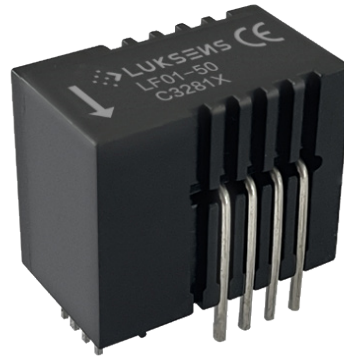


# LF01 Series Fluxgate Current Sensor

The LF01 series fluxgate current sensor incorporates dynamic fluxgate detection technology. Its design is simple and practical, with the ability to inhibit high temperature drift. Fluxgate technology makes use of the phenomenon of magnetic core saturation to modulate the measured magnetic field, transforming it into an electric field and thus, completing the magnetic field measurement process.



## Features

- Non-contact measurement of high current
- Fluxgate technology without hall element
- Output voltage proportional to carried current
- Max. nominal range  $\pm 50\text{A}$  (DC or AC peak)
- High frequency bandwidth 300kHz
- Compact size for PCB mount
- RoHs compliance (Lead-Free)

## Applications

- Solar inverters
- Servo motor drives
- Uninterruptible power supplies
- Battery management systems
- Welding applications

## Advantages

- Accurately measures AC, DC and pulse currents
- Rapid response, minimal noise output
- Superior temperature stability and linearity
- No insertion losses
- High immunity from external interference
- Nearly zero offset voltage
- High ESD sensitivity (Human Body Model) 4kV

## Standards

- EN 50178: 1997
- IEC 60950-1:2006
- IEC 61010-1:2010
- IEC 62109-1: 2010

## Absolute maximum ratings

Symbol	Parameter	Min.	Max.	Unit
$V_{DD\ max.}$	Maximum supply voltage (not destructive)		7	V
$T_{PC}$	Primary conductor temperature		110	°C
$T_A$	Ambient operating temperature	-40	105	°C
$T_S$	Storage temperature range	-40	105	°C
$V_{ESD-HBM}$	ESD sensitivity HBM (Human Body Model)		4	kV

Stresses above these ratings may cause permanent damage. Exposure to absolute maximum ratings for extended periods may degrade reliability.

## Specifications ( $T_A = 25^\circ\text{C}$ , $V_{DD} = 5.0\text{V}$ )

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
$V_{DD}$	Supply voltage		4.75	5	5.25	V
$I_C$	Current consumption ( $I_P=0\text{A}$ without load)	LF01-06		25		mA
		LF01-15		30		
		LF01-25		35		
		LF01-50		55		
$I_{PN}$	Current nominal measuring range	LF01-06	-20	$\pm 06$	20	A
		LF01-15	-51	$\pm 15$	51	
		LF01-25	-85	$\pm 25$	85	
		LF01-50	-150	$\pm 50$	150	
$n_p$	Number of primary turns		1, 2, 3, 4			
$n_s$	Number of secondary turns	LF01-06	1,816			
		LF01-15	1,737			
		LF01-25	1,764			
		LF01-50	1,600			
$V_{REF1}$	Internal reference voltage	$I_P=0\text{A}$	2.495	2.5	2.505	V
$V_{REF2}$	External reference voltage		0		4	V
$V_{OUT}$	Output voltage range		0.375		4.625	V
$V_O$	Zero current output voltage	$I_P=0\text{A}$	$V_{REF1}$ or $V_{REF2}$ <sup>*1</sup>			V

\*1  $V_O$  can work in internal reference voltage ( $V_{REF1}$ ) or external reference voltage ( $V_{REF2}$ ) mode.

# Specifications ( $T_A = 25^\circ\text{C}$ , $V_{DD} = 5.0\text{V}$ )

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
$V_{OE}$	Offset voltage $V_{OE} = V_{OUT} (@I_p = 0A) - V_{REF1 \text{ or } REF2}$	LF01-06	-5.3		5.3	mV
		LF01-15	-2.21		2.21	
		LF01-25	-1.35		1.35	
		LF01-50	-0.725		0.725	
$I_{OE}$	Offset current referred to primary without magnetic hysteresis	LF01-06	-51		51	mA
		LF01-15	-53		53	
		LF01-25	-54		54	
		LF01-50	-58		58	
$T_{CVREF1}$	Temperature coefficient of $V_{REF1}$		-50	$\pm 5$	50	ppm/ $^\circ\text{C}$
$T_{CVO}$	Temperature coefficient of $V_o$ @ $I_p = 0A$ $T_A = -40^\circ\text{C} \dots 105^\circ\text{C}$ , $V_o = 2.5V$	LF01-06	-14	$\pm 6$	14	ppm/ $^\circ\text{C}$
		LF01-15	-6	$\pm 2.3$	6	
		LF01-25	-4	$\pm 1.4$	4	
		LF01-50	-3	$\pm 0.7$	3	
$G$	Nominal sensitivity ( $625\text{mV} / I_{pN}$ )	LF01-06		104.2		mV/A
		LF01-15		41.67		
		LF01-25		25		
		LF01-50		12.5		
$\epsilon_G$	Sensitivity error	$\pm I_{pN}$	-0.7		0.7	$\% / I_{pN}$
$T_{CG}$	Temperature coefficient of G	$T_A = -40^\circ\text{C} \dots 105^\circ\text{C}$	-40		40	ppm/ $^\circ\text{C}$
$\epsilon_L$	Non-linearity error	$\pm I_{pN}$ without offset	-0.1		0.1	$\% / I_{pN}$
$I_{om}$	Magnetic offset current	After $10 \cdot I_p$ overload	-0.1		0.1	A
$V_{NP-P}$	Peak-Peak output noise $R_L = 1k\Omega$	LF01-06		40	160	mV
		LF01-15		15	60	
		LF01-25		10	40	
		LF01-50		5	20	
$T_{RA}$	Step response to 10% of $I_{pN}$ , $di/dt = 18A / \mu s$	LF01-06		0.3	1	$\mu s$
	Step response to 10% of $I_{pN}$ , $di/dt = 44A / \mu s$	LF01-15		0.3	1	
	Step response to 10% of $I_{pN}$ , $di/dt = 68A / \mu s$	LF01-25		0.3	1	
	Step response to 10% of $I_{pN}$ , $di/dt = 100A / \mu s$	LF01-50		0.3	1	

## Specifications ( $T_A = 25^\circ\text{C}$ , $V_{DD} = 5.0\text{V}$ )

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
$T_R$	Step response to 90% of $I_{PR}$ , $di/dt = 18\text{A}/\mu\text{s}$	LF01-06		0.5	1	$\mu\text{s}$
	Step response to 90% of $I_{PR}$ , $di/dt = 44\text{A}/\mu\text{s}$	LF01-15		0.5	1	
	Step response to 90% of $I_{PR}$ , $di/dt = 68\text{A}/\mu\text{s}$	LF01-25		0.5	1	
	Step response to 90% of $I_{PR}$ , $di/dt = 100\text{A}/\mu\text{s}$	LF01-50		0.5	1	
<b>BW</b>	Frequency bandwidth(-1dB)		200			kHz
<b>BW</b>	Frequency bandwidth(-3dB)		300			kHz

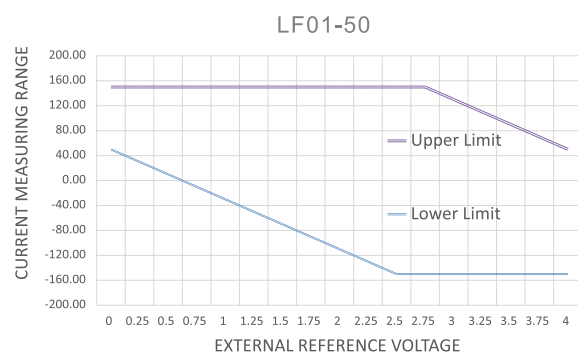
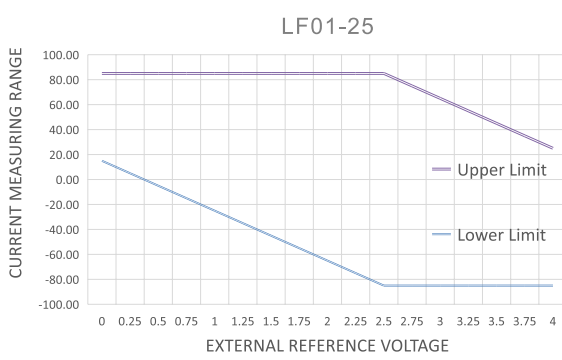
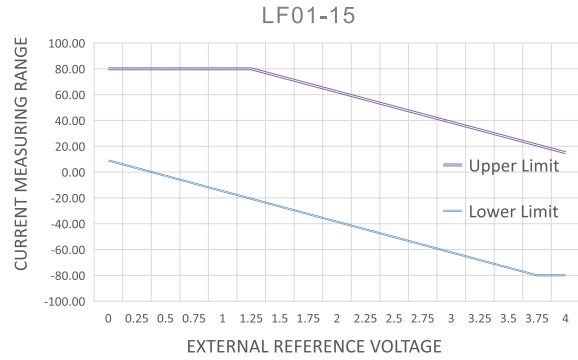
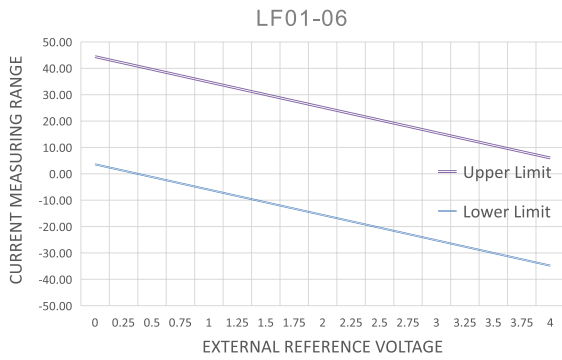
## Insulation characteristics

Symbol	Parameter	Value	Unit	Comment
$V_o$	Insulation voltage for isolation, 50Hz, 1 min	4300	V	
$R_{iso}$	Isolation resistance @ DC 500V	>500	M $\Omega$	
<b>D-CLE</b>	Clearance	8.3	mm	Shortest distance through air
<b>D-CRD</b>	Creepage distance	8.3	mm	Shortest path along sensor body

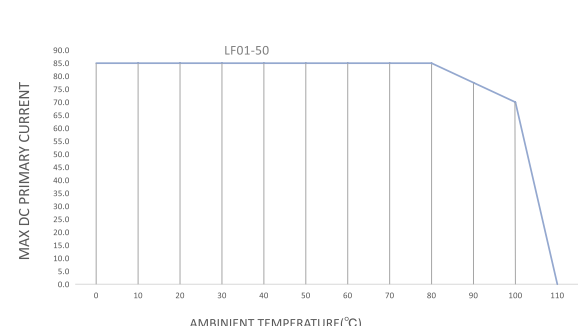
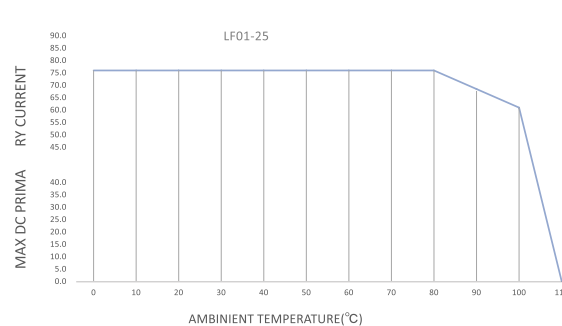
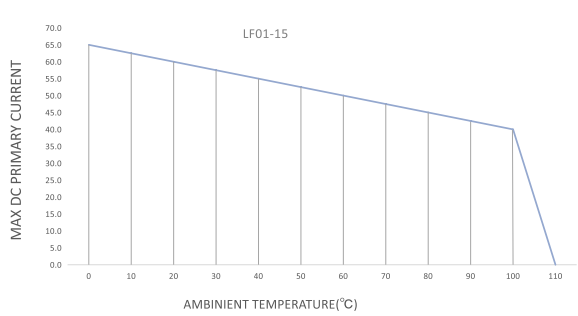
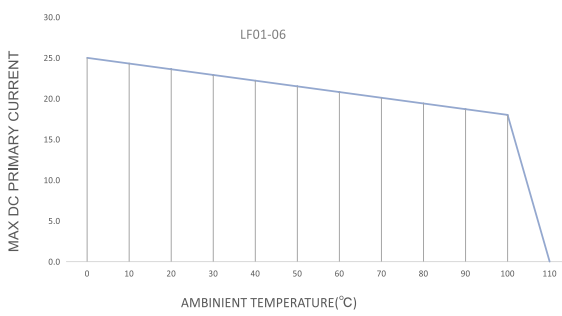
## General characteristics

Symbol	Parameter	Value	Unit	Comment
<b>m-HSE</b>	Housing material	V0		Bobbin: UL 94-V0 (Nylon) Plastic case: UL 94-V0 (PBT)
<b>m-CDT</b>	Conductor material	H62		
<b>m</b>	Mass	12	grams	

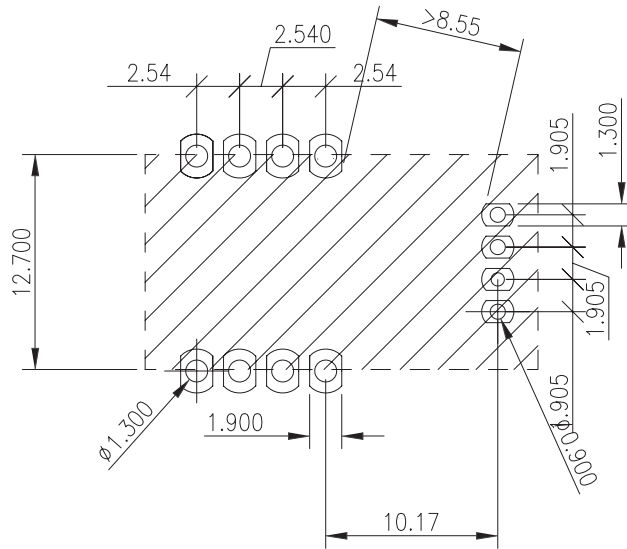
## Current measurement range versus external reference voltage



## Max. DC primary current versus ambient temperature



# PCB footprint (mm, general tolerance $\pm 0.05\text{mm}$ )



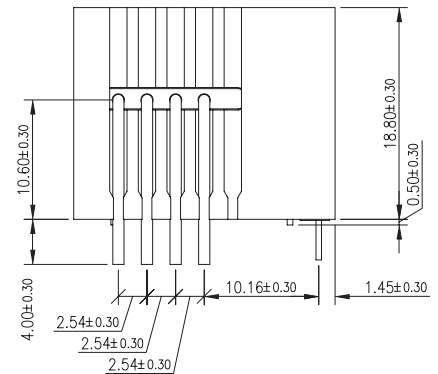
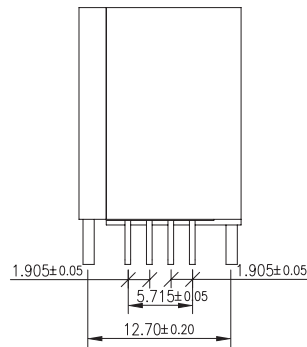
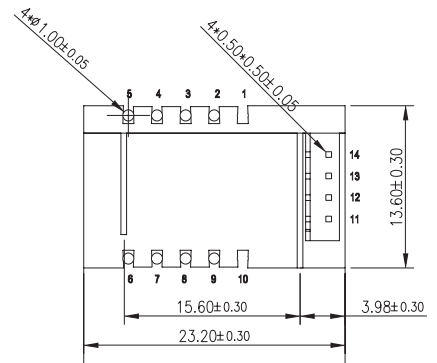
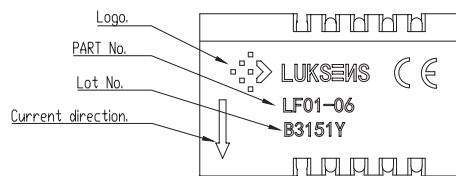
**Note:**

Maximum soldering temperature 260°C 10s

Maximum PCB thickness 2.4mm

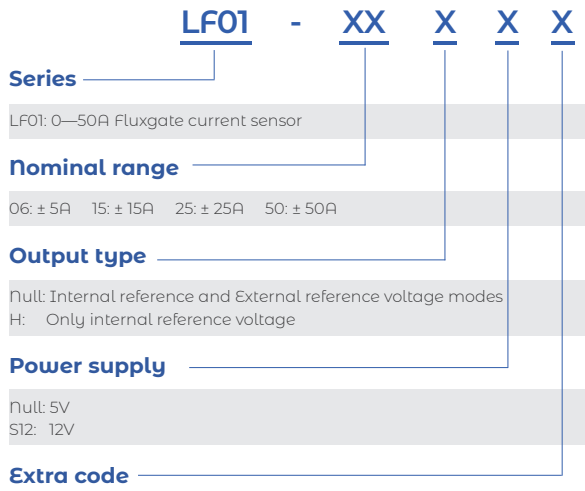
## Dimension (mm)

Pin	Symbol
1	—
2	Input
3	Input
4	Input
5	Input
6	Output
7	Output
8	Output
9	Output
10	—
11	$V_{REF}^1$
12	$V_O$
13	GND
14	$V_{DD}$



<sup>1</sup> $V_{REF}$  can be used in internal reference or external reference voltage mode

# Name Guide Description



## Notes

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# Safety and Environment



The product is to be installed by manufacturer trained personnel or competent person trained in accordance with manufacturer installation instructions.

With respect to applicable standards IEC 61010-1/ EN 61010-1 *safety requirements for electrical equipment for measurement, control and laboratory use part 1 general requirements*, the product should be used in limited energy secondary circuits.



## Risk of electrical shock

Certain parts of the module can carry hazardous voltage during the operation process of the product because hazardous live voltage of primary conductor, power supply occurs, injury and/or serious damage will be caused if this warning is ignored.

Conducting parts must be inaccessible after installation of the product. Additional protection including shield or protective housing could be used according to IEC 60664 Insulation coordination for equipment within low-voltage supply systems.

Disconnection of the main supply will protect against possible injury and serious damage.



## ESD protection

Damage from an ESD event will occur if the personnel is not well grounded when handling.

## Important notice

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