

1500 Watt Low Profile Surface Mount Transient Voltage Suppressor

M3UPT(B)5.0 – M3UPT(B)170e3



Product Overview

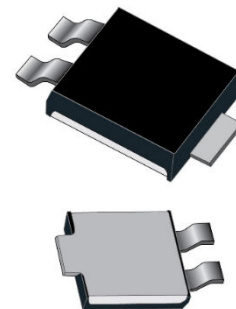
The M3UPT(B) series of low profile, surface mount 1500 watt transient voltage suppressors are provided with design features that offer power-handling capabilities often only found in larger packages. Powermite® 3 Package features include a full metallic bottom that eliminates the possibility of solder-flux entrapment during assembly as well as unique locking tabs that act as an integral heat sink. With its very short terminations, parasitic inductance is minimized to reduce voltage overshoots during fast-rise-time transients. These high-reliability devices are available in either unidirectional or bidirectional versions. RoHS compliant versions are available. These are available with a variety of upsampling options for enhanced reliability. They can protect against the secondary effects of lightning per IEC61000-4-5 and against voltage pulses from inductive switching environments and induced by RF radiation. Since their response time is virtually instantaneous, they can also be used in protection from ESD and EFT per IEC61000-4-2 and IEC61000-4-4.

Note: For the latest information, visit our website <http://www.microchip.com>.

Features

- Available in both unidirectional and bidirectional configurations.
- 3 σ lot norm screening performed on standby current I_D for all M prefix devices
- 100% surge tested devices
- Suppresses transients up to 1,500 W @ 10/1000 μ s (see [Figure 4-1](#)).
- Very low-profile surface mount package (1.1mm).
- Enhanced reliability screening in reference to MIL-PRF-19500 is available. Refer to [High Reliability Non-Hermetic Product Portfolio](#) for more details on the screening options (see [Part Nomenclature](#) for all options).
- High reliability controlled devices have wafer fabrication and assembly lot traceability for all M prefix devices.
- Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020F for all M prefix devices.
- RoHS compliant (2002/95/EC) devices available.
- Halogen free (IEC 61249-2-21)

Figure 1. Powermite® 3 Package



Also available in:

- DO-214AB or DO-215AB Package (surface mount) [MSMC\(G/J\)5.0A – MXLSMC\(G/J\)170CA](#)
- Case 1 (Axial) [M1.5KE6.8A – MXL1.5KE400CA](#)
- Commercial grade (DO-214AB or DO-215AB) [SMCG\(J\)5.0A – SMCG\(J\)170CAe3](#)

Applications/Benefits

- Protection from switching transients and induced RFI.
- Integrated heat sink/locking tabs
- Protects sensitive components such as IC's, CMOS, Bipolar, BiCMOS, ECL, DTL, T2L, etc.
- Fully metallic bottom side eliminates flux entrapment.
- 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: M3UPT(B) 5.0 to MXL3UPT(B) 170
 - Class 2: M3UPT(B) 5.0 to MXL3UPT(B) 150
 - Class 3: M3UPT(B) 5.0 to MXL3UPT(B) 75
 - Class 4: M3UPT(B) 5.0 to MXL3UPT(B) 36
- Secondary lightning protection per IEC 61000-4-5 with 12 ohms source impedance:
 - Class 1: M3UPT(B) 5.0 to MXL3UPT(B) 90
 - Class 2: M3UPT(B) 5.0 to MXL3UPT(B) 45
 - Class 3: M3UPT(B) 5.0 to MXL3UPT(B) 24
 - Class 4: M3UPT(B) 5.0 to MXL3UPT(B) 11
- Secondary lightning protection per IEC 61000-4-5 with 2 ohms source impedance:
 - Class 2: M3UPT(B) 5.0 to MXL3UPT(B) 22
 - Class 3: M3UPT(B) 5.0 to MXL3UPT(B) 10

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1. Maximum Ratings

Table 1-1. Maximum Ratings

Parameters/Test Conditions	Symbol	Value	Unit
Junction and Storage Temperature	T_J and T_{STG}	-55 to +150	°C
Thermal Resistance Junction-to-Ambient ⁽¹⁾	$R_{\theta JA}$	65	°C/W
Thermal Resistance Junction-to-Case	$R_{\theta JC}$	4.22	°C/W
Impulse Repetition Rate (duty factor)	—	0.01	%
Peak Pulse Power @ 10/1000 μ s ⁽²⁾	P_{pp}	1500	W
$t_{clamping}$ (0 volts to $V_{(BR)}$ min)	Unidirectional	$t_{clamping}$	<100
	Bidirectional		<5
Forward Clamping Voltage @ 100 Amps ⁽³⁾	V_{FS}	3.5	V
Forward Surge Current ⁽³⁾	I_{FSM}	200	A
Solder Temperature @ 10 s	T_{SP}	260	°C
Average Power dissipation ⁽⁵⁾	$T_C = +30$ °C	$P_{M(AV)}$	28.44 ⁽¹⁾
	$T_A = +25$ °C		1.92 ⁽⁴⁾
			W

Notes:

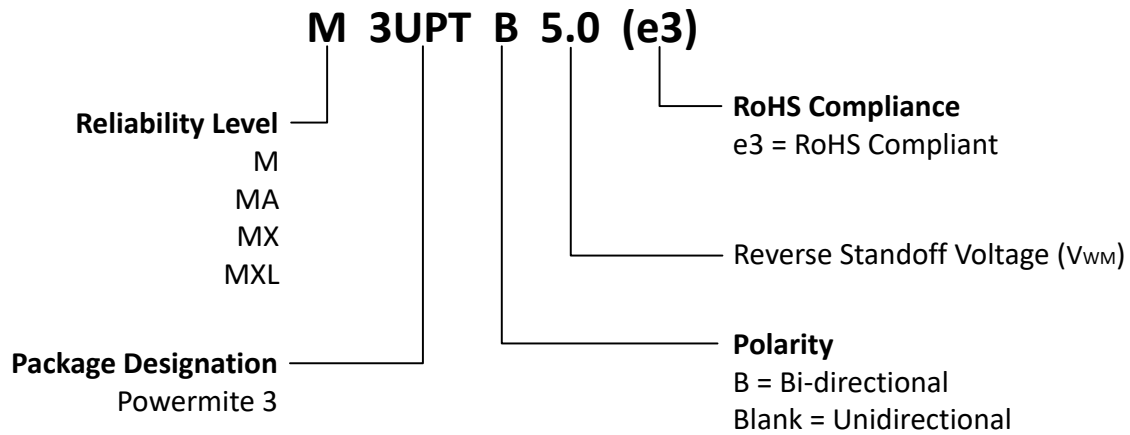
- When mounted on FR4 PC board (1 oz Cu) with recommended mounting pad (see [Pad Layout](#)).
- See [Figure 4-1](#) and [Figure 4-2](#). With impulse repetition rate (duty factor) of 0.05% or less.
- At 8.3 ms half-sine wave (unidirectional devices only).
- Case temperature controlled on heat sink as specified.
- See [MicroNote 134](#) for derating P_{PP} when also applying steady-state power.

1.1. Mechanical Packaging

- Case: Void-free transfer molded thermosetting epoxy compound meeting UL94V-0
- Terminals: Tin-lead or RoHS compliant annealed matte-tin plating. Solderable per MIL-STD-750, method 2026.
- Marking:
 - First letter is screening level where “M” depicts M, “A” depicts MA, “X” depicts MX, “L” depicts MXL.
 - Anode to TABS 1 and 2: “T” plus the V_{WM} of part number in two digit form underlined, e.g. M3UPT5.0 is M3T05, MA3UPT12 is A3T12
 - Bidirectional: “B” plus the V_{WM} of part number in two digit form underlined, e.g. M3UPTB8 is M3B08, M3UPTB12 is M3B12, etc.
 - RoHS Complaint: Parts will be marked with the suffix “-” which corresponds to “e3”. e.g. M3UPT5.0e3 is M3T05-
- Polarity: Cathode designated by heatsink / Tab 3 (see [Schematic](#))
- Tape and Reel option: 16 mm tape per standard EIA-481-B. Consult factory for quantities.
- Weight: Approximately 0.072 gram.

Note: See [Package Dimensions](#).

2. Part Nomenclature



Note: See [Hi-Rel Non-Hermetic Product Portfolio](#) and the [Electrical Characteristics](#) table.

2.1. Symbols and Definitions

Table 2-1. Symbols and Definitions

Symbol	Definition
V_{WM}	Working Stand-off Voltage: The maximum-rated value of dc or repetitive peak positive cathode-to-anode voltage that may be continuously applied over the standard operating temperature.
I_D	Standby Current: The current at the rated standoff voltage V_{WM} .
$V_{(BR)}$	Breakdown Voltage: The voltage across the device at a specified current $I_{(BR)}$ in the breakdown region.
$I_{(BR)}$	Breakdown Current: The current used for measuring breakdown voltage $V_{(BR)}$.
$\alpha_{V(BR)}$	Temperature Coefficient of Breakdown Voltage: The change in breakdown voltage divided by the change in temperature that caused it expressed in %/°C or mV/°C.
P_{PP}	Peak Pulse Power: The peak power that can be applied for a specific pulse width and waveform. The product of V_C and I_{PP} .
V_C	Clamping Voltage: The voltage across the device in a region of low differential resistance during the application of an impulse current (I_{PP}) for a specified waveform.
I_{PP}	Peak Impulse Current: The maximum rated random recurring peak impulse current or nonrepetitive peak impulse current that may be applied to a device. A random recurring or nonrepetitive transient current is usually due to an external cause, and it is assumed that its effect will have completely disappeared before the next transient arrives.
C_T	Total Capacitance: The total small signal capacitance between the diode terminals of a complete device.

3. Electrical Characteristics

Table 3-1. Electrical Characteristics

Part Number	Working Stand-Off Voltage (1)	Maximum Standby Current (2)	Breakdown Voltage			Maximum Clamping Voltage (3)	Peak Impulse Current @ 10/1000 μs (4)	Maximum Temperature Coefficient Of V _{BR}
			V _(BR) @ I _(BR)		I _(BR)			
			V _{WM}	I _D @ V _{WM}				
	[V]	[μA]	Min.	Max.	[mA]	[V]	[A]	%/°C
M3UPT(B)5.0	5.00	1000	6.40	7.00	10.0	9.20	163.00	0.057
M3UPT(B)6.5	6.50	500	7.22	7.98	10.0	11.2	133.90	0.061
M3UPT(B)7.0	7.00	200	7.78	8.60	10.0	12.0	125.00	0.065
M3UPT(B)7.5	7.50	100	8.33	9.21	1.00	12.9	116.30	0.067
M3UPT(B)8.5	8.50	20.0	9.44	10.40	1.00	14.4	104.20	0.073
M3UPT(B)9.0	9.00	10.0	10.0	11.1	1.00	15.4	97.40	0.076
M3UPT(B)10	10.0	5.00	11.1	12.3	1.00	17.0	88.20	0.078
M3UPT(B)11	11.0	5.00	12.2	13.5	1.00	18.2	82.40	0.081
M3UPT(B)12	12.0	5.00	13.3	14.7	1.00	19.9	75.30	0.082
M3UPT(B)14	14.0	1.00	15.6	17.2	1.00	23.2	64.70	0.086
M3UPT(B)15	15.0	1.00	16.7	18.5	1.00	24.4	61.50	0.087
M3UPT(B)16	16.0	1.00	17.8	19.7	1.00	26.0	57.70	0.088
M3UPT(B)18	18.0	1.00	20.0	22.1	1.00	29.2	51.40	0.092
M3UPT(B)20	20.0	1.00	22.2	24.5	1.00	32.4	46.30	0.093
M3UPT(B)24	24.0	1.00	26.7	29.5	1.00	38.9	38.60	0.096
M3UPT(B)26	26.0	1.00	28.9	31.9	1.00	42.1	35.60	0.097
M3UPT(B)28	28.0	1.00	31.1	34.4	1.00	45.4	33.00	0.098
M3UPT(B)30	30.0	1.00	33.3	36.8	1.00	48.4	31.00	0.099
M3UPT(B)33	33.0	1.00	36.7	40.6	1.00	53.3	28.10	0.100
M3UPT(B)36	36.0	1.00	40.0	44.2	1.00	58.1	25.80	0.101
M3UPT(B)40	40.0	1.00	44.4	49.1	1.00	64.5	23.20	0.101
M3UPT(B)43	43.0	1.00	47.8	52.8	1.00	69.4	21.60	0.102
M3UPT(B)48	48.0	1.00	53.3	58.9	1.00	77.4	19.40	0.103
M3UPT(B)54	54.0	1.00	60.0	66.3	1.00	87.1	17.20	0.104
M3UPT(B)58	58.0	1.00	64.4	71.2	1.00	93.6	16.00	0.104
M3UPT(B)64	64.0	1.00	71.1	78.6	1.00	103	14.60	0.105
M3UPT(B)70	70.0	1.00	77.8	86.0	1.00	113	13.30	0.105
M3UPT(B)78	78.0	1.00	86.7	95.8	1.00	126	11.40	0.106
M3UPT(B)85	85.0	1.00	94.4	104.0	1.00	137	10.40	0.106
M3UPT(B)100	100	1.00	111	123	1.00	162	9.30	0.107
M3UPT(B)110	110	1.00	122	135	1.00	177	8.40	0.107
M3UPT(B)130	130	1.00	144	159	1.00	209	7.20	0.108
M3UPT(B)150	150	1.00	167	185	1.00	243	6.20	0.108
M3UPT(B)170	170	1.00	189	209	1.00	275	5.50	0.108

Notes:

1. Normal selection criteria for TVS devices is by working standoff voltage (V_{WM}) and should be equal or greater than DC or continuous peak operating voltage.
2. For bidirectional types having V_{WM} of 10 volts and under, the I_D leakage current is doubled. Also, for bidirectional parts, the capacitance will be half that shown in Figure 4-2 for zero bias.
3. TVS devices are tested to maximum peak pulse current (I_{PP}) with clamping voltage monitored. This surge capability is one of the most significant electrical characteristics of the device and should be considered as part of customer quality inspections.
4. For 10/1000 μ s pulse, see [Figure 4-2](#).

4. Key Parameter Graphs and Waveforms

Figure 4-1. Peak Pulse Power vs. Pulse Time (to 50% of exponentially decaying pulse)

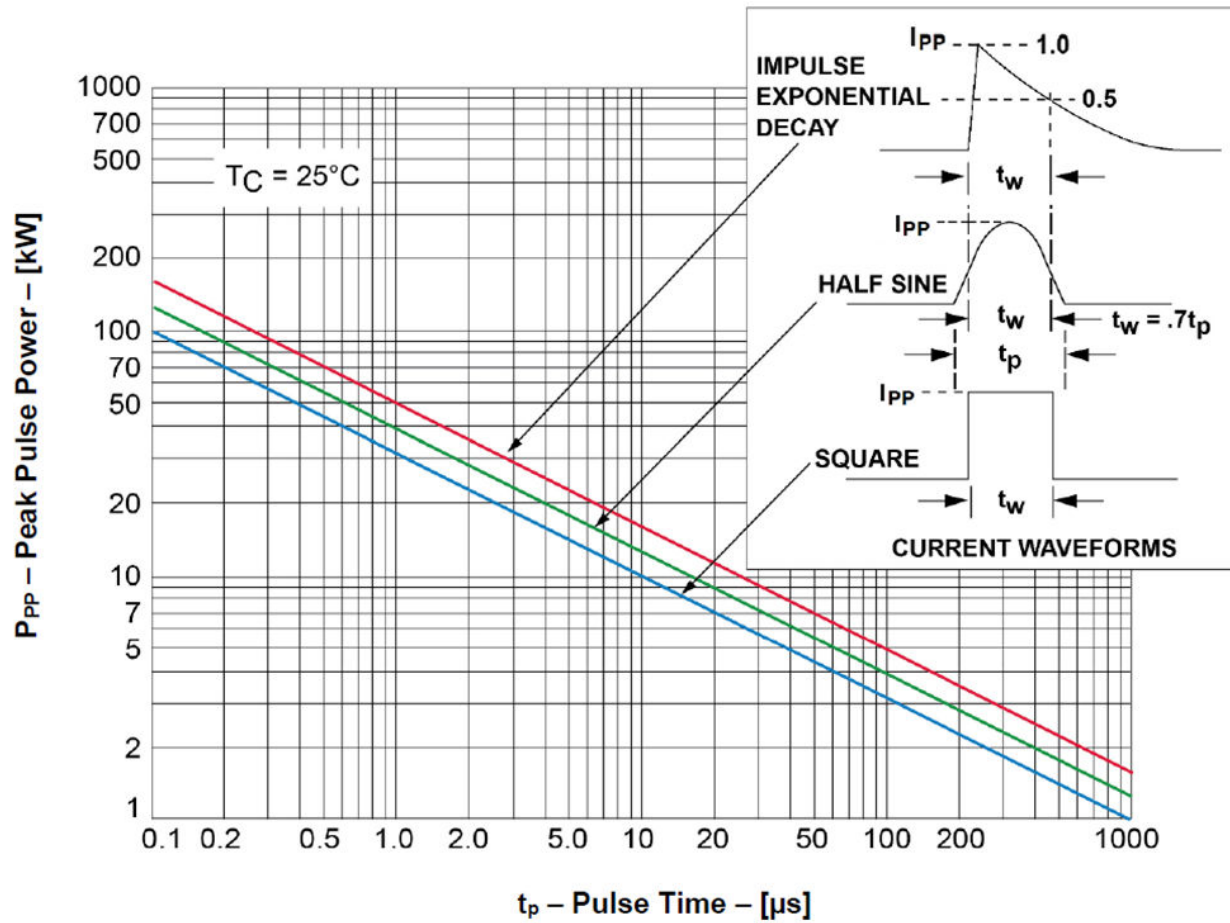


Figure 4-2. Pulse Waveform

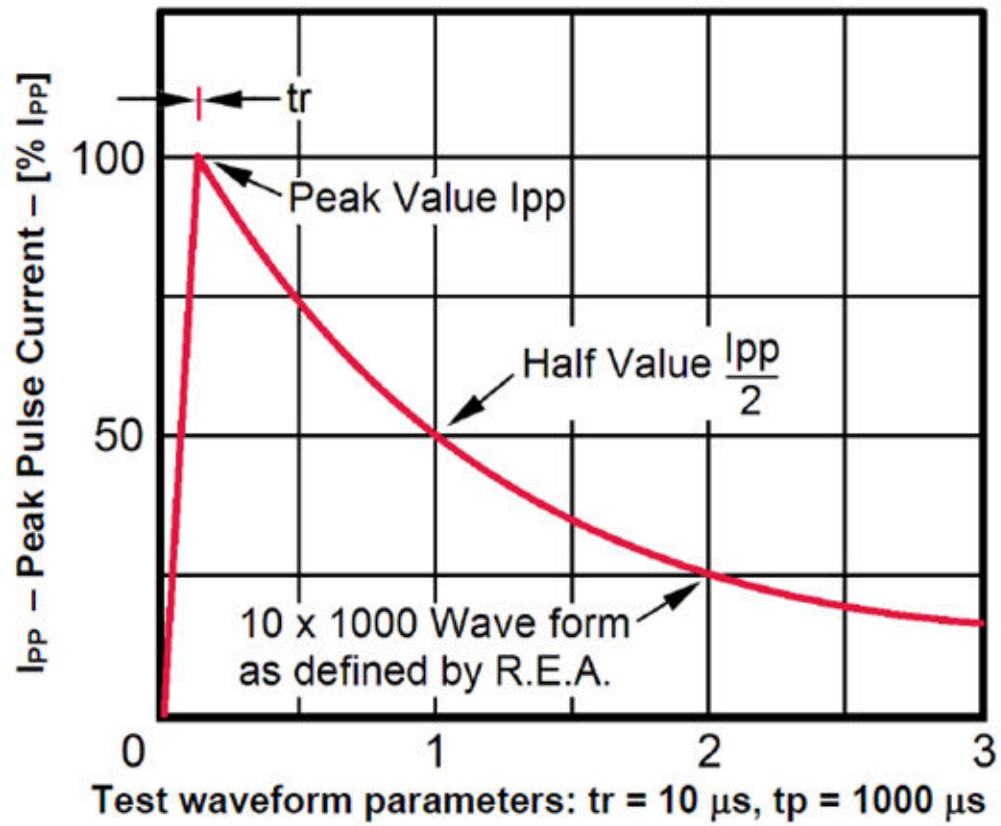


Figure 4-3. Derating Curve

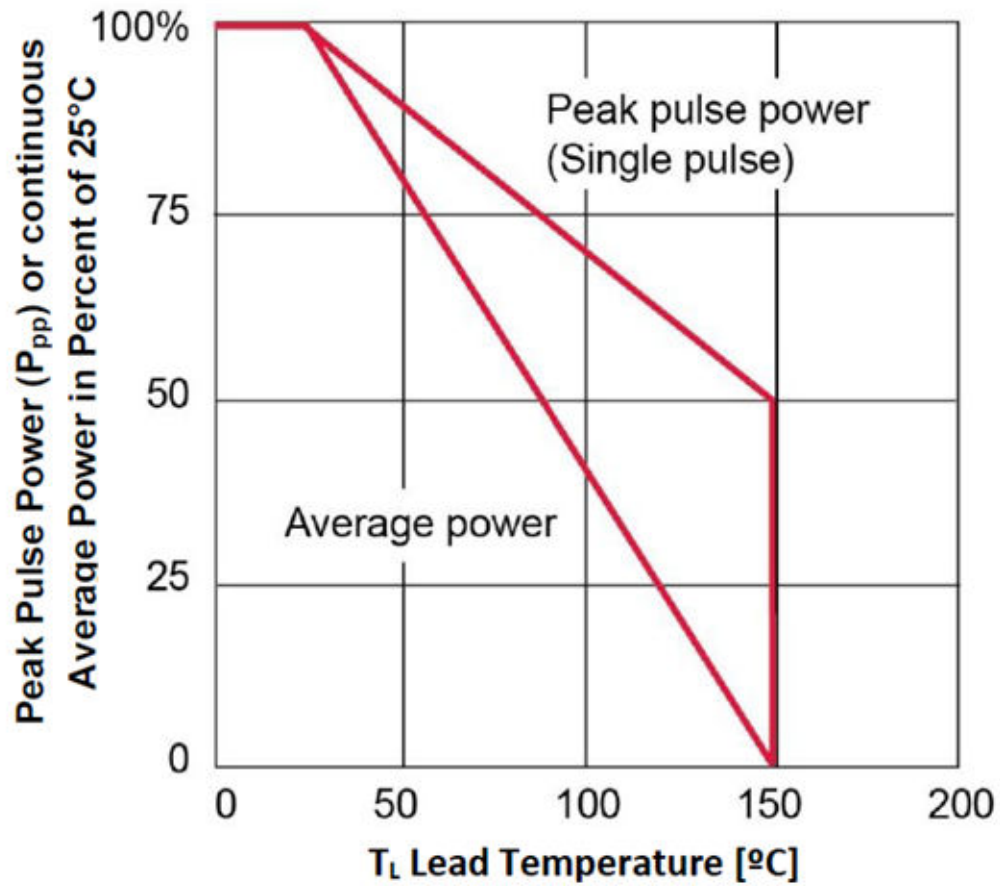
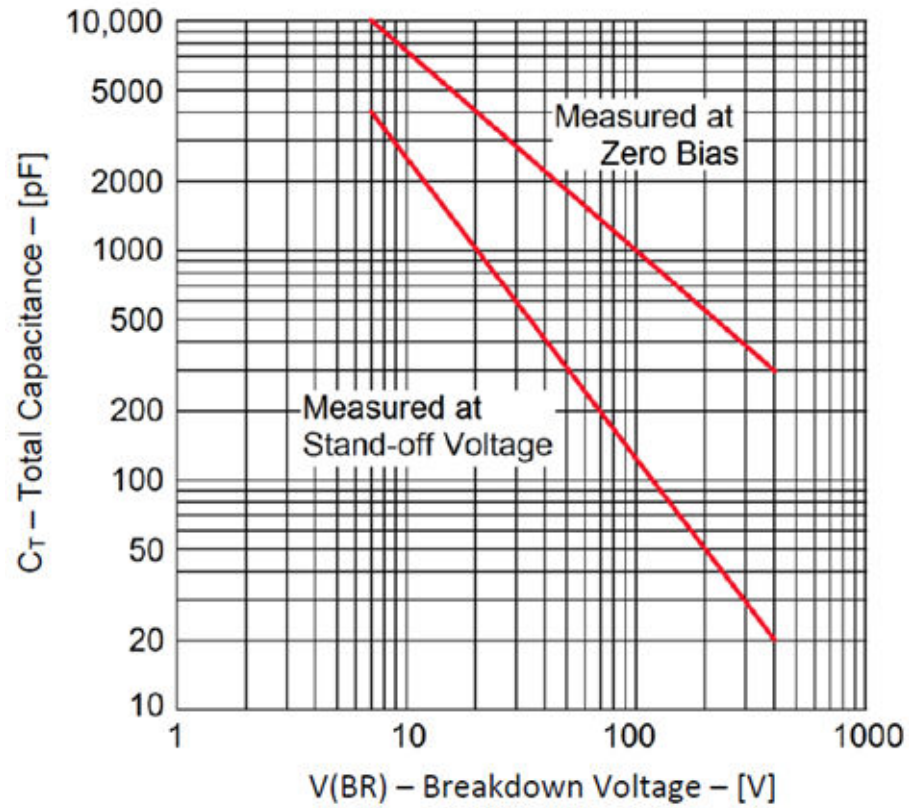


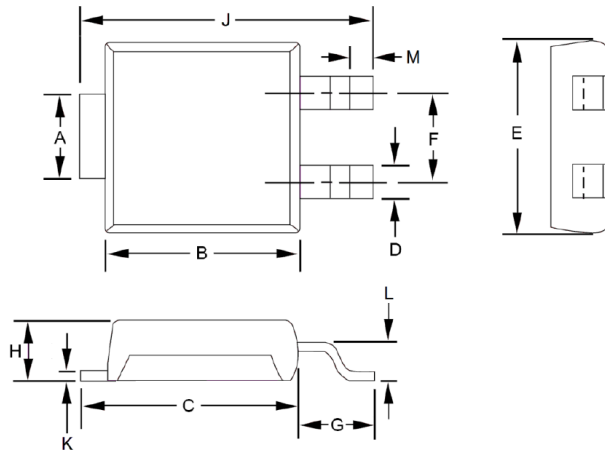
Figure 4-4. Typical Capacitance vs. Breakdown Voltage ($f = 1\text{MHz}$ @ 0V) (Unidirectional Configuration)



Note: Bidirectional capacitance is half of that shown.

5. Package Dimensions

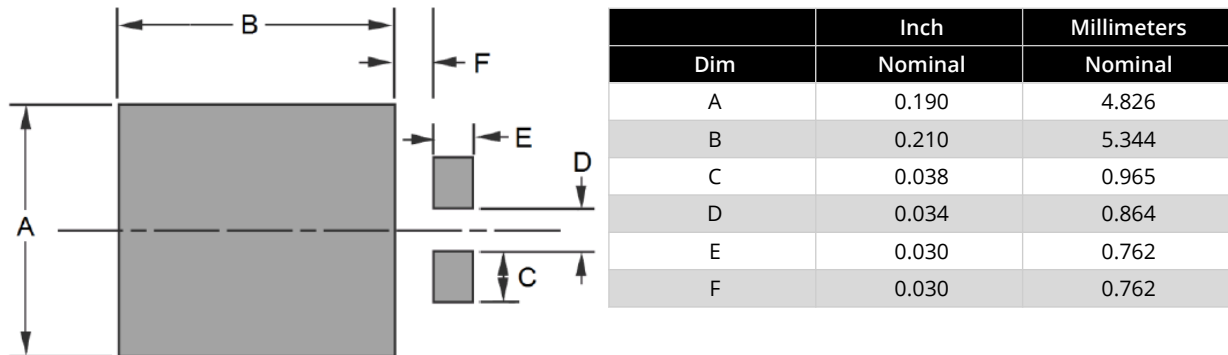
Figure 5-1. Package Dimensions



Dim	Inch		Millimeters	
	Min	Max	Min	Max
A	0.068	0.072	1.73	1.83
B	0.172	0.174	4.37	4.43
C	0.197	0.204	5.01	5.17
D	0.035 NOM		0.889 NOM	
E	0.159	0.161	4.03	4.09
F	0.072 NOM		1.83 NOM	
G	0.056 NOM		1.422 NOM	
H	0.043	0.045	1.10	1.14
J	0.252	0.260	6.40	6.61
K	0.007 NOM		0.178 NOM	
L	0.028	0.030	0.71	0.77
M	0.014	0.018	0.36	0.46

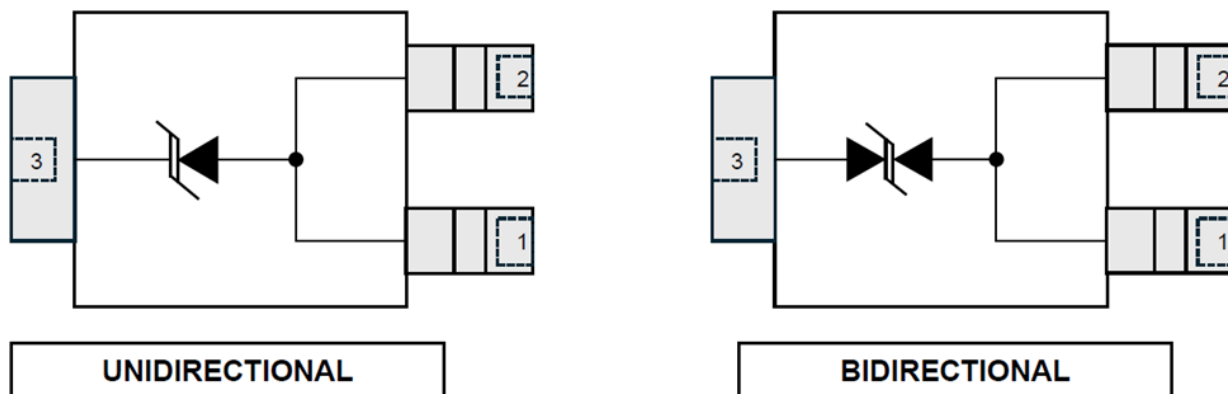
6. Pad Layout

Figure 6-1. Pad Layout



7. Schematic

Figure 7-1. Schematic



8. Revision History

Revision Level	Date	Description
A	5/2026	Initial version created in the Microchip template. Legacy document number is RF01369.

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