

# Automotive Grade Thick Film Chip Resistors

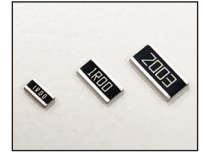
NRC-RA Series

## FEATURES

- EIA STANDARD SIZING 0612 (3/4W), 1020 (1W), 1225 (2W)
- HIGH POWER AUTOMOTIVE GRADE AEC Q-200 QUALIFIED
- BOTH FLOW SOLDER AND REFLOW SOLDERING ARE APPLICABLE

*Reverse Geometry Long Side Terminations*

*Automotive Grade Resistors*



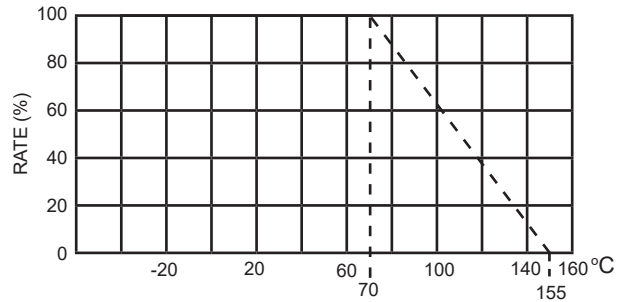
Type	EIA Size	Power Rating at 70°C	Max.*1 Working Voltage	Max.*2 Overload Voltage	Resistance Tolerance (Code)	Temperature Coefficient (ppm/°C)	Resistance Range (Ω)	Resistance Value	Temperature Range
NRC-RA0612	0612	3/4W	200V	400V	±1% (F)	±100	1.0 ~ 1M	E-24 & E-96	-55°C~+155°C
					±2% (G), ±5% (J)	±200	1.0 ~ 1M	E-24	
NRC-RA1020	1020	1W	200V	400V	±1% (F)	±100	10 ~ 1M	E-24 & E-96	
					±2% (G), ±5% (J)	±200	1.0 ~ 9.76	E-24 & E-96	
NRC-RA1225	1225	2W	200V	400V	±1% (F)	±100	1.0 ~ 1M	E-24 & E-96	
					±2% (G), ±5% (J)	±200	1.0 ~ 1M	E-24	

Note \*1 - Maximum allowable continuous Working Voltage for all resistors is the lower of the two values: "Maximum Working Voltage" as specified above (or)

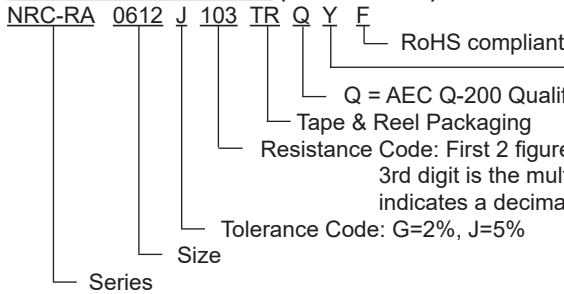
$$\sqrt{\text{Power rating (Watts) x Resistance (Ohms)}}$$

Note \*2 - Maximum allowable Overload voltage is two times the Maximum Working Voltage (see Note \*1 above).

**Power Derating Curve:** For operation above 70°C, power rating must be derated according to the following chart:

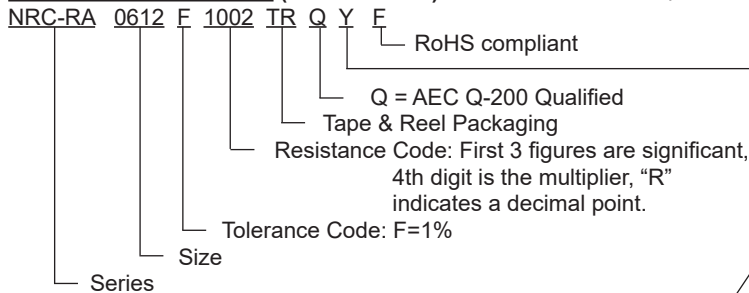


### PART NUMBER SYSTEM (E-24 VALUES)



Examples of Resistance Code: 4R7 = 4.7 ohms 103 = 10K ohms  
 100 = 10 ohms 104 = 100K ohms  
 101 = 100 ohms 105 = 1 meg ohms  
 102 = 1K ohms 106 = 10meg ohms

### PART NUMBER SYSTEM (E-96 VALUES)

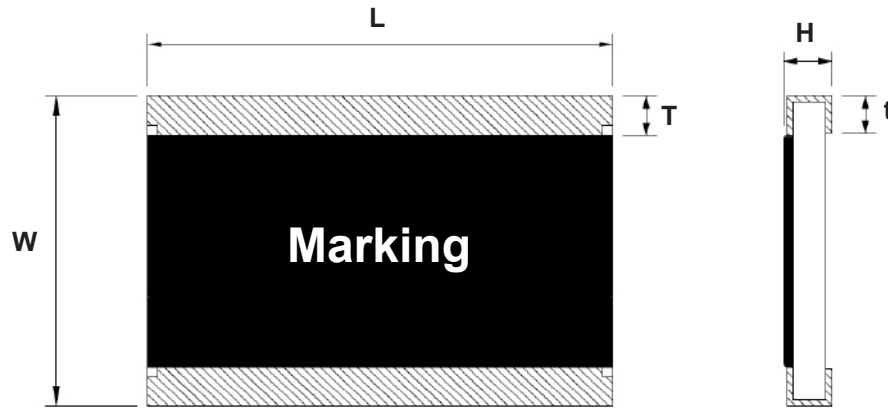


Examples of Resistance Code: 10R0 = 10 ohms 1004 = 1meg ohms  
 47R5 = 47.5 ohms 1050 = 105 ohms  
 1000 = 100 ohms 1501 = 1.5K ohms  
 1001 = 1K ohms 1052 = 10.5K ohms  
 1002 = 10K ohms 1153 = 115K ohms  
 1003 = 100K ohms 1214 = 1.21meg ohms

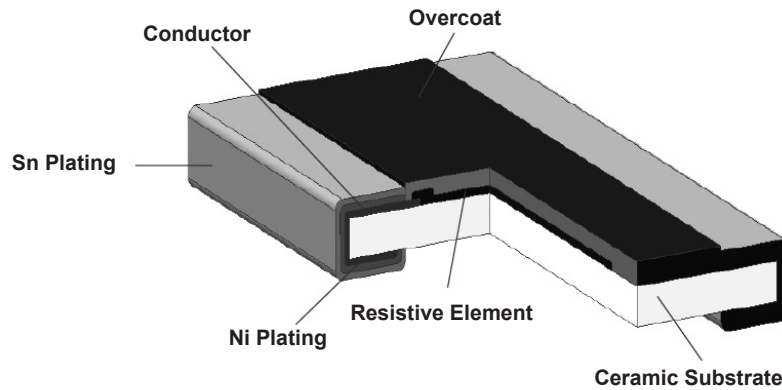


## COMPONENT DIMENSIONS (mm)

Type	Power Rating	EIA Size	L	W	H	T	t
NRC-RA0612	0.75W	0612	3.20 ± 0.20	1.60 ± 0.20	0.55 ± 0.10	0.25 ± 0.15	0.35 ± 0.15
NRC-RA1020	1W	1020	5.00 ± 0.20	2.50 ± 0.20	0.55 ± 0.10	0.25 ± 0.15	0.40 ± 0.15
NRC-RA1225	2W	1225	6.30 ± 0.20	3.20 ± 0.20	0.70 ± 0.10	0.40 ± 0.20	0.80 ± 0.20

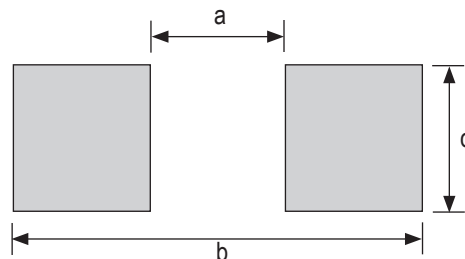


## CONSTRUCTION



## LAND PATTERN DIMENSIONS (mm)

Type	EIA Size	a	b	c
NRC-RA0612	0612	0.6 ~ 0.8	2.0 ~ 2.6	3.4 ~ 4.0
NRC-RA1020	1020	1.0 ~ 1.3	3.5 ~ 4.0	5.5 ~ 6.0
NRC-RA1225	1225	1.0 ~ 1.2	4.4 ~ 5.0	6.4 ~ 7.0



## ENVIRONMENTAL CHARACTERISTICS

Item	Specification	Test Method
	All Values	
Temperature Coefficient of Resistance	As specified -55°C~+125°C	IEC60115-1-4.8 JIS-C5201-1-4.8
Load Life	1%: $\Delta R \pm(1.0\%+0.05\Omega)$ 2% & 5%: $\Delta R \pm(2.0\%+0.1\Omega)$	1000 hrs at rated power and +70°C 1.5 hours "ON", 0.5 hours "OFF" IEC60115-1-4.25.1, JIS-C5201-1-4.25.1
Bias Humidity	1%: $\Delta R \pm(1.0\%+0.05\Omega)$ 2% & 5%: $\Delta R \pm(2.0\%+0.1\Omega)$	+85°C $\pm$ 2/85% $\pm$ 5 RH, $V = 0.1 \times \sqrt{P_{70} \times R} < 100V$ for 1,000 hrs IEC60115-1-4.24, JIS-C5201-1-4.24
Short Time Overload	$\Delta R \pm(2\% + 0.05\Omega)$	2.5 X rated voltage for 5 sec IEC60115-1-4.13, JIS-C5201-1-4.13
Intermittent Overload	$\Delta R \pm(5.0\% + 0.1\Omega)$	2.5X rated voltage or Max Overload Voltage 1 sec "ON" , 25sec "OFF" , 10000 cycles IEC60115-1-4.39, JIS-C5201-1-4.39
Resistance to Dry Heat	1%: $\Delta R \pm(1.0\%+0.05\Omega)$ 2% & 5%: $\Delta R \pm(2.0\%+0.1\Omega)$	155 $\pm$ 5°C for 1000 hrs IEC60115-1-4.23.2, JIS-C5201-1-4.23.2
Rapid Change of Temperature	$\Delta R \pm(1.0\%+0.05\Omega)$	-55°C (30 min.) /+125°C (30 min.), 1000 cycles IEC60115-1-4.19, JIS-C5201-1-4.19
Solderability	At least 95% of surface area of electrode shall be covered with new solder.	245 $\pm$ 5°C solder, 2°C $\pm$ 0.5 sec dwell. Solder: Sn96.5 / Ag3.0 / Cu0.5 IEC60115-1-4.17, JIS-C5201-1-4.17
Dielectric Withstanding Voltage	No abnormalities such as flashover, burning dielectric breakdown shall appear.	Applying voltage: 500V for a minute IEC60115-1-4.7, JIS-C5201-1-4.7
Bending Strength	$\Delta R \pm(0.5\%+0.05\Omega)$	2mm Deflection IEC60115-1-4.33, JIS-C5201-1-4.33
Insulation Resistance	$\geq 1G\Omega$	Applying 100V for 1 minute. IEC60115-1-4.6, JIS-C5201-1-4.6
Vibration	$\Delta R \pm(1\% + 0.1\Omega)$	5 g's for 20 min., 12 cycles each of 3 orientations. Note: Test from 10-2000 Hz. AEC-Q200-REV C-Test 14, MIL-STD-202 Method 204
ESD	$\Delta R \pm(1\% + 0.1\Omega)$	Verify the voltage setting at 500V AEC-Q200-REV, C-Test 17
Resistance to Soldering Heat	$\Delta R \pm(0.5\% +0.05\Omega)$	260 $\pm$ 5°C solder, 10 $\pm$ 1 sec dwell IEC60115-1-4.18, JIS-C5201-1-4.18



### Reflow Soldering Heat Profile and Limits

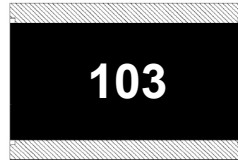
→ [www.nicomp.com/resource/files/resistive/NIC-ChipR-Reflow-Sept2020-Rev2.pdf](http://www.nicomp.com/resource/files/resistive/NIC-ChipR-Reflow-Sept2020-Rev2.pdf)  
Wave soldering? – Please review your wave soldering process profile with NIC: [tpmg@nicomp.com](mailto:tpmg@nicomp.com)

### Marking

1. For **E-24** Series  $\pm 2\%$  = G and  $\pm 5\%$  = J Tolerance:

3 DIGIT SYSTEM - First two digits are significant and third digit is multiplier, "R" indicates decimal on values under 10 ohms.

Examples: 1R0 = 1.0 ohms    102 = 1K ohms    470 = 47 ohms  
 103 = 10k ohms    101 = 100 ohms    104 = 100K ohms    105 = 1 Megohms



2. For **E-96** Series  $\pm 1\%$  = F Tolerance:

4 DIGIT SYSTEM - First 3 digits are significant and fourth digit is multiplier, "R" indicates decimal on values under 100 ohms.

Examples: 1R00 = 1.0 ohms    10R0 = 10 ohms    1003 = 100 Kohms  
 1000 = 100 ohms    1004 = 1 Megohms    1001 = 1K ohms  
 1052 = 10.5K ohms    1002 = 10K ohms    2213 = 221K ohms



### STANDARD E-24 AND E-96 VALUES

E-24	E-96				
Value	Value	Value	Value	Value	Value
100	100	102	105	107	
110	110	113	115	118	
120	121	124	127	130	
130	133	137	140	143	
150	147	150	154	158	
160	162	165	169	174	
180	178	182	187	191	
200	196	200	205	210	
220	215	221	226	232	
240	237	243	249	255	
270	261	267	274	280	
300	287	294	301	309	
330	316	324	332	340	
360	348	357	365	374	
390	383	392	402	412	
430	422	432	442	453	
470	464	475	487	499	
510	511	523	536	549	
560	562	576	590	604	
620	619	634	649	665	
680	681	698	715	732	
750	750	768	787	806	
820	825	845	866	887	
910	909	931	953	976	

### MULTIPLIER CODE

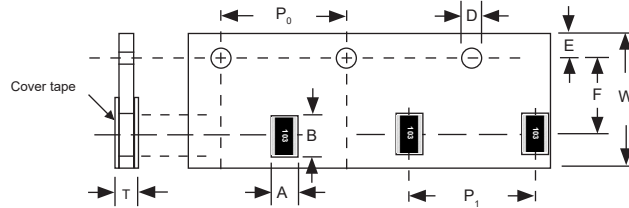
Code	A	B,b	C	D,d	E	F	G	H	X	Y	Z
Multiplier	10 <sup>0</sup>	10 <sup>1</sup>	10 <sup>2</sup>	10 <sup>3</sup>	10 <sup>4</sup>	10 <sup>5</sup>	10 <sup>6</sup>	10 <sup>7</sup>	10 <sup>-1</sup>	10 <sup>-2</sup>	10 <sup>-3</sup>

## TAPING CARRIER MATERIAL

Type	Power Rating	EIA Size	Carrier Tape	
			Material	Width (mm)
NRC-RA0612	0.75W	0612	Paper	8
NRC-RA1020	1W	1020	Plastic	8
NRC-RA1225	2W	1225	Plastic	8

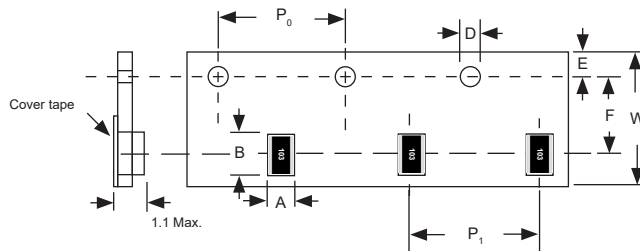
## PAPER CARRIER DIMENSIONS (mm)

Type	A	B	D	E	F	P <sub>0</sub>	P <sub>1</sub>	T	W
NRC-RA0612	2.0 ± 0.15	3.6 ± 0.20	1.5 +0.1/-0	1.75 ± 0.1	3.5 ± 0.05	4.0 ± 0.1	2.0 ± 0.05	0.84 ± 0.1	8.0 ± 0.2

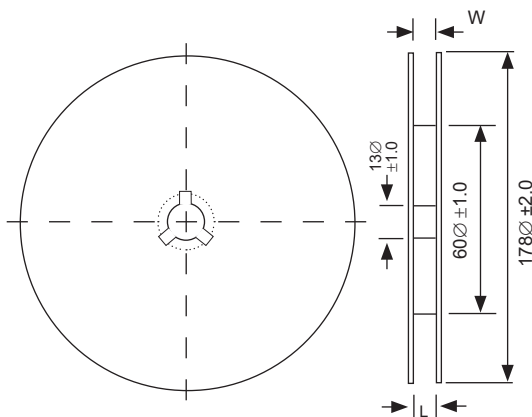


## EMBOSSED PLASTIC CARRIER DIMENSIONS

Type	A	B	D	E	F	P <sub>0</sub>	P <sub>1</sub>	T	W
NRC-RA1020	2.80 ± 0.20	5.30 ± 0.20	1.5 +0.1/-0	1.75 ± 0.1	5.50 ± 0.05	4.0 ± 0.05	4.0 ± 0.1	0.85 ± 0.15	12.0 ± 0.2
NRC-RA1225	3.60 ± 0.20	6.90 ± 0.20							



## REEL DIMENSIONS AND QUANTITIES



Type	W	L	Quantity
			7" reel
NRC-RA0612	9.0 ± 1.0	11.5 ± 1.0	5,000
NRC-RA1020	13.0 ± 1.0	15.5 ± 1.0	4,000
NRC-RA1225			4,000