

Website: <http://www.microsemi.com>

## 1500 Watt Low Capacitance Transient Voltage Suppressor

- High Reliability controlled devices
- Unidirectional (A) construction
- Plastic encapsulated TVS series for Thru Hole mounting
- Selections for 6.5 to 170 V standoff voltages (V<sub>WM</sub>)

<b>DEVICES</b>	<b>MLCE6.5A thru MLCE170A, e3</b>	<b>LEVELS M, MA, MX, MXL</b>
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**FEATURES**

- High reliability controlled devices with wafer fabrication and assembly lot traceability
- 100 % surge tested devices
- Unidirectional construction. For bidirectional option see Figure 4.
- Suppresses transients up to 1500 watts @10/1000µs (see Figure 1)
- Clamps transients in less than 100 pico seconds
- Optional upscreening available by replacing the M prefix with MA, MX or MXL. These prefixes specify various screening and conformance inspection options based on MIL-PRF-19500. Refer to [MicroNote 129](#) for more details on the screening options.
- Surface mount equivalent packages also available as MSMC(G/J)LCE6.5A - MSMC(G/J)LCE170A in separate data sheet (consult factory for other surface mount options)
- Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020B
- RoHS Compliant devices available by adding "e3" suffix
- 3σ lot norm screening performed on Standby Current I<sub>b</sub>

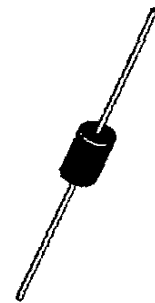
**APPLICATIONS / BENEFITS**

- Protection from switching transients and induced RF
- Low capacitance for data line protection to 1 MHz
- Protection for aircraft fast data rate lines up to Level 5 Waveform 4 and Level 2 Waveform 5A in RTCA/DO-160D (also see MicroNote 130) & ARINC 429 with bit rates of 100 kb/s (per ARINC 429, Part 1, par 2.4.1.1)
- 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 MLCE45 A
  - 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

**MAXIMUM RATINGS**

- Peak Pulse Power dissipation at 25 °C: 1500 watts at 10/1000 µs (see Figure 1) with impulse repetition rate of 0.01% or less\* at lead temperature T<sub>L</sub> of 25°C
- Operating & Storage Temperatures: -65 °C to +150 °C
- Thermal Resistance: 22 °C/W junction to lead at 3/8 inch (10 mm) from body, or 82 °C/W junction to ambient when mounted on FR4 PC board with 4 mm<sup>2</sup> copper pads (1oz), track width 1 mm, length 25mm
- Steady-State Power dissipation\*: 5 watts at T<sub>L</sub> = 40 °C, or 1.52 watts at T<sub>A</sub> = 25 °C when mounted on FR4 PC board described for thermal resistance
- Solder Temperatures: 260 °C for 10 s (maximum)

\* TVS devices are not typically used for dc power dissipation and are instead operated at ≤ V<sub>WM</sub> except for transients that briefly drive the device into avalanche breakdown (V<sub>BR</sub> to V<sub>C</sub> region) of the TVS element. Also see Figures 3 and 4 for further protection details in rated peak power for unidirectional and bidirectional configurations respectively.

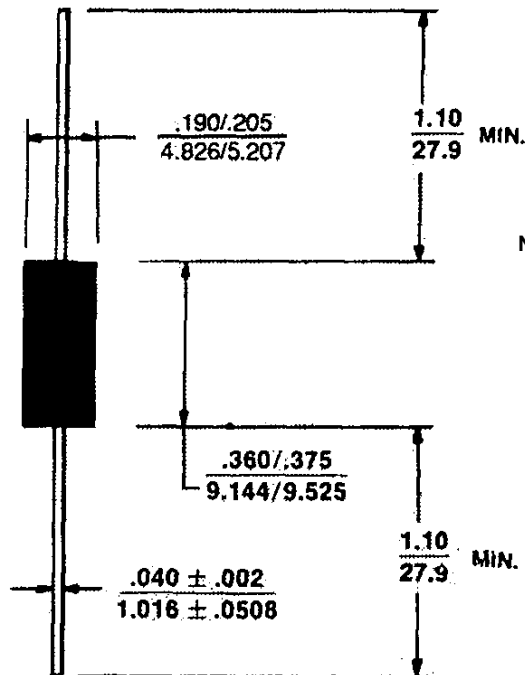


CASE 1

## MECHANICAL AND PACKAGING

- Void-free transfer molded thermosetting epoxy body meeting UL94V-0
- Tin-Lead (90 % Sn, 10 % Pb) or RoHS (100% Sn) Compliant annealed matte-Tin plating readily solderable per MIL-STD-750, method 2026
- Body marked with part number
- Cathode indicated by band. No cathode band on bi-directional devices.
- Available in Bulk or custom TAPE & REEL packaging
- TAPE & REEL standard per EIA-296 (add "TR" suffix to part number)
- Weight: 1.5 gram (approximately)

## PACKAGE DIMENSIONS



**NOTE:** Cathode indicated by band  
 All dimensions in inches  
 millimeters

## SYMBOLS & DEFINITIONS

Symbol	Definition	Symbol	Definition
$V_{WM}$	Working Peak (Standoff) Voltage	$I_{PP}$	Peak Pulse Current
$P_{PP}$	Peak Pulse Power	$V_C$	Clamping Voltage
$V_{BR}$	Breakdown Voltage	$I_{BR}$	Breakdown Current for $V_{BR}$
$I_D$	Standby Current		

## ELECTRICAL CHARACTERISTICS @ 25°C

MICROSEMI PART NUMBER	REVERSE STANDOFF VOLTAGE $V_{WM}$ (Note 1)  V	BREAKDOWN VOLTAGE $V_{BR}$ @ $I_{BR}$			MAXIMUM STANDBY CURRENT $I_D$ @ $V_{WM}$  $\mu A$	MAXIMUM CLAMPING VOLTAGE $V_C$ @ $I_{PP}$  V	MAXIMUM PEAK PULSE CURRENT $I_{PP}$  A	MAXIMUM CAPACITANCE @ 0 V $f = 1$ MHz  pF	WORKING INVERSE BLOCKING VOLTAGE $V_{WIB}$  V	INVERSE BLOCKING LEAKAGE CURRENT $I_{IB}$ @ $V_{WIB}$  $\mu A$	PEAK INVERSE BLOCKING VOLTAGE $V_{PIB}$  V
		$V_{MIN}$	$V_{MAX}$	mA							
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	9.21	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	45.4	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	103.0	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" ( $V_{WM}$ ) that should be equal to or greater than the dc or continuous peak operating voltage level

## GRAPHS

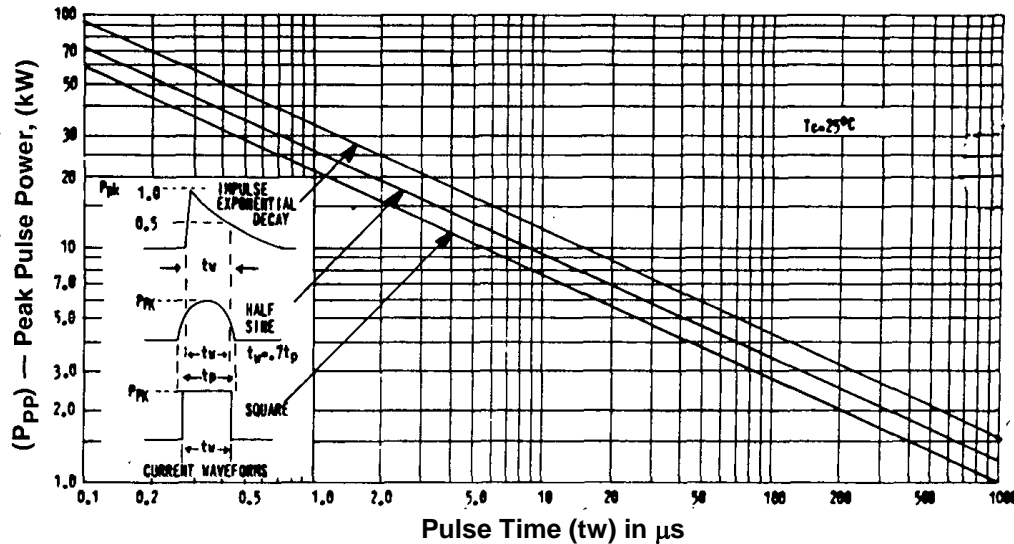


FIGURE 1 - Peak Pulse Power vs. Pulse Time ( $t_w$ ) in  $\mu s$

## SCHEMATIC APPLICATIONS

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 5. 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.

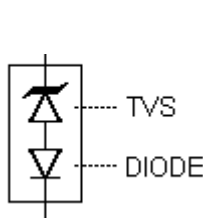


FIGURE 2  
TVS with internal Low Capacitance Diode

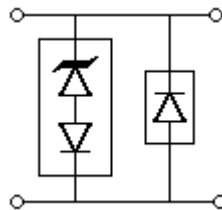


FIGURE 3  
Optional Unidirectional configuration (TVS and separate rectifier diode) in parallel.

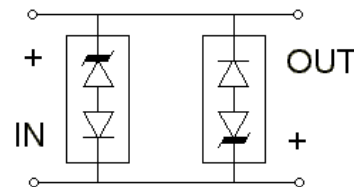


FIGURE 4  
Optional Bidirectional configuration (two TVS devices in anti-parallel)