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SPECIFICATION FOR APPROVAL

DATE :

CUSTOMER :

PART NAME :

General Purpose Lead Free &. Halogen Free Chip Resistors

CUSTOMER'S DWG. NO. :

CUSTOMER'S PART NO. :

PDC PART NO. :

ECF-E SERIES APPROVED

DESCRIPTION. :

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

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

CUSTOMER SIGNATURE FOR
ACCEPTANCE

FCF E code series. (General Purpose)

Current Sensing Resistors

Thick-film Chip Resistors

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FCF E code series. (General Purpose)

Current Sensing Resistors

Thick-film Chip Resistors

1. Features

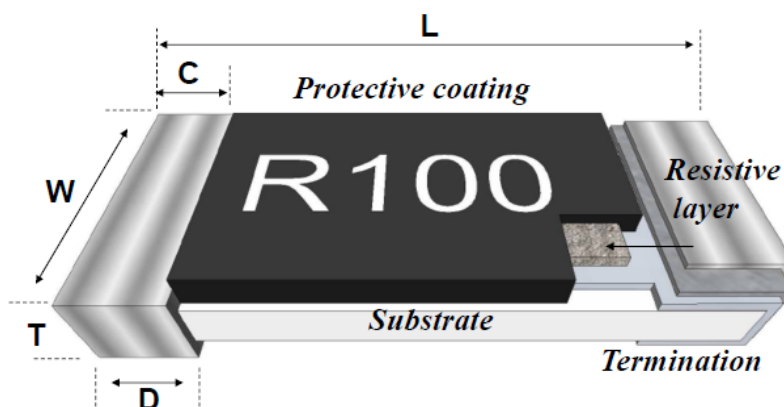
- Low TCR and high precision
- Excellent reliability and suitable cost
- Suitable for lead free soldering
- RoHS compliant & Halogen Free
- Totally lead (Pb) free & RoHS exemption free

2. Applications

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

3. Dimensions and Constructions

※ R value $\geq 40\text{m}\Omega$



Unit : mm

Type	Size	L	W	C	D	T
FCF03	0603	1.60±0.10	0.80±0.10	0.30±0.20	0.30±0.20	0.45±0.10
FCF05	0805	2.00±0.10	1.25±0.10	0.40±0.20	0.40±0.20	0.50±0.10
FCF06	1206	3.10±0.10	1.60±0.10	0.50±0.25	0.50±0.25	0.55±0.10
FCF12	1210	3.10±0.10	2.60±0.10	0.50±0.25	0.50±0.25	0.55±0.10
FCF20	2010	5.00±0.20	2.50±0.20	0.60±0.25	0.60±0.25	0.60±0.10
FCF25	2512	6.30±0.20	3.10±0.20	0.60±0.25	0.90±0.25	0.60±0.15



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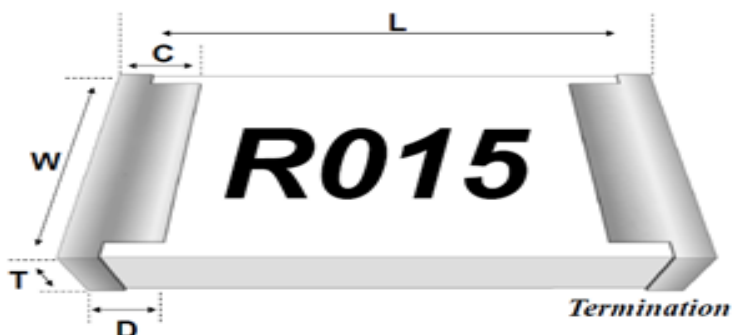


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※ R value $\leq 39\text{m}\Omega$

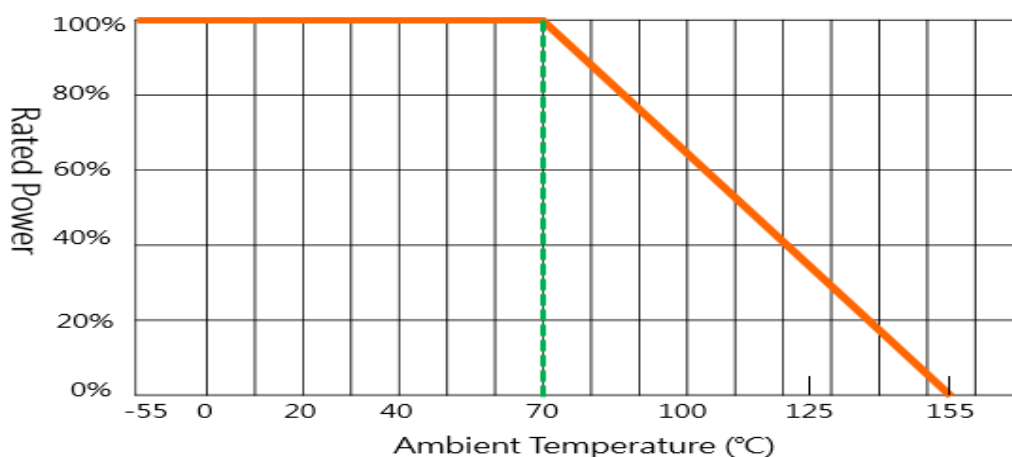


Unit : mm

Type	Size	L	W	C	D	T
FCF05	0805	2.00±0.10	1.25±0.10	0.25±0.20	0.65±0.20	0.60±0.10
FCF06	1206	3.10±0.15	1.60±0.10	0.25±0.20	0.90±0.25	0.55±0.10
FCF12	1210	3.10±0.15	2.60±0.10	0.25±0.25	0.90±0.25	0.60±0.10
FCF20	2010	5.00±0.20	2.50±0.20	0.25±0.25	1.10±0.25	0.60±0.10
FCF25	2512	6.40±0.20	3.10±0.20	0.25±0.25	1.80±0.30	0.60±0.15

4. Power Derating Curve

Operating Temperature Range: -55 to +155°C



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5. Rating

Normal Power		Rating @70°C	Max. RCWV (mV)	Max. Overload Voltage (mV)	Resistance Tolerance (%)	Temperature Coefficient (TCR; ppm/°C)	Resistance Range (mΩ)		Preferred Resistance of E-Series
Type	Size						Min.	Max.	
FCF03 E code	0603	1/8W	337	754	±1 ±2、±5	±200	100	910	E-24
						±400	50	99	
FCF05 E code	0805	1/4W	477	1067	±1 ±2、±5	±200	100	910	E-24
						±400	50	99	
						±600	22	49	
						±1000	10	20	
FCF06 E code	1206	1/3W	551	1232	±1 ±2、±5	±200	100	910	E-24
						±400	50	99	
						±600	22	49	
						±1000	10	20	
FCF12 E code	1210	2/3W	779	1742	±1 ±2、±5	±200	100	910	E-24
						±400	50	99	
						±600	22	49	
						±1000	10	20	
FCF20 E code	2010	3/4W	826	1847	±1 ±2、±5	±200	100	910	E-24
						±400	50	99	
						±600	22	49	
						±1000	10	20	
FCF25 E code	2512	1W	954	2133	±1 ±2、±5	±200	100	910	E-24
						±400	50	99	
						±600	22	49	
						±1000	10	20	

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°C when working.



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Current Sensing Resistors

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High Power		Rating @70°C	Max. RCWV (mV)	Max. Overload Voltage (mV)	Resistance Tolerance (%)	Temperature Coefficient (TCR; ppm/°C)	Resistance Range (mΩ)		Preferred Resistance of E-Series
Type	Size						Min.	Max.	
FCF03 E code	0603	1/4W	477	1067	±1 ±2、±5	±200	100	910	E-24
						±400	50	99	
FCF05 E code	0805	1/2W	675	1508	±1 ±2、±5	±200	100	910	E-24
						±400	50	99	
						±600	22	49	
						±1000	10	20	
FCF06 E code	1206	3/4W	826	1847	±1 ±2、±5	±200	100	910	E-24
						±400	50	99	
						±600	22	49	
						±1000	10	20	
FCF12 E code	1210	3/4W	826	1847	±1 ±2、±5	±200	100	910	E-24
						±400	50	99	
						±600	22	49	
						±1000	10	20	
FCF20 E code	2010	1W	954	2133	±1 ±2、±5	±200	100	910	E-24
						±400	50	99	
						±600	22	49	
						±1000	10	20	
FCF25 E code	2512	2W	1349	3017	±1 ±2、±5	±200	100	910	E-24
						±400	50	99	
						±600	22	49	
						±1000	10	20	

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.



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6. Part Number

Type	Size	Tolerance	Packing	Power Code	R Codes	Control Code
FCF	03 :0603	F :±1%	Paper Tape :	Normal	XXXX 4 digits	Normal
	05 :0805	G :±2%	0603.0805.1206.1210	Power		Power
	06 :1206	J :±5%	T : 5Kpcs	± :		-E
	12 :1210		V : 10Kpcs	High		High Power
	20 :2010		W : 20Kpcs	Power		LE : 200ppm
	25 :2512		Plastic Tape :	D :1/4W		KE : 400ppm
			2010.2512	E :1/2W		JE : 600ppm
			P : 4Kpcs	G :3/4W		HE : 1000ppm
			X : 8Kpcs	H :1W		
			Y : 16Kpcs	J :2W		

Example :

FCF06FT-R100-E

→1206 size, normal power, ±1%, paper tape, 100mΩ.

FCF25FPJR470LE

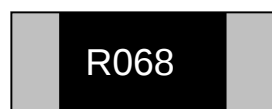
→2512 size, high power, ±1%, plastic tape, 470mΩ.

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

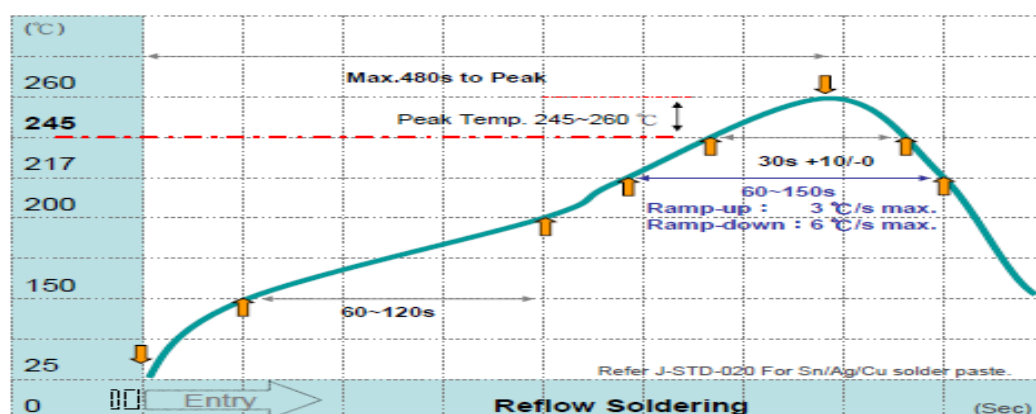
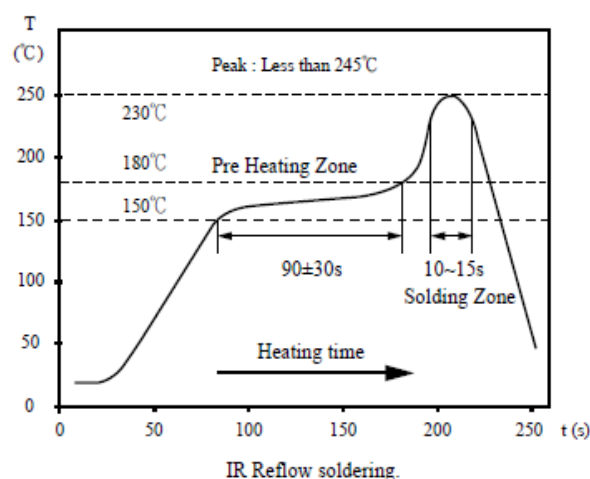
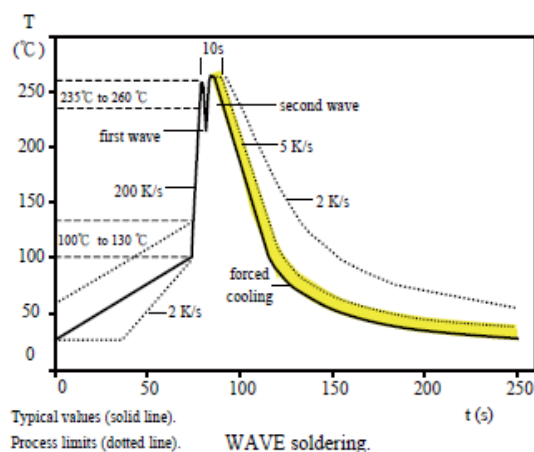


FCF E code series. (General Purpose)

Current Sensing Resistors

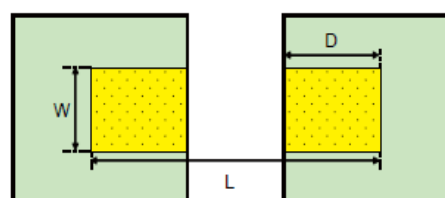
Thick-film Chip Resistors

Soldering Reference : Compatible for most industrial soldering request.



Recommend Solder Pad Dimensions :

Type	W	D	L
FCF03	0.90	1.00	3.00
FCF05	1.30	1.15	3.50
FCF06	1.80	1.30	4.70
FCF12	3.00	1.30	4.70
FCF20	3.00	1.50	6.80
FCF25	3.70	1.60	7.60



Unit. mm



FCF E code series. (General Purpose)

Current Sensing Resistors

Thick-film Chip Resistors

8. Reliability Performance

Test Item	Specification	Test Method
DC Resistance	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	$\Delta R \leq \pm(1\% + 0.5m\Omega)$ F : $\Delta R \leq \pm(0.5\% + 0.5m\Omega)$ No mechanical damage	IEC 60115-1, Clause 4.18 Solder dipping @ 260°C $\pm$ 5°C for 10sec. $\pm$ 1sec.
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°C molten solder bath for 3 $\pm$ 0.5 sec.
Short Time Overload	$\Delta R \leq \pm(2\% + 0.5m\Omega)$ 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 $TCR = \frac{R_2 - R_1}{R_1 \times (T_2 - T_1)} \times 10^6$ Test temperature : 25°C~ 155°C TCR(ppm/°C) = (R ₂ -R ₁)/R ₁ $\times$ 1 / (T ₂ -T ₁) $\times$ 10 ⁶
Load Life	$\Delta R \leq \pm(3\% + 0.5m\Omega)$ F : $\Delta R \leq \pm(1\% + 0.5m\Omega)$	IEC 60115-1, Clause 4.25 Rated voltage for 1.5 hours for followed by a pause 0.5 hour at 70 $\pm$ 2°C. Cycle repeated 1000 hours.
Bending strength	$\Delta R \leq \pm(1\% + 0.5m\Omega)$ 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 $\pm$ 15V



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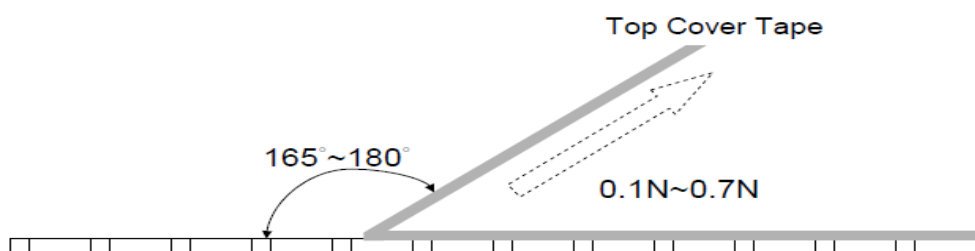
Thick-film Chip Resistors

9. PACKAGING

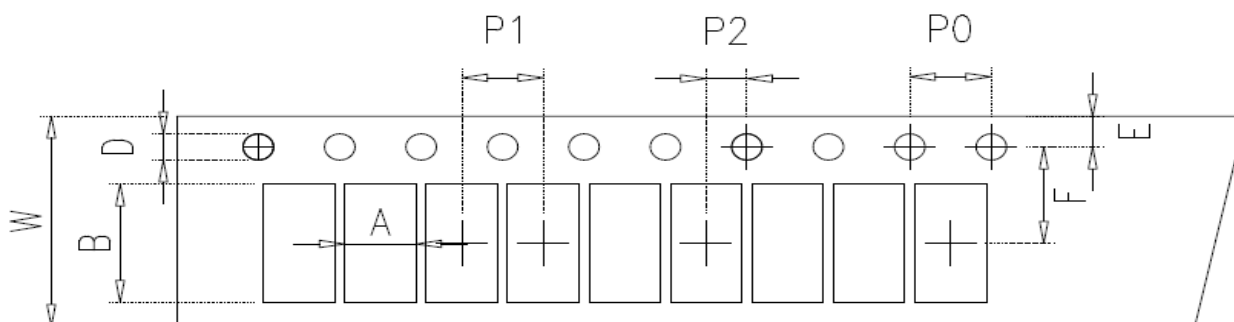
9.1 Peel Strength of Top Cover Tape

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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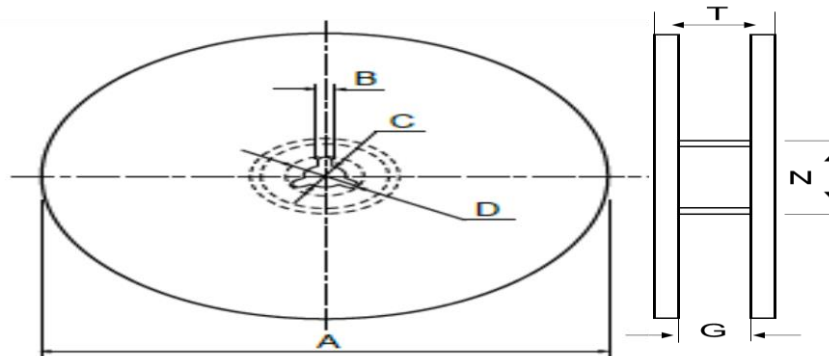


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9.3 Reel Dimensions



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.

