Hall Effect Isolated Current Sensor

FEATURES AND BENEFITS

- **Single Chip Isolated Current Sensor**
- **Current Sensing Range:**
  - **±20A, ±30A**
  - **+20A, +30A**
- **High Bandwidth: 120kHz**
- **Fast Response: $t_{respons}$<2.5us**
- **High Precision: ±1% FS**
- **Working Over Industry Temperature: -40℃~125℃**
- **Primary Conductor Resistance: <1.1mΩ**
- **Single Power Supply: 4.5V ~ 5.5V**
- **Small Footprint, Low Profile SOP-8 Package**

Applications

- **White Goods**
- **Small Motor Control**
- **Mobile Fast Charge Device**

Description

SC4702 provides users with a high-precision current detection single chip scheme, which can detect DC or AC current. Because of its low cost, SC4702 can be widely used in household appliances and small electric vehicles. Its typical applications include: motor current detection, system power supply monitoring and key device current protection。

SC4702 includes linear Hall sensing circuit, temperature compensation circuit, etc. the detected current flows through the chip copper conductor and completes the current detection function by detecting the electromagnetic field generated by the measured current. Due to the use of magnetic field detection, SC4702 can achieve the highest isolation performance of 420Vpk (ul60950-1 ed.2). At the same time, because the detected current does not flow through any semiconductor device, its current path impedance is less than 1.1m Ω, which greatly reduces the power loss in the process of current detection。

The output of the voltage signal output terminal (VOUT) of the SC4702 changes with the current flowing through its current input / output terminal. When the current is zero, the output voltage value is equal to half of the chip supply voltage. The effective current detection bandwidth of SC4702 is adjustable up to 120kHz For applications requiring high-speed overcurrent protection, the SC4702 provides high-speed response with a delay of no more than 3.5 microseconds.

Due to the use of advanced linear Hall device sensing circuit and sensing algorithm, SC4702 can effectively attenuate the interference of environmental magnetic field, so as to greatly improve the detection accuracy of conductor current. The magnetic interference signal intensity caused by the magnetic field caused by the magnetic source more than 20mm from the center of the chip can be attenuated by more than 60dB.

SC4702 adopts SOIC8 package, which effectively reduces the area occupied by the device in application. At the same time, due to the effective temperature and compensation function, the current detection accuracy can be maintained within ± 3% within the working temperature range of - 40 ℃ ~ 125 ℃.

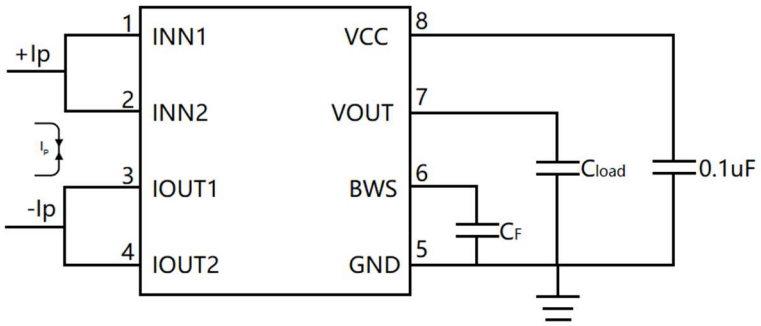


Figure 1. Typical Application

PINOUT DIAGRAM

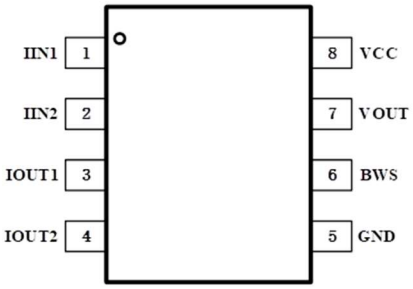


Figure 2. Pinout Diagram

TERMINAL LIST TABLE

Pin No	Name	Type	Description
1, 2	IIN1	In/Out	Terminals for Current Sensed
3, 4	IIN2	In/Out	Terminals for Current Sensed
5	GND	In/Out	Signal Ground Terminal
6	BWS	Output	Terminal for External Capacitor That Sets Bandwidth
7	VOUT	Output	Analog Output Signal
8	VCC	In/Out	Device Power Supply Terminal

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Power Supply Voltage	V_{CC}	-0.3	6.0	V
Output Voltage Range	V_{IO}	-0.3	Vcc+0.3	V
Filter Pin Voltage	V_{FILTER}	-0.3	Vcc+0.3	V
Storage Temperature Range	T_{STG}	-60	150	℃
Max Junction Temperature	T_J		150	℃

ESD Ratings

Parameter	Classified	Value	Unit
Human Body Model (HBM)	Class 3B	8	kV
Charged Device Model (CDM)	Class C3	2	kV
Latch Up	Class IA		

ISOLATION CHARACTERISTICS

Parameter	Symbol	Notes	Value	Unit
Dielectric Strength Test Voltage	V_{ISO}	UL60950-1 (edition.2)	2400	V_{RMS}
Working Voltage for Basic Isolation	V_{WVBI}	UL60950-1 (edition.2)	420	V_{PK}
			297	V_{RMS}
Clearance Distance	D_{cl}	Between primary and secondary conductors	3.9	mm
Creepage Distance	D_{cp}	Between primary and secondary conductors	3.9	mm

Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit
Operation Temperature	T_A	-40		125	℃
Power Supply Voltage	V_{CC}	4.5	5.0	5.5	V

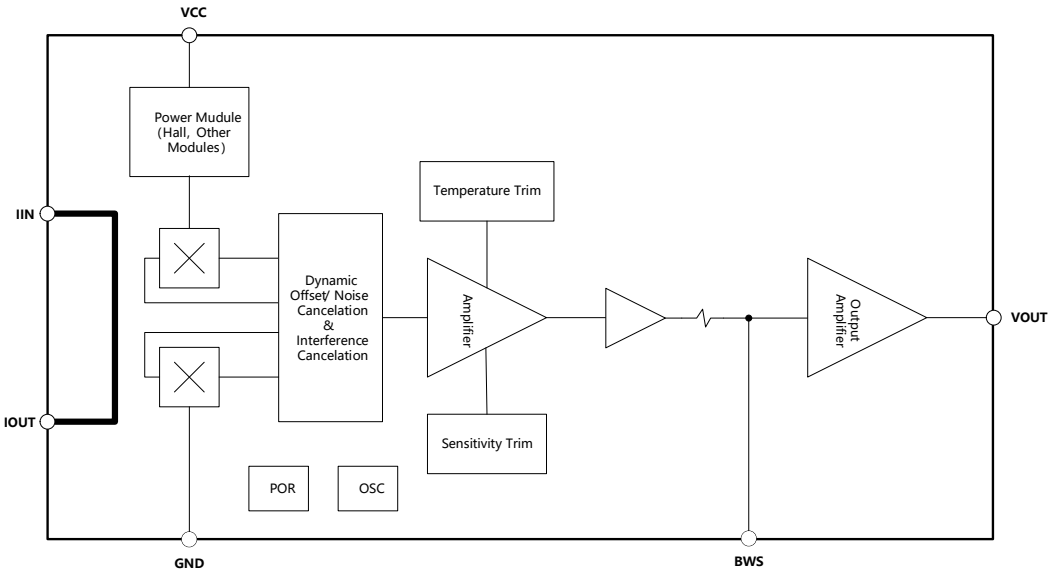


Figure 3. Functional Blocks

SELECTION GUIDE

Part Number	Current Sensing Range (A)	Sensitivity (mV/A)	Current Mode	Working Temperature T_A(℃)
SC4702SD20U	20	200	DC	-40 ~ 125
SC4702SD20B	±20	100	DC/AC	-40 ~ 125
SC4702SD30U	30	133	DC	-40 ~ 125
SC4702SD30B	±30	66	DC/AC	-40 ~ 125

COMMON ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
						Electrical Characteristics
VCC	Operate Voltage Range		4.5	5.0	5.5	V
ICC	Power Supply Current	No Load		12	14	mA
CL	Output Capacitance Load	VOUT to GND			10	nF
RL	Output Resistive Load	VOUT to GND	4.7			kΩ
RP	Primary Conductor Resistance	T_A=25℃		1.3		mΩ
TPOR	Power On Time	输出从0到90%		50		us
Tr	V_{OUT} Rising Time	T_A=25℃, CL=1nF		2		us
TPD	V_{OUT} Delay Time	Delay between the input signal reaching 90% to the output signal reaching 90%, T_A=25℃, Terminal Open		2.5		us
BW	Output Signal Bandwidth	CL=1nF		120		KHz
IN	Noise	Input Reference Noise: CF=4.7nF, CL=1nF, BW=18KHz,T_A=25℃,		50		mA(rms)
VOH	Analog Voltage High	RL=4.7KΩ		VCC-0.3		V
VOL	Analog Voltage Low	RL=4.7KΩ		0.3		V

SC4702SD20U: PERFORMANCE CHARACTERISTICS: TA Range L, valid at TA = – 40°C to 125°C, VCC = 5 V, Unless Otherwise Specified

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
IP	Current Sensing Range		0		+20	A
Sens	Sensitivity	-5A≤IP≤+5		200		mV/A
$V_{OUT}(Q)$	Zero-Current Output Voltage	IP=0		0.5*VCC		V
V_{OE}	Voltage Offset Error	IP=0,TA=-40℃~25℃		±10		mV
		IP=0,TA=25℃~125℃		±15		mV
E_{TOT}	Total Output Error	IP=5A,TA=-40℃~25℃		±2.5		%
		IP=5A,TA=25℃~125℃		±3		%
E_{SENS}	Sensitivity Error	IP=5A,TA=-40℃~25℃		±2		%
		IP=5A,TA=25℃~125℃		±2.5		%

SC4702SD20B: PERFORMANCE CHARACTERISTICS: TA Range L, valid at TA = – 40°C to 125°C, VCC = 5 V, Unless Otherwise Specified

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
IP	Current Sensing Range		-20		+20	A
Sens	Sensitivity	-5A≤IP≤+5		100		mV/A
$V_{OUT}(Q)$	Zero-Current Output Voltage	IP=0		0.5*VCC		V
V_{OE}	Voltage Offset Error	IP=0,TA=-40℃~25℃		±10		mV
		IP=0,TA=25℃~125℃		±10		mV
E_{TOT}	Total Output Error	IP=5A,TA=-40℃~25℃		±2.5		%
		IP=5A,TA=25℃~125℃		±4		%
E_{SENS}	Sensitivity Error	IP=5A,TA=-40℃~25℃		±2		%
		IP=5A,TA=25℃~125℃		±3.5		%

SC4702SD30U: PERFORMANCE CHARACTERISTICS: TA Range L, valid at TA = – 40°C to 125°C, VCC = 5 V, Unless Otherwise Specified

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
IP	Current Sensing Range		0		+30	A
Sens	Sensitivity	-5A≤IP≤+5		133		mV/A
$V_{OUT}(Q)$	Zero-Current Output Voltage	IP=0		0.5*VCC		V
V_{OE}	Voltage Offset Error	IP=0,TA=-40℃~25℃		±10		mV
		IP=0,TA=25℃~125℃		±15		mV
E_{TOT}	Total Output Error	IP=5A,TA=-40℃~25℃		±2.5		%
		IP=5A,TA=25℃~125℃		±4		%
E_{SENS}	Sensitivity Error	IP=5A,TA=-40℃~25℃		±2		%
		IP=5A,TA=25℃~125℃		±3.5		%

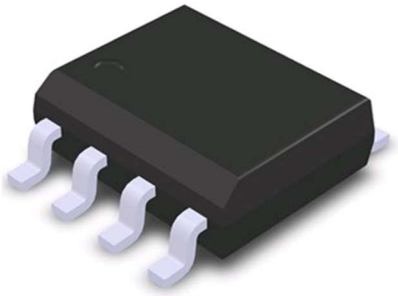
SC4702SD30B: PERFORMANCE CHARACTERISTICS: TA Range L, valid at TA = – 40°C to 125°C, VCC = 5 V, Unless Otherwise Specified

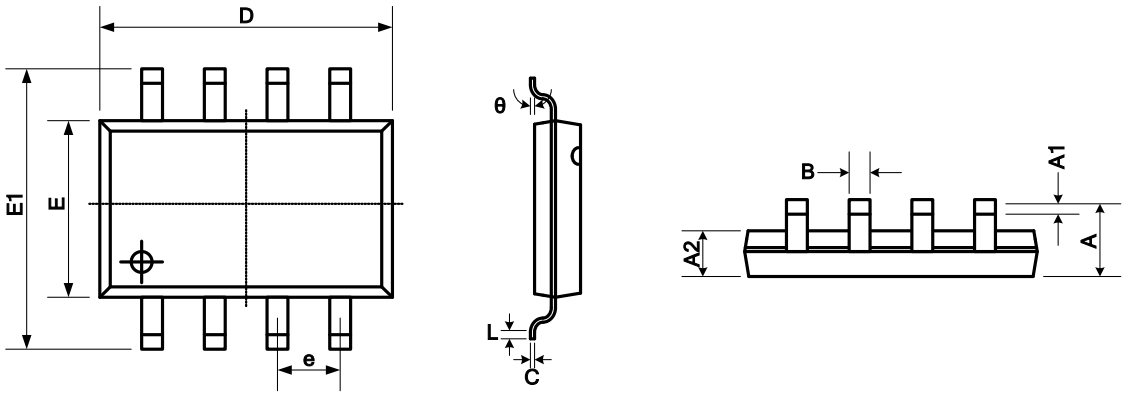
Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
IP	Current Sensing Range		-30		+30	A
Sens	Sensitivity	-5A≤IP≤+5		66		mV/A
$V_{OUT}(Q)$	Zero-Current Output Voltage	IP=0		0.5*VCC		V
V_{OE}	Voltage Offset Error	IP=0,TA=-40℃~25℃		±10		mV
		IP=0,TA=25℃~125℃		±10		mV
E_{TOT}	Total Output Error	IP=5A,TA=-40℃~25℃		±2.5		%
		IP=5A,TA=25℃~125℃		±4		%
E_{SENS}	Sensitivity Error	IP=5A,TA=-40℃~25℃		±2		%
		IP=5A,TA=25℃~125℃		±3.5		%

PACKAGE OUTLING DRAWING

SOIC-8

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
B	0.330	0.510	0.013	0.020
C	0.190	0.250	0.007	0.010
D	4.780	5.000	0.188	0.197
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.248
e	1.270 TYP		0.050 TYP	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°





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