

DATA SHEET

CURRENT SENSOR - LOW TCR

PT series

5%, 2%, 1%

sizes 0402/0603/0805/1206/2010/2512

RoHS compliant & Halogen free



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
- Car electronics

FEATURES

- AEC-Q200 qualified
- Halogen Free Epoxy
- RoHS compliant
- Reduce environmentally
- High component and equipment reliability
- Non-forbidden material used in products/production
- Low resistances applied to current sensing
- Moisture sensitivity level: MSL 1

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 / 2010 / 2512

(2) TOLERANCE

F = $\pm 1\%$

G = $\pm 2\%$

J = $\pm 5\%$

"-" = jumper ordering

(3) PACKAGING TYPE

R = Paper taping reel

K = Embossed taping reel

(4) TEMPERATURE COEFFICIENT OF RESISTANCE

- = Based on spec.

(5) TAPING REEL

07 = 7 inch dia. Reel and standard power

13 = 13 inch dia. Reel and standard power

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

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

7T = 7 inch dia. reel and 3 x standard power

(6) RESISTANCE VALUE

There are 3~5 digits indicated the resistor value. Letter R is decimal point.

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
0RXXXX	0R025 = 25 mΩ
(25 to 910 mΩ)	0R1 = 100 mΩ
	0R91 = 910 mΩ

ORDERING EXAMPLE

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

NOTE

1. All our Rchip 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)

MARKING

PT0402/PT1206^(Note)



No marking

Fig. 1

Note : $75\text{m}\Omega \leq R < 91\text{m}\Omega$

PT0603

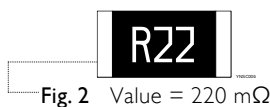


Fig. 2 Value = 220 mΩ

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.

PT0805 / PT1206 / PT2010 / PT2512



Fig. 3 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.

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

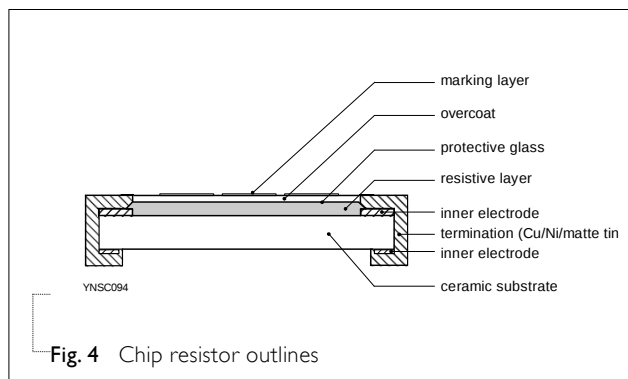


Fig. 4 Chip resistor outlines

DIMENSIONS

Table I

TYPE	L (mm)	W (mm)	H (mm)	l ₁ (mm)	l 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
PT1206(Note)	3.10 ±0.10	1.60 ±0.10	0.55 ±0.10	0.75 ±0.20	0.45 ±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

Note: For resistance range: $75\text{m}\Omega \leq R < 91\text{m}\Omega$, no marking

For dimensions, please refer to Table I

PT 0402/0603/0805/
1206/2010/2512

Side view for all type

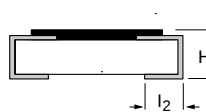
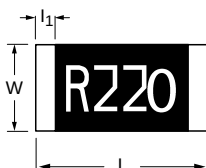


Fig. 5 Chip resistor dimensions

YNSC098-3

ELECTRICAL CHARACTERISTICS

Table 2

Type	Power	Operating Temp. range	Max working voltage	Tolerance	Temperature Coefficient of Resistance		Jumper criteria	
PT0402	1/16W	-55° C to +155° C	(PxR)^1/2	E24 ±2%, ±5% E24/E96 ±1%	50mΩ ≤ R < 68mΩ	±600ppm/° C	Max. resistance	10mΩ
	1/8 W				68mΩ ≤ R < 100mΩ	±300ppm/° C	Rated current	3A
	1/6 W				100mΩ ≤ R < 1Ω	±200ppm/° C		--
PT0603	1/10W	-55° C to +155° C	(PxR)^1/2	E24 ±2%, ±5% E24/E96 ±1%	50mΩ	0/+400ppm/° C	Max. resistance	8mΩ
	1/5 W				50mΩ < R < 68mΩ	0/+350ppm/° C	Rated current	5A
	1/3 W				68mΩ ≤ R < 100mΩ	0/+300ppm/° C		--
PT0805	1/8 W	-55° C to +155° C	(PxR)^1/2	E24 ±2%, ±5% E24/E96 ±1%	50mΩ	0/+400ppm/° C		--
	1/4 W				50mΩ < R < 68mΩ	0/+350ppm/° C	Max. resistance	5mΩ
	1/2 W				68mΩ ≤ R < 100mΩ	0/+300ppm/° C	Rated current	6A
PT1206	1/4 W	-55° C to +155° C	(PxR)^1/2	E24 ±2%, ±5% E24/E96 ±1%	50mΩ ≤ R < 75mΩ	±350ppm/° C	Max. resistance	5mΩ
	1/2 W				75mΩ ≤ R ≤ 100mΩ	±100ppm/° C	Rated current	10A
	3/4 W				100mΩ < R < 1Ω	±75ppm/° C		--
PT2010	1W	-55° C to +155° C	(PxR)^1/2	E24 ±2%, ±5% E24/E96 ±1%				--
	2W							--
PT2512	1W	-55° C to +155° C	(PxR)^1/2	E24 ±2%, ±5% E24/E96 ±1%	100 mΩ	±100 ppm/° C		--
	2W				100 mΩ < R < 1Ω	±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	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

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=1/16W, 1/8W, 1/6W

PT0603=1/10W, 1/5W, 1/3W

PT0805=1/8W, 1/4W

PT1206=1/4W, 1/2W

PT2010=3/4W, 1W

PT2512=1W, 2W

RATED VOLTAGE

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

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

Where

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

P = Rated power (W)

R = Resistance value (Ω)

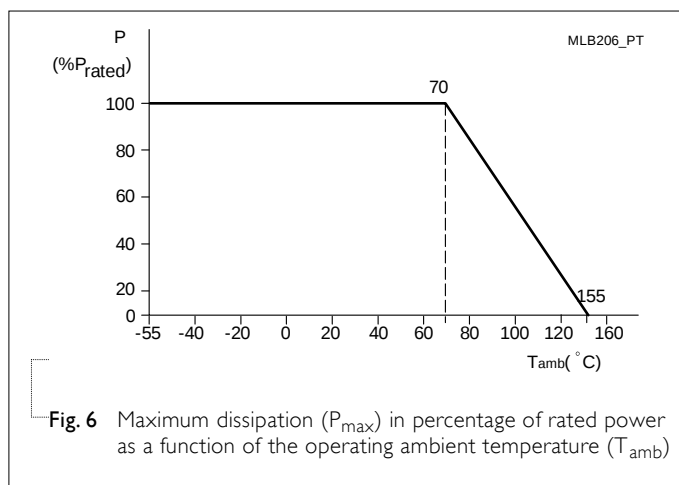


Fig. 6 Maximum dissipation (P_{max}) in percentage of rated power as a function of the operating ambient temperature (T_{amb})

TESTS AND REQUIREMENTS

Table 4 Test condition, procedure and requirements

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Temperature Coefficient of Resistance (T.C.R.)	MIL-STD-202 Method 304	At +25/+125 °C Formula: $T.C.R. = \frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (ppm/°C)}$ 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	MIL-STD-202 Method 108A IEC 60115-1 4.25.1	1,000 hours at 70±2 °C applied rated power 1.5 hours on, 0.5 hour off, still air required	± (1.0%+0.0005 Ω)
High Temperature Exposure	MIL-STD-202 Method 108A 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	± (0.5%+0.0005 Ω)
Thermal Shock	MIL-STD-202 Method 107	-55/+125 °C Number of cycles required is 300. Maximum Devices mounted: 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-I 4.13	PT standard power: 2.5 times rated voltage for 5 sec at room temperature PT high power: 5 times rated power for 5 sec at room temperature PT jumper: 2.5 times rated current for 5 sec at room temperature	$\pm (1.0\%+0.0005 \Omega)$ No visible damage
Board Flex/ Bending	IEC 60115-I 4.33	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	$\pm (1.0\%+0.0005 \Omega)$ No visible damage
Solderability - Wetting	J-STD-002 test B	Electrical Test not required Magnification 50X SMD conditions: 1 st step: method B, aging 4 hours at 155 °C dry heat 2 nd 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-I 4.18	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	$\pm (0.5\%+0.0005 \Omega)$ No visible damage

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version 3	Dec 04, 2023	-	- Update PT0402 7T power rating
Version 2	May 24, 2018	-	- Update PT0603 7T coding
Version 1	Jul. 02, 2015	-	- Extend resistor value
Version 0	Aug. 21, 2014	-	- New datasheet for current sensor - low TCR PT series sizes of 0402/0603/0805/1206/2010/2512, 1%, 2%, 5% with lead-free termination

LEGAL DISCLAIMER

YAGEO, its distributors and agents (collectively, "YAGEO"), hereby disclaims any and all liabilities for any errors, inaccuracies or incompleteness contained in any product related information, including but not limited to product specifications, datasheets, pictures and/or graphics. YAGEO may make changes, modifications and/or improvements to product related information at any time and without notice.

YAGEO makes no representation, warranty, and/or guarantee about the fitness of its products for any particular purpose or the continuing production of any of its products. To the maximum extent permitted by law, YAGEO disclaims (i) any and all liability arising out of the application or use of any YAGEO product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for a particular purpose, non-infringement and merchantability.

YAGEO products are designed for general purpose applications under normal operation and usage conditions. Please contact YAGEO for the applications listed below which require especially high reliability for the prevention of defects which might directly cause damage to the third party's life, body or property: Aerospace equipment (artificial satellite, rocket, etc.), Atomic energy-related equipment, Aviation equipment, Disaster prevention equipment, crime prevention equipment, Electric heating apparatus, burning equipment, Highly public information network equipment, data-processing equipment, Medical devices, Military equipment, Power generation control equipment, Safety equipment, Traffic signal equipment, Transportation equipment and Undersea equipment, or for any other application or use in which the failure of YAGEO products could result in personal injury or death, or serious property damage. Particularly **YAGEO Corporation and its affiliates do not recommend the use of commercial or automotive grade products for high reliability applications or manned space flight.**

Information provided here is intended to indicate product specifications only. YAGEO reserves all the rights for revising this content without further notification, as long as products are unchanged. Any product change will be announced by PCN.