SCOPE

This specification describes PT series current sensor - low TCR and high power with lead-free terminations made by thick film process.

APPLICATIONS

- Converters
- Printer equipment
- Server board
- Telecom
- Consumer electronics

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
- Reduce environmentally hazardous wastes
- High component and equipment reliability
- None forbidden-materials used in products/production
- Low resistances applied to current sensing

ORDERING INFORMATION - GLOBAL PART NUMBER

Part numbers is identified by the series, size, tolerance, packing type, temperature coefficient, taping reel and resistance value.

YAGEO BRAND ordering code

GLOBAL PART NUMBER (PREFERRED)

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

(1) SIZE

0402 / 0603 / 0805 / 1206 / 0815 / 2010 / 2512

(2) TOLERANCE

F = ±1%

G = ±2%

J = ±5%

(3) PACKAGING TYPE

R = Paper taping reel

K = Embossed taping reel

(4) TEMPERATURE COEFFICIENT OF RESISTANCE

– = Based on spec.

(5) TAPING REEL

7W = 7 inch dia. reel and 2 x standard power

3W = 13 inch dia. reel and 2 x standard power

(6) RESISTANCE VALUE

There are 3~5 digits indicated the resistor value. Letter R is decimal point, no need to mention the last zero after R.

Detailed coding rules of resistance are shown in the table of "Resistance rule of global part number".

(7) DEFAULT CODE

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

Resistance rule of global part number

Resistance code rule	Example
0RXXX (25 to 910 mΩ)	0R025 = 25 mΩ 0R1 = 100 mΩ 0R91 = 910 mΩ

ORDERING EXAMPLE

The ordering code of a PT0603 chip resistor, 1/5W, value 0.56 Ω with ±1% tolerance, supplied in 7-inch tape reel is: PT0603FR-7W0R56L.

MARKING

PT0815

Fig. 1 Value = 25 mΩ

E-24 series / Non-E series (R= 25/40/50 mΩ): 4 digits

The "R" is used as a decimal point; the other 3 digits are significant.

PT0805 / PT1206 / PT2010 / PT2512

Fig. 2 Value = 220 mΩ

E-24 series / Non-E series (R= 250/400/500 mΩ): 4 digits

The "R" is used as a decimal point; the other 3 digits are significant.

PT0603

Fig. 3 Value = 220 mΩ

E-24 series / Non-E series (R= 250/400/500 mΩ): 3 digits

The "R" is used as a decimal point; the other 2 digits are significant.

PT0402

Fig. 4

No marking

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

CONSTRUCTION

The resistors are constructed out of a high-grade ceramic body. Internal metal electrodes are added at each end and connected by a resistive paste. The composition of the paste is adjusted to give the approximately required resistance and laser cutting of this resistive layer that achieves tolerance trims the value. The resistive layer is covered with a protective coat and printed with the resistance value. Finally, the three external terminations (Cu/Ni/matte tin) are added, as shown in Fig.5.

OUTLINES

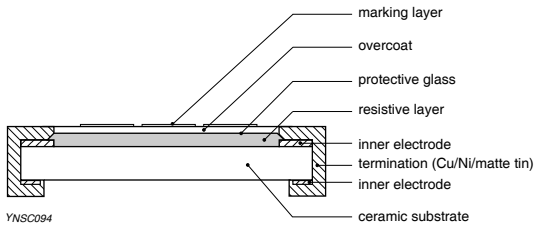

Fig. 5 Chip resistor outlines

DIMENSIONS

Table 1

TYPE	L (mm)	W (mm)	H (mm)	I_1 (mm)	I_2 (mm)
PT0402	1.00 ±0.10	0.50 ±0.05	0.35 ±0.05	0.20 ±0.10	0.25 ±0.10
PT0603	1.60 ±0.10	0.80 ±0.10	0.45 ±0.10	0.25 ±0.15	0.25 ±0.15
PT0805	2.00 ±0.10	1.25 ±0.10	0.55 ±0.10	0.35 ±0.20	0.35 ±0.20
PT1206	3.10 ±0.10	1.60 ±0.10	0.55 ±0.10	0.45 ±0.20	0.45 ±0.20
PT0815	2.00 ±0.10	3.70 ±0.10	0.50 ±0.10	0.35 ±0.20	0.40 ±0.20
PT2010	5.00 ±0.10	2.50 ±0.15	0.55 ±0.10	0.60 ±0.20	0.50 ±0.20
PT2512	6.35 ±0.10	3.20 ±0.15	0.55 ±0.10	0.60 ±0.20	0.50 ±0.20

For dimensions, please refer to Table 1

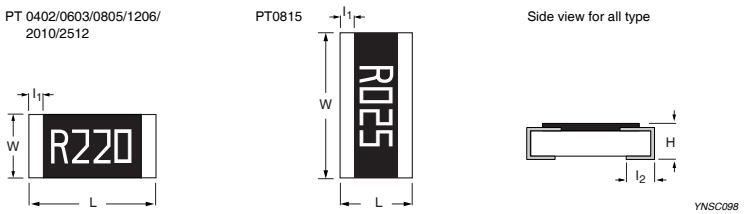

Fig. 6 Chip resistor dimensions

ELECTRICAL CHARACTERISTICS

Table 2

Type	Power	Resistance Range	Tolerance	Temperature Coefficient of Resistance	
PT0402	1/8 W	100 mΩ ≤ R < 1 Ω	±1%, ±2%, ±5%		±200 ppm/°C
PT0603	1/5 W				
PT0805	1/4 W				±100 ppm/°C
PT1206	1/2 W			100 mΩ	±100 ppm/°C
				100 mΩ < R < 1 Ω	±75 ppm/°C
PT0815	1 W	25 mΩ ≤ R < 50 mΩ			±100 ppm/°C
PT2010	1 W	100 mΩ ≤ R < 1 Ω		100 mΩ	±100 ppm/°C
PT2512	2 W			100 mΩ < R < 1 Ω	±75 ppm/°C

FOOTPRINT AND SOLDERING PROFILES

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	PT0402	PT0603	PT0805	PT1206	PT0815	PT2010	PT2512
Paper taping reel (R)	7" (178 mm)	10,000	5,000	5,000	5,000	---	---	---
	13" (330 mm)	50,000	20,000	20,000	20,000	---	---	---
Embossed taping reel (K)	7" (178 mm)	---	---	---	---	4,000	4,000	4,000

NOTE

1. For paper/embossed tape and reel specification/dimensions, please refer to 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:
PT0402=1/8 W
PT0603=1/5 W
PT0805=1/4 W
PT1206=1/2 W
PT0815=1 W
PT2010=1 W
PT2512=2 W

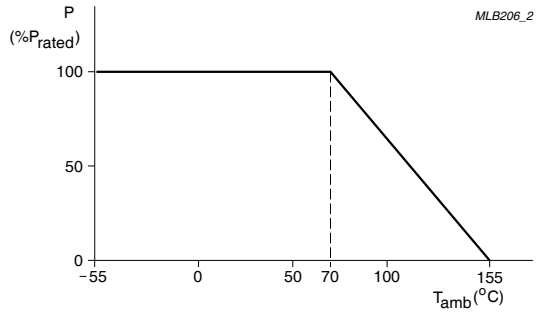

Fig. 7 Maximum dissipation (P_{max}) in percentage of rated power as a function of the operating ambient temperature (T_{amb})

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)

TESTS AND REQUIREMENTS

Table 4 Test condition, procedure and requirements

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Temperature Coefficient of Resistance (T.C.R.)	MIL-STD-202 Method-304	At +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=+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	1,000 hours at 70±5 °C applied RCWV 1.5 hours on, 0.5 hour off, still air required	± (1.0%+0.0005 Ω)
High Temperature Exposure/ Endurance at Upper Category Temperature	IEC 60068-2-2	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%+0.0005 Ω)
Moisture Resistance	MIL-STD-202 Method-106	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	± (0.5%+0.0005 Ω)
Thermal Shock	MIL-STD-202 Method-107	-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	± (1.0%+0.0005 Ω)

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Short Time Overload	IEC60115-1 4.13	5 times of rated power for 5 seconds at room temperature	± (1.0%+0.0005 Ω) No visible damage
Board Flex/ Bending	IEC 60068-2-21	Device mounted on PCB test board as described, only 1 board bending required Bending for 0402: 5 mm 0603/0805: 3 mm 1206 and above: 2 mm Holding time: minimum 60±1 seconds Ohmic value checked during bending	± (1.0%+0.0005 Ω) No visible damage
Solderability - Wetting	IPC/JEDECJ-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: 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	Leadfree 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. Leadfree solder, 260±5 °C, 10±1 seconds immersion time Procedure 2 for SMD: devices fluxed and cleaned with isopropanol	± (0.5%+0.0005 Ω) No visible damage

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version 0	Apr 12, 2011	-	- New datasheet for current sensor - low TCR and high power PT series sizes of 0402/0603/0805/1206/0815/2010/2512, 1%, 2%, 5% with lead-free terminations