SINOMAGS 希 磁 科 技

Current Sensor

Product Series:	STK-616KMF
Part number:	STK-616K-30MFB5 STK-616K-40MFB3 STK-616K-40MFB5 STK-616K-65MFB3
Version:	Ver 2.9

Sinomags Technology Co., Ltd

Web site: www.sinomags.com

CONTENT

1. Description

The STK-616KM series current sensor is based on TMR (tunnel 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
- Electric welder power supply
- 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

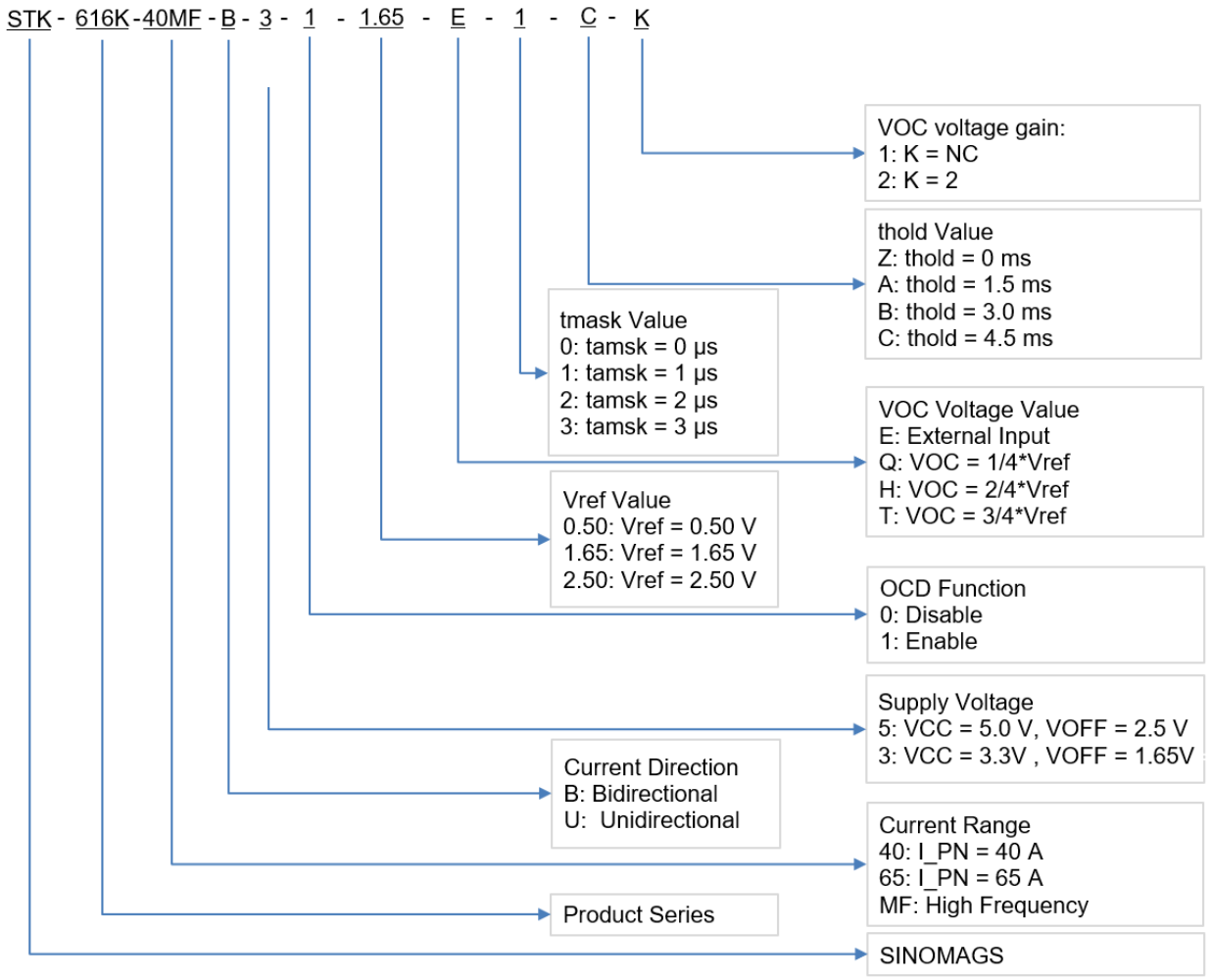
Parameter	Symbol	Unit	Value	Comment
RMS voltage for AC test 50Hz/1 min	Ud	kV	3.6	
Impulse withstand voltage 1.2/50μs	Ûw	kV	10	
Clearance distance (pri. -sec)	dCl	mm	7.5	Determined by customer's layout
Creepage distance (pri. -sec)	dCp	mm	7.5	

Measuring current table

Product	**Optimized Range I_pn (A)**	**Sensitivity, (mV/A)**	**Vcc(V)**	**T(℃)**
STK-616K-40MFB3-1-1.65-E-2-C	±40A	33	3.3V	-40 ~ 125
STK-616K-40MFB3-1-1.65-E-2-C-2	±40A	33	3.3V	-40 ~ 125
STK-616K-40MFB3-1-1.65-E-1-Z	±40A	33	3.3V	-40 ~ 125
STK-616K-40MFB3-1-1.65-X-X-X	±40A	33	3.3V	-40 ~ 125
STK-616K-40MFB3-1-1.65-E-2-Z	±40A	33	3.3V	-40 ~ 125
STK-616K-65MFB3-1-1.65-E-2-C	±65A	20.3	3.3V	-40 ~ 125

STK-616K-65MFB3-1-1.65-E-1-Z	±65A	20.3	3.3V	-40 ~ 125
STK-616K-65MFB3-1-1.65-E-2-Z	±65A	20.3	3.3V	-40 ~ 125
STK-616K-30MFB5-1-2.5-E-1-Z	±30A	66.6	5V	-40 ~ 125
STK-616K-30MFB5-1-2.5-E-2-Z	±30A	66.6	5V	-40 ~ 125
STK-616K-40MFB5-1-2.5-E-2-Z	±40A	50	5V	-40 ~ 125
STK-616K-65MFB5-1-2.5-E-2-Z	±65A	30.8	5V	-40 ~ 125

2. Part number definition



3. Temperature vs Current

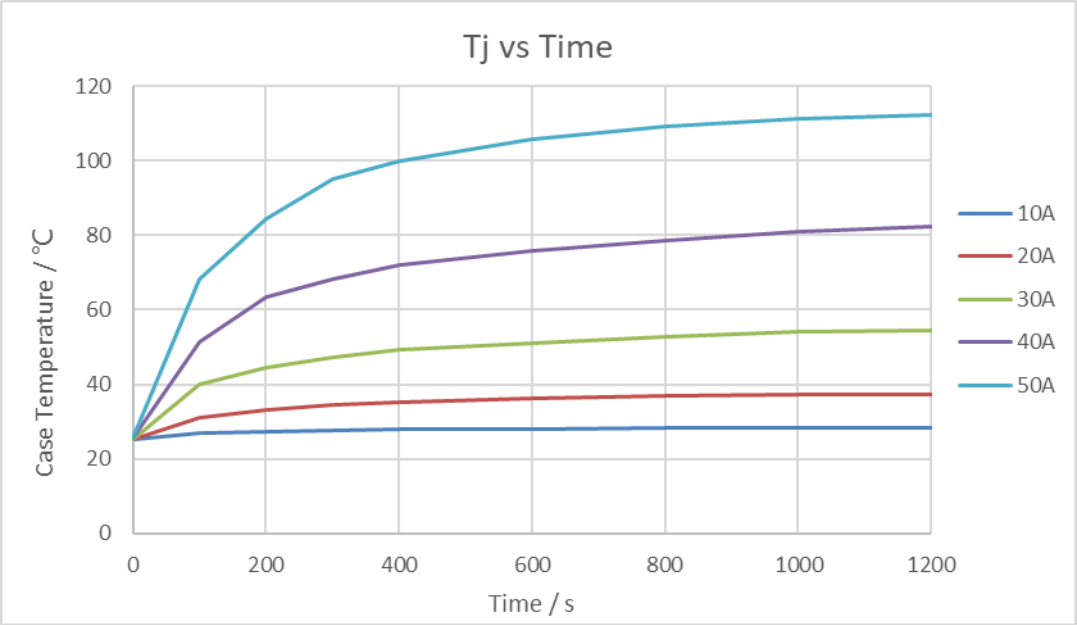


Figure 1. Relationship between STK-616KM Case temperature and amount of input current

Remark 1： Figure 1 shows the results of current & temperature measurement. Tested by using a standard demo test board, with 4 layers of copper conductors, where the thickness for each layer is 2 oz, the total thickness of demo board is 1.6 mm. This result is a reference data. Tc is changed much by the board layout and the heat dissipation. Please confirm it in your evaluation environment.

4. Electrical data STK-616K-XXMFB3

Condition：T_A = 25℃，Vcc = 3.3 V

Parameter	Symbol	Unit	Min	Typ	Max	Comment
General parameters						
Primary nominal current	I_pn	A	-40		40	STK-616K-40MFB3
			-65		65	STK-616K-65MFB3
Supply voltage	Vcc	V	3.15	3.3	3.45	
Current consumption	Icc	mA		7	12	
Primary Conductor Resistance	R_{IP}	mΩ		0.85		
Quiescent voltage	Voff	V	1.6	1.65	1.7	
Internal output resistance	Rout	Ω	1		30	
Theoretical gain	G_th	mV/A		33		STK-616K-40MFB3
				20.3		STK-616K-65MFB3
OCD function (if applicable)						
OCD range	VOC	V	0.3		1.6	K=1
			0.3		1.6	K=2
FAULT error		%		5%		% of OCD
OCD Hysteresis	IHYS	%		10%		% of OCD

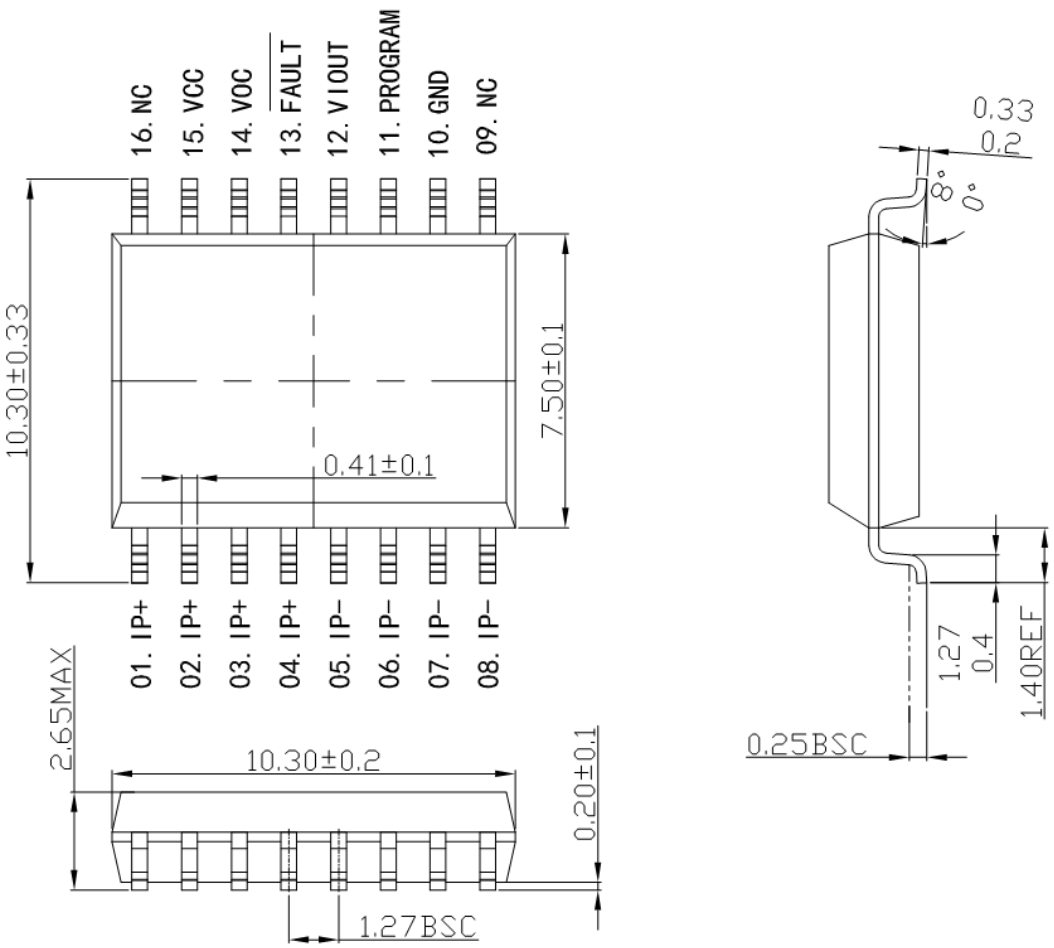
OCD Fault Mask	tmask	μs		1		0, 1, 2, 3 μs
OCD Fault Mask error	Tmask_error	ns		125		
OCD Fault Hold Time	thold	ms		4.5		0, 1.5, 3, 4.5 ms
Rated linearity error@25℃	Non-L	%I_pn		±1.5		±I_pn
Accuracy performance						
Delay time	t_delay	μs		0.2		@400 kHz
Step response time	t_res	μs		0.2		@90% of I_pn STK-616K-XXMFB3
Frequency bandwidth	BW	MHz		1.5		@-3dB STK-616K-XXMFB3
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	% of G_th		±1.5		@ -40~105℃ drift related to the value @25℃
Thermal drift of Voff	Voff_T	mV		±15		
Total Accuracy	X_TRange	% of I_pn		±3		

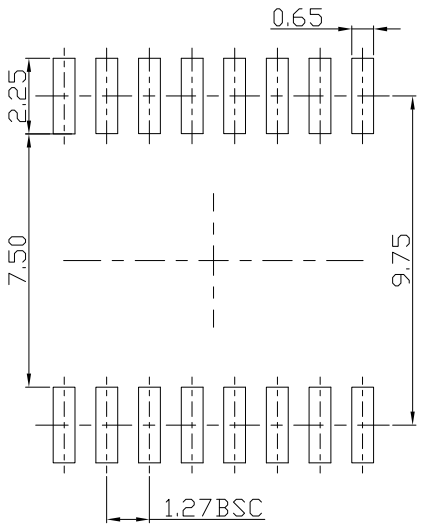
5. Electrical data STK-616K-XXMFB5

Condition：T_A = 25℃，Vcc = 5 V

Parameter	Symbol	Unit	Min	Typ	Max	Comment
General parameters						
Primary nominal current	I_pn	A	-30		30	STK-616K-30MFB5
			-40		40	STK-616K-40MFB5
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	Voff	V	2.45	2.5	2.55	
Internal output resistance	Rout	Ω	1		30	
Theoretical gain	G_th	mV/A		66.6		STK-616K-30MFB5
				50		STK-616K-40MFB5
OCD function (if applicable)						
OCD range	VOC	V	0.3		3.3	K=1
			0.3		2	K=2
FAULT error		%		5%		% of OCD
OCD Hysteresis	IHYS	%		10%		% of OCD
OCD Fault Mask	tmask	μs		1		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
Rated linearity error@25℃	Non-L	%I_pn		±1.5		±I_pn
Accuracy performance						
Delay time	t_delay	μs		0.2		@400 kHz
Step response time	t_res	μs		0.2		@90% of I_pn STK-616K-XXMFB3
Frequency bandwidth	BW	MHz		1.5		@-3dB STK-616K-XXMFB3
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	% of G_th		±1.5		@ -40~105℃ drift related to the value @25℃
Thermal drift of Voff	Voff_T	mV		±15		
Total Accuracy	X_TRange	% of I_pn		±3		

6. Dimension & Pin definitions



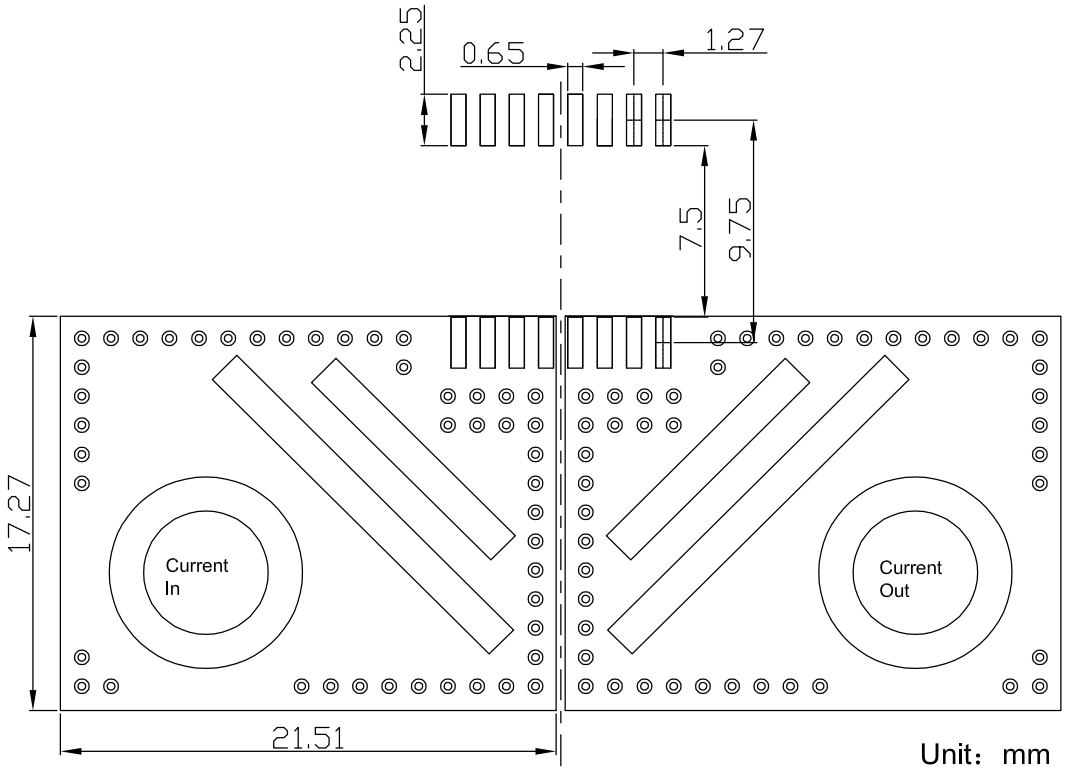


PCB Layout Reference View

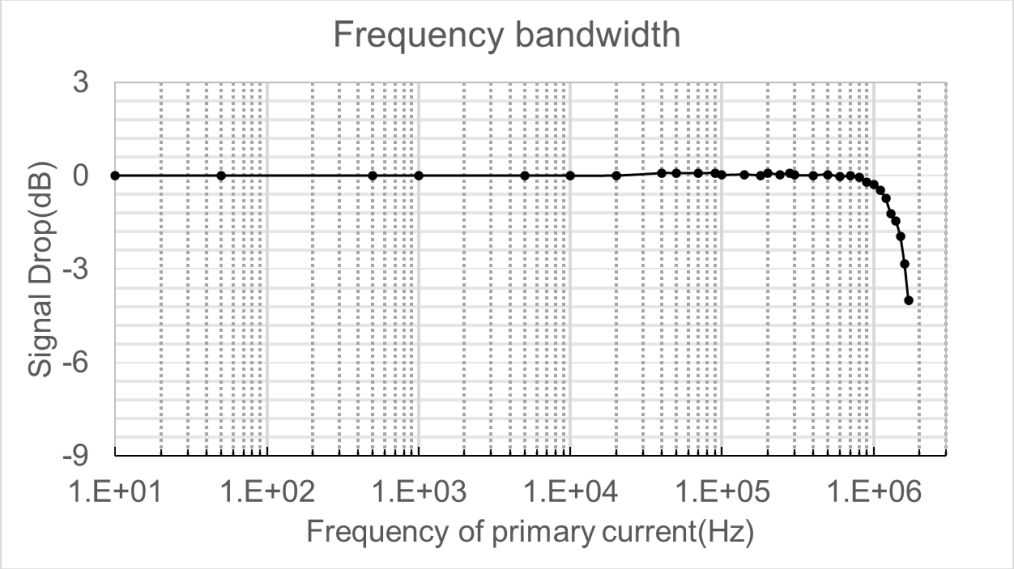
7. Pin definitions

PIN	Symbol	Description
1,2,3,4	IP+	Primary conductor pin (+)
5,6,7,8	IP-	Primary conductor pin (-)
9	NC	Not connected
10	GND	Ground pin (GND)
11	PROGRAM	Internal use only
12	VIOUT	Sensor output pin
13	FAULT	Over current detection alarm output, the pin is open leakage output。Normally, the output of fault pin is high level
14	VOCD	Over current detection threshold input pin
15	VCC	Power supply pin
16	NC	Not connected

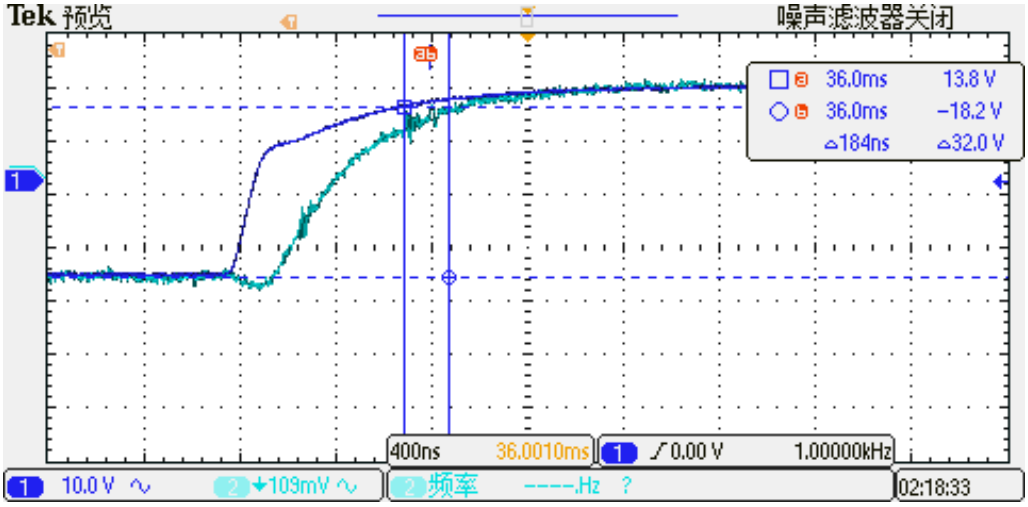
8. PCB layout recommendation



9. Frequency bandwidth of STK-616K-XXMFBX

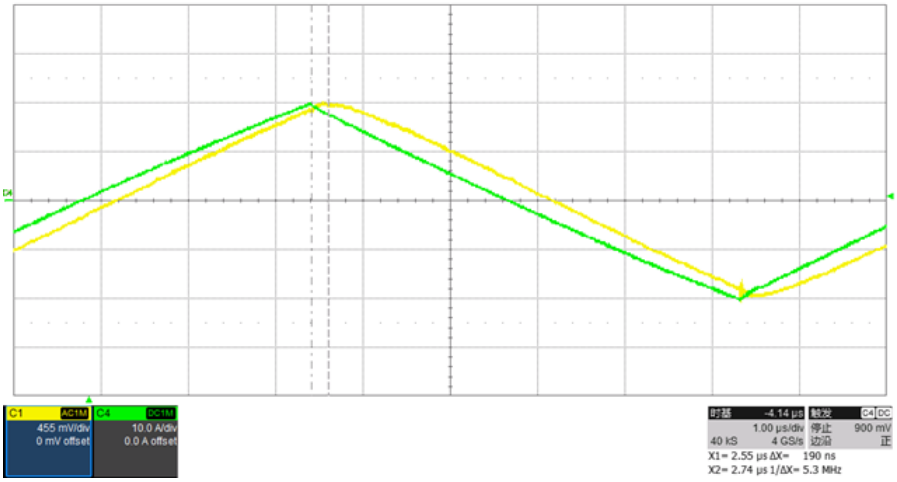


10. Step response time of STK-616K-XXMFBX

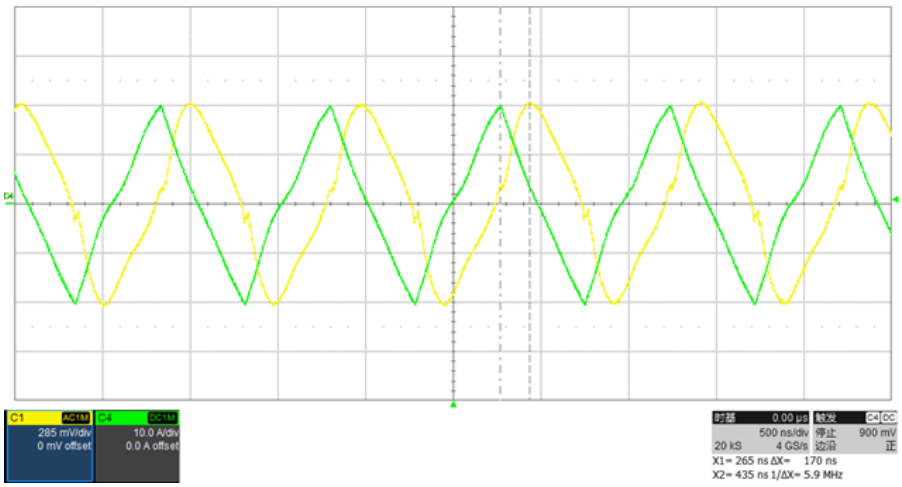


The typical frequency response of STK-616KMF current sensor. The response time from 90% of the primary current to 90% of the secondary output is about 0.2μs.

11. The delay time of Triangular Wave.

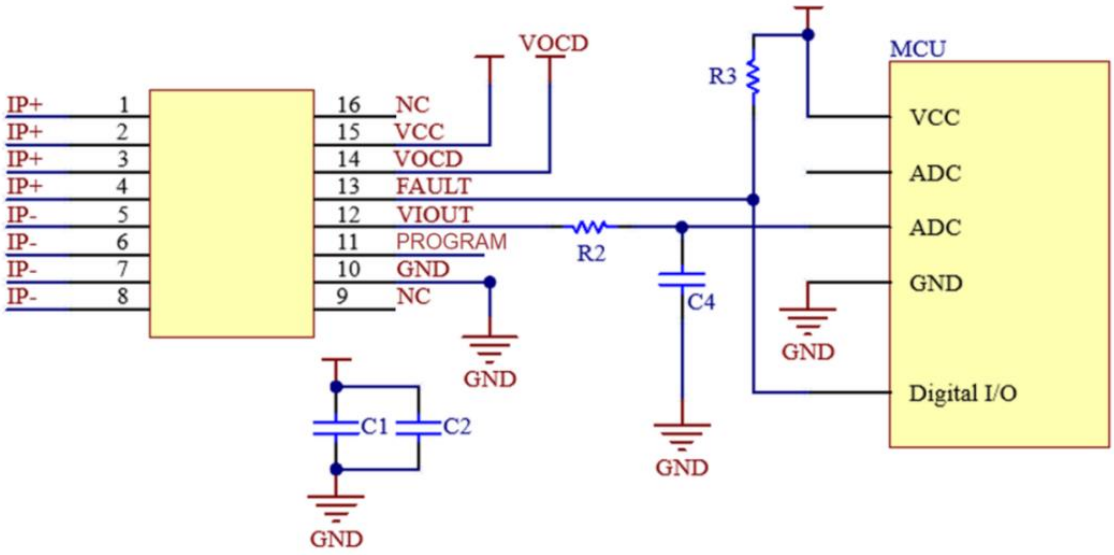


100 kHz Triangular delay---0.2 µ s

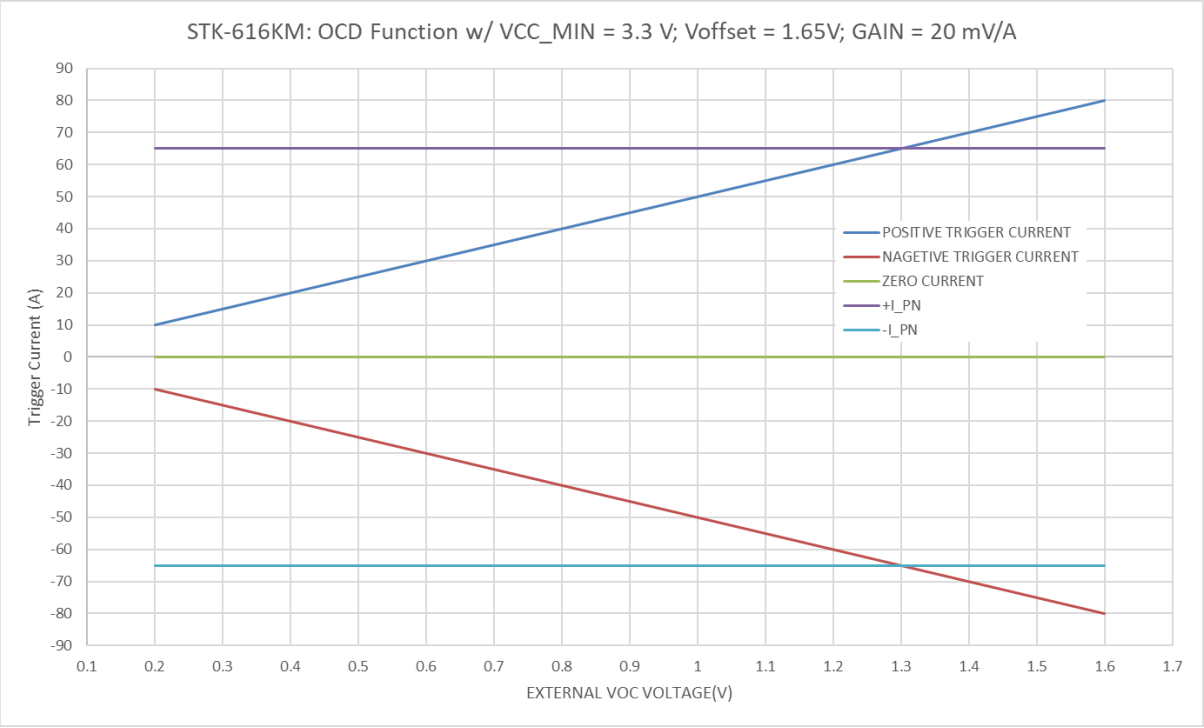


1MHz Triangular delay---0.2 µ s

12. Typical Application of STK-616KMF



13. Examples of OCD function

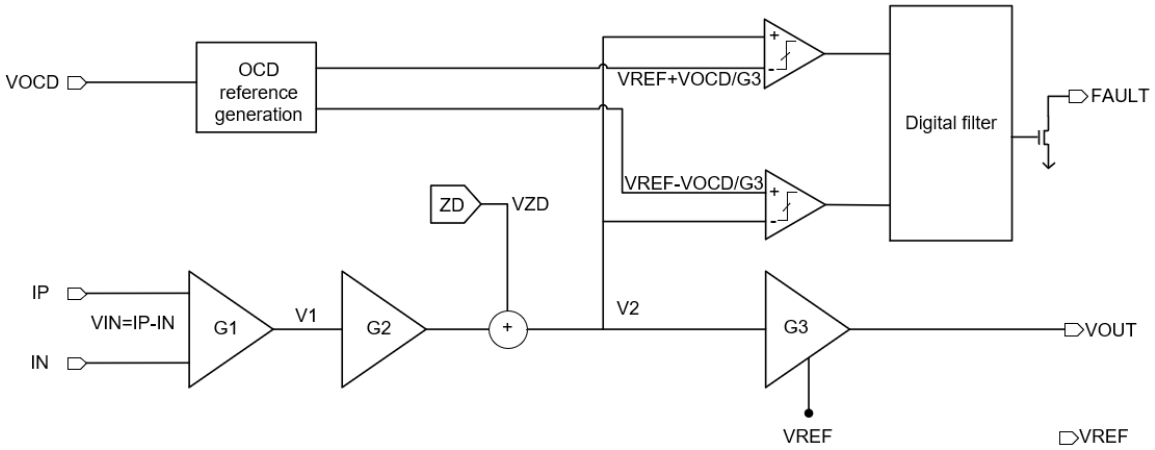


OCD function for STK-616K-65MFB3

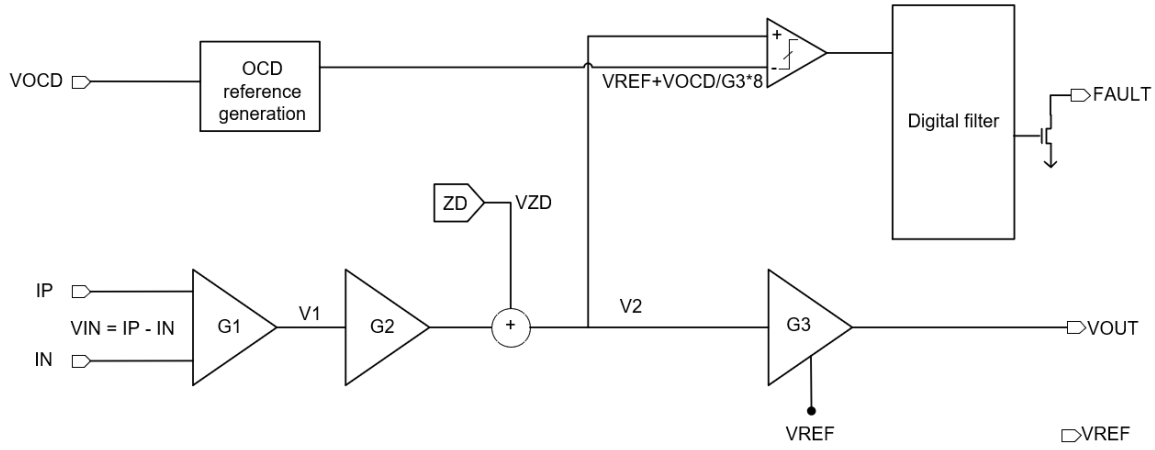
14. General information on OCD

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
   a) 0.5 V ≦ VOC ≦ Vcc – 1.7 V;
   b) Trigger voltage = Vref +/- VOC;
   c) Trigger current = (Vref +/- VOC -Voff) / G_th;
b) Vref = 1.65 V
   a) 0.3 V ≦ VOC ≦ Vcc – 1.7 V;
   b) Trigger voltage = Vref +/- VOC;
   c) Trigger current = (Vref +/- VOC -Voff) / G_th
c) Vref = 0.5 V
   a) 0.2 V ≦ VOC ≦ 0.5 V;
   b) Trigger voltage = Vref + 8*VOC;
   c) Trigger current = (Vref + VOC -Voff) / G_th

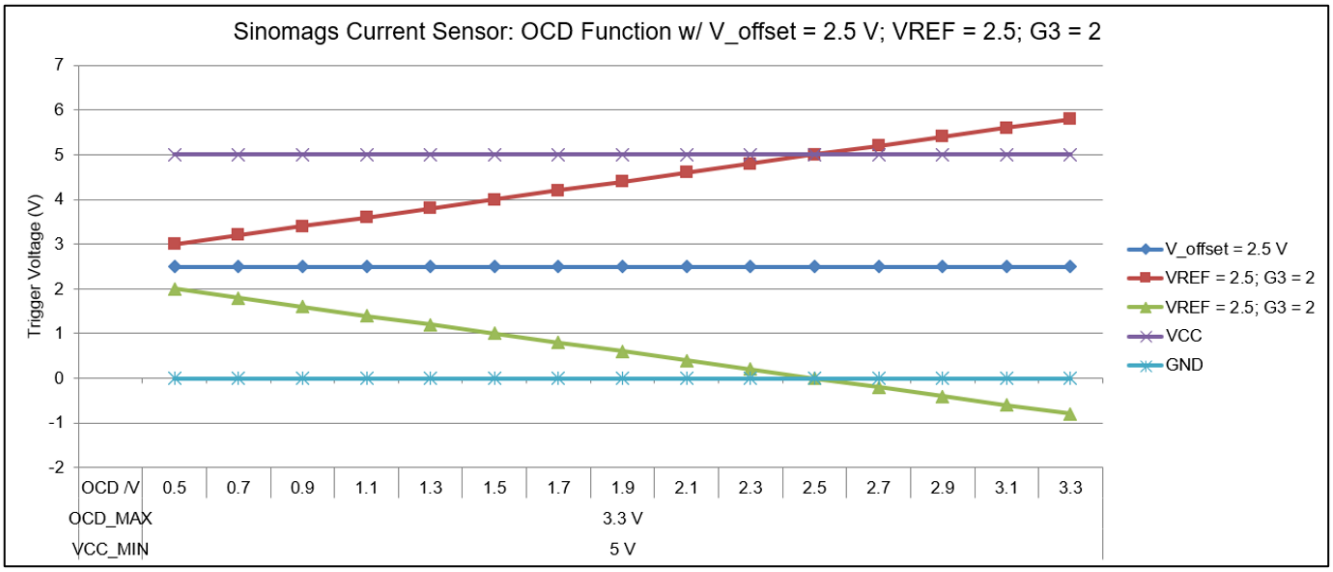


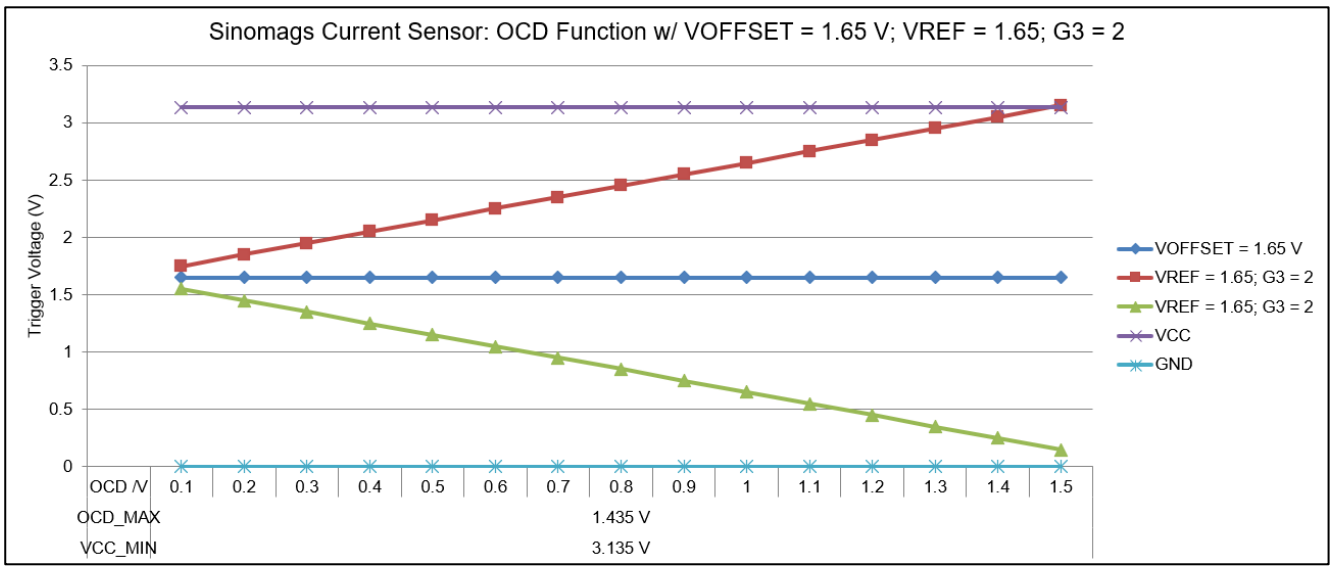
Functional Block Diagram on OCD function when Vref = 2.5 V



Functional Block Diagram on OCD function when Vref = 0.5 V

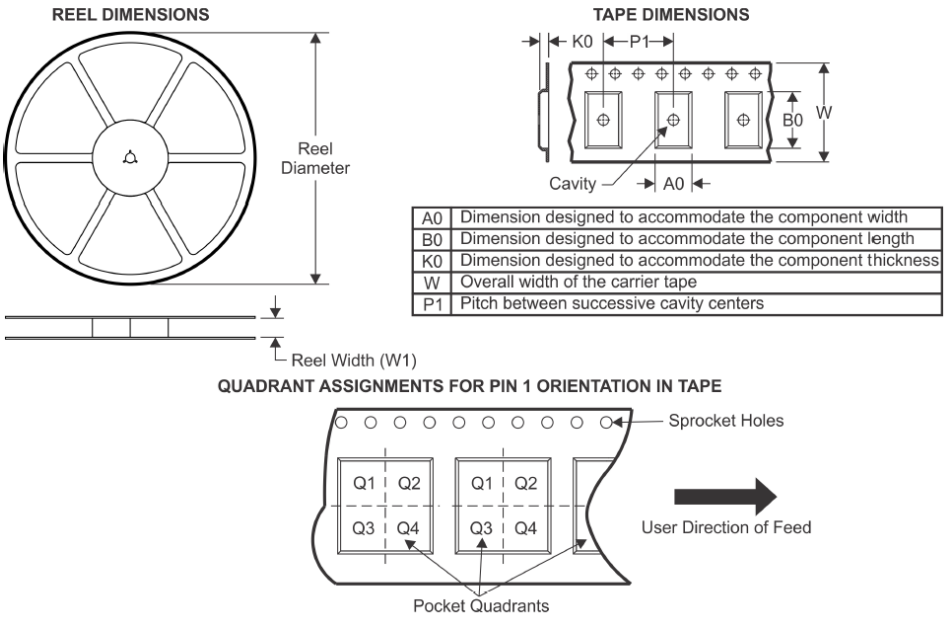
With the above definition, below shows the relationship between trigger voltage and the setting of Vcc, VOC.





15. PACKAGE MATERIALS INFORMATION

TAPE AND REEL INFORMATION



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