

Thin Film Precision Chip Resistor (AR Series)

Features

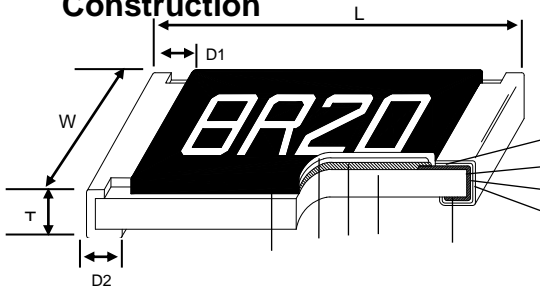
- Advanced thin film technology
- Very tight tolerance down to $\pm 0.01\%$
- Extremely low TCR down to $\pm 1\text{PPM}/^\circ\text{C}$
- Wide resistance range 1ohm ~ 3Mega ohm
- Miniature size 0201 available

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

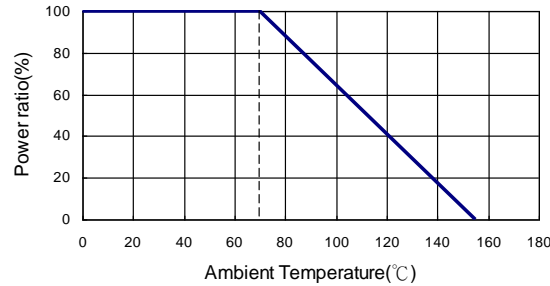
Unit: mm

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

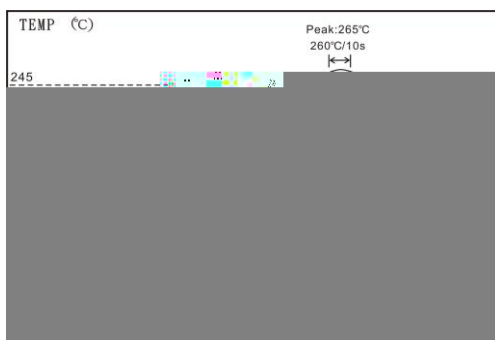
Environmental Characteristics

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