

Magnetic Proportion System / Through Type, Non ratiometric output, Vref-OUT/IN mode, $\Delta V_{out} = 625mV @ I_{PN}$

LA37S S05K SERIES



[STANDARDS]
 •UL508
 •CSA C22.2 No.14-18
 •EN 62477-1



ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Comment
Supply voltage	V_{CC}	V	7.2	
Primary conductor temperature	—	°C	120	
ESD (HBM : Human Body Model)	V_{ESD}	kV	2	C=100 pF, R=1.5 kΩ

ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Comment
Insulation voltage	V_d	—	AC3300V, 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}	—	5.5 mm (MIN)	Primary ⇔ Secondary
Creepage distance	d_{Cp}	—	5.5 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 * 1	T_A	°C	- 40		+ 105	
Ambient storage temperature	T_S	°C	- 40		+ 105	
Mass	m	g		60		
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

T_A = +25°C RL = 10 kΩ V_{CC}=+5V

Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Primary nominal current	LA37S050S05K*	I _{PN}	A		50		
	LA37S100S05K*				100		
	LA37S200S05K*				200		
	LA37S300S05K*				300		
	LA37S400S05K*				400		
	LA37S500S05K*				500		
	LA37S600S05K*				600		
Primary current, measuring range * 1	LA37S050S05K*	I _{PM}	A	- 150		150	V _{CC} > 4.8V Ref OUT mode
	LA37S100S05K*			- 300		300	
	LA37S200S05K*			- 600		600	
	LA37S300S05K*			- 900		900	
	LA37S400S05K*			- 1200		1200	
	LA37S500S05K*			- 1200		1200	
	LA37S600S05K*			- 1200		1200	
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} / R _L	
Load resistance	R _L	kΩ	4.7	10			
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	Inside LA37SxxxS05K * .	
Internal output resistance of V _{out}	R _{out}	Ω		2	5	Inside LA37SxxxS05K *	
Electrical offset voltage (@ I _p =0 A) * 2	V _{oe}	mV	- 5		5	V _{out} -V _{ref} at V _{ref} =2.5V	
Magnetic offset voltage	V _{OH}	mV	- 2.5		2.5	@ 0A → I _{PN} → 0A	
Temperature drift of reference voltage (at I _p =0 A)	V _{refT}	mV	- 10		10	@T _A = - 40°C~ 105°C	
Temperature drift of offset voltage (at I _p =0 A)	V _{oeT}	mV	- 10		10	@T _A = - 40°C~ 105°C	
Theoretical sensitivity	LA37S050S05K*	G _{th}	mV/A		12.50		625mV @ I _{PN} V _{out} = V _{ref} + V _{oe} + (G _{th} × I _p)
	LA37S100S05K*				6.250		
	LA37S200S05K*				3.125		
	LA37S300S05K*				2.083		
	LA37S400S05K*				1.563		
	LA37S500S05K*				1.250		
	LA37S600S05K*				1.042		
Sensitivity error * 3	ε _G	%	- 1.3		1.3	@ I _{PN}	
Temperature drift of sensitivity	G _T	%	- 3.0		3.0	@T _A = - 40°C~ 105°C	

* 1 Measurement condition : Primary conductor cross sectional area is as same as through hole, and penetration with 1 turn in through hole.

* 2 Electrical offset voltage value is after removal of magnetic offset voltage (core hysteresis).

* 3 Sensitivity error is factory inspection value. MAX and MIN are values of ± 3 σ .

SPECIFICATIONS

T_A = +25°C RL = 10 kΩ V_{CC}=+5V

Parameters		Symbol	Unit	Value			Comment
				MIN	TYP	MAX	
Linearity error	@0A ~ I _{PN}	ε _L	%	-0.5		0.5	
	@0A ~ I _{PM}			-1.0		1.0	
Reaction time (@ 10 % of I _{PN}) * 1		t _{ra}	μs			3.0	di/dt=100A / μs
Response time (@ 90 % of I _{PN}) * 1	LA37S050S05K*	tr	μs			4.0	di/dt=100A / μs
	Others					3.5	
Frequency bandwidth		BW	kHz		100		@ - 3dB
Output voltage noise	LA37S050S05K*	V _{no}	mVpp		30		DC..20MHz
	LA37S100S05K*				25		
	LA37S200S05K*				20		
	LA37S300S05K*				20		
	LA37S400S05K*				25		
	LA37S500S05K*				20		
	LA37S600S05K*				20		
Accuracy * 4	T _A =25°C	X1	% of I _{PN}	-1.8		1.8	@ I _{PN}
	T _A =105°C	X2	% of I _{PN}	-6.4		6.4	

* 1 Measurement condition : Primary conductor cross sectional area is as same as through hole, and penetration with 1 turn in through hole.

* 4 Accuracy formula is following
 Accuracy X1 = ε_G + ε_L
 Accuracy X2 = X1 + (V_{oeT} / 625 × 100) + G_T

STANDARDS



EN62477-1:2012, EN62477-1:2012/A1:2017 and EN62477-1:2012/A11:2014
 Rated voltage 300V, CAT III, PD2, Reinforced isolation, non uniform field



UL508, CSA C22.2 No.14-18 (UL FILE No. E243511)
 Rated voltage 600V, PD2

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

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 (Fig 1) show the output voltage (@ $I_p = 0A$) and the reference input / output current due to the external reference voltage value Vref2.

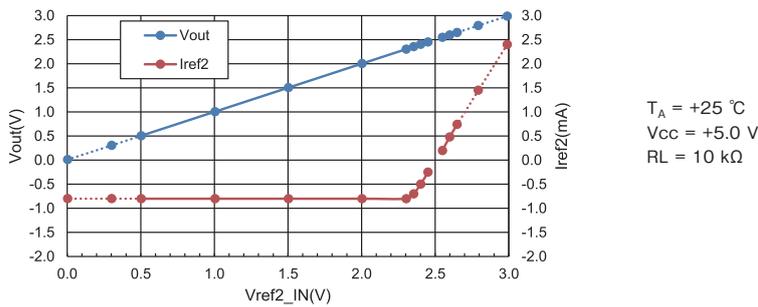
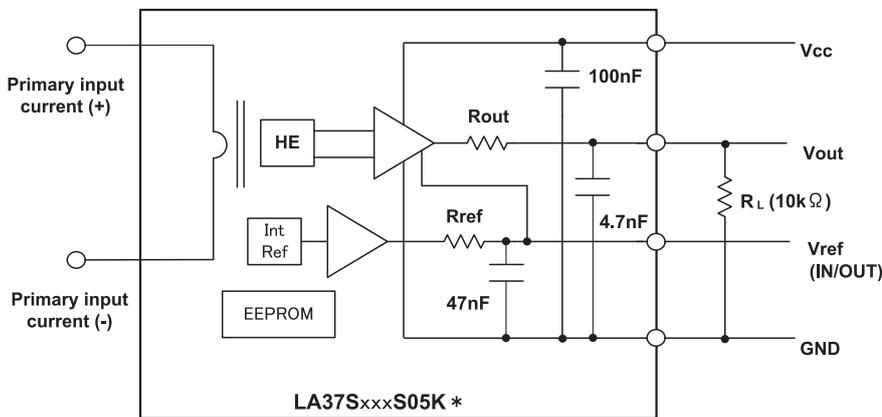


Fig 1 : Vref2 input voltage vs Output voltage and Iref2 (= Vref2 current) (Typical performance)

CONNECTION

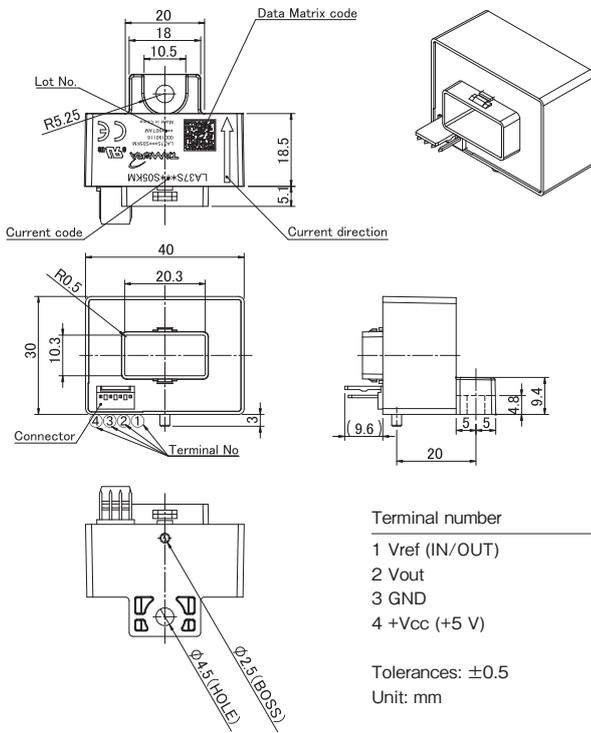


< Notice >

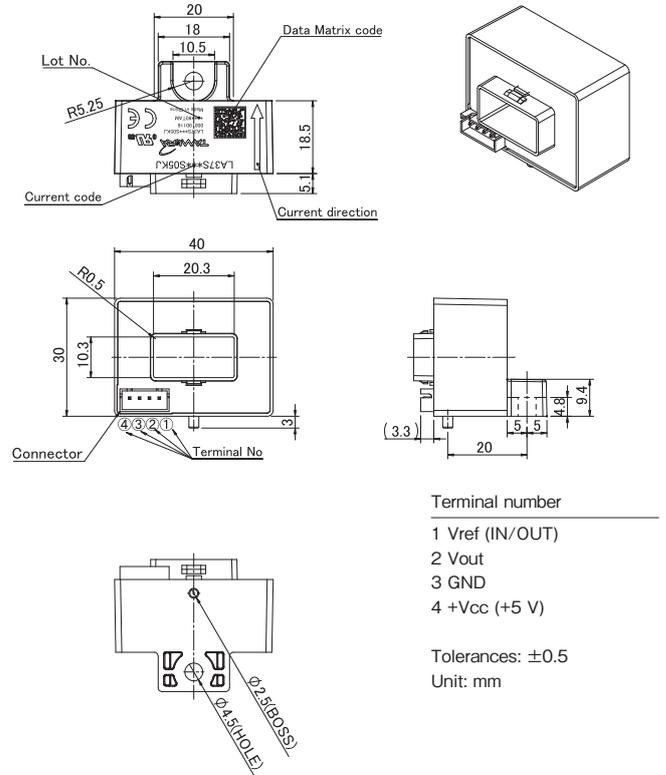
Sufficient capacitors are built into the product for the purpose of reducing output noise. Do not attach external capacitors to the Vout and Vref terminals.

DIMENSIONS (mm)

LA37SxxxS05KM(M-A) Series



LA37SxxxS05KJ Series



- Recommended fastening screw type : M4 with flat washer and spring washer
- Recommended fastening torque : < 1.5 N · m

Note
It is different from how to put the pin numbering of connector manufacturer (JST). It is matched to the Molex type.

Order number and Connector number (terminal plating)

Types		Connector			
		Manufacturer	Part Number	Old Part Number	Plating of terminal
LA37SxxxS05KJ	Standard	JST	B4B-XH-A-G	—	Au
LA37SxxxS05KM	Standard	Molex	22-04-1041	5045-04A	Sn
LA37SxxxS05KM-A	Build to Order		22-11-1041	5045-04AG	Au

- * Rated current (3 figures)
- * As for the LA37SxxxS05KM series of a gold-plated connector, ' -A ' attaches to the end of the product name.
- * The pin numbers of LA37SxxxS05KJ are different from those of the connector maker (JST). It is matched to the Molex type.

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:

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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.