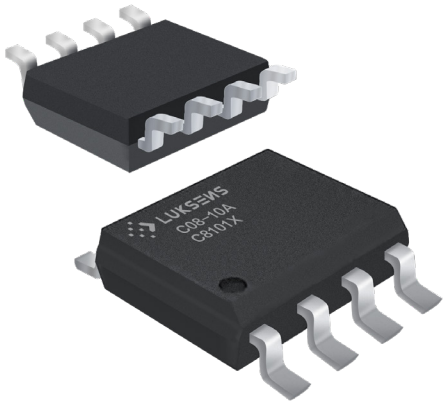
C08K Series Linear Hall Effect Current Sensor IC

Fully Integrated, 0.75 mΩ Conductor, 3 kVrms Isolation, 400 kHz High Bandwidth

The C08K 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.

The C08K features a 400 kHz (3 dB) bandwidth, 3 kVrms isolation, and an ultra-low 750 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 · 60A · +V 0V · HALL EFFECT

Features

- Factory trimmed sensitivity sensor
- Flexible supply voltage with factory selectable 5 V or 3.3 V mode
- 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 1.5 µs, 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 400 kHz (-3 dB)

Applications

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

Standards

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

Absolute maximum ratings

Symbol	Parameter	Min.	Max.	Unit
$V_{CC\ max.}$	Maximum supply voltage (not destructive)	-0.3	12	V
T_A	Ambient operating temperature	-40	125	°C
$T_{J\ max.}$	Maximum junction temperature		150	°C
T_S	Storage temperature range	-40	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} = 5 V)

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_{CC}	Supply voltage	C08K-XXA	4.5	5	5.5	V
I_C	Current consumption	I_P = 0 A without load, V_{CC} = 5 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_{PRI}	Primary conductor resistance	T_A = 25 °C		0.75		mΩ
$I_{P-MAX25}$	Maximum continuous input current	T_A = 25 °C, 2 layer 4.5 ounce PCB			62	A
$I_{P-MAX125}$	Maximum continuous input current	T_A = 85 °C, 2 layer 4.5 ounce PCB			50	A

Common operating characteristics (T_A = 25 °C, V_{CC} = 5 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 * I_{Pn}, V_{SAT-H} = V_{CC} – V_{OUT} R_L = 10 kΩ 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 = 10 kΩ 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 A, V_{CC} = 5 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	±I_{Pn} without offset		±0.2		% / I_{Pn}
IND	Input-referenced noise density	V_{CC} = 5 V, C_L = 0.47 nF		240		µA / √Hz
CMFR	Common-mode field rejection	CMFR = (ΔV_{OUT} / ΔB) / G, DC to 1 kHz.		0.5		mA / G
CMTI	Common-mode transient immunity	VCM = 1000 V, ΔV_{OUT} > 100 mV and duration > 1 µs		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(ΔG / G / ΔV_{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(ΔV_{OE} / ΔV_{CC})		-50		dB
BW	Frequency bandwidth (-3 dB)			400		kHz
T_{D90}	V_{OUT} delay time to 90% I_{Pn}	I_P step ≤ 100 ns		1.5		µs
T_{D10}	V_{OUT} delay time to 10% I_{Pn}	I_P step ≤ 100 ns		0.2		µs
T_R	V_{OUT} rise time (10% to 90%)	I_P step ≤ 100 ns		1.2		µs
T_F	V_{OUT} fall time (90% to 10%)	I_P step ≤ 100 ns		1.2		µs

C08K-10A characteristics (T_A= 25 °C, V_{CC}= 5.0 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 A	-5		5	mV
V_O	V_{OUT} at I_P = 0 A	I_P = 0 A	2.485	2.500	2.515	V
T_{CVO}	Temperature coefficient of V_O at I_P = 0 A T_A = -40 °C ... 125 °C		-5		5	mV
T_{CG}	Temperature coefficient of G	T_A = -40 °C ... 125 °C	-1.5		1.5	%
ε_{TOT}	Total Output Error	Percentage of I_{PN}	-3	±2	3	%

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

C08K-20A characteristics (T_A = 25 °C, V_{CC} = 5.0 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 A	-5		5	mV
V_O	V_{OUT} at I_P = 0 A	I_P = 0 A	2.485	2.500	2.515	V
T_{CVO}	Temperature coefficient of V_O at I_P = 0 A T_A = -40 °C ... 125 °C		-5		5	mV
T_{CG}	Temperature coefficient of G	T_A = -40 °C ... 125 °C	-1.5		1.5	%
ε_{TOT}	Total output error	Percentage of I_{PN}	-3	±2	3	%

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

C08K-30A characteristics (T_A = 25 °C, V_{CC} = 5.0 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 A	-5		5	mV
V_O	V_{OUT} at I_P = 0 A	I_P = 0 A	2.485	2.500	2.515	V
T_{CVO}	Temperature coefficient of V_0 at I_P = 0 A T_A = -40 °C ... 125 °C		-5		5	mV
T_{CG}	Temperature coefficient of G	T_A = -40 °C ... 125 °C	-1.5		1.5	%
E_{TOT}	Total output error	Percentage of I_{Pn}	-3	±2	3	%

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

C08K-40A characteristics (T_A = 25 °C, V_{CC} = 5.0 V) *1

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
I_{Pn}	Current nominal measuring range		-40		40	A
G	Nominal sensitivity			50		mV / A
V_{OE}	Offset voltage	$V_{OE} = V_{OUT}-V_{REF}$, at I_P = 0 A	-5		5	mV
V_O	V_{OUT} at I_P = 0 A	I_P = 0 A	2.485	2.500	2.515	V
T_{CVO}	Temperature coefficient of V_0 at I_P = 0 A T_A = -40 °C ... 125 °C		-5		5	mV
T_{CG}	Temperature coefficient of G	T_A = -40 °C ... 125 °C	-1.5		1.5	%
E_{TOT}	Total output error	Percentage of I_{Pn}	-3	±2	3	%

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

C08K-50A characteristics (T_A = 25 °C, V_{CC} = 5.0 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 A	-5		5	mV
V_O	V_{OUT} at I_P = 0 A	I_P = 0 A	2.485	2.500	2.515	V
T_{CVO}	Temperature coefficient of V_O at I_P = 0 A T_A = -40 °C ... 125 °C		-5		5	mV
T_{CG}	Temperature coefficient of G	T_A = -40 °C ... 125 °C	-1.5		1.5	%
ε_{TOT}	Total output error	Percentage of I_{PN}	-3	±2	3	%

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

C08K-60A characteristics (T_A = 25 °C, V_{CC} = 5.0 V) *1

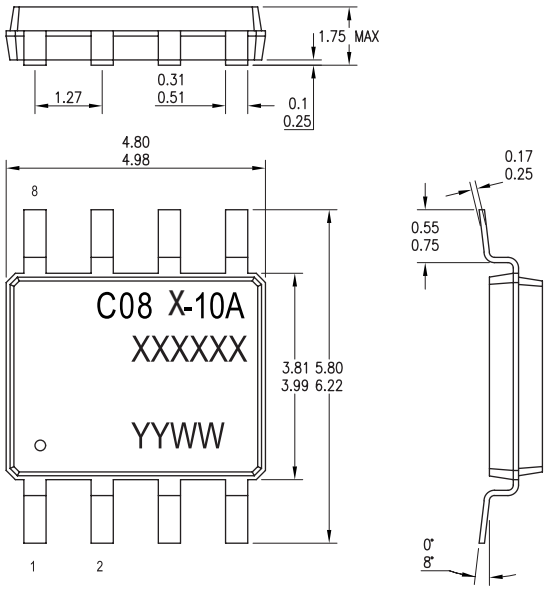
Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
I_{PN}	Current nominal measuring range		-60		60	A
G	Nominal sensitivity			33.33		mV / A
V_{OE}	Offset voltage	$V_{OE} = V_{OUT} - V_{REF}$, at I_P = 0 A	-5		5	mV
V_O	V_{OUT} at I_P = 0 A	I_P = 0 A	2.485	2.500	2.515	V
T_{CVO}	Temperature coefficient of V_O at I_P = 0 A T_A = -40 °C ... 125 °C		-5		5	mV
T_{CG}	Temperature coefficient of G	T_A = -40 °C ... 125 °C	-1.5		1.5	%
ε_{TOT}	Total output error	Percentage of I_{PN}	-3	±2	3	%

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

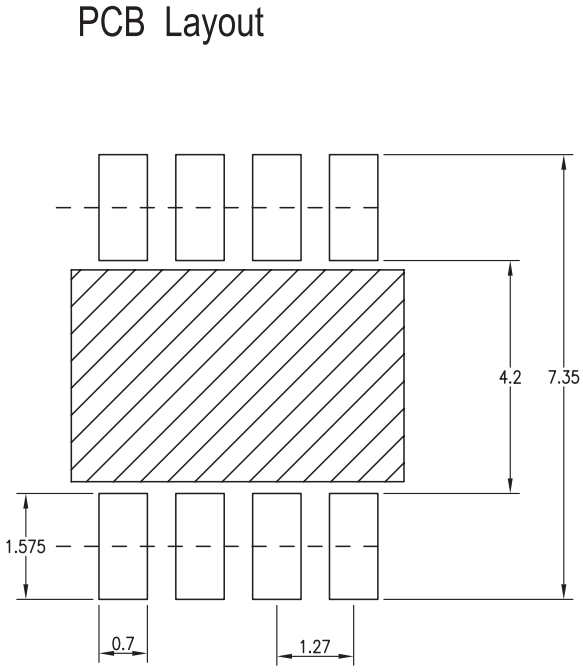
Insulation characteristics

Symbol	Parameter	Value	Unit	Comment
V_{ISO}	Dielectric Strength Test Voltage	3000	V_{RMS}	Agency type-tested for 60 seconds per UL standard 60950-1, 1st Edition
V_{SURGE}	Impulse withstand voltage 1.2 / 50 µs	6000	V	According to IEC 61000-4-5, tested in air, ±5 pulses, 2 pulses / min, 1.2 µs (rise) / 50 µs (width).
I_{SURGE}	Impulse withstand current 8 / 20 µs	8	kA	
V_{WFSI}	Basic isolation	600	V_{Peek} / V_{DC}	According to UL / IEC 62368-1: 2018
		424	V_{RMS}	
V_{WVRI}	Reinforced (double) isolation	417	V_{Peek} / V_{DC}	According to UL / IEC 62368-1: 2018
		214	V_{RMS}	
CTI	Comparative tracking index	≥ 600	V	
CMTI	Common-mode transient immunity	150	V / ns	
D-CLE	Clearance	4	mm	Shortest distance through air
D-CRD	Creepage distance	4	mm	Shortest distance through body

Dimension (mm)



PCB footprint (mm, general tolerance: ±0.05 mm)

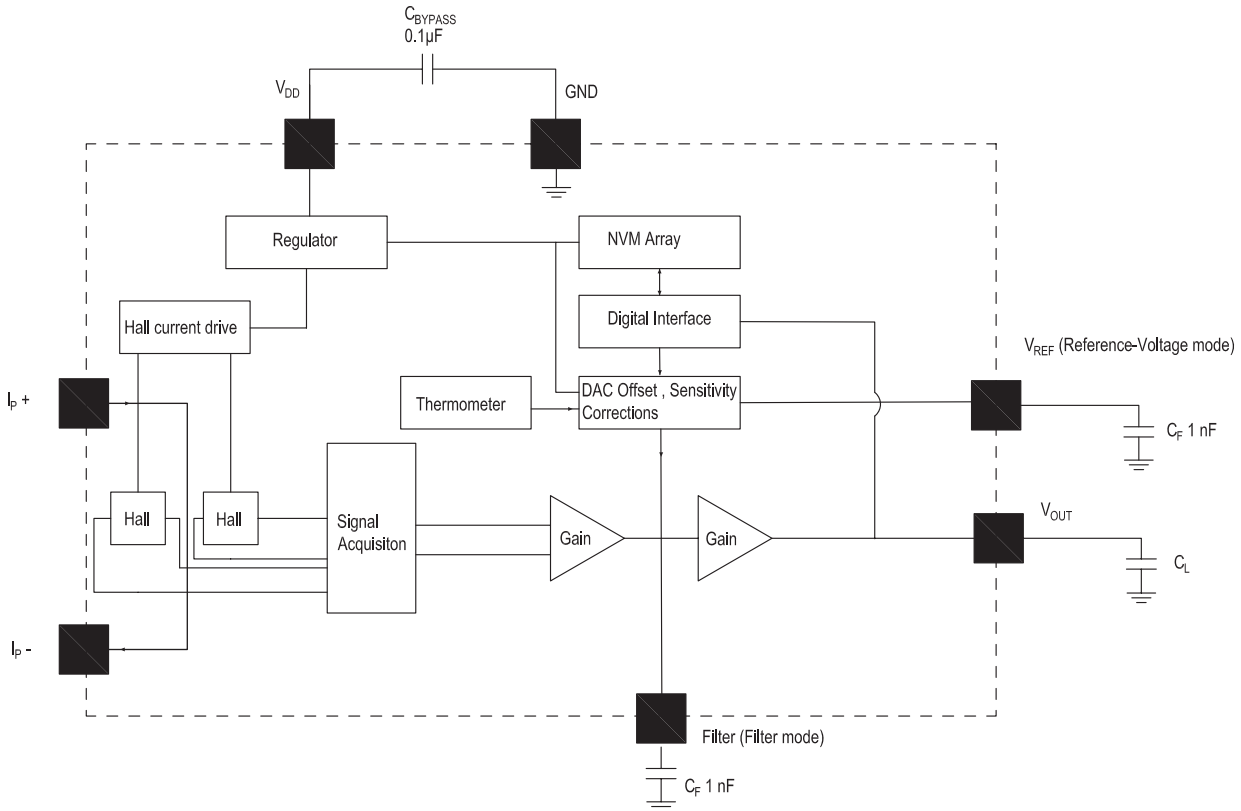


Note:

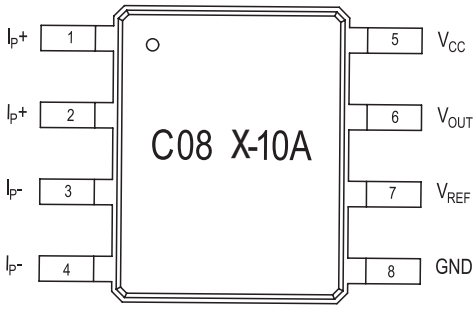
Maximum soldering temperature 260 °C, 10 s

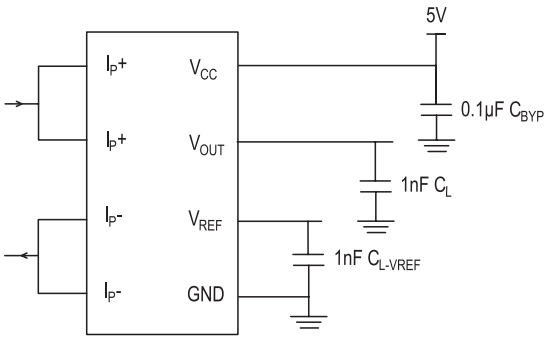
Maximum PCB thickness 2.4 mm

Function block diagram



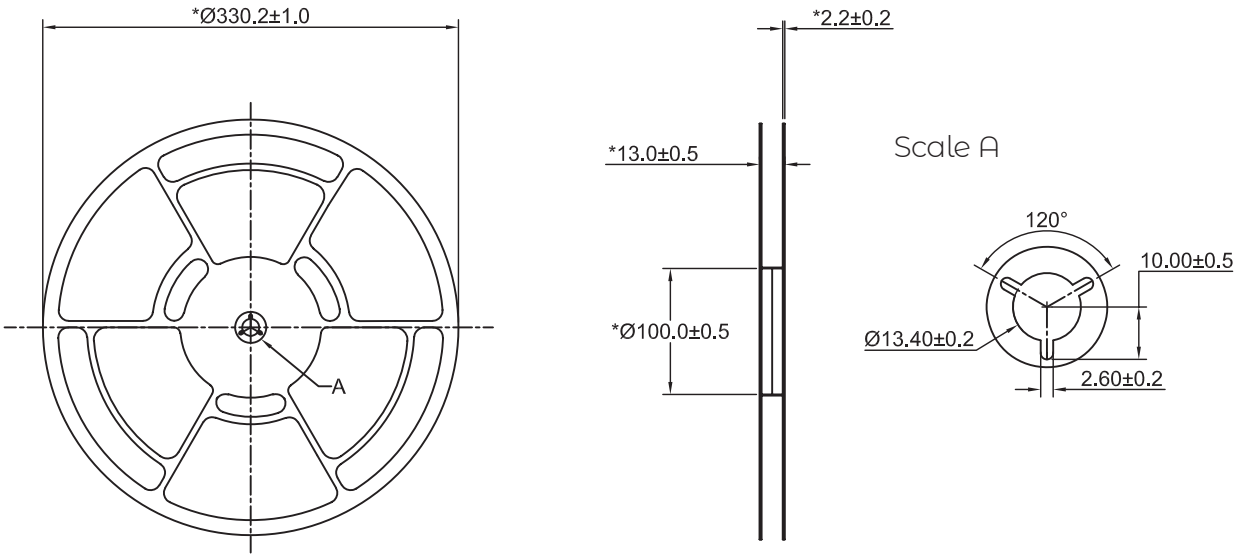
Pin-out diagram



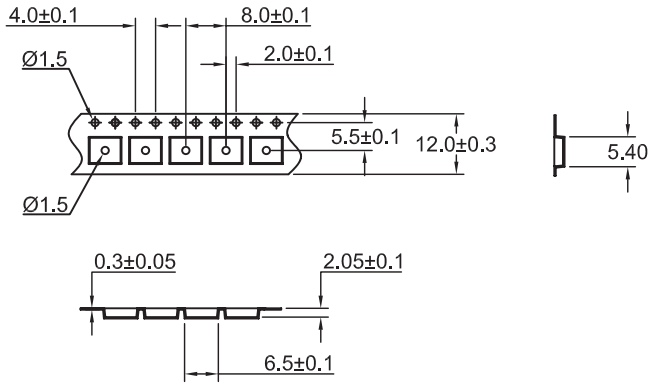


Packaging information

Reel size

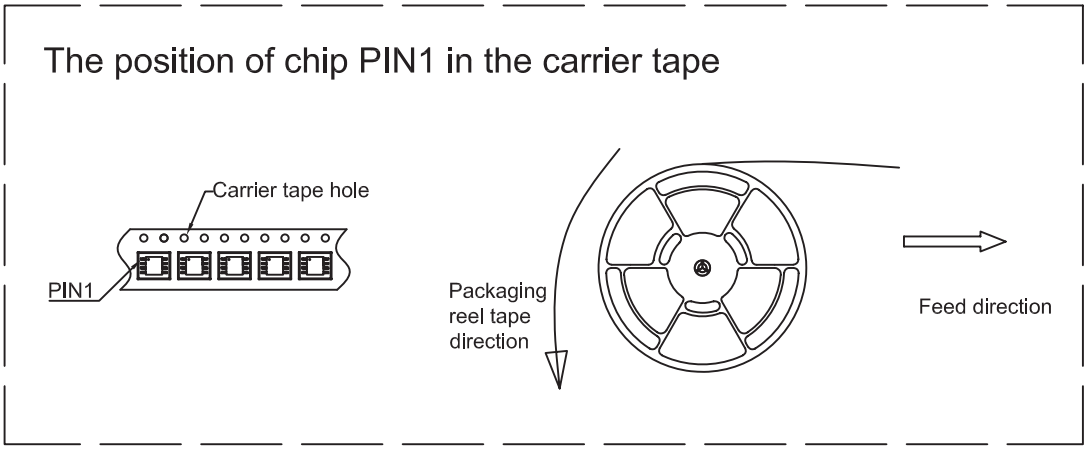


Tape size



Notes

1. All measurements are in mm.
2. Pay special attention to sizes marked with (*); these are key dimensions.



Name Guide Description

C08 K - XXA XX X X

Series

C08K series ICS

BW grade

Null: 240 kHz
K: 400 kHz M: 2 MHz

Max. range

10: ±10 A 20: ±20 A 30: ±30 A
40: ±40 A 50: ±50 A 60: ±60 A

Supply voltage

Null: 5 V
33: 3.3 V

Meas. Dir.

Null: Bidirectional
U: Unidirectional

Extra code

Selection guide

Part Number	Package	Moisture Sensitivity Level	Nominal Range (A)	Sensitivity (mV / A)	SPQ (Standard Pack Quantity)
C08K-10A	SOIC8	MSL3	±10 A	200	Tape and reel, 3000 pieces / reel
C08K-20A	SOIC8	MSL3	±20 A	100	Tape and reel, 3000 pieces / reel
C08K-30A	SOIC8	MSL3	±30 A	66.67	Tape and reel, 3000 pieces / reel
C08K-40A	SOIC8	MSL3	±40 A	50	Tape and reel, 3000 pieces / reel
C08K-50A	SOIC8	MSL3	±50 A	40	Tape and reel, 3000 pieces / reel
C08K-60A	SOIC8	MSL3	±60 A	33.33	Tape and reel, 3000 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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