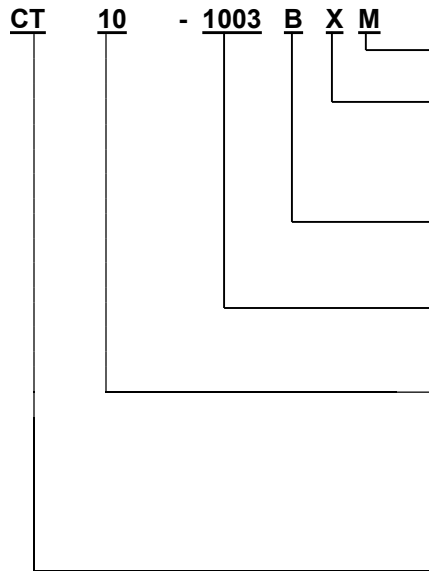


## HOW TO ORDER



**Packaging**  
M = Std. Reel      O = Cutting Tape

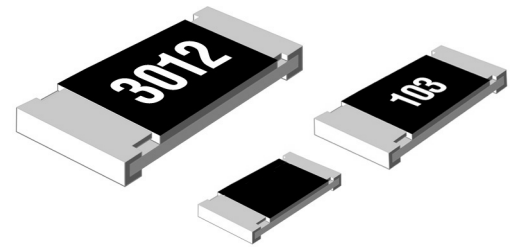
**TCR (PPM/°C)**  
L =  $\pm 1$       P =  $\pm 5$       Y =  $\pm 50$   
M =  $\pm 2$       Q =  $\pm 10$       Z =  $\pm 100$   
N =  $\pm 3$       X =  $\pm 25$

**Tolerance (%)**  
U =  $\pm 0.01$     A =  $\pm 0.05$     C =  $\pm 0.25$     F =  $\pm 1$   
P =  $\pm 0.02$     B =  $\pm 0.10$     D =  $\pm 0.50$

**EIA Resistance Value**  
Standard decade values

**Size**  
01=2512      05=0402      10=0805  
10P=0805P    11=2020      12=2010  
13=1217      14=1210      16=0603  
16P=0603P    18=1206      18P=1206P  
20=0201

**Series**  
CT = Lead Free Thin Film Precision Resistors  
Sn Termination

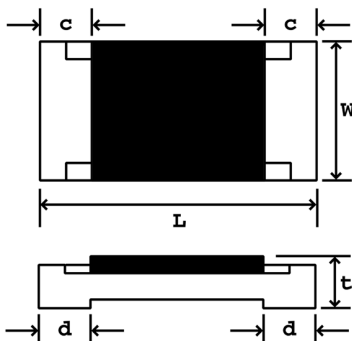


## FEATURES

- High Power Available 0603P 1/8W, 0805P 1/4W, 1206P 1/2W
- Nichrome Thin Film Resistor Element
- Anti-Leaching Nickel Barrier Terminations
- Very Tight Tolerances, as low as  $\pm 0.01\%$
- Extremely Low TCR, as low as  $\pm 1$ ppm
- Reference Standard = IEC 60115-8, JIS C 5201-8

## SCHEMATIC

Wraparound Termination



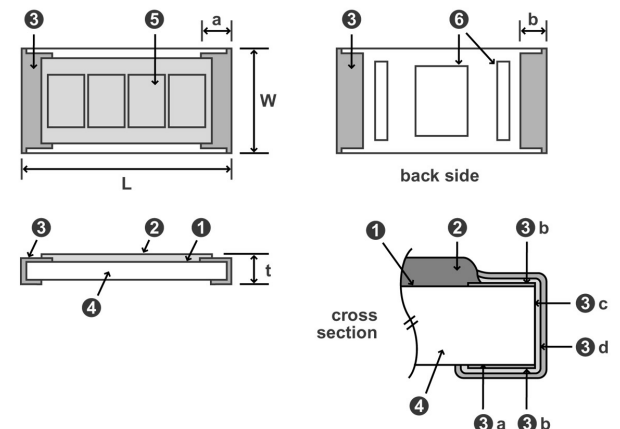
## DIMENSIONS (mm)

Size	L	W	c	d	t
0201	$0.60 \pm 0.05$	$0.30 \pm 0.05$	$0.13 \pm 0.05$	$0.25 + 0.05$	$0.25 \pm 0.05$
0402	$1.00 \pm 0.05$	$0.5 + 0.1^{0.05}$	$0.20 \pm 0.10$	$0.25 + 0.05^{0.10}$	$0.35 \pm 0.05$
0603, P	$1.60 \pm 0.10$	$0.80 \pm 0.10$	$0.20 \pm 0.10$	$0.30 + 0.20^{0.10}$	$0.50 \pm 0.10$
0805, P	$2.00 \pm 0.15$	$1.25 \pm 0.15$	$0.40 \pm 0.25$	$0.30 + 0.20^{0.10}$	$0.50 \pm 0.15$
1206, P	$3.20 \pm 0.15$	$1.60 \pm 0.15$	$0.45 \pm 0.25$	$0.40 + 0.20^{0.10}$	$0.60 \pm 0.15$
1210	$3.20 \pm 0.15$	$2.60 \pm 0.15$	$0.50 \pm 0.30$	$0.40 + 0.20^{0.10}$	$0.60 \pm 0.10$
1217	$3.00 \pm 0.20$	$4.20 \pm 0.20$	$0.80 \pm 0.30$	$0.80 \pm 0.25$	0.9 max
2010	$5.00 \pm 0.15$	$2.60 \pm 0.15$	$0.50 \pm 0.30$	$0.40 + 0.20^{0.10}$	$0.70 \pm 0.10$
2020	$5.08 \pm 0.20$	$5.08 \pm 0.20$	$0.80 \pm 0.30$	$0.80 \pm 0.30$	0.9 max
2045	$5.00 \pm 0.15$	$11.5 \pm 0.30$	$0.80 \pm 0.30$	$0.80 \pm 0.30$	0.9 max
2512	$6.30 \pm 0.15$	$3.10 \pm 0.15$	$0.60 \pm 0.25$	$0.50 \pm 0.25$	$0.60 \pm 0.10$

## CONSTRUCTION MATERIALS

Item	Part	Material
①	Resistor	Nichrome Thin Film
②	Protective Film	Polymide Epoxy Resin
③	Electrode	
③a	Grounding Layer	Nichrome Thin Film
③b	Electrode Layer	Copper Thin Film
③c	Barrier Layer	Nickel Plating
③d	Solder Layer	Solder Plating (Sn)
④	Substrate	Alumina
⑤ & ⑥	Marking	Epoxy Resin
⑥	The resistance value is on the front side The production month is on the backside	

## CONSTRUCTION FIGURE (Wraparound)



The content of this specification may change without notification 05/15/2015

## ELECTRICAL CHARACTERISTICS

Size	Power Rating at 70° (W)	Resistance Range	±% Tolerance	TCR (10 <sup>-6</sup> /°C)	Working Voltage	Overload Voltage	Operating Temp Range
<b>0201</b>	0.05	22 ~ 75K	0.1, 0.5, 1.0	±25 ±50 ±100	25V	50V	-55°C ~ +125°C
		1K ~ 10K	0.05	±10			
<b>0402</b>	0.063	10.0 ~ 46.4	0.1, 0.5, 1	±10, ±25, ±50	50V	100V	-55°C ~ +125°C
		47.0 ~ 97.6	0.05, 0.1, 0.25, 0.5, 1	±10, ±25, ±50			
		100 ~ 2.94K	0.02, 0.05, 0.1, 0.25, 0.5, 1	±5, ±10, ±25, ±50			
		3.00K ~ 100K	0.05, 0.1, 0.25, 0.5, 1	±10, ±25, ±50			
<b>0603</b>	0.063 0.100	10.0 ~ 100K	0.01, 0.02, 0.05, 0.1, 0.25, 0.5, 1	1,2,3,5,10,25,50	75V	150V	-55°C ~ +125°C
		102K ~ 270K	0.05, 0.1, 0.25, 0.5, 1	10, 25, 50			-55°C ~ +125°C
		274K ~ 360K	0.1, 0.25, 0.5, 1	10, 25, 50			-55°C ~ +125°C
<b>0603P</b>	0.125	1.0 - 9.1	0.5, 1	±50, ±100	75V	150V	-55°C ~ +125°C
		10 - 390K	0.1, 1.0	±10, ±25, ±50, ±100			
<b>0805</b>	0.100	10.0 ~ 200K	0.01, 0.02, 0.05, 0.1, 0.25, 0.5, 1	1, 2, 3, 5, 10, 25, 50	100V	200V	-55°C ~ +125°C
		205K ~ 360K	0.05, 0.1, 0.25, 0.5	10, 25, 50			
		365K ~ 487K	0.05, 0.1, 0.25, 0.5	10, 25			
		499K ~ 1.00M	0.1, 0.5	25			
<b>0805P</b>	0.250	1.0 - 9.1	0.5, 1	±50, ±100	150V	300V	-55°C ~ +125°C
		10 - 800K	0.1, 1.0	±10, ±25, ±50, ±100			
<b>1206</b>	0.125	5.01 ~ 560K	0.01, 0.02, 0.05, 0.1, 0.25, 0.5, 1	1, 2, 3, 5, 10, 25, 50	150V	300V	-55°C ~ +125°C
		562K ~ 1.00M	0.05, 0.1, 0.25, 0.5	10, 25			
<b>1206P</b>	0.500	1.0 - 9.1	0.5, 1	±50, ±100	150V	300V	-55°C ~ +125°C
		10 ~ 1.00M	0.1, 1.0	±10, ±25, ±50, ±100			
<b>1210</b>	0.250	100 ~ 330K	0.1	±5, ±10	200V	400V	-55°C ~ +125°C
		51.0 ~ 2.00M	0.1, 0.5	±25			
		10.0 ~ 49.9	0.5	±50			
<b>1217</b>	0.250	5.10 ~ 1.00M	0.01, 0.02, 0.05, 0.1, 0.25, 0.5, 1	±1, 2, 3, 5, 10, 25	200V	400V	-55°C ~ +155°C
<b>2010</b>	0.250	100 ~ 20.0K	0.01, 0.05, 0.1, 0.25, 0.5	±5	150V	300V	-55°C ~ +125°C
		50.0 ~ 40.0K	0.01, 0.05, 0.1, 0.25, 0.5	±10			
		10.0 ~ 500K	0.01, 0.05	±25			
		4.70 - 1.00M	0.1, 0.25, 0.5, 1	±50			
		10.0 ~ 500K	0.01, 0.05	±50			
		1.00 ~ 1.00M	0.1, 0.25, 0.5, 1	±50			
<b>2020</b>	0.500	5.10 ~ 2.00M	0.01, 0.02, 0.05, 0.1, 0.25, 0.5, 1	±1, 2, 3, 5, 10, 25	350V	700V	-55°C ~ +155°C
<b>2045</b>	1.000	20.0 ~ 4.99M	0.01, 0.02, 0.05, 0.1, 0.25, 0.5, 1	±1, 2, 3, 5, 10, 25	500V	1000V	-55°C ~ +155°C
<b>2512</b>	0.500	100 ~ 20.0K	0.01, 0.05, 0.1, 0.25, 0.5	±5	150V	300V	-55°C ~ +125°C
		50.0 ~ 40.0K	0.01, 0.05, 0.1, 0.25, 0.5	±10			
		10.0R ~ 500K	0.01, 0.05	±25			
		4.70 - 1.00M	0.1, 0.25, 0.5, 1	±50			
		10.0R ~ 500K	0.01, 0.05	±50			
		1.00 1.00M	0.1, 0.25, 0.5, 1	±50			

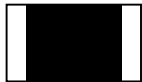
\* Rated Voltage:  $\sqrt{P \times R}$

## PERFORMANCE & ENVIRONMENTAL SPECIFICATIONS

Test Item	Maximum $\Delta \Omega$ +0.05 $\Omega$ (Tolerance)			Condition
	A	B, C	D, F	
Short Time Overload	$\pm 0.1\%$	$\pm 0.1\%$	$\pm 0.5\%$	2.5 times of the rated voltage shall be applied for 5 seconds
Load Life	$\pm 0.1\%$	$\pm 0.25\%$	$\pm 0.5\%$	The resistor shall be subjected to rated voltage for 90 min. followed by a pause of 30 min. at a temperature of $70 \pm 3^\circ\text{C}$ . This constitutes 1 cycle. Cycles shall be repeated for 1000 hours.
Moisture Load Life	$\pm 0.1\%$	$\pm 0.25\%$	$\pm 0.5\%$	The resistor subjected to rated voltage for 90 min followed by a pause for 30 min at a temperature of $60 \pm 2^\circ\text{C}$ with relative humidity of 90% to 95%. This constitutes 1 cycle. Cycles shall be repeated for 1000 hours.
Temperature Cycle	$\pm 0.1\%$	$\pm 0.1\%$	$\pm 0.5\%$	$[-55^\circ\text{C} \text{ 30 min} \rightarrow +125^\circ\text{C} \text{ 30 min} \rightarrow \text{R.T. 3 min}]$ The resistor shall be subjected to 5 continuous cycles
Resistance to Solder Heat	$\pm 0.05\%$	$\pm 0.1\%$	$\pm 0.5\%$	The resistor shall withstand dipped into solder for $10 \pm 1$ sec. At $260 \pm 5^\circ\text{C}$
Terminal Strength	$\pm 0.1\%$	$\pm 0.1\%$	$\pm 0.5\%$	Distance between fulcrums: 90mm; Bending width: 3 mm
Solderability	A new uniform coating of solder shall cover minimum of 95% of surface being immersed			The resistor shall be dipped into the solder of $235 \pm 5^\circ\text{C}$ for $3 \pm 0.5$ seconds
Insulation Resistance	DC 500V for 1 minute			1000 Meg $\Omega$ or over

## VALUE MARKING

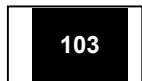
For those parts ordered with an E-24 value, the product will be marked with a 3 digit code. For those products ordered with an E-96 value, the product will be marked with a 4 digit code. For those parts which fall under E-96 and E-24 values (e.g. 1K ohm is both an E-96 and E-24 value), the part will be marked with a 3 digit code; 4 digit markings for this type is available upon special request.



0201, and 0402 Size  
No marking  
E-24 & E-96 Values  
Custom Value Any Size



0603 Size  
EIA 96 Digit Code of 3.32K ohm  
E-96 Values



0603 ~ 2512 Sizes  
EIA 3 Digit Code of 10K ohm resistor  
E-24 Values, E-96 Values



0805 ~ 2512 Sizes  
EIA 4 Digit Code of 121K ohm resistor  
E-96 Values

## LABEL DESCRIPTION

One side surface of a reel is marked with a label with the following items of information.

1. Chip Resistor
2. Part Number
3. Tolerance
4. Quantity
5. Lot number for production month/year\*
6. Manufacturer's name or symbol

\* The suffix "L" indicates that this item is lead free. As of September 2004, all new production items of the series CR and CJ are no longer containing tin/lead (SnPb) terminals; they are lead free and in compliance with Lead Free/RoHS.

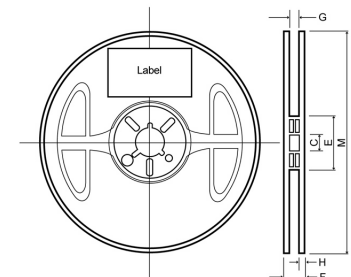
## PACKAGE QUANTITY

Type	0201	0402	0603	0805	1206
M	5,000	10,000	5,000	5,000	5,000
O	1,000	1,000	1,000	1,000	1,000

Type	1210	1217	2010	2020	2045	2512
B	5,000	2,000	4,000	2,000	3,000	4,000
O	1,000	1,000	1,000	1,000	1,000	1,000

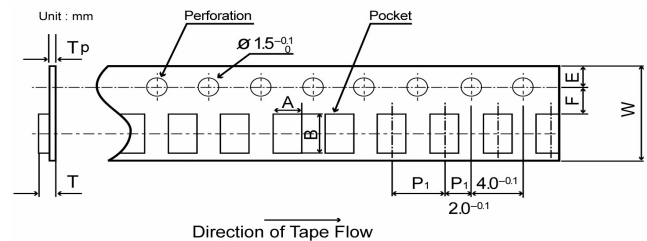
## REEL SCHEMATIC & DIMENSIONS (mm)

	O & M Type	M Type
	7" Reel	13" Reel
C	$\varnothing 13 \pm 0.2$	$\varnothing 13 \pm 0.2$
E	$60 \pm 0.5$	$100 \pm 0.2$
F	$11.4 \pm 1.0$	$13.5 \pm 1.0$
G	$9.0 \pm 0.3$	$9.5 \pm 0.5$
H	$1.5 \pm 0.3$	$2.0 \pm 0.5$
M	$\varnothing 180 \pm 2.0$	$\varnothing 330 \pm 2.0$



Reel size is dependent upon the package quantity & resistor size. Call for more info.

## TAPE SCHEMATIC



## TAPE DIMENSIONS (mm)

	0201	0402	0603	0805	1206
A	$0.41 \pm 0.1$	$0.65 \pm 0.1$	$1.1 \pm 0.1$	$1.6 \pm 0.15$	$2.0 \pm 0.15$
B	$0.71 \pm 0.1$	$1.15 \pm 0.1$	$1.9 \pm 0.1$	$2.4 \pm 0.2$	$3.6 \pm 0.2$
W	$8.0 \pm 0.2$	$8.0 \pm 0.2$	$8.0 \pm 0.2$	$8.0 \pm 0.2$	$8.0 \pm 0.2$
E	$1.75 \pm 0.10$	$1.75 \pm 0.10$	$1.75 \pm 0.1$	$1.75 \pm 0.1$	$1.75 \pm 0.1$
F	$3.5 \pm 0.05$	$3.5 \pm 0.05$	$3.5 \pm 0.05$	$3.5 \pm 0.05$	$3.5 \pm 0.05$
P <sub>1</sub>	$2.0 \pm 0.05$	$2.0 \pm 0.05$	$4.0 \pm 0.1$	$4.0 \pm 0.1$	$4.0 \pm 0.1$
T	$0.5_{\text{max}}$	$0.55 \pm 0.1$	$0.64 \pm 0.1$	$0.84 \pm 0.1$	$0.84 \pm 0.1$
T <sub>p</sub>	$0.4 \pm 0.05$	$0.40 \pm 0.05$			

	1210	1217	2010	2020	2045	2512
A	$2.9 \pm 0.1$	$3.5 \pm 0.1$	$2.9 \pm 0.1$	$5.5 \pm 0.1$	$5.4 \pm 0.1$	$2.9 \pm 0.1$
B	$3.5 \pm 0.1$	$4.9 \pm 0.1$	$5.3 \pm 0.1$	$5.5 \pm 0.1$	$11.9 \pm 0.1$	$5.3 \pm 0.1$
W	$8.0 \pm 0.2$	$12.0 \pm 0.2$	$12.0 \pm 0.2$	$12.0 \pm 0.2$	$24.0 \pm 0.2$	$12.0 \pm 0.2$
E	$1.75 \pm 0.1$	$1.75 \pm 0.1$	$1.75 \pm 0.1$	$1.75 \pm 0.1$	$1.75 \pm 0.1$	$1.75 \pm 0.1$
F	$3.5 \pm 0.05$	$5.5 \pm 0.1$	$5.5 \pm 0.1$	$5.5 \pm 0.1$	$11.5 \pm 0.1$	$5.5 \pm 0.05$
P <sub>1</sub>	$4.0 \pm 0.1$	$8.0 \pm 0.1$	$4.0 \pm 0.1$	$8.0 \pm 0.1$	$8.0 \pm 0.1$	$4.0 \pm 0.1$
T	$0.90 \pm 0.1$	$0.90 \pm 0.1$	$1.0 \pm 0.1$	$1.0 \pm 0.1$	$1.0 \pm 0.1$	$1.0 \pm 0.1$
T <sub>p</sub>	$0.75 \pm 0.1$		$0.25 \pm 0.1$			$0.25 \pm 0.1$