Magnetic Proportion System / Compact size and High-speed response

LA01P SERIES

RoHS

ABSOLUTE MAXIMUM RATINGS

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

ISOLATION CHARACTERISTICS

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

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

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

SPECIFICATIONS

Ta=+25℃,V_{DD}=+5V,RL≧10MΩ

Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Measurement current range	**LA01P035S05**	If	A	− 35		35	
	LA01P046S05			− 46		46	
	LA01P054S05			− 54		54	
	LA01P085S05			− 85		85	
	LA01P170S05			− 170		170	

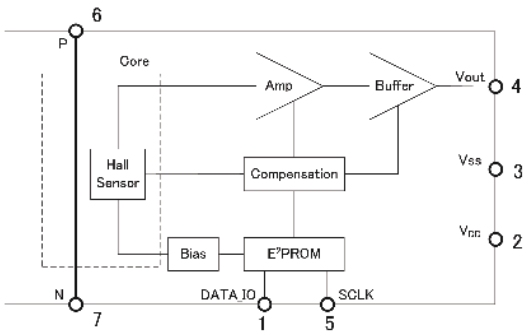
SPECIFICATIONS

Ta=+25℃,V_{DD}=+5V,RL≧10MΩ

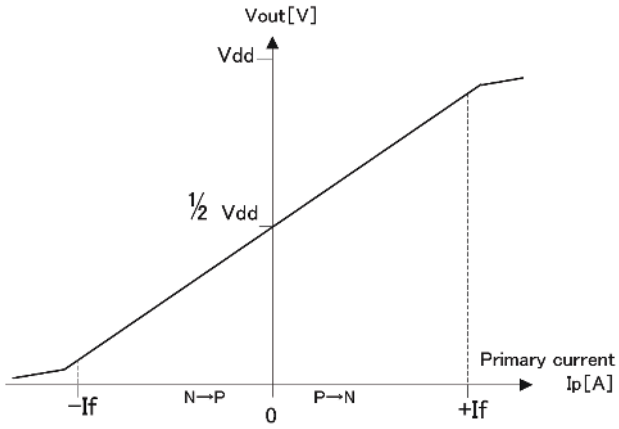
Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Maximum primary current (RMS)		$Ip_{(RMS)}$ max	A			50	＊1
Supply Voltage		V_{DD}	V	4.5	5.0	5.5	
Number of primary turns		Np	T		1		
Primary Jumper resistance		Rp	mΩ		0.10		
Current consumption (at Ip=0A)		I_{DD}	mA			10	
Offset voltage	**LA01P035S05**	Vof	V	2.408	2.500	2.592	
	LA01P046S05			2.423	2.500	2.577	
	LA01P054S05			2.432	2.500	2.568	
	LA01P085S05			2.451	2.500	2.549	
	LA01P170S05			2.465	2.500	2.535	
Temperature drift of offset voltage (at Ta=－40～＋90℃, Variation from Vof (Ta=35℃), Ip=0A)	**LA01P035S05**	TCVo	mV		±21.5		
	LA01P046S05				±17.0		
	LA01P054S05				±14.0		
	LA01P085S05				±9.0		
	LA01P170S05				±4.5		
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	
	LA01P170S05			11.7	12.0	12.3	
Temperature coefficient 1 of Sensitivity (at Ta=＋35～＋90℃, Variation ratio to G (Ta=35℃))	**LA01P035S05**	TCG1	%		±1		
	LA01P046S05				±2		
	LA01P054S05				±1		
	LA01P085S05				±1		
	LA01P170S05				±2		
Temperature coefficient 2 of Sensitivity (at Ta=－40～＋35℃, Variation ratio to G (Ta=35℃))		TCG2	%		±2		
Output Linearity (at 0... If)		ε_L	%	－1		1	
Output noise voltage		V_{NRMS}	mVrms			2.1	
Ratiometric error of sensitivity		V_{G-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

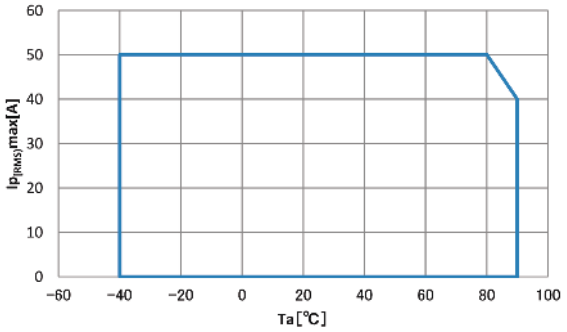
＊1 When $Ip_{(RMS)}$max is bigger than the value of If, $Ip_{(RMS)}$max restricts it to the value of If.

FUNCTIONAL BLOCK DIAGRAM



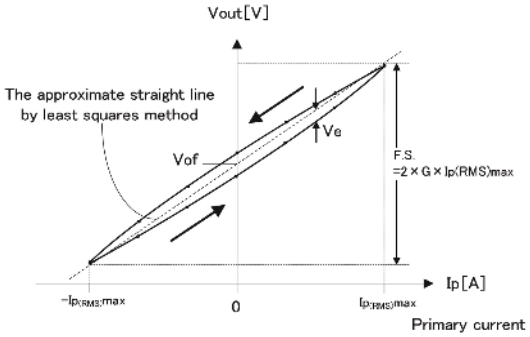
CHARACTERISTIC CURVE (TYP) AND PRIMARY CURRENT DERATING CURVE





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

CHARACTERISTICS DEFINITIONS



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

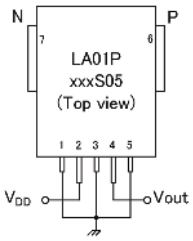
・Sensitivity G[mV/A],Offset voltage Vof[V]
Sensitivity(G)is defined as slope of the approximate straight line by least squares method, using the data of the output voltage(Vout)when sweeping the measured current Ip at rated current range.
Also Offset voltage(Vof)is defined as the intercept of the approximate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

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

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

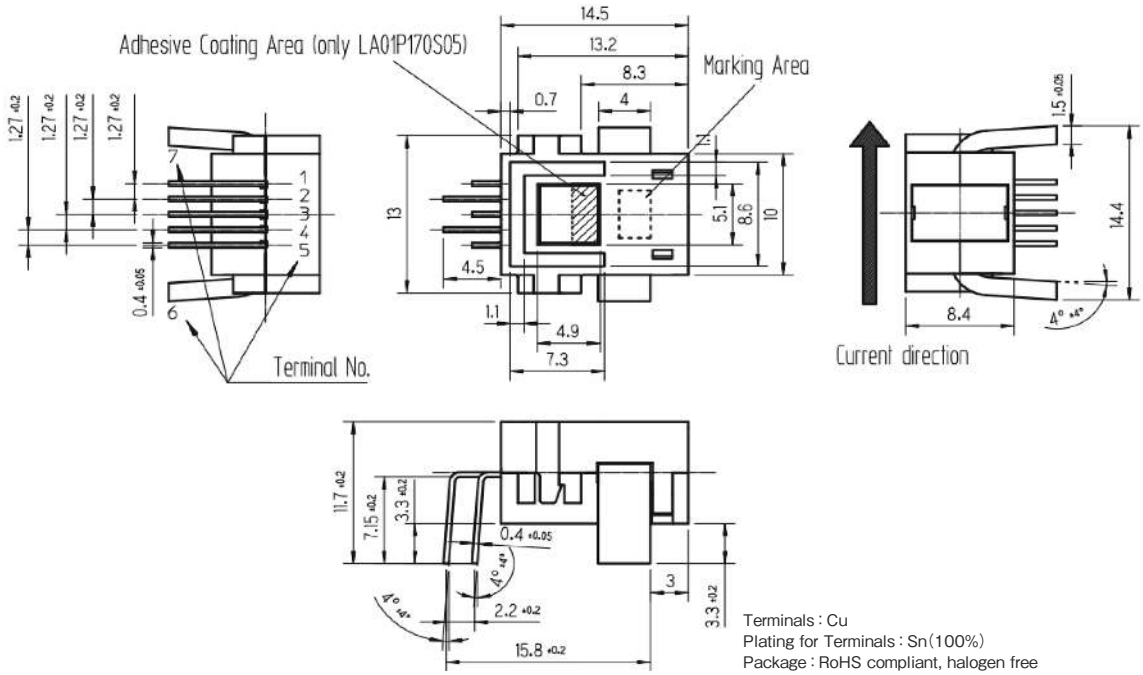
・Ratiometric error is defined as follows in the supply voltage range (4.5V<V_{DD}1<5.5V);
$V_{G\text{-}R}$ =100×[(G(V_{DD}=V_{DD}1)／G(V_{DD}=5V))−(V_{DD}1／5)]／(V_{DD}1／5)
$Vof_{\text{-}R}$ =100×[Vof(V_{DD}=V_{DD}1)−Vof(V_{DD}=5V)×(V_{DD}1／5)]／F.S.

TERMINAL DESCRIPTIONS



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

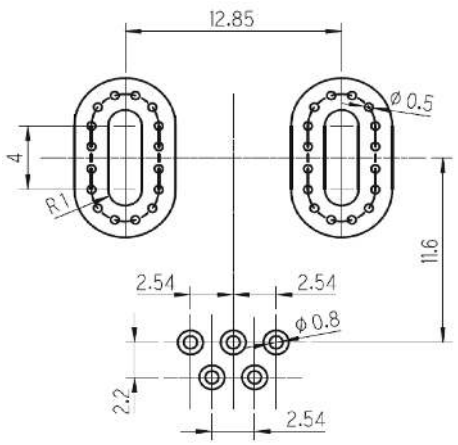
DIMENSIONS (mm)



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

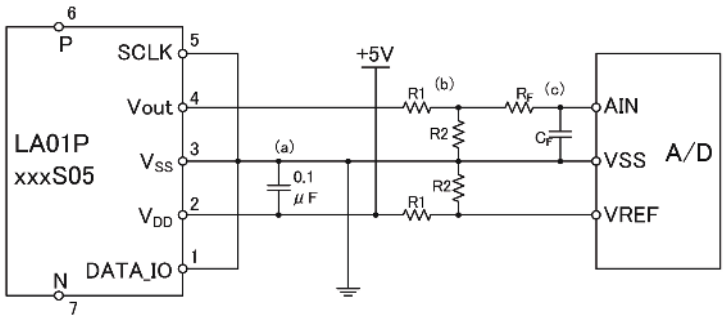
Note1) The tolerances of dimensions without any mention are ± 0.1mm.
Note2) The adhesive material (RoHS compliant, halogen free) is used for holding the magnetic core. (Only LA01P170S05)

RECOMMENDED THROUGH-HOLE LAYOUTS (mm)



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

TYPICAL APPLICATION



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

TYPE DESIGNATION

LA01 P * * * S 05
① ② ③ ④ ⑤

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

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.

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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.

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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.*

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Application notes

<General Considerations>

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

<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.