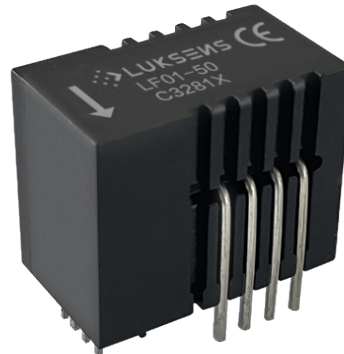


# LF01 Series Fluxgate Current Sensor

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. measuring range  $\pm 150\text{A}$  (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

- IEC 60068-2 Series
- EN 61000-4 Series
- EN 50178: 1998
- IEC 62109: 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<br>( $I_P=0\text{A}$ 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<br>$V_{OE} = V_{OUT} (@I_P = 0A) - V_{REF1 \text{ or } REF2}$   | 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 $V_o$<br>@ $I_P = 0A$<br>$T_A = -40^\circ\text{C} \dots 105^\circ\text{C}$ , $V_o = 2.5V$ | 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<br>( $625\text{mV} / I_{PN}$ )   | 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<br>$R_L = 1k\Omega$   | LF01-06   |        | 40        | 160   | mV                    |
|              |  | LF01-15   |        | 15        | 60    |                       |
|              |  | LF01-25   |        | 10        | 40    |                       |
|              |  | LF01-50   |        | 5         | 20    |                       |
| $T_{RR}$     | Step response to 10% of $I_{PN}$ , $di/dt = 18A / \mu s$   | LF01-06   |        |           | 0.3   | $\mu s$               |
|              | Step response to 10% of $I_{PN}$ , $di/dt = 44A / \mu s$   | LF01-15   |        |           | 0.3   |                       |
|              | Step response to 10% of $I_{PN}$ , $di/dt = 68A / \mu s$   | LF01-25   |        |           | 0.3   |                       |
|              | Step response to 10% of $I_{PN}$ , $di/dt = 100A / \mu s$  | LF01-50   |        |           | 0.3   |                       |

## 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        |      |      | 0.3  | $\mu\text{s}$ |
|           | Step response to 90% of $I_{PR}$ , $di/dt = 44\text{A}/\mu\text{s}$  | LF01-15        |      |      | 0.3  |               |
|           | Step response to 90% of $I_{PR}$ , $di/dt = 68\text{A}/\mu\text{s}$  | LF01-25        |      |      | 0.3  |               |
|           | Step response to 90% of $I_{PR}$ , $di/dt = 100\text{A}/\mu\text{s}$ | LF01-50        |      |      | 0.3  |               |
| <b>BW</b> | Frequency bandwidth(-1dB)  |                | 200  |      |      | kHz           |
| <b>BW</b> | Frequency bandwidth(-3dB)  |                | 300  |      |      | kHz           |

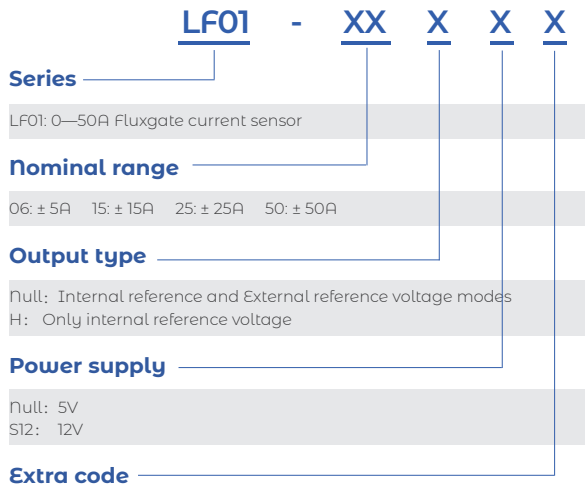
## Insulation characteristics

| Symbol       | Parameter                                     | Value | Unit             | Comment                         |
|--------------|---|-------|------------------|---------------------------------|
| $V_o$        | Insulation voltage for isolation, 50Hz, 1 min | 4300  | V                |                                 |
| $R_{iso}$    | Isolation resistance @ DC 500V                | >500  | $\text{M}\Omega$ |                                 |
| <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    |       | Flame retardant UL 94 |
| <b>m-CDT</b> | Conductor material | H62   |       |                       |
| <b>m</b>     | Mass               | 12    | grams |                       |

# Name Guide Description



## Notes

The content of this document is subject to revision without notice. Luksens shall have no liability for any error or damage of any kind resulting from the use of this document.

# 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

Luksens reserves the right to make changes to or discontinue any product or service identified in this publication without notice. Luksens advises its customers to obtain the latest version of the relevant information to verify, before placing any orders. The information included herein is believed to be accurate and reliable. However, since additional design, measure, production, quality control take effect in the end product, therefore Luksens shall have no liability for any potential hazards, damages, injuries or loss of life resulting from the end product.

Luksens products are not to be used in any equipment or system, including but not limited to life support equipment or systems, where failure of Luksens products may cause bodily harm.