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SPECIFICATION FOR APPROVAL

DATE：

CUSTOMER：

PART NAME： Thick Film General Purpose Chip Resistor

CUSTOMER'S DWG. NO.：

CUSTOMER'S PART NO.：

PDC PART NO.： **FCF 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

PDC

THICK FILM
LEAD FREE CHIP RESISTORS

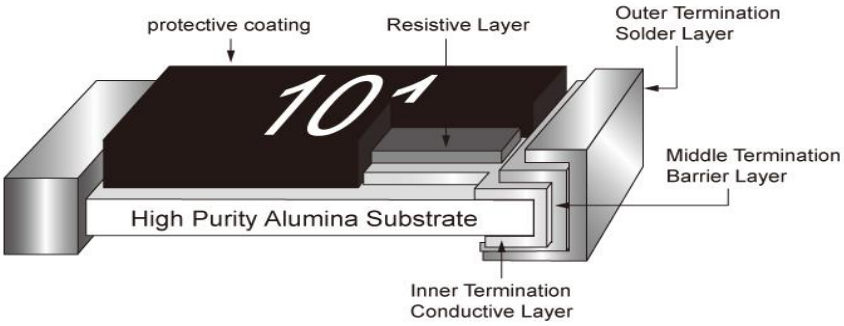
Features

- Suitable for lead free soldering.
- Compatible with wave and reflow soldering
- RoHS compliant & Halogen Free

Applications

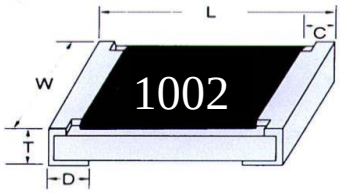
- Portable Devices
- Consumer Electronics
- Measurement instrument
- Computer / Motherboard

Configuration



Construction of Chip-Resistor

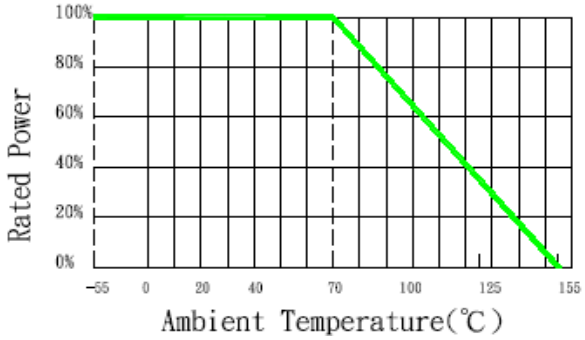
Dimensions



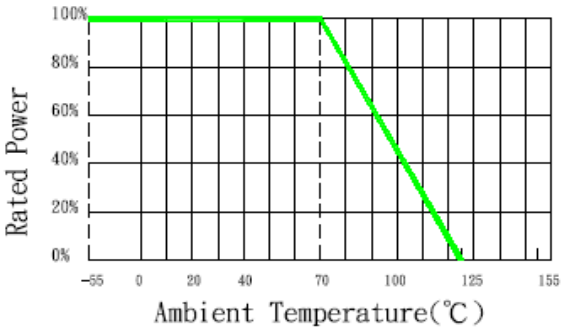
Size	L	W	C	D	T
01005	0.40±0.02	0.20±0.02	0.08±0.03	0.10±0.03	0.13±0.02
0201	0.60±0.03	0.30±0.03	0.10±0.05	0.15±0.05	0.23±0.03
0402	1.00±0.05	0.50±0.05	0.20±0.10	0.25±0.10	0.35±0.05
0603	1.60±0.10	0.80±0.10	0.30±0.20	0.30±0.20	0.45±0.10
0805	2.00±0.10	1.25±0.10	0.40±0.20	0.40±0.20	0.50±0.10
1206	3.10±0.10	1.60±0.10	0.50±0.20	0.50±0.25	0.55±0.10
1210	3.10±0.10	2.60±0.15	0.50±0.25	0.50±0.25	0.55±0.10
2010	5.00±0.20	2.50±0.20	0.60±0.25	0.60±0.25	0.60±0.10
2512	6.40±0.20	3.20±0.20	0.60±0.25	0.90±0.25	0.60±0.15

(unit: mm)

Power Derating Curve



Maximum dissipation in percentage of rated power as a function of the ambient temperature for 0402,0603,0805,1206,1210,2010,2512



Maximum dissipation in percentage of rated power as a function of the ambient temperature for 01005,0201

Rating

FCF Series

- **LEAD FREE CHIP RESISTORS**

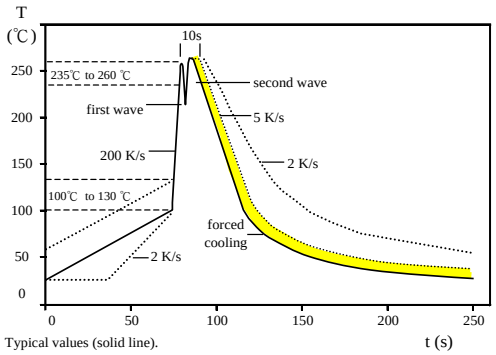
Type	Size	Power Rating at 70℃	Max. RCWV	Max. Overload Voltage	Resistance Tolerance (%)	Temperature Coefficient (TCR; ppm/℃)	Resistance Range(Ω) Min.	Resistance Range(Ω) Max.	Standard Resistance Values
FCF0A	01005	1/32W	15V	30V	±1%(F)	±200	100	1M	E-96
						±300	10	91	E-96
						-200 ~ +600	0 &. 4.7	9.76	E-96
					±5%(J)	±200	100	1M	E-24
						±300	10	91	E-24
						-200 ~ +600	0 &. 4.7	9.1	E-24
FCF01	0201	1/20W	25V	50V	±1%(F)	±200	10	10M	E-96
						-200 ~ +600	1	9.76	E-96
					±5%(J)	±200	10	10M	E-24
						-200 ~ +600	0 &. 1	9.76	E-24
FCF02	0402	1/16W	50V	100V	±0.1%(B)	±100	10	1M	E-96
					±0.5%(D)	±100	10	1M	E-96
					±1%(F)	±100	10.2	10M	E-96
						-200 ~ +400	1	10	E-96
					±5%(J)	±100	10.2	10M	E-24
						-200 ~ +400	0 &. 1	10	E-24
FCF03	0603	1/10W	75V	100V	±0.1%(B)	±50	20	510K	E-96
					±0.25%(C)				E-96
					±0.5%(D)				E-96
FCF05	0805	1/8W	150V	300V	±1%(F)				E-96
					±1%(F)	±100	10.2	10M	E-96
						-200 ~ +400	1	10	E-96
FCF06	1206	1/4W	200V	400V	±5%(J)	±100	10.2	10M	E-24
						-200 ~ +400	0 &. 1	10	E-24
FCF12	1210	1/3W	200V	400V	±1%(F)	±100	10.2	10M	E-96
FCF20	2010	3/4W	200V	400V		±200	1	10	E-96
FCF25	2512	1W	250V	500V	±5%(J)	±100	10.2	10M	E-24
						-200 ~ +400	0 &. 1	10	E-24

※ Resistance 1~10Ω, TCR 100ppm available upon special request. For size : 0603/0805/1206/2010/2512

- **LEAD FREE CHIP JUMPERS (0 ohm)**

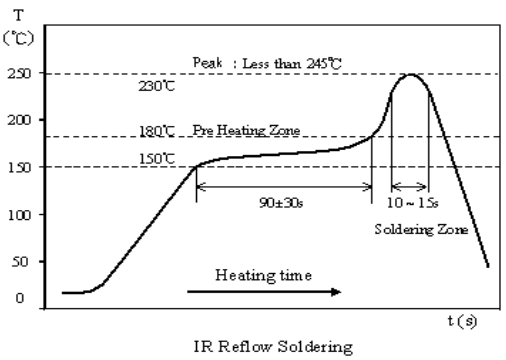
Type	Rated Current(A)	Peak Current(A)	Rmax (mΩ)	Remakrs :
FCF0A	0.8	2	50	TCR parameter is not applicable of jumper.
FCF01	1	2.5	50	
FCF02	1	2	50	
FCF03	1	3	50	
FCF05	2	4	50	
FCF06	2	5	50	
FCF12	2.5	6	50	
FCF20	3.8	9	50	
FCF25	4.5	11	50	

Soldering Temperature Curve



Typical values (solid line).
Process limits (dotted line).

WAVE soldering.



IR Reflow Soldering

Part Number

FCF	05	F	T	–	1002	–
Type	Size	Tolerance	Packing		R codes	TCR

FCF	0A : 01005	B : ± 0.1%	S : Paper tape 1Kpcs	±0.1%(B)	Null : TCR as rating table
	01 : 0201	C : ±0.25%	T : Paper tape 5Kpcs	to	
	02 : 0402	D : ± 0.5%	V : Paper tape 10Kpcs	±1%(F)	**P：50ppm**
	03 : 0603	F : ± 1%	U : Paper tape 15Kpcs	4 codes	Applicable for ±1%(F)
	05 : 0805	G : ± 2%	W : Paper tape 20Kpcs		0603/0805/1206
	06 : 1206	J : ± 5%	H : Paper tape 50Kpcs	±2%(G)	20Ω~510KΩ
	12 : 1210		Z : Paper tape 70Kpcs	to	**N：100ppm**
	20 : 2010		P : Plastic tape 4Kpcs	±5%(J)	Applicable for ±1%(F)
	25 : 2512		X : Plastic tape 8Kpcs	3 codes	0603/0805/1206/2010/2512
			Y : Plastic tape 16Kpcs		1Ω~10Ω

example:
FCF05FT-1002P

SPECIFICATION

Resistance Marking

E - 24 SERIES

3 digits for 0603/0805/1206/1210, ±5%, E24
examples: **473** 47× 10^3 = 47KΩ
1R5 = 1.5Ω

4 digits for 2010/2512, ±5%, E24
examples: **4702** 470× 10^2 = 47KΩ
1R50 = 1.5Ω

E - 96 SERIES

4 digits for ±1%, E24
examples: **1542** 154× 10^2 = 15K4Ω
22R1 = 22.1Ω

3 digits for 0603, ±1%, E96
examples: **02C** (Table 1)
102× 10^2 = 10K2Ω

※ No Marking of 0402 / 0201 / 01005

SPECIFICATION

0603 1% Marking Table (Table 1)

Code	E48	E96	Code	E48	E96	Code	E48	E96	Code	E48	E96
01	100	100	25	178	178	49	316	316	73	562	562
02		102	26		182	50		324	74		576
03	105	105	27	187	187	51	332	332	75	590	590
04		107	28		191	52		340	76		604
05	110	110	29	196	196	53	348	348	77	619	619
06		113	30		200	54		357	78		634
07	115	115	31	205	205	55	365	365	79	649	649
08		118	32		210	56		374	80		665
09	121	121	33	215	215	57	383	383	81	681	681
10		124	34		221	58		392	82		698
11	127	127	35	226	226	59	402	402	83	715	715
12		130	36		232	60		412	84		732
13	133	133	37	237	237	61	422	422	85	750	750
14		137	38		243	62		432	86		768
15	140	140	39	249	249	63	442	442	87	787	787
16		143	40		255	64		453	88		806
17	147	147	41	261	261	65	464	464	89	825	825
18		150	42		267	66		475	90		845
19	154	154	43	274	274	67	487	487	91	866	866
20		158	44		280	68		499	92		887
21	162	162	45	287	287	69	511	511	93	909	909
22		165	46		294	70		523	94		931
23	169	169	47	301	301	71	536	536	95	953	953
24		174	48		309	72		549	96		976

Code	A	B	C	D	E	F	G	H	X	Y	Z
Multiplier	10^{0}	10^{1}	10^{2}	10^{3}	10^{4}	10^{5}	10^{6}	10^{7}	10^{-1}	10^{-2}	10^{-3}

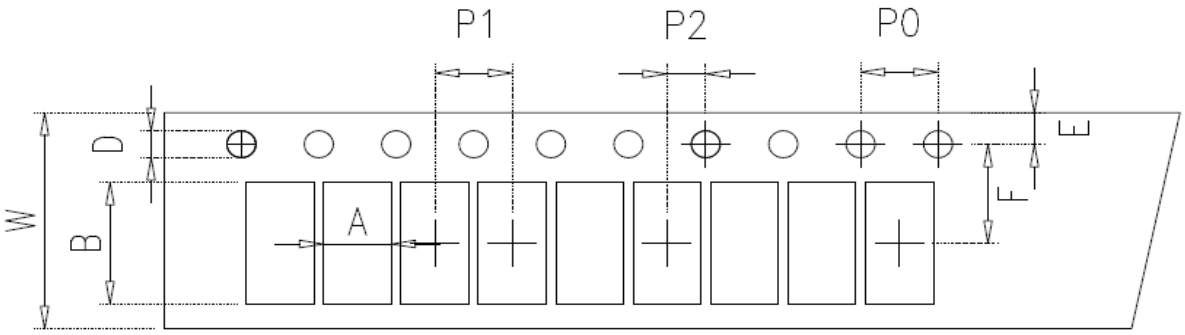
Standard resistance value

E3	10				22				47								
E6	10		15		22		33		47		68						
E12	10	12	15	18	22	27	33	39	47	56	68	82					
E24	10	11	12	13	15	16	18	20	22	24	27	30	33	36	39	43	47
	51	56	62	68	75	82	91										
E96	100	102	105	107	110	113	115	118	121	124	127	130	133	137	140	143	147
	150	154	158	162	165	169	174	178	182	187	191	196	200	205	210	215	221
	226	232	237	243	249	255	261	267	274	280	287	294	301	309	316	324	332
	340	348	357	365	374	383	392	402	412	422	432	442	453	464	475	487	499
	511	523	536	549	562	576	590	604	619	634	649	665	681	698	715	732	750
	768	787	806	825	845	866	887	909	931	953	976						

SPECIFICATION

■ Tape And Reel Package

- Taping specs are according to EIA RS-481



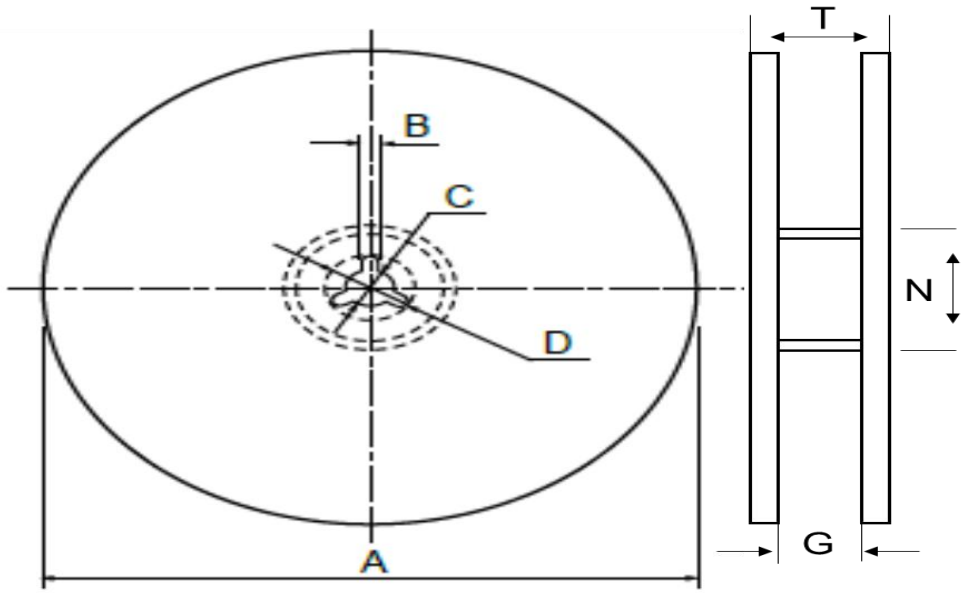
Accumulated dimensional tolerance 40±0.2mm

Size	A	B	W	F	E	P1	P2	P0	D
01005	0.24±0.03	0.45±0.03	8.00±0.20	3.50±0.05	1.75±0.10	2.00±0.05	2.00±0.05	4.00±0.10	1.50+0.10/-0
0201	0.37±0.05	0.67±0.05	8.00±0.20	3.50±0.05	1.75±0.10	2.00±0.05	2.00±0.05	4.00±0.10	1.50+0.10/-0
0402	0.70±0.10	1.20±0.10	8.00±0.30	3.50±0.05	1.75±0.10	2.00±0.10	2.00±0.05	4.00±0.10	1.50+0.10/-0
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)

SPECIFICATION

• Reel Package



Size	Packaging Q'ty	A	N	C	D	B	G	T
01005	20Kpcs / Reel	178.0±2.0	60.0±0.5	13.0±0.5	20min	2.0±0.5	9.0±1.0	14.9 max.
0201	15Kpcs / Reel	178.0±2.0	60.0±0.5	13.0±0.5	20min	2.0±0.5	9.0±0.5	14.9 max.
	50Kpcs / Reel	330.0±2.0	100.0±1.0	13.0±0.5	20min	2.0±0.5	9.0±0.5	14.9 max.
	70Kpcs / Reel	330.0±2.0	100.0±1.0	13.0±0.5	20min	2.0±0.5	9.0±0.5	14.9 max.
0402	10Kpcs / Reel	178.0±2.0	60.0±0.5	13.0±0.5	20min	2.0±0.5	10.0±1.5	14.9 max.
0603 0805 1206 1210	1Kpcs / Reel	100.0±0.5	52.0±0.5	13.0±0.5	20min	2.0±0.5	9.0±0.5	12.5 max.
	5Kpcs / Reel	178.0±2.0	60.0±0.5	13.0±0.5	20min	2.0±0.5	10.0±1.5	14.9 max.
	10Kpcs / Reel	254.0±2.0	100.0±1.0	13.5±0.5	20min	2.0±0.5	10.0±1.5	14.9 max.
	20Kpcs / Reel	330.0±2.0	100.0±1.0	13.5±0.5	20min	2.0±0.5	10.0±1.5	14.9 max.
2010 2512	4Kpcs / Reel	178.0±2.0	60.0±0.5	13.0±0.5	20min	2.0±0.5	13.8±1.5	16.7 max.
	8Kpcs / Reel	254.0±2.0	100.0±1.0	13.5±0.5	20min	2.0±0.5	13.8±1.5	16.7 max.
	16Kpcs / Reel	330.0±2.0	100.0±1.0	13.5±0.5	20min	2.0±0.5	13.8±1.5	20.0 max.

(unit: mm)

SPECIFICATION

■ FCF≧ 1Ω Specification And Test Methods

ITEM	SPECIFICATION	TEST METHOD
DC Resistance	J : ±5% , G: ±2% , F: ±1% D: ±0.5% , C: ±0.25% , B: ±0.1% Zero ohm Jumper ＜ 50mΩ	**IEC 60115-1 / JIS C 5201-1 , Clause 4.5** Measure the resistance value.
Short time Overload	J、G: △R ≦ ± (2% + 0.1Ω) F、D: △R ≦ ± (1% + 0.05Ω) C、B: △R ≦ ± (0.5% + 0.05Ω)	**IEC 60115-1 / JIS C 5201-1 , Clause 4.13** 2.5×Rated voltage or Max. Overload Voltage for 5 sec. measure resistance after 30 minutes
Solderability	Over 95% of termination must be covered with Solder	**IEC 60115-1 / JIS C 5201-1 , Clause 4.17** After immersing flux, dip in the 245±2℃ molten solder bath for 3±0.5 sec
Resistance to Solder Heat	J、G: △R ≦ ± (1% + 0.1Ω) F、D、C、B: △R ≦ ± (0.5% + 0.05Ω) No mechanical damage	**IEC 60115-1 / JIS C 5201-1 , Clause 4.18** With 260±5℃ for 10±1 sec.
High Temperature Exposure	J、G: ΔR ≦ ± (2% + 0.1Ω) F、D、C、B: ΔR ≦ ± (1% + 0.1Ω) no visible damage	**MIL-STD-202 method 108** 1000+48/-0 hours; without load in a temperature chamber 155°C, size 01005 125°C
Temperature Coefficient of Resistance (TCR)	Refer to the rating table information.	**IEC 60115-1 / JIS C 5201-1 , Clause 4.8** Test temperature : 25℃ (T1) → -55℃ (T2) 25℃ (T1) → +155℃ (T2) $TCR\ (ppm/℃) = \frac{R2-R1}{R1} \times \frac{1}{T2-T1} \times 10^6$ T1: 25℃ T2: Test temperature R1: Resistance at reference temperature (T1) R2: Resistance at test temperature (T2)
Load Life Humidity	J、G: △R ≦ ± (3% + 0.1Ω) F、D: △R ≦ ± (1% + 0.05Ω) C、B: △R ≦ ± (0.5% + 0.05Ω)	**IEC 60115-1 / JIS C 5201-1 , Clause 4.24** Maintain the temperature of the resistor at 40±2℃ and 90～95% R.H. with the rated voltage applied. Cycle ON for 1.5 hours and OFF for 0.5 hour for 1000+48/-0 hours. After 1～4 hour, measure the resistance value.
Load Life	J、G: △R ≦ ± (3% + 0.1Ω) F、D: △R ≦ ± (1% + 0.05Ω2) C、B: △R ≦ ± (0.5% + 0.05Ω)	**IEC 60115-1 / JIS C 5201-1 , Clause 4.25** Permanent resistance change after 1000+48/-0 hours (1.5 hours ON , 0.5 hour OFF) at RCWV or Max. Keep the resistor at 70±2℃ ambient
Temperature Cycle	J、G: △R ≦ ± (1% + 0.1Ω) F、D、C、B: △R ≦ ± (0.5% + 0.05Ω) No mechanical damage	**IEC 60115-1 / JIS C 5201-1 , Clause 4.19** Repeat 5 cycles as follows -55℃(30 min.) + 25℃(2～3 min.) +155℃(30 min.) + 25℃(2～3 min.)
Insulation Resistance	Between termination and coating must be over 1000MΩ	**IEC 60115-1 / JIS C 5201-1 , Clause 4.6** Test voltage: 100±15V
Bending Strength	J、G: △R ≦ ± (1% + 0.1Ω) F、D、C、B: △R ≦ ± (0.5% + 0.05Ω) No mechanical damage	**IEC 60115-1 / JIS C 5201-1 , Clause 4.33** Resistance change after bended on the 90mm PCB. Bend: 3mm for 01005、0201、0402、0603、0805、1206、1210; 2mm for 2010、2512

■ 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.