

DATA SHEET

GENERAL PURPOSE CHIP RESISTORS

 $\begin{array}{c} RC_L \; series \\ \pm 0.1\%, \; \pm 0.5\%, \; \pm 1\%, \; \pm 5\% \\ \mbox{Sizes } 0075/0100/0201/0402/0603/0805/ \\ 1206/1210/1218/2010/2512 \end{array}$

RoHS compliant & Halogen free





YAGEO Phícomp



Chip Resistor Surface Mount

SERIES 0075 to 2512

<u>SCOPE</u>

This specification describes RC series chip resistors with lead free terminations made by thick film process.

APPLICATIONS

• All general purpose application

FEATURES

- Halogen Free Epoxy
- RoHS compliant
 - Products with lead free terminations meet RoHS requirements
 - Pb-glass contained in electrodes, resistors 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

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

GLOBAL PART NUMBER

RC_L

RC XXXX X X X XX XXXX L

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

(I) SIZE

0075/0100/0201/0402/0603/0805/1206/1210/1218/2010/2512

(2) TOLERANCE

(1)

 $B = \pm 0.1\%$

 $D = \pm 0.5\%$

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F = \pm 1.0\%
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 $J = \pm 5.0\%$ (for jumper ordering, use code of J)

(3) PACKAGING TYPE

- R = Paper taping reel
- K = Embossed taping reel
- S = ESD safe reel (0075/0100 only)

(4) TEMPERATURE COEFFICIENT OF RESISTANCE

- = Based on spec.

(5) TAPING REEL

- 07= 7 inch dia. Reel
- 10=10 inch dia. Reel
- 13=13 inch dia. Reel
- 7W = 7 inch dia. Reel & 2 x standard power
- 7N = 7 inch dia. Reel, ESD safe reel (0075/0100 only)

3W = 13 inch dia. Reel & 2 × standard power

(6) RESISTANCE VALUE

There are $2 \sim 4$ digits indicated the resistance value.

Letter R/K/M is decimal point

Example:

 $97R6 = 97.6\Omega$

9K76 = 9760Ω

 $IM = I,000,000\Omega$

(7) DEFAULT CODE

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

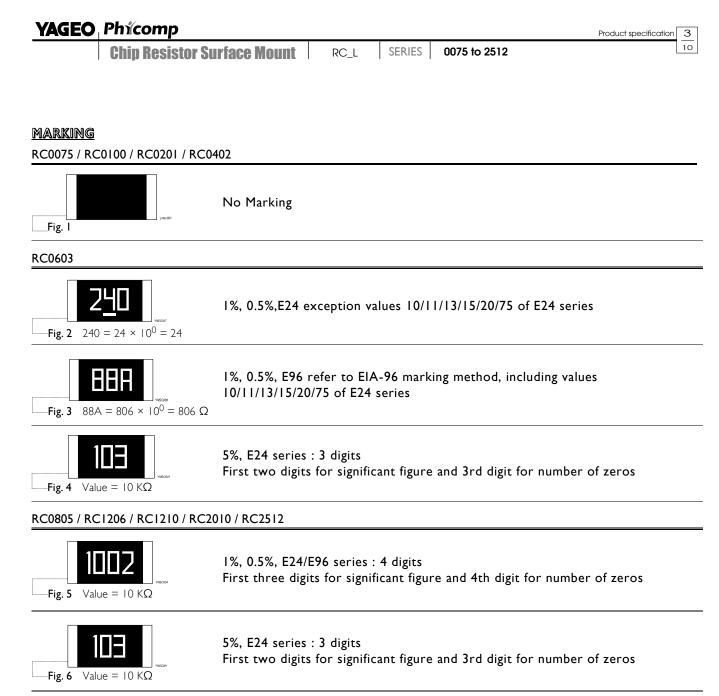
ORDERING EXAMPLE

The ordering code for a RC0402 0.0625W chip resistor value $100K\Omega$ with

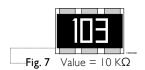
 $\pm 5\%$ tolerance, supplied in 7-inch tape reel of 10,000 units per reel is: RC0402JR-07100KL.

NOTE

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



RC1218



1002 Fig. 8 Value = 10 KΩ E-24 series: 3 digits, $\pm 5\%$ First two digits for significant figure and 3rd digit for number of zeros

Both E-24 and E-96 series: 4 digits, $\pm 1\% \& \pm 0.5\%$ 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".

Chip Resistor Surface Mount

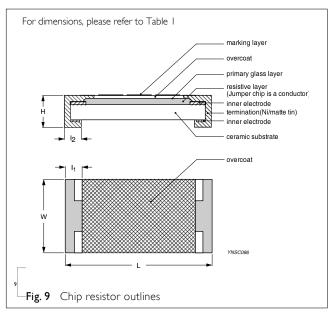
SERIES 0075 to 2512

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 imbedded 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, as shown in Fig.9.

Outlines

RC_L



DIMENSION

Table I

TYPE	L (mm)	W (mm)	H (mm)	I₁ (mm)	l ₂ (mm)
RC0075	0.30±0.015	0.15±0.015	0.13±0.02	0.08±0.03	0.08±0.03
RC0100	0.40±0.02	0.20±0.02	0.13±0.02	0.10±0.03	0.10±0.03
RC0201	0.60±0.03	0.30±0.03	0.23±0.03	0.10±0.05	0.15±0.05
RC0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10
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
RC1210	3.10±0.10	2.60±0.15	0.55±0.10	0.45±0.15	0.50±0.20
RC1218	3.10±0.10	4.60±0.10	0.55±0.10	0.45±0.20	0.40±0.20
RC2010	5.00±0.10	2.50±0.15	0.55±0.10	0.45±0.15	0.50±0.20
RC2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.20	0.50±0.20

ELECTRICAL CHARACTERISTICS

Dec. 12, 2018 V.10

Table 2								
CHARAC- TERISTICS	POWER	OPERATING TEMPERATURE RANGE	MAXIMUM WORKING VOLTAGE	MAXIMUM OVERLOAD V VOLTAGE	DIELECTRIC VITHSTANDING VOLTAGE	RESISTANCE RANGE	TEMPERATURE COEFFICIENT	JUMPER CRITERIA
RC0075	I/50 W	-55°C to 125°C	10V	25V	25V	5% (E24) Ι0Ω≦R≦ΙΜΩ Ι% (E24/E96) Ι0Ω≦R≦ΙΜΩ Jumper<50mΩ	10Ω≦R<100Ω -200~+600ppm°C 100Ω≦R≦1MΩ ±200ppm°C	Rated Current 0.5A Maximum Current 1.0A
RC0100	1/32 W	-55℃ to 125℃	15V	30V	30V	5% (E24) ΙΩ≦R≦22MΩ Ι% (E24/E96) ΙΩ≦R≦10MΩ 0.5% (E24/E96) 33Ω≦R≦470KΩ Jumper<50mΩ	IΩ≦R<10Ω -200~+600ppm°C I0Ω≤ R < 100Ω: ±300ppm/°C I00Ω≤ R ≤ I0MΩ: ±200ppm/°C I0MΩ< R ≤ 22MΩ: ±250ppm/°C	Rated Current 0.5A Maximum Current 1.0A

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Table 2

-	TEMPERATURE COEFFICIENT	RESISTANCE RANGE	DIELECTRIC WITHSTANDING VOLTAGE	MAXIMUM OVERLOAD VOLTAGE	MAXIMUM WORKING VOLTAGE	OPERATING TEMPERATURE RANGE	POWER	CHARAC- TERISTICS
0.54 Maximun Curren	ΙΩ≦R≦Ι0Ω -100~+350ppm°C Ι0Ω <r≦ι0μω ±200ppm°C</r≦ι0μω 	5% (E24) IΩ≦R≦I0MΩ I% (E24/E96) IΩ≦R≦I0MΩ 0.1%, 0.5% (E24/E96) I0Ω≦R≦IMΩ Jumper<50mΩ	50V	50V	25V	-55℃ to 125℃	1/20 W	RC0201
1.04 Maximun Curren 2.04	IΩ≦R≦I0Ω ±200ppm°C I0Ω <r≦i0mω ±I00ppm°C I0MΩ<r≦22mω ±200ppm°C</r≦22mω </r≦i0mω 	5% (E24) IΩ≦R≦22MΩ I% (E24/E96) IΩ≦R≦I0MΩ 0.1%, 0.5% (E24/E96) I0Ω≦R≦IMΩ Jumper<50mΩ	100V	100V	50V	-55℃ to 155℃	1/16 W	RC0402
	IΩ≦R≦IMΩ ±200ppm°C	5% (E24) IΩ≦R≦IMΩ I% (E24/E96) IΩ≦R≦IMΩ	100V	100∨	50V	-55℃ to 155℃	I/8W	
1.04 Maximun Curren 2.04	IΩ≦R≦I0Ω ±200ppm°C I0Ω <r≦i0mω ±100ppm°C I0MΩ<r≦22mω ±200ppm°C</r≦22mω </r≦i0mω 	5% (E24) IΩ≦R≦22MΩ I% (E24/E96) IΩ≦R≦I0MΩ 0.1%, 0.5% (E24/E96) I0Ω≦R≦IMΩ Jumper<50mΩ	150V	150V	757	-55℃ to 155℃	1/10 W	RC0603
	IΩ≦R≦IMΩ ±200ppm°C	5% (E24) IΩ≦R≦IMΩ I% (E24/E96) IΩ≦R≦IMΩ	150V	150∨	75V	-55℃ to 155℃	1/5 W	
2.04 Maximun Curren 5.04	IΩ≦R≦I0Ω ±200ppm°C I0Ω <r≦i0mω ±100ppm°C I0MΩ<r≦22mω ±200ppm°C 24MΩ<r≦i00mω ±300ppm°C</r≦i00mω </r≦22mω </r≦i0mω 	5% (E24) IΩ≦R≦100MΩ I% (E24/E96) IΩ≦R≦10MΩ 0.1%, 0.5% (E24/E96) I0Ω≦R≦1MΩ I0%, 20% (E24) 24MΩ≦R≦100MΩ Jumper<50mΩ	300V	300V	150V	-55°C to 155°C	1/8 W	RC0805
	IΩ≦R≦IMΩ ±200ppm℃	5% (E24) I Ω≦R≦I ΜΩ I% (E24/E96) I Ω≦R≦I ΜΩ	300V	300V	I 50V	-55℃ to 155℃	1/4 W	

Chip Resistor Surface Mount RC_L

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FOOTPRINT AND SOLDERING PROFILES

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

SERIES

0075 to 2512

JUMPE CRITERI	TEMPERATURE COEFFICIENT	RESISTANCE RANGE	DIELECTRIC WITHSTANDING VOLTAGE	MAXIMUM OVERLOAD VOLTAGE	MAXIMUM WORKING VOLTAGE	OPERATING TEMPERATURE RANGE	POWER	CHARAC- TERISTICS
Rated Curren 2.04 Maximun Curren 10.04	IΩ≦R≦10Ω ±200ppm°C I0Ω <r≦10mω ±100ppm°C I0MΩ<r≦22mω ±200ppm°C 24MΩ≦R≦100MΩ ±300ppm°C</r≦22mω </r≦10mω 	5% (E24) IΩ≦R≦100MΩ I% (E24/E96) IΩ≦R≦10MΩ 0.1%, 0.5% (E24/E96) I0Ω≦R≦1MΩ I0%, 20% (E24) 24MΩ≦R≦100MΩ Jumper<50mΩ	500V	400V	200V	-55°C to 155°C	1/4 W	RC1206
	IΩ≦R≦IMΩ ±200ppm°C	5% (E24) IΩ≦R≦IMΩ I% (E24/E96) IΩ≦R≦IMΩ	500V	400∨	200V	-55℃ to 155℃	1/2 W	
Rated Curren 2.04 Maximun Curren 10.04	ΙΩ≦R≦Ι0Ω ±200ppm°C Ι0Ω <r≦ι0μω ±100ppm°C Ι0MΩ<r≦22mω ±200ppm°C</r≦22mω </r≦ι0μω 	5% (E24) IΩ≦R≦22MΩ I% (E24/E96) IΩ≦R≦10MΩ 0.1%, 0.5% (E24/E96) I0Ω≦R≦IMΩ Jumper<50mΩ	500V	500V	200V	-55℃ to 155℃	1/2 W	RC1210
Rated Curren 6.04 Maximun Curren 10.04	ΙΩ≦R≦Ι0Ω ±200ppm°C Ι0Ω <r≦ιμω ±Ι00ppm°C</r≦ιμω 	5% (E24) IΩ≦R≦IMΩ I% (E24/E96) IΩ≦R≦IMΩ 0.1%, 0.5% (E24/E96) I0Ω≦R≦IMΩ Jumper<50mΩ	500V	500V	200V	-55℃ to 155℃	١w	RC1218
Rated Curren 2.04 Maximun Curren 10.04	IΩ≦R≦I0Ω ±200ppm°C I0Ω <r≦i0mω ±I00ppm°C I0MΩ<r≦22mω ±200ppm°C</r≦22mω </r≦i0mω 	5% (E24) IΩ≦R≦22MΩ I% (E24/E96) IΩ≦R≦10MΩ 0.1%, 0.5% (E24/E96) I0Ω≦R≦IMΩ Jumper<50mΩ	500∨	500∨	200V	-55°C to 155°C	3/4 W	RC2010
Rated Curren 2.04 Maximun Curren 10.04	IΩ≦R≦I0Ω ±200ppm°C I0Ω <r≦i0mω ±I00ppm°C I0MΩ<r≦22mω ±200ppm°C</r≦22mω </r≦i0mω 	5% (E24) IΩ≦R≦22MΩ I% (E24/E96) IΩ≦R≦10MΩ 0.1%, 0.5% (E24/E96) I0Ω≦R≦IMΩ Jumper<50mΩ	500∨	500V	200V	-55℃ to 155℃	IW	RC2512
	IΩ≦R≦IMΩ ±200ppm°C	5% (E24) I Ω≦R≦IMΩ I% (E24/E96) I Ω≦R≦IMΩ	500V	400V	200V	-55°C to 155°C	2 W	

Chip Resistor Surface Mount

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PACKING STYLE AND PACKAGING QUANTITY

Table 3 Packing style and packaging quantity

PACKING STYLE	PAPER TAPINO	G REEL (R)		ESD SAFE REEL (S) (4MM WIDTH, IMM PITCH PLASTIC EMBOSSED)	EMBOSSED TAPING REEL
REEL DIMENSION	7" (178 mm)	10" (254mm)	13" (330 mm)	7" (178 mm)	7" (178 mm)
RC0075				20000	
RC0100	20000		80000	40000	
RC0201	10000	20000	50000		
RC0402	10000	20000	50000		
RC0603	5000	10000	20000		
RC0805	5000	10000	20000		
RC1206	5000	10000	20000		
RC1210	5000	10000	20000		
RC1218					4000
RC2010					4000
RC2512					4000

RC_L

NOTE

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

FUNCTIONAL DESCRIPTION

OPERATING TEMPERATURE RANGE

RC0402 to RC2512 Range: -55°C to +155°C (Fig. 10-1) RC0075 to RC0201 Range: -55°C to +125°C (Fig. 10-2)

POWER RATING

Each type rated power at 70 °C: RC0075=1/50W RC0100=1/32W RC0201=1/20W RC0402=1/16W, 1/8W RC0603=1/10W, 1/5W RC0805=1/8W, 1/4W RC1206=1/4W, 1/2W RC1210=1/2W RC1218=1W RC2010=3/4W RC2512=1W, 2W

RATED VOLTAGE

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

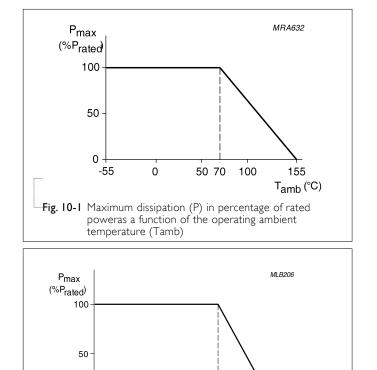
$$V = \sqrt{(P \times R)}$$

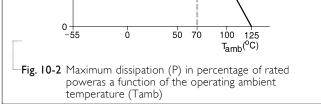
or max. working voltage whichever is less Where

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

P = Rated power (W)

 $R = Resistance value (\Omega)$





Chip Resistor Surface MountRC_LSERIES0075 to 2512

TESTS AND REQUIREMENTS

Table 8 Test condition, procedure and requirements

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Temperature Coefficient of Resistance	MIL-STD-202 Method 304	At +25/–55°C and +25/+125°C	Refer to table 2
(T.C.R.)		Formula:	
		$T.C.R = \frac{R_2 - R_I}{R_I(t_2 - t_I)} \times 10^6 \text{ (ppm/°C)}$	
		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	
Life/ Endurance	MIL-STD-202 Method 108A IEC 60115-1 4.25.1	At 70±2°C for 1,000 hours; RCWV applied for 1.5 hours on and 0.5 hour off, still air required	0075: \pm (5%+100mΩ) <100mΩ for jumper 01005: \pm (3% +50mΩ) <100mΩf or jumper Others:
			$\pm(1\%+50m\Omega)$ for B/D/F tol $\pm(3\%+50m\Omega)$ for J tol <100mR for jumper
High	MIL-STD-202 Method 108A	I,000 hours at maximum operating temperature	$0075: \pm (5\% + 100 \text{m}\Omega)$
Temperature Exposure	IEC 60068-2-2	depending on specification, unpowered.	$<100m\Omega$ for jumper 01005: $\pm(1\% +50m\Omega)$ $<50m\Omega$ f or jumper
			Others:
			\pm (1%+50m Ω) for B/D/F tol
			$\pm(2\%+50m\Omega)$ for J tol
			<50mR for jumper
Moisture Resistance	MIL-STD-202 Method 106G	Each temperature / humidity cycle is defined at 8 hours (method 106F), 3 cycles / 24 hours for 10d with 25°C / 65°C 95% R.H, without steps	0075: ± (2%+100mΩ) <100mΩ for jumper 01005: ±(2% +50mΩ) < 100mΩf or jumper
		7a & 7b, unpowered	Others:
		Parts mounted on test-boards, without	$\pm(0.5\%{+}50m\Omega)$ for B/ D/F tol
		condensation on parts	\pm (2%+50m Ω) for J tol
			<100mR for jumper
Humidity	IEC 60115-1 4.24.2	Steady state for 1000 hours at 40°C / 95% R.H. RCWV applied for 1.5 hours on and 0.5 hour off	0075: ± (5%+100mΩ) no visible damage 01005: ±(3% +50mΩ) < 100mΩf or jumper
			Others:
			\pm (1%+50m Ω) for B/D/F tol \pm (2%+50m Ω) for J tol
			<100mR for jumper

Chip Resistor Surface Mount RC_L SEF

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Thermal Shock	MIL-STD-202 Method 107G	-55/+125°C Note Number of cycles required is 300. Devices mounted Maximum transfer time is 20 seconds.	$0075/01005: \pm (1\% +50m\Omega)$ < $50m\Omega$ f or jumper Others: $\pm (0.5\%+50m\Omega)$ for B/D/F tol	
		Dwell time is 15 minutes. Air - Air	±(1%+50mΩ) for J tol < 50mR for jumper	
Short Time Overload	IEC 60115-1 4.13	2.5 times RCWV or maximum overload voltage which is less for 5 seconds at room temperature	0075/01005: ±(2% +50mΩ) < 50mΩf or jumper Others: ±(1%+50mΩ) for B/D/F tol ±(2%+50mΩ) for J tol <50mR for jumper	
Board Flex/ Bending	IEC 60115-1 4.33	Device mounted or as described only 1 board bending required bending time: 60±5 seconds 0075/0100/0201/0402:5mm;	No visible damage $0075/01005: \pm (1\% + 50m\Omega)$ $< 50m\Omega f \text{ or jumper}$ Others: $\pm (1\% + 50m\Omega)$ for B/D/F/J tol	
		0603/0805:3mm; I 206 and above:2mm	<50mR for jumper No visible damage	
Solderability - Wetting	J-STD-002 test B	Electrical Test not required Magnification 50X SMD conditions: Ist 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	W ell 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	MIL-STD-202 Method 210F IEC 60115-1 4.18	Condition B, no pre-heat of samples Leadfree solder, $260^{\circ}C \pm 5^{\circ}C$, 10 ± 1 seconds immersion time Procedure 2 for SMD: devices fluxed and cleaned with isopropanol	$\begin{array}{c} 0075: \pm (3\% + 50 \text{m}\Omega) \\ < 50 \text{m}\Omega \text{ for jumper} \\ 01005: \pm (1\% + 50 \text{m}\Omega) \\ < 50 \text{m}\Omega \text{f or jumper} \\ \end{array} \\ \begin{array}{c} \text{Others:} \\ \pm (0.5\% + 50 \text{m}\Omega) \text{ for B/D/F tol.} \\ \pm (1\% + 50 \text{m}\Omega) \text{ for J tol.} \\ < 50 \text{mR for jumper} \\ \end{array} \\ \begin{array}{c} \text{No visible damage} \end{array}$	

YAGEO	Phicomp			Product specification	
	Chip Resistor Surface Mount	RC_L	SERIES	0075 to 2512	

<u>REVISION HISTORY</u>

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version 10	Dec. 12, 2018	-	- Updated 0075 dimensions
Version 9	Mar. 06, 2018	-	- Add 0.5%/1% marking rule for RC0603 ~ RC2512 based on marking datasheet
Version 8	July 10, 2017	-	- Add "3W" part number coding for 13" Reel & double power
Version 7	Mar. 7, 2017	-	- Add 10" packing
Version 6	Feb.15, 2017	-	- Extend RC0805 and RC1206 resistance range to 100Mohm
Version 5	Oct. 06, 2016	-	- Description: Update Dimension of I2 of RC2512 (2W)
Version 4	Jan. 22, 2016	-	- Update resistance range
Version 3	Dec. 24, 2015	-	- Updated test and requirements
Version 2	Jul. 23, 2015	-	- Updated test and requirements
Version I	Jan. 21, 2015	-	- ESD Safe Reel update
Version 0	Dec. 15, 2014	-	- First issue of this specification

"Yageo reserves all the rights for revising the content of this datasheet without further notification, as long as the products itself are unchanged. Any product change will be announced by PCN."

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