TPSMC-VR Series
Surface Mount – 1500W

AUTOMOTIVE GRADE HF RoHS

Agency Approvals

Agency	Agency File Number
	E230531

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

Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation (IPP x VC)by 10/1000µs Waveform (Fig.2) (Note 1), (Note 2)	P_{PPM}	1500	W
Power Dissipation on Infinite Heat Sink at T_A=50°C	$P_{M(AV)}$	6.5	W
Peak Forward Surge Current, 8.3ms Single Half Sine Wave	I_{FSM}	200	A
Maximum Instantaneous Forward Voltage at 100A for Unidirectional Only (Note 4)	V_F	3.5	V
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to 150	°C
Typical Thermal Resistance Junction to Lead	$R_{\theta JL}$	15	°C/W
Typical Thermal Resistance Junction to Ambient	$R_{\theta JA}$	75	°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 0.31x0.31" (8.0 x 8.0mm) to each terminal.
3. Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional component only, duty cycle=4 per minute maximum.

Description

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

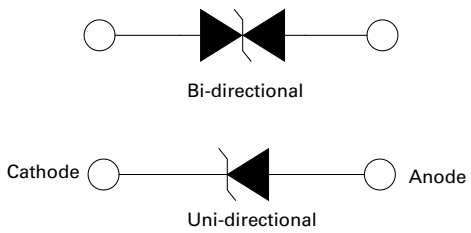
Features & Benefits

- 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
- Built-in strain relief
- Glass passivated chip junction
- 1500W peak pulse power capability at 10/1000µs waveform, repetition rate (duty cycles):0.01%
- Fast response time: typically less than 1.0ps from 0V to VBR min
- Excellent clamping capability
- Low incremental surge resistance
- 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)

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



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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 (µA)	Maximum Temperature coefficient of V_{BR} (%/C)	Agency Approval
		UNI	BI		MIN	MAX						
TPSMC11A-VR	TPSMC11CA-VR	GDZA	BDZA	11.0	12.20	13.50	1	18.2	82.5	1	0.074	X
TPSMC12A-VR	TPSMC12CA-VR	GEEA	BEEA	12.0	13.30	14.70	1	19.9	75.4	1	0.075	X
TPSMC13A-VR	TPSMC13CA-VR	GEGA	BEGA	13.0	14.40	15.90	1	21.5	69.8	1	0.076	X
TPSMC14A-VR	TPSMC14CA-VR	GEKA	BEKA	14.0	15.60	17.20	1	23.2	64.7	1	0.080	
TPSMC15A-VR	TPSMC15CA-VR	GEMA	BEMA	15.0	16.70	18.50	1	24.4	61.5	1	0.083	X
TPSMC16A-VR	TPSMC16CA-VR	GEPA	BEPA	16.0	17.80	19.70	1	26.0	57.7	1	0.084	X
TPSMC17A-VR	TPSMC17CA-VR	GERA	BERA	17.0	18.90	20.90	1	27.6	54.4	1	0.085	
TPSMC18A-VR	TPSMC18CA-VR	GETA	BETA	18.0	20.00	22.10	1	29.2	51.4	1	0.088	X
TPSMC20A-VR	TPSMC20CA-VR	GEVA	BEVA	20.0	22.20	24.50	1	32.4	46.3	1	0.091	X
TPSMC22A-VR	TPSMC22CA-VR	GEXA	BEXA	22.0	24.40	26.90	1	35.5	42.3	1	0.092	X
TPSMC24A-VR	TPSMC24CA-VR	GEZA	BEZA	24.0	26.70	29.50	1	38.9	38.6	1	0.092	X
TPSMC26A-VR	TPSMC26CA-VR	GFEA	BFEA	26.0	28.90	31.90	1	42.1	35.7	1	0.093	
TPSMC28A-VR	TPSMC28CA-VR	GFGA	BFGA	28.0	31.10	34.40	1	45.4	33.1	1	0.094	
TPSMC30A-VR	TPSMC30CA-VR	GFKA	BFKA	30.0	33.30	36.80	1	48.4	31.0	1	0.096	X
TPSMC33A-VR	TPSMC33CA-VR	GFMA	BFMA	33.0	36.70	40.60	1	53.3	28.2	1	0.097	X
TPSMC36A-VR	TPSMC36CA-VR	GFPA	BFPA	36.0	40.00	44.20	1	58.1	25.9	1	0.098	X
TPSMC40A-VR	TPSMC40CA-VR	GFRA	BFRA	40.0	44.40	49.10	1	64.5	23.3	1	0.099	
TPSMC43A-VR	TPSMC43CA-VR	GFTA	BFTA	43.0	47.80	52.80	1	69.4	21.7	1	0.100	X
TPSMC45A-VR	TPSMC45CA-VR	GFVA	BFVA	45.0	50.00	55.30	1	72.7	20.6	1	0.101	
TPSMC48A-VR	TPSMC48CA-VR	GFXA	BFXA	48.0	53.30	58.90	1	77.4	19.4	1	0.101	
TPSMC51A-VR	TPSMC51CA-VR	GFZA	BFZA	51.0	56.70	62.70	1	82.4	18.2	1	0.101	X
TPSMC54A-VR	TPSMC54CA-VR	GGEA	BGEA	54.0	60.00	66.30	1	87.1	17.3	1	0.102	
TPSMC58A-VR	TPSMC58CA-VR	GGGA	BGGA	58.0	64.40	71.20	1	93.6	16.1	1	0.103	
TPSMC60A-VR	TPSMC60CA-VR	GGKA	BGKA	60.0	66.70	73.70	1	96.8	15.5	1	0.103	
TPSMC64A-VR	TPSMC64CA-VR	GGMA	BGMA	64.0	71.10	78.60	1	103.0	14.6	1	0.104	
TPSMC70A-VR	TPSMC70CA-VR	GGPA	BGPA	70.0	77.80	86.00	1	113.0	13.3	1	0.105	
TPSMC75A-VR	TPSMC75CA-VR	GGRA	BGRA	75.0	83.30	92.10	1	121.0	12.4	1	0.106	X
TPSMC78A-VR	TPSMC78CA-VR	GGTA	BGTA	78.0	86.70	95.80	1	126.0	11.9	1	0.106	
TPSMC85A-VR	TPSMC85CA-VR	GGVA	BGVA	85.0	94.40	104.00	1	137.0	11.0	1	0.106	
TPSMC90A-VR	TPSMC90CA-VR	GHEA	BHEA	90	100	111	1	145.4	10.3	1	0.107	
TPSMC100A-VR	TPSMC100CA-VR	GHFA	BHFA	100	111	123	1	159.9	9.4	1	0.107	X
TPSMC110A-VR	TPSMC110CA-VR	GHGA	BHGA	110	122	135	1	175.5	8.6	1	0.107	X
TPSMC120A-VR	TPSMC120CA-VR	GHHA	BHHA	120	133	147	1	191.1	7.9	1	0.108	X
TPSMC130A-VR	TPSMC130CA-VR	GHIA	BHIA	130	144	159	1	206.7	7.3	1	0.108	X
TPSMC150A-VR	TPSMC150CA-VR	GHKA	BHKA	150	167	185	1	240.5	6.2	1	0.108	X
TPSMC160A-VR	TPSMC160CA-VR	GHLA	BHLA	160	178	197	1	256.1	5.9	1	0.108	X
TPSMC170A-VR	TPSMC170CA-VR	GHMA	BHMA	170	189	209	1	271.7	5.5	1	0.108	X
TPSMC180A-VR	TPSMC180CA-VR	GHNA	BHNA	180	201	222	1	288.6	5.2	1	0.108	X
TPSMC188A-VR	TPSMC188CA-VR	GHOA	BHOA	188	209	231	1	300.3	5.0	1	0.11	
TPSMC200A-VR	TPSMC200CA-VR	GHPA	BHPA	200	224	247	1	321.1	4.7	1	0.11	X

V_{BR} @ T_J = V_{BR} @ 25°C x (1 + αT x (TJ - 25)) (αT:Temperature Coefficient, typical value is 0.1%)

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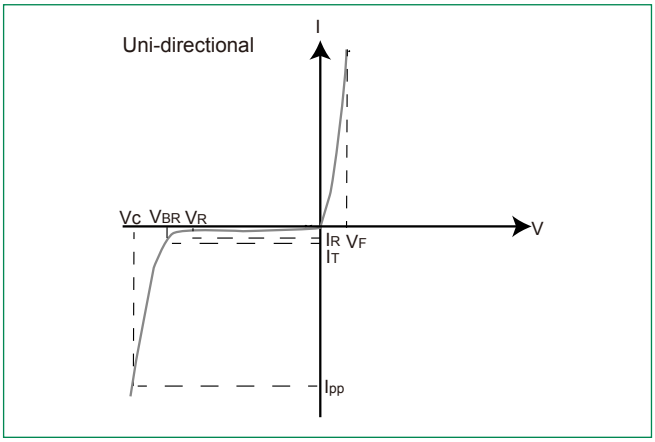
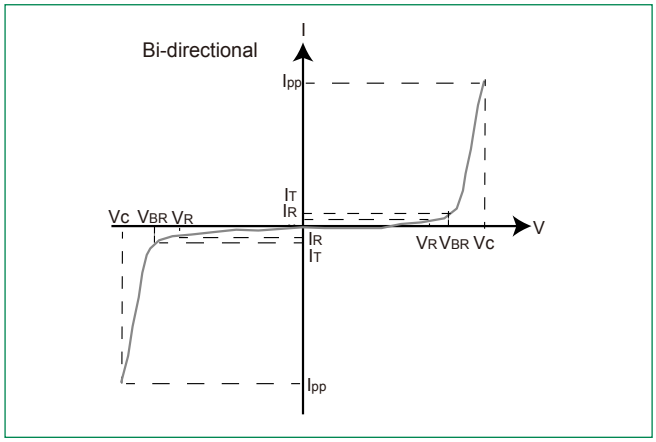
I-V Curve Characteristics





P_{PPM} Peak Pulse Power Dissipation (I_{PP} x V_C)– 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

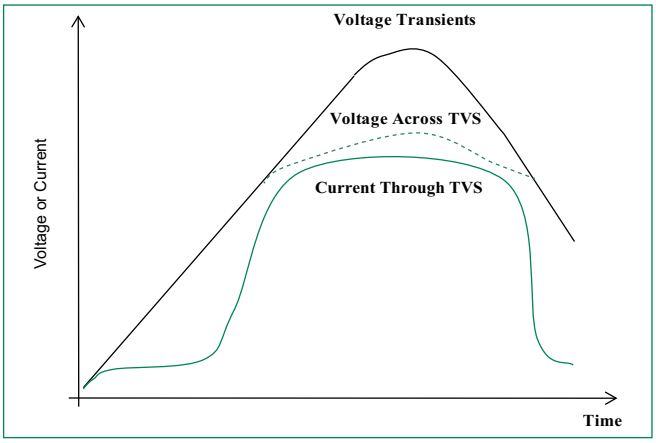


Figure 2: Peak Pulse Power Rating

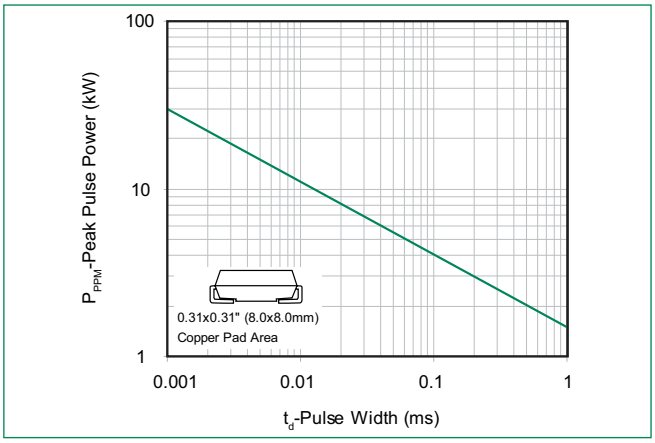


Figure 3: Peak Pulse Power Derating Curve

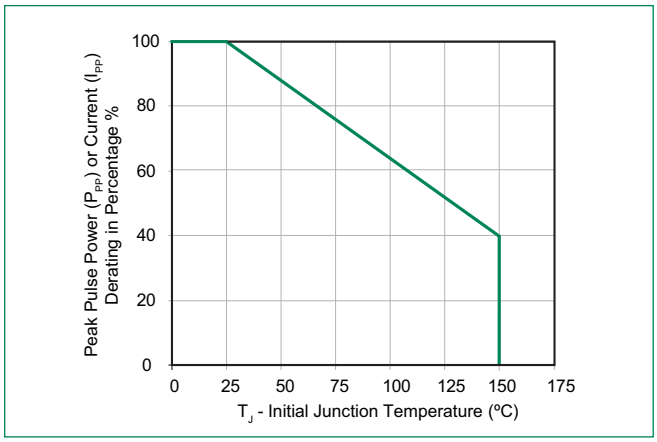


Figure 4: Pulse Waveform

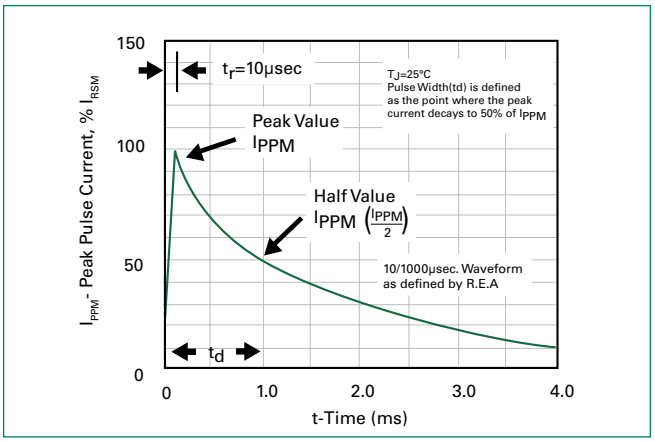


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Figure 5 - Typical Junction Capacitance

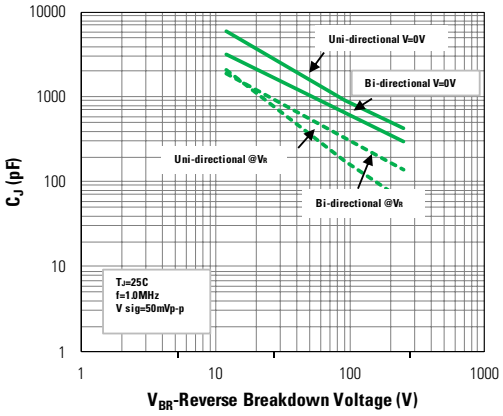
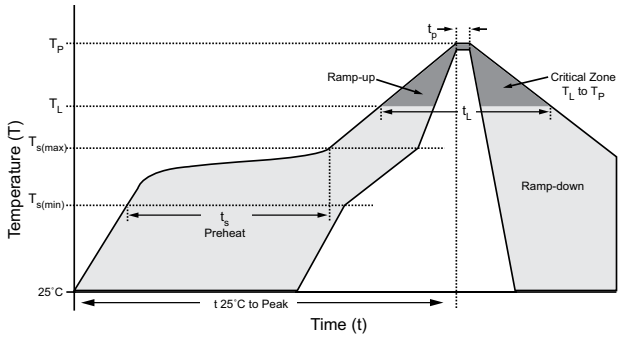


Figure 6 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only

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	0.007 ounce, 0.21 grams
Case	JEDEC DO214AB. 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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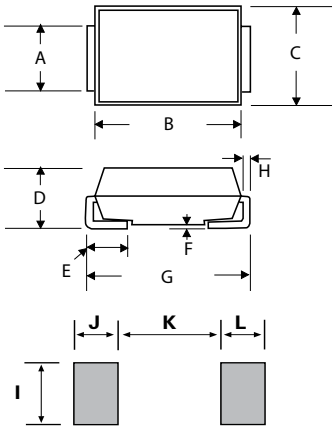
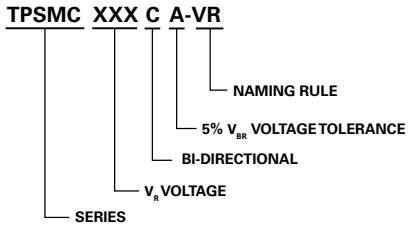
Dimensions

DO-214AB (SMC J-Bend)

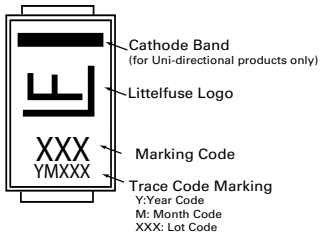


Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	0.114	0.126	2.900	3.200
B	0.260	0.280	6.600	7.110
C	0.220	0.245	5.590	6.220
D	0.079	0.103	2.060	2.620
E	0.030	0.060	0.760	1.520
F	-	0.008	-	0.203
G	0.305	0.320	7.750	8.130
H	0.006	0.012	0.152	0.305
I	0.129	-	3.300	-
J	0.094	-	2.400	-
K	-	0.165	-	4.200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

Part Numbering System



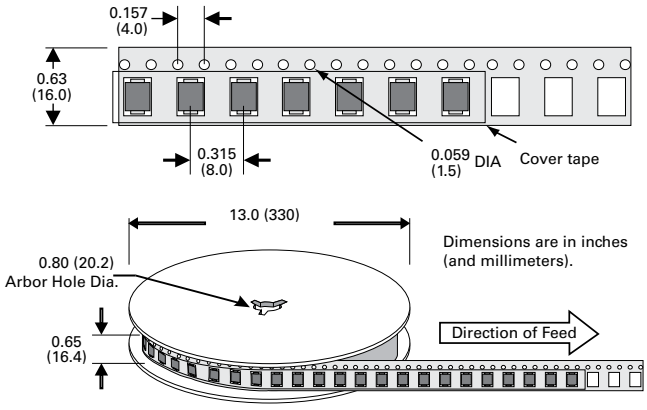
Part Marking System

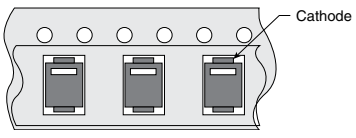


Packaging

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

Tape and Reel Specification





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