Innovative Service Around the Globe YAGEO

DATA SHEET

CURRENT SENSOR - LOW TCR

AUTOMOTIVE GRADE

PE Series - Wide Terminal

5%, 1%, 0.5%

sizes 0508/0612/0815/1225

RoHS compliant & Halogen free

YAGEO

Product specification – May 17, 2023 V.2

SCOPE

This specification describes PE series wide-terminal current sensor - low TCR chip resistors made by metal alloy process.

APPLICATIONS

- Battery pack
- Inverter/converter (DC-DC/AC-DC/DC-AC)
- Consumer electronics
- Laptops
- Automotive
- Alternative Energy

FEATURES

- AEC-Q200 qualified
- Total lead free without RoHS exemption
- High component and equipment reliability
- Ultra low resistance and narrow tolerance suitable for current detection

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	L
	(1)	(2)	(3)	(4)	(5)	(6)	(7)

(1) SIZE

0508/0612/0815/1225

(2) TOLERANCE

D = ±0.5% (by request) 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
L = ±150 ppm/°C

(5) TAPING REEL

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

(6) RESISTANCE VALUE

0R001 (1 mΩ) ~ 1R (1Ω)
There are 3~5 digits indicated the resistance value. Letter R is decimal point.

(7) DEFAULT CODE

L = system default code for ordering only

ORDERING EXAMPLE

The ordering code of a PE0508 1W chip resistor, value 0.01 Ω with ±1% tolerance TCR ±75 ppm/°C, supplied in 7-inch tape reel with 5Kpcs quantity is: PE0508FRM070R01L.

NOTE

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

MARKING

PE0508

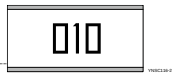

Fig. 1 Value = 10 mΩ

3 digits

PE0612/0815/1225

Fig. 2 Value = 10 mΩ

4 digits

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.

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

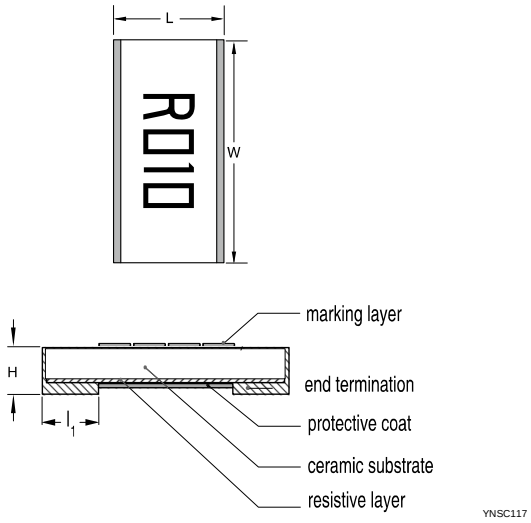

Fig. 3 Chip resistor outlines

DIMENSION

Table 1

TYPE	RESISTANCE RANGE	L (mm)	W (mm)	H (mm)	I_1 (mm)
PE0508	5 mΩ ≤ R ≤ 1Ω	1.25±0.10	2.00±0.10	0.55±0.15	0.35±0.15
PE0612	1 mΩ	1.60±0.20	3.20±0.20	0.60±0.15	0.55±0.20
	2 mΩ ≤ R ≤ 4 mΩ	1.60±0.20	3.20±0.20	0.60±0.15	0.40±0.15
	5 mΩ ≤ R ≤ 1Ω	1.60±0.20	3.20±0.20	0.60±0.15	0.30±0.15
PE0815	1 mΩ ≤ R ≤ 2 mΩ	2.00±0.20	3.70±0.20	0.60±0.15	0.50±0.20
	3 mΩ ≤ R ≤ 20 mΩ	2.00±0.20	3.70±0.20	0.60±0.15	0.60±0.20
PE1225	6 mΩ ≤ R ≤ 150mΩ	3.20±0.20	6.40±0.20	0.60±0.15	0.50±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

SIZE	POWER RATING (4)	RESISTANCE RANGE	TOLERANCE (2)	TEMPERATURE COZEFFICIENT OF RESISTANCE(3)
PE0508	1W	5 mΩ ≤ R < 75 mΩ	0.5% (By request)	±100ppm/°C
		75 mΩ ≤ R ≤ 1Ω	±1%	±50ppm/°C
			±5%	
PE0612	1W	1 mΩ ≤ R ≤ 1Ω	0.5% (By request) ±1% ±5%	1 mΩ : ±150ppm/°C 2 mΩ : ±100ppm/°C 3 mΩ ≤ R ≤ 1Ω : ±50ppm/°C, ±75ppm/°C, ±100ppm/°C
	2W	1 mΩ ≤ R ≤ 10mΩ		1 mΩ : ±150ppm/°C 2 mΩ : ±100ppm/°C 3 mΩ ≤ R ≤ 10mΩ : ±50ppm/°C, ±75ppm/°C, ±100ppm/°C
PE0815	1/2W 1W	1mΩ ≤ R ≤ 20 mΩ	0.5% (By request) ±1% ±5%	1mΩ ≤ R ≤ 20 mΩ : ±75ppm/°C, ±100ppm/°C
PE1225	3/2W 3W	6 mΩ ≤ R ≤ 150mΩ	±1% ±5%	6 mΩ ≤ R ≤ 150mΩ : ±50ppm/°C, ±75ppm/°C

Note:
1. Please contact with sales offices, distributors and representatives in your region before ordering
2. Global part number (code7)
3. Global part number (code 9)
4. Global part number (code 10-11)

FUNCTIONAL DESCRIPTION

OPERATING TEMPERATURE RANGE

PE0508/PE0612/PE0815 Range: -55°C to +155°C
PE1225 Range: -55°C to +170°C

POWER RATING

Standard rated power at 70°C:
PE0508 = 1W
PE0612 = 1W; 2W
PE0815 = 1/2W; 1W
PE1225 = 3/2W; 3W

RATED VOLTAGE

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

$$V = \sqrt{(P*R)}$$

Where

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

P = Rated power (W)

R = Resistance value (Ω)

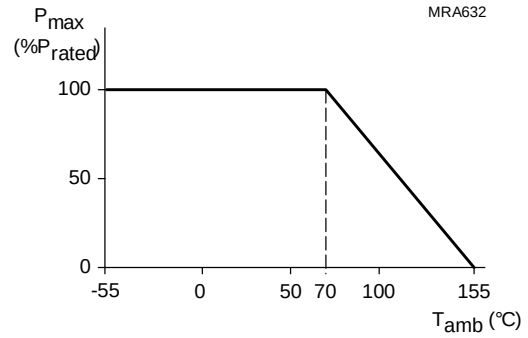

Fig. 4 Maximum dissipation (P_{max}) in percentage of rated power as a function of the operating ambient temperature (T_{amb})

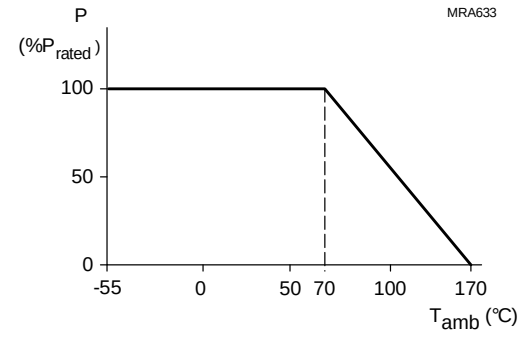

Fig. 5 Maximum dissipation (P_{max}) in percentage of rated power as a function of the operating ambient temperature (T_{amb})

PACKING STYLE AND PACKAGING QUANTITY

Table 3 Packing style and packaging quantity

PACKING STYLE	REEL DIMENSION	PE0508	PE0612	PE0815	PE1225
Paper taping reel (R)	7" (178 mm)	5,000	---	---	---
Embossed taping reel (K)	7" (178 mm)	---	5000	4000	4000

PAPER TAPE

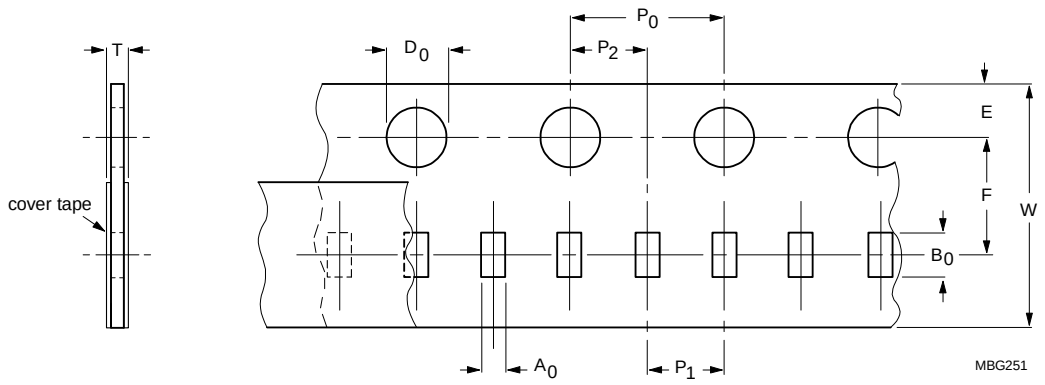

Fig. 6 Paper Tape

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	$\varnothing D_0$	T
PE0508	1.50± 0.15	2.25± 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	0.75± 0.15

EMBOSSED TAPE

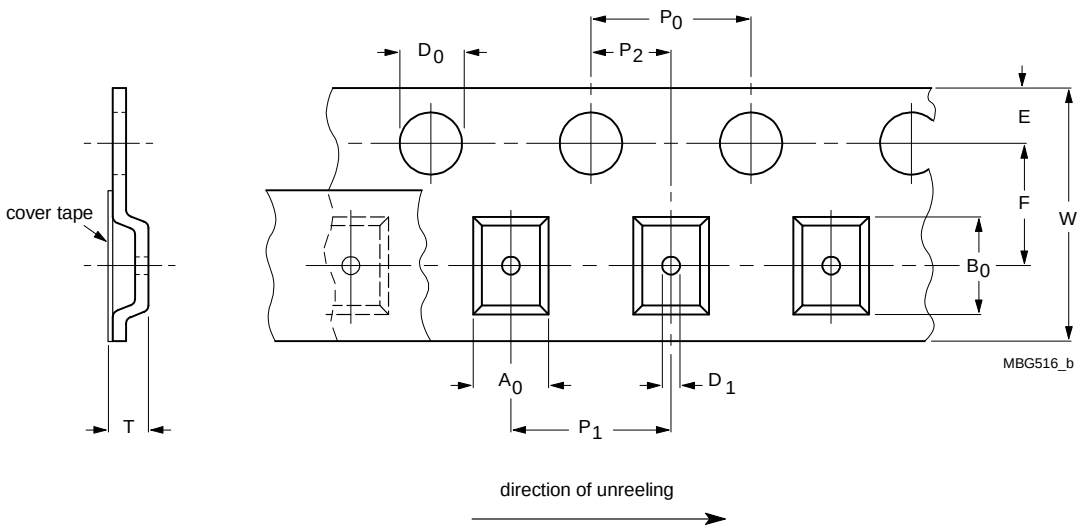

Fig. 7 Embossed Tape

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	$\varnothing D_0$	D_1	T
PE0612	1.80±0.15	3.52± 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	0.75± 0.15
PE0815	2.25±0.15	4.00± 0.15	12.00±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	0.75± 0.15
PE1225	3.40±0.15	6.70±0.15	12.00±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

REEL SPECIFICATION

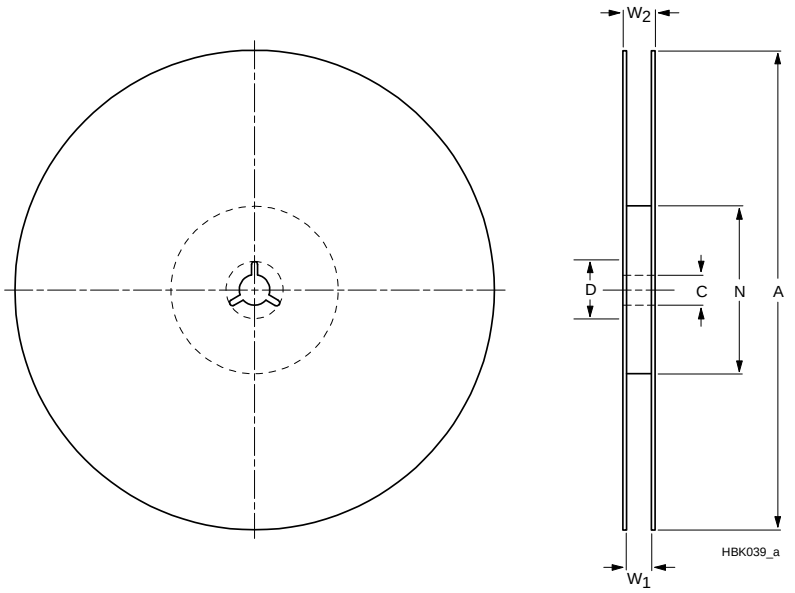

Fig. 8 Reel

Table 6 Dimensions of reel specification for relevant chip resistors size

SIZE	SYMBOL						Unit: mm
	8 mm TAPE WIDE	A	N	C	D	W_1	$W_{2\ MAX.}$
PE0508	7" (Ø178 mm)	178.0±5	60.0+1/-0	13.00±0.5	17.70±0.5	8.4 +1/-0	12.4±1
PE0612	7" (Ø178 mm)	178.0±5	60.0+1/-0	13.00±0.5	17.70±0.5	8.4 +1/-0	12.4±1

SIZE	SYMBOL						Unit: mm
	12 mm TAPE WIDE	A	N	C	D	W_1	$W_{2\ MAX.}$
PE0815	7" (Ø178 mm)	178.0 ±5	60.0 +1/-0	13.00±0.5	17.70±0.5	12.3 +1/-0	18.4±1
PE1225	7" (Ø178 mm)	178.0 ±5	60.0 +1/-0	13.00±0.5	17.70±0.5	12.3 +1/-0	18.4±1

SOLDERING PROFILES

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

FOOTPRINT

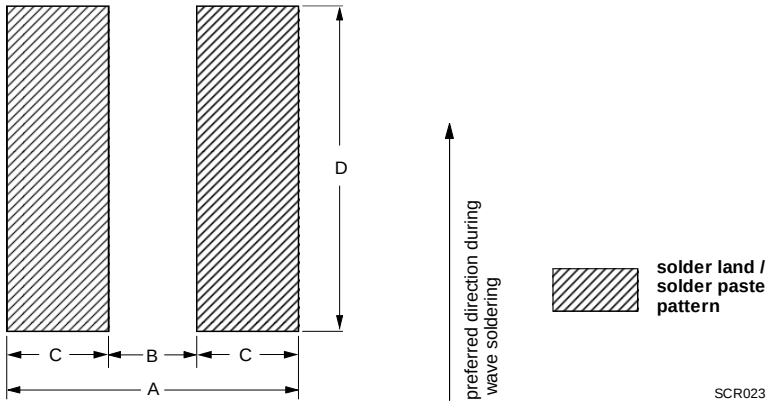

Fig. 9 Single resistor chips recommended dimensions of footprints

Table 7 Footprint dimensions

Unit: mm

SIZE	RESISTANCE RANGE	A	B	C	D
PE0508	5 mΩ ≤ R ≤ 1Ω	1.80~2.00	0.40~0.60	0.70	2.00
PE0612	1 mΩ ≤ R ≤ 4mΩ	4.60	0.40	2.10	3.68
	5 mΩ ≤ R ≤ 1Ω	4.60	0.60	2.00	3.68
PE0815	1mΩ ≤ R ≤ 20mΩ	3.38	0.58	1.40	4.20
PE1225	6 mΩ ≤ R ≤ 150mΩ	6.1	1.4	2.35	7.25

TESTS AND REQUIREMENTS

Table 8 Test condition, procedure and requirements

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Life/ Endurance	IEC 60115-1 4.25.1	1,000 hours at 70±5 °C applied rated power 1.5 hours on, 0.5 hour off, still air required	±(1%+0.0005 Ω)
High Temperature Exposure/ Endurance at Upper Category Temperature	IEC 60068-2-2	1,000 hours at maximum operating temperature depending on specification, unpowered No direct impingement of forced air to the parts PE0508 to PE0815: 155 °C±5°C PE1225: 170 °C±5 °C	±(1%+0.0005 Ω)
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 Parts mounted on test-boards, without condensation on parts Measurement at 24±2 hours after test conclusion	±(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	IEC60068-2-21	Device mounted on glass epoxy resin PCB test board (FR4), 2 mm bending Bending time: 60±5 seconds	±(1%+0.0005 Ω) No visible damage

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Solderability Wetting	J-STD-002B test B	Electrical Test not required Magnification 50X SMD conditions: 1st step: method B, aging 4 hours at 155 °C dry heat 2nd step: leadfree solder bath at 245±3 °C Dipping time: 3±0.5 seconds	Well tinned (≥95% covered) No visible damage
Resistance to Soldering Heat	IEC 60068-2-58	Condition B, no pre-heat of samples Leadfree solder, 260 °C, 10±1 seconds immersion time Procedure 2 for SMD: devices fluxed and cleaned with isopropanol	±(0.5%+0.0005 Ω) No visible damage

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version 2	May. 17, 2023	-	- Add PE1225 - Extend PE0612 power rating
Version 1	Apr. 13, 2021	-	- Update the marking of PE0508
Version 0	Dec. 03, 2018	-	- New datasheet for current sensor - low TCR wide terminal PE series with lead-free terminations.

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