

ELECTRONICS COMPONENTS

CURRENT SENSORS



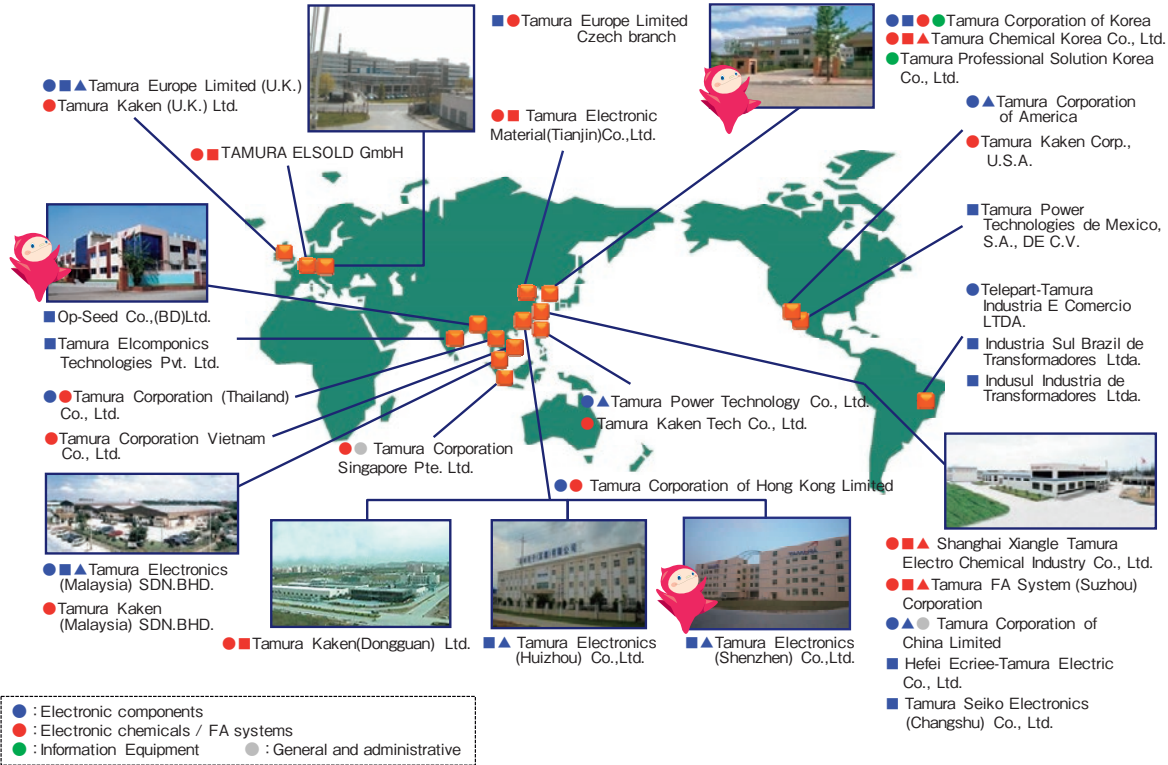
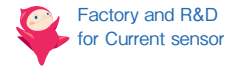
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Group network map

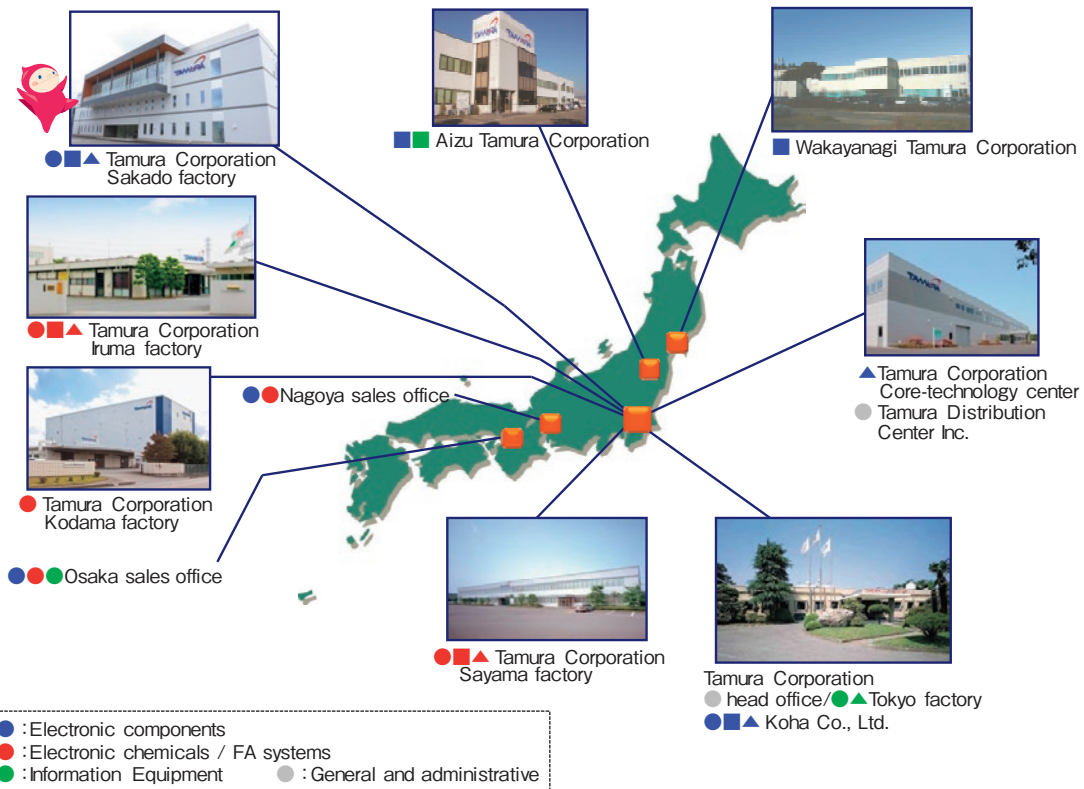
Group Network - Overseas

○: Sales □: Factory ▲: R&D



Group Network - Japan

○: Sales □: Factory ▲: R&D



Outlines / Applications / Features

Introduction

Fluxgate system

Open loop

Closed loop

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, I_f , induced in the magnetic circuit, passes through the Hall element inserted in the gap of the magnetic circuit resulting in a potential difference, V_h , expressed by the following formula:

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

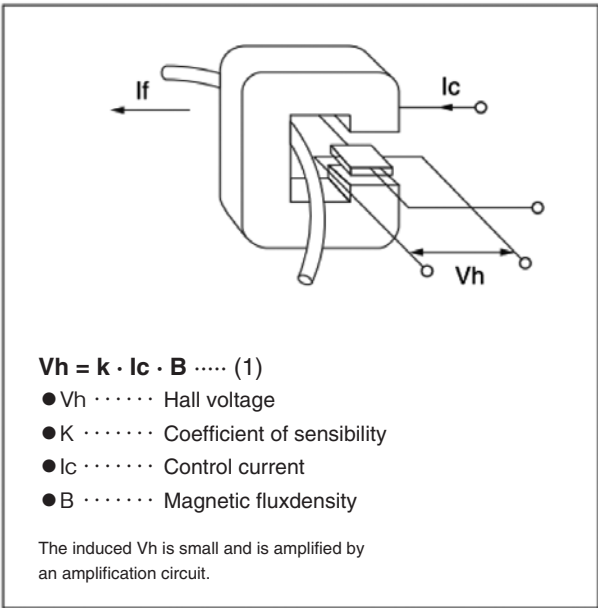


Figure-1

Features

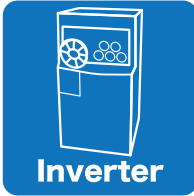
Measurement of DC, AC (kHz range), & complex current (AC+DC). The lineup of rated currents ranges from a few A to over 1000 A.

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

Applications of Current Sensor

Applications

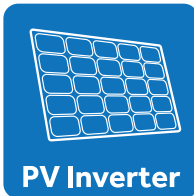
Series (Example)



L18P	L07P	L06P	L03S
L37S	L34S	LA**P	S27S
S28S	S29S	S30S	S42S



L18P	L08P	L06P	L03S
L37S	S21S	S22S	S27S
S28S			



L18P	L34S	S22P	S23P
S30S	S42S	LA**P	F**P



L03S	L37S	L07P	L08P
S22P	S23P	S21S	S27S
F**P			



L03S	L37S	L08P	L34S
S28S	S29S		






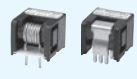

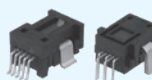






L18P	L12P	F**P	S22P
S23P	S21S	S27S	S28S
S29S			
















L03S	L37S	L08P	L06P
L34S	S21S	S27S	S28S
S29S			




Current Sensor / Guide map

Current range	SERIES	Model	Main Specification					UL R/C	Features	Page
			Circuit System	Mounting Configuration	Primary Conductor	Rated Current	Power Voltage			
6A ~ 150A	F01P 	F01PxxxS05L	Fluxgate system	On-board	Built-in bus-bar	6~50A	+5V	●	<ul style="list-style-type: none"> • Super precision & High stability • F02P & F03P : With reference access • F03P : Longer creepage and clearance distances 	18
	F02P 	F02PxxxS05L								
	F03P 	F03PxxxS05L								
	F23P 	F23PxxxS05R	Fluxgate system	On-board	Built-in bus-bar	50~100A	+5V	●	<ul style="list-style-type: none"> • Super precision & High stability • With reference access 	36
	F26P 	F26PxxxS05 F26PxxxS05A	Fluxgate system	On-board	Through hole □20.5×11	50~150A	+5V	●	<ul style="list-style-type: none"> • Super precision & High stability • With reference access • Name end "A"; Output voltage waveform distortion improvement model 	42
3A ~ 1500A	L18P 	L18PxxxD15AHV L18PxxxD15-OP	Open loop	On-board	Built-in coil/ bus-bar	3~60A	±15V	●	<ul style="list-style-type: none"> • Low cost • Compact, high performance • Name end "AHV"; Anti-Sulfurated (Coating), Improve dvdt characteristics • Name end "R"; Rated voltage change 	57
		L18PxxxS05 L18PxxxS05R					+5V			
		L18PxxxS12					+12V			
	L07P 	L07PxxxD15 L07PxxxD15S	Open loop	On-board	Built-in coil	3~30A	±15V	●	<ul style="list-style-type: none"> • Low cost • Built-in 2 circuits • Name end "S"; Anti-Sulfurated (Coating, Anti-Sulfurated resistance) 	63
		L07PxxxS05					+5V			
	LA01P(M) LA04P 	LA01MxxxS05	Open loop	On-board (SMT)	Built-in bus-bar	21~41A *1	+5V	●	<ul style="list-style-type: none"> • Open loop - one chip ASIC model • Low profile package(8.5mm on PCB) • High-speed response * 1 : Measurement current range 	87
		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	●	<ul style="list-style-type: none"> • Open loop - one chip ASIC model • Creepage distance : 13mm • Low profile package(9.2mm on PCB) • High-speed response * 1 : Measurement current range 	102
LA03PxxxS05		+5V								
L12P 	L12P025D15	Open loop	On-board	Built-in coil	25A	±15V	●	<ul style="list-style-type: none"> • Low cost • Compact 	66	
L32P 	L32PxxxS05BFS	Open loop	On-board	Built-in bus-bar	50A, 100A	+5V	●	<ul style="list-style-type: none"> • Ferrite core is used. • With reference access • Used Anti-Sulfurated resistance 	67	
	L32PxxxS05FS			Through hole □15×8	50~400A					
L08P 	L08PxxxD15IPV/ W/IPVW	Open loop	On-board	Through hole φ16	50~500A	±15V	●	<ul style="list-style-type: none"> • Wide range of applications • Improve dV/dt characteristics 	68	

Current Sensor / Guide map

Current range	SERIES	Model	Main Specification					UL R/C	Features	Page
			Circuit System	Mounting Configuration	Primary Conductor	Rated Current	Power Voltage			
3A ~ 1500A	L01Z 	L01ZxxxS05	Open loop	On-board	Through hole □15×8	50~600A	+5V	• Wide electrical current range • Compact	71	
	L37S 	L37SxxxS05M L37SxxxS05J L37SxxxD15M L37SxxxD15J	Open loop	Connector (MOLEX/JST)	Through hole □20.4×10.4	50~600A 50~600(800)A	+5V ±15V	• Design for lower dv/dt noise • L37SxxxD15x : Succession model of L03SxxxD15W series • L37SxxxS05x : With reference access • Wide electrical current range • Compact	72	
	L03S 	L03SxxxD15 L03SxxxD15WM L03SxxxD15WJ	Open loop	Connector (MOLEX) Connector (MOLEX/JST)	Through hole □20.5×10.5	50~600A 50~800A	±15V	• Wide electrical current range • Compact • Name end"W"; Saturation current up, Change position of CN (MOLEX or JST)	78	
	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	80	
	L06P 	L06PxxxS05	Open loop	On-board	Through hole φ22	300~800A	+5V	• Wide range of applications • Single power supply type	81	
	L05Z 	L05Z800S15	Open loop	Connector (JST)	Through hole □20.5×10.5	800A	+15V	• Wide range of applications • Single power supply type	82	
	L34S 	L34SxxxD15 L34SxxxD15T	Open loop	Connector (MOLEX)	Through hole □40.5×40.5	200~1500A	±15V	• High-current (1500A_max) • Wide electrical current range • Large aperture	83	
6A ~ 2000A	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	112	
	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 Ratio 1:1000 • Conversion Ratio - Normal & M2 type are 1:2000	114	
	S21S 	S21S180D15JN	Closed loop	Connector (JST)	Through hole R10	180A	±15V	• Semicircle aperture • Conversion Ratio 1:4000	117	
	S20S 	S20S200D15M1	Closed loop	Connector (JST)	Through hole φ20.5	200A	±15V	• High accuracy, High performance • Conversion Ratio 1:2000	118	
	S27S 	S27S300D15Y S27S300D15YM	Closed loop	Connector (MOLEX)	Through hole φ20	300A	±20V	• High accuracy, High performance • Conversion Ratio 1:2000 • Connector:MOLEX (2 type)	119	
	S28S 	S28S500D24Z S28S500D24ZM	Closed loop	Connector (MOLEX)	Through hole φ30	500A	±24V	• High-current, High accuracy • Conversion Ratio 1:5000 • Connector:MOLEX (2 type)	121	

Current Sensor / Guide map

Current range	SERIES	Model	Main Specification					UL R/C	Features	Page
			Circuit System	Mounting Configuration	Primary Conductor	Rated Current	Power Voltage			
6A ? 2000A	S29S 	S29S1T0D24Z S29S1T0D24ZM S29S1T0D24ZJ	Closed loop	Connector (MOLEX/JST)	Through hole φ38.5	1000A	±24V	●	<ul style="list-style-type: none"> High-current, High accuracy Conversion Ratio 1:5000 Connector: MOLEX (2 type), JST (1 type) 	123
	S30S 	S30S2T0D24Z S30S2T0D24ZM S30S2T0D24ZJ	Closed loop	Connector (MOLEX/JST)	Through hole φ61	2000A	±24V	●	<ul style="list-style-type: none"> High-current, High accuracy Conversion Ratio 1:5000 Connector : MOLEX (2 types), JST (1 type) 	125
	S42S 	S42S1T0D24Z S42S1T0D24ZM S42S1T0D24ZJ	Closed loop	Connector (MOLEX/JST)	Through hole φ42	1000A	±24V	●	<ul style="list-style-type: none"> High-current, High accuracy Conversion Ratio 1:5000 Connector : MOLEX (2 types), JST (1 type) 	129

Introduction

Fluxgate system

Open loop

Closed loop

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.

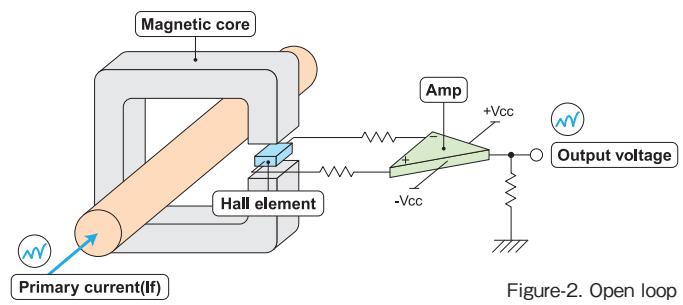


Figure-2. Open loop

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)

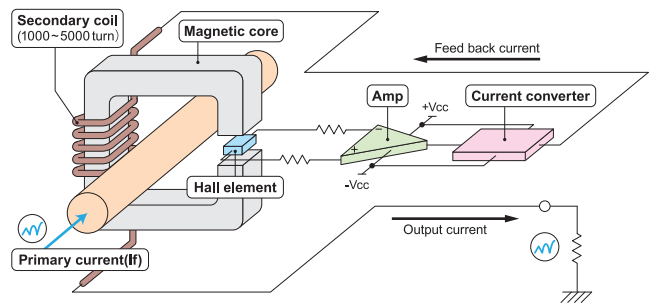


Figure-3. Closed loop

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.

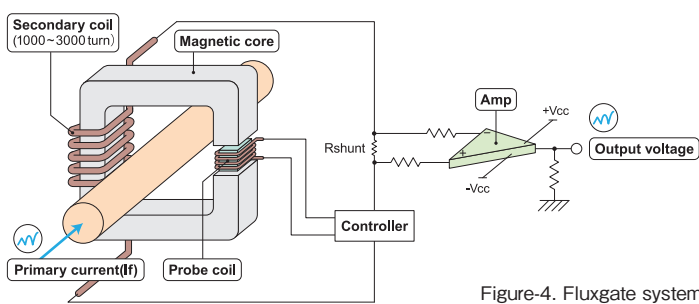


Figure-4. Fluxgate system

Application notes

Introduction

Fluxgate system

Open loop

Closed loop

<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.

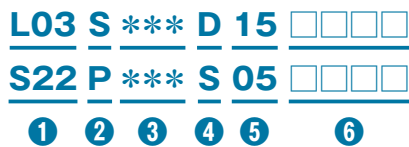
<Flux-Gate>

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)



① 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

② Mounting configuration (1 figure)

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

③ Rated current (3 figures)

Ex)

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

④ Control power supply type (1 figure)

- S : Single supply D : Dual supply

⑤ Power supply voltage (2 figures)

- 15 : 15V 05 : 5V

⑥ 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 TAMURA 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.
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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
F26P	F26P *** S05	USR
	F26P *** S05A	
L07P	L07P *** D15	USR, CNR
	L07P *** D15S	
	L07P *** S05	
L18P	L18P *** D15	USR, CNR
	L18P *** D15C	
	L18P *** D15-OP	
	L18P *** D15AH	
	L18P *** S05	
	L18P *** S05R	
	L18P *** S12	
	SL18P *** D15	
L18P *** D15AHV		
L31S	L31S *** S05S	USR, CNR
	L31S *** S05FS	USR
L32P	L32P *** S05(B)FS	USR
L34S	L34S *** D15	USR, CNR
	L34S *** D15C	
	L34S *** D15T	
	L34S *** D15TC	
L37S	L37S *** D15J	USR
	L37S *** D15M	
	L37S *** D15LJ	
	L37S *** D15LM	
	L37S *** S05J	
	L37S *** S05M	
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
F26P	F26P *** S05	85°C.	2
	F26P *** S05A		
L07P	L07P *** D15	80°C.	2
	L07P *** D15S		
	L07P *** S05		
L18P	L18P *** D15	80°C.	2
	L18P *** D15C		
	L18P *** D15-OP		
	L18P *** D15AH		
	L18P *** S05		
	L18P *** S05R		
	L18P *** S12		
	SL18P *** D15		
L18P *** D15AHV			
L31S	L31S *** S05S	85°C.	2
	L31S *** S05FS		
L32P	L32P *** S05(B)FS	85°C.	2
L34S	L34S *** D15	80°C.	2
	L34S *** D15C	105°C.	2
	L34S *** D15T		
	L34S *** D15TC		
L37S	L37S *** D15J	85°C.	2
	L37S *** D15M		
	L37S *** D15LJ		
	L37S *** D15LM		
	L37S *** S05J		
	L37S *** S05M		
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	USR, CNR
	S22P *** S05P	
	S22P *** S05M2	
S23P	S23P50/100D15	USR, CNR
	S23P50/100D15M1	
	S23P50/100D15M2	
S25P	S25P *** D15 *	USR, CNR
S26P	S26P200D15Y	USR, CNR
S27S	S27S300D15Y	USR, CNR
	S27S300D15YM	
S28S	S28S500D24Z	USR
	S28S500D24ZM	
S29S	S29S1T0D24Z	USR
	S29S1T0D24ZM	
	S29S1T0D24ZJ	
S30S	S30S2T0D24Z	USR, CNR
	S30S2T0D24ZM	
	S30S2T0D24ZJ	
S42S	S42S1T0D24Z	USR, CNR
	S42S1T0D24ZM	
	S42S1T0D24ZJ	

Ratings - Environmental

Series	Model	Environmental	
		Maximum Surrounding Air Temperature rating	Pollution Degree
S21S	S21S180D15JN	80°C.	2
S22P	S22P *** S05	85°C.	2
	S22P *** S05P		
	S22P *** S05M2		
S23P	S23P50/100D15	85°C.	2
	S23P50/100D15M1		
	S23P50/100D15M2		
S25P	S25P *** D15 *	85°C.	2
S26P	S26P200D15Y	85°C.	2
S27S	S27S300D15Y	85°C.	2
	S27S300D15YM		
S28S	S28S500D24Z	70°C.	2
	S28S500D24ZM		
S29S	S29S1T0D24Z	85°C.	2
	S29S1T0D24ZM		
	S29S1T0D24ZJ		
S30S	S30S2T0D24Z	85°C.	2
	S30S2T0D24ZM		
	S30S2T0D24ZJ		
S42S	S42S1T0D24Z	85°C.	2
	S42S1T0D24ZM		
	S42S1T0D24ZJ		

Note

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

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, 55 mA	2.5 ± 2.2 Vdc, ± 0.5 mA	
	F23P100S05R	100 A, 600 Vrms	5 Vdc, 110mA		
F26P	F26P050S05	50 A, 1000 Vrms	+5 Vdc, +60 mA	0 - 4.625 Vdc, 0 ± 0.35 mA	
	F26P050S05A				
	F26P100S05	100 A, 1000 Vrms	+5 Vdc, +100 mA		
	F26P100S05A				
	F26P150S05	150 A, 1000 Vrms	+5 Vdc, +115 mA		
	F26P150S05A				
L07P	L07P003D15	3 A, 600 Vrms	± 15 Vdc, ± 30 mA	0 - 4 Vdc, 0.4 mA	
	L07P003D15S				
	L07P005D15	5 A, 600 Vrms			
	L07P005D15S				
	L07P010D15	10 A, 600 Vrms			
	L07P010D15S				
	L07P015D15	15 A, 600 Vrms			
	L07P015D15S				
	L07P020D15	20 A, 600 Vrms			
	L07P020D15S				
	L07P025D15	25 A, 600 Vrms			
	L07P025D15S				
	L07P030D15	30 A, 600 Vrms			
	L07P030D15S				
	L07P003S05	3 A, 600 Vrms			5 Vdc, 30 mA
	L07P005S05				
L07P010S05					
L07P015S05					
L07P020S05					
L07P025S05					
L07P030S05					
L07P030S05					
L18P	L18P003D15	3 A, 600 Vrms	± 15 Vdc, ± 15 mA	0-4 Vdc, 0.4 mA	
	L18P005D15				
	L18P010D15				
	L18P015D15				
	L18P020D15				
	L18P025D15				
	L18P030D15				
	L18P040D15				
	L18P050D15				
	L18P060D15				

Ratings - Electrical

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	50 A, 600 Vrms	5 Vdc, 15 mA	1.875 - 3.125 Vdc, 0.3125 mA
	L31S050S05FS			
	L31S100S05S	100 A, 600 Vrms		
	L31S100S05FS			
	L31S200S05S	200 A, 600 Vrms		
	L31S200S05FS			
	L31S300S05S	300 A, 600 Vrms		
	L31S300S05FS			
	L31S400S05S	400 A, 600 Vrms		
	L31S400S05FS			
L31S500S05S	500 A, 600 Vrms			
L31S500S05FS				
L31S600S05S	600 A, 600 Vrms			
L31S600S05FS				
L32P	L32P050S05FS	50 A, 600 Vrms	5 Vdc, 15 mA	1.875 - 3.125 Vdc, 0.3125 mA
	L32S050S05BFS			
	L32P100S05FS	100 A, 600 Vrms		
	L32P100S05BFS			
	L32P150S05FS	150 A, 600 Vrms		
	L32P200S05FS			
L32P300S05FS	300 A, 600 Vrms			
L32P400S05FS		400 A, 600 Vrms		

Ratings - Electrical

Series	Model	Primary (Feed-through)	Secondary (Sensing)	
			Input	Output
L34S	L34SxxxD15	600 Vrms	± 15 Vdc, ± 25mA	0 - 4 Vdc, 0.4 mA
	L34SxxxD15T			
	L34SxxxD15C	1500 Vrms		
	L34SxxxD15TC			
	L34S200D15	200 A		
	L34S200D15C			
	L34S200D15T			
	L34S200D15TC			
	L34S300D15	300 A		
	L34S300D15C			
	L34S300D15T			
	L34S300D15TC	400 A		
	L34S400D15			
	L34S400D15C			
	L34S400D15T	500 A		
	L34S400D15TC			
	L34S500D15			
	L34S500D15C	600 A		
	L34S500D15T			
	L34S500D15TC			
L34S600D15	800 A			
L34S600D15C				
L34S600D15T				
L34S600D15TC	1000 A			
L34S800D15				
L34S800D15C				
L34S800D15T	1200 A			
L34S800D15TC				
L34S1T0D15				
L34S1T0D15C	1500 A			
L34S1T0D15T				
L34S1T0D15TC				
L34S1T2D15	1500 A			
L34S1T2D15C				
L34S1T2D15T				
L34S1T2D15TC	1500 A			
L34S1T5D15				
L34S1T5D15C				
L34S1T5D15T	1500 A			
L34S1T5D15TC				

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

Ratings - Electrical

Series	Model	Primary (Feed-through)	Secondary (Sensing)	
			Input	Output
L37S	L37S050D15J	50 A, 600 Vrms	± 15 Vdc, ± 25mA	0 - 4 Vdc, 0.4 mA
	L37S050D15M			
	L37S050D15LJ			
	L37S050D15LM			
	L37S100D15J	100 A, 600 Vrms		
	L37S100D15M			
	L37S100D15LJ			
	L37S100D15LM			
	L37S200D15J	200 A, 600 Vrms		
	L37S200D15M			
	L37S200D15LJ			
	L37S200D15LM			
	L37S300D15J	300 A, 600 Vrms		
	L37S300D15M			
	L37S300D15LJ			
	L37S300D15LM			
	L37S400D15J	400 A, 600 Vrms		
	L37S400D15M			
	L37S400D15LJ			
	L37S400D15LM			
L37S500D15J	500 A, 600 Vrms			
L37S500D15M				
L37S500D15LJ				
L37S500D15LM				
L37S600D15J	600 A, 600 Vrms			
L37S600D15M				
L37S600D15LJ				
L37S600D15LM				
L37S	L37S050S05J	50 A, 600 Vrms	5 Vdc, 20mA	2.5 ± 0.625 Vdc, 0.3125 mA
	L37S050S05M			
	L37S100S05J	100 A, 600 Vrms		
	L37S100S05M			
	L37S200S05J	200 A, 600 Vrms		
	L37S200S05M			
	L37S300S05J	300 A, 600 Vrms		
	L37S300S05M			
	L37S400S05J	400 A, 600 Vrms		
	L37S400S05M			
	L37S500S05J	500 A, 600 Vrms		
	L37S500S05M			
L37S600S05J	600 A, 600 Vrms			
L37S600S05M				
S21S	S21S180D15JN	180 A, 600 Vrms	± 15 Vdc, ± 25mA	0 - 1.35 Vdc, 45mA
S22P	S22P006S05	6 A, 600 Vrms	5 Vdc, 12.5 mA	0 - 3.125 Vdc, 3mA
	S22P006S05P			
	S22P006S05M2			
	S22P015S05	15 A, 600 Vrms		
	S22P015S05P			
	S22P015S05M2			
	S22P025S05	25 A, 600 Vrms		
	S22P025S05P			
S22P025S05M2	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

Ratings - Electrical

Series	Model	Primary (Feed-through)	Secondary (Sensing)	
			Input	Output
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	300 A, 600 Vrms	± 15 Vdc, ± 162.5 mA	0 - ± 7.5 Vdc, ± 150mA
	S27S300D15YM			
S28S	S28S500D24Z	500 A, 600 Vrms	± 24 Vdc, ± 130 mA	0 - ± 5 Vdc, ± 100mA
	S28S500D24ZM			
S29S	S29S1T0D24Z	1000 A, 600 Vrms	± 24 Vdc, ± 235 mA	0 - ± 10 Vdc, ± 200mA
	S29S1T0D24ZJ			
S30S	S30S2T0D24Z	2000 A, 600 Vrms	24 Vdc, 45 mA; - 24 Vdc, - 45 mA	0 - ± 10 Vdc, ± 400mA
	S30S2T0D24ZM			
	S30S2T0D24ZJ			
S42S	S42S1T0D24Z	1000 A, 600 Vrms	± 24 Vdc, ± 245 mA	± 10 Vdc, ± 200mA
	S42S1T0D24ZM			
	S42S1T0D24ZJ			
LA02P	LA02P021S03	50 A, 480 Vac	3.3Vdc, 0.5mA	3.3Vdc, 0.5mA
	LA02P035S03			
	LA02P054S03			
	LA02P085S03			
LA03P	LA03P021S05	50 A, 480 Vac	5Vdc, 0.5mA	5Vdc, 0.5mA
	LA03P035S05			
	LA03P054S05			
	LA03P085S05			

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 copper conductor-cum-heat sink as the primary conductor, measured 100 by 85 mm, 0.5 mm thick.
F26P	F26P *** S05	- / Notice: All devices have been evaluated with the bus bar (20.5 mm x 11 mm (225.5 mm ²) x 170 mm long) under the temperature test. Based on this effect, the temperature of the bus bar was kept at 94.9 °C.
	F26P *** S05A	
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	- / Notice: Do not wrap the primary conductor around the core part of the product for preventing to reduce the required Spacings.
	L31S *** S05FS	
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	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.
	L34S *** D15C	
	L34S *** D15T	
	L34S *** D15TC	
L37S	L37S *** D15J	- / 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.
	L37S *** D15M	
	L37S *** D15LJ	
	L37S *** D15LM	
	L37S *** S05J	
L37S *** S05M		
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	CAUTION : Provide two min. 100 by 85 mm, 0.5mm thick copper 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.
	S23P50/100D15M1	
	S23P50/100D15M2	
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	- / Notice: Do not wrap the primary conductor around the core part of the product for preventing to reduce the required Spacings.
	S27S300D15YM	
S28S	S28S500D24Z	- / 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.
	S28S500D24ZM	
S29S	S29S1T0D24Z	- / 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.
	S29S1T0D24ZM	
	S29S1T0D24ZJ	
S30S	S30S2T0D24Z	- / 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.
	S30S2T0D24ZM	
	S30S2T0D24ZJ	
S42S	S42S1T0D24Z	- / Notice : These devices have been evaluated with the copper bus bar (Size : φ 44mm, L350mm) under the temperature test. Based on this effect, the temperature of the bus bar was kept at 138.5°C. Other than this usage, an additional evaluation shall be considered and conducted in the end-use application.
	S42S1T0D24ZM	
	S42S1T0D24ZJ	

Introduction

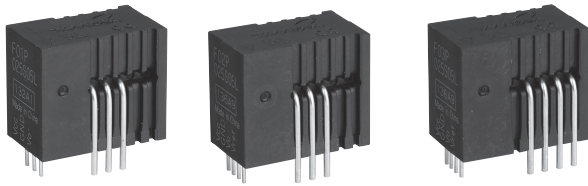
Fluxgate system

Open loop

Closed loop

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°C . 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.

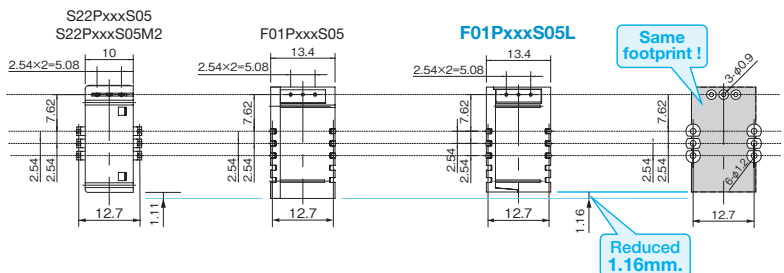
***: Rated Current symbol

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°C)		± 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°C ~ +105°C		

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	—	°C	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	Primary ↔ Secondary
Creepage distance	dCp	—	7.7mm	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 EN62477-1:2012 and EN62477-1:2012/A11:2014, EN61010
	—	—	600V, CAT III, PD2	Basic isolation, non uniform field according to EN62477-1:2012 and EN62477-1:2012/A11:2014, EN61010

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Ambient operating temperature	T _A	°C	- 40		+ 105	
Ambient storage temperature	T _S	°C	- 40		+ 105	
Mass	m	g		12		

SPECIFICATIONS

T_A=+25°C, N_p=1T, R_L=10kΩ, V_{cc}=+5V

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Primary nominal current	F01P006S05L	I _{PN}	A		6	
	F01P015S05L				15	
	F01P025S05L				25	
	F01P050S05L				50	
Primary current, measuring range	F01P006S05L	I _{PM}	A	- 20		20
	F01P015S05L			- 51		51
	F01P025S05L			- 85		85
	F01P050S05L			- 150		150
Supply Voltage	V _{cc}	V	4.75	5.00	5.25	
Number of primary turns	N _p	T	1, 2, 3			
Number of secondary turns	F01P006S05L	N _s	T		1816	
	F01P015S05L				1737	
	F01P025S05L				1764	
	F01P050S05L				1600	
Consumption current (at I _p)	F01P006S05L	I _{cc}	mA		25	I _{cc} =15 + I _p (mA) / N _s
	F01P015S05L				30	
	F01P025S05L				35	
	F01P050S05L				55	
Output voltage range	V _o	V	0.375		4.625	
Output voltage (at I _p =0A)	V _o	V		2.5		
Electrical offset voltage * 1	F01P006S05L	V _{oe}	mV	- 10.40		10.40
	F01P015S05L			- 7.10		7.10
	F01P025S05L			- 6.25		6.25
	F01P050S05L			- 5.80		5.80
Electrical offset current referred to primary * 1	F01P006S05L	I _{oe}	A	- 0.10		0.10
	F01P015S05L			- 0.17		0.17
	F01P025S05L			- 0.25		0.25
	F01P050S05L			- 0.46		0.46
Temperature coefficient of V _o (at I _p =0A)	F01P006S05L	TCV _o	ppm/K		± 10.0	± 80.0
	F01P015S05L				± 7.5	± 70.0
	F01P025S05L				± 6.5	± 60.0
	F01P050S05L				± 6.0	± 60.0
Theoretical sensitivity	F01P006S05L	G _{th}	mV/A		104.2	625mV/I _{PN}
	F01P015S05L				41.67	
	F01P025S05L				25	
	F01P050S05L				12.5	
Sensitivity error	ε _G	%	- 0.7		0.7	
Temperature coefficient of Sensitivity (at T _A = - 40°C~+ 105°C)	TCG	ppm/K			± 40	
Linearity error (at I _p)	ε _L	%	- 0.1		0.1	
Magnetic offset current referred to primary (at 10 × I _p)	I _{OM}	A	- 0.1		0.1	

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

SPECIFICATIONS

T_A=+25°C, N_p=1T, R_L=10kΩ, V_{cc}=+5V

Parameters	Symbol	Unit	Value			Comment	
			MIN	TYP	MAX		
Peak to peak output ripple at oscillator frequency (f typ=450kHz)	F01P006S05L	—	mV		40	160	R _L =1k Ω
	F01P015S05L				15	60	
	F01P025S05L				10	40	
	F01P050S05L				5	20	
Reaction time (at 10% of I _{PN})	F01P006S05L	t _{ra}	μs			0.3	R _L =1k Ω, di/dt=18A/μs
	F01P015S05L					0.3	R _L =1k Ω, di/dt=44A/μs
	F01P025S05L					0.3	R _L =1k Ω, di/dt=68A/μs
	F01P050S05L					0.3	R _L =1k Ω, di/dt=100A/μs
Response time (at 90% of I _{PN})	F01P006S05L	tr	μs			0.3	R _L =1k Ω, di/dt=18A/μs
	F01P015S05L					0.3	R _L =1k Ω, di/dt=44A/μs
	F01P025S05L					0.3	R _L =1k Ω, di/dt=68A/μs
	F01P050S05L					0.3	R _L =1k Ω, di/dt=100A/μs
Frequency bandwidth (± 1dB)	BW	kHz	200			R _L =1k Ω	
Frequency bandwidth (± 3dB)	BW	kHz	300			R _L =1k Ω	
Overall Accuracy (at T _A =25°C)	F01P006S05L	X _G	%			2.5	X _G = (100 × V _{oe} /625) + ε _G + ε _L
	F01P015S05L					1.9	
	F01P025S05L					1.8	
	F01P050S05L					1.7	

STANDARDS

EN62477-1 : 2012 and EN62477-1 : 2012/A11 2014, EN61010-1, EN62368-1, UL508 (file No E243511)

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

Characteristic curve (TYP)

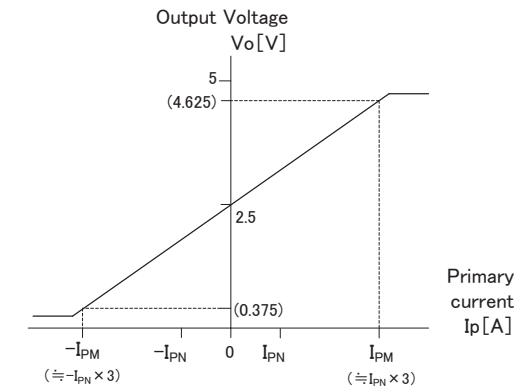
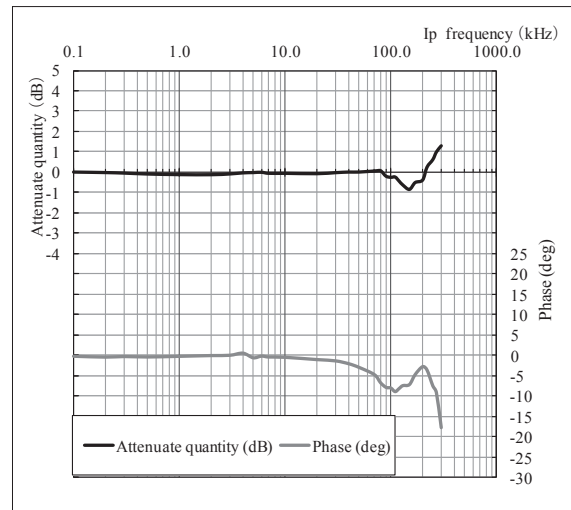


Figure 1 : Linearity curve



Measurement condition T_A=+25°C, R_L=1k Ω, I_p=3A, V_{cc}=+5V

SUPPORT DOCUMENTATION

Maximum continuous DC primary current

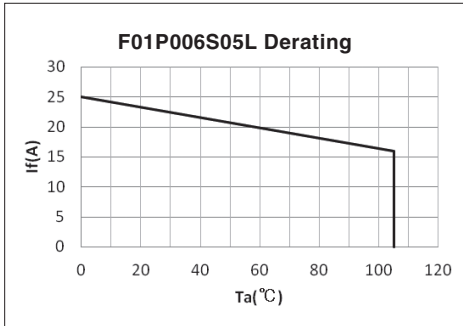


Figure 3 : Ip vs Ta for F01P006S05L

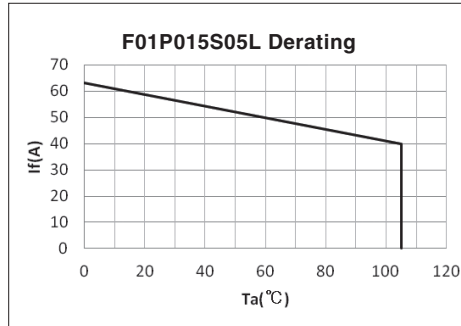


Figure 4 : Ip vs Ta for F01P015S05L

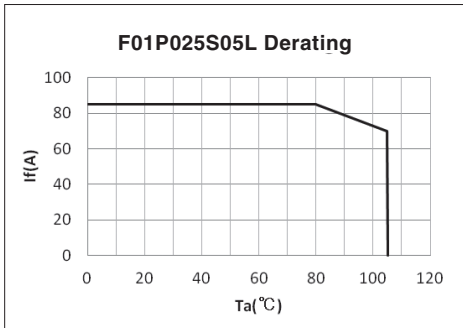


Figure 5 : Ip vs Ta for F01P025S05L

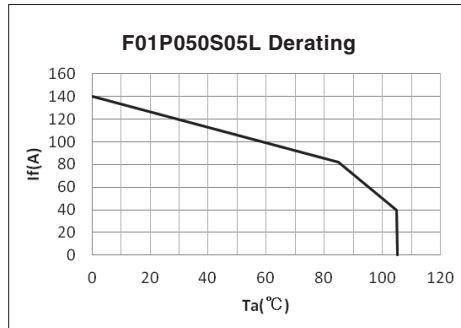


Figure 6 : Ip vs Ta for F01P050S05L

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

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

Frequency derating

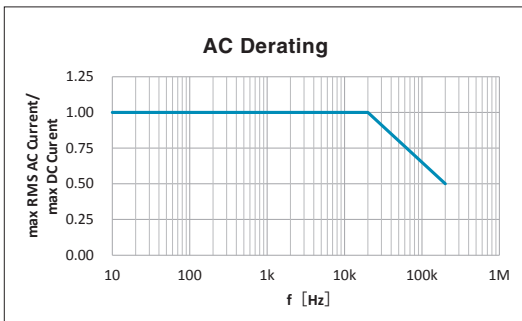
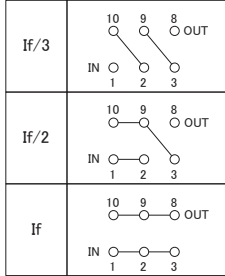
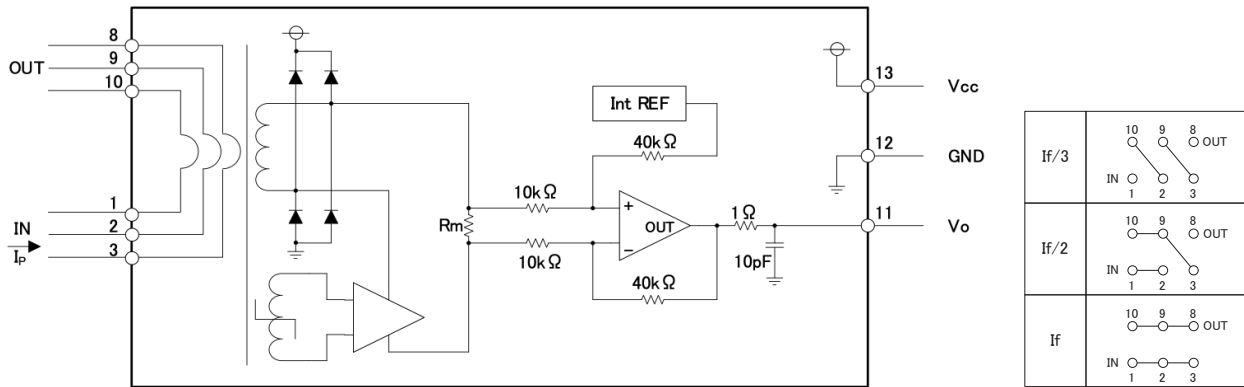
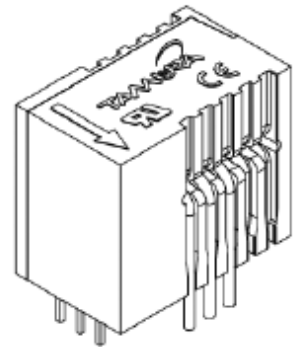
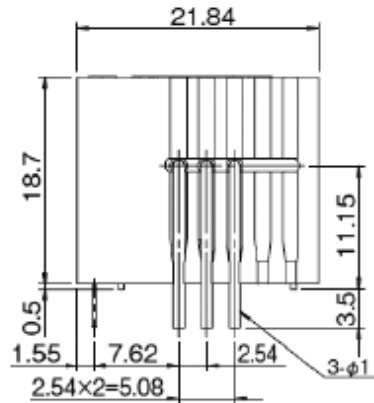
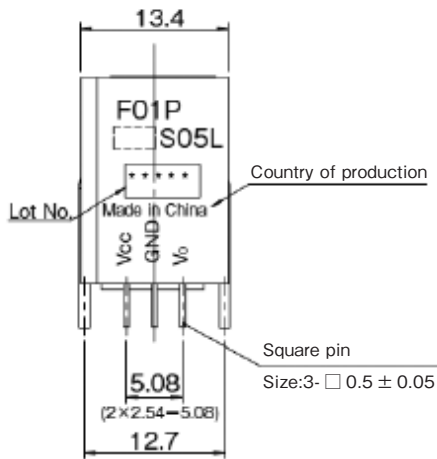


Figure 7 : Maximum RMS AC primary current/maximum DC primary current vs frequency

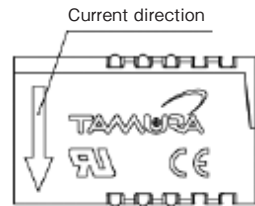
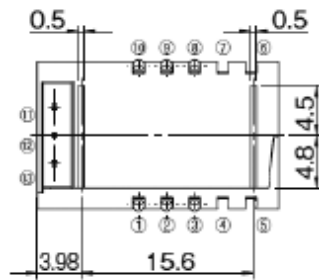
CURRENT SENSORS



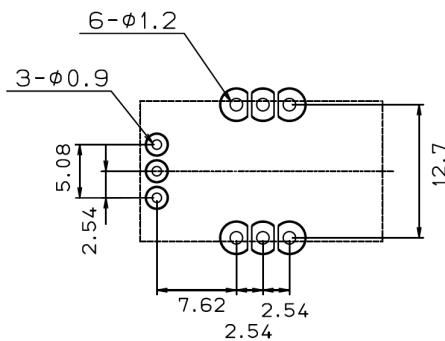
DIMENSIONS (mm)



Terminal number	Note
① Input	1. Unless otherwise specified, tolerances shall be ±0.25mm
② Input	
③ Input	2. Unit is [mm]
④ —	
⑤ —	⑪ Vo
⑥ —	⑫ GND
⑦ —	⑬ Vcc



RECOMMENDED HOLE DIAMETER (mm)

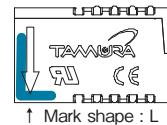


Identification marking

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

- Rated current 6A ... Blue color
- Rated current 15A ... White color
- Rated current 25A ... Orange color
- Rated current 50A ... Green color

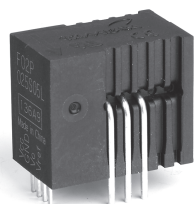
Ex) Marking example



↑ Mark shape : L

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

F02P L SERIES



ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Comment
Supply voltage	Vcc	V	7	
Primary conductor temperature	—	°C	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	d _{ci}	—	7.5mm	Primary ↔ Secondary
Creepage distance	d _{cp}	—	7.5mm	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 EN62477-1:2012 and EN62477-1:2012/A11:2014, EN61010
	—	—	600V, CAT III, PD2	Basic isolation, non uniform field according to EN62477-1:2012 and EN62477-1:2012/A11:2014, EN61010

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Ambient operating temperature	T _A	°C	- 40		+ 105	
Ambient storage temperature	T _S	°C	- 40		+ 105	
Mass	m	g		12		

SPECIFICATIONS

T_A=+25°C, N_p=1T, R_L=10kΩ, V_{cc}=+5V

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Primary nominal current	F02P006S05L	I _{PN}	A		6	
	F02P015S05L				15	
	F02P025S05L				25	
	F02P050S05L				50	
Primary current, measuring range	F02P006S05L	I _{PM}	A	- 20		20
	F02P015S05L			- 51		51
	F02P025S05L			- 85		85
	F02P050S05L			- 150		150
Supply Voltage	V _{cc}	V	4.75	5.00	5.25	
Number of primary turns	N _p	T	1, 2, 3			
Number of secondary turns	F02P006S05L	N _s	T		1816	
	F02P015S05L				1737	
	F02P025S05L				1764	
	F02P050S05L				1600	
Consumption current ((at I _p)	F02P006S05L	I _{cc}	mA		25	I _{cc} =15 + I _p (mA) / N _s
	F02P015S05L				30	
	F02P025S05L				35	
	F02P050S05L				55	
Reference voltage (output) (at I _p =0A)	V _{ref1}	V	2.495	2.500	2.505	Ref OUT mode
Reference voltage (input)	V _{ref2}	V	0		4	Ref IN mode
Output voltage range	V _o	V	0.375		4.625	
Output voltage (at I _p =0A)	V _o	V		V _{ref1} , V _{ref2}		
Electrical offset voltage * 1	F02P006S05L	V _{oe}	mV	- 5.300		5.300
	F02P015S05L			- 2.210		2.210
	F02P025S05L			- 1.350		1.350
	F02P050S05L			- 0.725		0.725
Electrical offset current referred to primary * 1	F02P006S05L	I _{oe}	mA	- 51		51
	F02P015S05L			- 53		53
	F02P025S05L			- 54		54
	F02P050S05L			- 58		58
Temperature coefficient of V _{ref1}	TCV _{ref1}	ppm/K		± 5.0	± 50	
Temperature coefficient of V _o (at I _p =0A)	F02P006S05L	TCV _o	ppm/K		± 6.0	± 14
	F02P015S05L				± 2.3	± 6
	F02P025S05L				± 1.4	± 4
	F02P050S05L				± 0.7	± 3
Theoretical sensitivity	F02P006S05L	G _{th}	mV/A		104.2	625mV/I _{PN}
	F02P015S05L				41.67	
	F02P025S05L				25	
	F02P050S05L				12.5	
Sensitivity error	ε _G	%	- 0.7		0.7	
Temperature coefficient of Sensitivity (at T _A = - 40°C~+ 105°C)	TCG	ppm/K			± 40	
Linearity error (at I _p)	ε _L	%	- 0.1		0.1	
Magnetic offset current referred to primary (at 10 × I _p)	I _{OM}	A	- 0.1		0.1	

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

SPECIFICATIONS

T_A=+25°C, N_p=1T, R_L=10kΩ, V_{cc}=+5V

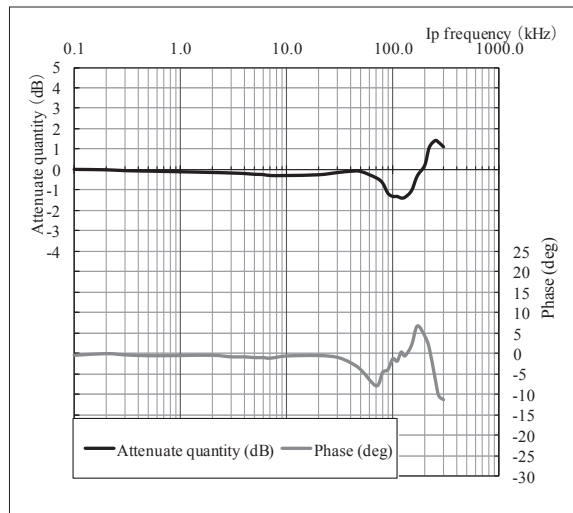
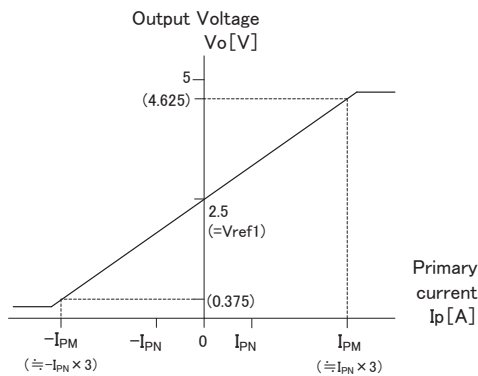
Parameters	Symbol	Unit	Value			Comment	
			MIN	TYP	MAX		
Peak to peak output ripple at oscillator frequency (f typ=450kHz)	F02P006S05L	—	mV		40	160	R _L =1kΩ
	F02P015S05L				15	60	
	F02P025S05L				10	40	
	F02P050S05L				5	20	
Reaction time (at 10% of I _{PN})	F02P006S05L	t _{ra}	μs			0.3	R _L =1kΩ, di/dt=18A/μs
	F02P015S05L					0.3	R _L =1kΩ, di/dt=44A/μs
	F02P025S05L					0.3	R _L =1kΩ, di/dt=68A/μs
	F02P050S05L					0.3	R _L =1kΩ, di/dt=100A/μs
Response time 1 (at 90% of I _{PN})	F02P006S05L	t _r	μs			0.3	R _L =1kΩ, di/dt=18A/μs
	F02P015S05L					0.3	R _L =1kΩ, di/dt=44A/μs
	F02P025S05L					0.3	R _L =1kΩ, di/dt=68A/μs
	F02P050S05L					0.3	R _L =1kΩ, di/dt=100A/μs
Frequency bandwidth (± 1dB)	BW	kHz	200			R _L =1kΩ	
Frequency bandwidth (± 3dB)	BW	kHz	300			R _L =1kΩ	
Overall Accuracy (at T _A =25°C)	F02P006S05L	X _G	%			1.7	X _G = (100 × V _{oe} /625) + ε _G + ε _L
	F02P015S05L					1.2	
	F02P025S05L					1.0	
	F02P050S05L					0.9	

STANDARDS

EN62477-1 : 2012 and EN62477-1 : 2012/A11 2014, EN61010-1, EN62368-1, UL508 (file No. E243511)

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

Characteristic curve (TYP)



SUPPORT DOCUMENTATION

Maximum continuous DC primary current

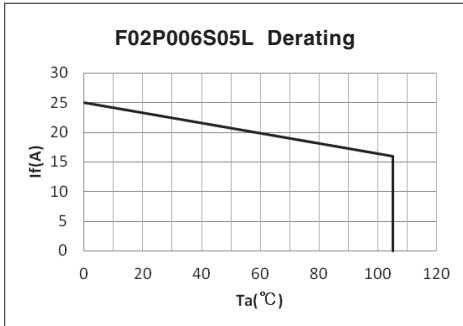


Figure 3 : Ip vs Ta for F02P006S05L

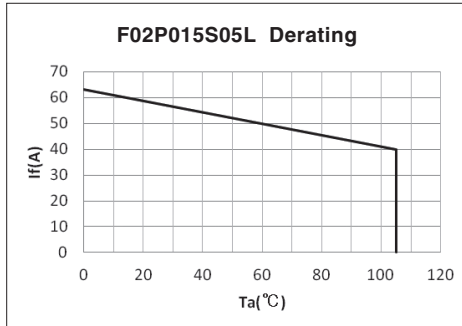


Figure 4 : Ip vs Ta for F02P015S05L

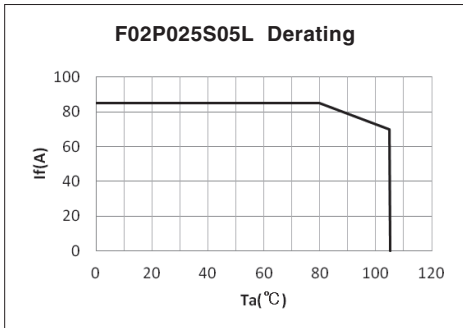


Figure 5 : Ip vs Ta for F02P025S05L

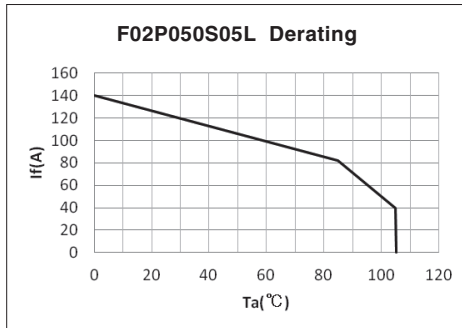


Figure 6 : Ip vs Ta for F02P050S05L

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

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

Frequency derating

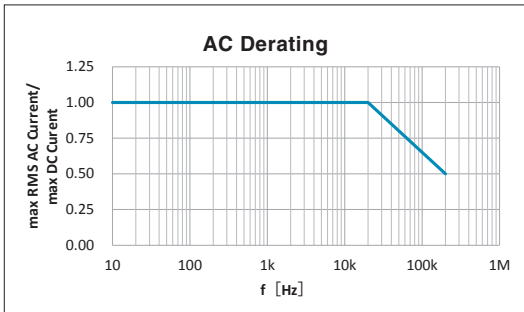


Figure 7 : Maximum RMS AC primary current/maximum DC primary current vs frequency

Reference voltage

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

< Ref OUT mode >

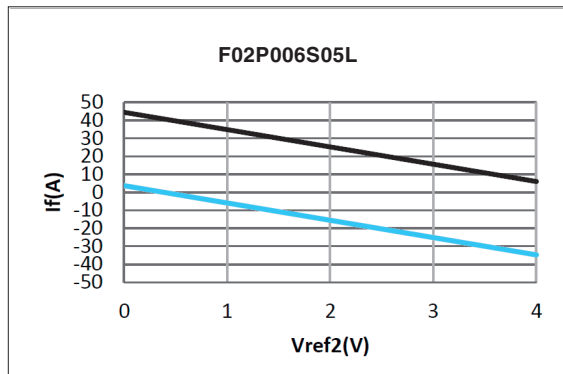
The 2.5V internal precision reference is used by the transducer as the reference point for bipolar measurements;

< Ref IN mode >

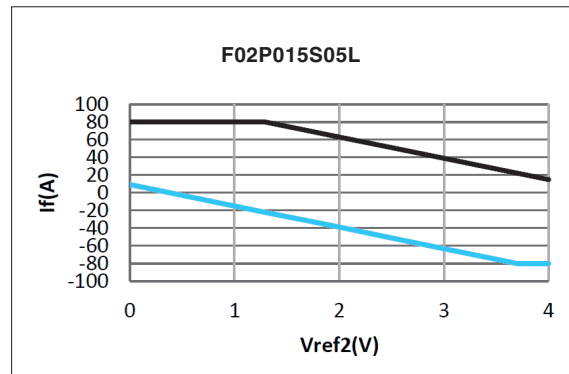
An external reference voltage is connected to the Ref pin; this voltage is specified in the range 0 to 4 V , its voltage is used as the reference voltage at the time of measurement.

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

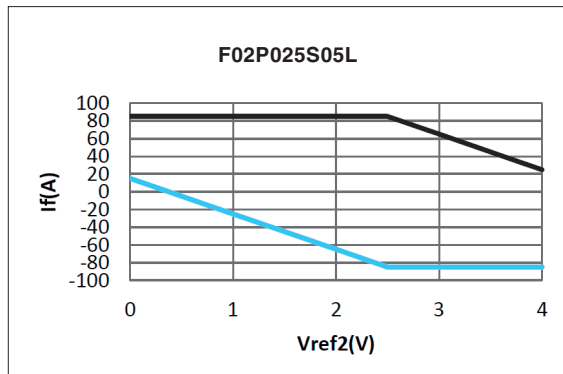
The following graphs show how the measuring range of each transducer version depends on external reference voltage value V_{ref2} .



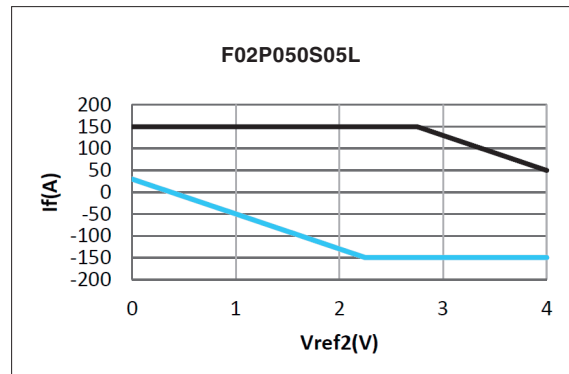
Upper limit : $I_p = -9.6 \times V_{ref2} + 44.4$ ($V_{ref2} = 0...4V$)
 Lower limit : $I_p = -9.6 \times V_{ref2} + 3.6$ ($V_{ref2} = 0...4V$)



Upper limit : $I_p = 80$ ($V_{ref2} = 0...1.29V$)
 $I_p = -24 \times V_{ref2} + 111$ ($V_{ref2} = 1.29...4V$)
 Lower limit : $I_p = -24 \times V_{ref2} + 9$ ($V_{ref2} = 0...3.7V$)
 $I_p = -80$ ($V_{ref2} = 3.7...4V$)



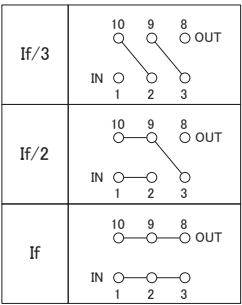
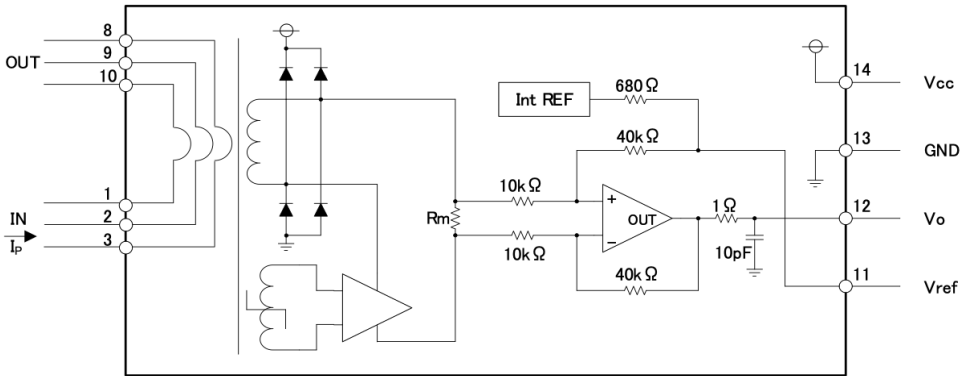
Upper limit : $I_p = 85$ ($V_{ref2} = 0...2.5V$)
 $I_p = -40 \times V_{ref2} + 185$ ($V_{ref2} = 2.5...4V$)
 Lower limit : $I_p = -40 \times V_{ref2} + 15$ ($V_{ref2} = 0...2.5V$)
 $I_p = -85$ ($V_{ref2} = 2.5...4V$)



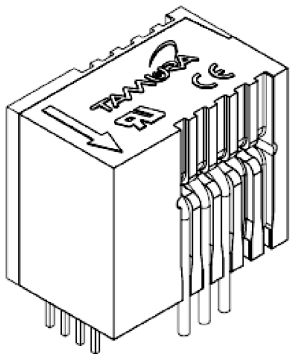
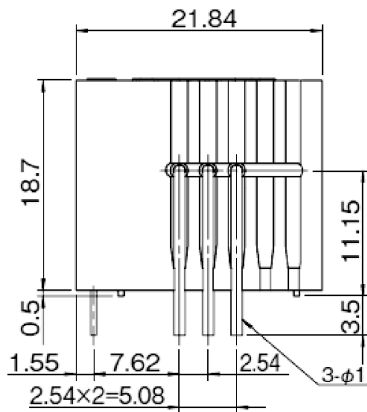
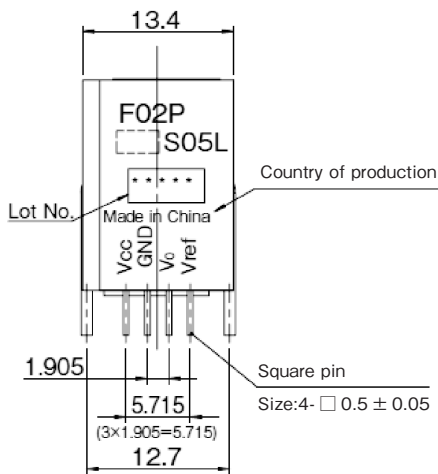
Upper limit : $I_p = 150$ ($V_{ref2} = 0...2.75V$)
 $I_p = -80 \times V_{ref2} + 370$ ($V_{ref2} = 2.75...4V$)
 Lower limit : $I_p = -80 \times V_{ref2} + 30$ ($V_{ref2} = 0...2.25V$)
 $I_p = -150$ ($V_{ref2} = 2.25...4V$)

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

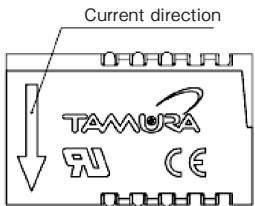
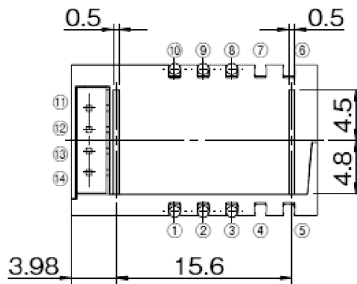
CONNECTION



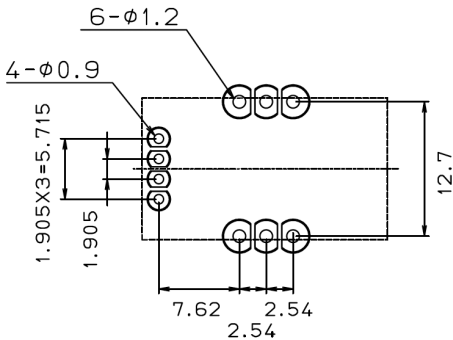
DIMENSIONS (mm)



Terminal number	Note
① Input	1. Unless otherwise specified, tolerances shall be ±0.25mm
② Input	
③ Input	2. Unit is [mm]
④ —	
⑤ —	⑪ Vref
⑥ —	⑫ Vo
⑦ —	⑬ GND
⑧ Output	⑭ Vcc
⑨ Output	
⑩ Output	



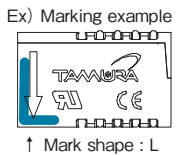
RECOMMENDED HOLE DIAMETER (mm)



Identification marking

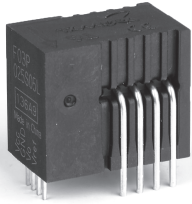
The top side of product is marked for identification with the previous model.

- Rated current 6A ... Blue color
- Rated current 15A ... White color
- Rated current 25A ... Orange color
- Rated current 50A ... Green color



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

F03P L SERIES



ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Comment
Supply voltage	Vcc	V	7	
Primary conductor temperature	—	°C	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	d _{Ci}	—	8.2mm	Primary ↔ Secondary
Creepage distance	d _{Cp}	—	8.2mm	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 EN62477-1:2012 and EN62477-1:2012/A11:2014.
	—	—	1000V, CAT III, PD2	Basic isolation, non uniform field according to EN62477-1:2012 and EN62477-1:2012/A11:2014.

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Ambient operating temperature	T _A	°C	- 40		+ 105	
Ambient storage temperature	T _S	°C	- 40		+ 105	
Mass	m	g		12		

SPECIFICATIONS

T_A=+25°C, N_p=1T, R_L=10kΩ, V_{cc}=+5V

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Primary nominal current	F03P006S05L	I _{PN}	A		6	
	F03P015S05L				15	
	F03P025S05L				25	
	F03P050S05L				50	
Primary current, measuring range	F03P006S05L	I _{PM}	A	- 20		20
	F03P015S05L			- 51		51
	F03P025S05L			- 85		85
	F03P050S05L			- 150		150
Supply Voltage	V _{cc}	V	4.75	5.00	5.25	
Number of primary turns	N _p	T	1, 2, 3, 4			
Number of secondary turns	F03P006S05L	N _s	T		1816	
	F03P015S05L				1737	
	F03P025S05L				1764	
	F03P050S05L				1600	
Consumption current ((at I _p)	F03P006S05L	I _{cc}	mA		25	I _{cc} = 15 + I _p (mA) / N _s
	F03P015S05L				30	
	F03P025S05L				35	
	F03P050S05L				55	
Reference voltage (output) (at I _p =0A)	V _{ref1}	V	2.495	2.500	2.505	Ref OUT mode
Reference voltage (input)	V _{ref2}	V	0		4	Ref IN mode
Output voltage range	V _o	V	0.375		4.625	
Output voltage (at I _p =0A)	V _o	V		V _{ref1} , V _{ref2}		
Electrical offset voltage * 1	F03P006S05L	V _{oe}	mV	- 5.300		5.300
	F03P015S05L			- 2.210		2.210
	F03P025S05L			- 1.350		1.350
	F03P050S05L			- 0.725		0.725
Electrical offset current referred to primary * 1	F03P006S05L	I _{oe}	mA	- 51		51
	F03P015S05L			- 53		53
	F03P025S05L			- 54		54
	F03P050S05L			- 58		58
Temperature coefficient of V _{ref1}	TCV _{ref1}	ppm/K		± 5.0	± 50	
Temperature coefficient of V _o (at I _p =0A)	F03P006S05L	TCV _o	ppm/K		± 6.0	± 14
	F03P015S05L				± 2.3	± 6
	F03P025S05L				± 1.4	± 4
	F03P050S05L				± 0.7	± 3
Theoretical sensitivity	F03P006S05L	G _{th}	mV/A		104.2	625mV/I _{PN}
	F03P015S05L				41.67	
	F03P025S05L				25	
	F03P050S05L				12.5	
Sensitivity error	ε _G	%	- 0.7		0.7	
Temperature coefficient of Sensitivity (at T _A = - 40°C ~ + 105°C)	TCG	ppm/K			± 40	
Linearity error (at I _p)	ε _L	%	- 0.1		0.1	
Magnetic offset current referred to primary (at 10 × I _p)	I _{OM}	A	- 0.1		0.1	

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

SPECIFICATIONS

T_A=+25°C, N_p=1T, R_L=10kΩ, V_{cc}=+5V

Parameters	Symbol	Unit	Value			Comment	
			MIN	TYP	MAX		
Peak to peak output ripple at oscillator frequency (f typ = 450kHz)	F03P006S05L	—	mV		40	160	R _L = 1kΩ
	F03P015S05L				15	60	
	F03P025S05L				10	40	
	F03P050S05L				5	20	
Reaction time (at 10% of I _{PN})	F03P006S05L	t _{ra}	μs			0.3	R _L = 1kΩ, di/dt = 18A/μs
	F03P015S05L					0.3	R _L = 1kΩ, di/dt = 44A/μs
	F03P025S05L					0.3	R _L = 1kΩ, di/dt = 68A/μs
	F03P050S05L					0.3	R _L = 1kΩ, di/dt = 100A/μs
Response time (at 90% of I _{PN})	F03P006S05L	t _r	μs			0.3	R _L = 1kΩ, di/dt = 18A/μs
	F03P015S05L					0.3	R _L = 1kΩ, di/dt = 44A/μs
	F03P025S05L					0.3	R _L = 1kΩ, di/dt = 68A/μs
	F03P050S05L					0.3	R _L = 1kΩ, di/dt = 100A/μs
Frequency bandwidth (± 1dB)	BW	kHz	200			R _L = 1kΩ	
Frequency bandwidth (± 3dB)	BW	kHz	300			R _L = 1kΩ	
Overall Accuracy (at T _A =25°C)	F03P006S05L	X _G	%			1.7	X _G = (100 × V _{oe} /625) + ε _G + ε _L
	F03P015S05L					1.2	
	F03P025S05L					1.0	
	F03P050S05L					0.9	

STANDARDS

EN62477-1 : 2012 and EN62477-1 : 2012/A11 2014, EN61010-1, EN62368-1, UL508 (file No. E243511)

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

Characteristic curve (TYP)

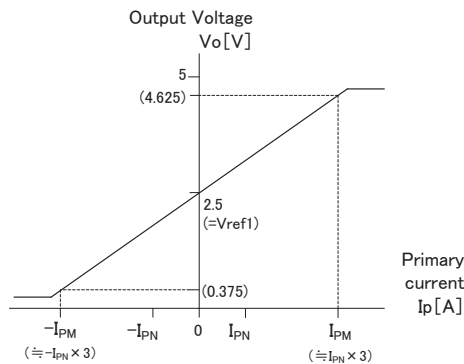


Figure 1 : Linearity curve (Internal reference voltage)

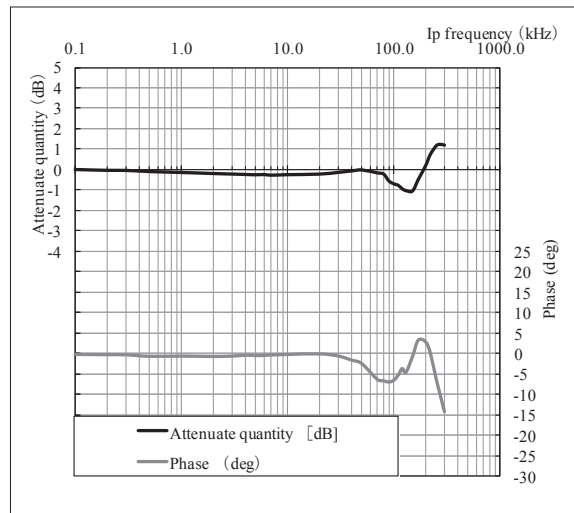


Figure 2 : Frequency response curve
ex) F03P025S05L
Measurement condition T_a=+25°C, R_L=1kΩ, I_p=3A, V_{cc}=+5V

SUPPORT DOCUMENTATION

Maximum continuous DC primary current

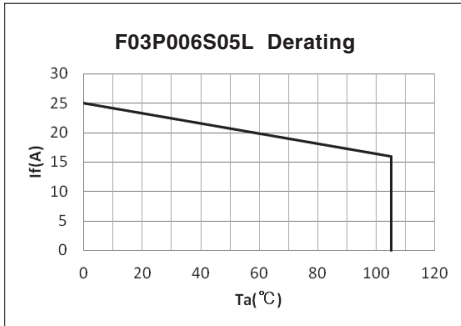


Figure 3 : Ip vs Ta for F03P006S05L

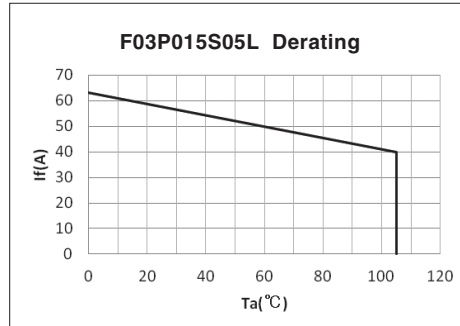


Figure 4 : Ip vs Ta for F03P015S05L

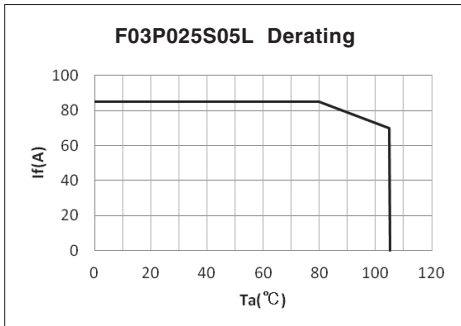


Figure 5 : Ip vs Ta for F03P025S05L

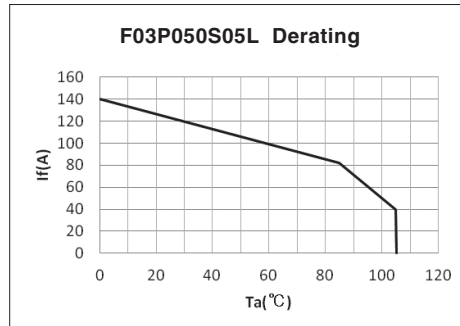


Figure 6 : Ip vs Ta for F03P050S05L

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

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

Frequency derating

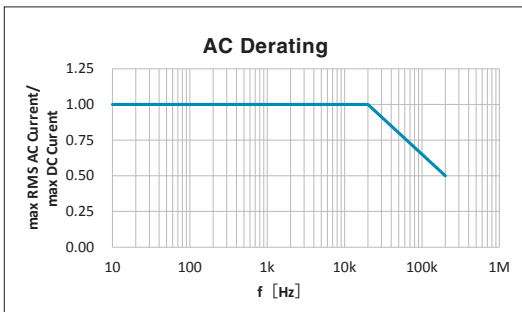


Figure 7 : Maximum RMS AC primary current/maximum DC primary current vs frequency

Reference voltage

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

< Ref OUT mode >

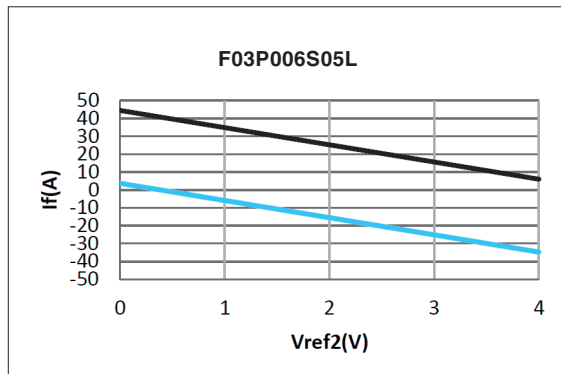
The 2.5V internal precision reference is used by the transducer as the reference point for bipolar measurements;

< 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.

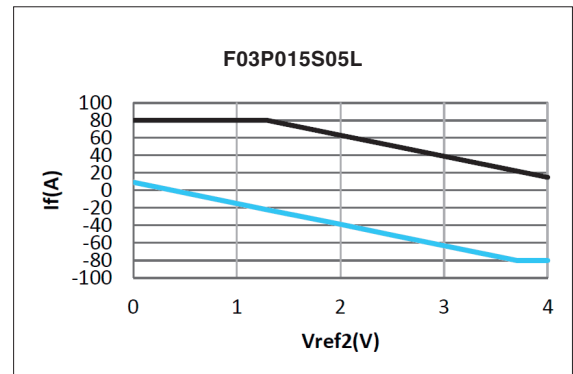
- either to source a typical current of $(V_{ref} - 2.5) / 680$, the maximum value will be 2.2mA typ. when $V_{ref2} = 4V$.
- or to sink a typical current of $(2.5 - V_{ref2}) / 680$, the maximum value will be 3.68mA typ. when $V_{ref2} = 0V$.

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



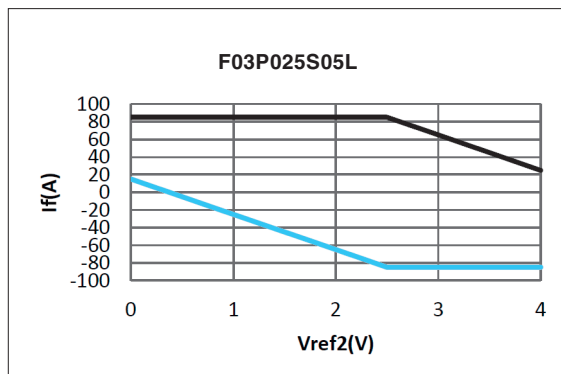
Upper limit : $I_p = -9.6 \times V_{ref2} + 44.4$ ($V_{ref2} = 0...4V$)

Lower limit : $I_p = -9.6 \times V_{ref2} + 3.6$ ($V_{ref2} = 0...4V$)



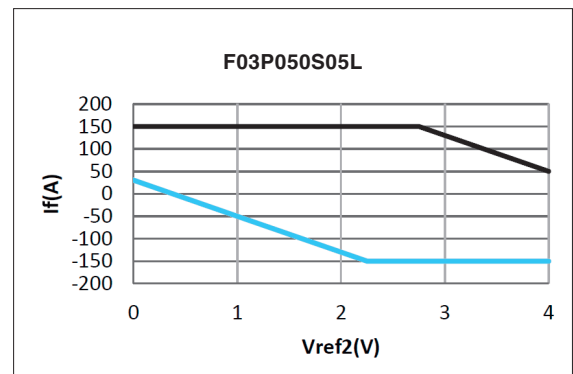
Upper limit : $I_p = 80$ ($V_{ref2} = 0...1.29V$)
 $I_p = -24 \times V_{ref2} + 111$ ($V_{ref2} = 1.29...4V$)

Lower limit : $I_p = -24 \times V_{ref2} + 9$ ($V_{ref2} = 0...3.7V$)
 $I_p = -80$ ($V_{ref2} = 3.7...4V$)



Upper limit : $I_p = 85$ ($V_{ref2} = 0...2.5V$)
 $I_p = -40 \times V_{ref2} + 185$ ($V_{ref2} = 2.5...4V$)

Lower limit : $I_p = -40 \times V_{ref2} + 15$ ($V_{ref2} = 0...2.5V$)
 $I_p = -85$ ($V_{ref2} = 2.5...4V$)

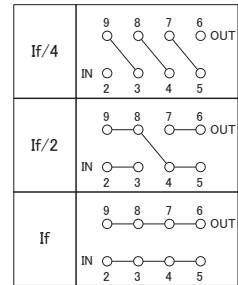
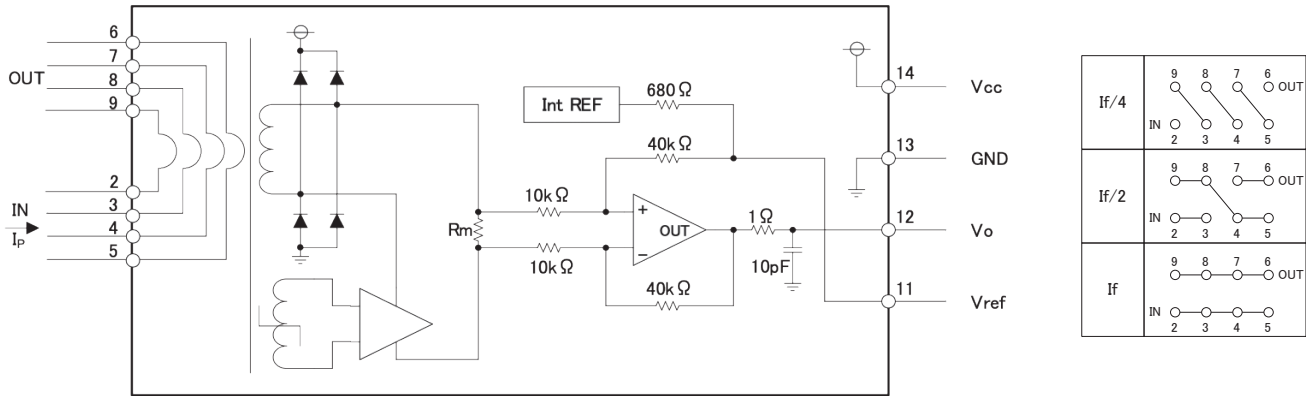


Upper limit : $I_p = 150$ ($V_{ref2} = 0...2.75V$)
 $I_p = -80 \times V_{ref2} + 370$ ($V_{ref2} = 2.75...4V$)

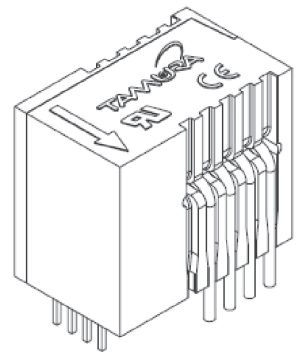
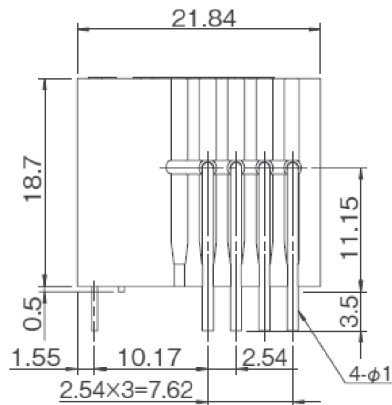
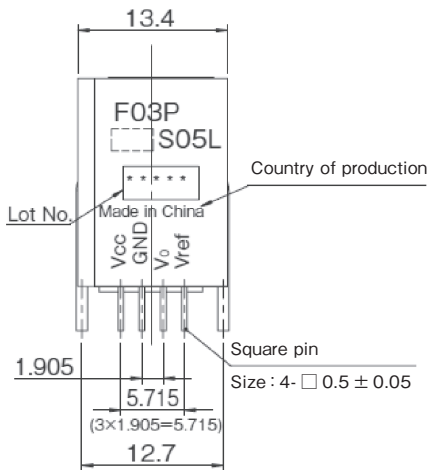
Lower limit : $I_p = -80 \times V_{ref2} + 30$ ($V_{ref2} = 0...2.25V$)
 $I_p = -150$ ($V_{ref2} = 2.25...4V$)

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

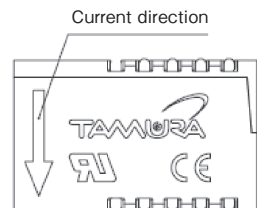
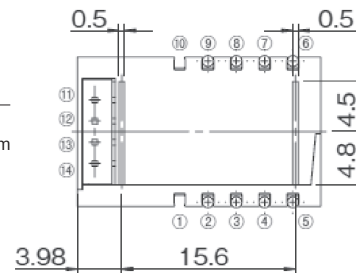
CONNECTION



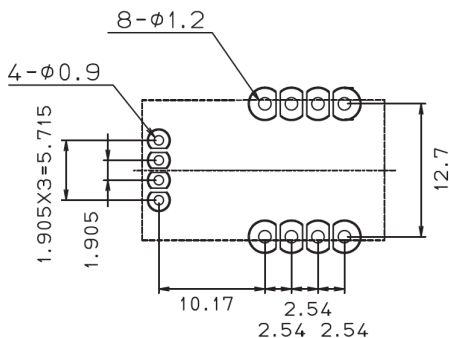
DIMENSIONS (mm)



Terminal number	Note
① —	1. Unless otherwise specified, tolerances shall be ±0.25mm
⑧ Output	
② Input	2. Unit is [mm]
⑨ Output	
③ Input	
④ Input	
⑤ Input	
⑥ Output	
⑦ Output	
⑧ Output	
⑨ Output	
⑩ —	
⑪ Vref	
⑫ Vo	
⑬ GND	
⑭ Vcc	



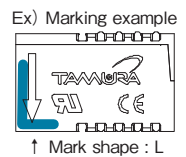
RECOMMENDED HOLE DIAMETER (mm)



Identification marking

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

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



Fluxgate system / Voltage-output type

F23PxxxS05R SERIES



ABSOLUTE MAXIMUM RATINGS

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

ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Comment
Insulation voltage	Vd	—	AC5000V, for 1minute (Sensing current 0.5mA)	Primary ⇔ Secondary
Insulation Resistance	R _{IS}	—	≥ 500M Ω (at DC500V)	Primary ⇔ Secondary
Clearance distance	d _{cl}	—	11.0mm (MIN)	Primary ⇔ Secondary
Creepage distance	d _{cp}	—	12.7mm (MIN)	Primary ⇔ Secondary
Case material	—	—	UL94 V-0	
Comparative Tracking Index : (CTI)	CTI	V	600	
Application example	—	—	600V, CAT III, PD2	Reinforced isolation,non uniform field according to EN62477-1 : 2012 and EN62477-1 : 2012/A11 2014, IEC61800-5-1
	—	—	1000V, CAT III, PD2	Basic isolation,non uniform field according to EN62477-1 : 2012 and EN62477-1 : 2012/A11 2014, IEC61800-5-1

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

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

SPECIFICATIONS

Ta=+25°C, Np=1T, RL=10kΩ, Vcc=+5V

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Primary nominal current	F23P050S05R	I _{PN}	A		50	
	F23P100S05R				100	
Primary current, measuring range (at Vcc= + 5V, Ta= + 85°C)	F23P050S05R	I _{PM}	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+I _{PN} /Ns
	F23P100S05R				110	
Reference voltage (output) (at IP=0A)	Vref1	V	2.495	2.500	2.505	Ref OUT mode
Reference voltage (input)	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 referred to primary	F23P050S05R	Ioe	mA	- 200		200
	F23P100S05R			- 400		400
Temperature coefficient of Vref1	TCVref1	ppm/K		± 5.0	± 50	
Temperature coefficient of Output voltage (at Ip=0A)	F23P050S05R	TCVo	ppm/K		± 3.0	± 10
	F23P100S05R					ppm/K of 2.5V (- 40°C~+ 85°C)
Theoretical sensitivity	F23P050S05R	Gth	mV/A		12.5	625mV (at I _{PN}) = Vref - Vout / I _{PN}
	F23P100S05R				6.25	
Sensitivity error	ε _G	%	- 0.7		0.7	
Temperature coefficient of Sensitivity (at Ta= - 40°C~+ 85°C)	TCG	ppm/K			± 40	
Linearity error (at IP)	ε _L	%	- 0.1		0.1	
External recommended resistance of Vout	RL	k Ω		10		
External recommended capacitance of Vout	CL	pF			500	

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

SPECIFICATIONS

Ta=+25°C, Np=1T, RL=10kΩ, Vcc=+5V

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Peak to peak output ripple at oscillator frequency (f typ =450kHz)	F23P050S05R F23P100S05R	—	mV	5	20	RL=1kΩ
Reaction time (at 10% of I _{PN})	F23P050S05R F23P100S05R	t _{ra}	μs		0.5	RL=1kΩ, di/dt=100A/μs
Response time (at 90% of I _{PN})	F23P050S05R F23P100S05R	t _r	μs		0.5	RL=1kΩ, di/dt=100A/μs
Frequency bandwidth (± 3dB)		BW	kHz	100		RL=1kΩ
Output Voltage Accuracy (Overall)	F23P050S05R F23P100S05R	X _G	%		1.2	X _G = (100 × V _{oe} /625) + ε _G + ε _L

STANDARDS

EN62477-1 : 2012 and EN62477-1 : 2012/A11 2014, 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)

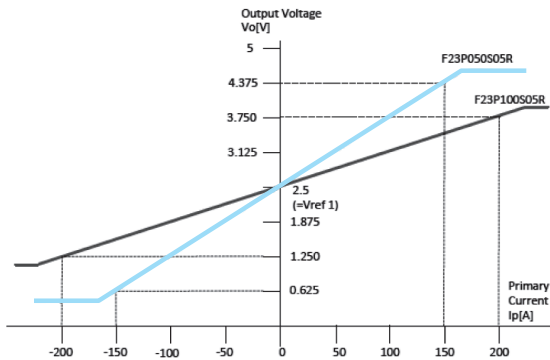


Figure 1 : Linearity curve (Internal reference voltage)
 Measurement condition Ta=+25°C, RL=10kΩ, Vcc=+5V

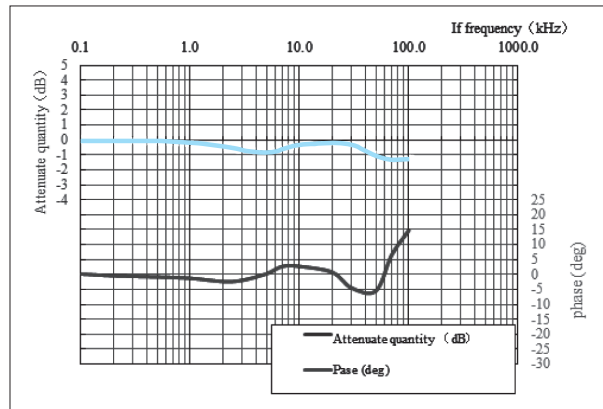


Figure 2 : Frequency response curve
 ex) F23P100S05R
 Measurement condition Ta=+25°C, RL=1kΩ, Ip=3A × 3T, Vcc=+5V

SUPPORT DOCUMENTATION

Maximum continuous DC primary current

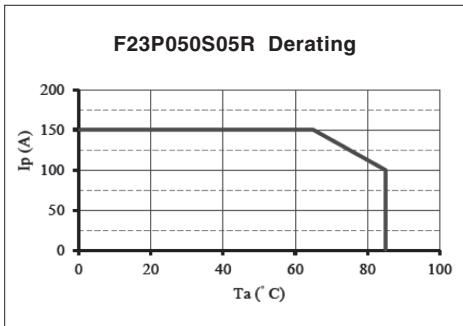


Figure 3 : Ip vs Ta for F23P050S05R

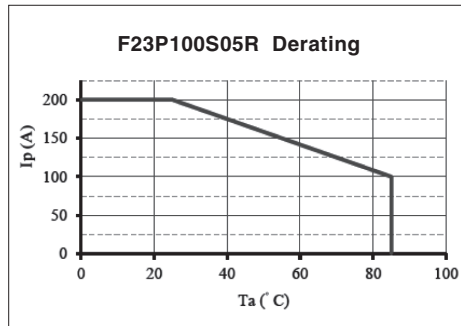


Figure 4 : Ip vs Ta for F23P100S05R
Measurement condition Vcc=+5V , RL=10kΩ

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

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

Frequency derating

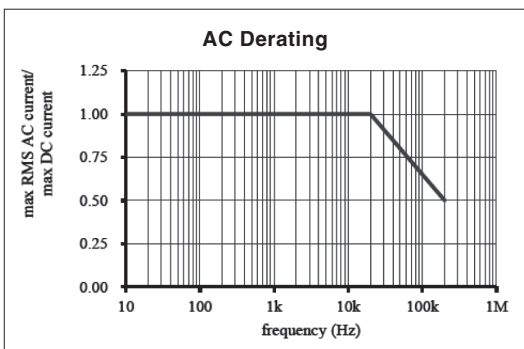


Figure 7 : Maximum RMS AC primary current/maximum DC primary current vs frequency

Reference voltage

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

< Ref OUT mode >

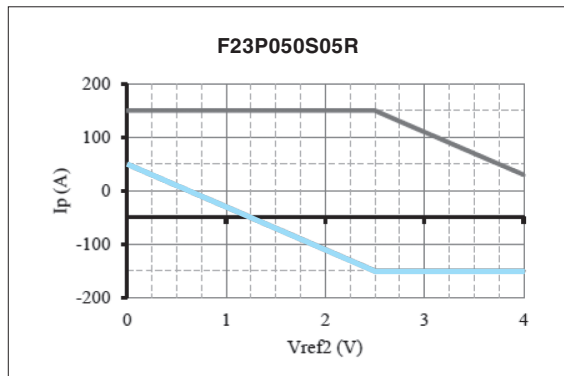
The 2.5V internal precision reference is used by the transducer as the reference point for bipolar measurements;

< Ref IN mode >

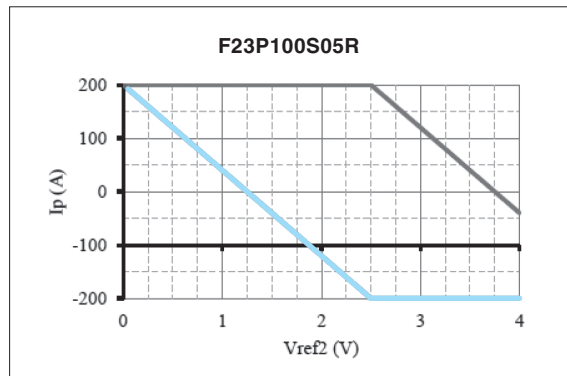
An external reference voltage is connected to the Ref pin; this voltage is specified in the range 0 to 4 V , its voltage is used as the reference voltage at the time of measurement.

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

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



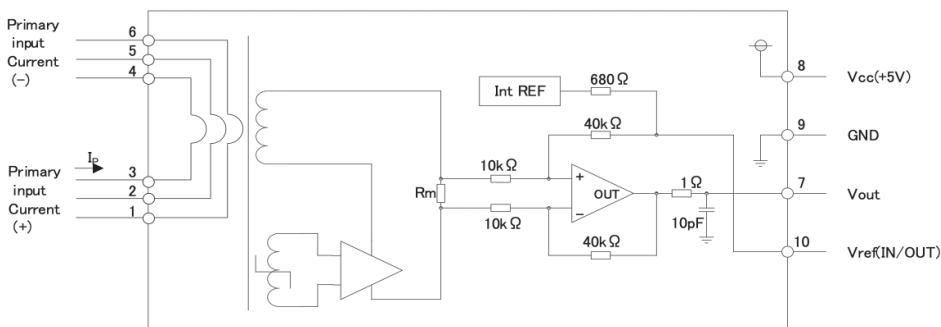
Upper limit : $I_p = 150$ (Vref2 = 0...2.5V)
 $I_p = -80 \times V_{ref2} + 350$ (Vref2 = 2.5...4V)
 Lower limit : $I_p = -80 \times V_{ref2} + 50$ (Vref2 = 0...2.5V)
 $I_p = -150$ (Vref2 = 2.5...4V)



Upper limit : $I_p = 200$ (Vref2 = 0...2.5V)
 $I_p = -160 \times V_{ref2} + 600$ (Vref2 = 2.5...4V)
 Lower limit : $I_p = -160 \times V_{ref2} + 200$ (Vref2 = 0...2.5V)
 $I_p = -200$ (Vref2 = 2.5...4V)

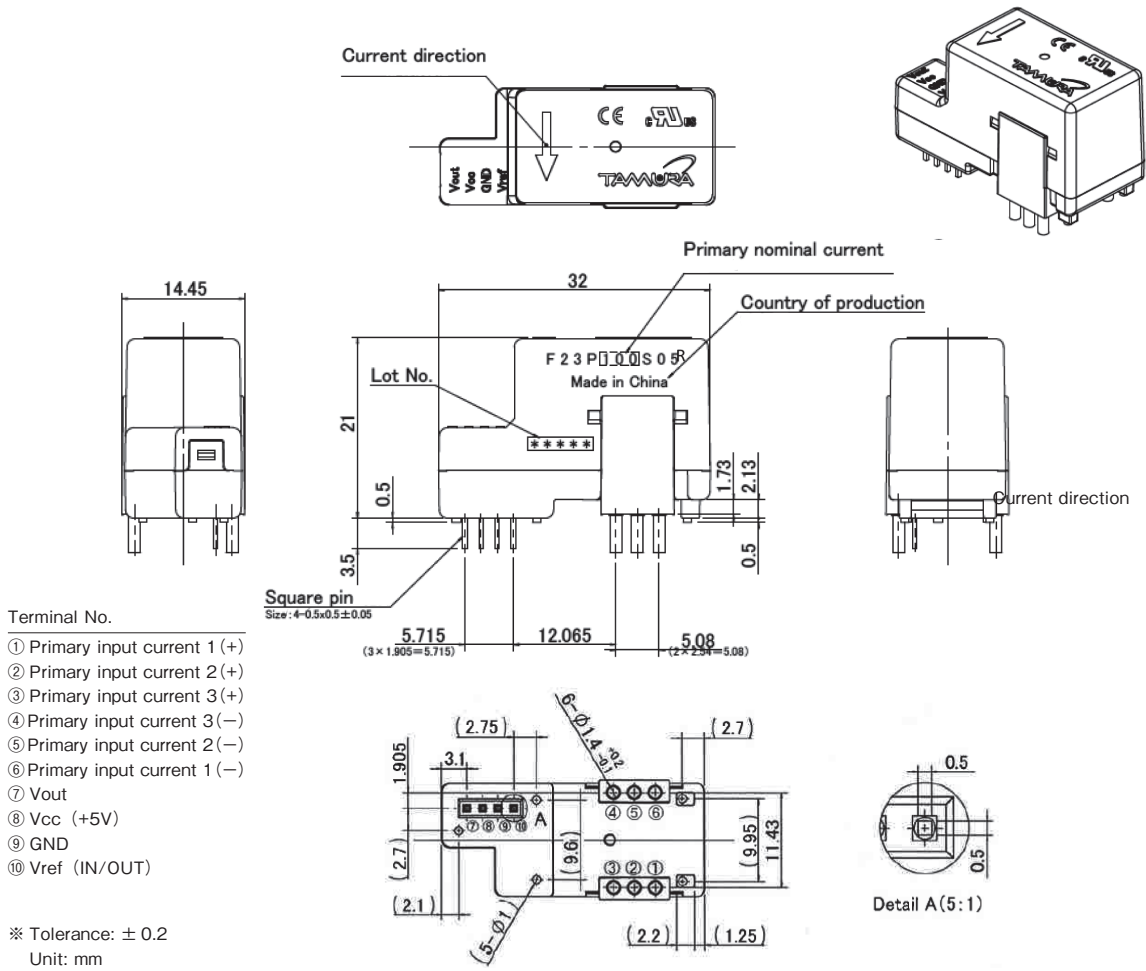
If you do not want to use the Ref pin, please unconnected.

CONNECTION

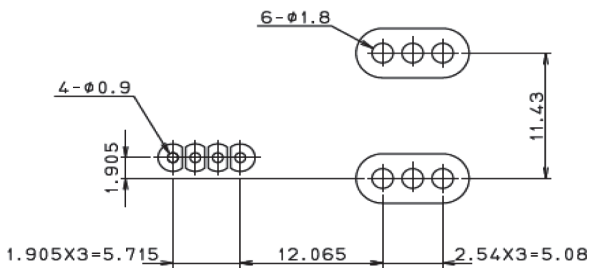


Primary winding I_p	Primary current I_p (A)	wiring	Primary resistance R_p (mΩ)
3	$I_p/3$		1
2	$I_p/2$		0.45
1	I_p		0.1

DIMENSIONS (mm)

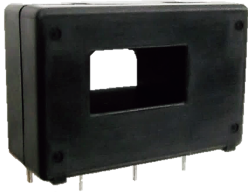


RECOMMENDED HOLE DIAMETER (mm)



Fluxgate system / Voltage-output type, Through Type

F26PxxxS05 SERIES



ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Comment
Supply voltage	Vcc	V	+7	
Primary conductor temperature	—	°C	105	
ESD (HBM: Human Body Model)	—	kV	4	C=150 pF, R=330 Ω

ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Comment
Insulation voltage	Vd	—	AC4300 V, for 1minute (Sensing current 0.5 mA)	Primary ⇔ Secondary
Impulse withstand voltage	Vw	kV	10	Primary ⇔ Secondary Input waveform : • Front time 1.2 μs • Time to half value 50 μs • single
Insulation Resistance	R _{IS}	—	≥ 500M Ω (at DC500V)	Primary ⇔ Secondary
Clearance distance	d _{Cl}	mm	12.7 (MIN)	Primary ⇔ Secondary
Creepage distance	d _{Cp}	mm	12.7 (MIN)	Primary ⇔ Secondary
Case material	—	—	UL94 V-0	
Comparative Tracking Index : (CTI)	CTI	V	600 (group I)	
Application example	—	—	600V, CAT III, PD2	Reinforced isolation, non uniform field according to EN62477-1:2012 and EN62477-1:2012/A11:2014.
	—	—	1000V, CAT III, PD2	Basic isolation, non uniform field according to EN62477-1:2012 and EN62477-1:2012/A11:2014.

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Ambient operating temperature	T _A	°C	- 40		+ 85	
Ambient storage temperature	T _S	°C	- 40		+ 85	
Mass	m	g		33		

SPECIFICATIONS

Ta=+25°C, RL=10kΩ, Vcc=+5V

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Primary nominal current	F26P050S05	IPN	A		50	
	F26P100S05				100	
	F26P150S05				150	
Primary current, measuring range (at Vcc= + 5V, Ta= + 85°C)	F26P050S05	IPM	A	- 150		150
	F26P100S05			- 270		270
	F26P150S05			- 230		230
Number of secondary turns	F26P050S05	Ns	T		1258	
	F26P100S05				1258	
	F26P150S05				1588	
Supply Voltage	Vcc	V	4.75	5.00	5.25	
Consumption current (at IP=0 A)	Icc	mA		19		Icc=19+Ip/Ns+Vout/RL
Reference voltage (output) (at IP=0 A)	Vref1	V	2.495	2.500	2.505	Ref OUT mode
Reference voltage (input)	Vref2	V	0		4	Ref IN mode
Output voltage (at Ip=0A)	Vout	V		Vref1,Vref2		
Electrical offset voltage * 1	Voe	mV	- 1.0		+1.0	Voe=Vout (at Ip=0 A)-Vref
Electrical offset current referred to primary	F26P050S05	loe	mA	- 80		+80
	F26P100S05			- 160		+160
	F26P150S05			- 240		- 240
Temperature coefficient of Vref1	TCVref1	ppm/K			± 50	
Temperature coefficient of Output voltage (at Ip=0 A)	TCVo	ppm/K			± 10	ppm/K of 2.5 V (-40°C~+85°C)
Theoretical sensitivity	F26P050S05	Gth	mV/A		12.50	
	F26P100S05				6.25	
	F26P150S05				4.17	
Sensitivity error * 2	εG	%	- 0.7		+0.7	
Temperature coefficient of Sensitivity (at Ta= - 40°C~+ 85°C)	TCG	ppm/K			± 40	
Sensitivity linearity error (at IPN) * 2	εL	%	- 0.1		+0.1	
Peak to peak output ripple at oscillator frequency (f typ=450kHz)	—	mV		20		RL=1 kΩ , at Ip=0 A
Reaction time (at 10% of IPN) * 2	tra	μs		0.6		RL=1 kΩ , di/dt=100 A/μs
Response time (at 70% of IPN) * 2	tr	μs		0.6		RL=1 kΩ , di/dt=100 A/μs
Frequency bandwidth (± 3 dB) * 2 * 3	BW	kHz		100		RL=1 kΩ
Overall accuracy * 2	XG	%	- 0.96		+0.96	XG=(100 × Voe/625)+ εG+ εL

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

*2 Measurement condition : Primary conductor (bus bar) cross sectional area is as same as through hole, and penetration with 1 turn in through hole. Differences occur depending on the conditions of the primary conductor (busbar).

*3 High fundamental frequency primary current and/or harmonic current may result in excessive heating in magnetic core.

*4 The measurement range is less than F26P100S05.

STANDARDS

EN62477-1:2012 and EN62477-1:2012/A11:2014 , UL508 (File No.E243511)

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

CHARACTERISTIC CURVE (TYP)

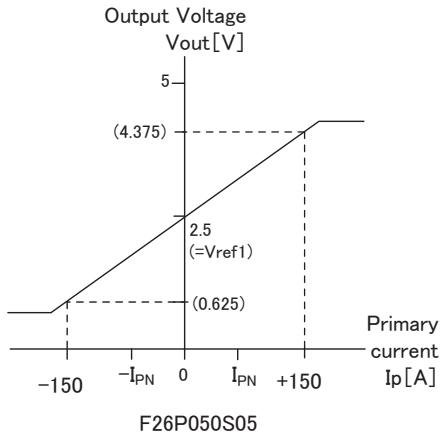


Figure 1 : Linearity curve (Internal reference voltage)

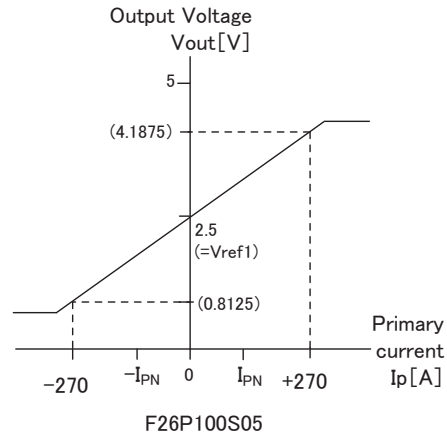


Figure 2 : Linearity curve (Internal reference voltage)

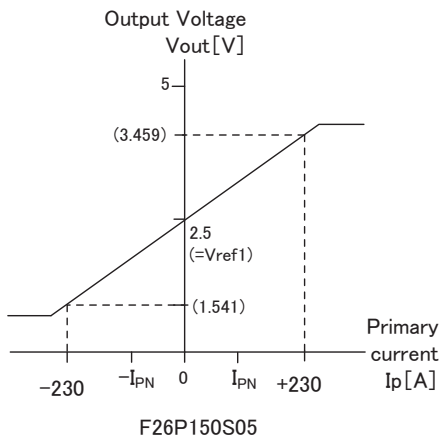


Figure 3 : Linearity curve (Internal reference voltage)

SUPPORT DOCUMENTATION

Maximum repetitive primary current

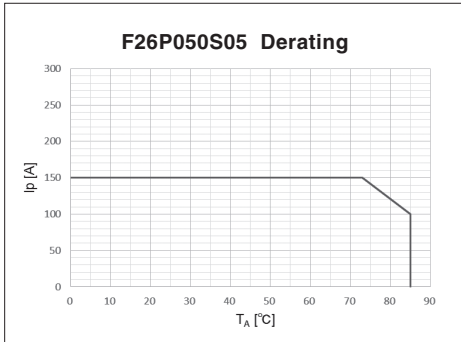


Figure 4 : Ip vs TA for F26P050S05

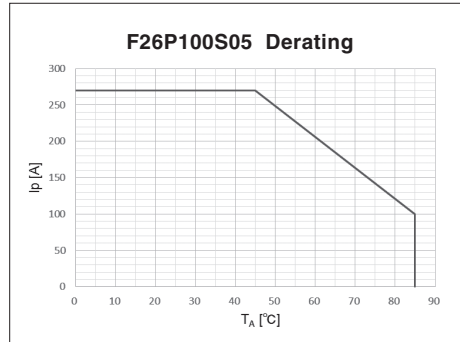


Figure 5 : Ip vs TA for F26P100S05

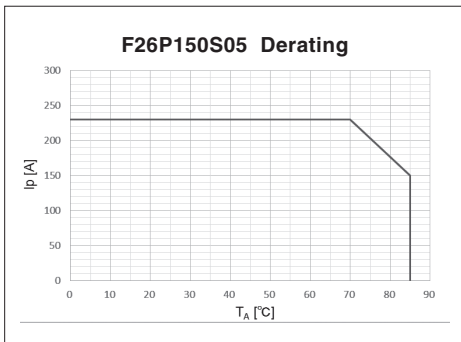


Figure 6 : Ip vs TA for F26P150S05

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

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

SUPPORT DOCUMENTATION

Reference voltage

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

< Ref OUT mode >

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

< Ref IN mode >

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

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

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

$R_L = 1 \text{ k}\Omega$, $V_{CC} = +5 \text{ V}$, $T_A = -40 \sim +85 \text{ }^\circ\text{C}$

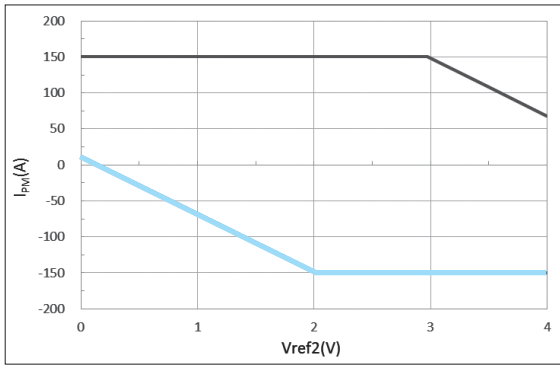


Figure 7 : I_{PM} vs V_{ref2} for F26P050S05

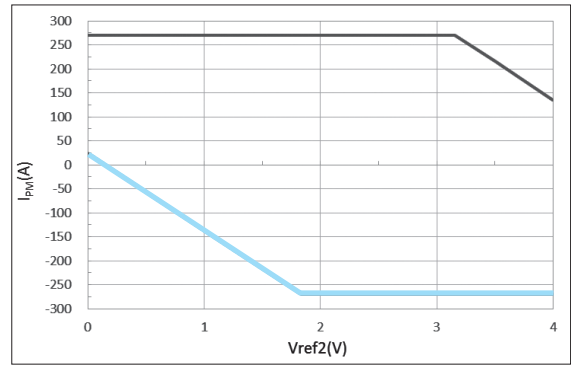


Figure 8 : I_{PM} vs V_{ref2} for F26P100S05

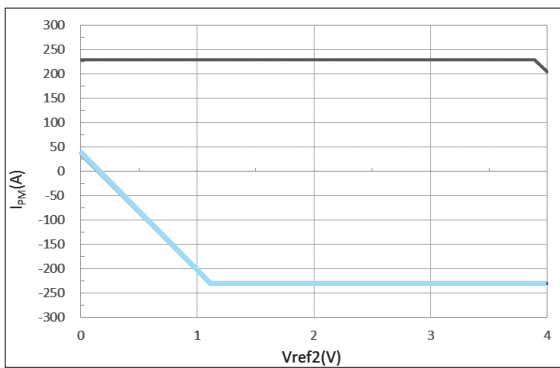


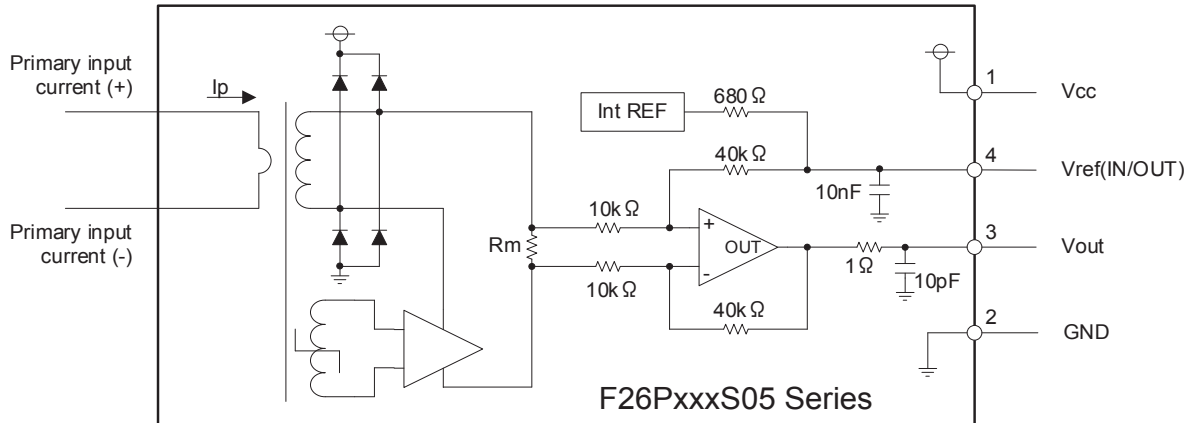
Figure 9 : I_{PM} vs V_{ref2} for F26P150S05

e. g. ; In case of F26P100S05

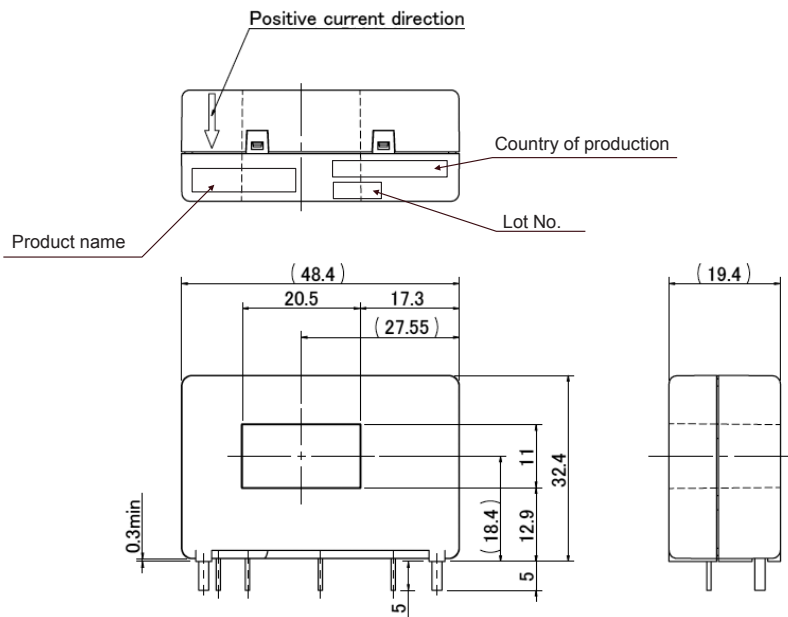
- Upper limit : $I_p = +270 \text{ A}$ ($V_{ref2} = 0 \text{ V} \sim 3.16 \text{ V}$)
- $I_p = +270 - (V_{ref2} - 3.16 \text{ V}) / 0.00625$ ($V_{ref2} = 3.16 \text{ V} \sim 4 \text{ V}$)
- Lower limit : $I_p = -270 \text{ A}$ ($V_{ref2} = 1.84 \text{ V} \sim 4 \text{ V}$)
- $I_p = -270 - (V_{ref2} - 1.84 \text{ V}) / 0.00625$ ($V_{ref2} = 0 \text{ V} \sim 1.84 \text{ V}$)

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

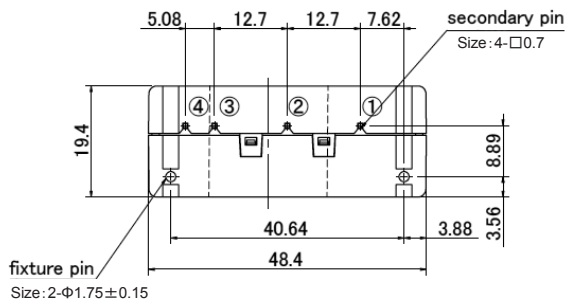
CONNECTION



DIMENSIONS (mm)

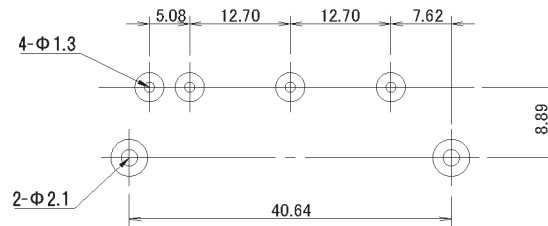


- Terminal No.
- ① Vcc (+5V)
 - ② GND
 - ③ Vout
 - ④ Vref (IN/OUT)



※ Tolerance: ± 0.5
Unit: mm

RECOMMENDED HOLE DIAMETER (mm)



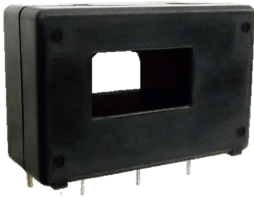
TYPE DESIGNATION

F26 P xxx S 05
 ① ② ③ ④ ⑤ ⑥

- ① Model (3 figures)
F26 : Series
- ② Mounting configuration (1 figure)
P : PCB Mounting type
- ③ Measurement current range (3 figures)
050 : 50A
100 : 100A
150 : 150A
- ④ Control power supply type (1 figure)
S : Single supply
- ⑤ Power supply voltage (2 digits)
05 : 5V
- ⑥ Special specification
(none) : Standard type.
A : Output voltage waveform distortion improvement type.

Fluxgate system / Voltage-output type, Through Type

F26PxxxS05A SERIES



F26PxxxS05A series is a model that output voltage waveform distortion improvement of the F26PxxxS05 series. For details, please refer to supplementary material(P6).

ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Comment
Supply voltage	V _{CC}	V	+7	
Primary conductor temperature	—	°C	105	
ESD (HBM: Human Body Model)	—	kV	4	C=150 pF, R=330 Ω

ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Comment
Insulation voltage	V _d	—	AC4300 V, for 1minute (Sensing current 0.5 mA)	Primary ⇔ Secondary
Impulse withstand voltage	V _w	kV	10	Primary ⇔ Secondary Input waveform : • Front time 1.2 μs • Time to half value 50 μs • single
Insulation Resistance	R _{IS}	—	≧ 500M Ω (at DC500V)	Primary ⇔ Secondary
Clearance distance	d _{cl}	mm	12.7 (MIN)	Primary ⇔ Secondary
Creepage distance	d _{cp}	mm	12.7 (MIN)	Primary ⇔ Secondary
Case material	—	—	UL94 V-0	
Comparative Tracking Index : (CTI)	CTI	V	600 (group I)	
Application example	—	—	600V, CAT III, PD2	Reinforced isolation, non uniform field according to EN62477-1:2012 and EN62477-1:2012/A11:2014.
	—	—	1000V, CAT III, PD2	Basic isolation, non uniform field according to EN62477-1:2012 and EN62477-1:2012/A11:2014.

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Ambient operating temperature	T _A	°C	- 40		+ 85	
Ambient storage temperature	T _S	°C	- 40		+ 85	
Mass	m	g		33		

SPECIFICATIONS

Ta=+25°C, RL=10kΩ, Vcc=+5V

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Primary nominal current	F26P050S05A	IPN	A		50	
	F26P100S05A				100	
	F26P150S05A				150	
Primary current, measuring range (at Vcc= + 5V, Ta= + 85°C)	F26P050S05A	IPM	A	- 150		150
	F26P100S05A			- 270		270
	F26P150S05A			- 230		230
Number of secondary turns	F26P050S05A	Ns	T		1258	
	F26P100S05A				1258	
	F26P150S05A				1588	
Supply Voltage	Vcc	V	4.75	5.00	5.25	
Consumption current (at IP=0 A)	Icc	mA		20		Icc=20+Ip/Ns+Vout/RL
Reference voltage (output) (at IP=0 A)	Vref1	V	2.495	2.500	2.505	Ref OUT mode
Reference voltage (input)	Vref2	V	0		4	Ref IN mode
Output voltage (at Ip=0A)	Vout	V		Vref1,Vref2		
Electrical offset voltage * 1	Voe	mV	- 1.0		+1.0	Voe=Vout (at Ip=0 A)-Vref
Electrical offset current referred to primary	F26P050S05A	loe	mA	- 80		+80
	F26P100S05A			- 160		+160
	F26P150S05A			- 240		- 240
Temperature coefficient of Vref1	TCVref1	ppm/K			± 50	
Temperature coefficient of Output voltage (at Ip=0 A)	TCVo	ppm/K			± 10	ppm/K of 2.5 V (-40°C~+85°C)
Theoretical sensitivity	F26P050S05A	Gth	mV/A		12.50	
	F26P100S05A				6.25	
	F26P150S05A				4.17	
Sensitivity error * 2	εG	%	- 0.7		+0.7	
Temperature coefficient of Sensitivity (at Ta= - 40°C~+ 85°C)	TCG	ppm/K			± 40	
Sensitivity linearity error (at IPN) * 2	εL	%	- 0.1		+0.1	
Peak to peak output ripple at oscillator frequency (f typ=450kHz)	—	mV		16		RL=1 kΩ , at Ip=0 A
Reaction time (at 10% of IPN) * 2	tra	μs		1		RL=1 kΩ , di/dt=100 A/μs
Response time (at 70% of IPN) * 2	tr	μs		1		RL=1 kΩ , di/dt=100 A/μs
Frequency bandwidth (± 3 dB) * 2 * 3	BW	kHz		100		RL=1 kΩ
Overall accuracy * 2	XG	%	- 0.96		+0.96	XG=(100 × Voe/625)+ εG+ εL

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

*2 Measurement condition : Primary conductor (bus bar) cross sectional area is as same as through hole, and penetration with 1 turn in through hole. Differences occur depending on the conditions of the primary conductor (busbar).

*3 High fundamental frequency primary current and/or harmonic current may result in excessive heating in magnetic core.

*4 The measurement range is less than F26P100S05.

STANDARDS

EN62477-1:2012 and EN62477-1:2012/A11:2014 , UL508 (File No.E243511)

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

CHARACTERISTIC CURVE (TYP)

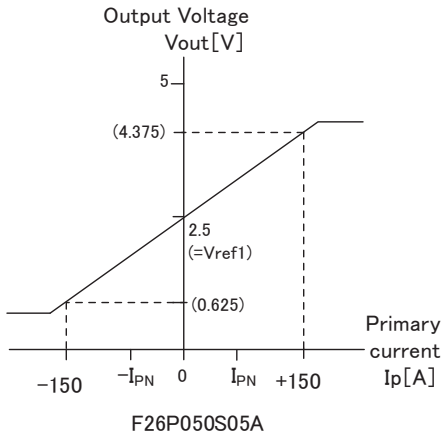


Figure 1 : Linearity curve (Internal reference voltage)

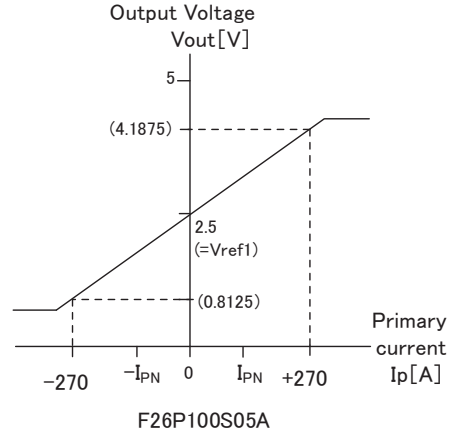


Figure 2 : Linearity curve (Internal reference voltage)

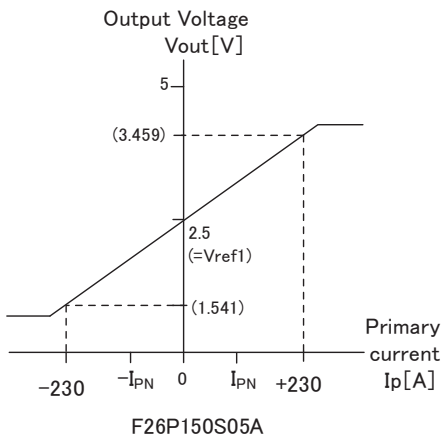


Figure 3 : Linearity curve (Internal reference voltage)

SUPPORT DOCUMENTATION

Maximum repetitive primary current

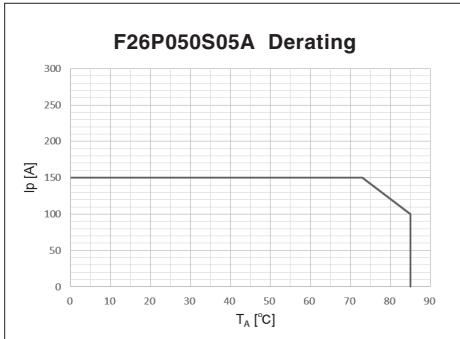


Figure 4 : Ip vs TA for F26P050S05A

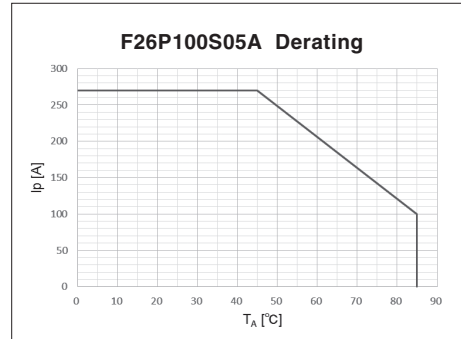


Figure 5 : Ip vs TA for F26P100S05A

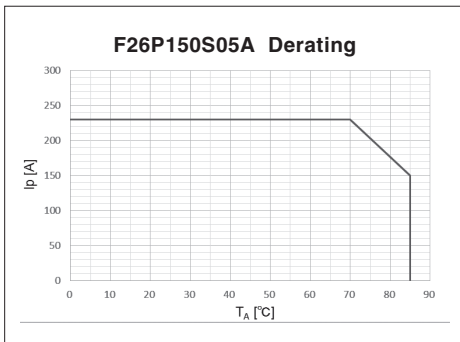


Figure 6 : Ip vs TA for F26P150S05A

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

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

SUPPORT DOCUMENTATION

Reference voltage

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

< Ref OUT mode >

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

< Ref IN mode >

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

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

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

$R_L=1\text{ k}\Omega$, $V_{CC}=+5\text{ V}$, $T_A=-40 \sim +85\text{ }^\circ\text{C}$

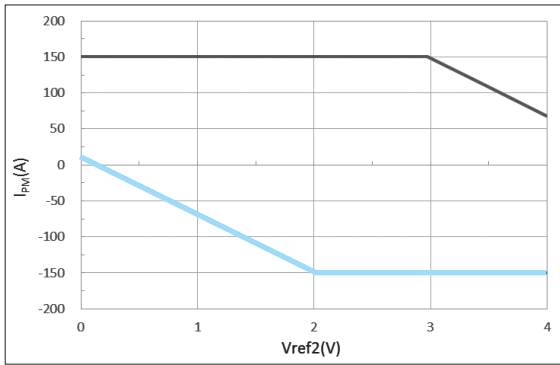


Figure 7 : I_{PM} vs V_{ref2} for F26P050S05A

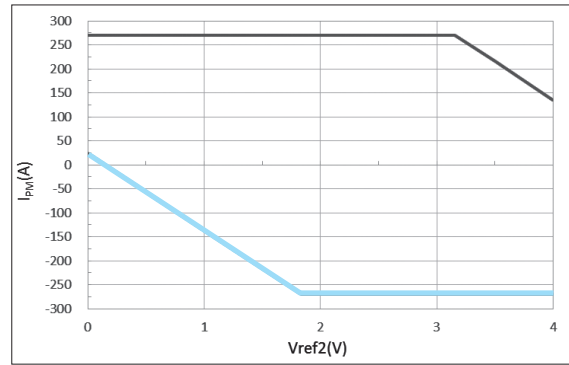


Figure 8 : I_{PM} vs V_{ref2} for F26P100S05A

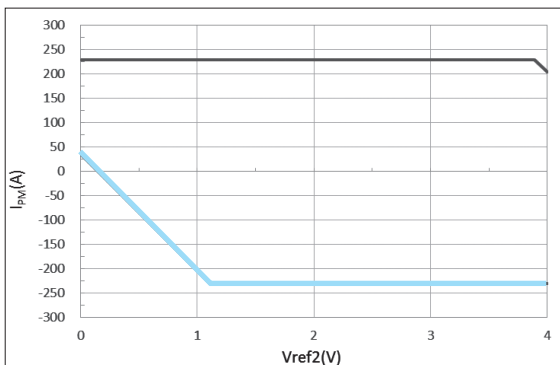


Figure 9 : I_{PM} vs V_{ref2} for F26P150S05A

e. g. ; In case of F26P100S05A

- Upper limit : $I_p = +270\text{ A}$ ($V_{ref2}=0\text{ V} \sim 3.16\text{ V}$)
- $I_p = +270 - (V_{ref2} - 3.16\text{ V}) / 0.00625$ ($V_{ref2}=3.16\text{ V} \sim 4\text{ V}$)
- Lower limit : $I_p = -270\text{ A}$ ($V_{ref2}=1.84\text{ V} \sim 4\text{ V}$)
- $I_p = -270 - (V_{ref2} - 1.84\text{ V}) / 0.00625$ ($V_{ref2}=0\text{ V} \sim 1.84\text{ V}$)

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

SUPPORT DOCUMENTATION

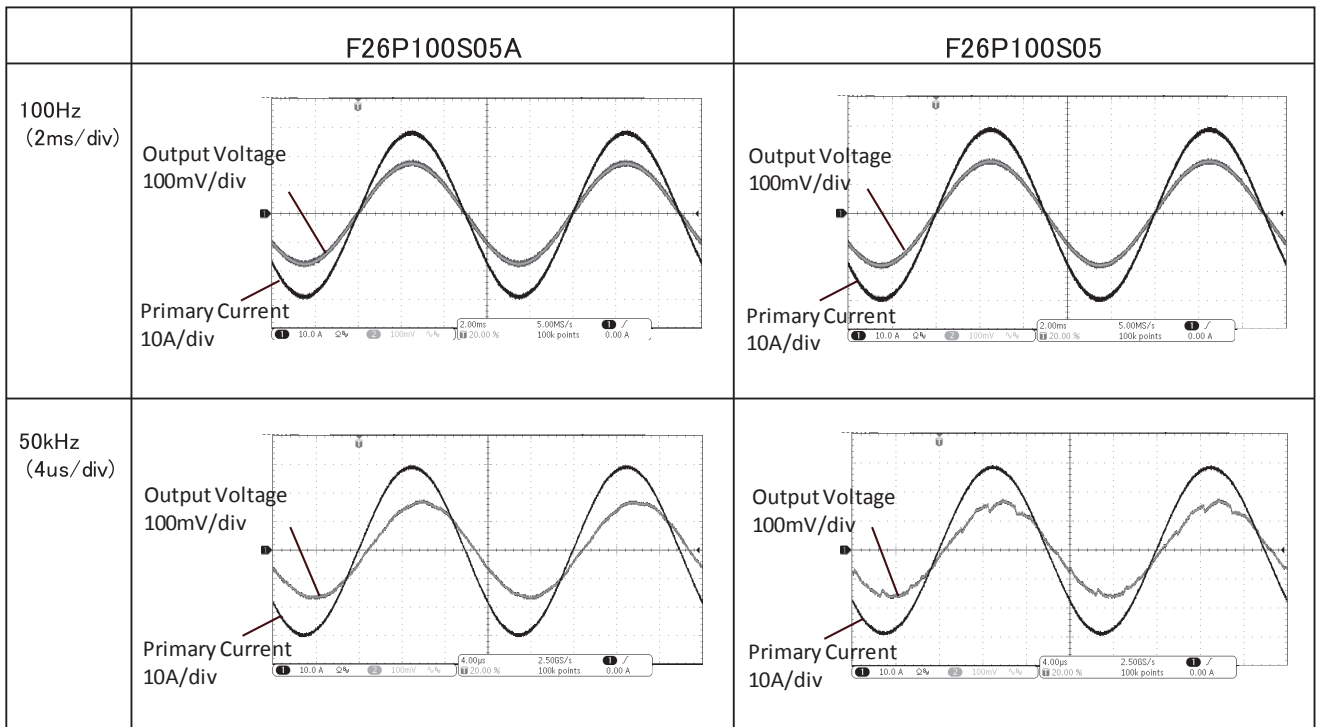
Information on F26PxxxS05A series.

F26PxxxS05A series is a model that output voltage waveform distortion improvement of the F26PxxxS05 series. Please select according to the application.

e. g. F26P100S05A

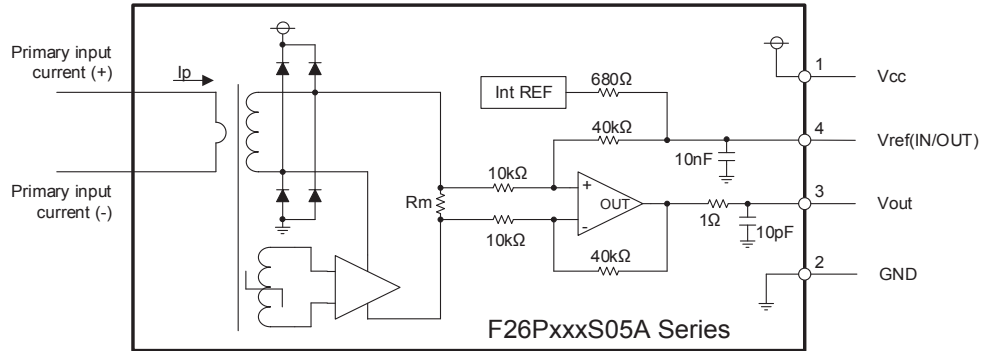
Measurement condition $T_A=25\text{ }^\circ\text{C}$ $R_L=1\text{ k}\Omega$ $I_p=20\text{ A}$ $V_{cc}=+5\text{ V}$

Primary conductor (bus bar) cross sectional area is as same as through hole, and penetration with 1 turn in through hole.



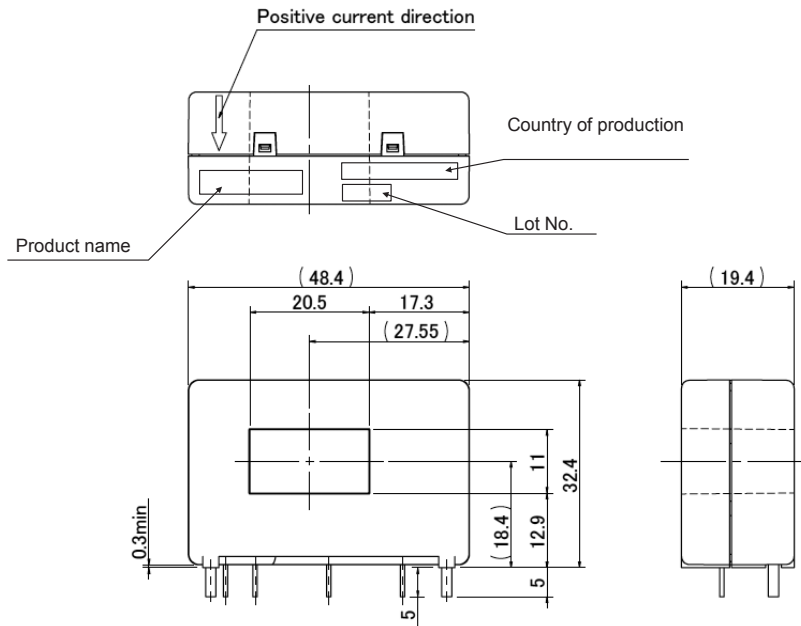
Differences occur depending on the conditions of the primary conductor (busbar). Please use it after actual machine verification.

CONNECTION



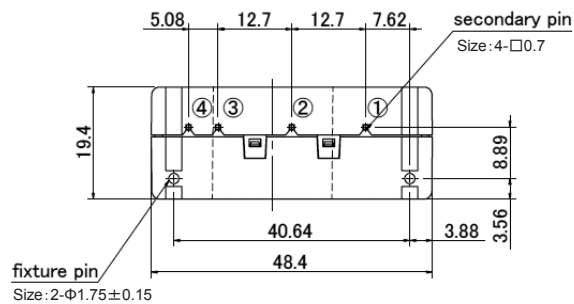
DIMENSIONS (mm)

※ Tolerance: ±0.5
Unit: mm

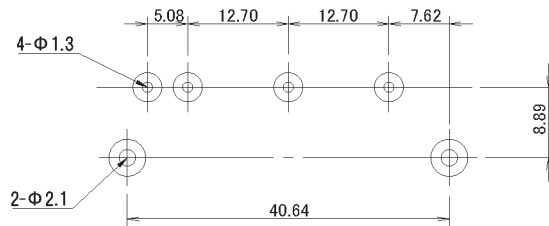


Terminal No.

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



RECOMMENDED HOLE DIAMETER (mm)



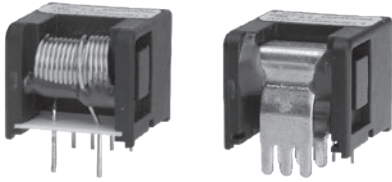
TYPE DESIGNATION

F26 P xxx S 05 A
 ① ② ③ ④ ⑤ ⑥

- ① Model (3 figures)
F26 : Series
- ② Mounting configuration (1 figure)
P : PCB Mounting type
- ③ Measurement current range (3 figures)
050 : 50A
100 : 100A
150 : 150A
- ④ Control power supply type (1 figure)
S : Single supply
- ⑤ Power supply voltage (2 digits)
05 : 15V
- ⑥ Special specification
(none) : Standard type.
A : Output voltage waveform distortion improvement type.

Magnetic Proportion System

L18PxxxD15AHV SERIES



ABSOLUTE MAXIMUM RATINGS

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

ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Comment
Insulation voltage	Vd	—	AC3000V, for 1minute (Sensing current 0.5mA)	Primary ⇔ Secondary
Impulse withstand voltage	Vw	kV	6.0	Primary ⇔ Secondary Input waveform : • Front time 1.2μs • Time to half value 50μs • single
Insulation resistance	R _{is}	—	≥ 500M Ω (at DC500V)	Primary ⇔ Secondary
Clearance distance	d _{ci}	—	9.2mm (MIN)	Primary ⇔ Secondary
			L18PxxxD15AHV xxx=003 ~ 030	
Creepage distance	d _{cp}	—	9.2mm (MIN)	Primary ⇔ Secondary
			L18PxxxD15AHV xxx=040 ~ 060	
Case material	—	—	UL94 V-0	
Comparative Tracking Index : (CTI)	CTI	V	175 (group III a)	

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Ambient operating	T _A	°C	- 30		+ 80	
Ambient storage temperature	T _S	°C	- 40		+ 85	
Mass	m	g		7		

SPECIFICATIONS

T_A=+25°C, R_L=10kΩ, V_{CC}=+5V

Parameters	Symbol	Unit	Value			Comment	
			MIN	TYP	MAX		
Primary nominal current	L18P003D15AHV	I _{PN}	A		3		
	L18P005D15AHV				5		
	L18P010D15AHV				10		
	L18P015D15AHV				15		
	L18P020D15AHV				20		
	L18P025D15AHV				25		
	L18P030D15AHV				30		
	L18P040D15AHV				40		
	L18P050D15AHV				50		
	L18P060D15AHV				60		
Primary current, measuring range * 1,2	L18P003D15AHV	I _{PM}	A	9			
	L18P005D15AHV			15			
	L18P010D15AHV			30			
	L18P015D15AHV			45			
	L18P020D15AHV			60			
	L18P025D15AHV			75			
	L18P030D15AHV			90			
	L18P040D15AHV			120			
	L18P050D15AHV			150			
	L18P060D15AHV			180			
Supply Voltage	V _{CC}	V	± 12 (± 5%)	± 15 (± 5%)			
Consumption current	I _{CC}	mA		14	18		
Rated output voltage	L18PxxxD15AHV xxx=003~030	V _O	V	3.960	4.000	4.040	at I _{pN}
	L18PxxxD15AHV xxx=040~060			3.950	4.000	4.050	
Offset voltage * 3	L18PxxxD15AHV xxx=003~030	V _{OF}	V	- 0.040	0.000	0.040	at I _p = 0A
	L18PxxxD15AHV xxx=040~060			- 0.050	0.000	0.050	
Hysteresis error	L18PxxxD15AHV xxx=003~030	V _{OH}	mV	- 25		25	at 0A → I _{PN} → 0A
	L18PxxxD15AHV xxx=040~060			- 40		40	
Temperature coefficient of V _O	T _C V _O	%/°C	- 0.1		+0.1	Without T _C V _{OF}	
Temperature coefficient of	T _C V _{OF}	mV/°C	- 1.5		+1.5	at I _p = 0A	
Linearity error (0A ~ I _{PN})	ε _L	%	- 1.0		+1.0		
Response time * 4	t _r	μs			5	di/dt=I _{PN} / μs	

Anti-Sulfurated PCB coating : HumiSeal®, Resistors : Thick film (General purpose)
dv/dt improvement type

- *1 Also operate at V_{CC} = ± 12V power supplies , measuring range reduced to 2.5 x I_{PM}.
- *2 The value of measured current which indicates an output with a greater than ± 10% deviation from the theoretical output value.
- *3 Offset voltage value is after removal of core hysteresis.
- *4 The response time is the time difference from 10% of the applied input step current to 90% of the sensor output signal.

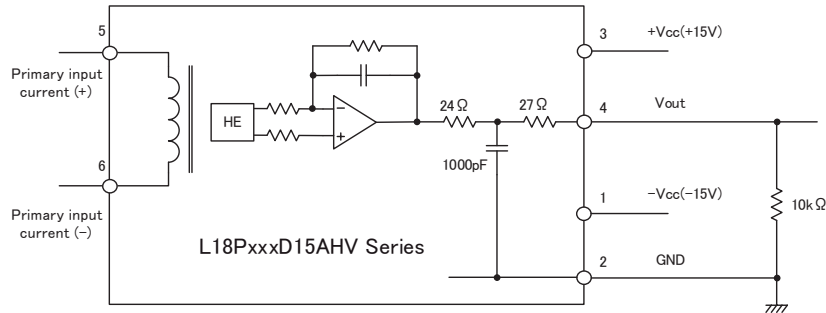
STANDARDS

UL508, CSA22.2 No.14 (UL File No.E243511)

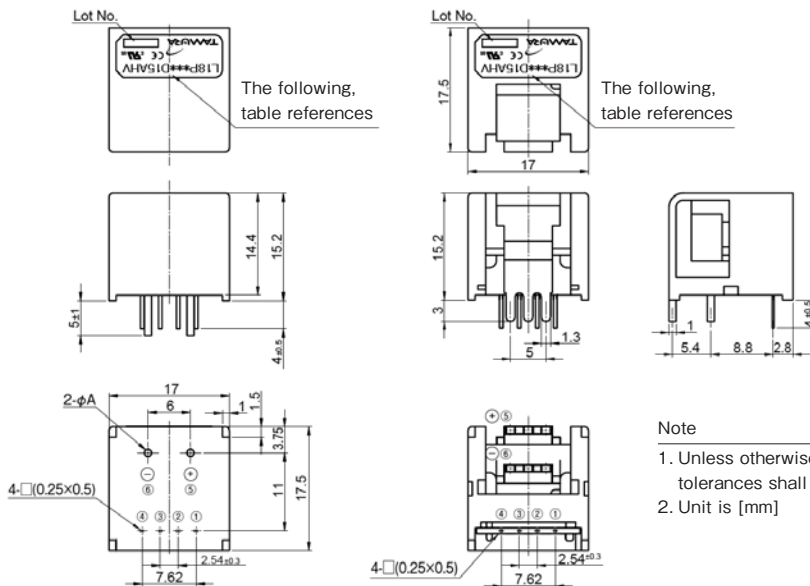
EN 62477-1, IEC/EN61800-5-1

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

CONNECTION



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]

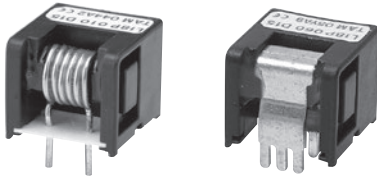
TYPE DESIGNATION

L18 P *** D15 AHV
 ① ② ③ ④ ⑤ ⑥

- ① Model (4 figures)
L18 : Series
- ② Mounting configuration (1 figure)
P : PCB Mounting type
- ③ Measurement current range (3 figures)
Ex) 050 : 50A
- ④ Control power supply type (1 figure)
D : Dual supply
- ⑤ Power supply voltage (2 digits)
15 : 15V
- ⑥ Special specification
Dust-proof PCB coating : HumiSeal®
dv/dt improvement type

Magnetic Proportion System

L18P S05 SERIES



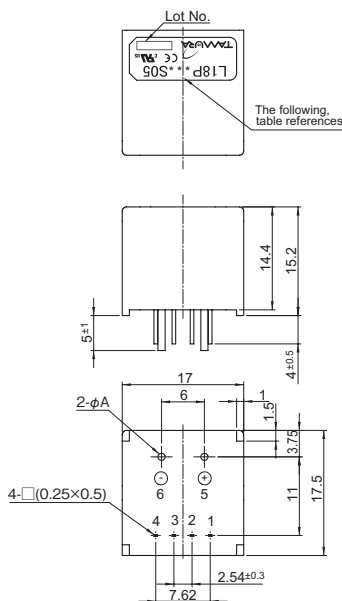
SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc= +5V

Spec	Types	Types									
		L18P003S05	L18P005S05	L18P010S05	L18P015S05	L18P020S05	L18P025S05	L18P030S05	L18P040S05	L18P050S05	L18P060S05
Primary nominal 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)	εL	≤ ± 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	TcVo	≤ ± 2.0mV / °C (Without Tc Vof)									
Thermal drift of offset	TcVof	≤ ± 2.0mV / °C									
Hysteresis error	Voh	≤ 25mV (at If = 0A → If → 0A)									
Insulation voltage	Vd	AC3000V for 1 minute (Sensing current 0.5mA) Primary ↔ Secondary									
Insulation resistance	Ris	≥ 500M Ω (at DC500V) Primary ↔ Secondary									
Ambient Operating temperature	Ta	- 30°C ~ + 80°C									
Ambient storage temperature	Ts	- 40°C ~ + 85°C									

* 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)



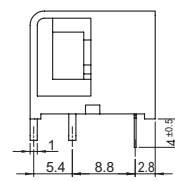
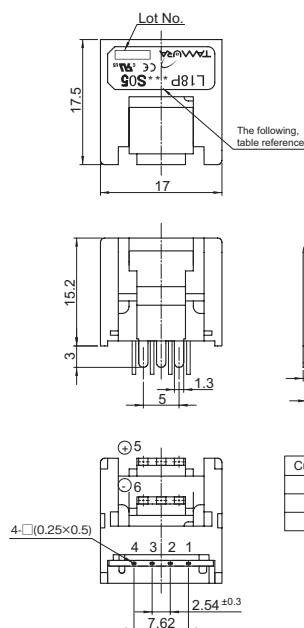
Terminal number

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

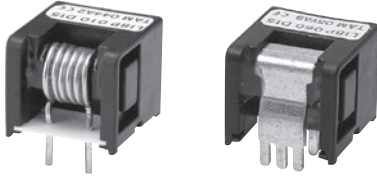
1. GND
2. GND
3. + Vcc
4. OUT
5. + IN
6. - IN

Note

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

Magnetic Proportion System

L18P S05R SERIES



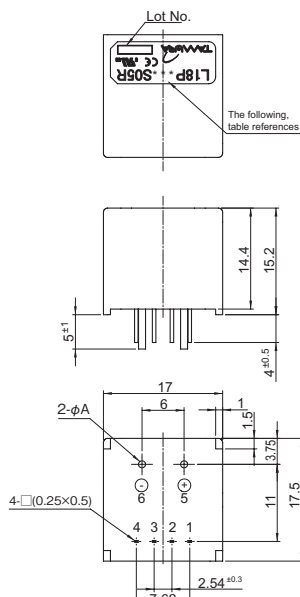
SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc= +5V

Spec	Types	L18P003	L18P005	L18P010	L18P015	L18P020	L18P025	L18P030	L18P040	L18P050	L18P060
		S05R	S05R	S05R	S05R	S05R	S05R	S05R	S05R	S05R	S05R
Primary nominal 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)	εL	≤ ± 1% (at If)									
Power supply voltage	Vcc	+ 5V ± 5%									
Consumption current	Icc	≤ 15mA									
di / dt Response time	tr	≤ 5 μs (di/dt = If / μs)									
Thermal drift of gain	TcVo	≤ ± 0.1% / °C (Without Tc Vof)									
Thermal drift of offset	TcVof	≤ ± 1.0mV / °C									
Hysteresis error	Voh	≤ 25mV (at If = 0A → If → 0A)									
Insulation voltage	Vd	AC3000V for 1 minute (Sensing current 0.5mA) Primary ⇄ Secondary									
Insulation resistance	Ris	≥ 500MΩ (at DC500V) Primary ⇄ Secondary									
Ambient Operating temperature	TA	- 30°C ~ + 80°C									
Ambient storage temperature	TS	- 40°C ~ + 85°C									

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

DIMENSIONS (mm)



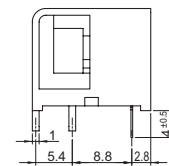
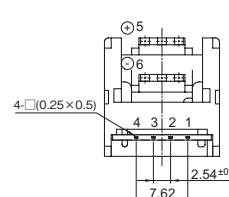
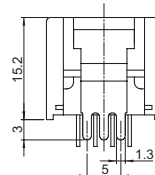
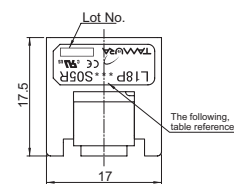
Terminal number

- 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

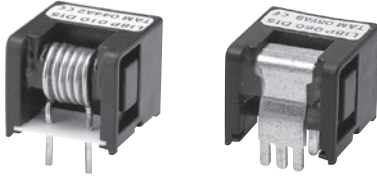
- 1. GND
- 2. GND
- 3. + Vcc
- 4. OUT
- 5. + IN
- 6. - IN

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	Types									
		L18P003S12	L18P005S12	L18P010S12	L18P015S12	L18P020S12	L18P025S12	L18P030S12	L18P040S12	L18P050S12	L18P060S12
Primary nominal 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)	εL	≤ ± 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	TcVo	≤ ± 2.0mV / °C (Without Tc Vof)									
Thermal drift of offset	TcVof	≤ ± 2.0mV / °C									
Hysteresis error	Voh	≤ 25mV (at If = 0A → If → 0A)									
Insulation voltage	Vd	AC3000V for 1 minute (Sensing current 0.5mA) Primary ↔ Secondary									
Insulation resistance	Ris	≥ 500M Ω (at DC500V) Primary ↔ Secondary									
Ambient Operating temperature	TA	- 30°C ~ + 80°C									
Ambient storage temperature	TS	- 40°C ~ + 85°C									

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

DIMENSIONS (mm)

The following table references

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]

The following table references

Terminal number

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

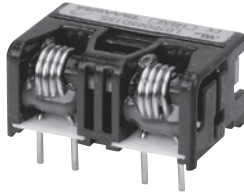
Current	***	φA
40A	040	
50A	050	
60A	060	

Note

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

Magnetic Proportion System, 2 Circuits Type

L07P D15 SERIES



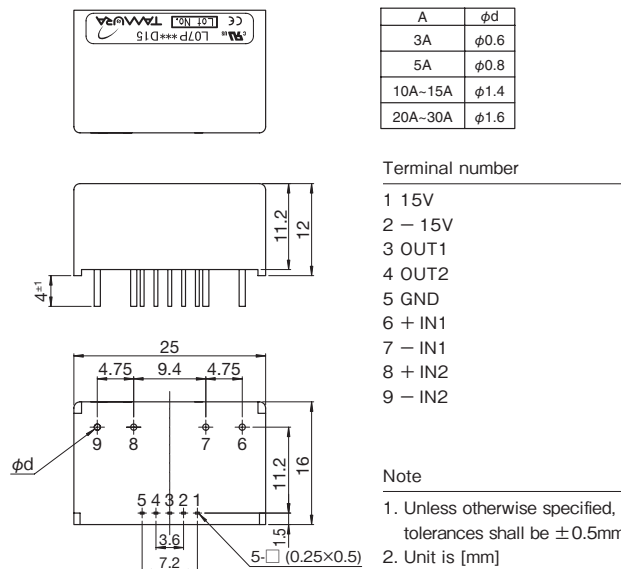
SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc=±15V

Spec		Types						
		L07P003D15	L07P005D15	L07P010D15	L07P015D15	L07P020D15	L07P025D15	L07P030D15
Primary nominal 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)	εL	≤ ± 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	TcVo	≤ 0.1% / °C (Without Tc Vof)						
Thermal drift of offset	TcVof	≤ ± 2.5mV / °C						
Hysteresis error	Voh	≤ 30mV (at If = 0A → If → 0A)						
Insulation voltage	Vd	AC2000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Secondary						
Insulation resistance	Ris	≥ 500MΩ (at DC500V) Primary ⇔ Secondary						
Ambient Operating temperature	Ta	- 30°C ~ + 80°C						
Ambient storage temperature	Ts	- 40°C ~ + 85°C						

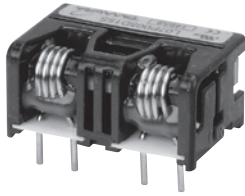
* 1 Offset voltage value is after removal of core hysteresis. *2 Shall be each channel's value. Other channel's input current to be 0A. *Please refer to the another sheet about conditions of UL Recognition.

DIMENSIONS (mm)



Magnetic Proportion System, 2 Circuits Type, Anti-Sulfurated

L07P D15S SERIES



Introduction

Fluxgate system

Open loop

Closed loop

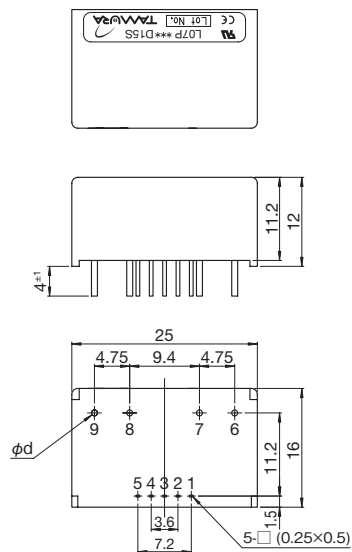
SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc=±15V

Types		Types						
		L07P003D15S	L07P005D15S	L07P010D15S	L07P015D15S	L07P020D15S	L07P025D15S	L07P030D15S
Primary nominal 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)	εL	≤ ± 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	TcVo	≤ 0.1% / °C (Without Tc Vof)						
Thermal drift of offset	TcVof	≤ ± 2.5mV / °C						
Hysteresis error	Voh	≤ 30mV (at If = 0A → If → 0A)						
Insulation voltage	Vd	AC2000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Secondary						
Insulation resistance	Ris	≥ 500M Ω (at DC500V) Primary ⇔ Secondary						
Ambient Operating temperature	TA	- 30°C ~ + 80°C						
Ambient storage temperature	TS	- 40°C ~ + 85°C						

* 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°C, 85%RH, 1500h, N=11, Pass)

DIMENSIONS (mm)



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

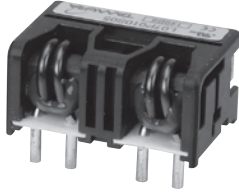
- Terminal number
- + Vcc (+ 15V)
 - Vcc (- 15V)
 - Vout 1
 - Vout 2
 - GND
 - Primary input current 1 (+)
 - Primary input current 1 (-)
 - Primary input current 2 (+)
 - Primary input current 2 (-)

Weight:
8g

- Note
- Unless otherwise specified, tolerances shall be ± 0.5mm
 - Unit is [mm]

Magnetic Proportion System, 2 Circuits Type

L07P S05 SERIES



SPECIFICATIONS

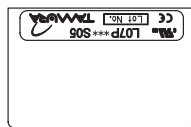
Ta=25°C, RL=10kΩ, Vcc=+5V

Spec		Types						
		L07P003S05	L07P005S05	L07P010S05	L07P015S05	L07P020S05	L07P025S05	L07P030S05
Primary nominal 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)	εL	≤ ± 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	TcVo	≤ 2mV / °C (Without Tc Vof)						
Thermal drift of offset	TcVof	≤ ± 2.0mV / °C MAX.						
Hysteresis error	Voh	≤ 15mV (at If = 0A → If → 0A)						
Insulation voltage	Vd	AC2000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Secondary						
Insulation resistance	Ris	≥ 500MΩ (at DC500V) Primary ⇔ Secondary						
Ambient Operating temperature	Ta	- 30°C ~ + 80°C						
Ambient storage temperature	Ts	- 40°C ~ + 85°C						

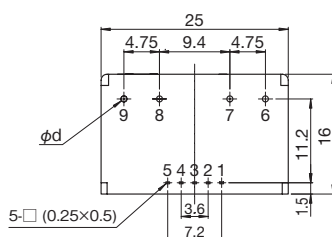
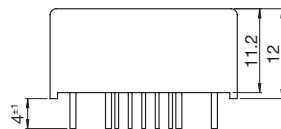
* 1 Offset voltage value is after removal of core hysteresis.

* 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

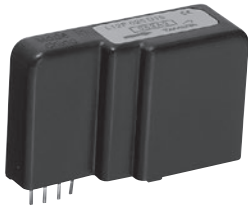
1. + 5V
2. NC
3. OUT1
4. OUT2
5. GND
6. + IN1
7. - IN1
8. + IN2
9. - IN2

Note

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

Magnetic Proportion System

L12P D15 SERIES



Introduction

Fluxgate system

Open loop

Closed loop

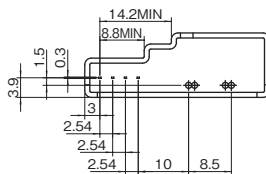
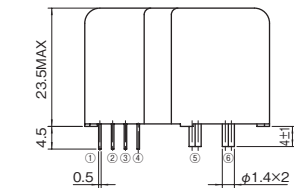
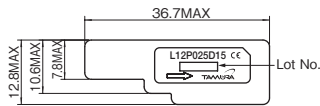
SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc=±15V

Spec	Types	Symbol	L12P025D15
Primary nominal current		If	25A
Primary conductor specification		—	Φ 1.4 × 2 *1
Continuous DC current		I _{con}	25A
Saturation current		I _{f max}	I _f × 3 *2
Rated output voltage		ε _L	4V ± 0.040V (at I _f)
Offset voltage		V _{of}	≤ ± 0.040V (at I _f = 0A) *3
Output linearity (0A ~ I _f)		V _{cc}	≤ ± 1% (at I _f)
Power supply voltage		V _{cc}	± 12V (± 5%) ~ ± 15V (± 5%)
Consumption current		I _{cc}	≤ 15mA
di/dt Response time		t _r	≤ 3μs (di/dt = I _f / μs)
Thermal drift of gain		T _{cVo}	≤ ± 0.1% / °C (Without T _c V _{of})
Thermal drift of offset		T _{cVof}	≤ ± 3.0mV / °C
Hysteresis error		V _{OH}	≤ 25mV (at I _f = 0A → I _f → 0A)
Insulation voltage		V _d	AC2500V for 1 minute (Sensing current 0.5mA) Primary ↔ Secondary
Insulation resistance		R _{is}	≥ 500MΩ (at DC500V) Primary ↔ Secondary
Ambient Operating temperature		T _A	- 30°C ~ + 80°C
Ambient storage temperature		T _S	- 40°C ~ + 85°C

* 1 Conductor terminals are soldered together. * 2 Also operate at V_{cc} = ± 12V power supplies, measuring range reduced to 2.5 x I_f.
 * 3 Offset voltage value is after removal of core hysteresis.

DIMENSIONS (mm)



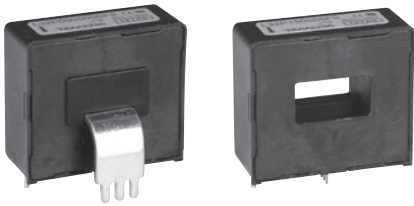
- Terminal number
- ① + Vcc (+ 15V)
 - ② - Vcc (- 15V)
 - ③ Vout
 - ④ GND
 - ⑤ Primary input current (+)
 - ⑥ Primary input current (-)

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



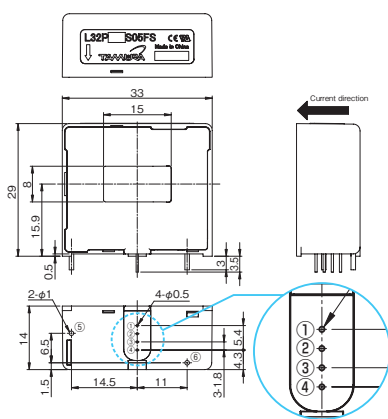
SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc=+5.0V

Spec	Types	Symbol	L32P050S05(B)FS	L32P100S05(B)FS	L32P150S05FS	L32P200S05FS	L32P300S05FS	L32P400S05FS
Primary nominal 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 ≥ 1M Ω . Ouput impedance : typ 200 Ω)					
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)		εL	± 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		TcVO	≤ ± 1.5mV/°C (Without TcVof)					
Thermal drift of offset (at If=0A)		TcVof	≤ ± 1.0mV/°C		≤ ± 0.6mV/°C		≤ ± 0.3mV/°C	
Hysteresis error (at 0A → If → 0A)		VOH	≤ ± 10mV		≤ ± 5.0mV		≤ ± 2.5mV	
Insulation voltage		Vd	AC2500V for 1 minute (Sensing current 0.5mA) Primary ↔ Secondary					
Insulation resistance		RiS	≥ 500M Ω (at DC500V) Primary ↔ Secondary					
Ambient Operating temperature		TA	- 40 ~ + 85°C					
Ambient storage temperature		TS	- 40 ~ + 85°C					

* 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 voltage 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

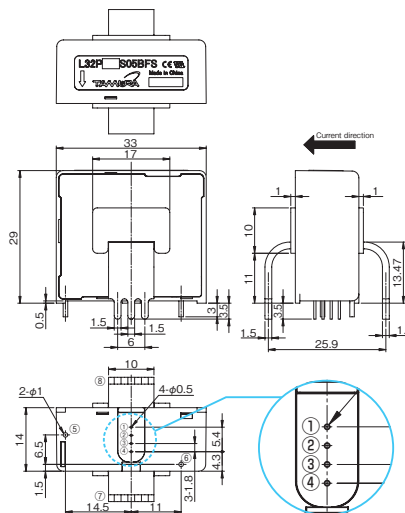
- ① Vcc (+5V)
- ② GND
- ③ Vout
- ④ Vref (IN/OUT)
- ⑤⑥ NC

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

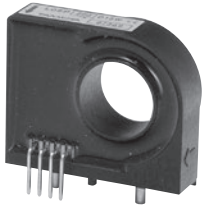
30g

Note

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

Magnetic Proportion System / Through Type

L08P IPV/W/IPVW SERIES



ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Comment
Supply voltage	V _{cc}	V	± 18V	

ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Comment
Insulation voltage	V _d	—	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	T _A	°C	- 40		+ 80	
Ambient storage temperature	T _S	°C	- 40		+ 85	
Mass	m	g		22		

SPECIFICATIONS

T_a=+25°C, R_L=10kΩ, V_{cc}=±15V

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Primary nominal current	L08P050D15IPV	I _{PN}	A		50	
	L08P100D15IPV				100	
	L08P150D15IPV				150	
	L08P200D15W				200	
	L08P300D15IPVW				300	
	L08P400D15IPVW				400	
	L08P500D15IPVW				500	
Primary current, measuring range * 1	L08P050D15IPV	I _{PM}	A	150		
	L08P100D15IPV			300		
	L08P150D15IPV			450		
	L08P200D15W			600		
	L08P300D15IPVW			600		
	L08P400D15IPVW			600		
	L08P500D15IPVW			600		

SPECIFICATIONS

Ta=+25°C, R_L=10kΩ, V_{cc}=±15V

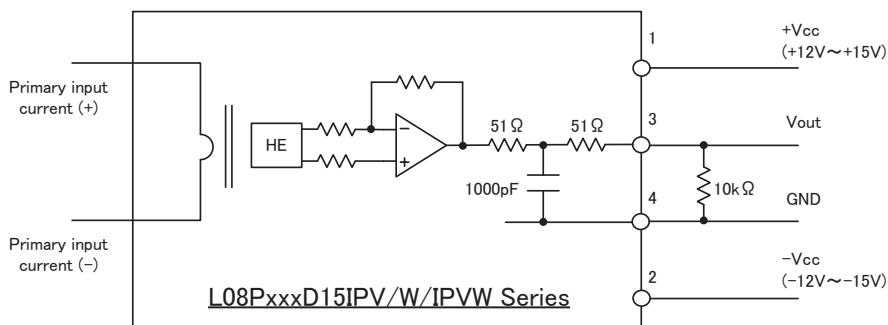
Parameters	Symbol	Unit	Value			Comment	
			MIN	TYP	MAX		
Supply voltage	V _{cc}	V	±12(±5%)	±15(±5%)			
Consumption current	I _{cc}	mA		14	20		
Rated output voltage	V _o	V	3.960	4.000	4.040	at I _{PN}	
Offset voltage * 2	V _{of}	V	-0.030	0.000	+0.030	at I _{PN} = 0A	
Hysteresis error	V _{OH}	mV			± 20	at 0A → I _{PN} → 0A	
Thermal drift of gain	TcV _o	%/°C			± 0.05	Without TcV _{of}	
Thermal drift of V _{of}	L08P050D15IPV	TcV _{of}	mV/°C			± 2	at I _{PN} = 0A
	L08P100D15IPV					± 1	
	L08P150D15IPV					± 1	
	L08P200D15W					± 1	
	L08P300D15IPVW					± 1	
	L08P400D15IPVW					± 1	
	L08P500D15IPVW					± 1	
Linearity error (0A ~ I _{PN})	ε _L	%	-1		+1		
Response time (@70% of I _{PN} - 70% of V _o)	t _r	μs			3	di/dt=100A/μs	
Response time (@10% of I _{PN} - 90% of V _o)	L08P050D15IPV	t _r	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	t _r	μs			7	di/dt=100A/μs

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

STANDARDS

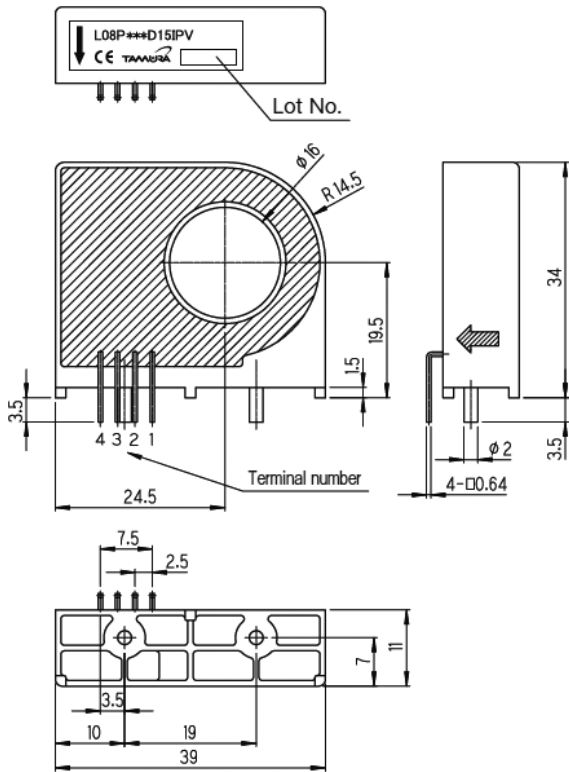
EN62477-1:2012 and EN62477-1:2012/A11:2014

CONNECTION

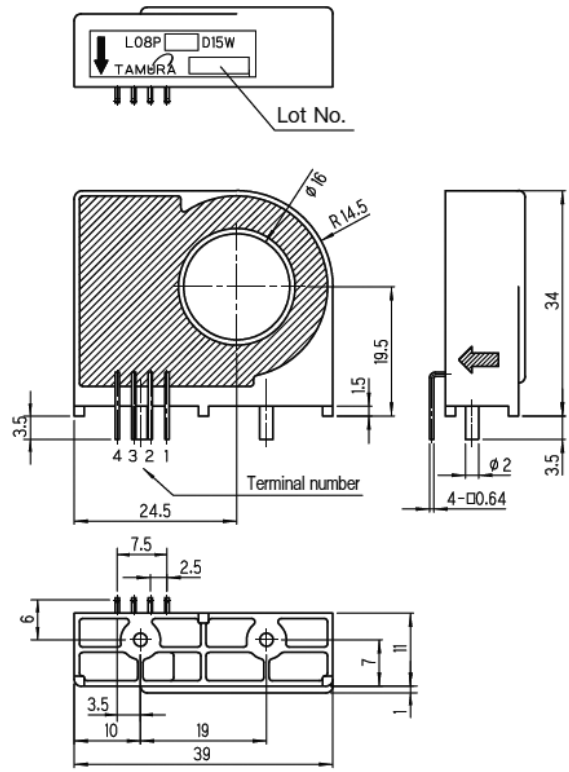


DIMENSIONS (mm)

L08PxxxD15IPV



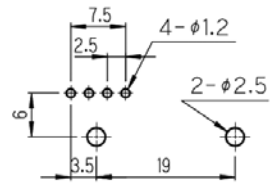
L08PxxxD15W/IPVW



- Terminal number
- 1 + Vcc (+ 15V)
 - 2 - Vcc (- 15V)
 - 3 Vout
 - 4 GND

Note

1. Unless otherwise specified, tolerances shall be $\pm 0.5\text{mm}$



Circuit board hole dimension (View of solder surface)

Magnetic Proportion System / Through Type

L37S S05 SERIES



ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Comment
Supply voltage	Vcc	V	+ 7V	

ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Comment
Insulation voltage	Vd	—	AC3300V, for 1minute (Sensing current 0.5mA)	Primary ⇔ Secondary
Impulse withstand voltage	Vw	kV	6.0	Primary ⇔ Secondary Input waveform : • Front time 1.2μs • Time to half value 50μs • single
Insulation resistance	R _{IS}	—	≥ 1000M Ω (at DC500V)	Primary ⇔ Secondary
Clearance distance	d _{ci}	—	6.5mm (MIN)	Primary ⇔ Secondary
Creepage distance	d _{cp}	—	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 EN62477-1 : 2012 and EN62477-1 : 2012/A11 2014, IEC/EN 61010-1
	—	—	600V, CAT III, PD2	Basic isolation, non uniform field according to EN62477-1 : 2012 and EN62477-1 : 2012/A11 2014, IEC/EN 61010-1

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Ambient operating temperature	T _A	°C	- 40		+ 85	
Ambient storage temperature	T _S	°C	- 40		+ 85	
Mass	m	g		62		

SPECIFICATIONS

Ta=+25°C, R_L=10kΩ, V_{CC}=±15V

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Primary nominal current	L37S050S05 *	I _{PN}	A		50	
	L37S100S05 *				100	
	L37S200S05 *				200	
	L37S300S05 *				300	
	L37S400S05 *				400	
	L37S500S05 *				500	
	L37S600S05 *				600	
Primary current, measuring range	L37S050S05 *	I _{PM}	A	150		
	L37S100S05 *			300		
	L37S200S05 *			600		
	L37S300S05 *			900		
	L37S400S05 *			900		
	L37S500S05 *			900		
	L37S600S05 *			900		
Supply voltage	V _{CC}	V	4.75	5.00	5.25	
Consumption current	I _{CC}	mA		15	20	
Reference voltage (output)	V _{ref1}	V	2.475	2.495	2.515	at I _p = 0A
Reference voltage (input) * 1	V _{ref2}	V	1.500		2.800	
Reference internal output resistance	R _{ref}	Ω		200		
Reference internal output capacitance	C _{ref}	nF		47		
Output voltage	V _o	V	V _{of} + 0.625V ± 0.015V			at I _{PN}
Offset voltage * 2	V _{of}	V				at I _p = 0A
Hysteresis error	V _{OH}	mV			± 20	at 0A → I _{PN} → 0A
Temperature coefficient of V _{ref1}	T _c V _{ref}	ppm/K				at I _p = 0A
Temperature coefficient of V _o	T _c V _o	%/K			± 0.1	Without T _c V _{of}
Temperature coefficient of V _{of}	L37S050S05 *	T _c V _{of}	mV/K			± 1.0
	L37S100S05 *					± 1.0
	L37S200S05 *					± 1.0
	L37S300S05 *					± 0.3
	L37S400S05 *					± 0.3
	L37S500S05 *					± 0.3
	L37S600S05 *					± 0.3
Linearity error 1	ε _{L1}	%	- 0.5		+ 0.5	at I _p = 0A ~ I _{PN}
Linearity error 2	ε _{L2}	%	- 1.0		+ 1.0	at I _p = 0A ~ I _{PM}
Response time (@90% of I _f)	t _r	μs			5	di/dt=100A/μs
Frequency bandwidth (at -3dB) * 4	BW	kHz	50			
Output voltage noise (DC · · · 10MHz)	V _{no}	mVpp			40	

* 1 It is possible to change V_{of} with an external reference voltage (between 1.5V - 2.8V providing its ability to sink or source approximately 5 mA.).
If the external reference voltage is not used, the V_{ref} pin should be left unconnected.

* 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 1 turn in through hole.

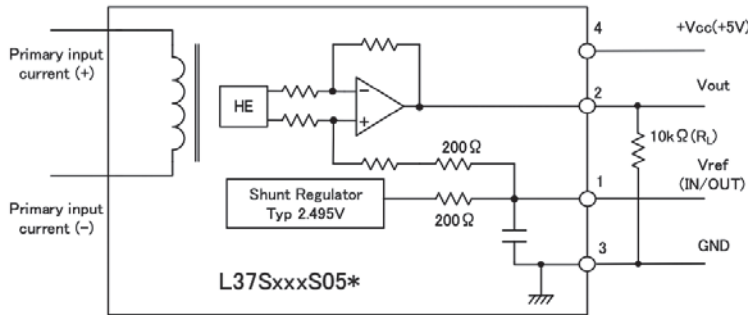
* 4 Please derate input current to avoid excessive product heating. If you input current with high frequency band.

STANDARDS

EN62477-1:2012 and EN62477-1:2012/A11:2014 , EN50178 , IEC/EN 61010-1 , IEC/EN 62109-1 , UL508 (file No. E243511)

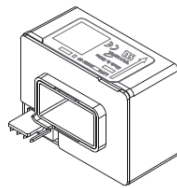
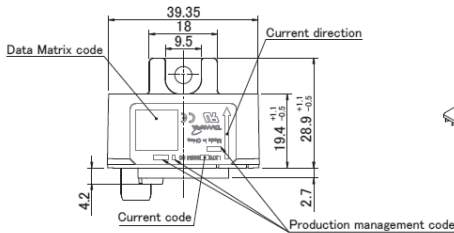
※ Please refer to the another sheet about conditions of UL Recognition.

CONNECTION

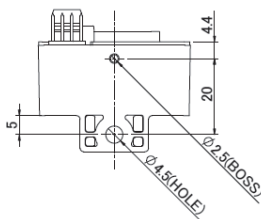
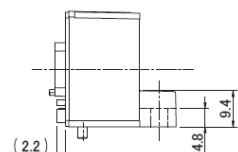
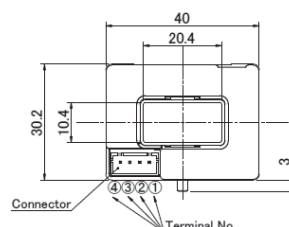
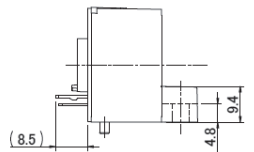
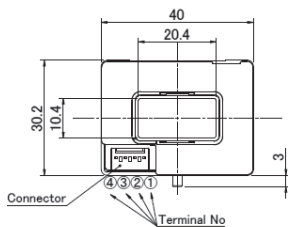
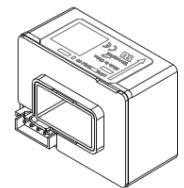
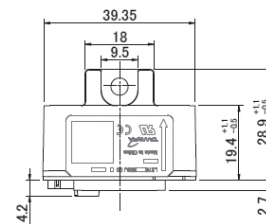


DIMENSIONS (mm)

L37SxxxD15M



L37SxxxD15J



Terminal number

- 1 VREF
- 2 Vout
- 3 GND
- 4 +Vcc (+5V)

Note

Unless otherwise specified tolerances shall be ±0.5mm.

Note

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

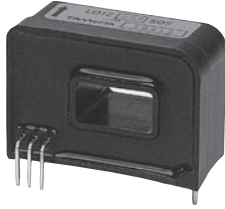
Order number and Connector number (terminal plating)

Types		Connector			
		Manufacturer	Part Number	Old Part Number	Plating of terminal
L37SxxxS05J	Standard	JST	B4B-XH-A-G	—	Au
L37SxxxS05M	Standard	Molex	22-04-1041	5045-04A	Sn
L37SxxxS05M-A	Build to Order		22-11-1041	5045-04AG	Au

As for the L37SxxxS05M series of a gold-plated connector, 'A' attaches to the end of the product name.

Magnetic Proportion System / Through Type

L01Z SERIES



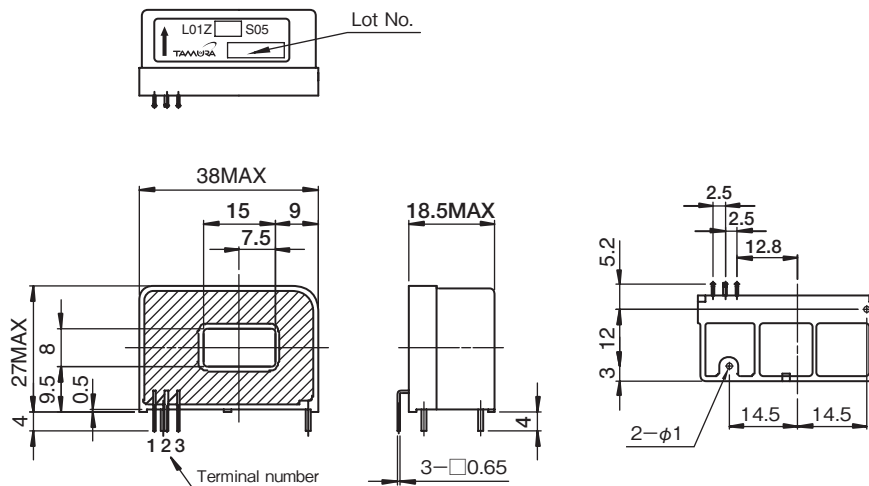
SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc=+5V

Spec	Types	L01Z050S05	L01Z100S05	L01Z150S05	L01Z200S05	L01Z300S05	L01Z400S05	L01Z500S05	L01Z600S05
		Primary nominal current	If	50AT	100AT	150AT	200AT	300AT	400AT
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)	εL	≤ ± 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	TcVo	≤ ± 2mV / °C (Without Tc Vof)	≤ ± 1.5mV / °C (Without Tc Vof)						
Thermal drift of offset	TcVof	≤ ± 2mV / °C	≤ ± 1mV / °C						
Hysteresis error	VOH	≤ 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	RIS	≥ 500MΩ (at DC500V) inside of through hole ⇔ terminal							
Ambient Operating temperature	TA	- 20°C ~ + 80°C							
Ambient storage temperature	TS	- 40°C ~ + 85°C							

* 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



ABSOLUTE MAXIMUM RATINGS

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

ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Comment
Insulation voltage	V _d	—	AC3600V, for 1minute (Sensing current 0.5mA)	Primary ⇔ Secondary
Impulse withstand voltage	V _w	kV	6.6	Primary ⇔ Secondary Input waveform : • Front time 1.2μs • Time to half value 50μs • single
Insulation resistance	R _{IS}	—	≥ 1000M Ω (at DC500V)	Primary ⇔ Secondary
Clearance distance	d _{Cl}	—	6.5mm (MIN)	Primary ⇔ Secondary
Creepage distance	d _{CP}	—	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 EN62477-1 : 2012 and EN62477-1 : 2012/A11 2014, IEC/EN 61010-1
	—	—	600V, CAT III, PD2	Basic isolation, non uniform field according to EN62477-1 : 2012 and EN62477-1 : 2012/A11 2014, IEC/EN 61010-1

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Ambient operating temperature	T _A	°C	- 40		+ 85	
Ambient storage temperature	T _S	°C	- 40		+ 85	
Mass	m	g		62		

SPECIFICATIONS

Ta=+25°C, R_L=10kΩ, V_{CC}=±15V

Parameters	Symbol	Unit	Value			Comment	
			MIN	TYP	MAX		
Primary nominal current * 1	L37S050D15 *	I _{PN}	A		I _{fmax}		
	L37S100D15 *				100		
	L37S200D15 *				200		
	L37S300D15 *				300		
	L37S400D15 *				400		
	L37S500D15 *				500		
	L37S600D15 *				600		
Primary current, measuring range * 2	L37S050D15 *	I _{PM}	A	150			
	L37S100D15 *			300			
	L37S200D15 *			600			
	L37S300D15 *			900			
	L37S400D15 *			1000			
	L37S500D15 *			1000			
	L37S600D15 *			1000			
Supply voltage * 3	V _{CC}	V	± 12(± 5%)	± 15(± 5%)			
Consumption current	I _{CC}	mA		15	20		
Rated output voltage	V _O	V	3.960	4.000	4.040	at I _{PN}	
Offset voltage * 4	L37S050D15 *	V _{of}	V	- 0.030	0.000	+ 0.030	at I _p = 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 → I _{PN} → 0A	
Thermal drift of gain	TcV _o	%/°C			± 0.1	Without TcV _{of}	
Temperature coefficient of V _{of}	L37S050D15 *	TcV _{of}	mV/°C			± 2	at I _p = 0A
	L37S100D15 *					± 1	
	L37S200D15 *					± 1	
	L37S300D15 *					± 1	
	L37S400D15 *					± 1	
	L37S500D15 *					± 1	
	L37S600D15 *					± 1	
Linearity error	ε _L	%	- 1		+ 1	at I _p = 0A ~ I _{PN}	
Response time (at 90% of I _{PN})	t _r	μs			3	di/dt=100A/μs	

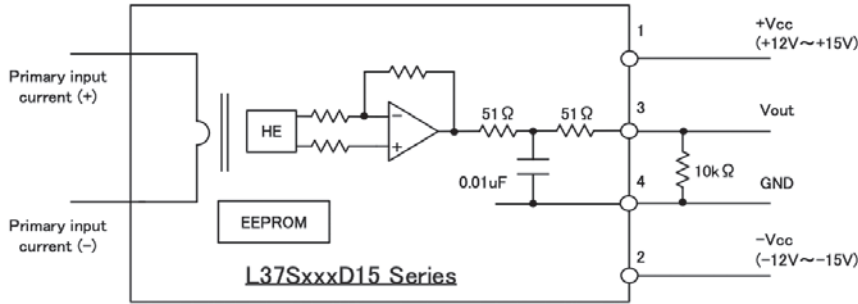
* 1 Products with a primary nominal current of 800A are also available. Please contact us for details.
 * 2 If the product of 300A or less operate at V_{CC} = ± 12V power supplies, measuring range reduced to 2.5 x I_{PN}.
 * 3 The power on rise time should be less than 45ms at time from 0 to + 11V.
 Current sensor may not operate normally because EEPROM in sensor does not work normally.
 * 4 Offset voltage value is after removal of core hysteresis.

STANDARDS

EN62477-1: 2012 and EN62477-1: 2012/A11 2014, IEC/EN 61010-1, IEC/EN 62109-1, UL508 (file No E243511)

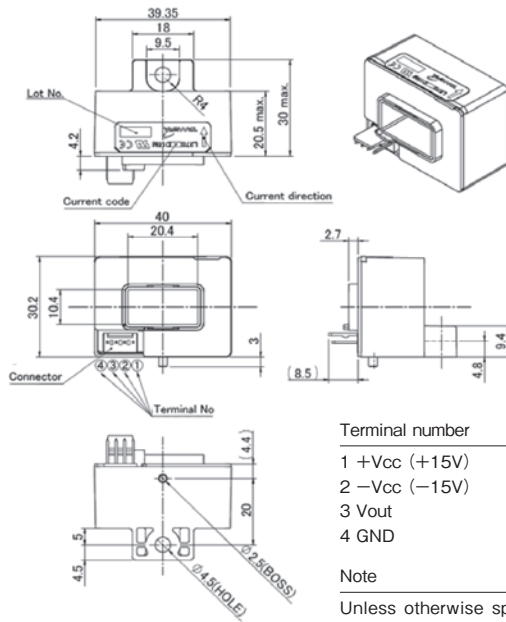
※ Please refer to the another sheet about conditions of UL Recognition.

CONNECTION

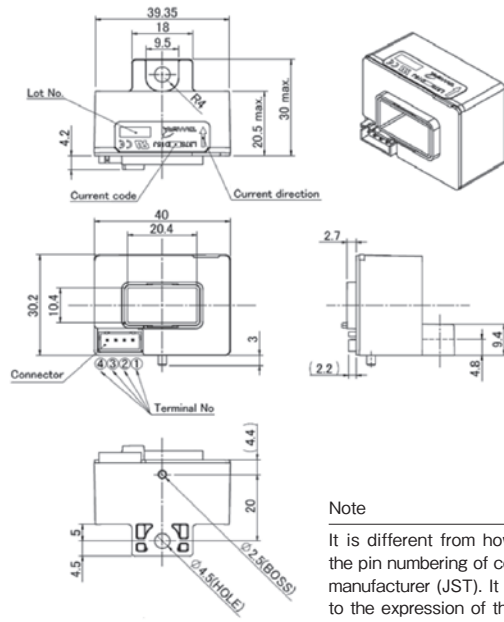


DIMENSIONS (mm)

L37SxxxD15M



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.

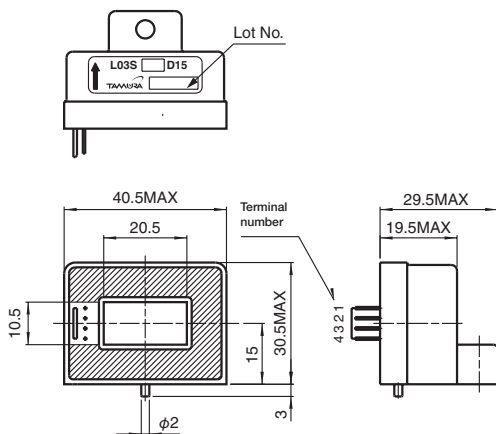
SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc=±15V

Types		Types						
		L03S050D15	L03S100D15	L03S200D15	L03S300D15	L03S400D15	L03S500D15	L03S600D15
Primary nominal 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)	εL	≤± 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	TcVo	≤± 0.1% / °C (without Tc Vof)						
Thermal drift of offset	TcVof	≤± 2mV / °C	≤± 1mV / °C					
Hysteresis error	V0H	≤ 20mV (at If = 0A → If → 0A)						
Insulation voltage	Vd	AC2500V for 1 minute (Sensing current 0.5mA) inside of through hole ⇔ terminal						
Insulation resistance	Ris	≥ 500MΩ (at DC500V) , inside of through hole ⇔ terminal						
Ambient Operating temperature	TA	- 20°C ~ + 80°C						
Ambient storage temperature	TS	- 40°C ~ + 90°C						

* 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

L31S S05FS SERIES



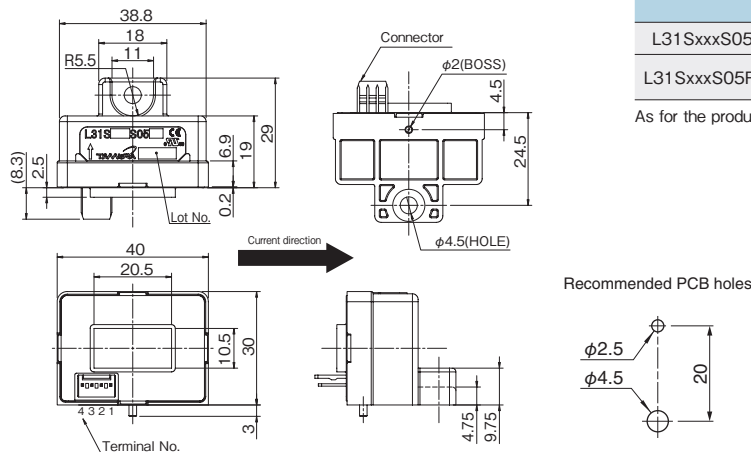
SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc=+5.0V

Spec	Types	Symbol	Types						
			L31S050S05FS	L31S100S05FS	L31S200S05FS	L31S300S05FS	L31S400S05FS	L31S500S05FS	L31S600S05FS
Primary nominal 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)		εL	± 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		TcVO	≤ ± 1.5mV/°C (Without TcVof)						
Thermal drift of offset (at If=0A)		TcVof	≤ ± 1.0mV/°C			≤ ± 0.3mV/°C			
Hysteresis error (at 0A → If → 0A)		VOH	≤ ± 10mV			≤ ± 2.5mV			
Insulation voltage		Vd	AC3300V for 1 minute (Sensing current 0.5mA) Primary ↔ Secondary						
Insulation resistance		Ris	≥ 500M Ω (at DC500V) Primary ↔ Secondary						
Ambient Operating temperature		TA	- 40 ~ + 85°C						
Ambient storage temperature		TS	- 40 ~ + 85°C						

* 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)



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	Molex	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	Note
1 Vref (IN/OUT)	1. Unless otherwise specified, tolerances shall be ±0.5mm 2. Unit is [mm]
2 Vout	
3 GND	
4 +Vcc (+5V)	
Weight	
38g	

Magnetic Proportion System / Through Type

L06P S05 SERIES



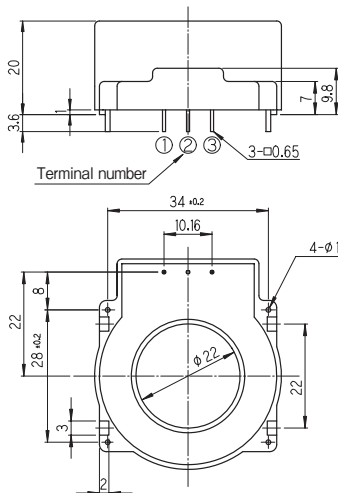
SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc=+5V

Types		L06P300S05	L06P400S05	L06P600S05	L06P800S05
Primary nominal 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 (OA ~ If)	εL	≤ ± 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	TcVo	≤ ± 1.5mV/°C (Without Tc Vof)			
Thermal drift of offset	TcVof	≤ ± 1.0mV/°C (at If = 0A)			
Hysteresis error	VOH	≤ 10mV (at If = 0A → If → 0A)			
Insulation voltage	Vd	AC2500V for 1 minute (Sensing current 0.5mA) Primary ↔ Secondary			
Insulation resistance	RIS	≥ 500M Ω (at DC500V) Primary ↔ Secondary			
Ambient Operating temperature	TA	- 40°C ~ + 85°C			
Ambient storage temperature	TS	- 40°C ~ + 85°C			

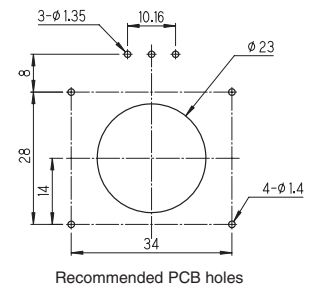
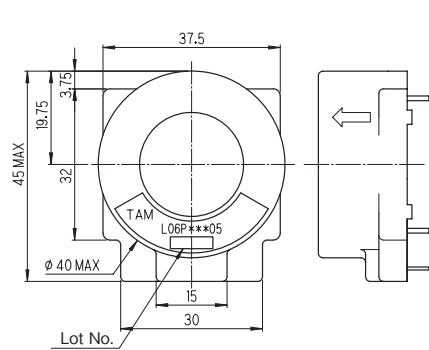
* 1 Vref=Vcc/2 * 2 Offset voltage value is after removal of core hysteresis.

DIMENSIONS (mm)



Terminal number
 1 OUTPUT
 2 GND
 3 + 5V
 Weight:
 65 ± 5g

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



Magnetic Proportion System / Through Type

L05Z SERIES



Introduction

Fluxgate system

Open loop

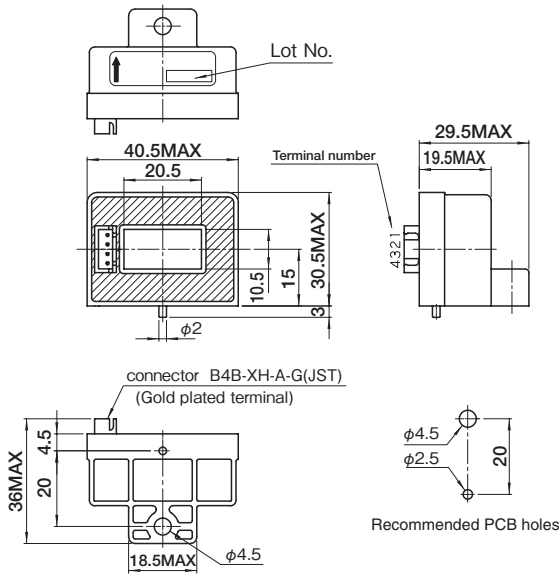
Closed loop

SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc=±15V

Types		L05Z800S15
Spec		
Primary nominal 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)	εL	± 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	TcVo	± 0.1% / °C (Without Tc Vof)
Thermal drift of offset	TcVof	± 1.0mV / °C
Hysteresis error	VOH	≤ 20mV (at If = 0A → If → 0A)
Insulation voltage	Vd	AC2500V for 1 minute (Sensing current 0.5mA) inside of through hole ⇔ terminal
Insulation resistance	RIS	≥ 500MΩ (at DC500V) inside of through hole ⇔ terminal
Ambient Operating temperature	TA	- 40°C ~ + 85°C
Ambient storage temperature	TS	- 40°C ~ + 85°C

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 / Through Type, Ta=105°C Operating

L34S D15T SERIES



ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Comment
Supply voltage	Vcc	V	± 18V	
Primary conductor temperature	—	°C	105	
Minimum load resistance	R _L	—	2 kΩ	Recommend R _L = 10kΩ

ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Comment
Insulation voltage	V _d	—	AC3000V, for 1minute (Sensing current 0.5mA)	Primary ⇔ Secondary
Impulse withstand voltage	V _w	kV	6.0	Primary ⇔ Secondary Input waveform : • Front time 1.2μs • Time to half value 50μs • single
Insulation resistance	R _{IS}	—	≥ 500MΩ (at DC500V)	Primary ⇔ Secondary
Clearance distance	d _{cl}	—	6.6mm (MIN)	Primary ⇔ Secondary
Creepage distance	d _{cp}	—	6.6mm (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 EN62477-1 : 2012 and EN62477-1 : 2012/A11 2014
	—	—	600V, CAT III, PD2	Basic isolation, non uniform field according to EN62477-1 : 2012 and EN62477-1 : 2012/A11 2014

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Ambient operating temperature * 1	T _A	°C	- 40		+ 105	
Ambient storage temperature	T _S	°C	- 40		+ 105	
Mass	m	g		165		
Internal magnetic core	—	—	Silicon steel			

* 1 Temperature of the connector should not exceed 105°C because the absolute maximum temperature of the connector is +105°C.

SPECIFICATIONS

Ta=+25°C, R_L=10kΩ, V_{cc}=±15V

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Primary nominal current	L34S200D15T	I _{PN}	A		200	
	L34S300D15T				300	
	L34S400D15T				400	
	L34S500D15T				500	
	L34S600D15T				600	
	L34S800D15T				800	
	L34S1T0D15T				1000	
	L34S1T2D15T				1200	
	L34S1T5D15T				1500	
Primary current, measuring range * 1,2	L34S200D15T	I _{PM}	A	600		
	L34S300D15T			900		
	L34S400D15T			1200		
	L34S500D15T			1500		
	L34S600D15T			1800		
	L34S800D15T			2400		
	L34S1T0D15T			2500		
	L34S1T2D15T			2500		
	L34S1T5D15T			2500		
Supply Voltage	V _{cc}	V	± 12 (± 5%)	± 15 (± 5%)		
Consumption current	I _{cc}	mA		16	25	
Rated output voltage	V _o	V	3.960	4.000	4.040	at I _{pN}
Offset voltage * 3	V _{of}	V	- 0.020	0.000	+ 0.020	at I _p = 0A
Hysteresis error	V _{OH}	mV	- 10		± 10	at 0A → I _{pN} → 0A
Temperature coefficient of V _{of}	TcV _o	%/°C	- 0.05		+ 0.05	Without TcV _{of}
Temperature coefficient of V _{of}	TcV _{ref}	mV/°C	- 1.0		± 1.0	at I _p = 0A
Linearity error (0A ~ I _{pN})	ε _L	%	- 0.5		+ 0.5	at 0A , 1/2I _{pN} , I _{pN}
Response time (@90% of I _p) * 4	t _r	μs			5	di/dt=100A/μs
Frequency bandwidth (- 3dB) * 5	BW	kHz	25			at very low current

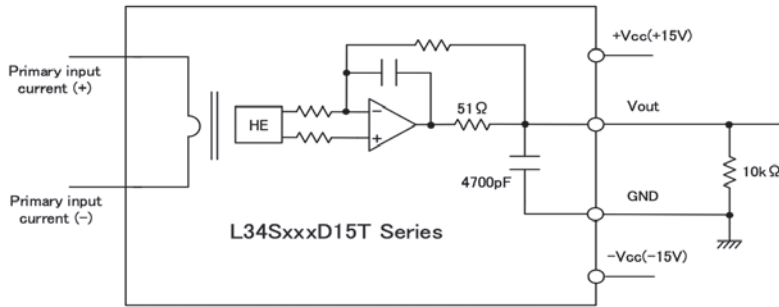
- * 1 If the product of 800A or less operate at V_{cc} = ± 12V power supplies, measuring range reduced to 2.5 x I_{pN}.
- * 2 The value of measured current which indicates an output with a greater than ± 5% deviation from the theoretical output value.
- * 3 Offset voltage value is after removal of core hysteresis.
- * 4 Measurement condition : Primary conductor cross sectional area is as same as through hole, and penetration with 1turn in through hole.
- * 5 High fundamental frequency primary current and/or harmonic current may result in excessive heating in magnetic core (Silicon steel).

STANDARDS

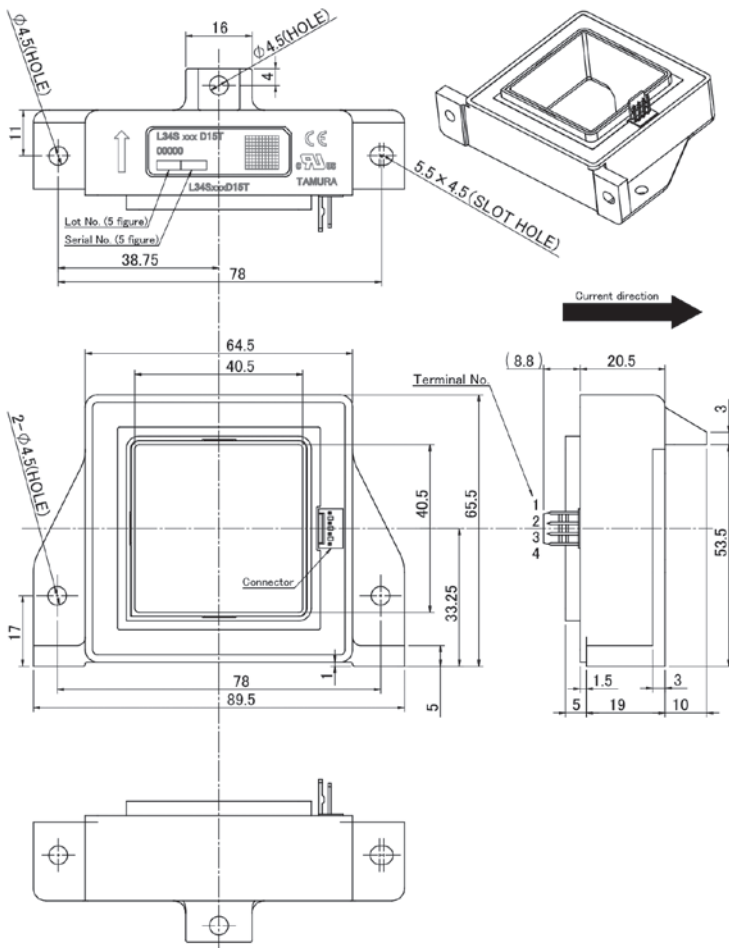
EN62477-1 : 2012 and EN62477-1 : 2012/A11 2014, UL508, CSA

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

CONNECTION



DIMENSIONS (mm)



- Terminal number
- 1 +Vcc (+15V)
 - 2 -Vcc (-15V)
 - 3 Vout
 - 4 GND

Unit mm

Note
Unless otherwise specified tolerances shall be ±0.5mm.

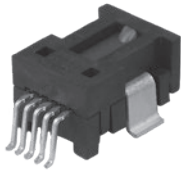
Order number and Connector number (terminal plating)

Types		Connector			
		Manufacturer	Part Number	Old Part Number	Plating of terminal
L34SxxxD15T	Standard	Molex	22-04-1041	5045-04A	Sn
L34SxxxD15T-A	Build to Order		22-11-1041	5045-04AG	Au

*As for the L34SxxxD15T series of a gold-plated connector, '-A' attaches to the end of the product name.

Magnetic Proportion System / Compact size and High-speed response

LA01M SERIES



ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Comment
Supply voltage	V _{DD}	V	6	
Jumper temperature	—	°C	120	
Output current	I _{out}	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	V _d	V	≥ AC2500V, 50/60Hz, for 1minute (Sensing current 0.5mA)	Primary ⇔ Secondary
Impulse withstand voltage	V _w	kV	2.5	Primary ⇔ Secondary Input waveform : • Front time 1.2μs • Time to half value 50μs • single
Clearance distance	d _{Cl}	mm	2.0	Primary ⇔ Secondary
Creepage distance	d _{cp}	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	T _A	°C	- 40		+ 90	
Ambient storage temperature	T _S	°C	- 40		+ 125	
Mass	m	g		2		

SPECIFICATIONS

Ta=+25°C, V_{DD}=+5V, R_L≥10MΩ

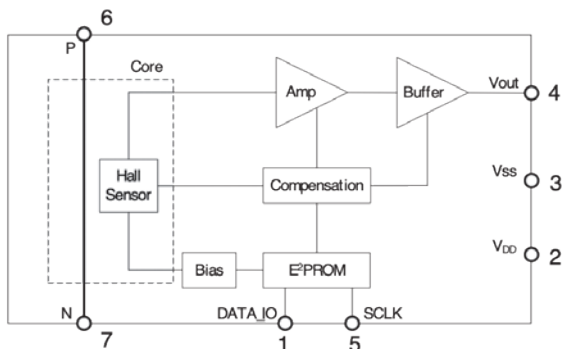
Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Measurement current range	LA01M021S05	I _{PN}	A	- 21		21
	LA01M032S05			- 31.8		31.8
	LA01M035S05			- 35		35
	LA01M041S05			- 41		41
Maximum primary current (RMS)	I _{p (RMS) max}	A			20	

SPECIFICATIONS

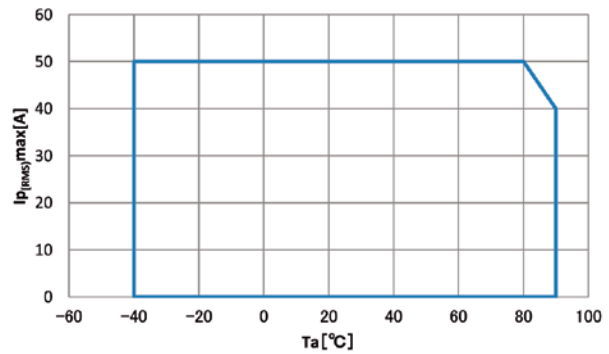
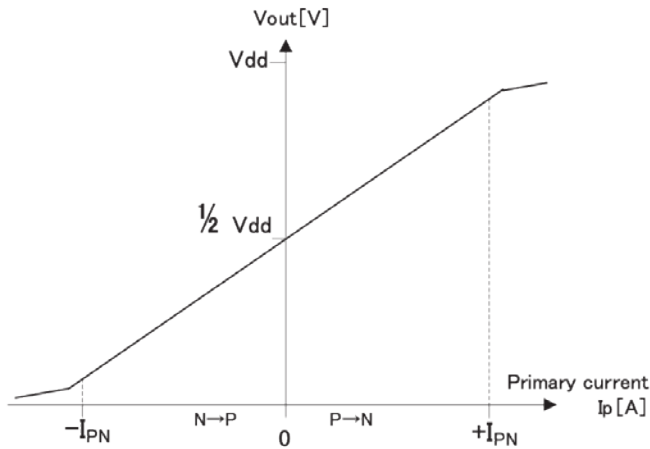
Ta=+25°C, V_{DD}=+5V, R_L≥10MΩ

Parameters	Symbol	Unit	Value			Comment	
			MIN	TYP	MAX		
Supply Voltage	V _{DD}	V	4.5	5.0	5.5		
Number of primary turns	N _p	T	1				
Primary Jumper resistance	R _p	mΩ		0.34			
Current consumption (at I _p =0A)	I _{DD}	mA			10		
Offset voltage	LA01M021S05	V _{of}	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°C, Variation from V _{of} (Ta=35°C), I _p =0A)	LA01M021S05	TCV _o	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 G (at Ta= +35 ~ +90°C, Variation ratio to G (Ta=35°C))	LA01M021S05	TCG ₁	%	± 1.0			
	LA01M032S05			± 1.0			
	LA01M035S05			± 1.0			
	LA01M041S05			± 2.0			
Temperature coefficient 2 of G (at Ta= -40 ~ +35°C, Variation ratio to G (Ta=35°C))	TCG ₂	%		± 2.0			
Linearity error	ε _L	%	-1		1	at I _P = 0A ~ I _{PN}	
Output noise voltage	V _{NRMS}	mV _{rms}			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 I _{PN})	t _r	μs		1		C _L =100pF	
Frequency bandwidth (-3dB)	BW	kHz		400		C _L =100pF	

FUNCTIONAL BLOCK DIAGRAM

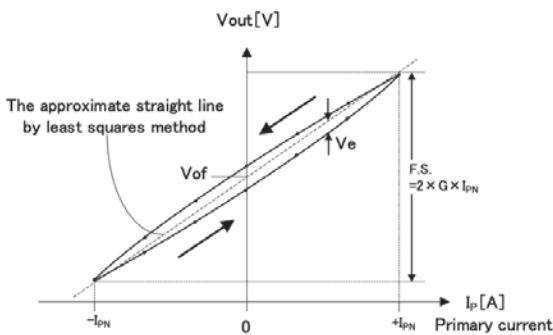


CHARACTERISTIC CURVE (TYP) AND PRIMARY CURRENT DERATING CURVE



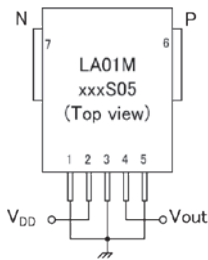
Conditions : Mounted on the test board complying with the EIA/JEDEC Standards (EIA/JESD51.)

CHARACTERISTICS DEFINITIONS



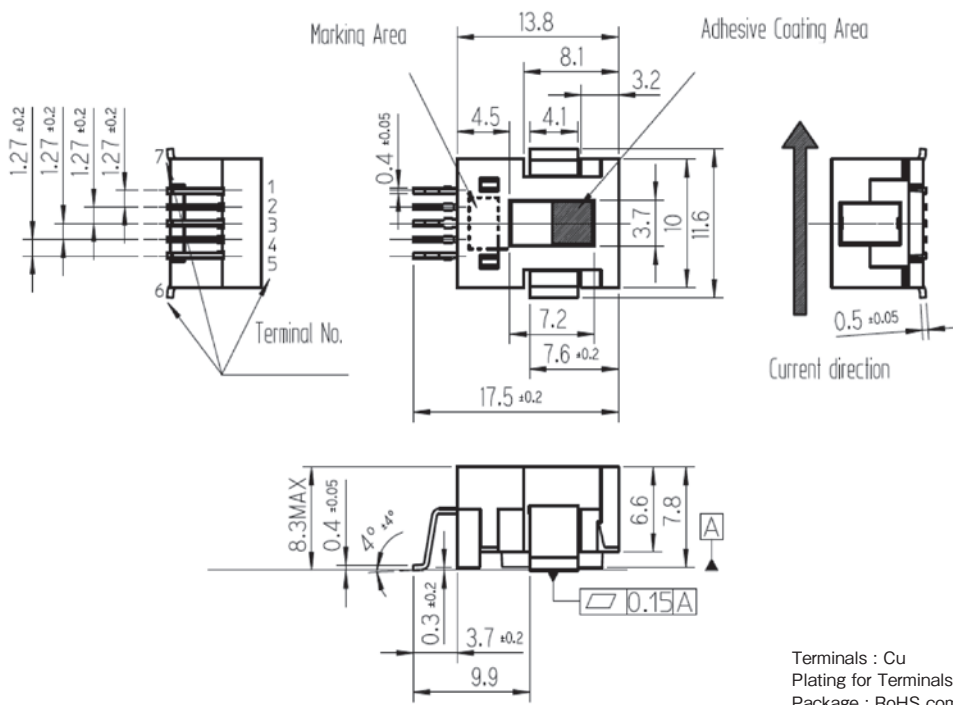
- Sensitivity G [mV/A], Offset voltage V_{of} [V]
Sensitivity (G) is defined as slope of the approximate straight line by least squares method, using the data of the output voltage (V_{out}) when sweeping the measured current I_p at rated current range.
Also Offset voltage (V_{of}) is defined as the intercept of the approximate straight line.
- Output linearity ϵ_L [%]
Output linearity (ϵ_L) is defined as the ratio of maximum error voltage (V_e) to the full scale (F.S.), where V_d is maximum difference between the Output voltage (V_{out}) and the approximate straight line calculated in the sensitivity and offset voltage definition;
 $\epsilon_L = V_e / F.S. \times 100$
- Ratiometric error of sensitivity V_{G-R} [%], ratiometric error of Offset voltage V_{of-R} [%]
Output of LA01M Series is ratiometric.
Sensitivity (G) and Offset voltage (V_{of}) are proportional to Supply voltage (V_{DD}).
- Ratiometric error is defined as follows in the supply voltage range ($4.5V < V_{DD} < 5.5V$);
 $V_{G-R} = 100 \times [(G(V_{DD}=V_{DD1}) / G(V_{DD}=5V)) - (V_{DD1} / 5)] / (V_{DD1} / 5)$
 $V_{of-R} = 100 \times [V_{of}(V_{DD}=V_{DD1}) - V_{of}(V_{DD}=5V) \times (V_{DD1} / 5)] / F.S.$

TERMINAL DESCRIPTIONS



Terminal number	Description
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

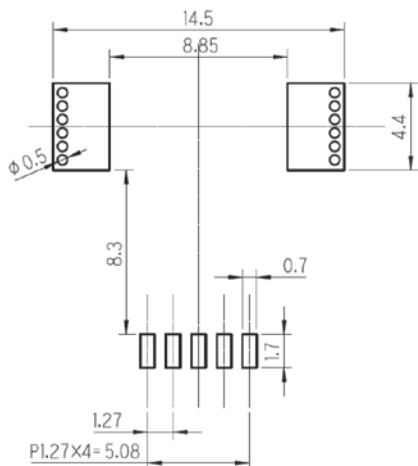
DIMENSIONS (mm)



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

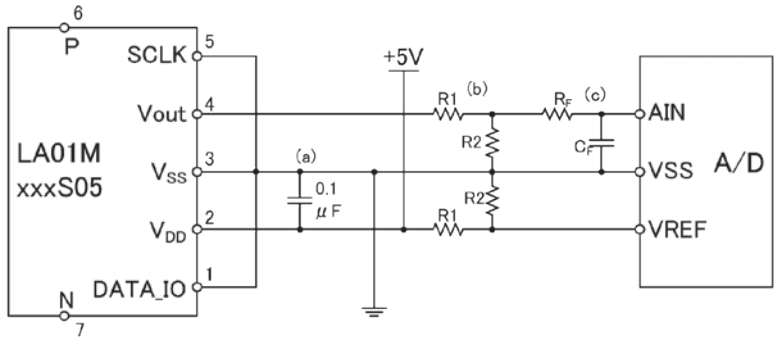
- Note1) The tolerances of dimensions without any mention are ± 0.1mm.
- Note2) The adhesive material (RoHS compliant, halogen free) is used for holding the magnetic core.

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 μF 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.

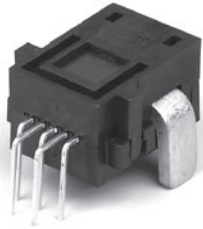
TYPE DESIGNATION

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	—	°C	120	
Output current	I _{out}	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	V _d	V	≥ AC2500V, 50/60Hz, for 1minute (Sensing current 0.5mA)	Primary ⇔ Secondary
Impulse withstand voltage	V _w	kV	2.5	Primary ⇔ Secondary Input waveform : • Front time 1.2μs • Time to half value 50μs • single
Clearance distance	d _{ci}	mm	2.7	Primary ⇔ Secondary
Creepage distance	d _{cp}	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	T _a	°C	- 40		+ 90	
Ambient storage temperature	T _s	°C	- 40		+ 125	
Mass	m	g		12		

SPECIFICATIONS

T_a=+25°C, V_{DD}=+5V, R_L≥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

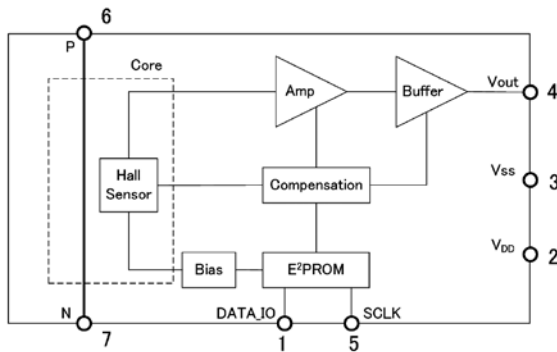
SPECIFICATIONS

Ta=+25°C, VDD=+5V, RL≥10MΩ

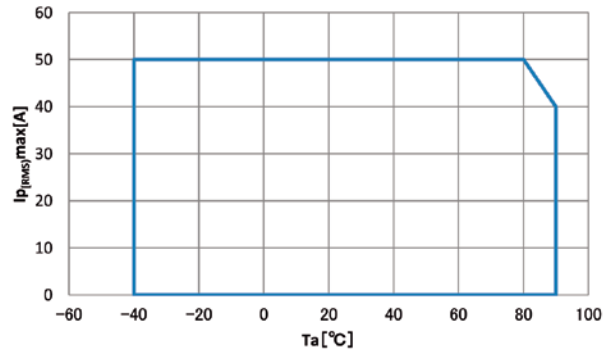
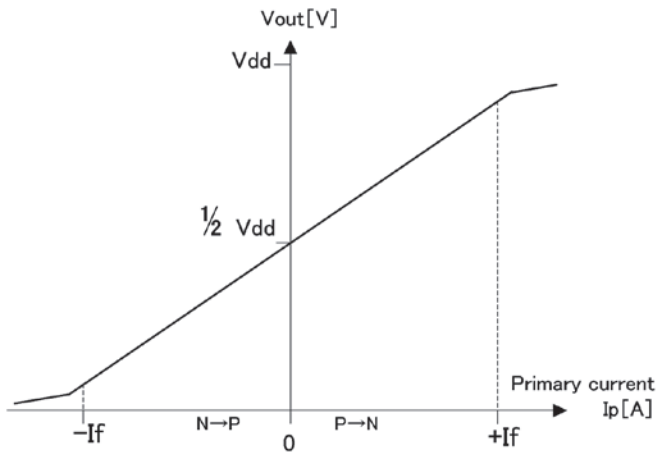
Parameters	Symbol	Unit	Value			Comment	
			MIN	TYP	MAX		
Maximum primary current (RMS)	$I_{p(RMS)}$ max	A			50	* 1	
Supply Voltage	V_{DD}	V	4.5	5.0	5.5		
Number of primary turns	N_p	T	1				
Primary Jumper resistance	R_p	mΩ		0.10			
Current consumption (at $I_p=0A$)	I_{DD}	mA			10		
Offset voltage	LA01P035S05	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°C, Variation from Vof (Ta=35°C), $I_p=0A$)	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°C, Variation ratio to G (Ta=35°C))	LA01P035S05	TCG1	%		± 1		
	LA01P046S05				± 2		
	LA01P054S05				± 1		
	LA01P085S05				± 1		
Temperature coefficient 2 of Sensitivity (at Ta= -40 ~+35°C, Variation ratio to G (Ta=35°C))	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-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	

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

FUNCTIONAL BLOCK DIAGRAM

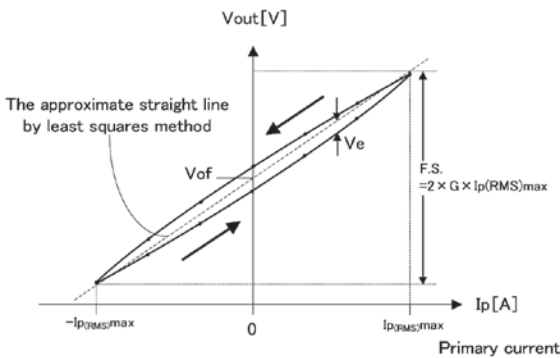


CHARACTERISTIC CURVE (TYP) AND PRIMARY CURRENT DERATING CURVE



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

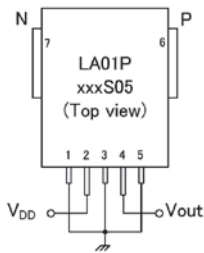
CHARACTERISTICS DEFINITIONS



• When $I_{p(RMS)max}$ is bigger than the value of I_f , $I_{p(RMS)max}$ restricts it to the value of I_f .

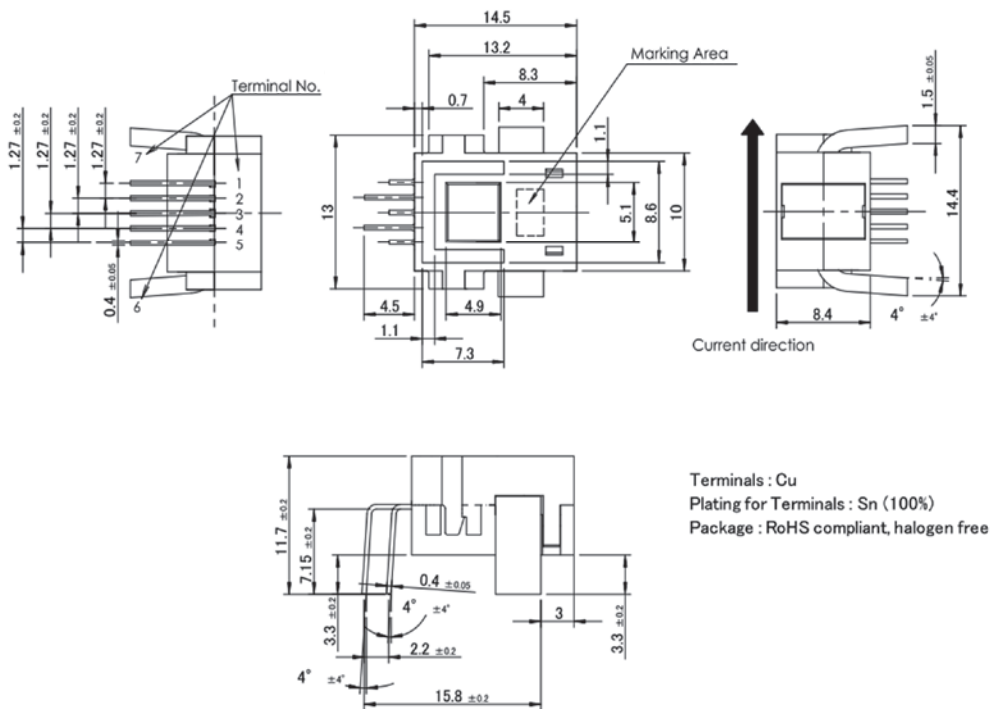
- Sensitivity G [mV/A], Offset voltage V_{of} [V]
Sensitivity (G) is defined as slope of the approximate straight line by least squares method, using the data of the output voltage (V_{out}) when sweeping the measured current I_p at rated current range.
Also Offset voltage (V_{of}) is defined as the intercept of the approximate straight line.
- Output linearity ϵ_L [%]
Output linearity (ϵ_L) is defined as the ratio of maximum error voltage (V_e) to the full scale (F.S.), where V_d is maximum difference between the Output voltage (V_{out}) and the approximate straight line calculated in the sensitivity and offset voltage definition;
 $\epsilon_L = V_e / F.S. \times 100$
- Ratiometric error of sensitivity V_{G-R} [%], ratiometric error of Offset voltage V_{of-R} [%]
Output of LA01P Series is ratiometric.
Sensitivity (G) and Offset voltage (V_{of}) are proportional to Supply voltage (V_{DD}).
- Ratiometric error is defined as follows in the supply voltage range ($4.5V < V_{DD1} < 5.5V$);
 $V_{G-R} = 100 \times [(G(V_{DD}=V_{DD1}) / G(V_{DD}=5V)) - (V_{DD1} / 5)] / (V_{DD1} / 5)$
 $V_{of-R} = 100 \times [V_{of}(V_{DD}=V_{DD1}) - V_{of}(V_{DD}=5V) \times (V_{DD1} / 5)] / F.S.$

TERMINAL DESCRIPTIONS



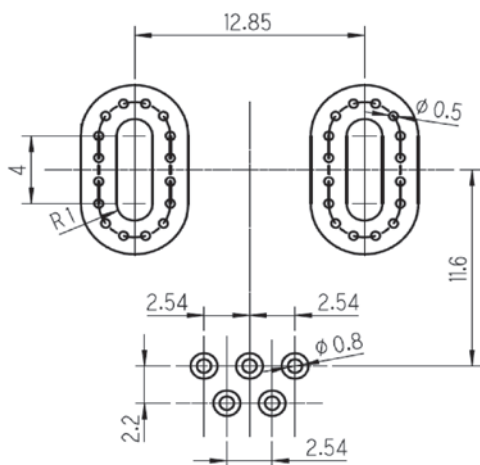
Terminal number	Description
① DATA_IO	Test pin (connect to GND)
② V _{DD}	Power supply (5V)
③ V _{SS}	GND (0V)
④ Vout	Analog output
⑤ SCLK	Test pin (connect to GND)
⑥ P	Input
⑦ N	Output

DIMENSIONS (mm)



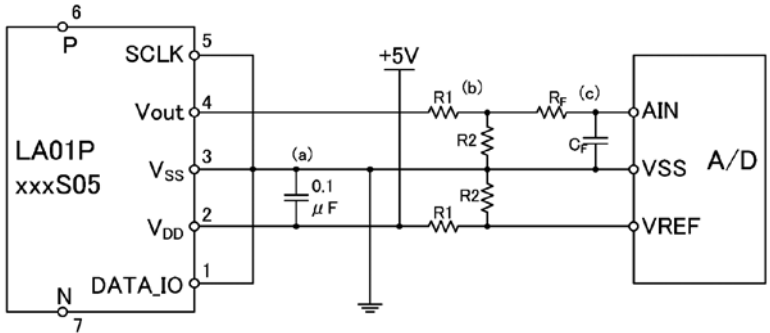
Note1) The tolerances of dimensions without any mention are ± 0.1mm.

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 μ F as close as possible to the VDD and VSS 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.

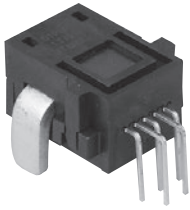
TYPE DESIGNATION

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	—	°C	120	
Output current	I _{out}	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	V _d	V	≧ AC2500V, 50/60Hz, for 1minute (Sensing current 0.5mA)	Primary ⇔ Secondary
Insulation resistance	R _{IS}	—	≧ 500M Ω (at DC500V)	Primary ⇔ Secondary
Impulse withstand voltage	V _w	kV	2.5	Primary ⇔ Secondary Input waveform : • Front time 1.2μs • Time to half value 50μs • single
Clearance distance	d _{CI}	mm	2.7	Primary ⇔ Secondary
Creepage distance	d _{CP}	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	T _a	°C	- 40		+ 110	
Ambient storage temperature	T _s	°C	- 40		+ 150	
Mass	m	g		5		
Internal magnetic core	—	—	Silicon steel			

SPECIFICATIONS

T_a=+25°C, V_{DD}=+5V, R_L≧10MΩ

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Measurement current range	I _f	A	- 170		170	
Maximum primary current (RMS)	I _{p(RMS)max}	A			50	
Supply Voltage	V _{DD}	V	4.5	5	5.5	
Number of primary turns	N _p	T	1			

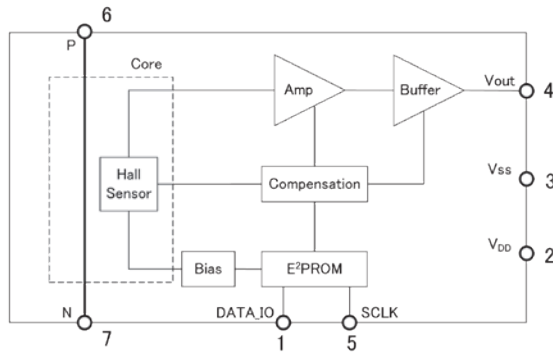
SPECIFICATIONS

Ta=+25°C, VDD=+5V, RL≥10MΩ

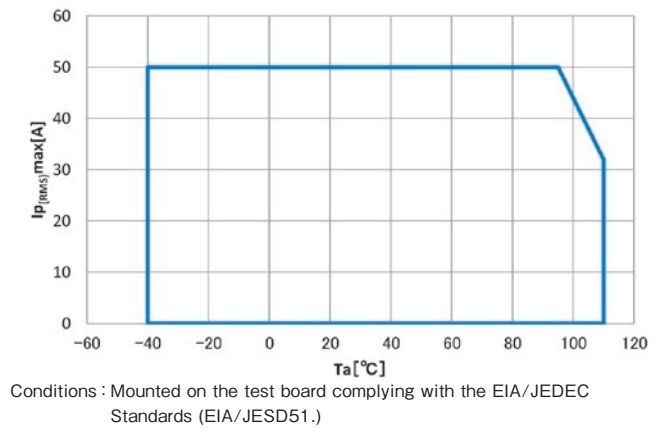
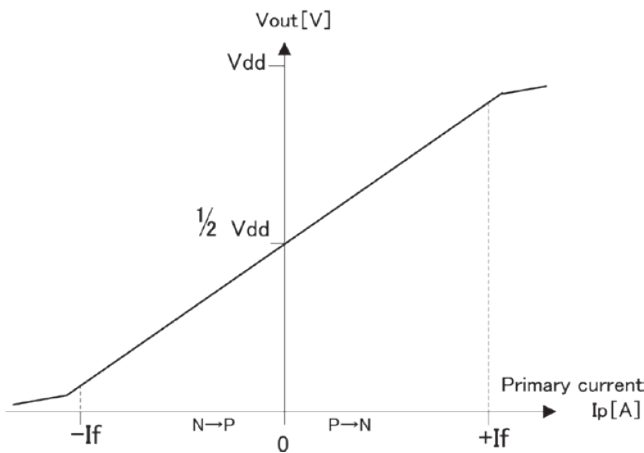
Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Primary Jumper resistance	Rp	mΩ		0.1		
Current consumption (at If)	IDD	mA		8.3	11	
Offset voltage (at If=0A)	Vof	V	2.465	2.500	2.535	* 1
Temperature drift of offset voltage (at Ta= -40 ~+110°C, Variation from Vof (Ta=35°C), Ip=0A)	TCVof	mV		± 4.0		
Sensitivity	G	mV/A	11.8	12.0	12.2	* 1
Temperature coefficient 1 of Sensitivity (at Ta= -40 ~+110°C, Variation ratio to G (Ta=35°C))	TCG	%		± 0.5		
Output Linearity (at 0... If)	εL	%F.S.	- 1		1	* 1
Output noise voltage	VNRMS	mVrms		0.5		100Hz ~ 4MHz
Ratiometric error of sensitivity	VG-R	%	- 1		1	
Ratiometric error of offset voltage	Vof-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.

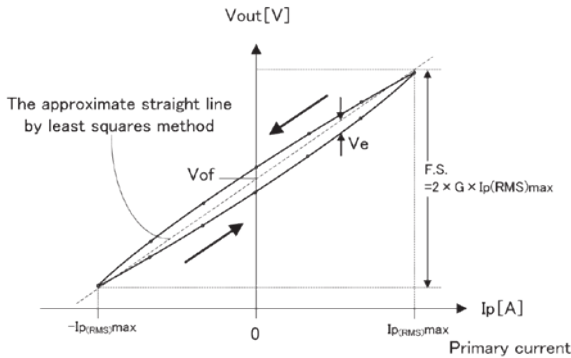
FUNCTIONAL BLOCK DIAGRAM



CHARACTERISTIC CURVE (TYP) AND PRIMARY CURRENT DERATING CURVE



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 εL [%]
Output linearity (εL) 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:

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

- Ratiometric error of sensitivity VG-R [%], ratiometric error of Offset voltage Vof-R [%]

Output of LA04P Series is ratiometric.

Sensitivity (G) and Offset voltage (Vof) are proportional to Supply voltage (VDD).

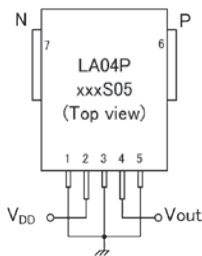
Ratiometric error is defined as follows in the supply voltage range (4.5V < VDD1 < 5.5V):

$$V_{G-R} = 100 \times [(G(V_{DD}=V_{DD1}) / G(V_{DD}=5V)) - (V_{DD1} / 5)] / (V_{DD1} / 5)$$

$$V_{of-R} = 100 \times [Vof(V_{DD}=V_{DD1}) - Vof(V_{DD}=5V) \times (V_{DD1} / 5)] / F.S.$$

$$*F.S. = 2 \times G \times Ip(RMS)_{max}$$

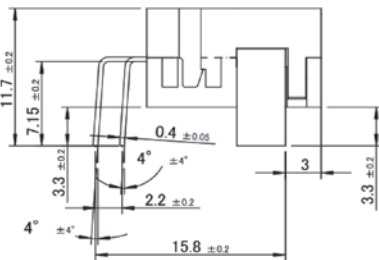
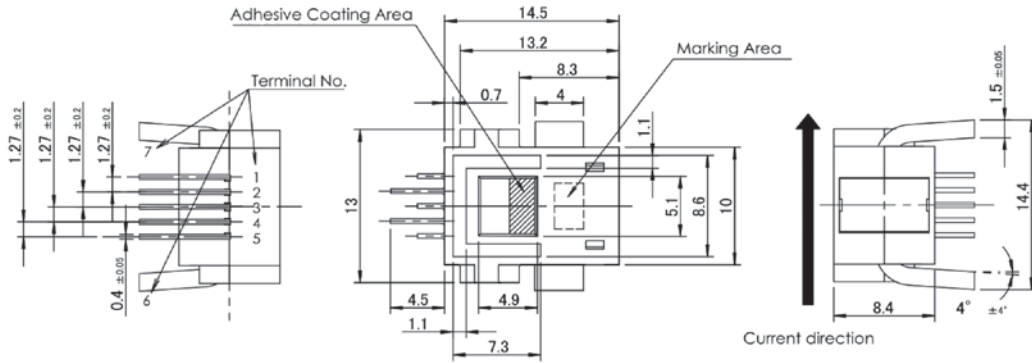
TERMINAL DESCRIPTIONS



Terminal number

- ① DATA_IO Test pin (connect to GND)
- ② VDD Power supply (5V)
- ③ VSS GND (0V)
- ④ Vout Analog output
- ⑤ SCLK Test pin (connect to GND)
- ⑥ P Input
- ⑦ N Output

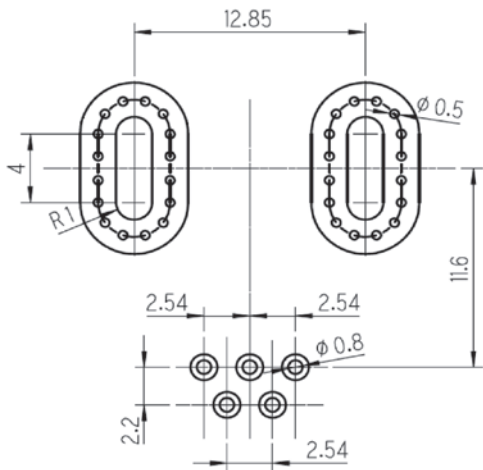
DIMENSIONS (mm)



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

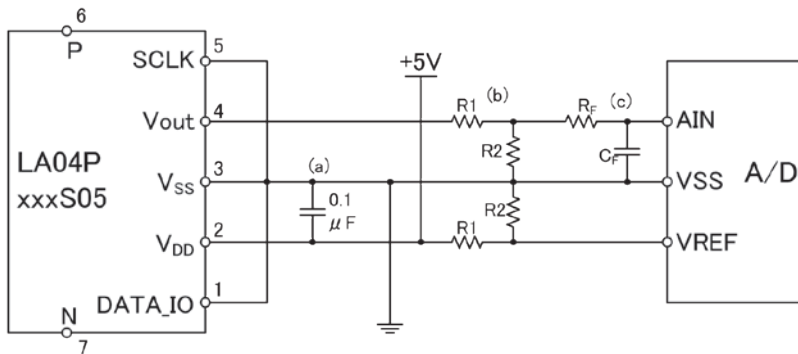
Note1) The tolerances of dimensions without any mention are ± 0.1mm.
 Note2) An adhesive material (RoHS compliant, halogen free) is applied on a part of "Adhesive Area" to hold the magnetic core.

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 0.1 μF as close as possible to the VDD and VSS 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°C, 85%RH, continuous operation	22	1000h
2	High Temperature Bias Test	[JEITA EIAJ ED-4701 101] Ta=125°C, continuous operation	22	1000h
3	High Temperature Storage Test	[JEITA EIAJ ED-4701 201] Ta=150°C	22	1000h
4	Low Temperature Storage Test	[JEITA EIAJ ED-4701 202] Ta=-65°C	22	1000h
5	Heat Cycle Test	[JEITA EIAJ ED-4701 105] -65°C(30min) ↔ 150°C(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°C/24h → Moisture Absorption: 85°C/85%RH/168h → Flow: 1time (260°C, 10s)

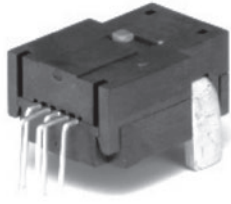
Criterion for determining

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°C) : Within ± 1.5%
- Offset Voltage Vof (Ta=25°C) : Within ± 100mV
- Output Linearity εL (Ta=25°C) : 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	—	°C	120	
Output current	I _{out}	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	V _d	V	≧ AC3000V, 50/60Hz, for 1minute (Sensing current 0.5mA)	Primary ⇔ Secondary
Impulse withstand voltage	V _w	kV	6	Primary ⇔ Secondary Input waveform : • Front time 1.2μs • Time to half value 50μs • single
Clearance distance	d _{ci}	mm	13.3	Primary ⇔ Secondary
Creepage distance	d _{cp}	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	T _a	°C	- 40		+ 110	
Ambient storage temperature	T _s	°C	- 40		+ 150	
Mass	m	g		5.5		
Internal magnetic core	—	—	Ferrite			

SPECIFICATIONS

T_a=+25°C, V_{DD}=+3.3V, R_L≧10MΩ

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Measurement current range	LA02P021S03	I _f	A	- 21		21
	LA02P035S03			- 35		35
	LA02P054S03			- 54		54
	LA02P085S03			- 85		85

SPECIFICATIONS

Ta=+25°C, VDD=+3.3V, RL≥10MΩ

Parameters	Symbol	Unit	Value			Comment	
			MIN	TYP	MAX		
Maximum primary current (RMS)	$I_{p(RMS)}$ max	A			50	* 1	
Supply Voltage	V_{DD}	V	2.97	3.3	3.63		
Number of primary turns	N_p	T	1				
Primary Jumper resistance	R_p	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°C, Variation from Vof (Ta=35°C), 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°C, Variation ratio to G (Ta=35°C))	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-R}	%	- 1		1		
Ratiometric error of offset voltage	LA02P021S03	Vof-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	

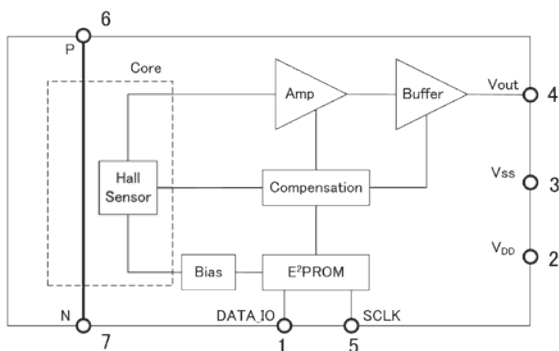
* 1 When $I_{p(RMS)}$ max is bigger than the value of If, $I_{p(RMS)}$ max restricts it to the value of If.

STANDARDS

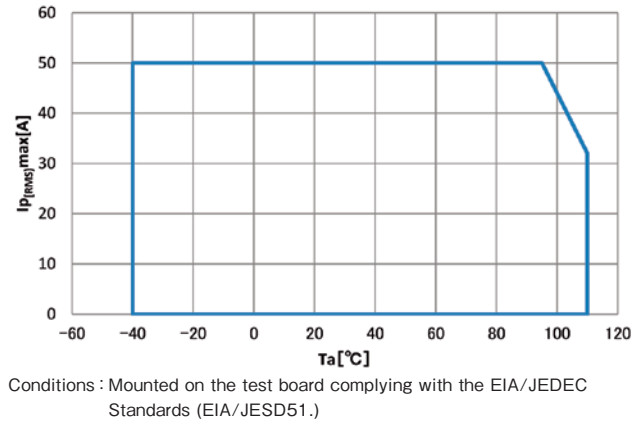
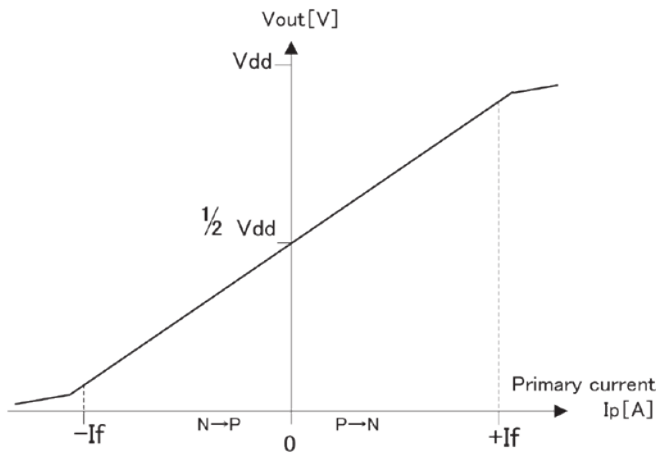
IEC60950 , UL508 , CSA C22.2 No. 14

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

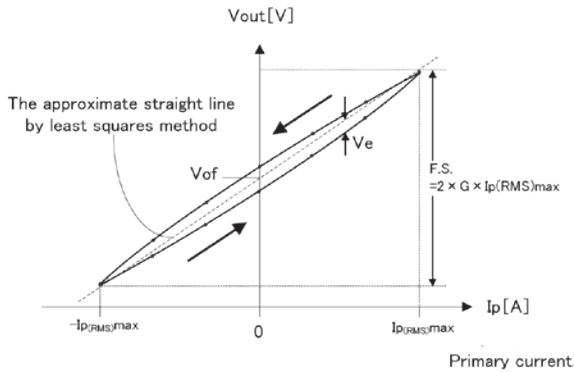
FUNCTIONAL BLOCK DIAGRAM



CHARACTERISTIC CURVE (TYP) AND PRIMARY CURRENT DERATING CURVE



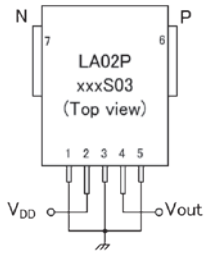
CHARACTERISTICS DEFINITIONS



- When $I_{p(RMS)max}$ is bigger than the value of I_f , $I_{p(RMS)max}$ restricts it to the value of I_f .

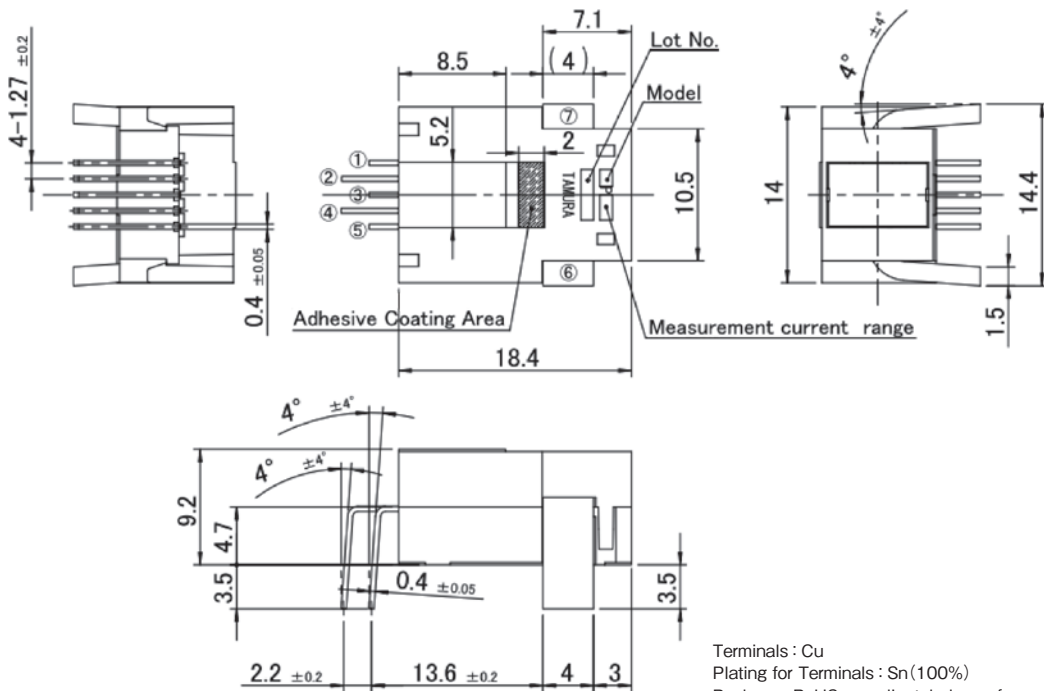
- Sensitivity G [mV/A], Offset voltage V_{of} [V]
Sensitivity (G) is defined as slope of the approximate straight line by least squares method, using the data of the output voltage (V_{out}) when sweeping the measured current I_p at rated current range.
Also Offset voltage (V_{of}) is defined as the intercept of the approximate straight line.
- Output linearity ϵ_L [%]
Output linearity (ϵ_L) is defined as the ratio of maximum error voltage (V_e) to the full scale (F.S.), where V_d is maximum difference between the Output voltage (V_{out}) and the approximate straight line calculated in the sensitivity and offset voltage definition;
 $\epsilon_L = V_e / F.S. \times 100$
- Ratiometric error of sensitivity V_{G-R} [%], ratiometric error of Offset voltage V_{of-R} [%]
Output of LA02P Series is ratiometric.
Sensitivity (G) and Offset voltage (V_{of}) are proportional to Supply voltage (V_{DD}).
- Ratiometric error is defined as follows in the supply voltage range ($2.97V < V_{DD1} < 3.63V$);
 $V_{G-R} = 100 \times [(G(V_{DD} = V_{DD1}) / G(V_{DD} = 3.3V)) - (V_{DD1} / 3.3)] / (V_{DD1} / 3.3)$
 $V_{of-R} = 100 \times [V_{of}(V_{DD} = V_{DD1}) - V_{of}(V_{DD} = 3.3V) \times (V_{DD1} / 3.3)] / F.S.$

TERMINAL DESCRIPTIONS



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

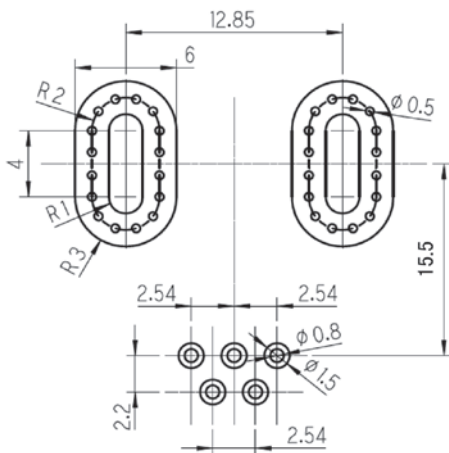
DIMENSIONS (mm)



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

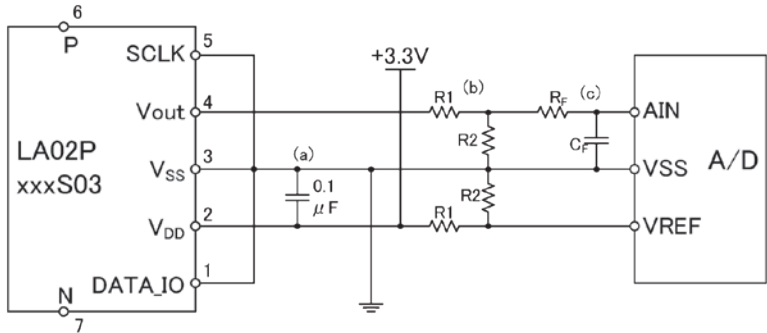
Note1) The tolerances of dimensions without any mention are ± 0.1mm.

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 μ F 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°C, 85%RH, continuous operation	22	1000h
2	High Temperature Bias Test	【JEITA EIAJ ED-4701 101】 Ta=125°C, continuous operation	22	1000h
3	High Temperature Storage Test	【JEITA EIAJ ED-4701 201】 Ta=150°C	22	1000h
4	Low Temperature Storage Test	【JEITA EIAJ ED-4701 202】 Ta=-55°C	22	1000h
5	Heat Cycle Test	【JEITA EIAJ ED-4701 105】 -65°C(30min) ⇄ 150°C(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°C /24h → Moisture Absorption : 85°C /85%RH/168h → Flow : 1 time (260°C , 10s)

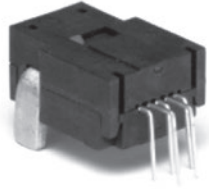
Criterion for determining

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°C) : Within \pm 1.5% (All model)
- Offset Voltage Vof (Ta=25°C) : Within \pm 100mV (LA02P021S03), Within \pm 66mV (Other model)
- Output Linearity ϵ_L (Ta=25°C) : Within \pm 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	—	°C	120	
Output current	I _{out}	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	V _d	V	≧ AC3000V, 50/60Hz, for 1minute (Sensing current 0.5mA)	Primary ⇔ Secondary
Impulse withstand voltage	V _w	kV	6	Primary ⇔ Secondary Input waveform : • Front time 1.2μs • Time to half value 50μs • single
Clearance distance	d _{ci}	mm	13.3	Primary ⇔ Secondary
Creepage distance	d _{cp}	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	T _a	°C	- 40		+ 110	
Ambient storage temperature	T _s	°C	- 40		+ 150	
Mass	m	g		5.5		
Internal magnetic core	—	—	Ferrite			

SPECIFICATIONS

T_a=+25°C, V_{DD}=+5V, R_L≧10MΩ

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Measurement current range	LA03P021S05	I _f	A	- 21		21
	LA03P035S05			- 35		35
	LA03P054S05			- 54		54
	LA03P085S05			- 85		85

SPECIFICATIONS

Ta=+25°C, VDD=+5V, RL≥10MΩ

Parameters	Symbol	Unit	Value			Comment	
			MIN	TYP	MAX		
Maximum primary current (RMS)	$I_{p(RMS)max}$	A			50	* 1	
Supply Voltage	V_{DD}	V	4.5	5.0	5.5		
Number of primary turns	N_p	T	1				
Primary Jumper resistance	R_p	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°C, Variation from Vof (Ta=35°C), 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°C, Variation ratio to G (Ta=35°C))	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-R}	%	- 1		1		
Ratiometric error of offset voltage	LA03P021S05	Vof-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	

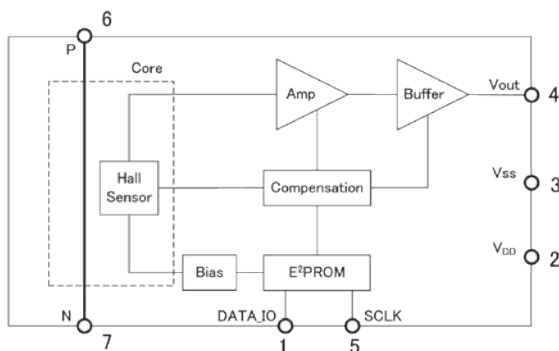
* 1 When $I_{p(RMS)max}$ is bigger than the value of If, $I_{p(RMS)max}$ restricts it to the value of If.

STANDARDS

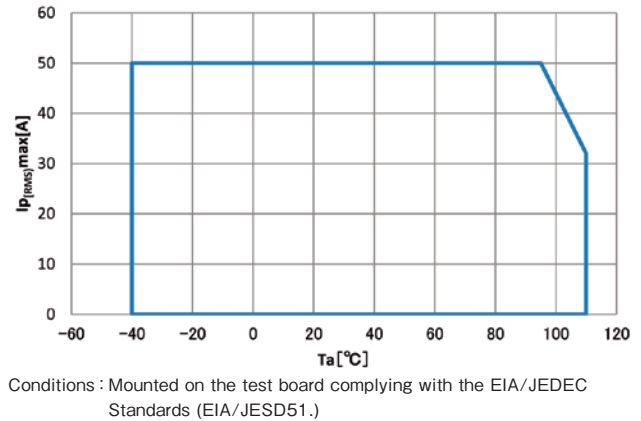
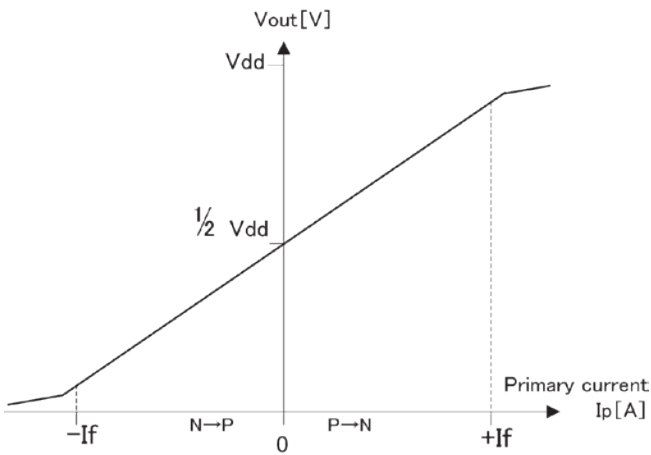
IEC60950 , UL508 , CSA C22.2 No. 14

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

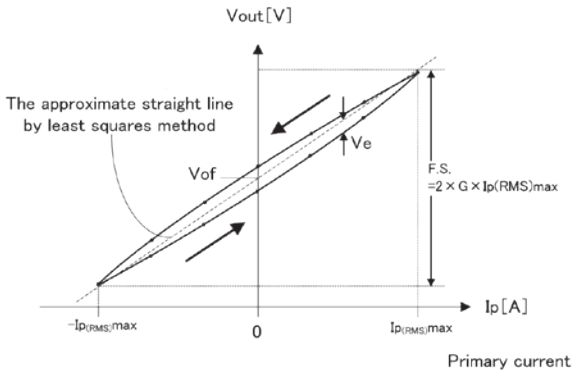
FUNCTIONAL BLOCK DIAGRAM



CHARACTERISTIC CURVE (TYP) AND PRIMARY CURRENT DERATING CURVE



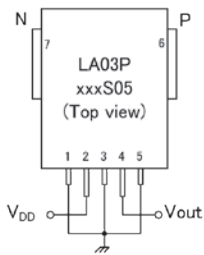
CHARACTERISTICS DEFINITIONS



• When $I_{p(RMS)max}$ is bigger than the value of I_f , $I_{p(RMS)max}$ restricts it to the value of I_f .

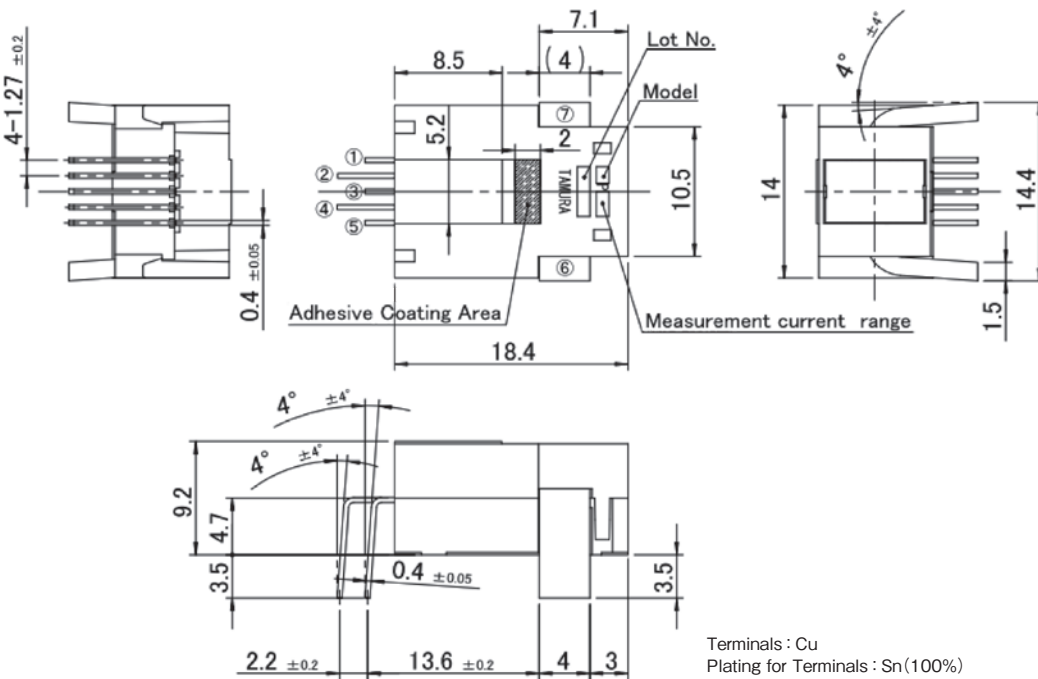
- Sensitivity G [mV/A], Offset voltage V_{of} [V]
Sensitivity (G) is defined as slope of the approximate straight line by least squares method, using the data of the output voltage (V_{out}) when sweeping the measured current I_p at rated current range.
Also Offset voltage (V_{of}) is defined as the intercept of the approximate straight line.
- Output linearity ϵ_L [%]
Output linearity (ϵ_L) is defined as the ratio of maximum error voltage (V_e) to the full scale (F.S.), where V_d is maximum difference between the Output voltage (V_{out}) and the approximate straight line calculated in the sensitivity and offset voltage definition;
 $\epsilon_L = V_e / F.S. \times 100$
- Ratiometric error of sensitivity V_{G-R} [%], ratiometric error of Offset voltage V_{of-R} [%]
Output of LA03P Series is ratiometric.
Sensitivity (G) and Offset voltage (V_{of}) are proportional to Supply voltage (V_{DD}).
- Ratiometric error is defined as follows in the supply voltage range ($4.5V < V_{DD1} < 5.5V$);
 $V_{G-R} = 100 \times [(G(V_{DD}=V_{DD1}) / G(V_{DD}=5V)) - (V_{DD1} / 5)] / (V_{DD1} / 5)$
 $V_{of-R} = 100 \times [V_{of}(V_{DD}=V_{DD1}) - V_{of}(V_{DD}=5V) \times (V_{DD1} / 5)] / F.S.$

TERMINAL DESCRIPTIONS



Terminal number	Description
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

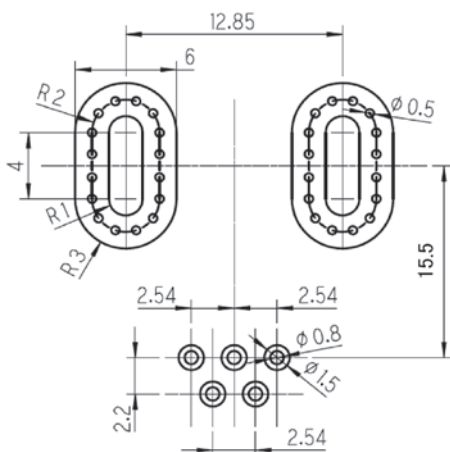
DIMENSIONS (mm)



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

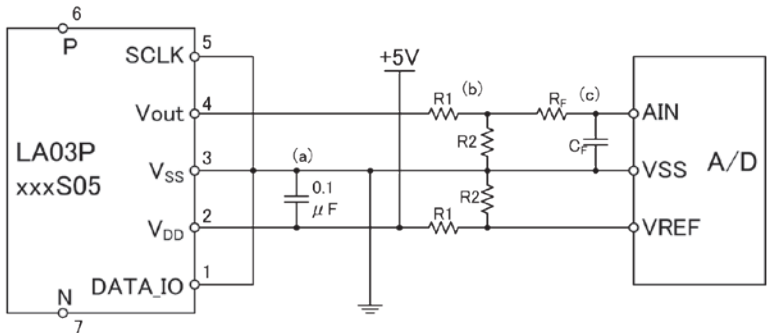
Note1) The tolerances of dimensions without any mention are ± 0.1mm.

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 μ F as close as possible to the VDD and VSS 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°C, 85%RH, continuous operation	22	1000h
2	High Temperature Bias Test	【JEITA EIAJ ED-4701 101】 Ta=125°C, continuous operation	22	1000h
3	High Temperature Storage Test	【JEITA EIAJ ED-4701 201】 Ta=150°C	22	1000h
4	Low Temperature Storage Test	【JEITA EIAJ ED-4701 202】 Ta=-55°C	22	1000h
5	Heat Cycle Test	【JEITA EIAJ ED-4701 105】 -65°C(30min) ⇄ 150°C(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°C /24h → Moisture Absorption : 85°C /85%RH/168h → Flow : 1 time (260°C , 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°C) : Within ± 1.5% (All model)
 Offset Voltage Vof (Ta=25°C) : Within ± 150mV (LA03P021S05), Within ± 100mV (Other model)
 Output Linearity εL (Ta=25°C) : Within ± 1% (All model)

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

S22P M2 SERIES



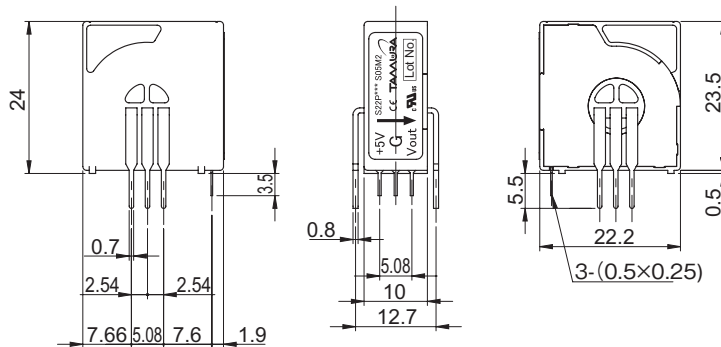
SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc=+5V

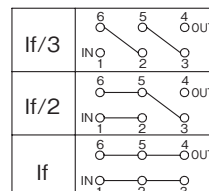
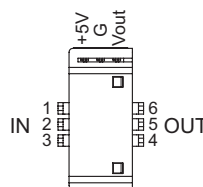
Types		S22P006S05M2	S22P015S05M2	S22P025S05M2
Primary nominal current	If	6A	15A	25A
Saturation current	If max	± 18A	± 45A	± 75A
Rated output voltage	Vo	Vof ± 0.625V (at If)		
Output voltage accuracy	XG	0.625V ± 0.010V (at If)		
Offset voltage*1	Vof	2.5V ± 0.050V (at If = 0A)	2.5V ± 0.020V (at If = 0A)	2.5V ± 0.015V (at If = 0A)
Output linearity	εL	≤ ± 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	TcVo	≤ ± 0.05mV / °C (Without TcVof)		
Thermal drift of offset	TcVof	- 10 ~ 25°C : ± 1.6mV / °C 25 ~ 85°C : ± 0.8mV / °C	- 10 ~ 25°C : ± 0.6mV / °C 25 ~ 85°C : ± 0.3mV / °C	- 10 ~ 25°C : ± 0.4mV / °C 25 ~ 85°C : ± 0.2mV / °C
Hysteresis error	VOH	≤ 0.5mV (at If = 0A → If → 0A)		
Insulation voltage	Vd	AC3000V for 1 minute (Sensing current 0.5mA) Primary ↔ Secondary		
Insulation resistance	RIS	≥ 500MΩ (at DC500V) Primary ↔ Secondary		
Ambient Operating temperature	TA	- 10°C ~ + 85°C		
Ambient storage temperature	TS	- 25°C ~ + 100°C		

* 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



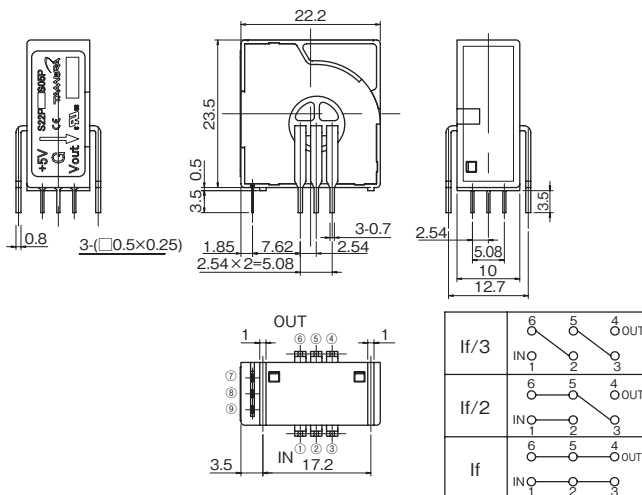
SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc=+5V

Types		S22P006S05P	S22P015S05P	S22P025S05P
Primary nominal current	If	6A	15A	25A
Saturation current	If max	± 18A	± 45A	± 75A
Rated output voltage	Vo	Vof ± 0.625V (at If)		
Output voltage accuracy	XG	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	εL	≤ ± 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	TcVo	≤ ± 0.05mV / °C (Without TcVof)		
Thermal drift of offset	TcVof	- 10 ~ 25°C : ± 1.6mV / °C 25 ~ 85°C : ± 0.8mV / °C	- 10 ~ 25°C : ± 0.6mV / °C 25 ~ 85°C : ± 0.3mV / °C	- 10 ~ 25°C : ± 0.4mV / °C 25 ~ 85°C : ± 0.2mV / °C
Hysteresis error	VOH	≤ 0.5mV (at If = 0A → If → 0A)		
Insulation voltage	Vd	AC3000V for 1 minute (Sensing current 0.5mA) Primary ↔ Secondary		
Insulation resistance	RIS	≥ 500M Ω (at DC500V) Primary ↔ Secondary		
Ambient Operating temperature	TA	- 10°C ~ + 85°C		
Ambient storage temperature	TS	- 25°C ~ + 100°C		

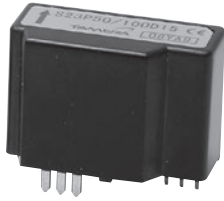
* 1 Offset voltage value is after removal of core hysteresis. * Please refer to the another sheet about conditions of UL Recognition.

DIMENSIONS (mm)



Servo system Current-output type

S23P M2



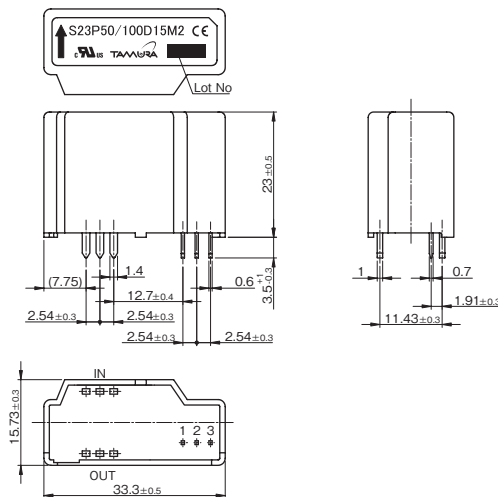
SPECIFICATIONS

Ta=25°C, Vcc=±15V

Types		S23P50/100D15M2			
Spec		50A		100A	
Primary nominal current	If	50A		100A	
Measuring resistance (If= ± ADC, Ta=85°C)	RL	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	XG	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	εL	≤ ± 0.15% (at If)			
Power supply voltage	Vcc	± 12V ± 5% ~ ± 15V ± 5% (Rated 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%/°C (Without Tclof)			
Thermal drift of offset	Tclof	≤ ± 0.5mA (- 25°C~+ 85°C)			
Hysteresis error	Ioh	≤ 0.3mA (at If=0A → If → If=0A)			
Insulation voltage	Vd	AC5000V for 1 minute (Sensing current 0.5mA) Primary ↔ Secondary			
Insulation resistance	RIS	≥ 500M Ω (at DC500V) Primary ↔ Secondary			
Ambient Operating temperature	TA	- 40°C~+ 85°C			
Ambient storage temperature	TS	- 40°C~+ 90°C			
Secondary coil resistance	RS	at Ta=70°C 115 Ω at Ta=85°C 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]

Introduction

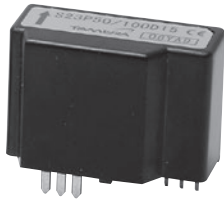
Fluxgate system

Open loop

Closed loop

Servo system Current-output type

S23P M1



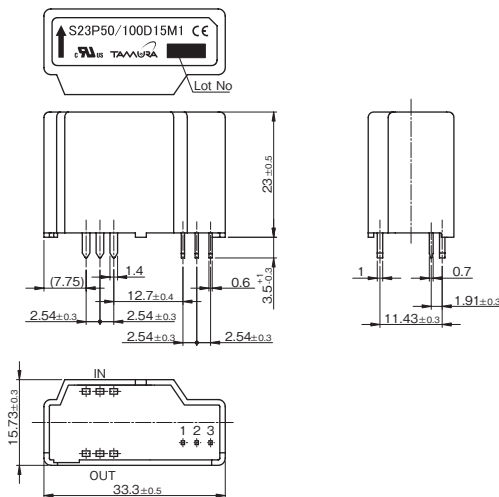
SPECIFICATIONS

Ta=25°C, Vcc=±15V

Types		S23P50/100D15M1			
Spec		50A		100A	
Primary nominal current	If	50A		100A	
Measuring resistance If= ± ADC at Ta=85°C	RL	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	XG	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	εL	± 0.15% (at If)			
Power supply voltage	Vcc	± 12V ± 5% ~ ± 15V ± 5% (Rated 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%/°C (Without Tclof)			
Thermal drift of offset	Tclof	± 0.5mA type, ≤ ± 0.8mA max (-25°C~+ 85°C)			
Hysteresis error	Ioh	≤ 0.3mA (at If=0A → If → 0A)			
Insulation voltage	Vd	AC5000V for 1 minute (Sensing current 0.5mA) Primary ↔ Secondary			
Insulation resistance	RIS	≥ 500M Ω (at DC500V) Primary ↔ Secondary			
Ambient Operating temperature	TA	- 40°C~+ 85°C			
Ambient storage temperature	TS	- 40°C~+ 90°C			
Secondary coil resistance	RS	at Ta=70°C 33 Ω at Ta=85°C 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.

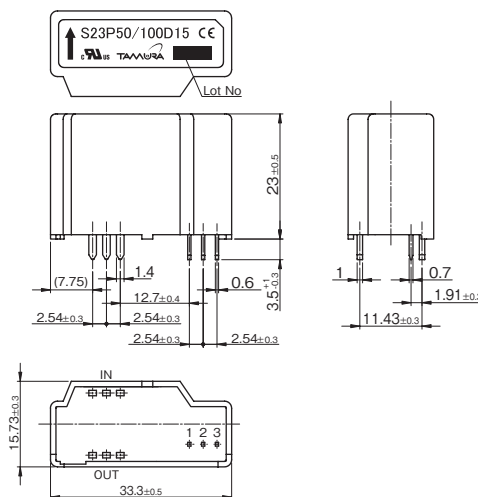
SPECIFICATIONS

Ta=25°C, Vcc=±15V

Types		S23P50/100D15			
Spec		50A		100A	
Primary nominal current	If				
Measuring resistance If= ± ADC at Ta=85°C	RL	Vcc= ± 12V	0 Ω~ 217 Ω	Vcc= ± 12V	0 Ω~ 57 Ω
		Vcc= ± 15V	0 Ω~ 327 Ω	Vcc= ± 15V	45 Ω~ 114 Ω
Rated output current	Io	25mA (Turn ratio 1 : 2000)		50mA (Turn ratio 1 : 2000)	
Output current accuracy	XG	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	εL	± 0.15% (at If)			
Power supply voltage	Vcc	± 12V ± 5% ~ ± 15V ± 5% (Rated 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%/°C (Without Tclof)			
Thermal drift of offset	Tclof	± 0.5mA max (-25°C~+85°C)			
Hysteresis error	Ioh	≤ 0.3mA (at If=0A → If → 0A)			
Insulation voltage	Vd	AC5000V for 1 minute (Sensing current 0.5mA) Primary ↔ Secondary			
Insulation resistance	RIS	≥ 500M Ω (at DC500V) Primary ↔ Secondary			
Ambient Operating temperature	TA	-40°C~+85°C			
Ambient storage temperature	TS	-40°C~+90°C			
Secondary coil resistance	RS	at Ta=70°C 115 Ω		at Ta=85°C 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

S21S SERIES



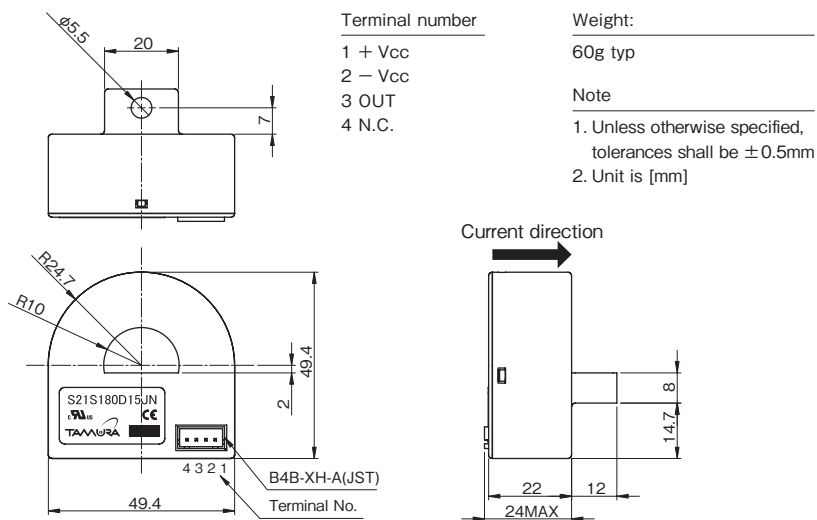
SPECIFICATIONS

Ta=25°C, Vcc=±15V

Spec	Types	S21S180D15JN
Primary nominal current	If	180A
Measuring Resistance (at 80°C)	R _L	0 ~ 68 Ω (at Vcc= ± 12V) 0 ~ 100 Ω (at Vcc= ± 15V)
Rated output Current	I _o	45mA (Turn Ratio: 1:4000)
Output Current Accuracy	X _G	I _o ± 1% (at I _f without I _{of})
Offset Current	I _{of}	≤ ± 0.2mA (at I _f =0A) *1
Maximum Current	I _f max	± 540A (TA=25°C, at 5 ≤ R _M ≤ 30 Ω; at TA=80°C, 5 ≤ R _M ≤ 20 Ω)
Output Linearity	ε _L	≤ ± 0.3% (at I _f)
Power supply voltage	Vcc	± 12V ± 5% ~ ± 15V ± 5% (Rated output current is restricted by Vcc)
Consumption Current	I _{cc}	≤ ± 16mA (without I _o)
di/dt Response Time (@90% of I _f)	t _r	≤ 1μs (at di/dt=100A/μs)
Thermal drift of gain	TC _{lo}	≤ ± 0.02%/°C (without TC _{lof})
Thermal drift of offset	TC _{lof}	≤ ± 0.01mA/°C
Hysteresis error	I _{oH}	≤ 0.2mA (at I _f = 0A → I _f → 0A)
Insulation voltage	V _d	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°C ~ + 80°C
Ambient storage temperature	T _S	- 40°C ~ + 85°C
Secondary coil resistance	R _s	48 Ω (at T _A =25°C) , 60 Ω (at T _A =80°C)

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

DIMENSIONS (mm)



Servo system Current-output type

S20S M1 SERIES



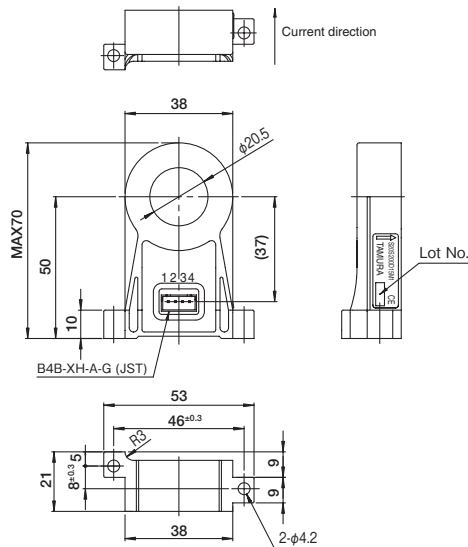
SPECIFICATIONS

Ta=25°C, Vcc=±15V

Spec	Types	S20S200D15M1			
		200AT		300AT	
Primary nominal current	If	200AT		300AT	
Measuring resistance	RL	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	XG	Io ± 1% (without Iof)			
Offset current *1	Iof	≤ ± 0.5mA (at If=0A)			
Maximum current @ Vcc ± 15VDC&Ta=70°C	If max	± 300AT (at RL=30 Ω)			
Output linearity	εL	≤ ± 0.25% (at If)			
Power supply voltage	Vcc	± 12V ± 5% ~ ± 15V ± 5% (Rated 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%/°C (Without Tc Iof) (- 5°C~+ 70°C)			
Thermal drift of offset	Tclof	≤ ± 0.012mA/°C (- 5°C~+ 70°C)			
Hysteresis error	Ioh	≤ 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	RIS	≥ 500M Ω (at DC500V) inside of through hole ⇔ terminal			
Ambient Operating temperature	TA	- 20°C~+ 70°C			
Ambient storage temperature	TS	- 20°C~+ 85°C			
Secondary coil resistance	RS	33 Ω @ Ta=70°C			

* 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

S27S SERIES



SPECIFICATIONS

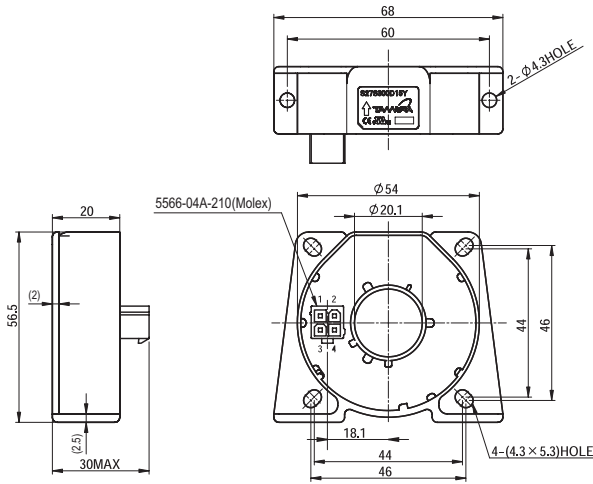
Ta=25°C, Vcc=±15V

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°C	If max	± 500A	
Measuring resistance at Ta=85°C If = [± ADC]	RL	± 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	XG	Io ± 0.4% (without Iof)	
Offset Current	Iof	≦ ± 0.2mA (at If=0A) *1	
Output Linearity	εL	≦ ± 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%/°C (without TClof)	
Thermal drift of offset	TClof	≦ ± 0.5mA max	
Hysteresis error	Ioh	≦ 0.1mA (at If = 0A → If → 0A)	
Insulation voltage	Vd	AC4000V, for 1minute (sensing current 0.5mA), inside of through hole ⇔ terminal	
Insulation resistance	RIS	≧ 500MΩ (at DC500V) inside of through hole ⇔ terminal	
Ambient Operating temperature	TA	- 40°C ~ + 85°C	
Ambient storage temperature	TS	- 40°C ~ + 90°C	
Secondary coil resistance	RS	25Ω (Ta=70°C) 28Ω (Ta=85°C)	

* 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

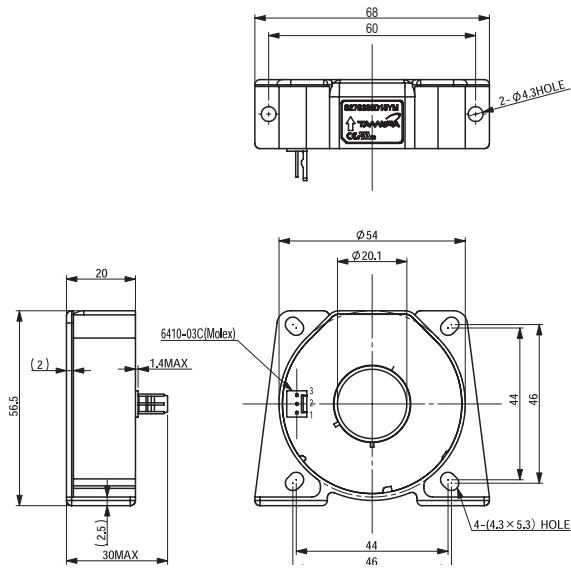
Weight:

90g typ

Note

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

S27S300D15YM



Terminal number

- 1 + Vcc
- 2 Output
- 3 - Vcc

Weight:

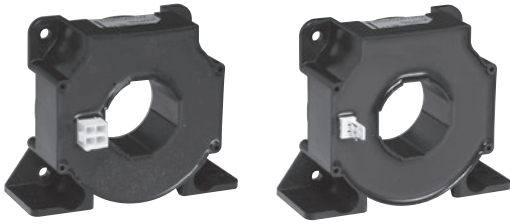
90g typ

Note

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

Servo system Current-output type

S28S SERIES



SPECIFICATIONS

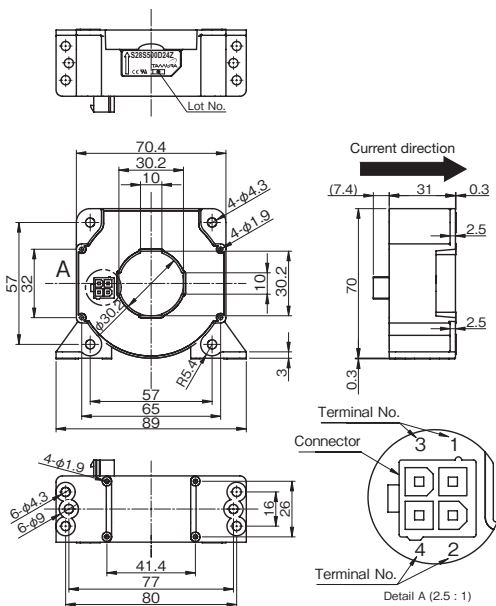
Ta=25°C, Vcc=±15V

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 Ratio 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		TClo	≤ ± 0.01%/°C (Without TClof)	
Offset Temperature Characteristic		TClof	≤ ± 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°C ~ + 70°C	
Storage Temperature		T _S	- 40°C ~ + 85°C	
Secondary coil resistance		Rs	70 Ω (Ta=70°C)	

* 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

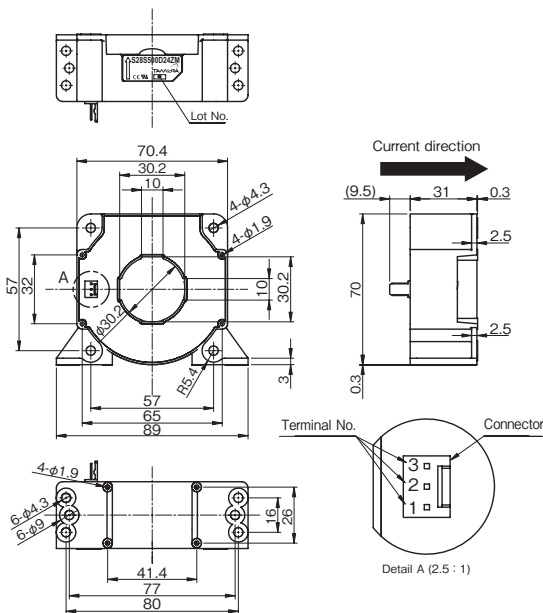
Connector

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

Note

1. Unless otherwise specified, tolerances shall be $\pm 0.5\text{mm}$
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 $\pm 0.5\text{mm}$
2. Unit is [mm]

Servo system Current-output type

S29S D24 SERIES



SPECIFICATIONS

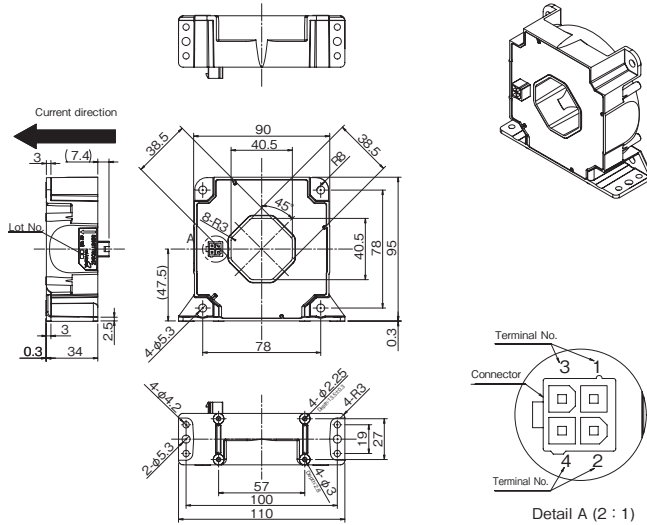
Ta=25°C, Vcc=±15V

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	RL	± 15V	70°C	1000A 0Ω~ 21Ω 1200A 0Ω~ 9Ω 1300A 0Ω~ 5Ω	
			85°C	1000A 0Ω~ 18Ω 1200A 0Ω~ 7Ω	
		± 24V	70°C	1000A 0Ω~ 60.5Ω 1800A 0Ω~ 14Ω 2100A 0Ω~ 4Ω	
			85°C	1000A 10Ω~ 58.5Ω 1800A 10Ω~ 12Ω	
Output current	Io		200mA (Conversion Ratio 1:5000)		
Output current accuracy	XG		Io ± 0.4% (without Iof)		
Offset current	Iof		≤ ± 0.4mA (at If=0A) * 1		
Output linearity	εL		≤ ± 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	TClO		≤ ± 0.01%/°C (without TClOf)		
Thermal drift of offset	TClOf		≤ ± 0.5mA max (at - 10°C~+ 70°C) ≤ ± 0.8mA max (at - 40°C~+ 85°C)		
Hysteresis error	Ioh		≤ ± 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	Ris		≥ 500MΩ (at DC500V) inside of through hole ⇔ terminal		
Ambient Operating temperature	TA		- 40°C~+ 85°C		
Ambient storage temperature	TS		- 40°C~+ 90°C		
Secondary coil resistance	Rs		48Ω (Ta=70°C) 50Ω (Ta=85°C)		

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

DIMENSIONS (mm)

S29S1T0D24Z



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

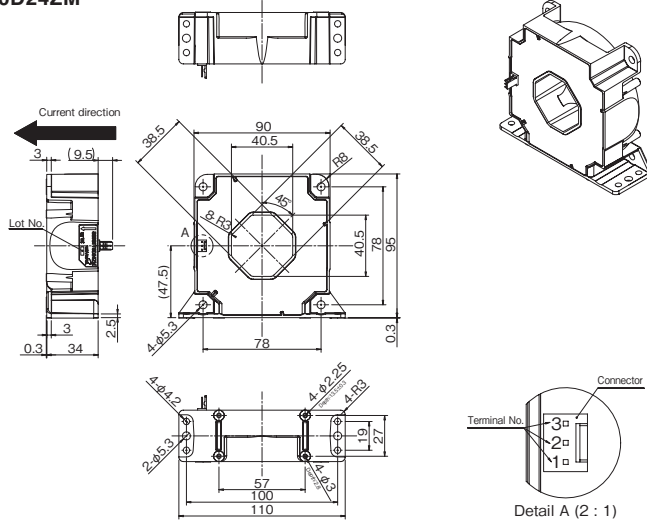
Weight

560g typ

Note

- 1. Unless otherwise specified, tolerances shall be $\pm 0.5\text{mm}$
- 2. Unit is [mm]

S29S1T0D24ZM



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

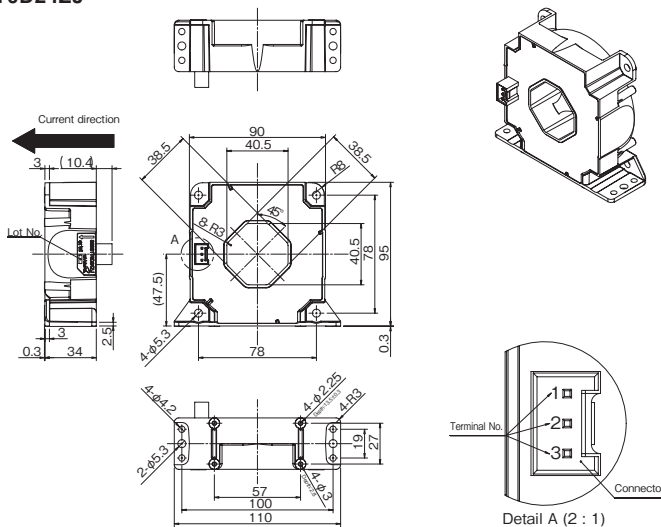
Weight

560g typ

Note

- 1. Unless otherwise specified, tolerances shall be $\pm 0.5\text{mm}$
- 2. Unit is [mm]

S29S1T0D24ZJ



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 $\pm 0.5\text{mm}$
- 2. Unit is [mm]

Servo system Current-output type

S30S D24 SERIES



ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Remarks
Maximum Supply voltage	V _{CC}	V	± 25.2	
Primary conductor temperature	T _B	°C	100	

ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Remarks	
Insulation voltage	V _d	kVrms	AC6700V, for 1minute (Sensing current 0.5mA)	Primary ⇔ Secondary	
Impulse withstand voltage	V _w	kV	23	Primary ⇔ Secondary Input waveform : • Front time 1.2μs • Time to half value 50μs • single	
Insulation resistance	R _{IS}	—	≥ 500M Ω (at DC500V)	Primary ⇔ Secondary	
Clearance distance	d _{Cl}	—	min : 12.1 (min : 30.4)	Primary ⇔ Secondary (Busbar ⇔ ConnectorPWB)	
Creepage distance	d _{Cp}	—	min : 35.5 (min : 33.0)	Primary ⇔ Secondary (Busbar ⇔ ConnectorPIN)	
Case material	—	—	UL94 V-0		
Filler material	—	—	UL94 V-0		
Comparative Tracking Index : (CTI)	Case	CTI	V	400 ~ 599 (Group II)	
	Filler	CTI	V	600 (Group I)	
Application example	—	—	2.475kVa.c ,CAT III , PD2	Reinforced isolation, non uniform field according to EN50178 : 1997	
	—	—	1kVa.c 1.5kVd.c ,CAT III , PD2	Reinforced isolation, non uniform field according to EN62477-1 : 2012 and EN62477-1 : 2012/A11 2014	

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

Parameters	Symbol	Unit	Value			Remarks
			MIN	TYP	MAX	
Ambient operating temperature	T _A	°C	- 40	—	+ 85	
Ambient storage temperature	T _S	°C	- 40	—	+ 90	
Mass	m	kg	—	1.3	—	

SPECIFICATIONS

T_A=+25°C, R_M=1Ω, V_{CC}=±24V

Parameters	Symbol	Unit	Value			Remarks
			MIN	TYP	MAX	
Primary nominal current	I _{PN}	A	—	2000	—	
Primary current, measuring range * 1,2	I _{PM}	A	3500	—	—	at Ta=+85°C, Vcc= ± 22.8Vmin, RM=1ohm, t=2sec
Measuring resistance * 1	R _M	Ω	0	—	—	See Fig1
Conversion ratio	K _N	—	—	1 : 5000	—	
Output current @I _{PN}	I _o	mA	—	400	—	I _o = I _{PN} / 5000. Without I _{of} .
Accuracy @I _{PN}	X	%	- 0.2	0.0	+ 0.2	T _A =25°C~ 85°C, Without I _{of} .
			- 0.3	0.0	+ 0.3	T _A = - 40°C~ 85°C, Without I _{of} .
Offset current * 3	I _{of}	mA	- 0.2	0.0	+ 0.2	at I _p = 0A.
Linearity error (0A ~ I _{PN})	ε _L	%	- 0.1	0.0	+ 0.1	
Hysteresis error	I _{OH}	mA	- 0.2	0.0	+ 0.2	at I _p = 0A → I _{PN} → 0A
Supply voltage	V _{CC}	V	± 15 (± 5%)	± 24 (± 5%)		
Consumption current	I _{CC}	mA	—	45	—	at I _p = 0A. I _{CC} = 45 + I _p / 5000.
Response time @90% of I _{PN} * 4	t _r	μs	—	0.5	—	di/dt=100A/μs
Frequency bandwidth (- 3dB) * 5	BW	kHz	—	150	—	See Fig2, at very low current
Temperature coefficient of I _{of} * 3	T _{cIof}	μA/°C	- 4.8	0	+ 4.8	at I _p = 0A
Secondary coil resistance	R _s	Ω	—	—	24.5	T _A = + 85°C

- * 1 Current sensor has limited operating time depending on the measured resistance and maximum current. Internal circuits can become corrupted if you used beyond the limited time.
- * 2 The value of measured current which indicates an output with a greater than ± 5% deviation from the theoretical output value.
- * 3 Offset current is measured after removal of the hysteresis.
- * 4 Measurement condition : Primary conductor cross sectional area is as same as through hole, and penetration with 1turn in through hole.
- * 5 High fundamental frequency primary current and/or harmonic current may result in excessive heating in magnetic core (Silicon steel).

STANDARDS

EN50178:1997, EN62477-1 : 2012 and EN62477-1 : 2012/A11 2014, UL508 (No.E243511), CSA22.2 No.14-13
 ※ Please refer to the another sheet about conditions of UL Recognition.

TYPICAL CHARACTERISTIC CURVES

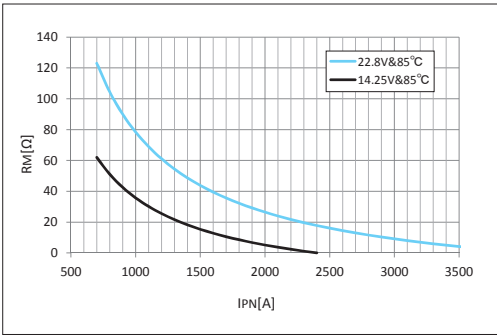
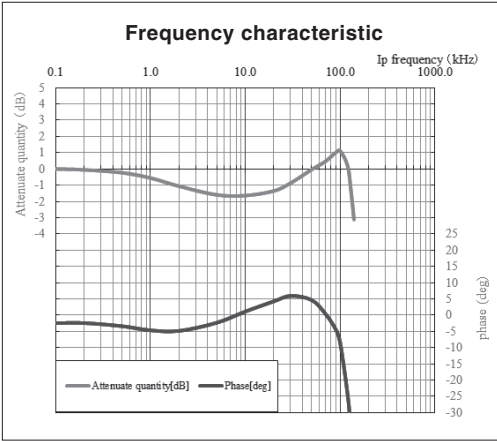


Figure 1 : Maximum Measuring Resistance



Measurement conditions:
 $T_A = +25^\circ\text{C}$, $R_M = 2.4 \Omega$, $I_P = 3A * 20T$, $V_{CC} = \pm 24V$

Figure 2 : Frequency response curve

CONNECTION

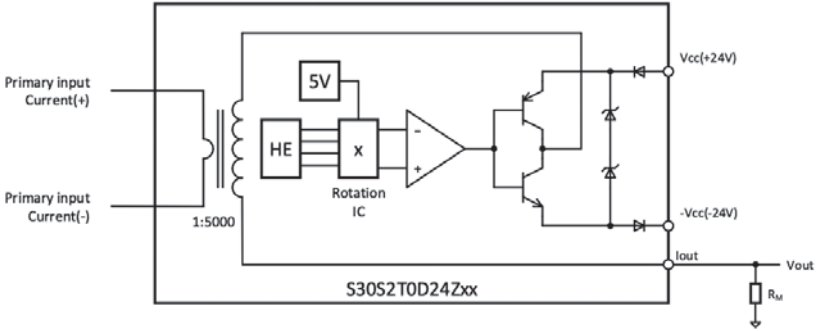


Figure 3 : Block diagram

DIMENSIONS (mm)

S30S2T0D24Z

Terminal number

1	Vcc (+24V)
2	Iout
3	-Vcc (-24V)
4	N.C

Tolerance : ± 0.5
Unit : mm

Connector		
Maker	PartsNo.	old parts No.
Molex	39-28-8040	5566-04A-210

Example of Name Plate

Revision code(5 figure), Lot No.(5 figure)
Serial No.(4 figure), Factory code(2 figure)

S30S2T0D24ZM

Terminal number

1	Vcc (+24V)
2	Iout
3	-Vcc (-24V)

Tolerance : ± 0.5
Unit : mm

Connector		
Maker	PartsNo.	old parts No.
Molex	38-00-6293	AE-6410-03C(197)

S30S2T0D24ZJ

Terminal number

1	-Vcc (-24V)
2	Iout
3	Vcc (+24V)

Tolerance : ± 0.5
Unit : mm

Connector		
Maker	PartsNo.	old parts No.
JST	BH3P-VH-1	-

Servo system Current-output type

S42S D24 SERIES



ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Remarks
Maximum Supply voltage	V _{cc}	V	± 25.2	
Primary conductor temperature	T _B	°C	100	

ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Remarks	
Insulation voltage	V _d	—	AC4400V, for 1minute (Sensing current 0.5mA)	Primary ⇔ Secondary	
Impulse withstand voltage	V _w	kV	12	Primary ⇔ Secondary Input waveform : · Front time 1.2μs · Time to half value 50μs · single	
Insulation resistance	R _{IS}	MΩ	≥ 500M Ω (at DC500V)	Primary ⇔ Secondary	
Clearance distance	d _{cl}	mm	min : 7.3 (min : 14.0)	Primary ⇔ Secondary (Busbar ⇔ ConnectorPWB)	
Creepage distance	d _{cp}	mm	min : 9.3 (min : 18.2)	Primary ⇔ Secondary (Busbar ⇔ ConnectorPIN)	
Case material	—	—	UL94 V-0		
Filler material	—	—	UL94 V-0		
Comparative Tracking Index : (CTI)	Case	CTI	V	400 ~ 599 (Group II)	
	Filler	CTI	V	600 (Group I)	
Application example	—	—	1kVa.c ,CAT III , PD2 1.5kVd.c	Reinforced isolation, non uniform field according to EN62477-1 : 2012 and EN62477-1 : 2012/A11 2014	

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

Parameters	Symbol	Unit	Value			Remarks
			MIN	TYP	MAX	
Ambient operating temperature	T _A	°C	- 40	—	+ 85	
Ambient storage temperature	T _S	°C	- 40	—	+ 90	
Mass	m	g	—	400	—	

SPECIFICATIONS

T_A=+25°C, R_M=1Ω, V_{CC}=±24V

Parameters	Symbol	Unit	Value			Remarks
			MIN	TYP	MAX	
Primary nominal current	I _{PN}	A	—	1000	—	
Primary current, measuring range * 1,2	I _{PM}	A	2100	—	—	at T _A = + 85°C, V _{CC} = ± 22.8V, R _M =1 Ω, t=4sec
Measuring resistance * 1	R _M	Ω	0	—	—	See Fig1
Conversion ratio	K _N	—	—	1 : 5000	—	
Output current @I _{PN}	I _O	mA	—	200	—	I _O = I _{PN} /5000. Without I _{of} .
Accuracy @I _{PN}	X	%	- 0.2	0.0	+ 0.2	T _A =25°C~+ 85°C, Without I _{of} .
			- 0.3	0.0	+ 0.3	T _A = - 40°C~+ 85°C, Without I _{of} .
Offset current * 3	I _{of}	mA	- 0.2	0.0	+ 0.2	at I _p = 0A.
Linearity error (0A ~ I _{PN})	ε _L	%	- 0.1	0.0	+ 0.1	
Hysteresis error	I _{OH}	mA	- 0.2	0.0	+ 0.2	at I _p = 0A → I _{PN} → 0A
Supply voltage	V _{CC}	V	± 15 (± 5%)	± 24 (± 5%)		
Consumption current	I _{CC}	mA	—	45	—	at I _p = 0A. I _{CC} = 45 + I _p /5000.
Response time @90% of I _{PN} * 4	t _r	μs	—	0.5	—	di/dt=100A/μs
Frequency bandwidth (- 3dB) * 5	BW	kHz	—	150	—	at very low current
Temperature coefficient of I _{of} * 3	T _{cIof}	μA/°C	- 4.8	0	+ 4.8	at I _p = 0A
Secondary coil resistance	R _S	Ω	—	—	47.5	T _A = + 85°C

- * 1 Current sensor has limited operating time depending on the measured resistance and maximum current. Internal circuits can become corrupted if you used beyond the limited time.
- * 2 The value of measured current which indicates an output with a greater than ± 5% deviation from the theoretical output value.
- * 3 Offset current is measured after removal of the hysteresis.
- * 4 Measurement condition : Primary conductor cross sectional area is as same as through hole, and penetration with 1turn in through hole.
- * 5 High fundamental frequency primary current and/or harmonic current may result in excessive heating in magnetic core (Silicon steel).

STANDARDS

EN62477-1 : 2012 and EN62477-1 : 2012/A11 2014, UL508 (No.E243511) , CSA22.2 No.14-13

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

TYPICAL CHARACTERISTIC CURVES

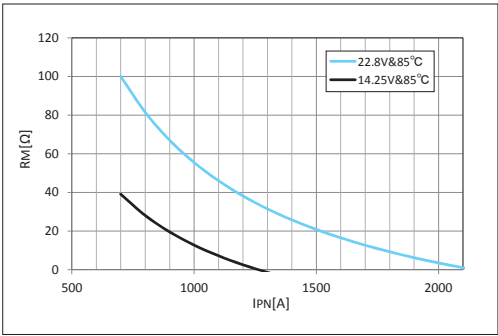
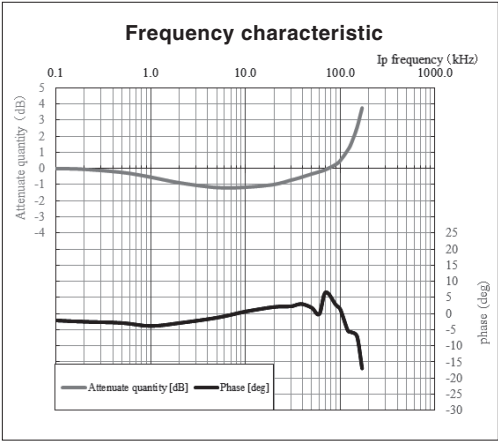


Figure 1 : Maximum Measuring Resistance



Measurement conditions:
 $T_A = +25^\circ\text{C}$, $R_M = 2.4 \Omega$, $I_P = 3A * 20T$, $V_{CC} = \pm 24V$

Figure 2 : Frequency response curve

CONNECTION

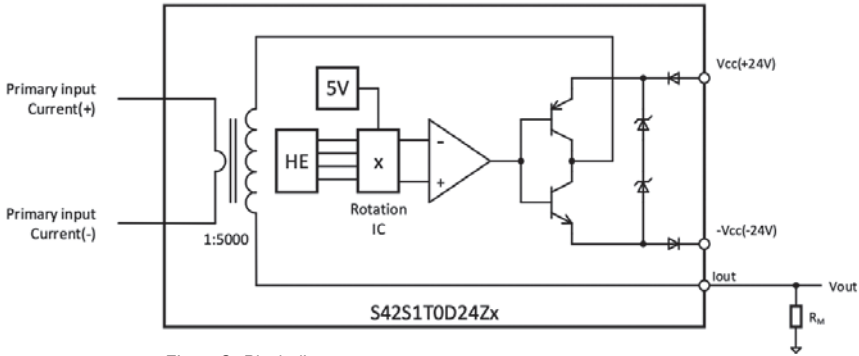
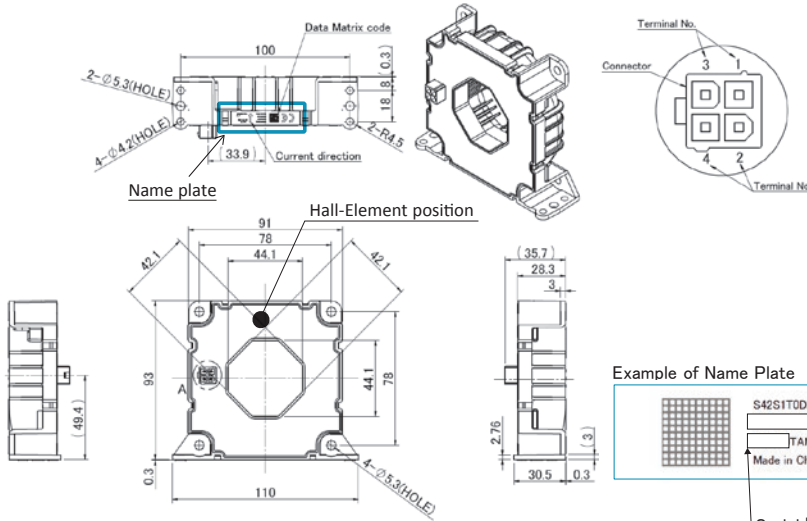


Figure 3 : Block diagram

DIMENSIONS (mm)

S42S1T0D24Z

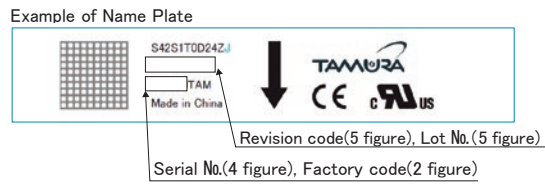


Terminal number

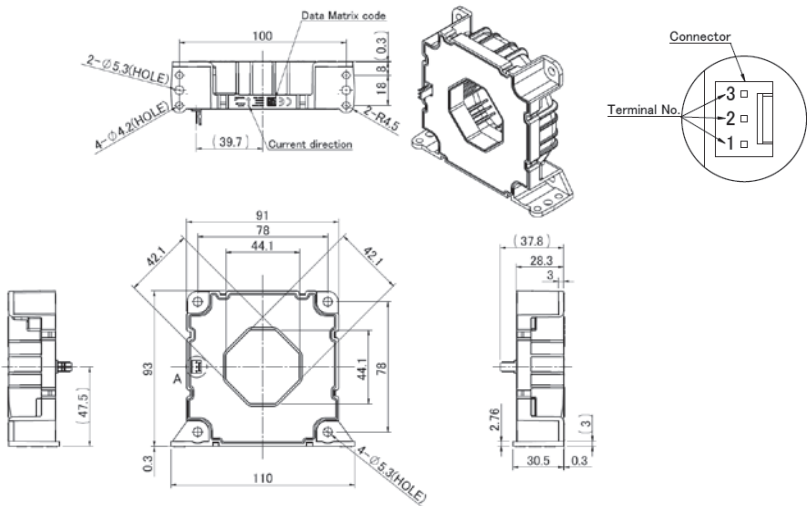
- 1 N.C
- 2 Vcc (+24V)
- 3 -Vcc (-24V)
- 4 Iout

Tolerance : ±0.5
Unit : mm

Connector		
Maker	PartsNo.	old parts No.
Molex	39-28-8040	5566-04A-210



S42S1T0D24ZM



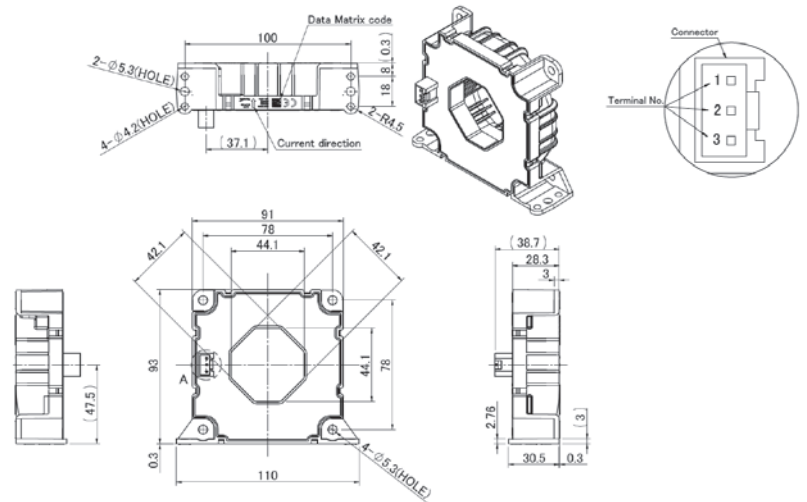
Terminal number

- 1 Vcc(+24V)
- 2 Iout
- 3 -Vcc(-24V)

Tolerance : ±0.5
Unit : mm

Connector		
Maker	PartsNo.	old parts No.
Molex	38-00-6293	AE-6410-03C(197)

S42S1T0D24ZJ



Terminal number

- 1 -Vcc(-24V)
- 2 Iout
- 3 Vcc(+24V)

Tolerance : ±0.5
Unit : mm

Connector		
Maker	PartsNo.	old parts No.
JST	BH3P-VH-1	-

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