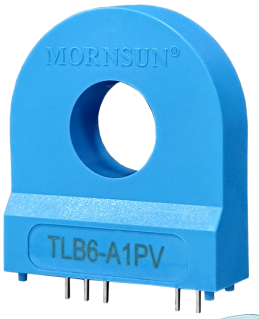
EV Charger Residual Current Transducer
TLB6-A1PV



RoHS

3 years Warranty

Features

- Open-loop, fluxgate-based current transducer
- Meet the residual current requirements of Mode 2 (IEC 62752, GB/T 41589)
- Meet the residual current requirements of RDC-PD in Mode 3 (IEC 62955, GB/T 40820)
- Meet the requirements of AC 30mA and DC 6mA residual current detection
- PCB installation, easy for using
- 3,000 A surge current capability

TLB6-A1PV *is a residual current transducer for EV charger. It can be widely used in the electric vehicle charger industry. It uses fluxgate detection technology to detect DC, AC, and various pulsating residual currents. The module meets the residual current detection standards of IEC 62752, GB/T 41589 (Mode 2) and IEC 62955, GB/T 40820 (mode 3). It can detect residual current waveform covering Type B, and can detect 6mA DC residual current. The trigger is sensitive and responds to leakage events in time.*

Selection Guide

Part No.	Input Voltage (VDC)	Rated DC Residual Current (mA)	Rated AC Residual Current (mA)	Rated current (A)	Maximum Power Dissipation(W)
TLB6-A1PV	5	6	30	80A/ 40A (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	V_{CC}	4.85	5	5.15	V
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	$V_{TEST-IN\ IH}$	3	--	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 Test	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	℃
Storage Temperature	T_S	-50	--	+125	℃
Weight	m	--	32	--	g
Vibration		20-150Hz, 2g	(GB2423.10, IEC60068-2-6)		
Overvoltage Category		OVC III	(IEC61010)		

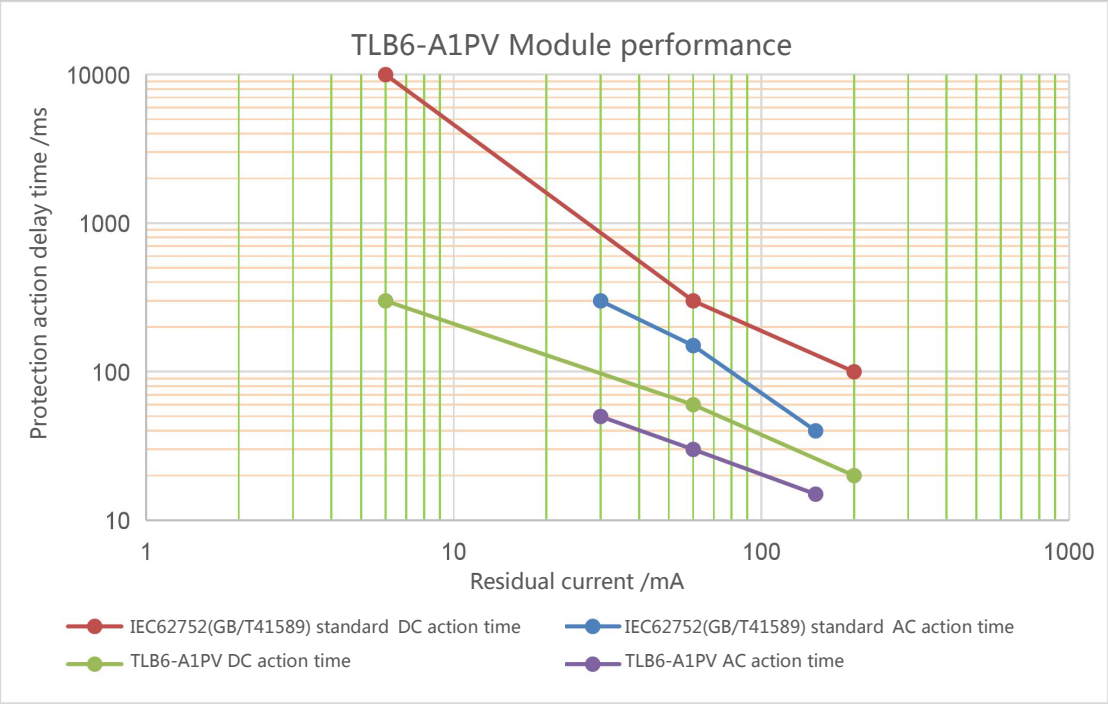
Performance Characteristic

Item	Symbol	Residual Current Waveform	Min	Typ	Max	Unit.
Residual Operating Current	$I_{\Delta NAC50}$	Frequency 50Hz AC	15	22.5	30	mA RMS
	$I_{\Delta NA0}$	0 Angle Pulsating DC	11	15	30	mA RMS
	$I_{\Delta NA90}$	90 Angle Pulsating DC	10	15	30	mA RMS
	$I_{\Delta NA135}$	135 Angle Pulsating DC	10	15	35	mA RMS
	$I_{\Delta NS-DC}$	Smooth DC	3	4.5	6	mA RMS
	$I_{\Delta N2PDC}$	Two Phase Rectification DC	3.5	5	7	mA RMS
	$I_{\Delta N3PDC}$	Three Phase Rectification DC	3.1	4.5	6.2	mA RMS
	$I_{\Delta NF}$	Composite Current	18	28	38	mA RMS
Response Time	$T_{\Delta NAC50@30mA}$	RMS 30mA Frequency 50Hz AC	--	40	60	ms
	$T_{\Delta NAC50@60mA}$	RMS 60mA Frequency 50Hz AC	--	30	60	ms
	$T_{\Delta NAC50@150mA}$	RMS 150mA Frequency 50Hz AC	--	15	40	ms
	$T_{\Delta NA0@42mA}$	RMS 42mA 0 Angle Pulsating DC	--	38	50	ms
	$T_{\Delta NA0@84mA}$	RMS 84mA 0 Angle Pulsating DC	--	30	40	ms
	$T_{\Delta NA0@210mA}$	RMS 210mA 0 Angle Pulsating DC	--	25	35	ms
	$T_{\Delta NA0@42mA+S-DC@6mA}$	RMS 42mA 0 Angle Pulsating DC with 6mA Smooth DC	--	38	50	ms
	$T_{\Delta NA0@84mA+S-DC@6mA}$	RMS 84mA 0 Angle Pulsating DC with 6mA Smooth DC	--	30	40	ms
	$T_{\Delta NA0@210mA+S-DC@6mA}$	RMS 210mA 0 Angle Pulsating DC with 6mA Smooth DC	--	25	35	ms
	$T_{\Delta NS-DC@6mA}$	6mA Smooth DC	--	300	600	ms
	$T_{\Delta NS-DC@60mA}$	60mA Smooth DC	--	25	60	ms
	$T_{\Delta NS-DC@300mA}$	300mA Smooth DC	--	25	30	ms
	$T_{\Delta N2PDC@60mA}$	RMS 60mA Two Phase Rectification DC	--	25	60	ms
	$T_{\Delta N2PDC@300mA}$	RMS 300mA Two Phase Rectification DC	--	25	30	ms
	$T_{\Delta N3PDC@6mA}$	RMS 6mA Three Phase Rectification DC	--	300	400	ms
	$T_{\Delta N3PDC@60mA}$	RMS 60mA Three Phase Rectification DC	--	25	60	ms
	$T_{\Delta N3PDC@300mA}$	RMS 300mA Three Phase Rectification DC	--	25	30	ms
	$T_{\Delta NF@210mA}$	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 ±6kV, Air ±8kV	perf. Criteria A
	RS	IEC/EN61000-4-3 30V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4 ±4kV	perf. Criteria A
	Surge Current	6000V/2Ω/3000A, 8/20us	perf. Criteria B

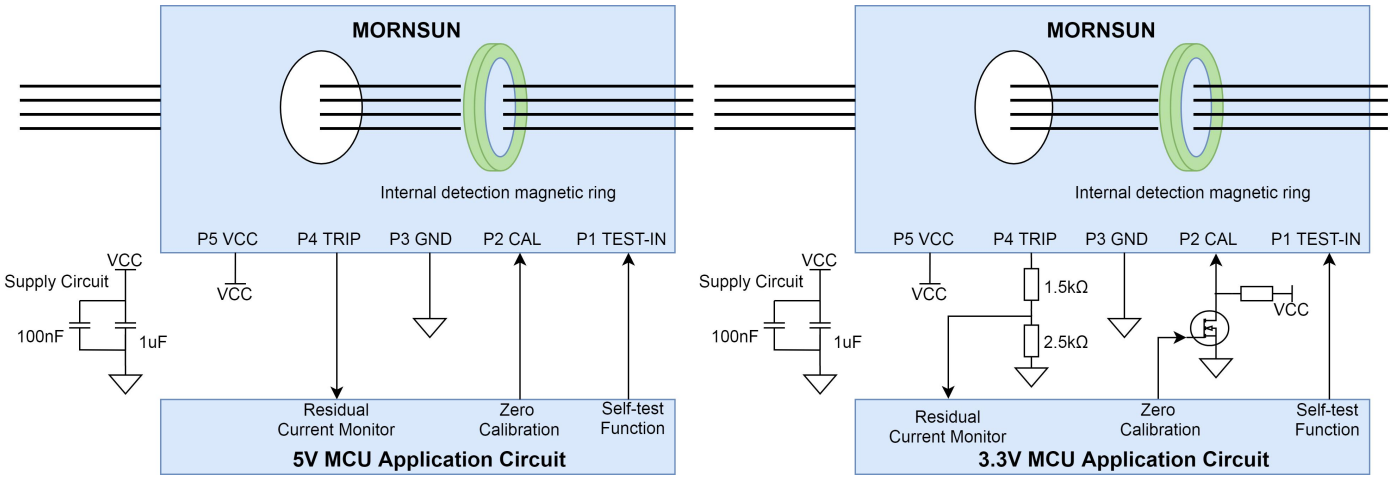
Product Characteristic Curve



Pin Description

Pin	Mark	Description
1	TEST-IN	Test pin, when the pin input high level, there will be a built-in residual current, making the action signal action. It can be designed for periodic self-test 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 in push-pull mode 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

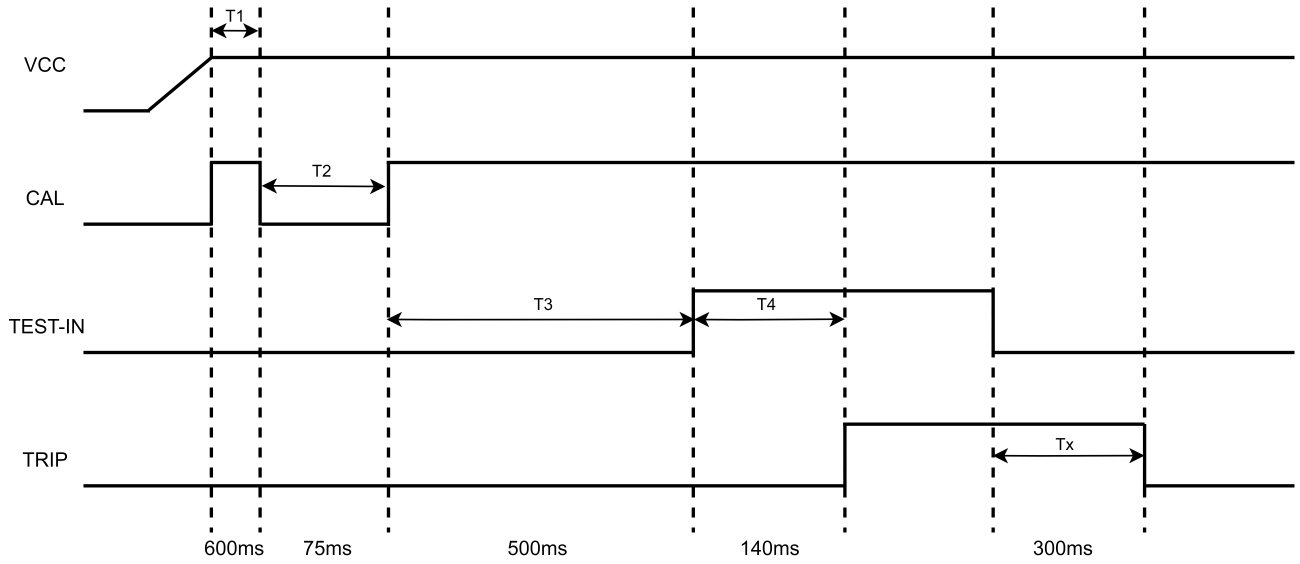


1. Two capacitors 1uF/16V and 100nF/16V need to be provided at VCC and GND for energy storage and decoupling.
2. Residual current protection monitoring pin TRIP, zero calibration pin CAL, and TEST-IN pin are generally controlled by a microcontroller.
3. The residual current protection detection pin will output high level when the current value flowing through the internal detection magnetic ring exceeds the specification value.
4. 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.
5. 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.
6. Hot plug is unavailable.
7. 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. At the same time, the zero-point calibration function needs to adjust the level logic. When accessing the 3.3V periphery of the above MCU, the MOS tube is used for level conversion, and the opposite logic is required for control.
8. The product is susceptible to magnetic interference, it is recommended that the main circuit switch relay away from the product placement.

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	--	--	200	ms

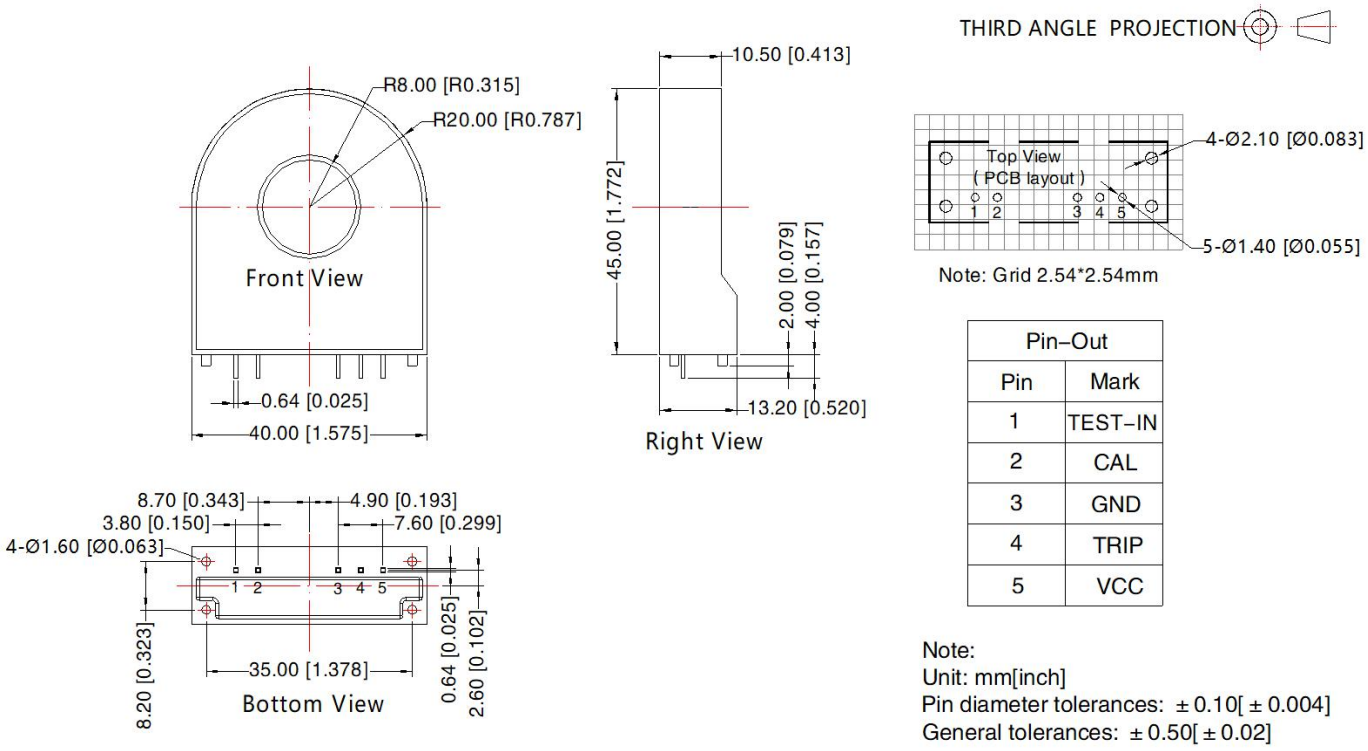
Timing Application Design



Timing application design essentials:

1. After the power supply is fully started, the module has a startup stability time of 200-300ms. It is recommended that the zero calibration delay time T1 should be greater than 600ms;
2. Zero calibration signal duration T2 should be greater than 50ms, less than 100ms; When CAL low time is greater than 50ms, TLB6-A1PV starts to zero correction, and it is recommended that CAL duration T2 be 75ms.
3. After the completion of calibration, the calibration stabilization time is about 200-250ms, and the waiting time for the calibration completion time T3 should be greater than 500ms, and the recommended stabilization time of T3 is 500ms;
4. he TEST-IN self-test test signal can only be enabled after T3 is complete, After the TEST-IN signal application duration T4 is about 120-140ms, TRIP is set high. It is recommended to keep T4 at least 200ms and use rising edge to detect TRIP signal.
5. After the module TRIP is set to high level, the TEST-IN can be set to low level. After the TEST-IN signal is turned off, the high level of the TRIP pin returns to low level after Tx=150-350ms, and the residual current detection is required after 350ms.
6. In the process of self-test and calibration, do not close the charging switch of the main loop, so as to avoid the residual current that will affect the self-test and calibration function of the module. After completing the self-test and calibration function, if the TRIP pin is turned over to a high level, it is judged that RCD is normal and the self-test signal is removed. Wait for the TRIP pin to return to the low level before conducting subsequent charging and detection operations.
7. After completing the above calibration and self-test after starting, it is not recommended to continue calibration and self-test during normal operation. In order to avoid accidental leakage current detection in the module leading to false trip, the time required for self-test signal T4 should be extended to >300ms after 5s of module startup. If the system is applied, the self-test should be performed again after 5s of startup, and the duration of TEST-IN signal T4 should be 400ms.

Dimensions and Recommended



Pin–Out	
Pin	Mark
1	TEST–IN
2	CAL
3	GND
4	TRIP
5	VCC

Note:
Unit: mm[inch]
Pin diameter tolerances: ± 0.10[± 0.004]
General tolerances: ± 0.50[± 0.02]

Notes:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. 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 Ta=25℃, humidity<75%RH with nominal input voltage;
4. We can provide product customization service, please contact our technicians directly for specific information;
5. This products 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 products 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.

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