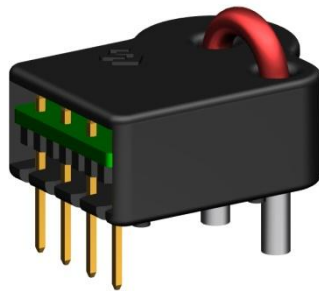


CURRENT SENSOR

PRODUCT SERIES: STK-HD/P

PRODUCT PART NUMBER: STK-20HD/P4

REVISION: Ver 1.0



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1. Description

STK-HD/P current sensor is based on the open loop principle and TMR technology. DC, AC, pulses and any kind of irregularities wave can be measured by the current sensor under the isolated conditions.

Typical application

- AC Variable speed drives
- PV string current detection
- Switched model power supplies (SMPS)
- Direct-current dynamo
- MPPT

General parameters

| Parameter | Symbol | Unit | Value |
|---------------------|------------------|------|-----------|
| Working temperature | T _A | °C | -40 ~ 105 |
| Storage temperature | T _{stg} | °C | -40 ~ 105 |
| Mass | m | g | 10 |

Absolute parameters

| Parameters | Symbol | Unit | Value |
|------------------|------------------|------|-------|
| Supply voltage | V _C | V | 6 |
| ESD rating (HBM) | U _{ESD} | kV | 4 |

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 parameters

| Parameter | Symbol | Unit | Value | Remark |
|--|-----------------|------|-----------------------|---|
| RMS voltage for AC test 50Hz/1 min | U _d | kV | 4 | |
| Impulse withstand voltage 1.2/50μs | Ū _w | kV | 6 | |
| Clearance distance (pri. -sec) | d _{Cl} | mm | 9.6 | Shortest distance through air |
| Creepage distance (pri. -sec) | d _{Cp} | mm | 9.6 | Shortest path along device body |
| Electrical clearance | - | mm | 9 | When mounted on PCB with recommended layout |
| Case material | | | V0 according UL 94 | to |
| Comparative tracking index | CTI | V | 600 | |

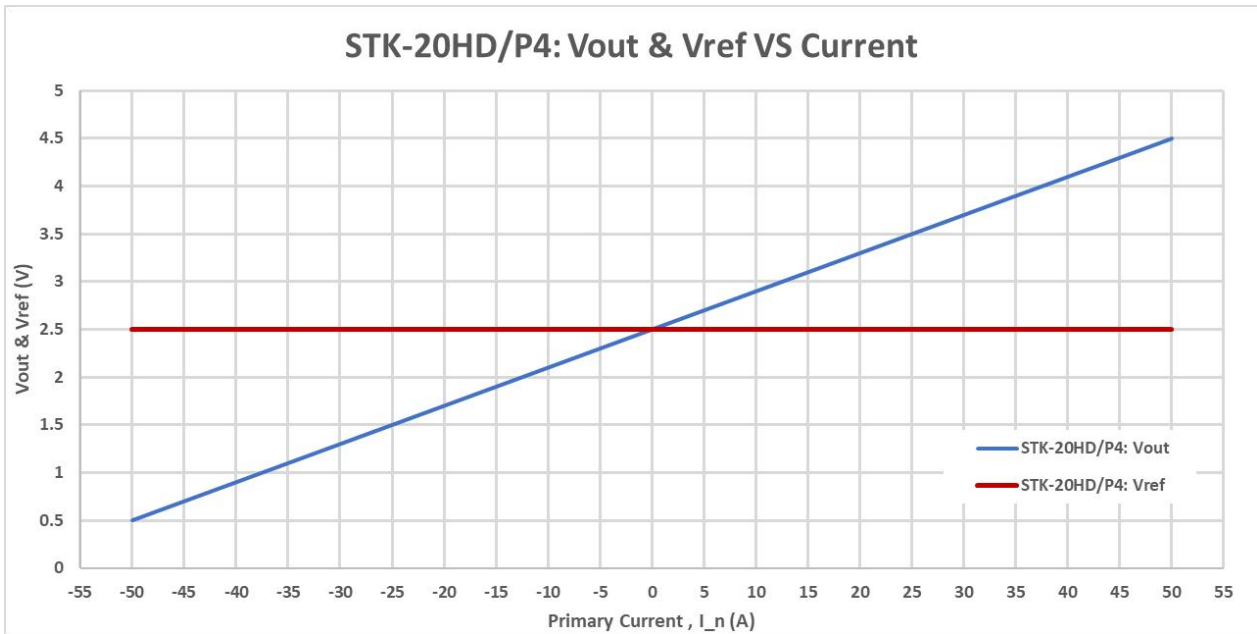
2. Electrical performance of STK-20HD/ P4

| Parameter | Symbol | Unit | Min | Typ | Max | Comment |
|---|---------------------|----------------------|------|---------|------|--------------------------|
| Primary nominal current rms | I _{pn} | A | | 20 | | |
| Primary current measuring range | I _{pm} | A | -50 | | 50 | |
| Supply voltage | V _{cc} | V | 4.75 | 5 | 5.25 | |
| Current consumption | I _{cc} | mA | | 5 | 10 | |
| Reference voltage | V _{ref} | V | 2.47 | 2.5 | 2.53 | Output function |
| Quiescent voltage V _{out} @ 0 A | V _{off} | V | 2.47 | 2.5 | 2.53 | |
| Electrical offset voltage (V _{out} – V _{ref}) @ 0 A | V _{oe} | mV | -30 | | 30 | |
| Rated output voltage ((V _{out} – V _{ref})@I _{pn}) – V _{oe} | V _{FS} | V | | 0.8 | | |
| Internal output resistance | R _{out} | Ω | | 1 | | |
| Internal reference resistance | R _{ref} | Ω | | 1 | | |
| Theoretical gain | G | mV/A | | 40 | | |
| Rated linearity error | Non-L | %I _{pn} | | 0.7 | | Within ±I _{pn} |
| Reaction time | t _{ra} | μs | | 0.5 | | @ 10% of I _{pn} |
| Step response time | t _{res} | μs | | 1.0 | | @ 90% of I _{pn} |
| Delay time | t _{delay} | μs | | 0.5 | | 400 kHz sine wave |
| Frequency bandwidth (-3dB) | BW | kHz | | 600 | | No RC circuit |
| Output voltage noise DC ~ 10 kHz DC ~ 100 kHz | V _{noise} | mVpp | | 8 10 | | @250kHz Sampling Rate |
| Accuracy @ 25°C | X | % of I _{pn} | -1 | | 1 | @ 25°C |
| Accuracy @ -40°C~105°C | X _{TRange} | % of I _{pn} | -3 | | 3 | -40°C ~ 105°C |

Remarks:

- the accuracy @ -40°C~105°C, X_{TRange} = (((V_{out} – V_{ref})@ I_n @ T_x) – V_{oe}@ 25°C – G_{th} * I_n) / V_{FS}, where T_x represents present temperature, G_{th} is fitted gain at room temperature.

3. Output voltage VS primary current of STK-20HD/ P4



The dependence of Vout&Vref of STK-20HD/P4 on the primary current.

4. Frequency band width

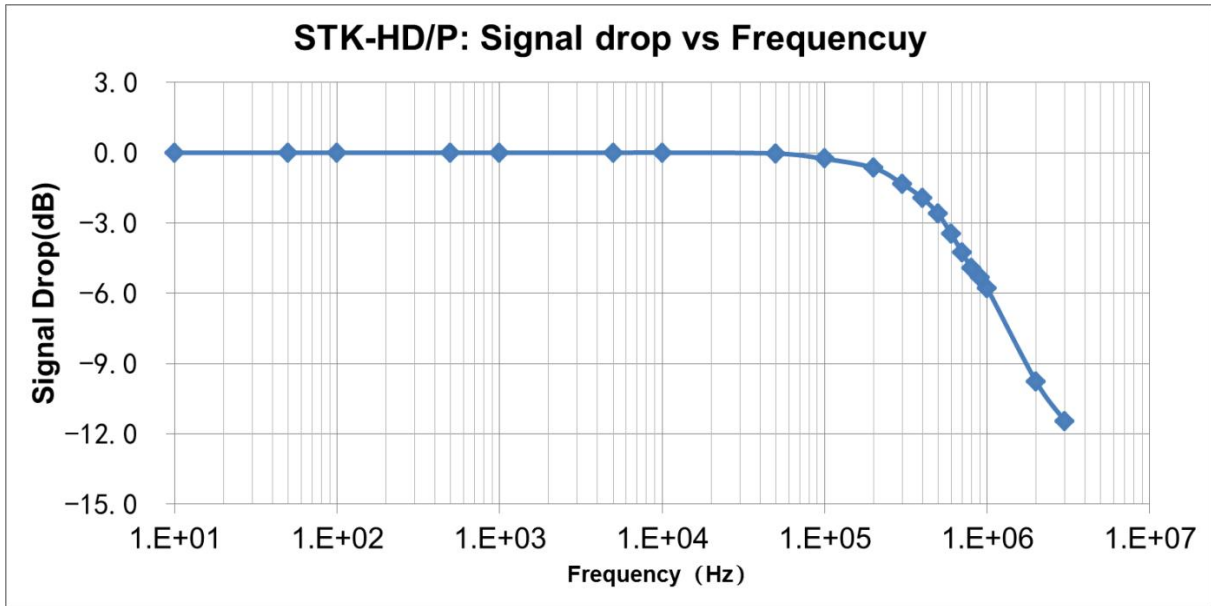


Fig.1 the frequency band width of STK-HD/P series current sensors.

5. Step response time

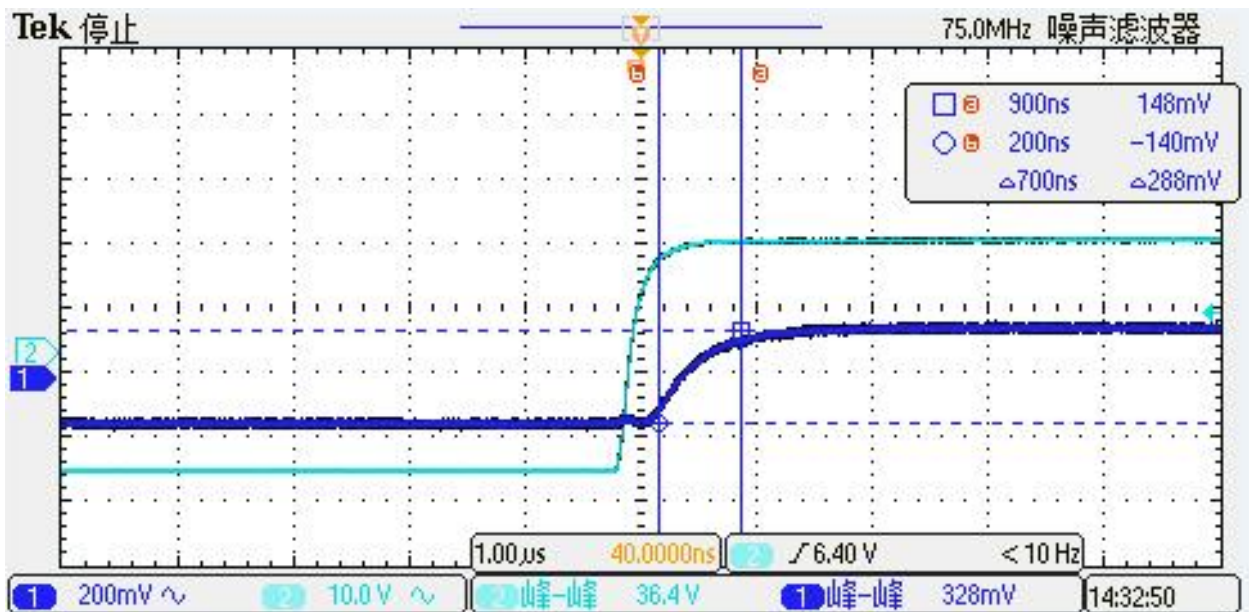


Fig.2 the step response time of STK-HD/P current sensors. The light blue is primary current, while the dark blue is output signal of current sensor. The step response time is less than 1.0 μ s.

6. Delaytime

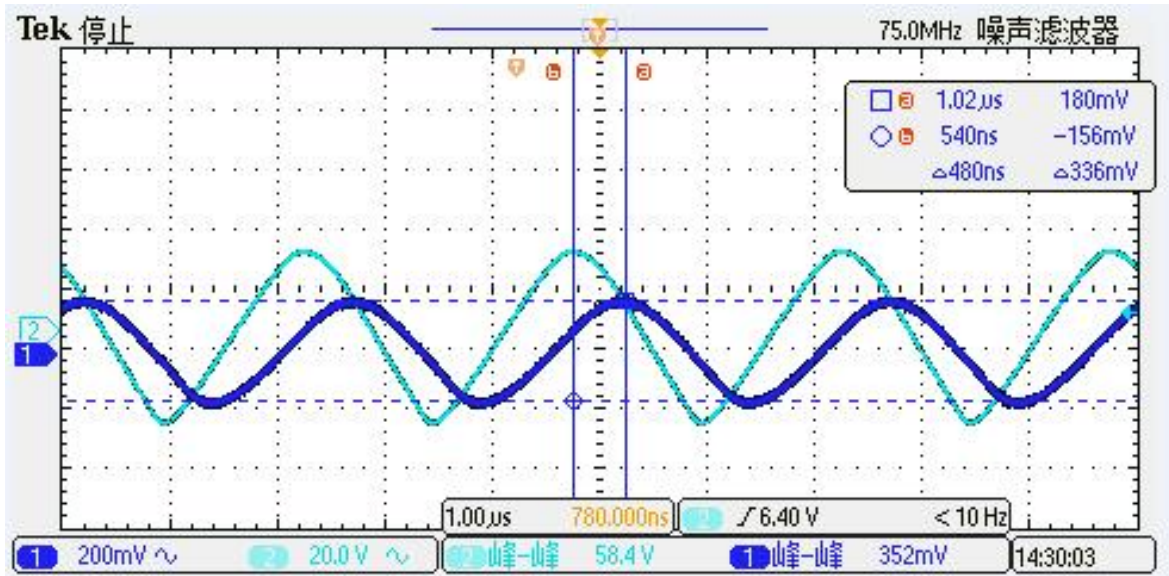
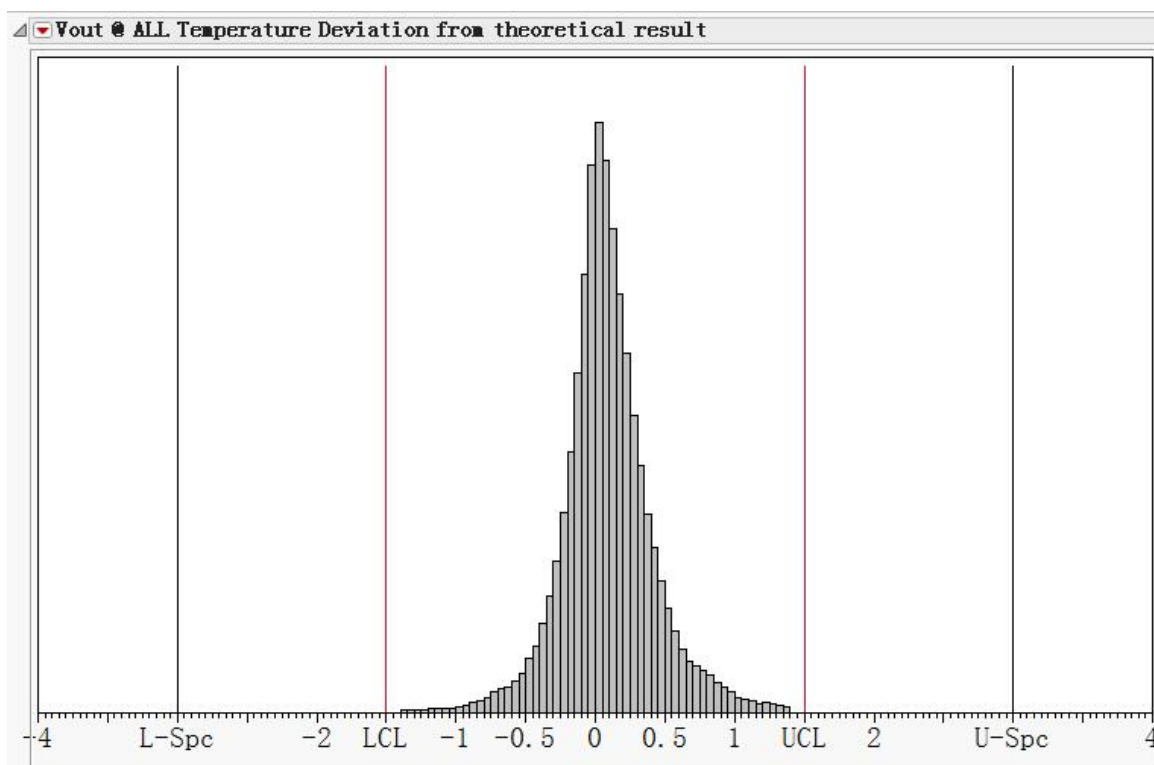
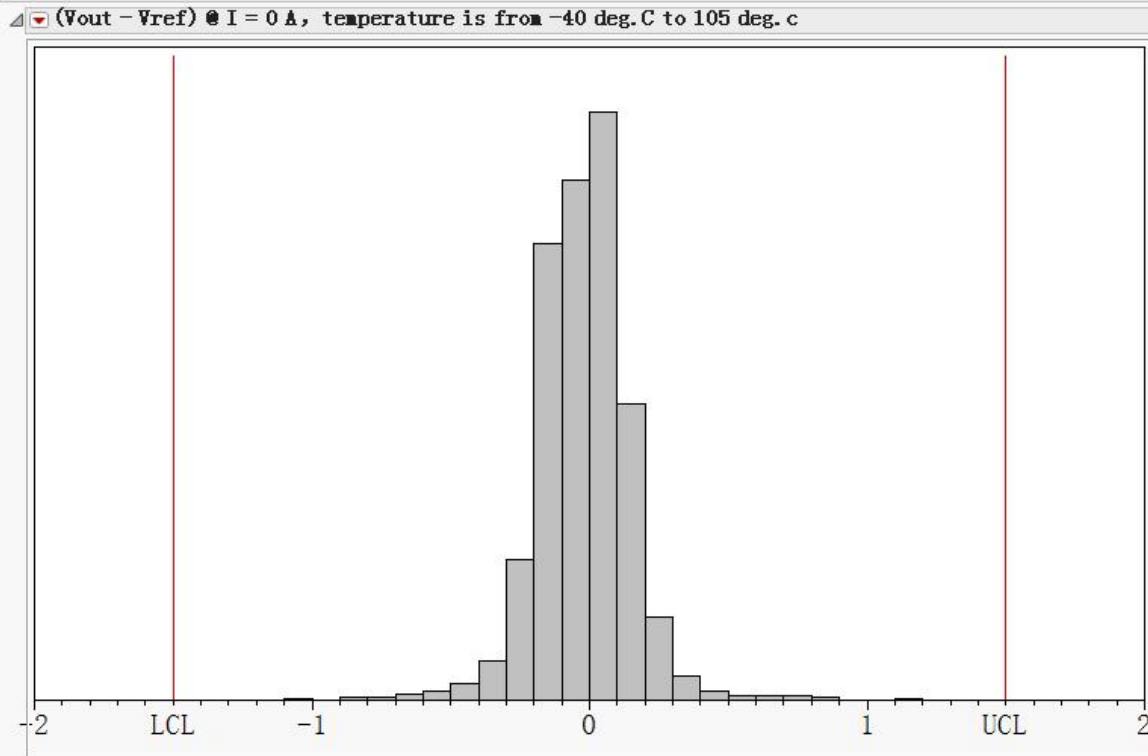


Fig.3 when detection the primary current with a frequency of 400 kHz. The delay time from the primary current (light blue) to the output of the sensor (dark blue) is around 0.5 μ s.

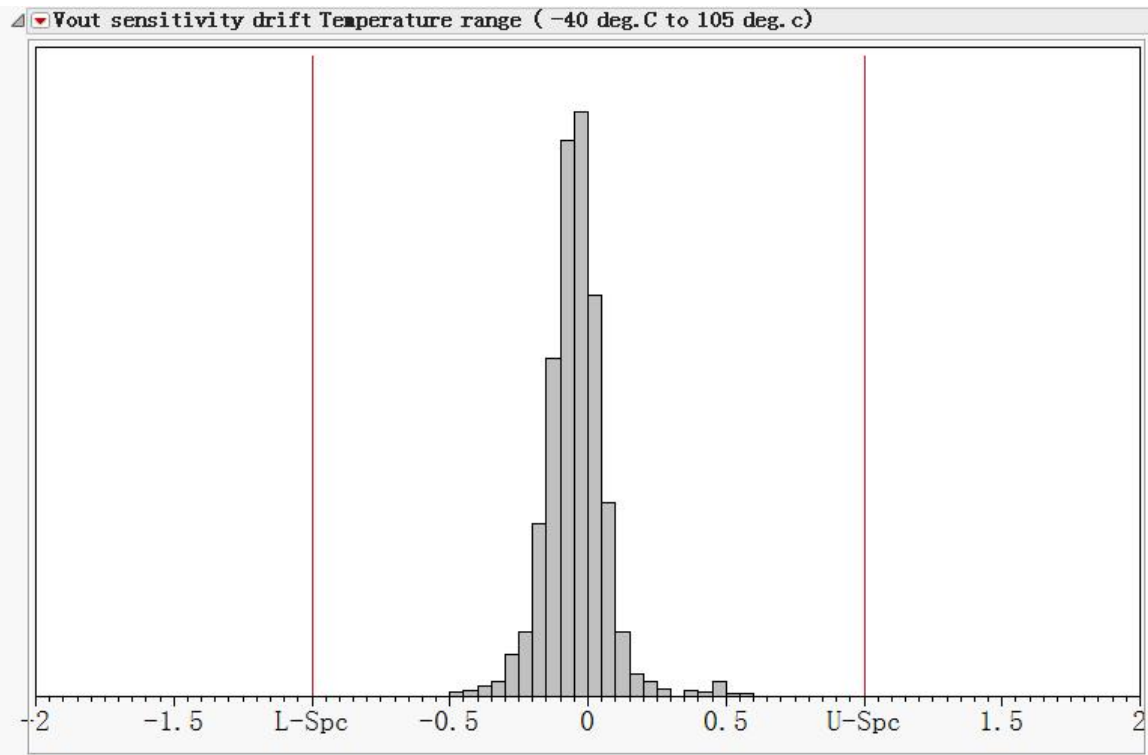
7. Accuracy performance



The error of $(V_{out} - V_{ref})$ (for STK-20HD/Px) current sensors in the temperature range of $-40^{\circ}\text{C} \sim 120^{\circ}\text{C}$ compared with the standard output $(V = G_{th} * I_n)$.

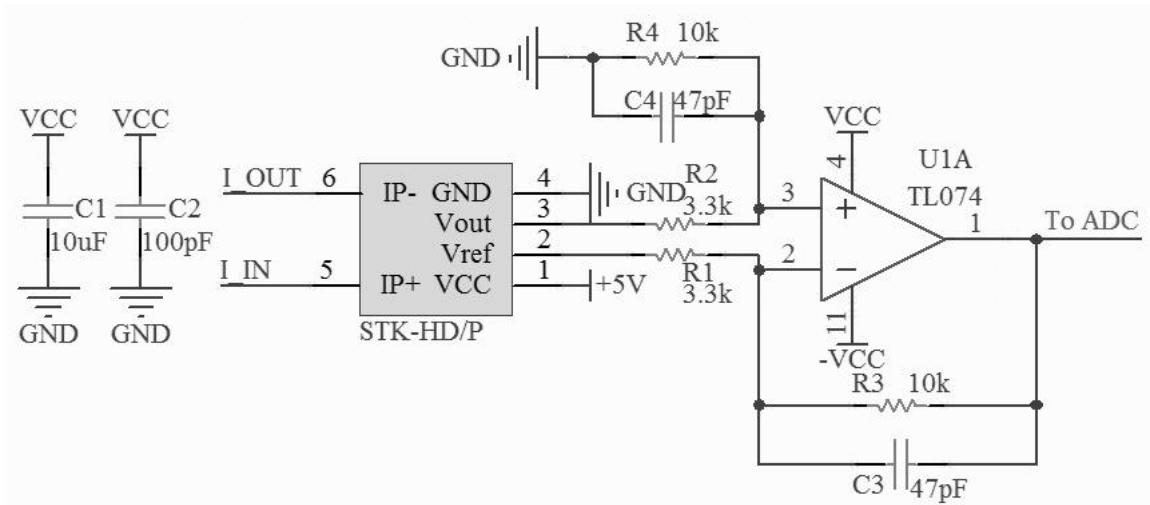


Temperature drift of Voe, $V_{oe_TRange} = (V_{oe} @ T_x - V_{oe} @ 25^\circ C) / V_{FS}$. T_x represents present temperature, V_{FS} the rated output voltage.



The error of gain at room temperature

8. Typical application circuits for STK-HD/Px

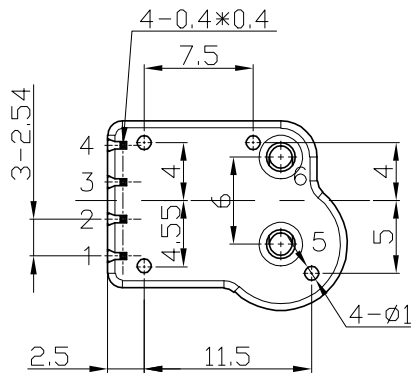
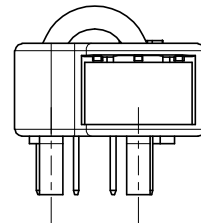
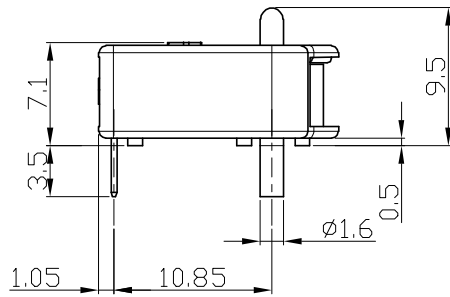
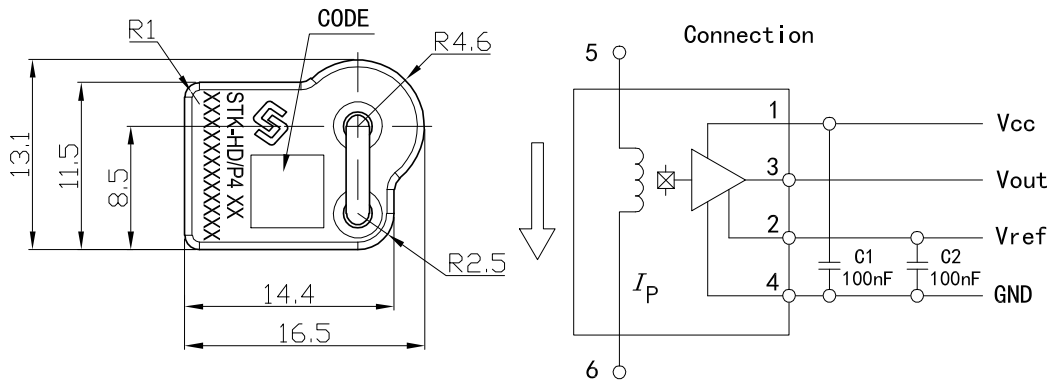


Typical application circuits for STK-HD/P1& STK-HD/P2 current sensor. The magnification can be estimated as $M = R4/R2$ with the condition of $R1 = R2$, and $R3 = R4$. The magnification in the above circuit is about 3.

| $R3$ (kohm) = $R4$ (kohm) | $C3$ (pF) = $C4$ (pF) | Theoretical -3dB $f = 1/(2\pi RC)$ (kHz) | Tested -3dB (kHz) |
|------------------------------|--------------------------|--|----------------------|
| 20 | 20 | 398 | ~400 |
| 20 | 81 | 98 | ~100 |
| 20 | 810 | 10 | ~10 |

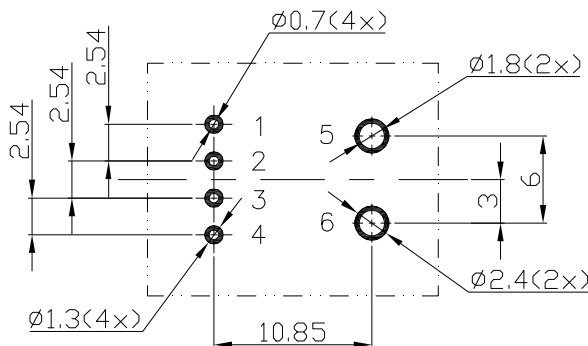
The frequency characteristics of STK_HD/P series current sensor are not affected by the R-C setting (according to recommended R-C setting), therefore the active filter circuit or R-C circuit can be applied to modulate the sensor's frequency characteristics.

9. Dimensions & Pins & Footprint



Terminals

| | |
|----|------|
| 1. | Vcc |
| 2. | Vref |
| 3. | Vout |
| 4. | GND |
| 5. | Ip+ |
| 6. | Ip- |



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

