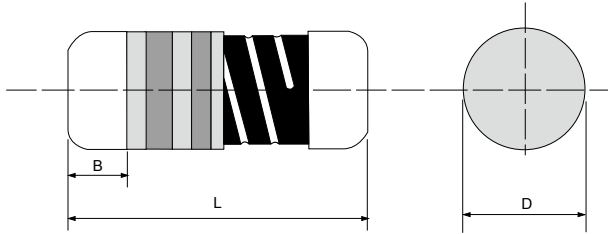


EFP - Enhanced Film Power MELF Resistor

Quality • Reliability
Cost-Down via Technology



Specifications Per

- IEC 60115-1, 60115-2
- CECC 40101
- DIN 44061

Features

- High Power Handling with Superior Reliability and Stability
- Conformal Coating against Humidity
- SMD Enabled Structure with Excellent Solderability
- 5% is 3-band coded; 2% and under is 4-band coded
- RoHS / REACH Compliant

DIMENSIONS

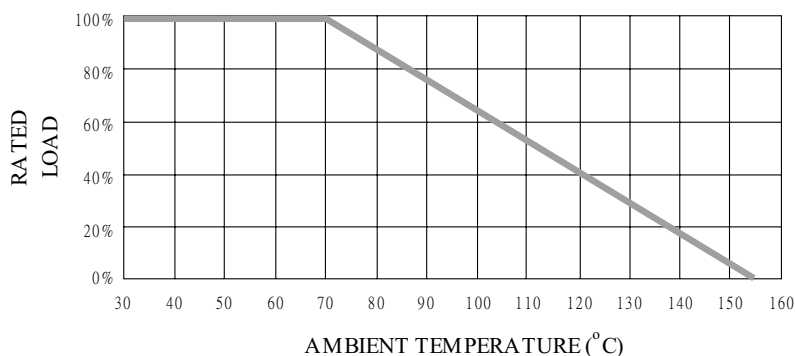
Type	Body Length (L, mm)	Body Diameter (D, mm)	Soldering spot (B, mm)	Net Weight Per 1000 pcs
EFP204	3.52 ± 0.08	1.35 ± 0.1	0.6 Min.	17 grams
EFP101	5.90 ± 0.2	2.20 ± 0.1	1.0 min.	66 grams
EFP201	8.50 ± 1.0	3.00 ± 0.2	1.3 min.	186 grams
EFP301	10.5 ± 1.0	4.00 ± 0.5	1.6 min.	446 grams
EFP401	12.6 ± 1.5	4.60 ± 0.7	1.8 min.	750 grams
EFP501	14.6 ± 2.0	5.10 ± 1.0	2.0 min.	1000 grams

GENERAL SPECIFICATIONS

Type	Power Rating (at 70°C)	Max. Working Voltage	Max. Overload Voltage	Resistance Range Min.	Resistance Range Max.	Resistance Tolerance	Standard Resistance Value
EFP204	1/2W	250V	500V	0Ω	1MΩ	±0.5%~5%	E-24 / 96
EFP101	1W	300V	600V	0Ω	1MΩ	±0.5%~5%	E-24 / 96
EFP201	2W	350V	700V	0Ω	4.7MΩ	±0.5%~5%	E-24 / 96
EFP301	3W	400V	800V	0Ω	6.8MΩ	±0.5%~5%	E-24 / 96
EFP401	4W	400V	800V	0Ω	8.2MΩ	±0.5%~5%	E-24 / 96
EFP501	5W	450V	900V	0Ω	10MΩ	±0.5%~5%	E-24 / 96

Special sizes, values, and specifications not listed available on special order.
For values between 1mΩ & 510mΩ, please see CSM series.

POWER DERATING CURVE



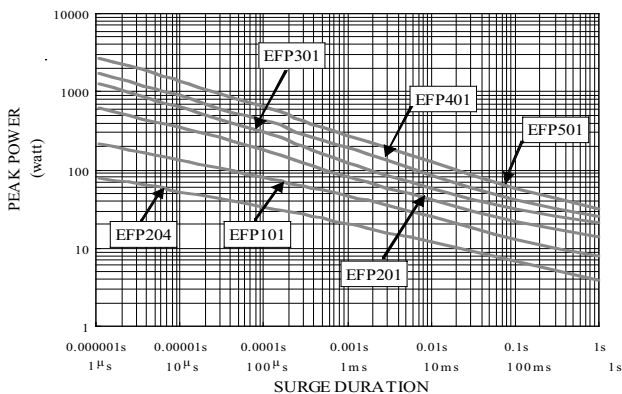
TECHNICAL SUMMARY

Characteristics	Limits
Dielectric Withstanding Voltage, VAC or VDC	EFP204: 300 EFP101: 500 EFP201: 700 EFP301, EFP401, EFP501: 1000
Temperature Coefficient, PPM / °C	≤ 100KΩ: ±200 110KΩ ~ 1.1MΩ: ±400 1.1MΩ ~ 6.8MΩ: ±600 > 6.8MΩ: ±800
Operating Temperature Range, °C	-55 ~ +155
Insulation Resistance, MΩ	>10 ⁴
Voltage Coefficient, PPM / V	<25
Failure Rate in Time, pcs / 109 device hours	<1
Tin Whisker (JESD201 Temperature Cycling & High Temp./ Humidity Storage), μm	<5

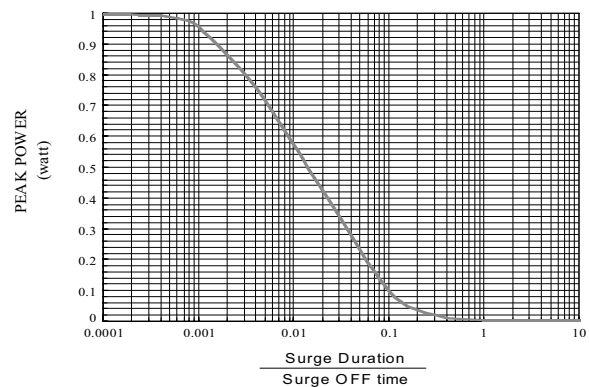
ORDERING INFORMATION (EXAMPLES)

Type	Tolerance	Resistance Value	Packaging	Special Request (Optional)
EFP204	D (0.5%) F (1%) G (2%) J (5%)	R68 84K5 1M69	TR3 (3K/reel) TR6 (6K/reel) TR10 (10K/reel)	LV (Low value) HV (High value)
EFP101			TR2 (2K/reel) TR6 (6K/reel) TR10 (10K/reel)	
EFP201			TR2.5 (2.5K/reel)	
EFP301			TR2 (2K/reel)	
EFP401			B (Bulk)	
EFP501			B (Bulk)	

SINGLE SURGE PERFORMANCE



SURGE POWER DERATING CURVE



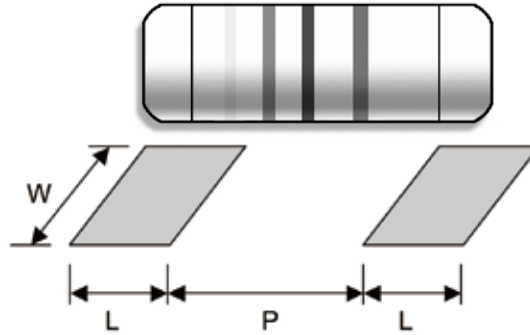
Notes:

1. 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.
2. For applicable surge power in continuous-surge applications please see SURGE POWER DERATING CURVE below.

■ PERFORMANCE SPECIFICATIONS

Test Characteristics	Test Conditions	Limits	
Short Time Overload	IEC 60115-1 4.13 5 seconds 2.5x rated voltage (not over max. overload voltage)	±0.5%, 1%: ±2%: ±5%:	±(0.5%+0.05R) ±(0.8%+0.05R) ±(2%+0.05R)
Load Life	IEC 60115-1 4.25.1 Rated load 1.5 hours ON, 0.5 hours OFF, at 70°C	±(5%+0.05R)	
Load Life In Humidity	IEC 60115-1 4.24 56 days rated load at 40°C and 93% relative humidity	±(5%+0.05R)	
Resistance To Soldering Heat	IEC 60115-1 4.18 10 seconds at 260°C solder bath temperature	±(1%+0.05R)	
Periodic Electric Overload	IEC 60115-1 4.37 3.9x rated voltage (not over max. overload voltage) with 0.1s ON, 2.5s OFF for 1,000 cycles	±(5%+0.05R)	
Solderability	MIL-STD-202 Method 208 Solder area covered after 230±5°C/5±0.5 seconds w/ flux applied	> 95%	
Thermal Endurance	IEC 60115-1 4.25.3 1,000 hours at 155°C without load	±(1%+0.05R)	
Thermal Shock	IEC 60115-1 4.19 -55°C 30minutes, +155°C 30minutes, 5 cycles	±(2%+0.05R)	
Single pulse high voltage overload	IEC 60115-1 4.27 Severity no.4 10 pulses of 10/700µs at 10x rated voltage (not over max. overload voltage) with interval of 60 sec.	± 2%	
Electrostatic discharge (Human body mode)	IEC 60115-1 4.40 3 positive & 3 negative discharges with 4KV source	± 5%	
Climatic test	IEC 60115-1 4.23 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°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	IEC 60115-1 4.35 Needle flame test 10s	No burning after 30s	
Vibration	IEC 60115-1 4.22 Six hours in each parallel and axial direction w/a simple harmonic motion having an amplitude of 0.75mm and 10 to 500 Hz.	±(1%+0.05R)	
Bending test	IEC 60115-1 4.33 Pressing depth 2mm, 3 times	± 0.5%	

■ SUGGESTED PAD LAYOUT



Type	Soldering mode	Pad Length (L, mm, min.)	Pad Spacing (P, mm)	Pad Width (W, mm, min.)
EFP204	Reflow	1.0	2.0 ± 0.2	1.6
	Wave	1.2	2.0 ± 0.2	1.6
EFP101	Reflow	2.0	3.0 ± 0.3	3.0
	Wave	2.5	3.0 ± 0.3	3.0
EFP201	Reflow	3.0	4.9 ± 0.3	3.7
	Wave	3.5	4.8 ± 0.3	4.0
EFP301	Reflow (Not recommended)	4.0	6.2 ± 0.4	4.5
	Wave	4.5	6.0 ± 0.4	5.0
EFP401	Reflow (Not recommended)	4.5	8.0 ± 0.4	5.0
	Wave	5.0	7.7 ± 0.4	5.5
EFP501	Reflow (Not recommended)	5.0	9.3 ± 0.4	5.5
	Wave	5.0	9.0 ± 0.4	5.5

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

■ COVER TAPE PEELING SPECIFICATION

Recommended peeling force:

EFP204, EFP101: 50±5gf EFP201, EFP301: 70±10gf EFP401, EFP501: 80±10gf

