

# DATA SHEET

## CURRENT SENSOR - LOW TCR

PA0402 series

5%, 1%

sizes 0402

RoHS compliant & Halogen free



**SCOPE**

This specification describes PA0402 series current sensor - low TCR with lead-free terminations metal substrate.

**APPLICATIONS**

- Consumer goods
- Computer
- Telecom / Datacom
- Industrial / Power supply
- Alternative Energy
- Car electronics

**FEATURES**

- Halogen-free Epoxy
- RoHS compliant
- Reduce environmentally hazardous wastes
- High component and equipment reliability
- Non-forbidden materials used in products/production
- Low resistances applied to current sensing
- Moisture sensitivity level: MSL 1

**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**

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

**(1) SIZE**

0402

**(2) TOLERANCE**

F = ±1%

J = ±5%

**(3) PACKAGING TYPE**

R = Paper taping reel

**(4) TEMPERATURE COEFFICIENT OF RESISTANCE**

J = ± 350 ppm/°C

L = ± 150ppm/°C

**(5) TAPING REEL**

07 / 7W / 7T / 47 = 7 inch dia. Reel and specific rated power

Detailed power rating are shown in the Table 2.

**(6) RESISTANCE VALUE**

2.5 mΩ to 20 mΩ

**(7) DEFAULT CODE**

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

Resistance code rule	Example
0RXXX (2.5 to 50 mΩ)	2U5 = 2.5mΩ 0R001 = 1 mΩ 0R02 = 20 mΩ

**ORDERING EXAMPLE**

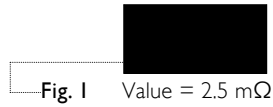
The ordering code for a PA0402 0.25W chip resistor, TC350 value 0.0025Ω (2.5mR) with ±1% tolerance, supplied in 7-inch tape reel with 10Kpcs quantify is: **PA0402FRJ472U5L**

**NOTE**

1. All our RChip products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead-Free Process"

MARKING

PA0402



No Marking

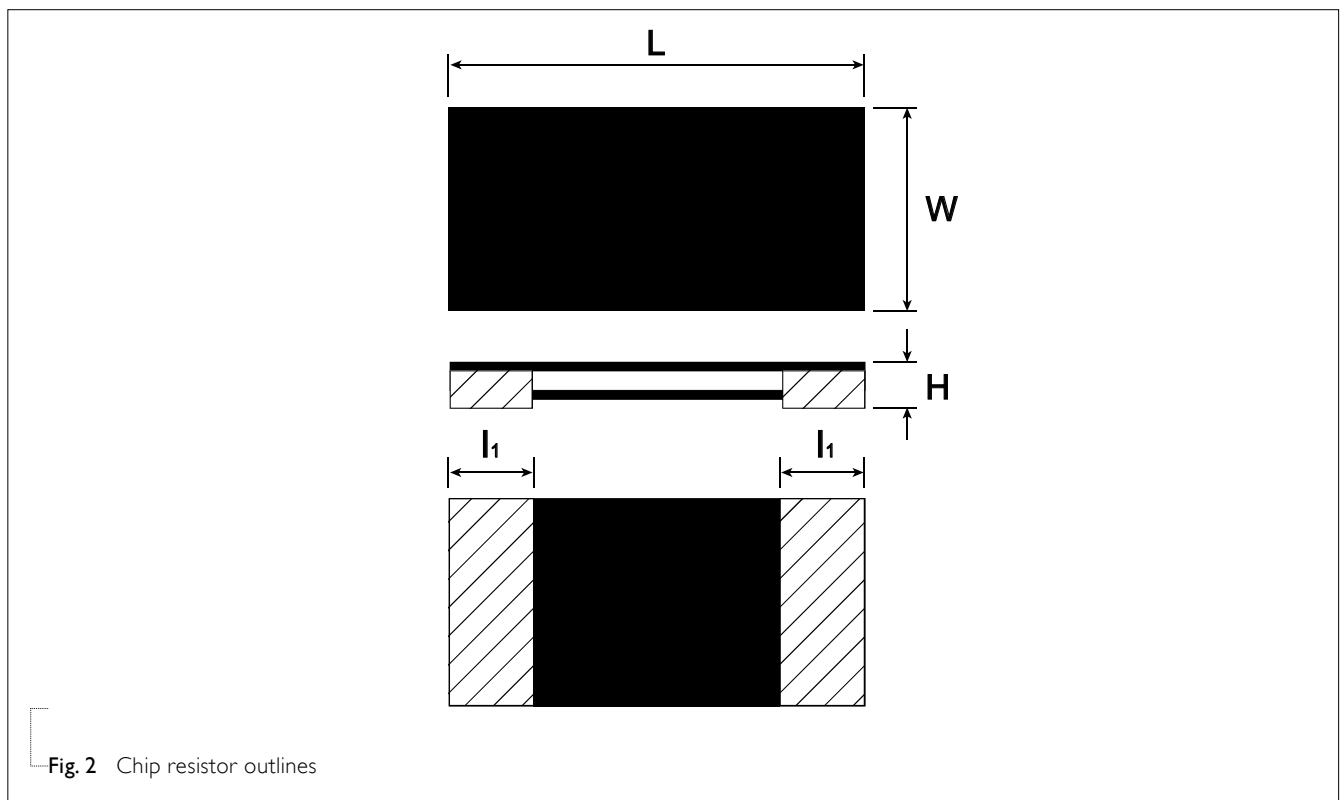
CONSTRUCTION

The resistors are constructed using outstanding TCR level material, which makes Yageo PA resistors excellent for current sensing application in battery charger circuit & DC-DC converter.

The composition of the resistive material is adjusted to give the approximate required resistance and is covered with a protective coating. Marking is printed on the top side of the resistor.

Finally, the three external terminations (Cu / Ni / matte Tin) are added, as shown in Fig. 2.

**Outlines**



**DIMENSION**

Table 1 For outlines, please refer to Fig. 4

TYPE	RESISTANCE RANGE	POWER RATING	L (mm)	W (mm)	H (mm)	l <sub>1</sub> (mm)
PA0402	2.5mΩ	1/16 W	1.00±0.10	0.55±0.10	0.30±0.10	0.25±0.10
	5mΩ ≤ R ≤ 10mΩ	1/8 W	1.00±0.10	0.55±0.10	Max. 0.40	0.25±0.10
	12mΩ ≤ R ≤ 20mΩ	1/4 W	1.00±0.10	0.55±0.10	Max. 0.40	0.25±0.10

Note:

1. For relevant physical dimensions, please refer to construction outlines.
2. Please contact with sales offices, distributors and representatives in your region before ordering.

**ELECTRICAL CHARACTERISTICS**

Table 2

SERIES	SIZE	POWER RATING				TOLERANCE	RESISTANCE RANGE	TEMPERATURE COEFFICIENT OF RESISTANCE
		07	7W	7T	47			
PA	0402	1/16W	1/8W	1/6W	1/4 W	±1%, ±5%	2.5mΩ 5 mΩ ≤ R ≤ 20mΩ	±350 ppm/°C ±150 ppm/°C

Note: Please contact with sales offices, distributors and representatives in your region before ordering.

**FUNCTIONAL DESCRIPTION**

**OPERATING TEMPERATURE RANGE**

PA0402 Range: -55°C to +125°C

**POWER RATING**

Standard rated power at 70°C:

For detail power value, please refer to Table 2.

**RATED VOLTAGE**

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

$$V = \sqrt{PxR}$$

Where

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

P = Rated power (W)

R = Resistance value (Ω)

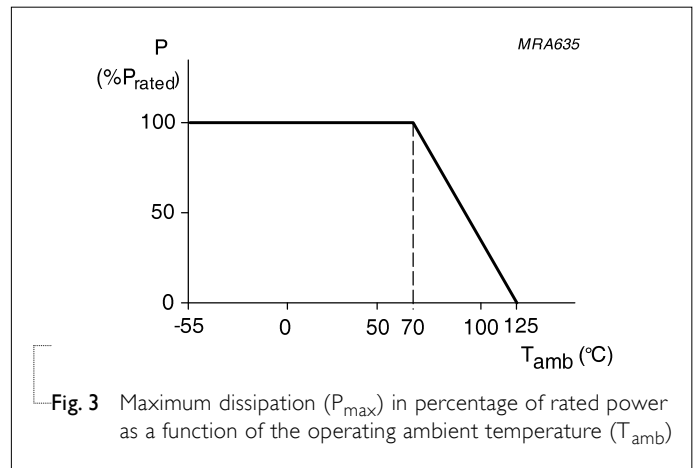


Fig. 3 Maximum dissipation (P<sub>max</sub>) in percentage of rated power as a function of the operating ambient temperature (T<sub>amb</sub>)

**PACKING STYLE AND PACKAGING QUANTITY**

Table 3 Packing style and packaging quantity

PACKING STYLE	REEL DIMENSION	PA0402
Paper taping reel (R)	7" (178 mm)	10,000

**PAPER TAPE**

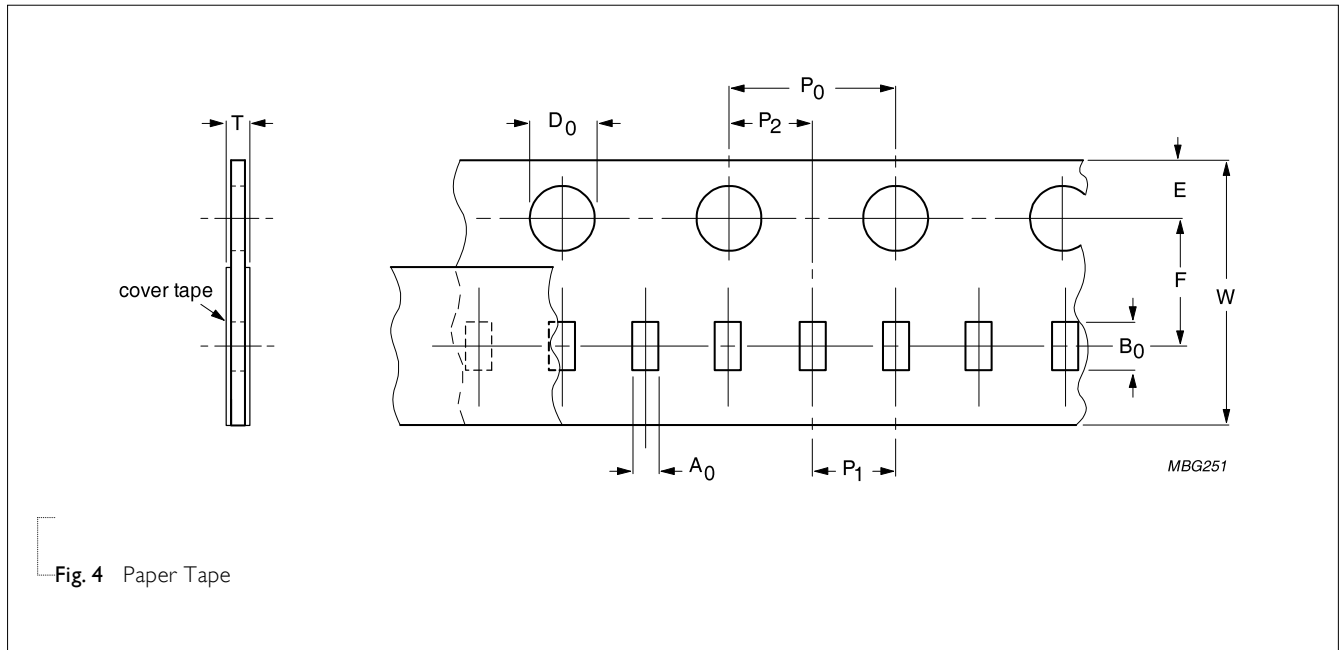


Fig. 4 Paper Tape

Table 4 Dimensions of paper tape for relevant chip resistors size

SIZE	SYMBOL											Unit: mm
	A <sub>0</sub>	B <sub>0</sub>	W	E	F	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	ØD <sub>0</sub>	ØD <sub>1</sub>	T	
PA0402	0.59±0.10	1.10±0.10	8.00±0.10	1.75±0.10	3.50±0.10	4.00±0.10	4.00±0.10	2.00±0.10	1.55±0.05	1.50±0.10	0.48±0.03	

**REEL SPECIFICATION**

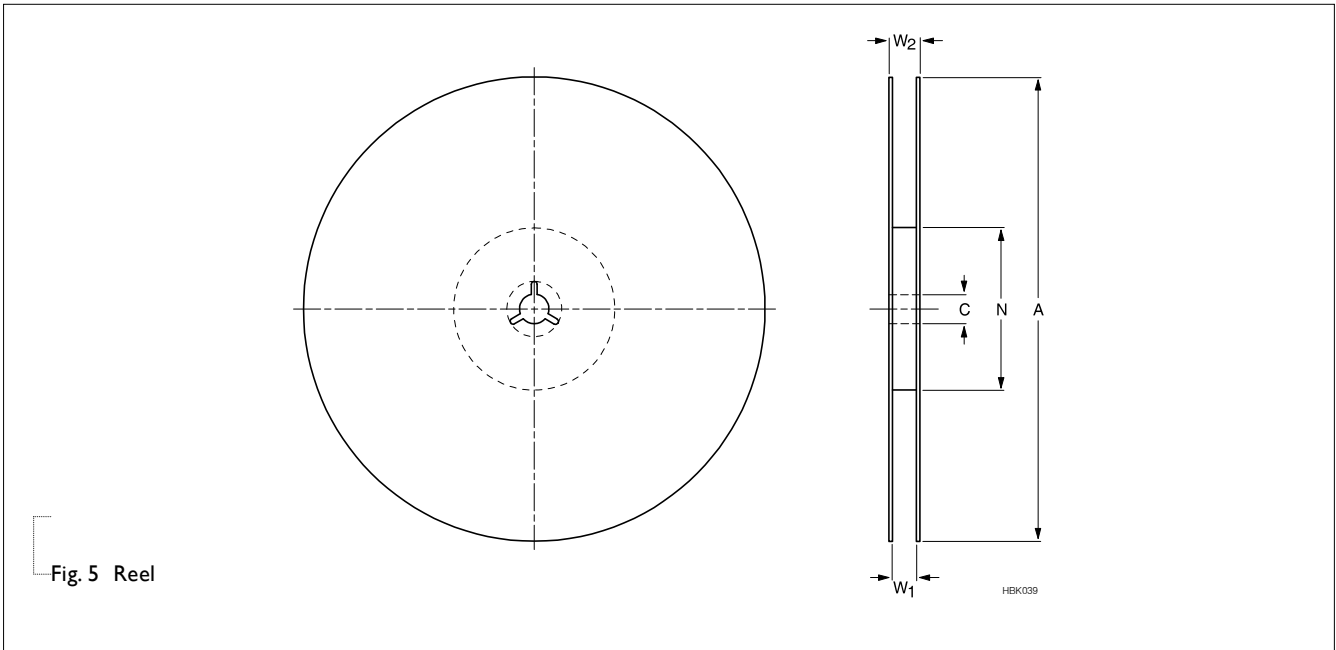
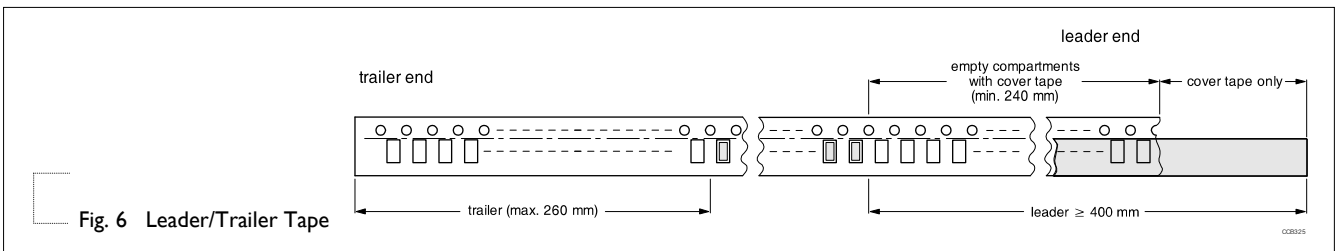


Table 5 Dimensions of reel specification for relevant chip resistors size

SIZE	QUANTITY PER REEL	REEL SIZE 8 mm TAPE WIDE	SYMBOL					Unit: mm	
			A	N	C	D	W <sub>1</sub>	W <sub>2</sub> MAX.	
PA0402	10,000	7" (Ø178 mm)	178.0±1.0	60.0+1/-0	13.50±0.5	21.0±0.8	9.0±0.5	12.0±0.2	

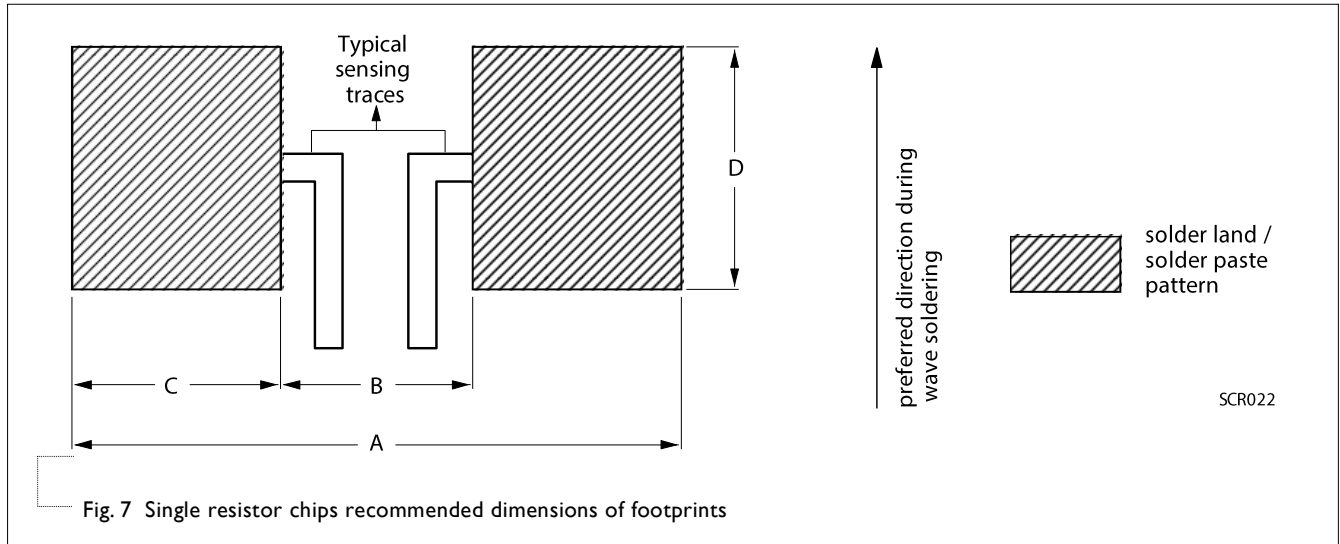
**LEADER/TRAILER TAPE SPECIFICATION**



**FOOTPRINT AND SOLDERING PROFILES**

For recommended soldering profiles, please refer to data sheet “Chip resistors mounting”.

**FOOTPRINT**



**Table 6** Footprint dimensions

SIZE	RESISTANCE RANGE	Unit: mm			
		A	B	C	D
PA0402	2.5mΩ 5mΩ ≤ R ≤ 20mΩ	2.0	0.4	0.8	0.6

**TESTS AND REQUIREMENTS**
**Table 8** Test condition, procedure and requirements

TEST	TEST METHOD	PROCEDURE	REQUIREMENT
Short time overload	IEC60115-1 4.13	2.5 times of rated power for 5 seconds at room temperature	$\pm(1\%+0.0005\Omega)$ No visible damage
High Temperature Exposure	MIL-STD-202-Method 108	1,000 hours at maximum operating temperature depending on specification, unpowered  No direct impingement of forced air to the parts Tolerances: $125\pm 5^{\circ}\text{C}$	$\pm(1.0\%+0.0005\Omega)$
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 $25^{\circ}\text{C}$ / $65^{\circ}\text{C}$ 95% R.H, without steps 7a & 7b, unpowered	$\pm(0.5\%+0.0005\Omega)$
Operational Life/ Endurance	MIL-STD-202 Method 108 IEC 60115-1 4.25.1	1,000 hours at $70\pm 2^{\circ}\text{C}$ applied RCWV 1.5 hours on, 0.5 hour off, still air required	$\pm(1.0\%+0.0005\Omega)$
Resistance to Soldering Heat	MIL-STD-202-method 210	Condition B, no pre-heat of samples Leadfree solder, $260^{\circ}\text{C}$ , 10 seconds immersion time  Procedure 2 for SMD: devices fluxed and cleaned with isopropanol	$\pm(0.5\%+0.0005\Omega)$ No visible damage
Thermal Shock	MIL-STD-202 Method 107	$-55/+125^{\circ}\text{C}$ , Number of cycles is 300. Devices mounted. Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air -Air	$\pm(1\%+0.0005\Omega)$ No visible damage
Solderability - Wetting	J-STD-002 test B	Electrical Test not required Magnification 50X SMD conditions: 1st step : method B, aging 4 hours at $155^{\circ}\text{C}$ dry heat 2nd step : leadfree solder bath at $245\pm 3^{\circ}\text{C}$ Dipping time: $3\pm 0.5$ seconds	Well tinned (>95% covered) No visible damage
Board Flex / Bending	IEC 60115-1 4.33	Chips mounted on a 90mm glass epoxy resin PCB (FR4), Bending for 0402=2 mm Holding time: Min.60 seconds	$\pm(1.0\%+0.0005\Omega)$



REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version 0	Mar. 23, 2017	-	- New datasheet for automotive grade current sensor –PA0402 series.

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