



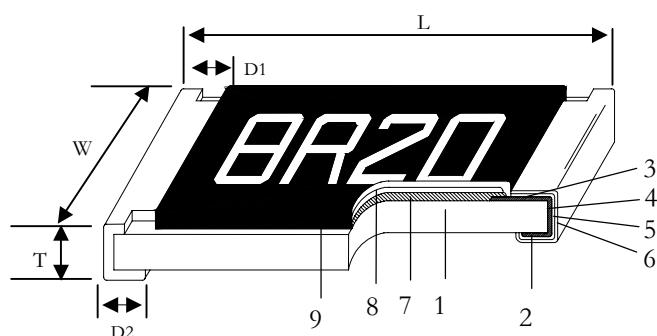
## ● Features

- Advanced thin film technology.
- Very tight tolerance down to  $\pm 0.01\%$ .
- Extremely low TCR down to  $\pm 5\text{PPM}/^{\circ}\text{C}$ .
- Wide resistance range 1ohm  $\sim$  3Mega ohm.
- Miniature size 0201 available.

## ● Applications

- Medical Equipment
- Testing / Measurement Equipment
- Printer Equipment
- Automatic Equipment Controller
- Converters
- Communication Device, Smart Phone, Navigation system

## ● Construction



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

## ● Dimensions

| Type | Size<br>(Inch) | Dimensions(mm)  |                 |                 |                 |                 |
|------|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|      |                | L               | W               | T               | D1              | D2              |
| Ar01 | 0201           | $0.58 \pm 0.05$ | $0.29 \pm 0.05$ | $0.23 \pm 0.05$ | $0.12 \pm 0.05$ | $0.15 \pm 0.05$ |
| Ar02 | 0402           | $1.00 \pm 0.05$ | $0.50 \pm 0.05$ | $0.30 \pm 0.05$ | $0.20 \pm 0.10$ | $0.20 \pm 0.10$ |
| Ar03 | 0603           | $1.55 \pm 0.10$ | $0.80 \pm 0.10$ | $0.45 \pm 0.10$ | $0.30 \pm 0.20$ | $0.30 \pm 0.20$ |
| Ar05 | 0805           | $2.00 \pm 0.15$ | $1.25 \pm 0.15$ | $0.55 \pm 0.10$ | $0.30 \pm 0.20$ | $0.40 \pm 0.20$ |
| Ar06 | 1206           | $3.05 \pm 0.15$ | $1.55 \pm 0.15$ | $0.55 \pm 0.10$ | $0.42 \pm 0.20$ | $0.35 \pm 0.25$ |
| Ar13 | 1210           | $3.10 \pm 0.15$ | $2.40 \pm 0.15$ | $0.55 \pm 0.10$ | $0.40 \pm 0.20$ | $0.55 \pm 0.25$ |
| Ar10 | 2010           | $4.90 \pm 0.15$ | $2.40 \pm 0.15$ | $0.55 \pm 0.10$ | $0.60 \pm 0.30$ | $0.50 \pm 0.25$ |
| Ar12 | 2512           | $6.30 \pm 0.15$ | $3.10 \pm 0.15$ | $0.55 \pm 0.10$ | $0.60 \pm 0.30$ | $0.50 \pm 0.25$ |

## Reference Standards

JISC 5201-1

## Ordering Information

Example:

|             |            |                      |     |            |         |         |              |
|-------------|------------|----------------------|-----|------------|---------|---------|--------------|
| AR          | 05         | F                    | S   | 1004       | B       | B       | N            |
| (1)         | (2)        | (3)                  | (4) | (5)        | (6)     | (7)     | (8)          |
| Series Name | Dimensions | Resistance Tolerance | TCR | Resistance | Packing | Packing | Marking Code |

(1)Type: AR SERIES

(2)Dimensions: 01=0201,02=0402,03=0603,05=0805,06=1206,13=1210,10=2010,12=2512

(3)Tolerance: T=  $\pm 0.01\%$ , A=  $\pm 0.05\%$ , B=  $\pm 0.1\%$ , C=  $\pm 0.25\%$ , D=  $\pm 0.5\%$ , F=  $\pm 1\%$

(4)TCR(ppm/ $^{\circ}\text{C}$ ):S:  $\pm 5$ ,B:  $\pm 10$ ,N:  $\pm 15$ ,C:  $\pm 25$ ,D:  $\pm 50$

(5)Resistance Value:0010=1 $\Omega$ ,4R70= 4.7 $\Omega$ ,1001= 1K $\Omega$ ,1004=1M $\Omega$

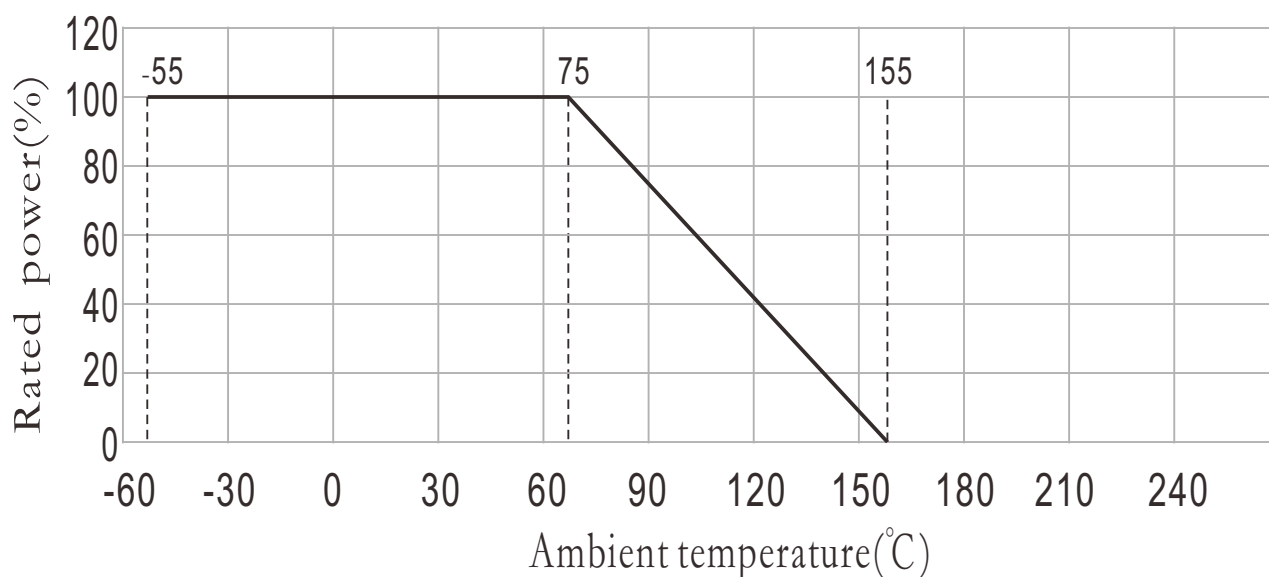
(6)Packing:B=bulk T=Taping Reel

(7)Power:: Standard,Y: 1/16W,X: 1/10W,W: 1/8W,M: 1/6W,P: 1/5W,V: 1/4W,

O: 1/3W,U: 1/2W,Q: 3/4W,T: 1W

(8)Marking Code:: Standard Marking for E96 / E24 N: No Marking

## Derating Curve



## Standard Electrical Specifications

| Type         | Power Rating at 70°C | Operating Temp. Range | Max. Operating Voltage | Max. Overload Voltage | Resistance Range |               |             |                |     | TCR (PPM/°C) |
|--------------|----------------------|-----------------------|------------------------|-----------------------|------------------|---------------|-------------|----------------|-----|--------------|
|              |                      |                       |                        |                       | ±0.05%           | ±0.1%         | ±0.25%      | ±0.5%          | ±1% |              |
| Ar01 (0201)  | 1/32W                | -55~+155°C            | 15V                    | 30V                   | —                |               |             | 49.9Ω - 4.99KΩ |     | ±25          |
|              |                      |                       |                        |                       |                  |               |             | 49.9Ω - 33KΩ   |     | ±50          |
| Ar02 (0402)  | 1/16W                | -55~+155°C            | 25V                    | 50V                   | 49.9Ω - 12KΩ     | 10Ω - 205KΩ   |             |                |     | ±25          |
|              |                      |                       |                        |                       |                  | 10Ω - 205KΩ   |             | 1Ω - 205KΩ     |     | ±50          |
| Ar03 (0603)  | 1/16W                | -55~+155°C            | 50V                    | 100V                  | 4.7Ω - 332KΩ     | 4.7Ω - 1MΩ    | 2Ω - 1MΩ    |                |     | ±25          |
|              |                      |                       |                        |                       |                  |               | 1Ω - 1MΩ    |                |     | ±50          |
| Ar05 (0805)  | 1/10W                | -55~+155°C            | 100V                   | 200V                  | 4.7Ω - 511KΩ     | 4.7Ω - 2MΩ    | 1Ω - 2MΩ    |                |     | ±25<br>±50   |
| ArR06 (1206) | 1/8W                 | -55~+155°C            | 150V                   | 300V                  | 4.7Ω - 1MΩ       | 4.7Ω - 2.49MΩ | 1Ω - 2.49MΩ |                |     | ±25          |
| Ar13 (1210)  | 1/4W                 |                       |                        |                       |                  |               |             |                |     | ±50          |
| Ar10 (2010)  | 1/4W                 | -55~+155°C            | 150V                   | 300V                  | 4.7Ω - 1MΩ       | 4.7Ω - 3MΩ    | 1Ω - 3MΩ    |                |     | ±25          |
| Ar12 (2512)  | 1/2W                 |                       |                        |                       |                  |               |             |                |     | ±50          |

Operating Voltage=√(P\*R) or Max. operating voltage listed above, whichever is lower.

Overload Voltage=2.5\*√(P\*R) or Max. overload voltage listed above, whichever is lower.

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

Lower Resistance: 1~10Ω

## Special Electrical Specifications

| Item<br>Type | Power<br>Rating<br>at 70℃ | Operating<br>Temp. Range | Max.<br>Operating<br>Voltage | Max.<br>Overload<br>Voltage | Resistance Range |              |                | TCR<br>(PPM/℃) |
|--------------|---------------------------|--------------------------|------------------------------|-----------------------------|------------------|--------------|----------------|----------------|
|              |                           |                          |                              |                             | ±0.01%           | ±0.05%       | ±0.1%          |                |
| AR02 (0402)  | 1/16W                     | -55 ~ +155C              | 25V                          | 50V                         | 49.9Ω - 4.99KΩ   |              |                | ±5             |
|              |                           |                          |                              |                             | 49.9Ω - 12KΩ     |              |                | ±10            |
|              |                           |                          |                              |                             | 49.9Ω - 12KΩ     |              | 49.9Ω - 69.8KΩ | ±15            |
| AR03 (0603)  | 1/16W                     | -55 ~ +155℃              | 50V                          | 100V                        | 24.9Ω - 15KΩ     |              |                | ±5             |
|              |                           |                          |                              |                             | 24.9Ω - 100KΩ    | 4.7Ω - 332KΩ |                | ±10<br>±15     |
| AR05 (0805)  | 1/10W                     | -55 ~ +155℃              | 100V                         | 200V                        | 24.9Ω - 30KΩ     |              |                | ±5             |
|              |                           |                          |                              |                             | 24.9Ω - 200KΩ    | 4.7Ω - 511KΩ |                | ±10<br>±15     |
| AR06 (1206)  | 1/8W                      | -55 ~ +155℃              | 150V                         | 300V                        | 24.9Ω -49.9K Ω   |              |                | ±5             |
|              |                           |                          |                              |                             | 24.9Ω - 499KΩ    | 4.7Ω - 1MΩ   |                | ±10<br>±15     |
| AR13 (1210)  | 1/4W                      | -55 ~ +155℃              | 150V                         | 300V                        | 24.9Ω -49.9K Ω   |              |                | ±5             |
|              |                           |                          |                              |                             | 24.9Ω - 499KΩ    | 4.7Ω - 1MΩ   |                | ±10<br>±15     |
| AR10 (2010)  | 1/4W                      | -55 ~ +155℃              | 150V                         | 300V                        | 24.9Ω - 100KΩ    |              |                | ±5             |
|              |                           |                          |                              |                             | 24.9Ω - 499KΩ    | 4.7Ω - 1MΩ   |                | ±10<br>±15     |
| AR12 (2512)  | 1/2W                      | -55 ~ +155℃              | 150V                         | 300V                        | 24.9Ω - 100KΩ    |              |                | ±5             |
|              |                           |                          |                              |                             | 24.9Ω - 499KΩ    | 4.7Ω - 1MΩ   |                | ±10<br>±15     |

Operating Voltage=√(P\*R) or Max. operating voltage listed above, whichever is lower.

Overload Voltage=2.5\*√(P\*R) or Max. overload voltage listed above, whichever is lower.

## High Power Rating Electrical Specifications

| Type \ Item | Power Rating at 70 C | Operating Temp. Range | Max. Operating Voltage | Max. Overload Voltage | Resistance Range |              |              |           |                        | TCR (PPM/ C)           |
|-------------|----------------------|-----------------------|------------------------|-----------------------|------------------|--------------|--------------|-----------|------------------------|------------------------|
|             |                      |                       |                        |                       |                  |              |              |           |                        |                        |
| AR03 (0603) | 1/10W                | -55 ~ +155 C          | 75V                    | 150V                  | 24.9Ω - 15KΩ     |              |              |           |                        | ± 5                    |
|             |                      |                       |                        |                       | 24.9Ω - 100KΩ    | 4.7Ω - 332KΩ | 4.7Ω - 332KΩ |           |                        | ±10<br>±15             |
|             |                      |                       |                        |                       |                  |              | 4.7Ω - 1MΩ   |           |                        | ±25<br>±50             |
|             | 1/6W                 | -55 ~ +155 C          | 100V                   | 150V                  | —                | 10Ω - 332KΩ  |              |           |                        | ±25<br>±50             |
| AR05 (0805) | 1/8W                 | -55 ~ +155 C          | 150V                   | 300V                  | 24.9Ω - 30KΩ     |              |              |           |                        | ± 5                    |
|             |                      |                       |                        |                       | 24.9Ω - 200KΩ    | 4.7Ω - 511KΩ | 4.7Ω - 511KΩ |           |                        | ± 10                   |
|             |                      |                       |                        |                       |                  |              | 4.7Ω - 1MΩ   |           |                        | ± 15                   |
|             |                      |                       |                        |                       |                  |              | 4.7Ω -1MΩ    | 1Ω - 1MΩ  |                        | ±25<br>±50             |
|             | 1/4W                 | -55 ~ +155 C          | 150V                   | 300V                  | —                | 10Ω -499K Ω  |              |           |                        | ±25<br>±50             |
| AR06 (1206) | 1/4W                 | -55 ~ +155 C          | 200V                   | 400V                  | 24.9Ω -49.9K Ω   |              |              |           |                        | ± 10                   |
|             |                      |                       |                        |                       | 24.9Ω - 499KΩ    | 4.7Ω - 1MΩ   |              |           | ± 10, ± 15<br>±25, ±50 |                        |
|             | 1/3W                 | -55 ~ +155 C          | 200V                   | 400V                  | —                | 10Ω - 1MΩ    |              |           |                        | ±25<br>±50             |
| AR13 (1210) | 1/3W                 | -55 ~ +155 C          | 200V                   | 400V                  | 24.9Ω - 49.9KΩ   |              |              |           |                        | ± 5                    |
|             |                      |                       |                        |                       | 24.9Ω - 499KΩ    | 4.7Ω - 1MΩ   |              |           | ± 10, ± 15<br>±25, ±50 |                        |
| AR10 (2010) | 1/3W                 | -55 ~ +155 C          | 200V                   | 400V                  | 24.9Ω - 49.9KΩ   |              |              |           |                        | ± 5                    |
|             |                      |                       |                        |                       | 24.9Ω - 499KΩ    | 4.7Ω - 1MΩ   |              |           | ± 10, ± 15<br>±25, ±50 |                        |
| AR12 (2512) | 3/4W                 | -55 ~ +155 C          | 200V                   | 400V                  | 24.9Ω - 2KΩ      | 4.7Ω - 2KΩ 1 |              | Ω - 2KΩ   |                        | ± 10, ± 15<br>±25, ±50 |
|             | 1W                   | -55 ~ +155 C          | 200V                   | 400V                  | -                |              | 4.7Ω - 100Ω  | 1Ω - 100Ω |                        | ±25<br>±50             |

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

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

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

Lower Resistance: 1~10Ω ; High Power Rating

## ● Environmental Characteristics

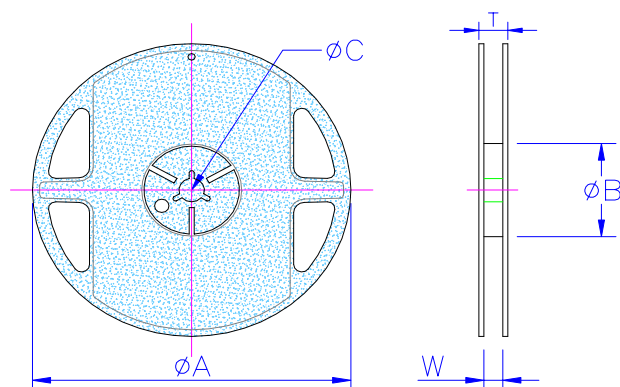
| Item                                          | Requirement                                |                       | Test Method                                                                                 |
|-----------------------------------------------|--------------------------------------------|-----------------------|---------------------------------------------------------------------------------------------|
| Temperature Coefficient of Resistance(T.C.R.) | As Spec                                    |                       | +25/-55/+25/+125/+25° C                                                                     |
| Short Time Overload                           | $\Delta R \pm 0.05\%$                      | $\Delta R \pm 0.2\%$  | RCWV*2.5 or Max. overload voltage for 5 seconds                                             |
|                                               | $\Delta R \pm 0.2\%$ for high power rating |                       |                                                                                             |
| Insulation Resistance                         | >1000 MΩ                                   |                       | Apply 100V DC for 1 minute                                                                  |
| Endurance                                     | $\Delta R \pm 0.05\%$                      | $\Delta R \pm 0.2\%$  | 70 ± 2° C, Max. working voltage for 1000 hrs with 1.5 hrs “ON” and 0.5 hrs “OFF”            |
|                                               | >7kΩ $\Delta R \pm 0.5\%$                  |                       |                                                                                             |
|                                               | $\Delta R \pm 0.5\%$ for high power rating |                       |                                                                                             |
| Damp Heat with Load                           | $\Delta R \pm 0.05\%$                      | $\Delta R \pm 0.3\%$  | 40 ± 2° C, 90~95% R.H. Max. working voltage for 1000hrs with 1.5 hrs “ON” and 0.5 hrs “OFF” |
|                                               | $\Delta R \pm 0.5\%$ for high power rating |                       |                                                                                             |
| Bending Strength                              | $\Delta R \pm 0.05\%$                      | $\Delta R \pm 0.2\%$  | Bending amplitude 3 mm for 10 s                                                             |
| Solderability                                 | 95% min. coverage                          |                       | 245 ± 5° C for 3 seconds                                                                    |
| Resistance to Soldering Heat                  | $\Delta R \pm 0.05\%$                      | $\Delta R \pm 0.2\%$  | 260 ± 5° C for 10 seconds                                                                   |
| Dielectric Withstand Voltage                  | By Type                                    |                       | Max. overload voltage for 1 minute                                                          |
| Thermal Shock                                 | $\Delta R \pm 0.05\%$                      | $\Delta R \pm 0.25\%$ | -55° C~150° C, 100 cycles                                                                   |
| Low Temperature Operation                     | $\Delta R \pm 0.05\%$                      | $\Delta R \pm 0.2\%$  | 1 hour, -65° C, followed by 45 minutes of RCWV                                              |
|                                               | $\Delta R \pm 0.5\%$ for high power rating |                       |                                                                                             |

Reference Standards: MIL-STD-202, JIS-C 5201-1

Storage Temperature: 25  $\pm$  3°C; Humidity < 80%RH

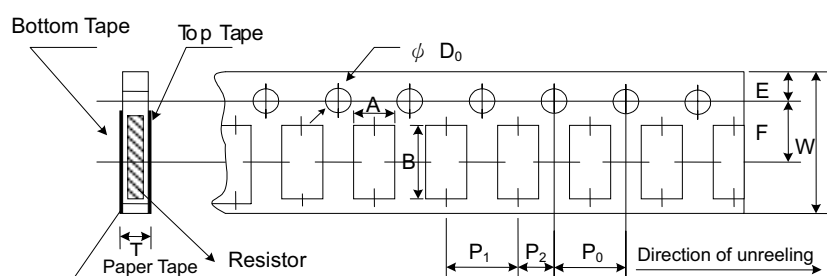
## ● Packaging

### Packaging Quantity & Reel Specifications



| Type | ΦA          | ΦB         | ΦC         | W          | T          | Paper Tape (EA) | Embossed Plastic Tape (EA) |
|------|-------------|------------|------------|------------|------------|-----------------|----------------------------|
| AR01 | 178.0 ± 1.0 | 60.0 + 1.0 | 13.5 ± 0.7 | 9.5 ± 1.0  | 11.5 ± 1.0 | 10,000          | -                          |
| AR02 | 178.0 ± 1.0 | 60.0 + 1.0 | 13.5 ± 0.7 | 9.5 ± 1.0  | 11.5 ± 1.0 | 10,000          | -                          |
| AR03 | 178.0 ± 1.0 | 60.0 + 1.0 | 13.5 ± 0.7 | 9.5 ± 1.0  | 11.5 ± 1.0 | 5,000           | -                          |
| AR05 | 178.0 ± 1.0 | 60.0 + 1.0 | 13.5 ± 0.7 | 9.5 ± 1.0  | 11.5 ± 1.0 | 5,000           | -                          |
| AR06 | 178.0 ± 1.0 | 60.0 + 1.0 | 13.5 ± 0.7 | 9.5 ± 1.0  | 11.5 ± 1.0 | 5,000           | -                          |
| AR13 | 178.0 ± 1.0 | 60.0 + 1.0 | 13.5 ± 0.7 | 9.5 ± 1.0  | 11.5 ± 1.0 | 5,000           | -                          |
| AR10 | 178.0 ± 1.0 | 60.0 + 1.0 | 13.5 ± 0.7 | 13.5 ± 1.0 | 15.5 ± 1.0 | -               | 4,000                      |
| AR12 | 178.0 ± 1.0 | 60.0 + 1.0 | 13.5 ± 0.7 | 13.5 ± 1.0 | 15.5 ± 1.0 | -               | 4,000                      |

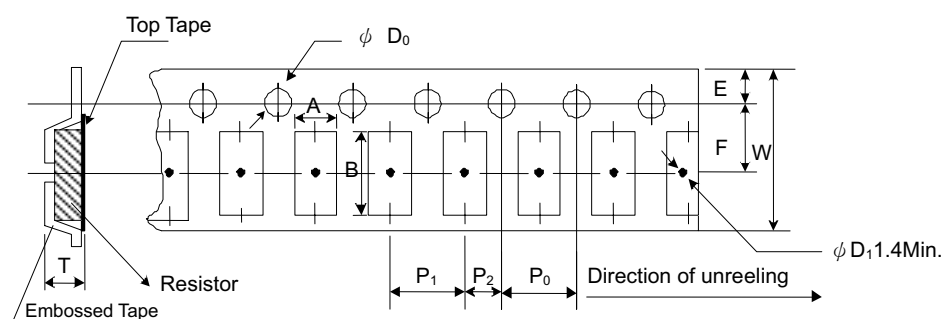
## Paper Tape Specifications



Unit: mm

| Type | A           | B           | W           | E           | F          | P <sub>0</sub> | P <sub>1</sub> | P <sub>2</sub> | ΦD <sub>0</sub> | T           |
|------|-------------|-------------|-------------|-------------|------------|----------------|----------------|----------------|-----------------|-------------|
| AR01 | 0.40 ± 0.05 | 0.70 ± 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 ± 0.03     | 0.42 ± 0.02 |
| 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 |
| AR13 | 2.75 ± 0.05 | 3.40 ± 0.05 | 8.00 ± 0.10 | 1.75 ± 0.05 | 3.5 ± 0.05 | 4.00 ± 0.05    | 4.00 ± 0.10    | 2.00 ± 0.05    | 1.60 ± 0.10     | 0.75 ± 0.05 |

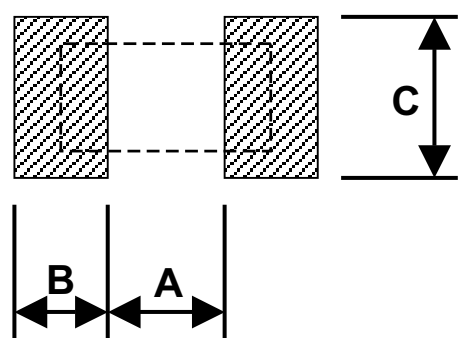
## Embossed Plastic Tape Specifications



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           |
|------|-------------|-------------|-------------|-------------|------------|----------------|----------------|----------------|-----------------|-------------|
| 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



| Type | A    | B    | C          |
|------|------|------|------------|
| AR01 | 0.25 | 0.30 | 0.40 ± 0.2 |
| AR02 | 0.50 | 0.50 | 0.60 ± 0.2 |
| AR03 | 0.80 | 1.00 | 0.90 ± 0.2 |
| AR05 | 1.00 | 1.00 | 1.35 ± 0.2 |
| AR06 | 2.00 | 1.15 | 1.70 ± 0.2 |
| AR13 | 2.00 | 1.15 | 2.50 ± 0.2 |
| AR10 | 3.60 | 1.40 | 2.50 ± 0.2 |
| AR12 | 4.90 | 1.60 | 3.10 ± 0.2 |