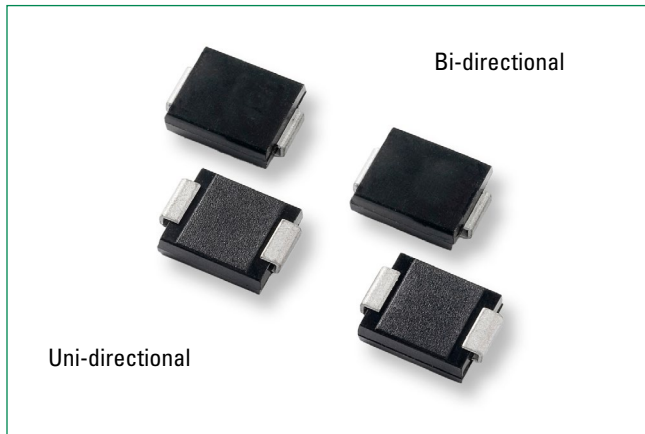


# TPSMD Series

## Surface Mount – 3000W



### Web Resources



Download ECAD models, order samples, and find technical resources at [www.littelfuse.com/tpsmd](http://www.littelfuse.com/tpsmd)

### Agency Approvals

Agency	Agency File Number
	E230531

### Maximum Ratings and Thermal Characteristics

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

Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation at $T_A=25^\circ\text{C}$ by 10/1000 $\mu\text{s}$ Waveform (Fig.2) (Note 1), (Note 2)	$P_{PPM}$	3000	W
Power Dissipation on Infinite Heat Sink at $T_A=50^\circ\text{C}$	$P_{M(AV)}$	6.5	W
Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3)	$I_{FSM}$	300	A
Maximum Instantaneous Forward Voltage at 100A for Unidirectional Only	$V_F$	3.5	V
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-65 to 150	$^\circ\text{C}$
Typical Thermal Resistance Junction to Lead	$R_{\theta JL}$	15	$^\circ\text{C/W}$
Typical Thermal Resistance Junction to Ambient	$R_{\theta JA}$	75	$^\circ\text{C/W}$

#### Notes:

1. Non-repetitive current pulse, per Fig. 4 and derated above  $T_A = 25^\circ\text{C}$  per Fig. 3.
2. Mounted on copper pad area of 0.31x0.31" (8.0 x 8.0mm) to each terminal.
3. Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional device only, duty cycle=4 per minute maximum.



### Description

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

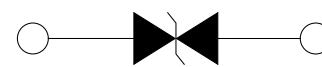
### Features & Benefits

- Hi reliability application and automotive grade AEC-Q101 qualified
- SMT for minimal board footprint
- 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
- IEC-61000-4-2 ESD 30kV(Air), 30kV (Contact)
- EFT protection of data lines in accordance with IEC 61000-4-4
- Built-in strain relief
- $V_{BR} @ T_J = V_{BR} @ 25^\circ\text{C} \times (1 + \alpha_T \times (T_J - 25))$  ( $\alpha_T$ : Temperature Coefficient)
- Glass passivated chip junction
- 3000W peak pulse power capability at 10/1000 $\mu\text{s}$  waveform, repetition rate (duty cycles):0.01%
- Fast response time: typically less than 1.0ps from 0V to  $V_{BR}$  min
- Excellent clamping capability
- Low incremental surge resistance
- Typical  $I_R \leq 2\mu\text{A}$  for  $V_R > 10\text{V}$
- High temperature soldering guaranteed: 260 $^\circ\text{C}$ /10 seconds at terminals
- UL Recognized compound meeting flammability rating V-0.
- Meet MSL level1, per J-STD-020, high temperature soldering guaranteed.
- 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)

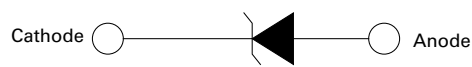
### Applications

TVS Components are ideal for the protection of I/O Interfaces,  $V_{CC}$  bus and other vulnerable circuits used in Telecom, Computer, Industrial and Consumer electronic applications.

### Functional Diagram



Bi-directional




Uni-directional

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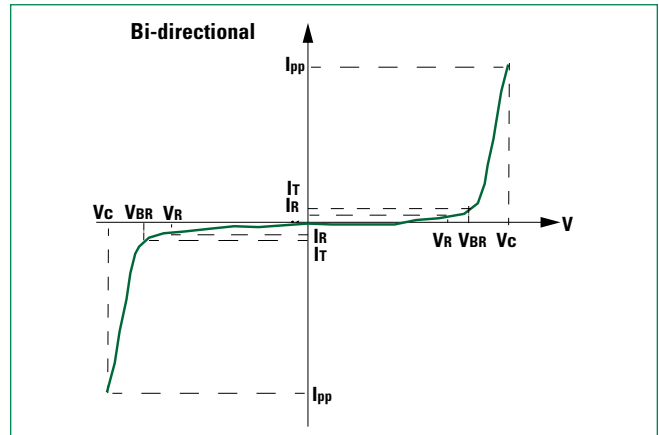
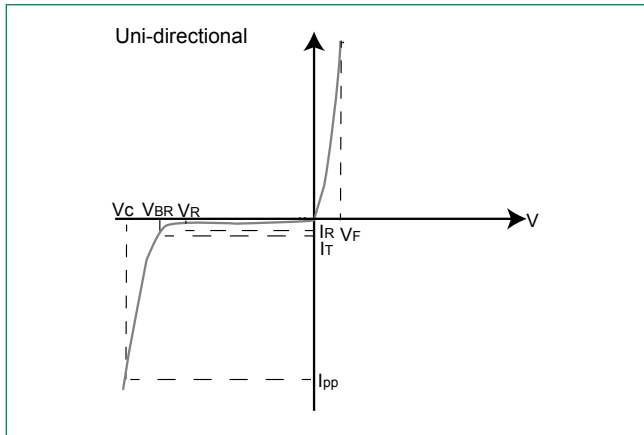
### Electrical Characteristics

Part Number (Uni)	Part Number (Bi)	Marking		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 $I_R$ @ $V_R$ ( $\mu$ A)	Agency Approval 
		UNI	BI		MIN	MAX					
TPSMD10A	TPSMD10CA	PDXA	DDXA	10.0	11.10	12.30	1	17.0	176.5	5	X
TPSMD11A	TPSMD11CA	PDZA	DDZA	11.0	12.20	13.50	1	18.2	164.8	2	X
TPSMD12A	TPSMD12CA	PEEA	DEEA	12.0	13.30	14.70	1	19.9	150.8	2	X
TPSMD13A	TPSMD13CA	PEGA	DEGA	13.0	14.40	15.90	1	21.5	139.5	2	X
TPSMD14A	TPSMD14CA	PEKA	DEKA	14.0	15.60	17.20	1	23.2	129.3	2	X
TPSMD15A	TPSMD15CA	PEMA	DEMA	15.0	16.70	18.50	1	24.4	123.0	2	X
TPSMD16A	TPSMD16CA	PEPA	DEPA	16.0	17.80	19.70	1	26.0	115.4	2	X
TPSMD17A	TPSMD17CA	PERA	DERA	17.0	18.90	20.90	1	27.6	108.7	2	X
TPSMD18A	TPSMD18CA	PETA	DETA	18.0	20.00	22.10	1	29.2	102.7	2	X
TPSMD20A	TPSMD20CA	PEVA	DEVA	20.0	22.20	24.50	1	32.4	92.6	2	X
TPSMD22A	TPSMD22CA	PEXA	DEXA	22.0	24.40	26.90	1	35.5	84.5	2	X
TPSMD24A	TPSMD24CA	PEZA	DEZA	24.0	26.70	29.50	1	38.9	77.1	2	X
TPSMD26A	TPSMD26CA	PFEA	DFEA	26.0	28.90	31.90	1	42.1	71.3	2	X
TPSMD28A	TPSMD28CA	PFGA	DFGA	28.0	31.10	34.40	1	45.4	66.1	2	X
TPSMD30A	TPSMD30CA	PFKA	DFKA	30.0	33.30	36.80	1	48.4	62.0	2	X
TPSMD33A	TPSMD33CA	PFMA	DFMA	33.0	36.70	40.60	1	53.3	56.3	2	X
TPSMD36A	TPSMD36CA	PFPA	DFPA	36.0	40.00	44.20	1	58.1	51.6	2	X
TPSMD40A	TPSMD40CA	PFRA	DFRA	40.0	44.40	49.10	1	64.5	46.5	2	X
TPSMD43A	TPSMD43CA	PFTA	DFTA	43.0	47.80	52.80	1	69.4	43.2	2	X
TPSMD45A	TPSMD45CA	PFVA	DFVA	45.0	50.00	55.30	1	72.7	41.3	2	X
TPSMD48A	TPSMD48CA	PFXA	DFXA	48.0	53.30	58.90	1	77.4	38.8	2	X
TPSMD51A	TPSMD51CA	PFZA	DFZA	51.0	56.70	62.70	1	82.4	36.4	2	X
TPSMD54A	TPSMD54CA	RGEA	DGEA	54.0	60.00	66.30	1	87.1	34.4	2	X
TPSMD58A	TPSMD58CA	PGGA	DGGA	58.0	64.40	71.20	1	93.6	32.1	2	X
TPSMD60A	TPSMD60CA	PGKA	DGKA	60.0	66.70	73.70	1	96.8	31.0	2	X
TPSMD64A	TPSMD64CA	PGMA	DGMA	64.0	71.10	78.60	1	103.0	29.1	2	X
TPSMD70A	TPSMD70CA	PGPA	DGPA	70.0	77.80	86.00	1	113.0	26.5	2	X
TPSMD75A	TPSMD75CA	PGRA	DGRA	75.0	83.30	92.10	1	121.0	24.8	2	X
TPSMD78A	TPSMD78CA	PGTA	DGTA	78.0	86.70	95.80	1	126.0	23.8	2	X
TPSMD85A	TPSMD85CA	PGVA	DGVA	85.0	94.40	104.00	1	137.0	21.9	2	X
TPSMD90A	TPSMD90CA	PGXA	DGXA	90	100.00	111.00	1	146.0	20.5	2	x
TPSMD100A	TPSMD100CA	PGZA	DGZA	100	111.00	123.00	1	162.0	18.5	2	x
TPSMD110A	TPSMD110CA	PHEA	DHEA	110	122.00	135.00	1	177.0	16.9	2	x
TPSMD120A	TPSMD120CA	PHGA	DHGA	120	133.00	147.00	1	193.0	15.5	2	x
TPSMD130A	TPSMD130CA	PHKA	DHKA	130	144.00	159.00	1	209.0	14.4	2	x
TPSMD150A	TPSMD150CA	PHMA	DHMA	150	167.00	185.00	1	243.0	12.3	2	x
TPSMD160A	TPSMD160CA	PHPA	DHPA	160	178.00	197.00	1	259.0	11.6	2	x
TPSMD170A	TPSMD170CA	PHRA	DHRA	170	189.00	209.00	1	275.0	10.9	2	x
-	TPSMD400CA-A	-	PGCA	400.0	447.00	494.00	1	658.0	4.7	2	X

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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 ( $I_r$ )
- $V_c$  Clamping Voltage** – Peak voltage measured across the suppressor 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

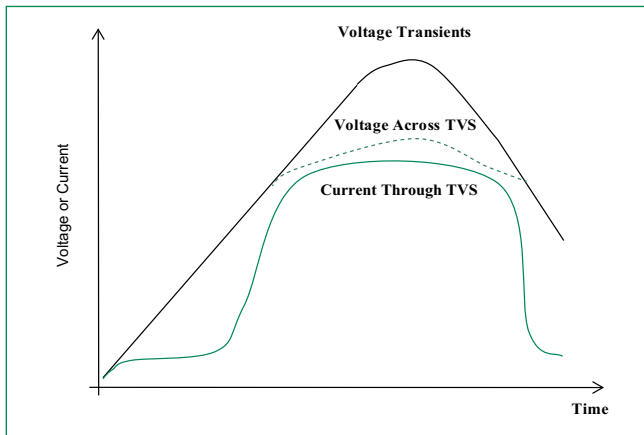
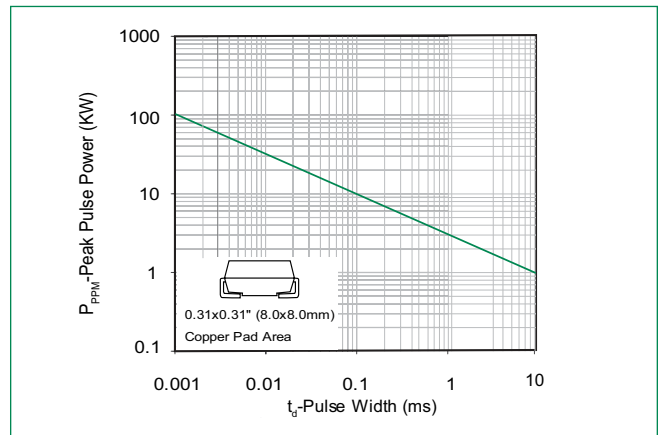


Figure 2 - Peak Pulse Power Rating



continues on next page.

# TPSMD Series

## Surface Mount – 3000W

### Ratings and Characteristic Curves ( $T_A=25^\circ\text{C}$ unless otherwise noted) (Continued)

Figure 3 - Peak Pulse Power or Current Derating Curve vs Initial Junction Temperature

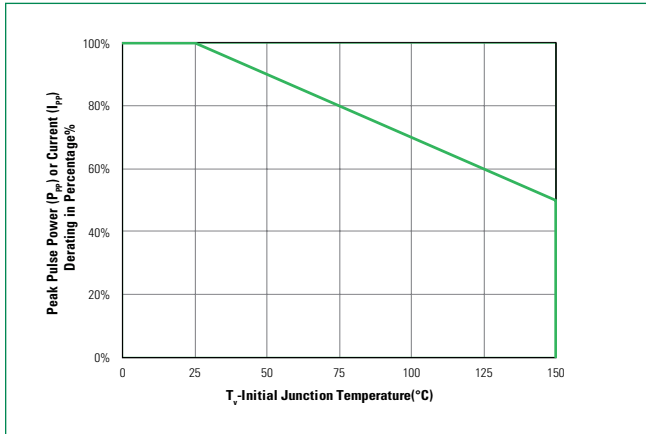


Figure 4 - Pulse Waveform

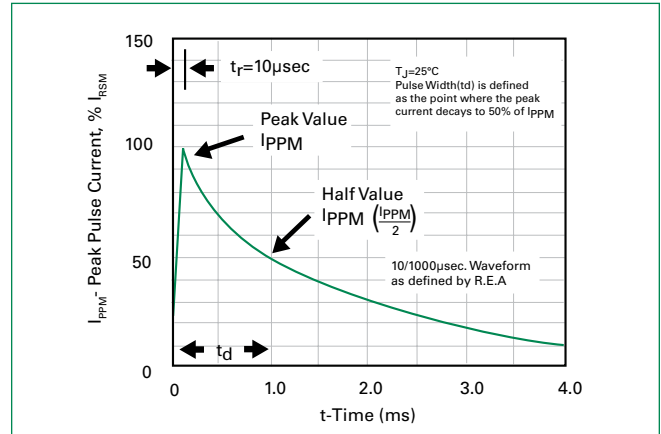


Figure 5 - Typical Junction Capacitance

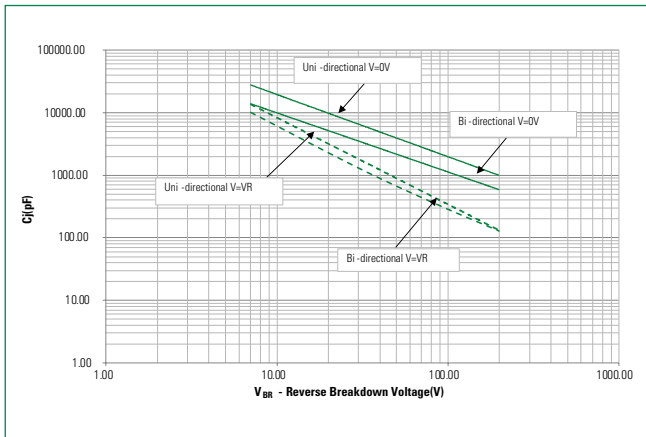


Figure 6 - Steady State Power Derating Curve

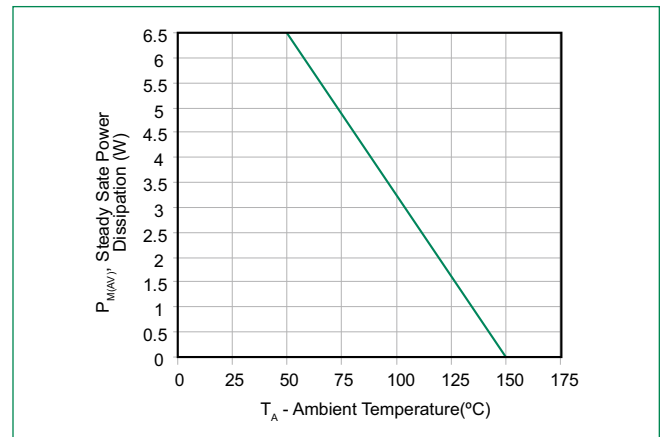
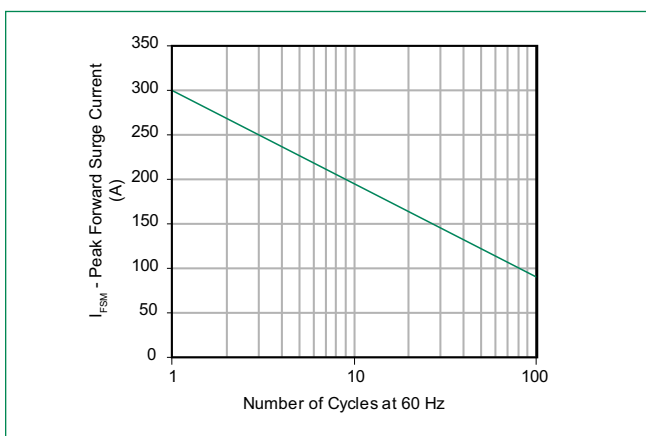


Figure 7 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional only

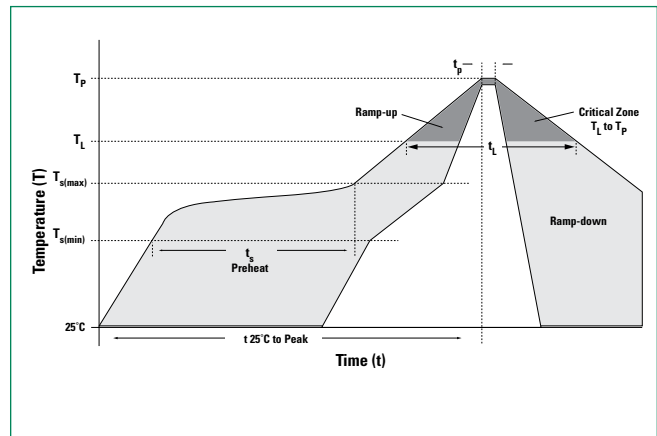


# TPSMD Series

## Surface Mount – 3000W

### 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



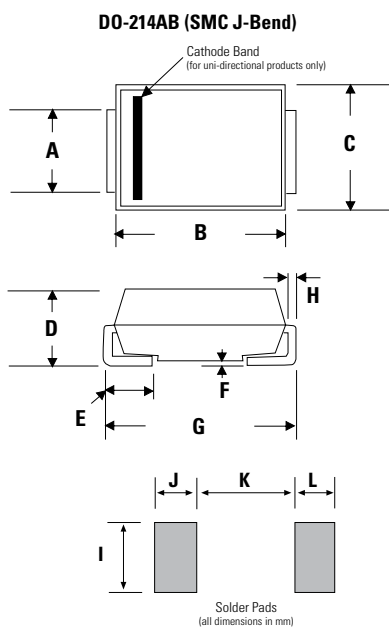
### Physical Specifications

<b>Weight</b>	0.007 ounce, 0.21 grams
<b>Case</b>	JEDEC DO214AB. Molded plastic body over glass passivated junction
<b>Polarity</b>	Color band denotes positive end (cathode) except Bidirectional.
<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-B106

### Dimensions

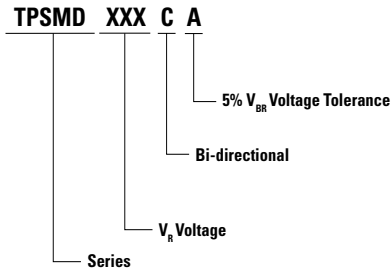


Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	0.114	0.126	2.900	3.200
B	0.260	0.280	6.600	7.110
C	0.220	0.245	5.590	6.220
D	0.079	0.103	2.060	2.620
E	0.030	0.060	0.760	1.520
F	-	0.008	-	0.203
G	0.305	0.320	7.750	8.130
H	0.006	0.012	0.152	0.305
I	0.129	-	3.300	-
J	0.094	-	2.400	-
K	-	0.165	-	4.200
L	0.094	-	2.400	-

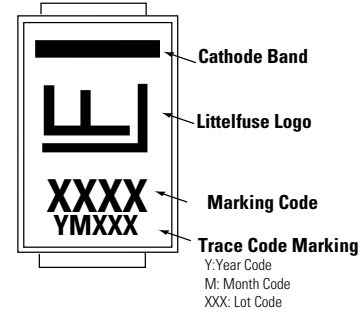
# TPSMD Series

## Surface Mount – 3000W

### Part Numbering System



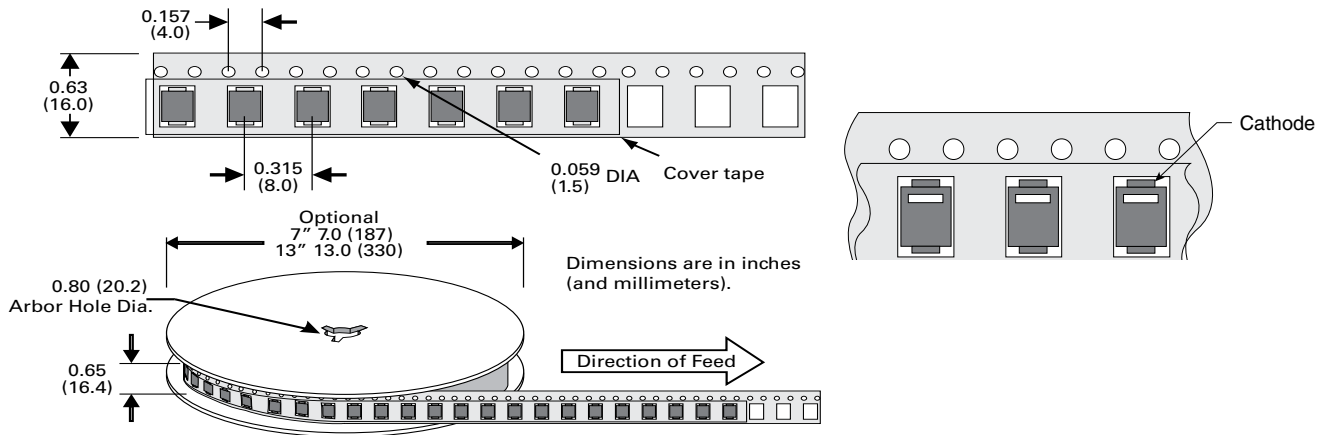
### Part Marking System



### Packaging Options

Part number	Component Package	Quantity	Packaging Option	Packaging Specification
TPSMDxxxX	DO-214AB	3000	Tape & Reel - 16mm tape/13" reel	EIA STD RS-481
TPSMDxxxX-T7	DO-214AB	500	Tape & Reel – 16mm tape /7" reel	EIA STD RS-481

### Tape and Reel Specification



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