Innovative Service Around the Globe YAGEO

DATA SHEET

CURRENT SENSOR - LOW TCR

AUTOMOTIVE GRADE

PE_L series

5%, 1%, 0.5%

sizes

0201/0402/ 0603/ 0805/ 1206/ 2010/ 2512

RoHS compliant & Halogen free

YAGEO Phycomp

Product specification – November 28, 2016 V.5

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
- Automotive
- Alternative Energy

FEATURES

- AEC-Q200 qualified
- Halogen-free Epoxy
- RoHS compliant
- Reduce environmentally hazardous wastes
- High component and equipment reliability
- None 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	L
	(1)	(2)	(3)	(4)	(5)	(6)	(7)

(1) SIZE

0201/ 0402/ 0603/ 0805/ 1206/ 2010/ 2512

(2) TOLERANCE

D = ±0.5% (≥10mΩ) F = ±1% J = ±5%

(3) PACKAGING TYPE

R = Paper/ PE taping reel

K = Embossed taping reel

(4) TEMPERATURE COEFFICIENT OF RESISTANCE

E = ±50 ppm/°C

M = ±75 ppm/°C

F = ±100 ppm/°C

J = ±350 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

5 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 L 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:
PE2512FKM070R006L

NOTE

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

MARKING

PE0201 / PE0402

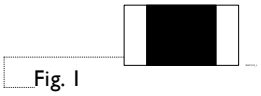


Fig. 1

No marking

PE0603

5mΩ ≦ R≦ 50mΩ

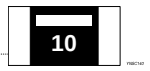


Fig. 2 Value = 10 mΩ

51mΩ ≦ R≦ 910mΩ

Value =51 mΩ

2 digits

PE0805

5mΩ ≦ R≦ 50mΩ

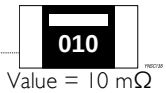


Fig. 3 Value = 10 mΩ

51mΩ ≦ R≦ 910mΩ

Value =51 mΩ

3 digits

PE1206

5mΩ ≦ R≦ 50mΩ

Fig. 4 Value = 10 mΩ

51mΩ ≦ R≦ 910mΩ

Value = 51 mΩ

4 digits

The "R" is used as a decimal point; the other 3 digits are significant.

PE2010 / PE2512

5mΩ ≦ R≦ 100mΩ

Fig. 5 Value = 10 mΩ

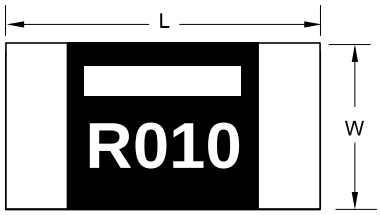
4 digits

The "R" is used as a decimal point; the other 3 digits are significant.

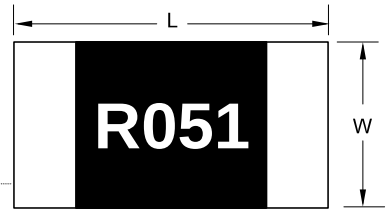
Outlines

For dimensions, please refer to Table 1

5mΩ ≦ R≦ 50mΩ



51mΩ ≦ R≦ 910mΩ



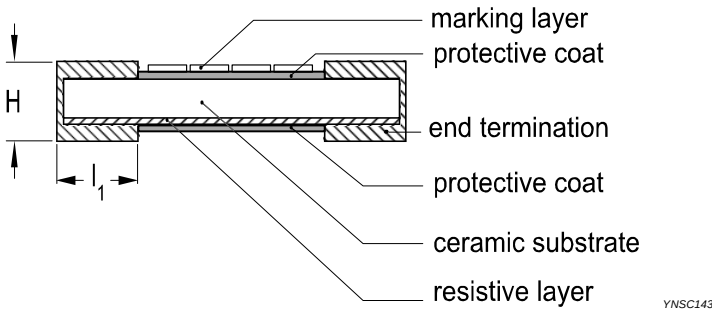


Fig. 5 Chip resistor outlines

DIMENSION

Table 1 For outlines, please refer to Fig. 4

TYPE	RESISTANCE RANGE	L (mm)	W (mm)	H (mm)	I_1 (mm)
PE0201	50 mΩ ≦ R ≦ 200 mΩ	0.60±0.03	0.31±0.04	0.27±0.04	0.14±0.06
PE0402	10 mΩ ≦ R ≦ 910 mΩ	1.00+0.10/-0.15	0.50+0.10/-0.15	0.35±0.15	0.25±0.10
PE0603	5 mΩ , 10 mΩ , 15mΩ , 20 mΩ ≦ R ≦ 50 mΩ	1.60±0.20	0.76±0.25	0.35±0.25	0.38±0.25
	51 mΩ ≦ R ≦ 910 mΩ	1.52±0.25	0.76±0.25	0.45±0.10	0.38±0.25
PE0805	5 mΩ , 10 mΩ , 15mΩ , 20 mΩ ≦ R ≦ 50 mΩ	2.03±0.25	1.27±0.25	0.35±0.25	0.38±0.25
	51 mΩ ≦ R ≦ 910 mΩ	2.03±0.25	1.27±0.25	0.55±0.10	0.35±0.20
PE1206	5 mΩ	3.20±0.25	1.60±0.25	0.64±0.25	0.64±0.25
	6 mΩ ≦ R ≦ 910 mΩ	3.20±0.25	1.60±0.25	0.64±0.25	0.51±0.25
PE2010	5 mΩ ≦ R ≦ 6 mΩ	5.08±0.25	2.54±0.25	0.64±0.25	1.47±0.25
	7 mΩ ≦ R ≦ 100 mΩ	5.08±0.25	2.54±0.25	0.64±0.25	0.51±0.25
PE2512	6 mΩ ≦ R ≦ 100 mΩ	6.35±0.25	3.18±0.25	0.64±0.25	0.76±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) 07	7W	7T	47	57	TOLERANCE	RESISTANCE RANGE	TEMPERATURE COEFFICIENT OF RESISTANCE
PE	0201	1/20W	1/10W	---	---	---	±0.5%(≥10 mΩ) ±1% ±5%	50 mΩ ≦ R ≦ 200mΩ	20mΩ ≦ R≦ 70mΩ ±350ppm/°C 70mΩ<R≦ 200mΩ ±100ppm/°C
	0402	1/16W	1/8W	1/6W	1/4W	---		10 mΩ ≦ R ≦ 910 mΩ	±100 ppm/°C
	0603	1/10W	1/5W	1/3W	2/5W	1/2W		5mΩ , 10mΩ , 15mΩ 20 mΩ ≦ R ≦ 910 mΩ	±75 ppm/°C
	0805	1/8W	1/4W	1/3W	1/2W	---			±100 ppm/°C
	1206	1/4W	1/2W	---	1W	---		5 mΩ ≦ R ≦ 910 mΩ	
	2010	1/2W	1W	---	---	---		5mΩ ≦ R≦ 100mΩ	±50 ppm/°C
	2512	1W	2W	---	---	---		6mΩ ≦ R≦ 100mΩ	±75 ppm/°C ±100 ppm/°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

PE0201 to PE0402 Range: -55°C to +125°C (Fig. 6-1)

PE0603 to PE2512 Range: -55°C to +170°C (Fig. 6-2)

POWER RATING

Standard rated power at 70°C:

PE0201 = 1/20W
PE0402 = 1/16W
PE0603 = 1/10W
PE0805 = 1/8W
PE1206 = 1/4W
PE2010 = 1/2W
PE2512 = 1W
For detail power value, please refer to Table 2.

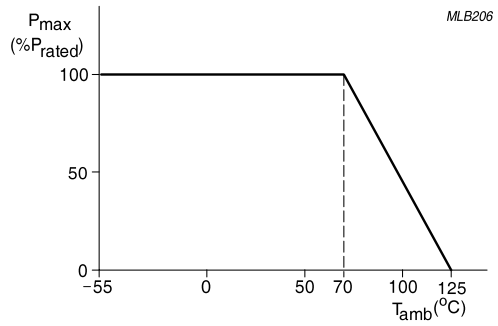


Fig. 6-1 Maximum dissipation (P_{max}) in percentage of rated power as a function of the operating ambient temperature (T_{amb})

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)

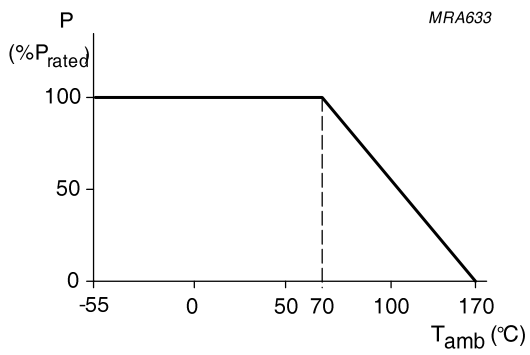


Fig. 6-2 Maximum dissipation (P_{max}) in percentage of rated power as a function of the operating ambient temperature (T_{amb})

PACKING STYLE AND PACKAGING QUANTITY

Table 3 Packing style and packaging quantity

PACKING STYLE	REEL DIMENSION	PE0201	PE0402	PE0603	PE0805	PE1206	PE2010	PE2512
Paper taping reel (R)	7" (178 mm)	10,000	10,000	5,000	5,000	4,000	---	---
Embossed taping reel (K)	7" (178 mm)	---	---	---	---	---	4,000	4,000

PAPER TAPE

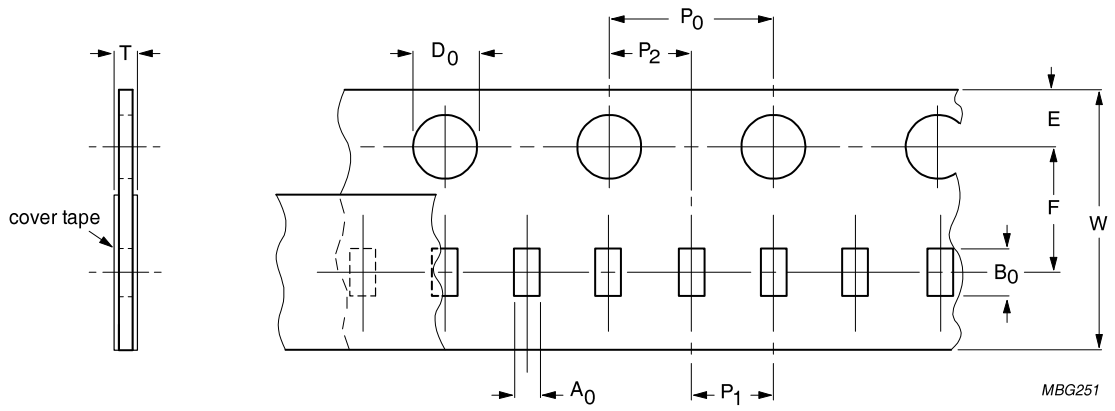


Fig. 7 Paper Tape

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
PE0201	0.35±0.10	1.65±0.10	8.00±0.30	1.75±0.10	3.50±0.10	4.00±0.10	2.00±0.05	2.00±0.05	1.50±0.10	0.53±0.10
PE0402	0.65±0.10	1.15±0.10	8.00±0.30	1.75±0.10	3.50±0.10	4.00±0.10	2.00±0.05	2.00±0.05	1.50±0.10	0.53±0.10
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
PE1206	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	1.50±0.10	1.50±0.10

EMBOSSED TAPE

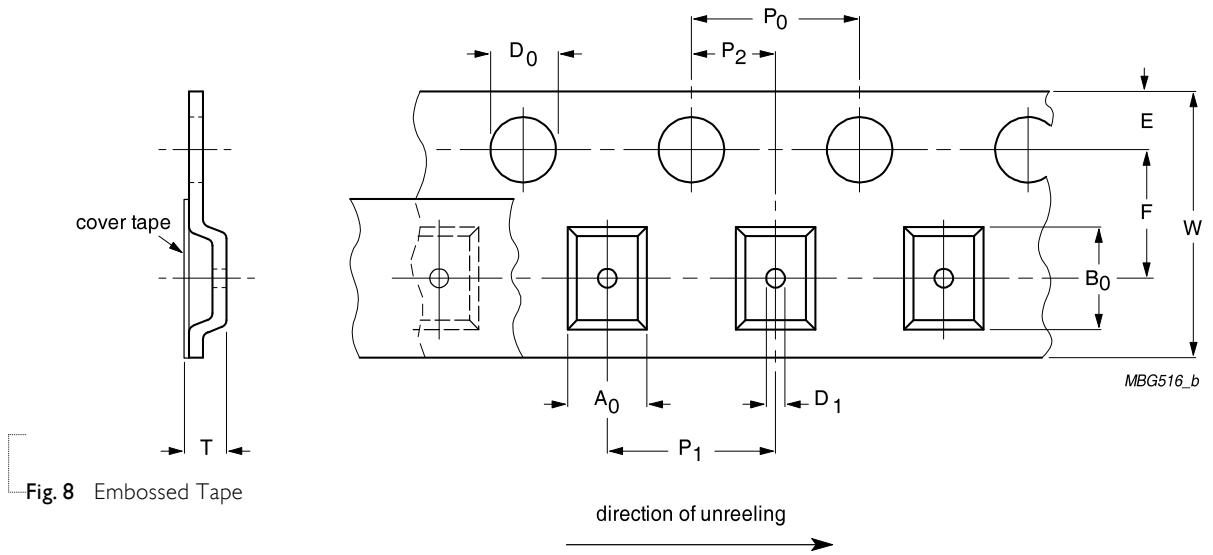


Fig. 8 Embossed Tape

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
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

REEL SPECIFICATION

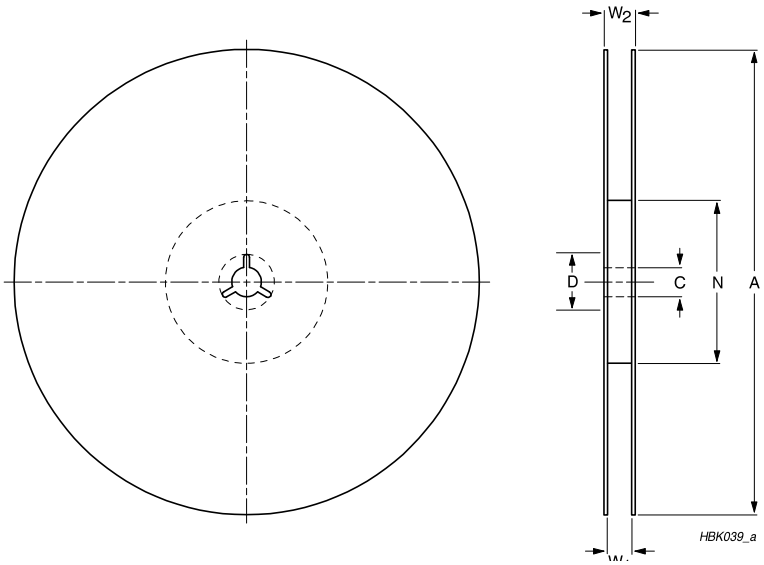


Fig. 9 Reel

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	$W_{2\ MAX.}$
PE0201	10,000	7" (Ø178 mm)	---	---	180.0+0/-3	60.0+1/-0	13.0±0.2	21.0±0.8	9.0±0.30	12.4
PE0402	10,000	7" (Ø178 mm)	---	---	180.0+0/-3	60.0+1/-0	13.0±0.2	21.0±0.8	9.0±0.30	12.4
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

LEADER/TRAILER TAPE SPECIFICATION

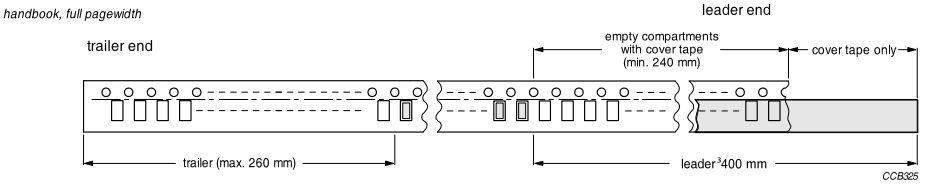


Fig.10 Leader/Trailer Tape

FOOTPRINT AND SOLDERING PROFILES

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

FOOTPRINT

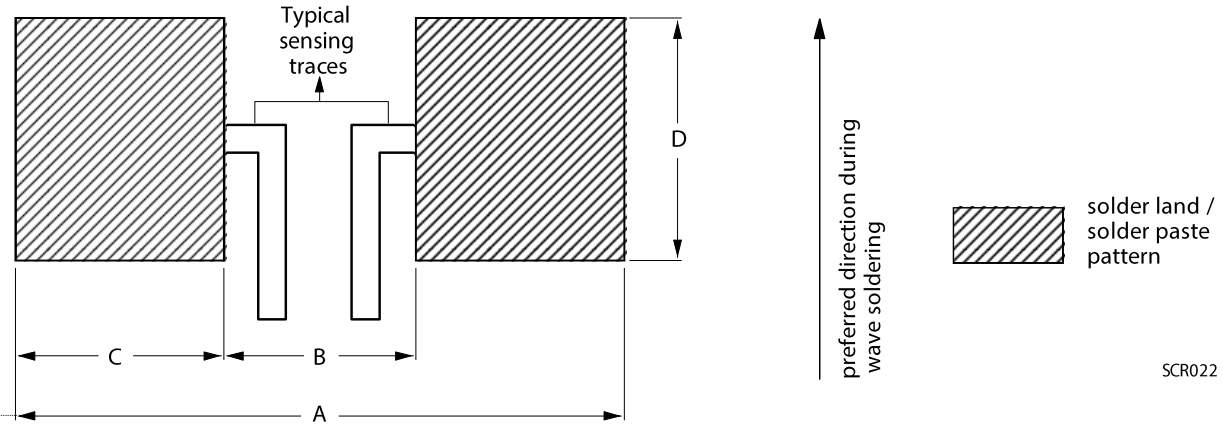


Fig. 11 Single resistor chips recommended dimensions of footprints

Table 7 Footprint dimensions

Unit: mm

SIZE	RESISTANCE RANGE	A	B	C	D
PE0201	50 mΩ ≦ R ≦ 200 mΩ	1.00	0.30	0.35	0.40
PE0402	10 mΩ ≦ R ≦ 910 mΩ	1.45	0.35	0.55	0.55
PE0603	5 mΩ , 10 mΩ , 15 mΩ , 20mΩ ≦ R ≦ 910 mΩ	2.52	0.50	1.01	1.01
PE0805	5 mΩ , 10 mΩ , 15 mΩ , 20mΩ ≦ R ≦ 910 mΩ	2.54	0.50	1.02	1.27
PE1206	5 mΩ ≦ R ≦ 910 mΩ	3.90	0.76	1.57	1.78
PE2010	5 mΩ ≦ R ≦ 6 mΩ	6.12	1.40	2.36	3.05
	7 mΩ ≦ R ≦ 100 mΩ	6.10	3.30	1.40	3.05
PE2512	6 mΩ	7.40	3.18	2.11	3.68
	7 mΩ ≦ R ≦ 100 mΩ	7.36	4.06	1.65	3.68

TESTS AND REQUIREMENTS

Table 8 Test condition, procedure and requirements

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Life/ Operational Life/ Endurance	MIL-STD-202G-method 108 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/ Endurance at Upper Category Temperature	MIL-STD-202G-method 108 IEC 60115-1 4.25.3	1,000 hours at maximum operating temperature depending on specification, unpowered No direct impingement of forced air to the parts Tolerances: 0201/0402 155±3℃ 0603 and above 170±3℃	±(1%+0.0005 Ω)
Moisture Resistance	MIL-STD-202G-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)
Thermal Shock	MIL-STD-202G-method 107	-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	±(1%+0.0005 Ω)
Short Time Overload	IEC60115-1 4.13	5 times of rated power for 5 seconds at room temperature	±(1%+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 0201: 3mm 0402 and above: 2mm Holding time: minimum 60 seconds	±(1%+0.0005 Ω) No visible damage
Biased Humidity	MIL-STD-202 Method 103	1,000 hours at 85°C/85%R.H. 10% of operating power, no condensation on the devices, circulating air.	± (1.0 % + 0.0005Ω)

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Solderability			
- Wetting	IPC/JEDEC 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
- Leaching	IPC/JEDEC J-STD-002B test D	Leadfree solder, 260 °C, 30 seconds immersion time	No visible damage
- Resistance to Soldering Heat	MIL-STD-202G-method 210F IEC 60115-1 4.18	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 5	Nov 23,2016	-	- Extend resistor value for 0.5%
Version 4	Dec. 21, 2015	-	- Update resistance value
Version 3	Aug. 06, 2015	-	- Update 0603 to 1206 TCR
Version 2	Apr. 20, 2015	-	- Extend resistor value
Version 1	Mar. 04, 2015	-	- Update TCR and operating temperature
Version 0	Feb. 10, 2015	-	- New datasheet for current sensor - low TCR PE series sizes of 0201/0402/0603/0805/1206/2010/2512, 0.5%, 1%, and 5%

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