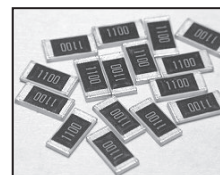


### FEATURES

- EIA STANDARD SIZING 0201, 0402, 0603, 0805, 1206, 1210, 2010 AND 2512
- SUIT FOR HIGH RELIABILITY APPLICATIONS IN HARSH ENVIRONMENTS
- AEC-Q200 QUALIFIED OPTION AVAILABLE (SEE PART NUMBERING SYSTEM)
- ALL SIZES ARE AVAILABLE IN TAPE/REEL FOR AUTOMATIC MOUNTING
- SAC REFLOW SOLDERABLE (THREE TIMES AT 260°C FOR 10 SECONDS)

**RoHS  
Compliant**  
includes all homogeneous materials

\*See Part Number System for Details



### SPECIFICATIONS

| 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)*3             | Resistance Values | Operating Temperature Range |
|-----------|----------|----------------------|-------------------------|--------------------------|---------------------------|----------------------------------|------------------------------------|-------------------|-----------------------------|
| NRC-AS02  | 0201     | 0.05W                | 25V                     | 50V                      | ±1%(F), ±5%(J)            | ±200ppm                          | 1 ~ 10M                            | E-24 & 96         | -55°C ~ +125°C              |
| NRC-AS04  | 0402     | 0.063W               | 50V                     | 100V                     | ±0.5%(D), ±1%(F), ±5%(J)  | ±100ppm<br>±200ppm               | 10 ~ 1M<br>1 ~ 9.76<br>1.02M ~ 10M | E-24 & 96         | -55°C ~ +155°C              |
| NRC-AS06  | 0603     | 0.10W                | 75V                     | 100V                     | ±0.5%(D), ±1%(F), ±5%(J)  | ±100ppm<br>±200ppm               | 10 ~ 1M<br>1 ~ 9.76<br>1.02M ~ 10M | E-24 & 96         |                             |
| NRC-AS10  | 0805     | 0.125W               | 150V                    | 300V                     | ±0.5%(D), ±1%(F), ±5%(J)  | ±100ppm<br>±200ppm               | 10 ~ 1M<br>1 ~ 9.76<br>1.02M ~ 10M | E-24 & 96         |                             |
| NRC-AS12  | 1206     | 0.25W                | 200V                    | 400V                     | ±0.5%(D), ±1%(F), ±5%(J)  | ±100ppm<br>±200ppm               | 10 ~ 1M<br>1 ~ 9.76<br>1.02M ~ 10M | E-24 & 96         |                             |
| NRC-AS25  | 1210     | 0.33W                | 200V                    | 400V                     | ±0.5%(D), ±1%(F), ±5%(J)  | ±100ppm<br>±200ppm               | 10 ~ 1M<br>1 ~ 9.76<br>1.02M ~ 10M | E-24 & 96         |                             |
| NRC-AS50  | 2010     | 0.75W                | 200V                    | 400V                     | ±0.5%(D), ±1%(F), ±5%(J)  | ±100ppm<br>±200ppm               | 10 ~ 1M<br>1 ~ 9.76<br>1.02M ~ 10M | E-24 & 96         |                             |
| NRC-AS100 | 2512     | 1.0W                 | 250V                    | 500V                     | ±0.5%(D), ±1%(F), ±5%(J)  | ±100ppm<br>±200ppm               | 10 ~ 1M<br>1 ~ 9.76<br>1.02M ~ 10M | E-24 & 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 the result of the following formula

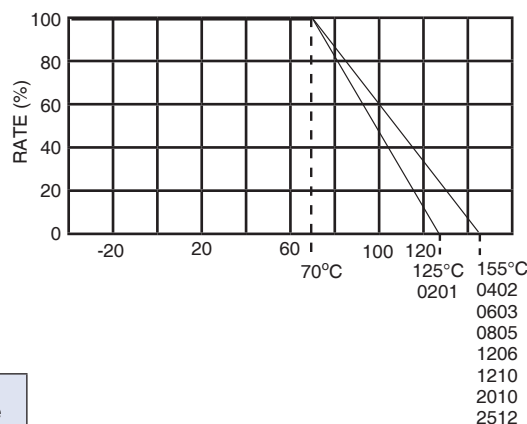
$$\sqrt{\text{Power rating (Watts)} \times \text{Resistance (Ohms)}}$$

Note \*2 - "Maximum Overload Voltage" for all resistors is the lower of the two values:

"Maximum Overload Voltage" as specified above  
or 2x the result of the following formula

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

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



### ZERO OHM JUMPERS\*

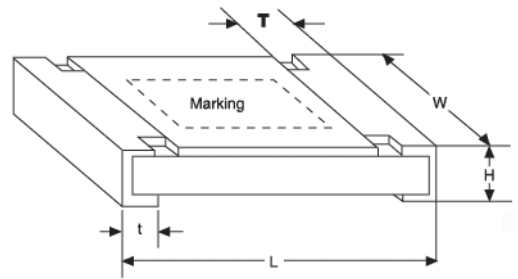
| Part Number    | EIA Size | Max. Current at 70°C | Max. Resistance | Operating Temperature Range |
|----------------|----------|----------------------|-----------------|-----------------------------|
| NRC-AS02ZOTRF  | 0201     | 1A                   | <50mΩ           | -55°C ~ +125°C              |
| NRC-AS04ZOTRF  | 0402     | 1A                   | <50mΩ           |                             |
| NRC-AS06ZOTRF  | 0603     | 1A                   | <50mΩ           | -55°C ~ +155°C              |
| NRC-AS10ZOTRF  | 0805     | 2A                   | <50mΩ           |                             |
| NRC-AS12ZOTRF  | 1206     | 2A                   | <50mΩ           |                             |
| NRC-AS25ZOTRF  | 1210     | 2.5A                 | <50mΩ           |                             |
| NRC-AS50ZOTRF  | 2010     | 3.5A                 | <50mΩ           |                             |
| NRC-AS100ZOTRF | 2512     | 4A                   | <50mΩ           |                             |

\*Optional AEC Q-200 Qualified "TRQYF" is also available



### DIMENSIONS (mm)

| Type      | EIA Size | L               | W               | H               | T               | t               |
|-----------|----------|-----------------|-----------------|-----------------|-----------------|-----------------|
| NRC-AS02  | 0201     | $0.60 \pm 0.03$ | $0.30 \pm 0.03$ | $0.23 \pm 0.03$ | $0.15 \pm 0.05$ | $0.15 \pm 0.05$ |
| NRC-AS04  | 0402     | $1.00 \pm 0.05$ | $0.50 \pm 0.05$ | $0.35 \pm 0.05$ | $0.20 \pm 0.10$ | $0.20 \pm 0.10$ |
| NRC-AS06  | 0603     | $1.60 \pm 0.10$ | $0.80 \pm 0.10$ | $0.45 \pm 0.10$ | $0.30 \pm 0.20$ | $0.30 \pm 0.20$ |
| NRC-AS10  | 0805     | $2.00 \pm 0.10$ | $1.25 \pm 0.10$ | $0.50 \pm 0.10$ | $0.35 \pm 0.20$ | $0.40 \pm 0.20$ |
| NRC-AS12  | 1206     | $3.10 \pm 0.10$ | $1.55 \pm 0.10$ | $0.55 \pm 0.10$ | $0.50 \pm 0.25$ | $0.50 \pm 0.20$ |
| NRC-AS25  | 1210     | $3.10 \pm 0.10$ | $2.60 \pm 0.15$ | $0.55 \pm 0.10$ | $0.50 \pm 0.25$ | $0.50 \pm 0.20$ |
| NRC-AS50  | 2010     | $5.00 \pm 0.10$ | $2.50 \pm 0.15$ | $0.55 \pm 0.10$ | $0.60 \pm 0.25$ | $0.50 \pm 0.20$ |
| NRC-AS100 | 2512     | $6.35 \pm 0.10$ | $3.10 \pm 0.15$ | $0.55 \pm 0.10$ | $0.60 \pm 0.25$ | $0.50 \pm 0.20$ |



### PART NUMBER SYSTEM - STANDARD PARTS

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

NRC-AS 12 J 103 TR F

- Series
- Case Size
- Tolerance Code: J =  $\pm 5\%$
- Resistance Code: First 2 figures are significant, 3rd digit is the multiplier, "R" indicates a decimal point.
- Tape & Reel Packaging
- RoHS compliant

#### PART NUMBER SYSTEM (E-96 VALUES)

NRC-AS 12 F 1002 TR F

- Series
- Case Size
- Tolerance Code: F =  $\pm 1\%$
- Resistance Code: First 2 figures are significant, 3rd digit is the multiplier, "R" indicates a decimal point.
- Tape & Reel Packaging
- RoHS compliant

### PART NUMBER SYSTEM - AUTOMOTIVE OPTION

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

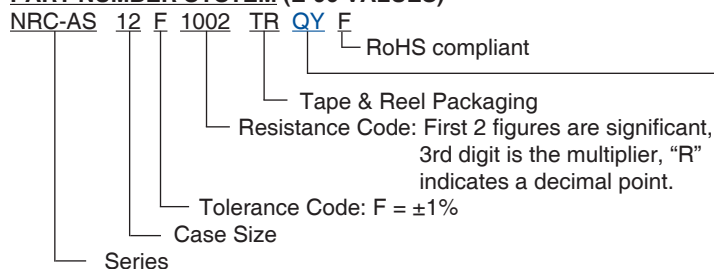
NRC-AS 12 J 103 TR QY F

- Series
- Case Size
- Tolerance Code: J =  $\pm 5\%$
- Resistance Code: First 2 figures are significant, 3rd digit is the multiplier, "R" indicates a decimal point.
- Tape & Reel Packaging
- RoHS compliant

"QY" denotes optional AEC Q-200 qualified parts suitable for automotive equipment, sourced to special production and inspection at TS-16949 certified production site

## PART NUMBER SYSTEM - AUTOMOTIVE OPTION

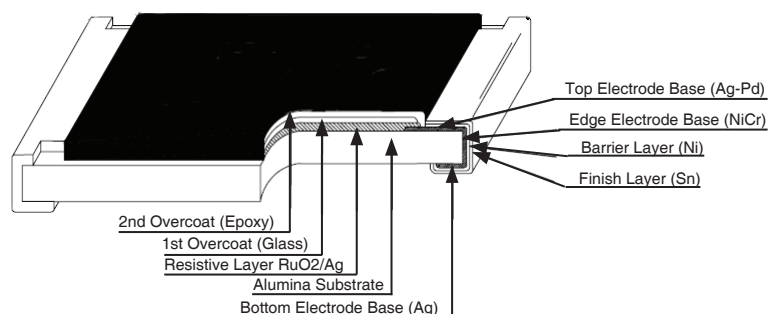
## PART NUMBER SYSTEM (E-96 VALUES)



"QY" denotes optional AEC Q-200 qualified parts suitable for automotive equipment, sourced to special production and inspection at TS-16949 certified production site

| Item                                  | Specification                                                         |                                   |                 | Test Method                                                                                        |
|---------------------------------------|-----------------------------------------------------------------------|-----------------------------------|-----------------|----------------------------------------------------------------------------------------------------|
|                                       | $\pm 0.5\%$ & $\pm 1\%$ tolerance                                     | $\pm 5\%$ tolerance               | Zero Ohm Jumper |                                                                                                    |
| Temperature Coefficient of Resistance | As specified                                                          |                                   |                 | -55°C ~ +125°C, +25°C reference point                                                              |
| Short Time Overload                   | $\Delta R \pm 1\% + 0.05\Omega$                                       | $\Delta R \pm 2\% + 0.05\Omega$   | 50m $\Omega$    | RCWV x 2.5 or Max Overloading Voltage for 5 Seconds                                                |
| Insulation Resistance                 | >10G $\Omega$                                                         |                                   |                 | Maximum Overload Voltage for 1 Minute                                                              |
| Load Life                             | $\Delta R \pm 2\% + 0.10\Omega$                                       | $\Delta R \pm 3\% + 0.10\Omega$   | 100m $\Omega$   | Max. WV +70°C, 1.5 hours ON, 0.5 hours OFF<br>Total time 1,000                                     |
| Damp Heat (with load)                 | $\Delta R \pm 2\% + 0.10\Omega$                                       | $\Delta R \pm 3\% + 0.10\Omega$   | 100m $\Omega$   | +40°C, 90% ~ 95% RH, Max. WV 1.5 hours ON, 0.5 hours OFF<br>Total time 1,000                       |
| Resistance to Dry Heat                | $\Delta R \pm 1\% + 0.05\Omega$                                       | $\Delta R \pm 1.5\% + 0.05\Omega$ | 50m $\Omega$    | +125°C or +155°C for 1000 hours                                                                    |
| Temperature Cycling                   | $\Delta R \pm 0.5\% + 0.05\Omega$                                     | $\Delta R \pm 1\% + 0.05\Omega$   | 50m $\Omega$    | -55°C to +125°C or +155°C, 5 cycles                                                                |
| Bending Strength                      | $\Delta R \pm 1\% + 0.05\Omega$                                       | $\Delta R \pm 2\% + 0.05\Omega$   | 50m $\Omega$    | Bending amplitude 3mm (2mm for 2010 & 2512)<br>One bend for 5 seconds                              |
| Resistance to Soldering Heat          | $\Delta R \pm 0.5\% + 0.05\Omega$                                     | $\Delta R \pm 1\% + 0.05\Omega$   | 50m $\Omega$    | 260°C $\pm 5^\circ\text{C}$ for 10 seconds                                                         |
| Sulfur Test                           | $\Delta R \pm 0.5\% + 0.05\Omega$                                     | $\Delta R \pm 0.5\% + 0.05\Omega$ | 50m $\Omega$    | 1,000ppm H <sub>2</sub> S, +50°C $\pm 2^\circ\text{C}$ , 91 ~ 93% RH<br>for 1,000 hours (no power) |
| Leaching Test                         | Individual leaching are $\leq 5\%$<br>Total leaching area $\leq 10\%$ |                                   |                 | +260°C for 30 seconds                                                                              |

## CONSTRUCTION

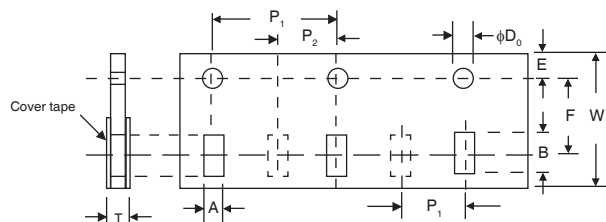


### STANDARD E-24, E-96 VALUES AND 0603 RESISTANCE CODES

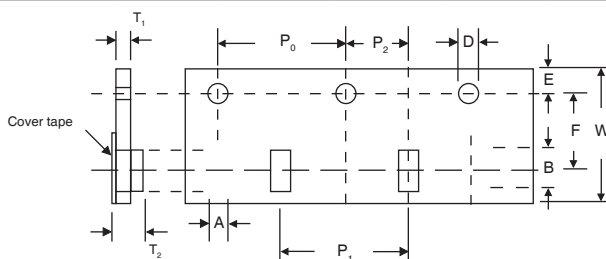
| E-24  | E-96  |      |       |      |       |      |       |      |
|-------|-------|------|-------|------|-------|------|-------|------|
| Value | Value | Code | Value | Code | Value | Code | Value | Code |
| 100   | 100   | 01   | 102   | 02   | 105   | 03   | 107   | 04   |
| 110   | 110   | 05   | 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   |

### PAPER CARRIER TAPE DIMENSIONS (mm)

| Type     | EIA Case Size | A         | B         | W<br>± 0.20 | E<br>± 0.10 | F<br>± 0.05 | P <sub>0</sub><br>± 0.10 | P <sub>1</sub><br>± 0.05 | P <sub>2</sub><br>± 0.05 | φD <sub>0</sub><br>+0.1/-0 | T         |
|----------|---------------|-----------|-----------|-------------|-------------|-------------|--------------------------|--------------------------|--------------------------|----------------------------|-----------|
| NRC-AS02 | 0201          | 0.38±0.05 | 0.68±0.05 | 8.0         | 1.75        | 3.50        | 4.00                     | 2.00                     | 2.00                     | 1.50                       | 0.42±0.20 |
| NRC-AS04 | 0402          | 0.65±0.10 | 1.15±0.10 | 8.0         | 1.75        | 3.50        | 4.00                     | 2.00                     | 2.00                     | 1.50                       | 0.45±0.10 |
| NRC-AS06 | 0603          | 1.10±0.10 | 1.90±0.10 | 8.0         | 1.75        | 3.50        | 4.00                     | 4.00                     | 2.00                     | 1.50                       | 0.70±0.10 |
| NRC-AS10 | 0805          | 1.60±0.10 | 2.40±0.20 | 8.0         | 1.75        | 3.50        | 4.00                     | 4.00                     | 2.00                     | 1.50                       | 0.85±0.10 |
| NRC-AS12 | 1206          | 1.90±0.10 | 3.50±0.20 | 8.0         | 1.75        | 3.50        | 4.00                     | 4.00                     | 2.00                     | 1.50                       | 0.85±0.10 |
| NRC-AS25 | 1210          | 2.90±0.10 | 3.50±0.20 | 8.0         | 1.75        | 3.50        | 4.00                     | 4.00                     | 2.00                     | 1.50                       | 0.85±0.10 |

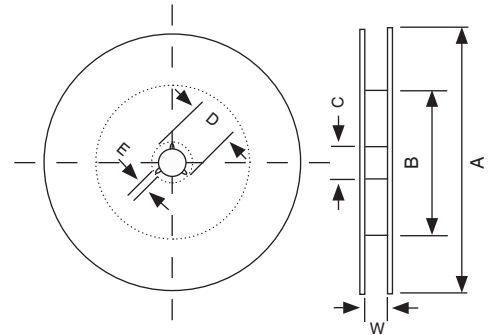


| Type      | EIA Case Size | A        | B        | W<br>± 0.30 | E<br>± 0.10 | F<br>± 0.05 | P <sub>0</sub><br>± 0.10 | P <sub>1</sub><br>± 0.05 | P <sub>2</sub><br>± 0.05 | φD <sub>0</sub><br>+0.1/-0 | T max. |
|-----------|---------------|----------|----------|-------------|-------------|-------------|--------------------------|--------------------------|--------------------------|----------------------------|--------|
| NRC-AS50  | 2010          | 2.8±0.10 | 5.5±0.10 | 12.0        | 1.75        | 5.50        | 4.00                     | 4.00                     | 2.00                     | 1.50                       | 1.2    |
| NRC-AS100 | 2512          | 3.5±0.10 | 6.7±0.10 | 12.0        | 1.75        | 5.50        | 4.00                     | 4.00                     | 2.00                     | 1.50                       | 1.2    |



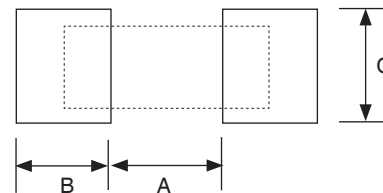
### REEL DIMENSIONS (mm)

| Type      | EIA Case Size | Reel Quantity | Tape Width | Reel Diameter | ϕB         | ϕC        | W        | T         |
|-----------|---------------|---------------|------------|---------------|------------|-----------|----------|-----------|
| NRC-AS02  | 0201          | 15,000        | 8mm        | 178.5 ± 1.5   | 60.0 +1/-0 | 13.0 ±0.2 | 9.0 ±0.5 | 12.5 ±0.5 |
| NRC-AS04  | 0402          | 10,000        |            |               |            |           |          |           |
| NRC-AS06  | 0603          | 5,000         |            |               |            |           |          |           |
| NRC-AS10  | 0805          | 5,000         |            |               |            |           |          |           |
| NRC-AS12  | 1206          | 5,000         |            |               |            |           |          |           |
| NRC-AS25  | 1210          | 5,000         | 12mm       | 178.5 ± 1.5   | 100 ±0.5   | 13.0 ±0.2 | 9.5 ±0.5 | 13.5 ±0.5 |
| NRC-AS50  | 2010          | 4,000         |            |               |            |           |          |           |
| NRC-AS100 | 2512          | 4,000         |            |               |            |           |          |           |



### LAND PATTERN DIMENSIONS (mm)

| Type      | EIA Case Size | A    | B    | C    |
|-----------|---------------|------|------|------|
| NRC-AS02  | 0201          | 0.30 | 0.25 | 0.30 |
| NRC-AS04  | 0402          | 0.50 | 0.45 | 0.60 |
| NRC-AS06  | 0603          | 0.90 | 0.60 | 0.90 |
| NRC-AS10  | 0805          | 1.20 | 0.70 | 1.30 |
| NRC-AS12  | 1206          | 2.00 | 0.90 | 1.60 |
| NRC-AS25  | 1210          | 2.00 | 0.90 | 2.80 |
| NRC-AS50  | 2010          | 3.80 | 0.90 | 2.80 |
| NRC-AS100 | 2512          | 3.80 | 1.60 | 3.50 |



### REFLOW SOLDERING TEMPERATURE PROFILE

