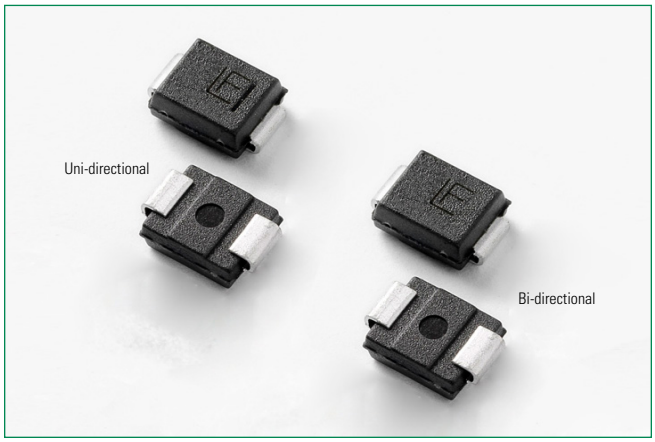
TPSMB Series
Surface Mount – 600W

AUTOMOTIVE GRADE HF RoHS



Agency Approvals

Agency	Agency Number
	E230531

Maximum Ratings & Thermal Characteristics
(T_A=25°C unless otherwise noted)

Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation by 10/1000µs waveform (Fig.1)(Note 1), (Note 2)	P_{PPM}	600	W
Power Dissipation on infinite heat sink at T_L=50°C	$P_{M(AV)}$	5.0	W
Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3)	I_{FSM}	100	A
Maximum Instantaneous Forward Voltage at 50A for Unidirectional only (Note 4)	V_F	3.5/5	V
Operating Junction Temperature Range (V_{BR}≤ 91V)	T_J	-65 to 175	°C
Operating Junction Temperature Range (V_{BR} > 91V)	T_J	-65 to 150	
Storage Temperature Range	T_{STG}	-65 to 175	
Typical Thermal Resistance Junction to Lead	$R_{\theta JL}$	20	°C/W
Typical Thermal Resistance Junction to Ambient	$R_{\theta JA}$	100	°C/W

Notes:
1. Non-repetitive current pulse, per Fig.4 and derated above T_A=25°C per Fig. 3.
2. Mounted on copper pad area of 0.2x0.2" (5.0 x 5.0mm) to each terminal.
3. Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional component only,duty cycle=4 per minute maximum.
4. VF < 3.5V for part number with Vbr < 300V, VF < 5.0V for part number with Vbr > =300V.

Description

The TPSMB series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

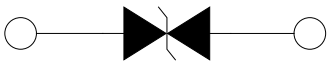
Features & Benefits

- High reliability application and automotive grade AEC Q101 qualified
- Surface mount component to optimize board space
- Low profile package
- Typical failure mode is short from over-specified voltage or current
- Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- ESD protection of data lines in accordance with IEC 61000-4-2 30kV(Air), 30kV (Contact)
- EFT protection of data lines in accordance with IEC 61000-4-4
- Glass passivated chip junction
- 600W PPPM (peak pulse power) capability at 10/1000µs waveform, repetition rate (duty cycles):0.01 %
- Fast response time: typically less than 1.0ns from 0V to V_{BR} min
- Excellent clamping capability
- Low incremental surge resistance
- Typical I_R ≤ 1µA for V_R>10.2V
- UL Recognized compound meeting flammability rating V-0
- Meet MSL level1, per J-STD-020, High temperature soldering guaranteed: 260°C/10 seconds at terminals
- Matte tin lead–free plated
- Halogen free and RoHS compliant
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal finish material is tin(Sn) (IPC/JEDEC J-STD-609A.01)
- Support active clamping (please see app. note "Littelfuse Using High Voltage TVS Diodes in IGBT active Clamp Applications" for futher details)

Applications

TVS components are ideal for the protection of I/O Interfaces, V_{CC} bus and other vulnerable circuits used in Automotive applications.

Functional Diagram



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Electrical Characteristics
(T_A=25°C unless otherwise noted)

Part Number (Uni)	Part Number (Bi)	Marking		Typical I_R @ 150°C (µA)	Reverse Stand off Voltage V_R (Volts)	Breakdown Voltage V_{BR} (Volts) @ I_T		Test Current I_T (mA)	Maximum Clamping Voltage V_C @ I_{PP} (V)	Maximum Peak Pulse Current I_{PP} (A)	Maximum Reverse Leakage I_R @ V_R (µA)	Maximum Temperature coefficient of V_{BR} (%/C)	Agency Approval
		Uni	Bi			Min	Max						
TPSMB7.5A	-	7V5AA	-	500	6.40	7.13	7.88	10	11.3	54.0	500	0.052	X
TPSMB8.2A	-	8V2AA	-	200	7.02	7.79	8.61	10	12.1	50.4	200	0.058	X
TPSMB9.1A	-	9V1AA	-	50	7.78	8.65	9.55	1	13.4	45.5	50	0.063	X
TPSMB10A	TPSMB10CA	10AA	10CA	20	8.55	9.50	10.50	1	14.5	42.1	10	0.066	X
TPSMB11A	TPSMB11CA	11AA	11CA	8	9.40	10.50	11.60	1	15.6	39.1	5	0.069	X
TPSMB12A	TPSMB12CA	12AA	12CA	8	10.20	11.40	12.60	1	16.7	36.5	5	0.071	X
TPSMB13A	TPSMB13CA	13AA	13CA	8	11.10	12.40	13.70	1	18.2	33.5	1	0.074	X
TPSMB15A	TPSMB15CA	15AA	15CA	8	12.80	14.30	15.80	1	21.2	28.8	1	0.076	X
TPSMB16A	TPSMB16CA	16AA	16CA	8	13.60	15.20	16.80	1	22.5	27.1	1	0.080	X
TPSMB18A	TPSMB18CA	18AA	18CA	8	15.30	17.10	18.90	1	25.5	24.2	1	0.083	X
TPSMB20A	TPSMB20CA	20AA	20CA	8	17.10	19.00	21.00	1	27.7	22.0	1	0.085	X
TPSMB22A	TPSMB22CA	22AA	22CA	8	18.80	20.90	23.10	1	30.6	19.9	1	0.088	X
TPSMB24A	TPSMB24CA	24AA	24CA	8	20.50	22.80	25.20	1	33.2	18.4	1	0.091	X
TPSMB27A	TPSMB27CA	27AA	27CA	8	23.10	25.70	28.40	1	37.5	16.3	1	0.092	X
TPSMB30A	TPSMB30CA	30AA	30CA	8	25.60	28.50	31.50	1	41.4	14.7	1	0.093	X
TPSMB33A	TPSMB33CA	33AA	33CA	8	28.20	31.40	34.70	1	45.7	13.3	1	0.094	X
TPSMB36A	TPSMB36CA	36AA	36CA	8	30.80	34.20	37.80	1	49.9	12.2	1	0.096	X
TPSMB39A	TPSMB39CA	39AA	39CA	8	33.30	37.10	41.00	1	53.9	11.3	1	0.097	X
TPSMB43A	TPSMB43CA	43AA	43CA	8	36.80	40.90	45.20	1	59.3	10.3	1	0.098	X
TPSMB47A	TPSMB47CA	47AA	47CA	8	40.20	44.70	49.40	1	64.8	9.4	1	0.099	X
TPSMB51A	TPSMB51CA	51AA	51CA	8	43.60	48.50	53.60	1	70.1	8.7	1	0.100	X
TPSMB56A	TPSMB56CA	56AA	56CA	8	47.80	53.20	58.80	1	77.0	7.9	1	0.101	X
TPSMB58A	TPSMB58CA	58AA	58CA	8	52.78	55.10	60.90	1	79.8	7.7	1	0.101	X
TPSMB62A	TPSMB62CA	62AA	62CA	8	53.00	58.90	65.10	1	85.0	7.2	1	0.102	X
TPSMB64A	TPSMB64CA	64AA	64CA	8	54.40	60.80	67.20	1	86.90	7.0	1	0.102	X
TPSMB68A	TPSMB68CA	68AA	68CA	8	58.10	64.60	71.40	1	92.0	6.6	1	0.103	X
TPSMB75A	TPSMB75CA	75AA	75CA	8	64.10	71.30	78.80	1	103.0	5.9	1	0.104	X
TPSMB82A	TPSMB82CA	82AA	82CA	8	70.10	77.90	86.10	1	113.0	5.4	1	0.105	X
TPSMB91A	TPSMB91CA	91AA	91CA	8	77.80	86.50	95.50	1	125.0	4.9	1	0.106	X
TPSMB100A	TPSMB100CA	100A	100C	-	85.50	95.00	105.00	1	137.0	4.5	1	0.106	X
TPSMB110A	TPSMB110CA	110A	110C	-	94.00	105.00	116.00	1	152.0	4.0	1	0.107	X
TPSMB120A	TPSMB120CA	120A	120C	-	102.00	114.00	126.00	1	165.0	3.7	1	0.107	X
TPSMB130A	TPSMB130CA	130A	130C	-	111.00	124.00	137.00	1	179.0	3.4	1	0.107	X
TPSMB150A	TPSMB150CA	150A	150C	-	128.00	143.00	158.00	1	207.0	2.9	1	0.108	X
TPSMB160A	TPSMB160CA	160A	160C	-	136.00	152.00	168.00	1	219.0	2.8	1	0.108	X
TPSMB170A	TPSMB170CA	170A	170C	-	145.00	162.00	179.00	1	234.0	2.6	1	0.108	X
TPSMB180A	TPSMB180CA	180A	180C	-	154.00	171.00	189.00	1	246.0	2.5	1	0.108	X
TPSMB200A	TPSMB200CA	200A	200C	-	171.00	190.00	210.00	1	274.0	2.2	1	0.108	X
TPSMB210A	TPSMB210CA	210A	210C	-	179.60	199.50	220.50	1	288.0	2.1	1	0.110	X
TPSMB219A	-	219A	-	23	187.00	210.00	228.00	1	300.0	2.0	1	0.110	X
TPSMB220A	TPSMB220CA	220A	220C	-	185.00	209.00	231.00	1	328.0	1.9	1	0.110	X
TPSMB250A	TPSMB250CA	250A	250C	-	214.00	237.00	263.00	1	344.0	1.8	1	0.110	X
TPSMB300A-A	TPSMB300CA-A	300A	300C	-	256.00	285.00	315.00	1	414.0	1.5	1	0.110	X
TPSMB350A-A	TPSMB350CA-A	350A	350C	-	300.00	332.00	368.00	1	482.0	1.3	1	0.112	X
TPSMB400A-A	TPSMB400CA-A	400A	400C	-	342.00	380.00	420.00	1	548.0	1.1	1	0.112	X
TPSMB440A-A	TPSMB440CA-A	440A	440C	-	376.00	418.00	462.00	1	602.0	1.0	1	0.112	X
TPSMB480A-A	TPSMB480CA-A	480A	480C	-	408.00	456.00	504.00	1	658.0	0.9	1	0.112	X
TPSMB510A-A	TPSMB510CA-A	510A	510C	-	434.00	485.00	535.00	1	698.0	0.9	1	0.112	X
TPSMB520A-A	TPSMB520CA-A	520A	520C	-	443.00	494.50	545.50	1	718.0	0.9	1	0.112	X
TPSMB530A-A	TPSMB530CA-A	530A	530C	-	451.00	503.50	556.50	1	725.0	0.8	1	0.112	X
TPSMB540A-A	TPSMB540CA-A	540A	540C	-	460.00	513.00	567.00	1	740.0	0.8	1	0.112	X
TPSMB550A-A	TPSMB550CA-A	550A	550C	-	468.00	522.50	577.50	1	760.0	0.8	1	0.112	X
-	TPSMB600CA-A	-	600C	-	511.00	570.00	630.00	1	828.0	0.8	1	0.112	-
-	TPSMB650CA-A	-	650C	-	553.00	617.50	682.50	1	897.0	0.8	1	0.112	-

Note:
1. For bidirectional type having V_R of 10 volts and less, the I_R limit is double.
2. V_{BR} @T_J= V_{BR}@25°C x (1+**α**T x (T_J - 25)) (**α**T:Temperature Coefficient).
3: The CTI (Comparative Tracking Index) of TPSMB600CA-A and TPSMB650CA-A is 600 and other parts is 550

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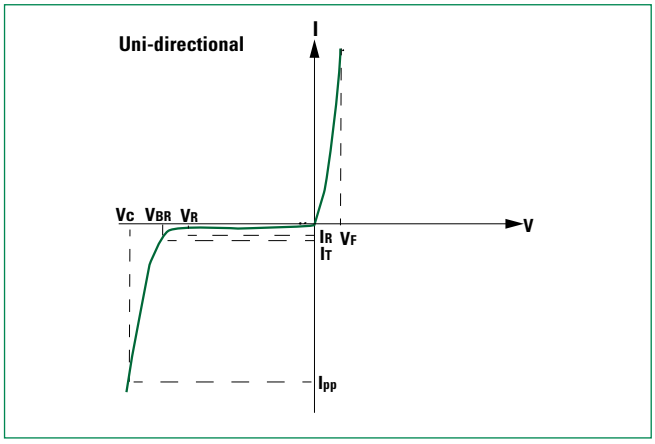
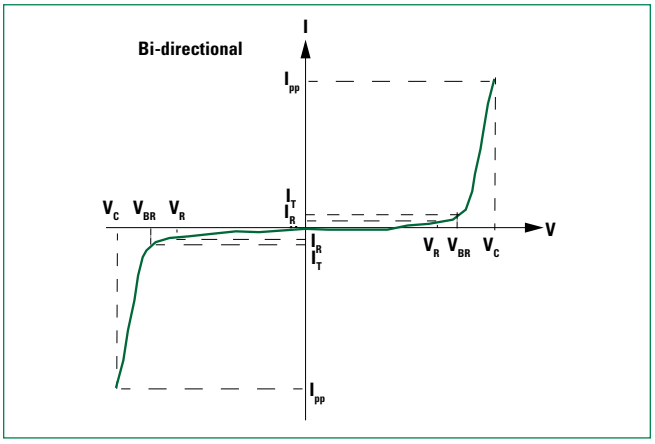
I-V Curve Characteristics





P_{PPM} Peak Pulse Power Dissipation – Max power dissipation
V_R Stand-off Voltage – Maximum voltage that can be applied to the TVS without operation
V_{BR} Breakdown Voltage – Maximum voltage that flows though the TVS at a specified test current (I_T)
V_C Clamping Voltage – Peak voltage measured across the TVS at a specified Ippm (peak impulse current)
I_R Reverse Leakage Current -- Current measured at V_R
V_F Forward Voltage Drop for Uni-directional

Ratings and Characteristic Curves
(T_A=25°C unless otherwise noted)

Figure 1 - TVS Transients Clamping Waveform

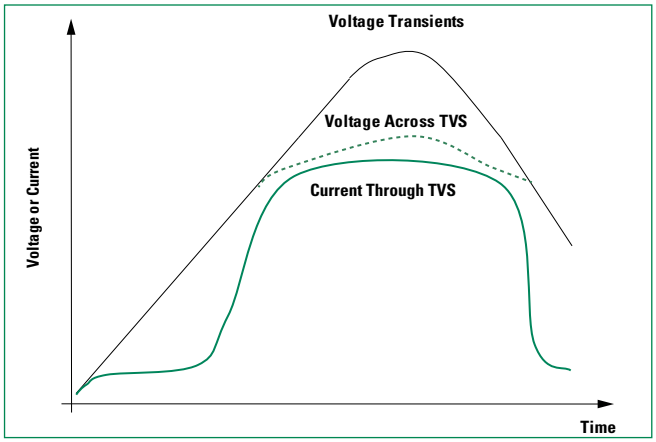


Figure 2 - Peak Pulse Power Rating Curve

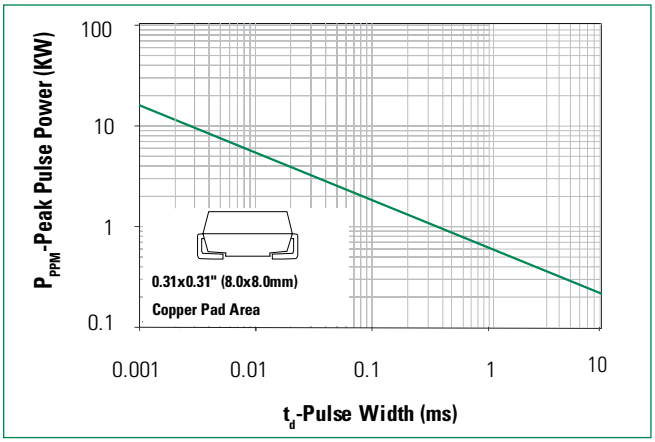


Figure 3 - Peak Pulse Power Derating Curve

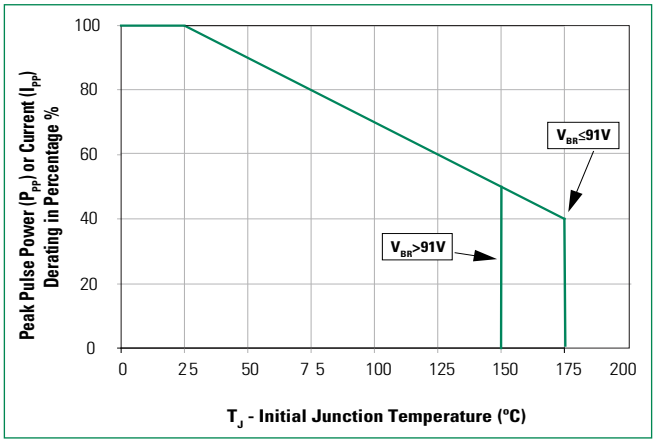


Figure 4 - Pulse Waveform

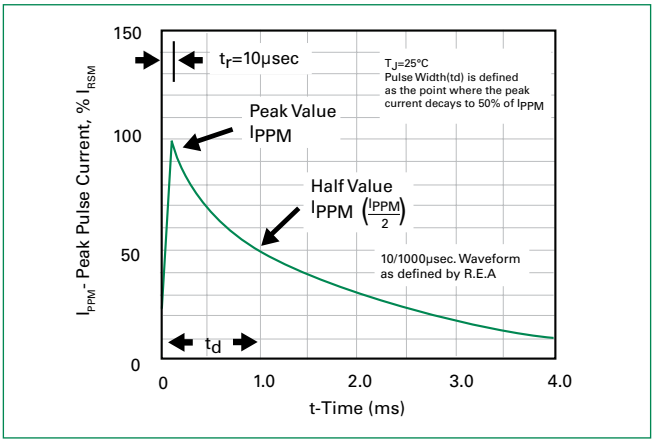


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Figure 5 - Typical Junction Capacitance

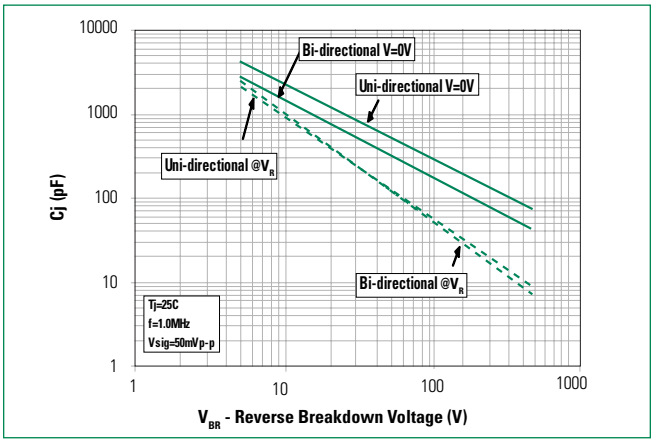
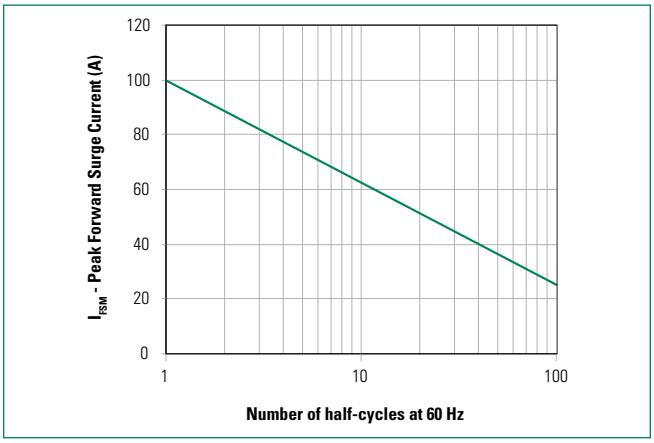
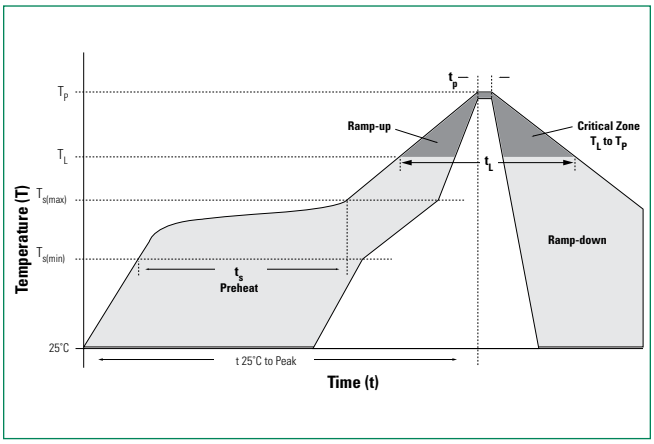


Figure 6 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only



Soldering Parameters

Reflow Condition		Lead–free assembly
Pre Heat	**- Temperature Min ($T_{s(min)}$)**	150°C
	- Temperature Max ($T_{s(max)}$)	200°C
	- Time (min to max) (t_s)	60 – 120 secs
Average ramp up rate (Liquidus Temp (T_L) to peak		3°C/second max
$T_{S(max)}$ to T_L - Ramp-up Rate		3°C/second max
Reflow	**- Temperature (T_L) (Liquidus)**	217°C
	- Time (min to max) (t_s)	60 – 150 seconds
Peak Temperature (T_P)		$260^{+0/-5}$ °C
Time within 5°C of actual peak Temperature (t_p)		30 seconds max
Ramp-down Rate		6°C/second max
Time 25°C to peak Temperature (T_P)		8 minutes max.
Do not exceed		260°C



Physical Specifications

Weight	0.003 ounce, 0.093 gram
Case	JEDEC DO214AA. Molded plastic body over glass passivated junction
Polarity	Color band denotes cathode for unidirectional components.
Terminal	Matte Tin-plated leads, Solderable per JESD22-B102

Environmental Specifications

High Temp. Storage	JESD22-A103
HTRB	JESD22-A108
Temperature Cycling	JESD22-A104
MSL	JEDEC-J-STD-020, Level 1
H3TRB	JESD22-A101
RSH	JESD22-A111

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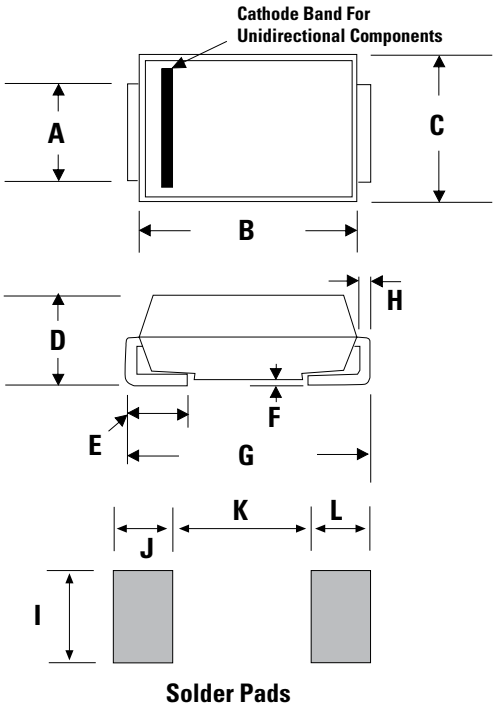
Dimensions

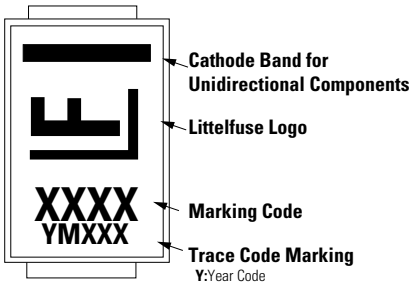
DO-214AA (SMB J-Bend)



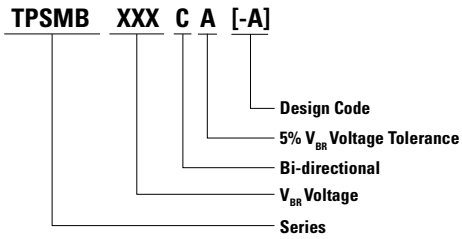
Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	0.077	0.086	1.950	2.200
B	0.160	0.180	4.060	4.570
C	0.130	0.155	3.300	3.940
D	0.084	0.096	2.130	2.440
E	0.030	0.060	0.760	1.520
F	-	0.008	-	0.203
G	0.205	0.220	5.210	5.590
H	0.006	0.012	0.152	0.305
I	0.089	-	2.260	-
J	0.085	-	2.160	-
K	-	0.107	-	2.740
L	0.085	-	2.160	-

Note: Dimension in inches and (millimeters)

Part Marking System



Part Numbering System



Packaging

Part Number	Component Package	Quantity	Packaging Option	Packaging Specification
TPSMBxxxXX	DO-214AA	3000	Tape & Reel - 12mm tape/13" reel	EIA STD RS-481

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Tape and Reel Specification