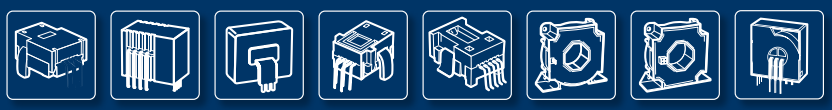
TAMURA

ELECTRONICS COMPONENTS

CURRENT SENSORS



TAMURA CORPORATION

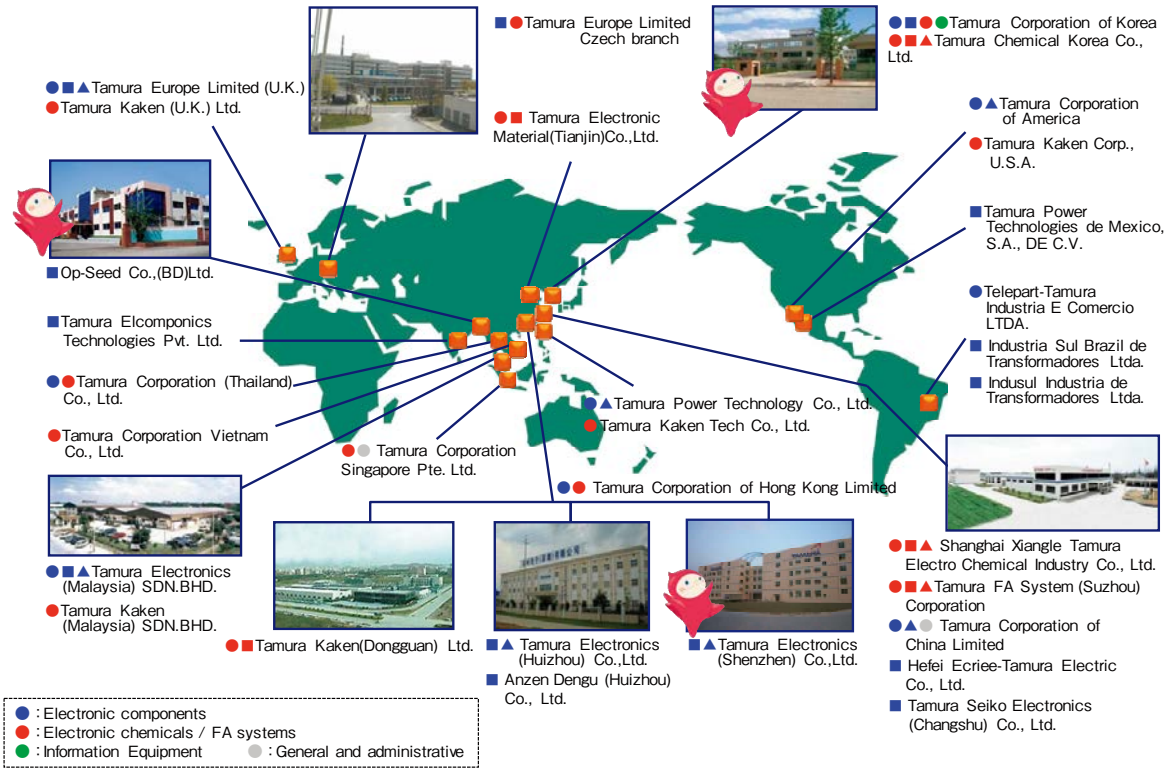
Content

Group network map

Group Network - Overseas

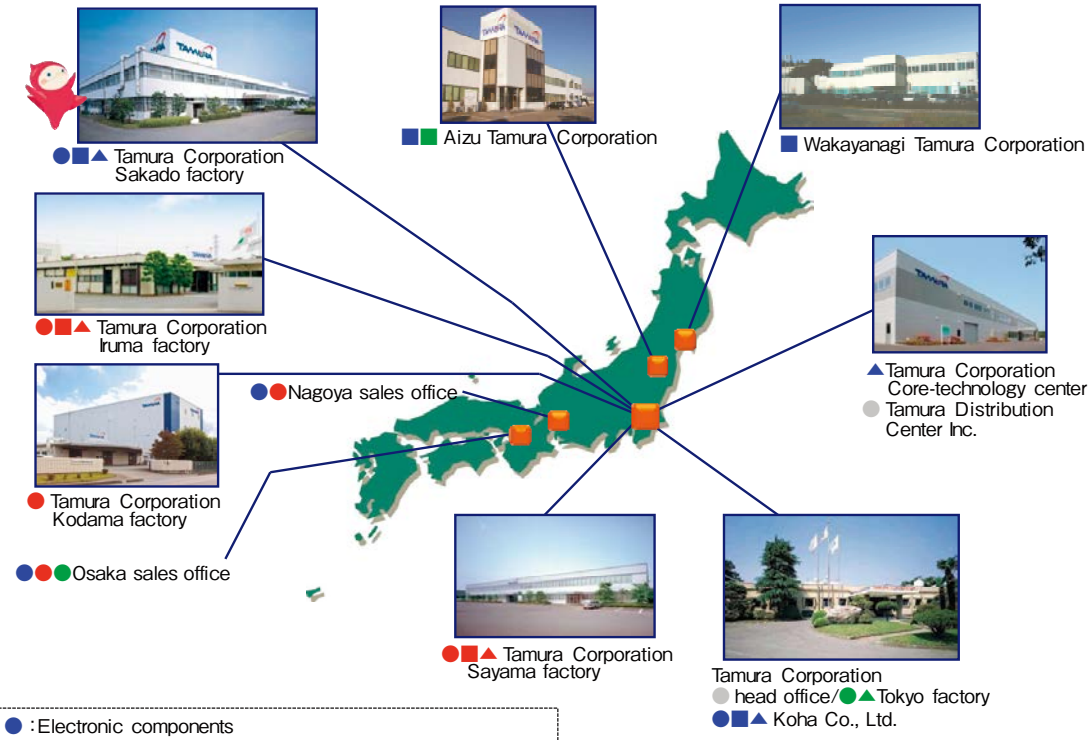
○: Sales □: Factory △: R&D

Factory and R&D for Current sensor



Group Network - Japan

○: Sales □: Factory △: R&D

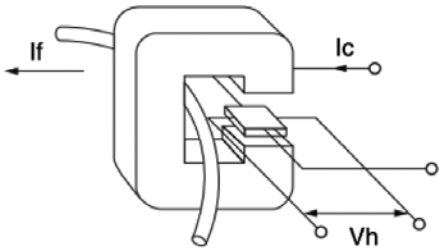


Outline / Applications / Features

Outlines

The current sensor is a sensor to measure the current as its name. However, The current is various. There is a current value up to 10k amperes treated in the power plant from 1mA, and the shape of current waves also has AC, DC, and AC + DC. Since a method and a structure the best in each measuring object are different, there are also various current sensors. Tamura supplies the sensor using the Hall-Effect system for measuring the current value from several amperes to several kilo-ampere.

The Hall-Effect current sensor measures the magnetic flux produced in proportion to the primary current without any direct contact with the primary circuit; the combination of the Hall element and magnetic circuit provide excellent solution for measuring AC/ DC current with galvanic isolation and zero insertion loss.
The diagram in Figure-1 depicts the Hall current sensor basic principle. The magnetic flux produced in proportion to the primary current, If, induced in the magnetic circuit, passes through the Hall element inserted in the gap of the magnetic circuit resulting in a potential difference, Vh, expressed by the following formula:



Vh = k · Ic · B ····· (1)

- Vh ····· Hall voltage
- K ····· Coefficient of sensibility
- Ic ····· Control current
- B ····· Magnetic fluxdensity

The induced Vh is small and is amplified by an amplification circuit.

Figure-1

Applications

Current control and detection of over-current in various types of inverters. Used for general-purpose inverter, various types of power conversion equipment to control and to detect over-current. Also used to measure DC current from the battery.

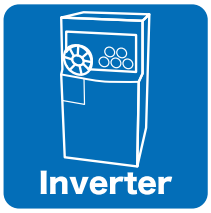
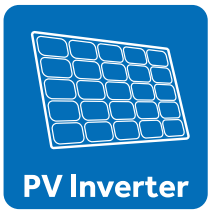
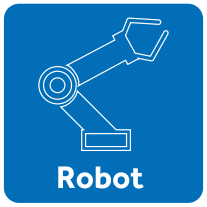
- Various types of inverters (CVCF, vector), Industrial robots, automation, devices, NC
- UPS, Elevator, Laser Cutting Machines, Welding Machines, Various types of Regulated Power Supply
- Solar power generation systems, Wind power systems, Fuel cell systems

Features

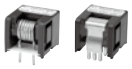
Measurement of DC, AC (kHz range), & complex current (AC+DC). Our current range is 3A to 1500A in various mechanical configurations.

- Galvanic isolation with many UL compliant configurations.
- Fast response time
- High Reliability

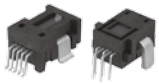
Applications of Current Sensor

Applications	Series (Example)		
 Inverter	L18P	L07P	L06P
	L03S	L37S	LA**P
	S27S	S28S	S29S
 Motor control unit	L18P	L08P	L06P
	L03S	L37S	S21S
	S22S	S27S	S28S
 PV Inverter	L18P	S22P	S23P
	LA**P	F**P	
 Elevator	L03S	L37S	L07P
	L08P	S22P	S23P
	S21S	S27S	F**P
 Robot	L03S	L37S	L08P
	L34S	S28S	S29S
 UPS	L18P	L12P	F03P
	S22P	S23P	S21S
	S27S	S28S	S29S
 Welding machine	L03S	L37S	L08P
	L06P	L34S	S21S
	S27S	S28S	S29S

Current Sensor / Guide map

SERIES	Model	Main Specification					UL R/C	Features	Page
		Circuit System	Mounting Configuration	Primary Conductor	Rated Current	Power Voltage			
F01P 	F01PxxxS05L F01PxxxS05	Fluxgate system	On-board	Built-in bus-bar	6~50A	+5V	●	• Super precision & High stability • F02P & F03P : With reference access • F03P : Longer creepage and clearance distances • Name end"L" ; Backward compatible, Anti-Surge current, Compact	15
F02P 	F02PxxxS05L F02PxxxS05								
F03P 	F03PxxxS05L F03PxxxS05								
F23P NEW 	F23PxxxS05R	Fluxgate system	On-board	Built-in bus-bar	50-100A	+5V	●	· Super precision & High stability · With reference access	51
L18P 	L18PxxxD15-OP SL18PxxxD15 L18PxxxD15	Open loop	On-board	Built-in coil/ bus-bar	3~60A	±15V	●	• Low cost • Compact, high performance • Name First "SL18P"; Anti-Sulfurated (Coating, Anti-Sulfurated re-sistance) • Name end "R"; Rated voltage change	57
	L18PxxxS05 L18PxxxS05R					+5V			
	L18PxxxS12					+12V			
L07P 	L07PxxxD15	Open loop	On-board	Built-in coil	3~30A	±15V	●	• Low cost • Built-in 2 circuits • Name end "S";Anti-Sulfurated (Coating, Anti-Sulfurated resistance)	63
	L07PxxxD15S								
	L07PxxxS05					+5V			
L12P 	L12P025D15	Open loop	On-board	Built-in coil	25A	±15V		• Low cost • Compact	66
L32P 	L32PxxxS05BFS	Open loop	On-board	Built-in bus-bar	50A, 100A	+5V	●	• Ferrite core is used. • With reference access • Used Anti-Sulfurated resistance	67
	L32PxxxS05FS			Through hole □15×8	50~400A				
L08P 	L08PxxxD15	Open loop	On-board	Through hole ϕ16	5~200A	±15V		• Wide range of applications • Name end"W";Saturation current up, NC pin is deleted.	68
	L08PxxxD15W/ IPV				50~500A				
L01Z 	L01ZxxxS05	Open loop	On-board	Through hole □15×8	50~600A	+5V		• Wide electrical current range • Compact	71
L37S NEW 	L37SxxxD15M L37SxxxD15J	Open loop	Connector (MOLEX/JST)	Through hole □20.4×10.4	50~600A	±15V	●	• Design for lower dvdt noise • Succession model of L03SxxxD15W series • Wide electrical current range • Compact	72
L03S 	L03SxxxD15	Open loop	Connector (MOLEX)	Through hole □20.5× 10.5	50~600A	±15V		• Wide electrical current range • Compact • Name end"W"; Saturation current up, Change position of CN (MOLEX or JST)	75
	L03SxxxD15WM L03SxxxD15WJ		Connector (MOLEX/JST)		50~800A				
L31S 	L31SxxxS05FS	Open loop	Connector (MOLEX)	Through hole □20.5×10.5	50~600A	+5V	●	• Wide electrical current range • Ferrite core is used. • With reference access • Used Anti-Sulfurated resistance	77
L06P 	L06PxxxS05	Open loop	On-board	Through hole ϕ22	300~800A	+5V		• Wide range of applications • Single power supply type	78

Current Sensor / Guide map

SERIES	Model	Main Specification					UL R/C	Features	Page
		Circuit System	Mounting Configuration	Primary Conductor	Rated Current	Power Voltage			
L05Z 	L05Z800S15	Open loop	Connector (JST)	Through hole □20.5× 10.5	800A	+15V		• Wide range of applications • Single power supply type	79
L34S 	L34SxxxD15	Open loop	Connector (MOLEX)	Through hole □40.5× 40.5	200~1500A	±15V	●	• High-Curent (1500A_max) • Wide electrical current range • Large aperture	80
LA01P(M) LA04P 	LA01MxxxS05	Open loop	On-board (SMT)	Built-in bus-bar	21~41A *1	+5V		• Open loop - one chip ASIC model • Low profile package(8.5mm on PCB) • High-speed response *1 : Measurement current range	81
	LA01PxxxS05		On-board (Discrete)		35~85A *1				
	LA04P170S05				170A *1				
LA02P LA03P 	LA02PxxxS03	Open loop	On-board (Discrete)	Built-in bus-bar	21~85A *1	+3.3V	●	• Open loop - one chip ASIC model • Creepage distance : 13mm • Low profile package(9.2mm on PCB) • High-speed response *1 : Measurement current range	96
	LA03PxxxS05					+5V			
S22P 	S22PxxxS05M2 S22PxxxS05P	Closed loop	On-board	Built-in bus-bar	6~25A	+5V	●	• Voltage - output type • Name end"M2"; Backward compatible of normal model, External magnetic field improvement model • Name end "P"; Short lead model of normal model	106
S23P 	S23PxxxD15M2 S23PxxxD15M1 S23PxxxD15	Closed loop	On-board	Built-in bus-bar	100A	±15V	●	• High accuracy, High performance • Name end"M2"; Backward compatible, dv/dt improvement type • Name end"M1": Conversion Ration 1:1000 • Conversion Ration - Normal & M2 type are 1:2000	108
S25P 	S25P050D15X S25P100D15Y S25P100D15X S25P150D15Y	Closed loop	On-board	Through hole □13×8.5	50~150A	±15V	●	• High accuracy, High performance • Conversion Ration 1:1000 (Name end "X"), 1:2000 (Name end "Y")	111
S21S 	S21S180D15JN	Closed loop	Connector (JST)	Through hole R10	180A	±15V	●	• Semicircle aperture • Conversion Ration 1:4000	112
S20S 	S20S200D15M1	Closed loop	Connector (JST)	Through hole ϕ20.5	200A	±15V		• High accuracy, High performance • Conversion Ration 1:2000	113
S26P 	S26P200D15Y	Closed loop	On-board	Through hole □17×11	200A	±15V	●	• High accuracy, High performance • Conversion Ration 1:2000	114
S27S 	S27S300D15Y S27S300D15YM	Closed loop	Connector (MOLEX)	Through hole ϕ20	300A	±20V	●	• High accuracy, High performance • Conversion Ration 1:2000 • Connector:MOLEX (2 type)	115
S28S 	S28S500D24Z S28S500D24ZM	Closed loop	Connector (MOLEX)	Through hole ϕ30	500A	±24V	●	• High-current, High accuracy • Conversion Ration 1:5000 • Connector:MOLEX (2 type)	117
S29S 	S29S1T0D24Z S29S1T0D24ZM S29S1T0D24ZJ	Closed loop	Connector (MOLEX/JST)	Through hole ϕ38.5	1000A	±24V	●	• High-current, High accuracy • Conversion Ration 1:5000 • Connector:MOLEX (2 type), JST (1 type)	119

Circuit system

Tamura offers multiple current sensor options to meet application requirements : Open Loop or Linear type (magnetic proportionality); Closed Loop or Servo-type (magnetic balance); Flux-Gate (magnetic equilibrium).

Open loop

If the current is applied to the cable, the magnetic field proportional to the current in surroundings of the cable is generated on Ampere's rule. The magnetic core is set in surroundings of the cable to improve the sensitivity. The Magnetic field is converted into the voltage by the linear type - hall element is placed in the gap of the magnetic core. But the output voltage of hall element is several tens of milli-volt, It enlarges it to the output voltage of the product specification (several volts) by the operational amplifier.

The sensor output voltage is linearly proportional to the magnetic flux generated by the measured current. In general, the open loop sensor is voltage output. The characteristic (accuracy, linearity, response, temperature property, and high-frequency current*1, etc.) of the current sensor is not a little better than that of other circuit methods because of the difference of the circuit configuration (magnetic circuit , magnetism-electric conversion and amplification of electrical circuit). However, the size can be reduced and it is lower -cost more than other circuit methods.

*1-We use silicon steel and permalloy in internal magnetic core of the open-loop sensors in order to improve the measurement possible current and hysteresis error. Therefore, at the frequency of the applied current exceeds more than several KHz, there is a possibility that the internal circuit may be damaged by the heat generation of the core loss.

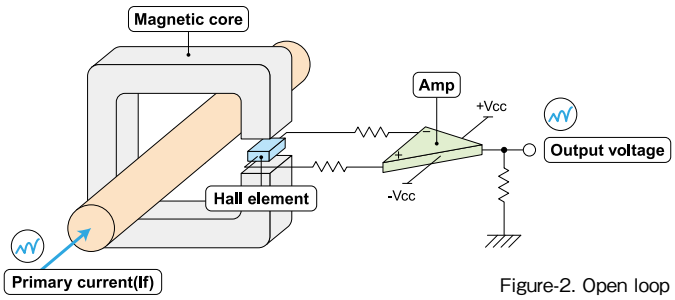


Figure-2. Open loop

Closed loop

The closed loop type current sensor measures the applied current on the condition that the magnetic flux density in the magnetic core is extremely zero. Therefore, there is no influence on accuracy by the non-linearity and hysteresis in the core because the flux density in the magnetic core operates in the starting point of the B-H curve in the operation region*1. The characteristic of the closed loop type is better than the open loop type current sensor.

The addition of a secondary winding (1000-5000 turns) on the magnetic core allows feedback current to be supplied in opposition to measured current to compensate or cancel the magnetic flux generated by the measured current. The output of the closed loop sensor is a current output proportional to the measured current divided by the number of secondary winding turns*2.

*1-At the high-frequency current (1-2kHz or more) and the pulse current, current sensor should operate at ACCT (transformer) because the loop gain of the feedback control decreases. Under such a condition, the magnetic flux in the magnetic core is generated .
*2-Output current = (Primary current) / (Secondary winding turns)

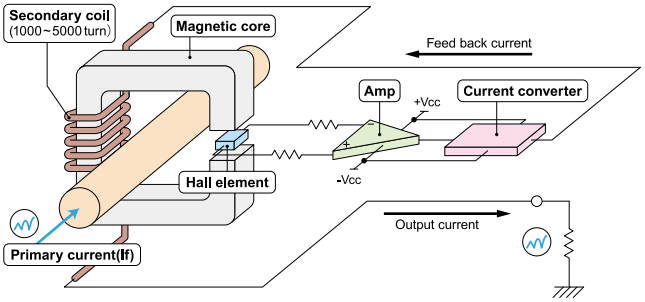


Figure-3. Closed loop

Fluxgate system

The flux-gate current sensor replaces the Hall element with probe coil made of highly saturable material. The magnetic offset of the probe coil does not occur in order to be driven by high-frequency current. The flux-gate utilizes a magnetic balance system to achieve high accuracy, temperature stable current output typically converted to a voltage output with an internal high precision resistor.

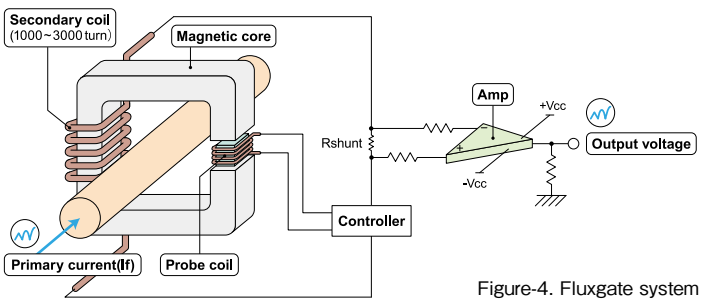


Figure-4. Fluxgate system

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.

Part numbering system

Outlines

Ex)

L03 S *** D 15 □□□□
S22 P *** S 05 □□□□
❶ ❷ ❸ ❹ ❺ ❻

❶ Model (3 figures or 4 figures)

L ** : Open loop system (Magnetic Proportion System)
S ** : Closed loop system (Servo system)
F ** : Fluxgate system
LA ** : Open loop system - One chip ASIC

❷ Mounting configuration (1 figure)

P : Through Hole Mounting Device
M : Surface Mount Device
S : Bolt-on Device

❸ Rated current (3 figures)

Ex)
2R5 : 2.5A 005 : 5A
050 : 50A 500 : 500A
1T0 : 1000A

❹ Control power supply type (1 figure)

S : Single supply D : Dual supply

❺ Power supply voltage (2 figures)

15 : 15V 05 : 5V

❻ Special specification (4 figures_MAX.)

Ex)

Figures	Special specification
B	With a busbar
C	With a cover
J	Connector Maker : JST
M	Connector Maker : Molex
W	Saturation current is increased.
X	Secondary coil :1000 Turns
Z	Secondary coil : 5000 Turns
Y	Secondary coil : 2000 Turns

Important Notice

1. The content of this information is subject to change without prior notice for the purpose of improvements, etc. Ensure that you are in possession of the most up-to-date information when using this product.

2. This product is intended to be used in general electronics applications (electric home appliances, business equipment, information equipment, communication terminal equipment, measuring devices, industrial equipment, and so on). This product is neither intended nor warranted for use in following equipment or devices:

   Special application (such as for medical devices, transportation equipment, traffic signal control equipment, fire and crime prevention equipment, aeronautics and space devices, nuclear power control, fuel control, in-vehicle equipment, safety devices, and so on) in which extremely high quality and high reliability is required, or if the malfunction or failures of product could be cause loss of human life, bodily injury.

   Tamura Corporation shall not be held responsible for any damage incurred by customers or any third party when products are used in special application, unless specifically permitted in this document.

3. Tamura Corporation constantly strives to improve quality and reliability, but malfunction or failures are bound to occur with some probability in current sensor. To ensure that failures do not cause accidents resulting in injury or death, fire accidents, social damage, and so on, users are to thoroughly verify the safety of their designs in devices and/or systems.

4. The operation examples and circuit examples shown in this information are for reference purposes only, and Tamura Corporation disclaims all responsibility for any violations of industrial property rights, intellectual property rights and any other rights owned by Tamura Corporation or third parties that these may entail.

5. The circuit examples and part constants listed in these specifications are provided as reference for the verification of characteristics. The user is to perform design, verification, and judgment under his or her own responsibility, taking into account the various conditions.

6. The products are designed for use in environments where consumer electronics are commonly used. It is not designed for use in special environments such as listed below, and if such use is considered, the user is to perform thorough safety and reliability checks under his/her responsibility.

7. This product is not designed to resist radiation.
   - *Use in liquids such as water, oil, chemical solutions, or organic solvents, and use in locations where the product will be exposed to such liquids.*
   - *Use that involves exposure to direct sunlight, outdoor exposure, or dusty conditions.*
   - *Use in locations where corrosive gases such as sea winds, Cl2, H2S, NH3, SO2, or NO2, are present. (Some product improves durability)*
   - *Use in environments with strong static electricity or electromagnetic radiation.*
   - *Use that involves placing inflammable material next to the product.*
   - *Use of this product either sealed with a resin filling or coated with resin.*
   - *Use of water or a water soluble detergent for flux cleaning.*
   - *Use in locations where condensation is liable to occur.*

8. Do not use or otherwise make available the TAMUTA products or the technology described in this document for any military purposes, including without limitation, for the design, development, use, stockpiling or manufacturing of mass destruction weapons (e.g. nuclear, chemical, or biological weapons or missile technology products). When exporting and re-exporting the products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations including, without limitation, Japan -Foreign Exchange and Foreign Trade Control Law and U.S.-Export Administration Regulations. The TAMURA products and related technology should not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations.

9. Please contact your TAMURA sales office for details as to environmental matters such as the RoHS compatibility of Product. Please use TAMURA products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. TAMURA assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.

10. TAMURA assumes no liability for damages or losses incurred by you or third parties as a result of unauthorized use of TAMURA products.

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According to UL508 standard and CSA C22.2 No.14 standard

Note> Models F01P; followed by 006, 015, 025 or 050, followed by S05, may be followed by D, or L, may be followed by slash and any numbers from 01 through 99 or blank. Models F02P; followed by 006, 015, 025 or 050, followed by S05, may be followed by D, L, -P0, -P1, -P2, -P3, -P4, -P5, -P6, -P7, -P8, -P9, -PA, -PB, -PC, -PD, -PE or -PF, may be followed by slash and any numbers from 01 through 99 or blank. Models F03P; followed by 006, 015, 025 or 050, followed by S05, may be followed by D, L, -P1, -P2, -P3, -P4, -P5, -P6, -P7, -P8, -P9, -PA, -PB, -PC, -PD, -PE or -PF, may be followed by slash and any numbers from 01 through 99 or blank, may be prefixed by V.

Power Circuit and Motor-mounted Apparatus - Component
UL FILE No.E243511

Series	Model	Requirements Evaluated to (US and/or CN)
F01P	F01P***S05	USR
F02P	F02P***S05	USR
F03P	F03P***S05	USR
F23P	F23P***S05R	USR, CNR
L07P	L07P***D15 L07P***D15S L07P***S05	USR, CNR
L18P	L18P***D15 L18P***D15C L18P***D15-OP L18P***D15AH L18P***S05 L18P***S05R L18P***S12 SL18P***D15 L18P***D15AHV	USR, CNR
L31S	L31S***S05S	USR, CNR
	L31S***S05FS	USR
L32P	L32P***S05(B)FS	USR
L34S	L34S***D15 L34S***D15C L34S***D15T L34S***D15TC	USR, CNR
L37S	L37S***D15J L37S***D15M L37S***D15LJ L37S***D15LM L37S***S05J L37S***S05M	USR
LA02P	LA02P***S03	USR, CNR
LA03P	LA03P***S05	USR, CNR

Note: US indicates United States Standard.
CN indicates Canadian National Standard.

Ratings - Environmental

Series	Model	Environmental	
		Maximum Surrounding Air Temperature rating	Pollution Degree
F01P	F01P***S05	105°C.	2
F02P	F02P***S05	105°C.	2
F03P	F03P***S05	105°C.	2
F23P	F23P***S05R	85°C.	2
L07P	L07P***D15 L07P***D15S L07P***S05	80°C.	2
L18P	L18P***D15 L18P***D15C L18P***D15-OP L18P***D15AH L18P***S05 L18P***S05R L18P***S12 SL18P***D15 L18P***D15AHV	80°C.	2
L31S	L31S***S05S L31S***S05FS	85°C.	2
L32P	L32P***S05(B)FS	85°C.	2
L34S	L34S***D15 L34S***D15C	80°C.	2
	L34S***D15T	105°C.	2
L37S	L37S***D15J L37S***D15M L37S***D15LJ L37S***D15LM L37S***S05J L37S***S05M	85°C.	2
LA02P	LA02P***S03	110°C.	2
LA03P	LA03P***S05	110°C.	2

According to UL508 standard and CSA C22.2 No.14 standard

Note> Models F01P; followed by 006, 015, 025 or 050, followed by S05, may be followed by D, or L, may be followed by slash and any numbers from 01 through 99 or blank. Models F02P; followed by 006, 015, 025 or 050, followed by S05, may be followed by D, L, -P0, -P1, -P2, -P3, -P4, -P5, -P6, -P7, -P8, -P9, -PA, -PB, -PC, -PD, -PE or -PF, may be followed by slash and any numbers from 01 through 99 or blank. Models F03P; followed by 006, 015, 025 or 050, followed by S05, may be followed by D, L, -P1, -P2, -P3, -P4, -P5, -P6, -P7, -P8, -P9, -PA, -PB, -PC, -PD, -PE or -PF, may be followed by slash and any numbers from 01 through 99 or blank, may be prefixed by V.

Power Circuit and Motor-mounted Apparatus - Component
UL FILE No.E243511

Series	Model	Requirements Evaluated to (US and/or CN)
S21S	S21S180D15JN	USR, CNR
S22P	S22P***S05 S22P***S05P S22P***S05M2	USR, CNR
S23P	S23P50/100D15 S23P50/100D15M1 S23P50/100D15M2	USR, CNR
S25P	S25P***D15*	USR, CNR
S26P	S26P200D15Y	USR, CNR
S27S	S27S300D15Y S27S300D15YM	USR, CNR
S28S	S28S500D24Z S28S500D24ZM	USR
S29S	S29S1T0D24Z S29S1T0D24ZM S29S1T0D24ZJ	USR
S30S	S30S2T0D24Z S30S2T0D24ZM S30S2T0D24ZJ	USR, CNR

Note: US indicates United States Standard.
CN indicates Canadian National Standard.

Ratings - Environmental

Series	Model	Environmental	
		Maximum Surrounding Air Temperature rating	Pollution Degree
S21S	S21S180D15JN	80°C.	2
S22P	S22P***S05 S22P***S05P S22P***S05M2	85°C.	2
S23P	S23P50/100D15 S23P50/100D15M1 S23P50/100D15M2	85°C.	2
S25P	S25P***D15*	85°C.	2
S26P	S26P200D15Y	85°C.	2
S27S	S27S300D15Y S27S300D15YM	85°C.	2
S28S	S28S500D24Z S28S500D24ZM	70°C.	2
S29S	S29S1T0D24Z S29S1T0D24ZM S29S1T0D24ZJ	85°C.	2
S30S	S30S2T0D24Z S30S2T0D24ZM S30S2T0D24ZJ	85°C.	2

According to UL508 standard and CSA C22.2 No.14 standard

Note> Models F01P; followed by 006, 015, 025 or 050, followed by S05, may be followed by D, or L, may be followed by slash and any numbers from 01 through 99 or blank. Models F02P; followed by 006, 015, 025 or 050, followed by S05, may be followed by D, L, -P0, -P1, -P2, -P3, -P4, -P5, -P6, -P7, -P8, -P9, -PA, -PB, -PC, -PD, -PE or -PF, may be followed by slash and any numbers from 01 through 99 or blank. Models F03P; followed by 006, 015, 025 or 050, followed by S05, may be followed by D, L, -P1, -P2, -P3, -P4, -P5, -P6, -P7, -P8, -P9, -PA, -PB, -PC, -PD, -PE or -PF, may be followed by slash and any numbers from 01 through 99 or blank, may be prefixed by V.

Ratings - Electrical

Series	Model	Primary (Feed - through)	Secondary (Sensing)	
			Input	Output
F01P	F01P006S05	6 A, 600 Vrms	5 Vdc, 25 mA	2.5±2.2 Vdc, ±0.5 mA
	F01P015S05	15 A, 600 Vrms	5 Vdc, 30 mA	
	F01P025S05	25 A, 600 Vrms	5 Vdc, 35 mA	
	F01P050S05	50 A, 600 Vrms	5 Vdc, 55 mA	
F02P	F02P006S05	6 A, 600 Vrms	5 Vdc, 25 mA	2.5±2.2 Vdc, ±0.5 mA
	F02P015S05	15 A, 600 Vrms	5 Vdc, 30 mA	
	F02P025S05	25 A, 600 Vrms	5 Vdc, 35 mA	
	F02P050S05	50 A, 600 Vrms	5 Vdc, 55 mA	
F03P	F03P006S05	6 A, 600 Vrms	5 Vdc, 25 mA	2.5±2.2 Vdc, ±0.5 mA
	F03P015S05	15 A, 600 Vrms	5 Vdc, 30 mA	
	F03P025S05	25 A, 600 Vrms	5 Vdc, 35 mA	
	F03P050S05	50 A, 600 Vrms	5 Vdc, 55 mA	
F23P	F23P050S05R	50 A, 600 Vrms	5 Vdc, 55mA	2.5 ±2.2 Vdc, ±0.5mA
	F23P100S05R	100 A, 600 Vrms	5 Vdc, 110mA	
L07P	L07P003D15 L07P003D15S	3 A, 600 Vrms	±15 Vdc, ±30 mA	0 - 4 Vdc, 0.4 mA
	L07P005D15 L07P005D15S	5 A, 600 Vrms		
	L07P010D15 L07P010D15S	10 A, 600 Vrms		
	L07P015D15 L07P015D15S	15 A, 600 Vrms		
	L07P020D15 L07P020D15S	20 A, 600 Vrms		
	L07P025D15 L07P025D15S	25 A, 600 Vrms		
	L07P030D15 L07P030D15S	30 A, 600 Vrms		
	L07P003S05	3 A, 600 Vrms	5 Vdc, 30 mA	0 - 3.75 Vdc, 0.4 mA
	L07P005S05	5 A, 600 Vrms		
	L07P010S05	10 A, 600 Vrms		
	L07P015S05	15 A, 600 Vrms		
	L07P020S05	20 A, 600 Vrms		
	L07P025S05	25 A, 600 Vrms		
	L07P030S05	30 A, 600 Vrms		
L18P	L18P003D15	3 A, 600 Vrms	±15 Vdc, ±15 mA	0 - 4 Vdc, 0.4 mA
	L18P005D15	5 A, 600 Vrms		
	L18P010D15	10 A, 600 Vrms		
	L18P015D15	15 A, 600 Vrms		
	L18P020D15	20 A, 600 Vrms		
	L18P025D15	25 A, 600 Vrms		
	L18P030D15	30 A, 600 Vrms		
	L18P040D15	40 A, 600 Vrms		
	L18P050D15	50 A, 600 Vrms		
	L18P060D15	60 A, 600 Vrms		

Series	Model	Primary (Feed - through)	Secondary (Sensing)	
			Input	Output
L18P	L18P003D15-OP	3 A, 600 Vrms	±15 Vdc, ±15 mA	0 - 4 Vdc, 0.4 mA
	L18P005D15-OP	5 A, 600 Vrms		
	L18P010D15-OP	10 A, 600 Vrms		
	L18P015D15-OP	15 A, 600 Vrms		
	L18P020D15-OP	20 A, 600 Vrms		
	L18P025D15-OP	25 A, 600 Vrms		
	L18P030D15-OP	30 A, 600 Vrms		
	L18P040D15-OP	40 A, 600 Vrms		
	L18P050D15-OP	50 A, 600 Vrms		
	L18P060D15-OP	60 A, 600 Vrms		
L18P	L18P003D15AH	3 A, 600 Vrms	±15 Vdc, ±15 mA	0 - 4 Vdc, 0.4 mA
	L18P005D15AH	5 A, 600 Vrms		
	L18P010D15AH	10 A, 600 Vrms		
	L18P015D15AH	15 A, 600 Vrms		
	L18P020D15AH	20 A, 600 Vrms		
	L18P025D15AH	25 A, 600 Vrms		
	L18P030D15AH	30 A, 600 Vrms		
	L18P040D15AH	40 A, 600 Vrms		
	L18P050D15AH	50 A, 600 Vrms		
	L18P060D15AH	60 A, 600 Vrms		
L18P	L18P003S05	3 A, 600 Vrms	5 Vdc, 15 mA	0 - 4 Vdc, 0.4 mA
	L18P005S05	5 A, 600 Vrms		
	L18P010S05	10 A, 600 Vrms		
	L18P015S05	15 A, 600 Vrms		
	L18P020S05	20 A, 600 Vrms		
	L18P025S05	25 A, 600 Vrms		
	L18P030S05	30 A, 600 Vrms		
	L18P040S05	40 A, 600 Vrms		
	L18P050S05	50 A, 600 Vrms		
	L18P060S05	60 A, 600 Vrms		
L18P	L18P003S05R	3 A, 600 Vrms	5 Vdc, 15 mA	0 - 3.2 Vdc, 0.32 mA
	L18P005S05R	5 A, 600 Vrms		
	L18P010S05R	10 A, 600 Vrms		
	L18P015S05R	15 A, 600 Vrms		
	L18P020S05R	20 A, 600 Vrms		
	L18P025S05R	25 A, 600 Vrms		
	L18P030S05R	30 A, 600 Vrms		
	L18P040S05R	40 A, 600 Vrms		
	L18P050S05R	50 A, 600 Vrms		
	L18P060S05R	60 A, 600 Vrms		
L18P	L18P003S12	3 A, 600 Vrms	12 Vdc, 15 mA	0 - 4 Vdc, 0.4 mA
	L18P005S12	5 A, 600 Vrms		
	L18P010S12	10 A, 600 Vrms		
	L18P015S12	15 A, 600 Vrms		
	L18P020S12	20 A, 600 Vrms		
	L18P025S12	25 A, 600 Vrms		
	L18P030S12	30 A, 600 Vrms		
	L18P040S12	40 A, 600 Vrms		
	L18P050S12	50 A, 600 Vrms		
	L18P060S12	60 A, 600 Vrms		

According to UL508 standard and CSA C22.2 No.14 standard

Ratings - Electrical

Series	Model	Primary (Feed - through)	Secondary (Sensing)	
			Input	Output
L18P	SL18P003D15	3 A, 600 Vrms	±15 Vdc, ±15 mA	0 - 4 Vdc, 0.4 mA
	SL18P005D15	5 A, 600 Vrms		
	SL18P010D15	10 A, 600 Vrms		
	SL18P015D15	15 A, 600 Vrms		
	SL18P020D15	20 A, 600 Vrms		
	SL18P025D15	25 A, 600 Vrms		
	SL18P030D15	30 A, 600 Vrms		
	SL18P040D15	40 A, 600 Vrms		
	SL18P050D15	50 A, 600 Vrms		
	SL18P060D15	60 A, 600 Vrms		
L18P	L18P003D15AHV	3 A, 600 Vrms	±15 Vdc, ±15 mA	0 - 4 Vdc, 0.4 mA
	L18P005D15AHV	5 A, 600 Vrms		
	L18P010D15AHV	10 A, 600 Vrms		
	L18P015D15AHV	15 A, 600 Vrms		
	L18P020D15AHV	20 A, 600 Vrms		
	L18P025D15AHV	25 A, 600 Vrms		
	L18P030D15AHV	30 A, 600 Vrms		
	L18P040D15AHV	40 A, 600 Vrms		
	L18P050D15AHV	50 A, 600 Vrms		
	L18P060D15AHV	60 A, 600 Vrms		
L18P	L18P003D15C	3 A, 600 Vrms	±15 Vdc, ±15 mA	0 - 4 Vdc, 0.4 mA
	L18P005D15C	5 A, 600 Vrms		
	L18P010D15C	10 A, 600 Vrms		
	L18P015D15C	15 A, 600 Vrms		
	L18P020D15C	20 A, 600 Vrms		
	L18P025D15C	25 A, 600 Vrms		
	L18P030D15C	30 A, 600 Vrms		
	L18P040D15C	40 A, 600 Vrms		
	L18P050D15C	50 A, 600 Vrms		
	L18P060D15C	60 A, 600 Vrms		
L31S	L31S050S05S L31S050S05FS	50 A, 600 Vrms	5 Vdc, 15 mA	1.875 - 3.125 Vdc, 0.3125 mA
	L31S100S05S L31S100S05FS	100 A, 600 Vrms		
	L31S200S05S L31S200S05FS	200 A, 600 Vrms		
	L31S300S05S L31S300S05FS	300 A, 600 Vrms		
	L31S400S05S L31S400S05FS	400 A, 600 Vrms		
	L31S500S05S L31S500S05FS	500 A, 600 Vrms		
	L31S600S05S L31S600S05FS	600 A, 600 Vrms		
L32P	L32P050S05FS L32S050S05BFS	50 A, 600 Vrms	5 Vdc, 15 mA	1.875 - 3.125 Vdc, 0.3125 mA
	L32P100S05FS L32P100S05BFS	100 A, 600 Vrms		
	L32P150S05FS	150 A, 600 Vrms		
	L32P200S05FS	200 A, 600 Vrms		
	L32P300S05FS	300 A, 600 Vrms		
	L32P400S05FS	400 A, 600 Vrms		

Series	Model	Primary (Feed - through)	Secondary (Sensing)	
			Input	Output
L34S	L34S200D15 L34S200D15C L34S200D15T L34S200D15TC	200 A, 600 Vrms	±15 Vdc, ±25mA	0 - 4 Vdc, 0.4 mA
	L34S300D15 L34S300D15C L34S300D15T L34S300D15TC	300 A, 600 Vrms		
	L34S400D15 L34S400D15C L34S400D15T L34S400D15TC	400 A, 600 Vrms		
	L34S500D15 L34S500D15C L34S500D15T L34S500D15TC	500 A, 600 Vrms		
	L34S600D15 L34S600D15C L34S600D15T L34S600D15TC	600 A, 600 Vrms		
	L34S1T0D15 L34S1T0D15C L34S1T0D15T L34S1T0D15TC	1000 A, 600 Vrms		
	L34S1T2D15 L34S1T2D15C L34S1T2D15T L34S1T2D15TC	1200 A, 600 Vrms		
	L34S1T5D15 L34S1T5D15C L34S1T5D15T L34S1T5D15TC	1500 A, 600 Vrms		
L37S	L37S050D15J L37S050D15M L37S050D15LJ L37S050D15LM	50 A, 600 Vrms	±15 Vdc, ±25mA	0 - 4 Vdc, 0.4 mA
	L37S100D15J L37S100D15M L37S100D15LJ L37S100D15LM	100 A, 600 Vrms		
	L37S200D15J L37S200D15M L37S200D15LJ L37S200D15LM	200 A, 600 Vrms		
	L37S300D15J L37S300D15M L37S300D15LJ L37S300D15LM	300 A, 600 Vrms		
	L37S400D15J L37S400D15M L37S400D15LJ L37S400D15LM	400 A, 600 Vrms		
	L37S500D15J L37S500D15M L37S500D15LJ L37S500D15LM	500 A, 600 Vrms		
	L37S600S05J L37S600S05M L37S600S05LJ	600 A, 600 Vrms		
L37S	L37S050S05J L37S050S05M	50 A, 600 Vrms	5 Vdc, 20mA	0 - 4 Vdc, 0.4 mA
	L37S100S05J L37S100S05M	100 A, 600 Vrms		
	L37S200S05J L37S200S05M	200 A, 600 Vrms		
	L37S300S05J L37S300S05M	300 A, 600 Vrms		
	L37S400S05J L37S400S05M	400 A, 600 Vrms		
	L37S500S05J L37S500S05M	500 A, 600 Vrms		
	L37S600S05J L37S600S05M	600 A, 600 Vrms		

According to UL508 standard and CSA C22.2 No.14 standard

Ratings - Electrical

Series	Model	Primary (Feed - through)	Secondary (Sensing)	
			Input	Output
S21S	S21S180D15JN	180 A, 600 Vrms	±15 Vdc, ±25mA	0 - 1.35 Vdc, 45mA
S22P	S22P006S05 S22P006S05P S22P006S05M2	6 A, 600 Vrms	5 Vdc, 12.5 mA	0 - 3.125 Vdc, 3mA
	S22P015S05 S22P015S05P S22P015S05M2	15 A, 600 Vrms		0 - 3.125 Vdc, 7.5mA
	S22P025S05 S22P025S05P S22P025S05M2	25 A, 600 Vrms		0 - 3.125 Vdc, 12.5mA
S23P	S23P50/100D15	100 A, 600 Vrms	MAX. ±15 Vdc, ±62.5 mA	-2.5 - 2.5 Vdc; -50 - 50mA
	S23P50/100D15M1	100 A, 600 Vrms	MAX. ±15 Vdc, ±112.5 mA	-5 - 5 Vdc; -100 - 100mA
	S23P50/100D15M2	100 A, 600 Vrms	MAX. ±15 Vdc, ±62.5 mA	-2.5 - 2.5 Vdc; -50 - 50mA
S25P	S25P050D15X	50 A, 600 Vrms	MAX. ±15 Vdc, ±62.5 mA	-5 - 5 Vdc; -50 - 50mA
	S25P100D15X	100 A, 600 Vrms	MAX. ±15 Vdc, ±112.5 mA	-5 - 5 Vdc; -100 - 100mA
	S25P100D15Y	100 A, 600 Vrms	MAX. ±15 Vdc, ±62.5 mA	-5 - 5 Vdc; -50 - 50mA
	S25P150D15Y	150 A, 600 Vrms	MAX. ±15 Vdc, ±87.5 mA	-3.75 - 3.75 Vdc; -75 - 75mA
S26P	S26P200D15Y	200 A, 600 Vrms	MAX. ±15 Vdc, ±112.5 mA	-5 - 5 Vdc; -100 - 100mA
S27S	S27S300D15Y S27S300D15YM	300 A, 600 Vrms	±15 Vdc, ±162.5 mA	0 - ±7.5 Vdc, ±150mA
S28S	S28S500D24Z S28S500D24ZM	500 A, 600 Vrms	±24 Vdc, ±130 mA	0 - ±5 Vdc, ±100mA
S29S	S29S1T0D24Z S29S1T0D24ZM S29S1T0D24ZJ	1000 A, 600 Vrms	±24 Vdc, ±235 mA	0 - ±10 Vdc, ±200mA
S30S	S30S2T0D24Z S30S2T0D24ZM S30S2T0D24ZJ	2000 A, 600 Vrms	24 Vdc, 45 mA; -24 Vdc, -45 mA	0 - ±10 Vdc, ±400mA
LA02P	LA02P021S03 LA02P035S03 LA02P054S03 LA02P085S03	50 A, 480Vac	3.3Vdc, 0.5mA	3.3Vdc, 0.5mA
LA03P	LA03P021S05 LA03P035S05 LA03P054S05 LA03P085S05	50 A, 480Vac	5Vdc, 0.5mA	5Vdc, 0.5mA

According to UL508 standard and CSA C22.2 No.14 standard

Note> Models F01P; followed by 006, 015, 025 or 050, followed by S05, may be followed by D, or L, may be followed by slash and any numbers from 01 through 99 or blank. Models F02P; followed by 006, 015, 025 or 050, followed by S05, may be followed by D, L, -P0, -P1, -P2, -P3, -P4, -P5, -P6, -P7, -P8, -P9, -PA, -PB, -PC, -PD, -PE or -PF, may be followed by slash and any numbers from 01 through 99 or blank. Models F03P; followed by 006, 015, 025 or 050, followed by S05, may be followed by D, L, -P1, -P2, -P3, -P4, -P5, -P6, -P7, -P8, -P9, -PA, -PB, -PC, -PD, -PE or -PF, may be followed by slash and any numbers from 01 through 99 or blank, may be prefixed by V.

CAUTION

The descriptions are directed from UL.

Series	Model	CAUTION / Notice
F01P	F01P***S05	- / Notice: The maximum temperature at top of case shall not be higher than 110°C and busbar shall not be higher than 108°C in the end-use product.
F02P	F02P***S05	
F03P	F03P***S05	
F23P	F23P***S05R	- / Notice: The devices have been evaluated with the provision of the two cupper conductor-cum-heat sink as the primary conductor, measured 100 by 85 mm, 0.5 mm thick.
L07P	L07P***D15 L07P***D15S L07P***S05	- / -
L18P	L18P***D15 L18P***D15C L18P***D15-OP L18P***D15AH L18P***S05 L18P***S05R L18P***S12 SL18P***D15 L18P***D15AHV	- / -
L31S	L31S***S05S L31S***S05FS	- / Notice: Do not wrap the primary conductor around the core part of the product for preventing to reduce the required Spacings.
L32P	L32P***S05(B)FS	- / Notice: Do not wrap the primary conductor around the core part of the product for preventing to reduce the required Spacings. The maximum temperature at case should not exceed 150˚C by the case's insulation performance.
L34S	L34S***D15 L34S***D15C L34S***D15T L34S***D15TC	CAUTION: Do not wrap the primary conductor around the core part of the product for preventing to reduce the required Spacings. / For models with suffix T in Temperature Rating designation detailed in NOMENCLATURE for models in L34S series and L34SC series, the maximum temperature of the bus bar (primary conductor) shall not exceed 135°C at the end-use application.
L37S	L37S***D15J L37S***D15M L37S***D15LJ L37S***D15LM L37S***S05J L37S***S05M	- / Notice: The housing of the female connector provided by the end-product shall be evaluated as a barrier under the end-application Standard in the end-use application, in case the clearance and/or the creepage distance do not meet the requirements of the end-application Standard. The maximum temperature of busbar shall not be higher than 102.3°C respectively at the end-use application.
LA02P	LA02P***S03	- / -
LA03P	LA03P***S05	- / -

According to UL508 standard and CSA C22.2 No.14 standard

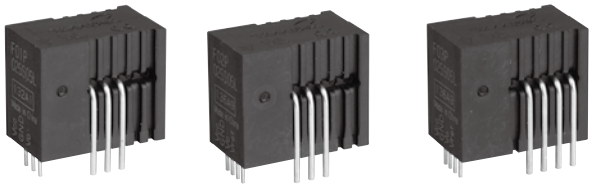
CAUTION

The descriptions are directed from UL.

Series	Model	CAUTION / Notice
S21S	S21S180D15JN	CAUTION: Do not wrap the primary conductor around the core part of the product to increase measured current. / -
S22P	S22P***S05 S22P***S05P S22P***S05M2	- / -
S23P	S23P50/100D15 S23P50/100D15M1 S23P50/100D15M2	CAUTION: Provide two min. 100 by 85 mm, 0.5mm thick cupper conductor-cum- heat sink as primary conductor of each side for safe usage. / Notice : The primary conductor temperature and PCB should not exceed 100˚C by the temperature regulations of internal parts.
S25P	S25P***D15*	CAUTION: Do not wrap the primary conductor around the core part of the product to increase measured current. / -
S26P	S26P200D15Y	CAUTION: Do not wrap the primary conductor around the core part of the product to increase measured current. / -
S27S	S27S300D15Y S27S300D15YM	- / Notice: Do not wrap the primary conductor around the core part of the product for preventing to reduce the required Spacings.
S28S	S28S500D24Z S28S500D24ZM	- / Notice: Do not wrap the primary conductor around the core part of the product for preventing to reduce the required Spacings. The maximum temperature at case should not exceed 140˚C by the case's insulation performance.
S29S	S29S1T0D24Z S29S1T0D24ZM S29S1T0D24ZJ	- / Notice: Do not wrap the primary conductor around the core part of the product for preventing to reduce the required Spacings. The primary conductor temperature should not exceed 95˚C by the temperature regulations of internal parts.
S30S	S30S2T0D24Z S30S2T0D24ZM S30S2T0D24ZJ	- / Notice: These devices have been evaluated with the bus bar cooled by Liquid CPU cooler, Type ELC-LMR240-BS manufactured by Enermax Technology Corporation. Based on this effect, the temperature of the bus bar was kept at 116.0˚C. Other than this usage, an additional evaluation shall be considered and conducted in the end-use application.

Fluxgate system / Voltage-output type, Anti-Surge current, Compact

F01P S05L, F02P S05L, F03P S05L SERIES



F01PxxxS05L F02PxxxS05L F03PxxxS05L

- Backward compatible to F01PxxxS05, F02PxxxS05, F03PxxxS05 Series.
- Anti-Surge current (4kAT, 8/20uS, single)
- Mounting area reduced, however, pin compatibility. Longitudinal dimension reduced.
- Super precision & High stability (Low temperature drift) .
- Unipolar power voltage; +5V. Rated Current; 6 ~ 50A. Multi-range models. MAX_Temp.105℃ . Voltage-output type.
- F01PxxxS05L series are designed by the pin compatibility as high-end models of S22PxxxS05M2 series.

Comparison of the main features

Series	Features
F01PxxxS05L	Without reference access.
F02PxxxS05L	With reference access, Ref_in / Ref_out.
F03PxxxS05L	With reference access, Ref_in / Ref_out. Higher creepage and clearance distances.

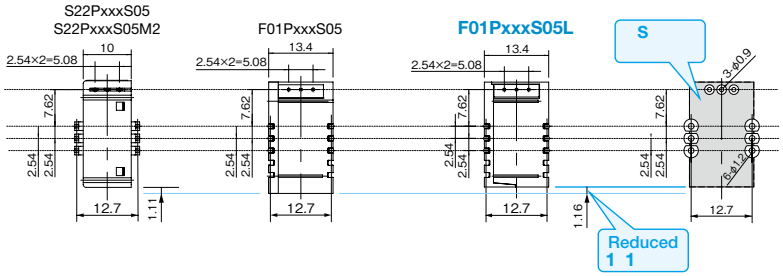
***: Rated Current symbol

SPECIFICATIONS

Spec \ Types	Value		
	F01PxxxS05L	F02PxxxS05L	F03PxxxS05L
Maximum peak current	4kAT (2kA × 2. Number of primary tunes is two tunes.)		
Rated Current If (xxx: Rated Current symbol)	6A (006) / 15A (015) / 25A (025) / 50A (050)		
Maximum current (At Vcc=+5V, Ta=+105℃)	± 20A (If=6A) / ± 51A (If=15A) / ± 85A (If=25A) / ± 150A (If=50A)		
Existence of reference access	No	Yes	
Number of primary busbar	3pcs		4pcs
Clearance distance, Primary ⇔ Secondary	7.7mm	7.5mm	8.2mm
STANDARDS	UL508 (file No. E243511), EN50178, EN61010-1, EN60950-1		
Ambient operating temperature	− 40℃ ~ +105℃		

Mounting area

The mounting area has been reduced more than the F01P / F02P / F03PxxxS05 series. However, the F01P / F02P / F03PxxxS05L series series are 100% compatible with the F01P / F02P / F03PxxxS05series in regards to the footprint mounting.

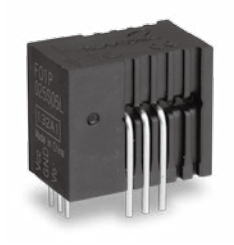


The F02P/F03PxxxS05L series also similarly reduces the mounting area.

The above-mentioned comparison tables are the auxiliary data for understanding each series. For details, please confirm the next page or subsequent ones. ▶▶▶

Fluxgate system / Voltage-output type Anti-Surge current, Compact size

F01P L SERIES



ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Comment
Supply voltage	Vcc	V	7	
Primary conductor temperature	—	℃	110	
ESD (HBM: Human Body Model)	—	kV	4	C=100pF, R=1.5k Ω
Maximum peak current	—	kAT	4	Current waveform : ・Front time 8μs ・Time to half value 20μs ・single

ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Comment
Insulation voltage	Vd	—	AC4200V, for 1minute (Sensing current 0.5mA)	Primary ⇔ Secondary
Insulation Resistance	R_{IS}	—	≧ 500M Ω (at DC500V)	Primary ⇔ Secondary
Clearance distance	dCi	—	7.7mm (TYP)	Primary ⇔ Secondary
Creepage distance	dCp	—	7.7mm (TYP)	Primary ⇔ Secondary
Case material	—	—	UL94 V-0	
Comparative Tracking Index ; (CTI)	CTI	V	600	
Application example	—	—	300V, CAT Ⅲ, PD2	Reinforced isolation, non uniform field according to EN50178, EN61010
	—	—	600V, CAT Ⅲ, PD2	Reinforced isolation, non uniform field according to EN50178, EN61010

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Ambient operating temperature	Ta	℃	− 40		+ 105	
Ambient storage temperature	T_S	℃	− 40		+ 105	
Mass	m	g		12		

SPECIFICATIONS

Ta=+25℃,Np=1T,RL=10kΩ,Vcc=+5V

Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Rated Current	**F01P006S05L**	If	A		6		
	F01P015S05L				15		
	F01P025S05L				25		
	F01P050S05L				50		
Maximum current (at Vcc=＋5V, Ta=＋105℃)	**F01P006S05L**	Ipmax	A	－20		20	
	F01P015S05L			－51		51	
	F01P025S05L			－85		85	
	F01P050S05L			－150		150	
Supply Voltage		Vcc	V	4.75	5.00	5.25	
Number of primary turns		Np	T		1, 2, 3		
Number of secondary turns	**F01P006S05L**	Ns	T		1816		
	F01P015S05L				1737		
	F01P025S05L				1764		
	F01P050S05L				1600		
Consumption current (at If)	**F01P006S05L**	Icc	mA		25		Icc=15＋Ip (mA) ／ Ns
	F01P015S05L				30		
	F01P025S05L				35		
	F01P050S05L				55		
Output voltage		Vo	V	0.375		4.625	
Output voltage (at Ip=0A)		Vo	V		2.5		
Electrical offset voltage＊1	**F01P006S05L**	Voe	mV	－10.40		10.40	
	F01P015S05L			－7.10		7.10	
	F01P025S05L			－6.25		6.25	
	F01P050S05L			－5.80		5.80	
Electrical offset current reffered to primary	**F01P006S05L**	Ioe	A	－0.10		0.10	
	F01P015S05L			－0.17		0.17	
	F01P025S05L			－0.25		0.25	
	F01P050S05L			－0.46		0.46	
Temperature coefficient of Output voltage (at Ip=0A)	**F01P006S05L**	TCVo	ppm/K		±10.0	±80.0	ppm/K of 2.5V (－40℃～＋105℃)
	F01P015S05L				±7.5	±70.0	
	F01P025S05L				±6.5	±60.0	
	F01P050S05L				±6.0	±60.0	
Sensitivity (Theoretical value)	**F01P006S05L**	Gth	mV/A		104.2		625mV/If
	F01P015S05L				41.67		
	F01P025S05L				25		
	F01P050S05L				12.5		
Sensitivity error		ε_G	%	－0.7		0.7	
Temperature coefficient of Sensitivity (at Ta=－40℃～＋105℃)		TCG	ppm/K			±40	
Output Linearity		ε_L	%	－0.1		0.1	
Magnetic offset current reffered to primary (at 10×If)		I_{OM}	A	－0.1		0.1	
Output current noise reffered to primary (at 100Hz～100kHz)	**F01P006S05L**	Ino	$\mu A/(Hz)^{1/2}$		36		RL=1kΩ
	F01P015S05L				90		
	F01P025S05L				150		
	F01P050S05L				300		

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

SPECIFICATIONS

Ta=+25℃,Np=1T,RL=10kΩ,Vcc=+5V

Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Peak to peak output ripple at oscillator freqency (f t yp =450kHz)	F01P006S05L	—	mV		40	160	RL=1k Ω
	F01P015S05L				15	60	
	F01P025S05L				10	40	
	F01P050S05L				5	20	
Reaction time (at 10% of If)	F01P006S05L	tra	μs			0.3	RL=1k Ω, di/dt=18A/μs
	F01P015S05L					0.3	RL=1k Ω, di/dt=44A/μs
	F01P025S05L					0.3	RL=1k Ω, di/dt=68A/μs
	F01P050S05L					0.3	RL=1k Ω, di/dt=100A/μs
Response time 1 (at 90% of If)	F01P006S05L	tr	μs			0.3	RL=1k Ω, di/dt=18A/μs
	F01P015S05L					0.3	RL=1k Ω, di/dt=44A/μs
	F01P025S05L					0.3	RL=1k Ω, di/dt=68A/μs
	F01P050S05L					0.3	RL=1k Ω, di/dt=100A/μs
Response time 2 (at 10% of If to 90% of Vo)		tr	μs			0.6	RL=1k Ω, di/dt=If/μs
Frequency bandwidth (± 1dB)		BW	kHz	200			RL=1k Ω
Frequency bandwidth (± 3dB)		BW	kHz	300			RL=1k Ω
Output Voltage Accuracy (Overall)	F01P006S05L	X_G	%			2.5	X_G= (100 × Voe/625) + ε_G + ε_L
	F01P015S05L					1.9	
	F01P025S05L					1.8	
	F01P050S05L					1.7	

STANDARDS

EN50178, EN61010-1, EN60950-1, UL508 (file No. E243511)

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

Characteristic curve TYP

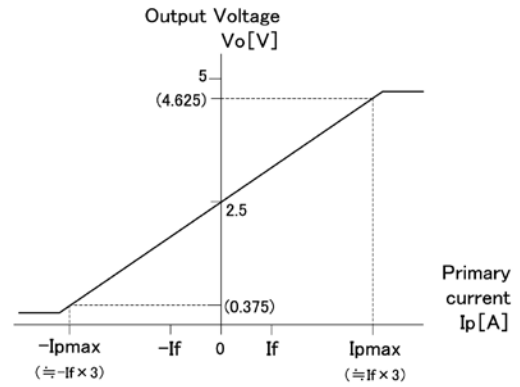


Figure 1 : Linearity curve

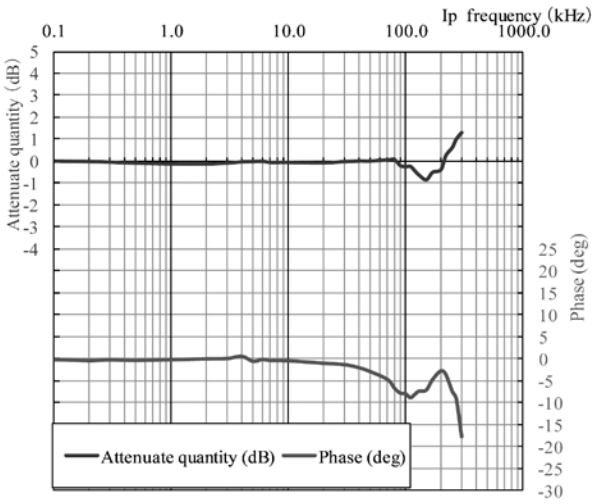


Figure 2 : Frequency response curve
ex) F01P025S05L
Measurement condition Ta=+25℃, RL=1k Ω, Ip=3A, Vcc=+5V

SUPPORT DOCUMENTATION

Maximum continuous DC primary current

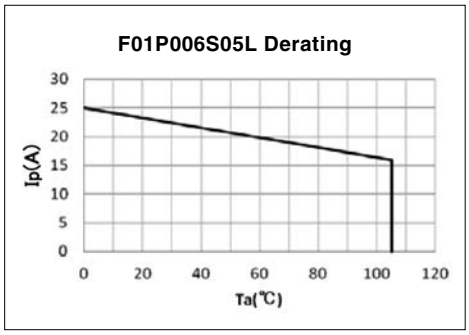


Figure 3 : Ip vs Ta for F01P006S05L

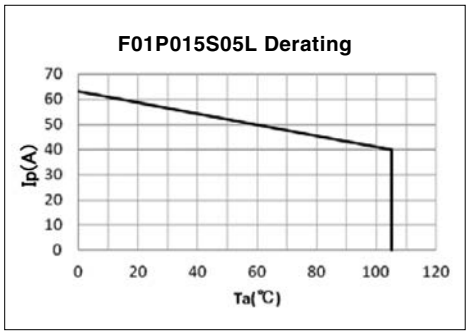


Figure 4 : Ip vs Ta for F01P015S05L

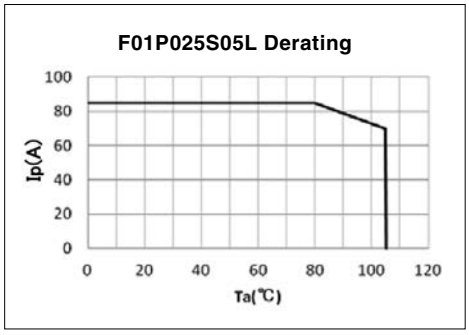


Figure 5 : Ip vs Ta for F01P025S05L

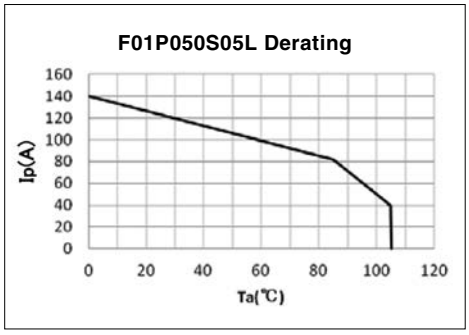


Figure 6 : Ip vs Ta for F01P050S05L

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

① Ip < Ipmax
② Junction temperature Tj < 125℃
③ Primary conductor temperature < 110℃
④ Resistor power dissipation < 0.5 x rated power

Frequency derating

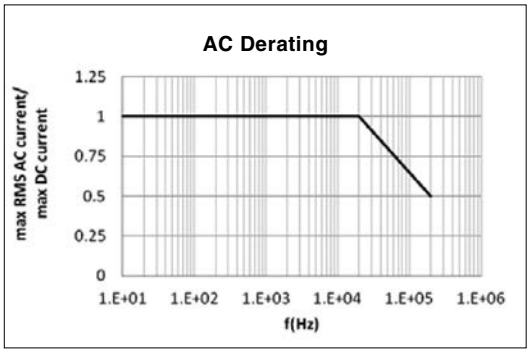
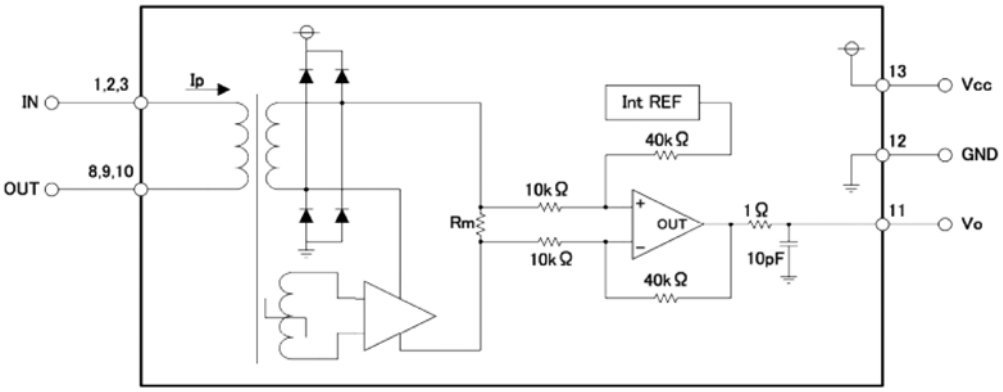
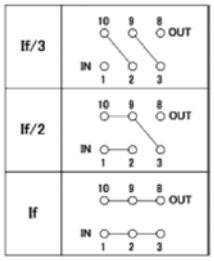


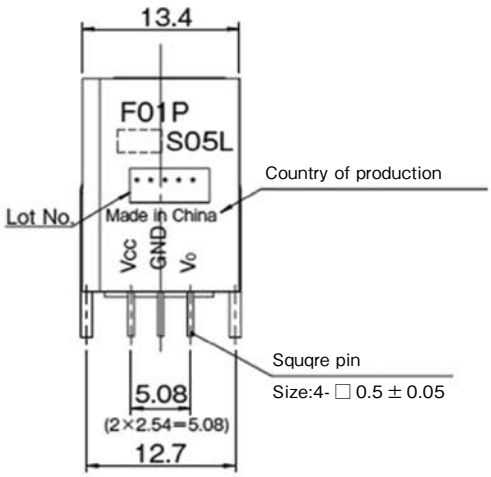
Figure 7 : Maximum RMS AC primary current/maximum DC primary current vs frequency

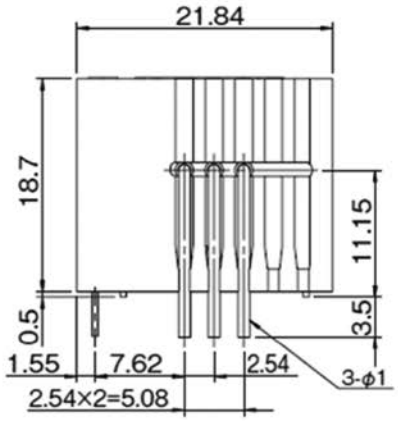
CURRENT SENSORS

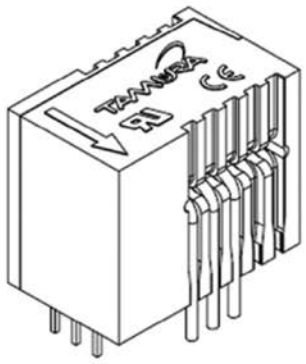


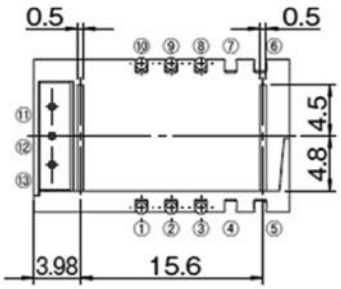


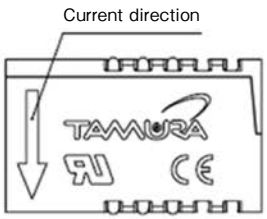
DIMENSIONS (mm)











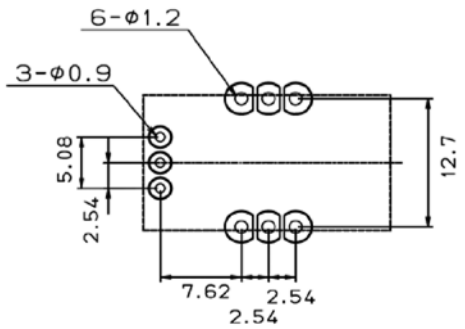
Terminal number

①	Input	⑧	Output
②	Input	⑨	Output
③	Input	⑩	Output
④	—	⑪	Vo
⑤	—	⑫	GND
⑥	—	⑬	Vcc
⑦	—		

Note

1. Unless otherwise specified, tolerances shall be ±0.25mm
2. Unit is [mm]

RECOMMENDED HOLE DIAMETER (mm)

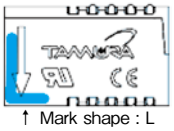


Identification marking

The top side of product is marked for identification with the previous model.

Rated cunnrent 6A ··· Blue color
Rated cunnrent 15A ··· White color
Rated cunnrent 25A ··· Orange color
Rated cunnrent 50A ··· Green color

Ex) Marking exeample



↑ Mark shape : L

Fluxgate system / Voltage-output type Anti-Surge current, Compact size

F02P L SERIES

RoHS

ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Comment
Supply voltage	Vcc	V	7	
Primary conductor temperature	—	℃	110	
ESD (HBM: Human Body Model)	—	kV	4	C=100pF, R=1.5k Ω
Maximum peak current	—	kAT	4	Current waveform : ・Front time 8μs ・Time to half value 20μs ・single

ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Comment
Insulation voltage	Vd	—	AC4100V, for 1minute (Sensing current 0.5mA)	Primary ⇔ Secondary
Insulation Resistance	R_{IS}	—	≧ 500M Ω (at DC500V)	Primary ⇔ Secondary
Clearance distance	dCi	—	7.5mm (TYP)	Primary ⇔ Secondary
Creepage distance	dCp	—	7.5mm (TYP)	Primary ⇔ Secondary
Case material	—	—	UL94 V-0	
Comparative Tracking Index; (CTI)	CTI	V	600	
Application example	—	—	300V, CAT Ⅲ, PD2	Reinforced isolation, non uniform field according to EN50178, EN61010
	—	—	600V, CAT Ⅲ, PD2	Simple isolation, non uniform field according to EN50178, EN61010

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Ambient operating temperature	Ta	℃	− 40		+ 105	
Ambient storage temperature	T_S	℃	− 40		+ 105	
Mass	m	g		12		

SPECIFICATIONS

Ta=+25℃, Np=1T, RL=10kΩ, Vcc=+5V

Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Rated Current	F02P006S05L	If	A		6		
	F02P015S05L				15		
	F02P025S05L				25		
	F02P050S05L				50		
Maximum current (at Vcc=＋5V, Ta=＋105℃)	F02P006S05L	Ipmax	A	－20		20	
	F02P015S05L			－51		51	
	F02P025S05L			－85		85	
	F02P050S05L			－150		150	
Supply Voltage		Vcc	V	4.75	5.00	5.25	
Number of primary turns		Np	T		1, 2, 3		
Number of secondary turns	F02P006S05L	Ns	T		1816		
	F02P015S05L				1737		
	F02P025S05L				1764		
	F02P050S05L				1600		
Consumption current (at If)	F02P006S05L	Icc	mA		25		Icc=15＋Ip（mA）／Ns
	F02P015S05L				30		
	F02P025S05L				35		
	F02P050S05L				55		
Internal reference voltage (at Ip=0A)		Vref1	V	2.495	2.500	2.505	Ref OUT mode
External reference voltage		Vref2	V	0		4	Ref IN mode
Output voltage		Vo	V	0.375		4.625	
Output voltage (at Ip=0A)		Vo	V		Vref1,Vref2		
Electrical offset voltage＊1	F02P006S05L	Voe	mV	－5.300		5.300	
	F02P015S05L			－2.210		2.210	
	F02P025S05L			－1.350		1.350	
	F02P050S05L			－0.725		0.725	
Electrical offset current reffered to primary	F02P006S05L	Ioe	mA	－51		51	
	F02P015S05L			－53		53	
	F02P025S05L			－54		54	
	F02P050S05L			－58		58	
Temperature coefficient of Internal reference voltage		TCVref1	ppm/K		±5.0	±50	
Temperature coefficient of Output voltage (at Ip=0A)	F02P006S05L	TCVo	ppm/K		±6.0	±14	ppm/K of 2.5V (－40℃～＋105℃)
	F02P015S05L				±2.3	±6	
	F02P025S05L				±1.4	±4	
	F02P050S05L				±0.7	±3	
Sensitivity (Theoretical value)	F02P006S05L	Gth	mV/A		104.2		625mV/If
	F02P015S05L				41.67		
	F02P025S05L				25		
	F02P050S05L				12.5		
Sensitivity error		ε_G	%	－0.7		0.7	
Temperature coefficient of Sensitivity (at Ta=－40℃～＋105℃)		TCG	ppm/K			±40	
Output Linearity		ε_L	%	－0.1		0.1	
Magnetic offset current reffered to primary (at 10×If)		I_{OM}	A	－0.1		0.1	
Output current noise reffered to primary (at 100Hz～100kHz)		Ino	$\mu A/(Hz)^{1/2}$		20		RL=1kΩ

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

SPECIFICATIONS

Ta=+25℃, Np=1T, RL=10kΩ, Vcc=+5V

Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Peak to peak output ripple at oscillator freqency (f typ =450kHz)	F02P006S05L	—	mV		40	160	RL=1kΩ
	F02P015S05L				15	60	
	F02P025S05L				10	40	
	F02P050S05L				5	20	
Reaction time (at 10% of If)	F02P006S05L	tra	μs			0.3	RL=1kΩ, di/dt=18A/μs
	F02P015S05L					0.3	RL=1kΩ, di/dt=44A/μs
	F02P025S05L					0.3	RL=1kΩ, di/dt=68A/μs
	F02P050S05L					0.3	RL=1kΩ, di/dt=100A/μs
Response time 1 (at 90% of If)	F02P006S05L	tr	μs			0.3	RL=1kΩ, di/dt=18A/μs
	F02P015S05L					0.3	RL=1kΩ, di/dt=44A/μs
	F02P025S05L					0.3	RL=1kΩ, di/dt=68A/μs
	F02P050S05L					0.3	RL=1kΩ, di/dt=100A/μs
Response time 2 (at 10% of If to 90% of Vo)		tr	μs			0.6	RL=1kΩ, di/dt=If/μs
Frequency bandwidth (±1dB)		BW	kHz	200			RL=1kΩ
Frequency bandwidth (±3dB)		BW	kHz	300			RL=1kΩ
Output Voltage Accuracy (Overall)	F02P006S05L	X_G	%			1.7	X_G= (100×Voe/625) + ε_G + ε_L
	F02P015S05L					1.2	
	F02P025S05L					1.0	
	F02P050S05L					0.9	

STANDARDS

EN50178, EN61010-1, EN60950-1, UL508 (file No. E243511)

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

Characteristic curve (TYP)

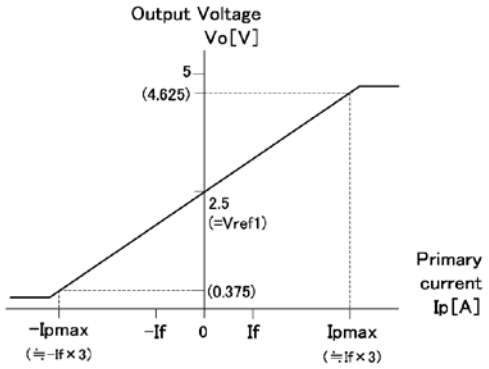


Figure 1 : Linearity curve (Internal reference voltage)

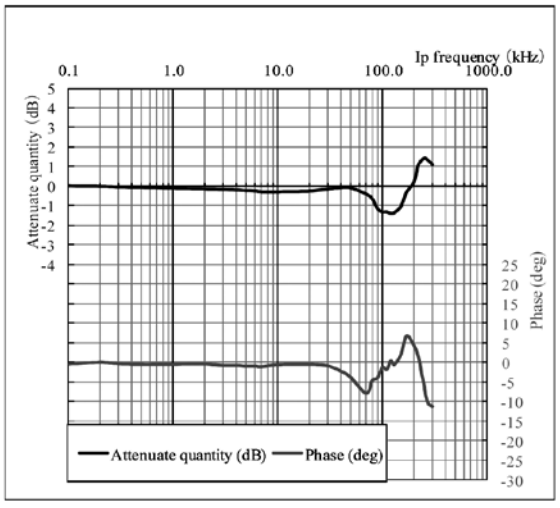


Figure 2 : Frequency response curve
ex) F02P025S05L
Measurement condition Ta=+25℃, RL=1kΩ, Ip=3A, Vcc=+5V

SUPPORT DOCUMENTATION

Maximum continuous DC primary current

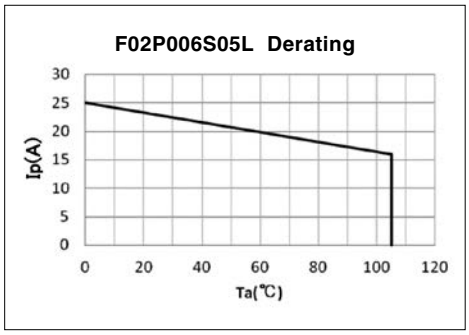


Figure 3 : Ip vs Ta for F02P006S05L

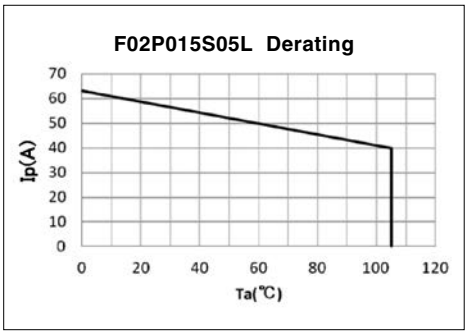


Figure 4 : Ip vs Ta for F02P015S05L

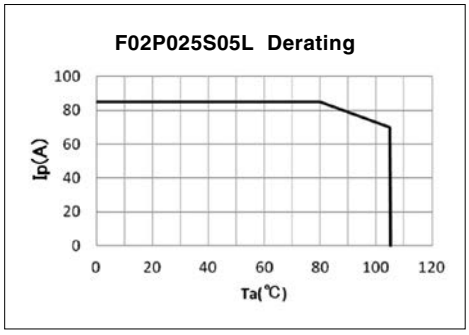


Figure 5 : Ip vs Ta for F02P025S05L

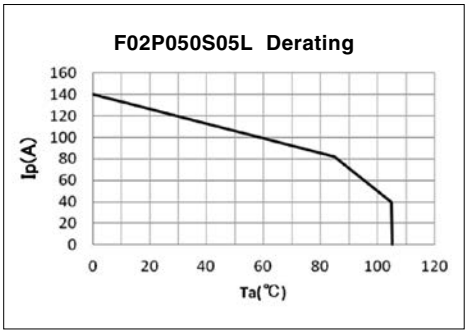


Figure 6 : Ip vs Ta for F02P050S05L

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

① Ip < Ipmax
② Junction temperature Tj < 125℃
③ Primary conductor temperature < 110℃
④ Resistor power dissipation < 0.5 x rated power

Frequency derating

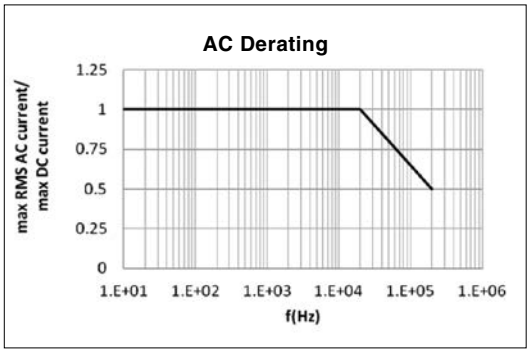


Figure 7 : Maximum RMS AC primary current/maximum DC primary current vs frequency

Reference voltage

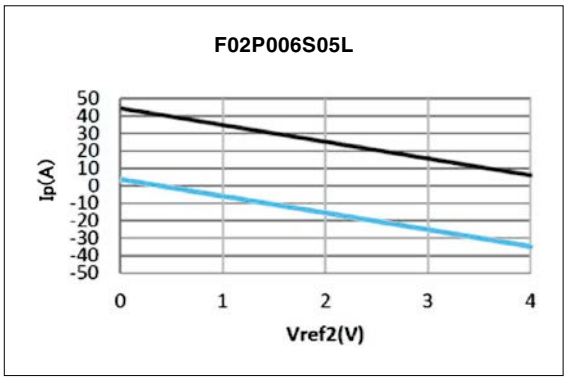
The Ref pin has two modes Ref IN and Ref OUT :

< 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.

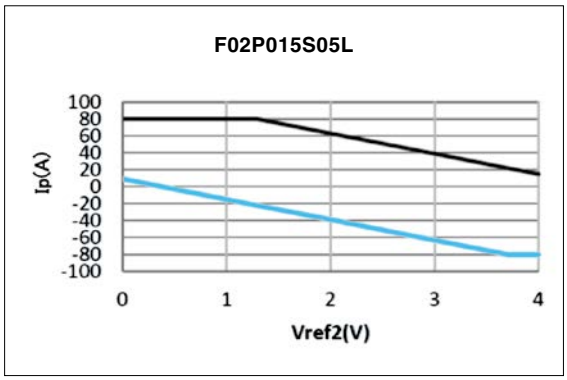
- either to source a typical current of (Vref − 2.5) /680,the maximum value will be 2.2mA typ.when Vref2 = 4V.
- or to sink a typical current of (2.5 − Vref2) /680,the maximum value will be 3.68mA typ.when Vref2 = 0V.

The following graphs show how the measuring range of each transducer version depends on external reference voltage value Vref2.

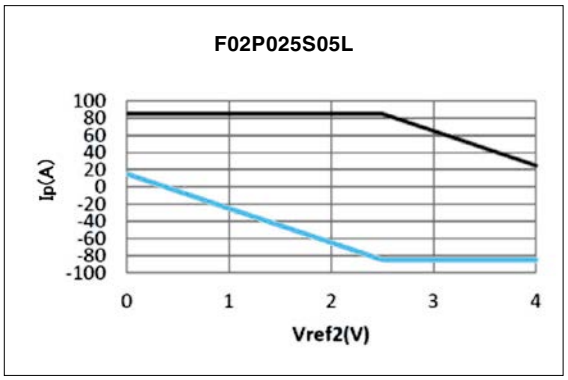


Upper limit : Ip = − 9.6 × Vref2 + 44.4 (Vref2 = 0...4V)

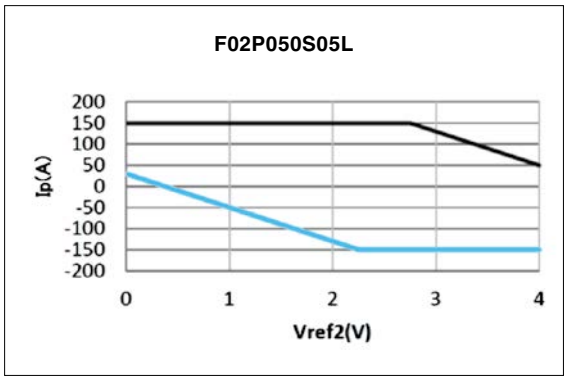
Lower limit : Ip = − 9.6 × Vref2 + 3.6 (Vref2 = 0...4V)



Upper limit : Ip = 80 (Vref2 = 0...1.29V)
Ip = − 24 × Vref2 + 111 (Vref2 = 1.29...4V)
Lower limit : Ip = − 24 × Vref2 + 9 (Vref2 = 0...3.7V)
Ip = − 80 (Vref2 = 3.7...4V)



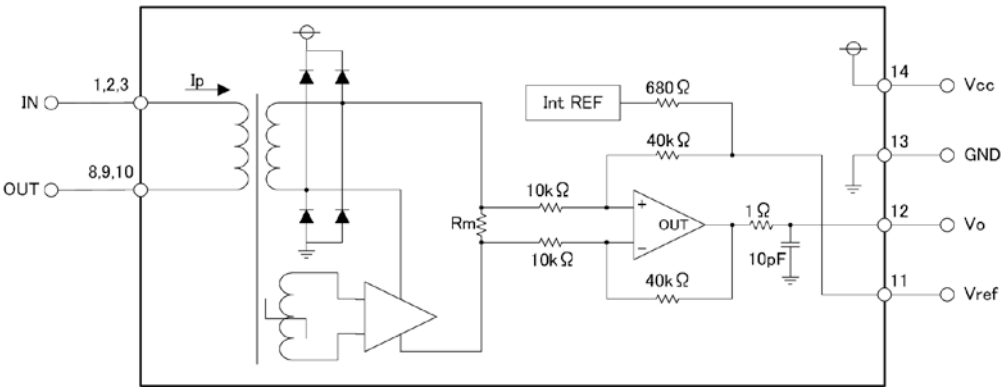
Upper limit : Ip = 85 (Vref2 = 0...2.5V)
Ip = − 40 × Vref2 + 185 (Vref2 = 2.5...4V)
Lower limit : Ip = − 40 × Vref2 + 15 (Vref2 = 0...2.5V)
Ip = − 85 (Vref2 = 2.5...4V)

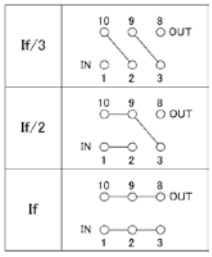


Upper limit : Ip = 150 (Vref2 = 0...2.75V)
Ip = − 80 × Vref2 + 370 (Vref2 = 2.75...4V)
Lower limit : Ip = − 80 × Vref2 + 30 (Vref2 = 0...2.25V)
Ip = − 150 (Vref2 = 2.25...4V)

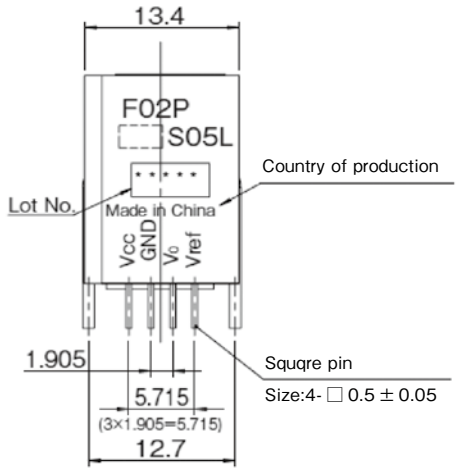
If you do not want to use the Ref pin, please unconnected.

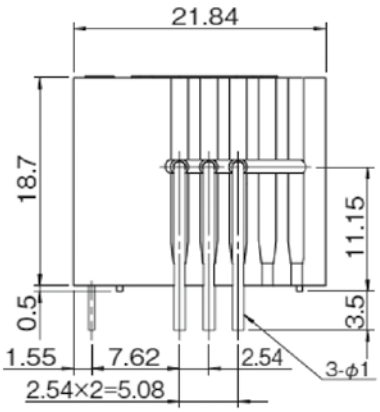
CONNECTION

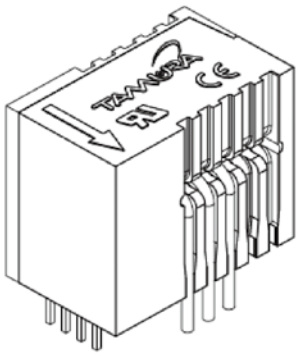


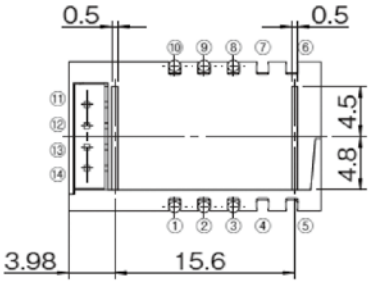


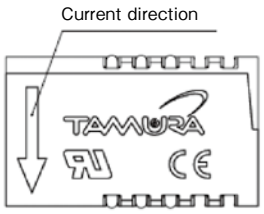
DIMENSIONS (mm)









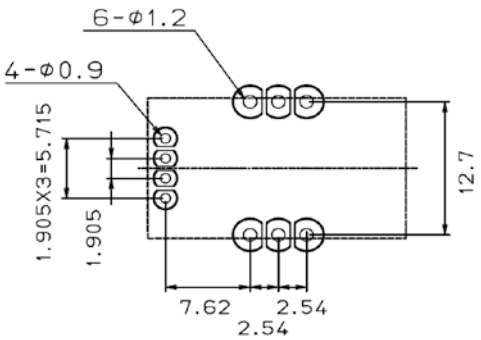


Terminal number			
①	Input	⑧	Output
②	Input	⑨	Output
③	Input	⑩	Output
④	—	⑪	Vref
⑤	—	⑫	Vo
⑥	—	⑬	GND
⑦	—	⑭	Vcc

Note

1. Unless otherwise specified, tolerances shall be ±0.25mm
2. Unit is [mm]

RECOMMENDED HOLE DIAMETER (mm)

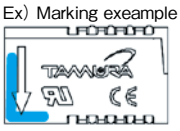


Identification marking

The top side of product is marked for identification with the previous model.

Rated cunnrent 6A ··· Blue color
Rated cunnrent 15A ··· White color
Rated cunnrent 25A ··· Orange color
Rated cunnrent 50A ··· Green color

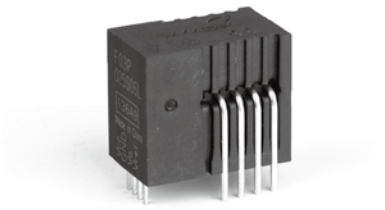
Ex) Marking exeample



↑ Mark shape : L

Fluxgate system / Voltage-output type Anti-Surge current, Compact size

F03P L SERIES



RoHS

ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Comment
Supply voltage	Vcc	V	7	
Primary conductor temperature	—	℃	110	
ESD (HBM: Human Body Model)	—	kV	4	C=100pF, R=1.5k Ω
Maximum peak current	—	kAT	4	Current waveform : ・Front time 8μs ・Time to half value 20μs ・single

ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Comment
Insulation voltage	Vd	—	AC4300V, for 1minute (Sensing current 0.5mA)	Primary ⇔ Secondary
Insulation Resistance	R_{IS}	—	≧ 500M Ω (at DC500V)	Primary ⇔ Secondary
Clearance distance	dCi	—	8.2mm (TYP)	Primary ⇔ Secondary
Creepage distance	dCp	—	8.2mm (TYP)	Primary ⇔ Secondary
Case material	—	—	UL94 V-0	
Comparative Tracking Index ; (CTI)	CTI	V	600	
Application example	—	—	300V, CAT Ⅲ, PD2	Reinforced isolation, non uniform field according to EN61010
	—	—	600V, CAT Ⅲ, PD2	Reinforced isolation, non uniform field according to EN50178
	—	—	1000V, CAT Ⅲ, PD2	Simple isolation, non uniform field according to EN50178

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Ambient operating temperature	Ta	℃	− 40		+ 105	
Ambient storage temperature	T_S	℃	− 40		+ 105	
Mass	m	g		12		

SPECIFICATIONS

Ta=+25℃,Np=1T,RL=10kΩ,Vcc=+5V

Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Rated Current	F03P006S05L	If	A		6		
	F03P015S05L				15		
	F03P025S05L				25		
	F03P050S05L				50		
Maximum current	F03P006S05L	Ipmax	A	−20		20	
	F03P015S05L			−51		51	
	F03P025S05L			−85		85	
	F03P050S05L			−150		150	
Supply Voltage		Vcc	V	4.75	5.00	5.25	
Number of primary turns		Np	T		1, 2, 3, 4		
Number of secondary turns	F03P006S05L	Ns	T		1816		
	F03P015S05L				1737		
	F03P025S05L				1764		
	F03P050S05L				1600		
Consumption current (at If)	F03P006S05L	Icc	mA		25		Icc = 15 + Ip(mA) / Ns
	F03P015S05L				30		
	F03P025S05L				35		
	F03P050S05L				55		
Internal reference voltage (at Ip = 0A)		Vref1	V	2.495	2.500	2.505	Ref OUT mode
External reference voltage		Vref2	V	0		4	Ref IN mode
Output voltage		Vo	V	0.375		4.625	
Output voltage (at Ip = 0A)		Vo	V		Vref1,Vref2		
Electrical offset voltage * 1	F03P006S05L	Voe	mV	−5.300		5.300	
	F03P015S05L			−2.210		2.210	
	F03P025S05L			−1.350		1.350	
	F03P050S05L			−0.725		0.725	
Electrical offset current reffered to primary	F03P006S05L	Ioe	mA	−51		51	
	F03P015S05L			−53		53	
	F03P025S05L			−54		54	
	F03P050S05L			−58		58	
Temperature coefficient of Internal reference voltage		TCVref1	ppm/K		±5.0	±50	
Temperature coefficient of Output voltage (at Ip = 0A)	F03P006S05L	TCVo	ppm/K		±6.0	±14	ppm/K of 2.5V (−40℃~+105℃)
	F03P015S05L				±2.3	±6	
	F03P025S05L				±1.4	±4	
	F03P050S05L				±0.7	±3	
Sensitivity (Theoretical value)	F03P006S05L	Gth	mV/A		104.2		625mV/If
	F03P015S05L				41.67		
	F03P025S05L				25		
	F03P050S05L				12.5		
Sensitivity error		ε_G	%	−0.7		0.7	
Temperature coefficient of Sensitivity (at Ta =− 40℃~+ 105℃)		TCG	ppm/K			±40	
Output Linearity (at If)		ε_L	%	−0.1		0.1	
Magnetic offset current reffered to primary (at 10 × If)		I_{OM}	A	−0.1		0.1	
Output current noise reffered to primary (at 100Hz ~ 100kHz)		Ino	$\mu A/(Hz)^{1/2}$		20		RL = 1k Ω

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

SPECIFICATIONS

Ta=+25℃,Np=1T,RL=10kΩ,Vcc=+5V

Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Peak to peak output ripple at oscillator freqency (f typ = 450kHz)	F03P006S05L	—	mV		40	160	RL = 1k Ω
	F03P015S05L				15	60	
	F03P025S05L				10	40	
	F03P050S05L				5	20	
Reaction time (at 10% of If)	F03P006S05L	tra	μs			0.3	RL = 1k Ω, di/dt = 18A/μs
	F03P015S05L					0.3	RL = 1k Ω, di/dt = 44A/μs
	F03P025S05L					0.3	RL = 1k Ω, di/dt = 68A/μs
	F03P050S05L					0.3	RL = 1k Ω, di/dt = 100A/μs
Response time 1 (at 90% of If)	F03P006S05L	tr	μs			0.3	RL = 1k Ω, di/dt = 18A/μs
	F03P015S05L					0.3	RL = 1k Ω, di/dt = 44A/μs
	F03P025S05L					0.3	RL = 1k Ω, di/dt = 68A/μs
	F03P050S05L					0.3	RL = 1k Ω, di/dt = 100A/μs
Response time 2 (at 10% of If to 90% of Vo)		tr	μs			0.6	RL = 1k Ω, di/dt = If/μs
Frequency bandwidth (± 1dB)		BW	kHz	200			RL = 1k Ω
Frequency bandwidth (± 3dB)		BW	kHz	300			RL = 1k Ω
Output Voltage Accuracy (Overall)	F03P006S05L	X_G	%			1.7	$X_G = (100 \times Voe/625) + \varepsilon_G + \varepsilon_L$
	F03P015S05L					1.2	
	F03P025S05L					1.0	
	F03P050S05L					0.9	

STANDARDS

EN50178, EN61010-1, EN60950-1, UL508 (file No. E243511)

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

Characteristic curve (TYP)

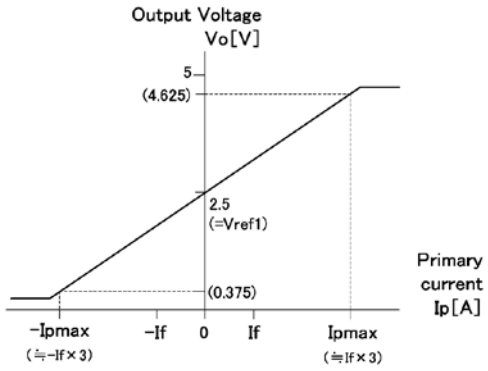


Figure 1 : Linearity curve (Internal reference voltage)

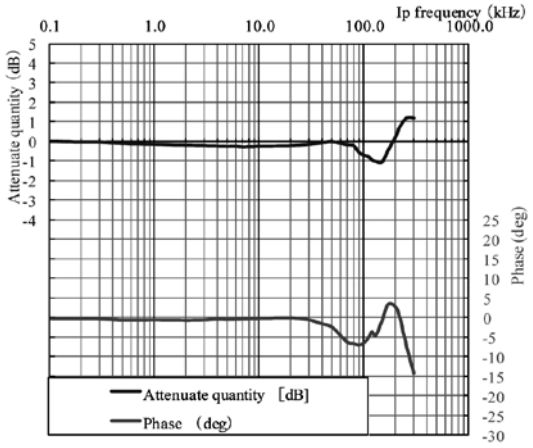


Figure 2 : Frequency response curve
ex) F03P025S05L
Measurement condition Ta=+25℃, RL=1k Ω, Ip=3A, Vcc=+5V

SUPPORT DOCUMENTATION

Maximum continuous DC primary current

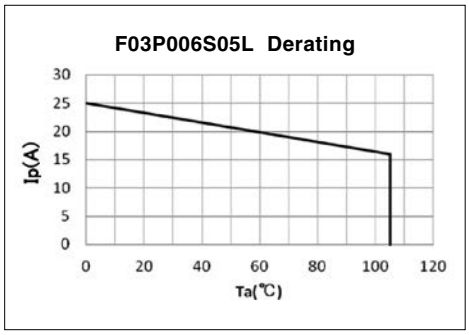


Figure 3 : Ip vs Ta for F03P006S05L

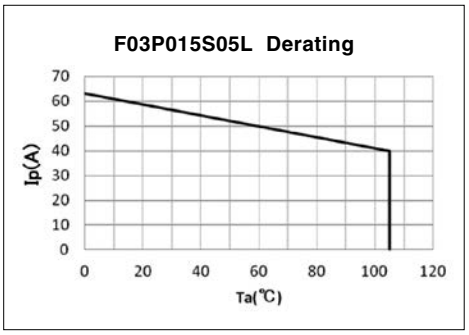


Figure 4 : Ip vs Ta for F03P015S05L

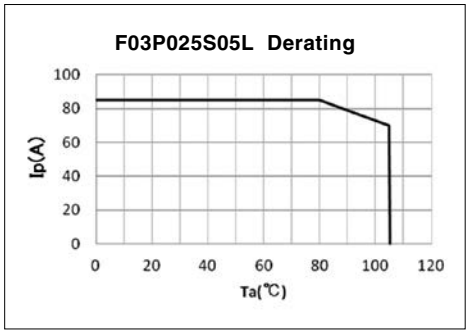


Figure 5 : Ip vs Ta for F03P025S05L

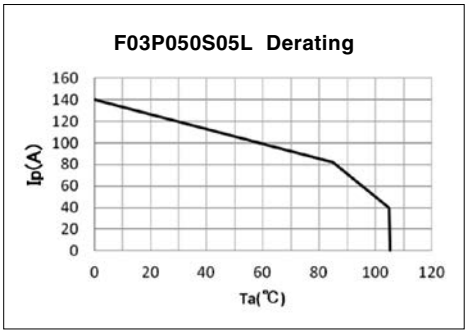


Figure 6 : Ip vs Ta for F03P050S05L

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

① Ip < Ipmax
② Junction temperature Tj < 125℃
③ Primary conductor temperature < 110℃
④ Resistor power dissipation < 0.5 x rated power

Frequency derating

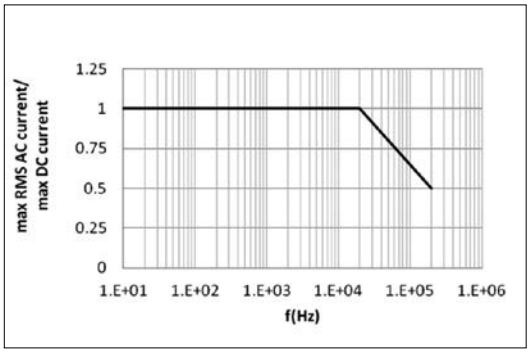


Figure 7 : Maximum RMS AC primary current/maximum DC primary current vs frequency

Reference voltage

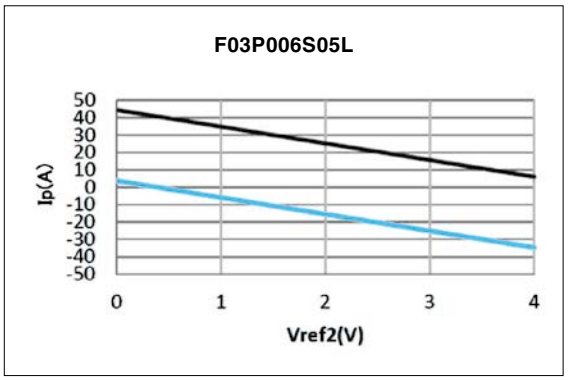
The Ref pin has two modes Ref IN and Ref OUT :

< 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.

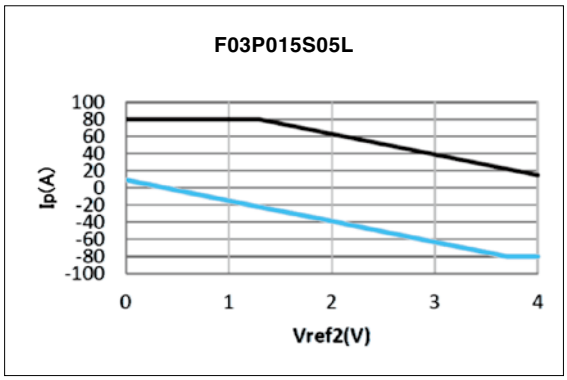
-either to source a typical current of (Vref − 2.5) /680,the maximum value will be 2.2mA typ.when Vref2 = 4V.
-or to sink a typical current of (2.5 − Vref2) /680,the maximum value will be 3.68mA typ.when Vref2 = 0V.

The following graphs show how the measuring range of each transducer version depends on external reference voltage value Vref2.

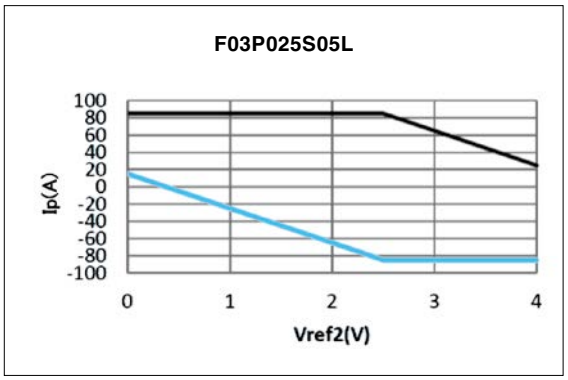


Upper limit : Ip = − 9.6 × Vref2 + 44.4 (Vref2 = 0...4V)

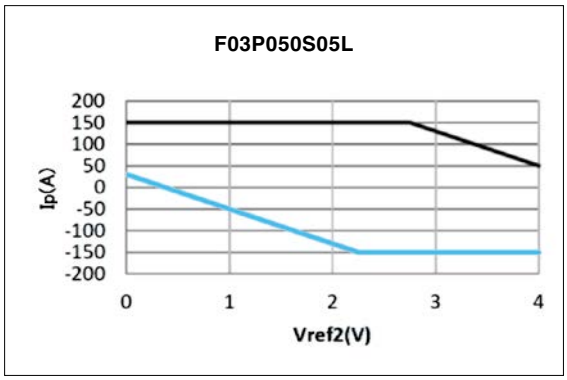
Lower limit : Ip = − 9.6 × Vref2 + 3.6 (Vref2 = 0...4V)



Upper limit : Ip = 80 (Vref2 = 0...1.29V)
Ip = − 24 × Vref2 + 111 (Vref2 = 1.29...4V)
Lower limit : Ip = − 24 × Vref2 + 9 (Vref2 = 0...3.7V)
Ip = − 80 (Vref2 = 3.7...4V)



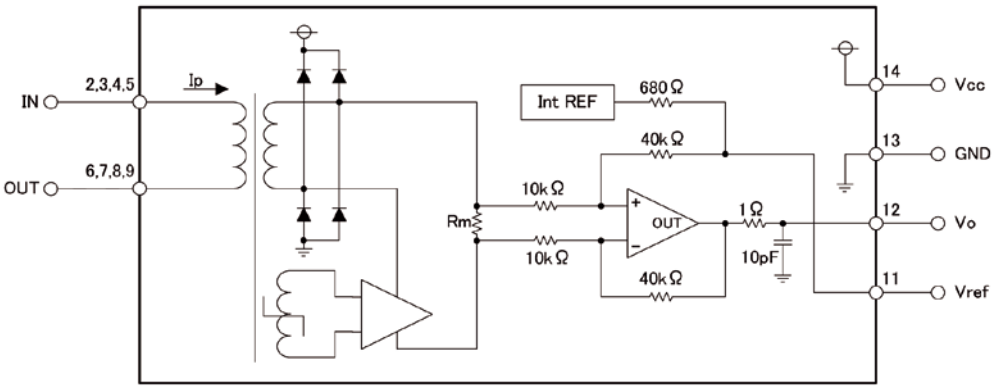
Upper limit : Ip = 85 (Vref2 = 0...2.5V)
Ip = − 40 × Vref2 + 185 (Vref2 = 2.5...4V)
Lower limit : Ip = − 40 × Vref2 + 15 (Vref2 = 0...2.5V)
Ip = − 85 (Vref2 = 2.5...4V)

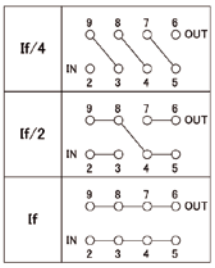


Upper limit : Ip = 150 (Vref2 = 0...2.75V)
Ip = − 80 × Vref2 + 370 (Vref2 = 2.75...4V)
Lower limit : Ip = − 80 × Vref2 + 30 (Vref2 = 0...2.25V)
Ip = − 150 (Vref2 = 2.25...4V)

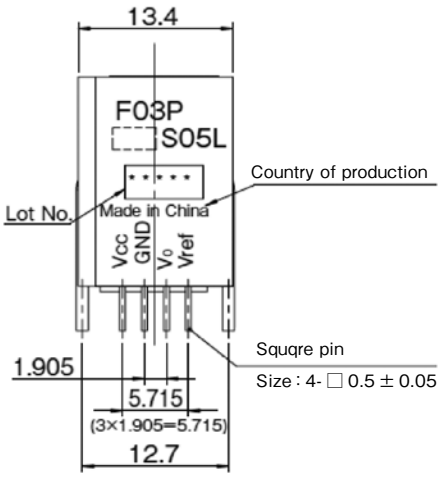
If you do not want to use the Ref pin, please unconnected.

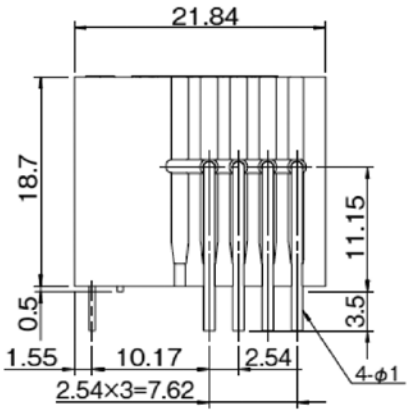
CONNECTION

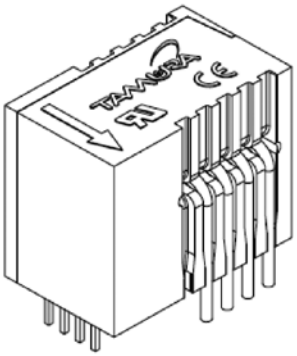


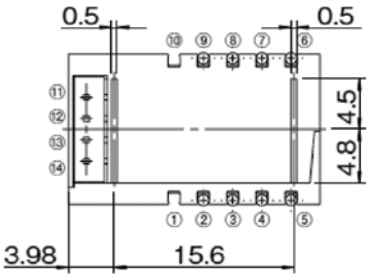


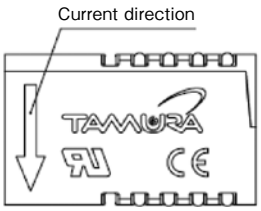
DIMENSIONS (mm)









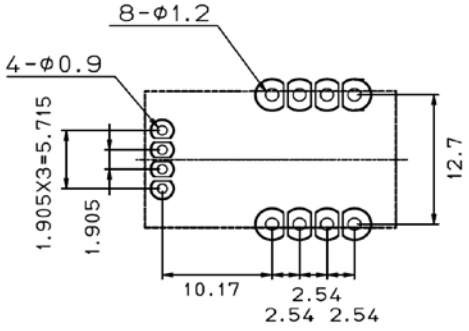


Terminal number			
①	—	⑧	Output
②	Input	⑨	Output
③	Input	⑩	—
④	Input	⑪	Vref
⑤	Input	⑫	Vo
⑥	Output	⑬	GND
⑦	Output	⑭	Vcc

Note

1. Unless otherwise specified, tolerances shall be ±0.25mm
2. Unit is [mm]

RECOMMENDED HOLE DIAMETER (mm)

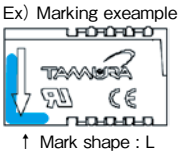


Identification marking

The top side of product is marked for identification with the previous model.

Rated cunnrent 6A ··· Blue color
Rated cunnrent 15A ··· White color
Rated cunnrent 25A ··· Orange color
Rated cunnrent 50A ··· Green color

Ex) Marking exeample



↑ Mark shape : L

Fluxgate system / Voltage-output type

F01P***S05, F02P***S05, F03P***S05 SERIES


F01P SERIES


F02P SERIES


F03P SERIES

- Super precision & High stability (Low temperature drift) .
- Unipolar power voltage; +5V. Rated Current; 6 ~ 50A.
  Multi-range models. MAX_Temp.105℃ . Voltage-output type.

Comparison of the main features

Series	Features
F01P*S05**	Without reference access.
F02P*S05**	With reference access.
F03P*S05**	With reference access. Higher creepage and clearance distances.

*** : Rated Current symbol

SPECIFICATIONS

Spec \ Types		F01P***S05	F02P***S05	F03P***S05
Rated Current If (***: Rated Current symbol)		6A (006) / 15A (015) / 25A (025) / 50A (050)		
Maximum current (At Vcc=+5V, Ta=+105℃)		± 20A (If=6A) / ± 51A (If=15A) / ± 85A (If=25A) / ± 150A (If=25A)		
Supply Voltage		+5.00V ± 0.25V		
Output Voltage Accuracy (Overall) <Accuracy of F02P series & F03P series> When the accuracy of output voltage is calculated on the basis of reference output voltage.	If=6A	≦ 2.5%	≦ 1.7%	
	If=15A	≦ 1.9%	≦ 1.2%	
	If=25A	≦ 1.8%	≦ 1.0%	
	If=50A	≦ 1.7%	≦ 0.9%	
Existence of reference access		No	Yes	
Number of primary busbar		3pcs		4pcs
Number of secondary pin		3pcs	4pcs	
Clearance distance, Primary ⇔ Secondary		7.7mm	7.5mm	8.2mm
Creepage distance, Primary ⇔ Secondary		7.7mm	7.5mm	8.2mm
for 1minute (Sensing current 0.5mA) Insulation voltage, Primary ⇔ Secondary		AC4200V	AC4100V	AC4300V
Case material (Flame Rating) / Comparative Tracking Index;		UL94 V-0 / CTI 600V		
STANDARDS		UL508 (file No. E243511) ,EN50178, EN61010-1, EN60950-1		
Ambient operating temperature		− 40℃ ~ +105℃		

The above-mentioned comparison tables are the auxiliary data for understanding each series. For details, please confirm the next page or subsequent ones. ▶▶▶

Fluxgate system / Voltage-output type

F01P SERIES

ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Comment
Supply voltage	Vcc	V	7	
Primary conductor temperature	—	℃	110	
Non r epetitive p rimary current pulse (20μS), in powered or unpowered state.	Îp	A	20 × If	
ESD (HBM: Human Body Model)	—	kV	4	C=100pF, R=1.5k Ω

ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Comment
Insulation voltage	Vd	—	AC4200V, for 1minute (Sensing current 0.5mA)	Primary ⇔ Secondary
Insulation Resistance	R_{IS}	—	≧ 500M Ω (at DC500V)	Primary ⇔ Secondary
Clearance distance	dCi	—	7.7mm (TYP)	Primary ⇔ Secondary
Creepage distance	dCp	—	7.7mm (TYP)	Primary ⇔ Secondary
Case material	—	—	UL94 V-0	
Comparative Tracking Index; (CTI)	CTI	V	600	
Application example	—	—	300V, CAT Ⅲ, PD2	Reinforced isolation,non uniform field according to EN50178, EN61010
	—	—	600V, CAT Ⅲ, PD2	Simple isolation,non uniform field according to EN50178, EN61010

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Ambient operating temperature	Ta	℃	− 40		+ 105	
Ambient storage temperature	T_S	℃	− 40		+ 105	
Mass	m	g		12		

SPECIFICATIONS

Ta=+25℃,RL=10kΩ,Vcc=+5V

Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Rated Current	F01P006S05	If	A		6		
	F01P015S05				15		
	F01P025S05				25		
	F01P050S05				50		
Maximum current (at Vcc=＋5V, Ta=＋105℃)	F01P006S05	Ipmax	A	－20		20	
	F01P015S05			－51		51	
	F01P025S05			－85		85	
	F01P050S05			－150		150	
Supply Voltage		Vcc	V	4.75	5.00	5.25	
Number of primary turns		Np	T		1, 2, 3		
Number of secondary turns	F01P006S05	Ns	T		1816		
	F01P015S05				1737		
	F01P025S05				1764		
	F01P050S05				1600		
Consumption current (at If)	F01P006S05	Icc	mA		25		Icc＝15＋Ip(mA)／Ns
	F01P015S05				30		
	F01P025S05				35		
	F01P050S05				55		
Output voltage		Vo	V	0.375		4.625	
Output voltage (at Ip＝0A)		Vo	V		2.5		
Electrical offset voltage＊1	F01P006S05	Voe	mV	－10.40		10.40	
	F01P015S05			－7.10		7.10	
	F01P025S05			－6.25		6.25	
	F01P050S05			－5.80		5.80	
Electrical offset current reffered to primary	F01P006S05	Ioe	A	－0.10		0.10	
	F01P015S05			－0.17		0.17	
	F01P025S05			－0.25		0.25	
	F01P050S05			－0.46		0.46	
Temperature coefficient of Output voltage (at Ip＝0A)	F01P006S05	TCVo	ppm/K		±10.0	±80.0	ppm/K of 2.5V (－40℃～＋105℃)
	F01P015S05				±7.5	±70.0	
	F01P025S05				±6.5	±60.0	
	F01P050S05				±6.0	±60.0	
Sensitivity (Theoretical value)	F01P006S05	Gth	mV/A		104.2		625mV/If
	F01P015S05				41.67		
	F01P025S05				25		
	F01P050S05				12.5		
Sensitivity error		ε_G	%	－0.7		0.7	
Temperature coefficient of Sensitivity (at Ta＝－40℃～＋105℃)		TCG	ppm/K			±40	
Output Linearity		ε_L	%	－0.1		0.1	
Magnetic offset current reffered to primary (at 10×If)		I_{OM}	A	－0.1		0.1	
Output current noise reffered to primary (at 100Hz～100kHz)	F01P006S05	Ino	$\mu A/(Hz)^{1/2}$		36		RL＝1kΩ
	F01P015S05				90		
	F01P025S05				150		
	F01P050S05				300		

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

SPECIFICATIONS

Ta=+25℃,RL=10kΩ,Vcc=+5V

Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Peak to peak output ripple at oscillator freqency (f typ = 450kHz)	F01P006S05	—	mV		40	160	RL = 1k Ω
	F01P015S05				15	60	
	F01P025S05				10	40	
	F01P050S05				5	20	
Reaction time (at 10% of If)	F01P006S05	tra	μs			0.3	RL = 1k Ω, di/dt = 18A/μs
	F01P015S05					0.3	RL = 1k Ω, di/dt = 44A/μs
	F01P025S05					0.3	RL = 1k Ω, di/dt = 68A/μs
	F01P050S05					0.3	RL = 1k Ω, di/dt = 100A/μs
Response time 1 (at 90% of If)	F01P006S05	tr	μs			0.3	RL = 1k Ω, di/dt = 18A/μs
	F01P015S05					0.3	RL = 1k Ω, di/dt = 44A/μs
	F01P025S05					0.3	RL = 1k Ω, di/dt = 68A/μs
	F01P050S05					0.3	RL = 1k Ω, di/dt = 100A/μs
Response time 2 (at 10% of If to 90% of Vo)		tr	μs			0.6	RL = 1k Ω, di/dt = If/μs
Frequency bandwidth (± 1dB)		BW	kHz	200			RL = 1k Ω
Frequency bandwidth (± 3dB)		BW	kHz	300			RL = 1k Ω
Output Voltage Accuracy (Overall)	F01P006S05	X_G	%			2.5	$X_G = (100 \times Voe/625) + \varepsilon_G + \varepsilon_L$
	F01P015S05					1.9	
	F01P025S05					1.8	
	F01P050S05					1.7	

STANDARDS

EN50178, EN61010-1, EN60950-1, UL508 (file No. E243511)

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

Characteristic curve (TYP)

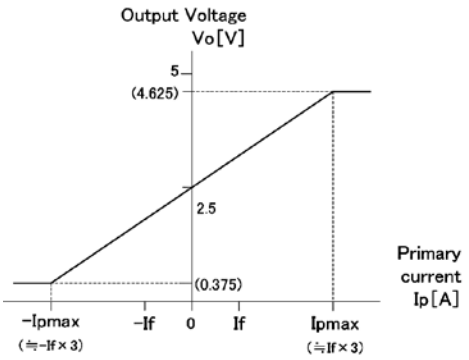


Figure 1 : Linearity curve

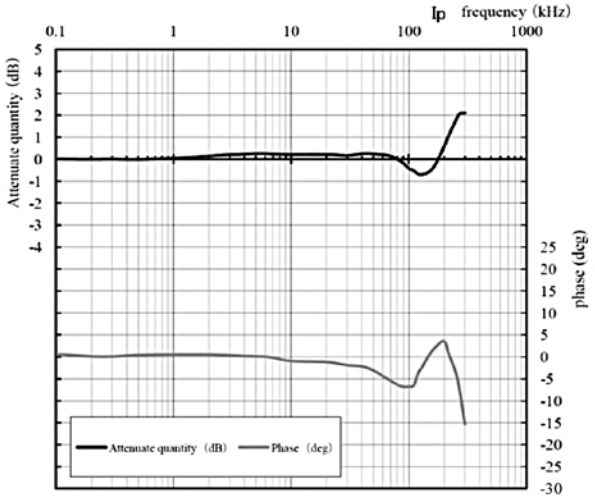


Figure 2 : Frequency response curve
ex) F01P025S05
Measurement condition Ta=+25℃, RL=1k Ω, Ip=3A, Vcc=+5V

SUPPORT DOCUMENTATION

Maximum continuous DC primary current

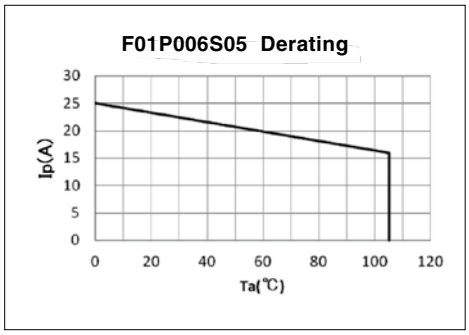


Figure 3 : Ip vs Ta for F01P006S05

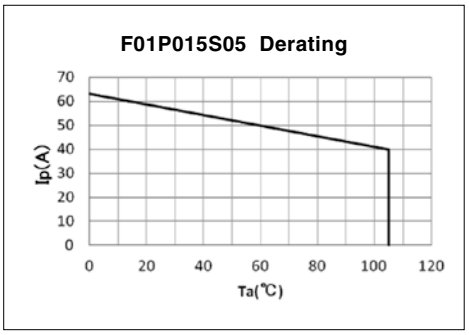


Figure 4 : Ip vs Ta for F01P015S05

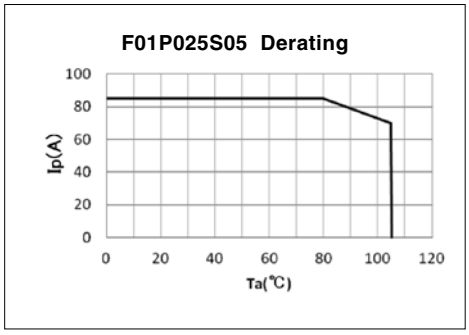


Figure 5 : Ip vs Ta for F01P025S05

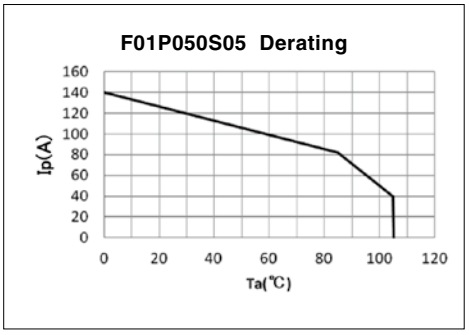


Figure 6 : Ip vs Ta for F01P050S05

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

① Ip < Ipmax
② Junction temperature Tj < 125℃
③ Primary conductor temperature < 110℃
④ Resistor power dissipation < 0.5 x rated power

Frequency derating

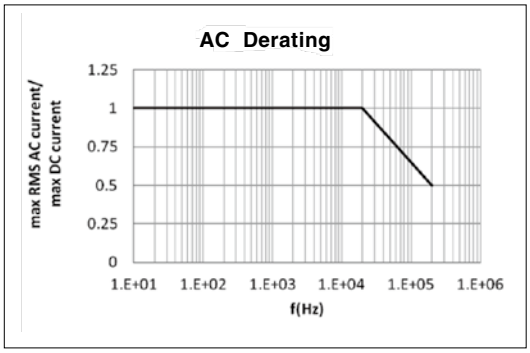
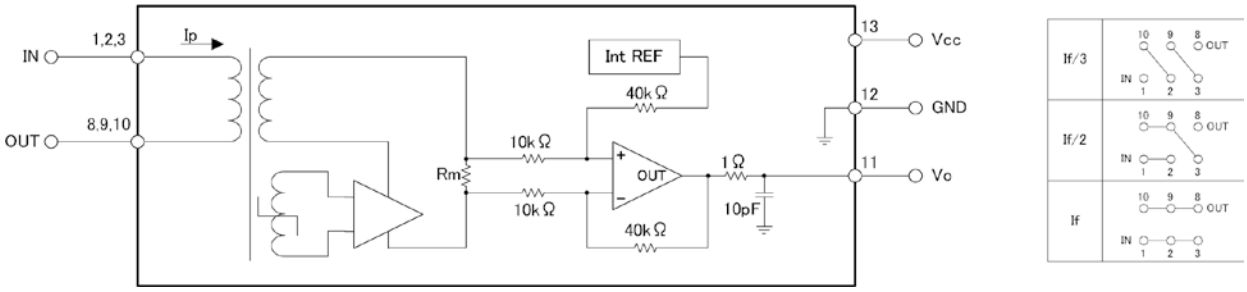
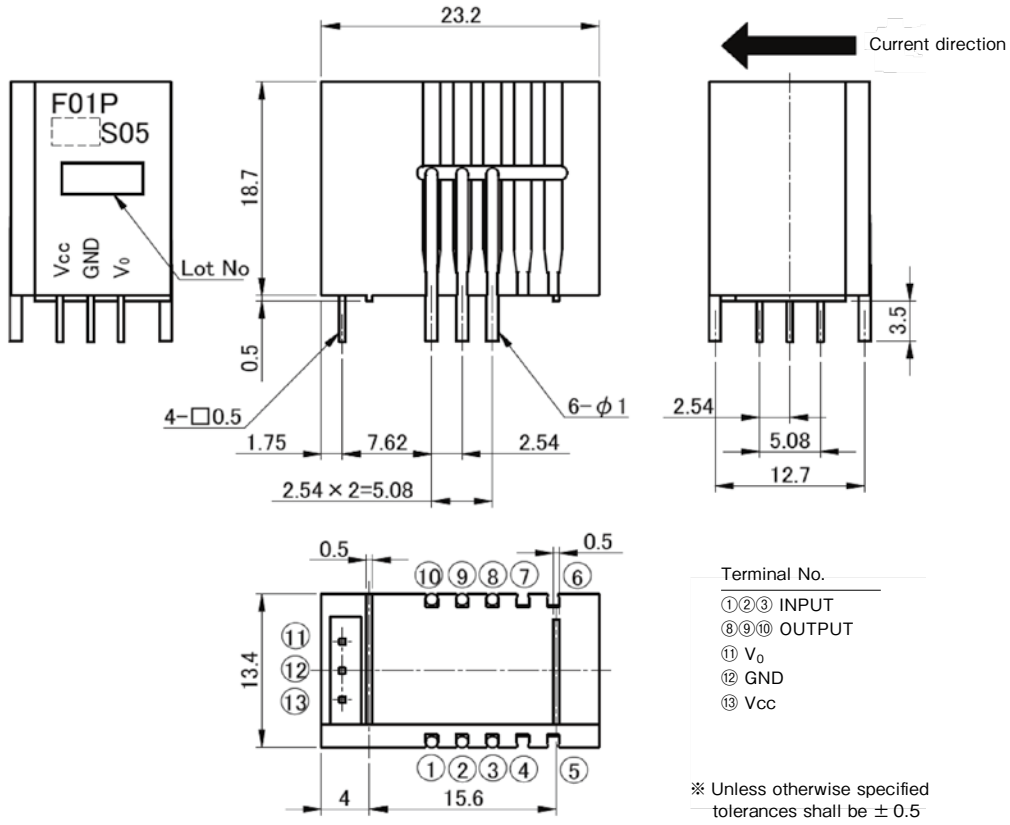


Figure 7 : Maximum RMS AC primary current/maximum DC primary current vs frequency

CONNECTION



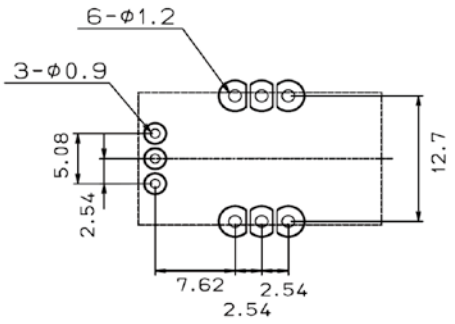
DIMENSIONS (mm)



Terminal No.
①②③ INPUT
⑧⑨⑩ OUTPUT
⑪ V_o
⑫ GND
⑬ Vcc

※ Unless otherwise specified tolerances shall be ± 0.5

RECOMMENDED HOLE DIAMETER (mm)



Fluxgate system / Voltage-output type

F02P SERIES

ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Comment
Supply voltage	Vcc	V	7	
Primary conductor temperature	—	℃	110	
Non repetitive primary current pulse (20μS), in powered or unpowered state.	Îp	A	20 × If	
ESD (HBM: Human Body Model)	—	kV	4	C=100pF, R=1.5k Ω

ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Comment
Insulation voltage	Vd	—	AC4100V, for 1minute (Sensing current 0.5mA)	Primary ⇔ Secondary
Insulation Resistance	R_{IS}	—	≧ 500M Ω (at DC500V)	Primary ⇔ Secondary
Clearance distance	dCi	—	7.5mm (TYP)	Primary ⇔ Secondary
Creepage distance	dCp	—	7.5mm (TYP)	Primary ⇔ Secondary
Case material	—	—	UL94 V-0	
Comparative Tracking Index ; (CTI)	CTI	V	600	
Application example	—	—	300V, CAT Ⅲ, PD2	Reinforced isolation,non uniform field according to EN50178, EN61010
	—	—	600V, CAT Ⅲ, PD2	Simple isolation,non uniform field according to EN50178, EN61010

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Ambient operating temperature	Ta	℃	− 40		+ 105	
Ambient storage temperature	T_S	℃	− 40		+ 105	
Mass	m	g		12		

SPECIFICATIONS

Ta=+25℃,RL=10kΩ,Vcc=+5V

Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Rated Current	F02P006S05	If	A		6		
	F02P015S05				15		
	F02P025S05				25		
	F02P050S05				50		
Maximum current (at Vcc= + 5V, Ta= + 105℃)	F02P006S05	Ipmax	A	− 20		20	
	F02P015S05			− 51		51	
	F02P025S05			− 85		85	
	F02P050S05			− 150		150	
Supply Voltage		Vcc	V	4.75	5.00	5.25	
Number of primary turns		Np	T		1, 2, 3		
Number of secondary turns	F02P006S05	Ns	T		1816		
	F02P015S05				1737		
	F02P025S05				1764		
	F02P050S05				1600		
Consumption current (at If)	F02P006S05	Icc	mA		25		Icc = 15 + Ip(mA) / Ns
	F02P015S05				30		
	F02P025S05				35		
	F02P050S05				55		
Internal reference voltage (at Ip = 0A)		Vref1	V	2.495	2.500	2.505	Ref OUT mode
External reference voltage		Vref2	V	0		4	Ref IN mode
Output voltage		Vo	V	0.375		4.625	
Output voltage (at Ip = 0A)		Vo	V		Vref1,Vref2		
Electrical offset voltage * 1	F02P006S05	Voe	mV	− 5.300		5.300	
	F02P015S05			− 2.210		2.210	
	F02P025S05			− 1.350		1.350	
	F02P050S05			− 0.725		0.725	
Electrical offset current reffered to primary	F02P006S05	Ioe	mA	− 51		51	
	F02P015S05			− 53		53	
	F02P025S05			− 54		54	
	F02P050S05			− 58		58	
Temperature coefficient of Internal reference voltage		TCVref1	ppm/K		± 5.0	± 50	
Temperature coefficient of Output voltage (at Ip = 0A)	F02P006S05	TCVo	ppm/K		± 6.0	± 14	ppm/K of 2.5V (− 40℃~+ 105℃)
	F02P015S05				± 2.3	± 6	
	F02P025S05				± 1.4	± 4	
	F02P050S05				± 0.7	± 3	
Sensitivity (Theoretical value)	F02P006S05	Gth	mV/A		104.2		625mV/If
	F02P015S05				41.67		
	F02P025S05				25		
	F02P050S05				12.5		
Sensitivity error		ε_G	%	− 0.7		0.7	
Temperature coefficient of Sensitivity (at Ta =− 40℃~+ 105℃)		TCG	ppm/K			± 40	
Output Linearity		ε_L	%	− 0.1		0.1	
Magnetic offset current reffered to primary (at 10 × If)		I_{OM}	A	− 0.1		0.1	
Output current noise reffered to primary (at 100Hz ~ 100kHz)		Ino	$\mu A/(Hz)^{1/2}$		20		RL = 1k Ω

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

SPECIFICATIONS

Ta=+25℃,RL=10kΩ,Vcc=+5V

Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Peak to peak output ripple at oscillator freqency (f typ = 450kHz)	F02P006S05	—	mV		40	160	RL = 1k Ω
	F02P015S05				15	60	
	F02P025S05				10	40	
	F02P050S05				5	20	
Reaction time (at 10% of If)	F02P006S05	tra	μs			0.3	RL = 1k Ω, di/dt = 18A/μs
	F02P015S05					0.3	RL = 1k Ω, di/dt = 44A/μs
	F02P025S05					0.3	RL = 1k Ω, di/dt = 68A/μs
	F02P050S05					0.3	RL = 1k Ω, di/dt = 100A/μs
Response time 1 (at 90% of If)	F02P006S05	tr	μs			0.3	RL = 1k Ω, di/dt = 18A/μs
	F02P015S05					0.3	RL = 1k Ω, di/dt = 44A/μs
	F02P025S05					0.3	RL = 1k Ω, di/dt = 68A/μs
	F02P050S05					0.3	RL = 1k Ω, di/dt = 100A/μs
Response time 2 (at 10% of If to 90% of Vo)		tr	μs			0.6	RL = 1k Ω, di/dt = If/μs
Frequency bandwidth (± 1dB)		BW	kHz	200			RL = 1k Ω
Frequency bandwidth (± 3dB)		BW	kHz	300			RL = 1k Ω
Output Voltage Accuracy (Overall)	F02P006S05	X_G	%			1.7	$X_G = (100 \times Voe/625) + \varepsilon_G + \varepsilon_L$
	F02P015S05					1.2	
	F02P025S05					1.0	
	F02P050S05					0.9	

STANDARDS

EN50178, EN61010-1, EN60950-1, UL508 (file No. E243511)

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

Characteristic curve (TYP)

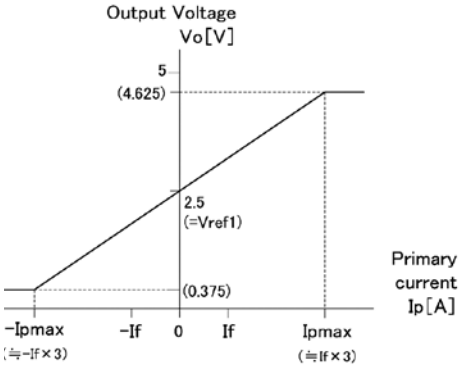


Figure 1 : Linearity curve (Internal reference voltage)

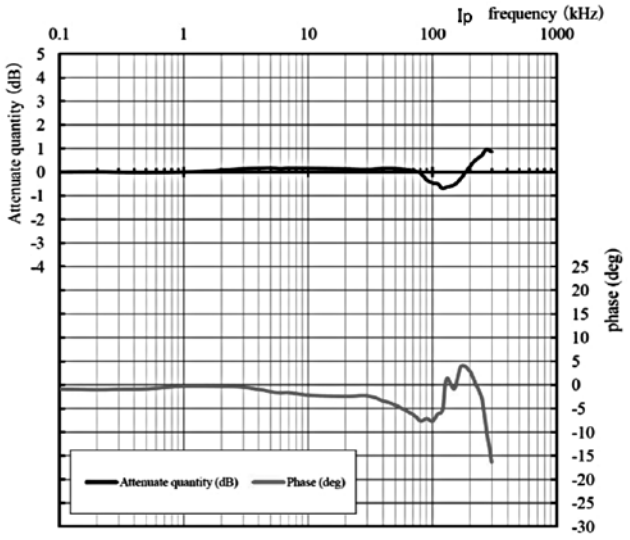


Figure 2 : Frequency response curve
ex) F02P025S05
Measurement condition Ta=+25℃, RL=1k Ω, Ip=3A, Vcc=+5V

SUPPORT DOCUMENTATION

Maximum continuous DC primary current

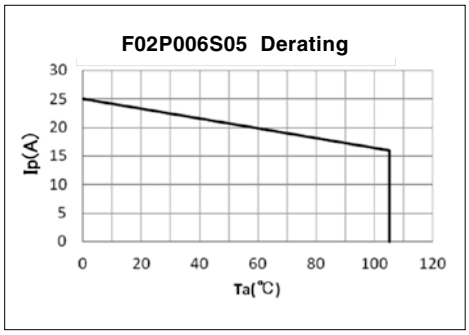


Figure 3 : Ip vs Ta for F02P006S05

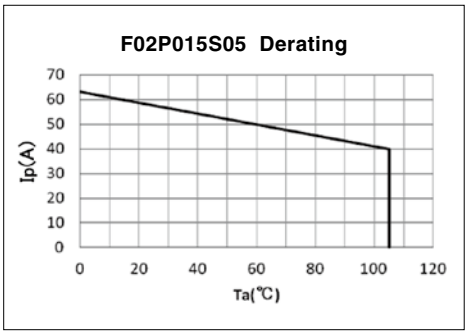


Figure 4 : Ip vs Ta for F02P015S05

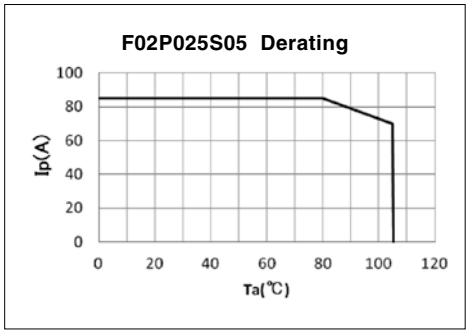


Figure 5 : Ip vs Ta for F02P025S05

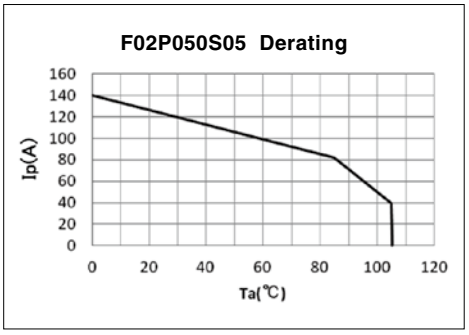


Figure 6 : Ip vs Ta for F02P050S05

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

① Ip < Ipmax
② Junction temperature Tj < 125℃
③ Primary conductor temperature < 110℃
④ Resistor power dissipation < 0.5 x rated power

Frequency derating

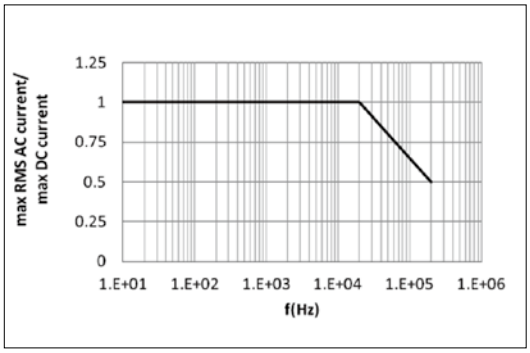


Figure 7 : Maximum RMS AC primary current/maximum DC primary current vs frequency

Reference voltage

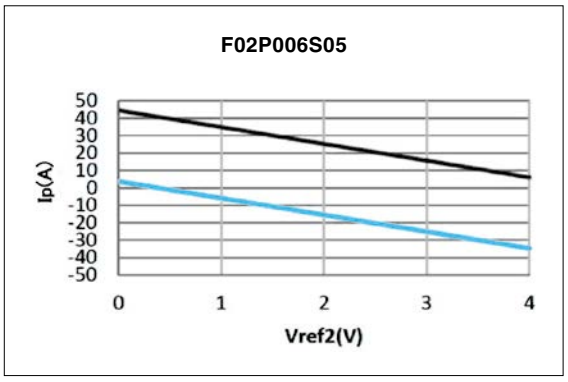
The Ref pin has two modes Ref IN and Ref OUT:

＜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.

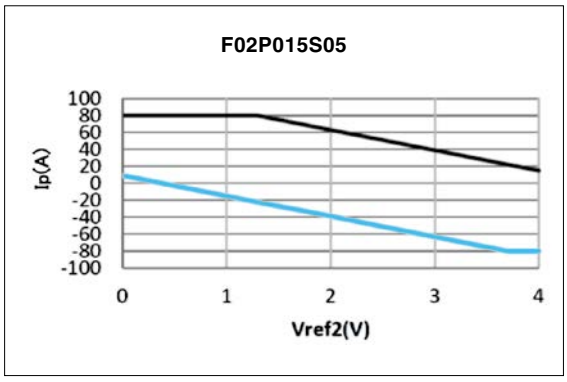
-either to source a typical current of (Vref − 2.5) /680,the maximum value will be 2.2mA typ.when Vref2 = 4V.
-or to sink a typical current of (2.5 − Vref2) /680,the maximum value will be 3.68mA typ.when Vref2 = 0V.

The following graphs show how the measuring range of each transducer version depends on external reference voltage value Vref2.

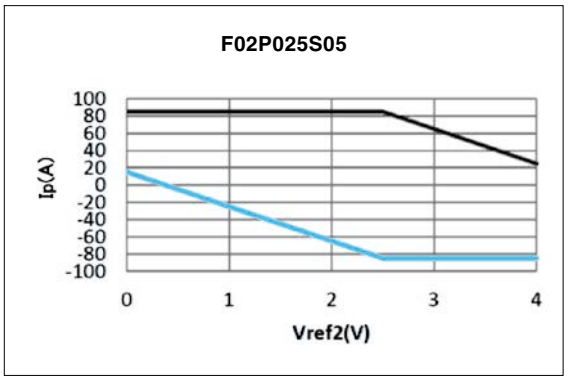


Upper limit : Ip = − 9.6 × Vref2 + 44.4 (Vref2 = 0...4V)

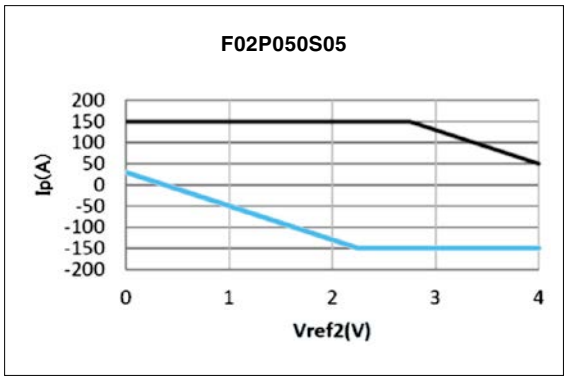
Lower limit : Ip = − 9.6 × Vref2 + 3.6 (Vref2 = 0...4V)



Upper limit : Ip = 80 (Vref2 = 0...1.29V)
Ip = − 24 × Vref2 + 111 (Vref2 = 1.29...4V)
Lower limit : Ip = − 24 × Vref2 + 9 (Vref2 = 0...3.7V)
Ip = − 80 (Vref2 = 3.7...4V)



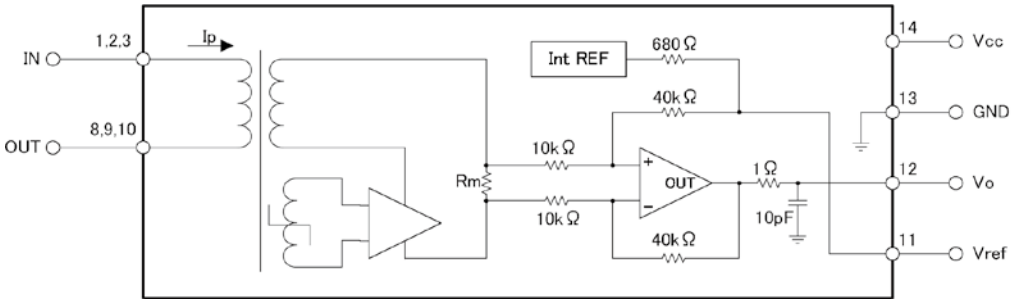
Upper limit : Ip = 85 (Vref2 = 0...2.5V)
Ip = − 40 × Vref2 + 185 (Vref2 = 2.5...4V)
Lower limit : Ip = − 40 × Vref2 + 15 (Vref2 = 0...2.5V)
Ip = − 85 (Vref2 = 2.5...4V)

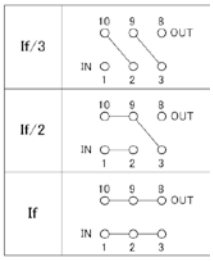


Upper limit : Ip = 150 (Vref2 = 0...2.75V)
Ip = − 80 × Vref2 + 370 (Vref2 = 2.75...4V)
Lower limit : Ip = − 80 × Vref2 + 30 (Vref2 = 0...2.25V)
Ip = − 150 (Vref2 = 2.25...4V)

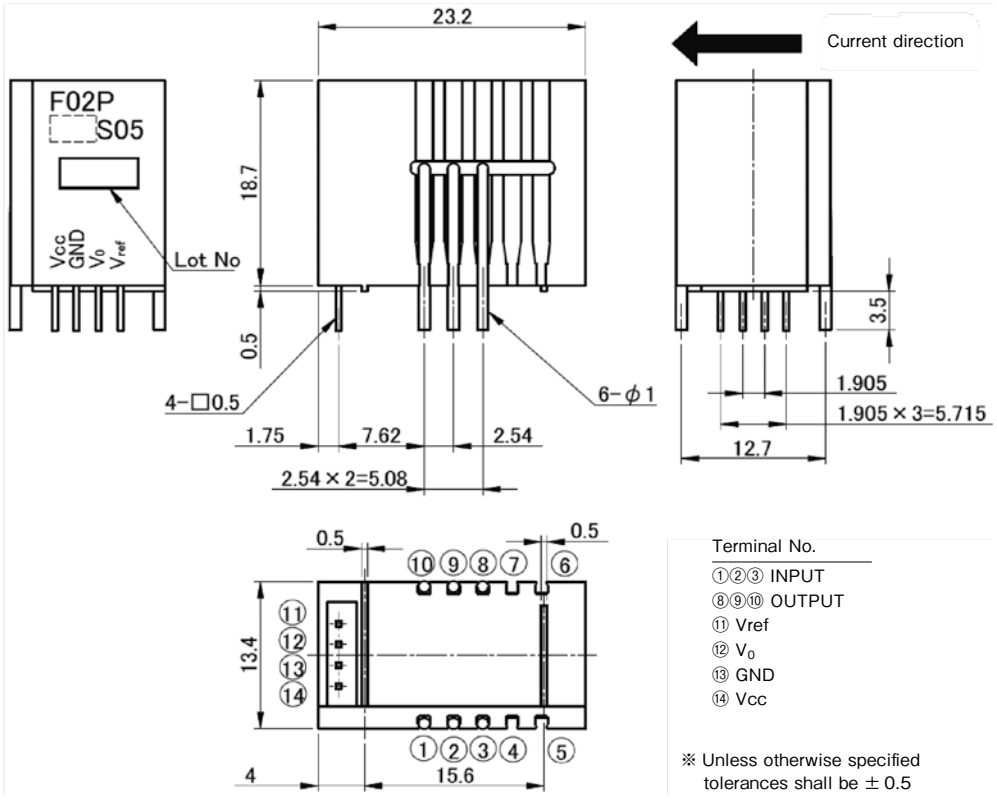
If you do not want to use the Ref pin, please unconnected.

CONNECTION

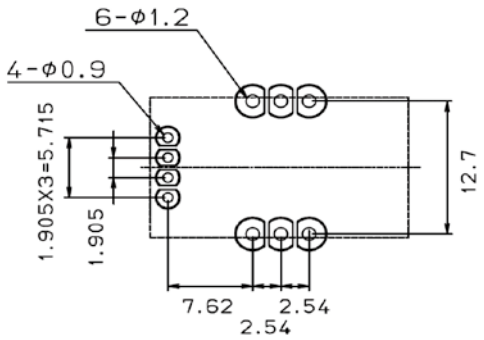




DIMENSIONS (mm)



RECOMMENDED HOLE DIAMETER (mm)



Fluxgate system / Voltage-output type

F03P SERIES

ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Comment
Supply voltage	Vcc	V	7	
Primary conductor temperature	—	℃	110	
Non r epetitive p rimary current pulse (20μS), in powered or unpowered state.	Îp	A	20 × If	
ESD (HBM: Human Body Model)	—	kV	4	C=100pF, R=1.5k Ω

ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Comment
Insulation voltage	Vd	—	AC4300V, for 1minute (Sensing current 0.5mA)	Primary ⇔ Secondary
Insulation Resistance	R_{IS}	—	≧ 500M Ω (at DC500V)	Primary ⇔ Secondary
Clearance distance	dCi	—	8.2mm (TYP)	Primary ⇔ Secondary
Creepage distance	dCp	—	8.2mm (TYP)	Primary ⇔ Secondary
Case material	—	—	UL94 V-0	
Comparative Tracking Index ; (CTI)	CTI	V	600	
Application example	—	—	300V, CAT Ⅲ, PD2	Reinforced isolation, non uniform field according to EN61010
	—	—	600V, CAT Ⅲ, PD2	Reinforced isolation, non uniform field according to EN50178
	—	—	1000V, CAT Ⅲ, PD2	Simple isolation, non uniform field according to EN50178

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Ambient operating temperature	Ta	℃	− 40		+ 105	
Ambient storage temperature	T_S	℃	− 40		+ 105	
Mass	m	g		12		

SPECIFICATIONS

Ta=+25℃,Np=1T,RL=10kΩ,Vcc=+5V

Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Rated Current	F03P006S05	If	A		6		
	F03P015S05				15		
	F03P025S05				25		
	F03P050S05				50		
Maximum current	F03P006S05	Ipmax	A	−20		20	
	F03P015S05			−51		51	
	F03P025S05			−85		85	
	F03P050S05			−150		150	
Supply Voltage		Vcc	V	4.75	5.00	5.25	
Number of primary turns		Np	T	1, 2, 3, 4			
Number of secondary turns	F03P006S05	Ns	T		1816		
	F03P015S05				1737		
	F03P025S05				1764		
	F03P050S05				1600		
Consumption current (at If)	F03P006S05	Icc	mA		25		Icc=15+Ip(mA)／Ns
	F03P015S05				30		
	F03P025S05				35		
	F03P050S05				55		
Internal reference voltage (at Ip=0A)		Vref1	V	2.495	2.500	2.505	Ref OUT mode
External reference voltage		Vref2	V	0		4	Ref IN mode
Output voltage		Vo	V	0.375		4.625	
Output voltage (at Ip=0A)		Vo	V		Vref1,Vref2		
Electrical offset voltage＊1	F03P006S05	Voe	mV	−5.300		5.300	
	F03P015S05			−2.210		2.210	
	F03P025S05			−1.350		1.350	
	F03P050S05			−0.725		0.725	
Electrical offset current reffered to primary	F03P006S05	Ioe	mA	−51		51	
	F03P015S05			−53		53	
	F03P025S05			−54		54	
	F03P050S05			−58		58	
Temperature coefficient of Internal reference voltage		TCVref1	ppm/K		±5.0	±50	
Temperature coefficient of Output voltage (at Ip=0A)	F03P006S05	TCVo	ppm/K		±6.0	±14	ppm/K of 2.5V (−40℃～+105℃)
	F03P015S05				±2.3	±6	
	F03P025S05				±1.4	±4	
	F03P050S05				±0.7	±3	
Sensitivity (Theoretical value)	F03P006S05	Gth	mV/A		104.2		625mV/If
	F03P015S05				41.67		
	F03P025S05				25		
	F03P050S05				12.5		
Sensitivity error		ε_G	%	−0.7		0.7	
Temperature coefficient of Sensitivity (at Ta=−40℃～+105℃)		TCG	ppm/K			±40	
Output Linearity (at If)		ε_L	%	−0.1		0.1	
Magnetic offset current reffered to primary (at 10×If)		I_{OM}	A	−0.1		0.1	
Output current noise reffered to primary (at 100Hz～100kHz)		Ino	$\mu A/(Hz)^{1/2}$		20		RL=1kΩ

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

SPECIFICATIONS

Ta=+25℃,Np=1T,RL=10kΩ,Vcc=+5V

Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Peak to peak output ripple at oscillator freqency (f typ =450kHz)	F03P006S05	—	mV		40	160	RL=1kΩ
	F03P015S05				15	60	
	F03P025S05				10	40	
	F03P050S05				5	20	
Reaction time (at 10% of If)	F03P006S05	tra	μs			0.3	RL=1kΩ, di/dt=18A/μs
	F03P015S05					0.3	RL=1kΩ, di/dt=44A/μs
	F03P025S05					0.3	RL=1kΩ, di/dt=68A/μs
	F03P050S05					0.3	RL=1kΩ, di/dt=100A/μs
Response time 1 (at 90% of If)	F03P006S05	tr	μs			0.3	RL=1kΩ, di/dt=18A/μs
	F03P015S05					0.3	RL=1kΩ, di/dt=44A/μs
	F03P025S05					0.3	RL=1kΩ, di/dt=68A/μs
	F03P050S05					0.3	RL=1kΩ, di/dt=100A/μs
Response time 2 (at 10% of If to 90% of Vo)		tr	μs			0.6	RL=1kΩ, di/dt=If/μs
Frequency bandwidth (±1dB)		BW	kHz	200			RL=1kΩ
Frequency bandwidth (±3dB)		BW	kHz	300			RL=1kΩ
Output Voltage Accuracy (Overall)	F03P006S05	X_G	%			1.7	X_G= (100×Voe/625) +ε_G+ε_L
	F03P015S05					1.2	
	F03P025S05					1.0	
	F03P050S05					0.9	

STANDARDS

EN50178, EN61010-1, EN60950-1, UL508 (file No. E243511)

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

Characteristic curve (TYP)

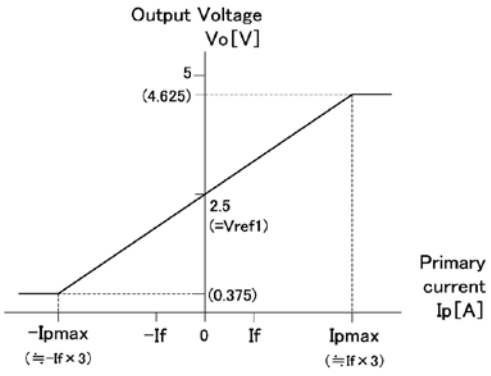


Figure 1 : Linearity curve (Internal reference voltage)

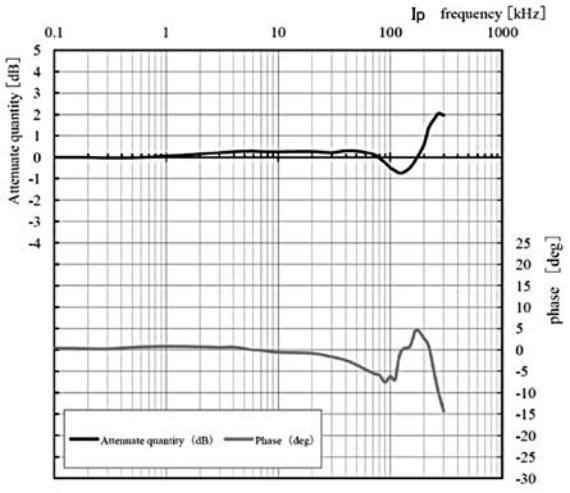


Figure 2 : Frequency response curve
ex) F03P025S05L
Measurement condition Ta=+25℃, RL=1kΩ, Ip=3A, Vcc=+5V

SUPPORT DOCUMENTATION

Maximum continuous DC primary current

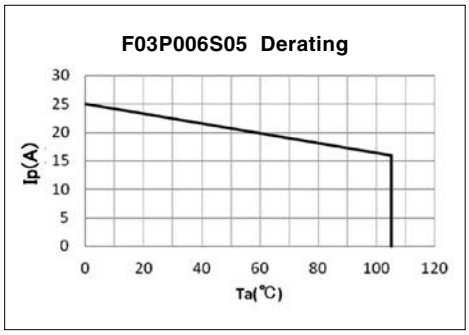


Figure 3 : Ip vs Ta for F03P006S05

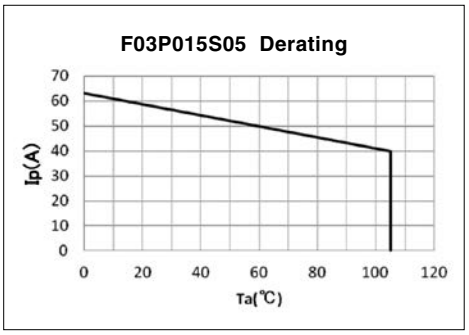


Figure 4 : Ip vs Ta for F03P015S05

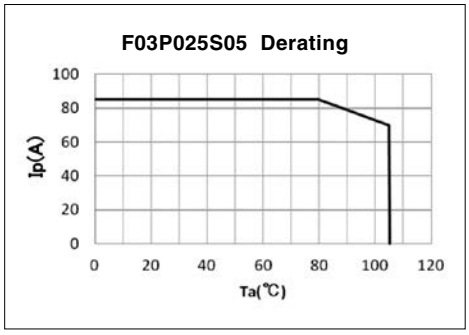


Figure 5 : Ip vs Ta for F03P025S05

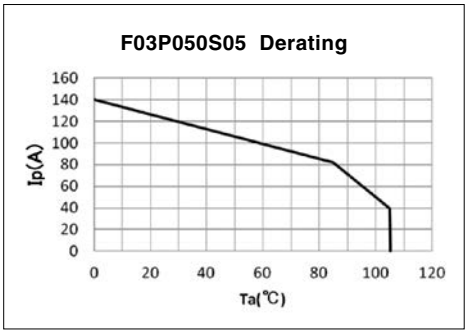


Figure 6 : Ip vs Ta for F03P050S05

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

① Ip < Ipmax
② Junction temperature Tj < 125℃
③ Primary conductor temperature < 110℃
④ Resistor power dissipation < 0.5 x rated power

Frequency derating

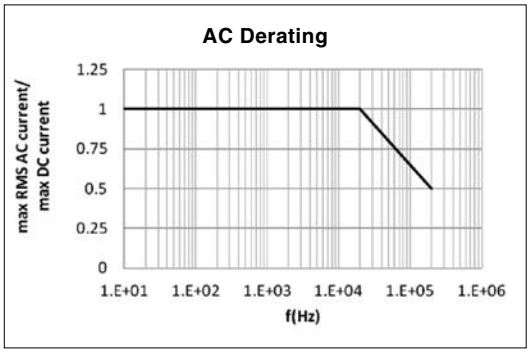


Figure 7 : Maximum RMS AC primary current/maximum DC primary current vs frequency

Reference voltage

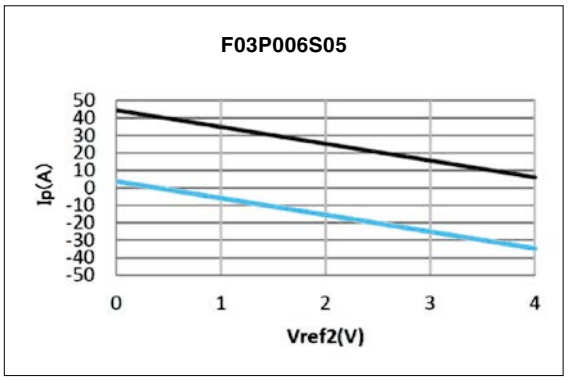
The Ref pin has two modes Ref IN and Ref OUT :

< 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.

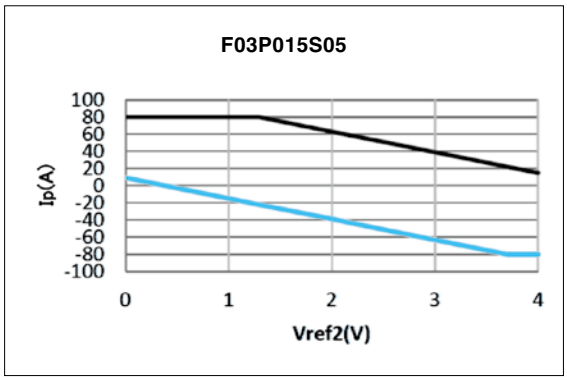
-either to source a typical current of (Vref − 2.5) /680,the maximum value will be 2.2mA typ.when Vref2 = 4V.
-or to sink a typical current of (2.5 − Vref2) /680,the maximum value will be 3.68mA typ.when Vref2 = 0V.

The following graphs show how the measuring range of each transducer version depends on external reference voltage value Vref2.

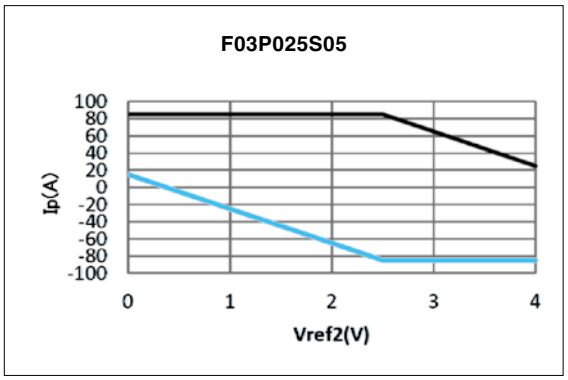


Upper limit : Ip = − 9.6 × Vref2 + 44.4 (Vref2 = 0...4V)

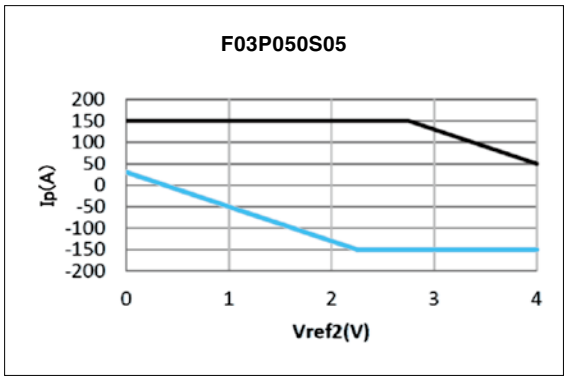
Lower limit : Ip = − 9.6 × Vref2 + 3.6 (Vref2 = 0...4V)



Upper limit : Ip = 80 (Vref2 = 0...1.29V)
Ip = − 24 × Vref2 + 111 (Vref2 = 1.29...4V)
Lower limit : Ip = − 24 × Vref2 + 9 (Vref2 = 0...3.7V)
Ip = − 80 (Vref2 = 3.7...4V)



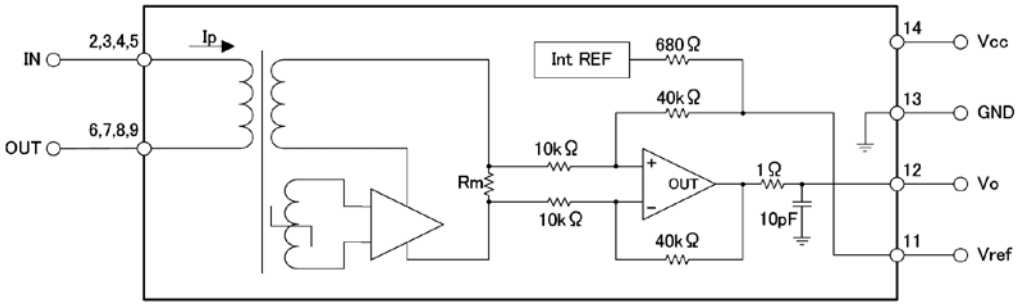
Upper limit : Ip = 85 (Vref2 = 0...2.5V)
Ip = − 40 × Vref2 + 185 (Vref2 = 2.5...4V)
Lower limit : Ip = − 40 × Vref2 + 15 (Vref2 = 0...2.5V)
Ip = − 85 (Vref2 = 2.5...4V)

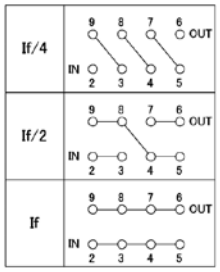


Upper limit : Ip = 150 (Vref2 = 0...2.75V)
Ip = − 80 × Vref2 + 370 (Vref2 = 2.75...4V)
Lower limit : Ip = − 80 × Vref2 + 30 (Vref2 = 0...2.25V)
Ip = − 150 (Vref2 = 2.25...4V)

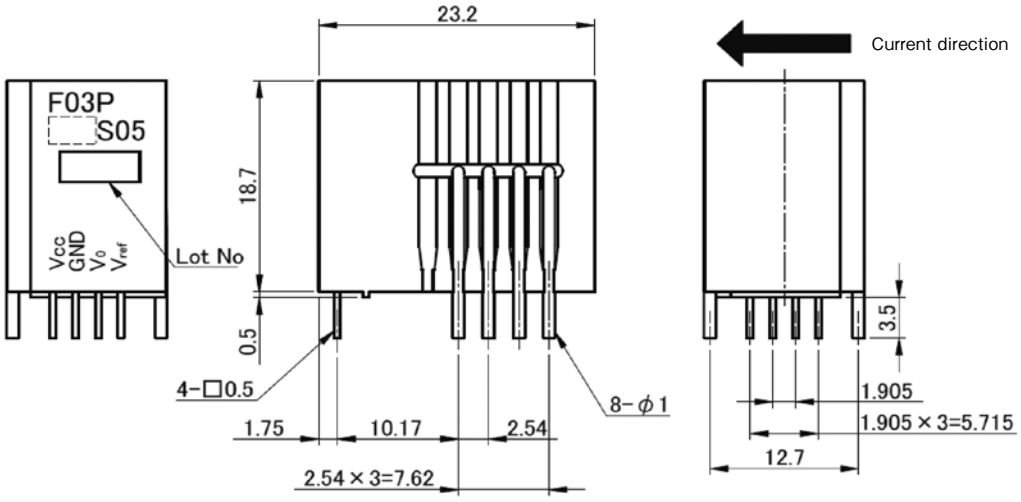
If you do not want to use the Ref pin, please unconnected.

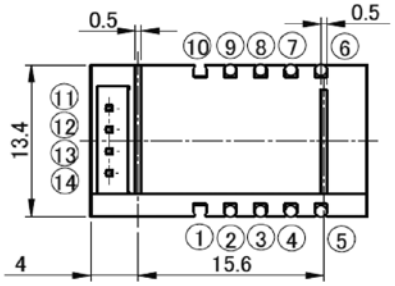
CONNECTION





DIMENSIONS (mm)

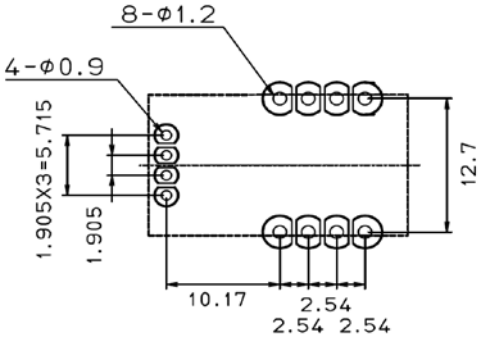




Terminal number
②③④⑤ Input
⑥⑦⑧⑨ Output
⑪ Vref
⑫ Vo
⑬ GND
⑭ Vcc

※ Unless otherwise specified, tolerances shall be ±0.5mm

RECOMMENDED HOLE DIAMETER (mm)



Fluxgate system / Voltage-output type

F23PxxxS05R SERIES

ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Comment
Supply voltage	Vcc	V	7	
Primary conductor temperature	—	℃	110	
ESD (HBM: Human Body Model)	—	kV	4	C=150pF, R=330 Ω

ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Comment
Insulation voltage	Vd	—	AC5000V, for 1minute (Sensing current 0.5mA)	Primary ⇔ Secondary
Insulation Resistance	R_{IS}	—	≧ 500M Ω (at DC500V)	Primary ⇔ Secondary
Clearance distance	dCi	—	11.0mm (MIN)	Primary ⇔ Secondary
Creepage distance	dCp	—	12.7mm (MIN)	Primary ⇔ Secondary
Case material	—	—	UL94 V-0	
Comparative Tracking Index ; (CTI)	CTI	V	600	
Application example	—	—	600V, CAT Ⅲ, PD2	Reinforced isolation,non uniform field according to EN50178, IEC61800-5-1
	—	—	1000V, CAT Ⅲ, PD2	Basic isolation,non uniform field according to EN50178, IEC61800-5-1

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Ambient operating temperature	Ta	℃	− 40		+ 85	
Ambient storage temperature	T_S	℃	− 40		+ 85	
Mass	m	g		13		

SPECIFICATIONS

Ta=+25℃,Np=1T,RL=10kΩ,Vcc=+5V

Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Rated Current	**F23P050S05R**	If	A		50		
	F23P100S05R				100		
Maximum current (at Vcc=＋5V, Ta=＋85℃)	**F23P050S05R**	Ipmax	A	－150		＋150	
	F23P100S05R			－200		＋200	
Supply Voltage		Vcc	V	4.75	5.00	5.25	
Number of primary turns		Np	T	1, 2, 3			
Number of secondary turns	**F23P050S05R**	Ns	T		1441		
	F23P100S05R				1127		
Consumption current (at If)	**F23P050S05R**	Icc	mA		55		Icc=20+If／Ns
	F23P100S05R				110		
Internal reference voltage (at Ip=0A)		Vref1	V	2.495	2.500	2.505	Ref OUT mode
External reference voltage		Vref2	V	0		4	Ref IN mode
Output voltage (at Ip=0A)		Vo	V		Vref1,Vref2		
Electrical offset voltage＊1	**F23P050S05R**	Voe	mV	－2.5		2.5	
	F23P100S05R						
Electrical offset current reffered to primary	**F23P050S05R**	Ioe	mA	－200		200	
	F23P100S05R			－400		400	
Temperature coefficient of Internal reference voltage		TCVref1	ppm/K		±5.0	±50	
Temperature coefficient of Output voltage (at Ip=0A)	**F23P050S05R**	TCVo	ppm/K		±3.0	±10	ppm/K of 2.5V (－40℃～＋85℃)
	F23P100S05R						
Sensitivity (Theoretical value)	**F23P050S05R**	Gth	mV/A		12.5		625mV (at If) = | Vref－Vout |/If
	F23P100S05R				6.25		
Sensitivity error		ε_G	%	－0.7		0.7	
Temperature coefficient of Sensitivity (at Ta=－40℃～＋85℃)		TCG	ppm/K			±40	
Output Linearity (at If)		ε_L	%	－0.1		0.1	
External recommended resistance of Vout		RL	kΩ		10		
External recommended capacitance of Vout		CL	pF			500	

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

SPECIFICATIONS

Ta=+25℃,Np=1T,RL=10kΩ,Vcc=+5V

Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Peak to peak output ripple at oscillator freqency (f typ =450kHz)	F23P050S05R	—	mV		5	20	RL=1k Ω
	F23P100S05R						
Reaction time (at 10% of If)	F23P050S05R	tra	μs			0.5	RL=1k Ω, di/dt=100A/μs
	F23P100S05R						
Response time (at 90% of If)	F23P050S05R	tr	μs			0.5	RL=1k Ω, di/dt=100A/μs
	F23P100S05R						
Frequency bandwidth (± 3dB)		BW	kHz		100		RL=1k Ω
Output Voltage Accuracy (Overall)	F23P050S05R	X_G	%			1.2	X_G= (100 × Voe/625) + ε_G + ε_L
	F23P100S05R						

STANDARDS

EN50178, EN(IEC)61800-5-1, UL508 (file No. E243511), CSA22.2 No.14-13

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

Characteristic curve (TYP)

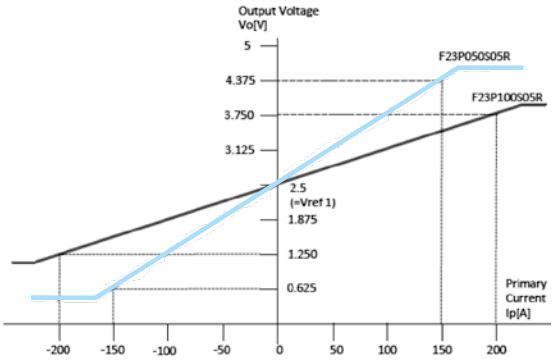


Figure 1 : Linearity curve (Internal reference voltage)
Measurement condition Ta=+25℃, RL=10k Ω, Vcc=+5V

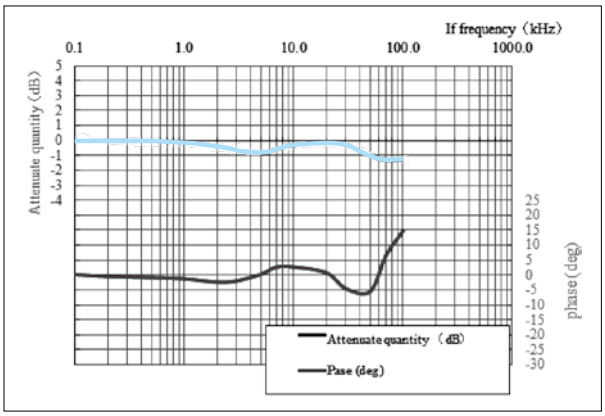


Figure 2 : Frequency response curve
ex) F23P100S05R
Measurement condition Ta=+25℃, RL=1k Ω, Ip=3A × 3T, Vcc=+5V

SUPPORT DOCUMENTATION

Maximum continuous DC primary current

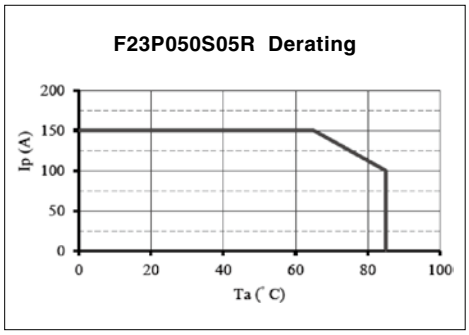


Figure 3 : Ip vs Ta for F23P050S05R

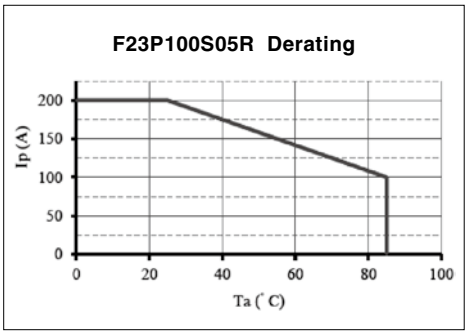


Figure 4 : Ip vs Ta for F23P100S05R
Measurement condition Vcc=+5V , RL=10k Ω

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

① Ip < Ipmax
② Junction temperature Tj < 125℃
③ Resistor power dissipation < 0.5 x rated power

Frequency derating

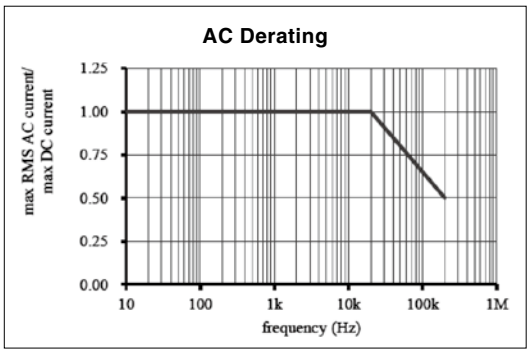


Figure 7 : Maximum RMS AC primary current/maximum DC primary current vs frequency

Reference voltage

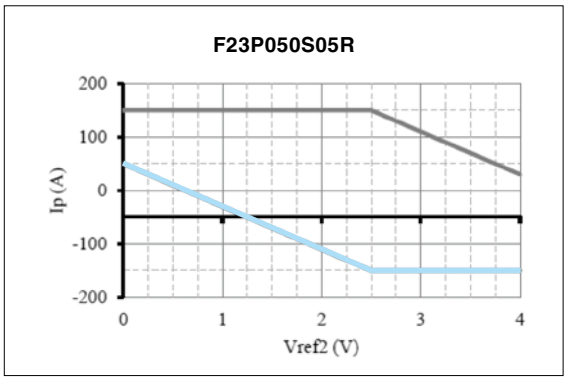
The Ref pin has two modes Ref IN and Ref OUT :

< Ref OUT mode >
The 2.5V internal precision reference is used by the transducer as the reference point for bipolar measurements;

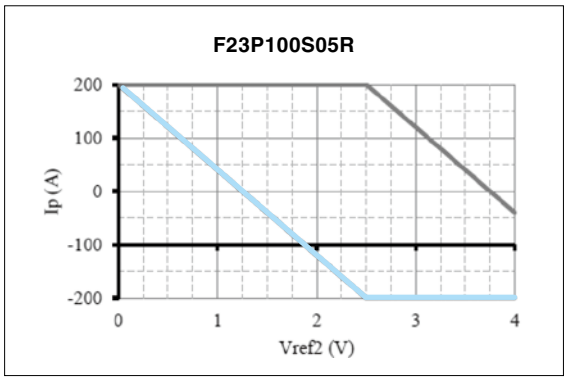
< Ref IN mode >
An external reference voltage is connected to the Ref pin; this voltage is specified in the range 0 to 4 V ,
its voltage is used as the reference voltage at the time of measurement.

-either to source a typical current of (Vref − 2.5) /680,the maximum value will be 2.2mA typ.when Vref2 = 4V.
-or to sink a typical current of (2.5 − Vref2) /680,the maximum value will be 3.68mA typ.when Vref2 = 0V.

The following graphs show how the measuring range of each transducer version depends on external reference voltage value Vref2.



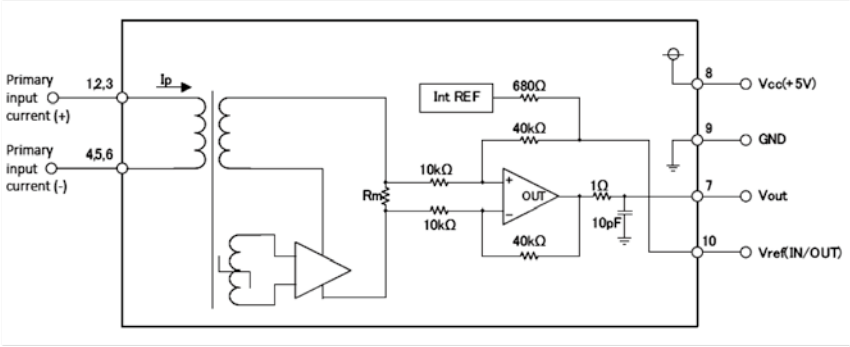
Upper limit : Ip = 150 (Vref2 = 0...2.5V)
Ip = − 80 × Vref2 + 350 (Vref2 = 2.5...4V)
Lower limit : Ip = − 80 × Vref2 + 50 (Vref2 = 0...2.5V)
Ip = − 150 (Vref2 = 2.5...4V)



Upper limit : Ip = 200 (Vref2 = 0...2.5V)
Ip = − 160 × Vref2 + 600 (Vref2 = 2.5...4V)
Lower limit : Ip = − 160 × Vref2 + 200 (Vref2 = 0...2.5V)
Ip = − 200 (Vref2 = 2.5...4V)

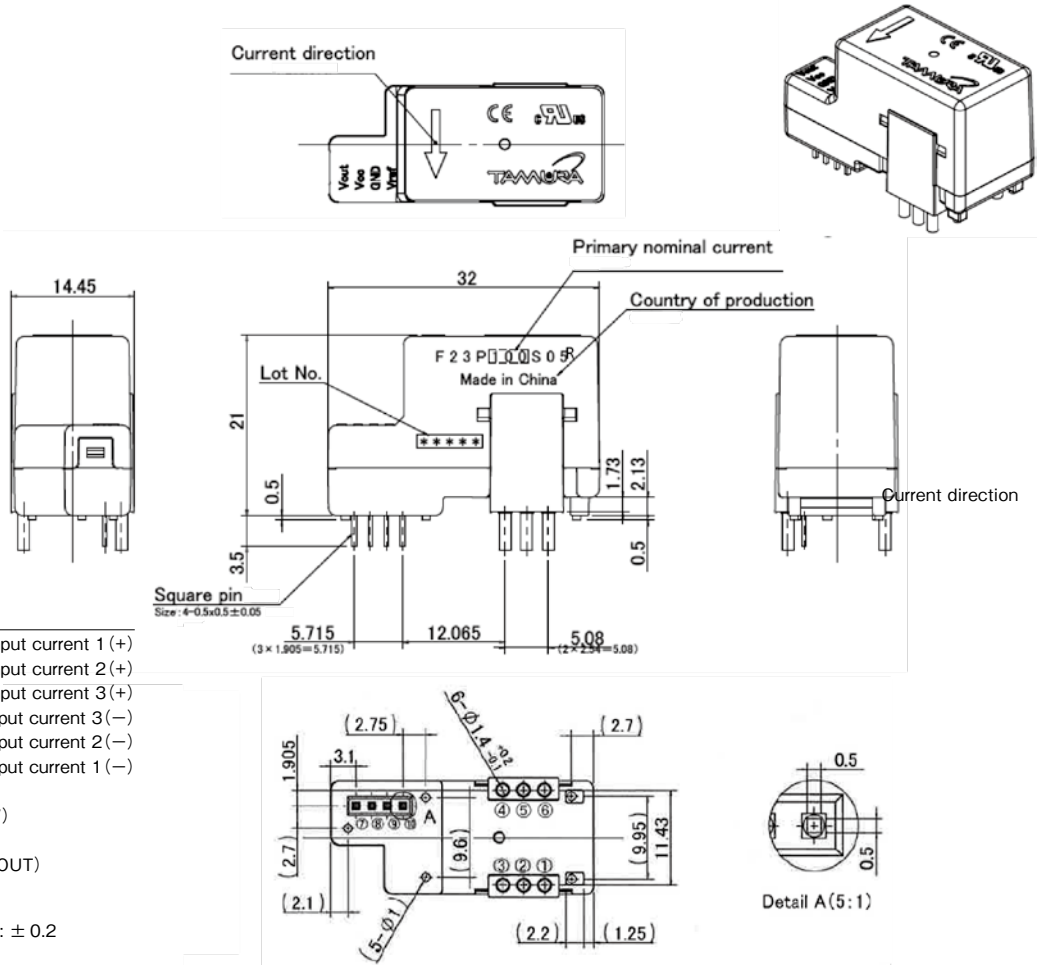
If you do not want to use the Ref pin, please unconnected.

CONNECTION



Primary winding Np	Primary current Ip [A]	wiring	Primary resistance Rp [mΩ]
3	Ip/3	Primary input current(+) 3 2 1 — 4 5 6 Primary input current(-)	1
2	Ip/2	Primary input current(+) 3 2 1 — 4 5 6 Primary input current(-)	0.45
1	Ip	Primary input current(+) 3 2 1 — 4 5 6 Primary input current(-)	0.1

DIMENSIONS (mm)

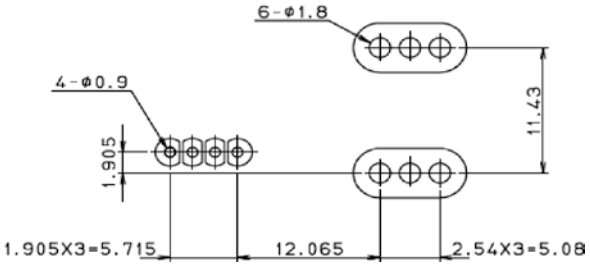


Terminal No.

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)



Magnetic Proportion System

L18P D15-OP SERIES

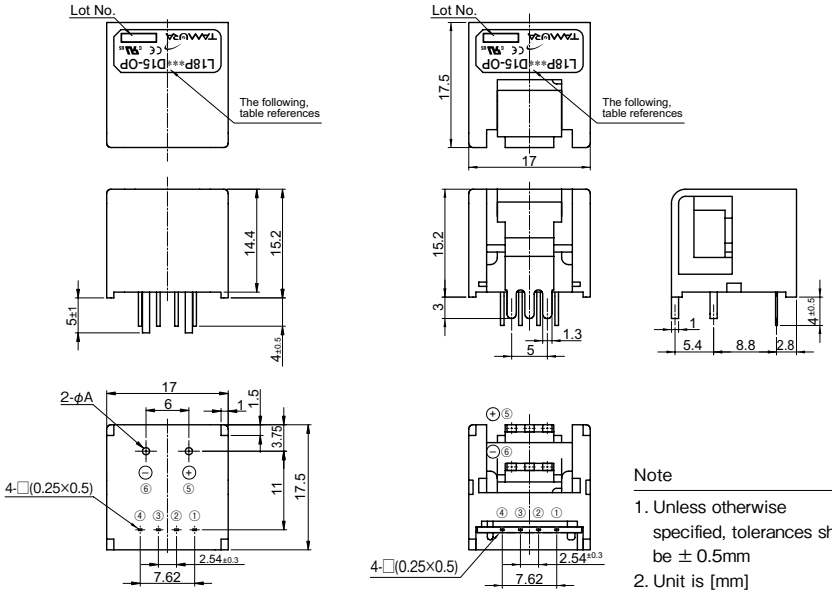

SPECIFICATIONS

Ta=25℃, RL=10kΩ, Vcc= ±15V

Spec \ Types	*** :	L18P***D15–OP ***: Priamary current code									
		003	005	010	015	020	025	030	040	050	060
Primary norminal current	If	3A	5A	10A	15A	20A	25A	30A	40A	50A	60A
Primary wire	ϕ	0.6mm	0.8mm	1.1mm	1.4mm	1.6mm			bus-bar 1.0 × 6.3		
Saturation current	If max	If × 3 *1									
Rated output voltage	Vo	4V ± 0.040V (at If)							4V ± 0.050V (at If)		
Offset voltage *2	Vof	≦± 0.040V (at If = 0A)							≦± 0.050V (at If = 0A)		
Output linearity (without offset)	ε_L	≦± 1% (at If)									
Power supply voltage	Vcc	± 12V (± 5%) ～ ± 15V (± 5%)									
Consumption current	Icc	± 14mA (typ) , ≦± 18mA									
di/dt Response time	tr	≦ 5μs (di/dt = If /μs)									
Thermal drift of gain	T_CVo	≦± 0.1% / ℃ (Without Tc Vof)									
Thermal drift of offset	T_CVof	≦± 1.5mV / ℃									
Hysteresis error	V_{OH}	≦ 25mV (at If = 0A → If → 0A)							≦ 40mV (at If = 0A → If → 0A)		
Insulation voltage	Vd	AC3000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Secondary									
Insulation resistance	R_{IS}	≧ 500M Ω (at DC500V) Primary ⇔ Secondary									
Ambient Operating temperature	T_A	− 30℃～+ 80℃									
Ambient storage temperature	T_S	− 40℃～+ 85℃									

＊1 Also operate at Vcc = ± 12V power supples, measuring range reduced to 2.5 x If. ＊2 Offset voltage value is after removal of core hysteresis.
＊ Please refer to the another sheet about conditions of UL Recognition.

DIMENSIONS (mm)



Terminal number

① − Vcc (− 15V)
② GND
③ + Vcc (+ 15V)
④ Vout
⑤ Primary input current (+)
⑥ Primary input current (−)

Current	***	ϕA
3A	003	ϕ0.6
5A	005	ϕ0.8
10A	010	ϕ1.1
15A	015	ϕ1.4
20A	020	ϕ1.6
25A	025	ϕ1.6
30A	030	ϕ1.6
40A	040	Busbar
50A	050	Busbar
60A	060	Busbar

Note

1. Unless otherwise specified, tolerances shall be ± 0.5mm
2. Unit is [mm]

Weight:

8g

Magnetic Proportion System

SL18P D15 SERIES


RoHS
Anti-Sulfuratad

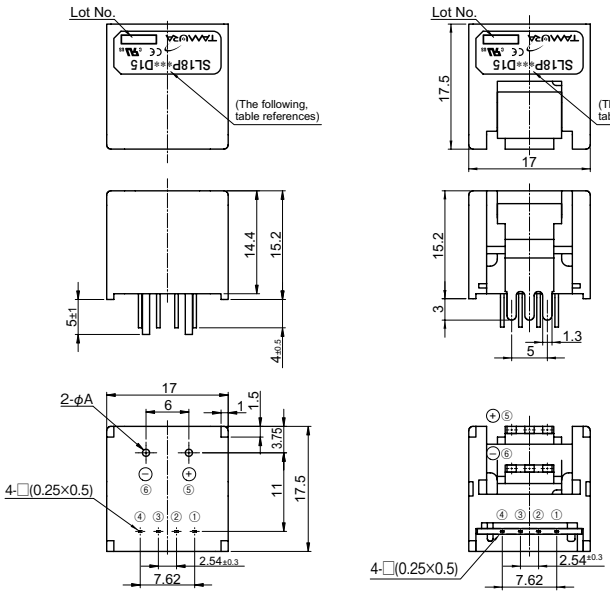
SPECIFICATIONS

Ta=25℃, RL=10kΩ, Vcc=±15V

Spec \ Types	*** :	SL18P*** D15***: Priamary current code									
		003	005	010	015	020	025	030	040	050	060
Primary norminal current	If	3A	5A	10A	15A	20A	25A	30A	40A	50A	60A
Primary wire	φ	0.6mm	0.8mm	1.1mm	1.4mm	1.6mm			bus-bar 1.0×6.3		
Saturation current	If max	If×3*1									
Rated output voltage	Vo	4V±0.040V (at If)							4V±0.050V (at If)		
Offset voltage*2	Vof	≦±0.040V (at If = 0A)							≦±0.050V (at If = 0A)		
Output linearity (without offset)	ε_L	≦±1% (at If)									
Power supply voltage	Vcc	±12V (±5%) ~ ±15V (±5%)									
Consumption current	Icc	±12mA (typ), ≦15mA									
di/dt Response time	tr	≦5μs (di/dt = If /μs)									
Thermal drift of gain	T_CVo	≦±0.1% / ℃ (Without Tc Vof)									
Thermal drift of offset	T_CVof	≦±1.5mV / ℃									
Hysteresis error	V_{OH}	≦25mV (at If = 0A → If → 0A)							≦40mV (at If = 0A → If → 0A)		
Insulation voltage	Vd	AC3000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Secondary									
Insulation resistance	R_{IS}	≧500MΩ (at DC500V) Primary ⇔ Secondary									
Ambient Operating temperature	T_A	−30℃~+80℃									
Ambient storage temperature	T_S	−40℃~+85℃									

*1 Also operate at Vcc = ±12V power supples, measuring range reduced to 2.5 x If. *2 Offset voltage value is after removal of core hysteresis. *Please refer to the another sheet about conditions of UL Recognition. *Anti-Sulfurated (Used resistors : Gold internal Electrodes, PCB coating : HumiSeal®) *Reliability test High Temperature and High Humidity Operation Test (85℃, 85%RH, 1000h, N=11, Pass)

DIMENSIONS



Terminal number

① − Vcc (− 15V)
② GND
③ + Vcc (+ 15V)
④ Vout
⑤ Primary input current (+)
⑥ Primary input current (−)

Current	***	φA
3A	003	φ0.6
5A	005	φ0.8
10A	010	φ1.1
15A	015	φ1.4
20A	020	φ1.6
25A	025	φ1.6
30A	030	φ1.6
40A	040	Busbar
50A	050	Busbar
60A	060	Busbar

Note

1. Unless otherwise specified, tolerances shall be ± 0.5mm
2. Unit is [mm]

Weight:

8g

Magnetic Proportion System

L18P D15 SERIES


TAMURA recommends L18P D15-0P series as a succession model.

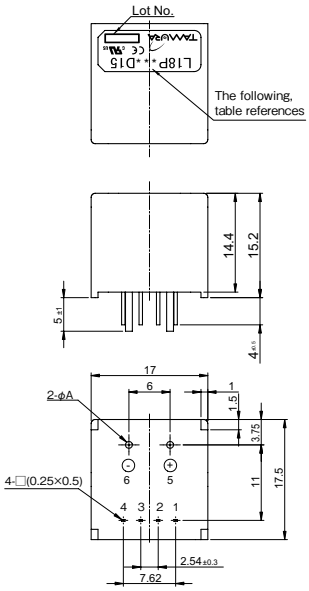
SPECIFICATIONS

Ta=25℃, RL=10kΩ, Vcc=±15V

Spec \ Types		L18P003D15	L18P005D15	L18P010D15	L18P015D15	L18P020D15	L18P025D15	L18P030D15	L18P040D15	L18P050D15	L18P060D15
Primary norminal current	If	3A	5A	10A	15A	20A	25A	30A	40A	50A	60A
Primary wire	φ	0.6mm	0.8mm	1.1mm	1.4mm	1.6mm			bus-bar 1.0 × 6.3		
Saturation current	If max	If × 3									
Rated output voltage	Vo	4V ± 0.040V (at If)							4V ± 0.050V (at If)		
Offset voltage	Vof	≦± 0.040V (at If = 0A) *1							≦± 0.050V (at If = 0A) *1		
Output linearity (without offset)	ε_L	≦± 1% (at If)									
Power supply voltage	Vcc	± 15V ± 5%									
Consumption current	Icc	± 12mA (typ) , ≦± 15mA									
di/dt Response time	tr	≦ 5μs (di/dt = If /μs)									
Thermal drift of gain	T_CVo	≦± 0.1% / ℃ (Without Tc Vof)									
Thermal drift of offset	T_CVof	≦± 1.5mV / ℃									
Hysteresis error	V_{OH}	≦ 25mV (at If = 0A → If → 0A)							≦ 40mV (at If = 0A → If → 0A)		
Insulation voltage	Vd	AC3000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Secondary									
Insulation resistance	R_{IS}	≧ 500M Ω (at DC500V) Primary ⇔ Secondary									
Ambient Operating temperature	T_A	− 30℃~+ 80℃									
Ambient storage temperature	T_S	− 40℃~+ 85℃									

∗1 Offset voltage value is after removal of core hysteresis. Please refer to the another sheet about conditions of UL Recognition.

DIMENSIONS (mm)



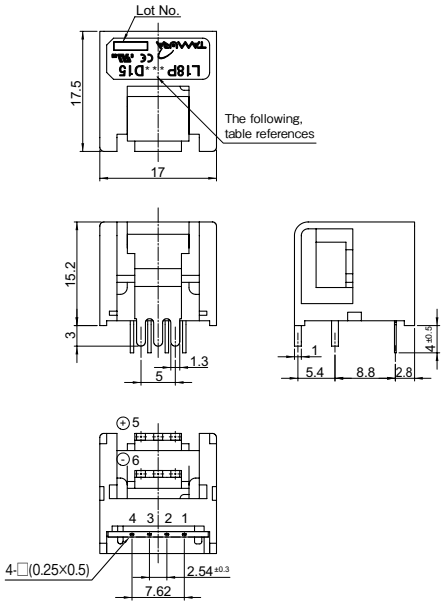
Terminal number

1 − Vcc
2 GND
3 + Vcc
4 OUT
5 + IN
6 − IN

Current	***	φA
3A	003	φ0.6
5A	005	φ0.8
10A	010	φ1.1
15A	015	φ1.4
20A	020	φ1.6
25A	025	φ1.6
30A	030	φ1.6

Note

1. Unless otherwise specified, tolerances shall be ±0.5mm
2. Unit is [mm]



Terminal number

1 − Vcc
2 GND
3 + Vcc
4 OUT
5 + IN
6 − IN

Current	***
40A	040
50A	050
60A	060

Note

1. Unless otherwise specified, tolerances shall be ±0.5mm
2. Unit is [mm]

Magnetic Proportion System

L18P S05 SERIES

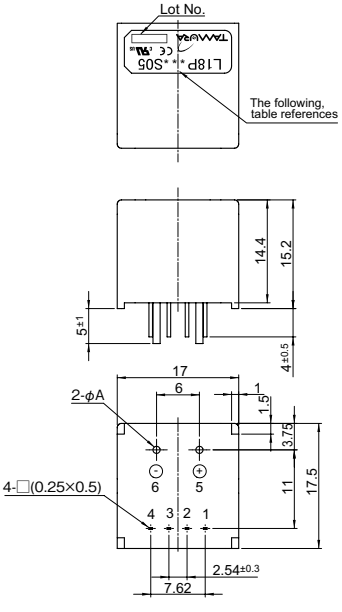

SPECIFICATIONS

Ta=25℃, RL=10kΩ, Vcc= +5V

Spec \ Types		L18P003S05	L18P005S05	L18P010S05	L18P015S05	L18P020S05	L18P025S05	L18P030S05	L18P040S05	L18P050S05	L18P060S05
Primary norminal current	If	3A	5A	10A	15A	20A	25A	30A	40A	50A	60A
Primary wire	ϕ	0.6mm	0.8mm	1.1mm	1.4mm	1.6mm			bus-bar 1.0 × 6.3		
Saturation current	If max	If × 1.5 *1									
Rated output voltage	Vo	Vof + 1.5V ± 0.045V (at If)									
Offset voltage	Vof	Vcc/2 ± 0.035V (at If = 0A) *2									
Output linearity (without offset)	ε_L	≦± 1% (at If)									
Power supply voltage	Vcc	+ 5V ± 5%									
Consumption current	Icc	≦ 15mA									
di/dt Response time	tr	≦ 5μs (di/dt = If /μs)									
Thermal drift of gain	T_CVo	≦± 2.0mV / ℃ (Without Tc Vof)									
Thermal drift of offset	T_CVof	≦± 2.0mV / ℃									
Hysteresis error	V_{OH}	≦ 25mV (at If = 0A → If → 0A)									
Insulation voltage	Vd	AC3000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Sacondary									
Insulation resistance	R_{IS}	≧ 500M Ω (at DC500V) Primary ⇔ Sacondary									
Ambient Operating temperature	T_A	− 30℃~+ 80℃									
Ambient storage temperature	T_S	− 40℃~+ 85℃									

*1 Vcc= + 5.0V (depending on Vcc) *2 Offset voltage value is after removal of core hysteresis. Please refer to the another sheet about conditions of UL Recognition.

DIMENSIONS (mm)



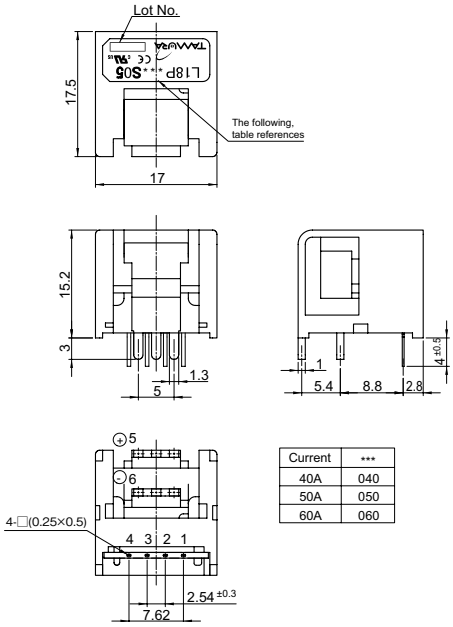
Terminal number

1. GND
2. GND
3. + Vcc
4. OUT
5. + IN
6. − IN

Current	***	φA
3A	003	φ0.6
5A	005	φ0.8
10A	010	φ1.1
15A	015	φ1.4
20A	020	φ1.6
25A	025	φ1.6
30A	030	φ1.6

Note

1. Unless otherwise specified, tolerances shall be ± 0.5mm
2. Unit is [mm]



Current	***
40A	040
50A	050
60A	060

Terminal number

1. GND
2. GND
3. + Vcc
4. OUT
5. + IN
6. − IN

Note

1. Unless otherwise specified, tolerances shall be ± 0.5mm
2. Unit is [mm]

Magnetic Proportion System

L18P S05R SERIES

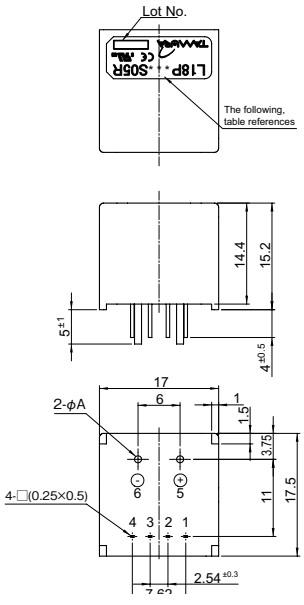

SPECIFICATIONS

Ta=25℃, RL=10kΩ, Vcc= +5V

Spec \ Types		L18P003 S05R	L18P005 S05R	L18P010 S05R	L18P015 S05R	L18P020 S05R	L18P025 S05R	L18P030 S05R	L18P040 S05R	L18P050 S05R	L18P060 S05R
Primary norminal current	If	3A	5A	10A	15A	20A	25A	30A	40A	50A	60A
Primary wire	ϕ	0.6mm	0.8mm	1.1mm	1.4mm	1.6mm			bus-bar 1.0 × 6.3		
Saturation current	If max	If × 3									
Rated output voltage	Vo	Vof + 0.625V ± 0.045V (at If)									
Offset voltage	Vof	2.5V ± 0.035V (at If = 0A) *1									
Output linearity (without offset)	ε_L	≦± 1% (at If)									
Power supply voltage	Vcc	+ 5V ± 5%									
Consumption current	Icc	≦ 15mA									
di ／ dt Response time	tr	≦ 5 μ s (di/dt = If / μ s)									
Thermal drift of gain	T_CVo	≦± 0.1% / ℃ (Without Tc Vof)									
Thermal drift of offset	T_CVof	≦± 1.0mV / ℃									
Hysteresis error	V_{OH}	≦ 25mV (at If = 0A → If → 0A)									
Insulation voltage	Vd	AC3000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Sacondary									
Insulation resistance	R_{IS}	≧ 500M Ω (at DC500V) Primary ⇔ Sacondary									
Ambient Operating temperature	T_A	− 30℃~+ 80℃									
Ambient storage temperature	T_S	− 40℃~+ 85℃									

*1 Offset voltage value is after removal of core hysteresis. Please refer to the another sheet about conditions of UL Recognition.

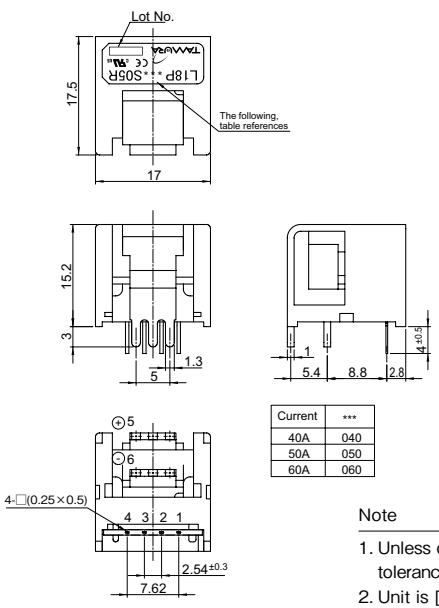
DIMENSIONS (mm)



Terminal number
1. GND
2. GND
3. + Vcc
4. OUT
5. + IN
6. − IN

Current	***	ϕA
3A	003	ϕ0.6
5A	005	ϕ0.8
10A	010	ϕ1.1
15A	015	ϕ1.4
20A	020	ϕ1.6
25A	025	ϕ1.6
30A	030	ϕ1.6

Note
1. Unless otherwise specified, tolerances shall be ± 0.5mm
2. Unit is [mm]



Current	***
40A	040
50A	050
60A	060

Terminal number
1. GND
2. GND
3. + Vcc
4. OUT
5. + IN
6. − IN

Note
1. Unless otherwise specified, tolerances shall be ± 0.5mm
2. Unit is [mm]

Magnetic Proportion System

L18P S12 SERIES

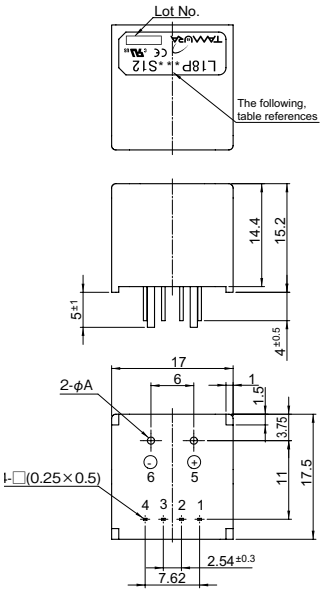

SPECIFICATIONS

Ta=25˚C, RL=10kΩ, Vcc=+12V

Spec \ Types		L18P003S12	L18P005S12	L18P010S12	L18P015S12	L18P020S12	L18P025S12	L18P030S12	L18P040S12	L18P050S12	L18P060S12
Primary norminal current	If	3A	5A	10A	15A	20A	25A	30A	40A	50A	60A
Primary wire	ϕ	0.6mm	0.8mm	1.1mm	1.4mm	1.6mm			bus-bar 1.0 × 6.3		
Saturation current	If max	If × 1.25									
Rated output voltage	Vo	Vof + 1.5V ± 0.045V (at If)									
Offset voltage	Vof	2.5V ± 0.035V (at If = 0A) *1									
Output linearity (without offset)	ε_L	≦± 1% (at If)									
Power supply voltage	Vcc	+ 12V ± 5%									
Consumption current	Icc	≦ 15mA									
di/dt Response time	tr	≦ 5μs (di/dt = If /μs)									
Thermal drift of gain	T_CVo	≦± 2.0mV / ℃ (Without Tc Vof)									
Thermal drift of offset	T_CVof	≦± 2.0mV / ℃									
Hysteresis error	V_{OH}	≦ 25mV (at If = 0A → If → 0A)									
Insulation voltage	Vd	AC3000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Sacondary									
Insulation resistance	R_{IS}	≧ 500M Ω (at DC500V) Primary ⇔ Sacondary									
Ambient Operating temperature	T_A	− 30℃~+ 80℃									
Ambient storage temperature	T_S	− 40℃~+ 85℃									

*1 Offset voltage value is after removal of core hysteresis. Please refer to the another sheet about conditions of UL Recognition.

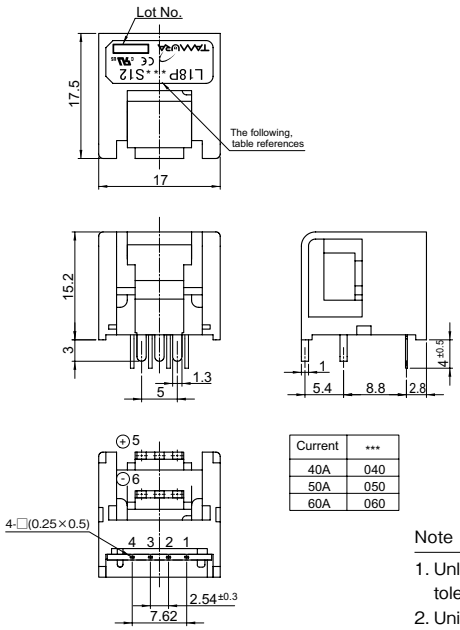
DIMENSIONS (mm)



Terminal number
1. GND
2. GND
3. + Vcc
4. OUT
5. + IN
6. − IN

Current	***	φA
3A	003	φ0.6
5A	005	φ0.8
10A	010	φ1.1
15A	015	φ1.4
20A	020	φ1.6
25A	025	φ1.6
30A	030	φ1.6

Note
1. Unless otherwise specified, tolerances shall be ± 0.5mm
2. Unit is [mm]



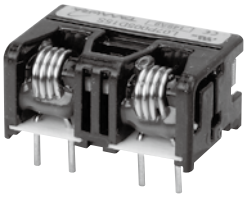
Current	***
40A	040
50A	050
60A	060

Terminal number
1. GND
2. GND
3. + Vcc
4. OUT
5. + IN
6. − IN

Note
1. Unless otherwise specified, tolerances shall be ± 0.5mm
2. Unit is [mm]

Magnetic Proportion System, 2 Circuits Type

L07P D15 SERIES



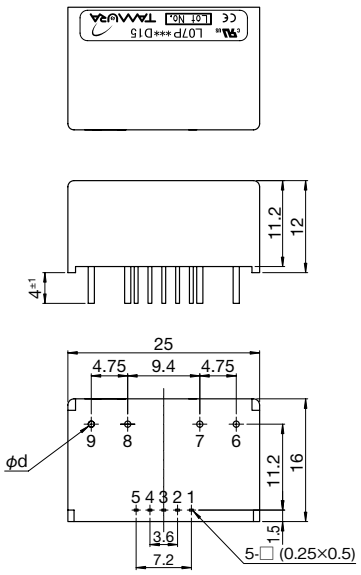
SPECIFICATIONS

Ta=25℃, RL=10kΩ, Vcc=±15V

Spec \ Types		L07P003D15	L07P005D15	L07P010D15	L07P015D15	L07P020D15	L07P025D15	L07P030D15
Primary norminal current	If	3A	5A	10A	15A	20A	25A	30A
Saturation current	If max	If × 3						
Rated output voltage	Vo	4V ± 0.060V (at If)						
Offset voltage	Vof	≦ ± 0.060V (at If = 0A) ※1						
Output linearity (0A ~ If)	ε_L	≦ ± 1% (at If)						
Power supply voltage	Vcc	± 15V ± 5%						
Consumption current	Icc	≦ ± 30mA						
di/dt Response time	tr	≦ 5μs (di / dt = If /μs) ※2						
Thermal drift of gain	T_CVo	≦ 0.1% / ℃ (Without Tc Vof)						
Thermal drift of offset	T_CVof	≦± 2.5mV / ℃						
Hysteresis error	V_{OH}	≦ 30mV (at If = 0A → If → 0A)						
Insulation voltage	Vd	AC2000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Sacondary						
Insulation resistance	R_{IS}	≧ 500M Ω (at DC500V) Primary ⇔ Sacondary						
Ambient Operating temperature	T_A	− 30℃~+ 80℃						
Ambient storage temperature	T_S	− 40℃~+ 85℃						

※1 Offset voltage value is after removal of core hysteresis. *2 Shall be each channel's value. Other channel's input current to be 0A. *Please refer to the another sheet about conditions of UL Recognition.

DIMENSIONS (mm)



A	ϕd
3A	ϕ0.6
5A	ϕ0.8
10A~15A	ϕ1.4
20A~30A	ϕ1.6

Terminal number

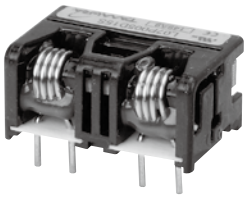
1 15V
2 − 15V
3 OUT1
4 OUT2
5 GND
6 + IN1
7 − IN1
8 + IN2
9 − IN2

Note

1. Unless otherwise specified, tolerances shall be ±0.5mm
2. Unit is [mm]

Magnetic Proportion System, 2 Circuits Type, Anti-Sulfurated

L07P D15S SERIES



RoHS

Anti-Sulfuratad

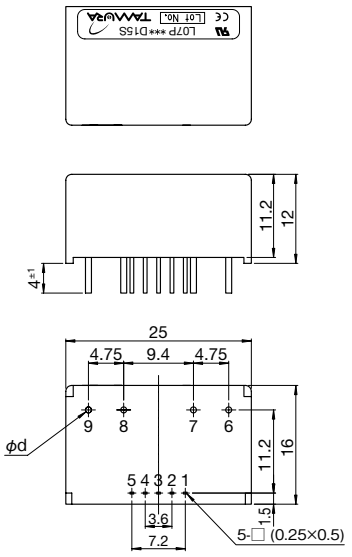
SPECIFICATIONS

Ta=25℃, RL=10kΩ, Vcc=±15V

Spec \ Types		L07P003D15S	L07P005D15S	L07P010D15S	L07P015D15S	L07P020D15S	L07P025D15S	L07P030D15S
Primary norminal current	If	3A	5A	10A	15A	20A	25A	30A
Saturation current	If max	If × 3						
Rated output voltage	Vo	4V ± 0.060V (at If)						
Offset voltage	Vof	≦ ± 0.060V (at If = 0A) ※1						
Output linearity (0A ~ If)	ε_L	≦ ± 1% (at If)						
Power supply voltage	Vcc	± 15V ± 5%						
Consumption current	Icc	≦ ± 30mA						
di/dt Response time	tr	≦ 5μs (di / dt = If /μs) ※2						
Thermal drift of gain	T_CVo	≦ 0.1% / ℃ (Without Tc Vof)						
Thermal drift of offset	T_CVof	≦± 2.5mV / ℃						
Hysteresis error	V_{OH}	≦ 30mV (at If = 0A → If → 0A)						
Insulation voltage	Vd	AC2000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Secondary						
Insulation resistance	R_{IS}	≧ 500M Ω (at DC500V) Primary ⇔ Secondary						
Ambient Operating temperature	T_A	− 30℃~+ 80℃						
Ambient storage temperature	T_S	− 40℃~+ 85℃						

∗1 Offset voltage value is after removal of core hysteresis. ∗2 Shall be each channel's value. Other channel's input current to be 0A. ∗ Please refer to the another sheet about conditions of UL Recognition. ∗ Anti-Sulfurated (Used resistors : Gold internal Electrodes, PCB coating : HumiSeal®) *Reliability test High Temperature and High Humidity Operation Test (85℃, 85%RH, 1500h, N=11, Pass)

DIMENSIONS (mm)



A	ϕd
3A	ϕ0.6
5A	ϕ0.8
10A~15A	ϕ1.4
20A~30A	ϕ1.6

Terminal number

1. + Vcc (+ 15V)
2. − Vcc (− 15V)
3. Vout 1
4. Vout 2
5. GND
6. Primary input current 1(+)
7. Primary input current 1(−)
8. Primary input current 2(+)
9. Primary input current 2(−)

Weight:

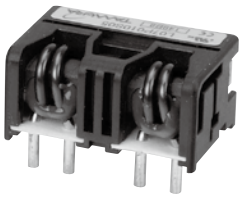
8g

Note

1. Unless otherwise specified, tolerances shall be ± 0.5mm
2. Unit is [mm]

Magnetic Proportion System, 2 Circuits Type

L07P S05 SERIES



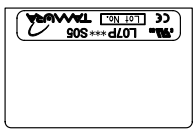
SPECIFICATIONS

Ta=25℃, RL=10kΩ, Vcc=+5V

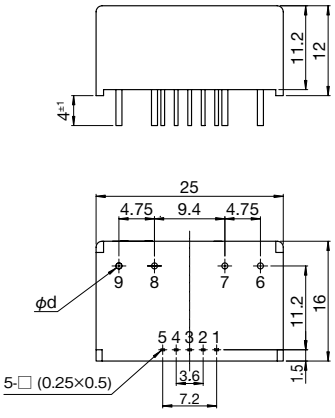
Spec \ Types		L07P003S05	L07P005S05	L07P010S05	L07P015S05	L07P020S05	L07P025S05	L07P030S05
Primary norminal current	If	3A	5A	10A	15A	20A	25A	30A
Saturation current	If max	If × 1.5						
Rated output voltage	Vo	Vof + 1.250V ± 0.040V (at If)						
Offset voltage	Vof	Vcc/2 ± 0.040V ※1 (at If = 0A)						
Output linearity (0A ～ If)	ε_L	≦± 1% (at If)						
Power supply voltage	Vcc	+ 5V ± 5%						
Consumption current	Icc	≦ 30mA						
di/dt Response time	tr	≦ 5μs (di / dt = If /μs) ※2						
Thermal drift of gain	T_CVo	≦ 2mV / ℃ (Without Tc Vof)						
Thermal drift of offset	T_CVof	≦± 2.0mV / ℃ MAX.						
Hysteresis error	V_{OH}	≦ 15mV (at If = 0A → If → 0A)						
Insulation voltage	Vd	AC2000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Sacondary						
Insulation resistance	R_{IS}	≧ 500M Ω (at DC500V) Primary ⇔ Sacondary						
Ambient Operating temperature	T_A	− 30℃～+ 80℃						
Ambient storage temperature	T_S	− 40℃～+ 85℃						

＊1 Offset voltage value is after removal of core hysteresis.
＊2 Shall be each channel's value. Other channel's input current to be 0A. ＊Please refer to the another sheet about conditions of UL Recognition.

DIMENSIONS (mm)



A	ϕd
3A	ϕ0.6
5A	ϕ0.8
10A～15A	ϕ1.4
20A～30A	ϕ1.6



Terminal number

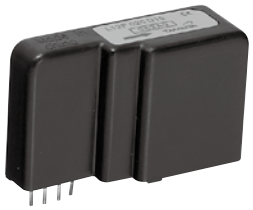
1. + 5V
2. NC
3. OUT1
4. OUT2
5. GND
6. + IN1
7. − IN1
8. + IN2
9. − IN2

Note

1. Unless otherwise specified, tolerances shall be ± 0.5mm
2. Unit is [mm]

Magnetic Proportion System

L12P D15 SERIES



CE RoHS

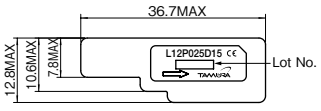
SPECIFICATIONS

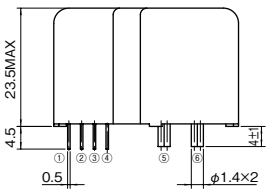
Ta=25℃, RL=10kΩ, Vcc=±15V

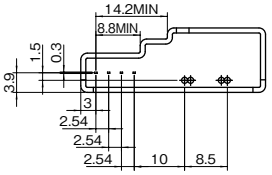
Spec \ Types	Symbol	L12P025D15
Primary norminal current	If	25A
Primary conductor specification	—	Φ 1.4 × 2 *1
Continuous DC current	Icon	25A
Saturation current	If max	If × 3 *2
Rated output voltage	ε_L	4V ± 0.040V (at If)
Offset voltage	Vof	≦ ± 0.040V (at If = 0A) *3
Output linearity (0A ~ If)	Vcc	≦ ± 1% (at If)
Power supply voltage	Vcc	± 12V (± 5%) ~ ± 15V (± 5%)
Consumption current	Icc	≦ 15mA
di/dt Response time	tr	≦ 3μs (di/dt = If /μs)
Thermal drift of gain	TcVo	≦ ± 0.1% / ℃ (Without Tc Vof)
Thermal drift of offset	TcVof	≦± 3.0mV / ℃
Hysteresis error	V_{OH}	≦ 25mV (at If = 0A → If → 0A)
Insulation voltage	Vd	AC2500V for 1 minute (Sensing current 0.5mA) Primary ⇔ Secondary
Insulation resistance	R_{IS}	≧ 500M Ω (at DC500V) Primary ⇔ Secondary
Ambient Operating temperature	T_A	− 30℃~+ 80℃
Ambient storage temperature	T_S	− 40℃~+ 85℃

＊1 Conductor terminals are soldered together. ＊2 Also operate at Vcc = ± 12V power supples, measuring range reduced to 2.5 x If.
＊3 Offset voltage value is after removal of core hysteresis.

DIMENSIONS (mm)







Terminal number

① + Vcc (+ 15V)
② − Vcc (− 15V)
③ Vout
④ GND
⑤ Primary input current (+)
⑥ Primary input current (−)

Weight:

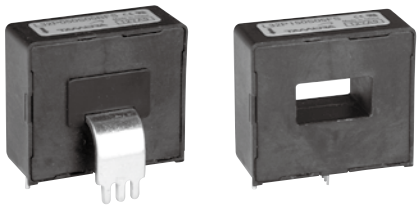
20g

Note

1. Unless otherwise specified, tolerances shall be ±0.5mm
2. Unit is [mm]

Magnetic Proportion System / Through Type and Busbar Type

L32P S05(B)FS SERIES



RoHS Anti-Sulfuratad

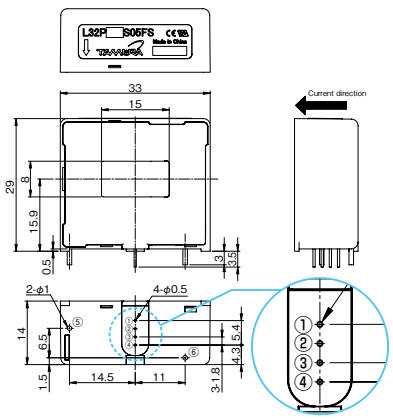
SPECIFICATIONS

Ta=25℃, RL=10kΩ, Vcc=+5.0V

Spec \ Types	Symbol	L32P050S05(B)FS	L32P100S05(B)FS	L32P150S05FS	L32P200S05FS	L32P300S05FS	L32P400S05FS
Primary norminal current	If	50A	100A	150A	200A	300A	400A
Saturation current	If max	≧±150A	≧±300A	≧±450A	≧±600A	≧±600A	≧±600A
Type	—	Through hole type : L32PxxxS05FS Bus bar type : L32PxxxS05BFS		Through hole type			
Reference Voltage	V ref	+2.495V±0.020V*1 (at Rref ≥ 1MΩ. Ouput impedance : typ 200Ω)					
Rated output voltage	Vo	Vof+0.625V±0.015 (at If)					
Offset voltage	Vof	Vref±0.025V (at If=0A) *2					
Output linearity (0A ~ If)	ε_L	±0.5% (at 0A, 1/2If, If)					
Power supply voltage	Vcc	+5V±5%					
Consumption current	Icc	≦20mA					
di/dt Response time	tr	≦5μs (at di/dt=100A/μs)					
Reference Temperature Characteristic	TcVref	≦ ±0.012%/°C					
Thermal drift of gain	T_CVO	≦ ±1.5mV/℃ (Without TcVof)					
Thermal drift of offset (at If=0A)	TcVof	≦±1.0mV/℃		≦±0.6mV/℃		≦±0.3mV/℃	
Hysteresis error (at 0A→If→0A)	V_{OH}	≦±10mV		≦±5.0mV		≦±2.5mV	
Insulation voltage	Vd	AC2500V for 1 minute (Sensing current 0.5mA) Primary ⇔ Secondary					
Insulation resistance	R_{IS}	≧500MΩ (at DC500V) Primary ⇔ Secondary					
Ambient Operating temperature	T_A	−40 ~+85℃					
Ambient storage temperature	Ts	−40 ~+85℃					

* 1 It is possible to change Vof with an external reference voltage (between 1.5V - 2.8V providing its ability to sink or source approximately 5 mA.). If the external reference voltag is not used, the Vref pin should be left unconnected. * 2 Offset voltage value is after removal of core hysteresis. * Please refer to the another sheet about conditions of UL Recognition. * Anti-Sulfurated (Used resistors : Gold internal Electrodes) * Ferrite core is used.

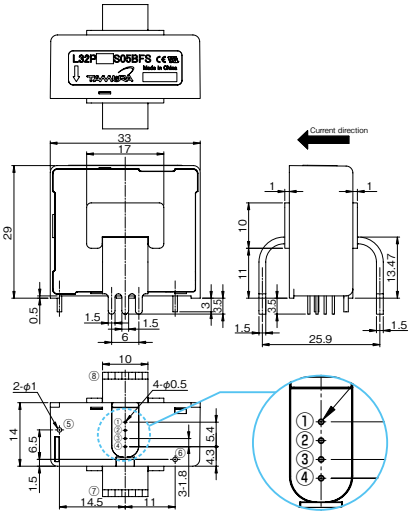
DIMENSIONS (mm)



Terminal number
① Vcc (+5V)
② GND
③ Vout
④ Vref (IN/OUT)
⑤⑥ NC

Weight
22g

Note
1. Unless otherwise specified, tolerances shall be ±0.5mm
2. Unit is [mm]



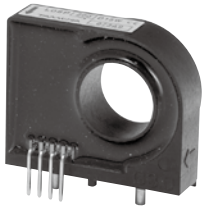
Terminal number
① Vcc (+5V)
② GND
③ Vout
④ Vref (IN/OUT)
⑤⑥ NC
⑦ Primary input current (+)
⑧ Primary input current (−)

Weight
30g

Note
1. Unless otherwise specified, tolerances shall be ±0.5mm
2. Unit is [mm]

Magnetic Proportion System / Through Type / Response time, dv/dt improvement type

L08P IPV/W/IPVW SERIES



CE RoHS

ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Comment
Supply voltage	Vcc	V	± 18V	

ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Comment
Insulation voltage	Vd	—	AC2500V, for 1minute (Sensing current 0.5mA)	Primary ⇔ Secondary
Insulation Resistance	R_{IS}	—	≧ 500M Ω (at DC500V)	Primary ⇔ Secondary
Case material	—	—	UL94 V-0	

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Ambient operating temperature	Ta	℃	− 40		+ 80	
Ambient storage temperature	T_S	℃	− 40		+ 85	
Mass	m	g		22		

SPECIFICATIONS

Ta=+25℃,RL=10kΩ,Vcc=±15V

Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Primary norminal current	L08P050D15IPV	If	A		50		
	L08P100D15IPV				100		
	L08P150D15IPV				150		
	L08P200D15W				200		
	L08P300D15IPVW				300		
	L08P400D15IPVW				400		
	L08P500D15IPVW				500		
Saturation current * 1	L08P050D15IPV	Ifmax	A	150			
	L08P100D15IPV			300			
	L08P150D15IPV			450			
	L08P200D15W			600			
	L08P300D15IPVW			600			
	L08P400D15IPVW			600			
	L08P500D15IPVW			600			

SPECIFICATIONS

Ta=+25℃,RL=10kΩ,Vcc=±15V

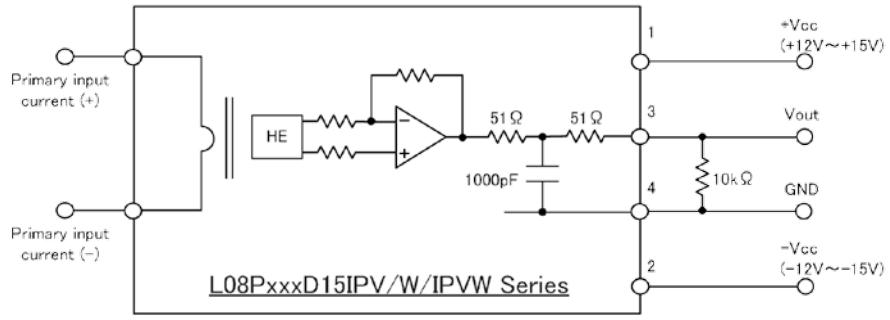
Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Power supply voltage		Vcc	V	±12(±5%)	±15(±5%)		
Consumption current		Icc	mA		14	20	
Rated output voltage		Vo	V	3.960	4.000	4.040	at If
Offset voltage＊2		Vof	V	－0.030	0.000	＋0.030	at If = 0A
Hysteresis error		V_{OH}	mV			±20	at 0A → If → 0A
Thermal drift of gain		TcVo	%/℃			±0.05	Without TcVof
Thermal drift of offset	L08P050D15IPV	TcVof	mV/℃			±2	at If = 0A
	L08P100D15IPV					±1	
	L08P150D15IPV					±1	
	L08P200D15W					±1	
	L08P300D15IPVW					±1	
	L08P400D15IPVW					±1	
	L08P500D15IPVW					±1	
Output Linearity（0A ～ If）		ε_L	%	－1		＋1	
Response time（@70% of If － 70% of Vo）		tr	μs			3	di/dt=100A/μs
Response time（@10% of If － 90% of Vo）	L08P050D15IPV	tr	μs			5	di/dt=100A/μs
	L08P100D15IPV					5	
	L08P150D15IPV					5	
	L08P200D15W					5	
	L08P300D15IPVW					5	
	L08P400D15IPVW					5	
	L08P500D15IPVW					8	
Response time（@10% of 250A － 90% of 2V）	L08P500D15IPVW	tr	μs			7	di/dt=100A/μs

＊1 If the product of 200A or less operate at Vcc = ± 12V power supplies, measuring range reduced to 2.5 x If.
＊2 Offset voltage value is after removal of core hysteresis.

STANDARDS

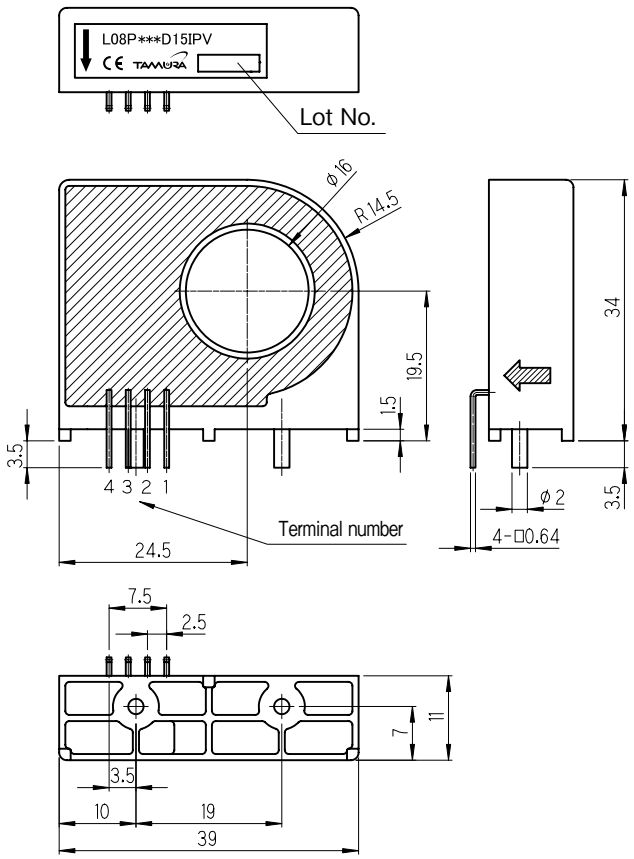
EN50178

CONNECTION

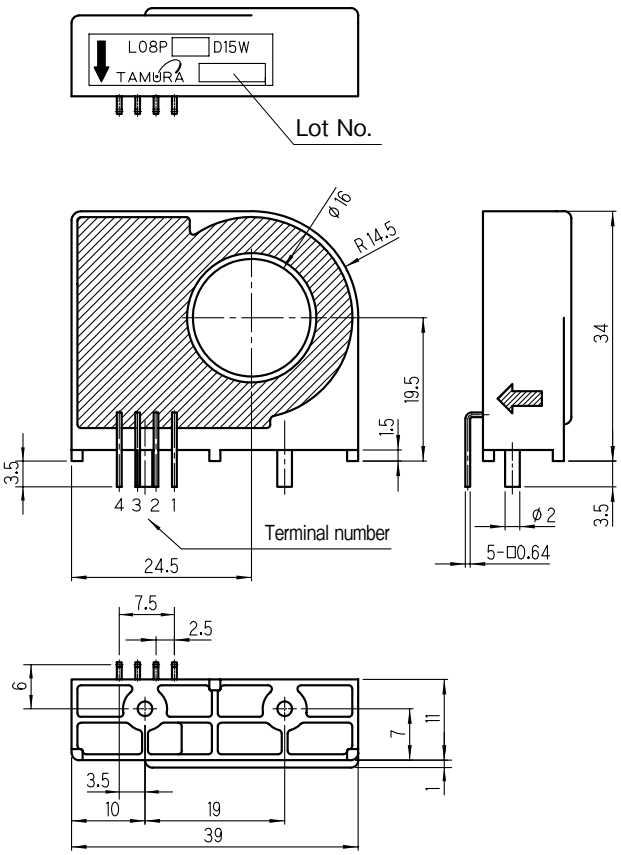


DIMENSIONS (mm)

L08PxxxD15IPV



L08PxxxD15W/IPVW



Terminal number

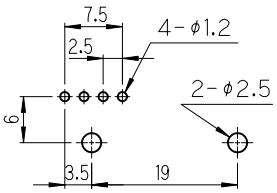
1 + Vcc (+ 15V)
2 − Vcc (− 15V)
3 Vout
4 GND

Weight:

20g

Note

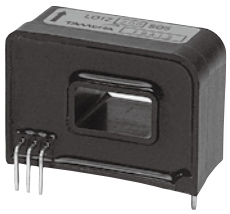
1. Unless otherwise specified, tolerances shall be ±0.5mm



Circuit boad hole dimension
(View of solder surface)

Magnetic Proportion System / Through Type

L01Z SERIES



CE RoHS

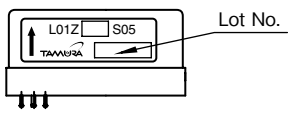
SPECIFICATIONS

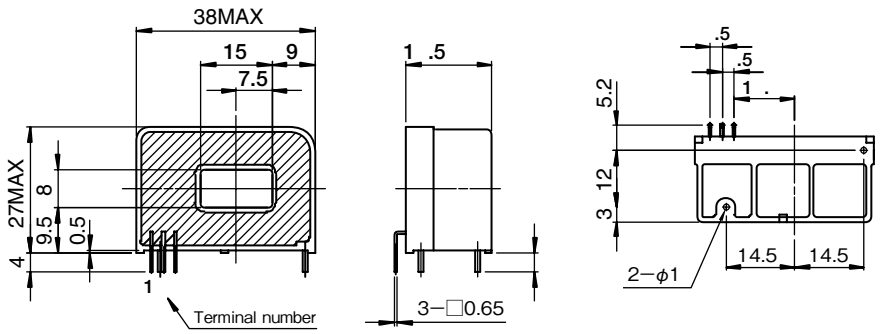
Ta=25℃, RL=10kΩ, Vcc=+5V

Spec \ Types		L01Z050S05	L01Z100S05	L01Z150S05	L01Z200S05	L01Z300S05	L01Z400S05	L01Z500S05	L01Z600S05
Primary norminal current	If	50AT	100AT	150AT	200AT	300AT	400AT	500AT	600AT
Saturation current	If max	If × 1.25							
Rated output voltage	Vo	Vref + 1.5V ± 0.045V (at If)	Vref + 1.5V ± 0.035V (at If)						
Saturation output voltage	Vo min/max	Vo min ≦ 0.5V, 4.5V ≦ Vo max							
Offset voltage *1	Vof	Vref ± 0.035V (at If = 0A)	Vref ± 0.030V (at If = 0A)						
Output linearity (0A ~ If)	ε_L	≦± 1% (at If)							
Power supply voltage	Vcc	+ 5V ± 2%							
Consumption current	Icc	≦ 15mA							
di/dt Response time	tr	≦ 10μs (di/dt = 100A /μs)							
Thermal drift of gain	T_CVo	≦± 2mV / ℃ (Without Tc Vof)	≦± 1.5mV / ℃ (Without Tc Vof)						
Thermal drift of offset	T_CVof	≦± 2mV / ℃	≦ ± 1mV / ℃						
Hysteresis error	V_{OH}	≦ 8mV (at If = 0A → If → 0A)			≦ 4mV (at If = 0A → If → 0A)		≦ 6mV (at If = 0A → If → 0A)		
Insulation voltage	Vd	AC2500V for 1 minute (Sensing current 0.5mA) inside of through hole ⇔ terminal							
Insulation resistance	R_{IS}	≧ 500M Ω (at DC500V) inside of through hole ⇔ terminal							
Ambient Operating temperature	T_A	− 20℃~+ 80℃							
Ambient storage temperature	T_S	− 40℃~+ 85℃							

＊1 Vref=Vcc/2

DIMENSIONS (mm)





Terminal number

1 Vout
2 GND
3 + Vcc (+ 5V)

Weight:

45g

Note

Unless otherwise specified, tolerances shall be ± 0.5mm

Magnetic Proportion System / Through Type

L37S D15 SERIES

RoHS

ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Comment
Supply voltage	V_{CC}	V	± 18V	

ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Comment
Insulation voltage	Vd	—	AC3600V, for 1minute (Sensing current 0.5mA)	Primary ⇔ Secondary
Impulse withstand voltage	Vw	kV	6.6	Primary ⇔ Secondary Input waveform : · Front time 1.2μs · Time to half value 50μs · single
Insulation resistance	R_{IS}	—	≧ 1000MΩ (at DC500V)	Primary ⇔ Secondary
Clearance distance	dCi	—	6.5mm (MIN)	Primary ⇔ Secondary
Creepage distance	dCp	—	6.5mm (MIN)	Primary ⇔ Secondary
Case material	—	—	UL94 V-0	
Comparative tracking index; (CTI)	CTI	V	200 (group IIIa)	
Application example	—	—	300V, CAT Ⅲ, PD2	Reinforced isolation, non uniform field according to EN50178, IEC/EN 61010-1
	—	—	600V, CAT Ⅲ, PD2	Basic isolation, non uniform field according to EN50178, IEC/EN 61010-1

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Ambient operating temperature	Ta	℃	− 40		+ 85	
Ambient storage temperature	T_S	℃	− 40		+ 85	
Mass	m	g		62		

SPECIFICATIONS

Ta=+25℃,RL=10kΩ,V_{CC}=±15V

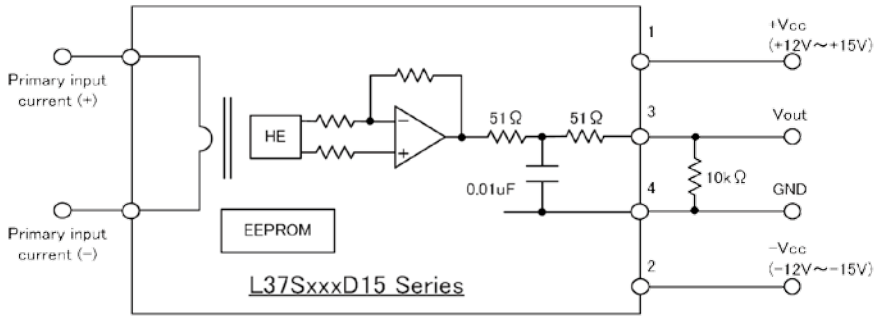
Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Primary norminal current	**L37S050D15＊**	If	A		Ifmax		
	L37S100D15＊				100		
	L37S200D15＊				200		
	L37S300D15＊				300		
	L37S400D15＊				400		
	L37S500D15＊				500		
	L37S600D15＊				600		
Saturation current＊1	**L37S050D15＊**	Ifmax	A	150			
	L37S100D15＊			300			
	L37S200D15＊			600			
	L37S300D15＊			900			
	L37S400D15＊			1000			
	L37S500D15＊			1000			
	L37S600D15＊			1000			
Power supply voltage＊2		Vcc	V	±12(±5%)	±15(±5%)		
Consumption current		Icc	mA		15	20	
Rated output voltage		Vo	V	3.960	4.000	4.040	at If
Offset voltage	**L37S050D15＊**	Vof	V	−0.030	0.000	+0.030	at If = 0A
	L37S100D15＊			−0.020	0.000	+0.020	
	L37S200D15＊			−0.020	0.000	+0.020	
	L37S300D15＊			−0.020	0.000	+0.020	
	L37S400D15＊			−0.020	0.000	+0.020	
	L37S500D15＊			−0.020	0.000	+0.020	
	L37S600D15＊			−0.020	0.000	+0.020	
Hysteresis error		V_{OH}	mV			±20	at 0A → If → 0A
Thermal drift of gain		TcVo	%/℃			±0.1	Without TcVof
Thermal drift of offset	**L37S050D15＊**	TcVof	mV/℃			±2	at If = 0A
	L37S100D15＊					±1	
	L37S200D15＊					±1	
	L37S300D15＊					±1	
	L37S400D15＊					±1	
	L37S500D15＊					±1	
	L37S600D15＊					±1	
Output linearity (0A ～ If)		ε_L	%	−1		+1	
Response time (@90% of If)		tr	μs			3	di/dt=100A/μs

＊1 If the product of 300A or less operate at Vcc = ± 12V power supplies, measuring range reduced to 2.5 x If.
＊2 The power on rise time should be less than 45ms at time from 0 to + 11V.
Current sensor may not operate normally because EEPROM in sensor does not work normally.
＊3 Offset voltage value is after removal of core hysteresis.

STANDARDS

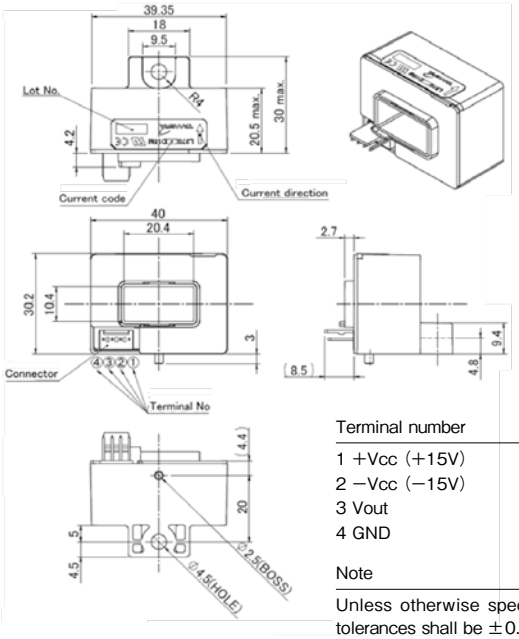
EN50178 , IEC/EN 61010-1 , IEC/EN 62109-1 , UL508（file No. E243511）
※ Please refer to the another sheet about conditions of UL Recognition.

CONNECTION



DIMENSIONS (mm)

L37SxxxD15M



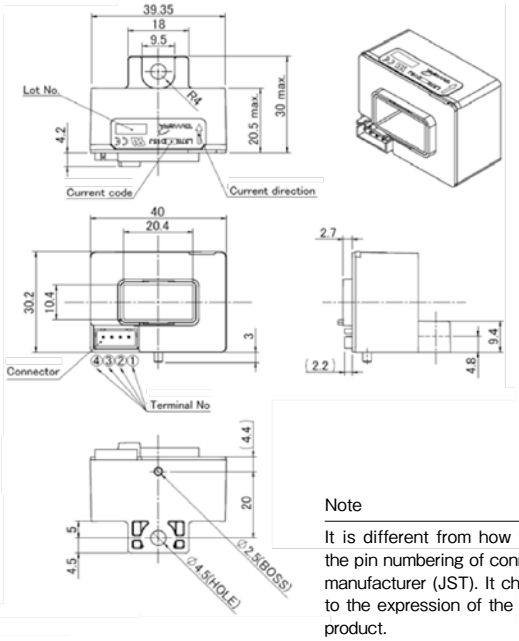
Terminal number

1 +Vcc (+15V)
2 −Vcc (−15V)
3 Vout
4 GND

Note

Unless otherwise specified tolerances shall be ±0.5mm.

L37SxxxD15J



Note

It is different from how to put the pin numbering of connector manufacturer (JST). It changes to the expression of the Molex product.

Order number and Connector number (terminal plating)

Types		Connector			
		Manufacturer	Part Number	Old Part Number	Plating of terminal
L37SxxxD15J	Standard	JST	B4B-XH-A-G	—	Au
L37SxxxD15M	Standard	Molex	22-04-1041	5045-04A	Sn
L37SxxxD15M-A	Build to Order		22-11-1041	5045-04AG	Au

As for the L37SxxxD15M series of a gold-plated connector, '-A' attaches to the end of the product name.

Magnetic Proportion System / Through Type

L03S SERIES

TAMURA recommends L37S series as a succession model.

SPECIFICATIONS

Ta=25℃, RL=10kΩ, Vcc=±15V

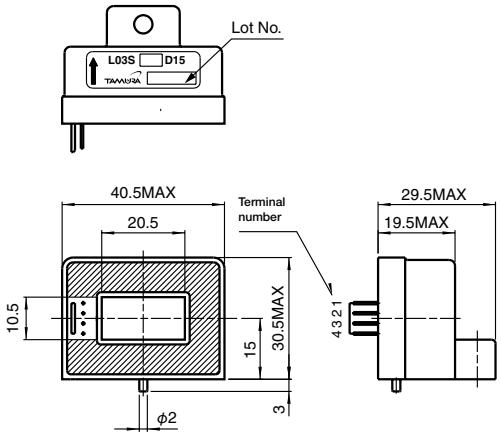
Spec \ Types		L03S050D15	L03S100D15	L03S200D15	L03S300D15	L03S400D15	L03S500D15	L03S600D15
Primary norminal current	If	50AT	100AT	200AT	300AT	400AT	500AT	600AT
Saturation current	If max	≧± 150AT	≧± 300AT	≧± 600AT	≧± 700AT	≧± 700AT	≧± 700AT	≧± 700AT
Output voltage	Vo	4V ± 0.040V (at If)						
Offset voltage *1	Vof	≦± 0.040V (at If=0A)	≦± 0.030V (at If=0A)					
Output linearity (without offset)	ε_L	≦ ± 1% (at If)						
Power supply voltage	Vcc	± 15V ± 5%						
Consumption current	Icc	± 12mA (typ) , ≦ ± 20mA						
di/dt Response time *2	tr	≦ 10μs						
Thermal drift of gain	T_CVo	≦± 0.1% / ℃ (without Tc Vof)						
Thermal drift of offset	T_CVof	≦± 2mV / ℃	≦± 1mV / ℃					
Hysteresis error	V_{OH}	≦ 20mV (at If = 0A → If → 0A)						
Insulation voltage	Vd	AC2500V for 1 minute (Sensing current 0.5mA) inside of through hole ⇔ terminal						
Insulation resistance	R_{IS}	≧ 500M Ω (at DC500V) , inside of through hole ⇔ terminal						
Ambient Operating temperature	T_A	− 20℃~+ 80℃						
Ambient storage temperature	T_S	− 40℃~+ 90℃						

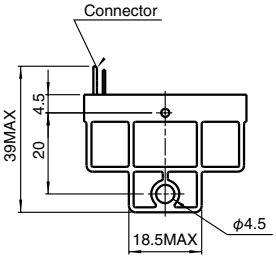
＊1 Offset voltage value is after removal of core hysteresis. ＊2 The smaller one on either at di/dt = 100A/us or at di/dt = If/us.

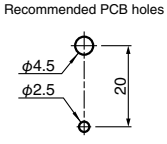
DIMENSIONS (mm)

Types		Connector			
		Manufacturer	Part Number	Old Part Number	Plating of terminal
L03SxxxD15	Standard	Molex	22-04-1041	5045-04A	Sn
L03SxxxD15-A	Build to Order		22-11-1041	5045-04AG	Gold

As for the product of a gold-plated connector, '-A' attaches to the end of the product name.







Terminal number

1 + Vcc (+ 15V)
2 − Vcc (− 15V)
3 Vout
4 GND

Weight:

50g

Note

1. Unless otherwise specified, tolerances shall be 0.5mm

Magnetic Proportion System / Through Type

L03S D15W SERIES

CE RoHS

TAMURA recommends L37S series as a succession model.

SPECIFICATIONS

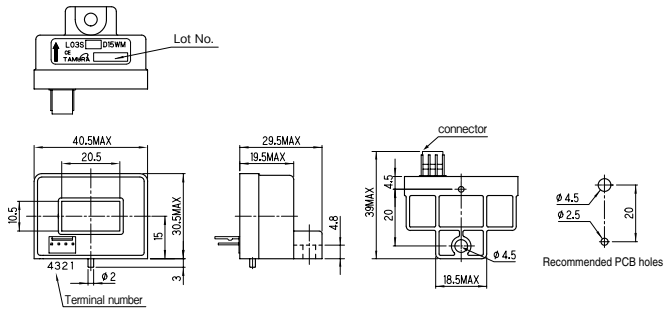
Ta=25℃, RL=10kΩ, Vcc=±15V

Spec \ Types		L03S050D15W	L03S100D15W	L03S200D15W	L03S300D15W	L03S400D15W	L03S500D15W	L03S600D15W	L03S700D15W	L03S800D15W
Primary norminal current	If	50AT	100AT	200AT	300AT	400AT	500AT	600AT	700AT	800AT
Saturation current *1	If max	≧± 150AT	≧± 300AT	≧± 600AT	≧± 900AT	≧± 1000AT				
Output voltage	Vo	4V ± 0.040V (at If)								
Offset voltage *2	Vof	≦± 0.040V (at If=0A)	≦± 0.030V (at If = 0A)							
Output linearity (without offset)	ε_L	≦± 1% (at If)								
Power supply voltage	Vcc	± 12V (± 5%) ~± 15V (± 5%)								
Consumption current	Icc	≦± 20mA								
di/dt Response time *3	tr	≦ 5us (at 90% of If - 90% of Vo) , ≦ 10us (at 10% of If - 90% of Vo)								
Thermal drift of gain	T_CVo	≦ 0.1% / ℃ (Without Tc Vof)								
Thermal drift of offset	T_CVof	≦± 2mV / ℃	≦± 1mV / ℃							
Hysteresis error	V_{OH}	≦ 20mV (at If = 0A → If → 0A)								
Insulation voltage	Vd	AC2500V for 1 minute (Sensing current 0.5mA) inside of through hole ⇔ terminal								
Insulation resistance	R_{IS}	≧ 500M Ω (at DC500V) , inside of through hole ⇔ terminal								
Ambient Operating temperature	T_A	− 20℃~+ 80℃								
Ambient storage temperature	T_S	− 40℃~+ 85℃								

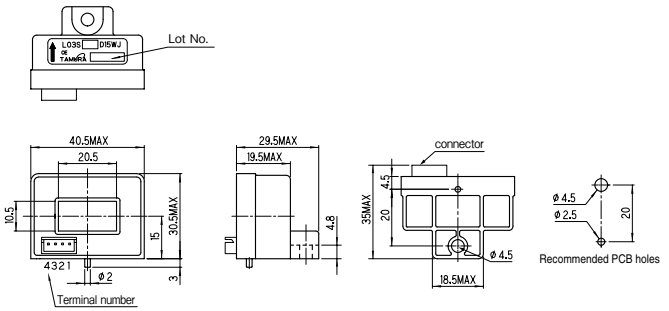
* 1 If the product of 300A or less operate at Vcc = ± 12V power supples, measuring range reduced to 2.5 x If. * 2 Offset voltage value is after removal of core hysteresis.
* 3 The smaller one on either at di/dt = 100A/us or at di/dt = If/us.

DIMENSIONS (mm)

L03S*D15WM**



L03S*D15WJ**



Types		Connector			
		Manufacturer	Part Number	Old Part Number	Plating of terminal
L03SxxxD15WJ	Standard	JST	B4B-XH-A-G	–	Gold
L03SxxxD15WM	Standard	Molex	22-04-1041	5045-04A	Sn
L03SxxxD15WM-A	Build to Order		22-11-1041	5045-04AG	Gold

As for L03SxxxD15WM of a gold-plated connector, '-A' attaches to the end of the product name.

Terminal number	Weight
1 + Vcc (+ 15V)	50g
2 − Vcc (− 15V)	
3 Vout	
4 GND	

Note

1. Unless otherwise specified, tolerances shall be ± 0.5mm

Magnetic Proportion System / Through Type

L31S S05FS SERIES

RoHS

Anti-Sulfuratad

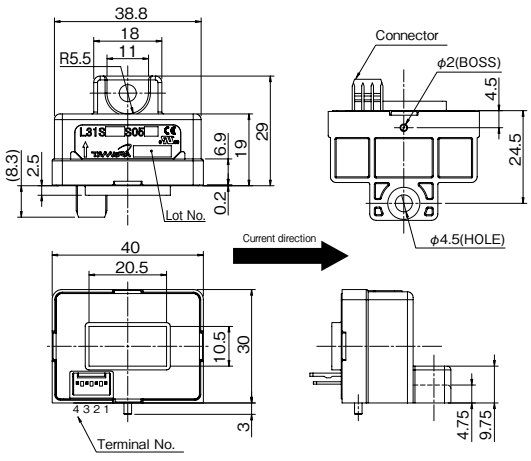
SPECIFICATIONS

Ta=25℃, RL=10kΩ, Vcc=+5.0V

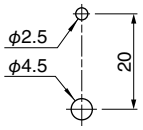
Spec \ Types	Symbol	L31S050S05FS	L31S100S05FS	L31S200S05FS	L31S300S05FS	L31S400S05FS	L31S500S05FS	L31S600S05FS
Primary norminal current	If	50A	100A	200A	300A	400A	500A	600A
Saturation current	If max	≧ ± 150A	≧ ± 300A	≧ ± 600A	≧ ± 900A	≧ ± 900A	≧ ± 900A	≧ ± 900A
Reference Voltage	V ref	+ 2.495V ± 0.020V *1 (at Rref ≥ 1M Ω . Ouput impedance : typ 200 Ω)						
Rated output voltage	Vo	Vof + 0.625V ± 0.015V (at If)						
Offset voltage	Vof	Vref ± 0.025V (at If=0A) *2						
Output linearity (0A ~ If)	ε_L	± 0.5% (at 0A, 1/2If, If)						
Power supply voltage	Vcc	+ 5V ± 5%						
Consumption current	Icc	≦ 20mA						
di/dt Response time	tr	≦ 5μs (at di/dt=100A/μs)						
Reference Temperature Characteristic	T_CVO	≦ ± 0.012%/℃						
Thermal drift of gain	T_CVof	≦ ± 1.5mV/℃ (Without TcVof)						
Thermal drift of offset (at If=0A)	V_{OH}	≦ ± 1.0mV/℃			≦ ± 0.3mV/℃			
Hysteresis error (at 0A → If → 0A)	Vd	≦± 10mV			≦± 2.5mV			
Insulation voltage	R_{IS}	AC3300V for 1 minute (Sensing current 0.5mA) Primary ⇔ Secondary						
Insulation resistance	T_A	≧ 500M Ω (at DC500V) Primary ⇔ Secondary						
Ambient Operating temperature	T_S	− 40 ~+ 85℃						
Ambient storage temperature	Ts	− 40 ~+ 85℃						

* 1 It is possible to change Vof with an external reference voltage (between 1.5V - 2.8V providing its ability to sink or source approximately 5 mA.) . If the external reference voltag is not used, the Vref pin should be left unconnected. * 2 Offset voltage value is after removal of core hysteresis. * Please refer to the another sheet about conditions of UL Recognition. * Anti-Sulfurated (Used resistors : Gold internal Electrodes) * Ferrite core is used.

DIMENSIONS (mm)



Recommended PCB holes



Types		Connector			
		Manufacturer	Part Number	Old Part Number	Plating of terminal
L31SxxxS05FS	Standard	Molex	22-04-1041	5045-04A	Sn
L31SxxxS05FS-A	Build to Order		22-11-1041	5045-04AG	Gold

As for the product of a gold-plated connector, '-A' attaches to the end of the product name.

Terminal number

1 Vref (IN/OUT)
2 Vout
3 GND
4 +Vcc (+5V)

Weight

38g

Note

1. Unless otherwise specified, tolerances shall be ±0.5mm
2. Unit is [mm]

Magnetic Proportion System / Through Type

L06P S05 SERIES

CE RoHS

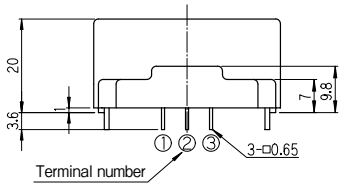
SPECIFICATIONS

Ta=25℃, RL=10kΩ, Vcc=+5V

Spec \ Types		L06P300S05	L06P400S05	L06P600S05	L06P800S05
Primary norminal current	If	300AT	400AT	600AT	800AT
Saturation current	If max	≧ If × 1.33			
Rated output voltage	Vo	Vref + 1.5V ± 0.035V (at If) *1			
Offset voltage	Vof	Vref ± 30mV *2			
Output linearity (0A ~ If)	ε_L	≦± 1% (at If)			
Power supply voltage	Vcc	+ 5V ± 0.1V			
Consumption current	Icc	≦ 15mA			
di/dt Response time	tr	≦ 5μs (at di/dt = 100A /μs)			
Thermal drift of gain	T_CVo	≦± 1.5mV/ ℃ (Without Tc Vof)			
Thermal drift of offset	T_CVof	≦± 1.0mV/℃ (at If = 0A)			
Hysteresis error	V_{OH}	≦ 10mV (at If = 0A → If → 0A)			
Insulation voltage	Vd	AC2500V for 1 minute (Sensing current 0.5mA) Primary ⇔ Sacondary			
Insulation resistance	R_{IS}	≧ 500M Ω (at DC500V) Primary ⇔ Sacondary			
Ambient Operating temperature	T_A	− 40℃~+ 85℃			
Ambient storage temperature	T_S	− 40℃~+ 85℃			

＊1 Vref=Vcc/2 ＊2 Offset voltage value is after removal of core hysteresis.

DIMENSIONS (mm)



Terminal number

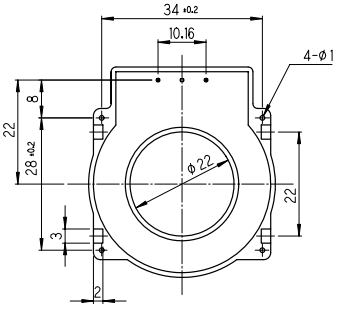
1 OUTPUT
2 GND
3 + 5V

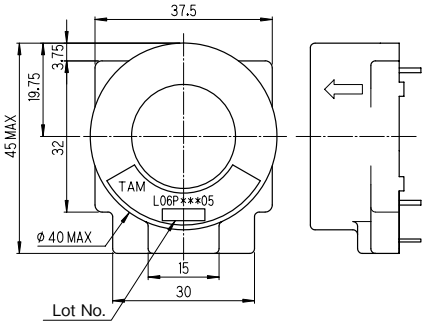
Weight:

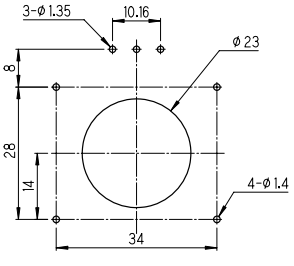
65 ± 5g

Note

1. Unless otherwise specified, tolerances shall be ±0.5mm







Recommended PCB holes

Magnetic Proportion System / Through Type

L05Z SERIES

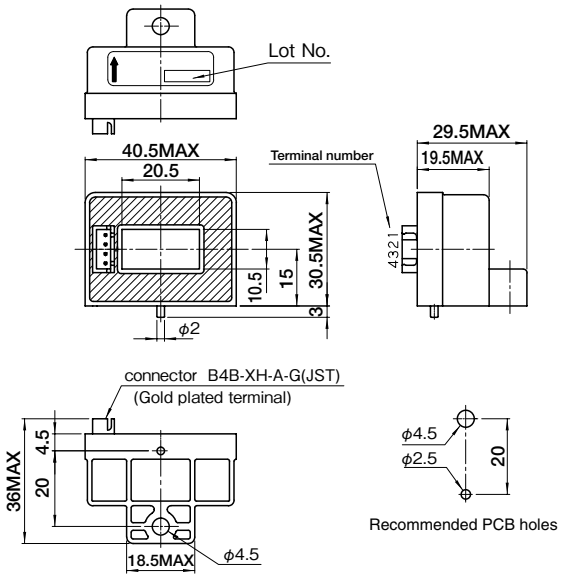
CE RoHS

SPECIFICATIONS

Ta=25℃, RL=10kΩ, Vcc=±15V

Spec \ Types		L05Z800S15
Primary norminal current	If	800AT
Saturation current	If max	≧± 900AT
Rated output voltage	Vo	11V ± 0.11V (at If)
Offset voltage	Vof	+ 7V ± 50mV (If = 0A)
Output linearity (0A ~ If)	ε_L	± 1% (at If)
Power supply voltage	Vcc	+ 15V ± 5%
Consumption current	Icc	≦ 20mA
di/dt Response time	tr	≦ 10μs (at di/dt = 100A /μs)
Thermal drift of gain	T_CVo	± 0.1% / ℃ (Without Tc Vof)
Thermal drift of offset	T_CVof	± 1.0mV / ℃
Hysteresis error	V_{OH}	≦ 20mV (at If = 0A → If → 0A)
Insulation voltage	Vd	AC2500V for 1 minute (Sensing current 0.5mA) inside of through hole ⇔ terminal
Insulation resistance	R_{IS}	≧ 500M Ω (at DC500V) inside of through hole ⇔ terminal
Ambient Operating temperature	T_A	− 40℃~+ 85℃
Ambient storage temperature	T_S	− 40℃~+ 85℃

DIMENSIONS (mm)



Terminal number

1 + Vcc
2 GND
3 OUT
4 GND

Note

1. Unless otherwise specified, tolerances shall be ± 0.5mm
2. Mass is 50 ± 5g.

Magnetic Proportion System

L34S D15 SERIES

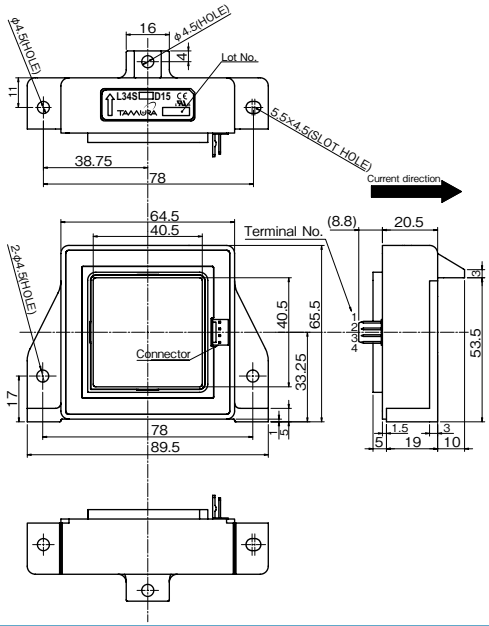
SPECIFICATIONS

Ta=25℃, RL=10kΩ, Vcc=+5.0V

Spec \ Types	Symbol	L34S200D15	L34S300D15	L34S400D15	L34S500D15	L34S600D15	L34S800D15	L34S1T0D15	L34S1T2D15	L34S1T5D15
Primary norminal current	If	200A	300A	400A	500A	600A	800A	1000A	1200A	1500A
Saturation current *1	If max	± 600A	± 900A	± 1200A	± 1500A	± 1800A	± 2400A	± 2500A	± 2500A	± 2500A
Rated Output Voltage	Vo	4V ± 0.040V (at If)								
Offset voltage	Vof	≦± 0.020V (at If = 0A) *2								
Output linearity (without offset)	ε_L	≦± 0.5% (at 0A, 1/2If, If)								
Power supply voltage	Vcc	± 12V (± 5%) ~ ± 15V (± 5%)								
Consumption current	Icc	16mA (TYP) ≦ 25mA								
di/dt (@90% of If) Response time	tr	≦ 5μs (di/dt = 100A /μs) *3								
Thermal drift of gain	T_CVO	≦ ± 0.05%/℃ (Without TcVof)								
Thermal drift of offset	T_CVof	≦ ± 1.0mV/℃ (at If=0A)								
Hysteresis error	V_{OH}	≦ ± 10mV (at 0A → If → 0A)								
Insulation voltage	Vd	AC3000V, for 1minute (Sensing current 0.5mA), inside of through hole ⇔ terminal								
Insulation resistance	R_{IS}	≧ 500MΩ (at DC500V) inside of through hole ⇔ terminal								
Ambient Operating temperature	T_A	− 30℃~+ 80℃								
Ambient storage temperature	T_S	− 40℃~+ 85℃								

*1 If the product of 800A or less operate at Vcc = ± 12V power supples, measuring range reduced to 2.5 x If. *2 Offset voltage value is after removal of core hysteresis. *3 Measurement condition : Primary conductor cross sectional area is as same as through hole, and penetration with 1turn in through hole. *Please refer to the another sheet about conditions of UL Recognition.

DIMENSIONS (mm)



Types		Connector			
		Manufacturer	Part Number	Old Part Number	Plating of terminal
L34SxxxD15	Standard	Molex	22-04-1041	5045-04A	Sn
L34SxxxD15-A	Build to Order		22-11-1041	5045-04AG	Gold

As for the product of a gold-plated connector, '-A' attaches to the end of the product name.

Terminal number

1 +Vcc (+15V)
2 −Vcc (−15V)
3 Vout
4 GND

Weight

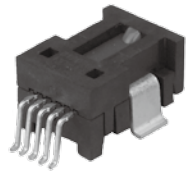
165g

Note

1. Unless otherwise specified, tolerances shall be ±0.5mm

Magnetic Proportion System / Compact size and High-speed response

LA01M SERIES



RoHS

ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Comment
Supply voltage	V_{DD}	V	6	
Jumper temperature	—	℃	120	
Output current	Iout	mA	±1	Recommend ; < ±0.5mA
ESD rating (HBM: Human Body Model)	—	kV	2	C=100pF, R=1.5k Ω

ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Comment
Insulation voltage	Vd	V	≧ AC2500V, 50/60Hz, for 1minute (Sensing current 0.5mA)	Primary ⇔ Secondary
Impulse withstand voltage	Vw	kV	2.5	Primary ⇔ Secondary Input waveform : ・Front time 1.2μs ・Time to half value 50μs ・single
Clearance distance	dCi	mm	2.0	Primary ⇔ Secondary
Creepage distance	dCp	mm	2.0	Primary ⇔ Secondary
Case material	—	—	UL94 V-0	
Comparative Tracking Index ; (CTI)	CTI	V	200	

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Ambient operating temperature	Ta	℃	− 40		+ 90	
Ambient storage temperature	T_S	℃	− 40		+ 125	
Mass	m	g		2		

SPECIFICATIONS

Ta=+25℃, V_{DD}=+5V, RL≧10MΩ

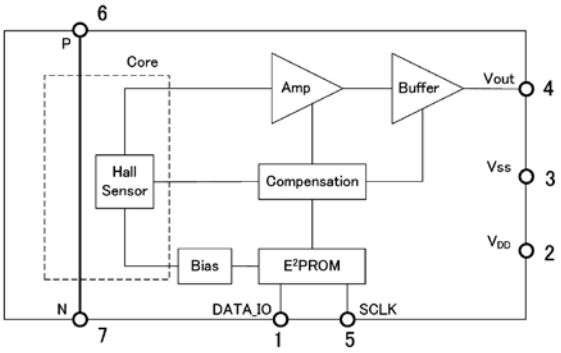
Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Measurement current range	**LA01M021S05**	If	A	− 21		21	
	LA01M032S05			− 31.8		31.8	
	LA01M035S05			− 35		35	
	LA01M041S05			− 41		41	
Maximum primary current (RMS)		$I_{P\ (RMS)}$ max	A			20	

SPECIFICATIONS

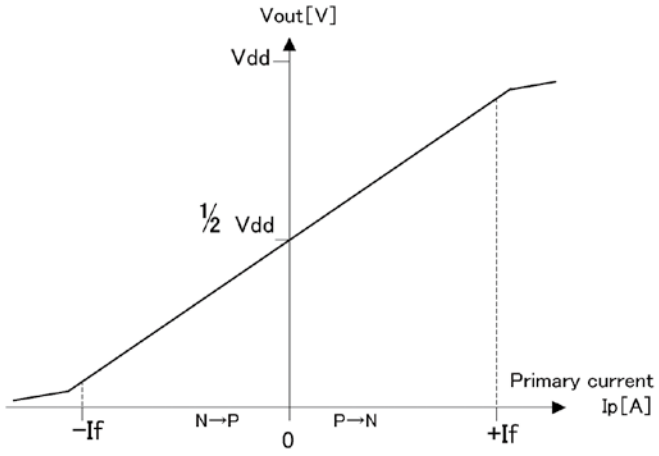
Ta=+25℃,V_{DD}=+5V,RL≧10MΩ

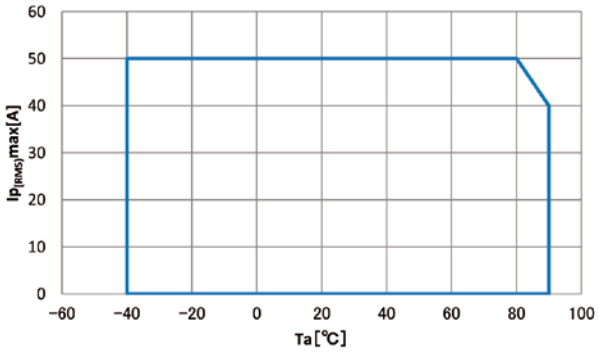
Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Supply Voltage		V_{DD}	V	4.5	5.0	5.5	
Number of primary turns		Np	T		1		
Primary Jumper resistance		Rp	mΩ		0.34		
Current consumption (at Ip=0A)		I_{DD}	mA			10	
Offset voltage	**LA01M021S05**	Vof	V	2.390	2.500	2.610	
	LA01M032S05			2.408	2.500	2.592	
	LA01M035S05			2.423	2.500	2.577	
	LA01M041S05			2.432	2.500	2.568	
Temperature drift of offset voltage (at Ta= − 40 ～+ 90℃, Variation from Vof (Ta=35℃), Ip=0A)	**LA01M021S05**	TCVo	mV		± 26.0		
	LA01M032S05				± 22.0		
	LA01M035S05				± 17.5		
	LA01M041S05				± 14.5		
Sensitivity	**LA01M021S05**	G	mV/A	98.0	100.0	102.0	
	LA01M032S05			64.7	66.0	67.3	
	LA01M035S05			58.8	60.0	61.2	
	LA01M041S05			49.0	50.0	51.0	
Temperature coefficient 1 of Sensitivity (at Ta= + 35 ～+ 90℃, Variation ratio to G (Ta=35℃))	**LA01M021S05**	TCG1	%		± 1.0		
	LA01M032S05				± 1.0		
	LA01M035S05				± 1.0		
	LA01M041S05				± 2.0		
Temperature coefficient 2 of Sensitivity (at Ta= − 40 ～+ 35℃, Variation ratio to G (Ta=35℃))		TCG2	%		± 2.0		
Output Linearity (at 0... If)		ε_L	%	− 1		1	
Output noise voltage		V_{NRMS}	mVrms			2.1	
Ratiometric error of sensitivity		V_{G-R}	%	− 1		1	
Ratiometric error of offset voltage		V_{of-R}	%	− 1		1	
Response time 1 (at 90% of If)		tr	μs		1		CL=100pF
Frequency bandwidth (− 3dB)		BW	kHz		400		CL=100pF

FUNCTIONAL BLOCK DIAGRAM



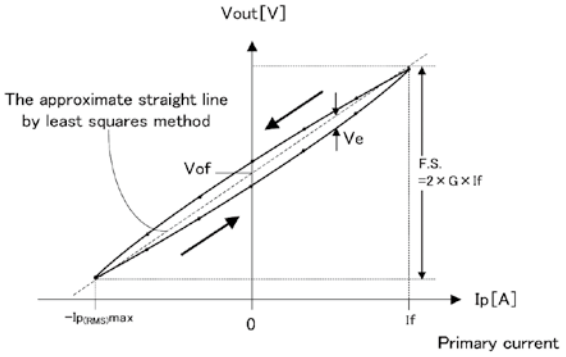
CHARACTERISTIC CURVE (TYP) AND PRIMARY CURRENT DERATING CURVE





Conditions : Mounted on the test board complying with the EIA/JEDEC Standards (EIA/JESD51.)

CHARACTERISTICS DEFINITIONS



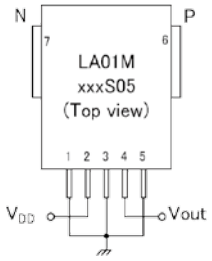
・Sensitivity G[mV/A],Offset voltage Vof[V]
Sensitivity (G) is defined as slope of the approximate straight line by least squares method, using the data of the output voltage (Vout) when sweeping the measured current Ip at rated current range.
Also Offset voltage (Vof) is defined as the intercept of the approximate straight line.

・Output linearity ε_L[%]
Output linearity (ε_L) is defined as the ratio of maximum error voltage (Ve) to the full scale (F.S.) , where Vd is maximum difference between the Output voltage (Vout) and the approximate straight line calculated in the sensitivity and offset voltage definition;
ε_L=Ve／F.S.×100

・Ratiometric error of sensitivity $V_{G\text{-}R}$[%],ratiometric error of Offset voltage $Vof_{\text{-}R}$[%]
Output of LA01M Series is ratiometric.
Sensitivity(G) and Offset voltage(Vof) are proportional to Supply voltage (V_{DD}).

・Ratiometric error is defined as follows in the supply voltage range (4.5V<V_{DD}1<5.5V);
$V_{G\text{-}R}$ =100×[(G(V_{DD}=V_{DD}1)／G(V_{DD}=5V))−(V_{DD}1／5)]／(V_{DD}1／5)
$Vof_{\text{-}R}$ =100×[Vof(V_{DD}=V_{DD}1)−Vof(V_{DD}=5V)×(V_{DD}1／5)]／F.S.

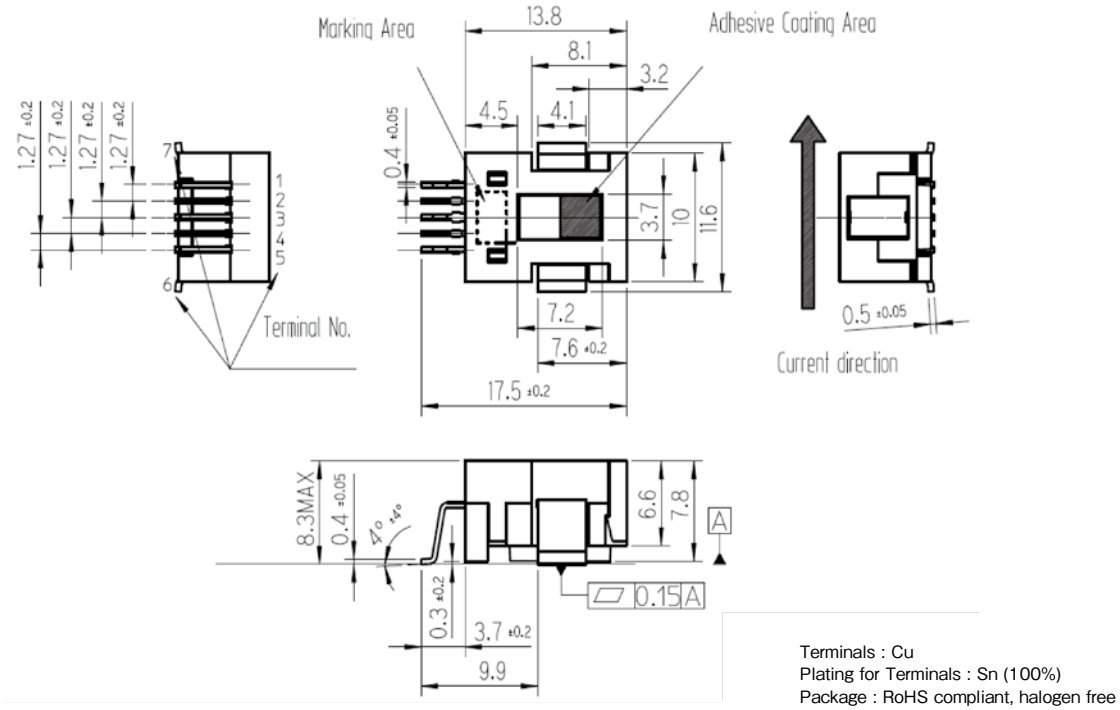
TERMINAL DESCRIPTIONS



Terminal number

①	DATA_IO	Test pin (connect to GND)
②	V_{DD}	Power supply (5V)
③	V_{SS}	GND (0V)
④	Vout	Analog output
⑤	SCLK	Test pin (connect to GND)
⑥	P	Input
⑦	N	Output

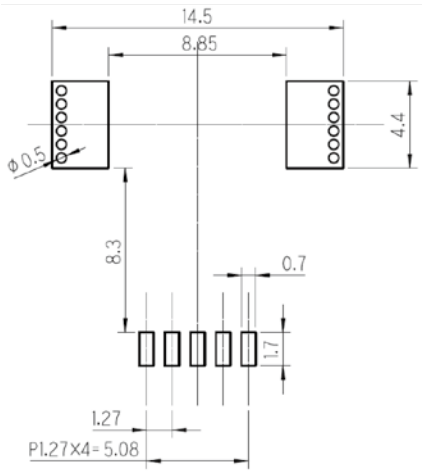
DIMENSIONS (mm)



Terminals : Cu
Plating for Terminals : Sn (100%)
Package : RoHS compliant, halogen free

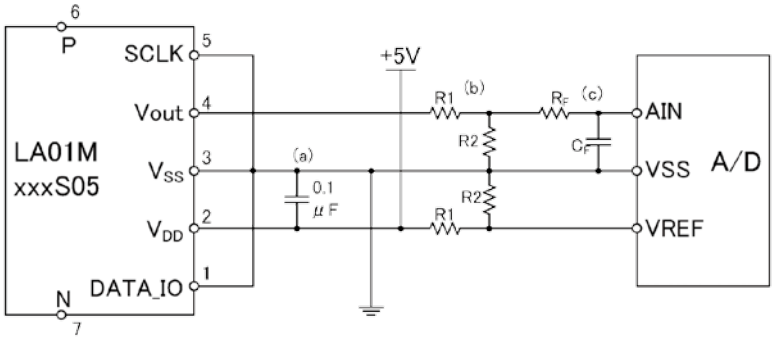
Note1) The tolerances of dimensions without any mention are ± 0.1mm.
Note2) The adhesive material (RoHS compliant, halogen free) is used for holding the magnetic core.

RECOMMENDED THROUGH-HOLE LAYOUTS (mm)



Note) If 2 or more trace layers are used as the current path, please make enough number of through-holes to flow current between the trace layers.

TYPICAL APPLICATION



(a) Please be placed the bypass capacitor 0.1 μ F as close as possible to the VDD and VSS pins of LA01M Series.
(b) LA01M Series have a ratiometric output. When received output by the A / D converter , it is possible to reduce the A / D conversion error due to supply voltage fluctuations by setting a common voltage level of the A / D converter and supply voltage. The resistive divider with R1 and R2 is required, if the reference voltage of the A / D converter is lower than + 5V.
(c) If necessary, please insert a low-pass filter to Vout.

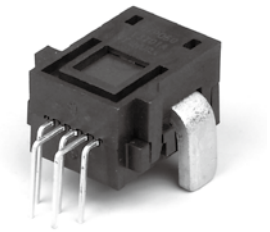
TYPE DESIGNATION

LA01 M * * * S 05
① ② ③ ④ ⑤

① Model (4 figures)
LA01 : Series
② Mounting configuration (1 figure)
M : Surface mount type
③ Measurement current range (3 figures)
Ex) 035 : 35A 100 : 100A
④ Control power supply type (1 figure)
S : Single supply
⑤ Power supply voltage (2 digits)

Magnetic Proportion System / Compact size and High-speed response

LA01P SERIES



RoHS

ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Comment
Supply voltage	V_{DD}	V	6	
Jumper temperature	—	℃	120	
Output current	Iout	mA	±1	Recommend ; < ±0.5mA
ESD rating (HBM: Human Body Model)	—	kV	2	C=100pF, R=1.5kΩ

ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Comment
Insulation voltage	Vd	V	≧AC2500V, 50/60Hz, for 1minute (Sensing current 0.5mA)	Primary ⇔ Secondary
Impulse withstand voltage	Vw	kV	2.5	Primary ⇔ Secondary Input waveform : ・Front time 1.2μs ・Time to half value 50μs ・single
Clearance distance	dCi	mm	2.7	Primary ⇔ Secondary
Creepage distance	dCp	mm	2.7	Primary ⇔ Secondary
Case material	—	—	UL94 V-0	
Comparative Tracking Index ; (CTI)	CTI	V	200	

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Ambient operating temperature	Ta	℃	−40		+90	
Ambient storage temperature	T_S	℃	−40		+125	
Mass	m	g		12		

SPECIFICATIONS

Ta=+25℃,V_{DD}=+5V,RL≧10MΩ

Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Measurement current range	**LA01P035S05**	If	A	−35		35	
	LA01P046S05			−46		46	
	LA01P054S05			−54		54	
	LA01P085S05			−85		85	

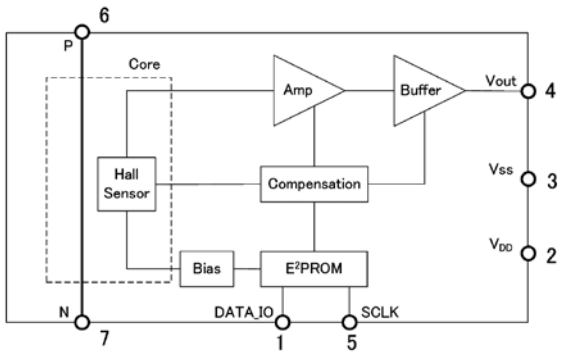
SPECIFICATIONS

Ta=+25℃,V_{DD}=+5V,RL≧10MΩ

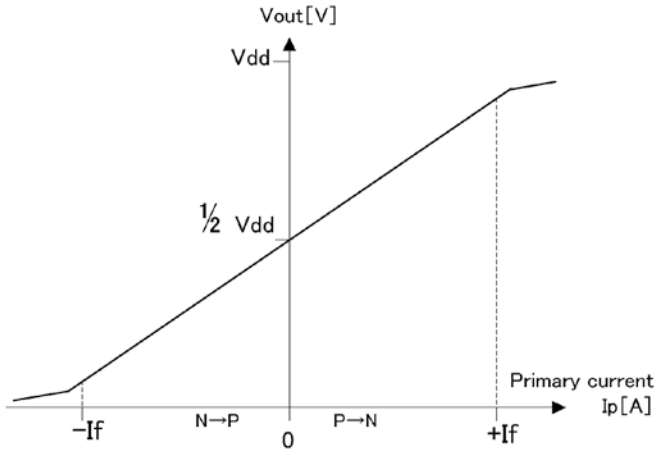
Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Maximum primary current (RMS)		$Ip_{(RMS)}$ max	A			50	＊1
Supply Voltage		V_{DD}	V	4.5	5.0	5.5	
Number of primary turns		Np	T		1		
Primary Jumper resistance		Rp	mΩ		0.10		
Current consumption (at Ip=0A)		I_{DD}	mA			10	
Offset voltage	**LA01P035S05**	Vof	V	2.408	2.500	2.592	
	LA01P046S05			2.423	2.500	2.577	
	LA01P054S05			2.432	2.500	2.568	
	LA01P085S05			2.451	2.500	2.549	
Temperature drift of offset voltage (at Ta= − 40 ～+ 90℃, Variation from Vof (Ta=35℃), Ip=0A)	**LA01P035S05**	TCVo	mV		± 21.5		
	LA01P046S05				± 17.0		
	LA01P054S05				± 14.0		
	LA01P085S05				± 9.0		
Sensitivity	**LA01P035S05**	G	mV/A	58.8	60.0	61.2	
	LA01P046S05			44.1	45.0	45.9	
	LA01P054S05			39.2	40.0	40.8	
	LA01P085S05			24.5	25.0	25.5	
Temperature coefficient 1 of Sensitivity (at Ta= + 35 ～+ 90℃, Variation ratio to G (Ta=35℃))	**LA01P035S05**	TCG1	%		± 1		
	LA01P046S05				± 2		
	LA01P054S05				± 1		
	LA01P085S05				± 1		
Temperature coefficient 2 of Sensitivity (at Ta= − 40 ～+ 35℃, Variation ratio to G (Ta=35℃))		TCG2	%		± 2		
Output Linearity (at 0... If)		ε_L	%	− 1		1	
Output noise voltage		V_{NRMS}	mVrms			2.1	
Ratiometric error of sensitivity		$V_{G\text{-}R}$	%	− 1		1	
Ratiometric error of offset voltage		$V_{of\text{-}R}$	%	− 1		1	
Response time 1 (at 90% of If)		tr	μs		1		CL=100pF
Frequency bandwidth (− 3dB)		BW	kHz		400		CL=100pF

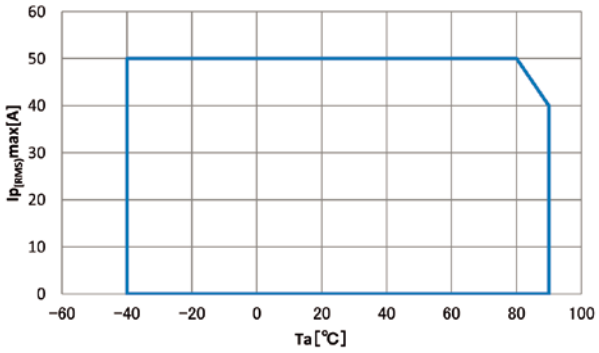
＊1 When $Ip_{(RMS)}$max is bigger than the value of If, $Ip_{(RMS)}$max restricts it to the value of If.

FUNCTIONAL BLOCK DIAGRAM



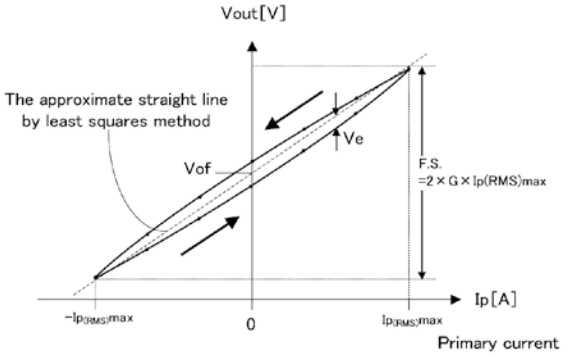
CHARACTERISTIC CURVE (TYP) AND PRIMARY CURRENT DERATING CURVE





Conditions : Mounted on the test board complying with the EIA/JEDEC Standards (EIA/JESD51.)

CHARACTERISTICS DEFINITIONS



・When $Ip_{(RMS)}max$ is bigger than the value of If, $Ip_{(RMS)}max$ restricts it to the value of If.

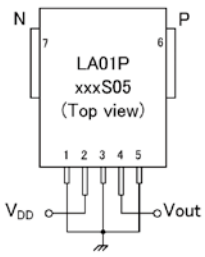
・Sensitivity G[mV/A],Offset voltage Vof[V]
Sensitivity(G)is defined as slope of the approximate straight line by least squares method, using the data of the output voltage(Vout)when sweeping the measured current Ip at rated current range.
Also Offset voltage(Vof)is defined as the intercept of the approximate straight line.

・Output linearity ε_L[%]
Output linearity(ε_L)is defined as the ratio of maximum error voltage(Ve)to the full scale(F.S.) , where Vd is maximum difference between the Output voltage(Vout)and the approximate straight line calculated in the sensitivity and offset voltage definition;
ε_L=Ve／F.S.×100

・Ratiometric error of sensitivity $V_{G\text{-}R}$[%],ratiometric error of Offset voltage $Vof_{\text{-}R}$[%]
Output of LA01P Series is ratiometric.
Sensitivity(G)and Offset voltage(Vof)are proportional to Supply voltage (V_{DD}).

・Ratiometric error is defined as follows in the supply voltage range (4.5V<V_{DD}1<5.5V);
$V_{G\text{-}R}$ =100×[(G(V_{DD}=V_{DD}1)／G(V_{DD}=5V))−(V_{DD}1／5)]／(V_{DD}1／5)
$Vof_{\text{-}R}$ =100×[Vof(V_{DD}=V_{DD}1)−Vof(V_{DD}=5V)×(V_{DD}1／5)]／F.S.

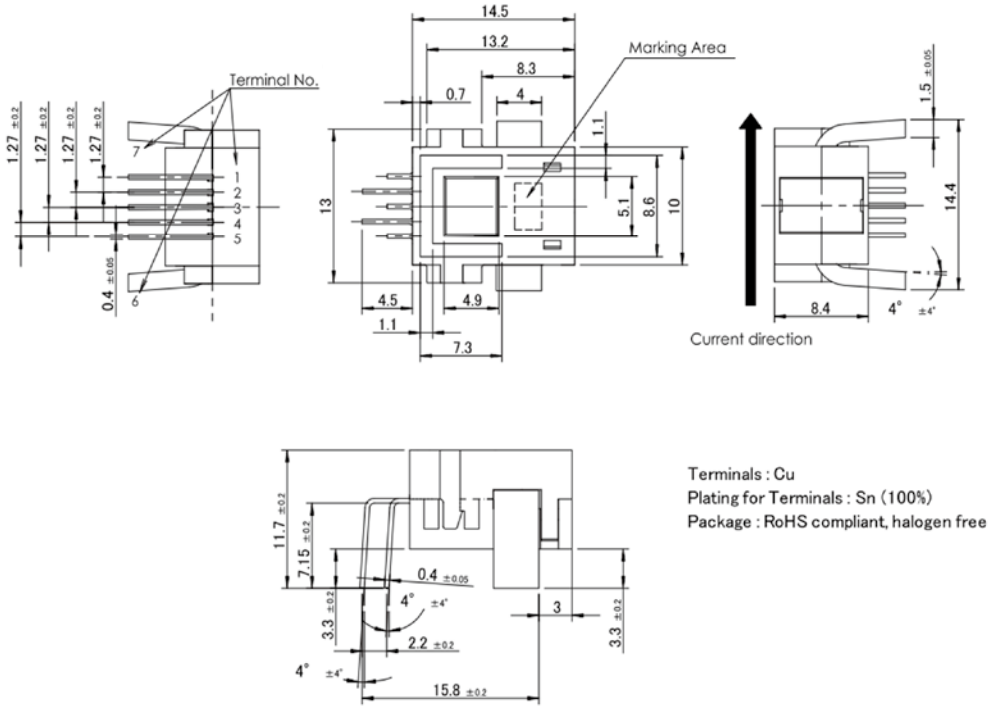
TERMINAL DESCRIPTIONS



Terminal number

①	DATA_IO	Test pin (connect to GND)
②	V_{DD}	Power supply (5V)
③	V_{SS}	GND (0V)
④	Vout	Analog output
⑤	SCLK	Test pin (connect to GND)
⑥	P	Input
⑦	N	Output

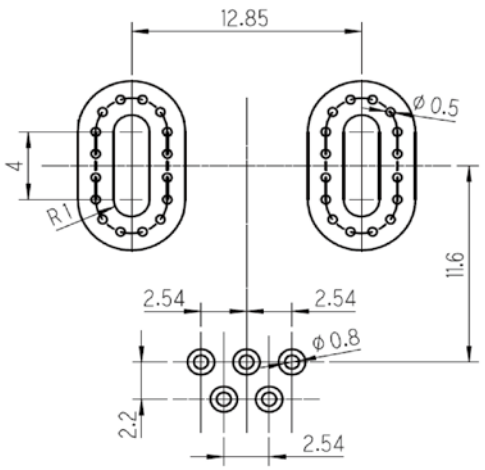
DIMENSIONS (mm)



Terminals : Cu
Plating for Terminals : Sn (100%)
Package : RoHS compliant, halogen free

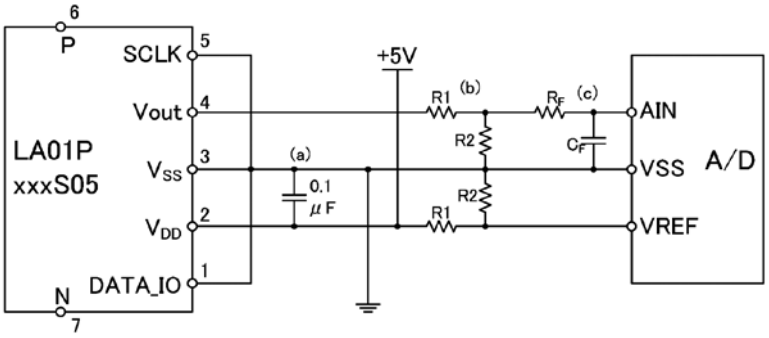
Note1) The tolerances of dimensions without any mention are ± 0.1mm.

RECOMMENDED THROUGH-HOLE LAYOUTS (mm)



Note) If 2 or more trace layers are used as the current path, please make enough number of through-holes to flow current between the trace layers.

TYPICAL APPLICATION



(a) Please be placed the bypass capacitor 0.1 μF as close as possible to the V_{DD} and V_{SS} pins of LA01P Series.
(b) LA01P Series have a ratiometric output. When received output by the A / D converter , it is possible to reduce the A / D conversion error due to supply voltage fluctuations by setting a common voltage level of the A / D converter and supply voltage. The resistive divider with R1 and R2 is required, if the reference voltage of the A / D converter is lower than + 5V.
(c) If necessary, please insert a low-pass filter to Vout.

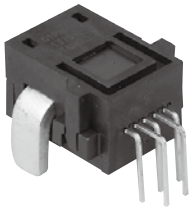
TYPE DESIGNATION

LA01 P * * * S 05
① ② ③ ④ ⑤

① Model (4 figures)
LA01 : Series
② Mounting configuration (1 figure)
P : PCB Mounting type
③ Measurement current range (3 figures)
Ex) 035 : 35A 085 : 85A
④ Control power supply type (1 figure)
S : Single supply
⑤ Power supply voltage (2 digits)

Magnetic Proportion System / Compact size and High-speed response.

LA04P170S05



RoHS

ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Comment
Supply voltage	V_{DD}	V	6.5	
Jumper temperature	—	℃	120	
Output current	Iout	mA	±1	Recommend ; < ±0.5mA
ESD rating (HBM: Human Body Model)	—	kV	2	C=100pF, R=1.5kΩ

ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Comment
Insulation voltage	Vd	V	≧ AC2500V, 50/60Hz, for 1minute (Sensing current 0.5mA)	Primary ⇔ Secondary
Insulation resistance	R_{IS}	—	≧ 500MΩ (at DC500V)	Primary ⇔ Secondary
Impulse withstand voltage	Vw	kV	2.5	Primary ⇔ Secondary Input waveform : ・Front time 1.2μs ・Time to half value 50μs ・single
Clearance distance	dCi	mm	2.7	Primary ⇔ Secondary
Creepage distance	dCp	mm	2.7	Primary ⇔ Secondary
Case material	—	—	UL94 V-0	
Comparative Tracking Index ; (CTI)	CTI	V	200	

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Ambient operating temperature	Ta	℃	−40		+110	
Ambient storage temperature	T_S	℃	−40		+150	
Mass	m	g		5		
Internal magnetic core	—	—	Silicon steel			

SPECIFICATIONS

Ta=+25℃,V_{DD}=+5V,RL≧10MΩ

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Measurement current range	If	A	−170		170	
Maximum primary current (RMS)	$Ip_{(RMS)}max$	A			50	
Supply Voltage	V_{DD}	V	4.5	5	5.5	
Number of primary turns	Np	T	1			

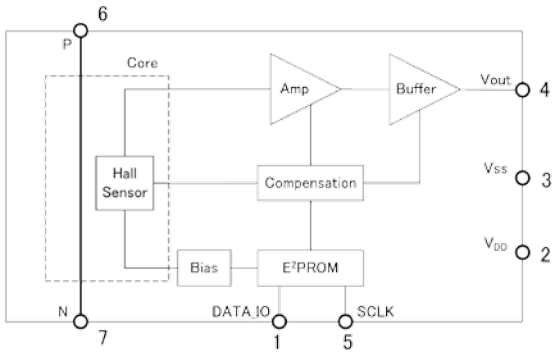
SPECIFICATIONS

Ta=+25℃,V_{DD}=+5V,RL≧10MΩ

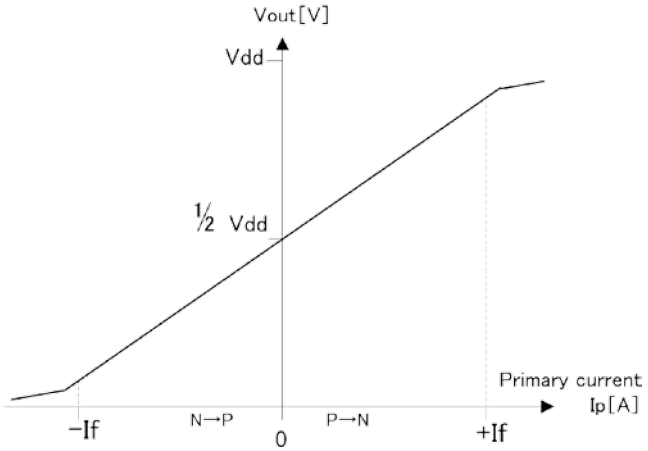
Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Primary Jumper resistance	Rp	mΩ		0.1		
Current consumption (at If)	I_{DD}	mA		8.3	11	
Offset voltage (at If=0A)	Vof	V	2.465	2.500	2.535	＊1
Temperature drift of offset voltage (at Ta= −40 ～+110℃, Variation from Vof (Ta=35℃), Ip=0A)	TCVof	mV		± 4.0		
Sensitivity	G	mV/A	11.8	12.0	12.2	＊1
Temperature coefficient 1 of Sensitivity (at Ta= −40 ～+110℃, Variation ratio to G (Ta=35℃))	TCG	%		± 0.5		
Output Linearity (at 0... If)	ε_L	%F.S.	− 1		1	＊1
Output noise voltage	V_{NRMS}	mVrms		0.5		100Hz ～ 4MHz
Ratiometric error of sensitivity	$V_{G\text{-}R}$	%	− 1		1	
Ratiometric error of offset voltage	$V_{of\text{-}R}$	%F.S.	− 0.5		0.5	
Response time 1 (at 90% of If)	tr	μs		1.5		CL=100pF
Frequency bandwidth (−3dB)	BW	kHz		180		CL=100pF

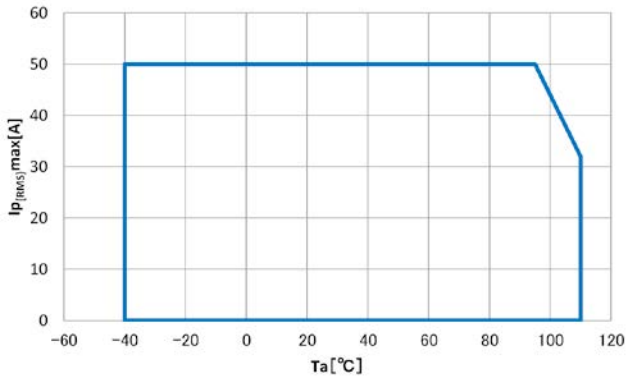
＊1 Please refer to Reliability Tests section to know the values after the variation and over the lifetime of this product.

FUNCTIONAL BLOCK DIAGRAM



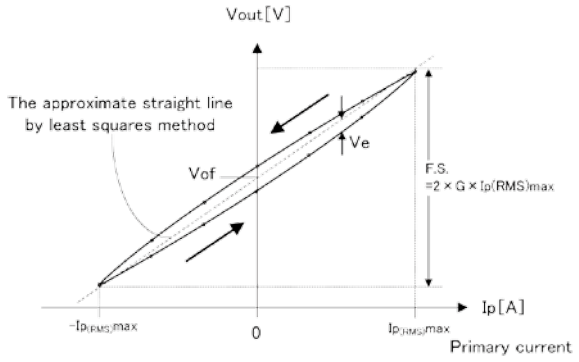
CHARACTERISTIC CURVE (TYP) AND PRIMARY CURRENT DERATING CURVE





Conditions : Mounted on the test board complying with the EIA/JEDEC Standards (EIA/JESD51.)

CHARACTERISTICS DEFINITIONS



・Sensitivity G[mV/A],Offset voltage Vof[V]
Sensitivity (G) is defined as slope of the approximate straight line by least squares method, using the data of the output voltage (Vout) when sweeping the measured current Ip at rated current range.
Also Offset voltage (Vof) is defined as the intercept of the approximate straight line.

・Output linearity ε_L[%]
Output linearity(ε_L) is defined as the ratio of maximum error voltage (Ve) to the full scale(F.S.) , where Vd is maximum difference between the Output voltage (Vout) and the approximate straight line calculated in the sensitivity and offset voltage definition;

$$\varepsilon_L = Ve / F.S. \times 100$$

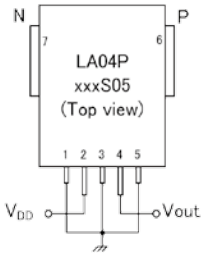
・Ratiometric error of sensitivity $V_{G\text{-}R}$[%],ratiometric error of Offset voltage $Vof_{\text{-}R}$[%]
Output of LA04P Series is ratiometric.
Sensitivity(G) and Offset voltage(Vof) are proportional to Supply voltage (V_{DD}).
Ratiometric error is defined as follows in the supply voltage range ($4.5V < V_{DD}1 < 5.5V$);

$$V_{G\text{-}R} = 100 \times [(G(V_{DD}=V_{DD}1) / G(V_{DD}=5V)) - (V_{DD}1 / 5)] / (V_{DD}1 / 5)$$

$$Vof_{\text{-}R} = 100 \times [Vof(V_{DD}=V_{DD}1) - Vof(V_{DD}=5V) \times (V_{DD}1 / 5)] / F.S.$$

*F.S. =2×G×Ip(RMS)max

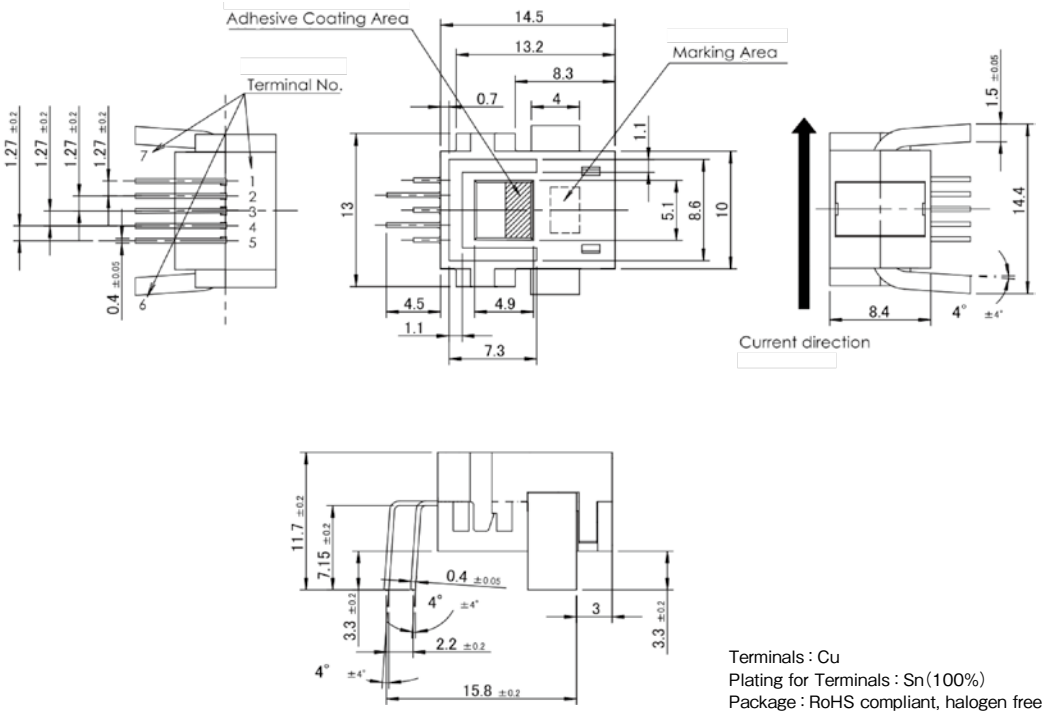
TERMINAL DESCRIPTIONS



Terminal number

①	DATA_IO	Test pin (connect to GND)
②	V_{DD}	Power supply (5V)
③	V_{SS}	GND (0V)
④	Vout	Analog output
⑤	SCLK	Test pin (connect to GND)
⑥	P	Input
⑦	N	Output

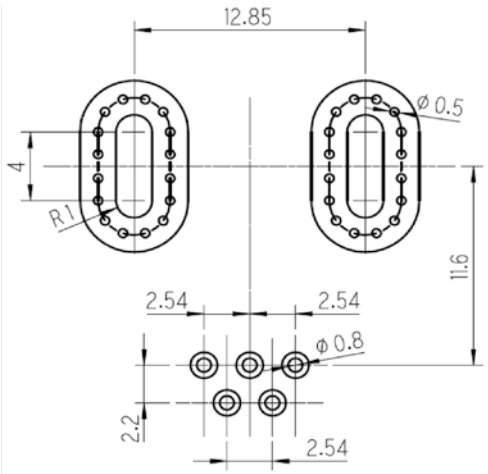
DIMENSIONS (mm)



Terminals : Cu
Plating for Terminals : Sn(100%)
Package : RoHS compliant, halogen free

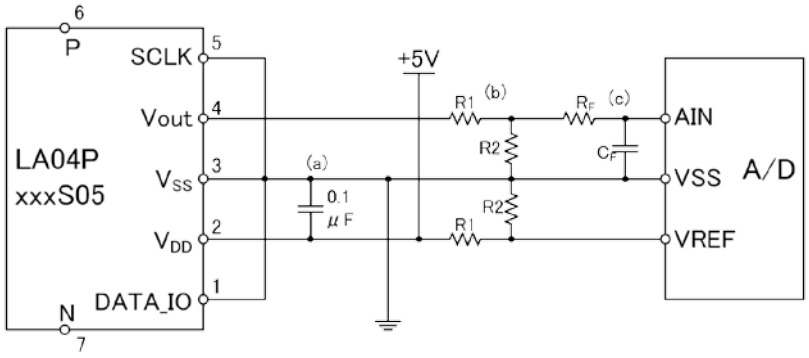
Note1) The tolerances of dimensions without any mention are ± 0.1mm.
Note2) An adhesive material (RoHS compliant, halogen free) is applied on a part of "Adhesive Area" to hold the magnetic core.

RECOMMENDED THROUGH-HOLE LAYOUTS (mm)



Note) If 2 or more trace layers are used as the current path, please make enough number of through-holes to flow current between the trace layers.

TYPICAL APPLICATION



(a) Please be placed the bypass capacitor 0.1μF as close as possible to the V_{DD} and V_{SS} pins of LA04P Series.
(b) LA04P Series have a ratiometric output. When received output by the A/D converter , it is possible to reduce the A/D conversion error due to supply voltage fluctuations by setting a common voltage level of the A/D converter and supply voltage. The resistive divider with R1 and R2 is required, if the reference voltage of the A/D converter is lower than +5V.
(c) If necessary, please insert a low-pass filter to Vout.

TYPE DESIGNATION

LA04 P * * * S 05
① ② ③ ④ ⑤

① Model (4 figures)
LA04 : Series
② Mounting configuration (1 figure)
P : PCB Mounting type
③ Measurement current range (3 figures)
Ex) 170 : 170A
④ Control power supply type (1 figure)
S : Single supply
⑤ Power supply voltage (2 digits)

RELIABILITY TEST

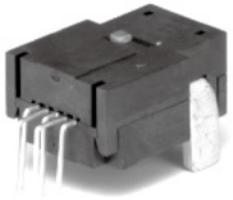
No.	Item	Test Conditions	n	Test Time
1	High Temp. High Humidity Bias Test	【JEITA EIAJ ED-4701 102】 Ta=85℃, 85%RH, continuous operation	22	1000h
2	High Temperature Bias Test	【JEITA EIAJ ED-4701 101】 Ta=125℃,continuous operation	22	1000h
3	High Temperature Storage Test	【JEITA EIAJ ED-4701 201】 Ta=150℃	22	1000h
4	Low Temperature Storage Test	【JEITA EIAJ ED-4701 202】 Ta=-65℃	22	1000h
5	Heat Cycle Test	【JEITA EIAJ ED-4701 105】 -65℃(30min) ⇔ 150℃(30min) Tested in vapor phase	22	500 cycles
6	Vibration Test	【JEITA EIAJ ED-4701 403】 Vibration frequency: 10～55Hz(1 min.) Vibration amplitude: 1.5mm(x,y,z directions)	5	2h for each direction

Tested samples are pretreated as below before each reliability test:
Desiccation : 125℃/24h → Moisture Absorption: 85℃/85%RH/168h → Flow: 1time (260℃ , 10s)

Criterion for determining
Products whose drifts before and after the reliability tests do not exceed the values below are considered to be in spec.
Sensitivity G (Ta=25℃) : Within ± 1.5%
Offset Voltage Vof (Ta=25℃) : Within ± 100mV
Output Linearity ε_L (Ta=25℃) : Within ± 1% FS

Magnetic Proportion System / Compact size and High-speed response. Vcc = +3.3V

LA02P Series



ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Comment
Supply voltage	V_{DD}	V	6.5	
Jumper temperature	—	℃	120	
Output current	Iout	mA	± 1	Recommend ; < ± 0.5mA
ESD rating (HBM: Human Body Model)	—	kV	2	C=100pF, R=1.5k Ω

ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Comment
Insulation voltage	Vd	V	≧ AC3000V, 50/60Hz, for 1minute (Sensing current 0.5mA)	Primary ⇔ Secondary
Impulse withstand voltage	Vw	kV	6	Primary ⇔ Secondary Input waveform : ・Front time 1.2μs ・Time to half value 50μs ・single
Clearance distance	dCi	mm	13.3	Primary ⇔ Secondary
Creepage distance	dCp	mm	13.3	Primary ⇔ Secondary
Case material	—	—	UL94 V-0	
Comparative Tracking Index ; (CTI)	CTI	V	150	

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Ambient operating temperature	Ta	℃	− 40		+ 110	
Ambient storage temperature	T_S	℃	− 40		+ 150	
Mass	m	g		5.5		
Internal magnetic core	—	—	Ferrite			

SPECIFICATIONS

Ta=+25℃,V_{DD}=+3.3V,RL≧10MΩ

Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Measurement current range	**LA02P021S03**	If	A	− 21		21	
	LA02P035S03			− 35		35	
	LA02P054S03			− 54		54	
	LA02P085S03			− 85		85	

SPECIFICATIONS

Ta=+25℃,V_{DD}=+3.3V,RL≧10MΩ

Parameters		Symbol	Unit	Value MIN	Value TYP	Value MAX	Comment
Maximum primary current (RMS)		$Ip_{(RMS)}$ max	A			50	＊1
Supply Voltage		V_{DD}	V	2.97	3.3	3.63	
Number of primary turns		Np	T		1		
Primary Jumper resistance		Rp	mΩ		0.1		
Current consumption (at If)		I_{DD}	mA			10	
Offset voltage (at If=0A)	—	Vof	V	1.636	1.650	1.664	At factory shipment
	LA02P021S03			(1.565)	1.650	(1.735)	Reference value after the flow soldering and over the lifetime of this product.
	LA02P035S03			(1.593)	1.650	(1.707)	
	LA02P054S03			(1.608)	1.650	(1.692)	
	LA02P085S03			(1.618)	1.650	(1.682)	
Temperature drift of offset voltage (at Ta= − 40 ～+ 110℃, Variation from Vof (Ta=35℃), Ip=0A)	**LA02P021S03**	TCVof	mV		± 9.0		
	LA02P035S03				± 5.5		
	LA02P054S03				± 3.5		
	LA02P085S03				± 2.5		
Sensitivity	**LA02P021S03**	G	mV/A	61.1	62.5	63.9	
	LA02P035S03			36.7	37.5	38.3	
	LA02P054S03			23.9	24.5	25.1	
	LA02P085S03			15.1	15.5	15.9	
Temperature coefficient 1 of Sensitivity (at Ta= − 40 ～+ 110℃, Variation ratio to G (Ta=35℃))		TCG1	%		± 0.4		
Output Linearity (at 0... If)		ε_L	%F.S.	− 1		1	
Output noise voltage		V_{NRMS}	mVrms		1.7		
Ratiometric error of sensitivity		$V_{G\text{-}R}$	%	− 1		1	
Ratiometric error of offset voltage	**LA02P021S03**	$V_{of\text{-}R}$	%F.S.	− 0.8		0.8	
	LA02P035S03			− 0.6		0.6	
	LA02P054S03			− 0.6		0.6	
	LA02P085S03			− 0.6		0.6	
Response time 1 (at 90% of If)		tr	μs		1		CL=100pF
Frequency bandwidth (− 3dB)		BW	kHz		300		CL=100pF

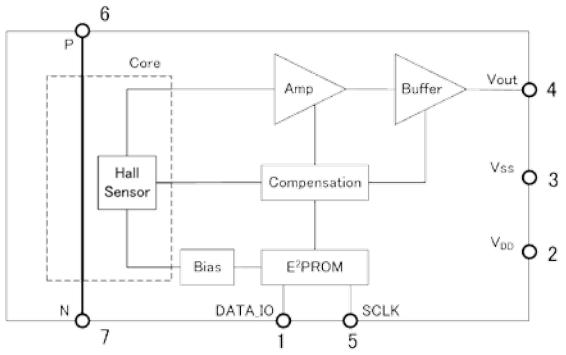
＊1 When $Ip_{(RMS)}$max is bigger than the value of If, $Ip_{(RMS)}$max restricts it to the value of If.

STANDARDS

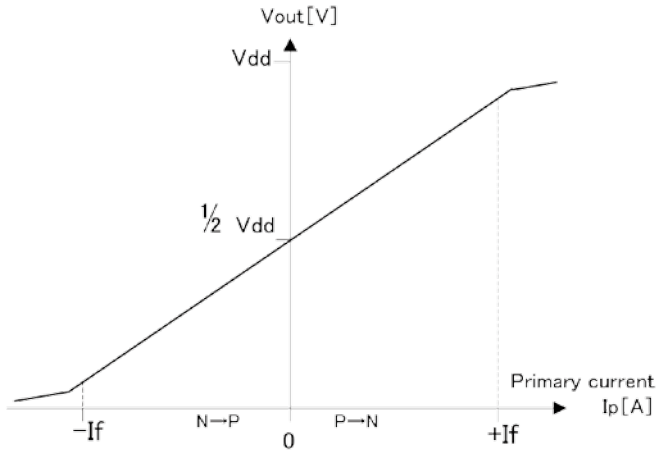
IEC60950 , UL508 , CSA C22.2 No. 14

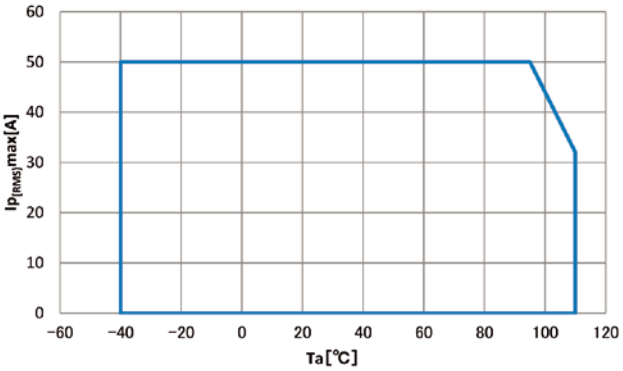
※ Please refer to the another sheet about conditions of UL Recognition.

FUNCTIONAL BLOCK DIAGRAM



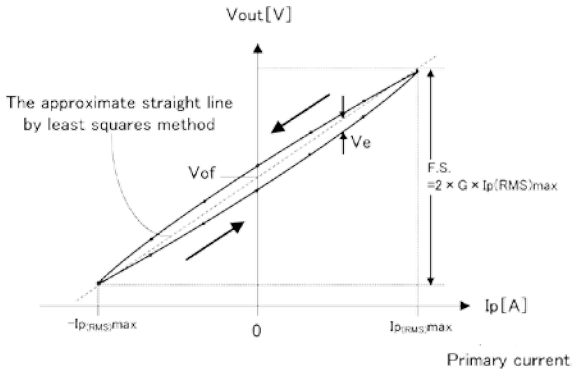
CHARACTERISTIC CURVE (TYP) AND PRIMARY CURRENT DERATING CURVE





Conditions : Mounted on the test board complying with the EIA/JEDEC Standards (EIA/JESD51.)

CHARACTERISTICS DEFINITIONS



・When $Ip_{(RMS)}max$ is bigger than the value of If, $Ip_{(RMS)}max$ restricts it to the value of If.

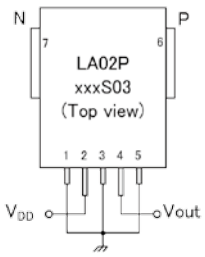
・Sensitivity G[mV/A],Offset voltage Vof[V]
Sensitivity(G)is defined as slope of the approximate straight line by least squares method, using the data of the output voltage(Vout)when sweeping the measured current Ip at rated current range.
Also Offset voltage(Vof)is defined as the intercept of the approximate straight line.

・Output linearity ε_L[%]
Output linearity(ε_L)is defined as the ratio of maximum error voltage(Ve)to the full scale(F.S.) , where Vd is maximum difference between the Output voltage(Vout)and the approximate straight line calculated in the sensitivity and offset voltage definition;
ε_L=Ve／F.S.×100

・Ratiometric error of sensitivity $V_{G\text{-}R}$[%],ratiometric error of Offset voltage $Vof_{\text{-}R}$[%]
Output of LA02P Series is ratiometric.
Sensitivity(G)and Offset voltage(Vof)are proportional to Supply voltage (V_{DD}).

・Ratiometric error is defined as follows in the supply voltage range (2.97V<V_{DD}1<3.63V);
$V_{G\text{-}R}$ =100×[(G(V_{DD}=V_{DD}1)／G(V_{DD}=3.3V))−(V_{DD}1／3.3)]／(V_{DD}1／3.3)
$Vof_{\text{-}R}$ =100×[Vof(V_{DD}=V_{DD}1)−Vof(V_{DD}=3.3V)×(V_{DD}1／3.3)]／F.S.

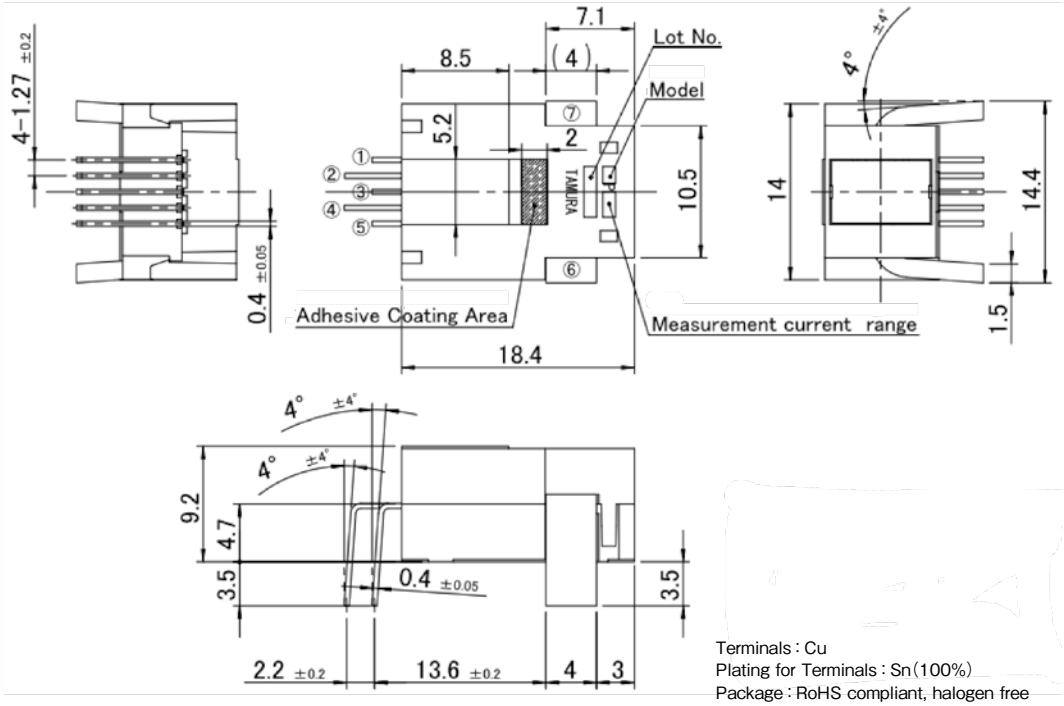
TERMINAL DESCRIPTIONS



Terminal number

①	DATA_IO	Test pin (connect to GND)
②	V_{DD}	Power supply (3.3V)
③	V_{SS}	GND (0V)
④	Vout	Analog output
⑤	SCLK	Test pin (connect to GND)
⑥	P	Input
⑦	N	Output

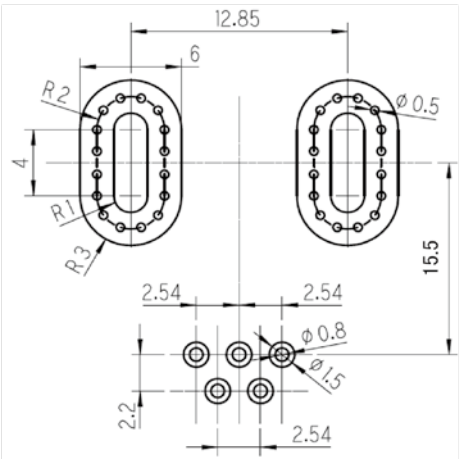
DIMENSIONS (mm)



Terminals : Cu
Plating for Terminals : Sn(100%)
Package : RoHS compliant, halogen free

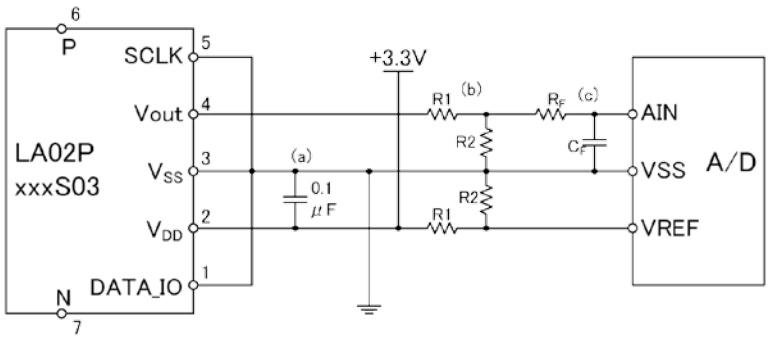
Note1) The tolerances of dimensions without any mention are ± 0.1mm.

RECOMMENDED THROUGH-HOLE LAYOUTS (mm)



Note) If 2 or more trace layers are used as the current path, please make enough number of through-holes to flow current between the trace layers.

TYPICAL APPLICATION



(a) Please be placed the bypass capacitor 0.1 μF as close as possible to the V_{DD} and V_{SS} pins of LA02P Series.
(b) LA02P Series have a ratiometric output. When received output by the A / D converter , it is possible to reduce the A / D conversion error due to supply voltage fluctuations by setting a common voltage level of the A / D converter and supply voltage. The resistive divider with R1 and R2 is required, if the reference voltage of the A / D converter is lower than + 3.3V.
(c) If necessary, please insert a low-pass filter to Vout.

TYPE DESIGNATION

LA02 P * * * S 03
① ② ③ ④ ⑤

① Model (4 figures)
LA02 : Series
② Mounting configuration (1 figure)
P : PCB Mounting type
③ Measurement current range (3 figures)
Ex) 035 : 35A 085 : 85A
④ Control power supply type (1 figure)
S : Single supply
⑤ Power supply voltage (2 digits)

RELIABILITY TEST

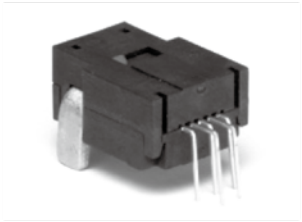
No.	Item	Test Conditions	n	Test Time
1	High Temp. High Humidity Bias Test	【JEITA EIAJ ED-4701 102】 Ta=85℃, 85%RH, continuous operation	22	1000h
2	High Temperature Bias Test	【JEITA EIAJ ED-4701 101】 Ta=125℃,continuous operation	22	1000h
3	High Temperature Storage Test	【JEITA EIAJ ED-4701 201】 Ta=150℃	22	1000h
4	Low Temperature Storage Test	【JEITA EIAJ ED-4701 202】 Ta=-55℃	22	1000h
5	Heat Cycle Test	【JEITA EIAJ ED-4701 105】 -65℃(30min) ⇔ 150℃(30min) Tested in vapor phase	22	500 cycles
6	Vibration Test	【JEITA EIAJ ED-4701 403】 Vibration frequency: 10~55Hz(1 min.) Vibration amplitude: 1.5mm(x,y,z directions)	5	2h for each direction

Tested samples are pretreated as below before each reliability test:
Desiccation : 125℃ /24h → Moisture Absorption : 85℃ /85%RH/168h → Flow : 1 time (260℃ , 10s)

Criterion for determining
Products whose drifts before and after the reliability tests do not exceed the values below are considered to be in spec.
Sensitivity G (Ta=25℃) : Within ± 1.5% (All model)
Offset Voltage Vof (Ta=25℃) : Within ± 100mV (LA02P021S03), Within ± 66mV (Other model)
Output Linearity ε_L (Ta=25℃) : Within ± 1% (All model)

Magnetic Proportion System / Compact size and High-speed response. Vcc = +5.0V

LA03P Series



ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Comment
Supply voltage	V_{DD}	V	6.5	
Jumper temperature	—	℃	120	
Output current	Iout	mA	± 1	Recommend ; < ± 0.5mA
ESD rating (HBM: Human Body Model)	—	kV	2	C=100pF, R=1.5k Ω

ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Comment
Insulation voltage	Vd	V	≧ AC3000V, 50/60Hz, for 1minute (Sensing current 0.5mA)	Primary ⇔ Secondary
Impulse withstand voltage	Vw	kV	6	Primary ⇔ Secondary Input waveform : ・Front time 1.2μs ・Time to half value 50μs ・single
Clearance distance	dCi	mm	13.3	Primary ⇔ Secondary
Creepage distance	dCp	mm	13.3	Primary ⇔ Secondary
Case material	—	—	UL94 V-0	
Comparative Tracking Index ; (CTI)	CTI	V	150	

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Ambient operating temperature	Ta	℃	− 40		+ 110	
Ambient storage temperature	T_S	℃	− 40		+ 150	
Mass	m	g		5.5		
Internal magnetic core	—	—		Ferrite		

SPECIFICATIONS

Ta=+25℃,V_{DD}=+5V,RL≧10MΩ

Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Measurement current range	**LA03P021S05**	If	A	− 21		21	
	LA03P035S05			− 35		35	
	LA03P054S05			− 54		54	
	LA03P085S05			− 85		85	

SPECIFICATIONS

Ta=+25℃,V_{DD}=+5V,RL≧10MΩ

Parameters		Symbol	Unit	Value MIN	Value TYP	Value MAX	Comment
Maximum primary current (RMS)		$Ip_{(RMS)}$ max	A			50	＊1
Supply Voltage		V_{DD}	V	4.5	5.0	5.5	
Number of primary turns		Np	T		1		
Primary Jumper resistance		Rp	mΩ		0.1		
Current consumption (at If)		I_{DD}	mA			11	
Offset voltage (at If=0A)	—	Vof	V	2.480	2.500	2.520	At factory shipment
	LA03P021S05			(2.350)	2.500	(2.650)	Reference value after the flow soldering and over the lifetime of this product.
	LA03P035S05			(2.400)	2.500	(2.600)	
	LA03P054S05			(2.425)	2.500	(2.575)	
	LA03P085S05			(2.445)	2.500	(2.555)	
Temperature drift of offset voltage (at Ta= − 40 ～+ 110℃, Variation from Vof (Ta=35℃), Ip=0A)	LA03P021S05	TCVof	mV		± 23.0		
	LA03P035S05				± 12.0		
	LA03P054S05				± 8.0		
	LA03P085S05				± 6.0		
Sensitivity	LA03P021S05	G	mV/A	98.0	100.0	102.0	
	LA03P035S05			58.8	60.0	61.2	
	LA03P054S05			39.2	40.0	40.8	
	LA03P085S05			24.4	25.0	25.6	
Temperature coefficient 1 of Sensitivity (at Ta= − 40 ～+ 110℃, Variation ratio to G (Ta=35℃))		TCG1	%		± 0.5		
Output Linearity (at 0... If)		ε_L	%F.S.	− 1		1	
Output noise voltage		V_{NRMS}	mVrms		1.7		
Ratiometric error of sensitivity		$V_{G\text{-}R}$	%	− 1		1	
Ratiometric error of offset voltage	LA03P021S05	$V_{of\text{-}R}$	%F.S.	− 0.7		0.7	
	LA03P035S05			− 0.5		0.5	
	LA03P054S05			− 0.5		0.5	
	LA03P085S05			− 0.5		0.5	
Response time 1 (at 90% of If)		tr	μs		1		CL=100pF
Frequency bandwidth (− 3dB)		BW	kHz		300		CL=100pF

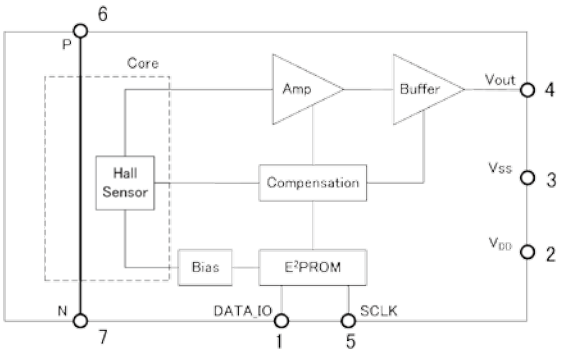
＊1 When $Ip_{(RMS)}$max is bigger than the value of If, $Ip_{(RMS)}$max restricts it to the value of If.

STANDARDS

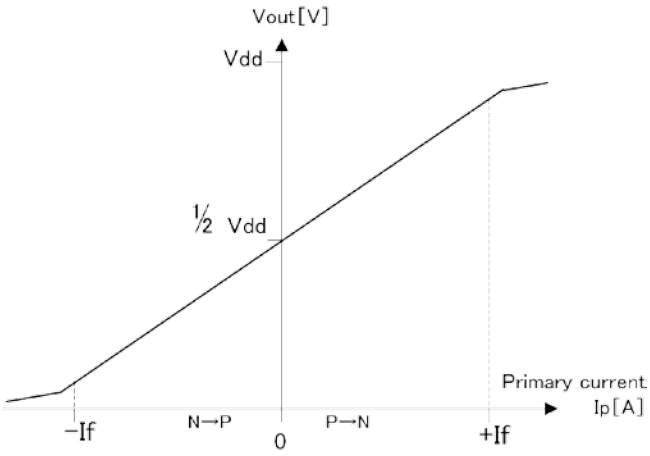
IEC60950 , UL508 , CSA C22.2 No. 14

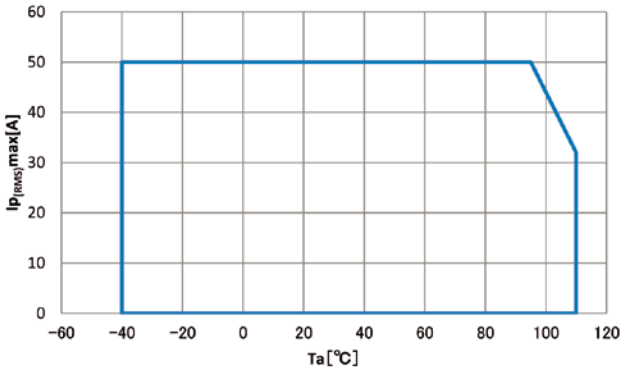
※ Please refer to the another sheet about conditions of UL Recognition.

FUNCTIONAL BLOCK DIAGRAM



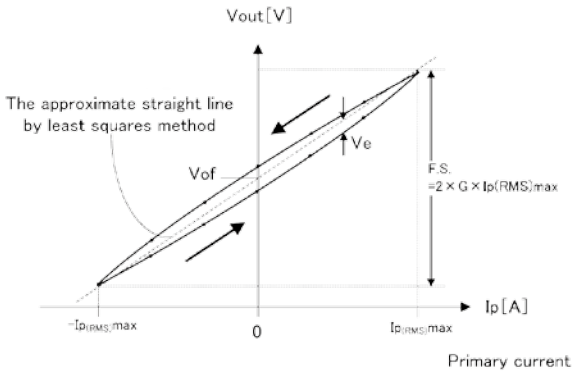
CHARACTERISTIC CURVE (TYP) AND PRIMARY CURRENT DERATING CURVE





Conditions : Mounted on the test board complying with the EIA/JEDEC Standards (EIA/JESD51.)

CHARACTERISTICS DEFINITIONS



・When $Ip_{(RMS)}max$ is bigger than the value of If, $Ip_{(RMS)}max$ restricts it to the value of If.

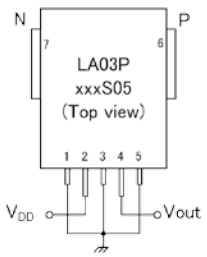
・Sensitivity G[mV/A],Offset voltage Vof[V]
Sensitivity(G)is defined as slope of the approximate straight line by least squares method, using the data of the output voltage(Vout)when sweeping the measured current Ip at rated current range.
Also Offset voltage(Vof)is defined as the intercept of the approximate straight line.

・Output linearity ε_L[%]
Output linearity(ε_L)is defined as the ratio of maximum error voltage(Ve)to the full scale(F.S.) , where Vd is maximum difference between the Output voltage(Vout)and the approximate straight line calculated in the sensitivity and offset voltage definition;
ε_L=Ve／F.S.×100

・Ratiometric error of sensitivity $V_{G\text{-}R}$[%],ratiometric error of Offset voltage $Vof_{\text{-}R}$[%]
Output of LA03P Series is ratiometric.
Sensitivity(G)and Offset voltage(Vof)are proportional to Supply voltage (V_{DD}).

・Ratiometric error is defined as follows in the supply voltage range (4.5V<V_{DD}1<5.5V);
$V_{G\text{-}R}$ =100×[(G(V_{DD}=V_{DD}1)／G(V_{DD}=5V))−(V_{DD}1／5)]／(V_{DD}1／5)
$Vof_{\text{-}R}$ =100×[Vof(V_{DD}=V_{DD}1)−Vof(V_{DD}=5V)×(V_{DD}1／5)]／F.S.

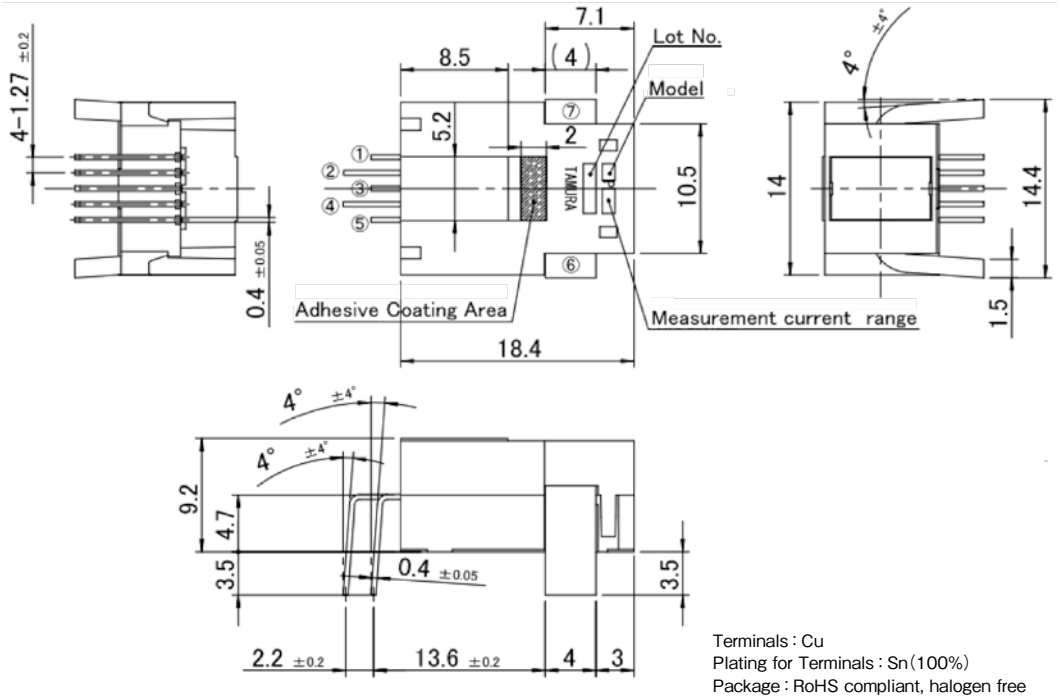
TERMINAL DESCRIPTIONS



Terminal number

①	DATA_IO	Test pin (connect to GND)
②	V_{DD}	Power supply (5V)
③	V_{SS}	GND (0V)
④	Vout	Analog output
⑤	SCLK	Test pin (connect to GND)
⑥	P	Input
⑦	N	Output

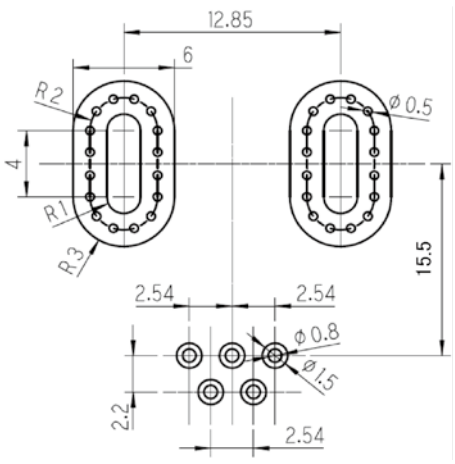
DIMENSIONS (mm)



Terminals : Cu
Plating for Terminals : Sn(100%)
Package : RoHS compliant, halogen free

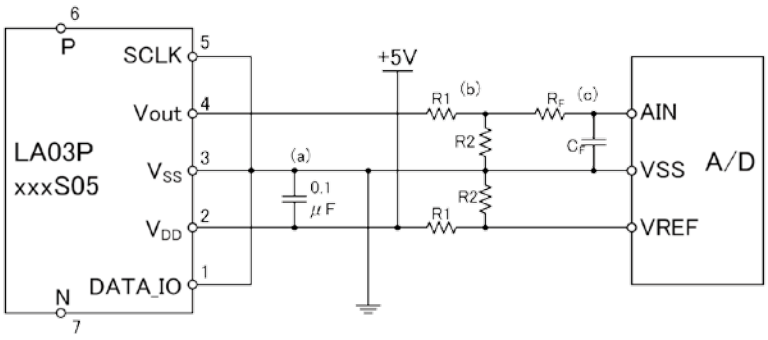
Note1) The tolerances of dimensions without any mention are ± 0.1mm.

RECOMMENDED THROUGH-HOLE LAYOUTS (mm)



Note) If 2 or more trace layers are used as the current path, please make enough number of through-holes to flow current between the trace layers.

TYPICAL APPLICATION



(a) Please be placed the bypass capacitor 0.1 μF as close as possible to the V_{DD} and V_{SS} pins of LA03P Series.
(b) LA03P Series have a ratiometric output. When received output by the A / D converter , it is possible to reduce the A / D conversion error due to supply voltage fluctuations by setting a common voltage level of the A / D converter and supply voltage. The resistive divider with R1 and R2 is required, if the reference voltage of the A / D converter is lower than + 5V.
(c) If necessary, please insert a low-pass filter to Vout.

TYPE DESIGNATION

LA03 P * * * S 05
① ② ③ ④ ⑤

① Model (4 figures)
LA03 : Series
② Mounting configuration (1 figure)
P : PCB Mounting type
③ Measurement current range (3 figures)
Ex) 035 : 35A 085 : 85A
④ Control power supply type (1 figure)
S : Single supply
⑤ Power supply voltage (2 digits)

RELIABILITY TEST

No.	Item	Test Conditions	n	Test Time
1	High Temp. High Humidity Bias Test	【JEITA EIAJ ED-4701 102】 Ta=85℃, 85%RH, continuous operation	22	1000h
2	High Temperature Bias Test	【JEITA EIAJ ED-4701 101】 Ta=125℃,continuous operation	22	1000h
3	High Temperature Storage Test	【JEITA EIAJ ED-4701 201】 Ta=150℃	22	1000h
4	Low Temperature Storage Test	【JEITA EIAJ ED-4701 202】 Ta=-55℃	22	1000h
5	Heat Cycle Test	【JEITA EIAJ ED-4701 105】 -65℃(30min) ⇔ 150℃(30min) Tested in vapor phase	22	500 cycles
6	Vibration Test	【JEITA EIAJ ED-4701 403】 Vibration frequency: 10～55Hz(1 min.) Vibration amplitude: 1.5mm(x,y,z directions)	5	2h for each direction

Tested samples are pretreated as below before each reliability test:
Desiccation : 125℃ /24h → Moisture Absorption : 85℃ /85%RH/168h → Flow : 1 time (260℃ , 10s)

Criterion for determining
Products whose drifts before and after the reliability tests do not exceed the values below are considered to be in spec.
Sensitivity G (Ta=25℃) : Within ± 1.5% (All model)
Offset Voltage Vof (Ta=25℃) : Within ± 150mV (LA03P021S05), Within ± 100mV (Other model)
Output Linearity ε_L (Ta=25℃) : Within ± 1% (All model)

Servo system / Voltage-output type External magnetic field improvement type

S22P M2 SERIES

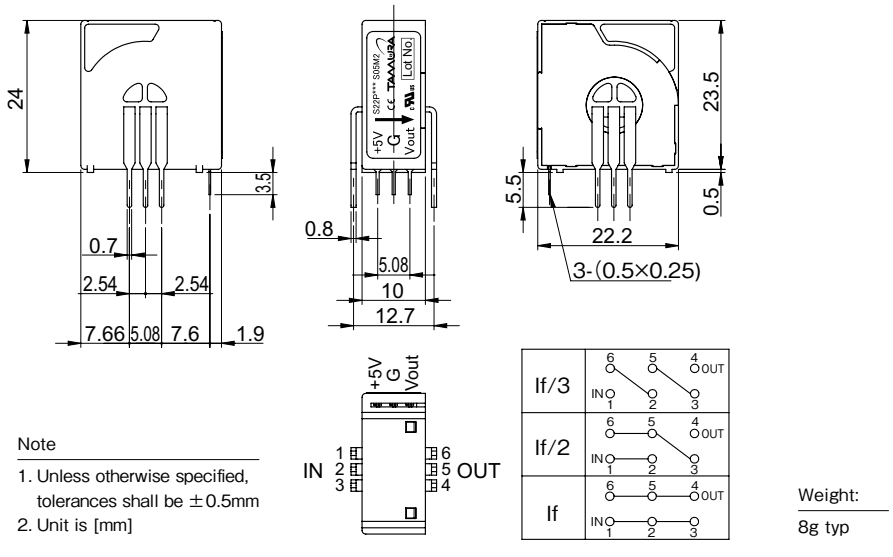
SPECIFICATIONS

Ta=25℃, RL=10kΩ, Vcc=+5V

Spec \ Types		S22P006S05M2	S22P015S05M2	S22P025S05M2
Primary norminal current	If	6A	15A	25A
Saturation current	If max	± 18A	± 45A	± 75A
Rated output voltage	Vo	Vof ± 0.625V (at If)		
Output voltage accuracy	X_G	0.625V ± 0.010V (at If)		
Offset voltage*1	Vof	2.5V ± 0.050V (at If = 0A)	2.5V ± 0.020V (at If = 0A)	2.5V ± 0.015V (at If = 0A)
Output linearity	ε_L	≦± 0.2% (at If)		
Power supply voltage	Vcc	+ 5V ± 5%		
Consumption current	Icc	Typ. 12.5mA (If=0A) + 37.5mA (If max)		
di/dt Response time (@90% of If)	tr	≦ 1μs (at di / dt = If /μs)		
Thermal drift of gain	T_CVo	≦ ± 0.05mV / ℃ (Without TcVof)		
Thermal drift of offset	TcVof	− 10 ~ 25℃ : ± 1.6mV / ℃ 25 ~ 85℃ : ± 0.8mV / ℃	− 10 ~ 25℃ : ± 0.6mV / ℃ 25 ~ 85℃ : ± 0.3mV / ℃	− 10 ~ 25℃ : ± 0.4mV / ℃ 25 ~ 85℃ : ± 0.2mV / ℃
Hysteresis error	V_{OH}	≦ 0.5mV (at If = 0A → If → 0A)		
Insulation voltage	Vd	AC3000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Sacondary		
Insulation resistance	R_{IS}	≧ 500M Ω (at DC500V) Primary ⇔ Sacondary		
Ambient Operating temperature	T_A	− 10℃~+ 85℃		
Ambient storage temperature	T_S	− 25℃~+ 100℃		

* 1 Offset voltage value is after removal of core hysteresis. * Please refer to the another sheet about conditions of UL Recognition.

DIMENSIONS (mm)



Note

1. Unless otherwise specified, tolerances shall be ±0.5mm
2. Unit is [mm]

Weight:
8g typ

Servo system / Voltage-output type / Short lead model

S22P P SERIES

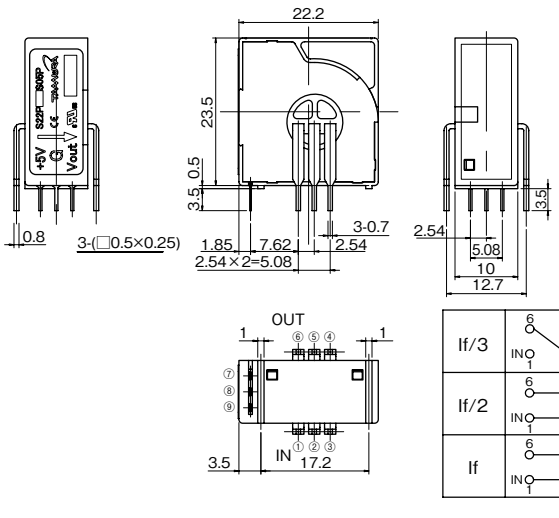
SPECIFICATIONS

Ta=25℃, RL=10kΩ, Vcc=+5V

Spec \ Types		S22P006S05P	S22P015S05P	S22P025S05P
Primary norminal current	If	6A	15A	25A
Saturation current	If max	± 18A	± 45A	± 75A
Rated output voltage	Vo	Vof ± 0.625V (at If)		
Output voltage accuracy	X_G	0.625V ± 0.010V (at If)		
Offset voltage *1	Vof	2.5V ± 0.050V (at If = 0 A)	2.5V ± 0.020V (at If = 0 A)	2.5V ± 0.015V (at If = 0 A)
Output linearity	ε_L	≦± 0.2% (at If)		
Power supply voltage	Vcc	+ 5V ± 5%		
Consumption current	Icc	Typ.12.5mA (If=0A) + 37.5mA (If max)		
di ／ dt Response time (@90% of If)	tr	≦ 1μs (di/dt = If /μs)		
Thermal drift of gain	T_CVo	≦ ± 0.05mV / ℃ (Without TcVof)		
Thermal drift of offset	TcVof	− 10 ～ 25℃ : ± 1.6mV / ℃ 25 ～ 85℃ : ± 0.8mV / ℃	− 10 ～ 25℃ : ± 0.6mV / ℃ 25 ～ 85℃ : ± 0.3mV / ℃	− 10 ～ 25℃ : ± 0.4mV / ℃ 25 ～ 85℃ : ± 0.2mV / ℃
Hysteresis error	V_{OH}	≦ 0.5mV (at If = 0A → If → 0A)		
Insulation voltage	Vd	AC3000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Sacondary		
Insulation resistance	R_{IS}	≧ 500M Ω (at DC500V) Primary ⇔ Sacondary		
Ambient Operating temperature	T_A	− 10℃～+ 85℃		
Ambient storage temperature	T_S	− 25℃～+ 100℃		

＊1 Offset voltage value is after removal of core hysteresis. ＊ Please refer to the another sheet about conditions of UL Recognition.

DIMENSIONS (mm)



Tolerance : ±0.5
Unit : mm

Terminal number

① IN-1
② IN-2
③ IN-3
④ OUT-3
⑤ OUT-2
⑥ OUT-1
⑦ Vout
⑧ GND
⑨ + Vcc (+ 5V)

Weight:

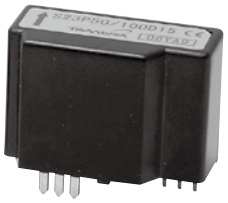
8g typ

Note

1. Unless otherwise specified, tolerances shall be ±0.5mm
2. Unit is [mm]

Servo system Current-output type

S23P M2



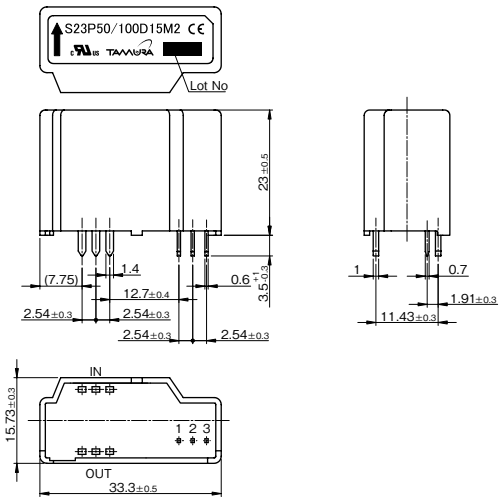
SPECIFICATIONS

Ta=25℃, Vcc=±15V

Spec \ Types		S23P50/100D15M2			
Primary norminal current	If	50A		100A	
Measuring resistance (If= ± ADC, Ta=85℃)	R_L	Vcc= ± 12V	0 Ω～ 217 Ω	Vcc= ± 12V	0 Ω～ 57 Ω
		Vcc= ± 15V	0 Ω～ 327 Ω	Vcc= ± 15V	45 Ω～ 114 Ω
Output current	Io	25mA (Turn ratio 1 : 2000)		50mA (Turn ratio 1 : 2000)	
Output current accuracy	X_G	Io ± 0.25% (without Iof)			
Offset current	Iof	≦ ± 0.15mA (at If=0A) *1			
Maximum current Vcc= ± 15V (Operating time: ≦ 10sec)	If max	± 110A (at RL ≦ 71 Ω)		± 160A (at RL ≦ 25 Ω)	
Output linearity	ε_L	≦ ± 0.15% (at If)			
Power supply voltage	Vcc	± 12V ± 5% ～± 15V ± 5% (Ratad output current is restricted by Vcc)			
Consumption current	Icc	≦ ± 16mA (without Io)			
di/dt Response time (@90% of If)	tr	≦ 0.5μs (at di/dt = 100A/μss)			
Thermal drift of gain	Tclo	≦ ± 0.01%/℃ (Without Tclof)			
Thermal drift of offset	Tclof	≦ ± 0.5mA (− 25℃～+ 85℃)			
Hysteresis error	I_{oH}	≦ 0.3mA (at If=0A → If → If=0A)			
Insulation voltage	Vd	AC5000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Sacondary			
Insulation resistance	R_{IS}	≧ 500M Ω (at DC500V) Primary ⇔ Sacondary			
Ambient Operating temperature	T_A	− 40℃～+ 85℃			
Ambient storage temperature	T_S	− 40℃～+ 90℃			
Secondary coil resistance	Rs	at Ta=70℃ 115 Ω at Ta=85℃ 121 Ω			

＊1 Offset current value is after removal of core hysteresis. ＊ Please refer to the another sheet about conditions of UL Recognition.

DIMENSIONS (mm)



Terminal number

1 − Vcc
2 + Vcc
3 OUT

Weight:

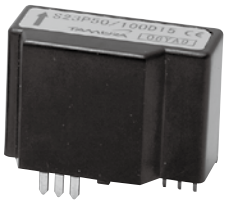
26g typ

Note

1. Unless otherwise specified, tolerances shall be ±0.5mm
2. Unit is [mm]

Servo system Current-output type

S23P M1



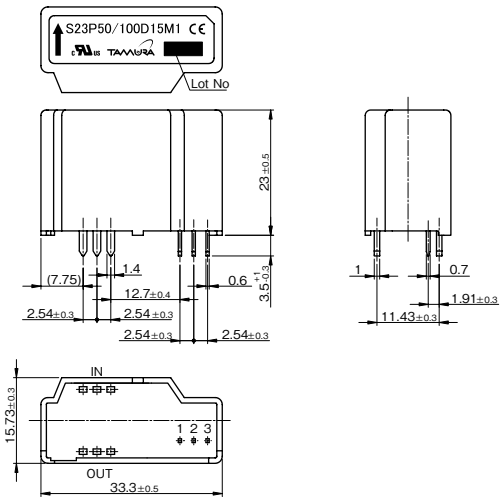
SPECIFICATIONS

Ta=25℃, Vcc=±15V

Spec \ Types		S23P50/100D15M1			
Primary norminal current	If	50A		100A	
Measuring resistance If= ± ADC at Ta=85℃	R_L	Vcc= ± 12V	20 Ω～ 145 Ω	Vcc= ± 12V	20 Ω～ 57 Ω
		Vcc= ± 15V	48 Ω～ 205 Ω	Vcc= ± 15V	48 Ω～ 85 Ω
Rated output current	Io	50mA (Turn ratio 1 : 1000)		100mA (Turn ratio 1 : 1000)	
Output current accuracy	X_G	Io ± 0.25% (without Iof)			
Offset current	Iof	≦± 0.3mA (at If=0A) *1			
Maximum current Vcc= ± 12V (Operating time: ≦ 3sec)	If max	± 226A (at RL=7.5 Ω)			
Output linearity	ε_L	≦ ± 0.15% (at If)			
Power supply voltage	Vcc	± 12V ± 5% ～± 15V ± 5% (Ratad output current is restricted by Vcc)			
Consumption current	Icc	≦ ± 16mA (without Io)			
di/dt Response time (@90% of If)	tr	≦ 0.5μs (at di / dt = 100A/μs)			
Thermal drift of gain	Tclo	≦± 0.01%/℃ (Without Tclof)			
Thermal drift of offset	Tclof	± 0.5mA type, ≦± 0.8mA max (− 25℃～+ 85℃)			
Hysteresis error	I_{oH}	≦ 0.3mA (at If=0A → If → 0A)			
Insulation voltage	Vd	AC5000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Sacondary			
Insulation resistance	R_{IS}	≧ 500M Ω (at DC500V) Primary ⇔ Sacondary			
Ambient Operating temperature	T_A	− 40℃～+ 85℃			
Ambient storage temperature	T_S	− 40℃～+ 90℃			
Secondary coil resistance	Rs	at Ta=70℃ 33 Ω at Ta=85℃ 35 Ω			

* 1 Offset current value is after removal of core hysteresis. * Please refer to the another sheet about conditions of UL Recognition.

DIMENSIONS (mm)



Terminal number

1 − Vcc
2 + Vcc
3 OUT

Weight:

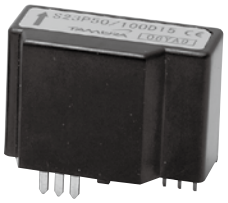
26g typ

Note

1. Unless otherwise specified, tolerances shall be ±0.5mm
2. Unit is [mm]

Servo system Current-output type

S23P



TAMURA recommends S23P50/100D15M2 as a succession model.

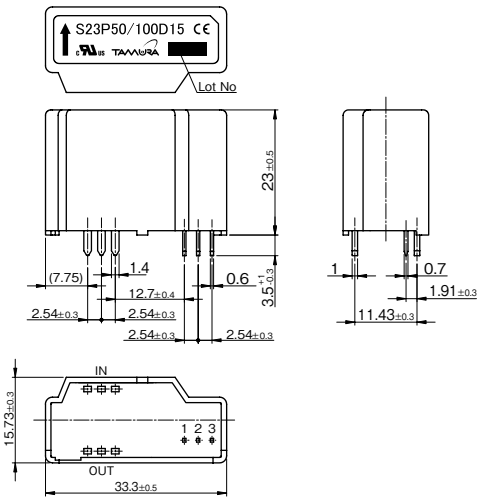
SPECIFICATIONS

Ta=25℃, Vcc=±15V

Spec \ Types		S23P50/100D15			
Primary norminal current	If	50A		100A	
Measuring resistance If=±ADC at Ta=85℃	R_L	Vcc=±12V	0Ω～217Ω	Vcc=±12V	0Ω～57Ω
		Vcc=±15V	0Ω～327Ω	Vcc=±15V	45Ω～114Ω
Rated output current	Io	25mA (Turn ratio 1 : 2000)		50mA (Turn ratio 1 : 2000)	
Output current accuracy	X_G	Io±0.25% (without Iof)			
Offset current	Iof	≦±0.15mA (at If=0A) *1			
Maximum current Vcc=±15V (Operating time: ≦10sec)	If max	±110A (at RL≦71Ω)		±160A (at RL≦25Ω)	
Output linearity	ε_L	≦±0.15% (at If)			
Power supply voltage	Vcc	±12V±5%～±15V±5% (Ratad output current is restricted by Vcc)			
Consumption current	Icc	≦±16mA (without Io)			
di/dt Response time (@90% of If)	tr	≦0.5μs (di / dt = 100A/μs)			
Thermal drift of gain	Tclo	≦±0.01%/℃ (Without Tclof)			
Thermal drift of offset	Tclof	≦±0.5mA max (−25℃～+85℃)			
Hysteresis error	I_{oH}	≦0.3mA (at If=0A → If → 0A)			
Insulation voltage	Vd	AC5000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Sacondary			
Insulation resistance	R_{IS}	≧500MΩ (at DC500V) Primary ⇔ Sacondary			
Ambient Operating temperature	T_A	−40℃～+85℃			
Ambient storage temperature	T_S	−40℃～+90℃			
Secondary coil resistance	Rs	at Ta=70℃ 115Ω at Ta=85℃ 121Ω			

* 1 Offset current value is after removal of core hysteresis. * Please refer to the another sheet about conditions of UL Recognition.

DIMENSIONS (mm)



Terminal number

1 − Vcc
2 + Vcc
3 OUT

Weight:

26g typ

Note

1. Unless otherwise specified, tolerances shall be ±0.5mm
2. Unit is [mm]

Servo system Current-output type

S25P SERIES

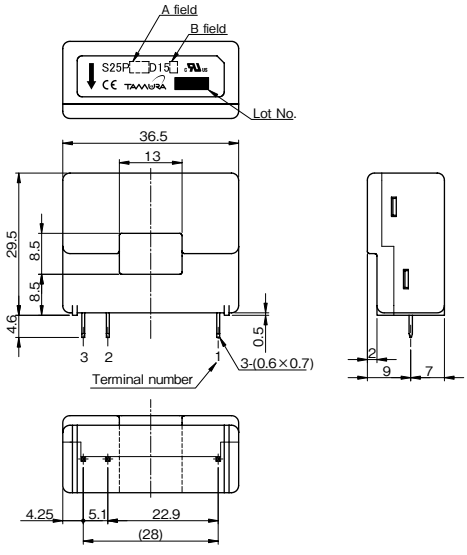
SPECIFICATIONS

Ta=25℃, Vcc=±15V

Spec \ Types		S25P050D15X	S25P100D15Y	S25P100D15X	S25P150D15Y
Primary norminal current	If	50A	100A	100A	150A
Measuring resistance If=±ADC at Ta=85℃	R_L	Vcc=±12V 60Ω～95Ω Vcc=±15V 135Ω～155Ω	Vcc=±12V 0Ω～42Ω Vcc=±15V 20Ω～102Ω	Vcc=±12V 10Ω～65Ω Vcc=±15V 40Ω～95Ω	Vcc=±12V 0Ω～15Ω Vcc=±15V 0Ω～55Ω
Rated output current	Io	50mA (Turn ratio 1 : 1000)	50mA (Turn ratio 1 : 2000)	100mA (Turn ratio 1 : 1000)	75mA (Turn ratio 1 : 2000)
Output current accuracy	X_G	Io±0.5% (without Iof)			
Offset current *1	Iof	≦±0.2mA (at If=0A)	≦±0.1mA (at If=0A)	≦±0.2mA (at If=0A)	≦±0.2mA (at If=0A)
Maximum current Vcc=±15V,Ta=85℃	If max	±55A (at RL=135Ω) *2	±150A (at 20Ω≦RL≦25Ω)	±160A (at 40Ω≦RL≦50Ω)	±200A (at 0Ω≦RL≦40Ω)
Output linearity	ε_L	≦±0.15% (at If)			≦±0.25% (at If)
Power supply voltage	Vcc	±12V±5%～±15V±5% (Ratad output current is restricted by Vcc)			
Consumption current	Icc	≦±16mA (Without Io)			
di/dt Response time (@90% of If)	tr	≦1μS (at di/dt=If/μs)			
Thermal drift of gain	TCIo	≦±0.01%/℃ (Without Tclof)			
Thermal drift of offset	TClof	≦±0.5mA			
Hysteresis error	I_{OH}	≦0.3mA (at If=0A → If → If=0A)			
Insulation voltage	Vd	AC3000V for 1 minute (Sensing current 0.5mA) inside of through hole ⇔ terminal			
Insulation resistance	R_{IS}	≧500MΩ (at DC500V) inside of through hole ⇔ terminal			
Ambient Operating temperature	T_A	−40℃～+85℃			
Ambient storage temperature	T_S	−40℃～+90℃			
Secondary coil resistance	Rs	at Ta=70℃ 80Ω at Ta=85℃ 85Ω	at Ta=70℃ 120Ω at Ta=85℃ 128Ω	at Ta=70℃ 25Ω at Ta=85℃ 28Ω	at Ta=70℃ 95Ω at Ta=85℃ 105Ω

＊1 Offset current value is after removal of core hysteresis. ＊2 Ta=70℃, If max=70A (at 50Ω≦RL≦90Ω)
＊ Please refer to the another sheet about conditions of UL Recognition.

DIMENSIONS (mm)



A field display

Current	A field
50A	050
100A	100
150A	150

B field display

Coil	B field
1000T	X
2000T	Y

※50A is 1000T only, 150A is 2000T only

Terminal number

1 + Vcc
2 − Vcc
3 OUT

Weight:

20g typ

Note

1. Unless otherwise specified, tolerances shall be ±0.5mm

Servo system / Current-output type

S21S SERIES

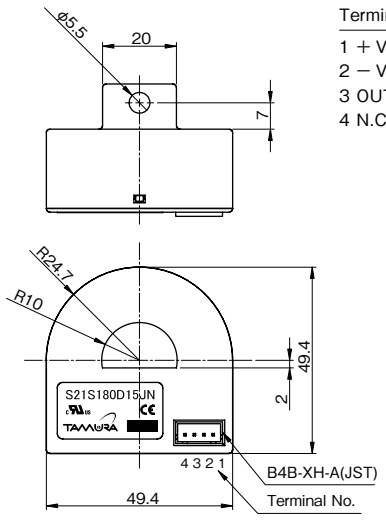
SPECIFICATIONS

Ta=25℃, Vcc=±15V

Spec \ Types		S21S180D15JN
Primary norminal current	If	180A
Measuring Resistance (at 80℃)	R_L	0 ～ 68 Ω (at Vcc=±12V)　0 ～ 100 Ω (at Vcc=±15V)
Rated output Current	Io	45mA (Turn Ratio: 1:4000)
Output Current Accuracy	X_G	Io ± 1% (at If without Iof)
Offset Current	Iof	≦ ± 0.2mA (at If=0A) ※1
Maximum Current	If max	± 540A (TA=25℃ , at 5 ≦ R_M ≦ 30 Ω ; at T_A=80℃ , 5 ≦ R_M ≦ 20 Ω)
Output Linearity	ε_L	≦ ± 0.3% (at If)
Power supply voltage	Vcc	± 12V ± 5% ～± 15V ± 5% (Ratad output current is restricted by Vcc)
Consumption Current	Icc	≦ ± 16mA (without Io)
di/dt Response Time (@90% of If)	tr	≦ 1μs (at di/dt=100A/μs)
Thermal drift of gain	TCIo	≦ ± 0.02%/℃ (without TCIof)
Thermal drift of offset	TCIof	≦ ± 0.01mA/℃
Hysteresis error	I_{oH}	≦ 0.2mA (at If = 0A → If → 0A)
Insulation voltage	Vd	AC2500V for 1 minute (Sensing current 0.5mA) inside of through hole ⇔ terminal
Insulation resistance	R_{IS}	≧ 500M Ω (at DC500V) inside of through hole ⇔ terminal
Ambient Operating temperature	T_A	− 30℃～+ 80℃
Ambient storage temperature	T_S	− 40℃～+ 85℃
Secondary coil resistance	Rs	48 Ω (at T_A=25℃) , 60 Ω (at T_A=80℃)

* 1 Offset current value is after removal of core hysteresis. * Please refer to the another sheet about conditions of UL Recognition.

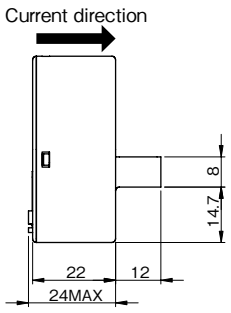
DIMENSIONS (mm)



Terminal number
1 + Vcc
2 − Vcc
3 OUT
4 N.C.

Weight:
60g typ

Note
1. Unless otherwise specified, tolerances shall be ±0.5mm
2. Unit is [mm]



Servo system Current-output type

S20S M1 SERIES

CE RoHS

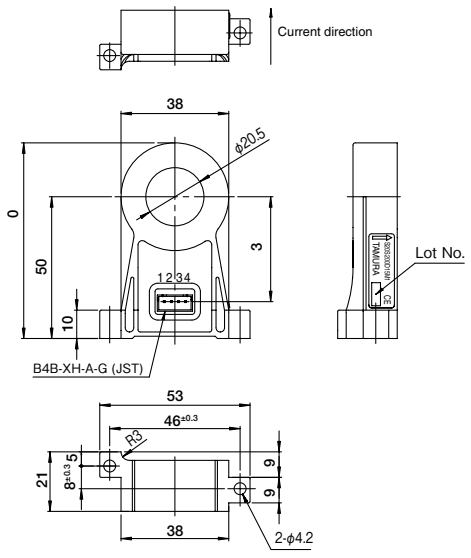
SPECIFICATIONS

Ta=25℃, Vcc=±15V

Spec \ Types		S20S200D15M1			
Primary norminal current	If	200AT		300AT	
Measuring resistance	R_L	Vcc= ± 12V	5 Ω～ 35 Ω	Vcc= ± 12V	9 Ω～ 13 Ω
		Vcc= ± 15V	25 Ω～ 65 Ω	Vcc= ± 15V	29 Ω～ 33 Ω
Rated output current	Io	100mA (Turn Ratio: 1 : 2000)		150mA (Turn Ratio: 1 : 2000)	
Output current accuracy	X_G	Io ± 1% (without Iof)			
Offset current *1	Iof	≦ ± 0.5mA (at If=0A)			
Maximum current @ Vcc ± 15VDC&Ta=70℃	If max	± 300AT (at RL=30 Ω)			
Output linearity	ε_L	≦ ± 0.25% (at If)			
Power supply voltage	Vcc	± 12V ± 5% ～± 15V ± 5% (Ratad output current is restricted by Vcc)			
Consumption current	Icc	≦ ± 16mA (without Io)			
di/dt Response time	tr	≦ 1μs (di / dt = If/μs)			
Frequency characteristics @− 1dB	f	DC…150kHz			
Thermal drift of gain	Tclo	≦ ± 0.02%/℃ (Without Tc Iof) (− 5℃～+ 70℃)			
Thermal drift of offset	Tclof	≦ ± 0.012mA/℃ (− 5℃～+ 70℃)			
Hysteresis error	I_{oH}	≦ 0.3mA (at If = 0A → If → 0A)			
Insulation voltage	Vd	AC2500V for 1 minute (Sensing current 0.5mA) inside of through hole ⇔ terminal			
Insulation resistance	R_{IS}	≧ 500M Ω (at DC500V) inside of through hole ⇔ terminal			
Ambient Operating temperature	T_A	− 20℃～+ 70℃			
Ambient storage temperature	Ts	− 20℃～+ 85℃			
Secondary coil resistance	Rs	33 Ω @ Ta=70℃			

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

DIMENSIONS (mm)



Terminal number

1 + Vcc
2 − Vcc
3 OUT
4 NC

Weight:

46g typ

Note

1. Unless otherwise specified, tolerances shall be ±0.5mm

Servo system Current-output type

S26P SERIES

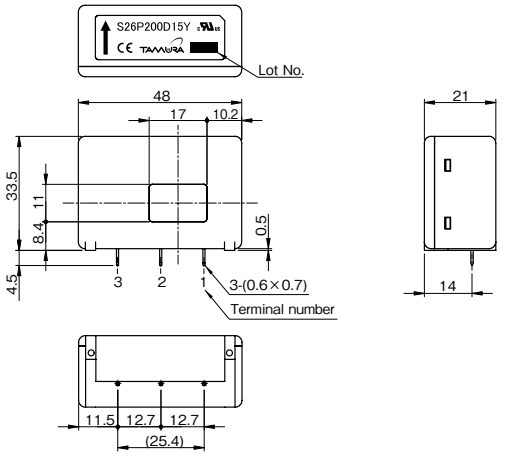
SPECIFICATIONS

Ta=25℃, Vcc=±15V

Spec \ Types		S26P200D15Y	
Primary norminal current	If	200A	300A
Measuring resistance @Ta=85℃	R_L	Vcc=±12V 0Ω~26Ω Vcc=±15V 0Ω~56Ω	Vcc=±12V 0Ω~4Ω*1 Vcc=±15V 0Ω~8Ω
Rated output current	Io	100mA (Turn Ratio: 1:2000)	150mA (Turn Ratio: 1:2000)
Output current accuracy	X_G	Io±0.4% (Without Iof)	
Offset current	Iof	≦±0.2mA (at If=0A) *2	
Maximum current Vcc=±15V, Ta=85℃	If max	±350A (at RL≦5Ω)	
Output linearity	ε_L	≦±0.15% (at If)	
Power supply voltage	Vcc	±12V±5%~±15V±5% (Ratad output current is restricted by Vcc)	
Consumption current	Icc	≦±16mA (Without Io)	
di/dt Response time (@90% of If)	tr	≦1μS (at di/dt=If/μs)	
Frequency characteristics @−1dB	f	DC···100kHz	
Thermal drift of gain	TCIo	≦±0.01%/℃ (Without Tclof)	
Thermal drift of offset	TCIof	≦±0.5mA	
Hysteresis error	I_{oH}	≦0.3mA (at If=0A → If → If=0A)	
Insulation voltage	Vd	AC3000V for 1 minute (Sensing current 0.5mA) inside of through hole ⇔ terminal	
Insulation resistance	R_{IS}	≧500MΩ (at DC500V) inside of through hole ⇔ terminal	
Ambient Operating temperature	T_A	−40℃~+85℃	
Ambient storage temperature	T_S	−40℃~+90℃	
Secondary coil resistance	Rs	at Ta=70℃ 60Ω at Ta=85℃ 65Ω	

*1 : If=250A *2 Offset current value is after removal of core hysteresis. *Please refer to the another sheet about conditions of UL Recognition.

DIMENSIONS (mm)



Terminal number

1 + Vcc
2 Output
3 − Vcc

Weight:

45g typ

Note

1. Unless otherwise specified, tolerances shall be ±0.5mm
2. Unit is [mm]

Servo system Current-output type

S27S SERIES


SPECIFICATIONS

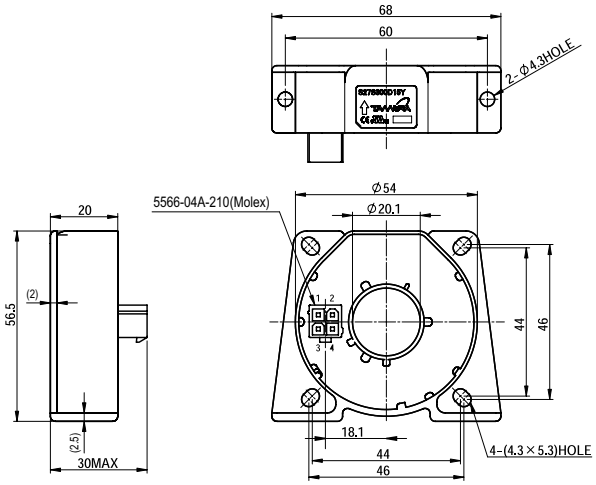
Ta=25℃, Vcc=±15V

Spec \ Types		S27S300D15Y	S27S300D15YM
Connector	–	39-28-8040［5566-04A-210］(Molex)	38-00-6293［6410-03C（102)］(Molex)
Rated Current	If	300A	
Maximum Current RL：測定抵抗 Vcc=±15V,Ta=85℃	If max	±500A	
Measuring resistance at Ta=85℃ If=【±ADC】	R_L	±12V	300A 0Ω～39Ω 500A 0Ω～12Ω
		±15V	300A 0Ω～58Ω 500A 0Ω～22Ω
		±20V	300A 15Ω～93Ω 500A 15Ω～45Ω
Output Current	Io	150mA（Conversion Ratio 1:2000）	
Output Current Accuracy	X_G	Io±0.4%（without Iof）	
Offset Current	Iof	≦±0.2mA（at If=0A）*1	
Output Linearity	ε_L	≦±0.1%（at If）	
Power Supply Voltage	Vcc	±12～±20V	
Consumption Current	Icc	≦±20mA（without Io）	
di/dt Response Time（@90% of If）	tr	≦1us（di/dt=100A/us）	
Thermal drift of gain	TCIo	≦±0.01%/℃（without Tclof）	
Thermal drift of offset	TCIof	≦±0.5mA max	
Hysteresis error	I_{oH}	≦0.1mA（at If=0A→If→0A）	
Insulation voltage	Vd	AC4000V, for 1minute（sensing current 0.5mA）, inside of through hole ⇔ terminal	
Insulation resistance	R_{IS}	≧500MΩ（at DC500V）inside of through hole ⇔ terminal	
Ambient Operating temperature	T_A	−40℃～+85℃	
Ambient storage temperature	T_S	−40℃～+90℃	
Secondary coil resistance	Rs	25Ω（Ta=70℃） 28Ω（Ta=85℃）	

* 1 Offset current value is after removal of core hysteresis.
* Please refer to the another sheet about conditions of UL Recognition.

DIMENSIONS (mm)

S27S300D15Y



Terminal number

1 + Vcc
2 Output
3 − Vcc
4 nc

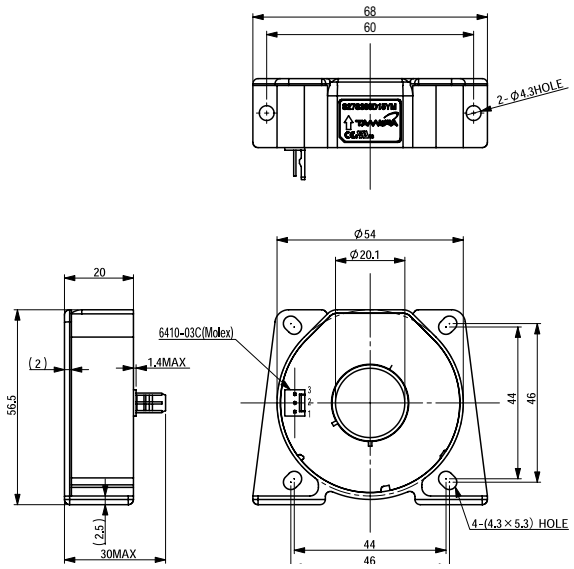
Weight:

90g typ

Note

1. Unless otherwise specified, tolerances shall be ±0.5mm
2. Unit is [mm]

S27S300D15YM



Terminal number

1 + Vcc
2 Output
3 − Vcc

Weight:

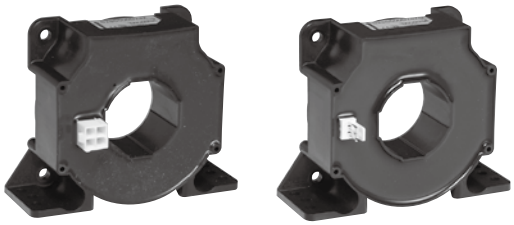
90g typ

Note

1. Unless otherwise specified, tolerances shall be ±0.5mm
2. Unit is [mm]

Servo system Current-output type

S28S SERIES



RoHS

SPECIFICATIONS

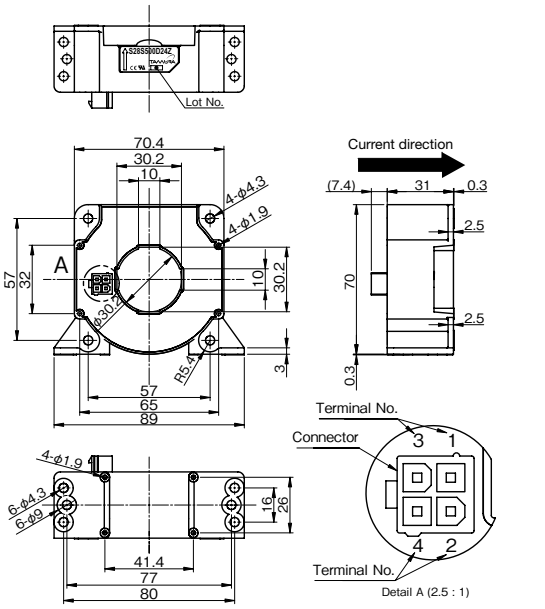
Ta=25℃, Vcc=±15V

Spec \ Types	Symbol	S28S500D24Z		S28S500D24ZM
Connector	—	39-28-8040 [5566-04A-210] (Molex)		38-00-6293 [6410-03C (102)] (Molex)
Rated Current	If	500A		
Maximum Current	If max	± 800A		
Measuring resistance	R_L	± 15V	500A 0 Ω～ 60 Ω 800A 0 Ω～ 11 Ω	
		± 18V	500A 0 Ω～ 92 Ω 800A 0 Ω～ 30 Ω	
		± 24V	500A 5 Ω～ 149 Ω 800A 5 Ω～ 65 Ω	
Output Current	Io	100mA (Conversion Ration 1:5000)		
Output Current Accuracy	X_G	Io ± 0.5% (without Iof)		
Offset Current	Iof	≦± 0.4mA (at If = 0A) *1		
Output Linearity	ε_L	≦± 0.1% (at If)		
Power Supply Voltage	Vcc	± 15 ～± 24V		
Consumption Current	Icc	≦± 30mA (without Io)		
di/dt Response Time (@90% of If)	tr	≦ 1us (di/dt=100A/us)		
Output Temperature Characteristic	TCIo	≦± 0.01%/℃ (Without TCIof)		
Offset Temperature Characteristic	TCIof	≦± 0.4mA max		
Hysteresis allowance	I_{oH}	≦± 0.2mA max (at If = 0A → 3*If → 0A)		
Insulation Withstanding	Vd	AC4,000V, for 1minute (sensing current 0.5mA) inside of through hole ⇔ terminal		
Insulation Withstanding	R_{IS}	≧ 500M Ω (at DC500V) inside of through hole ⇔ terminal		
Operating Temperature	T_A	− 40℃～+ 70℃		
Storage Temperature	T_S	− 40℃～+ 85℃		
Secondary coil resistance	Rs	70 Ω (Ta=70℃)		

* 1 Offset current value is after removal of core hysteresis.
* Please refer to the another sheet about conditions of UL Recognition.

DIMENSIONS (mm)

S28S500D24Z



Terminal number

1 NC
2 − Vcc
3 OUT
4 + Vcc

Weight:

260g typ

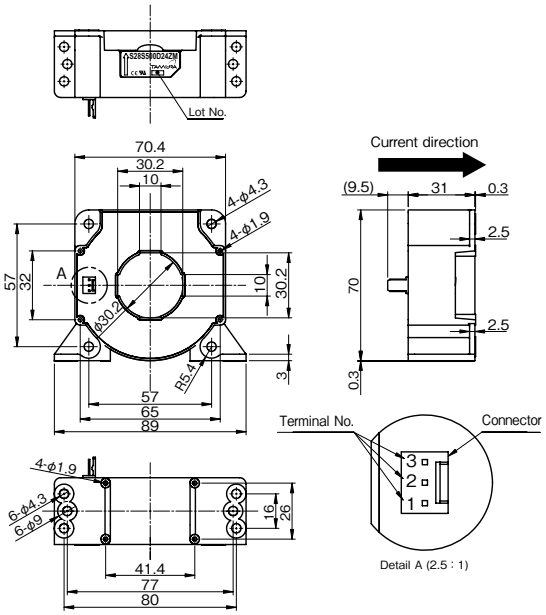
Connector

Manufacturer	Part Number	Old Part Number
Molex	39-28-8040	5566-04A-210

Note

1. Unless otherwise specified, tolerances shall be ± 0.5mm
2. Unit is [mm]

S28S500D24ZM



Terminal number

1 + Vcc
2 OUT
3 − Vcc

Weight:

260g typ

Connector

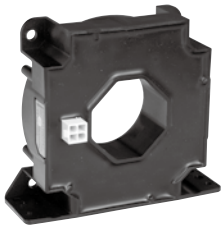
Manufacturer	Part Number	Old Part Number
Molex	38-00-6293	6410-03C (102)

Note

1. Unless otherwise specified, tolerances shall be ± 0.5mm
2. Unit is [mm]

Servo system Current-output type

S29S D24 SERIES



RoHS

SPECIFICATIONS

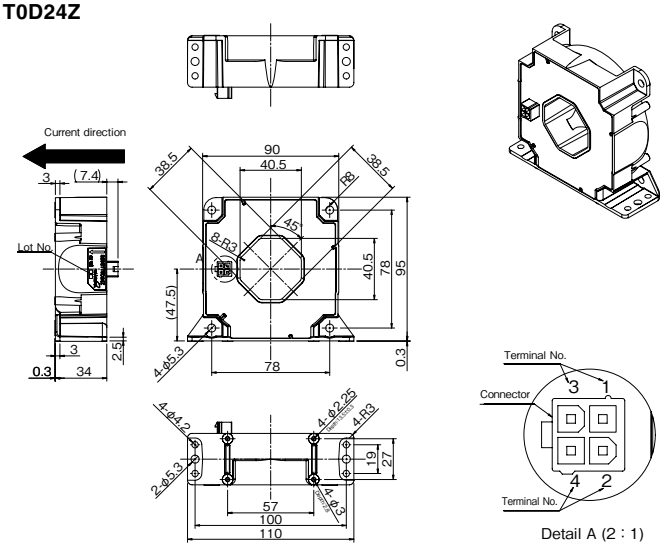
Ta=25℃, Vcc=±15V

Spec \ Types	Symbol	S29S1T0D24Z		S29S1T0D24ZM	S29S1T0D24ZJ
Connector	—	39-28-8040 [5566-04A-210] (Molex)		38-00-6293 [6410-03C (102)] (Molex)	BH3P-VH-1 (JST)
Rated current	If	1000A			
Maximum current 3sec	If max	±2100A			
Measuring resistance	R_L	±15V	70℃	1000A 0Ω～21Ω 1200A 0Ω～9Ω 1300A 0Ω～5Ω	
			85℃	1000A 0Ω～18Ω 1200A 0Ω～7Ω	
		±24V	70℃	1000A 0Ω～60.5Ω 1800A 0Ω～14Ω 2100A 0Ω～4Ω	
			85℃	1000A 10Ω～58.5Ω 1800A 10Ω～12Ω	
Output current	Io	200mA (Conversion Ratio 1:5000)			
Output current accuracy	X_G	Io ± 0.4% (without Iof)			
Offset current	Iof	≦± 0.4mA (at If=0A) ＊1			
Output linearity	ε_L	≦± 0.1% (at If)			
Power supply voltage	Vcc	± 15V (± 5%) ～± 24V (± 5%)			
Consumption current	Icc	≦± 35mA (Without Io)			
di/dt response time (@90% of If)	tr	≦ 1us (di/dt=100A/us)			
Thermal drift of gain	TCIo	≦± 0.01%/℃ (without TCIof)			
Thermal drift of offset	TCIof	≦± 0.5mA max (at − 10℃～+ 70℃) ≦± 0.8mA max (at − 40℃～+ 85℃)			
Hysteresis error	I_{oH}	≦± 0.2mA (at If=0A ⇒ 3 × If ⇒ 0A)			
Insulation withstanding	Vd	AC4,000V, for 1minute (sensing current 0.5mA) ,inside of through hole ⇔ terminal			
Insulation resistance	R_{IS}	≧ 500MΩ (at DC500V) inside of through hole ⇔ terminal			
Ambient Operating temperature	T_A	− 40℃～+ 85℃			
Ambient storage temperature	T_S	− 40℃～+ 90℃			
Secondary coil resistance	Rs	48Ω (Ta=70℃) 50Ω (Ta=85℃)			

＊1 Offset current value is after removal of core hysteresis. ＊Temperature of the primary conductor(busbar) should not exceed 100℃ .
＊Please refer to the another sheet about conditions of UL Recognition.

DIMENSIONS (mm)

S29S1T0D24Z



Detail A (2 : 1)

Terminal number

1 NC (No connection)
2 +Vcc (+24V)
3 −Vcc (−24V)
4 Iout

Connector		
Manufacturer	Part Number	Old Part Number
Molex	39-28-8040	5566-04A-210

Plating of terminal; Sn

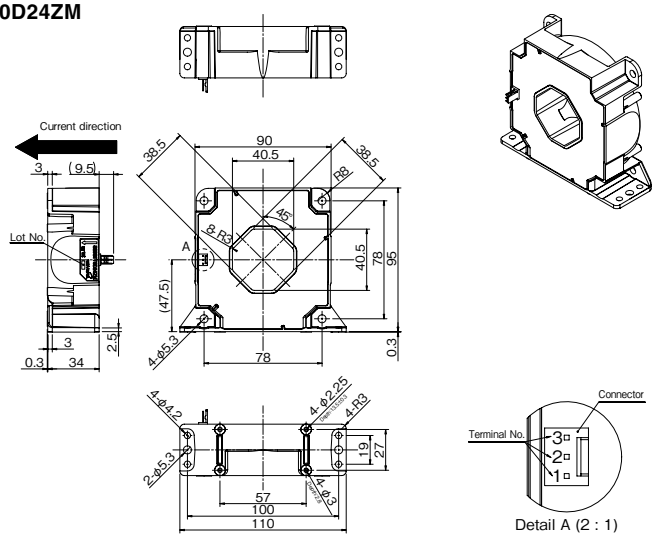
Weight

560g typ

Note

1. Unless otherwise specified, tolerances shall be ±0.5mm
2. Unit is [mm]

S29S1T0D24ZM



Detail A (2 : 1)

Terminal number

1 +Vcc (+24V)
2 Iout
3 −Vcc (−24V)

Connector		
Manufacturer	Part Number	Old Part Number
Molex	38-00-6293	6410-03C（102）

Plating of terminal; Sn

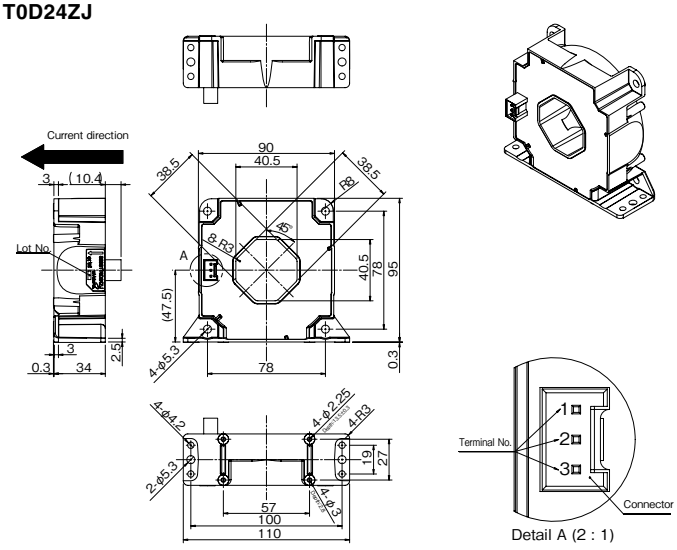
Weight

560g typ

Note

1. Unless otherwise specified, tolerances shall be ±0.5mm
2. Unit is [mm]

S29S1T0D24ZJ



Detail A (2 : 1)

Terminal number

1 −Vcc (−24V)
2 Iout
3 +Vcc (+24V)

Connector	
Manufacturer	Part Number
JST	BH3P-VH-1

Plating of terminal; Sn

Weight

560g typ

Note

1. Unless otherwise specified, tolerances shall be ±0.5mm
2. Unit is [mm]

TAMURA

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