

Fluxgate system / Voltage-output type

F23PxxxS05R SERIES



[STANDARDS]

- UL508
- CSA C22.2 No.14-18
- EN 62477-1
- IEC61800-5-1



ABSOLUTE MAXIMUM RATINGS

| Parameters | Symbol | Unit | Value | Comment |
|-------------------------------|-----------------|------|-------|------------------|
| Supply voltage | V _{cc} | V | 7 | |
| Primary conductor temperature | — | °C | 110 | |
| ESD (HBM: Human Body Model) | — | kV | 4 | C=150pF, R=330 Ω |

ISOLATION CHARACTERISTICS

| Parameters | Symbol | Unit | Value | Comment |
|------------------------------------|-----------------|------|---|---------------------|
| Insulation voltage | V _d | — | AC5000V, for 1minute (Sensing current 0.5mA) | Primary ⇔ Secondary |
| Insulation Resistance | R _{IS} | — | ≥ 500M Ω (at DC500V) | Primary ⇔ Secondary |
| Clearance distance | d _{Cl} | — | 11.0mm (MIN) | Primary ⇔ Secondary |
| Creepage distance | d _{Cp} | — | 12.7mm (MIN) | Primary ⇔ Secondary |
| Case material | — | — | UL94 V-0 | |
| Comparative Tracking Index : (CTI) | CTI | V | 600 | |

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

| Parameters | Symbol | Unit | Value | | | Comment |
|-------------------------------|----------------|------|-------|-----|------|---------|
| | | | MIN | TYP | MAX | |
| Ambient operating temperature | T _A | °C | - 40 | | + 85 | |
| Ambient storage temperature | T _S | °C | - 40 | | + 85 | |
| Mass | m | g | | 13 | | |

SPECIFICATIONS

Ta=+25°C, Np=1T, RL=10kΩ, Vcc=+5V

| Parameters | Symbol | Unit | Value | | | Comment |
|----------------------------------|-----------------|-----------------|---------|-------|------|---------|
| | | | MIN | TYP | MAX | |
| Primary nominal current | F23P050S05R | I _{PN} | A | | 50 | |
| | F23P100S05R | | | | 100 | |
| Primary current, measuring range | F23P050S05R | I _{PM} | A | - 150 | | + 150 |
| | F23P100S05R | | | - 200 | | + 200 |
| Supply Voltage | V _{cc} | V | 4.75 | 5.00 | 5.25 | |
| Number of primary turns | N _p | T | 1, 2, 3 | | | |
| Number of secondary turns | F23P050S05R | N _s | T | | 1441 | |
| | F23P100S05R | | | | 1127 | |
| Consumption current | F23P050S05R | I _{cc} | mA | | 55 | |
| | F23P100S05R | | | | 110 | |

I_{cc} = 20 + I_{PN} / N_s + V_{out} / R_L

SPECIFICATIONS

Ta=+25°C ,Np=1T, RL=10kΩ, Vcc=+5V

| Parameters | Symbol | Unit | Value | | | Comment | |
|--|-------------|-----------------|-------|-------------|-------|---|---|
| | | | MIN | TYP | MAX | | |
| Reference voltage (output) | Vref1 | V | 2.495 | 2.500 | 2.505 | Ref OUT mode. at Ip=0A | |
| Reference voltage (input) | Vref2 | V | 0 | | 4 | Ref IN mode | |
| Output voltage | Vo | V | | Vref1,Vref2 | | at Ip=0A | |
| Electrical offset voltage * 1 | F23P050S05R | Voe | mV | - 2.5 | 2.5 | | |
| | F23P100S05R | | | | | | |
| Electrical offset current referred to primary | F23P050S05R | Ioe | mA | - 200 | 200 | | |
| | F23P100S05R | | | | | | - 400 |
| Temperature coefficient of Vref1 | TCVref1 | ppm/K | | ± 5.0 | ± 50 | | |
| Temperature coefficient of Vo | F23P050S05R | TCVo | ppm/K | ± 3.0 | ± 10 | ppm/K of 2.5V. at Ip=0A, Ta : -40°C~ +85°C. | |
| | F23P100S05R | | | | | | |
| Theoretical sensitivity | F23P050S05R | Gth | mV/A | 12.5 | 6.25 | 625mV (at IPN) = Vref - Vout / IPN | |
| | F23P100S05R | | | | | | |
| Sensitivity error | εG | % | - 0.7 | | 0.7 | | |
| Temperature coefficient of Sensitivity | TCG | ppm/K | | | ± 40 | Ta=-40°C~ +85°C | |
| Linearity error | εL | % | - 0.1 | | 0.1 | at Ip = 0A ~ IPN | |
| External recommended resistance of Vout | RL | kΩ | | 10 | | | |
| External recommended capacitance of Vout | CL | pF | | | 500 | | |
| Peak to peak output ripple at oscillator frequency | F23P050S05R | — | mV | | 5 | 20 | RL=1kΩ, f_t yp =450kHz |
| | F23P100S05R | | | | | | |
| Reaction time (at 10% of IPN) | F23P050S05R | t _{ra} | μs | | | 0.5 | RL=1kΩ, di/dt = Ipn or 100A/μs. Whichever is smaller. |
| | F23P100S05R | | | | | | |
| Response time (at 90% of IPN) | F23P050S05R | tr | μs | | | 0.5 | RL=1kΩ, di/dt = Ipn or 100A/μs. Whichever is smaller. |
| | F23P100S05R | | | | | | |
| Frequency bandwidth (± 3dB) | BW | kHz | | 100 | | RL=1kΩ | |
| Overall Accuracy (at TA=25°C) | F23P050S05R | XG | % | | | 1.2 | XG= (100 × Voe/625) + εG+εL |
| | F23P100S05R | | | | | | |

*1 Offset voltage value is after removal of core hysteresis.

STANDARDS



EN62477-1:2012, EN62477-1:2012/A1:2017 and EN62477-1:2012/A11:2014
Rated voltage 600V, CAT III, PD2, Reinforced isolation, non uniform field

IEC61800-5-1

Rated voltage 600V, CAT III, PD2, Reinforced isolation, non uniform field



UL508, CSA C22.2 No.14-18 (CSA FILE No. E243511)
Rated voltage 600V, PD2

※ Please refer to the another sheet about conditions of UL Recognition.

Characteristic curve (TYP)

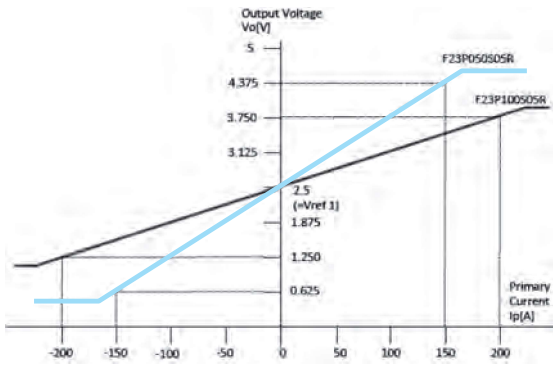


Figure 1 : Linearity curve (Internal reference voltage)
Measurement condition Ta=+25°C, RL=10kΩ, Vcc=+5V

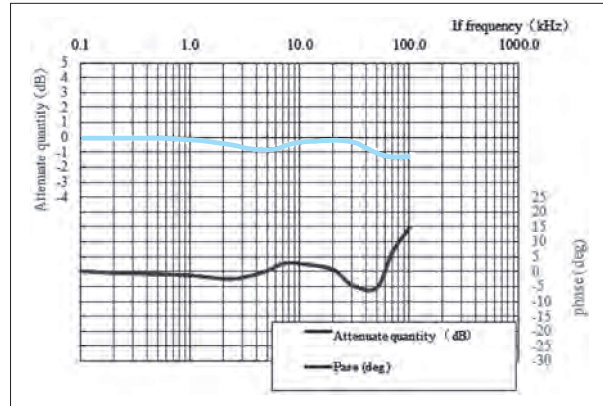


Figure 2 : Frequency response curve
ex) F23P100S05R
Measurement condition Ta=+25°C, RL=1kΩ, Ip=3A × 3T, Vcc=+5V

SUPPORT DOCUMENTATION

Maximum continuous DC primary current

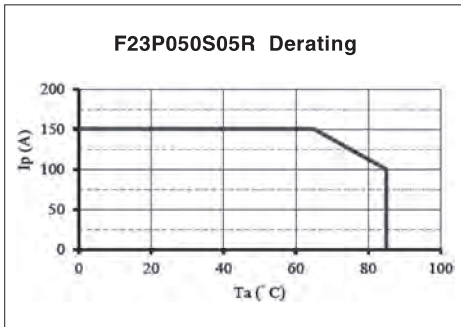


Figure 3 : Ip vs Ta for F23P050S05R

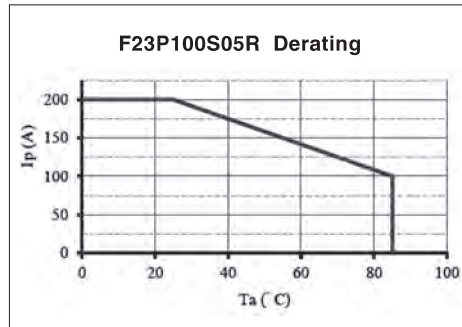


Figure 4 : Ip vs Ta for F23P100S05R
Measurement condition Vcc=+5V, RL=10kΩ

According to which the following conditions are true the maximum continuous DC primary current plot shows the boundary of the area.

- ① $I_p < I_{PM}$
- ② Junction temperature $T_j < 125^\circ\text{C}$
- ③ Resistor power dissipation $< 0.5 \times$ rated power

Frequency derating

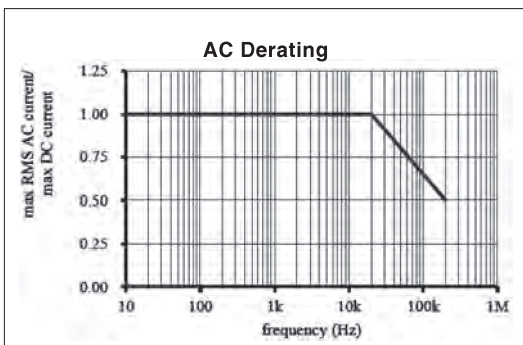


Figure 7 : Maximum RMS AC primary current/maximum DC primary current vs frequency

Reference voltage

The Ref pin has two modes Ref IN and Ref OUT. If you do not want to use the Ref pin, please unconnected.

< Ref OUT mode >

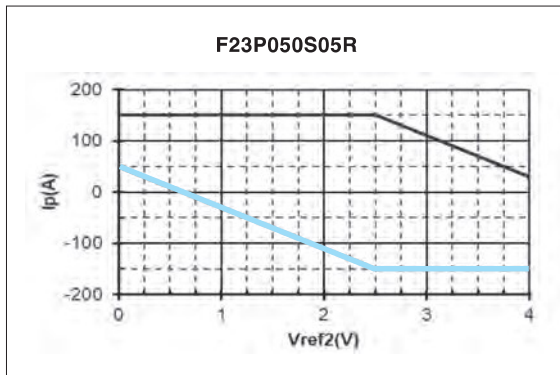
The 2.5V internal precision reference is used by the transducer as the reference point for bipolar measurements;

< Ref IN mode >

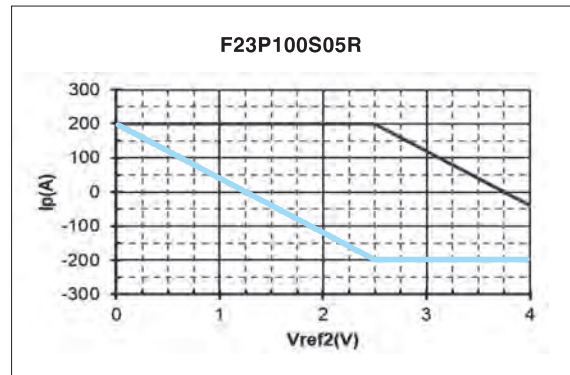
An external reference voltage is connected to the Ref pin; this voltage is specified in the range 0 to 4 V , its voltage is used as the reference voltage at the time of measurement.

- either to source a typical current of $(V_{ref} - 2.5) / 680$, the maximum value will be 2.2mA typ. when $V_{ref2} = 4V$.
- or to sink a typical current of $(2.5 - V_{ref2}) / 680$, the maximum value will be 3.68mA typ. when $V_{ref2} = 0V$.

The following graphs show how the measuring range of each transducer version depends on external reference voltage value V_{ref2} .

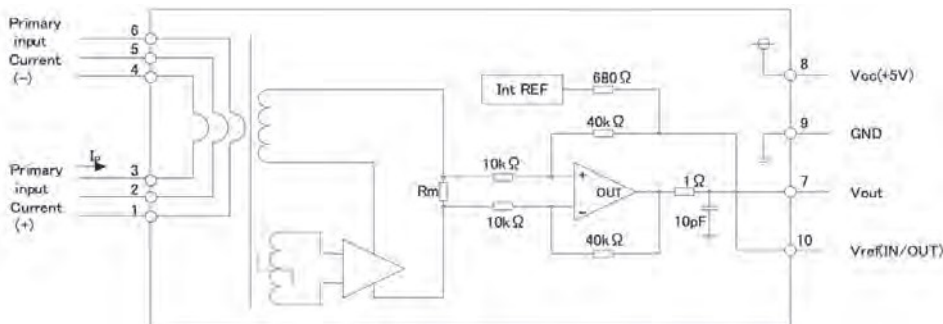


Upper limit : $I_p = 150$ ($V_{ref2} = 0 \dots 2.5V$)
 $I_p = -80 \times V_{ref2} + 350$ ($V_{ref2} = 2.5 \dots 4V$)
 Lower limit : $I_p = -80 \times V_{ref2} + 50$ ($V_{ref2} = 0 \dots 2.5V$)
 $I_p = -150$ ($V_{ref2} = 2.5 \dots 4V$)



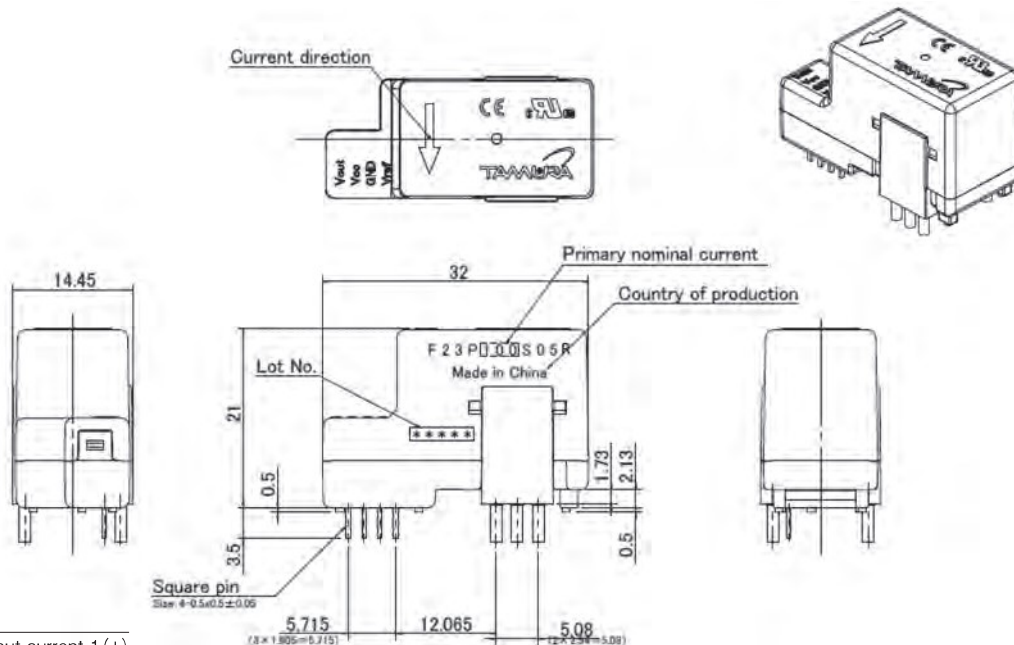
Upper limit : $I_p = 200$ ($V_{ref2} = 0 \dots 2.5V$)
 $I_p = -160 \times V_{ref2} + 600$ ($V_{ref2} = 2.5 \dots 4V$)
 Lower limit : $I_p = -160 \times V_{ref2} + 200$ ($V_{ref2} = 0 \dots 2.5V$)
 $I_p = -200$ ($V_{ref2} = 2.5 \dots 4V$)

CONNECTION



| Primary winding Ip | Primary current Ip(A) | wiring | Primary resistance Rm(Ω) |
|--------------------|-----------------------|--------|--------------------------|
| 3 | Ip/3 | | 1 |
| 2 | Ip/2 | | 0.45 |
| 1 | Ip | | 0.1 |

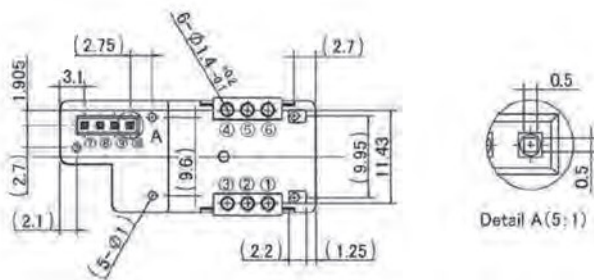
DIMENSIONS (mm)



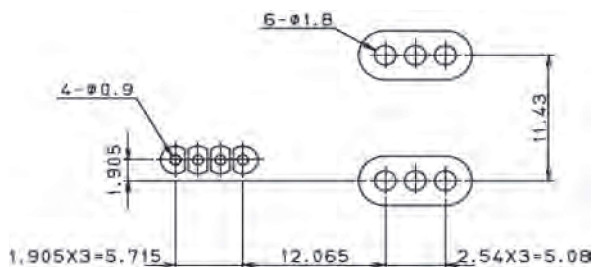
Terminal No.

- ① Primary input current 1 (+)
- ② Primary input current 2 (+)
- ③ Primary input current 3 (+)
- ④ Primary input current 3 (-)
- ⑤ Primary input current 2 (-)
- ⑥ Primary input current 1 (-)
- ⑦ Vout
- ⑧ Vcc (+5V)
- ⑨ GND
- ⑩ Vref (IN/OUT)

※ Tolerance: ± 0.2
Unit: mm



RECOMMENDED HOLE DIAMETER (mm)



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