TRANSHIELD* SILICON SURGE SUPPRESSOR DIODES 9-275V BREAKDOWN VOLTAGES

CP2000 & CP2000A SERIES

Transhield CP2000 and CP2000A surge suppressors are silicon diffused junction pn devices having bidirectional positive clamping characteristics. Devices are available having tolerances on the nominal breakdown voltages of ± 10% (CP2000 series) and ± 5% (CP2000A series).

The suppressors are characterised by sharp breakdown voltages, low slope resistances, fast response times, high surge capability, and long-term voltage stability. Each device is 100% tested. In the event of an abnormal surge causing the ratings of a Transhield suppressor to be exceeded, the device will initially fail safe to a short-circuit state tripping the series protective device.

The suppressors are intended for telecommunication, data transmission and general applications where permanent damage could otherwise be caused to integrated circuits, m.o.s. devices, hybrids and other voltage sensitive semiconductors and components by surges deriving from lightning, electrostatic discharges, NEMP, inductive switching, etc.

Transhield suppressors can be supplied bandoliered (tape and reel).

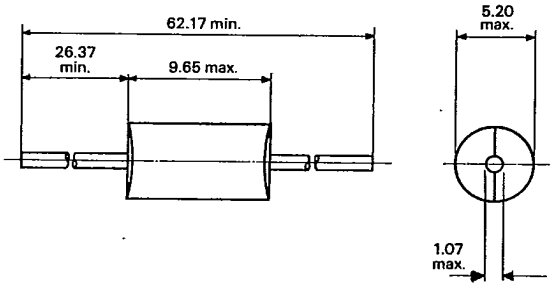
*Trademark of Lucas Industries plc.

QUICK REFERENCE DATA

	CP2000	CP2000A
P_{SM} max. (10/1000μs waveform)	1.5kW	
V_{SO}	7.37 – 223V	7.78 – 235V
V_{CL} max. (10/1000μs waveform)	13.00 – 393V	12.4 – 375V

Outline and Dimensions

All dimensions in millimetres. For detail dimensions see Page 10.



2763 A-14

RATINGS

The ratings quoted are limiting values of operating and environmental conditions and are in accordance with the absolute maximum rating system defined in BS3494 (Part 1) and IEC Publication 134.

Voltage Ratings

V_{so}	Stand-off voltage	See pages 4 and 6
V_{SM}	Maximum non-repetitive peak pulse voltage (1.2/50μs and 10/700μs waveforms)	See pages 5 and 7

Current Rating

I_{SM}	Maximum non-repetitive peak pulse current (10/1000μs and 8/20μs waveforms)	See pages 4, 5, 6, 7

Power Ratings

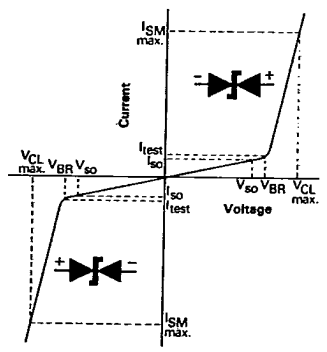
P_{tot}	Total continuous power dissipation at T_{lead} = 100°C	5W
P_{SM}	Maximum non-repetitive peak pulse power dissipation	See page 8

Thermal Ratings

T_j	Maximum junction temperature	175°C
T_{stg}	Storage temperature range	−55°C to +175°C

CHARACTERISTICS

V_{BR}	Breakdown voltage at I_{test} = 1mA and T_{amb} = 25°C	See pages 4 and 6
V_{CL}	Clamping voltage at T_{amb} = 25°C	See pages 4, 5, 6, 7
I_{so}	Leakage current at V_{so} and T_{amb} = 25°C	See pages 4 and 6
ΔV_{BR}	Breakdown voltage/temperature variation	See pages 4 and 6
C_{tot}	Total suppressor capacitance	See page 9
t_{on}	Turn on time (theoretical)	1×10^{-12}s
$R_{th\ (j\text{-}lead)}$	Thermal resistance (junction to lead)	15 deg C/W max.



Voltage/current characteristic.

V_{so} Stand-off voltage is the maximum rated continuous or repetitive peak voltage at which the device should be operated, and should be equal to or greater than the normal operating voltage of the circuit to be protected.

V_{CL}max. Maximum clamping voltage is the peak voltage across the device when subjected to the maximum rated peak surge current of a specified waveshape.

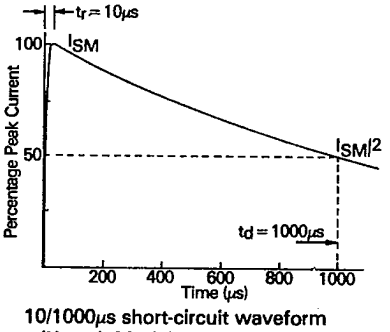
TRANSHIELD SILICON SURGE SUPPRESSOR DIODES
9–275V BREAKDOWN VOLTAGES

CP2000 & CP2000A SERIES

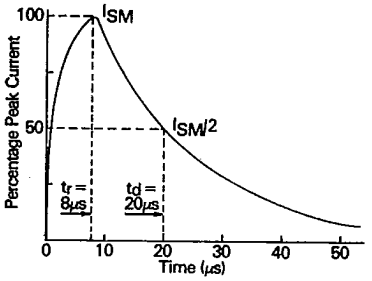
81C 00225 D

T-11-23

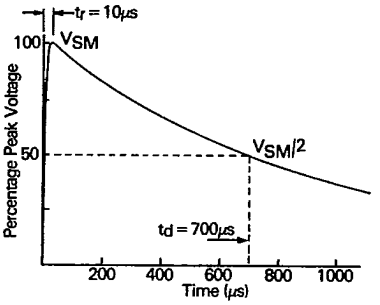
Test Waveforms and Circuits



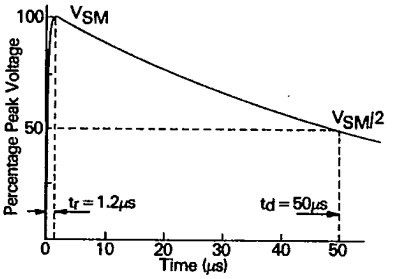
10/1000μs short-circuit waveform
(Keytek Model 424 generator)



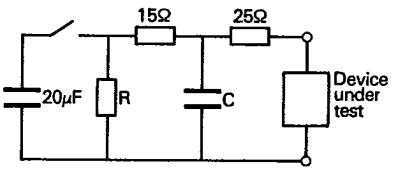
8/20μs short-circuit waveform
(Keytek Model 424 generator)



10/700μs open-circuit waveform
(Haefley Model P6T generator)



1.2/50μs open-circuit waveform
(Haefley Model P6T generator)



10/700μs R = 50Ω C = 0.2μF

1.2/50μs R = 3Ω C = 15nF

Haefley Model P6T generator internal drive circuits for 10/700μs and 1.2/50μs open-circuit voltage waveforms. The 20μF capacitor is charged to the required voltage level (see tables pages 5 and 7) and then discharged into the network to which the device under test is attached.

2765 B-02

Type number	V_{so}	Breakdown voltage at $T_{amb}=25°C$			ΔV_{BR} max.	I_{so} max. at V_{so} & $T_{amb}=25°C$	10/1000μs s.c. waveform	
		V_{BR} min.	V_{BR} max.	I_{test}			V_{CL} max. at I_{SM} max. & $T_{amb}=25°C$	I_{SM} max.
	V	V	V	mA	mV/ deg. C	μA	V	A
CP2009	7.37	8.19	10.00	1	7.0	100	13.00	115.0
CP2009A	7.78	8.65	9.55	1	7.0	100	12.40	121.0
CP2010	8.10	9.00	11.00	1	8.0	20	14.30	105.0
CP2010A	8.55	9.50	10.50	1	8.0	20	13.70	110.0
CP2011	8.92	9.90	12.10	1	9.0	10	15.70	95.0
CP2011A	9.40	10.50	11.60	1	9.0	10	15.10	99.0
CP2012	9.72	10.80	13.20	1	10.0	10	17.20	87.0
CP2012A	10.20	11.40	12.60	1	10.0	10	16.40	92.0
CP2013	10.50	11.70	14.30	1	11.0	10	18.60	81.0
CP2013A	11.10	12.40	13.70	1	11.0	10	17.80	84.0
CP2015	12.10	13.50	16.50	1	13.0	10	21.50	70.0
CP2015A	12.80	14.30	15.80	1	12.0	10	20.50	73.0
CP2016	12.90	14.40	17.60	1	16.0	10	22.90	66.0
CP2016A	13.60	15.20	16.80	1	14.0	10	21.80	68.0
CP2018	14.50	16.20	19.80	1	17.0	10	25.70	58.0
CP2018A	15.30	17.10	18.90	1	19.0	10	24.60	61.0
CP2020	16.20	18.00	22.00	1	20.0	10	28.60	52.0
CP2020A	17.10	19.00	21.00	1	19.0	10	27.30	55.0
CP2022	17.80	19.80	24.20	1	21.0	10	31.50	47.0
CP2022A	18.80	20.90	23.10	1	20.0	10	30.00	50.0
CP2024	19.40	21.60	26.40	1	25.0	10	34.30	44.0
CP2024A	20.50	22.80	25.20	1	23.0	10	32.80	46.0
CP2027	21.80	24.30	29.70	1	28.0	10	38.60	39.0
CP2027A	23.10	25.70	28.40	1	25.0	10	36.90	41.0
CP2030	24.33	27.00	33.00	1	31.0	10	42.90	35.0
CP2030A	25.60	28.50	31.50	1	28.0	10	40.90	37.0
CP2033	26.80	29.70	36.30	1	31.0	10	47.20	32.0
CP2033A	28.20	31.40	34.70	1	30.0	10	45.10	33.0
CP2036	29.10	32.40	39.60	1	35.0	10	51.50	29.2
CP2036A	30.80	34.20	37.80	1	31.0	10	49.10	30.4
CP2039	31.60	35.10	42.90	1	39.0	10	55.80	26.9
CP2039A	33.30	37.10	41.00	1	36.0	10	53.30	28.2
CP2043	34.80	38.70	47.30	1	46.0	10	61.50	24.4
CP2043A	36.80	40.90	45.20	1	44.0	10	58.80	25.5
CP2047	38.10	42.30	51.70	1	50.0	10	67.20	22.3
CP2047A	40.20	44.70	49.40	1	48.0	10	64.20	23.3

TRANSHIELD SILICON SURGE SUPPRESSOR DIODES
9–275V BREAKDOWN VOLTAGES

CP2000 & CP2000A SERIES

81C 00227 D

T-11-23

Type number	1.2/50μs o.c. waveform		10/700μs o.c. waveform		8/20μs s.c. waveform	
	V_{CL} max. at V_{SM} max. & T_{amb} = 25°C	V_{SM} max.	V_{CL} max. at V_{SM} max. & T_{amb} = 25°C	V_{SM} max.	V_{CL} max. at I_{SM} max. & T_{amb} = 25°C	I_{SM} max.
	V	kV	V	kV	V	A
CP2009	15.0	17.3	14.0	7.15	17.0	647
CP2009A	14.3	18.2	13.4	7.47	16.2	679
CP2010	16.5	15.8	15.4	6.50	18.7	588
CP2010A	15.8	16.5	14.7	6.81	17.9	615
CP2011	18.2	14.3	16.9	5.93	20.6	534
CP2011A	17.4	14.9	16.2	6.18	19.7	558
CP2012	19.8	13.1	18.5	5.42	22.4	491
CP2012A	18.9	13.8	17.6	5.69	21.4	514
CP2013	21.5	12.1	20.0	5.01	24.3	453
CP2013A	20.6	12.6	19.2	5.22	23.3	472
CP2015	24.8	10.5	23.1	4.34	28.0	393
CP2015A	23.7	11.0	22.1	4.54	26.9	409
CP2016	26.4	9.86	24.6	4.08	29.9	368
CP2016A	25.2	10.30	23.5	4.27	28.6	385
CP2018	29.7	8.77	27.7	3.63	33.7	326
CP2018A	28.4	9.17	26.5	3.79	32.1	343
CP2020	33.0	7.90	30.8	3.27	37.4	294
CP2020A	31.5	8.27	29.4	3.42	35.7	308
CP2022	36.3	7.18	33.9	2.97	41.1	268
CP2022A	34.7	7.51	32.3	3.12	39.3	280
CP2024	39.6	6.59	37.0	2.72	44.9	245
CP2024A	37.8	6.90	35.3	2.85	42.8	257
CP2027	44.6	5.85	41.5	2.44	50.5	218
CP2027A	42.6	6.13	39.7	2.55	48.3	228
CP2030	49.5	5.28	46.2	2.19	56.1	196
CP2030A	47.3	5.52	44.1	2.29	53.6	205
CP2033	54.5	4.80	50.8	2.00	61.7	178
CP2033A	52.1	5.02	48.6	2.09	59.0	186
CP2036	59.4	4.41	55.4	1.84	67.3	163
CP2036A	56.7	4.62	53.0	1.92	64.3	171
CP2039	64.4	4.07	60.1	1.70	72.9	151
CP2039A	61.5	4.26	57.4	1.78	69.7	158
CP2043	71.0	3.70	66.2	1.55	80.4	137
CP2043A	67.8	3.87	63.3	1.62	76.8	143
CP2047	77.6	3.39	72.4	1.42	87.9	125
CP2047A	74.1	3.55	69.1	1.49	84.0	131

81C 00228 D T-11-23

Type number	V_{so}	Breakdown voltage at $T_{amb}=25°C$			ΔV_{BR} max.	I_{so} max. at V_{so} & $T_{amb}=25°C$	10/1000μs s.c. waveform	
		V_{BR} min.	V_{BR} max.	I_{test}			V_{CL} max. at I_{SM} max. & $T_{amb}=25°C$	I_{SM} max.
	V	V	V	mA	mV/ deg. C	μA	V	A
CP2051	41.30	45.90	56.10	1	55.0	10	72.90	20.6
CP2051A	43.60	48.50	53.60	1	51.0	10	69.70	21.5
CP2056	45.50	50.40	61.60	1	58.0	10	80.10	18.7
CP2056A	47.80	53.20	58.80	1	56.0	10	76.40	19.6
CP2062	50.20	55.80	68.20	1	65.0	10	88.00	17.0
CP2062A	53.00	58.90	65.10	1	62.0	10	84.00	17.8
CP2068	55.10	61.20	74.80	1	71.0	10	97.00	15.0
CP2068A	58.10	64.60	71.40	1	69.0	10	92.00	16.3
CP2075	60.70	67.50	82.50	1	80.0	10	107.00	14.0
CP2075A	64.10	71.30	78.80	1	76.0	10	102.00	14.7
CP2082	66.40	73.80	90.20	1	90.0	10	117.00	12.8
CP2082A	70.10	77.90	86.10	1	86.0	10	111.00	13.5
CP2091	73.70	81.90	100.00	1	99.0	10	130.00	11.5
CP2091A	77.80	86.50	95.50	1	94.0	10	124.00	12.1
CP2100	81.00	90.00	110.00	1	109.0	10	143.00	10.5
CP2100A	85.50	95.00	105.80	1	104.0	10	136.00	11.0
CP2110	89.00	99.00	121.00	1	120.0	10	157.00	9.5
CP2110A	94.00	105.00	116.00	1	115.0	10	150.00	10.0
CP2120	97.00	108.00	132.00	1	131.0	10	171.00	8.8
CP2120A	102.00	114.00	126.00	1	125.0	10	163.00	9.2
CP2130	105.00	117.00	143.00	1	142.0	10	185.00	8.1
CP2130A	111.00	124.00	137.00	1	136.0	10	178.00	8.4
CP2150	121.00	135.00	165.00	1	164.0	10	214.00	7.0
CP2150A	128.00	143.00	158.00	1	157.0	10	205.00	7.3
CP2160	130.00	144.00	176.00	1	175.0	10	228.00	6.6
CP2160A	136.00	152.00	168.00	1	167.0	10	218.00	6.8
CP2170	138.00	153.00	187.00	1	186.0	10	243.00	6.2
CP2170A	154.00	162.00	179.00	1	188.0	10	232.00	6.4
CP2180	146.00	162.00	198.00	1	197.0	10	257.00	5.8
CP2180A	154.00	171.00	189.00	1	188.0	10	245.00	6.1
CP2200	162.00	180.00	220.00	1	219.0	10	286.00	5.2
CP2200A	171.00	190.00	210.00	1	209.0	10	273.00	5.5
CP2220	175.00	198.00	242.00	1	240.0	10	314.00	4.8
CP2220A	185.00	209.00	231.00	1	230.0	10	300.00	5.0
CP2250	202.00	225.00	275.00	1	270.0	10	357.00	4.2
CP2250A	214.00	237.00	263.00	1	260.0	10	341.00	4.4
CP2275	223.00	247.50	302.50	1	300.0	10	393.00	3.8
CP2275A	235.00	261.30	288.80	1	290.0	10	375.00	4.0

TRANSHIELD SILICON SURGE SUPPRESSOR DIODES
9–275V BREAKDOWN VOLTAGES

CP2000 & CP2000A SERIES

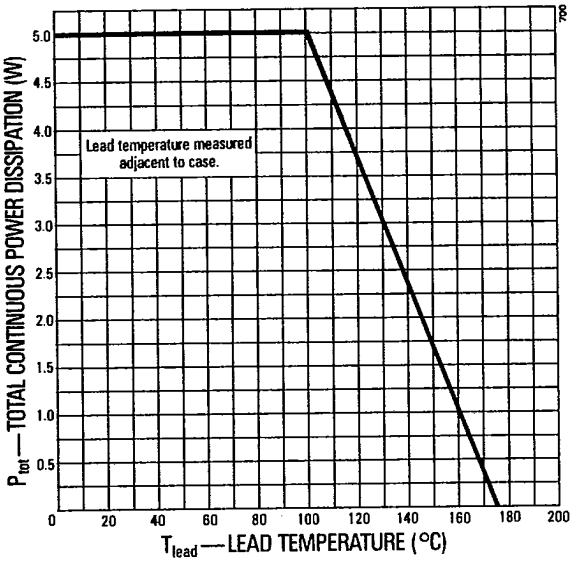
81C 00229 D

T-11-23

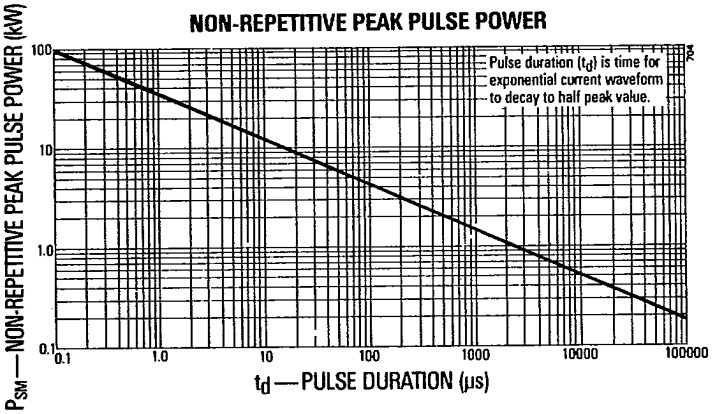
Type number	1.2/50μs o.c. waveform		10/700μs o.c. waveform		8/20μs s.c. waveform	
	V_{CL} max. at V_{SM} max. & T_{amb} = 25°C	V_{SM} max.	V_{CL} max. at V_{SM} max. & T_{amb} = 25°C	V_{SM} max.	V_{CL} max. at I_{SM} max. & T_{amb} = 25°C	I_{SM} max.
	V	kV	V	kV	V	A
CP2051	84.2	3.13	78.5	1.32	95.4	115
CP2051A	80.4	3.28	75.0	1.38	91.1	121
CP2056	92.4	2.86	86.2	1.21	104.7	105
CP2056A	88.2	3.00	82.3	1.27	100.0	110
CP2062	102.0	2.60	95.0	1.10	115.0	95.6
CP2062A	97.0	2.72	91.0	1.15	110.0	100.0
CP2068	112.2	2.38	104.0	1.02	127.0	86.6
CP2068A	107.0	2.49	100.0	1.06	121.0	90.9
CP2075	123.0	2.17	115.0	0.936	140.0	78.6
CP2075A	118.0	2.27	110.0	0.977	134.0	82.1
CP2082	135.0	2.00	126.0	0.867	153.0	71.9
CP2082A	129.0	2.09	120.0	0.905	146.0	75.3
CP2091	150.0	1.81	140.0	0.794	170.0	64.7
CP2091A	143.0	1.89	133.0	0.828	162.0	67.9
CP2100	165.0	1.67	154.0	0.739	187.0	58.8
CP2100A	157.0	1.74	147.0	0.770	178.0	61.8
CP2110	181.0	1.53	169.0	0.690	205.0	53.7
CP2110A	174.0	1.60	162.0	0.720	197.0	55.8
CP2120	198.0	1.42	184.0	0.649	224.0	49.0
CP2120A	189.0	1.49	176.0	0.681	214.0	51.4
CP2130	214.0	1.33	200.0	0.617	243.0	45.2
CP2130A	205.0	1.39	191.0	0.643	232.0	47.3
CP2150	247.0	1.19	231.0	0.568	280.0	39.2
CP2150A	237.0	1.24	221.0	0.593	268.0	41.0
CP2160	264.0	1.13	246.0	0.550	299.0	36.8
CP2160A	252.0	1.18	235.0	0.575	285.0	38.5
CP2170	280.0	1.08	261.0	0.535	317.0	34.6
CP2170A	268.0	1.13	250.0	0.559	304.0	36.1
CP2180	297.0	1.04	277.0	0.521	336.0	32.7
CP2180A	283.0	1.09	264.0	0.548	321.0	34.2
CP2200	330.0	0.97	308.0	0.505	374.0	29.4
CP2200A	315.0	1.02	294.0	0.530	357.0	30.8
CP2220	363.0	0.92	338.0	0.495	411.0	26.7
CP2220A	346.0	0.96	323.0	0.519	292.0	37.6
CP2250	412.0	0.86	385.0	0.485	467.0	23.5
CP2250A	394.0	0.90	368.0	0.509	447.0	24.6
CP2275	453.0	0.82	423.0	0.484	514.0	21.4
CP2275A	433.0	0.86	404.0	0.508	491.0	22.4

2769 B-06

POWER DERATING



NON-REPETITIVE PEAK PULSE POWER

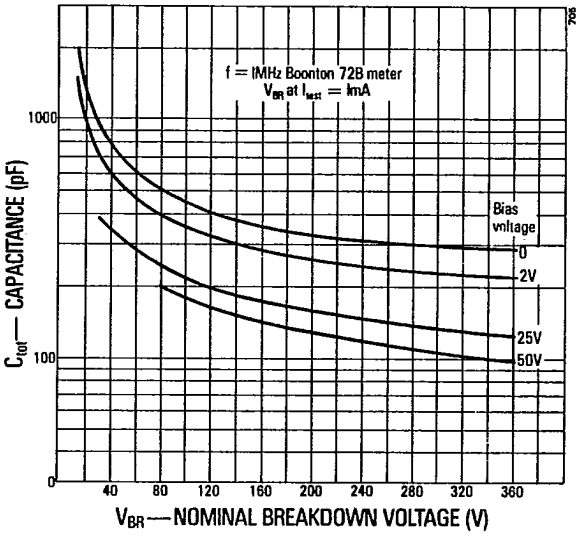


TRANSHIELD SILICON SURGE SUPPRESSOR DIODES **CP2000 & CP2000A SERIES**
9–275V BREAKDOWN VOLTAGES

81C 00231 D

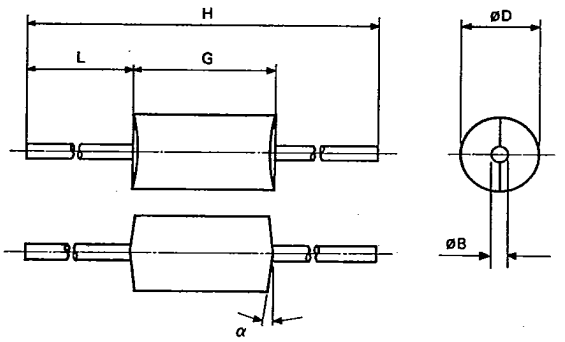
T-11-23

TYPICAL SUPPRESSOR CAPACITANCE AGAINST NOMINAL BREAKDOWN VOLTAGE



2771 B-08

MECHANICAL DETAILS 81C 00232 D T-11-23
Outline and Dimensions



Ref.	Millimetres		Degrees	Inches		Notes
	Min.	Max.	Max.	Min.	Max.	
ØB2	0.96	1.07		0.038	0.042	
ØD	5.07	5.20		0.200	0.205	
G	9.40	9.65		0.370	0.380	
H	62.17	63.58		2.448	2.503	
L	26.37	26.87		1.038	1.058	
α			10			

Note:
The inch dimensions are derived from the millimetre dimensions.

Weight: 1.0 gramme

INSTALLATION NOTES

The suppressors have insulated bodies which permits high density component mounting.

The minimum axial length within which these suppressors may be placed with their leads bent at right angles is 0.63 in (16mm).

The suppressors may be dip-soldered at a temperature of 240°C for a maximum of 10 seconds up to a point 0.2 in (5mm) from their bodies.

Lucas Electrical Electronics & Systems Limited
Mere Green Road · Sutton Coldfield · West Midlands B75 5BN
Telephone: 021-308 3501 · Telex: 338461

 Publication No. 3800/63 Printed in England 5M/185/R

81C 00233 D

T-11-23

TRANSHIELD* SILICON SURGE SUPPRESSOR DIODES 9-275V BREAKDOWN VOLTAGES

FP2000 & FP2000A SERIES

Transhield FP2000 and FP2000A surge suppressors are silicon diffused junction devices having bidirectional foldback characteristics. Devices are available having tolerances on the nominal breakdown voltages of ± 10% (FP2000 series) and ± 5% (FP2000A series).

The foldback characteristic provides the suppressors with an increased surge current handling capability coupled with lower clamping voltages compared with industrial standard devices. Each device is 100% tested. In the event of an abnormal surge causing the ratings of a Transhield suppressor to be exceeded, the device will initially fail safe to a short-circuit state tripping the series protective device.

The suppressors are intended for telecommunication, data transmission and general applications where permanent damage could otherwise be caused to integrated circuits, m.o.s. devices, hybrids and other voltage sensitive semiconductors and components by surges deriving from lightning, electrostatic discharges, NEMP, inductive switching, etc.

Transhield suppressors can be supplied bandoliered (tape and reel).

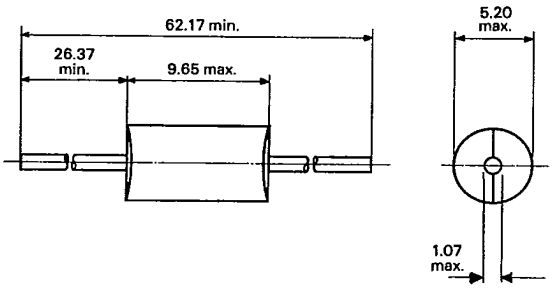
*Trademark of Lucas Industries plc.

QUICK REFERENCE DATA

	FP2000	FP2000A
V_{SO}	7.37 – 223V	7.78 – 235V
V_{CL} max. (10/1000μs waveform)	13.0 – 340V	12.4 – 324V

Outline and Dimensions

All dimensions in millimetres. For detail dimensions see Page 10.



2773 B-10

®Registered trademark of Ledex Inc.

RATINGS

The ratings quoted are limiting values of operating and environmental conditions and are in accordance with the absolute maximum rating system defined in BS3494 (Part 1) and IEC Publication 134.

Voltage Ratings

V_{so}	Stand-off voltage	See pages 4 and 6
V_{SM}	Maximum non-repetitive peak pulse voltage (1.2/50μs and 10/700μs waveforms)	See pages 5 and 7

Current Rating

I_{SM}	Maximum non-repetitive peak pulse current (10/1000μs and 8/20μs waveforms)	See pages 4, 5, 6, 7

Power Ratings

P_{tot}	Total continuous power dissipation at T_{lead} = 50°C	5W
P_{SM}	Maximum non-repetitive peak pulse power dissipation	See page 8

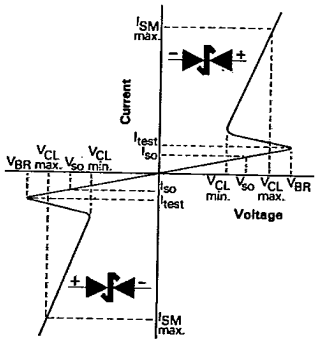
Thermal Ratings

T_j	Maximum junction temperature	125°C
T_{stg}	Storage temperature range	−55°C to +125°C

CHARACTERISTICS

V_{BR}	Breakdown voltage at T_{amb} = 25°C	See pages 4 and 6
S_{BR}	Temperature coefficient of breakdown voltage	See note below
V_{CL}	Clamping voltage at T_{amb} = 25°C	See pages 4, 5, 6, 7
I_{so}	Leakage current at V_{so} and T_{amb} = 25°C	See pages 4 and 6
C_{tot}	Total diode capacitance	See page 9
t_{on}	Turn on time (theoretical) to	
	– breakdown voltage	1×10^{-12}s
	– sustaining voltage	1×10^{-6}s
$R_{th\ (j\text{-}lead)}$	Thermal resistance (junction to lead)	15 deg C/W max.

Note: Temperature coefficient of breakdown voltage. For low voltage devices (<45V) the temperature coefficient of V_{BR} is the same as the zener temperature coefficient. For higher voltage devices the temperature coefficient is virtually zero between room temperature and −55°C. At temperatures up to 125°C the temperature coefficient is negative and has a typical value of −0.2%/deg C. Further information is available from the address on page 10.



Voltage/current characteristic.

V_{so} Stand-off voltage is the maximum rated continuous or repetitive peak voltage at which the device should be operated, and should be equal to or greater than the normal operating voltage of the circuit to be protected.

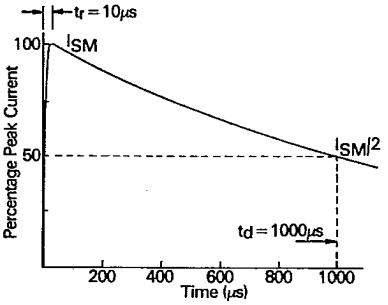
V_{CL}max. Maximum clamping voltage is the peak voltage across the device when subjected to the maximum rated peak surge current of a specified waveshape.

TRANSHIELD SILICON SURGE SUPPRESSOR DIODES
9 – 275V BREAKDOWN VOLTAGES

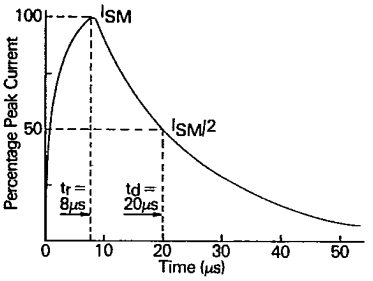
FP2000 & FP2000A IES

81C 00235 D T-11-23

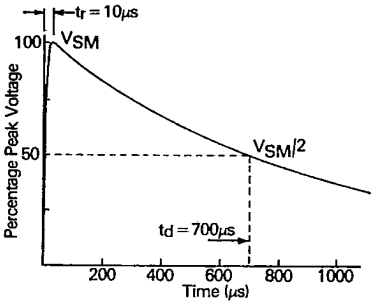
Test Waveforms and Circuits



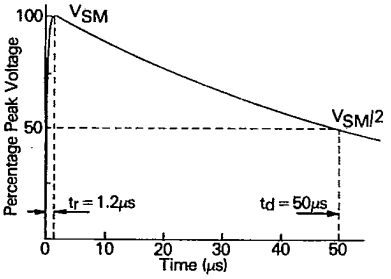
10/1000μs short-circuit waveform
(Keytek Model 424 generator)



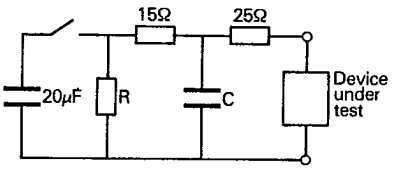
8/20μs short-circuit waveform
(Keytek Model 424 generator)



10/700μs open-circuit waveform
(Haefley Model P6T generator)



1.2/50μs open-circuit waveform
(Haefley Model P6T generator)



10/700μs R = 50Ω
C = 0.2μF

1.2/50μs R = 3Ω
C = 15nF

Haefley Model P6T generator internal drive circuits for 10/700μs and 1.2/50μs open-circuit voltage waveforms. The 20μF capacitor is charged to the required voltage level (see tables pages 5 and 7) and then discharged into the network to which the device under test is attached.

2775 B-12

81C 00236 D

T-11-23

Type number	V_{so}	Breakdown voltage at $T_{amb}=25°C$			V_{CL} min.	I_{so} max. at V_{so} & $T_{amb}=25°C$	10/1000μs s.c. waveform	
		V_{BR} min.	V_{BR} max.	I_{test}			V_{CL} max. at I_{SM} max. & $T_{amb}=25°C$	I_{SM} max.
	V	V	V	μA	V	μA	V	A
FP2009	7.37	8.19	10.00	1000	7.78	50	13.0	115.4
FP2009A	7.78	8.65	9.55	1000	8.22	50	12.4	120.8
FP2010	8.10	9.00	11.00	1000	8.60	10	14.3	104.9
FP2010A	8.55	9.50	10.50	1000	9.03	10	13.7	109.9
FP2011	8.92	9.90	12.10	1000	9.41	5	15.7	95.4
FP2011A	9.40	10.50	11.60	1000	9.98	5	15.1	99.5
FP2012	9.72	10.80	13.20	1000	10.26	5	17.2	87.4
FP2012A	10.20	11.40	12.60	1000	10.83	5	16.4	91.6
FP2013	10.50	11.70	14.30	1000	11.11	5	18.6	80.7
FP2013A	11.10	12.40	13.70	1000	11.78	5	17.8	84.2
FP2015	12.10	13.50	16.50	1000	12.83	5	21.5	69.9
FP2015A	12.80	14.30	15.80	1000	13.59	5	20.5	73.0
FP2016	12.90	14.40	17.60	1000	13.68	5	22.9	65.6
FP2016A	13.60	15.20	16.80	1000	14.44	5	21.8	68.7
FP2018	14.50	16.20	19.80	1000	14.58	5	25.7	58.3
FP2018A	15.30	17.10	18.90	1000	15.39	5	24.6	61.0
FP2020	16.20	18.00	22.00	1000	14.85	5	28.6	52.4
FP2020A	17.10	19.00	21.00	1000	15.68	5	27.3	54.9
FP2022	17.80	19.80	24.20	1000	14.85	5	31.5	47.7
FP2022A	18.80	20.90	23.10	1000	15.68	5	30.0	50.0
FP2024	19.40	21.60	26.40	1000	16.20	5	34.0	43.7
FP2024A	20.50	22.80	25.20	1000	17.10	5	32.8	45.8
FP2027	21.80	24.30	29.70	100	17.00	5	35.6	50.5
FP2027A	23.10	25.70	28.40	100	18.00	5	34.1	52.8
FP2030	24.33	27.00	33.00	100	18.90	5	39.6	45.5
FP2030A	25.60	28.50	31.50	100	20.00	5	38.0	47.6
FP2033	26.80	29.70	36.30	100	20.00	5	43.5	41.3
FP2033A	28.20	31.40	34.70	100	21.20	5	41.6	43.2
FP2036	29.10	32.40	39.60	100	21.10	5	45.5	44.5
FP2036A	30.80	34.20	37.80	100	22.20	5	43.5	46.7
FP2039	31.60	35.10	42.90	100	22.00	5	49.3	41.1
FP2039A	33.30	37.10	41.00	100	23.20	5	47.1	43.0
FP2043	34.80	38.70	47.30	100	23.20	5	54.4	37.3
FP2043A	36.80	40.90	45.20	100	24.50	5	52.0	39.0
FP2047	38.10	42.30	51.70	<100	25.40	5	58.2	38.7
FP2047A	40.20	44.70	49.40	<100	26.80	5	55.6	40.5

All stand-off voltages (V_{so}) are valid from d.c. to 100Hz. Breakdown voltages (V_{BR}) are measured at 5Hz. Clamp voltages (V_{CL}) are valid for the waveforms stated. For operation outside these limits contact the address on page 10.

TRANSHIELD SILICON SURGE SUPPRESSOR DIODES
9–275V BREAKDOWN VOLTAGES

FP2000 & FP2000A SERIES

81C 00237 D

T-11-23

Type number	1.2/50μs o.c. waveform		10/700μs o.c. waveform		8/20μs s.c. waveform	
	V_{CL} max. at V_{SM} max. & T_{amb} = 25°C	V_{SM} max.	V_{CL} max. at V_{SM} max. & T_{amb} = 25°C	V_{SM} max.	V_{CL} max. at I_{SM} max. & T_{amb} = 25°C	I_{SM} max.
	V	kV	V	kV	V	A
FP2009	14.0	18.30	13.5	7.70	16.0	657
FP2009A	13.4	19.20	12.9	8.05	15.3	687
FP2010	15.4	16.60	14.9	7.05	17.6	597
FP2010A	14.7	17.40	14.2	7.30	16.8	625
FP2011	16.9	15.10	16.3	6.40	19.4	542
FP2011A	16.2	15.80	15.7	6.65	18.6	565
FP2012	18.2	13.90	17.8	5.85	21.1	498
FP2012A	17.6	14.50	17.0	6.15	20.2	521
FP2013	20.0	12.80	19.3	5.40	22.9	459
FP2013A	19.2	13.40	18.5	5.65	21.9	479
FP2015	23.1	11.10	22.3	4.70	26.4	397
FP2015A	22.1	11.60	21.3	4.90	25.3	415
FP2016	24.6	10.40	23.8	4.40	28.2	373
FP2016A	23.5	10.90	22.7	4.60	26.9	395
FP2018	27.7	9.25	26.7	3.95	31.7	331
FP2018A	26.5	9.70	25.5	4.10	30.2	347
FP2020	30.8	8.33	29.7	3.55	35.2	298
FP2020A	29.4	8.73	28.4	3.70	33.6	313
FP2022	33.9	7.58	32.7	3.20	38.7	271
FP2022A	32.3	7.94	31.2	3.40	37.0	284
FP2024	37.0	6.95	35.6	3.00	39.7	249
FP2024A	35.3	7.28	34.0	3.10	38.0	260
FP2027	35.6	8.64	35.6	3.50	35.6	353
FP2027A	34.1	9.04	34.1	3.70	34.1	370
FP2030	39.6	7.78	39.6	3.20	39.6	318
FP2030A	38.0	8.16	38.0	3.35	38.0	333
FP2033	43.5	7.08	43.5	2.90	43.5	289
FP2033A	41.6	7.41	41.6	3.05	41.6	303
FP2036	45.5	7.21	45.5	3.15	45.5	295
FP2036A	43.5	7.56	43.5	3.25	43.5	309
FP2039	49.3	6.67	49.3	2.90	49.3	272
FP2039A	47.2	6.97	47.2	3.00	47.2	285
FP2043	54.4	6.05	54.4	2.65	54.4	247
FP2043A	52.0	6.33	52.0	2.75	52.0	258
FP2047	58.2	6.23	58.2	2.70	58.2	254
FP2047A	55.6	6.52	55.6	2.85	55.6	266

LEDEX®

2777 B-14

81C 00238 D

T-11-23

Type number	V_{so}	Breakdown voltage at $T_{amb}=25°C$			V_{CL} min.	I_{so} max. at V_{so} & $T_{amb}=25°C$	10/1000μs s.c. waveform	
		V_{BR} min.	V_{BR} max.	I_{test}			V_{CL} max. at I_{SM} max. & $T_{amb}=25°C$	I_{SM} max.
	V	V	V	μA	V	μA	V	A
FP2051	41.30	45.90	56.10	<100	26.40	5	63.1	35.7
FP2051A	43.60	48.50	53.60	<100	27.90	5	60.3	37.3
FP2056	45.50	50.40	61.60	<100	29.00	5	69.3	32.5
FP2056A	47.80	53.20	58.80	<100	30.60	5	66.2	34.0
FP2062	50.20	55.80	68.20	<100	30.70	5	76.0	29.3
FP2062A	53.00	58.90	65.10	<100	32.40	5	73.0	30.7
FP2068	55.10	61.20	74.80	<100	33.70	5	84.0	26.7
FP2068A	58.10	64.60	71.40	<100	35.50	5	80.0	28.0
FP2075	60.70	67.50	82.50	<100	35.50	5	92.0	24.2
FP2075A	64.10	71.30	78.80	<100	37.40	5	88.0	25.4
FP2082	66.40	73.80	90.20	<100	38.50	5	103.0	19.6
FP2082A	70.10	77.90	86.10	<100	40.90	5	99.0	20.5
FP2091	73.70	81.90	100.00	<100	49.10	5	115.0	21.2
FP2091A	77.80	86.50	95.50	<100	51.90	5	109.0	22.2
FP2100	81.00	90.00	110.00	<100	51.80	5	123.0	19.3
FP2100A	85.50	95.00	105.00	<100	54.60	5	118.0	20.2
FP2110	89.00	99.00	121.00	<100	56.90	5	136.0	19.8
FP2110A	94.00	105.00	116.00	<100	60.40	5	130.0	20.7
FP2120	97.00	108.00	132.00	<100	59.40	5	148.0	18.2
FP2120A	102.00	114.00	126.00	<100	62.70	5	141.0	19.0
FP2130	105.00	117.00	143.00	<100	64.40	5	160.0	16.8
FP2130A	111.00	124.00	137.00	<100	68.20	5	154.0	17.5
FP2150	121.00	135.00	165.00	<100	70.90	5	185.0	14.5
FP2150A	128.00	143.00	158.00	<100	75.10	5	177.0	15.2
FP2160	130.00	144.00	176.00	<100	75.60	5	198.0	13.6
FP2160A	136.00	152.00	168.00	<100	79.80	5	189.0	14.3
FP2170	138.00	153.00	187.00	<100	76.50	5	210.0	12.8
FP2170A	145.00	162.00	179.00	<100	81.00	5	201.0	13.4
FP2180	146.00	162.00	198.00	<100	81.00	5	222.0	12.1
FP2180A	154.00	171.00	189.00	<100	85.50	5	212.0	12.7
FP2200	162.00	180.00	220.00	<100	90.00	5	247.0	10.9
FP2200A	171.00	190.00	210.00	<100	95.00	5	236.0	11.4
FP2220	175.00	198.00	242.00	<100	89.10	5	272.0	9.9
FP2220A	185.00	209.00	231.00	<100	94.50	5	259.0	10.4
FP2250	202.00	225.00	275.00	<100	90.00	5	309.0	8.7
FP2250A	214.00	237.00	263.00	<100	94.80	5	295.0	9.1
FP2275	223.00	247.50	302.50	<100	93.80	5	340.0	7.9
FP2275A	235.00	261.30	288.80	<100	92.00	5	324.0	8.3

All stand-off voltages (V_{so}) are valid from d.c. to 100Hz. Breakdown voltages (V_{BR}) are measured at 5Hz. Clamp voltages (V_{CL}) are valid for the waveforms stated. For operation outside these limits contact the address on page 10.

TRANSHIELD SILICON SURGE SUPPRESSOR DIODES
9–275V BREAKDOWN VOLTAGES

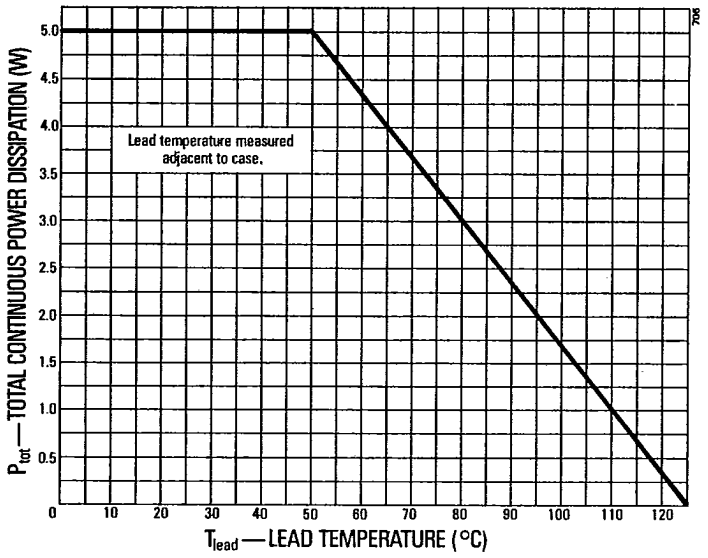
FP2000 & FP2000A SERIES

81C 00239 D

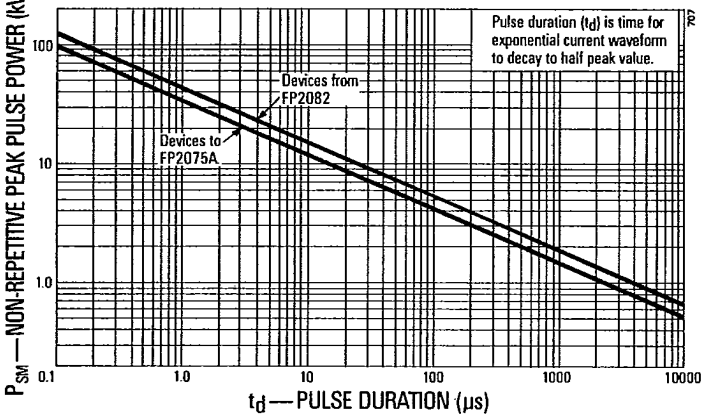
T-11-23

Type number	1.2/50μs o.c. waveform		10/700μs o.c. waveform		8/20μs s.c. waveform	
	V_{CL} max. at V_{SM} max. & T_{amb} = 25°C	V_{SM} max.	V_{CL} max. at V_{SM} max. & T_{amb} = 25°C	V_{SM} max.	V_{CL} max. at I_{SM} max. & T_{amb} = 25°C	I_{SM} max.
	V	kV	V	kV	V	A
FP2051	63.1	5.75	63.1	2.50	63.1	234
FP2051A	60.3	6.02	60.3	2.65	60.3	245
FP2056	69.3	5.24	69.3	2.30	69.3	213
FP2056A	66.2	5.49	66.2	2.40	66.2	223
FP2062	76.0	4.74	76.0	2.10	76.0	192
FP2062A	73.0	4.97	73.0	2.20	73.0	202
FP2068	84.0	4.62	84.0	1.90	84.0	175
FP2068A	80.0	4.84	80.0	2.00	80.0	184
FP2075	92.0	4.20	92.0	1.75	92.0	159
FP2075A	88.0	4.40	88.0	1.82	88.0	167
FP2082	103.0	3.40	103.0	1.42	103.0	129
FP2082A	99.0	3.57	99.0	1.49	99.0	136
FP2091	115.0	3.66	115.0	1.54	115.0	144
FP2091A	109.0	3.83	109.0	1.61	109.0	151
FP2100	123.0	3.33	123.0	1.59	123.0	131
FP2100A	118.0	3.50	118.0	1.66	118.0	138
FP2110	136.0	3.44	136.0	1.46	136.0	134
FP2110A	130.0	3.59	130.0	1.53	130.0	140
FP2120	148.0	3.17	148.0	1.36	148.0	123
FP2120A	141.0	3.32	141.0	1.42	141.0	129
FP2130	160.0	2.94	160.0	1.27	160.0	114
FP2130A	154.0	3.08	154.0	1.33	154.0	119
FP2150	185.0	2.58	185.0	1.13	185.0	98
FP2150A	177.0	2.70	177.0	1.18	177.0	103
FP2160	198.0	2.43	198.0	1.08	198.0	92
FP2160A	189.0	2.55	189.0	1.13	189.0	97
FP2170	210.0	2.30	210.0	1.03	210.0	87
FP2170A	201.0	2.41	201.0	1.08	201.0	91
FP2180	222.0	2.19	222.0	0.99	222.0	82
FP2180A	212.0	2.30	212.0	1.04	212.0	86
FP2200	247.0	1.99	247.0	0.92	247.0	74
FP2200A	236.0	2.09	236.0	0.97	236.0	77
FP2220	272.0	1.84	272.0	0.87	272.0	67
FP2220A	259.0	1.93	259.0	0.92	259.0	70
FP2250	309.0	1.67	309.0	0.81	309.0	59
FP2250A	295.0	1.75	295.0	0.85	295.0	62
FP2275	340.0	1.55	340.0	0.78	340.0	54
FP2275A	324.0	1.63	324.0	0.82	324.0	56

POWER DERATING



NON-REPETITIVE PEAK PULSE POWER

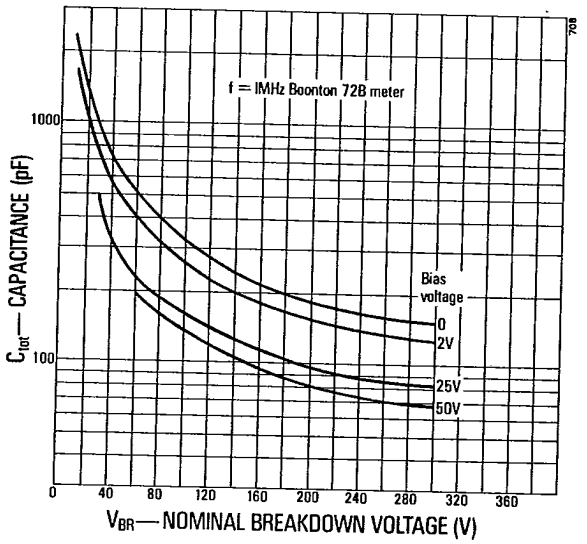


TRANSHIELD SILICON SURGE SUPPRESSOR DIODES
9–275V BREAKDOWN VOLTAGES
81C 00241 D

T-11-23

FP2000 & FP2000A SERIES

TYPICAL SUPPRESSOR CAPACITANCE AGAINST NOMINAL BREAKDOWN VOLTAGE

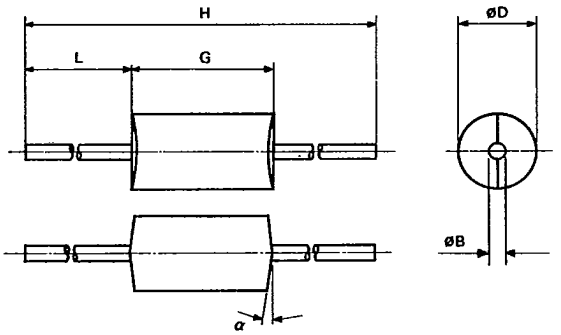


2781 C-04

MECHANICAL DETAILS 81C 00242 D

Outline and Dimensions

T-11-23



Ref.	Millimetres		Degrees	Inches		Notes
	Min.	Max.	Max.	Min.	Max.	
ØB2	0.96	1.07		0.038	0.042	
ØD	5.07	5.20		0.200	0.205	
G	9.40	9.65		0.370	0.380	
H	62.17	63.58		2.448	2.503	
L	26.37	26.87		1.038	1.058	
α			10			

Note:
The inch dimensions are derived from the millimetre dimensions.

Weight: 1.0 gramme

INSTALLATION NOTES

The suppressors have insulated bodies which permits high density component mounting.

The minimum axial length within which these suppressors may be placed with their leads bent at right angles is 0.63in (16mm).

The suppressors may be dip-soldered at a temperature of 220°C for a maximum of 10 seconds up to a point 0.2in (5mm) from their bodies.

Ledex Inc
801 Scholz Drive
Vandalia · Ohio 45377 · USA
Telephone: 513/898 – 3621
Twx: 810-450-2526 Fax: 513-898-8624 Telex: 288228

Transhield surge suppressors are manufactured in the UK by Lucas Electrical Electronics & Systems Limited a subsidiary company of Lucas Industries plc.

 Publication No. 3800/64/L Printed in England 5M/185/R