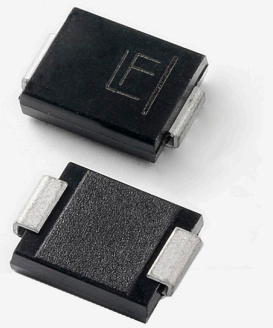
TPSMC-VR-L Series

Automotive, Ultra Low Clamping, Unidirectional Surface Mount 1500 W in SMC

AUTOMOTIVE GRADE HF RoHS

Uni-directional



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 (I_{PP} x V_C) 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 °C	$P_{M(AV)}$	6.5	W
Peak Forward Surge Current, 8.3 ms Single Half Sine Wave	I_{FSM}	200	A
Maximum Instantaneous Forward Voltage at 100 A 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 8.0 mm) to each terminal.
3. Measured on 8.3 ms single half sine wave or equivalent square wave for unidirectional component only, duty cycle = 4 per minute maximum.

Description

The TPSMC-VR-L 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 61000-4-2,30 kV(Air), 30 kV (Contact)
- EFT protection of data lines in accordance with IEC 61000-4-4
- Built-in strain relief
- Glass passivated chip junction
- 1500 W peak pulse power capability at 10/1000 µs waveform, repetition rate (duty cycles):0.01 %
- Fast response time: typically less than 1.0 ps from 0 V to V_{BR} min
- Excellent clamping capability
- Low incremental surge resistance
- UL recognized compound meeting flammability rating V-0.
- Meet MSL level 1, 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)

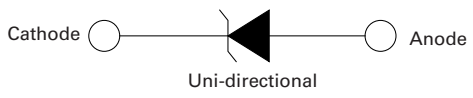
Applications

TVS components are ideal for the protection of I/O interfaces, VCC bus and other vulnerable circuits used in automotive applications.

-Battery Management System of Electrical Vehicle

-400V/800V Lithium-ion battery AFE IC protection, especially for 24 cells.

Functional Diagram



Electrical Characteristics

Part Number (Uni)	Marking	Reverse Stand off Voltage V_R (V)	Breakdown Voltage V_{BR} (Volts) @ I_T		Test Current I_T (mA)	Maximum Clamping Voltage V_C @ I_{PP} (10/1000 µs) (V)	Maximum Peak Pulse Current I_{PP} (10/1000 µs) (A)	Maximum Clamping Voltage V_C@I_{PP} = 15 A (8/20 µs) (V)	Maximum Clamping Voltage V_C@I_{PP} (8/20 µs) (V)	Maximum Peak Pulse Current I_{PP} (8/20 µs) (A)	Maximum Reverse Leakage I_R @ V_R (µA)	Maximum Temperature coefficient of V_{BR} (%/C)
			Min	Max								
TPSMC110A-VR-L	GHFL	110	122	135	1	165	8.6	145	165	43	1	0.1

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

Revised: FW.03/03/26

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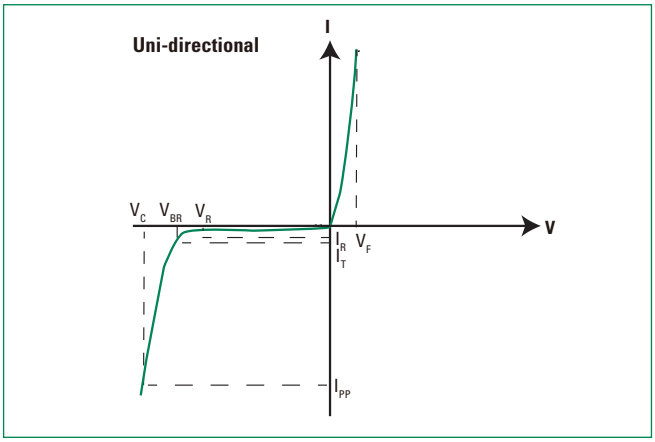
I-V Curve Characteristics



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

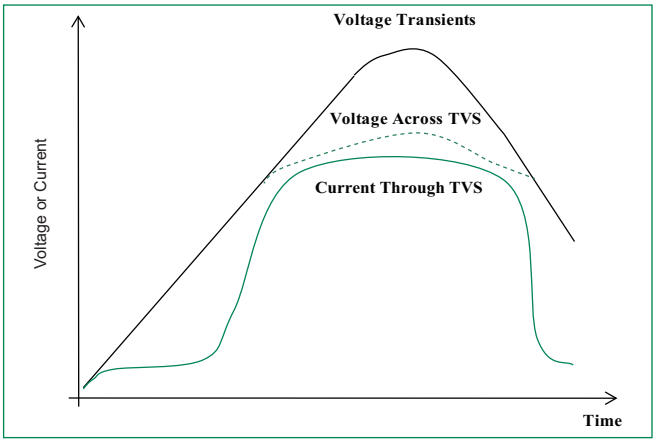


Figure 2: Peak Pulse Power Rating

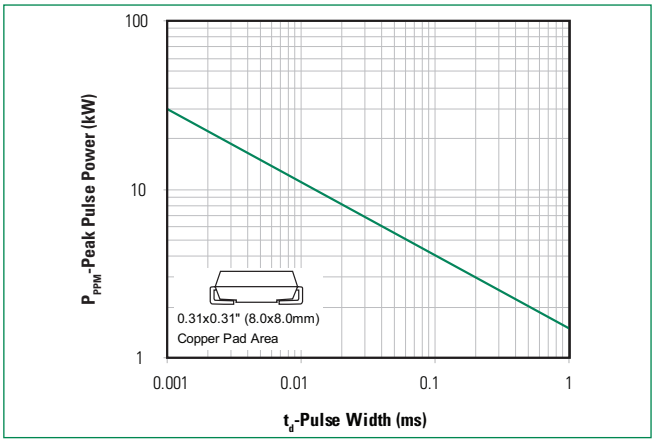


Figure 3: Peak Pulse Power Derating Curve

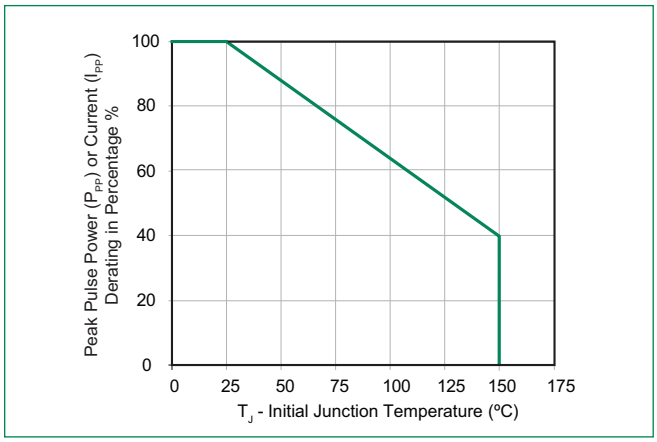


Figure 4: Pulse Waveform

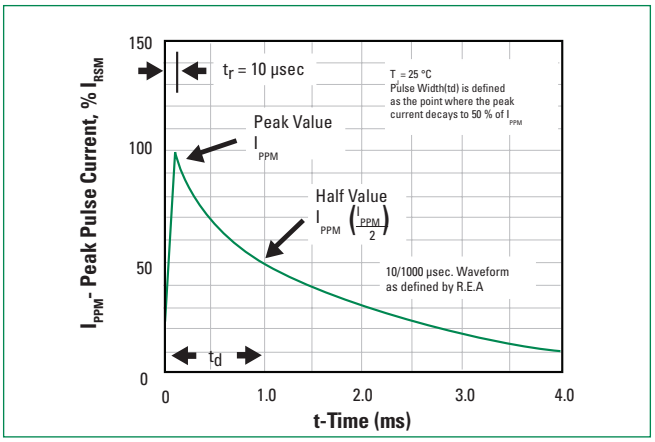


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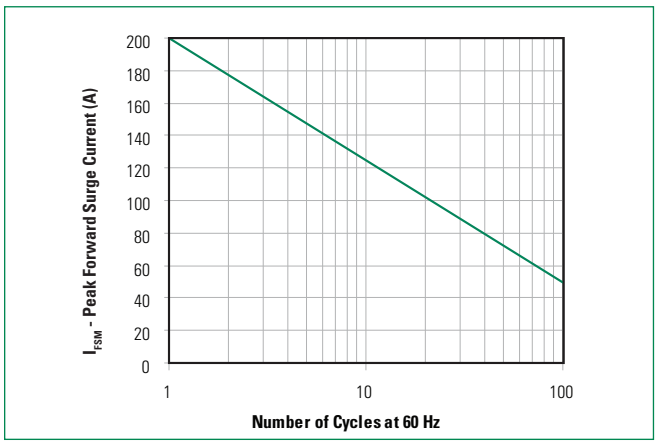
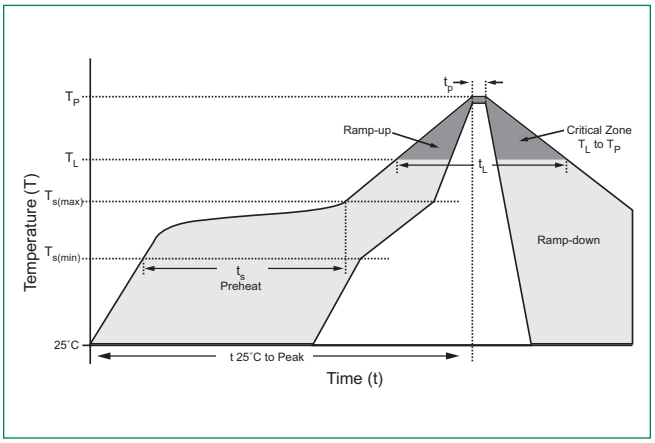
Figure 5 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only



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 Temperature 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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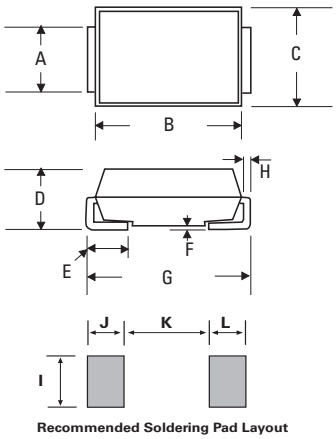
Dimensions

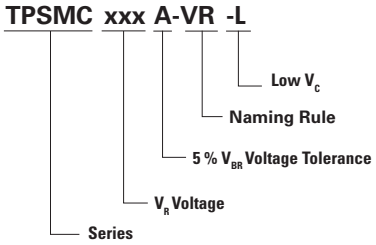
DO-214AB (SMC J-Bend)



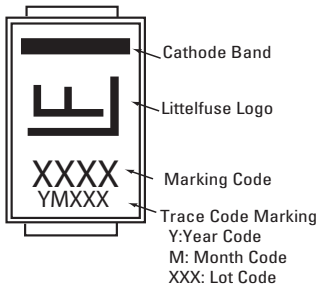
Recommended Soldering Pad Layout

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
TPSMCxxxA-VR-L	DO-214AB	3000	Tape & Reel - 16mm tape/13" reel	EIA STD RS-481

Tape and Reel Specification