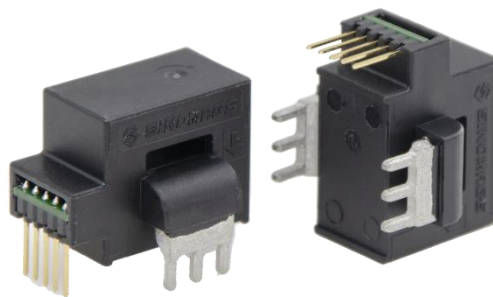


Current Sensor

Product Series: STK-HO-Z

Part number: STK-150HO-Z
STK-180HO-Z
STK-200HO-Z
STK-250HO-Z
STK-300HO-Z

Version: Ver1.9



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1. Summary

The STK-H0-Z series is based on open-loop technology and design. It is suitable for DC, AC, pulse and any type of irregular current measurement under isolated conditions. The nominal current range of STK-H0-Z current sensors includes 150 A, 180 A, 200 A, 250 A, 300A.

Typical applications

- PV combiner box
- PV inverter (MPPT & AC)
- motor driver controller
- SMPS & UPS
- Battery management system

Standards

- EN50178:1997
- IEC 61010-1:2010
- IEC 61326-1:2012

General parameter

Parameter	Symbol	Unit	Value
Working temperature	T _A	°C	-40 ~ 105
Storage temperature	T _{stg}	°C	-40 ~ 105
Mass	m	g	23.6

Absolute maximum rating

Parameter	Symbol	Unit	Value
Supply voltage (non-destructive)	V _C	V	6.0
ESD rating (HBM)	U _{ESD}	kV	4
ESD rating (CDM)	U _{CDM}	kV	1.5

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.

Ratings

Parameter	Symbol	Unit	Value
Primary involved potential		V AC/DC	600
Ambient operating temperature	T_A	°C	105
Primary current	I_p	A	According to series primary current
Secondary supply voltage	U_c	V DC	5
Output voltage	V_out	V	0.1 ~ 4.9

Isolation parameter

Parameter	Symbol	Unit	Value	Comment
RMS voltage for AC test 50Hz/1 min	U _d	kV	5	
Impulse withstand voltage 1.2/50μs	Ū _w	kV	8	
Clearance distance (pri. -sec)	d _{Cl}	mm	11	Shortest distance through air
Creepage distance (pri. -sec)	d _{Cp}	mm	11	Shortest path along device body
Comparative tracking index	CTI	V	600	
Case material			V0 according to UL 94	
Application example		V	600	Reinforced insulation, CAT III, PD 2, non uniform field according EN 50178, IEC 61010
Application example		V	1000	Basic insulation, CAT III, PD 2, non uniform field according EN 50178, IEC 61010
Application example		V	1500	Basic insulation, CAT III, PD 2, according to IEC 62109-1 Altitude ≤ 3000 m
Application example		V	600	CAT III, PD 2, according to UL 508

2. STK-150HO-Z Electrical performance

Condition: $T_A = 25^\circ\text{C}$ $V_{CC} = 5\text{ V}$ (Except special instructions)

Parameter	Symbol	Unit	Min	Typ	Max	Comment
Primary nominal current rms	I_{pn}	A		150		
Primary current measuring range	I_{pm}	A	-375		375	
Supply voltage	V_{CC}	V	4.75	5	5.25	
Current consumption	I_{CC}	mA		8	10	
Reference voltage	V_{ref}	V	2.48	2.5	2.52	Output function
Rated output voltage	V_{FS}	V		0.8		$(V_{out} - V_{ref}) @ I_{pn}$
Internal output resistance	R_{out}	Ω		1		Output
Quiescent voltage	V_{off}	V	2.48	2.5	2.52	$V_{out} @ 0\text{ A}$
Electrical offset voltage	V_{oe}	mV	-5		5	$T_A @ 25^\circ\text{C}$
Magnetic offset current	I_{om}	A	-0.75		0.75	@ $\pm 10 \times I_{pn}$
Theoretical gain	G_{th}	mV/A		5.333		$800\text{mV} @ I_{pn}$
Error of gain	Err_G	% G_{th}		± 1		Trimmed in the factory @ 25°C
Temperature drift of gain	G_{TR}	% G_{th}	-1.0		1.0	$-40^\circ\text{C} \sim 105^\circ\text{C}$
Temperature drift of V_{oe}	V_{oe_TRange}	% V_{FS}	-1.5		1.5	$-40^\circ\text{C} \sim 105^\circ\text{C}$
Rated linearity error	$Non-L_{pn}$	% I_{pn}	-0.5		0.5	$\pm I_{pn}$
Linearity error @ I_{pm}	$Non-L_{pm}$	% I_{pm}	-3		3	$\pm I_{pm}$
Reaction time	t_{ra}	μs			1	@ 10% of I_{pn}
Step response time	t_{res}	μs		0.3	1	@ 90% of I_{pn}
Delay time	t_{delay}	μs			1	300 kHz sine wave
Frequency bandwidth (-3dB)	BW	kHz		300		No RC circuit
Output voltage noise DC ~ 10 kHz DC ~ 100 kHz	V_{noise}	mVpp		10 15		
Accuracy @ 25°C	X	% of I_{pn}	-1		1	@ 25°C
Accuracy @ $-40^\circ\text{C} \sim 105^\circ\text{C}$ ①	X_{TRange}	% of I_{pn}	-2		2	$-40^\circ\text{C} \sim 105^\circ\text{C}$

Remarks:

①. the accuracy @ $-40^\circ\text{C} \sim 105^\circ\text{C}$, $X_{TRange} = (((V_{out} - V_{ref}) @ I_n @ T_x) - V_{oe} @ 25^\circ\text{C} - G_{th} * I_n) / V_{FS}$, where T_x represents present temperature, G_{th} is fitted gain at room temperature.

3. STK-180HO-Z Electrical performance

Condition: $T_A = 25^{\circ}\text{C}$ $V_{CC} = 5\text{ V}$ (Except special instructions)

Parameter	Symbol	Unit	Min	Typ	Max	Comment
Primary nominal current rms	I_{pn}	A		180		
Primary current measuring range	I_{pm}	A	-450		450	
Supply voltage	V_{CC}	V	4.75	5	5.25	
Current consumption	I_{CC}	mA		8	10	
Reference voltage	V_{ref}	V	2.48	2.5	2.52	Output function
Rated output voltage	V_{FS}	V		0.8		$(V_{out} - V_{ref}) @ I_{pn}$
Internal output resistance	R_{out}	Ω		1		Output
Quiescent voltage	V_{off}	V	2.48	2.5	2.52	$V_{out} @ 0\text{ A}$
Electrical offset voltage	V_{oe}	mV	-5		5	$T_A @ 25^{\circ}\text{C}$
Magnetic offset current	I_{om}	A	-0.9		0.9	@ $\pm 10 \times I_{pn}$
Theoretical gain	G_{th}	mV/A		4.444		800mV @ I_{pn}
Error of gain	Err_G	% G_{th}		± 1		Trimmed in the factory @ 25°C
Temperature drift of gain	G_{TR}	% G_{th}	-1.0		1.0	$-40^{\circ}\text{C} \sim 105^{\circ}\text{C}$
Temperature drift of V_{oe}	V_{oe_TRange}	% V_{FS}	-1.5		1.5	$-40^{\circ}\text{C} \sim 105^{\circ}\text{C}$
Rated linearity error	$Non-L_{pn}$	% I_{pn}	-0.5		0.5	$\pm I_{pn}$
Linearity error @ I_{pm}	$Non-L_{pm}$	% I_{pm}	-3		3	$\pm I_{pm}$
Reaction time	t_{ra}	μs			1	@ 10% of I_{pn}
Step response time	t_{res}	μs		0.3	1	@ 90% of I_{pn}
Delay time	t_{delay}	μs			1	300 kHz sine wave
Frequency bandwidth (-3dB)	BW	kHz		300		No RC circuit
Output voltage noise DC ~ 10 kHz DC ~ 100 kHz	V_{noise}	mVpp		10 15		
Accuracy @ 25°C	X	% of I_{pn}	-1		1	@ 25°C
Accuracy @ $-40^{\circ}\text{C} \sim 105^{\circ}\text{C}$ ①	X_{TRange}	% of I_{pn}	-2		2	$-40^{\circ}\text{C} \sim 105^{\circ}\text{C}$

Remarks:

①. the accuracy @ $-40^{\circ}\text{C} \sim 105^{\circ}\text{C}$, $X_{TRange} = (((V_{out} - V_{ref}) @ I_n @ T_x) - V_{oe} @ 25^{\circ}\text{C} - G_{th} * I_n) / V_{FS}$, where T_x represents present temperature, G_{th} is fitted gain at room temperature .

4. STK-200HO-Z Electrical performance

Condition: $T_A = 25^\circ\text{C}$ $V_{CC} = 5\text{ V}$ (Except special instructions)

Parameter	Symbol	Unit	Min	Typ	Max	Comment
Primary nominal current rms	I_{pn}	A		200		
Primary current measuring range	I_{pm}	A	-500		500	
Supply voltage	V_{CC}	V	4.75	5	5.25	
Current consumption	I_{CC}	mA		8	10	
Reference voltage	V_{ref}	V	2.48	2.5	2.52	Output function
Rated output voltage	V_{FS}	V		0.8		$(V_{out} - V_{ref}) @ I_{pn}$
Internal output resistance	R_{out}	Ω		1		Output
Quiescent voltage	V_{off}	V	2.48	2.5	2.52	$V_{out} @ 0\text{ A}$
Electrical offset voltage	V_{oe}	mV	-5		5	$T_A @ 25^\circ\text{C}$
Magnetic offset current	I_{om}	A	-1		1	@ $\pm 10 \times I_{pn}$
Theoretical gain	G_{th}	mV/A		4		$800\text{mV} @ I_{pn}$
Error of gain	Err_G	% G_{th}		± 1		Trimmed in the factory @ 25°C
Temperature drift of gain	G_{TR}	% G_{th}	-1.0		1.0	$-40^\circ\text{C} \sim 105^\circ\text{C}$
Temperature drift of V_{oe}	V_{oe_TRange}	% V_{FS}	-1.5		1.5	$-40^\circ\text{C} \sim 105^\circ\text{C}$
Rated linearity error	$Non-L_{pn}$	% I_{pn}	-0.5		0.5	$\pm I_{pn}$
Linearity error @ I_{pm}	$Non-L_{pm}$	% I_{pm}	-3		3	$\pm I_{pm}$
Reaction time	t_{ra}	μs			1	@ 10% of I_{pn}
Step response time	t_{res}	μs		0.3	1	@ 90% of I_{pn}
Delay time	t_{delay}	μs			1	300 kHz sine wave
Frequency bandwidth (-3dB)	BW	kHz		300		No RC circuit
Output voltage noise DC ~ 10 kHz DC ~ 100 kHz	V_{noise}	mVpp		10 15		
Accuracy @ 25°C	X	% of I_{pn}	-1		1	@ 25°C
Accuracy @ $-40^\circ\text{C} \sim 105^\circ\text{C}$ ①	X_{TRange}	% of I_{pn}	-2		2	$-40^\circ\text{C} \sim 105^\circ\text{C}$

Remarks:

①. the accuracy @ $-40^\circ\text{C} \sim 105^\circ\text{C}$, $X_{TRange} = (((V_{out} - V_{ref}) @ I_n @ T_x) - V_{oe} @ 25^\circ\text{C} - G_{th} * I_n) / V_{FS}$, where T_x represents present temperature, G_{th} is fitted gain at room temperature.

5. STK-250HO-Z Electrical performance

Condition: $T_A = 25^\circ\text{C}$ $V_{CC} = 5\text{ V}$ (Except special instructions)

Parameter	Symbol	Unit	Min	Typ	Max	Comment
Primary nominal current rms	I_{pn}	A		250		
Primary current measuring range	I_{pm}	A	-625		625	
Supply voltage	V_{CC}	V	4.75	5	5.25	
Current consumption	I_{CC}	mA		8	10	
Reference voltage	V_{ref}	V	2.48	2.5	2.52	Output function
Rated output voltage	V_{FS}	V		0.8		$(V_{out} - V_{ref}) @ I_{pn}$
Internal output resistance	R_{out}	Ω		1		Output
Quiescent voltage	V_{off}	V	2.48	2.5	2.52	$V_{out} @ 0\text{ A}$
Electrical offset voltage	V_{oe}	mV	-5		5	$T_A @ 25^\circ\text{C}$
Magnetic offset current	I_{om}	A	-1.25		1.25	$@ \pm 10 \times I_{pn}$
Theoretical gain	G_{th}	mV/A		3.2		$800\text{ mV} @ I_{pn}$
Error of gain	Err_G	% G_{th}		± 1		Trimmed in the factory @ 25°C
Temperature drift of gain	G_{TR}	% G_{th}	-1.0		1.0	$-40^\circ\text{C} \sim 105^\circ\text{C}$
Temperature drift of V_{oe}	V_{oe_TRange}	% V_{FS}	-1.5		1.5	$-40^\circ\text{C} \sim 105^\circ\text{C}$
Rated linearity error	$Non-L_{pn}$	% I_{pn}	-0.5		0.5	$\pm I_{pn}$
Linearity error @ I_{pm}	$Non-L_{pm}$	% I_{pm}	-3		3	$\pm I_{pm}$
Reaction time	t_{ra}	μs			1	@ 10% of I_{pn}
Step response time	t_{res}	μs		0.3	1	@ 90% of I_{pn}
Delay time	t_{delay}	μs			1	300 kHz sine wave
Frequency bandwidth (-3dB)	BW	kHz		300		No RC circuit
Output voltage noise DC ~ 10 kHz DC ~ 100 kHz	V_{noise}	mVpp		10 15		
Accuracy @ 25°C	X	% of I_{pn}	-1		1	@ 25°C
Accuracy @ $-40^\circ\text{C} \sim 105^\circ\text{C}$ ①	X_{TRange}	% of I_{pn}	-2		2	$-40^\circ\text{C} \sim 105^\circ\text{C}$

Remarks:

①. the accuracy @ $-40^\circ\text{C} \sim 105^\circ\text{C}$, $X_{TRange} = (((V_{out} - V_{ref}) @ I_n @ T_x) - V_{oe} @ 25^\circ\text{C} - G_{th} * I_n) / V_{FS}$, where T_x represents present temperature, G_{th} is fitted gain at room temperature .

6. STK-300HO-Z Electrical performance

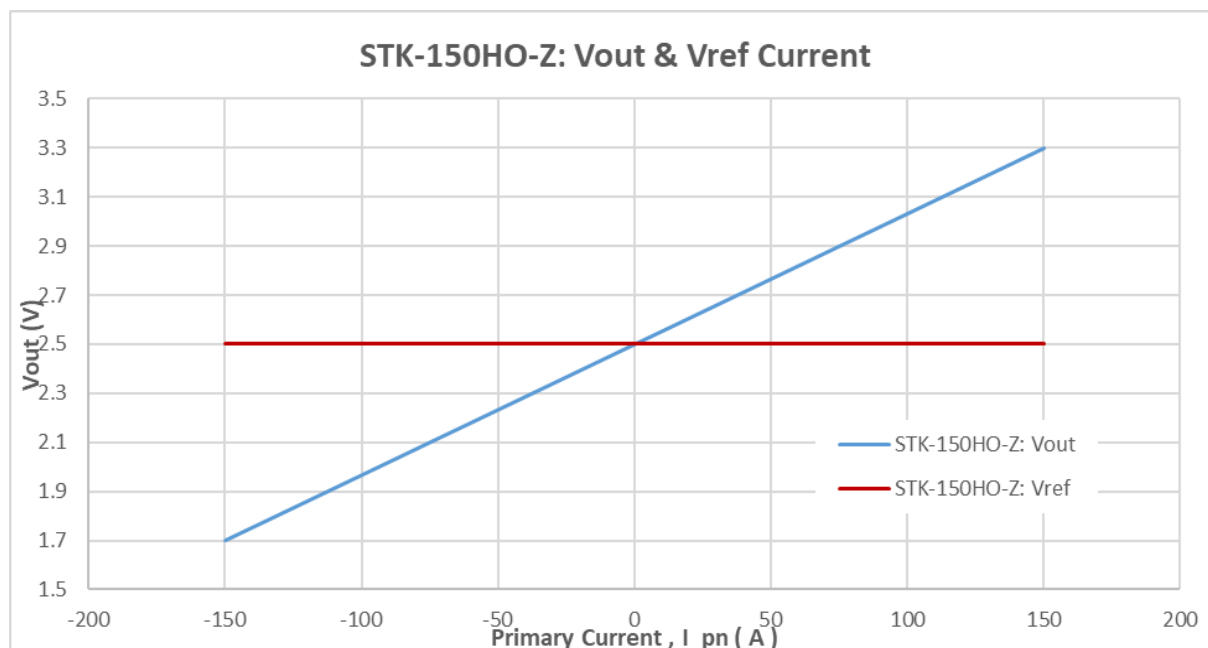
Condition: $T_A = 25^{\circ}\text{C}$ $V_{CC} = 5\text{ V}$ (Except special instructions)

Parameter	Symbol	Unit	Min	Typ	Max	Comment
Primary nominal current rms	I_{pn}	A		300		
Primary current measuring range	I_{pm}	A	-700		700	
Supply voltage	V_{CC}	V	4.75	5	5.25	
Current consumption	I_{CC}	mA		8	10	
Reference voltage	V_{ref}	V	2.48	2.5	2.52	Output function
Rated output voltage	V_{FS}	V		0.8		$(V_{out} - V_{ref}) @ I_{pn}$
Internal output resistance	R_{out}	Ω		1		Output
Quiescent voltage	V_{off}	V	2.48	2.5	2.52	$V_{out} @ 0\text{ A}$
Electrical offset voltage	V_{oe}	mV	-5		5	$T_A @ 25^{\circ}\text{C}$
Magnetic offset current	I_{om}	A	-1.5		1.5	$@ \pm 10 \times I_{pn}$
Theoretical gain	G_{th}	mV/A		2.6667		$800\text{ mV} @ I_{pn}$
Error of gain	Err_G	% G_{th}		± 1		Trimmed in the factory @ 25°C
Temperature drift of gain	G_{TR}	% G_{th}	-1.0		1.0	$-40^{\circ}\text{C} \sim 105^{\circ}\text{C}$
Temperature drift of V_{oe}	V_{oe_TRange}	% V_{FS}	-1.5		1.5	$-40^{\circ}\text{C} \sim 105^{\circ}\text{C}$
Rated linearity error	$Non-L_{pn}$	% I_{pn}	-0.5		0.5	$\pm I_{pn}$
Linearity error @ I_{pm}	$Non-L_{pm}$	% I_{pm}	-3		3	$\pm I_{pm}$
Reaction time	t_{ra}	μs			1	@ 10% of I_{pn}
Step response time	t_{res}	μs		0.3	1	@ 90% of I_{pn}
Delay time	t_{delay}	μs			1	300 kHz sine wave
Frequency bandwidth (-3dB)	BW	kHz		300		No RC circuit
Output voltage noise DC ~ 10 kHz DC ~ 100 kHz	V_{noise}	mVpp		10 15		
Accuracy @ 25°C	X	% of I_{pn}	-1		1	@ 25°C
Accuracy @ $-40^{\circ}\text{C} \sim 105^{\circ}\text{C}$ ①	X_{TRange}	% of I_{pn}	-2		2	$-40^{\circ}\text{C} \sim 105^{\circ}\text{C}$

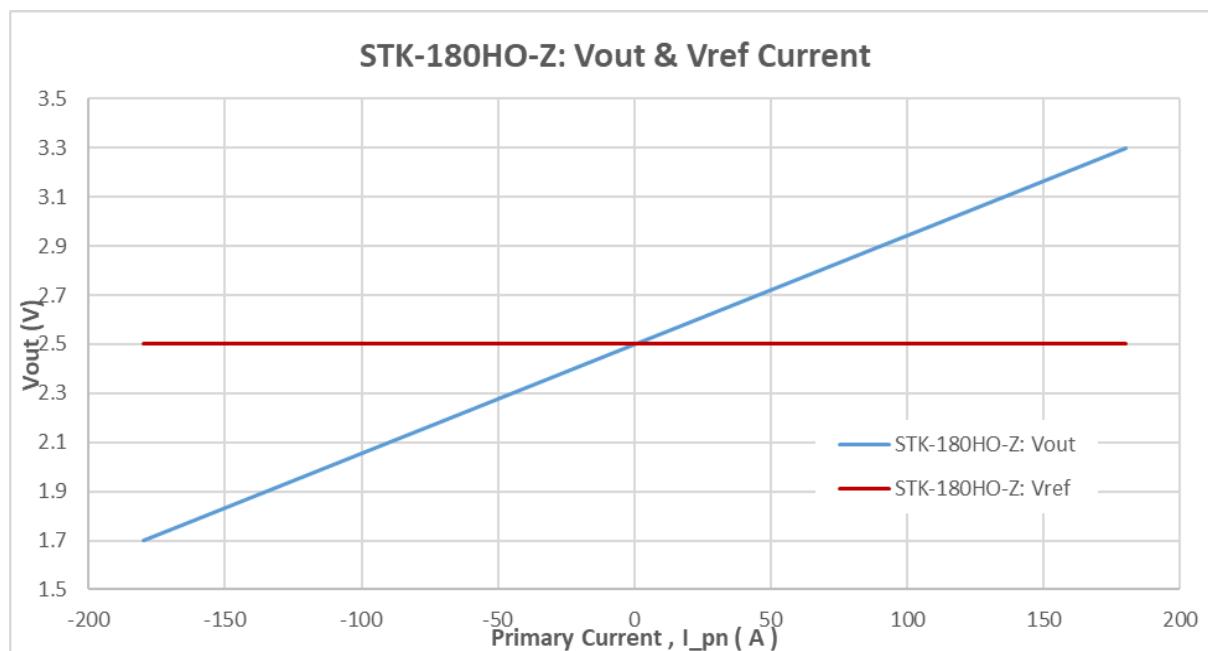
Remarks:

①. the accuracy @ $-40^{\circ}\text{C} \sim 105^{\circ}\text{C}$, $X_{TRange} = (((V_{out} - V_{ref}) @ I_n @ T_x) - V_{oe} @ 25^{\circ}\text{C} - G_{th} * I_n) / V_{FS}$, where T_x represents present temperature, G_{th} is fitted gain at room temperature.

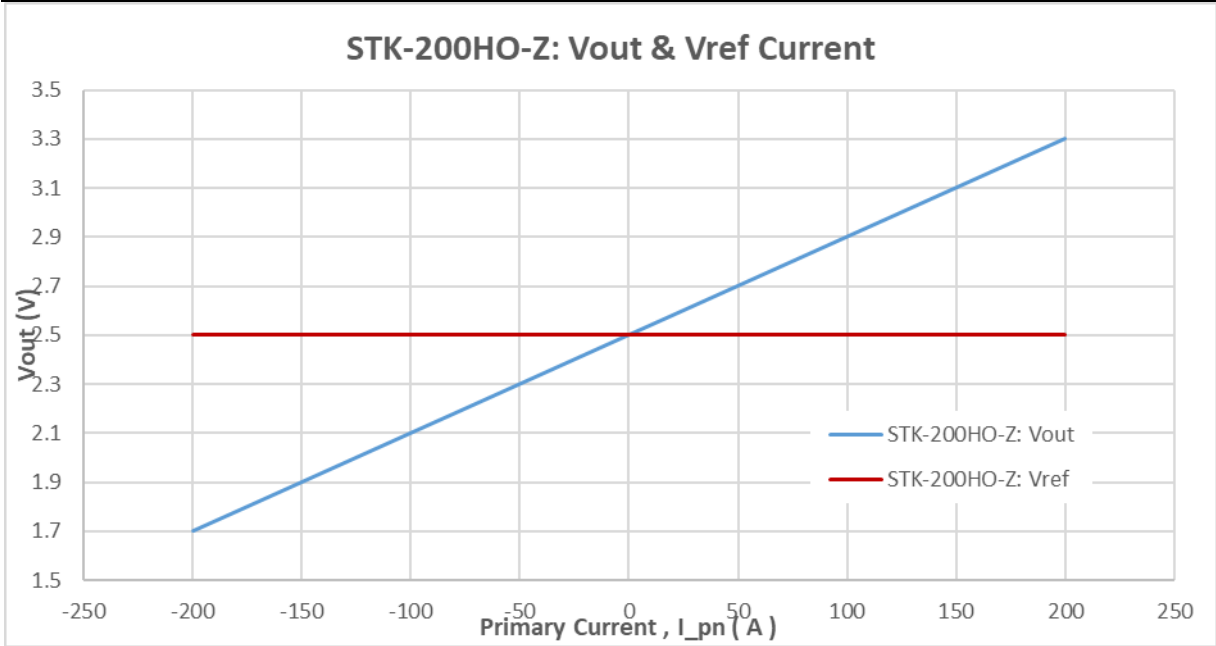
7. Output voltage VS primary current



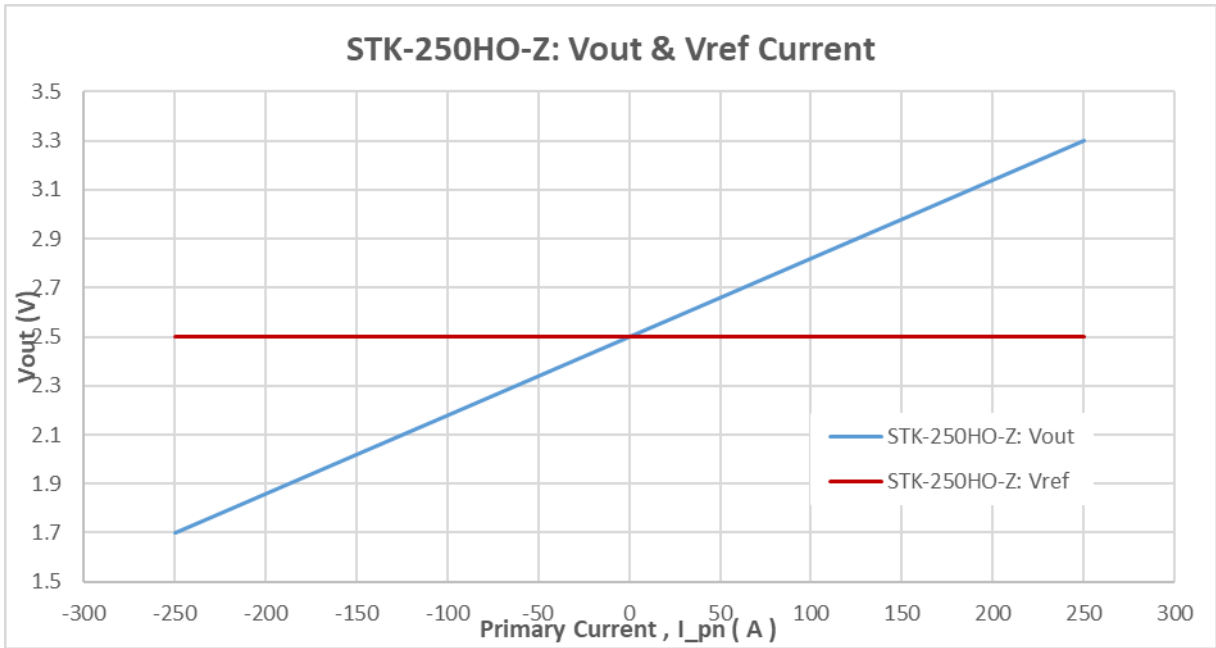
The dependence of Vout of STK-150HO-Z on the primary current.



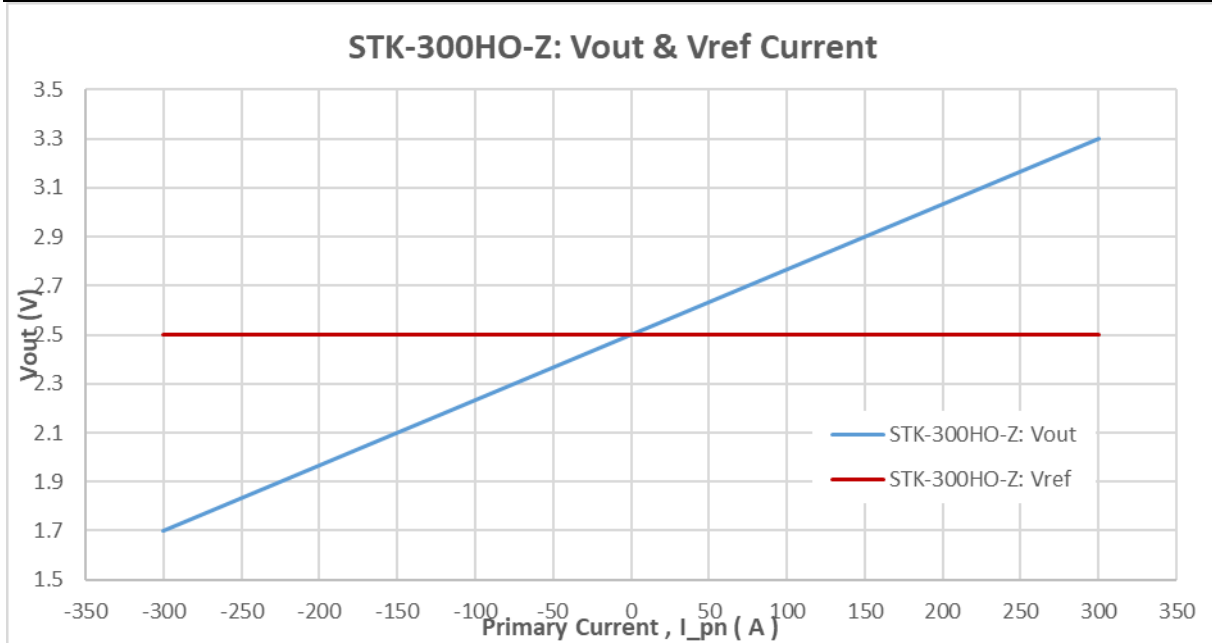
The dependence of Vout of STK-180HO-Z on the primary current.



The dependence of Vout of STK-200HO-Z on the primary current.

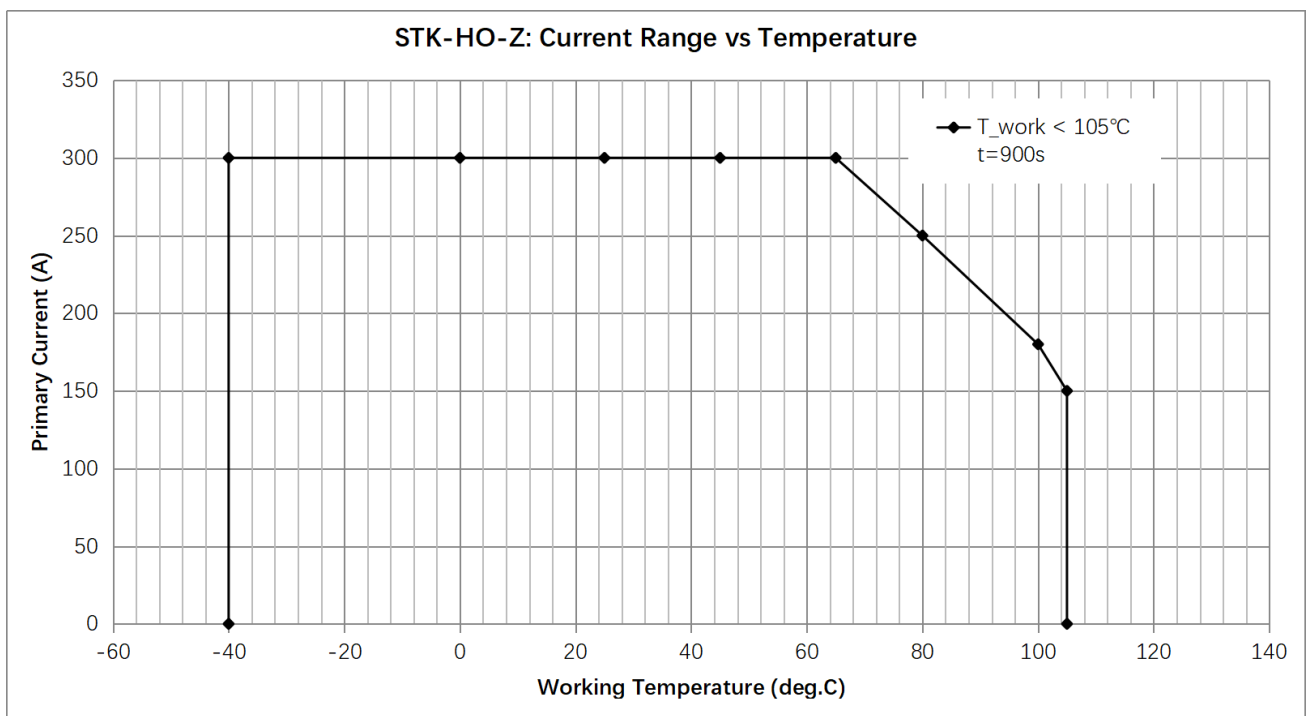


The dependence of Vout of STK-250HO-Z on the primary current.



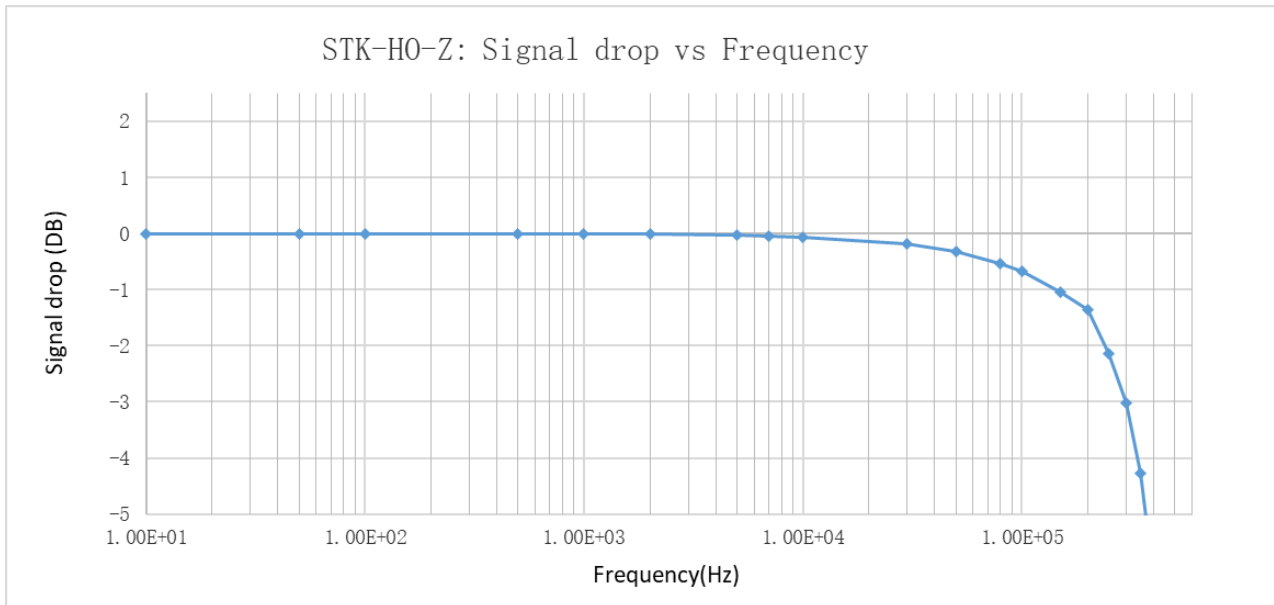
The dependence of Vout of STK-300HO-Z on the primary current.

8. Maximum continues DC current



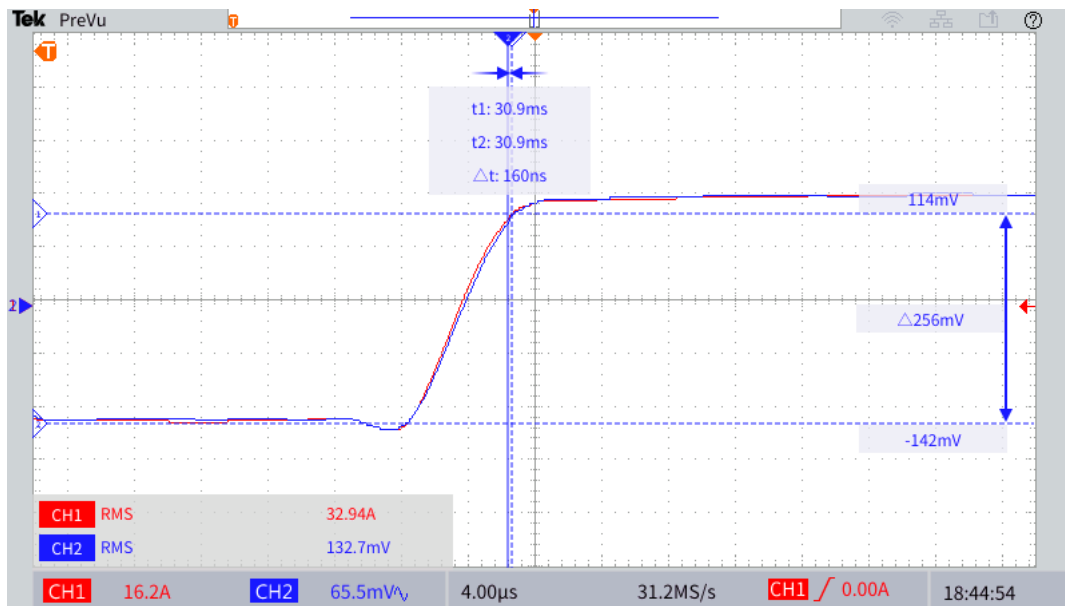
The dependence of maximum continues current of STK-xxHO-Z current on the working temperature.

9. Frequency response and bandwidth



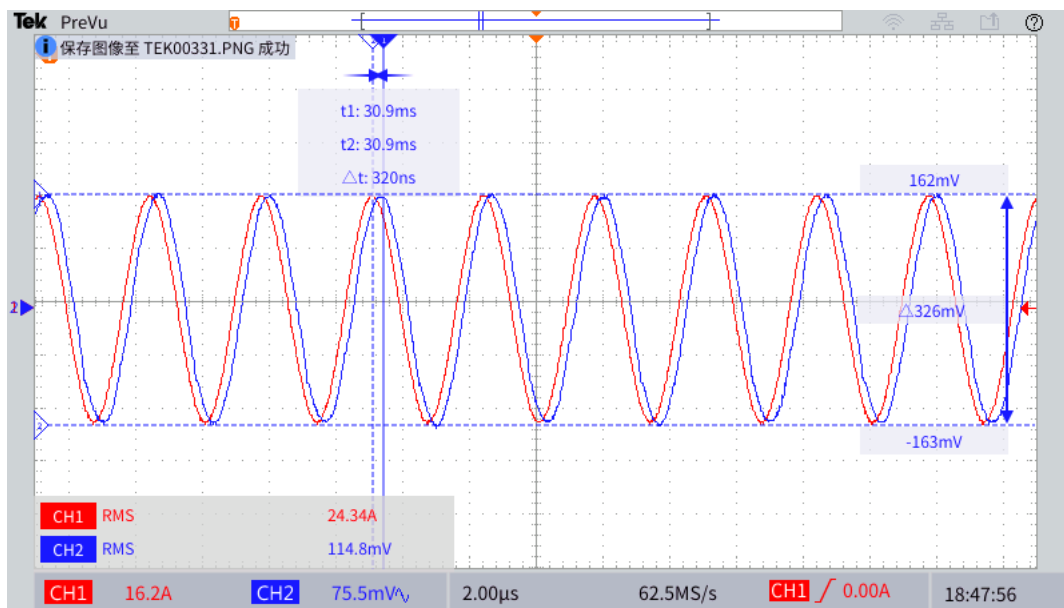
The frequency bandwidth of STK-xxHO-Z series current sensor. The bandwidth of current sensor is DC ~ 300 kHz (-3dB).

10. Step response time



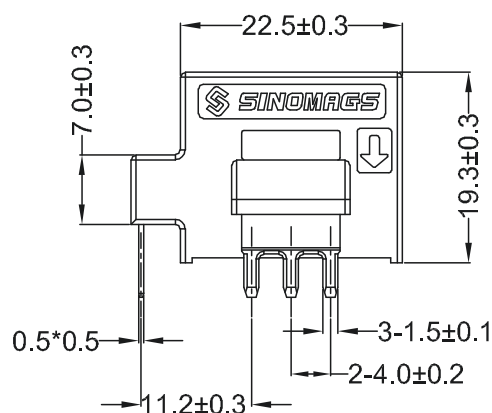
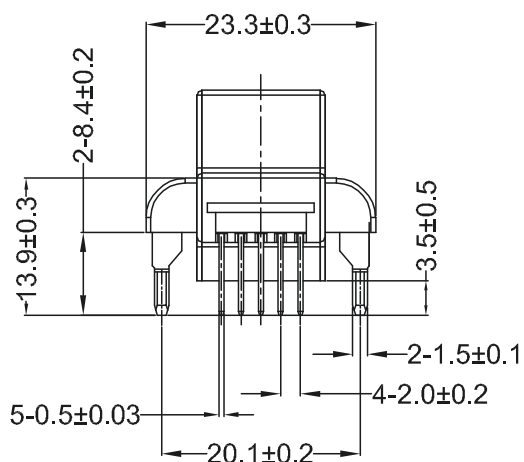
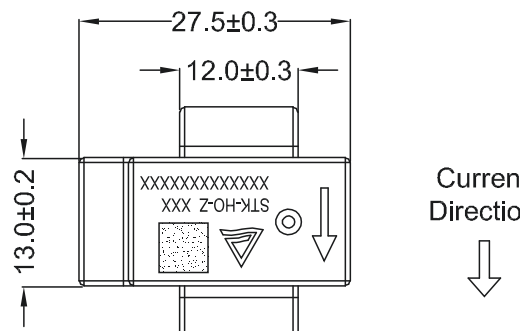
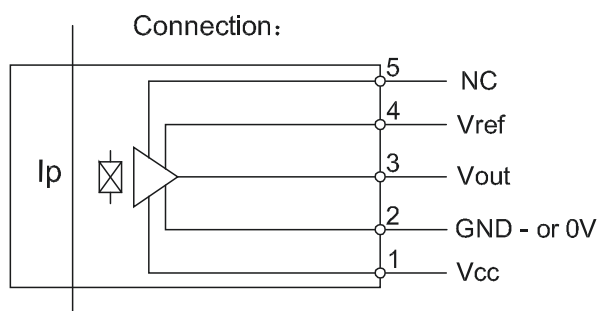
The typical frequency response of STK-xxHO-Z current sensor. The response time from 90% of the primary current (red) to 90% of the secondary output (blue) is less than 1 μs.

11. Frequency delay performance



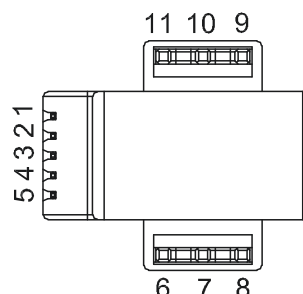
When testing 300 kHz sine wave, the typical result of STK-xxHO-Z current sensor's output. The response time from the primary current (red) to the secondary output (blue) is less than 1 μ s.

12. Dimension & Pin definitions

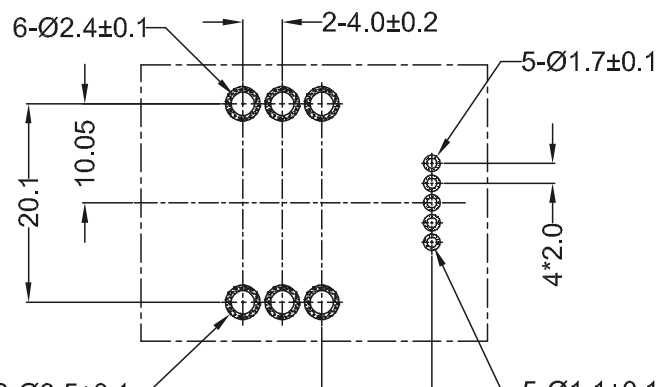


Terminal Pin Identification:

- 1 : Vcc
- 2 : GND
- 3 : Vout
- 4 : Vref (OUT)
- 5 : NC
- 6, 7, 8: Primary input Current (+)
- 9, 10, 11: Primary input Current (-)



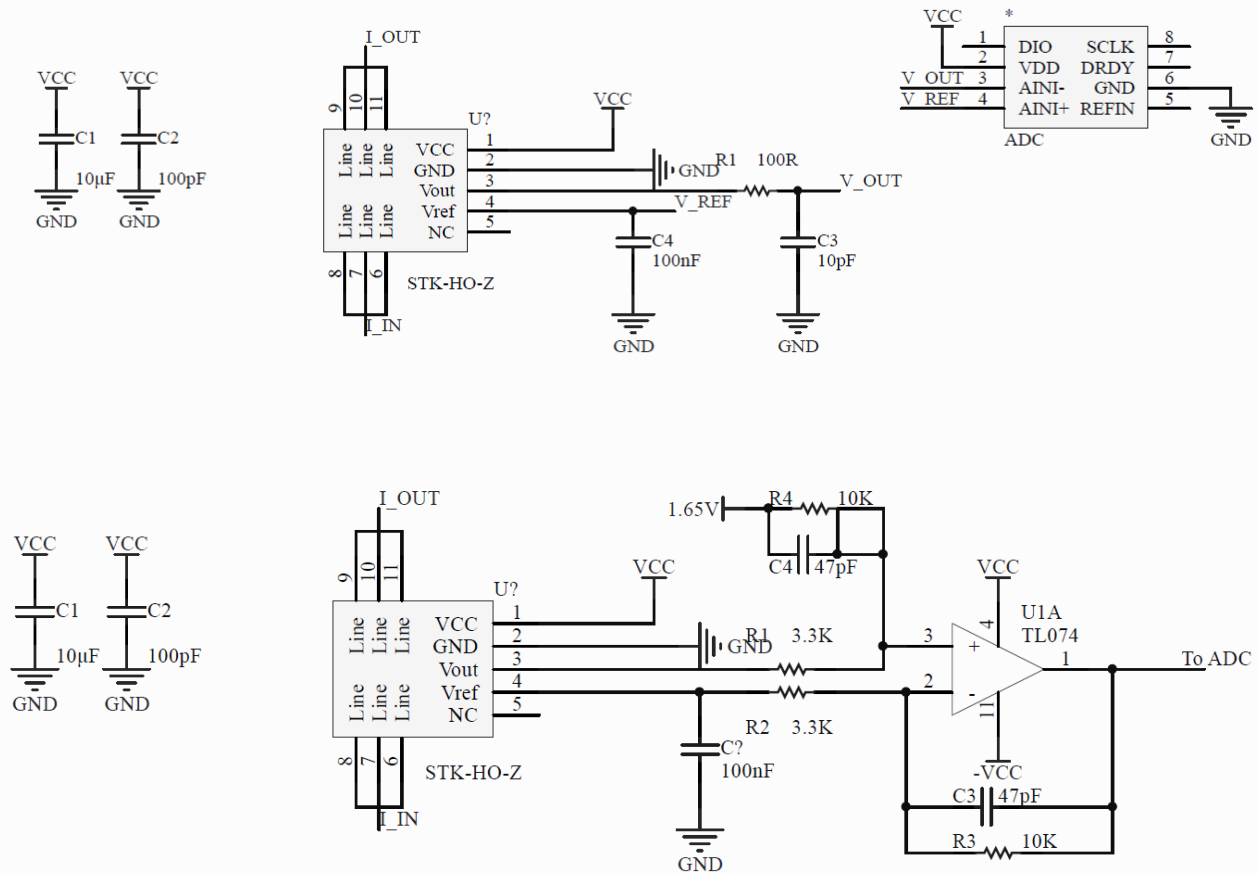
Recommended PCB Layout:



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



13. Appendix: typical application circuit



Typical application circuits for STK-H0-Z current sensor. The magnification can be estimated as $M = R4/R2$ with the condition of $R1 = R2$, and $R3 = R4$, $C3 = C4$. The magnification in the above circuit is about 3, The signal input to ADC is $1.65 + R4/R2 * (V_{out} - V_{ref})$.

R3 (kohm)	C3 (pF)	Theoretical -3dB $f = 1/(2\pi RC)$ (kHz)	Measured -3dB (kHz)
10	47	398	~340
20	81	98	~ 100
20	810	10	~ 10

The frequency characteristics of STK-H0-Z series current sensor are not affected by the R-C setting (according to recommended R-C setting), therefore the active filter circuit or R-C circuit can be applied to modulate the sensor's frequency characteristics.