

Thin Film Precision Chip Resistor (AR Series)

Features

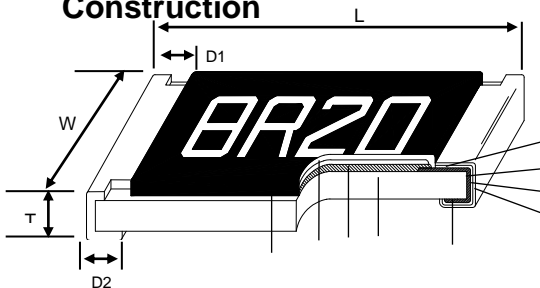
- Advanced thin film technology
- Very tight tolerance down to $\pm 0.01\%$
- Extremely low TCR down to $\pm 1\text{PPM}/^\circ\text{C}$
- Wide resistance range 1ohm ~ 3Mega ohm
- Miniature size 0201 available

Applications

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



Construction



| | | |
|-------------------|--------------------|----------------|
| Alumina Substrate | Edge Electrode | Resistor Layer |
| Bottom Electrode | Barrier Layer | Overcoat |
| Top Electrode | External Electrode | Marking |

Dimensions

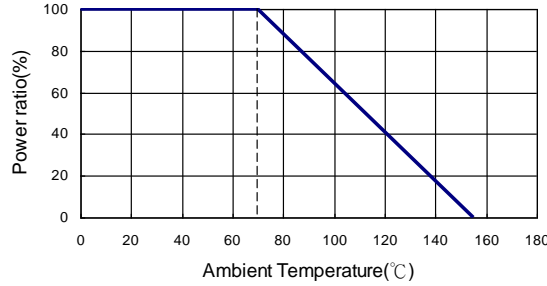
Unit: mm

| Type | Size (Inch) | L | W | T | D1 | D2 | Weight (g) (1000pcs) |
|------------|-------------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------------|
| 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 | 0.14 |
| 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 | 0.54 |
| 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 | 1.83 |
| 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 | 4.71 |
| 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 | 9.02 |
| 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 | 10 |
| 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 | 23.61 |
| AR10(1/2W) | 2010(1/2W) | 4.90 \pm 0.15 | 2.40 \pm 0.15 | 0.55 \pm 0.10 | 0.60 \pm 0.30 | 2.20 \pm 0.25 | 26.68 |
| 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 | 38.06 |
| AR12(1W) | 2512(1W) | 6.30 \pm 0.15 | 3.10 \pm 0.15 | 0.55 \pm 0.10 | 0.60 \pm 0.30 | 2.50 \pm 0.25 | 44.65 |

Part Numbering

| AR | 03 | T | T | B | Y | 1001 | N |
|--------------|--|---|---------------------------|--|--|--|---|
| Product Type | Dimensions (LxW) | Resistance Tolerance | Packaging Code | TCR (PPM/ $^\circ$ C) | Power Rating | Resistance | Marking Code |
| | 01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 13: 1210 10: 2010 12: 2512 | T: $\pm 0.01\%$ A: $\pm 0.05\%$ B: $\pm 0.1\%$ C: $\pm 0.25\%$ D: $\pm 0.5\%$ F: $\pm 1\%$ | T: Taping Reel B: Bulk | 5: ± 1 X: ± 2 O: ± 3 S: ± 5 B: ± 10 N: ± 15 C: ± 25 D: ± 50 | : Standard N: 1/20W 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 | 0010: 1 4R70: 4.7 1001: 1K 1004: 1M | : Standard Marking for E96 / E24 N: No Marking |

Derating Curve



Standard Electrical Specifications

| Item 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 | | | | | | 49.9 - 75K | ±25,±50 |
| AR02 (0402) | 1/16W | -55 ~ +155 C | 50V | 100V | 49.9 - 12K | | | | | 4 - 511K | ±25,±50 |
| AR03 (0603) | 1/16W | -55 ~ +155 C | 50V | 100V | 4.7 - 332K | | | | | 1 - 1M | ±25,±50 |
| AR05 (0805) | 1/10W | -55 ~ +155 C | 100V | 200V | 4.7 - 1M | | | | | 1 - 2M | ±25,±50 |
| AR06 (1206) | 1/8W | -55 ~ +155 C | 150V | 300V | 4.7 - 1M | | | | | 1 - 2.5M | ±25,±50 |
| AR13 (1210) | 1/4W | | | | | | | | | | |
| AR10 (2010) | 1/4W | | | | | | | | | | |
| AR12 (2512) | 1/2W | -55 ~ +155 C | 150V | 300V | 4.7 - 1M | | | | | 1 - 3M | ±25,±50 |

Lower Resistance:1~10

Special Electrical Specifications

| Item Type | Power Rating at 70°C | Operating Temp. Range | Max. Operating Voltage | Max. Overload Voltage | Resistance Range | | | | | | TCR (PPM/°C) | | | | |
|--------------|----------------------|-----------------------|------------------------|-----------------------|------------------|------------|-------------|--------|-------|-----|--------------|-----------|--|----------|----------|
| | | | | | ±0.01% | ±0.05% | ±0.1% | ±0.25% | ±0.5% | ±1% | | | | | |
| AR02 (0402) | 1/16W | -55 ~ +155 C | 50V | 100V | 49.9 - 4.99K | | | | | | | ±1, ±2,±3 | | | |
| | | | | | 49.9 - 20K | | | | | | | | | | ±5 |
| | | | | | 49.9 - 20K | | 49.9 - 100K | | | | | | | | ±10, ±15 |
| AR03 (0603) | 1/16W | -55 ~ +155 C | 50V | 100V | 24.9 - 15K | | | | | | | ±1, ±2,±3 | | | |
| | | | | | 24.9 - 60K | | | | | | | | | ±5 | |
| | | | | | 24.9 - 100K | 4.7 - 332K | 4.7 - 511K | | | | | | | ±10, ±15 | |
| AR05 (0805) | 1/10W | -55 ~ +155 C | 100V | 200V | 24.9 - 30K | | | | | | | ±1, ±2,±3 | | | |
| | | | | | 24.9 - 150K | | | | | | | | | ±5 | |
| | | | | | 24.9 - 200K | 4.7 - 1M | | | | | | | | ±10, ±15 | |
| AR06 (1206) | 1/8W | -55 ~ +155 C | 150V | 300V | 24.9 - 49.9K | | | | | | | ±1, ±2,±3 | | | |
| | | | | | 24.9 - 300K | | | | | | | | | ±5 | |
| | | | | | 24.9 - 499K | 4.7 - 1.5M | | | | | | | | ±10, ±15 | |
| AR13 (1210) | 1/ 4W | -55 ~ +155 C | 150V | 300V | 24.9 - 49.9K | | | | | | | ±1, ±2,±3 | | | |
| | | | | | 24.9 - 300K | | | | | | | | | ±5 | |
| | | | | | 24.9 - 499K | 4.7 - 1M | | | | | | | | ±10, ±15 | |
| AR10 (2010) | 1/4W | -55 ~ +155 C | 150V | 300V | 24.9 - 100K | | | | | | | ±1, ±2,±3 | | | |
| | | | | | 24.9 - 300K | | | | | | | | | ±5 | |
| | | | | | 24.9 - 499K | 4.7 - 1M | | | | | | | | ±10, ±15 | |
| AR12 (2512) | 1/2W | -55 ~ +155 C | 150V | 300V | 24.9 - 100K | | | | | | | ±1, ±2,±3 | | | |
| | | | | | 24.9 - 300K | | | | | | | | | ±5 | |
| | | | | | 24.9 - 499K | 4.7 - 1M | | | | | | | | ±10, ±15 | |

High Power Rating Electrical Specifications

| Item Type | Power Rating at 70°C | Operating Temp. Range | Max. Operating Voltage | Max. Overload Voltage | Resistance Range | | | | | | TCR (PPM/°C) |
|----------------|----------------------------|-----------------------------|------------------------------|-----------------------------|------------------|------------|-------------|--------|---------|----------|-----------------|
| | | | | | ±0.01% | ±0.05% | ±0.1% | ±0.25% | ±0.5% | ±1% | |
| AR01 (0201) | 1/20W | -55 ~ +155°C | 25V | 50V | | | 5K - 75K | | | | ±25,±50 |
| AR02 (0402) | 1/10W | -55 ~ +155°C | 50V | 100V | 49.9 - 4.99K | | | | | | ±1, ±2,±3 |
| | | | | | 49.9 - 20K | | | | | | ±5 |
| | | | | | 49.9 - 12K | | 49.9 - 100K | | | | ±10, ±15 |
| | | | | | | 49.9 - 12K | 4.7 ~255K | | | ±25,±50 | |
| AR03 (0603) | 1/10W | -55 ~ +155°C | 75V | 150V | 24.9 - 15K | | | | | | ±1, ±2,±3 |
| | | | | | 24.9 - 60K | | | | | | ±5 |
| | | | | | 24.9 - 100K | 4.7 - 332K | 4.7 - 511K | | | ±10,±15 | |
| | 1 - 1M | | | ±25,±50 | | | | | | | |
| 1/6W | -55 ~ +155°C | 100V | 150V | | | 10 - 332K | | | | ±25,±50 | |
| AR05 (0805) | 1/8W | -55 ~ +155°C | 150V | 300V | 24.9 - 30K | | | | | | ±1, ±2,±3 |
| | | | | | 24.9 - 150K | | | | | | ±5 |
| | | | | | 24.9 - 200K | 4.7 - 511K | 4.7 - 1M | | | ±10, ±15 | |
| | 1 - 1M | | | ±25,±50 | | | | | | | |
| 1/4W | -55 ~ +155°C | 150V | 300V | | | 10 - 499K | | | | ±25,±50 | |
| AR06 (1206) | 1/4W | -55 ~ +155°C | 200V | 400V | 24.9 - 49.9K | | | | | | ±1, ±2,±3 |
| | | | | | 24.9 - 300K | | | | | | ±5 |
| | | | | | 24.9 - 499K | 4.7 - 1M | | | ±10,±15 | | |
| | 1 - 1M | | | ±25,±50 | | | | | | | |
| 1/3W | -55 ~ +155°C | 200V | 400V | | | 10 ~1M | | | | ±25,±50 | |
| AR13 (1210) | 1/ 3W | -55 ~ +155°C | 200V | 400V | 24.9 - 49.9K | | | | | | ±1, ±2,±3 |
| | | | | | 24.9 - 300K | | | | | | ±5 |

24.9

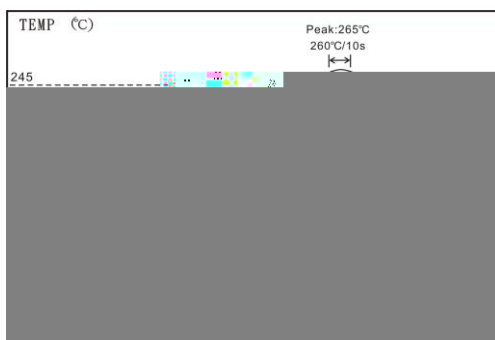
Environmental Characteristics

| Item | Requirement | | Test Method |
|--|------------------------------------|----------------|---|
| | Tol. \leq 0.05% | Tol. $>$ 0.05% | |
| Temperature Coefficient of Resistance (T.C.R.) | As Spec. | | MIL-STD-202 Method 304 +25/-55/+25/+125/+25°C |
| Short Time Overload | R \pm 0.05% | R \pm 0.2% | JIS-C-5201-1 4.13 RCWV*2.5 or Max. overload voltage whichever is lower for 5 seconds |
| | R \pm 0.2% for high power rating | | |
| Insulation Resistance | >9999 M | | MIL-STD-202 Method 302 Apply 100V _{DC} for 1 minute |
| Endurance | R \pm 0.05% | R \pm 0.2% | MIL-STD-202 Method 108A 70 \pm 2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF" |
| | R \pm 0.5% for high power rating | | |
| | 0201: >7k | R \pm 0.5% | |
| | 7k | R \pm 0.2% | |
| Damp Heat with Load | R \pm 0.05% | R \pm 0.3% | MIL-STD-202 Method 103B 40 \pm 2°C, 90~95% R.H. RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF" |
| | R \pm 0.5% for high power rating | | |
| Bending Strength | R \pm 0.05% | R \pm 0.1% | JIS-C-5201-1 4.33 Bending amplitude 3 mm for 10 seconds 2010 2512 sizes: 2 mm Other sizes: 3 mm |
| Solderability | 95% min. coverage | | MIL-STD-202 Method 208H 245 \pm 5°C for 3 seconds |
| Resistance to Soldering Heat | R \pm 0.05% | R \pm 0.1% | MIL-STD-202 Method 210E 260 \pm 5°C for 10 seconds |
| Dielectric Withstand Voltage | By Type | | MIL-STD-202 Method 301 Max. overload voltage for 1 minute |
| Low Temperature Operation | R \pm 0.05% | R \pm 0.2% | JIS-C-5201-1 4.36 1 hour, -65°C, followed by 45 minutes of RCWV |
| | R \pm 0.5% for high power rating | | |
| High Temperature Exposure | R \pm 0.5% | | MIL-STD-202 Method 108 at +155°C for 1000 hrs |

RCWV(Rated continuous working voltage)= (P*R) or Max. Operating voltage whichever is lower

■ Storage Temperature: 15~28°C; Humidity < 80%RH

Soldering Condition



IR Reflow Soldering



Wave Soldering (Flow Soldering)

- (1) Time of IR reflow soldering at maximum temperature point 260°C 10s
- (2) Time of wave soldering at maximum temperature point 260°C 10s
- (3) Time of soldering iron at maximum temperature point 410°C 5s