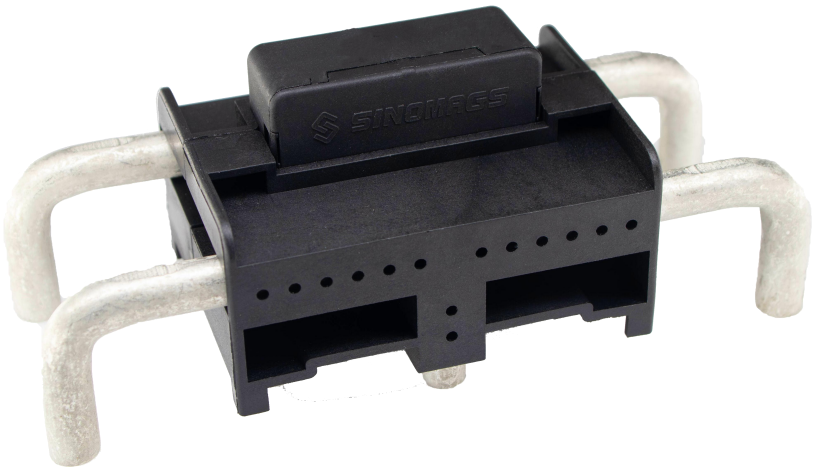
CURRENT SENSOR

PRODUCT SERIES： SFG-X.XP/P3

PRODUCT PART NUMBER： SFG-3.0P/P3,
SFG-5.0P/P3

Version： Ver 2.8



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CONTENT

1. Description

Features

- Closed loop (compensated) current transducer
- Voltage output
- Insulation voltage for 5 kVAC
- Single supply voltage
- PCB mounting.

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 PV inverters
- First human contact protection of PV arrays
- Failure detection in power sources
- Leakage current detection in stacked DC sources
- Communication power.

2. Absolute parameter: SFG-X.XP/P3

Absolute maximum ratings

Parameter	Symbol	Unit	Value
Maximum Supply voltage	Vc_{max}	V	7
Maximum Primary conductor temperature	$T_{B\ max}$	℃	110
Maximum overload capability (100 μs, 500 A/μs)	$\hat{I}_{P\ max}$	A	3300
Maximum Voltage between test winding and secondary pins	$V_{d\ max}$	V	35
Maximum Current of test winding	$I_{T\ max}$	mA	300

Ratings

Parameter	Symbol	Unit	Value
Primary involved potential		V AC/DC	1000
Primary current @ T_{Amax}=105℃	I_P	A	220
Primary current @ T_{Amax}=85℃	I_P	A	300
Secondary supply voltage	U_C	V DC	5
Output voltage	V_{out}	V	0 to 5

Isolation parameters

Parameter	Symbol	Unit	Value	Remark
RMS voltage for AC	V_d	kV	4	test 50 Hz/1 min
Impulse withstand voltage	V_w	kV	10.1	1.2/50μs
Clearance distance (pri. –pri.)	d_{Cl}	mm	11	Shortest distance through air
Creepage distance (pri. – pri.)	d_{Cp}	mm	11	Shortest path along device body
Clearance distance (pri. –sec.)	d_{Cl}	mm	12.1	When mounted on PCB with recommended layout
Creepage distance (pri. –sec.)	d_{Cp}	mm	12.1	When mounted on PCB with recommended layout
Comparative tracking index	CTI	V	600	
Application example		V	600 CAT III, PD2	Reinforced insulation, non uniform field
Application example		V	1500 CAT III, PD2	Basic insulation, non uniform field

Environmental and mechanical characteristics

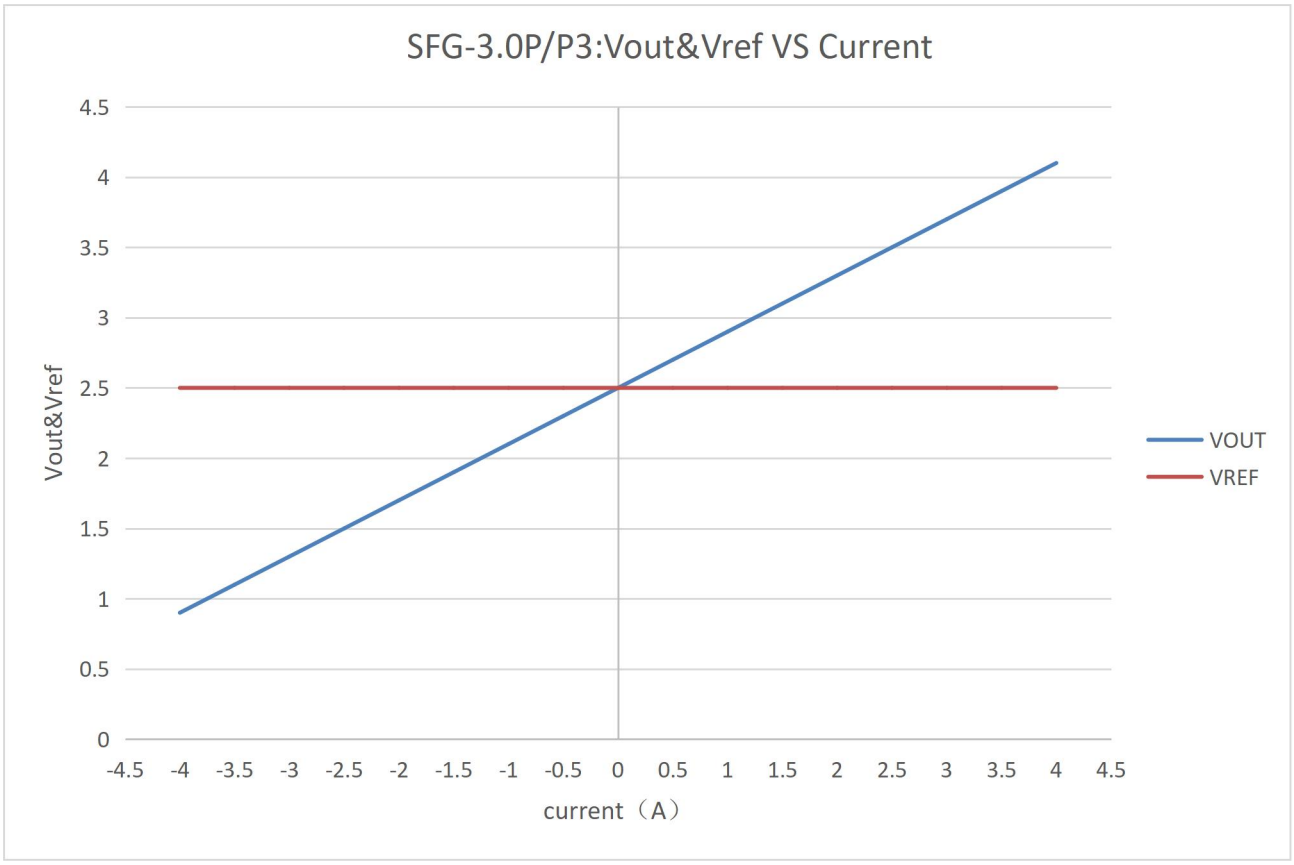
Parameter	Symbol	Unit	Min	Typ	Max	Comment
Ambient operating temperature	T_A	℃	-40		105	
Ambient storage temperature	T_S	℃	-40		105	
Mass	m	g		300		
standard	EN 50178, IEC 61010, UL 508					

3. Electrical data: SFG-3.0P/P3

At T_A = 25 ℃, V_C = 5 V.

Parameters	Symbol	Unit	Min	Typ	Max	Remark
Primary nominal residual rms current	I_{PN}	A		3		
Primary residual current, measuring range	I_{PM}	A	-5		5	
Supply voltage	V_C	V	4.75	5	5.5	
Current consumption	I_C	mA		17.5	21.6	I_P(mA) / Na N_a = 1000 turns - 40°C …105°C
Reference voltage @ I_P = 0	V_{ref}	V	2.495	2.5	2.505	Internal reference
External reference voltage	V_{REF}	V	2.3		4	Internal reference of V_{ref} input = 499 Ω
Electrical offset current referred to primary	I_{OE}	mA	-24	7	24	
Electrical offset voltage	V_{oe}	mV	-25		25	(V_{out} – V_{ref}) @ 0 A
Temperature coefficient of VOE @ I_P = 0	TCV_{OE}	ppm/K			570	ppm/K of 2.5 V −40 … 105 °C
Theoretical sensitivity	Gth	V/A		0.4		
Sensitivity error	ε_G	%	-1.6	0.5	1.6	R_L > 500 kΩ
Temperature coefficient of G	TCG	ppm/K		±400		- 40°C …105°C
Linearity error	ε_L	%		0.5	1	
Number of turns (test winding)	N_T			20		R_L > 500 kΩ, di/dt > 5 A/μs
Reaction time @ 10 % of I_{PRN}	t_{ra}	μs		5		R_L > 500 kΩ, di/dt > 5 A/μs
Step response time to 90 % of I_{PN}	t_r	μs		40		R_L > 500 kΩ
Frequency bandwidth (−3dB)	BW	kHz		15		R_L > 500 kΩ
Noise(1 Hz ~ 10 kHz)	V_{no}	mV rms		10		
Accuracy@ I_{PN} @TA = 25℃	$X_{25℃}$	% of I_{PN}		±1.9		
Accuracy@ I_{PN} @TA = 105℃	$X_{105℃}$	% of I_{PN}		±3.2		

4. Output voltage VS primary current of SFG-3.0P/P3

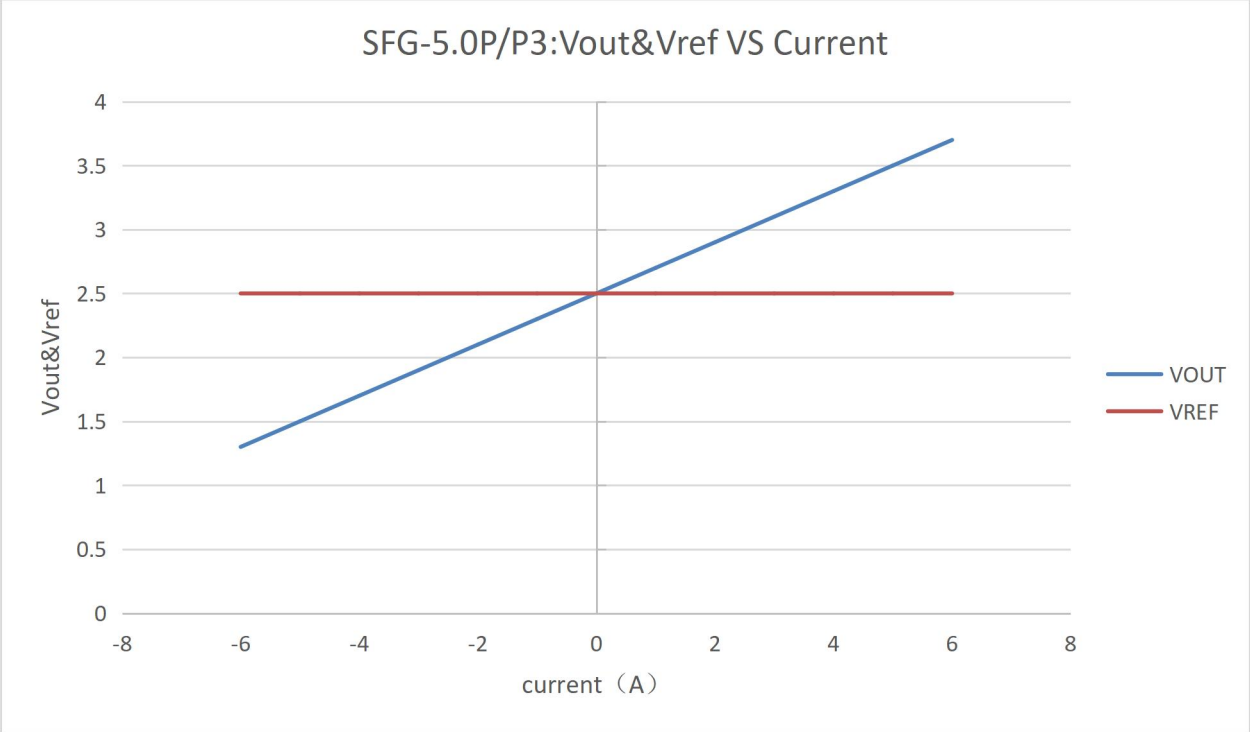


5. Electrical data: SFG-5.0P/P3

At T_A = 25 ℃, V_C = 5 V.

Parameters	Symbol	Unit	Min	Typ	Max	Remark
Primary nominal residual rms current	I_{PN}	A		5		
Primary residual current, measuring range	I_{PM}	A	-8		8	
Supply voltage	V_C	V	4.75	5	5.5	
Current consumption	I_C	mA		17.5	21.6	I_P(mA) / Na N_a = 1000 turns - 40°C …105°C
Reference voltage @ I_P = 0	V_{ref}	V	2.495	2.5	2.505	Internal reference
External reference voltage	V_{REF}	V	2.3		4	Internal reference of V_{ref} input = 499 Ω
Electrical offset current referred to primary	I_{OE}	mA	-35	12	35	
Electrical offset voltage	V_{oe}	mV	-25		25	(V_{out} – V_{ref}) @ 0 A
Temperature coefficient of VOE @ I_P = 0	TCV_{OE}	ppm/K			570	ppm/K of 2.5 V −40 … 105 °C
Theoretical sensitivity	Gth	V/A		0.2		
Sensitivity error	ε_G	%	-1.6	0.5	1.6	R_L > 500 kΩ
Temperature coefficient of G	TCG	ppm/K		±400		- 40°C …105°C
Linearity error	ε_L	%		0.5	1	
Number of turns (test winding)	N_T			20		R_L > 500 kΩ, di/dt > 5 A/μs
Reaction time @ 10 % of I_{PRN}	t_{ra}	μs		5		R_L > 500 kΩ, di/dt > 5 A/μs
Step response time to 90 % of I_{PN}	t_r	μs		40		R_L > 500 kΩ
Frequency bandwidth (−3dB)	BW	kHz		15		R_L > 500 kΩ
Noise(1 Hz ~ 10 kHz)	V_{no}	mV rms		10		
Accuracy@ I_{PN} @TA = 25℃	$X_{25℃}$	% of I_{PN}		±1.9		
Accuracy@ I_{PN} @TA = 105℃	$X_{105℃}$	% of I_{PN}		±3.2		

6. Output voltage VS primary current of SFG-5.0P/P3



7. Frequency band width

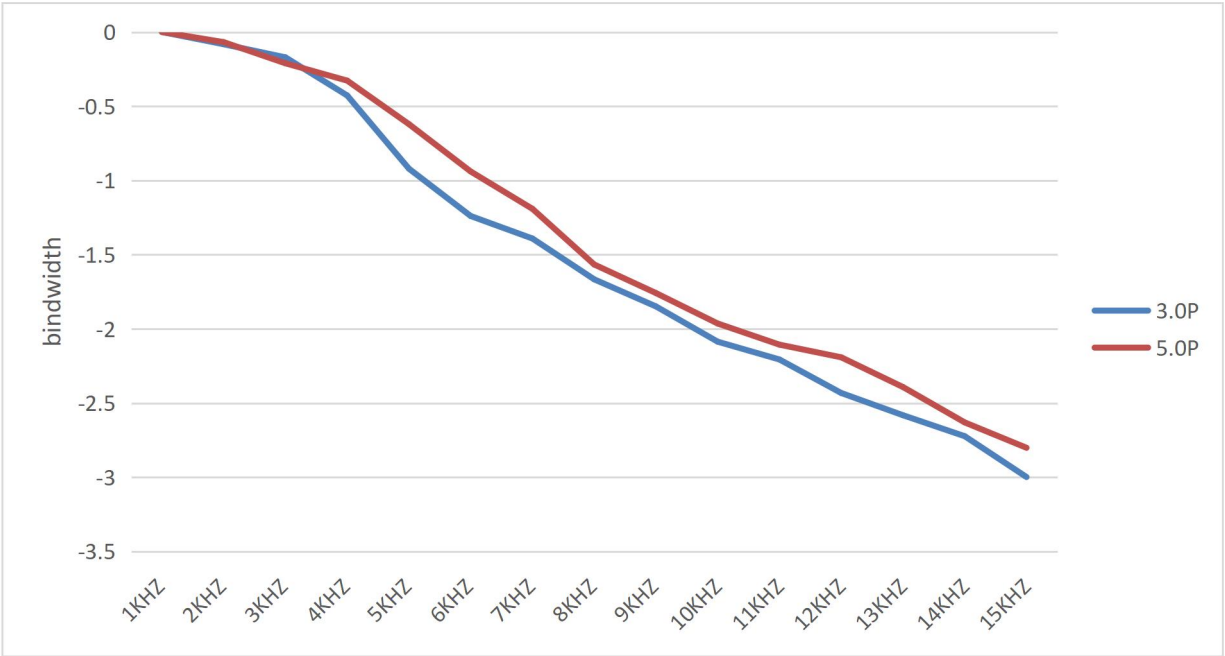


Fig.1 the frequency band width of SFG-3.0P/P3&SFG-5.0P/P3 series current sensors.

8. Step response time

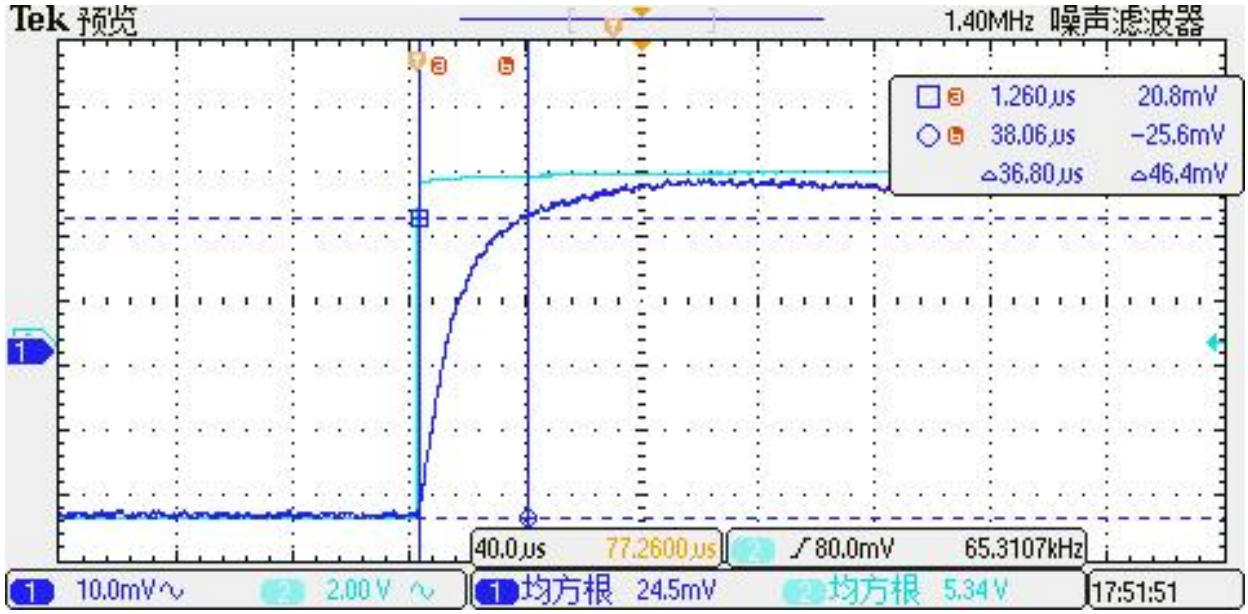


Fig.2 is the step response time of SFG-3.0P/P3 current sensors. The light blue is primary current, while the dark blue is output signal of current sensor. The step response time is less than 40μs.

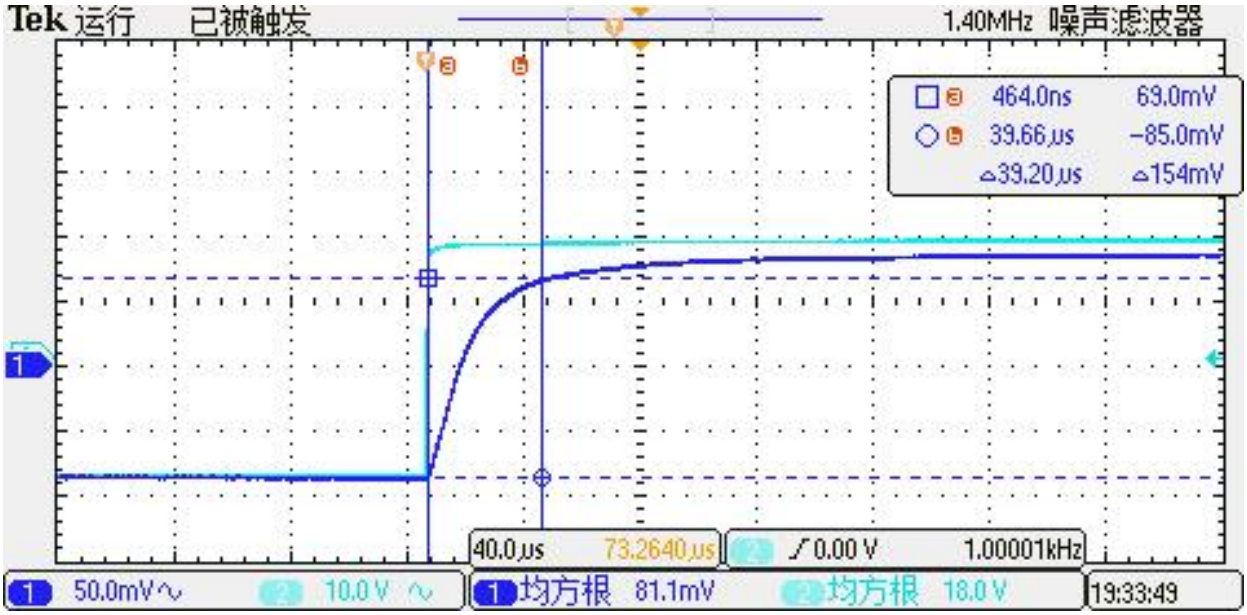
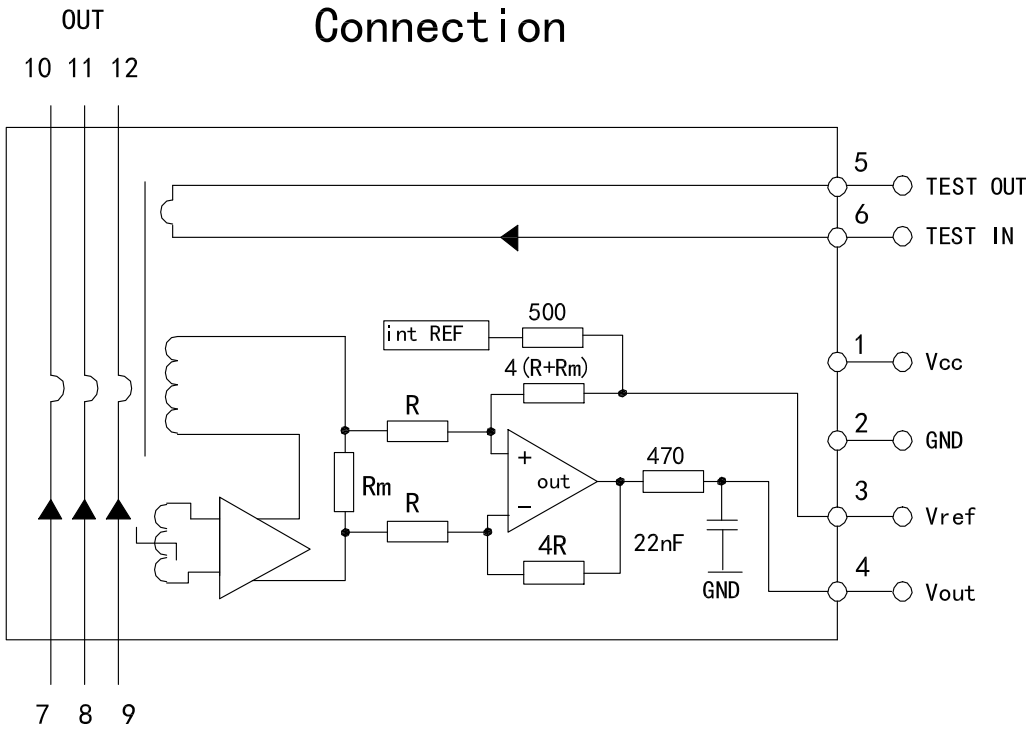


Fig3 is the step response time of SFG-5.0P/P3 current sensors. The light blue is primary current, while the dark blue is output signal of current sensor. The step response time is less than 40μs.

9. SFG- P/P3 Application information

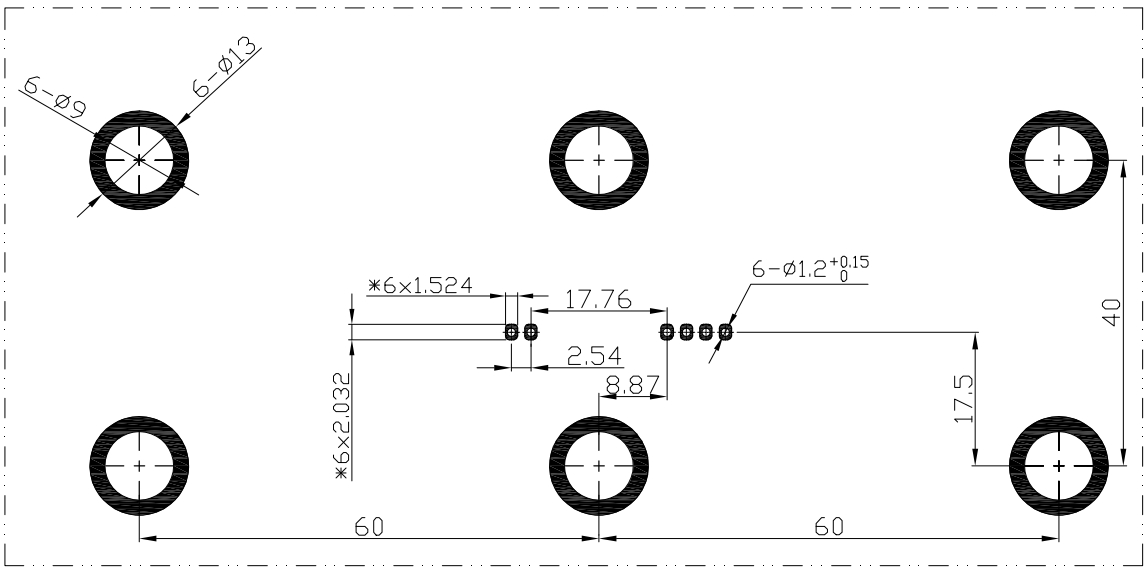


Test winding

A test winding is wound around the compensation winding. It allows simulating a primary residual current to test the function of the transducer. The output voltage V_{out} referred to V_{ref} for a test current IT is below.

$V_{out} - V_{ref} = G_{th} * I_T$ (test current) * 20

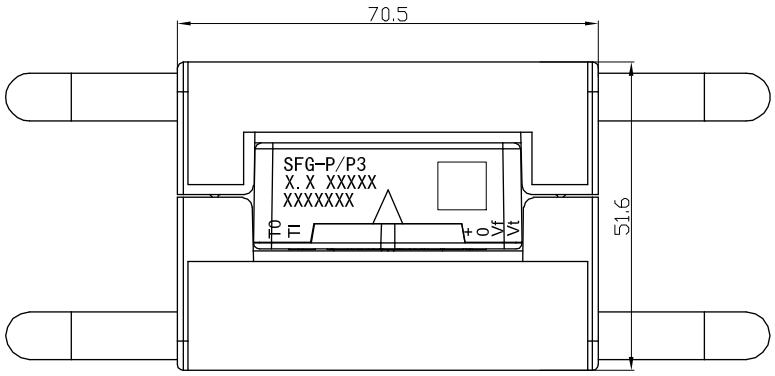
10. SFG- P/P3 PCB footprint



Assembly on PCB

- No Primary in shadow area
- Maximum PCB thickness 2.4 mm
- Wave-soldering：260°C @ 10 s
- Recommended PCB hole diameter 1.2 mm for secondary pin.

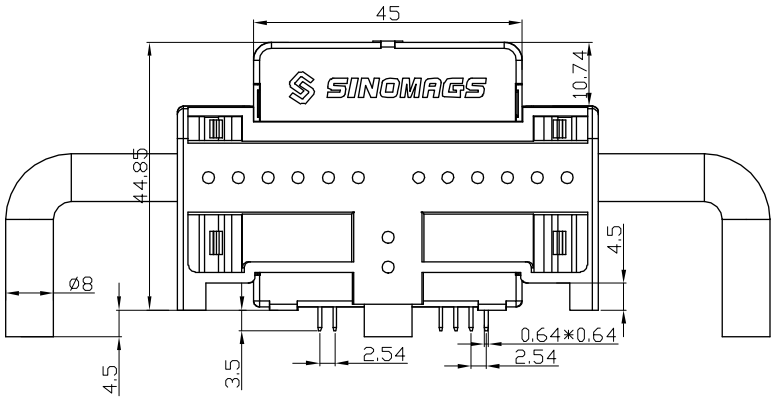
11. SFG- P/P3 Dimensions

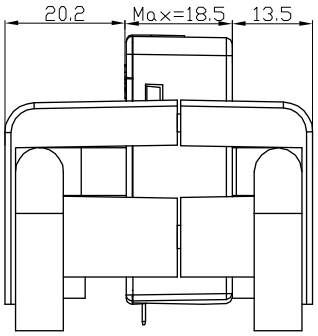


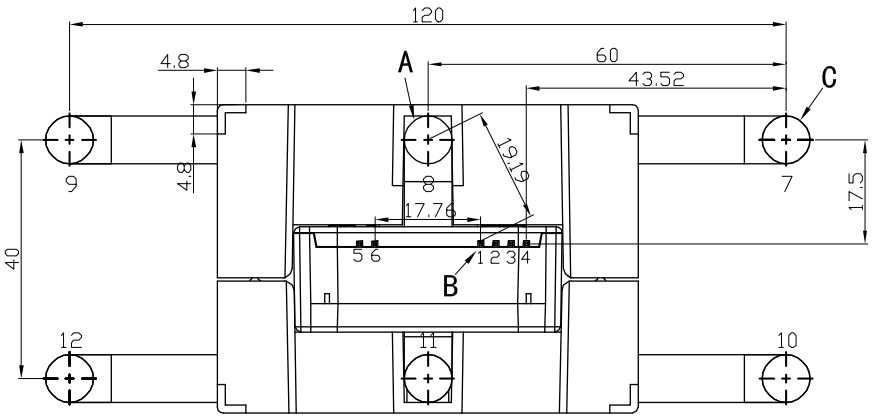
	D_{CI}	D_{CP}
A-B	15.1	--
A-C	11	12
A-D	15	15

D is secondary inside the transducer

On the customer's PCBA		
	D_{CI}	D_{CP}
A-B	12.1	12.1
A-C	11	47







Terminals:

1	Vcc	7	Ip+
2	GND	8	Ip+
3	Vref	9	Ip+
4	Vout	10	Ip-
5	Test Out	11	Ip-
6	Test In	12	Ip-

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