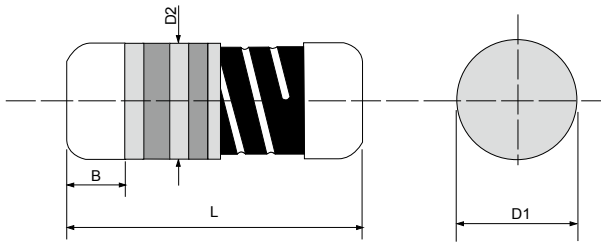


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## Specifications Per

- IEC 60115-1 60115-2
- EN 140401-803

## Features

- SMD enabled Structure with excellent solderability
- Excellent solderability termination
- Products meet RoHS requirements and do not contain substances of very high concern identified by European Chemicals Agency

## DIMENSIONS

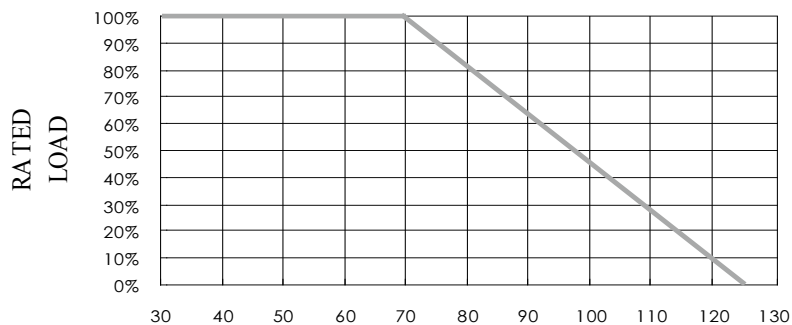
Type	Body Length (L, mm)	Cap Diameter (D1, mm)	Body Diameter (D2, mm)	Soldering Spot (B, mm)	Net Weight Per 1000 pcs
SM16	3.52 ± 0.15	1.35 ± 0.1	D1+0.02/ -0.15	0.6 Min.	17 grams
SM204	3.52 ± 0.15	1.35 ± 0.1	D1+0.02/ -0.15	0.6 Min.	17 grams
SM207	5.90 ± 0.20	2.20 ± 0.1	D1+0.02/ -0.2	1.0 Min.	66 grams
SM52	5.90 ± 0.20	2.20 ± 0.1	D1+0.02/ -0.2	1.0 Min.	66 grams

## GENERAL SPECIFICATIONS

Type	Power Rating (at 70°C)	Maximum Working Voltage	Maximum Overload Voltage	Minimum Resistance	Maximum Resistance	Resistance Tolerance	Available Resistance Values
SM16	1/6W	200V	400V	0.51Ω	10MΩ	±1%	E-24/E-96
						±2%, ±5%	E-24
SM204	1/4W	200V	400V	0.51Ω	10MΩ	±1%	E-24/E-96
						±2%, ±5%	E-24
SM207	1/3W	250V	500V	0.51Ω	10MΩ	±1%	E-24/E-96
						±2%, ±5%	E-24
SM52	1/2W	250V	500V	0.51Ω	10MΩ	±1%	E-24/E-96
						±2%, ±5%	E-24

For zero-ohm jumper, please see ZMM series. For 10m~510mΩ, please see CSM series. Special sizes, values, and specifications not listed available on special order.

## POWER DERATING CURVE

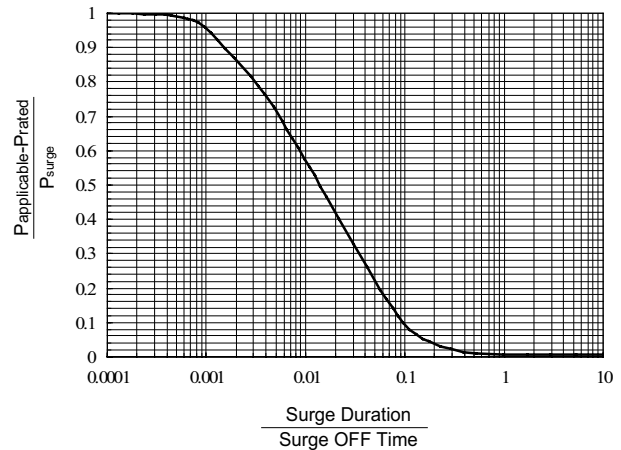
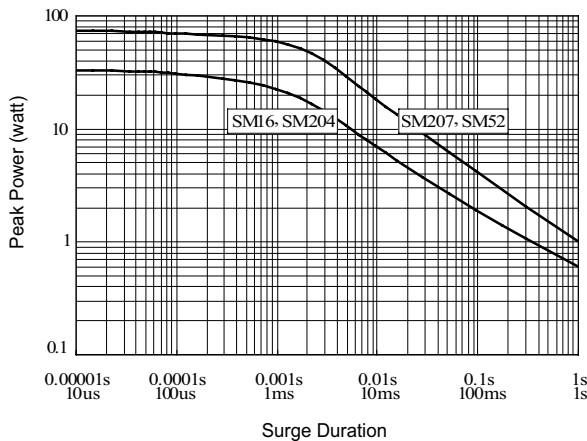


## TECHNICAL SUMMARY

Characteristics	Ranges & Limits	
Operating Temperature Range, °C	-55 ~ +125	
Temperature Coefficient, PPM / °C*	±1%, ±2%	±25, ±50, ±100
	±5%	±100
Dielectric Withstanding Voltage, VAC or DC	SM16, SM204	200
	SM207, SM52	500
Insulation Resistance, MΩ	>10 <sup>4</sup>	
Film Temperature, °C	SM16, SM204, SM207	125
	SM52	140
Failure Rate, pcs/10 <sup>9</sup> device hours	<0.1	
Thermal Resistance, K/W	<220	
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).

## SINGLE SURGE PERFORMANCE



### Notes:

1. 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 125°C.
2. To determine applicable surge power in continuous-surge applications:
  - Identify allowable duration and peak power P<sub>surge</sub> of single surge;
  - Determine ratio of surge duration/surge OFF time in application;
  - Calculate P<sub>applicable</sub> backwardly according to Y-axis of SURGE POWER DERATING CURVE.

## PERFORMANCE SPECIFICATIONS

Characteristics	Test Conditions	Limits		
Short Time Overload	<b>IEC 60115-1 4.13</b> 5 seconds 2.5x rated voltage (not over max. overload voltage)	0.51Ω to 332KΩ	±0.05%	
		>332KΩ	±0.15%	
Load Life	<b>IEC 60115-1 4.25.1</b> Rated load (not over max. working voltage) 1000 hrs with 1.5 hours ON, 0.5 hours OFF, at (70±2)°C	±0.5%		
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	±0.35%		
Load Life In Humidity (accelerated mode)	<b>IEC 60115-1 4.37</b> 1,000 hours at 85°C and 85% relative humidity with 0.1x rated voltage (not over 100V)	<10Ω	±1.0%	
		10Ω to <10KΩ	±0.5%	
		10KΩ to 332KΩ	±0.75%	
		>332KΩ	±1.0%	
Periodic Electric Overload	<b>IEC 60115-1 4.39</b> 3.9x rated voltage (not over max. overload voltage) with 0.1s ON, 2.5s OFF for 1,000 cycles	±0.5%		
Resistance To Soldering Heat	<b>IEC 60115-1 4.18.2</b> Dip the resistor into a solder bath measured (260±5)°C and hold it for a 10±1 seconds	<1Ω	±0.25%	
		1Ω to 332KΩ	±0.1%	
		>332KΩ	±0.25%	
Thermal Endurance	<b>IEC 60115-1 4.25.3</b> 1,000 hours without load	85°C	<1Ω	±0.25%
			1Ω to 100Ω	±0.2%
			>100Ω to 332KΩ	±0.2%
		125°C	> 332KΩ	±0.25%
			<1Ω	±0.5%
			1Ω to 100Ω	±0.25%
Thermal Shock	<b>IEC 60115-1 4.19</b> -55°C 30minutes, +125°C 30minutes	5 cycles	<1Ω	±0.15%
			1Ω to 332KΩ	±0.05%
			> 332KΩ	±0.15%
		1,000 cycles	<1Ω	±0.5%
			1Ω to 332KΩ	±0.2%
			> 332KΩ	±0.5%
Single pulse high voltage overload	<b>IEC 60115-1 4.27</b> • 5 pulses of 1.2/50μs at 10x rated voltage (not over 400V for SM16 & SM204; not over 500V for SM207 & SM52) with interval of 12 sec. • 10 pulses of 10/700μs at 10x rated voltage (not over 400V for SM16 & SM204; not over 500V for SM207 & SM52) with interval of 60 sec.	±0.15%		
		±0.15%		
Electrostatic discharge (Human body model)	<b>IEC 60115-1 4.38</b> 3 positive & 3 negative discharges with 2KV for SM16 & SM204 or 4KV for SM207 & SM52 (For continuous surge application please see Surge Performance paragraph)	±0.5%		
Climatic test	<b>IEC 60115-1 4.23</b> 4.23.2 - dry heat: 16 hours 125°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 125°C each for 1 min.	±0.5%		
Solderability	<b>IEC 60115-1 4.17.2</b> Solder area covered after (235±3)°C/(2±0.2) seconds with flux applied	95% min.coverage		
Vibration	<b>IEC 60115-1 4.22</b> Six hours in each parallel and axial direction with a simple harmonic motion having an amplitude of 1.52mm and 10 to 2,000 Hz.	±0.15%		
Bending test	<b>IEC 60115-1 4.33</b> Pressing depth 2mm, 3 times	±0.15%		
Flammability	<b>IEC 60115-1 4.35</b> Needle flame test 10s	No burning after 30s		

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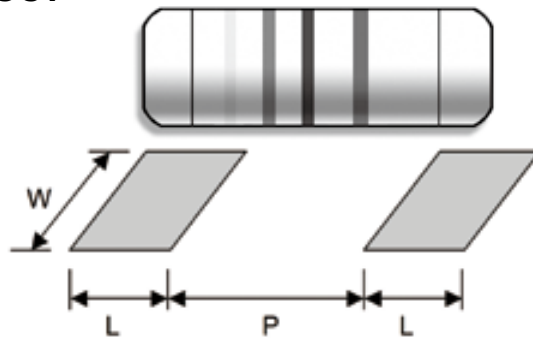
**■ PART NUMBER**

Example: SM204F84K5TKRTR3K0

<b>SM204</b>	<b>F</b>	<b>84K5</b>	<b>TKR</b>	<b>TR3K0</b>
Type	Tolerance*	Resistance	TCR*	Packaging
	F (1%) G (2%) J (5%)	84.5KΩ <b>4-character code</b> containing - 3 significant digits 1 letter multiplier <b>OHM MULTIPLIER</b> R = 1 K = 10 <sup>3</sup> M = 10 <sup>6</sup> G = 10 <sup>9</sup>	50ppm <b>3-character code</b>  TKQ = ± 25ppm TKR = ± 50ppm TKS = ± 100ppm	<b>5-character code</b> TR = Tape Reel (pieces per reel) <u>SM16/SM204</u> 3K0 = 3,000 6K0 = 6,000** 10K = 10,000** <u>SM207/SM52</u> 2K0 = 2,000 6K0 = 6,000** 10K = 10,000**

\* 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.

**■ SUGGESTED PAD LAYOUT**

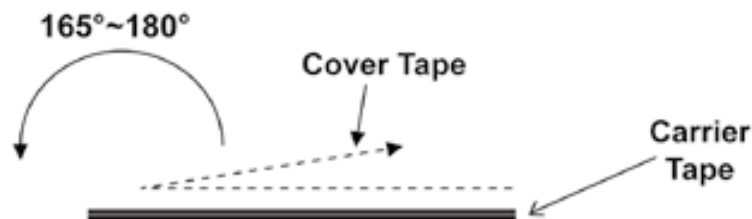


Type	Soldering Mode	Pad Length (L, mm, Min.)	Pad Spacing (P, mm)	Pad Width (W, mm, Min.)
SM16 SM204	Reflow	1.3	1.6 ± 0.1	1.6
	Wave	1.5	1.5 ± 0.1	1.8
SM207 SM52	Reflow	2.0	3.0 ± 0.1	3.0
	Wave	2.5	3.0 ± 0.1	3.0

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

**■ COVER TAPE PEELING SPECIFICATION**

Recommended peeling force: 50±gf



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