信昌電子陶瓷股份有限公司
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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-M SERIES APPROVED**

DESCRIPTION.：

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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

PDC

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FBF-M series. (Metal Paste)
Thick-film Current Sensing Resistors
Sulfur Resistant, AEC-Q200 qualified

1. Features

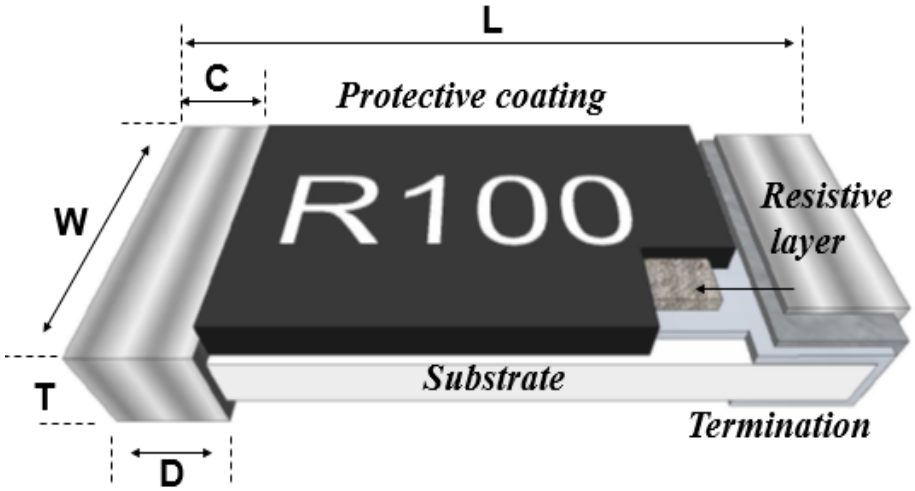
- Low resistance and high precision (1%).
- High reliability and suitable cost.
- Suitable for lead free soldering.
- RoHS compliant, RoHS exemption free.
- Halogen Free, totally Pb Free(≦100ppm).
- AEC-Q200 qualified.
- Sulfur resistant, according EIA-977 test condition B.

2. Applications

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

3. Dimensions and Constructions

Dimensions :



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

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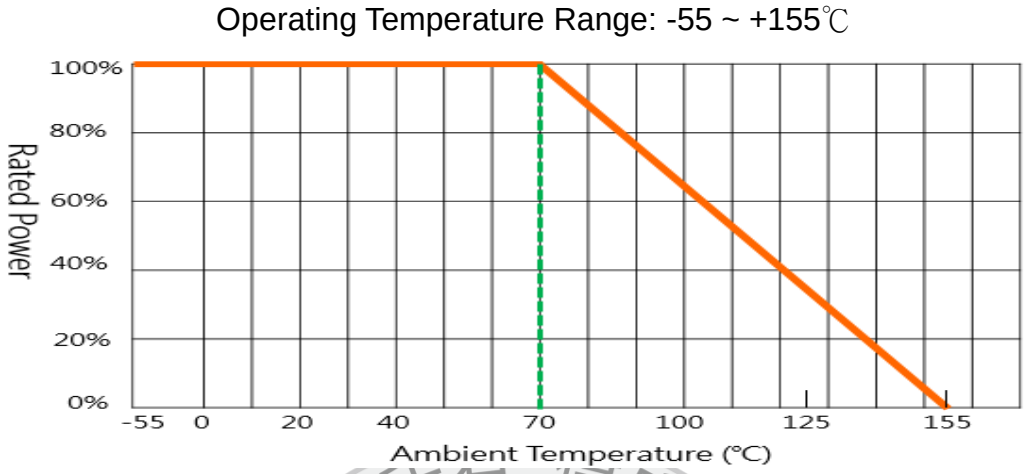
4. Power Derating Curve



5. Rating

General Type		Power Rating at 70℃	Max. RCWV (mV)	Max. Overload Voltage (mV)	Tolerance (± %)	Temperature Coefficient (ppm/℃)	Resistance Range (mΩ)		Standard Resistance Values
Type	Size						Min.	Max.	
FBF03	0603	1/8W	337	754	1, 2, 5	±200	50	91	E-24
						±100	100	910	
FBF05	0805	1/4W	477	1067	1, 2, 5	±100	50	910	E-24
FBF06	1206	1/3W	551	1232	1, 2, 5	±100	50	910	E-24
FBF12	1210	2/3W	779	1742	1, 2, 5	±100	50	910	E-24
FBF20	2010	3/4W	826	1847	1, 2, 5	±100	50	910	E-24
FBF25	2512	1W	954	2133	1, 2, 5	±100	50	910	E-24

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FBF-M series. (Metal Paste)
Thick-film Current Sensing Resistors
Sulfur Resistant, AEC-Q200 qualified

Power Type		Power Rating at 70℃	Max. RCWV (mV)	Max. Overload Voltage (mV)	Tolerance (± %)	Temperature Coefficient (ppm/℃)	Resistance Range (mΩ)		Standard Resistance Values
Type	Size						Min.	Max.	
FBF03	0603	1/4W	477	1067	1, 2, 5	±200	50	91	E-24
						±100	100	910	
FBF05	0805	1/2W	675	1508	1, 2, 5	±100	50	910	E-24
FBF06	1206	3/4W	826	1847	1, 2, 5	±100	50	910	E-24
FBF12	1210	3/4W	826	1847	1, 2, 5	±100	50	910	E-24
FBF20	2010	1W	954	2133	1, 2, 5	±100	50	910	E-24
FBF25	2512	2W	1349	3016	1, 2, 5	±100	50	910	E-24

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℃ when working.

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6. Part Number

Type	Size	Tolerance	Packing Tape	Power Code	R Value Code	-	Control Code
FBF	**03** :0603 **05** :0805 **06** :1206 **12** :1210 **20** :2010 **25** :2512	**F** :±1% **G** :±2% **J** :±5%	**Paper :** 0603.0805.1206 1210 **T** : 5Kpcs **V** : 10Kpcs **W** : 20Kpcs **Plastic :** 2010.2512 **P** : 4Kpcs **X** : 8Kpcs **Y** : 16Kpcs	**-**: General **P**: Power	**XXXX** 4 digits	**-**	**M**: AEC-Q200 Qualified **ME**: AEC-Q200 Qualified &. Anti-sulfur

※ Sulfur resistant criteria : (Code ME)
EIA-977.105'C.750H Compliable. △R≦±3%.
Example：

FBF06FT-R100-M
➔1206 size, ±1%, paper tape, 1/3w, 100mΩ, AEC-Q200.

FBF20FPPR050-ME
➔2010 size, ±1%, plastic tape, 1w, 50mΩ, AEC-Q200, sulfur resistant.

7. Marking/Soldering/Surge

Resistance value identify :

0805/1206/1210/2010

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

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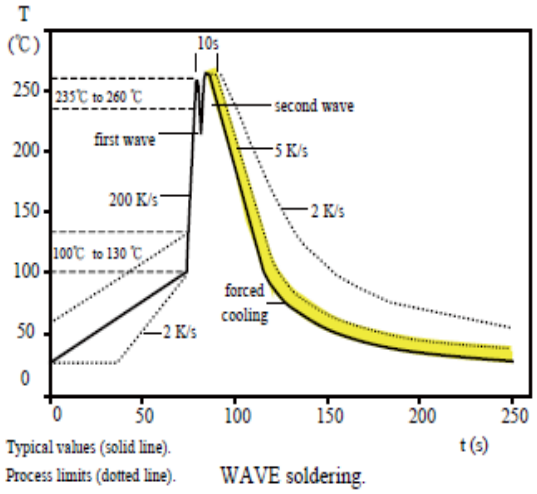
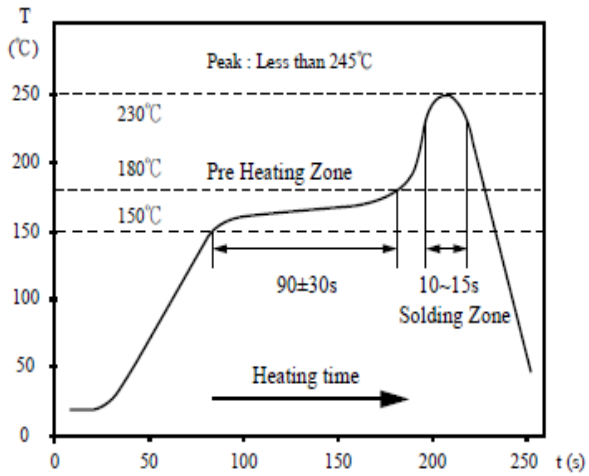
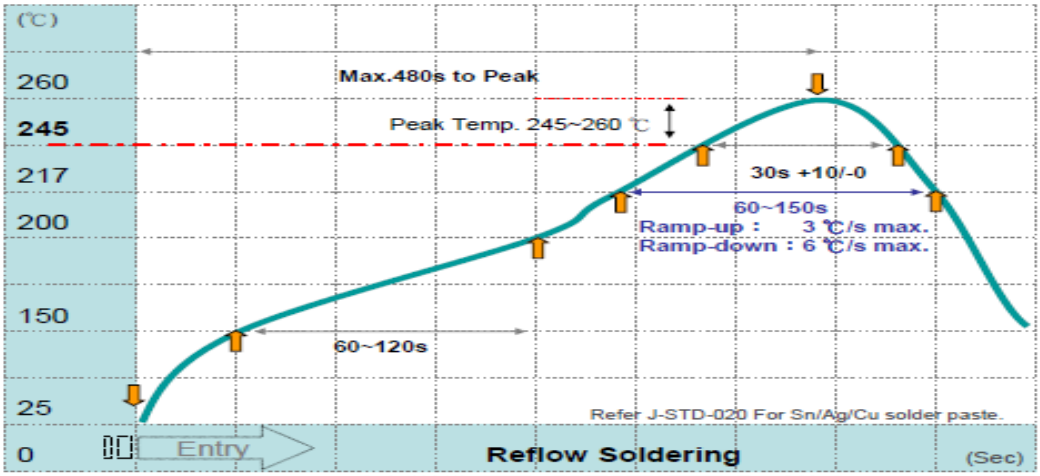
Soldering Reference：Compatible for most industrial soldering request.



WAVE soldering.

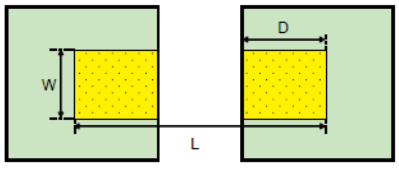


IR Reflow soldering.



Recommend Solder Pad Dimensions：(Unit: mm)

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



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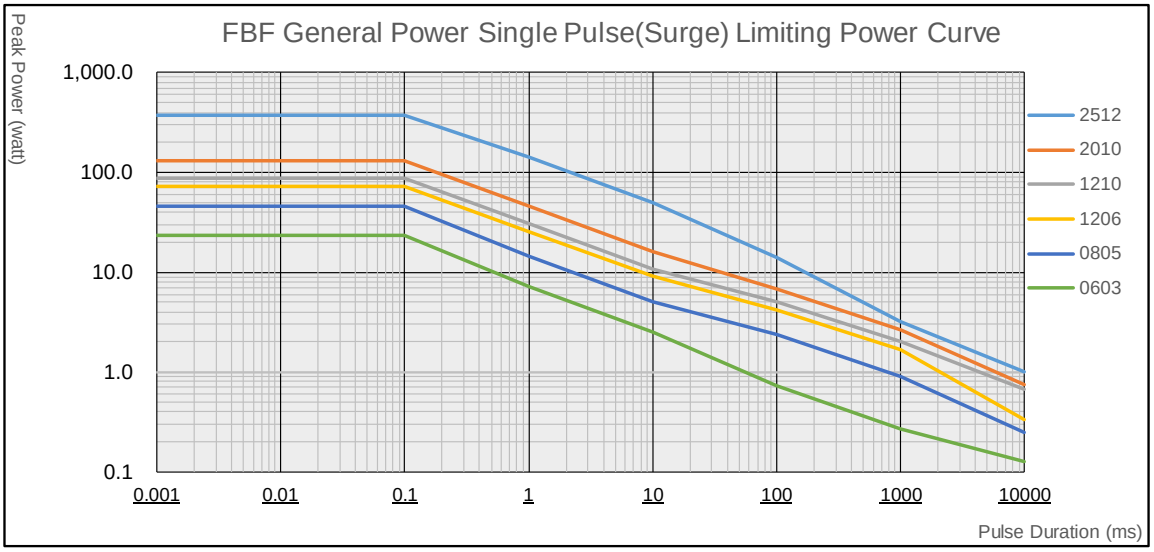
Surge Performance：

General Type



Note.
Due to appliaction is varied, the pulse endurance are not assured values. Please evaluate the products on actual circuits when use them.
10 rectangular pulses amplitudes are applied to the component at intervals of 60 seconds, permissible the resistance to be varied by ±(1% R+0.01Ω).

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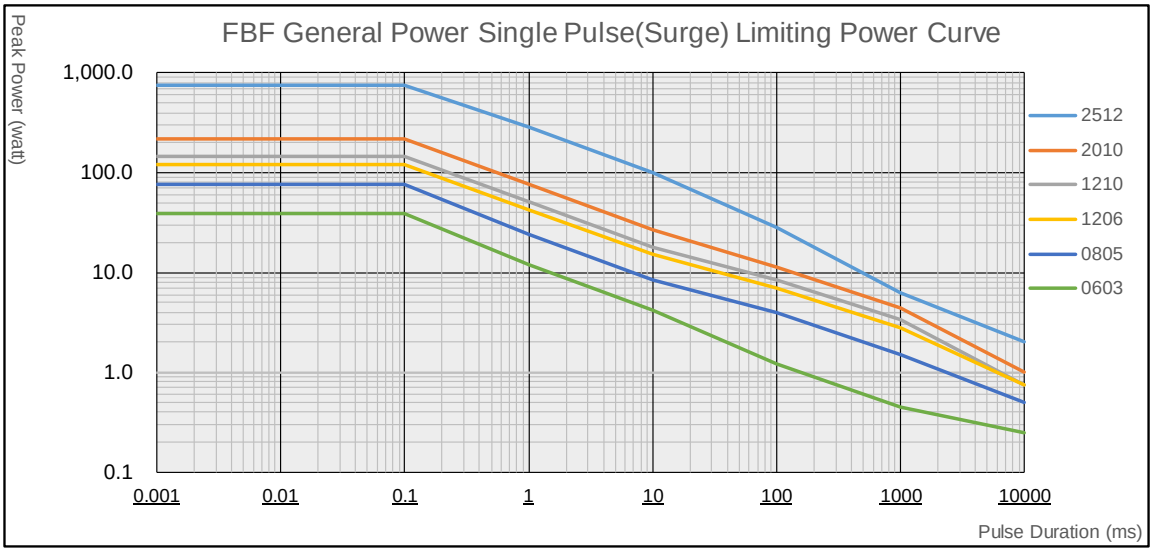
Power Type



Note.
Due to appliaction is varied, the pulse endurance are not assured values. Please evaluate the products on actual circuits when use them.
10 rectangular pulses amplitudes are applied to the component at intervals of 60 seconds, permissible the resistance to be varied by ±(1% R+0.01Ω).

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8. Reliability Performance

AEC-Q200	Specification	Test Methods (AEC-Q200)
DC Resistance	F：± 1%　G：±2% 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)	△R≦±(3%+0.5mΩ) F：△R≦±(1%+0.5mΩ)	**AEC-Q200 TABLE 7.3** 1000 hrs. @ T=155℃. Unpowered. Measurement at 24 ±2 hours after test conclusion.
Temperature Cycling	△R≦±(1%＋0.5mΩ) F：△R≦±(0.5%＋0.5mΩ) No mechanical damage.	**AEC-Q200 TABLE 7.4** 1000 Cycles (-55°C to +125°C). Measurement at 24±2 hours after test conclusion.
Moisture Resistance	△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	△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: Half-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.

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Resistance to Solder Heat	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	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	ΔR≦±(1%＋0.5mΩ) F： ΔR≦±(0.5%＋0.5mΩ) 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.
Electrical	**Specification**	**Test Methods (IEC 60115)**
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
Temperature Coefficient of Resistance (TCR)	Within the spec.	**IEC 60115-1, Clause 4.8** T_1 T_2 Test temperature： 25℃ ~ +155℃ TCR(ppm/℃) = $(R_2-R_1)/R_1 \times 1 / (T_2-T_1) \times 10^6$
Environmental	**Specification**	**Test Methods (IEC 60115)**
Anti-Sulfur	ΔR≦ ±(3%+0.5mΩ)	**EIA-977(Test B)** Sulfur 750 hours, 105±2°C

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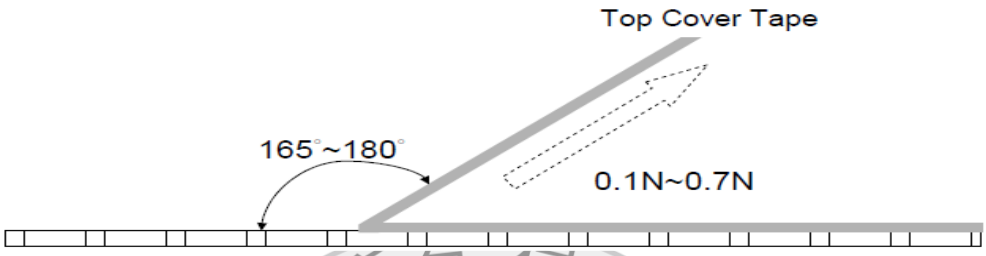
9. PACKAGING

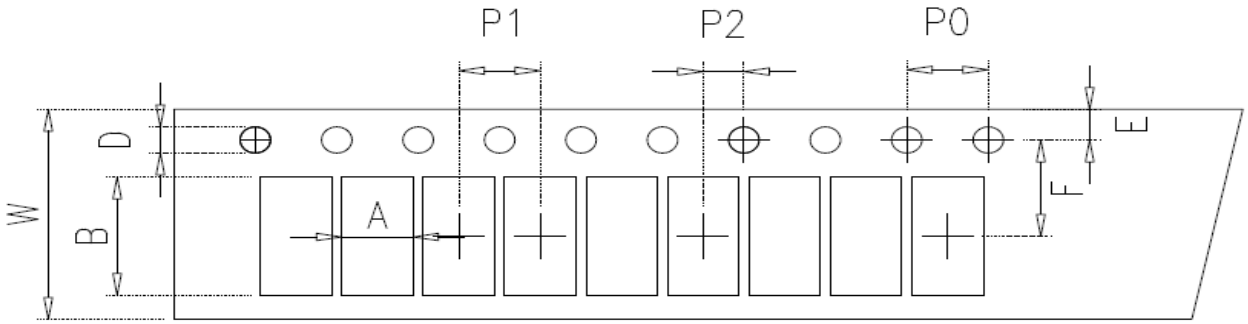
9.1 Peel Strength of Top Cover Tape

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

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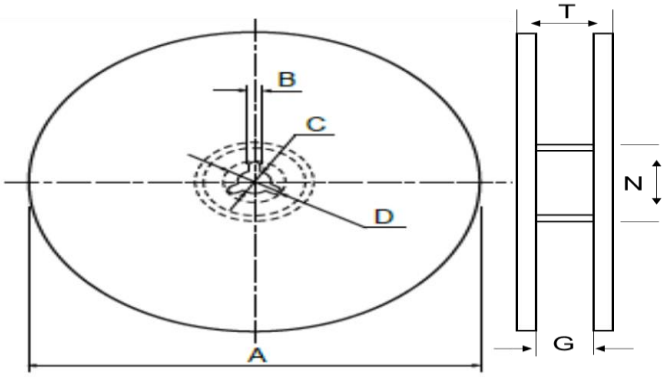
9.3 Reel Dimensions (Unit:mm)



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.

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