Thick Film Chip Resistors

NRCW Series

FEATURES

- EIA STANDARD SIZING 0603 (1/8W), 0805 (1/4W), 1206 (1/2W), 2010 (1W) AND 2512 (2W)
- VOLTAGE RATINGS (50VDC ~ 300VDC)
- RESISTANCE VALUES (0Ω TO 1MΩ)
- THICK FILM ON ALUMINA SUBSTRATE, RuO_2/Ag RESISTIVE LAYER
- GLASS AND EPOXY OVERCOAT

NEW High Power Resistors (Up to 2Watt)

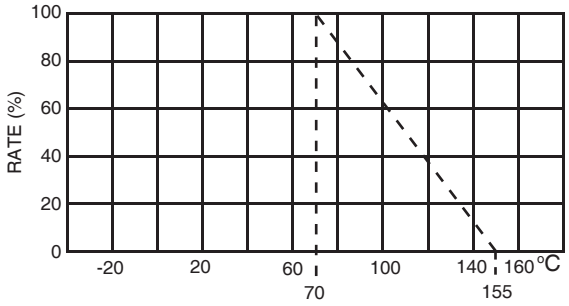
Type	EIA Size	Power Rating at 70°C	Max.*1 Working Voltage	Max.*2 Overload Voltage	Resistance Tolerance (Code)	Temperature Coefficient (ppm/°C) +20°C ~ +155°C	Resistance Range (Ω)	Resistance Value	Operating Temperature Range (°C)
NRCW06	0603	1/8W (0.125W)	50V	100V	±1% (F) ±5% (J)	±100	1.0 ~ 1M	E-24,E-96	-55 ~ +155
NRCW10	0805	1/4W (0.25W)	150V	300V	±1% (F) ±5% (J)	±100	1.0 ~ 1M	E-24,E-96	
NRCW12	1206	1/2W (0.50W)	200V	400V	±1% (F) ±5% (J)	±100	1.0 ~ 1M	E-24,E-96	
NRCW50	2010	1W	200V	400V	±1% (F) ±5% (J)	±100	1.0 ~ 1M	E-24,E-96	
NRCW100	2512	2W	300V	500V	±1% (F) ±5% (J)	±100	1.0 ~ 1M	E-24,E-96	

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:



ZERO OHM PART NUMBERS AND SPECIFICATIONS

Part Numbers*	EIA Size	Rated Current (A)	Peak Current (A)	Max. Resistance (mΩ)	Operating Temperature Range (°C)
NRCW06ZOTRF	0603	2.0	5.0	20	-55 ~ +155
NRCW10ZOTRF	0805	4.0	10	20	
NRCW12ZOTRF	1206	5.0	12.5	20	
NRCW50ZOTRF	2010	7.0	17.5	20	
NRCW100ZOTRF	2512	10	25	20	

* See page 5 for optional reel sizes/quantities on 0603 and 0805 case sizes.

PART NUMBER SYSTEM (5% Tol. E-24 VALUES)

NRCW 10 J 103 TR 10 F
- F — RoHS compliant
- 10 — Opt. Reel Qty 10=10K (see page 6)
- TR — Tape & Reel Packaging
- 103 — Resistance Code: First 2 figures are significant, 3rd digit is the multiplier
- J — Tolerance Code: J = 5%
- 10 — Size Code
- NRCW — Series

PART NUMBER SYSTEM (1% Tol. E-24 & E96 VALUES)

NRCW 10 F 1002 TR 10 F
- F — RoHS compliant
- 10 — Opt. Reel Qty 10=10K (see page 6)
- TR — Tape & Reel Packaging
- 1002 — Resistance Code: First 3 figures are significant, 4th digit is the multiplier
- F — Tolerance Code: F = 1%
- 10 — Size Code
- NRCW — Series

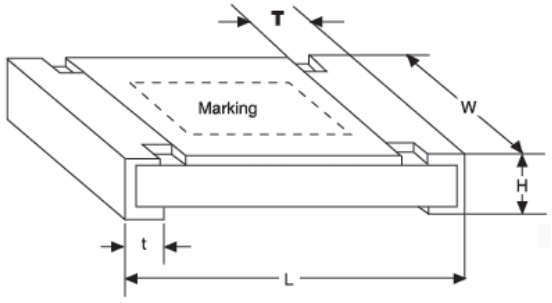
ENVIRONMENTAL CHARACTERISTICS

Item	Specification			Test Method
	Tol. 1%	Tol. 5%	0Ω	
Short Time Overload	ΔR ±(1% + 0.05Ω)	ΔR ±(2% + 0.05Ω)	20mΩ max.	JIS-C-5201-1 4.13 5x rated power or max overloading voltage whichever is less for 5 Seconds
Insulation Resistance	>10,000MΩ			JIS-C-5201-1 4.6 Maximum overload voltage for 1 minute
Endurance (Load Life)	ΔR ±(1% + 0.05Ω)	ΔR ±(3% + 0.1Ω)	20mΩ max.	JIS-C-5201-1 4.25 RCWV +70°C, 1.5 hours "ON", 0.5 hours "OFF" Total time 1,000 hours
Damp Heat with Load	ΔR ±(1% + 0.05Ω)	ΔR ±(3% + 0.1Ω)	20mΩ max.	JIS-C-5201-1 4.24 RCWV +40°C, 90~95% RH, 1.5 hour "ON", 0.5 hours "OFF" Total time 1,000 hours
Bending Strength	ΔR ±(0.5% + 0.05Ω)	ΔR ±(1% + 0.1Ω)	20mΩ max.	JIS-C-5201-1 4.33 Bend once for 10 seconds (0603 ~ 1206: 3mm, 2010, 2512: 2mm)
Solderability	>95% minimum coverage			JIS-C-5201-1 4.17 235°C ± 5°C for 2 ± 0.5 seconds
Resistance to Soldering Heat	ΔR ±(0.5% + 0.05Ω)	ΔR ±(1% + 0.1Ω)	20mΩ max.	JIS-C-5201-1 4.18 260°C ± 5°C for 10 seconds
Withstanding Voltage	No breakdown or flashover		20mΩ max.	JIS-C-5201-1 4.7 maximum overload voltage (AC) for 1 minute
Temperature Cycling	ΔR ±(0.5% + 0.05Ω)	ΔR ±(1% + 0.1Ω)	20mΩ max.	JIS-C-5201-1 4.19 30 minutes -55°C, 2 ~ 3 minutes +20°C, 30 minutes @155°C, 2 ~ 3 minutes +20°C (5 cycles)

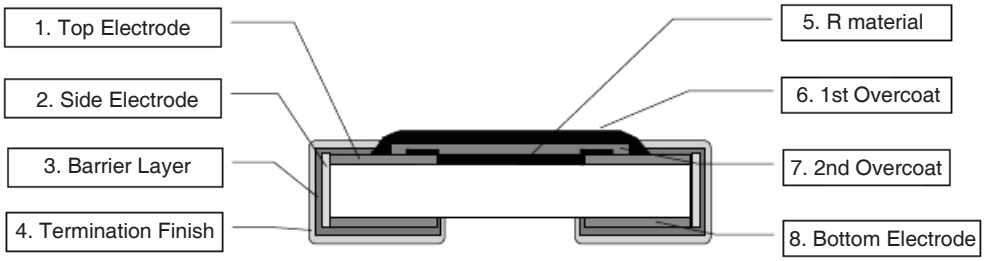
COMPONENT DIMENSIONS (mm)*

Type	EIA Size	L	W	H	T	t
NRCW06	0603	1.60 ± 0.10	0.80 ± 0.10	0.45 ± 0.15	0.30 ± 0.15	0.30 ± 0.10
NRCW10	0805	2.00 ± 0.10	1.25 ± 0.10	0.50 ± 0.15	0.40 ± 0.20	0.40 ± 0.20
NRCW12	1206	3.10 ± 0.15	1.60 ± 0.15	0.55 ± 0.10	0.50 ± 0.25	0.50 ± 0.25
NRCW50	2010	5.00 ± 0.20	2.50 ± 0.20	0.60 ± 0.10	0.60 ± 0.25	0.60 ± 0.25
NRCW100	2512	6.30 ± 0.20	3.10 ± 0.20	0.60 ± 0.15	0.60 ± 0.25	1.80 ± 0.25

*Same for Zero Ohm Jumper



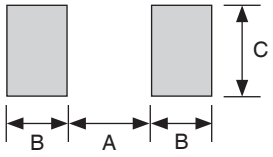
CONSTRUCTION



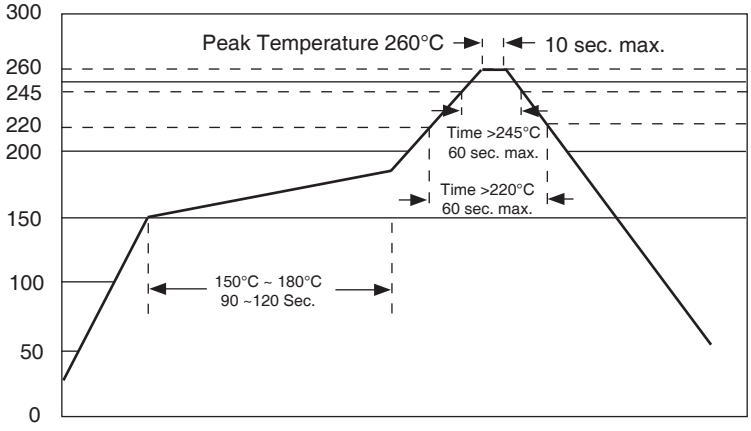
1. Ag/Pd Top Electrode
2. NiCr Side Electrode
3. Ni Barrier
4. 100% Sn Finish
5. Thick Film RuO2
6. Epoxy Resin
7. Glass
8. Ag Bottom Electrode

LAND PATTERN DIMENSIONS (mm)

Type	EIA Size	A	B	C
NRCW06	0603	0.90	0.60	0.90
NRCW10	0805	1.20	0.70	1.30
NRCW12	1206	2.00	0.90	1.60
NRCW50	2010	3.80	0.90	2.80
NRCW100	2512	3.80	1.60	3.50



REFLOW SOLDERING TEMPERATURE PROFILE



COMPONENT MARKING (Note: no marking on 0402 case size parts).

1. For **E-24** Series J (±5%) Tolerance In 0603, 0805, 1206, 2010 and 2512 sizes:

   3 DIGIT SYSTEM - First two digits are significant and third digit is multiplier

   Examples: 100 = 10 ohms 101 = 100 ohms 102 = 1,000 103 = 10,000 ohms 104 = 100,000 ohms

   105 = 1,000,000 ohms

2. For **E-96** Series F (±1%) Tolerance in 0805, 1206 and 2010 and 2512 sizes:

   4 DIGIT SYSTEM - First 3 digits are significant and fourth digit is multiplier, "R" represents decimal point

   Examples: 10R0 = 10 ohms 1000 = 100 ohms 1001 = 1,000 ohms 1002 = 10,000 1003 = 100,000 ohms

   1004 = 1,000,000 ohms

3. For **E-96** Series F (±1%) Tolerance in 0603 size (available from 1.0 ohm ~ 1.0Mohm)

   Special 3 DIGIT SYSTEM below (Due to space restrictions)

0603 E-96 VALUES 1% TOLERANCE RESISTANCE CODE

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

MULTIPLIER CODE

Code	A	B,b	C	D,d	E	F	G	H	X	Y	Z
Multiplier	10^0	10^1	10^2	10^3	10^4	10^5	10^6	10^7	10^{-1}	10^{-2}	10^{-3}

CODING FORMULA

XX X

Multiplier Code

Resistance Code

Example: $10.2k\Omega = \frac{102}{02} \times \frac{10^2}{C} \Omega = 02C$

$33.2\ \Omega = \frac{332}{51} \times \frac{10^{-1}}{X} = 51X$

MARKING EXAMPLES

10Ω = 01X

7.5KΩ = 85B or 85b

150KΩ = 18D or 18d

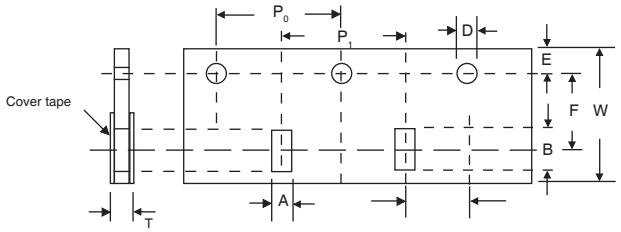
1.0MegΩ = 01E

PUNCHED TAPING SPECIFICATIONS
REEL QUANTITIES

Type	EIA Size	Carrier Tape			Qty per 7" Reel	Qty per 10" Reel	Qty per 13" Reel
		Fig.	Material	Width (mm)			
NRCW06	0603	A	Paper	8	5,000	10,000	20,000
NRCW10	0805	A	Paper	8	5,000	10,000	20,000
NRCW12	1206	A	Paper	8	5,000	N/A	N/A

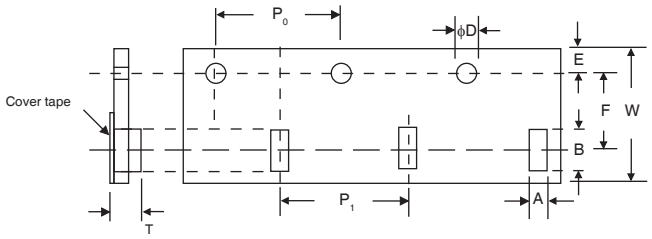
CARRIER DIMENSIONS (mm)

Type	EIA Size	A	B	D	E	F	P_o	P_1	T	W
NRCW06	0603	1.10 ± 0.20	1.90 ± 0.20	$1.5^{+0.1}/_{-0}$	1.75 ± 0.1	3.5 ± 0.2	4.0 ± 0.1	4.0 ± 0.1	0.65 ± 0.05	8.0 ± 0.3
NRCW10	0805	1.65 ± 0.20	2.40 ± 0.20						1.0 max.	
NRCW12	1206	2.00 ± 0.10	3.60 ± 0.20							



EMBOSSED PLASTIC TAPE SPECIFICATION
REEL QUANTITIES AND CARRIER DIMENSIONS (mm)

Type	EIA Size	A	B	ϕD	E	F	P_0	P_1	T	W	Qty per Reel
											7" Reel
NRCW50	2010	2.80 ± 0.20	5.50 ± 0.20	$1.5^{+0.1}/_{-0}$	1.75 ± 0.1	5.5 ± 0.1	4.0 ± 0.1	4.0 ± 0.1	1.2 max.	12.0 ± 0.1	4,000
NRCW100	2512	3.60 ± 0.20	6.90 ± 0.20								



REEL SPECIFICATIONS

Type	Reel Diameter ϕA		ϕB (mm)	C (mm)	W (mm)	Reel Qty	Part Number Suffix
NRCW06	7"	ϕ178 ± 2.0	ϕ60 ± 1.0	13.0 ± 0.2	9.0 ± 0.5	5,000	TRF
NRCW10	10"	ϕ254 ± 2.0	ϕ100 ± 1.0			10,000	TR10F
NRCW12	13"	ϕ330 ± 2.0				20,000	TR20F
NRCW50	7"	ϕ178 ± 2.0	ϕ60 ± 1.0		12.4 ± 1.0	4,000	TRF
NRCW100						4,000	TRF