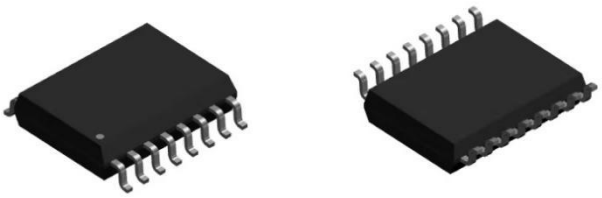
Current Sensor

Product Series: STK-616TMAF

Part number:
STK-616T-20MAFB5
STK-616T-40MAFB5
STK-616T-50MAFB5
STK-616T-65MAFB5
STK-616T-100MAFB5
STK-616T-20MAFB3
STK-616T-40MAFB3
STK-616T-50MAFB3
STK-616T-65MAFB3

Version: Ver 1.0



Sinomags Technology Co., Ltd

Web site: www.sinomags.com

CONTENT

1. Description

The STK-616TM series current sensor is based on TMR (magneto resistance) technology and open-loop design. It is suitable for DC, AC pulsed and any kind of irregular current measurement under the isolated conditions.

- The product is packaged in standard SOIC16 form.
- AEC-Q100,automotive qualified.

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

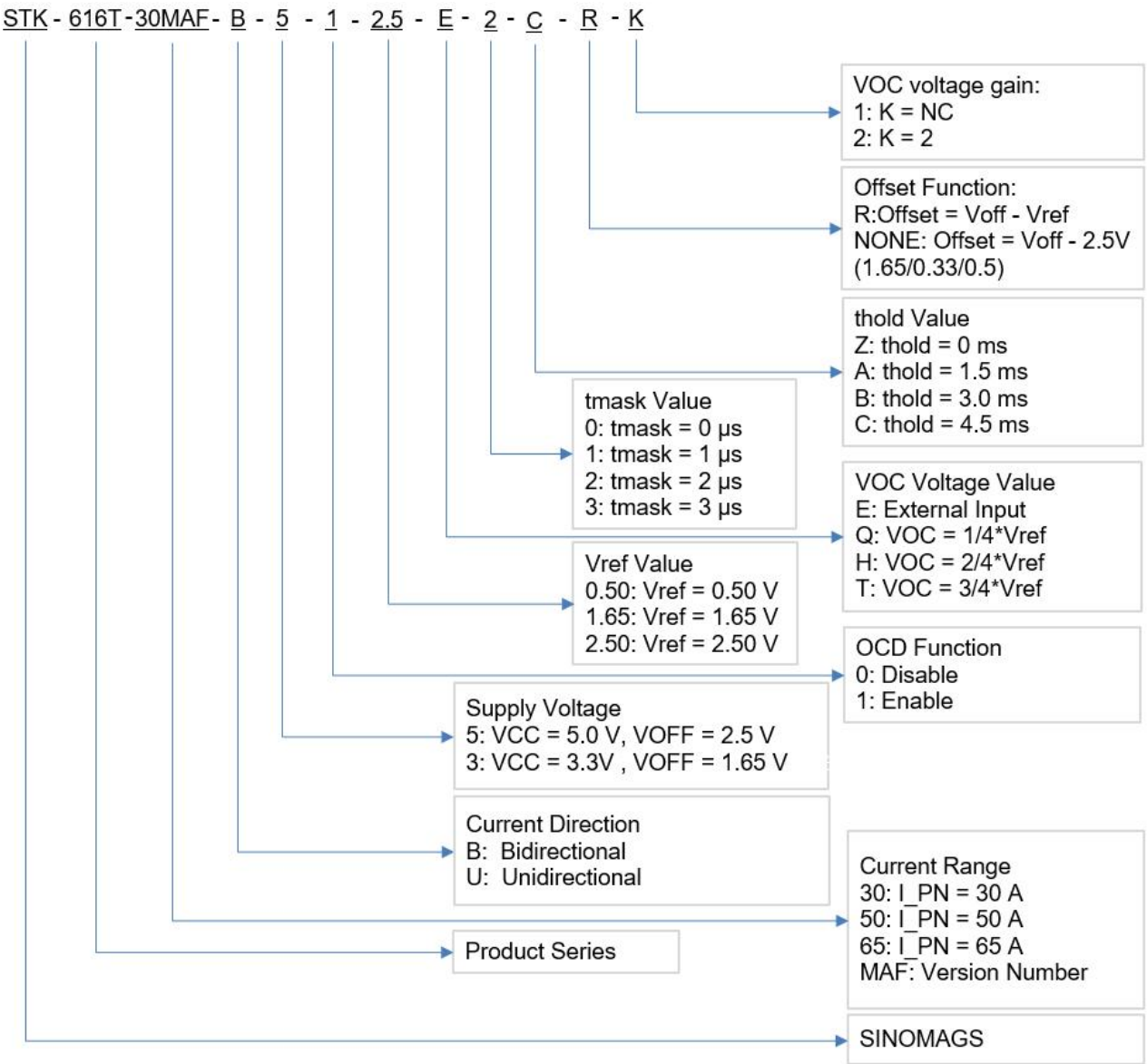
Parameter	Symbol	Unit	Value	Comment
RMS voltage for AC test 50Hz/1 min	Ud	kV	3.6	
Impulse withstand voltage 1.2/50μs	Ûw	kV	6	
Clearance distance (pri. -sec)	Dci	mm	8	Determined by customer's layout
Creepage distance (pri. -sec)	Dcp	mm	8	

Measuring current table

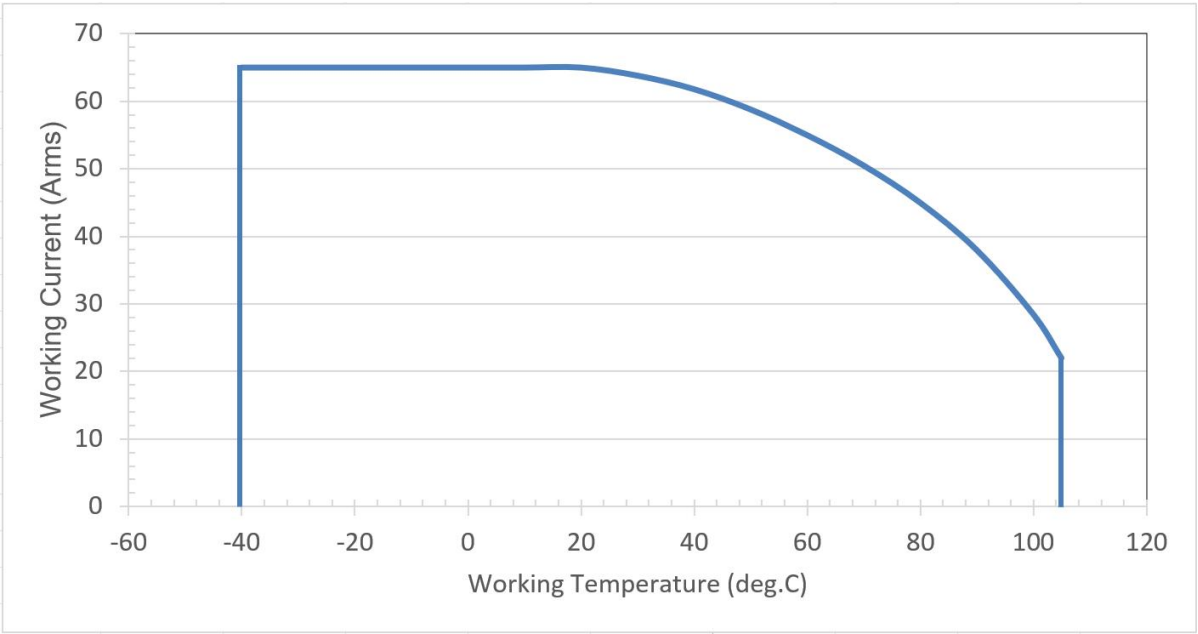
Product	Meas. Range I_pn (A)	Sensitivity (mV/A)	Vcc (V)	T (℃)
STK-616T-20MAFB3-1-1.65-E-2-C-N	±20A	66	3.3	-40 ~ 125
STK-616T-40MAFB3-1-1.65-E-2-C-N	±40A	33	3.3	-40 ~ 125
STK-616T-30MAFB3-1-1.65-E-2-C-R-2	±30A	44	3.3	-40 ~ 125
STK-616T-50MAFB3-1-1.65-E-2-C-N	±50A	26.4	3.3	-40 ~ 125
STK-616T-65MAFB3-1-1.65-E-2-C-N	±65A	20.3	3.3	-40 ~ 125
STK-616T-20MAFB5-1-2.5-E-2-C-N	±20A	100	5	-40 ~ 125
STK-616T-30MAFB5-1-2.5-E-2-C-R-2	±30A	66.7	5	-40 ~ 125

STK-616T-40MAFB5-1-2.5-E-2-C-N	±40A	50	5	-40 ~ 125
STK-616T-50MAFB5-1-2.5-E-2-C-N	±50A	40	5	-40 ~ 125
STK-616T-65MAFB5-1-2.5-E-2-C-N	±65A	30.8	5	-40 ~ 125
STK-616T-100MAFB5-1-2.5-E-2-C-N	±100A	20	5	-40 ~ 125

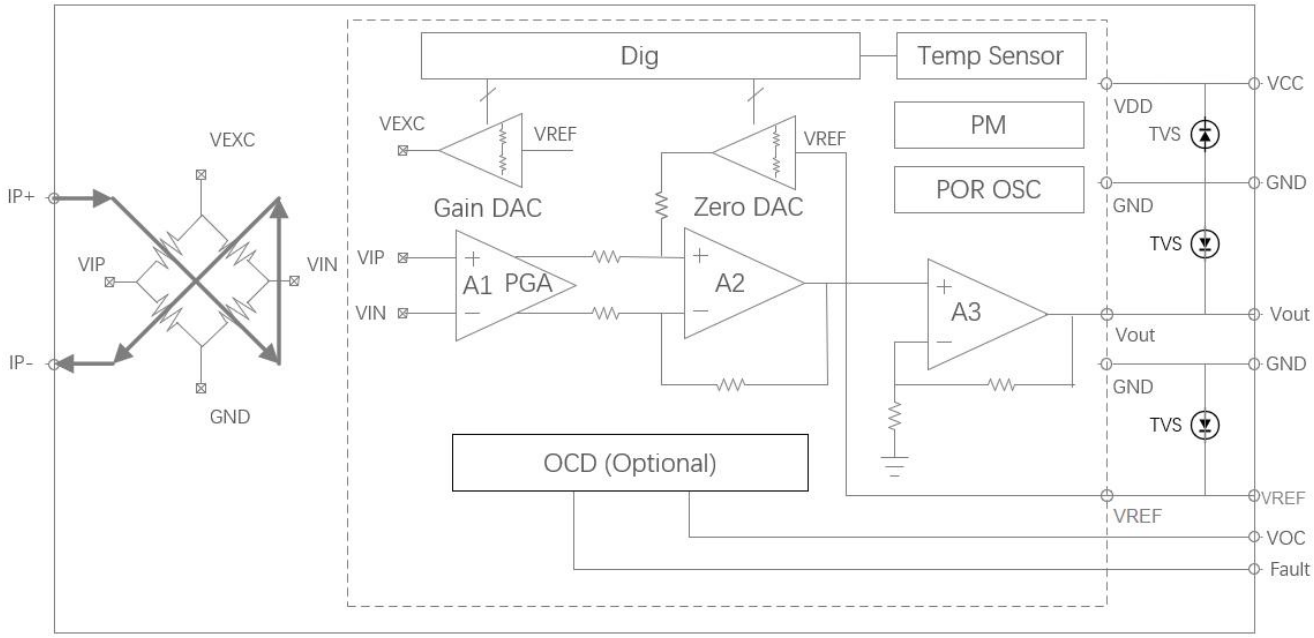
2. Part number definition



3. Temperature vs Current



4. Functional Block Diagram



5. Electrical data STK-616T-XXMAFB5

Condition：T_A = 25℃, Vcc = 5 V

Parameter	Symbol	Unit	Min	Typ	Max	Comment
General parameters						
Primary nominal current	I_pn	A	-20		20	STK-616T-20MFB5
			-30		30	STK-616T-30MFB5
			-40		40	STK-616T-40MFB5
			-50		50	STK-616T-50MFB5
			-65		65	STK-616T-65MFB5
			-100		100	STK-616T-100MFB5
Supply voltage	Vcc	V	4.5	5	5.5	
Current consumption	Icc	mA		7	12	
Primary conductor resistance	R_IP	mΩ		0.85		
Quiescent voltage@0A	Voff	V	2.45	2.5	2.55	
Reference voltage	Vref	V	2.45	2.5	2.55	
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		100		STK-616T-20MFB5
				66.7		STK-616T-30MFB5
				50		STK-616T-40MFB5
				40		STK-616T-50MFB5
				30.8		STK-616T-65MFB5
				20		STK-616T-100MFB5
OCD function (if applicable)						
OCD range	VOC	V	0.5		3.3	
FOULT error		%		5%		% of OCD
OCD	IHYS	%		10%		% of OCD
OCD Fault Mask	tmask	μs		2		0, 1, 2, 3 μs
OCD Fault Mask error	Tmask_error	ns		125		
OCD Fault Hold Time	thold	ms		4.5		0, 1.5, 3, 4.5 ms
Accuracy performance						
Rated linearity error@25℃	Non-L	%I_pn		±1		±I_pn
Step response time	t_res	μs		0.2		@90% of I_pn STK-616T-XXMFBX
Frequency bandwidth	BW	MHz		1.5		@-3dB STK-616T-XXMFBX
Output voltage noise	Vnoise	mVpp		10		@1.4 MHz

Total Accuracy	X_TRange	% I_pn		±2		@ -40~105℃ drift related to the value @25℃
Thermal drift of G_th	GAIN_T	% G_th		±1.5		
Thermal drift of Voff	Voff_T	mV		±4		@ 25~105℃
				±10		@ -40~25℃

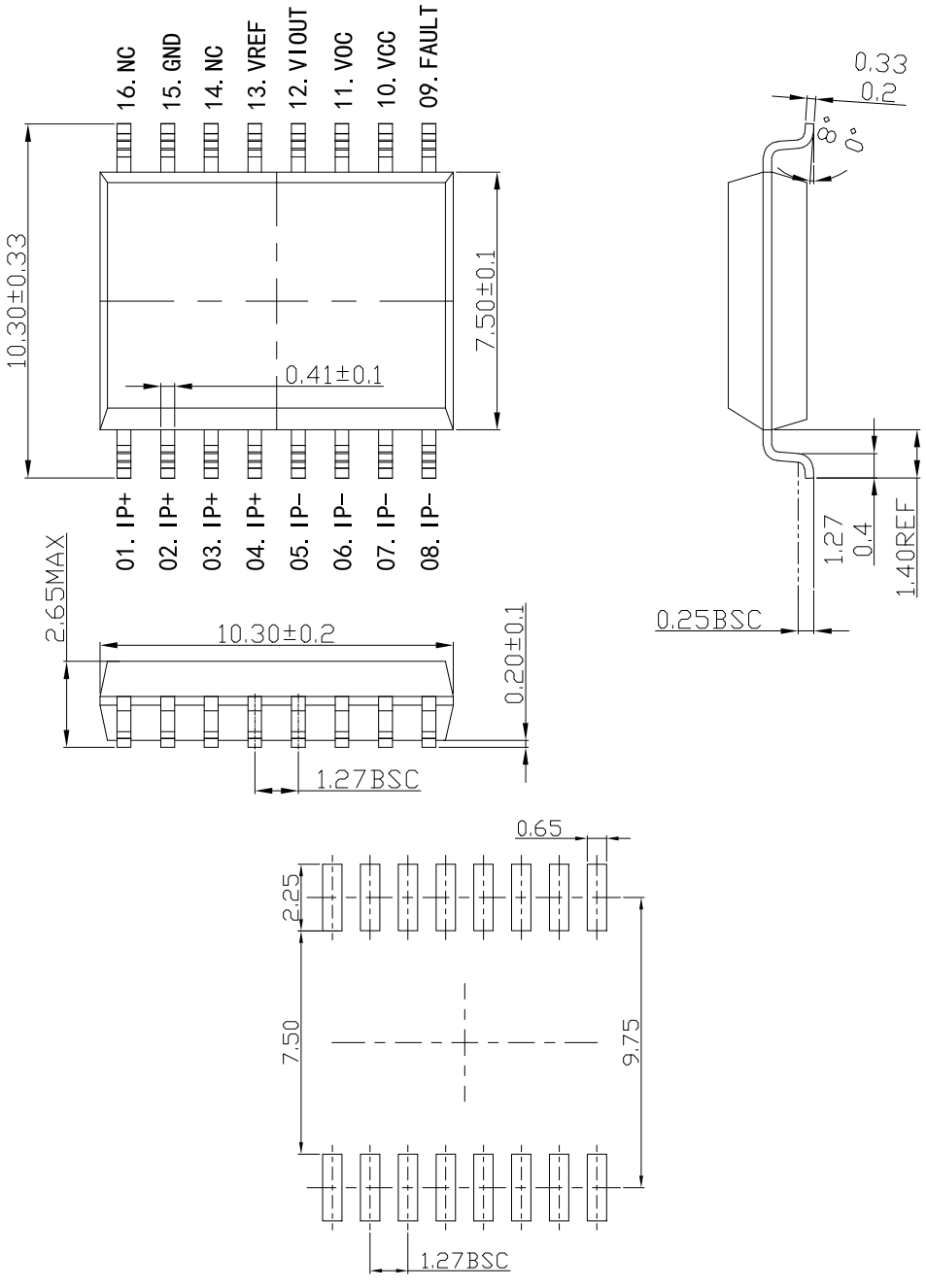
6. Electrical data STK-616T-XXMAFB3

Condition：T_A = 25℃, Vcc = 3.3 V

Parameter	Symbol	Unit	Min	Typ	Max	Comment
General parameters						
Primary nominal current	I_pn	A	-20		20	STK-616T-20MFB3
			-30		30	STK-616T-30MFB3
			-40		40	STK-616T-40MFB3
			-50		50	STK-616T-50MFB3
			-65		65	STK-616T-65MFB3
Supply voltage	Vcc	V	3.15	3.3	3.45	
Current consumption	Icc	mA		7	12	
Primary conductor resistance	R_IP	mΩ		0.9		
Quiescent voltage@0A	Voff	V	1.6	1.65	1.7	
Reference voltage	Vref	V	1.6	1.65	1.7	
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		66		STK-616T-20MFB3
				33		STK-616T-40MFB3
				44		STK-616T-30MFB3
				26.4		STK-616T-50MFB3
				20.3		STK-616T-65MFB3
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		2		0, 1, 2, 3 μs
OCD Fault Mask error	Tmask_error	ns		125		
OCD Fault Hold Time	thold	ms		4.5		0, 1.5, 3, 4.5 ms
Accuracy performance						
Rated linearity error@25℃	Non-L	%I_pn		±1		±I_pn
Step response time	t_res	μs		0.2		@90% of I_pn STK-616T-XXMFBX

Frequency bandwidth	BW	MHz		1.5		@-3dB STK-616T-XXMFBX
Output voltage noise	Vnoise	mVpp		10		@1.4 MHz
Total Accuracy	X_TRange	% I_pn		±2		@ -40~105℃ drift related to the value @25℃
Thermal drift of G_th	GAIN_T	% G_th		±1.5		
Thermal drift of Voff	Voff_T	mV		±4		@ 25~105℃
				±10		@ -40~25℃

7. Dimension & Pin definitions with OCD function



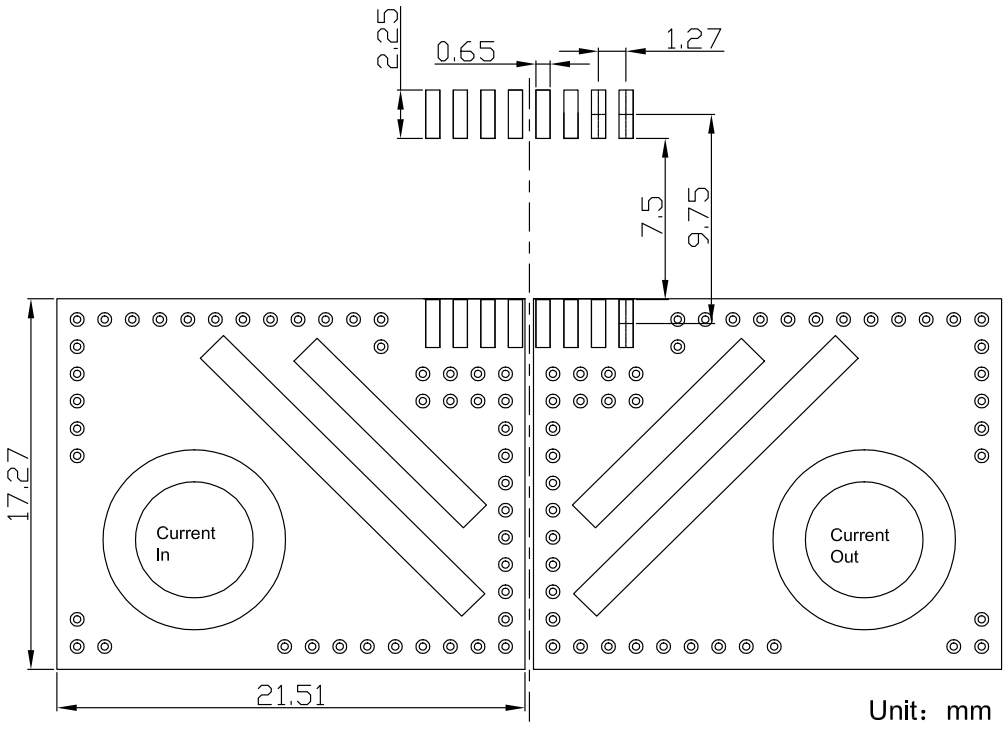
PCB Layout Reference View

8. Pin definitions

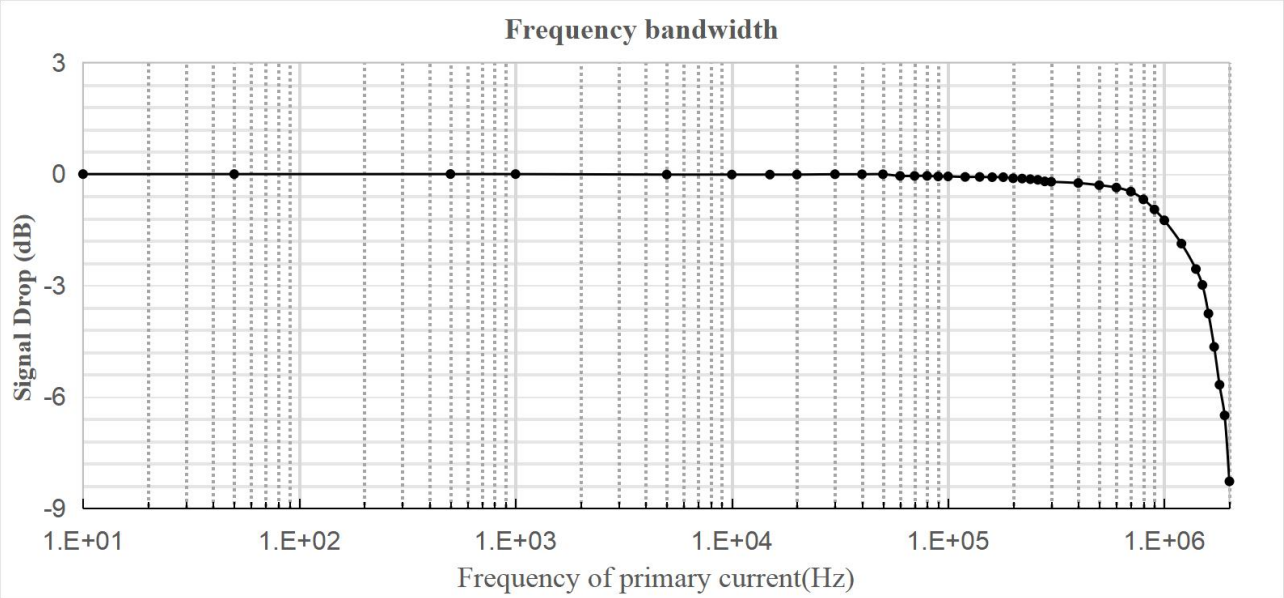
Pin definition for product with OCD function

PIN	Symbol	Description
1,2,3,4	IP+	Primary conductor pin (+)
5,6,7,8	IP-	Primary conductor pin (-)
9	FAULT	Over current detection alarm output, the pin is open leakage output. Normally, the output of fault pin is high level.
10	VCC	Power supply pin
11	VOC	Over current detection threshold input pin
12	VIOUT	Sensor output pin
13	VREF	Reference pin, output function
14	NC	No connection
15	GND	Ground pin (GND)
16	NC	No connection

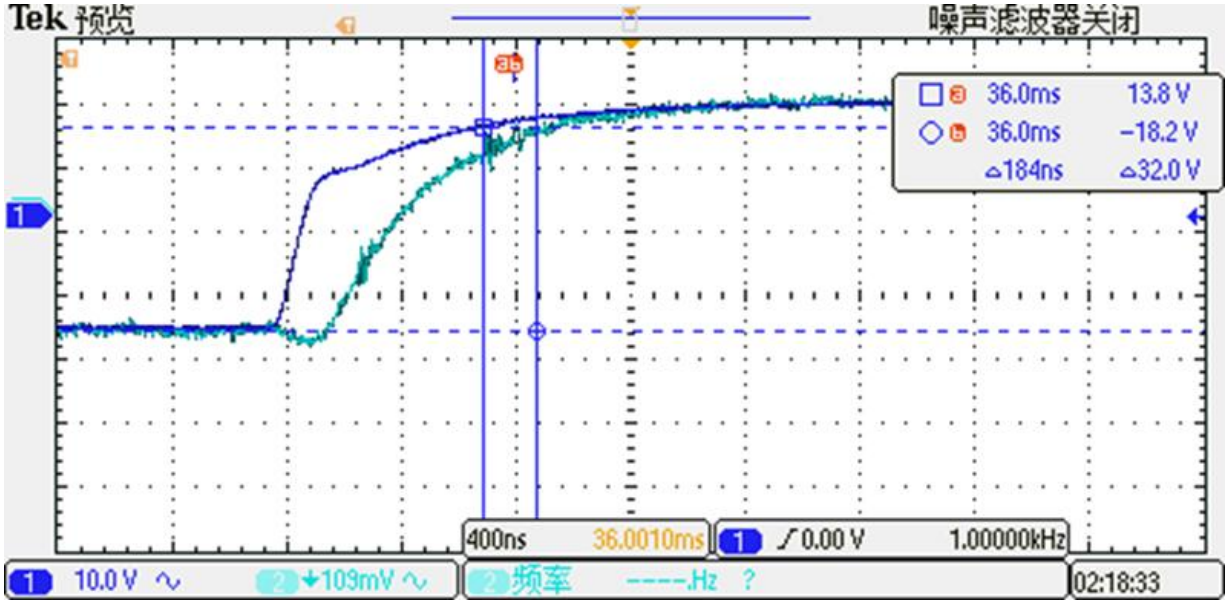
9. PCB layout recommendation



10. Frequency bandwidth of STK-616T-XXMAFBX

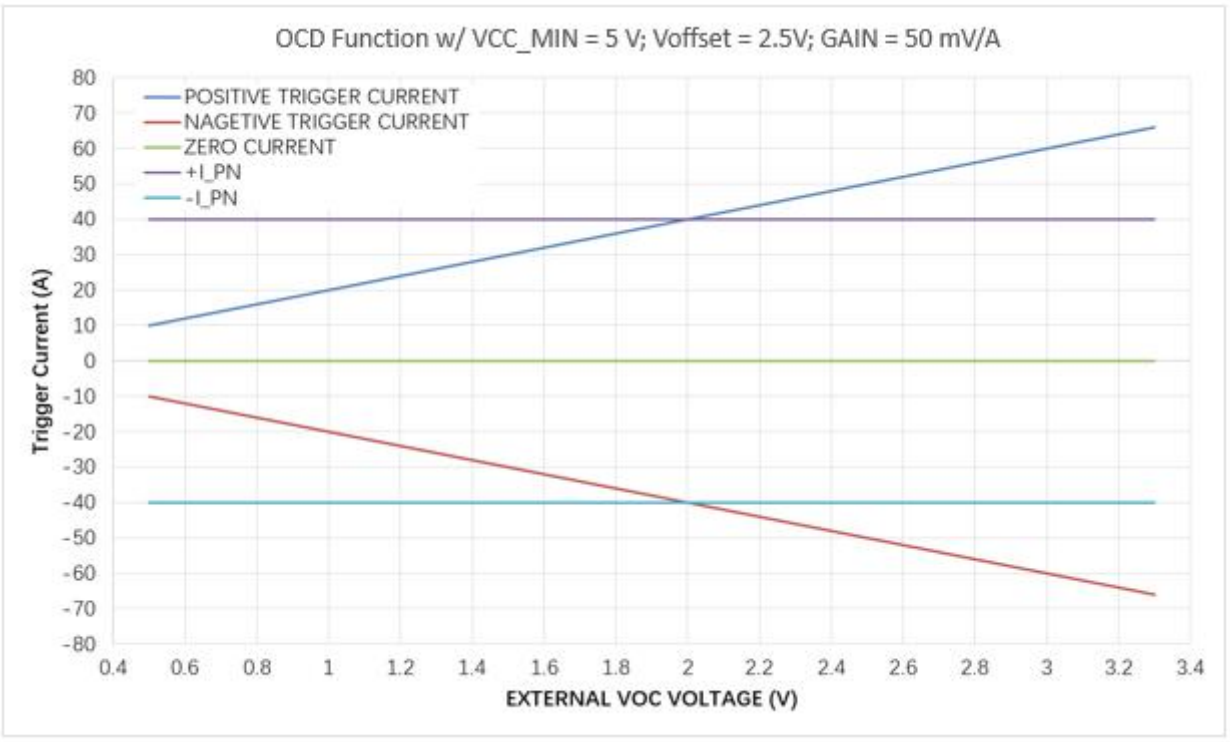


11. Step response time of STK-616T-XXMAFBX

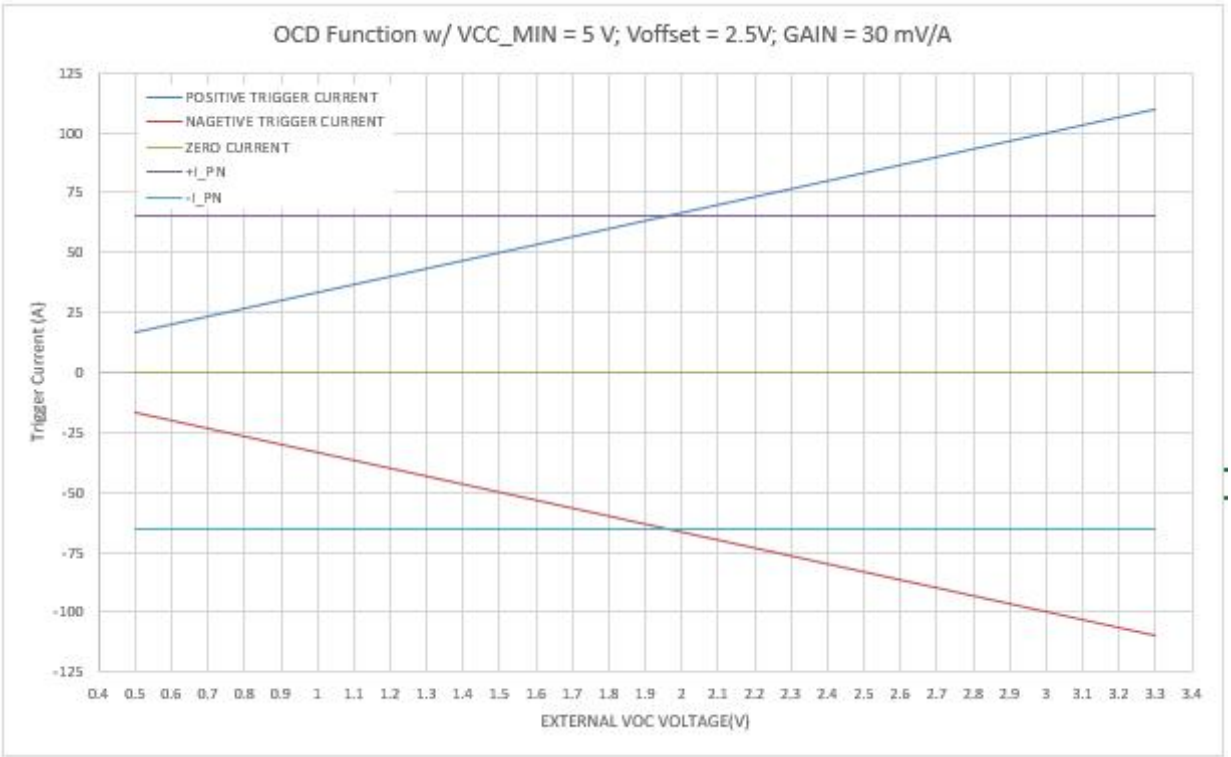


The typical high frequency response of STK-616TM current sensor. The response time from 90% of the primary current to 90% of the secondary output is 0.2μs.

12. Examples of OCD function



OCD function for STK-616T-40MAFB5



OCD function for STK-616T-65MAFB5

13. General information on OCD

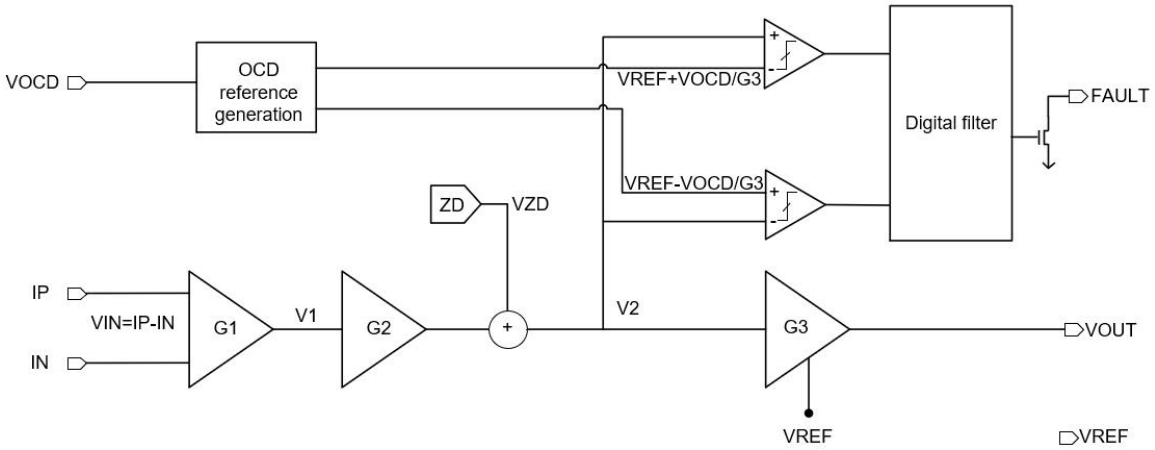
This section describes the general information on OCD function, the specific functions, which are not listed in the section of “electrical data”, can be defined per request.

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:

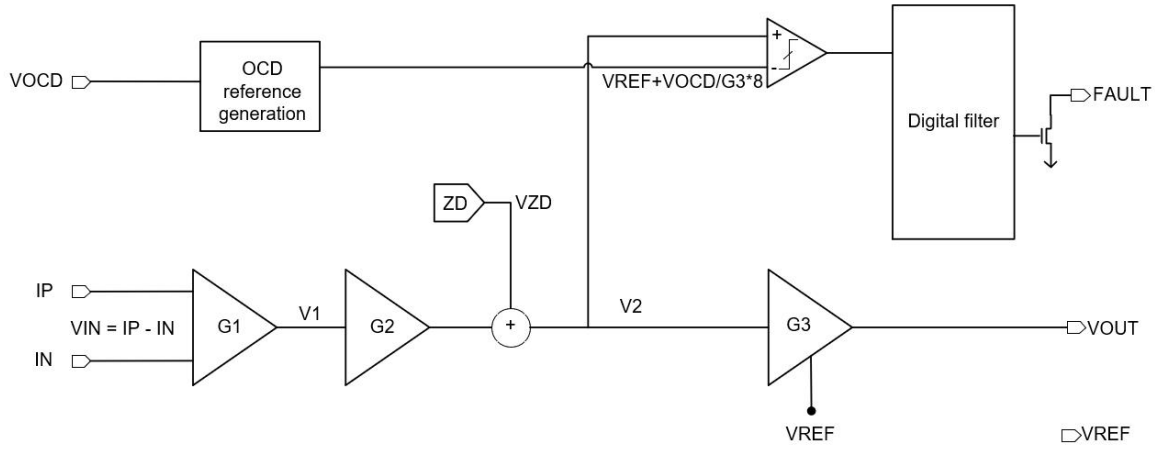
a) Vref = 2.5 V
   ①. 0.5 V ≦ VOC ≦ Vcc – 1.7 V;
   ②. Trigger voltage = Vref +/- VOC;
   ③. Trigger current = (Vref +/- VOC -Voff) / G_th;

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

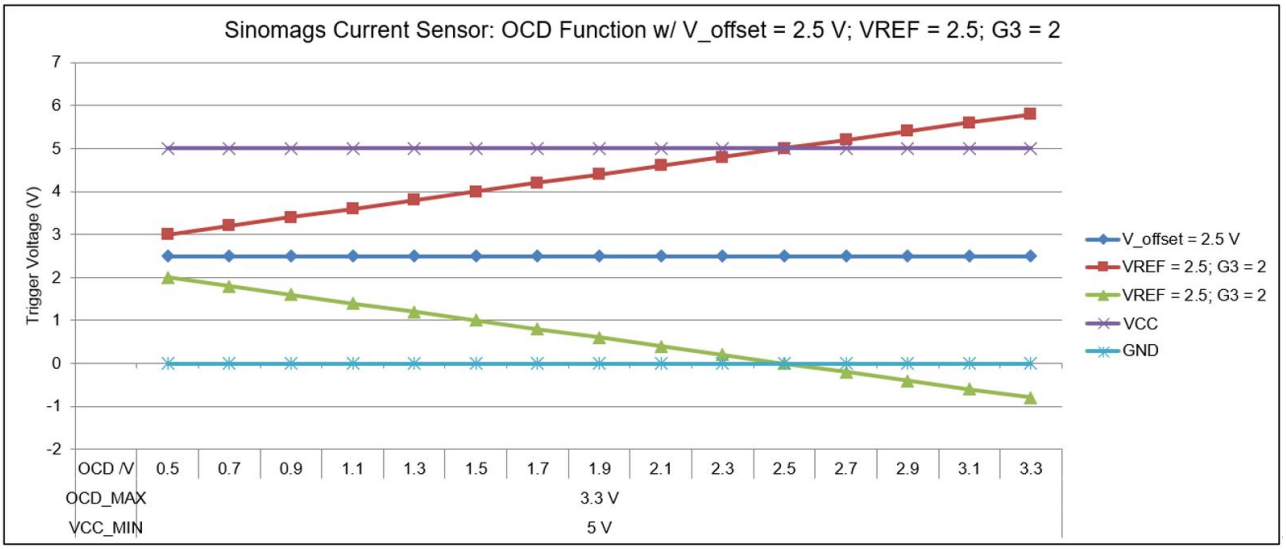


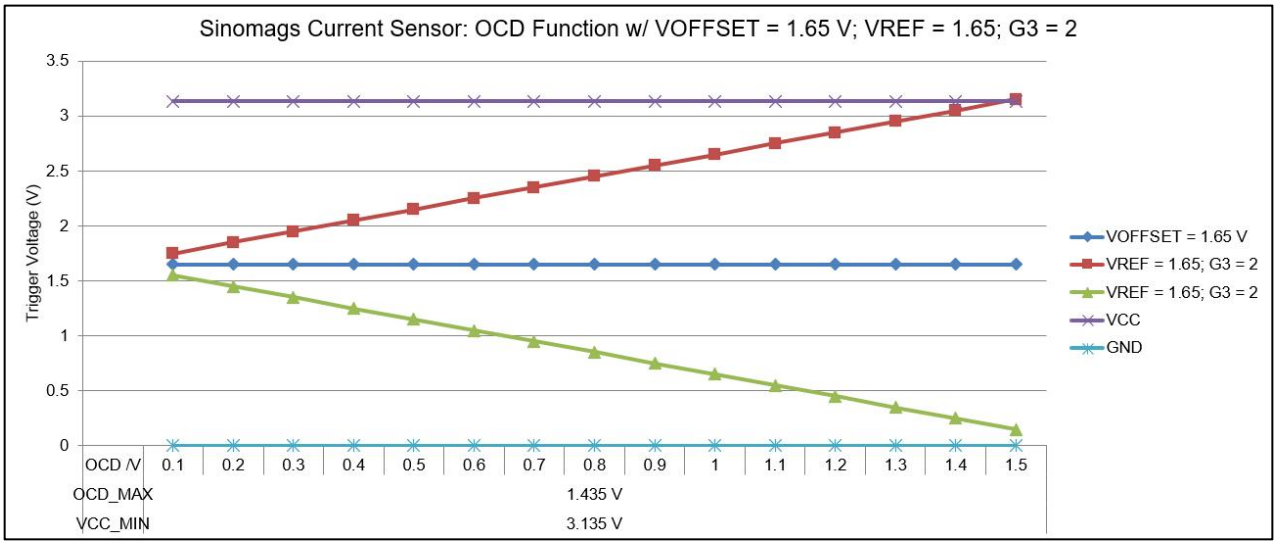
Functional Block Diagram on OCD function when Vref = 2.5 V



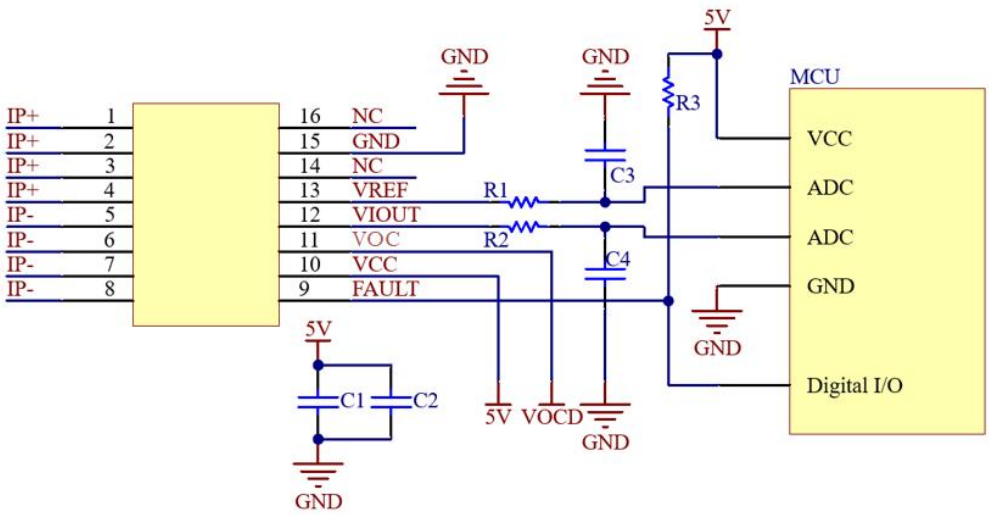
Functional Block Diagram on OCD function when Vref = 0.5 V

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





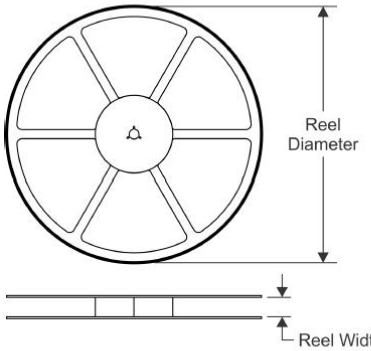
14. Typical Application of STK-616TMAF



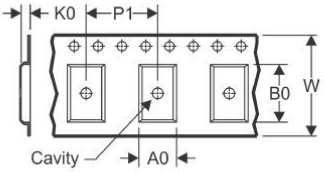
15. PACKAGE MATERIALS INFORMATION

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