

Thin Film Precision Chip Resistor



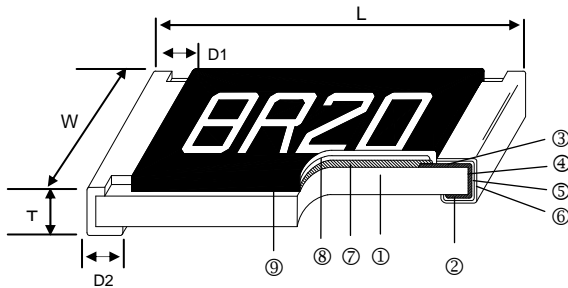
■ Features

- 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 ~ 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



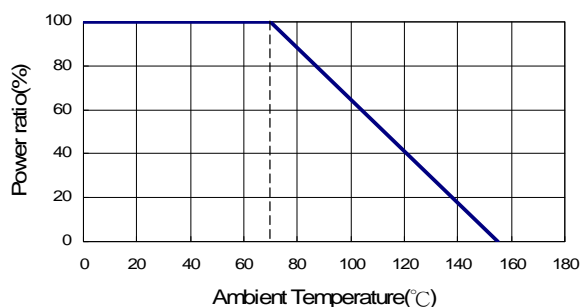
① Alumina Substrate	④ Edge Electrode (NiCr)	⑦ Resistor Layer (NiCr)
② Bottom Electrode (Ag)	⑤ Barrier Layer (Ni)	⑧ Overcoat (Epoxy)
③ Top Electrode (Ag-Pd)	⑥ External Electrode (Sn)	⑨ Marking

■ Dimensions

Unit: mm

Size (Inch)	L	W	T	D1	D2
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
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
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
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
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
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
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
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

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%	
0201	1/32W	-55 ~ +155°C	15V	30V	—					±25 ±50
0402	1/16W	-55 ~ +155°C	25V	50V	49.9Ω - 12KΩ	10Ω - 255KΩ				±25 ±50
0603	1/16W	-55 ~ +155°C	50V	100V	4.7Ω - 332KΩ	4.7Ω - 1MΩ	2Ω - 1MΩ			±25 ±50
0805	1/10W	-55 ~ +155°C	100V	200V	4.7Ω - 1MΩ	4.7Ω - 2MΩ	1Ω - 2MΩ			±25 ±50
1206	1/8W	-55 ~ +155°C	150V	300V	4.7Ω - 1MΩ	4.7Ω - 2.49MΩ	1Ω - 2.49MΩ			±25 ±50
1210	1/4W									
2010	1/4W	-55 ~ +155°C	150V	300V	4.7Ω - 1MΩ	4.7Ω - 3MΩ	1Ω - 3MΩ			±25 ±50
2512	1/2W									

■ 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%	
0402	1/16W	-55 ~ +155°C	25V	50V	49.9Ω - 4.99KΩ						±5
					49.9Ω - 12KΩ						±10
					49.9Ω - 12KΩ	49.9Ω - 69.8KΩ					±15
0603	1/16W	-55 ~ +155°C	50V	100V	24.9Ω - 15KΩ						±5
					24.9Ω - 100KΩ	4.7Ω - 332KΩ					±10 ±15
0805	1/10W	-55 ~ +155°C	100V	200V	24.9Ω - 30KΩ						±5
					24.9Ω - 200KΩ	4.7Ω - 511KΩ					±10
						4.7Ω - 1MΩ					
1206	1/8W	-55 ~ +155°C	150V	300V	24.9Ω - 49.9KΩ						±5
					24.9Ω - 499KΩ	4.7Ω - 1MΩ					±10 ±15
1210	1/4W	-55 ~ +155°C	150V	300V	24.9Ω - 49.9KΩ						±5
					24.9Ω - 499KΩ	4.7Ω - 1MΩ					±10 ±15
2010	1/4W	-55 ~ +155°C	150V	300V	24.9Ω - 100KΩ						±5
					24.9Ω - 499KΩ	4.7Ω - 1MΩ					±10 ±15
2512	1/2W	-55 ~ +155°C	150V	300V	24.9Ω - 100KΩ						±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%	
0603	1/10W	-55 ~ +155°C	75V	150V	24.9Ω - 15KΩ						±5
					24.9Ω - 100KΩ	4.7Ω - 332KΩ	4.7Ω - 332KΩ				±10
	4.7Ω - 1MΩ						±15				
1/6W	-55 ~ +155°C	100V	150V	—	10Ω - 332KΩ				±25 ±50		
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
	1/4W	-55 ~ +155°C	150V	300V	—	10Ω - 499KΩ				±25 ±50	
1206	1/4W	-55 ~ +155°C	200V	400V	24.9Ω - 49.9KΩ						±5
					24.9Ω - 499KΩ	4.7Ω - 1MΩ				±10 ±15 ±25 ±50	
	1/3W	-55 ~ +155°C	200V	400V		—	10Ω ~1MΩ				±25 ±50
1210	1/3W	-55 ~ +155°C	200V	400V	24.9Ω - 49.9KΩ						±5
					24.9Ω - 499KΩ	4.7Ω - 1MΩ				±10 ±15 ±25 ±50	
2010	1/3W	-55 ~ +155°C	200V	400V		24.9Ω - 49.9KΩ					
					24.9Ω - 499KΩ	4.7Ω - 1MΩ				±10 ±15 ±25 ±50	
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	-		4.7Ω - 100Ω	1Ω - 100Ω		±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.

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

(Lower Resistance:1~10Ω ; High Power Rating)

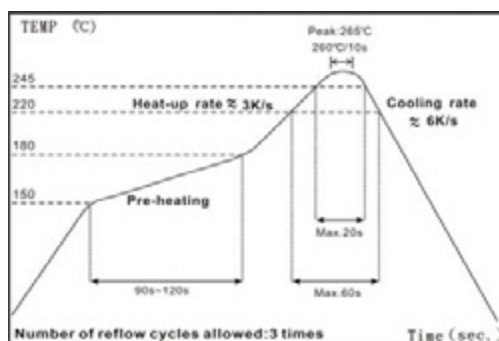
Environmental Characteristics

Item	Requirement	
	Tol. $\leq 0.05\%$	Tol. $> 0.05\%$
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	
Short Time Overload	$\Delta R \pm 0.05\%$	$\Delta R \pm 0.2\%$
	$\Delta R \pm 0.2\%$ for high power rating	
Insulation Resistance	$> 1000 \text{ M}\Omega$	
Endurance	$\Delta R \pm 0.05\%$	$\Delta R \pm 0.2\%$
	$> 7\text{k}\Omega \Delta R \pm 0.5\%$	
	$\Delta R \pm 0.5\%$ for high power rating	
Damp Heat with Load	$\Delta R \pm 0.05\%$	$\Delta R \pm 0.3\%$
	$\Delta R \pm 0.5\%$ for high power rating	
Bending Strength	$\Delta R \pm 0.05\%$	$\Delta R \pm 0.2\%$
Solderability	95% min. coverage	
Resistance to Soldering Heat	$\Delta R \pm 0.05\%$	$\Delta R \pm 0.2\%$
Dielectric Withstand Voltage	By Type	
Thermal Shock	$\Delta R \pm 0.05\%$	$\Delta R \pm 0.25\%$
Low Temperature Operation	$\Delta R \pm 0.05\%$	$\Delta R \pm 0.2\%$
	$\Delta R \pm 0.5\%$ for high power rating	

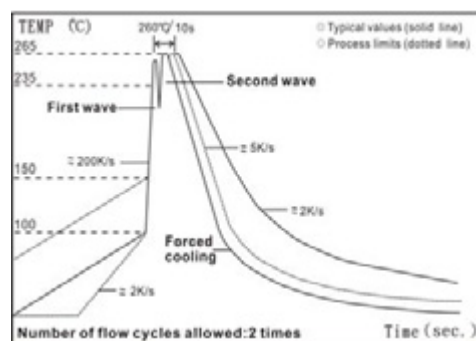
RCWV(Rated continuous working voltage)= $\sqrt{P \cdot R}$ or Max. Operating voltage whichever is lower

■ Storage Temperature: $25 \pm 3^\circ\text{C}$; Humidity $< 80\% \text{RH}$

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