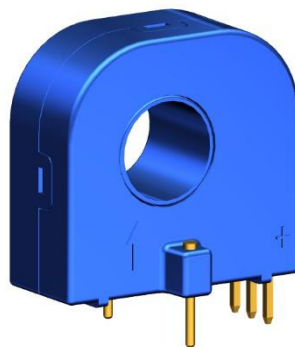


CURRENT SENSOR

Product series: STK-CTS/W

Product part number: STK-15CTS/W 、 STK-20CTS/W
STK-25CTS/W

Version: Ver 4.5



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CONTENTS

1. Description.....	
2. STK-15CTS/W parameters.....	
3. STK-20CTS/W parameters.....	
4. STK-25CTS/W parameters.....	
5. Accuracy.....	
6. Frequency band width.....	
7. Step response time.....	
8. Frequency delay performace.....	
9. Install on PCB.....	
10. Dimensions & Pins & Footprint.....	

1. Description

STK-CTS/W series current sensors are based on open loop principle with TMR technology. The sensor can detect those current with DC, AC, pulse and irregular wave shape.

Typical application

- Variable speed driving
- continuous current dynamo
- Switch mode power supply
- Weld machine power supply
- MPPT

General Parameter

Parameter	Symbol	Unit	Value
Working temperature	T_A	°C	-40 ~ 105
Storage temperature	T_stg	°C	-40 ~ 105
Mass	m	g	10

Absolute Parameter

Parameter	Symbol	Unit	Value
Supply voltage	V _C	V	5.5
ESD rating (HBM)	U _{ESD}	kV	4

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 parameters

Parameter	Symbol	Unit	Value	Remark
Isolation voltage, 50Hz, 1 min	U _d	kV	4	
Impact voltage 1.2/ 50s	Ū _w	kV	6	
Clearance	d _{Cl}	mm	> 8	Shortest distance through air
Creepage distance	d _{Cp}	mm	> 8	Shortest distance along device body
Case material			V0 according to UL 94	

2. STK-15CTS/W parameters

Condition: $V_{cc} = 5.0\text{ V}$, $T_A = 25^\circ\text{C}$, unless specified.

Parameters	Symbol	Unit	Min.	Typ.	Max.	Remark
Primary current	I_{pn}	A		15		
Maximum current	I_{pm}	A	-15		15	
Supply voltage	V_{cc}	V	4.75	5	5.25	
Consumption current	I_{cc}	mA		5	10	
Full-scale output	V_{FS}	V		± 2		$(V_{out} @ \pm I_{pn}) - V_{off}$
Output resistance	R_{out}	Ω		1		@ V_{out}
Offset voltage	V_{off}	V	2.48	2.5	2.52	$V_{out} @ 0\text{ A}$
Theoretical gain	G_{th}	mV/A		133		$2\text{ V} @ I_{pn}$
Gain error	Err_G	% G_{th}	-0.5		0.5	Adjusted@ 25°C
Non-linearity	Non-L	% I_{pn}	-0.5		0.5	$\pm I_{pn}$
reaction time	t_{ra}	μs		0.5		@10% of I_{PN}
Step response time	t_{res}	μs		1		@90% of I_{PN}
Delay time	t_{delay}	μs		1		@300 kHz
-3 dB band width	BW	kHz		400		Back-end non-RC circuit
Noise DC ~ 10 kHz DC ~ 100 kHz	V_{noise}	mVpp		15 25		
Accuracy @ RT	X	% of I_{pn}	-1		1	@ 25°C
Accuracy	X_{TRange}	% of I_{pn}	-2		2	$-40^\circ\text{C} \sim 85^\circ\text{C}$

Note:

- Accuracy @ RT, $X = ((V_{out} @ I_n @ 25^\circ\text{C}) - (G_{fit} * I_n + V_{off} @ 25^\circ\text{C})) / V_{FS}$, Here I_n is the current test current. G_{fit} is the normal temperature fitting gain.
- Accuracy, $X_{TRange} = ((V_{out} @ I_n @ T_x) - (G_{fit@25^\circ\text{C}} * I_n + V_{off} @ 25^\circ\text{C})) / V_{FS}$, The fitting gain of the product at $G_{fit@25^\circ\text{C}}$ is 25°C .

3. STK-20CTS/W parameters

Condition: Vcc = 5.0 V, T_A = 25°C, unless specified.

Parameters	Symbol	Unit	Min.	Typ.	Max.	Remark
Primary current	I _{pn}	A		20		
Maximum current	I _{pm}	A	-20		20	
Supply voltage	V _{cc}	V	4.75	5	5.25	
Consumption current	I _{cc}	mA		5	10	
Full-scale output	V _{FS}	V		±2		(V _{out @ ±I_{pn}}) – V _{off}
Output resistance	R _{out}	Ω		1		@V _{out}
Offset voltage	V _{off}	V	2.48	2.5	2.52	V _{out @ 0 A}
Theoretical gain	G _{th}	mV/A		100		2 V @ I _{pn}
Gain error	Err _G	%G _{th}	-0.5		0.5	Adjusted@25°C
Non-linearity	Non-L	%I _{pn}	-0.5		0.5	±I _{pn}
reaction time	t _{ra}	μs		0.5		@10% of I _{PN}
Step response time	t _{res}	μs		1		@90% of I _{PN}
Delay time	t _{delay}	μs		1		@300 kHz
-3 dB band width	BW	kHz		400		Back-end non-RC circuit
Noise DC ~ 10 kHz DC ~ 100 kHz	V _{noise}	mVpp		15 25		
Accuracy @ RT	X	% of I _{pn}	-1		1	@ 25°C
Accuracy	X _{TRange}	% of I _{pn}	-2		2	-40°C ~ 85°C

Note:

1. Accuracy @ RT, $X = ((V_{out @ I_n @ 25^\circ C}) - (G_{fit} * I_n + V_{off @ 25^\circ C})) / V_{FS}$, Here I_n is the current test current. G_{fit} is the normal temperature fitting gain.

2. Accuracy, $X_{TRange} = ((V_{out @ I_n @ T_x}) - (G_{fit@25^\circ C} * I_n + V_{off @ 25^\circ C})) / V_{FS}$, The fitting gain of the product at G_{fit@25 °C} is 25 °C.

4. STK-25CTS/W parameters

Condition: Vcc = 5.0 V, T_A = 25°C, unless specified.

Parameters	Symbol	Unit	Min.	Typ.	Max.	Remark
Primary current	I _{pn}	A		25		
Maximum current	I _{pm}	A	-25		25	
Supply voltage	Vcc	V	4.75	5	5.25	
Consumption current	Icc	mA		5	10	
Full-scale output	V _{FS}	V		±2		(Vout @ ±I _{pn}) – Voff
Output resistance	R _{out}	Ω		1		@Vout
Offset voltage	Voff	V	2.48	2.5	2.52	Vout @ 0 A
Theoretical gain	G _{th}	mV/A		80		2 V @ I _{pn}
Gain error	Err _G	%G _{th}	-0.5		0.5	Adjusted@25°C
Non-linearity	Non-L	%I _{pn}	-0.5		0.5	±I _{pn}
reaction time	t _{ra}	μs		0.5		@10% of I _{PN}
Step response time	t _{res}	μs		1		@90% of I _{PN}
Delay time	t _{delay}	μs		1		@300 kHz
-3 dB band width	BW	kHz		400		Back-end non-RC circuit
Noise DC ~ 10 kHz DC ~ 100 kHz	Vnoise	mVpp		15 25		
Accuracy @ RT	X	% of I _{pn}	-1		1	@ 25°C
Accuracy	X _{TRange}	% of I _{pn}	-2		2	-40°C ~ 85°C

Note:

1. Accuracy @ RT, $X = ((V_{out} @ I_n @ 25^\circ C) - (G_{fit} * I_n + V_{off} @ 25^\circ C)) / V_{FS}$, Here I_n is the current test current. G_{fit} is the normal temperature fitting gain.

2. Accuracy, $X_{TRange} = ((V_{out} @ I_n @ T_x) - (G_{fit@25^\circ C} * I_n + V_{off} @ 25^\circ C)) / V_{FS}$, The fitting gain of the product at G_{fit@25 °C} is 25 °C.

5. Accuracy

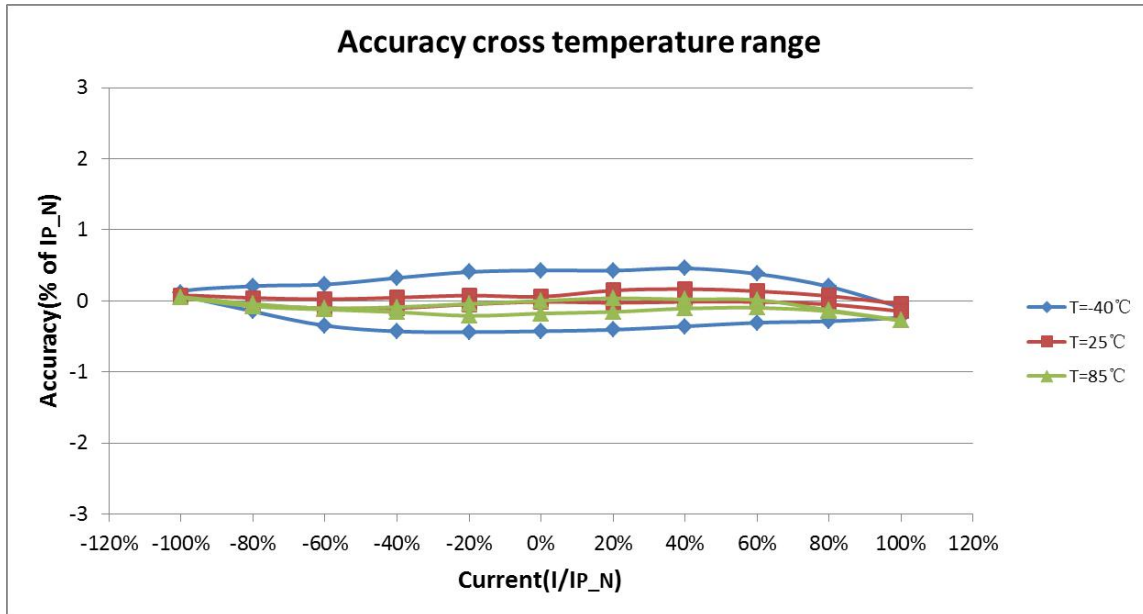


Fig.2 Deviation between actual output and theoretical output of STK-CTS/W current Sensor in full temperature range (-40 °C ~ 85 °C), $((V_{out} @ I_n @ T_x) - (G_{th} * I_n + V_{off} @ 25^\circ C)) / V_{FS}$. V_{out} is the sensor V_{out} pin voltage, V_{off} is the static output voltage of the sensor, I_n is the current primary current, T_x is the current temperature, G_{th} is the theoretical gain of the sensor, V_{FS} is the full range output of the sensor.

6. Frequency band width

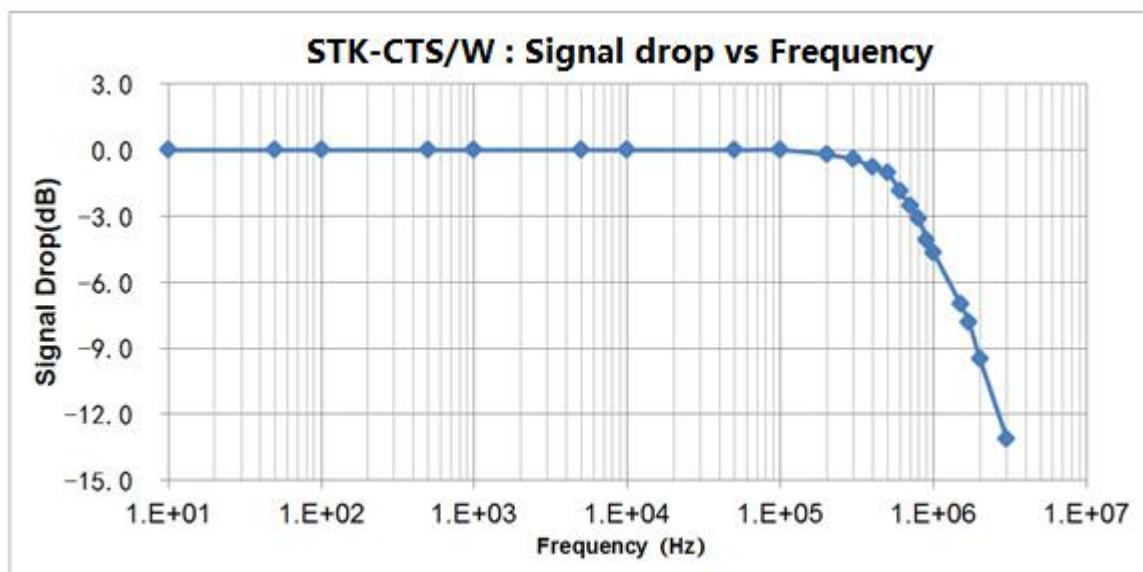


Fig.4 the band width of STK-CTS/W series current sensors. The bandwidth of the sensor is in the range of DC ~ 400 kHz (-3 dB).

7. Step response time

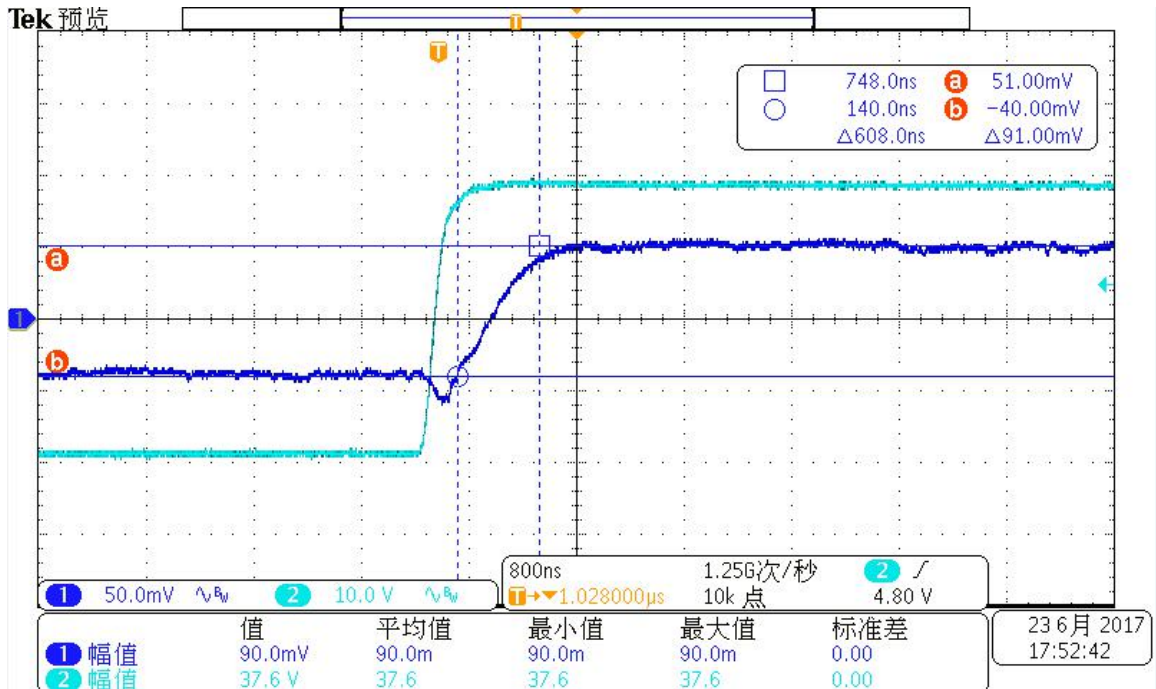


Fig.5 the step response time of STK-CTS/W current sensors. The light blue is primary current, while the dark blue is output signal of current sensor. The delay from 90% of the original current signal to 90% of the output of the sensor is less than 1 μ s.

8. Frequency delay performance

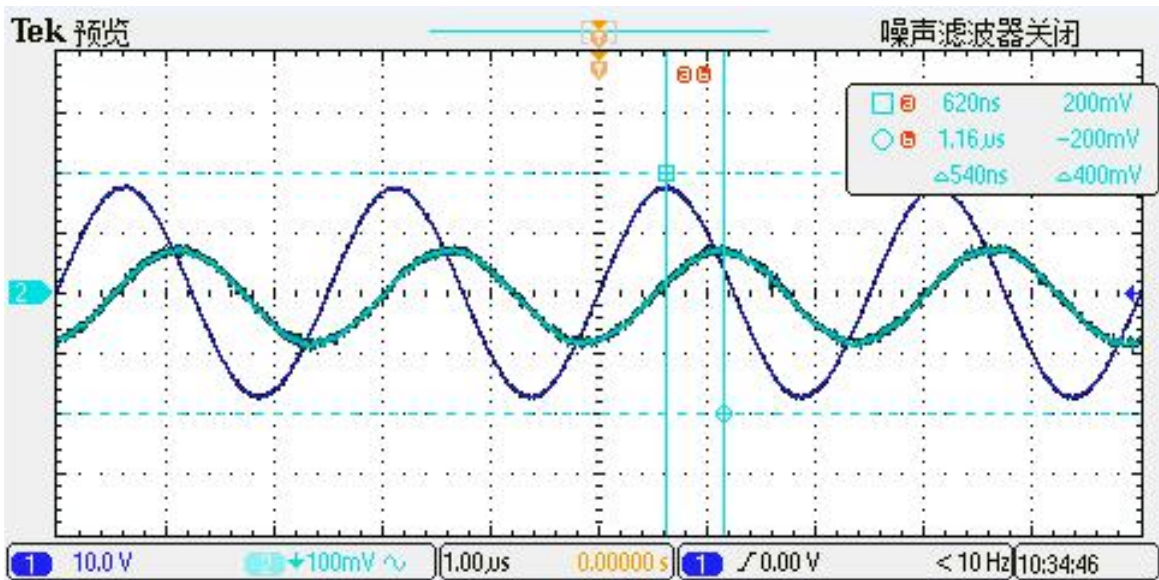
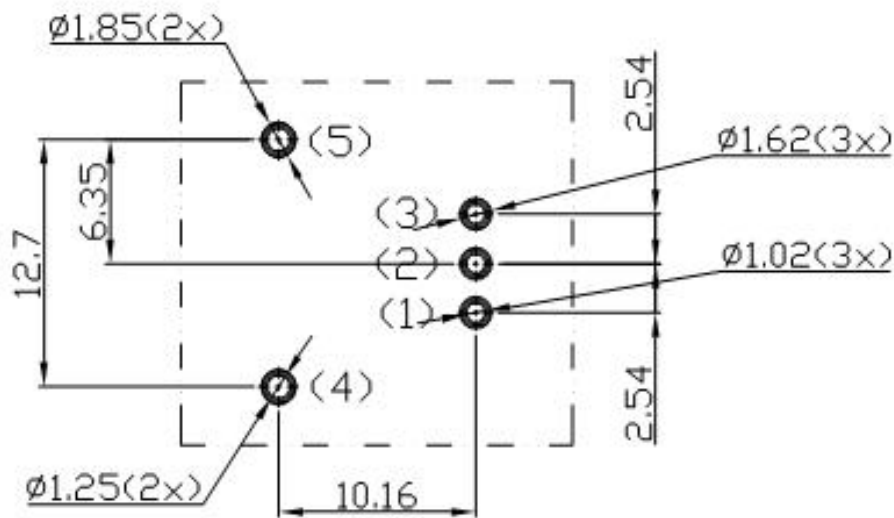


Fig.6 when detection the primary current with a frequency of 400 kHz. The typical results of the output of STK-CTS/w current sensor on the primary current delay characteristics. The delay time from primary current (light blue) to the output of the sensor (dark blue) is less than 1 μ s.

9. Install on PCB



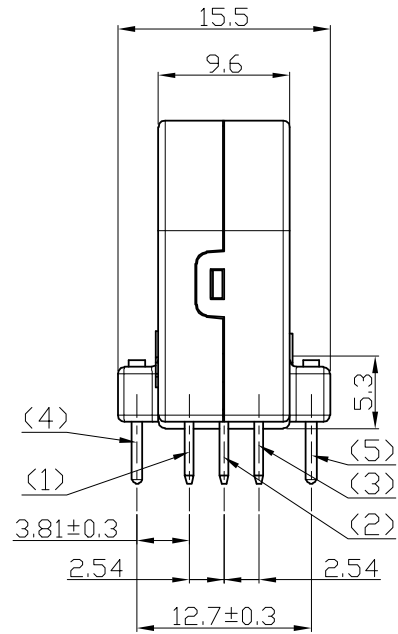
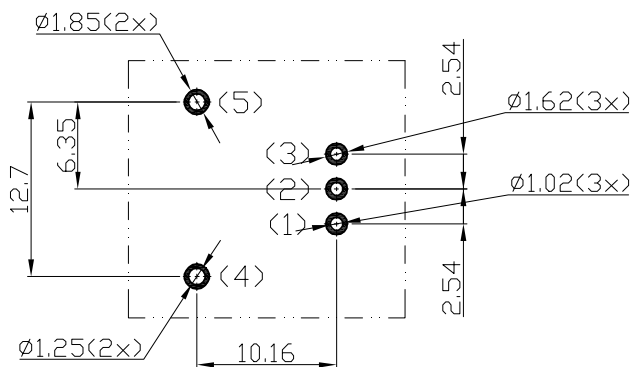
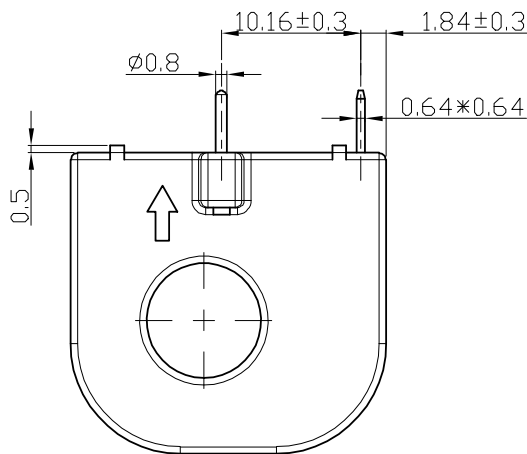
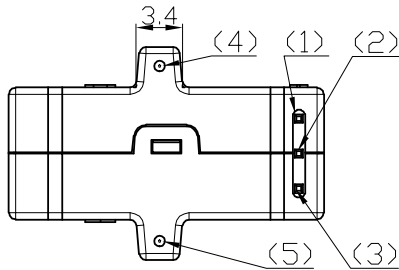
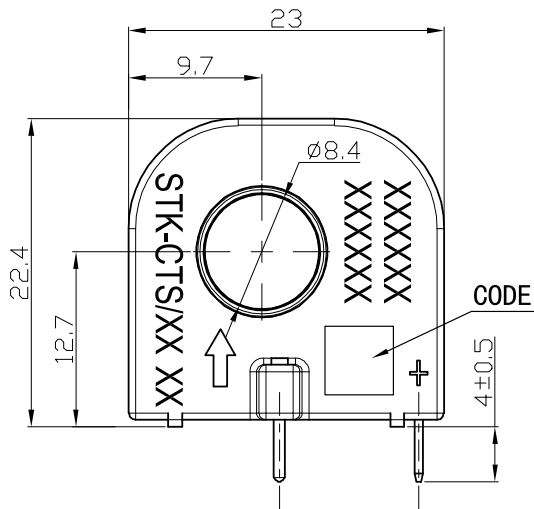
1. Installation angle: Overlooking (viewed from the side where the sensor is installed, unit: mm)
2. It is suggested that the aperture (diameter of secondary signal line $\times 1.25$) mm of PCB should be installed.
3. Maximum PCB thickness 2.5 mm
4. Wave peak welding temperature curve: $260\text{ }^{\circ}\text{C} \times 10\text{ s}$



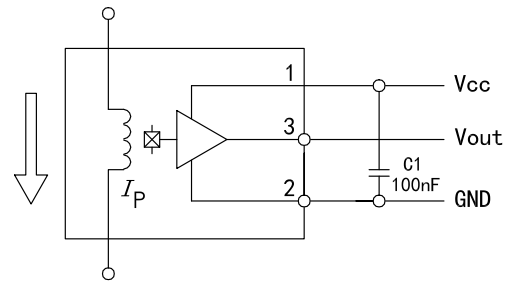
Safe: This current sensor shall be used in IEC61010-1-compliant energy limiting secondary circuits

- This current sensor is used in electronic / electrical equipment that meets the application standards and is subject to the manufacturer's safety operating requirements;
- When operating the current sensor, we should pay attention to the dangerous voltage of the original side current line;
- Failure to connect according to the diagram will cause damage to the product;
- Ignoring the warning can lead to serious consequences;
- Additional protective cover can be added;
- The main power supply must be disconnected.

10. Dimensions & Pins & Footprint



Connection



Terminals

(1)	Vcc
(2)	GND
(3)	Vout
(4)	NC
(5)	NC

Material : Fit UL94V-0 & RoHS requirements ;
General tolerance : ± 0.5
Unit : mm

