

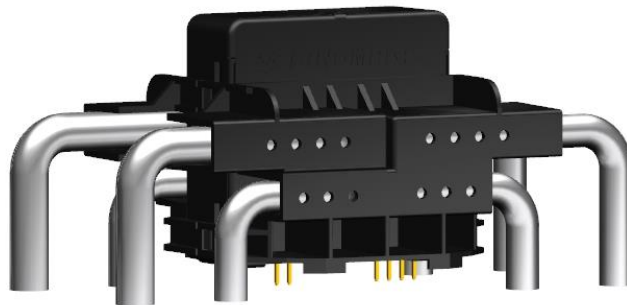


CURRENT SENSOR

PRODUCT SERIES: SFG-X.XP/PF

PRODUCT PART NUMBER: SFG-0.6P/PF
SFG-3.0P/PF

Version: Ver 1.5



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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/PF

Absolute maximum ratings

| Parameter | Symbol | Unit | Value |
|---|--------------------|------|-------|
| Maximum Supply voltage | $V_{C\ max}$ | V | 7 |
| Maximum Primary conductor temperature | $T_{B\ max}$ | °C | 110 |
| Maximum overload capability (100 μ s, 500 A/ μ s) | $\hat{I}_{P\ max}$ | 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 |
| 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 | 1.2/50 μ s |
| Clearance distance (pri. –pri.) | d_{Cl} | mm | 8 | Shortest distance through air |
| Creepage distance (pri. – pri.) | d_{Cp} | mm | 13 | Shortest path along device body |
| Clearance distance (pri. –sec.) | d_{Cl} | mm | 14.5 | When mounted on PCB with recommended layout |
| Creepage distance (pri. –sec.) | d_{Cp} | mm | 14.5 | 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 | °C | -40 | | 105 | |
| Ambient storage temperature | T_S | °C | -40 | | 105 | |
| Mass | m | g | | 300 | | |
| standard | EN 50178, IEC 61010, UL 508 | | | | | |

3. Electrical data: SFG-0.6P/PF

At $T_A = 25\text{ }^\circ\text{C}$, $V_C = 5\text{ V}$.

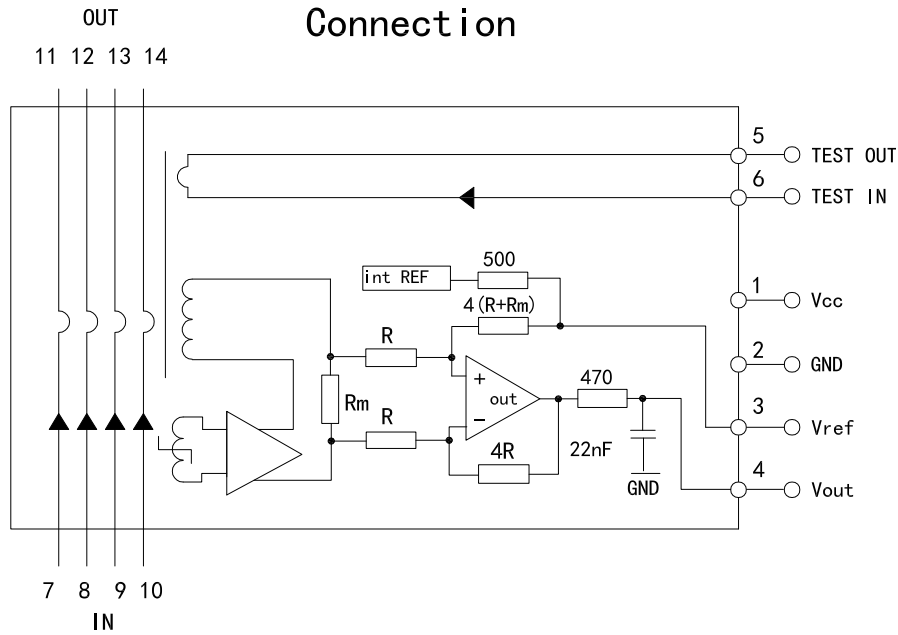
| Parameters | Symbol | Unit | Min | Typ | Max | Remark |
|---|---------------------------------|---------------|-------|-----------|-----------|---|
| Primary nominal residual rms current | I_{PN} | A | | 0.6 | | |
| Primary residual current, measuring range | I_{PM} | A | -0.85 | | 0.85 | |
| Supply voltage | V_C | V | 4.75 | 5 | 5.25 | |
| Current consumption | I_C | mA | | 17.5 | 21.6 | $I_P(\text{mA}) / N_a$ $N_a = 1000\text{ turns}$ - $40\text{ }^\circ\text{C} \dots 105\text{ }^\circ\text{C}$ |
| 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 = $499\ \Omega$ |
| 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 - $40 \dots 105\text{ }^\circ\text{C}$ |
| Theoretical sensitivity | G_{th} | V/A | | 2.476 | | |
| Sensitivity error | ϵ_G | % | -0.7 | 0.5 | 0.7 | $R_L > 500\text{ k}\Omega$ |
| Temperature coefficient of G | TCG | ppm/K | | | ± 100 | - $40\text{ }^\circ\text{C} \dots 105\text{ }^\circ\text{C}$ |
| Linearity error | ϵ_L | % | | 0.4 | 1.3 | |
| Number of turns (test winding) | N_T | | | 20 | | $R_L > 500\text{ k}\Omega$, $di/dt > 5\text{ A}/\mu\text{s}$ |
| Reaction time @ 10 % of I_{PRN} | t_{ra} | μs | | 5 | | $R_L > 500\text{ k}\Omega$, $di/dt > 5\text{ A}/\mu\text{s}$ |
| Step response time to 90 % of I_{PN} | t_r | μs | | 40 | | $R_L > 500\text{ k}\Omega$ |
| Frequency bandwidth (-3dB) | BW | kHz | | 15 | | $R_L > 500\text{ k}\Omega$ |
| Noise(1 Hz ~ 10 kHz) | V_{no} | mV rms | | 10 | | |
| Accuracy @ I_{PN} @ $T_A = 25\text{ }^\circ\text{C}$ | $X_{25\text{ }^\circ\text{C}}$ | % of I_{PN} | | ± 1.9 | | |
| Accuracy @ I_{PN} @ $T_A = 105\text{ }^\circ\text{C}$ | $X_{105\text{ }^\circ\text{C}}$ | % of I_{PN} | | ± 3.2 | | |

4. Electrical data: SFG-3.0P/PF

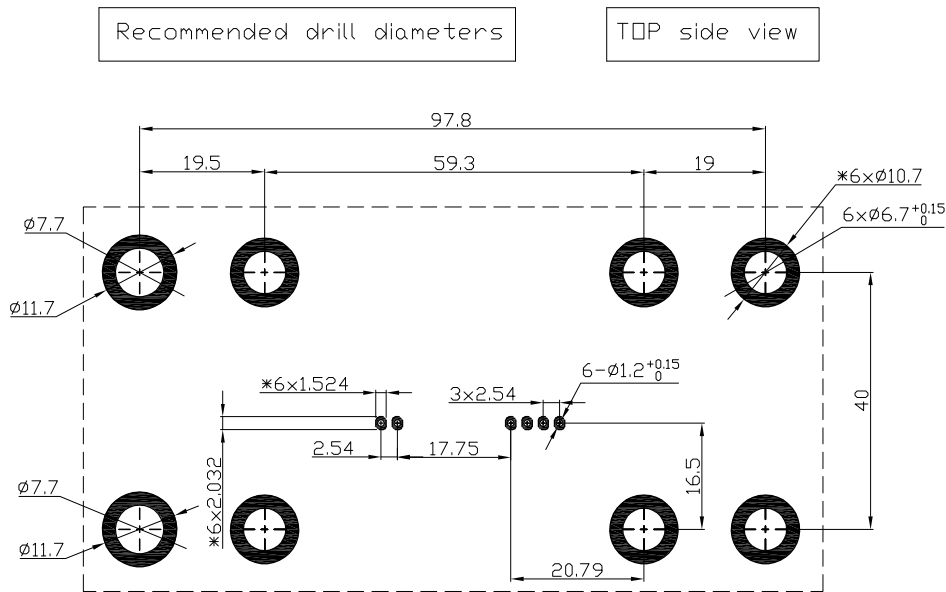
At $T_A = 25\text{ }^\circ\text{C}$, $V_C = 5\text{ V}$.

| 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 | $I_P(\text{mA}) / N_a$ $N_a = 1000\text{ turns}$ - $40\text{ }^\circ\text{C} \dots 105\text{ }^\circ\text{C}$ |
| 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 = $499\ \Omega$ |
| 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 - $40 \dots 105\text{ }^\circ\text{C}$ |
| Theoretical sensitivity | G_{th} | V/A | | 0.4 | | |
| Sensitivity error | ϵ_G | % | -1.6 | 0.5 | 1.6 | $R_L > 500\text{ k}\Omega$ |
| Temperature coefficient of G | TCG | ppm/K | | ± 400 | | - $40\text{ }^\circ\text{C} \dots 105\text{ }^\circ\text{C}$ |
| Linearity error | ϵ_L | % | | 0.5 | 1 | |
| Number of turns (test winding) | N_T | | | 20 | | $R_L > 500\text{ k}\Omega$, $di/dt > 5\text{ A}/\mu\text{s}$ |
| Reaction time @ 10 % of I_{PRN} | t_{ra} | μs | | 5 | | $R_L > 500\text{ k}\Omega$, $di/dt > 5\text{ A}/\mu\text{s}$ |
| Step response time to 90 % of I_{PN} | t_r | μs | | 40 | | $R_L > 500\text{ k}\Omega$ |
| Frequency bandwidth (-3dB) | BW | kHz | | 15 | | $R_L > 500\text{ k}\Omega$ |
| Noise(1 Hz ~ 10 kHz) | V_{no} | mV rms | | 10 | | |
| Accuracy @ I_{PN} @ $T_A = 25\text{ }^\circ\text{C}$ | $X_{25\text{ }^\circ\text{C}}$ | % of I_{PN} | | ± 1.9 | | |
| Accuracy @ I_{PN} @ $T_A = 105\text{ }^\circ\text{C}$ | $X_{105\text{ }^\circ\text{C}}$ | % of I_{PN} | | ± 3.2 | | |

5. SFG- P/PF Application information



6. SFG- P/PF PCB footprint



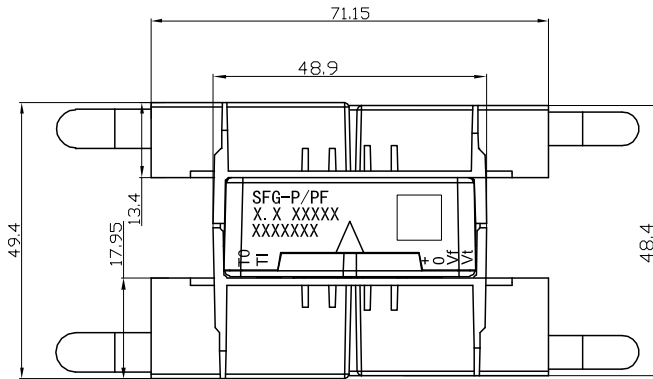
PCB holes diameter:
Secondary Pins: $\phi 1.2\text{mm}$
Primary Pins: $\phi 6.7\text{mm}$

*=Pads design according to IPC 2221, IPC 2222

Assembly on PCB

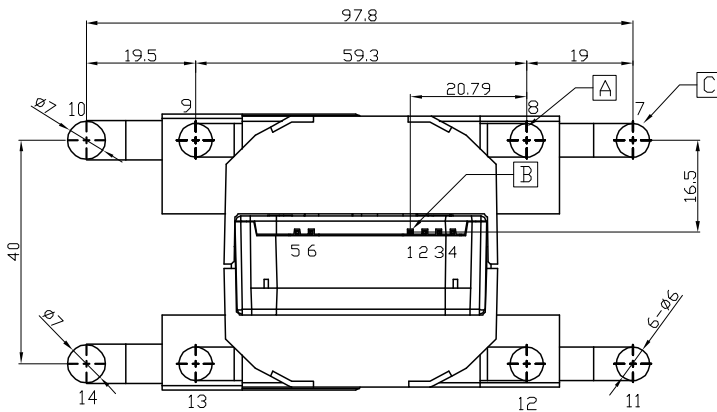
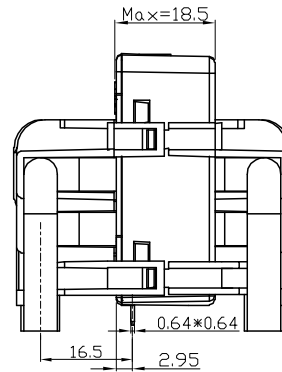
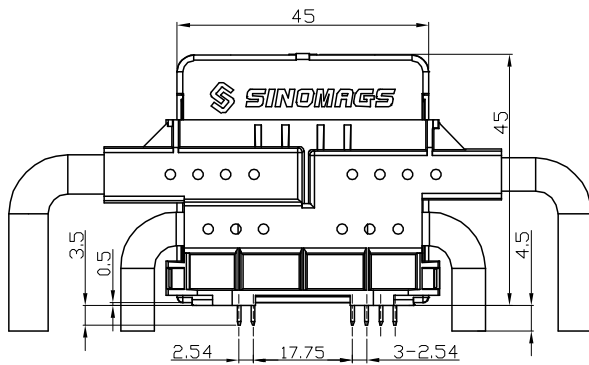
- No Primary in shadow area
- Maximum PCB thickness 2.4 mm
- Wave-soldering: 260°C @ 10 s
- Recommended PCB hole diameter 1.2 mm for secondary pin.

7. SFG- P/PF Dimensions



Terminals :

| | | |
|-----------------|-----------------|-----------------|
| 1 | 2 | 3 |
| Vcc | GND | Vref |
| 4 | 5 | 6 |
| Vout | Test Out | Test In |
| 7 | 8 | 9 |
| I _{p+} | I _{p+} | I _{p+} |
| 10 | 11 | 12 |
| I _{p+} | I _{p-} | I _{p-} |
| 13 | 14 | |
| I _{p-} | I _{p-} | |



| | d_{CI} | d_{CP} |
|-----|----------|----------|
| A-B | 21mm | --- |
| A-C | 8mm | 12mm |
| C-D | 16.0mm | 16.0mm |

D is secondary inside the transducer

| On the customer's PCBA | | |
|------------------------|----------|----------|
| | d_{CI} | d_{CP} |
| A-B | 14.5mm | 14.5mm |
| A-C | 8mm | 8mm |

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

