

# LF03 Series Fluxgate Current Sensor

The LF03 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

- Fluxgate technology without hall element
- Output voltage proportional to carried current
- Max. measuring range  $\pm 270\text{A}$  (DC or AC peak)
- Compact size for PCB mount
- Unipolar power supply
- 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
- Very low offset voltage
- Fast response  $1\mu\text{s}$
- High frequency bandwidth
- Nearly zero offset voltage

## 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		105	°C
$T_A$	Ambient operating temperature	-40	85	°C
$T_S$	Storage temperature range	-40	110	°C
$V_{ESD-HBM}$	ESD sensitivity HBM(Human Body Model)		8	kV

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

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

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V <sub>DD</sub>	Supply voltage		4.75	5	5.25	V
I <sub>c</sub>	Current consumption	I <sub>p</sub> =0A without load	20+I <sub>p</sub> / n <sub>s</sub> +V <sub>OUT</sub> / R <sub>L</sub>			mA
I <sub>p1</sub>	Current nominal measuring range	LF03-50	-150	±50	150	A
		LF03-100	-270	±100	270	
		LF03-150	-270	±150	270	
n <sub>s</sub>	Number of secondary turns	LF03-50	1,258			
		LF03-100	1,258			
		LF03-150	1,588			
V <sub>REF1</sub>	Internal reference voltage	I <sub>p</sub> =0A	2.495	2.5	2.505	V
V <sub>REF2</sub>	External reference voltage		0		4	V
V <sub>OUT</sub>	Output voltage		0.375		4.625	V
V <sub>0</sub>	Zero current output voltage	I <sub>p</sub> =0A	V <sub>REF1</sub> or V <sub>REF2</sub> *1			V
V <sub>OE</sub>	Offset voltage	V <sub>OE</sub> =V <sub>OUT</sub> (@I <sub>p</sub> =0A)-V <sub>REF1</sub> or V <sub>REF2</sub>	-1		1	mV
T <sub>CVREF1</sub>	Temperature coefficient of V <sub>REF1</sub>		-50		50	ppm/°C
T <sub>CVO</sub>	Temperature coefficient of V <sub>0</sub>	@I <sub>p</sub> =0A T <sub>a</sub> =-40°C ...85°C	-10		10	ppm/°C
T <sub>RA</sub>	Step response to 10% of I <sub>p1</sub>			1		µs
T <sub>R</sub>	Step response to 90% of I <sub>p1</sub>			1		µs
BW	Frequency bandwidth(-3dB)			100		kHz

\*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
$I_{oe}$	Offset current referred to primary without magnetic hysteresis	LF03-50	-80		80	mA
		LF03-100	-160		160	
		LF03-150	-240		240	
$G$	Nominal sensitivity (625mV / $I_{pn}$ )	LF03-50		12.5		mV/A
		LF03-100		6.25		
		LF03-150		4.17		
$\epsilon_G$	Sensitivity error	$\pm I_{pn}$ @ $T_A = -40^\circ\text{C} \dots 85^\circ\text{C}$	-0.7		0.7	%/ $I_{pn}$
$T_{cg}$	Temperature coefficient of G	$T_A = -40^\circ\text{C} \dots 85^\circ\text{C}$	-40		40	ppm/ $^\circ\text{C}$
$\epsilon_L$	Non-linearity error	$\pm I_{pn}$ without offset	-0.1		0.1	%/ $I_{pn}$

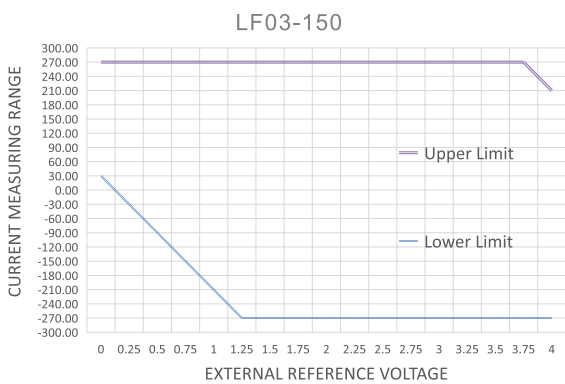
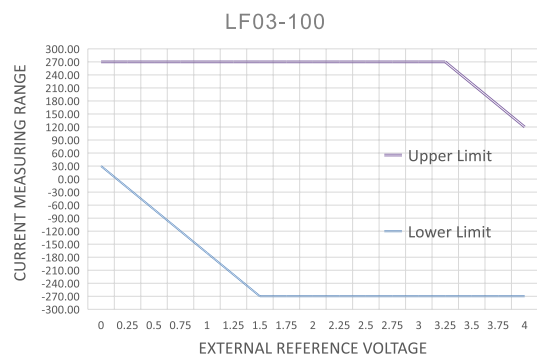
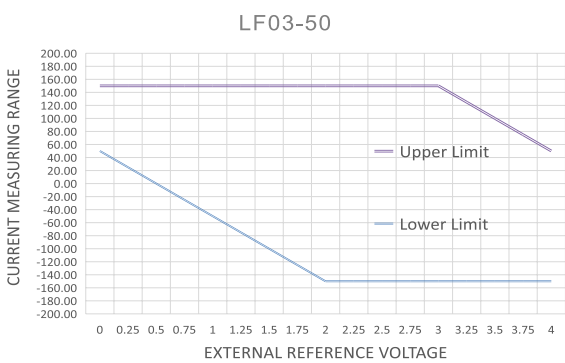
## Insulation characteristics

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	12.9	mm	Shortest distance through air
<b>D-CRD</b>	Creepage distance	12.9	mm	Shortest path along body

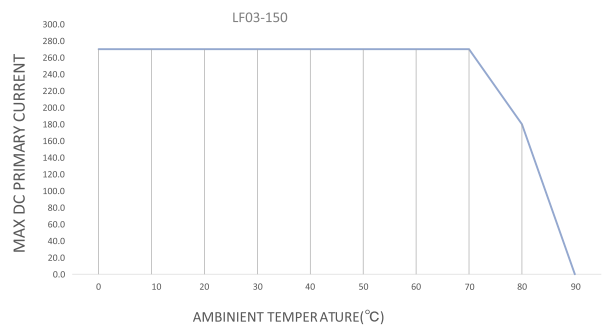
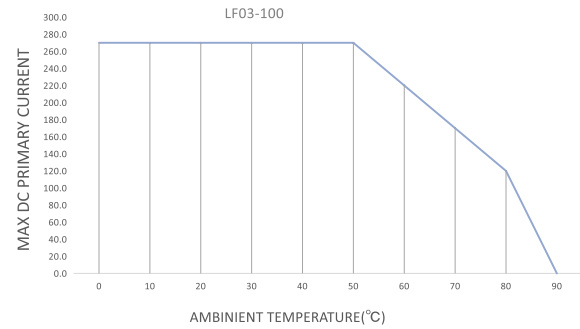
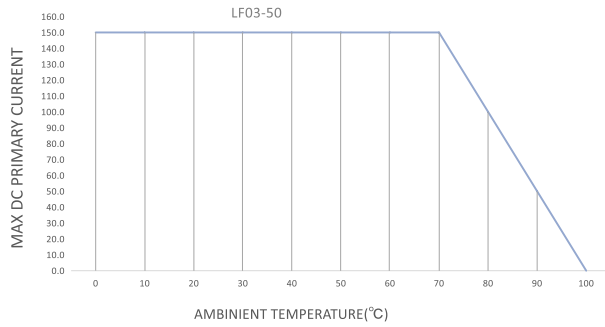
# General characteristics

Symbol	Parameter	Value	Unit	Comment
m-HSE	Housing material	V0		Flame retardant UL 94
m	Mass	35	grams	

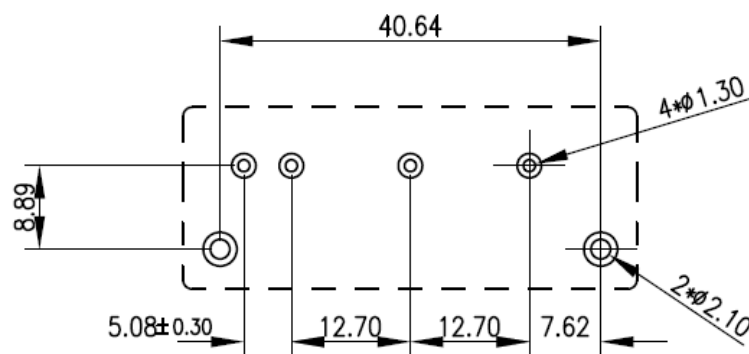
## Current measurement range versus external reference voltage



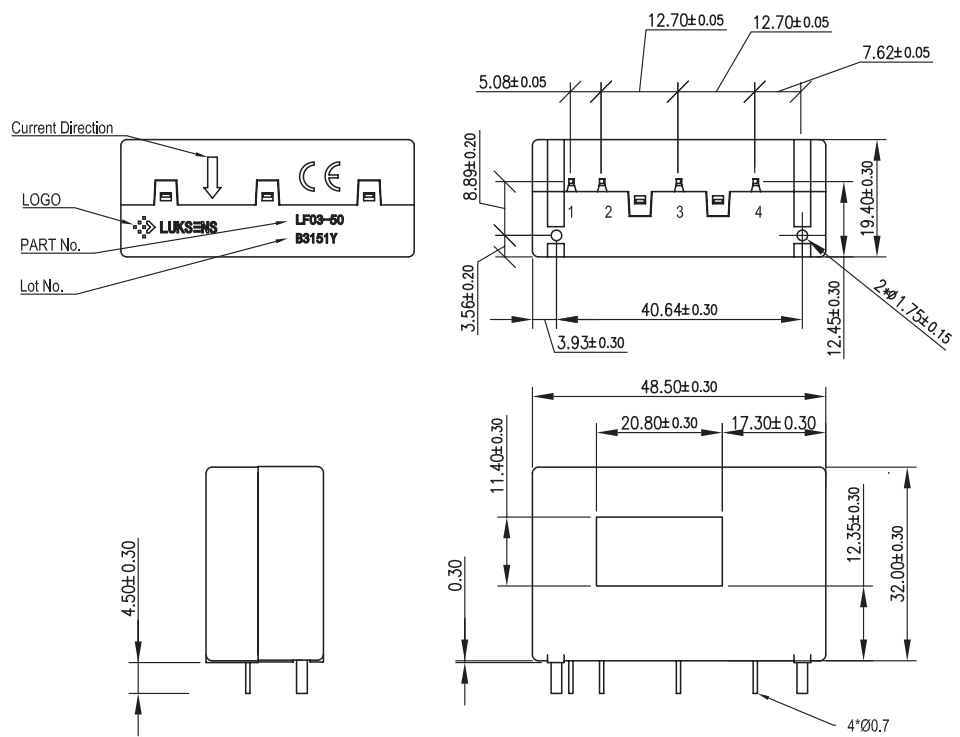
## Max. DC primary current versus ambient temperature



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



Dimension (mm)



Pin	Symbol
1	$V_{REF}^{*1}$
2	$V_{OUT}$
3	GND
4	$V_{DD}$

\*1  $V_{REF}$  can be used in internal reference or external reference voltage mode

## Name Guide Description

	<u>LF03</u>	-	<u>XX</u>	<u>X</u>	<u>X</u>	<u>X</u>
<b>Series</b>						
LF03: 50—150A Fluxgate current sensor						
<b>Nominal range</b>						
50: ± 50A    100: ± 100A    150: ± 150A						
<b>Output type</b>						
Null: Internal reference and External reference voltage modes H: Only internal reference voltage						
<b>Power supply</b>						
Null: 5V S12: 12V						
<b>Extra code</b>						

### 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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