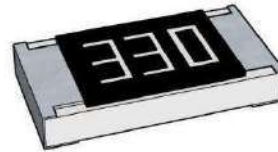


(Thick Film Chip Resistor)



■ (Application)

- Entertainment: Stereo,TV tuners , Tape recorder
- Appliance: Air conditioner, Refrigerator
- Computer & relative products : Main board, PDA
- Communication equipment: Cell phone, Fax machine
- Power equipment: Power supply , II Lumination equipment
- Measuring instrument: Electric meter,Navigation equipment

■ (Features)

small size and light weight

- Reliability, high quality

■ (Parts Number Explanation)

(Example) : FRC1206F1001TS

<u>F</u>	<u>R</u>	<u>C</u>	<u>1206</u>	<u>F</u>	<u>1001</u>	<u>T</u>	<u>S</u>	
FOJAN	R:Resistor C:Capacitor L:Inductor D:Diode A:Audion P:Hi-Power	C:Normal P:Hi-Power L:Lowohmic A:Array S:Surge H:Hi-Precision V:Hi-Voltage Q:Auto-motive R:Anti-sulfur M:Metal	0201 0402 0603 0805 1206 1210 1218 1812 2010 2512	A:±0.05% B:±0.1% C:±0.25% D:±0.5% F:±1% J:±5% P: Jumper H: 0~1% L: -1~0%	±5%:E24 3-digits+blank 102=1KΩ 1R0=1Ω ±1%&Below: E24+E96: 4-digits 1001=1KΩ 1R00=1Ω	T: 7 inch reel Q:10 inch reel R:13 inch reel B:Bulk	S: Sn C: Cu A: Au	Blank: none
Company code	Type code	Functional code	Size code	Tolerance code	Resistance code	Packaging code	Termination code	Special Case

■ (Marking on the Resistor's Body)

1.0201 For 0201 and 0402 size, no marking on the body due to the small size of the resistor		472=47×10 ² =4.7KΩ
2. ±5% tolerance product: the marking is 3 digits, the first two digits are significant figures of resistance value and the 3rd one denotes the power number of 10, (10X)		10Ω: 5R6=5.6Ω Below 10Ω: 5R6=5.6Ω
3.±0.5%, ±1%, ±2% ±0.5%, ±1%,±2% tolerance product: the marking is 4 digits, the first 3 digits are significant figures of resistance value and the 4th one denotes the power number of 10, (10X)		4992=499×10 ² =49.9KΩ
4.0603 ±1% E96 Standard E96 series values of 0603 ±1%: due to the small size of the resistor's body, use 3 digits code to indicate the resistance value.		100Ω 6R81=6.81Ω Below 100Ω: 6R81=6.81Ω
5. All type and tolerance of Jumper products used 1 digit code to indicate the value, i.e. 0		0Ω=0

■ 0603±1% E96 Standard E96 Series Resistance Value Code for 0603 ±1% Marking

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

■ 0603±1% Multiplier Code for 0603 ±1% Marking

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

So the resistance value are marked as the following examples)



$$10D = 124 \times 10^3 = 124K\Omega$$



$$38Y = 243 \times 10^{-2} = 2.43\Omega$$

0603 ±1% (Standard E24 and not belong to E96 series values of 0603 ±1%, the marking is the same as 5% tolerance but marking as underline)

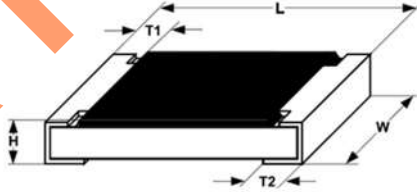


$$33_1 = 33 \times 10^1 = 330\Omega$$



$$56_0 = 56 \times 10^0 = 56\Omega$$

■ (Dimension):

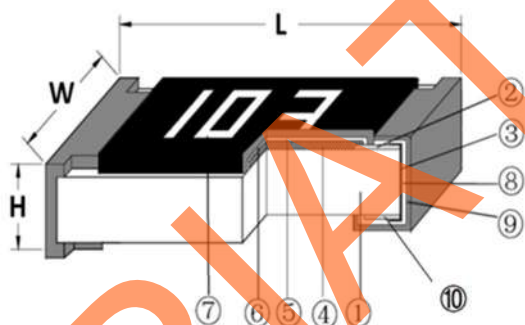
dimension					
(Type)	L	W	H	T1	T2
0201	0.60±0.03	0.30±0.03	0.23±0.03	0.10±0.05	0.15±0.05
0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10
0603	1.60±0.10	0.80±0.10	0.45±0.10	0.25±0.15	0.25±0.15
0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20
1206	3.10±0.10	1.60±0.10	0.55±0.10	0.45±0.20	0.45±0.20
1210	3.10±0.10	2.50±0.15	0.55±0.10	0.45±0.15	0.50±0.20
1218	3.10±0.10	4.60±0.10	0.55±0.10	0.45±0.20	0.40±0.20
1812	4.50±0.20	3.10±0.20	0.55±0.10	0.55±0.20	0.70±0.20
2010	5.00±0.10	2.50±0.15	0.55±0.10	0.45±0.15	0.50±0.20
2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.20	0.50±0.20

(unit) : mm

(Derating Curve)

使用温度范围	-55~+125℃ (0201尺寸)	-55~+155℃ (0402, 0603, 0805, 1206, 1210, 1812, 2010, 2512尺寸)
说明	周围温度若超过70℃至125℃之间，功率可照下图曲线予以修订	周围温度若超过70℃至155℃之间，功率可照下图曲线予以修订
功率衰减曲线图		

(Construction)



NO.	construction	Major material
1	Ceramic substrate	Al ₂ O ₃
2	Conductive layer (Top)	Ag
3	Side conductive layer	NiCr
4	Resistive layer	RuO ₂ + glass
5	Inner protective layer	Glass
6	Outer Protective layer	Epoxy
7	Marking	Epoxy
8	Ni plating layer	Ni
9	Sn plating layer	Matte Tin
10	Conductive layer (Back)	Ag

▪ (Electrical characteristics)

Type	0201	0402	0603	0805	1206	1210	1218	1812	2010	2512
Rated power	1/20W	1/16W	1/10W	1/8W	1/4W	1/2W	1W	3/4W	3/4W	1W
Max Working Voltage	25V	50V	75V	150V	200V	200V	200V	200V	200V	200V
Max Overload Voltage	50V	100V	150V	300V	400V	400V	500V	400V	400V	400V
Dielectric Withstanding Voltage	-	100V	100V	300V	500V	500V	500V	500V	500V	500V
Resistance Value of Jumper ±1%	-	<30mΩ	<30mΩ	<30mΩ	<30mΩ	<30mΩ	<30mΩ	<30mΩ	<30mΩ	<30mΩ
±5% Resistance Value of Jumper ±5%	<50mΩ	<50mΩ	<50mΩ	<50mΩ	<50mΩ	<50mΩ	<50mΩ	<50mΩ	<50mΩ	<50mΩ
Rated Current of Jumper	0.5A	1A	1A	2A	2A	2A	6A	2A	2A	2A
Max Current of Jumper	1A	2A	2A	5A	10A	10A	10A	10A	10A	10A

(remark) : (The rated voltage is calculated by the following formula) :

$$E = \sqrt{RP}$$

E: Rated Voltage) (V)

P: Rated Power) (W)

R: (Resistance) (ohm)

In case the value calculated by the formula exceed the maximum working voltage as above table 8, the maximum working voltage shall be regarded as rated voltage.

▪ (Standard Electrical Specifications)

Type	(Power Rating at 70°C)	Max. RCWV	Max. Overload Voltage	T.C.R. (PPM/°C)	Resistance Range
0201	1/20W	25V	50V	± 400	1Ω~10Ω
				± 200	10Ω~10MΩ
0402	1/16W	50V	100V	± 200	1Ω~10Ω
				± 100	10MΩ~22MΩ
0603	1/10W	75V	150V	± 200	1Ω~10Ω
				± 100	10MΩ~22MΩ
0805	1/8W	150V	300V	± 200	1Ω~10Ω
				± 100	10MΩ~22MΩ
1206	1/4W	200V	400V	± 200	1Ω~10Ω
				± 100	10MΩ~22MΩ
1210	1/2W	200V	400V	± 200	1Ω~10Ω
				± 100	10MΩ~22MΩ
1218	1W	200V	500V	± 200	1Ω~10Ω
				± 100	10Ω~1MΩ
1812	3/4W	200V	400V	± 200	1Ω~10Ω
				± 100	10Ω~10MΩ
2010	3/4W	200V	400V	± 200	1Ω~10Ω
				± 100	10MΩ~22MΩ
2512	1W	200V	400V	± 200	1Ω~10Ω
				± 100	10MΩ~22MΩ

▪ (Performance Specifications)

Item	Test Methods	Test Conditions	Specification
Temperature Coefficient	JIS C 5201 4.8 IEC60115-1-4.8	$TCR = (R - R_0) / (t - t_0) R_0 \times 10^6$ (ppm) R_0 (resistance at room temperature) R (resistance at 125°C or -55°C) t_0 (room temperature) t (test temperature 125°C or -55°C)	As SPEC
Short-time overload	JIS C 5201 4.13 IEC60115-1-4.13	Applied 2.5 times of rated voltage for 5 second. Measure the variation of resistance.	0.5%、1%: $\pm(1.0\%+0.05\Omega)$ 5%: $\pm(2.0\%+0.05\Omega)$
Solderability	JIS C 5201 4.17 IEC60115-1-4.17	245±5°C, Dip the terminal in a flux and then dip into a soldering bath at 245±5°C for 3±0.5sec.	> 95% (> 95% coverage)
Resist to soldering heat	JIS C 5201 4.18 IEC 60115-1-4.18	Dip the terminal in a flux and then dip into a soldering bath at 260±5°C for 10±0.5sec. Measure the variation of resistance.	$\pm(1.00\% + 0.05\Omega)$
Insulation resistance	JIS C 5201 4.6 IEC60115-1-4.6	Applied the dielectric withstanding voltage on the center of body for 60±5seconds. Then measure insulation resistance.	>10GΩ

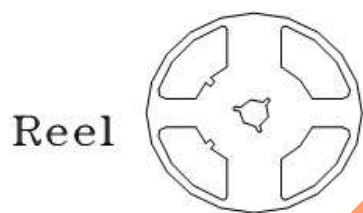
Item	Test Methods	Test Conditions	Specification
Dielectric withstanding voltage	JIS C 5201 4.7 IEC60115-1-4.7	Applied the dielectric withstanding voltage on the center of body for 60±5 seconds.	No evidence of flashover, mechanical damage arcing or insulation breakdown
Terminal bending	JIS C 5201 4.33 IEC60115-1-4.33	Specimen shall be mounted on test board, then bend the board and maintained for 20±1s. the distance of bending is 5+0.2/0 mm for resistors which size no larger than 1206 or 2+0.2/0 mm which size larger than 1206. Measure the variation of resistance. (test board) (jig)	±(1.00%+0.05Ω)
Rapid temperature changes	JIS C 5201 4.19 IEC60115-1-4.19	Put specimen in a chamber which temperature can be T1: -55±3°C; T2: 155±3°C/125±3°C, 30min, repeated 300 cycles. Measure the variation of resistance.	0.5%、1%: ±(1.0%+0.05Ω) 5%: ±(2.0%+0.05Ω)

Item	Test Methods	Test Conditions	Specification
Humidity	JIS C 5201 4.24 IEC60115-1-4.24	Put the specimen in a chamber at $40 \pm 2^{\circ}\text{C}$ temperature and 90~95% relative humidity, then applied rated voltage for 1.5H and rested for 0.5H repeatedly till total test time is 1000^{+48}_{-0} H. Measure the variation of resistance.	0.5%、1%: $\pm(1.0\%+0.05\Omega)$ 5%: $\pm(2.0\%+0.05\Omega)$
Load life	JIS C 5201 4.25.1 IEC 60115-1-4.25.1	Put the specimen in a chamber at $70 \pm 2^{\circ}\text{C}$ temperature, ON TIME:1.5H, OFF TIME:0.5H, and applied rated voltage for 1000^{+24}_{-0} H. Measure the variation of resistance.	0.5%、1%: $\pm(1.0\%+0.05\Omega)$ 5%: $\pm(2.0\%+0.05\Omega)$
Moisture resistance	MIL-STD-202 METHOD 106	2 $25^{\circ}\text{C} \sim 65^{\circ}\text{C}$, 90~100%RH, 2.5H; 65°C 90~100%RH, 3H; $65^{\circ}\text{C} \sim 25^{\circ}\text{C}$ 80~100%RH, 2.5H, 10 cycles, Measurement at 24 ± 4 hours after test conclusion.	0.5%、1%: $\pm(1.0\%+0.05\Omega)$ 5%: $\pm(2.0\%+0.05\Omega)$

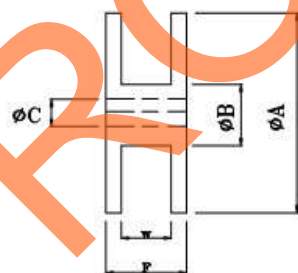
▪ (Tapping Specification)

(Reel dimension)

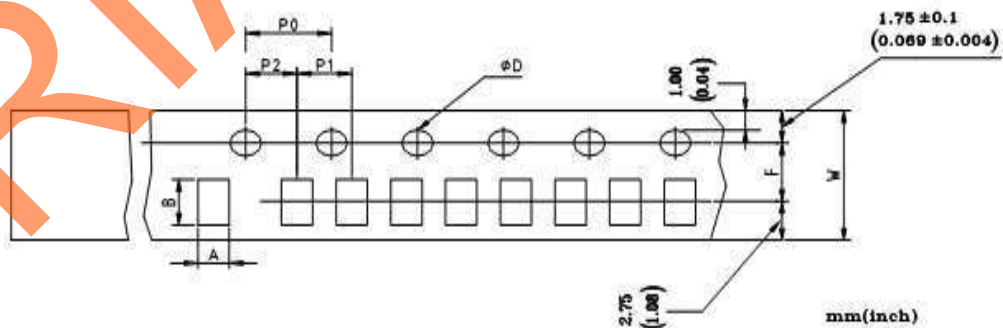
Type	Size		Unit	A	B	C	F	W
0201/0402	7"	10K/Reel 15K/Reel 0201 only	mm	178±2.0	60.0±1.0	13.5±0.5	11.4±0.1	9.00±0.3
0402	13"	40K/50K Reel	mm	330±2.0	100.0±1.0	13.5±0.5	11.4±0.1	9.00±0.3
0603/0805/1206/1210	7"	5K/Reel	mm	178±2.0	60.0±1.0	13.5±0.5	11.4±0.1	9.00±0.3
0603/0805/1206	10"	10K/Reel	mm	254±2.0	100.0±1.0	13.5±0.5	11.4±0.1	9.00±0.3
0603/0805/1206	13"	20K/Reel	mm	330±2.0	100.0±1.0	13.5±0.5	11.4±0.1	9.00±0.3
1218/1812/2010/2512	7"	4K/Reel	mm	178±2.0	60.0±1.0	13.5±0.5	15.4±1.0	13.0±0.3



Standard Quantity per Reel
5,000 pcs/Reel



(packing dimension)

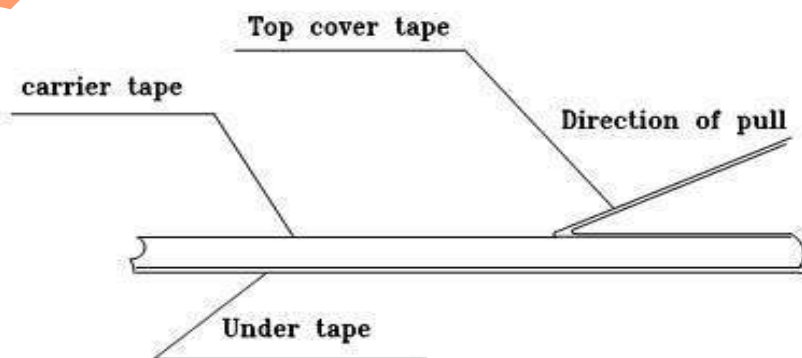


Unit: mm

Dimensions	A	B	D	F	P0	P1	P2	W
0201	0.38±0.05	0.68±0.05	1.50± _{0.0} ^{0.1}	3.50±0.05	4.00±0.10	2.00±0.10	2.00±0.05	8.00±0.20
0402	0.65±0.10	1.15±0.10	1.50± _{0.0} ^{0.1}	3.50±0.05	4.00±0.10	2.00±0.10	2.00±0.05	8.00±0.20
0603	1.10±0.10	1.90±0.10	1.50± _{0.0} ^{0.1}	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20
0805	1.65±0.20	2.40±0.20	1.50± _{0.0} ^{0.1}	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20
1206	1.90±0.20	3.50±0.20	1.50± _{0.0} ^{0.1}	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20
1210	2.80±0.20	3.50±0.20	1.50± _{0.0} ^{0.1}	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20
1218	2.80±0.20	4.60±0.20	1.50± _{0.0} ^{0.1}	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	12.0±0.10
1812	3.30±0.20	4.60±0.20	1.50± _{0.0} ^{0.1}	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	12.0±0.10
2010	2.90±0.10	5.30±0.10	1.50± _{0.0} ^{0.1}	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	12.0±0.10
2512	3.40±0.10	6.60±0.10	1.50± _{0.0} ^{0.1}	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	12.0±0.10

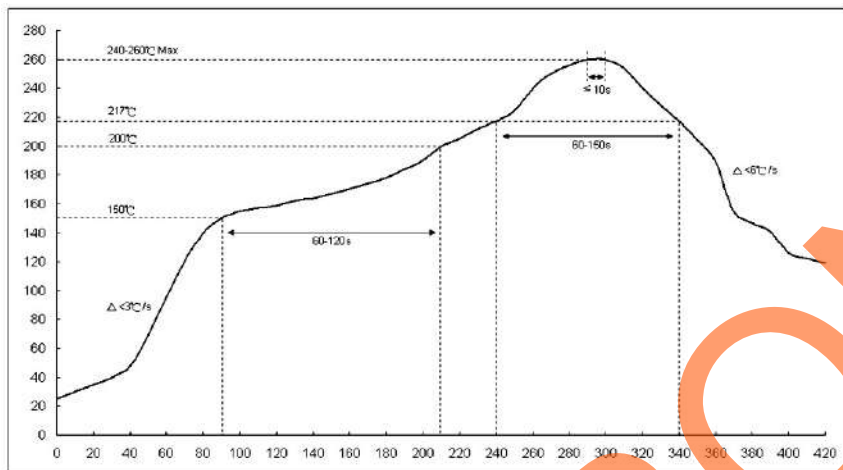
Peel force of top cover tape)

The top cover tape is pulled at a speed of 200 mm/min with the angle between the tape during peel and the direction of unreeling maintained at 165 to 180 degree as following picture. The peel force of paper carrier tape shall be 0.1N to 0.7N(10 to 70 g), the peel force of plastic carrier tape shall be 0.3N to 1N (30 to 100 g)

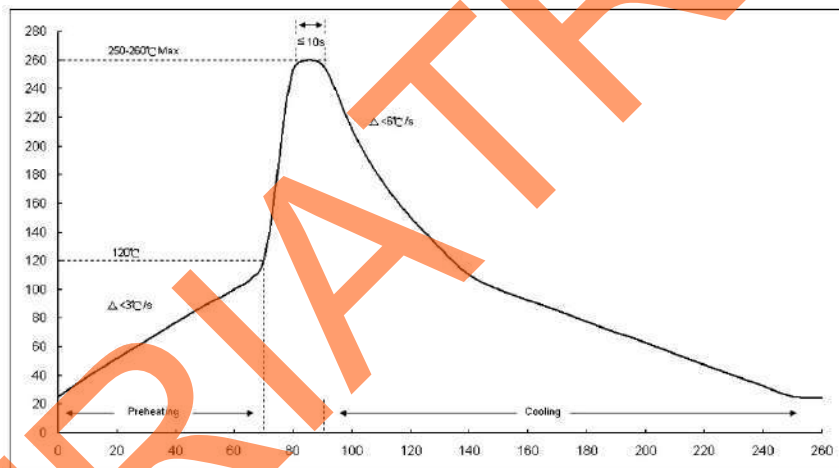


- (soldering) :
- (soldering)

(Recommend reflow soldering profile)



(Recommend wave soldering profile)



hand soldering temperature)

The iron temperature is $350 \pm 10^\circ\text{C}$, hand soldering time less than 3S. Avoid solder iron tip direct touch the components body

▪ Chip Resistor Instructions for use)

- (Application of the products in a special environment can deteriorate product

performance) :

1. High temperature
2. Near the sea ,or corrosive gas, such as Cl_2 , H_2S , NH_3 , SO_2 , and NO_2 , etc;
3. Unverified liquids, such as water, oil, chemical or organic solvent;
Unverified resin or paint to cover products;
4. Products should be washed with soluble cleaner even if non cleaning flux.

- (STORAGE / CARRY CONDITIONS)

6. 储存温度 $25 \pm 5^\circ\text{C}$ Temperature: $25 \pm 5^\circ\text{C}$
7. 湿度 30~70%RH Humidity: 30~70%RH
8. 储存期限: 先进先出, 2 年 Storage life: 2years FIFO
9. 存放和搬运时, 请保持盒子的正确方向。严禁跌落在箱体上, 否则可能损坏产品电极或本体
Please hold box correct orientation when storing and carrying. It is strictly prohibited to
fall on the box, otherwise the product electrode or body may be damaged.