NRCAH Series

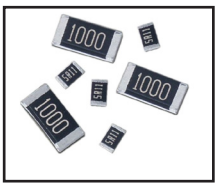
Automotive Ultra High Power Thick Film Chip Resistor

AEC-Q200 QUALIFIED

ROHS/REACH COMPLIANT HALOGEN FREE

COMPONENTS
Performance Passives By Design

FEATURES



- HIGH POWER RATING (UP TO 3.0W)
- 1.0Ω ~ 10MΩ RESISTANCE RANGE
- TCR DOWN TO ±100 PPM/°C
- OPTIONAL SULFUR RESISTANT (ASTM-B-809-95 AND EIA EIA-977)*
- AEC-Q200 QUALIFIED FOR AUTOMOTIVE APPLICATIONS
- OPERATING TEMPERATURE UP TO 155°C FOR 1000 HOURS
- SIZES 0402 (0.200W) ~ 2512 (3.0W)

*SEE PART NUMBERING SYSTEM

ELECTRICAL SPECIFICATIONS (0.5%, 1% & 2% TOL. E-24 & E-96 VALUES, 5% TOL. E-24 VALUES)

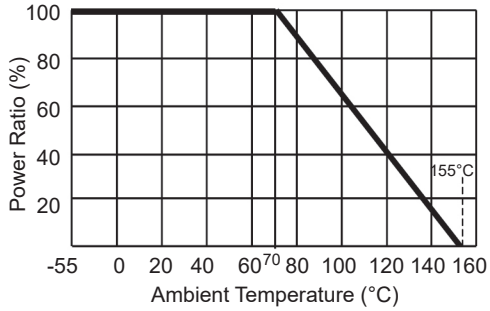
Type	EIA Size	Power Rating At 70°C	Temperature Range	Max.*1 Working Voltage	Max.*2 Overload Voltage	Resistance Tolerance (Code)	Temperature Coefficient (ppm/°C)	Resistance Range (Ω)
NRCAH04	0402	0.20W	-55 °C ~ +155 °C	50V	100V	±0.5% (D)	±100	10Ω ~ 1MΩ
						±1%(F), ±2% (G), ±5% (J)	±400	1Ω ~ 9.76Ω
							±100	10Ω ~ 10MΩ
NRCAH06	0603	0.33W		150V	200V	±0.5% (D)	±100	10Ω ~ 1MΩ
						±1%(F), ±2% (G), ±5% (J)	±400	1Ω ~ 9.76Ω
							±100	10Ω ~ 10MΩ
NRCAH10	0805	0.50W		400V	800V	±0.5% (D)	±100	10Ω ~ 1MΩ
						±1%(F), ±2% (G), ±5% (J)	±400	1Ω ~ 9.76Ω
							±100	10Ω ~ 10MΩ
NRCAH12	1206	0.75W		200V	400V	±0.5% (D)	±100	10Ω ~ 1MΩ
						±1%(F), ±2% (G), ±5% (J)	±400	1Ω ~ 9.76Ω
							±100	10Ω ~ 10MΩ
NRCAH25	1210	1.0W		200V	400V	±0.5% (D)	±100	10Ω ~ 1MΩ
						±1%(F), ±2% (G), ±5% (J)	±400	1Ω ~ 9.76Ω
							±100	10Ω ~ 10MΩ
NRCAH50	2010	1.5W		200V	400V	±0.5% (D)	±150	10Ω ~ 1MΩ
						±1%(F), ±2% (G), ±5% (J)	±400	1Ω ~ 9.76Ω
							±150	10Ω ~ 10MΩ
NRCAH100	2512	3.0W		250V	500V	±0.5% (D)	±150	10Ω ~ 1MΩ
						±1%(F), ±2% (G), ±5% (J)	±400	1Ω ~ 9.76Ω
							±150	10Ω ~ 10MΩ

*Working rating or current rating for values greater than/ equal to 1Ω.
The resistor shall have a DC continuous working voltage or a RMS AC continuous working voltage at commercial-line frequency and wave form corresponding to the power rating, as determined formula as following:

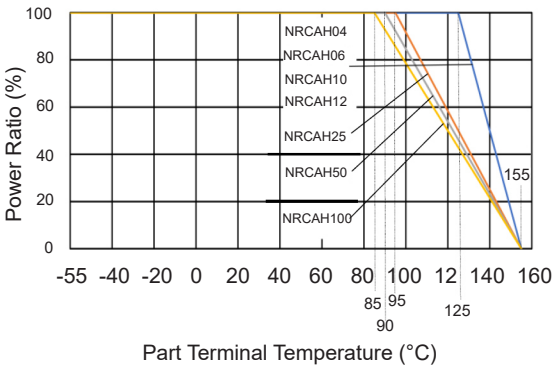
$$E(RCWV) = \sqrt{P \times R}$$

E = Rated Voltage (V)
P = Power Rating (W)
R = Nominal Resistance (Ω)

Derating Curve



Component Terminal Temperature



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COMPONENTS
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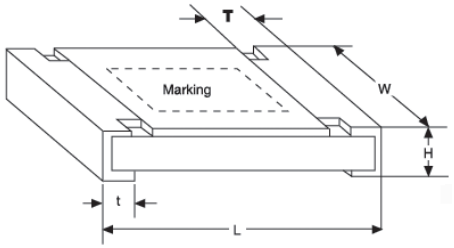
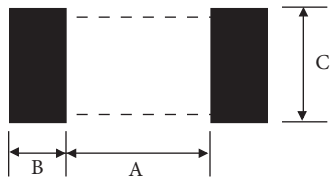
COMPONENT & LAND PATTERN DIMENSIONS (mm)

	Type	L	W	H	T	t	A	B	C
NRCAH04	0402	1.00±0.05	0.50±0.05	0.30±0.05	0.15±0.10	0.20±0.10	0.60	0.50	0.70
NRCAH06	0603	1.60±0.10	0.80±0.10	0.40±0.10	0.30±0.20	0.30±0.10	0.80	0.80	1.00
NRCAH10	0805	2.00±0.10	1.25±0.10	0.50±0.15	0.30±0.15	0.40±0.15	1.30	0.80	1.40
NRCAH12	1206	3.05±0.10	1.60±0.10	0.55±0.15	0.40±0.20	0.50±0.20	2.20	1.00	1.70
NRCAH25	1210	3.05±0.10	2.50±0.15	0.55±0.15	0.50±0.20	0.50±0.20	2.00	1.20	2.70
NRCAH50	2010	5.00±0.20	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	3.80	1.40	2.70
NRCAH100	2512	6.30±0.20	3.20±0.15	0.68±0.15	0.60±0.20	0.60±0.20	4.90	1.60	3.40





PART NUMBER SYSTEM (5% TOLERANCE, E-24 VALUES)

NRCAH 10 J S 103 TR Q Y F

- F — RoHS compliant
- Y — "Y" denotes suitable for automotive equipment, sourced to special production and inspection at IATF-16949 certified production site
- Q — AEC-Q200 Qualified
- TR — Tape & Reel Packaging: TR = Standard Tape & Reel, TR1K = Optional 1,000 quantity
- 103 — Resistance Code: First 2 digits are significant figures, 3th digit is the multiplier, "R" indicates a decimal point.
- S — Leave blank for standard, Letter "S" for Sulfur Resistance
- J — Tolerance Code: J = ±5%
- 10 — Size Code: 04=0402, 06=0603, 10=0805, 12=1206, 25=1210, 50=2012, 100=2512
- NRCAH — Series

PART NUMBER SYSTEM (0.5%, 1% & 2% TOLERANCE, E-24 AND E-96 VALUES)

NRCAH 10 F S 1002 TR Q Y F

- F — RoHS compliant
- Y — "Y" denotes suitable for automotive equipment, sourced to special production and inspection at IATF-16949 certified production site
- Q — AEC-Q200 Qualified
- TR — Tape & Reel Packaging: TR = Standard Tape & Reel, TR1K = Optional 1,000 quantity
- 1002 — Resistance Code: First 3 digits are significant figures, 4th digit is the multiplier, "R" indicates a decimal point.
- S — Leave blank for standard, Letter "S" for Sulfur Resistance
- F — Tolerance Code: F = ±1% & G = ±2%
- 10 — Size Code: 04=0402, 06=0603, 10=0805, 12=1206, 25=1210, 50=2012, 100=2512
- NRCAH — Series

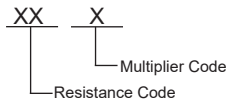
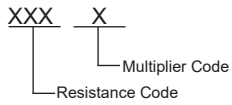
STANDARD E-24 AND E-96 VALUES AND RESISTANCE CODES

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

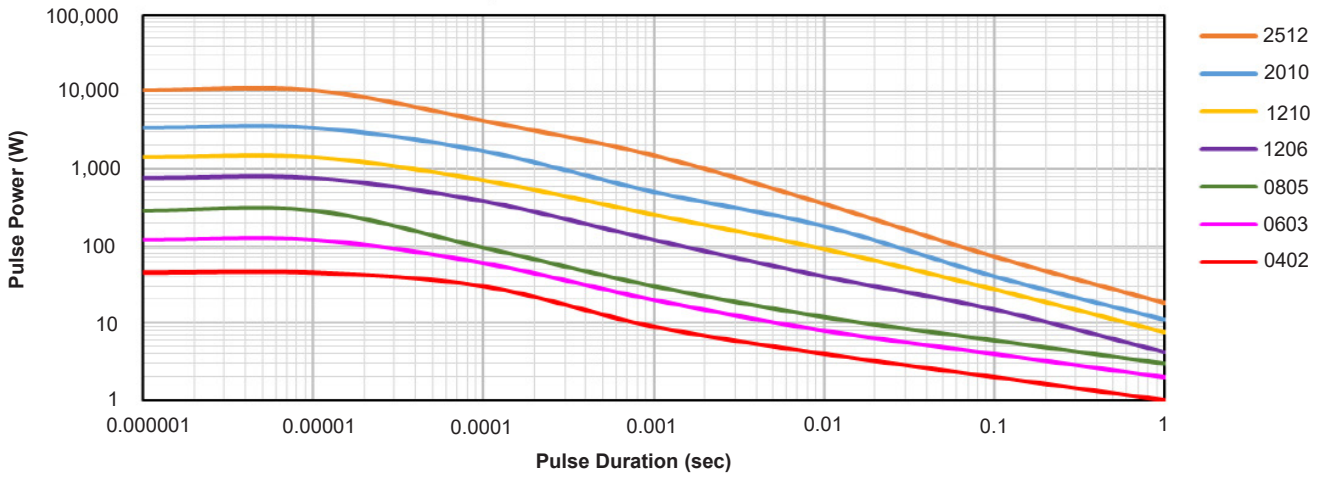
MULTIPLIER CODE

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}

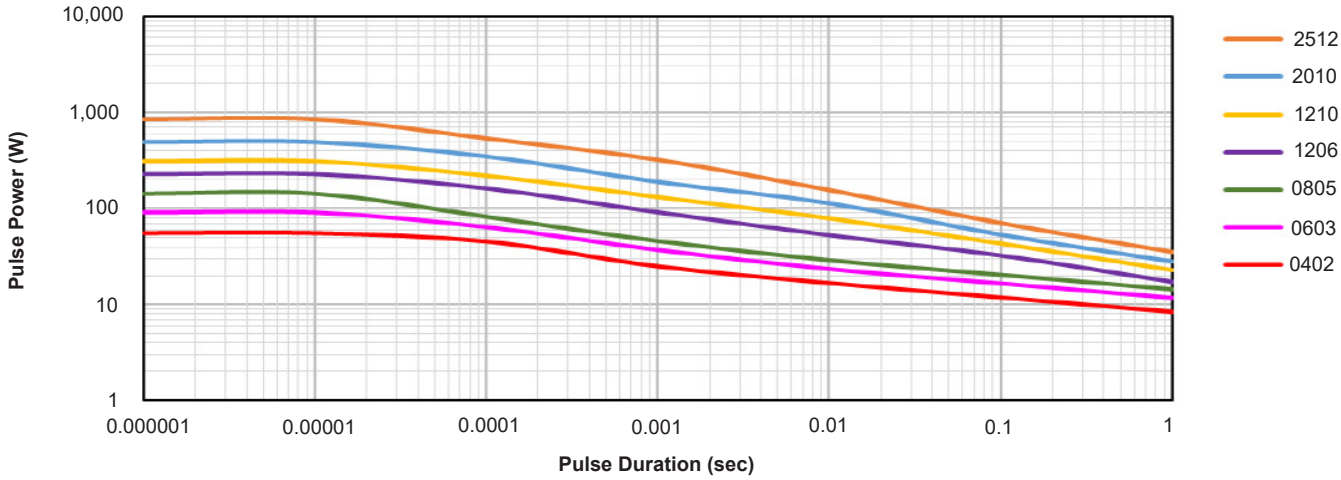
MARKING IDENTIFIERS

0402 Size	0603 Size	0805 and 1206 Size
No Marking	3 Digit Marking System: 2 digit value code + 1 digit multiplier code  E24 0603 Multiplier Code: 10e multiplier E96 0603 Multiplier Code: Per table 0603 Marking Examples: 101 = 100 Ω (E24) 13C = 13.3 KΩ (E96) 68B = 4.99 KΩ (E96) 103 = 10 KΩ (E24)	4 Digit Marking System: 3 digit value code + 1 digit multiplier code where "R" denotes a decimal  Value Multiplier Code: 10e multiplier Marking Examples: 10R0 = 10 Ω 1332 = 13.3 KΩ 4992 = 49.9 KΩ 1003 = 100 KΩ

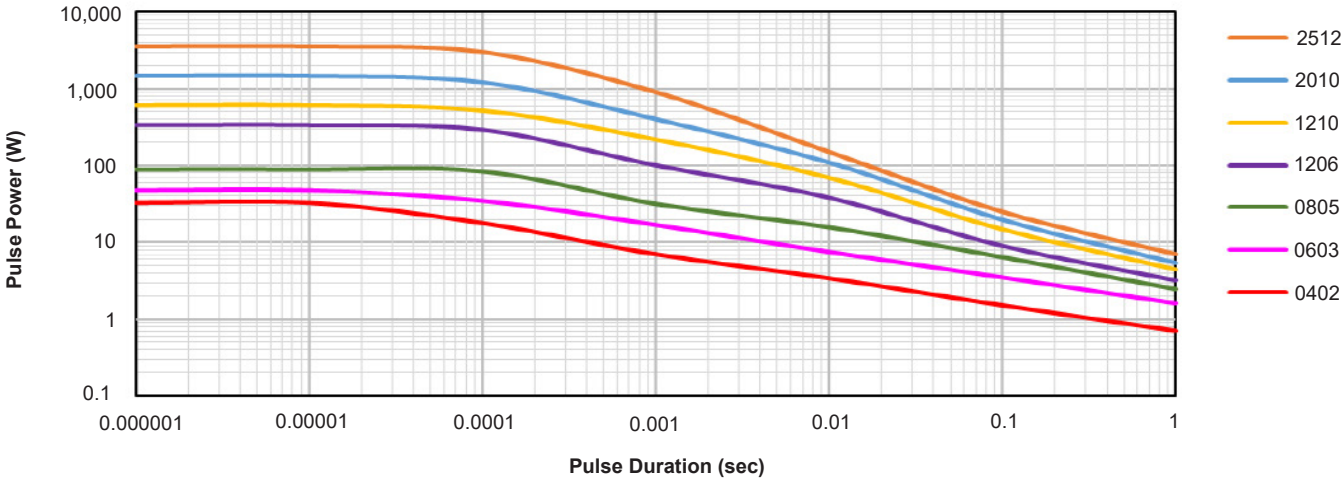
Single Pulse Power Curve (100Ω 5%)



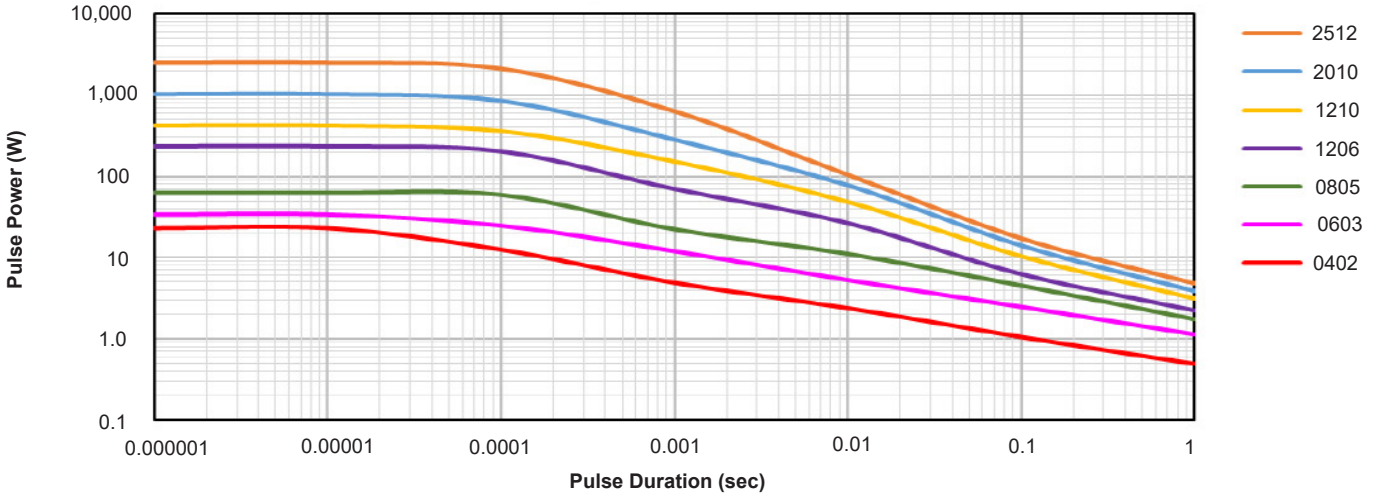
Single Pulse Power Curve (100Ω 1%)



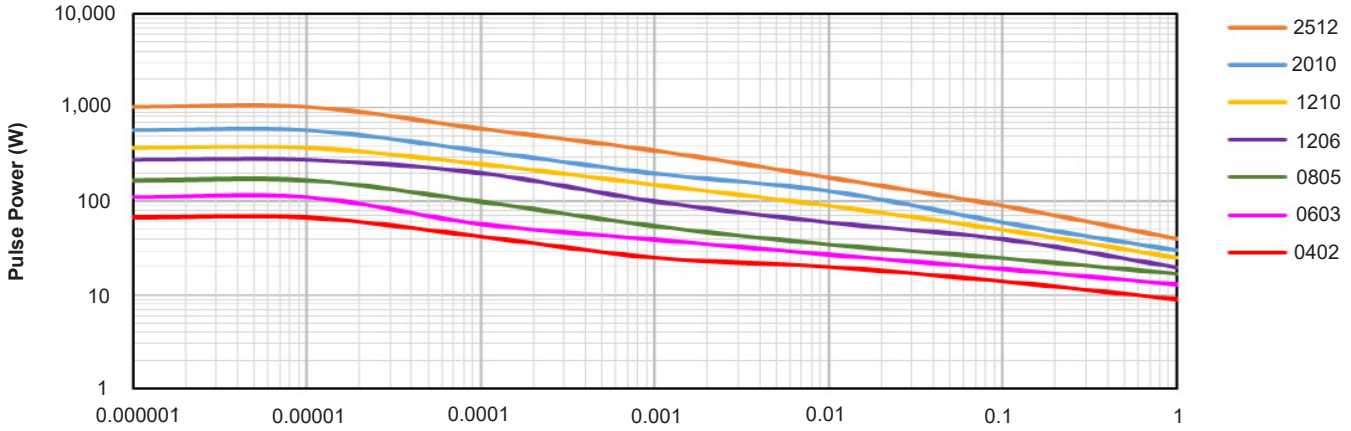
Continuous Pulse Power Curve (100Ω 5%)



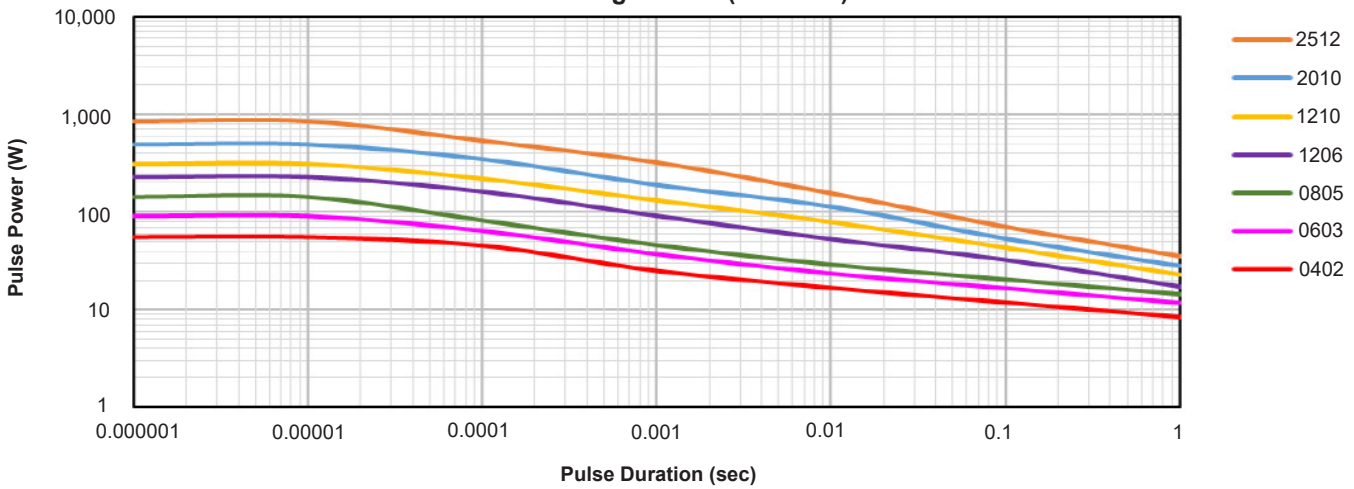
Continuous Pulse Power Curve (100Ω 1%)



Pulse Voltage Curve (100Ω 5%)



Pulse Voltage Curve (100Ω 1%)



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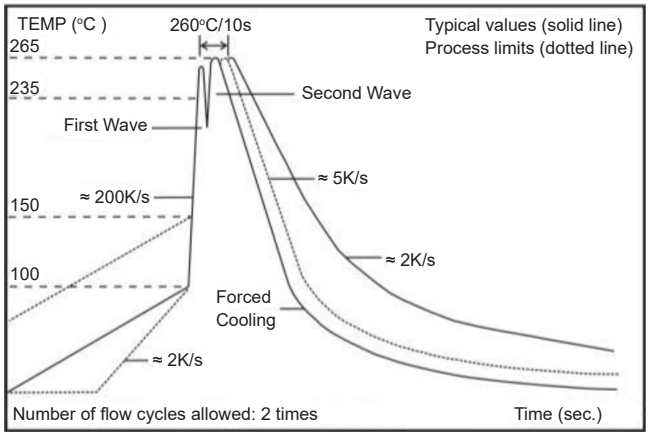
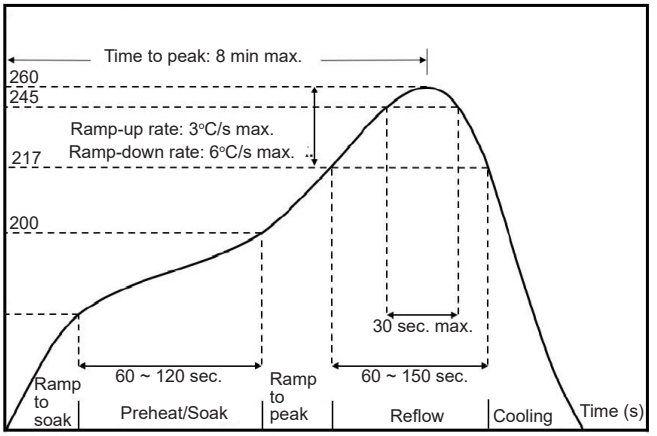
NIC COMPONENTS Performance Passives By Design

WAVE SOLDERING PROFILE



REFLOW SOLDERING PROFILE



ENVIRONMENTAL CHARACTERISTICS

Item	Requirement	Test Method*
Temperature Coefficient of Resistance	As specified	JISC5201-1 4.8 IEC60115-1 4.8 At 25°C/-55°C and 25°C/+155°C, 25°C is the reference temperature.
Short Time Overload	±0.5% & ±1% tolerance: ±(1.0%+0.05Ω) ±2% & ±5% tolerance: ±(2.0%+0.10Ω)	JISC5201-1 4.13 IEC60115-1 4.13 Ultra Power: 5 × Rated power or Max Overload Voltage whichever is less or 5 seconds
Leaching	Individual leaching area ≤5% Total leaching area ≤10%	JISC5201-1 4.18 IEC60068-2-58 8.2.1 +260°C for 30 seconds
Insulation Resistance	≥ 10GΩ	JISC5201-1 4.6 IEC60115-1 4.6 Apply 100VDC for 1 minute
Operational Life	±0.5% & ±1% tolerance: ±(1.0%+0.05Ω) ±2% & ±5% tolerance: ±(3.0%+0.10Ω)	MIL-STD 202 Method 108 Condition D Steady State TA=125°C at derated power.Measurement at 4±4 hours after test conclusion.
High Temperature Exposure (Storage)	±0.5% & ±1% tolerance: ±(0.5%+0.05Ω) ±2% & ±5% tolerance: ±(2.0%+0.05Ω)	MIL-STD 202 Method 108 1000 hrs. @ T=155°C. Unpowered. Measurement at 24±4 hours after test conclusion.
Temperature Cycling	±0.5% & ±1% tolerance: ±(0.5%+0.05Ω) ±2% & ±5% tolerance: ±(1.0%+0.10Ω)	JESD22 Method JA104 1000 Cycles (55°C to +125°C) Measureme n t at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme.
Resistance to Solvents	±0.5% & ±1% tolerance: ±(0.5%+0.05Ω) ±2% & ±5% tolerance: ±(0.5%+0.05Ω)	MIL-STD 202 Method 215 Add Aqueous wash chemical OKEM Clean or equivalent.
Biased Humidity	±0.5% & ±1% tolerance: ±(1.0%+0.05Ω) ±2% & ±5% tolerance: ±(3.0%+0.05Ω)	MIL-STD 202 Method 103 1,000 hours; 85°C / 85% RH, 10% of operating power. Measurement at 24±4 hours after test conclusion.
Mechanical Shock	±0.5% & ±1% tolerance: ±(1.0%+0.05Ω) ±2% & ±5% tolerance: ±(2.0%+0.10Ω)	MIL-STD 202 Method 213 Wave Form : Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration(D) is 6(ms)

ENVIRONMENTAL CHARACTERISTICS

Item	Requirement	Test Method*
Vibration	±0.5% & ±1% tolerance: ±(1.0%+0.05Ω) ±2% & ±5% tolerance: ±(2.0%+0.10Ω)	MIL-STD 202 Method 204 5 g's for 20 min., 12 cycles each of 3 orientations. Note: Test from 10 ~ 2000Hz
ESD	±(3.0%+0.05Ω)	AEC-Q200-002 or ISO/DIS 10605 Human body model 0402/0603: 1KV, 0805 and above above 2KV
Board Flexing	±0.5% & ±1% tolerance: ±(1.0%+0.05Ω) ±2% & ±5% tolerance: ±(1.0%+0.05Ω)	AEC-Q200-002 Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	±0.5% & ±1% tolerance: ±(0.5%+0.05Ω) ±2% & ±5% tolerance: ±(1.0%+0.05Ω)	J-STD-002 (1) 4 hrs 155°C dry heat (2) 245°C ± 5°C 3 sec.
Resistance to Soldering Heat	±0.5% & ±1% tolerance: ±(0.5%+0.05Ω) ±2% & ±5% tolerance: ±(1.0%+0.05Ω)	JISC 5201 1 4.18 IEC60115 1 4.18 260°C ± 5°C for 10 seconds
Terminal Strength	None broken	AEC-Q200-006 Pressurizing force for 60 seconds 0402/0603: 8N, 0805 and above above: 17.7N
Single pulse high voltage overload	±(1.0%+0.05Ω)	IEC60115 Severity No. 4: $U = 10 \times P_{70} \times R$ or $U = 2 \times U_{max.}$; whichever is the less severe. One pulse per minute, 10 pulses 10/700µs.
Sulfur Test (For Optional “S”)	±(2.0%+0.05Ω)	ASTM-B-809-95 EIA-977 105±2°C, no rating power for 1000 hrs

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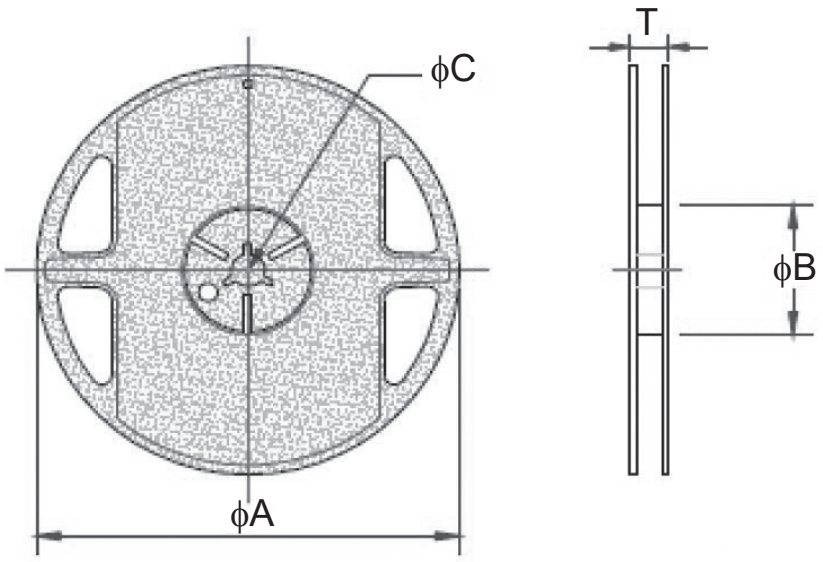
NIC COMPONENTS Performance Passives By Design

TAPING SPECIFICATIONS

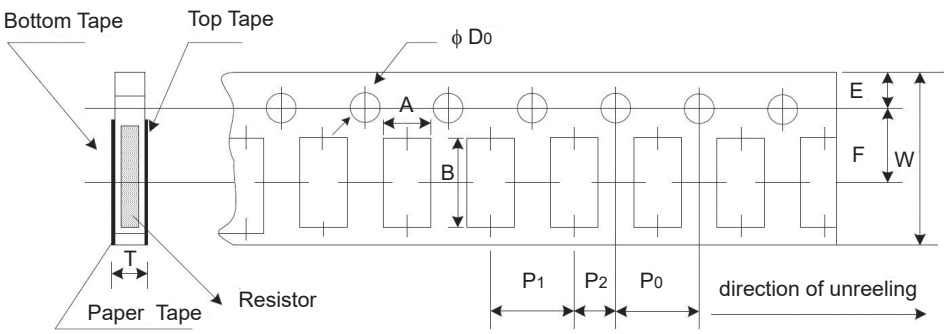
Type	EIA Size	A	B	C	T	Paper Tape (EA)
NRCAH04	0402	1.78 ±2.0	60.0±1.0	13.5 ±1.0	11.5 ±2.0	10,000
NRCAH06	0603					5,000
NRCAH10	0805					5,000
NRCAH12	1206					5,000
NRCAH25	1210					5,000
NRCAH50	2010				16.0 ±2.0	4,000
NRCAH100	2512					4,000

REEL DIMENSIONS (mm)



PAPER TAPE DIMENSIONS (mm)

Type	EIA Size	A	B	D	E	F	P_0	P_1	P_2	W	T
NRCAH04	0402	0.70 ± 0.10	1.20 ± 0.10	1.50 +0.1/-0.0	1.75 ± 0.10	3.5 ±0.05	4.00 ± 0.10	2.00 ± 0.05	2.00 ±0.05	8.00 ± 0.20	0.45 ± 0.10
NRCAH06	0603	1.05 ± 0.20	1.80 ± 0.20					4.00 ± 0.10			0.60 ± 0.10
NRCAH10	0805	1.55 ± 0.20	2.30 ± 0.20								0.75 ± 0.10
NRCAH12	1206	1.90 ± 0.20	3.50 ± 0.20								
NRCAH25	1210	2.85 ± 0.20	3.50 ± 0.20								



EMBOSSED PLASTIC CARRIER DIMENSIONS (mm)

Type	EIA Size	A	B	D	E	F	P_0	P_1	P_2	W	T
NRCAH50	2010	2.80 ± 0.20	5.60 ± 0.20	1.50 +0.1/-0	1.75 ± 0.10	5.5 ± 0.05	4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	12.0 ± 0.10	0.85 ± 0.15
NRCAH100	2512	3.40 ± 0.20	6.70 ± 0.20								0.95 ± 0.15