

# Current Sensor TLE4973

## 120A three-phase measurement board



### About this document

- TLE4973 EVAL 120A board description (Three-Phase Current Sensor board)
- Layout guideline for highest ampacity
- 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.

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## **1 Introduction**

### **1.1 Three Phase Evaluation Board**

- The TLE4973 EVAL 120A board is a three-phase measurement board developed for design in support and evaluation purpose.
- To connect the sensor PCB with the generic Infineon evaluation board (CUR SENSOR PROG GEN2) a connector is installed on the measurement board.
- In combination with generic Infineon evaluation board (CUR SENSOR PROG GEN2) the output-mode “SE-AO” is not supported in hardware revision 1.0 of this board but will be fixed in future version.
- A detailed description of the generic programmer board and the interface GUI is described in the “Programmer User Manual” Application note.
- For better readability and better overview on documentation on Infineon web page this document combines the 3-phase evaluation board of TLE4973.
- Using this link you may find the software package for the related XENSIV™ TLE4973 Current Sensor Programmer interfacing the Three Phase Evaluation Board:  
<https://www.infineon.com/cms/de/product/evaluation-boards/cur-sensor-prog-gen2/>
- Please be also aware further technical data to this board is available on [www.infineon.com](http://www.infineon.com) in section “myInfineon”. Please register your new Three Phase Evaluation Board!

### **1.2 Order Information**

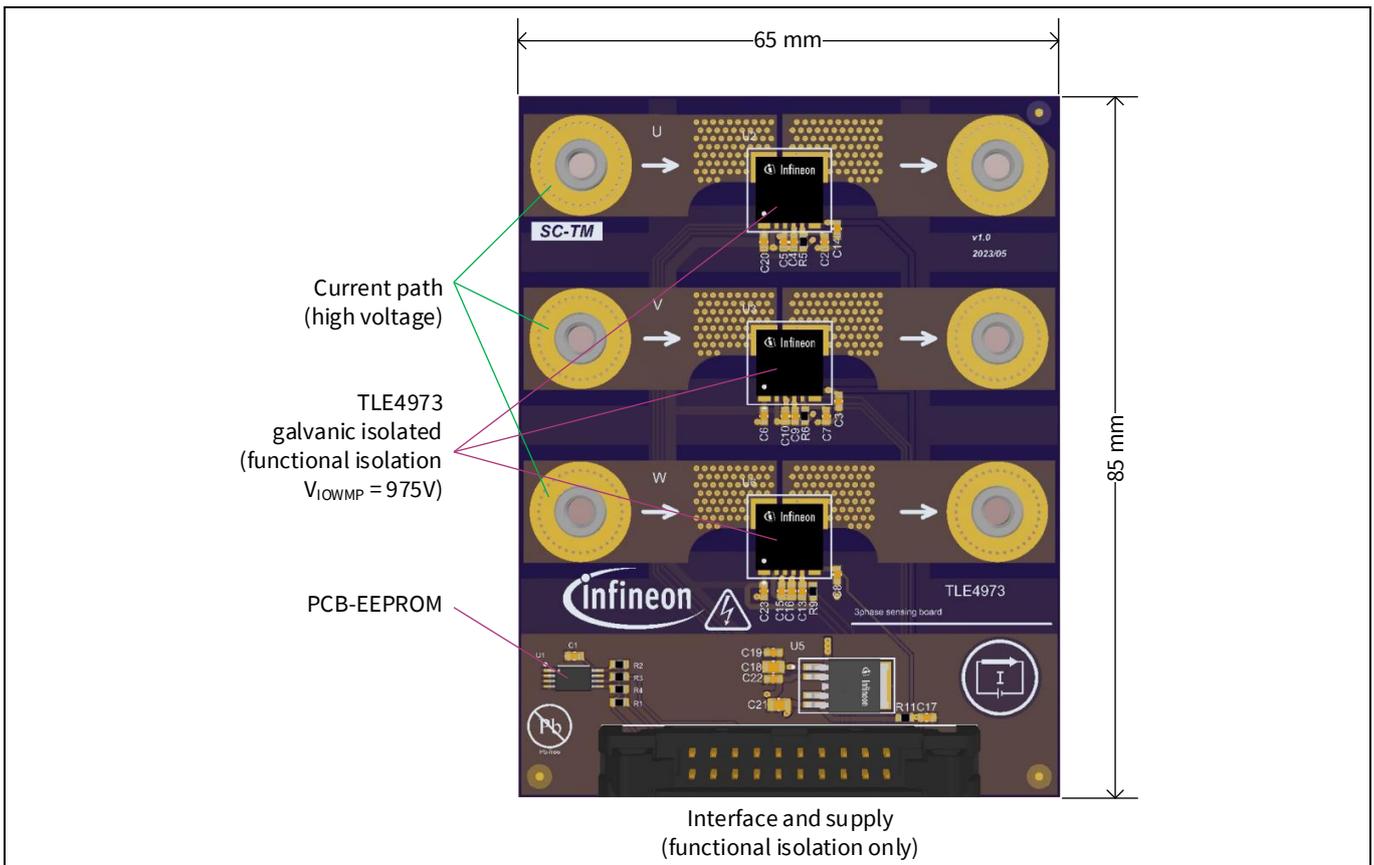
**Table 1 Order Information**

<b>Product Name</b>	<b>Description</b>	<b>Ordering Number</b>
TLE4973 EVAL 120A	Three-Phase Current Sensor Measurement Board	SP006015313
CUR SENSOR PROG GEN2	Programmer for current sensors TLE4973	SP005859612

Please contact your local Infineon sales office to order the sensor board or a programming board.

## 2 Board description

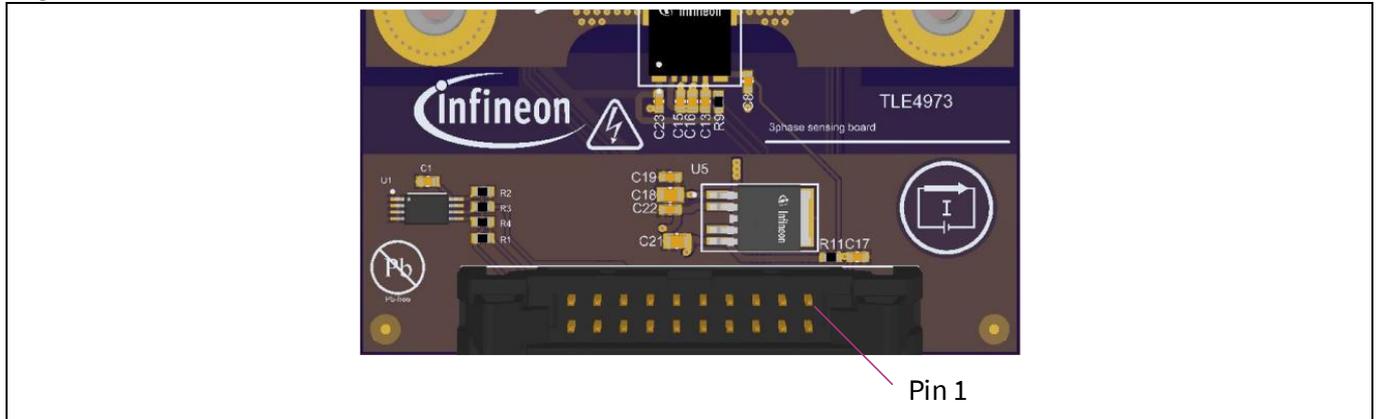
- The TLE4973 EVAL 120A is a three-phase current sensor board equipped with TLE4973 current sensor.
- The current rail distance is 8.7mm in order to meet the 4mm clearance/creepage distance between the high voltage current rails and the low voltage signal pins.
- The PCB is equipped with an EEPROM in order to store for each board individual settings and ID.
- A connector is installed to supply and interface the sensor.



**Figure 1 TLE4973 EVAL 120A, three phase measurement board**

## 2.1 Pin description

Figure 2 shows the header detail of the measurement board.



**Figure 2 DUT board connector**

Table 2 is describing the pin connector in detail.

**Table 2 Measurement board Pin description of version V1.0**

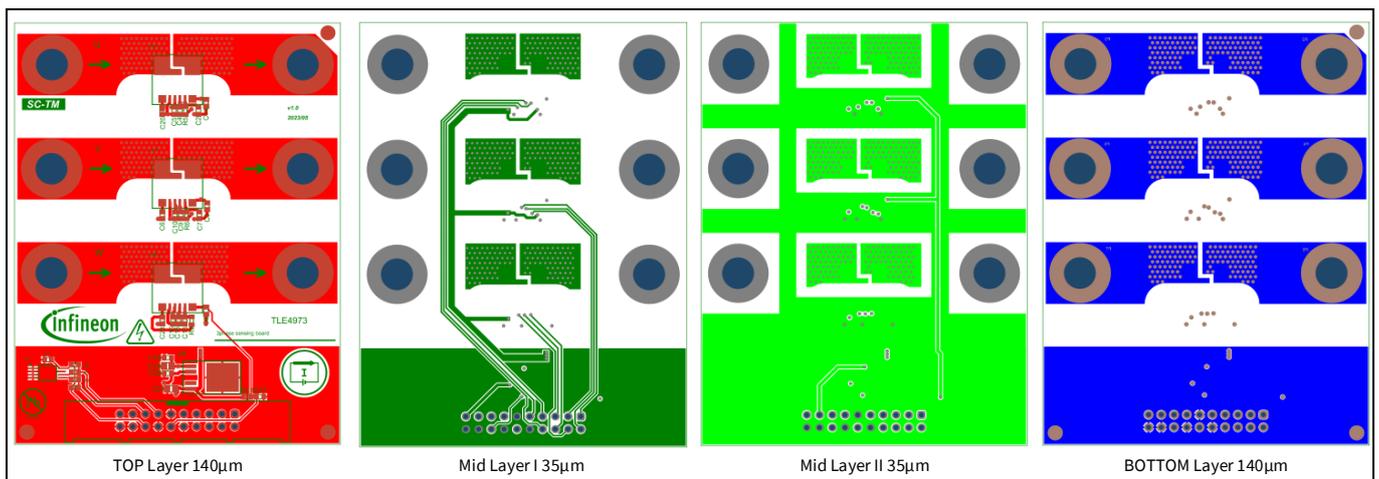
Pin Number	Symbol	Function
1	VREF-V	Reference voltage of sensor phase V
2	AOUT-V	Analog output voltage of sensor phase V
3	OCD-V	Over Current Detection of sensor phase V (open drain)
4	VREF-W	Reference voltage of sensor phase W
5	AOUT-W	Analog output voltage of sensor phase W
6	OCD-W	Over Current Detection of sensor phase W (open drain)
7	VREF-U	Reference voltage of sensor phase U
8	AOUT-U	Analog output voltage of sensor phase U
9	OCD-U	Over Current Detection of sensor phase U (open drain)
10	GND	Ground connection
11	GND	Ground connection
12	DCDI	Digital Control Diagnostic Interface. One wire, open drain, connected to all sensors. UART protocol.
13	SCL	Clock for communication with external EEPROM on Infineon's evaluation boards.
14	GND	Ground connection
15	SDA	Data link for communication with external EEPROM on Infineon's evaluation boards.
16	VDD	5V supply voltage, connected to each sensor on VDD pin. This voltage is generated onboard by the LDO.
17	Vs+	Supply voltage of the evaluation board. Connected to LDO input. To be used to supply the evaluation board as standalone. The voltage must be in the range 6V to 9V
18	GND	Ground connection
19	EN	LDO enable. It must be connected to VS+ when the evaluation board is used as standalone.
20	GND	Ground connection

### 3 Layout Guideline

#### 3.1 PCB-recommendation & Layout guideline

There are pcb-recommendations how to get exact the datasheet parameters as mentioned in the datasheet of the TLE4973: [TLE4973 pcb-recommendations \(PG-TISON-8\)](#)

The 120A three-phase measurement board is following these rules and implemented for a high ampacity the recommended sensing structure on all 4 layers.



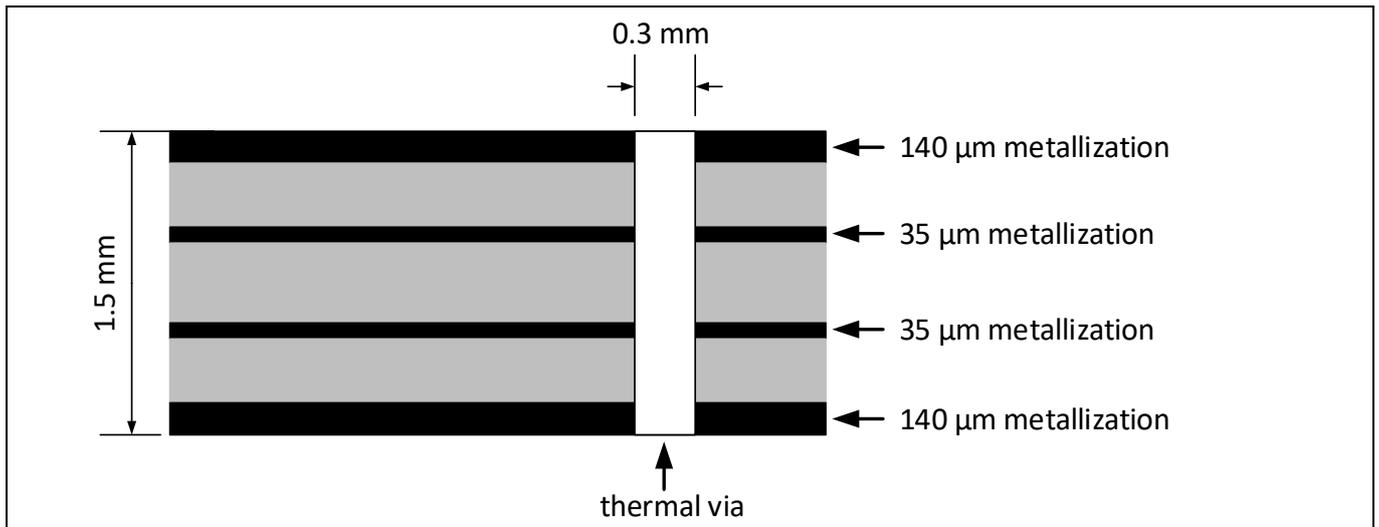
**Figure 3 Board layout of 4-layer reference board**

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 as shown in figure above.

### 3.2 Layer Stack

- The TLE4973 EVAL 120A board consist of four layers described in the below Figure 4.
- The two outer layer consists of 140µm copper.
- The inner layer consists of 35µm copper.
- Table 3 gives a detailed description of the board stack.



**Figure 4 Reference board layer stack**

**Table 3 Single-phase reference board specification**

Position	Description
Board dimension	65mm x 85mm x 1.5mm
PCB Material	FR4
Copper metallization	4 layers 140/35/35/140 µm
Thermal Vias	Ø = 0.3 mm;
Package Attach [50µm]	solder
Surface finish	Board with mounted TLE4973: ENIG

## 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

	<p><b>Attention:</b>                  The sensor device on the sensor board provides only functional isolation, the user has to take care for proper voltage isolation between high voltage and low voltage domain to be protected against injury or death. 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.</p>
	<p><b>Attention:</b>                  It has to be considered that an additional isolation has to be added to the 3-Phase Sensor Board by the operator to protect the user against hazards caused by high voltage. 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.</p>
	<p><b>Attention:</b>                  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 sensor board in a high voltage environment. Failure to comply may result in personal injury and/or equipment damage.</p>
	<p><b>Attention:</b>                  The sensor on the 3-Phase Sensor Board may become hot during sensing operation. The board is not designed to carry high current (maximum 70A<sub>DC</sub> continuously) without additional cooling or temperature sinks. Hence, necessary precautions are required while handling the board, failure to comply may cause injury and / or equipment damage.</p>
	<p><b>Attention:</b>                  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.</p>
	<p><b>Attention:</b>                  Sensing board using TLE4973 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. If you are not familiar with electrostatic control procedures, refer to applicable ESD protection handbooks and guidelines.</p>

Revision history

<b>Document version</b>	<b>Date of release</b>	<b>Description of changes</b>
V1.1	2024-01-22	Pin-description updated Exception for SE-AO in combination with programmer added
V1.0	2023-12-01	Initial version

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**Document reference**

**AppNote TLE4973 EVAL 120A**

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