RoHS Available

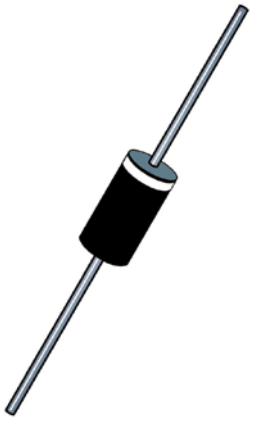
1500 Watt Low Capacitance Transient Voltage Suppressor

Screening in reference to MIL-PRF-19500 available

DESCRIPTION

This high-reliability plastic encapsulated Transient Voltage Suppressor (TVS) diode series for thru-hole mounting includes a rectifier diode element in series and in the opposite direction. This allows it to present a very low (< 100 pF) capacitance to the system it is protecting (see Figure 2). The low capacitance of these devices makes them particularly useful for protecting lines carrying high frequency signals. They are also useful in protecting from the secondary effects of lightning in airborne avionics per IEC61000-4-5, RTCA/DO-160G, and ARINC 429. If bidirectional transient capability is required, two of these low capacitance TVS devices may be used in parallel and opposite directions (anti-parallel) for complete ac protection.

Important: For the latest information, visit our website http://www.microsemi.com.



Case 1 Package

Also available in:

SMCG & SMCJ package
(tabbed surface mounts)
SMCG(J)LCE6.5 – SMCG(J)LCE170

FEATURES

- High reliability with fabrication and assembly lot traceability.
- All devices are 100% surge tested.
- Unidirectional construction. For bidirectional applications, use two in anti-parallel (see Figure 4).
- Suppresses transients up to 1500 watts @10/1000µs (see Figure 1).
- Working standoff voltage (V_{WM}) range 6.5 V to 170 V.
- 5% and 10% tolerance options available
- Clamps transients in less than 100 pico seconds.*
- 3σ lot norm screening performed on standby current I_D.
- Moisture classification is level 1 with no dry pack required per IPC/JEDEC J-STD-020B.
- Screening options available in reference to MIL-PRF-19500. See Part Nomenclature below for all available options, and to our Hi-Rel Non-Hermetic Products brochure on our web site for more details.
- RoHS compliant versions available.

*measurement limitation

APPLICATIONS / BENEFITS

- Protection from switching transients and induced RFI.
- Low capacitance for data line protection to 1 MHz.
- Protection for fast data rate lines in aircraft up to:
  RTCA/DO-160G – level 5 Waveform 4 and Level 2 Waveform 5A in (also see MicroNote 130)
  ARINC 429, Part 1, paragraph 2.4.1.1 with bit rates of 100 kb/s.
- Protection from ESD and EFT per IEC 61000-4-2 and IEC 61000-4-4.
- Secondary lightning protection per IEC 61000-4-5 with 42 Ohms source impedance:
  Class 1: MLCE6.5A to MLCE170A
  Class 2: MLCE6.5A to MLCE150A
  Class 3: MLCE6.5A to MLCE70A
  Class 4: MLCE6.5A to MLCE36A
- Secondary lightning protection per IEC 61000-4-5 with 12 Ohms source impedance:
  Class 1: MLCE6.5A to MLCE90A
  Class 2: MLCE6.5A to MLCE45A
  Class 3: MLCE6.5A to MLCE22A
  Class 4: MLCE6.5A to MLCE11A
- Secondary lightning protection per IEC 61000-4-5 with 2 Ohms source impedance:
  Class 2: MLCE6.5A to MLCE20A
  Class 3: MLCE6.5A to MLCE10A

MSC – Lawrence
6 Lake Street,
Lawrence, MA 01841
Tel: 1-800-446-1158 or
(978) 620-2600
Fax: (978) 689-0803

MSC – Ireland
Gort Road Business Park,
Ennis, Co. Clare, Ireland
Tel: +353 (0) 65 6840044
Fax: +353 (0) 65 6822298

Website:
www.microsemi.com

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MAXIMUM RATINGS @ 25 ºC unless otherwise stated

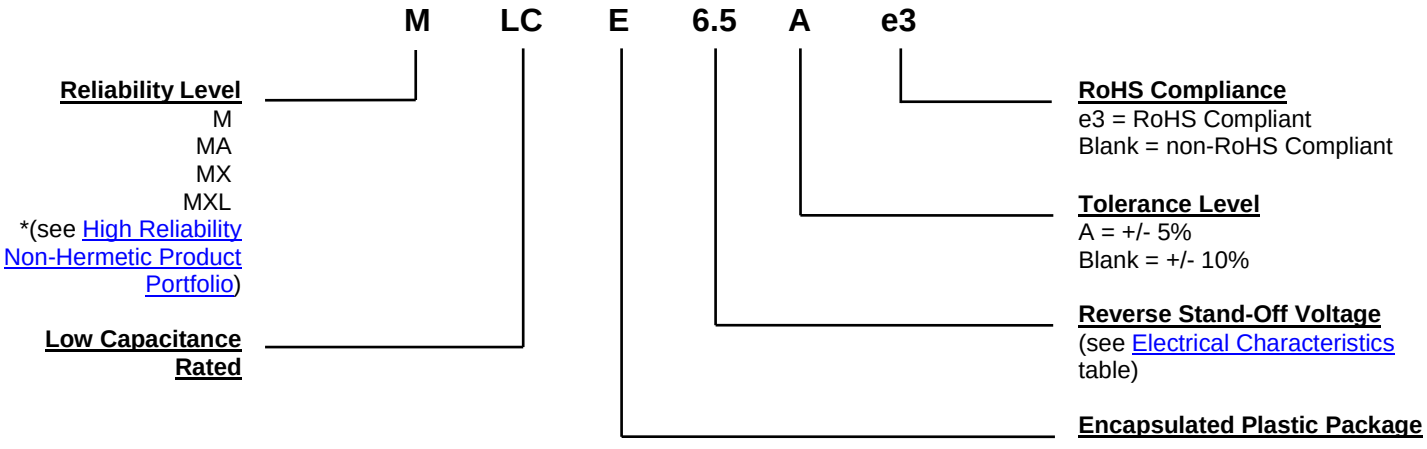
Parameters/Test Conditions	Symbol	Value	Unit
Junction and Storage Temperature	T_J and T_{STG}	-65 to +150	ºC
Thermal Resistance Junction-to-Lead (1)	$R_{\Theta JL}$	22	ºC/W
Peak Pulse Power dissipation @ 25 ºC (at 10/1000 µs, see Figures 1, 2, and 3) (2)	P_{PP}	1500	W
Rated Average Power Dissipation T_L = +40 ºC T_A = +25 ºC(1)	$P_{M(AV)}$	5.0 1.52	W
Solder Temperature @ 10 s	T_{SP}	260	°C

Notes:
1. At 3/8 inch (10 mm) from body, or 82 ºC/W junction to ambient when mounted on FR4 PC board with 4 mm2 copper pads (1oz), track width 1 mm, length 25mm.
2. With a impulse repetition rate of 0.01% or less. TVS devices are not typically used for dc power dissipation and are instead operated at ≤ V_{WM} except for transients that briefly drive the device into avalanche breakdown (V_{BR} to V_C region) of the TVS element. Also see Application Schematics for further protection details in rated peak power for unidirectional and bidirectional configurations respectively.

MECHANICAL and PACKAGING

- CASE: Void-free transfer molded thermosetting epoxy body meeting UL94V-0.
- TERMINALS: Tin-lead or RoHS compliant annealed matte-tin plating. Solderable to MIL-STD-750, method 2026.
- MARKING: Part number.
- POLARITY: Cathode indicated by band.
- TAPE & REEL option: Standard per EIA-296 (add "TR" suffix to part number). Consult factory for quantities.
- WEIGHT: Approximately 1.5 grams.
- See Package Dimensions on last page.

PART NOMENCLATURE



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SYMBOLS & DEFINITIONS	
Symbol	**Definition**
$I_{(BR)}$	Breakdown Current: The current used for measuring breakdown voltage $V_{(BR)}$.
I_D	Standby Current: The current at the rated standoff voltage V_{WM}.
I_F	Forward Current: The forward current dc value, no alternating component.
I_{PP}	Peak Impulse Current: The peak current during the impulse.
P_{PP}	Peak Pulse Power: The peak power dissipation resulting from the peak impulse current I_{PP}.
V_C	Clamping Voltage: The maximum clamping voltage at specified I_{PP} (peak pulse current) at the specified pulse conditions.
$V_{(BR)}$	Minimum Breakdown Voltage: The minimum voltage the device will exhibit at a specified current.
V_{WM}	Working Standoff Voltage: The maximum peak voltage that can be applied over the operating temperature range.

ELECTRICAL CHARACTERISTICS @ 25 ºC unless otherwise stated

MICROSEMI Part Number	Working Stand-Off Voltage V_{WM} (Note 1)	Breakdown Voltage $V_{(BR)}$ @ $I_{(BR)}$			Maximum Stanby Current I_D @ V_{WM}	Maximum Clamping Voltage V_C @ I_{PP}	Maximum Peak Pulse Current I_{PP}	Maximum Capacitance C @ 0 Volts, f = 1 MHz	Working Inverse Blocking Voltage V_{WIB}	Inverse Blocking Leakage Current I_{IB}	Peak Inverse Blocking Voltage V_{PIB}
	Volts	MIN	MAX	mA	µA	Volts	Amps	pF	Volts	µA	Volts
MLCE6.5A	6.5	7.22	7.98	10	1000	11.2	100	100	75	10	100
MLCE7.0A	7.0	7.78	8.60	10	500	12.0	100	100	75	10	100
MLCE7.5A	7.5	8.33	10.2	10	250	12.9	100	100	75	10	100
MLCE8.0A	8.0	8.89	9.83	1	100	13.6	100	100	75	10	100
MLCE8.5A	8.5	9.44	10.4	1	50	14.4	100	100	75	10	100
MLCE9.0A	9.0	10.0	11.1	1	10	15.4	97	100	75	10	100
MLCE10A	10	11.1	12.3	1	5	17.0	88	100	75	10	100
MLCE11A	11	12.2	13.5	1	5	18.2	82	100	75	10	100
MLCE12A	12	13.3	14.7	1	5	19.9	75	100	75	10	100
MLCE13A	13	14.4	15.9	1	5	21.5	70	100	75	10	100
MLCE14A	14	15.6	17.2	1	5	23.2	65	100	75	10	100
MLCE15A	15	16.7	18.5	1	5	24.4	61	100	75	10	100
MLCE16A	16	17.8	19.7	1	5	26.0	57	100	75	10	100
MLCE17A	17	18.9	20.9	1	5	27.6	54	100	75	10	100
MLCE18A	18	20.0	22.1	1	5	29.2	51	100	75	10	100
MLCE20A	20	22.2	24.5	1	5	32.4	46	100	75	10	100
MLCE22A	22	24.4	26.9	1	5	35.5	42	100	75	10	100
MLCE24A	24	26.7	29.5	1	5	38.9	39	100	75	10	100
MLCE26A	26	28.9	31.9	1	5	42.1	36	100	75	10	100
MLCE28A	28	31.1	34.4	1	5	45.5	33	100	75	10	100
MLCE30A	30	33.3	36.8	1	5	48.4	31	100	75	10	100
MLCE33A	33	36.7	40.6	1	5	53.3	28.1	100	75	10	100
MLCE36A	36	40.0	44.2	1	5	58.1	25.8	100	75	10	100
MLCE40A	40	44.4	49.1	1	5	64.5	23.3	100	75	10	100
MLCE43A	43	47.8	52.8	1	5	69.4	21.6	100	150	10	200
MLCE45A	45	50.0	55.3	1	5	72.7	20.6	100	150	10	200
MLCE48A	48	53.3	58.9	1	5	77.4	19.4	100	150	10	200
MLCE51A	51	56.7	62.7	1	5	82.4	18.2	100	150	10	200
MLCE54A	54	60.0	66.3	1	5	87.1	17.2	100	150	10	200
MLCE58A	58	64.4	71.2	1	5	93.6	16.0	100	150	10	200
MLCE60A	60	66.7	73.7	1	5	96.8	15.5	90	150	10	200
MLCE64A	64	71.1	78.6	1	5	103	14.6	90	150	10	200
MLCE70A	70	77.8	86.0	1	5	113	13.3	90	150	10	200
MLCE75A	75	83.3	92.1	1	5	121	12.4	90	150	10	200
MLCE80A	80	88.7	98.0	1	5	129	11.6	90	150	10	200
MLCE90A	90	100	111	1	5	146	10.3	90	300	10	200
MLCE100A	100	111	123	1	5	162	9.3	90	300	10	200
MLCE110A	110	122	135	1	5	178	8.4	90	300	10	400
MLCE120A	120	133	147	1	5	193	7.8	90	300	10	400
MLCE130A	130	144	159	1	5	209	7.2	90	300	10	400
MLCE150A	150	167	185	1	5	243	6.2	90	300	10	400
MLCE160A	160	178	197	1	5	259	5.8	90	300	10	400
MLCE170A	170	189	209	1	5	275	5.4	90	300	10	400

NOTE 1: TVS are normally selected according to the reverse "standoff voltage" (V_{WM}) which should be equal to or greater than the dc or continuous peak operating voltage level.

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GRAPHS

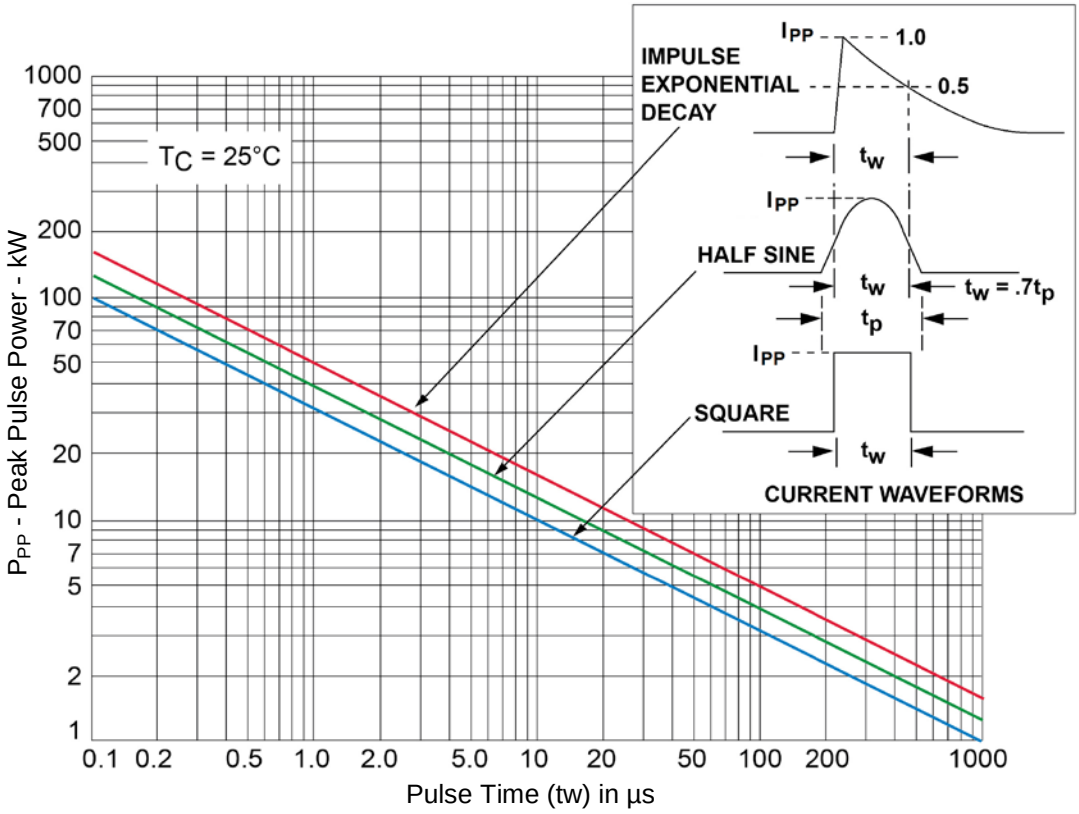

FIGURE 1
Peak Pulse Power vs Pulse Time (tw) in µs

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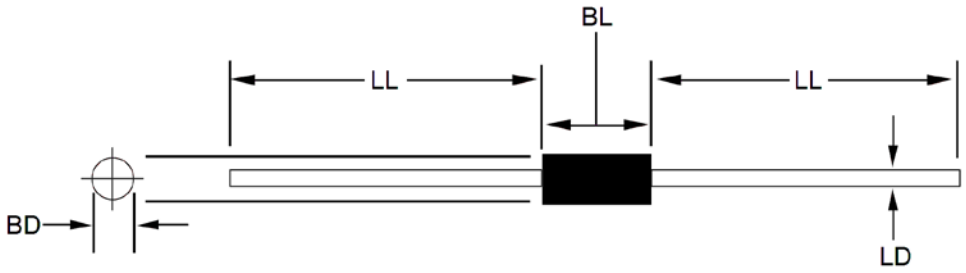
PACKAGE DIMENSIONS



NOTES:
1. Dimensions are in inches.
2. Millimeter equivalents are given for information only.
3. The major diameter is essentially constant along its length.
4. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BD	0.190	0.205	4.826	5.207
BL	0.360	0.375	9.146	9.527
LD	0.038	0.042	0.958	1.074
LL	1.10	1.625	27.9	41.28

APPLICATION SCHEMATICS

The TVS low capacitance device configuration is shown in figure 2. As a further option for unidirectional applications, an additional low capacitance rectifier diode may be used in parallel in the same polarity direction as the TVS as shown in figure 3. In applications where random high voltage transients occur, this will prevent reverse transients from damaging the internal low capacitance rectifier diode and also provide a low voltage conducting direction. The added rectifier diode should be of similar low capacitance and also have a higher reverse voltage rating than the TVS clamping voltage V_C. The Microsemi recommended rectifier part number is the “ELCR80” for the application in figure 3. If using two (2) low capacitance TVS devices in anti-parallel for bidirectional applications, this added protective feature for both directions (including the reverse of each rectifier diode) is also provided. The unidirectional and bidirectional configurations in figure 3 and 4 will both result in twice the capacitance of figure 2.

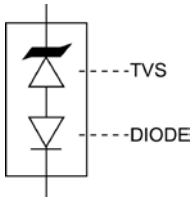


FIGURE 2
TVS with internal Low Capacitance Diode

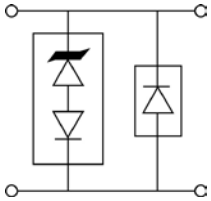


FIGURE 3
Optional Unidirectional configuration (TVS and separate rectifier diode in parallel)

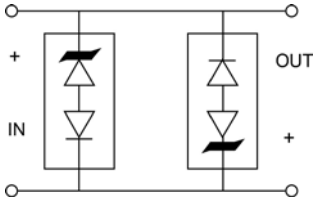


FIGURE 4
Optional Bidirectional configuration (two TVS devices in anti-parallel)

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