C10M Series Linear Hall Effect Current Sensor IC

Fully Integrated, 0.2mΩ Conductor, 5kVrms Isolation, 2MHz High Bandwidth

The C10M is a high-performance, fully integrated Hall-effect current sensor employing a differential architecture to effectively suppress external common-mode magnetic interference. It provides a pair of differential outputs (OUT and REF) to maximize the signal-to-noise ratio (SNR) in noisy environments, while integrated temperature and stress compensation ensures high accuracy over a temperature range of -40°C to +125°C, and feature a FAULT overcurrent detection with an externally adjustable overcurrent threshold, saving the cost of additional board-level comparators.
The C10M features a 2 MHz (3dB) bandwidth, 5 kVrms isolation, and an ultra-low 200 μΩ primary resistance, optimized for the high-frequency, fast switching requirements of SiC and GaN-based power electronics. It provides a robust and efficient solution for next-generation high-density electric vehicle chargers, photovoltaic inverters, and precision motor control.

TSCA compliant · REACH Compliant · RoHS COMPLIANT · 250A · +V -0V · HALL EFFECT

Features

- Factory trimmed sensitivity sensor
- Primary conductor resistance is only 0.2mΩ
- Superior temperature stability and linearity
- Compact size for applications with limited space
- RoHs compliance (Lead-Free)

Advantages

- Accurately measures AC, DC and pulse currents
- Fast response 0.3μs, minimal noise output
- No insertion losses
- Differential common-mode rejection circuitry eliminates errors from external magnetic fields
- Very low thermal drift for wide temperature range
- Ultra-high bandwidth of 2MHz (-3dB)

Applications

- Motor control
- Solar inverter
- Smart battery junction boxes
- Industrial power supply
- DCDC
- Charging pile

Standards

- IEC 61800-5-1
- IEC 62109-1: 2010
- IEC 62638

Absolute maximum ratings

Symbol	Parameter	Min.	Max.	Unit
$V_{CC\ max.}$	Maximum supply voltage (not destructive)	-0.6	12	V
T_A	Ambient operating temperature	-40	125	°C
$T_{J\ max.}$	Maximum junction temperature		150	°C
T_S	Storage temperature range	-50	150	°C
$V_{ESD-HBM}$	ESD sensitivity Human-Body model , JEDEC JS-001	-8	8	kV
$V_{ESD-CDM}$	ESD sensitivity Charged-Device model, JEDEC JS-002	-2	2	kV

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

Common operating characteristics (T_A= 25°C, V_{CC}=5V)

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_{CC}	Supply voltage	C10M-XXA	4.5	5	5.5	V
I_C	Current consumption	I_P=0A without load, V_{CC}=5V		22		mA
C_{BYPASS}	Supply bypass capacitor	V_{CC} to GND	100			nF
T_{POD}	Power-On Time	V_{CC} rises to > U_{VLO} and continues for a period until the power is on.	0.1	1		ms
U_{VLO}	Undervoltage lockout	V_{CC} falling		4		V
$U_{VLO-HYS}$	Undervoltage lockout hysteresis			0.2		V
T_{VLO-RD}	Undervoltage lockout release delay	V_{CC} rising		940		μs
T_{VLO-ED}	Undervoltage lockout entry delay	V_{CC} falling		80		μs
$V_{CC-CLAMP}$	Overvoltage clamp			12.7		V
R_L	Output load resistance	V_{OUT} to GND	10			kΩ
C_L	Output load capacitance	V_{OUT} to GND		0.47	1	nF
R_{L-VREF}	V_{REF} load resistance	V_{REF} to GND	10			kΩ
C_{L-VREF}	V_{REF} load capacitance	V_{REF} to GND		2.2	4.7	nF
R_{F-PU}	Fault Pull-UP resistance		4.7		500	kΩ
R_{PRI}	Primary conductor resistance	T_A=25°C		0.2		mΩ
$I_{P-MAX25}$	Maximum continuous input current	T_A=25°C, 6 layer 2 ounce PCB			145	A
$I_{P-MAX125}$	Maximum continuous input current	T_A=125°C, 6 layer 2 ounce PCB			65	A

Common operating characteristics (T_A= 25°C, V_{CC}=5V)

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
Output signal characteristics						
V_{OOR}	Output Operating Range		0.5		4.5	V
V_{SAT-H}	High-level saturation voltage	I_P>1.2*I_{PN}, V_{SAT-H} = V_{CC} – V_{OUT} R_L=10kΩ to GND		0.05		V
V_{SAT-L}	Low-level saturation voltage	I_P< -1.2*I_{PN}, V_{SAT-L} = V_{OUT} R_L=10kΩ to V_{CC}		0.05		V
I_{OUT_SOURCE}	Output current limit	V_{OUT} shorted to GND		39		mA
I_{OUT_SINK}	Output current limit	V_{OUT} shorted to V_{CC}		37		mA
V_{REF}	Internal reference voltage	I_P=0A, V_{CC}=5V	2.496	2.5	2.504	V
$I_{REF-SOURCE}$	Reference current limit	V_{REF} shorted to GND		28		mA
$I_{REF-SINK}$	Reference current limit	V_{REF} shorted to V_{CC}		28		mA
ε_L	Non-linearity error	±I_{PN} without offset		±0.2		%/I_{PN}
IND	Input-referenced noise density	V_{CC}=5V, C_L=0.47nF		240		µA/√Hz
CMFR	Common-mode field rejection	CMFR = ($\Delta V_{OUT}/\Delta B$)/G, DC to 1kHz.		0.5		mA/G
CMTI	Common-mode transient immunity	VCM = 1000V, ΔV_{OUT} > 100mV and duration > 1µs		150		V/ns
$PSRR_G$	Power supply rejection ratio sensitivity	DC to 1 kHz, 100 mV peak ripple around V_{CC}, I_P = I_{PN}, 20log($\Delta G/G/\Delta V_{CC}/V_{CC}$)		-25		dB
$PSRR_{VOE}$	Power supply rejection ratio offset	DC to 1 kHz, 100 mV peak ripple around V_{CC}, I_P = 0, 20log($\Delta V_{OE}/\Delta V_{CC}$)		-50		dB
BW	Frequency bandwidth (-3dB)			2		MHz
T_{D90}	V_{OUT} delay time to 90% I_{PN}	I_P step ≤ 100ns		0.3		µs
T_{D10}	V_{OUT} delay time to 10% I_{PN}	I_P step ≤ 100ns		0.18		µs
T_R	V_{OUT} rise time (10% to 90%)	I_P step ≤ 100ns		0.2		µs
T_F	V_{OUT} fall time (90% to 10%)	I_P step ≤ 100ns		0.2		µs
Overcurrent fault characteristics						
$V_{VOC-EXT}$	VOC operating voltage range		0.5		2	V
$V_{VOC-THRESHOLD}$	Threshold voltage of VOC pin when setting overcurrent fault	I_{VOC}: Expected fault current (in A) G: Sensor output gain sensitivity	$V_{VOC-THERSHOLD}$ = I_{VOC}*G/2			V
ε_{OCF}	Overcurrent fault error			±3		%*I_{VOC}
$I_{VOC-HYS}$	Overcurrent fault hysteresis			±10		%*I_{VOC}
$V_{FAULT-ON}$	Overcurrent fault Pull-down voltage	R_L = 4.7 kΩ, under fault condition		0.08	0.4	V
I_{LK-VOC}	VOC pin leakage current		-50		50	nA

Common operating characteristics (T_A= 25°C, V_{CC}=5V)

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
Overcurrent fault characteristics						
$I_{LK\text{-}FAULT}$	Fault pin leakage current	I_P=0A, V_{FAULT}=5V			100	nA
$T_{OCF\text{-}R}$	Overcurrent fault reaction time	Time from I_P>I_{VOC}, until fault releases		0.4		μs
$T_{OCF\text{-}MASK}$	Overcurrent fault mask	The time required to trigger FAULT after I_P > I_{VOC} must be maintained.		0.5		μs
$T_{OCF\text{-}HOLD}$	Overcurrent fault hold time	Shortest duration of FAULT status		10		μs

C10M-50A characteristics (T_A= 25°C, V_{CC}= 5.0V) *1

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
I_{PN}	Current nominal measuring range		-50		50	A
G	Nominal sensitivity			40		mV/A
V_{OE}	Offset voltage	V_{OE}=V_{OUT}-V_{REF}, at I_P=0A	-2		2	mV
V_O	V_{OUT} at I_P=0A	I_P=0A		2.500		V
T_{CVO}	Temperature coefficient of V_O	I_P=0A, T_A=-40°C ...125°C	-3		3	mV
T_{CG}	Temperature coefficient of G	T_A = -40°C ...125°C	-1		1	%
ε_{TOT}	Total output error	Percentage of I_{PN}	-2.0	±1.3	2.0	%

1. Ensure T_J remains below $T_{J\,max}$. when operating at higher I_P and T_A.

C10M-90A characteristics (T_A= 25°C, V_{CC}= 5.0V) *1

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
I_{PN}	Current nominal measuring range		-90		90	A
G	Nominal sensitivity			22.22		mV/A
V_{OE}	Offset voltage	V_{OE}=V_{OUT}-V_{REF}, at I_P=0A	-2		2	mV
V_O	V_{OUT} at I_P=0A	I_P=0A		2.500		V
T_{CVO}	Temperature coefficient of V_O	I_P=0A, T_A=-40°C ...125°C	-3		3	mV
T_{CG}	Temperature coefficient of G	T_A = -40°C ...125°C	-1		1	%
ε_{TOT}	Total output error	Percentage of I_{PN}	-2.0	±1.3	2.0	%

1. Ensure T_J remains below $T_{J\,max}$. when operating at higher I_P and T_A.

C10M-100A characteristics (T_A= 25°C, V_{CC}= 5.0V) *1

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
I_{pn}	Current nominal measuring range		-100		100	A
G	Nominal sensitivity			20		mV/A
V_{OE}	Offset voltage	$V_{OE}=V_{OUT}-V_{REF}$, at I_P=0A	-2		2	mV
V_O	V_{OUT} at I_P=0A	I_P=0A		2.500		V
T_{CVO}	Temperature coefficient of V_O	I_P=0A, T_A=-40°C ...125°C	-3		3	mV
T_{CG}	Temperature coefficient of G	T_A = -40°C ...125°C	-1		1	%
ε_{TOT}	Total output error	Percentage of I_{pn}	-2.0	±1.3	2.0	%

1. Ensure T_J remains below $T_{J\,max}$. when operating at higher I_P and T_A.

C10M-125A characteristics (T_A= 25°C, V_{CC}= 5.0V) *1

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
I_{pn}	Current nominal measuring range		-125		125	A
G	Nominal sensitivity			16		mV/A
V_{OE}	Offset voltage	$V_{OE}=V_{OUT}-V_{REF}$, at I_P=0A	-2		2	mV
V_O	V_{OUT} at I_P=0A	I_P=0A		2.500		V
T_{CVO}	Temperature coefficient of V_O	I_P=0A, T_A=-40°C ...125°C	-3		3	mV
T_{CG}	Temperature coefficient of G	T_A = -40°C ...125°C	-1		1	%
ε_{TOT}	Total output error	Percentage of I_{pn}	-2.0	±1.3	2.0	%

1. Ensure T_J remains below $T_{J\,max}$. when operating at higher I_P and T_A.

C10M-150A characteristics (T_A= 25°C, V_{CC}= 5.0V) *1

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
I_{Pn}	Current nominal measuring range		-150		150	A
G	Nominal sensitivity			13.33		mV/A
V_{OE}	Offset voltage	V_{OE}=V_{OUT}-V_{REF}, at I_P=0A	-2		2	mV
V_O	V_{OUT} at I_P=0A	I_P=0A		2.500		V
T_{CVO}	Temperature coefficient of V_O	I_P=0A, T_A=-40°C …125°C	-3		3	mV
T_{CG}	Temperature coefficient of G	T_A = -40°C …125°C	-1		1	%
ε_{TOT}	Total output error	Percentage of I_{Pn}	-2.0	±1.3	2.0	%

1. Ensure T_J remains below $T_{J\,max}$. when operating at higher I_P and T_A.

C10M-200A characteristics (T_A= 25°C, V_{CC}= 5.0V) *1

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
I_{Pn}	Current nominal measuring range		-200		200	A
G	Nominal sensitivity			10		mV/A
V_{OE}	Offset voltage	V_{OE}=V_{OUT}-V_{REF}, at I_P=0A	-2		2	mV
V_O	V_{OUT} at I_P=0A	I_P=0A		2.500		V
T_{CVO}	Temperature coefficient of V_O	I_P=0A, T_A=-40°C …125°C	-3		3	mV
T_{CG}	Temperature coefficient of G	T_A = -40°C …125°C	-1		1	%
ε_{TOT}	Total output error	Percentage of I_{Pn}	-2.0	±1.3	2.0	%

1. Ensure T_J remains below $T_{J\,max}$. when operating at higher I_P and T_A.

C10M-250A characteristics (T_A= 25°C, V_{CC}= 5.0V) *1

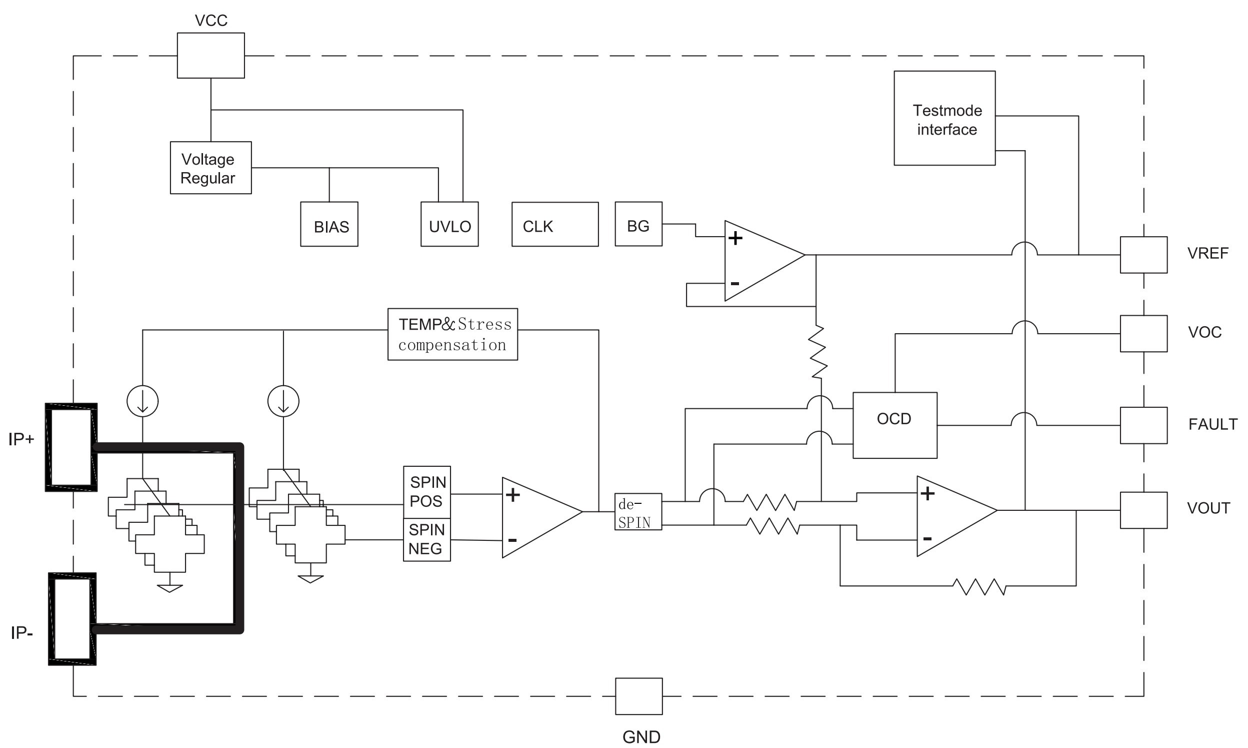
Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
I_{Pn}	Current nominal measuring range		-250		250	A
G	Nominal sensitivity			8		mV/A
V_{OE}	Offset voltage	V_{OE}=V_{OUT}-V_{REF}, at I_P=0A	-2		2	mV
V_O	V_{OUT} at I_P=0A	I_P=0A		2.500		V
T_{CVO}	Temperature coefficient of V_O	I_P=0A, T_A=-40°C …125°C	-3		3	mV
T_{CG}	Temperature coefficient of G	T_A = -40°C …125°C	-1		1	%
ε_{TOT}	Total output error	Percentage of I_{Pn}	-2.0	±1.3	2.0	%

1. Ensure T_J remains below $T_{J\,max}$. when operating at higher I_P and T_A.

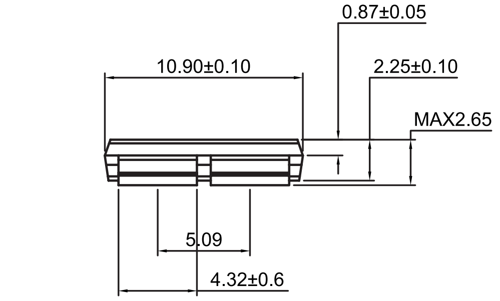
Insulation characteristics

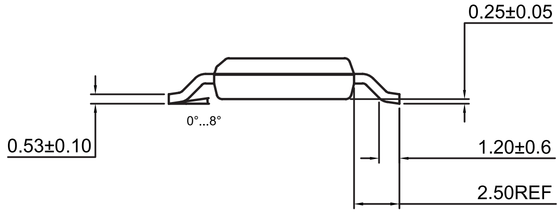
Symbol	Parameter	Value	Unit	Comment
V_{ISO}	Dielectric Strength Test Voltage	5000	V_{RMS}	Agency rated for 60 seconds per UL 62368-1
V_{SURGE}	Impulse withstand voltage 1.2/50 μs	15000	V	According to IEC 61000-4-5, tested in air
I_{SURGE}	Impulse withstand current 8/20 μs	32	kA	According to IEC 61000-4-5, tested in air
V_{WFSI}	Basic isolation	1618	V_{Peek} / V_{DC}	According to UL/IEC 62368-1: 2018
		1114	V_{RMS}	
V_{WVRI}	Reinforced (double) isolation	809	V_{Peek} / V_{DC}	According to UL/IEC 62368-1: 2018
		572	V_{RMS}	
CTI	Comparative tracking index	≥600	V	
D-CLE	Clearance	8.2	mm	Shortest distance through air
D-CRD	Creepage distance	8.2	mm	Shortest distance through body

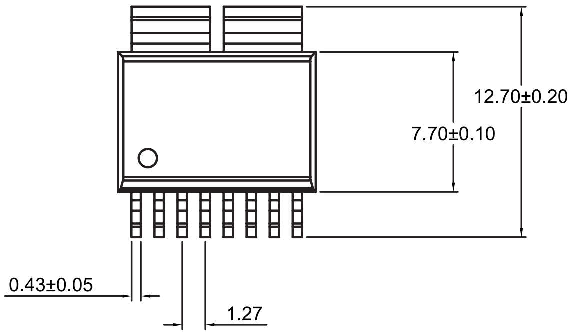
Function block diagram



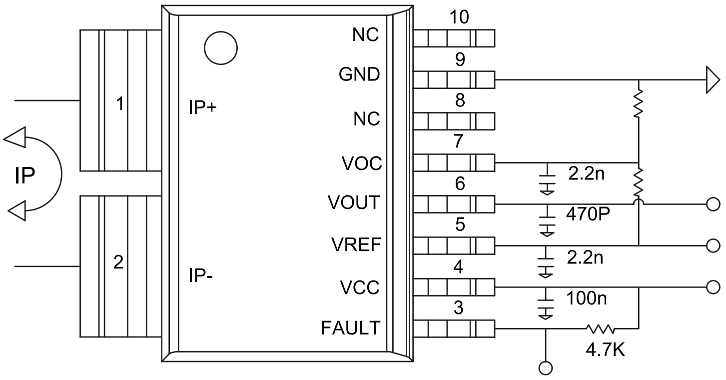
Dimension (mm)







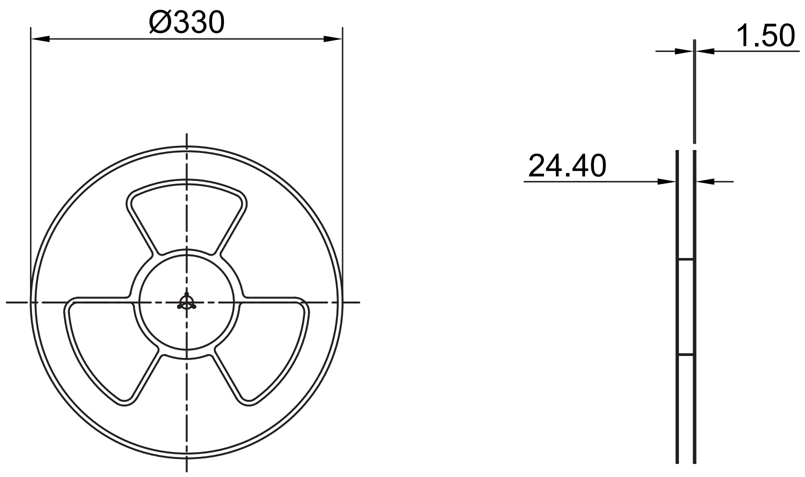
Pin-out diagram



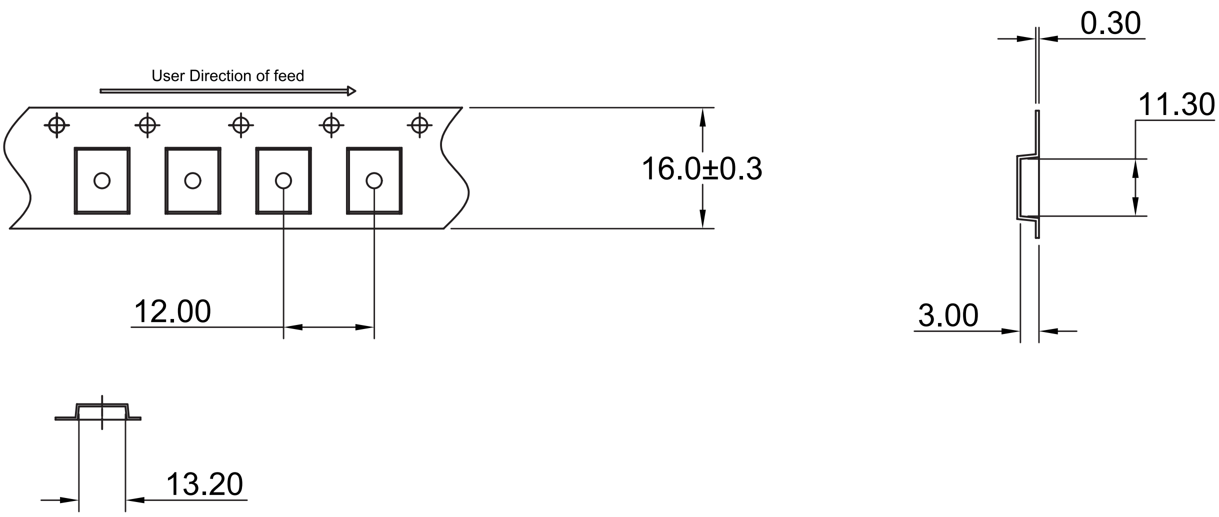
Pin	Symbol	Description
1	I_{P+}	Positive primary current terminal
2	I_{P-}	Negative primary current terminal
3	FAULT	Overcurrent fault output (Active Low)
4	V_{CC}	Device power supply input
5	V_{REF}	Reference voltage output
6	V_{OUT}	Analog signal output
7	VOC	Overcurrent threshold setting
9	GND	Device ground terminal
8,10	NC	Not connect

Packaging information

Reel size



Tape size



Notes

1. All measurements are in mm.

Name Guide Description

C10 M - XXA XX X X

Series

C10 series ICS

BW grade

K: 400 KHz
M: 2 MKHz

Max. range

50: ±50A 90: ±90A 100: ±100A
125 ±125A 150: ±150A 200: ±200A 250: ±250A

Supply voltage

Null: 5V
33: 3.3V

Meas. Dir.

Null: Bidirectional
U: Unidirectional

Extra code

Selection guide

Part Number	Package	Nominal Range (A)	Sensitivity (mV/A)	SPQ (Standard Pack Quantity)
C10M-50A	SOW10	±50A	40	Tape and reel, 1000 pieces/reel
C10M-90A	SOW10	±90A	22.22	Tape and reel, 1000 pieces/reel
C10M-100A	SOW10	±100A	20	Tape and reel, 1000 pieces/reel
C10M-125A	SOW10	±125A	16	Tape and reel, 1000 pieces/reel
C10M-150A	SOW10	±150A	13.33	Tape and reel, 1000 pieces/reel
C10M-200A	SOW10	±200A	10	Tape and reel, 1000 pieces/reel
C10M-250A	SOW10	±250A	8	Tape and reel, 1000 pieces/reel

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 change the specifications, including all statements and data appearing in Luksens' catalogues, data sheets and advertisements, without notice. Luksens will publish the modified specifications on its website. If such changes to specifications are made, Luksens shall have no obligation to provide the change on Products previously purchased. 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 less 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.