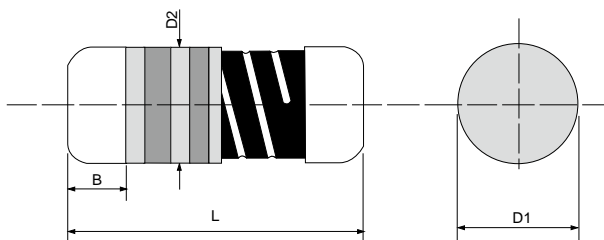


SRM Surge Resistant MELF Resistor

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Specifications Per

- IEC 60115-1
- AEC-Q200 Rev.D

Features

- AEC-Q200 Compliant
- Anti-sulfuration test qualified
- MELF packaging yet capable of high power handling
- Special conductive film enhances anti-surge capability.
- Absorbs harmful surge which damages precious devices or components.
- SMD-enabled alternative to carbon composition resistors
- Approved to the safety requirement of VDE0860 under license number 40043961 (=IEC 60065 clause 14.2a & UL 1676)
- Products meet RoHS requirements and do not contain substances of very high concern identified by European Chemicals Agency

DIMENSIONS

Type	Body Length (L, mm)	Cap Diameter (D1, mm)	Body Diameter (D2, mm)	Soldering Spot (B, mm)	Net Weight Per 1000 pcs
SRM204	3.52 ± 0.15	1.35 ± 0.1	D1+0.02/ -0.15	0.6 Min.	17 grams
SRM204T	3.52 ± 0.15	1.35 ± 0.1	D1+0.02/ -0.15	0.6 Min.	17 grams
SRM207	5.90 ± 0.20	2.20 ± 0.1	D1+0.02/ -0.2	1.0 Min.	66 grams
SRM207P	5.90 ± 0.20	2.20 ± 0.1	D1+0.02/ -0.2	1.0 Min.	66 grams
SRM101	5.90 ± 0.20	2.20 ± 0.1	D1+0.02/ -0.2	1.0 Min.	66 grams
SRM101T	5.90 ± 0.20	2.20 ± 0.1	D1+0.02/ -0.2	1.0 Min.	66 grams
SRM201	8.50 ± 0.50	3.00 ± 0.2	D1+0.05/ -0.35	1.3 Min.	186 grams
SRM301	10.5 ± 0.50	4.00 ± 0.5	D1+0.05/ -0.45	1.6 Min.	446 grams

GENERAL SPECIFICATIONS

Type	Power Rating (at 70°C)	Maximum Working Voltage	Maximum Permissible Surge Voltage	Minimum Resistance	Maximum Resistance	Resistance Tolerance	Available Resistance Values
SRM204	1/4W	400V	2,000V	1Ω	1MΩ	±1%~±5%	E-24/E-96
SRM204T	1/2W	450V	4,000V	1Ω	10MΩ	±1%~±5%	E-24/E-96
SRM207	1/2W	600V	6,000V	1Ω	2M2Ω	±1%~±5%	E-24/E-96
SRM207P	1/2W	600V	8,000 V	0.1Ω	2M2Ω	±1%~±5%	E-24/E-96
SRM101	1W	600V	8,000 V	0.1Ω	2M2Ω	±1%~±5%	E-24/E-96
SRM101T	1W	600V	10,000 V	0.1Ω	2M2Ω	±1%~±5%	E-24/E-96
SRM201	2W	700V	9,000V	0.1Ω	2M2Ω	±1%~±5%	E-24/E-96
SRM301	3W	800V	10,000V	0.1Ω	2M2Ω	±1%~±5%	E-24/E-96

Special sizes, values, and specifications not listed available on special order.
For resistance values outside the specified ranges, please contact us.

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■ PART NUMBER

Example: SRM204TF16R2TKZTR3K0

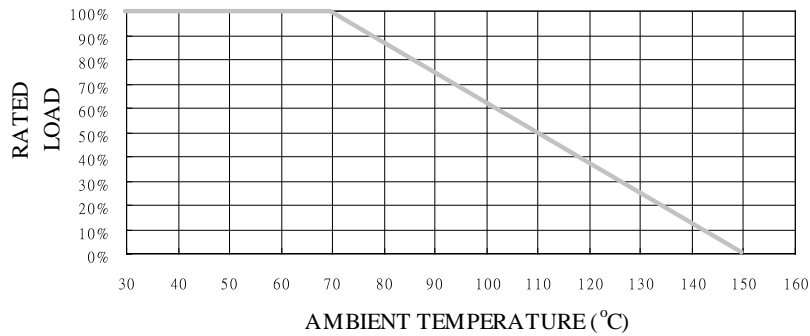
SRM204T	F	16R2	TKZ	TR3K0
Type	Tolerance*	Resistance	TCR	Packaging
	F(1%) G(2%) J(5%)	16.2Ω 4-character code containing - 3 significant digits 1 letter multiplier <u>OHM MULTIPLIER</u> R = 1 K = 10 ³ M = 10 ⁶ G = 10 ⁹	3-character code TKZ = Default Product Temperature Coefficient. Information of typical product temperature coefficient can be found in the Technical Summary section of the datasheet.**	5-character code TR = Tape Reel (pieces per reel) <u>SRM204/SRM204T</u> 3K0 = 3,000 6K0 = 6,000*** 10K = 10,000*** <u>SRM207/SRM207P</u> <u>SRM101/SRM101T</u> 2K0 = 2,000 6K0 = 6,000*** 10K = 10,000*** <u>SRM201</u> 2K5 = 2,500 <u>SRM301</u> 2K0 = 2,000

* Listed values may not be applicable across product types or to all resistance values. Please check with us before placing order.

** For the availabilities of non-default temperature coefficient, please check with us. Reference for TCR letter codes can be found in section (4) of Part Number Construction in the Appendices.

*** upon request

■ POWER DERATING CURVE



■ TECHNICAL SUMMARY

Characteristics	Ranges & Limits	
Dielectric Withstanding Voltage, VAC or DC	SRM204T SRM204/207/207P/101 SRM201/101T SRM301	300 350 500 800
Temperature Coefficient, PPM / °C*	±200, ±400, ±800, ±1200	
Operating Temperature Range, °C	-55 ~ +150	
Insulation Resistance, MΩ	>10 ⁴	
Tin Whisker (JESD201 Temperature Cycling & High Temp. /Humidity Storage), μm	<5	

* Not applicable to all resistance values. Please check with us regarding the PPM of specific resistance value(s).

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PERFORMANCE SPECIFICATIONS

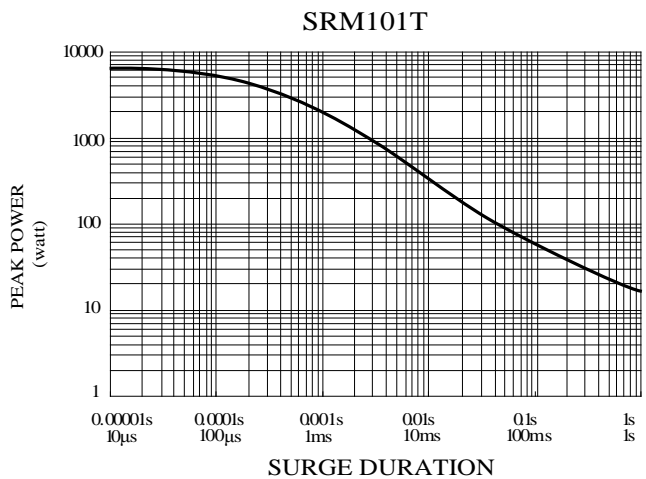
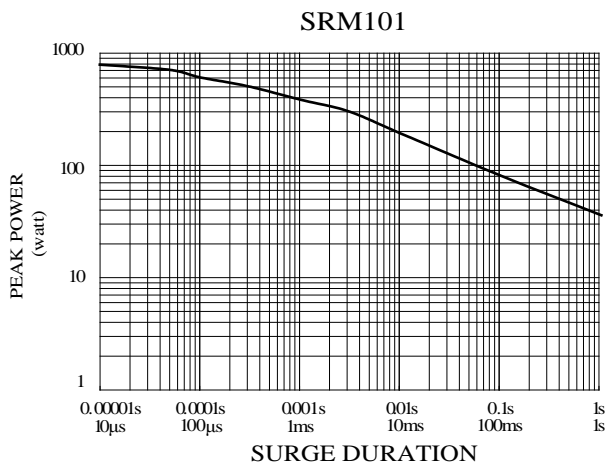
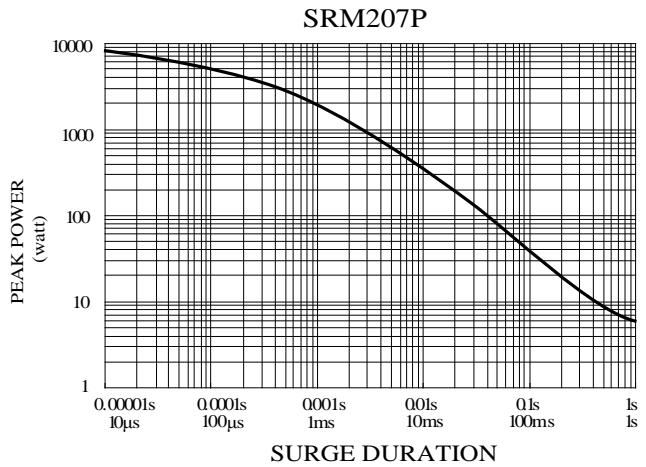
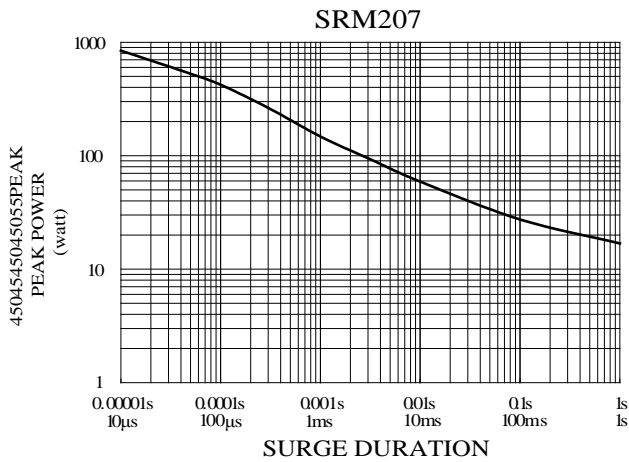
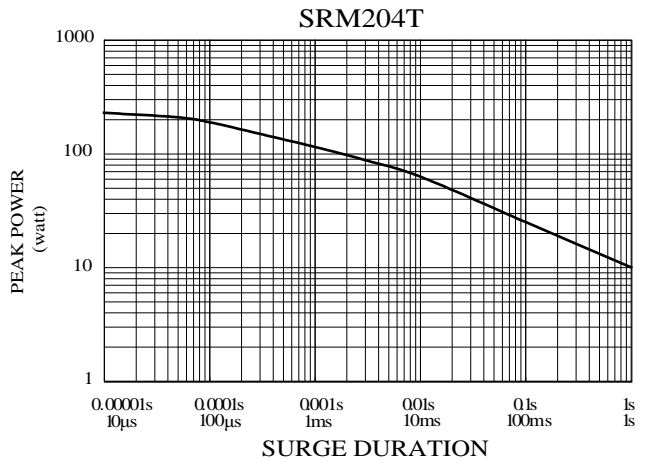
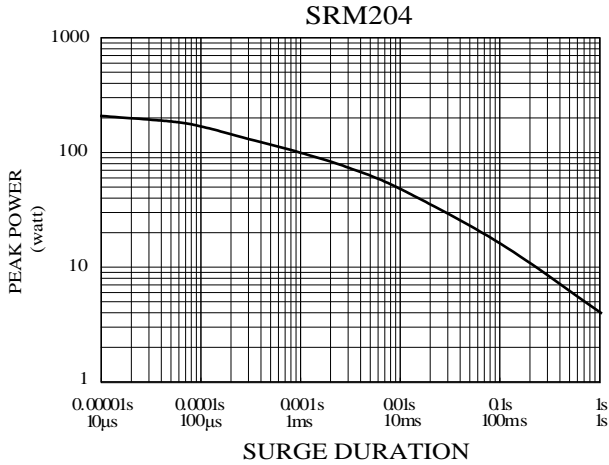
Characteristics	Test Conditions	Limits		
High Temperature Exposure	AEC-Q200 REV D. Stress NO.3 (refer to IEC 60115-1 4.25.3/ MIL-STD-202 Method 108) 1,000 hours at 150°C without load	±2.5%		
Temperature Cycling	AEC-Q200 REV D. Stress NO.4 (refer to IEC 60115-1 4.19/ JESD22 Method JA-104) -55°C 30minutes, +125°C 30minutes, 1,000 cycles	±2%		
	Proprietary test specification FRC-AEQ-180702 -20°C 30minutes, +120°C 30minutes, 1,000 cycles (Recommended solder paste composition: 96.5% Sn, 3% Ag, 0.5% Cu)	Force of 1kg for 10 secs and without distinct looseness of terminals		
Biased Humidity	AEC-Q200 REV D. Stress NO.7 (refer to IEC 60115-1 4.37/ MIL-STD-202 Method 103) 1,000 hours at 85°C and 85% relative humidity with 10% operating power	±5%		
Load Life	IEC 60115-1 4.25.1 Rated load (not over max. working voltage) 1,000 hours with 1.5 hours ON, 0.5 hours OFF, at 70°C	±5%		
	AEC-Q200 REV D. Stress NO.8 (refer to MIL-STD-202 Method 108) 1,000 hours at 125°C with de-rated continuous working voltage	±5%		
Resistance to Solvents	AEC-Q200 REV D. Stress NO.12 (refer to MIL-STD-202 Method 215) Add Aqueous wash chemical-OKEM Clean or equivalent. Do not use banned solvents.	No visible damage on appearance and marking		
Mechanical Shock	AEC-Q200 REV D. Stress NO.13 (refer to MIL-STD-202 Method 213 Condition C) Three shocks in each direction shall be applied along the three mutually perpendicular axes of the test specimen. Peak value: 100 g's, Duration: 6 ms, Velocity change: 12.3 ft/s, Waveform: Half sine	±0.5%		
Vibration	AEC-Q200 REV D. Stress NO.14 (refer to MIL-STD-202 Method 204) 5 g's for 20 min., 12 cycles each of 3 orientations, Test from 10 - 2,000 Hz.	±0.5%		
Resistance to Soldering Heat	AEC-Q200 REV D. Stress NO.15 (refer to IEC 60115-1 4.18.2/ MIL-STD-202 Method 210) Dip the resistor into a solder bath measured (260±5)°C and hold it for a 10±1 seconds	±1%		
ESD	AEC-Q200 REV D. Stress NO.17 (refer to AEC-Q200-002/ ISO/DIS 10605) (150pF/ 20000ohm discharge network) Human body model, 1 positive & 1 negative discharges with 2KV source	±0.5%		
Solderability	AEC-Q200 REV D. Stress NO.18 (refer to J-STD-002 or IEC 60115-1 4.17) Solder area covered after (235±3)°C/(2±0.2) seconds with flux applied	95% min. covered		
Flammability	AEC-Q200 REV D. Stress NO.20 (refer to UL-94) V-0 or V-1 are acceptable. Electrical test not required.	NO flaming		
Board Flex	AEC-Q200 REV D. Stress NO.21 (refer to AEC-Q200-005) 60 sec minimum holding time.	±0.5%		
Terminal Strength	AEC-Q200 REV D. Stress NO.22 (refer to AEC-Q200-006) Force of 1.8kg for 60 seconds	±0.5%		
Short Time Overload	IEC 60115-1 4.13 2 seconds 2.5x rated voltage (not over max. working voltage)	±2%		
Climatic test	IEC 60115-1 4.23 4.23.2 - dry heat: 16 hours 150°C 4.23.3 - damp heat: 24 hours 55°C with 95% relative humidity 4.23.4 - cold: 2 hours -55°C 4.23.5 - negative air pressure: 2 hour 8.5KPa at (25±10)°C 4.23.6 - damp heat cyclic: 5 days 55°C with 95% relative humidity 4.23.7 - DC load: rated voltage at -55°C and 150°C each 1 Min.	±2%		
Load Life In Humidity	IEC 60115-1 4.24 56 days rated load (not over max. working voltage) at (40±2)°C and (93±3)% relative humidity	±5%		
Single pulse high voltage overload	IEC 60115-1 4.27 10 pulses of 10/700µs at 10x rated voltage (not over 2x max. working voltage) with interval of 60 sec.	±1%		
Periodic Electric Overload	IEC 60115-1 4.39 3.9x rated voltage (not over 2X max. working voltage) with 0.1s ON, 2.5s OFF for 1,000 cycles	±1%		
Surge Test	Proprietary test specification FRC-TR-010113 = $\sqrt{(6000 \times P \times R)}$ DC P is power rating, R is resistance value, surge voltage is not more than listed at right Surge spec = 1.2/50µs Period = 12 sec Number of surges = 5	SRM204	2KV	±5%
		SRM204T	4KV	
		SRM207	6KV	
		SRM101/207P	8KV	
		SRM201	9KV	
		SRM301/101T	10KV	
Anti-sulfuration test	EIA-977(conditions B) 750 hours at (105±2)°C without load	±1% ±2% ±5%	±1% ±2% ±5%	

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■ SINGLE SURGE PERFORMANCE

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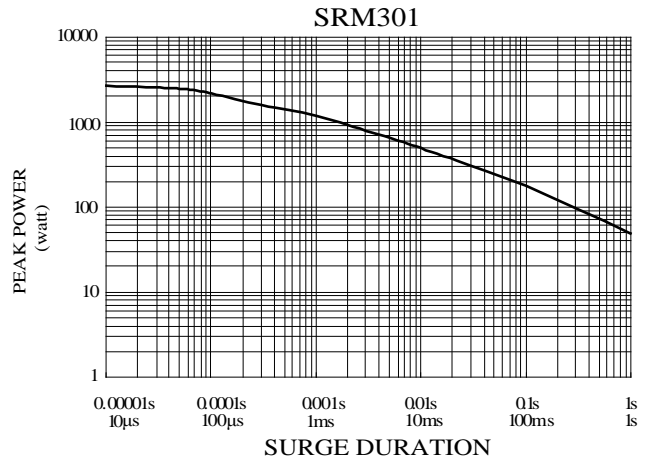
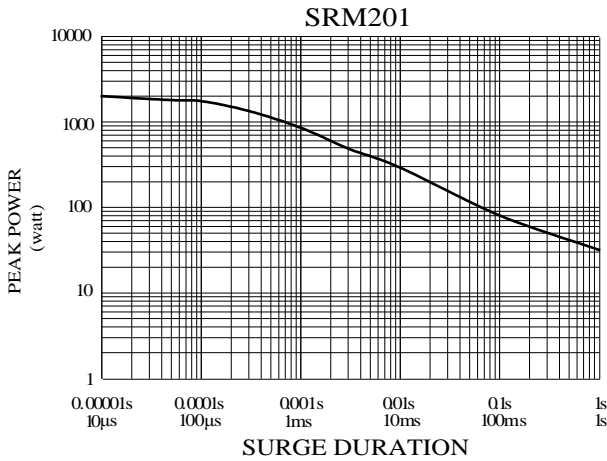


SRM Surge Resistant MELF Resistor

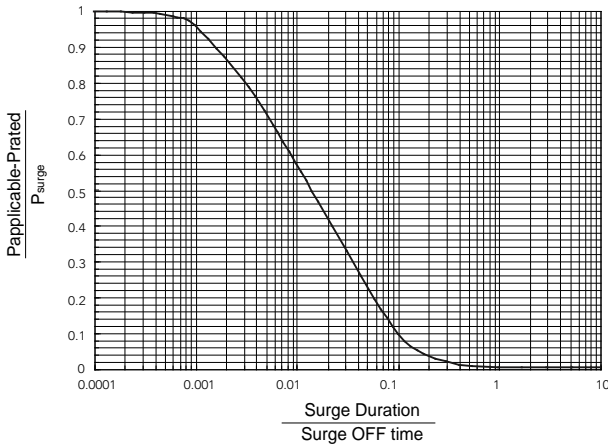
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■ SINGLE SURGE PERFORMANCE



■ SURGE POWER DERATING CURVE



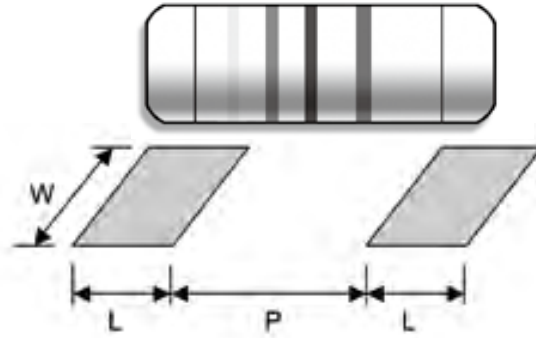
Notes:

- SINGLE SURGE PERFORMANCE graph is good for NON REPETITIVE applications operating in an ambient temperature of 70°C or less. For temperatures above 70°C, the graph power must be derated further linearly down to zero at 150 °C.
- To determine applicable surge power in continuous-surge applications:
 1. Identify allowable duration and peak power P_{surge} of single surge;
 2. Determine ratio of surge duration/surge OFF time in application;
 3. Calculate $P_{applicable}$ backwardly according to Y-axis of SURGE POWER DERATING CURVE.

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■ SUGGESTED PAD LAYOUT



Type	Soldering Mode	Pad Length (L, mm, Min.)	Pad Spacing (P, mm)	Pad Width (W, mm, Min.)
SRM204/SRM204T	Reflow	1.3	1.6 ± 0.1	1.6
	Wave	1.5	1.5 ± 0.1	1.8
SRM207/207P	Reflow	2.0	3.0 ± 0.1	3.0
	Wave	2.5	3.0 ± 0.1	3.0
SRM101/101T	Reflow	2.0	3.0 ± 0.1	3.0
	Wave	2.5	3.0 ± 0.1	3.0
SRM201	Reflow	3.0	4.9 ± 0.3	3.7
	Wave	3.5	4.8 ± 0.3	4.0
SRM301	Reflow	4.0	6.2 ± 0.4	5.0
	Wave	4.5	6.0 ± 0.4	5.0

For better heat dissipation / lower heat resistance, increase W & L.

■ COVER TAPE PEELING SPECIFICATION

Recommended peeling force:

SRM204, SRM204T, SRM207, SRM207P, SRM101, SRM101T: 50±5gf SRM201, SRM301: 70±10gf

