

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

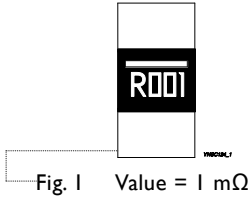
The ordering code of a PA1206 1/4W chip resistor, TC100, value 0.003Ω with ±1% tolerance, supplied in 7-inch tape reel is : PA1206FRF070R003L

NOTE

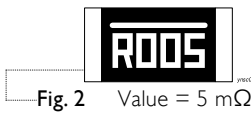
1. All our RChip products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead-Free Process"

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. 3.

Outlines

For dimensions, please refer to Table I

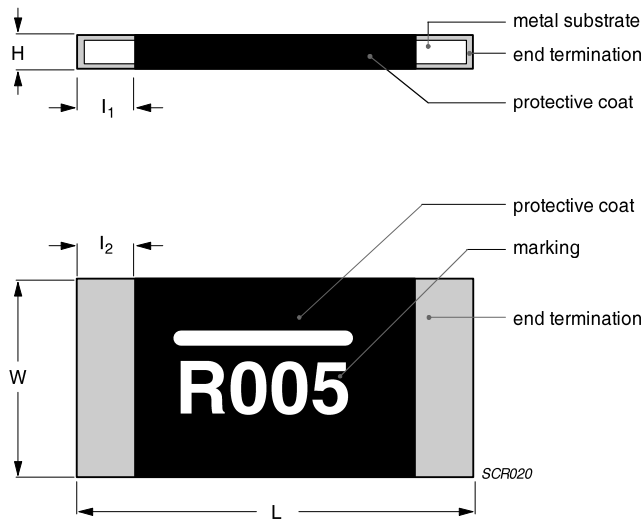


Fig. 3 Chip resistor outlines

DIMENSION

Table 1 For outlines, please refer to Fig. 3

TYPE	RESISTANCE RANGE	POWER RATING	L (mm)	W (mm)	H (mm)	I ₁ (mm)	I ₂ (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)

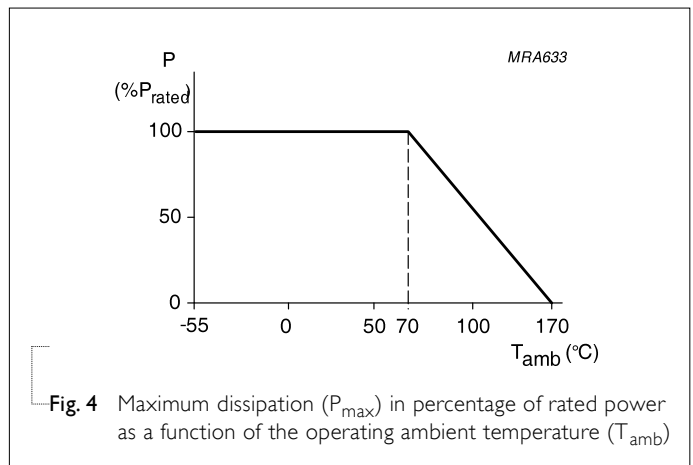


Fig. 4 Maximum dissipation (P_{max}) in percentage of rated power as a function of the operating ambient temperature (T_{amb})

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

EMBOSSED TAPE

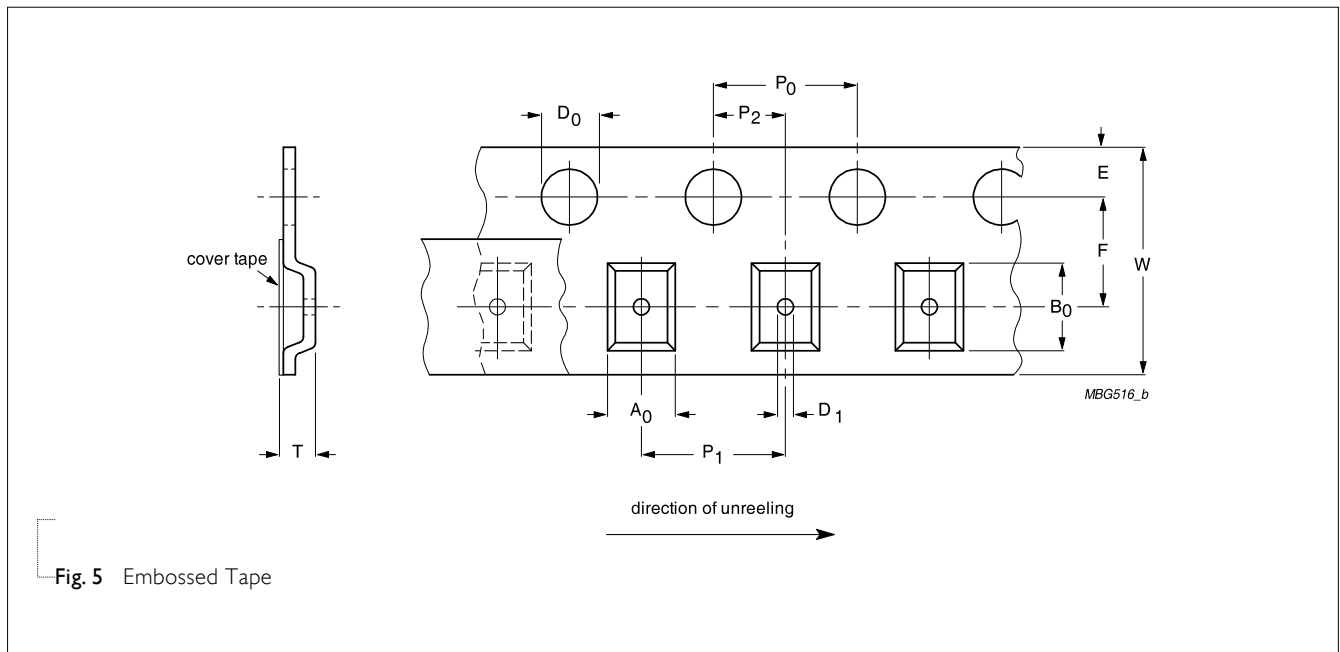


Fig. 5 Embossed Tape

Table 4 Dimensions of embossed tape for relevant chip resistors size

SIZE	SYMBOL										Unit: mm
	A ₀	B ₀	W	E	F	P ₀	P ₁	P ₂	ØD ₀	ØD ₁	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

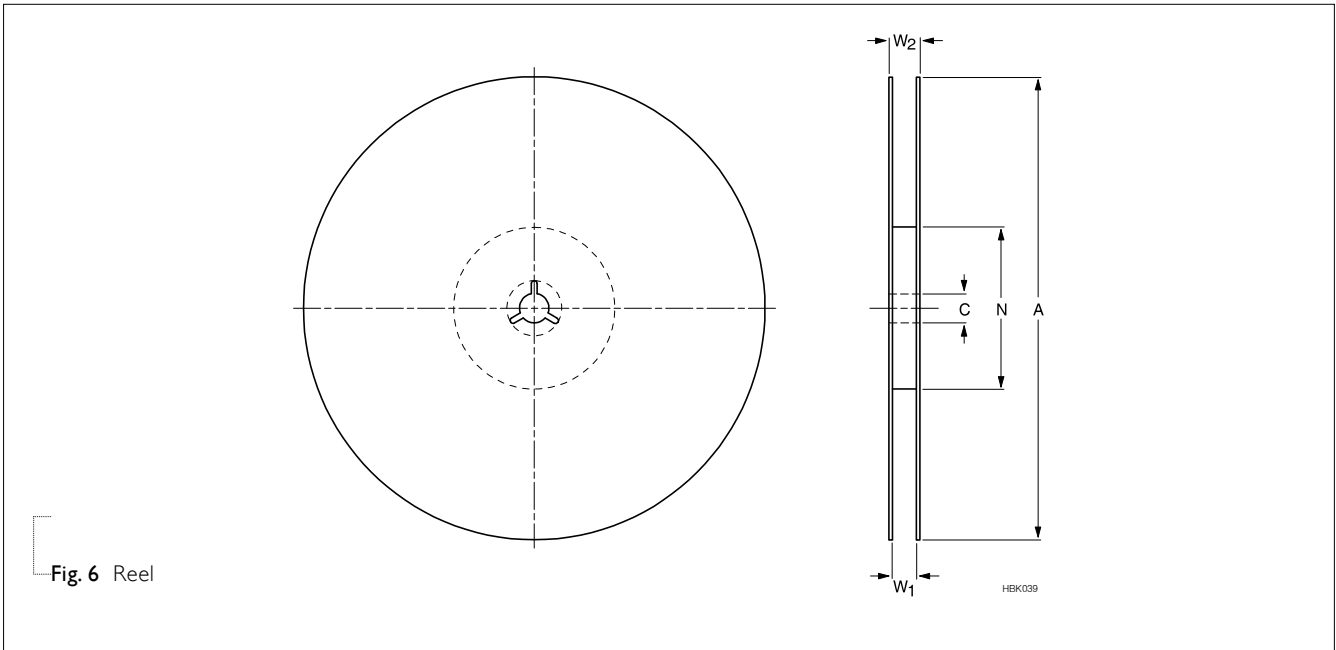
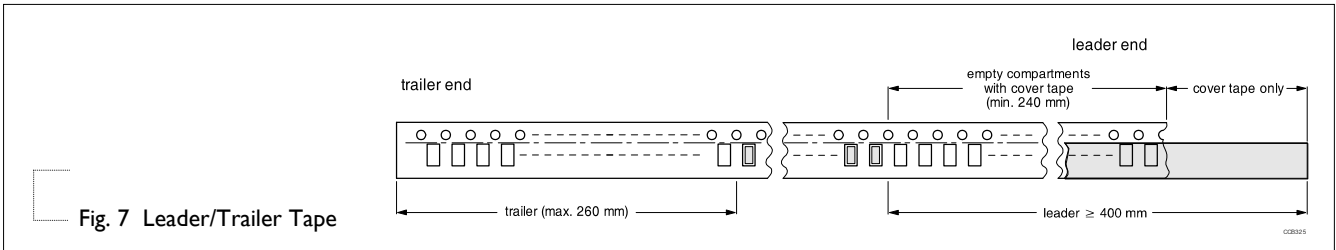


Table 5 Dimensions of reel specification for relevant chip resistors size

SIZE	QUANTITY PER REEL	REEL SIZE		SYMBOL					Unit: mm	
		8 mm TAPE WIDE	12 mm TAPE WIDE	A	N	C	D	W ₁	W ₂ 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

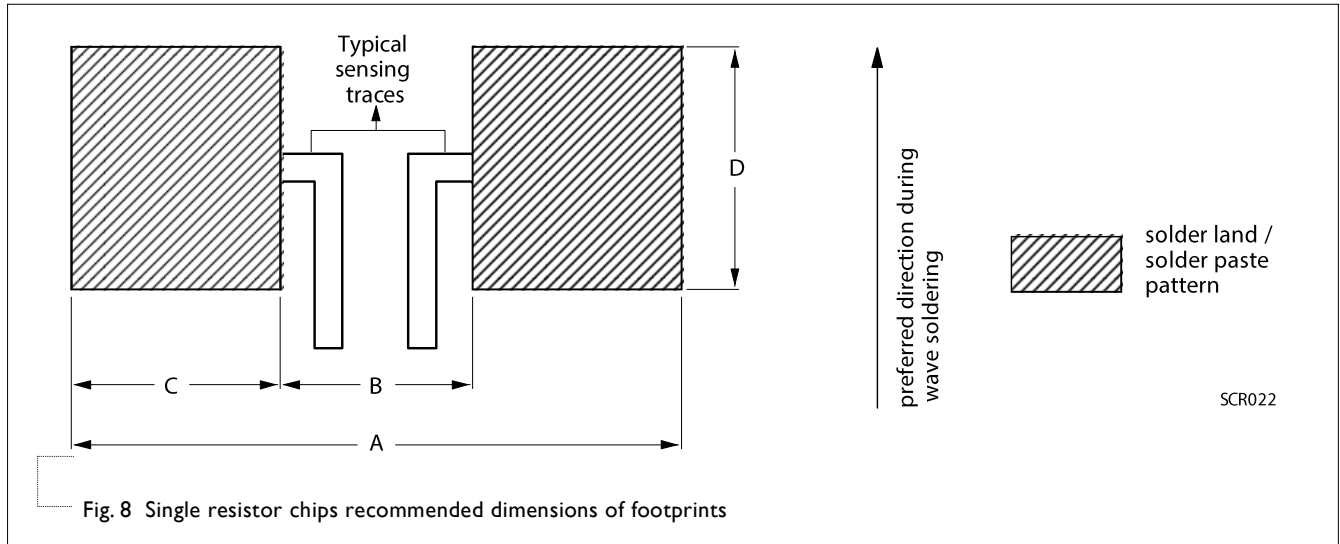


Table 6 Footprint dimensions

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

TESTS AND REQUIREMENTS

Table 7 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°C / 65°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°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°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
Electrostatic Discharge	AEC-Q200-002	Human Body Model, 1 pos + 1 neg. Discharges 1206=2KV	±(1.0%+0.0005Ω) No visible damage
Solderability - Wetting	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
Flammability	UL94	Try to inflame a specimen by a needle flame	No ignition of specimen; V-0
Board Flex / Bending	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)
Terminal Strength (SMD)	AEC-Q200-006	Applied a 17.7N (1.8Kg) for 60±1 seconds.	±(1.0%+0.0005Ω) No visible damage
Flame Retardance	AEC-Q200-001	Apply voltage from 9V to 32V to increase the surface temp to 350°C	No flame, no explosion
Temperature Coefficient of Resistance (T.C.R.)	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
Flower-of-Sulfur (FOS)	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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