

High-Power Lead Free Chip Resistors

FPF series

1. FEATURES

Rated Power up to 2W

Suitable for lead free soldering.

Compatible with flow and reflow soldering.

2. APPLICATIONS

2.1 Consumer electronics

2.2 SMPS

2.3 Power supply

2.4 Motherboard

2.5 Electronic equipment

2.6 Portable Hi-Fi

3. RATING

3-1. High Power Chip Resistors

Type	Size	Power Rating at 70°C	Max RCWV	Max. Overload Voltage	Resistance Tolerance (%)	Temperature Coefficient (TCR; ppm/°C)	Resistance Range		Standard Resistance Values
							Min.	Max.	
FPF03	0603	1/8W	50V	100V	± 1%(F) ± 5%(J)	± 100	1Ω	1MΩ	E-96
FPF05	0805	1/4W	150V	300V					
FPF06	1206	1/2W	200V	400V					
FPF20	2010	1W	200V	400V		± 200	0Ω&1Ω	1MΩ	
FPF25	2512	2W	300V	600V					

Jumper: 0603 maximum resistance $R_{max} < 20m\Omega$ and rated current $I_R \leq 2A$

0805, 1206 maximum resistance $R_{max} \leq 20m\Omega$ and rated current $I_R \leq 4A$

2010, 2512 maximum resistance $R_{max} \leq 20m\Omega$ and rated current $I_R \leq 6A$

*FPF03&FPF05 1Ω~9.76Ω TCF 25°C~-55°C= ±150 ppm/°C

3-2. Low Resistance

Type	Size	Power Rating at 70°C	Max RCWV	Max. Overload Voltage	Resistance Tolerance (%)	Temperature Coefficient (TCR; ppm/°C)	Resistance Range	
							Min.	Max.
FPF03	0603	1/8W	477mV	954mV	± 1%(F) ± 5%(J)	±250	47mΩ	91mΩ
						±150	100mΩ	910mΩ
FPF05	0805	1/4W	551mV	1102mV		±200	47mΩ	91mΩ
						±100	100mΩ	910mΩ
FPF06	1206	1/2W	675mV	1349mV		±100	47mΩ	91mΩ
FPF20	2010	1W	954mV	1908mV	100mΩ		910mΩ	
FPF25	2512	2W	1349mV	2698mV	47mΩ		91mΩ	

*TCR: Resistance 47mΩ~91mΩ Temperature 25°C~-55°C, 150ppm for 2512, 2010, 200ppm for 1206
Resistance 100mΩ~910mΩ Temperature 25°C~-55°C, 150ppm for 0805, 200ppm for 0603

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4. PART NUMBER

<u>FPF</u> Type	<u>05</u> Size	<u>F</u> Tolerance	<u>T</u> Packing	<u>1002</u> Marking
FPF	03:0603	F: $\pm 1\%$	T: Paper tape – 5Kpcs	Examples: 1002 100x10 ² =10K Ω
	05:0805	J: $\pm 5\%$	V: Paper tape – 10Kpcs	
	06:1206		W: Paper tape – 20Kpcs	
	20:2010		P: Plastic tape – 4Kpcs	
	25:2512		X: Plastic tape – 8Kpcs	
			Y: Plastic tape – 16Kpcs	

5. Marking Table of 0603 $\pm 1\%$, $\pm 5\%$ (47m Ω ~91m Ω)

Resistance	Marking	Resistance	Marking
47m Ω	47M	70m Ω	70M
50m Ω	50M	75m Ω	75M
51m Ω	51M	80m Ω	80M
55m Ω	55M	82m Ω	82M
56m Ω	56M	85m Ω	85M
60m Ω	60M	90m Ω	90M
62m Ω	62M	91m Ω	91M
65m Ω	65M		
68m Ω	68M		

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6. SPECIFICATION AND TEST METHODS

6-1. FPF_{≥1Ω}

Item	Specification	Test method
DC Resistance	J : ± 5% , F: ± 1%	IEC 60115-1 / JIS C 5201-1, Clause 4.5 Measure the resistance value.
Short time Overload	J: Δ R≤± (2%+ 0.1 Ω) F: Δ R≤± (1%+ 0.05 Ω)	IEC 60115-1 / JIS C 5201-1, Clause 4.13 5 X Rated power or Max, Overload Voltage for 5 sec. measure resistance after 30 minutes
Solderability	Over 95% of termination must be covered with solder	IEC 60115-1 / JIS C 5201-1, Clause 4.17 After immersing flux , dip in the 235 ±2°C molten solder bath for 2±0.5 sec.
Resistance to Solder Heat	J: Δ R≤± (1%+ 0.1 Ω) F: Δ R≤± (0.5%+ 0.05 Ω). No mechanical damage	IEC 60115-1 /JIS C 5201-1, Clause 4.18 With 260±5°C for 10±1 sec.
Temperature Coefficient of Resistance (TCR)	Test temperature: -55~155°C Refer to T.C.R. specification in page 7	IEC 60115-1 / JIS C 5201-1, Clause 4.8 Test temperature : 25°C (T1) →-55°C (T2) 25°C (T1) →+155°C (T2) $TCR(ppm/^{\circ}C) = \frac{R2 - R1}{R1} * \frac{1}{T2 - T1} * 10^6$ T1 : 25°C T2: Test temperature R1: Resistance at reference temperature (T1) R2: Resistance at test temperature (T2)
Load life Humidity	J: Δ R≤± (3%+ 0.1 Ω) F: Δ R≤± (1%+ 0.05 Ω)	IEC 60115-1 / JIS C 5201-1, Clause 4.24 Maintain the temperature of the resistor at 40±2°C and 90~95% R.H. with the rated voltage applied. Cycle ON for 1.5 hours and OFF for 0.5 hour for 1000+48/-0 hours. After 1~4 hour, measure the resistance value.
Load Life	J: Δ R≤± (3%+ 0.1 Ω) F: Δ R≤± (1%+ 0.05 Ω)	IEC 60115-1 / JIS C 5201-1, Clause 4.25 Permanent resistance change after 1000+48/-0 hours (1.5 hours ON, 0.5hour OFF) at RCWV or Max. Keep the resistor at 70±3°C ambient
Temperature Cycle	J: Δ R≤± (1%+ 0.1 Ω) F: Δ R≤± (0.5%+ 0.05 Ω) No mechanical damage	IEC 60115-1 / JIS C5201-1, Clause 4.19 Repeat 5 cycles as follows -55°C (30min)~ +25°C (2~3 min.) +155°C (30min)~ +25°C (2~3min.)
Insulation Resistance	Between termination and coating must be over 1000M Ω	IEC 60115-1 / JIS C 5201-1, Clause 4.6 Test voltage: 100 ±15V
Bending Strength	J: Δ R≤± (1%+ 0.1 Ω) F: Δ R≤± (0.5%+ 0.05 Ω) No mechanical damage	IEC 60115-1 / JIS C 5201-1, Clause 4.33 Resistance change after bended on the 90mm PCB. Bend: 3mm for 0603, 0805 2mm for 1206, 2010, 2512

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6-2. FPF<1Ω

Item	Specification	Test method
DC Resistance	J : ± 5% , F: ± 1%	IEC 60115-1 / JIS C 5201-1, Clause 4.5 Measure the resistance value.
Short time Overload	J: Δ R ≤ ± (2%+ 0.5m Ω) F: Δ R ≤ ± (1%+ 0.5m Ω)	IEC 60115-1 / JIS C 5201-1, Clause 4.13 5 X Rated power or Max, Overload Voltage for 5 sec. measure resistance after 30 minutes
Solderability	Over 95% of termination must be covered with solder	IEC 60115-1 / JIS C 5201-1, Clause 4.17 After immersing flux , dip in the 235 ±2°C molten solder bath for 2±0.5 sec.
Resistance to Solder Heat	J: Δ R ≤ ± (1%+ 0.5m Ω) F: Δ R ≤ ± (0.5%+ 0.5m Ω). No mechanical damage	IEC 60115-1 / JIS C 5201-1, Clause 4.18 With 260±5°C for 10±1 sec.
Temperature Coefficient of Resistance (TCR)	Test temperature: -55~155°C Refer to T.C.R. specification in page 7	IEC 60115-1 / JIS C 5201-1, Clause 4.8 Test temperature : 25°C (T1) → -55°C (T2) 25°C (T1) → +155°C (T2) $TCR(ppm/°C) = \frac{R2 - R1}{R1} * \frac{1}{T2 - T1} * 10^6$ T1 : 25°C T2: Test temperature R1: Resistance at reference temperature (T1) R2: Resistance at test temperature (T2)
Load life Humidity	J: Δ R ≤ ± (3%+ 0.5m Ω) F: Δ R ≤ ± (1%+ 0.5m Ω)	IEC 60115-1 / JIS C 5201-1, Clause 4.24 Maintain the temperature of the resistor at 40±2°C and 90~95% R.H. with the rated voltage applied. Cycle ON for 1.5 hours and OFF for 0.5 hour for 1000+48/-0 hours. After 1~4 hour, measure the resistance value.
Load Life	J: Δ R ≤ ± (3%+ 0.5m Ω) F: Δ R ≤ ± (1%+ 0.5m Ω)	IEC 60115-1 / JIS C 5201-1, Clause 4.25 Permanent resistance change after 1000+48/-0 hours (1.5 hours ON, 0.5hour OFF) at RCWV or Max. Keep the resistor at 70±3°C ambient
Temperature Cycle	J: Δ R ≤ ± (1%+ 1m Ω) F: Δ R ≤ ± (0.5%+ 1m Ω) No mechanical damage	IEC 60115-1 / JIS C 5201-1, Clause 4.19 Repeat 5 cycles as follows -55°C (30min)~ +25°C (2~3 min.) +155°C (30min)~ +25°C (2~3min.)
Insulation Resistance	Between termination and coating must be over 1000M Ω	IEC 60115-1 / JIS C 5201-1, Clause 4.6 Test voltage: 100 ±15V
Bending Strength	J: Δ R ≤ ± (1%+ 1m Ω) F: Δ R ≤ ± (0.5%+ 1m Ω) No mechanical damage	IEC 60115-1 / JIS C 5201-1, Clause 4.33 Resistance change after bended on the 90mm PCB. Bend: 3mm for 0603, 0805 2mm for 1206, 2010, 2512