

## 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

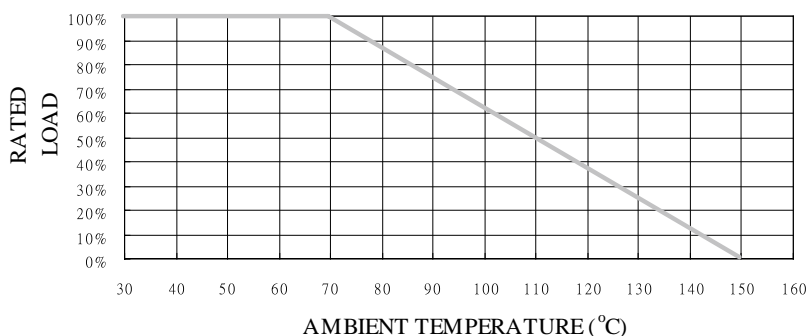
SRM204T	F	16R2	TKZ	TR3K0
Type	Tolerance*	Resistance	TCR	Packaging
	F(1%) G(2%) J(5%)	16.2Ω <b>4-character code</b> containing - 3 significant digits 1 letter multiplier  <u>OHM MULTIPLIER</u> R = 1 K = 10 <sup>3</sup> M = 10 <sup>6</sup> G = 10 <sup>9</sup>	<b>3-character code</b>  TKZ = Default Product Temperature Coefficient.  Information of typical product temperature coefficient can be found in the Technical Summary section of the datasheet.**	<b>5-character code</b>  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 <sup>4</sup>	
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).

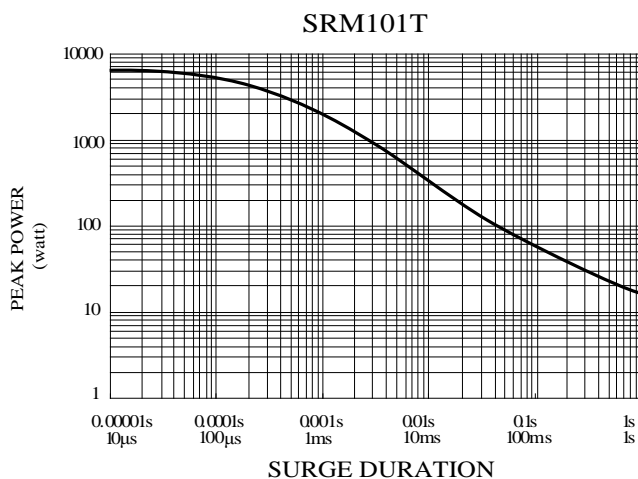
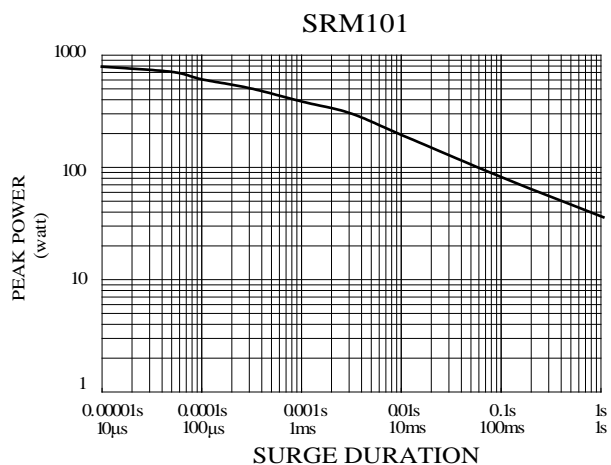
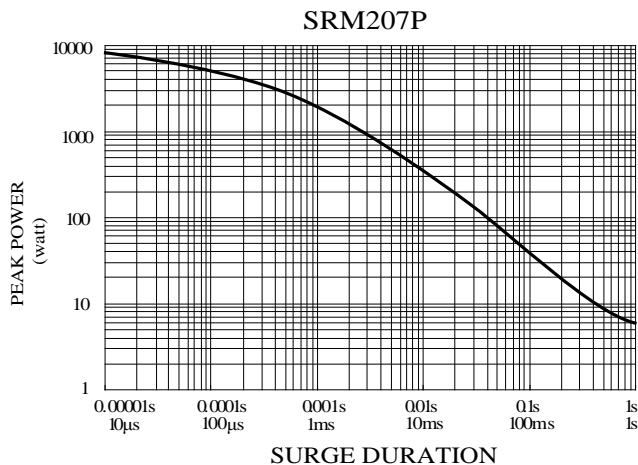
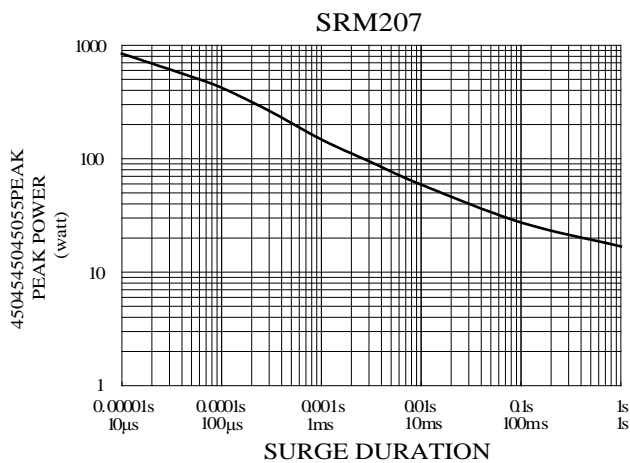
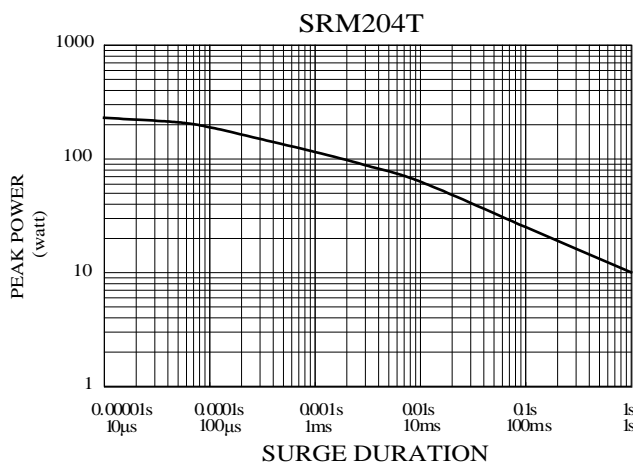
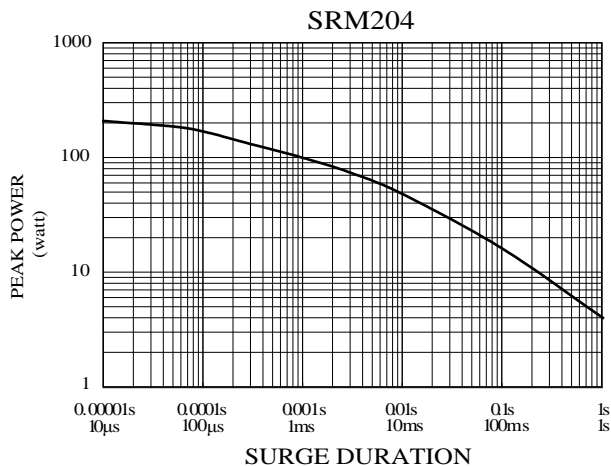
## PERFORMANCE SPECIFICATIONS

Characteristics	Test Conditions	Limits		
High Temperature Exposure	<b>AEC-Q200 REV D. Stress NO.3 (refer to IEC 60115-1 4.25.3/ MIL-STD-202 Method 108)</b> 1,000 hours at 150°C without load	±2.5%		
Temperature Cycling	<b>AEC-Q200 REV D. Stress NO.4 (refer to IEC 60115-1 4.19/ JESD22 Method JA-104)</b> -55°C 30minutes, +125°C 30minutes, 1,000 cycles	±2%		
	<b>Proprietary test specification FRC-AEQ-180702</b> -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	<b>AEC-Q200 REV D. Stress NO.7 (refer to IEC 60115-1 4.37/ MIL-STD-202 Method 103)</b> 1,000 hours at 85°C and 85% relative humidity with 10% operating power	±5%		
Load Life	<b>IEC 60115-1 4.25.1</b> Rated load (not over max. working voltage) 1,000 hours with 1.5 hours ON, 0.5 hours OFF, at 70°C	±5%		
	<b>AEC-Q200 REV D. Stress NO.8 (refer to MIL-STD-202 Method 108)</b> 1,000 hours at 125°C with de-rated continuous working voltage	±5%		
Resistance to Solvents	<b>AEC-Q200 REV D. Stress NO.12 (refer to MIL-STD-202 Method 215)</b> Add Aqueous wash chemical-OKEM Clean or equivalent. Do not use banned solvents.	No visible damage on appearance and marking		
Mechanical Shock	<b>AEC-Q200 REV D. Stress NO.13 (refer to MIL-STD-202 Method 213 Condition C)</b> 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	<b>AEC-Q200 REV D. Stress NO.14 (refer to MIL-STD-202 Method 204)</b> 5 g's for 20 min., 12 cycles each of 3 orientations, Test from 10 - 2,000 Hz.	±0.5%		
Resistance to Soldering Heat	<b>AEC-Q200 REV D. Stress NO.15 (refer to IEC 60115-1 4.18.2/ MIL-STD-202 Method 210)</b> Dip the resistor into a solder bath measured (260±5)°C and hold it for a 10±1 seconds	±1%		
ESD	<b>AEC-Q200 REV D. Stress NO.17 (refer to AEC-Q200-002/ ISO/DIS 10605) (150pF/ 20000ohm discharge network)</b> Human body model, 1 positive & 1 negative discharges with 2KV source	±0.5%		
Solderability	<b>AEC-Q200 REV D. Stress NO.18 (refer to J-STD-002 or IEC 60115-1 4.17)</b> Solder area covered after (235±3)°C/(2±0.2) seconds with flux applied	95% min. covered		
Flammability	<b>AEC-Q200 REV D. Stress NO.20 (refer to UL-94)</b> V-0 or V-1 are acceptable. Electrical test not required.	NO flaming		
Board Flex	<b>AEC-Q200 REV D. Stress NO.21 (refer to AEC-Q200-005)</b> 60 sec minimum holding time.	±0.5%		
Terminal Strength	<b>AEC-Q200 REV D. Stress NO.22 (refer to AEC-Q200-006)</b> Force of 1.8kg for 60 seconds	±0.5%		
Short Time Overload	<b>IEC 60115-1 4.13</b> 2 seconds 2.5x rated voltage (not over max. working voltage)	±2%		
Climatic test	<b>IEC 60115-1 4.23</b> 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	<b>IEC 60115-1 4.24</b> 56 days rated load (not over max. working voltage) at (40±2)°C and (93±3)% relative humidity	±5%		
Single pulse high voltage overload	<b>IEC 60115-1 4.27</b> 10 pulses of 10/700µs at 10x rated voltage (not over 2x max. working voltage) with interval of 60 sec.	±1%		
Periodic Electric Overload	<b>IEC 60115-1 4.39</b> 3.9x rated voltage (not over 2X max. working voltage) with 0.1s ON, 2.5s OFF for 1,000 cycles	±1%		
Surge Test	<b>Proprietary test specification FRC-TR-010113 = <math>\sqrt{(6000 \times P \times R)}</math> DC</b> 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	<b>EIA-977(conditions B)</b> 750 hours at (105±2)°C without load	±1% ±2% ±5%	±1% ±2% ±5%	

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## ■ SINGLE SURGE PERFORMANCE

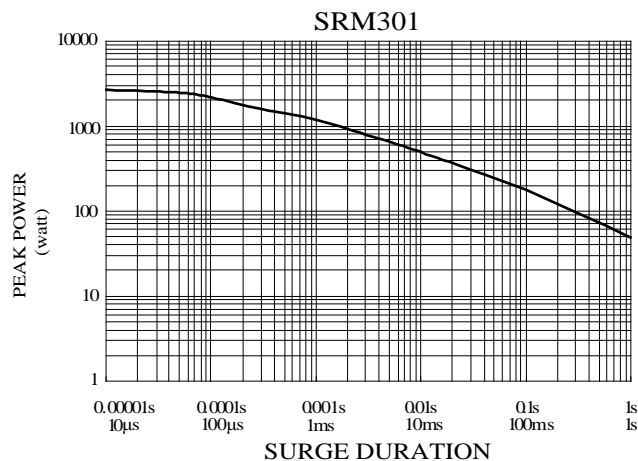
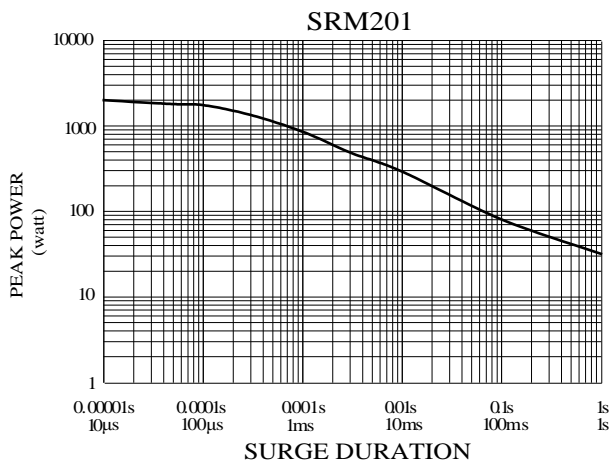
SRM



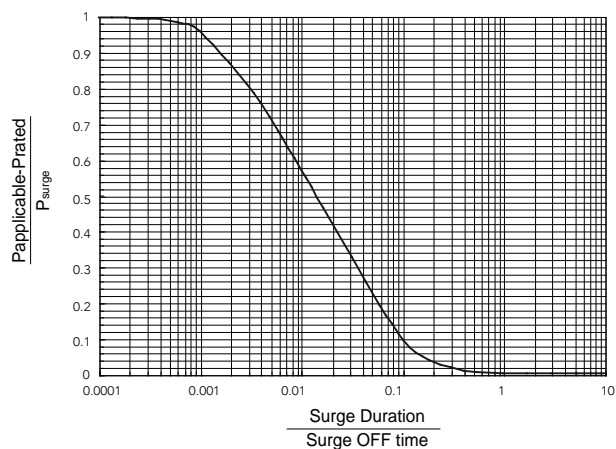
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SRM

## ■ SINGLE SURGE PERFORMANCE



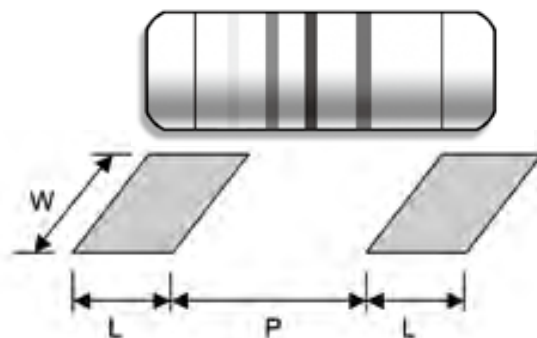
## ■ SURGE POWER DERATING CURVE



### 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.

## ■ 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

