SM20 Varistor Series



Agency Approvals

Agency	Agency Approval	Agency File Number
	UL1449	E320116

Additional Information

Datasheet | Resources | Samples

Description

The Littelfuse 20mm SMD Series is a surface-mount metal oxide varistor device, for use in applications requiring hi-energy / transient current capability.

The AC rated parts are designed to operate continuously across AC power lines. The DC rated parts are suitable for Automotive applications. The series comprises a Nylon molded package with folded tin plated metal leads for soldering to board.

The SMD Series is based on radial 20mm internal varistor element with similar characteristics to the Littelfuse LA / ZA series of varistors.

Features

- DC Voltage Rating 26 - 420VDC
- AC Voltage Rating 20Vac - 320AC
- No De-Rating up to 85°C ambient
- Lead-Free, Halogen-Free and RoHS Compliant
- Low voltage devices specified for automotive load dump energy
- Available in "waffle" tray packaging

Absolute Maximum Ratings

• For ratings of individual members of a series, see Device Ratings and Specifications chart

Continuous		SM20 Series	Units
Steady State Applied Voltage:			
	AC Voltage Range ($V_{M(AC)RMS}$)	20 to 320	V
	DC Voltage Range ($V_{M(DC)}$)	26 to 420	V
Transients:			
	Peak Pulse Current (I_{TM}) 8/20µs Current Wave, Single Pulse	up to 6500	A
	Single Pulse Energy Capability (W_{TM}) 10/1000µs Current Wave	165	J
	Load Dump Energy Capability (td>=30ms)	160	J
Operating Ambient Temperature Range (T_A)		-40 to +85	°C
Storage Temperature Range (T_{STG})		-40 to +125	°C
Temperature Coefficient (a^V) of Clamping Voltage (V_C) at Specified Test Current		<0.01	%/°C
Hi-Pot Encapsulation (COATING Isolation Voltage Capability) (Dielectric must withstand indicated DC voltage for one minute per MIL-STD 202, Method 301)		2500	V
COATING Insulation Resistance		1000	MΩ

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

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Metal-Oxide Varistors (MOVs)

Surface Mount Varistors > SM20 Series

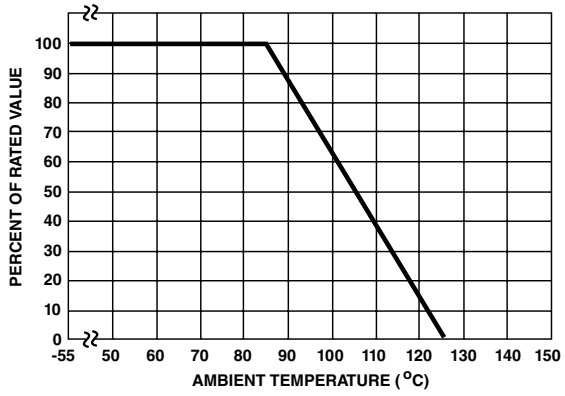
SM20 Series Ratings & Specifications

Part Number	Branding	Maximum Rating (85°C)				Specifications (25°C)				
		Continuous		Transient		Varistor Voltage at 1mA DC Test Current		Maximum Clamping Voltage 8 x 20 μs		Typical Capacitance f = 1MHz
		V_{RMS}	V_{DC}	Energy 10 x 1000μs	Peak Current 8 x 20μs					
		$V_{M(AC)}$	$V_{M(DC)}$	W_{TM} 1x pulse	I_{TM} 1x pulse	V_{NOM} Min	V_{NOM} Max	V_C	I_{PK}	C
		(V)	(V)	(J)	(A)	(V)	(V)	(V)	(A)	(pF)
V26SM20	26SM20	20	26	20 160 (note 1)	2000	32 (10mA)	40 (10mA)	63	20	12000
V175SM20	175SM20	175	225	90	6500	247	303	455	100	1400
V230SM20	230SM20	230	300	122	6500	324	396	595	100	1100
V250SM20	250SM20	250	330	130	6500	354	429	650	100	1000
V275SM20	275SM20	275	369	140	6500	389	473	710	100	900
V300SM20	300SM20	300	405	165	6500	420	517	775	100	800
V320SM20	320SM20	320	420	150	6500	462	540	810	100	750

1. Energy rating for impulse duration of 30ms minimum to one half of peak current (automotive load dump).

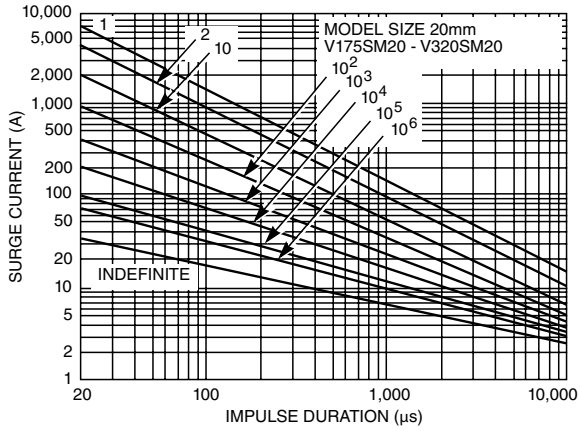
Peak Current, Energy and Power Derating Curve

For applications exceeding 85°C ambient temperature, the peak surge current and energy ratings must be reduced as shown below

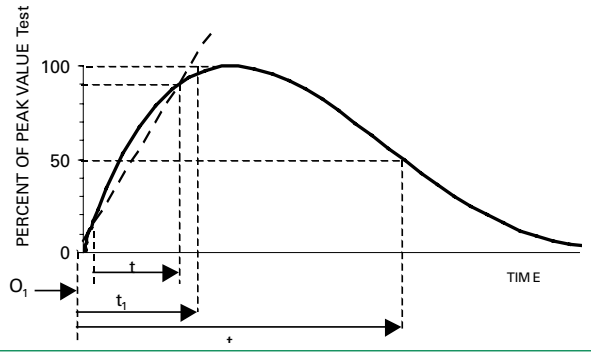


Repetitive Surge Capability

V175SM20 - V320SM20



Peak Pulse Current Test Waveform for Clamping Voltage



0_1 = Virtual Origin of Wave
T = Time from 10% to 90% of Peak
T_1 = Rise Time = 1.25 x T
T_2 = Decay Time

Example - For an 8/20 μs Current Waveform:
8μs = T_1 = Rise Time
20μs = T_2 = Decay Time

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Lead (Pb) Soldering Recommendations

The principal techniques used for the soldering of components in surface mount technology are IR Re-flow and Wave soldering. Typical profiles are shown on the right.

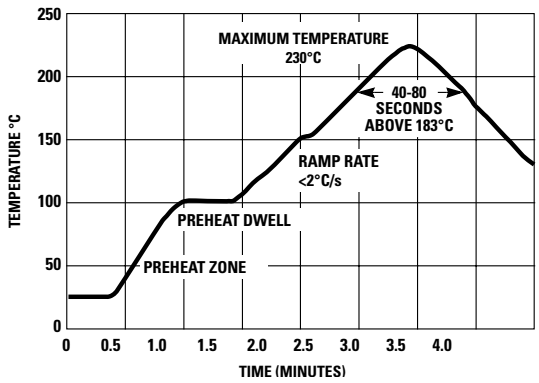
The terminals of SM20 series devices are tin plated copper, and the recommended solder is 62/36/2 (Sn/Pb/Ag), 60/40 (Sn/Pb) or 63/37 (Sn/Pb). Littelfuse also recommends an RMA solder flux.

Wave soldering is the most strenuous of the processes. To avoid the possibility of generating stresses due to thermal shock, a preheat stage in the soldering process is recommended, and the peak temperature of the solder process should be rigidly controlled.

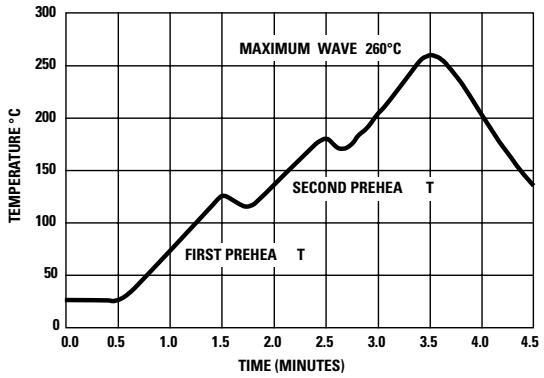
When using a reflow process, care should be taken to ensure that the SM20 chip is not subjected to a thermal gradient steeper than 4 degrees per second; the ideal gradient being 2 degrees per second. During the soldering process, preheating to within 100 degrees of the solder's peak temperature is essential to minimize thermal shock.

Once the soldering process has been completed, it is still necessary to ensure that any further thermal shocks are avoided. One possible cause of thermal shock is hot printed circuit boards being removed from the solder process and subjected to cleaning solvents at room temperature. The boards must be allowed to cool gradually to less than 50°C before cleaning.

Reflow Solder Profile



Wave Solder Profile



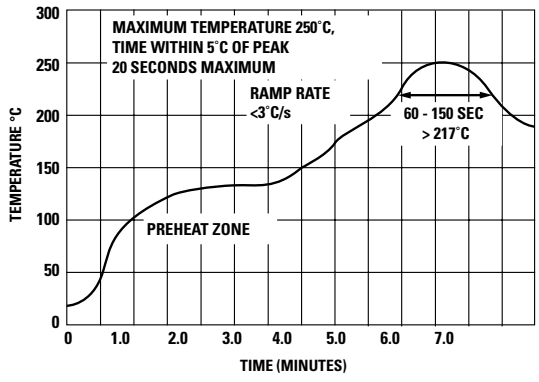
Lead–free (Pb-free) Soldering Recommendations

The terminals of SM20 series devices are tin plated copper, and the recommended Lead-free solder is 96.5/3.0/0.5 (SnAgCu) with an RMA flux, though there is a wide selection of pastes and fluxes available that should be compatible.

The reflow profile must be constrained by the maximums in the Lead–free Reflow Profile. For Lead–free Wave soldering, the Wave Solder Profile still applies.

Note: the Lead–free paste, flux and profile were used for evaluation purposes by Littelfuse, based upon industry standards and practices. There are multiple choices of all three available, it is advised that the customer explores the optimum combination for their process as processes vary considerably from site to site.

Lead–free Re-flow Solder Profile



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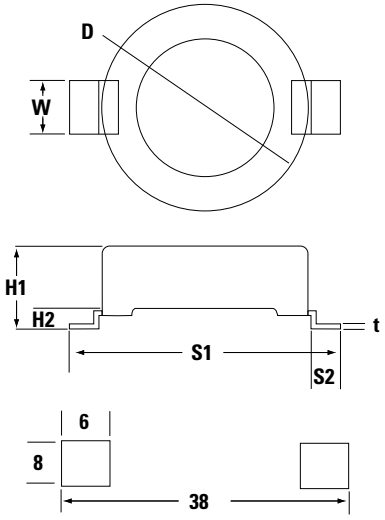
Physical Specifications

Lead Material	Folded Tin Plated Metal Leads
Soldering Characteristics	J-STD-002
Coating	Molded Plastic Meets UL94 V-0 Requirement

Environmental Specifications

Operating Ambient Temperature Range (T_A)	-40°C to +85°C
Storage Temperature Range(T_{STG})	-55°C to 125°C
Solvent Resistance	MIL STD 202, Method 215
Moisture Sensitivity	Level 1, J-STD-020

Product Dimensions

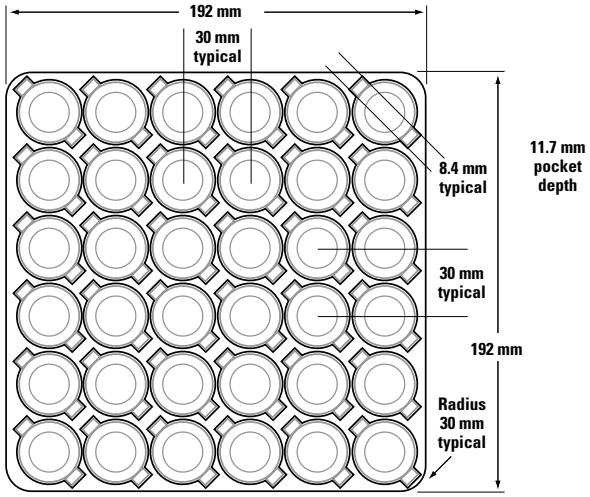


Soldering Pad Layout

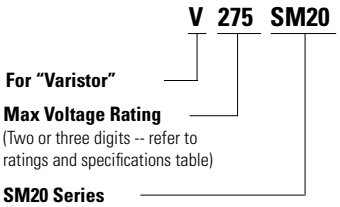
Symbol	Millimeters	
	Min	Max
D (diameter)	---	26
H1	---	10.5
H2	1.0	--
t	0.50	0.70
S1	32.5	35
S2	3.0	4.5
W	6.2	6.6

Packaging

Standard Packaging is in "Waffle" trays:
Quantity per tray: 36 pieces
Quantity per box: 108 pieces



Part Numbering System



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