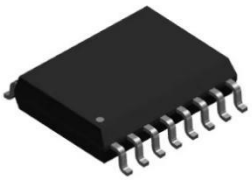
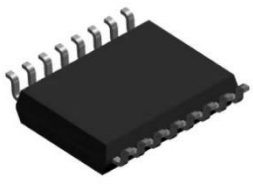
Current Sensor

Product Series: STK-616DML

Part number:
STK-616D-12MLB3
STK-616D-20MLB3
STK-616D-25MLB3
STK-616D-6MLB5
STK-616D-12MLB5
STK-616D-25MLB5

Version: Ver 2.5





Sinomags Technology Co., Ltd

Web site: www.sinomags.com

CONTENT

1. Description

The STK-616DM series current sensor is based on TMR (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
- AC/DC, DC/DC power supplies
- Switched model power supplies (SMPS)

General parameter

Parameter	Symbol	Unit	Value
Working temperature	T_A	℃	-40 ~ 125
Storage temperature	T_stg	℃	-40 ~ 125
Mass	m	g	0.5

Absolute maximum rating

Parameter	Symbol	Unit	Value
Supply voltage	Vcc	V	6
ESD rating（HBM）	U_ESD	kV	4
Junction temperature	T_J	℃	150

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 parameter

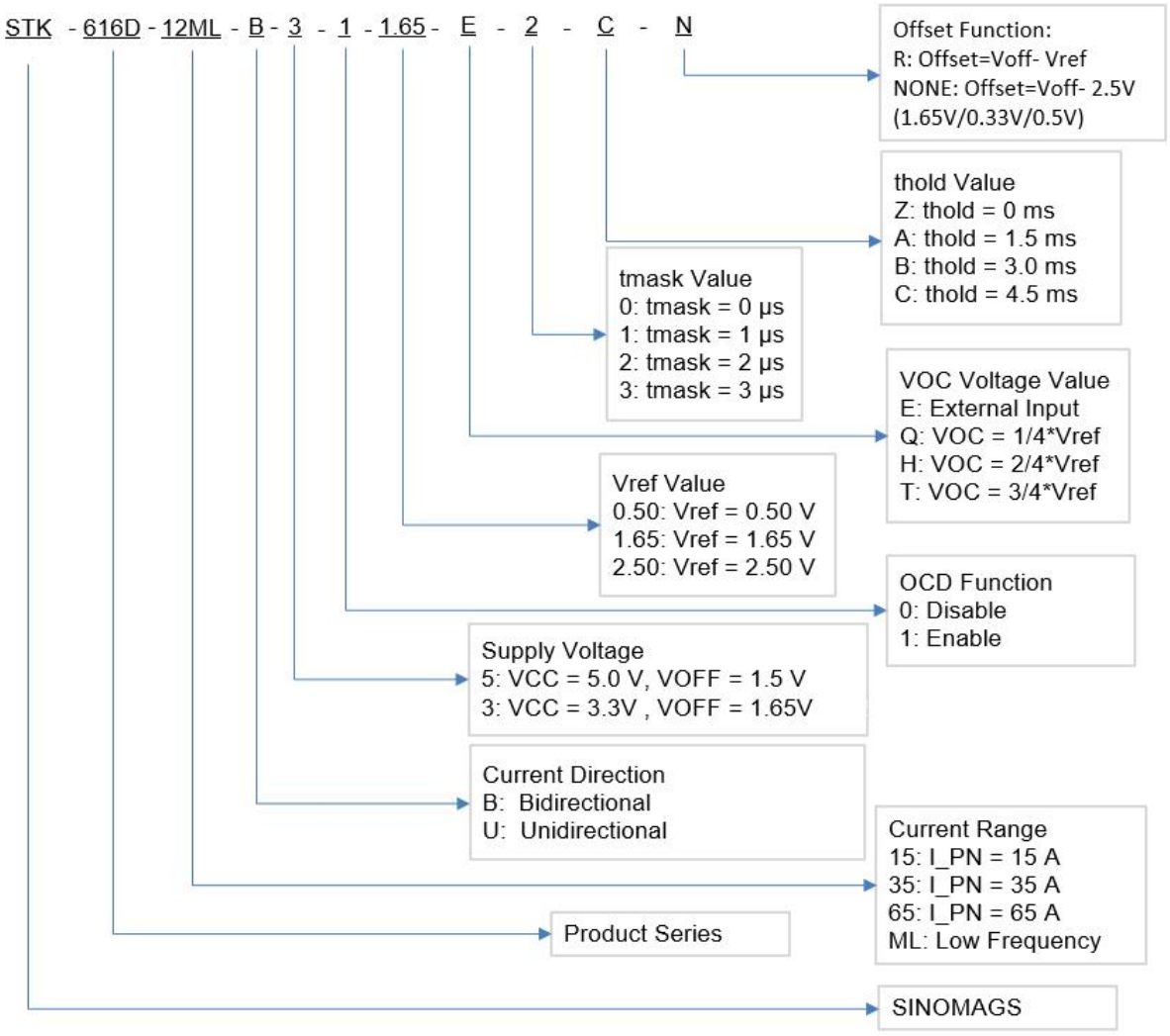
Parameter	Symbol	Unit	Value	Comment
RMS voltage for AC test 50Hz/1 min	Ud	kV	3.6	
Impulse withstand voltage 1.2/50μs	Ûw	kV	6	
Clearance distance (pri. -sec)	D_{Cl}	mm	7.5	Determined by customer's layout
Creepage distance (pri. -sec)	D_{CP}	mm	7.5	
Working Voltage for Basic Isolation	V_{WVBI}	V_{PK} or V_{DC}	870	
		V_{RMS}	616	

Measuring current table

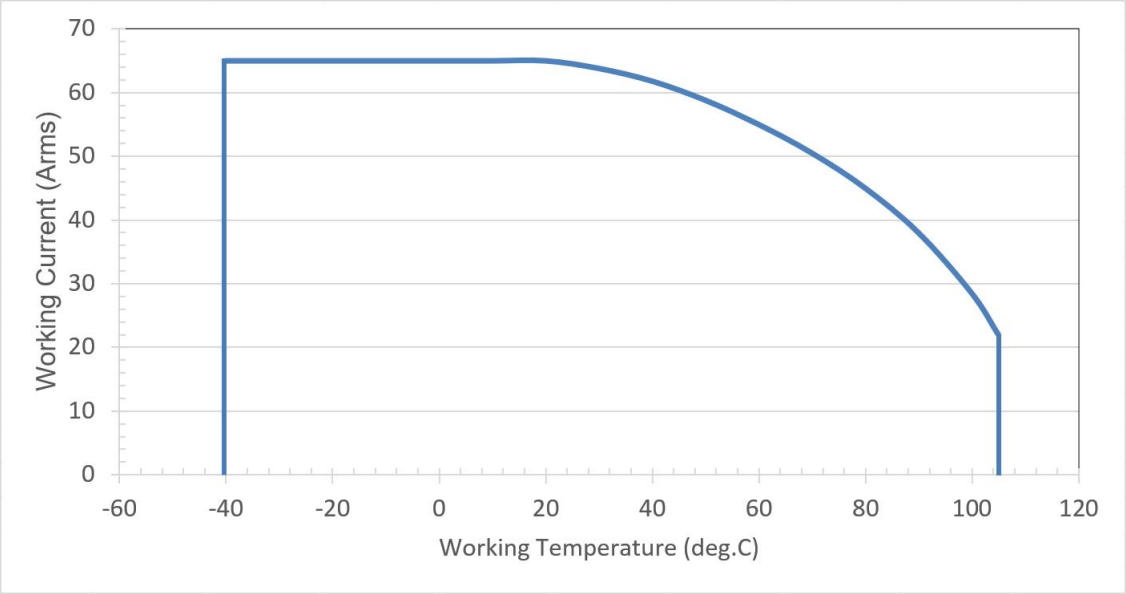
Product	Meas. Range I_pn (A)	Sensitivity (mV/A)	Vcc (V)	T (℃)
STK-616D-12MLB3-1-1.65-E-2-C-N	±12.5A	37	3.3	-40 ~ 125
STK-616D-25MLB3-1-1.65-E-2-C-N	±25A	18.5	3.3	-40 ~ 125
STK-616D-12MLB3-1-1.65-E-2-Z-N	±12.5A	37	3.3	-40 ~ 125
STK-616D-20MLB3-1-1.65-E-2-A-N	±20A	25	3.3	-40 ~ 125
STK-616D-25MLB3-1-1.65-E-2-Z-N	±25A	18.5	3.3	-40 ~ 125
STK-616D-6MLB5-1-2.5-E-2-C-N	±7.5A	151	5	-40 ~ 125
STK-616D-12MLB5-1-2.5-E-2-C-N	±12.5A	56	5	-40 ~ 125

STK-616D-25MLB5-1-2.5-E-2-C-N	±25A	28	5	-40 ~ 125

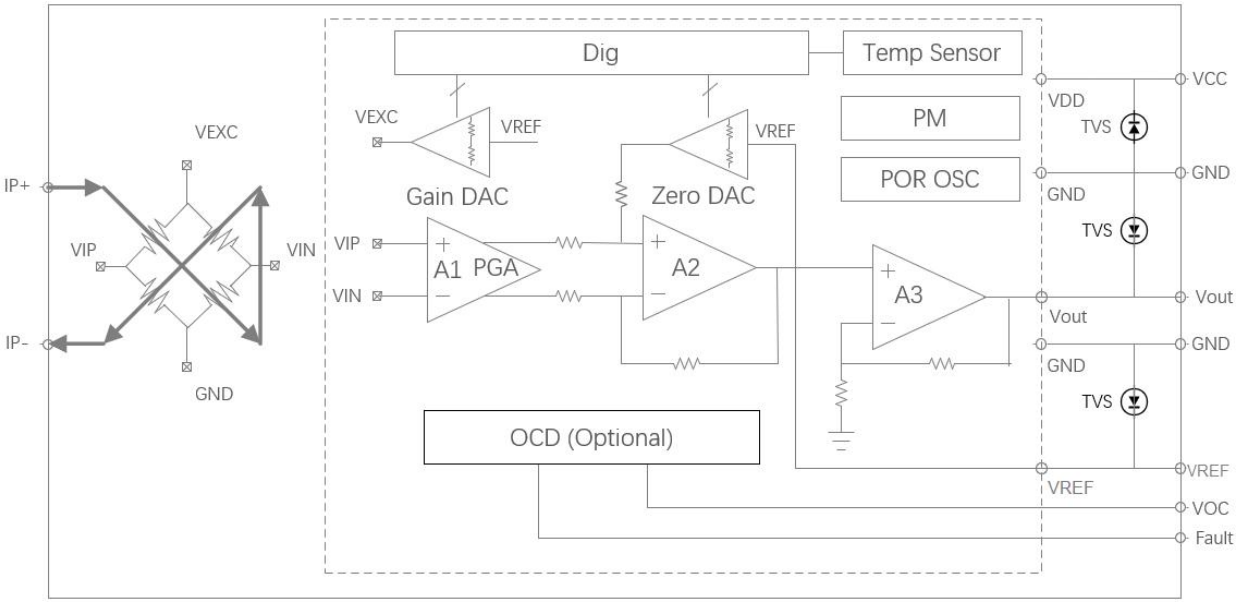
2. Part number definition



3. Temperature vs Current



4. Functional Block Diagram



5. Electrical data STK-616D-xxMLB3

Condition：T_A = 25℃, Vcc = 3.3 V

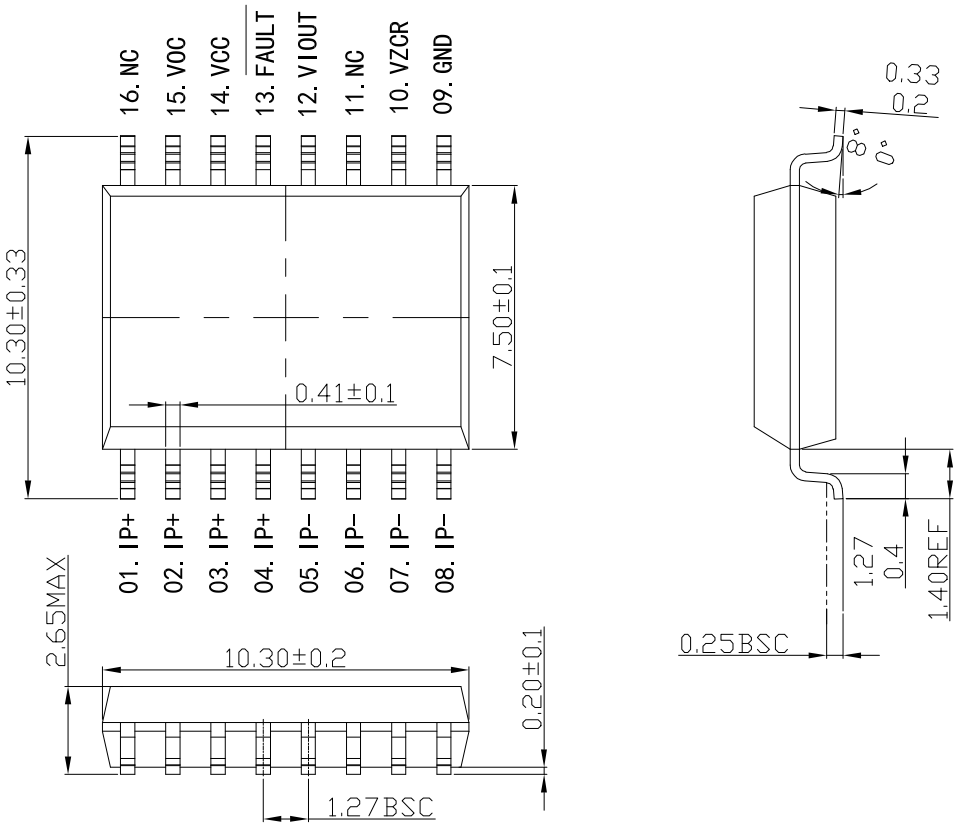
Parameter	Symbol	Unit	Min	Typ	Max	Comment
General parameters						
Primary nominal current	I_pn	A	-12.5		12.5	STK-616D-12MLB3
			-20		20	STK-616D-20MLB3
			-25		25	STK-616D-25MLB3
Linear Sensing Range	I_pm	A	-37.5		37.5	STK-616D-12MLB3
			-50		50	STK-616D-20MLB3
			-75		75	STK-616D-25MLB3
Supply voltage	Vcc	V	3	3.3	3.6	
Current consumption	Icc	mA		9	11	
Primary conductor resistance	R_IP	mΩ		0.85		
Quiescent voltage@0A	Voff	V		1.65		
Reference voltage	Vref	V		1.65		
Electrical offset voltage	Offset	mV		±10		Voff - Vref
Output Specifications	R_out	Ω	1		30	
	R_ref		1		80	
Theoretical gain	G_th	mV/A		37		STK-616D-12MLB3
				25		STK-616D-20MLB3
				18.5		STK-616D-25MLB3
OCD function (if applicable)						
OCD range	VOC	V	0.3		1.6	
FOULT error		%		5%		% of OCD
OCD Hysteresis	IHYS	%		10%		% of OCD
OCD Fault Mask	tmask	μs	0	2	3	0, 1, 2, 3μs
OCD Fault Mask error	Tmask_error	ns		125		
OCD Fault Hold Time	thold	ms		4.5		0, 1.5, 3, 4.5ms
Accuracy performance						
Rated linearity error@25℃	Non-L	%I_pn		±0.75		±I_pn
Step response time	t_res	μs		0.9		@90% of I_pn
Frequency bandwidth	BW	kHz		600		@-3dB
Output voltage noise	Vnoise	mVpp		10		@1.4MHz
Accuracy @ 25℃	X	% I_pn		±1.5		@ 0.5*I_pn
Thermal drift of G_th	GAIN_T	% G_th		±1.5		@ -40~105℃ drift related to the value @25℃
Thermal drift of Voff	Voff_T	mV		±15		
Total Accuracy	X_TRange	% I_pn		±3.5		

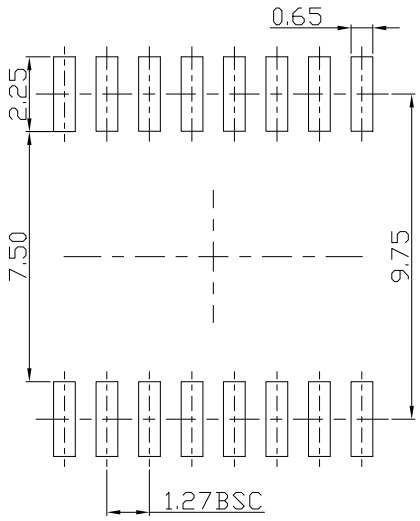
6. Electrical data STK-616D-xxMLB5

Condition：T_A = 25℃, Vcc = 5 V

Parameter	Symbol	Unit	Min	Typ	Max	Comment
General parameters						
Primary nominal current	I_pn	A	-7.5		7.5	STK-616D-6MLB5
			-12.5		12.5	STK-616D-12MLB5
			-25		25	STK-616D-25MLB5
Linear Sensing Range	I_pm	A	-14		14	STK-616D-6MLB5
			-37.5		37.5	STK-616D-12MLB5
			-75		75	STK-616D-25MLB5
Supply voltage	Vcc	V	4.5	5	5.5	
Current consumption	Icc	mA		9	11	
Primary conductor resistance	R_IP	mΩ		0.85		
Quiescent voltage@0A	Voff	V		2.5		
Reference voltage	Vref	V		2.5		
Electrical offset voltage	Offset	mV		±10		Voff - Vref
Output Specifications	R_out	Ω	1		30	
	R_ref		1		80	
Theoretical gain	G_th	mV/A		151		STK-616D-6MLB5
				56		STK-616D-12MLB5
				28		STK-616D-25MLB5
OCD function (if applicable)						
OCD range	VOC	V	0.5		3.3	
FOULT error		%		5%		% of OCD
OCD Hysteresis	IHYS	%		10%		% of OCD
OCD Fault Mask	tmask	μs	0	2	3	0, 1, 2, 3μs
OCD Fault Mask error	Tmask_error	ns		125		
OCD Fault Hold Time	thold	ms		4.5		0, 1.5, 3, 4.5ms
Accuracy performance						
Rated linearity error@25℃	Non-L	%I_pn		±0.75		±I_pn
Step response time	t_res	μs		0.9		@90% of I_pn
Frequency bandwidth	BW	kHz		600		@-3dB
Output voltage noise	Vnoise	mVpp		10		@1.4MHz
Accuracy @ 25℃	X	% I_pn		±1.5		@ 0.5*I_pn
Thermal drift of G_th	GAIN_T	% G_th		±1.5		@ -40~105℃ drift related to the value @25℃
Thermal drift of Voff	Voff_T	mV		±15		
Total Accuracy	X_TRange	% I_pn		±3.5		

7. Dimension & Pin definitions





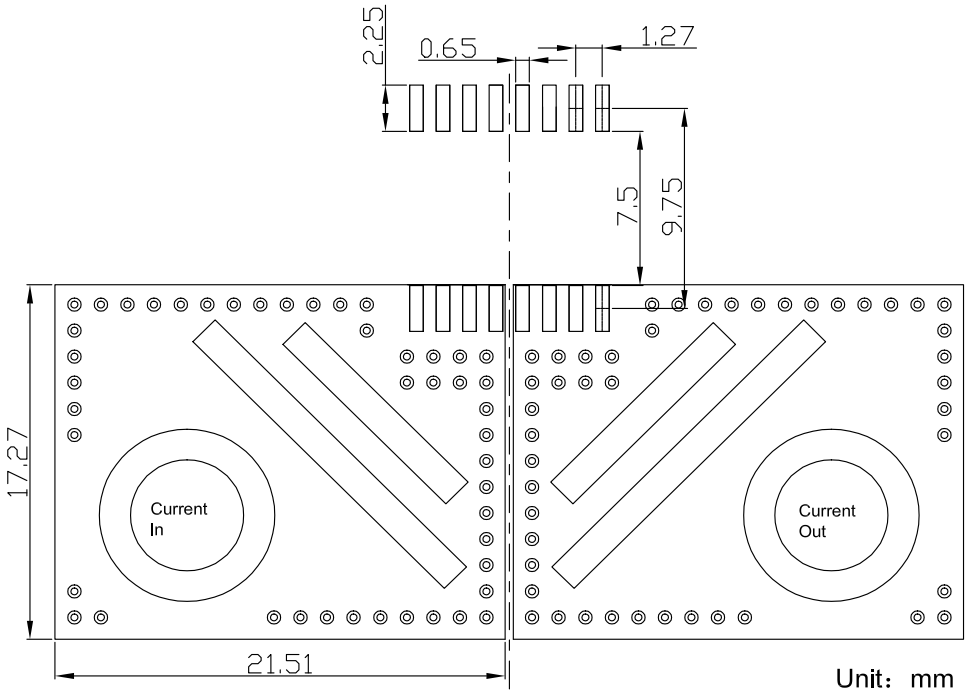
PCB Layout Reference View

8. Pin definitions

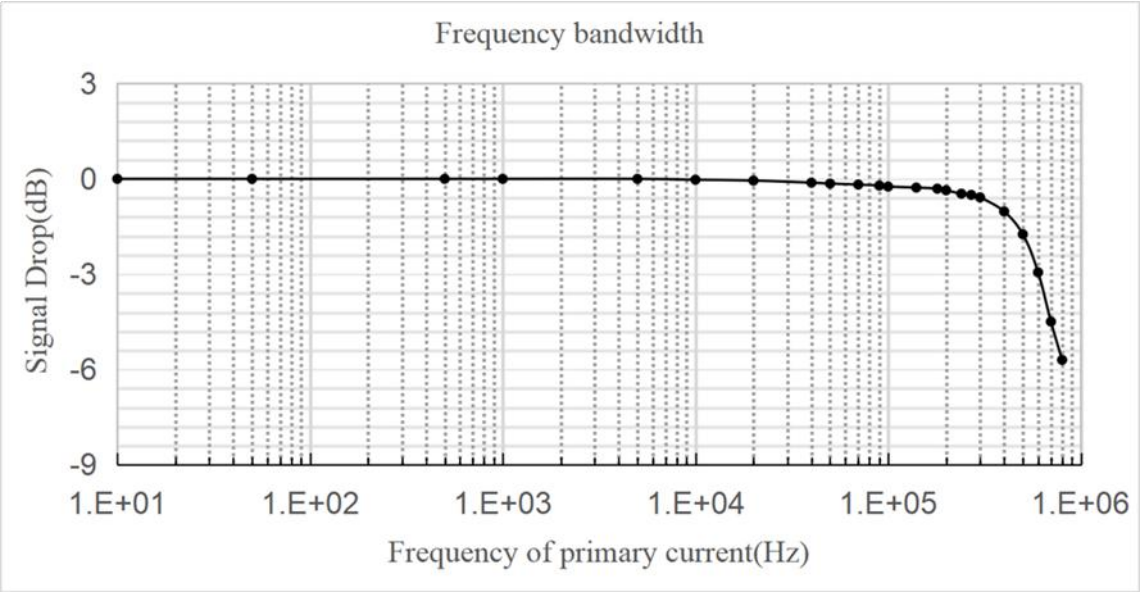
Pin definition for product with OCD function

PIN	Symbol	Description
1,2,3,4	IP+	Primary conductor pin (+)
5,6,7,8	IP-	Primary conductor pin (-)
9	GND	Ground pin (GND)
10	VZCR	Voltage Reference Output pin
11	NC	Not connected
12	VIOUT	Sensor output pin
13	$\overline{\text{FAULT}}$	Over current detection alarm output, the pin is open leakage output. Normally, the output of fault pin is high level.
14	VCC	Power supply pin
15	VOC	Over current detection threshold input pin
16	NC	Not connected

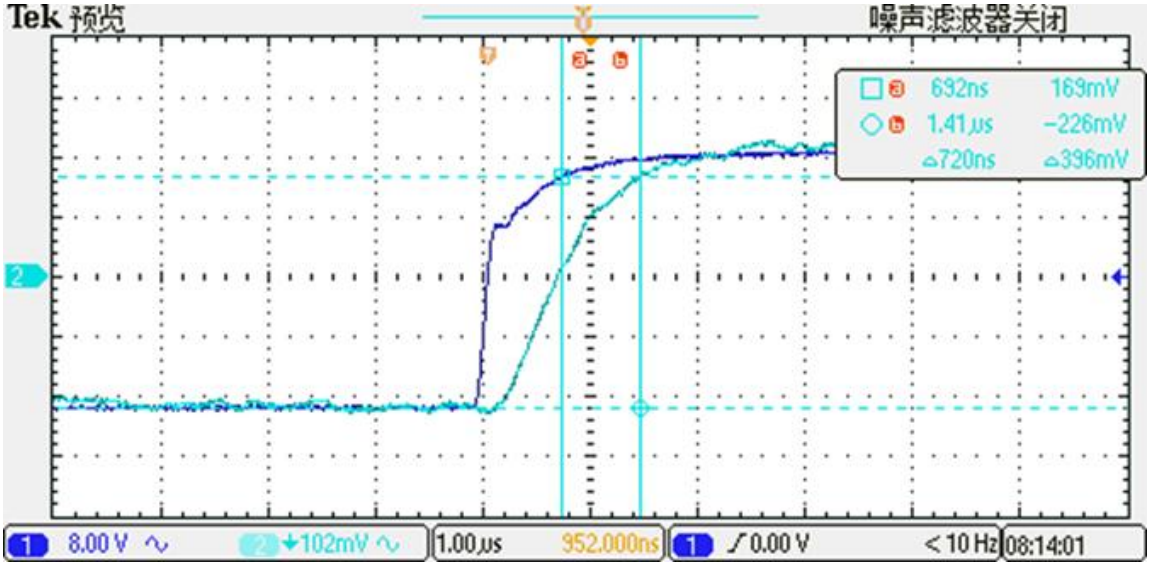
9. PCB layout recommendation



10. Frequency bandwidth

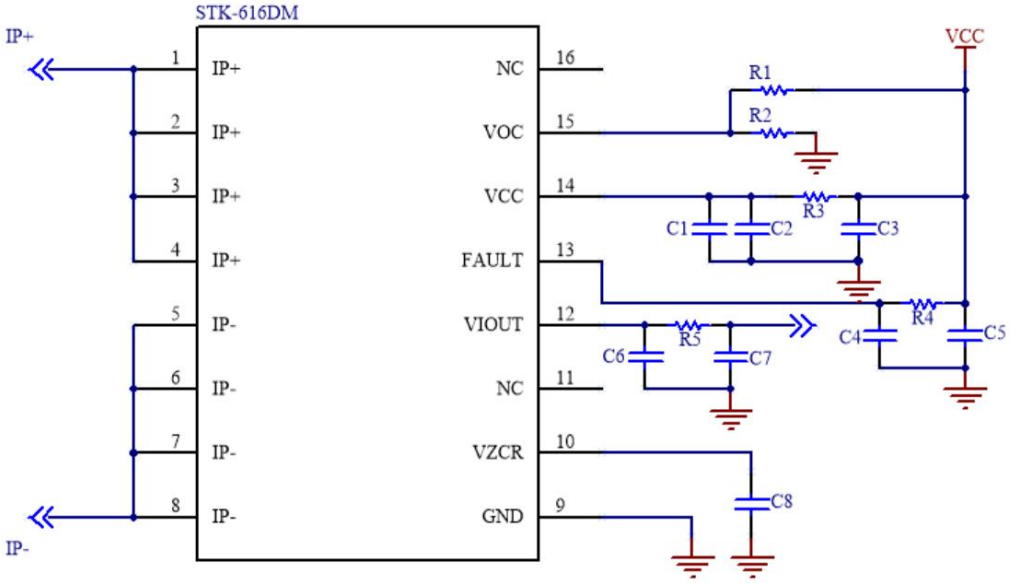


11. Step response time

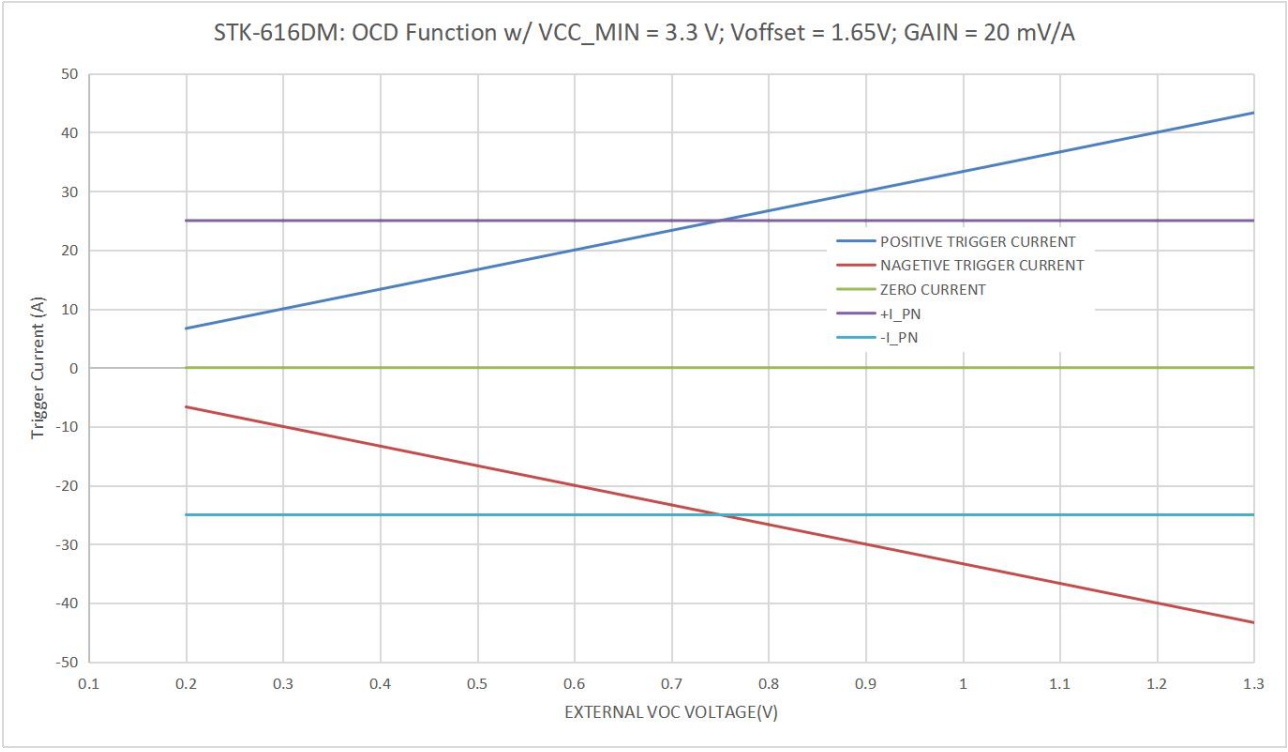


The typical frequency response of STK-616DML current sensor. The response time from 90% of the primary current to 90% of the secondary output is 0.9μs.

12. Typical Application of STK-616DML



13. Examples of OCD function



OCD function for STK-616D-12MLB3

14. General information on OCD

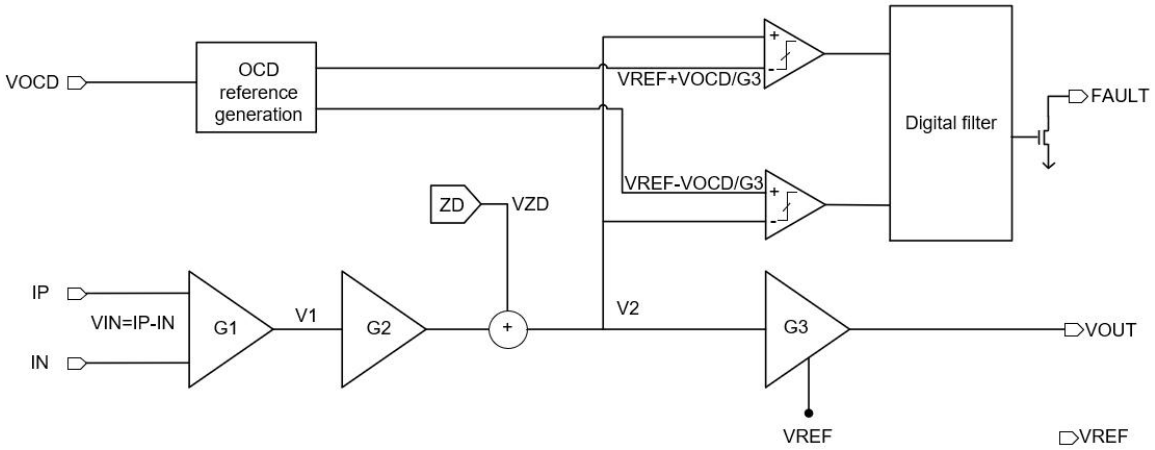
This section describes the general information on OCD function, the specific functions, which are not listed in the section of “electrical data”, can be defined per request.

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:

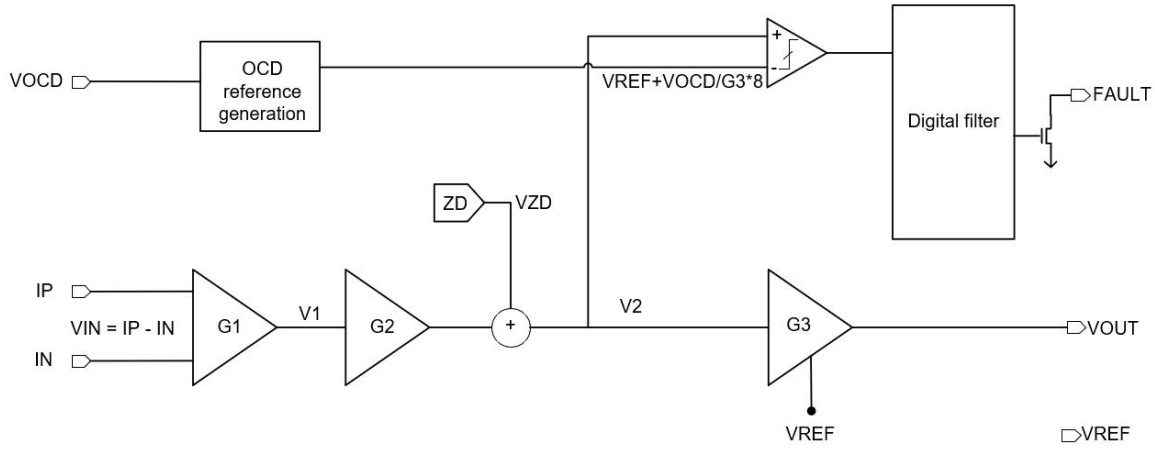
a) Vref = 2.5 V
   ①. 0.5 V ≦ VOC ≦ Vcc – 1.7 V;
   ②. Trigger voltage = Vref +/- VOC;
   ③. Trigger current = (Vref +/- VOC -Voff) / G_th;

b) Vref = 1.65 V
   ①. 0.3 V ≦ VOC ≦ Vcc – 1.7 V;
   ②. Trigger voltage = Vref +/- VOC;
   ③. Trigger current = (Vref +/- VOC -Voff) / G_th

c) Vref = 0.5 V
   ①. 0.2 V ≦ VOC ≦ 0.5 V;
   ②. Trigger voltage = Vref + 8*VOC;
   ③. Trigger current = (Vref + VOC -Voff) / G_th

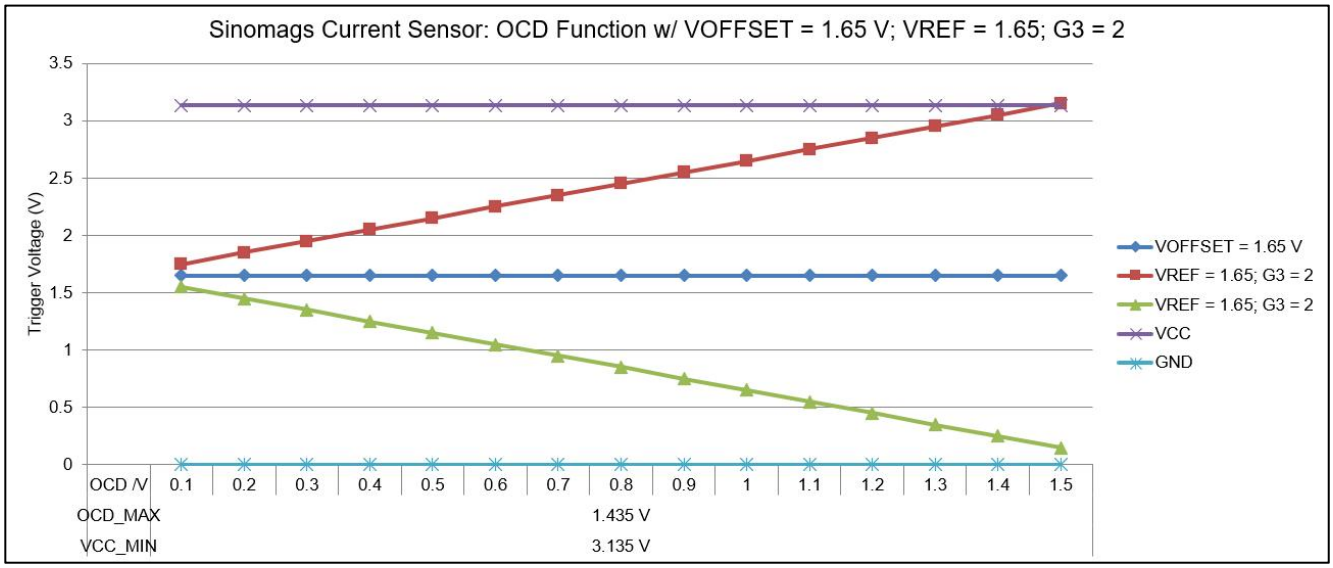


Functional Block Diagram on OCD function when Vref = 2.5 V



Functional Block Diagram on OCD function when Vref = 0.5 V

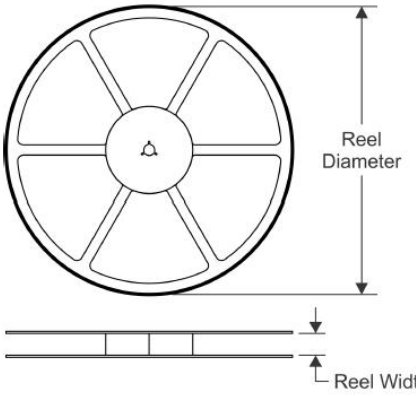
With the above definition, below shows the relationship between trigger voltage and the setting of Vcc, VOC.



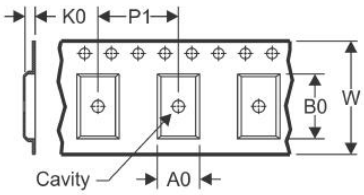
15. PACKAGE MATERIALS INFORMATION

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE