

TPSMC Series

Surface Mount - 1500W



Agency Approvals

Agency	Agency File Number
	E230531

Maximum Ratings & Thermal Characteristics

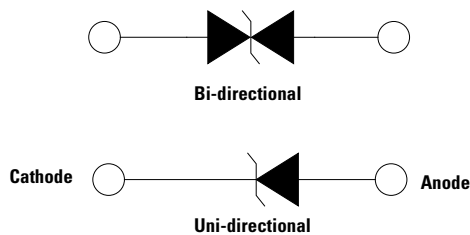
($T_A = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation by 10/1000 μs Waveform (Fig.2)(Note 1), (Note 2)	P_{PPM}	1500	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}	200	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.

Functional Diagram



Description

The TPSMC 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
- For surface mounted applications 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
- IEC 61000-4-2 ESD 30kV(Air), 30kV (Contact)
- ESD protection of data lines in accordance with IEC 61000-4-2
- EFT protection of data lines in accordance with IEC 61000-4-4
- Built-in strain relief
- $V_{BR} @ T_J = V_{BR} @ 25^\circ\text{C} \times (1 + \alpha T \times (T_J - 25))$ (α : Temperature Coefficient)
- Glass passivated chip junction
- 1500W peak pulse power capability at 10/1000 μs 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 less than 1 μA above 13V
- High temperature soldering guaranteed: 260 $^\circ\text{C}$ /10 seconds at terminals
- UL Recognized body that meets 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)
- UL Recognized to ANSI/UL 497B: Protectors for Data Communications and Fire-Alarm Circuits
- Support active clamping (please see app. note ["Littelfuse Using High Voltage TVS Diodes in IGBT active Clamp Applications"](#) for further details)

Applications

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

TPSMC Series

Surface Mount - 1500W

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 (μA)	Agency Approval 
		UNI	BI		MIN	MAX					
TPSMC12A	TPSMC12CA	12AA	12CA	10.20	11.40	12.60	1	16.7	91.0	5	X
TPSMC13A	TPSMC13CA	13AA	13CA	11.10	12.40	13.70	1	18.2	83.5	1	X
TPSMC15A	TPSMC15CA	15AA	15CA	12.80	14.30	15.80	1	21.2	71.7	1	X
TPSMC16A	TPSMC16CA	16AA	16CA	13.60	15.20	16.80	1	22.5	67.6	1	X
TPSMC18A	TPSMC18CA	18AA	18CA	15.30	17.10	18.90	1	25.2	60.3	1	X
TPSMC20A	TPSMC20CA	20AA	20CA	17.10	19.00	21.00	1	27.7	54.9	1	X
TPSMC22A	TPSMC22CA	22AA	22CA	18.80	20.90	23.10	1	30.6	49.7	1	X
TPSMC24A	TPSMC24CA	24AA	24CA	20.50	22.80	25.20	1	33.2	45.8	1	X
TPSMC27A	TPSMC27CA	27AA	27CA	23.10	25.70	28.40	1	37.5	40.5	1	X
TPSMC30A	TPSMC30CA	30AA	30CA	25.60	28.50	31.50	1	41.4	36.7	1	X
TPSMC33A	TPSMC33CA	33AA	33CA	28.20	31.40	34.70	1	45.7	33.3	1	X
TPSMC36A	TPSMC36CA	36AA	36CA	30.80	34.20	37.80	1	49.9	30.5	1	X
TPSMC39A	TPSMC39CA	39AA	39CA	33.30	37.10	41.00	1	53.9	28.2	1	X
TPSMC43A	TPSMC43CA	43AA	43CA	36.80	40.90	45.20	1	59.3	25.6	1	X
TPSMC47A	TPSMC47CA	47AA	47CA	40.20	44.70	49.40	1	64.8	23.5	1	X
TPSMC51A	TPSMC51CA	51AA	51CA	43.60	48.50	53.60	1	70.1	21.7	1	X
TPSMC56A	TPSMC56CA	56AA	56CA	47.80	53.20	58.80	1	77.0	19.7	1	X
TPSMC62A	TPSMC62CA	62AA	62CA	53.00	58.90	65.10	1	85.0	17.9	1	X
TPSMC68A	TPSMC68CA	68AA	68CA	58.10	64.60	71.40	1	92.0	16.5	1	X
TPSMC75A	TPSMC75CA	75AA	75CA	64.10	71.30	78.80	1	103.0	14.8	1	X
TPSMC82A	TPSMC82CA	82AA	82CA	70.10	77.90	86.10	1	113.0	13.5	1	X
TPSMC91A	TPSMC91CA	91AA	91CA	77.80	86.50	95.50	1	125.0	12.2	1	X
TPSMC100A	TPSMC100CA	100AA	100CA	85.50	95.00	105.26	1	137.0	11.1	1	X
TPSMC110A	TPSMC110CA	110AA	110CA	94.50	104.50	115.79	1	152.0	10	1	X
TPSMC120A	TPSMC120CA	120AA	120CA	102.60	114.00	126.32	1	165.0	9.2	1	X
TPSMC130A	TPSMC130CA	130AA	130CA	111.15	123.50	136.84	1	179.0	8.5	1	X
TPSMC150A	TPSMC150CA	150AA	150CA	128.25	142.50	157.89	1	207.0	7.3	1	X
TPSMC160A	TPSMC160CA	160AA	160CA	136.80	152.00	168.42	1	219.0	6.9	1	X
TPSMC170A	TPSMC170CA	170AA	170CA	145.35	161.50	178.95	1	234.0	6.5	1	X
TPSMC180A	TPSMC180CA	180AA	180CA	153.90	171.00	189.47	1	246.0	6.2	1	X
TPSMC200A	TPSMC200CA	200AA	200CA	171.00	190.00	210.53	1	274.0	5.5	1	X
TPSMC220A	TPSMC220CA	220AA	220CA	188.10	209.00	231.58	1	328.0	4.6	1	X
TPSMC250A	TPSMC250CA	250AA	250CA	213.75	237.50	263.16	1	344.0	4.4	1	X
TPSMC300A	TPSMC300CA	300AA	300CA	256.00	285.00	315.00	1	412.0	3.6	1	X
TPSMC350A-A	TPSMC350CA-A	350AA	350CA	300.00	332.00	368.00	1	482.0	3.1	1	-
TPSMC400A-A	TPSMC400CA-A	400AA	400CA	342.00	380.00	420.00	1	548.0	2.7	1	-
TPSMC440A-A	TPSMC440CA-A	440AA	440CA	376.00	418.00	462.00	1	602.0	2.5	1	-
TPSMC480A-A	TPSMC480CA-A	480AA	480CA	408.00	456.00	504.00	1	658.0	2.3	1	-
TPSMC510A-A	TPSMC510CA-A	510AA	510CA	434.00	485.00	535.00	1	698.0	2.1	1	-
TPSMC520A-A	TPSMC520CA-A	520AA	520CA	443.00	494.50	545.50	1	718.0	2.1	1	-
TPSMC530A-A	TPSMC530CA-A	530AA	530CA	451.00	503.50	556.50	1	725.0	2.1	1	-
TPSMC540A-A	TPSMC540CA-A	540AA	540CA	460.00	513.00	567.00	1	740.0	2.0	1	-

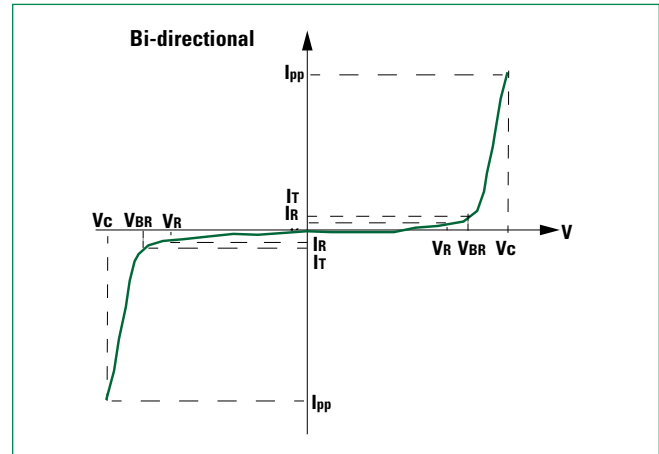
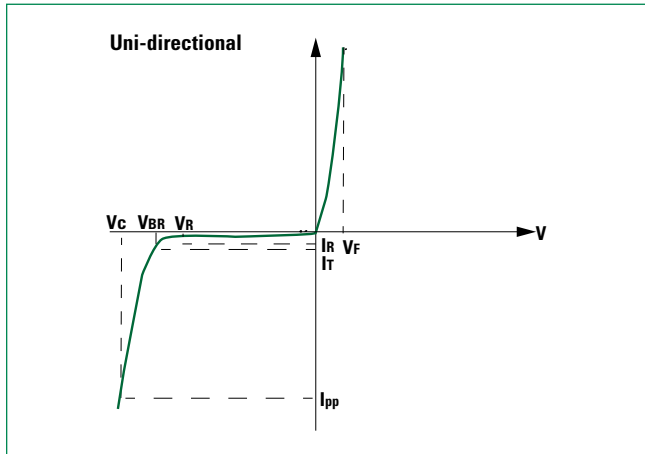
For bidirectional type having V_R of 10 volts and less, the I_R limit is double.

-A means stack die parts.

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Surface Mount - 1500W

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 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

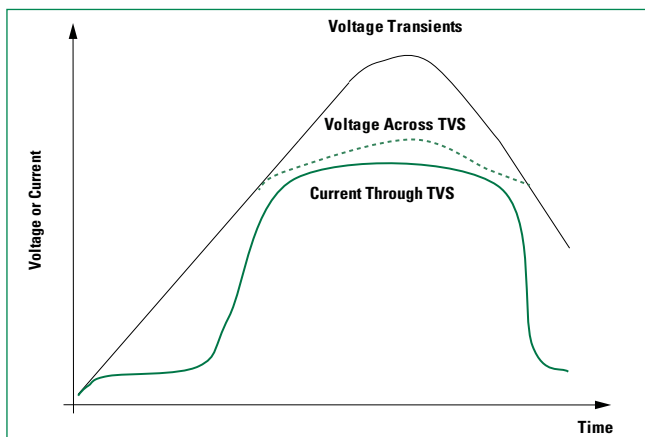


Figure 2 - Peak Pulse Power Rating

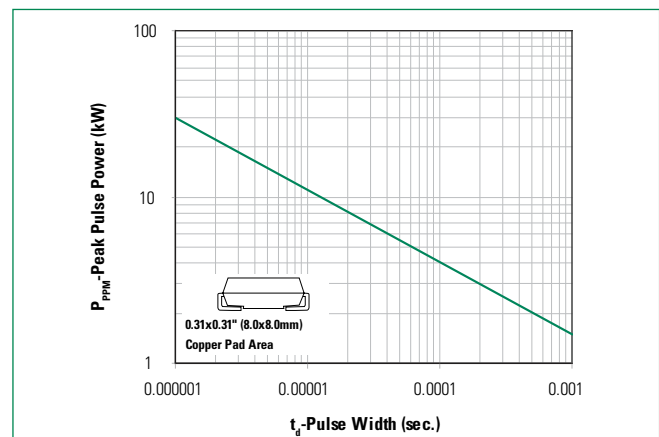


Figure 3 - Peak Pulse Power Derating Curve

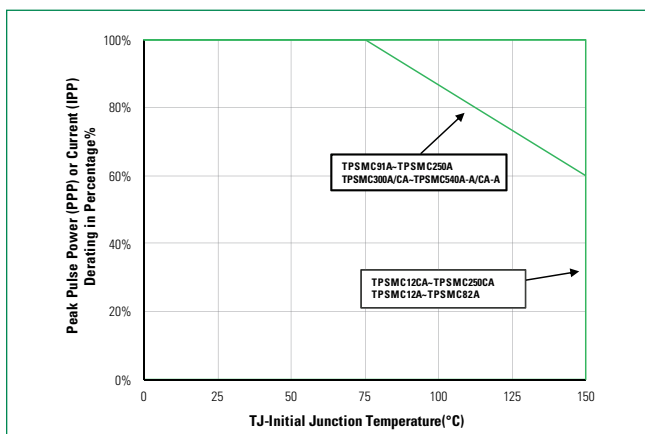
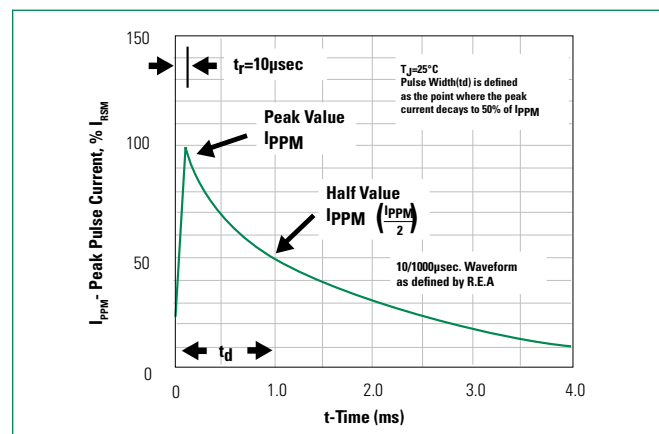


Figure 4 - Pulse Waveform



TPSMC Series

Surface Mount - 1500W

Figure 5 - Typical Junction Capacitance

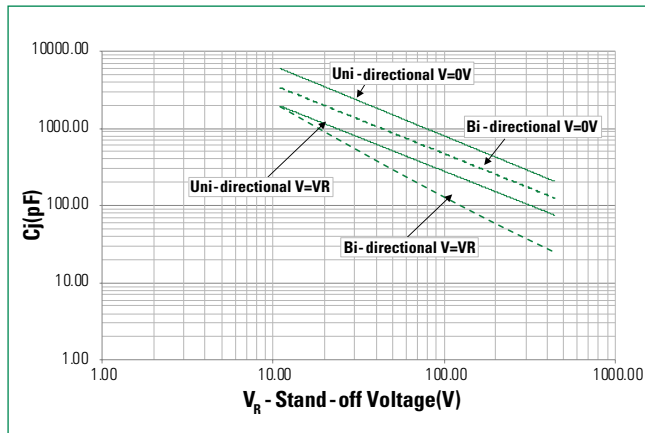


Figure 6 - Steady State Power Dissipation Derating Curve

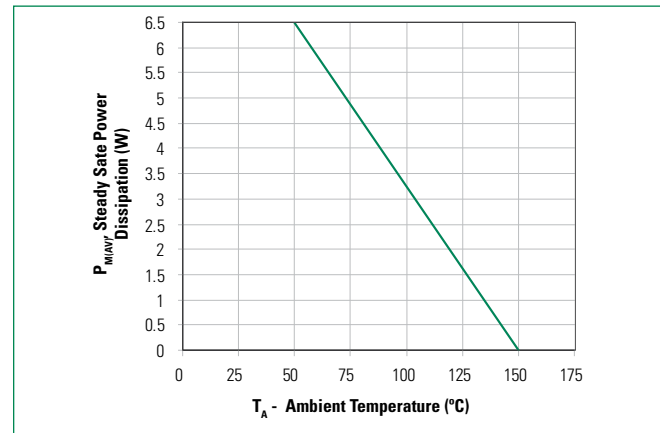
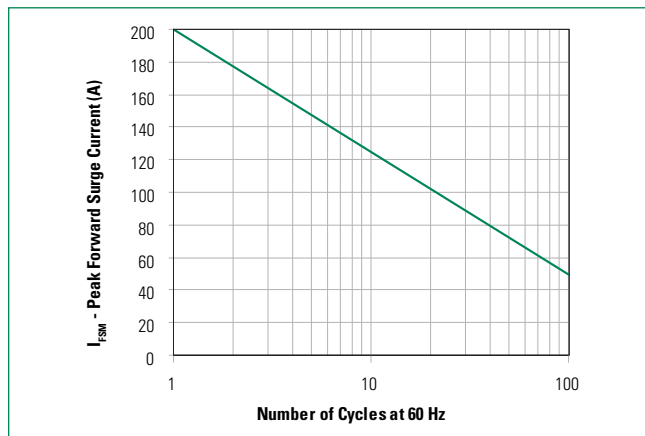


Figure 7 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only



Soldering Parameters

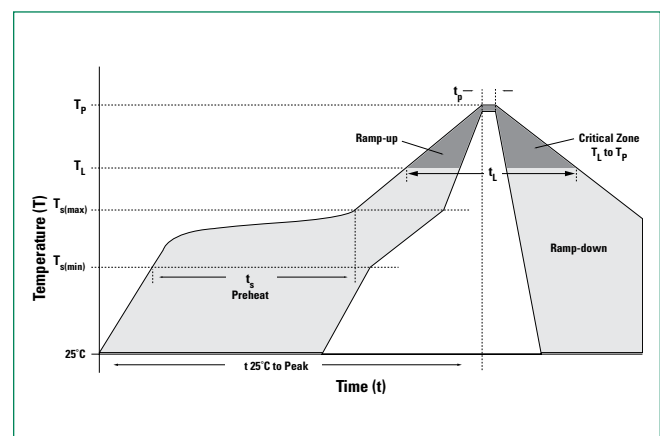
Reflow Condition		Lead-free assembly
Pre Heat	- Temperature Min ($T_{s(min)}$)	150°C
	- Temperature Max ($T_{s(max)}$)	200°C
	- Time (min to max) (t_s)	60 – 120 secs
Average ramp up rate (Liquidus Temp (T_L) to peak)		3°C/second max
$T_{s(max)}$ to T_L - Ramp-up Rate		3°C/second max
Reflow	- Temperature (T_L) (Liquidus)	217°C
	- Time (min to max) (t_r)	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	0.007 ounce, 0.21 grams
Case	JEDEC DO214AB. Molded plastic body over glass passivated junction
Polarity	Color band denotes positive end (cathode) except Bidirectional.
Terminal	Matte Tin-plated leads, Solderable per JESD22-B102

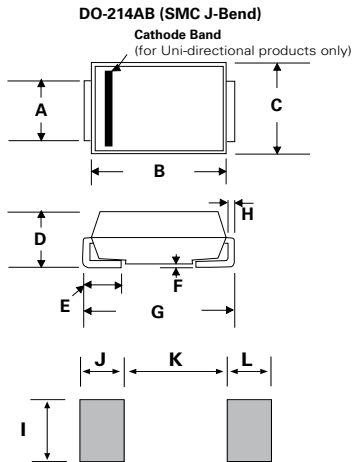
Environmental Specifications

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



TPSMC Series

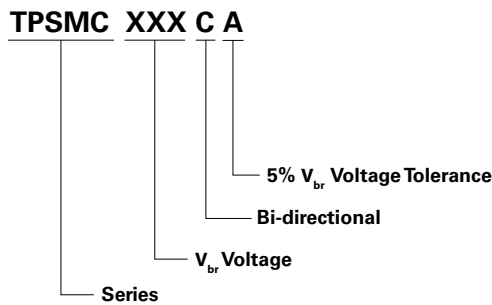
Surface Mount - 1500W



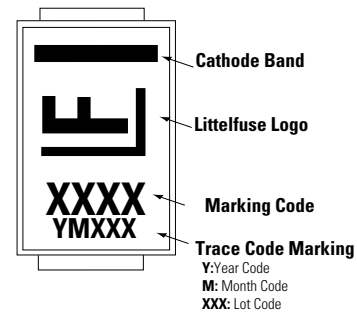
Dimensions

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	-

Part Numbering System



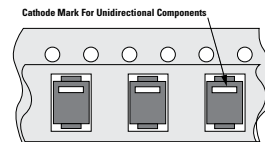
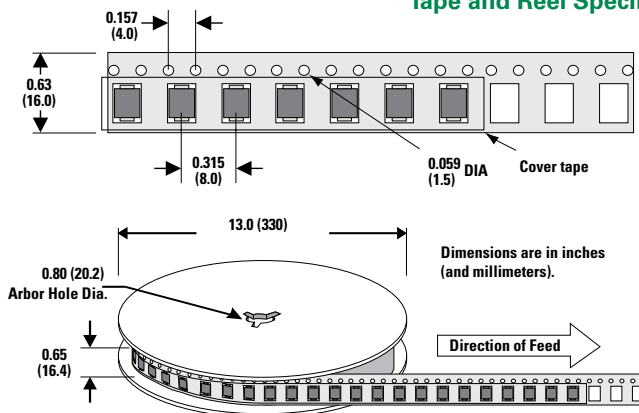
Part Marking System



Packaging

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

Tape and Reel Specification



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