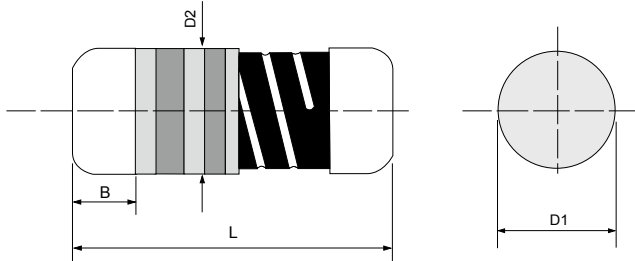


EFP - Enhanced Film Power MELF Resistor

Quality • Reliability
Cost-Down via Innovation.

EFP



Specifications Per

• IEC 60115-1

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

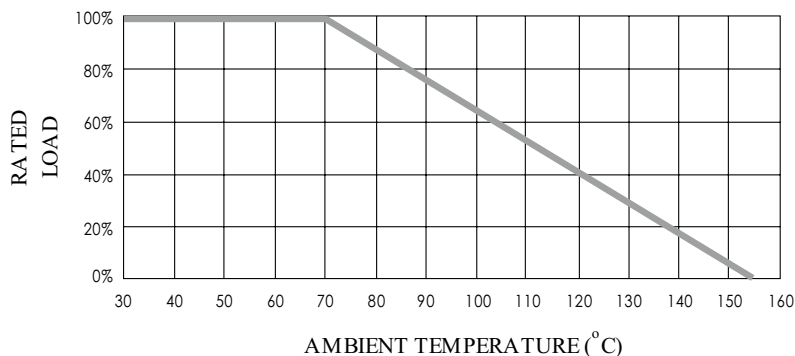
Type	Body Length (L, mm)	Cap Diameter (D1, mm)	Body Diameter (D2, mm)	Soldering Spot (B, mm)	Net Weight Per 1000 pcs
EFP204	3.52 ± 0.15	1.35 ± 0.1	D1+0.02/ -0.15	0.6 Min.	17 grams
EFP101	5.90 ± 0.2	2.20 ± 0.1	D1+0.02/ -0.2	1.0 Min.	66 grams
EFP201	8.50 ± 0.5	3.00 ± 0.2	D1+0.05/ -0.35	1.3 Min.	186 grams
EFP301	10.5 ± 0.5	4.00 ± 0.5	D1+0.05/ -0.45	1.6 Min.	446 grams
EFP401	12.6 ± 0.6	4.60 ± 0.5	D1+0.05/ -0.50	1.8 Min.	750 grams
EFP501	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
EFP204	1/2W	250V	500V	0.51Ω	1MΩ	±0.5%~5%	E-24 / E-96
EFP101	1W	300V	600V	0.51Ω	1MΩ	±0.5%~5%	E-24 / E-96
EFP201	2W	350V	700V	0.51Ω	4.7MΩ	±0.5%~5%	E-24 / E-96
EFP301	3W	400V	800V	0.51Ω	6.8MΩ	±0.5%~5%	E-24 / E-96
EFP401	4W	400V	800V	0.51Ω	8.2MΩ	±0.5%~5%	E-24 / E-96
EFP501	5W	450V	900V	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 CSM series.

POWER DERATING CURVE



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TECHNICAL SUMMARY

Characteristics	Limits
Dielectric Withstanding Voltage, VAC or VDC	EFP204: 300 EFP101: 500 EFP201: 700 EFP301, EFP401, EFP501: 1000
Temperature Coefficient, PPM / °C*	±200, ±400, ±600, ±800
Operating Temperature Range, °C	-55 ~ +155
Insulation Resistance, MΩ	>10 ⁴
Failure Rate in Time, pcs / 10 ⁹ 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).

PART NUMBER

Example: EFP401J1M49TKZBK500

EFP401	J	1M49	TKZ	BK500
Type	Tolerance*	Resistance	TCR	Packaging
	D (0.5%) F (1%) G (2%) J (5%)	1.49MΩ 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.**	Bulk 500 pieces 5-character code TR = Tape Reel (pieces per reel) <u>EFP204</u> 3K0 = 3,000 6K0 = 6,000*** 10K = 10,000*** <u>EFP101</u> 2K0 = 2,000 6K0 = 6,000*** 10K = 10,000*** <u>EFP201</u> 2K5 = 2,500 <u>EFP301</u> 2K0 = 2,000 BK = Bulk <u>EFP401/EFP501</u> BK + Quantity

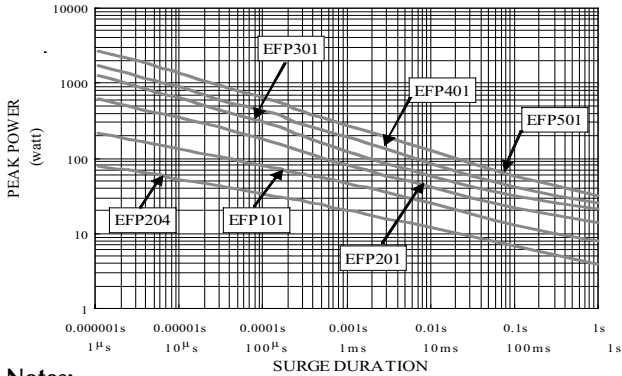
* Listed values may not be applicable to all resistance values. Please check with us before placing order.

** 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.

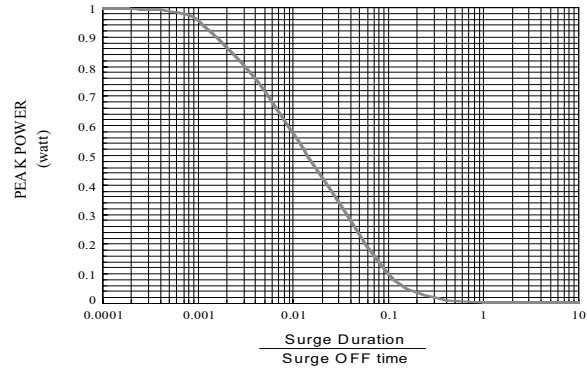
*** upon request

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■ 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.

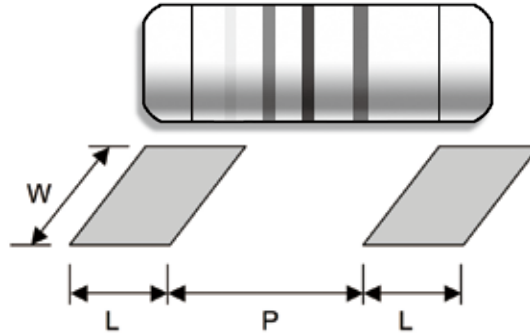
■ PERFORMANCE SPECIFICATIONS

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% ±0.8% ±2%
Load Life	IEC 60115-1 4.25.1 Rated load (not over max. working voltage) 1000 hrs with 1.5 hours ON, 0.5 hours OFF, at (70±2)°C	±5%	
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%	
Resistance To Soldering Heat	IEC 60115-1 4.18.2 Dip the resistor into a solder bath measured (260±5)°C and hold it for a 10±1 seconds	±1%	
Periodic Electric Overload	IEC 60115-1 4.39 3.9x rated voltage (not over max. overload voltage) with 0.1s ON, 2.5s OFF for 1,000 cycles	±5%	
Solderability	IEC 60115-1 4.17.2 Solder area covered after (235±3)°C / (2±0.2) seconds with flux applied	> 95%	
Thermal Endurance	IEC 60115-1 4.25.3 1,000 hours at 155°C without load	±2%	
Thermal Shock	IEC 60115-1 4.19 -55°C 30minutes, +155°C 30minutes, 5 cycles	±2%	
Single pulse high voltage overload	IEC 60115-1 4.27 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)	IEC 60115-1 4.38 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	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±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	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 with a simple harmonic motion having an amplitude of 0.75mm and 10 to 500 Hz.	±1%	
Bending test	IEC 60115-1 4.33 Pressing depth 2mm, 3 times	±1%	

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■ SUGGESTED PAD LAYOUT



Type	Soldering Mode	Pad Length (L, mm, Min.)	Pad Spacing (P, mm)	Pad Width (W, mm, Min.)
EFP204	Reflow	1.3	1.6 ± 0.1	1.6
	Wave	1.5	1.5 ± 0.1	1.8
EFP101	Reflow	2.0	3.0 ± 0.1	3.0
	Wave	2.5	3.0 ± 0.1	3.0
EFP201	Reflow	3.0	4.9 ± 0.3	3.7
	Wave	3.5	4.8 ± 0.3	4.0
EFP301	Reflow	4.0	6.2 ± 0.4	5.0
	Wave	4.5	6.0 ± 0.4	5.0
EFP401	Reflow	4.5	8.0 ± 0.4	5.5
	Wave	5.0	7.7 ± 0.4	5.5
EFP501	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.

■ COVER TAPE PEELING SPECIFICATION

Recommended peeling force:

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

