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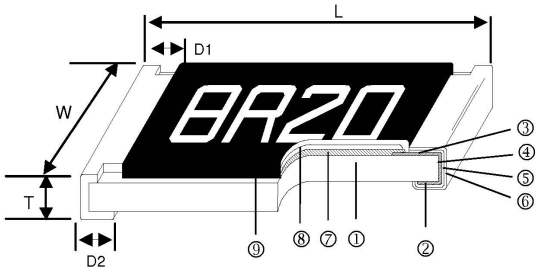
Thin Film Precision Chip Resistor—FHR Series

FAMULIA

■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

■Features

- —Advanced thin film technology
- —Very tight tolerance down to ±0.01%
- —Extremely low TCR down to ±5PPM/°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

■Dimensions

Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
FHR01	0201	0.58	0.29	0.23	0.12	0.15	0.14
FHR02	0402	1.00	0.50	0.30	0.20	0.20	0.54
FHR03	0603	1.55	0.80	0.45	0.30	0.30	1.83
FHR05	0805	2.00	1.25	0.55	0.30	0.40	4.71
FHR06	1206	3.05	1.55	0.55	0.42	0.35	9.02
FHR13	1210	3.10	2.40	0.55	0.40	0.55	10
FHR10	2010	4.90	2.40	0.55	0.60	0.50	23.61
FHR12	2512	6.30	3.10	0.55	0.60	0.50	38.06

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■Part Numbering

FHR	03	T	T	B	Y	1001	N
Product Type	Dimensions (L×W)	Resistance Tolerance	Packaging Code	TCR (PPM/℃)	Power Rating	Resistance	Marking Code
	01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 13: 1210 10: 2010 12: 2512	T: ±0.01% A: ±0.05% B: ±0.1% C: ±0.25% D: ±0.5% F: ±1%	T: Taping Reel B: Bulk	S: ±5 B: ±10 N: ±15 C: ±25 D: ±50	: Standard Y: 1/16W X: 1/10W W: 1/8W P: 1/5W V: 1/4W O: 1/3W U: 1/2W T: 1W	0010: 1Ω 4R70: 4.7Ω 1001: 1KΩ 1004: 1MΩ	: Standard Marking for E96 / E24 N: No Marking

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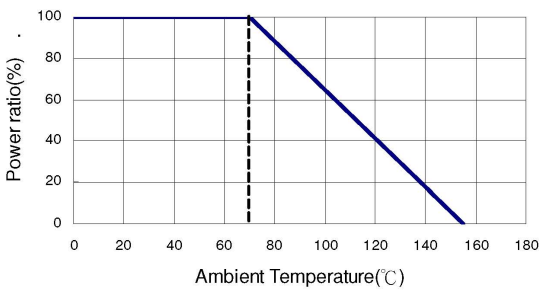
■Derating Curve



■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	—			49.9Ω - 5KΩ		±25 ±50
								49.9Ω - 33KΩ		±50
0402	1/16W	-55 ~ +155°C	25V	50V	—	10Ω - 205KΩ				±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 -511KΩ	4.7Ω - 2MΩ	1Ω - 2MΩ			±25 ±50
1206	1/8W	-55 ~ +155°C	150V	300V	4.7Ω - 1MΩ	4.7Ω - 2.5MΩ	1Ω - 2.5MΩ			±25 ±50
1210	1/5W									
2010	1/4W	-55 ~ +155°C	150V	300V	4.7Ω - 1MΩ	4.7Ω - 3MΩ	1Ω - 3MΩ			±25 ±50
2512	1/2W									

Operating Voltage=$\sqrt{(P*R)}$ or Max. operating voltage listed above, whichever is lower.

Overload Voltage=2.5*$\sqrt{(P*R)}$ or Max. overload voltage listed above, whichever is lower.

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■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%	
02 (0402)	1/16W	-55 ~ +155°C	25V	50V	49.9Ω - 5KΩ			±5
					49.9Ω - 12KΩ			±10 ±15
					—		49.9Ω - 70KΩ	±15
03 (0603)	1/16W	-55 ~ +155°C	50V	100V	24.9Ω - 15KΩ			±5
					24.9Ω - 100KΩ			±10 ±15
					—	4.7Ω - 332KΩ		
05 (0805)	1/10W	-55 ~ +155°C	100V	200V	24.9Ω - 30KΩ			±5
					24.9Ω - 200KΩ			±10 ±15
					—	4.7Ω - 511KΩ		
06 (1206)	1/8W	-55 ~ +155°C	150V	300V	24.9Ω - 50KΩ			±5
					24.9Ω - 500KΩ			±10 ±15
					—	4.7Ω - 1MΩ		
13 (1210)	1/ 5W	-55 ~ +155°C	150V	300V	24.9Ω - 50KΩ			±5
					24.9Ω - 500KΩ			±10 ±15
					—	4.7Ω - 1MΩ		
10 (2010)	1/4W	-55 ~ +155°C	150V	300V	24.9Ω - 100KΩ			±5
					24.9Ω - 500KΩ			±10 ±15
					—	4.7Ω - 1MΩ		
12 (2512)	1/2W	-55 ~ +155°C	150V	300V	24.9Ω - 100KΩ			±5
					24.9Ω - 500KΩ			±10 ±15
					—	4.7Ω - 1MΩ		

Operating Voltage=$\sqrt{(P*R)}$ or Max. operating voltage listed above, whichever is lower.

Overload Voltage=2.5*$\sqrt{(P*R)}$ or Max. overload voltage listed above, whichever is lower.

■High Power Rating Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range ±0.01%	±0.05%	±0.1%	±0.25%	±0.5%	TCR (PPM/°C)
03 (0603)	1/10W	-55 ~ +155°C	75V	150V	24.9Ω - 15KΩ					±5
					24.9Ω - 100KΩ	4.7Ω - 332KΩ				±10 ±15 ±25 ±50
	1/6W		100V	150V	—	100Ω - 332KΩ				±25 ±50
05 (0805)	1/8W	-55 ~ +155°C	150V	300V	24.9Ω - 30KΩ					±5
					24.9Ω - 200KΩ	4.7Ω - 511KΩ				±10 ±15 ±25 ±50
					—		4.7Ω - 1MΩ			±15 ±25 ±50
	1/4W		150V	300V	—	100Ω - 500KΩ				±25 ±50
06 (1206)	1/4W	-55 ~ +155°C	200V	400V	24.9Ω - 50KΩ					±5
					24.9Ω - 500KΩ	4.7Ω - 1MΩ				±10 ±15 ±25 ±50
	1/3W		200V	400V	—	100Ω - 1MΩ				±25 ±50
13 (1210)	1/ 3W	-55 ~ +155°C	200V	400V	24.9Ω - 50KΩ					±5
					24.9Ω - 500KΩ	4.7Ω - 1MΩ				±10 ±15 ±25 ±50

Operating Voltage=$\sqrt{(P*R)}$ or Max. operating voltage listed above, whichever is lower.

Overload Voltage=2.5*$\sqrt{(P*R)}$ or Max. overload voltage listed above, whichever is lower.

■Environmental Characteristics

Item	Requirement Tol. ≦ 0.05%	Tol. > 0.05%	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.		+25/-55/+25/+125/+25°C
Short Time Overload	ΔR±0.05%	ΔR±0.2%	RCWV*2.5 or Max. overload voltage for 5 seconds
	ΔR±0.2% for high power rating		
Insulation Resistance	>1000 MΩ		Apply 100V_{DC} for 1 minute
Endurance	ΔR±0.05%	ΔR±0.2%	70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
	>7kΩ ΔR±0.5%		
	ΔR±0.5% for high power rating		
Damp Heat with Load	ΔR±0.05%	ΔR±0.3%	40±2°C, 90~95% R.H. Max. working voltage 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±0.2%	Bending amplitude 3 mm for 10 seconds
Solderability	95% min. coverage		245±5°C for 3 seconds
Resistance to Soldering Heat	ΔR±0.05%	ΔR±0.2%	260±5°C for 10 seconds
Dielectric Withstand Voltage	By Type		Max. overload voltage for 1 minute
Thermal Shock	ΔR±0.05%	ΔR±0.25%	-55°C~150°C, 100 cycles
Low Temperature Operation	ΔR±0.05%	ΔR±0.2%	1 hour, -65°C, followed by 45 minutes of RCWV
	ΔR±0.5% for high power rating		

■ Reference Standards: MIL-STD-202, JIS-C 5201-1

■ Storage Temperature: 25±3°C; Humidity < 80%RH