

DATA SHEET

ANTI-SULFURATED CHIP RESISTORS

AF122 (4Pin/2R) / AF124 (8Pin/4R) / AF162 (4Pin/2R)/ AF164 (8Pin/4R) 5%, 1%

sizes 2 × 0402, 4 × 0402, 2 × 0603, 4 × 0603 RoHS compliant



YAGEO Phi(comp



SCOPE

This specification describes AFI22/AFI24/AFI62/AFI64 (convex)series chip resistor arrays with lead-free terminations made by thick film process.

<u>APPLICATIONS</u>

- Terminal for SDRAM and **DDRAM**
- High-end Computer & Multimedia Electronics in high sulfur environment
- Consume electronic equipments: PDAs, PNDs
- Mobile phone, telecom...

FEATURES

- AEC-Q200 qualified
- RoHS compliant
- Reducing environmentally hazardous wastes
- High component and equipment reliability
- Saving of PCB space
- None forbidden-materials used in products/production
- Halogen Free Epoxy
- Moisture sensitivity level: MSL I

ORDERING INFORMATION - GLOBAL PART NUMBER & 12NC

Both part numbers are identified by the series, size, tolerance, packing type, temperature coefficient, taping reel and resistance value.

YAGEO BRAND ordering code

GLOBAL PART NUMBER (PREFERRED)

SERIES

AF XX X - X X X XX XXXX L

(1) (2) (3) (4) (5) (6)

(I) SIZE

 $12 = 0402 \times 2 (0404)$

 $12 = 0402 \times 4 (0408)$

 $16 = 0603 \times 2 (0606)$

 $16 = 0603 \times 4 (0612)$

(2) NUMBER OF RESISTORS

2 = 2 resistors

4 = 4 resistors

(3) TOLERANCE

 $F = \pm 1\%$

 $| = \pm 5\%$ (for jumper ordering, use code of |)

(4) PACKAGING TYPE

R = Paper taping reel

(5) TEMPERATURE COEFFICIENT OF RESISTANCE

- = Base on spec

(6) TAPING REEL

07 = 7 inch dia. Reel

13 = 13 inch dia, Reel

(7) RESISTANCE VALUE

There are 2~4 digits indicated the resistor value. Letter R/K/M is decimal point, no need to mention the last zero after R/K/M, e.g. I K2, not I K20.

Detailed resistance rules show in table of "Resistance rule of global part number".

Resistance rule of global part number

Resistance code rule	Example		
0R	0R = Jumper		
XRXX (1 to 9.76 Ω)	IR = I Ω IR5 = I.5 Ω 9R76 = 9.76 Ω		
XXRX (10 to 97.6 Ω)	IOR = IO Ω 97R6 = 97.6 Ω		
XXXR (100 to 976 Ω)	100R = 100 Ω		
XKXX (1 to 9.76 KΩ)	IK = 1,000 Ω 9K76 = 9760 Ω		
XM (Ι ΜΩ)	ΙΜ = 1,000,000 Ω		

ORDERING EXAMPLE

The ordering code of a AFI22 convex chip resistor array, value $1,000\Omega$ with ±5% tolerance, supplied in 7-inch tape reel is: AF122-JR-071KL.

NOTE

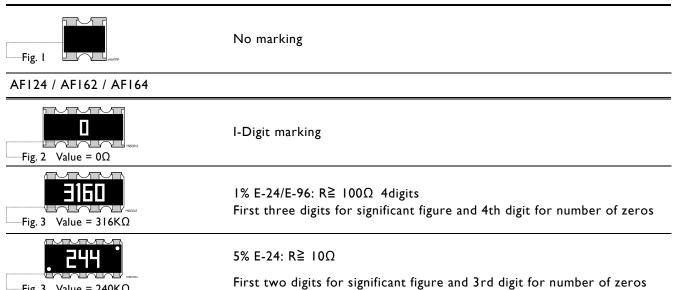
- I. All our R-Chip products meet RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"
- 2. On customized label, "LFP" or specific symbol printed and the optional "L" at the end of GLOBAL PART NUMBER



SERIES

<u>MARKING</u>

AFI22



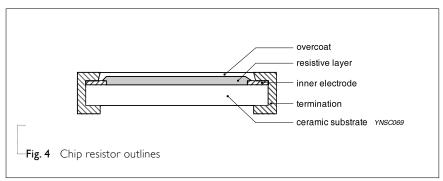
For further marking information, please refer to data sheet "Chip resistors marking".

CONSTRUCTION

Fig. 3 Value = $240K\Omega$

The resistor is constructed on top of a high-grade ceramic body. Internal metal electrodes are added on each end to make the contacts to the thick film resistive element. The composition of the resistive element is a noble metal embedded into a glass and covered by a glass. The resistor is laser trimmed to the rated resistance value. The resistor is covered with a protective epoxy coat, finally the external terminations (matte tin on Nibarrier) are added as shown in Fig.4.

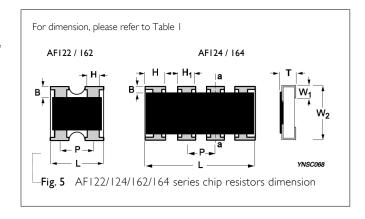
OUTLINES



DIMENSIONS

Table I

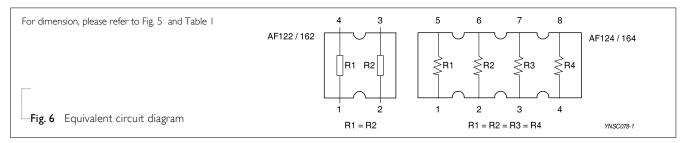
TYPE	AFI22	AFI24	AFI62	AFI64
B (mm)	0.24±0.10	0.25±0.15	0.35 ± 0.10	0.35±0.15
H (mm)	0.30+0.10/-0.05	0.45±0.05	0.30 ± 0.10	0.65±0.05
H _I (mm)		0.30±0.05		0.50±0.15
P (mm)	0.67±0.05	0.50±0.05	0.80 ± 0.05	0.80±0.05
L (mm)	1.00±0.10	2.00±0.10	1.60±0.10	3.20±0.15
T (mm)	0.30±0.10	0.45±0.10	0.40 ± 0.10	0.60±0.10
W _I (mm)	0.25±0.10	0.30±0.15	0.30 ± 0.10	0.30±0.15
W ₂ (mm)	1.00±0.10	1.00±0.10	1.60 ± 0.10	1.60±0.15



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SCHEMATIC



ELECTRICAL CHARACTERISTICS

Table 2

CHARACTERISTICS	AF	122		AFI24		AFI62	AF	164
Operating Temperature	–55 °C to +15	5°C	–55 °C to +	+155 °C	–55 °C to	+155 °C	-55 °C to +15	55 °C
Rated Power	1/1	6 W		1/16 W		1/16W	1/	16W
Maximum Working Voltage		50 V		25 V		50V		50V
Maximum Overload Voltage	I	00 V		50 V		100V	1	100V
Dielectric Withstanding	I	00 V		100 V		100V		100V
Resistance Range	5% (E24) I Ω to I M Ω I% (E24/E96) I0 Ω to I M Ω Jumper < 50 m Ω		5% (E24) Ω t % (E24/E96) Ω t Jumper <	ο Ι ΜΩ	'		5% (E24) I Ω to I % (E24/E96) I Ω to I Jumper < 50	$\mathbf{M}\Omega$
Temperature Coefficient	I Ω ≤ R ≤ I0 Ω ±250 ppm/°C I0 Ω ≤ R ≤ I ΜΩ ±200 ppm/°C $±250 ppm/°C$							
Jumper Criteria	Rated Current ().5 A	Rated Current	1.0 A	Rated Current	1.0 A	Rated Current	1.0A
Jumper Criteria	Maximum Current 1.0 A Maximum Current 2.0 A Maximum Current		2.0 A	A Maximum Current 2.0A				

FOOTPRINT AND SOLDERING PROFILES

For recommended footprint and soldering profiles, please refer to data sheet "Chip resistors mounting".

PACKING STYLE AND PACKAGING QUANTITY

Table 3 Packing style and packaging quantity

PACKING STYLE	REEL DIMENSION	AFI22	AFI24	AFI62	AFI64
Paper Taping Reel (R)	7" (178 mm)	10,000 units	10,000 units	5,000 units	5,000 units
	13" (330 mm)	50,000 units	40,000 units		20,000 units

NOTE

1. For paper tape and reel specification/dimensions, please refer to data sheet "Chip resistors packing".

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FUNCTIONAL DESCRIPTION

POWER RATING

AFI22 / AFI24 / AFI62 / AFI64 rated power at 70 °C is I/16 W

RATED VOLTAGE

The DC or AC (rms) continuous working voltage corresponding to the rated power is determined by the following formula:

$$V = \sqrt{(P \times R)}$$

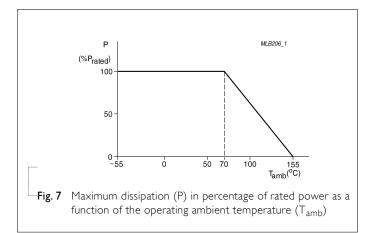
or max. working voltage whichever is less

Where

V=Continuous rated DC or AC (rms) working voltage (V)

P=Rated power (W)

R=Resistance value (Ω)



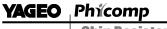
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TESTS AND REQUIREMENTS

Table 4 Test condition, procedure and requirements

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Life/	MIL-STD-202-method 108	1,000 hours at 70±2 °C applied RCWV	±(2%+0.05 Ω)
Endurance	IEC 60115-1 4.25	1.5 hours on, 0.5 hour off, still air required	<100 m Ω for Jumper
High Temperature Exposure	MIL-STD-202-method 108	I,000 hours at maximum operating temperature depending on specification, unpowered	\pm (1%+0.05 Ω) <50 m Ω for Jumper
		Tolerances: I55±3 °C	
Moisture	MIL-STD-202-method 106	Each temperature / humidity cycle is defined at	±(2%+0.05 Ω)
Resistance		8 hours (method 106G), 3 cycles / 24 hours for 10d with 25 °C / 65 °C 95% R.H., without steps 7a & 7b, unpowered	<100 m Ω for Jumper
		Parts mounted on test-boards, without condensation on parts	
		Measurement at 24±2 hours after test conclusion	
Thermal Shock	MIL-STD-202-method 107	-55/+125 °C	±(1%+0.05 Ω)
		Note: Number of cycles required is 300. Devices mounted	<50 m Ω for Jumper
		Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air	
Short Time	IEC60115-1 4.13	2.5 times RCWV or maximum overload voltage whichever is less for 5 sec at room temperature	±(2%+0.05 Ω)
Overload			$<$ 50 m Ω for Jumper
			No visible damage
Board Flex/	IEC60115-1 4.33	Device mounted on PCB test board as	±(1%+0.05 Ω)
Bending		described, only 1 board bending required 3 mm bending	$<$ 50 m Ω for Jumper
		3 mm bending Bending time: 60±5 seconds	No visible damage
		Ohmic value checked during bending	





Chip Resistor Surface Mount AF

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TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Solderability			
- Wetting	J-STD-002 test B	Electrical Test not required	Well tinned (≥95% covered)
		Magnification 50X	No visible damage
		SMD conditions:	
		I st step: method B, aging 4 hours at 155 °C dry heat	
		2 nd step: leadfree solder bath at 245±3 °C	
		Dipping time: 3±0.5 seconds	
- Leaching	J-STD-002 test D	Leadfree solder, 260 °C, 30 seconds immersion time	No visible damage
- Resistance to	IEC 60115-1 4.18	Condition B, no pre-heat of samples	±(1%+0.05Ω)
Soldering Heat	MIL-STD-202 Method 215	Leadfree solder, 260 °C, 10 seconds immersion time	$<$ 50 m Ω for Jumper
			No visible damage
		Procedure 2 for SMD: devices fluxed and cleaned with isopropanol	·
FOS	ASTM-B-809-95*	Sulfur 750 hours, 105°C, unpowered	±(4.0%+0.05Ω)
	*Modified		$<$ 100m Ω for Jumper

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REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version 5	Mar. 20, 2017	-	- Modify AF124/164 Equivalent Circuit Diagram
Version 4	Jun. 23, 2016	-	- AEC-Q200 qualified
Version 3	Nov. 17, 2015	-	- Add in AF162
Version 2	May 29,2015	-	- Add in AF164
Version I	Aug. 15, 2014	-	- Update AFI24 dimensions
Version 0	Oct. 02, 2013	-	- First issue of this specification

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