

DATA SHEET

CURRENT SENSOR - LOW TCR

PR series

5%, 1%

sizes 0805/1206/2010/2512

RoHS compliant & Halogen free



SCOPE

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

APPLICATIONS

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

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

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

PR XXXX X X X XX XXXX Z
 (1) (2) (3) (4) (5) (6) (7)

(1) SIZE

0805/1206 / 2010 / 2512

(2) TOLERANCE

F = ±1%
 J = ±5%

(3) PACKAGING TYPE

R = Paper taping reel
 K = Embossed taping reel

(4) TEMPERATURE COEFFICIENT OF RESISTANCE

D = ±25 ppm/°C
 E = ±50 ppm/°C
 F = ±100ppm/°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

0.5 mΩ to 100 mΩ
 There are 3~5 digits indicated the resistance value.
 Detailed coding rules of resistance are shown in the table of "Resistance rule of global part number".

(7) DEFAULT CODE

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

| Resistance code rule | Example |
|----------------------|--------------|
| 0RXXX | 0U5 = 0.5 mΩ |
| (0.5 to 100 mΩ) | 0R001 = 1 mΩ |
| | 0R1 = 100 mΩ |

ORDERING EXAMPLE

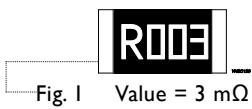
The ordering code of a PR1206 1/4W chip resistor, TC50, value 0.003Ω with ± 1% tolerance, supplied in 7-inch tape reel is: PR1206FKE070R003Z

NOTE

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

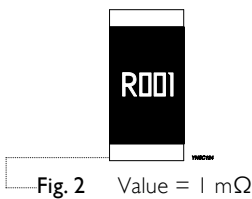
MARKING

PR1206 / PR2010 / PR2512



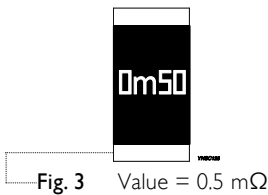
4 digits
 The “R” is used as a decimal point; the other 3 digits are significant
 PR1206: 1mΩ to 4mΩ
 PR2010: 4mΩ
 PR2512: 5mΩ

PR2010 / PR2512



4 digits
 The “R” is used as a decimal point; the other 3 digits are significant
 PR2010: 1 mΩ to 3 mΩ
 PR2512: 1 mΩ to 4 mΩ

PR2512



4 digits
 The “m” is used as a decimal point; the other 3 digits are significant and the unit is milliohm
 PR2512: 0.5 mΩ to 0.91 mΩ

CONSTRUCTION

The resistors are constructed using outstanding TCR level material, which makes Yageo PR 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

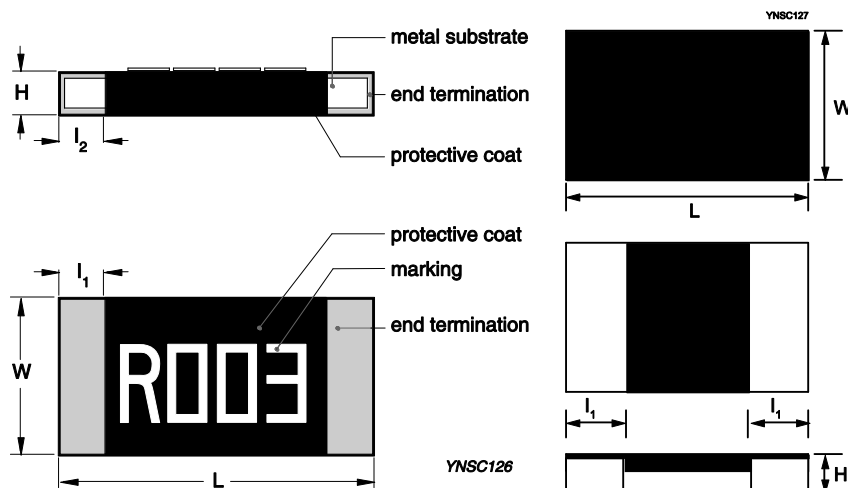


Fig. 4 PR1206~PR2512 Chip resistor outlines

DIMENSION
Table 1 For outlines, please refer to Fig. 4

| TYPE | RESISTANCE RANGE | POWER RATING | L (mm) | W (mm) | H (mm) | l ₁ (mm) | l ₂ (mm) |
|--------|-------------------|------------------|-----------|-----------|-----------|---------------------|---------------------|
| PR0805 | 3mΩ ≤ R ≤ 50mΩ | 1/8W, 1/4W, 1/2W | 2.03±0.25 | 1.27±0.25 | 0.30±0.10 | 0.35±0.25 | |
| | 1mΩ | | 3.20±0.25 | 1.60±0.25 | 0.64±0.25 | 0.50±0.25 | 0.50±0.25 |
| PR1206 | 2mΩ ≤ R ≤ 4mΩ | 1/4W, 1/2W, 1W | 3.20±0.25 | 1.60±0.25 | 0.55±0.25 | 0.50±0.25 | 0.50±0.25 |
| | 5mΩ | | 3.20±0.25 | 1.60±0.25 | 0.55±0.25 | 0.60±0.25 | 0.60±0.25 |
| | 6mΩ ≤ R ≤ 50mΩ | | 3.20±0.25 | 1.60±0.25 | 0.55±0.25 | 0.50±0.25 | 0.50±0.25 |
| PR2010 | 1mΩ ≤ R ≤ 3mΩ | 1/2W, 1W | 5.08±0.25 | 2.54±0.25 | 0.78±0.25 | 1.30±0.25 | 1.30±0.25 |
| | 3mΩ < R ≤ 4mΩ | | 5.08±0.25 | 2.54±0.25 | 0.64±0.25 | 0.78±0.25 | 0.78±0.25 |
| | 4mΩ < R ≤ 100mΩ | | 5.08±0.25 | 2.54±0.25 | 0.64±0.25 | 0.78±0.25 | 0.78±0.25 |
| PR2512 | 0.5mΩ ≤ R ≤ 3mΩ | 1W | 6.25±0.25 | 3.20±0.25 | 0.78±0.25 | 1.88±0.25 | 1.88±0.25 |
| | 3mΩ < R ≤ 4mΩ | | 6.25±0.25 | 3.20±0.25 | 0.78±0.25 | 1.88±0.25 | 1.88±0.25 |
| | 4mΩ < R ≤ 75mΩ | | 6.25±0.25 | 3.20±0.25 | 0.64±0.25 | 1.11±0.25 | 1.11±0.25 |
| | 75mΩ < R ≤ 100mΩ | | 6.25±0.25 | 3.20±0.25 | 0.64±0.25 | 0.86±0.25 | 0.86±0.25 |
| | 0.5mΩ ≤ R ≤ 3mΩ | | 6.25±0.25 | 3.20±0.25 | 0.78±0.25 | 1.88±0.25 | 1.88±0.25 |
| PR2512 | 3mΩ < R ≤ 4mΩ | 2W | 6.25±0.25 | 3.20±0.25 | 0.78±0.25 | 1.88±0.25 | 1.88±0.25 |
| | 4mΩ < R ≤ 75mΩ | | 6.25±0.25 | 3.20±0.25 | 0.64±0.25 | 1.11±0.25 | 1.11±0.25 |
| | 0.5mΩ | 3W | 6.25±0.25 | 3.20±0.25 | 0.78±0.25 | 1.88±0.25 | 1.88±0.25 |
| | 0.5mΩ < R ≤ 2.9mΩ | | 6.25±0.25 | 3.20±0.25 | 0.78±0.25 | 1.11±0.25 | 1.11±0.25 |
| | 3mΩ ≤ R ≤ 4mΩ | | 6.25±0.25 | 3.20±0.25 | 0.78±0.25 | 1.67±0.25 | 1.67±0.25 |
| | 4mΩ < R ≤ 10mΩ | | 6.25±0.25 | 3.20±0.25 | 0.64±0.25 | 1.11±0.25 | 1.11±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 (1) | | | | TOLERANCE | RESISTANCE RANGE | TEMPERATURE COEFFICIENT OF RESISTANCE | |
|--------|------|------------------|------|------|-----|-----------|-------------------------------------|---------------------------------------|------------------------|
| | | 07 | 7W | 7T | 47 | | | | |
| PR | 0805 | 1/8W | 1/4W | 1/2W | 1W | | $3m\Omega \leq R \leq 50m\Omega$ | $3m\Omega \leq R < 5m\Omega$ | $\pm 100ppm/^{\circ}C$ |
| | | | | | | | | $5m\Omega \leq R \leq 50m\Omega$ | $\pm 50ppm/^{\circ}C$ |
| | 1206 | 1/4W | 1/2W | --- | 1W | $\pm 1\%$ | $1m\Omega \leq R \leq 50m\Omega$ | | $\pm 50ppm/^{\circ}C$ |
| | 2010 | 1/2W | 1W | --- | --- | $\pm 5\%$ | $1m\Omega \leq R \leq 100m\Omega$ | | |
| | 2512 | 1W | 2W | 3W | --- | | $0.5m\Omega \leq R \leq 100m\Omega$ | $0.5m\Omega \leq R \leq 3m\Omega$ | $\pm 50ppm/^{\circ}C$ |
| | | | | | | | | $3m\Omega < R \leq 100m\Omega$ | $\pm 25ppm/^{\circ}C$ |

- Note: 1. Global part number (code 10 - 11)
 2. Please contact with sales offices, distributors and representatives in your region before ordering.

FUNCTIONAL DESCRIPTION

OPERATING TEMPERATURE RANGE

PR0805 Range: -55°C to + 150°C

PR1206~PR2512 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)

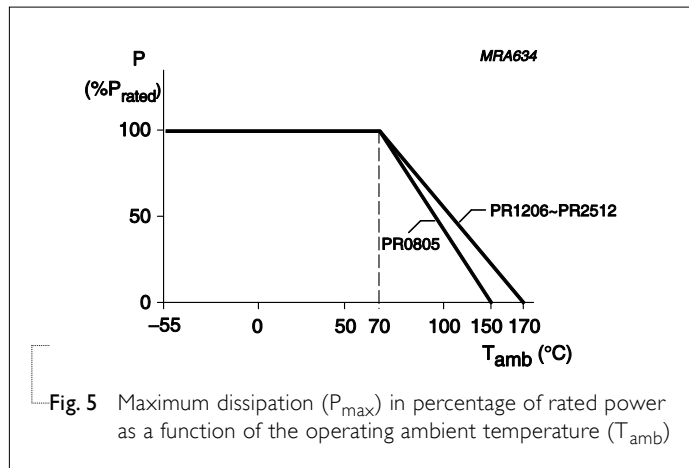


Fig. 5 Maximum dissipation (P_{max}) in percentage of rated power as a function of the operating ambient temperature (T_{amb})

PACKING STYLE AND PACKAGING QUANTITY

Table 3 Packing style and packaging quantity

| PACKING STYLE | REEL DIMENSION | PR0805 | PR1206 | PR2010 | PR2512 |
|--------------------------|----------------|--------|--------|--------|--------|
| Paper taping reel (R) | 7" (178 mm) | 5,000 | --- | --- | --- |
| Embossed taping reel (K) | | --- | 4,000 | 2,000 | 4,000 |

EMBOSSED TAPE

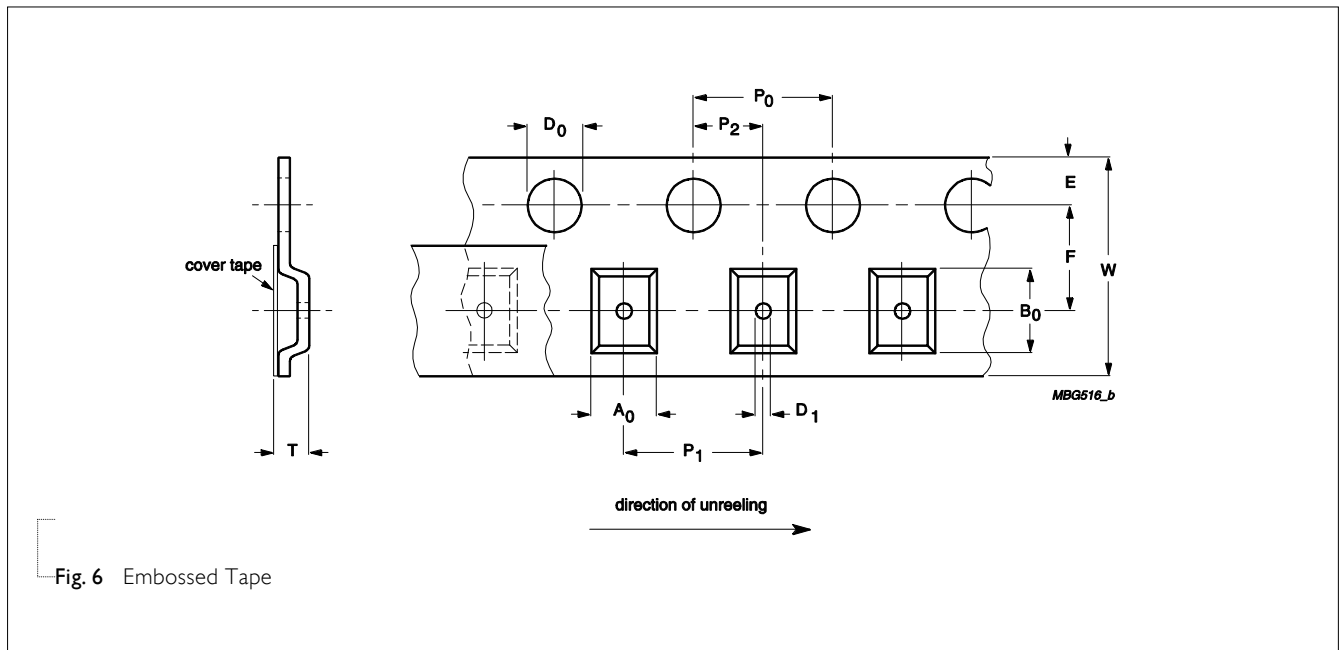


Fig. 6 Embossed Tape

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 | |
| PR0805 | 1.60±0.15 | 2.30±0.15 | 8.00±0.30 | 1.75±0.10 | 3.50±0.10 | 4.00±0.10 | 4.00±0.10 | 2.00±0.10 | 1.50±0.10 | --- | 0.40+0.20/-0 | |
| PR1206 | 1.83±0.10 | 3.50±0.10 | 8.00±0.15 | 1.75±0.10 | 3.50±0.10 | 4.00±0.10 | 4.00±0.10 | 2.00±0.10 | 1.55±0.05 | 1.00±0.10 | 0.90±0.10 | |
| PR2010 | 2.90±0.10 | 5.45±0.10 | 12.00±0.15 | 1.75±0.10 | 5.50±0.10 | 4.00±0.10 | 4.00±0.10 | 2.00±0.10 | 1.50±0.05 | 1.50±0.10 | 1.10±0.10 | |
| PR2512 | 3.90±0.10 | 6.74±0.10 | 12.00±0.15 | 1.75±0.10 | 5.50±0.10 | 4.00±0.10 | 4.00±0.10 | 2.00±0.10 | 1.55±0.05 | 1.50±0.10 | 1.08±0.10 | |

REEL SPECIFICATION

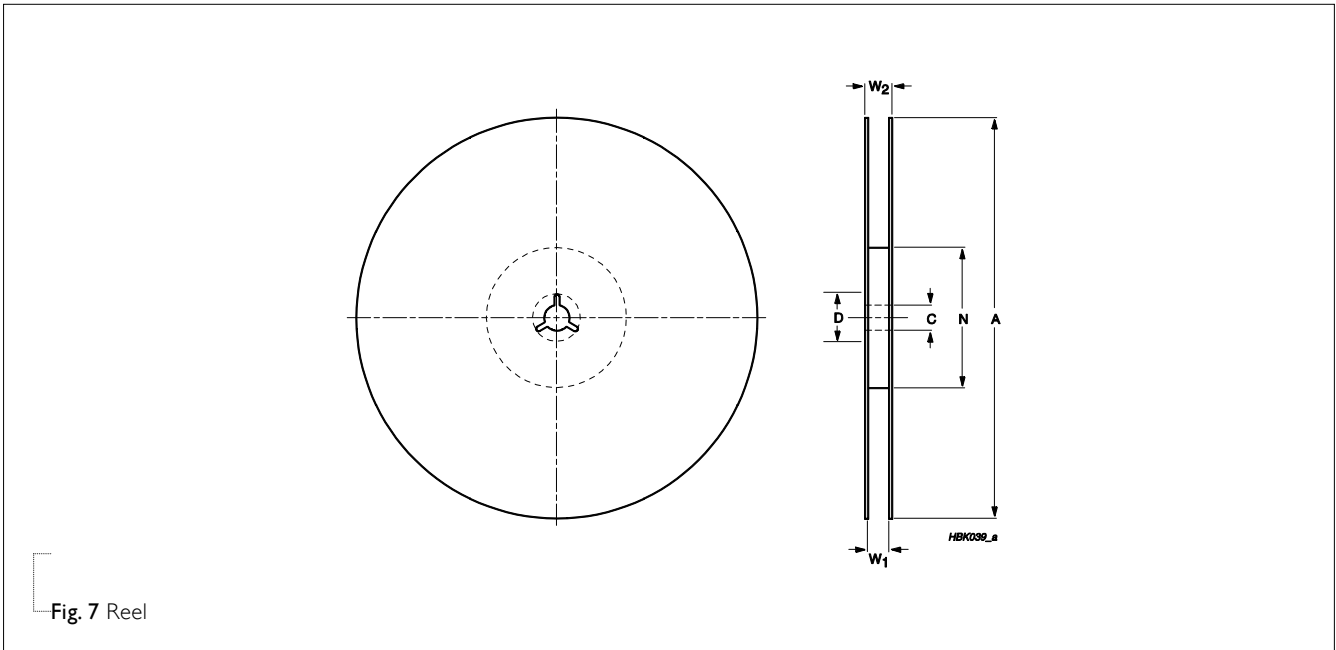


Fig. 7 Reel

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. |
| PR0805 | 5000 | 7" (Ø178 mm) | --- | 178.0±1.0 | 60.0+1/-0 | 13.20±0.5 | 17.70±0.5 | 8.4 +1/-0 | 12.4±0.5 |
| PR1206 | 4000 | 7" (Ø178 mm) | -- | 178.0±1.0 | 60.0±0.5 | 13.20±0.5 | 17.70±0.5 | 9.0±0.3 | 12.0±0.5 |
| PR2010 | 2000 | -- (Ø178 mm) | 7" | 178.0±1.0 | 60.0±0.5 | 13.50±0.5 | 17.70±0.5 | 13.0±0.5 | 16.2±0.5 |
| PR2512 | 4000 | -- (Ø178 mm) | 7" | 178.0±1.0 | 60.0±0.5 | 13.50±0.5 | 17.70±0.5 | 13.0±0.5 | 16.2±0.5 |

LEADER/TRAILER TAPE SPECIFICATION

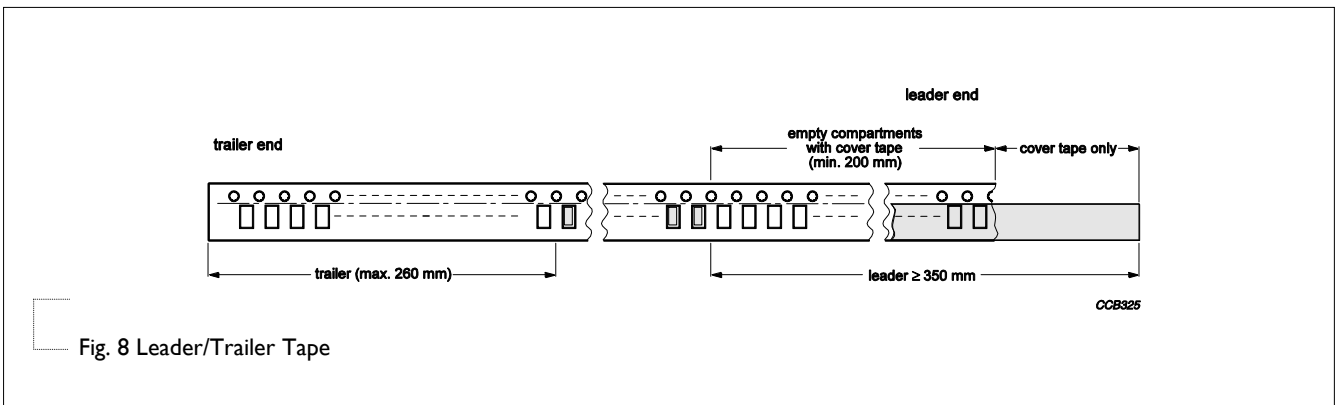


Fig. 8 Leader/Trailer Tape

FOOTPRINT AND SOLDERING PROFILES

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

FOOTPRINT

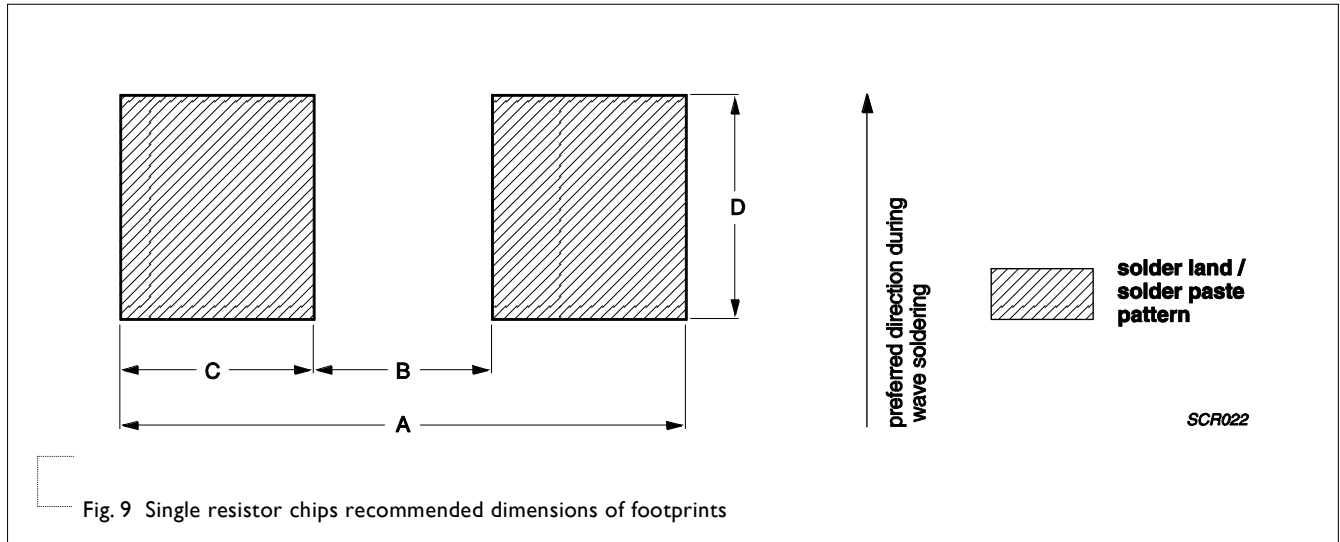


Table 6 Footprint dimensions

| SIZE | RESISTANCE RANGE | POWER RATING | A | B | C | D | Unit: mm |
|--------|---|------------------|------|------|------|------|----------|
| PR0805 | $3\text{m}\Omega \leq R \leq 50\text{ m}\Omega$ | 1/8W, 1/4W, 1/2W | 4.26 | 0.66 | 1.80 | 2.18 | |
| PR1206 | $1\text{m}\Omega \leq R \leq 50\text{m}\Omega$ | 1/4W, 1/2W, 1W | 4.20 | 1.00 | 1.60 | 2.18 | |
| PR2010 | $1\text{m}\Omega \leq R \leq 3\text{m}\Omega$ | 1/2W, 1W | 7.00 | 1.22 | 2.89 | 2.92 | |
| | $3\text{m}\Omega < R \leq 100\text{ m}\Omega$ | | 6.99 | 2.41 | 2.29 | 2.92 | |
| | $0.5\text{m}\Omega \leq R \leq 4\text{m}\Omega$ | 1W, 2W | 7.37 | 1.27 | 3.05 | 3.68 | |
| | $4\text{m}\Omega < R \leq 100\text{ m}\Omega$ | | 7.40 | 3.18 | 2.11 | 3.68 | |
| | $0.5\text{m}\Omega$ | | 7.37 | 1.27 | 3.05 | 3.68 | |
| PR2512 | $0.5\text{m}\Omega < R < 3\text{m}\Omega$, $4\text{m}\Omega < R \leq 10\text{ m}\Omega$ | 3W | 7.38 | 3.00 | 2.19 | 3.68 | |
| | $3\text{m}\Omega \leq R \leq 4\text{m}\Omega$ | | 7.38 | 1.80 | 2.79 | 3.68 | |

TESTS AND REQUIREMENTS
Table 8 Test condition, procedure and requirements

| TEST | TEST METHOD | PROCEDURE | REQUIREMENTS |
|----------------------------------|---|--|---------------------------------------|
| Life/ Endurance | MIL-STD-202-method 108A IEC 60115-1 4.25.1 | 1,000 hours at 70±2 °C applied RCWV 1.5 hours on, 0.5 hour off, still air required | ±(1%+0.0005 Ω) |
| High Temperature Exposure/ | MIL-STD-202-method 108A IEC60068-2-2 | 1,000 hours at maximum operating temperature depending on specification, unpowered No direct impingement of forced air to the parts Tolerances: 170±3 °C | ±(1%+0.0005 Ω) |
| Moisture Resistance | MIL-STD-202-method 106G | 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 107G | PR1206~PR2512 : -55/+155 °C PR0805 : -55/+125 °C Note: Number of cycles required is 300. Devices mounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air | ±(0.5%+0.0005 Ω) |
| Short Time Overload | IEC60115-1 4.13 | 5 times of rated power for 5 seconds at room temperature | ±(0.5%+0.0005 Ω) No visible damage |
| Board Flex/ Bending | IEC60115-1 4.33 | Device mounted on PCB test board as described, only 1 board bending required Bending for 0805/1206/2010/2512: 2 mm Holding time: minimum 60 seconds | ±(1%+0.0005 Ω) No visible damage |
| Humidity | IEC 60115-1 4.24.2 | Steady state for 1000 hours at 40 °C / 95% R.H. RCWV applied for 1.5 hours on and 0.5 hour off | ±(1%+0.0005Ω) |

| TEST | TEST METHOD | PROCEDURE | REQUIREMENTS |
|-----------------------------------|-------------------------|---|------------------------------------|
| Solderability - Wetting | J-STD-002B test B | Electrical Test not required | Well tinned ($\geq 95\%$ covered) |
| | | Magnification 50X | No visible damage |
| | | 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 | |
| - Leaching | J-STD-002B test D | Leadfree solder, 260 °C, 30 seconds immersion time | No visible damage |
| - Resistance to Soldering Heat | MIL-STD-202-method 210F | Condition B, no pre-heat of samples | $\pm(0.5\% + 0.0005 \Omega)$ |
| | IEC 60115-1 4.18 | Leadfree solder, 260 °C, 10 seconds immersion time | No visible damage |
| | | Procedure 2 for SMD: devices fluxed and cleaned with isopropanol | |

REVISION HISTORY

| REVISION | DATE | CHANGE NOTIFICATION | DESCRIPTION |
|-----------|---------------|---------------------|---|
| Version 1 | Jun.18, 2015 | - | - Update 0805 dimensions |
| Version 0 | Feb. 07, 2014 | - | - New datasheet for current sensor - low TCR PR series sizes of 1206/2010/2512, 1% and 5% with lead-free terminations |

“Yageo reserves all the rights for revising the content of this datasheet without further notification, as long as the products itself are unchanged. Any product change will be announced by PCN.”