CURRENT SENSOR

PRODUCT SERIES：	SHK-VBS/D
PRODUCT PART NUMBER：	SHK-VBS/D-A SHK-VBS/D-B SHK-VBS/D-C SHK-VBS/D-D SHK-VBS/D-E
VERSION：	Ver1.7

Sinomags Technology Co., Ltd.

Web site: www.sinomags.com

CONTENTS

1. Description

The SHK-VBS/D series current sensor is based on TMR (tunnel magnetoresistance) technology and open-loop design. It is suitable for DC, AC pulsed and any kind of irregular current measurement under the isolated conditions.

Typical applications

- AC Variable speed drives
- Inverter
- Electric welder power supply
- Switched model power supplies (SMPS)

General parameter

Parameter	Symbol	Unit	Value
Working temperature	T_A	℃	-40 ~ 125
Storage temperature	T_stg	℃	-40 ~ 125
Mass	m	g	80

Absolute maximum rating

Parameter	Symbol	Unit	Value
Supply voltage	Vcc	V	6
ESD rating（HBM）	U_ESD	kV	8

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
RMS voltage for AC test 50Hz/1 min	Ud	kV	2.5	
Impulse withstand voltage 1.2/50μs	Ûw	kV	6	
Insulaion resistance	R_{IS}	MΩ	500	
Clearance distance (pri. -sec)	dCl	mm	3.1	Determined by customer's layout
Creepage distance (pri. -sec)	dCp	mm	3.1	

Measuring current table

Product	Channel	Optimized Range I_pn (A)	Sensitivity, (mV/A)	T(℃)
SHK-VBS/D-A	CH1	±75 A	26.67	-40 ~ 125
	CH2	±1000 A	2	-40 ~ 125
SHK-VBS/D-B	CH1	±75 A	26.7	-40 ~ 125
	CH2	±750 A	2.7	-40 ~ 125
SHK-VBS/D-C	CH1	±75 A	26.7	-40 ~ 125
	CH2	±500 A	4	-40 ~ 125
SHK-VBS/D-D	CH1	±30 A	66.7	-40 ~ 125
	CH2	±350 A	5.7	-40 ~ 125
SHK-VBS/D-E	CH1	±40 A	50	-40 ~ 125
	CH2	±400 A	5	-40 ~ 125

2. Electrical data SHK-VBS/D-A

Condition: Vcc = 5.0 V, T_A = 25℃, unless specified.

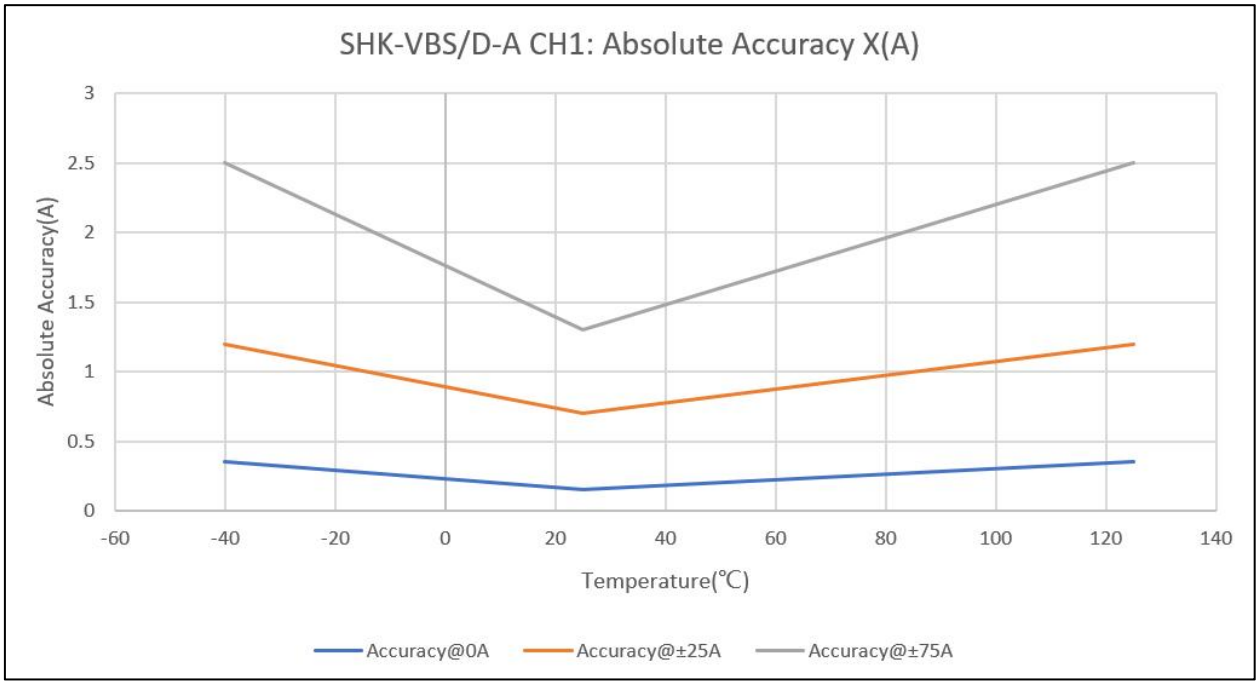
Parameters	Symbol	Unit	Min.	Typ.	Max.	Remark
Primary current	I_pn	A	-75		75	CH1
			-1000		1000	CH2
Supply voltage	Vcc	V	4.75	5	5.25	
Consumption current	Icc	mA	21	28	35	
Full-scale output	V_FS	V		±2		(Vout @ ±I_pn) – Voff
Output resistance	R_out	kΩ		5		@Vout
Offset voltage	Voff	V	2.475	2.5	2.525	Vcc=5V
Theoretical gain	G_th	mV/A		26.67		CH1
				2		CH2
Non-linearity	Non-L	%I_pn	-1	0.5	1	±I_pn
Step response time	t_res	μs		18	20	@90% of I_{PN}
-3dB band width	BW	kHz		10		Back-end non-RC circuit
Noise DC ~ 10 kHz DC ~ 100 kHz	Vnoise	mVpp		 15 20		

Note:

1. Accuracy @ RT,X = ((Vout @ In @ 25℃) – (G_fit * In+Voff @ 25℃)) / V_FS,Here In is the current test current. G_fit is the normal temperature fitting gain.
2. Accuracy,X_TRange = ((Vout @ In @ T_x) – (G_fit@25℃ * In+Voff @ 25℃)) / V_FS,The fitting gain of the product at G_fit@25 ℃ is 25 ℃.

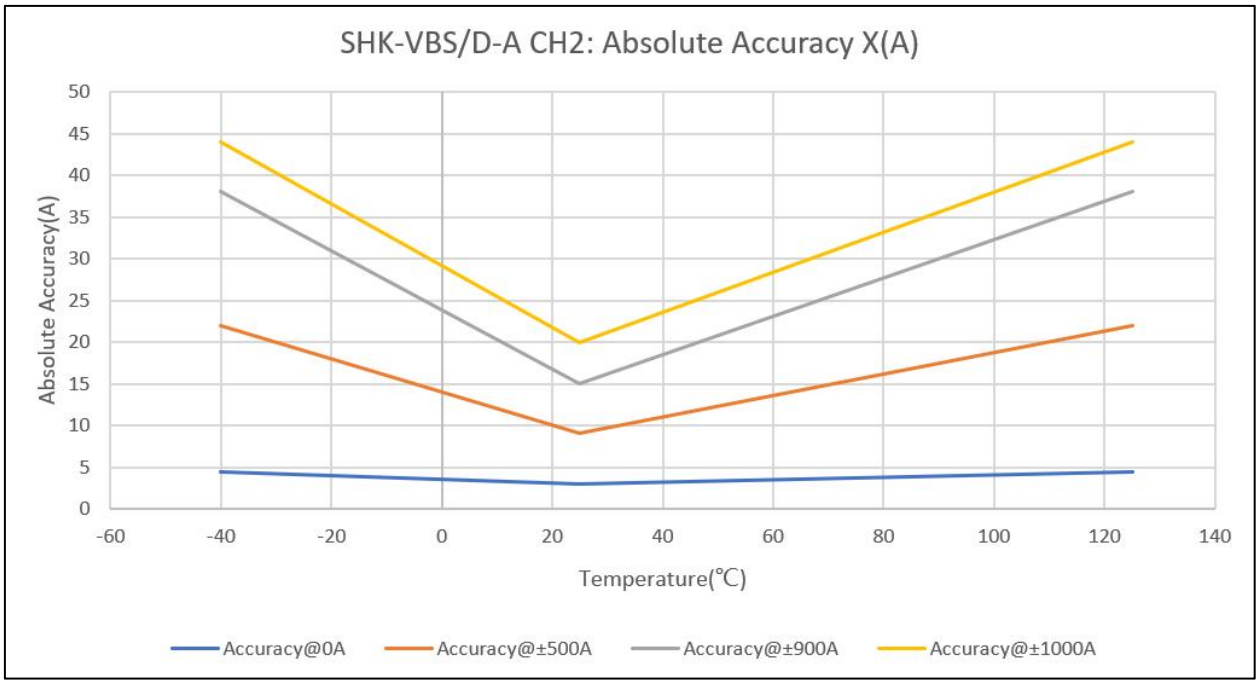
Accuracy table：SHK-VBS/D-A CH1

Parameter	Symbol	Unit	Temperature					
			-40℃	-20℃	0℃	25℃	65℃	125℃
Accuracy@0A	X	A	0.35	0.29	0.23	0.15	0.23	0.35
Accuracy@±25A			1.20	1.05	0.89	0.7	0.90	1.20
Accuracy@±75A			2.50	2.13	1.76	1.3	1.78	2.50



Accuracy table：SHK-VBS/D-A CH2

Parameter	Symbol	Unit	Temperature					
			-40℃	-20℃	0℃	25℃	65℃	125℃
Accuracy@0A	X	A	4.5	4	3.6	3	3.6	4.5
Accuracy@±500A			22.0	18.0	14.0	9.0	14.2	22.0
Accuracy@±900A			38.0	30.9	23.9	15.0	24.2	38.0
Accuracy@±1000A			44.0	36.6	29.2	20.0	29.6	44.0



3. Electrical data SHK-VBS/D-B

Condition: Vcc = 5.0 V, T_A = 25℃, unless specified.

Parameters	Symbol	Unit	Min.	Typ.	Max.	Remark
Primary current	I_pn	A	-75		75	CH1
			-750		750	CH2
Supply voltage	Vcc	V	4.75	5	5.25	
Consumption current	Icc	mA	21	28	35	
Full-scale output	V_FS	V		±2		(Vout @ ±I_pn) – Voff
Output resistance	R_out	kΩ		5		@Vout
Offset voltage	Voff	V	2.475	2.5	2.525	Vcc=5V
Theoretical gain	G_th	mV/A		26.7		CH1
				2.7		CH2
Non-linearity	Non-L	%I_pn	-1	0.5	1	±I_pn
Step response time	t_res	μs		18	20	@90% of I_{PN}
-3dB band width	BW	kHz		10		Back-end non-RC circuit
Noise DC ~ 10 kHz DC ~ 100 kHz	Vnoise	mVpp		 15 20		

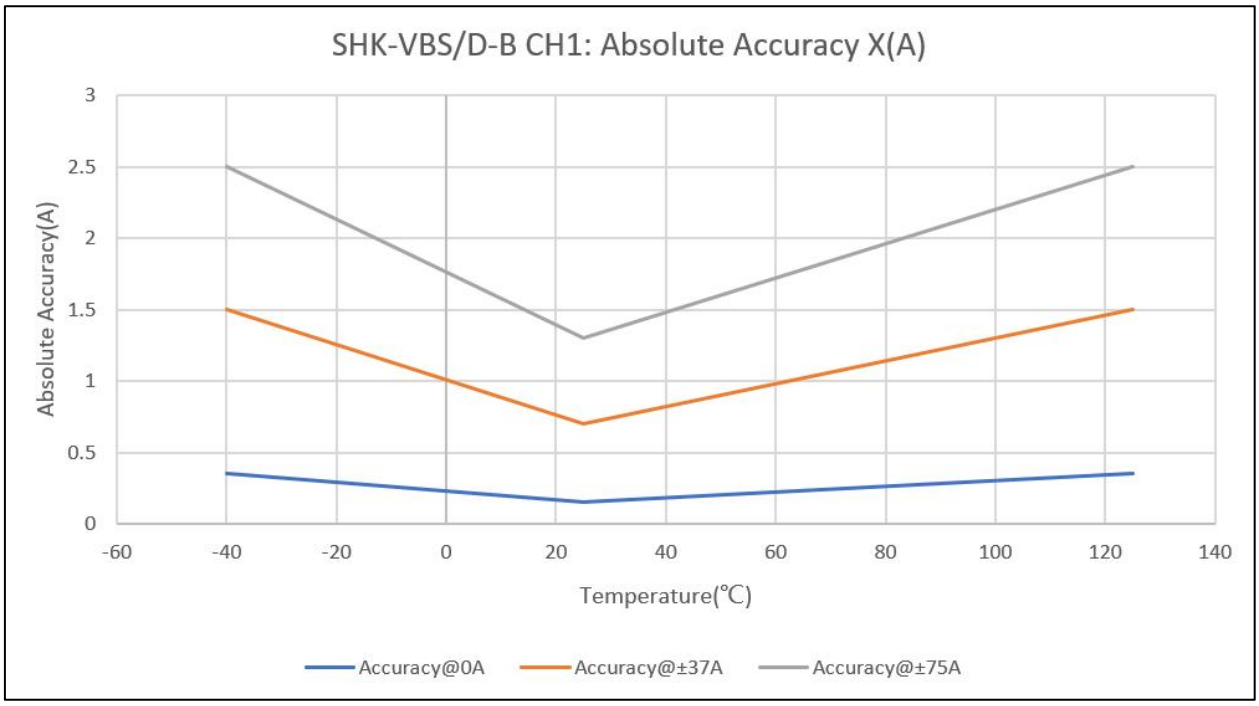
Note:

3. Accuracy @ RT,X = ((Vout @ In @ 25℃) – (G_fit * In+Voff @ 25℃)) / V_FS,Here In is the current test current. G_fit is the normal temperature fitting gain.

4. Accuracy,X_TRange = ((Vout @ In @ T_x) – (G_fit@25℃ * In+Voff @ 25℃)) / V_FS,The fitting gain of the product at G_fit@25 ℃ is 25 ℃.

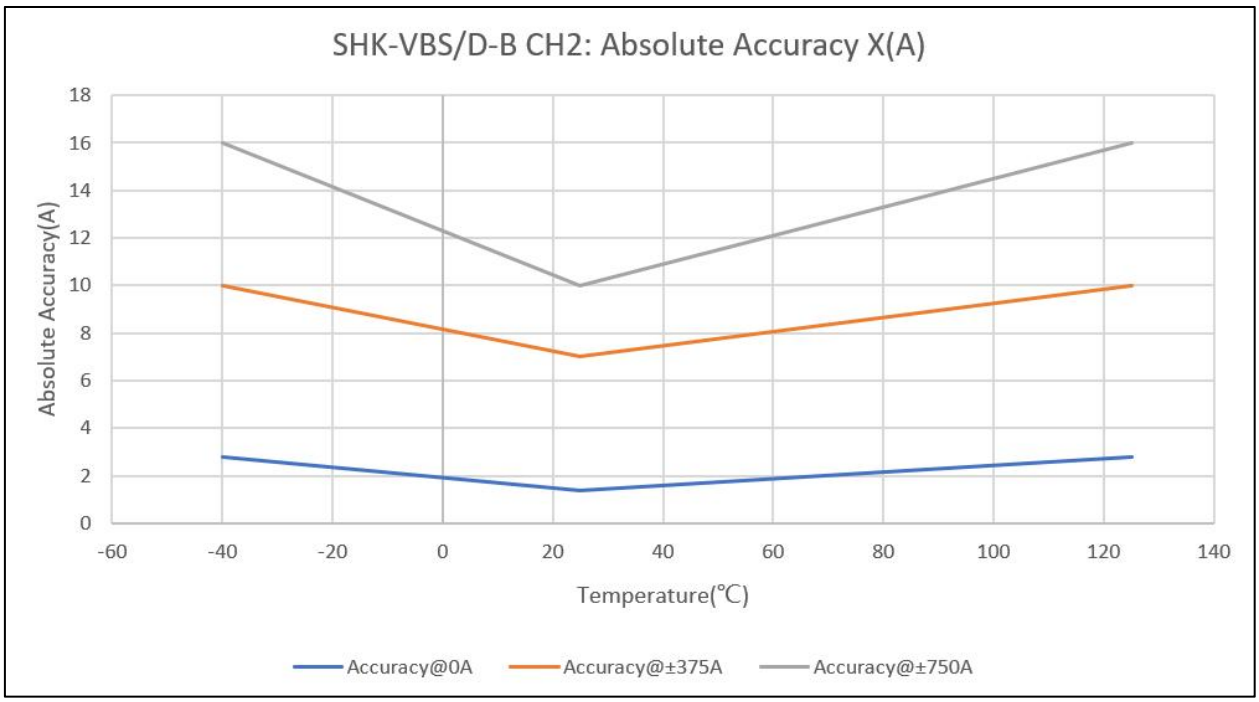
Accuracy table：SHK-VBS/D-B CH1

Parameter	Symbol	Unit	Temperature					
			-40℃	-20℃	0℃	25℃	65℃	125℃
Accuracy@0A	X	A	0.35	0.29	0.23	0.15	0.23	0.35
Accuracy@±37A			1.50	1.25	1.01	0.7	1.02	1.50
Accuracy@±75A			2.50	2.13	1.76	1.3	1.78	2.50



Accuracy table：SHK-VBS/D-B CH2

Parameter	Symbol	Unit	Temperature					
			-40℃	-20℃	0℃	25℃	65℃	125℃
Accuracy@0A	X	A	2.80	2.37	1.94	1.40	1.96	2.8
Accuracy@±375A			10.0	9.08	8.15	7.001	8.20	10.0
Accuracy@±750A			16.0	14.2	12.3	10.0	12.4	16.0



4. Electrical data SHK-VBS/D-C

Condition: Vcc = 5.0 V, T_A = 25℃, unless specified.

Parameters	Symbol	Unit	Min.	Typ.	Max.	Remark
Primary current	I_pn	A	-75		75	CH1
			-500		500	CH2
Supply voltage	Vcc	V	4.75	5	5.25	
Consumption current	Icc	mA	21	28	35	
Full-scale output	V_FS	V		±2		(Vout @ ±I_pn) – Voff
Output resistance	R_out	kΩ		5		@Vout
Offset voltage	Voff	V	2.475	2.5	2.525	Vcc=5V
Theoretical gain	G_th	mV/A		26.7		CH1
				4		CH2
Non-linearity	Non-L	%I_pn	-1	0.5	1	±I_pn
Step response time	t_res	μs		18	20	@90% of I_{PN}
-3dB band width	BW	kHz		10		Back-end non-RC circuit
Noise DC ~ 10 kHz DC ~ 100 kHz	Vnoise	mVpp		 15 20		

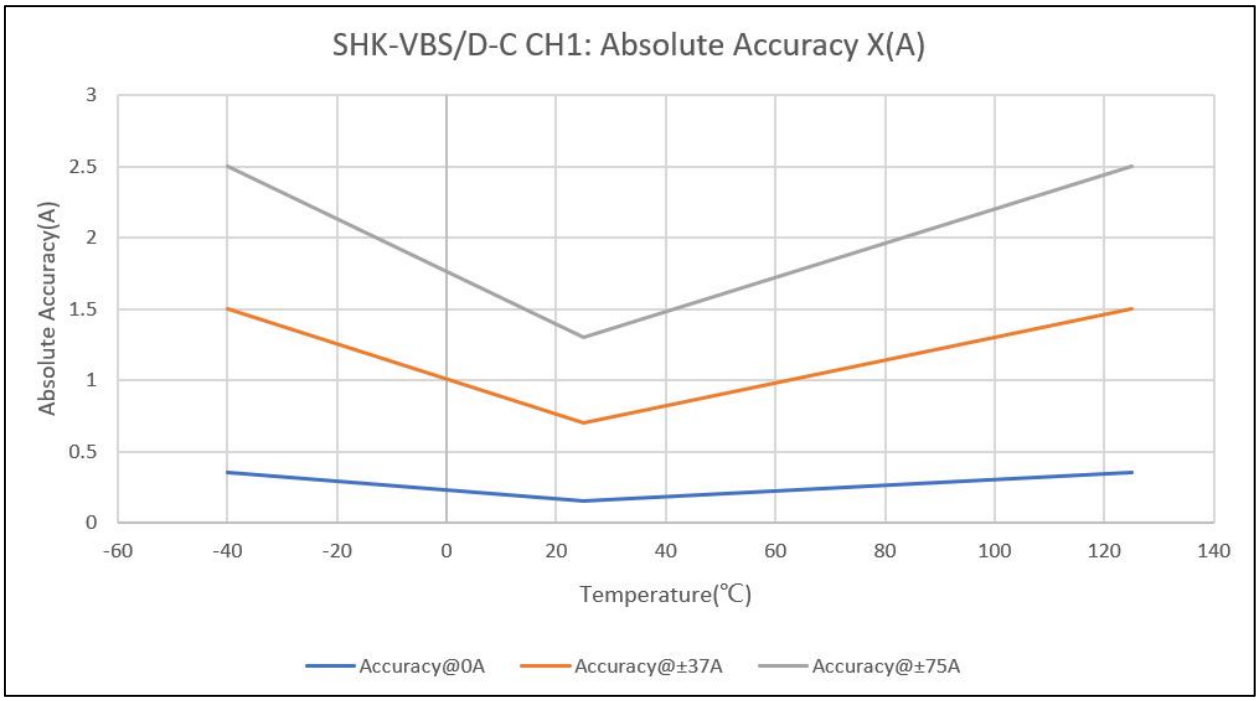
Note:

5. Accuracy @ RT,X = ((Vout @ In @ 25℃) – (G_fit * In+Voff @ 25℃)) / V_FS,Here In is the current test current. G_fit is the normal temperature fitting gain.

6. Accuracy,X_TRange = ((Vout @ In @ T_x) – (G_fit@25℃ * In+Voff @ 25℃)) / V_FS,The fitting gain of the product at G_fit@25 ℃ is 25 ℃.

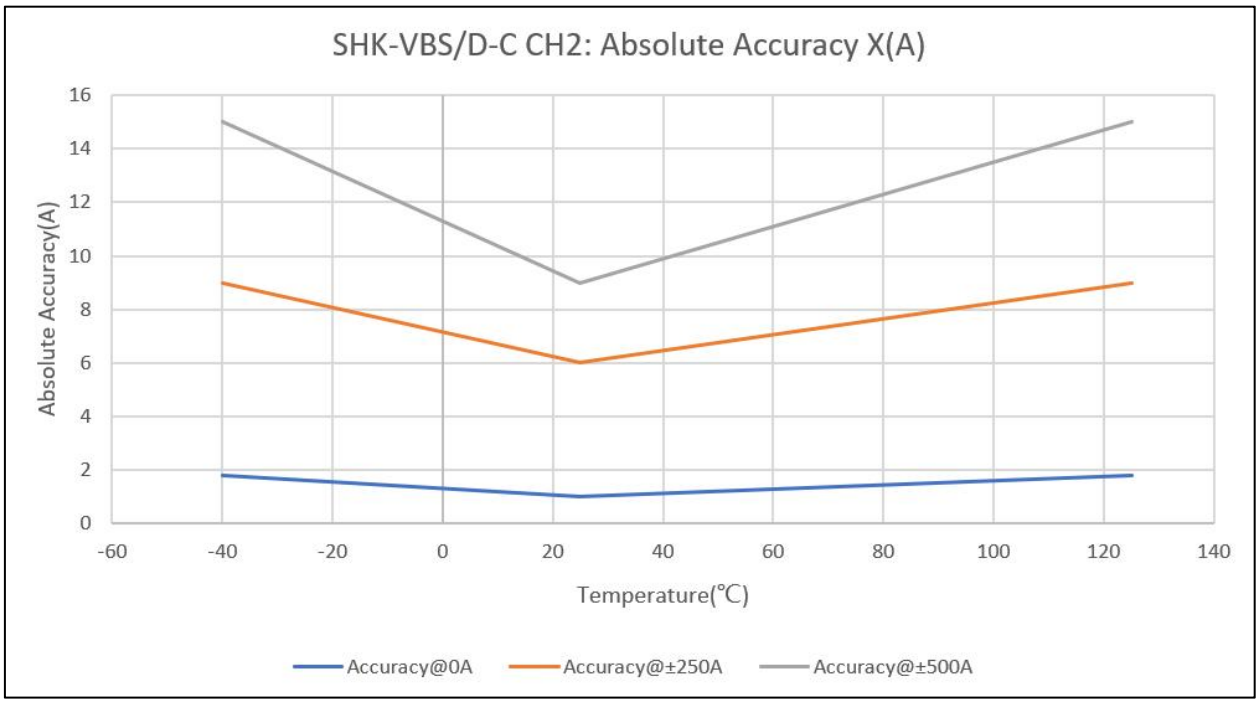
Accuracy table：SHK-VBS/D-C CH1

Parameter	Symbol	Unit	Temperature					
			-40℃	-20℃	0℃	25℃	65℃	125℃
Accuracy@0A	X	A	0.35	0.29	0.23	0.15	0.23	0.35
Accuracy@±37A			1.50	1.25	1.01	0.7	1.02	1.50
Accuracy@±75A			2.50	2.13	1.76	1.3	1.78	2.50



Accuracy table：SHK-VBS/D-C CH2

Parameter	Symbol	Unit	Temperature					
			-40℃	-20℃	0℃	25℃	65℃	125℃
Accuracy@0A	X	A	1.80	1.55	1.31	1.00	1.32	1.80
Accuracy@±250A			9.00	8.08	7.15	6.00	7.20	9.00
Accuracy@±500A			15.0	13.15	11.31	9.00	11.4	15.0



5. Electrical data SHK-VBS/D-D

Condition: Vcc = 5.0 V, T_A = 25℃, unless specified.

Parameters	Symbol	Unit	Min.	Typ.	Max.	Remark
Primary current	I_pn	A	-30		30	CH1
			-350		350	CH2
Supply voltage	Vcc	V	4.75	5	5.25	
Consumption current	Icc	mA	21	28	35	
Full-scale output	V_FS	V		±2		(Vout @ ±I_pn) – Voff
Output resistance	R_out	kΩ		5		@Vout
Offset voltage	Voff	V	2.475	2.5	2.525	Vcc=5V
Theoretical gain	G_th	mV/A		66.7		CH1
				5.7		CH2
Non-linearity	Non-L	%I_pn	-1	0.5	1	±I_pn
Step response time	t_res	μs		18	20	@90% of I_{PN}
-3dB band width	BW	kHz		10		Back-end non-RC circuit
Noise DC ~ 10 kHz DC ~ 100 kHz	Vnoise	mVpp		 15 20		

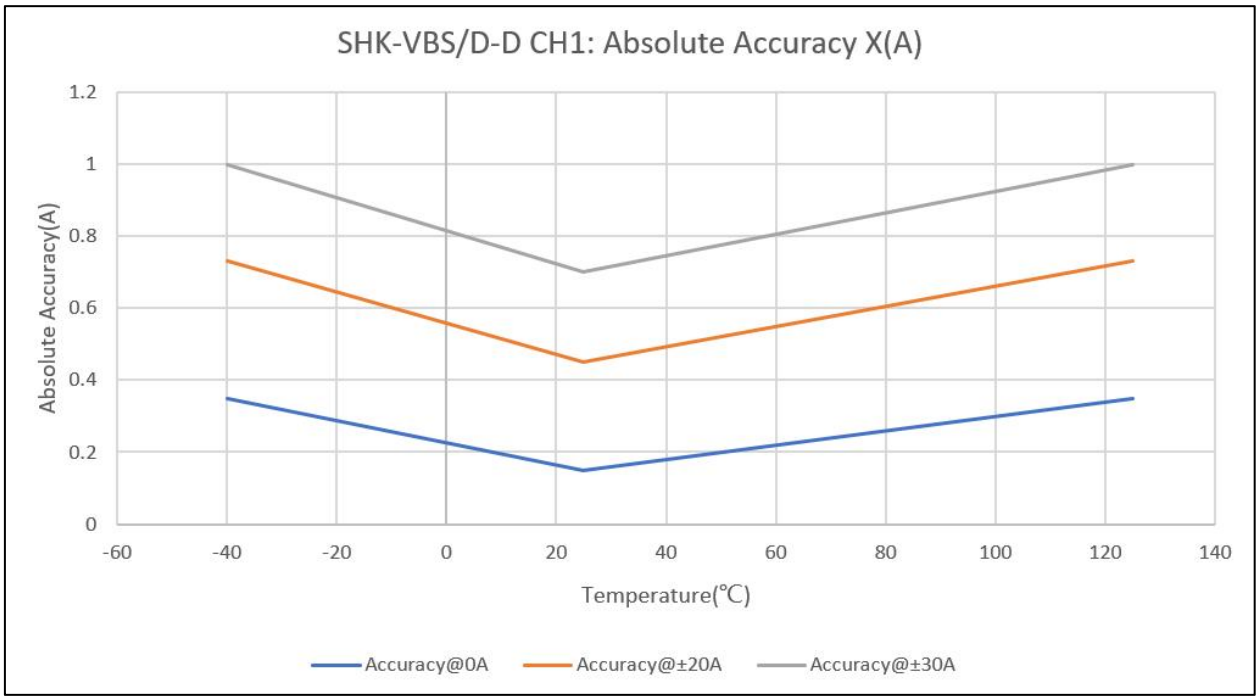
Note:

7. Accuracy @ RT,X = ((Vout @ In @ 25℃) – (G_fit * In+Voff @ 25℃)) / V_FS,Here In is the current test current. G_fit is the normal temperature fitting gain.

8. Accuracy,X_TRange = ((Vout @ In @ T_x) – (G_fit@25℃ * In+Voff @ 25℃)) / V_FS,The fitting gain of the product at G_fit@25 ℃ is 25 ℃.

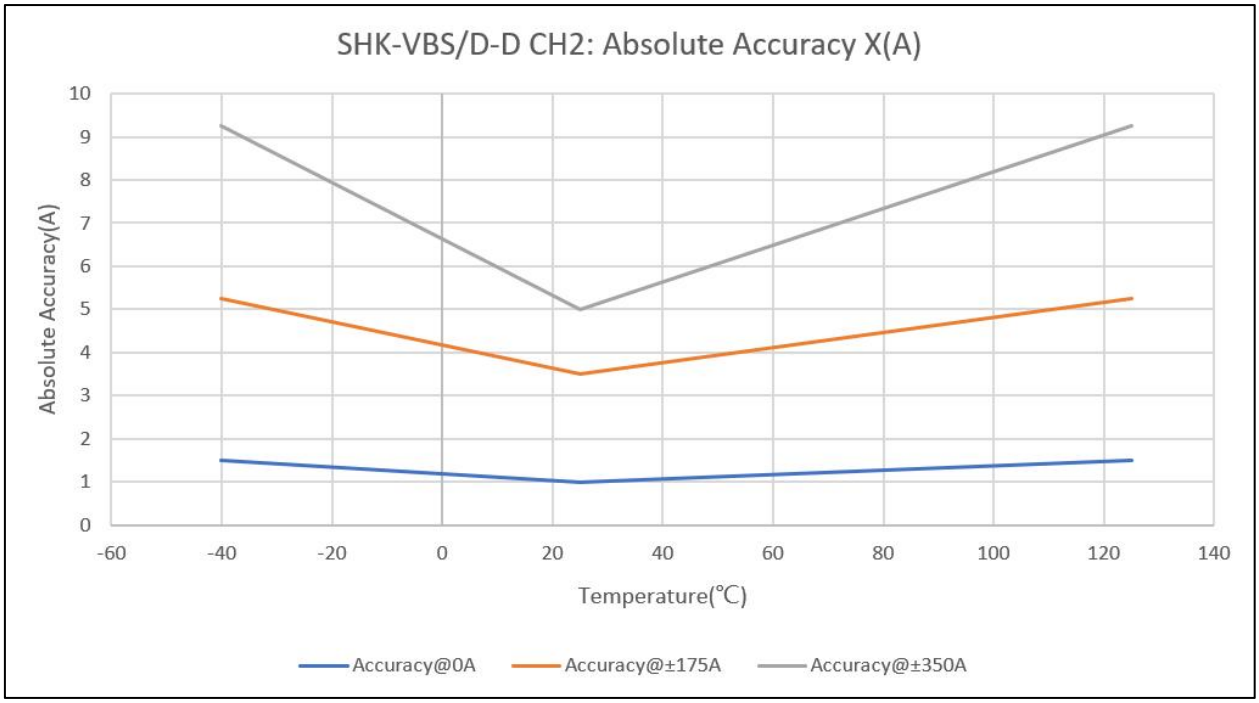
Accuracy table：SHK-VBS/D-D CH1

Parameter	Symbol	Unit	Temperature					
			-40℃	-20℃	0℃	25℃	65℃	125℃
Accuracy@0A	X	A	0.35	0.29	0.23	0.15	0.23	0.35
Accuracy@±20A			0.73	0.64	0.56	0.45	0.56	0.73
Accuracy@±30A			1.00	0.91	0.82	0.70	0.82	1.00



Accuracy table：SHK-VBS/D-D CH2

Parameter	Symbol	Unit	Temperature					
			-40℃	-20℃	0℃	25℃	65℃	125℃
Accuracy@0A	X	A	1.50	1.35	1.19	1.00	1.20	1.50
Accuracy@±175A			5.25	4.71	4.14	3.50	4.20	5.25
Accuracy@±350A			9.25	7.94	6.63	5.00	6.70	9.25



6. Electrical data SHK-VBS/D-E

Condition: Vcc = 5.0 V, T_A = 25℃, unless specified.

Parameters	Symbol	Unit	Min.	Typ.	Max.	Remark
Primary current	I_pn	A	-40		40	CH1
			-400		400	CH2
Supply voltage	Vcc	V	4.75	5	5.25	
Consumption current	Icc	mA	21	28	35	
Full-scale output	V_FS	V		±2		(Vout @ ±I_pn) – Voff
Output resistance	R_out	kΩ		5		@Vout
Offset voltage	Voff	V	2.475	2.5	2.525	Vcc=5V
Theoretical gain	G_th	mV/A		50		CH1
				5		CH2
Non-linearity	Non-L	%I_pn	-1	0.5	1	±I_pn
Step response time	t_res	μs		18	20	@90% of I_{PN}
-3dB band width	BW	kHz		10		Back-end non-RC circuit
Noise DC ~ 10 kHz DC ~ 100 kHz	Vnoise	mVpp		 15 20		

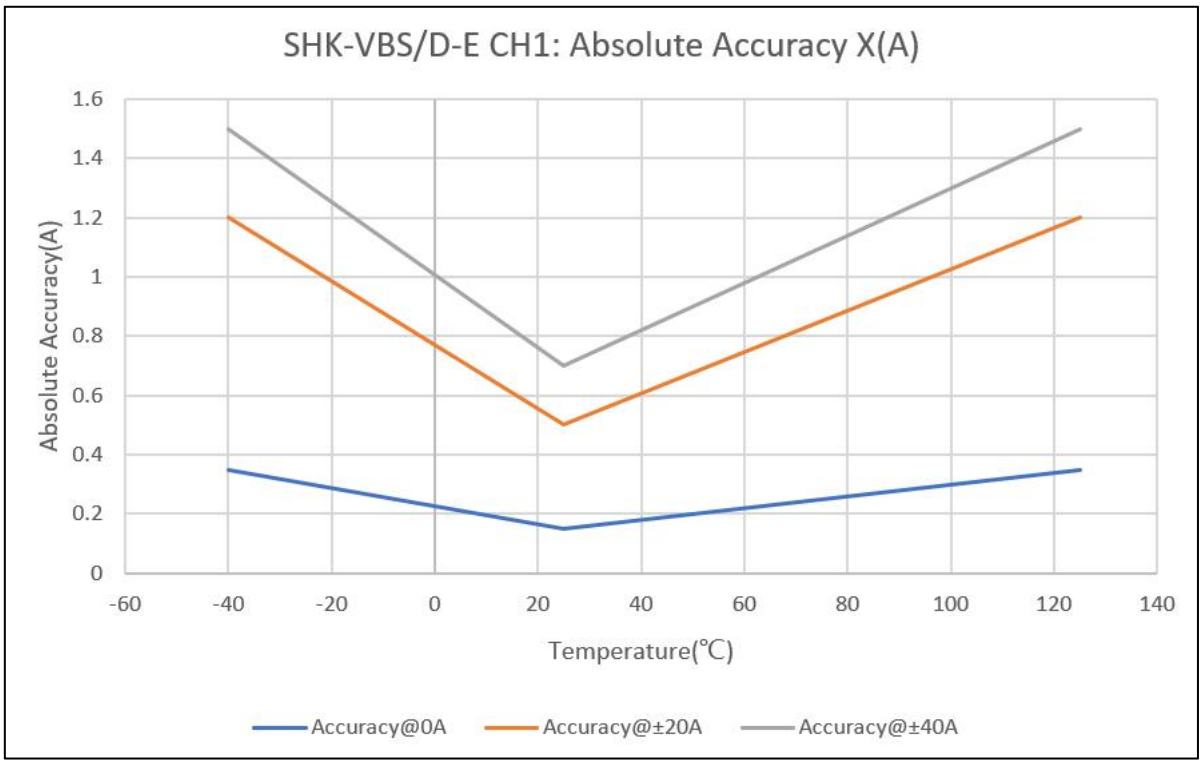
Note:

9. Accuracy @ RT,X = ((Vout @ In @ 25℃) – (G_fit * In+Voff @ 25℃)) / V_FS,Here In is the current test current. G_fit is the normal temperature fitting gain.

10. Accuracy,X_TRange = ((Vout @ In @ T_x) – (G_fit@25℃ * In+Voff @ 25℃)) / V_FS,The fitting gain of the product at G_fit@25 ℃ is 25 ℃.

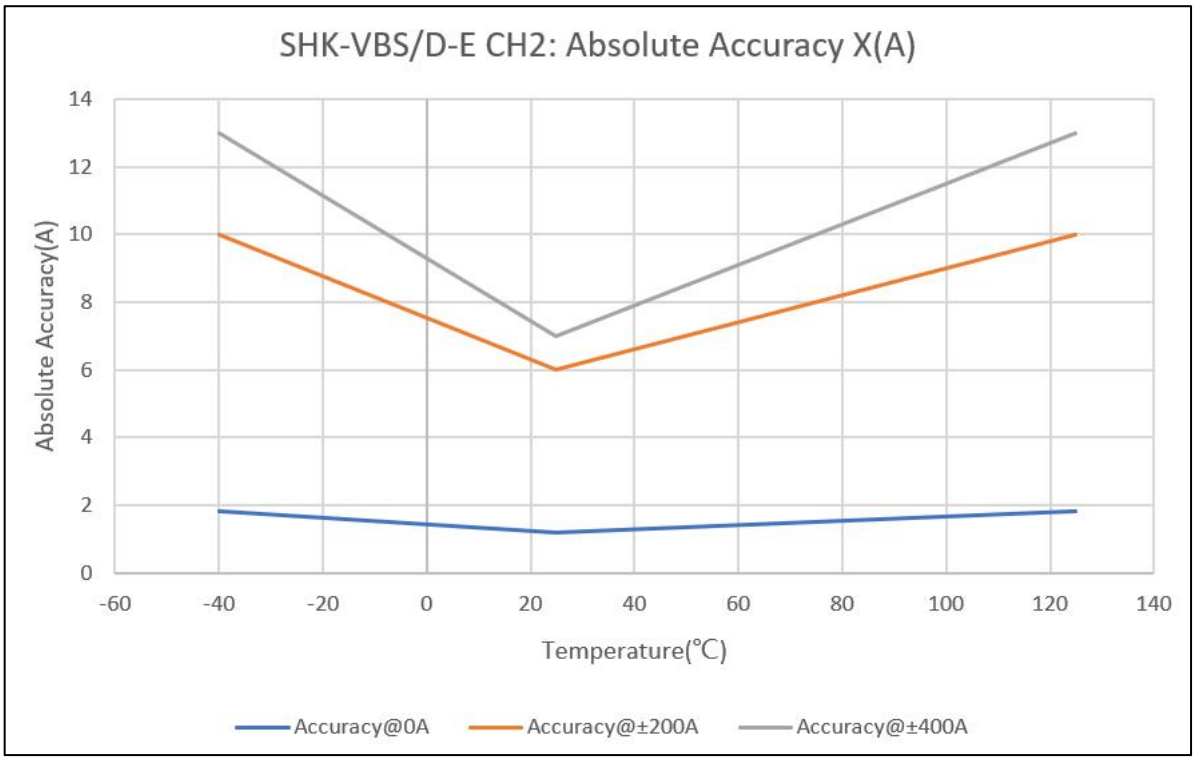
Accuracy table：SHK-VBS/D-E CH1

Parameter	Symbol	Unit	Temperature					
			-40℃	-20℃	0℃	25℃	65℃	125℃
Accuracy@0A	X	A	0.35	0.29	0.23	0.15	0.23	0.35
Accuracy@±20A			1.20	0.98	0.77	0.50	0.80	1.20
Accuracy@±40A			1.50	1.25	1.01	0.70	1.02	1.50



Accuracy table：SHK-VBS/D-E CH2

Parameter	Symbol	Unit	Temperature					
			-40℃	-20℃	0℃	25℃	65℃	125℃
Accuracy@0A	X	A	1.80	1.6	1.4	1.2	1.4	1.8
Accuracy@±200A			10.0	8.8	7.5	6.0	7.6	10.0
Accuracy@±400A			13.0	11.2	9.3	7.0	9.4	13.0



7. Frequencuy band width

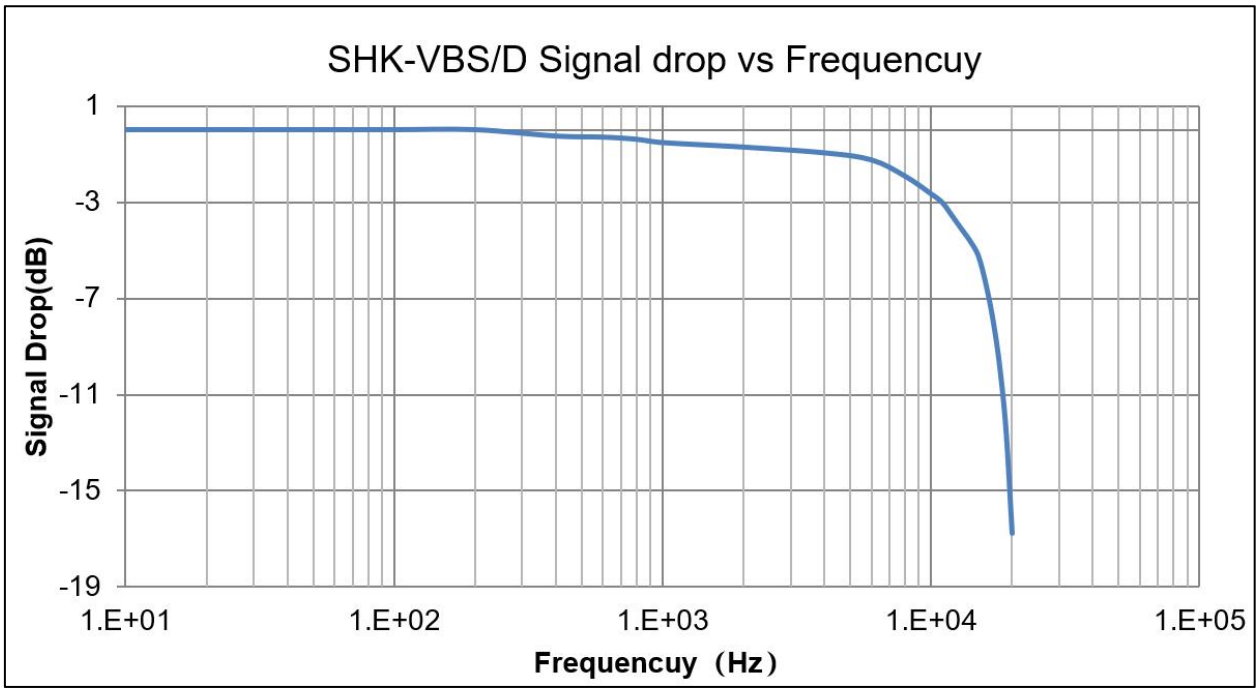
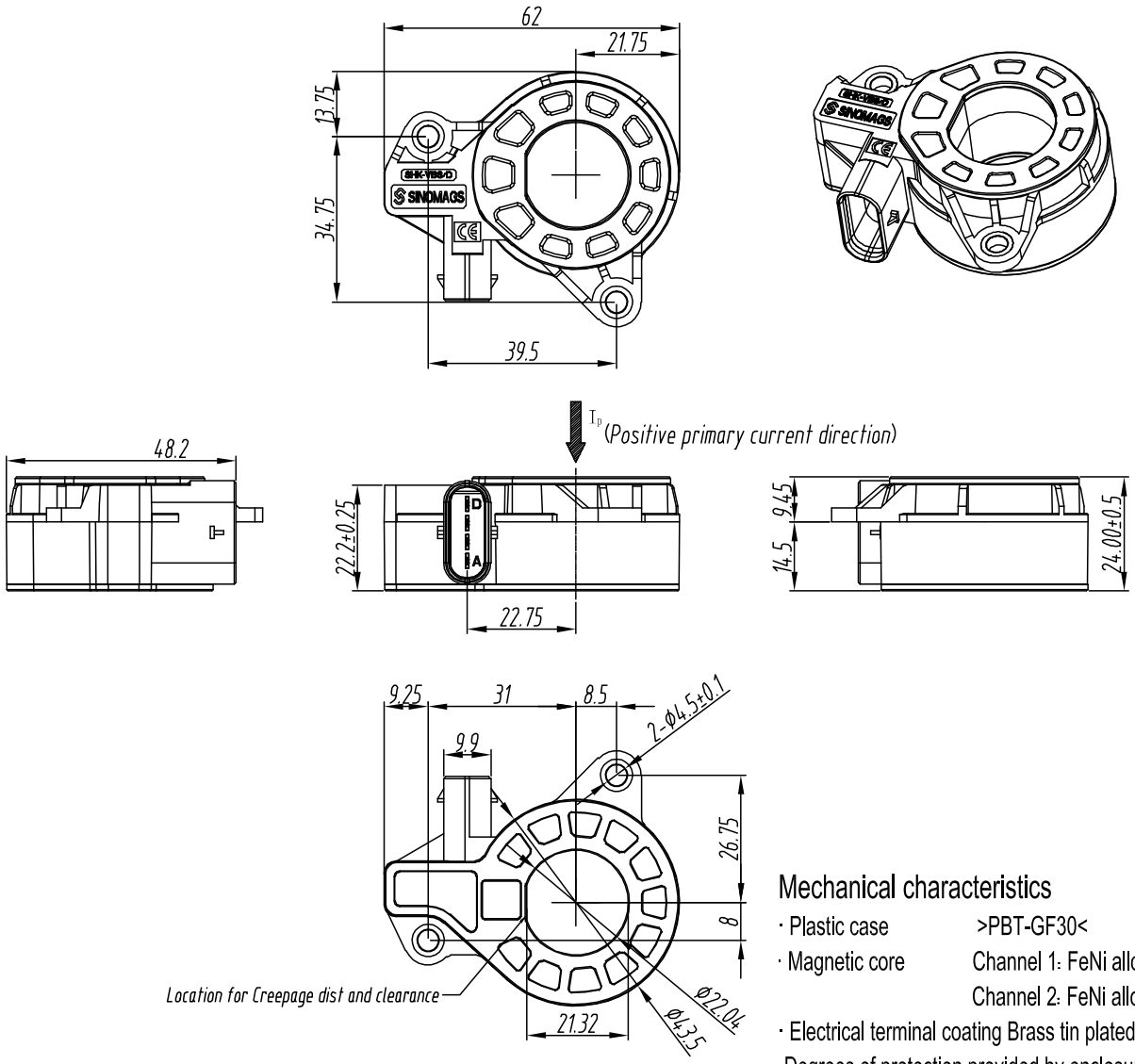


Fig.1 the band width of SHK-VBS/D series current sensors.The bandwidth of the sensor is in the range of DC ~10 kHz (-3 dB).

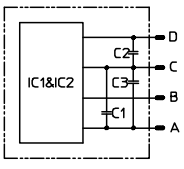
8. SHK-VBS/D Dimensions & Pins & Footprint



Mechanical characteristics

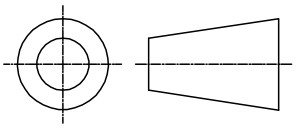
- Plastic case >PBT-GF30<
- Magnetic core Channel 1: FeNi alloy
  Channel 2: FeNi allo
- Electrical terminal coating Brass tin plated
- Degrees of protection provided by enclosure IP6K9K

ELECTRICAL DIAGRAM



Pin out	
D	V_{out} low current range
C	GND
B	V_{out} high current range
A	U_c 5V

Material : Fit UL94V-0 & RoHS requirements ;
General tolerance : ±0.5
Unit :mm

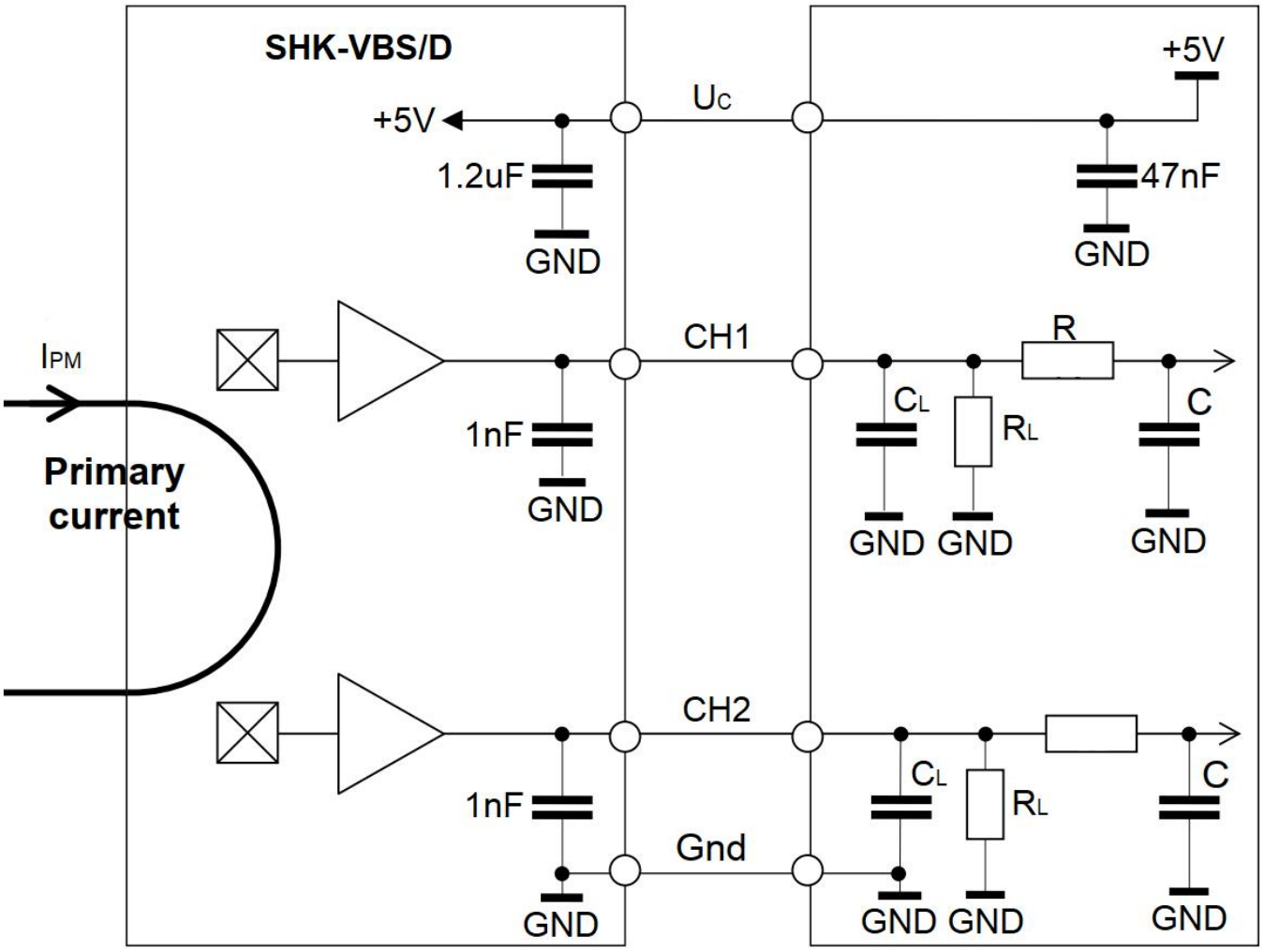


Mounting recommendation:

Mating connector P/N TYCO 1-1456426-5
Max assembly torque 2.5 N m(for M4 × 0.7mm)
Clamping force must be applied on the compression limiter

CE

9. Typical application



Notes:

1. R_L ＞ 10kΩ optional resistor for signal line diagnostic;
2. C_L ＜ 10nF EMC protection;
3. R_C Low pass filter EMC protection(optional);