# Current Sensor

Product Series： STK-616ZMT

Part number：

STK-616Z-10MTB5
STK-616Z-20MTB5
STK-616Z-30MTB5
STK-616Z-40MTB5
STK-616Z-50MTB5
STK-616Z-65MTB5
STK-616Z-50MTB3

Version： Ver 1.1
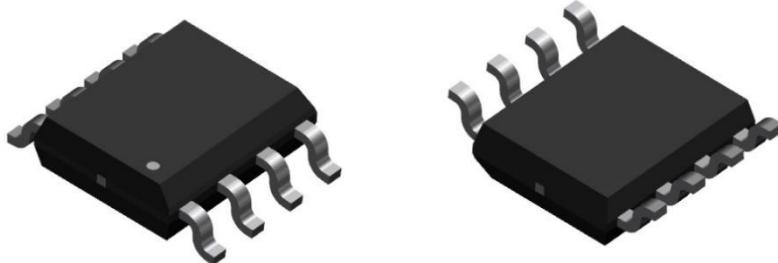
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CONTENT

1. Introduction

STK-616ZM series current sensor is based on TMR (tunnel magneto resistance) technology, and it has an 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
- Switching power supply
- Motor control

General parameter

Parameter	Symbol	Unit	Value
Working temperature	T_A	℃	-40 ~ 125
Storage temperature	T_stg	℃	-40 ~ 125
Mass	m	g	0.1

Absolute maximum rating

Parameter	Symbol	Unit	Value
Supply voltage	V_{CC}	V	6
ESD rating（HBM）	U_{ESD}	kV	4

Remark 1: 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	2.4	All
Clearance distance (Shortest distance through air)	D_{Cl}	mm	4.2	All
Creepage distance (Shortest path along device body)	D_{Cp}	mm	4.2	All

2. Package: SOIC8 compatible
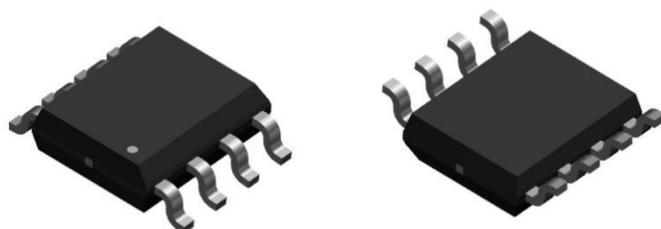
3. Selection Guide

Part Number	Vcc(V)	Current Range (A)	Sensitivity (mV/A)	Offset (V)	Current Directionality	Top(℃)
STK-616Z-10MTB5	5	±10	200	2.5	Bidirectional	-40~125
STK-616Z-20MTB5	5	±20	100	2.5	Bidirectional	-40~125
STK-616Z-30MTB5	5	±30	66.7	2.5	Bidirectional	-40~125
STK-616Z-40MTB5	5	±40	50	2.5	Bidirectional	-40~125
STK-616Z-50MTB5	5	±50	40	2.5	Bidirectional	-40~125
STK-616Z-65MTB5	5	±65	30	2.5	Bidirectional	-40~125
STK-616Z-50MTB3	5	±50	26.4	1.65	Bidirectional	-40~125

4. Production Information

STK - 616Z -20MT - B - 5 - 1 - 2.5 - Q - 2 - C - 1

VOC voltage gain
1: K=1
2: K=2

thold Value
Z: thold = 0 ms
A: thold = 1.5 ms
B: thold = 3.0 ms
C: thold = 4.5 ms

tmask Value
0: tmask = 0 µs
1: tmask = 1 µs
2: tmask = 2 µs
3: tmask = 3 µs

VOC Voltage Value
Q: VOC = 1/4*Vref
H: VOC = 2/4*Vref
T: VOC = 3/4*Vref

Vref Value
1.65: Vref = 1.65 V
2.50: Vref = 2.50 V

OCD Function
0: Disable
1: Enable

Supply Voltage
5: VCC = 5.0 V
3: VCC = 3.3 V

Current Direction
B: Bidirectional
U: Unidirectional

Current Range
10:I_PN = 10 A
20: I_PN = 20 A
30: I_PN = 30 A
50: I_PN = 50 A
65: I_PN = 65 A
MT: OCD Version

Product Series

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5. Electrical data STK-616Z-XXMTB5

Condition：T_A = 25℃, Vcc = 5 V

Parameter	Symbol	Unit	Min	Typ	Max	Comment
Supply voltage	Vcc	V		5 ± 5%		STK-616Z-XXMTB5
Primary nominal current	I_{PN}	A	-10		10	STK-616Z-10MTB5
			-20		20	STK-616Z-20MTB5
			-30		30	STK-616Z-30MTB5
			-40		40	STK-616Z-40MTB5
			-50		50	STK-616Z-50MTB5
			-65		65	STK-616Z-65MTB5
Current consumption	Icc	mA		6		STK-616Z-XXMTB5
Primary conductor resistance	R_pr	mΩ		0.9		STK-616Z-XXMTB5
Quiescent voltage Vout @ 0 A	$V_{IOUT(Q)}$	V		2.5 ± 0.05		STK-616Z-XXMTB5
Zero Current Reference Voltage	V_{REF}	V		2.5 ± 0.05		STK-616Z-XXMTB5
Peak output voltage (Vout @ ±I_pm) – $V_{IOUT(Q)}$	V_FS	V		±2		STK-616Z-XXMTB5
Internal output resistance	R_out	Ω		2		STK-616Z-XXMTB5
Rated linearity error	E_{LIN}	% I_{PN}		±1.5		±I_{PN}
Step response time	t_res	µs		0.05		@90% of I_pn STK-616Z-XXMTB5
Frequency bandwidth (-3dB)	BW	MHz		2		@-3dB STK-616Z-XXMTB5
Output voltage noise	Vnoise	mVpp		10		@1.4 MHz
Accuracy @ 25℃	E_{TOT}	% of I_{PN}		±1.5		All
Accuracy @ -40℃~105℃	E_{TOT}	% of I_{PN}		±3.5		All
OCD function (if applicable)						
OCD	VOC	V		0.625, 1.25,1.875		K = 1, 2
FAULT operating point	I_trigger	A		±0.93×I_{PN}		K = 1, VOC = 1.875 V
				±1.25×I_{PN}		K = 2, VOC = 1.25 V
Fault 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

6. Electrical data STK-616Z-XXMTB3

Condition：T_A = 25℃, Vcc = 3.3 V

Parameter	Symbol	Unit	Min	Typ	Max	Comment
Supply voltage	Vcc	V		3.3 ± 5%		STK-616Z-XXMTB3
Primary nominal current	I_{PN}	A	-50		50	STK-616Z-50MTB3
Current consumption	Icc	mA		6		STK-616Z-XXMTB3
Primary conductor resistance	R_pr	mΩ		0.9		STK-616Z-XXMTB3
Quiescent voltage Vout @ 0 A	$V_{IOUT(Q)}$	V		1.65 ± 0.05		STK-616Z-XXMTB3
Zero Current Reference Voltage	V_{REF}	V		1.65 ± 0.05		STK-616Z-XXMTB3
Peak output voltage (Vout @ +I_pm) $-V_{IOUT(Q)}$	V_FS	V		1.32		STK-616Z-XXMTB3
Internal output resistance	R_out	Ω		2		STK-616Z-XXMTB3
Rated linearity error	E_{LIN}	% I_{PN}		±1.5		±I_{PN}
Step response time	t_res	μs		0.05		@90% of I_pn STK-616Z-XXMTB3
Frequency bandwidth (-3dB)	BW	MHz		2		@-3dB STK-616Z-XXMTB3
Output voltage noise	Vnoise	mVpp		10		@1.4 MHz
Accuracy @ 25℃	E_{TOT}	% of I_{PN}		±1.5		All
Accuracy @ -40℃~105℃	E_{TOT}	% of I_{PN}		±3.5		All
OCD function (if applicable)						
OCD	VOC	V	0.4125, 0.825, 1.2375			K=1, 2
FAULT operating point	I_trigger	A	±0.93×I_{PN}			K = 1 VOC = 1.2375 V
			±1.25×I_{PN}			K = 2 VOC = 0.825 V
Fault 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

7. Typical Application Circuit
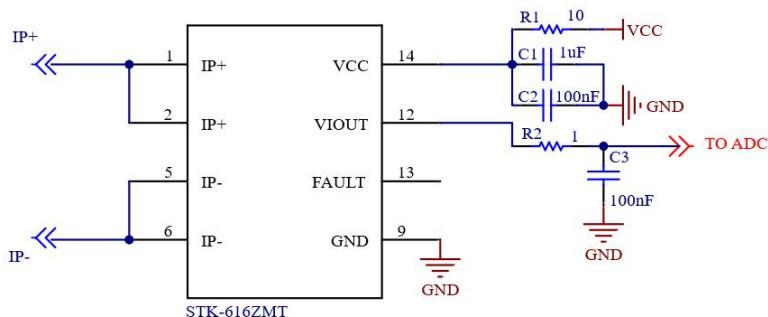
8. Dimension & Pin Definitions
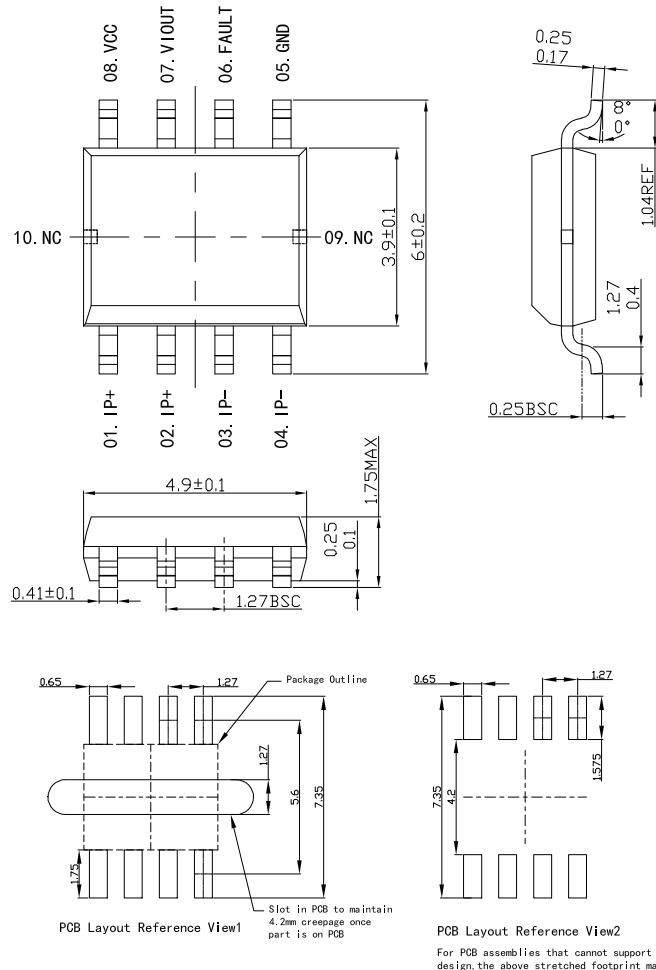
9. Pin definitions

Pin definition for product with OCD function

PIN	Symbol	Description
1,2	IP+	Primary conductor pin (+)
3,4	IP-	Primary conductor pin (-)

| 5	GND	Ground pin (GND)
6	FAULT	Over current detection alarm output, the pin is open leakage output. Normally, the output of fault pin is high level.
7	VIOUT	Sensor output pin
8	VCC	Power supply pin

10. Frequency bandwidth of STK-616Z-XXMTBX
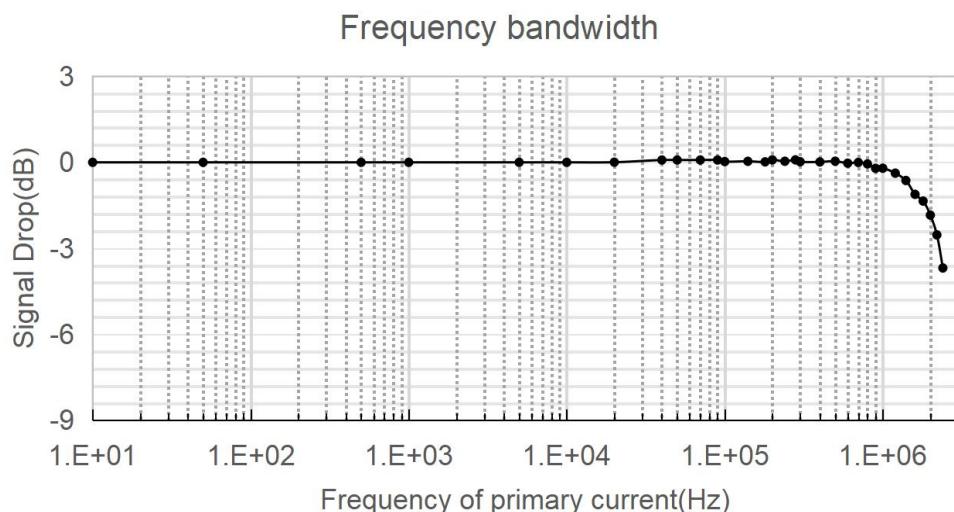

11. Step response time of STK-616Z-XXMTBX
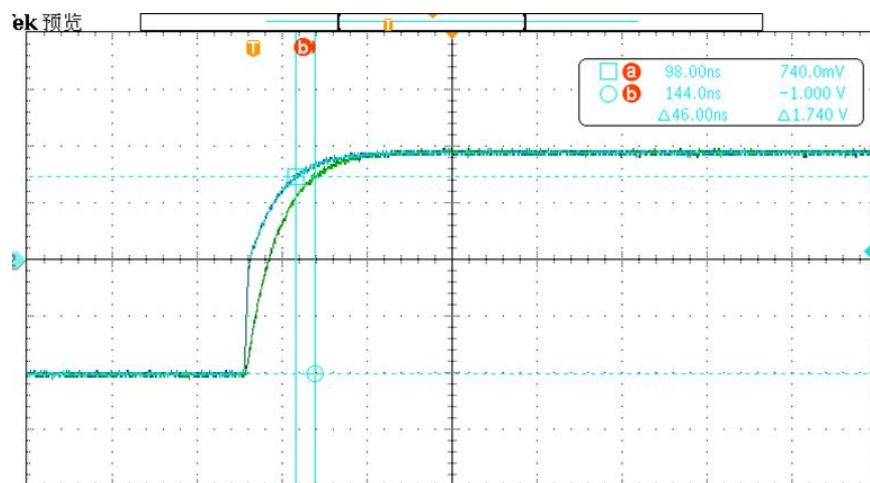
The typical frequency response of STK-616ZMT current sensor. The response time from 90% of the primary current to 90% of the secondary output is 0.05 μs.

12. The delay time of the Triangular wave
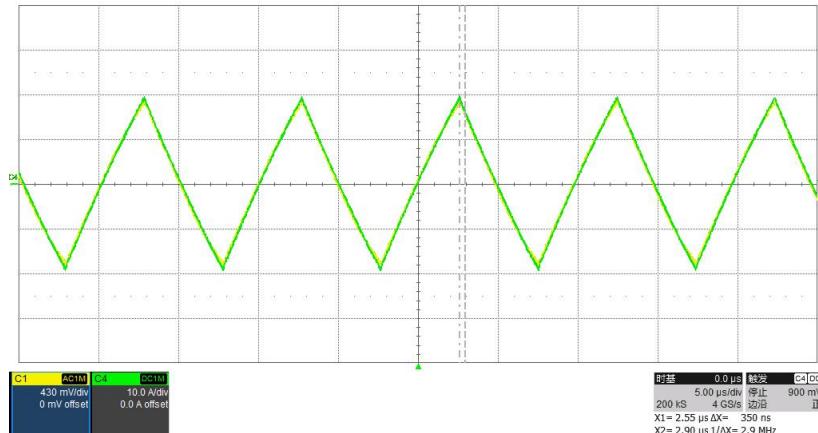

100 kHz Triangular delay---0.05μs
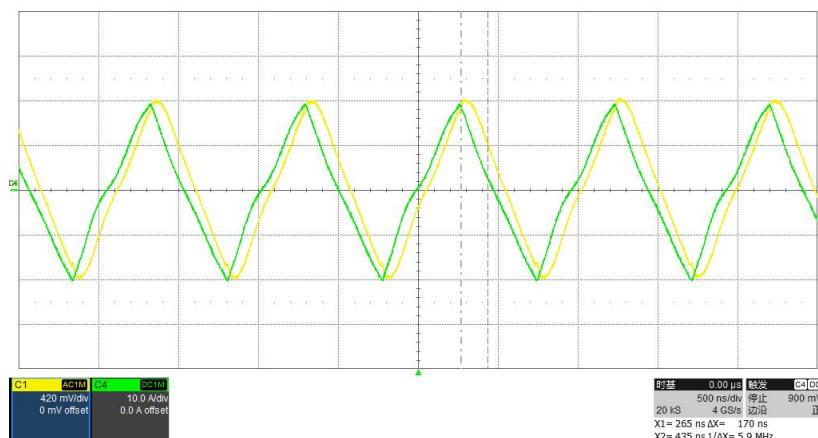
1 MHz Triangular delay---0.05μs

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, VCC= 5 V, K = 1, 2;
   ①. VOC = 0.625 V or 1.25 V or 1.875 V;
   ②. V_trigger = Vref $\pm$ K * VOC / G3;
   ③. I_trigger = (Vref $\pm$ K * VOC - Voff) / G_th;
b) Vref = 1.65 V, VCC = 3.3 V, K = 1, 2;
   ①. VOC = 0.4125 V or 0.825 V or 1.2375 V;
   ②. V_trigger = Vref $\pm$ K * VOC / G3;
   ③. I_trigger = (Vref $\pm$ K * VOC - Voff) / G_th;
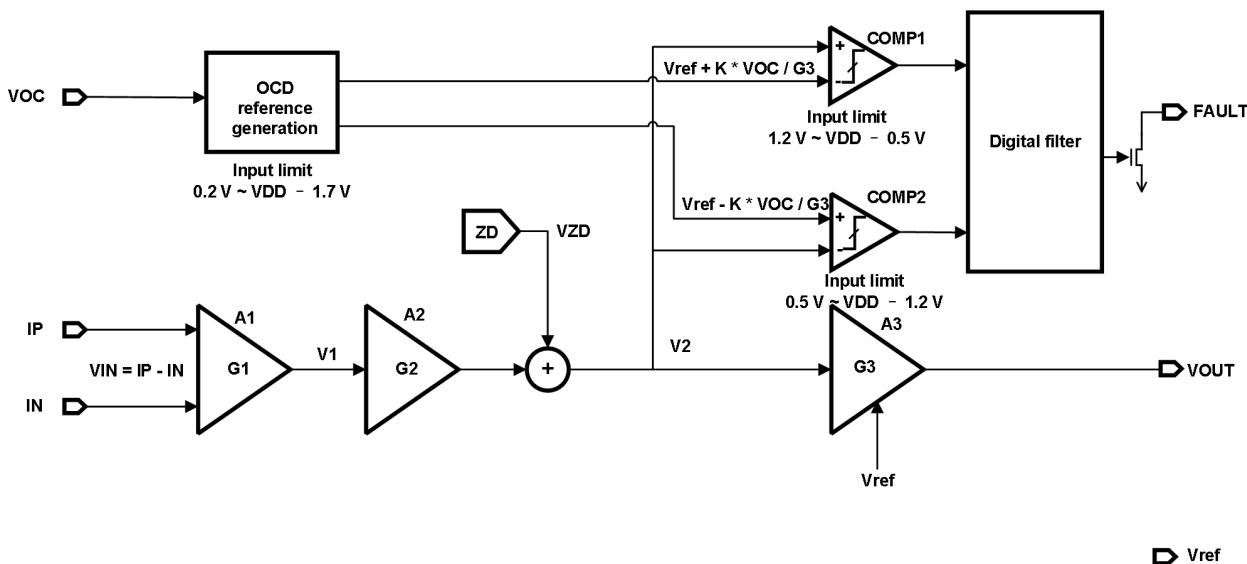
Functional Block Diagram on OCD function when Vref = 2.5 V

Remark 2: V_trigger represents the over-current protection trigger voltage of comparator 1 (COMP1) and comparator 2 (COMP2). I_trigger represents the over-current protection trigger current of the current sensor.

14. 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