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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
	"V"		
FULL APPROVED			
CONDITIONAL APPROVED			
REJECTED			

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

CUSTOMER SIGNATURE FOR
ACCEPTANCE

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

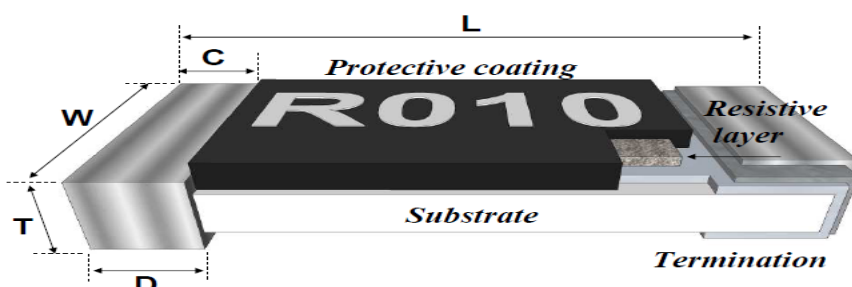
1. Features

- 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

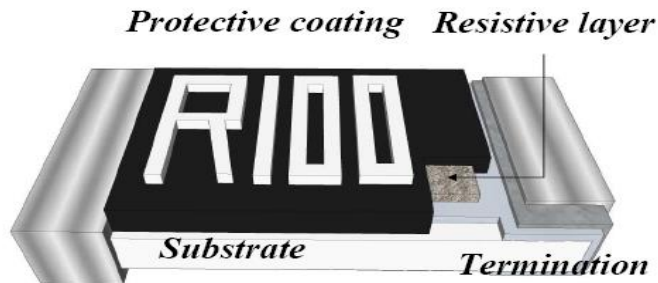


Unit : mm

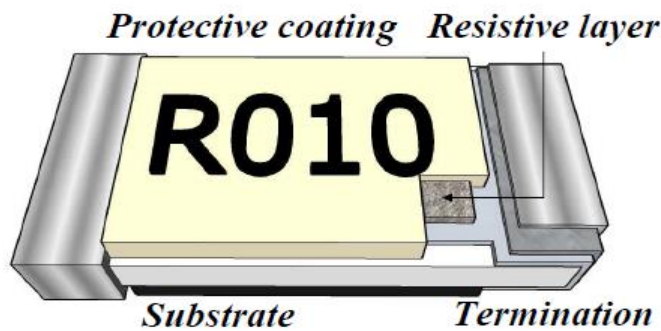
Type 1.	L	W	C	D	T
FBF03	1.60±0.10	0.80±0.10	0.30±0.20	0.30±0.20	0.45±0.10
FBF05	2.00±0.10	1.25±0.10	0.40±0.20	0.40±0.20	0.50±0.10
FBF06	3.10±0.10	1.60±0.10	0.50±0.25	0.50±0.25	0.55±0.10
FBF12	3.10±0.10	2.60±0.10	0.50±0.25	0.50±0.25	0.55±0.10
FBF20	5.00±0.20	2.50±0.20	0.60±0.25	0.60±0.25	0.60±0.10
FBF25	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 $\geq 40\text{m}\Omega$

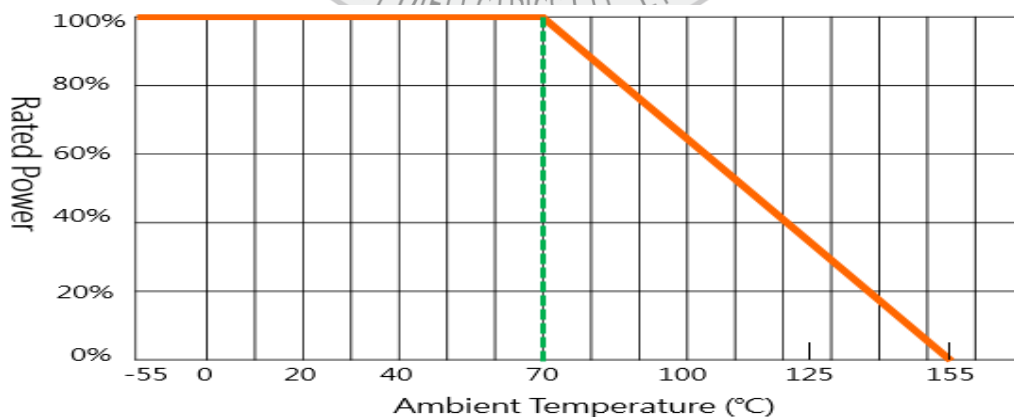


Type 2. Resistance $\leq 39\text{m}\Omega$



4. Power Derating Curve

Operating Temperature Range: -55 to +155°C



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

5. Rating

Normal Type		Power Rating at 70℃	Max. RCWV (mV)	Max. Overload Voltage (mV)	Resistance Tolerance (%) **	TCR (ppm/℃) *	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℃	Max. RCWV (mV)	Max. Overload Voltage (mV)	Resistance Tolerance (%) *	TCR (ppm/℃) **	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	



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Notes:

1. RCWV is Rated Voltage, $V = \sqrt{P \cdot R}$ 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℃ when working.
4. *: ± 400 / ± 200 means 10m Ω ~18m Ω : TCR ± 400 ppm, 20m Ω ~46m Ω : TCR ± 200 ppm
5. **: $\pm 0.5\%$ available items please refer below.

Type	Available Resistance (m Ω)
FBF06	50,100

6. Part Number

Type	Size	Tolerance	Packing	Power Code	R Value (GM)	Control Code
FBF	03 :0603 05 :0805 06 :1206 12 :1210 20 :2010 25 :2512	D : $\pm 0.5\%$ F : $\pm 1\%$ G : $\pm 2\%$ J : $\pm 5\%$	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

Example :

FBF06FT-R100

→1206 size, tolerance 1%, paper tape, 100m Ω

FBF25FP-R015K

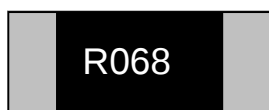
→2512 size, tolerance 1%, plastic tape, 15m Ω .

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

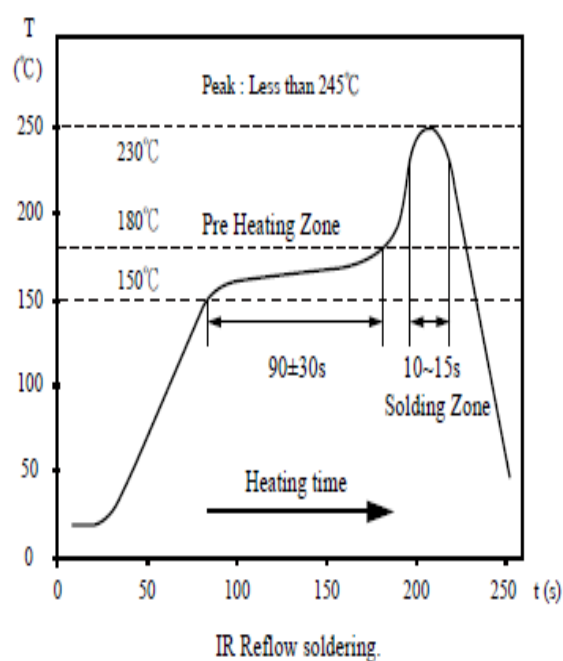
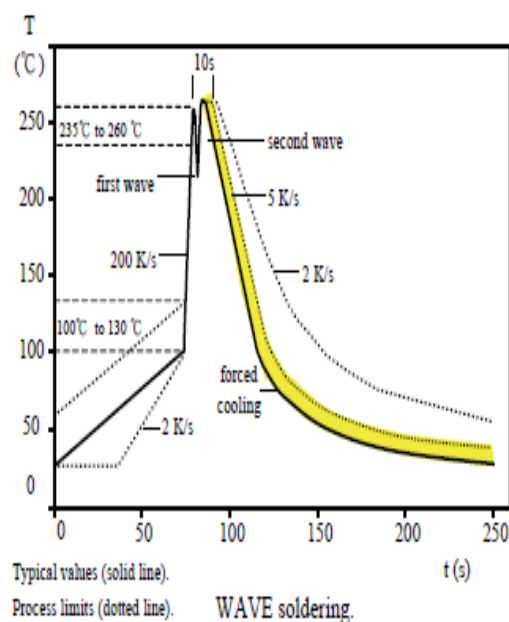
0603

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

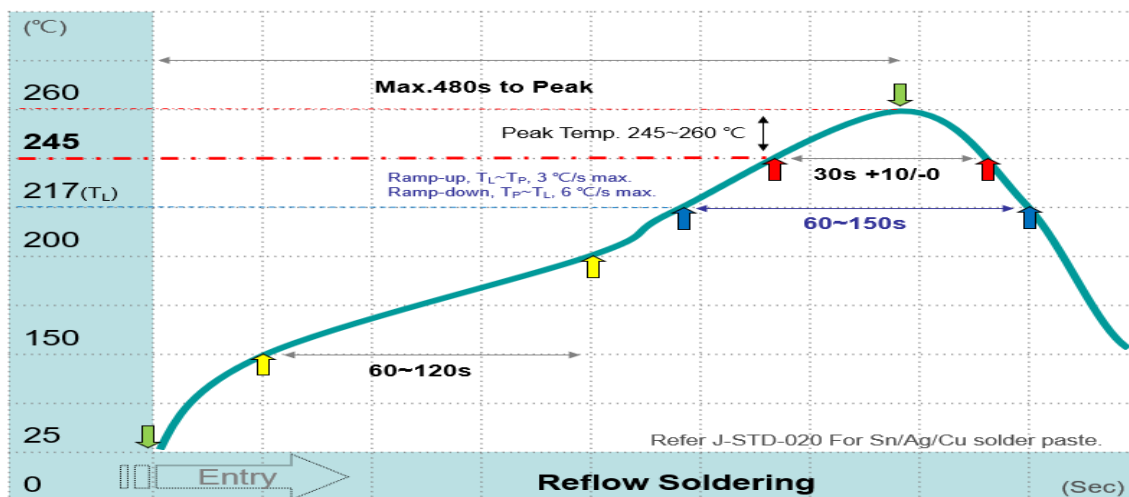


R12=120mΩ , 68M=68mΩ

Soldering Reference :



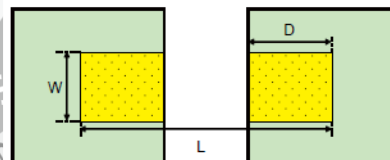
J-STD-020



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



8. Reliability Performance

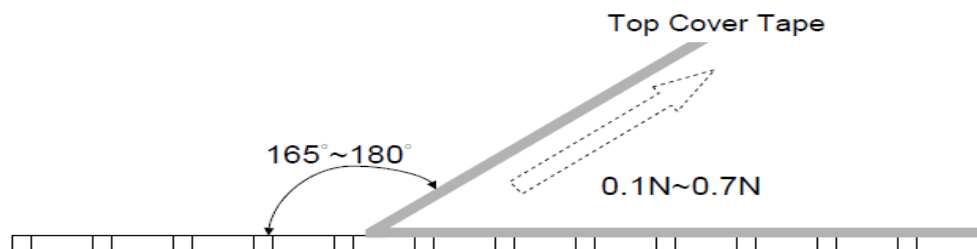
Test Item	Specification	Test Method
DC Resistance	D : $\pm 0.5\%$ F : $\pm 1\%$ G : $\pm 2\%$ J : $\pm 5\%$	IEC 60115-1 / JIS C 5201-1 , Clause 4.5 Measure the resistance Value.
Resistance to Solder Heat	$\Delta R \leq \pm(1\% + 0.5m\Omega)$ D.F : $\Delta R \leq \pm(0.5\% + 0.5m\Omega)$ No mechanical 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

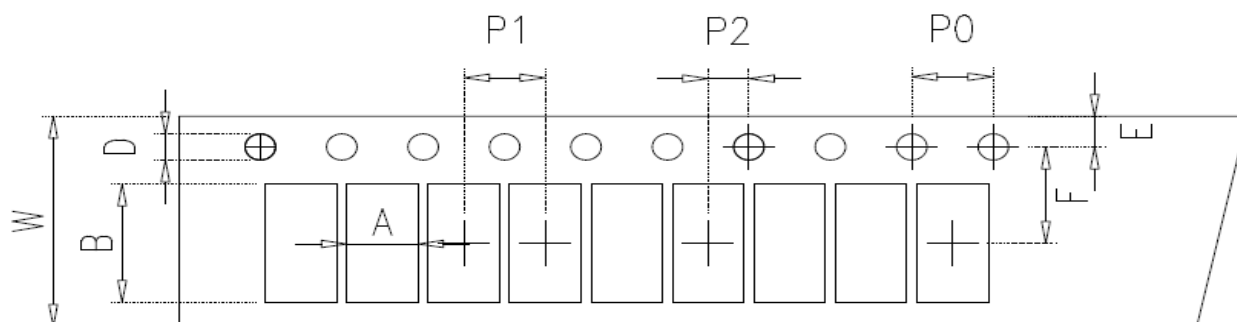
9.1 Peel Strength of Top Cover Tape

The peel speed shall be about 300 mm/min

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



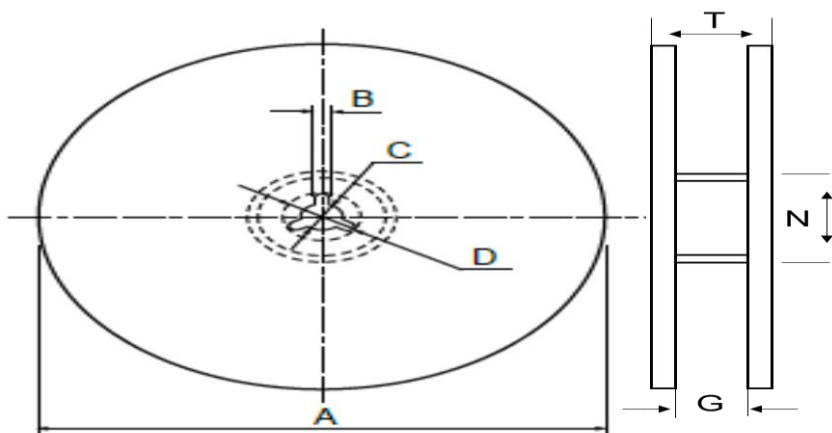
9.2 Tape Packaging Dimensions



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

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	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	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.
2512	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.