RoHS Compliant

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

HALOGEN FREE

DESCRIPTION

This RoHS compliant transient voltage suppressor series 5KP5.0e3 - 5KP250CAe3 provides a range of standoff voltage options from 5.0 to 250V in both unidirectional and bidirectional options. Clamping action is almost instantaneous. As a result, they provide effective protection from ESD and EFT per IEC61000-4-2 and IEC61000-4-4, as well as transients caused by inductive switching and RFI. They also protect from secondary lightning effects per 61000-4-5 at the class levels specified below.

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

P600 Package

Also available in:

Case 5A (DO-204AR) package
(hirel plastic axial-leaded)
M5KP5.0A – M5KP110CA

DO-13 package
(metal axial-leaded)
LC6.5A – LC170A

FEATURES

- Available in both unidirectional and bidirectional configurations
- Moisture classification is level 1 with no dry pack required per IPC/JEDEC J-STD-020B
- RoHS compliant

APPLICATIONS / BENEFITS

- Selections for 5.0 to 250 volts stand-off voltage (V_{WM})
- Economical TVS series for thru-hole mounting
- Pico- to nano-second response time
- Protection from transients caused by inductive switching and RFI
- 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 & 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

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MAXIMUM RATINGS @ 25 ºC unless otherwise noted

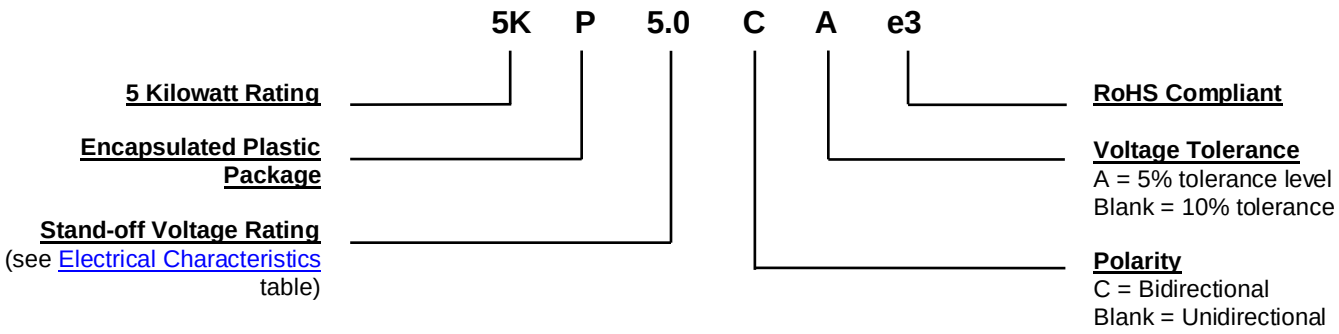
Parameters/Test Conditions	Symbol	Value	Unit
Junction and Storage Temperature	T_J and T_{STG}	-55 to +175	^oC
Thermal Resistance, Junction to Lead @ 0.375 inch (9.5 mm) lead length from body	$R_{\Theta JL}$	8.0	$^oC/W$
Thermal Resistance, Junction to Ambient	$R_{\Theta JA}$	40	$^oC/W$
Peak Pulse Power Dissipation 10/1000 µs	P_{PP}	5000	W
Rated Average Power Dissipation @ T_L = 75 ºC 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 @ 10 s		260	^oC

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

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 & REEL option: Standard per EIA-296 (add "TR" suffix to part number). Consult factory for quantities.
- WEIGHT: Approximately 2.1 grams
- See Package Dimensions on last page.

PART NOMENCLATURE



SYMBOLS & 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.
I_D	Standby Current: The current through the device at rated stand-off voltage.
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.

ELECTRICAL CHARACTERISTICS @ 25 ºC unless otherwise stated

DEVICE NUMBER	BREAKDOWN VOLTAGE (1) $V_{(BR)}$ @ I_T		TEST CURRENT I_T	WORKING STAND-OFF VOLTAGE V_{WM}	MAXIMUM STANDBY CURRENT (3) I_D @ V_{WM}	MAXIMUM PEAK PULSE CURRENT (2) I_{PP}	MAXIMUM CLAMPING VOLTAGE V_C @ I_{PP}	MAXIMUM TEMPERATURE COEFFICIENT OF $V_{(BR)}$ $\alpha_{V(BR)}$
	Min	Max						
	Volts	mA	mA	Volts	µA	Amps	Volts	%/ºC
5KP5.0e3 / 5KP5.0Ce3	6.40	7.30	50	5.0	5000	521	9.6	0.057
5KP5.0Ae3 / 5KP5.0CAe3	**6.40**	**7.00**	**50**	**5.0**	**5000**	**543**	**9.2**	**0.057**
5KP6.0e3 / 5KP6.0Ce3	6.67	8.15	50	6.0	5000	439	11.4	0.061
5KP6.0Ae3 / 5KP6.0CAe3	**6.67**	**7.37**	**50**	**6.0**	**5000**	**485**	**10.3**	**0.061**
5KP6.5e3 / 5KP6.5Ce3	7.22	8.82	50	6.5	2000	407	12.3	0.065
5KP6.5Ae3 / 5KP6.5CAe3	**7.22**	**7.98**	**50**	**6.5**	**2000**	**446**	**11.2**	**0.065**
5KP7.0e3 / 5KP7.0Ce3	7.78	9.51	50	7.0	1000	376	13.3	0.068
5KP7.0Ae3 / 5KP7.0CAe3	**7.78**	**8.60**	**50**	**7.0**	**1000**	**417**	**12.0**	**0.068**
5KP7.5e3 / 5KP7.5Ce3	8.33	10.2	5	7.5	250	350	14.3	0.073
5KP7.5Ae3 / 5KP7.5CAe3	**8.33**	**9.21**	**5**	**7.5**	**250**	**388**	**12.9**	**0.073**
5KP8.0e3 / 5KP8.0Ce3	8.89	10.9	5	8.0	150	333	15.0	0.075
5KP8.0Ae3 / 5KP8.0CAe3	**8.89**	**9.83**	**5**	**8.0**	**150**	**368**	**13.6**	**0.075**
5KP8.5e3 / 5KP8.5Ce3	9.44	11.5	5	8.5	50	314	15.9	0.078
5KP8.5Ae3 / 5KP8.5CAe3	**9.44**	**10.4**	**5**	**8.5**	**50**	**347**	**14.4**	**0.078**
5KP9.0e3 / 5KP9.0Ce3	10.0	12.2	5	9.0	20	296	16.9	0.081
5KP9.0Ae3 / 5KP9.0CAe3	**10.0**	**11.1**	**5**	**9.0**	**20**	**325**	**15.4**	**0.081**
5KP10e3 / 5KP10Ce3	11.1	13.6	5	10	15	266	18.8	0.084
5KP10Ae3 / 5KP10CAe3	**11.1**	**12.3**	**5**	**10**	**15**	**294**	**17.0**	**0.084**
5KP11e3 / 5KP11Ce3	12.2	14.9	5	11	10	249	20.1	0.086
5KP11Ae3 / 5KP11CAe3	**12.2**	**13.5**	**5**	**11**	**10**	**275**	**18.2**	**0.086**
5KP12e3 / 5KP12Ce3	13.3	16.3	5	12	5	227	22.0	0.088
5KP12Ae3 / 5KP12CAe3	**13.3**	**14.7**	**5**	**12**	**5**	**251**	**19.9**	**0.088**
5KP13e3 / 5KP13Ce3	14.4	17.6	5	13	2	210	23.8	0.090
5KP13Ae3 / 5KP13CAe3	**14.4**	**15.9**	**5**	**13**	**2**	**233**	**21.5**	**0.090**
5KP14e3 / 5KP14Ce3	15.6	19.1	5	14	2	194	25.8	0.092
5KP14Ae3 / 5KP14CAe3	**15.6**	**17.2**	**5**	**14**	**2**	**216**	**23.2**	**0.092**
5KP15e3 / 5KP15Ce3	16.7	20.4	5	15	2	186	26.9	0.094
5KP15Ae3 / 5KP15CAe3	**16.7**	**18.5**	**5**	**15**	**2**	**205**	**24.4**	**0.094**
5KP16e3 / 5KP16Ce3	17.8	21.8	5	16	2	174	28.8	0.096
5KP16Ae3 / 5KP16CAe3	**17.8**	**19.7**	**5**	**16**	**2**	**192**	**26.0**	**0.096**
5KP17e3 / 5KP17Ce3	18.9	23.1	5	17	2	164	30.5	0.097
5KP17Ae3 / 5KP17CAe3	**18.9**	**20.9**	**5**	**17**	**2**	**181**	**27.6**	**0.097**
5KP18e3 / 5KP18Ce3	20.0	24.4	5	18	2	155	32.2	0.098
5KP18Ae3 / 5KP18CAe3	**20.0**	**22.1**	**5**	**18**	**2**	**171**	**29.2**	**0.098**
5KP20e3 / 5KP20Ce3	22.2	27.1	5	20	2	140	35.8	0.099
5KP20Ae3 / 5KP20CAe3	**22.2**	**24.5**	**5**	**20**	**2**	**154**	**32.4**	**0.099**
5KP22e3 / 5KP22Ce3	24.4	29.8	5	22	2	127	39.4	0.100
5KP22Ae3 / 5KP22CAe3	**24.4**	**26.9**	**5**	**22**	**2**	**141**	**35.5**	**0.100**
5KP24e3 / 5KP24Ce3	26.7	32.6	5	24	2	116	43.0	0.101
5KP24Ae3 / 5KP24CAe3	**26.7**	**29.5**	**5**	**24**	**2**	**129**	**38.9**	**0.101**

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ELECTRICAL CHARACTERISTICS @ 25 ºC unless otherwise stated (continued)

DEVICE NUMBER	BREAKDOWN VOLTAGE (1) $V_{(BR)}$ @ I_T		TEST CURRENT I_T	STAND-OFF VOLTAGE V_{WM}	MAXIMUM STANDBY CURRENT (3) I_D @ V_{WM}	MAXIMUM PEAK PULSE CURRENT (2) I_{PP}	MAXIMUM CLAMPING VOLTAGE V_C @ I_{PP}	MAXIMUM TEMPERATURE COEFFICIENT OF $V_{(BR)}$ $\alpha_{V(BR)}$
	Min	Max						
	Volts	mA	mA	Volts	µA	Amps	Volts	%/ºC
5KP26e3 / 5KP26Ce3	28.9	35.3	5	26	2	107	46.6	0.101
5KP26Ae3 / 5KP26CAe3	**28.9**	**31.9**	**5**	**26**	**2**	**119**	**42.1**	**0.101**
5KP28e3 / 5KP28Ce3	31.1	38.0	5	28	2	100	50.0	0.102
5KP28Ae3 / 5KP28CAe3	**31.1**	**34.4**	**5**	**28**	**2**	**110**	**45.4**	**0.102**
5KP30e3 / 5KP30Ce3	33.3	40.7	5	30	2	93.5	53.5	0.103
5KP30Ae3 / 5KP30CAe3	**33.3**	**36.8**	**5**	**30**	**2**	**103**	**48.4**	**0.103**
5KP33e3 / 5KP33Ce3	36.7	44.9	5	33	2	84.7	59.0	0.104
5KP33Ae3 / 5KP33CAe3	**36.7**	**40.6**	**5**	**33**	**2**	**93.8**	**53.3**	**0.104**
5KP36e3 / 5KP36Ce3	40.0	48.9	5	36	2	77.8	64.3	0.104
5KP36Ae3 / 5KP36CAe3	**40.0**	**44.2**	**5**	**36**	**2**	**86.1**	**58.1**	**0.104**
5KP40e3 / 5KP40Ce3	44.4	54.3	5	40	2	70.0	71.4	0.105
5KP40Ae3 / 5KP40CAe3	**44.4**	**49.1**	**5**	**40**	**2**	**77.5**	**64.5**	**0.105**
5KP43e3 / 5KP43Ce3	47.8	58.4	5	43	2	65.2	76.7	0.105
5KP43Ae3 / 5KP43CAe3	**47.8**	**52.8**	**5**	**43**	**2**	**72.0**	**69.4**	**0.105**
5KP45e3 / 5KP45Ce3	50.0	61.1	5	45	2	62.3	80.3	0.106
5KP45Ae3 / 5KP45CAe3	**50.0**	**55.3**	**5**	**45**	**2**	**68.8**	**72.7**	**0.106**
5KP48e3 / 5KP48Ce3	53.3	65.2	5	48	2	58.5	85.5	0.106
5KP48Ae3 / 5KP48CAe3	**53.3**	**58.9**	**5**	**48**	**2**	**64.6**	**77.4**	**0.106**
5KP51e3 / 5KP51Ce3	56.7	69.3	5	51	2	54.9	91.1	0.107
5KP51Ae3 / 5KP51CAe3	**56.7**	**62.7**	**5**	**51**	**2**	**60.7**	**82.4**	**0.107**
5KP54e3 / 5KP54Ce3	60.0	73.3	5	54	2	51.9	96.3	0.107
5KP54Ae3 / 5KP54CAe3	**60.0**	**66.3**	**5**	**54**	**2**	**57.4**	**87.1**	**0.107**
5KP58e3 / 5KP58Ce3	64.4	78.7	5	58	2	48.5	103	0.107
5KP58Ae3 / 5KP58CAe3	**64.4**	**71.2**	**5**	**58**	**2**	**53.4**	**94**	**0.107**
5KP60e3 / 5KP60Ce3	66.7	81.5	5	60	2	46.7	107	0.108
5KP60Ae3 / 5KP60CAe3	**66.7**	**73.7**	**5**	**60**	**2**	**51.7**	**97**	**0.108**
5KP64e3 / 5KP64Ce3	71.1	86.9	5	64	2	43.9	114	0.108
5KP64Ae3 / 5KP64CAe3	**71.1**	**78.6**	**5**	**64**	**2**	**48.5**	**103**	**0.108**
5KP70e3 / 5KP70Ce3	77.8	95.1	5	70	2	40.0	125	0.108
5KP70Ae3 / 5KP70CAe3	**77.8**	**86.0**	**5**	**70**	**2**	**44.2**	**113**	**0.108**
5KP75e3 / 5KP75Ce3	83.3	102	5	75	2	37.3	134	0.108
5KP75Ae3 / 5KP75CAe3	**83.3**	**92.1**	**5**	**75**	**2**	**41.3**	**121**	**0.108**
5KP78e3 / 5KP78Ce3	86.7	106	5	78	2	36.0	139	0.108
5KP78Ae3 / 5KP78CAe3	**86.7**	**95.8**	**5**	**78**	**2**	**39.7**	**126**	**0.108**
5KP85e3 / 5KP85Ce3	94.4	115	5	85	2	33.1	151	0.108
5KP85Ae3 / 5KP85CAe3	**94.4**	**104**	**5**	**85**	**2**	**36.5**	**137**	**0.108**
5KP90e3 / 5KP90Ce3	100	122	5	90	2	31.3	160	0.110
5KP90Ae3 / 5KP90CAe3	**100**	**111**	**5**	**90**	**2**	**34.2**	**146**	**0.110**
5KP100e3 / 5KP100Ce3	111	136	5	100	2	27.9	179	0.110
5KP100Ae3 / 5KP100CAe3	**111**	**123**	**5**	**100**	**2**	**30.9**	**162**	**0.110**

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ELECTRICAL CHARACTERISTICS @ 25 ºC unless otherwise stated (continued)

DEVICE NUMBER	BREAKDOWN VOLTAGE (1) V_{BR} @ I_T		TEST CURRENT I_T	STAND-OFF VOLTAGE V_{WM}	MAXIMUM STANDBY CURRENT (3) I_D @ V_{WM}	MAXIMUM PEAK PULSE CURRENT (2) I_{PP}	MAXIMUM CLAMPING VOLTAGE V_C @ I_{PP}	MAXIMUM TEMPERATURE COEFFICIENT OF $V_{(BR)}$ $\alpha_{V(BR)}$
	Min	Max						
	Volts	mA	mA	Volts	µA	Amps	Volts	%/ºC
5KP110e3 / 5KP110Ce3	122	149	5	110	2	25.5	196	0.110
5KP110Ae3 / 5KP110CAe3	**122**	**135**	**5**	**110**	**2**	**28.2**	**177**	**0.110**
5KP120e3 / 5KP120Ce3	133	162	5	120	2	23.5	213	0.110
5KP120Ae3 / 5KP120CAe3	**133**	**147**	**5**	**120**	**2**	**26.4**	**193**	**0.110**
5KP130e3 / 5KP130Ce3	144	175	5	130	2	21.6	231	0.110
5KP130Ae3 / 5KP130CAe3	**144**	**159**	**5**	**130**	**2**	**24.4**	**209**	**0.110**
5KP150e3 / 5KP150Ce3	167	204	5	150	2	18.7	268	0.110
5KP150Ae3 / 5KP150CAe3	**167**	**185**	**5**	**150**	**2**	**21.0**	**243**	**0.110**
5KP160e3 / 5KP160Ce3	178	217	5	160	2	17.4	287	0.110
5KP160Ae3 / 5KP160CAe3	**178**	**197**	**5**	**160**	**2**	**19.7**	**259**	**0.110**
5KP170e3 / 5KP170Ce3	189	231	5	170	2	16.4	304	0.110
5KP170Ae3 / 5KP170CAe3	**189**	**209**	**5**	**170**	**2**	**18.5**	**275**	**0.110**
5KP180e3 / 5KP180Ce3	200	244	5	180	2	15.5	323	0.110
5KP180Ae3 / 5KP180CAe3	**200**	**221**	**5**	**180**	**2**	**17.5**	**292**	**0.110**
5KP190e3 / 5KP190Ce3	211	258	5	190	2	14.6	343	0.110
5KP190Ae3 / 5KP190CAe3	**211**	**233**	**5**	**190**	**2**	**16.5**	**310**	**0.110**
5KP200e3 / 5KP200Ce3	222	271	5	200	2	13.7	364	0.110
5KP200Ae3 / 5KP200CAe3	**222**	**246**	**5**	**200**	**2**	**15.5**	**329**	**0.110**
5KP210e3 / 5KP210Ce3	233	284	5	210	2	12.9	386	0.110
5KP210Ae3 / 5KP210CAe3	**233**	**258**	**5**	**210**	**2**	**14.6**	**349**	**0.110**
5KP220e3 / 5KP220Ce3	244	298	5	220	2	12.2	410	0.110
5KP220Ae3 / 5KP220CAe3	**244**	**270**	**5**	**220**	**2**	**13.7**	**371**	**0.110**
5KP250e3 / 5KP250Ce3	277	338	5	250	2	10.6	470	0.110
5KP250Ae3 / 5KP250CAe3	**277**	**306**	**5**	**250**	**2**	**12.0**	**425**	**0.110**

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 3 and derated per Figure 2

(3) For bidirectional types with V_{WM} of 30 volts and less, the I_D limit is doubled

GRAPHS

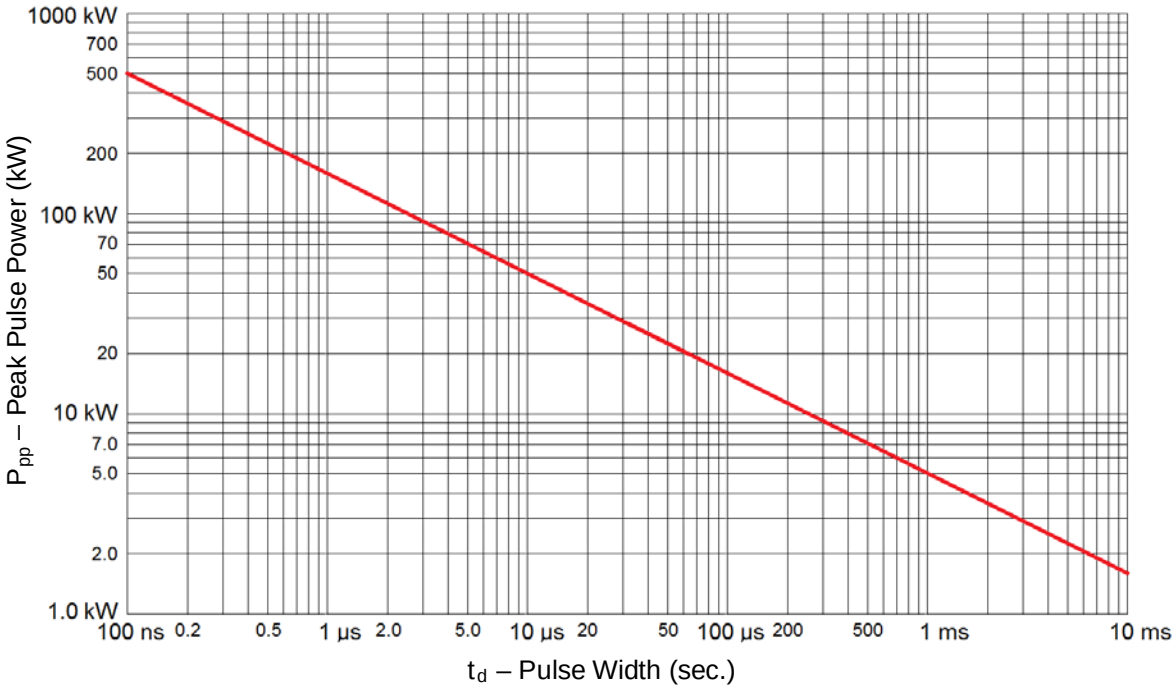


FIGURE 1
Peak Pulse Power Rating Curve

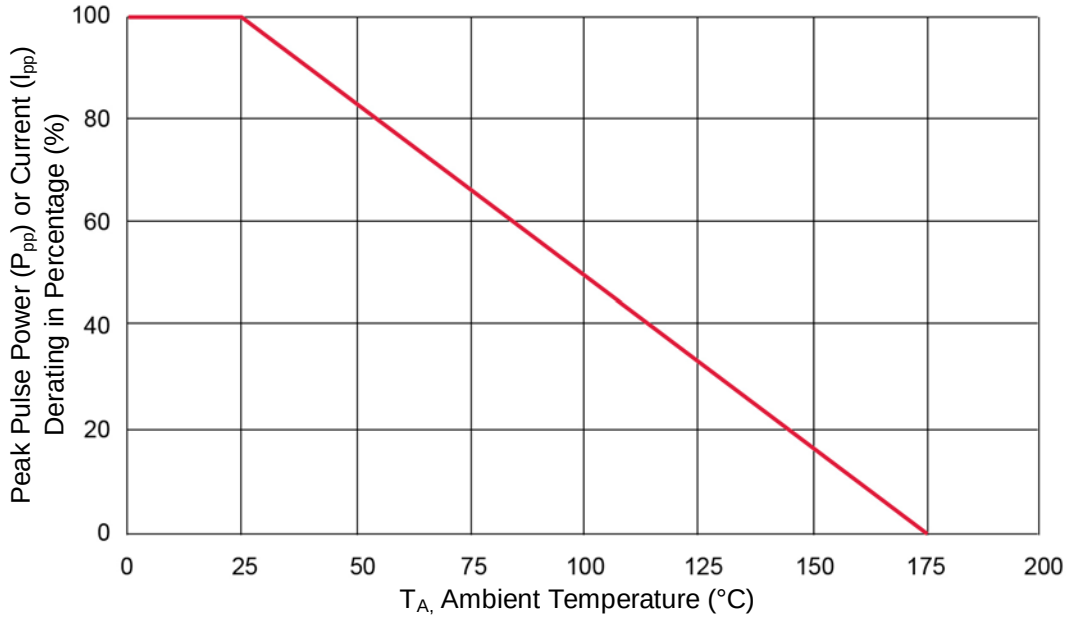
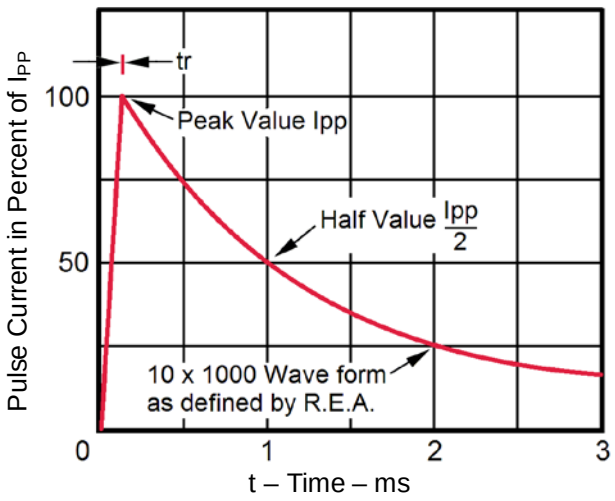


FIGURE 2
Pulse Derating Curve

GRAPHS (continued)



Test waveform parameters: tr=10 µs, tp=1000 µs

FIGURE 3
Pulse Waveform for 10/1000 µs Exponential Surge

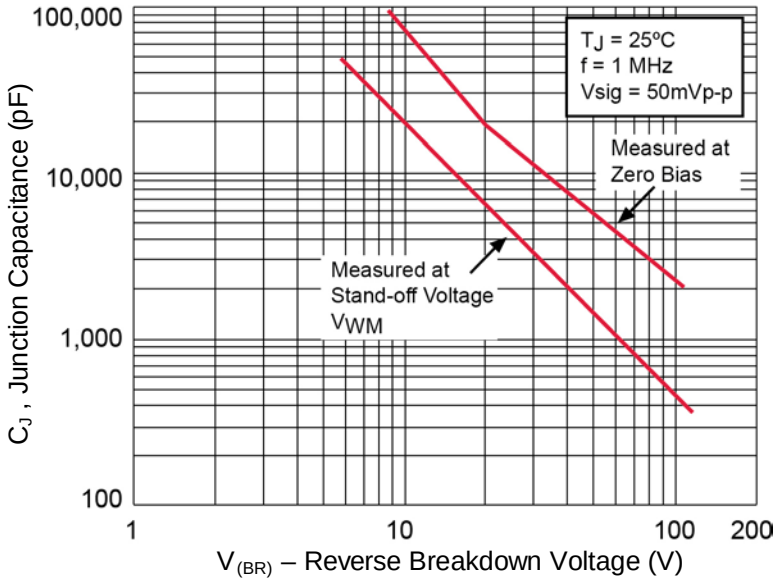


FIGURE 4
Typical Junction Capacitance

GRAPHS (continued)

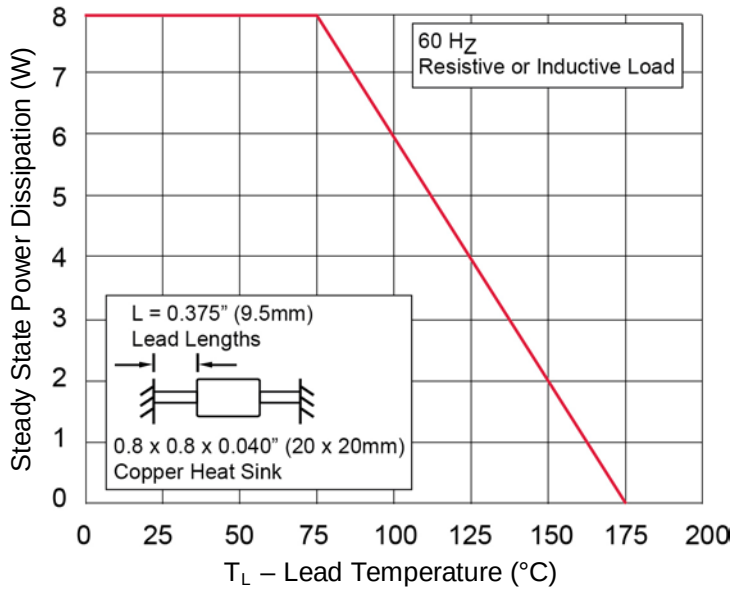


FIGURE 5
Steady State Power Derating Curve

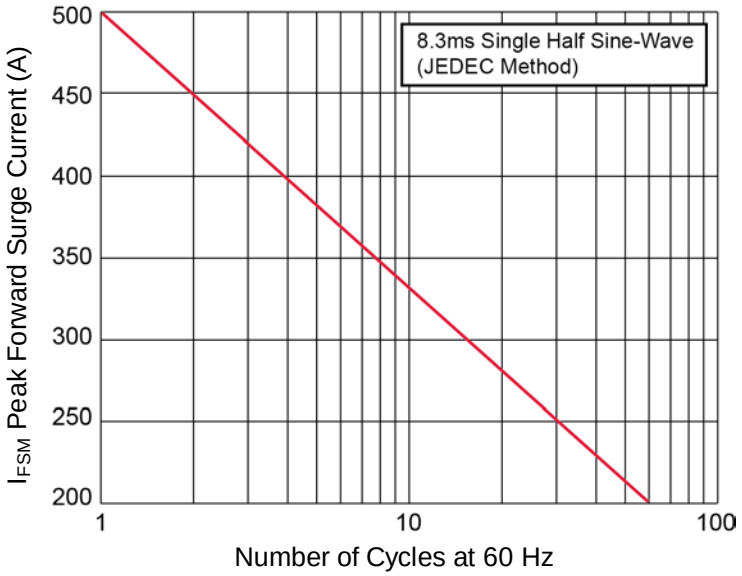
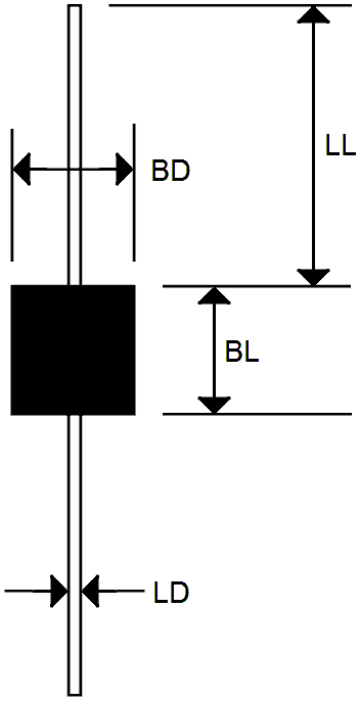


FIGURE 6
Maximum Non-repetitive Forward Surge Current

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

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