

FHH Series Thick Film Chip Resistors Product Specification

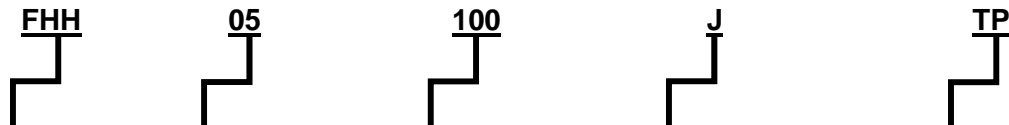
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1 Scope:

- 1.1 This specification is applicable to fully lead-free and halogen-free FHH series super high power thick film chip resistors.
- 1.2 Fully lead-free products without RoHS exemptions.
- 1.3 The product is for general electronic purpose.

2 Explanation Of Part Numbers:

(EX)



Type	Size	Nominal Resistance	Resistance Tolerance	Packaging(Refer to IE-SP-055)
Fully Lead-free Super High Power Thick Film Chip Resistors	05(0805)	5% (3-Digit) EX. 10Ω=100 4.7Ω=4R7 JUMPER=000	B=± 0.1% D=± 0.5% F=± 1% J=± 5%	TP : 4 mm Pitch Carrier Tape 5000 pcs P2 : 4 mm Pitch Carrier Tape 10000 pcs P3 : 4 mm Pitch Carrier Tape 15000 pcs P4 : 4 mm Pitch Carrier Tape 20000 pcs
		0.1% 0.5% 1% (4-Digit) EX. 10.2Ω=10R2 10KΩ=1002 JUMPER=0000		

3 General Specifications:

Type	Rated Power at 70°C	Max Working Voltage	Max Overload Voltage	T.C.R (ppm/°C)	Resistance Range				JUMPER Rated Power		JUMPER Resistance Value	
					B(±0.1%) E-24、E-96	D(±0.5%) E-24、E-96	F(±1%) E-24、E-96	J(±5%) E-24	J (±5%)	F (±1%)	J (±5%)	F (±1%)
FHH05 (0805)	1/2W	150V	300V	±100	100Ω ≤ R ≤ 1MΩ	10Ω ≤ R ≤ 5MΩ	10Ω ≤ R ≤ 5MΩ	10Ω ≤ R ≤ 5MΩ	2.5A	3.5A	50mΩ MAX.	20mΩ MAX.
				±200	-----	1Ω ≤ R < 10Ω	1Ω ≤ R < 10Ω	1Ω ≤ R < 10Ω				
Operating Temperature Range					-55°C ~ +155°C							

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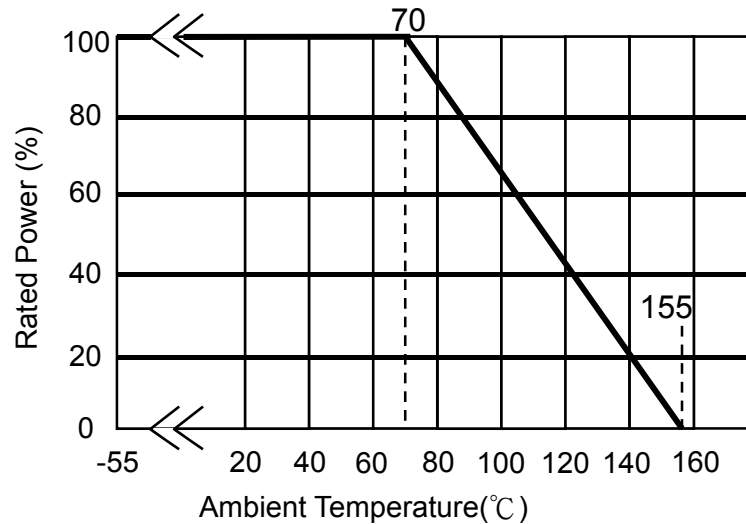
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3.1 Power Derating Curve:

Operating Temperature Range:- 55 ~ 155 °C

If the ambient temperature exceeds 70 degrees centigrade to 155 degrees centigrade, the power can be modified by the curve as below.



3.2 Voltage Rating

Rated Voltage: DC voltage or AC voltage (rms) based on the rated power.

The voltage can be calculated by the following formula. If the calculated value exceeds the Max voltage specified in the Table 3, the Max voltage rating is set as the voltage rating.

$$E = \sqrt{R \times P}$$

E= Voltage rating (v)
 P= Power rating (w)
 R= Nominal resistance(Ω)

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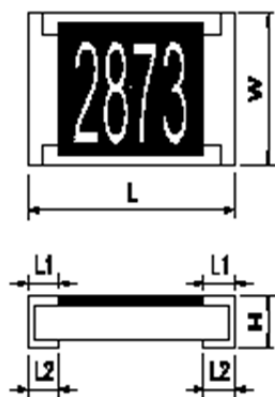
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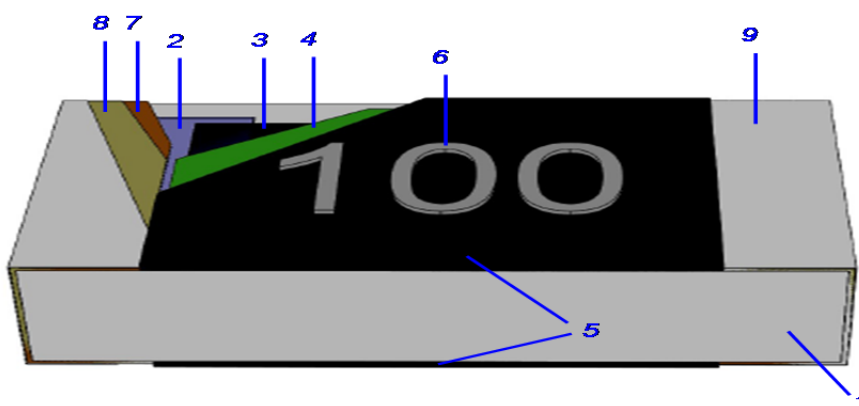
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4 Dimensions:



Dimension		Unit:mm				
		L	W	H	L1	L2
Type	Size Code					
FHH05	0805	2.00±0.10	1.25±0.10	0.55±0.10	0.35±0.20	0.35±0.20

5 Structure Graph (The top and the bottom are the same) :



1	Ceramic substrate	6	Marking
2	1st Top inner electrode	7	Terminal inner electrode
3	Resistive layer	8	Ni plating
4	1st Protective coating	9	Sn plating
5	2nd Protective coating	-	-

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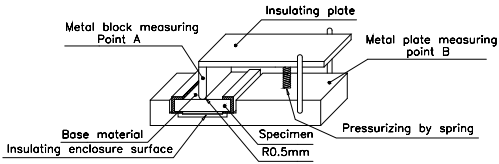
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6 Reliability Test:

6.1 Electrical Performance Test

Item	Conditions	Specifications	
		Resistors	Jumper
Temperature Coefficient of Resistance	$TCR \text{ (ppm/}^\circ\text{C)} = \frac{(R2 - R1)}{R1 (T2 - T1)} \times 10^6$ R1: Resistance at room temperature R2: Resistance at -55°C or +125°C T1: Room temperature T2: Temperature -55°C or +125°C Refer to JIS-C5201-1 4.8	Refer to item 3. general specifications	NA
Short Time Overload	Applied 2.5 times rated voltage for 5 seconds and release the load for about 30 minutes , then measure its resistance variance rate.(Rated voltage refer to item 3. general specifications) Refer to JIS-C5201-1 4.13	0.1%、0.5%、1%: $\Delta R\% = \pm 1.0\%$ 5%: $\Delta R\% = \pm 2.0\%$	Refer to item 3. general specifications
Insulation Resistance	Put the resistor in the fixture, add 100 VDC in + , - terminal for 60 sec then measured the insulation resistance between electrodes and insulating enclosure. Refer to JIS-C5201-1 4.6 	$\geq 10^9 \Omega$	

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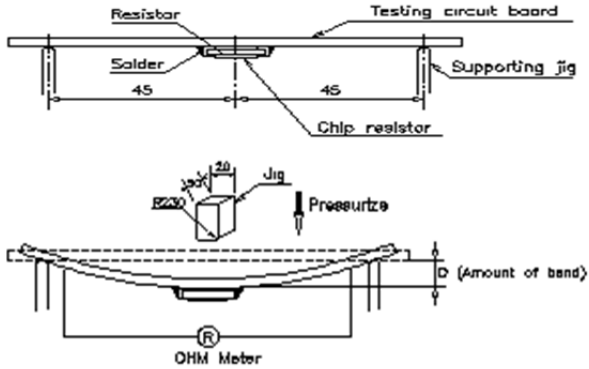
6.2 Mechanical Performance Test

Item	Conditions	Specifications	
		Resistors	Jumper
Terminal Strength	Test1: The resistor mounted on the board applied 5N pushing force on the sample rear for 10sec. Test2: The resistor mounted on the board and slowly add force on the sample rear until the sample termination is breakdown. Refer to JIS-C5201-1 4.16	Test1: No evidence of mechanical damage Test2: $\geq 5N$	
Resistance to Solvent	The tested resistor be immersed into isopropyl alcohol of 20~25°C for 5±0.5 minutes, then the resistor is left in the room for 48 hrs, and measured its resistance variance rate. Refer to JIS-C5201-1 4.29	$\Delta R\% = \pm 0.5\%$	Refer to item 3. general specifications
Solderability	Preconditioning: Put the tested resistor in the apparatus of PCT, at a temperature of 105°C, humidity of 100% RH, and pressure of 1.22×10^5 Pa for a duration of 4 hours. Then after left the tested resistor in room temperature for 2 hours or more. Test method: The resistor be immersed into solder pot in temperature 235±3°C for 2±0.5 sec, then the resistor is left as placed under microscope to observed its solder area. Refer to JIS-C5201-1 4.17	Solder coverage over 95%	
Resistance to Soldering Heat	◎Test method 1 (solder pot test): The tested resistor be immersed into molten solder of 260+5/-0°C for 10+1/-0 seconds. Then the resistor is left in the room for 1 hour. ◎Test method 2 (solder pot test): The tested resistor be immersed into molten solder of 260+5/-0°C for 30+1/-0 seconds. Then the resistor is left as placed under microscope to observe its solder area. ◎Test method 3 (Electric iron test): Preheating temperature : 350±10°C Electric iron preheating time : 3+1/-0 sec Preheating the electric iron on electrode termination, as after that step placed the iron over 60 min. and measured its resistance variance rate. Refer to JIS-C5201-1 4.18	Test item 1: (1) Variance rate on resistance $\Delta R\% = \pm 1.0\%$ Test item 2: (1) Solder coverage over 95%. (2) The underlying material (such as ceramic) shall not be visible at the crest corner area of the electrode. Test item 3: (1) Variance rate on resistance $\Delta R\% = \pm 1.0\%$	Refer to item 3. general specifications

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Item	Conditions	Specifications	
		Resistors	Jumper
Joint Strength of Solder	<p>◎Bending Strength: Solder tested resistor on to PC board. Add force in the middle down, and under load measured its resistance variance rate. D:FHH05=5mm</p>  <p style="text-align: center;">Refer to JIS-C5201-1 4.33</p>	$\Delta R\% = \pm 1.0\%$	Refer to item 3. general specifications

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6.3 Environmental Test

Item	Conditions	Specifications									
		Resistors	Jumper								
Resistance to Dry Heat	Put tested resistor in chamber under temperature $155\pm 5^{\circ}\text{C}$ for 1000 +48/-0 hours. Then leaving the tested resistor in room temperature for 60 minutes, and measure its resistance variance rate. Refer to JIS-C5201-1 4.25	0.1%、0.5%、1%: $\Delta R\% = \pm 1.0\%$ 5%: $\Delta R\% = \pm 2.0\%$	Refer to item 3. general specifications								
Thermal Shock	Put chip resistors in the thermal shock machine ,and the temperature was -55°C for 15 minutes and $+125^{\circ}\text{C}$ for 15 minutes, the total of 300 times and then removed, let stand for more than 1 hour before measuring the resistance change rate.. <table border="1" style="margin: 5px auto; width: 80%;"> <thead> <tr> <th colspan="2">Testing Condition</th> </tr> </thead> <tbody> <tr> <td>Lowest Temperature</td> <td>$-55\pm 5^{\circ}\text{C}$</td> </tr> <tr> <td>Highest Temperature</td> <td>$125\pm 5^{\circ}\text{C}$</td> </tr> <tr> <td>Temperature-retaining time</td> <td>15 minutes each</td> </tr> </tbody> </table> Refer to MIL-STD 202 Method 107	Testing Condition		Lowest Temperature	$-55\pm 5^{\circ}\text{C}$	Highest Temperature	$125\pm 5^{\circ}\text{C}$	Temperature-retaining time	15 minutes each	0.1%、0.5%、1%: $\Delta R\% = \pm 0.5\%$ 5%: $\Delta R\% = \pm 1.0\%$	Refer to item 3. general specifications
Testing Condition											
Lowest Temperature	$-55\pm 5^{\circ}\text{C}$										
Highest Temperature	$125\pm 5^{\circ}\text{C}$										
Temperature-retaining time	15 minutes each										
Loading Life in Moisture	Put the tested resistor in the chamber under temperature $40\pm 2^{\circ}\text{C}$, relative humidity 90~95% and load the rated voltage for 90 minutes on, 30 minutes off, total 1000 hours. Then leaving the tested resistor in room temperature for 60 minutes, and measure its resistance variance rate. Refer to JIS-C5201-1 4.24	0.1%、0.5%、1%: $\Delta R\% = \pm 2\%$ 5%: $\Delta R\% = \pm 3\%$	Refer to item 3. general specifications								
Load Life	Put the tested resistor in chamber under temperature $70\pm 2^{\circ}\text{C}$ and load the rated voltage for 90 minutes on, 30 minutes off, total 1000 hours. Then leaving the tested resistor in room temperature for 60 minutes, and measure its resistance variance rate. Refer to JIS-C5201-1 4.25	0.1%、0.5%、1%: $\Delta R\% = \pm 2\%$ 5%: $\Delta R\% = \pm 3\%$	Refer to item 3. general specifications								

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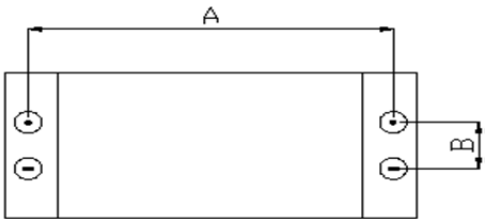
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7 Measurement Point:

Bottom electrode	Unit : mm		
 <p style="text-align: center;"> + Current Terminal - Voltage Terminal </p>	DIM	A	B
TYPE			
FHH05		1.80±0.05	0.35±0.05

8 Plating Thickness:

- 8.1 Ni: $\geq 2\mu\text{m}$
- 8.2 Sn(Tin): $\geq 3\mu\text{m}$
- 8.3 Sn(Tin): Matte Sn

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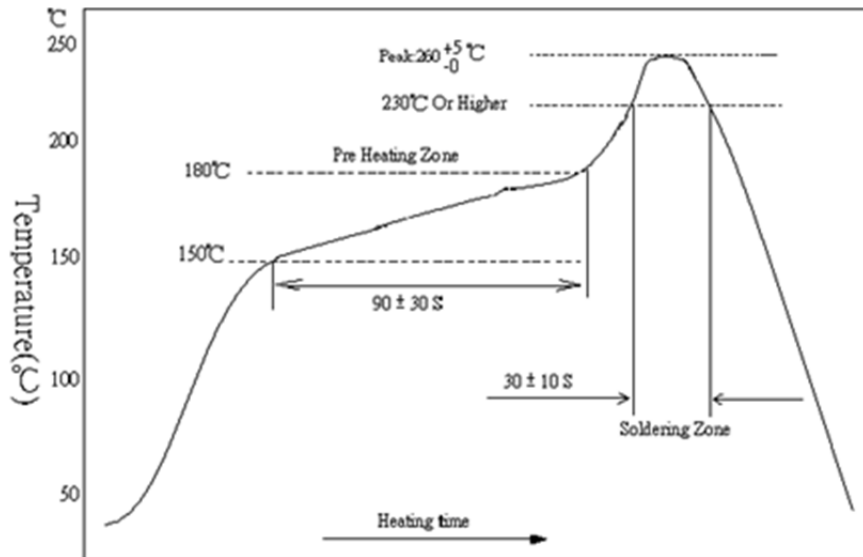
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9 Technical application notes: (This is for recommendation, please customer perform adjustment according to actual application)

9.1 Recommend Soldering Method:

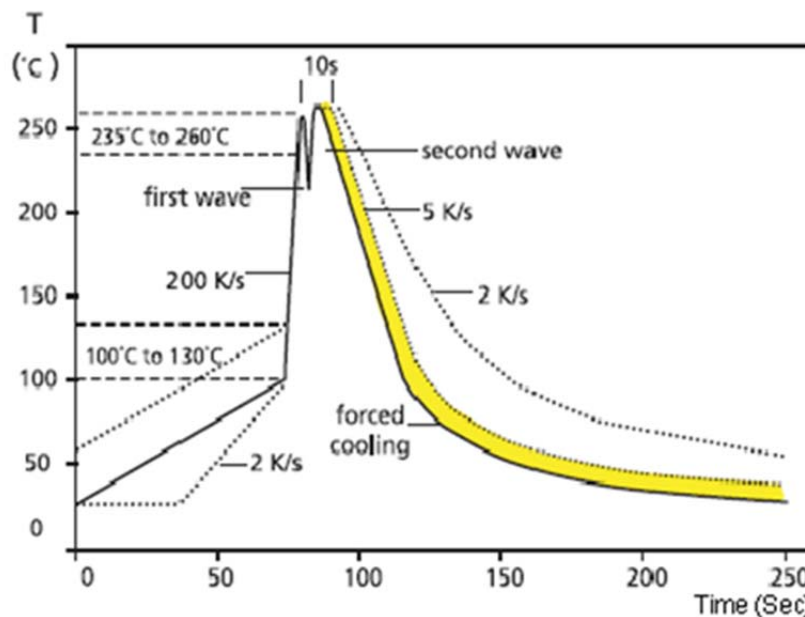
9.1.1 Lead Free IR Reflow Soldering Profile



Remark1: Recommended IR Reflow Soldering Profile meet J-STD-020D.

Remark2: The peak temperature of soldering heat is 260 +5/-0 °C for 10 seconds.

9.1.2 Lead Free Double-Wave Soldering Profile. (This applies to 0603 size inclusive above products)



9.1.3 Soldering Iron: temperature 350°C ± 10°C, dwell time shall be less than 3 sec.

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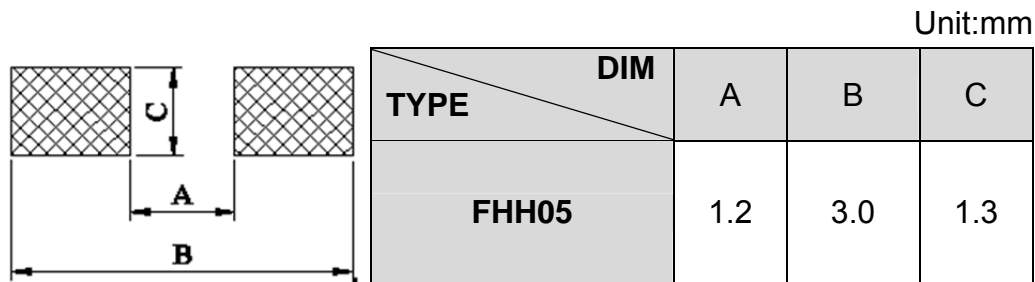
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9.2 Recommend Land Pattern Design (For Reflow Soldering):

When a component is soldered, the resistance after soldering changes slightly depending on the size of the soldering area and the amount of soldering. When designing a circuit, it is necessary to consider the effect of a decrease or increase in its resistance.



9.3 Environment Precautions:

This specification product is for general electronic use, ABCO will not be responsible for any damage, cost or loss caused by using this specification product in any special environment. If other applications, you need to confirm with ABCO.

If consumer intends to use our Company product in special environment or condition (including but not limited to those mentioned below), then will need to make individual recognition of product features and reliability accordingly.

- (a) Used in high temperature and humidity environment
- (b) Exposed to sea breeze or other corrosive gas, such as Cl₂、H₂S、NH₃、SO₂ and NO₂.
- (c) Used in non-verified liquids including water, oil, chemical and organic solvents.
- (d) Using non-verified resin or other coating material to seal or coat our Company product.
- (e) After soldering, it is necessary to use water-soluble detergents to clean residual solder fluxes, even though no-clean fluxes are recommended.

9.4 Momentary Overload Precautions:

The product might be out of function when momentary overloaded. Please make sure to avoid momentary overloading while using and preserving ◦

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9.5 Operation and Processing Precautions:

- (a) Avoid damage to the edge of resistor and protective layer caused by mechanical stress.
- (b) Handle with care when printing circuit board (PCB) is divided or fixed on support body, because bending of printing circuit board (PCB) mounting will make mechanical stress for resistors.
- (c) Make sure the power rating is under the limit when using the resistor. When power rating is over the limit, the resistor will be overloaded. There might be machinery damage due to the climbing temperature.
- (d) If the resistor will be exposed under massive impact load (shock wave) in a short period of time, the working environment must be set up well before use.
- (e) Please make evaluation and confirmation when the product is well used in your company and have a through consideration of it's fail-safe design to ensure the system safety.

10 Storage and transportation requirement:

10.1 The temperature condition must be controlled at $25\pm 5^{\circ}\text{C}$, the R.H. must be controlled at $60\pm 15\%$. The stock can maintain quality level in two years.

10.2 Please avoid the mentioned harsh environment below when storing to ensure product performance and its weldability. Places exposed to sea breeze or other corrosive gas, such as Cl_2 、 H_2S 、 NH_3 、 SO_2 and NO_2 .

10.3 When the product is moved and stored, please ensure the correct orientation of the box. Do not drop or squeeze the box. Otherwise, the electrode or the body of the product may be damaged.

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