



# CURRENT SENSOR

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PRODUCT SERIES: STK-HO/1

PRODUCT PARNUMBER: STK-100HO/1

STK-200HO/1

REVISION: Ver 1.0



Sinomags Technology Co., Ltd.

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## 1. Description

STK-HO/1 current sensor is based on the open loop principle. DC, AC, pulses and any kind of irregular wave can be measured by the current sensor under the isolated conditions.

### Typical application

- AC Variable speed drives
- Power supplies for welding applications
- Switched model power supplies (SMPS)
- Battery supplied applications
- UPS
- MPPT
- Static converters for DC motor drives
- Combiner box

### General parameters

Parameter	Symbol	Unit	Value
Working temperature	T_a	C°	-40 ~ 105
Storage temperature	T_stg	C°	-40 ~ 105
Mass	m	g	33.7

### Absolute parameters

Parameters	Symbol	Unit	Value
Supply voltage (not-destructive)	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	Ud	kV	4.3	@ 50Hz/1 min
Impulse withstand voltage	Ūw	kV	8	1.2/50μs
Case material	-	-	V0	According to UL 94
Comparative tracking index	CTI	-	600	
Clearance (pri. - sec.)	D_ci	mm	>8	Shortest distance through air
Creepage distance (pri. - sec.)	D_cp	mm	>8	When mounted on PCB with recommended layout

## 2. Electrical performance of STK-100HO/1

$V_{cc} = 5\text{ V}, T_A = 25^\circ\text{C}$

Parameter	Symbol	Unit	Min	Typ	Max	Comment
Primary nominal current rms	$I_{pn}$	A		100		STK-100HO/1
Primary current measuring range	$I_{pm}$	A	-300		300	STK-100HO/1
Supply voltage	$V_{cc}$	V	4.75	5	5.25	
Current consumption	$I_{cc}$	mA		6	10	
Reference voltage (output)	$V_{ref}$	V	2.48	2.5	2.52	Output function
Electrical offset voltage @ $I_P = 0\text{ A}$	$V_{oe}$	mV	-8		8	$V_{out} - V_{ref} @ V_{ref} = 2.5\text{ V}$
Electrical offset current referred to primary	$I_{oe}$	A	-1.28		1.28	
Output voltage range @ I P M	$V_{FS}$	V	-1.875		1.875	$((V_{out} - V_{ref}) @ I_{pm}) - V_{oe}$
Internal $V_{ref}$ resistance	$R_{ref}$	$\Omega$	4.5	12	19.5	Series
Internal output resistance	$R_{out}$	$\Omega$	4.5	12	19.5	Series
Difference of output resistance ( $R_{ref} - R_{out}$ )	$R_{oe}$	$\Omega$	-5		5	Series
OCD output mask time ①	$T_{mask}$	$\mu\text{s}$		2		
OCD output hold time ②	$T_{hold}$	ms		1.5		
Theoretical gain	$G$	mV/A		6.25		625 mV @ I P N
Temperature drift of $V_{oe}$	$V_{oe\_TR\ range}$	mV	-10		10	$-40^\circ\text{C} \sim 105^\circ\text{C}$
Error of gain	$Err\_G$	% $G_{th}$	-0.5		0.5	Trimmed in the factory @ $25^\circ\text{C}$
Temperature drift of gain	$G\_TR$	% $G_{th}$	-1		1	@ $-40^\circ\text{C} \sim 105^\circ\text{C}$
Rated linearity error	Non- $L_{pn}$	% $I_{pn}$	-0.5		0.5	Within $\pm I_{pn}$
Linearity error @ $I_{pm}$	Non- $L_{pm}$	% $I_{pm}$	-1		1	$\pm I_{pm}$
Step response time	$t_{res}$	$\mu\text{s}$		2	2.5	@ 90% of $I_{pn}$
Frequency bandwidth (-3dB)	BW	kHz		200		No RC circuit
Output voltage noise	$V_{noise}$	mVpp		4.4		@140kHz Sampling Rate
Primary current, detection threshold ③	$I_{pth}$	A		$3 * I_{pn}$		Peak value $\pm 10\%$ overcurrent detection OCD
Accuracy @ $25^\circ\text{C}$	X	% of $I_{pn}$	-1		1	@ $25^\circ\text{C}$
Accuracy @ $-40^\circ\text{C} \sim 105^\circ\text{C}$ ④	$X_{TR\ range}$	% of $I_{pn}$	-3		3	$-40^\circ\text{C} \sim 105^\circ\text{C}$

Remarks :

① ②. To prevent nuisance tripping, a tmask time is used. If an over current occurs, but does not persist for the duration of tmask, it does not trigger the fault pin. This prevents short transient spikes from causing erroneous fault detections. In the event where transient error reporting is desired, the tmask can be disabled. If the fault is triggered, it will remain active for a minimum time of thold and up to the end of the fault condition, whichever is greater.

③. STK-60HO/2 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 .

④. the accuracy @  $-40^{\circ}\sim 105^{\circ}$ ,  $X\_TRange = ((V_{out} - V_{ref})@ In @ T_x) - V_{oe@ 25^{\circ}} - G_{th} * In) / V_{FS}$ , where  $T_x$  represents present temperature,  $G_{th}$  is fitted gain at room temperature .

### 3. Electrical performance of STK-200HO/1

$V_{cc} = 5\text{ V}, T_A = 25^\circ\text{C}$

Parameter	Symbol	Unit	Min	Typ	Max	Comment
Primary nominal current rms	$I_{pn}$	A		200		STK-100HO/1
Primary current measuring range	$I_{pm}$	A	-600		600	STK-100HO/1
Supply voltage	$V_{cc}$	V	4.75	5	5.25	
Current consumption	$I_{cc}$	mA		6	10	
Reference voltage (output)	$V_{ref}$	V	2.48	2.5	2.52	Output function
Electrical offset voltage @ $I_P = 0\text{ A}$	$V_{oe}$	mV	-8		8	$V_{out} - V_{ref} @ V_{ref} = 2.5\text{ V}$
Electrical offset current referred to primary	$I_{oe}$	A	-2.56		2.56	
Output voltage range @ $I_P M$	$V_{FS}$	V	-1.875		1.875	$((V_{out} - V_{ref}) @ I_{pm}) - V_{oe}$
Internal $V_{ref}$ resistance	$R_{ref}$	$\Omega$	4.5	12	19.5	Series
Internal output resistance	$R_{out}$	$\Omega$	4.5	12	19.5	Series
Difference of output resistance ( $R_{ref} - R_{out}$ )	$R_{oe}$	$\Omega$	-5		5	Series
OCD output mask time ①	$T_{mask}$	$\mu\text{s}$		2		
OCD output hold time ②	$T_{hold}$	ms		1.5		
Theoretical gain	$G$	mV/A		3.125		625 mV @ $I_P N$
Temperature drift of $V_{oe}$	$V_{oe\_TR\text{ange}}$	mV	-10		10	$-40^\circ\text{C} \sim 105^\circ\text{C}$
Error of gain	$Err\_G$	% $G_{th}$	-0.5		0.5	Trimmed in the factory @ $25^\circ\text{C}$
Temperature drift of gain	$G\_TR$	% $G_{th}$	-1		1	@ $-40^\circ\text{C} \sim 105^\circ\text{C}$
Rated linearity error	$Non-L_{pn}$	% $I_{pn}$	-0.5		0.5	Within $\pm I_{pn}$
Linearity error @ $I_{pm}$	$Non-L_{pm}$	% $I_{pm}$	-1		1	$\pm I_{pm}$
Step response time	$t_{res}$	$\mu\text{s}$		2	2.5	@ 90% of $I_{pn}$
Frequency bandwidth (-3dB)	$BW$	kHz		200		No RC circuit
Output voltage noise	$V_{noise}$	mVpp		4.4		@140kHz Sampling Rate
Primary current, detection threshold ③	$I_{pth}$	A		$3 * I_{pn}$		Peak value $\pm 10\%$ overcurrent detection OCD
Accuracy @ $25^\circ\text{C}$	$X$	% of $I_{pn}$	-1		1	@ $25^\circ\text{C}$
Accuracy @ $-40^\circ\text{C} \sim 105^\circ\text{C}$ ④	$X_{TR\text{ange}}$	% of $I_{pn}$	-3		3	$-40^\circ\text{C} \sim 105^\circ\text{C}$

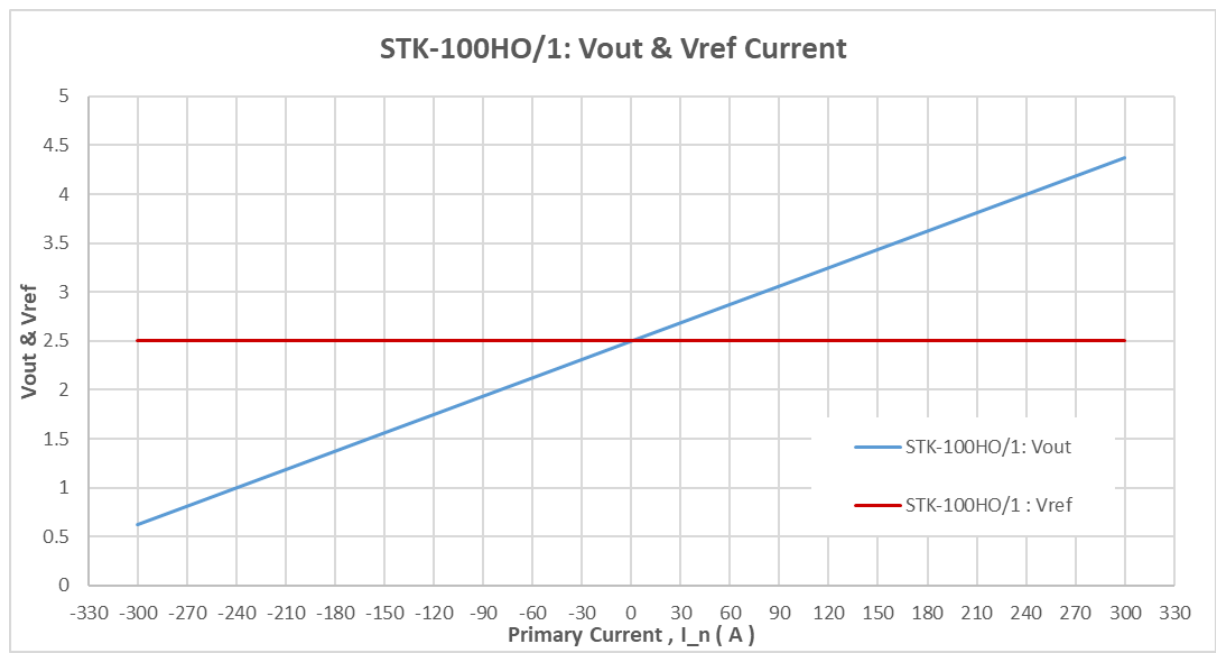
Remarks :

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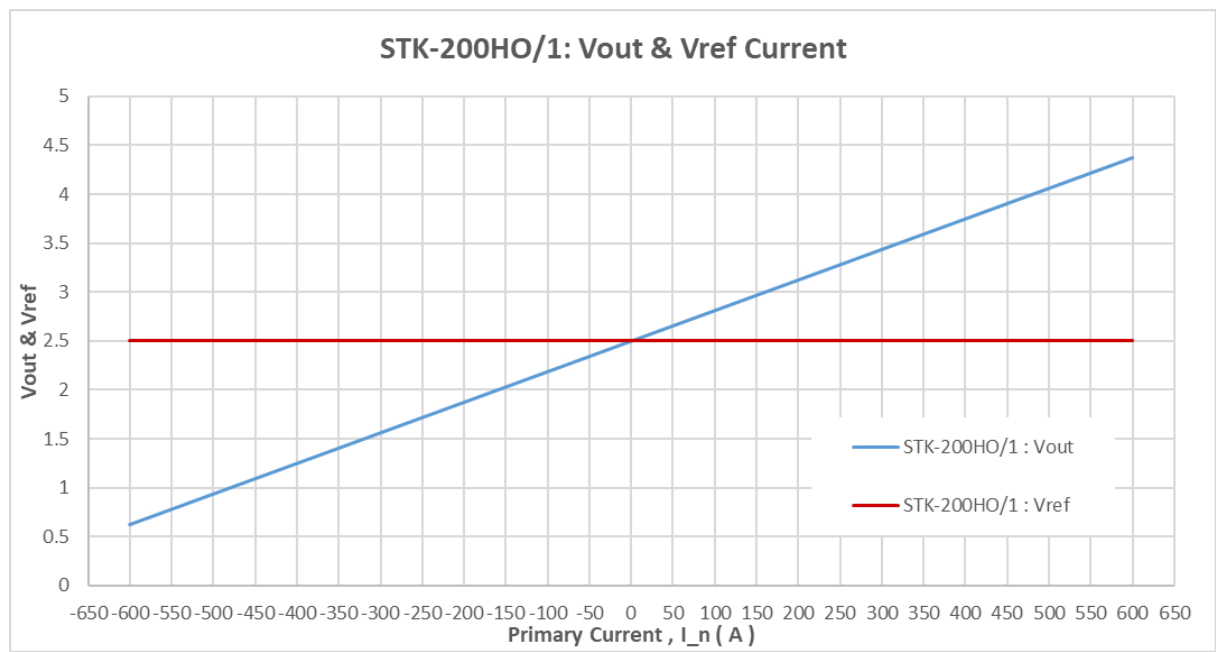
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④. the accuracy @  $-40^{\circ}\sim 105^{\circ}$ ,  $X\_TRange = ((V_{out} - V_{ref})@ In @ T_x) - V_{oe@ 25^{\circ}} - G_{th} * In) / V_{FS}$ , where  $T_x$  represents present temperature,  $G_{th}$  is fitted gain at room temperature .

#### 4. Output voltage VS primary current of STK-HO/1



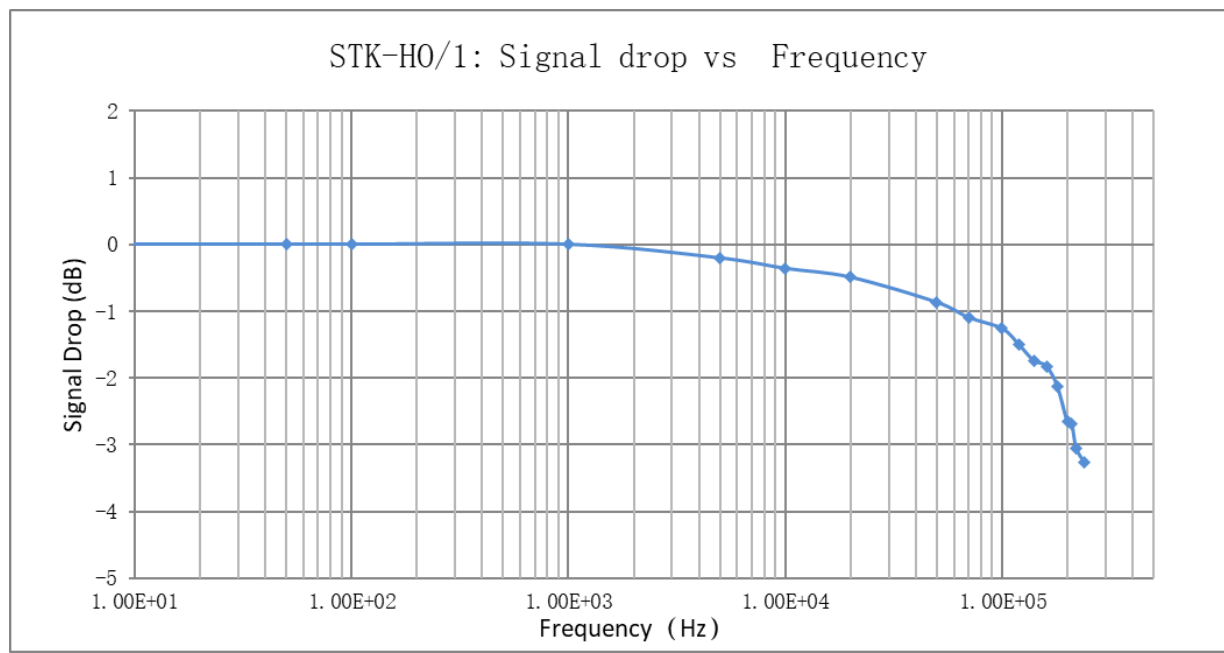
The dependence of Vout & Vref of STK-100HO/1 on the primary current.



The dependence of Vout & Vref of STK-200HO/1 on the primary current.

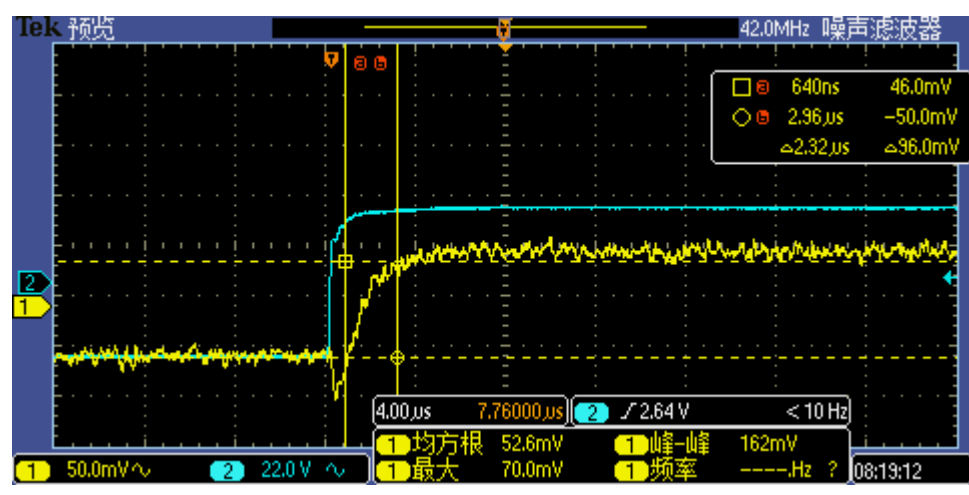


### 5. Frequency bandwidth



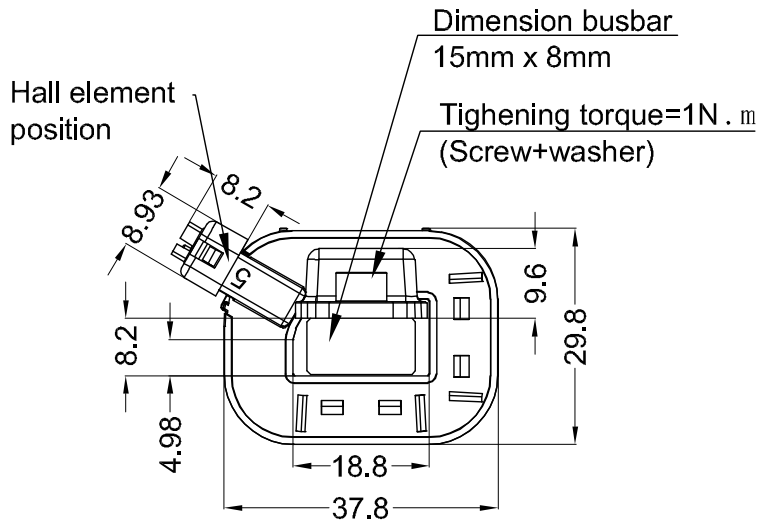
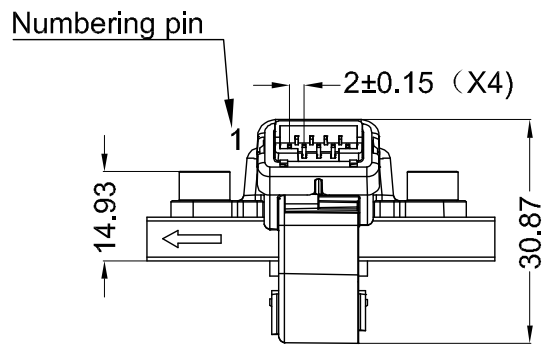
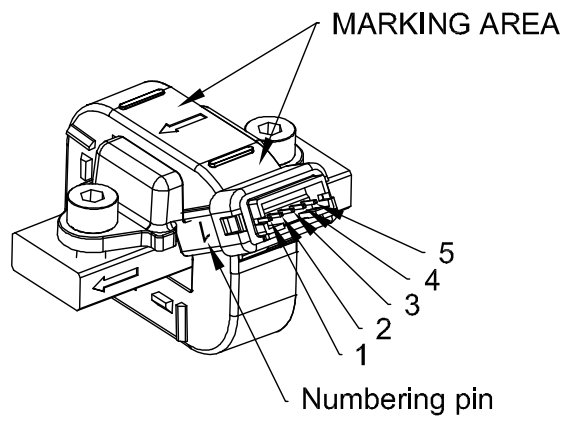
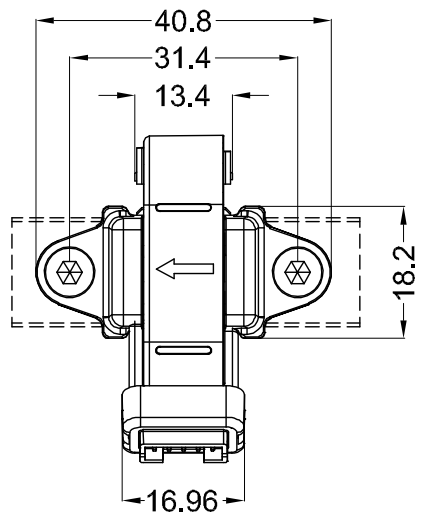
The frequency band width of STK-HO/1 series current sensors.

### 6. Step response time

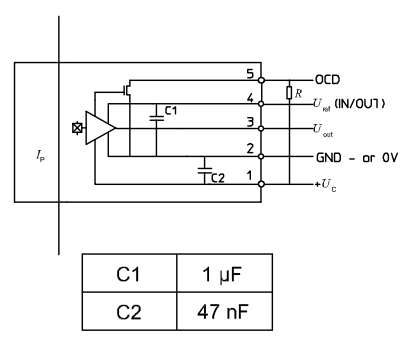


The step response time of STK-HO/1 current sensors. The dark light blue is primary current, while the light blue is output signal of current sensor. The step response time is about 2 μs.

## 7. Dimensions & Pins & Footprint



### Connection

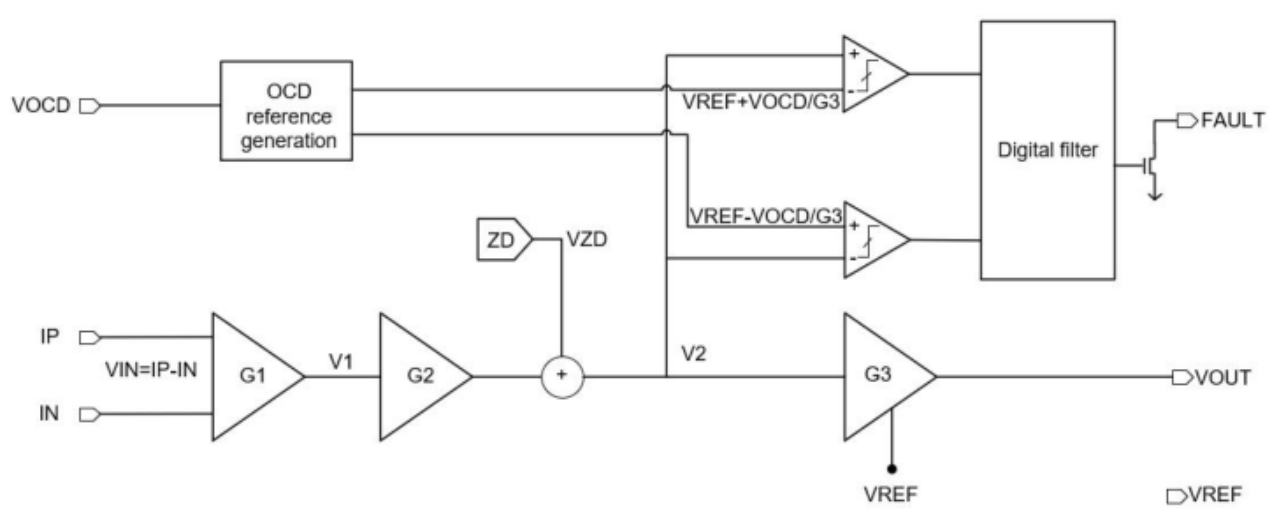


## 8. General information on OCD

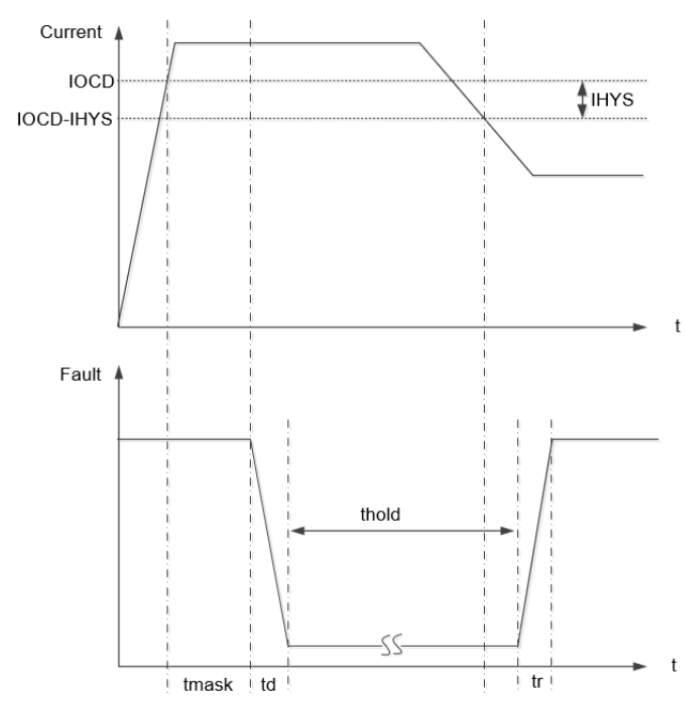
This section describes the general information on OCD function, the specific functions, which are not listed in the section of "electrical data", can be defined per request.

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)  $0.5\text{ V} \leq V_{OC} \leq V_{ref}$ ;
- c) Trigger voltage =  $V_{ref} \pm V_{OC}$ ;
- d) Trigger current =  $(V_{ref} \pm V_{OC} - V_{off}) / G_{th}$ ;



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



The above plot shows the definition on the time in OCD function. The typical value for  $t_{mask}$  &  $t_{hold}$  is that  $t_{mask} = 2\mu\text{s}$ , and  $t_{hold} = 1.5\text{ms}$ . The overcurrent detection function can also set  $t_{mask}$  and  $t_{hold}$  time:

a)

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