Innovative Service Around the Globe YAGEO

DATA SHEET

ANTI-SULFURATED CHIP RESISTORS

AF122 (4Pin/2R) / AF124 (8Pin/4R) /
AF162 (4Pin/ 2R)/ AF164 (8Pin/ 4R)

5%, 1%

sizes 2 × 0402, 4 x 0402, 2 x 0603, 4 x 0603

RoHS compliant

YAGEO
Phycomp

Product specification – March 20, 2017 V.5

SCOPE

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 1

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)

AF XX X - X X X XX XXXX L

(1) (2) (3) (4) (5) (6) (7)

(1) SIZE

12 = 0402 × 2 (0404)
12 = 0402 × 4 (0408)
16 = 0603 × 2 (0606)
16 = 0603 × 4 (0612)

(2) NUMBER OF RESISTORS

2 = 2 resistors
4 = 4 resistors

(3) TOLERANCE

F = ±1%
J = ±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.1K2, not 1K20.

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)	1R = 1 Ω 1R5 = 1.5 Ω 9R76 = 9.76 Ω
XXRX (10 to 97.6 Ω)	10R = 10 Ω 97R6 = 97.6 Ω
XXXR (100 to 976 Ω)	100R = 100 Ω
XKXX (1 to 9.76 KΩ)	1K = 1,000 Ω 9K76 = 9760 Ω
XM (1 MΩ)	1M = 1,000,000 Ω

ORDERING EXAMPLE

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

NOTE

1. 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

MARKING

AF122

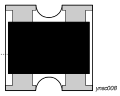

Fig. 1

No marking

AF124 / AF162 / AF164

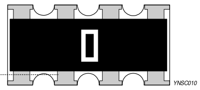

Fig. 2 Value = 0Ω

1-Digit marking

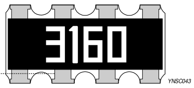

Fig. 3 Value = 316KΩ

1% E-24/E-96: R≧ 100Ω 4digits
First three digits for significant figure and 4th digit for number of zeros

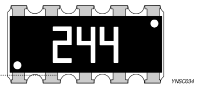

Fig. 3 Value = 240KΩ

5% E-24: R≧ 10Ω

First two digits for significant figure and 3rd digit for number of zeros

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 Ni-barrier) are added as shown in Fig.4.

OUTLINES

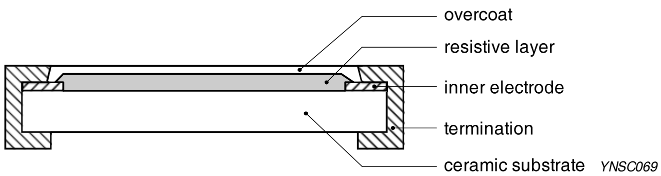

Fig. 4 Chip resistor outlines

DIMENSIONS

Table 1

TYPE	AF122	AF124	AF162	AF164
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_1 (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_1 (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

For dimension, please refer to Table 1

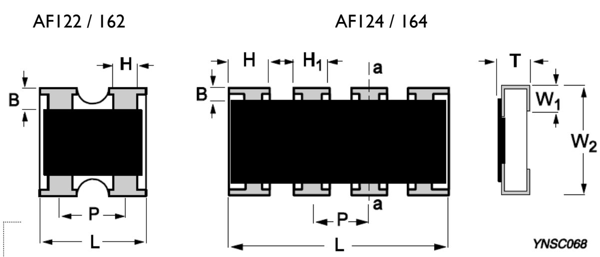

Fig. 5 AF122/124/162/164 series chip resistors dimension

SCHEMATIC

For dimension, please refer to Fig. 5 and Table 1

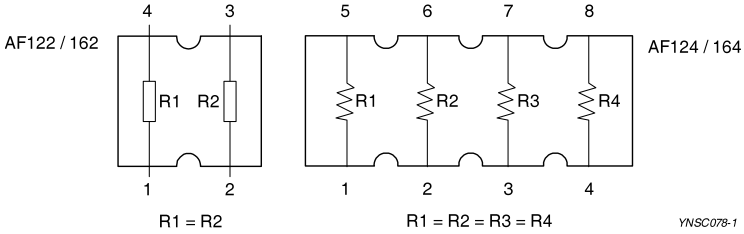

Fig. 6 Equivalent circuit diagram

ELECTRICAL CHARACTERISTICS

Table 2

CHARACTERISTICS	AF122	AF124	AF162	AF164
Operating Temperature	–55 °C to +155 °C	–55 °C to +155 °C	–55 °C to +155 °C	–55 °C to +155 °C
Rated Power	1/16 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) 1 Ω to 1 MΩ 1% (E24/E96) 10 Ω to 1 MΩ Jumper < 50 mΩ	5% (E24) 1 Ω to 1 MΩ 1% (E24/E96) 1 Ω to 1 MΩ Jumper < 50 mΩ	5% (E24) 1 Ω to 1 MΩ 1% (E24/E96) 1 Ω to 1 MΩ Jumper < 50 mΩ	5% (E24) 1 Ω to 1 MΩ 1% (E24/E96) 1 Ω to 1 MΩ Jumper < 50 mΩ
Temperature Coefficient	1 Ω ≤ R ≤ 10 Ω ±250 ppm/°C 10 Ω ≤ R ≤ 1 MΩ ±200 ppm/°C			±250 ppm/°C
Jumper Criteria	Rated Current 0.5 A Maximum Current 1.0 A	Rated Current 1.0 A Maximum Current 2.0 A	Rated Current 1.0 A Maximum Current 2.0 A	Rated Current 1.0A 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	AF122	AF124	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".

FUNCTIONAL DESCRIPTION

POWER RATING

AF122 / AF124 / AF162 / AF164 rated power at 70 °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)

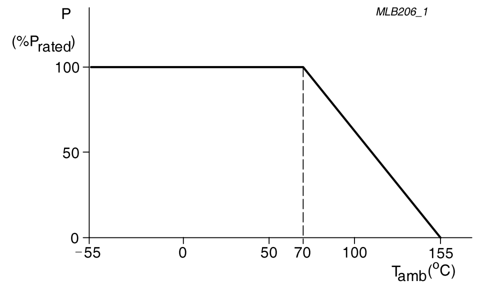

Fig. 7 Maximum dissipation (P) in percentage of rated power as a function of the operating ambient temperature (T_{amb})

TESTS AND REQUIREMENTS

Table 4 Test condition, procedure and requirements

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Life/ Endurance	MIL-STD-202-method 108 IEC 60115-1 4.25	1,000 hours at 70±2 °C applied RCWV 1.5 hours on, 0.5 hour off, still air required	±(2%+0.05 Ω) <100 mΩ for Jumper
High Temperature Exposure	MIL-STD-202-method 108	1,000 hours at maximum operating temperature depending on specification, unpowered Tolerances: 155±3 °C	±(1%+0.05 Ω) <50 mΩ for Jumper
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 Parts mounted on test-boards, without condensation on parts Measurement at 24±2 hours after test conclusion	±(2%+0.05 Ω) <100 mΩ for Jumper
Thermal Shock	MIL-STD-202-method 107	-55/+125 °C Note: Number of cycles required is 300. Devices mounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air	±(1%+0.05 Ω) <50 mΩ for Jumper
Short Time Overload	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) <50 mΩ for Jumper No visible damage
Board Flex/ Bending	IEC60115-1 4.33	Device mounted on PCB test board as described, only 1 board bending required 3 mm bending Bending time: 60±5 seconds Ohmic value checked during bending	±(1%+0.05 Ω) <50 mΩ for Jumper No visible damage

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

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 1	Aug. 15, 2014	-	- Update AF124 dimensions
Version 0	Oct. 02, 2013	-	- First issue of this specification

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AF124-JR-0722RL AF124-JR-0715RL AF122-JR-0722RL AF124-JR-0736RL AF124-JR-0747RL AF124-JR-07240RL AF124-JR-0724RL AF124-JR-0730RL AF122-JR-0775RL AF122-JR-0736RL AF124-JR-0782RL AF122-JR-0747RL AF124-JR-0751RL AF122-JR-0739RL AF122-JR-0733RL AF124-JR-0727RL AF122-JR-0715RL AF124-JR-0733RL AF122-JR-0727RL AF124-JR-0739RL AF124-JR-0743RL AF124-JR-0718RL AF122-JR-0730RL AF122-JR-0718RL AF124-JR-0710RL AF124-JR-071KL AF124-JR-070RL AF124-FR-07100KL AF124-JR-0722KL AF124-JR-0775RL AF122-JR-073RL AF124-JR-07100RL AF124-JR-077R5L AF124-FR-0710KL AF124-FR-07100RL AF124-JR-073RL AF124-FR-071KL AF124-JR-0710KL AF164-FR-071KL AF164-FR-0749R9L AF164-FR-0710KL AF164-FR-0722KL AF162-JR-0722RL AF164-JR-0722RL AF164-JR-073RL AF164-JR-0710KL AF164-JR-071KL AF164-JR-072K2L AF164-JR-0747KL AF164-FR-07100KL AF164-FR-0720KL AF164-FR-0733RL AF164-FR-077K5L AF164-JR-074K7L AF164-JR-0733RL AF164-JR-0751KL AF164-JR-0756RL AF124-JR-07470RL AF124-JR-0747KL AF124-JR-074K7L AF124-FR-0733RL AF124-FR-0749R9L AF124-JR-07100KL AF164-JR-07100KL AF164-JR-07100RL AF164-JR-0715KL AF124-FR-07470RL AF164-FR-074K7L AF122-JR-07100KL AF122-JR-07100RL AF164-FR-0715RL AF164-FR-0712KL AF122-FR-073K3L AF124-JR-0733KL AF164-JR-07470RL AF164-JR-0722KL AF164-FR-07620RL AF164-JR-078K2L AF164-JR-07150RL AF164-JR-0727RL AF122-JR-0710RL AF164-JR-07680RL AF124-FR-0751RL AF122-FR-0733RL AF164-FR-0756RL AF164-JR-07300RL AF164-JR-07510KL AF122-JR-075R1L AF124-JR-0720KL AF164-FR-0747KL AF162-JR-072K2L AF164-JR-0751RL AF164-JR-0733KL AF122-JR-071ML AF164-FR-0715KL AF164-JR-072K7L AF122-JR-0747KL AF124-FR-071K5L AF164-FR-075K1L AF164-FR-071ML