

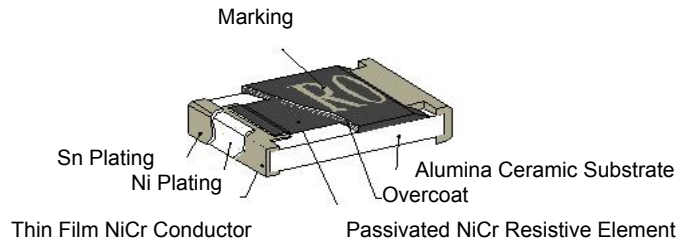
# Thin Film Precision Chip Resistor – AR Series



## Features

- Thin Film Passivated NiCr Resistor
- Very Tight Tolerance from  $\pm 0.01\%$ ~ $1\%$
- Extremely Low TCR from  $\pm 5$ ~ $\pm 50$  PPM/ $^{\circ}\text{C}$
- Wide R-Value Range

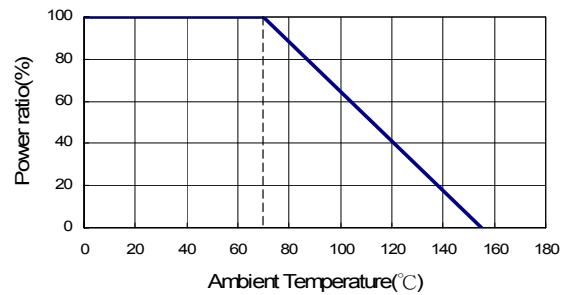
## Construction



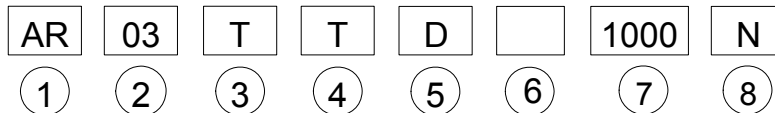
## Applications

- Medical Equipment
- Testing / Measurement Equipment
- Consumer Product
- Printer Equipment
- Automatic Equipment Controller
- Converters
- Communication Device, Cell phone, GPS, PDA

## Derating Curve



## Part Numbering



### ① Product Type

| Product Type |                                   |
|--------------|-----------------------------------|
| AR           | Thin Film Precision Chip Resistor |

### ② Dimensions (LxW)

| Codes | Dimensions (LxW) | EIA  |
|-------|------------------|------|
| AR02  | 1.00×0.50mm      | 0402 |
| AR03  | 1.60×0.80mm      | 0603 |
| AR05  | 2.00×1.25mm      | 0805 |
| AR06  | 3.00×1.50mm      | 1206 |
| AR10  | 4.90×2.40mm      | 2010 |
| AR12  | 6.30×3.10mm      | 2512 |

### ③ Resistance Tolerance

| Codes | Resistance Tolerance |
|-------|----------------------|
| T     | $\pm 0.01\%$         |
| A     | $\pm 0.05\%$         |
| B     | $\pm 0.10\%$         |
| C     | $\pm 0.25\%$         |
| D     | $\pm 0.50\%$         |
| F     | $\pm 1.00\%$         |

### ④ Packaging

| Codes | Type        |
|-------|-------------|
| T     | Taping Reel |
| B     | Bulk        |

### ⑤ TCR

| Codes | Type                             |
|-------|----------------------------------|
| S     | $\pm 5$ PPM/ $^{\circ}\text{C}$  |
| B     | $\pm 10$ PPM/ $^{\circ}\text{C}$ |
| N     | $\pm 15$ PPM/ $^{\circ}\text{C}$ |
| C     | $\pm 25$ PPM/ $^{\circ}\text{C}$ |
| D     | $\pm 50$ PPM/ $^{\circ}\text{C}$ |

### ⑥ Higher Power Rating

| Codes | Power Rating       |
|-------|--------------------|
|       | Standard / Special |
| U     | 1/2W               |
| V     | 1/4W               |
| W     | 1/8W               |
| X     | 1/10W              |
| T     | 1W                 |

### ⑦ Resistance

| Codes | Type            |
|-------|-----------------|
| 0010  | 1 $\Omega$      |
| 4R70  | 4.7 $\Omega$    |
| 1000  | 100 $\Omega$    |
| 2201  | 2200 $\Omega$   |
| 1002  | 10000 $\Omega$  |
| 4992  | 49900 $\Omega$  |
| 1003  | 100000 $\Omega$ |

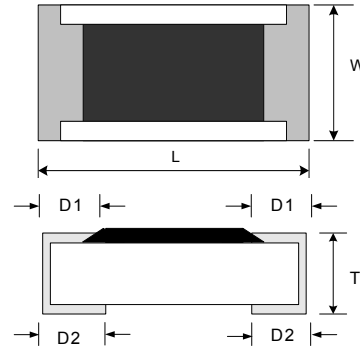
### ⑧ Marking

| Codes | Type                           |
|-------|--------------------------------|
|       | Standard Marking for E96 / E24 |
| N     | No Marking                     |

## Dimensions

Unit: mm

| Codes | L         | W         | T         | D1        | D2        |
|-------|-----------|-----------|-----------|-----------|-----------|
| AR02  | 1.00±0.05 | 0.50±0.05 | 0.30±0.05 | 0.20±0.10 | 0.20±0.10 |
| AR03  | 1.55±0.10 | 0.80±0.10 | 0.45±0.10 | 0.30±0.20 | 0.30±0.20 |
| AR05  | 2.00±0.15 | 1.25±0.15 | 0.55±0.10 | 0.30±0.20 | 0.40±0.25 |
| AR06  | 3.05±0.15 | 1.55±0.15 | 0.55±0.10 | 0.42±0.20 | 0.35±0.25 |
| AR10  | 4.90±0.15 | 2.40±0.15 | 0.55±0.10 | 0.60±0.30 | 0.50±0.25 |
| AR12  | 6.30±0.15 | 3.10±0.15 | 0.55±0.10 | 0.60±0.30 | 0.50±0.25 |



## Standard Electrical Specifications

| Item Type   | Power Rating at 70°C | Operating Temp. Range | Max Operating Voltage | Max Overloading Voltage | Resistance Tolerance       | Resistance Range | TCR (PPM/°C) |
|-------------|----------------------|-----------------------|-----------------------|-------------------------|----------------------------|------------------|--------------|
| AR02 (0402) | 1/16W                | -55 ~ +155°C          | 25V                   | 50V                     | ±0.10%<br>±0.25%<br>±0.50% | 10Ω~205KΩ        | ±25<br>±50   |
| AR03 (0603) | 1/16W                | -55 ~ +155°C          | 50V                   | 100V                    | ±0.05%                     | 4.7Ω~150KΩ       | ±25<br>±50   |
|             |                      |                       |                       |                         | ±0.10%                     | 4.7Ω~1MΩ         |              |
| AR05 (0805) | 1/10W                | -55 ~ +155°C          | 100V                  | 200V                    | ±0.25%<br>±0.50%           | 2Ω~1MΩ           | ±25<br>±50   |
|             |                      |                       |                       |                         | ±0.05%                     | 4.7Ω~500KΩ       |              |
|             |                      |                       |                       |                         | ±0.10%                     | 4.7Ω~2MΩ         |              |
| AR06 (1206) | 1/8W                 | -55 ~ +155°C          | 150V                  | 300V                    | ±0.25%<br>±0.50%           | 1Ω~2MΩ           | ±25<br>±50   |
|             |                      |                       |                       |                         | ±0.05%                     | 4.7Ω~1MΩ         |              |
|             |                      |                       |                       |                         | ±0.10%                     | 4.7Ω~2.5MΩ       |              |
| AR10 (2010) | 1/4W                 | -55 ~ +155°C          | 150V                  | 300V                    | ±0.05%                     | 4.7Ω~1MΩ         | ±25<br>±50   |
|             |                      |                       |                       |                         | ±0.10%                     | 4.7Ω~3MΩ         |              |
| AR12 (2512) | 1/2W                 |                       |                       |                         | ±0.25%<br>±0.50%           | 1Ω~3MΩ           |              |

\*Viking is capable of manufacturing the optional spec based on customer's requirement.

## Special Electrical Specifications

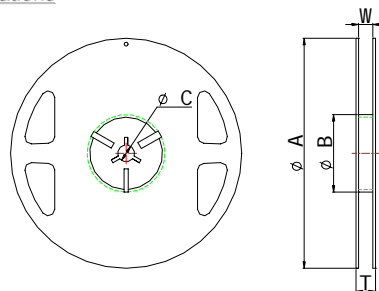
| Item Type   | Power Rating at 70°C | Operating Temp. Range | Max Operating Voltage | Max Overloading Voltage | Resistance Tolerance | Resistance Range | TCR (PPM/°C) |
|-------------|----------------------|-----------------------|-----------------------|-------------------------|----------------------|------------------|--------------|
| AR02 (0402) | 1/16W                | -55 ~ +155°C          | 25V                   | 50V                     | ±0.01%               | 49.9Ω~3KΩ        | ±5           |
|             |                      |                       |                       |                         | ±0.05%<br>±0.10%     | 49.9Ω~12KΩ       | ±10<br>±15   |
| AR03 (0603) | 1/16W                | -55 ~ +155°C          | 50V                   | 100V                    | ±0.01%               | 25Ω~15KΩ         | ±5           |
|             |                      |                       |                       |                         | ±0.05%<br>±0.10%     | 25Ω~100KΩ        | ±10<br>±15   |
|             |                      |                       |                       |                         | ±0.10%               | 4.7Ω~332KΩ       | ±10          |
| AR05 (0805) | 1/10W                | -55 ~ +155°C          | 100V                  | 200V                    | ±0.01%               | 25Ω~30KΩ         | ±5           |
|             |                      |                       |                       |                         | ±0.05%<br>±0.10%     | 25Ω~200KΩ        | ±10<br>±15   |
|             |                      |                       |                       |                         | ±0.05%<br>±0.10%     | 4.7Ω~500KΩ       | ±10          |
| AR06 (1206) | 1/8W                 | -55 ~ +155°C          | 150V                  | 300V                    | ±0.01%               | 25Ω~50KΩ         | ±5           |
|             |                      |                       |                       |                         | ±0.05%<br>±0.10%     | 25Ω~500KΩ        | ±10<br>±15   |
|             |                      |                       |                       |                         | ±0.10%               | 4.7Ω~1MΩ         | ±10          |
| AR10 (2010) | 1/4W                 | -55 ~ +155°C          | 150V                  | 300V                    | ±0.01%               | 25Ω~100KΩ        | ±5           |
|             |                      |                       |                       |                         | ±0.05%<br>±0.10%     | 25Ω~500KΩ        | ±10<br>±15   |
|             |                      |                       |                       |                         | ±0.10%               | 4.7Ω~1MΩ         | ±10          |
| AR12 (2512) | 1/2W                 | -55 ~ +155°C          | 150V                  | 300V                    | ±0.01%               | 25Ω~100KΩ        | ±5           |
|             |                      |                       |                       |                         | ±0.05%<br>±0.10%     | 25Ω~500KΩ        | ±10<br>±15   |
|             |                      |                       |                       |                         | ±0.10%               | 4.7Ω~1MΩ         | ±10          |

## Higher Power Rating Electrical Specifications

| Item Type   | Power Rating at 70°C | Operating Temp. Range | Max Operating Voltage | Max Overloading Voltage | Resistance Tolerance       | Resistance Range | TCR (PPM/°C) |
|-------------|----------------------|-----------------------|-----------------------|-------------------------|----------------------------|------------------|--------------|
| AR03 (0603) | 1/10W                | -55 ~ +155°C          | 50V                   | 100V                    | ±0.10%<br>±0.25%<br>±0.50% | 10Ω~332KΩ        | ±25<br>±50   |
| AR05 (0805) | 1/8W                 | -55 ~ +155°C          | 150V                  | 300V                    | ±0.10%<br>±0.25%<br>±0.50% | 4.7Ω~1MΩ         | ±25<br>±50   |
| AR06 (1206) | 1/4W                 | -55 ~ +155°C          | 200V                  | 400V                    | ±0.10%<br>±0.25%<br>±0.50% | 4.7Ω~1MΩ         | ±25<br>±50   |

## Packaging

### Packaging Quantity & Reel Specifications

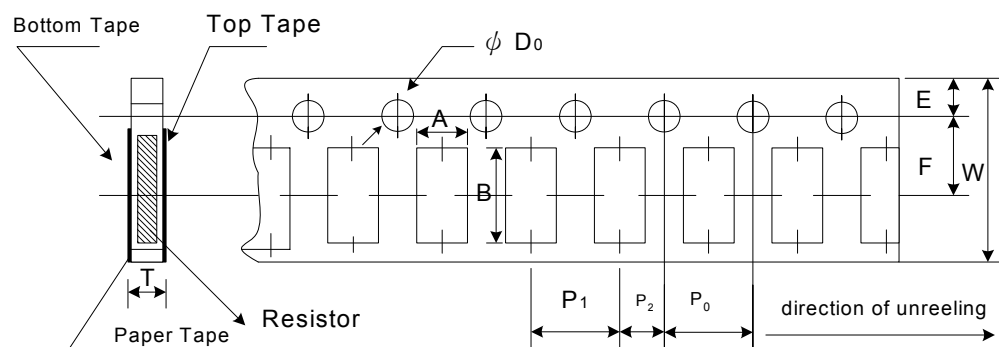


Unit: mm

| Codes | ΦA    | ΦB       | ΦC        | W         | T         | Paper Tape (EA) | Emboss Plastic Tape (EA) |
|-------|-------|----------|-----------|-----------|-----------|-----------------|--------------------------|
| AR02  | 178±1 | 60.0+0.5 | 13.0±0.20 | 9.00±0.50 | 12.0±0.15 | 10,000          | -                        |
| AR03  | 178±1 | 60.0+0.5 | 13.0±0.20 | 9.00±0.50 | 12.0±0.15 | 5,000           | -                        |
| AR05  | 178±1 | 60.0+0.5 | 13.0±0.20 | 9.00±0.50 | 12.0±0.15 | 5,000           | -                        |
| AR06  | 178±1 | 60.0+0.5 | 13.0±0.20 | 9.00±0.50 | 12.0±0.15 | 5,000           | -                        |
| AR10  | 178±1 | 60.2±0.5 | 13.0±1.00 | 13.2±1.50 | 16.0±0.20 | -               | 4,000                    |
| AR12  | 178±1 | 60.2±0.5 | 13.0±0.50 | 13.2±1.50 | 16.0±0.20 | -               | 4,000                    |

## Packaging

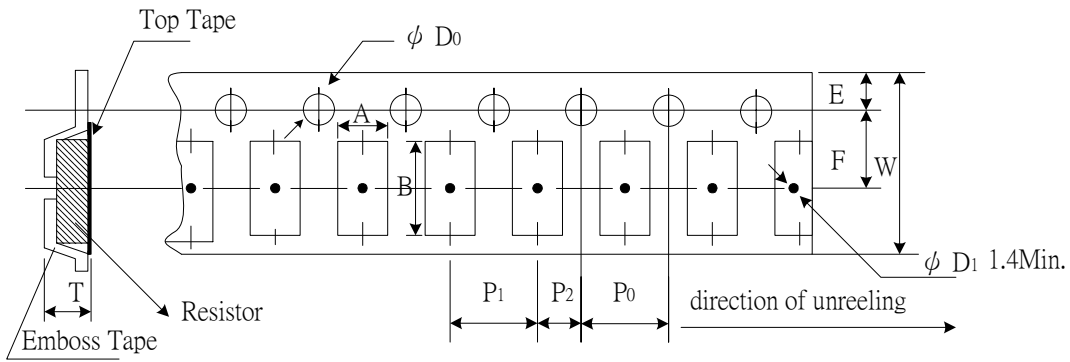
### Paper Tape Specifications



Unit: mm

| Codes | A         | B         | W         | E         | F        | P0        | P1        | P2        | ΦD0       | T         |
|-------|-----------|-----------|-----------|-----------|----------|-----------|-----------|-----------|-----------|-----------|
| AR02  | 0.70±0.05 | 1.16±0.05 | 8.00±0.10 | 1.75±0.05 | 3.5±0.05 | 4.00±0.10 | 2.00±0.05 | 2.00±0.05 | 1.55±0.05 | 0.40±0.03 |
| AR03  | 1.10±0.05 | 1.90±0.05 | 8.00±0.10 | 1.75±0.05 | 3.5±0.05 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.55±0.05 | 0.60±0.03 |
| AR05  | 1.60±0.05 | 2.37±0.05 | 8.00±0.10 | 1.75±0.05 | 3.5±0.05 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.55±0.05 | 0.75±0.05 |
| AR06  | 2.00±0.05 | 3.55±0.05 | 8.00±0.10 | 1.75±0.05 | 3.5±0.05 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.55±0.05 | 0.75±0.05 |

### Emboss Plastic Tape Specifications



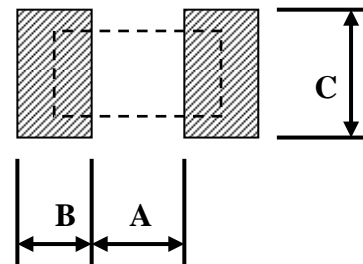
Unit: mm

| Codes | A         | B         | W         | E         | F        | P <sub>0</sub> | P <sub>1</sub> | P <sub>2</sub> | ΦD <sub>0</sub> | T         |
|-------|-----------|-----------|-----------|-----------|----------|----------------|----------------|----------------|-----------------|-----------|
| AR10  | 2.85±0.10 | 5.45±0.10 | 12.0±0.10 | 1.75±0.10 | 5.5±0.05 | 4.00±0.05      | 4.00±0.10      | 2.00±0.05      | 1.50+0.10       | 1.00±0.20 |
| AR12  | 3.40±0.10 | 6.65±0.10 | 12.0±0.10 | 1.75±0.10 | 5.5±0.05 | 4.00±0.05      | 4.00±0.10      | 2.00±0.05      | 1.50+0.10       | 1.00±0.20 |

### Recommend Land Pattern

Unit : mm

| Codes | A    | B    | C        |
|-------|------|------|----------|
| AR12  | 4.90 | 1.60 | 3.10±0.2 |
| AR10  | 3.60 | 1.40 | 2.50±0.2 |
| AR06  | 2.00 | 1.15 | 1.70±0.2 |
| AR05  | 1.00 | 1.00 | 1.35±0.2 |
| AR03  | 0.80 | 1.00 | 0.90±0.2 |
| AR02  | 0.50 | 0.50 | 0.60±0.2 |



## Environmental Characteristics

| Test Item                             | Specification                              |                       | Test Method   |
|---------------------------------------|--|-----------------------|---|
|                                       | Tol. $\leq 0.05\%$                         | Tol. $> 0.05\%$       |   |
| Temperature Coefficient of Resistance | As Spec                                    |                       | <b>MIL-STD-202F Method 304</b><br>+25/-55/+25/+125/+25°C  |
| Short Time Overload                   | $\Delta R \pm 0.05\%$                      | $\Delta R \pm 0.5\%$  | <b>JIS-C-5202-5.5</b><br>RCWV*2.5 or Max Overloading Voltage · 5 seconds                                    |
|                                       | $\Delta R \pm 0.5\%$ for high power rating |                       |   |
| Dielectric Withstand Voltage          | By type                                    |                       | <b>MIL-STD-202F Method 301</b><br>Apply Max Overload Voltage for 1 minute                                   |
| Insulation Resistance                 | $> 1000M\Omega$                            |                       | <b>MIL-STD-202F Method 302</b><br>Apply $100V_{DC}$ for 1 minute  |
| Thermal Shock                         | $\Delta R \pm 0.05\%$                      | $\Delta R \pm 0.25\%$ | <b>MIL-STD-202F Method 107G</b><br>-55°C ~ 150°C, 100 cycles  |
| Load Life                             | $\Delta R \pm 0.05\%$                      | $\Delta R \pm 0.2\%$  | <b>MIL-STD-202F Method 108A</b><br>RCWV · 70°C · 1.5 hours ON · 0.5 hours OFF, total 1000~1048 hours        |
|                                       | $> 7k\Omega$ $\Delta R \pm 0.5\%$          |                       |   |
|                                       | $\Delta R \pm 0.5\%$ for high power rating |                       |   |
| Humidity ( Steady State )             | $\Delta R \pm 0.05\%$                      | $\Delta R \pm 0.3\%$  | <b>MIL-STD-202F Method 103B</b><br>40°C , 90~95%RH, RCWV 1.5 hours ON, 0.5 hours OFF, total 1000~1048 hours |
|                                       | $\Delta R \pm 0.5\%$ for high power rating |                       |   |
| Resistance to Dry Heat                | $\Delta R \pm 0.05\%$                      | $\Delta R \pm 0.2\%$  | <b>JIS-C-5202-7.2</b><br>96 hours @ +155°C without load   |
| Low Temperature Operation             | $\Delta R \pm 0.05\%$                      | $\Delta R \pm 0.2\%$  | <b>JIS-C-5202-7.1</b><br>1 hours, -65°C, followed by 45 minutes of RCWV                                     |
|                                       | $\Delta R \pm 0.5\%$ for high power rating |                       |   |
| Bending Strength                      | $\Delta R \pm 0.05\%$                      | $\Delta R \pm 0.2\%$  | <b>JIS-C-5202-6.1.4</b><br>Bending Amplitude 3mm for 10 seconds   |
| Solderability                         | 95%min coverage                            |                       | <b>MIL-STD-202F Method 208H</b><br>245°C $\pm 5^\circ C$ , 2 $\pm 0.5$ (sec)                                |
| Resistance to Soldering Heat          | $\Delta R \pm 0.05\%$                      | $\Delta R \pm 0.2\%$  | <b>MIL-STD-202F Method 210E</b><br>260 $\pm 5^\circ C$ , 10 $\pm 1$ seconds                                 |

\* Storage Temperature : 25 $\pm 3^\circ C$ ; Humidity <80%RH