

Current Sensor

Product Series: STK-616T

STK-616T-40AB

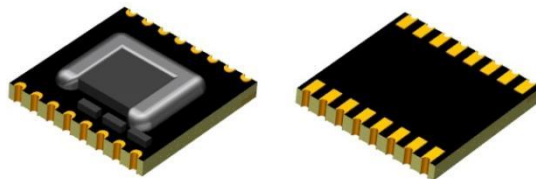
STK-616T-65AB

Part number: STK-616T-66AC

STK-616T-100AB

STK-616T-133AU

Version: Ver 3.9.3



Sinomags Technology Co., Ltd

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1. Description

The STK-616T series current sensor is based on MR (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	°C	-40 ~ 125
Storage temperature	T_stg	°C	-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	°C	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.

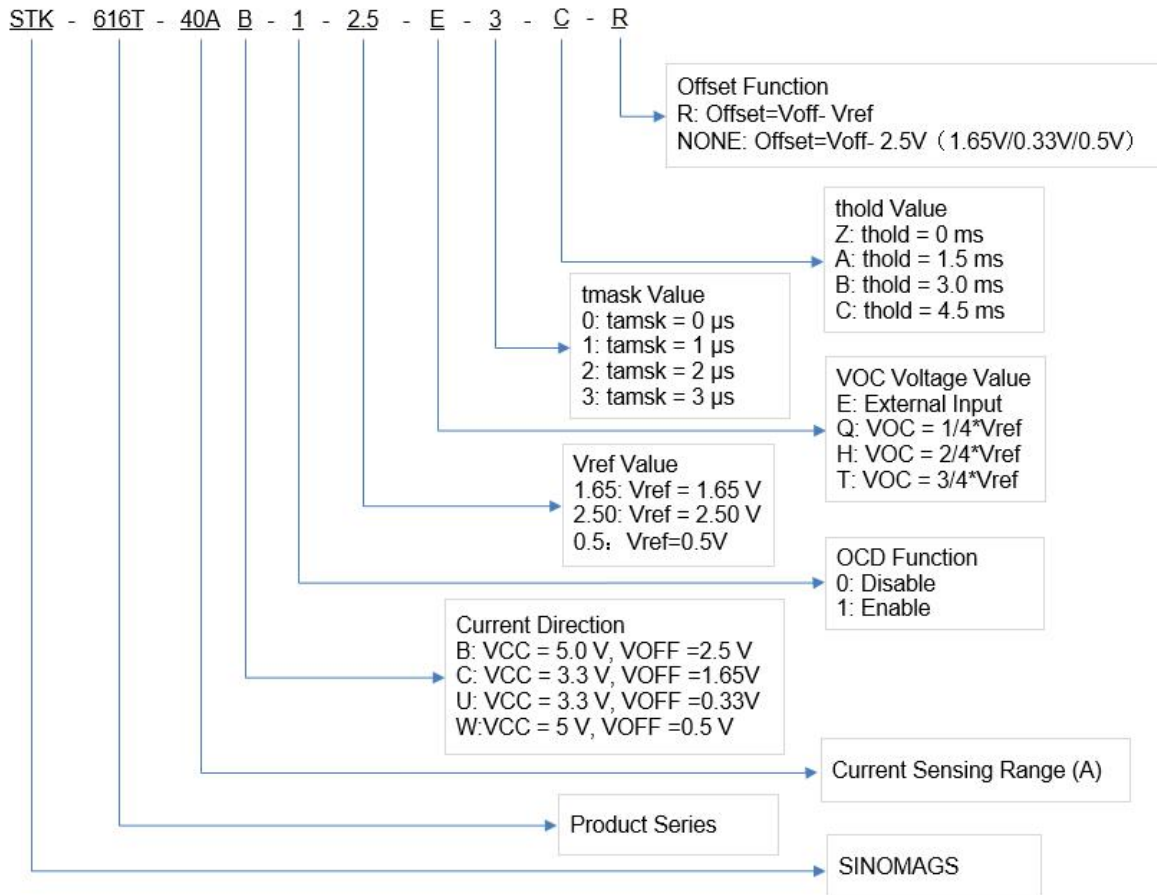
Isolation parameter

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

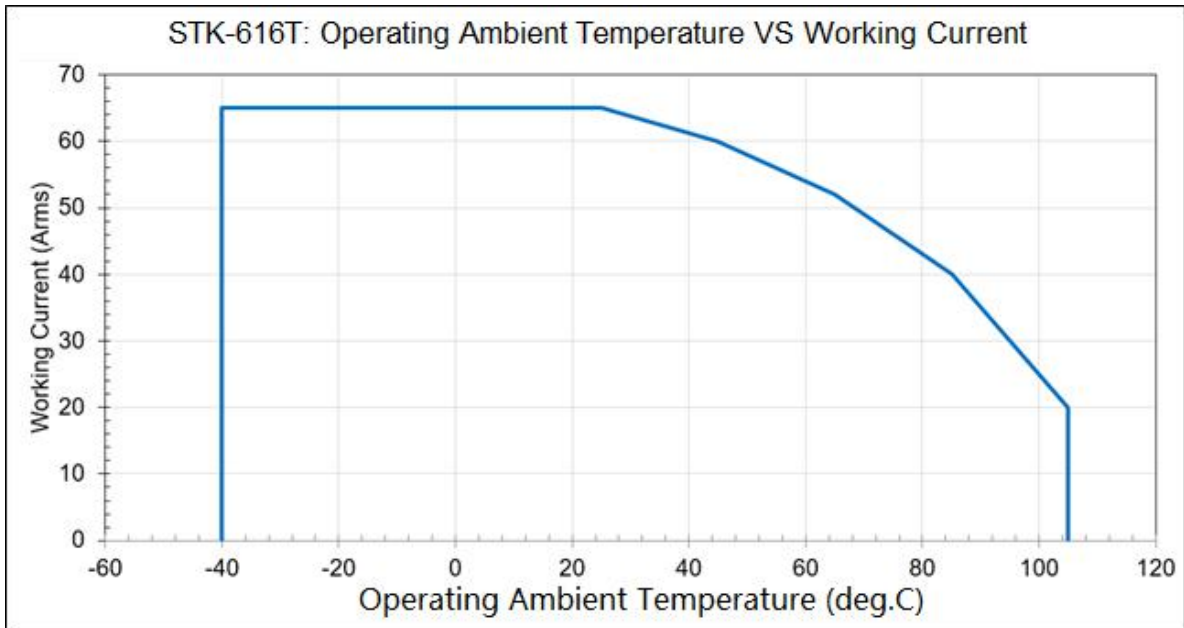
Measuring current table

Product	Meas. Range I _{pn} (A)	Sensitivity (mV/A)	Vcc (V)	T (°C)
STK-616T-40AB-1-2.5-E-2-C-N	±40A	50	5	-40 ~ 125
STK-616T-65AB-1-2.5-E-2-C-N	±65A	30	5	-40 ~ 125
STK-616T-65AB-1-2.5-E-1-Z-N	±65A	30	5	-40 ~ 125
STK-616T-40AB-1-2.5-E-1-C-N	±40A	50	5	-40 ~ 125
STK-616T-133AU-0-1.65-X-X-X-N	+133A	19.8	3.3	-40 ~ 125
STK-616T-66AC-0-1.65-X-X-X-R	±66A	19.8	3.3	-40 ~ 125
STK-616T-100AB-1-2.5-E-2-C-R	±100A	20	5	-40 ~ 125

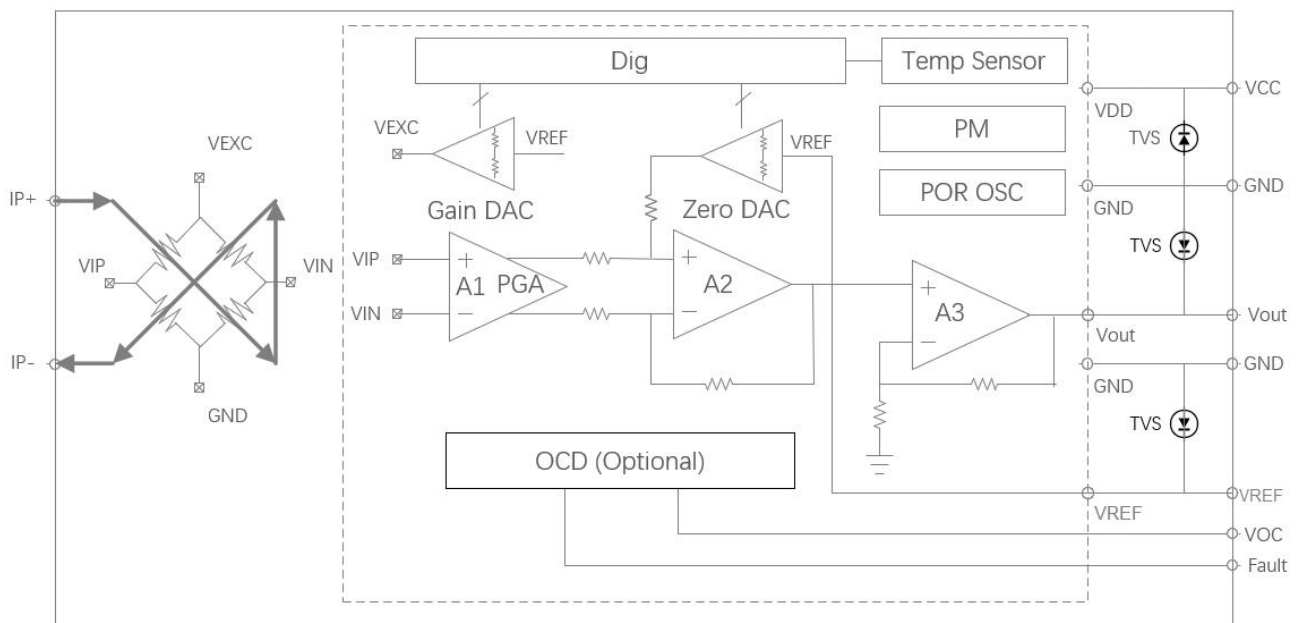
2. Part number definition



3. Temperature vs Current



4. Functional Block Diagram



5. Electrical data STK-616T-xxAB

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

Parameter	Symbol	Unit	Min	Typ	Max	Comment
General parameters						
Primary nominal current	I_{pn}	A	-40		40	STK-616T-40AB
			-65		65	STK-616T-65AB
			-100		100	STK-616T-100AB
Supply voltage	V_{cc}	V	4.5	5	5.5	
Current consumption	I_{cc}	mA		7	12	
Primary conductor resistance	R_{IP}	m Ω		0.4		
Quiescent voltage@0A	V_{off}	V	2.45	2.5	2.55	
Reference voltage	V_{ref}	V	2.45	2.5	2.55	
Electrical offset voltage	Offset	mV		± 10		$V_{off} - V_{ref}$
Output Specifications	R_{out}	Ω	1		30	
	R_{ref}		1		80	
Theoretical gain	G_{th}	mV/A		50		STK-616T-40AB
				30		STK-616T-65AB
				20		STK-616T-100AB
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 $^{\circ}\text{C}$	Non-L	% I_{pn}		± 1.5		$\pm I_{pn}$
Step response time	t_{res}	μs		1.5		@90% of I_{pn}
Frequency bandwidth	BW	kHz		150		@-3dB
Output voltage noise	V_{noise}	mVpp		20		100 ~ 120 kHz @250 kHz S.R.
Accuracy @ 25 $^{\circ}\text{C}$	X	% I_{pn}		± 1.5		@ $0.5 * I_{pn}$
Thermal drift of G_{th}	GAIN_T	% G_{th}	-1.5		1.5	@ -40~105 $^{\circ}\text{C}$
Thermal drift of V_{off}	V_{off_T}	mV	-15		15	drift related to the
Total Accuracy	X_{TRange}	% I_{pn}	-3		3	value @25 $^{\circ}\text{C}$

6. Electrical data STK-616T-xxAC

 Condition: $T_A = 25^{\circ}\text{C}$, $V_{CC} = 3.3\text{ V}$

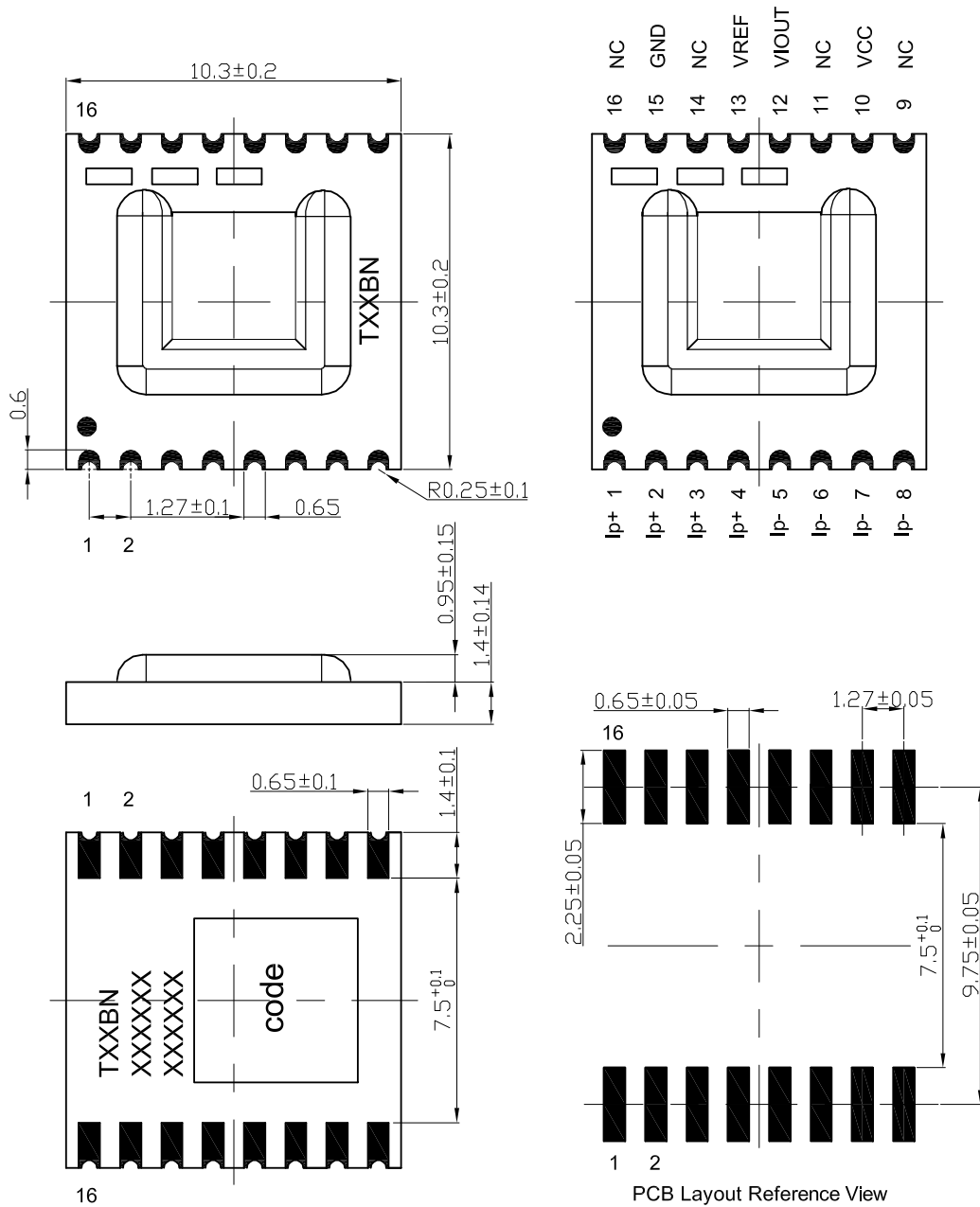
Parameter	Symbol	Unit	Min	Typ	Max	Comment
General parameters						
Primary nominal current	I _{pn}	A	-66		66	STK-616T-66AC
Supply voltage	V _{cc}	V	3.15	3.3	3.6	
Current consumption	I _{cc}	mA		7	12	
Primary conductor resistance	R _{IP}	mΩ		0.4		
Quiescent voltage@0A	V _{off}	V	1.60	1.65	1.70	
Reference voltage	V _{ref}	V	1.60	1.65	1.70	
Electrical offset voltage	Offset	mV		10		
Output resistance	V _{out}	Ω	1		30	
	V _{ref}		1		80	
Theoretical gain	G _{th}	mV/A		19.8		STK-616T-66AC
OCD function (if applicable)						
OCD range	VOC	V	0.3		1.6	
FOULT error		%		5%		% of OCD
OCD Hysteresis	I _{HYS}	%		10%		% of OCD
OCD Fault Mask	t _{mask}	μs	0	1	3	0, 1, 2, 3 μs
OCD Fault Mask error	T _{mask_error}	ns		125		
OCD Fault Hold Time	t _{hold}	ms		4.5		0, 1.5, 3, 4.5 ms
Accuracy performance						
Rated linearity error@25°C	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	V _{noise}	mVpp		20		100 ~ 120 kHz @250 kHz S.R.
Accuracy @ 25°C	X	% I _{pn}		±1.5		@ 0.5*I _{pn}
Thermal drift of G _{th}	GAIN _T	% G _{th}	-1.5		1.5	@ -40~105°C
Thermal drift of V _{off}	V _{off_T}	mV	-15		15	drift related to the
Total Accuracy	X _{TRange}	% I _{pn}	-3		3	value @25°C

7. Electrical data STK-616T-xxAU

 Condition: $T_A = 25^{\circ}\text{C}$, $V_{CC} = 3.3\text{ V}$

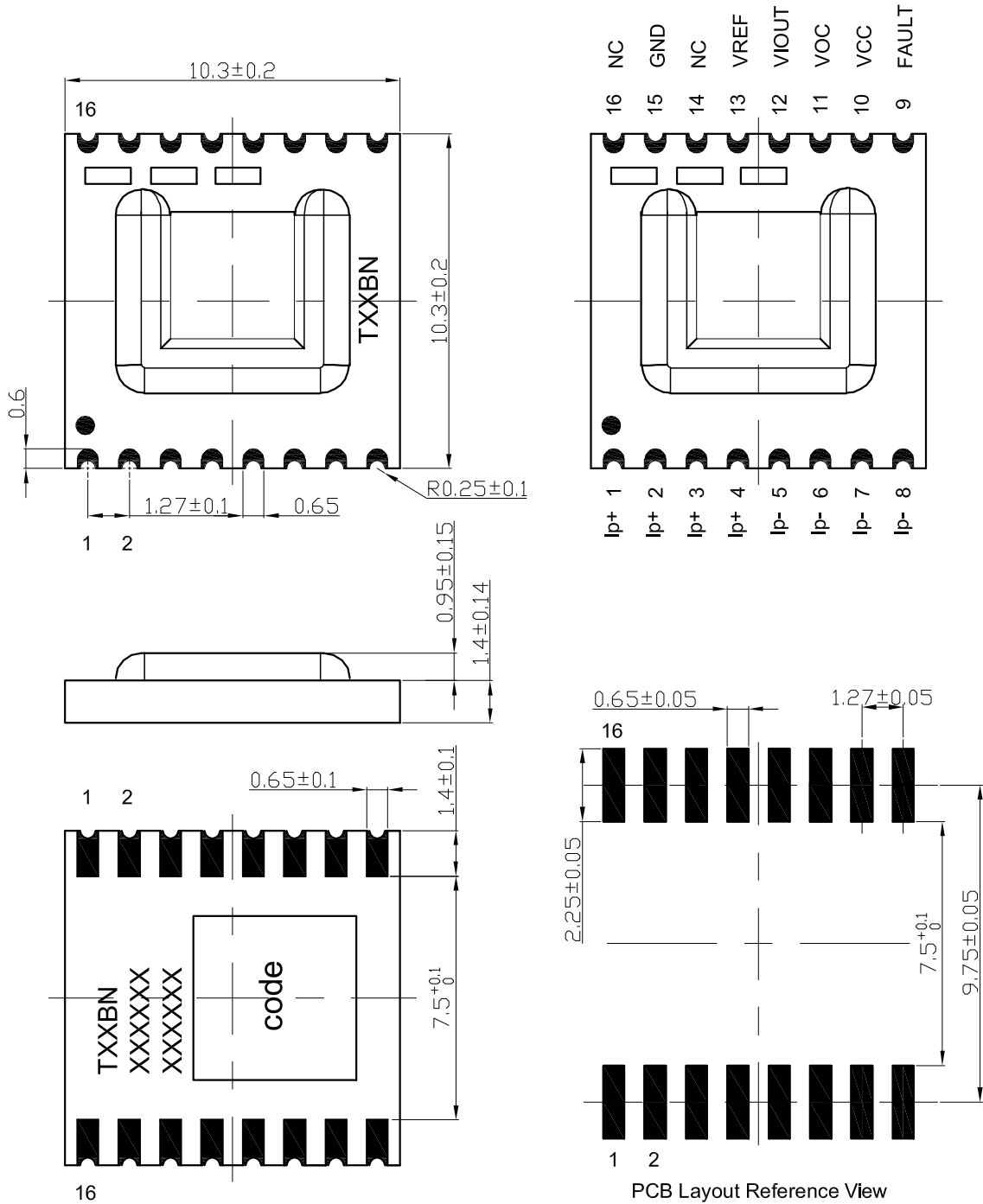
Parameter	Symbol	Unit	Min	Typ	Max	Comment
General parameters						
Primary nominal current	I _{pn}	A	-5		133	STK-616T-133AU
Supply voltage	V _{cc}	V	3.15	3.3	3.45	
Current consumption	I _{cc}	mA		7	12	
Primary conductor resistance	R _{IP}	mΩ		0.4		
Quiescent voltage@0A	V _{off}	V	0.28	0.33	0.38	
Reference voltage	V _{ref}	V	0.45	0.5	0.55	
Electrical offset voltage	Offset	mV		0.17		V _{off} - V _{ref}
Output resistance	V _{out}	Ω	1		30	
	V _{ref}		1		80	
Theoretical gain	G _{th}	mV/A		19.8		STK-616T-66AC
OCD function (if applicable)						
OCD range	VOC	V	0.2		0.5	
FAULT error		%		5%		% of OCD
OCD Hysteresis	I _{HYS}	%		10%		% of OCD
OCD Fault Mask	t _{mask}	μs	0	1	3	0, 1, 2, 3 μs
OCD Fault Mask error	T _{mask_error}	ns		125		
OCD Fault Hold Time	t _{hold}	ms		4.5		0, 1.5, 3, 4.5 ms
Accuracy performance						
Rated linearity error@25°C	Non-L	%I _{pn}		±2.5		±I _{pn}
Step response time	t _{res}	μs		1.5		@90% of I _{pn}
Frequency bandwidth	BW	kHz		150		@-3dB
Output voltage noise	V _{noise}	mV _{pp}		20		100 ~ 120 kHz @250 kHz S.R.
Accuracy @ 25°C	X	% I _{pn}		±2.5		@ 0.5*I _{pn}
Thermal drift of G _{th}	GAIN _T	% G _{th}	-1.5		1.5	@ -40~105°C
Thermal drift of V _{off}	V _{off_T}	mV	-15		15	drift related to the
Total Accuracy	X _T Range	% I _{pn}	-3.5		3.5	value @25°C

8. Dimension & Pin definitions without OCD function



The mark of "TXXBN" on the top surface shows the information on the "Part number": "T" = "STK-616T", "XX" = "Product sensing range", "B" = "Current direction", "N" = Offset function.

9. Dimension & Pin definitions with OCD function



The mark of “TXXBN” on the top surface shows the information on the “Part number”: T = “STK-616T”, “XX” = “Product sensing range”, “B” = “Current direction”, “N” = Offset function.

10. Pin definitions

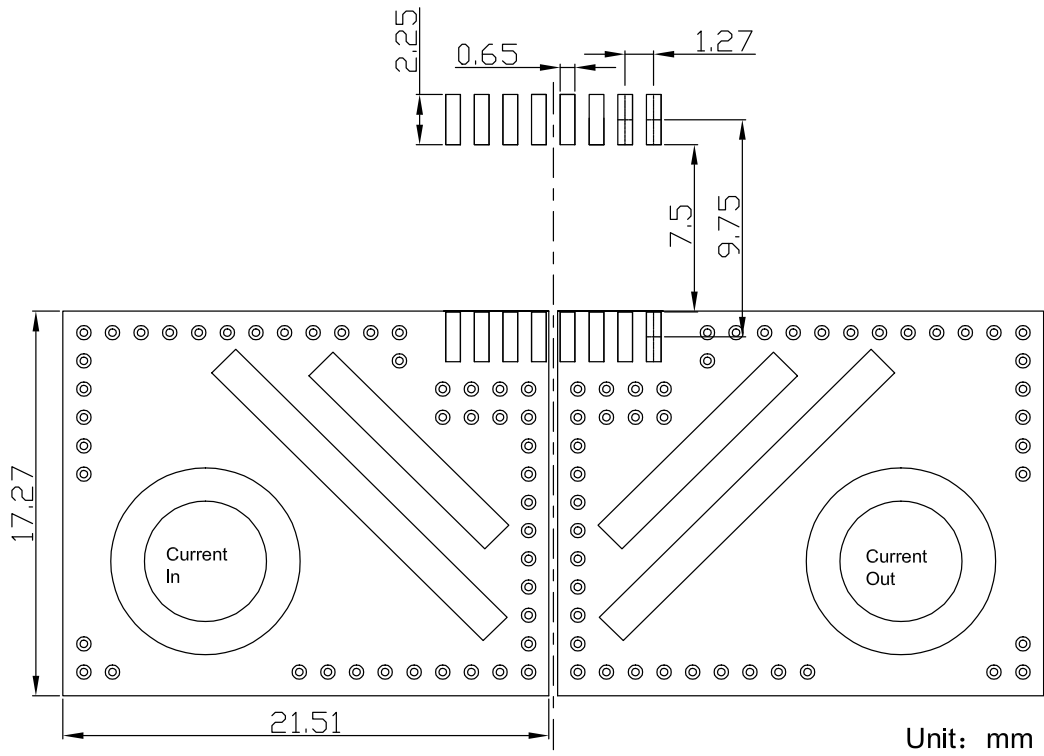
Pin definition for product without OCD function

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

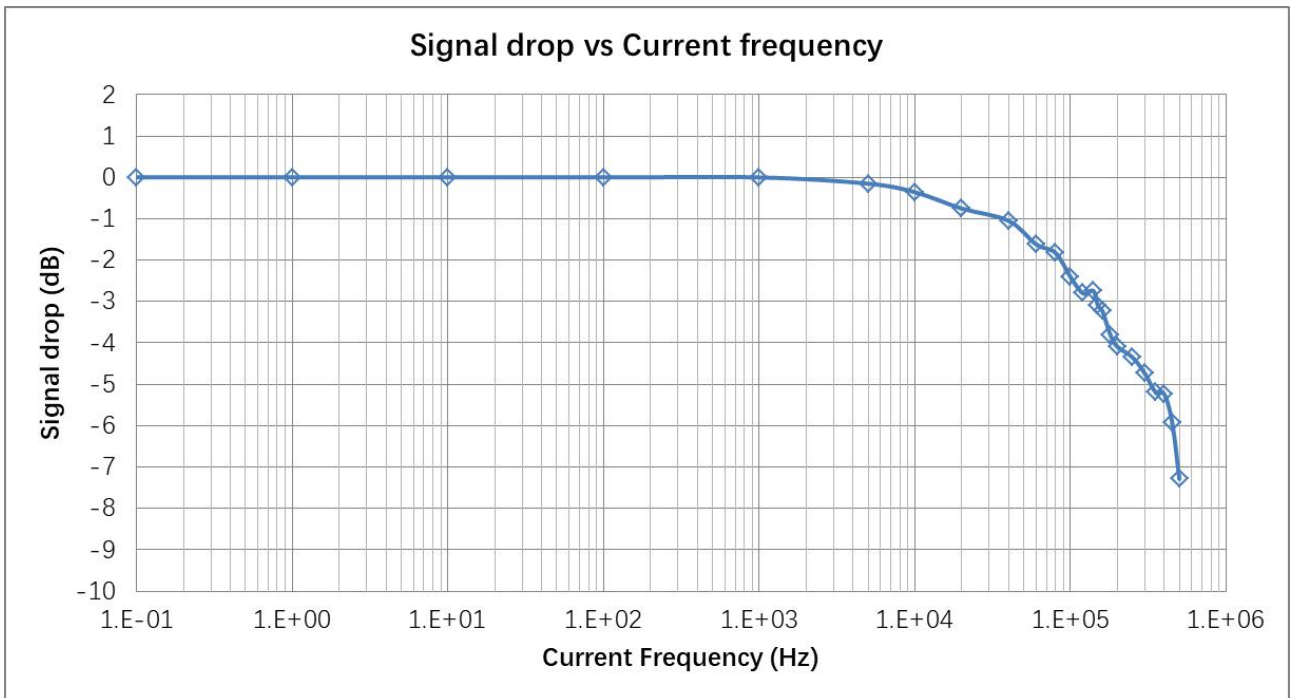
Pin definition for product with OCD function

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

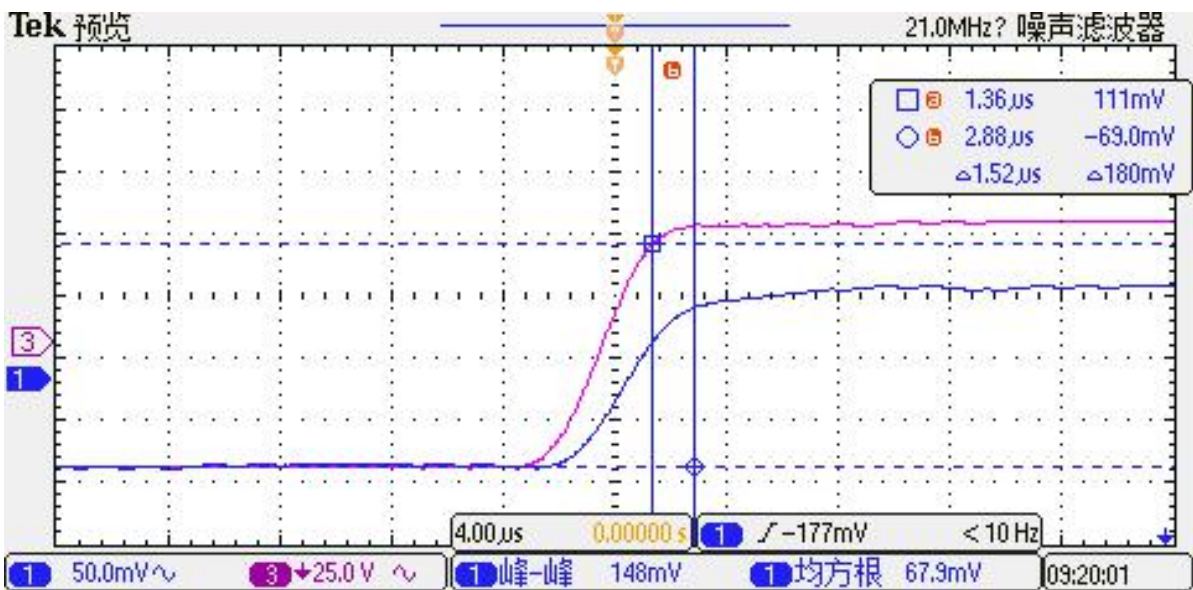
11. PCB layout recommendation



12. Frequency band width

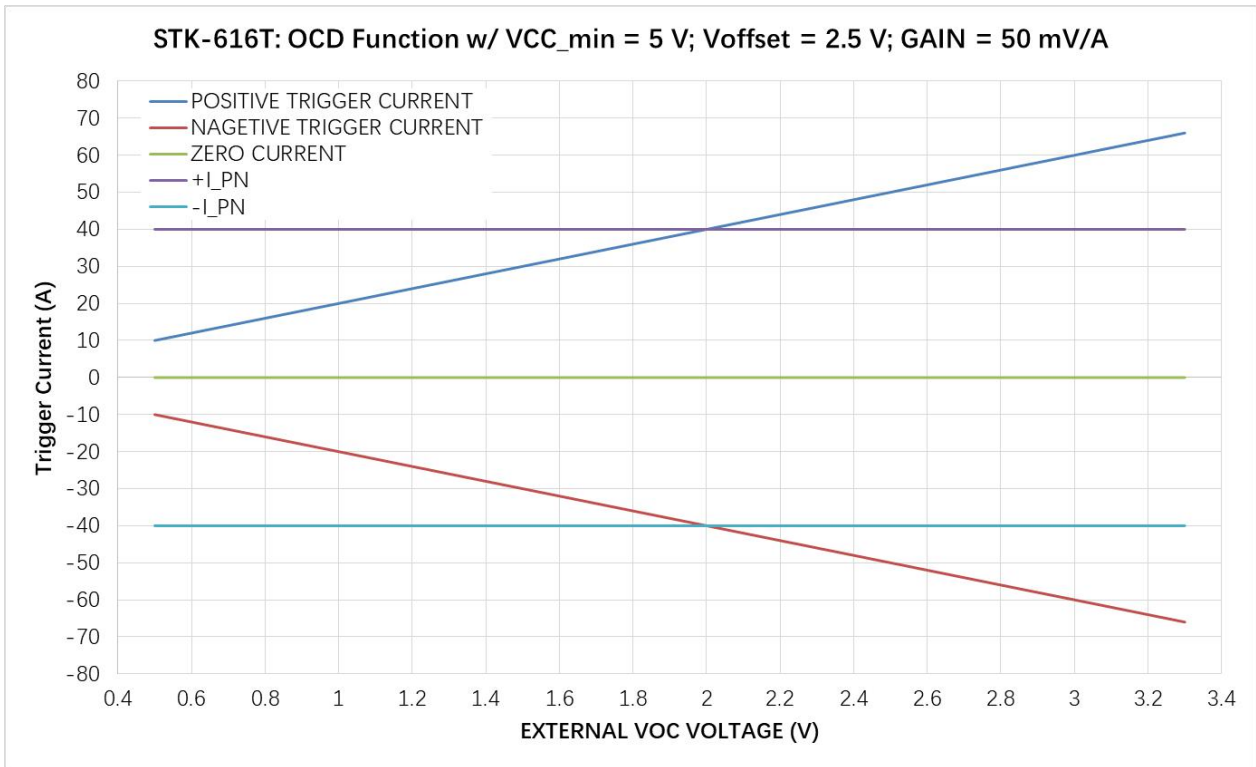


13. Step response time

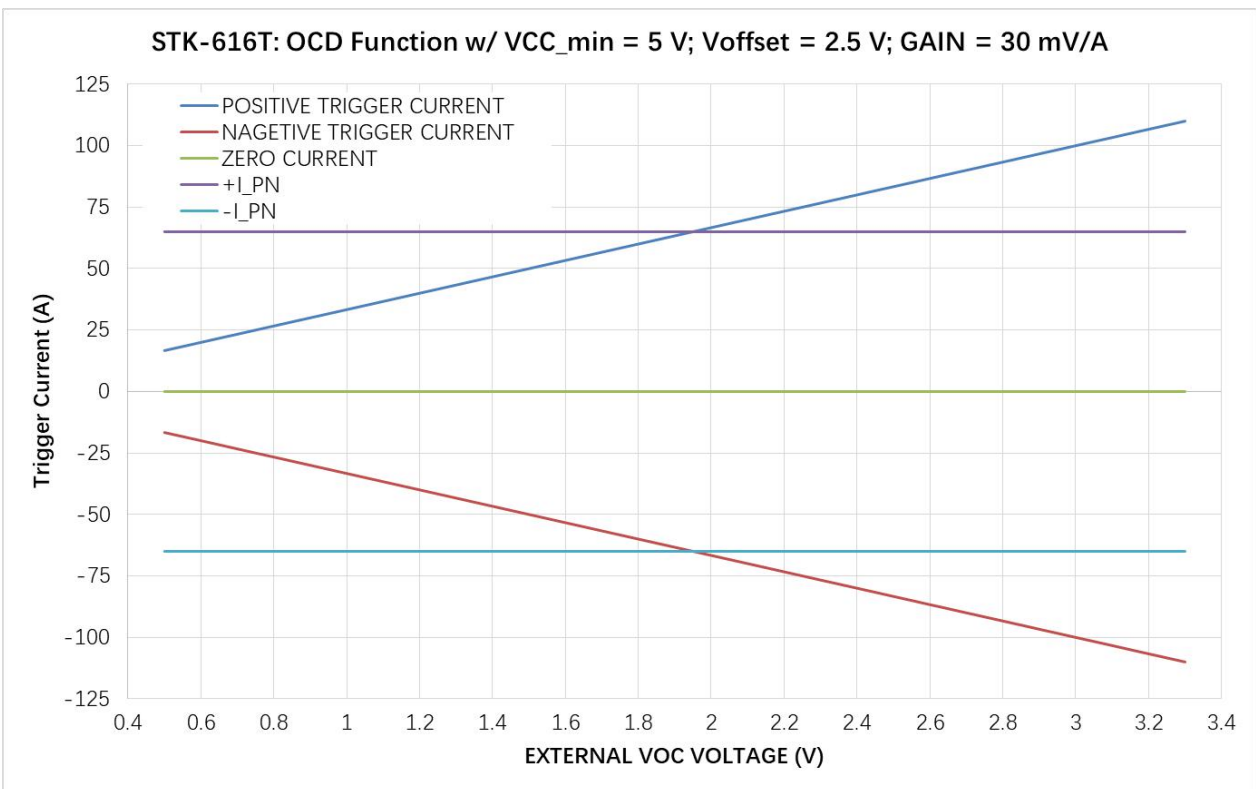


The typical frequency response of STK-616T current sensor. The response time from 90% of the primary current (pink) to 90% of the secondary output (blue) is 1.5 μs..

15. Examples of OCD function



OCD function for STK-616T-40AB



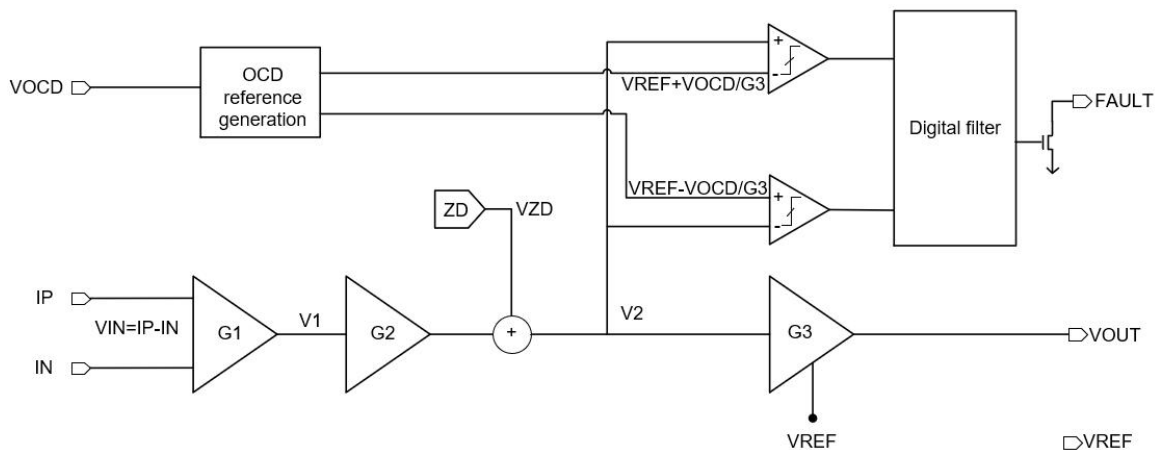
OCD function for STK-616T-65AB

16. General information on OCD

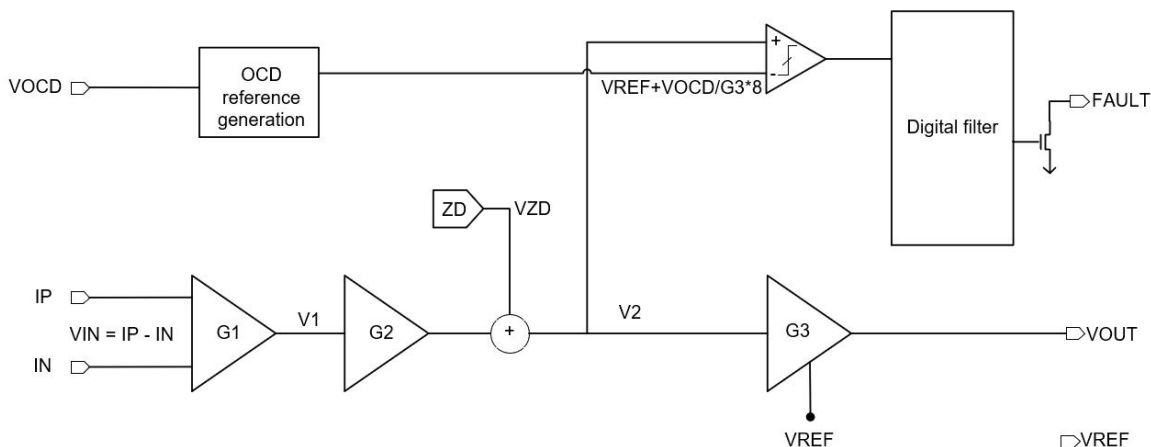
This section describes the general information on OCD function, the specific functions, which are not listed in the section of “electrical data”, can be defined per request.

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) $V_{ref} = 2.5\text{ V}$
 - ① $0.5\text{ V} \cong VOC \cong V_{cc} - 1.7\text{ V}$;
 - ② Trigger voltage = $V_{ref} \pm VOC$;
 - ③ Trigger current = $(V_{ref} \pm VOC - V_{off}) / G_{th}$;
- b) $V_{ref} = 1.65\text{ V}$
 - ① $0.3\text{ V} \cong VOC \cong V_{cc} - 1.7\text{ V}$;
 - ② Trigger voltage = $V_{ref} \pm VOC$;
 - ③ Trigger current = $(V_{ref} \pm VOC - V_{off}) / G_{th}$;
- c) $V_{ref} = 0.5\text{ V}$
 - ① $0.2\text{ V} \cong VOC \cong 0.5\text{ V}$;
 - ② Trigger voltage = $V_{ref} + 8 \cdot VOC$;
 - ③ Trigger current = $(V_{ref} + VOC - V_{off}) / G_{th}$;

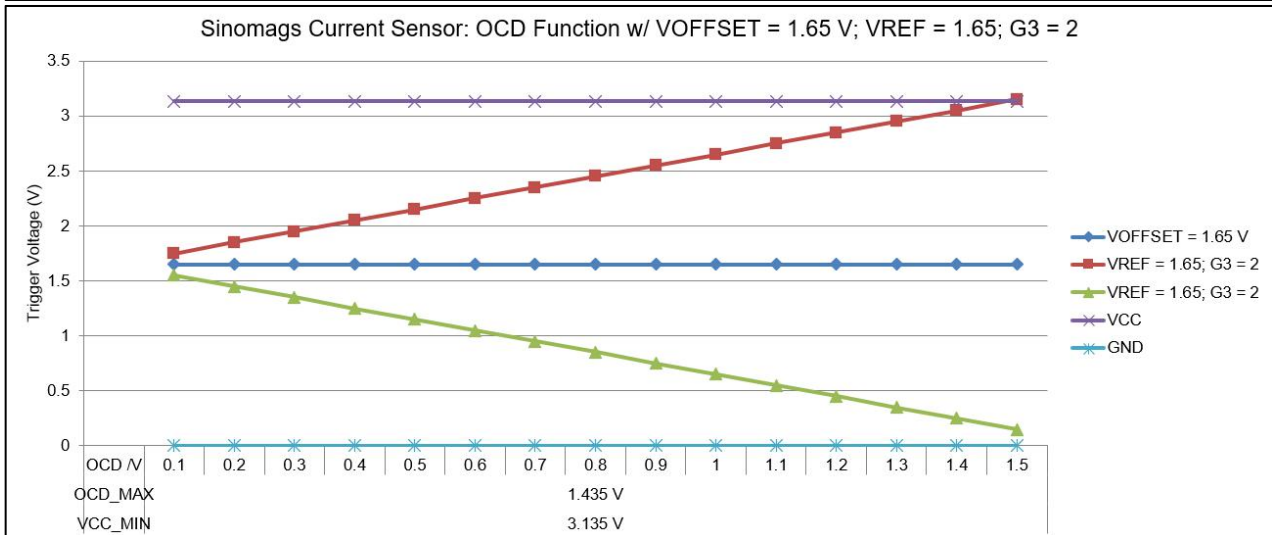
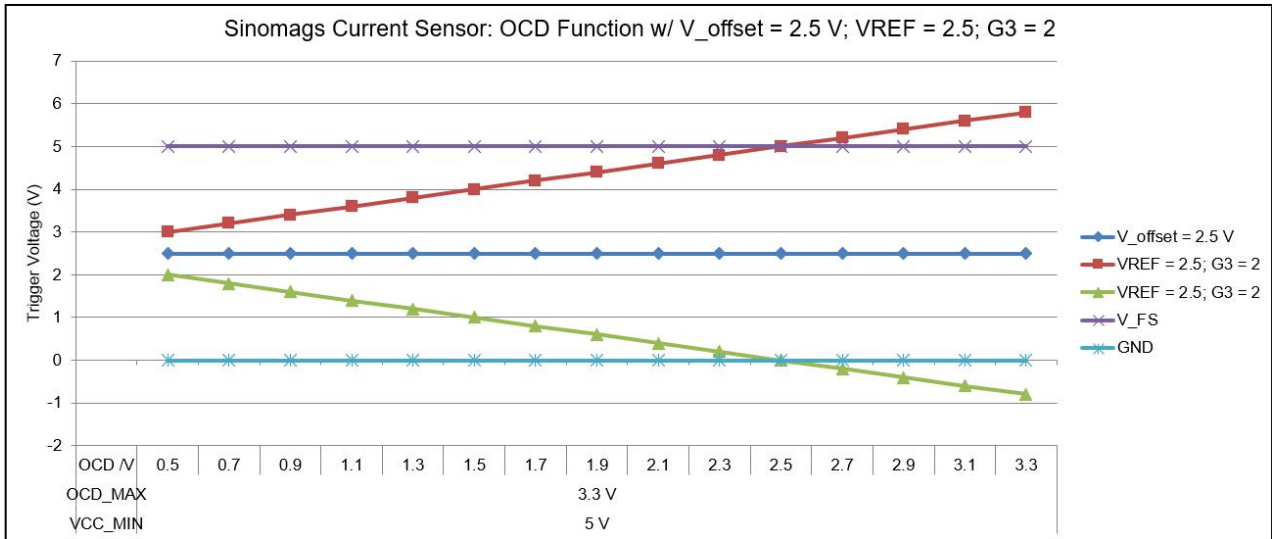


Functional Block Diagram on OCD function when $V_{ref} = 2.5\text{ V}$



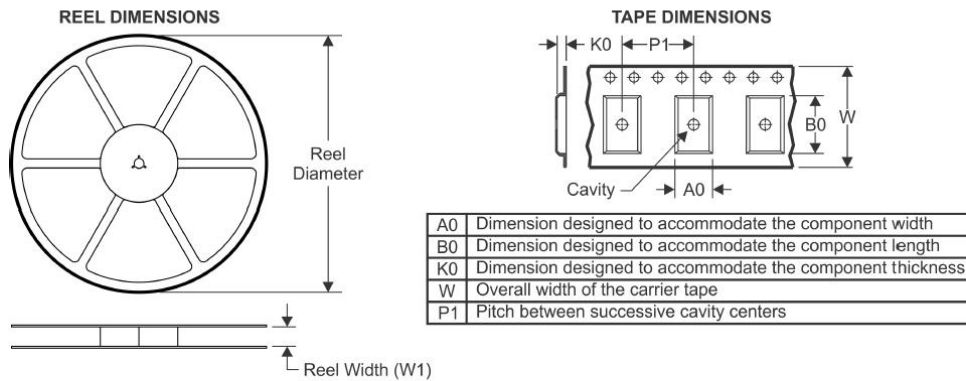
Functional Block Diagram on OCD function when $V_{ref} = 0.5\text{ V}$

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

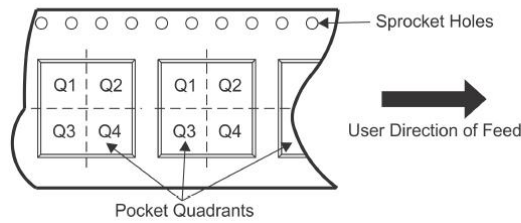


17. PACKAGE MATERIALS INFORMATION

TAPE AND REEL INFORMATION



QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel	Reel	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
					Diameter (mm)	With W1 (mm)						
STK-616T	16-WDFN	WDFN	16	2000	330.0	24.0	12.0	12.0	3.5	16.0	24.5	Q1