

Magnetic Proportion System / Through Type

# L51S D15 SERIES



- [STANDARDS]**
- UL508
  - CSA C22.2 No.14-18
  - EN 62477-1
  - EN 50178



### ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Unit	Value	Comment
Supply voltage	Vcc	V	± 18V	
Primary conductor temperature	—	°C	120	

### ISOLATION CHARACTERISTICS

Parameters	Symbol	Unit	Value	Comment	
Insulation voltage	L51SxxxD15*** L51SxxxD15L***	Vd	—	AC5400V, for 1minute (Sensing current 0.5mA)	Primary ↔ Secondary
	L51SxxxD15C***			AC7400V, for 1minute (Sensing current 0.5mA)	
Impulse withstand voltage	L51SxxxD15*** L51SxxxD15L***	Vw	kV	9.6	Primary ↔ Secondary Input waveform : • Front time 1.2μs • Time to half value 50μs • single
	L51SxxxD15C***			16.5	
Insulation resistance	R <sub>IS</sub>	—	≥ 1000M Ω (at DC500V)	Primary ↔ Secondary	
Clearance distance	L51SxxxD15*** L51SxxxD15L***	d <sub>Cl</sub>	—	11.0mm (MIN)	Primary ↔ Secondary
	L51SxxxD15C***			20.0mm (MIN)	Primary ↔ Secondary
Creepage distance	L51SxxxD15*** L51SxxxD15L***	d <sub>cp</sub>	—	12.7mm (MIN)	Primary ↔ Secondary
	L51SxxxD15C***			30.5mm (MIN)	Primary ↔ Secondary
Case material	—	—	UL94 V-0		
Filler material	—	—	UL94 V-0		
Comparative Tracking Index : (CTI)	Case	CTI	V	600 ( group I )	
	Filler			600 ( group I )	

### ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Ambient operating temperature * 1	T <sub>A</sub>	°C	- 40		+ 105	
Ambient storage temperature	T <sub>S</sub>	°C	- 40		+ 105	
Mass	m	g		400		
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, RL=10kΩ, Vcc=±15V

Parameters	Symbol	Unit	Value			Comment
			MIN	TYP	MAX	
Primary nominal current	L51S500D15****	I <sub>PN</sub>	A		500	
	L51S600D15****				600	
	L51S850D15****				850	
	L51S1T0D15****				1000	
	L51S1T2D15****				1200	
	L51S1T5D15****				1500	
	L51S2T0D15****				2000	
	L51S2T5D15****				2500	
Primary current, measuring range * 1, 2	L51S500D15****	I <sub>PM</sub>	A	-1500		1500
	L51S600D15****			-1800		1800
	L51S850D15****			-2550		2550
	L51S1T0D15****			-3000		3000
	L51S1T2D15****			-3600		3600
	L51S1T5D15****			-4500		4500
	L51S2T0D15****			-5500		5500
	L51S2T5D15****			-5500		5500
Supply Voltage	V <sub>cc</sub>	V	± 12(± 5%)	± 15(± 5%)		
Consumption current	I <sub>cc</sub>	mA		20	30	at I <sub>p</sub> = 0A, I <sub>cc</sub> = 20 + V <sub>out</sub> / R <sub>L</sub>
Rated output voltage	V <sub>o</sub>	V	3.960	4.000	4.040	at I <sub>PN</sub>
Offset voltage * 3	V <sub>of</sub>	V	-0.020	0.000	+0.020	at I <sub>p</sub> = 0A
Hysteresis error	V <sub>OH</sub>	mV			± 30	at 0A → I <sub>PN</sub> → 0A
Temperature coefficient of V <sub>o</sub>	TcV <sub>o</sub>	%/°C			± 0.1	Without TcV <sub>of</sub>
Temperature coefficient of V <sub>of</sub>	TcV <sub>of</sub>	mV/°C	-1		+1	at I <sub>p</sub> = 0A
Linearity error (0A ~ I <sub>PN</sub> )	ε <sub>L</sub>	%	-1		+1	
Output load resistance	R <sub>L</sub>	k Ω		10		
Response time (@90% of I <sub>PN</sub> ) * 4	t <sub>r</sub>	μ s			5	di/dt=100A/μs
Frequency bandwidth (-3dB) * 5	BW	kHz	25			at very low current

\*1 If the product of 1500A or less operate at V<sub>cc</sub> = ± 12V power supplies, measuring range is reduced to 2.5 x I<sub>PN</sub>.  
 \*2 The value of measured current which indicates an output with a greater than ± 5% deviation from 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 1 turn in through hole.  
 \*5 High fundamental frequency primary current and/or harmonic current may result in excessive heating in magnetic core(Silicon steel).

STANDARDS



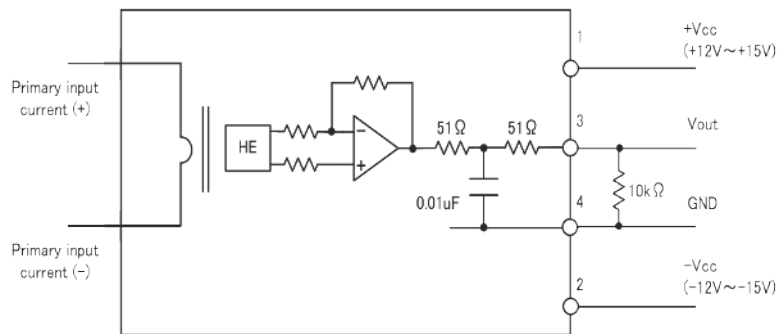
EN62477-1:2012, EN62477-1:2012/A1:2017 and EN62477-1:2012/A11:2014  
 Rated voltage L51SxxxD15\*\*\*, L51SxxxD15L\*\*\* 600V, CAT III, PD2, Reinforced isolation, non uniform field  
 L51SxxxD15C\*\*\* 1000V, CAT III, PD2, Reinforced isolation, non uniform field

EN50178:1997  
 Rated voltage L51SxxxD15C\*\*\* 1500V, CAT III, PD2, Reinforced isolation, non uniform field



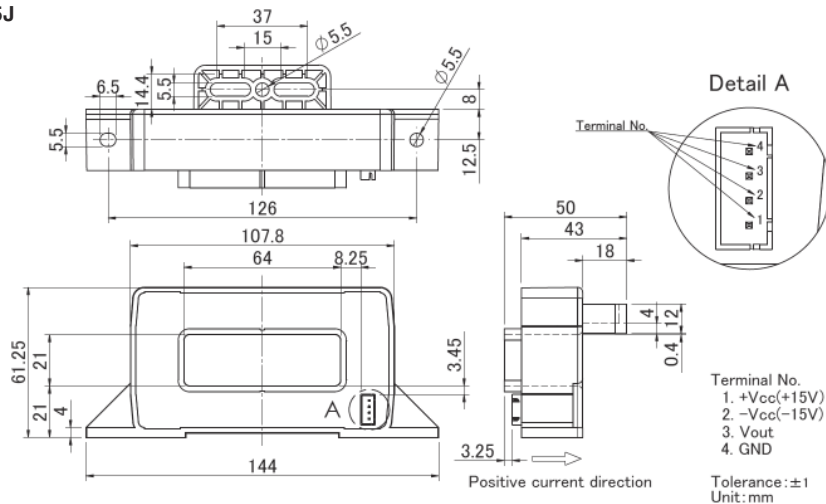
UL508, CSA C22.2 No.14-18 ( UL FILE No. E243511 )  
 Rated voltage L51SxxxD15\*\*\*, L51SxxxD15L\*\*\* 600V, PD2  
 L51SxxxD15C\*\*\* 1500V, PD2

CONNECTION



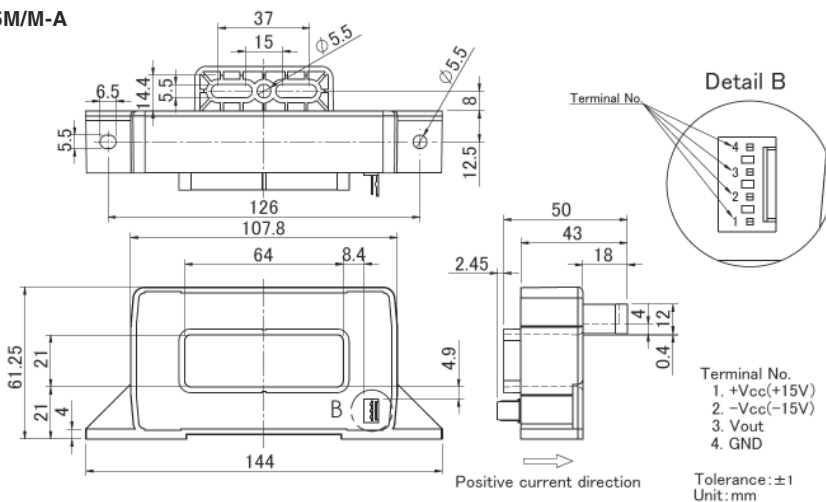
DIMENSIONS (mm)

L51SxxxD15J

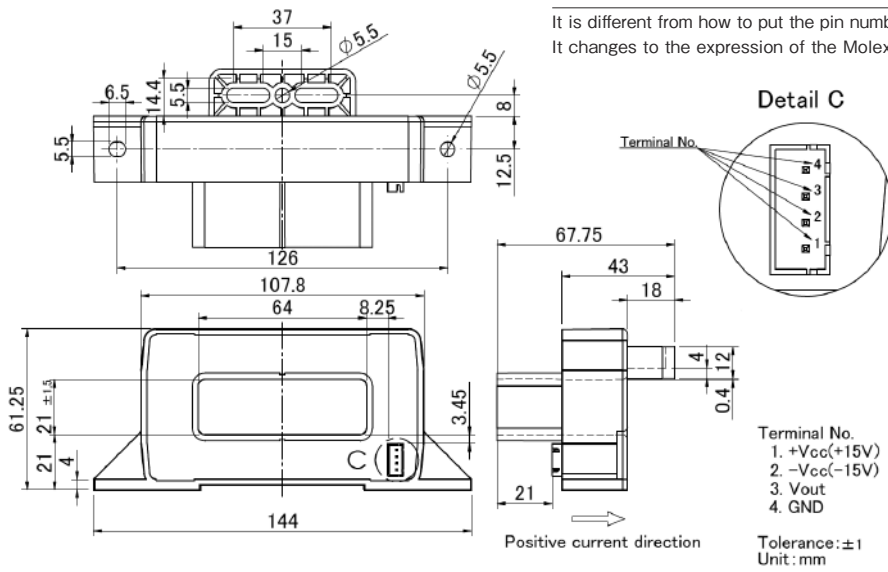


NOTE  
 It is different from how to put the pin numbering of connector manufacturer (JST). It changes to the expression of the Molex product.

L51SxxxD15M/M-A



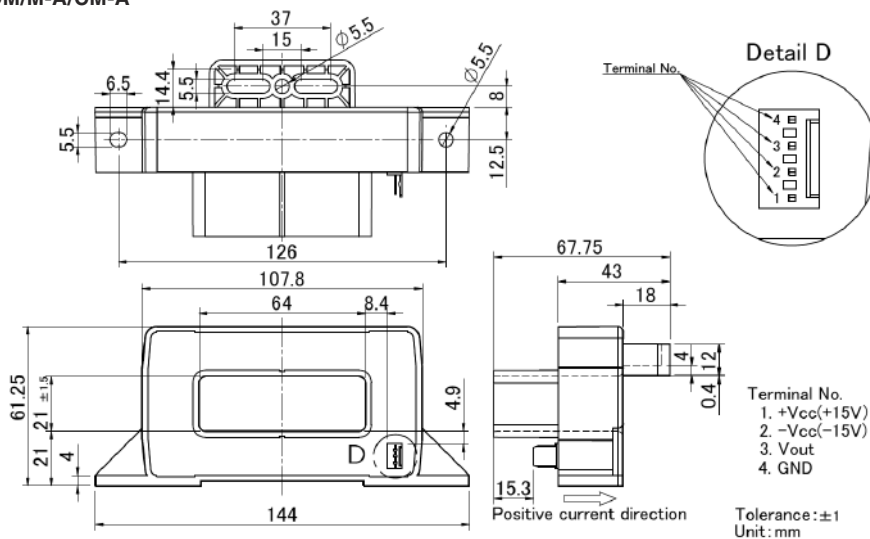
L51SxxxD15CJ



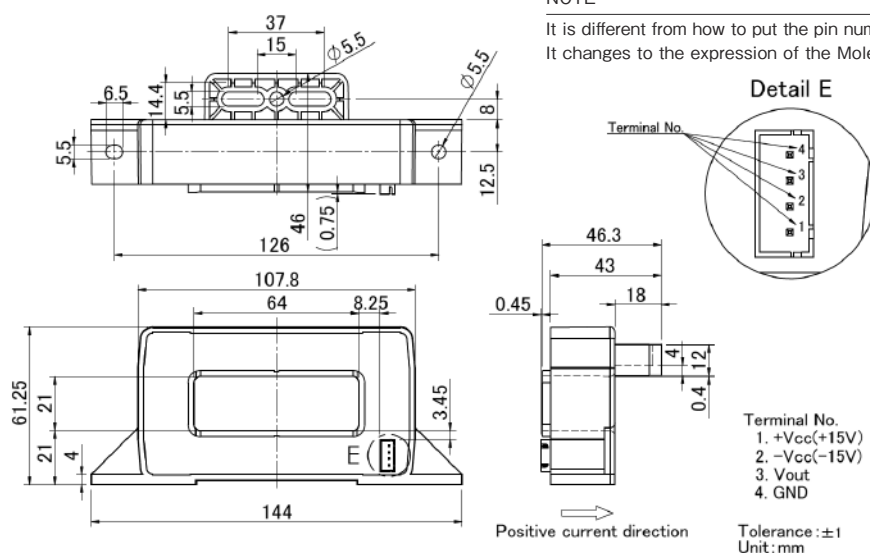
NOTE

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

L51SxxxD15M/CM/M-A/CM-A



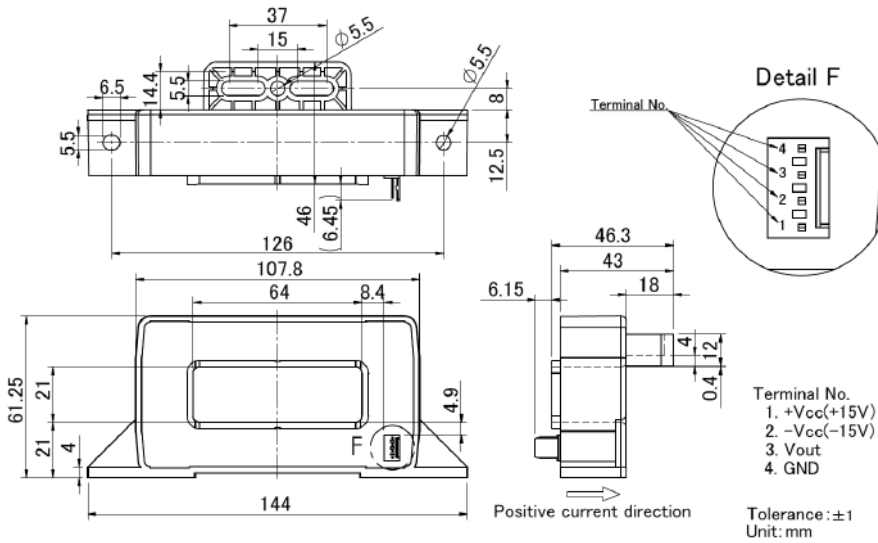
L51SxxxD15LJ



NOTE

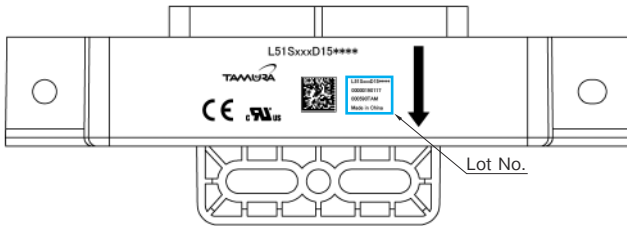
It is different from how to put the pin numbering of connector manufacturer (JST). It changes to the expression of the Molex product.

L51SxxxD15LM/LM-A



- Recommended fastening screw type : M5 with flat washer and spring washer
- Recommended fastening torque : < 1.5 N · m

MARKING



Example of Lot No.

**L51SxxxD15\*\*\*\***  
 (\*6) **0190117** ← Types  
**000590TAM** ← Revision code(1 figure), Date code(6 figures)  
 Serial No.(4 figures), Factory code(2 figures)  
**Made in China** ← Country of production

\*6 Digit number adjustment code

Order number and Safety application / Connector number (terminal plating)

Types	Safety application		Connector			
	UL508-600V EN	UL508-1500V EN	Manufacturer	Part Number	Old Part Number	Plating of terminal
L51SxxxD15J	○		JST	B4B-XH-A-G	—	Au
L51SxxxD15LJ	○					
L51SxxxD15CJ		○				
L51SxxxD15M	○		Molex	22-04-1041	5045-04A	Sn
L51SxxxD15LM	○					
L51SxxxD15CM		○				
L51SxxxD15M-A	○					
L51SxxxD15LM-A	○		Build to Order	22-11-1041	5045-04AG	Au
L51SxxxD15CM-A		○				

\* Rated current (3 figures)  
 \* As for the L51SxxxD15M series of a gold-plated connector, ' -A ' attaches to the end of the product name.  
 \* The pin number of "B4B-XH-A-G" are different from those of the connector manufacturer (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:
 

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, Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, or NO<sub>2</sub>, 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.