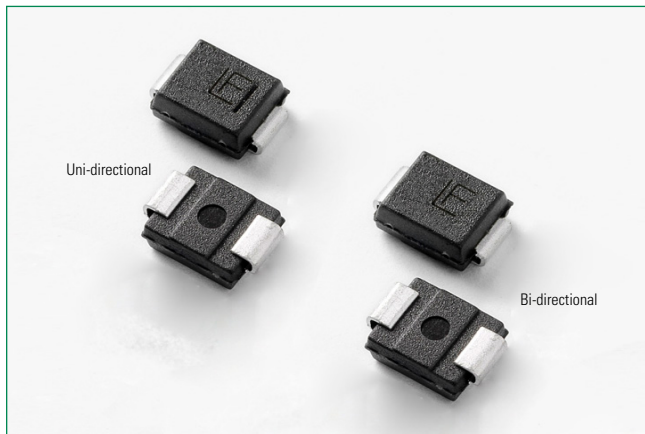


# TPSMB Series

## Surface Mount – 600W



### Agency Approvals

Agency	Agency Number
	E230531

### Maximum Ratings & Thermal Characteristics ( $T_A=25^{\circ}\text{C}$ unless otherwise noted)

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

#### Notes:

- Non-repetitive current pulse, per Fig.4 and derated above  $T_A=25^{\circ}\text{C}$  per Fig. 3.
- Mounted on copper pad area of 0.2x0.2" (5.0 x 5.0mm) to each terminal.
- Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional component only, duty cycle=4 per minute maximum.
- $V_F < 3.5\text{V}$  for part number with  $V_{\text{BR}} < 300\text{V}$ ,  $V_F < 5.0\text{V}$  for part number with  $V_{\text{BR}} > 300\text{V}$ .

## Description

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

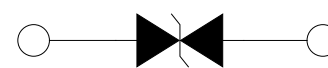
## Features & Benefits

- 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 PPM (peak pulse power) capability at 10/1000 $\mu\text{s}$  waveform, repetition rate (duty cycles):0.01%
- Fast response time: typically less than 1.0ns from 0V to  $V_{\text{BR}}$  min
- Excellent clamping capability
- Low incremental surge resistance
- Typical  $I_{\text{R}} \leq 1\mu\text{A}$  for  $V_{\text{R}} > 10.2\text{V}$
- 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 further details)

## Applications

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

### Functional Diagram



Bi-directional




Uni-directional

# TPSMB Series

## Surface Mount – 600W

### Electrical Characteristics

( $T_A = 25^\circ\text{C}$  unless otherwise noted)

Part Number (Uni)	Part Number (Bi)	Marking		Typical $I_R$ @ $150^\circ\text{C}$ ( $\mu\text{A}$ )	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 $I_R$ @ $V_R$ ( $\mu\text{A}$ )	Maximum Temperature coefficient of $V_{BR}$ (%/C)	Agency Approval 
		Uni	Bi			Min	Max						
TPSMB75A	-	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	-

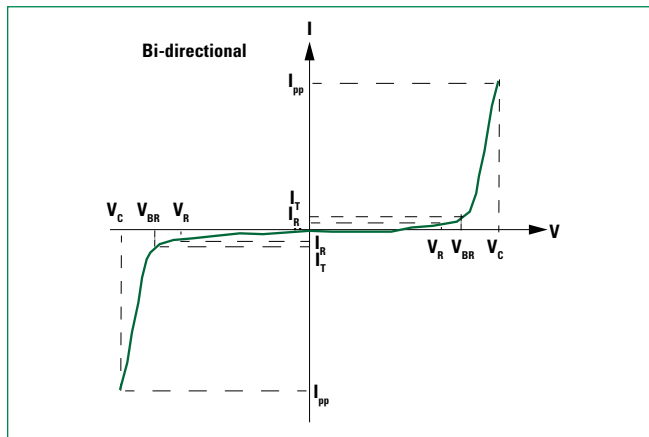
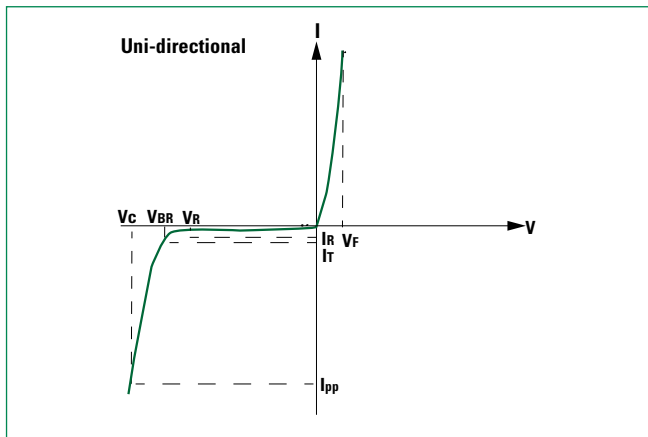
**Note:**

- For bidirectional type having  $V_R$  of 10 volts and less, the  $I_R$  limit is double.
- $V_{BR} @ T_A = V_{BR} @ 25^\circ\text{C} \times (1 + \alpha T \times (T_A - 25))$  ( $\alpha T$ : Temperature Coefficient).
- The CTI (Comparative Tracking Index) of TPSMB600CA-A and TPSMB650CA-A is 600 and other parts is 550

# TPSMB Series

## Surface Mount – 600W

### 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 thogh the TVS at a specified test current ( $I_T$ )

**$V_C$  Clamping Voltage** – Peak voltage measured across the TVS at a specified  $I_{ppm}$  (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

( $T_A=25^\circ\text{C}$  unless otherwise noted)

Figure 1 - TVS Transients Clamping Waveform

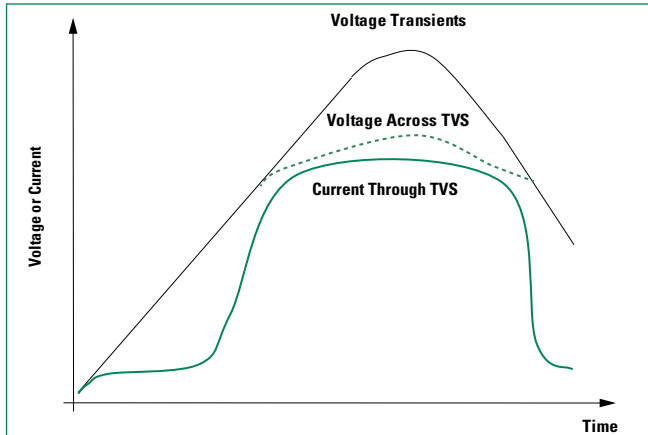


Figure 3 - Peak Pulse Power Derating Curve

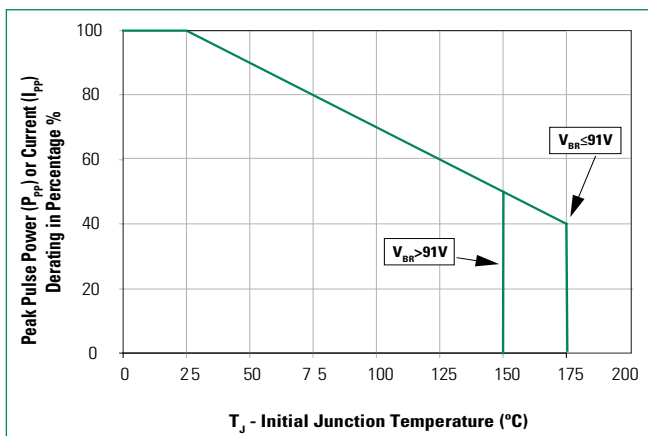


Figure 2 - Peak Power Rating Curve

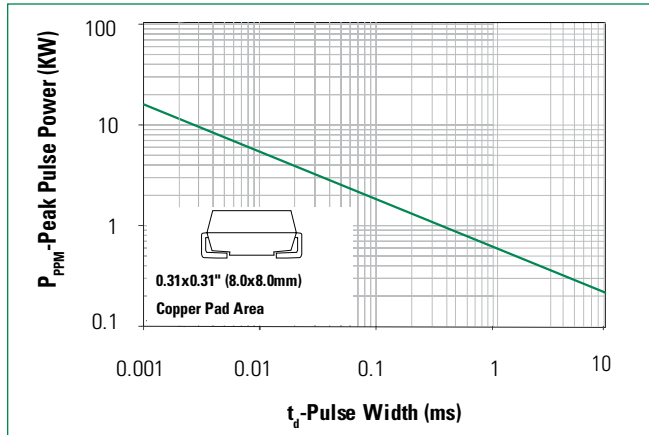
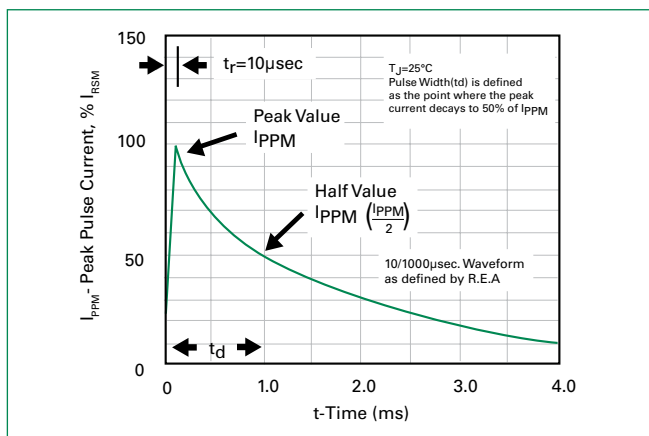


Figure 4 - Pulse Waveform



# TPSMB Series

## Surface Mount – 600W

Figure 5 - Typical Junction Capacitance

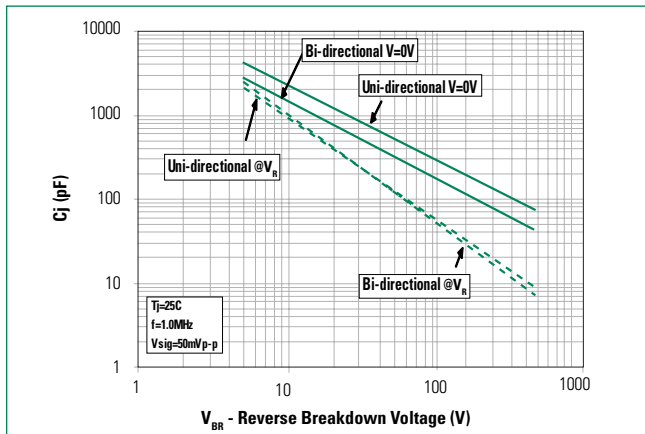
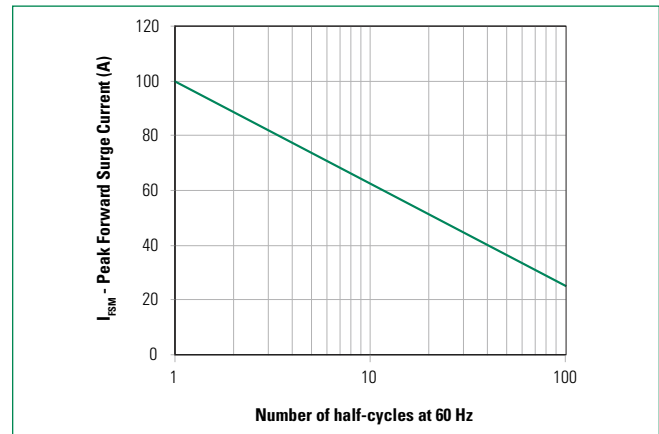
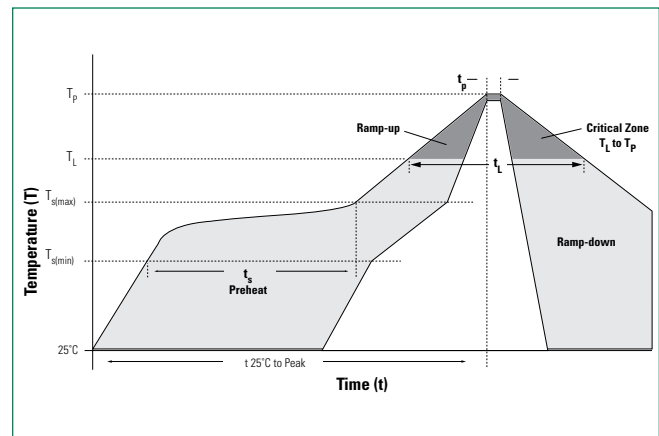


Figure 6 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only



### Soldering Parameters

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



### Physical Specifications

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

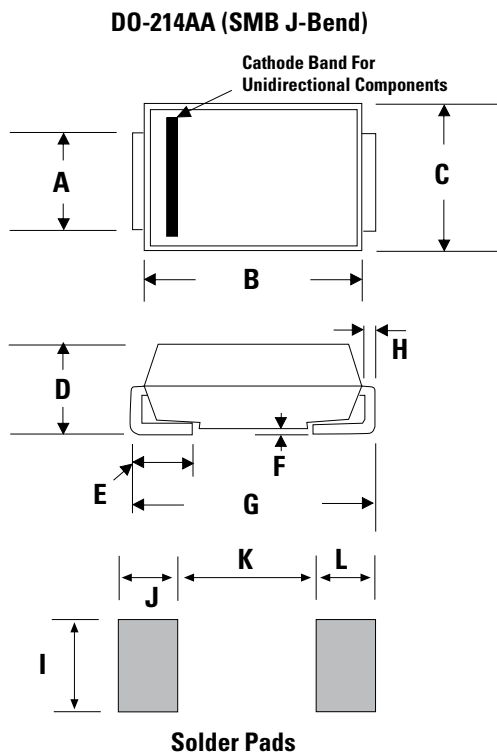
### Environmental Specifications

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

# TPSMB Series

## Surface Mount – 600W

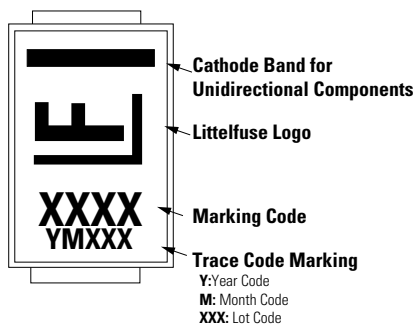
### Dimensions



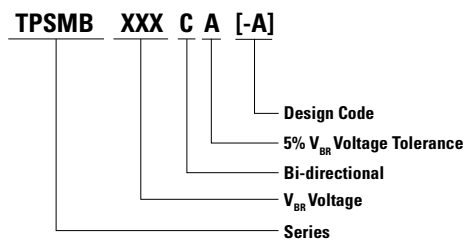
Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	0.077	0.086	1.950	2.200
B	0.160	0.180	4.060	4.570
C	0.130	0.155	3.300	3.940
D	0.084	0.096	2.130	2.440
E	0.030	0.060	0.760	1.520
F	-	0.008	-	0.203
G	0.205	0.220	5.210	5.590
H	0.006	0.012	0.152	0.305
I	0.089	-	2.260	-
J	0.085	-	2.160	-
K	-	0.107	-	2.740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

Note: Dimension in inches and (millimeters)

### Part Marking System



### Part Numbering System



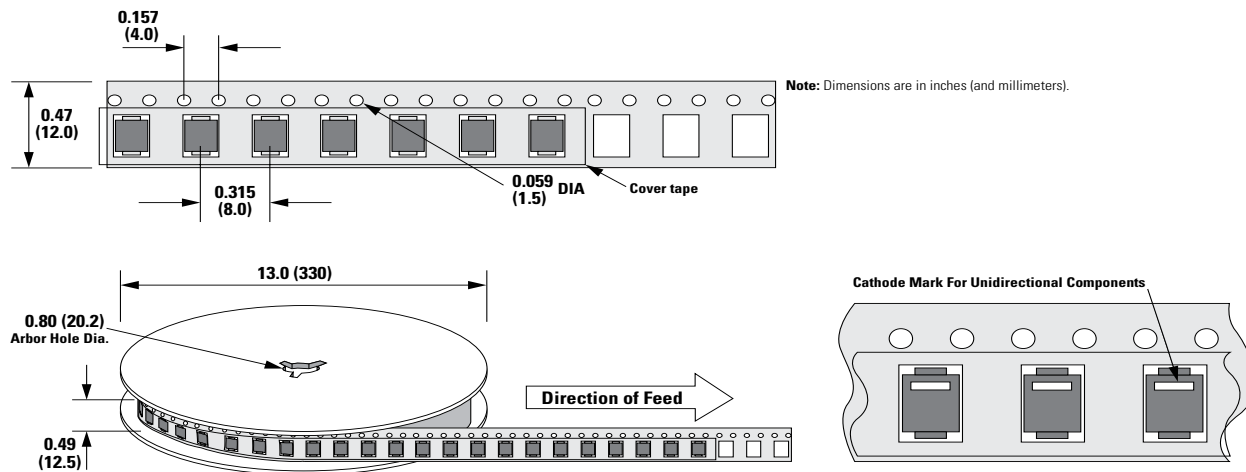
### Packaging

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

# TPSMB Series

## Surface Mount – 600W

### Tape and Reel Specification



**Disclaimer Notice** - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at [www.littelfuse.com/disclaimer-electronics](http://www.littelfuse.com/disclaimer-electronics).