

## *Data Sheet*

Customer: \_\_\_\_\_

Product: Thin Film Chip Resistor. Precision Tolerance RT Series \_\_\_\_\_

Size : 0201/0402/0603/0805/1206/1210/2512 \_\_\_\_\_

Issued Date: 22-Nov.-2016 \_\_\_\_\_

Edition: Ver. 4 \_\_\_\_\_

### Record of change

Date	Ver.	Description	Page
1-Apr.-2015	1		
10-Nov-2015	2	Adjustment of standard ohmic values range	
2-Sep-2016	3	Add low TCR items	
22-Nov-2016	4	Adjustment of standard ohmic value range and RCWW	

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Prepared by	Checked by	Approved by	Accepted by (customer)
1-Apr.-2015	1-Apr.-2015	1-Apr.-2015	
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# THIN FILM CHIP RESISTORS

# RT SERIES

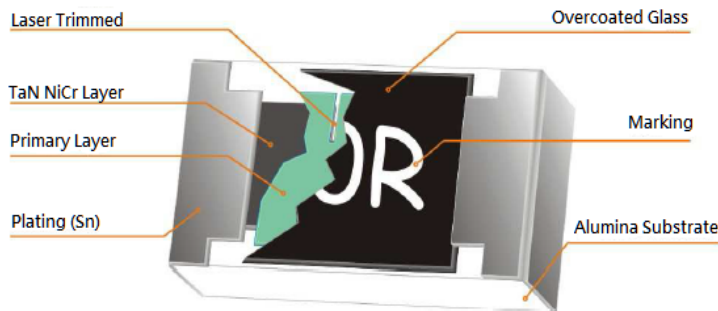
## Feature

- Thin film TaN, NiCr passivated.
- Very tight tolerance down to  $\pm 0.01\%$
- Extremely low TCR down to  $\pm 2\text{ppm}/^\circ\text{C}$
- Low current noise, RoHs compliant and lead free

## Application

- Medical Equipment
- Measurement instrument
- Communication Device
- Computer peripheral

## Construction



## Part Numbering:

RT 0805

B

R

B

H

100R

Size 0201 0402 0603 0805 1206 1210 2010 2512	Tolerance T= $\pm 0.01\%$ A= $\pm 0.05\%$ B= $\pm 0.10\%$ C= $\pm 0.25\%$ D= $\pm 0.50\%$ F= $\pm 1\%$	Packing style R = Paper K = Embossed Plastic	TCR X= $\pm 2\text{ppm}/^\circ\text{C}$ O= $\pm 3\text{ppm}/^\circ\text{C}$ A= $\pm 5\text{ppm}/^\circ\text{C}$ B= $\pm 10\text{ppm}/^\circ\text{C}$ C= $\pm 15\text{ppm}/^\circ\text{C}$ D= $\pm 25\text{ppm}/^\circ\text{C}$ E= $\pm 50\text{ppm}/^\circ\text{C}$	- Standard  H High Power	Resistance Value for example 1R      4R99    10R 100R    499R    1KR 10KR    49K9R 1MR      4M7R
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## Resistance Marking

NO MARKING RT0201 RT0402	Value= 10 K $\Omega$ 1% marking for E-96 RT0805 RT1206 RT1210 RT2010 RT2512	Value= 12.4 K $\Omega$ 1% marking for RT0603 EIA-96 series items	E-24 1% Value=56 K 1% marking for EIA-24 series items

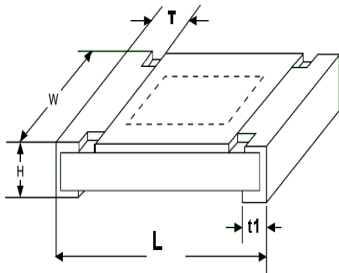
### Marking explanation

- 1% tolerance: 4 digits. First three digits are significant figures, fourth digit is number of zeros,
- Letter R is decimal point.
- RT0603 1% : EIA-96 marking at following page, when values in E-24 series marking as last column of above

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## ■ Dimension (mm)



EIA Size	L	W	H	T	t <sub>1</sub>
0201	0.6±0.10	0.3±0.05	0.25±0.05	0.15±0.10	0.15±0.10
0402	1.0±0.10	0.5±0.05	0.30±0.05	0.20±0.10	0.25±0.10
0603	1.6±0.10	0.8±0.10	0.45±0.10	0.25±0.15	0.25±0.15
0805	2.0±0.10	1.20±0.10	0.50±0.10	0.35±0.20	0.35±0.20
1206	3.1±0.15	1.55±0.15	0.55±0.10	0.45±0.20	0.40±0.20
1210	3.1±0.15	2.60±0.15	0.50±0.10	0.50±0.20	0.50±0.20
2010	5.0±0.15	2.50±0.15	0.55±0.10	0.55±0.20	0.50±0.20
2512	6.4±0.15	3.20±0.15	0.55±0.10	0.60±0.20	0.50±0.20

## ■ Rating:

General High Precision :

Standard Type	Power Rating @ 70°C	Max. RCWV	Max. Overload	TCR (ppm/°C)	Tolerance (%)	Resistance Range		Standard Resistance
						Min.	Max.	
0201	1/32W	15V	30V	±25	±0.01%	100Ω	12KΩ	E24
0402	1/16W	50V	100V			4.7Ω	240KΩ	
0603	1/10W	75V	150V	±50	±0.05%	4.7Ω	1MΩ	E96
0805	1/8W	150V	300V			4.7Ω	1.5MΩ	
1206	1/4W	200V	400V	±50	±0.25%	4.7Ω	1.5MΩ	E96
1210	1/4W	200V	400V			4.7Ω	1MΩ	
2010	1/2W	200V	400V	±50	±0.50%	4.7Ω	1MΩ	E96
2512	3/4W	200V	400V			4.7Ω	1MΩ	

Power High Precision :

Power Type	Power Rating @ 70°C	Max. RCWV	Max. Overload	TCR (ppm/°C)	Tolerance (%)	Resistance Range		Standard Resistance
						Min.	Max.	
0201	1/20W	15V	30V	±25	±0.01%	27Ω	22KΩ	E24
0402	1/10W	50V	100V			10Ω	100KΩ	
1210	1/3W	200V	400V	±50	±0.1%	10Ω	1MΩ	E96
2010	3/4W	200V	400V			10Ω	1.5MΩ	
2512	1W	200V	400V	±50	±0.25%	10Ω	1.5MΩ	E96
						10Ω	1.5MΩ	

Special TCR High Precision :

Narrow TCR Type	Power Rating @ 70°C	Max. RCWV	Max. Overload	TCR (ppm/°C)	Tolerance (%)	Resistance Range		Standard Resistance values
						Min.	Max.	
0402	1/16W	25V	50V	±2	±0.05%	10Ω	8KΩ	E24
0603	1/10W	50V	100V			4.7Ω	40KΩ	
0805	1/8W	100V	200V	±2	±0.1%	4.7Ω	80KΩ	E96
1206	1/8W	150V	300V			4.7Ω	120KΩ	
1210	1/4W	200V	400V	±2	±0.25%	4.7Ω	150KΩ	E96
2010	1/2W	200V	400V			4.7Ω	360KΩ	
2512	3/4W	200V	400V	±2	±0.50%	4.7Ω	600KΩ	E96
						4.7Ω	600KΩ	

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Special TCR High Precision :

Narrow TCR Type	Power Rating @ 70°C	Max. RCWV	Max. Overload	TCR (ppm/°C)	Tolerance (%)	Resistance Range		Standard Resistance values
						Min.	Max.	
0402	1/16W	25V	50V	±2	±0.05%	10Ω	8KΩ	E24
0603	1/10W	50V	100V		±0.1%	4.7Ω	40KΩ	
0805	1/8W	100V	200V	±3	±0.25%	4.7Ω	80KΩ	E96
1206	1/8W	150V	300V		±0.50%	4.7Ω	120KΩ	
1210	1/4W	200V	400V		±1.0%	4.7Ω	150KΩ	
2010	1/2W	200V	400V		4.7Ω	360KΩ		
2512	3/4W	200V	400V			4.7Ω	600KΩ	

Special TCR High Precision :

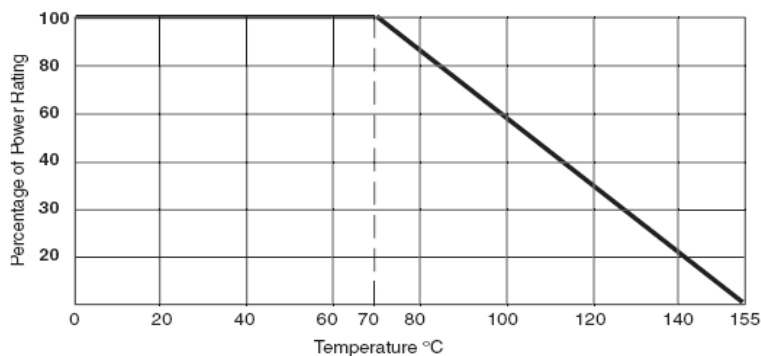
Narrow TCR Type	Power Rating @ 70°C	Max. RCWV	Max. Overload	TCR (ppm/°C)	Tolerance (%)	Resistance Range		Standard Resistance values	
						Min.	Max.		
0402	1/16W	25V	50V	±5	±0.01%	10Ω	10KΩ	E24	
0603	1/10W	50V	100V		±0.05%	4.7Ω	50KΩ		
0805	1/8W	100V	200V		±0.1%	4.7Ω	100KΩ	E96	
1206	1/8W	150V	300V		±0.25%	4.7Ω	150KΩ		
1210	1/4W	200V	400V		±0.50%	4.7Ω	150KΩ		
2010	1/2W	200V	400V		±1.0%	4.7Ω	360KΩ		
2512	3/4W	200V	400V				4.7Ω	600KΩ	

Special TCR High Precision :

Narrow TCR Type	Power Rating @ 70°C	Max. RCWV	Max. Overload	TCR (ppm/°C)	Tolerance (%)	Resistance Range		Standard Resistance values
						Min.	Max.	
0402	1/16W	25V	50V	±10	±0.01%	10Ω	20KΩ	E24
0603	1/10W	50V	100V		±0.05%	4.7Ω	100KΩ	
0805	1/8W	100V	200V	±15	±0.1%	4.7Ω	200KΩ	E96
1206	1/8W	150V	300V		±0.25%	4.7Ω	300KΩ	
1210	1/4W	200V	400V		±0.50%	4.7Ω	400KΩ	
2010	1/2W	200V	400V		±1.0%	4.7Ω	900KΩ	
2512	3/4W	200V	400V			4.7Ω	1.5MΩ	

## Derating Curve

For resistors operated in ambient temperatures above 70°C, power rating just be derated in accordance with curve below.



## 0603 1% Marking Table

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

This table shows the first two digits for the 3 digits EIA-96 part marking scheme.

The 3<sup>rd</sup> character is a letter multiplier : Y=10<sup>-2</sup>, X=10<sup>-1</sup>, A=10<sup>0</sup>, B=10<sup>1</sup>, C=10<sup>2</sup>, D=10<sup>3</sup>, E=10<sup>4</sup>, F=10<sup>5</sup>

EX: 49.9Ω=68X, 499Ω=68A, 4K99=68B, 49K9=68C, 499K=68D, 4M99=68E

Note:

1. This is the maximum voltage that may be continuously applied to the resistor element, refer to IEC 60115-8
2. Maximum operating voltage is so called RCWV(Rated Continuous Working Voltage) is determined by  

$$RCWV = \sqrt{PxR}$$
or max RCWV listed above, whichever is lower.
3. Customized specification might be available. Please make contact with our sales.

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## ■ Specification & Test Method

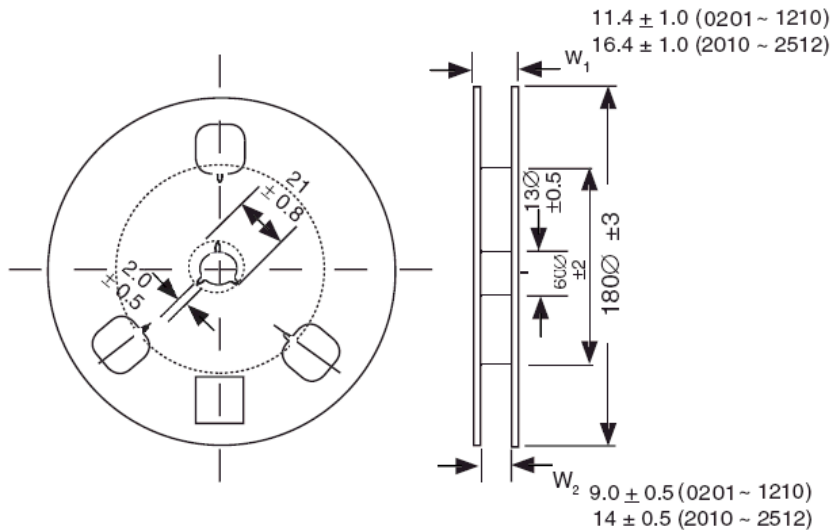
Characteristics	Specification	Test Method
Short time overload	$\Delta R(0.25\% + 0.05 \Omega)$ Max.	MIL-R-55342D- para 4.7.5 Rated voltage $\times$ 2.5 times for 5 seconds at room temperature
Insulation resistance	Between termination and coating must be over 1000M $\Omega$	MIL-STD-202F-302 Test voltage : 100V for 1 minute
Bending strength	$\Delta R(0.2\% + 0.05 \Omega)$ Max. No mechanical damage	JIS C5202 6.14 Bending 3mm for 10 seconds
Moisture resistance	$\Delta R(0.25\% + 0.05 \Omega)$ Max.	MIL-STD-202G-106F Each temp./humidity cycle is defined at 8 hrs, 3 cycles/24hrs for 10d with 25 $^{\circ}$ C/65 $^{\circ}$ C 95% R.H.
Load life	$\Delta R(0.25\% + 0.05 \Omega)$ Max.	MIL-STD-202G-108A At 70 $^{\circ}$ C rated voltage with The cycle of 1.5hrs ON and 0.5hrs OFF for 1000hrs
Resistance to Soldering heat	$\Delta R(0.25\% + 0.05 \Omega)$ Max.	MIL-STD-202G-108A Pb free solder, 270 $^{\circ}$ C for 10 seconds immersion
Solderability	Well tinned $\geq 95\%$ covered No mechanical damage	IPC/JEDECJ-STD-002B Electrical test not required. Magnification 50X, Pb-free solder After immersing flux, dip in 245 $\pm$ 3 $^{\circ}$ C solder bath for 3 $\pm$ 0.5 sec.
Thermal Shock	$\Delta R(0.25\% + 0.05 \Omega)$ Max.	MIL-STD-202G-107G -55 $^{\circ}$ C $\sim$ 150 $^{\circ}$ C, 100 cycles Max transfer time 20 seconds

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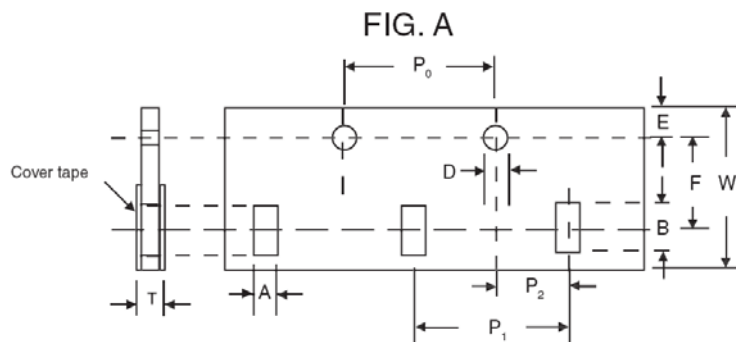
# RT SERIES

## ■ Packaging

### REEL DIMENSION (mm)



### PAPER TAPE DIMENSIONS (mm)

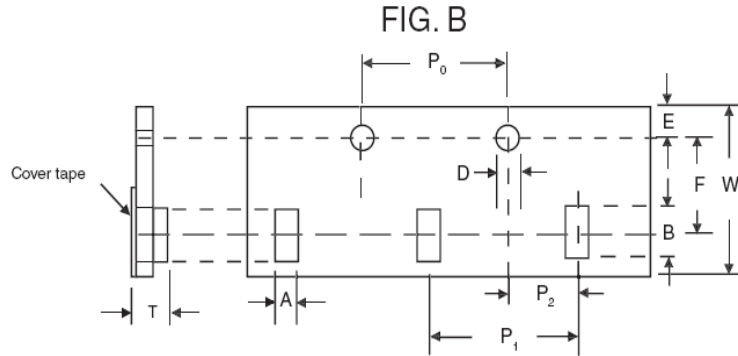


Size	A	B	D	E	F	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	W	T
0201	0.45±0.1	0.75±0.1	1.5+0.1/- 0	1.75±0.1	3.50±0.05	4.0±0.1	2.0±0.05	2±0.0 5	8±0.1	0.35±0.1
0402	0.65±0.1	1.15±0.1								0.53±0.1
0603	1.10±0.1	1.90±0.1					0.70±0.1			
0805	1.65±0.1	2.40±0.1					0.85±0.1			
1206	1.90±0.1	3.50±0.1								
1210	2.80±0.1	3.50±0.1								

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## EMBOSSED TAPE DIMENSIONS (mm)



Size	A	B	D	E	F	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	W	T
2010	2.80±0.2	5.40±0.2	1.5+0.1/-	1.75±0.1	5.50±0.05	4.0±0.1	4.0±0.1	2±0.05	12.±0.3	1.0±0.1
2512	3.50±0.2	6.7±0.2	0							

### ■ Packing Q'TY

Size	Reel	7 inches Reel
0201		10,000
0402		10,000
0603		5,000
0805		5,000
1206		5,000
1210		5,000
*2010		4,000
*2512		4,000

\* Embossed Tape

### ■ Soldering Temperature Curve

