C16-XXA Series Current Sensor

The C16-XXA series current sensor is a high-insulation, micro-core-based device that uses open-loop hall technology for accurate, fast measurements. It is available in two supply versions (5V and 3.3V DC), with a measuring range up to 30A. This SMT mountable sensor is ideal for integrating onto PCBA. It provides a compact, economical and accurate solution for AC or DC current detection, and is an ideal choice for motor control, load detection and management, power supply and DC-DC converter control, and inverter control.

Features

- High reliability Hall current sensor
- Flexible supply voltage with factory selectable 5VDC or 3.3VDC mode
- Superior temperature stability and linearity
- Measuring range up to 30A
- Incorporates an integrated flux collector
- RoHs compliance (Lead-Free)

Advantages

- Accurately measures AC, DC and pulse currents
- Fast response up to 2μs
- SMT mount
- Very low thermal drift for wide temperature range

Applications

- Motion control
- DC-DC converter
- Small drives
- HVAC Inverters
- Home appliances
- Solar Inverters
- Battery detection

Standards

- IEC 61800-5-1:2020
- IEC 62109-1: 2010
- IEC 60950-1:2006

Absolute maximum ratings

Symbol	Parameter	Min.	Max.	Unit
$V_{DD\ max.}$	Maximum supply voltage (not destructive)	-0.3	6.5	V
I_{pm}	Maximum measuring current	-75	75	A
T_A	Ambient operating temperature	-40	125	°C
T_S	Storage temperature range	-55	150	°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°C, V_{DD}= 3.3V/5.0V)

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_{DD}	Supply voltage	C16-XXA33	3.15	3.3	3.45	V
		C16-XXA	4.75	5	5.25	
I_C	Current consumption	I_P=0A without load	6	7.5	11	mA
I_{Pn}	Current nominal measuring range	C16-06A/C16-06A33	-15	±6	15	A
		C16-08A/C16-08A33	-20	±8	20	
		C16-10A/C16-10A33	-25	±10	25	
		C16-15A/C16-15A33	-37.5	±15	37.5	
		C16-20A/C16-20A33	-50	±20	50	
		C16-30A/C16-30A33	-75	±30	75	
R_{IP}	Primary conductor resistance	T_A=25°C		1		mΩ
T_{PO}	Power-On time	T_A=25°C		1		ms
R_L	Output load resistance	V_{OUT} to GND	4.7			kΩ
C_L	Output load capacitance	V_{OUT} to GND		1	10	nF
V_{REF}	Internal reference voltage	I_P=0A, V_{DD}=5V	2.48		2.52	V
		I_P=0A, V_{DD}=3.3V	1.63		1.67	

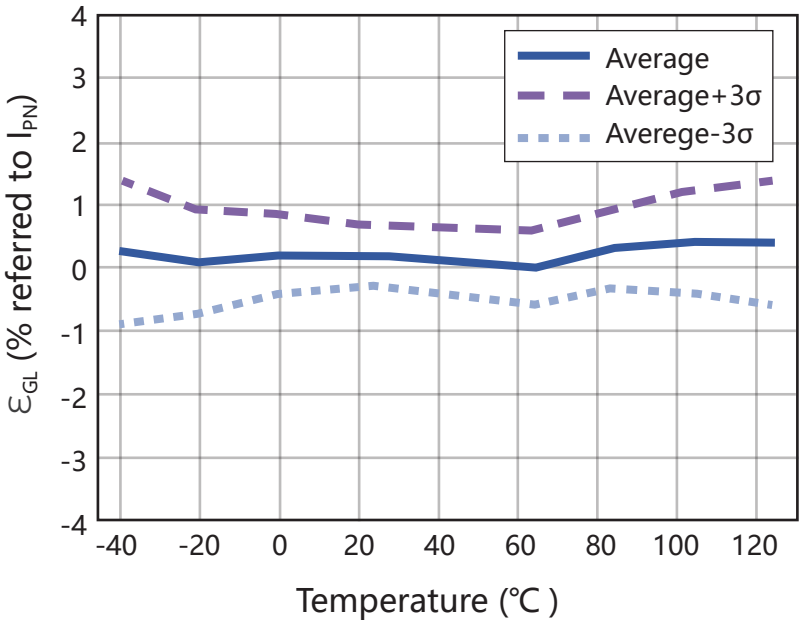
Specifications (T_A= 25°C, V_{DD}= 3.3V/5.0V)

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_{OE}	Offset voltage V_O-V_{ref}	I_P=0A	-5	±3	5	mV
G	Nominal sensitivity 800mV/I_{PN}@V_{DD}=5.0V 460mV/I_{PN}@V_{DD}=3.3V	C16-06A		133.33		mV/A
		C16-08A		100		
		C16-10A		80		
		C16-15A		53.33		
		C16-20A		40		
		C16-30A		26.67		
		C16-06A33		76.66		
		C16-08A33		57.5		
		C16-10A33		46		
		C16-15A33		30.66		
		C16-20A33		23		
		C16-30A33		15.33		
V_{out}-V_{ref}	Out voltage range	@I_{PM} V_{DD}=5V	-2		2	V
	Out voltage range	@I_{PM} V_{DD}=3.3V	-1.15		1.15	V
T_{CVOE}	Temperature coefficient of V_{OE}	T_A=-40°C ...125°C	-0.075	0.05	0.075	mV/K
T_{CG}	Temperature coefficient of G	T_A = -40°C ...125°C (except T_{CVOE})	-1.5	1	1.5	%
E_L	Non-linearity error	±I_{PN} without offset	-0.8	±0.5	0.8	%/I_{PN}
E_{GL}	Sum of sensitivity and linearity error	±I_{PN} @T_A =25°C V_{OUT}-V_{ref}	-1.25		1.25	%/I_{PN}
I_{OM}	Magnetic offset current after overload (I_P> 500 A) referred to primary			0.18		A
BW	Frequency bandwidth (-3dB)			250		kHz
T_R	Step response to 90% I_{PN}	(Design target)		2		µs

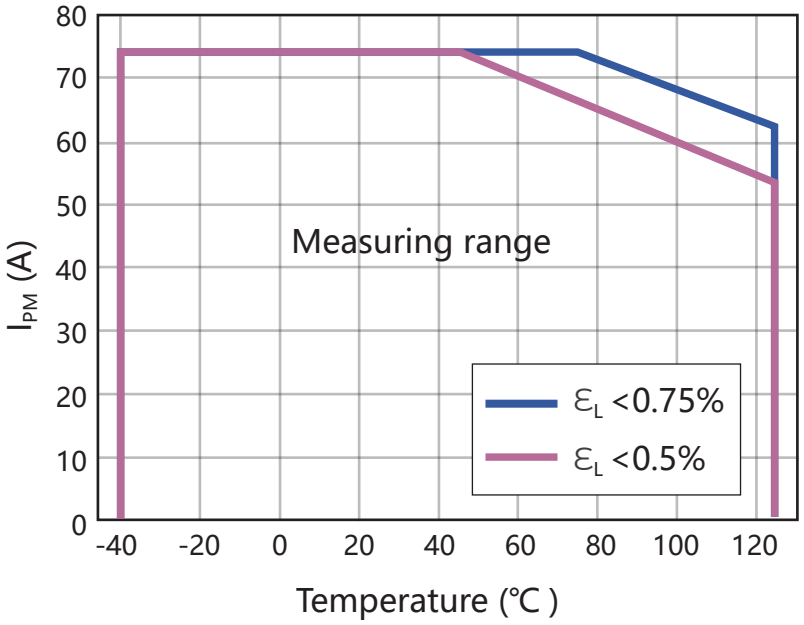
Insulation characteristics

Symbol	Parameter	Value	Unit	Comment
V_D	Insulation voltage for isolation, 50Hz, 1 min	5000	V	
V_{SURGE}	Impulse withstand voltage 1.2/50 µs	4500	V	According to IEC 62109-1, IEC 61800-5-1
R_{ISO}	Isolation resistance @500VDC	>500	MΩ	
D-CLE	Clearance	8	mm	Shortest distance through air
D-CRD	Creepage distance	8	mm	Shortest distance through body

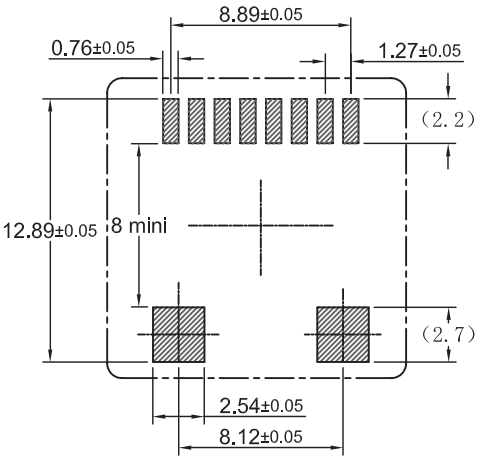
Sum of sensitivity and linearity error



Measuring range vs ambient temperature



PCB footprint (in mm)



Recommended solder pad layout

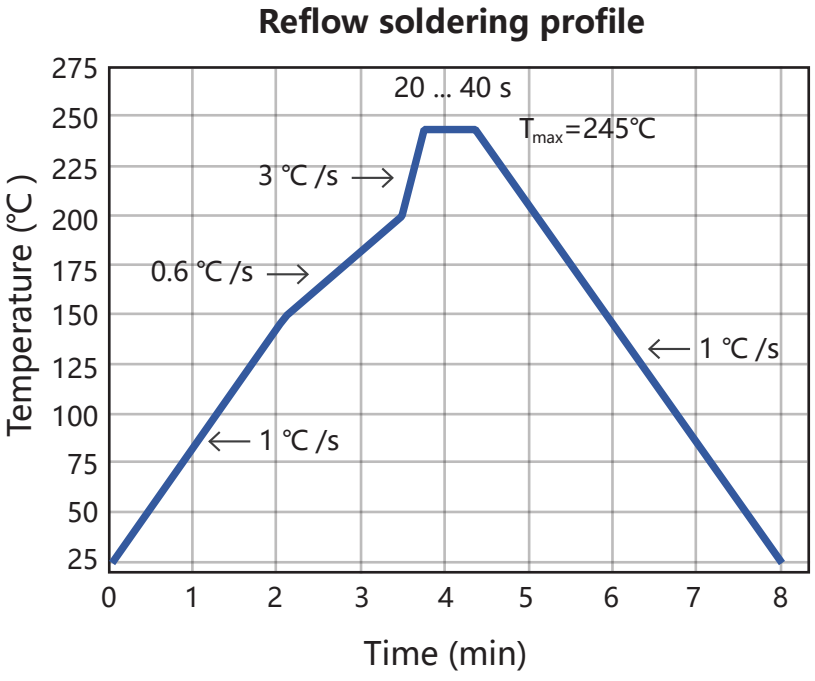
Notes

For packages over 2.5mm thickness, refer to JEDEC J-STD-020E, table 4.2 (Pb-Free Process).

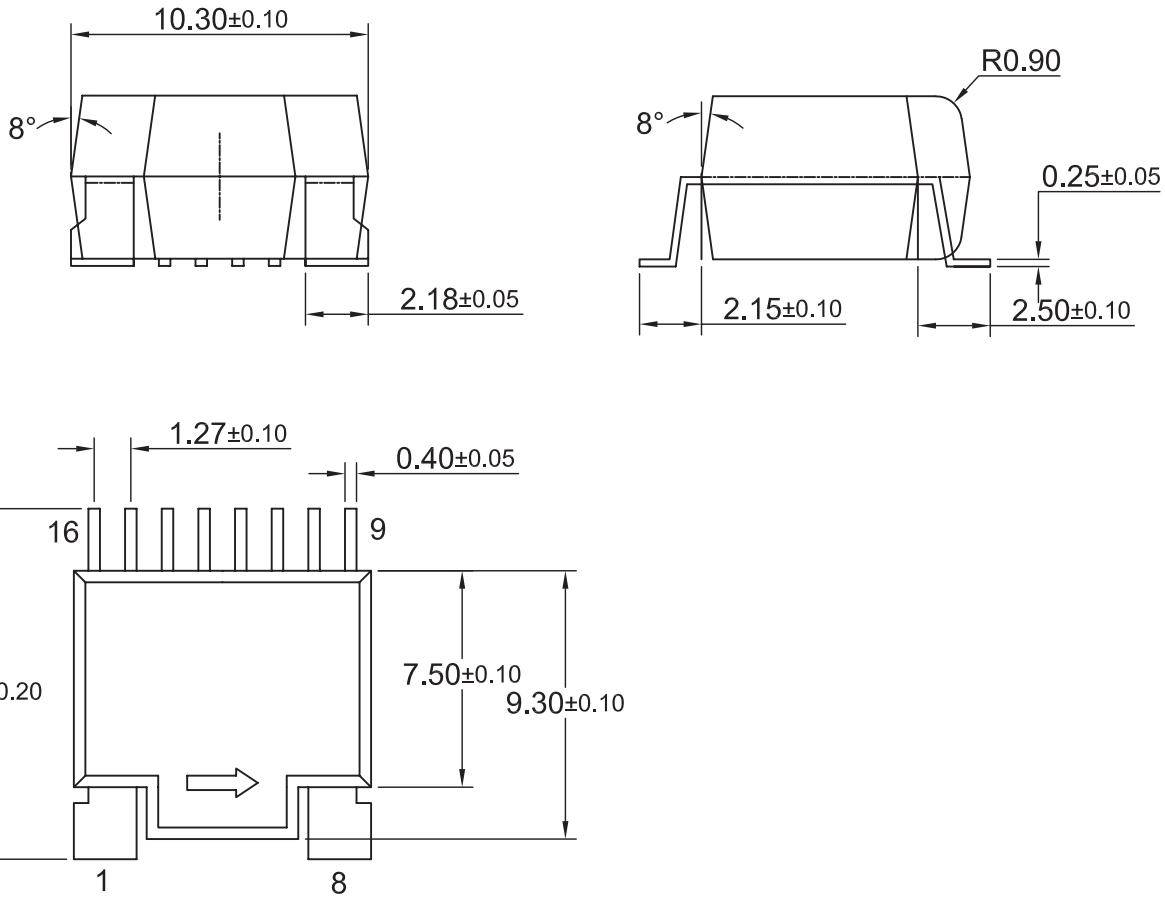
Recommend to use a conventional reflow system with 7 zones and follow the indicated temperature profile.

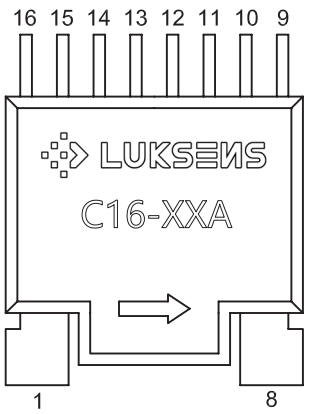
Rework is discouraged.

Soldering on PCB



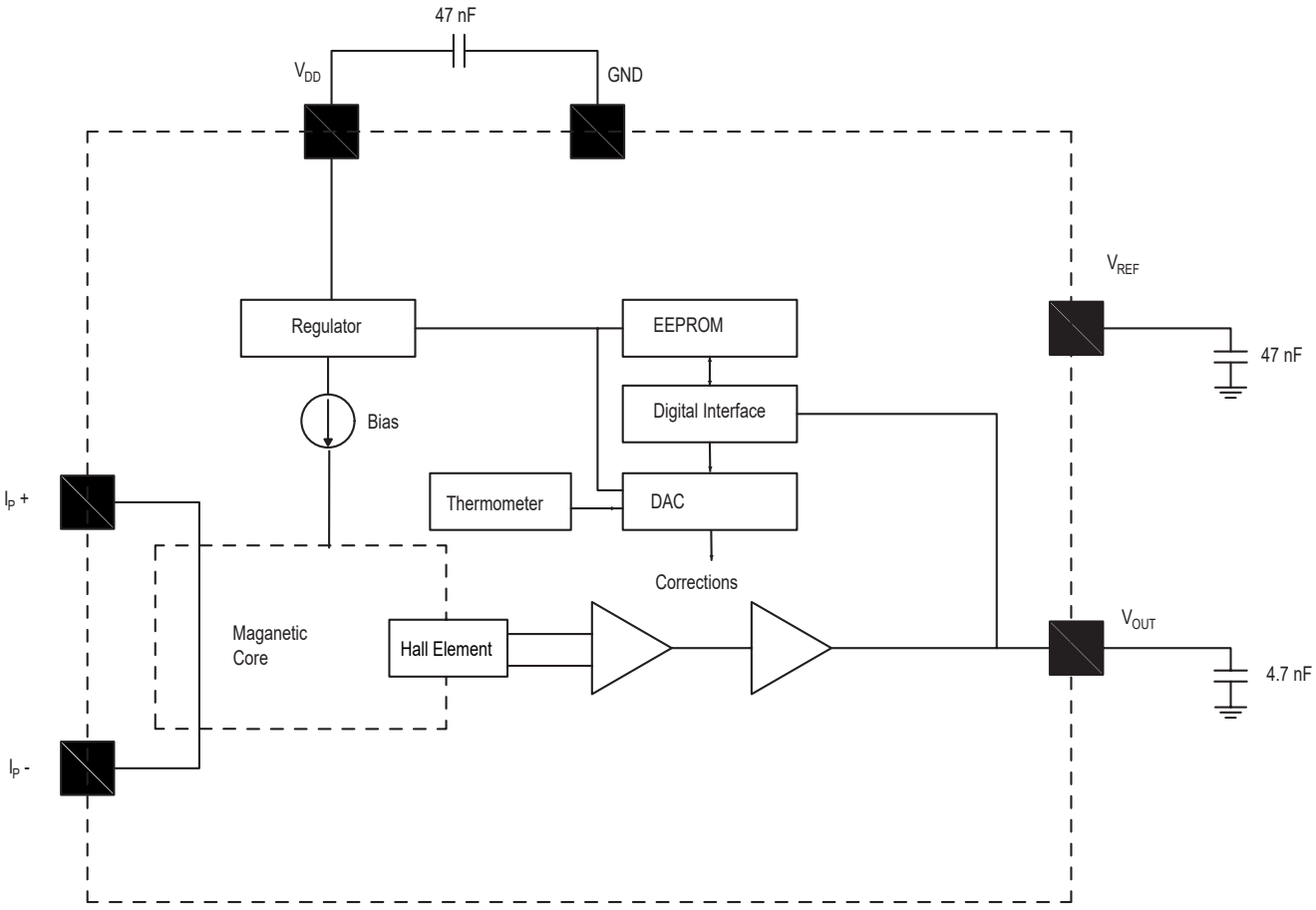
Dimension (mm)



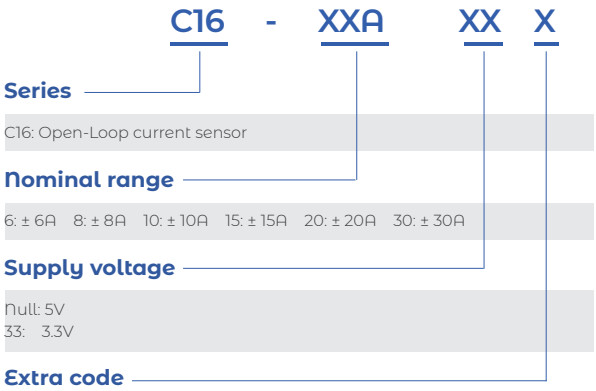


Pin	Symbol
1	$+I_P$
8	$-I_P$
9, 13, 14, 16	NC
10	V_{DD}
11	V_{REF}
12	V_{OUT}
15	GND

Block diagram



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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