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SPECIFICATION FOR APPROVAL

DATE :

CUSTOMER :

PART NAME :

Metal Paste Low Ohm Current Sense Chip Resistor

CUSTOMER'S DWG. NO. :

CUSTOMER'S PART NO. :

PDC PART NO. :

FBF SERIES APPROVED

DESCRIPTION. :

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

OUR ACTION	SIGNATURE
PREPARED By	<i>Jenny Tseng</i>
CHECKED By	<i>Tony Chou</i>
APPROVED By	<i>Byron Tsai</i>

CUSTOMER SIGNATURE FOR ACCEPTANCE

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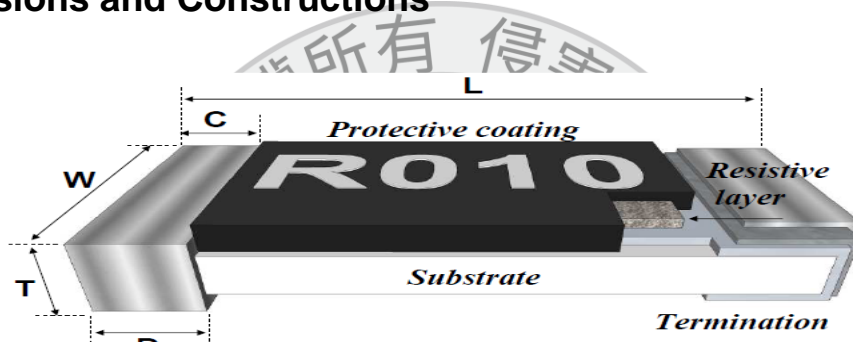
1. Features

- Low resistance and high precision (1%).
- Excellent reliability and suitable cost.
- Suitable for lead free soldering.
- RoHS compliant & Halogen Free.

2. Applications

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

3. Dimensions and Constructions



Unit : mm

Type 1.	L	W	C	D	T
FBF03	1.60±0.10	0.80±0.10	0.30±0.20	0.30±0.20	0.45±0.10
FBF05	2.00±0.10	1.25±0.10	0.40±0.20	0.40±0.20	0.50±0.10
FBF06	3.10±0.10	1.60±0.10	0.50±0.25	0.50±0.25	0.55±0.10
FBF12	3.10±0.10	2.60±0.10	0.50±0.25	0.50±0.25	0.55±0.10
FBF20	5.00±0.20	2.50±0.20	0.60±0.25	0.60±0.25	0.60±0.10
FBF25	6.30±0.20	3.10±0.20	0.60±0.25	0.90±0.25	0.60±0.15

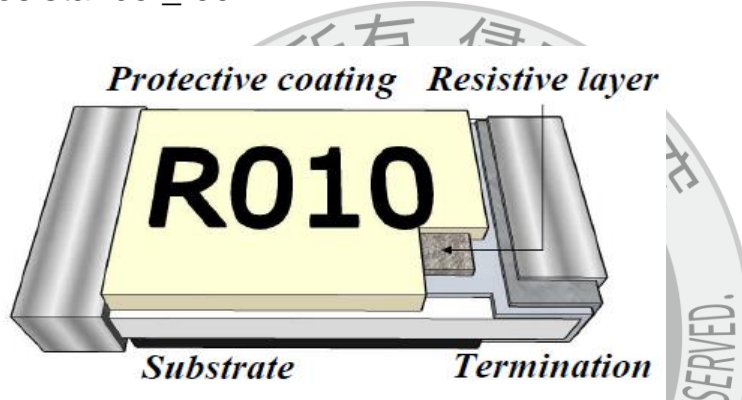
Type 2.	L	W	C	D	T
FBF03	1.60±0.10	0.80±0.10	0.30±0.20	0.50±0.20	0.50±0.10
FBF05	2.00±0.10	1.25±0.10	0.40±0.20	0.65±0.20	0.60±0.10
FBF06	3.10±0.10	1.60±0.10	0.50±0.25	0.90±0.25	0.65±0.10
FBF12	3.10±0.10	2.60±0.10	0.50±0.25	0.90±0.25	0.65±0.10
FBF20	5.00±0.20	2.50±0.20	0.60±0.25	1.25±0.25	0.65±0.10
FBF25	6.30±0.20	3.10±0.20	0.60±0.25	1.90±0.25	0.65±0.15



Type 1. Resistance $\geq 40\text{m}\Omega$

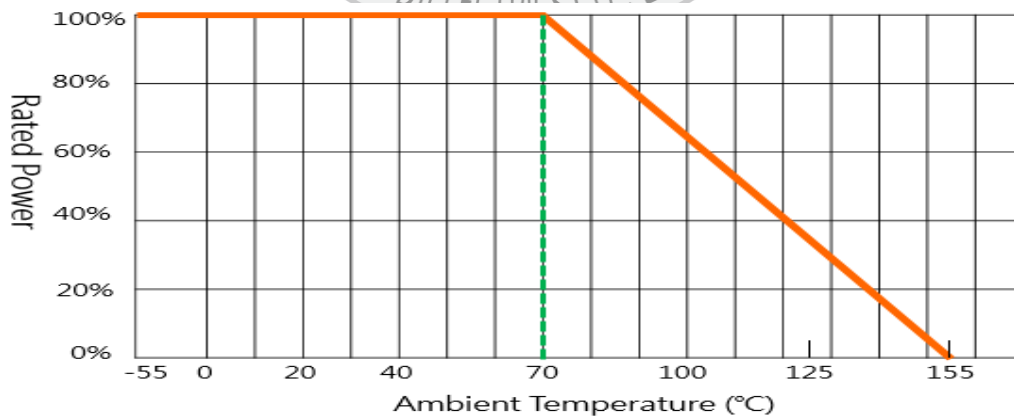


Type 2. Resistance $\leq 39\text{m}\Omega$



4. Power Derating Curve

Operating Temperature Range: -55 to $+155^\circ\text{C}$



FBF series. (Metal Paste) Current Sensing Resistors Thick-film Chip Resistors

5. Rating

Normal Type		Power Rating at 70°C	Max. RCWV (mV)	Max. Overload Voltage (mV)	Resistance Tolerance (%) **	TCR (ppm/°C) *	Resistance Range (mΩ)		Standard Resistance Values
Type	Size						Min.	Max.	
FBF03	0603	1/8W	337	754	±1	±200	40	91	E-24
					±2、±5	±100	100	910	
FBF05	0805	1/4W	477	1067	±1	±400 / ±200	10	46	E-24
					±2、±5	±100	47	910	
FBF06	1206	1/3W	551	1232	±1	±400 / ±200	10	46	E-24
					±2、±5	±100	47	910	
FBF12	1210	2/3W	779	1742	±1	±400 / ±200	10	46	E-24
					±2、±5	±100	47	910	
FBF20	2010	3/4W	826	1847	±1	±400 / ±200	10	46	E-24
					±2、±5	±100	47	910	
FBF25	2512	1W	954	2133	±1	±400 / ±200	10	46	E-24
					±2、±5	±100	47	910	
Power Type		Power Rating at 70°C	Max. RCWV (mV)	Max. Overload Voltage (mV)	Resistance Tolerance (%) *	TCR (ppm/°C) **	Resistance Range (mΩ)		Standard Resistance Values
Type	Size						Min.	Max.	
FBF03	0603	1/4W	477	1067	±1	±200	40	91	E-24
					±2、±5	±100	100	910	
FBF05	0805	1/2W	675	1508	±1	±400 / ±200	10	46	E-24
					±2、±5	±100	47	910	
FBF06	1206	3/4W	826	1847	±1	±400 / ±200	10	46	E-24
					±2、±5	±100	47	910	
FBF12	1210	3/4W	826	1847	±1	±400 / ±200	10	46	E-24
					±2、±5	±100	47	910	
FBF20	2010	1W	954	2133	±1	±400 / ±200	10	46	E-24
					±2、±5	±100	47	910	
FBF25	2512	2W	1349	3017	±1	±400 / ±200	10	46	E-24
					±2、±5	±100	47	910	



FBF series. (Metal Paste) Current Sensing Resistors Thick-film Chip Resistors

Notes:

1. RCWV is Rated Voltage, $V = \sqrt{P * R}$ or Max. Working Voltage whichever is lower.
2. V : Working Voltage(V), P : Rated Power (W), R : Resistance Value(Ω)
3. Before use low ohm resistors, please consider the resistance variance from soldering pad/trace/amount, and keep the surface temperature do not exceed 105°C when working.
4. *: ±400 / ±200 means 10mΩ~18mΩ: TCR ±400ppm, 20mΩ~46mΩ: TCR ±200ppm
5. **: ±0.5% available items please refer below.

Type	Available Resistance (mΩ)
FBF06	50,100

6. Part Number

Type	Size	Tolerance	Packing	Power Code	R Value (GM)	Control Code
FBF	03 :0603	D :±0.5%	Paper Tape : 0603.0805.1206 1210 I : 5Kpcs V : 10Kpcs W : 20Kpcs Plastic Tape : 2010.2512 P : 4Kpcs X : 8Kpcs Y : 16Kpcs	Normal Rating P: Power Rating	XXXX 4 digits	K R010~R018 Control code
	05 :0805	F :±1%				
	06 :1206	G :±2%				
	12 :1210	J :±5%				
	20 :2010					
	25 :2512					

Example :

FBF06FT-R100

→1206 size, tolerance 1%, paper tape, 100mΩ

FBF25FP-R015K

→2512 size, tolerance 1%, plastic tape, 15mΩ.

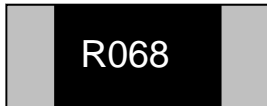


7. Marking/Soldering

Resistance value identify :

0805/1206/1210/2010/2512

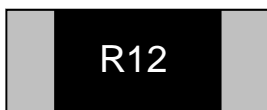
Top Marking. (4 Digits marking to identify the resistance value.)



R068=68mΩ , R120=120mΩ

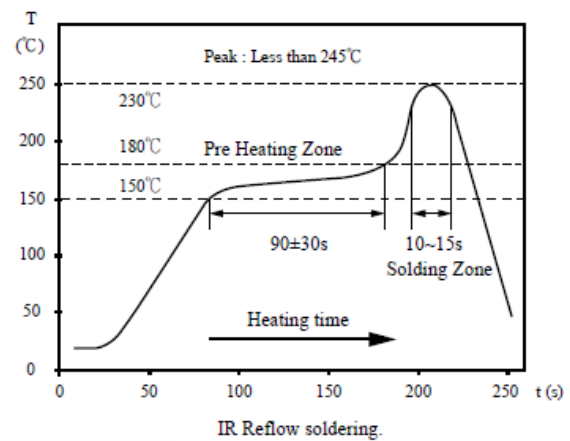
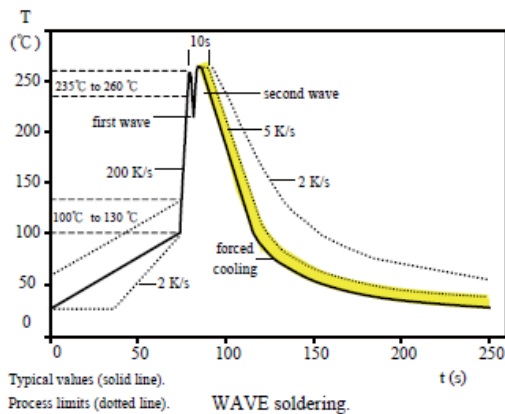
0603

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



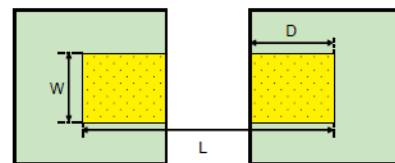
R12=120mΩ , 68M=68mΩ

Soldering Reference :



Recommend Solder Pad Dimensions:

Type	W	D	L
FBF03	0.90	1.00	3.00
FBF05	1.30	1.15	3.50
FBF06	1.80	1.30	4.70
FBF12	3.00	1.30	4.70
FBF20	3.00	1.50	6.80
FBF25	3.70	1.60	7.60



Unit:mm



FBF series. (Metal Paste) Current Sensing Resistors Thick-film Chip Resistors

8. Reliability Performance

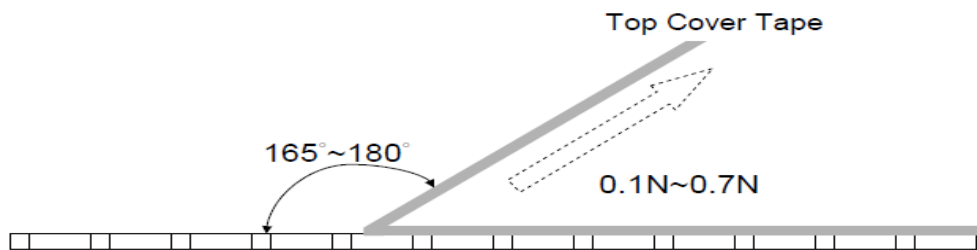
Test Item	Specification	Test Method
DC Resistance	D : $\pm 0.5\%$ F : $\pm 1\%$ G : $\pm 2\%$ J : $\pm 5\%$	IEC 60115-1 / JIS C 5201-1 , Clause 4.5 Measure the resistance Value.
Resistance to Solder Heat	$\Delta R \leq \pm(1\% + 0.5m\Omega)$ D.F : $\Delta R \leq \pm(0.5\% + 0.5m\Omega)$ No mechanical damage	IEC 60115-1, Clause 4.18 Solder dipping @ $260^{\circ}\text{C} \pm 5^{\circ}\text{C}$ for 10sec. ± 1 sec.
Solder Ability	Over 95% of termination must be covered with Solder.	IEC 60115-1, Clause 4.17 After immersing flux, dip in the $245 \pm 2^{\circ}\text{C}$ molten solder bath for 3 ± 0.5 sec.
Short Time Overload	$\Delta R \leq \pm(2\% + 0.5m\Omega)$ D.F : $\Delta R \leq \pm(1\% + 0.5m\Omega)$	IEC 60115-1, Clause 4.13 $5 \times$ Rated power for 5 seconds
Temperature Coefficient of Resistance (TCR)	Within the spec.	IEC 60115-1, Clause 4.8 T_1 T_2 Test temperature : $25^{\circ}\text{C} \sim 155^{\circ}\text{C}$ $\text{TCR}(\text{ppm}/^{\circ}\text{C}) = (R_2 - R_1) / R_1 \times 1 / (T_2 - T_1) \times 10^6$
Load Life	$\Delta R \leq \pm(3\% + 0.5m\Omega)$	IEC 60115-1, Clause 4.25 Rated voltage for 1.5 hours for followed by a pause 0.5 hour at $70 \pm 2^{\circ}\text{C}$. Cycle repeated 1000 hours.
Bending Strength	$\Delta R \leq \pm(1\% + 0.5m\Omega)$ D.F : $\Delta R \leq \pm(0.5\% + 0.5m\Omega)$ No mechanical damage.	IEC 60115-1 / JIS C 5201-1 , Clause 4.33 Resistance variance after bended on the 90mm PCB. Bending width : 3mm for 0603 0805 2mm for 1206 2010 2512
Insulation Resistance	Between termination and coating must over 1000M Ω	IEC 60115-1, Clause 4.6 Test voltage : $100 \pm 15\text{V}$

9. PACKAGING

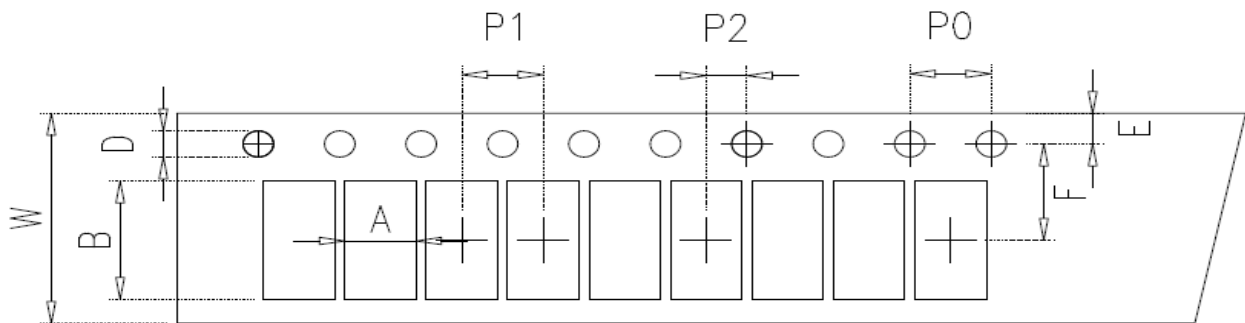
9.1 Peel Strength of Top Cover Tape

The peel speed shall be about 300 mm/min

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



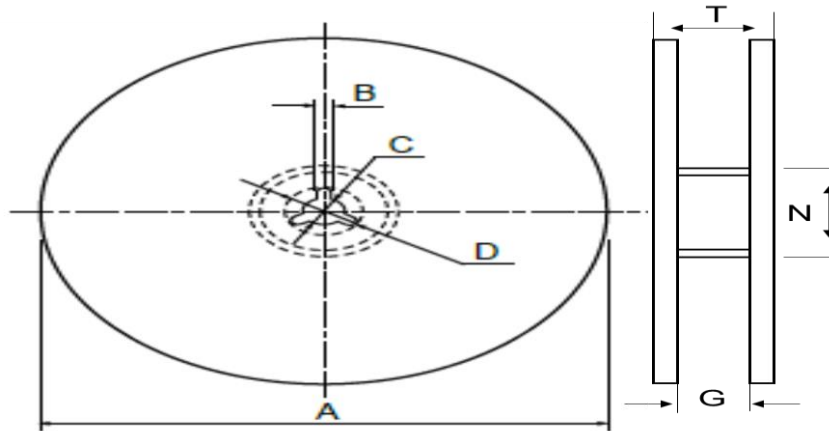
9.2 Tape Packaging Dimensions



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	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.
0805	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.
1206		330.0±2.0	100.0±1.0	13.5±0.5	20(Min.)	2.0±0.5	10.0±1.5	14.9max.
1210	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°C ; Humidity: 20 to 70% relative humidity.

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

