Innovative Service Around the Globe YAGEO

DATA SHEET

TRIMMABLE CHIP RESISTORS

TR series

0/-10%, 0/-20%, 0/-30%

sizes 0402/0603/0805/1206

RoHS compliant

YAGEO Phycomp

Product specification – Jan 14, 2009 V.1

SCOPE

This specification describes TR0402 to TR1206 trimmable chip resistors with lead-free terminations made by thick film process.

APPLICATIONS

- Hand-held measuring equipment
- Mobile phones
- Camcorders
- Portable radios, CD and cassette
- Tuners
- Photo sensors

FEATURES

- 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 & 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)

TR XXXX X X X XX XXXX
(1) (2) (3) (4) (5) (6)

(1) SIZE

0402
0603
0805
1206

(2) TOLERANCE

K = 0/-10%
M = 0/-20%
N = 0/-30%

(3) PACKAGING TYPE

R = Paper taping reel

(4) TEMPERATURE COEFFICIENT OF RESISTANCE

– = Base on spec

(5) TAPING REEL

07 = 7 inch dia. Reel

(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

L = optional symbol (Note)

Resistance rule of global part number

Resistance code rule	Example
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 TR0603 chip resistor, value 330 Ω with 0/-30% tolerance, supplied in 7-inch tape reel is: TR0603NR-07330R(L).

NOTE

1. All our RSMD 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 / 12NC can be added (both are on customer request)

PHYCOMP BRAND ordering codes

Both GLOBAL PART NUMBER (preferred) and 12NC (traditional) codes are acceptable to order Phycomp brand products.

GLOBAL PART NUMBER (PREFERRED)

For detailed information of GLOBAL PART NUMBER and ordering example, please refer to page 2.

12NC CODE

2350 XXX XXXXX L
(1) (2) (3) (4)

SIZE	TYPE	START IN (1)	TOL. (%)	RESISTANCE RANGE	PAPER/PE TAPE ON REEL (units) (2)		
					10,000	5,000/10,000	5,000
0402	RC32TR	2350	0/-10%	1 to 10 MΩ	503 22xxx		-
			0/-20%	1 to 10 MΩ	503 21xxx		-
			0/-30%	1 to 10 MΩ	503 20xxx		-
0603	RC22TR	2350	0/-10%	1 to 10 MΩ	-		502 12xxx
			0/-20%	1 to 10 MΩ	-		502 11xxx
			0/-30%	1 to 10 MΩ	-		502 10xxx
0805	RC12TR	2350	0/-10%	1 to 10 MΩ	-		501 12xxx
			0/-20%	1 to 10 MΩ	-		501 11xxx
			0/-30%	1 to 10 MΩ	-		501 10xxx
1206	RC02TR	2350	0/-10%	1 to 10 MΩ	-		500 12xxx
			0/-20%	1 to 10 MΩ	-		500 11xxx
			0/-30%	1 to 10 MΩ	-		500 10xxx

(1) The resistors have a 12-digit ordering code starting with 2350.

(2) The subsequent 4 or 5 digits indicate the resistor tolerance and packaging.

(3) The remaining 4 or 3 digits represent the resistance value with the last digit indicating the multiplier as shown in the table of "Last digit of 12NC".

(4) "L" is optional symbol (Note).

Last digit of 12NC

Resistance decade (3)	Last digit
0.01 to 0.0976 Ω	0
0.1 to 0.976 Ω	7
1 to 9.76 Ω	8
10 to 97.6 Ω	9
100 to 976 Ω	1
1 to 9.76 KΩ	2
10 to 97.6 KΩ	3
100 to 976 KΩ	4
1 to 9.76 MΩ	5
10 to 97.6 MΩ	6

Example:
- 0.02 Ω = 0200 or 200
- 0.3 Ω = 3007 or 307
- 1 Ω = 1008 or 108
- 33 KΩ = 3303 or 333
- 10 MΩ = 1006 or 106

ORDERING EXAMPLE

The ordering code of a RC22TR resistor with terminations, value 330 Ω with 0/-30% tolerance, supplied in tape of 5,000 units per reel is: 235050210331(L) or TR0603NR-07330R(L).

NOTE

1. All our RSMD products are 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 / 12NC can be added (both are on customer request)

MARKING

TR0402/0603/0805/1206

Fig. 1 No marking

For further marking information, please see special data sheet "Chip resistors marking".

CONSTRUCTION

The resistors are constructed on a high-grade ceramic body (aluminium oxide). Internal metal electrodes are added at each end and a connection is made between them using a resistive metal glaze; the approximate resistor values are dependent on the composition of the glaze.

The resistive layer is covered with a translucent protective coat. Finally, two end electrodes are added, the composition of which has been designed to provide ease of soldering. See fig. 2.

DIMENSIONS

Table 1 For outlines see fig. 2

TYPE	L (mm)	W (mm)	H (mm)	I_1 (mm)	I_2 (mm)
TR0402	1.00 ±0.10	0.50 ±0.05	0.35 ±0.05	0.20 ±0.10	0.25 ±0.10
TR0603	1.60 ±0.10	0.80 ±0.10	0.45 ±0.10	0.25 ±0.15	0.25 ±0.15
TR0805	2.00 ±0.10	1.25 ±0.10	0.50 ±0.10	0.35 ±0.20	0.35 ±0.20
TR1206	3.10 ±0.10	1.60 ±0.10	0.55 ±0.10	0.45 ±0.20	0.40 ±0.20

OUTLINES

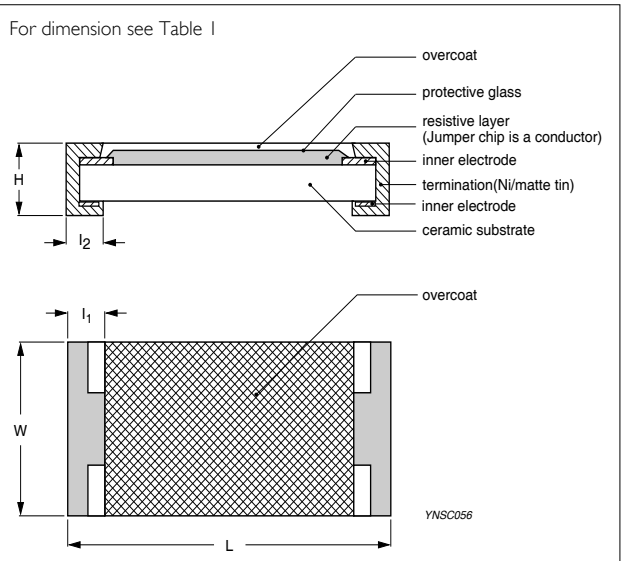

Fig. 2 Chip resistor outlines

ELECTRICAL CHARACTERISTICS

Table 2

TYPE	RESISTANCE RANGE	CHARACTERISTICS					
		Rated Power	Operating Temperature Range	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Temperature Coefficient of Resistance
TR0402	0/-10%, 0/-20%, 0/-30%: 1 Ω to 10 MΩ (E-24)	1/16 W	–55 °C to +125 °C	50 V	100 V	100 V	1 Ω ≤ R ≤ 10 Ω: ±200 ppm/°C 10 Ω < R ≤ 1 MΩ: ±100 ppm/°C 1 MΩ < R ≤ 10 MΩ: ±200 ppm/°C
TR0603		1/16 W		50 V	100 V	100 V	
TR0805		1/8 W	–55 °C to +155 °C	150 V	300 V	500 V	
TR1206		1/4 W		200 V	500 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	TR0402	TR0603	TR0805	TR1206
Paper taping reel (R)	7" (178 mm)	10,000	5,000	5,000	5,000

NOTE

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

FUNCTIONAL DESCRIPTION

OPERATING TEMPERATURE RANGE

Each type range:

TR0402/0603: –55°C to +125°C;
TR0805/1206: –55°C to +155°C.

POWER RATING

Each type rated power at 70°C:

TR0402=1/16 W; TR0603=1/16 W;
TR0805=1/8 W; TR1206=1/4 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)

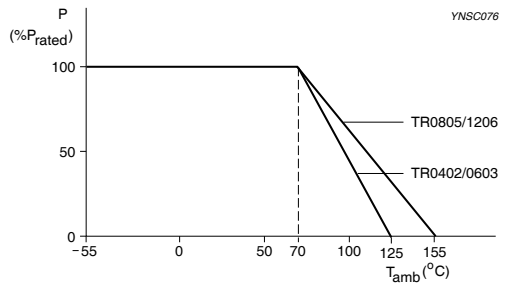

Fig. 3 Maximum dissipation (P_{max}) in percentage of rated power as a function of the operating ambient temperature (T_{amb})

TESTS AND REQUIREMENTS

Table 4 Test condition, procedure and requirements

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Life/ Operational Life/ Endurance	MIL-STD-202G-method 108A IEC 60115-1 4.25.1 JIS C 5202-7.10	1,000 hours at 70±5 °C applied RCWV 1.5 hours on, 0.5 hour off, still air required	±(2%+0.05 Ω)
High Temperature Exposure/ Endurance at upper category temperature	MIL-STD-202G-method 108A IEC 60115-1 4.25.3 JIS C 5202-7.11	1,000 hours at maximum operating temperature depending on specification, unpowered No direct impingement of forced air to the parts Tolerances: 155±3 °C	±(1%+0.05 Ω)
Moisture Resistance	MIL-STD-202G-method 106F IEC 60115-1 4.24.2	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 7a & 7b, unpowered Parts mounted on test-boards, without condensation on parts Measurement at 24±2 hours after test conclusion	±(2%+0.05 Ω)
Thermal Shock	MIL-STD-202G-method 107G	AR0402/0603: -55/+155 °C AR0805/1206: -55/+125 °C Note: 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 10 KΩ to 10 MΩ ±(1%+0.05 Ω) for others
Short time overload	MIL-R-55342D-para 4.7.5 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) 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) No visible damage

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Solderability			
- Wetting	IPC/JEDECJ-STD-002B test B IEC 60068-2-58	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	IPC/JEDECJ-STD-002B test D IEC 60068-2-58	Leadfree solder, 260 °C, 30 seconds immersion time	No visible damage
- Resistance to Soldering Heat	MIL-STD-202G-method 210F IEC 60068-2-58	Condition B, no pre-heat of samples Leadfree solder, 270 °C, 10 seconds immersion time Procedure 2 for SMD: devices fluxed and cleaned with isopropanol	±(1%+0.05 Ω) No visible damage

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version 1	Jan 14, 2009	-	- Change to dual brand datasheet that describes TR0402 to TR1206 with RoHS compliant - Define global part number
Version 0	Oct 18, 2005	-	- New datasheet for trimmable chip resistors sizes of 0402/0603/0805/1206, 0/-10%, 0/-20, and 0/-30% tolerance with lead-free terminations - Replace the 0603/0805/1206 parts of pdf files: RC02TR_12TR_9.pdf, RC22_TR_3.pdf, and combine into a document. - Test method and procedure updated - PE tape added (paper tape will be replaced by PE tape)

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