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DVK91231

Application Note

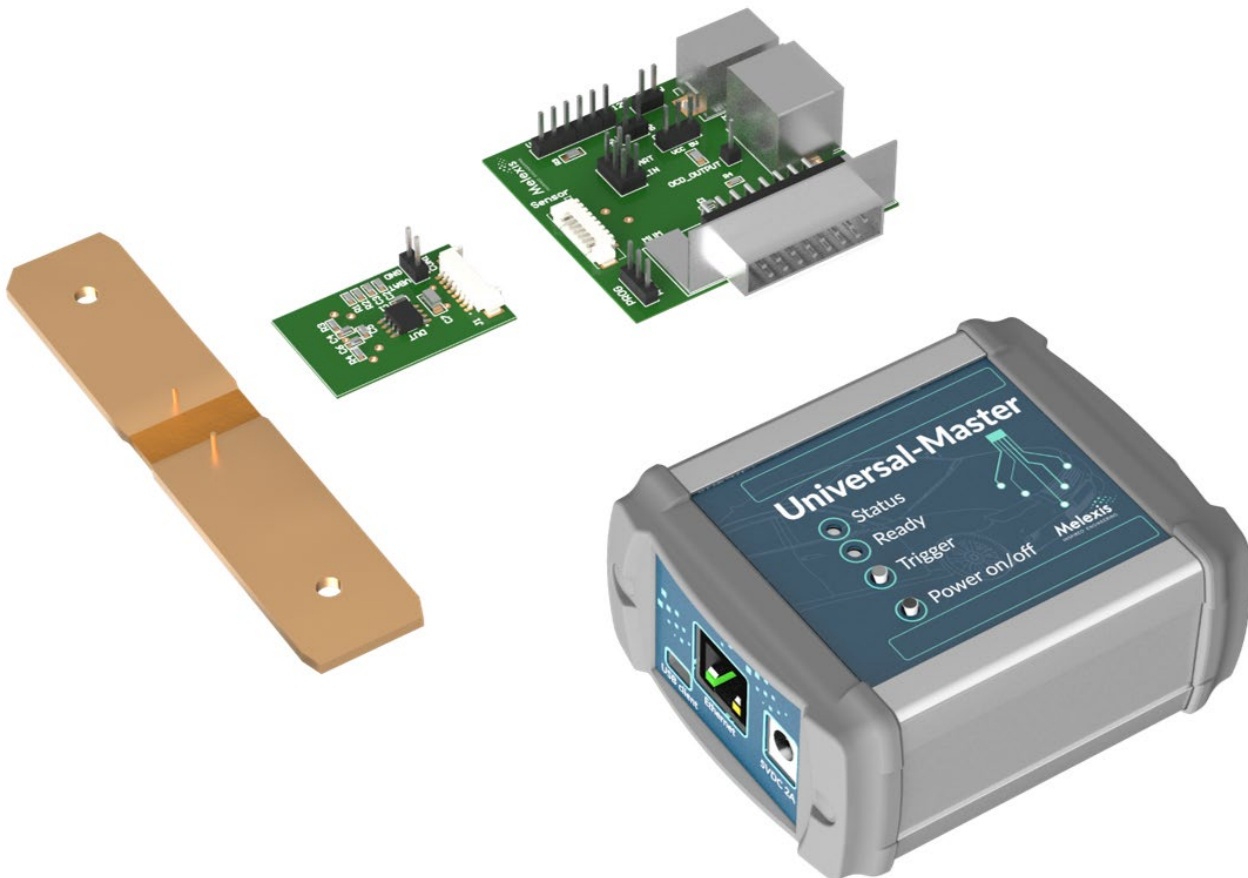
1. Scope

The MLX91231 represents a smart shunt ASIL-compliant current sensor solution. In addition to its primary function of highly-precise current measurement using Shunt, the MLX91231 offers extended capabilities encompassing voltage measurement, internal temperature sensing and automatic triggering of Overcurrent Detection events via a dedicated pin.

MLX91231 is equipped with an embedded flash memory and supports communication protocols through both LIN and UART interfaces. To facilitate LIN communication, Melexis has developed the “Melexis Universal Master (MUM)”, enabling connectivity to computer via USB. This is complemented by a simple graphical user interface which facilitates sensor calibration, programming and application.

The development kit comprises a Mother Board and a Sensor Board and has been engineered to enable comprehensive performance evaluation of the sensor's capabilities.

The following Application Note outlines the components within the MLX91231 development kit and aims to provide valuable guidance for the utilization of the DVK.



From left to right: Shunt bar- Sensor board- Mother board - Melexis Universal Master (Not included in the DVK)

Figure1: DVK91231 overview

DVK91231

Application Note

2. Hardware

2.1. Overview

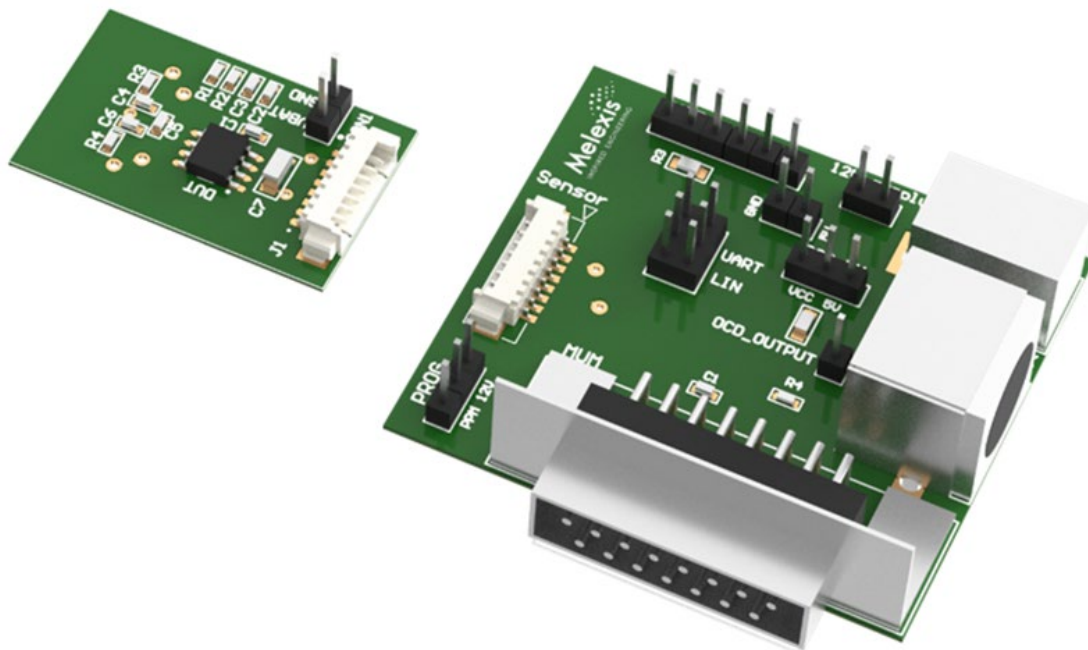
The “DVK91231” comprises (Refer to Figure 1 for the whole view):

- Mother Board: junction between the Programmer (not included in the DVK) and the Sensor Board
- Sensor Board: ready to use with a soldered MLX91231
- Connectors: Between Mother Board and Programmer (DB-15) , between Mother Board and Sensor Board (Molex)
- Shunt bar, with a resistance of **0.1mΩ**
- Spare MLX91231 ICs (x2)

To be able to program the IC the following programmer is needed:

- Melexis Universal Master (MUM): programmer tool and LIN master¹

MUM allows LIN communication for programming and application. To communicate over UART a USB to UART cable (FTDI cable) can be connected on the Mother Board.



From left to right: Sensor Board - Mother Board

Figure2: PCBs inside the DVK91231

¹ MUM is not included in the DVK91231 kit

DVK91231

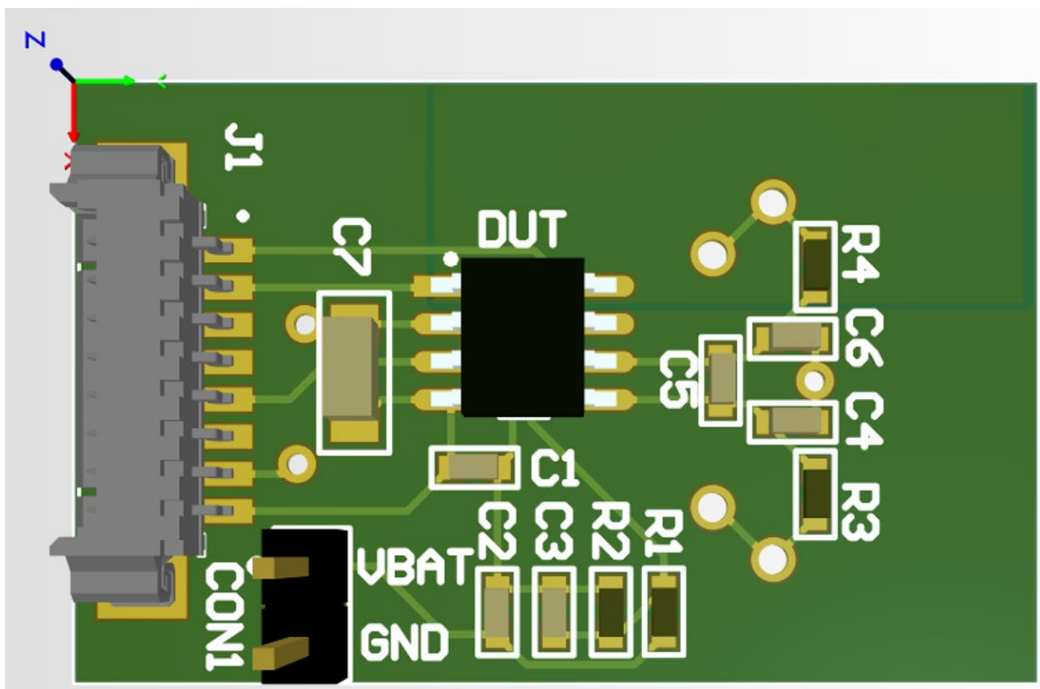
Application Note

2.2. Sensor Board

The Sensor Board comprises the integrated sensing IC designed to accurately measure the following key parameters:

- Current
- Internal temperature
- Battery voltage (post the resistive division)

The IC communicates over LIN or UART and provides an OCD on the TX pin or on the LIN pin. This depends on the loaded Firmware in the sensor. LIN is chosen as the default communication protocol with an OCD on the TX pin.



Part	Value
C1, C2	100nF
C3	1nF
C4, C6	22nF
C5	33nF
C7	4.7uF

Part	Value
R1	2.2kΩ
R2	TBD
R3, R4	100Ω

Figure3: Sensor Board schematics and component values

DVK91231

Application Note

2.2.1. Voltage circuitry

The internal resistive division in the IC allows MLX91231 to measure 12V/24V/48V directly on the pin. For high voltage (HV) applications, a direct connection of the pin to the ADC is possible provided an external voltage divider is in place. In the default Software the IC is set to measure the voltage of a 12V Battery on the pin. In order to measure voltages around 12V, the external resistive divider can be shorted with R1=0Ω and R2 open. For higher voltages an external divider is needed.

2.3. Mother Board

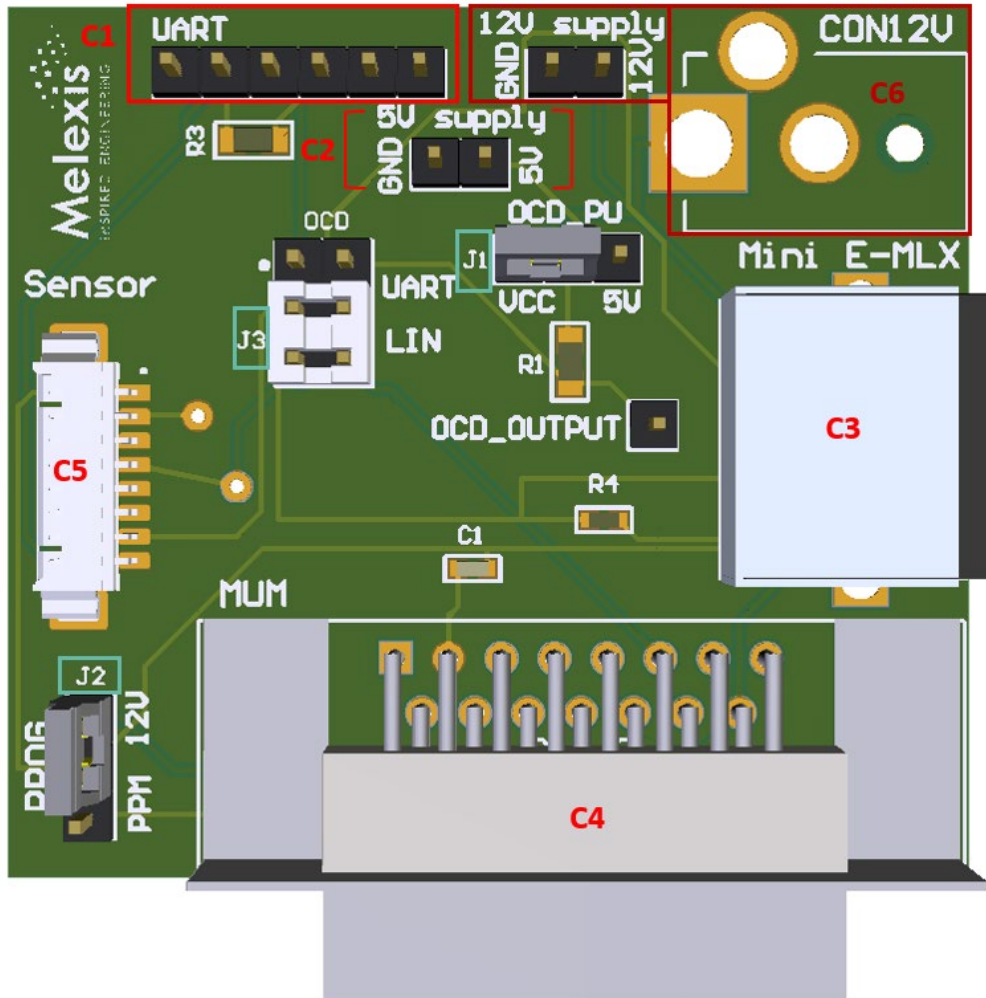
The Mother Board has been designed with the aim of providing flexibility. Through its diverse jumpers, the user can choose to:

- Communicate over UART with the OCD on the LIN pin
- Communicate over LIN with the OCD on the TX pin
- Program the IC
- Set the OCD to VCC or to an external applied voltage (i.e. 5V)

The following components are on the board (C = connector, J = Jumper):

- **C1** – UART communication:
 - USB to UART cable header. From left to right: NC ,RXD, TXD, 5V, NC ,GND
- **C2** – input:
 - OCD Pull-up voltage if J1 is set to 5V. From left to right: GND, 5V
- **C3** – communication:
 - Mini E-MLX communication interface
- **C4** – communication:
 - Melexis Universal Master (MUM) communication interface
- **C5** – communication:
 - Sensor Board interface. From top to bottom: VCC, GND, NC, OCD_LIN, NC, NC, OCD_TX, OCD_RX
- **C6** – supply:
 - Power supply between 4.5 and 18V, possibility to solder a socket for a DC plug to the right
- **J1** – OCD jumper:
 - Select the Pull-up voltage, either VCC (left) or external voltage applied on C2 (right)

- **J2** – Program jumper:
 - Running mode (top) and Programming mode PPM (bottom)
- **J3** – Communication jumper:
 - Select between LIN with OCD on TX (bottom) and UART with OCD on LIN (top)



Part	Value
C1	100nF
R1, R3	10kΩ
R4	3.3kΩ

Figure4: Mother Board schematics and component values

In all following subsections of 2.3, the mandatory jumper positions for every setting are indicated in black.

2.3.1. LIN communication

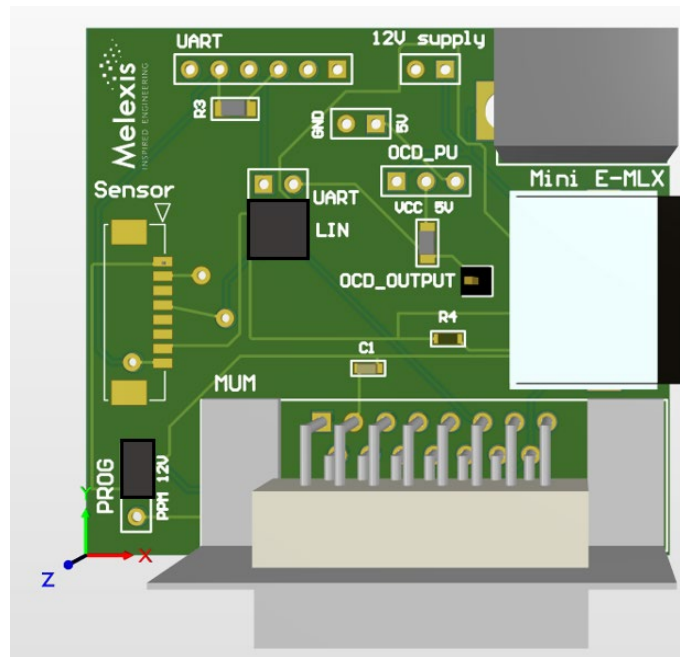


Figure5: Mother Board setting for LIN

2.3.2. UART communication

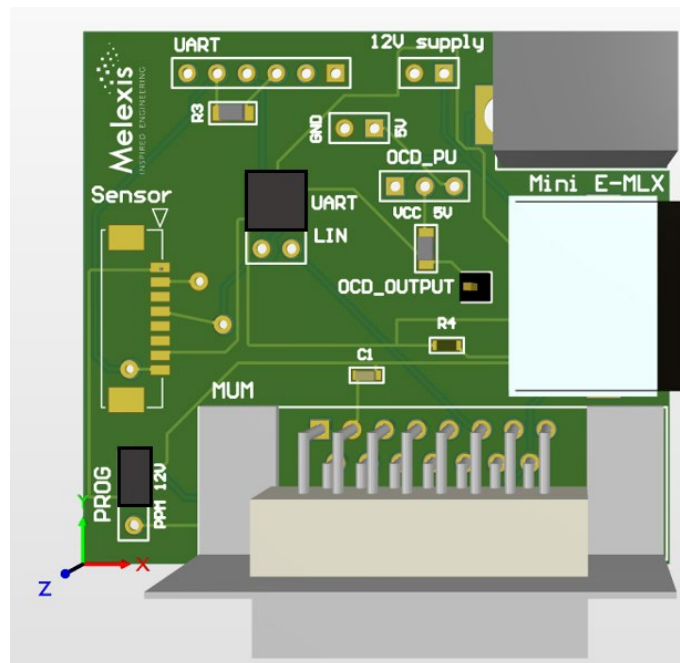


Figure6: Mother Board setting for UART

DVK91231

Application Note

2.3.3. Sensor programming

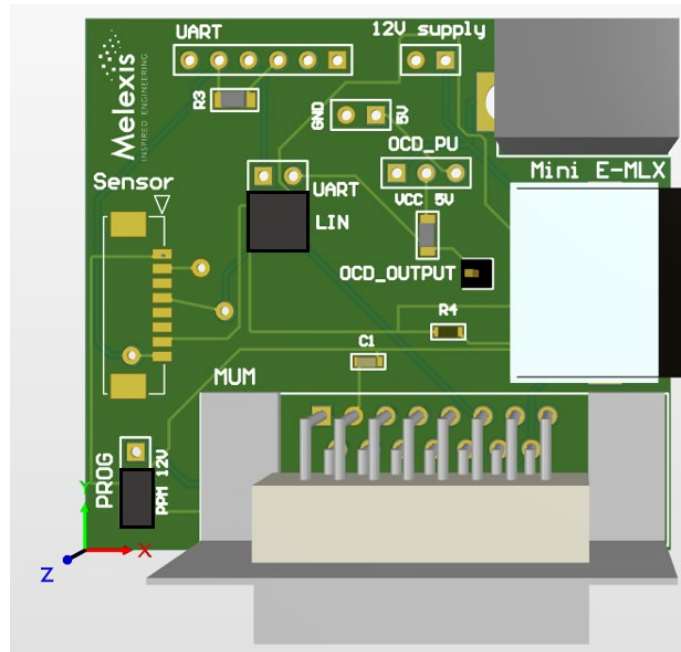


Figure7: Mother Board setting for Programming

2.3.4. OCD pull-up to VCC

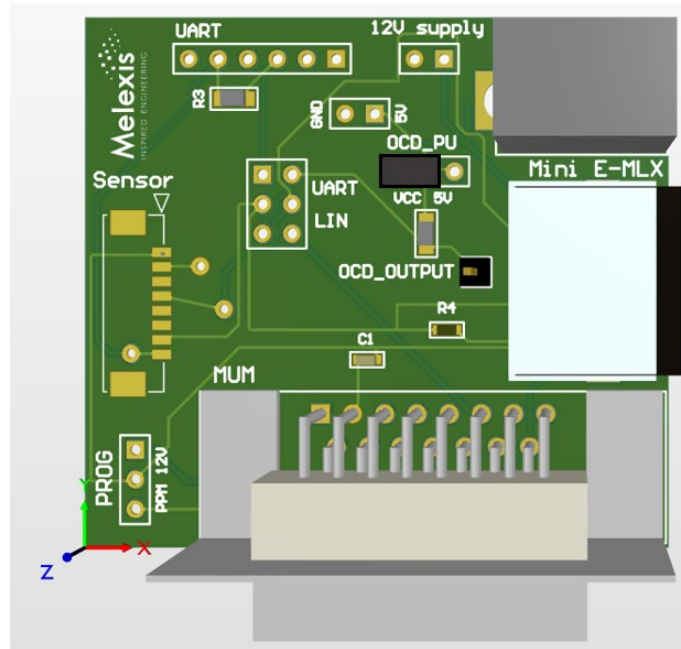


Figure8: Mother Board setting with OCD Pull-up to VCC

2.3.5. OCD pull-up to an external voltage

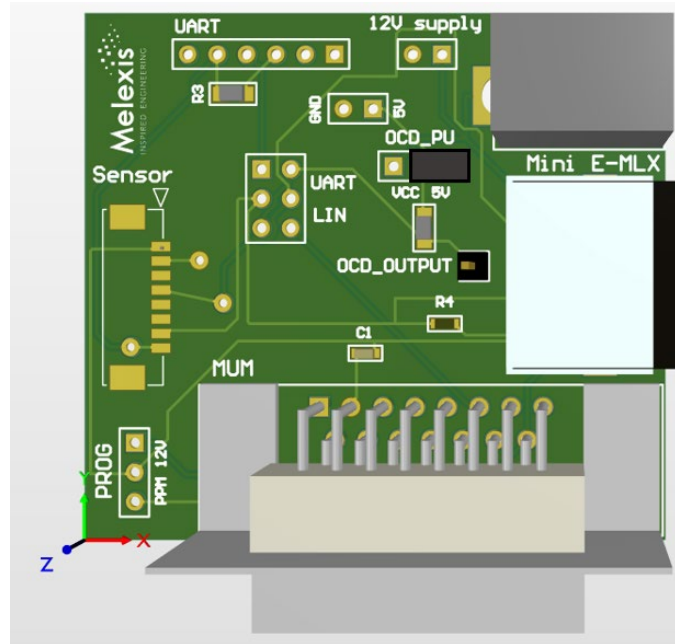


Figure9: Mother Board setting with OCD Pull-up to external

3. Melexis Universal Master

3.1. Overview

The “[Melexis Universal Master](#)” can be used as a master device in order to control and program Melexis ICs via following interfaces:

- LIN
- PPM
- FastLIN
- MeLiBu

MLX91231 can be programmed in PPM (Pulse-position modulation) and communicated-with in LIN (Local Interconnect Network).

The default IP address of the “Melexis Universal Master” on Windows is 192.168.7.2

4. Revision history table

Revision	Date	Description/comments
1.0	07/12/2023	Official release

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