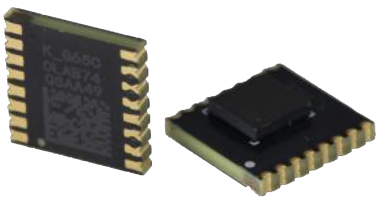
Current Sensor

Product Series:	STK-616K
Part number:	STK-616K-30GB STK-616K-40GB STK-616K-65GB STK-616K-65GC STK-616K-40GC STK-616K-75GB
Version:	Ver 3.1



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1. Description

The STK-616K series current sensor is based on TMR (tunnel 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
- 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

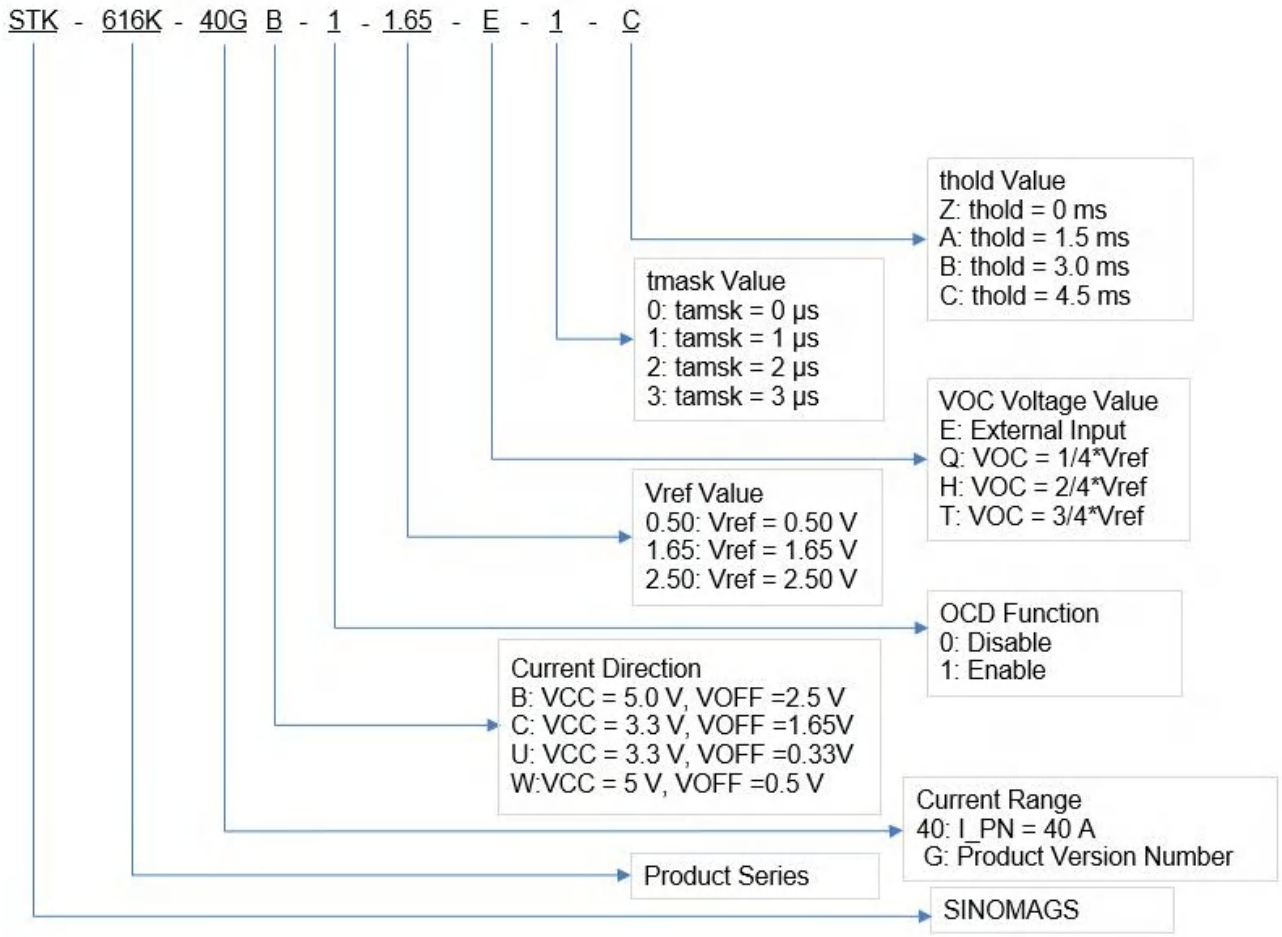
Parameter	Symbol	Unit	Value	Comment
RMS voltage for AC test 50Hz/1 min	Ud	kV	3.6	
Impulse withstand voltage 1.2/50μs	Ûw	kV	10	
Clearance distance (pri. -sec)	dCl	mm	6	Determined by customer's layout
Creepage distance (pri. -sec)	dCp	mm	6	

Measuring current table

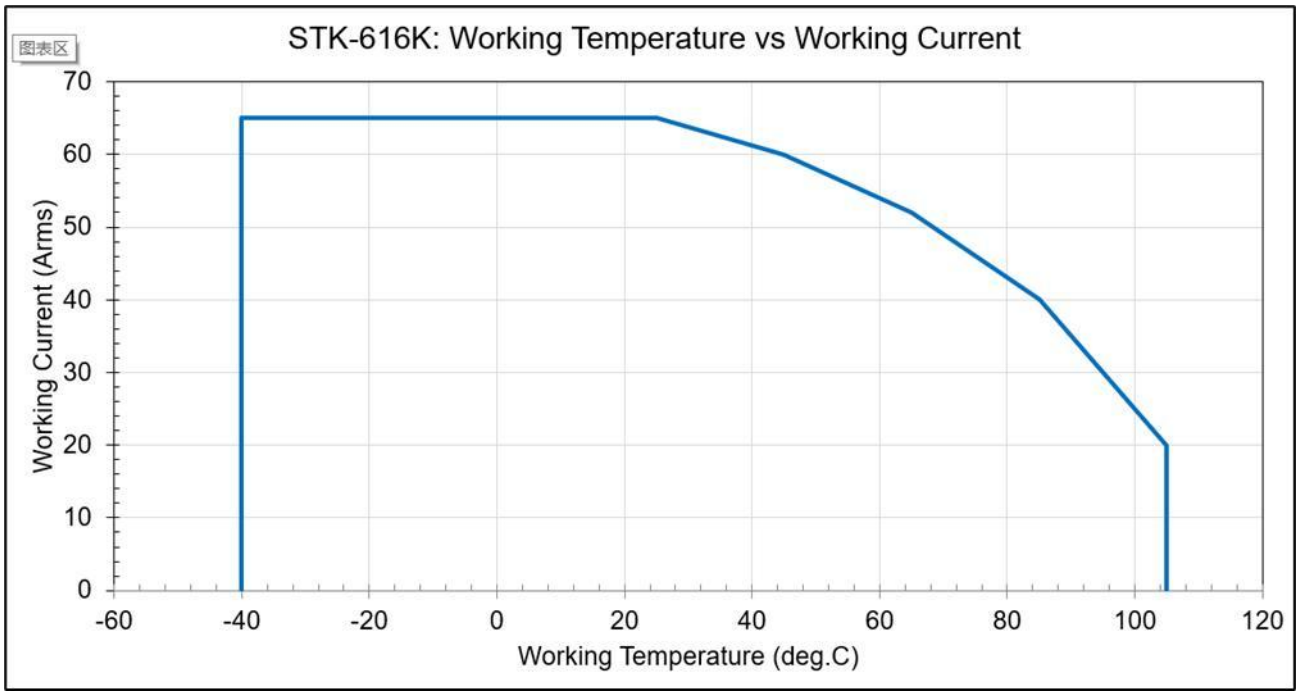
Product	**Optimized Range I_pn (A)**	**Sensitivity, (mV/A)**	**Vcc(V)**	**T(℃)**
STK-616K-30GB-0-2.5	±30A	66.7	5	-40 ~ 125
STK-616K-40GB-0-2.5	±40A	50	5	-40 ~ 125
STK-616K-65GB-0-2.5	±65A	30	5	-40 ~ 125
STK-616K-75GB-0-2.5	±75A	26.6	5	-40 ~ 125
STK-616K-40GC-1-1.65-E-1-C	±40A	33	3.3	-40 ~ 125
STK-616K-65GC-1-1.65-E-1-C	±65A	20	3.3	-40 ~ 125
STK-616K-65GC-1-1.65-E-1-Z	±65A	20	3.3	-40 ~ 125
STK-616K-40GC-1-1.65-E-1-Z	±40A	33	3.3	-40 ~ 125
STK-616K-65GC-0-1.65	±65A	20	3.3	-40 ~ 125
STK-616K-40GC-0-1.65	±40A	33	3.3	-40 ~ 125
STK-616K-40GC-1-1.65-E-2-Z	±40A	33	3.3	-40 ~ 125

STK-616K-40GC-1-1.65-E-0-Z	±40A	33	3.3	-40 ~ 125
STK-616K-65GB-1-2.5-E-1-Z	±65A	30	5	-40 ~ 125
STK-616K-75GB-1-2.5-E-1-Z	±75A	26.6	5	-40 ~ 125

2. Part number definition



3. Temperature vs Current



4. Electrical data STK-616K-xxGB

Condition：T_A = 25℃，Vcc = 5 V

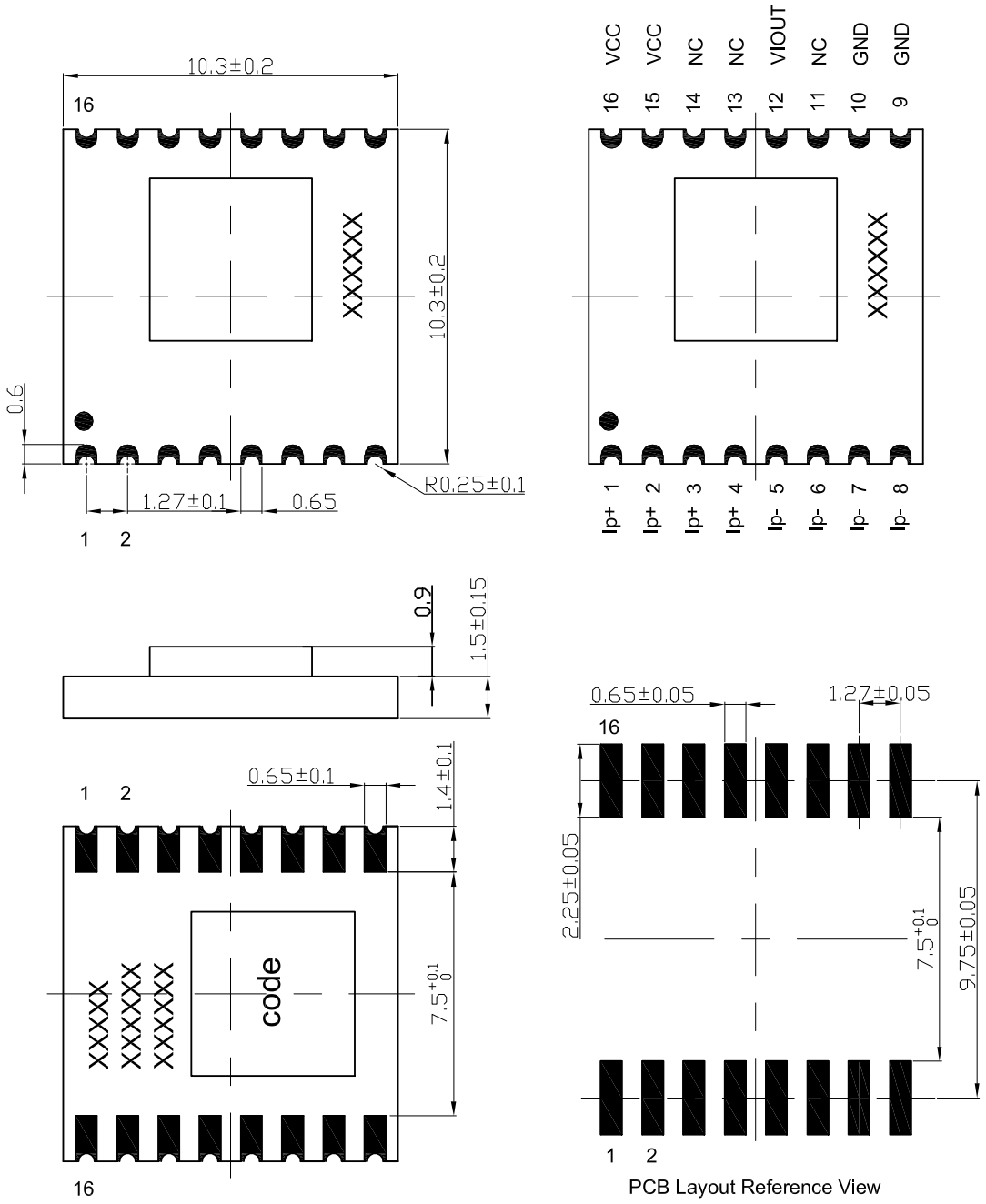
Parameter	Symbol	Unit	Min	Typ	Max	Comment
General parameters						
Primary nominal current	I_pn	A	-30		30	STK-616K-30GB
			-40		40	STK-616K-40GB
			-65		65	STK-616K-65GB
			-75		75	STK-616K-75GB
Supply voltage	Vcc	V	4.5	5	5.5	
Current consumption	Icc	mA		7	12	
Quiescent voltage	Voff	V	2.45	2.5	2.55	
Output Specifications	Vout	Ω	1		30	
Theoretical gain	G_th	mV/A		66.7		STK-616K-30GB
				50		STK-616K-40GB
				30		STK-616K-65GB
				26.6		STK-616K-75GB
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	1	3	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		±1.5		@±I_pn
Step response time	t_res	μs		1.5		@90% of I_pn
Frequency bandwidth	BW	kHz		150		@-3dB
Output voltage noise	Vnoise	mVpp		20		100 ~ 120 kHz @250 kHz S.R.
Accuracy @ 25℃	X	% I_pn		±1.5		@ 0.5*I_pn
Thermal drift of G_th	GAIN_T	% of G_th	-1.5		1.5	@ -40~105℃ drift related to the value @25℃
Thermal drift of Voff	Voff_T	mV	-15		15	
Total Accuracy	X_TRange	% of I_pn	-3		3	

5. Electrical data STK-616K-xxGC

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-40GC
			-65		65	STK-616K-65GC
Supply voltage	Vcc	V	3.15	3.3	3.45	
Current consumption	Icc	mA		7	12	
Quiescent voltage	Voff	V	1.6	1.65	1.7	
Internal output resistance	Vout	Ω	1		30	Vout
Theoretical gain	G_th	mV/A		33		STK-616K-40GC
				20		STK-616K-65GC
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		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						
Step response time	t_res	μs		1.5		@90% of I_pn
Frequency bandwidth	BW	kHz		150		@-3dB
Output voltage noise	Vnoise	mVpp		20		100 ~ 120 kHz @250 kHz S.R.
Accuracy @ 25℃	X	% I_pn		±1.5		@ 0.5*I_pn
Thermal drift of G_th	GAIN_T	% of G_th	-1.5		1.5	@ -40~105℃ drift related to the value @25℃
Thermal drift of Voff	Voff_T	mV	-15		15	
Total Accuracy	X_TRange	% of I_pn	-3		3	

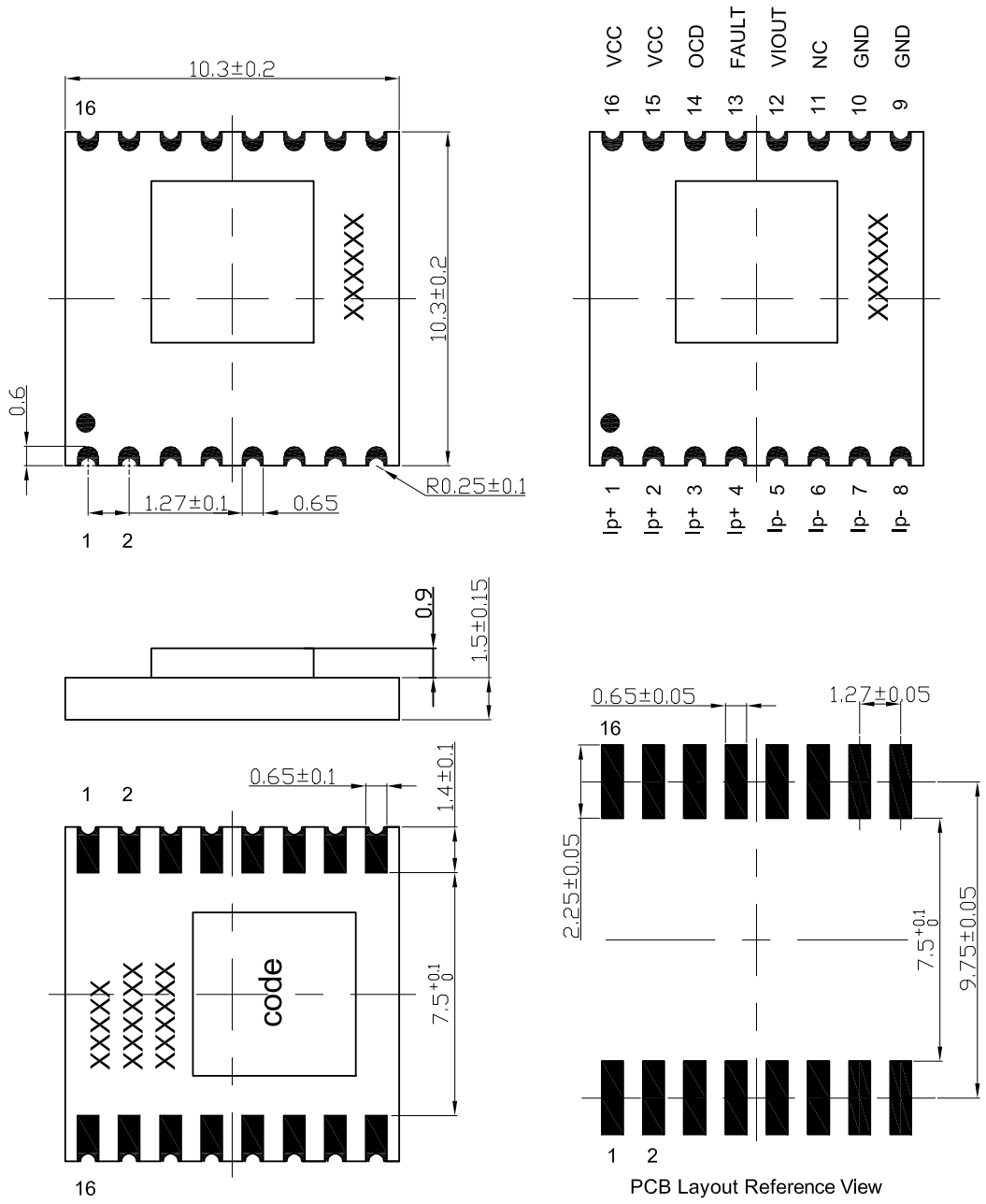
6. Dimension & Pin definitions without OCD function



PCB Layout Reference View

The mark of “KXXB” on the top surface shows the information on the “Part number”: “K” = “STK-616K”, “XX” = “Product sensing range”, “B” = “Current direction”.

7. Dimension & Pin definitions with OCD function



PCB Layout Reference View

The mark of “KXXC” on the top surface shows the information on the “Part number”: “K” = “STK-616K”, “XX” = “Product sensing range”, “C” = “Current direction”.

8. Pin definitions

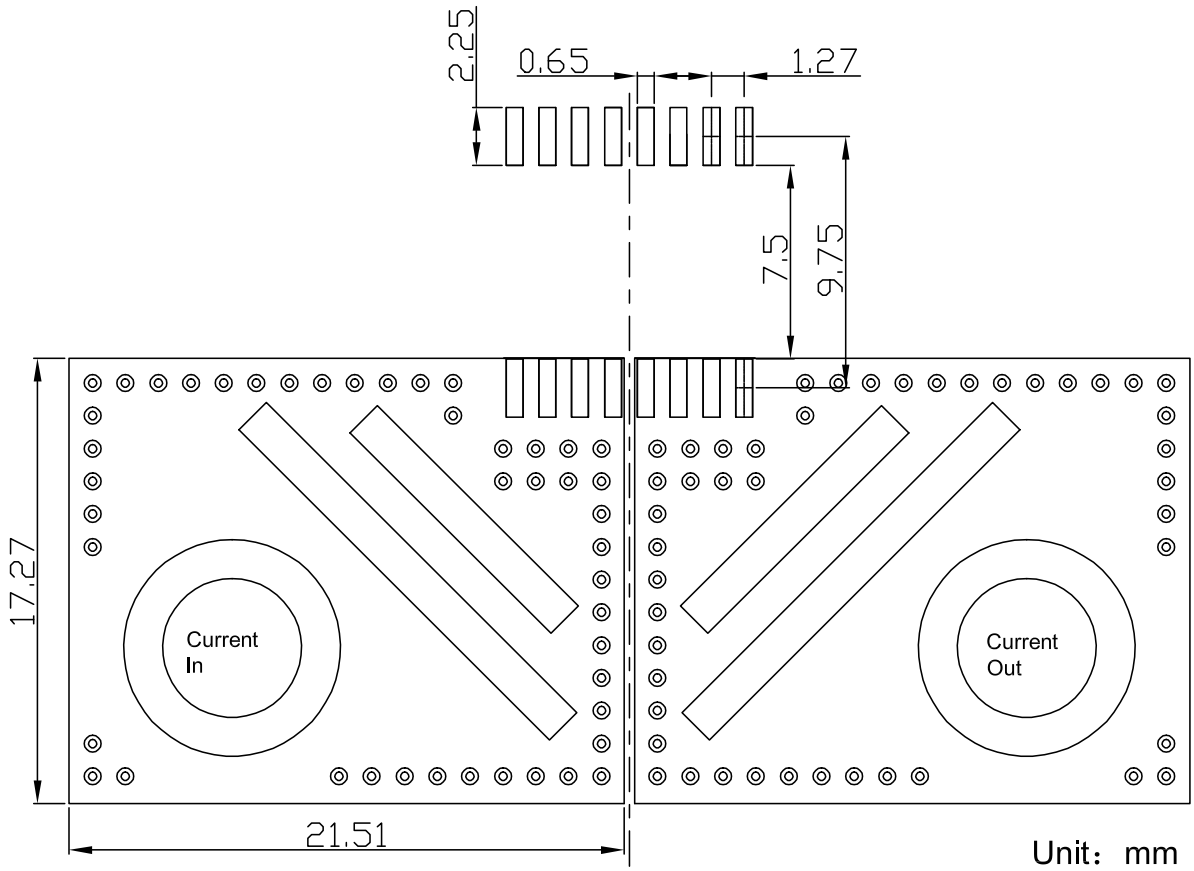
Product pin definition without OCD function

PIN	Symbol	Description
1,2,3,4	IP+	Primary conductor pin (+)
5,6,7,8	IP-	Primary conductor pin (-)
9,10,11	GND	Ground pin (GND)
12	VIOUT	Sensor output pin
13	NC	No connection, Internal use
14	NC	No connection, Internal use
15,16	VCC	Power supply pin

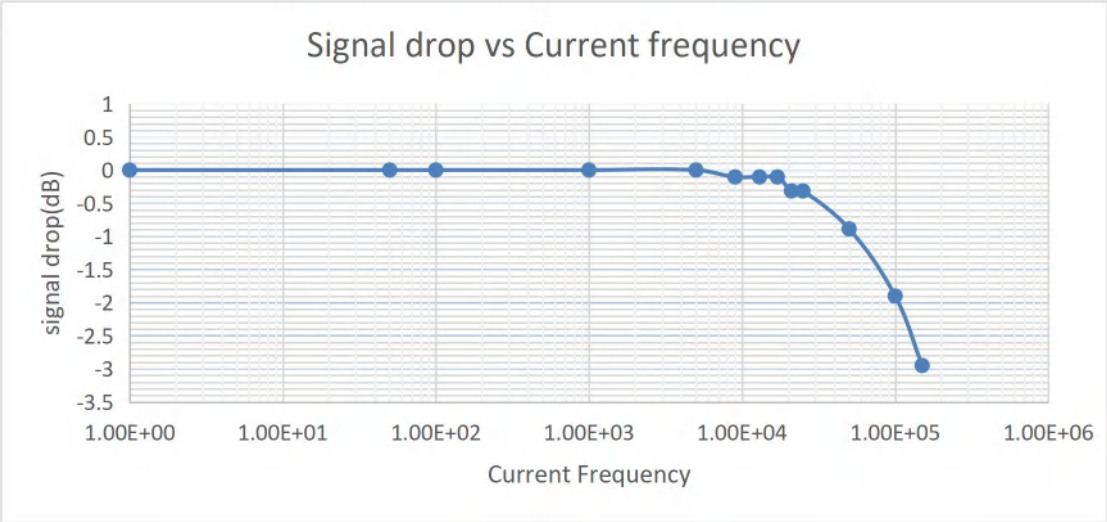
Product pin definition with OCD function

PIN	Symbol	Description
1,2,3,4	IP+	Primary conductor pin (+)
5,6,7,8	IP-	Primary conductor pin (-)
9,10,11	GND	Ground pin (GND)
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	OCD	Over current detection threshold input pin
15,16	VCC	Power supply pin

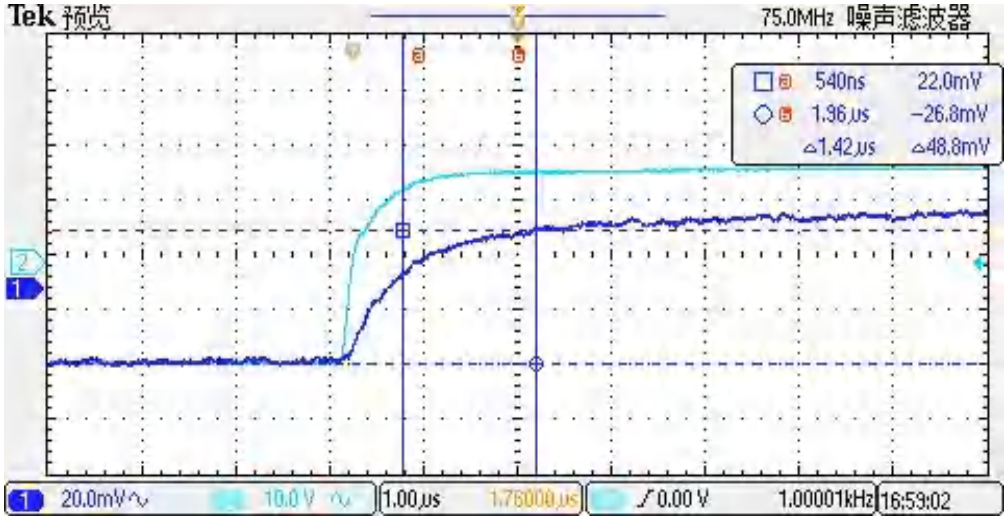
9. PCB layout recommendation



10. Frequency band width

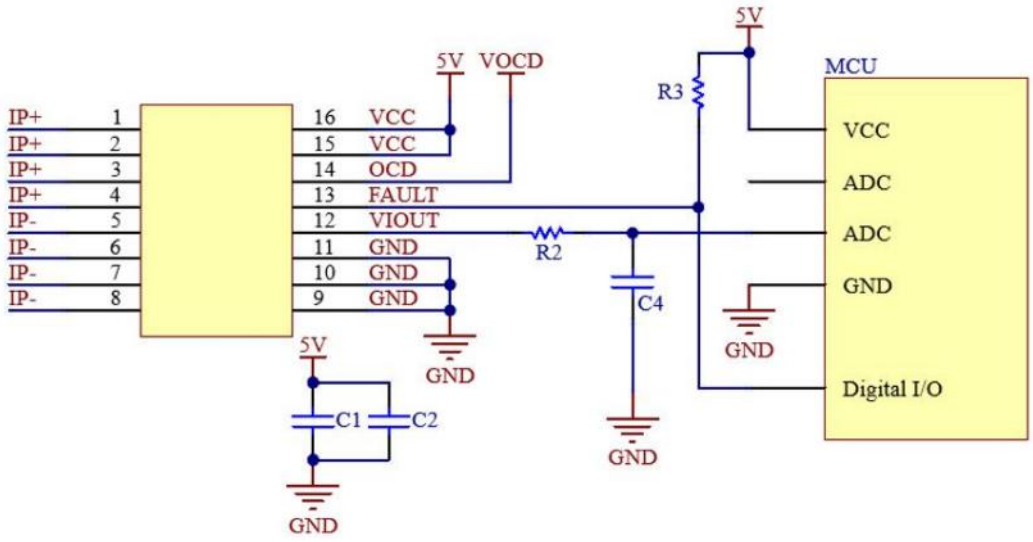


11. Step response time



The typical frequency response of STK-616K current sensor. The response time from 90% of the primary current (pink) to 90% of the secondary output (blue) is 1.5 µs.

12. Typical Application of STK-616K



Remark:

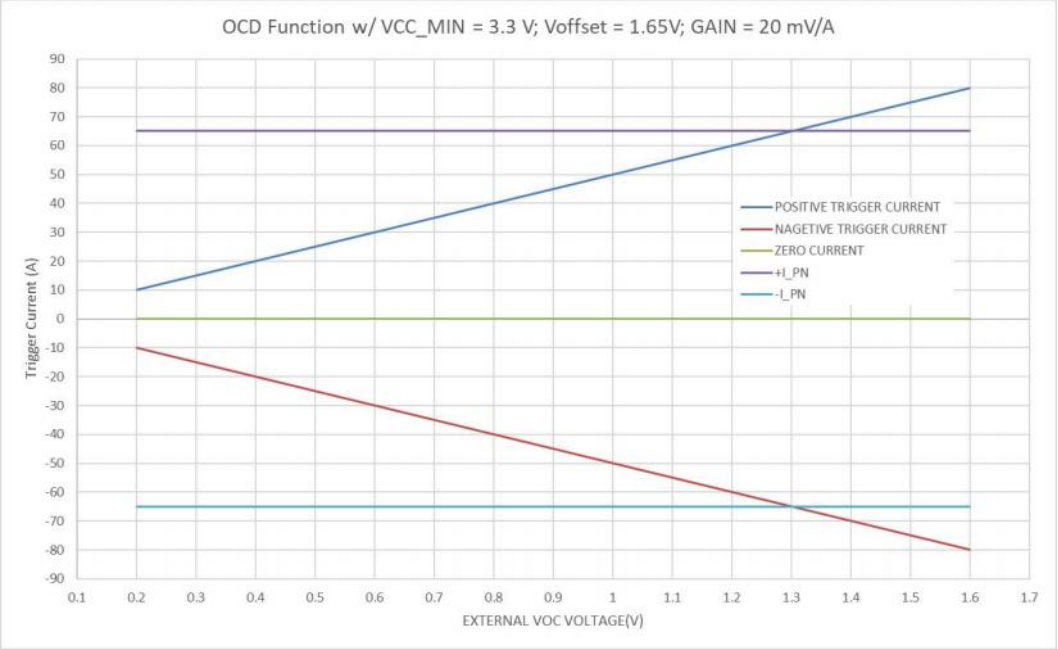
With below recommended setting, the response speed of the chip will be not affected:

R3 = 5 kΩ, C1 = 1 μf, C2 = 10 nf, C4 = 50 pf.

While, R2 and C4 constitute RC filter circuit. The relationship between RC value and frequency is shown in below Table

R2 (kohm)	C4 (nF)	Theoretical band width f = 1/(2πRC) (kHz)	Measured band width (kHz)
1	1	150	~ 150
1	1.6	99	~ 100
1	16	9.9	~ 10

13. Examples of OCD function



OCD function for STK-616K-65GC

14. General information on OCD

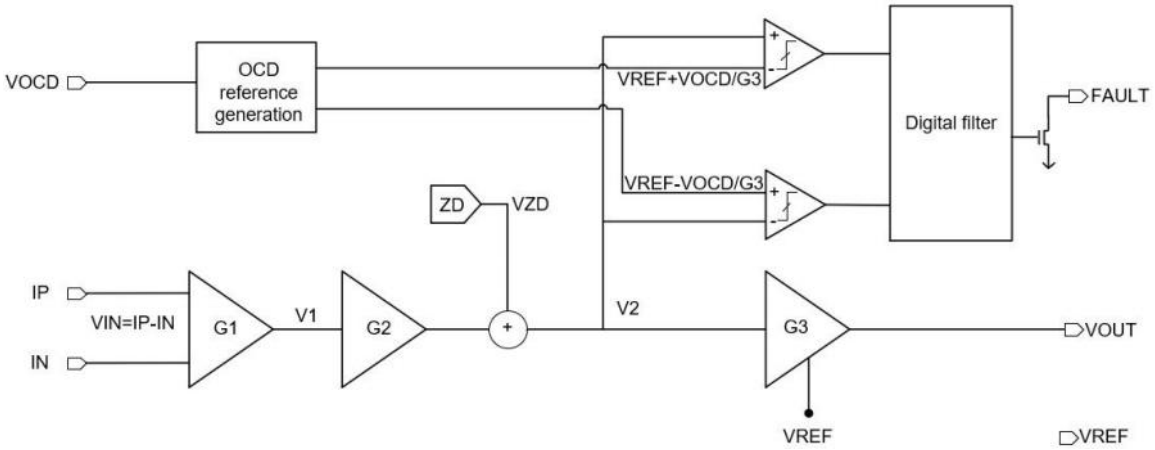
This section describes the general information on OCD function, the specific functions, which are not listed in the section of “electrical data”, can be defined per request.

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:

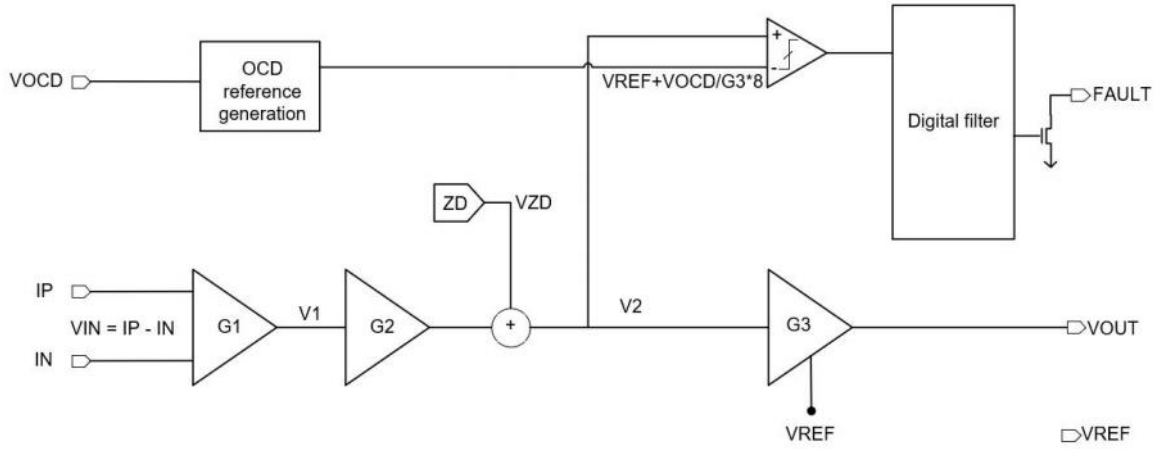
a) Vref = 2.5 V
   a) 0.5 V ≦ VOC ≦ Vcc – 1.7 V;
   b) Trigger voltage = Vref +/- VOC;
   c) Trigger current = (Vref +/- VOC -Voff) / G_th;

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

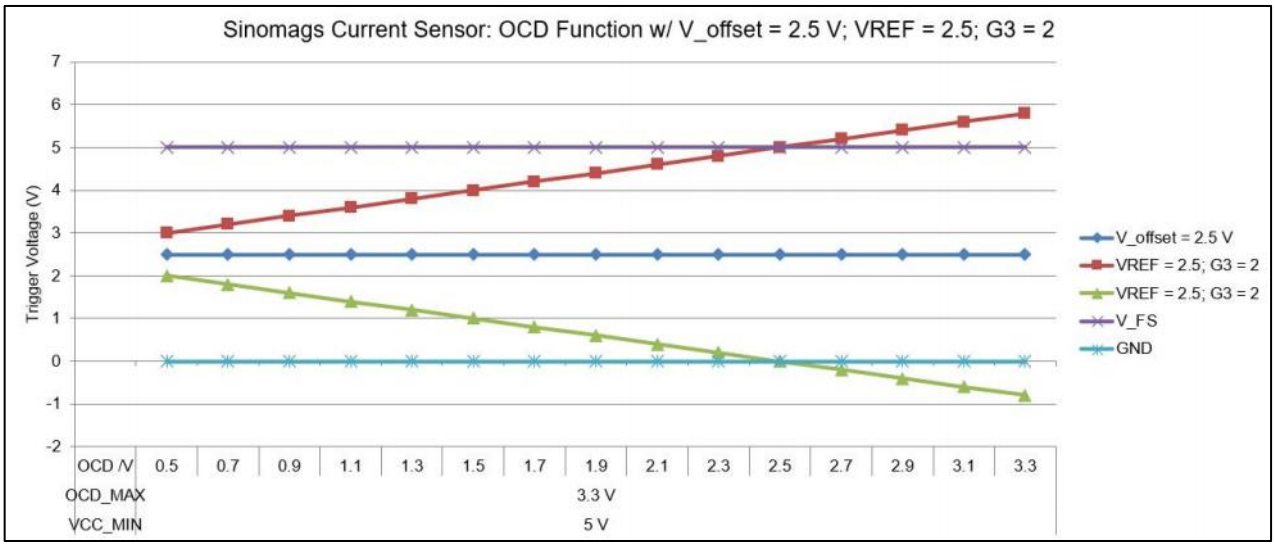


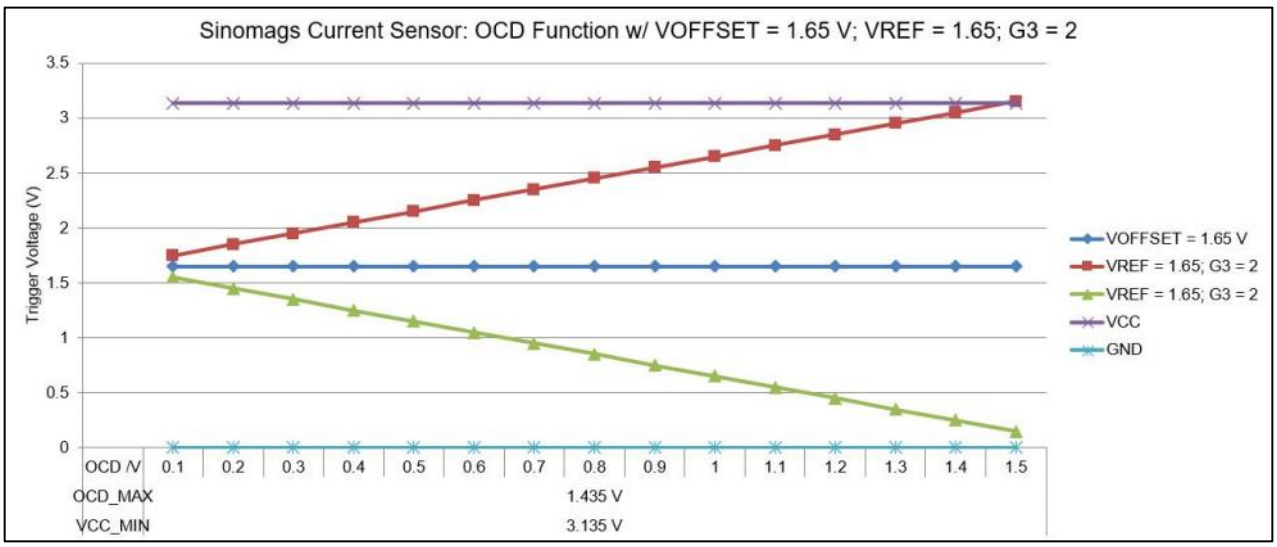
Functional Block Diagram on OCD function when Vref = 2.5 V



Functional Block Diagram on OCD function when Vref = 0.5 V

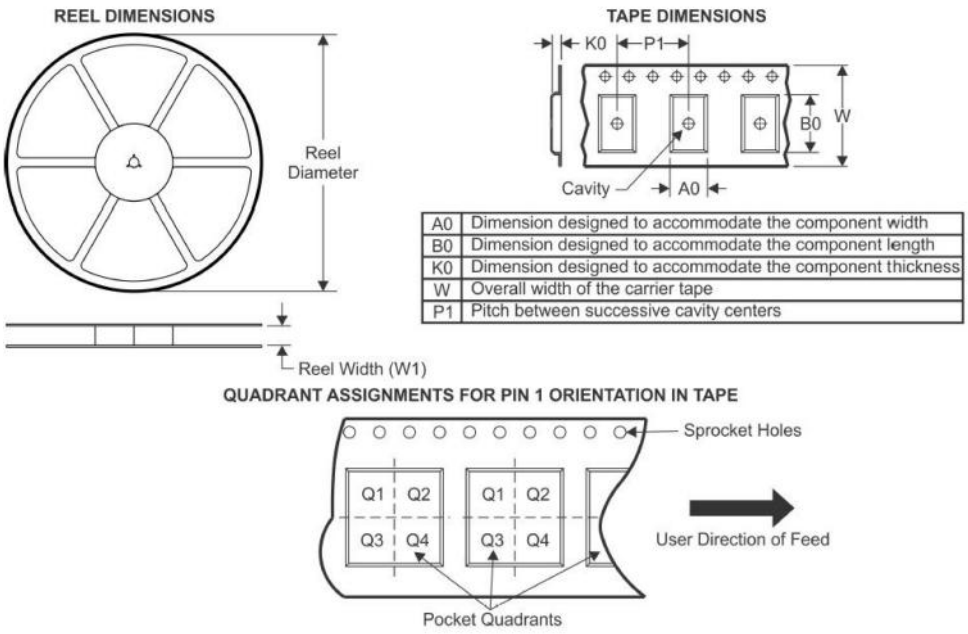
With the above definition, below shows the relationship between trigger voltage and the setting of Vcc, VOC.





15. PACKAGE MATERIALS INFORMATIONN

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