

Features

- Open-loop, fluxgate-based current transducer
- 80A Single phase (40A Three phase)
- Meet IEC 62752: 2018 (IC-CPD)
- Meet IEC 62955: 2018 (RDC-PD)
- Meet the requirements of AC 30mA and DC 6mA residual current detection.
- PCB installation, easy to use.
- 3,000 A surge current capability



Ideal Power's 36TLB6-A1PV EV Charger Residual Current Transducer Series are certified to RoHS & IEC 61010/IEC 62752 /IEC 62955 Standards and comply with the relevant Efficiency Regulations. These are primarily used in EV Automotive Industries and customised solutions are available upon request.

Models

| Model Number | Input Voltage (V DC) | Rated DC Residual Current (mA) | Rated AC Residual Current (mA) | Rated current (A) | Static Power Dissipation (W) |
|--------------|----------------------|--------------------------------|--------------------------------|--------------------------|------------------------------|
| TLB6-A1PV | 5 | 6 | 30 | 80/ 40(1 phase/ 3 phase) | 0.25 |

Electrical Characteristics

| Item | Symbol | Min | Typ | Max | Unit. |
|---|------------------------|------|-----|------|-------|
| Rated Residual DC Operating Current | $I_{\Delta NDC}$ | -- | 6 | -- | mA |
| Rated Residual AC Operating Current | $I_{\Delta NAC}$ | -- | 30 | -- | mA |
| Range of Remaining DC Operating Current | $I_{\Delta NDC-RANGE}$ | 3 | 4.5 | 6 | mA |
| Range of Remaining AC Operating Current | $I_{\Delta NAC-RANGE}$ | 15 | 24 | 30 | mA |
| Input Voltage | VCC | 4.85 | 5 | 5.15 | V |
| Static Operating Current | -- | -- | 30 | -- | mA |

Protection and Detection Characteristics

| Item | Symbol | Min | Typ | Max | Unit. |
|-------------------------------------|--------------|-----|-----|-----|-------|
| Self-Check Input Low-Level Voltage | V TEST-IN IL | 0 | -- | 1 | V |
| Self-Check Input High-Level Voltage | V TEST-IN IH | 4 | -- | 5.1 | V |
| Calibration Input Low Voltage | V CAL-IL | 0 | -- | 1 | V |
| Calibration Input High Voltage | V CAL-IH | 4 | -- | 5.1 | V |
| Operating Output Low-Level Voltage | V TRIP-OL | 0 | -- | 0.6 | V |
| Operating Output High-Level Voltage | V TRIP-OH | 4.5 | -- | VCC | V |

Isolation Characteristics

| Item | Operating Conditions | Min | Typ | Max | Unit. |
|-----------------------|--|-----|-----|-----|-------|
| Isolation Voltage | Primary edge input, secondary output; 50Hz, 1min; leakage current<0.1mA | -- | -- | 5 | kVAC |
| Insulation Resistance | 500VDC | 1 | -- | -- | GΩ |

General Characteristics

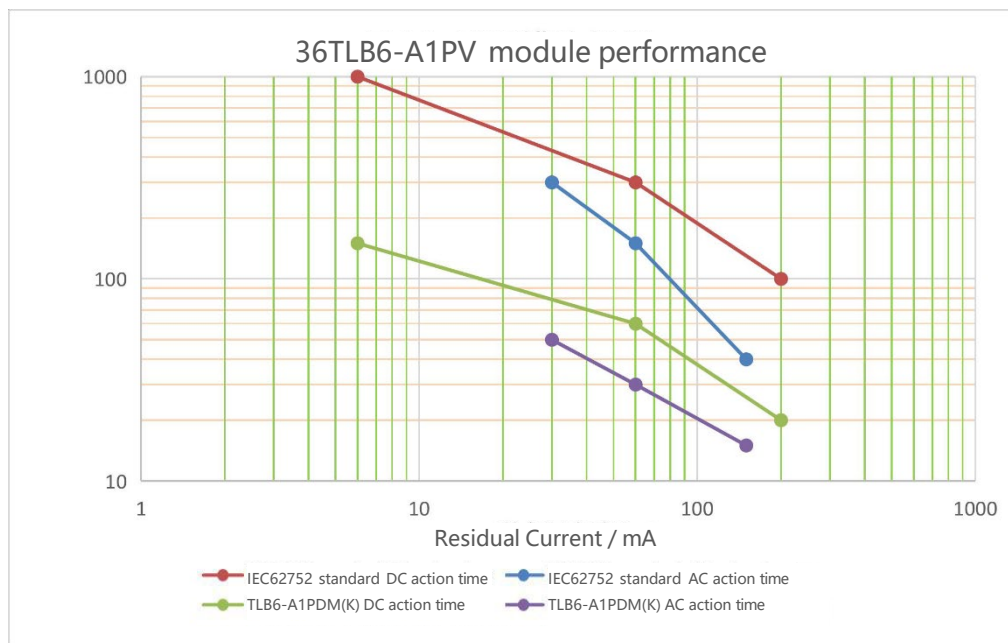
| Item | Symbol | Min | Typ | Max | Unit. |
|-----------------------|--|-----|-----|------|-------|
| Operating Temperature | Ta | -40 | -- | +85 | °C |
| Storage Temperature | Ts | -50 | -- | +125 | °C |
| Weight | m | -- | 32 | -- | g |
| Vibration | 20-150Hz, 2g (GB2423.10, IEC60068-2-6) | | | | |
| Overvoltage Category | OVC III (IEC61010) | | | | |

Performance Characteristic

| Item | Symbol | Residual Current Waveform | Min | Typ | Max | Unit. |
|----------------------------|-----------------------------|---|-----|------|-----|--------|
| Residual operating current | IΔNAC50 | Frequency 50Hz AC | 15 | 22.5 | 30 | mA RMS |
| | IΔNA0 | 0 Angle Pulsating DC | 11 | 15 | 30 | mA RMS |
| | IΔNA90 | 90 Angle Pulsating DC | 10 | 15 | 30 | mA RMS |
| | IΔNA135 | 135 Angle Pulsating DC | 10 | 15 | 35 | mA RMS |
| | IΔNS-DC | Smooth DC | 3 | 4.5 | 6 | mA RMS |
| | IΔN2PDC | Two-Phase Rectification DC | 3.5 | 5 | 7 | mA RMS |
| | IΔN3PDC | Three-Phase Rectification DC | 3.1 | 4.5 | 6.2 | mA RMS |
| | IΔNF | Composite Current | 18 | 28 | 38 | mA RMS |
| Response time | TΔNAC50@30mA | RMS 30mA Frequency 50Hz AC | -- | 40 | 60 | ms |
| | TΔNAC50@60mA | RMS 60mA Frequency 50Hz AC | -- | 30 | 60 | ms |
| | TΔNAC50@150mA | RMS 150mA Frequency 50Hz AC | -- | 15 | 40 | ms |
| | TΔNA0@42mA | RMS 42mA 0 Angle Pulsating DC | -- | 38 | 50 | ms |
| | TΔNA0@84mA | RMS 84mA 0 Angle Pulsating DC | -- | 30 | 40 | ms |
| | TΔNA0@210mA | RMS 210mA 0 Angle Pulsating DC | -- | 25 | 35 | ms |
| | TΔNA0@42mA+S-DC@6mA | RMS 42mA 0 Angle Pulsating DC with 6mA Smooth DC | -- | 38 | 50 | ms |
| | TΔNA0@84mA+S-DC@6mA | RMS 84mA 0 Angle Pulsating DC with 6mA Smooth DC | -- | 30 | 40 | ms |
| | TΔNA0@210mA+S-DC@6mA | RMS 210mA 0 Angle Pulsating DC with 6mA Smooth DC | -- | 25 | 35 | ms |
| | TΔNS-DC@6mA | 6mA Smooth DC | -- | 140 | 200 | ms |
| | TΔNS-DC@60mA | 60mA Smooth DC | -- | 25 | 60 | ms |
| | TΔNS-DC@300mA | 300mA Smooth DC | -- | 25 | 30 | ms |
| | TΔN2PDC@6mA | RMS 6mA Two Phase Rectification DC | -- | 140 | 200 | ms |
| | TΔN2PDC@60mA | RMS 60mA Two Phase Rectification DC | -- | 25 | 60 | ms |
| | TΔN2PDC@300mA | RMS 300mA Two Phase Rectification DC | -- | 25 | 30 | ms |
| | TΔN3PDC@6mA | RMS 6mA Three Phase Rectification DC | -- | 140 | 200 | ms |
| | TΔN3PDC@60mA | RMS 60mA Three Phase Rectification DC | -- | 25 | 60 | ms |
| | TΔN3PDC@300mA | RMS 300mA Three Phase Rectification DC | -- | 25 | 30 | ms |
| TΔNF@210mA | RMS 210mA Composite Current | -- | 15 | 35 | ms | |

EMC

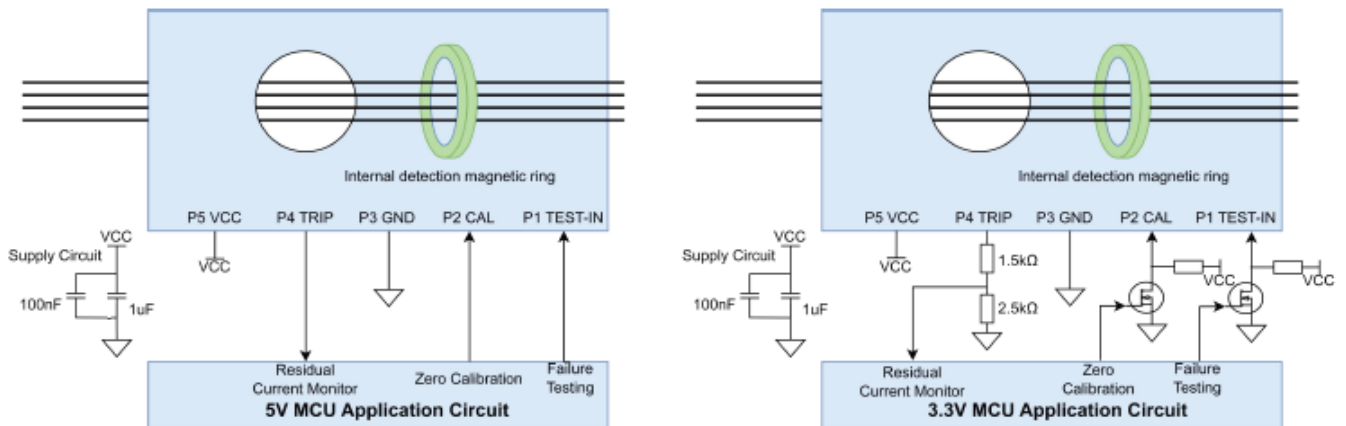
| Item | Specifications | | |
|------|----------------|---|------------------|
| EMI | CE | CISPR32/EN55032 CLASS B | |
| | RE | CISPR32/EN55032 CLASS B | |
| EMS | ESD | IEC/EN61000-4-2 Contact $\pm 6kV$, Air $\pm 8kV$ | perf. Criteria A |
| | RS | IEC/EN61000-4-3 30V/m | perf. Criteria A |
| | Surge Current | IEC62955 6000V/2 Ω /3000A, 8/20us | perf. Criteria B |

Characteristic Curve


AC-DC

Pin Configuration

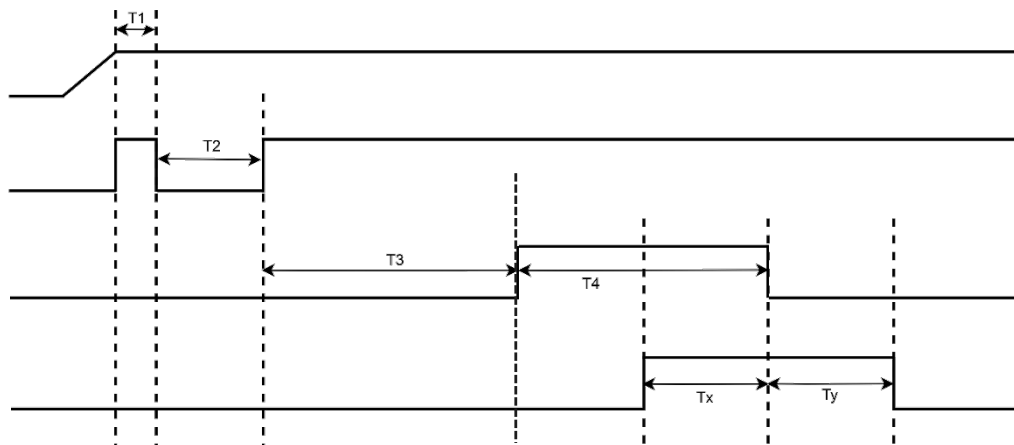
| Pin | Mark | Description |
|-----|---------|--|
| 1 | TEST-IN | Test pin, when the pin inputs high level, there will be a built-in residual current, making the action signal action. It can be designed for periodic self-testing of products. |
| 2 | CAL | Zero calibration pin, when the pin inputs a duration >50ms and <100ms low voltage, the calibration function is enabled, and the residual current detected at the moment is used as the zero current point of the residual current compensated for subsequent detection. This residual current compensation value is stored internally and continues to be compensated upon reboot. |
| 3 | GND | Product-powered ground. |
| 4 | TRIP | Trip output pin, when detected > 6mA DC residual current or > 30mA AC residual current, the pin is set high and a trip signal is generated. |
| 5 | VCC | The product is powered by VCC, which needs to supply 5V, and 100nF and 1uF capacitors are connected in parallel at the input end. |

Connection and Description


- Two capacitors 1uF/16V and 100nF/16V need to be provided at VCC and GND for energy storage and decoupling.
- Residual current protection monitoring pin TRIP, zero calibration pin CAL, and TEST-IN pin are generally controlled by a microcontroller.
- The residual current protection detection pin will output high level when the current value flowing through the internal detection magnetic ring exceeds the specification value.
- When the module is started, the zero-calibration pin should be kept at a low level for a period of time and then placed at a high level. See the timing sequence characteristic description.
- TEST-IN is used to test the performance of residual current transducer when self-test is required, and the test signal needs to meet the timing characteristics.
- Hot plug is unavailable.
- The product is connected to 5V MCU for use, and it is necessary to pay attention to level matching. If a 3.3V MCU is connected, a level conversion circuit is required for voltage conversion (as shown in the figure above). The 5V voltage is converted to 3.3V by two resistors, and the ratio of the two resistors is generally selected to be close to 3:5. At the same time, the input impedance of the MCU should be considered, and the resistance value of the two voltages should not be greater than one-tenth of the input impedance of the MCU. For example, the values of the two resistors are 1.5kΩ and 2.5kΩ or 10kΩ and 15kΩ. In addition, the zero-calibration function and failure testing function need to adjust the timing. For example, the zero-calibration function of the product is effective at a low level. After connecting the MOS for level conversion, the 3.3V MCU should output a high level to make the calibration function effective, and the 3.3V MCU should output a low level when the product is not calibrated. Similarly, the 3.3V MCU output's low level makes the failure testing function effective; when failure testing is not in use, the 3.3V MCU should output a high level.

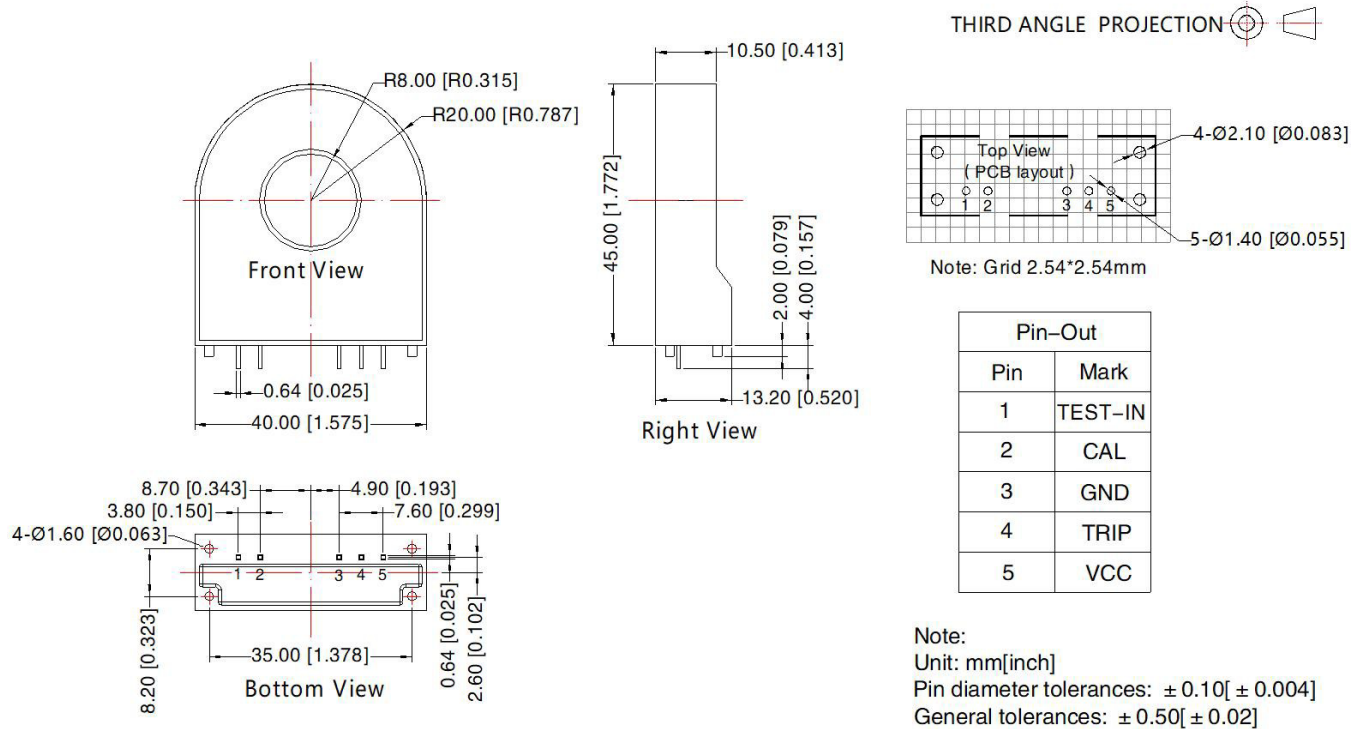
Timing Characteristics

| Item | Symbol | Min | Typ | Max | Unit. |
|---|--------|-----|-----|-----|-------|
| Start To Calibration Interval | T1 | 600 | -- | -- | ms |
| Calibrate Signal Maintenance Time | T2 | 50 | -- | 100 | ms |
| Calibration Signal Completion Wait Time | T3 | -- | 500 | -- | ms |
| Test Signal Duration | T4 | 400 | -- | -- | ms |

Timing Application Design


Timing application design essentials:

1. After the power supply is fully started, the startup and stabilisation time of the module is about 40-1200ms (T1). During this period, it is recommended that the whole system do not operate.
2. When performing signal calibration, the external signal sets the TEST-IN pin to a low level, and the recognition time (T2) of the TEST-IN pin low level is about 300ms. After successful identification, a signal calibration test is carried out internally. The duration of the calibration test was approximately 200ms (T3).
3. External input test current I_{DN1} , delay about 80ms (T4), X6-OUT pin output high impedance (trip signal); Then the test current is increased to I_{DN2} , and after a delay of about 20ms (T5), the X6-OUT pin and X30-OUT pin output high impedance (trip signal).
4. The test current input stops, and after a delay of about 200ms (T6), the X6-OUT pin and X30-OUT pin stop the output trip signal and output low level.
5. When the external input test current I_{DN3} (I_{DN3} is greater than the product measurement range), the X6-OUT pin and X30-OUT pin first output the high impedance (trip signal), and after a delay of about 300ms, the ERROR-OUT pin outputs the high impedance.

Mechanical Specifications

Notes:

1. For additional information on Product Packaging, please refer to www.idealpower.co.uk. Packaging bag number: 58070006.
2. All index testing methods in this datasheet are based on company corporate standards.
3. Unless otherwise specified, parameters in this datasheet were measured under the conditions of $T_a=25^\circ\text{C}$, humidity<75%RH with nominal input voltage.
4. We can provide product customisation service. Please contact our technicians directly for specific information.
5. This product is used in electronic equipment. Please follow the operation and instructions of the manual and use it in a standard and safe environment.
6. Please do not install the product in a dangerous area; beware of the risk of electric shock during operating, some modules may generate dangerous voltages (such as primary wires, power supply wires);
7. This product is a build-in device. After installation, the conductive part must not be touched completely. A protective box or shield can be used.
8. It is strictly forbidden to disassemble and assemble the products privately to prevent equipment without failure or malfunction.
9. Our products shall be classified according to ISO14001 and related environmental laws and regulations and shall be handled by qualified units.