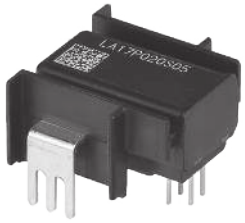
Magnetic Proportion System / Non ratiometric output, Vref-OUT/IN mode, Ta=105℃ Operating,

LA17P S05 SERIES



【STANDARDS】
·UL508
·CSA C22.2 No.14
·EN 62477-1

RoHS

ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Comment
Maximum supply voltage (not destructive)	V_{CC}	V	15	
Operational supply voltage (not entering non standard modes)	V_{CC}	V	7.2	
Primary conductor temperature	—	℃	120	
ESD (HBM : Human Body Model)	V_{ESD}	kV	2	C=150 pF, R=330 Ω

ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Comment
Insulation voltage	Vd	—	AC4300V, for 1minute(Sensing current 0.5mA)	Primary ⇔ Secondary
Impulse withstand voltage	Vw	kV	8.0	Primary ⇔ Secondary Input waveform : · Front time 1.2μs · Time to half value 50μs · single
Clearance distance	d_{Cl}	—	8.0 mm (MIN)	Primary ⇔ Secondary
Creepage distance	d_{Cp}	—	8.0 mm (MIN)	Primary ⇔ Secondary
Case material	—	—	UL94 V-0	
Comparative Tracking Index; (CTI)	CTI	V	600 (group Ⅰ)	

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Ambient operating temperature	T_A	℃	− 40		+ 105	
Ambient storage temperature	T_S	℃	− 40		+ 105	
Mass	m	g		6.5		
Internal magnetic core	—	—	Ferrite			

SPECIFICATIONS

T_A = +25℃ RL = 10 kΩ CL_out = 4.7 nF CL_ref = 47 nF, Vcc = +5.0 V

Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Primary nominal current	**LA17P010S05**	I_{PN}	A		10		
	LA17P016S05				16		
	LA17P020S05				20		
	LA17P032S05				32		
	LA17P040S05				40		
	LA17P050S05				50		
Primary current, measuring range	**LA17P010S05**	I_{PM}	A	− 25		25	Vcc > 4.8V Ref OUT mode
	LA17P016S05			− 40		40	
	LA17P020S05			− 50		50	
	LA17P032S05			− 80		80	
	LA17P040S05			− 100		100	
	LA17P050S05			− 125		125	
Number of primary turns		N_P	T		1		
Primary conductor resistance	T_A = 25℃	R_P	m Ω		0.21		
	T_A = 105℃				0.28		
Supply voltage		Vcc	V	4.5	5.0	5.5	
Consumption current		Icc	mA		16	23	@ Ip = 0A, Icc = 16+ Vout / RL
Internal reference voltage (output)		Vref1	V	2.48	2.50	2.52	Ref OUT mode
External reference input voltage		Vref2	V	0.50		2.65	Ref IN mode
Reference source current		Iref	mA	0.5	0.7	1.0	Vref to GND. See "support docu..." section.
Reference sink current		Iref	mA		5	10	Vref to Vcc. See "support docu..."section.
Output voltage range (@ I_{PM})		Vout-Vref	V	− 2		2	Ref OUT mode
Internal output resistance of Vref		Rref	Ω	150	200	300	
Internal output resistance of Vout		Rout	Ω		2	5	
External capacitive load of Vref		C_{L_ref}	nF	0.5		47	
External capacitive load of Vout		C_{L_out}	nF			4.7	
Electrical offset voltage (@ I_P=0 A) ＊1		Voe	mV	− 5		5	Vout - Vref @ Vref = 2.5 V
Temperature drift of Vref		$Vref_T$	mV	− 10		10	@T_A = − 40℃～ 105℃
Temperature drift of Voe (@ I_P=0 A)		Voe_T	mV	− 10		10	@T_A = − 40℃～ 105℃
Theoretical sensitivity	**LA17P010S05**	Gth	mV/A		80.0		800mV @ I_{PN} Vout = Vref + Voe + (Gth × I_P)
	LA17P016S05				50.0		
	LA17P020S05				40.0		
	LA17P032S05				25.0		
	LA17P040S05				20.0		
	LA17P050S05				16.0		
Sensitivity error ＊2		ε_G	%	− 0.5		0.5	@ I_{PN}
Temperature drift of sensitivity		G_T	%	− 3		3	@T_A = − 40℃～ 105℃

＊1 Electrical offset voltage value is after removal of magnetic offset voltage (core hysteresis).
＊2 It is the adjustment value at the time of shipment from the factory.

SPECIFICATIONS

T_A = +25℃ RL = 10 kΩ CL_out = 4.7 nF CL_ref = 47 nF, Vcc = +5.0 V

Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Linearity error	@0A ~ I_{PN}	ε_L	%	− 0.5		0.5	
	@0A ~ I_{PM}			− 0.5		0.5	
Magnetic offset current referred to primary		I_{OM}	A	− 0.25		0.25	@ $I_P = 10 \times I_{PN}$
Reaction time (@ 10 % of I_{PN})		t_{ra}	μs			2	@di/dt= I_{PN} / μs
Response time (@ 90 % of I_{PN})		t_r	μs			2.5	@di/dt= I_{PN} / μs
Frequency bandwidth		BW	kHz		400		@ − 3dB
Accuracy ＊3	T_A=25℃	X1	% of I_{PN}	− 1.0		1.0	@ I_{PN}
	T_A=105℃	X2	% of I_{PN}	− 5.3		5.3	

＊3 Accuracy formula is following Accuracy X1 = $\varepsilon_G + \varepsilon_L$
Accuracy X2 = X1 + (Voe_T / 800 × 100) + G_T

STANDARDS

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

UL508, CSA C22.2 No.14 (UL FILE No. E243511)
Rated voltage 600 V, PD2
The devices have been evaluated that they are intended to be supplied from an isolated secondary circuit of Limited Voltage/Current circuit or Limiting Impedance circuit defined in United States Standard or Industrial Control Equipment, UL 508.

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

CHARACTERISTIC CURVE (TYP)

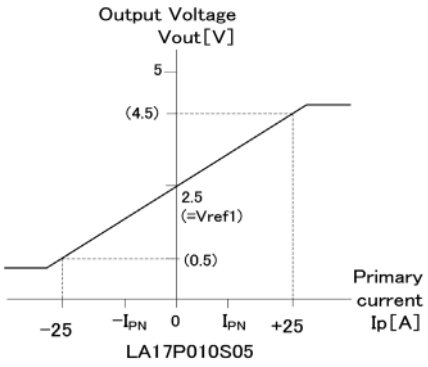


Fig 1 : Linearity curve Internal reference voltage)

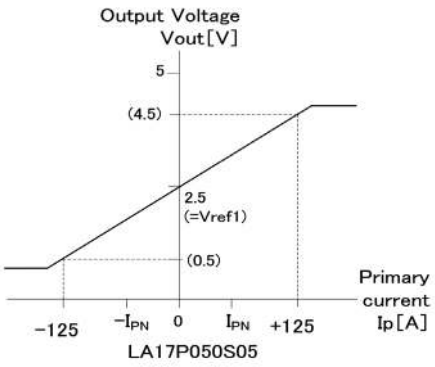


Fig 2 : Linearity curve Internal reference voltage)

SUPPORT DOCUMENTATION

Reference voltage

The Ref pin can be used as Ref OUT mode and/or Ref IN mode.

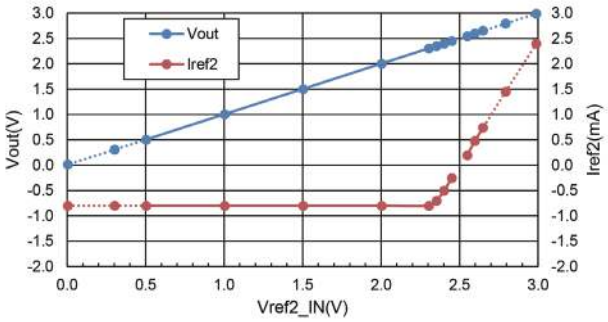
<Ref OUT mode>

The 2.5 V internal 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 0.5 to 2.65 V, its voltage is used as the offset voltage at the measurement.

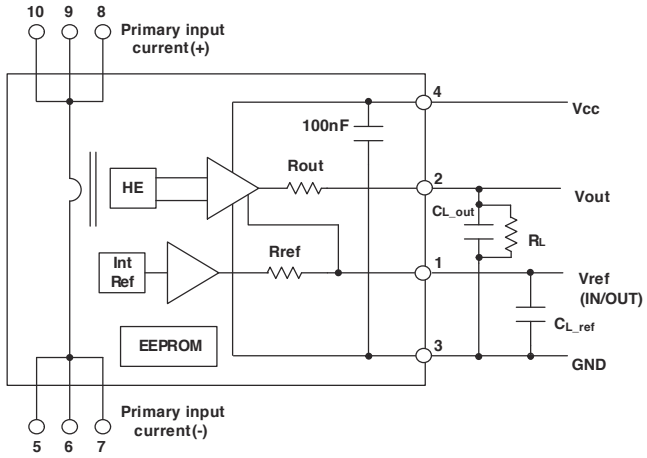
The following graphs (Fig3) show the output voltage (@ Ip = 0A) and the reference input / output current due to the external reference voltage value Vref2.



T_A = +25 ℃
Vcc = +5.0 V
RL = 10 kΩ
CL_out = 4.7 nF
CL_ref = 47 nF

Fig 3 : Vref2 input voltage vs Output voltage and Iref2 (= Vref2 current)
(Typical performance)

CONNECTION

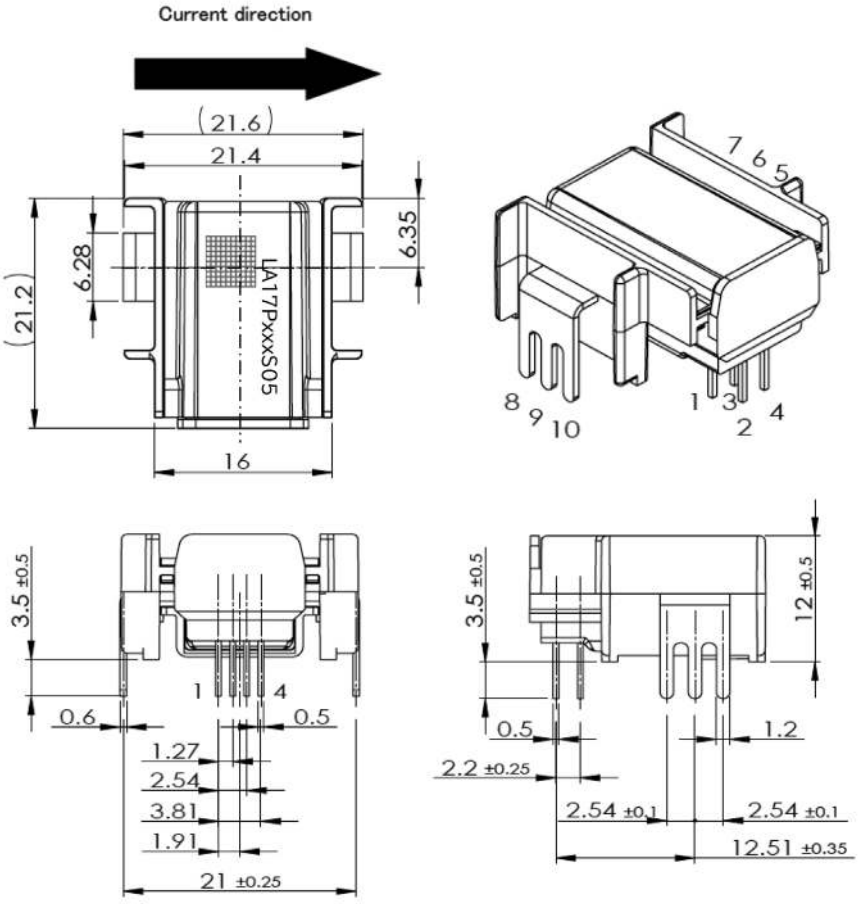


Condition (Standard)
C1 = 100 nF
C_{L_ref} = 0.5 nF MIN , 4.7 nF MAX
C_{L_out} = 4.7 nF MAX
RL = 10kΩ

< Notice >

- Capacitors are recommended for Vout and Vref terminals in order to reduce the noise of the output voltage.
  Vout terminal : 4.7 nF, Vref terminal : 47 nF.

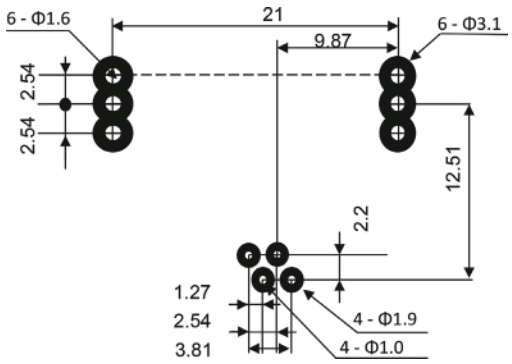
DIMENSIONS (mm)



Terminal No.
1 : Vref (IN/OUT)
2 : Vout
3 : GND
4 : Vcc (+5V)
5 : Primary input current(-)
6 : Primary input current(-)
7 : Primary input current(-)
8 : Primary input current(+)
9 : Primary input current(+)
10 : Primary input current(+)

Tolerance : ± 0.2
Unit : mm

RECOMMEND HOLE DIAMETER (unit : mm)



Perspective view

Unit : mm

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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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   - *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) .
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.