

Thin Film Precision Chip Resistor (AR Series)

■ Features

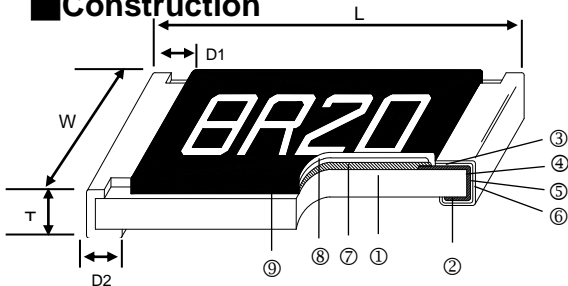
- Advanced thin film technology
- Very tight tolerance down to $\pm 0.01\%$
- Extremely low TCR down to $\pm 1\text{PPM}/^\circ\text{C}$
- Wide resistance range 1ohm ~ 3Mega ohm
- Miniature size 0201 available

■ Applications

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



■ Construction



① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Overcoat
③ Top Electrode	⑥ External Electrode	⑨ Marking

■ Dimensions

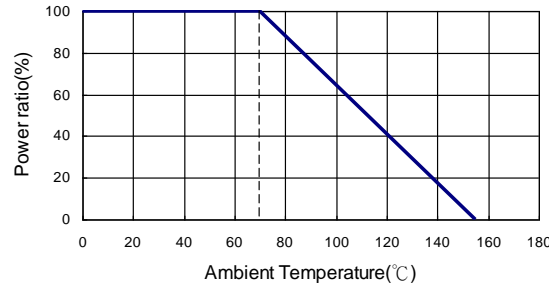
Unit: mm

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 Ω 4R70: 4.7 Ω 1001: 1K Ω 1004: 1M Ω	: 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	—	49.9Ω - 75KΩ					±25,±50
AR02 (0402)	1/16W	-55 ~ +155°C	50V	100V	49.9Ω - 12KΩ	4Ω - 511KΩ					±25,±50
AR03 (0603)	1/16W	-55 ~ +155°C	50V	100V	4.7Ω - 332KΩ	1Ω - 1MΩ					±25,±50
AR05 (0805)	1/10W	-55 ~ +155°C	100V	200V	4.7Ω - 1MΩ	1Ω - 2MΩ					±25,±50
AR06 (1206)	1/8W	-55 ~ +155°C	150V	300V	4.7Ω - 1MΩ	1Ω - 2.5MΩ					±25,±50
AR13 (1210)	1/4W										
AR10 (2010)	1/4W										
AR12 (2512)	1/2W	-55 ~ +155°C	150V	300V	4.7Ω - 1MΩ	1Ω - 3MΩ					±25,±50

■ Lower Resistance: 1~10Ω

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	49.9Ω - 4.99KΩ		—				±1, ±2, ±3
					49.9Ω - 20KΩ						±5
					49.9Ω - 20KΩ		49.9Ω - 100KΩ				±10, ±15
AR03 (0603)	1/16W	-55 ~ +155°C	50V	100V	24.9Ω - 15KΩ		—				±1, ±2, ±3
					24.9Ω - 60KΩ						±5
					24.9Ω - 100KΩ	4.7Ω - 332KΩ	4.7Ω - 511KΩ				±10, ±15
AR05 (0805)	1/10W	-55 ~ +155°C	100V	200V	24.9Ω - 30KΩ		—				±1, ±2, ±3
					24.9Ω - 150KΩ						±5
					24.9Ω - 200KΩ	4.7Ω - 1MΩ				±10, ±15	
AR06 (1206)	1/8W	-55 ~ +155°C	150V	300V	24.9Ω - 49.9KΩ		—				±1, ±2, ±3
					24.9Ω - 300KΩ						±5
					24.9Ω - 499KΩ	4.7Ω - 1.5MΩ				±10, ±15	
AR13 (1210)	1/ 4W	-55 ~ +155°C	150V	300V	24.9Ω - 49.9KΩ		—				±1, ±2, ±3
					24.9Ω - 300KΩ						±5
					24.9Ω - 499KΩ	4.7Ω - 1MΩ				±10, ±15	
AR10 (2010)	1/4W	-55 ~ +155°C	150V	300V	24.9Ω - 100KΩ		—				±1, ±2, ±3
					24.9Ω - 300KΩ						±5
					24.9Ω - 499KΩ	4.7Ω - 1MΩ				±10, ±15	
AR12 (2512)	1/2W	-55 ~ +155°C	150V	300V	24.9Ω - 100KΩ		—				±1, ±2, ±3
					24.9Ω - 300KΩ						±5
					24.9Ω - 499KΩ	4.7Ω - 1MΩ				±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	—		5KΩ - 75KΩ				±25,±50
AR02 (0402)	1/10W	-55 ~ +155°C	50V	100V	49.9Ω - 4.99KΩ			—			±1, ±2,±3
					49.9Ω - 20KΩ						±5
					49.9Ω - 12KΩ			49.9Ω - 100KΩ			±10, ±15
					—	49.9Ω - 12KΩ	4.7Ω ~255KΩ			±25,±50	
AR03 (0603)	1/10W	-55 ~ +155°C	75V	150V	24.9Ω - 15KΩ			—			±1, ±2,±3
					24.9Ω - 60KΩ						±5
					24.9Ω - 100KΩ	4.7Ω - 332KΩ	4.7Ω - 511KΩ			±10,±15	
	—	—	1Ω - 1MΩ			±25,±50					
	1/6W	-55 ~ +155°C	100V	150V	—	10Ω - 332KΩ				±25,±50	
AR05 (0805)	1/8W	-55 ~ +155°C	150V	300V	24.9Ω - 30KΩ			—			±1, ±2,±3
					24.9Ω - 150KΩ						±5
					24.9Ω - 200KΩ	4.7Ω - 511KΩ	4.7Ω - 1MΩ			±10, ±15	
	—	—	1Ω - 1MΩ			±25,±50					
	1/4W	-55 ~ +155°C	150V	300V	—	10Ω - 499KΩ				±25,±50	
AR06 (1206)	1/4W	-55 ~ +155°C	200V	400V	24.9Ω - 49.9KΩ			—			±1, ±2,±3
					24.9Ω - 300KΩ						±5
					24.9Ω - 499KΩ	4.7Ω - 1MΩ			±10,±15		
	—	1Ω - 1MΩ			±25,±50						
1/3W	-55 ~ +155°C	200V	400V	—	10Ω ~1MΩ				±25,±50		
AR13 (1210)	1/ 3W	-55 ~ +155°C	200V	400V	24.9Ω - 49.9KΩ			—			±1, ±2,±3
					24.9Ω - 300KΩ						±5
					24.9Ω - 499KΩ	4.7Ω - 1MΩ			±10,±15		
					—	1Ω - 1MΩ			±25,±50		
AR10(2010)	1/3W	-55 ~ +155°C	200V	400V	24.9Ω - 49.9KΩ			—			±1, ±2,±3
					24.9Ω - 300KΩ						±5
					24.9Ω - 499KΩ	4.7Ω - 1MΩ			±10,±15		
	—	1Ω - 1MΩ			±25,±50						
	1/2W	-55 ~ +155°C	200V	400V	24.9Ω - 2KΩ	4.7Ω - 1MΩ	1Ω - 1MΩ		±10,±15,±25,±50		
AR12(2512)	3/4W	-55 ~ +155°C	200V	400V	24.9Ω - 2KΩ	4.7Ω - 2KΩ	1Ω - 2KΩ		±10,±15,±25,±50		
	1W	-55 ~ +155°C	200V	400V	24.9Ω - 2KΩ	4.7Ω - 1MΩ	1Ω - 1MΩ		±10,±15,±25,±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)

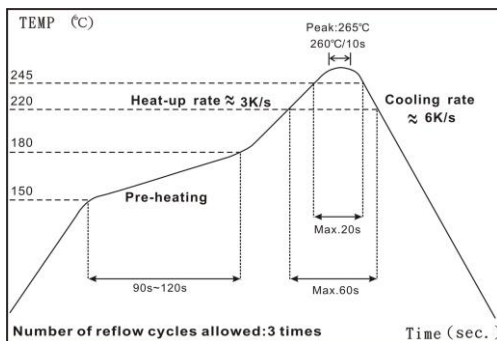
Environmental Characteristics

Item	Requirement		Test Method
	Tol. ≤ 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	ΔR±0.05%	ΔR±0.2%	JIS-C-5201-1 4.13 RCWV*2.5 or Max. overload voltage whichever is lower for 5 seconds
	ΔR±0.2% for high power rating		
Insulation Resistance	>9999 MΩ		MIL-STD-202 Method 302 Apply 100V _{DC} for 1 minute
Endurance	ΔR±0.05%	ΔR±0.2%	MIL-STD-202 Method 108A 70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
	ΔR±0.5% for high power rating		
	0201: >7kΩ → ΔR±0.5% ≤7kΩ → ΔR±0.2%		
Damp Heat with Load	ΔR±0.05%	ΔR±0.3%	MIL-STD-202 Method 103B 40±2°C, 90~95% R.H. RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
	ΔR±0.5% for high power rating		
Bending Strength	ΔR±0.05%	ΔR±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±5°C for 3 seconds
Resistance to Soldering Heat	ΔR±0.05%	ΔR±0.1%	MIL-STD-202 Method 210E 260±5°C for 10 seconds
Dielectric Withstand Voltage	By Type		MIL-STD-202 Method 301 Max. overload voltage for 1 minute
Low Temperature Operation	ΔR±0.05%	ΔR±0.2%	JIS-C-5201-1 4.36 1 hour, -65°C, followed by 45 minutes of RCWV
	ΔR±0.5% for high power rating		
High Temperature Exposure	ΔR±0.5%		MIL-STD-202 Method 108 at +155°C for 1000 hrs

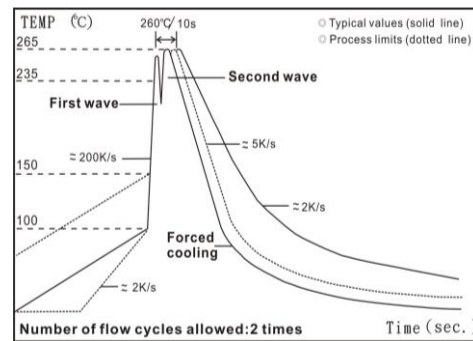
RCWV(Rated continuous working voltage)= $\sqrt{P \cdot R}$ or Max. Operating voltage whichever is lower

■ 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