

# Thick Film Chip Resistors

NRC Series

## FEATURES

- EIA STANDARD SIZING 01005(1/32W), 0201(1/20W), 0402(1/16W), 0603(1/10W), 0805(1/8W), 1206(1/4W), 1210(1/3W), 2010(3/4W) AND 2512(1W)
- METAL GLAZED THICK FILM ON HIGH PURITY ALUMINA SUBSTRATE (CERMET) PROVIDES UNIFORM QUALITY AND HIGH RELIABILITY
- DOUBLE GLASS OVERCOAT ASSURES STRONG MECHANICAL CONSTRUCTION AND LONG LIFE, NICKEL BARRIER PREVENTS LEACHING
- BOTH FLOW SOLDER AND REFLOW SOLDERING ARE APPLICABLE
- ZERO OHM (JUMPER) CHIP AND TRIMMABLE TYPE ARE AVAILABLE \*4

**NEW**  
**01005**  
**Case Sizes**



| 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) |
|----------|----------|---|------------------------|-------------------------|---|----------------------------------|---------------------------|---------------------------|----------------------------------|
| NRC01    | 01005    | 1/32 (0.031) W                                | 15V                    | 30V                     | ±1% (F)                                       | ±300                             | 10 ~ 91                   | E-96                      | -55 ~ +125                       |
|          |          |   |                        |                         | ±1% (F)                                       | ±200                             | 100 ~ 1.62M               | E-96                      |                                  |
|          |          |   |                        |                         | ±5% (J)                                       | +600/-200                        | 1.0 ~ 9.1                 | E-24                      |                                  |
|          |          |   |                        |                         | ±5% (J)                                       | ±300                             | 10 ~ 91                   | E-24                      |                                  |
|          |          |   |                        |                         | ±5% (J)                                       | ±200                             | 100 ~ 10M                 | E-24                      |                                  |
| NRC02    | 0201     | 1/20 (0.05) W                                 | 25V                    | 50V                     | ±1% (F)                                       | ±250                             | 10 ~ 1M                   | E-24                      | -55 ~ +125                       |
|          |          |   |                        |                         | ±5% (J)                                       | ±200                             | 10 ~ 10M                  | E-24                      |                                  |
|          |          |   |                        |                         | ±10% (K)                                      |                                  |                           | E-12                      |                                  |
| NRC04    | 0402     | 1/16 (0.063) W                                | 50V                    | 100V                    | ±1% (F)                                       | +500/-200                        | 1.0 ~ 9.96                | E-96                      | -55 ~ +155                       |
|          |          |   |                        |                         | ±1% (F)                                       | ±100                             | 10 ~ 1M                   | E-96                      |                                  |
|          |          |   |                        |                         | ±1% (F)                                       | ±300                             | 1.02M ~ 10M               | E-96                      |                                  |
|          |          |   |                        |                         | ±5% (J)                                       | ±200                             | 10 ~ 1M                   | E-24                      |                                  |
|          |          |   |                        |                         | ±5% (J)                                       | ±350                             | 1.0 ~ 9.1 & 1.1M ~ 10M *3 | E-24                      |                                  |
| NRC06    | 0603     | 1/10 (0.10) W                                 | 50V                    | 100V                    | ±1% (F)                                       | ±400                             | 1.0 ~ 9.96                | E-96                      | -55 ~ +155                       |
|          |          |   |                        |                         | ±1% (F)                                       | ±100                             | 33.2 ~ 1M                 | E-96                      |                                  |
|          |          |   |                        |                         | ±1% (F)                                       | ±200                             | 10 ~ 32.4 & 1.1M ~ 10M *3 | E-96                      |                                  |
|          |          |   |                        |                         | ±5% (J)                                       | ±200                             | 10 ~ 1M                   | E-24                      |                                  |
|          |          |   |                        |                         | ±5% (J)                                       | ±350                             | 1.0 ~ 9.1 & 1.1M ~ 10M *3 | E-24                      |                                  |
| NRC10    | 0805     | 1/8 (0.125) W                                 | 150V                   | 300V                    | ±1% (F)                                       | ±400                             | 1.0 ~ 9.96                | E-96                      | -55 ~ +175                       |
|          |          |   |                        |                         | ±1% (F)                                       | ±100                             | 33.2 ~ 1M                 | E-96                      |                                  |
|          |          |   |                        |                         | ±1% (F)                                       | ±200                             | 10 ~ 32.4 & 1.1M ~ 10M *3 | E-96                      |                                  |
|          |          |   |                        |                         | ±5% (J)                                       | ±200                             | 10 ~ 1M                   | E-24                      |                                  |
|          |          |   |                        |                         | ±5% (J)                                       | ±350                             | 1.0 ~ 9.1 & 1.1M ~ 10M *3 | E-24                      |                                  |
| NRC12    | 1206     | 1/4 (0.250) W                                 | 200V                   | 400V                    | ±1% (F)                                       | ±400                             | 1.0 ~ 9.96                | E-96                      | -55 ~ +175                       |
|          |          |   |                        |                         | ±1% (F)                                       | ±100                             | 33.2 ~ 1M                 | E-96                      |                                  |
|          |          |   |                        |                         | ±1% (F)                                       | ±200                             | 10 ~ 32.4 & 1.1M ~ 10M *3 | E-96                      |                                  |
|          |          |   |                        |                         | ±5% (J)                                       | ±200                             | 10 ~ 1M                   | E-24                      |                                  |
|          |          |   |                        |                         | ±5% (J)                                       | ±350                             | 1.0 ~ 9.1 & 1.1M ~ 10M *3 | E-24                      |                                  |
| NRC25    | 1210     | 1/3 (0.33) W                                  | 200V                   | 400V                    | ±1% (F)                                       | ±100                             | 10 ~ 1M                   | E-96                      | -55 ~ +175                       |
|          |          |   |                        |                         | ±5% (J)                                       | ±200                             |                           | E-24                      |                                  |
|          |          |   |                        |                         | ±5% (J)                                       | ±350                             |                           | 1.0 ~ 9.1 & 1.1M ~ 10M *3 |                                  |
| NRC50    | 2010     | 3/4 (0.75) W                                  | 200V                   | 400V                    | ±1% (F)                                       | ±100                             | 10 ~ 1M                   | E-96                      | -55 ~ +175                       |
|          |          |   |                        |                         | ±5% (J)                                       | ±250                             |                           | E-24                      |                                  |
|          |          |   |                        |                         | ±5% (J)                                       | ±350                             |                           | 1.0 ~ 9.1 & 1.1M ~ 10M *3 |                                  |
| NRC100   | 2512     | 1W  | 250V                   | 500V                    | ±1% (F)                                       | ±100                             | 10 ~ 1M                   | E-96                      | -55 ~ +175                       |
|          |          |   |                        |                         | ±5% (J)                                       | ±250                             |                           | E-24                      |                                  |
|          |          |   |                        |                         | ±5% (J)                                       | ±350                             |                           | 1.0 ~ 9.1 *3              |                                  |
| NRC01ZO  | 01005    | Zero Ohm Jumper                               |                        |                         | Rated Current 0.5A (0.05Ω max. DC Resistance) |                                  |                           |                           | -55 ~ +125                       |
| NRC02ZO  | 0201     |   |                        |                         | Rated Current 0.5A (0.05Ω max. DC Resistance) |                                  |                           |                           |                                  |
| NRC04ZO  | 0402     |   |                        |                         | Rated Current 1.0A (0.05Ω max. DC Resistance) |                                  |                           |                           |                                  |
| NRC06ZO  | 0603     |   |                        |                         | Rated Current 1.0A (0.05Ω max. DC Resistance) |                                  |                           |                           |                                  |
| NRC10ZO  | 0805     |   |                        |                         | Rated Current 2.0A (0.05Ω max. DC Resistance) |                                  |                           |                           | -55 ~ +175                       |
| NRC12ZO  | 1206     |   |                        |                         | Rated Current 2.0A (0.05Ω max. DC Resistance) |                                  |                           |                           |                                  |
| NRC25ZO  | 1210     |   |                        |                         | Rated Current 2.0A (0.05Ω max. DC Resistance) |                                  |                           |                           |                                  |
| NRC50ZO  | 2010     |   |                        |                         | Rated Current 2.0A (0.05Ω max. DC Resistance) |                                  |                           |                           |                                  |
| NRC100ZO | 2512     | Rated Current 2.0A (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 two times the Maximum Working Voltage (see Note \*1 above).

Note \*3 - Made to order. Contact NIC for leadtime.

Note \*4 - Please contact NIC for availability of laser trimmable versions of 0805 and 1206 sizes parts.

Note \*5 - Please note, NIC's NRC series products are capable of meeting the following specifications: JIS-C 5202, EIAJ RC-2690, EIA575, EIA PDP-100, MIL-R-5542D and UL94V-0.

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



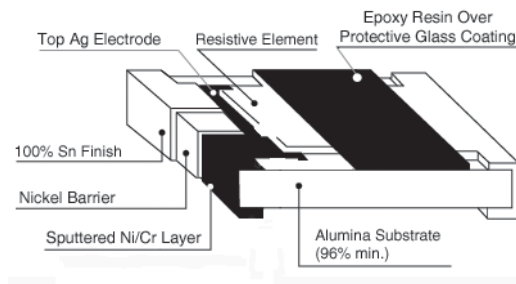
## DIMENSIONS (mm)

| Type     | Power Rating | EIA Size | L              | W              | H           | T           | t           |  |
|----------|--------------|----------|----------------|----------------|-------------|-------------|-------------|--|
| NRC01    | 1/32W        | 01005    | 0.40 ± 0.02    | 0.20 ± 0.02    | 0.13 ± 0.02 | 0.10 ± 0.03 | 0.10 ± 0.03 |  |
| NRC02    | 1/20W        | 0201     | 0.6 ± 0.03     | 0.3 ± 0.03     | 0.25 ± 0.05 | 0.1 ± 0.05  | 0.15 ± 0.05 |  |
| NRC04    | 1/16W        | 0402     | 1.0 +0.1/-0.05 | 0.5 +0.1/-0.05 | 0.3 ± 0.05  | 0.2 ± 0.1   | 0.25 ± 0.1  |  |
| NRC06    | 1/10W        | 0603     | 1.6 ± 0.15     | 0.8 ± 0.15     | 0.45 ± 0.1  | 0.3 ± 0.15  | 0.3 ± 0.15  |  |
| NRC10    | 1/8W         | 0805     | 2.0 ± 0.20     | 1.25 ± 0.10    | 0.5 ± 0.10  | 0.35 ± 0.20 | 0.35 ± 0.15 |  |
| NRC12    | 1/4W         | 1206     | 3.1 ± 0.15     | 1.55 ± 0.15    | 0.55 ± 0.10 | 0.45 ± 0.20 | 0.35 ± 0.15 |  |
| NRC25    | 1/3W         | 1210     | 3.1 ± 0.15     | 2.50 ± 0.20    | 0.55 ± 0.10 | 0.50 ± 0.20 | 0.50 ± 0.25 |  |
| NRC50    | 3/4W         | 2010     | 5.0 ± 0.15     | 2.50 ± 0.15    | 0.55 ± 0.10 | 1.00 ± 0.20 | 0.50 ± 0.25 |  |
| NRC100   | 1W           | 2512     | 6.4 ± 0.15     | 3.20 ± 0.15    | 0.55 ± 0.10 | 1.30 ± 0.20 | 0.60 ± 0.30 |  |
| NRC01ZO  | JUMPER       | 01005    | Same as NRC01  |                |             |             |             |  |
| NR02ZO   | JUMPER       | 0201     | Same as NRC02  |                |             |             |             |  |
| NR04ZO   | JUMPER       | 0402     | Same as NRC04  |                |             |             |             |  |
| NR06ZO   | JUMPER       | 0603     | Same as NRC06  |                |             |             |             |  |
| NRC10ZO  | JUMPER       | 0805     | Same as NRC10  |                |             |             |             |  |
| NRC12ZO  | JUMPER       | 1206     | Same as NRC12  |                |             |             |             |  |
| NRC25ZO  | JUMPER       | 1210     | Same as NRC25  |                |             |             |             |  |
| NRC50ZO  | JUMPER       | 2010     | Same as NRC50  |                |             |             |             |  |
| NRC100ZO | JUMPER       | 2512     | Same as NRC100 |                |             |             |             |  |

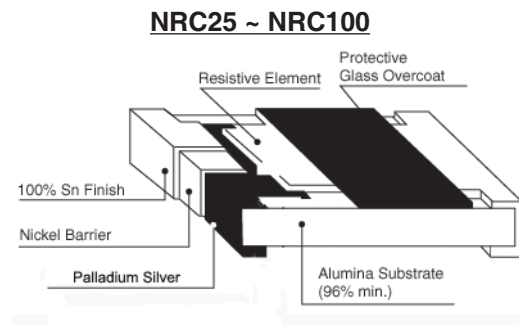
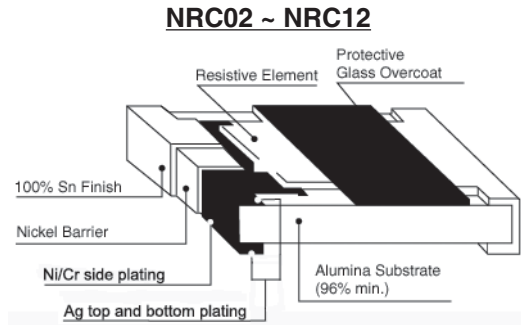


## CONSTRUCTION

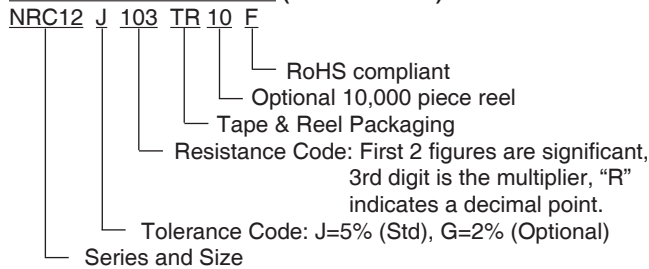
### NRC01 (01005)



## CONSTRUCTION

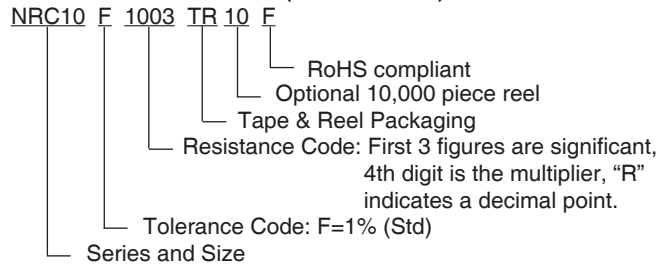


### PART NUMBER SYSTEM (E-24 VALUES)



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 (E-96 VALUES)



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

**Marking** (No marking on 0201 and 0402 size).

1. For **E-12 & E-24** Series (G + ±2%, J = ±5% (STD) Tolerance) In 0603, 0805, 1206, 1210, 2010 and 2512 sizes:

**3 DIGIT SYSTEM** - First two digits are significant and third digit is multiplier, "R" indicates decimal on values under 10 ohms.

Examples: R10 = .10 ohms    1R0 = 1.0 ohms    102 = 1k ohms    470 = 47 ohms  
 103 = 10k ohms    101 = 100 ohms    104 = 100k ohms    105 = 1 megohms

2. For **E-96** Series (F% = 1% Tolerance) in 0805, 1206 and 1210 sizes:

**4 DIGIT SYSTEM** - First 3 digits are significant and fourth digit is multiplier, "R" indicates decimal on values under 100 ohms.

Examples: 0R10 = .10 ohms    1R00 = 1.0 ohms    10R0 = 10 ohms    1003 = 100 kohms  
 1000 = 100 ohms    1004 = 1 megohms    1001 = 1k ohms  
 1052 = 10.5k ohms    1002 = 10k ohms    2213 = 221k ohms

3. For **E-96** Series (F = 1% Tolerance) in 0603 size

**3 DIGIT SYSTEM** (Due to space restrictions)



## STANDARD E-12, E-24, E-96 VALUES AND 0603 RESISTANCE CODES

| E-12  |  | E-24  |  | E-96  |      |       |      |       |      |       |      |
|-------|--|-------|--|-------|------|-------|------|-------|------|-------|------|
| Value |  | Value |  | Value | Code | Value | Code | Value | Code | Value | Code |
| 10    |  | 100   |  | 100   | 01   | 102   | 02   | 105   | 03   | 107   | 04   |
| 12    |  | 110   |  | 110   | 05   | 113   | 06   | 115   | 07   | 118   | 08   |
| 15    |  | 120   |  | 121   | 09   | 124   | 10   | 127   | 11   | 130   | 12   |
| 18    |  | 130   |  | 133   | 13   | 137   | 14   | 140   | 15   | 143   | 16   |
| 22    |  | 150   |  | 147   | 17   | 150   | 18   | 154   | 19   | 158   | 20   |
| 27    |  | 160   |  | 162   | 21   | 165   | 22   | 169   | 23   | 174   | 24   |
| 33    |  | 180   |  | 178   | 25   | 182   | 26   | 187   | 27   | 191   | 28   |
| 39    |  | 200   |  | 196   | 29   | 200   | 30   | 205   | 31   | 210   | 32   |
| 47    |  | 220   |  | 215   | 33   | 221   | 34   | 226   | 35   | 232   | 36   |
| 56    |  | 240   |  | 237   | 37   | 243   | 38   | 249   | 39   | 255   | 40   |
| 68    |  | 270   |  | 261   | 41   | 267   | 42   | 274   | 43   | 280   | 44   |
| 82    |  | 300   |  | 287   | 45   | 294   | 46   | 301   | 47   | 309   | 48   |
| 91    |  | 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 CODE

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

### 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

- 10Ω = 01X
- 7.5kΩ = 85B or 85b
- 150kΩ = 18D or 18d
- 1 MegΩ = 01E

## TAPING SPECIFICATIONS

### (1) Availability

| Type    | Power Rating | EIA Size | Carrier Tape |          |            | Qty per 7" Reel | Qty per 10" Reel |
|---------|--------------|----------|--------------|----------|------------|-----------------|------------------|
|         |              |          | Fig.         | Material | Width (mm) |                 |                  |
| NRC01   | 1/32W        | 01005    | A            | Paper    | 8          | 20,000          | N/A              |
| NRC02   | 1/20W        | 0201     | A            | Paper    | 8          | 10,000          | N/A              |
| NRC04   | 1/16W        | 0402     | A            | Paper    | 8          | 10,000          | N/A              |
| NRC06   | 1/10W        | 0603     | A            | Paper    | 8          | 5,000           | 10,000           |
| NRC10   | 1/8W         | 0805     | A            | Paper    | 8          | 5,000           | 10,000           |
| NRC12   | 1/4W         | 1206     | A            | Paper    | 8          | 5,000           | 10,000           |
| NRC25   | 1/3W         | 1210     | B            | Plastic  | 12         | 4,000           | N/A              |
| NRC04ZO | Jumper       | 0402     | A            | Paper    | 8          | 10,000          | N/A              |
| NRC06ZO | Jumper       | 0603     | A            | Paper    | 8          | 5,000           | 10,000           |
| NRC10ZO | Jumper       | 0805     | A            | Paper    | 8          | 5,000           | 10,000           |
| NRC12ZO | Jumper       | 1206     | A            | Paper    | 8          | 5,000           | 10,000           |
| NRC25ZO | Jumper       | 1210     | B            | Plastic  | 12         | 4,000           | N/A              |

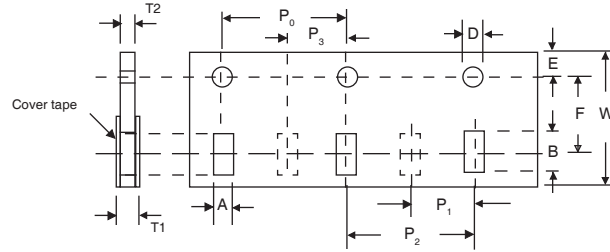


## (2) PAPER TAPE DIMENSIONS (mm)

**FIG. A**

| Type   | EIA Size | A            | B           | D            | E             | F             | P <sub>0</sub> | P <sub>1</sub> | P <sub>2</sub> | P <sub>3</sub> | T <sub>1</sub> | T <sub>2</sub> | W            |
|--------|----------|--------------|-------------|--------------|---------------|---------------|----------------|----------------|----------------|----------------|----------------|----------------|--------------|
| NRC01* | 01005    | 0.25 ± 0.05  | 0.45 ± 0.05 | 1.5<br>+ 0.1 | 1.75<br>± 0.1 | 3.5<br>± 0.05 | 4.0<br>± 0.1   | 2.0 ± 0.05     | N/A            | 2.0 ± 0.05     | 0.39 max.      | 0.31 ± 0.03    | 8.0<br>± 0.2 |
| NRC02* | 0201     | 0.41 ± 0.1   | 0.71 ± 0.1  |              |               |               |                | 2.0 ± 0.1      |                | 2.0 ± 0.1      |                |                |              |
| NRC04* | 0402     | 0.65 ± 0.1   | 1.15 ± 0.1  |              |               |               |                | 2.0 ± 0.05     |                | 2.0 ± 0.05     |                |                |              |
| NRC06* | 0603     | 1.135 ± 0.05 | 1.95 ± 0.05 |              |               |               |                | N/A            | 4.0<br>± 0.05  | 4.0 ± 0.05     | 1.1 max.       | 1.0 max.       |              |
| NRC10* | 0805     | 1.65 ± 0.2   | 2.4 ± 0.2   |              |               |               |                |                |                |                |                |                |              |
| NRC12* | 1206     | 2.0 ± 0.2    | 3.6 ± 0.2   |              |               |               |                |                |                |                |                |                |              |

\* Same for JUMPER (ZO) types.

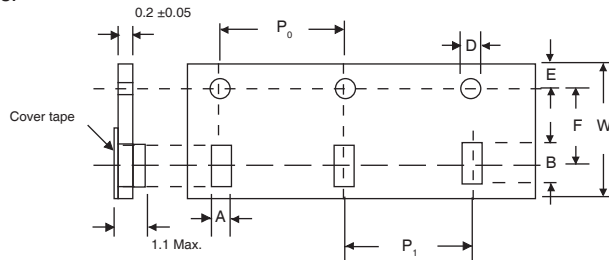


## (3) EMBOSSED PLASTIC TAPE SPECIFICATION

**FIG. B.**

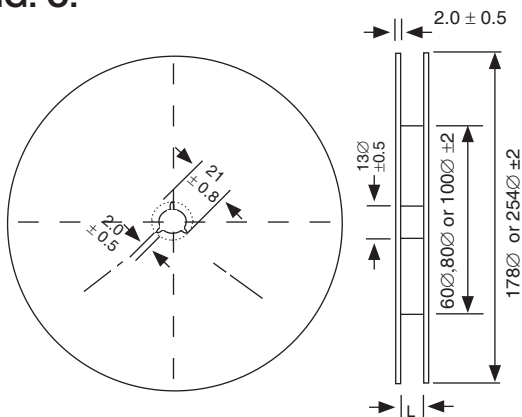
| Type    | EIA Size | A         | B         | D         | E         | F           | P <sub>0</sub> | P <sub>1</sub> | W          | Qty per 7" Reel |
|---------|----------|-----------|-----------|-----------|-----------|-------------|----------------|----------------|------------|-----------------|
| NRC25*  | 1210     | 2.9 ± 0.2 | 3.6 ± 0.2 | 1.5 ± 0.1 | 1.5 ± 0.1 | 5.65 ± 0.05 | 4.0 ± 0.1      | 4.0 ± 0.05     | 12.0 ± 0.1 | 4,000           |
| NRC50*  | 2010     | 2.9 ± 0.1 | 5.4 ± 0.1 |           |           |             |                |                |            | 4,000           |
| NRC100* | 2512     | 3.6 ± 0.1 | 6.9 ± 0.1 |           |           |             |                |                |            | 4,000           |

\* Same for JUMPER (ZO) types.



## (4) REEL SPECIFICATIONS

**FIG. C.**



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.

| Type    | EIA Size | L (mm)     |
|---------|----------|------------|
| NRC01*  | 01005    | 9.0 ± 0.3  |
| NRC02*  | 0201     | 10.0 ± 1.5 |
| NRC04*  | 0402     | 10.0 ± 1.5 |
| NRC06*  | 0603     | 10.0 ± 1.5 |
| NRC10*  | 0805     | 10.0 ± 1.5 |
| NRC12*  | 1206     | 10.0 ± 1.5 |
| NRC25   | 1210     | 10.0 ± 1.5 |
| NRC50   | 2010     | 13.5 ± 1.5 |
| NRC100* | 2512     | 13.5 ± 1.5 |

\* Same for JUMPER (ZO) types.

