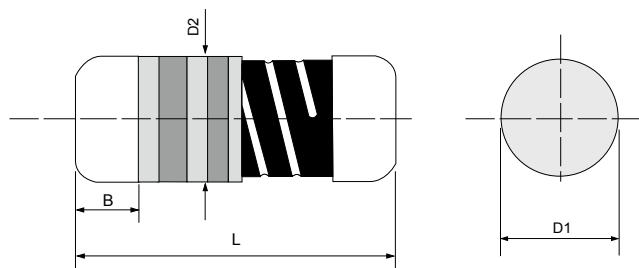


# REFP Series

## Enhanced Film Power MELF Resistor



### 1. Specifications Per

• IEC 60115-1

### 2. Features

- High power handling
- Superior reliability and stability
- SMD enabled structure with excellent solderability
- Products meet RoHS requirements and do not contain substances of very high concern identified by European Chemicals Agency

### ■ DIMENSIONS

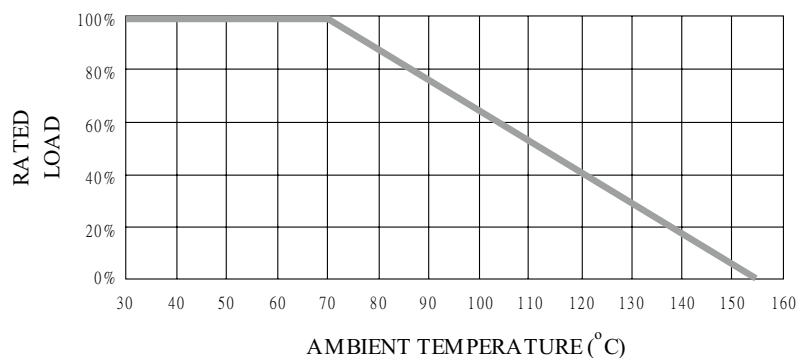
Type	Body Length (L, mm)	Cap Diameter (D1, mm)	Body Diameter (D2, mm)	Soldering Spot (B, mm)	Net Weight Per 1000 pcs
REFP204	3.52 ± 0.15	1.35 ± 0.1	D1+0.02/ -0.15	0.6 Min.	17 grams
REFP101	5.90 ± 0.2	2.20 ± 0.1	D1+0.02/ -0.2	1.0 Min.	66 grams
REFP201	8.50 ± 0.5	3.00 ± 0.2	D1+0.05/ -0.35	1.3 Min.	186 grams
REFP301	10.5 ± 0.5	4.00 ± 0.5	D1+0.05/ -0.45	1.6 Min.	446 grams
REFP401	12.6 ± 0.6	4.60 ± 0.5	D1+0.05/ -0.50	1.8 Min.	750 grams
REFP501	14.6 ± 0.6	5.10 ± 0.5	D1+0.05/ -0.50	2.0 Min.	1000 grams

### ■ GENERAL SPECIFICATIONS

Type	Power Rating (at 70°C)	Maximum Working Voltage	Maximum Overload Voltage	Minimum Resistance	Maximum Resistance	Resistance Tolerance	Available Resistance Values
REFP204	1/2W	250V	500V	0, 0.51Ω	1MΩ	±0.5%~5%	E-24 / E-96
REFP101	1W	300V	600V	0, 0.51Ω	1MΩ	±0.5%~5%	E-24 / E-96
REFP201	2W	350V	700V	0, 0.51Ω	4.7MΩ	±0.5%~5%	E-24 / E-96
REFP301	3W	400V	800V	0, 0.51Ω	6.8MΩ	±0.5%~5%	E-24 / E-96
REFP401	4W	400V	800V	0, 0.51Ω	8.2MΩ	±0.5%~5%	E-24 / E-96
REFP501	5W	450V	900V	0, 0.51Ω	10MΩ	±0.5%~5%	E-24 / E-96

Special sizes, values, and specifications not listed available on special order.  
For values between 10mΩ & 510mΩ, please see RCSM series.

### ■ POWER DERATING CURVE



# REFP Series

## Enhanced Film Power MELF Resistor

### TECHNICAL SUMMARY

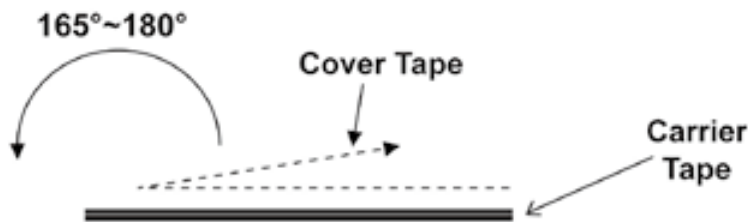
Characteristics	Limits
Dielectric Withstanding Voltage, VAC or VDC	REFP204: 300 REFP101: 500 REFP201: 700 REFP301, REFP401, REFP501: 1000
Temperature Coefficient, PPM / °C*	±200, ±400, ±600, ±800
Operating Temperature Range, °C	-55 ~ +155
Insulation Resistance, MΩ	>10 <sup>4</sup>
Failure Rate in Time, pcs / 10 <sup>9</sup> device hours	<1
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).

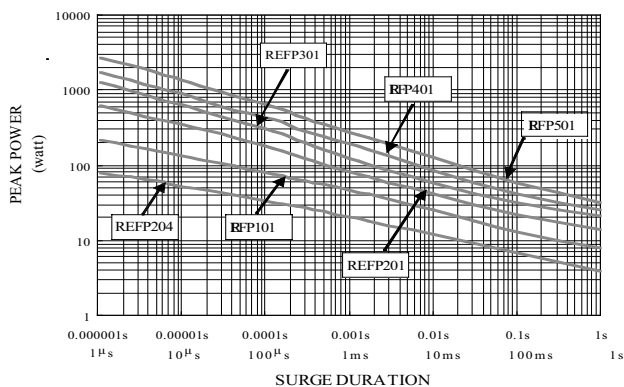
### COVER TAPE PEELING SPECIFICATION

Recommended peeling force:

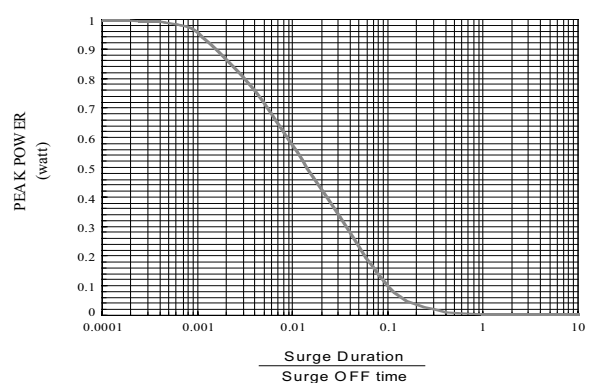
REFP204, REFP101: 50±5gf REFP201, REFP301: 70±10gf REFP401, REFP501: 80±10gf



### SINGLE SURGE PERFORMANCE



### SURGE POWER DERATING CURVE



#### Notes:

- Above graph is accurate 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 by 1.18% per °C.
- For applicable surge power in continuous-surge applications please see SURGE POWER DERATING CURVE above.

# REFP Series

## Enhanced Film Power MELF Resistor

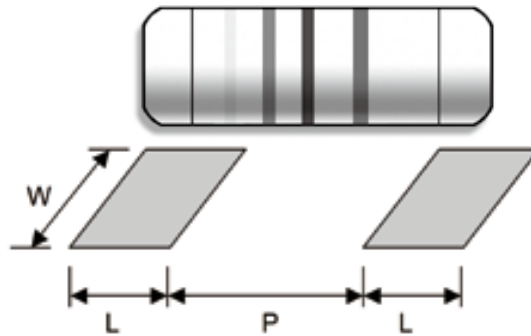
### ■ PERFORMANCE SPECIFICATIONS

Characteristics	Test Conditions	Limits	
Short Time Overload	<b>IEC 60115-1 4.13</b> 2 seconds 2.5x rated voltage (not over max. working voltage)	±0.5%, 1%: ± 2%: ±5%:	±0.5% ±0.8% ±2%
Load Life	<b>IEC 60115-1 4.25.1</b> Rated load (not over max. working voltage) 1,000 hrs with 1.5 hours ON, 0.5 hours OFF, at (70±2)°C	±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	±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	±1%	
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	±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	
Thermal Endurance	<b>IEC 60115-1 4.25.3</b> 1,000 hours at 155°C without load	±2%	
Thermal Shock	<b>IEC 60115-1 4.19</b> -55°C 30minutes, +155°C 30minutes, 5 cycles	±2%	
Single pulse high voltage overload	<b>IEC 60115-1 4.27</b> 10 pulses of 10/700µs at 10x rated voltage (not over max. overload voltage) with interval of 60 sec.	±2%	
Electrostatic discharge (Human body model)	<b>IEC 60115-1 4.38</b> 3 positive & 3 negative discharges with 2KV for EFP204 or 4KV for EFP101, EFP201, EFP301, EFP401 & EFP501 ( For continuous surge application please see Surge Performance paragraph )	±5%	
Climatic test	<b>IEC 60115-1 4.23</b> 4.23.2 - dry heat: 16 hours 155°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 155°C each 1 Min.	±2%	
Flammability	<b>IEC 60115-1 4.35</b> Needle flame test 10s	No burning after 30s	
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 0.75mm and 10 to 500 Hz.	±1%	
Bending test	<b>IEC 60115-1 4.33</b> Pressing depth 2mm, 3 times	±1%	

# REFP Series

## Enhanced Film Power MELF Resistor

### ■ SUGGESTED PAD LAYOUT



Type	Soldering Mode	Pad Length (L, mm, Min.)	Pad Spacing (P, mm)	Pad Width (W, mm, Min.)
REFP204	Reflow	1.3	1.6 ± 0.1	1.6
	Wave	1.5	1.5 ± 0.1	1.8
REFP101	Reflow	2.0	3.0 ± 0.1	3.0
	Wave	2.5	3.0 ± 0.1	3.0
REFP201	Reflow	3.0	4.9 ± 0.3	3.7
	Wave	3.5	4.8 ± 0.3	4.0
REFP301	Reflow	4.0	6.2 ± 0.4	5.0
	Wave	4.5	6.0 ± 0.4	5.0
REFP401	Reflow	4.5	8.0 ± 0.4	5.5
	Wave	5.0	7.7 ± 0.4	5.5
REFP501	Reflow	5.0	9.3 ± 0.4	6.5
	Wave	5.0	9.0 ± 0.4	6.0

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

### ■ PART NUMBER

Example: **REFP2041/2W22RK300ppmNIL**

REFP204	1/2W	22R	K	300ppm	NIL
Type	Power	Resistance	Tolerance	TCR	Packaging
	1/2W	22R=22Ω 22K=22KΩ 1M=1MΩ  R = 1 K = 10 <sup>3</sup> M = 10 <sup>6</sup> G = 10 <sup>9</sup>	J (5%) K (10%) M (20%)	3-7-character code  <b>TYL=Typical</b>  ± 5 ppm=5ppm ± 1000ppm=1000ppm	Nil = Bulk  <b>T/R = Tape and Reel</b> <b>T/B = Tape and Box</b>