Innovative Service Around the Globe YAGEO

DATA SHEET

CURRENT SENSOR - LOW TCR

PE series

5%, 1%

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

RoHS compliant & Halogen free

YAGEO Phycomp

Product specification – August 22, 2014 V.2



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
0RXXX (1 to 910 mΩ)	0R001 = 1 mΩ
	0R1 = 100 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



Fig. 1 Value = 10 mΩ

2 digits

PE0805



Fig. 2 Value = 10 mΩ

3 digits

PE1206 / PE2010 / PE2512 / PE4527



Fig. 3 Value = 33 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 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 1

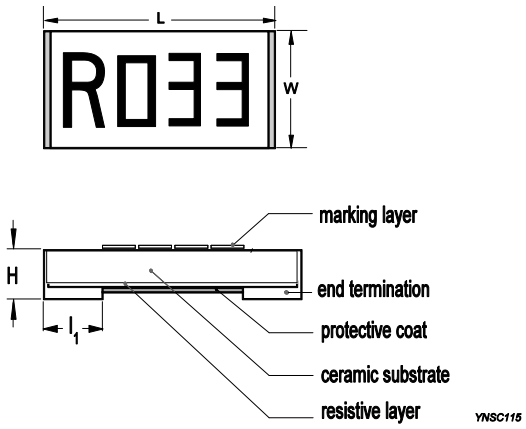


Fig. 4 Chip resistor outlines

DIMENSION

Table 1 For outlines, please refer to Fig. 4

TYPE	RESISTANCE RANGE	L (mm)	W (mm)	H (mm)	I1 (mm)
PE0603	5 mΩ ≦ R≦ 100 mΩ	1.60±0.25	0.80±0.25	0.60±0.25	0.40±0.25
PE0805	4 mΩ	2.00±0.25	1.25±0.25	0.60±0.25	0.70±0.25
	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			
PE	0603	1/10W	1/5W	1/3W	2/5W	1/2W	±1% ±5%	5 mΩ ≦ R ≦ 100 mΩ	±50 ppm/°C ±75 ppm/°C ±100 ppm/°C
	0805	1/8W	1/4W	1/3W	1/2W	---		4 mΩ ≦ R ≦ 100 mΩ	
	1206	1/4W	1/2W	---	1W	---		4 mΩ ≦ R ≦ 100 mΩ	
	2010	1/2W	1W	---	---	---		5 mΩ ≦ R ≦ 100 mΩ	
	2512	1W	2W	---	---	---		5 mΩ ≦ R ≦ 100 mΩ	
	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.

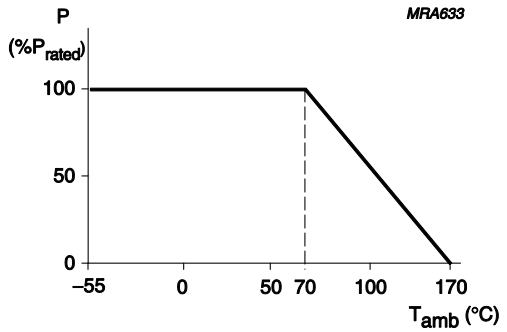


Fig. 5 Maximum dissipation (P_{max}) in percentage of rated power as a function of the operating ambient temperature (T_{amb})

RATED VOLTAGE

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

$$V = \sqrt{(PxR)}$$

Where

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

P = Rated power (W)

R = Resistance value (Ω)

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

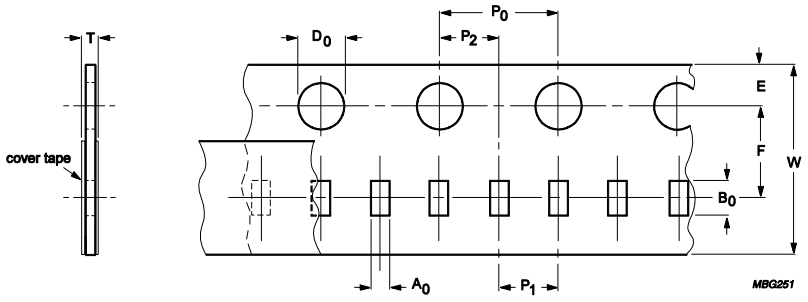


Fig. 6 Paper Tape

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	$\varnothing D_0$	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

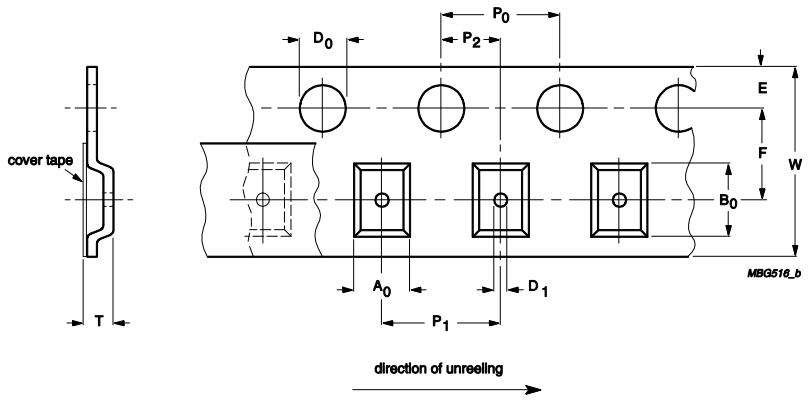


Fig. 7 Embossed Tape

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	$\varnothing D_0$	$\varnothing D_1$	T
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

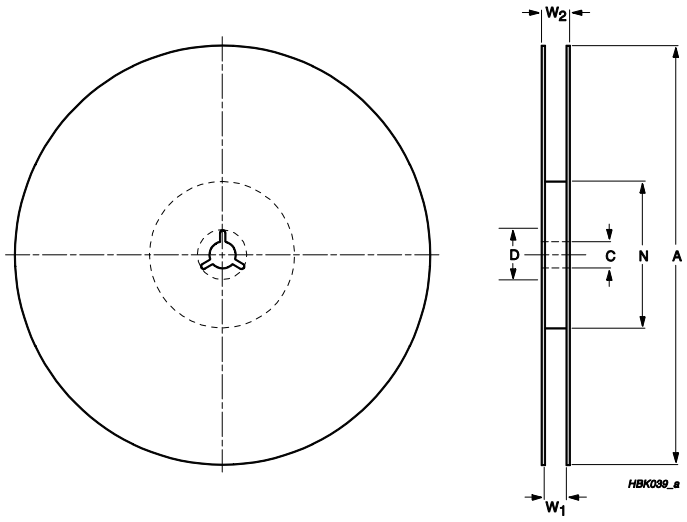


Fig. 8 Reel

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	--	7" (Ø178 mm)	--	180.0+0/-3	60.0+1/-0	13.0±0.2	21.0±0.8	12.3 +1/-0	18.4
PE2512	4000	--	7" (Ø178 mm)	--	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

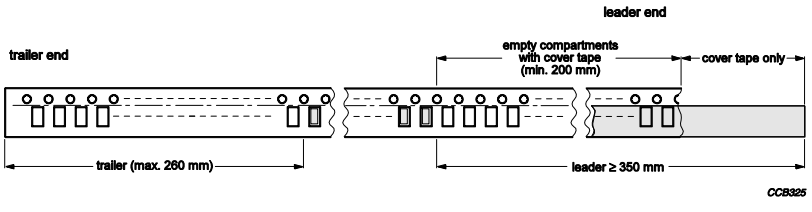


Fig.9 Leader/Trailer Tape

FOOTPRINT AND SOLDERING PROFILES

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

FOOTPRINT

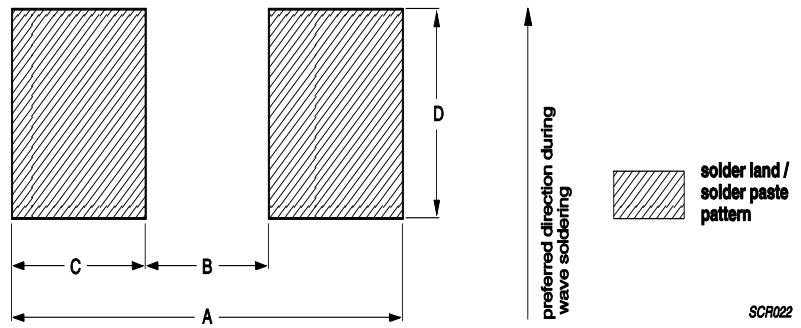


Fig. 10 Single resistor chips recommended dimensions of footprints

Table 7 Footprint dimensions

Unit: mm

SIZE	RESISTANCE RANGE	A	B	C	D
PE0603	5 mΩ ≦ R ≦ 100 mΩ	2.10	0.60	0.75	0.92
PE0805	4 mΩ	5.00	0.40	2.30	1.44
	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
	9 mΩ ≦ R ≦ 100 mΩ	6.20	1.20	2.50	1.84
PE2010	5 mΩ ≦ R ≦ 9 mΩ	8.00	1.40	3.30	2.88
	10 mΩ ≦ R ≦ 100 mΩ	8.00	2.70	2.65	2.88
PE2512	5 mΩ ≦ R ≦ 8 mΩ	9.30	1.60	3.85	3.57
	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 IEC 60115-1 4.25.1 JIS C 5202-7.10	1,000 hours at 70±5 °C applied RCWV 1.5 hours on, 0.5 hour off, still air required	±(1%+0.0005 Ω)
High Temperature Exposure/ Endurance at Upper Category Temperature	MIL-STD-202G-method 108A IEC 60115-1 4.25.3 JIS C 5202-7.11	1,000 hours at maximum operating temperature depending on specification, unpowered No direct impingement of forced air to the parts Tolerances: 155±3 °C	±(1%+0.0005 Ω)
Moisture Resistance	MIL-STD-202G-method 106F IEC 60115-1 4.24.2	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-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 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 0603/0805: 3 mm 1206/2512/4520/4527: 2 mm Holding time: minimum 60 seconds	±(1%+0.0005 Ω) No visible damage
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 IEC 60068-2-58	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
- 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 IEC 60068-2-58	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	±(0.5%+0.0005 Ω) 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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