



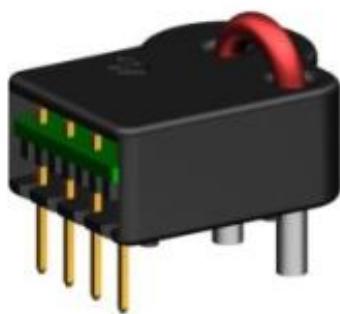
# CURRENT SENSOR

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PRODUCT SERIES: STK-HD/C

PRODUCT PART NUMBER: STK-20HD/C  
STK-40HD/C

REVISION: Ver 1.1



Sinomags Technology Co., Ltd.

Web site: [www.sinomags.com](http://www.sinomags.com)

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## 1. Description

STK-HD/C 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
- Direct-current dynamo
- PV string current detection
- MPPT
- Switched model power supplies  
(SMPS)

### 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	Ud	kV	4	
Impulse withstand voltage 1.2/50μs	Uw	kV	6	
Clearance distance (pri. -sec)	dCI	mm	9.6	Shortest distance through air
Creepage distance (pri. -sec)	dCp	mm	9.6	Shortest path along device body
Electrical clearance	-	mm	9	When mounted on PCB with recommended layout
Case material			V0 according to UL 94	
Comparative tracking index	CTI	V	600	

## 2. Electrical performance of STK-20HD/C

Parameter	Symbol	Unit	Min	Typ	Max	Comment
Primary nominal current rms	I_pn	A		20		
Supply voltage	Vcc	V	4.9	5	5.1	
Current consumption	Icc	mA		5	10	
Offset voltage	Voff	V	2.47	2.5	2.53	Vout @ 0 A
Reference voltage	Vref	V	2.48	2.5	2.5	internal voltage
Rated output voltage (Vout@I_pn) – Voff	V_FS	V		2		(Vout @ $\pm I_{pn}$ ) - Voff
Theoretical gain	G_th	mV/A		100		
Internal output resistance	R_out	$\Omega$		12		
OCD range ①	VOC	V	0		3.3	
FOULT error	%		5%			% of OCD
OCD output mask time ②	Tmask	$\mu s$		3		
OCD output hold time ③	Thold			$\infty$		
Rated linearity error	Non-L	% $I_{pn}$		0.7		Within $\pm I_{pn}$
Reaction time	t_ra	$\mu s$		0.5		@ 10% of $I_{pn}$
Step response time	t_res	$\mu s$		1.0		@ 90% of $I_{pn}$
Delay time	t_delay	$\mu s$		0.5		400 kHz sine wave
Frequency bandwidth (-3dB)	BW	kHz		400		No RC circuit
Output voltage noise DC ~ 10 kHz DC ~ 100 kHz	Vnoise	mVpp		8 10		@250kHz Sampling Rate
Primary current, detection threshold ④	I_pth	A		3.3* $I_{pn}$		overcurrent detection OCD
Accuracy @ 25°C	X	% of $I_{pn}$	-1		1	@ 25°C
Accuracy @ -40°C~105°C ⑤	X_TRange	% of $I_{pn}$	-3		3	-40°C ~ 105°C

Remarks:

- ①. The OCD trigger voltage = Vref +/- VOC. VOC voltage can be input by external voltage, but VOC shall be less than Vcc - 1.7 V. Refer the sections of “OCD function” & “General information on OCD” for more details.
- ②. The default time for OCD Fault Mask Time is 2 us, while it can be set as 0, 1, 2, 3 us per demand.
- ③. The default time for OCD Fault Hold Time is infinite , while it can be set as 0, 1.5, 3, 4.5 ms per demand.
- ④. STK-HD/C products may be ordered on request with a dedicated setting of the Trigger current . The product has a built-in overcurrent detection function, When the output voltage detected by the product exceeds the threshold, it is judged to be overcurrent and the output of fault pin changes to low level .
- ⑤. Accuracy,X\_TRange = ((Vout @ In @ T\_x) – (G\_fit@25°C \* In+Voff @ 25°C )) / V\_FS,The fitting gain of the product at G\_fit@25 °C is 25 °C.

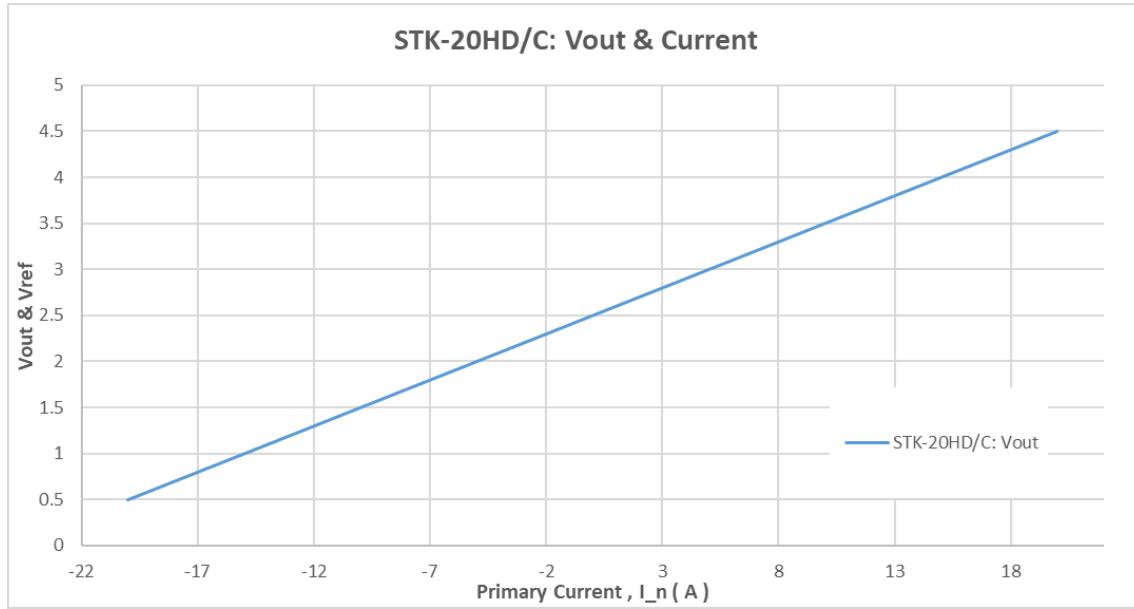
### 3. Electrical performance of STK-40HD/C

Parameter	Symbol	Unit	Min	Typ	Max	Comment
Primary nominal current rms	I_pn	A		40		
Supply voltage	Vcc	V	4.9	5	5.1	
Current consumption	Icc	mA		5	10	
Offset voltage	Voff	V	2.47	2.5	2.53	Vout @ 0 A
Reference voltage	Vref	V	2.48	2.5	2.5	internal voltage
Rated output voltage (Vout@I_pn) – Voff	V_FS	V		2		
Theoretical gain	G_th	mV/A		50		
Internal output resistance	R_out	Ω		12		
OCD range ①	VOC	V	0		3.3	
FOULT error	%		5%			% of OCD
OCD output mask time ②	Tmask	μs		3		
OCD output hold time ③	Thold			∞		
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		400		No RC circuit
Output voltage noise DC ~ 10 kHz DC ~ 100 kHz	Vnoise	mVpp		8 10		@250kHz Sampling Rate
Primary current, detection threshold ④	I_pth	A		3.3* I_pn		overcurrent detection OCD
Accuracy @ 25°C	X	% of I_pn	-1		1	@ 25°C
Accuracy @ -40°C~105°C ⑤	X_TRange	% of I_pn	-3		3	-40°C ~ 105°C

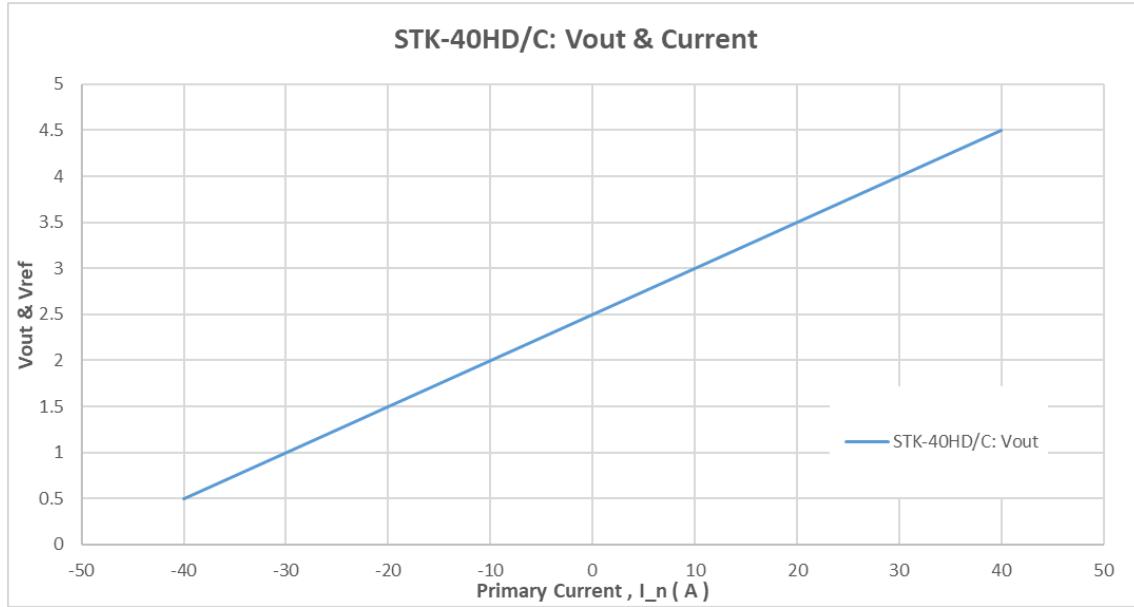
#### Remarks:

- ①. The OCD trigger voltage = Vref +/- VOC. VOC voltage can be input by external voltage, but VOC shall be less than Vcc - 1.7 V. Refer the sections of “OCD function” & “General information on OCD” for more details.
- ②. The default time for OCD Fault Mask Time is 2 us, while it can be set as 0, 1, 2, 3 us per demand.
- ③. The default time for OCD Fault Hold Time is infinite , while it can be set as 0, 1.5, 3, 4.5 ms per demand.
- ④. STK-HD/C products may be ordered on request with a dedicated setting of the Trigger current . The product has a built-in overcurrent detection function, When the output voltage detected by the product exceeds the threshold, it is judged to be overcurrent and the output of fault pin changes to low level .
- ⑤. Accuracy,X\_TRange = ((Vout @ In @ T\_x) – (G\_fit@25°C \* In+Voff @ 25°C)) / V\_FS,The fitting gain of the product at G\_fit@25 °C is 25 °C.

#### 4. Output voltage VS primary current of STK-HD/C

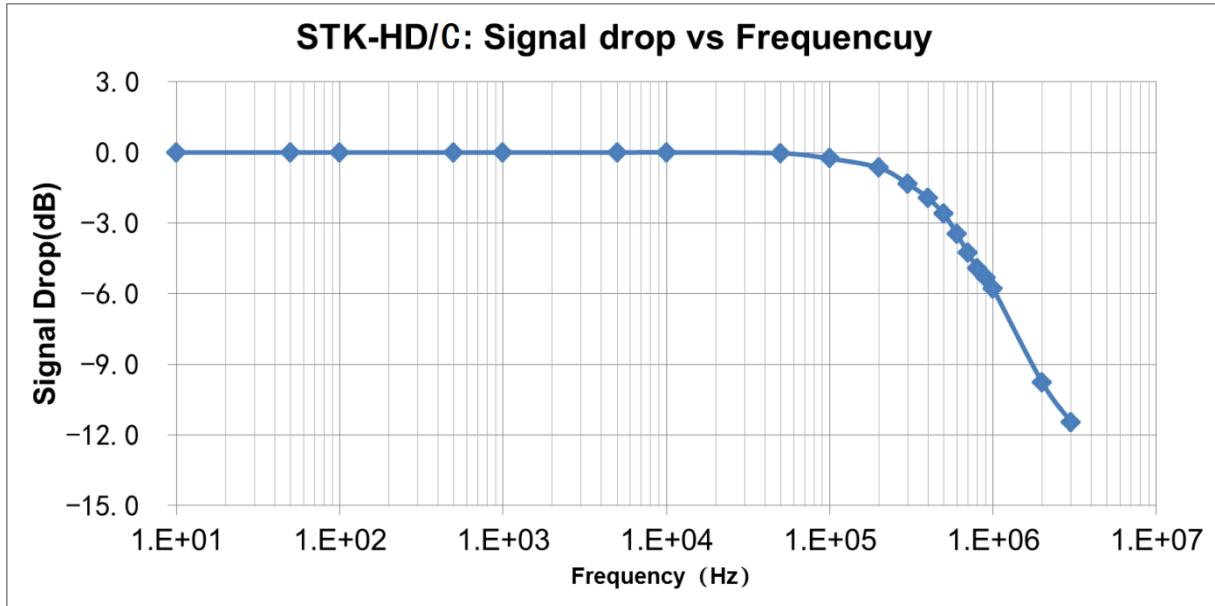


The dependence of  $V_{out}$ & $V_{ref}$  of STK-20HD/C on the primary current.



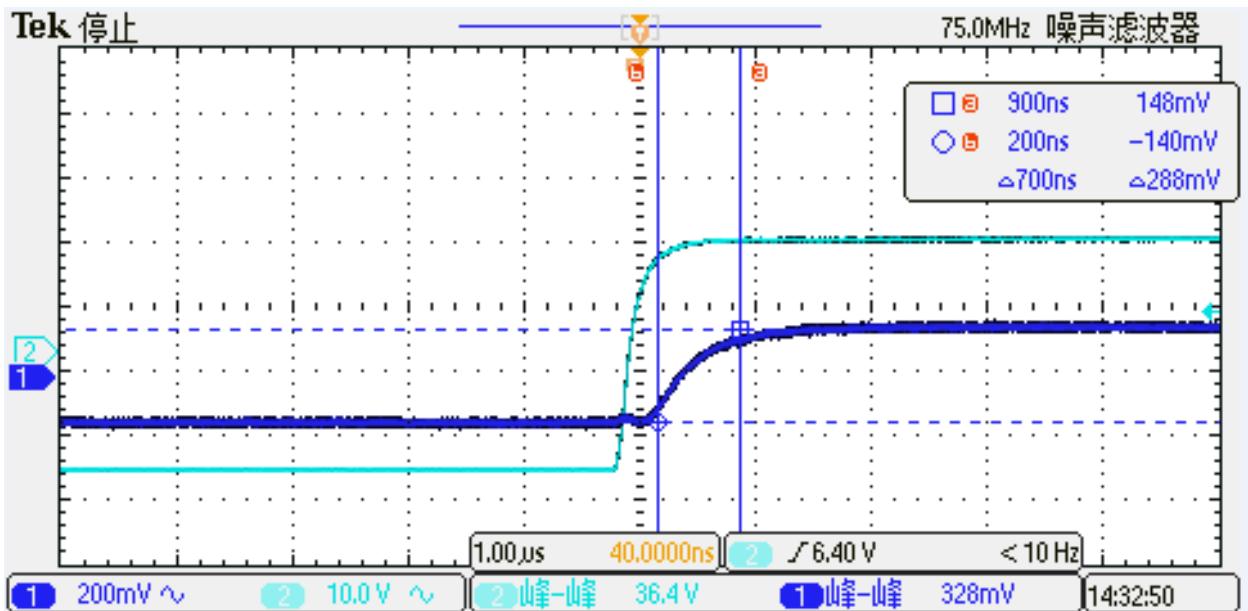
The dependence of  $V_{out}$ & $V_{ref}$  of STK-40HD/C on the primary current.

## 5. Frequency band width



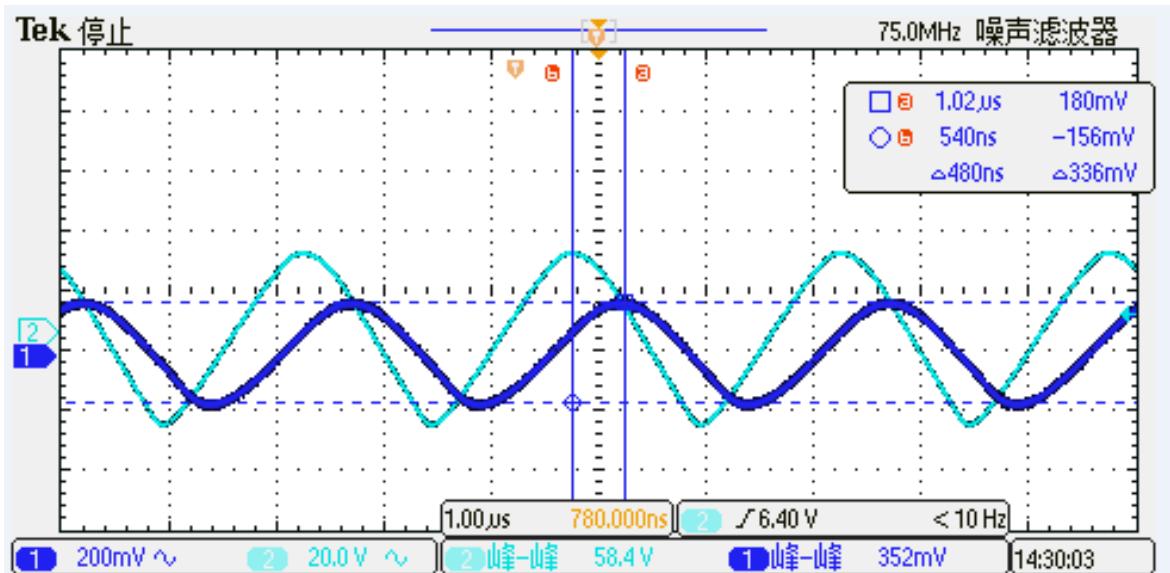
The frequency band width of STK-HD/C series current sensors.

## 6. Step response time



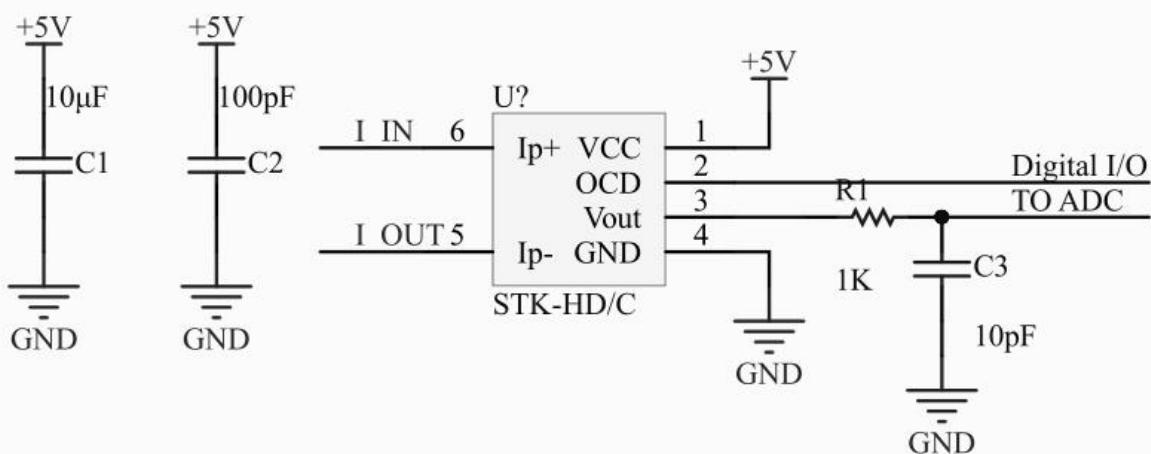
The step response time of STK-HD/C current sensors. The light blue is primary current, while the dark blue is output signal of current sensor. The step response time is less than 1.0μs.

## 7. 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  $\mu$ s.

## 8. Typical application circuits for STK-HD/C



Typical application circuits for STK-HD/C current sensor.

R1 (kohm)	C3 (pF)	Theoretical -3dB $f = 1/(2\pi RC)$ (kHz)	Tested -3dB (kHz)
20	20	398	~400
20	81	98	~100
20	810	10	~10

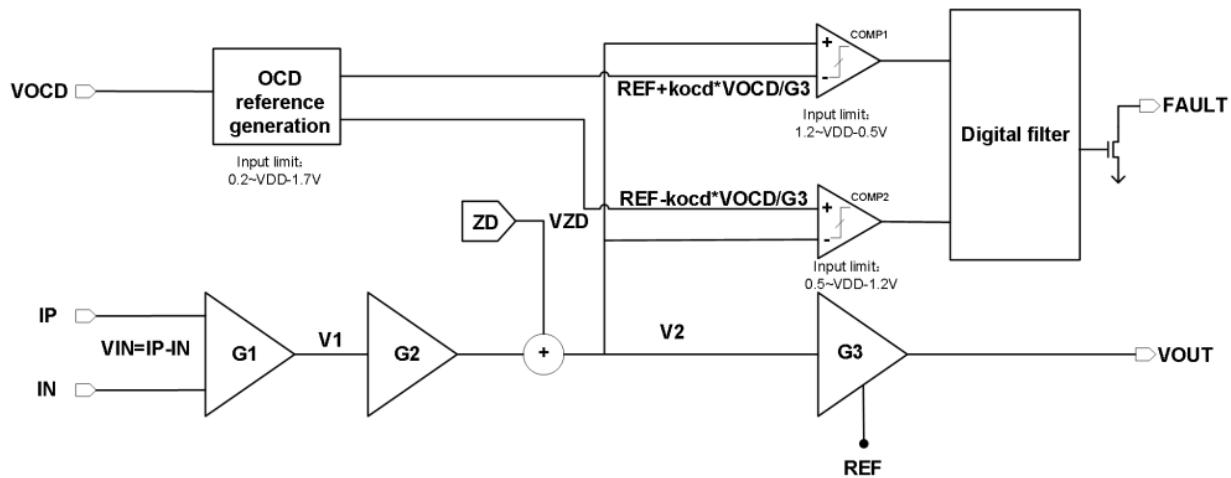
The frequency characteristics of STK-HD/C series current sensor are not affected by the R-C setting (according to recommended R-C setting), therefore the active filter circuit or R-C circuit can be applied to modulate the sensor's frequency characteristics.

## 9. General information on OCD

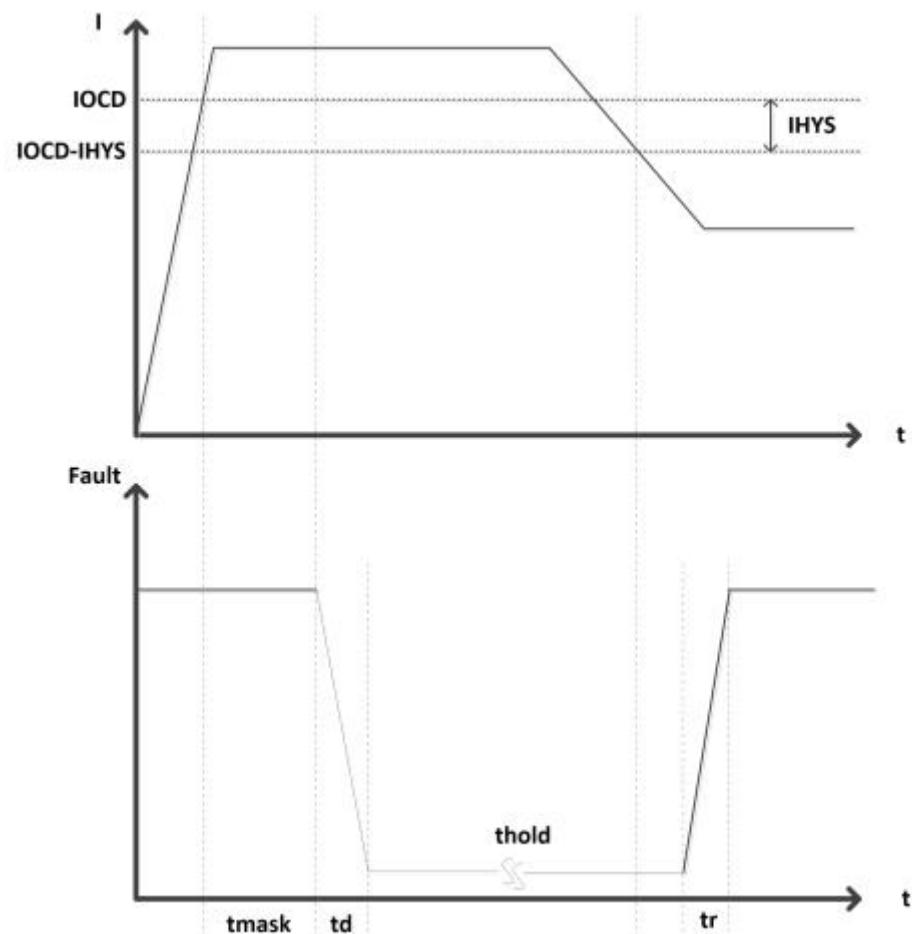
This section describes the general information on OCD function, the specific functions, which are not listed in the section of "electrical data", can be defined per request.

Since the trigger voltage is set after the second amplifier, the OCD function supports that the trigger current can be higher than  $I_{pn}$ . The trigger voltage can be defined:

- a)  $V_{ref} = 2.5 \text{ V}$ ;
- b)  $V_{OC} \leq V_{cc} - 1.7 \text{ V}$ ;
- c) Trigger voltage =  $V_{ref} +/ - V_{OC} * K_{ocd}$ ;
- d) Trigger current =  $(V_{ref} +/ - V_{OC} * K_{ocd} - V_{off}) / G_{th}$ ;



Functional Block Diagram on OCD function when  $V_{ref} = 2.5 \text{ V}$  or  $1.65 \text{ V}$ .

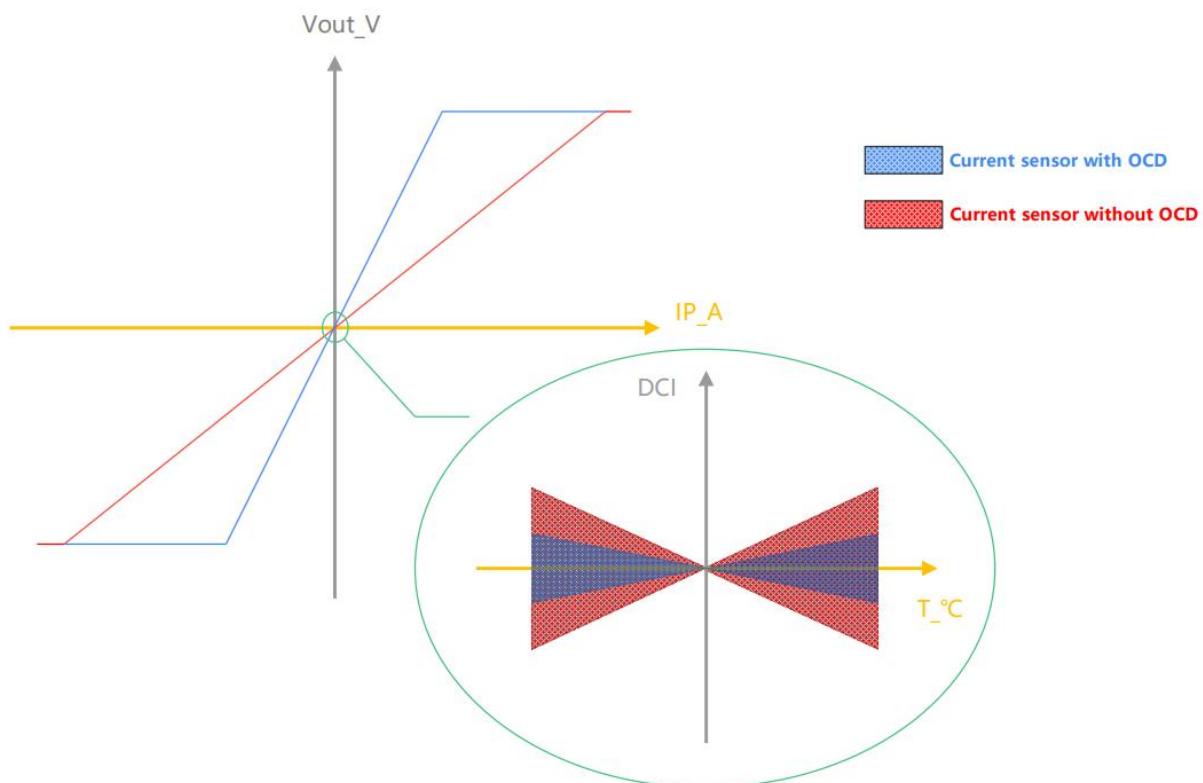
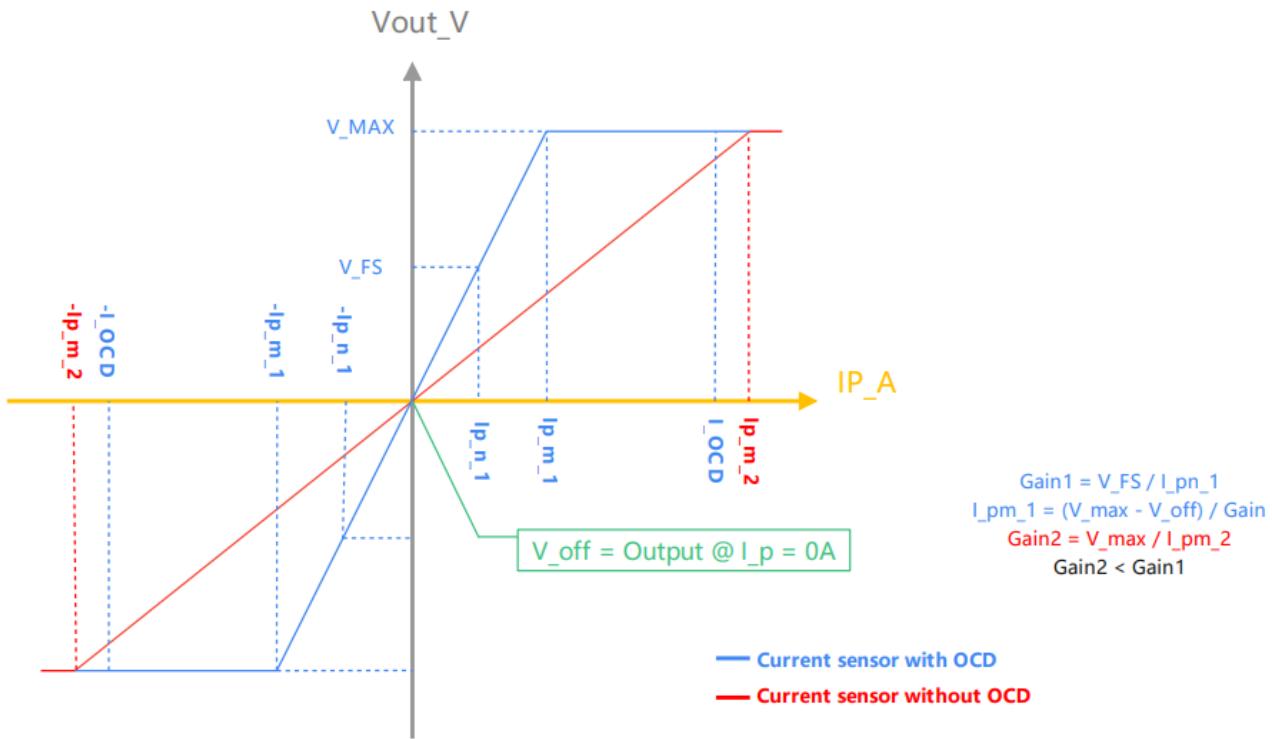


The above plot shows the definition on the time in OCD function. The typical value for  $t_{mask}$  &  $thold$  is that  $t_{mask} = 3\mu s$  , and  $thold = \infty$  . The overcurrent detection function can also set  $t_{mask}$  and  $thold$  time:

Tmask:set	Value
1	0 $\mu s$
2	1 $\mu s$
3	2 $\mu s$
4	3 $\mu s$

Thold:set	Value
1	0ms
2	1.5ms
3	3ms
4	4.5ms
5	$\infty$

## 10. OCD function of current sensor



As shown in the figure, products with OCD function can achieve smaller DC component.

## 11. Dimensions & Pins & Footprint

