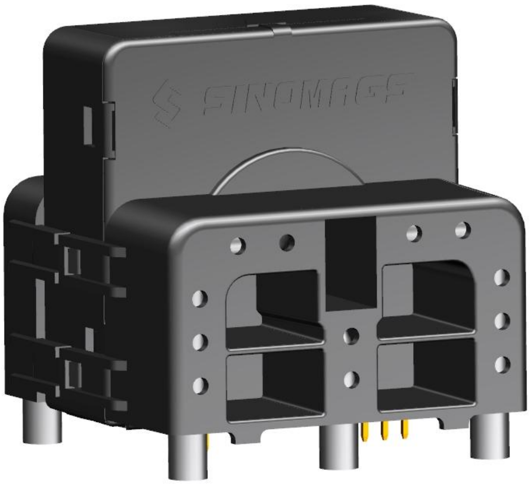
希磁科技

CURRENT SENSOR

PRODUCT SERIES：	SFG-P
PRODUCT PART NUMBER：	SFG-0.3P/P6, SFG-0.6P/P6, SFG-1.0P/P6 SFG-1.5P/P6, SFG-2.0P/P6, SFG-3.0P/P6 SFG-5.0P/P6
Version：	Ver 1.0



Sinomags Technology Co., Ltd

Web site: www.sinomags.com

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.
- Single phase or three phase nominal current (AC or DC)

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2. Absolute parameter: SFG-P/P6

Absolute maximum ratings

Parameter	Symbol	Unit	Value
Maximum Supply voltage	$V_{C\ max}$	V	7
Maximum Primary conductor temperature	$T_{B\ max}$	℃	110
Maximum overload capability (100 μs, 500 A/μs)	$\hat{I}_{P\ max}$	A	3300

Ratings

Parameter	Symbol	Unit	Value
Primary involved potential		V AC/DC	1000
Max surrounding air temperature	T_A	℃	105
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 test 50Hz/1 min	V_d	kV	4	
Impulse withstand voltage 1.2/50μs	V_w	kV	10.1	
Clearance distance (pri. –pri.)	d_{CI}	mm	11.4	Shortest distance through air
Creepage distance (pri. – pri.)	d_{Cp}	mm	15.8	Shortest path along device body
Clearance distance (pri. –sec.)	d_{CI}	mm	10.6	Shortest distance through air
Creepage distance (pri. –sec.)	d_{Cp}	mm	13.3	Shortest path along device body
Comparative tracking index	CTI	V	600	
Application example	-	V	600 CAT III, PD2	Reinforced insulation, non uniform field
Application example	-	V	1000 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		80		
standard	EN 50178, IEC 61010, UL 508					

3. Electrical data: SFG-0.3P/P6

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	4.75	5	5.25	
Current consumption	I_C	mA		17.5	21.6	I_P(mA) / Na N_a = 1000 turns - 40°C …105°C
Output voltage referred to V_{ref} (Test current)	V_{out}	V	0.7	1.2	1.7	
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	
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		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	
Reaction time @ 10 % of I_{PRN}	t_{ra}	μs		7		R_L > 500 kΩ, di/dt > 5 A/μs
Step response time to 90 % of I_{PN}	t_r	μs		50		R_L > 500 kΩ, di/dt > 5 A/μs
Frequency bandwidth (−3dB)	BW	kHz		15		R_L > 500 kΩ
Noise(1 Hz ~ 10 kHz)	V_{no}	mV rms		10		R_L > 500 kΩ
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. Electrical data: SFG-0.6P/P6

At T_A = 25 ℃, V_C = 5 V.

Parameters	Symbol	Unit	Min	Typ	Max	Remark
Primary nominal residual rms current	I_{PN}	A		0.6		
Primary residual current, measuring range	I_{PM}	A	-0.85		0.85	
Supply voltage	V_C	V	4.75	5	5.25	
Current consumption	I_C	mA		17.5	21.6	I_P(mA) / Na N_a = 1000 turns - 40°C …105°C
Output voltage referred to V_{ref} (Test current)	V_{out}	V	0.4	0.75	1.1	
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	4.2	24	
Temperature coefficient of VOE @ I_P = 0	TCV_{OE}	ppm/K			±520	ppm/K of 2.5 V −40 … 105 °C
Theoretical sensitivity	Gth	V/A		2.476		
Sensitivity error	ε_G	%	-0.7	0.5	0.7	R_L > 500 kΩ
Temperature coefficient of G	TCG	ppm/K			±100	- 40°C …105°C
Linearity error	ε_L	%		0.4	1.3	
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		30		R_L > 500 kΩ, di/dt > 5 A/μs
Frequency bandwidth (−3dB)	BW	kHz		15		R_L > 500 kΩ
Noise(1 Hz ~ 10 kHz)	V_{no}	mV rms		10		R_L > 500 kΩ
Accuracy@ I_{PN} @TA = 25℃	$X_{25℃}$	% of I_{PN}		±1.9		
Accuracy@ I_{PN} @TA = 105℃	$X_{105℃}$	% of I_{PN}		±3.2		

5. Electrical data: SFG-1.0P/P6

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	4.75	5	5.25	
Current consumption	I_C	mA		17.5	21.6	I_P(mA) / Na N_a = 1000 turns - 40°C …105°C
Output voltage referred to V_{ref} (Test current)	V_{out}	V	0.2	0.35	0.5	
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	
Temperature coefficient of VOE @ I_P = 0	TCV_{OE}	ppm/K		±50	±500	ppm/K of 2.5 V −40 … 105 °C
Theoretical sensitivity	Gth	V/A		1.2		
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	
Reaction time @ 10 % of I_{PRN}	t_{ra}	μs		7		R_L > 500 kΩ, di/dt > 5 A/μs
Step response time to 90 % of I_{PN}	t_r	μs		50		R_L > 500 kΩ, di/dt > 5 A/μs
Frequency bandwidth (−3dB)	BW	kHz		15		R_L > 500 kΩ
Noise(1 Hz ~ 10 kHz)	V_{no}	mV rms		10		R_L > 500 kΩ
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. Electrical data: SFG-1.5P/P6

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		2	
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
Output voltage referred to V_{ref} (Test current)	V_{out}	V	0.12		0.5	
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	-30	4.2	30	
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	
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		50		R_L > 500 kΩ, di/dt > 5 A/µs
Frequency bandwidth (−3dB)	BW	kHz		15		R_L > 500 kΩ
Noise(1 Hz ~ 10 kHz)	V_{no}	mV rms		10		R_L > 500 kΩ
Accuracy@ I_{PN} @TA = 25℃	$X_{25℃}$	% of I_{PN}		±1.9		
Accuracy@ I_{PN} @TA = 105℃	$X_{105℃}$	% of I_{PN}		±3.2		

7. Electrical data: SFG-2.0P/P6

At T_A = 25 ℃, V_C = 5 V.

Parameters	Symbol	Unit	Min	Typ	Max	Remark
Primary nominal residual rms current	I_{PN}	A		2.0		
Primary residual current, measuring range	I_{PM}	A	-3.0		3.0	
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	
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		0.66		
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	
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		50		R_L > 500 kΩ, di/dt > 5 A/μs
Frequency bandwidth (−3dB)	BW	kHz		15		R_L > 500 kΩ
Noise(1 Hz ~ 10 kHz)	V_{no}	mV rms		5		R_L > 500 kΩ
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. Electrical data: SFG-3.0P/P6

At T_A = 25 ℃, V_C = 5 V.

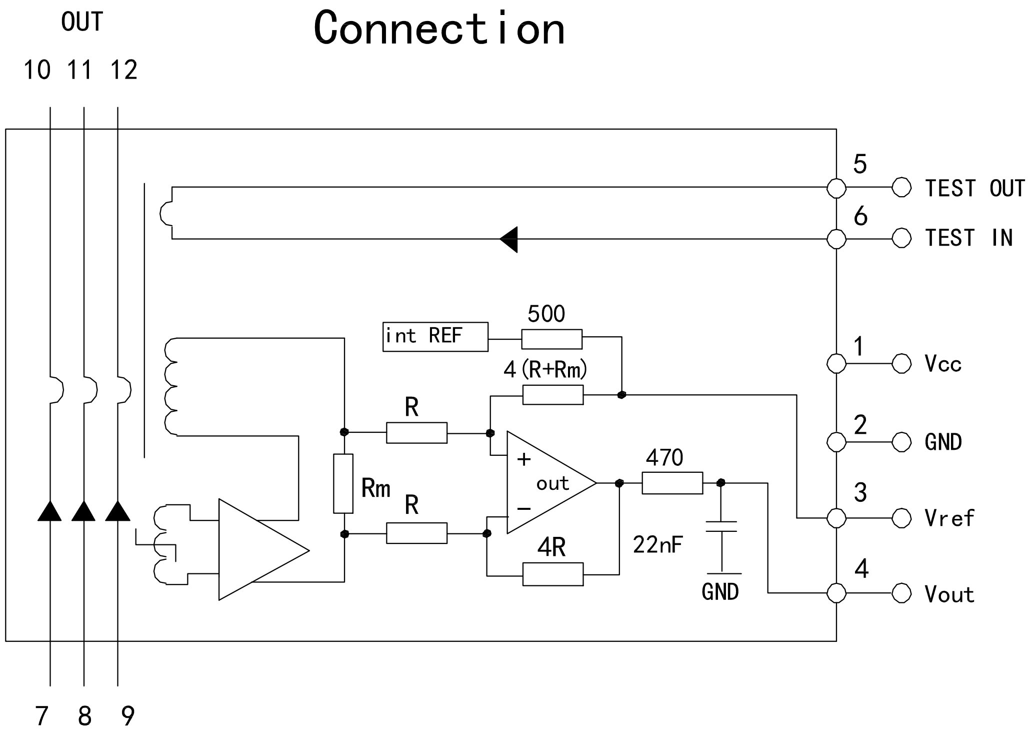
Parameters	Symbol	Unit	Min	Typ	Max	Remark
Primary nominal residual rms current	I_{PN}	A		3.0		
Primary residual current, measuring range	I_{PM}	A	-5		5	
Supply voltage	V_C	V	4.75	5	5.5	
Current consumption	I_C	mA		17.5	21.6	I_P(mA) / Na N_a = 1000 turns - 40°C …105°C
Reference voltage @ I_P = 0	V_{ref}	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	
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	
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		50		R_L > 500 kΩ, di/dt > 5 A/μs
Frequency bandwidth (−3dB)	BW	kHz		15		R_L > 500 kΩ
Noise(1 Hz ~ 10 kHz)	V_{no}	mV rms		10		R_L > 500 kΩ
Accuracy@ I_{PN} @TA = 25℃	$X_{25℃}$	% of I_{PN}		±1.9		
Accuracy@ I_{PN} @TA = 105℃	$X_{105℃}$	% of I_{PN}		±3.2		

9. Electrical data: SFG-5.0P/P6

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	-10		10	
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	
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	
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		50		R_L > 500 kΩ, di/dt > 5 A/μs
Frequency bandwidth (−3dB)	BW	kHz		15		R_L > 500 kΩ
Noise(1 Hz ~ 10 kHz)	V_{no}	mV rms		10		R_L > 500 kΩ
Accuracy@ I_{PN} @TA = 25℃	$X_{25℃}$	% of I_{PN}		±1.9		
Accuracy@ I_{PN} @TA = 105℃	$X_{105℃}$	% of I_{PN}		±3.2		

10. SFG- P/P6 Application information

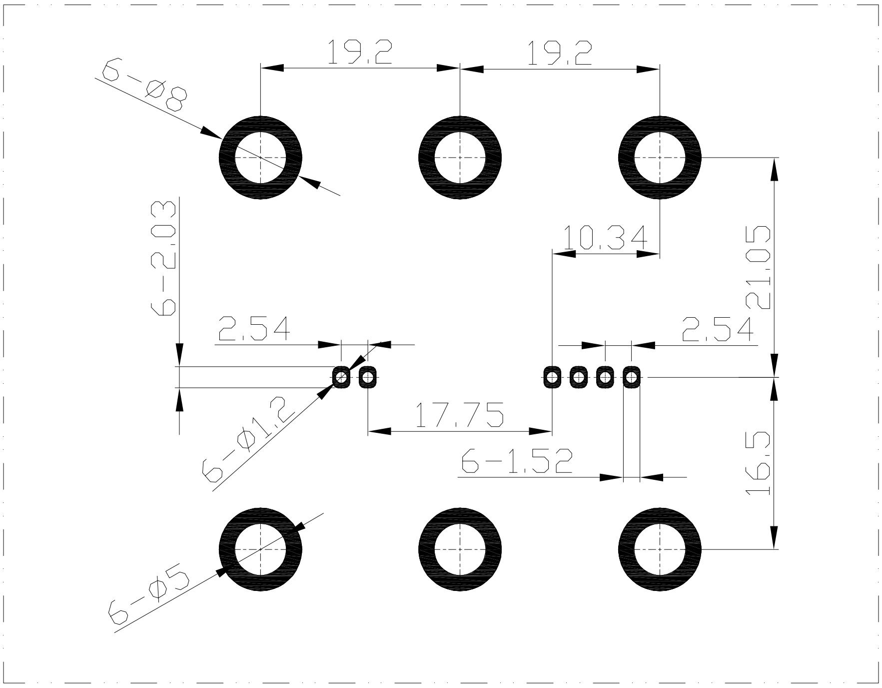


Test winding

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

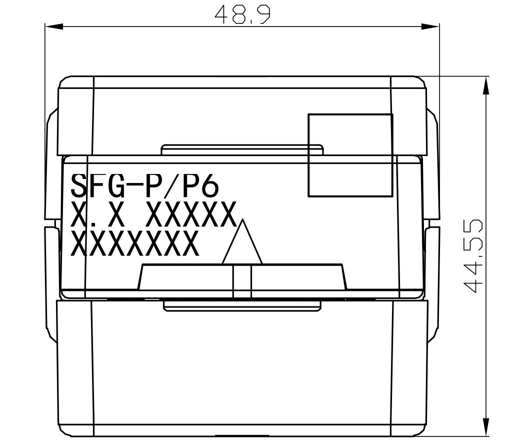
11. SFG- P/P6 PCB footprint



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.

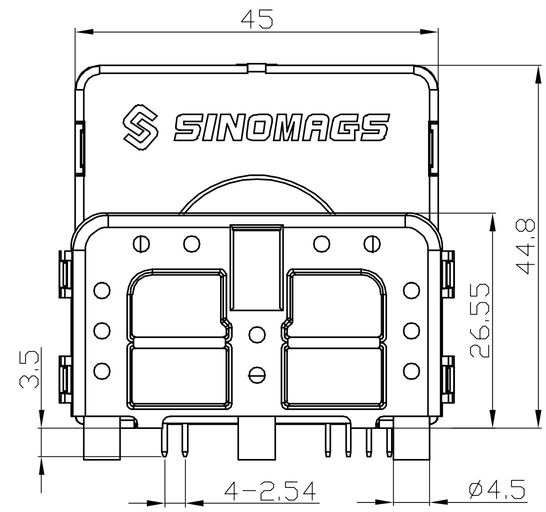
12. SFG- P/P6 Dimensions

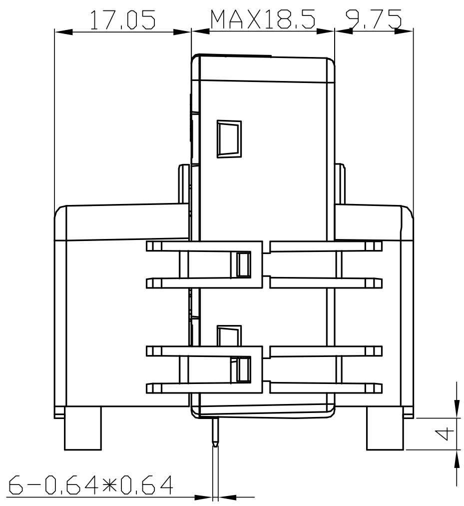


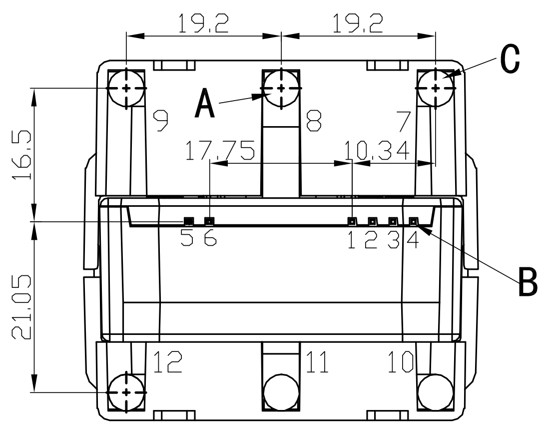
	DCI	DCP
B-C	14	--
A-C	13	>13
C-D	15	15

D is secondary inside the transducer

On the customer's PCBA		
	DCI	DCP
B-C	11.6	11.6
A-C	11.2	11.2







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