

## ARNA series

### Thin Film High Precision Chip Resistor Automotive

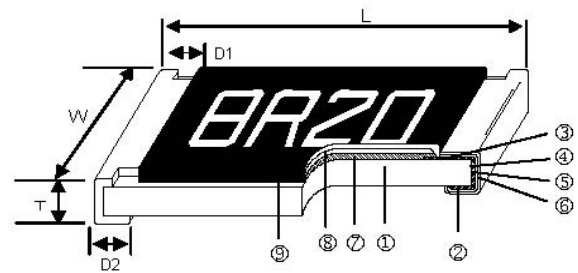
#### ◆ Features

- » Advanced thin film technology
- » Meet AEC-Q200 test
- » Special materials, design, and processing for high sulfur applications.
- » Test proven immunity to humidity, moisture, and sulfur.

#### ◆ Applications

- » Automotive.
- » Medical equipment
- » Testing/ Measurement equipment
- » Printer equipment
- » Automatic equipment controller
- » Converters
- » Communication device, Smart phone  
Navigation system

#### ◆ Construction



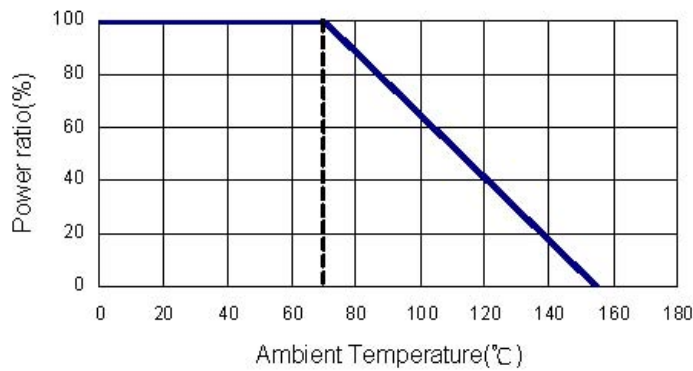
|   |                       |   |                         |   |                       |
|---|-----------------------|---|-------------------------|---|-----------------------|
| 1 | Alumina Substrate     | 4 | Edge Electrode (NiCr)   | 7 | Resistor Layer (NiCr) |
| 2 | Bottom Electrode (Ag) | 5 | Barrier Layer (Ni)      | 8 | Overcoat (Epoxy)      |
| 3 | Top Electrode (Ag-Pd) | 6 | External Electrode (Sn) | 9 | Marking               |

#### ◆ Dimensions

Unit: mm

| Type     | L         | W         | T         | D1        | D2        |
|----------|-----------|-----------|-----------|-----------|-----------|
| ARNA0402 | 1.00±0.10 | 0.50±0.05 | 0.30±0.05 | 0.20±0.10 | 0.20±0.10 |
| ARNA0603 | 1.60±0.20 | 0.80±0.15 | 0.45±0.10 | 0.30±0.20 | 0.30±0.20 |
| ARNA0805 | 2.00±0.20 | 1.25±0.15 | 0.55±0.10 | 0.30±0.20 | 0.40±0.25 |
| ARNA1206 | 3.05±0.15 | 1.60±0.20 | 0.55±0.15 | 0.42±0.20 | 0.45±0.25 |
| ARNA1210 | 3.10±0.15 | 2.50±0.20 | 0.55±0.15 | 0.40±0.20 | 0.55±0.25 |
| ARNA2010 | 5.00±0.20 | 2.50±0.20 | 0.55±0.10 | 0.60±0.30 | 0.60±0.25 |
| ARNA2512 | 6.30±0.20 | 3.10±0.20 | 0.55±0.10 | 0.60±0.30 | 0.60±0.25 |

## ◆ Derating Curve



## ◆ Standard Electrical Specifications

| Item<br>Type | Power<br>Rating<br>At 70°C | Operating<br>Temp.<br>Range | Max.<br>Operating<br>Voltage | Max.<br>Overload<br>Voltage | Resistance Range |             |        |       |     | TCR<br>(PPM/°C) |
|--------------|----------------------------|-----------------------------|------------------------------|-----------------------------|------------------|-------------|--------|-------|-----|-----------------|
|              |                            |                             |                              |                             | ±0.05%           | ±0.1%       | ±0.25% | ±0.5% | ±1% |                 |
| ARNA0402     | 1/16W                      | -55~+155 °C                 | 25V                          | 50V                         | ---              |             |        |       |     | ±25             |
|              |                            |                             |                              |                             | 49.9Ω-10KΩ       | 49.9Ω-100KΩ |        |       | ±50 |                 |
| ARNA0603     | 1/16W                      |                             | 50V                          | 100V                        | 10Ω-49.9KΩ       | 10Ω-332KΩ   |        |       | ±25 |                 |
|              |                            |                             |                              |                             |                  |             |        | ±50   |     |                 |
| ARNA0805     | 1/10W                      |                             | 100V                         | 200V                        | 10Ω-100KΩ        | 10Ω-1MΩ     |        |       | ±25 |                 |
|              |                            |                             |                              |                             |                  |             |        | ±50   |     |                 |
| ARNA1206     | 1/8W                       |                             | 150V                         | 300V                        | 10Ω-200KΩ        | 10Ω-1MΩ     |        |       | ±25 |                 |
|              |                            |                             |                              |                             |                  |             |        | ±50   |     |                 |
| ARNA1210     | 1/4W                       | 150V                        | 300V                         | 10Ω-499KΩ                   | 10Ω-1MΩ          |             |        | ±25   |     |                 |
| ARNA2010     |                            |                             |                              |                             |                  |             |        | ±50   |     |                 |
| ARNA2512     | 1/2W                       | 150V                        | 300V                         | 10Ω-499KΩ                   | 10Ω-1MΩ          |             |        | ±25   |     |                 |
|              |                            |                             |                              |                             |                  |             | ±50    |       |     |                 |

Operating Voltage =  $\sqrt{P \times R}$  or Max. operating voltage listed above, whichever is lower.

Overload Voltage =  $2.5 \times \sqrt{P \times R}$  or Max. overload voltage listed above whichever is lower.

Faithful Link is capable of manufacturing the optional spec based on customer's requirement.

### ◆ Special Electrical Specifications

| Item<br>Type | Power<br>Rating<br>At 70°C | Operating<br>Temp.<br>Range | Max.<br>Operating<br>Voltage | Max.<br>Overload<br>Voltage | Resistance Range |              |        |       |            | TCR<br>(PPM/°C) |
|--------------|----------------------------|-----------------------------|------------------------------|-----------------------------|------------------|--------------|--------|-------|------------|-----------------|
|              |                            |                             |                              |                             | ±0.05%           | ±0.1%        | ±0.25% | ±0.5% | ±1%        |                 |
| ARNA0402     | 1/16W                      | -55~+155°C                  | 25V                          | 50V                         | 49.9Ω-10KΩ       |              |        |       |            | ±10             |
|              |                            |                             |                              |                             | 49.9Ω-10KΩ       | 49.9Ω-69.8KΩ |        |       | ±15        |                 |
| ARNA0603     | 1/16W                      |                             | 50V                          | 100V                        | 10Ω-49.9KΩ       | 10Ω-332KΩ    |        |       | ±10        |                 |
| ARNA0805     | 1/10W                      |                             | 100V                         | 200V                        | 10Ω-100KΩ        | 10Ω-511KΩ    |        |       | ±15        |                 |
|              |                            |                             |                              |                             |                  | 10Ω-1MΩ      |        |       | ±10        |                 |
| ARNA1206     | 1/8W                       |                             | 150V                         | 300V                        | 10Ω-200KΩ        | 10Ω-1MΩ      |        |       | ±15        |                 |
| ARNA1210     | 1/4W                       |                             | 150V                         | 300V                        | 10Ω-499KΩ        | 10Ω-1MΩ      |        |       | ±10        |                 |
| ARNA2010     |                            |                             |                              |                             |                  | 10Ω-1MΩ      |        |       | ±15        |                 |
| ARNA2512     | 1/2W                       |                             | 150V                         | 300V                        | 10Ω-499KΩ        | 10Ω-1MΩ      |        |       | ±10<br>±15 |                 |

Operating Voltage =  $\sqrt{P \times R}$  or Max. operating voltage listed above, whichever is lower.

Overload Voltage =  $2.5 \times \sqrt{P \times R}$  or Max. overload voltage listed above whichever is lower.

## ◆ High Power Rating Electrical Specifications

| Item<br>Type | Power<br>Rating<br>At 70°C | Operating<br>Temp.<br>Range | Max.<br>Operating<br>Voltage | Max.<br>Overload<br>Voltage | Resistance Range |            |        |                          |                          | TCR<br>(PPM/°C) |
|--------------|----------------------------|-----------------------------|------------------------------|-----------------------------|------------------|------------|--------|--------------------------|--------------------------|-----------------|
|              |                            |                             |                              |                             | ±0.05%           | ±0.1%      | ±0.25% | ±0.5%                    | ±1%                      |                 |
| ARNA0603     | 1/10W                      | -55~+155 °C                 | 75V                          | 150V                        | 10Ω-49.9KΩ       | 10Ω-332KΩ  |        |                          | ±10<br>±15<br>±25<br>±50 |                 |
| ARNA0805     | 1/8W                       |                             | 150V                         | 300V                        | 10Ω-100KΩ        | 10Ω-511KΩ  |        |                          | ±10                      |                 |
|              |                            |                             | 10Ω-1MΩ                      |                             |                  | ±15        |        |                          |                          |                 |
|              |                            |                             | 10Ω-1MΩ                      |                             |                  | ±25<br>±50 |        |                          |                          |                 |
| ARNA1206     | 1/4W                       |                             | 200V                         | 400V                        | 10Ω-200KΩ        | 10Ω-1MΩ    |        |                          | ±10<br>±15<br>±25<br>±50 |                 |
| ARNA1210     | 1/3W                       | 200V                        | 400V                         | 10Ω-499KΩ                   | 10Ω-1MΩ          |            |        | ±10<br>±15<br>±25<br>±50 |                          |                 |
| ARNA2010     |                            |                             |                              |                             |                  |            |        |                          |                          |                 |

Operating Voltage=  $\sqrt{P \times R}$  ; Overload Voltage listed above, whichever is lower

Overload Voltage =  $2.5 \times \sqrt{P \times R}$  or Max. overload voltage listed above, whichever is lower

Faithful Link is capable of manufacturing the optional spec based on customer's requirement

◆ **Part Number**

| <b>ARNA</b> | <b>0603</b> | <b>F</b>         | <b>T</b>              | <b>B</b>                | <b>Y</b>               | <b>1K</b>         |
|-------------|-------------|------------------|-----------------------|-------------------------|------------------------|-------------------|
| <b>Type</b> | <b>size</b> | <b>Tolerance</b> | <b>Packing</b>        | <b>TCR<br/>(ppm/°C)</b> | <b>Watt</b>            | <b>R Value</b>    |
| <b>ARNA</b> | <b>0402</b> | <b>A: ±0.05%</b> | <b>T: Taping Reel</b> | <b>B: ±10</b>           | <b>X: 1/10W</b>        | <b>1Ω = 1R</b>    |
|             | <b>0603</b> | <b>B: ±0.1%</b>  |                       | <b>N: ±15</b>           | <b>W: 1/8W</b>         | <b>4.7Ω = 4R7</b> |
|             | <b>0805</b> | <b>C: ±0.25%</b> |                       | <b>C: ±25</b>           | <b>V: 1/4W</b>         | <b>1KΩ = 1K</b>   |
|             | <b>1206</b> | <b>D: ±0.5%</b>  |                       | <b>D: ±50</b>           | <b>O: 1/3W</b>         | <b>1MΩ = 1M</b>   |
|             | <b>1210</b> | <b>F: ±1%</b>    |                       |                         | <b>Blank: Standard</b> |                   |
|             | <b>2010</b> |                  |                       |                         |                        |                   |
|             | <b>2512</b> |                  |                       |                         |                        |                   |

## ◆ Environmental Characteristics

| ITEM  | REQUIREMENTS  |                        | TEST METHODS  |
|---|---|------------------------|---|
|   | Tol. $\leq$ 0.05%   | Tol. $>$ 0.05%         |   |
| Temperature coefficient of Resistance (T.C.R) | As spec   |                        | -55°C~+125°C, 25°C is the reference temperature   |
| Short Time Overload                           | $\Delta R_{\pm 0.05\%}$   |                        | RCWV x 2.5 or Max. Overload Voltage for 5 seconds   |
| Insulation Resistance                         | $>1000M\Omega$  |                        | 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 rated power.<br>Measurement at $24\pm 4$ hours after test conclusion. |
|   | $>7K\Omega \Delta R_{\pm 0.2\%}$                                      |                        |   |
|   | $\Delta R_{\pm 0.5\%}$ for high power rating                          |                        |   |
| Biased Humidity                               | $\Delta R_{\pm 0.1\%}$  |                        | 1000 hrs $85^\circ\text{C}/85\%\text{RH}$ 10% of operating power.   |
| High Temperature Exposure                     | $\Delta R_{\pm 0.2\%}$  |                        | at $+155^\circ\text{C}$ for 1000 hrs  |
| Temperature Cycling                           | $\Delta R_{\pm 0.1\%}$  |                        | $-55^\circ\text{C}$ to $+125^\circ\text{C}$ , 1000 cycles   |
| Bending Strength                              | $\Delta R_{\pm 0.1\%}$  |                        | Bending once for 60 seconds<br>Bending displacement:<br>2010 2512 sizes: 2 mm Other sizes: 3 mm                           |
| Solderability                                 | 95% min coverage  |                        | $245\pm 5^\circ\text{C}$ for 3 seconds  |
| Resistance to Soldering Heat                  | $\Delta R_{\pm 0.05\%}$   |                        | $260\pm 5^\circ\text{C}$ for 10 seconds   |
| Terminal strength                             | No broken   |                        | Force of 1.8kg for 60 seconds.  |
| Mechanical Shock                              | $\Delta R_{\pm 0.05\%}$   | $\Delta R_{\pm 0.1\%}$ | Wave Form: Tolerance for half sine shock pulse.<br>Peak value is 100g's. Normal duration (D) is 6.                        |
| Vibration                                     | $\Delta R_{\pm 0.05\%}$   | $\Delta R_{\pm 0.1\%}$ | 5 g's for 20 min., 12 cycles each of 3 orientations,<br>10-2000 Hz  |
| ESD   | $\Delta R_{\pm 0.1\%}$  |                        | Human body, 2KV   |
| Resistance to solvents                        | Marking Unsmearred  |                        | Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.   |
| Sulfur Test                                   | $\Delta R_{\pm 1\%}$  |                        | $105\pm 2^\circ\text{C}$ no power rating for 750 hrs.   |
| Flammability                                  | No ignition of the tissue paper or scorching<br>or the pinewood board |                        | V-0 or V-1 are acceptable. Electrical test not required.  |

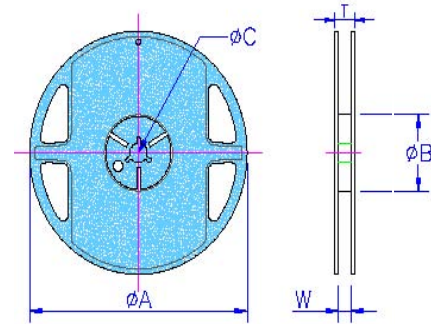
Reference Standards: MIL-STD-202, JIS-C 5201-1, AEC-Q200, JESD22, IEC-60115-1, EIA-997, UL-94

## ◆ Packaging

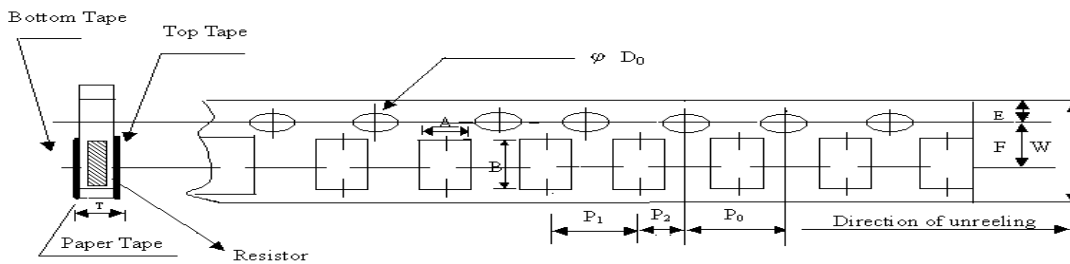
### Packaging Quantity & Reel Specifications

Unit: mm

| Size     | øA        | øB       | øC       | W        | T        | Paper Tape(EA) | Embossed Plastic Tape(EA) |
|----------|-----------|----------|----------|----------|----------|----------------|---------------------------|
| ARNA0402 | 178.0±1.0 | 60.0±1.0 | 13.5±0.7 | 9.5±1.0  | 11.5±1.0 | 10,000         | -                         |
| ARNA0603 | 178.0±1.0 | 60.0±1.0 | 13.5±0.7 | 9.5±1.0  | 11.5±1.0 | 5,000          | -                         |
| ARNA0805 | 178.0±1.0 | 60.0±1.0 | 13.5±0.7 | 9.5±1.0  | 11.5±1.0 | 5,000          | -                         |
| ARNA1206 | 178.0±1.0 | 60.0±1.0 | 13.5±0.7 | 9.5±1.0  | 11.5±1.0 | 5,000          | -                         |
| ARNA1210 | 178.0±1.0 | 60.0±1.0 | 13.5±0.7 | 9.5±1.0  | 11.5±1.0 | 5,000          | -                         |
| ARNA2010 | 178.0±1.0 | 60.0±1.0 | 13.5±0.7 | 13.5±1.0 | 15.5±1.0 | -              | 4,000                     |
| ARNA2512 | 178.0±1.0 | 60.0±1.0 | 13.5±0.7 | 13.5±1.0 | 15.5±1.0 | -              | 4,000                     |



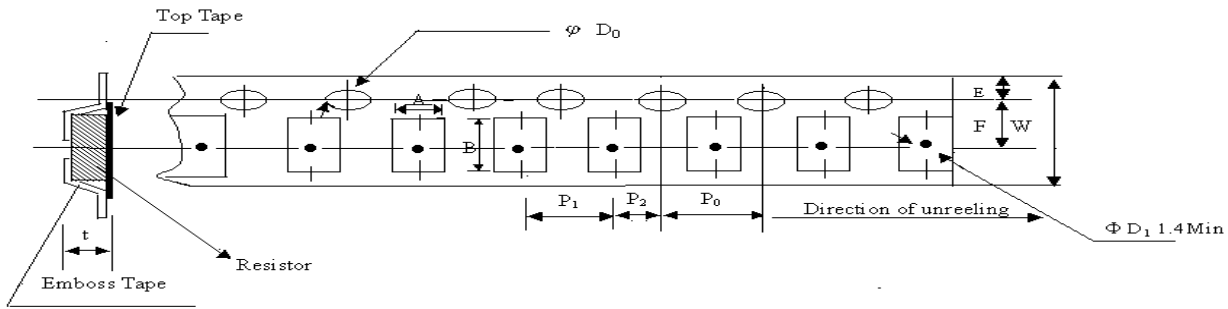
### Paper Tape Specifications



Unit: mm

| Size     | A         | B         | W         | E         | F        | P <sub>0</sub> | P <sub>1</sub> | P <sub>2</sub> | øD <sub>0</sub> | T         |
|----------|-----------|-----------|-----------|-----------|----------|----------------|----------------|----------------|-----------------|-----------|
| ARNA0402 | 0.70±0.05 | 1.16±0.05 | 8.00±0.10 | 1.75±0.05 | 3.5±0.05 | 4.0±0.10       | 2.0±0.05       | 2.0±0.05       | 1.55±0.05       | 0.40±0.03 |
| ARNA0603 | 1.10±0.05 | 1.90±0.05 | 8.00±0.10 | 1.75±0.05 | 3.5±0.05 | 4.0±0.10       | 4.0±0.10       | 2.0±0.05       | 1.55±0.05       | 0.60±0.03 |
| ARNA0805 | 1.60±0.05 | 2.37±0.05 | 8.00±0.10 | 1.75±0.05 | 3.5±0.05 | 4.0±0.10       | 4.0±0.10       | 2.0±0.05       | 1.55±0.05       | 0.75±0.03 |
| ARNA1206 | 2.00±0.05 | 3.55±0.05 | 8.00±0.10 | 1.75±0.05 | 3.5±0.05 | 4.0±0.10       | 4.0±0.10       | 2.0±0.05       | 1.55±0.05       | 0.75±0.03 |
| ARNA1210 | 2.75±0.05 | 3.40±0.05 | 8.00±0.10 | 1.75±0.05 | 3.5±0.05 | 4.0±0.05       | 4.0±0.10       | 2.0±0.05       | 1.60±0.10       | 0.75±0.03 |

## Embossed Plastic Tape Specifications

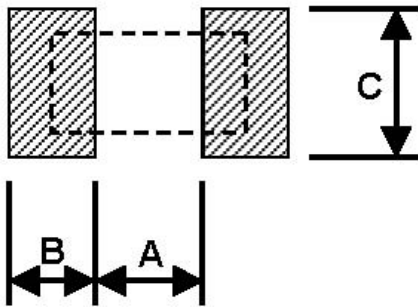


Unit: mm

| Type     | A         | B         | W         | E         | F        | P <sub>0</sub> | P <sub>1</sub> | P <sub>2</sub> | ΦD <sub>0</sub> | T         |
|----------|-----------|-----------|-----------|-----------|----------|----------------|----------------|----------------|-----------------|-----------|
| ARNA2010 | 2.85±0.20 | 5.45±0.10 | 12.0±0.10 | 1.75±0.10 | 5.5±0.05 | 4.0±0.05       | 4.0±0.10       | 2.0±0.05       | 1.5±0.10        | 1.00±0.20 |
| ARNA2512 | 3.40±0.10 | 6.65±0.10 | 12.0±0.10 | 1.75±0.10 | 5.5±0.05 | 4.0±0.05       | 4.0±0.10       | 2.0±0.05       | 1.5±0.10        | 1.00±0.20 |

### ◆ Recommend Land Pattern

Unit: mm



| Size     | A    | B    | C        |
|----------|------|------|----------|
| ARNA0402 | 0.50 | 0.50 | 0.60±0.2 |
| ARNA0603 | 0.80 | 1.00 | 0.90±0.2 |
| ARNA0805 | 1.00 | 1.00 | 1.35±0.2 |
| ARNA1206 | 2.00 | 1.15 | 1.70±0.2 |
| ARNA1210 | 2.00 | 1.15 | 2.50±0.2 |
| ARNA2010 | 3.60 | 1.40 | 2.50±0.2 |
| ARNA2512 | 4.90 | 1.60 | 3.10±0.2 |

### ◆ Storage Temperature:

15~28°C; Humidity &lt; 80% RH