

DATA SHEET

CURRENT SENSOR - LOW TCR

PE series

5%, 1%

sizes 0603/0805/1206/2010/2512/4527

RoHS compliant & Halogen free



SCOPE

This specification describes PE series current sensor - low TCR with lead-free terminations made by metal foil with ceramic 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

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

(1) SIZE

0603 / 0805 / 1206 / 2010 / 2512 / 4527

(2) TOLERANCE

F = ±1%
 J = ±5%

(3) PACKAGING TYPE

R = Paper taping reel
 K = Embossed taping reel

(4) TEMPERATURE COEFFICIENT OF RESISTANCE

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

(5) TAPING REEL

07 / 7W / 7T / 47 / 57 = 7 inch dia. Reel and specific rated power.
 Detailed power rating are shown in the Table 2.

(6) RESISTANCE VALUE

1 mΩ to 910 mΩ
 There are 3~5 digits indicated the resistance 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 Z is the system default code for ordering only. (Note)

| Resistance rule of global part number | |
|---------------------------------------|---------------|
| Resistance code rule | Example |
| | 0R001 = 1 mΩ |
| 0RXXX | 0R1 = 100 mΩ |
| (1 to 910 mΩ) | 0R91 = 910 mΩ |

ORDERING EXAMPLE

The ordering code of a PE2512 1W chip resistor, value 0.006 Ω with ±1% tolerance, supplied in 7-inch tape reel is:
PE2512FKM070R006Z

NOTE

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

MARKING

PE0603



2 digits

Fig. 1 Value = 10 mΩ

PE0805



3 digits

Fig. 2 Value = 10 mΩ

PE1206 / PE2010 / PE2512 / PE4527



4 digits

Fig. 3 Value = 33 mΩ

The “R” is used as a decimal point; the other 3 digits are significant

CONSTRUCTION

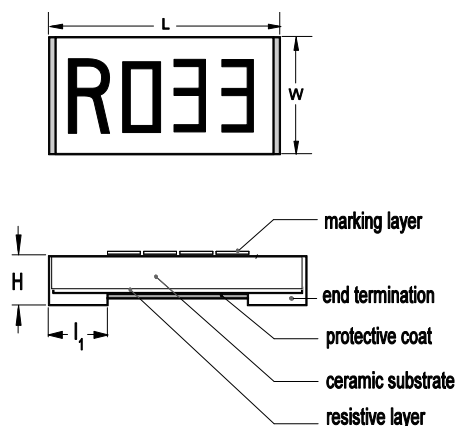
The resistors are constructed using outstanding TCR level material, which makes Yageo PE resistors excellent for current sensing application in battery charger circuit & DC-DC converter.

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



YNSC115

Fig. 4 Chip resistor outlines

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

| TYPE | RESISTANCE RANGE | L (mm) | W (mm) | H (mm) | l ₁ (mm) |
|--------|--------------------|------------|-----------|-----------|---------------------|
| PE0603 | 5 mΩ ≤ R ≤ 100 mΩ | 1.60±0.25 | 0.80±0.25 | 0.60±0.25 | 0.40±0.25 |
| | 4 mΩ | 2.00±0.25 | 1.25±0.25 | 0.60±0.25 | 0.70±0.25 |
| PE0805 | 5 mΩ | 2.00±0.25 | 1.25±0.25 | 0.60±0.25 | 0.73±0.25 |
| | 6 mΩ | 2.00±0.25 | 1.25±0.25 | 0.60±0.25 | 0.65±0.25 |
| | 7mΩ ≤ R ≤ 100 mΩ | 2.00±0.25 | 1.25±0.25 | 0.60±0.25 | 0.50±0.25 |
| PE1206 | 4 mΩ | 3.20±0.25 | 1.60±0.25 | 0.60±0.25 | 1.20±0.25 |
| | 5 mΩ ≤ R ≤ 8 mΩ | 3.20±0.25 | 1.60±0.25 | 0.60±0.25 | 1.15±0.25 |
| | 9 mΩ ≤ R ≤ 100 mΩ | 3.20±0.25 | 1.60±0.25 | 0.60±0.25 | 0.58±0.25 |
| PE2010 | 5 mΩ ≤ R ≤ 9 mΩ | 5.00±0.25 | 2.50±0.25 | 0.60±0.25 | 1.50±0.25 |
| | 10 mΩ ≤ R ≤ 100 mΩ | 5.00±0.25 | 2.50±0.25 | 0.60±0.25 | 0.60±0.25 |
| PE2512 | 5 mΩ | 6.45±0.25 | 3.25±0.25 | 0.70±0.25 | 1.95±0.25 |
| | 6 mΩ ≤ R ≤ 8mΩ | 6.45±0.25 | 3.25±0.25 | 0.70±0.25 | 1.90±0.25 |
| | 9 mΩ ≤ R < 100 mΩ | 6.45±0.25 | 3.25±0.25 | 0.70±0.25 | 0.95±0.25 |
| | 100mΩ | 6.45±0.25 | 3.25±0.25 | 0.70±0.25 | 0.60±0.25 |
| PE4527 | 5 mΩ | 11.50±0.25 | 7.00±0.25 | 0.60±0.25 | 2.90±0.25 |
| | 6 mΩ ≤ R <910 mΩ | 11.50±0.25 | 7.00±0.25 | 0.60±0.25 | 2.60±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 | 57 | | | |
| | 0603 | 1/10W | 1/5W | 1/3W | 2/5W | 1/2W | | 5 mΩ ≤ R ≤ 100 mΩ | |
| | 0805 | 1/8W | 1/4W | 1/3W | 1/2W | --- | | 4 mΩ ≤ R ≤ 100 mΩ | |
| PE | 1206 | 1/4W | 1/2W | --- | 1W | --- | ±1% | 4 mΩ ≤ R ≤ 100 mΩ | ±50 ppm/°C |
| | 2010 | 1/2W | 1W | --- | --- | --- | ±5% | 5 mΩ ≤ R ≤ 100 mΩ | ±75 ppm/°C |
| | 2512 | 1W | 2W | --- | --- | --- | | 5 mΩ ≤ R ≤ 100 mΩ | ±100 ppm/°C |
| | 4527 | 2W | 3W | --- | --- | --- | | 5 mΩ ≤ R < 910 mΩ | |

- 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

Range: -55°C to +170°C

POWER RATING

Standard rated power at 70°C:

- PE0603 = 1/10W
- PE0805 = 1/8W
- PE1206 = 1/4W
- PE2010 = 1/2W
- PE2512 = 1W
- PE4527 = 2W

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)

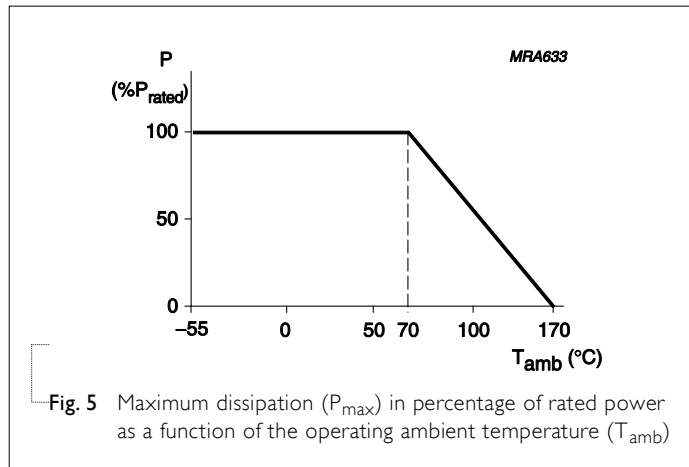


Fig. 5 Maximum dissipation (P_{max}) in percentage of rated power as a function of the operating ambient temperature (T_{amb})

PACKING STYLE AND PACKAGING QUANTITY

Table 3 Packing style and packaging quantity

| PACKING STYLE | REEL DIMENSION | PE0603 | PE0805 | PE1206 | PE2010 | PE2512 | PE4527 |
|--------------------------|----------------|--------|--------|--------|--------|--------|--------|
| Paper taping reel (R) | 7" (178 mm) | 5,000 | 5,000 | --- | --- | --- | --- |
| Embossed taping reel (K) | 7" (178 mm) | --- | --- | 4,000 | 4,000 | 4,000 | 1,000 |

PAPER TAPE

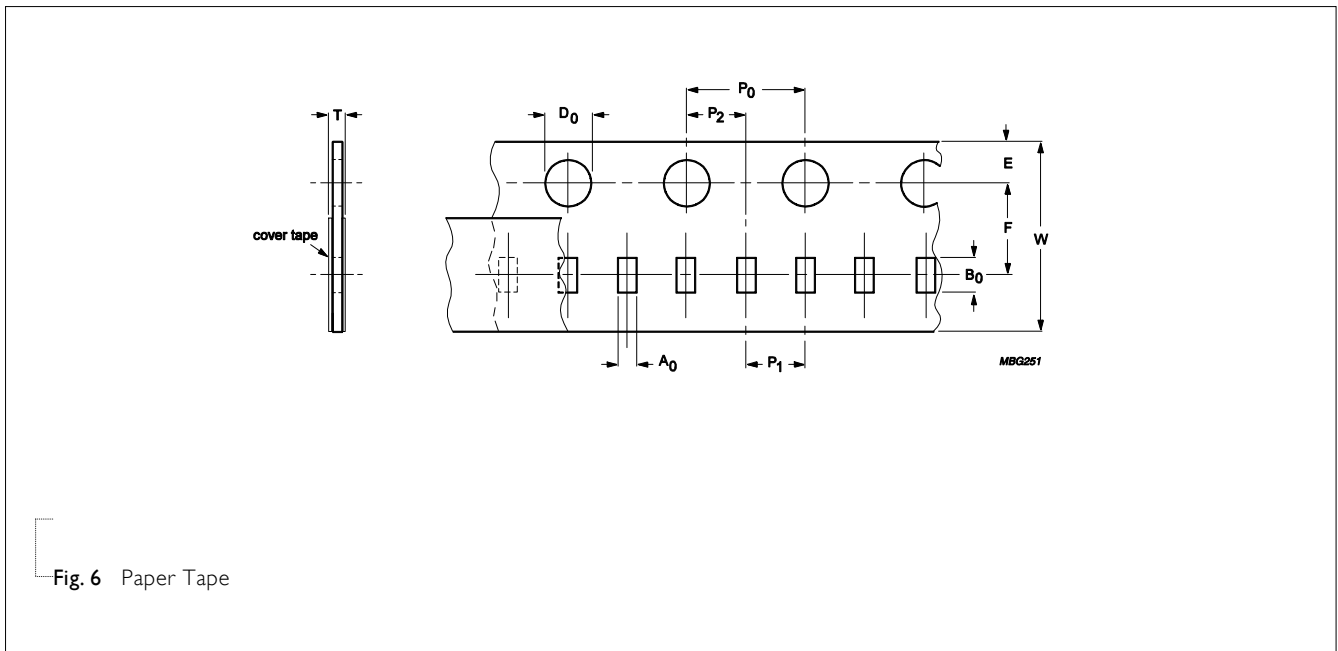


Fig. 6 Paper Tape

Table 4 Dimensions of paper 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 | T | |
| PE0603 | 1.20±0.15 | 1.90±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 | 0.55±0.15 | |
| PE0805 | 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 | 0.85±0.15 | |

EMBOSSED TAPE

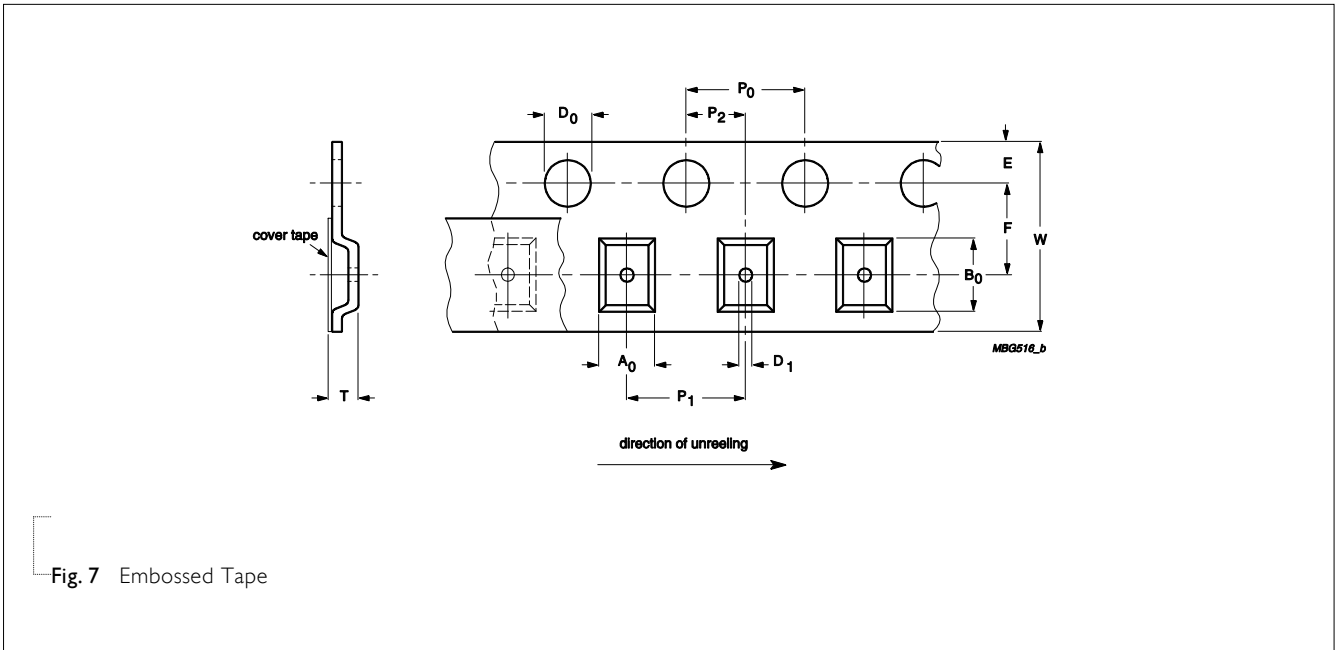


Fig. 7 Embossed Tape

Table 5 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 | |
| PE1206 | 1.82±0.15 | 3.53±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 | 1.50±0.10 | 0.85±0.15 |
| PE2010 | 3.00±0.15 | 5.60±0.15 | 12.10±0.30 | 1.75±0.10 | 5.50±0.10 | 4.00±0.10 | 4.00±0.10 | 2.00±0.10 | 1.50±0.10 | 1.50±0.10 | 0.80±0.15 |
| PE2512 | 3.40±0.15 | 6.70±0.15 | 12.10±0.30 | 1.75±0.10 | 5.50±0.10 | 4.00±0.10 | 4.00±0.10 | 2.00±0.10 | 1.50±0.10 | 1.50±0.10 | 0.80±0.15 |
| PE4527 | 7.50±0.15 | 12.0±0.15 | 24.00±0.30 | 1.75±0.10 | 11.50±0.10 | 4.00±0.10 | 8.00±0.10 | 2.00±0.10 | 1.50±0.10 | 1.50±0.10 | 0.90±0.15 |

REEL SPECIFICATION

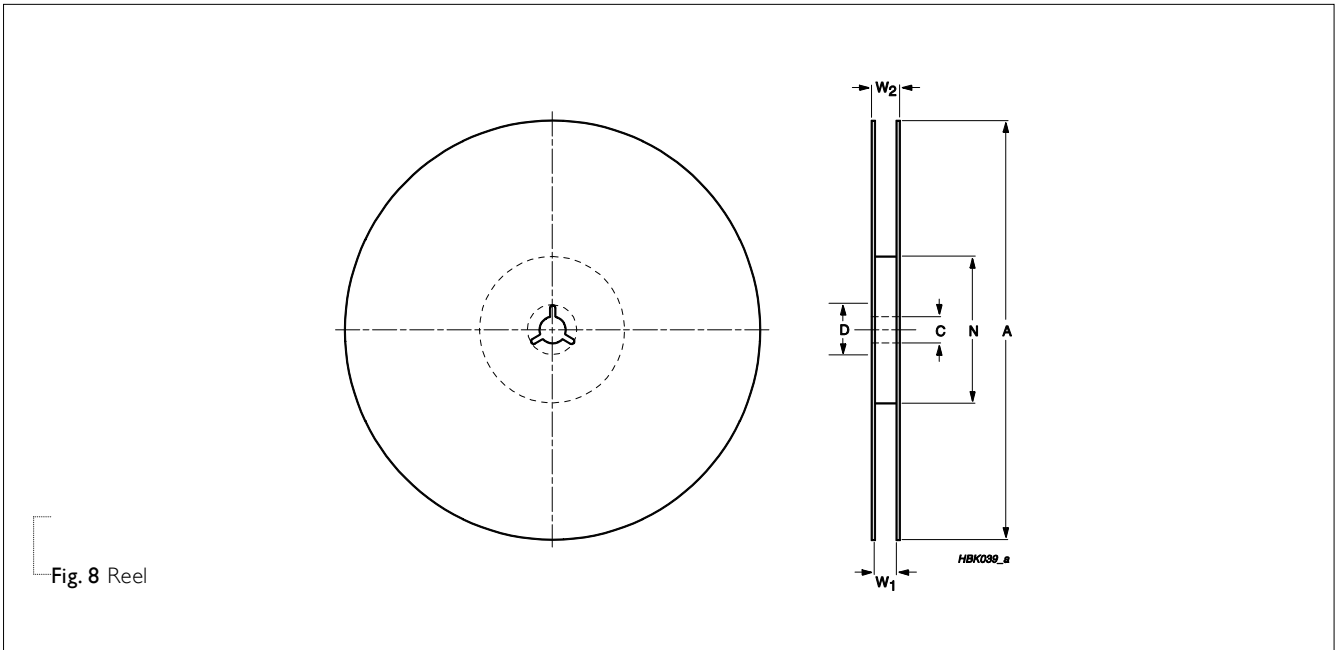


Fig. 8 Reel

Table 6 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 | 24 mm TAPE WIDE | A | N | C | D | W ₁ | W ₂ MAX. | |
| PE0603 | 5000 | 7" (Ø178 mm) | -- | -- | 180.0+0/-3 | 60.0+1/-0 | 13.0±0.2 | 21.0±0.8 | 8.4 +1/-0 | 12.4 | |
| PE0805 | 5000 | 7" (Ø178 mm) | -- | -- | 180.0+0/-3 | 60.0+1/-0 | 13.0±0.2 | 21.0±0.8 | 8.4 +1/-0 | 12.4 | |
| PE1206 | 4000 | 7" (Ø178 mm) | -- | -- | 180.0+0/-3 | 60.0+1/-0 | 13.0±0.2 | 21.0±0.8 | 8.4 +1/-0 | 12.4 | |
| PE2010 | 4000 | -- (Ø178 mm) | 7" | -- | 180.0+0/-3 | 60.0+1/-0 | 13.0±0.2 | 21.0±0.8 | 12.3 +1/-0 | 18.4 | |
| PE2512 | 4000 | -- (Ø178 mm) | 7" | -- | 180.0+0/-3 | 60.0+1/-0 | 13.0±0.2 | 21.0±0.8 | 12.3 +1/-0 | 18.4 | |
| PE4527 | 1000 | -- | -- | 7" (Ø178 mm) | 180.0+0/-3 | 60.0+1/-0 | 13.0±0.2 | 21.0±0.8 | 24.0 +1/-0 | 26.5 | |

LEADER/TRAILER TAPE SPECIFICATION

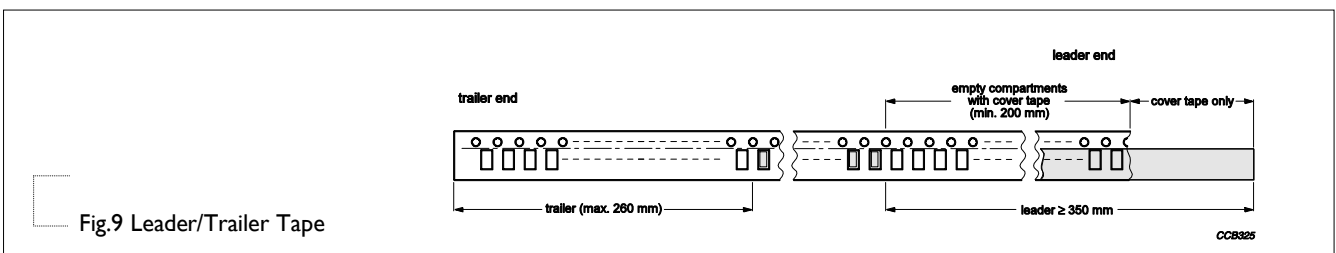


Fig.9 Leader/Trailer Tape

FOOTPRINT AND SOLDERING PROFILES

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

FOOTPRINT

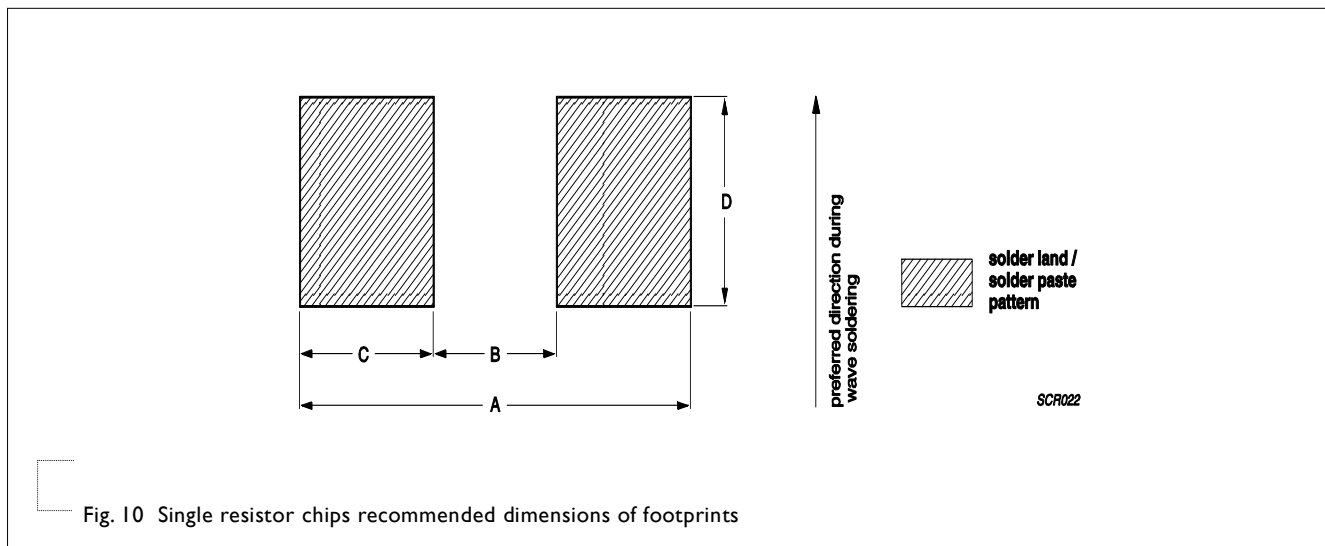


Fig. 10 Single resistor chips recommended dimensions of footprints

Table 7 Footprint dimensions

| SIZE | RESISTANCE RANGE | Unit: mm | | | |
|--------|--------------------|----------|------|------|------|
| | | A | B | C | D |
| PE0603 | 5 mΩ ≤ R ≤ 100 mΩ | 2.10 | 0.60 | 0.75 | 0.92 |
| | 4 mΩ | 5.00 | 0.40 | 2.30 | 1.44 |
| PE0805 | 5 mΩ | 5.00 | 0.50 | 2.25 | 1.44 |
| | 6 mΩ | 4.80 | 0.60 | 2.10 | 1.44 |
| | 7 mΩ ≤ R < 100 mΩ | 5.00 | 0.80 | 2.10 | 1.44 |
| PE1206 | 4 mΩ | 6.20 | 0.50 | 2.85 | 1.84 |
| | 5 mΩ ≤ R ≤ 8 mΩ | 6.20 | 0.60 | 2.80 | 1.84 |
| PE2010 | 9 mΩ ≤ R ≤ 100 mΩ | 6.20 | 1.20 | 2.50 | 1.84 |
| | 5 mΩ ≤ R ≤ 9 mΩ | 8.00 | 1.40 | 3.30 | 2.88 |
| PE2512 | 10 mΩ ≤ R ≤ 100 mΩ | 8.00 | 2.70 | 2.65 | 2.88 |
| | 5 mΩ ≤ R ≤ 8 mΩ | 9.30 | 1.60 | 3.85 | 3.57 |
| PE4527 | 9 mΩ ≤ R < 100 mΩ | 9.30 | 3.10 | 3.10 | 3.57 |
| | 100 mΩ | 9.30 | 3.60 | 2.85 | 3.57 |
| PE4527 | 5 mΩ | 14.50 | 4.00 | 5.25 | 8.05 |
| | 6 mΩ ≤ R < 910 mΩ | 14.50 | 4.40 | 5.05 | 8.05 |

TESTS AND REQUIREMENTS
Table 8 Test condition, procedure and requirements

| TEST | TEST METHOD | PROCEDURE | REQUIREMENTS |
|---|--------------------------|---|---------------------------------------|
| Life/ Operational Life/ Endurance | MIL-STD-202G-method 108A | 1,000 hours at 70±5 °C applied RCWV | ±(1%+0.0005 Ω) |
| | IEC 60115-1 4.25.1 | 1.5 hours on, 0.5 hour off, still air required | |
| | JIS C 5202-7.10 | | |
| High Temperature Exposure/ Endurance at Upper Category Temperature | MIL-STD-202G-method 108A | 1,000 hours at maximum operating temperature | ±(1%+0.0005 Ω) |
| | IEC 60115-1 4.25.3 | depending on specification, unpowered | |
| | JIS C 5202-7.11 | No direct impingement of forced air to the parts Tolerances: 155±3 °C | |
| Moisture Resistance | MIL-STD-202G-method 106F | 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) |
| | IEC 60115-1 4.24.2 | | |
| | | | |
| Thermal Shock | MIL-STD-202G-method 107G | -55/+155 °C Note: Number of cycles required is 300. Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air | ±(0.5%+0.0005 Ω) |
| Short Time Overload | MIL-R-55342D-para 4.7.5 | 5 times of rated power for 5 seconds at room temperature | ±(0.5%+0.0005 Ω) No visible damage |
| | IEC60115-1 4.13 | | |
| Board Flex/ Bending | IEC60115-1 4.33 | Device mounted on PCB test board as described, only 1 board bending required | ±(1%+0.0005 Ω) No visible damage |
| | | Bending for 0603/0805: 3 mm | |
| | | 1206/2512/4520/4527: 2 mm Holding time: minimum 60 seconds | |
| Humidity | IEC 60115-1 4.21 | Steady state for 1000 hours at 40 °C / 95% R.H. RCWV applied for 1.5 hours on and 0.5 hour off | ±(1%+0.0005 Ω) |

| TEST | TEST METHOD | PROCEDURE | REQUIREMENTS |
|-----------------------------------|--|--|------------------------------------|
| Solderability - Wetting | IPC/JEDECJ-STD-002B test B | Electrical Test not required | Well tinned ($\geq 95\%$ covered) |
| | IEC 60068-2-58 | 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 \pm 3 °C Dipping time: 3 \pm 0.5 seconds | No visible damage |
| - Leaching | IPC/JEDECJ-STD-002B test D IEC 60068-2-58 | Leadfree solder, 260 °C, 30 seconds immersion time | No visible damage |
| - Resistance to Soldering Heat | MIL-STD-202G-method 210F | Condition B, no pre-heat of samples | $\pm(0.5\%+0.0005 \Omega)$ |
| | IEC 60068-2-58 | Leadfree solder, 260 °C, 10 seconds immersion time Procedure 2 for SMD: devices fluxed and cleaned with isopropanol | No visible damage |

REVISION HISTORY

| REVISION | DATE | CHANGE NOTIFICATION | DESCRIPTION |
|-----------|---------------|---------------------|---|
| Version 2 | Aug. 22, 2014 | - | - extend resistance value - update dimensions - remove PE4520 - remove 2% and 0.5% tol. |
| Version 1 | Sep. 14, 2013 | - | - Update the PE2512 resistance value. |
| Version 0 | May. 28, 2012 | - | - New datasheet for current sensor - low TCR PE series sizes of 0603/0805/1206/2010/2512/4520/4527, 0.5%, 1%, 2% and 5% with lead-free terminations |

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[RLP73M1JR051FTDF](#) [RLP73N1JR47FTDF](#) [SR731ERTTP5R10F](#) [SR731ERTTP100J](#) [SR731ERTTP6R80F](#) [SR731ERTTP4R70F](#)
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