

## Thin Film Precision Chip Resistor (AR Series)

### Features

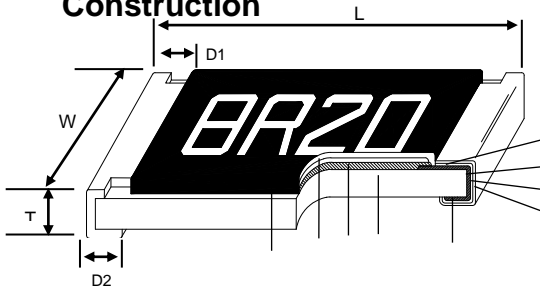
Advanced thin film technology  
 Very tight tolerance down to  $\pm 0.01\%$   
 Extremely low TCR down to  $\pm 1\text{PPM}/^\circ\text{C}$   
 Wide resistance range 1ohm ~ 3Mega ohm  
 Miniature size 0201 available

### 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

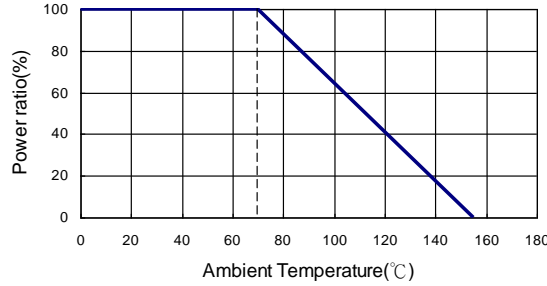
Unit: mm

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: $\pm 1$ X: $\pm 2$ O: $\pm 3$ S: $\pm 5$ B: $\pm 10$ N: $\pm 15$ C: $\pm 25$ D: $\pm 50$	: 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

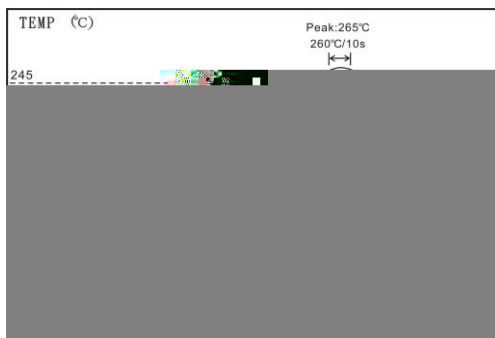
## Environmental Characteristics

Item	Requirement		Test Method
	Tol. $\leq$ 0.05%	Tol. $>$ 0.05%	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.		<b>MIL-STD-202 Method 304</b> +25/-55/+25/+125/+25°C
Short Time Overload	R $\pm$ 0.05%	R $\pm$ 0.2%	<b>JIS-C-5201-1 4.13</b> 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		<b>MIL-STD-202 Method 302</b> Apply 100V <sub>DC</sub> for 1 minute
Endurance	R $\pm$ 0.05%	R $\pm$ 0.2%	<b>MIL-STD-202 Method 108A</b> 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%	<b>MIL-STD-202 Method 103B</b> 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%	<b>JIS-C-5201-1 4.33</b> Bending amplitude 3 mm for 10 seconds 2010 2512 sizes: 2 mm Other sizes: 3 mm
Solderability	95% min. coverage		<b>MIL-STD-202 Method 208H</b> 245 $\pm$ 5°C for 3 seconds
Resistance to Soldering Heat	R $\pm$ 0.05%	R $\pm$ 0.1%	<b>MIL-STD-202 Method 210E</b> 260 $\pm$ 5°C for 10 seconds
Dielectric Withstand Voltage	By Type		<b>MIL-STD-202 Method 301</b> Max. overload voltage for 1 minute
Low Temperature Operation	R $\pm$ 0.05%	R $\pm$ 0.2%	<b>JIS-C-5201-1 4.36</b> 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%		<b>MIL-STD-202 Method 108</b> 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