CURRENT SENSOR

PRODUCT SERIES： STK-x.xP/Mx-x

PRODUCT PART NUMBER：
STK-0.3P/M1;STK-1.0P/M1;STK-1.0P/M1-1
STK-0.3P/M1S;STK-1.0P/M1S;STK-1.0P/M1S-1
STK-0.3P/M1A;STK-1.0P/M1A;STK-1.0P/M1A-1
STK-0.3P/M1T;STK-1.0P/M1T;STK-1.0P/M1T-1
STK-0.3P/M1F;STK-1.0P/M1F;STK-1.0P/M1F-1
STK-0.3P/MN;STK-1.0P/MN;STK-1.0P/MN-1

REVISION： Ver 1.7






Sinomags Technology Co., Ltd.
Website: www.sinomags.com

CONTENT

1. Description

Features

- Open loop current transducer
- Voltage output
- Insulation voltage for 5kV/AC
- Single supply voltage
- PCB mounting
- Cobalt base magnetic ring.

Advantages

- High accuracy
- High overload capability
- High insulation capability
- High separation ability
- Low temperature drift
- Degauss and test functions.

Applications

- Residual current measurement
- Leakage current measurement in transformerlessPVinverters
- First human contact protection of PV arrays
- Failure detection in power sources
- Leakage current detection instacked AC/DC sources
- Communication power
- Single phase or three phase nominal current （AC OR DC）

Standards

- EN 50178
- IEC 61326-1: 2012

Application Domain

- Industry.

2. Absolute parameter

Absolute maximum ratings

Parameter	Symbol	Unit	Value
Supply voltage	Vc	V	5.5
Primary conductor temperature	$T_{B\,max}$	℃	110
Overload capability (100 μs, 500 A/μs)	$\hat{I}_{P\,max}$	A	3300
Maximum Primary current @ T_{Amax}=105℃	I_M	A/wire	STK-x.xP/M1-x: 60 STK-x.xP/M1S-x: 20 STK-x.xP/M1A-x: 32 STK-x.xP/M1T-x: 32 STK-x.xP/M1F-x: 32
Primary carrier resistance per wire @ T_A=25°C	R_p	mΩ	STK-x.xP/M1-x: 0.2 STK-x.xP/M1S-x: 0.36 STK-x.xP/M1A-x: 0.3 STK-x.xP/M1T-x: 0.3 STK-x.xP/M1F-x: 0.3

Stresses above these ratings may cause permanent damage. Exposure to absolute maximum ratings for extended periods may degrade reliability.

Isolation parameters

Parameter	Symbol	Unit	Value
RMS voltage for AC test 50Hz/1min	V_d	kV	5
Impulse withstand voltage 1.2/50μs	V_w	kV	10.1
Comparative tracking index	CTI	V	600
Case material			V0 according to UL 94

Environmental and mechanical characteristics

Parameter	Symbol	Unit	Min	Typ	Max
Ambient operating temperature	T_A	℃	-40		105
Ambient storage temperature	T_S	℃	-45		125
Mass	m	g		STK-x.xP/M1-x: 35 STK-x.xP/M1S-x: 18 STK-x.xP/M1A-x: 30 STK-x.xP/M1T-x: 33 STK-x.xP/M1F-x: 36 STK-x.xP/MN-x: 15	
standard	EN 50178, IEC 61010-1, UL 508				

3. STK-0.3P/Mx Electrical data

STK-0.3P/Mx at T_A= 25℃, V_C=5 V.

Parameters	Symbol	Unit	Min	Typ	Max	Remark
Primary nominal residual rms current	I_{pn}	A		0.3		
Primary residual current, measuring range	I_{pm}	A	-0.5		0.5	
Supply voltage	V_C	V	4.9	5	5.1	
Current consumption	I_C	mA		18		I_P(mA) / N_a N_a = 40 turns - 40°C …105°C
Reference voltage @ I_P = 0	V_{ref}	V	2.475	2.5	2.525	Internal reference
Temperature coefficient of V_{ref} @ I_P = 0	TCV_{ref}	ppm/K		±100	±250	ppm/K of 2.5 V −40 … 105 °C
Electrical offset voltage	V_{oe}	mV	-25		25	(V_{out} – V_{ref}) @ 0 A
Temperature coefficient of V_{OE} @ I_P = 0	TCV_{oe}	ppm/K		±100	±300	ppm/K of 2.5 V −40 … 105 °C
Theoretical sensitivity	G_{th}	V/A		4		
Temperature coefficient of G_{th}	TCG	ppm/K		±300	±400	- 40°C …105°C
Sensitivity error	ε_G	%	-2	1	2	
Linearity error	ε_L	%		0.5	1	
Check current	I_{CK}	mA		50		Sum of 20turns
Output voltage(Checkfunction)	V_{CK}	V	0.194	Voe+0.2	0.206	
Check enable voltage	V_{CE}	V	3.3		V_C	
Check disabled voltage	V_{CD}	V		< 0.2		
Frequency bandwidth (−3dB)	BW	Hz		700		
Noise(1 Hz ~ 10 kHz)	V_{no}	mV rms		10		
Reaction time @ 10 % of I_{PN}	tra	μs		100		RL> 500 kΩ, di/dt> 5 A/μs
Step response time to 90 % of I_{PN}	tr	μs		700		RL> 500 kΩ, di/dt> 5 A/μs
Accuracy@ I_{PN}@TA= 25℃	$X_{25℃}$	% of I_{PN}		±2		
Accuracy@ I_{PN} @TA= 105℃	$X_{105℃}$	% of I_{PN}		±4		
Output internal resistance	R_{out}	Ω		49.9		
V_{ref} internal resistance	R_{ref}	Ω		49.9		

4. STK-1.0P/Mx Electrical data

STK-1.0P/Mx at T_A= 25℃, V_C=5 V.

Parameters	Symbol	Unit	Min	Typ	Max	Remark
Primary nominal residual rms current	I_{pn}	A		1.02		
Primary residual current, measuring range	I_{pm}	A	-1.7		1.7	
Supply voltage	V_C	V	4.9	5	5.1	
Current consumption	I_C	mA		18		I_P(mA) / N_a N_a = 40 turns - 40°C …105°C
Reference voltage @ I_P = 0	V_{ref}	V	2.475	2.5	2.525	Internal reference
Temperature coefficient of V_{ref} @ I_P = 0	TCV_{ref}	ppm/K		±100	±250	ppm/K of 2.5 V −40 … 105 °C
Electrical offset voltage	V_{oe}	mV	-25		25	(V_{out} – V_{ref}) @ 0 A
Temperature coefficient of V_{OE} @ I_P = 0	TCV_{oe}	ppm/K		±100	±300	ppm/K of 2.5 V −40 … 105 °C
Theoretical sensitivity	G_{th}	V/A		1.17		
Temperature coefficient of G_{th}	TCG	ppm/K		±300	±400	- 40°C …105°C
Sensitivity error	ε_G	%	-2	1	2	
Linearity error	ε_L	%		0.5	1	
Check current	I_{CK}	mA		170		
Output voltage(Checkfunction)	V_{CK}	V	0.194	Voe+0.2	0.206	Sum of 20turns
Check enable voltage	V_{CE}	V	3.3		V_C	
Check disabled voltage	V_{CD}	V		< 0.2		
Frequency bandwidth (−3dB)	BW	Hz		700		
Noise(1 Hz ~ 10 kHz)	V_{no}	mV rms		10		
Reaction time @ 10 % of I_{PN}	tra	μs		100		RL> 500 kΩ, di/dt> 5 A/μs
Step response time to 90 % of I_{PN}	tr	μs		700		RL> 500 kΩ, di/dt> 5 A/μs
Accuracy@ I_{PN}@TA= 25℃	$X_{25℃}$	% of I_{PN}		±2		
Accuracy@ I_{PN} @TA= 105℃	$X_{105℃}$	% of I_{PN}		±4		
Output internal resistance	R_{out}	Ω		49.9		
V_{ref} internal resistance	R_{ref}	Ω		49.9		

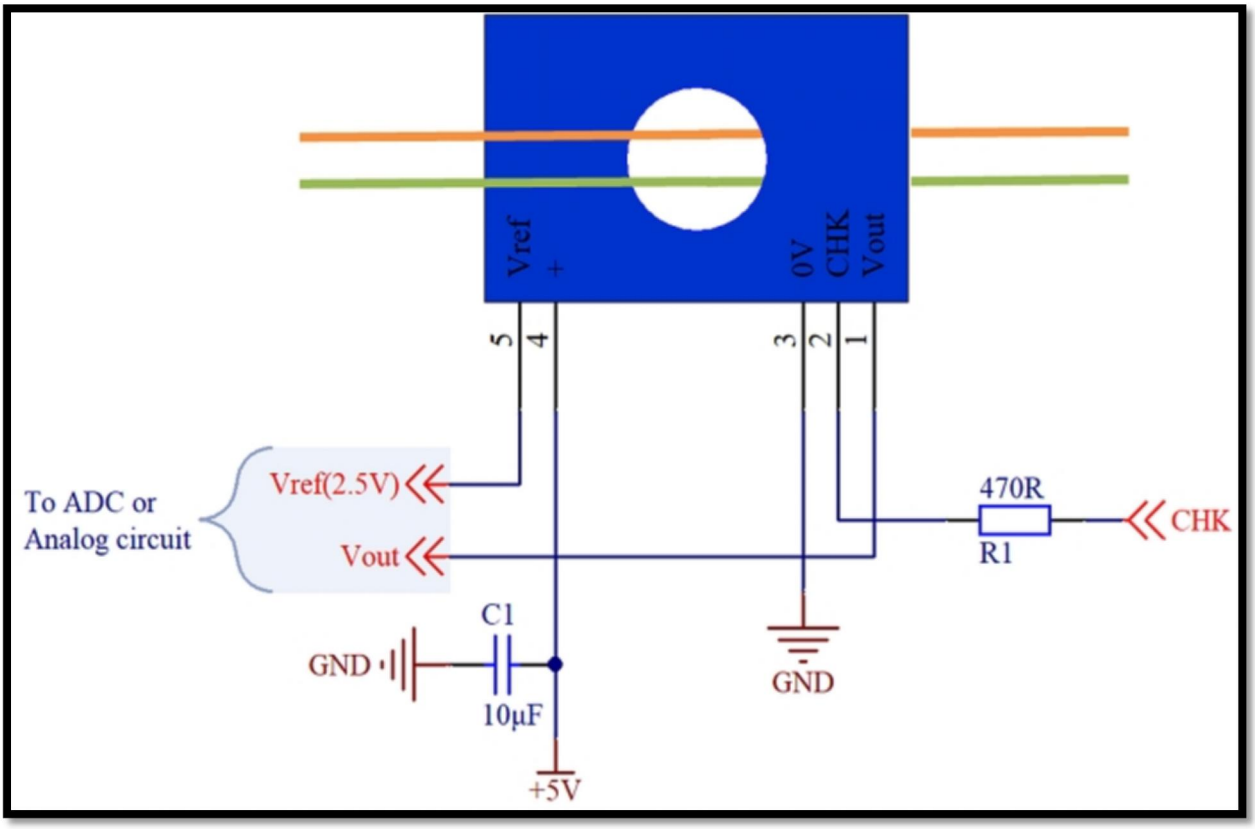
5. STK-1.0P/Mx-1 Electrical data

STK-1.0P/Mx-1 at T_A= 25℃, V_C=5 V.

Parameters	Symbol	Unit	Min	Typ	Max	Remark
Primary nominal residual rms current	I_{pn}	A		1		
Primary residual current, measuring range	I_{pm}	A	-1.7		1.7	
Supply voltage	V_C	V	4.9	5	5.1	
Current consumption	I_C	mA		18		I_P(mA) / N_a N_a = 40 turns - 40°C …105°C
Reference voltage @ I_P = 0	V_{ref}	V	2.475	2.5	2.525	Internal reference
Temperature coefficient of V_{ref} @ I_P = 0	TCV_{ref}	ppm/K		±100	±250	ppm/K of 2.5 V −40 … 105 °C
Electrical offset voltage	V_{oe}	mV	-25		25	(V_{out} – V_{ref}) @ 0 A
Temperature coefficient of V_{OE} @ I_P = 0	TCV_{oe}	ppm/K		±100	±300	ppm/K of 2.5 V −40 … 105 °C
Theoretical sensitivity	G_{th}	V/A		1.2		
Temperature coefficient of G_{th}	TCG	ppm/K		±300	±400	- 40°C …105°C
Sensitivity error	ε_G	%	-2	1	2	
Linearity error	ε_L	%		0.5	1	
Check current	I_{CK}	mA		166		Sum of 20turns
Output voltage(Checkfunction)	V_{CK}	V	0.194	Voe+0.2	0.206	
Check enable voltage	V_{CE}	V	3.3		V_C	
Check disabled voltage	V_{CD}	V		< 0.2		
Frequency bandwidth (−3dB)	BW	Hz		700		
Noise(1 Hz ~ 10 kHz)	V_{no}	mV rms		10		
Reaction time @ 10 % of I_{PN}	tra	μs		100		RL> 500 kΩ, di/dt> 5 A/μs
Step response time to 90 % of I_{PN}	tr	μs		700		RL> 500 kΩ, di/dt> 5 A/μs
Accuracy@ I_{PN}@TA= 25℃	$X_{25℃}$	% of I_{PN}		±2		
Accuracy@ I_{PN} @TA= 105℃	$X_{105℃}$	% of I_{PN}		±4		
Output internal resistance	R_{out}	Ω		49.9		
V_{ref} internal resistance	R_{ref}	Ω		49.9		

6. Application information

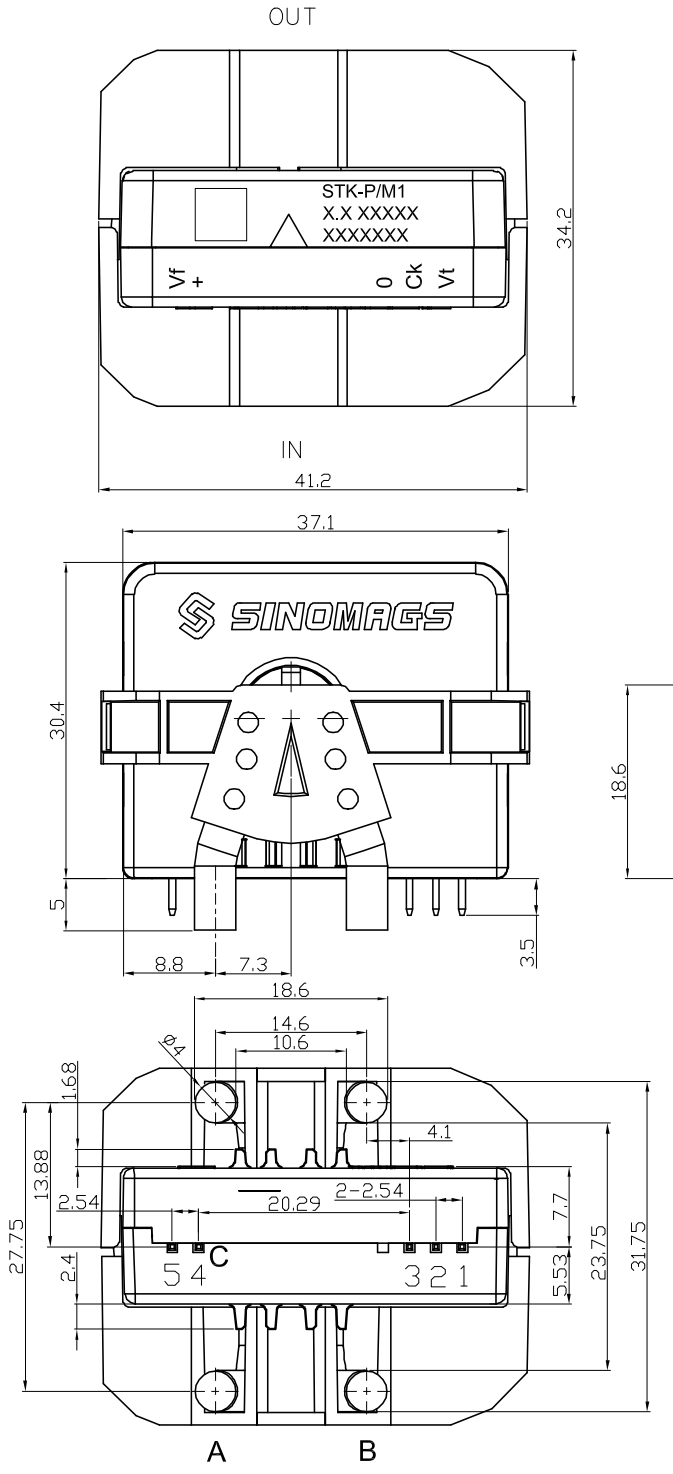
Application circuit



Self-check Function

Set the CHK pin to high status. STK-x.xP/Mx-x will run in self-test mode, check the out pin, equivalent to the status I_p isl I_{ck}, at this time the output has equival voltage, the detector is OK. Then sets CHK to low voltage V_{CD} < 0.2V, the sensor starts to run in the residual current.

7. STK-x.xP/M1-x Dimensions (in mm)



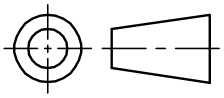
Terminals	
1	Vout
2	CHK
3	GND
4	Vcc
5	Vref

	D_{CI}	D_{CP}
A-B	5.6	8
A-C	11.6	--
A-D	10.8	10.8

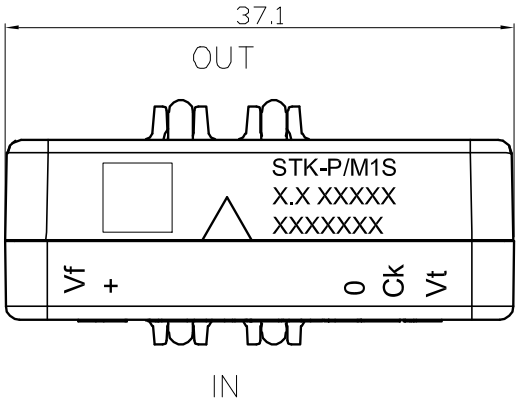
D is secondary inside the transducer

On the customer's PCBA		
	D_{CI}	D_{CP}
A-B	5.6	8
A-C	9.6	9.6

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

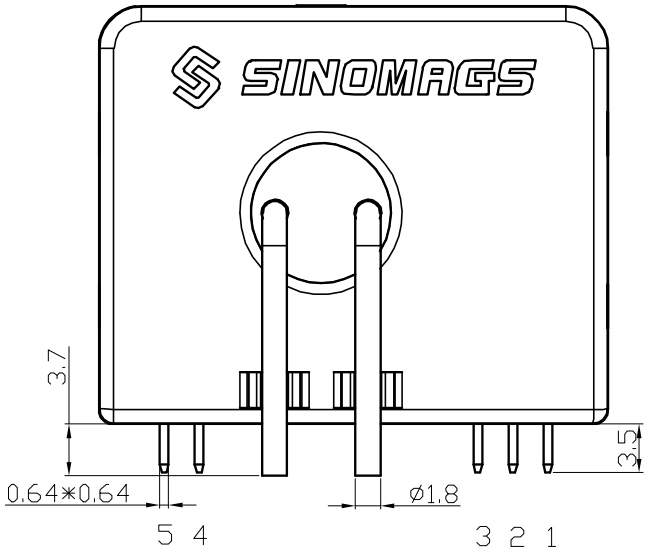


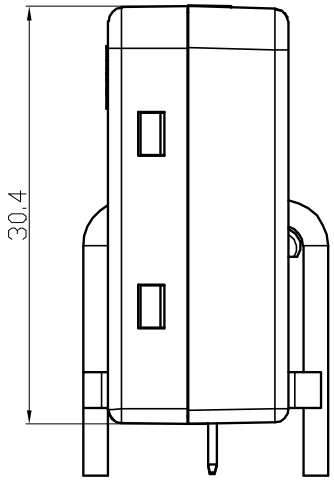
8. STK-x.xP/M1S-x Dimensions (in mm)

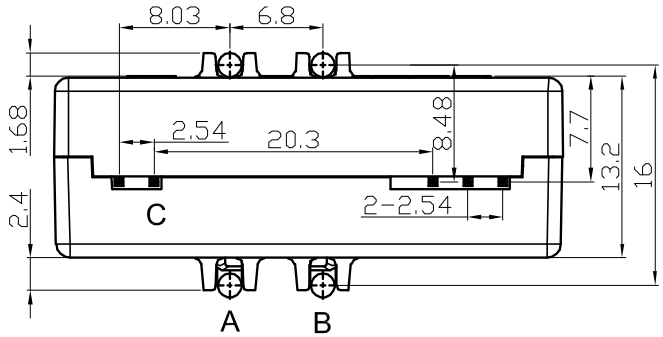


Terminals

1	Vout
2	CHK
3	GND
4	Vcc
5	Vref





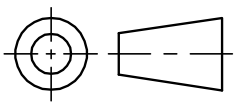


	D_{CI}	D_{CP}
A-B	5	5.5
A-C	8	--
A-D	--	9

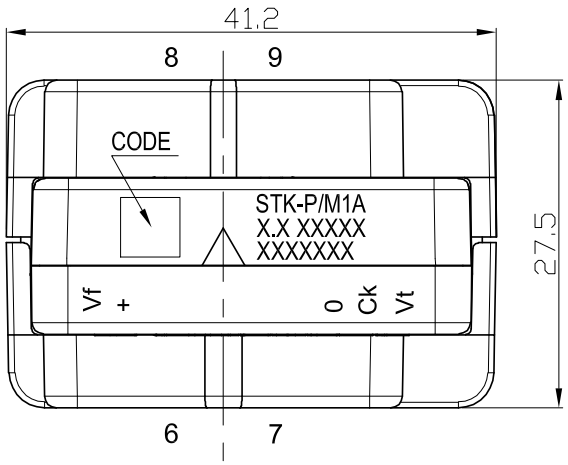
D is secondary inside the transducer

On the customer's PCBA		
	D_{CI}	D_{CP}
A-B	2.3	2.3
A-C	6	6

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



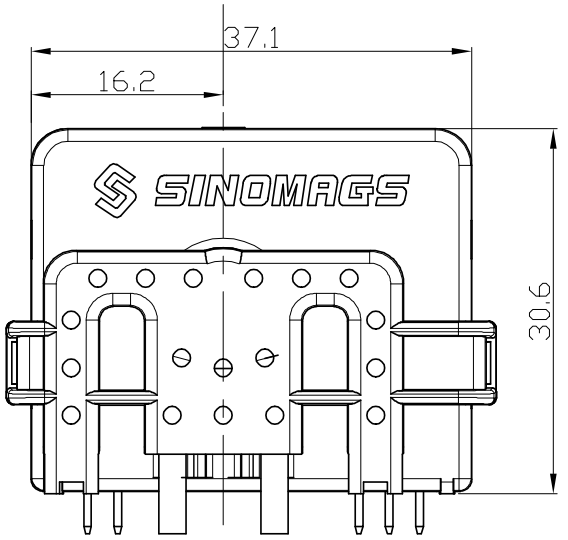
9. STK-x.xP/M1A-x Dimensions (in mm)

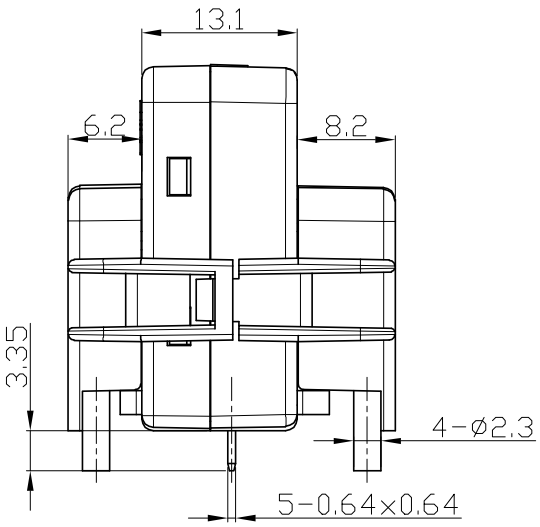


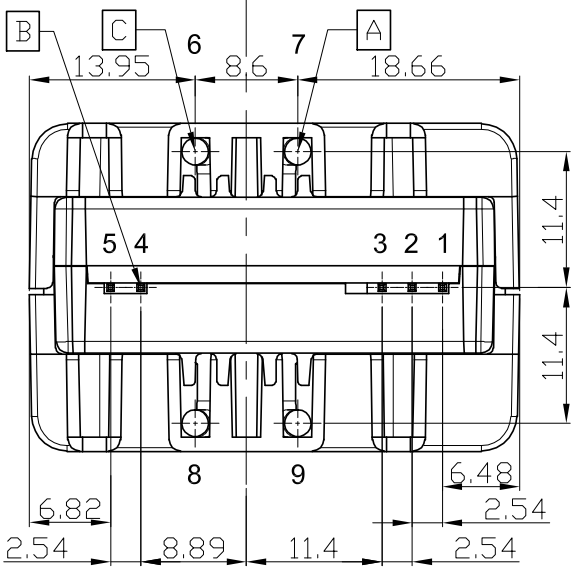
	d_{CI}	d_{Cp}
C-B	10.7mm	---
A-C	5.2mm	6mm
C-D	12mm	16.0mm

D is secondary inside the transducer

On the customer's PCBA		
	d_{CI}	d_{Cp}
C-B	9.1mm	9.1mm
A-C	4.4mm	4.4mm



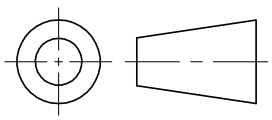




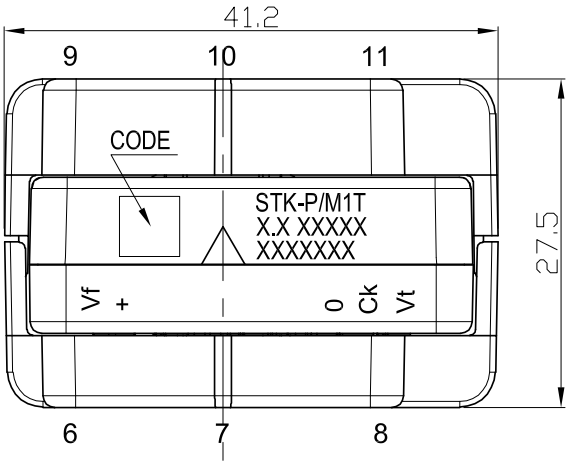
Terminals

1	Vout	6	Ip+
2	CHK	7	Ip+
3	GND	8	Ip-
4	Vcc	9	Ip-
5	Vref		

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



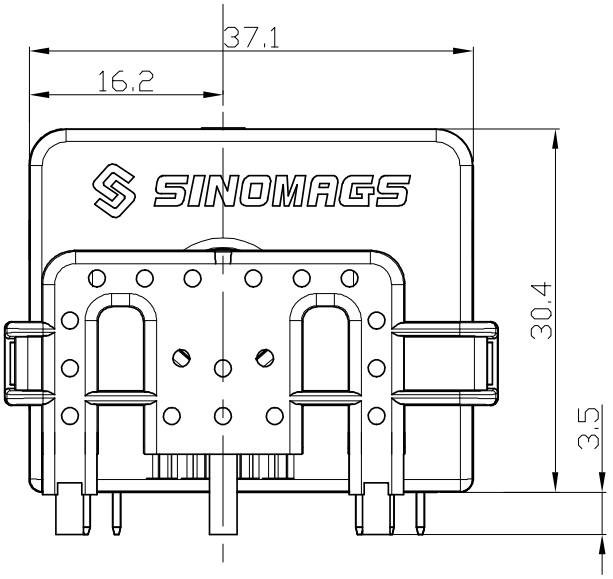
10. STK-x.xP/M1T-x Dimensions (in mm)

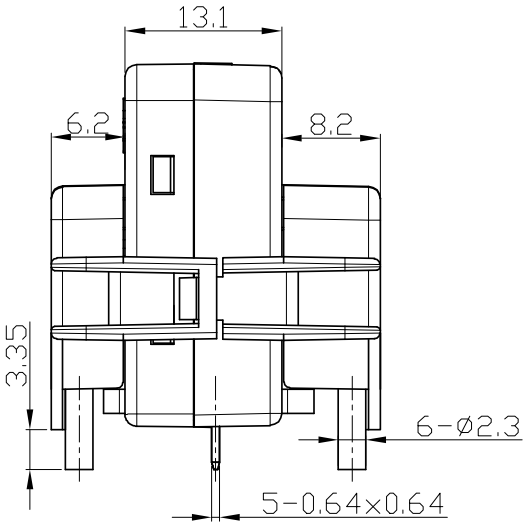


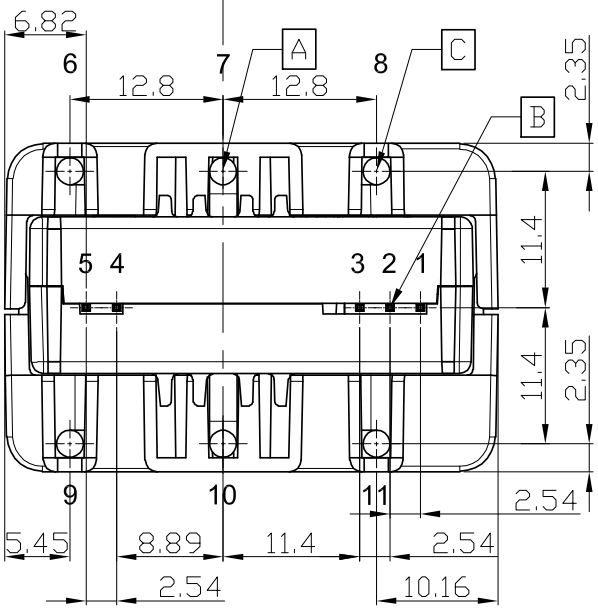
	d_{CI}	d_{Cp}
C-B	9.9mm	---
A-C	3.7mm	8.5mm
C-D	11.6mm	15.7mm

D is secondary inside the transducer

On the customer's PCBA		
	d_{CI}	d_{Cp}
C-B	8.3mm	8.3mm
A-C	3.7mm	8.5mm



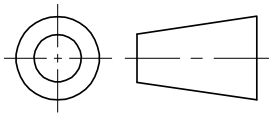




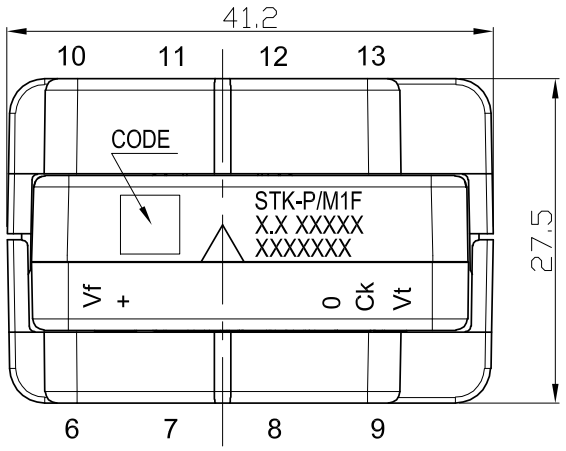
Terminals

1	Vout	6	Ip+	9	Ip-
2	CHK	7	Ip+	10	Ip-
3	GND	8	Ip+	11	Ip-
4	Vcc				
5	Vref				

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



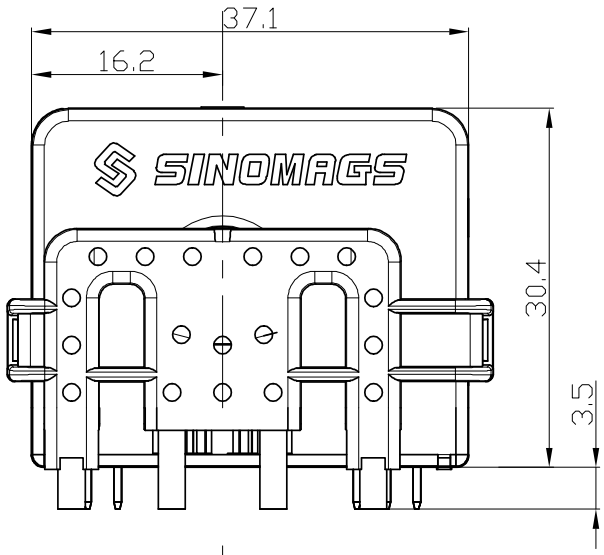
11. STK-x.xP/M1F-x Dimensions (in mm)

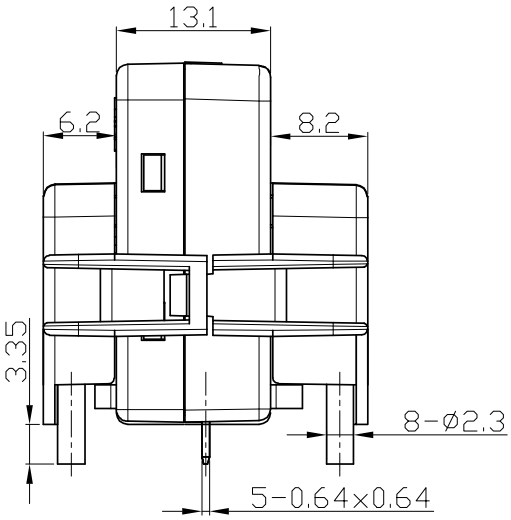


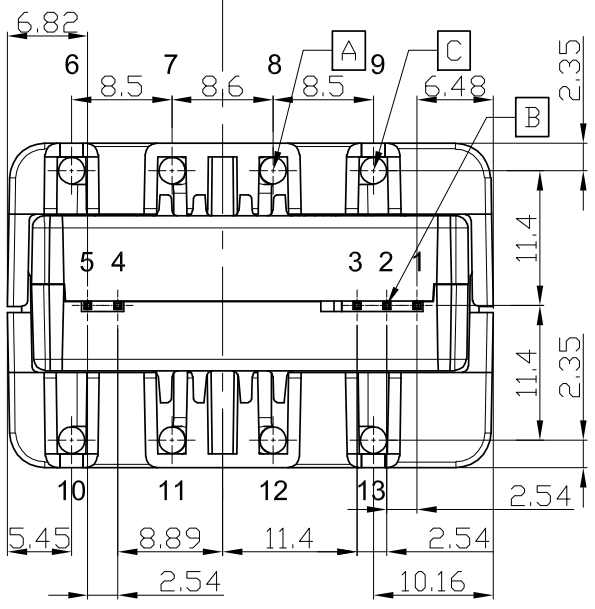
	d_{CI}	d_{Cp}
C-B	9.9mm	---
A-C	4.5mm	6mm
C-D	11.6mm	16.0mm

D is secondary inside the transducer

On the customer's PCBA		
	d_{CI}	d_{Cp}
C-B	8.3mm	8.3mm
A-C	4.3mm	4.3mm



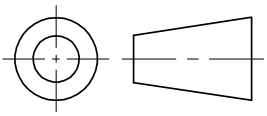




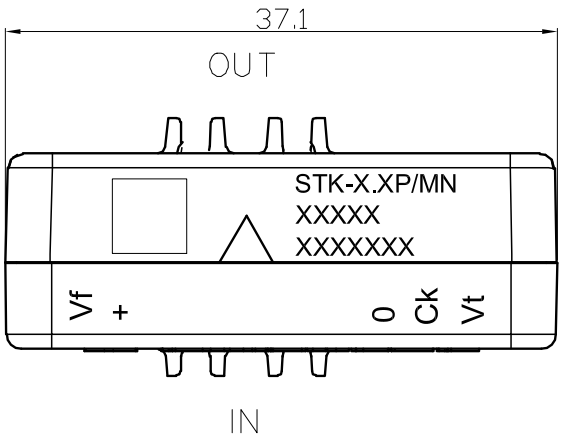
Terminals

1	Vout	6	Ip+	10	Ip-
2	CHK	7	Ip+	11	Ip-
3	GND	8	Ip+	12	Ip-
4	Vcc	9	Ip+	13	Ip-
5	Vref				

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

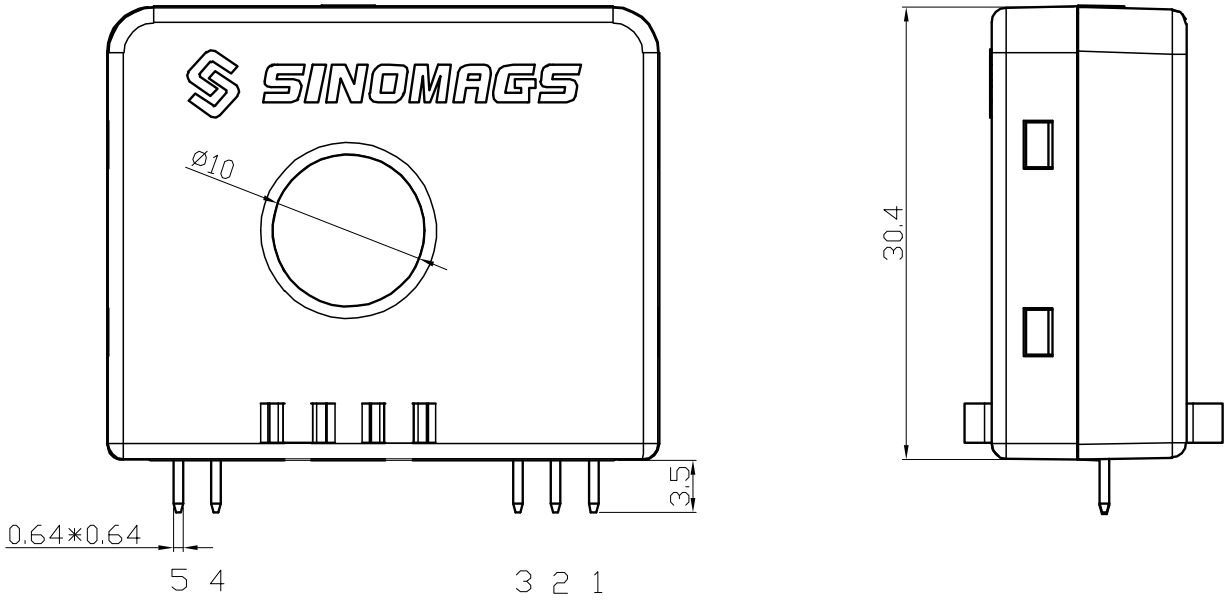


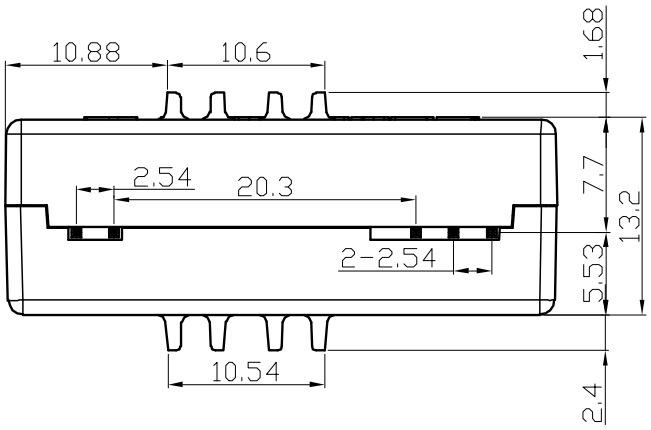
12. STK-x.xP/MN-x Dimensions (in mm)



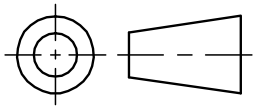
Terminals

1	Vout
2	CHK
3	GND
4	Vcc
5	Vref

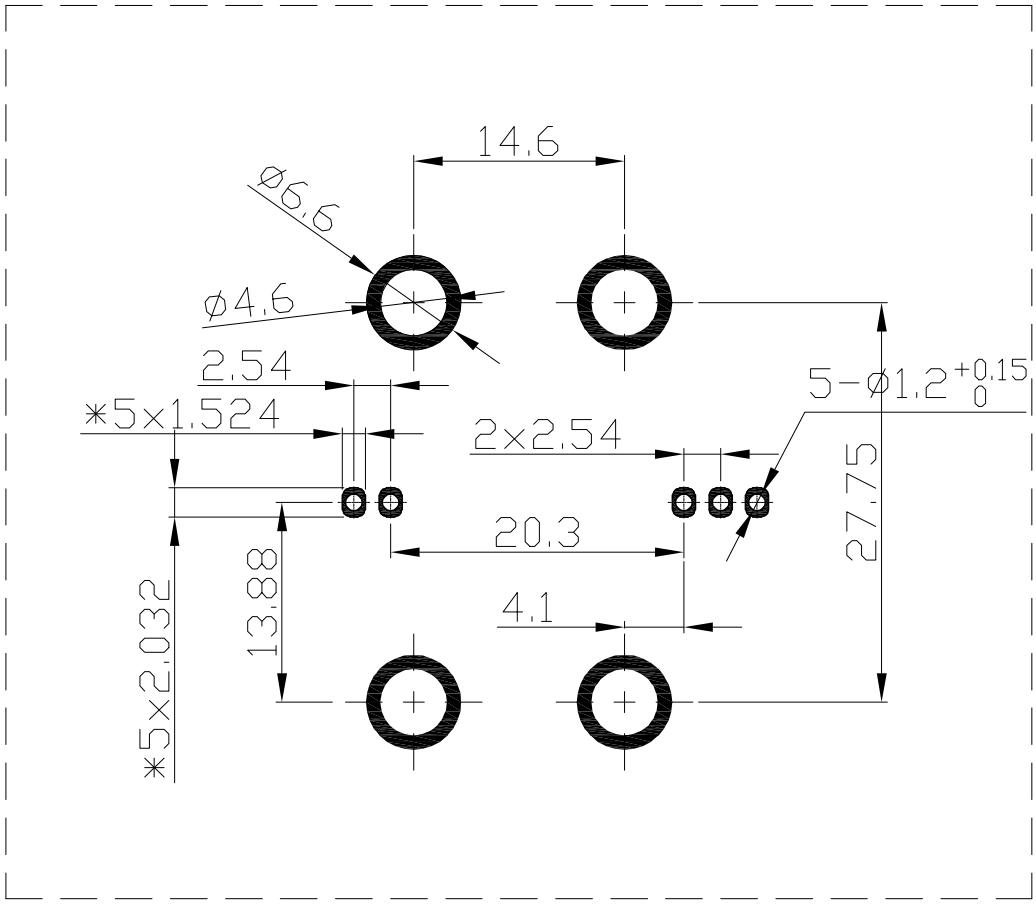




Material : Fit UL94V-0 & RoHS requirements ;
General tolerance : ±0.5
Unit :mm

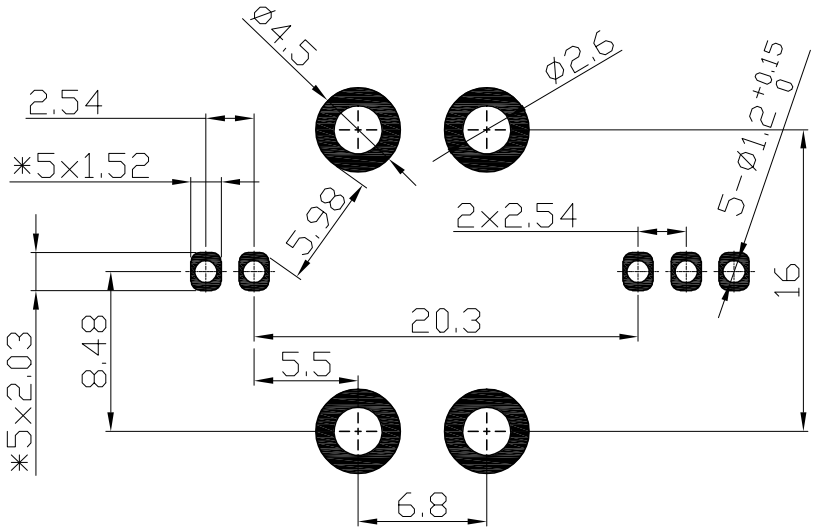


13. STK-x.xP/M1-x Assembly on PCB



- Maximum PCB thickness 2.4 mm
- Wave-soldering：260°C @ 10 s
- Recommended PCB hole diameter 1.2 mm for secondary pin.

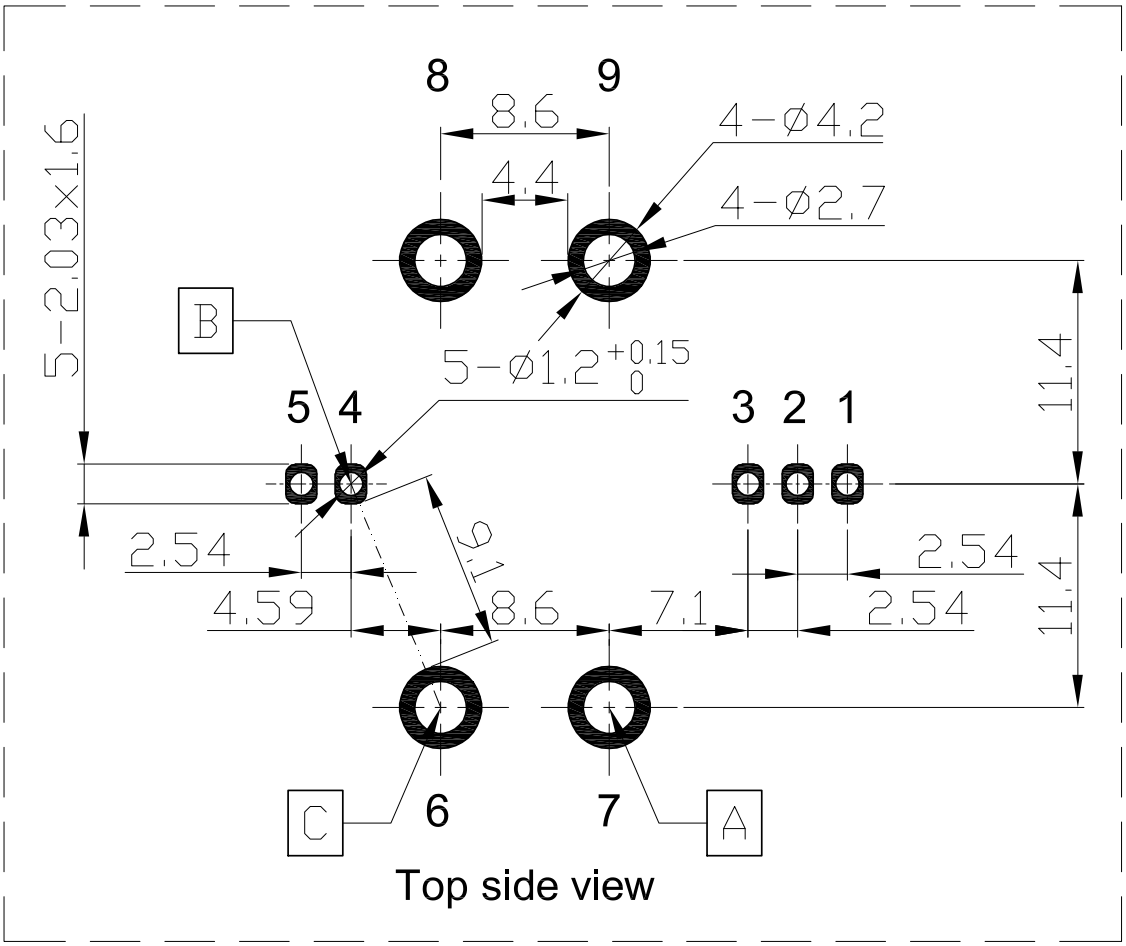
14. STK-x.xP/M1S-x Assembly on PCB



Top side view

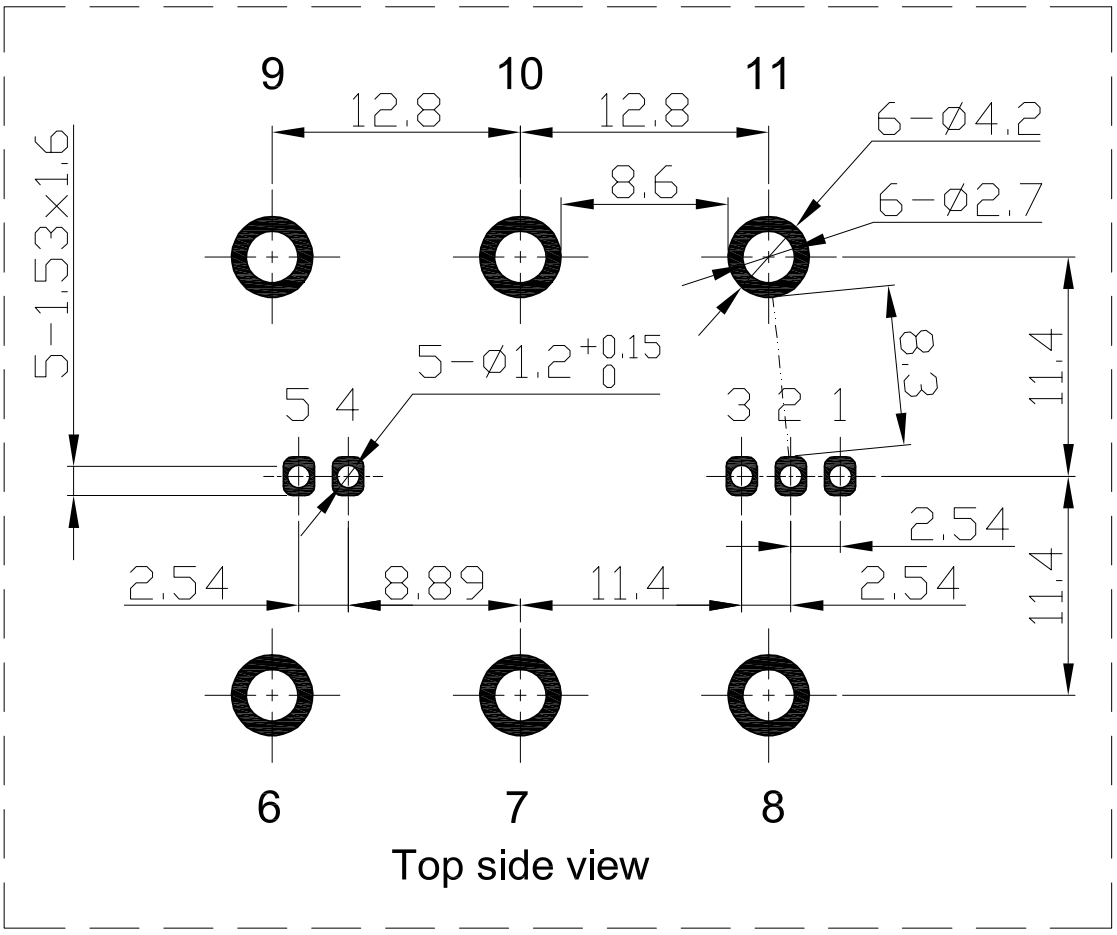
- Maximum PCB thickness 2.4 mm
- Wave-soldering：260°C @ 10 s
- Recommended PCB hole diameter 1.2 mm for secondary pin.

15. STK-x.xP/M1A-x Assembly on PCB



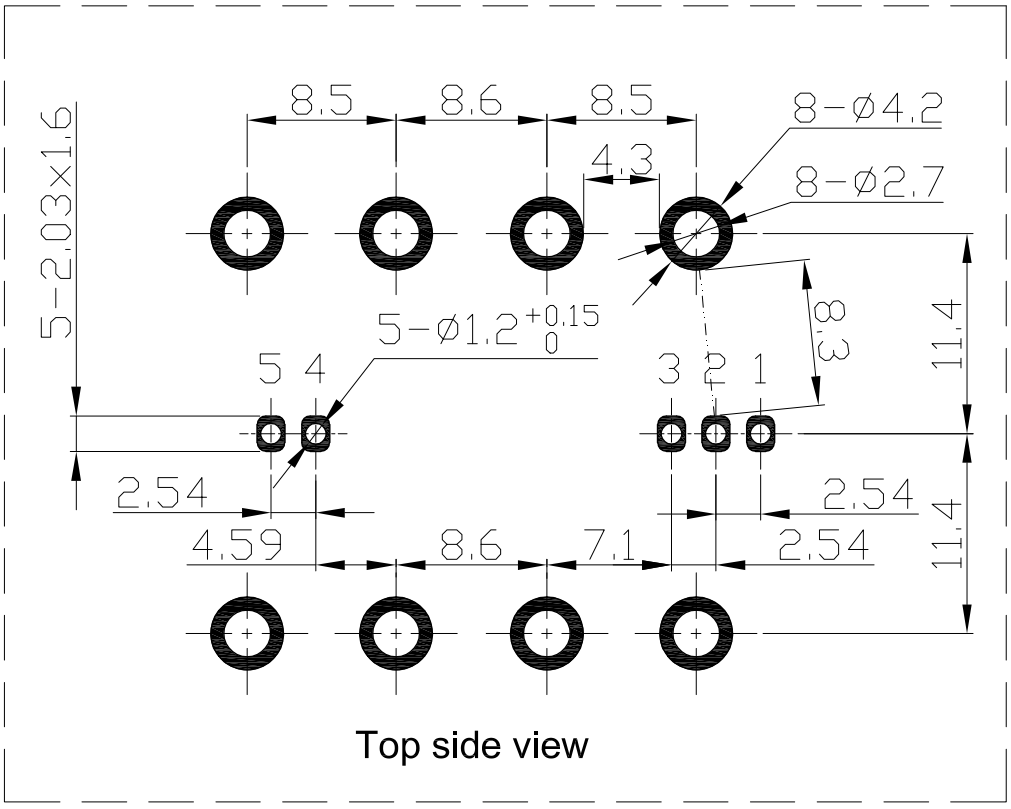
- Maximum PCB thickness 2.4 mm
- Wave-soldering：260°C @ 10 s
- Recommended PCB hole diameter 1.2 mm for secondary pin.

16. STK-x.xP/M1T-x Assembly on PCB



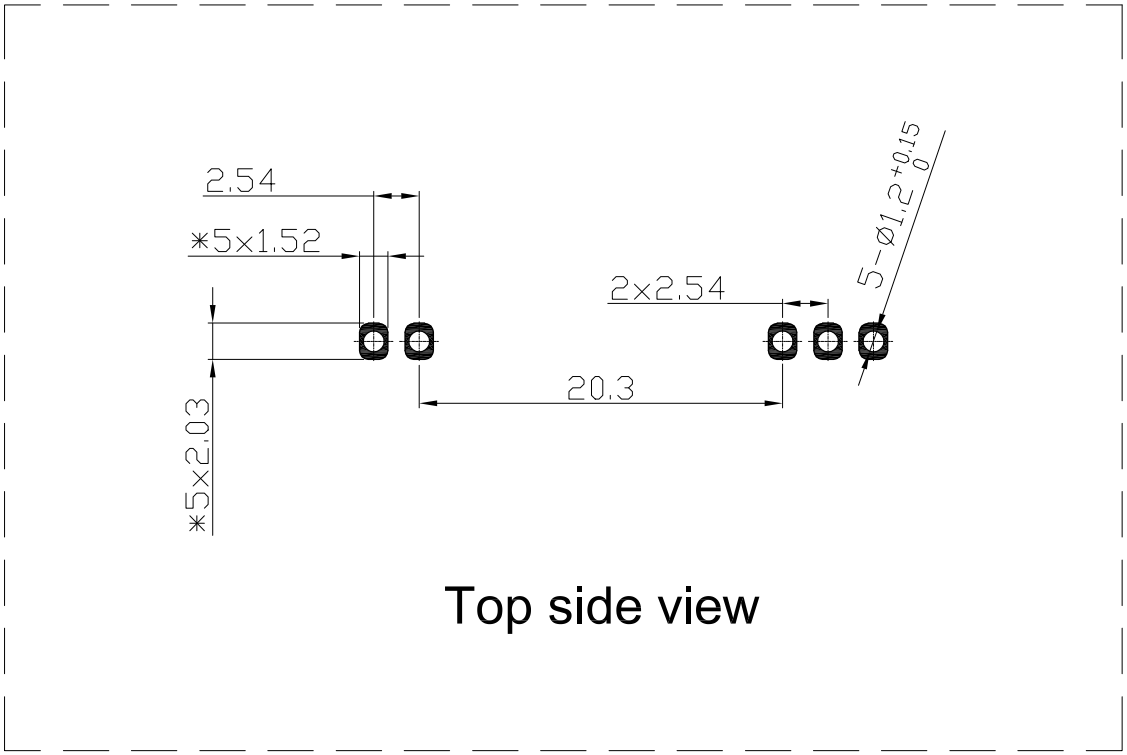
- Maximum PCB thickness 2.4 mm
- Wave-soldering：260°C @ 10 s
- Recommended PCB hole diameter 1.2 mm for secondary pin.

17. STK-x.xP/M1F-x Assembly on PCB



- Maximum PCB thickness 2.4 mm
- Wave-soldering：260°C @ 10 s
- Recommended PCB hole diameter 1.2 mm for secondary pin.

18. STK-x.xP/MN-x Assembly on PCB



- Maximum PCB thickness 2.4 mm
- Wave-soldering：260°C @ 10 s
- Recommended PCB hole diameter 1.2 mm for secondary pin.