

# DATA SHEET

CURRENT SENSOR - LOW TCR

PR/PF/PH series

5%, 2%, 1%

sizes 0805/1206/2512/0815

RoHS compliant & Halogen free



**SCOPE**

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

**APPLICATIONS**

- Power Management Applications
- Current detection for Switching Power Supply
- Computers, Consumer
- DC-DC Converter, Battery Pack, Charger, Adaptor

**FEATURES**

- Halogen-free Epoxy
- RoHS compliant
  - Products with lead-free terminations meet RoHS requirements
  - Pb-glass contained in electrodes, resistor element and glass are exempted by RoHS
- 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 & I2NC**

Both part numbers are identified by the series, size, tolerance, packing type, temperature coefficient, taping reel and resistance value.

**YAGEO BRAND ordering code**

**GLOBAL PART NUMBER (PREFERRED)**

**PR/PF/PH XXXX X X X XX XXXX L**  
 (1) (2) (3) (4) (5) (6) (7)

**(1) SIZE**

0805 / 1206 / 2512 / 0815

**(2) TOLERANCE**

F = ±1%                      G = ±2%                      J = ±5%

**(3) PACKAGING TYPE**

K = Embossed taping reel                      R = Paper taping reel

**(4) TEMPERATURE COEFFICIENT OF RESISTANCE**

M = ±75 ppm/°C  
 F = ±100 ppm/°C  
 G = ±200 ppm/°C

**(5) TAPING REEL**

07 = 7 inch dia. Reel and standard power  
 7W = 7 inch dia. Reel and 2 x standard power  
 7T = 7 inch dia. Reel and 3 x standard power

**(6) RESISTANCE VALUE**

1 mΩ to 50 mΩ  
 There are 4~5 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
0RXXX	0R05 = 50 mΩ
(1 to 50 mΩ)	0R001 = 1 mΩ

**ORDERING EXAMPLE**

The ordering code of a PR2512 chip resistor, value 0.005 Ω with ±1% tolerance, supplied in 7-inch tape reel is: PR2512FKF070R005L.

**NOTE**

1. All our RSMD products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead-Free Process"
2. On customized label, "LFP" or specific symbol printed and the optional "L" at the end of GLOBAL PART NUMBER / I2NC can be added (both are on customer request)

**PHYCOMP BRAND ordering codes**

Both GLOBAL PART NUMBER (preferred) and I2NC (traditional) codes are acceptable to order Phycomp brand products.

**GLOBAL PART NUMBER (PREFERRED)**

For detailed information of GLOBAL PART NUMBER and ordering example, please refer to page 2.

**I2NC CODE**

SIZE TYPE	2322		XXX XXXXX L		EMBOSSED <sup>(2)</sup> TAPE ON REEL	PAPER (units) <sup>(2)</sup> TAPE ON REEL
	(1)	(2)	(3)	(4)		
	START IN <sup>(1)</sup>	TOL (%)	RESISTANCE RANGE		4,000	4,000
2512 MPRC22I	2322	±5%	0.001 to 0.005 Ω		762 94xxx	-
MPRC22I	2322	±1%	0.001 to 0.005 Ω		763 95xxx	-

Resistance decade <sup>(3)</sup>	Last digit
0.001 to 0.005 Ω	0
Example: 0.005 Ω = 050	

- (1) The resistors have a 12-digit ordering code starting with 2322.
- (2) The subsequent 4 or 5 digits indicate the resistor tolerance and packaging.
- (3) The remaining 4 or 3 digits represent the resistance value with the last digit indicating the multiplier as shown in the table of "Last digit of I2NC".
- (4) "L" is optional symbol <sup>(Note)</sup>.

**ORDERING EXAMPLE**

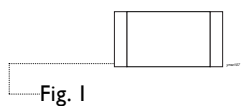
The ordering code of a MPRC22I resistor, value 0.005 Ω with ±5% tolerance, supplied in tape of 4,000 units per reel is:  
232276294050L or  
PR25 I2FKF070R005L.

**NOTE**

- 1. All our RSMD products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead-Free Process"
- 2. On customized label, "LFP" or specific symbol printed and the optional "L" at the end of GLOBAL PART NUMBER / I2NC can be added (both are on customer request)

**MARKING**

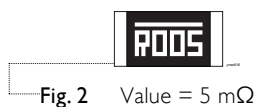
PF0805 / PH0805



No marking

PF1206 / PH1206 / PR2512:  
PF2512:

Full range  
R < 20 mΩ & R ≥ 20 mΩ with 2W



4 digits with top bar

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

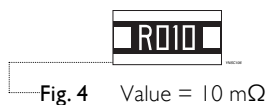
PF2512: R ≥ 20 mΩ with 1W



4 digits

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

PF0815



4 digits: E24 series

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

For further marking information, please refer to data sheet “Chip resistors marking”.

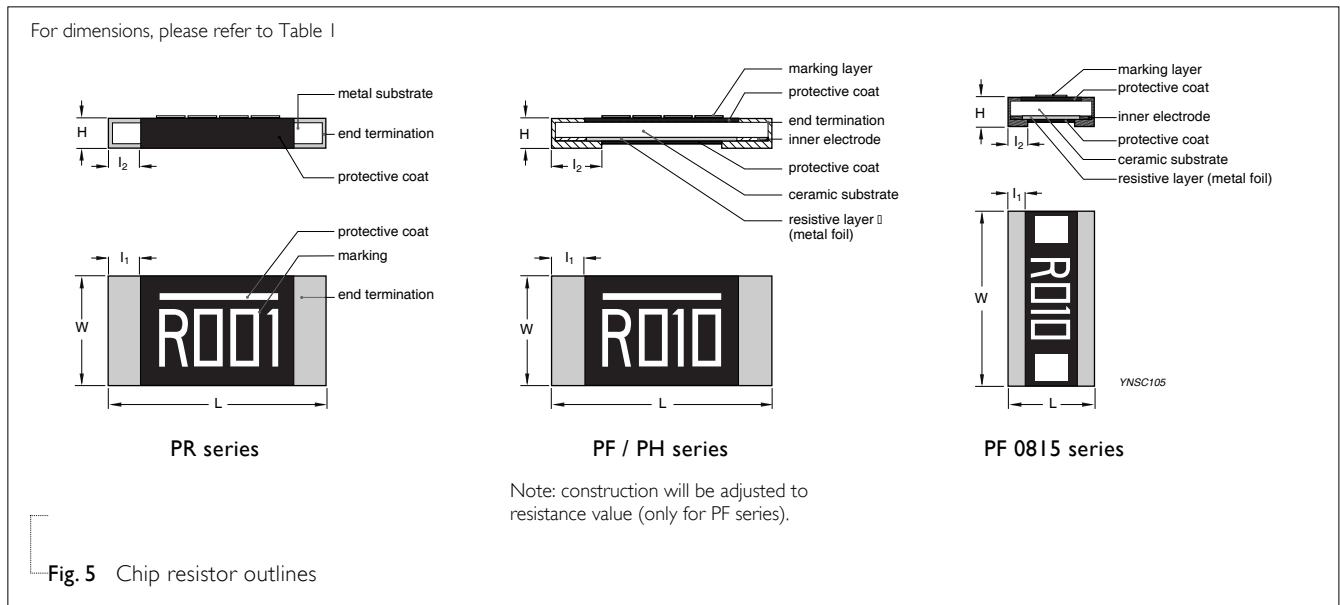
**CONSTRUCTION**

The resistors are constructed using outstanding TCR level material, which makes Yageo PR/PF/PH 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, which printed with the resistance value.

Finally, the three external terminations (Cu / Ni / matte Tin) are added, as shown in Fig. 4.

**Outlines**



**DIMENSION**

Table I For outlines, please refer to Fig. 5

TYPE	RESISTANCE RANGE	L (mm)	W (mm)	H (mm)	l <sub>1</sub> (mm)	l <sub>2</sub> (mm)
PF/PH0805	0.01 to 0.05 Ω	2.03 ±0.25	1.27 ±0.25	0.33 ±0.12	0.38 ±0.25	0.38 ±0.25
PF/PH1206	0.01 to 0.05 Ω	3.20 ±0.25	1.60 ±0.25	0.60 ±0.25	0.50 ±0.25	0.65 ±0.25
PF0815	0.01 to 0.02 Ω	2.15 ±0.20	3.75 ±0.25	0.65 ±0.25	0.65 ±0.25	0.70 ±0.25
	0.006 Ω	6.45 ±0.25	3.25 ±0.25	0.70 ±0.25	0.75 ±0.25	1.85 ±0.25
PF2512	0.007 to 0.015 Ω	6.45 ±0.25	3.25 ±0.25	0.70 ±0.25	0.75 ±0.25	1.55 ±0.25
	0.02 to 0.05 Ω (1W)	6.45 ±0.25	3.25 ±0.25	0.70 ±0.25	1.30 ±0.25	0.75 ±0.25
	0.02 to 0.05 Ω (2W)	6.45 ±0.25	3.25 ±0.25	0.70 ±0.25	0.75 ±0.25	1.30 ±0.25
PR2512	0.001 to 0.002 Ω	6.40 ±0.20	3.20 ±0.20	0.75 ±0.15	1.20 ±0.20	1.20 ±0.20
	0.003 to 0.005 Ω	6.40 ±0.20	3.20 ±0.20	0.55 ±0.15	0.60 ±0.20	0.60 ±0.20

**ELECTRICAL CHARACTERISTICS**

Table 2

TYPE	POWER	TOLERANCE	RESISTANCE RANGE	TEMPERATURE COEFFICIENT OF RESISTANCE
PF0805	1/8 W, 1/4 W, 1/3 W		10 / 20 / 25 / 50 mΩ	
PH0805	1/2 W		10 / 20 / 25 / 50 mΩ	
PF1206	1/4 W, 1/2 W		10 / 15 / 20 / 25 / 30 / 40 / 50 mΩ	
PH1206	1 W	±1%, ±2%, ±5%	10 / 15 / 20 / 25 / 30 / 40 / 50 mΩ	±100 ppm/°C, ±75 ppm/°C
PF0815	1/2W, 1W		10 / 15 / 20 mΩ	
PF2512	1 W, 2W		6 / 7 / 8 / 10 / 15 / 20 / 25 / 33 / 50 mΩ	
PR2512	1 W, 2W		1 / 2 / 3 / 4 / 5 mΩ	1 mΩ ≤ R ≤ 2 mΩ ±200 ppm/°C 3 mΩ ≤ R ≤ 5 mΩ ±100 ppm/°C

**FOOTPRINT AND SOLDERING PROFILES**

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

**PACKING STYLE AND PACKAGING QUANTITY**

Table 3 Packing style and packaging quantity

PACKING STYLE	REEL DIMENSION	PF / PH0805	PF / PH1206	PF0815	PF / PR2512
Paper taping reel (R)	7" (178 mm)	4,000	4,000	---	---
Embossed taping reel (K)	7" (178 mm)	---	---	4,000	4,000

**NOTE**

I. For paper/embossed tape and reel specification/dimensions, please refer to data sheet “Chip resistors packing”.

FUNCTIONAL DESCRIPTION

**OPERATING TEMPERATURE RANGE**

Range: -55°C to +155°C

**POWER RATING**

Standard rated power at 70°C:

PF0805 = 1/8W

PH0805 = 1/2W

PF1206 = 1/4W

PH1206 = 1W

PF0815 = 1/2W

PF2512 = 1W

PR2512 = 1W

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 ( $\Omega$ )

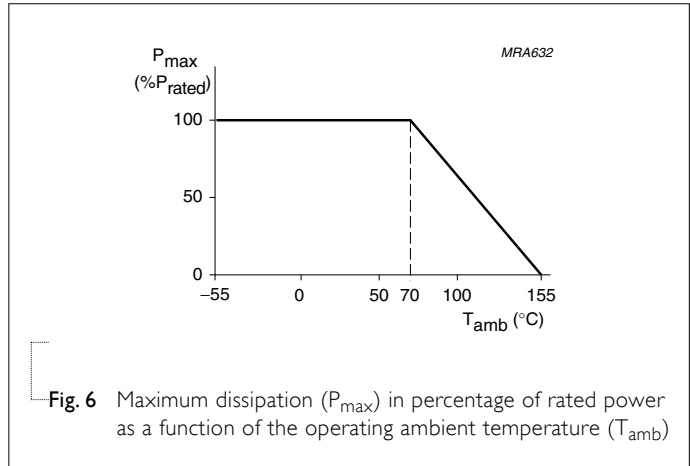


Fig. 6 Maximum dissipation ( $P_{max}$ ) in percentage of rated power as a function of the operating ambient temperature ( $T_{amb}$ )

**TESTS AND REQUIREMENTS**
**Table 4** 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. Devices unmounted  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%+0.05 Ω) No visible damage
		Bending for 0805: 3 mm 1206/2512/other: 2 mm Holding time: minimum 60 seconds	



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 <sup>st</sup> step: method B, aging 4 hours at 155 °C dry heat 2 <sup>nd</sup> 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 0	Nov 01, 2011	-	<ul style="list-style-type: none"> <li>- New datasheet for current sensor - low TCR PR/PF/PH series sizes of 0805/1206/2512, 1%, 2% and 5% with lead-free terminations</li> <li>- Replace the pdf files: Pu-PRPF_PE_5I_PbFree_L_1.pdf &amp; PYu-PR_52I_RoHS_L_2.pdf</li> </ul>

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