TLE4977 evaluation boards user guide

XENSIV™ current sensors

About this document

Scope and purpose

This user guide describes the hardware and software functionalities of the XENSIV™ TLE4977 current sensor evaluation boards TLE4977 EVAL 20A, TLE4977 EVAL 30A, TLE4977 EVAL 40A, TLE4977 EVAL 50A, TLE4977 EVAL 60A, and TLE4977 EVAL 80A.

Intended audience

This document is intended for use by hardware and software engineers involved in the evaluation of the XENSIV™ TLE4977 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 measurement with internal current rail packages and up to several kiloamps with external current rail packages.

Evaluation board

This board is intended for use 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

	**Warning**: *The evaluation or reference board contains DC bus capacitors which take time to discharge after removal of the main supply. Before working on the drive system, wait five minutes for capacitors to discharge to safe voltage levels. Failure to do so may result in personal injury or death. Darkened display LEDs are not an indication that capacitors have discharged to safe voltage levels.*
	**Warning:** *Remove or disconnect power from the drive before you disconnect or reconnect wires, or perform maintenance work. Wait five minutes after removing power to discharge the bus capacitors. Do not attempt to service the drive until the bus capacitors have discharged to zero. Failure to do so may result in personal injury or death.*
	**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

XENSIV™ TLE4977 is a high-bandwidth, high-precision, automotive, coreless current sensor with analog output and overcurrent detection (OCD).

The following sections describe the different components of the XENSIV™ TLE4977 current sensor evaluation boards, required hardware connections, and the software installation procedure. They also explain how to use the graphical user interface (GUI) to perform the first evaluation of the sensor in a particular application. The XENSIV™ TLE4977 evaluation board can be operated at low voltages, as described in the Safety precautions section. The current sensor provides galvanic isolation. Consider the safety precautions for high-voltage applications as described in the disclaimer document provided with the evaluation board.

1.1 Scope of supply

The evaluation kit contains the XENSIV™ TLE4977 evaluation board (TLE4977 EVAL 80A, TLE4977 EVAL 60A, TLE4977 EVAL 50A, TLE4977 EVAL 40A, TLE4977 EVAL 30A, or TLE4977 EVAL 20A).

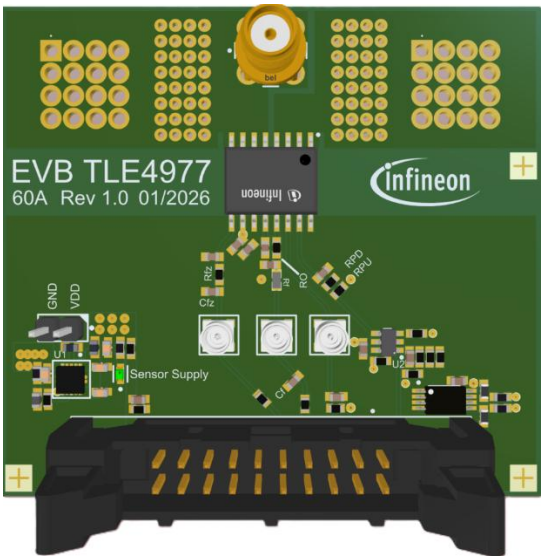

Figure 1 XENSIV™ TLE4977 current sensor evaluation board

To use the evaluation board, some additional components that do not come with the evaluation kit are also required:

- Current sensor programmer shield (CUR SENSOR PROG GEN2)
- XMC1100 Boot Kit (KIT_XMC11_BOOT_001) from Infineon XMC™ MCU family
- Ribbon cable

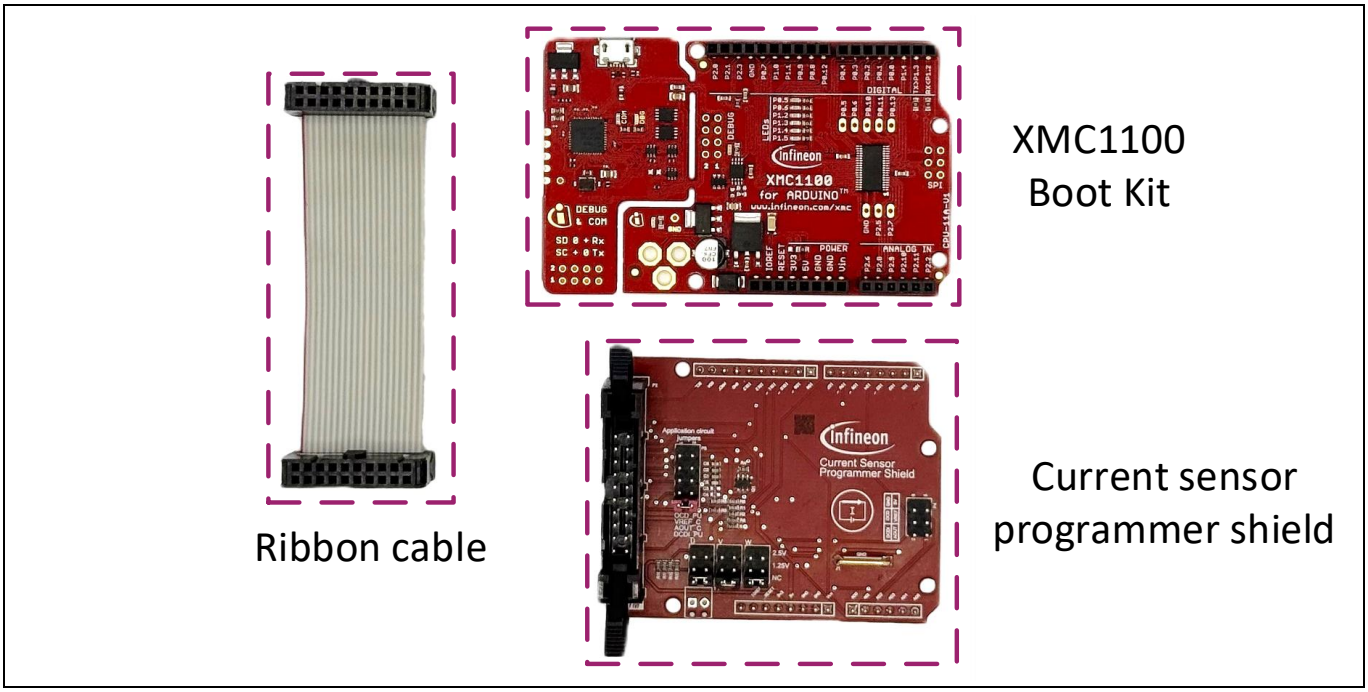

Figure 2 Additional components required for the XENSIV™ TLE4977 Evaluation Kit

1.2 Connection guide

The software supports connecting to sensors located in a custom setup. A setup that uses either one or three TLE4977 sensors can be detected by the software. In either of the two cases, make sure to add the components shown in the application circuit.

- 220 pF capacitor on AOUT
- 220 nF capacitor on VDD
- 1 kΩ pull-up resistor on DCDI or populate DCDI_PU jumper on shield

Figure 3 shows the sensor pinout. Only one side of the package has active pins.

Pin number	Description
1-4	IP+
5-8	IP-
9	FAULT
10	VDD
11	GND
12	RES
13	AOUT
14	OCD
15	DCDI/ OCD_THR
16	NC

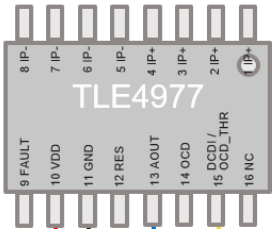

Figure 3 XENSIV™ TLE4977 sensor pinout diagram

1 The board at a glance

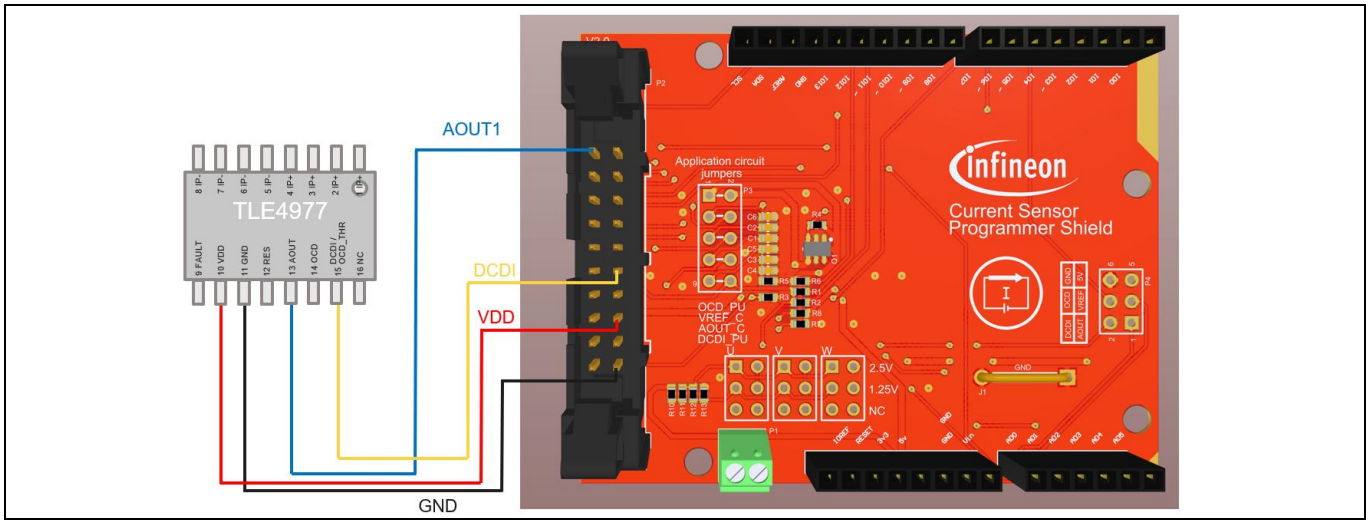

Figure 4 XENSIV™ TLE4977 sensor connection

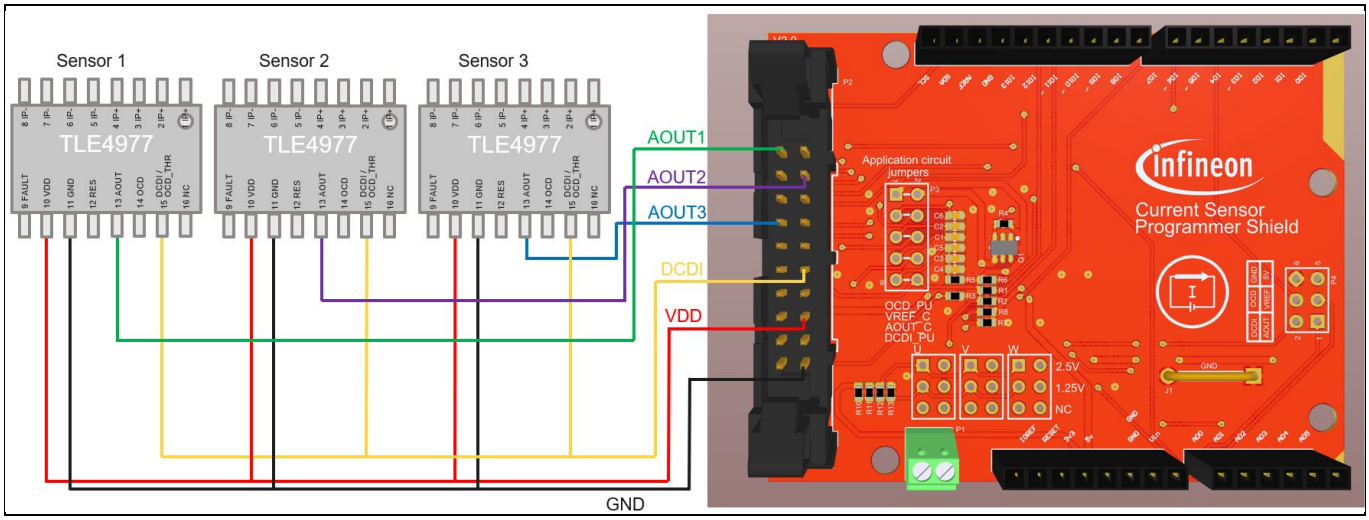

Figure 5 XENSIV™ TLE4977 three sensors connection

For custom setups, select “Custom” in the dropdown from the initialization wizard and configure the board accordingly: sensor AOUT on AOUT1 for one sensor, and on AOUT1, AOUT2, and AOUT3 for three sensors. More details are provided in Section 3.2.

1.3 Connector details

Connector X1 is described in Figure 6 and may be used for debugging, probing, or connecting additional hardware.

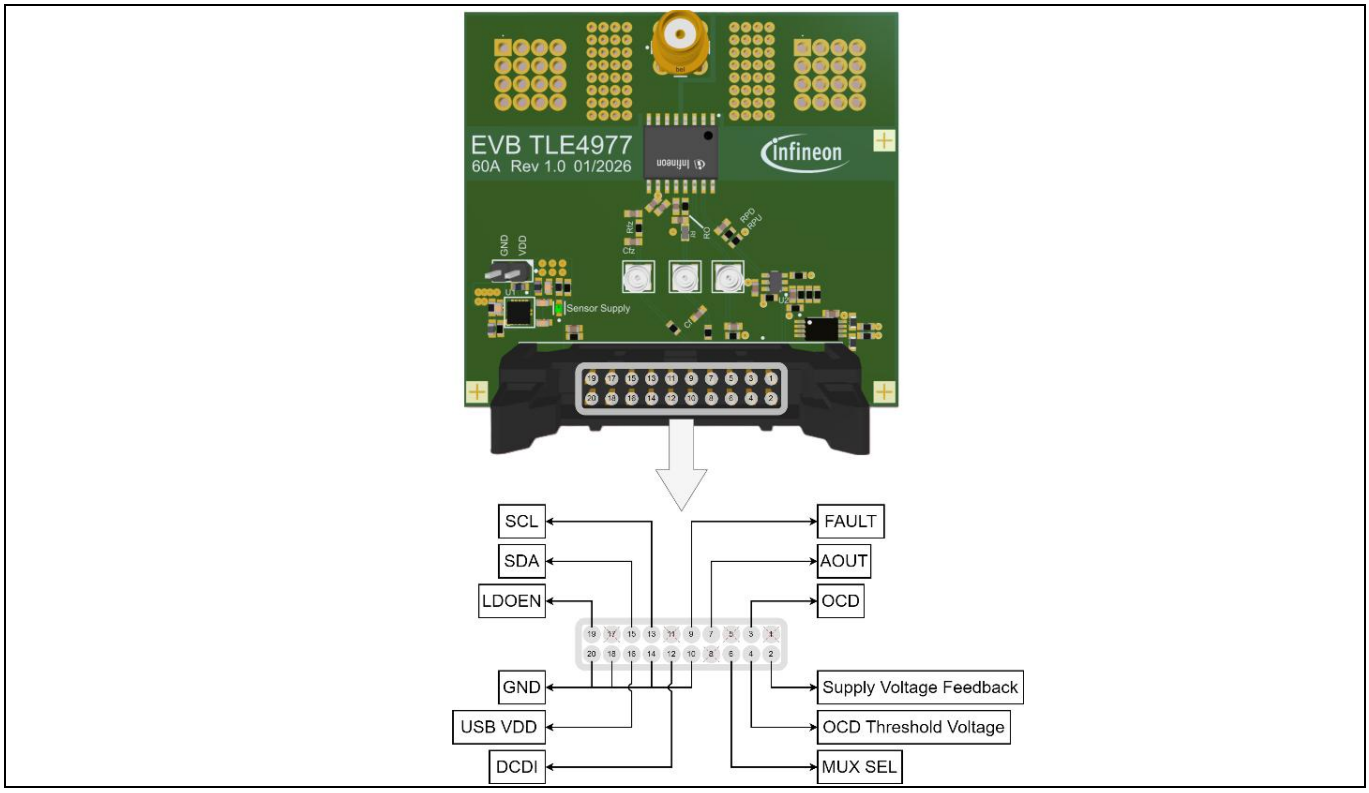

Figure 6 XENSIV™ TLE4977 evaluation board connector pinout

The external EEPROM uses **SCL** and **SDA** pins. **LDOEN** is used by the buck-boost converter that takes the USB voltage from **USB VDD** and regulates it at 5 V or 3.3 V. **AOUT**, **OCD**, **FAULT**, and **DCDI** are used directly by the sensor. **MUX SEL** is used by the analog multiplexer to switch the sensor's DCDI pin between OCD threshold and DCDI communication pin, depending on the sensor's operating mode. The OCD threshold voltage is generated by a voltage divider and is also present on the connector, so it can be measured and displayed in software. **Supply Voltage Feedback** is the output voltage of the buck-boost converter, which is also measured and displayed in software.

2 Evaluation software

The XENSIV™ TLE4978/77 Current Sensor Evaluation App assists in the swift evaluation of the sensors from the XENSIV™ TLE4977 family. The software allows live current and temperature readout as well as EEPROM read and burn operations.

2.1 Requirements

The XENSIV™ TLE4977 evaluation software was developed and tested using the following PC configuration:

- **Operating system:** Windows 10 64-bit or Windows 11 64-bit (Windows 7 is also supported)
- **RAM:** 8 GB (maximum RAM usage is estimated to be approximately 150 MB when data logging is enabled)
- **Storage:** 512 GB (minimum required for installation: 250 MB, including dependencies)
- **CPU:** 3.00 GHz, four cores (low-performance CPUs may experience performance issues)

2.2 Software download

Infineon offers graphical user interface software via the Infineon Developer Center or via the Infineon Developer Center Launcher. You can filter the tool list by searching for “Current Sensor” or “TLE4977”. The tool list will display the XENSIV™ TLE4978/77 Current Sensor Evaluation App, as shown in Figure 7.

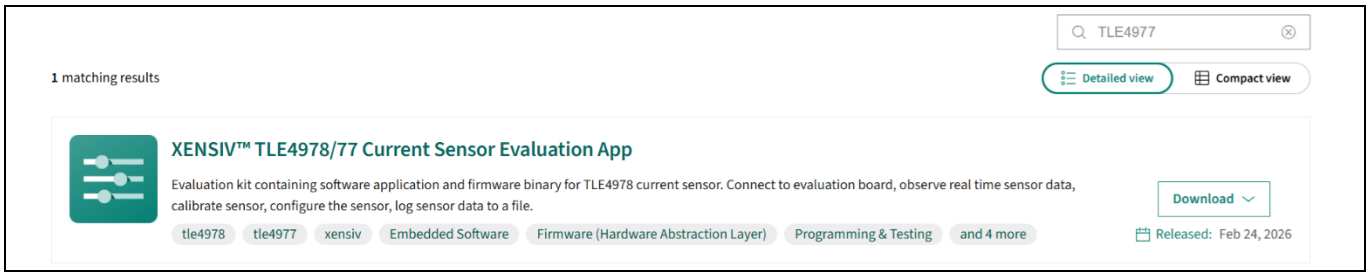

Figure 7 XENSIV™ TLE4978/77 Current Sensor Evaluation App

It is recommended to install the Infineon Developer Center Launcher before installing the above-mentioned application.

Note: The XENSIV™ TLE4978/77 Current Sensor Evaluation App can only be downloaded by users registered with a myInfineon account.

2.3 Software installation

1. Double-click the XENSIV™ TLE4978/77 Current Sensor Evaluation App installer to begin the installation

Note: Ensure that you have administrator rights to install the software.

The installer file contains the following elements:

- Binaries or compiled objects needed for running the graphical user interface
- SEGGER J-Link driver for establishing serial port communication with the onboard debugger
- .NET Framework 4.8 online installer (required only on older versions of Windows where it is not already installed). Installation requires a stable Internet connection

2. Read and accept the License Agreement, and then click **Next**

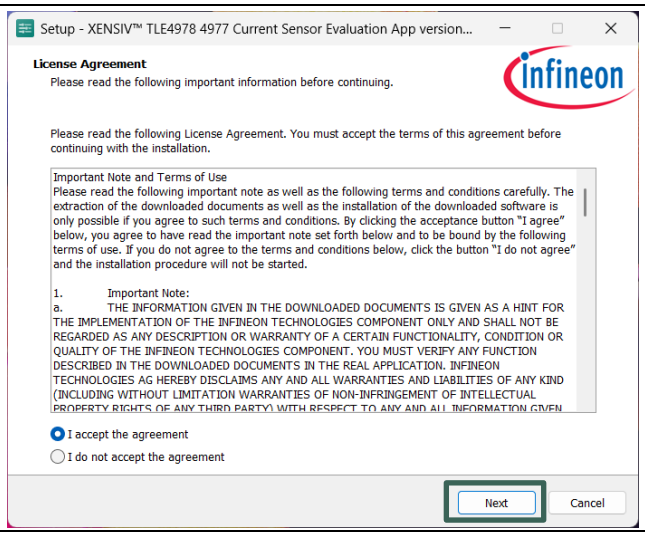

Figure 8 Accept the License Agreement

3. Select the installation type and click **Install** to begin the installation. It is recommended to use the **Quick Installation (Recommended)** option

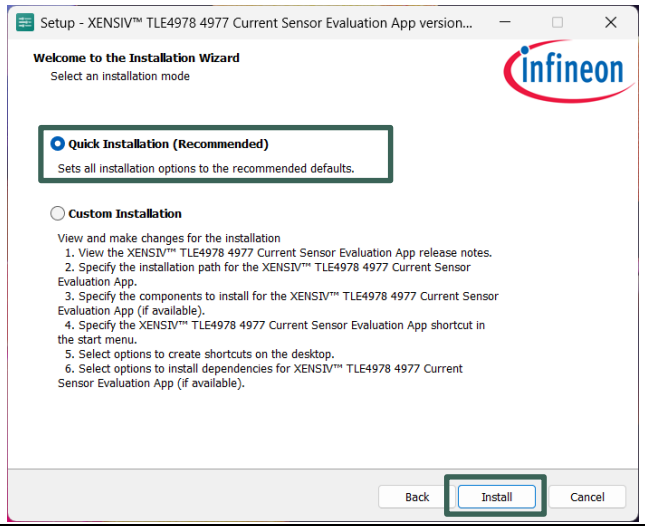

Figure 9 Quick installation

4. After the binaries have been copied to the installation folder, a prompt appears to install the SEGGER J-Link driver. Click **Next** to complete the installation

   If the SEGGER J-Link driver is already installed, this step can be skipped. Note that without the J-Link driver, the USB connection between the PC and the XENSIV™ TLE4977 evaluation board cannot be established

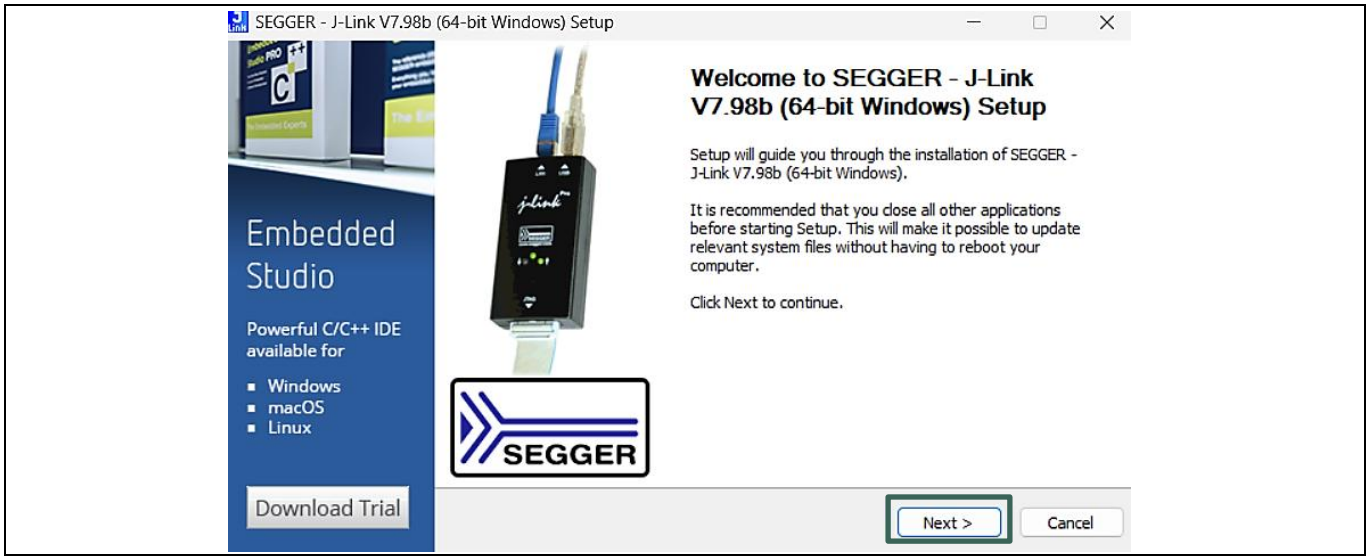

Figure 10 SEGGER J-Link driver installation

5. After the SEGGER J-Link driver has been installed, a prompt appears to install .NET Framework 4.8. Click **Continue** or **Close**, depending on whether the dependency is already installed

Note: This version of .NET Framework is preinstalled on Windows 10 version 1903 and later releases. If it is already installed, a corresponding notification is displayed. Otherwise, the installation will proceed automatically, provided that an active Internet connection is available

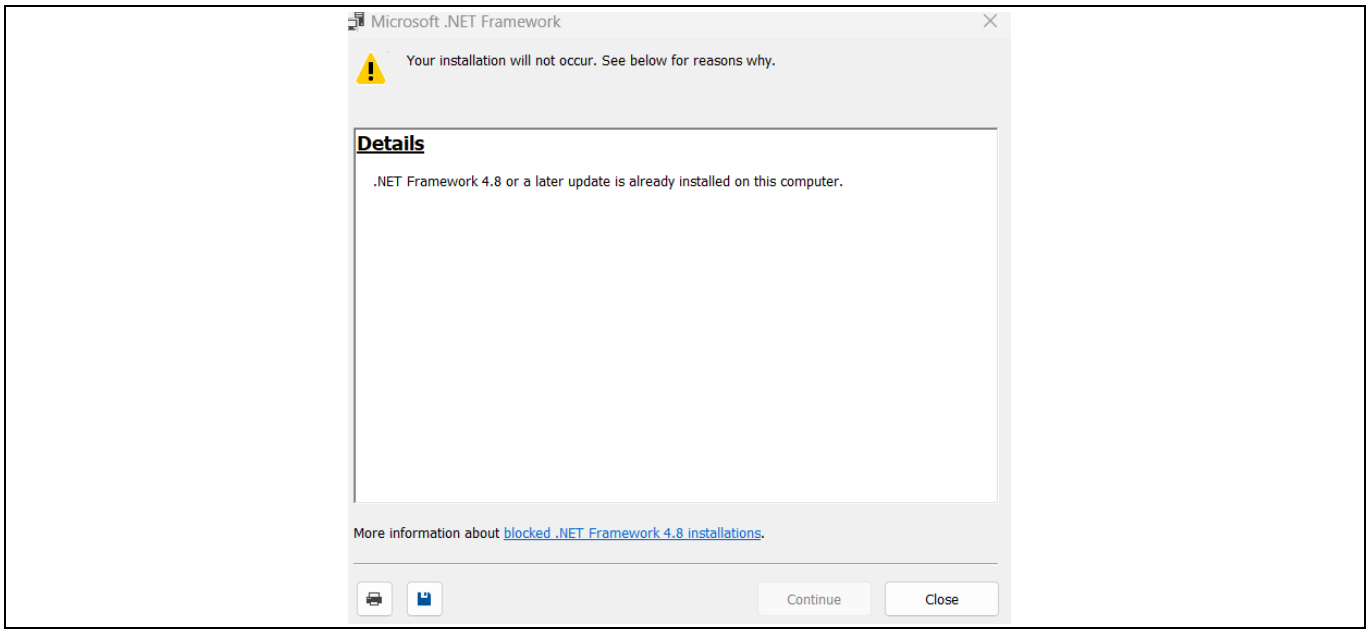

Figure 11 .NET Framework 4.8 installation

6. Click **Finish** to exit the setup. A notification is displayed after all installer processes are complete, and a shortcut is created on the desktop by default. You can choose to launch the application after the installation

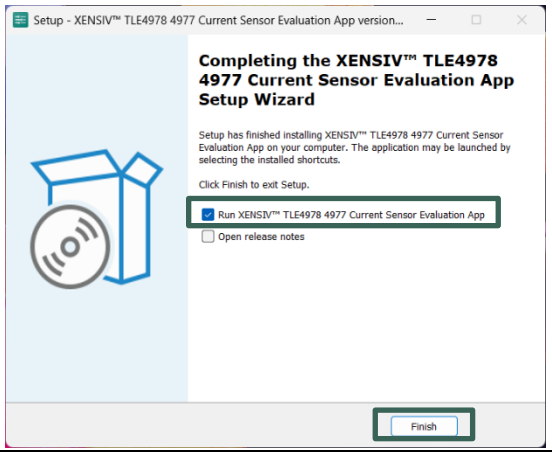

Figure 12 Installation complete

2.4 Uninstalling the software

To uninstall the software package, go to **Start** → **Add or remove programs** and search for the **XENSIV™ TLE4978/77 Current Sensor Evaluation App**. Click the ellipsis (three-dot) menu and select **Uninstall** to remove the software from the PC.

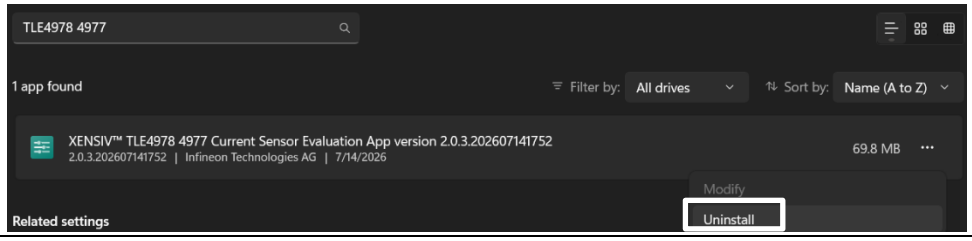

Figure 13 Software uninstallation

The uninstaller deletes all installation files from the system, except:

- SEGGER J-Link driver, which can be uninstalled separately if required
- .NET Framework 4.8 dependencies, which in most cases are part of the operating system

3 Using the evaluation software

This section describes the features of the XENSIV™ TLE4978/77 Current Sensor Evaluation App and their usage in correlation with the XENSIV™ TLE4977 evaluation board. Ensure that the evaluation board is attached to the current sensor programmer shield and XMC1100 Boot Kit board via the ribbon cable.

3.1 Startup screen and connecting to the programmer

Figure 14 shows the default screen of the XENSIV™ TLE4978/77 Current Sensor Evaluation App after startup.

The software scans all USB ports and identifies any connected device matching the XENSIV™ TLE4977 evaluation board signature. If a match is found, the software displays the detected device, as shown in Figure 14. Selecting the device establishes a connection between the software and the board.

If the firmware is outdated, the software automatically flashes the correct firmware version to the target microcontroller. Otherwise, the connection is established using the firmware version already installed on the selected board.

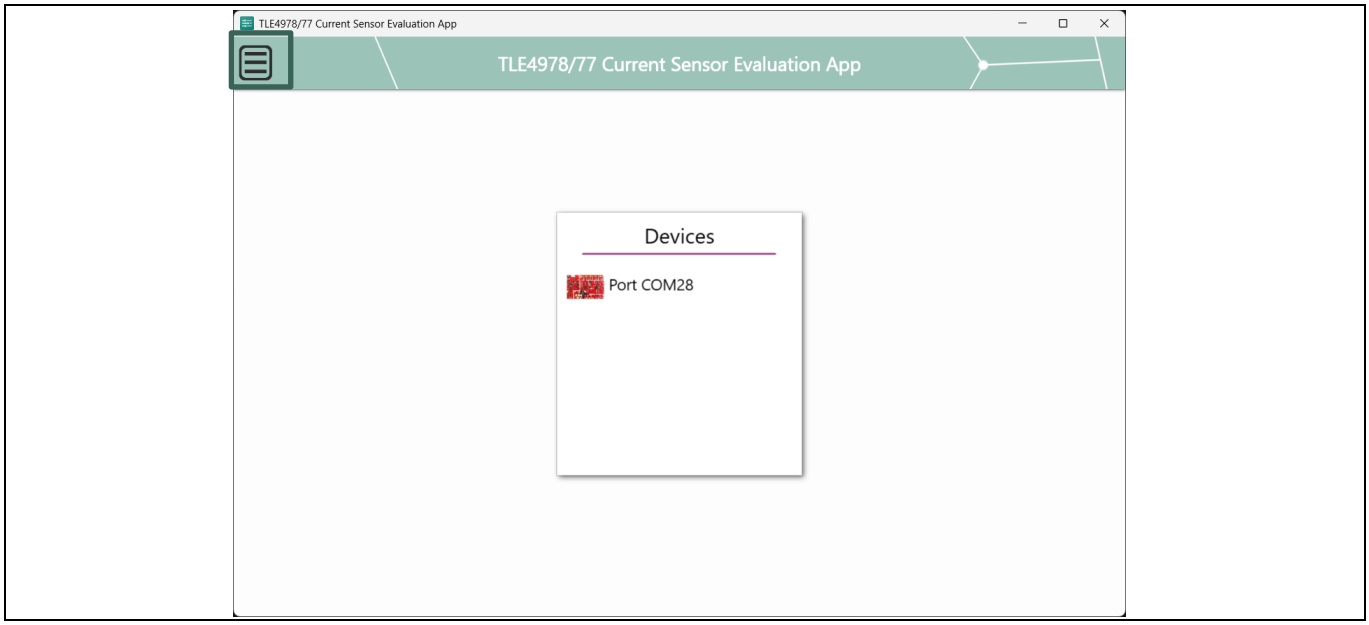

Figure 14 Startup screen

Note: The firmware can be flashed forcefully by going to Settings (menu button in the top-left corner) and checking 'Always update firmware (irrespective of current version)'.

3.2 Initialization wizard

If the external EEPROM on the evaluation board has been programmed with the correct configuration, the software displays the main menu. Otherwise, an initialization wizard is displayed, allowing selection from a predefined list of supported configurations, as shown in Figure 15.

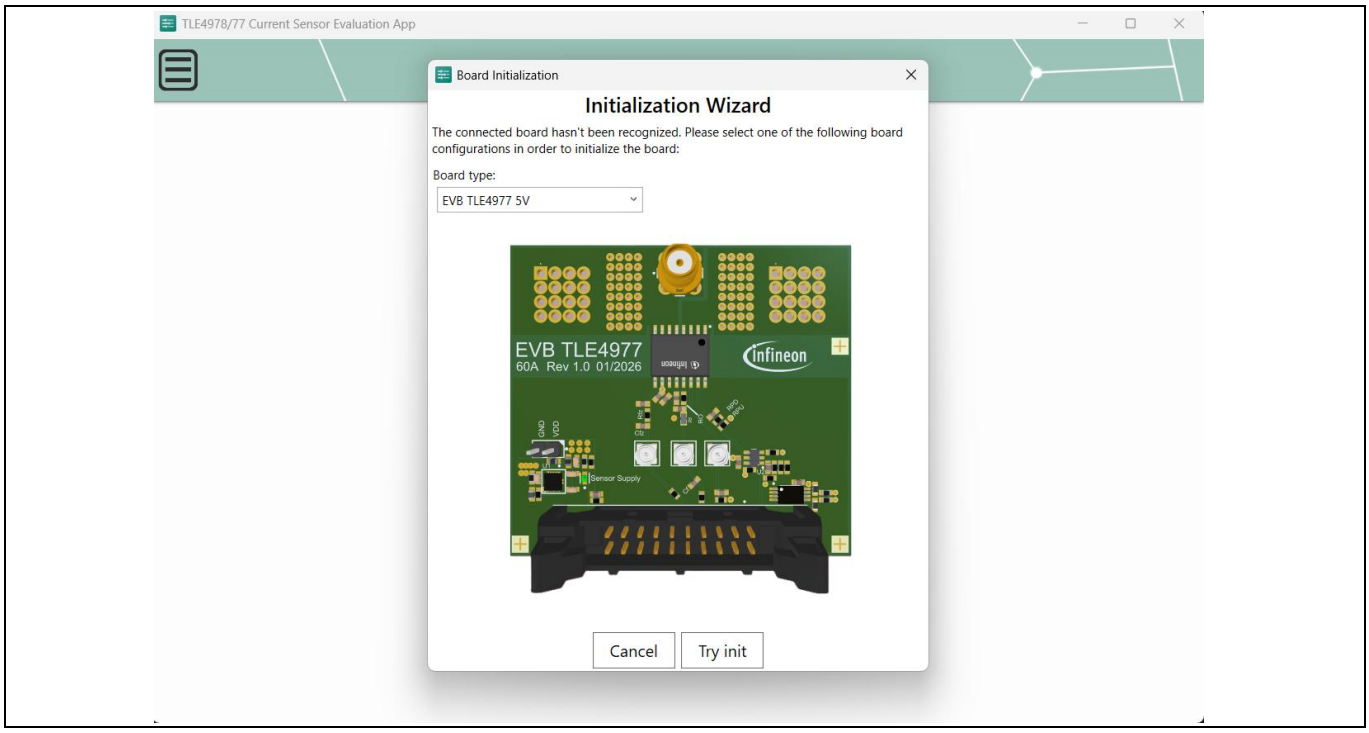

Figure 15 Initialization wizard

Click the **Board type** drop-down menu to show the supported board configurations:

- **EVB TLE4977 5 V** or **EVB TLE4977 3.3 V:** The evaluation board described in this user guide
- **Custom:** Custom setup with one, two, or three sensors

After you select a configuration, the software also checks if the connected board meets the required conditions. Some configurations require a digital control and diagnostic interface (DCDI) pull-up jumper to be placed on the shield, and other boards require a transistor for toggling power.

The software notifies you if these conditions are not met. If no errors are shown, you can proceed to use the software.

3.2.1 Custom setups

The software supports connecting to any custom board, if you specify all its parameters.

To access the custom board menu, select **Custom** in the initialization window drop-down list, as shown in Figure 16. From that window, you can select the following parameters:

- **Sensor type:** TLE4978 or TLE4977
- **Is AOUT connected:** the connector might not have access to the sensor's AOUT, so the address cannot be determined by the firmware. In this case, you can connect to a single sensor, and you must specify the sensor address
- **Number of sensors:** if AOUT is connected, either one or three sensors can be detected

- **ADC channels:** you must specify the pin on the connector for each sensor's analog output pin
- **OCD pins:** you must specify the pin on the connector for each sensor's OCD pin
- **Always in test mode:** if this is unchecked, then a special sequence is sent on the DCDI communications pin to put the sensor in test mode, after sensor power is toggled. If AOUT is not connected and there is no way for the software to toggle sensor power, the sensor cannot be detected
- **Measures OCD_THR:** if the sensor is not always in test mode, the DCDI communication pin can behave as an OCD threshold voltage. The software can read this voltage and display it. You must specify the connector pin
- **Sensor power:** you can power the sensor through the shield's VDD, an LDO toggled by the LDOEN pin or through an external VDD. For the first two options, sensor power can be toggled by the software
- **Sensor voltage:** 5 V or 3.3 V
- **Analog multiplexer:** the OCD_THR pin has two functions, and you can choose the function using a multiplexer, toggled by the selected pin

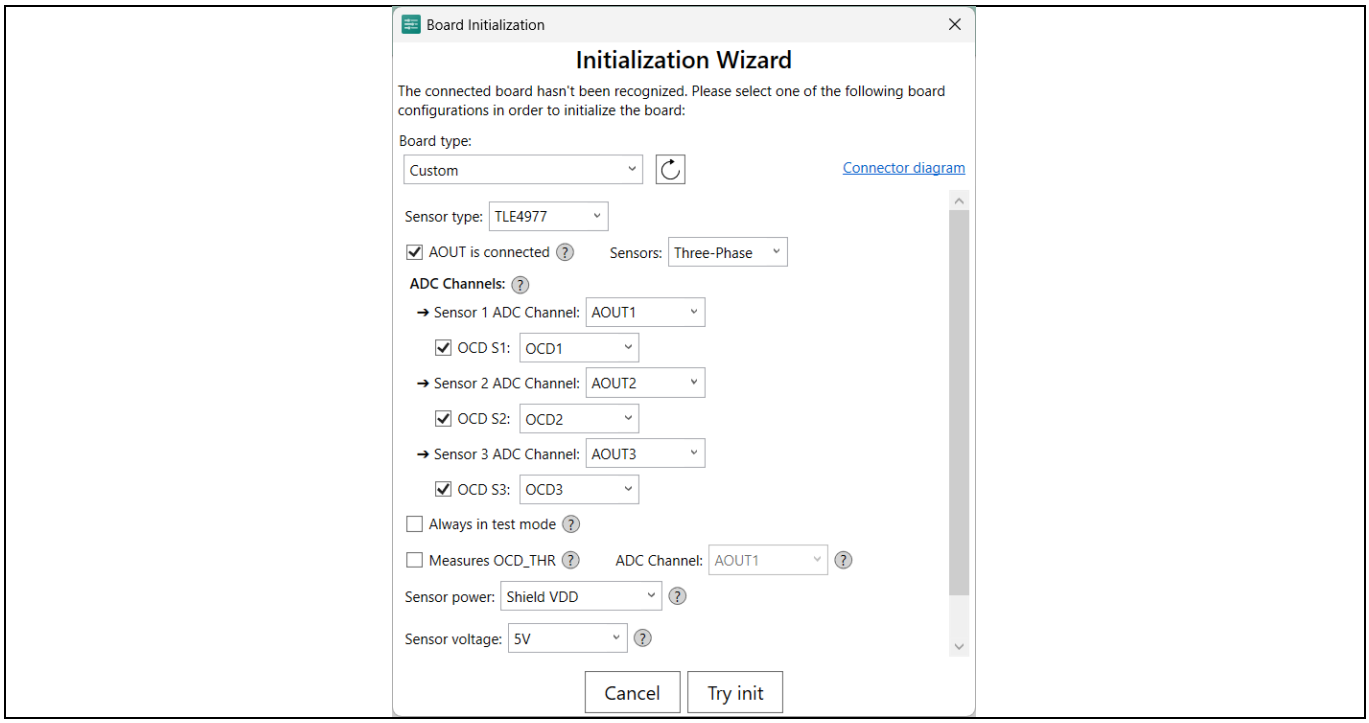

Figure 16 Connecting to custom boards

After you set the desired board configuration, click the **Try init** button. The software checks for conflicts in the ADC channels and OCD pins. For a detailed diagram of the connector pins, click the **Connector diagram** link in the top right of the window. To reset to the default configuration, click the button next to the board type drop-down list.

3.3 Main window and scenarios

Once the board is connected, the GUI updates, as shown in Figure 17. The GUI is divided into two sections:

- **Sensor controls:** Located on the left side of the window. This panel allows you to disconnect from the board or control the sensor. If a scenario is selected, different buttons and controls are displayed accordingly
- **Main section:** Located on the right side of the window. This panel allows you to select and interact with different scenarios. This panel is not intended for direct interaction with the sensor

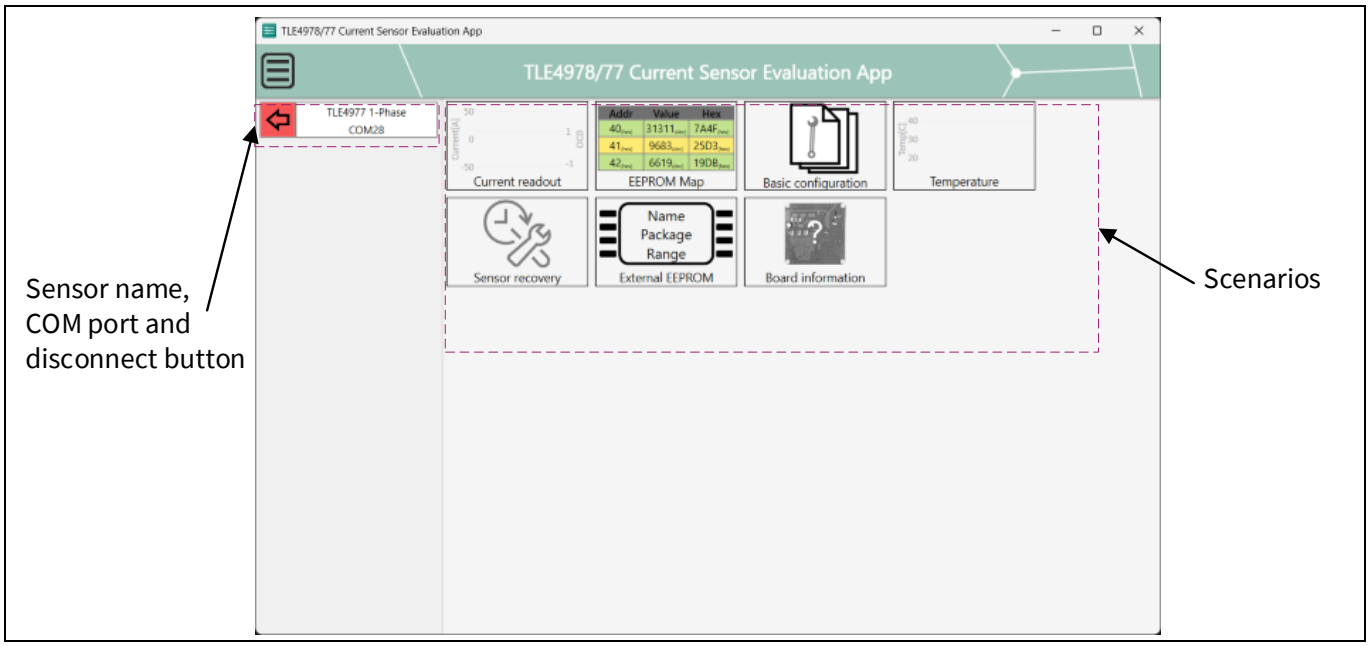

Figure 17 Main screen

3.3.1 Current readout

The main function of the sensor is current readout. In the software, the measured current is displayed on a chart along with the status of overcurrent detection (OCD). The overcurrent detection (OCD) status is displayed in the panel on the right:

- **If the circle is green:** The pin is inactive, at its default status (HIGH for OCD)
- **If the circle is red:** The pin is active (OCD is LOW)
- **If the circle has no color:** Readout is off

The controls panel (left) allows you to start or stop the readout and change the averaging window. The XMC™ Boot Kit ADC is configured for a sampling rate of 20 kHz. In the software, you can choose how many samples are averaged before the readout is sent to the software.

Example

For example, with 250 Hz and 64 averaging points, the averaging window is 64 samples wide, so a value is sent to the software at a frequency of 20,000/64 = 312.5 samples per second (ADC sample rate is 20 kHz). You can select 250 Hz as the maximum frequency, so the actual readout rate will be 250 samples per second.

The current readout scenario, as shown in Figure 18, has the following features:

- Switch current units between LSB and Amperes (A). This changes the unit for the chart, but also for the values on the right:
- **AOUT:** Voltage of the sensor's analog output, either in LSB or Volts (V)
- **VRef:** LDO reference voltage used to calculate the current in Amperes
- **Current value (A):** Always in Amperes. The value of the current in LSB will be the same as AOUT in LSB
- **VThr:** OCD threshold voltage, the voltage at which the OCD pin goes LOW. For the OCD threshold voltage formula, see the XENSIV™ TLE4977 sensor datasheet [1]

The chart shows the value of the current in the selected unit of measurement, along with the status of OCD. The chart automatically scales to higher current values. The settings button allows changing the chart limits to custom ones. Sensor readings are enabled by default when you enter the scenario.

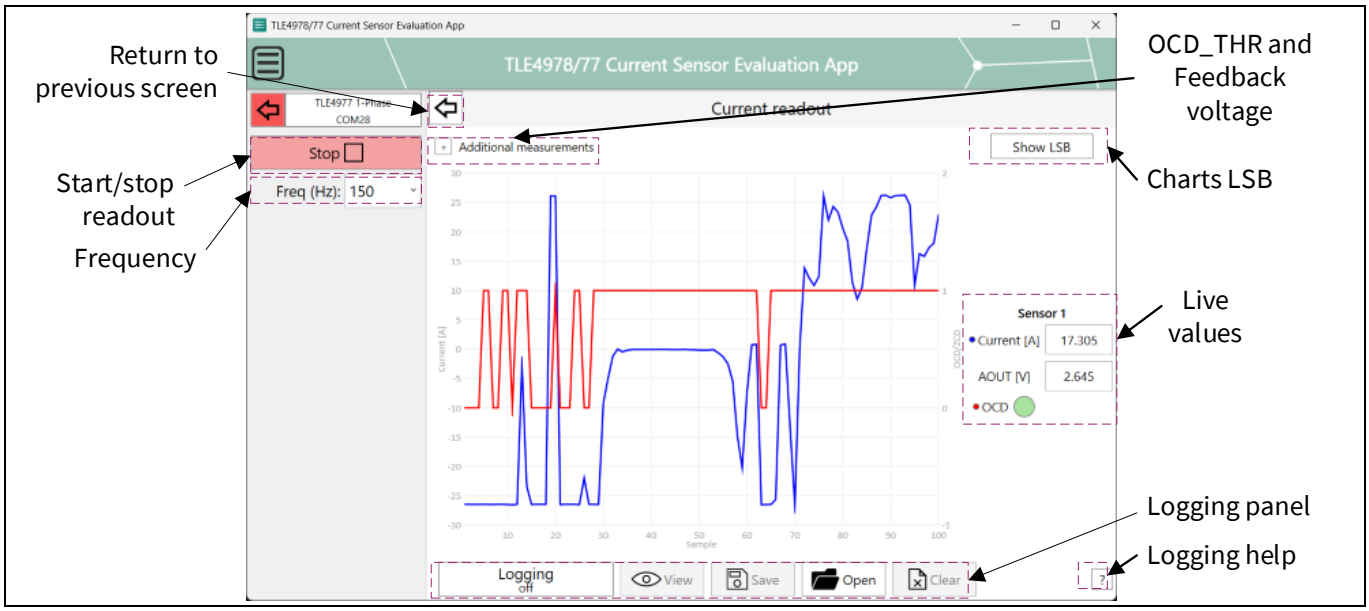

Figure 18 Current readout

3.3.2 Sensor data logging

The logging feature is useful when you need to capture an event, along with some samples before and after the event. Logging can be enabled by clicking the first button labeled **Logging**. When logging is enabled, the status text below the button changes from off to on, and the color of the button changes to red. Click the button again to disable logging.

Other buttons in the logging panel are:

- **View:** Opens a new window where the logged points are displayed
- **Save:** Saves the logged points to disk
- **Open:** Shows the logged points from a previously saved file
- **Clear:** Empties the logged points list

Data logging is supported in the current readout and wire on chip (WOC) scenarios. Each scenario has its own logging file format. Click the **Open** button in the logging panel from either scenario, and then select the desired logging file type.

Figure 19 Logging window

The logging file contains values for current (amperes and LSB) and OCD. The software saves the logging files in comma-separated values (*.csv*) format. There is no limit on how many points can be logged. Data logging is initially performed using a temporary file, so memory usage does not increase while logging is in progress.

Figure 19 shows the logging window, where logged data points can be viewed and edited. The buttons in the lower-right panel allow you to remove a selected range of the points, save changes temporarily, or reload the previously saved dataset. To permanently apply the changes, click the **Save** button.

The panel on the right allows you to change the following parameters of the chart:

- **Show LSB/Show A:** Switch between LSB and amperes (A)
- **Cursor checkbox:** Enable or disable the chart cursor. Disabling the cursor also hides the current-points pop-up
- **Series visibility:** Shows or hides certain waveforms
- **Zoom options:** Allow zooming only on the vertical or horizontal axis
- **Reset zoom:** Zoom to fit the whole chart and pan to the center

After clicking the **Save** button, you can enter a comment that will be added to the header of the file. The file is saved in *.csv* format with the following structure:

- **Header section:** Contains the timestamp, sensor name, logging mode (current or wire on chip), and the user comment
- **Data section:** Each logged line consists of a data bundle containing the index, computed current, OCD status, and current in LSB format

3.3.3 EEPROM Map

The EEPROM Map scenario allows you to view and modify various parameters of the sensor, such as DCDI address, baud rate, OCD threshold, and OCD deglitch parameters. You can change any of the parameters except cyclic redundancy check (CRC), which is automatically calculated and displayed in the GUI after every change of the EEPROM.

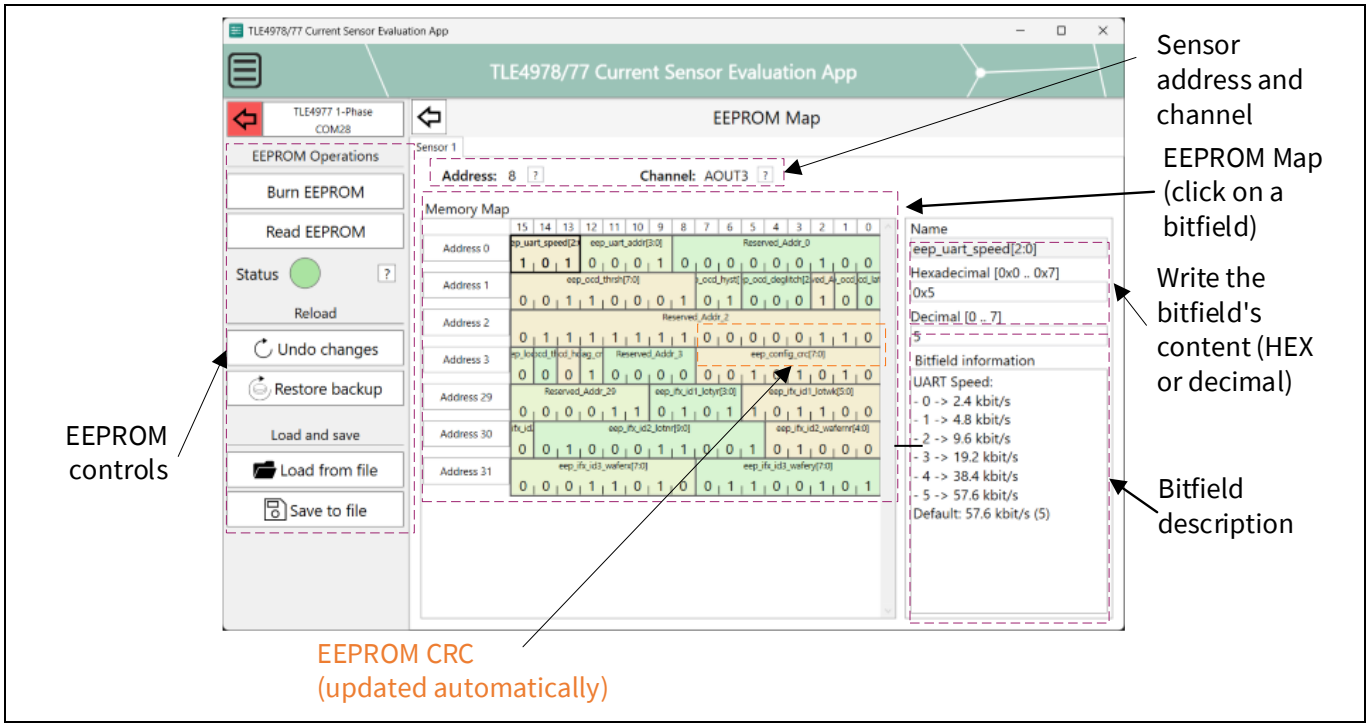

Figure 20 EEPROM Map

The scenario starts with a loading screen while the software reads the sensor EEPROM. Only the user-accessible area of the EEPROM can be changed, while the reserved area will be hidden. The software needs to read the complete register map to compute the correct CRC.

After reading the EEPROM, the memory map is displayed, with all the user-accessible rows and bitfields. Clicking on a bitfield will update the description on the right side of the panel. You can write either in decimal or hexadecimal format. For more information, see Figure 20

For a simpler view, enter the “Basic configuration” scenario. The bitfield values can be entered only in decimal format. Each field comes with a description tooltip that displays when the cursor is on top of the question mark button. For more information, see Figure 21

Both views have the same effect and are updated in real time, so if you change something in one view, it will be reflected in the other view as well.

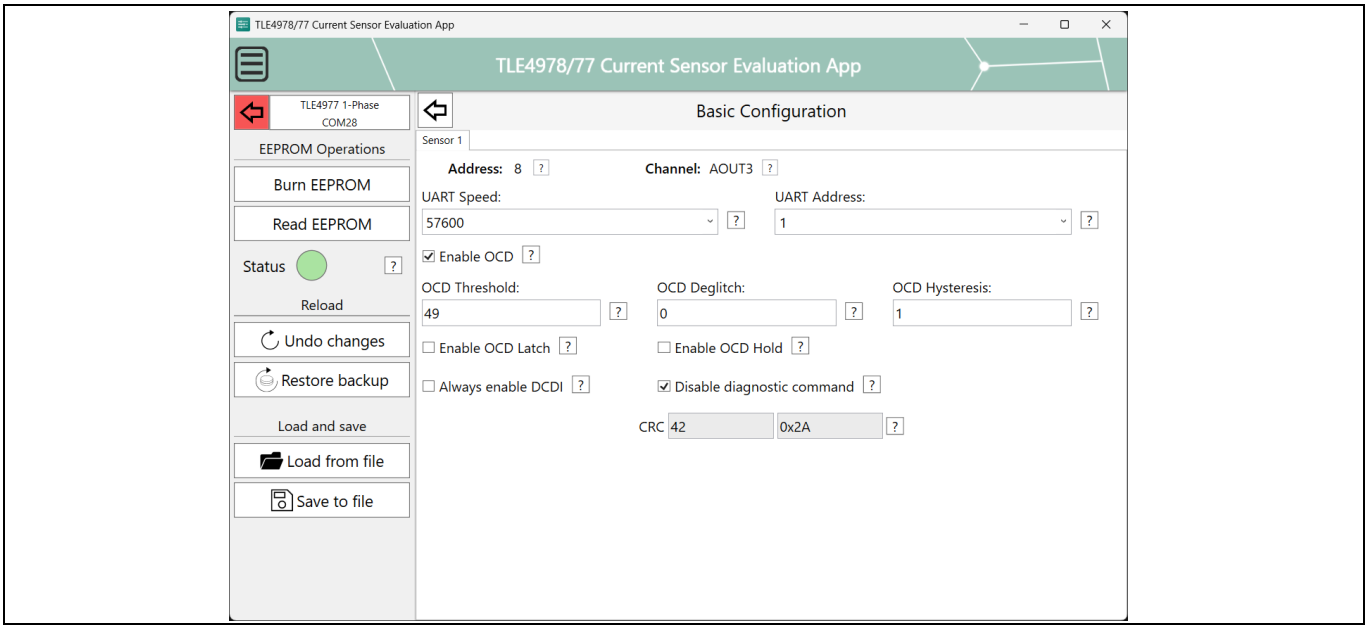

Figure 21 EEPROM basic configuration

When writing to the bitfields, the sensor's EEPROM is not changed. If you want to commit the changes, click the **Burn EEPROM** button on the left. This operation may take some time. **Do not** disconnect the sensor or close the program. Doing so may result in permanent sensor damage.

The software verifies each bitfield content. For example, if a bitfield is 3 bits wide, the content can be in the range [0, 7] and you cannot write a value outside that range. You cannot write to the CRC register as it is automatically calculated. The contents of the reserved registers are also locked, and you cannot modify them.

The panel on the left contains buttons for EEPROM burn and read, which are the only two operations that require the sensor. The status light indicates when the EEPROM is busy or if an error occurred during the last EEPROM operation. The **Undo changes** button is used for reloading the EEPROM to the last known state without reading it again from the sensor.

The software will automatically save the initial EEPROM content detected for each sensor (based on the ID fields) and will store that content on disk. Click the **Restore backup** button to reload the first configuration to the sensor. This backup contains only the EEPROM configuration that was first detected by the software on the current PC.

You can save a custom EEPROM configuration to a file (**Save to file**) or load it from a previously saved file (**Load from file**). You can load the configuration from another sensor. The ID fields of the original sensor will be kept, and you can choose to also keep the original UART parameters.

3.3.4 Temperature readout

The temperature readout scenario shown in Figure 22 is used to display the sensor's temperature in Celsius or LSB. The temperature is read digitally from a DCDI register. Therefore, the sensor will be in test mode in this scenario. The same features from the current readout scenario are also available here: start/stop readout, frequency, data logging, and switching between LSB and °C. The temperature readout frequency depends on the DCDI baud rate: a lower DCDI baud rate will result in a longer readout frame duration.

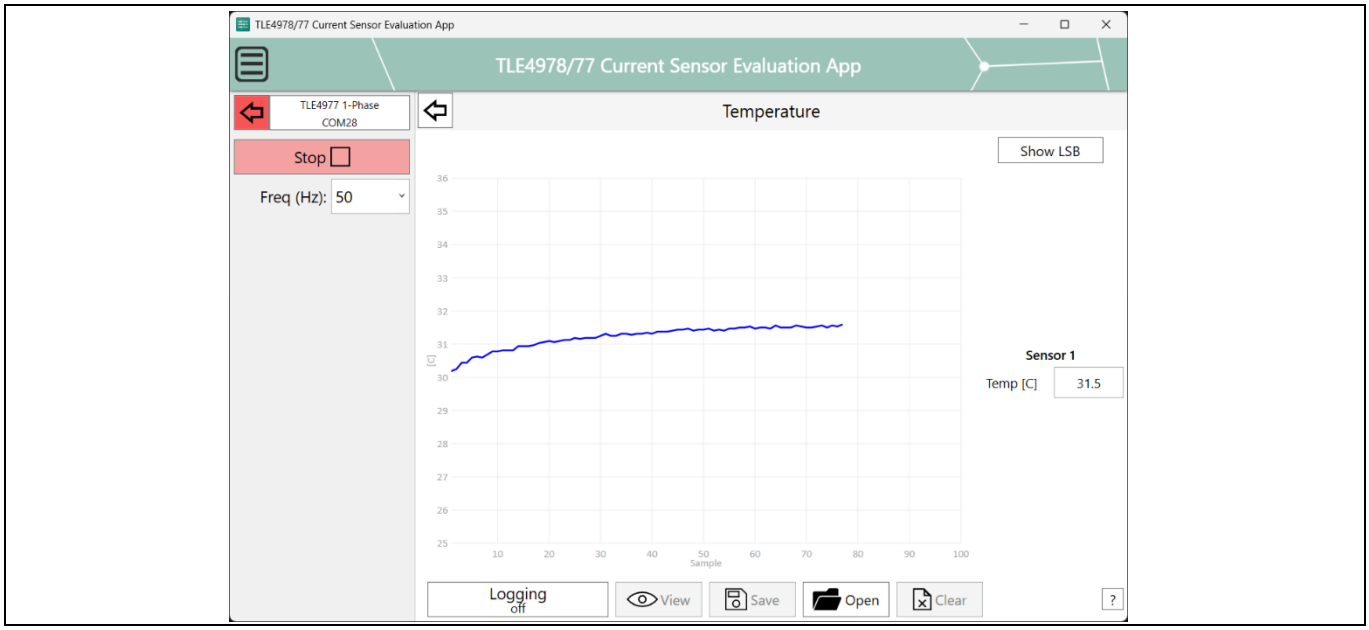

Figure 22 Temperature readout

Data logging in temperature readout mode works in the same way as current readout. This functionality is explained in Section 3.3.2.

3.3.5 Board information

The software supports multiple sensors and multiple board configurations. In this view, the software will show all the information about the currently selected board:

- The number and type of the sensors on the board
- Baud rate (must be the same for all sensors)
- Whether or not DCDI is always enabled on the sensors
- Additional features: OCD threshold measurement, analog multiplexer, feedback voltage measurement, and LDO

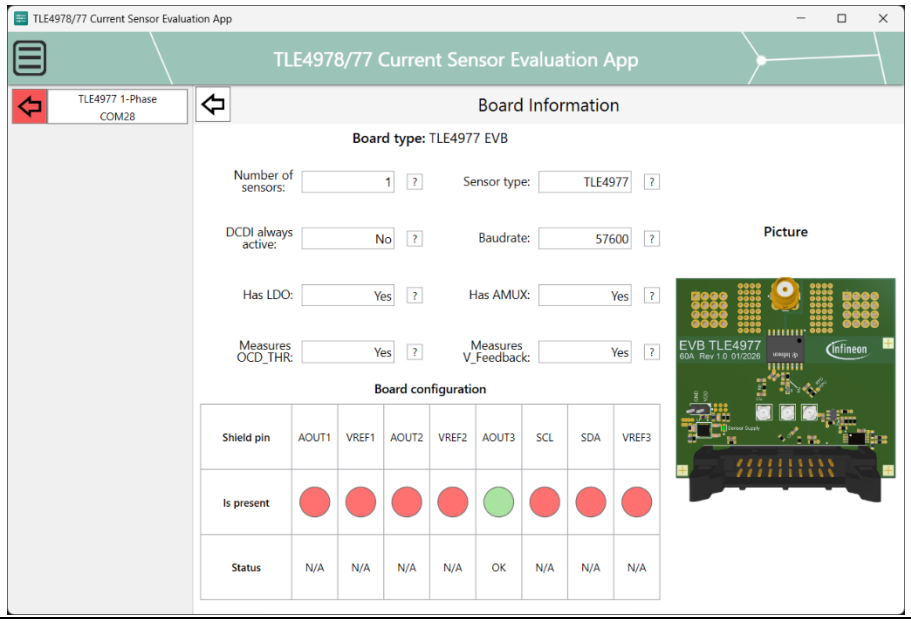

Figure 23 Board information

3.3.6 Sensor recovery

In some cases, the sensor's EEPROM might be compromised. If the sensor detects a wrong CRC in the EEPROM, the shadow registers will be set to their default values, indicating that the sensor will be stuck at a baud rate of 57,600 bps and DCDI will require a special sequence to be activated. The analog output of the sensor will also be wrong.

If the software does not detect a sensor, you can still use the software and enter the "*Sensor recovery*" view to restore the sensor's EEPROM to a working condition.

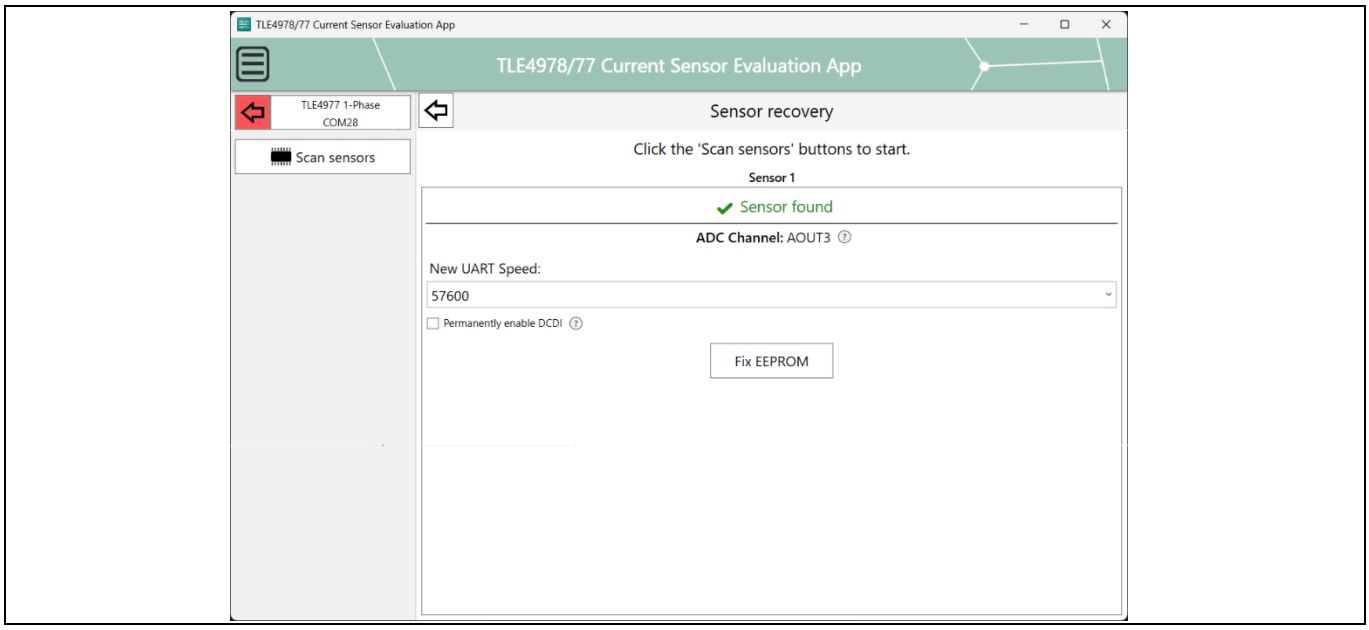

Figure 24 Sensor recovery

After clicking the **Scan sensors** button on the left, the software will begin scanning for sensors at all known baud rates. If a sensor is detected, you will be notified, and it can be recovered.

You can choose a UART speed for the sensor and whether to permanently enable DCDI. For TLE4977 sensors, this is not required as the DCDI sequence is always used. By always enabling DCDI, the sensor will ignore any voltage on the OCD_THR pin and rely on the value stored in the EEPROM.

Clicking the **Fix EEPROM** button will set the sensor's address to '1'. A message will be shown about the operation's result. After restoring the sensor's EEPROM, all the other views can be used again.

3.3.7 External EEPROM

The XENSIV™ TLE4977 evaluation board also contains an external I²C EEPROM used to store the sensor name, voltage, range, package, calibration parameters, and the date and time of programming (Figure 25). If the external EEPROM is not present, this scenario is not available. The scenario does not provide any controls in the left panel. Since the external EEPROM is read-only, its contents cannot be modified.

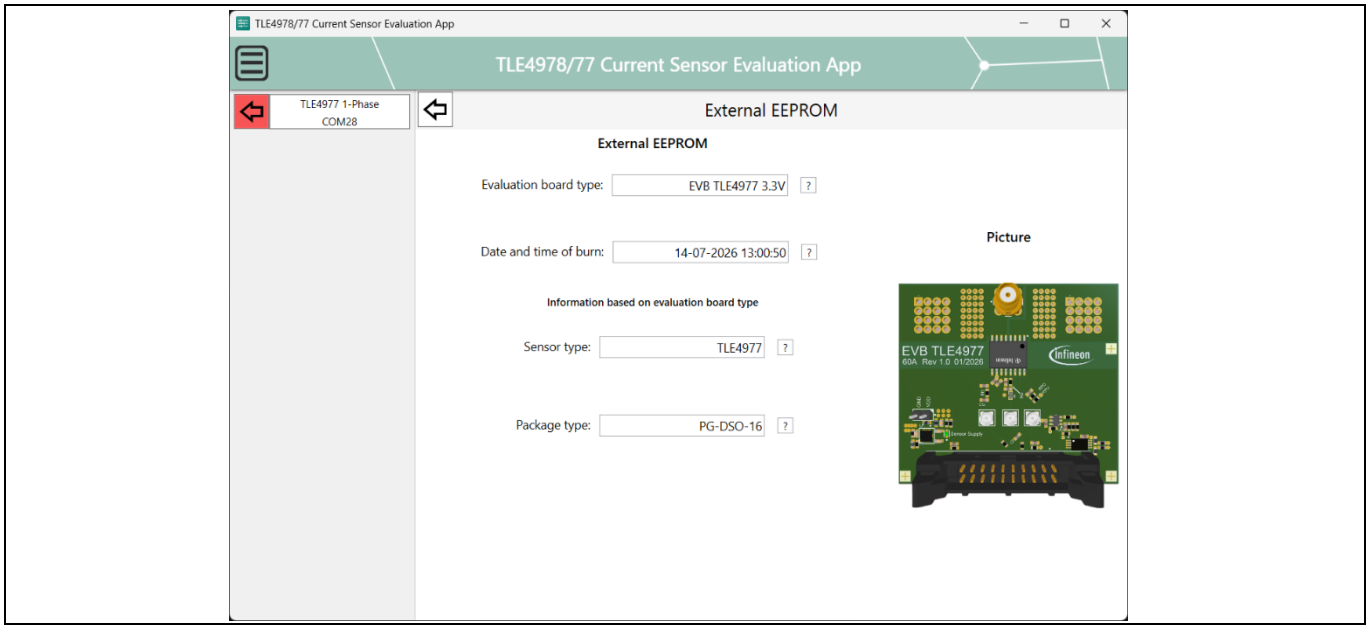

Figure 25 External EEPROM

If the board has no external EEPROM, the calibration parameters will be saved to a file and loaded automatically by the software.

4 System design

This section offers a detailed description of the hardware design Revision 1.00 of the TLE4977 evaluation board.

The hardware is composed of the following main blocks:

- **Application circuit:** Consisting of the following components:
  - XENSIV™ TLE4977 sensor (80 A/60 A/50 A/40 A/30 A/20 A), powered by a buck-boost converter
  - TS5A3159QDBVRQ1 analog multiplexer used to switch the OCD_THR pin's function between OCD threshold voltage and DCDI communication pin
  - Low-pass filter on the analog output (AOUT) pin
- **Power supply:** The TPS63002 buck-boost converter supplies a steady 5 V or 3.3 V to the sensor. The input voltage comes directly from the USB
- **External EEPROM:** The M24C02-WDW6TP I2C EEPROM stores board information, enabling the software to identify the board type without requiring user input.
- **Current sensor programmer shield:** Used to connect the XENSIV™ TLE4977 evaluation board to the XMC1100 Boot Kit. It also contains jumpers that can be used to connect the sensor without the other components on the evaluation board. An additional PMOS transistor can be used to control sensor power, if required
- **Target microcontroller:** The main microcontroller is an XMC1100 in a TSSOP38 package with 64 KB of flash memory. This device performs ADC sampling of the sensor analog output and forwards the acquired data to USB via a debugger
- **Onboard debugger:** The XMC1100 Boot Kit board features a debugger implemented via an XMC4200 microcontroller. This auxiliary microcontroller features debug probe firmware delivered by SEGGER J-Link. This debugger is used for flashing the target microcontroller and for establishing serial communication via USB

4.1 Schematics

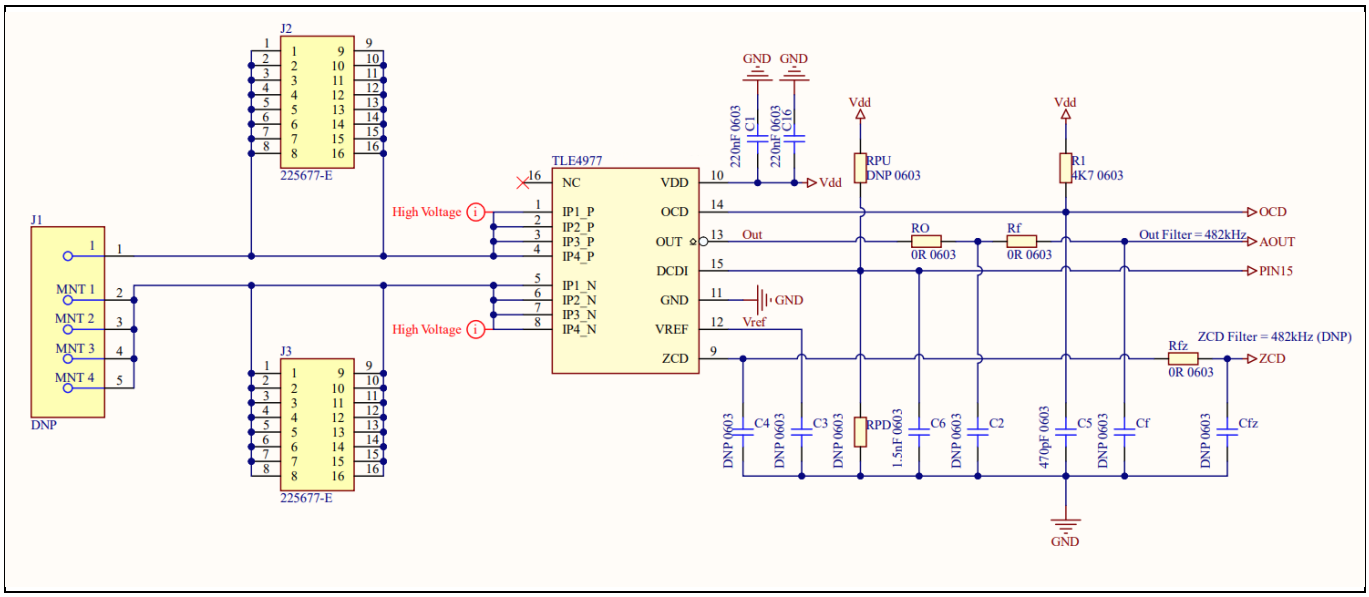

Figure 26 Application circuit

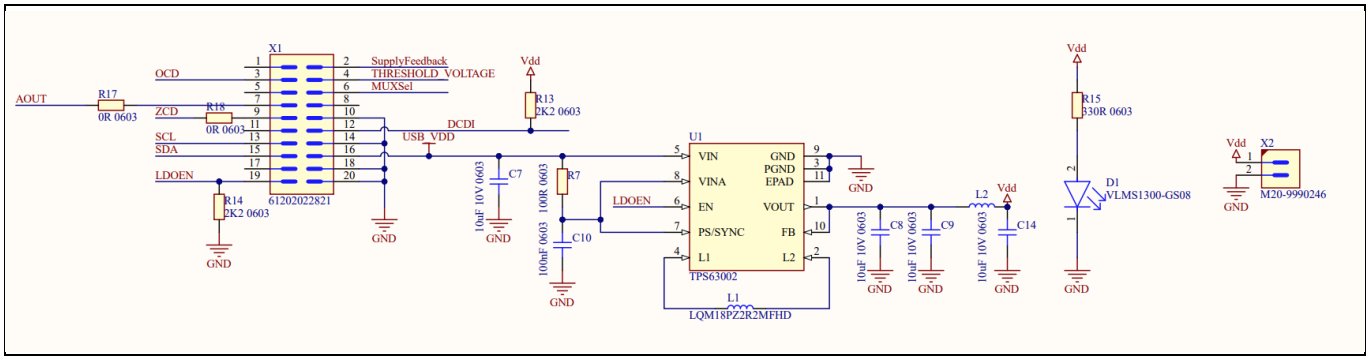

Figure 27 Connector and LDO

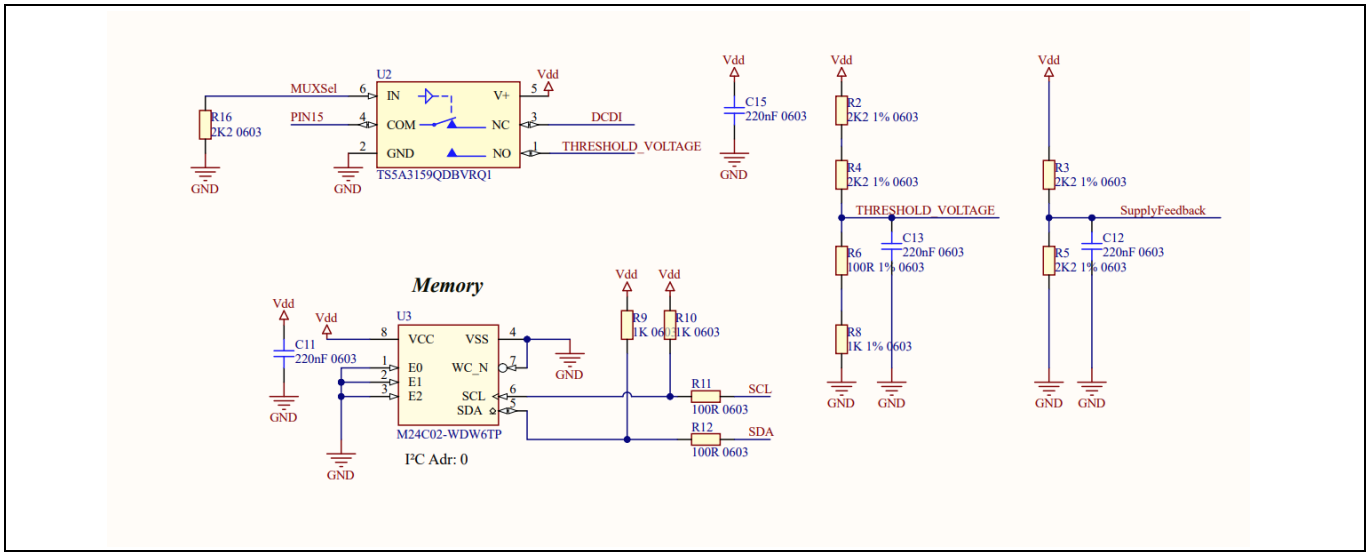

Figure 28 Analog multiplexer and external EEPROM

4.2 PCB layout

The design shown in Section 4.1 is physically implemented in PCB technology using a standard process with the following characteristics:

- PCB material: FR4
- PCB thickness: 1.6 mm ± 10%
- Copper: Four layers, 70 µm thickness for outer layers, 140 µm thickness for inner layers

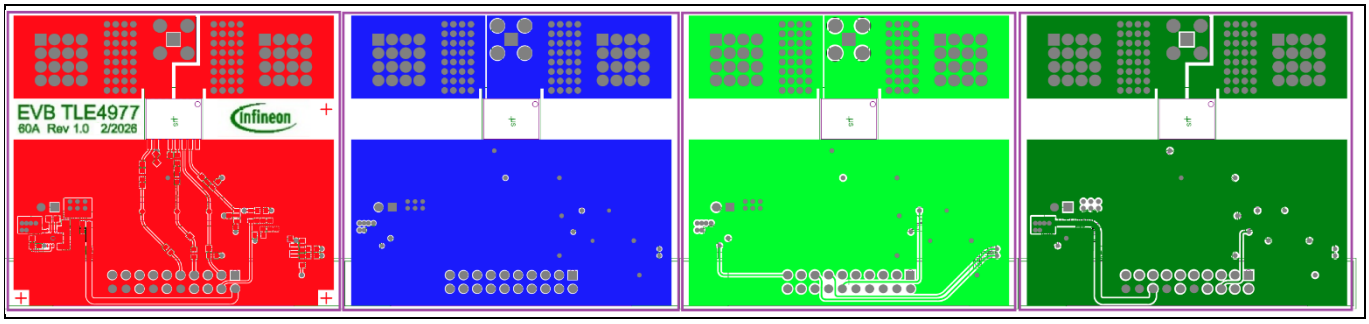

Figure 29 TLE4977 evaluation board PCB layout

4.3 Bill of materials

Table 2 Bill of materials

Qty.	Ref designator	Description	Footprint	Populated
6	C1, C11, C12, C13, C15, C16	220 nF 0603	CAPC1608X90N, CAPC1608X90N-3	Yes
7	C2, C3, C4, Cf, Cfz, RPD, RPU	DNP 0603	CAPC1608X90N-4, CAPC1608X90N, RESC1609X50N	No
1	C5	470 pF 0603	CAPC1608X90N	Yes
1	C6	1.5 nF 0603	CAPC1608X90N	Yes
4	C7, C8, C9, C14	10 µF 10 V 0603	CAPC1608X120N	Yes
1	C10	100 nF 0603	CAPC1608X87N	Yes
1	D1	VLMS1300-GS08	FP-6_541-5092_01-4-MFG	Yes
1	J1	DNP	FP-142-0701-201-MFG	Yes
2	J2, J3	225677-E	225677E	Yes
2	L1, L2	LQM18PZ2R2MFHD	INDC1608X95N_LQM18P_FR	Yes
3	MMCX_OCD, MMCX_Out_Flt, MMCX_ZCD	734152061	CON-SMA-734152061	Yes
1	R1	4K7 0603	RESC1609X50N	Yes
4	R2, R3, R4, R5	2K2 1% 0603	RESC1608X55N-1	Yes
1	R6	100R 1% 0603	RESC1608X55N-1	Yes
3	R7, R11, R12	100R 0603	RESC1608X55N-2	Yes
1	R8	1K 1% 0603	RESC1608X55N-1	Yes
2	R9, R10	1K 0603	RESC1608X55N-6	Yes
3	R13, R14, R16	2K2 0603	RESC1608X55N-1	Yes
1	R15	330R 0603	RESC1608X55N-2	Yes
5	R17, R18, Rf, Rfz, RO	0R 0603	RESC1609X50N, 1608[0603], RESC1608X55N-1	Yes
1	TLE4977	TLE4977 (80 A/60 A/50 A/40 A/30 A/20 A)	SOIC127P1030X265-16N-4	Yes
1	U1	TPS63002	SON50P300X300X100-11N-1-V	Yes
1	U2	TS5A3159QDBVRQ1	SOT95P280X145-6N-6	Yes
1	U3	M24C02-WDW6TP	SOP65P640X120-8N-1	Yes
1	X1	61202022821	CON-M-THT-61202022821	Yes
1	X2	M20-9990246	CON-M-THT-M20-9990246	Yes

5 Troubleshooting

Problem

The SEGGER J-Link driver is not installed correctly. If the device is not recognized properly in Device Manager (for example, if it appears as “BULK interface”), the driver is not installed.

The issue may occur if the software was installed without admin rights or if an error occurred during the installation process.

Symptoms

The software shows one of the following error messages:

- “Flashing finished successfully but expected FW is still different from actual FW”
- “J-Link driver missing or inaccessible”
- “Firmware version mismatch after flashing”
- “Firmware failed to answer after flashing”

Solution

Install the latest version of SEGGER J-Link from the SEGGER website. Run the installer with admin rights. Ensure that you select **Install legacy USB Driver for J-Link** when prompted (Figure 30). If the checkbox is missing (older J-Link versions), the driver will automatically be installed.

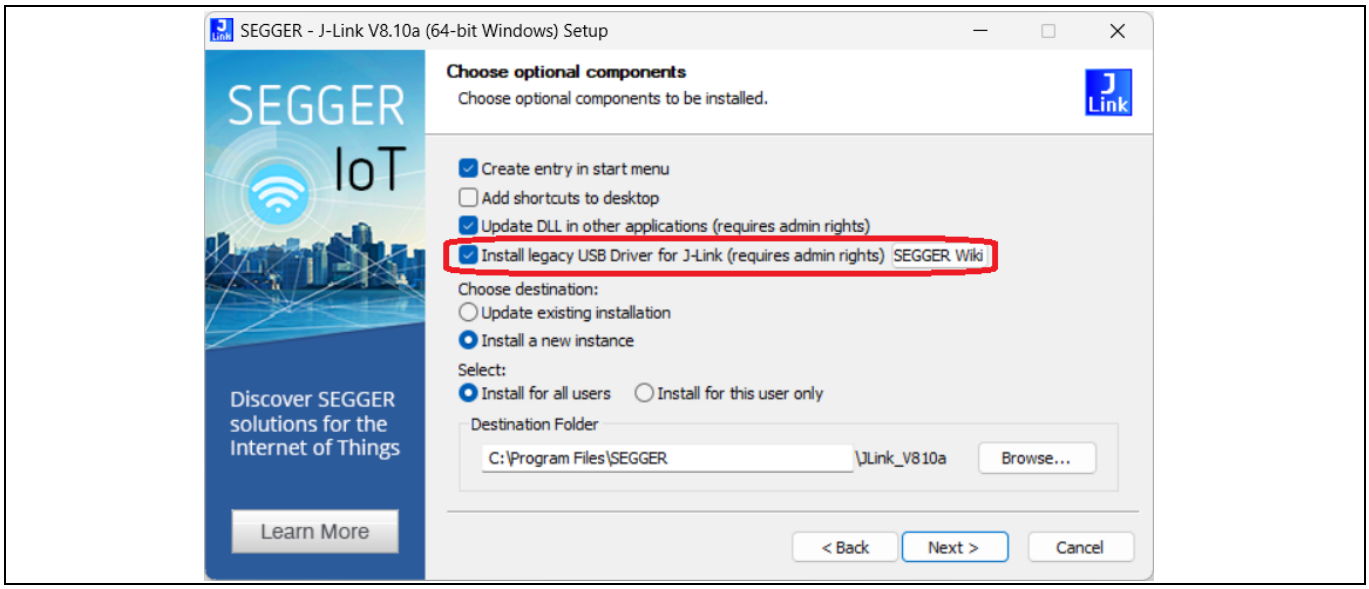

Figure 30 J-Link installation

6 Related resources

- Webpage: XENSIV™ current sensors
- Infineon Developer Community: XENSIV™ current sensors forum
- XENSIV™ TLE4978/77 Current Sensor Evaluation App

References

[1] Infineon Technologies AG: *XENSIV™ TLE4977 current sensor datasheet*;

[2] Infineon Technologies AG: *XENSIV™ TLE4977 current sensor user manual;*

Glossary

AC
alternating current (AC)

ADC
analog-to-digital converter (ADC)

AOUT
analog output (AOUT)

CPU
central processing unit (CPU)

CRC
cyclic redundancy check (CRC)

CSV
comma-separated values (CSV)

DC
direct current (DC)

DCDI
digital control and diagnostic interface (DCDI)

DNP
do not populate (DNP)

EEPROM
electrically erasable programmable read-only memory (EEPROM)

ESD
electrostatic discharge (ESD)

EVB
evaluation board (EVB)

FR4
flame-retardant glass-reinforced epoxy laminate (FR4)

FW
firmware (FW)

GUI
graphical user interface (GUI)

I^2C
inter-integrated circuit (I^2C)

Glossary

IDC
Infineon Developer Center (IDC)

LDO
low-dropout regulator (LDO)

LDOEN
low-dropout regulator enable (LDOEN)

LSB
least significant bit (LSB)

MCU
microcontroller unit (MCU)

MUX
multiplexer (MUX)

OBC
on-board charging (OBC)

OCD
overcurrent detection (OCD)

OCD_THR
overcurrent detection threshold (OCD_THR)

PC
personal computer (PC)

PCB
printed circuit board (PCB)

PMOS
P-channel metal-oxide-semiconductor (PMOS)

PSU
power supply unit (PSU)

RAM
random-access memory (RAM)

SCL
serial clock (SCL)

SDA
serial data (SDA)

UART
universal asynchronous receiver-transmitter (UART)

USB
universal serial bus (USB)

VDD
supply voltage (VDD)

Revision history

Document revision	Date	Description of changes
1.00	2026-08-10	Initial release

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Edition: 2026-08-10

Published by
Infineon Technologies AG
Am Campeon 1-15
85579 Neubiberg, Germany

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Document reference:
UG124632

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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.