TLx5572 Wiresense evaluation board user guide

XENSIV™ current sensors

About this document

Scope and purpose

This user guide describes the hardware functionalities of XENSIV™ TLx5572 current sensors evaluation board (EVAL_TLX5572_WIRESEN) contains three TLx5572 sensors in a circular array for cable current-sensing applications.

Intended audience

This document is intended for design engineers, technicians, and developers of electronic systems involved in the evaluation of the XENSIV™ TLx5572 current sensors.

About this product group

Target applications

- Server power supply units (PSU)
- DC-DC converters
- On-board charging
- General purpose motor drive
- Photovoltaic

Product family

Infineon's XENSIV™ current sensors deliver precise AC and DC current measurements with internal current rail (iCR) packages and up to several kiloamps with external current rail (eCR) packages.

Evaluation board

This board is to be used during the design-in process for evaluating and measuring characteristic curves, and for checking datasheet specifications.

Note: PCB and auxiliary circuits are NOT optimized for final customer design.

Safety precautions

Note: Please note the following warnings regarding the hazards associated with development systems.

Table 1 Safety precautions

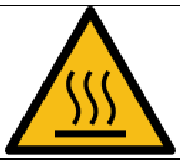	**Caution:** *The heat sink and device surfaces of the evaluation or reference board may become hot during testing. Hence, necessary precautions are required while handling the board. Failure to comply may cause injury.*
	**Caution:** *Only personnel familiar with the drive, power electronics and associated machinery should plan, install, commission and subsequently service the system. Failure to comply may result in personal injury and/or equipment damage.*
	**Caution:** *The evaluation or reference board contains parts and assemblies sensitive to electrostatic discharge (ESD). Electrostatic control precautions are required when installing, testing, servicing or repairing the assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with electrostatic control procedures, refer to the applicable ESD protection handbooks and guidelines.*
	**Caution:** *A drive that is incorrectly applied or installed can lead to component damage or reduction in product lifetime. Wiring or application errors such as undersizing the motor, supplying an incorrect or inadequate AC supply, or excessive ambient temperatures may result in system malfunction.*
	**Caution:** *The evaluation or reference board is shipped with packing materials that need to be removed prior to installation. Failure to remove all packing materials that are unnecessary for system installation may result in overheating or abnormal operating conditions.*

Table of contents

1 The board at a glance

The XENSIV™ TLx5572 Wiresense evaluation board (EVAL_TLX5572_WIRESEN) is developed to familiarize you with the TLx5572 current sensor for design-in support and evaluation purposes. It contains three sensors in a circular array and is optimized for cable current monitoring.

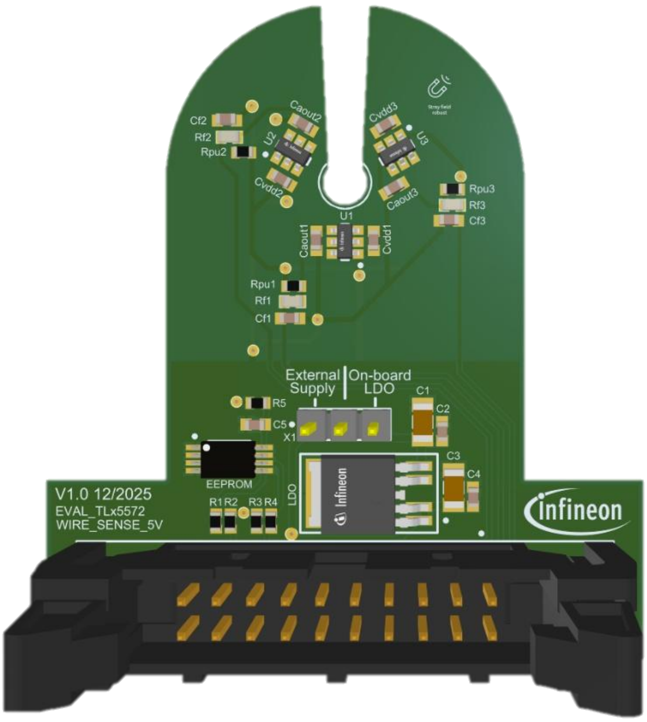

Figure 1 XENSIV™ TLx5572 Wiresense evaluation board

1.1 Block diagram

The device measures a magnetic field via a tunnel magnetoresistance (TMR) bridge. The output signal from the TMR bridge is fed into a first stage of amplification via an operational transconductance amplifier (OTA).

The output of the OTA runs through a differential amplifier, which provides a signal on the AOUT pin. The sensor is temperature compensated, pre-calibrated, and trimmed.

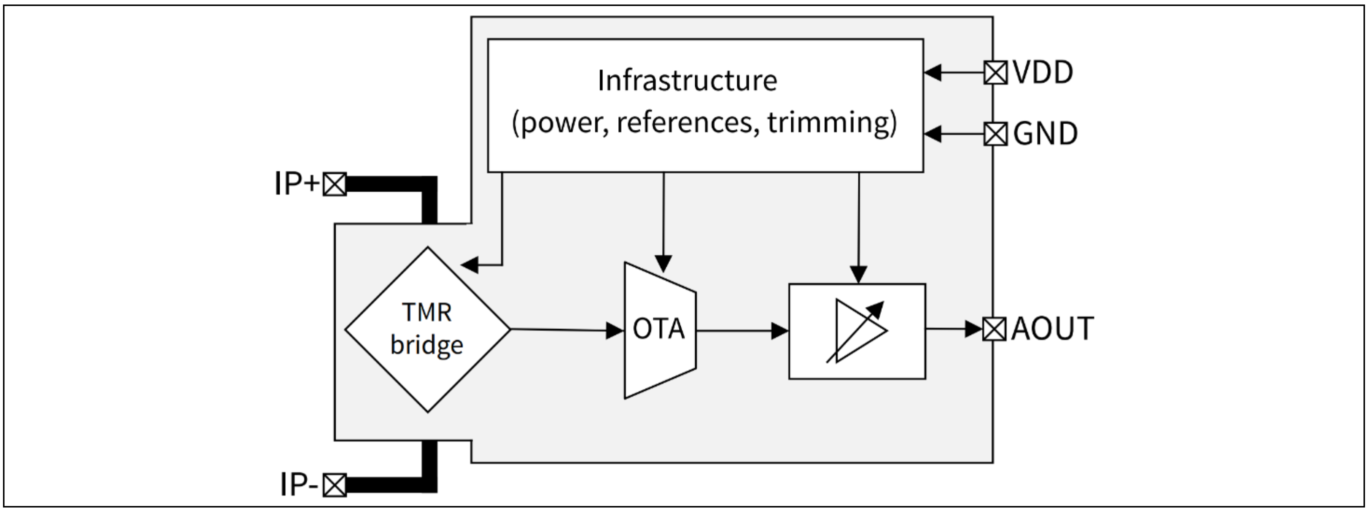

Figure 2 XENSIV™ TLx5572 Wiresense evaluation board block diagram

1.2 Main features

- The board is used for cable current measurement
- Three TLX5572 sensors provide robustness against external fields and cable-offset conditions
- Current rail replacement

1.3 Board parameters and technical data

The XENSIV™ TLx5572 Wiresense evaluation board (EVAL_TLX5572_WIRESEN) embeds three XENSIV™ TLx5572-AE04E1-R-E0001 current sensors with the characteristics listed in Table 2.

Table 2 TLx5572-AE04E1-R-E0001 sensor characteristics

Parameter	Symbol	Value	Unit
Sensitivity	S	12.88 (typ.)	mV/A
Full-scale	FS	150	A
Output mode	–	Analog output of three sensors	–
Sensor placement from the center	–	5	mm
Angular placement of the sensors	–	120	degree

For more information, see the product datasheet [1].

2 System and functional description

2.1 Commissioning

Supply the board via pin 16 (VS+, LDO input). To enable the onboard low-dropout (LDO), place the jumper provided on the board. The supply voltage must be 3.6 V for 3 V LDO output and 5.5 V for 5 V LDO output. See Figure 7 for the complete pinout of the evaluation board connector.

2.2 Description of the functional blocks

The board consists of three TLX5572 current sensors to accurately sense DC currents and a low dropout regulator to stabilize the supply voltage of the sensors. For additional information about the TLx5572, see the product datasheet [1].

2.3 Sensing structure layout

The sensor is sensitive to the sensing element plane magnetic field component directed from pin 5 to pin 2. The magnetic field on the sensing element location is positive when directed from pin 5 to pin 2. The magnetic field generated by a current flowing in an external conductor is positive when the current flows from pin 1 to pin 3. The sensor provides an output voltage higher than VOQ when the magnetic field is positive and lower than VOQ when the magnetic field is negative.

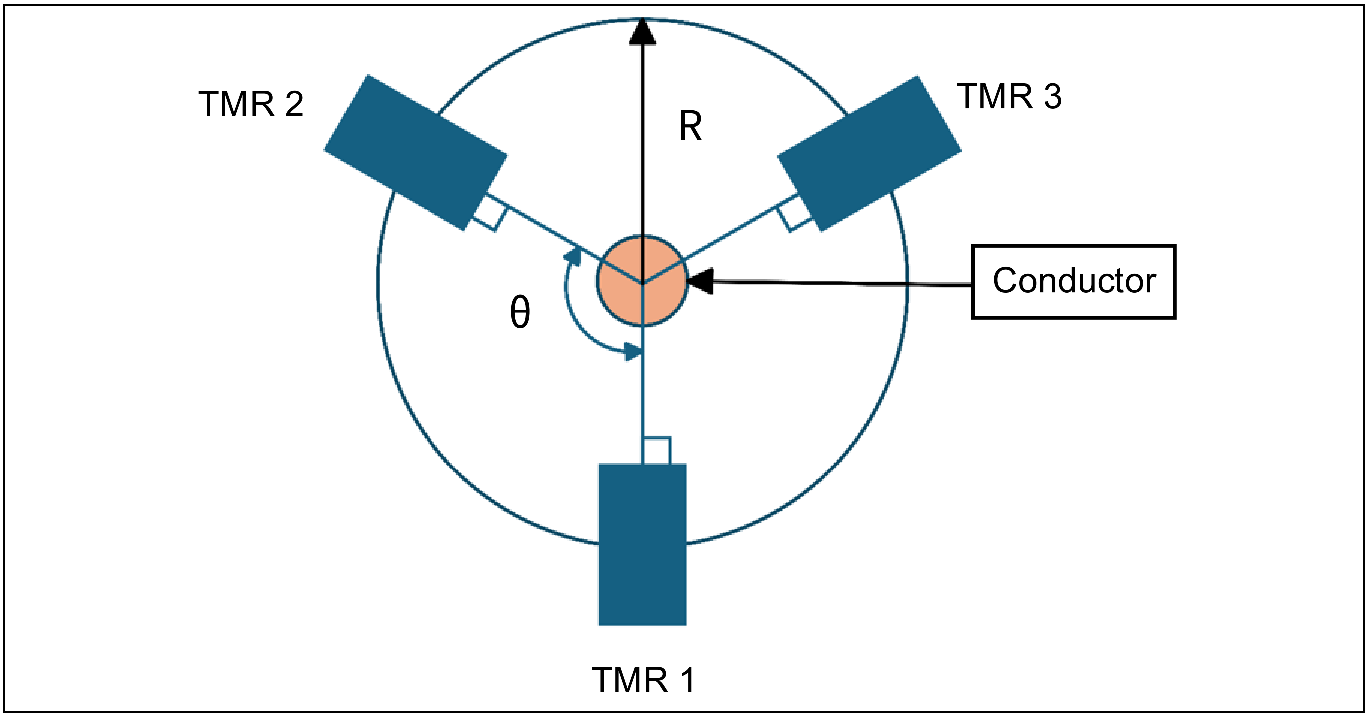

Figure 3 Sensing concept overview

3 System design

3.1 Schematics

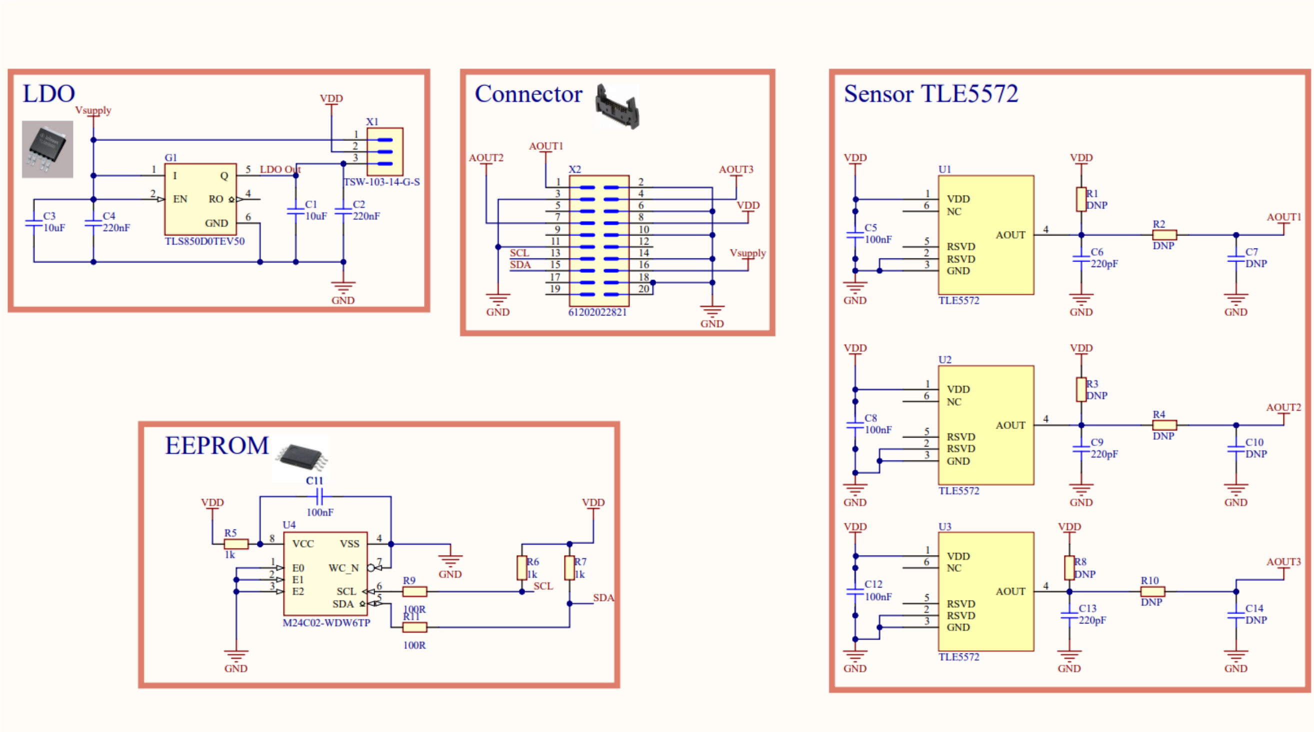

Figure 4 Schematics

To suppress the high-frequency noise and meet the EMC and ESD requirements, the following capacitors have been implemented:

- A 100 nF bypass capacitor at the VDD pins of the sensors
- A 220 pF bypass capacitor at the output pins of the sensors
- An LDO is implemented to supply the sensors with a stable voltage

3.2 Layout

The TLx5572 evaluation board consists of two layers, as shown in Figure 5.

#	Name	Material	Type	Weight	Thickness	Dk
	Top Overlay		Overlay			
	Top Solder	Solder Resist	Solder Mask		0.02mm	3.5
1	L1_Top	CF-004	Signal	1oz	0.035mm	
	Dielectric 1	FR-4	Prepreg		0.24mm	4.3
2	L2_Bot	CF-004	Signal	1oz	0.035mm	
	Bottom Solder	Solder Resist	Solder Mask		0.02mm	3.5
	Bottom Overlay		Overlay			

Figure 5 Layer stack-up of the evaluation board

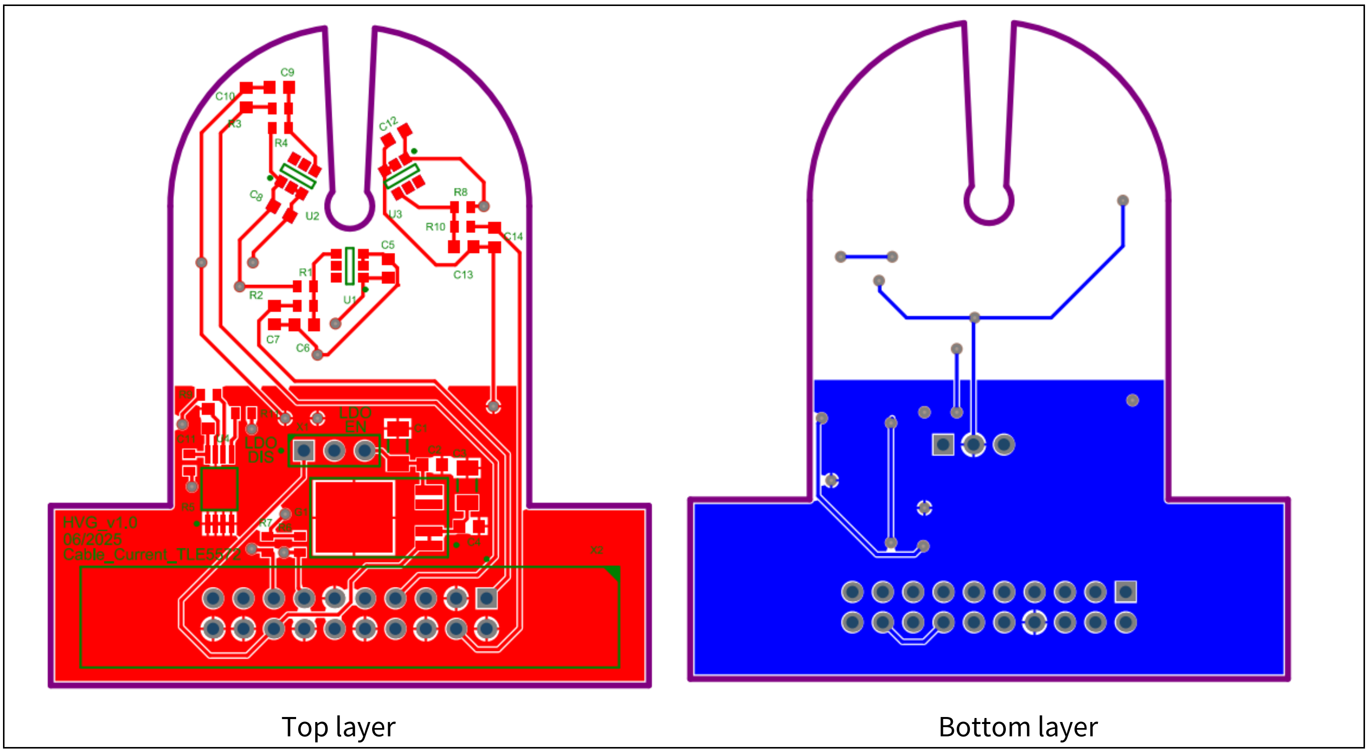

Figure 6 **Evaluation board PCB layout**

- Ground planes are used to protect the signal tracks and reduce the parasitic inductive couplings. In addition, it dissipates heat generated by components
- Copper planes are kept away from the sensing area to avoid magnetization effects

3.3 Bill of materials

Table 3 **Bill of materials**

Quantity	Ref designator	Description	Manufacturer	Manufacturer P/N	Populated
3	U1, U2, U3	TMR-based current sensor PG-SOT23-6-4	Infineon	TLx5572-AE04E1-x-E0001	Yes
1	G1	Low dropout linear voltage regulator, fixed output Voltage 5 V	Infineon	TLS850D0TEV50	Yes
1	X1	Header	–	TSW-103-14-G-S	Yes
1	X2	WR-BHD box header with long lever, male, pitch 2.54 mm, THT, straight, 20 p	–	61202022821	Yes
1	U4	EEPROM TSSOP8	–	M24C02-WDW6TP	Yes

Quantity	Ref designator	Description	Manufacturer	Manufacturer P/N	Populated
4	C5, C8, C11, C12	Capacitor, 100 nF, 0603	–	100 nF	Yes
3	C6, C9, C13	Capacitor, 220 pF, 0603	–	220 pF	Yes
2	C1, C3	Capacitor, 10 µF, 1206	–	–	Yes
2	C2, C4	Capacitor, 220 nF, 0603	–	–	Yes
2	R9, R11	Resistor, 100 ohms, 0603	–	–	Yes
3	R5, R6, R7	Resistor, 1k ohms, 0603	–	–	Yes
6	R1, R2, R3, R4, R8, R10	Resistor 0603	–	–	No
3	C7, C10, C14	Capacitor 0603	–	–	No

3.4 Connector details

Table 4 Connectors

Pin	Label	Function
1	AOUT1	Analog output voltage of sensor 1
7	AOUT2	Analog output voltage of sensor 2
4	AOUT3	Analog output voltage of sensor 3
8	VDD	Supply voltage, connected to each sensor on VDD pin. This voltage is generated on board by the LDO
13	SCL	Clock for communication with external EEPROM on Infineon's evaluation boards
15	SDA	Data link for communication with external EEPROM on Infineon's evaluation boards
16	V supply	External supply voltage of the evaluation board for LDO
2, 3, 6, 10, 11, 14, 18, 20	GND	Ground connection
5, 9, 12, 17, 19	Not connected	Not connected

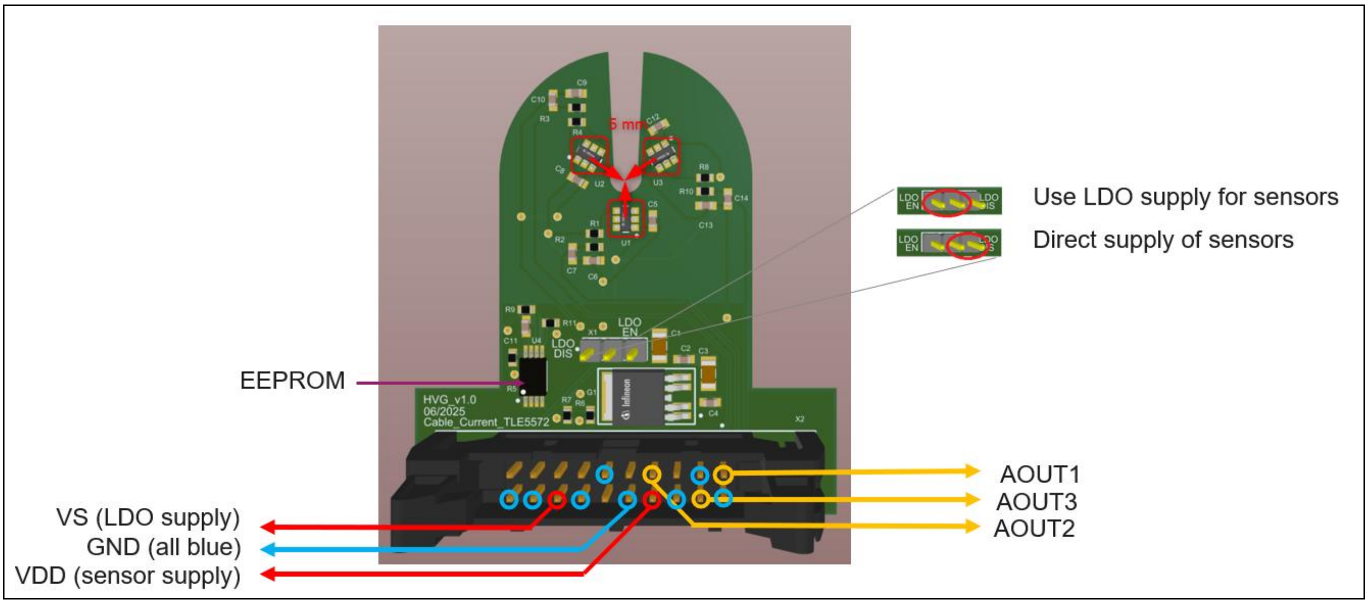

Figure 7 Pinout

4 System performance

4.1 Test points

The output voltages of the three sensors are measured at the evaluation board connector. See Figure 7 for the complete pinout of the evaluation board connector.

4.2 Test results

4.2.1 Sensor calibration setup

1. Select the LDO to provide a stabilized 3.3 V at VDD
- **Recommended**: Sensor supply via an LDO, 5 V
  - Place jumper on LDO_EN
- Direct supply of sensors (expert use only, V_{QC} and the full-scale range will change)
  - VDD 3.3 V to 5 V
  - Place the jumper on LDO_DIS

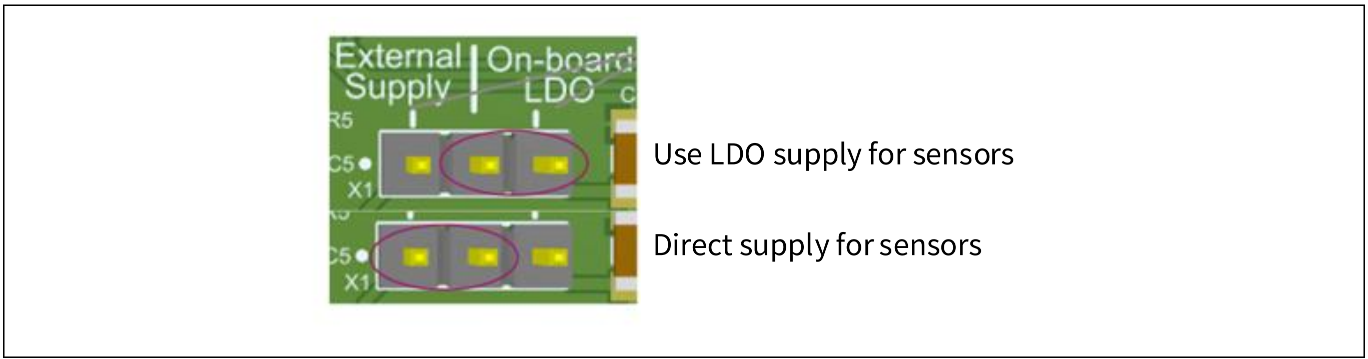

Figure 8 Supply selection: Onboard LDO vs. external VDD

2. Connect supply voltage input (VS)
- Set V_s =V_DD +0.5 V (e.g., 5.5 V for 5 V board version)
- Observe V_DD =3.3 V or 5 V
- Observe $V_{Aout}\ at\ (I_{primary} = 0A) = \frac{V_{DD}}{2} = V_{QC} = 1.65V\ or\ 2.5V$ at each output (Sensor 1, 2, 3)
3. Place the cable in the slit provided on the board.
- Supply $I_{primary}$ through cable
- Observe $V_{Aout} - V_{QC}$ changing proportionally to the $I_{primary}$

4.2.2 Final estimation of 5 V onboard supply

$$\text{Average Sensitivity} \ = \sim 12.88 \ \frac{mV}{A}$$

Equation 1 Average sensitivity

$$V_{QC\ nominal} = \frac{V_{DD}}{2} = 2.5\ V$$

Equation 2 Output voltage quiescent

$$V_{Avg.out} = \frac{V_{outs1} + V_{outs2} + V_{outs3}}{2}$$

Equation 3 Output voltage average

$$Current_{measured} \ = \frac{1}{Average\ Sensitivity} \cdot (V_{Avg.out} - V_{QC}) = \frac{1}{12.88} \frac{A}{mV} \cdot \ (2.82\ V - 2.5\ V) = \sim 25\ A$$

Equation 4 Measurement example for a 320 mV reading

4.2.3 Offset and sensitivity calibration

Single point sensitivity calibration

1. Offset compensation
- Measure $V_{QC} = V_{Avg.out}$ at $(I_{primary} = 0)$
2. Sensitivity compensation
- Pulse, e.g., $I_{primary} = 25\ A$ to keep self-heating at a minimum.
(Recommendation is approximately 20% of the full-scale range to have a good balance between self-heating and accuracy)
- Measure $V_{Avg.out}$ at $(I_{primary} = 25\ A)$
- Calculate the $Sensitivity = \frac{V_{Avg.out} - V_{QC}}{I_{primary}}$ in $\frac{mV}{A}$ for this specific board

Use these parameters V_{QC} and $Sensitivity$ for the calculation of the actual current:

$$I_{primary_{measured}} \ = \frac{1}{Sensitivity} \cdot (V_{Avg.out} - V_{QC})$$

Equation 5 Calibrated measurement

4.2.4 Measurement notes for error calculation

1. VDD = 5 V
2. Full scale range = 125 A
3. Estimated sensitivity = 12.88 mV/A (average sensitivity measured across all boards during measurement)
4. Seven boards were observed (each has three sensors)

5. Offset compensated at 0 A
6. Sensitivity calibrated at 25 A
7. $Current\ Error = \frac{\mathrm{V_{Avg.out}}}{\mathrm{Sensitivity}} - I_{primary}$

$$Error\ (\%) = \frac{Current\ Error}{Full\ scale\ Range}$$

4.2.5 Calibration

- It ensures that the sensor is measuring the magnetic field accurately, which is critical in applications where small errors can have significant consequences
- It identifies and corrects any errors or biases in the sensor's output, ensuring that the data is reliable and trustworthy
- It helps to identify and correct any offset errors, which are constant errors that occur due to the sensor's inherent characteristics or environmental factors
- By adjusting the sensor's output to match the known reference value, calibration eliminates these offset errors
- It can compensate for non-linearity in the sensor's response, which occurs when the output is not directly proportional to the input

Figure 9 shows current(A) vs. Error (%) when sensors are uncalibrated. Figure 10 shows data for seven boards after offset calibration when no current flowing through the cable. From the data, the error value converged to zero percent. Figure 11 shows data after offset and sensitivity calibration at 25 A. From the data, values are more closely clustered around the minimum error, less than 0.5%.

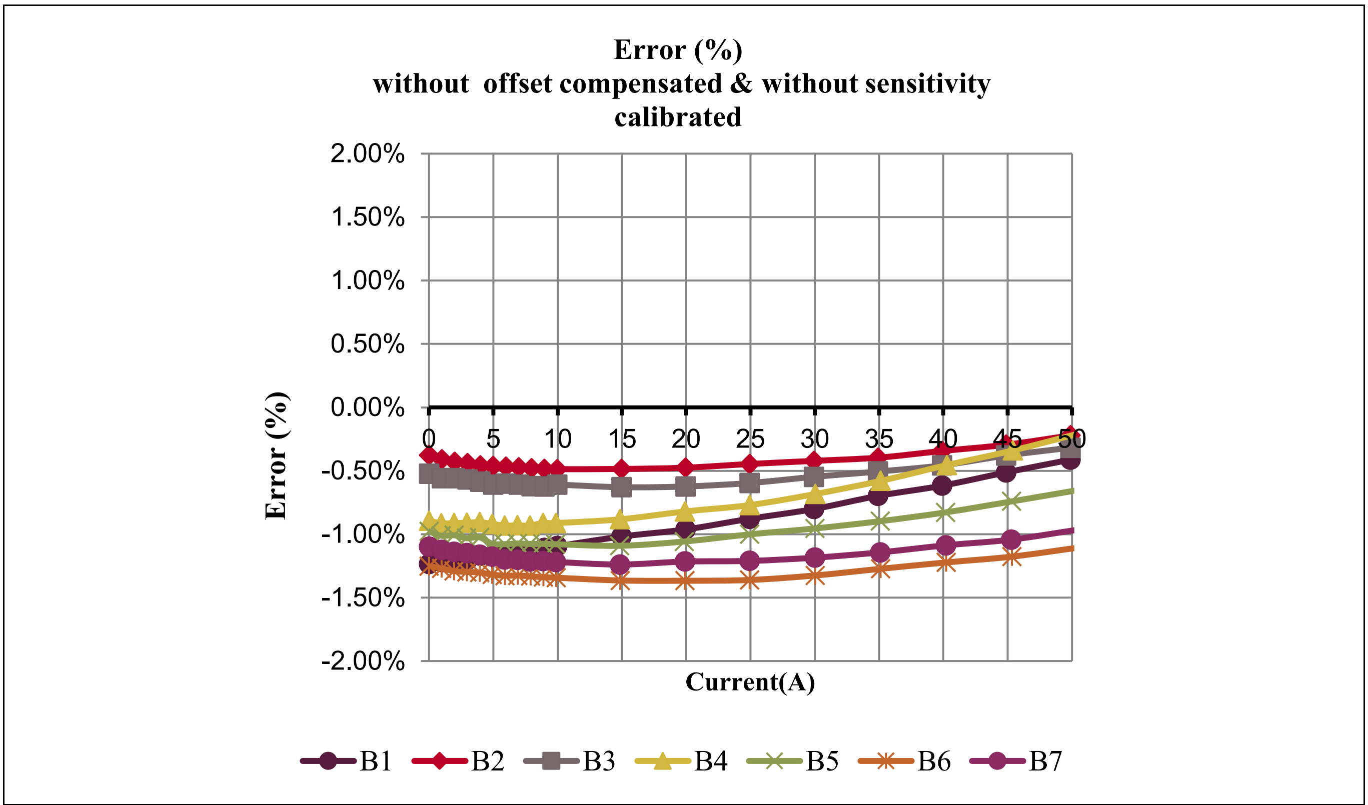

Figure 9 Measurement results of seven boards before offset and sensitivity calibration

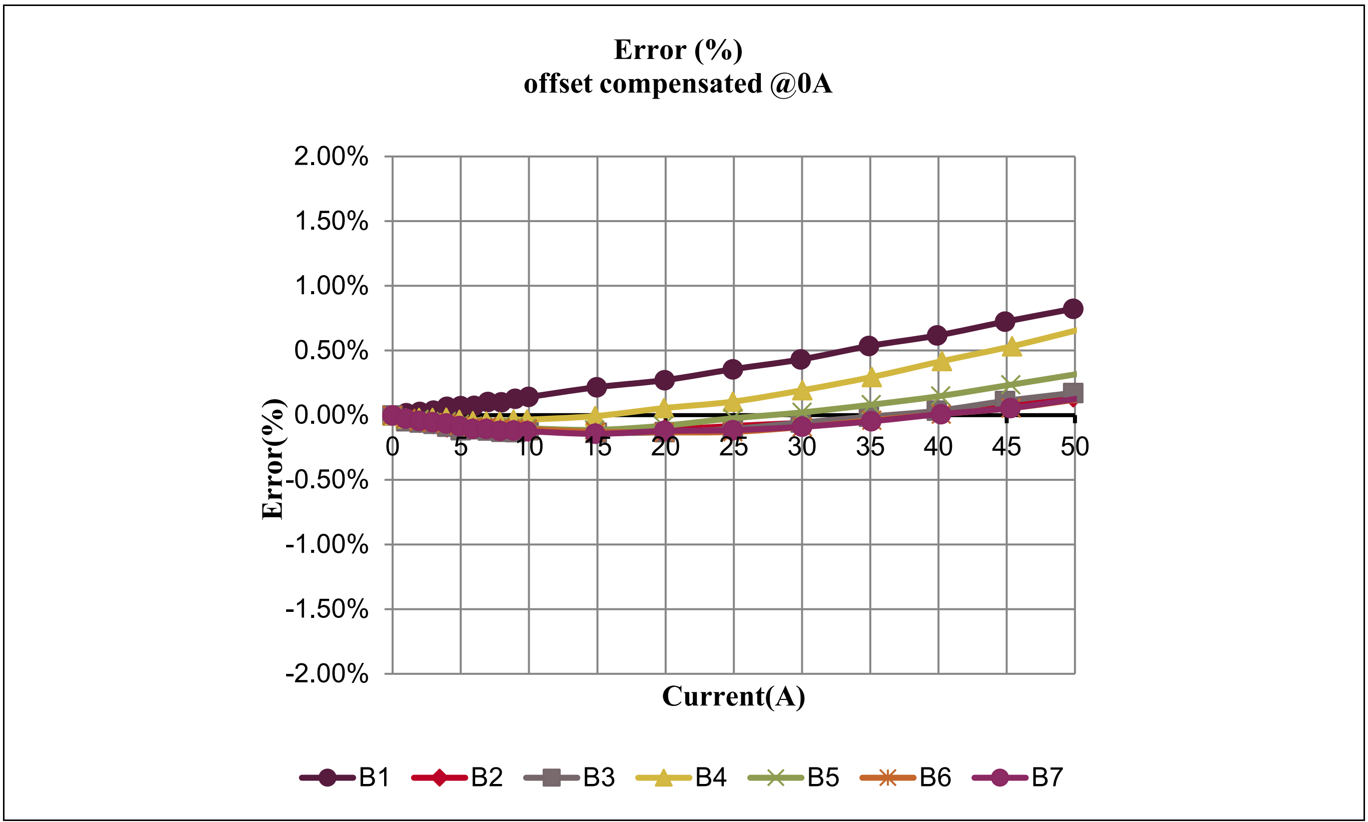

Figure 10 Measurement results after offset compensation at 0 A (seven boards)

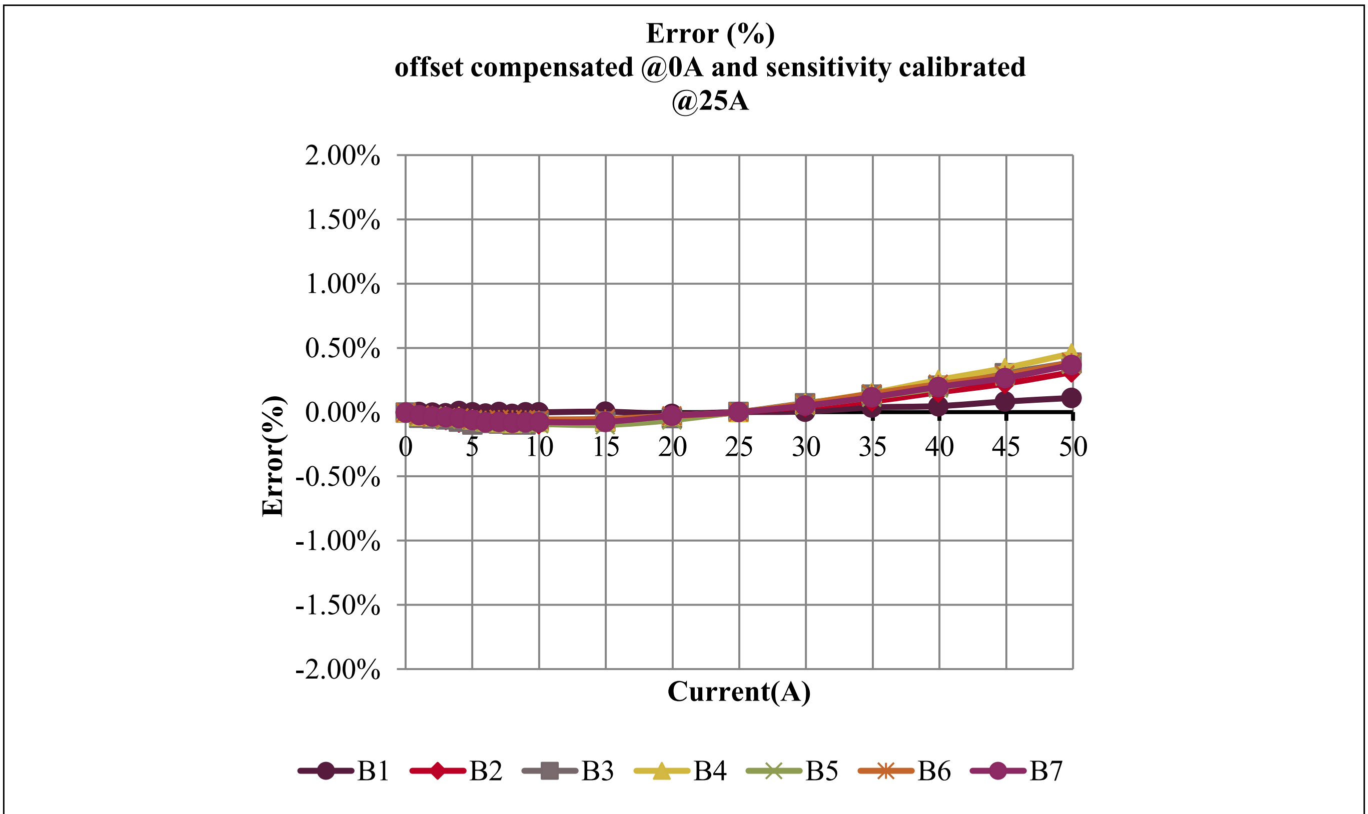

Figure 11 Measurement results after offset compensation and sensitivity calibration (seven boards)

4.2.6 Sensitivity distribution

Table 5 lists the calculated sensitivity for seven boards and its distribution.

Table 5 Sensitivities of all boards and their deviation from the average sensitivity value

Board	Sensitivity(mV/A)	Sensitivity difference (mV/A) (Sensitivity-average sensitivity)	Board-to-board sensitivity error (%)
B1	13.16	0.275	2.1
B2	12.82	-0.065	-0.5
B3	12.81	-0.082	-0.6
B4	12.97	0.081	0.6
B5	12.87	-0.019	-0.1
B6	12.79	-0.100	-0.8
B7	12.80	-0.090	-0.7

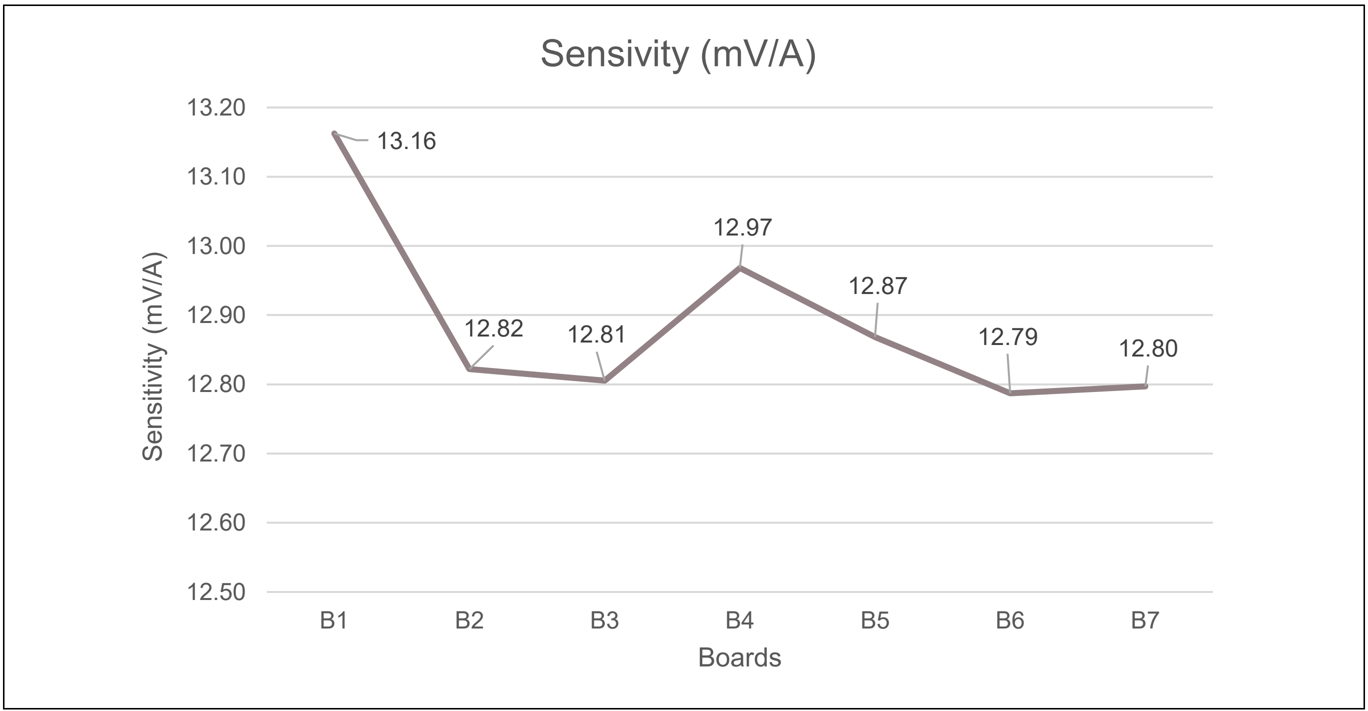

Figure 12 Sensitivity distribution

The sensitivities of seven boards were measured and range from 12.79 mV/A and 13.16 mV/A. One board's sensitivity differs slightly from that of the other six boards. However, sensitivities of the other six boards are between 12.79 mV/A and 13 mV/A.

5 Related resources

- Webpage: XENSIV™ current sensors
- Infineon Developer Community: XENSIV™ current sensors forum

References

[1] Infineon Technologies AG: *XENSIV™ TLx5572 current sensor datasheet;* Available online

[2] Infineon Technologies AG: *XENSIV™ TLE4972 and TLE4973 current sensors: Sensing structure design application note;* Available online

[3] Infineon Technologies AG: AN123820: *XENSIV™ TLx5572 current sensors in three-phase applications application note*; Available soon

Glossary

AC
alternating current (AC)

AOUT
analog output (AOUT)

BOM
bill of materials (BOM)

OTA
operational transconductance amplifier (OTA)

DC
direct current (DC)

EMC
electro-magnetic compatibility (EMC)

EEPROM
electrically erasable programmable read-only memory (EEPROM)

ESD
electro-static discharge (ESD)

eCR
external circuit rail (iCR)

FS
full scale (FS)

GND
ground (GND)

iCR
internal circuit rail (iCR)

LDO
low dropout (LDO)

PCB
printed circuit board (PCB)

PSU
power supply unit (PSU)

SCL
serial clock (SCL)

SDA
serial data (SDA)

SOT23
small-outline transistor package 23 (SOT23)

TMR
tunnel magnetoresistance (TMR)

THT
through-hole technology (THT)

TSSOP
thin shrink small-outline package (TSSOP)

VDC
volts direct current (VDC)

VDD
supply voltage (VDD)

VOQ
quiescent output voltage (VOQ)

VS
supply voltage input (VS)

Revision history

Document revision	Date	Description of changes
1.00	2026-07-22	Initial release

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Customer shall not touch the Evaluation Board during operation and keep a safe distance.
Customer shall not touch the Evaluation Board after disconnecting the power supply, several components may still store electrical voltage and can discharge through physical contact. Several parts, like heat sinks and transformers, may still be very hot. Allow the components to cool before touching or servicing.
The electrical installation must be completed in accordance with the appropriate safety requirements.