

Fluxgate system / Voltage-output type, Through Type

F26P150S12



[STANDARDS]  
·EN 62477-1

RoHS

ABSOLUTE MAXIMUM RATINGS

| Parameters                                      | Symbol | Unit | Value | Comment   |
|---|--------|------|-------|---|
| Supply voltage                                  | Vcc    | V    | +14.5 |   |
| Primary conductor temperature                   | —      | °C   | 100   |   |
| External voltage applied to Vref (out) terminal | —      | V    | 5     | Vref (out) terminal has only output function. There is no input function. |

ISOLATION CHARACTERISTICS

| Parameters                         | Symbol          | Unit | Value   | Comment  |
|------------------------------------|-----------------|------|---|--|
| Insulation voltage                 | Vd              | —    | AC4300 V, for 1minute<br>(Sensing current 0.5 mA) | Primary ⇔ Secondary  |
| Impulse withstand voltage          | Vw              | kV   | 10  | Primary ⇔ Secondary<br>Input waveform :<br>· Front time 1.2 μs<br>· Time to half value 50 μs<br>· single |
| Insulation resistance              | R <sub>IS</sub> | —    | ≥ 500M Ω (at DC500V)                              | Primary ⇔ Secondary  |
| Clearance distance                 | d <sub>Cl</sub> | mm   | 12.7 (MIN)  | Primary ⇔ Secondary  |
| Creepage distance                  | d <sub>Cp</sub> | mm   | 12.7 (MIN)  | Primary ⇔ Secondary  |
| Case material                      | —               | —    | UL94 V-0  |  |
| Comparative Tracking Index ; (CTI) | CTI             | V    | 600 (group I)                                     |  |

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

| Parameters                    | Symbol         | Unit | Value |      |      | Comment |
|-------------------------------|----------------|------|-------|------|------|---------|
|                               |                |      | MIN   | TYP  | MAX  |         |
| Ambient operating temperature | T <sub>A</sub> | °C   | - 40  |      | + 85 |         |
| Ambient storage temperature   | T <sub>S</sub> | °C   | - 40  |      | + 85 |         |
| Mass                          | m              | g    |       | 38.5 |      |         |

SPECIFICATIONS

T<sub>A</sub>=+25°C, R<sub>L</sub>=OPEN, V<sub>CC</sub>=+12V

| Parameters   | Symbol                | Unit  | Value  |                       |       | Comment   |
|--|-----------------------|-------|--------|-----------------------|-------|---|
|  |                       |       | MIN    | TYP                   | MAX   |   |
| Primary nominal current  | I <sub>PN</sub>       | A     |        | 150                   |       |   |
| Primary current, measuring range (at V <sub>CC</sub> = +12V, T <sub>A</sub> = +85°C) | I <sub>PM</sub>       | A     | - 450  |                       | 450   |   |
| Number of secondary turns  | N <sub>s</sub>        | T     |        | 2150                  |       |   |
| Supply Voltage   | V <sub>CC</sub>       | V     | 11.4   | 12                    | 12.6  |   |
| Consumption current (at I <sub>P</sub> =0 A)   | I <sub>CC</sub>       | mA    |        | 36.5                  |       | I <sub>CC</sub> =36.5+I <sub>P</sub> /N <sub>s</sub> +V <sub>out</sub> /R <sub>L</sub>                      |
| Reference voltage (output) (at I <sub>P</sub> =0 A) * 1                              | V <sub>ref(out)</sub> | V     | 2.495  | 2.500                 | 2.505 | No Load   |
| Output voltage (at I <sub>P</sub> =0A)   | V <sub>out</sub>      | V     |        | V <sub>ref(out)</sub> |       |   |
| Electrical offset voltage * 2  | V <sub>oe</sub>       | mV    | - 1.0  |                       | +1.0  | V <sub>oe</sub> =V <sub>out</sub> (at I <sub>P</sub> =0 A)-V <sub>ref(out)</sub>                            |
| Electrical offset current referred to primary  | I <sub>oe</sub>       | mA    | - 240  |                       | +240  |   |
| Temperature coefficient of V <sub>ref</sub> (out)                                    | TCV <sub>ref</sub>    | ppm/K |        |                       | ±50   |   |
| Temperature coefficient of Output voltage (at I <sub>P</sub> =0 A)                   | TCV <sub>o</sub>      | ppm/K |        |                       | ±10   | ppm/K of 2.5 V (-40°C~+85°C)  |
| Theoretical sensitivity  | G <sub>th</sub>       | mV/A  |        | 4.167                 |       | 625 mV(at I <sub>PN</sub> ),<br>G <sub>th</sub> = V <sub>out</sub> -V <sub>ref(out)</sub>  /I <sub>PN</sub> |
| Sensitivity error * 3  | ε <sub>G</sub>        | %     | - 0.7  |                       | +0.7  |   |
| Temperature coefficient of Sensitivity (at T <sub>A</sub> = -40°C~ +85°C)            | TCG                   | ppm/K |        |                       | ±40   |   |
| Linearity error (at I <sub>PN</sub> ) * 3  | ε <sub>L</sub>        | %     | - 0.1  |                       | +0.1  |   |
| Peak to peak output ripple at oscillator frequency (f typ=600kHz)                    | —                     | mV    |        | 16                    |       | R <sub>L</sub> =1 k Ω , at I <sub>P</sub> =0 A  |
| Reaction time (at 10% of I <sub>PN</sub> ) * 3                                       | t <sub>ra</sub>       | μs    |        | 1                     |       | R <sub>L</sub> =1 k Ω , di/dt=100 A/μs  |
| Response time (at 70% of I <sub>PN</sub> ) * 3                                       | t <sub>r</sub>        | μs    |        | 1                     |       | R <sub>L</sub> =1 k Ω , di/dt=100 A/μs  |
| Frequency bandwidth ( ± 3 dB) * 3 * 4  | BW                    | kHz   |        | 100                   |       | R <sub>L</sub> =1 k Ω   |
| Overall accuracy * 3   | X <sub>G</sub>        | %     | - 0.96 |                       | +0.96 | X <sub>G</sub> =(100 × V <sub>oe</sub> /625)+ ε <sub>G</sub> + ε <sub>L</sub>                               |

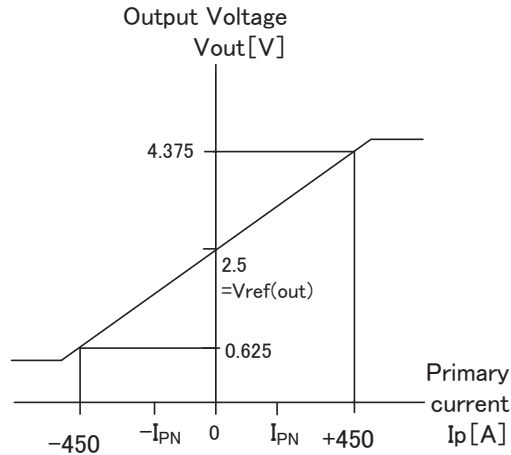
\*1 If the output impedance of the V<sub>ref</sub> (out) pin is small, the accuracy of the reference voltage will decrease.  
 \*2 Offset voltage value is after removal of core hysteresis.  
 \*3 Measurement condition : Primary conductor (bus bar) cross sectional area is as same as through hole, and penetration with 1 turn in through hole.  
 Differences occur depending on the conditions of the primary conductor (bus bar).  
 \*4 High fundamental frequency primary current and/or harmonic current may result in excessive heating in magnetic core.

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

CHARACTERISTIC CURVE (TYP)



F26P150S12

Figure 1 : Linearity curve

SUPPORT DOCUMENTATION

Maximum repetitive primary current

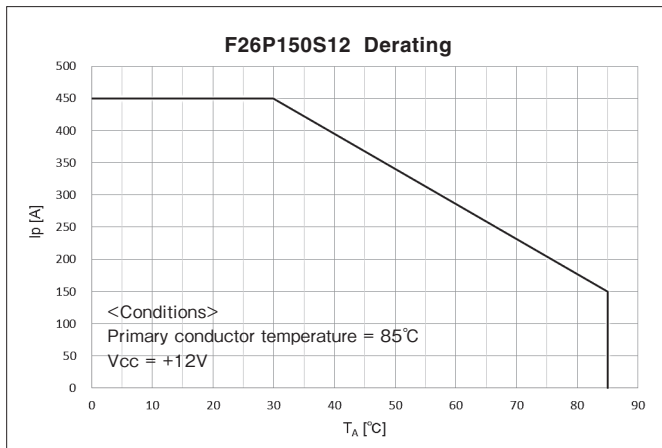


Figure 2 : Ip vs Ta for F26P150S12

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

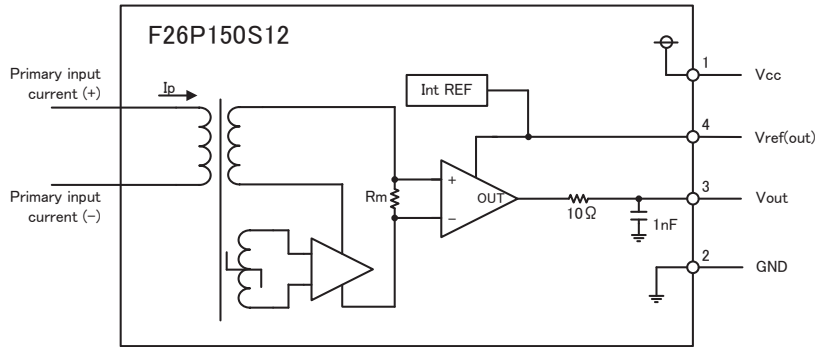
- ①  $I_p < I_{pm}$
- ② Junction temperature  $T_j <$  Absolute maximum rating of internal components.
- ③ Resistor power dissipation  $< 0.5 \times$  rated power

Reference voltage

The Vref(out) pin is used for output only. A precision internal reference voltage of 2.5V can be used as a reference point for bipolar measurements. An external reference voltage cannot be input for use.

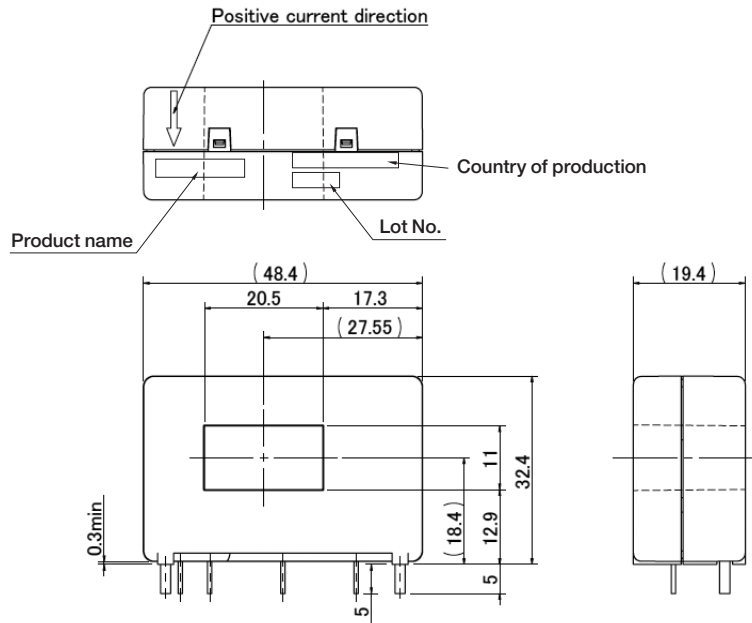
If you do not want to use the Vref(out) pin, please unconnected.

CONNECTION



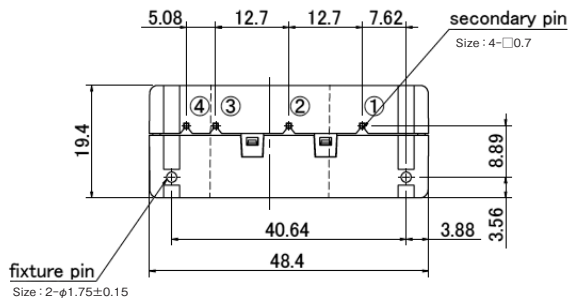
DIMENSIONS (mm)

※ Tolerance:  $\pm 0.5$   
Unit: mm

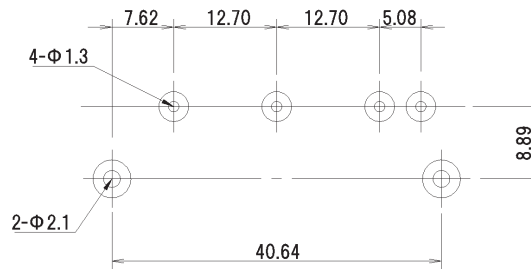


Terminal No.

- ① Vcc (+12V)
- ② GND
- ③ Vout
- ④ Vref (OUT)



RECOMMENDED HOLE DIAMETER (mm)



TYPE DESIGNATION

F26 P 150 S 12  
 ① ② ③ ④ ⑤

- ① Model (3 figures)  
F26 : Series
- ② Mounting configuration (1 figure)  
P : PCB Mounting type
- ③ Primary nominal current (3 figures)  
150 : 150A
- ④ Control power supply type (1 figure)  
S : Single supply
- ⑤ Power supply voltage (2 digits)  
12 : +12V

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# Application notes

## <General Considerations>

1. The sensor uses polar electronic components. When the polarity of the power supply is mistaken, the sensor is damaged.
2. Static electricity or excessive voltage can increase an offset voltage in the Hall element, and cause offset voltage to change. Please exercise care in handling and application.
3. In order to prevent the influence of noise, the use of twisted cable or shielded cable for the output line is recommended
4. If using this device within a magnetic field generated by other devices, the specified accuracy may not be obtainable.
5. Our products (several models are excluded ) are adjusted with the trimming method by the measurement condition (Load resistance, Power supply voltage) of specification sheets. Therefore, characteristics (Offset, Output, etc.) and its deviation may be changed in different circuit conditions from the measurement condition. All change characteristic items are not indicated on specification sheets.
6. The performance of current sensors with through-hole (aperture) is dependent on the position of the primary conductor. Tamura specifications are based on a primary conductor completely filling the through-hole (aperture) area.
7. The current sensor rated current in DC Amps.
8. Please use mating connector with equivalent terminal plating material to insure proper operation and avoid possibility of 'galvanic corrosion' .
9. Please do not store in high-temperature and high-humidity storage environment. Please use it after confirming soldering when it is kept for six months or more. (product soldered with substrate)
10. We recommend performing a zero offset adjustment by measuring the offset voltage at startup. In continuously operation for a few months, or at change of ambient temperature or humidity is large, we recommend regularly performing a zero offset adjustment at being idling (it is clear that the current is not apply) .
11. The current sensor doesn't have built-in protection circuit (devices and fuses, etc.). As a failure mode of the sensor, there is a short circuit and open state. In the case of a short-circuit state, the abnor-mal temperature rise of the internal parts is assumed, and there is a possibility to smoke and to ignite. If it is used in safety critical circuit blocks, please take appropriate measures by protection devices, protection circuits, etc. For closed loop -type sensors and flux gate (closed loop type) sensors, the consumption current of the secondary power supply varies in proportion to the measurement current.

## <Open loop>

1. High frequency primary current may result in excessive heating in iron magnetic core and cause damage to internal circuitry; for high frequency applications select current sensor with ferrite core material.
2. If the measured current exceeds the rated current, magnetic core saturation will occur and the output voltage signal will not be linearly proportional to the measured current.

## <Closed Loop>

1. For closed loop current sensors please insure the power supply voltage is balanced, symmetrical, and, applied simultaneously to avoid potential increase in DC offset error.
2. Maximum rated current measurement duration is timedependent. Maximum rated current applied in excess of the time limit can result in damage to internal electronic circuitry; please consult Tamura for assistance.
3. When using a measurement resistor to convert current output to voltage output select a resistor with stable temperature characteristic to insure accuracy of the output voltage.
4. Compensation current supplied to the secondary winding varies in proportion to the measured current based on the conversion ratio. (If/KN; KN = secondary turns) Please insure the PSU has required current capacity to supply compensation current to the secondary winding.

## <Flux-Gate>

1. Compensation current supplied to the secondary winding varies in proportion to the measured current. Please insure the PSU has required current capacity to supply compensation current to the secondary winding.
2. There is 450kHz ripple voltage present on the output and reference output voltage signals . An external capacitor maybe added if necessary.