

# DATA SHEET

**CURRENT SENSOR - LOW TCR  
AUTOMOTIVE GRADE**

PA1206\_L series  
5%, 1%

RoHS compliant & Halogen free



SCOPE

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

APPLICATIONS

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

FEATURES

- AEC-Q200 qualified
- 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

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**

1206

**(2) TOLERANCE**

D = ±0.5% (for 5mΩ and up)  
 F = ±1%  
 J = ±5%

**(3) PACKAGING TYPE**

R = Paper taping reel

**(4) TEMPERATURE COEFFICIENT OF RESISTANCE**

F = ± 100ppm/°C  
 M = ± 75ppm/°C  
 E = ± 50ppm/°C

**(5) TAPING REEL**

07 = 7 inch dia. Reel & standard power (1/4W)  
 7W = 7 inch dia. Reel & 2 x standard power (1/2W)  
 47 = 7 inch dia. Reel & 4 x standard power (1W)  
 67 = 7 inch dia. Reel & 6 x standard power (1.5W)

**(6) RESISTANCE VALUE**

1 mΩ to 50 mΩ

**(7) DEFAULT CODE**

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

Resistance code rule	Example
0RXXX	0R001 = 1 mΩ
(1 to 50mΩ)	0R015 = 15 mΩ

**ORDERING EXAMPLE**

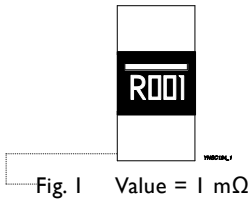
The ordering code of a PA1206 1W chip resistor, TC100, value 0.003Ω with ±1% tolerance, supplied in 7-inch tape reel is: PA1206FRF070R003L

**NOTE**

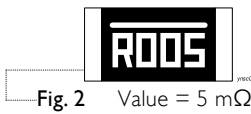
1. All our RChip products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead-Free Process"

**MARKING**

**PA1206**



4 digits  
The “R” is used as a decimal point; the other 3 digits are significant  
PA1206: 1mΩ



4 digits  
The “R” is used as a decimal point; the other 3 digits are significant  
PA1206: 2mΩ to 50mΩ

**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. 4.

**Outlines**

For dimensions, please refer to Table I

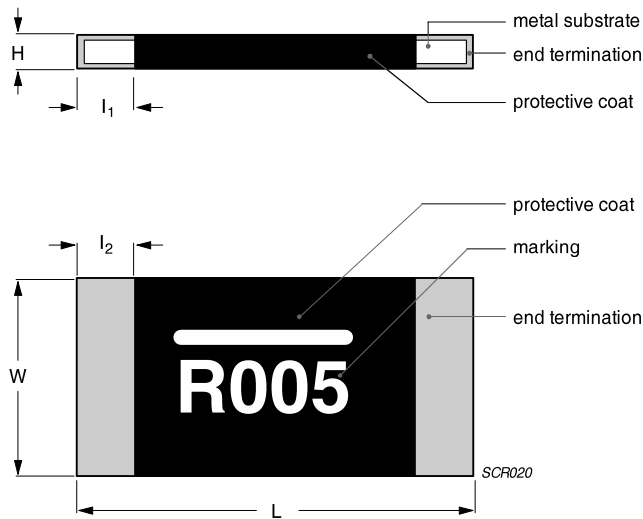


Fig. 3 Chip resistor outlines

**DIMENSION**

Table 1 For outlines, please refer to Fig. 4

TYPE	RESISTANCE RANGE	POWER RATING	L (mm)	W (mm)	H (mm)	I <sub>1</sub> (mm)	I <sub>2</sub> (mm)
PA1206	1mΩ	1/4W	3.20 ± 0.25	1.60±0.25	0.65±0.25	1.04±0.25	1.04±0.25
	2mΩ ≤ R ≤ 5mΩ	1/2W	3.20 ± 0.25	1.60±0.25	0.65±0.25	0.64±0.25	0.64±0.25
	6mΩ ≤ R ≤ 50mΩ	1W 1.5W (1~5mΩ)	3.20 ± 0.25	1.60±0.25	0.65±0.25	0.51±0.25	0.51±0.25

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
PA	1206	1/4W	±1% ±5%	1mΩ ≤ R ≤ 2mΩ	±75ppm/°C, ±100ppm/°C
		1/2W		3mΩ ≤ R ≤ 50mΩ	±50ppm/°C, ±75ppm/°C, ±100ppm/°C
		1W		1mΩ ≤ R ≤ 2mΩ	±75ppm/°C, ±100ppm/°C
		1.5W		3mΩ ≤ R ≤ 5mΩ	±50ppm/°C, ±75ppm/°C, ±100ppm/°C

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

**FUNCTIONAL DESCRIPTION**

**OPERATING TEMPERATURE RANGE**

PA1206 Range: -55°C to +170°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:

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

Where

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

P = Rated power (W)

R = Resistance value (Ω)

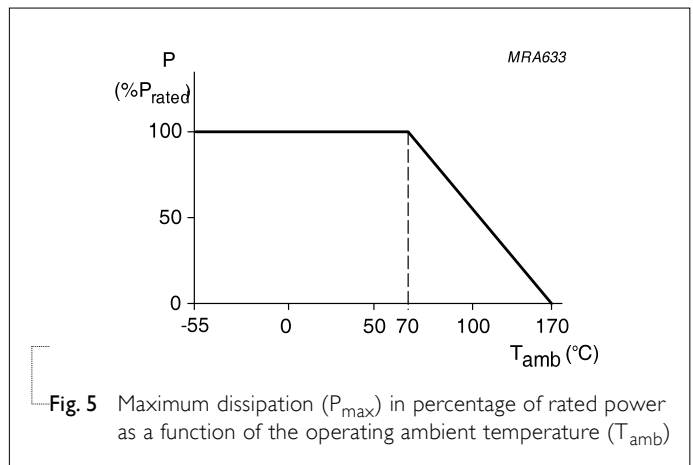


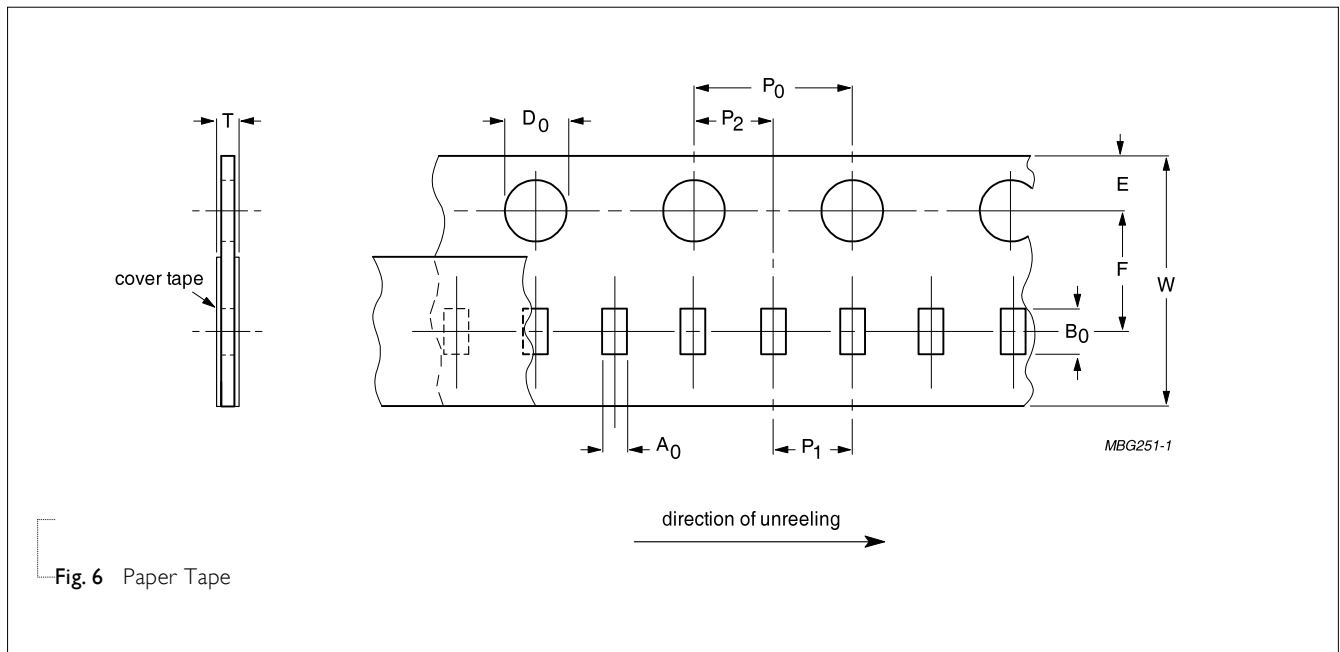
Fig. 5 Maximum dissipation (P<sub>max</sub>) in percentage of rated power as a function of the operating ambient temperature (T<sub>amb</sub>)

**PACKING STYLE AND PACKAGING QUANTITY**

**Table 3** Packing style and packaging quantity

PACKING STYLE	REEL DIMENSION	PA1206
Paper Taping Reel (R)	7" (178 mm)	4,000

**PAPER TAPE**



**Fig. 6** 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
PA1206	1.90±0.10	3.50±0.10	8.00±0.30	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	1.50±0.10

**REEL SPECIFICATION**

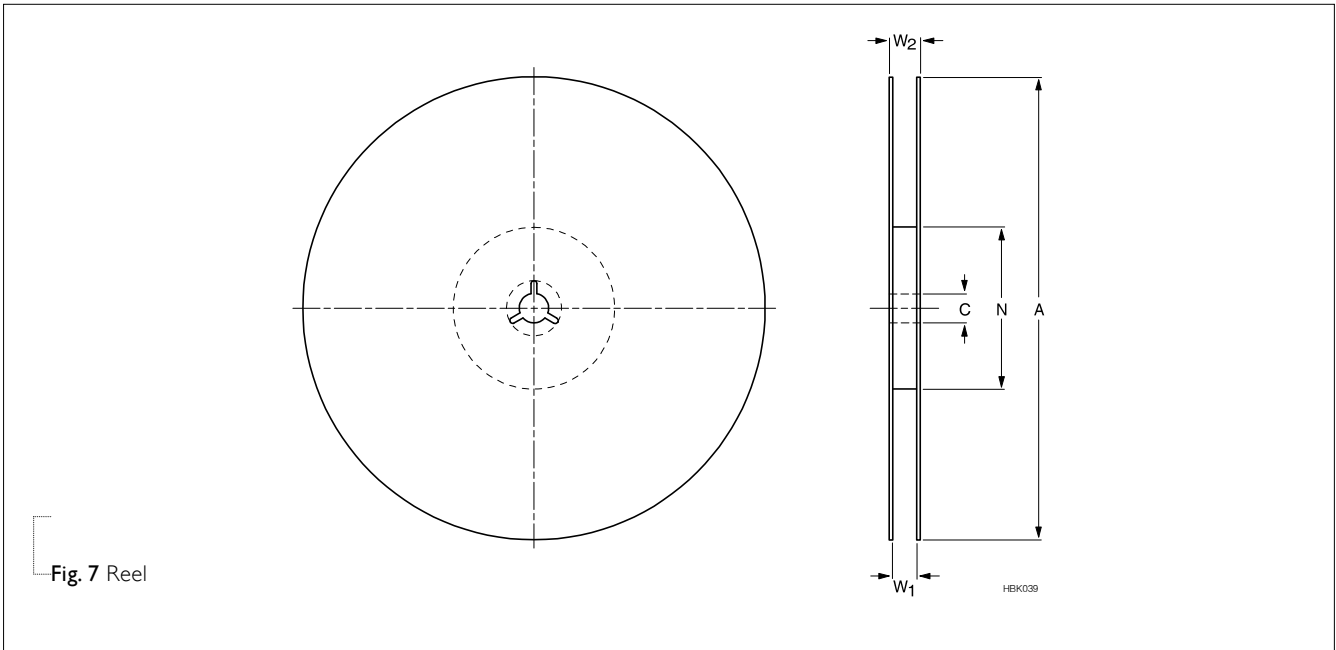
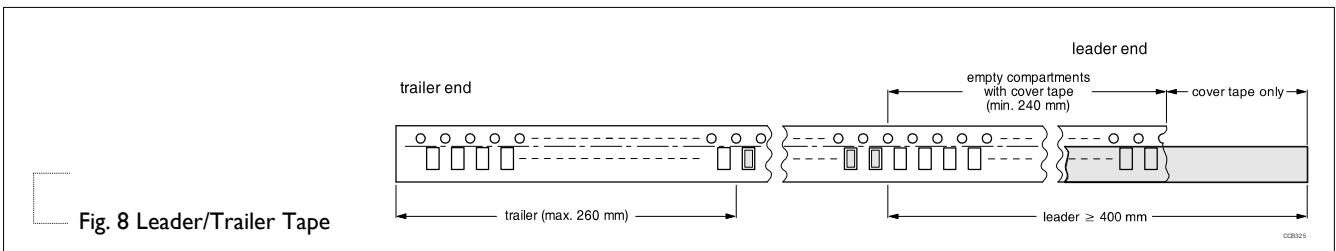


Table 5 Dimensions of reel specification for relevant chip resistors size

SIZE	QUANTITY PER REEL	REEL SIZE		SYMBOL				Unit: mm	
		8 mm TAPE WIDE	12 mm TAPE WIDE	A	N	C	D	W <sub>1</sub>	W <sub>2</sub> MAX.
PA1206	4000	--	7" (∅178 mm)	180.0+0/-3	60.0+1/-0	13.0± 0.2	21.0±0.8	8.4 +1/-0	12.4

**LEADER/TRAILER TAPE SPECIFICATION**



**FOOTPRINT AND SOLDERING PROFILES**

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

**FOOTPRINT**

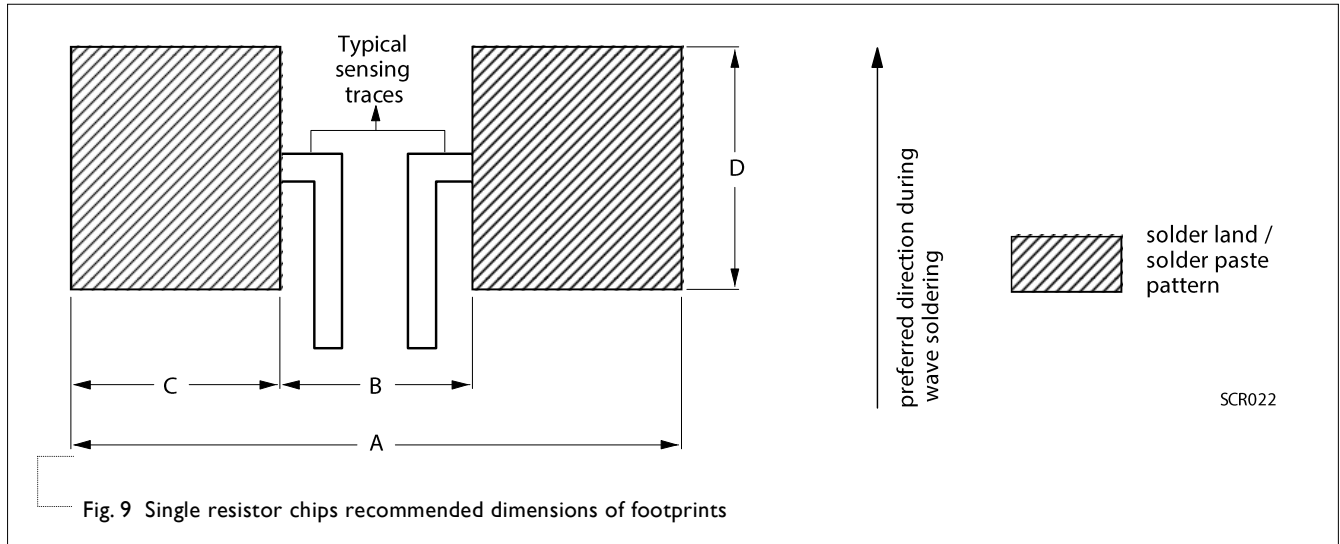


Table 6 Footprint dimensions

SIZE	RESISTANCE RANGE	A	B	C	D	Unit: mm
PA1206	$1\text{m}\Omega \leq R \leq 50\text{m}\Omega$	3.90	0.76	1.57	1.78	

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

TEST	TEST METHOD	PROCEDURE	REQUIREMENT
Short time overload	IEC60115-1 4.13	5 times of rated power for 5 seconds at room temperature	$\pm 0.5\% + 0.0005\Omega$ 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: $170 \pm 3^\circ\text{C}$	$\pm 1.0\% + 0.0005\Omega$
Temperature Cycling	JESD22-A104C	1,000 cycles, $-55/+125^\circ\text{C}$ for 1 cycle per hour	$\pm 0.5\% + 0.0005\Omega$
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	$\pm 0.5\% + 0.0005\Omega$
Biased Humidity	MIL-STD-202 Method 103	1,000 hours; $85^\circ\text{C} / 85\%$ RH  10% of operating power	$\pm 0.5\% + 0.0005\Omega$
Operational Life/ Endurance	MIL-STD-202-Method 108	1,000 hours at $125 \pm 3^\circ\text{C}$ , de-rated voltage applied for 1.5 hours on, 0.5 hour off, still-air required	$\pm 1.0\% + 0.0005\Omega$
		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 Solvents	MIL-STD-202 Method 215	Immerse in isopropyl alcohol for 5 min with ultrasonic at room temperature	No Visible damage
Mechanical Shock	MIL-STD-202 Method 213	Three shocks in each direction shall be applied along the three mutually perpendicular axes of the test specimen.  Peak value: 100 g's  Duration: 6 ms  Velocity change: 12.3 ft/s  Waveform: Half sine	$\pm 0.5\% + 0.0005\Omega$
Vibration	MIL-STD-202 Method 204	5 g's for 20 min., 12 cycles each of 3 orientations  Test from 10-2000 Hz.	$\pm 0.5\% + 0.0005\Omega$
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	$\pm 0.5\% + 0.0005\Omega$ No visible damage
TEST	TEST METHOD	PROCEDURE	REQUIREMENT



<b>Electrostatic Discharge</b>	AEC-Q200-002	Human Body Model, 1 pos + 1 neg. Discharges 1206=2KV	±1.0%+0.0005Ω No visible damage
<b>Solderability - Wetting</b>	J-STD-002B test B	a Method B, aging 4 hours at 155°C dry heat, dipping at 235±3°C for 5±0.5 seconds.  b Method B, steam aging 8 hours, dipping at 215±3°C for 5±0.5 seconds.  c Method D, steam aging 8 hours, dipping at 260±3 °C for 7±0.5 seconds.	Well tinned (>95% covered) No visible damage
<b>Flammability</b>	UL94	Try to inflame a specimen by a needle flame	No ignition of specimen; V-0
<b>Board Flex / Bending</b>	AEC-Q200-005	Chips mounted on a 90mm glass epoxy resin PCB FR4, Bending for 1206=2 mm  Holding time: Min.60 seconds	±1.0%+0.0005Ω
<b>Terminal Strength SMD</b>	AEC-Q200-006	Applied a 17.7N 1.8Kg for 60±1 seconds.	±1.0%+0.0005Ω No visible damage
<b>Flame Retardance</b>	AEC-Q200-001	Apply voltage from 9V to 32V to increase the surface temp to 350°C	No flame, no explosion
<b>Temperature Coefficient of Resistance T.C.R.</b>	MIL-STD-202 Method 304	At +25/+150°C  Formula: $T.C.R = \frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ppm}/^\circ\text{C}$  Where t1=+25°C or specified room temperature t2=+150°C test temperature R1=resistance at reference temperature in ohms R2=resistance at test temperature in ohms	Refer to table 2
<b>Flower-of-Sulfur FOS</b>	Modified ASTM B809-95	Sulfur 105°C, 750 hours, unpowered.	±1.0%+0.0005Ω

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version 2	Jul. 24, 2017	-	- Add part number coding details for the relationship between taping reel and rated power
Version 1	May 05, 2017	-	- Extend resistor value
Version 0	Mar. 31, 2017	-	- New datasheet for automotive grade current sensor –PA1206_L series.

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