Innovative Service Around the Globe YAGEO

DATA SHEET

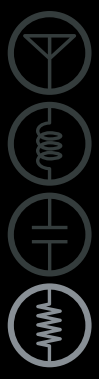
HIGH POWER CHIP RESISTORS

RC high power series

5%, 1%

sizes 0603/0805/1206/2512

RoHS compliant & Halogen free



YAGEO Phicomp

Product specification – Dec 14, 2010 V.0

SCOPE

This specification describes RC0603 to RC2512 high power chip resistors with lead-free terminations made by thick film process.

APPLICATIONS

- All general purpose applications

FEATURES

- Halogen Free Epoxy
- RoHS compliant
  - Products with lead-free terminations meet RoHS requirements
  - Pb-glass contained in electrodes, resistor element and glass are exempted by RoHS
- Reducing environmentally hazardous wastes
- High component and equipment reliability
- Saving of PCB space
- None forbidden-materials used in products/production

ORDERING INFORMATION - GLOBAL PART NUMBER

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

GLOBAL PART NUMBER (PREFERRED)

RC	XXXX	X	X	-	XX	XXXX	L
	(1)	(2)	(3)	(4)	(5)	(6)	(7)

(1) SIZE

0603 / 0805 / 1206 / 2512

(2) TOLERANCE

F = ±1%
J = ±5%

(3) PACKAGING TYPE

R = Paper taping reel
K = Embossed taping reel

(4) TEMPERATURE COEFFICIENT OF RESISTANCE

– = Base on spec

(5) TAPING REEL

7W = 2 x standard power

(6) 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".

(7) OPTIONAL CODE

Letter L is system default code for ordering only (Note)

Resistance rule of global part number

Resistance coding 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
XMXX (1 to 9.76 MΩ)	1M = 1,000,000 Ω 9M76= 9,760,000 Ω

ORDERING EXAMPLE

The ordering code of a RC2512 chip resistor, value 47 Ω, 2W with ±5% tolerance, supplied in 7-inch tape reel is: RC2512JR-7W47RL.

NOTE

1. All our RSMD products are RoHS compliant and Halogen free. "LFP" of the internal 2D reel label states "Lead-Free Process"
2. On customized label, "LFP" or specific symbol can be printed

MARKING

RC0603/0805/1206/2512

Fig. 1 Value=10 KΩ

E-24 series: 3 digits for 5%

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

Fig. 2 Value=10 KΩ

Both E-24 and E-96 series: 4 digits for 1%

First three digits for significant figure and 4th digit for number of zeros

For further marking information, please see special 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 second glass to prevent environmental influences. The resistor is laser trimmed to the rated resistance value. The resistor is covered with a protective epoxy coat, finally the two external terminations (matte tin on Ni-barrier) are added. See fig. 3.

DIMENSIONS

Table 1 For outlines see fig. 3

TYPE	L (mm)	W (mm)	H (mm)	I_1 (mm)	I_2 (mm)
RC0603	1.60 ±0.10	0.80 ±0.10	0.45 ±0.10	0.25 ±0.15	0.25 ±0.15
RC0805	2.00 ±0.10	1.25 ±0.10	0.50 ±0.10	0.35 ±0.20	0.35 ±0.20
RC1206	3.10 ±0.10	1.60 ±0.10	0.55 ±0.10	0.45 ±0.20	0.40 ±0.20
RC2512	6.35 ±0.10	3.10 ±0.15	0.55 ±0.10	0.60 ±0.20	0.50 ±0.20

OUTLINES

For dimension see Table 1

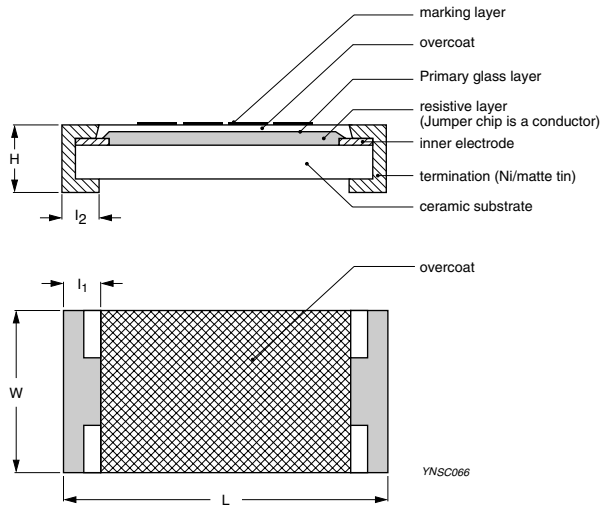


Fig. 3 Chip resistor outlines

ELECTRICAL CHARACTERISTICS

Table 2

TYPE	Resistance Range	Operating Temperature Range	Power Rating	Max. Working Vol.	Dielectric Withstand Vol.	Max. Overload Vol.	Temperature Coefficient of Resistance
RC0603	1 Ω ≤ R ≤ 10 KΩ	–55 °C to +155 °C	1/5 W	50 V	100 V	100 V	±200 ppm/°C
RC0805	1 Ω ≤ R ≤ 1 MΩ		1/4 W	150 V	300 V	300 V	
RC1206			1/2 W	200 V	400 V	500 V	
RC2512	1 Ω ≤ R ≤ 150Ω		2 W	200 V	400 V	500 V	

FOOTPRINT AND SOLDERING PROFILES

For recommended footprint and soldering profiles, please see the special data sheet "Chip resistors mounting".

PACKING STYLE AND PACKAGING QUANTITY

Table 3 Packing style and packaging quantity

PACKING STYLE	REEL DIMENSION	RC0603	RC0805	RC1206	RC2512
Paper taping reel (R)	7" (178 mm)	5,000	5,000	5,000	---
	10" (254 mm)	10,000	10,000	10,000	---
	13" (330 mm)	20,000	20,000	20,000	---
Embossed taping reel (K)	7" (178 mm)	---	---	---	4,000

NOTE

1. For paper/embossed tape and reel specification/dimensions, please see the special data sheet "Chip resistors packing".

FUNCTIONAL DESCRIPTION

OPERATING TEMPERATURE RANGE

Range: –55 °C to +155 °C

POWER RATING

Each type rated power at 70 °C:
RC0603=1/5 W; RC0805=1/4 W; RC1206=1/2 W;
RC2512=2 W

RATED VOLTAGE

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

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

Where

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

P = Rated power (W)

R = Resistance value (Ω)

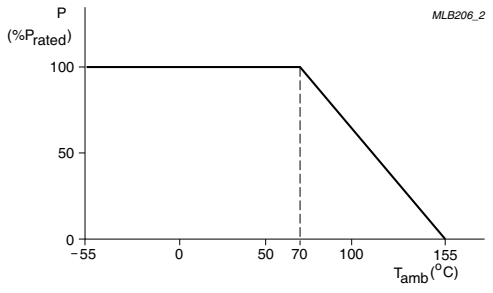


Fig. 4 Maximum dissipation (P) in percentage of rated power as a function of the operating ambient temperature (T_{amb})

TESTS AND REQUIREMENTS

Table 4 Test condition, procedure and requirements

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Temperature Coefficient of Resistance (T.C.R.)	IEC 60115-1 4.8	At +25/–55 °C and +25/+125 °C **Formula:** $T.C.R = \frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6$ (ppm/°C) Where t_1=+25 °C or specified room temperature t_2=–55 °C or +125 °C test temperature R_1=resistance at reference temperature in ohms R_2=resistance at test temperature in ohms	Refer to table 2
Life/Endurance	IEC 60115-1 4.25.1	At 70±5 °C for 1,000 hours, RCWV applied for 1.5 hours on, 0.5 hour off, still air required	±(1.0%+0.05 Ω) for 1% tol. ±(3.0%+0.05 Ω) for 5% tol.
High Temperature Exposure/ Endurance at Upper Category Temperature	IEC 60068-2-2	1,000 hours at 155±5 °C, unpowered	±(1.0%+0.05 Ω) for 1% tol. ±(2.0%+0.05 Ω) for 5% tol.
Moisture Resistance	MIL-STD-202G Method-106G	Each temperature / humidity cycle is defined at 8 hours, 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	±(0.5%+0.05 Ω) for 1% tol. ±(2.0%+0.05 Ω) for 5% tol.
Thermal Shock	MIL-STD-202G Method-107G	-55/+125 °C Number of cycles required is 300. Devices unmounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air	±(0.5%+0.05 Ω) for 1% tol. ±(1%+0.05 Ω) for 5% tol.
Short Time Overload	IEC60115-1 4.13	2.5 times of rated voltage or maximum overload voltage whichever is less for 5 sec at room temperature	±(1.0%+0.05 Ω) for 1% tol. ±(2.0%+0.05 Ω) for 5% tol. No visible damage

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Board Flex/ Bending	IEC 60068-2-21	Chips mounted on a 90mm glass epoxy resin PCB (FR4) 5 mm bending Bending time: 60±5 seconds	±(1.0%+0.05 Ω) for 1%, 5% tol. No visible damage
Low Temperature Operation	IEC 60068-2-1	The resistor shall be subjected to a DC rated voltage for 1.5 h-on, 0.5 h-off, at -55±3 °C This constitutes shall be repeated for 96 hours However the applied voltage shall not exceed the maximum operating voltage	±(0.5%+0.05 Ω) for 1% tol. ±(1.0%+0.05 Ω) for 5% tol. No visible damage
Insulation Resistance	IEC 60115-1 4.6	Rated continuous overload voltage (RCOV) for 1 minute	≥10 GΩ
Dielectric Withstand Voltage	IEC 60115-1 4.7	Maximum voltage (V_{rms}) applied for 1 minute	No breakdown or flashover
Resistance to Solvent	IPC/JEDEC J-STD-020D	Isopropylalcohol (C_3H_7OH) followed by brushing	No smeared
Noise	IEC 60115-1 4.12	Maximum voltage (Vrms) applied	Resistors range / Value: R < 100 Ω — 10 dB 100 Ω ≤ R < 1 KΩ — 20 dB 1 KΩ ≤ R < 10 KΩ — 30 dB 10 KΩ ≤ R < 100 KΩ — 40 dB 100 KΩ ≤ R < 1 MΩ — 46 dB
Biased Humidity (steady state)	IEC 60115-1 4.37	Steady state for 1000 hours at 40 °C / 95% R.H. RCWV applied for 1.5 hours on and 0.5 hour off	±(1.0%+0.05 Ω) for 1% tol. ±(2.0%+0.05 Ω) for 5% tol.
Intermittent Overload	IEC 60115-1 4.39	2.5 times of rated voltage or maximum overload voltage whichever is less for 1 second on and 25 seconds off; total 10,000 cycles	±(1.0%+0.05 Ω) for 1% tol. ±(2.0%+0.05 Ω) for 5% tol.

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Solderability			
- Wetting	IPC/JEDEC J-STD-002B test B	Electrical Test not required Magnification 50X SMD conditions: 1st step: method B, aging 4 hours at 155 °C dry heat 2nd step: lead-free solder bath at 245±3 °C Dipping time: 3±0.5 seconds	Well tinned (≥95% covered) No visible damage
- Leaching	IPC/JEDEC J-STD-002B test D	Lead-free solder, 260 °C, 30 seconds immersion time	No visible damage
- Resistance to Soldering Heat	IEC 60068-2-58	Condition B, no pre-heat of samples Lead-free solder, 260 °C, 10 seconds immersion time Procedure 2 for SMD: devices fluxed and cleaned with isopropanol	±(0.5%+0.05 Ω) for 1% tol. ±(1.0%+0.05 Ω) for 5% tol. No visible damage

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version 0	Dec 14, 2010	-	- First issue of this specification