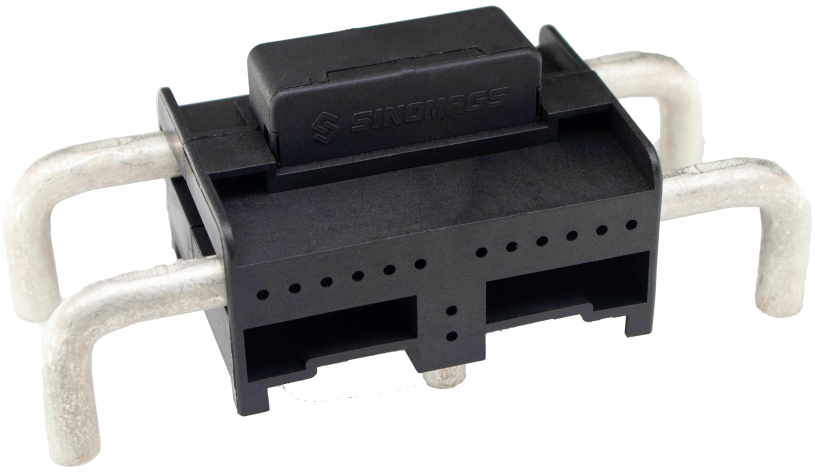
SINOMAGS
希 磁 科 技

CURRENT SENSOR

PRODUCT SERIES： SFG-X.XP/P3

PRODUCT PART NUMBER： SFG-1.5P/P3,
SFG-3.0P/P3,
SFG-5.0P/P3

Version： Ver 2.9



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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

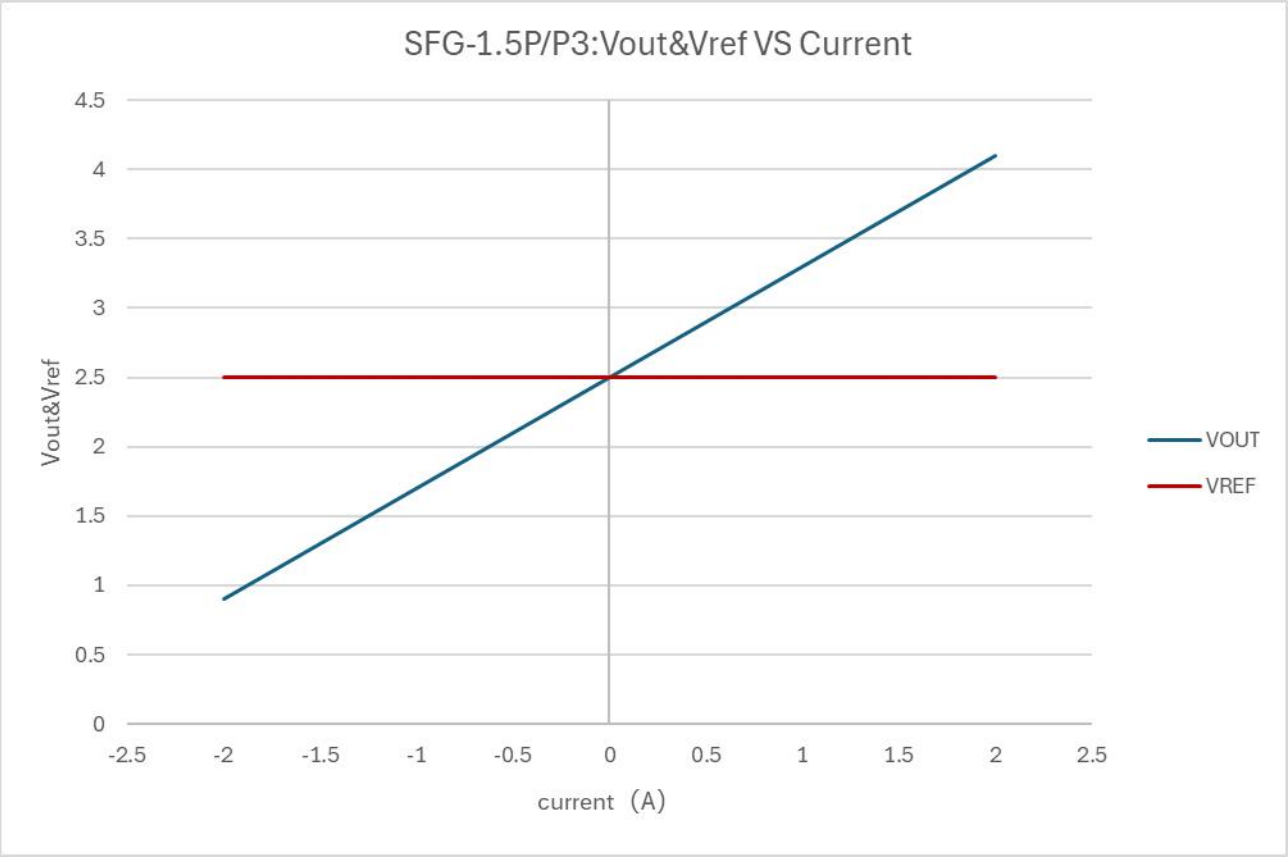
Parameter	Symbol	Unit	Min	Typ	Max	Comment
Ambient operating temperature	T_A	℃	-40		105	
Ambient storage temperature	T_S	℃	-40		105	
Mass	m	g		300		
standard	EN 50178, IEC 61010, UL 508					

3. Electrical data: SFG-1.5P/P3

At T_A = 25 ℃, V_C = 5 V.

Parameters	Symbol	Unit	Min	Typ	Max	Remark
Primary nominal residual rms current	I_{PN}	A		1.5		
Primary residual current, measuring range	I_{PM}	A	-2.5		2.5	
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	-12	3.5	12	
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		0.8		
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-1.5P/P3

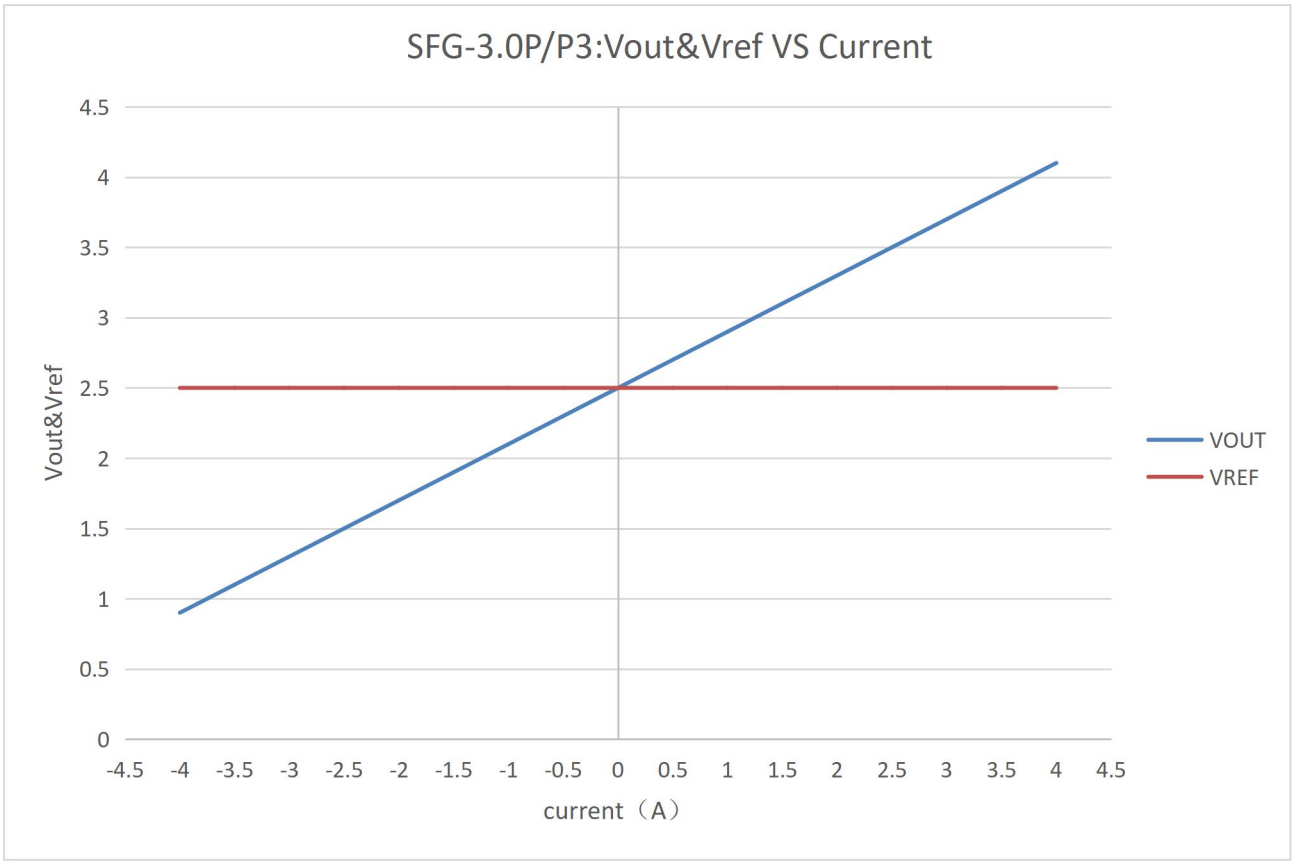


5. Electrical data: SFG-3.0P/P3

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		

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

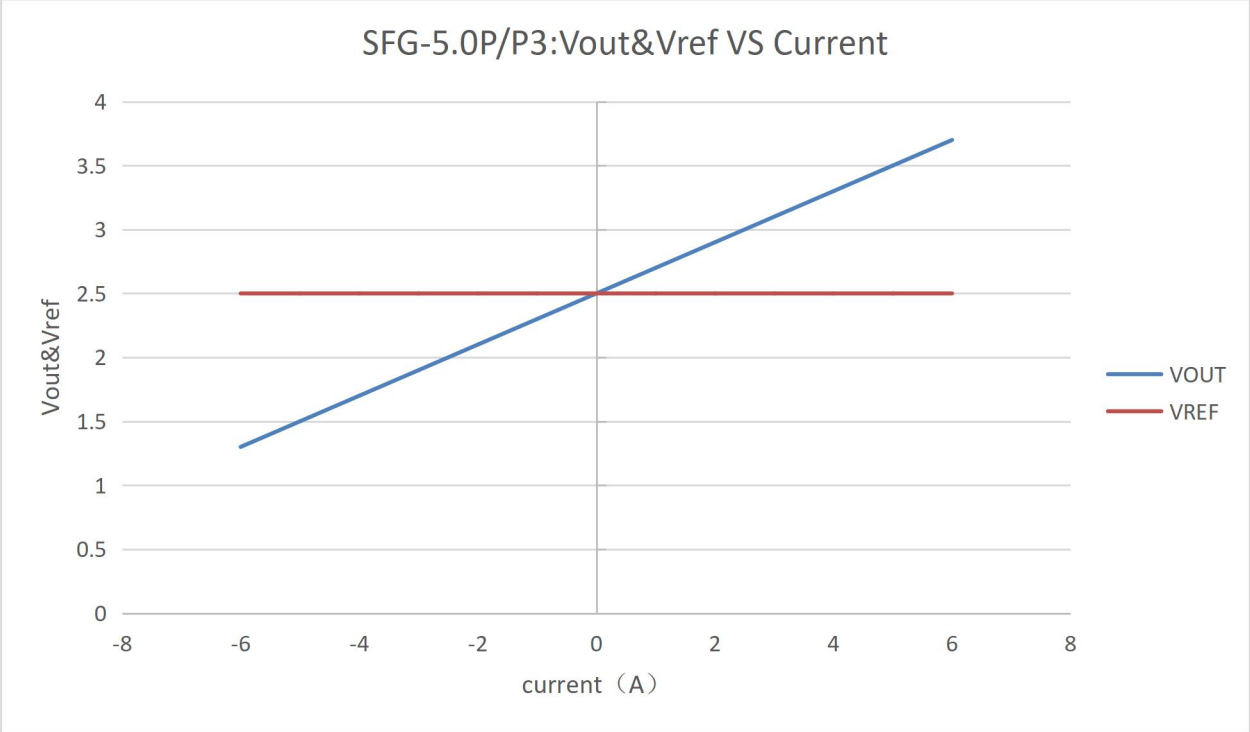


7. Electrical data: SFG-5.0P/P3

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		

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



9. Frequency band width

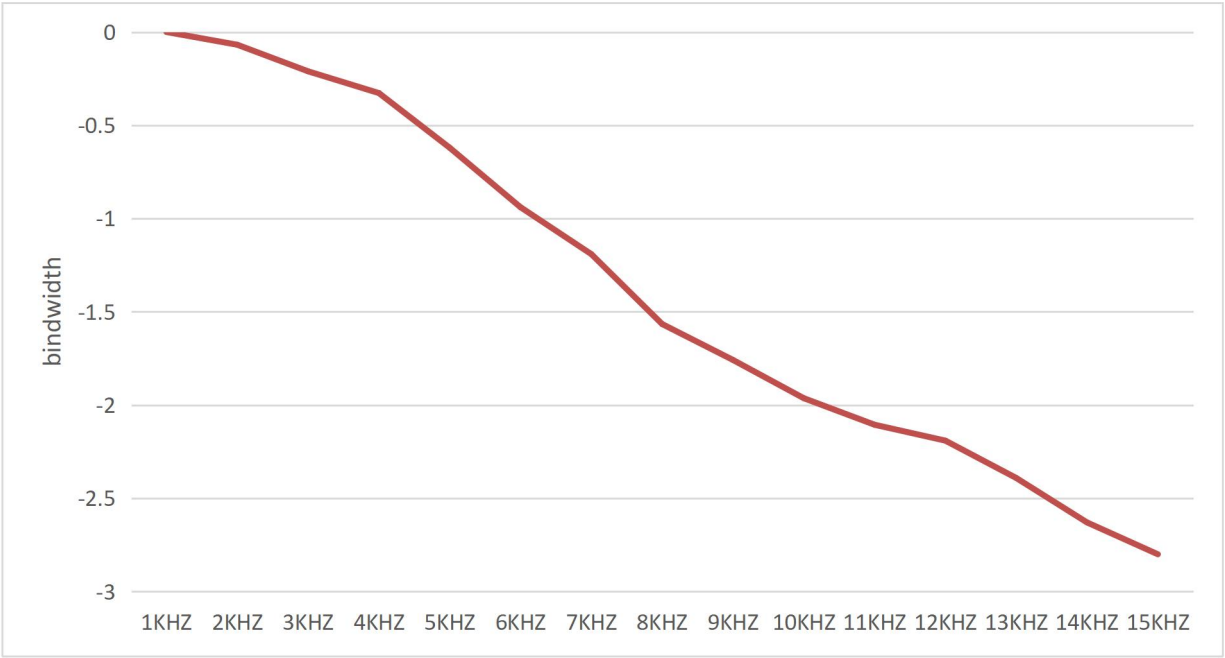


Fig.1 the frequency band width of SFG-X.XP/P3 series current sensors.

10. Step response time

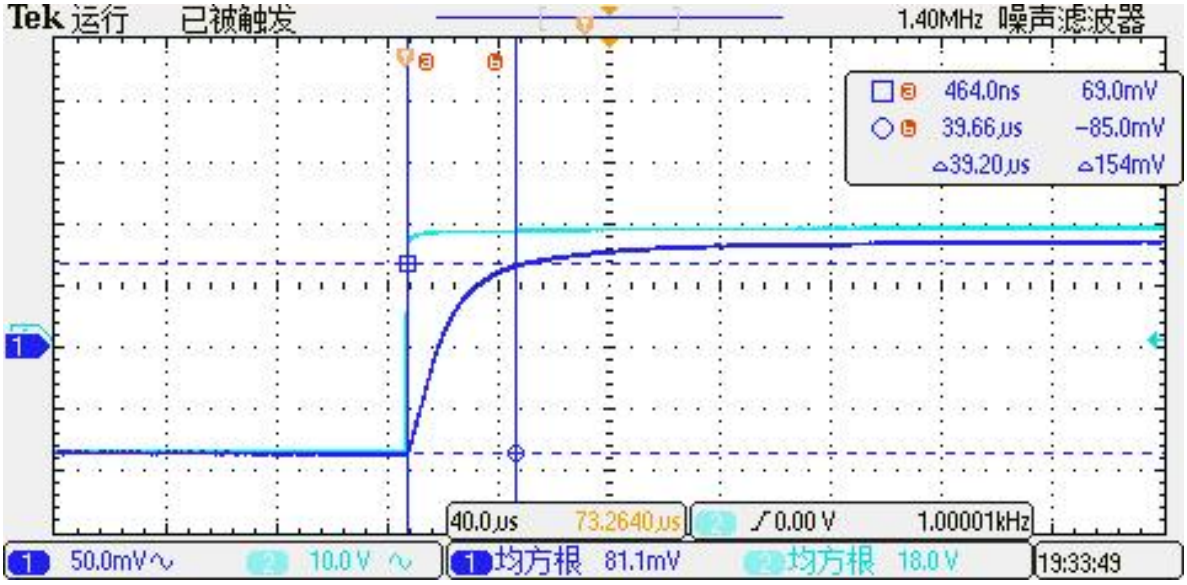
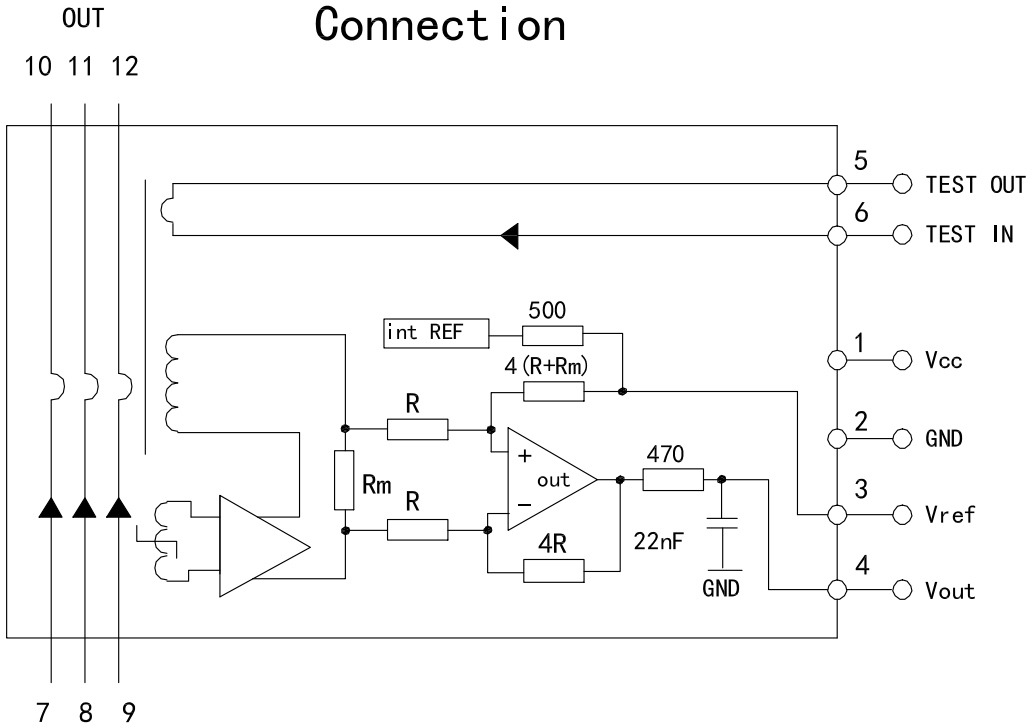


Fig1 is the step response time of SFG-P/P3 current sensors. The light blue is primary current, while the dark blue is output signal of current sensor. The step response time is less than 40µs.

11. SFG- P/P3 Application information

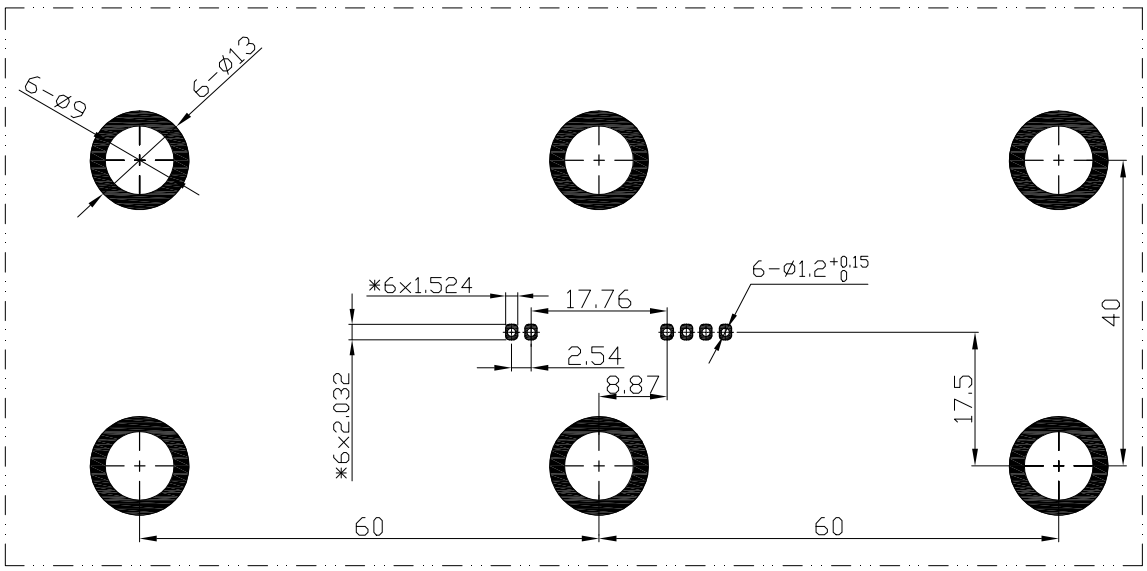


Test winding

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.

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

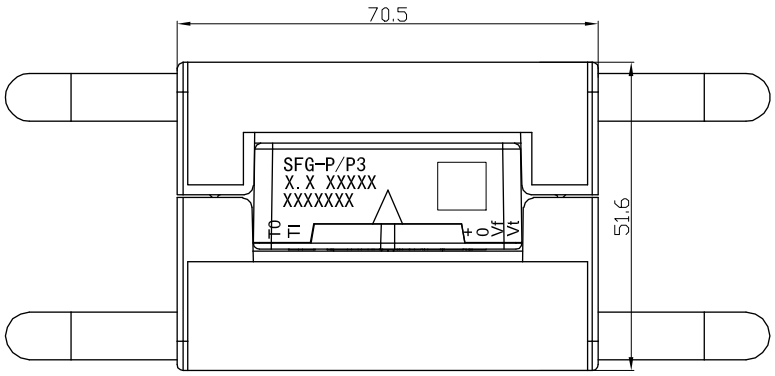
12. SFG- P/P3 PCB footprint



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.

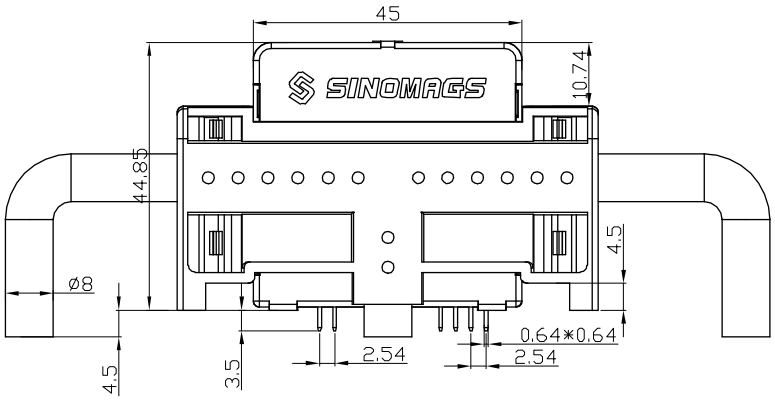
13. SFG- P/P3 Dimensions

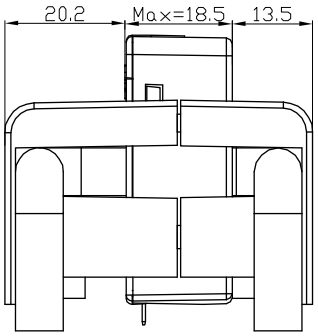


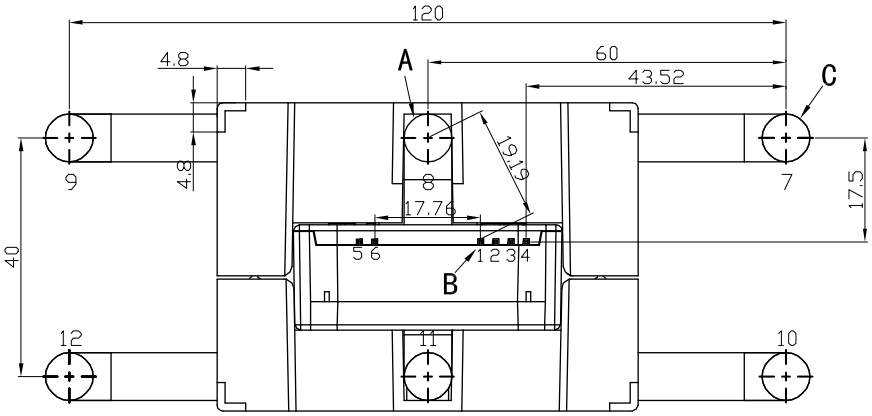
	D_{CI}	D_{CP}
A-B	15.1	--
A-C	11	12
A-D	15	15

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