

C16K Series Linear Hall Effect Current Sensor IC

Fully Integrated, 0.47mΩ Conductor, 5kVrms Isolation, 400kHz High Bandwidth

The C16K 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 C16K features a 400kHz (3dB) bandwidth, 5 kVrms isolation, and an ultra-low 470 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.



Features

- Factory trimmed sensitivity sensor
- Primary conductor resistance is only 0.47mΩ
- Superior temperature stability and linearity
- Compact size for applications with limited space
- RoHs compliance (Lead-Free)

Applications

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

Advantages

- Accurately measures AC, DC and pulse currents
- Fast response 1.5μs, 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 400KHz (-3dB)

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 ($T_A = 25^\circ\text{C}$, $V_{CC} = 5\text{V}$)

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_{CC}	Supply voltage	C16K-XXA	4.5	5	5.5	V
I_C	Current consumption	$I_P = 0\text{A}$ without load, $V_{CC} = 5\text{V}$		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	$T_A = 25^\circ\text{C}$		0.47		mΩ
$I_{P-MAX25}$	Maximum continuous input current	$T_A = 25^\circ\text{C}$, 6 layer 2 ounce PCB			90	A
$I_{P-MAX125}$	Maximum continuous input current	$T_A = 125^\circ\text{C}$, 6 layer 2 ounce PCB			40	A

Common operating characteristics ($T_A = 25^\circ\text{C}$, $V_{CC} = 5\text{V}$)

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	$I_P > 1.2 \cdot I_{PN}$, $V_{SAT-H} = V_{CC} - V_{OUT}$ $R_L = 10\text{k}\Omega$ to GND		0.05		V
V_{SAT-L}	Low-level saturation voltage	$I_P < -1.2 \cdot I_{PN}$, $V_{SAT-L} = V_{OUT}$ $R_L = 10\text{k}\Omega$ 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	$I_P = 0\text{A}$, $V_{CC} = 5\text{V}$	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	$\pm I_{PN}$ without offset		± 0.2		%/ I_{PN}
IND	Input-referenced noise density	$V_{CC} = 5\text{V}$, $C_L = 0.47\text{nF}$		220		$\mu\text{A}/\sqrt{\text{Hz}}$
$CMFR$	Common-mode field rejection	$CMFR = (\Delta V_{OUT}/\Delta B)/G$, DC to 1kHz.		0.5		mA/G
$CMTI$	Common-mode transient immunity	$V_{CM} = 1000\text{V}$, $\Delta V_{OUT} > 100\text{mV}$ and duration $> 1\mu\text{s}$		150		V/ns
$PSRR_G$	Power supply rejection ratio sensitivity	DC to 1 kHz, 100 mV peak ripple around V_{CC} , $I_P = I_{PN}$, $20\log(\Delta G/G/\Delta V_{CC}/V_{CC})$		-25		dB
$PSRR_{VOE}$	Power supply rejection ratio offset	DC to 1 kHz, 100 mV peak ripple around V_{CC} , $I_P = 0$, $20\log(\Delta V_{OE}/\Delta V_{CC})$		-50		dB
BW	Frequency bandwidth (-3dB)			400		kHz
T_{D90}	V_{OUT} delay time to 90% I_{PN}	I_P step $\leq 100\text{ns}$		1.5		μs
T_{D10}	V_{OUT} delay time to 10% I_{PN}	I_P step $\leq 100\text{ns}$		0.2		μs
T_R	V_{OUT} rise time (10% to 90%)	I_P step $\leq 100\text{ns}$		1.2		μs
T_F	V_{OUT} fall time (90% to 10%)	I_P step $\leq 100\text{ns}$		1.2		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	$V_{VOC-THRESHOLD} = I_{VOC} \cdot G/2$			V
ϵ_{OCF}	Overcurrent fault error			± 3		% $\cdot I_{VOC}$
$I_{VOC-HYS}$	Overcurrent fault hysteresis			± 10		% $\cdot I_{VOC}$
$V_{FAULT-ON}$	Overcurrent fault Pull-down voltage	$R_L = 4.7\text{k}\Omega$, under fault condition		0.08	0.4	V
I_{LK-VOC}	VOC pin leakage current		-50		50	nA

Common operating characteristics ($T_A = 25^\circ\text{C}$, $V_{CC} = 5\text{V}$)

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

C16K-10A characteristics ($T_A = 25^\circ\text{C}$, $V_{CC} = 5.0\text{V}$) *1

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
I_{PN}	Current nominal measuring range		-10		10	A
G	Nominal sensitivity			200		mV/A
V_{OE}	Offset voltage	$V_{OE} = V_{OUT} - V_{REF}$, at $I_P = 0\text{A}$	-2		2	mV
V_O	V_{OUT} at $I_P = 0\text{A}$	$I_P = 0\text{A}$		2.500		V
T_{CVO}	Temperature coefficient of V_O	$I_P = 0\text{A}$, $T_A = -40^\circ\text{C} \dots 125^\circ\text{C}$	-3		3	mV
T_{CG}	Temperature coefficient of G	$T_A = -40^\circ\text{C} \dots 125^\circ\text{C}$	-1		1	%
ϵ_{TOT}	Total output error	Percentage of I_{PN}	-2.5	± 1.5	2.5	%

1. Ensure T_J remains below T_{Jmax} when operating at higher I_P and T_A .

C16K-20A characteristics ($T_A = 25^\circ\text{C}$, $V_{CC} = 5.0\text{V}$) *1

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
I_{PN}	Current nominal measuring range		-20		20	A
G	Nominal sensitivity			100		mV/A
V_{OE}	Offset voltage	$V_{OE} = V_{OUT} - V_{REF}$, at $I_P = 0\text{A}$	-2		2	mV
V_O	V_{OUT} at $I_P = 0\text{A}$	$I_P = 0\text{A}$		2.500		V
T_{CVO}	Temperature coefficient of V_O	$I_P = 0\text{A}$, $T_A = -40^\circ\text{C} \dots 125^\circ\text{C}$	-3		3	mV
T_{CG}	Temperature coefficient of G	$T_A = -40^\circ\text{C} \dots 125^\circ\text{C}$	-1		1	%
ϵ_{TOT}	Total output error	Percentage of I_{PN}	-2.5	± 1.5	2.5	%

1. Ensure T_J remains below T_{Jmax} when operating at higher I_P and T_A .

C16K-30A characteristics ($T_A = 25^{\circ}\text{C}$, $V_{CC} = 5.0\text{V}$) *1

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
I_{PN}	Current nominal measuring range		-30		30	A
G	Nominal sensitivity			66.67		mV/A
V_{OE}	Offset voltage	$V_{OE} = V_{OUT} - V_{REF}$, at $I_P = 0\text{A}$	-2		2	mV
V_O	V_{OUT} at $I_P = 0\text{A}$	$I_P = 0\text{A}$		2.500		V
T_{CVO}	Temperature coefficient of V_O	$I_P = 0\text{A}$, $T_A = -40^{\circ}\text{C} \dots 125^{\circ}\text{C}$	-3		3	mV
T_{CG}	Temperature coefficient of G	$T_A = -40^{\circ}\text{C} \dots 125^{\circ}\text{C}$	-1		1	%
ϵ_{TOT}	Total output error	Percentage of I_{PN}	-2.5	± 1.5	2.5	%

1. Ensure T_J remains below T_{Jmax} . when operating at higher I_P and T_A .

C16K-50A characteristics ($T_A = 25^{\circ}\text{C}$, $V_{CC} = 5.0\text{V}$) *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 $I_P = 0\text{A}$	-2		2	mV
V_O	V_{OUT} at $I_P = 0\text{A}$	$I_P = 0\text{A}$		2.500		V
T_{CVO}	Temperature coefficient of V_O	$I_P = 0\text{A}$, $T_A = -40^{\circ}\text{C} \dots 125^{\circ}\text{C}$	-3		3	mV
T_{CG}	Temperature coefficient of G	$T_A = -40^{\circ}\text{C} \dots 125^{\circ}\text{C}$	-1		1	%
ϵ_{TOT}	Total Output Error	Percentage of I_{PN}	-2.5	± 1.5	2.5	%

1. Ensure T_J remains below T_{Jmax} . when operating at higher I_P and T_A .

C16K-65A characteristics ($T_A = 25^\circ\text{C}$, $V_{CC} = 5.0\text{V}$) ^{*1}

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
I_{PN}	Current nominal measuring range		-65		65	A
G	Nominal sensitivity			30.77		mV/A
V_{OE}	Offset voltage	$V_{OE} = V_{OUT} - V_{REF}$, at $I_P = 0\text{A}$	-2		2	mV
V_O	V_{OUT} at $I_P = 0\text{A}$	$I_P = 0\text{A}$		2.500		V
T_{CVO}	Temperature coefficient of V_O	$I_P = 0\text{A}$, $T_A = -40^\circ\text{C} \dots 125^\circ\text{C}$	-3		3	mV
T_{CG}	Temperature coefficient of G	$T_A = -40^\circ\text{C} \dots 125^\circ\text{C}$	-1		1	%
ϵ_{TOT}	Total output error	Percentage of I_{PN}	-2.5	± 1.5	2.5	%

1. Ensure T_J remains below T_{Jmax} . when operating at higher I_P and T_A .

C16K-100A characteristics ($T_A = 25^\circ\text{C}$, $V_{CC} = 5.0\text{V}$) ^{*1}

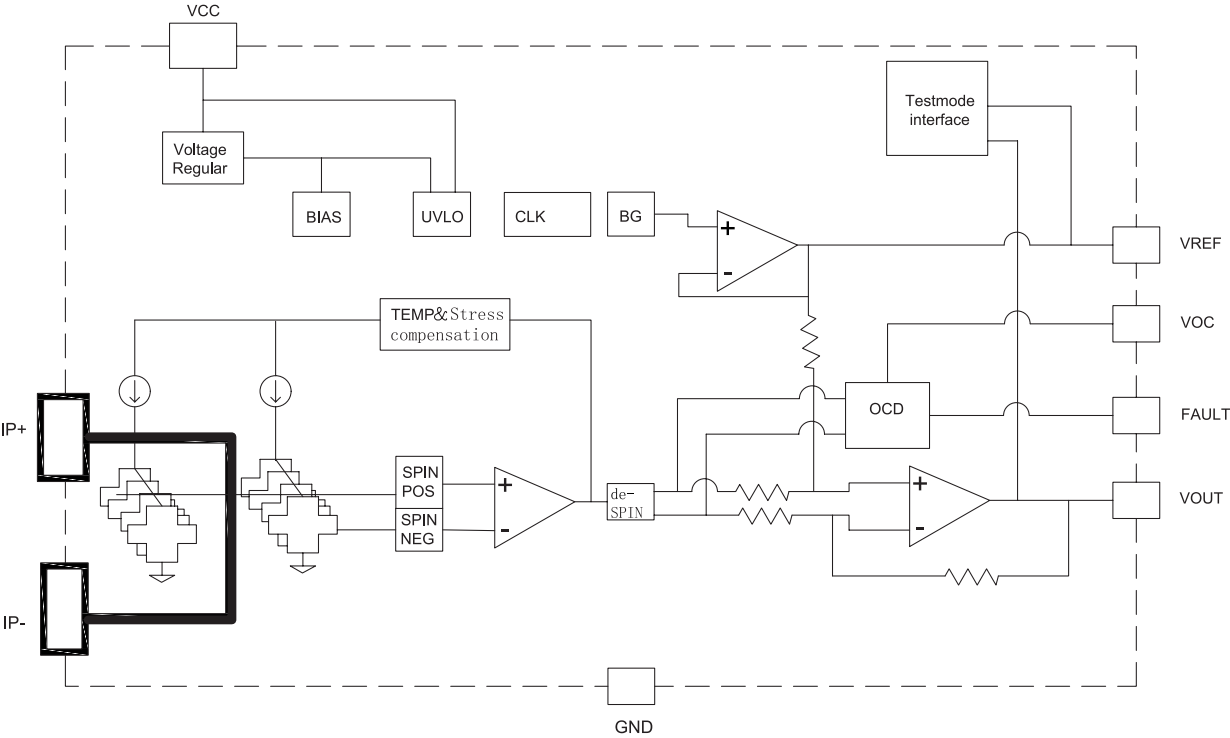
Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
I_{PN}	Current nominal measuring range		-100		100	A
G	Nominal sensitivity			20		mV/A
V_{OE}	Offset voltage	$V_{OE} = V_{OUT} - V_{REF}$, at $I_P = 0\text{A}$	-2		2	mV
V_O	V_{OUT} at $I_P = 0\text{A}$	$I_P = 0\text{A}$		2.500		V
T_{CVO}	Temperature coefficient of V_O	$I_P = 0\text{A}$, $T_A = -40^\circ\text{C} \dots 125^\circ\text{C}$	-3		3	mV
T_{CG}	Temperature coefficient of G	$T_A = -40^\circ\text{C} \dots 125^\circ\text{C}$	-1		1	%
ϵ_{TOT}	Total Output Error	Percentage of I_{PN}	-2.5	± 1.5	2.5	%

1. Ensure T_J remains below T_{Jmax} . when operating at higher I_P and T_A .

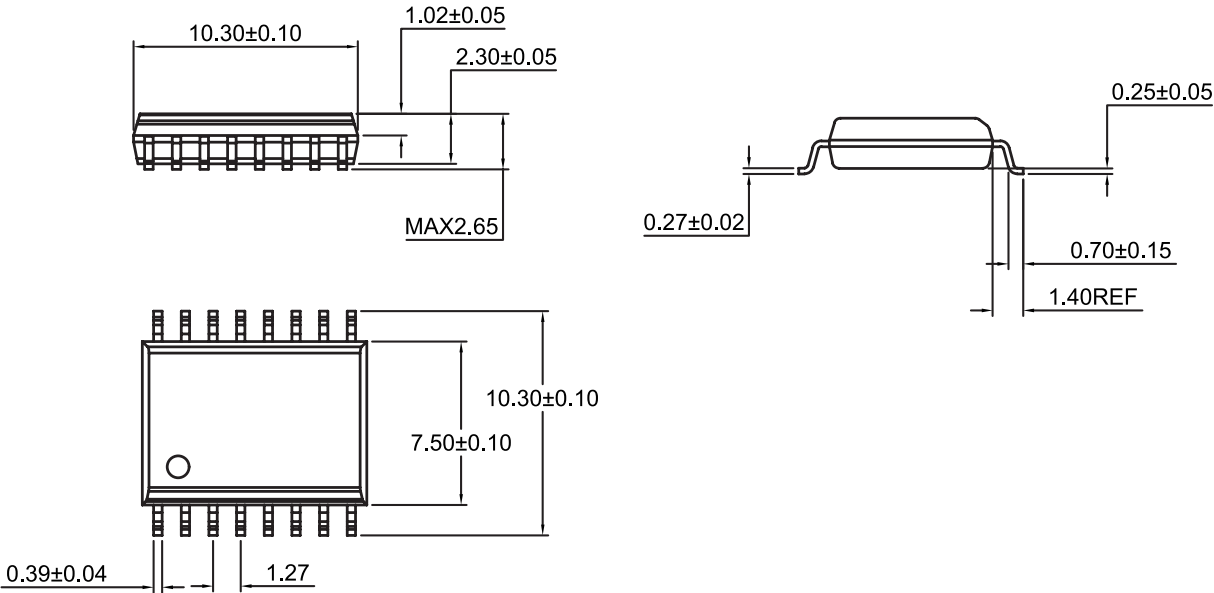
Insulation characteristics

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	11000	V	According to IEC 61000-4-5, tested in air
I_{SURGE}	Impulse withstand current 8/20 μs	14	kA	According to IEC 61000-4-5, tested in air
V_{WFSI}	Basic isolation	1618	V_{Peak} / V_{DC}	According to UL/IEC 62368-1: 2018
		1114	V_{RMS}	
V_{WVRI}	Reinforced (double) isolation	809	V_{Peak} / 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

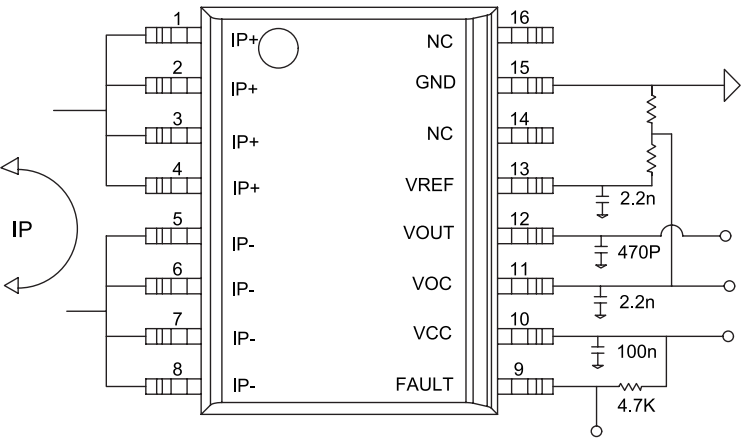
Function block diagram



Dimension (mm)



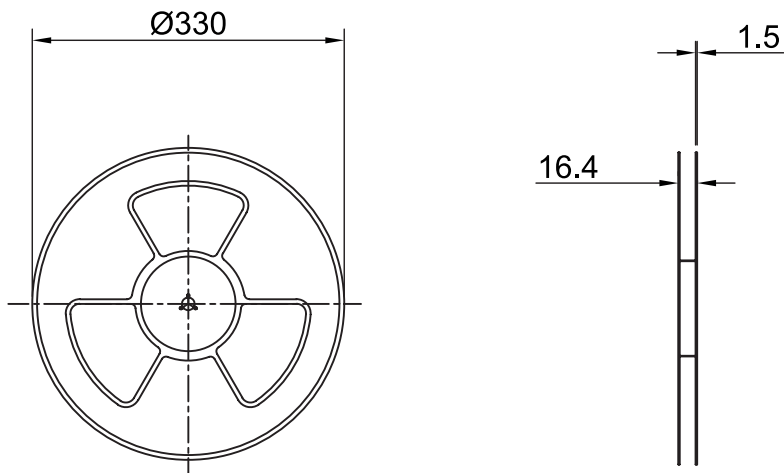
Pin-out diagram



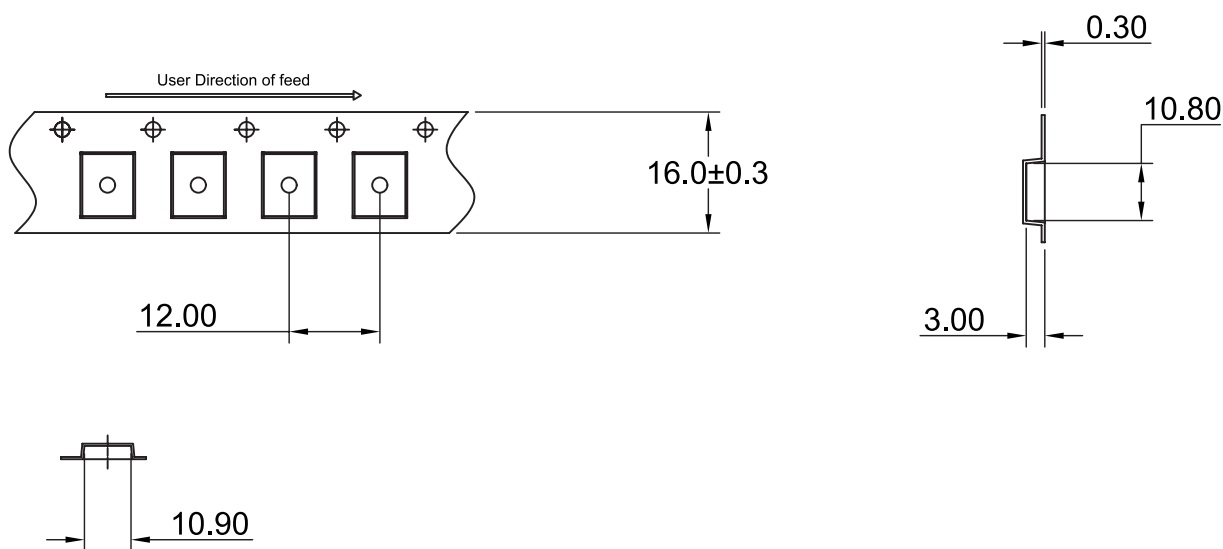
Pin	Symbol	Description
1,2,3,4	I_{p+}	Positive primary current terminal
5,6,7,8	I_{p-}	Negative primary current terminal
9	FAULT	Overcurrent fault output (Active Low)
10	V_{CC}	Device power supply input
11	VOC	Overcurrent threshold setting
12	V_{OUT}	Analog signal output
13	V_{REF}	Reference voltage output
15	GND	Device ground terminal
14,16	NC	Not connect

Packaging information

Reel size



Tape size



Notes

1. All measurements are in mm.

Name Guide Description

	C16	K	-	XXA	XX	X	X
Series	C16 series ICS						
BW grade	L: 250 KHz without OCD K: 400 KHz M: 2 MHz						
Max. range	10: ±10A 20: ±20A 30: ±30A 50 ±50A 65: ±65A 100: ±100A						
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)
C16K-10A	SOW16	±10A	200	Tape and reel, 1500 pieces/reel
C16K-20A	SOW16	±20A	100	Tape and reel, 1500 pieces/reel
C16K-30A	SOW16	±30A	66.67	Tape and reel, 1500 pieces/reel
C16K-50A	SOW16	±50A	40	Tape and reel, 1500 pieces/reel
C16K-65A	SOW16	±65A	30.77	Tape and reel, 1500 pieces/reel
C16K-100A	SOW16	±100A	20	Tape and reel, 1500 pieces/reel

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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