

AH951

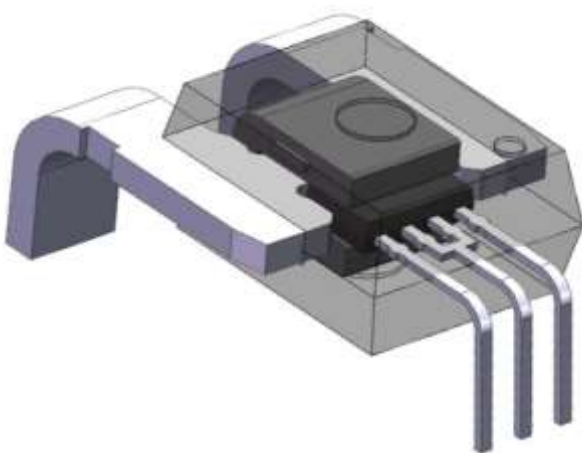
Open loop high-precision linear current sensor



1. Product Introduction

AH951 series is an open-loop current sensor module based on the Hall effect principle, providing a more economical and accurate solution for AC or DC detection. It is widely used in industrial, commercial, and communication systems for AC or DC current detection. This product can be used for motor control, load detection and load management, power supply and DC-DC converter, Solar inverter, UPS, over-current protection, medium and low power inverter current detection and other applications.

All pins of the AH950 series are tin plated, and the packaging material does not contain lead, meeting RoHS standards.



2. Function

- Operating Voltage: 4.5V~5.5V
- Single power supply
- Output voltage 2.5V or 50% V_{CC}
- Physical isolation between input and output
- Working temperature: -40 °C~150 °C
- Rated current detection range: $\pm 10A$, $\pm 16A$, $\pm 20A$, $\pm 32A$, $\pm 40A$, $\pm 50A$
- Product comes with reference output: 2.5V
- Safety regulations related certification:
UL508:2010
dielectric strength: 4800Vrms 1min
Isolation Operating Voltage: 680Vrms, V_{DC}
or V_{PK}
Electrical clearance: 8.3mm
Creepage distance: 8.3mm
- Compliance with RoHS regulations: (EU) 2015/863

AH951

Open loop high-precision linear current sensor



Alfa Electronics Co.,Ltd

3.Application

- Current detection of medium and low power frequency converters
- Combiner box and switching power supply
- Overload protection device
- Charger and converter
- Solar inverter
- Continuous power outage current source (UPS)

4. Product packaging

| Part No. | Sensitivity (mV/A) | Valid value | peak value | Temperature range | Packing |
|-----------|--------------------|-------------|------------|-------------------|-------------|
| AH951-10P | 80 | 10A | ±25A | -40°C~105°C | 500pcs/reel |
| AH951-16P | 50 | 16A | ±40A | -40°C~105°C | 500pcs/reel |
| AH951-20P | 40 | 20A | ±50A | -40°C~105°C | 500pcs/reel |
| AH951-32P | 25 | 32A | ±80A | -40°C~105°C | 500pcs/reel |
| AH951-40P | 20 | 40A | ±100A | -40°C~105°C | 500pcs/reel |
| AH951-50P | 16 | 50A | ±125A | -40°C~105°C | 500pcs/reel |



Content

| | |
|---|----|
| ➤ 1.Product Introduction | 1 |
| ➤ 2.Function | 1 |
| ➤ 3.Application | 2 |
| ➤ 4.Product packaging | 2 |
| ➤ 5.Functional Block Diagram..... | 4 |
| ➤ 6.Pin information | 4 |
| ➤ 7.Naming conventions | 5 |
| ➤ 8.Electromagnetic characteristics | 5 |
| ➤ 9.Precision Parameters..... | 8 |
| ➤ 10. Application Circuit | 11 |
| ➤ 11. Characteristic Performance..... | 12 |
| ➤ 12. Package Material Information | 13 |
| ➤ 13. Notes..... | 14 |
| ➤ 14. Historical Version | 15 |

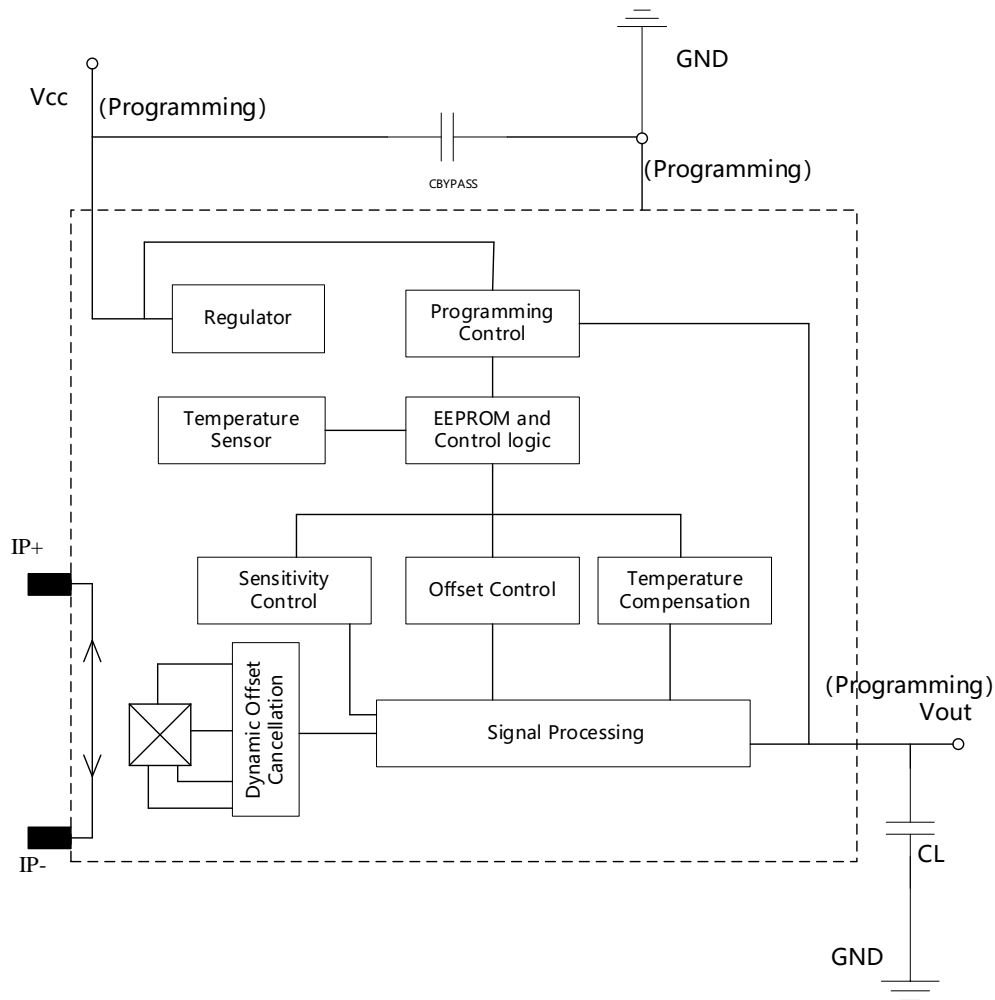
AH951

Open loop high-precision linear current sensor



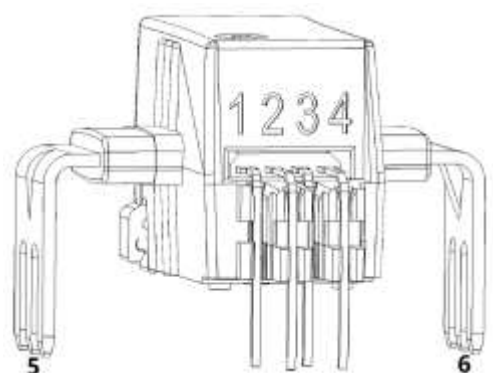
Alfa Electronics Co.,Ltd

5. Functional Block Diagram

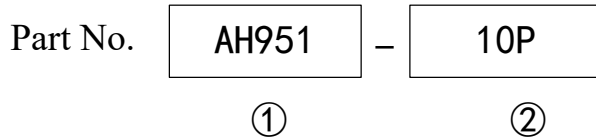


6. Pin information

| Number | Name | Functions |
|--------|------|---------------------------------|
| 1 | VREF | Reference voltage 2.5V output |
| 2 | VOUT | Signal output/programming pins |
| 3 | GND | Ground/programming pins |
| 4 | VCC | Power supply/programming pins |
| 5 | IP+ | Current input positive terminal |
| 6 | IP- | Current input negative terminal |



7.Naming conventions



①Series name

②Input current range

| Model | Rated current detection range | Peak to peak detection range |
|-------|-------------------------------|------------------------------|
| 10P | ±10A | ±25A |
| 16P | ±16A | ±40A |
| 20P | ±20A | ±50A |
| 32P | ±32A | ±80A |
| 40P | ±40A | ±100A |
| 50P | ±50A | ±125A |

8. Electromagnetic characteristics

8.1 limit parameter

The absolute maximum value is the limit value when applying a chip, exceeding this value may damage the chip. Although the functionality of the chip may not be compromised when the value is exceeded, if the value is exceeded for a certain period of time, the reliability of the chip may be affected..

| Symbols | Parameters | Min | Max | Units |
|---|---------------------------------|-----|--------------|-------|
| V_{CC} | Power supply voltage | – | 6 | V |
| V_{OUT} | Output voltage | | $V_{CC}-0.5$ | V |
| I_{OUT} (source) | Output current source | – | 80 | mA |
| I_{OUT} (sink) | Output current sink | – | 40 | mA |
| T_A | Working environment temperature | –40 | 105 | °C |
| T_S | Storage temperature | –65 | 170 | °C |
| T_J | Maximum junction temperature | – | 165 | °C |
| Endurance | EEPROM | 200 | – | cycle |
| Transient impulse current at the current sampling end | IP 1pulse 100ms | | 100 | A |



8.2 Isolation characteristics

| Symbols | Parameters | Test conditions | range | Units |
|------------|-----------------------------|--|-------|-------|
| V_W | Lightning surge voltage | Test ± 5 pulses every 30 seconds, in accordance with IEC 61000-4-5 1.2/50us (waveform width). | 8000 | V |
| V_{ISO} | dielectric strength | Testing method according to UL508 standard, $V_{TEST}=V_{ISO}$, $t=60s, 50/60Hz$ (qualified) $V_{TEST}=1.2 \times V_{ISO}, t=1s$ (100% full inspection) | 4800 | Vrms |
| V_{WFS1} | Isolation operating Voltage | UL508 standard, CATIII, PD3 | 680 | Vrms |
| D_{CL} | Electrical clearance | Minimum air distance from input terminal to output terminal | 8.3 | mm |
| D_{CR} | creepage | The shortest distance from the input terminal to the output terminal along the plastic packaging body | 8.3 | mm |

8.3ESD Parameters

| Symbols | Enforcement standards | Max | Units | |
|-----------|-----------------------|------------------|-------|----|
| V_{ESD} | HBM | JEDECJS-001-2017 | 5 | kV |

8.4Electrical parameters

$T_A=25^\circ C$, $V_{CC}=+5V$, $R_L=4.7k\Omega$

| Symbols | Parameters | Test conditions | Min | Typ | Max | Units |
|-------------------|----------------------|---|------|-------|------|------------|
| V_{CC} | Operating voltage | - | 4.5 | 5 | 5.5 | V |
| I_{CC} | Operating current | $V_{CC}=5V$, $T_A=25^\circ C$ | 9 | 11.18 | 13 | mA |
| B_W | Built-in bandwidth | Small signal: $-3dB$, $C_L=1nF$, $T_A=25^\circ C$ | - | 120 | - | kHz |
| R_{IP} | Conductor Resistance | $T_A=25^\circ C$ | | 0.15 | | m Ω |
| N_p | Primary turns | | | 1 | | |
| V_{REF} | reference voltage | | 2.48 | 2.50 | 2.52 | V |
| $V_{OUT}-V_{REF}$ | Output voltage range | | -2 | | 2 | V |
| R_{OUT} | output resistance | - | | 9 | | Ω |
| T_{PO} | Power-on time | $T_A=25^\circ C$, $C_L=1nF$, sensitivity 2 mV/G, constant magnetic: | - | 100 | - | us |



| | | 400Gs | | | | |
|-------------|--|--|--------------|-------|-------|------------|
| T_{TC} | Temperature compensation for power-on time | $T_A=150^{\circ}C$, $C_L=1nF$, sensitivity 2mV/G, constant magnetic field: 400Gs | - | 300 | - | us |
| V_{oq} | quiescent point | $T_A=25^{\circ}C$, $C_L=1nF$, sensitivity 2mV/Gs, $BWf=Bwi$ | 2.485 | 2.500 | 2.515 | V |
| V_{UVLOH} | Undervoltage-lockout threshold | $T_A=25^{\circ}C$, the voltage rises and the device starts working | | 4.1 | | V |
| V_{UVLOL} | | $T_A=25^{\circ}C$, the voltage drops and the device stops working | | 3.8 | | V |
| V_{PORH} | Reset voltage | $T_A=25^{\circ}C$, V_{CC} rising | - | 4.1 | - | V |
| V_{PORL} | | $T_A=25^{\circ}C$, V_{CC} goes down | - | 3.8 | - | V |
| t_{PORR} | Power-on reset release time | $T_A=25^{\circ}C$, V_{CC} rising | - | 10 | - | us |
| I_{SCLP} | Maximum current source | - | - | 80 | - | mA |
| I_{SCLN} | Maximum current sink | - | - | 40 | - | mA |
| V_N | noise | $T_A=25^{\circ}C$, $C_L=1nF$, sensitivity 2mV/Gs, $BWf=Bwi$ | - | 14.1 | - | mVp-p |
| V_{OL} | Analog output saturated low level | $R_L \geq 4.7k\Omega$ | - | 0.5 | | V |
| V_{OH} | Analog output saturated high level | $R_L \geq 4.7k\Omega$ | $V_{CC}-0.3$ | - | 4.97 | V |
| C_L | Output load capacitor | V_{OUT} to GND | - | 0.5 | 1 | nF |
| R_L | Output load resistance | V_{OUT} to GND | | 10 | - | k Ω |
| | | V_{OUT} to V_{CC} | | 10 | | k Ω |
| t_R | rise time | $T_A=25^{\circ}C$, constant magnetic field 400Gs, $C_L=1nF$, sensitivity 2mV/Gs | - | 5.5 | - | μs |
| T_{PD} | transmission delay | $T_A=25^{\circ}C$, constant magnetic field 400Gs, $C_L=1nF$, sensitivity 2mV/Gs | - | 4.5 | - | μs |
| T_{RESP} | response time | $T_A=25^{\circ}C$, constant magnetic field 400Gs, $C_L=1nF$, sensitivity 2mV/Gs | - | 4 | 5 | μs |
| E_{lin} | linearity error | $T_A=25^{\circ}C$, $C_L=1nF$, sensitivity | - | 0.4 | | % |

AH951

Open loop high-precision linear current sensor



Alfa Electronics Co.,Ltd

| | | | | | | |
|--|--|-----------------|--|--|--|--|
| | | 2mV/Gs, BWf=Bwi | | | | |
|--|--|-----------------|--|--|--|--|

9.Precision Parameters

AH951-10P

| Characteristic | Symbols | Test conditions | Min | Typ | Max | Units |
|-----------------------------|-------------|---|------|------|-----|-------|
| Nominal input current | IPN | Valid value | | 10 | | A |
| Maximum input current range | IPM | peak-to-peak | -25 | | 25 | A |
| sensitivity | SENS | | | 80 | | mV/A |
| hysteresis | IOM | | -0.2 | | 0.2 | A |
| Zero current output error | VOE(TA) | IP=0A, T _A =25°C | | ±7 | | mV |
| | VOE(TOP)HT | IP=0A, TOP=25°C~105°C | | ±15 | | mV |
| | VOE(TOP)LT | IP=0A, TOP=-40°C~25°C | | ±18 | | mV |
| sensitivity error | ESEN(TA) | IP=±50A, T _A =25°C | | ±1.2 | | % |
| | ESEN(TOP)HT | IP=±50A, TOP=25°C~105°C | | ±2.3 | | % |
| | ESEN(TPO)LT | IP=±50A, TOP=-40°C~25°C | | ±2.3 | | % |
| accuracy | ETOT(HT) | IP application time within the full range IP range 5ms, TOP=25°C to 105°C | | ±2.5 | | % |
| | ETOT(LT) | IP application time within the full range IP range 5ms, TOP=-40°C to 25°C | | ±2.5 | | % |

AH951-16P

| Characteristic | Symbols | Test conditions | Min | Typ | Max | Units |
|-----------------------------|---------|-----------------------------|------|-----|-----|-------|
| Nominal input current | IPN | Valid value | | 16 | | A |
| Maximum input current range | IPM | peak-to-peak | -40 | | 40 | A |
| sensitivity | SENS | | | 50 | | mV/A |
| hysteresis | IOM | | -0.2 | | 0.2 | A |
| | VOE(TA) | IP=0A, T _A =25°C | | ±7 | | mV |

AH951

Open loop high-precision linear current sensor



Alfa Electronics Co.,Ltd

| | | | | | | |
|---------------------------|-------------|---|--|------|--|----|
| Zero current output error | VOE(TOP)HT | IP=0A, TOP=25°C~105°C | | ±15 | | mV |
| | VOE(TOP)LT | IP=0A, TOP=-40°C~25°C | | ±18 | | mV |
| sensitivity error | ESEN(TA) | IP=±50A, TA=25°C | | ±1.2 | | % |
| | ESEN(TOP)HT | IP=±50A, TOP=25°C~105°C | | ±2.3 | | % |
| | ESEN(TPO)LT | IP=±50A, TOP=-40°C~25°C | | ±2.3 | | % |
| accuracy | ETOT(HT) | IP application time within the full range IP range 5ms, TOP=25°C to 105°C | | ±2.5 | | % |
| | ETOT(LT) | IP application time within the full range IP range 5ms, TOP=-40°C to 25°C | | ±2.5 | | % |

AH951-20P

| Characteristic | Symbols | Test conditions | Min | Typ | Max | Units |
|-----------------------------|-------------|---|------|------|-----|-------|
| Nominal input current | IPN | Valid value | | 20 | | A |
| Maximum input current range | IPM | peak-to-peak | -50 | | 50 | A |
| sensitivity | SENS | | | 40 | | mV/A |
| hysteresis | IOM | | -0.2 | | 0.2 | A |
| Zero current output error | VOE(TA) | IP=0A, TA=25°C | | ±7 | | mV |
| | VOE(TOP)HT | IP=0A, TOP=25°C~105°C | | ±15 | | mV |
| | VOE(TOP)LT | IP=0A, TOP=-40°C~25°C | | ±18 | | mV |
| sensitivity error | ESEN(TA) | IP=±50A, TA=25°C | | ±1.2 | | % |
| | ESEN(TOP)HT | IP=±50A, TOP=25°C~105°C | | ±2.3 | | % |
| | ESEN(TPO)LT | IP=±50A, TOP=-40°C~25°C | | ±2.3 | | % |
| accuracy | ETOT(HT) | IP application time within the full range IP range 5ms, TOP=25°C to 105°C | | ±2.5 | | % |
| | ETOT(LT) | IP application time within the full range IP range 5ms, TOP=-40°C to 25°C | | ±2.5 | | % |

AH951-32P

AH951

Open loop high-precision linear current sensor



Alfa Electronics Co., Ltd

| Characteristic | Symbols | Test conditions | Min | Typ | Max | Units |
|-----------------------------|-------------|---|------|------|-----|-------|
| Nominal input current | IPN | Valid value | | 32 | | A |
| Maximum input current range | IPM | peak-to-peak | -80 | | 80 | A |
| sensitivity | SENS | | | 25 | | mV/A |
| hysteresis | IOM | | -0.2 | | 0.2 | A |
| Zero current output error | VOE(TA) | IP=0A, T _A =25°C | | ±7 | | mV |
| | VOE(TOP)HT | IP=0A, TOP=25°C~105°C | | ±15 | | mV |
| | VOE(TOP)LT | IP=0A, TOP=-40°C~25°C | | ±18 | | mV |
| sensitivity error | ESEN(TA) | IP=±50A, T _A =25°C | | ±1.2 | | % |
| | ESEN(TOP)HT | IP=±50A, TOP=25°C~105°C | | ±2.3 | | % |
| | ESEN(TPO)LT | IP=±50A, TOP=-40°C~25°C | | ±2.3 | | % |
| accuracy | ETOT(HT) | IP application time within the full range IP range 5ms, TOP=25°C to 105°C | | ±2.5 | | % |
| | ETOT(LT) | IP application time within the full range IP range 5ms, TOP=-40°C to 25°C | | ±2.5 | | % |

AH951-40P

| Characteristic | Symbols | Test conditions | Min | Typ | Max | Units |
|-----------------------------|------------|-------------------------------|------|------|-----|-------|
| Nominal input current | IPN | Valid value | | 40 | | A |
| Maximum input current range | IPM | peak-to-peak | -100 | | 100 | A |
| sensitivity | SENS | | | 20 | | mV/A |
| hysteresis | IOM | | -0.2 | | 0.2 | A |
| Zero current output error | VOE(TA) | IP=0A, T _A =25°C | | ±7 | | mV |
| | VOE(TOP)HT | IP=0A, TOP=25°C~105°C | | ±15 | | mV |
| | VOE(TOP)LT | IP=0A, TOP=-40°C~25°C | | ±18 | | mV |
| sensitivity error | ESEN(TA) | IP=±50A, T _A =25°C | | ±1.2 | | % |

AH951

Open loop high-precision linear current sensor



Alfa Electronics Co.,Ltd

| | | | | | | |
|----------|-------------|---|--|------|--|---|
| | ESEN(TOP)HT | IP=±50A, TOP=25°C~105°C | | ±2.3 | | % |
| | ESEN(TPO)LT | IP=±50A, TOP=-40°C~25°C | | ±2.3 | | % |
| accuracy | ETOT(HT) | IP application time within the full range IP range 5ms, TOP=25°C to 105°C | | ±2.5 | | % |
| | ETOT(LT) | IP application time within the full range IP range 5ms, TOP=-40°C to 25°C | | ±2.5 | | % |

AH951-50P

| Characteristic | Symbols | Test conditions | Min | Typ | Max | Units |
|-----------------------------|-------------|---|------|------|-----|-------|
| Nominal input current | IPN | Valid value | | 50 | | A |
| Maximum input current range | IPM | peak-to-peak | -125 | | 125 | A |
| sensitivity | SENS | | | 80 | | mV/A |
| hysteresis | IOM | | -0.2 | | 0.2 | A |
| Zero current output error | VOE(TA) | IP=0A, T _A =25°C | | ±7 | | mV |
| | VOE(TOP)HT | IP=0A, TOP=25°C~105°C | | ±15 | | mV |
| | VOE(TOP)LT | IP=0A, TOP=-40°C~25°C | | ±18 | | mV |
| sensitivity error | ESEN(TA) | IP=±50A, T _A =25°C | | ±1.2 | | % |
| | ESEN(TOP)HT | IP=±50A, TOP=25°C~105°C | | ±2.3 | | % |
| | ESEN(TPO)LT | IP=±50A, TOP=-40°C~25°C | | ±2.3 | | % |
| accuracy | ETOT(HT) | IP application time within the full range IP range 5ms, TOP=25°C to 105°C | | ±2.5 | | % |
| | ETOT(LT) | IP application time within the full range IP range 5ms, TOP=-40°C to 25°C | | ±2.5 | | % |

10. Application Circuit

(1) AH951 series products, with a 2.5V reference output, can be directly used, or differential output with ADC or operational amplifier interface

(2) CBYPASS is 0.1 μ F bypass capacitor, PCB wiring should be as close as possible to the "VCC-GND" end,

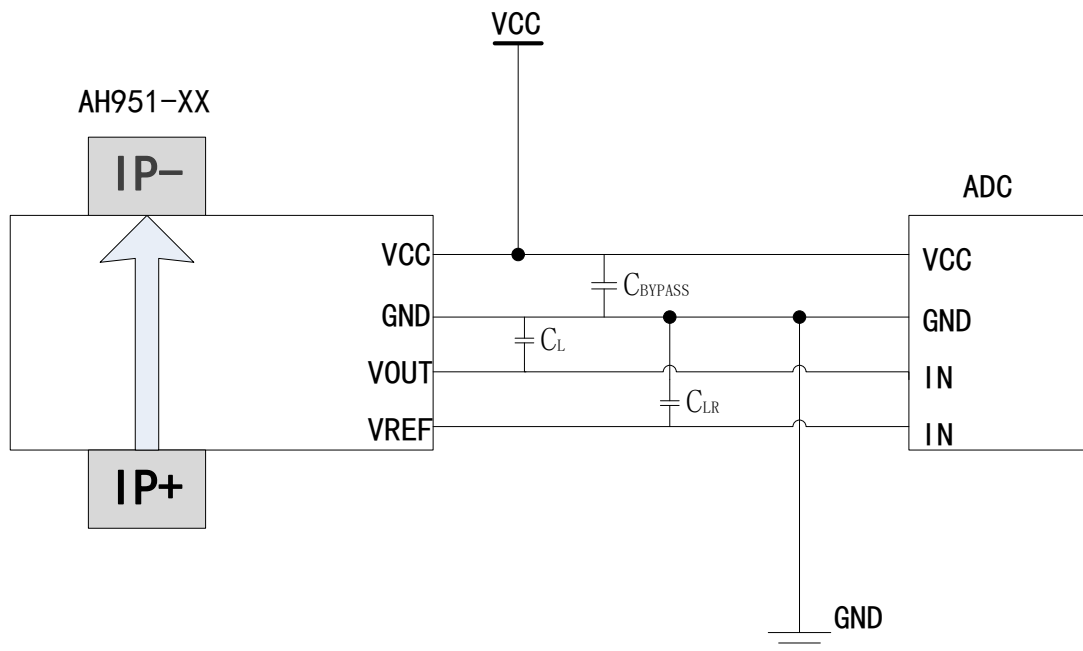
AH951

Open loop high-precision linear current sensor

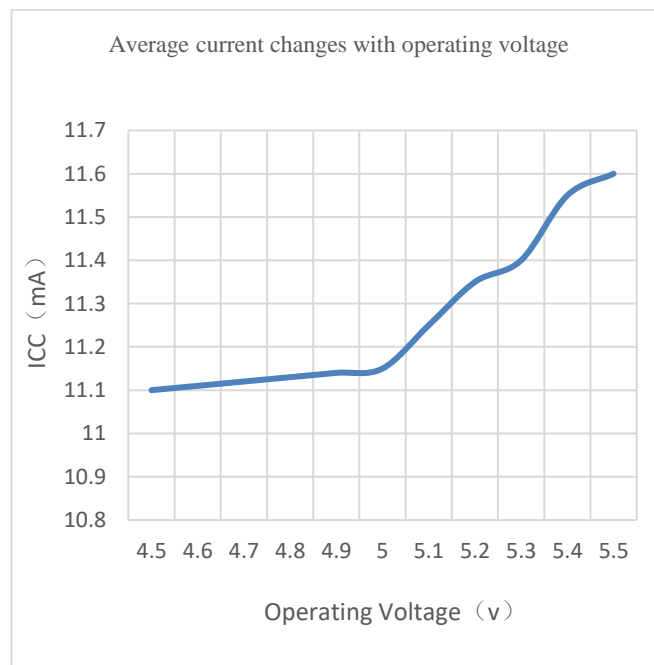
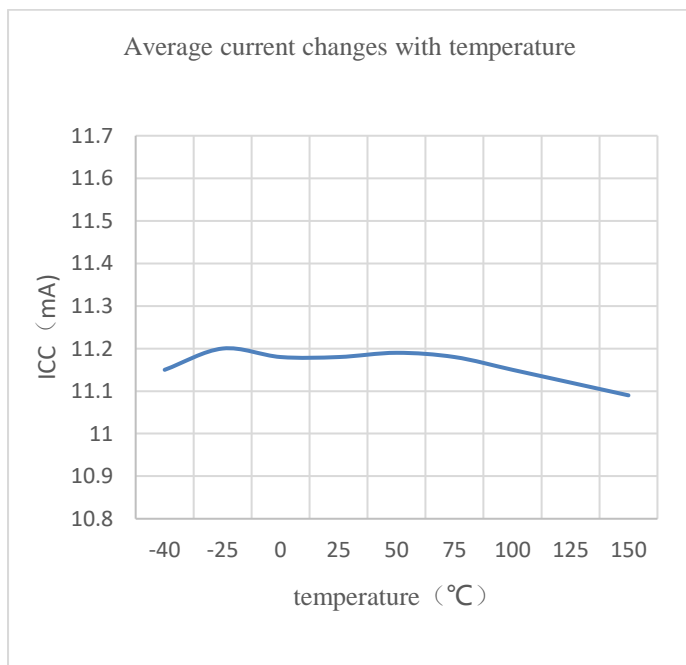


Alfa Electronics Co.,Ltd

(3) CL and CLR are 0.47nF filtering capacitors.



11. Characteristic Performance

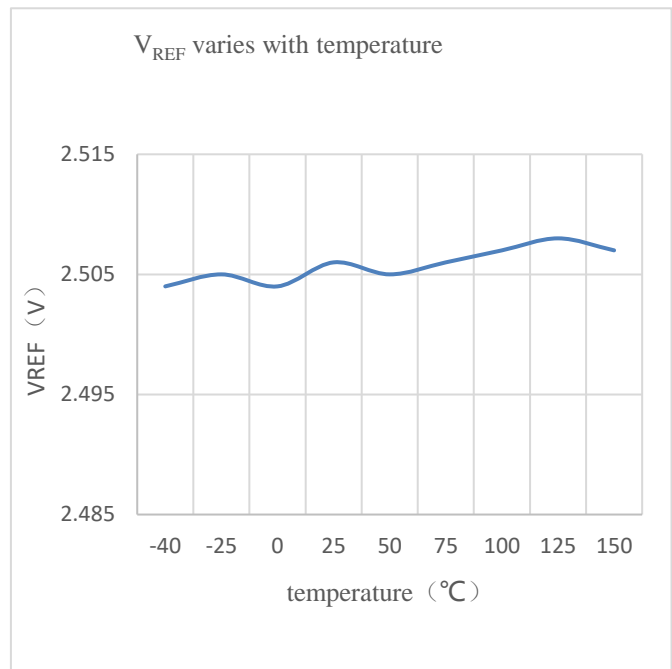
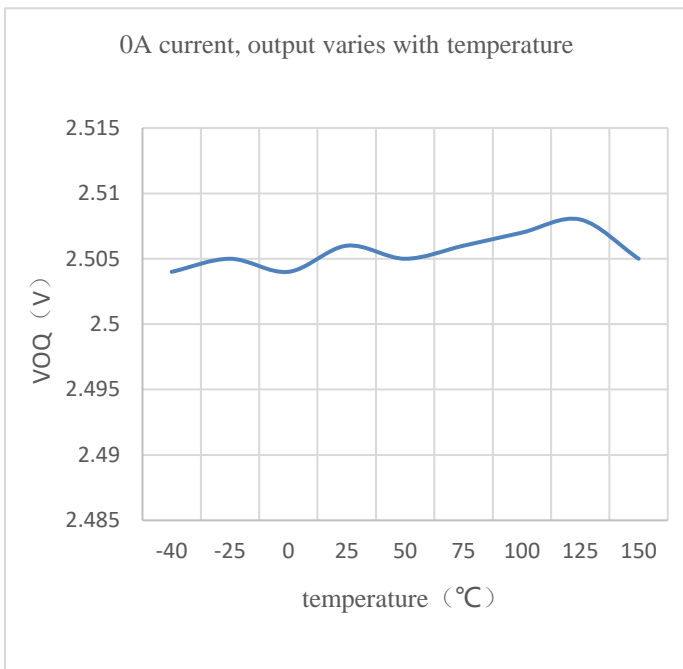


AH951

Open loop high-precision linear current sensor

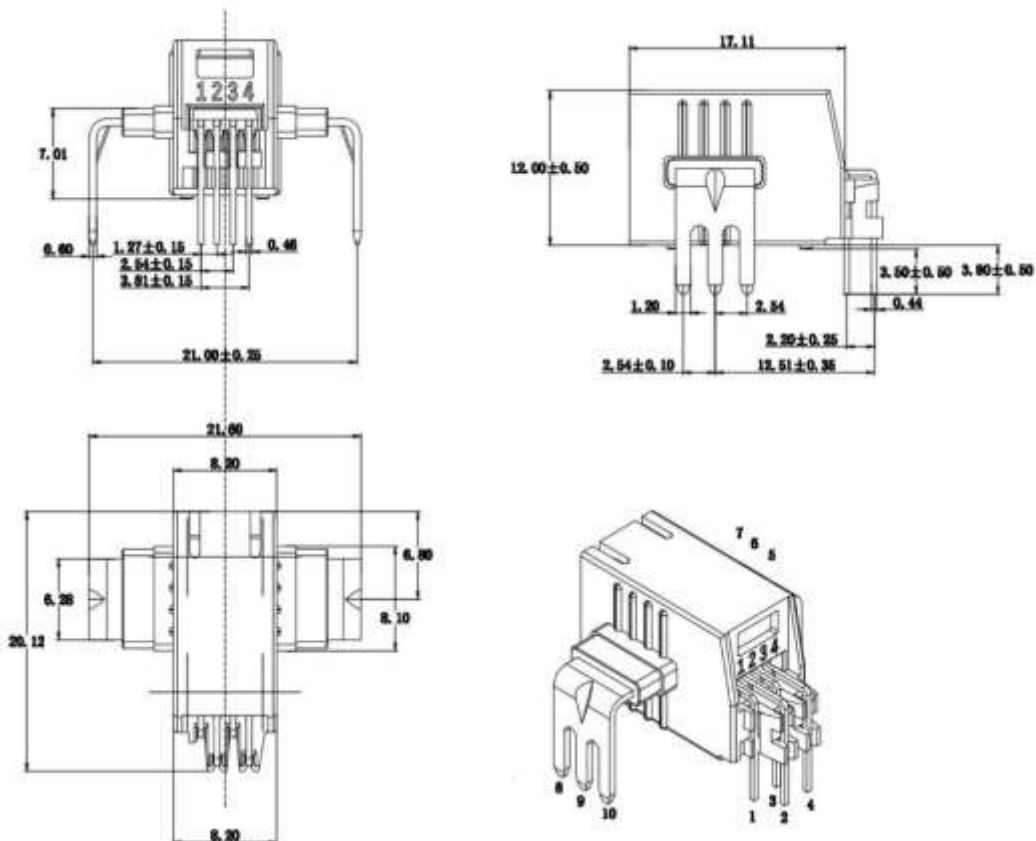


Alfa Electronics Co.,Ltd



12. Package Material Information

Product mechanical dimensions



AH951

Open loop high-precision linear current sensor



Alfa Electronics Co.,Ltd

PCB packaging

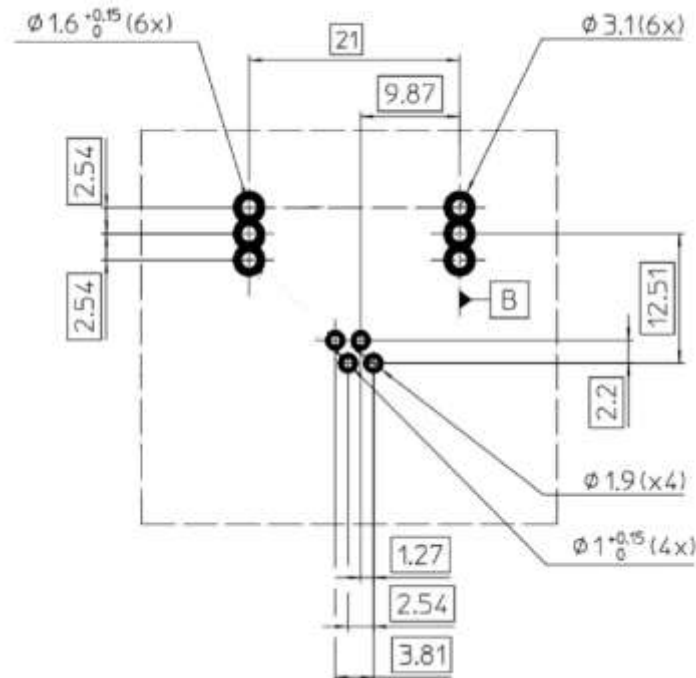
Important points to note:

Recommended PCB aperture main pin: 6mm

Auxiliary pin: 0mm

Maximum PCB thickness: 2.4mm

Wave soldering profile: maximum 260 °C, 10 seconds



13. Notes

- Hall is a sensitive device, and electrostatic protection measures should be taken during use and storage.
- During installation and use, mechanical stress applied to the device casing and leads should be minimized as much as possible.
- It is recommended that the welding temperature should not exceed 350 °C and the duration should not exceed 5 seconds.

AH951

Open loop high-precision linear current sensor



- To ensure the safety and stability of Hall chips, it is not recommended to use them beyond the parameter range for a long time.
- The sensor must comply with standards and safety requirements, and be used in electrical/electronic equipment according to the manufacturer's instructions
- Be careful of electric shock hazards.
- When operating the transducer, some modules may carry dangerous voltages (such as busbars and power supplies). Ignoring this warning will cause personal injury, and in severe cases, it can endanger life.

14. Historical Version

| No. | Time | Describe |
|-----|-------------------|-----------------------|
| 1 | January 6th, 2023 | Update considerations |

AH951

Open loop high-precision linear current sensor



Copyright ©2018, Alfa Electronics Co., Ltd

Alfa Electronics Co., Ltd reserves the right to make, from time to time, such departures from the detail specifications as may be required to permit improvements in the performance, reliability, or manufacturability of its products. Before placing an order, the user is cautioned to verify that the information being relied upon is current.

Alfa's products are not to be used in any devices or systems, including but not limited to life support devices or systems, in which a failure of Alfa's product can reasonably be expected to cause bodily harm.

The information included herein is believed to be accurate and reliable. However, Alfa Electronics Co., Ltd assumes no responsibility for its use; nor for any infringement of patents or other rights of third parties which may result from its use.