

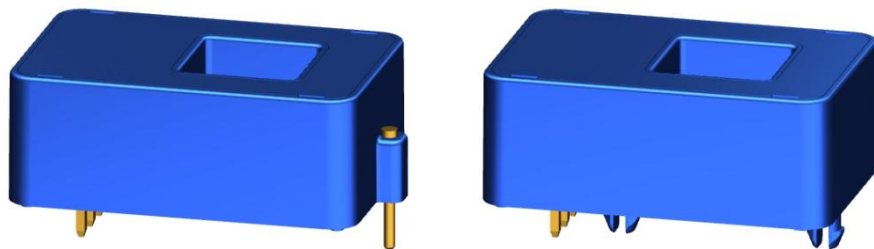
## Current Sensor

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Product Series: STK-CTS/P

Part number: STK-25CTS/P1、STK-32CTS/P1  
STK-25CTS/P2、STK-25CTS/P3、  
STK-25CTS/P4

Version: Ver5.2



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## 1. Description

The STK-CTS/P 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 <sub>A</sub>	°C	-40 ~ 105
Storage temperature	T <sub>stg</sub>	°C	-40 ~ 105
Mass	m	g	10

Remark 1: The product will not be damaged when used at 105 °C

### Absolute maximum rating

Parameter	Symbol	Unit	Value
Supply voltage	V <sub>cc</sub>	V	6
ESD rating (HBM)	U <sub>ESD</sub>	kV	4

Remark 2: 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	U <sub>d</sub>	kV	4	
Impulse withstand voltage 1.2/50μs	U <sub>w</sub>	kV	6	
Clearance distance (pri. -sec)	d <sub>Cl</sub>	mm	> 8	Space shortest distance
Creepage distance (pri. -sec)	d <sub>Cp</sub>	mm	> 8	Shortest distance along the body
Shell material			V0 according to UL 94	

## 2. Electrical data STK-25CTS/P1

Condition:  $T_A = 25^\circ\text{C}$ ,  $V_{CC} = 5\text{V}$

Parameter	Symbol	Unit	Min	Typ	Max	Comment
Primary nominal current	I <sub>pn</sub>	A		25		
Primary current measuring range	I <sub>pm</sub>	A	-25		25	
Supply voltage	V <sub>cc</sub>	V	4.75	5	5.25	
Current consumption	I <sub>cc</sub>	mA		5	10	
Rated output voltage	V <sub>FS</sub>	V		±2		(V <sub>out @ ±I<sub>pn</sub></sub> ) – V <sub>off</sub>
Internal output resistance	R <sub>out</sub>	Ω		1		@V <sub>out</sub>
Quiescent voltage	V <sub>off</sub>	V	2.48	2.5	2.52	V <sub>out @ 0 A</sub>
Theoretical gain	G <sub>th</sub>	mV/A		80		2 V @ I <sub>pn</sub>
Non-linearity	Non-L	%I <sub>pn</sub>		0.5		±I <sub>pn</sub>
reaction time	t <sub>ra</sub>	μs		0.5		@10% of I <sub>PN</sub>
Step response time	t <sub>res</sub>	μs		1		@90% of I <sub>PN</sub>
Delay time	t <sub>delay</sub>	μs		1		@400 kHz
-3dB band width	BW	kHz		400		Back-end non-RC circuit
Noise DC ~ 10 kHz DC ~ 100 kHz	V <sub>noise</sub>	mVpp		15 25		
Accuracy @ RT	X	% of I <sub>pn</sub>	-1		1	@ 25°C
Accuracy	X <sub>TRange</sub>	% of I <sub>pn</sub>	-2.5		2.5	-40°C ~ 85°C

Note:

1. Accuracy @ RT,  $X = ((V_{out @ I_n @ 25^\circ\text{C}}) - (G_{fit} * I_n + V_{off @ 25^\circ\text{C}})) / V_{FS}$ , Here  $I_n$  is the current test current.  $G_{fit}$  is the normal temperature fitting gain.

2. Accuracy,  $X_{TRange} = ((V_{out @ I_n @ T_x}) - (G_{fit@25^\circ\text{C}} * I_n + V_{off @ 25^\circ\text{C}})) / V_{FS}$ , The fitting gain of the product at  $G_{fit@25^\circ\text{C}}$  is 25 °C.

### 3. Electrical data STK-32CTS/P1

 Condition:  $T_A = 25^{\circ}\text{C}$ ,  $V_{CC} = 5\text{V}$ 

Parameter	Symbol	Unit	Min	Typ	Max	Comment
Primary nominal current	$I_{pn}$	A	-12.8		12.8	
Primary current measuring range	$I_{pm}$	A	-32		12.8	
Supply voltage	$V_{CC}$	V	4.75	5	5.25	
Current consumption	$I_{CC}$	mA		5	10	
Rated output voltage	$V_{FS}$	V		$\pm 0.8$		$(V_{out} @ \pm I_{pn}) - V_{off}$
Internal output resistance	$R_{out}$	$\Omega$		1		@ $V_{out}$
Quiescent voltage	$V_{off}$	V	2.48	2.5	2.52	$V_{out} @ 0\text{A}$
Theoretical gain	$G_{th}$	mV/A		62.5		$0.8\text{V} @ I_{pn}$
Non-linearity	Non-L	% $I_{pn}$		0.5		$\pm I_{pn}$
reaction time	$t_{ra}$	$\mu\text{s}$		0.5		@10% of $I_{PN}$
Step response time	$t_{res}$	$\mu\text{s}$		1		@90% of $I_{PN}$
Delay time	$t_{delay}$	$\mu\text{s}$		1		@400 kHz
-3dB band width	BW	kHz		400		Back-end non-RC circuit
Noise DC ~ 10 kHz DC ~ 100 kHz	$V_{noise}$	mVpp		15 25		
Accuracy @ RT	X	% of $I_{pn}$	-1		1	@ $25^{\circ}\text{C}$ When $I < I_{pn}$ $\Delta I (\text{max}) \leq 0.128A$
Accuracy	$X_{TRange}$	% of $I_{pn}$	-2		2	@ $-40^{\circ}\text{C} \sim 85^{\circ}\text{C}$ When $I < I_{pn}$ $\Delta I (\text{max}) \leq 0.256A$
Accuracy @ RT	X	% of $I_{pm}$	-0.8		0.8	@ $25^{\circ}\text{C}$ When $I_{pn} < I < I_{pm}$ $\Delta I (\text{max}) \leq 0.256A$
Accuracy	$X_{TRange}$	% of $I_{pm}$	-1.5		1.5	@ $-40^{\circ}\text{C} \sim 85^{\circ}\text{C}$ When $I_{pn} < I < I_{pm}$ $\Delta I (\text{max}) \leq 0.48A$

Note:

3. Accuracy @ RT,  $X = ((V_{out} @ I_n @ 25^{\circ}\text{C}) - (G_{fit} * I_n + V_{off} @ 25^{\circ}\text{C})) / V_{FS}$ , Here  $I_n$  is the current test current.  $G_{fit}$  is the normal temperature fitting gain.

4. Accuracy,  $X_{TRange} = ((V_{out} @ I_n @ T_x) - (G_{fit@25^{\circ}\text{C}} * I_n + V_{off} @ 25^{\circ}\text{C})) / V_{FS}$ , The fitting gain of the product at  $G_{fit@25^{\circ}\text{C}}$  is  $25^{\circ}\text{C}$ .

## 4. Electrical data STK-25CTS/P2

Condition:  $T_A = 25^{\circ}\text{C}$ ,  $V_{CC} = 5\text{V}$

Parameter	Symbol	Unit	Min	Typ	Max	Comment
Primary nominal current	$I_{pn}$	A		25		
Primary current measuring range	$I_{pm}$	A	-25		25	
Supply voltage	$V_{CC}$	V	4.75	5	5.25	
Current consumption	$I_{CC}$	mA		5	10	
Rated output voltage	$V_{FS}$	V		$\pm 1.25$		$(V_{out} @ \pm I_{pn}) - V_{off}$
Internal output resistance	$R_{out}$	$\Omega$		1		@ $V_{out}$
Quiescent voltage	$V_{off}$	V	1.63	1.65	1.67	$V_{out} @ 0\text{A}$
Theoretical gain	$G_{th}$	mV/A		50		$1.25\text{V} @ I_{pn}$
Non-linearity	Non-L	% $I_{pn}$		0.5		$\pm I_{pn}$
reaction time	$t_{ra}$	$\mu\text{s}$		0.5		@10% of $I_{PN}$
Step response time	$t_{res}$	$\mu\text{s}$		1		@90% of $I_{PN}$
Delay time	$t_{delay}$	$\mu\text{s}$		1		@400 kHz
-3dB band width	BW	kHz		400		Back-end non-RC circuit
Noise DC ~ 10 kHz DC ~ 100 kHz	$V_{noise}$	mVpp		15 25		
Accuracy @ RT	X	% of $I_{pn}$	-1		1	@ $25^{\circ}\text{C}$
Accuracy	$X_{TRange}$	% of $I_{pn}$	-2.5		2.5	$-40^{\circ}\text{C} \sim 85^{\circ}\text{C}$

Note:

5. Accuracy @ RT,  $X = ((V_{out} @ I_n @ 25^{\circ}\text{C}) - (G_{fit} * I_n + V_{off} @ 25^{\circ}\text{C})) / V_{FS}$ , Here  $I_n$  is the current test current.  $G_{fit}$  is the normal temperature fitting gain.

6. Accuracy,  $X_{TRange} = ((V_{out} @ I_n @ T_x) - (G_{fit@25^{\circ}\text{C}} * I_n + V_{off} @ 25^{\circ}\text{C})) / V_{FS}$ , The fitting gain of the product at  $G_{fit@25^{\circ}\text{C}}$  is  $25^{\circ}\text{C}$ .

## 5. Electrical data STK-25CTS/P3

Condition:  $T_A = 25^\circ\text{C}$ ,  $V_{CC} = 5\text{V}$

Parameter	Symbol	Unit	Min	Typ	Max	Comment
Primary nominal current	I <sub>pn</sub>	A		25		
Primary current measuring range	I <sub>pm</sub>	A	-25		25	
Supply voltage	V <sub>cc</sub>	V	4.75	5	5.25	
Current consumption	I <sub>cc</sub>	mA		5	10	
Rated output voltage	V <sub>FS</sub>	V		±2		(V <sub>out @ ±I<sub>pn</sub></sub> ) – V <sub>off</sub>
Internal output resistance	R <sub>out</sub>	Ω		1		@V <sub>out</sub>
Quiescent voltage	V <sub>off</sub>	V	2.48	2.5	2.52	V <sub>out @ 0 A</sub>
Theoretical gain	G <sub>th</sub>	mV/A		80		2 V @ I <sub>pn</sub>
Non-linearity	Non-L	%I <sub>pn</sub>		0.5		±I <sub>pn</sub>
reaction time	t <sub>ra</sub>	μs		0.5		@10% of I <sub>PN</sub>
Step response time	t <sub>res</sub>	μs		1		@90% of I <sub>PN</sub>
Delay time	t <sub>delay</sub>	μs		1		@400 kHz
-3dB band width	BW	kHz		400		Back-end non-RC circuit
Noise DC ~ 10 kHz DC ~ 100 kHz	V <sub>noise</sub>	mVpp		15 25		
Accuracy @ RT	X	% of I <sub>pn</sub>	-1		1	@ 25°C
Accuracy	X <sub>TRange</sub>	% of I <sub>pn</sub>	-2.5		2.5	-40°C ~ 85°C

Note:

7. Accuracy @ RT,  $X = ((V_{out @ I_n @ 25^\circ\text{C}}) - (G_{fit} * I_n + V_{off @ 25^\circ\text{C}})) / V_{FS}$ , Here  $I_n$  is the current test current.  $G_{fit}$  is the normal temperature fitting gain.

Accuracy,  $X_{TRange} = ((V_{out @ I_n @ T_x}) - (G_{fit@25^\circ\text{C}} * I_n + V_{off @ 25^\circ\text{C}})) / V_{FS}$ , The fitting gain of the product at  $G_{fit@25^\circ\text{C}}$  is  $25^\circ\text{C}$ .

## 6. Electrical data STK-25CTS/P4

Condition:  $T_A = 25^\circ\text{C}$ ,  $V_{CC} = 5\text{V}$

Parameter	Symbol	Unit	Min	Typ	Max	Comment
Primary nominal current	$I_{pn}$	A		25		
Primary current measuring range	$I_{pm}$	A	-25		25	
Supply voltage	$V_{CC}$	V	4.75	5	5.25	
Current consumption	$I_{CC}$	mA		5	10	
Rated output voltage	$V_{FS}$	V		$\pm 1.25$		$(V_{out} @ \pm I_{pn}) - V_{off}$
Internal output resistance	$R_{out}$	$\Omega$		1		@ $V_{out}$
Quiescent voltage	$V_{off}$	V	1.63	1.65	1.67	$V_{out} @ 0\text{A}$
Theoretical gain	$G_{th}$	mV/A		50		$1.25\text{V} @ I_{pn}$
Non-linearity	Non-L	% $I_{pn}$		0.5		$\pm I_{pn}$
reaction time	$t_{ra}$	$\mu\text{s}$		0.5		@10% of $I_{PN}$
Step response time	$t_{res}$	$\mu\text{s}$		1		@90% of $I_{PN}$
Delay time	$t_{delay}$	$\mu\text{s}$		1		@400 kHz
-3 dB band width	BW	kHz		400		Back-end non-RC circuit
Noise DC ~ 10 kHz DC ~ 100 kHz	$V_{noise}$	mVpp		15 25		
Accuracy @ RT	X	% of $I_{pn}$	-1		1	@ $25^\circ\text{C}$
Accuracy	$X_{TRange}$	% of $I_{pn}$	-2.5		2.5	$-40^\circ\text{C} \sim 85^\circ\text{C}$

Note:

8. Accuracy @ RT,  $X = ((V_{out} @ I_n @ 25^\circ\text{C}) - (G_{fit} * I_n + V_{off} @ 25^\circ\text{C})) / V_{FS}$ , Here  $I_n$  is the current test current.  $G_{fit}$  is the normal temperature fitting gain.

Accuracy,  $X_{TRange} = ((V_{out} @ I_n @ T_x) - (G_{fit}@25^\circ\text{C} * I_n + V_{off} @ 25^\circ\text{C})) / V_{FS}$ , The fitting gain of the product at  $G_{fit}@25^\circ\text{C}$  is  $25^\circ\text{C}$ .

## 7. Frequency band width

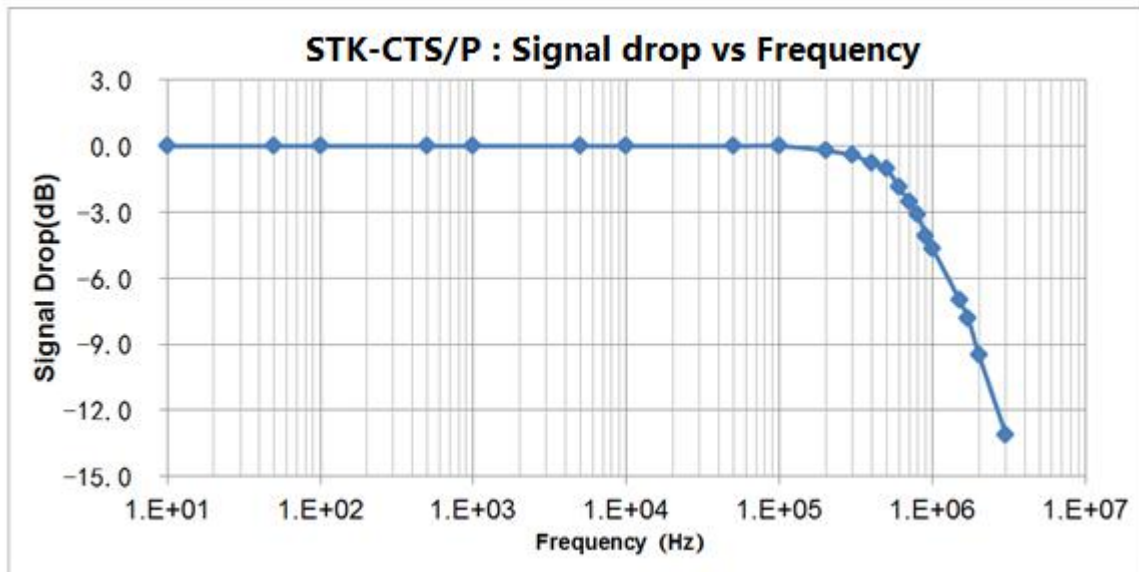


Fig.1 the band width of STK-CTS/P series current sensors. The bandwidth of the sensor is in the range of DC ~400 kHz (-3 dB).

## 8. Response time & noise with typical circuit

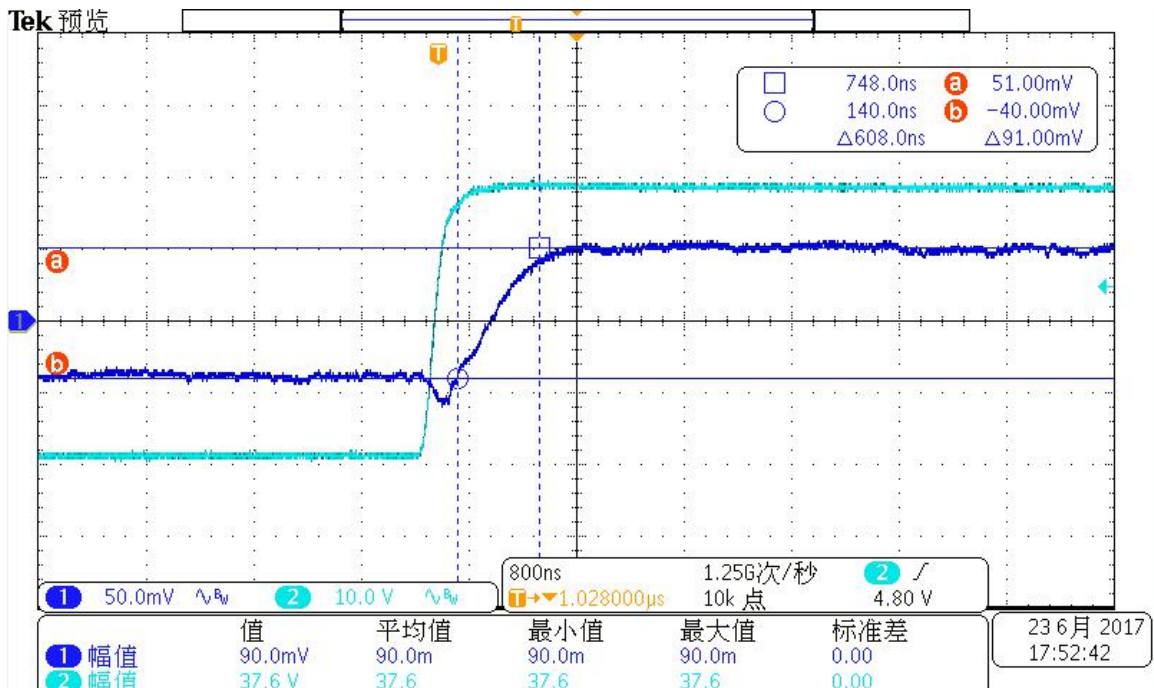


Fig.2 the step response time of STK-CTS/P current sensors. The light blue is primary current, while the dark blue is output signal of current sensor. The delay from 90% of the original current signal to 90% of the output of the sensor is less than 1µs.

## 9. Frequency delay performace

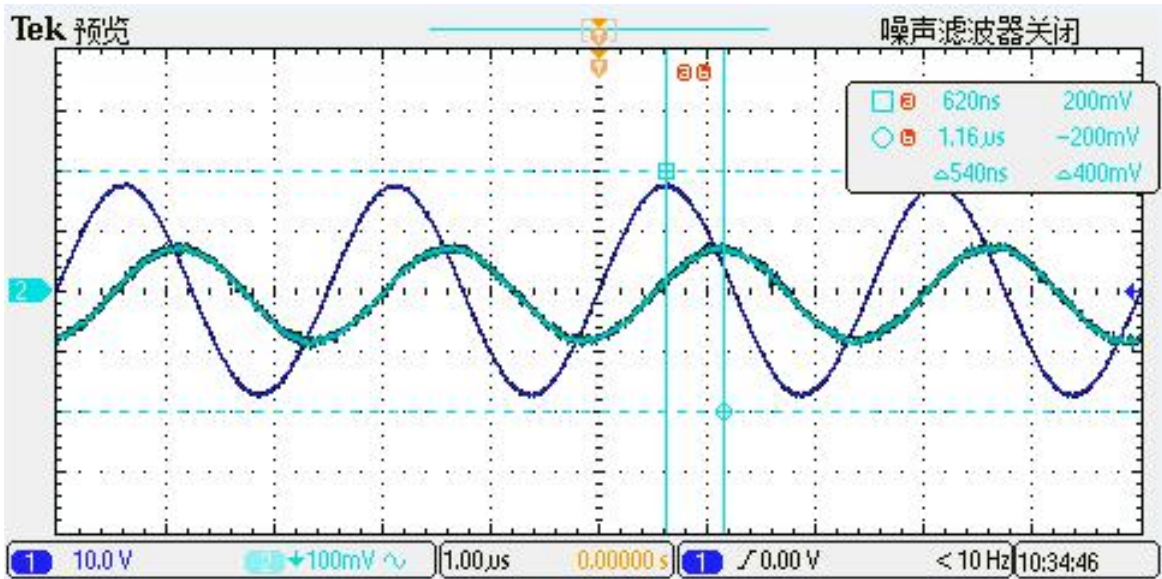
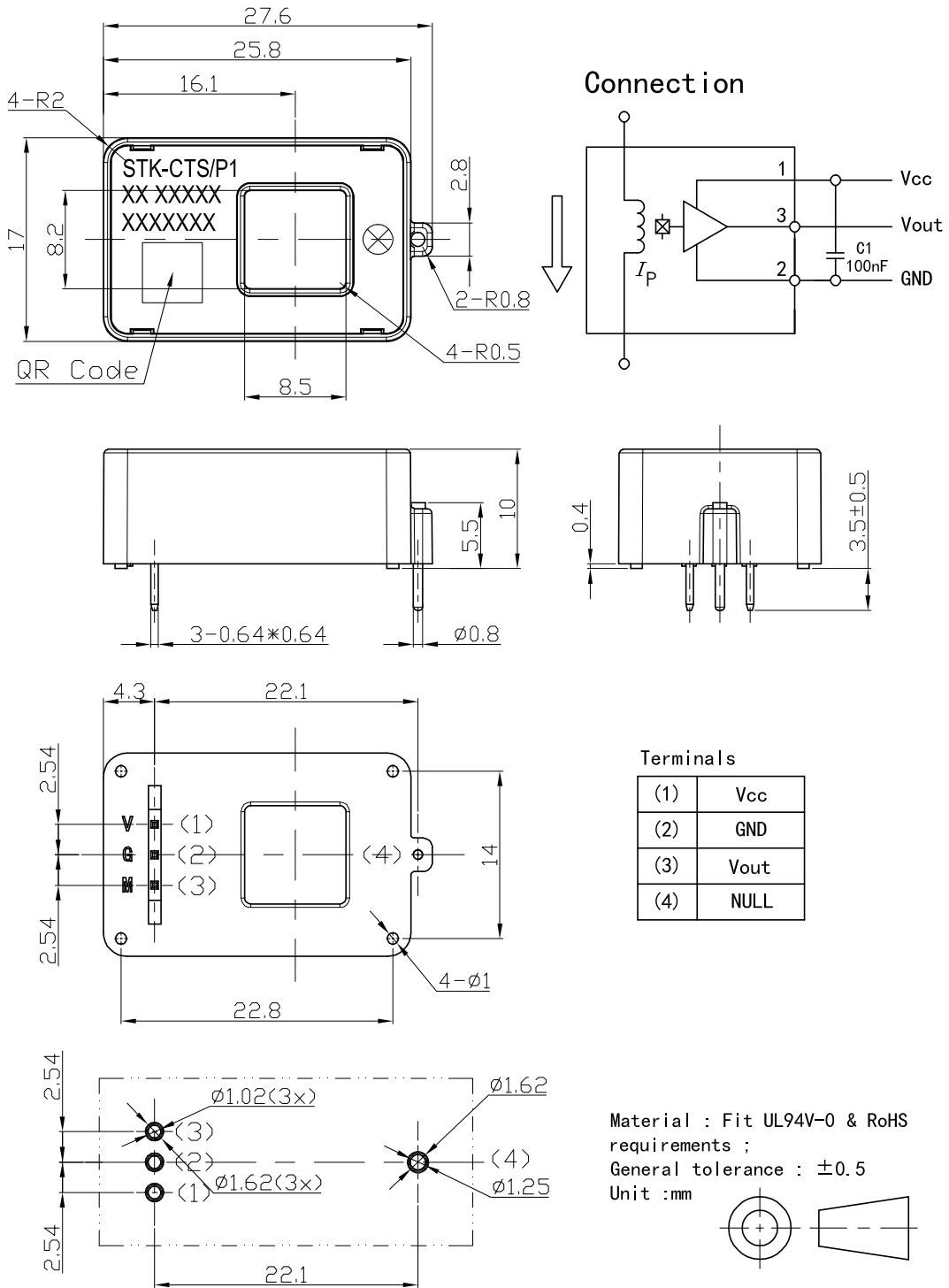
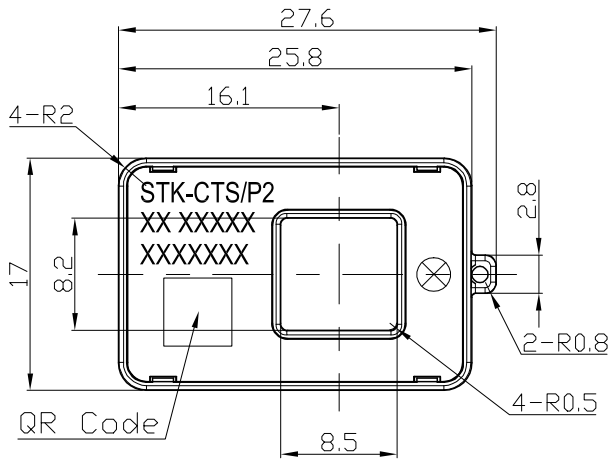


Fig.3 when detection the primary current with a frequency of 400 kHz. The typical results of the output of STK-CTS/P current sensor on the primary current delay characteristics. The delay time from primary current (light blue) to the output of the sensor (dark blue) is less than us.

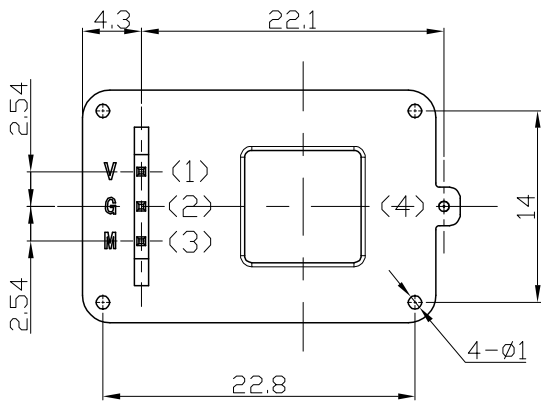
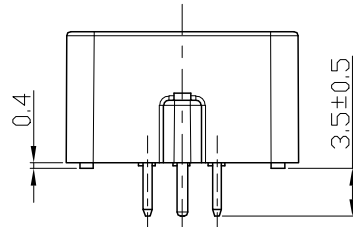
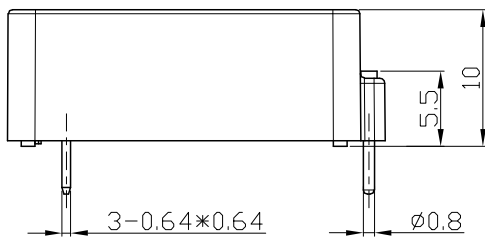
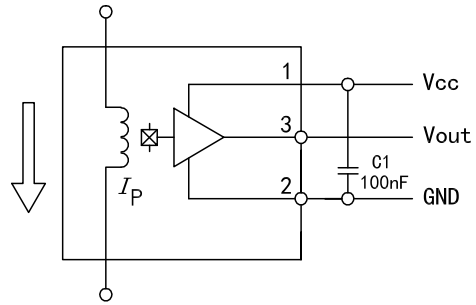
### 10. STK-CTS/P1 Dimensions & Pins & Footprint



## 11. STK-CTS/P2 Dimensions & Pins & Footprint

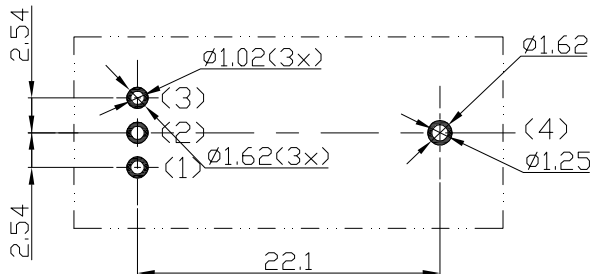


### Connection

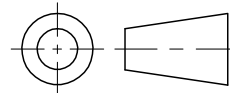


### Terminals

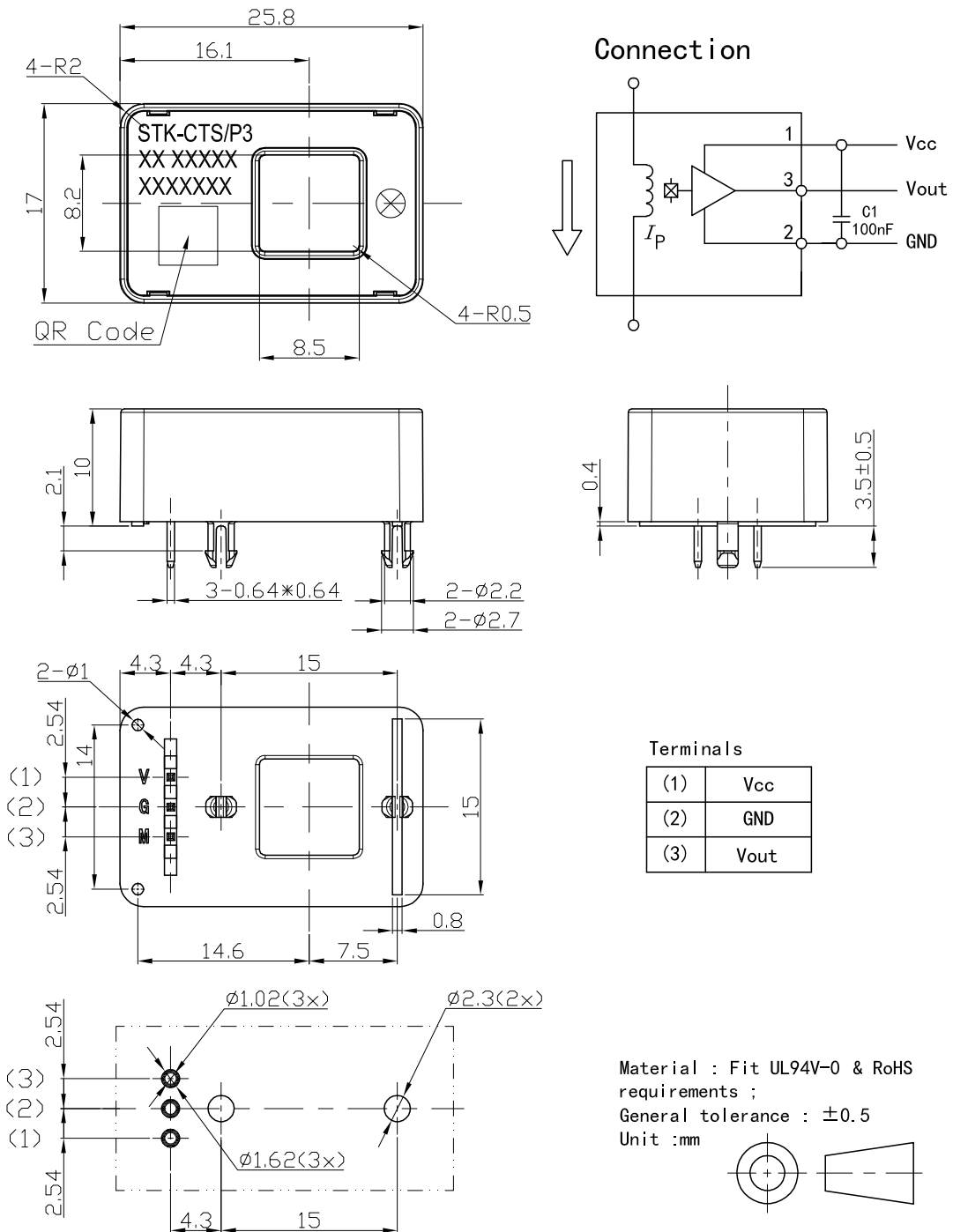
(1)	$V_{CC}$
(2)	GND
(3)	$V_{out}$
(4)	NULL



Material : Fit UL94V-0 & RoHS requirements ;  
General tolerance :  $\pm 0.5$   
Unit : mm



## 12. STK-25CTS/P3 Dimensions & Pins & Footprint



### 13. STK-25CTS/P4 Dimensions & Pins & Footprint

