

# 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. <sup>(Note)</sup>

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**

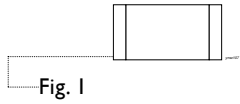
The ordering code of a MPRC22I resistor, value 0.005 Ω with ±5% tolerance, supplied in tape of 4,000 units per reel is:  
 232276294050L or  
 PR25 I2FKF070R005L.

**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**

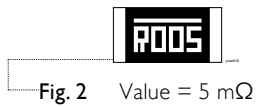
PF0805 / PH0805



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

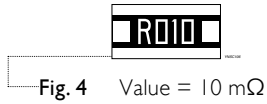
PF2512: R ≥ 20 mΩ with 1W



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”.

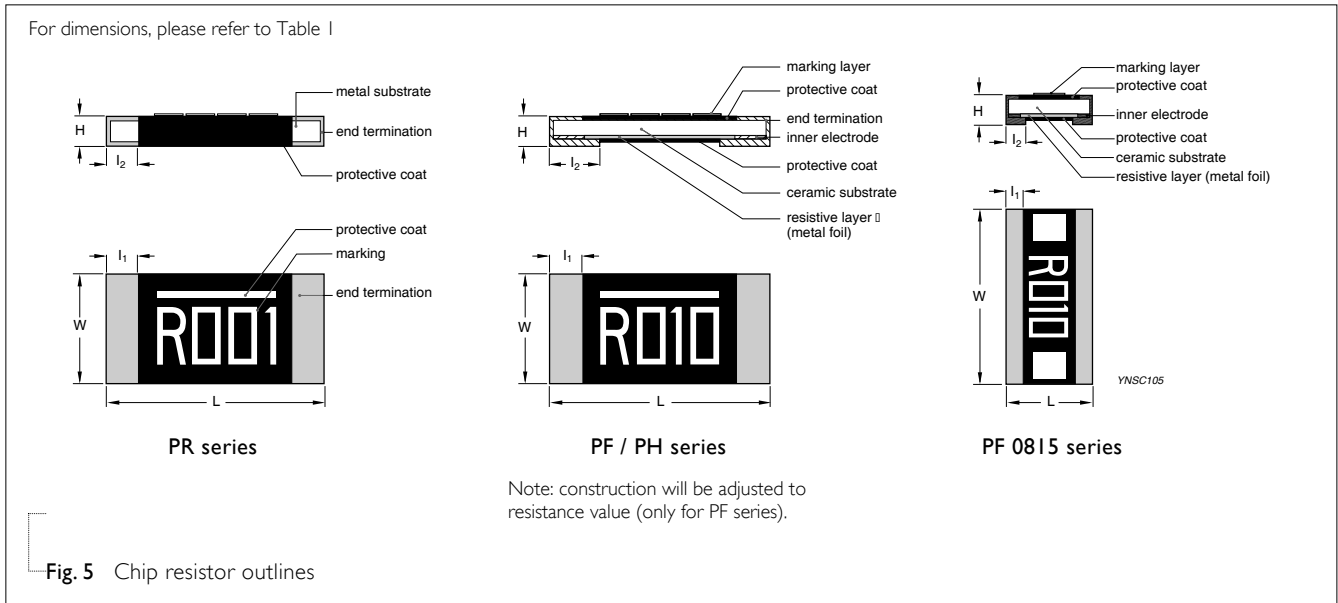
**CONSTRUCTION**

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 ( $\Omega$ )

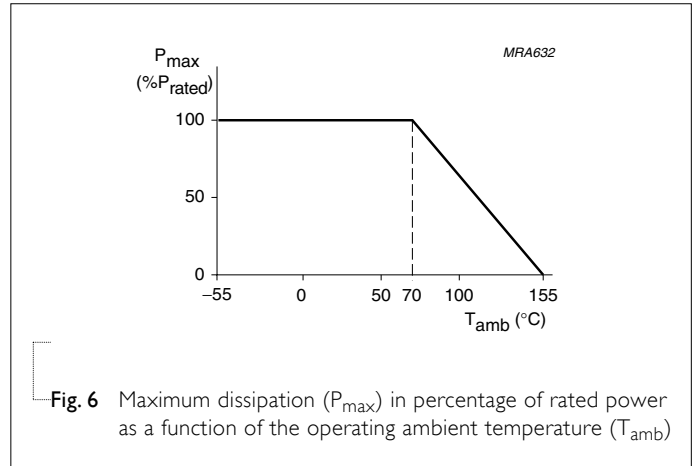


Fig. 6 Maximum dissipation ( $P_{max}$ ) in percentage of rated power as a function of the operating ambient temperature ( $T_{amb}$ )

**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)
	IEC60115-1 4.13		No visible damage
Board Flex/ Bending	IEC60115-1 4.33	Device mounted on PCB test board as described, only 1 board bending required	±(1%+0.05 Ω)
		Bending for 0805: 3 mm 1206/2512/other: 2 mm  Holding time: minimum 60 seconds	No visible damage



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>

*“ Yageo reserves all the rights for revising the content of this datasheet without further notification, as long as the products itself are unchanged. Any product change will be announced by PCN.”*