Current Sensor TLE4971

50A three-phase measurement board

About this document

- TLE4971 EVAL 50A board description (Three-Phase Current Sensor board)
- Thermal behavior
- High Voltage disclaimer and safety precaution

Scope and purpose

Describing the setup and behavior of the three-phase evaluation board

Intended audience

Users who are intending to use magnetic current sensors for high voltage applications.

Table of contents

1 Introduction

1.1 Three Phase Evaluation Board

- The TLE4971 EVAL 50A board is a three-phase measurement board developed for design in support and evaluation purpose.
- To connect the senor PCB with the generic Infineon evaluation board (CUR SENSOR PROGRAMMER) a connector is installed on the measurement board.
- A detailed description of the generic programmer board and the interface GUI is described in the “Programmer User Manual” Application note.
- Using this link you may find the software package for the related XENSIV™ TLx4971 - TLE4972 Current Sensor Programmer interfacing the Three Phase Evaluation Board: https://softwaretools.infineon.com/tools/com.ifx.tb.tool.xensivcurrentsensorevaluationsoftware
- Please be also aware further technical data to this board is available on www.infineon.com in section “myInfineon”. Please register your new Three Phase Evaluation Board!

1.2 Order Information

Table 1 Order Information

Producte Name	Description	Order ing Number
TLE4971 EVAL 50A	Three-Phase Current Sensor Measurement Board	SP006187479
CUR SENSOR PROGRAMER	Generic Interface and Programmer Board	SP004441438

2 Board description

- The TLE4971 EVAL 50A is a three-phase current sensor board equipped with TLE4971 current sensor.
- The current rail distance to secondary voltage is 4.2 mm and does not meet the full potential of the 8.2mm clearance/creepage distance of the DSO-16 package between the high voltage current rails and the low voltage signal pins. In the testing please be aware only high voltage according to the board-layout (4.2mm) may be applied!
- The PCB is equipped with an EEPROM in order to store for each board individual settings and ID.
- A connector is installed to supply and interface the sensor.

Figure 1 TLE4971 EVAL 50A, three phase measurement board

2.1 Layer Stack

- The TLE4971 EVAL 50A board consist of four layer described in the below Figure 2.
- The two outer layer consists of 140µm metallization.
- The inner layer consists of 35µm metallization.
- Table 2 gives a detailed description of the board setup

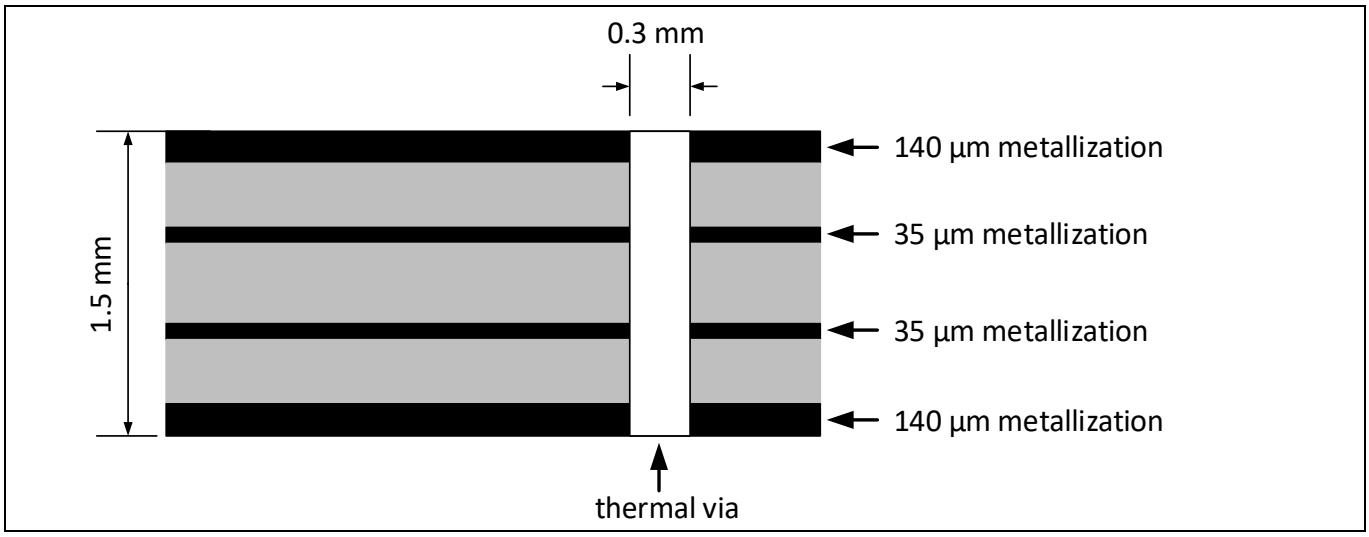

Figure 2 Reference board layer stack

Table 2 Single-phase reference board specification

Position	Description
PCB Material	FR4
Copper metallization	4 layers 140/35/35/140 µm
Thermal Vias	∅ = 0.3 mm;
Package Attach [50µm]	solder
Surface finish	ENIG

2.2 Pin description

Figure 3 shows the header detail of the measurement board.

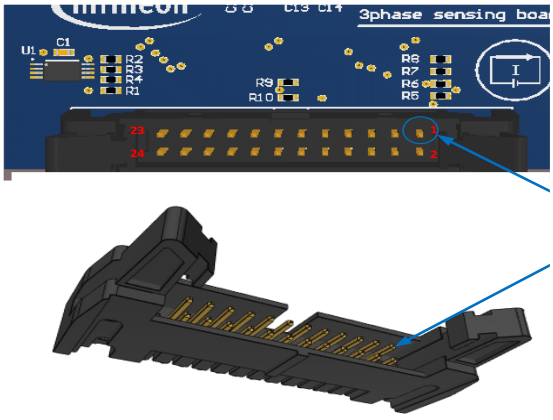

Figure 3 DUT board connector

Table 3 is describing the pin connector in detail.

Table 3 Measurement board Pin description

Pin Number	Symbol	Function
1	AOUT1	Analog output Voltage U-Phase
2	OCD_A1	Over Current Detection Channel 1, U-Phase (open drain)
3	VREF1	Analog voltage at reference output; U-Phase
4	OCD_B1	Over Current Detection Channel 2, U-Phase (open drain)
5	AOUT2	Analog output Voltage V-Phase
6	OCD_A2	Over Current Detection Channel 1, V-Phase (open drain)
7	VREF2	Analog voltage at reference output; V-Phase
8	OCD_B2	Over Current Detection Channel 2, V-Phase (open drain)
9	AOUT3	Analog output Voltage W-Phase
10	OCD_A3	Over Current Detection Channel 1, W-Phase (open drain)
11	VREF3	Analog voltage at reference output; W-Phase
12	OCD_B3	Over Current Detection Channel 2, W-Phase (open drain)
13	AOUT_comp1	Reserve, Additional ADC input on CUR SENSOR PROGRAMMER P14_7
14	VSENS	Sensor supply voltage
15	AOUT_comp2	Reserve, Additional ADC input on CUR SENSOR PROGRAMMER P14_9
16	V5	5V supply voltage
17	TRIG	External trigger input (connected to µC XMC4700 P4_0 on the CUR SESNOR PROGRAMMER board)
18	V_IO	For controller supply
19	SCL	Clock for PCB-EEPROM communication
20	GND	
21	SDA	Data link for PCB-EEPROM communication
22	GND	
23	-	
24	V33	3.3V supply

3 Thermal performance

3.1 Thermal evaluation

To evaluate the thermal behavior the reference board shown in figure 1 is a possible approach.

This three phase board is also the suggested reference board by Infineon for high current and high voltage applications since the clearance and creepage constraints is met by the design.

The inner layer are only connected to the current rail in the area where the thermal vias are placed.

Derived from the board characterization an equivalent circuit diagram describing the thermal behavior of the sensor respectively the sensor soldered on the reference board is available.

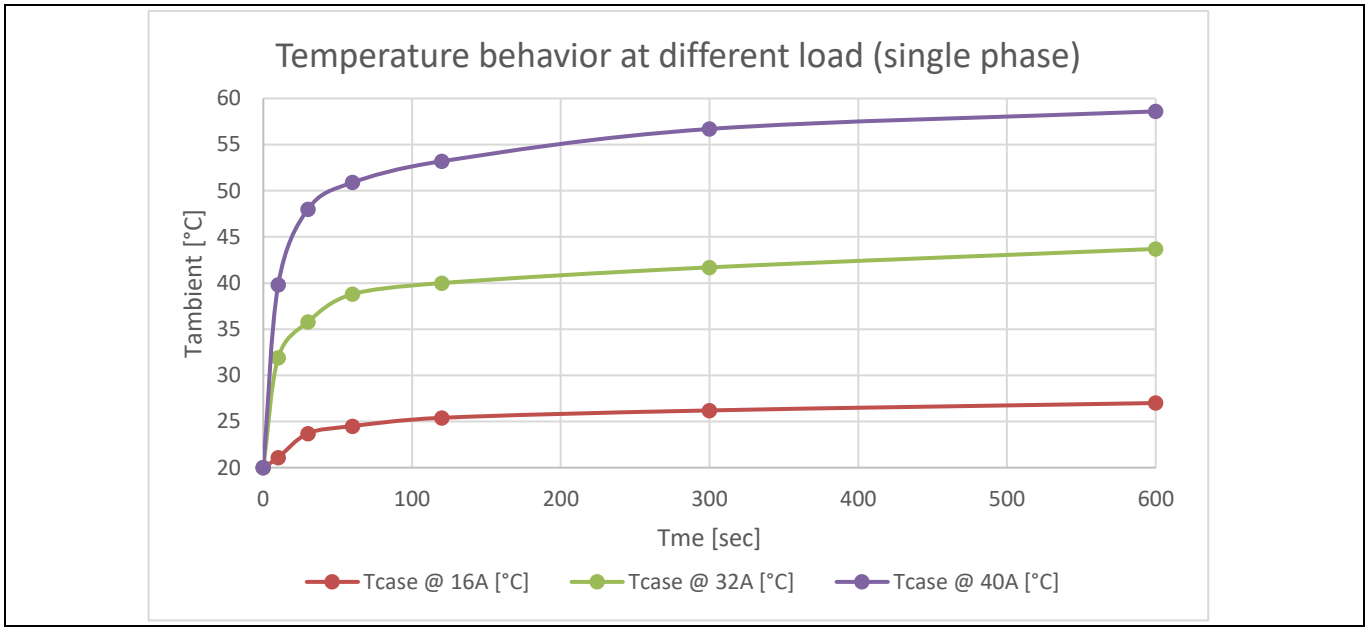

Figure 4 Heating curve

4 Disclaimer

Please read & understand the following safety precautions

The 3-Phase Sensing Board is a sample to be used by the customer solely for the purpose of evaluation and testing. See Legal Disclaimer and Warnings for further restrictions on Infineon Technologies warranty and liability.

Safety precautions

	**Attention:** The customer assumes all responsibility and liability for its correct handling and/or use of the 3-Phase Sensor Board and undertakes to indemnify and hold Infineon Technologies harmless from any third party claim in connection with or arising out of the use and/or handling of the 3-Phase Sensor Board by the customer.
	**Attention:** Infineon do not provide any isolation to protect human live against high voltage on this sensor board. The responsibility is up to the user to install a proper isolation between the sensor board and the user interface. Failure to comply may result in personal injury or death.
	**Attention:** The design operates with unprotected high voltages. Therefore, only personnel familiar with power electronics high voltage applications and associated machinery should plan or implement the installation, start-up and subsequence maintenance of the senor board in a high voltage environment. Failure to comply may result in personal injury and/or equipment damage.
	**Attention:** The sensor on the 3-Phase Sensor Board may become hot during sensing operation. Hence, necessary precautions are required while handling the board, failure to comply may cause injury and / or equipment damage.
	**Attention:** A drive or load, incorrectly applied or installed, can result in component damage or reduction in production lifetime. Errors such as to high current or to high voltage or excessive ambient temperature may result in system malfunction.
	**Attention:** Sensing board using TLE4971 contains parts and assemblies sensitive to Electrostatic Discharge (ESD). Electrostatic control precautions are required when installing, testing, servicing or repairing this assembly. Component damage may result if ESD control procedures are not followed.

Revision history

Document version	Date of release	Description of changes
V1.1	2025-07-16	Update of SP-Number and renaming from Application Note to User Manual
V1.0	2025-02-14	Initial version

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