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SPECIFICATION FOR APPROVAL

DATE：

CUSTOMER：

PART NAME： Thick Film High Power Low ohm Current Sense Chip Resistor

CUSTOMER'S DWG. NO.：

CUSTOMER'S PART NO.：

PDC PART NO.： **FPF-LOW OHM SERIES APPROVED**

DESCRIPTION.：

ACTION / RESULT	" V "	CUSTOMER'S SIGNATURE	NOTE
FULL APPROVED			
CONDITIONAL APPROVED			
REJECTED			

OUR ACTION	SIGNATURE
PREPARED By	Jenny Tseng
CHECKED By	Tony Chou
APPROVED By	Byron Tsai

CUSTOMER SIGNATURE FOR ACCEPTANCE

FPF-L series. (AEC-Q200)
Current Sensing Resistors
Thick-film Power Type Chip Resistors

FPF-L series. (AEC-Q200)
Current Sensing Resistors
Thick-film Power Type Chip Resistors

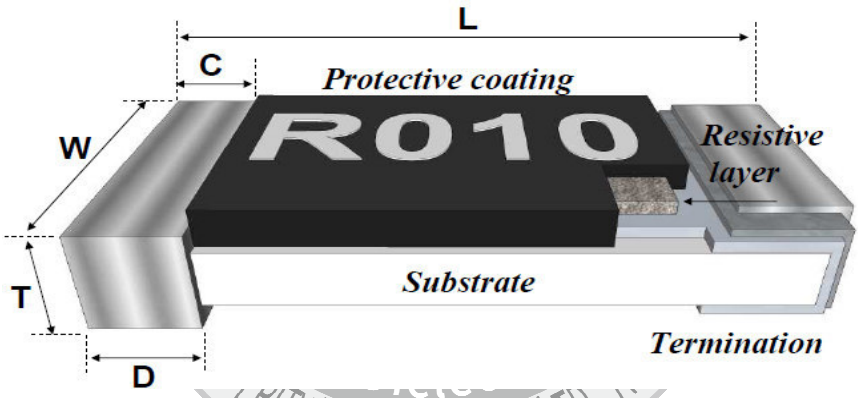
1. Features

- High power rating to 2W and low TCR.
- Low resistance and high precision (1%).
- Excellent reliability and suitable cost.
- Suitable for lead free soldering.
- Meet AEC-Q200, RoHS compliant & Halogen Free.

2.Applications

- Consumer electronics, M/B.
- Battery pack, BTC.
- Notebook, Tablet PC.
- Portable Device, Electronic Equipment.

3.Dimension and Construction

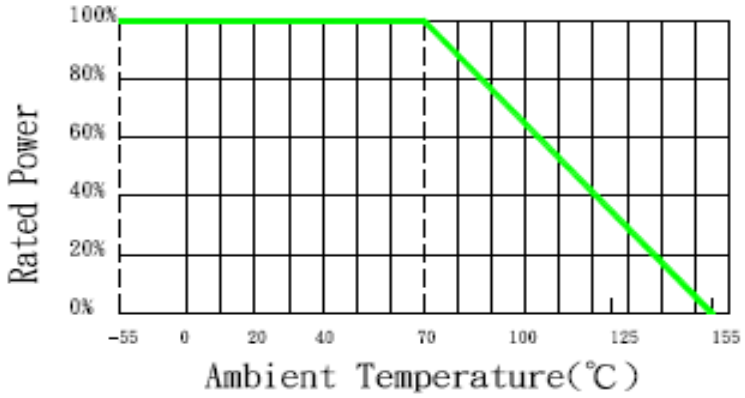


Unit：mm

Type	L	W	C	D	T
FPF03	1.60±0.10	0.80±0.10	0.30±0.20	0.30±0.20	0.45±0.10
FPF05	2.00±0.10	1.25±0.10	0.40±0.20	0.40±0.20	0.50±0.10
FPF06	3.10±0.10	1.60±0.10	0.50±0.25	0.50±0.25	0.55±0.10
FPF12	3.10±0.10	2.60±0.10	0.50±0.25	0.50±0.25	0.55±0.10
FPF20	5.00±0.20	2.50±0.20	0.65±0.25	0.60±0.25	0.60±0.10
FPF25	6.40±0.20	3.10±0.20	0.60±0.25	1.80±0.25	0.60±0.15

4.Power Derating Curve

Operating Temperature Range: -55 to +155 deg.C



5.Rating

High Power Type	Size	Power Rating at 70℃	Max. RCWV (mV)	Max. Overload Voltage (mV)	Resistance Tolerance (%)	Temperature Coefficient (TCR; ppm/℃)	Resistance Range (mΩ) Min.	Resistance Range (mΩ) Max.	Standard Resistance Values
FPF03	0603	1/4W	477	1066	±1、±5	±250	50	91	E-24
						±150*	100	910	
FPF05	0805	1/3W	551	1232	±1、±5	±200	50	91	
						±100*	100	910	
FPF06	1206	1/2W	675	1508	±1、±5	±100*	50	91	
						±100	100	910	
FPF12	1210	1/2W	675	1508	±1、±5	±100	50	910	
FPF20	2010	1W	954	2133	±1、±5	±100*	50	91	
						±100	100	910	
FPF25	2512	2W	1349	3017	±1、±5	±100*	50	91	
						±100	100	910	

Special request please contact sales window

*Temperature 25~-55℃, 200ppm for 0603, 150ppm for 0805.

*Temperature 25~-55℃, 150ppm for 1206、2010、2512

Note：(i) 2W loading with total solder-pad and trace size of 300 mm^2

(ii) $E=(P\times R)^{1/2}$ E：Working Voltage(V)，P：Rated Power(W)，R：Resistance Value(Ω)

6.Part Number

Type	Size	Tolerance	Packing	Watt	R Value (GM)	TCR	Special Code
FPF	**03** :0603 **05** :0805 **06** :1206 **12** :1210 **20** :2010 **25** :2512	**F** :±1% **G** :±2% **J** :±5%	**Paper Tape：** **0603.0805.1206** **1210** **T** : 5Kpcs **V** : 10Kpcs **W** : 20Kpcs **Plastic Tape：** **2010.2512** **P** : 4Kpcs **X** : 8Kpcs **Y** : 16Kpcs	**-**: As Rating Info	**XXXX** **0603:** 3 digit **Others:** 4 digit	**-**: As Rating Info	**" Null "**: Standard **M** : Meet AEC-Q200

Example：

FPF25FP-R100-M

➔2512 size, tolerance 1%, plastic tape, 2W, 100mΩ, Aec-Q200.

FPF06JT-R050

➔1206 size, tolerance 5%, paper tape, 1/2W, 50mΩ, standard.

7.Marking/Soldering

Resistance value identify：

0805/1206/1210/2010/2512

Top Marking. (4 Digits marking to identify the resistance value.)

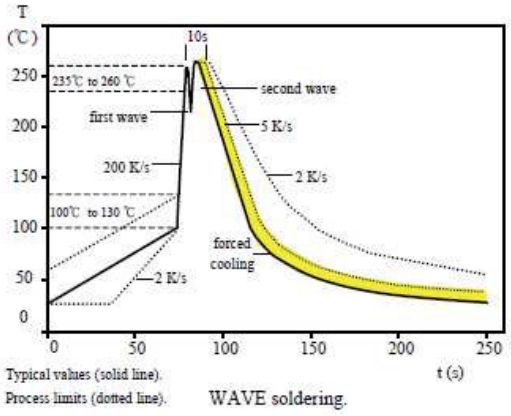
R068=68mΩ，R120=120mΩ

0603

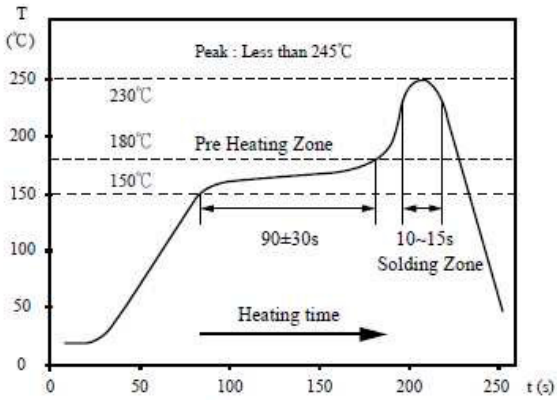
Top Marking. (3 Digits marking to identify the resistance value.)

R12=120mΩ，68M=68mΩ

Soldering Reference：



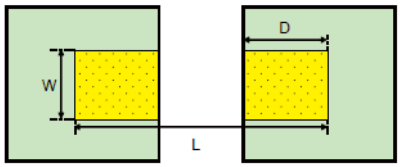
WAVE soldering.



IR Reflow soldering.

Recommend Solder Pad Dimensions：

Type	W	D	L
FPF03	0.90	1.00	3.00
FPF05	1.30	1.15	3.50
FPF06	1.80	1.30	4.70
FPF12	3.00	1.30	4.70
FPF20	3.00	1.50	6.80
FPF25	3.70	2.45	7.60



Unit:mm

8. Reliability Performance (AEC-Q200)

* Normal test items for standard product.

Test Item	Specification	Test Method (AEC-Q200. IEC 60115)
***DC Resistance**	F：±1%；J：±5%	**AEC-Q200 TABLE 7.1** **IEC 60115-1 / JIS C 5201-1 , Clause 4.5** Measure the resistance Value.
High Temperature Exposure (Storage)	J：△R≦ ±(3%+0.5mΩ) F：△R≦ ±(1%+0.5mΩ)	**AEC-Q200 TABLE 7.3** 1000 hrs. @ T=125℃. Unpowered. Measurement at 24 ±2 hours after test conclusion.
***Temperature Cycling**	J：ΔR≦ ±(1%＋1mΩ) F：ΔR≦ ±(0.5%＋1mΩ) No mechanical damage.	**AEC-Q200 TABLE 7.4** 1000 Cycles (-55°C to +125°C). Measurement at 24±4 hours after test conclusion.

Moisture Resistance	J：△R≦ ±(1%+0.5mΩ) F：△R≦ ±(0.5%+0.5mΩ)	**AEC-Q200 TABLE 7.6** Test 65℃/80~100%RH/10Cycles. Measurement at 24±2 hours after test conclusion. (t=24hrs/cycle).
Biased Humidity	J：△R≦ ±(3%+0.5mΩ) F：△R≦ ±(1%+0.5mΩ)	**AEC-Q200 TABLE 7.7** 1000 hours 85℃/85%RH. 10% of operating power. Measurement at 24 ±2 hours after test conclusion.
Operational Life	J：△R≦ ±(3%+0.5mΩ) F：△R≦ ±(1%+0.5mΩ)	**AEC-Q200 TABLE 7.8** Test 1000hr @ TA=125℃ at specified rated power. Measurement at 24±2 hours after test conclusion.
External Visual	No visual damage and refer PDC marking code.	**AEC-Q200 TABLE 7.9** Inspect device construction, marking and workmanship.
Physical Dimension	Within the spec.	**AEC-Q200 TABLE 7.10** Verify physical dimensions to the applicable device detail specification.
Mechanical Shock	Within product specification tolerance and no visible damage.	**AEC-Q200 TABLE 7.13** Test Peak value:100g's,Wave:Hail-sine, Duration:6ms,Velocity:12.3ft/sec.
Vibration	No mechanical damage.	**AEC-Q200 TABLE 7.14** 5 g's for 20 min., 12 cycles each of 3 orientations. Test from 10-2000 Hz.
***Resistance to Solder Heat**	J：ΔR≦ ±(1%＋0.5mΩ) F：ΔR≦ ±(0.5%＋0.5mΩ) No mechanical damage.	**AEC-Q200 TABLE 7.15** Solder dipping @ 270℃±5℃ for 10sec.±1sec.
Thermal Shock	J：ΔR≦ ±(1%＋0.5mΩ) F：ΔR≦ ±(0.5%＋0.5mΩ) No mechanical damage.	**AEC-Q200 TABLE 7.16** -55 to 155℃/ dwell time 15min/ Max transfer time 20sec/ 300cycles.
ESD	ΔR≦ ±(1%＋0.5mΩ) No mechanical damage.	**AEC-Q200-002** Test contact min. 1KV.

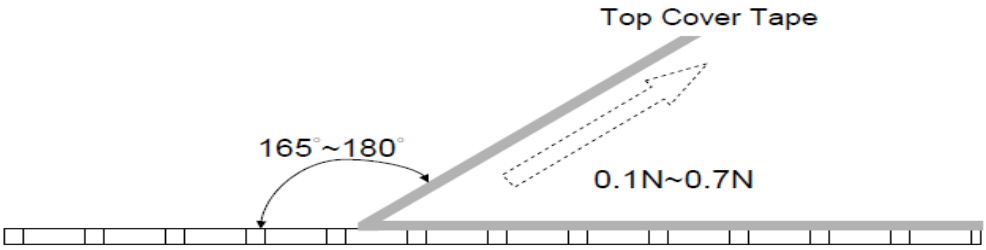
***Solder Ability**	Over 95% of termination must be covered with solder.	**AEC-Q200 TABLE 7.18** a)Baking 155℃ 4H, dipping 235℃ 5s b)Steam 1H, dipping 215℃ 5s c)Steam 1H, dipping 260℃ 7s
Flammability	Refer UL-94.	**AEC-Q200 TABLE 7.20** UL-94 V-0 or V-1 are acceptable
***Board Flex**	J：ΔR≦ ±(1%＋1mΩ) F：ΔR≦ ±(0.5%＋1mΩ) No mechanical damage.	**AEC-Q200 TABLE 7.21** Bending 2mm 2512.2010.1210.1206, 3mm 0805.0603.
Terminal Strength	No mechanical damage	**AEC-Q200 TABLE 7.22** Force 1 Kg for 60 seconds.
***Short Time Overload**	J：ΔR≦ ±(2%＋0.5mΩ) F：ΔR≦ ±(1%＋0.5mΩ)	**IEC 60115-1, Clause 4.13** 5 × Rated power for 5 seconds
***Load Life Humidity**	J：△R≦ ±(3%+0.5mΩ) F：△R≦ ±(1%+0.5mΩ)	**IEC 60115-1, Clause 4.24** 40±2℃ with relative humidity 90% ~ 95% D.C. rated voltage for 1.5 hours ON 30 minutes OFF. Cycle repeated 1000 hours.
***Temperature Coefficient of Resistance (TCR)**	Within the spec.	**IEC 60115-1, Clause 4.8** T_1 T_2 Test temperature： 25℃~ -55℃ 25℃~ +155℃ TCR(ppm/℃) = $(R_2-R_1)/R_1 \times 1 / (T_2-T_1) \times 10^6$
***Load Life**	J：△R≦ ±(3%+0.5mΩ) F：△R≦ ±(1%+0.5mΩ)	**IEC 60115-1, Clause 4.25** Rated voltage for 1.5 hours for followed by a pause 0.5 hour at 70±2℃. Cycle repeated 1000 hours.
***Insulation Resistance**	Between termination and coating must over 1000MΩ	**IEC 60115-1, Clause 4.6** Test voltage：100±15V

9. PACKAGING

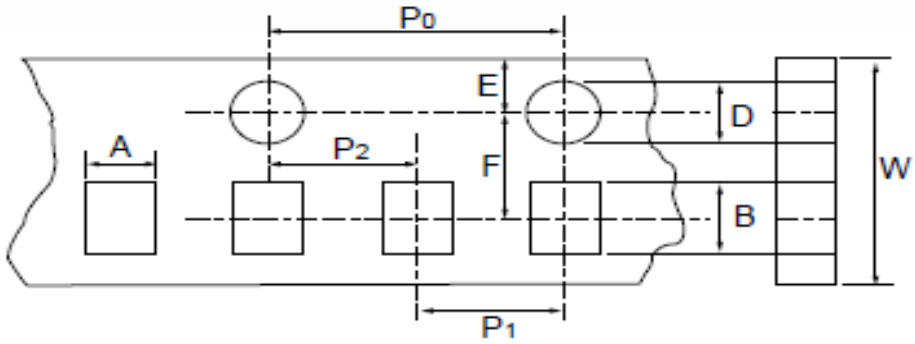
9.1 Peel Strength of Top Cover Tape

The peel speed shall be about 300 mm/min

The peel force of top cover tape shall between 0.1 to 0.7N



9.2 Tape Packaging Dimensions



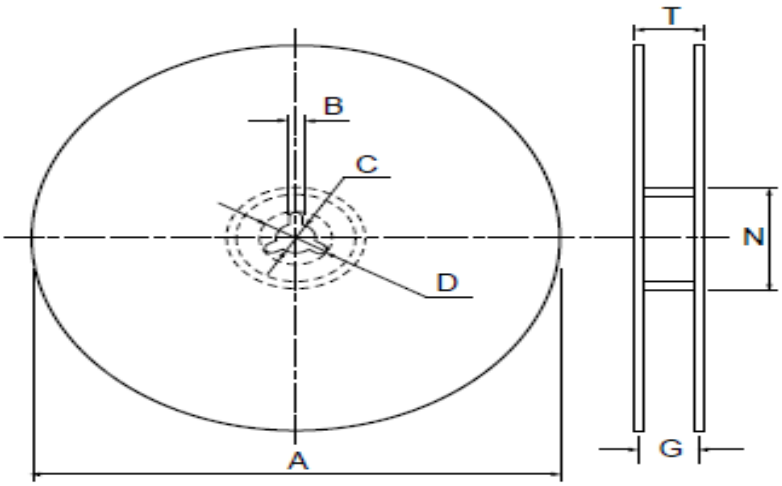
- Accumulated dimensional tolerance 40±0.2mm

unit:mm

Size	A	B	W	F	E	P1	P2	P0	D
0603	1.10±0.20	1.90±0.20	8.00±0.30	3.50±0.05	1.75±0.10	4.00±0.10	2.00±0.05	4.00±0.10	1.50+0.10/-0
0805	1.65±0.20	2.40±0.20	8.00±0.30	3.50±0.05	1.75±0.10	4.00±0.10	2.00±0.05	4.00±0.10	1.50+0.10/-0
1206	2.00±0.20	3.60±0.20	8.00±0.30	3.50±0.05	1.75±0.10	4.00±0.10	2.00±0.05	4.00±0.10	1.50+0.10/-0
1210	3.00±0.20	3.60±0.20	8.00±0.30	3.50±0.05	1.75±0.10	4.00±0.10	2.00±0.05	4.00±0.10	1.50+0.10/-0
2010	2.80±0.20	5.50±0.20	12.00±0.30	5.50±0.05	1.75±0.10	4.00±0.10	2.00±0.05	4.00±0.10	1.50+0.10/-0
2512	3.50±0.20	6.70±0.20	12.00±0.30	5.50±0.05	1.75±0.10	4.00±0.10	2.00±0.05	4.00±0.10	1.50+0.10/-0

unit : mm

9.3 Reel Dimensions



unit:mm

Size	Packaging Q'ty	A	N	C	D	B	G	T
0603 0805 1206 1210	5kpcs/Reel	178.0±2.0	60.0±0.5	13.0±0.5	20(Min.)	2.0±0.5	10.0±1.5	14.9max.
	10kpcs/Reel	254.0±2.0	100.0±1.0	13.5±0.5	20(Min.)	2.0±0.5	10.0±1.5	14.9max.
	20kpcs/Reel	330.0±2.0	100.0±1.0	13.5±0.5	20(Min.)	2.0±0.5	10.0±1.5	14.9max.
2010 2512	4kpcs/Reel	178.0±2.0	60.0±0.5	13.0±0.5	20(Min.)	2.0±0.5	13.8±1.5	16.7max.
	8kpcs/Reel	254.0±2.0	100.0±0.5	13.5±0.5	20(Min.)	2.0±0.5	13.8±1.5	20.0max.
	16kpcs/Reel	330.0±2.0	100.0±1.0	13.5±0.5	20(Min.)	2.0±0.5	13.8±1.5	20.0max.

10. Storage &. Handling

… Products are recommended to be used up within one year as ensured shelf life.
Check solder ability in case shelf life extension is needed.

… To store products with following condition:
Temperature:5 to 40℃；Humidity: 20 to 70% relative humidity.

Precaution for use：

The AEC-Q200 series resistors is mainly used on general automotive equipment without safety considerations. Please contact our company in advanced if you intend to use resistor for designing the equipment which may damage itself and the safety of third party. If necessary, please consider to add the protect circuit in devising process and obtaining fully safety evaluation. The contents of the acknowledgment is only used for our parent company, marketing subsidiaries and official marketing agents who purchase our products. Not applicable for the other nonofficial channels.

※ All product specification and data are subject to change without notice.