

Current Sensor

Product Series: SHK-VBS-TH-S2

SHK-VBS-TH-660-S2
SHK-VBS-TH-750-S2
Part number: SHK-VBS-TH-900-S2
SHK-VBS-TH-1000-S2
SHK-VBS-TH-1100-S2

Version: Ver 1.9



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1. Description

The SHK-VBS-TH-S2 current sensor is based on Hall and open-loop design. It is suitable for DC, AC pulsed and any kind of irregular current measurement under the isolated conditions.

Typical applications

- Electrical Power Steering
- Converters
- Motor drive application
- Battery Management

General parameter

Parameter	Symbol	Unit	Value
Working temperature	T_a	°C	-40 ~ 125
Storage temperature	T_{stg}	°C	-40 ~ 125
Mass	m	g	72

Absolute maximum rating

Parameter	Symbol	Unit	Value
Supply voltage	Vcc	V	-0.3 ~ 10 (Not operating)
			6.5
Electrostatic discharge voltage	U_{ESD}	kV	8 (HBM)

Remark: the unrecoverable damage may occur when the product works on the conditions over the absolute maximum ratings. Long - time working on the absolute maximum ratings may cause the degradation on performance and reliability.

Isolation parameter

Parameter	Symbol	Unit	Value	Comment
Insulation voltage	U_d	kV	2.8	RMS voltage for AC test 50 Hz / 1 min
Insulation resistance	R_{is}	MΩ	500	DC 1 kV / 1 min
Clearance distance (pri. -sec)	d_{Cl}	mm	9	Shortest distance through air
Creepage distance (pri. -sec)	d_{Cp}	mm	9	Shortest path along device body
Comparative tracking index	CTI	V	600	IEC60112
Case material				V0 according to UL 94

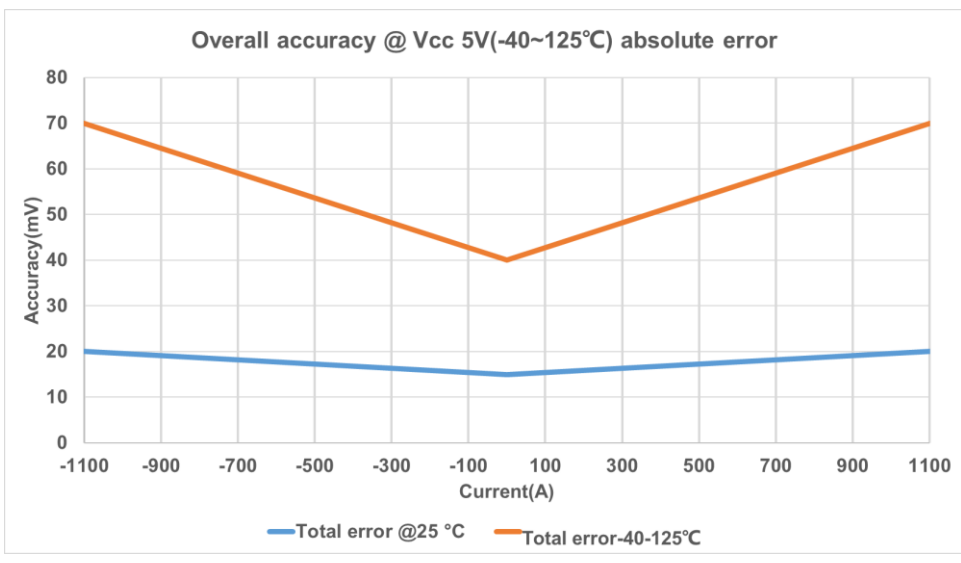
Selection Guide

Product	Nominal current	Measuring range
SHK-VBS-TH-660-S2	±660 A	±660 A
SHK-VBS-TH-750-S2	±750 A	±750 A
SHK-VBS-TH-900-S2	±900 A	±900 A
SHK-VBS-TH-1000-S2	±1000 A	±1000 A
SHK-VBS-TH-1100-S2	±1100 A	±1100 A

2. Electrical data SHK-VBS-TH-xxx-S2

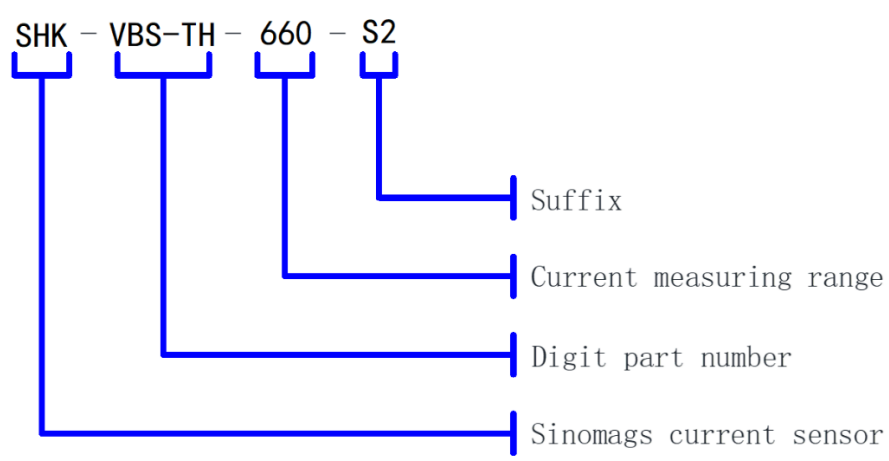
Parameter	Symbol	Unit	Min	Typ	Max	Comment
Primary current measuring range	I_{pm}	A	-660		660	SHK-VBS-TH-660-S2
			-750		750	SHK-VBS-TH-750-S2
			-900		900	SHK-VBS-TH-900-S2
			-1000		1000	SHK-VBS-TH-1000-S2
			-1100		1100	SHK-VBS-TH-1100-S2
Supply voltage	V_{CC}	V	4.75	5	5.25	
Current consumption	I_{CC}	mA		40	50	@ $V_{CC}=5.0\text{ V}$
Output voltage	V_{OUT}	V	$(V_{CC}/5) \times (V_{off} + G * I_{pn})$			@ $T_a = 25^\circ\text{C}$
Quiescent voltage	V_{off}	V		2.5		@ $T_a = 25^\circ\text{C}, V_{CC} = 5.0\text{ V}$
Sensitivity @ $T_a = 25^\circ\text{C}, V_{CC} = 5.0\text{ V}$	G	mV/A		3.03		SHK-VBS-TH-660-S2
				2.67		SHK-VBS-TH-750-S2
				2.22		SHK-VBS-TH-900-S2
				2.00		SHK-VBS-TH-1000-S2
				1.82		SHK-VBS-TH-1100-S2
Load resistance	R_L	k Ω	10		100	
Ratiometricity error	ϵ_r	%		± 0.5		@ $4.75\text{V} \leq V_{CC} \leq 5.25\text{V}$
Sensitivity error	ϵ_G	%		± 1		@ $T_a = 25^\circ\text{C}, V_{CC} = 5.0\text{ V}$
Electrical offset voltage error	V_{OE}	mV	-20	± 10	20	@ $T_a = 25^\circ\text{C}, V_{CC} = 5.0\text{ V}$
Magnetic offset voltage error	V_{OM}	mV		± 5		@ $T_a = 25^\circ\text{C}, V_{CC} = 5.0\text{ V}$, after $\pm I_{pm}$
Ave. Temp. coefficient of V_{OE}	TCV_{OEAV}	mV/ $^\circ\text{C}$		± 0.15		@ $-40^\circ\text{C} \leq T_a \leq 125^\circ\text{C}$
Ave. Temp. coefficient of G	TCG_{AV}	%/ $^\circ\text{C}$		± 0.03		@ $-40^\circ\text{C} \leq T_a \leq 125^\circ\text{C}$
Linearity	ϵ_L	%		± 1		@ $T_a = 25^\circ\text{C}, V_{CC} = 5.0\text{ V}$, $I = I_{pm}$
Accuracy @ 25°C	E_{TOT}	% of I_{pm}		± 1		@ $T_a = 25^\circ\text{C}, V_{CC} = 5.0\text{ V}$
Accuracy @ $-40^\circ\text{C} \sim 125^\circ\text{C}$	E_{TOT}	% of I_{pm}		± 3.5		@ $-40^\circ\text{C} \leq T_a \leq 125^\circ\text{C}$, $V_{CC} = 5.0\text{ V}$
Response time	T_r	μs		2	6	@ 90% of I_{pm}
Frequency bandwidth (-3 dB)	BW	kHz		40		No RC circuit
Output voltage noise	V_{no}	mVpp		20		@ DC ~ 10 kHz

3. Total error (mV) for $I_{pm} \leq 1100A$

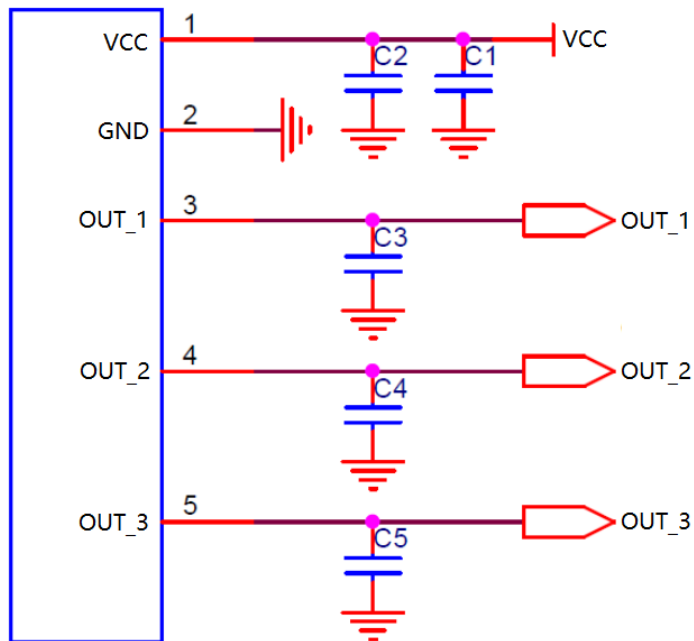


Overall accuracy X specification(mV)				
I _{PM} (A)	@25 °C, V _{cc} =5.0V		@-40-125°C, V _{cc} =5.0V	
	1100	20	1.00%	70
0	10	0.50%	15	0.75%
-1100	20	1.00%	70	3.50%

4. Product definition statement



5. Electrical circuit diagram

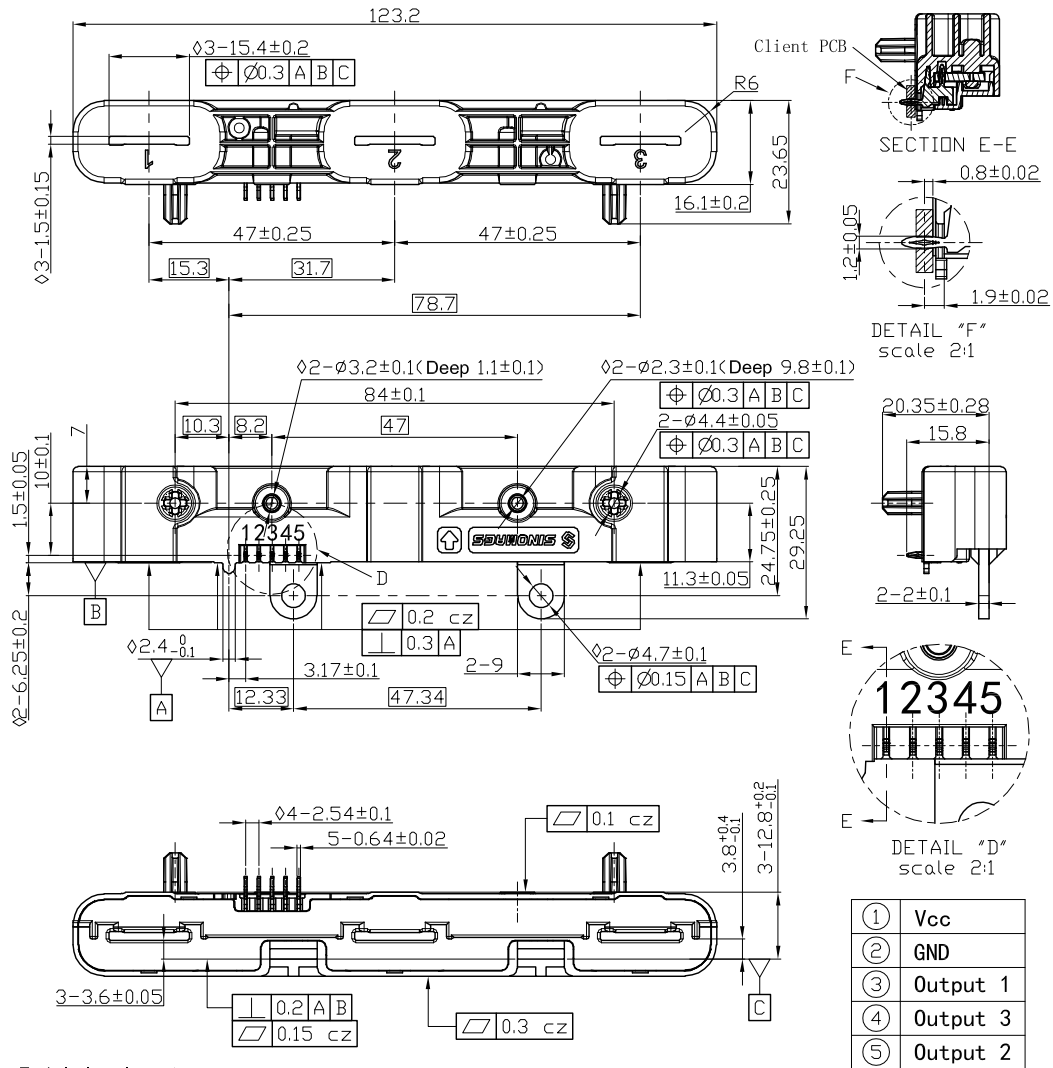


Remarks:

Capacitor recommended specification:

C1	1 uF
C2	100 nF
C3、C4、C5	1 nF

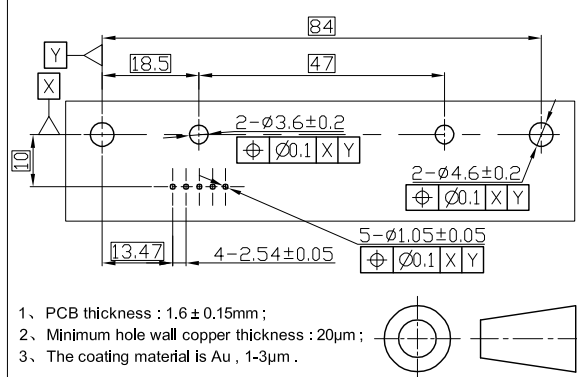
6. Dimension & Pin definitions



Technical requirements :

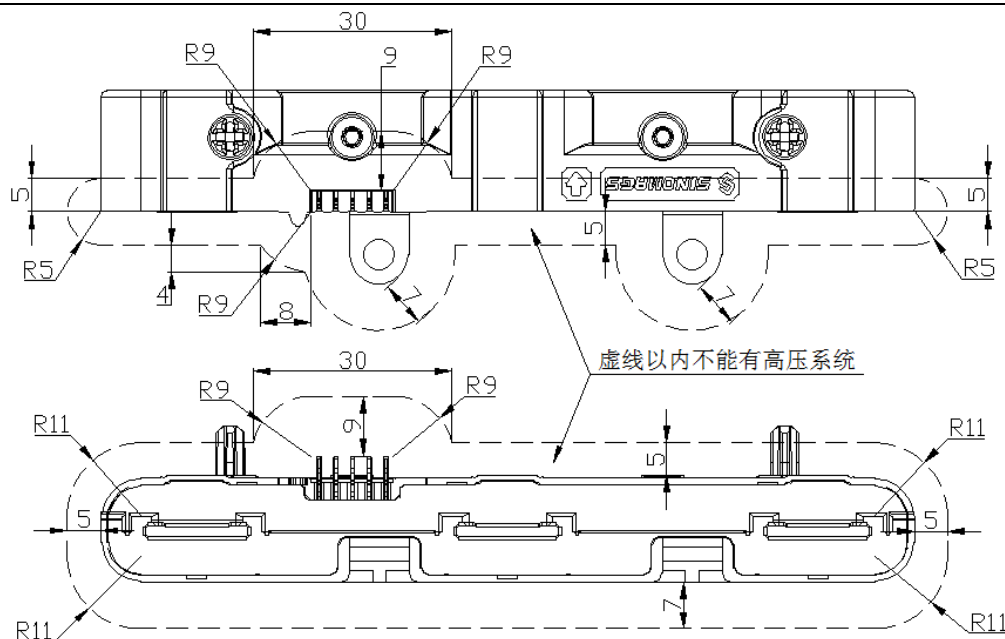
- Focus dimensions : the dimensions marked with a rhombus as the focus control dimensions ;
- The product shall be free of deformation , burr , crack and other defects , and the internal cleaning test of the product shall refer to the ISO16232 standard ;
- General tolerance :
 - 0-6 ± 0.1
 - 6-30 ± 0.2
 - 30-120 ± 0.3
- The working temperature range of the product is $-40 \sim 125 \text{ }^\circ\text{C}$;
- The shell assembly is composed of plastic shell , metal insert and magnetic core ;
The material of metal insert is A5052 ;
The material of plastic shell is PBT+30GF , which flame retardancy meets UL94-V0 and CTI meets PLC0 , and it's color is black ;
- Install self-tapping screws at two step holes (DELTA PT® $\phi 3$ wn5451) ; Torque : 0.8 N·m ± 0.1 N·m ;
Install M4 bolts on two fixing plates ; Torque : 2 N·m $\pm 10\%$;
- Product weight : 72 ± 3 g ;
- PCB pressing force : Min ≥ 100 N·m , Max ≤ 500 N·m .

PCB installation size recommendations



Remarks:

- The clearance distance and creepage distance of the product are related to the high-voltage layout.
- High voltage signal cannot be placed 7mm around the metal fixing plate.



7. Environmental test

Name	Test condition
Electrical tests	
Humidity test	85°C/85%,1000hr
Thermal shock	-40°C/125°C, 1000cycles
High temperature test	125°C, 1000hr
Low temperature test	-40°C, 1000hr
Insulation voltage	2800 V, AC/50Hz/1min
Insulation resistance	1000 V, DC/1min
Mechanical tests	
Shocks	ISO16750-3
Vibration test	ISO16750-3
EMC tests	
Electrostatic discharges	ISO10605(07/2008)
Bulk current injection	ISO11452-4(12/2011)
Immunity to Radiated disturbances	ISO11452-2(11/2004), ALSE
Emission radiated	CISPR25(03/2008), ALSE
Immunity power line magnetic fields	ISO11452-8(06/2015)

8. Important notice

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