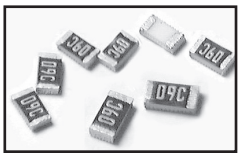
NTRH Series

High Power Thin Film Chip Resistors

ROHS/REACH COMPLIANT HALOGEN FREE

NIC COMPONENTS Performance Passives By Design

FEATURES



- **IMPROVED POWER RATING** (HIGHER THAN NTR SERIES)
- PRECISE TOLERANCE AND TEMPERATURE COEFFICIENT
- EIA STANDARD CASE SIZES (0201 ~ 2512)
- LOW NOISE, THIN FILM (NiCr) CONSTRUCTION
- REFLOW SOLDERABLE (Pb FREE TERMINATION FINISH)

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)	Reistance Values
NTRH02	0201	1/20 (0.050)W	25V	50V	±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F)	±25 (C), ±50 (D)	22 ~ 75KΩ	E24 & E-96
NTRH04	0402	1/10 (0.100)W	50V	100V	±0.01% (T), ±0.05% (A), ±0.1% (B)	±1 (Z) ±2 (X), ±3 (O)	49.9 ~ 4.99KΩ	
					±0.01% (T), ±0.05% (A), ±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F)	±5 (S)	49.9 ~ 20KΩ	
					±0.01% (T), ±0.05% (A)	±10 (B), ±15 (N)	49.9 ~ 12KΩ	
					±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F)		49.9 ~ 100KΩ	
					±0.05% (A)	±25 (C), ±50 (D)	49.9 ~ 12KΩ	
					±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F)		4.7 ~ 255KΩ	
NTRH06	0603	1/10 (0.100)W	75V	150V	±0.01% (T), ±0.05% (A), ±0.1% (B)	±1 (Z) ±2 (X), ±3 (O)	24.9 ~ 15KΩ	
					±0.01% (T), ±0.05% (A), ±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F)	±5 (S)	24.9 ~ 59KΩ	
					±0.01% (T)	±10 (B), ±15 (N)	24.9 ~ 100KΩ	
					±0.05% (A)		4.7 ~ 332KΩ	
					±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F)		4.7 ~ 511KΩ	
					±0.01% (T)	±25 (C), ±50 (D)	24.9 ~ 100KΩ	
					±0.05% (A)		4.7 ~ 332KΩ	
					±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F)		1.0 ~ 1MΩ	
NTRH07		1/6 (0.166)W	100V	150V	± 0.05% (A), ±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F)	±25 (C), ±50 (D)	10 ~ 332KΩ	
NTRH10	0805	1/8 (0.125)W	150V	300V	±0.01% (T), ±0.05% (A), ±0.1% (B)	±1 (Z) ±2 (X), ±3 (O)	24.9 ~ 30KΩ	
					±0.01% (T), ±0.05% (A), ±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F)	±5 (S)	24.9 ~ 150KΩ	
					±0.01% (T)	±10 (B), ±15 (N)	24.9 ~ 200KΩ	
					±0.05% (A)		4.7 ~ 511KΩ	
					±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F)		4.7 ~ 1MΩ	
					±0.01% (T)	±25 (C), ±50 (D)	4.7 ~ 1MΩ	
					±0.05% (A)		4.7 ~ 511KΩ	
					±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F)		1.0 ~ 2MΩ	
NTRH11		1/4 (0.250)W			± 0.05% (A), ±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F)	±25 (C), ±50 (D)	10 ~ 499KΩ	

PART NUMBER SYSTEM

NTRH 10 B 1003 C TR F

- F — RoHS compliant
- TR — Tape & Reel Packaging
- C — Temperature Coefficient Code: X = ±2ppm, O = ±3ppm, S = ±5ppm, B = ±10ppm, N = ±15ppm, C = ±25ppm, D = ±50ppm
- 1003 — Resistance Code: First 3 digits are significant figures (both E-24 and E-96 values), 4th digit is the multiplier, "R" indicates a decimal point.
- B — Tolerance Code: T = ± 0.01%, A = ± 0.05%, B = ± 0.1%, C = ± 0.25%, D = ± 0.5%, F = ± 1%
- 10 — Power Rating Code
- NTRH — Series

NTRH Series

High Power Thin Film Chip Resistors

ROHS/REACH COMPLIANT HALOGEN FREE

NIC COMPONENTS Performance Passives By Design

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)	Reistance Values
NTRH12	1206	1/4 (0.250)W	200V	400V	±0.01% (T), ±0.05% (A), ±0.1% (B)	±1 (Z) ±2 (X), ±3 (O)	24.9 ~ 49.9KΩ	E24 & E-96
					±0.01% (T), ±0.05% (A), ±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F)	±5 (S)	24.9 ~ 300KΩ	
					±0.01% (T)	±10 (B), ±15 (N)	24.9 ~ 499KΩ	
					±0.05% (A), ±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F)		4.7 ~ 1MΩ	
					±0.01% (T)	±25 (C), ±50 (D)	24.9 ~ 499KΩ	
					±0.05% (A)		1.0 ~ 1MΩ	
					±0.1% (B),±0.25 (C), ±0.5 (D), ±1% (F)		1.0 ~ 3MΩ	
NTRH13		1/3 (0.333)W			±0.05% (A), ±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F)	±25 (C), ±50 (D)	10 ~ 1MΩ	
NTRH15	1210	1/3 (0.333)W	200V	400V	±0.01% (T), ±0.05% (A), ±0.1% (B)	±1 (Z) ±2 (X), ±3 (O)	24.9 ~ 49.9KΩ	
					±0.01% (T), ±0.05% (A), ±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F)	±5 (S)	24.9 ~ 300KΩ	
					±0.01% (T)	±10 (B), ±15 (N)	24.9 ~ 499KΩ	
					±0.05% (A), ±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F)		4.7 ~ 1MΩ	
					±0.01% (T)	±25 (C), ±50 (D)	24.9 ~ 499KΩ	
					±0.05% (A)		1.0 ~ 1MΩ	
					±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F)		1.0 ~ 3MΩ	
NTRH20	2010	1/3 (0.333)W	200V	400V	±0.01% (T), ±0.05% (A), ±0.1% (B)	±1 (Z) ±2 (X), ±3 (O)	24.9 ~ 49.9KΩ	
					±0.01% (T), ±0.05% (A), ±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F)	±5 (S)	24.9 ~ 300KΩ	
					±0.01% (T)	±10 (B), ±15 (N)	24.9 ~ 499KΩ	
					±0.05% (A), ±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F)		4.7 ~ 1MΩ	
					±0.05% (A)	±25 (C), ±50 (D)	24.9 ~ 499KΩ	
					±0.1% (B)		1.0 ~ 1MΩ	
					±0.25 (C), ±0.5 (D), ±1% (F)		1.0 ~ 3MΩ	
NTRH21		1/2 (0.5)W	200V	400V	±0.01% (T)	±10 (B), ±15 (N)	24.9 ~ 2KΩ	
					±0.05% (A), ±0.1% (B)		4.7 ~ 1MΩ	
					±0.25 (C), ±0.5 (D), ±1% (F)		1.0 ~ 1MΩ	
					±0.01% (T)	±25 (C), ±50 (D)	24.9 ~ 2KΩ	
					±0.05% (A)		4.7 ~ 1MΩ	
					±0.1% (B)		4.7 ~ 3MΩ	
					±0.25 (C), ±0.5 (D), ±1% (F)		1.0 ~ 3MΩ	

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NTRH Series

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ROHS/REACH COMPLIANT HALOGEN FREE

COMPONENTS
Performance Passives By Design

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)	Reistance Values
NTRH25	2512	3/4 (0.75)W	200V	400V	±0.01% (T)	±10 (B), ±15 (N)	24.9 ~ 2KΩ	E24 & E-96
					±0.05% (A), ±0.1% (B)		4.7 ~ 2KΩ	
					±0.25 (C), ±0.5 (D), ±1% (F)		1.0 ~ 2KΩ	
					±0.01% (T)	±25 (C), ±50 (D)	24.9 ~ 2KΩ	
					±0.05% (A)		4.7 ~ 2KΩ	
					±0.1% (B)		4.7 ~ 3MΩ	
					±0.25 (C), ±0.5 (D), ±1% (F)		1.0 ~ 3MΩ	
NTRH26	2512	1.0 (1.0)W	200V	400V	±0.01% (T)	±10 (B), ±15 (N)	24.9 ~ 2KΩ	
					±0.05% (A), ±0.1% (B)		4.7 ~ 1MΩ	
					±0.25 (C), ±0.5 (D), ±1% (F)		1.0 ~ 1MΩ	
					±0.01% (T)	±25 (C), ±50 (D)	24.9 ~ 2KΩ	
					±0.05% (A)		4.7 ~ 1MΩ	
					±0.1% (B)		4.7 ~ 3MΩ	
					±0.25 (C), ±0.5 (D), ±1% (F)		1.0 ~ 3MΩ	

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COMPONENTS
Performance Passives By Design

ENVIRONMENTAL CHARACTERISTICS

Item	Specification		Test Method
	Tol.≤ 0.05%	Tol > 0.05%	
Standard Temperature Range: -55°C ~ +155°C (power derating above +70°C)			
Temperature Coefficient of Resistance	As specified		MIL-STD-202, Method 304 +25/-55/+25/+125/+25
Short Time Overload	ΔR ± 0.05%	ΔR ± 0.1% ΔR ± 0.2% for 0201	JISC 5201-1 4.13 RCWV x 2.5 or Max Overloading Voltage whichever is less for 5 Seconds
	ΔR ± 0.2% for Ultra High Power		
Dielectric Withstanding Voltage	As specified		MIL-STD-202F Method 301 Apply Max. Overload Voltage for 1 minute
Insulation Resistance	>9999MΩ		MIL-STD-202F Method 302 Apply 100Vdc for 1 minute
Endurance	ΔR ± 0.05%	ΔR ± 0.1%	MIL-STD-202F Method 108A RCWV 70±2°C, 1.5 hours ON, 0.5 hours OFF Total time 1,000 hours
	ΔR ± 0.5% for Ultra High Power		
	For 0201 >7K ΔR ± 0.5% <7K ΔR ± 0.2%		
Damp Heat with Load (for 0201 size)	ΔR ± 0.3%		MIL-STD-202F Method 103B 40±2°C, 90% ~ 95% RH, RCWV 1.5 hours ON, 0.5 hours OFF Total time 1,000 hours
High Temperature Exposure	ΔR ± 0.5%: 0402 ≥ 255.01K 0603 ≥ 402.01K 0805 ≥ 1.01M 1206 ≥ 1.01M 1210 1.01M 2010 1.01M 2512 1.01M ΔR ± 0.2 for the other		MIL-STD-202 Method 108 1000 hours @ +155°C without load
Low Temperature Operation	ΔR ± 0.05%	ΔR ± 0.2%	JIS-C-5201-1 4.36 1 hour @ -65°C followed by 45 minutes of RCWV
	ΔR ± 0.5% for High & Ultra High Power		
Temperature Cycling	ΔR ± 0.2% (excluding 0201 product)		JESD22 Method JA 104 -55°C to +125°C, 1000 cycles
Bending Strength	ΔR ± 0.05%	ΔR ± 0.1%	JIS-C-5201-1 4.33 Bending Amplitude 2010 & 2512 2mm, other sizes 3mm for 60 seconds
Solderability	95% Minimum Coverage		MIL-STD-202 Method 208H 245°C ±5°C, 5 ±0.5 seconds
Resistance to Soldering Heat	ΔR ± 0.05%	ΔR ± 0.1%	MIL-STD-202 Method 210E 260°C ±5°C for 10 ±1 seconds
ESD	ΔR ± 0.5% (excluding 0201 product)		AEC-Q200-002 Human body model 0402 ~ 0603: 200V 0805 ~ 1206: 1000V 1210, 2010 & 2512: 2000V
Sulfur Test	ΔR ± 2% (excluding 0201 product)		ASTM-B-809-95 Modified 105±2°C no power rating for 1000 hrs.
Biased Humidity	ΔR ± 0.1% (excluding 0201 product)		MIL-STD 202 Method 103 1000 hrs 85°C/85%RH 10% of operating power.

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 Overload Voltage for all resistors is the lower of the two values:
"Maximum Overload Voltage" as specified above
or
$2.5 \times \sqrt{\text{Power rating (Watts) x Resistance (Ohms)}}$

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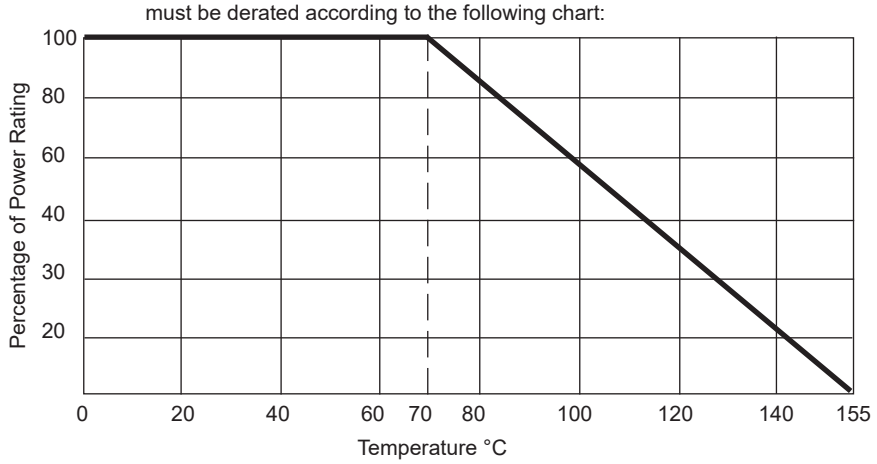
Power Derating Curve: For operation above 70°C, power rating must be derated according to the following chart:



STANDARD E-24, E-96 VALUES AND 0603 RESISTANCE CODES

E-24	E-96							
Value	Value	Code	Value	Code	Value	Code	Value	Code
100	100	01	102	02	105	03	107	04
110	110	05	113	06	115	07	118	08
120	121	09	124	10	127	11	130	12
130	133	13	137	14	140	15	143	16
150	147	17	150	18	154	19	158	20
160	162	21	165	22	169	23	174	24
180	178	25	182	26	187	27	191	28
200	196	29	200	30	205	31	210	32
220	215	33	221	34	226	35	232	36
240	237	37	243	38	249	39	255	40
270	261	41	267	42	274	43	280	44
300	287	45	294	46	301	47	309	48
330	316	49	324	50	332	51	340	52
360	348	53	357	54	365	55	374	56
390	383	57	392	58	402	59	412	60
430	422	61	432	62	442	63	453	64
470	464	65	475	66	487	67	499	68
510	511	69	523	70	536	71	549	72
560	562	73	576	74	590	75	604	76
620	619	77	634	78	649	79	665	80
680	681	81	698	82	715	83	732	84
750	750	85	768	86	787	87	806	88
820	825	89	845	90	866	91	887	92
910	909	93	931	94	953	95	976	96

MULTIPLIER CODES

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}

1. No marking for 0402 case size.
2. **Marking for 0603 case size is a three character code. The code** includes two characters to denote the value (based on 0603 Resistance Codes Table and a third character that denotes the value multiplier (see multiplier codes table).

CODING FORMULA

XX X

Multiplier Code

Resistance Code

MARKING EXAMPLES

10Ω = 01X

7.5k Ω = 85B

150k Ω = 18D

1 MegΩ = 01E

3. The 0805 and 1206 case sizes parts use the standard four character marking metthod as shown in the examples below.

E-24 and E-96 series - ±0.5% (D), ±0.25%(C), ±0.1% (B) tolerances 4 DIGIT MARKING SYSTEM - First 3 digits are the significant figures, the 4th digit is the mulitplier. "R"= decimal point.

Examples: 0R10 = 0.10 ohms, 1R00 = 1.0 ohms, 22R1=22.1 ohms, 3320= 332 ohms, 4751=4.75K ohms, 1132=11.3K ohms, 6493=649K ohms

NTRH Series

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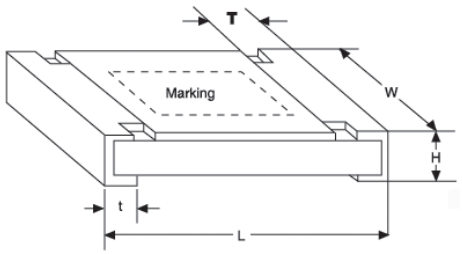
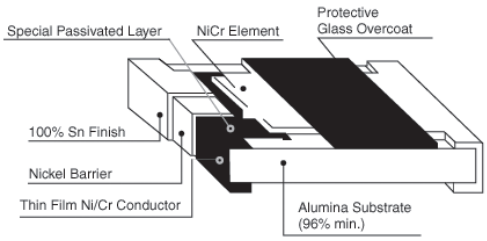
NIC COMPONENTS Performance Passives By Design

DIMENSIONS (mm)

Type	EIA Size	L	W	H	T	t
NTRH02	0201	0.58 ± 0.05	0.29 ± 0.05	0.23 ± 0.05	0.12 ± 0.05	0.15 ± 0.05
NTRH04	0402	1.00 ± 0.05	0.50 ± 0.05	0.30 ± 0.05	0.20 ± 0.15	0.20 ± 0.10
NTRH06/07	0603	1.55 ± 0.10	0.80 ± 0.10	0.45 ± 0.10	0.30 ± 0.25	0.30 ± 0.20
NTRH10/11	0805	2.0 ± 0.15	1.25 ± 0.15	0.55 ± 0.10	0.30 ± 0.25	0.40 ± 0.25
NTRH12/13	1206	3.05 ± 0.15	1.55 ± 0.15	0.55 ± 0.10	0.42 ± 0.30	0.35 ± 0.25
NTRH15	1210	3.10 ± 0.15	2.40 ± 0.15	0.55 ± 0.10	0.40 ± 0.30	0.55 ± 0.25
NTRH20	2010	4.90 ± 0.15	2.40 ± 0.15	0.55 ± 0.10	0.60 ± 0.40	0.50 ± 0.25
NTRH21	2010	4.90 ± 0.15	2.40 ± 0.15	0.55 ± 0.10	0.60 ± 0.40	2.20 ± 0.25
NTRH25	2512	6.30 ± 0.15	3.10 ± 0.15	0.55 ± 0.10	0.60 ± 0.40	0.50 ± 0.25
NTRH26 1Ω ~ 100Ω	2512	6.30 ± 0.15	3.10 ± 0.15	0.55 ± 0.10	0.60 ± 0.40	0.50 ± 0.25
NTRH26 101Ω ~ up	2512	6.30 ± 0.15	3.10 ± 0.15	0.55 ± 0.10	0.60 ± 0.40	2.50 ± 0.25



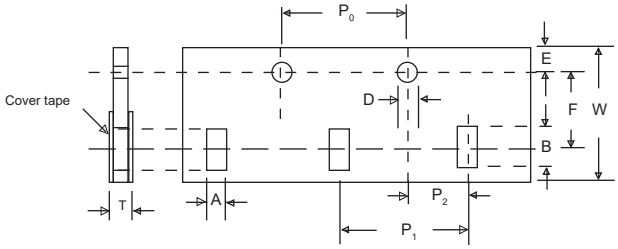


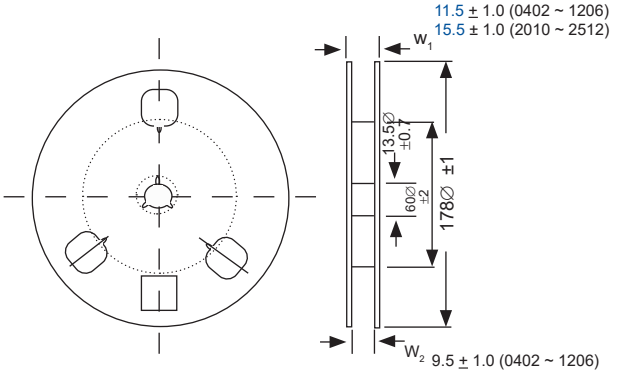
TAPING SPECIFICATIONS (1) Availability

Type	EIA Size	Carrier Tape		Qty per Reel (pcs)
		Material	Width (mm)	
NTRH02	0201	Paper	8	10,000
NTRH04	0402			
NTRH06/07	0603			5,000
NTRH10/11	0805			
NTRH12/13	1206			
NTRH15	1210			
NTRH20/21	2010	Plastic	12	4,000
NTRH25/26	2512			

(2) PAPER TAPE DIMENSIONS (mm)

Type	EIA Size	A ± 0.05	B ±0.05	D	E	F	P_0	P_1	P_2	W	T
NTRH02	0201	0.40	0.70	1.55 ±0.05	1.75 ±0.05	3.50 ±0.05	4.0 ±0.10	2.0 ±0.05	2.0 ±0.05	8.0 ±0.1	0.42 ±0.02
NTRH04	0402	0.70	1.16								0.40 ±0.03
NTRH06/07	0603	1.10	1.90					4.0 ±0.10			0.60 ±0.03
NTRH10/11	0805	1.60	2.37								0.75 ±0.05
NTRH12/13	1206	2.00	3.55								
NTRH15	1210	2.75	3.40	1.60±0.10							





NTRH Series

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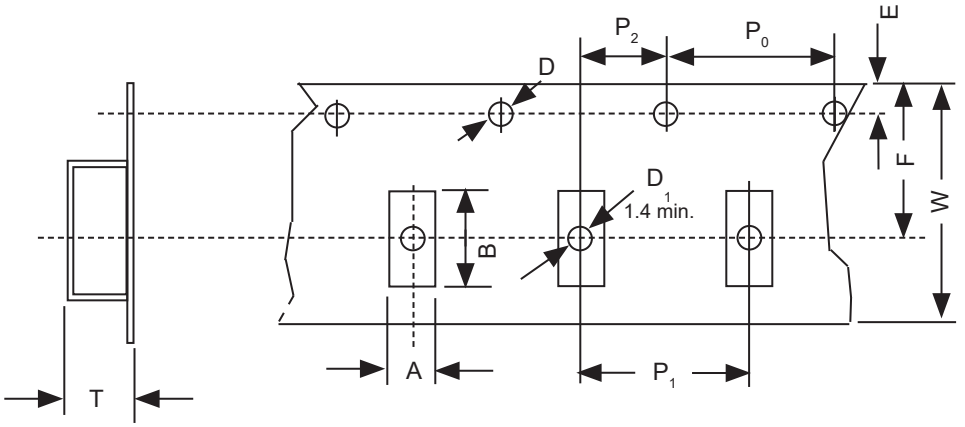
NIC COMPONENTS Performance Passives By Design

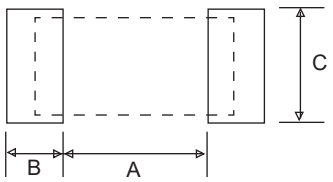
(2) PLASTIC TAPE DIMENSIONS (mm)

Type	EIA Size	A ± 0.10	B ±0.10	D	E	F	P_0	P_1	P_2	W	T
NTRH20/21	2010	2.85	5.45	1.50 ±0.10	1.75 ±0.10	5.50 ±0.05	4.0 ±0.05	4.0 ±0.10	2.0 ±0.05	12.0 ±0.1	1.0 ±0.20
NTRH25/26	2512	3.40	6.65								

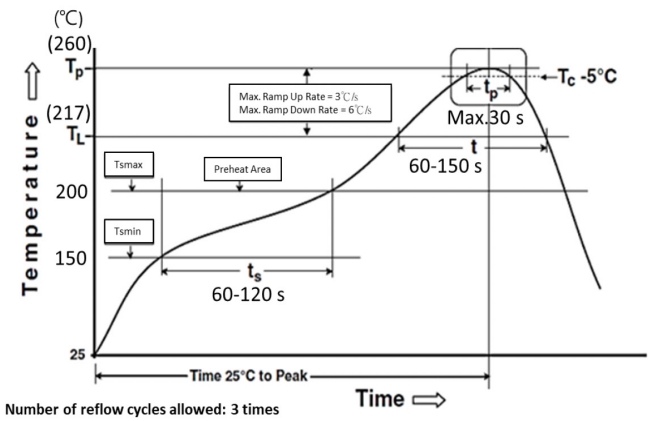


LAND PATTERN DIMENSIONS (mm)

Type	EIA Size	A	B	C
NTRH02	0201	0.25	0.30	0.40 ± 0.2
NTRH04	0402	0.50	0.50	0.60 ± 0.2
NTRH06/07	0603	0.80	1.00	0.90 ± 0.2
NTRH10/11	0805	1.00	1.00	1.35 ± 0.2
NTRH12	1206	2.00	1.15	1.70 ± 0.2
NTRH13		2.00	1.15	2.50 ± 0.2
NTRH15	1210	2.00	1.15	2.50 ± 0.2
NTRH20	2010	3.60	1.40	2.50 ± 0.2
NTRH21	2010	1.00	2.70	2.50 ± 0.2
NTRH25	2512	4.90	1.60	3.10 ± 0.2
NTRH26 1Ω ~ 100Ω	2512	4.90	1.60	3.10 ± 0.2
NTRH26 101Ω ~ up		1.00	3.55	3.10 ± 0.2



SOLDERING CONDITIONS (IPC/JEDEC J-STD-020)



Number of reflow cycles allowed: 3 times

Pb-Free Assembly	Time
Preheat Temp min (Tsmin)	150°C
Preheat Temp max (Tsmax)	200°C
Preheat time (ts)	60 - 120 seconds
Ramp-up rate (TL to TP)	3°C/second max.
Liquidous temperature (TL)	217°C
Time (tL) maintained above TL	60 - 150 seconds
Peak Temperature min (TP min)	235°C
Peak Temperature max (TP max)	260°C
Time (TP) within 5°C of the specified classification temperature (TC)	30 seconds max.
Ramp-down rate (TP to TL)	6°C/second max.
Time 25°C to peak temperature	8 minutes max.