



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

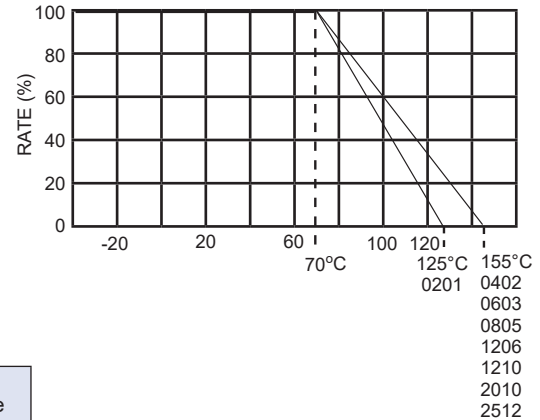
$$\sqrt{\text{Power rating (Watts)} \times \text{Resistance (Ohms)}}$$

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:



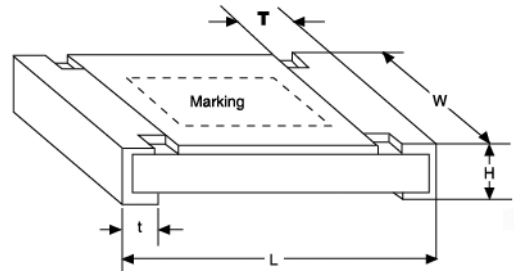
### ZERO OHM JUMPERS\*

| 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           | -55°C ~ +155°C              |
| NRC-AS06ZOTRF  | 0603     | 1A                   | <50mΩ           |                             |
| 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           |                             |

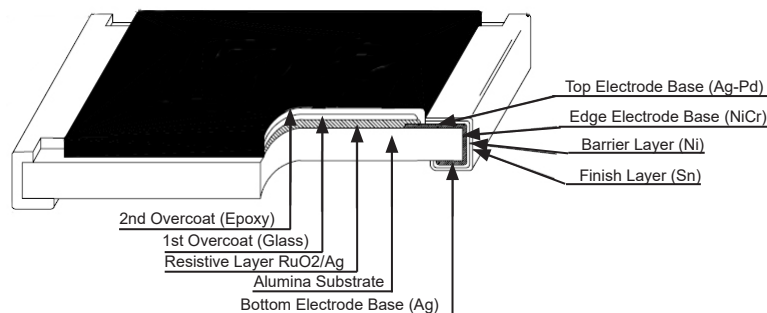
\*Optional AEC Q-200 Qualified "TRQYF" is also available

### DIMENSIONS (mm)

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



### CONSTRUCTION



### PART NUMBER SYSTEM

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

NRC-AS 12 J 103 TR E

- Series
- Case Size and Power Rating Code (add "P" for higher power rated parts)
- 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 E

- Series
- Case Size and Power Rating Code (add "P" for higher power rated parts)
- Tolerance Code: F =  $\pm 1\%$
- Resistance Code: First 3 figures are significant, 4th digit is the multiplier, "R" indicates a decimal point.
- Tape & Reel Packaging
- RoHS compliant

### PART NUMBER SYSTEM - AUTOMOTIVE OPTION (Standard Power Ratings Only)

#### 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 IATF-16949 certified production site

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

NRC-AS 12 F 1002 TR QY F

- Series
- Case Size
- Tolerance Code: F =  $\pm 1\%$
- Resistance Code: First 3 figures are significant, 4th 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 IATF-16949 certified production site

### ENVIRONMENTAL CHARACTERISTICS (NON--AUTOMOTIVE)

| 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                                                                              |

### ENVIRONMENTAL CHARACTERISTICS (AUTOMOTIVE GRADE PRODUCTS)

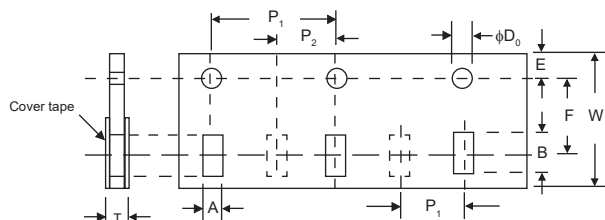
| Item                                  | Specification                                                         |                                   |                 | Test Method                                                                                                                             |
|---------------------------------------|-----------------------------------------------------------------------|-----------------------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------|
|                                       | $\pm 0.5\%$ & $\pm 1\%$ tolerance                                     | $\pm 5\%$ tolerance               | Zero Ohm Jumper |                                                                                                                                         |
| Temperature Coefficient of Resistance | As specified                                                          |                                   |                 | JIS C5201-1 4.8, IEC 60115-1 4.8<br>-55°C ~ +125°C, +25°C reference temperature                                                         |
| Short Time Overload                   | $\Delta R \pm 1\% + 0.05\Omega$                                       | $\Delta R \pm 2\% + 0.05\Omega$   | <50m $\Omega$   | JIS C5201-1 4.13, IEC 60115-1 4.13<br>RCWV x 2.5 or Max Overloading Voltage whichever is less for 5 Seconds                             |
| Insulation Resistance                 | >10G $\Omega$                                                         |                                   |                 | JIS C5201-1 4.6, IEC 60115-1 4.6<br>Maximum Overload Voltage for 1 Minute                                                               |
| Load Life                             | $\Delta R \pm 2\% + 0.10\Omega$                                       | $\Delta R \pm 3\% + 0.10\Omega$   | <100m $\Omega$  | JIS C5201-1 4.25, IEC 60115-1 4.25.1, MIL-STD-202, Method 108<br>Rated WV, +70°C, 1.5 hours ON, 0.5 hours OFF<br>Total time 1,000 hours |
| Biased Humidity                       | $\Delta R \pm 2\% + 0.10\Omega$                                       | $\Delta R \pm 3\% + 0.10\Omega$   | <100m $\Omega$  | MIL-STD-202, Method 103<br>1000 hours, +85°C/85% RH 10% of operating power                                                              |
| High Temperature Exposure             | $\Delta R \pm 1\% + 0.05\Omega$                                       | $\Delta R \pm 1.5\% + 0.05\Omega$ | <50m $\Omega$   | MIL-STD-202, Method 108<br>+155°C for 1000 hours                                                                                        |
| Temperature Cycling                   | $\Delta R \pm 0.5\% + 0.05\Omega$                                     | $\Delta R \pm 1.5\% + 0.05\Omega$ | <50m $\Omega$   | JESD22 Method JA-104<br>-55°C to +125°C, 1000 cycles                                                                                    |
| Bending Strength                      | $\Delta R \pm 1\% + 0.05\Omega$                                       | $\Delta R \pm 1\% + 0.05\Omega$   | <50m $\Omega$   | AEC-Q200-005<br>Bending amplitude 3mm (2mm for 2010 & 2512)<br>One bend for 60 seconds                                                  |
| Resistance to Solvents                | No visible damage of appearance and marking                           |                                   |                 | MIL-STD-202, Method 215<br>Add aqueous wash chemical (OKEM clean or equivalent). Do not use banned solvents                             |
| Terminal Strength                     | No broken terminals                                                   |                                   |                 | AEC-Q200-006<br>Force of 1.8kg for 60 seconds                                                                                           |
| Solderability                         | >95% Coverage                                                         |                                   |                 | JIS C5201-1 4.17, IEC 60115-1 4.17, J-STD-002<br>+245°C $\pm 5^\circ\text{C}$ for 3 seconds                                             |
| Resistance to Soldering Heat          | $\Delta R \pm 0.5\% + 0.05\Omega$                                     | $\Delta R \pm 1\% + 0.05\Omega$   | <50m $\Omega$   | MIL-STD-202, Method 210<br>260°C $\pm 5^\circ\text{C}$ for 10 seconds                                                                   |
| Voltage Proof                         | No breakdown or flashover                                             |                                   |                 | JIS C5201-1 4.7, IEC 60115-1 4.7<br>1.42 times maximum operating voltage for 1 minute                                                   |
| Flammability                          | No ignition of the tissue paper or scorching of the pinewood board    |                                   |                 | UL-94<br>V-0 or V-1 are acceptable. Electrical test not required                                                                        |
| Sulfur Test                           | $\Delta R \pm 0.5\%$                                                  |                                   | <50m $\Omega$   | ASTM-B-809-95<br>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 $\leq 10\%$ |                                   |                 | JIS C5201-1 4.18, IEC 60068-2-58 8.2.1<br>+260°C for 30 seconds                                                                         |
| Mechanical Shock                      | $\Delta R \pm 0.25\% + 0.05\Omega$                                    | $\Delta R \pm 1.0\% + 0.05\Omega$ | <50m $\Omega$   | MIL-STD-202, Method 213<br>Wave Form: Tolerance for half sine wave pulse.<br>Peak Value is 100g's. Normal duration (D) is 6.            |
| Vibration                             | $\Delta R \pm 0.5\% + 0.05\Omega$                                     | $\Delta R \pm 1.0\% + 0.05\Omega$ | <50m $\Omega$   | MIL-STD-202, Method 204<br>5g's for 20 minutes, 12 cycles each of 3 orientations,<br>10 ~ 2000Hz                                        |
| ESD                                   | $\Delta R \pm 1.0\% + 0.05\Omega$                                     |                                   | <50m $\Omega$   | AEC-Q200-002<br>Human body, 2KV                                                                                                         |

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

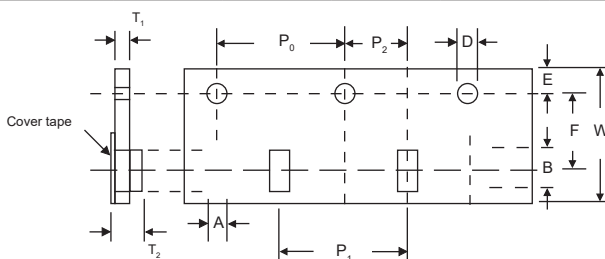
| E-24  | E-96  |      |       |      |       |      |       |      |
|-------|-------|------|-------|------|-------|------|-------|------|
| Value | Value | Code | Value | Code | Value | Code | Value | Code |
| 100   | 100   | 01   | 102   | 02   | 105   | 03   | 107   | 04   |
| 110   | 110   | 05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

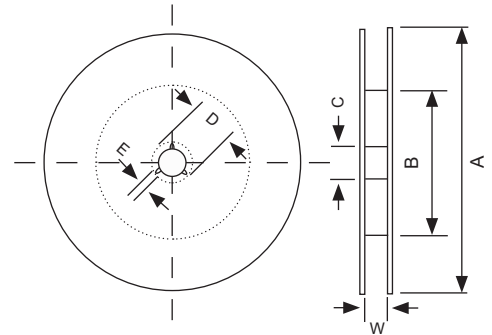


| Type      | EIA Case Size | A        | B        | W<br>± 0.30 | E<br>± 0.10 | F<br>± 0.05 | P <sub>0</sub><br>± 0.10 | P <sub>1</sub><br>± 0.05 | P <sub>2</sub><br>± 0.05 | φD <sub>0</sub><br>+0.1/-0 | T max. |
|-----------|---------------|----------|----------|-------------|-------------|-------------|--------------------------|--------------------------|--------------------------|----------------------------|--------|
| 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    |



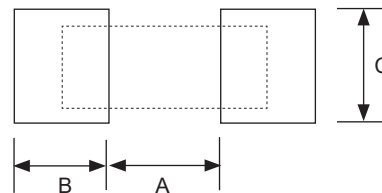
### REEL DIMENSIONS (mm)

| 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        |            |               | 100 ±0.5   |           | 9.5 ±0.5  | 13.5 ±0.5 |
| NRC-AS06  | 0603          | 5,000         |            |               |            |           |           |           |
| NRC-AS10  | 0805          | 5,000         |            |               |            |           |           |           |
| NRC-AS12  | 1206          | 5,000         |            |               |            |           |           |           |
| NRC-AS25  | 1210          | 5,000         | 12mm       | 60.0 +1/-0    | 13.0 ±0.5  | 13.0 ±0.5 | 15.5 ±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 Heat Profile and Limits**  
 → [www.nicomp.com/resource/files/resistive/NIC-ChipR-Reflow-Sept2020-Rev2.pdf](http://www.nicomp.com/resource/files/resistive/NIC-ChipR-Reflow-Sept2020-Rev2.pdf)  
 Wave soldering? – Please review your wave soldering process profile with NIC: [tpmg@nicomp.com](mailto:tpmg@nicomp.com)