

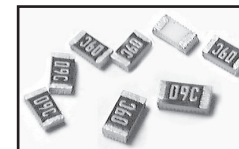
NTRA Series

Automotive Thin Film Chip Resistor



FEATURES

- PRECISE TOLERANCE AND TEMPERATURE COEFFICIENT
- EIA STANDARD CASE SIZES (0402 ~ 2512)
- AEC-Q200 QUALIFIED FOR AUTOMOTIVE APPLICATIONS
- LOW NOISE, THIN FILM (NiCr) CONSTRUCTION
- TEMPERATURE RANGE -55°C ~ +155°C
- OPTIONAL HIGH POWER RATING (0603 ~ 2010 CASE SIZES)
- ANTI-SULFUR (EIA-977 SULFUR TEST $\Delta R \pm 1\%$)



STANDARD POWER RATING

| 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 Values |
|---|--------------|----------------------|------------------------|-------------------------|---|----------------------------------|----------------------|--------------------|
| NTRA04 | 0402 | 1/16W (0.063W) | 25V | 50V | ±0.05% (A), ±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F) | ±10(B) | 49.9 ~ 10KΩ | E-24, E-96 & E-192 |
| | | | | | ±0.05% (A) | ±15(N) | 49.9 ~ 10KΩ | |
| | | | | | ±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F) | | 49.9 ~ 69.8KΩ | |
| | | | | | ±0.05% (A) | ±25(C), ±50(D) | 49.9 ~ 10KΩ | |
| ±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F) | 49.9 ~ 100KΩ | | | | | | | |
| NTRA06 | 0603 | 1/16W (0.063W) | 50V | 100V | ±0.05% (A) | ±10(B), ±15(N), ±25(C), ±50(D) | 10 ~ 49.9KΩ | |
| | | | | | ±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F) | 10 ~ 332KΩ | | |
| NTRA10 | 0805 | 1/10W (0.10W) | 100V | 200V | ±0.05% (A) | ±10(B), ±15(N), ±25(C), ±50(D) | 10 ~ 100KΩ | |
| | | | | | ±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F) | ±10(B) | 10 ~ 511KΩ | |
| | | | | | ±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F) | ±15(N), ±25(C), ±50(D) | 10 ~ 1MΩ | |
| NTRA12 | 1206 | 1/8W (0.125W) | 150V | 300V | ±0.05% (A) | ±10(B), ±15(N), ±25(C), ±50(D) | 10 ~ 200KΩ | |
| | | | | | ±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F) | 10 ~ 1MΩ | | |
| NTRA20 | 1210 | 1/4W (0.25W) | 150V | 300V | ±0.05% (A) | ±10(B), ±15(N), ±25(C), ±50(D) | 10 ~ 499KΩ | |
| | | | | | ±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F) | 10 ~ 1MΩ | | |
| NTRA25 | 2010 | 1/4W (0.25W) | 150V | 300V | ±0.05% (A) | ±10(B), ±15(N), ±25(C), ±50(D) | 10 ~ 499KΩ | |
| | | | | | ±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F) | 10 ~ 1MΩ | | |
| NTRA50 | 2512 | 1/2W (0.50W) | 150V | 300V | ±0.05% (A) | ±10(B), ±15(N), ±25(C), ±50(D) | 10 ~ 499KΩ | |
| | | | | | ±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F) | 10 ~ 1MΩ | | |

HIGH POWER RATING

| 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 Values |
|---------|----------|----------------------|------------------------|-------------------------|---|----------------------------------|----------------------|--------------------|
| NTRA06H | 0603 | 1/10W (0.10W) | 75V | 150V | ±0.05% (A) | ±10(B), ±15(N), ±25(C), ±50(D) | 10 ~ 49.9KΩ | E-24, E-96 & E-192 |
| | | | | | ±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F) | 10 ~ 332KΩ | | |
| NTRA10H | 0805 | 1/8W (0.125W) | 150V | 300V | ±0.05% (A) | ±25(C), ±50(D) | 10 ~ 100KΩ | |
| | | | | | ±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F) | ±10(B) | 10 ~ 511KΩ | |
| | | | | | | ±15(N), ±25(C), ±50(D) | 10 ~ 1MΩ | |
| NTRA12H | 1206 | 1/4W (0.25W) | 200V | 400V | ±0.05% (A) | ±10(B), ±15(N), ±25(C), ±50(D) | 10 ~ 200KΩ | |
| | | | | | ±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F) | 10 ~ 1MΩ | | |
| NTRA20H | 1210 | 1/3W (0.33W) | 200V | 400V | ±0.05% (A) | ±10(B), ±15(N), ±25(C), ±50(D) | 10 ~ 499KΩ | |
| | | | | | ±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F) | 10 ~ 1MΩ | | |
| NTRA25H | 2010 | 1/3W (0.33W) | 200V | 400V | ±0.05% (A) | ±10(B), ±15(N), ±25(C), ±50(D) | 10 ~ 499KΩ | |
| | | | | | ±0.1% (B), ±0.25 (C), ±0.5 (D), ±1% (F) | 10 ~ 1MΩ | | |

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 Overload Voltage for all resistors is the lower of the two values:

"Maximum Overload Voltage" as specified above
or

$$2.5 \times \sqrt{\text{Power rating (Watts)} \times \text{Resistance (Ohms)}}$$

Performance Passives By Design

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NTRA Series

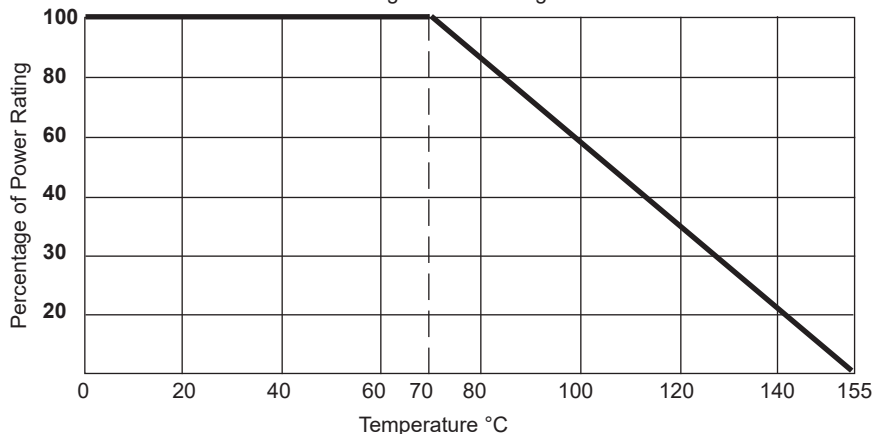
Automotive Thin Film Chip Resistor



TYPICAL NOISE CHARACTERISTICS

| Resistance Value (Ω) | Case Size | | |
|-------------------------------|-----------|--------|--------|
| | 0603 | 0805 | 1206 |
| 1 ~ 9 | -95dB | -95dB | -95dB |
| 10 ~ 49 | -85dB | -85dB | -85dB |
| 50 ~ 99 | -85dB | -85dB | -85dB |
| 100 ~ 4.99K | -100dB | -100dB | -105dB |
| 5K ~ 19.9K | -100dB | -100dB | -100dB |
| 20K ~ 1M | -90dB | -100dB | -100dB |

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



ENVIRONMENTAL CHARACTERISTICS

| Item | Specification | | Test Method |
|---------------------------------------|--|----------------------|---|
| | Tol. $\leq 0.05\%$ | Tol. $> 0.05\%$ | |
| Terminal Strength | None Broken | | AEC-Q200-006 Force of 1.8kg for 60 seconds |
| Mechanical Shock | $\Delta R \pm 0.05\%$ | $\Delta R \pm 0.1\%$ | MIL-STD-202 Method 213 Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6. |
| Vibration | $\Delta R \pm 0.05\%$ | $\Delta R \pm 0.1\%$ | MIL-STD-202 Method 204 5 g's for 20 minutes, 12 cycles each in 3 orientations, 10 ~ 2,000Hz |
| ESD | $\Delta R \pm 0.5\%$ | | AEC-Q200-002 0402 & 0603 = 0.2KV 0805 & 1206 = 1KV 1210, 2010 & 2512 = 2KV |
| Flammability | No ignition of the tissue paper or scorching of pinewood board | | UL-94 V-0 or V-1 acceptable. Electrical test not required |
| Resistance to solvents | Marking unsmearred | | MIL-STD-202 Method 215 Add aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents |
| Sulfur Test | $\Delta R \pm 1\%$ | | ASTM-B-809-95 Modified $+105^\circ\text{C} \pm 2^\circ\text{C}$ no power for 750 hours |
| Temperature Coefficient of Resistance | As specified | As specified | JIS-C-5201-1 4.8, IEC-60115-1 4.8 $+25/-55/+25/+125/+25$ |
| Short Time Overload | $\Delta R \pm 0.05\%$ | | JIS-C-5201-1 4.13, IEC-60115-1 4.13 RCWV x 2.5 or Max Overloading Voltage for 5 Seconds |
| Insulation Resistance | $> 1000\text{M}\Omega$ | | JIS-C-5201-1 4.6, IEC-60115-1 4.6 Apply 100Vdc for 1 minute |
| Operational Life | $\Delta R \pm 0.05\%$ | $\Delta R \pm 0.2\%$ | Condition D Steady State $T_a = +125^\circ\text{C}$ at derated power. Measurement at 24 \pm 4 hours after conclusion of test |
| | $> 7\text{K}\Omega \Delta R \pm 0.2\%$ | | |
| | $\Delta R \pm 0.5\%$ for High Power | | |
| Biased Humidity | $\Delta R \pm 0.1\%$ | | MIL-STD-202F Method 103 Total time 1,000, 85°C, 85%RH at 10% operating power |

NTRA Series

Automotive Thin Film Chip Resistor



| Item | Specification | | Test Method |
|------------------------------|----------------------|-----------------|---|
| | Tol. ≤ 0.05% | Tol. > 0.05% | |
| High Temperature Exposure | ΔR ±0.2% | | MIL-STD-202 Method 108 +155°C, 1000 hours |
| Temperature Cycling | ΔR ±0.1% | | JESD22, Method JA-104 -55°C to +125°C, 1,000 cycles |
| Bending Strength | ΔR ±0.1% | | JIS-C-5201-1 4.33 Bending once for 60 seconds Bending displacement: 2mm for 2010 & 2512 sizes, others 3mm |
| Solderability | 95% Minimum Coverage | | JIS-C-5201-1 4.17, IEC-60115-1 4.17 245°C ±5°C, 3 seconds |
| Resistance to Soldering Heat | ΔR ±0.05% | | JIS-C-5201-1 4.18, IEC-60115-1 4.18 260°C ±5°C for 10 seconds |

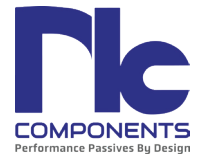
STANDARD E-24, E-96 AND E-192 VALUES AND 0603 RESISTANCE CODES

| E-24 | E-96 | | | | | | | | E-192* | | | | | |
|-------|-------|------|-------|------|-------|------|-------|------|--------|-------|-------|-------|-------|-------|
| Value | Value | Code | Value | Code | Value | Code | Value | Code | Value | Value | Value | Value | Value | Value |
| 100 | 100 | 01 | 102 | 02 | 105 | 03 | 107 | 04 | 100 | 147 | 215 | 316 | 464 | 681 |
| 110 | 110 | 05 | 113 | 06 | 115 | 07 | 118 | 08 | 101 | 149 | 218 | 320 | 470 | 690 |
| 120 | 121 | 09 | 124 | 10 | 127 | 11 | 130 | 12 | 102 | 150 | 221 | 324 | 475 | 698 |
| 130 | 133 | 13 | 137 | 14 | 140 | 15 | 143 | 16 | 104 | 152 | 223 | 328 | 481 | 706 |
| 150 | 147 | 17 | 150 | 18 | 154 | 19 | 158 | 20 | 105 | 154 | 226 | 332 | 487 | 715 |
| 160 | 162 | 21 | 165 | 22 | 169 | 23 | 174 | 24 | 106 | 156 | 229 | 336 | 493 | 723 |
| 180 | 178 | 25 | 182 | 26 | 187 | 27 | 191 | 28 | 107 | 158 | 232 | 340 | 499 | 732 |
| 200 | 196 | 29 | 200 | 30 | 205 | 31 | 210 | 32 | 109 | 160 | 234 | 344 | 505 | 741 |
| 220 | 215 | 33 | 221 | 34 | 226 | 35 | 232 | 36 | 110 | 162 | 237 | 348 | 511 | 750 |
| 240 | 237 | 37 | 243 | 38 | 249 | 39 | 255 | 40 | 111 | 164 | 240 | 352 | 517 | 759 |
| 270 | 261 | 41 | 267 | 42 | 274 | 43 | 280 | 44 | 113 | 165 | 243 | 357 | 523 | 768 |
| 300 | 287 | 45 | 294 | 46 | 301 | 47 | 309 | 48 | 114 | 167 | 246 | 361 | 530 | 777 |
| 330 | 316 | 49 | 324 | 50 | 332 | 51 | 340 | 52 | 115 | 169 | 249 | 365 | 536 | 787 |
| 360 | 348 | 53 | 357 | 54 | 365 | 55 | 374 | 56 | 117 | 172 | 252 | 370 | 542 | 796 |
| 390 | 383 | 57 | 392 | 58 | 402 | 59 | 412 | 60 | 118 | 174 | 255 | 374 | 549 | 806 |
| 430 | 422 | 61 | 432 | 62 | 442 | 63 | 453 | 64 | 120 | 176 | 258 | 379 | 556 | 816 |
| 470 | 464 | 65 | 475 | 66 | 487 | 67 | 499 | 68 | 121 | 178 | 261 | 383 | 562 | 825 |
| 510 | 511 | 69 | 523 | 70 | 536 | 71 | 549 | 72 | 123 | 180 | 264 | 388 | 569 | 835 |
| 560 | 562 | 73 | 576 | 74 | 590 | 75 | 604 | 76 | 124 | 182 | 267 | 392 | 576 | 845 |
| 620 | 619 | 77 | 634 | 78 | 649 | 79 | 665 | 80 | 126 | 184 | 271 | 397 | 583 | 856 |
| 680 | 681 | 81 | 698 | 82 | 715 | 83 | 732 | 84 | 127 | 187 | 274 | 402 | 590 | 866 |
| 750 | 750 | 85 | 768 | 86 | 787 | 87 | 806 | 88 | 129 | 189 | 270 | 407 | 597 | 876 |
| 820 | 825 | 89 | 845 | 90 | 866 | 91 | 887 | 92 | 130 | 191 | 280 | 412 | 604 | 887 |
| 910 | 909 | 93 | 931 | 94 | 953 | 95 | 976 | 96 | 132 | 193 | 284 | 417 | 612 | 898 |
| | | | | | | | | | 133 | 196 | 287 | 422 | 619 | 909 |
| | | | | | | | | | 135 | 198 | 291 | 427 | 626 | 920 |
| | | | | | | | | | 137 | 200 | 294 | 432 | 634 | 931 |
| | | | | | | | | | 138 | 203 | 298 | 437 | 642 | 942 |
| | | | | | | | | | 140 | 205 | 301 | 442 | 649 | 953 |
| | | | | | | | | | 142 | 208 | 305 | 448 | 657 | 965 |
| | | | | | | | | | 143 | 210 | 309 | 453 | 665 | 976 |
| | | | | | | | | | 145 | 213 | 312 | 459 | 673 | 988 |

* Special E192 resistance values are supported on all case sizes of NTRA series. Please review your E192 value requirements with NIC, as special terms apply, and E192 values are supplied without component resistance value marking.

MULTIPLIER CODE

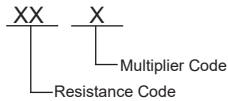
| Code | A | B, b | C | D, d | E | F | G | H | X | Y | Z |
|------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|------------------|
| Multiplier | 10 ⁰ | 10 ¹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



PART MARKING

- No marking on 0402 case size.
- Marking for 0603 case size:
 E-24 values and E-96 values: $\pm 1\%$ (F), $\pm 0.5\%$ (D), $\pm 0.25\%$ (C), $\pm 0.1\%$ (B) tolerances
 E-192 values: $\pm 0.1\%$ (B) tolerance (No Marking)

CODING FORMULA



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

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

MARKING EXAMPLES

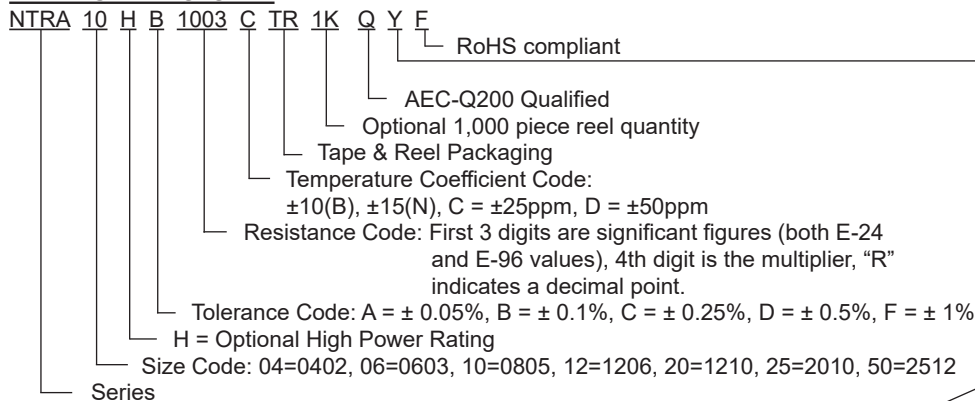
- 10 Ω = 01X
- 7.5k Ω = 85B
- 150k Ω = 18D
- 1 Meg Ω = 01E

- Marking for 0805, 1206, 2010 and 2512 case sizes:
 E-24 and E-96 values - $\pm 1\%$ (F), $\pm 0.5\%$ (D), $\pm 0.25\%$ (C), $\pm 0.1\%$ (B) tolerances
 E-192 values: $\pm 0.1\%$ (B) tolerance (No Marking)

4 DIGIT MARKING SYSTEM - First 3 digits are the significant figures, the 4th digit is the multiplier. "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

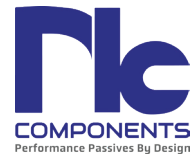
PART NUMBER SYSTEM



"Y" denotes suitable for automotive equipment, sourced to special production and inspection at IATF-16949 certified production site

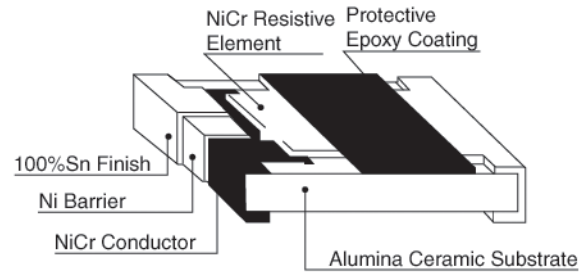
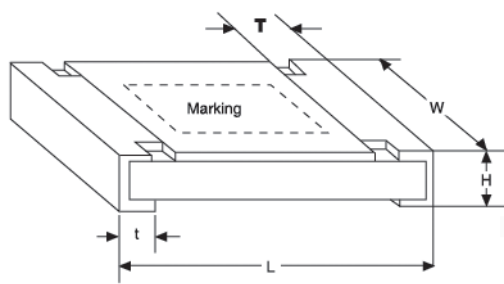
NTRA Series

Automotive Thin Film Chip Resistor



DIMENSIONS (mm)

| Type | EIA Size | L | W | H | T | t |
|--------|----------|-------------|-------------|-------------|-------------|-------------|
| NTRA04 | 0402 | 1.00 ± 0.05 | 0.50 ± 0.05 | 0.30 ± 0.05 | 0.20 ± 0.10 | 0.20 ± 0.10 |
| NTRA06 | 0603 | 1.55 ± 0.10 | 0.80 ± 0.10 | 0.45 ± 0.10 | 0.30 ± 0.20 | 0.30 ± 0.20 |
| NTRA10 | 0805 | 2.00 ± 0.15 | 1.25 ± 0.15 | 0.55 ± 0.10 | 0.30 ± 0.20 | 0.40 ± 0.25 |
| NTRA12 | 1206 | 3.05 ± 0.15 | 1.55 ± 0.15 | 0.55 ± 0.10 | 0.42 ± 0.20 | 0.35 ± 0.25 |
| NTRA20 | 1210 | 3.10 ± 0.15 | 2.40 ± 0.15 | 0.55 ± 0.10 | 0.40 ± 0.20 | 0.55 ± 0.25 |
| NTRA25 | 2010 | 4.90 ± 0.15 | 2.40 ± 0.15 | 0.55 ± 0.10 | 0.60 ± 0.30 | 0.50 ± 0.25 |
| NTRA50 | 2512 | 6.30 ± 0.15 | 3.10 ± 0.15 | 0.55 ± 0.10 | 0.60 ± 0.30 | 0.50 ± 0.25 |



TAPING SPECIFICATIONS

(1) Availability

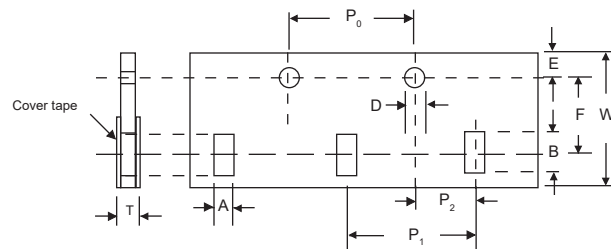
| Type | EIA Size | Carrier Tape | | | Qty per Reel (pcs) | |
|--------|----------|--------------|----------|-------------|--------------------|----------|
| | | Fig. | Material | Width (mm) | Standard | Optional |
| NTRA04 | 0402 | A | Paper | 9.5 ± 1.0 | 10,000 | 1,000 |
| NTRA06 | 0603 | A | | | | |
| NTRA10 | 0805 | A | | | | |
| NTRA12 | 1206 | A | | | | |
| NTRA20 | 1210 | A | | | | |
| NTRA25 | 2010 | B | Plastic | 13.5 ± 10.0 | 4,000 | 1,000 |
| NTRA50 | 2512 | B | | | | |

(2) PAPER TAPE DIMENSIONS (mm)

FIG. A

| Type | EIA Size | A | B | D | E | F | P ₀ | P ₁ | P ₂ | W | T |
|--------|----------|-------------|-------------|-------------|-------------|-------------|----------------|----------------|----------------|-----------|-------------|
| NTRA04 | 0402 | 0.70 ± 0.05 | 1.16 ± 0.05 | 1.55 ± 0.05 | 1.75 ± 0.10 | 3.50 ± 0.05 | 4.0 ± 0.10 | 2.0 ± 0.05 | 2.0 ± 0.05 | 8.0 ± 0.1 | 0.40 ± 0.03 |
| NTRA06 | 0603 | 1.10 ± 0.05 | 1.90 ± 0.05 | | | | | | | | 0.60 ± 0.03 |
| NTRA10 | 0805 | 1.60 ± 0.05 | 2.37 ± 0.05 | | | | | 0.75 ± 0.05 | | | |
| NTRA12 | 1206 | 2.00 ± 0.05 | 3.55 ± 0.05 | | | | | | | | |
| NTRA20 | 1210 | 2.75 ± 0.05 | 3.40 ± 0.05 | | | | | 1.6 ± 0.1 | | | |

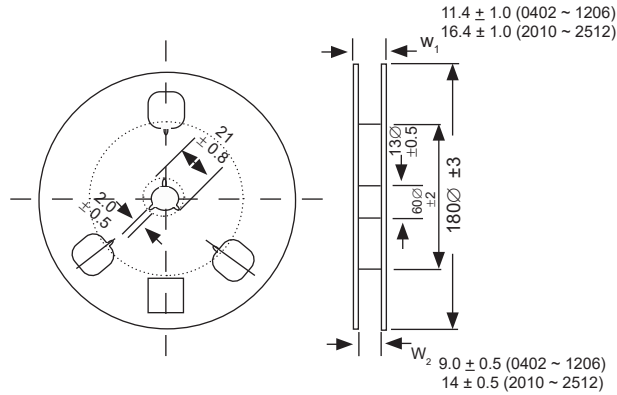
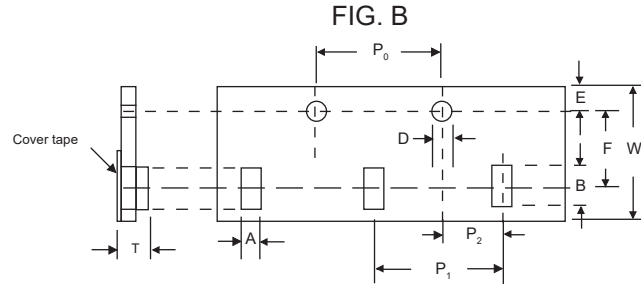
FIG. A



(3) PLASTIC EMBOSSED TAPE DIMENSIONS (mm)

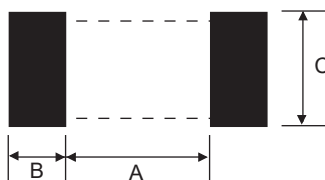
FIG. B

| Type | EIA Size | A | B | D | E | F | P ₀ | P ₁ | P ₂ | W | T |
|--------|----------|------------|------------|------------|------------|------------|----------------|----------------|----------------|-----------|-----------|
| NTRA25 | 2010 | 2.85 ±0.10 | 5.45 ±0.10 | 1.50 ±0.10 | 1.75 ±0.10 | 5.50 ±0.05 | 4.0 ±0.10 | 4.0 ±0.1 | 2.0 ±0.05 | 12.0 ±0.1 | 1.0 ±0.20 |
| NTRA50 | 2512 | 3.40 ±0.10 | 6.65 ±0.10 | | | | | | | | |



LAND PATTERN DIMENSIONS (mm)

| Type | EIA Size | A | B | C |
|--------|----------|------|------|------------|
| NTRA04 | 0402 | 0.50 | 0.50 | 0.60 ± 0.2 |
| NTRA06 | 0603 | 0.80 | 1.00 | 0.90 ± 0.2 |
| NTRA10 | 0805 | 1.00 | 1.00 | 1.35 ± 0.2 |
| NTRA12 | 1206 | 2.00 | 1.15 | 1.70 ± 0.2 |
| NTRA20 | 1210 | 2.00 | 1.15 | 2.50 ± 0.2 |
| NTRA25 | 2010 | 3.60 | 1.40 | 2.50 ± 0.2 |
| NTRA50 | 2512 | 4.90 | 1.60 | 3.10 ± 0.2 |



PEAK REFLOW SOLDERING CONDITIONS

