

5,000 Watt Transient Voltage Suppressor (TVS) Protection Device Data Sheet

5KP5.0Ae3–5KP250CAe3



Product Overview

This Transient Voltage Suppressor series of 5KP5.0Ae3–5KP250CAe3 offers commercial RoHS compliance along with bidirectional options. This device has the ability to clamp dangerous high voltage, short term transients such as those caused by directed or radiated electrostatic discharge phenomena before entering sensitive component regions of a circuit design. Response time of clamping action is virtually instantaneous. As a result, they may also be used effectively for protection from ESD or EFT per IEC61000-4-2 and IEC61000-4-4 or for inductive switching environments and induced RF. They can also be used for protecting other sensitive components from secondary lightning effects per IEC61000-4-5 and class levels defined herein.

Features

- Available in both unidirectional and bidirectional configurations
- Suppress transients up to 5,000 watts at 10/1000 μ s. (See [Figure 4-1](#))
- Moisture classification is level 1 with no dry pack required per IPC/JEDEC J-STD-020B
- RoHS compliant

Applications/Benefits

- Available in working standoff voltage (V_{WM}) range 5.0 to 250 volts
- Economical axial-lead plastic encapsulated TVS series for thru-hole mounting
- Protection from switching transients and induced RFI
- Fast Response with less than 5 ns turn-on time
- Compliant to IEC 61000-4-2 and IEC 61000-4-4 for ESD and EFT protection respectively
- Secondary lightning protection per IEC61000-4-5 with 42 ohms source impedance:
 - Class 1, 2, 3, 4: 5KP5.0 to 5KP110CA
 - Class 5: 5KP5.0 to 5KP110CA (short distance)
 - Class 5: 5KP5.0 to 5KP36CA (long distance)
- Secondary lightning protection per IEC61000-4-5 with 12 ohms source impedance:
 - Class 1 and 2: 5KP5.0 to 5KP110CA
 - Class 3: 5KP5.0 to 5KP78CA
 - Class 4: 5KP5.0 to 5KP40CA
- Secondary lightning protection per IEC61000-4-5 with 2 ohms source impedance:
 - Class 2: 5KP5.0 to 5KP70CA
 - Class 3: 5KP5.0 to 5KP36CA
 - Class 4: 5KP5.0 to 5KP18CA

Figure 1. P600 Package



Also available in:

Case 5A (DO-204AR) package

(hirel plastic axial-leaded)

[M5KP5.0A – M5KP110CA](#)

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1. Maximum Ratings

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

Parameters/Test Conditions		Symbol	Value	Unit
Junction and Storage Temperature		T_J and T_{STG}	–55 to +150	°C
Thermal Resistance, Junction to Lead at 0.375 inch (9.5 mm) lead length from body		$R_{\theta JL}$	8.0	°C/W
Thermal Resistance, Junction to Ambient		$R_{\theta JA}$	40	°C/W
Peak Pulse Power Dissipation	10/1000 μ s	P_{PP}	5000	W
Rated Average Power Dissipation at $T_L = 75^\circ\text{C}$ 0.375 inch (9.5 mm) from body ⁽¹⁾		$P_{M(AV)}$	8.0	W
Surge Peak Forward Current ⁽²⁾		I_{FSM}	500	A
Solder Temperature at 10 seconds		—	260	°C

Notes:

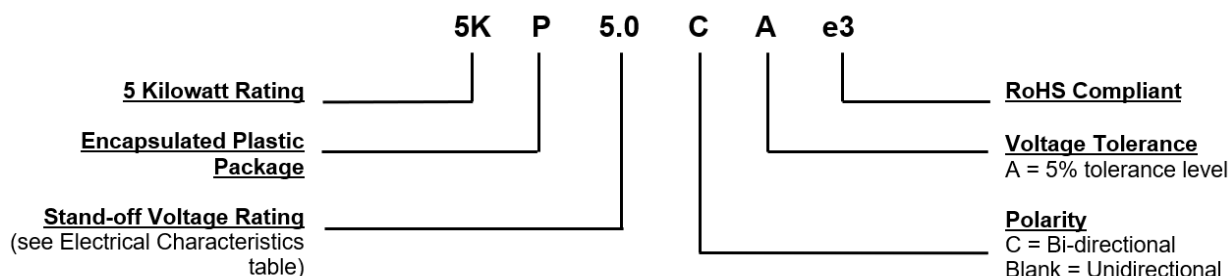
1. When mounted as shown in [Figure 4-5](#).
2. Measured on 8.3 ms single half sine-wave or equivalent square wave, duty cycle = 4 pulses per minute maximum.

1.1. Mechanical and Packaging

- Case: Void-free transfer molded thermosetting epoxy body meeting UL94V-0
- Terminals: RoHS compliant annealed matte-tin plating. Solderable per MIL-STD-750, method 2026.
- Marking: Manufacturer, date code, part number, polarity and tolerance suffixes
- Polarity: For unidirectional types the color band denotes the cathode, which is positive with respect to the anode under normal TVS operation.
- Tape and Reel Option: Standard per EIA-296 (add “TR” suffix to part number). Consult factory for quantities.
- Weight: Approximately 2.1 grams
- See [5. 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 $\%/^{\circ}\text{C}$ or $\text{mV}/^{\circ}\text{C}$.
C_T	Total Capacitance: The total small signal capacitance between the diode terminals of a complete device.
I_D	Standby Current: The current through the device at rated stand-off 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 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.
P_{PP}	Peak Pulse Power. The rated random recurring peak impulse power or rated nonrepetitive peak impulse power. The impulse power is the maximum-rated value of 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 ($T_A = 25\text{ }^{\circ}\text{C}$ Unless Otherwise Stated)

Device Number	Breakdown Voltage ⁽¹⁾ V _(BR) at I _T		Test Current I _T	Working Stand- Off Voltage V _{WM}	Maximum Standby Current ⁽³⁾ I _D at V _{WM}	Maximum Peak Pulse Current ⁽²⁾ I _{PP}	Maximum Clamping Voltage V _C at I _{PP}	Maximum Temperature Coefficient Of V _(BR) α _{V(BR)}
	Volts							
	Min.	Max.						
5KP5.0(C)Ae3	6.4	7	50	5	5000	543	9.2	0.057
5KP6.0(C)Ae3	6.67	7.37	50	6	5000	485	10.3	0.061
5KP6.5(C)Ae3	7.22	7.98	50	6.5	2000	446	11.2	0.065
5KP7.0(C)Ae3	7.78	8.6	50	7	1000	417	12	0.068
5KP7.5(C)Ae3	8.33	9.21	5	7.5	250	388	12.9	0.073
5KP8.0(C)Ae3	8.89	9.83	5	8	150	368	13.6	0.075
5KP8.5(C)Ae3	9.44	10.4	5	8.5	50	347	14.4	0.078
5KP9.0(C)Ae3	10	11.1	5	9	20	325	15.4	0.081
5KP10(C)Ae3	11.1	12.3	5	10	15	294	17	0.084
5KP11(C)Ae3	12.2	13.5	5	11	10	275	18.2	0.086
5KP12(C)Ae3	13.3	14.7	5	12	5	251	19.9	0.088
5KP13(C)Ae3	14.4	15.9	5	13	2	233	21.5	0.09
5KP14(C)Ae3	15.6	17.2	5	14	2	216	23.2	0.092
5KP15(C)Ae3	16.7	18.5	5	15	2	205	24.4	0.094
5KP16(C)Ae3	17.8	19.7	5	16	2	192	26	0.096
5KP17(C)Ae3	18.9	20.9	5	17	2	181	27.6	0.097
5KP18(C)Ae3	20	22.1	5	18	2	171	29.2	0.098
5KP20(C)Ae3	22.2	24.5	5	20	2	154	32.4	0.099
5KP22(C)Ae3	24.4	26.9	5	22	2	141	35.5	0.1
5KP24(C)Ae3	26.7	29.5	5	24	2	129	38.9	0.101
5KP26(C)Ae3	28.9	31.9	5	26	2	119	42.1	0.101
5KP28(C)Ae3	31.1	34.4	5	28	2	110	45.4	0.102
5KP30(C)Ae3	33.3	36.8	5	30	2	103	48.4	0.103
5KP33(C)Ae3	36.7	40.6	5	33	2	93.8	53.3	0.104
5KP36(C)Ae3	40	44.2	5	36	2	86.1	58.1	0.104
5KP40(C)Ae3	44.4	49.1	5	40	2	77.5	64.5	0.105
5KP43(C)Ae3	47.8	52.8	5	43	2	72	69.4	0.105
5KP45(C)Ae3	50	55.3	5	45	2	68.8	72.7	0.106
5KP48(C)Ae3	53.3	58.9	5	48	2	64.6	77.4	0.106
5KP51(C)Ae3	56.7	62.7	5	51	2	60.7	82.4	0.107
5KP54(C)Ae3	60	66.3	5	54	2	57.4	87.1	0.107
5KP58(C)Ae3	64.4	71.2	5	58	2	53.4	94	0.107
5KP60(C)Ae3	66.7	73.7	5	60	2	51.7	97	0.108
5KP64(C)Ae3	71.1	78.6	5	64	2	48.5	103	0.108
5KP70(C)Ae3	77.8	86	5	70	2	44.2	113	0.108
5KP75(C)Ae3	83.3	92.1	5	75	2	41.3	121	0.108
5KP78(C)Ae3	86.7	95.8	5	78	2	39.7	126	0.108
5KP85(C)Ae3	94.4	104	5	85	2	36.5	137	0.108
5KP90(C)Ae3	100	111	5	90	2	34.2	146	0.11

Table 3-1. Electrical Characteristics ($T_A = 25\text{ }^{\circ}\text{C}$ Unless Otherwise Stated) (continued)

Device Number	Breakdown Voltage ⁽¹⁾ V _(BR) at I _T		Test Current I _T	Working Stand- Off Voltage V _{WM}	Maximum Standby Current ⁽³⁾ I _D at V _{WM}	Maximum Peak Pulse Current ⁽²⁾ I _{PP}	Maximum Clamping Voltage V _C at I _{PP}	Maximum Temperature Coefficient Of V _(BR) α _{V(BR)}
	Volts							
	Min.	Max.						
5KP100(C)Ae3	111	123	5	100	2	30.9	162	0.11
5KP110(C)Ae3	122	135	5	110	2	28.2	177	0.11
5KP120(C)Ae3	133	147	5	120	2	26.4	193	0.11
5KP130(C)Ae3	144	159	5	130	2	24.4	209	0.11
5KP150(C)Ae3	167	185	5	150	2	21	243	0.11
5KP160(C)Ae3	178	197	5	160	2	19.7	259	0.11
5KP170(C)Ae3	189	209	5	170	2	18.5	275	0.11
5KP180(C)Ae3	200	221	5	180	2	17.5	292	0.11
5KP190(C)Ae3	211	233	5	190	2	16.5	310	0.11
5KP200(C)Ae3	222	246	5	200	2	15.5	329	0.11
5KP210(C)Ae3	233	258	5	210	2	14.6	349	0.11
5KP220(C)Ae3	244	270	5	220	2	13.7	371	0.11
5KP250(C)Ae3	277	306	5	250	2	12	425	0.11

Notes:

1. $V_{(BR)}$ measured after I_T applied for 300 μs , I_T = square wave pulse or equivalent.
2. Surge current waveform per [Figure 4-3](#) and derated per [Figure 4-2](#).
3. For bidirectional types with V_{WM} of 30 volts and less, the I_D limit is doubled.

4. Graphs

Figure 4-1. Peak Pulse Power Rating Curve

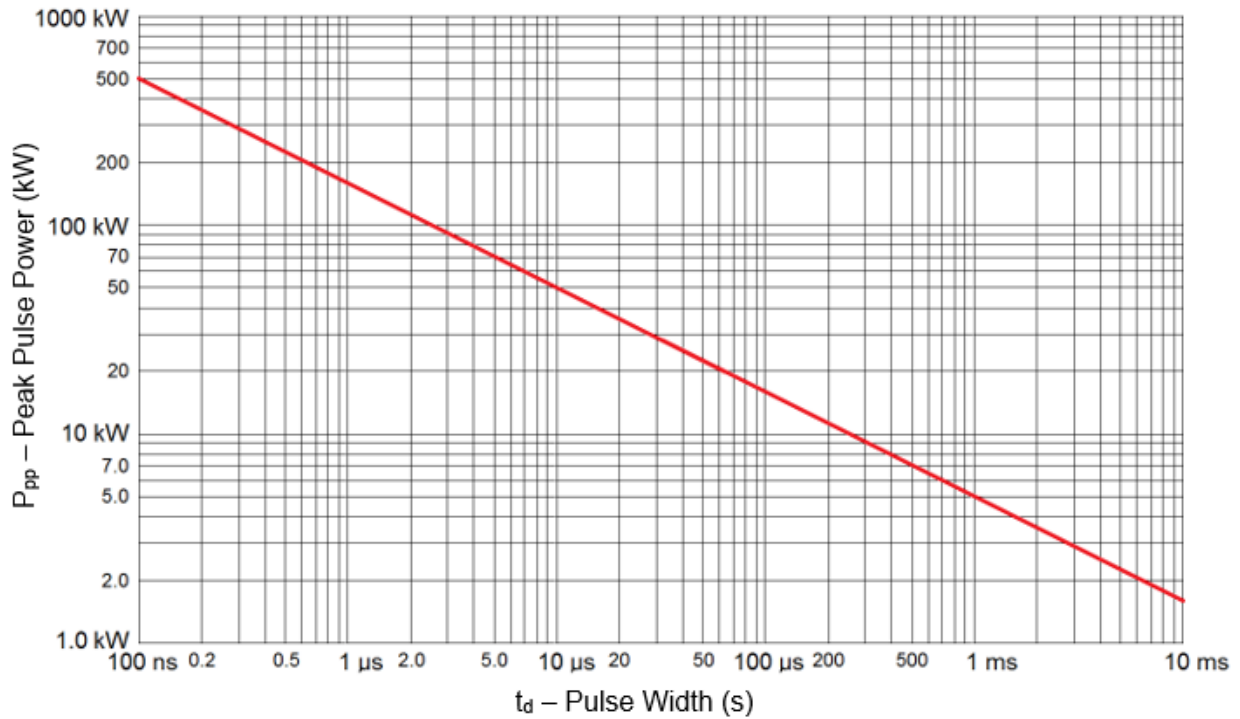


Figure 4-2. Pulse Derating Curve

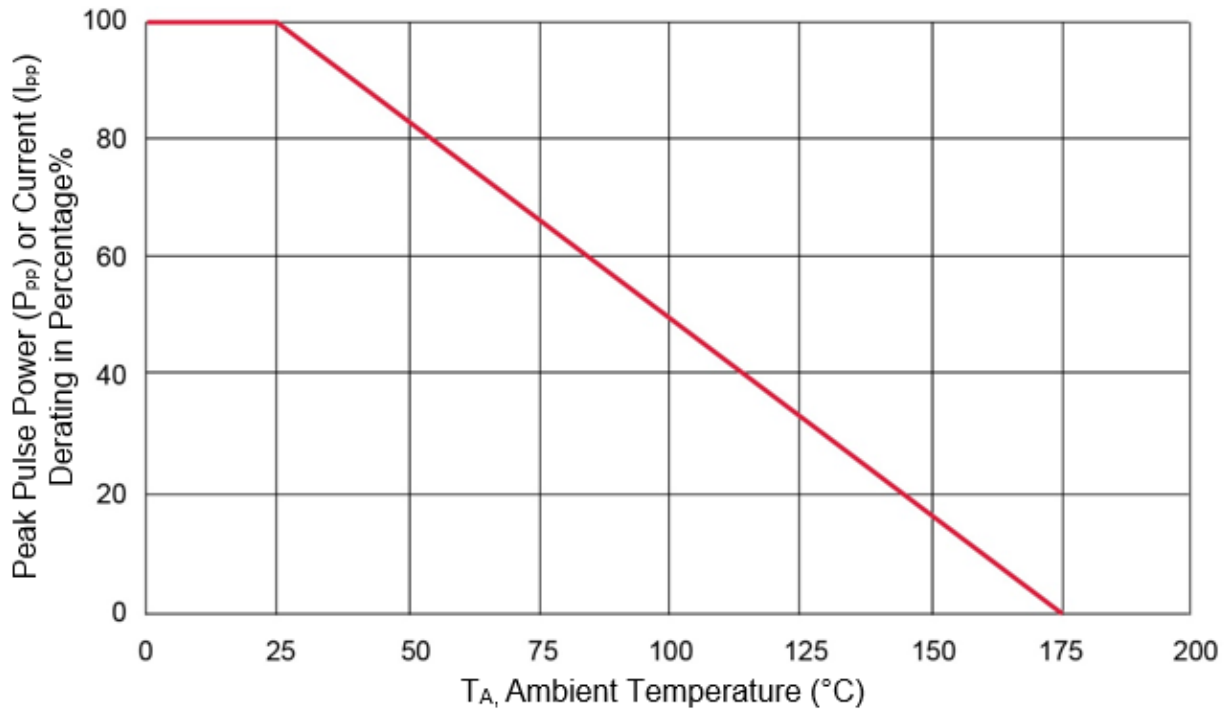


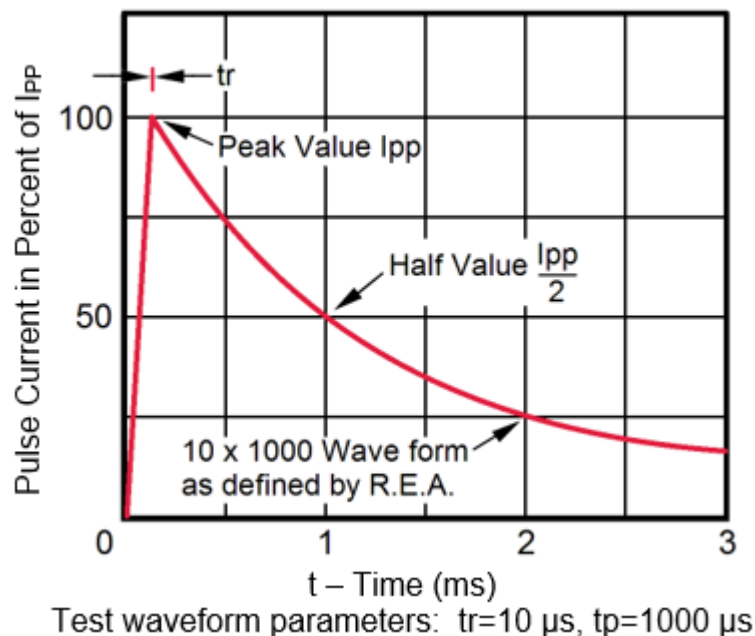
Figure 4-3. Pulse Waveform for 10/1000 μ s Exponential Surge

Figure 4-4. Typical Junction Capacitance

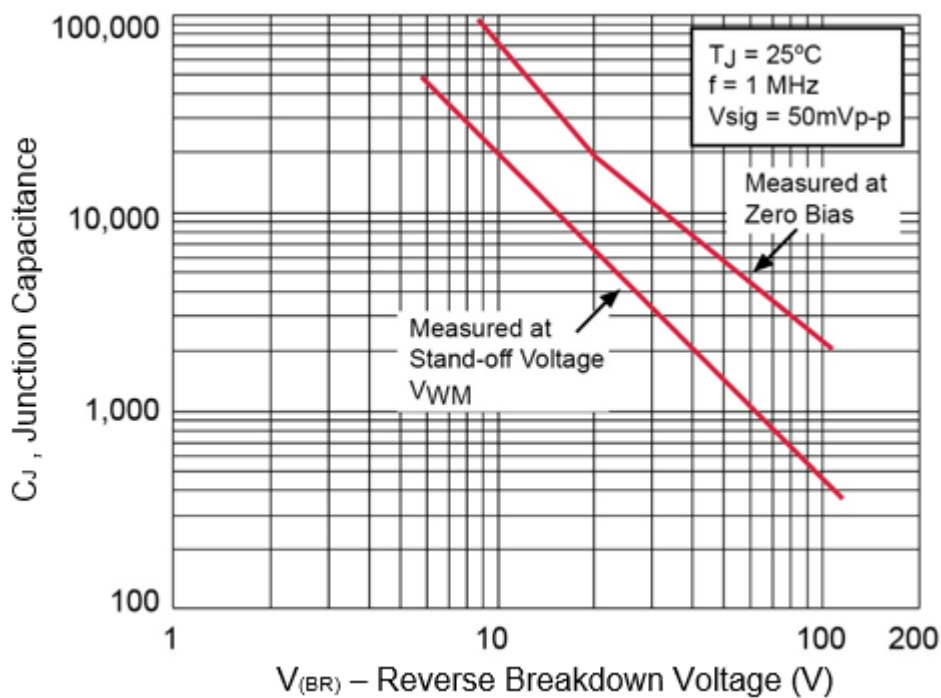


Figure 4-5. Steady State Power Derating Curve

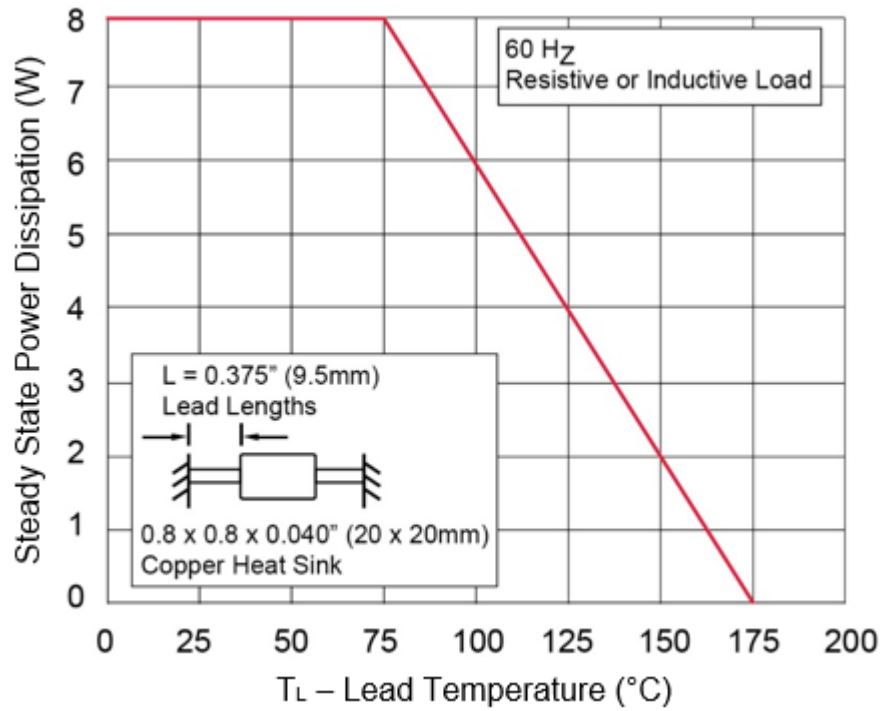
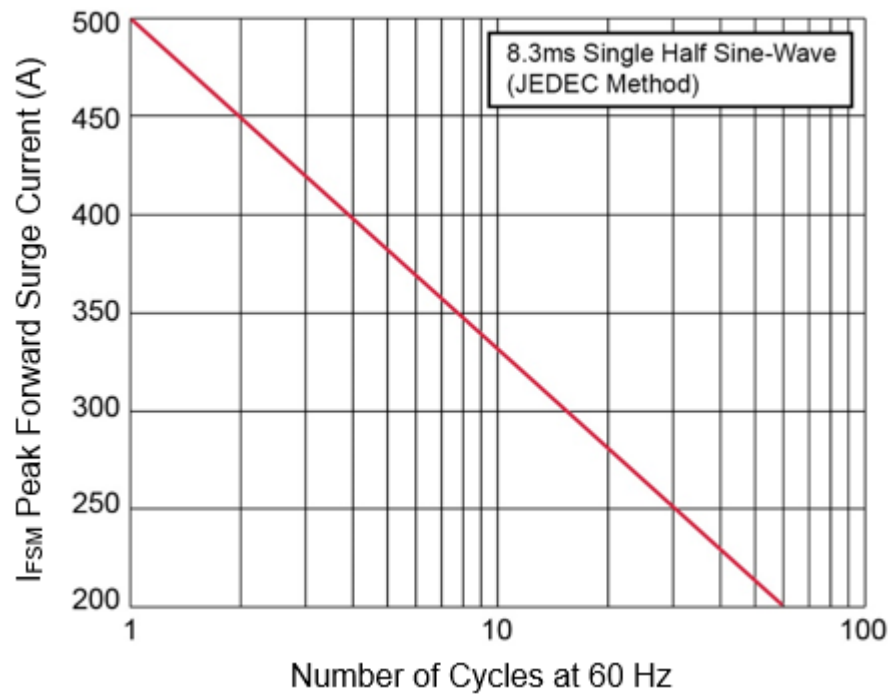
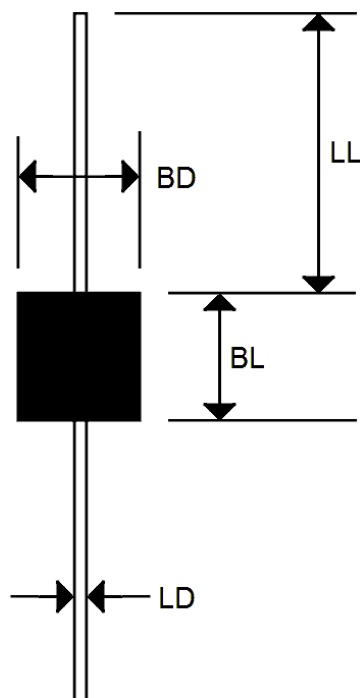


Figure 4-6. Maximum Non-Repetitive Forward Surge Current



5. Package Dimensions

Figure 5-1. Package Dimensions



Dim.	Dimensions			
	Inch		Millimeters	
	Min.	Max.	Min.	Max.
LL	0.750	—	19.05	—
BL	0.340	0.360	8.645	9.135
BD	0.340	0.360	8.645	9.135
LD	0.047	0.053	1.194	1.346

6. Revision History

Revision Level	Date	Description
A	9/2025	Initial version created in the Microchip template. Legacy document number is RF01010.

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ISBN: 979-8-3371-2028-7

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