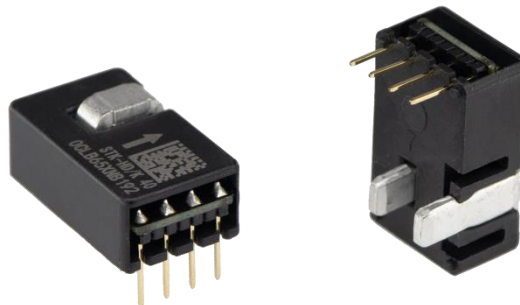


CURRENT SENSOR

PRODUCT SERIES: STK-HD/K

PRODUCT SERIES: STK-20HD/K
STK-32HD/K
STK-40HD/K
STK-50HD/K

REVISION: Ver 1.6



Sinomags Technology Co., Ltd.

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1. Description

STK-HD/K 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	3.3

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	
Case material			V0 according to UL 94	
Comparative tracking index	CTI	V	600	

2. Electrical performance of STK-20HD/ K

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	-8		8	
Rated output voltage ((V _{out} – V _{ref})@I _{pn}) – V _{oe}	V _{FS}	V		0.8		
Internal output resistance	R _{out}	Ω		15		
Internal reference resistance	R _{ref}	Ω		15		
Theoretical gain	G	mV/A		40		
Rated linearity error	Non-L	%I _{pn}		0.5		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℃	X	% of I _{pn}	-0.8		0.8	@ 25℃
Accuracy @ -40℃~105℃	X _{TRange}	% of I _{pn}	-1.5		1.5	-40℃ ~ 105℃

Remarks:

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

3. Electrical performance of STK-32HD/ K

Parameter	Symbol	Unit	Min	Typ	Max	Comment
Primary nominal current rms	I _{pn}	A		32		
Primary current measuring range	I _{pm}	A	-80		80	
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	-8		8	
Rated output voltage ((V _{out} – V _{ref})@I _{pn}) – V _{oe}	V _{FS}	V		0.8		
Internal output resistance	R _{out}	Ω		15		
Internal reference resistance	R _{ref}	Ω		15		
Theoretical gain	G	mV/A		25		
Rated linearity error	Non-L	%I _{pn}		0.5		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℃	X	% of I _{pn}	-0.8		0.8	@ 25℃
Accuracy @ -40℃~105℃	X _{TRange}	% of I _{pn}	-1.5		1.5	-40℃ ~ 105℃

Remarks:

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

4. Electrical performance of STK-40HD/ K

Parameter	Symbol	Unit	Min	Typ	Max	Comment
Primary nominal current rms	I _{pn}	A		40		
Primary current measuring range	I _{pm}	A	-100		100	
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	-8		8	
Rated output voltage ((V _{out} – V _{ref})@I _{pn}) – V _{oe}	V _{FS}	V		0.8		
Internal output resistance	R _{out}	Ω		15		
Internal reference resistance	R _{ref}	Ω		15		
Theoretical gain	G	mV/A		20		
Rated linearity error	Non-L _{pn}	%I _{pn}		0.5		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}	-0.8		0.8	@ 25°C
Accuracy @ -40°C~105°C	X _{TRange}	% of I _{pn}	-1.5		1.5	-40°C ~ 105°C

Remarks:

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

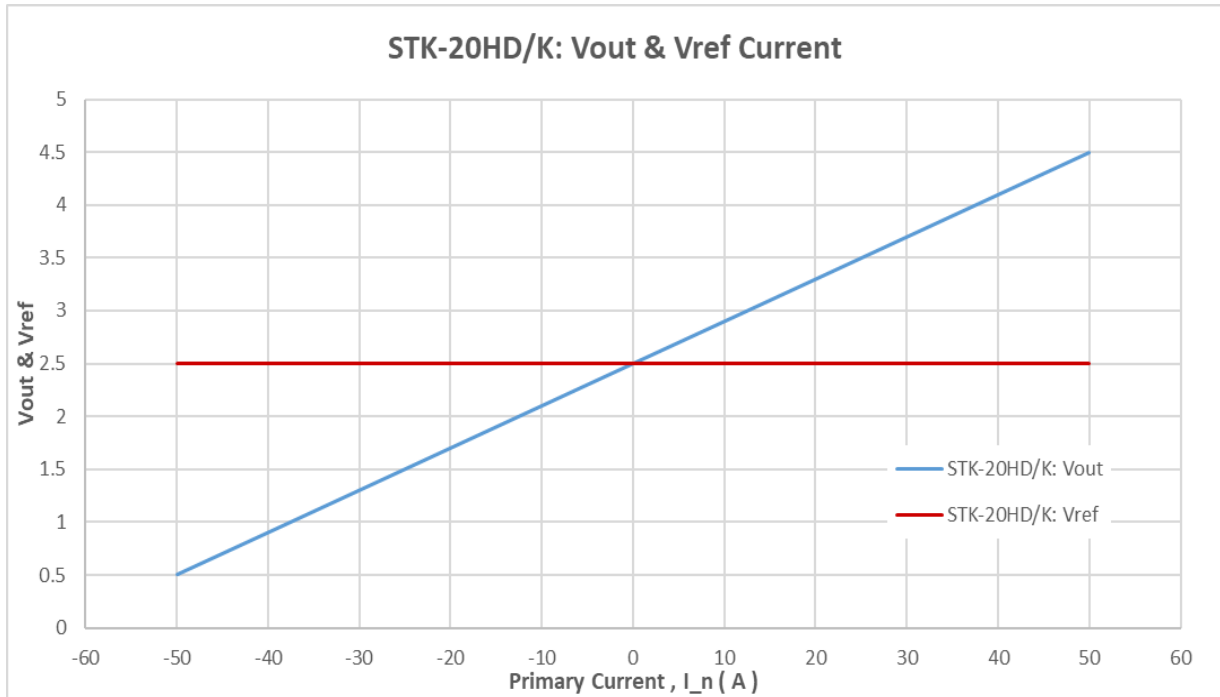
5. Electrical performance of STK-50HD/ K

Parameter	Symbol	Unit	Min	Typ	Max	Comment
Primary nominal current rms	I _{pn}	A		50		
Primary current measuring range	I _{pm}	A	-125		125	
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	-8		8	
Rated output voltage ((V _{out} – V _{ref})@I _{pn}) – V _{oe}	V _{FS}	V		0.8		
Internal output resistance	R _{out}	Ω		15		
Internal reference resistance	R _{ref}	Ω		15		
Theoretical gain	G	mV/A		16		
Rated linearity error	Non-L _{pn}	%I _{pn}		1		Within ±I _{pn}
Linearity error @ I _{pm}	Non-L _{pm}	%I _{pm}		3		±I _{pm}
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℃	X	% of I _{pn}	-0.8		0.8	@ 25℃
Accuracy @ -40℃~105℃	X _{TRange}	% of I _{pn}	-1.5		1.5	-40℃ ~ 105℃

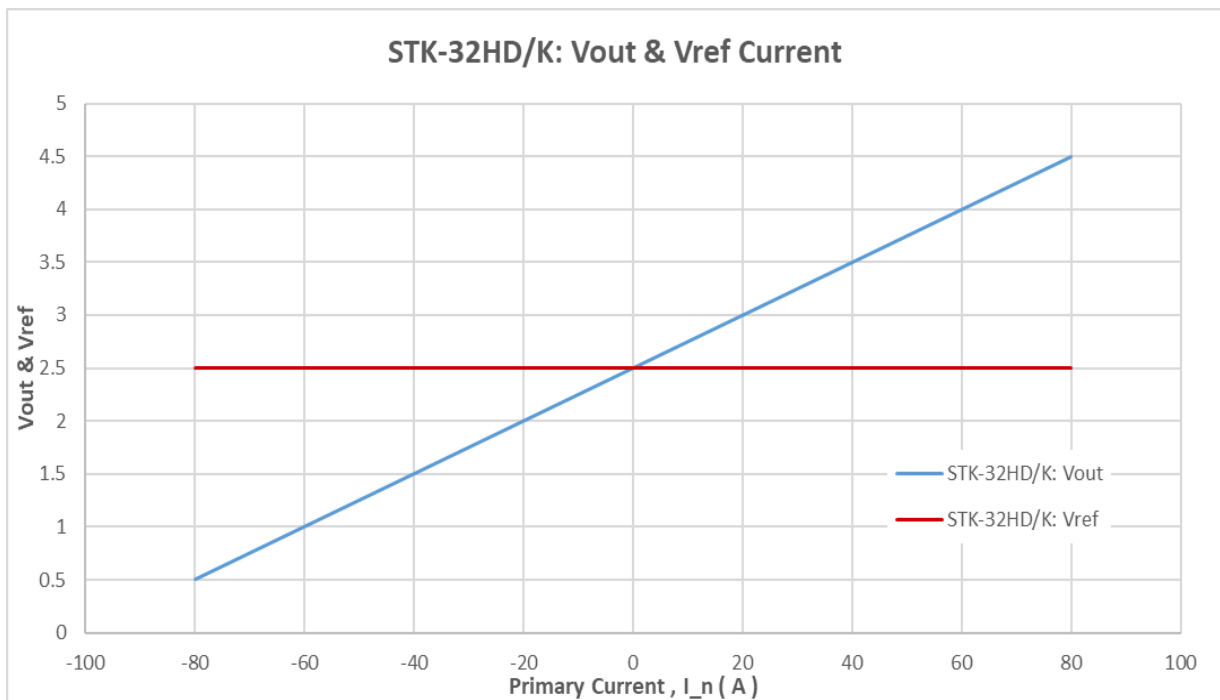
Remarks:

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

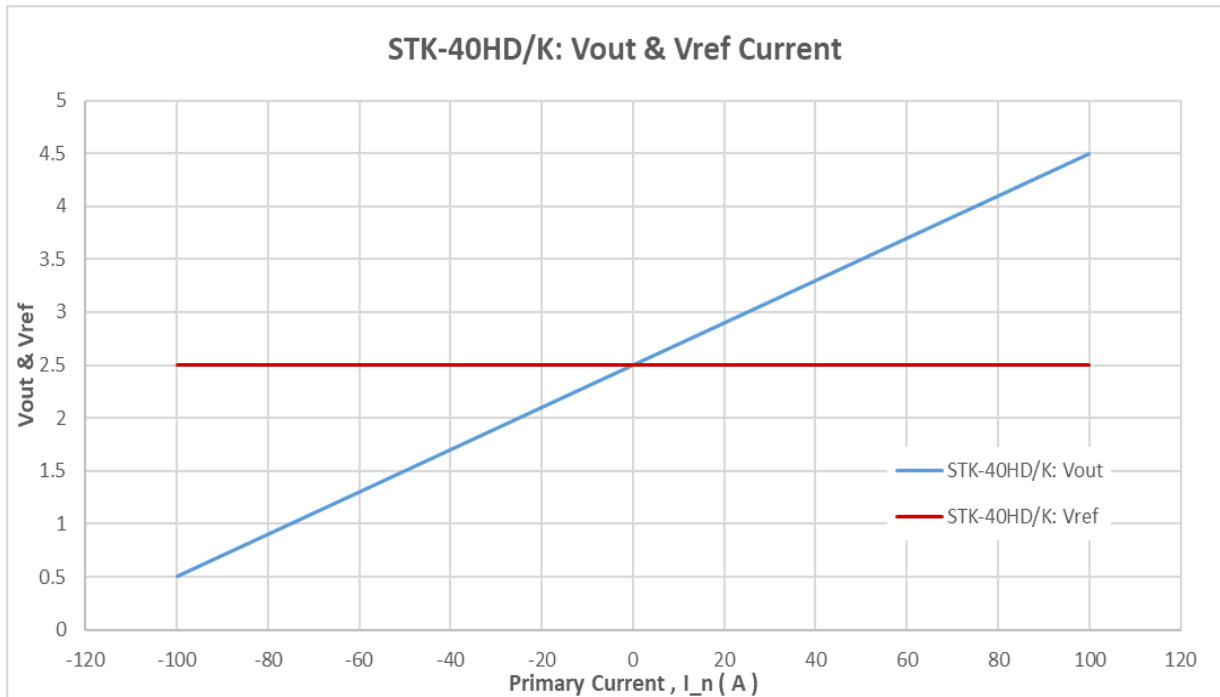
6. Output voltage VS primary current of STK-HD/ K



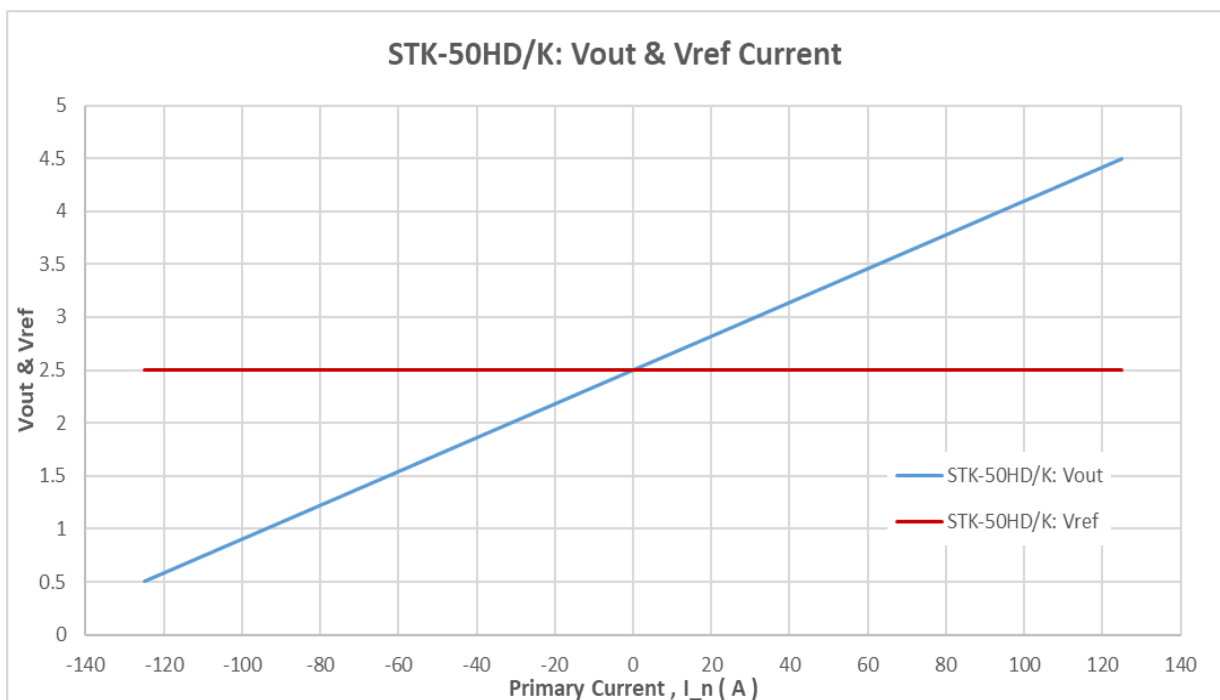
The dependence of V_{out} & V_{ref} of STK-20HD/K on the primary current.



The dependence of V_{out} & V_{ref} of STK-32HD/K on the primary current.

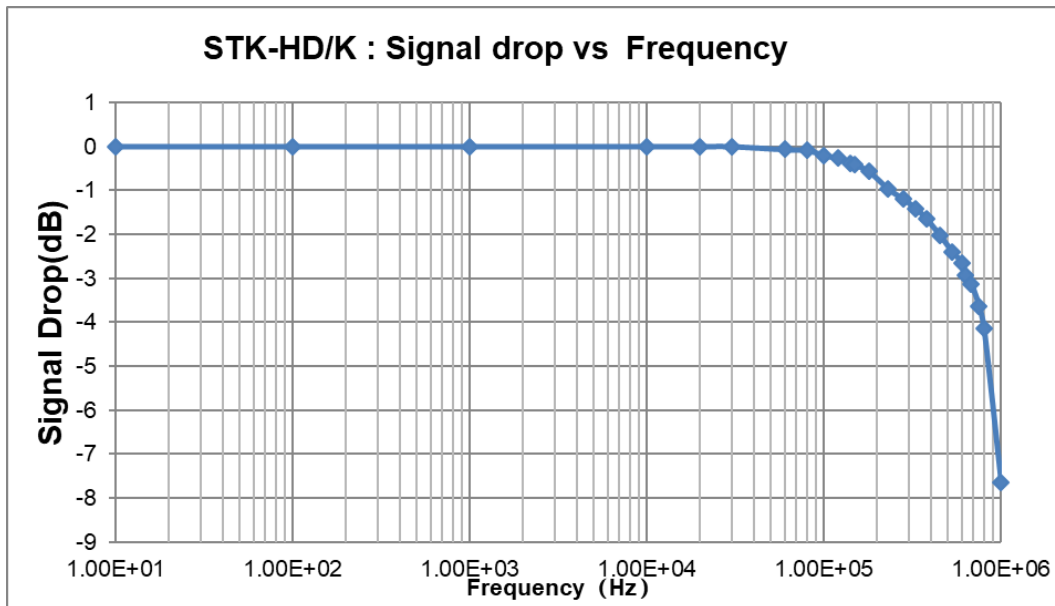


The dependence of Vout&Vref of STK-40HD/K on the primary current.



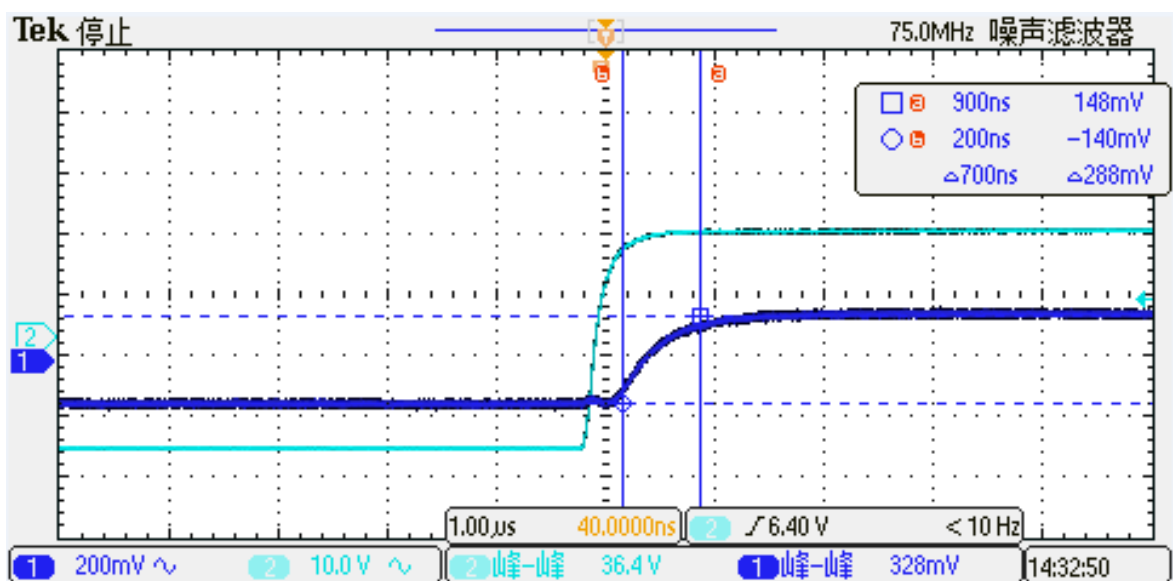
The dependence of Vout&Vref of STK-50HD/K on the primary current.

7. Frequency band width



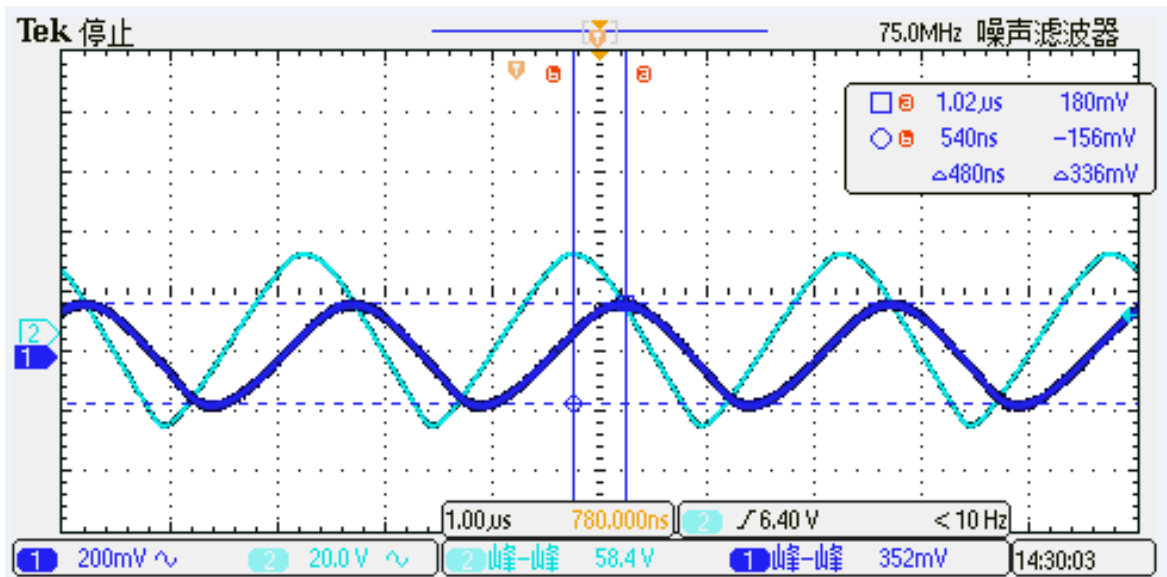
The frequency band width of STK-HD/K series current sensors.

8. Step response time

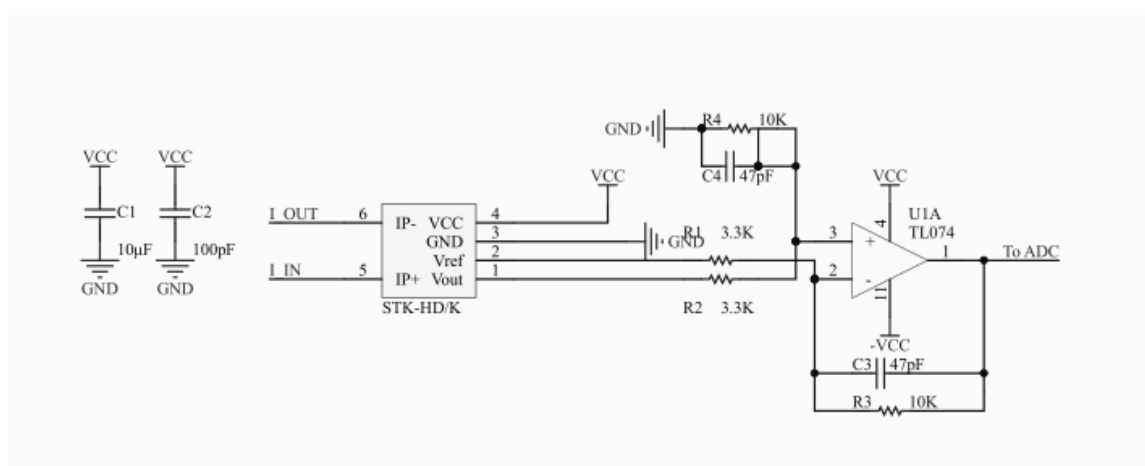


The step response time of STK-HD/K current sensors. The light blue is primary current, while the dark blue is output signal of current sensor. The step response time is less than 1.0 µs.

9. Delaytime

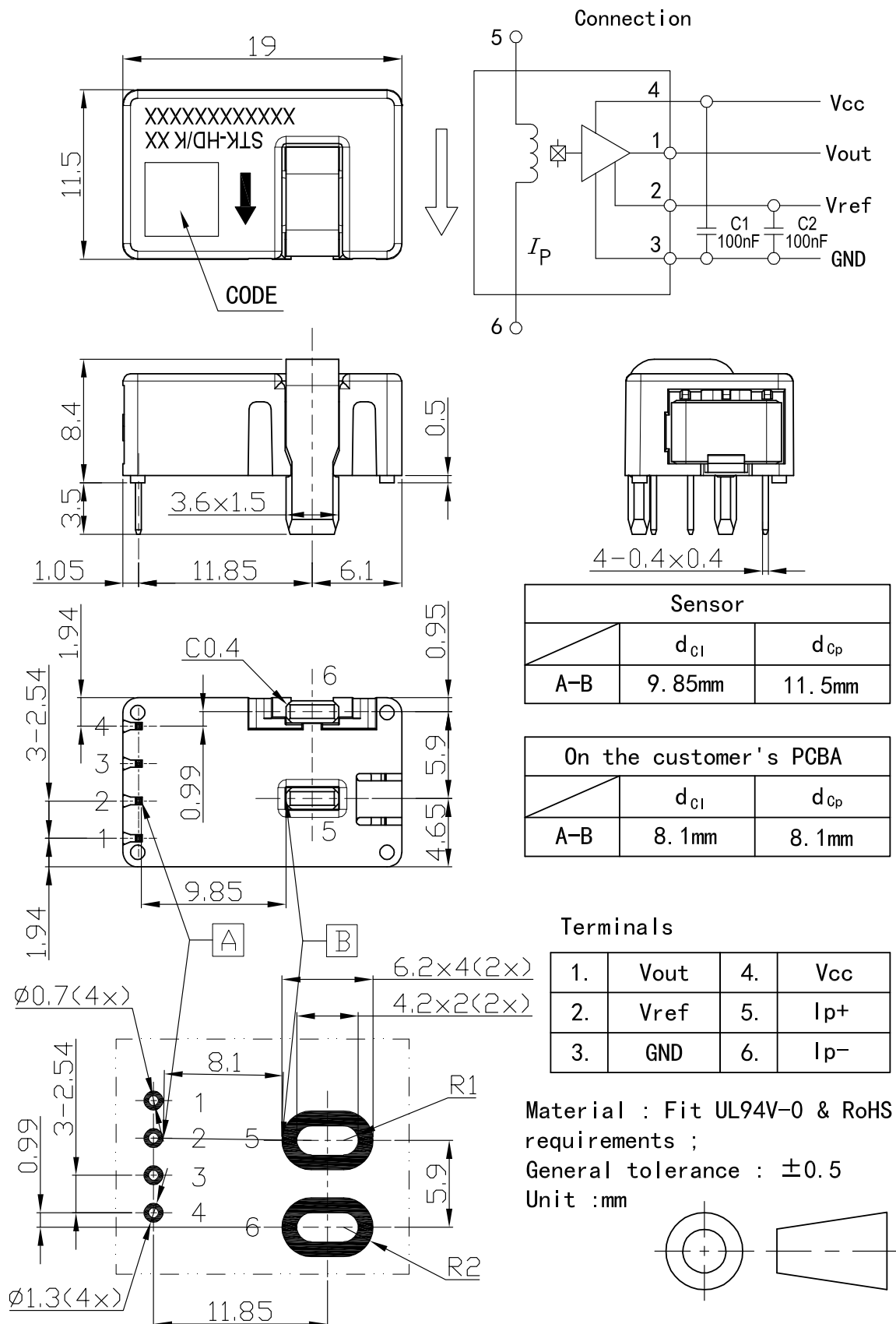


When detecting the primary current with a frequency of 400 kHz. The delay time from the primary current (light blue) to the output of the sensor (dark blue) is around 0.5 μ s.



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

11. Dimensions & Pins & Footprint



规格书修订履历

编写	审核	版本	修订内容	修订日期
张新传	朱海华	V1.0	增加 STK-40HD/K 产品规格	2021-03-05
张新传	朱海华	V1.1	增加 STK-32HD/K & STK-50HD/K 产品规格；增加 HD/K 的爬电距离参数；尺寸图纸更新	2021-03-24
张新传	朱海华	V1.2	更改产品 PCB 引脚定义顺序，更正部分结构尺寸大小	2021-04-08
张新传	白建民	V1.3	修改典型应用中引脚定义错误与产品质量参数	2021-04-23
张新传	朱海华	V1.4	增加 STK-20HD/K 产品规格与电流输出关系	2022-06-07
张新传	朱海华	V1.5	更改产品尺寸图，更改为卡扣版本外壳图（增加电流方向丝印）	2023-05-15
张新传	朱海华	V1.6	更改输出阻抗，从 1ohm 更改为 15ohm	2023-12-04