

FEATURES

- LEAD (Pb)-FREE CONSTRUCTION
- COMPLIES WITH RoHS DIRECTIVE 2002/95/EC WITHOUT EXEMPTIONS
- EIA STANDARD SIZING 0201 (1/20W), 0402 (1/16W), 0603 (1/10W), 0805 (1/8W), 1206 (1/4W) AND 1210 (1/3W)
- THICK FILM CONSTRUCTION USING HIGH PURITY ALUMINA SUBSTRATE WITH PB-FREE RESISTIVE PASTE COVERED WITH PROTECTIVE OVERCOAT
- HIGH TEMPERATURE (+260°C) REFLOW SOLDERING COMPATIBLE
- AVAILABLE IN ZERO OHM (JUMPER)

*RoHS Compliant
Pb Free
($<100\text{ppm}$)*



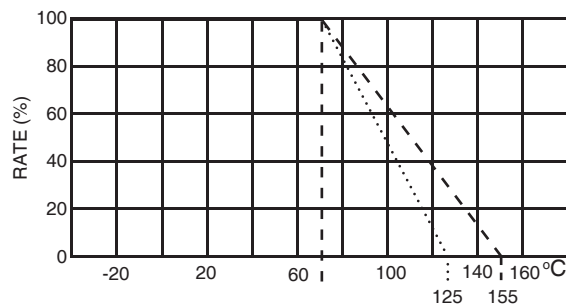
Type	EIA Size	Power Rating at 70°C	Max.*1 Working Voltage	Max.*2 Overload Voltage	Resistance Tolerance (Code)	Temperature Coefficient (ppm/°C)	Resistance Range (Ω)	Resistance Value	Operating Temperature Range (°C)
NRCL02	0201	1/20 (0.05) W	25V	50V	±1% (F)	±200	100 ~ 1M	E-24,E-96	-55 ~ +125
						+800/-100	1.0 ~ 9.76		
						+600/-0	10 ~ 97.6		
					±5% (J)	±200	100 ~ 10M	E-24	
						+800/-100	1.0 ~ 9.1		
						+600/-0	10 ~ 91		
NRCL04	0402	1/16 (0.063) W	50V	100V	±1% (F)	±200	10 ~ 1M	E-24,E-96	-55 ~ +155
						+500/-300	1.0 ~ 9.1		
					±5% (J)	±200	10 ~ 1M	E-24	
						±300	1.1M ~ 10M		
NRCL06	0603	1/10 (0.10) W	50V	100V	±1% (F)	±100	10 ~ 1M	E-24,E-96	
					±5% (J)	+500/-300	1.0 ~ 9.1	E-24	
NRCL10	0805	1/8 (0.125) W	150V	300V	±1% (F)	±100	10 ~ 1M	E-24,E-96	-55 ~ +155
					±5% (J)	+500/-300	1.0 ~ 9.1	E-24	
NRCL12	1206	1/4 (0.25) W	200V	400V	±1% (F)	±100	10 ~ 10M	E-24,E-96	-55 ~ +155
					±5% (J)	+500/-300	1.0 ~ 9.1	E-24	
NRCL25	1210	1/3 (0.33) W	200V	400V	±1% (F)	±100	10 ~ 1M	E-24,E-96	-55 ~ +155
					±5% (J)	+500/-300	1.0 ~ 9.1	E-24	
NRCL02ZO	0201	Zero Ohm Jumper			Rated Current 1.0A (0.05Ω max. DC Resistance)			-55 ~ +125	
NRCL04ZO	0402				Rated Current 1.0A (0.05Ω max. DC Resistance)				
NRCL06ZO	0603				Rated Current 1.0A (0.05Ω max. DC Resistance)				
NRCL10ZO	0805				Rated Current 1.5A (0.05Ω max. DC Resistance)				
NRCL12ZO	1206				Rated Current 2.0A (0.05Ω max. DC Resistance)				
NRCL25ZO	1210				Rated Current 2.5A (0.05Ω max. DC Resistance)				
					Rated Current 2.5A (0.05Ω max. DC Resistance)				

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

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

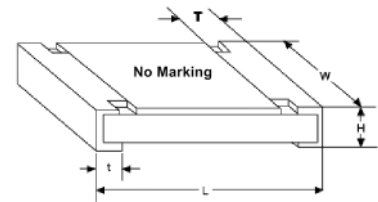
Note *2 - Maximum allowable Overload voltage is 2.5 times the Maximum Working Voltage (see Note *1 above).

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

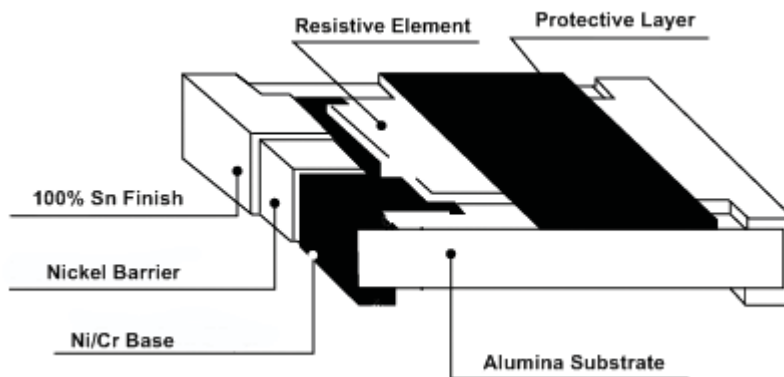


DIMENSIONS (mm)

Type	Power Rating	EIA Size	L	W	H	T	t	
NRCL02	1/20W	0201	0.6 ± 0.03	0.3 ± 0.03	0.23 ± 0.03	0.15 ± 0.05	0.10 ± 0.05	
NRCL04	1/16W	0402	1.0 ± 0.05	0.50 ± 0.05	0.35 ± 0.05	0.25 ± 0.10	0.20 ± 0.10	
NRCL06	1/10W	0603	1.6 ± 0.10	0.8 ± 0.10	0.45 ± 0.15	0.30 ± 0.15	0.30 ± 0.10	
NRCL10	1/8W	0805	2.0 ± 0.10	1.25 ± 0.10	0.50 ± 0.15	0.40 ± 0.20	0.40 ± 0.20	
NRCL12	1/4W	1206	3.1 ± 0.10	1.60 ± 0.10	0.60 ± 0.15	0.45 ± 0.20	0.50 ± 0.20	
NRCL25	1/3W	1210	3.1 ± 0.10	2.60 ± 0.10	0.55 ± 0.10	0.50 ± 0.20	0.50 ± 0.20	
NRCL02ZO	Jumper	0201	Same as NRCL02					
NRCL04ZO	Jumper	0402	Same as NRCL04					
NRCL06ZO	Jumper	0603	Same as NRCL06					
NRCL10ZO	Jumper	0805	Same as NRCL10					
NRCL12ZO	Jumper	1206	Same as NRCL12					
NRCL25ZO	Jumper	1210	Same as NRCL25					



CONSTRUCTION



OVERCOAT COLOR
 0201 - Black
 0402 ~ 1210 - Blue

PART NUMBER SYSTEM (5% tolerance E-24 values)

NRCL 10 J 103 TR 10 F

- NRCL: Series
- 10: Size Code
- J: Tolerance Code: J=5%
- 103: Resistance Code: First 3 figures are significant, 4th digit is the multiplier, "R" indicates a decimal point.
- TR: Tape & Reel Packaging
- 10: Opt. reel quantity for 0201 ~ 1210 case sizes
- F: RoHS compliant

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 (1% tolerance E-24 & E-96 values)

NRCL 10 F 1003 TR 10 F

- NRCL: Series
- 10: Size Code
- F: Tolerance Code: F=1%
- 1003: Resistance Code: First 3 figures are significant, 4th digit is the multiplier, "R" indicates a decimal point.
- TR: Tape & Reel Packaging
- 10: Opt. reel quantity for 0201 ~ 1210 case sizes
- F: RoHS compliant

Examples of Resistance Code: 10R0 = 10 ohms 1004 = 1 meg 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

RESISTANCE VALUE MARKING: Components are NOT marked.



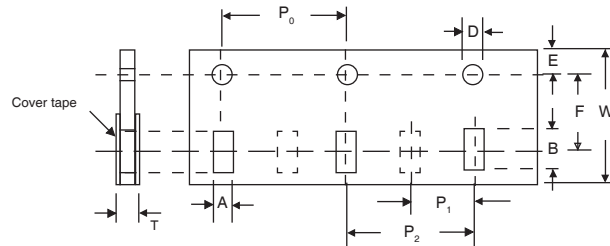
TAPING SPECIFICATIONS REEL QUANTITY

Type	Power Rating	EIA Size	Qty per 7" Reel (Std)	Qty per 10" Reel (Opt)	Qty per 13" Reel (Opt)
NRCL02	1/20W	0201	15,000	n/a	n/a
NRCL04	1/16W	0402	10,000	n/a	n/a
NRCL06	1/10W	0603	5,000	10,000	20,000
NRCL10	1/8W	0805	5,000	10,000	20,000
NRCL12	1/4W	1206	5,000	10,000	20,000
NRCL25	1/3W	1210	5,000	10,000	20,000
NRCL02ZO	Jumper	0201	15,000	n/a	n/a
NRCL04ZO	Jumper	0402	10,000	n/a	n/a
NRCL06ZO	Jumper	0603	5,000	10,000	20,000
NRCL10ZO	Jumper	0805	5,000	10,000	20,000
NRCL12ZO	Jumper	1206	5,000	10,000	20,000
NRCL25ZO	Jumper	1210	5,000	10,000	20,000

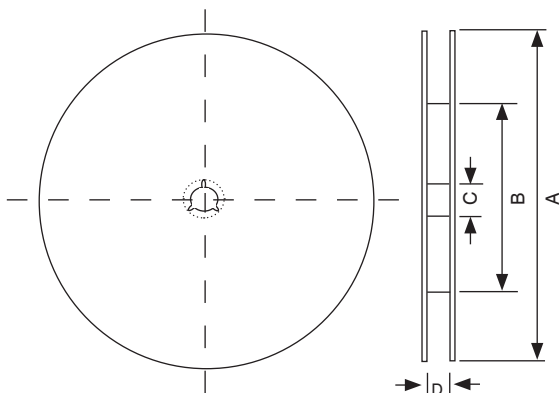
CARRIER TAPE DIMENSIONS (mm)

Type	EIA Size	A	B	D	E	F	P ₀	P ₁	P ₂	T	W
NRCL02*	0201	0.37 ± 0.05	0.67 ± 0.05	1.5 ^{+0.1/-0.0}	1.75 ± 0.1	3.5 ± 0.20	4.0 ± 0.10	2.0 ± 0.10	N/A	0.40 ± 0.05	8.0 ± 0.3
NRCL04*	0402	0.70 ± 0.10	1.20 ± 0.10					N/A	4.0 ± 0.10	0.65 ± 0.05	
NRCL06*	0603	1.10 ± 0.20	1.90 ± 0.20					1.0 max.			
NRCL10*	0805	1.65 ± 0.20	2.40 ± 0.20								
NRCL12*	1206	2.00 ± 0.20	3.60 ± 0.20								
NRCL25*	1210	3.00 ± 0.20	3.60 ± 0.20								

* Same for JUMPER (ZO) types.



REEL SPECIFICATIONS



Type	EIA Size	A ± 2.0		B ± 1.0	C ± 0.2	D ± 0.5
NRCL02*	0201	φ178 (Std)	-	φ60	φ13	φ9.0
NRCL04*	0402	-	-			
NRCL06*	0603	-	-			
NRCL10*	0805	φ178 (Std)	φ254 (Opt)			
NRCL12*	1206	φ178 (Std)	φ330 (Opt)			
NRCL25*	1210	-	-			

* Same for JUMPER (ZO) types.

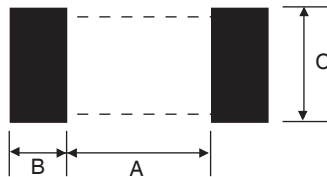
1. Leader tape : Approximately 250 m/m (160mm for 0201 case size) leader shall be provided at each end of the tape.

2. Accumulative tolerance of feeding hole and chip pocket shall not exceed 0.2mm over 10 pitches.

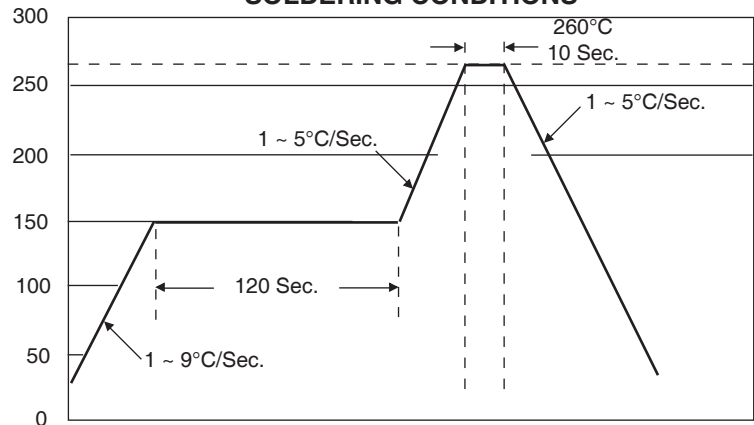


LAND PATTERN DIMENSIONS (mm)

Type	EIA Size	A	B	C
NRCL02	0201	0.30	0.30	0.30
NRCL04	0402	0.50	0.50	0.60
NRCL06	0603	0.90	0.60	0.90
NRCL10	0805	1.20	0.70	1.30
NRCL12	1206	2.00	0.90	1.60
NRCL25	1210	2.00	0.90	2.80



PEAK REFLOW SOLDERING CONDITIONS



ENVIRONMENTAL CHARACTERISTICS

Item	Specification		Test Method
	Tol. ± 1.0% & ± 5%	0Ω	
Resistance	As specified	<50mΩ	Measured at: <10Ω @ 0.1V, <100Ω @ 0.3V, <1KΩ @ 1.0V <10KΩ @ 3V, <100KΩ @ 10V, <1MΩ @ 25V, <10MΩ @ 30V
Temperature Coefficient of Resistance	As specified	N/A	JIS C5201-1 Clause 4.8
Short Time Overload	ΔR/R max. ±(2% + 0.10Ω)	<50mΩ	RCWV x 2.5 or Max Overloading Voltage for 5 Seconds JIS C5201-1 Clause 4.13
Resistance to soldering heat	ΔR/R max. ±(1% + 0.05Ω)	<50mΩ	Immersion for 10 ± 1 second in SAC solder +260°C JIS C5201-1 Clause 4.18
Temperature Cycling	ΔR/R max. ±(1% + 0.05Ω)	<50mΩ	5 cycles -55°C/+20°C/+155°C JIS C5201-1 Clause 4.19
Humidity Load Life	10Ω ≤ R < 1MΩ ΔR/R max. ±(3% + 0.10Ω) R < 10Ω < or > 1MΩ ΔR/R max. ±(5% + 0.10Ω)	<50mΩ	1,000 hours @ +40°C, 90% ~ 95% RH JIS C5201-1 Clause 4.24
Load Life	10Ω ≤ R < 1MΩ ΔR/R max. ±(3% + 0.10Ω) R < 10Ω < or > 1MΩ ΔR/R max. ±(5% + 0.10Ω)	<50mΩ	1,000 hours @ +70°C JIS C5201-1 Clause 4.25
Adhesion Strength	No removal of termination		5N for 10 seconds JIS C5201-1 Clause 4.32
Bending Strength	No visible damage ΔR/R max. ±(1% + 0.05Ω)	<50mΩ	5mm (0201 & 0402), 3mm (0603 ~ 1210) deflection for 10 seconds JIS C5201-1 Clause 4.33