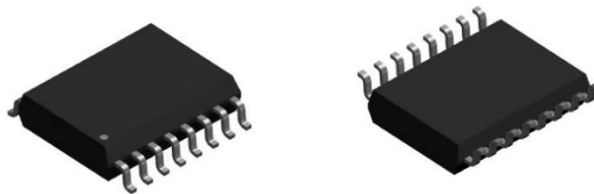


Current Sensor

Product Series: STK-616TMW

Part number: STK-616T-20MWB5
STK-616T-40MWB5
STK-616T-65MWB5
STK-616T-20MWB3
STK-616T-40MWB3
STK-616T-65MWB3

Version: Ver 2.8



Sinomags Technology Co., Ltd

Web site: www.sinomags.com

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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.

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	TMtg	°C	-40 ~ 125
Mass	m	g	0.5

Absolute maximum rating

Parameter	Symbol	Unit	Value
Supply voltage	V _{cc}	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	U _d	kV	3.6	
Impulse withstand voltage 1.2/50μs	Ū _w	kV	6	
Clearance distance (pri. -sec)	D _{ci}	mm	8	Determined by customer's layout
Creepage distance (pri. -sec)	D _{cp}	mm	8	

Measuring current table

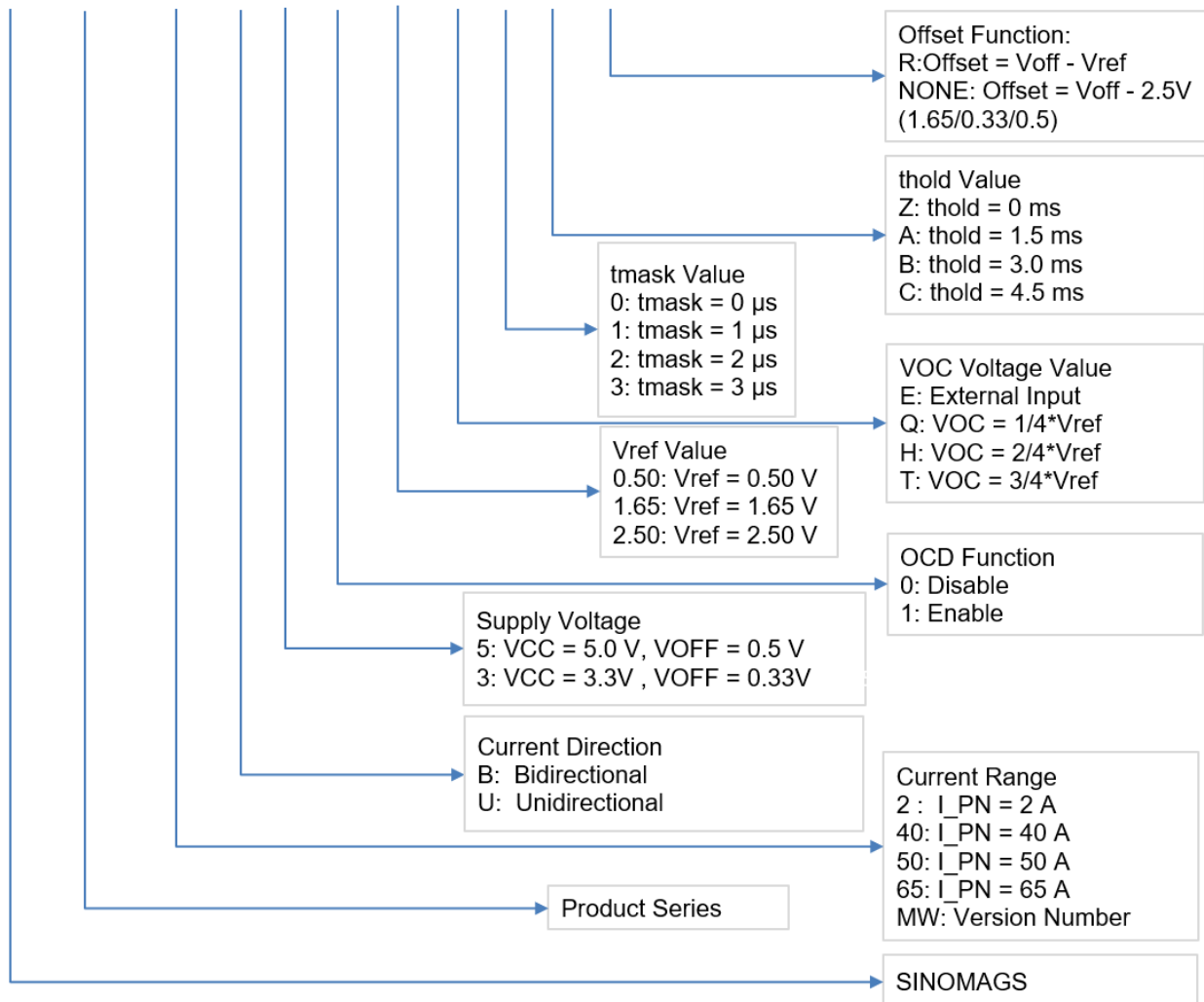
Product	VOUT	Meas. Range I _{pn} (A)	Sensitivity (mV/A)	V _{cc} (V)	T (°C)
STK-616T-20MWB3-1-1.65-T-0-C-N	VOUT1	±20A	66	3.3	-40 ~ 125
	VOUT2	±2A	660	3.3	-40 ~ 125
STK-616T-33MWB3-1-1.65-T-0-C-N	VOUT1	±33.3A	39.6	3.3	-40 ~ 125
	VOUT2	±3.33A	396	3.3	-40 ~ 125
STK-616T-40MWB3-1-1.65-T-2-C-N	VOUT1	±40A	33	3.3	-40 ~ 125
	VOUT2	±4A	330	3.3	-40 ~ 125
STK-616T-40MWB3-0-1.65-X-X-X-N	VOUT1	±40A	33	3.3	-40 ~ 125
	VOUT2	±4A	330	3.3	-40 ~ 125
STK-616T-65MWB3-1-1.65-T-2-C-N	VOUT1	±65A	20.3	3.3	-40 ~ 125

	VOUT2	±6.5A	203	3.3	-40 ~ 125
STK-616T-40MWB5-1-2.5-T-2-C-N	VOUT1	±40A	50	5	-40 ~ 125
	VOUT2	±4A	500	5	-40 ~ 125
STK-616T-65MWB5-1-2.5-T-2-C-N	VOUT1	±65A	30.8	5	-40 ~ 125
	VOUT2	±6.5A	308	5	-40 ~ 125
STK-616T-20MWB5-1-2.5-T-2-C-N	VOUT1	±20A	100	5	-40 ~ 125
	VOUT2	±2A	1000	5	-40 ~ 125

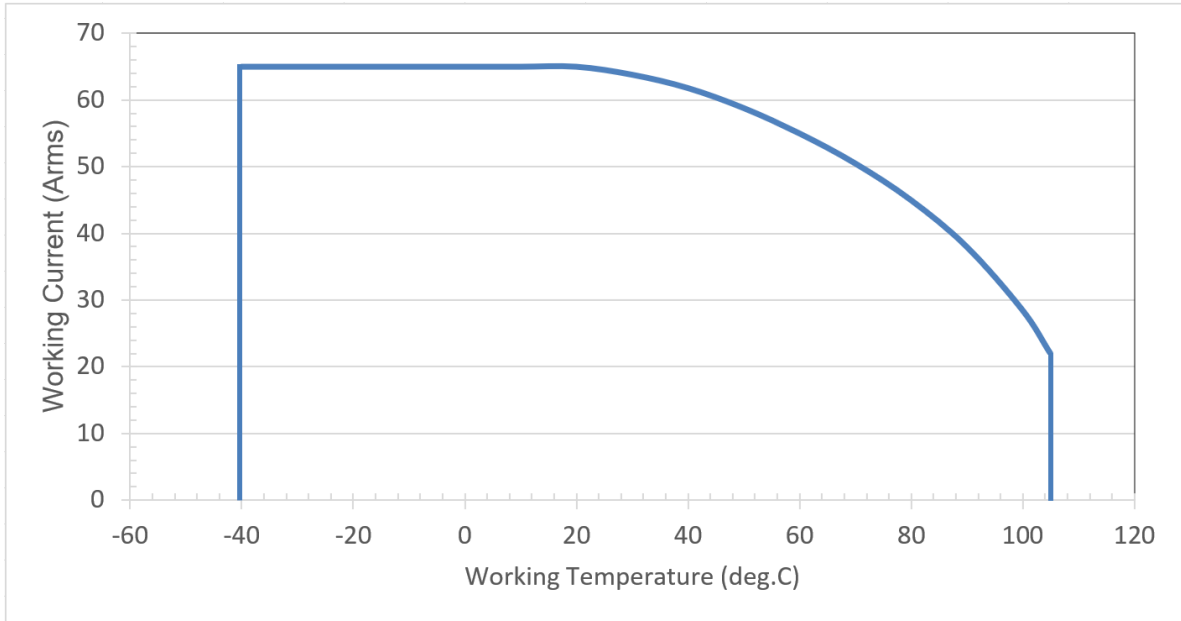
Remark: the sensitivity of VOUT2 is 10 times that of VOUT1 by default. At present, VOUT2 is mainly used for arc current detection, which mainly detects AC signals after capacitance isolation. VOUT1 is used for normal working current detection and can detect AC and DC signals.

2. Part number definition

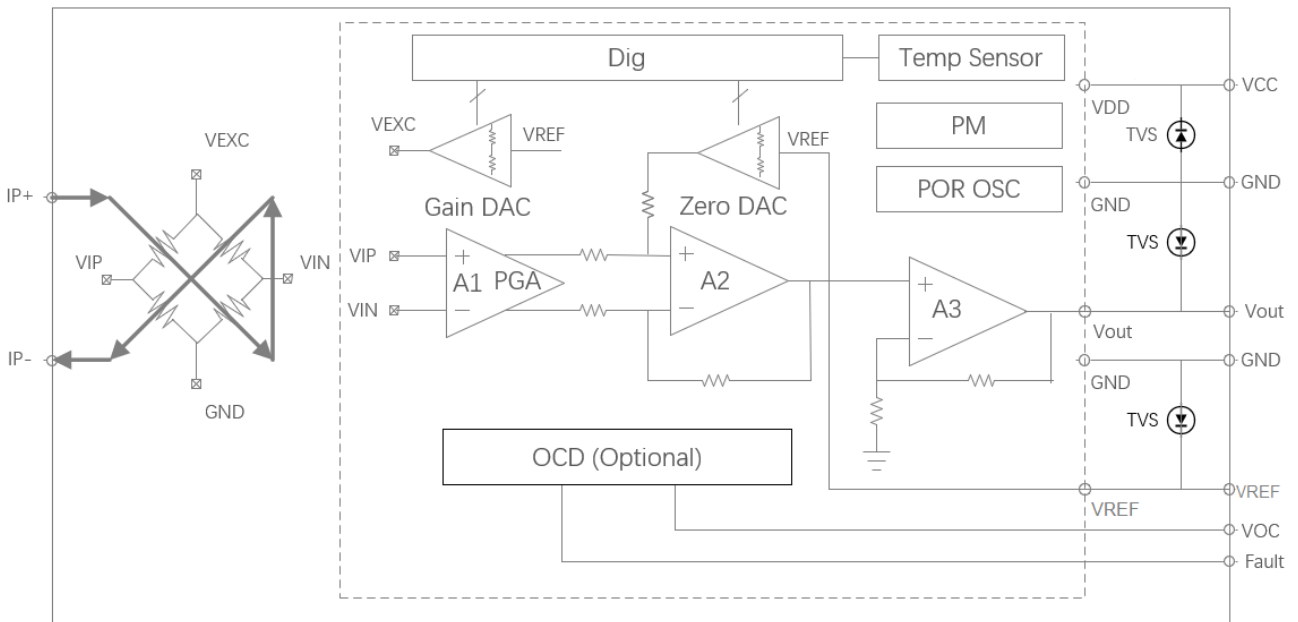
STK - 616T - 40MW - B - 5 - 1 - 2.5 - E - 2 - C - N



3. Temperature vs Current



4. Functional Block Diagram



5. Electrical data STK-616T-XXMWB5

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

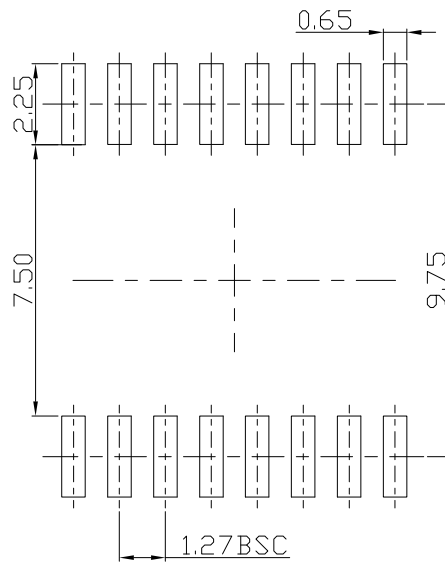
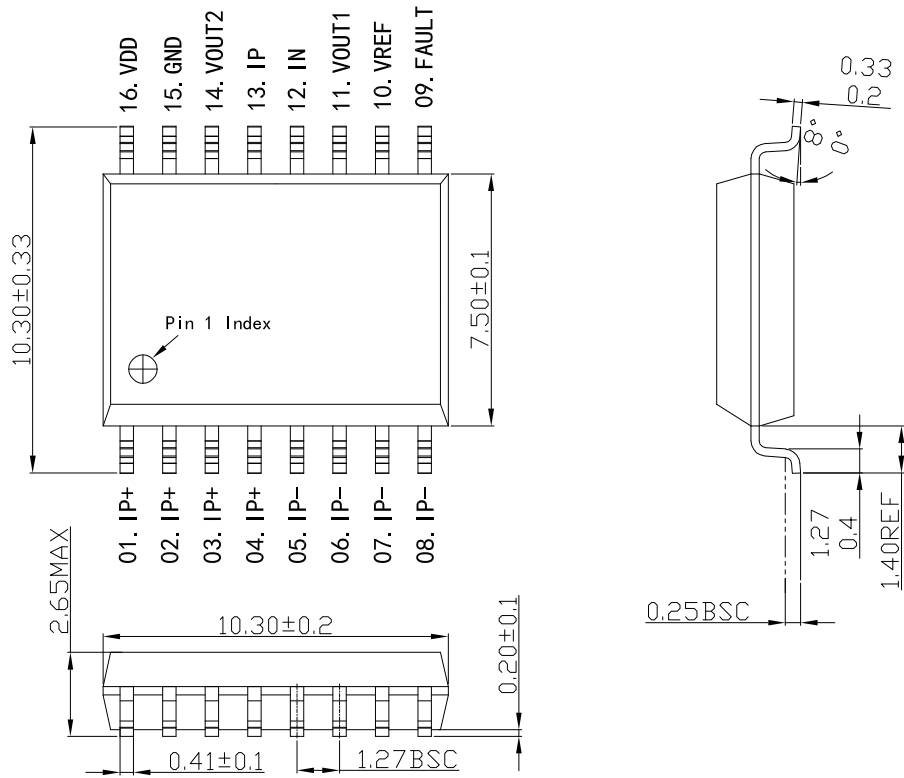
Parameter	Symbol	Unit	Min	Typ	Max	Comment(VOUT1)
General parameters						
Primary nominal current	I_{pn}	A	-20		20	STK-616T-20MWB5
			-40		40	STK-616T-40MWB5
			-65		65	STK-616T-65MWB5
Supply voltage	V_{cc}	V	4.5	5	5.5	
Current consumption	I_{cc}	mA		7	12	
Primary conductor resistance	R_{IP}	m Ω		0.85		
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		100		STK-616T-20MWB5
				50		STK-616T-40MWB5
				30.8		STK-616T-65MWB5
OCD function (if applicable)						
OCD range	VOC	V	0.5		3.3	
FAULT 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 $^{\circ}\text{C}$	Non-L	% I_{pn}		± 1.5		$\pm I_{pn}$
Step response time	t_res	μs		0.2		@90% of I_{pn} STK-616T-XXMWBX
Frequency bandwidth	BW	MHz		0.6		@-3dB STK-616T-XXMWBX
Output voltage noise	Vnoise	mVpp		10		@1.4 MHz, VOUT1 STK-616T-XXMWBX
				100		@1.4 MHz, VOUT2 STK-616T-XXMWBX
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		@ -40~105 $^{\circ}\text{C}$
Thermal drift of V_{off}	Voff_T	mV		± 15		drift related to the
Total Accuracy	X_TRange	% I_{pn}		± 3.5		value @25 $^{\circ}\text{C}$

6. Electrical data STK-616T-XXMWB3

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

Parameter	Symbol	Unit	Min	Typ	Max	Comment(VOUT1)
General parameters						
Primary nominal current	I _{pn}	A	-33		33	STK-616T-33MWB3
			-20		20	STK-616T-20MWB3
			-40		40	STK-616T-40MWB3
			-65		65	STK-616T-65MWB3
Supply voltage	V _{cc}	V	3.15	3.3	3.45	
Current consumption	I _{cc}	mA		7	12	
Primary conductor resistance	R _{IP}	mΩ		0.85		
Quiescent voltage@0A	V _{off}	V	1.6	1.65	1.7	
Reference voltage	V _{ref}	V	1.6	1.65	1.7	
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		39.6		STK-616T-33MWB3
				66		STK-616T-20MWB3
				33		STK-616T-40MWB3
				20.3		STK-616T-65MWB3
OCD function (if applicable)						
OCD range	VOC	V	0.3		1.6	
FAULT 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°C	Non-L	%I _{pn}		±1.5		±I _{pn}
Step response time	t _{res}	μs		0.2		@90% of I _{pn} STK-616T-XXMWBX
Frequency bandwidth	BW	MHz		0.6		@-3dB STK-616T-XXMWBX
Output voltage noise	Vnoise	mVpp		10		@1.4 MHz
Accuracy @ 25°C	X	% I _{pn}		±1.5		@ 0.5*I _{pn}
Thermal drift of G _{th}	GAIN_T	% G _{th}		±1.5		@ -40~105°C
Thermal drift of V _{off}	Voff_T	mV		±15		drift related to the
Total Accuracy	X_TRange	% I _{pn}		±3.5		value @25°C

7. Dimension & Pin definitions with OCD function



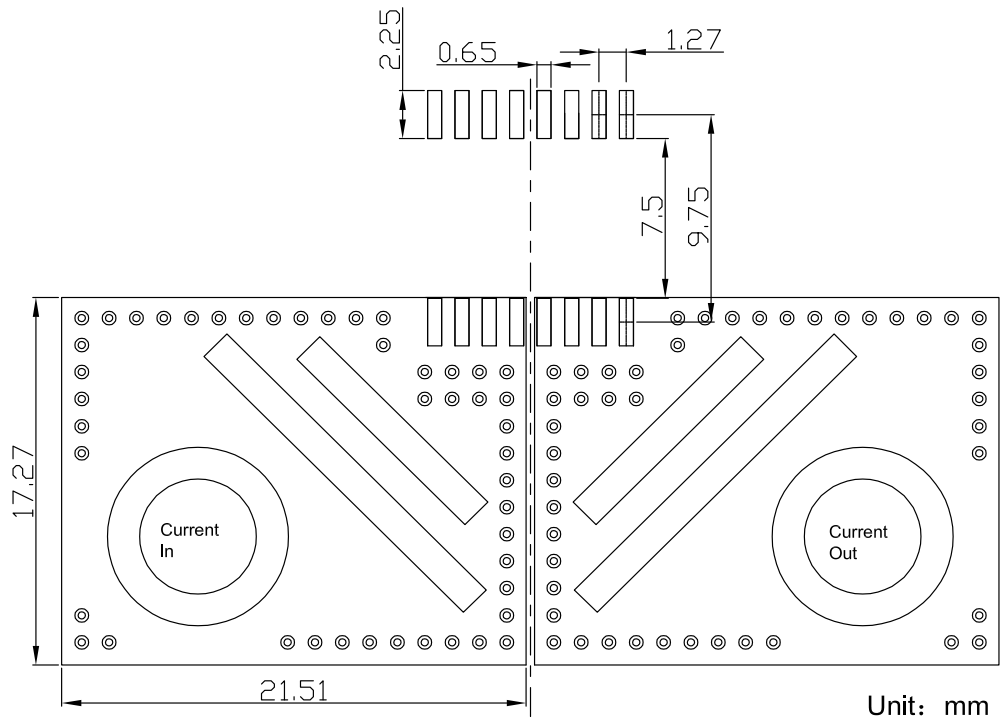
PCB Layout Reference View

8. Pin definitions

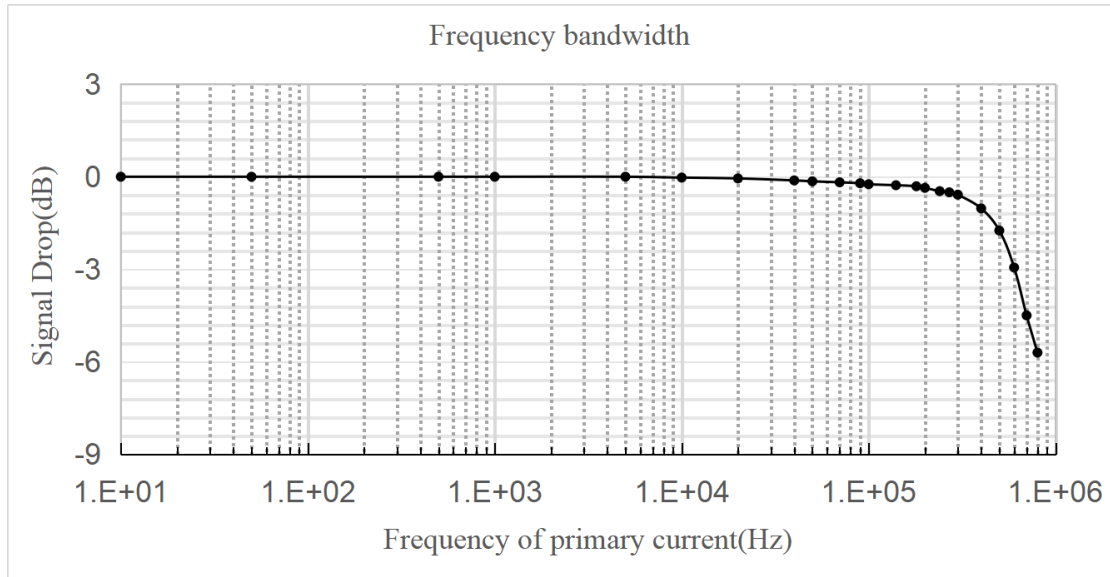
Pin definition for product with OCD function

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	VREF	Reference pin, output function
11	VOOUT1	Sensor output pin
12	IN	Signal input pin
13	IP	Signal input pin
14	VOOUT2	Sensor output pin
15	GND	Ground pin (GND)
16	VDD	Power supply pin

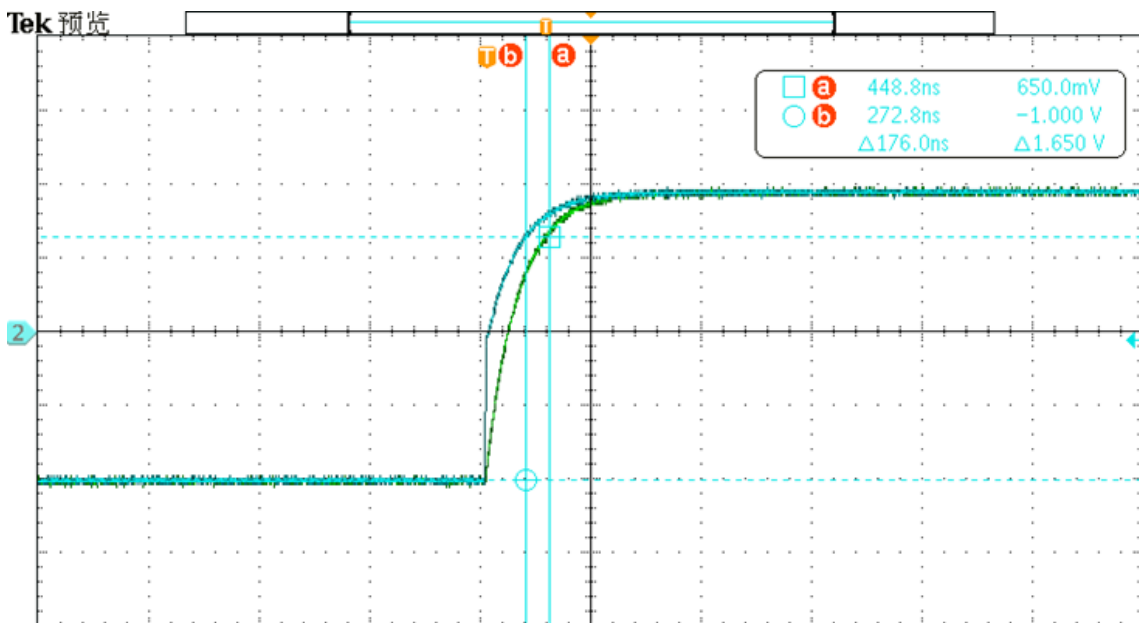
9. PCB layout recommendation



10. Frequency bandwidth of STK-616T-XXMWBX

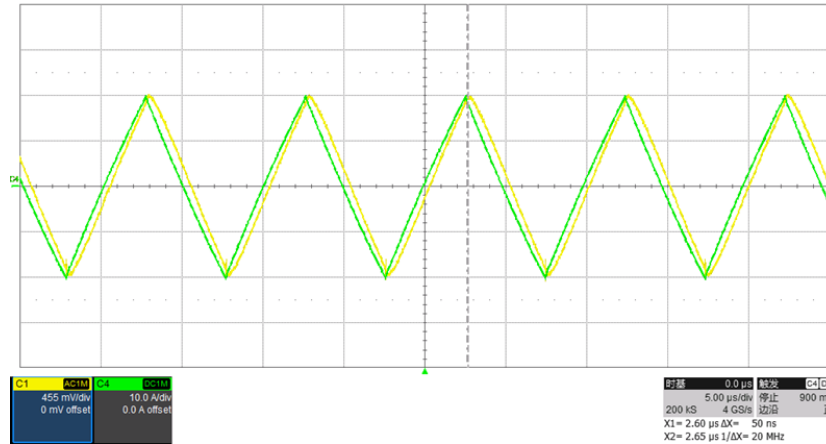


11. Step response time of STK-616T-XXMWBX

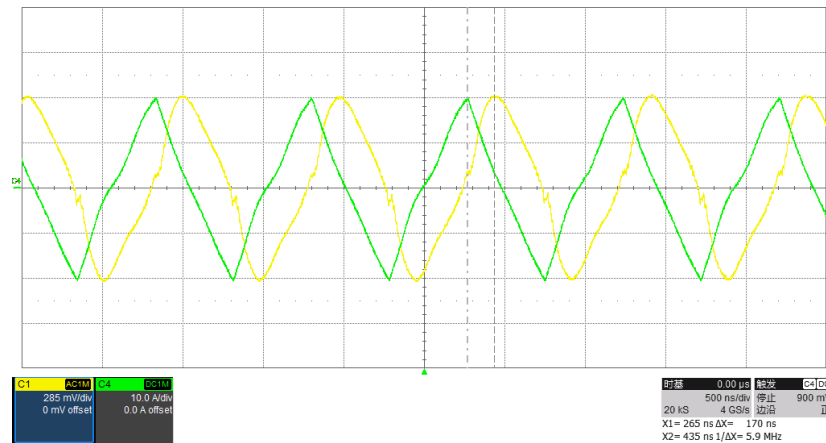


The typical high frequency response of STK-616TM current sensor. The response time from 90% of the primary current to 90% of the secondary output is 0.2 μ s.

12. The delay time of Triangular Wave

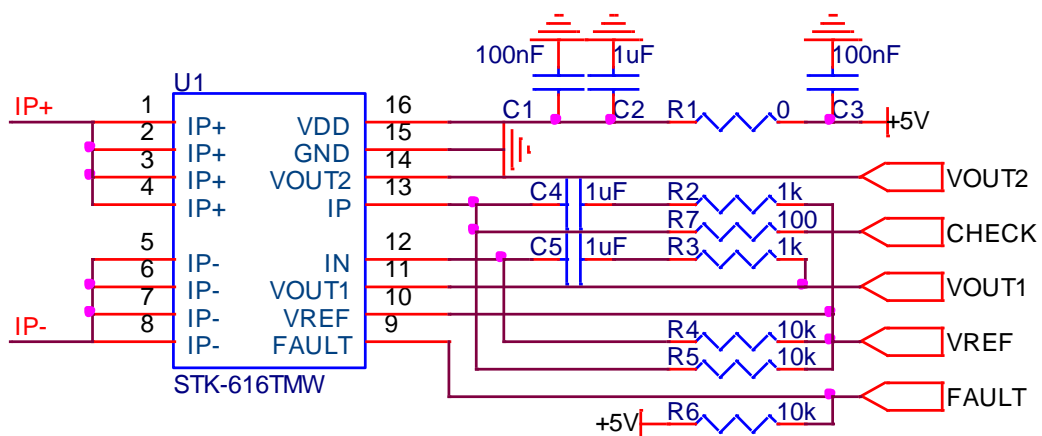


100 kHz Triangular delay---0.2 μs



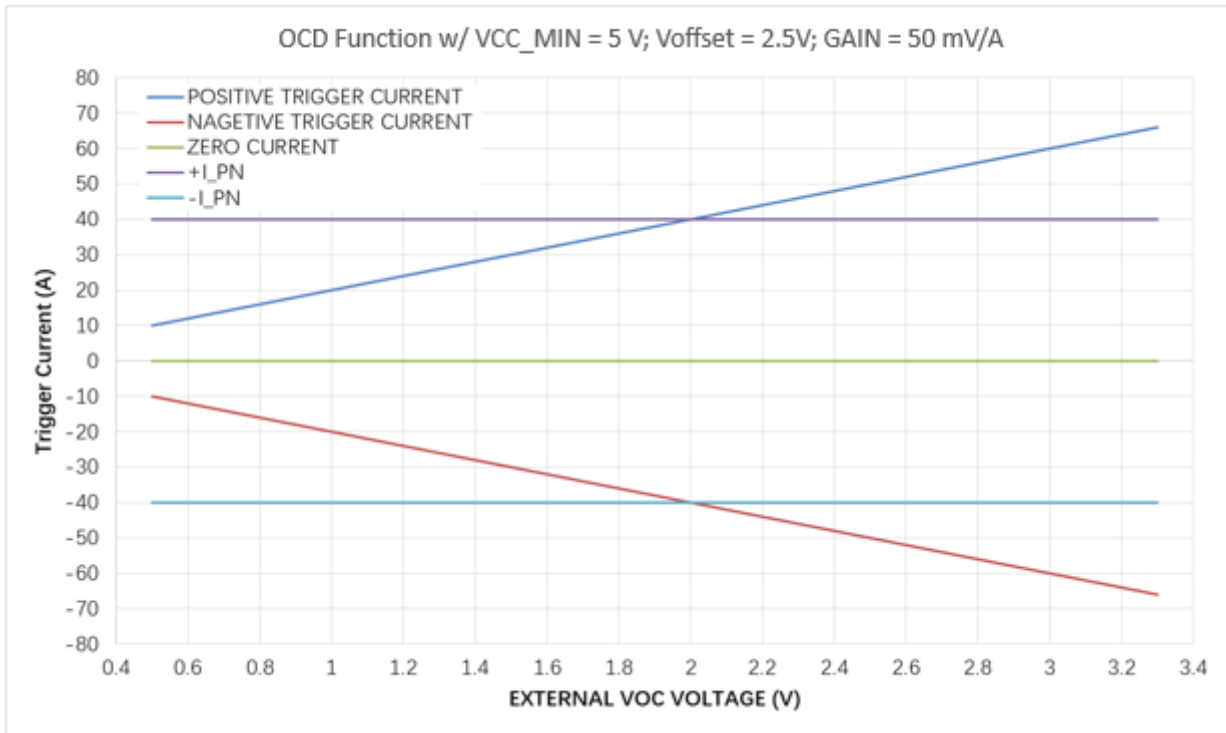
1 MHz Triangular delay---0.2 μs

13. Typical Application of STK-616TMW

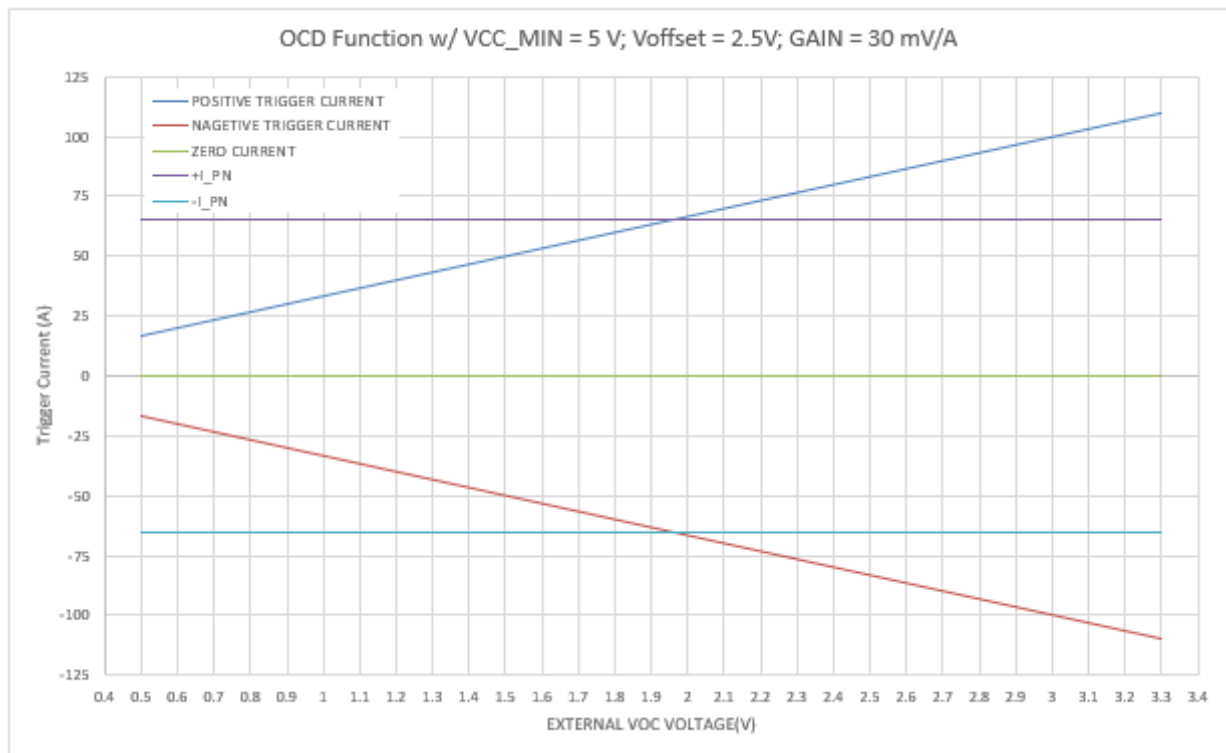


Remark: the CHECK function can be controlled through the TTL level of the IO port of MCU. Without the CHECK function, VOUT2 = 1.65 V @ 3.3 V, VOUT2 = 2.5 V @ 5 V. With the CHECK function, VOUT2 = 0 V @ 3.3 V, VOUT2 = 0 V @ 5 V.

14. Examples of OCD function



OCD function for STK-616T-40MWB5



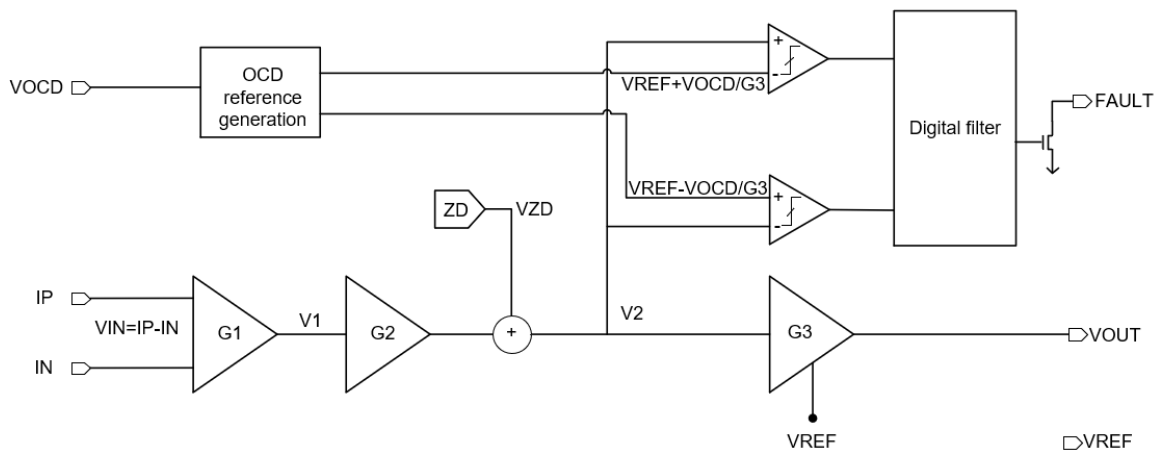
OCD function for STK-616T-65MWB5

15. General information on OCD

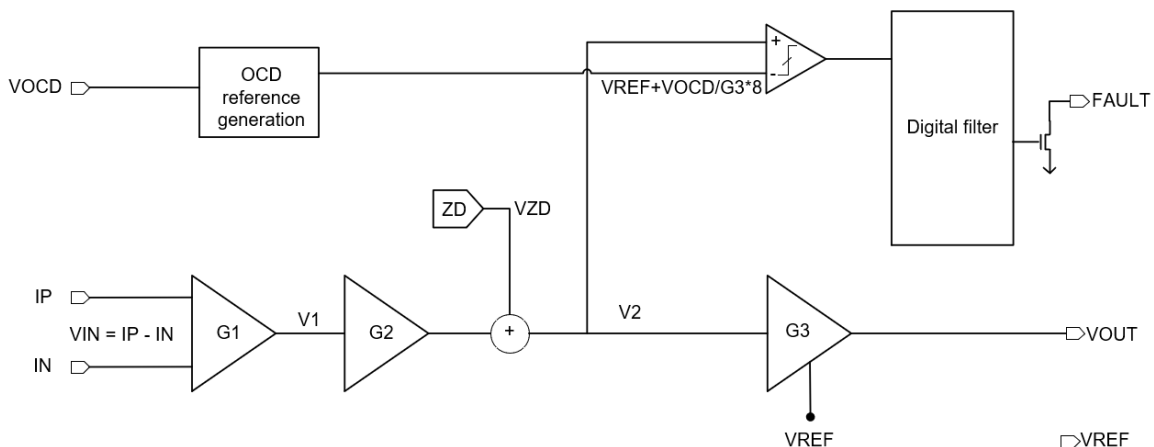
This section describes the general information on OCD function, the specific functions, which are not listed in the section of “electrical data”, can be defined per request.

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 = $(V_{ref} + VOC - V_{off}) / G_{th}$

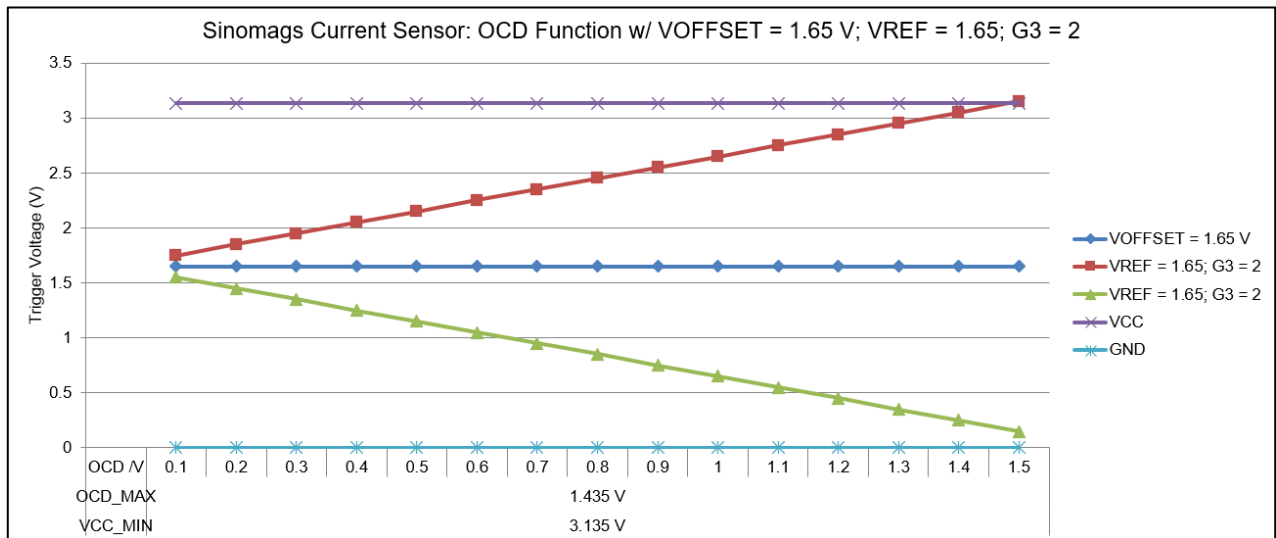
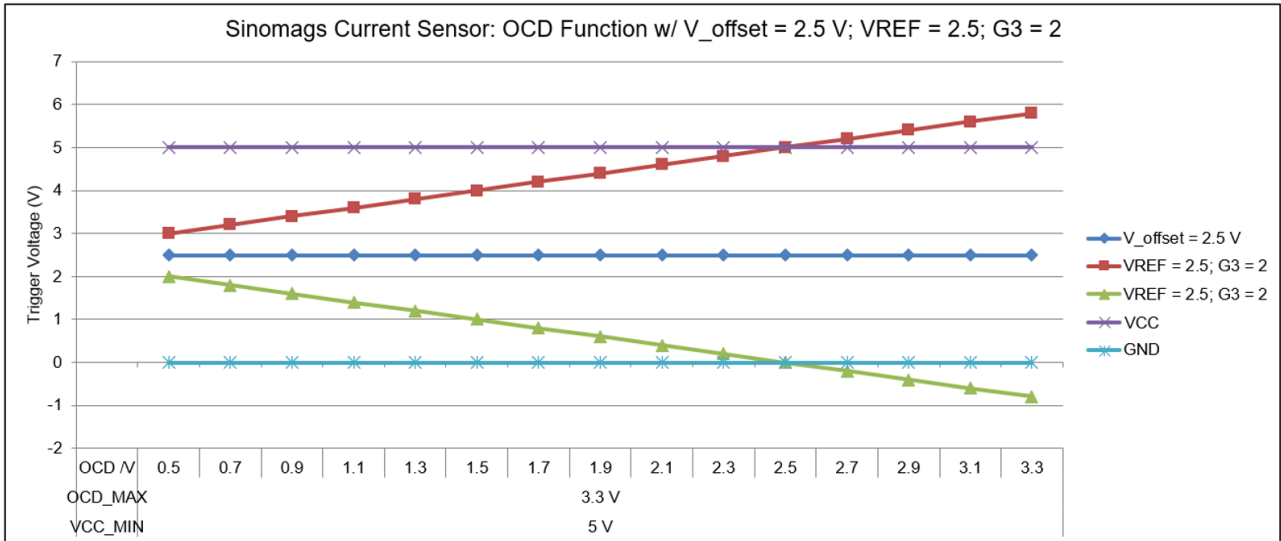


Functional Block Diagram on OCD function when $V_{ref} = 2.5\text{ V}$



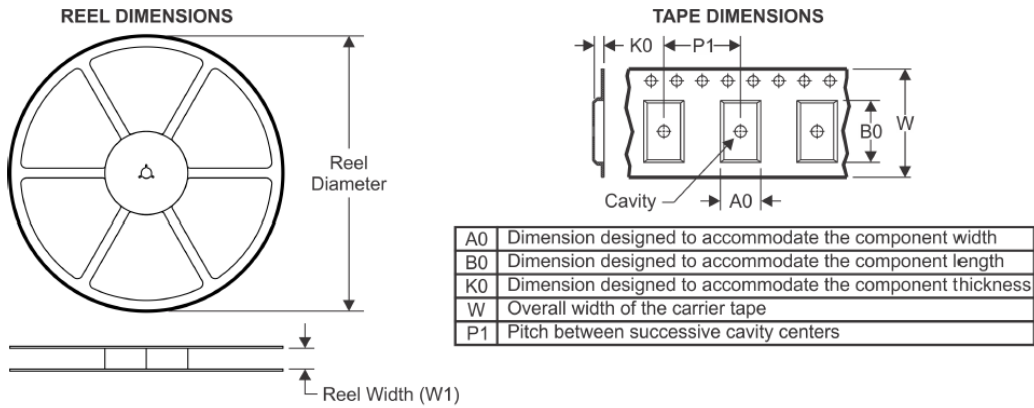
Functional Block Diagram on OCD function when $V_{ref} = 0.5\text{ V}$

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



16. Package materials information

TAPE AND REEL INFORMATION



QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE

