

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

LA17P S05 SERIES



[STANDARDS]
 •UL508
 •CSA C22.2 No.14
 •EN 62477-1



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	—	°C	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	V _d	—	AC4300V, for 1minute(Sensing current 0.5mA)	Primary ⇔ Secondary
Impulse withstand voltage	V _w	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	°C	- 40		+ 105	
Ambient storage temperature	T _S	°C	- 40		+ 105	
Mass	m	g		6.5		
Internal magnetic core	—	—	Ferrite			

SPECIFICATIONS

T_A = +25°C RL = 10 kΩ CL_{out} = 4.7 nF CL_{ref} = 47 nF, V_{cc} = +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	
	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°C	R _p	mΩ		0.21		
	T _A = 105°C				0.28		
Supply voltage	V _{cc}	V	4.5	5.0	5.5		
Consumption current	I _{cc}	mA		16	23	@ I _p = 0A, I _{cc} = 16+ V _{out} / RL	
Internal reference voltage (output)	V _{ref1}	V	2.48	2.50	2.52	Ref OUT mode	
External reference input voltage	V _{ref2}	V	0.50		2.65	Ref IN mode	
Reference source current	I _{ref}	mA	0.5	0.7	1.0	V _{ref} to GND. See "support docu..." section.	
Reference sink current	I _{ref}	mA		5	10	V _{ref} to V _{cc} . See "support docu..." section.	
Output voltage range (@ I _{PM})	V _{out} -V _{ref}	V	-2		2	Ref OUT mode	
Internal output resistance of V _{ref}	R _{ref}	Ω	150	200	300		
Internal output resistance of V _{out}	R _{out}	Ω		2	5		
External capacitive load of V _{ref}	C _{L,ref}	nF	0.5		47		
External capacitive load of V _{out}	C _{L,out}	nF			4.7		
Electrical offset voltage (@ I _p =0 A) * 1	V _{oe}	mV	-5		5	V _{out} - V _{ref} @ V _{ref} = 2.5 V	
Temperature drift of V _{ref}	V _{refT}	mV	-10		10	@T _A = -40°C~105°C	
Temperature drift of V _{oe} (@ I _p =0 A)	V _{oeT}	mV	-10		10	@T _A = -40°C~105°C	
Theoretical sensitivity	LA17P010S05	G _{th}	mV/A		80.0		
	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°C~105°C

* 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°C RL = 10 kΩ CL_{out} = 4.7 nF CL_{ref} = 47 nF, V_{cc} = +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 × 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°C	X1	% of I _{PN}	-1.0		1.0	@ I _{PN}
	T _A =105°C	X2	% of I _{PN}	-5.3		5.3	

* 3 Accuracy formula is following Accuracy X1 = ε_G + ε_L
Accuracy X2 = X1 + (V_{oeT} / 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)

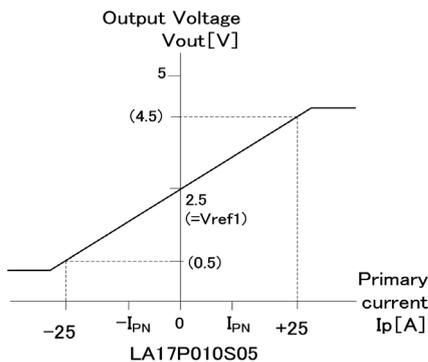


Fig 1 : Linearity curve Internal reference voltage)

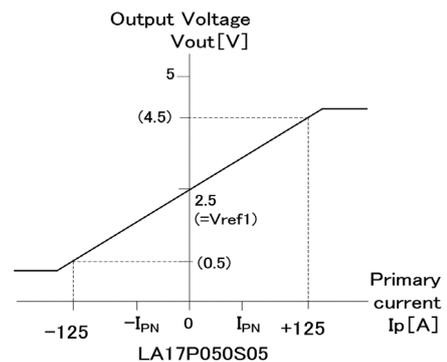


Fig 2 : Linearity curve Internal reference voltage)

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.

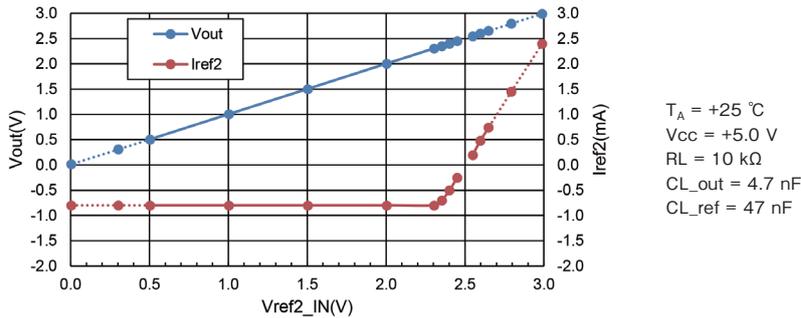
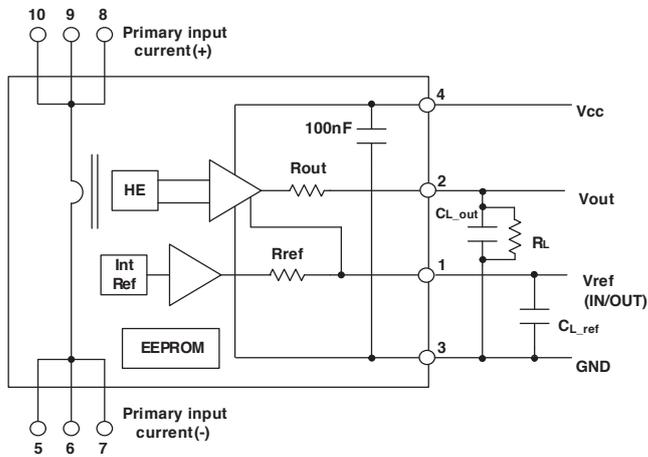


Fig 3 : Vref2 input voltage vs Output voltage and Iref2 (= Vref2 current) (Typical performance)

CONNECTION

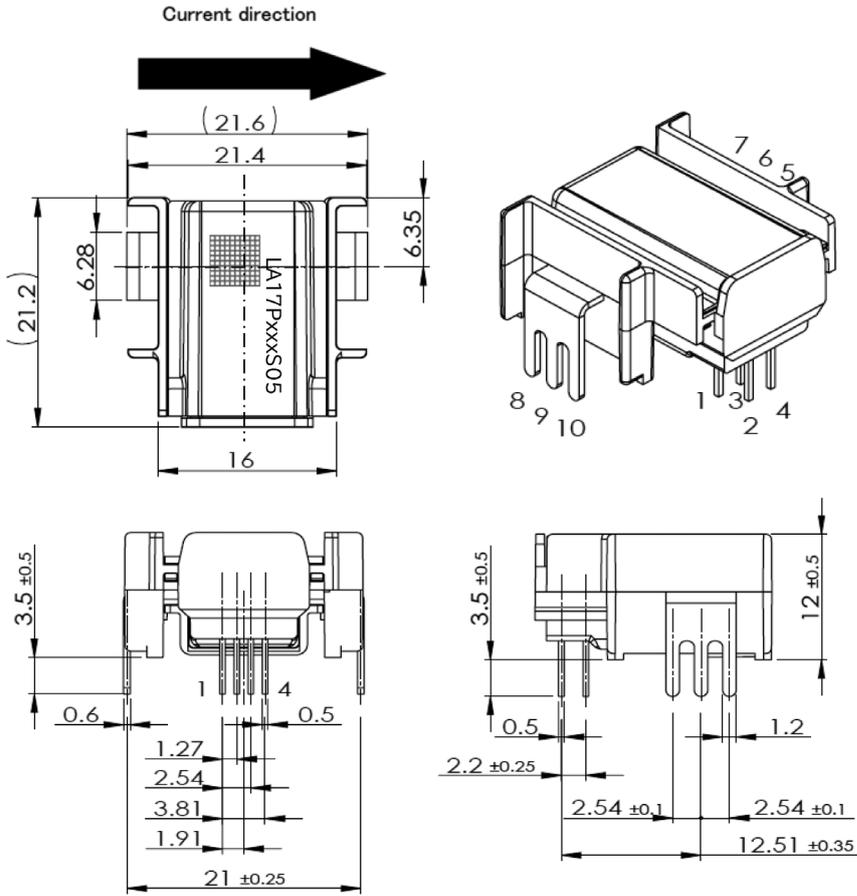


Condition (Standard)
 C1 = 100 nF
 CL_ref = 0.5 nF MIN , 4.7 nF MAX
 CL_out = 4.7 nF MAX
 RL = 10kΩ

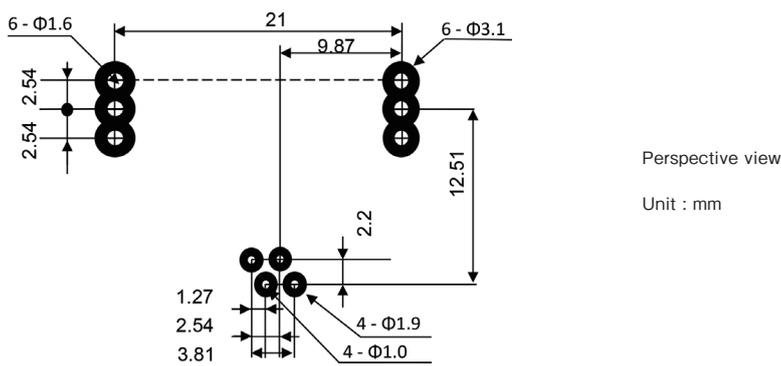
< Notice >

- 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)



RECOMMEND HOLE DIAMETER (unit : mm)



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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.