

Surface Mount 30,000 Watt Transient Voltage Suppressor

MPLAD30KP14A – MXLPLAD30KP400CA(e3)



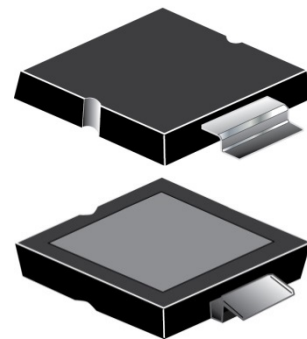
Product Overview

These 30 kW rated transient voltage suppressors (TVS) in a surface mount PLAD package are provided with design features to minimize thermal resistance and cumulative heating. These devices have the ability to clamp dangerous high voltage, short term transients such as those produced by electrostatic discharge, radiated RFI, inductive load dumps, and the secondary effects of lightning strikes before they reach sensitive component regions of a circuit. Typical applications include lightning and automotive load dump protection. They are particularly effective at meeting the multi-stroke lightning standard RTCA DO-160, section 22 for aircraft design. The all-metal bottom of this space-efficient, low profile package provides a very low thermal impedance path for heat to escape to the mounting substrate, keeping the junction temperature low. The PLAD30KP is offered with standoff voltages (V_{WM}) from 14 to 400 volts in either unidirectional or bidirectional versions. For more information on PLAD packaged products and our broad range of TVS solutions, please see the Microchip website.

Features

- Available in both unidirectional and bidirectional construction (bidirectional with CA suffix)
- 3σ lot norm screening performed on standby current (I_D) for all M prefix devices
- High reliability with wafer fabrication and assembly lot traceability for all M prefix devices
- 100% surge tested devices
- Suppresses transients up to 30,000W at 10/1000 μ s (see [Figure 4-1](#))
- Enhanced reliability screening in reference to MIL-PRF-19500 are available. Refer to [Hi-Rel Non-Hermetic Product Portfolio](#) for more details on the screening options.
- Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020F
- RoHS compliant versions are available

Figure 1. PLAD



(The cathode is the metal base under the body of this device.)

Also available:

PLAD15KP

(15,000 watts)

[MPLAD15KP7.0A](#) thru [MPLAD15KP200CA](#)

Applications/Benefits

- Available in working standoff voltage (V_{WM}) range 14 to 400 volts
- Protection from switching transients and induced RFI
- 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, 2, 3, 4, 5: MPLAD30KP14A to MXLPLAD30KP400CA
Class 5: MPLAD30KP14A to MXLPLAD30KP400CA (short distance)
Class 5: MPLAD30KP14A to MXLPLAD30KP220CA (long distance)
- Secondary lightning protection per IEC 61000-4-5 with 12 ohms source impedance:
Class 1, 2, 3: MPLAD30KP14A to MXLPLAD30KP400CA
Class 4: MPLAD30KP14A to MXLPLAD30KP220CA
- Secondary lightning protection per IEC 61000-4-5 with 2 ohms source impedance:
Class 2: MPLAD30KP14A to MXLPLAD30KP400CA
Class 3: MPLAD30KP14A to MXLPLAD30KP220CA
Class 4: MPLAD30KP14A to MXLPLAD30KP110CA
- Pin injection protection per RTCA/DO-160F for Waveform 4 (6.4/69 μ s at 25 °C)¹:
Level 4: MPLAD30KP14A to MXLPLAD30KP400CA
Level 5: MPLAD30KP14A to MXLPLAD30KP260CA
- Pin injection protection per RTCA/DO-160F for Waveform 5A (40/120 μ s at 25 °C)¹:
Level 4: MPLAD30KP14A to MXLPLAD30KP64CA
Level 5: MPLAD30KP14A to MXLPLAD30KP26CA

Note:

1. See [MicroNote 132](#) for further temperature derating selection.

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1. Maximum Ratings

Table 1-1. Maximum Ratings at 25 °C Unless Otherwise Noted

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	$R_{\theta JA}$	50	°C/W
Thermal resistance junction-to-case	$R_{\theta JC}$	1.0	°C/W
Peak pulse power ²	P_{PP}	30,000	W
$t_{clamping}$ (0 volts to $V_{(BR)}$ min)	Unidirectional	<100	ps
	Bidirectional	<5	ns
Forward surge current ³	I_{FSM}	1,500	A
Solder temperature at 10 seconds	T_{SP}	260	°C
Average power dissipation ⁵	$T_A = 25\text{ °C}$	2.5 ¹	W
	$T_C = 100\text{ °C}$	50 ⁴	W

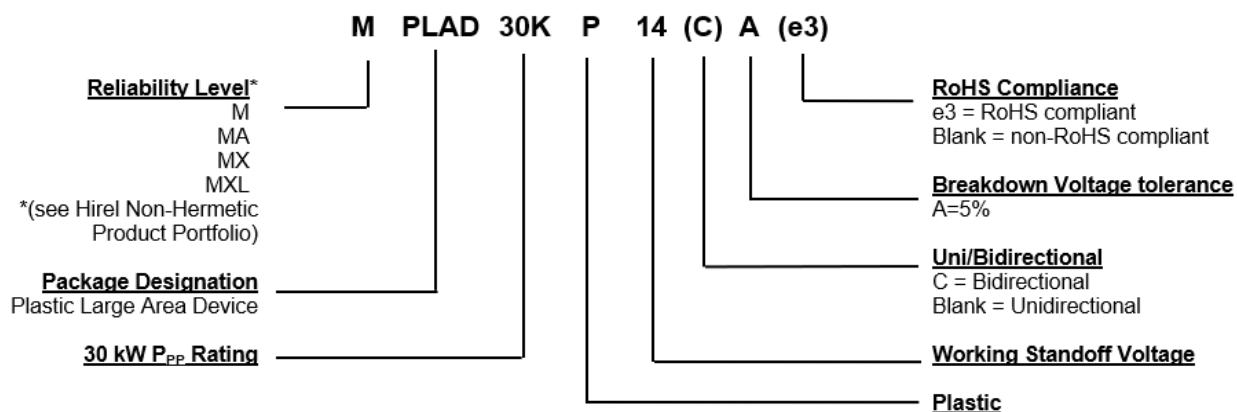
1. When mounted on FR4 PC board (1 oz Cu) with recommended mounting pad (see [Pad Layout](#)).
2. Also see [Figure 4-1](#) and [Figure 4-2](#). At 10/1000 μ s with impulse repetition rate (duty factor) of 0.05% or less.
3. At 8.3 ms half-sine wave (unidirectional devices only).
4. Case temperature controlled on heat sink as specified.
5. See [MicroNote 134](#) for derating P_{PP} when also applying steady-state power.

1.1 Mechanical Packaging

- Case: Void-free transfer molded thermosetting epoxy body meeting UL94V-0
- Terminals: Tin-lead or RoHS compliant annealed matte-tin plating readily solderable per MIL-STD-750, method 2026
- Marking: Reliability level, part number, date code
- Polarity: Unidirectional devices include polarity symbol, the cathode is on the metal backside (package bottom)
- Available in bulk or custom tape-and-reel packaging
- Tape-and-reel: Standard per EIA-481-B (add "TR" suffix to part number). Consult factory for quantities.
- Weight: Approximately 1.7 – 2.0 grams
- See [Package Dimensions](#)

2. Part Nomenclature

Figure 2-1. Part Nomenclature



2.1 Symbols and Definitions

Table 2-1. Symbols and Definitions

Symbol	Definition
$\alpha_{V(BR)}$	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.
C_T	Total capacitance: The total small signal capacitance between the diode terminals of a complete device.
$I_{(BR)}$	Breakdown current: The current used for measuring breakdown voltage $V_{(BR)}$.
I_D	Standby current: The current through the device at working standoff voltage.
I_{FSM}	Surge peak forward current: The forward current including all nonrepetitive transient currents but excluding all repetitive transients (ref JESD282-B).
I_{PP}	Peak impulse current: The peak current during an impulse.
P_{PP}	Peak pulse power: The peak power that can be applied for a specific pulse width and waveform. The product of I_{PP} and V_C .
$V_{(BR)}$	Breakdown voltage: The voltage across the device at a specified current $I_{(BR)}$ in the breakdown region.
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.
V_{WM}	Working standoff 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.

3. Electrical Characteristics

Table 3-1. Electrical Characteristics at 25 °C Unless Otherwise Stated

Part Number	Working Standoff Voltage V_{WM} (Note 1)	Breakdown Voltage $V_{(BR)}$ at $I_{(BR)}$		Maximum Clamping Voltage V_C at I_{PP}	Maximum Standby Current I_D at V_{WM}	Maximum Peak Pulse Current I_{PP} (Figure 4-3)	Maximum Temperature Coefficient $\alpha_{V(BR)}$
	Volts	Volts	mA	Volts	μA	A	mV/°C
MPLAD30KP14(C)A	14	15.6 – 17.2	150	24.0	3000	1251 ⁵	10
MPLAD30KP15(C)A	15	16.7 – 18.5	5	25.8	750	1164 ⁵	12
MPLAD30KP16(C)A	16	17.8 – 19.7	5	27.2	450	1101 ⁵	12
MPLAD30KP17(C)A	17	18.9 – 20.9	5	28.8	150	1041 ⁵	14
MPLAD30KP18(C)A	18	20.0 – 22.1	5	30.8	60	975	16
MPLAD30KP20(C)A	20	22.2 – 24.5	5	34.0	45	882	18
MPLAD30KP22(C)A	22	24.4 – 26.9	5	36.4	20	822	20
MPLAD30KP24(C)A	24	26.7 – 29.5	5	39.8	10	753	22
MPLAD30KP26(C)A	26	28.9 – 31.9	5	43.0	10	696	24
MPLAD30KP28(C)A	28	31.1 – 34.4	5	46.4	10	645	26
MPLAD30KP30(C)A	30	33.3 – 36.8	5	48.8	10	618	30
MPLAD30KP33(C)A	33	36.7 – 40.6	5	53.3	10	564	35
MPLAD30KP36(C)A	36	40.0 – 44.2	5	58.1	10	516	38
MPLAD30KP40(C)A	40	44.4 – 49.1	5	64.5	10	468	44
MPLAD30KP43(C)A	43	47.8 – 52.8	5	69.4	10	432	50
MPLAD30KP45(C)A	45	50.0 – 55.3	5	72.7	10	414	51
MPLAD30KP48(C)A	48	53.3 – 58.9	5	77.4	10	390	54
MPLAD30KP51(C)A	51	56.7 – 62.7	5	82.4	10	366	58
MPLAD30KP54(C)A	54	60.0 – 66.3	5	87.1	10	342	64
MPLAD30KP58(C)A	58	64.4 – 71.2	5	93.6	10	318	70
MPLAD30KP60(C)A	60	66.7 – 73.7	5	96.8	10	312	72
MPLAD30KP64(C)A	64	71.1 – 78.6	5	103.0	10	294	75
MPLAD30KP70(C)A	70	77.8 – 86.0	5	113	10	264	84
MPLAD30KP75(C)A	75	83.3 – 92.1	5	121	10	246	90
MPLAD30KP78(C)A	78	86.7 – 95.8	5	126	10	240	95
MPLAD30KP85(C)A	85	94.4 – 104.0	5	137	10	216	104
MPLAD30KP90(C)A	90	100 – 111	5	146	10	204	109
MPLAD30KP100(C)A	100	111 – 123	5	162	10	186	122
MPLAD30KP110(C)A	110	122 – 135	5	177	10	168	132
MPLAD30KP120(C)A	120	133 – 147	5	193	10	156	145
MPLAD30KP130(C)A	130	144 – 159	5	209	10	142	157
MPLAD30KP150(C)A	150	167 – 185	5	243	10	124	183
MPLAD30KP160(C)A	160	178 – 197	5	259	10	116	195
MPLAD30KP170(C)A	170	189 – 209	5	275	10	110	207

.....continued

Part Number	Working Standoff Voltage V_{WM} (Note 1)	Breakdown Voltage $V_{(BR)}$ at $I_{(BR)}$		Maximum Clamping Voltage V_C at I_{PP}	Maximum Standby Current I_D at V_{WM}	Maximum Peak Pulse Current I_{PP} (Figure 4-3)	Maximum Temperature Coefficient $\alpha_{V(BR)}$
	Volts	Volts	mA	Volts	μA	A	mV/°C
MPLAD30KP180(C)A	180	200 – 221	5	291	10	104	219
MPLAD30KP200(C)A	200	222 – 245	5	322	10	94	243
MPLAD30KP220(C)A	220	245 – 271	5	356	10	84	269
MPLAD30KP260(C)A	260	289 – 320	5	419	10	71	318
MPLAD30KP280(C)A	280	311 – 345	5	451	10	66	344
MPLAD30KP300(C)A	300	333 – 369	5	483	10	62	368
MPLAD30KP350(C)A	350	389 – 431	5	564	10	53	430
MPLAD30KP400(C)A	400	444 – 492	5	644	10	46	490

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. 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.
3. For bidirectional parts, the capacitance will be half that shown in [Figure 4-2](#) for zero bias.
4. For unidirectional parts, the forward voltage (V_F) is 4.0 volts maximum at 500 Amps peak for 8.3 ms half-sine wave.
5. Surge testing is performed to 1000 Amps due to equipment limitations.

4. Graphs

Figure 4-1. Peak Pulse Power Vs. Pulse Time

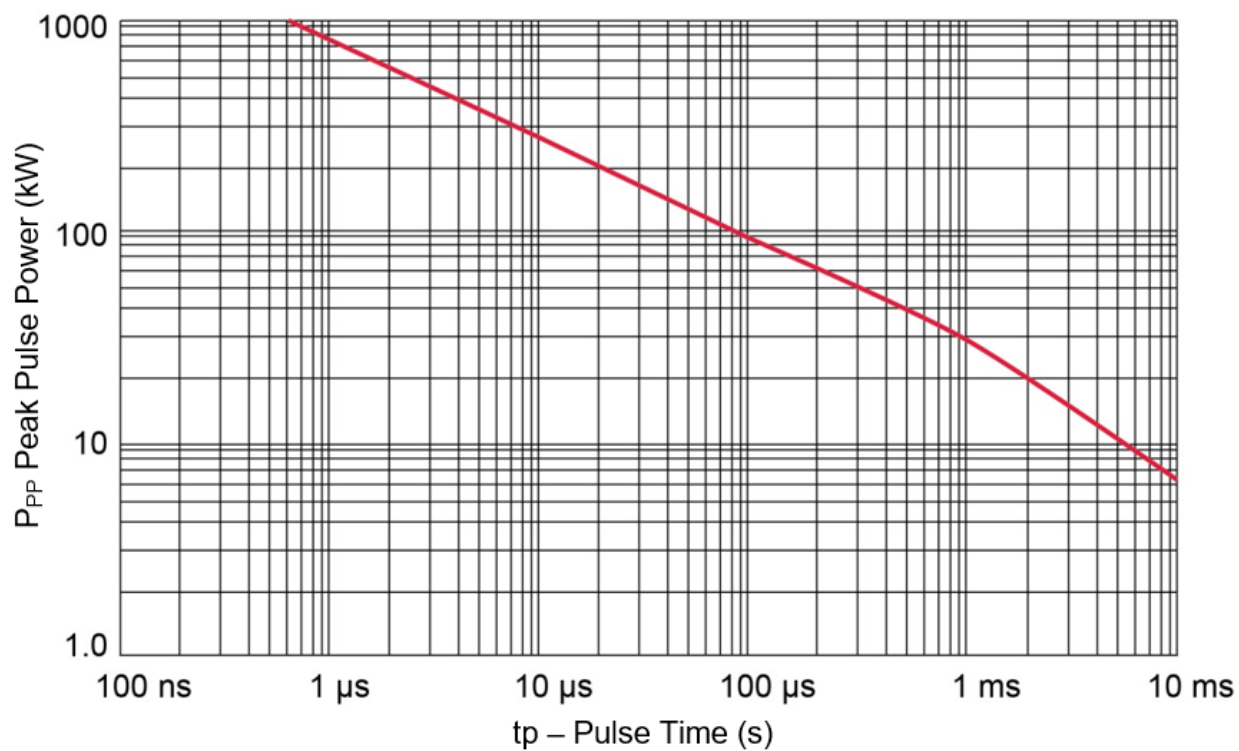


Figure 4-2. Pulse Waveform

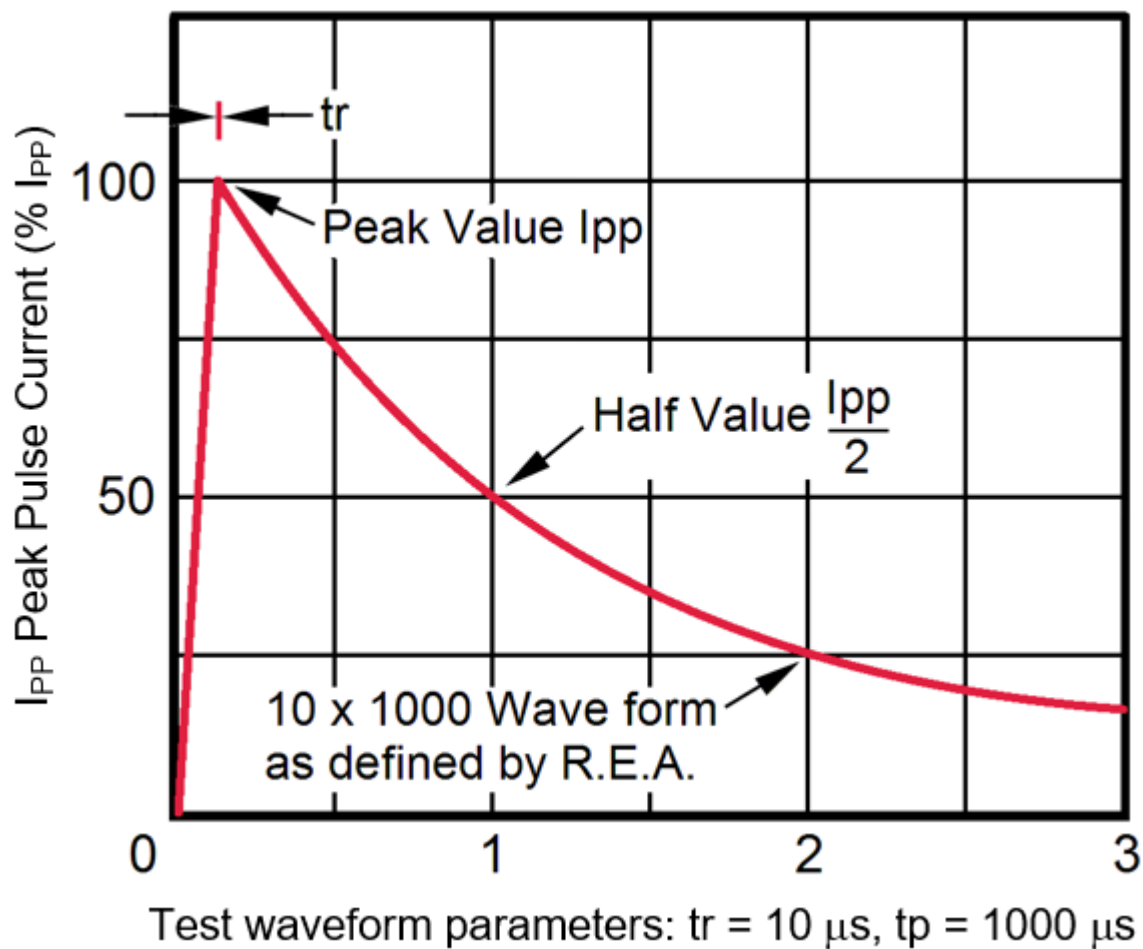


Figure 4-3. Derating Curve

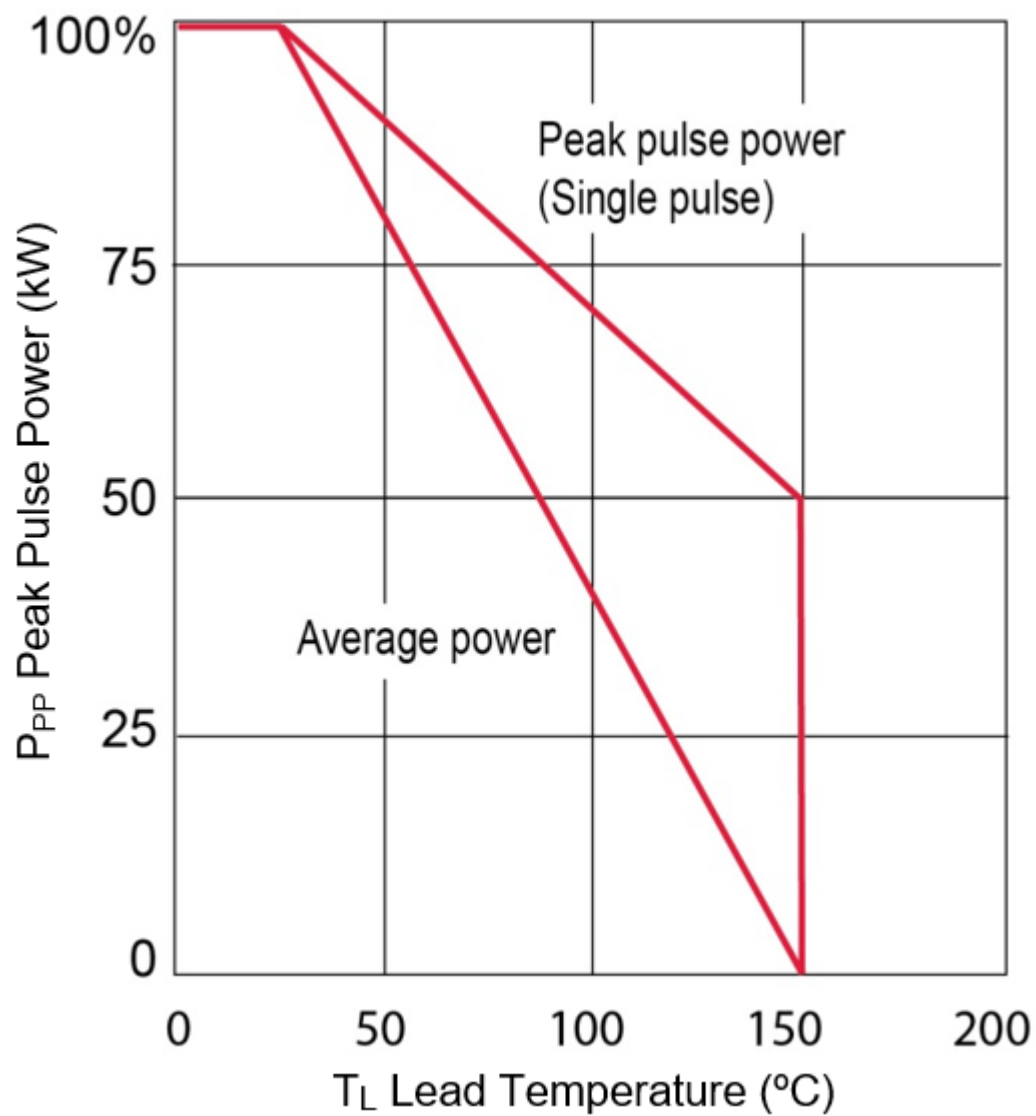
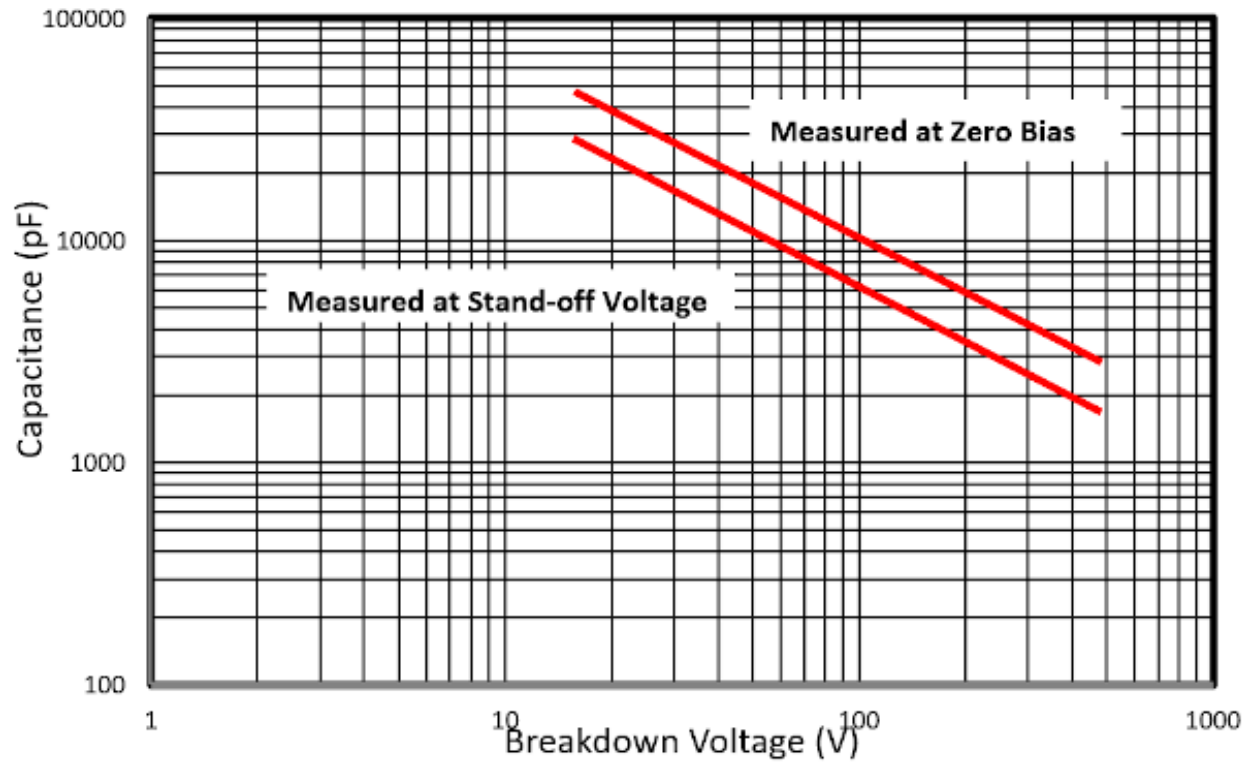
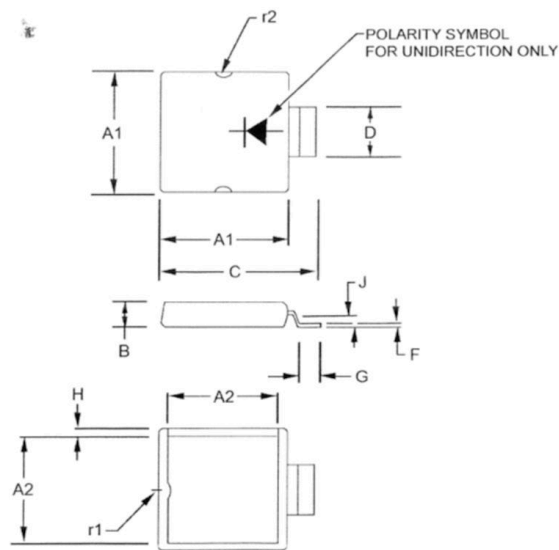


Figure 4-4. Typical Capacitance Vs. Breakdown Voltage (Unidirectional Configuration)

Bidirectional capacitance is half that shown at zero volts.

5. Package Dimensions

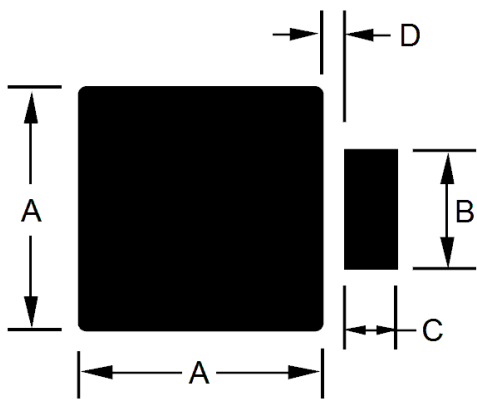
Figure 5-1. Package Dimensions



Ref.	Dimensions			
	Inch		Millimeters	
	Min.	Max.	Min.	Max.
A1	0.485	0.495	12.32	12.57
A2	0.445	0.455	11.30	11.56
B	0.145	0.155	3.68	3.94
C	0.585	0.595	14.86	15.11
D	0.200	0.210	5.08	5.33
F	0.008	0.013	0.20	0.33
G	0.055	0.065	1.40	1.65
H	0.015	0.025	0.38	0.64
J	0.062 TYP.		1.57 TYP.	
r1	0.030 TYP.		0.76 TYP.	
r2	0.045 TYP.		1.14 TYP.	

5.1 Pad Layout

Figure 5-2. Pad Layout



Ref.	Dimensions			
	Inch		Millimeters	
	Min.	Max.	Min.	Max.
A	0.465	0.475	11.81	12.07
B	0.225	0.235	5.72	5.97
C	0.095	0.105	2.41	2.67
D	0.04	0.05	1.02	1.27

6. Revision History

The revision history describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.

Revision	Date	Description
A	01/2024	Initial revision.

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