

**400W Transient Voltage Suppressor (TVS) protection device**
**Main product characteristics**

$V_{WM}$	5.0V – 440V
$V_{BR(min)} - V_{BR(max)}$	6.40V – 543V
$I_{PP}$	41.7A – 0.6A
$V_{CL(MAX)}$	9.6V – 713V
$P_{PP}$	400W


**Description and applications**

This device has the ability to clamp dangerous high voltage, short term transients such as produced 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. Microsemi also offers numerous other TVS products to meet higher and lower power demands and special applications.

- RoHS compliant (2002/95/EC), MSL level 1 (J-STD-020)
- Qualified to automotive grade – AEC Q101
- Bi-directional devices are denoted by the suffixes C or CA, electrical characteristics apply in both directions.

**Maximum ratings and characteristics<sup>(1)</sup>**

Symbol	Parameter	Value	Unit
$P_{PPM}$	Peak power dissipation with a 10/1000 $\mu$ s waveform <sup>(2)(3)</sup> (fig.1)	400	W
$I_{PPM}$	Peak pulse current with a 10/1000 $\mu$ s waveform <sup>(2)</sup> (fig. 3)	See next table	A
$P_{M(AV)}$	Steady state power dissipation at $T_L = 75^\circ\text{C}$ , lead lengths 0.375" (9.5mm) <sup>(3)</sup>	1.0	W
$I_{FSM}$	Non repetitive peak forward surge current (8.3ms single half sine wave) unidirectional only <sup>(4)</sup>	40	A
$V_F$	Maximum instantaneous forward voltage at 25A for unidirectional only <sup>(5)</sup>	3.5 / 5.0	V
$R_{\theta JL}$	Typical thermal resistance junction to lead	30	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Typical thermal resistance junction to ambient	120	$^\circ\text{C}/\text{W}$
$T_{STG}$	Storage temperature	-55 to +150	$^\circ\text{C}$
$T_J$	Junction temperature	-55 to +150	$^\circ\text{C}$

(1) All ratings at 25 $^\circ\text{C}$  unless specified otherwise

(2) Non-repetitive current pulse, per Fig. 3 and derated above  $T_A = 25^\circ\text{C}$  per Fig. 2. rating is 300W above 78V.

(3) Mounted on copper pad area of 0.2" x 0.2" (5.0mm x 5.0mm)

(4) Mounted on minimum recommended pad layout

(5)  $V_F=3.5\text{V}$  for devices of  $V_{BR} < 220\text{V}$  and  $V_F=5.0\text{V}$  maximum for devices of  $V_{BR} > 220\text{V}$

**400W Transient Voltage Suppressor (TVS) protection device**
**Electrical characteristics<sup>(1)</sup>**

DEVICE	Device marking code		BREAKDOWN VOLTAGE <sup>(2)</sup> , V <sub>BR</sub> V <sub>BR</sub> (V) @ I <sub>T</sub> (mA)		TEST CURRENT I <sub>T</sub> (mA)	STAND-OFF VOLTAGE V <sub>WM</sub> (V)	MAXIMUM STANDBY CURRENT <sup>(4)</sup> I <sub>D</sub> (μA) @ V <sub>WM</sub>	MAXIMUM PEAK PULSE CURRENT <sup>(3)</sup> I <sub>PP</sub> (A)	MAXIMUM CLAMPING VOLTAGE V <sub>C</sub> (V) @ I <sub>PP</sub>
	UNI	BI	Min	Max					
SMAJ5.0e3 / SMAJ5.0Ce3	MAD	MWD	6.40	7.82	10	5.0	800	41.7	9.6
SMAJ5.0Ae3 / SMAJ5.0CAe3 <sup>(5)</sup>	MAE	MWE	6.40	7.07	10	5.0	800	43.5	9.2
SMAJ6.0e3 / SMAJ6.0Ce3	MAF	MWF	6.67	8.15	10	6.0	800	35.1	11.4
SMAJ6.0Ae3 / SMAJ6.0CAe3	MAG	MWG	6.67	7.37	10	6.0	800	38.8	10.3
SMAJ6.5e3 / SMAJ6.5Ce3	MAH	MWH	7.22	8.82	10	6.5	500	32.5	12.3
SMAJ6.5Ae3 / SMAJ6.5CAe3	MAK	MWK	7.22	7.98	10	6.5	500	35.7	11.2
SMAJ7.0e3 / SMAJ7.0Ce3	MAL	MWL	7.78	9.51	10	7.0	200	30.1	13.3
SMAJ7.0Ae3 / SMAJ7.0CAe3	MAM	MWM	7.78	8.60	10	7.0	200	33.3	12.0
SMAJ7.5e3 / SMAJ7.5Ce3	MAN	MWN	8.33	10.2	1.0	7.5	100	28.0	14.3
SMAJ7.5Ae3 / SMAJ7.5CAe3	MAP	MWP	8.33	9.21	1.0	7.5	100	31.0	12.9
SMAJ8.0e3 / SMAJ8.0Ce3	MAQ	MWQ	8.89	10.9	1.0	8.0	50	26.7	15.0
SMAJ8.0Ae3 / SMAJ8.0CAe3	MAR	MWR	8.89	9.83	1.0	8.0	50	29.4	13.6
SMAJ8.5e3 / SMAJ8.5Ce3	MAS	MWS	9.44	11.5	1.0	8.5	10	25.2	15.9
SMAJ8.5Ae3 / SMAJ8.5CAe3	MAT	MWT	9.44	10.4	1.0	8.5	10	27.8	14.4
SMAJ9.0e3 / SMAJ9.0Ce3	MAU	MWU	10.0	12.2	1.0	9.0	5.0	23.7	16.9
SMAJ9.0Ae3 / SMAJ9.0CAe3	MAV	MWV	10.0	11.1	1.0	9.0	5.0	26.0	15.4
SMAJ10e3 / SMAJ10Ce3	MAW	MWW	11.1	13.6	1.0	10	1.0	21.3	18.8
SMAJ10Ae3 / SMAJ10CAe3	MAX	MWX	11.1	12.3	1.0	10	1.0	23.5	17.0
SMAJ11e3 / SMAJ11Ce3	MAY	MWY	12.2	14.9	1.0	11	1.0	19.9	20.1
SMAJ11Ae3 / SMAJ11CAe3	MAZ	MWZ	12.2	13.5	1.0	11	1.0	22.0	18.2
SMAJ12e3 / SMAJ12Ce3	MBD	MXD	13.3	16.3	1.0	12	1.0	18.2	22.0
SMAJ12Ae3 / SMAJ12CAe3	MBE	MXE	13.3	14.7	1.0	12	1.0	20.1	19.9
SMAJ13e3 / SMAJ13Ce3	MBF	MXF	14.4	17.6	1.0	13	1.0	16.8	23.8
SMAJ13Ae3 / SMAJ13CAe3	MBG	MXG	14.4	15.9	1.0	13	1.0	18.6	21.5
SMAJ14e3 / SMAJ14Ce3	MBH	MXH	15.6	19.1	1.0	14	1.0	15.5	25.8
SMAJ14Ae3 / SMAJ14CAe3	MBK	MXK	15.6	17.2	1.0	14	1.0	17.2	23.2
SMAJ15e3 / SMAJ15Ce3	MBL	MXL	16.7	20.4	1.0	15	1.0	14.9	26.9
SMAJ15Ae3 / SMAJ15CAe3	MBM	MXM	16.7	18.5	1.0	15	1.0	16.4	24.4
SMAJ16e3 / SMAJ16Ce3	MBN	MXN	17.8	21.8	1.0	16	1.0	13.9	28.8
SMAJ16Ae3 / SMAJ16CAe3	MBP	MXP	17.8	19.7	1.0	16	1.0	15.4	26.0
SMAJ17e3 / SMAJ17Ce3	MBQ	MXQ	18.9	23.1	1.0	17	1.0	13.1	30.5
SMAJ17Ae3 / SMAJ17CAe3	MBR	MXR	18.9	20.9	1.0	17	1.0	14.5	27.6
SMAJ18e3 / SMAJ18Ce3	MBS	MXS	20.0	24.4	1.0	18	1.0	12.4	32.2
SMAJ18Ae3 / SMAJ18CAe3	MBT	MXT	20.0	22.1	1.0	18	1.0	13.7	29.2
SMAJ20e3 / SMAJ20Ce3	MBU	MXU	22.2	27.1	1.0	20	1.0	11.2	35.8
SMAJ20Ae3 / SMAJ20CAe3	MBV	MXV	22.2	24.5	1.0	20	1.0	12.3	32.4
SMAJ22e3 / SMAJ22Ce3	MBW	MXW	24.4	29.8	1.0	22	1.0	10.2	39.4
SMAJ22Ae3 / SMAJ22CAe3	MBX	MXX	24.4	26.9	1.0	22	1.0	11.3	35.5

(1) All ratings at 25°C unless specified otherwise

(2) V<sub>BR</sub> measured after I<sub>T</sub> applied for 300μs, I<sub>T</sub>=square wave pulse or equivalent

(3) Surge current waveform per Fig.3 and derated per Fig.2

(4) For bidirectional types with V<sub>WM</sub> of 10 volts and less, the I<sub>D</sub> limit is doubled

(5) For the bidirectional SMAJ5.0CA, the maximum V<sub>BR</sub> is 7.25V

**400W Transient Voltage Suppressor (TVS) protection device**
**Electrical characteristics (cont.)<sup>(1)</sup>**

DEVICE	Device marking code		BREAKDOWN VOLTAGE <sup>(2)</sup> , V <sub>BR</sub> V <sub>BR</sub> (V) @ I <sub>T</sub> (mA)		TEST CURRENT I <sub>T</sub> (mA)	STAND-OFF VOLTAGE V <sub>WM</sub> (V)	MAXIMUM STANDBY CURRENT <sup>(4)</sup> I <sub>D</sub> (μA) @ V <sub>WM</sub>	MAXIMUM PEAK PULSE CURRENT <sup>(3)</sup> I <sub>PP</sub> (A)	MAXIMUM CLAMPING VOLTAGE V <sub>C</sub> (V) @ I <sub>PP</sub>
	UNI	BI	Min	Max					
SMAJ24e3 / SMAJ24Ce3	MBY	MXY	26.7	32.6	1.0	24	1.0	9.3	43.0
SMAJ24Ae3 / SMAJ24CAe3	MBZ	MXZ	26.7	29.5	1.0	24	1.0	10.3	38.9
SMAJ26e3 / SMAJ26Ce3	MCD	MYD	28.9	35.3	1.0	26	1.0	8.6	46.6
SMAJ26Ae3 / SMAJ26CAe3	MCE	MYE	28.9	31.9	1.0	26	1.0	9.5	42.1
SMAJ28e3 / SMAJ28Ce3	MCF	MYF	31.1	38.0	1.0	28	1.0	8.0	50.0
SMAJ28Ae3 / SMAJ28CAe3	MCG	MYG	31.1	34.4	1.0	28	1.0	8.8	45.4
SMAJ30e3 / SMAJ30Ce3	MCH	MYH	33.3	40.7	1.0	30	1.0	7.5	53.5
SMAJ30Ae3 / SMAJ30CAe3	MCK	MYK	33.3	36.8	1.0	30	1.0	8.3	48.4
SMAJ33e3 / SMAJ33Ce3	MCL	MYL	36.7	44.9	1.0	33	1.0	6.8	59.0
SMAJ33Ae3 / SMAJ33CAe3	MCM	MYM	36.7	40.6	1.0	33	1.0	7.5	53.3
SMAJ36e3 / SMAJ36Ce3	MCN	MYN	40.0	48.9	1.0	36	1.0	6.2	64.3
SMAJ36Ae3 / SMAJ36CAe3	MCP	MYP	40.0	44.2	1.0	36	1.0	6.9	58.1
SMAJ40e3 / SMAJ40Ce3	MCQ	MYQ	44.4	54.3	1.0	40	1.0	5.6	71.4
SMAJ40Ae3 / SMAJ40CAe3	MCR	MYR	44.4	49.1	1.0	40	1.0	6.2	64.5
SMAJ43e3 / SMAJ43Ce3	MCS	MYS	47.8	58.4	1.0	43	1.0	5.2	76.7
SMAJ43Ae3 / SMAJ43CAe3	MCT	MYT	47.8	52.8	1.0	43	1.0	5.8	69.4
SMAJ45e3 / SMAJ45Ce3	MCU	MYU	50.0	61.1	1.0	45	1.0	5.0	80.3
SMAJ45Ae3 / SMAJ45CAe3	MCV	MYV	50.0	55.3	1.0	45	1.0	5.5	72.7
SMAJ48e3 / SMAJ48Ce3	MCW	MYW	53.3	65.1	1.0	48	1.0	4.7	85.5
SMAJ48Ae3 / SMAJ48CAe3	MCX	MYX	53.3	58.9	1.0	48	1.0	5.2	77.4
SMAJ51e3 / SMAJ51Ce3	MCY	MYY	56.7	69.3	1.0	51	1.0	4.4	91.1
SMAJ51Ae3 / SMAJ51CAe3	MCZ	MYZ	56.7	62.7	1.0	51	1.0	4.9	82.4
SMAJ54e3 / SMAJ54Ce3	MRD	MZD	60.0	73.3	1.0	54	1.0	4.2	96.3
SMAJ54Ae3 / SMAJ54CAe3	MRE	MZE	60.0	66.3	1.0	54	1.0	4.6	87.1
SMAJ58e3 / SMAJ58Ce3	MRF	MZF	64.4	78.7	1.0	58	1.0	3.9	103
SMAJ58Ae3 / SMAJ58CAe3	MRG	MZG	64.4	71.2	1.0	58	1.0	4.3	93.6
SMAJ60e3 / SMAJ60Ce3	MRH	MZH	66.7	81.5	1.0	60	1.0	3.7	107
SMAJ60Ae3 / SMAJ60CAe3	MRK	MZK	66.7	73.7	1.0	60	1.0	4.1	96.8
SMAJ64e3 / SMAJ64Ce3	MRL	MZL	71.1	86.9	1.0	64	1.0	3.5	114
SMAJ64Ae3 / SMAJ64CAe3	MRM	MZM	71.1	78.6	1.0	64	1.0	3.9	103
SMAJ70e3 / SMAJ70Ce3	MRN	MZN	77.8	95.1	1.0	70	1.0	3.2	125
SMAJ70Ae3 / SMAJ70CAe3	MRP	MZP	77.8	86.0	1.0	70	1.0	3.5	113
SMAJ75e3 / SMAJ75Ce3	MRQ	MZQ	83.3	102	1.0	75	1.0	3.0	134
SMAJ75Ae3 / SMAJ75CAe3	MRR	MZR	83.3	92.1	1.0	75	1.0	3.3	121
SMAJ78e3 / SMAJ78Ce3	MRS	MZS	86.7	106	1.0	78	1.0	2.9	139
SMAJ78Ae3 / SMAJ78CAe3	MRT	MZT	86.7	95.8	1.0	78	1.0	3.2	126
SMAJ85e3 / SMAJ85Ce3	MRU	MZU	94.4	115	1.0	85	1.0	2.0	151
SMAJ85Ae3 / SMAJ85CAe3	MRV	MZV	94.4	104	1.0	85	1.0	2.2	137

(1) All ratings at 25°C unless specified otherwise

(2) V<sub>BR</sub> measured after I<sub>T</sub> applied for 300μs, I<sub>T</sub>=square wave pulse or equivalent

(3) Surge current waveform per Fig.3 and derated per Fig.2

(4) For bidirectional types with V<sub>WM</sub> of 10 volts and less, the I<sub>D</sub> limit is doubled

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**Electrical characteristics (cont.)<sup>(1)</sup>**

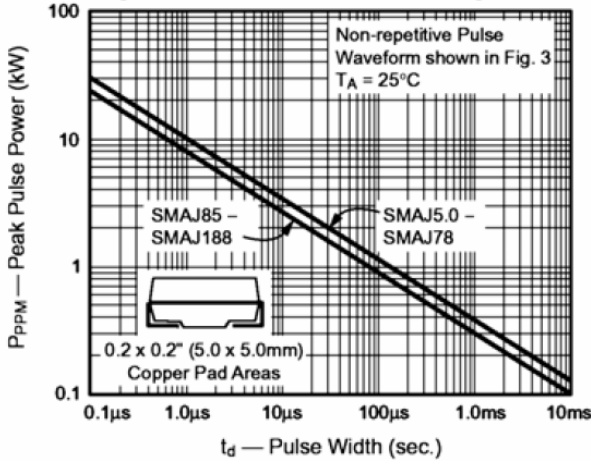
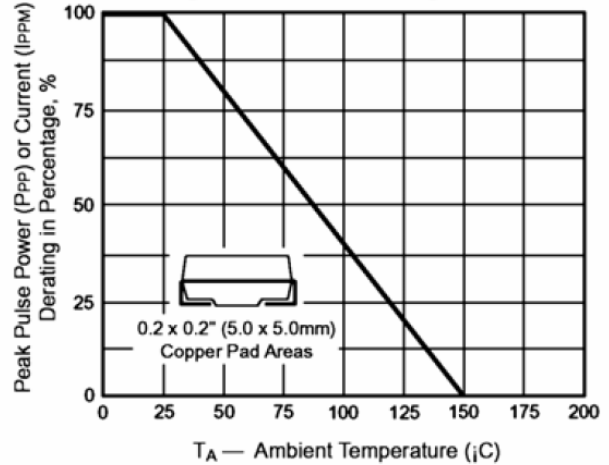
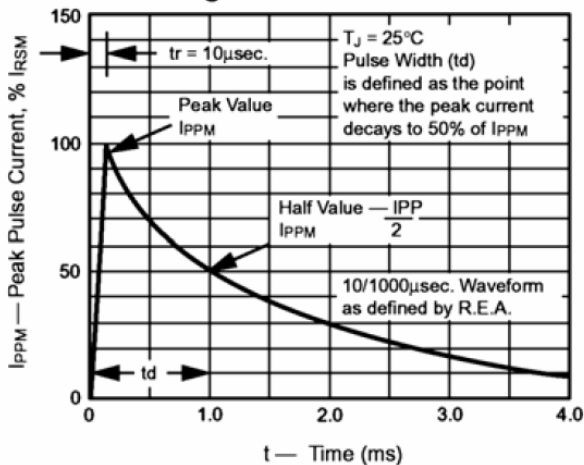
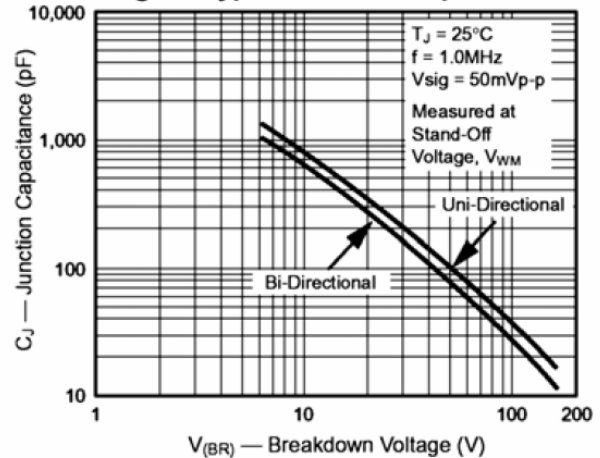
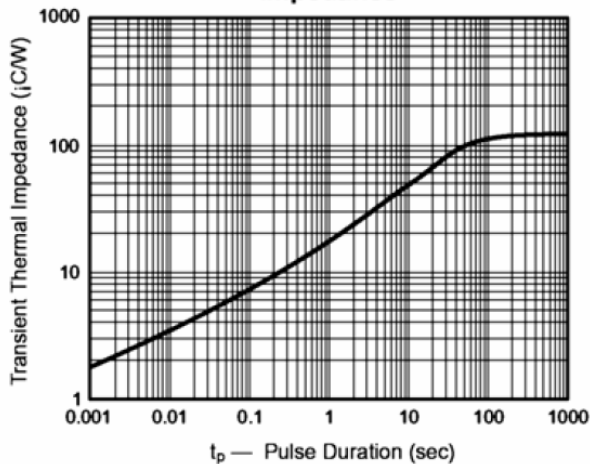
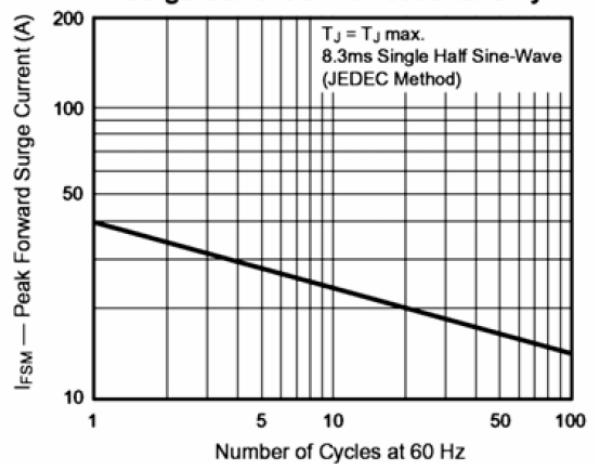
DEVICE	Device marking code		BREAKDOWN VOLTAGE <sup>(2)</sup> , V <sub>BR</sub> V <sub>BR</sub> (V) @ I <sub>T</sub> (mA)		TEST CURRENT I <sub>T</sub> (mA)	STAND-OFF VOLTAGE V <sub>WM</sub> (V)	MAXIMUM STANDBY CURRENT <sup>(4)</sup> I <sub>D</sub> (μA) @ V <sub>WM</sub>	MAXIMUM PEAK PULSE CURRENT <sup>(3)</sup> I <sub>PP</sub> (A)	MAXIMUM CLAMPING VOLTAGE V <sub>C</sub> (V) @ I <sub>PP</sub>
	UNI	BI	Min	Max					
SMAJ90e3 / SMAJ90Ce3	MRW	MZW	100	122	1.0	90	1.0	1.9	160
SMAJ90Ae3 / SMAJ90CAe3	MRX	MZX	100	111	1.0	90	1.0	2.1	146
SMAJ100e3 / SMAJ100Ce3	MRY	MZY	111	136	1.0	100	1.0	1.7	179
SMAJ100Ae3 / SMAJ100CAe3	MRZ	MZZ	111	123	1.0	100	1.0	1.9	162
SMAJ110e3 / SMAJ110Ce3	MSD	MVD	122	149	1.0	110	1.0	1.5	196
SMAJ110Ae3 / SMAJ110CAe3	MSE	MVE	122	135	1.0	110	1.0	1.7	177
SMAJ120e3 / SMAJ120Ce3	MSF	MVF	133	163	1.0	120	1.0	1.4	214
SMAJ120Ae3 / SMAJ120CAe3	MSG	MVG	133	147	1.0	120	1.0	1.6	193
SMAJ130e3 / SMAJ130Ce3	MSH	MVH	144	176	1.0	130	1.0	1.3	231
SMAJ130Ae3 / SMAJ130CAe3	MSK	MVK	144	159	1.0	130	1.0	1.4	209
SMAJ150e3 / SMAJ150Ce3	MSL	MVL	167	204	1.0	150	1.0	1.1	268
SMAJ150Ae3 / SMAJ150CAe3	MSM	MVM	167	185	1.0	150	1.0	1.2	243
SMAJ160e3 / SMAJ160Ce3	MSN	MVN	178	218	1.0	160	1.0	1.0	287
SMAJ160Ae3 / SMAJ160CAe3	MSP	MVP	178	197	1.0	160	1.0	1.2	259
SMAJ170e3 / SMAJ170Ce3	MSQ	MVQ	189	231	1.0	170	1.0	0.99	304
SMAJ170Ae3 / SMAJ170CAe3	MSR	MVR	189	209	1.0	170	1.0	1.09	275
SMAJ180Ae3 / SMAJ180CAe3	MST	MVT	201	222	1.0	180	1.0	1.4	292
SMAJ200Ae3 / SMAJ200CAe3	MSV	MVV	224	247	1.0	200	1.0	1.2	324
SMAJ220Ae3 / SMAJ220CAe3	MSX	MVX	246	272	1.0	220	1.0	1.1	356
SMAJ250Ae3 / SMAJ250CAe3	MSZ	MVZ	279	309	1.0	250	1.0	1.0	405
SMAJ300Ae3 / SMAJ300CAe3	MTE	MUE	335	371	1.0	300	1.0	0.8	486
SMAJ350Ae3 / SMAJ350CAe3	MTG	MUG	391	432	1.0	350	1.0	0.7	567
SMAJ400Ae3 / SMAJ400CAe3	MTK	MUK	447	494	1.0	400	1.0	0.6	648
SMAJ440Ae3 / SMAJ440CAe3	MTM	MUM	492	543	1.0	440	1.0	0.6	713

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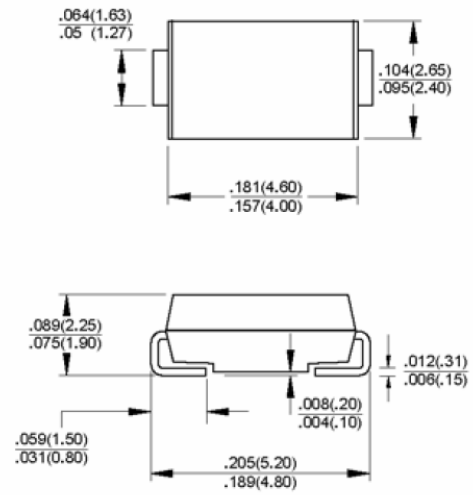
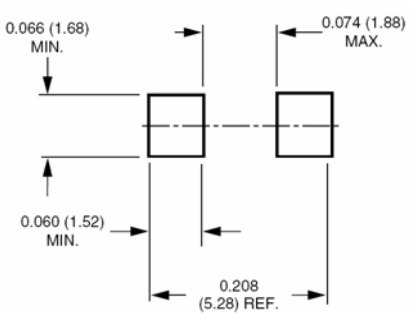

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(3) Surge current waveform per Fig.3 and derated per Fig.2

(4) For bidirectional types with V<sub>WM</sub> of 10 volts and less, the I<sub>D</sub> limit is doubled

**400W Transient Voltage Suppressor (TVS) protection device**
**Fig. 1 – Peak Pulse Power Rating Curve**

**Fig. 2 – Pulse Derating Curve**

**Fig. 3 – Pulse Waveform**

**Fig. 4 – Typical Junction Capacitance**

**Fig. 5 – Typical Transient Thermal Impedance**

**Fig. 6 - Maximum Non-Repetitive Forward Surge Current Uni-Directional Only**


**400W Transient Voltage Suppressor (TVS) protection device**
**Mechanical Characteristics**

Physical dimensions	Footprint dimensions	Package materials & information
 <p><b>Dimensions in inches and (millimeters)</b></p>		<p><b>Case :</b> Epoxy meets UL94V-0</p> <p><b>Electrode finish :</b> Matte Sn plating - fully RoHS compliant</p> <p><b>Terminals :</b> solderable per MIL-STD-750, Method 2026</p> <p><b>Marking code :</b> See electrical characteristics table and example below:</p> <div style="text-align: center; border: 1px solid black; width: fit-content; margin: 10px auto; padding: 5px;">  </div>

**POLARITY :** For unidirectional types the color band denotes the cathode, which is positive with respect to the anode under normal TVS operation.

**Ordering information**

Product order code	Package	Weight	Base qty	Delivery mode
<p><b>SMAJxxxxe3/TR13</b></p> <p>For example : SMAJ18CAe3/TR13 or SMAJ6.8Ae3/TR13</p>	<p>DO-214AC (SMA)</p>	<p>0.002oz. 0.064g</p>	<p>5000</p>	<p>Tape and reel (13 inch)</p>

Commercial Business Unit  
Microsemi Corporation

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Avenida Doutor Mario Soares  
Bank of China Building, 18/F, Unit D  
Macau SAR

Please refer to [www.microsemi.com](http://www.microsemi.com) for the terms and conditions of purchase