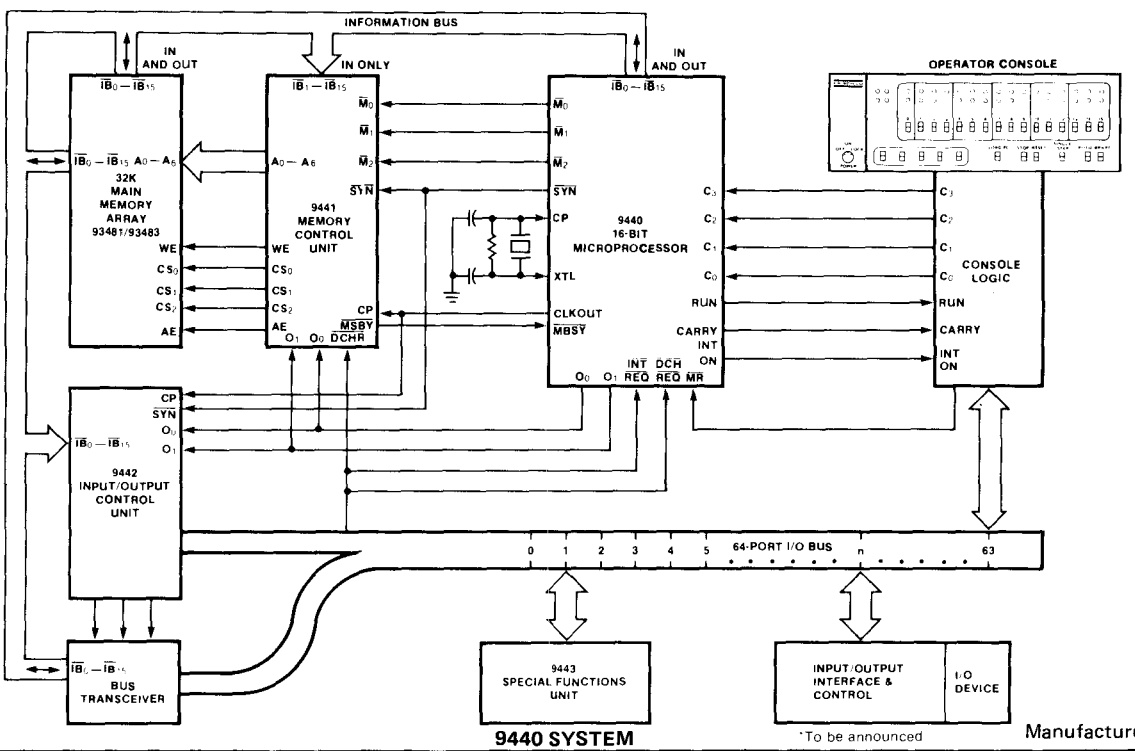
The 9440 system includes the following LSI support circuits.

9441 Memory Control Unit — contains a 15-bit memory address register, refresh address counter and a 7-bit address multiplexer. It provides the timing and control signals to operate up to 32K words (64K bytes) of I3L dynamic memory (93481, 93483) for read, write, refresh and DMA operations.

9442 Input/Output Control Unit — responds to I/O instructions and generates the timing and control signals for 9440 peripheral devices.

9443* Special Functions Unit — executes the multiply, divide and stack instructions.

To fully utilize the 9440 flexible instruction set the Fairchild Integrated Real-time Executive (FIRE™) software package is provided. It consists of all the required program development aids plus a full set of diagnostic programs as well as high level language processors.



9440 SYSTEM

*To be announced

Manufactured in U.S.A.

INTEGRATED CIRCUITS

Fire Microprocessor

FAIRCHILD

- 16 Bit Microprocessor Family
- CPU, Microcomputer, Minicomputer
- Fully Supported with Fire Software

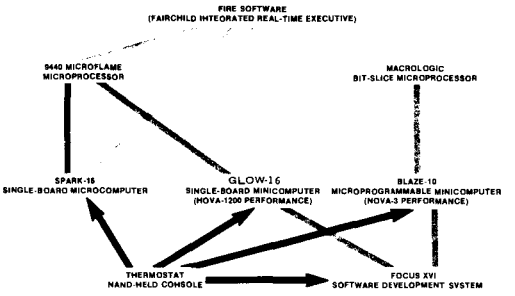
FIRE COMPUTERS

A set of computer boards has been developed to meet a broad range of data-processing requirements for immediate application in users' systems:

- SPARK-16 for small, low-cost memory requirements
- GLOW-16 with NOVA*1200 capabilities for larger, low-cost memory needs.
- BLAZE-16 with NOVA*3 capabilities for large, high-performance requirements.

Instruction execution times are given in *Table 1* for both the FIRE family and the NOVA* computers.

The FIRE Family



SPARK-16 Microcomputer Board

SPARK-16 is a double-sided 8" x 10" pc board designed as a vehicle for evaluating the 9440 MICROFLAME CPU. It may also be used as a stand-alone microcomputer for applications that require small amounts of memory. It includes the following:

- 16-bit 9440 MICROFLAME CPU
- 4K words of bipolar dynamic RAM (93481s)
- 2K words of autoload PROM (loaded with the FIREBUG Autoload program)
- Memory control with DMA capability
- Logic for a serial port — current loop (TTY) or RS232C interface
- 100-pin edge connector with the 9440 bus
- Connector for TTY/RS232C
- Control switches and display (Autoload, Continue, Halt, Reset).

SPARK-16 requires only a single 5 V, 4.5 A supply and a TTY or CRT terminal. When the Reset and Autoload switches are activated, FIREBUG provides a system ready to accept commands interactively from the terminal. Similar PROM resident programs, such as BABY BASIC, will be available as optional replacements for FIREBUG PROMs.

GLOW-16 Minicomputer Board

The FLAME-16 board is a 16-bit bipolar minicomputer with NOVA* 1200 capabilities, including up to 32K words of memory. The 15" x 15" board incorporates the following functions:

- 16-bit wide MICROFLAME CPU
- 32,768 words of main memory using 93481 4K bipolar dynamic RAMs (will be replaced by the 93483 16-bit RAMs when they are available)
- Memory parity logic
- Memory control logic implemented in MSI/SSI form using the same logic as the new 9441 LSI circuit
- Input/output control logic implemented with MSI/SSI using the same logic that will be available in the new 9442 I/O bus controller LSI
- Front-panel console interface for both conventional FOCVS-XVI and hand-held (THERMOSTAT)consoles
- Autoload logic and FIREBUG PROMS (2K x 16).

FOCVS XVI and Thermostat

The FOCVS XVI computer box features a 9-slot chassis, regulated power supply and a front-panel computer console. It is attractively designed for stand-alone use or to fit into a standard RETMA rack on chassis slides. The front panel console latches and displays the data and address; it has control switches for examining the memory and accumulator contents, for depositing data and for setting hardware breakpoints. Lights and control switches are also provided for examining and debugging the microprogram when FOCVS is used with BLAZE-16. The chassis accommodates up-to-nine standard 15" x 15" pc boards including GLOW-16, BLAZE-16, and the NOVA-compatible controller and interface boards. The THERMOSTAT is a hand-held console designed for use in MICROFLAME-based systems without front-panel console control.

BLAZE-16 Minicomputer Board Set

BLAZE-16 is a 16-bit microprogrammed minicomputer, implemented with the Macrologic bit-slice microprocessor set. It is compatible with the NOVA* 3, as well as the 9440 MICROFLAME microprocessor, and executes the same instruction set. Implemented on two 15" x 15" pc boards, BLAZE-16 includes the subsystems listed on page 13.

Board 1 — BLAZE-16/C

- Macrologic microprogrammed CPU
- Memory control logic
- A 16K word memory array (using 93481 4K x 1 RAMs)
- Memory parity logic
- Memory mapping logic (up to 256K words addressing)
- Autoload logic and FIREBUG PROMs
- Input/Output bus converter

Board 2 — BLAZE-16/M

- A 16K word memory array (using 93481 4K x 1 RAMs)
- TTY/RS232C interface logic
- High-speed paper tape reader/punch interface logic
- Real-time clock.

The BLAZE-16 CPU can essentially be divided into two major parts — a 16-bit-wide data path and a microprogram control. The data path consists of four 9405A arithmetic logic register stacks, each with eight registers/accumulators, and four 9404 data path switches. A 9408 (3L microprogram sequencer controls the 1024-word by 48-bit microprogram, which resides in twelve 1024 x 4 ROMs. In addition to the basic FIRE instruction set, the BLAZE-16 microprogram handles the multiply and divide instructions and the stack handling operations. It includes a self-test routine and 15 operator-console routines. About 70% of the microprogram memory is free for user microprogramming and future instruction-set expansion. BLAZE-16 operates in a pipeline mode with a 200 ns microcycle. A 16-bit-wide bidirectional bus, common to all peripheral devices as is that of the 9440-based system, transfers both addresses and data between the CPU and main memory. The memory arrays are designed to accommodate the 93483 16K x 1 bipolar RAMs, which expands BLAZE-16 to a 128K-word minicomputer system.

FIRE and NOVA* Computers Instruction Execution Times

INSTRUCTION	SPEED IN MICROSECONDS			
	BLAZE-16 (a)	NOVA* 3 (b)	9440 SPARK-16 GLOW-16 (c)	NOVA 1200
Load Accumulator	1.0	1.1 - 2.0	2.41	2.55
Store Accumulator	1.0	1.1 - 2.0	3.66	2.55
ISZ, DSZ	1.4	1.6 - 2.4	3.66	3.15
Jump	0.6	0.7 - 1.0	1.25	1.35
Jump to Subroutine	1.2	1.0 - 1.2	1.25	1.35
Add	1.0	0.7 - 1.0	1.25	1.35
Subtract	1.0	0.7 - 1.0	1.25	1.35
And	1.0	0.7 - 1.0	1.25	1.35
Move	1.0	0.7 - 1.0	1.25	1.35
+ Skip	0	0.3	1.25	1.35
I/O Input	1.6	2.0 - 2.2	2.08	2.55
I/O Output	1.6	2.0 - 2.2	2.08	3.15

(a) Oscillator frequency — 10 MHz, memory Read cycle — 400 ns.
(b) Minimum for semiconductor memory, maximum for 16K core.
(c) Oscillator frequency — 12 MHz, Memory Busy < 120 ns.

FIRE Software Package

PROGRAM	FUNCTION
FIRE-LOAD	Absolute binary tape loader
FIRE DIAGNOSTICS	Hardware diagnostic programs
FIREBUG	Interactive entry and debugging program
FIRE-EDIT	Text editor
FIRE-SYMBUG	Symbolic debugger
FIRE-BASIC	Extended BASIC interpreter
BABY BASIC	PROM resident expandable BASIC interpreter
FIRE-ASM	Relocatable code assembler
FIRE-MACRO	Macro assembler
FIRE-XREF	Cross-reference assembly lister
FIRE-RELOAD	Relocating loader
FIRE-LIBE	Library of relocatable utilities
FIRE-REX	Real-time executive for multi-tasking
FIRE-FDOS	Floppy disc operating system
FIRE-IDOS	Interactive disc operating system
FIRE-FORTRAN	FORTRAN 77 compiler
FIRE-PASCAL	PASCAL compiler and run time interpreter
FIRE-STOIC	STOIC compiler and run time interpreter

* Registered Trade Mark of Data General Ltd.

Manufactured in U.S.A.

- Radio & TV Circuits
- Amplifiers & Arrays
- Timers and Controllers

CONSUMER CIRCUITS

AUDIO POWER AMPLIFIERS

DEVICE NO.	Features	Power Supply Voltage V	Speaker Impedance Ω	Power Output W
TBA641A12	High current capability	9.0	4.0	2.2
TBA641B11	High current capability	14	4.0	4.5
TBA800	Suitable for 24 V supply operation; eg: TV	24	16	5.0
TBA800A	Suitable for 24 V supply operation; eg: TV	24	16	5.0
TBA810S	Thermal shutdown	14.4	4.0	6.0
TBA810AS	Thermal shutdown	14.4	4.0	6.0
TBA810DS	Thermal shutdown over voltage protection	14.4	4.0	6.0

DEVICE NO.	Features	Power Supply Voltage V	Speaker Impedance Ω	Power Output W
TBA810DAS	Thermal shutdown over voltage protection	14.4	4.0	6.0
TBA820	Low power supply operation-suitable for battery operation	12 9.0 6.0 3.5	8.0 8.0 4.0 4.0	2.0 1.2 0.75 0.22
TBA820L	Low power supply operation-suitable for battery operation	12 9.0 6.0 3.5	8.0 8.0 4.0 4.0	2.0 1.2 0.75 0.22

DEVICE NO.	Features	Power Supply Voltage V	Speaker Impedance Ω	Power Output W
TDA2002	Thermal shutdown, over voltage protection, short circuit protection	16 14.4 14.4	2.0 2.0 4.0	10 8.0 5.0
TDA2002A	Thermal shutdown, short circuit protection	16 14.4 14.4	2.0 2.0 4.0	10 8.0 5.0
μA706A	High current capability	9.0	4.0	2.2
μA706B	High current capability	14	4.0	5.5
μA783	Thermal shutdown (operation from 4.0 to 30 V)	24	8.0	9.0

RADIO-AUDIO CIRCUITS

IF, RF Amplifiers, Gain Blocks, Detectors, Decoders

DEVICE NO.	Description
μA703	IF, RF Amplifier
μA720	AM Radio Circuit (RF, Converter, IF)
μA721	AM/FM IF Amplifier, FM Limiter, Detector
μA732	Stereo Decoder

DEVICE NO.	Description
μA753	FM Gain Block
μA757	Gain Controlled IF Amplifier
μA758	PLL Stereo Decoder
μA767	Stereo Decoder
Preamplifiers	
μA733	Diff Video Amp
μA739	Dual Audio Preamplifier
μA749	Dual Audio Preamplifier

DEVICE NO.	Description
μA1310	PLL Stereo Decoder
μA2136	FM IF Limiter Detector
μA3075	FM IF Limiter Detector
μA3089	FM IF Limiter Detector

TELEVISION CIRCUITS

DEVICE NO.	Description
TAA630S	Chroma Demodulator
TBA510	Chroma Processor
TBA520	Chroma Demodulator
TBA530	RGB Matrix Preamplifier
TBA540	Reference Combination
TBA560C	Luma & Chroma Control Combination
TBA920	Horizontal Oscillator
TBA920S	Horizontal Oscillator
TBA970	Video Amplifier

DEVICE NO.	Description
TBA990	Chroma Demodulator
TDA1190	TV Sound System
TDA1190Z	TV Sound System
TDA2510	Chroma Combination
TDA2521	Chroma Demodulator
μA746	Chroma Demodulator
μA780	PLL Chroma Subcarrier Regenerator
μA781	Gain Controlled Chroma Amplifier

DEVICE NO.	Description
μA787	Chroma Processor
μA788	Chroma Demodulator—DC Tint Control
μA796	Double Balanced Modulator/Demodulator
μA1391	Horizontal Processor (+ Flyback)
μA1394	Horizontal Processor (- Flyback)
μA3064	Automatic Fine Tuning
μA3065	Sound IF

SPECIAL FUNCTIONS

OEVICE NO.	Description
μA742	Zero Crossing ac Trigger Trigac
μA7390	Ground Fault Detector
μA7391	2.0 A Motor Speed Control
μA7392	300 mA Motor Speed Control

DEVICE ND.	Description
μA555	Single Timer
μA556	Dual Timer
μA2240	Programmable Timer-Counter

ARRAYS

DEVICE NO.*	Function	Balanced Input	Balanced Output	Low Noise	AGC Capability	Multiple Unit	Wideband	Switching Application	V_{CBO}-V	V_{CEO}-V	V_{EBO}-V	I_C-mA	Diode Matching mV	Reverse Recovery Time-ns
μA726	Temp Controlled Diff Pair	•	•	•	—	—	—	—	40	30	5.0	5.0	—	—
μA3018	Matched Transistor Array	•	•	—	•	•	•	—	20	15	5.0	50	—	—
μA3018A	Matched Transistor Array	•	•	—	•	•	•	—	20	15	5.0	50	—	—
μA3019	Diode Array	—	—	—	—	—	—	•	—	—	—	—	1.0	—
μA3026	Dual Diff Amp Transistor Array	—	—	—	—	—	—	—	20	15	5.0	50	—	—
μA3036	Dual Darlington Transistor Array	•	•	•	—	•	—	—	30	15	5.0	50	—	—

DEVICE NO.*	Function	Balanced Input	Balanced Output	Low Noise	AGC Capability	Multiple Unit	Wideband	Switching Application	V_{CBO}-V	V_{CEO}-V	V_{EBO}-V	I_C-mA	Diode Matching mV	Reverse Recovery Time-ns
μA3039	Quad Plus Two Diodes	—	—	—	—	—	—	•	—	—	—	—	1.0	1.0
μA3045	Diff Pair Plus Three Transistors	•	•	—	—	•	•	—	20	15	5.0	50	—	—
μA3046	Diff Pair Plus Three Transistors	•	•	—	—	•	•	—	20	15	5.0	50	—	—
μA3054	Dual Diff Amp Transistor Array	—	—	—	—	•	—	—	20	15	5.0	50	—	—
μA3086	Diff Pair Plus Three Transistors	•	•	—	—	•	•	—	20	15	5.0	50	1.0	—

Manufactured in U.S.A.

Voltage Regulators

FAIRCHILD

- ☐ Positive and Negative
- ☐ Fixed and Adjustable
- ☐ Choice of Package

VOLTAGE REGULATORS (BY OUTPUT CURRENT)

Fixed Positive 100 mA

DEVICE NO.	Output Voltage V (Typ)	Temperature *	Line Regulation mV (Max)	Load Regulation mV (Max)	Ripple Rejection dB (Min)	Quiescent Current mA	Input Voltage Range V	Dropout Voltage V (Typ)	Package(s)
μA78L26	2.6	C, V	100	50	43	5.5	4.8 to 35	2.2	TO-39,TO-92
μA78L05	5.0	C, V	150	60	41	5.5	7.2 to 35	2.2	TO-39,TO-92
μA78L62	6.2	C, V	175	80	40	5.5	8.4 to 35	2.2	TO-39,TO-92
μA78L82	8.2	C, V	175	80	39	5.5	10.4 to 35	2.2	TO-39,TO-92
μA78L09	9.0	C, V	188	90	38	5.5	11.2 to 35	2.2	TO-39,TO-92
μA78L12	12	C, V	250	100	37	6.0	14.2 to 35	2.2	TO-39,TO-92
μA78L15	15	C, V	300	150	34	6.0	17.2 to 35	2.2	TO-39,TO-92
μA78L18	18	C, V	300	170	33	6.0	20.2 to 40	2.2	TO-39,TO-92
μA78L24	24	C, V	300	200	31	6.0	26.2 to 40	2.2	TO-39,TO-92

Fixed Positive 500 mA

μA78M05	5.0	M	50	50	62	6.0	8.0 to 35	2.5	TO-39
μA78M05	5.0	C	100	100	62	6.0	7.5 to 35	2.5	TO-39,TO-220
μA78C05	5.0	M	100	50	62	6.0	8.0 to 35	3.0	TO-220
μA78M06	6.0	M	60	60	59	6.0	9.0 to 35	2.5	TO-39
μA78M06	6.0	C	100	120	59	6.0	8.5 to 35	2.5	TO-39,TO-220
μA78C06	6.0	C, V	100	60	59	6.0	9.0 to 35	3.0	TO-220
μA78M08	8.0	M	60	80	56	6.0	11 to 35	2.5	TO-39
μA78M08	8.0	C	100	160	56	6.0	10.5 to 35	2.5	TO-39,TO-220
μA78C08	8.0	C, V	100	80	46	6.0	11 to 35	3.0	TO-220
μA78C10	10	C	100	100	55	6.0	13 to 35	3.0	TO-220
μA78M12	12	M	60	120	55	6.0	15 to 35	2.5	TO-39
μA78M12	12	C, V	100	240	55	6.0	14.5 to 35	2.5	TO-39,TO-220
μA78C12	12	C	100	120	46	6.0	15 to 35	3.0	TO-220
μA78M15	15	M	60	150	54	6.0	18 to 35	2.5	TO-39
μA78M15	15	C	100	300	54	6.0	17.5 to 35	2.5	TO-39,TO-220
μA78C15	15	C	100	150	46	6.0	18 to 35	3.0	TO-220
μA78C17	17	C	100	170	52	6.0	20 to 35	3.0	TO-220
μA78C18	18	C	100	180	46	6.0	21 to 35	3.0	TO-220
μA78M20	20	M	60	200	53	6.0	23 to 40	2.5	TO-39
μA78M20	20	C	100	400	53	6.0	22.5 to 40	2.5	TO-39,TO-220
μA78C20	20	C	100	200	46	6.0	23 to 40	3.0	TO-220
μA78C22	22	C	100	220	53	6.0	24.5 to 40	2.5	TO-220
μA78M24	24	M	60	240	50	6.0	27 to 40	2.5	TO-39
μA78M24	24	C	100	480	50	6.0	26.5 to 40	2.5	TO-39,TO-220
μA78C24	24	C	100	240	46	6.0	27 to 40	3.0	TO-220

Fixed Negative 500 mA

μA79M05	-5.0	M	50	100	54	2.0	-7.5 to -35	2.5	TO-39
μA79M05	-5.0	C	50	100	54	2.0	-7.3 to -35	2.3	TO-39
μA79M06	-6.0	M	60	120	54	2.0	-8.5 to -35	2.5	TO-39,TO-220
μA79M06	-6.0	C	60	120	54	2.0	-8.3 to -35	2.3	TO-220
μA79M08	-8.0	M	80	160	54	2.0	-10.5 to -35	2.5	TO-39
μA79M08	-8.0	C	80	160	54	2.0	-10.3 to -35	2.3	TO-39,TO-220
μA79M12	-12	M	80	240	54	3.0	-14.5 to -35	2.5	TO-39
μA79M12	-12	C	80	240	54	3.0	-14.3 to -35	2.3	TO-39,TO-220
μA79M15	-15	M	80	240	54	3.0	-17.5 to -35	2.5	TO-39
μA79M15	-15	C	80	240	54	3.0	-17.3 to -35	2.3	TO-39,TO-220
μA79M20	-20	M	80	300	54	3.5	-22.5 to -40	2.5	TO-39
μA79M20	-20	C	80	300	54	3.5	-22.3 to -40	2.3	TO-39,TO-220
μA79M24	-24	M	80	300	54	3.5	-26.5 to -40	2.5	TO-39
μA79M24	-24	C	80	300	54	3.5	-26.3 to -40	2.3	TO-39,TO-220

Fixed Positive 1.0 A

DEVICE NO.	Output Voltage V (Typ)	Temperature (1)	Line Regulation mV (Max)	Load Regulation mV (Max)	Ripple Rejection dB (Min)	Quiescent Current mA	Input Voltage Range V	Dropout Voltage V (Typ)	Package(s)
μA7805	5.0	M	50	50	68	6.0	8.0 to 35	3.0	TO-3
μA7805	5.0	C	100	100	62	8.0	7.5 to 35	2.5	TO-3,TO-220
μA309	5.0	C	50	100	--	10	—	—	TO-3
μA109	5.0	M	50	100	--	10	—	—	TO-3
μA209	5.0	V	50	100	--	10	—	—	TO-3
μA7806	6.0	M	60	60	65	6.0	9.0 to 35	3.0	TO-3
μA7806	6.0	C	120	120	59	8.0	8.5 to 35	2.5	TO-3,TO-220
μA7808	8.0	M	80	80	62	6.0	11 to 35	3.0	TO-3,TO-220
μA7808	8.0	C	160	160	56	8.0	10.5 to 35	2.5	TO-3,TO-220
μA7885	8.5	M	85	85	60	6.0	11.5 to 35	3.0	TO-3
μA7885	8.5	C	170	170	54	8.0	11 to 35	2.5	TO-3,TO-220
μA7812	12	M	120	120	61	6.0	15 to 35	3.0	TO-3
μA7812	12	C	240	240	55	8.0	14.5 to 35	2.5	TO-3,TO-220
μA7815	15	M	150	150	60	6.0	18 to 35	3.0	TO-3
μA7815	15	C	300	300	54	8.0	17.5 to 35	2.5	TO-3,TO-220
μA7818	18	M	180	180	59	6.0	21 to 35	3.0	TO-3
μA7818	18	C	360	360	53	8.0	20.5 to 35	2.5	TO-3,TO-220
μA7824	24	M	240	240	56	6.0	27 to 40	3.0	TO-3
μA7824	24	C	480	480	50	8.0	26.5 to 40	2.5	TO-3,TO-220

Fixed Negative 1.0 A

μA7905	-5.0	M	50	50	54	2.0	-7.8 to -35	2.8	TO-3
μA7905	-5.0	C	100	100	54	2.0	-7.3 to -35	2.3	TO-3,TO-220
μA7906	-6.0	M	60	60	54	2.0	-8.8 to -35	2.8	TO-3
μA7906	-6.0	C	120	120	54	2.0	-8.3 to -35	2.3	TO-3,TO-220
μA7908	-8.0	M	80	80	54	2.0	-10.8 to -35	2.8	TO-3
μA7908	-8.0	C	160	160	54	2.0	-10.3 to -35	2.3	TO-3,TO-220
μA7912	-12	M	120	120	54	3.0	-14.8 to -35	2.8	TO-3
μA7912	-12	C	240	240	54	3.0	-14.3 to -35	2.3	TO-3,TO-220
μA7915	-15	M	150	150	54	3.0	-17.8 to -35	2.8	TO-3
μA7915	-15	C	300	300	54	3.0	-17.3 to -35	2.3	TO-3,TO-220
μA7918	-18	M	180	180	54	3.0	-20.8 to -35	2.8	TO-3
μA7918	-18	C	360	360	54	3.0	-20.3 to -35	2.3	TO-3,TO-220
μA7924	-24	M	240	240	54	3.0	-26.8 to -40	2.8	TO-3
μA7924	-24	C	480	480	54	3.0	-26.3 to -40	2.3	TO-3,TO-220

Fixed Positive 2.0 A

μA78CB	13.8	C	150	150	50	8.0	17 to 25	2.5	TO-3,TO-220

Fixed Positive 3.0 A

SH123	5.0	M	25	100	—	20	7.5 to 20	2.5	TO-3
SH223	5.0	M	25	100	—	20	7.5 to 20	2.5	TO-3
SH323	5.0	C	25	100	—	20	7.5 to 20	2.5	TO-3

Fixed Positive 5.0 A

μA78H05	5.0	C, M	120	50	60	10	8.5 to 25	3.5	TO-3
μA78H05A (2)	5.0	C, M	25	50	60	10	7.8 to 25	2.3	TO-3
μA78H12	12	C	—	120	60	10	15.5 to 25	3.5	TO-3
μA78H15	15	C	30	30	60	10	18.5 to 25	—	TO-3

Fixed Positive 10 A

μA78P05 (2)	5.0	C	25	50	60	10	7.5 to 40	2.5	TO-3

1 Operating junction temperature range:
C = Commercial temperature range, 0°C to +125°C; V = Vehicular & Industrial temperature range, -40°C to +125°C; M = Extended Military, -55°C to +150°C.

2 To be announced

Manufactured in U.S.A.

- Positive and Negative
- Fixed and Adjustable
- Choice of Package

VOLTAGE REGULATORS (BY OUTPUT CURRENT) (Cont'd)

Positive Adjustable

DEVICE NO.	Output Current (mA)	Output Voltage Range V	Temperature[1]	Line Regulation %/V_{OUT}	Load Regulation %/V_{OUT}	Ripple Rejection dB	Quiescent Current mA	Input Voltage Range V	Dropout Voltage V
μA105	12	4.5 to 30	M	0.06	0.1	1.0	2.0	8.5 to 50	3.0
μA305	12	4.5 to 30	C	0.06	0.1	1.0	2.0	8.5 to 40	3.0
μA376	25	5.0 to 37	C	0.1	0.5	1.0	2.5	9.0 to 40	3.0
μA305A	45	4.5 to 40	C	0.06	0.4	—	2.0	8.5 to 50	3.0
μA723	150	2.0 to 37	M	0.3	0.15	58	3.5	9.5 to 40	3.0
μA723	150	2.0 to 37	C	0.5	0.2	58	4.0	9.5 to 40	3.0
μA78MG	500	5.0 to 30	M	1.0	1.0	62	5.0	7.5 to 40	3.0
μA78MG	500	5.0 to 30	C	1.0	1.0	62	5.0	7.5 to 40	2.5
μA78G	1000	5.0 to 30	M	1.0**	1.0	68	5.0	7.5 to 40	2.5
μA78G	1000	5.0 to 30	C	1.0	1.0	62	5.0	7.5 to 40	3.0
μA78HG	5000	5.0 to 24	C	1.0	1.0	60	10	8.5 to 25	3.5

Negative Adjustable

DEVICE NO.	Output Current (mA)	Output Voltage Range V	Temperature[1]	Line Regulation %/V_{OUT}	Load Regulation %/V_{OUT}	Ripple Rejection dB	Quiescent Current mA	Input Voltage Range V	Dropout Voltage V
μA104	25	-0.015 to -40	M	0.1	5mV	1.0	5.0	-8.0 to -50	2.0
μA304	25	-0.035 to -30	C	0.1	5mV	1.0	5.0	-8.0 to -40	2.0
μA79MG	500	-2.23 to -30	M	1.0	1.0	50	2.5	-7.0 to -30	2.5
μA79MG	500	-2.23 to -30	C	1.0	1.0	50	2.5	-7.0 to -30	2.3
μA79G	1000	-2.23 to -30	M	1.0	2.0	50	2.0	-7.0 to -40	2.8
μA79G	1000	-2.23 to -30	C	1.0	2.0	50	2.0	-7.0 to -40	2.3
μA79HG	5000	-2.25 to -24	C,M	1.0	1.0	50	5.0	-7.0 to -40	2.0

Adjustable Switching Regulator

μA78S	1500	-1.3 to -40	M	—	—	100	2.0	-2.5 to -40	—
μA78S	1500	-1.3 to -40	C	—	—	100	2.0	-2.5 to -40	—
SH1605[2]	5000	2.0 to 20	C	—	—	—	30	5.0 to 40	—

VOLTAGE COMPARATORS

DEVICE NO.	Description	Input Bias Current[1] μA (Max)	Input Offset Current[1] μA (Max)	Input Offset Voltage[1]	Voltage Gain (Typ)	Supply Voltage V (Typ)	Response Time[2] ns (Typ)	DTL/TTL Fanout	Temperature Range[3]
μAF111	Voltage Comparator (FET Front End Inputs)	0.05	0.000025	4.0	200K	+36	200	2	M
μAF211	Voltage Comparator (FET Front End Inputs)	0.05	0.000025	4.0	200K	+36	200	2	A
μAF311	Voltage Comparator (FET Front End Inputs)	0.15	0.000075	10	200K	+36	200	2	C
μA111	Voltage Comparator (Strobed Inputs, Single Supply, Low Ig)	0.1	0.04	0.7	200K	0, +5 to ±15	200	5	M
μA211	Voltage Comparator (Strobed Inputs, Single Supply, Low Ig)	0.1	0.04	0.7	200K	0, +5 to ±15	200	5	A
μA311	Voltage Comparator (Strobed Inputs, Single Supply, Low Ig)	0.25	0.06	2.0	200K	0, +5 to ±15	200	5	C
μA139	Quad Comparator (Single Supply, MRR incl. gnd)	0.1	0.025	5.0	200K	+1 to +18, gnd to +2 or gnd to +36	1300	1	M
μA139A	Quad Comparator (Single Supply, MRR incl. gnd)	0.1	0.025	2.0	200K	+1 to +18, gnd to +2 or gnd to +36	1300	1	M
μA239	Quad Comparator (Single Supply, MRR incl. gnd)	0.25	0.05	5.0	200K	±1 to ±18, gnd to +2 or gnd to +36	1300	1	A
μA239A	Quad Comparator (Single Supply, MRR incl. gnd)	0.25	0.05	2.0	200K	±1 to ±18, gnd to +2 or gnd to +36	1300	1	A
μA339	Quad Comparator (Single Supply, MRR incl. gnd)	0.25	0.05	5.0	200K	±1 to ±18, gnd to +2 or gnd to +36	1300	1	C
μA339A	Quad Comparator (Single Supply, MRR incl. gnd)	0.25	0.05	2.0	200K	±1 to ±18, gnd to +2 or gnd to +36	1300	1	C
μA710	Voltage Comparator	20/25	3.0/5.0	2.0/5.0	1.75K	+12,-6	40	1	M,C
μA711	Dual Comparator	75/100	10/15	3.5/5.0	1.5K	+12,-6	40	1	M,C
μA734	Precision Comparator (Low Drift ~3.5μV/°C)	0.15	0.025/0.05	5.0/3.0	25K	±5 to ±15	200	2	M,C
μA760	High Speed Differential Comparator	60	7.5	6.0	5K	±4.5 to ±6.5	25	2	M,C
μA775	Quad Comparator (Single Supply, MRR incl. gnd)	0.3	0.07	9.0	200K	±1 to ±18, gnd to +2 or gnd to +36	1300	1	M,C
μA2901	Quad Comparator (Single Supply, MRR incl. gnd)	0.25	0.05	7.0	200K	±1 to ±18, gnd to +2 or gnd to +36	1300	1	A
μA7302	Quad Comparator (Single Supply, MRR incl. gnd)	0.1	0.03	5.0	200K	+1 to ±18, gnd to +2 or gnd to +36	1300	1	C

1. Measured at T_A = 25°C
2. Response time is specified for 100 mV step input with 5.0 mV overdrive.
3. M = Military temperature range, -55°C to +125°C, A = Automotive temperature range, -40°C to +85°C, C = Commercial temperature range, 0°C to +70°C.

Manufactured in U.S.A.

- ☐ Single, Dual & Quad
- ☐ High Speed, & High Gain
- ☐ FET Input

OPERATIONAL AMPLIFIERS

OPERATIONAL AMPLIFIERS—COMMERCIAL (0°C TO +70°C)

DEVICE NO.	Description	Input Offset Voltage mV (Max)	Input Offset Voltage Drift μV/°C (Max)	Input Offset Current nA (Max)	Input Bias Current nA (Max)	Common Mode Range V	Differential Input Voltage V	Voltage Gain V/V	Bandwidth Av = 1 MHz	Output Current mA (Max)	Slew Rate Av = 1 V/μs	Supply Voltage Min V (Typ)	Supply Voltage Max V (Typ)	Supply Current mA (max)	Compensation Components
μA301A	General Purpose Op Amp	7.5	30	50	250	±12	±30	25K	1.0	5.0	0.5	±3	±18	3.0	1
μA302	Voltage Follower	15	30	—	30	±10	—	0.9985	10	1.0	10	±12	±18	5.5	0
μA307	General Purpose Op Amp	7.5	30	50	250	±15	±30	25K	1.0	5.0	0.5	±3	±18	3.0	0
μA308	Super Beta Op Amp	7.5	30	1.0	7.0	±13.5	±0.5	15K	1.0	1.0	0.3	±5	±18	0.8	1
μA308A	Super Beta Op Amp	0.5	5.0	1.0	7.0	±13.5	±0.5	80K	1.0	1.0	0.3	±2	±20	0.8	1
μA310	Voltage Follower	7.5	—	—	7.0	±10	—	0.999	20	1.0	30	±5	±18	5.5	0
μA318	High Speed Op Amp	10	—	200	500	±11.5	±10	25K	15	6.0	50	±5	±18	10	0
μA324	Quad Op Amp	7.0	—	50	250	+13,-V_S	±32	25K	1.0	1.2	0.5	±5	±32	2.0	0
μA348	Quad Op Amp	6.0	—	50	200	±12	±36	25K	1.0	5.0	0.5	±5	±18	4.5	0
μAF355	FET Input Op Amp	10	—	0.05	0.2	±10	±30	50K	2.5	—	5.0	±5	±18	4.0	0
μAF356	FET Input Op Amp	10	—	0.05	0.2	±10	±30	50K	5.0	—	12	±5	±18	10	0
μA702C	WideBand dc Amp	5.0	10	2000	7500	-4,+0.5	±5	2K	30	3.5	3.5	+6,-3	+14,-7	6.7	2
μA709C	High Perf Op Amp	7.5	—	500	1500	±8	±5	15K	1.0	5.0	0.3	±9	±18	2.9	0
μA714C	High Perf Op Amp	0.15	1.8	6.0	7.0	±13	±30	—	1.2	5.5	0.25	±3	±22	5.0	0
μA714E	High Perf Op Amp	0.075	1.3	3.8	4.0	±13	±30	—	1.2	6.0	0.25	±3	±22	4.0	0
μA714L	High Perf Op Amp	0.25	3.0	20	30	±13	±30	—	1.2	5.0	0.25	±3	±18	6.0	0
μA715C	High Speed Op Amp	7.5	—	250	1500	±10	±15	10K	65	5.0	100	±6	±18	10	3
μA725C	Instr Op Amp	2.5	—	35	125	±13.5	±22	250K	1.0	5.0	—	±3	±22	3.0	4
μA725E	Instr Op Amp	0.5	2.0	5.0	75	±13.5	±22	1000K	1.0	5.0	—	±3	±22	3.0	4
μA727C	Temp Controlled Diff Amp	10	1.5	25	75	±12	±15	0.06K	1.0	0.001	—	±9	±18	5.7	2
μA730C	Differential Amp	5.0	—	3.0	16	±3.5	±5	0.1K	1.5	—	—	±6	±14	13	0
μA740E	FET Input Op Amp	100	—	0.3	2.0	±10	±30	25K	3.0	5.0	6.0	±5	±22	8.0	0
μA741C	Freq Comp Op Amp	6.0	—	200	500	±12	±30	20K	1.0	5.0	0.5	±5	±18	2.8	0
μA741E	Freq Comp Op Amp	3.0	15	30	80	±12	±30	50K	1.0	5.0	0.7	±5	±22	3.75	0
μA747C	Dual Freq Comp Op Amp	6.0	—	200	500	±12	±30	20K	1.0	5.0	0.5	±5	±18	5.6	0
μA747E	Dual Freq Comp Op Amp	3.0	—	200	500	±12	±30	20K	1.0	5.0	0.5	±5	±18	4.25	0
μA748C	High Perf Op Amp	6.0	—	200	500	±12	±30	20K	1.0	5.0	0.5	±5	±18	2.8	1
uA771	Quad Fet Input Op. Amp	5	10 typ	0.05	0.1	±11	±30	25K	3.0 typ	25	13 typ	±5	±18	3.0	0
uA772	Quad Fet Input Op. Amp	5	10 typ	0.05	0.1	±11	±30	25K	3.0 typ	25	13 typ	±5	±18	3.0	0
uA774	Quad Fet Input Op. Amp	5	10 typ	0.05	0.1	±11	±30	25K	3.0 typ	25	13 typ	±5	±18	3.0	0
μA776C	Multi-Purpose Prog Op Amp (I_{SET} = 15 μA)	6.0	—	25	50	±10	±30	50K	1.0	2.0	0.8	±1.2	±18	0.19	1
μA776C	Multi-Purpose Prog Op Amp (I_{SET} = 1.5 μA)	6.0	—	6.0	10	±10	±30	50K	0.2	0.12	0.1	±1.2	±18	0.03	1
μA777C	Precision Op Amp	7.5	—	50	250	±12	±30	25K	1.0	5.0	0.5	±5	±20	2.8	1
μA791C	Power Operational Amp	6.0	—	200	500	±12	±30	20K	1.0	1080	0.5	±5	±18	25	4
μA798C	Dual Op Amp	6.0	—	50	250	±36,-V_S	±30	20K	1.0	6.0	0.5	±5	±36	4.0	0
μA1458C	Internally Comp. High Perf Dual Mono Op Amp	6.0	—	200	500	±12	±30	20K	1.0	5.0	0.5	±5	±18	2.9	0
μA3401	Quad Single Supply Amp	—	—	—	300	—	—	1K	5.0	10	0.6	+5	±9	10	0
μA3403	Quad Op Amp	8.0	—	50	500	±13, V_S	±30	25K	1.0	5.0	0.6	±5	±18	7.0	0
μA4136	Quad Op Amp	6.0	—	200	500	±12	±36	20K	3.0	5.0	1.2	±5	±18	10	0
μA4558	Dual Op Amp	6.0	—	200	500	±12	±36	20K	3.0	5.0	1.2	±5	±18	5.0	0

*Military, automotive and industrial range devices are available. Please request specific data

Manufactured in U.S.A.

- Line Drivers/Receivers
- Display and Peripheral Drivers
- Translators, Connectors and Sense Amplifiers

LINE DRIVERS/RECEIVERS/TRANSCEIVERS

LINE DRIVERS

DEVICE NO.	Function[2]	Companion Receiver	Input Compatibility	Type Output	Output Configuration	Output Current mA (Typ)	tpd-ns (Typ)	Supply Voltage V	Power Dissipation mW (Typ)	Drivers per Package
μA1488	Quad	μA1489	TTL	Volt	Single Ended	±10	220	±15	—	4
54/7437	Quad 2-NAND	Any TTL	TTL	Volt	Single Ended	48	10	+5.0	108	4
54/7438	Quad 2-NAND	96106	TTL	Volt	Single Ended	48	13	+5.0	98	4
54/7440	Dual 2-NAND	Any TTL	TTL	Volt	Single Ended	48	11	+5.0	52	2
54H/74H40	Dual 2-NAND	Any TTL	TTL	Volt	Single Ended	48	7.0	+5.0	88	2
54S/74S40	Dual 2-NAND	Any TTL	TTL	Volt	Single Ended	48	4.0	+5.0	88	2
8T13	Dual	8T14	TTL	Volt	Single Ended	250[2]	20	+5.0	280	2
8T23	Dual IBM-370	8T24	TTL	Volt	Single Ended	250[2]	20	+5.0	280	2
9009	Dual 2-NAND	Any TTL	TTL	Volt	Single Ended	48	10	+5.0	54	2
9612	Dual	9613	TTL	Volt	Diff	50	14	+5.0	150	2
9614	Dual	9615	TTL	Volt	Diff or Single	40	16	+5.0	170	2
9616	Triple RS232	9617, 9627	TTL	Volt	Single Ended	17	300	±12	250	3
9621	Dual	9622	TTL	Volt	Diff or Single	20	10	+5.0, +15	100	2
9634	Dual	9637A	TTL, CMOS	Volt	Diff	±50	10	+5.0	200	2
9636	Dual	9637A	TTL, CMOS	Volt	Single Ended	±75	—	±9.0 to ±15	200	2
9638	Dual	9637A	TTL	Volt	Diff	±50	10	+5.0	—	2
10123	Triple Bus Dvr	All 10K ECL	ECL	Volt	Single Ended	20	3.0	-5.2	312	3

DEVICE NO.	Function[2]	Companion Receiver	Input Compatibility	Type Output	Output Configuration	Output Current mA (Typ)	tpd-ns (Typ)	Supply Voltage V	Power Dissipation mW (Typ)	Drivers per Package
10192	Quad	All ECL Logic	ECL	Volt	Single Ended	16	3.0	-5.2	510	4
54S/74S140	Dual 2-NAND	Any TTL	TTL	Volt	Single Ended	40	4.0	+5.0	88	2
54LS/74LS240	Octal Inverting Bus Dvr	Any TTL	TTL	Volt	Single Ended	40	12	+5.0	175	8
54LS/74LS241	Octal Bus Dvr	Any TTL	TTL	Volt	Single Ended	40	12	+5.0	180	8
54LS/74LS244	Octal Bus Dvr	Any TTL	TTL	Volt	Single Ended	40	12	+5.0	180	8
54LS/74LS540	Octal 3S Inverting	Any TTL	TTL	Volt	Single Ended	40	12	+5.0	175	8
54LS/74LS541	Octal 3S	Any TTL	TTL	Volt	Single Ended	40	12	+5.0	180	8
55/75109	Dual	75107, 75108	TTL	Curr	Diff	6.0	9.0	±5.0	180	2
55/75110	Dual	75107, 75108	TTL	Curr	Diff	12	9.0	±5.0	285	2
55/75121	Dual	75122	TTL	Volt	Single Ended	250[2]	20	+5.0	280	2
75123	Dual IBM-370	75124	TTL	Volt	Single Ended	250[2]	20	+5.0	280	2
75150	Quad	75154	TTL DTL	Volt	Single Ended	15	20	±12	100	2
96101	Quad 2-NAND OC	96106	TTL	Volt	Single Ended	80	13	+5.0	98	4
100123	Hax Bus Dvr	All 95K and 100K ECL	ECL	Volt	Single Endad	20	1.8	-4.5	730	6
100194	Quint Duplex Bus Dvr	All 100K ECL	ECL	Volt	—	—	2.0	-4.5	—	—

1. OC = open collector, 3S = 3-state
2. Foldback current limited

LINE RECEIVERS

DEVICE NO.	Function	Companion Driver	Output Compatibility	Input Threshold Sensitivity V_{TH}-V	Common Mode V	Hysteresis Capability	tpd-ns (Typ)	Supply Voltage V	Power Dissipation mW (Typ)	Receivers per Package
μA1469	Quad RS232	μA1488	TTL	+0.5	±30	0.25V	220	—	—	4
μA1489A	Quad RS232	μA1488	TTL	+0.5	±30	1.0V	25	—	—	4
8T14	Triple	8T13	TTL	—	+5.0	Yes	20	+5.0	315	3
6T24	Triple IBM-370	8T23	TTL	—	+5.0	Yes	20	+5.0	315	3
9582	Triple	All ECL Logic	ECL	V_{REF}	±1.0	No	2.2	-5.2	250	3
9613	Dual Diff	9612	TTL	±0.5	±15	No	25	+5.0	143	2
9615	Dual Diff	9614	TTL	±1.0	±15	No	30	+5.0	150	2
9617	Triple RS232	9616	TTL	+1.5	±25	Yes	60	+5.0	60	3
9620	Dual Diff	9621	TTL	±0.5	±15	No	35	+5.0 -12	110	2
9622	Dual	9621	TTL	+1.5	±10	No	38	+5.0 -12	140	2
9627	Dual RS232/ mil. std. 188	9616	TTL	+0.45	±25	No	70	±12	234	2
9637A	Dual RS422/423	9634, 9636, 9638	TTL	+0.2	±15	0.3V	17	+5.0	—	2
10614	Active Tarminator	All ECL Logic	ECL	V_{REF}	—	No	—	-5.2	65	14
10114/	Triple	All ECL Logic	ECL	V_{REF}	±1.0	No	2.2	-5.2	145	3
10115	Quad	All ECL Logic	ECL	V_{REF}	+2.0	No	1.9	-5.2	95	4

DEVICE NO.	Function	Companion Driver	Output Compatibility	Input Threshold Sensitivity V_{TH}-V	Common Mode V	Hysteresis Capability	tpd-ns (Typ)	Supply Voltage V	Power Dissipation mW (Typ)	Receivers per Package
10116	Triple	All ECL Logic	ECL	V_{REF}	+2.0	No	1.9	-5.2	75	3
55/75107	Dual	75109 75110	TTL	±25	±3.0	No	17	±5.0	130	2
55/75108	Dual	75109 75110	TTL	±25	±3.0	No	19	±5.0	130	2
55/75122	Triple	75121	TTL	—	+5.0	Yes	20	+5.0	315	3
75124	Triple IBM-370	75123	TTL	—	+5.0	Yes	20	+5.0	315	3
75154	Quad RS232	75150	TTL, DTL	2.2	±15	Yes	22	+5.0 +12	200	4
75207	Dual	75109 75110	TTL	±10	±3.0	No	17	±5.0	130	2
75208	Dual	75109 75110	TTL	±10	±3.0	No	19	±5.0	130	2
95115	Quad	All ECL Logic	ECL	V_{REF}	+2.0	No	1.9	-5.2	95	4
95116	Tripla	All ECL Logic	ECL	V_{REF}	+2.0	No	1.9	-5.2	75	3
96106	Quad 2-NDR Bus	96101	TTL	1.5	—	No	20	+5.0	90	4
100114	Quint	All ECL Logic	ECL	V_{REF}	±1.0	No	1.2	-4.5	380	5

Manufactured in U.S.A.

- ☐ Line Drivers/Receivers
- ☐ Display and Peripheral Drivers
- ☐ Translators, Connectors and Sense Amplifiers

LINE DRIVERS/RECEIVERS/TRANSCEIVERS

TRANSCEIVERS

DEVICE NO.	Function [1]	Driver Output Current-mA	Receiver Output Current-mA	Hysteresis Capability	Receiver t_{pd}-ns	Driver t_{pd}-ns	Tranceivers per Package
8T26	Quad 3S	40	16	—	13	16	4
8T28	Quad 3S	40	16	—	13	16	4
9640/26S10	Quad OC Inverting	100	20	—	15	18	4
9641/26S11	Quad OC	100	20	—	15	20	4
9642	Quad OC Inverting	100	20	0.6V	15	18	4

DEVICE NO.	Function [1]	Driver Output Current-mA	Receiver Output Current-mA	Hysteresis Capability	Receiver t_{pd}-ns	Driver t_{pd}-ns	Tranceivers per Package
54LS/74LS242	Quad Inverting 3S	40	40	0.4V	12	12	4
54LS/74LS243	Quad 3S	40	40	0.4V	12	12	4
54LS[1]/74LS245	Octal 3S	40	40	0.4V	12	12	8
100194[1]	Duplex	—	—	—	2.0	1.1	5

1. OC = open collector, 3S = 3-state

DISPLAY DRIVERS

DEVICE NO.	Function [1]	Input Compatibility	BCD Decoder	Ripple Blanking	Blanking Above BCD 9 Input	Output Current mA	Output Standoff Voltage-V (Max)	Active HIGH/LOW	Display Type	Standby Power Dissipation-mW
4511B	7-Seg Latch/ Decoder/Dvr	CMDS	Yes	No	Yes	25	—	H	LED	0.015
4734B	7-Seg Latch/ Decoder/Dvr	CMDS	Yes	Yes	Yes	25	—	H	LED	0.015
4543B	7-Seg Latch/ Decoder/Dvr	CMOS	Yes	No	Yes	—	—	H	LCD	0.015
54/7441	1-of-10 Cold Cathode	TTL	Yes	No	No	7.0	55	L	Gas Discharge	145
54/7445	1-of-10 OC Dvr	TTL	Yes	No	Yes	80	30	L	Common Anode	215
54/7446	7-Seg Decoder/Dvr	TTL	Yes	Yes	No	40	30	L	Common Anode	320
54/7447	7-Seg Decoder/Dvr	TTL	Yes	Yes	No	40	15	L	Common Anode	320
54LS/ 74LS47	7-Seg Decoder/Dvr	TTL	Yes	Yes	No	12	15	L	Common Anode	35
54/7448	7-Seg Decoder	TTL	Yes	Yes	No	8.0	5.5	H	—	265
54LS/ 74LS48	7-Seg Decoder/Dvr	TTL	Yes	Yes	No	1.3	5.5	H	—	125
5449	7-Seg Decoder	TTL	Yes	Yes	No	9.6	5.5	H	—	165
54LS/ 74LS49	7-Seg Decoder/ Dvr OC	TTL	Yes	Yes	No	1.3	5.5	H	—	40
9302	1-of-10 OC Dvr	TTL	Yes	No	Yes	16	5.5	L	—	145
9307	7-Seg Decoder	TTL	Yes	Yes	No	11	5.5	H	LED, Com Cathode	165
9315	1-of-10 Cold Cathode	TTL	Yes	No	No	7.0	55	L	Gas Discharge	145
9317B	7-Seg Decoder/Dvr	TTL	Yes	Yes	Yes	40	20	L	LED, Com Anode	220
9317C	7-Seg Decoder/Dvr	TTL	Yes	Yes	Yes	20	30	L	LED, Com Anode	220

1. OC = open collector, 3S = 3-state

DEVICE NO.	Function [1]	Input Compatibility	BCD Decoder	Ripple Blanking	Blanking Above BCD 9 Input	Output Current mA	Output Standoff Voltage-V (Max)	Active HIGH/LOW	Display Type	Standby Power Dissipation-mW
9368	7-Seg LED Dvr	TTL	Yes	Yes	No	20	1.7	H	LED, Com Cathode	320
9370	7-Seg LED Dvr	TTL	Yes	Yes	No	25	5.5	L	LED, Com Anode	350
9374	7-Seg LED Dvr	TTL, CMDS	Yes	Yes	No	15	10	L	LED, Com Anode	175
9664	Hex Digit Dvr	MOS, TTL, CMOS	No	No	No	150	20	L	LED	Neg
9665	7-Darlington Dvr	DTL, TTL MOS, CMOS	No	No	No	350	50	L	LED, Gas Discharge	0
9666	7-Darlington Dvr	PMOS	No	No	No	350	50	L	LED, Gas Discharge	0
9667	7-Darlington Dvr	TTL, CMDS	No	No	No	350	50	L	LED, Gas Discharge	0
9668	7-Darlington Dvr	CMOS, PMOS	No	No	No	350	50	L	LED, Gas Discharge	0
54/ 74141	1-of-10 Cold Cathode	TTL	Yes	No	No	7.0	55	L	Gas Discharge	80
54/ 74145	1-of-10 OC Dvr	TTL	Yes	No	Yes	80	15	L	Common Anode	215
54LS/ 74LS247	7-Seg Decoder/Dvr	TTL	Yes	Yes	No	12	15	L	LED, Com Anode	30
54LS/ 74LS248	7-Seg Decoder/Dvr	TTL	Yes	Yes	No	1.3	5.5	H	—	125
54LS/ 74LS249	7-Seg OC Decoder/Dvr	TTL	Yes	Yes	No	1.3	5.5	H	—	40
75491	Quad Digit Seg Dvr	MOS, TTL, CMOS	No	No	No	50	20	L	LED	Neg
75492	Hex Digit Dvr	MOS, TTL, CMOS	No	No	No	250	20	L	LED	Neg

AUXILIARY DRIVERS

HIGH SPEED BUFFERS AND PERIPHERAL DRIVERS

DEVICE NO.	Function	Input Compatibility	Gate Function	Circuit Function	Transistor Connection Mode	Output Current mA	Output Voltage V	Latchup Voltage mV (Min)	t_{pd}-ns (Typ)	Drivers per Package
55/75430	Dual Drivers	TTL	AND	AND	External	300	15	15	15	2
55/75431	Dual Drivers	TTL	AND	AND	Internal	300	15	15	10	2
55/75432	Dual Drivers	TTL	NAND	NAND	Internal	300	15	15	15	2
55/75433	Dual Drivers	TTL	OR	OR	Internal	300	15	15	10	2
55/75434	Dual Drivers	TTL	NOR	NOR	Internal	300	15	15	13	2

DEVICE NO.	Function	Input Compatibility	Gate Function	Circuit Function	Transistor Connection Mode	Output Current mA	Output Voltage V	Latchup Voltage mV (Min)	t_{pd}-ns (Typ)	Drivers per Package
55/75450	Dual Drivers	TTL	AND	AND	External	300	30	20	30	2
55/75451	Dual Drivers	TTL	AND	AND	Internal	300	30	20	25	2
55/75452	Dual Drivers	TTL	AND	NAND	Internal	300	30	20	35	2
55/75453	Dual Drivers	TTL	NOR	OR	Internal	300	30	20	25	2
55/75454	Dual Drivers	TTL	DR	NOR	Internal	300	30	20	35	2

Manufactured in U.S.A.

- ☐ Line Drivers/Receivers
- ☐ Display and Peripheral Drivers
- ☐ Translators, Convertors and Sense Amplifiers

AUXILIARY DRIVERS

HIGH CURRENT, HIGH VOLTAGE BUFFERS AND PERIPHERAL DRIVERS

DEVICE NO.	Function	Input Compatibility	Gate Function	Circuit Function	Output Current mA (Max)	Output Voltage-V	Latchup Voltage V (Min)	t_{pd}-ns (Typ)	Drivers per Package
9664	Hex Driver	TTL, MOS, CMOS	—	—	150	20	—	600	6
55/75450	Dual Drivers	TTL	NAND	—	300	30	20	30	2
55/75451	Dual Drivers	TTL	—	AND	300	30	20	30	2
55/75452	Dual Drivers	TTL	—	NAND	300	30	20	35	2
55/75453	Dual Drivers	TTL	—	OR	300	30	20	25	2
55/75454	Dual Drivers	TTL	—	NOR	300	30	20	35	2
55/75460	Dual Drivers	TTL	NAND	—	300	35	30	35	2
55/75461	Dual Drivers	TTL	—	AND	300	35	30	35	2
55/75462	Dual Drivers	TTL	—	NAND	300	35	30	35	2

DEVICE NO.	Function	Input Compatibility	Gate Function	Circuit Function	Output Current mA (Max)	Output Voltage-V	Latchup Voltage V (Min)	t_{pd}-ns (Typ)	Drivers per Package
55/75463	Dual Drivers	TTL	—	OR	300	35	30	35	2
55/75464	Dual Drivers	TTL	—	NOR	300	35	30	35	2
55/75471	Dual Drivers	TTL	—	AND	300	80	55	30	2
55/75472	Dual Drivers	TTL	NAND	NAND	300	80	55	45	2
55/75473	Dual Drivers	TTL	—	DR	300	80	55	30	2
55/75474	Dual Drivers	TTL	—	NOR	300	80	55	40	2
75491	Quad Driver	TTL, MOS, CMDS	—	—	50	20	—	600	4
75492	Hex Driver	TTL, MOS, CMOS	—	—	250	20	—	600	6

MOS, CCD AND CORE MEMORY DRIVERS

DEVICE NO.	Function	Input Compatibility	Output Current (Capacitive Drive Capability) mA (pF)	t_{pd}-ns (Typ)	Supply Voltage V
9643	Dual TTL to CCD/MOS Dvr	TTL	(300)	8.0	+5.0
9644	Dual TTL to CCD/MOS Dvr	TTL	(300)	8.0	+5.0
9645	Quad TTL to CCD/MOS Dvr	TTL	(300)	8.0	+5.0
9646	Dual MOS Clock Dvr	TTL	(1000)	30	-22 to +22

DEVICE NO.	Function	Input Compatibility	Output Current (Capacitive Drive Capability) mA (pF)	t_{pd}-ns (Typ)	Supply Voltage V
55/75325	Core Memory Dvr	TTL	600	25	+5.0, +24
55/75326	Core Memory Dvr	TTL	600	30	+5.0
55/75327	Core Memory Dvr	TTL	600	35	+5.0 or +4.5 to +24

LEVEL TRANSLATORS

DEVICE NO.	Function	Supply Voltage V^+ (Typ)	Supply Voltage V^- (Typ)	V_{OH}-V (Min)	V_{OL}-V (Max)	t_{pd}-ns (Typ)	Power Dissipation mW
4049B	Hex Inverting Buffer	+3.0 to +15	0.0	-2.5[1]	+16[2]	—	—
4050B	Hex Non-Inverting Buffer	+3.0 to +15	0.0	-2.5[1]	+16[2]	—	—
4104B	TTL to Logic HIGH MDS	+3.0 to +15	0.0	+9.95	+0.05	85	1.4
9109	HLDTL-TTL Hex	+12 to +20	0.0	OC	+0.4	120	380
9112	TTL-HLDTL Hex	+12 to +20	0.0	(+V)-2.0	+0.4	90	440
9595	Oual ECL-TTL	+5.0	-5.2	+2.4	+0.4	6.0	375
9624	TTL-MOS	+5.0	0.0 to -30	V_{TAP}-1.0	(-V)+2.0	120	40
9625	MOS-TTL Dual	+5.0	0.0 to -30	+3.2	+0.4	70	60
9643	Dual TTL to MOS Driver	+5.0 to +12	0.0	V_{CC}-0.5	+0.3	8.0	—
9644	Dual TTL to MOS Driver	+5.0 to +12	0.0	V_{CC}-0.5	+0.3	8.0	—

1. I_{OH}-mA
2. I_{OL}-mA

Manufactured in U.S.A.

DEVICE NO.	Function	Supply Voltage V^+ (Typ)	Supply Voltage V^- (Typ)	V_{OH}-V (Min)	V_{OL}-V (Max)	t_{pd}-ns (Typ)	Power Dissipation mW
9645	Quad TTL to MOS Driver	+5.0	0.0	V_{CC}-0.5	+0.3	8.0	—
9646	Dual MOS Clock Driver	-22 to +22	0.0	V_{CC}-0.5	+1.0	30	—
11C24	Dual TTL Voltage Controlled Multivibrator	+5.0	—	+2.5	+0.5	30	160
11C44	Phase-Freq Detector	+5.0	—	+2.5	+0.5	—	165
11C58	ECL Voltage Controlled Multivibrator	+5.0	-5.2	-0.96	-1.62	—	260
10124	TTL-ECL Quad Diff Driver	+5.0	-5.2	-0.96	-1.65	3.0	265
10125	ECL-TTL Quad Buffer	+5.0	-5.2	+2.5	+0.5	3.0	410
10177	ECL to MOS	+5.0 or +6.0	-5.2	+3.0 or +4.0	+0.5 or +0.6	6.0	430
95124	TTL-ECL Quad Diff Driver	+5.0	-5.2	-1.05	-1.595	3.0	295

- ☐ Line Drivers/Receivers
- ☐ Display and Peripheral Drivers
- ☐ Translators, Convertors and Sense Amplifiers

CONVERTERS

DEVICE NO.	Function	Input Compatibility	Output Current MSB-mA (Max)	Non-Linearity % (Full Scale)	Output Current Settling Time ns
μA0801/ DAC-08	8-Bit High Speed Digital-to-Analog Converter	TTL, CMOS, ECL, HTL, MOS	2.0	±0.1	85
μA0802/ 1408	8-Bit Multiplying Digital-to-Analog Converter	TTL, CMOS	2.0	±0.19	250
μA4151	Voltage-to-Frequency Converter	TTL, CMOS	—	—	—
μA7151	Voltage-to-Frequency Converter w/Op Amp	TTL, CMOS	—	—	—
9650	4-Bit Current Source	TTL	2.0	±0.1	—

DEVICE NO.	Function	Input Compatibility	Output Current MSB-mA (Max)	Non-Linearity % (Full Scale)	Output Current Settling Time ns
9706[1]	8-Channel, 6-Bit Microprocessor, Digital-to-Analog Converter	TTL	—	—	—
9708[1]	6-Channel, 8-Bit Microprocessor, Analog-to-Digital Converter	TTL	—	±0.2	—
9710[1]	10-Bit High Speed Digital-to-Analog Converter	TTL, CMOS, ECL	8.0	±0.25	200
9712[1]	12-Bit High Speed Digital-to-Analog Converter	TTL, CMOS, ECL	8.0	±0.25	300

1. To be announced

CORE SENSE AMPLIFIERS

DEVICE NO.	Function	Differential Threshold Voltage Range V_{REF} = 15mV mV	Common Mode Range V	Gate Function	Output Configuration	t_{pd}-ns (Typ)
7524	Dual Sense Amp	11 to 19	±2.5	AND	Com Collector	25
7525	Dual Sense Amp	8.0 to 22	±2.5	AND	Com Collector	25
7528	Dual Sense Amp	11 to 19	±2.5	AND	Com Collector	25
7529	Dual Sense Amp	8.0 to 22	±2.5	AND	Com Collector	25

DEVICE NO.	Function	Differential Threshold Voltage-mV	Common Mode Range V	Gate Function	Output Configuration	t_{pd}-ns (Typ)
7534	Dual Sense Amp	11 to 19	±2.5	NAND	Uncom Collector	25
7535	Dual Sense Amp	8.0 to 22	±2.5	NAND	Uncom Collector	25
75234	Dual Sense Amp	11 to 19	±2.5	NAND	Com Collector	25
75235	Dual Sense Amp	8.0 to 22	±2.5	NAND	Com Collector	25

ANALOG SWITCHES

DEVICE NO.	Description	Input Logic	Channel Resistance Ω (Max)	Supply Voltage V
4016B	Quad Bilateral SPST Switch	CMOS	1080	3.0 to 15
4051B	8-Chan Analog Multiplexer	CMOS	340	3.0 to 15
4052B	Dual 4-Chan Analog Multiplexer	CMOS	340	3.0 to 15
4053B	Triple 2-Chan Analog Multiplexer	CMOS	340	3.0 to 15

DEVICE NO.	Description	Input Logic	Channel Resistance Ω (Max)	Supply Voltage V
4066B	Quad Bilateral SPST Switch	CMOS	300	3.0 to 15
4067B	16-Chan Analog Multiplexer	CMOS	340	3.0 to 15
4741B	4x4 Crosspoint Switch	CMOS	340	3.0 to 15

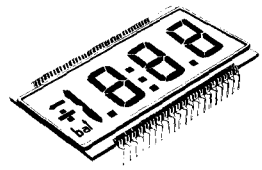
Manufactured in U.S.A.

MODELS 350/450/460 and 470

WAYCOM LIMITED

Liquid Crystal Displays

- Frit-seal and solder closure which assure a proven reliability over a 50,000 hour life.
- Wide operating voltage and temperature ranges.
- Good readability under different ambient conditions.
- Dual-in-Line Package.



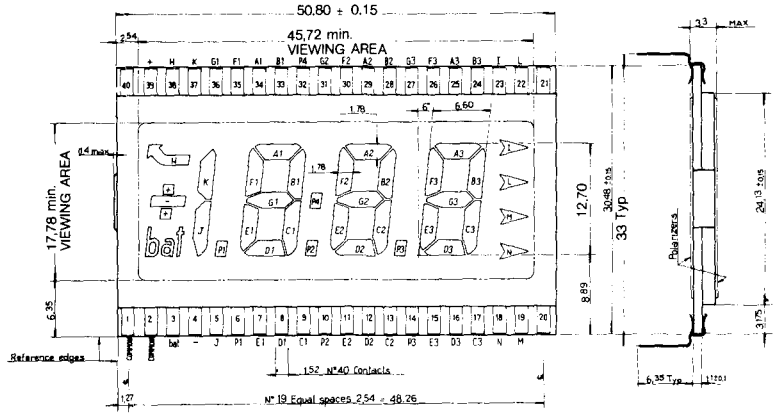
ELECTRICAL & OPTICAL CHARACTERISTICS

Measured at T_A = 25° C Operating Voltage = Typ. Voltage 32 Hz Square Wave	All Types			Units
	Min.	Typ.	Max.	
Operating voltage range	± 3 (6 p-p)	± 4.5 (9 p-p)	± 6 (12 p-p)	V
Total device operating current (With All Segments Energized) *	–	5	–	uA
Total paralleled segment resistance *	–	8	–	MΩ
Total paralleled segment capacitance *	–	5.000	–	pF
Optical response:				
Delay Time	–	20	–	ms
Rise Time	–	30	–	ms
Decay Time	–	100	–	ms
Operating-temperature range	-15	–	+60	°C
Storage-temperature range	-20	–	+70	°C
Contrast ratio	–	20 : 1	–	
Viewing angle (From Normal)	–	+40	–	Degrees
Operating frequency	25	32	2 K	Hz
Life	–	50.000	–	h

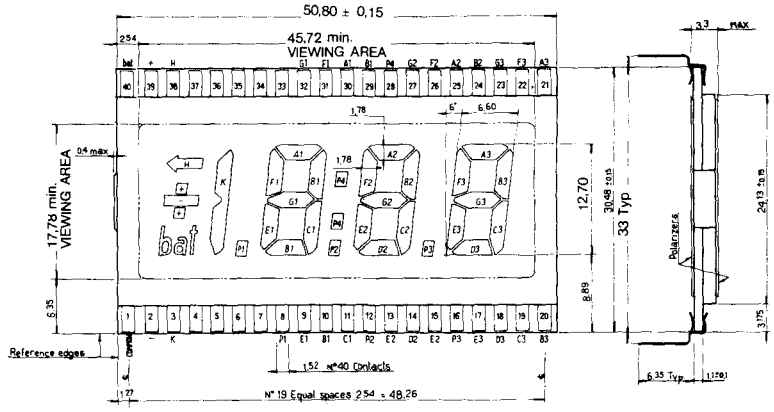
Typical values for types 351, 352, 353 & 354. *For other types contact our Bracknell Office.

STANDARD DISPLAYS AND PACKAGES

MODEL 351



MODEL 352



Manufactured In Italy by Optronics for Waycom Ltd.

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- Wide operating voltage and temperature ranges.
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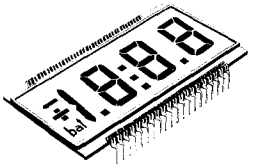
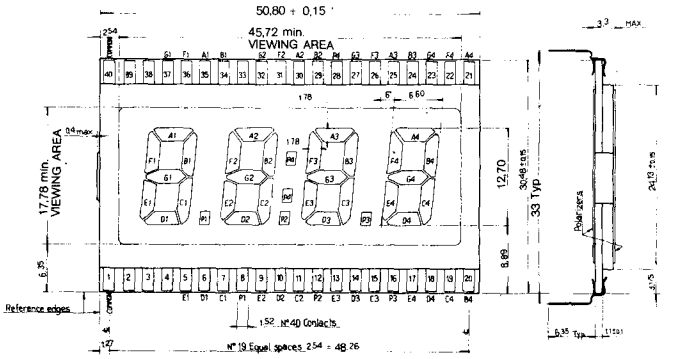
- Dual-in-Line Package.

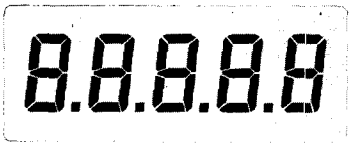


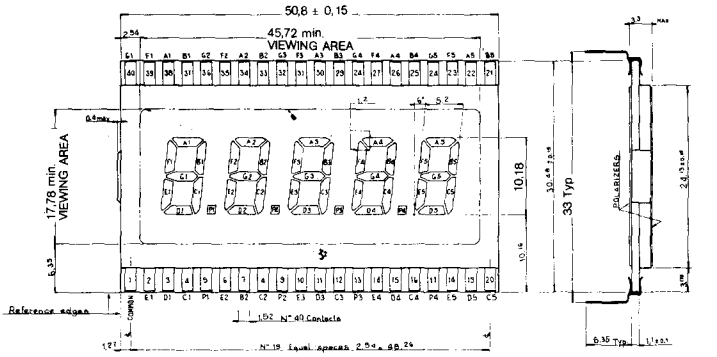
STANDARD DISPLAYS AND PACKAGES (Cont'd)

MODEL 353

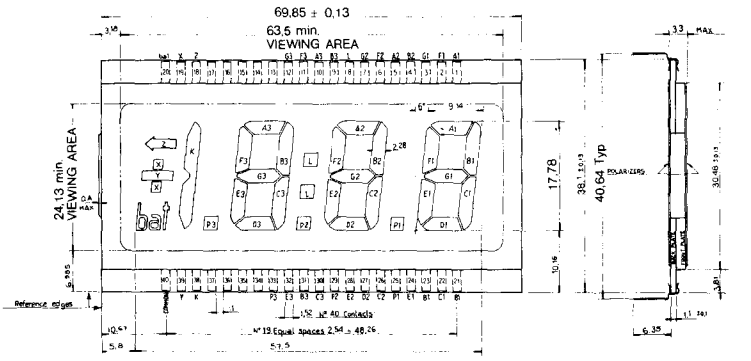


MODEL 354





MODEL 451



ORDERING PROCEDURE AND PART NUMBER

The models can be ordered as standard in accordance with the information contained herein.
When placing your order, please use the following part number to identify the standard models.
Displays are supplied individually packed with their own instruction sheet.

Example

Model Number — 352 R 4 — Driving voltage (typical) 4 = ± 4.5 V (9 V p-p)

R = reflective
H = transflective

WAYCOM LIMITED

MODELS 350/450/460 and 470

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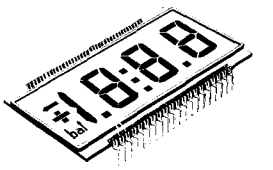
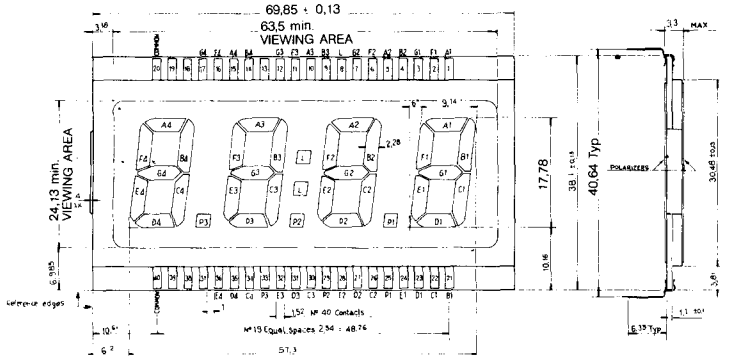
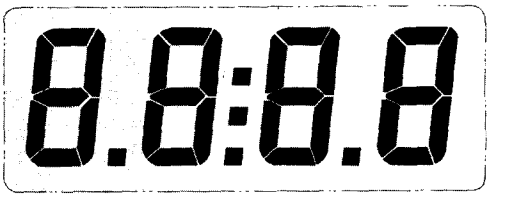
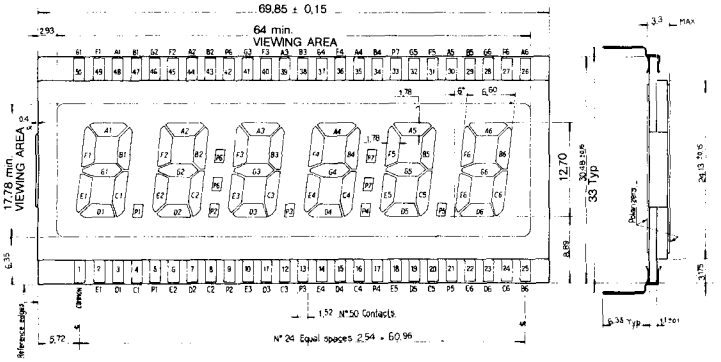


STANDARD DISPLAYS AND PACKAGES (Cont'd)

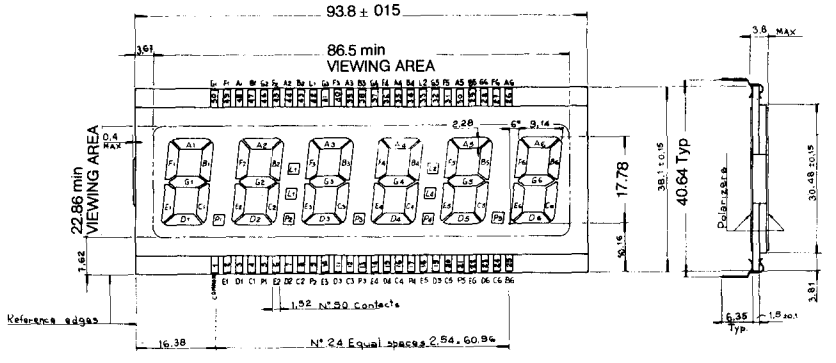


MODEL 452



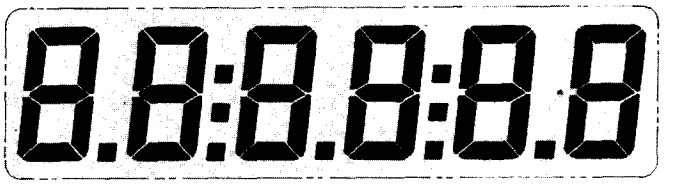


MODEL 461



MODEL 471

NOTE: Information on recommended sockets and drivers is available on request.



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NOTES