



ARTI-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

> > Product specification – March 20, 2017 V.5







Chip Resistor Surface Mount

<u>SCOPE</u>

This specification describes AF122/AF124/AF162/AF164 (convex)series chip resistor arrays with lead-free terminations made by thick film process.

APPLICATIONS

- 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

AF

GLOBAL PART NUMBER (PREFERRED)

AF XX X - X X X XX XXXX L

(I)	(2)) ((3)) ((4)) (5) (6) ((7)

I)	S	ΙZΕ
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12 = 0402 × 2 (0404)
$12 = 0402 \times 4 \ (0408)$
$16 = 0603 \times 2 \ (0606)$
$ 6 = 0603 \times 4 \ (06 2)$

(2) NUMBER OF RESISTORS

2 = 2 resistors

4 = 4 resistors

(3) TOLERANCE

 $F = \pm 1\%$

 $J = \pm 5\%$ (for Jumper ordering, use code of J)

(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 o	f global part
Resistance code rule	Example
OR	0R = Jumper
XRXX (Ι to 9.76 Ω)	R = Ω R5 = .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 (I to 9.76 K Ω)	ΙΚ = Ι,000 Ω 9K76 = 9760 Ω
XM (Ι ΜΩ)	IM = 1,000,000 Ω

ORDERING EXAMPLE

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

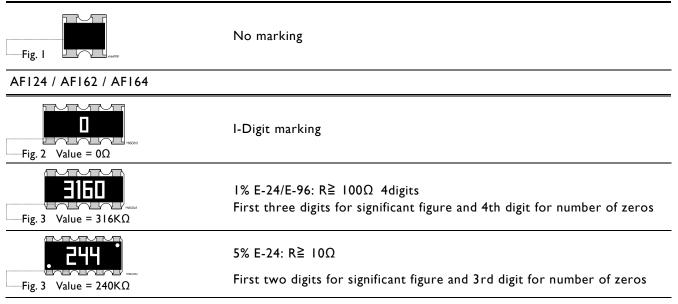
NOTE

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

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MARKING

AFI22

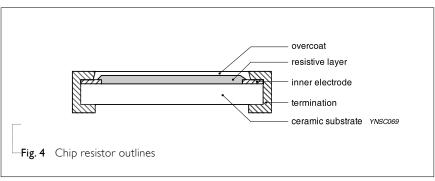


For further marking information, please refer to data sheet "Chip resistors marking".

CONSTRUCTION

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

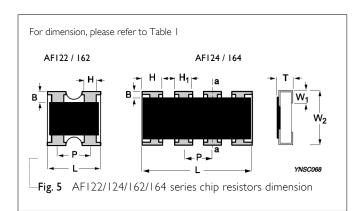


DIMENSIONS

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Table I

TYPE	AF122	AFI24	AF162	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
H₁ (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



Chip Resistor Surface Mount

SCHEMATIC

For dimension, please refer to Fig. 5 and Table I	4 3	5 6 7 8	
	AF122 / 162		AF124 / 164
Fig. 6 Equivalent circuit diagram	R1 = R2	1 2 3 4 R1 = R2 = R3 = R4	YNSC078-1

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ELECTRICAL CHARACTERISTICS

Table 2							
CHARACTERISTICS	A	AF122		AFI24		AF162	AF164
Operating Temperature	–55 °C to +	∣55 °C	–55 °C to +	+155 °C	–55 °C to	+155 °C	−55 °C to +155 °C
Rated Power	I	/16 W		1/16 W		1/16W	1/16W
Maximum Working Voltage		50 V		25 V		50V	50V
Maximum Overload Voltage		100 V		50 V		100V	100V
Dielectric Withstanding		100 V		100 V		100V	100V
Resistance Range	5% (E24) Ι Ω to Ι% (E24/E96) Ι0 Ω to Jumper < 5	ΙΜΩ	5% (E24) Ι Ω t Ι% (E24/E96) Ι Ω t Jumper <	ο Ι Μ Ω	5% (E24) ΙΩ t Ι% (E24/E96) ΙΩ t Jumper <	:o Ι ΜΩ Ι	5% (E24) Ι Ω to Ι ΜΩ % (E24/E96) Ι Ω to Ι ΜΩ Jumper < 50 mΩ
Temperature Coefficient		($ \Omega \leq R \leq 0 \Omega \pm 25$ $0 \Omega \leq R \leq M\Omega \pm 20$				±250 ppm/°C
Jumper Criteria	Rated Current	0.5 A	Rated Current	1.0 A	Rated Current	1.0 A	Rated Current 1.0A
	Maximum Current	1.0 A	Maximum Current	2.0 A	Maximum Current	2.0 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 sty	yle and packaging quantity				
PACKING STYLE	REEL DIMENSION	AFI22	AFI24	AF162	AF164
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

AF122 / AF124 / AF162 / AF164 rated power at 70 $^\circ\text{C}$ is 1/16 W

RATED VOLTAGE

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

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

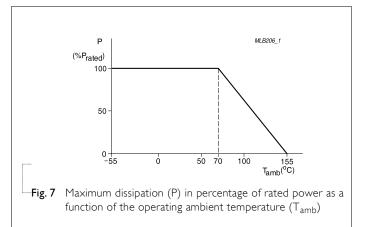
or max. working voltage whichever is less

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 \pm 2 °C applied RCWV	±(2%+0.05 Ω)
Endurance	IEC 60115-1 4.25	I.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	±(1%+0.05 Ω) <50 mΩ for Jumper
		Tolerances: 155±3 °C	
Moisture Resistance	MIL-STD-202-method 106	Each temperature / humidity cycle is defined at 8 hours (method 106G), 3 cycles / 24 hours for 10d with 25 °C / 65 °C 95% R.H, without steps 7a & 7b, unpowered	±(2%+0.05 Ω) <100 mΩ 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	${<}50~\text{m}\Omega$ for Jumper
		Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air	
Short Time	IEC60115-14.13	2.5 times RCWV or maximum overload	±(2%+0.05 Ω)
Overload		voltage whichever is less for 5 sec at room temperature	$<\!50~\text{m}\Omega$ 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 I board bending required	$<$ 50 m Ω for Jumper
		3 mm bending	No visible damage
		Bending time: 60±5 seconds Ohmic value checked during bending	

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122/124/162/164 (RoHS Compliant) SERIES

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TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Solderability			
- Wetting	J-STD-002 test B	Electrical Test not required	Well tinned (≥95% covered) No visible damage
		Magnification 50X	
		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 Soldering Heat	IEC 60115-1 4.18	Condition B, no pre-heat of samples	±(1%+0.05Ω)
	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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Chip Resistor Surface Mount AF

SERIES 122/124/162/164 (RoHS Compliant)

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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