

Multi-sensor RF platform sensor board

Introduction

The objective of this manual is to demonstrate the functionality of the STEVAL-IDI003V2 multi-sensor RF platform sensor board.

The STEVAL-IDI003V2 is an evaluation platform for testing multiple MEMS sensors from STMicroelectronics. It is used in conjunction with the STEVAL-IDI002V2, as a daughterboard for the evaluation of the multi-sensor RF platform based on 6LoWPAN. The STEVAL-IDI003V2 includes a MEMS accelerometer, pressure sensor, humidity sensor, and microphone. It also includes a photodiode. It connects to the STEVAL-IDI002V2 interface board using a 10-pin connector.

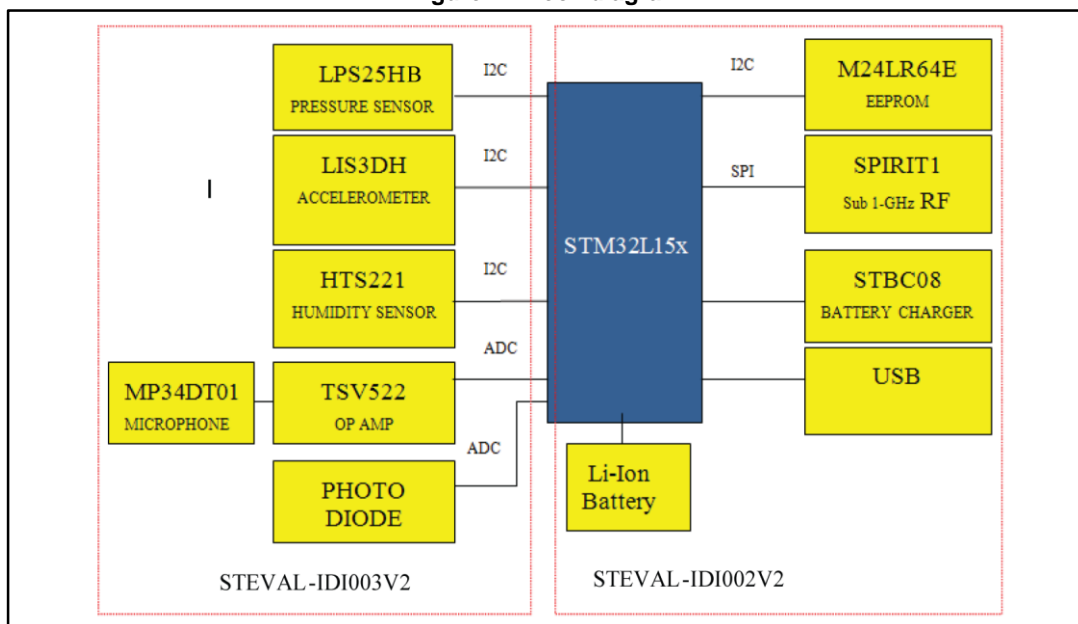
The STEVAL-IDI002V2 is the master board consisting of a STM32L152RBT6 Cortex-M3 microcontroller and wireless communication interface in the 868 MHz frequency band. It runs the open source Contiki 6LoWPAN 3.x stack, and provides a versatile platform for evaluating the 6LoWPAN solution in the Internet of Things context, where it can be interfaced to various sensors and/or actuators.

This board is connected to the STEVAL-IDI002V2 through GPIO's, ADC and I²C. The application firmware running on top of the Contiki 6LoWPAN stack interacts with the sensors and transmits the data over the 6LoWPAN network at 868 MHz.

The entire system can be powered by USB, or a single-cell Li-Ion battery (3.7 V, any capacity > 200 mAh).

The following is the block diagram of the system (both STEVAL-IDI002V2 and STEVAL-IDI003V2):

Figure 1: Block diagram



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1 Board description

Figure 2: STEVAL-IDI002V2 board photo

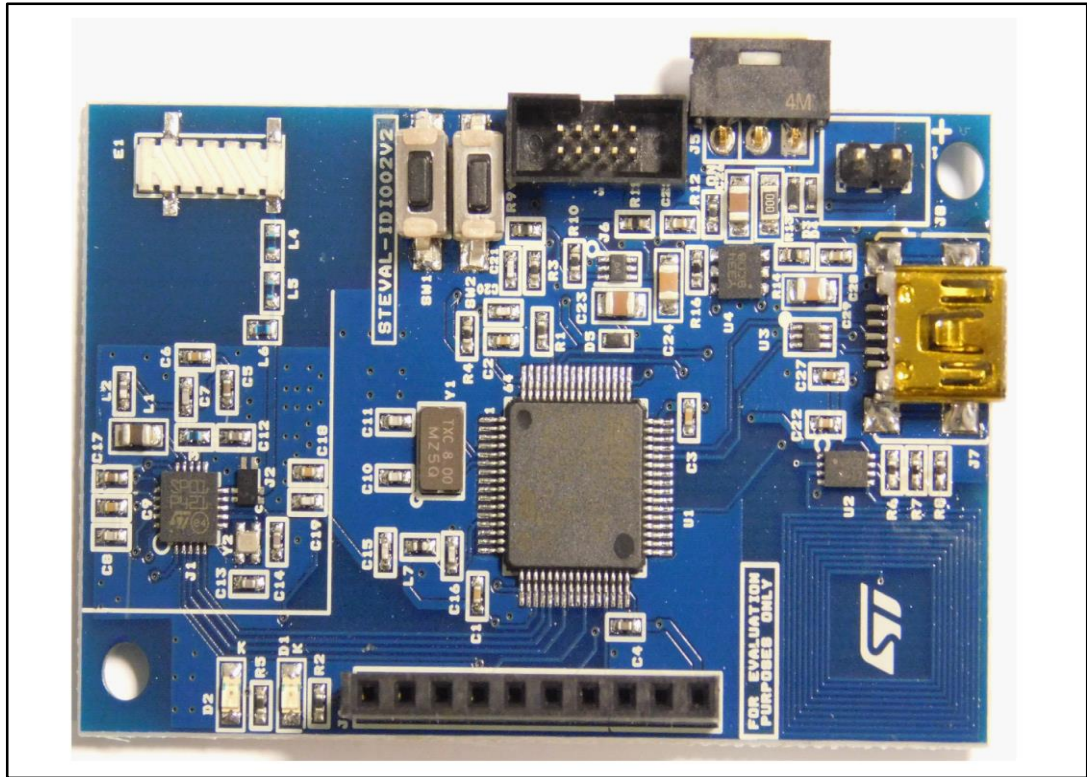
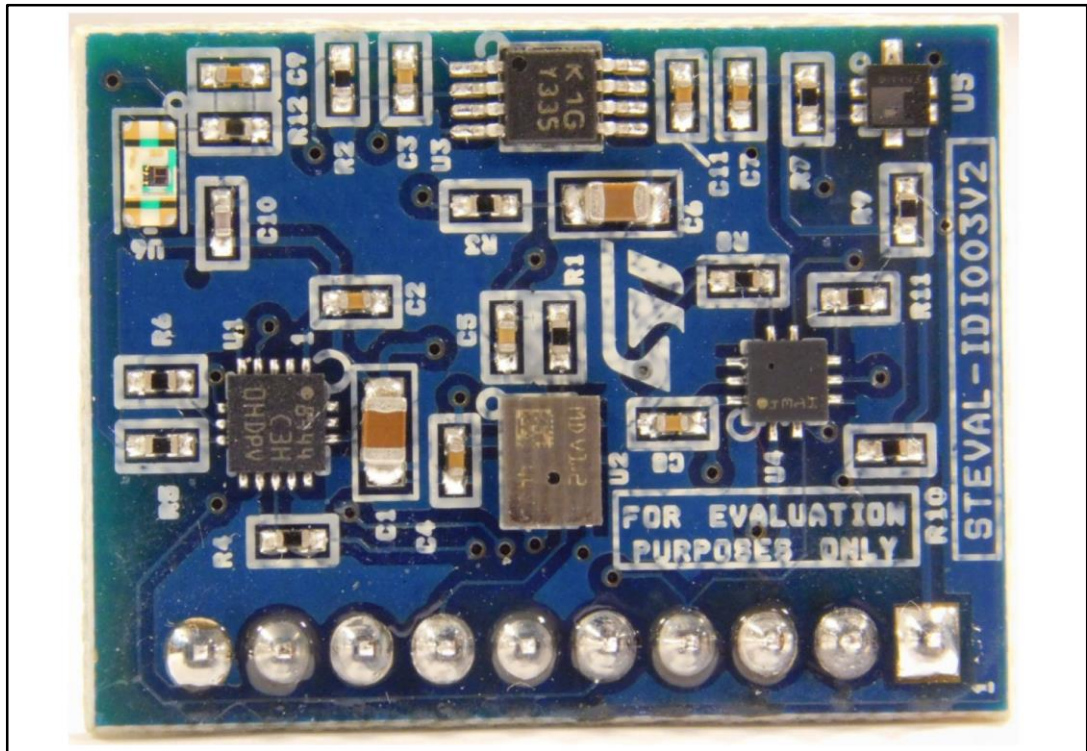


Figure 3: STEVAL-IDI003V2 board photo



To demonstrate the functionalities of the 6LoWPAN network based on the multi-sensor RF platform, the STEVAL-IDI004V2 is used. The STEVAL-IDI004V2 is a USB dongle based on the SPIRIT1 Sub 1-GHz RF transceiver and an STM32L microcontroller.

In the demo application, the STEVAL-IDI004V2 board acts as the root node in a 6LoWPAN network. The STEVAL-IDI004V2 and STEVAL-IDI002V2 boards together form a 6LoWPAN network. The STEVAL-IDI002V2 reads the data from the sensors on the STEVAL-IDI003V2, and transmits it to the root node through the 6LoWPAN network.

Communication between the various nodes in this 6LoWPAN network is handled by the SPIRIT1 868 MHz RF transceiver from STMicroelectronics. The SPIRIT1 is a very low power RF transceiver intended for RF wireless applications in the sub 1 GHz band. It is designed to operate both in the license-free ISM and SRD frequency bands at 169, 315, 433, 868, and 915 MHz, but can also be programmed to operate at other frequencies in the 300-348 MHz, 387-470 MHz, and 779-956 MHz bands.

The 6LoWPAN stack runs on the STM32L152RBT6 microcontroller on the multi-sensor RF platform. The STM32L series of microcontrollers are ultra low power microcontrollers based on the Cortex-M3 core. In the multi-sensor RF platform, it performs the tasks of collecting sensor data, interfacing, controlling the SPIRIT1 RF transceiver and executing the 6LoWPAN stack and application. The STEVAL-IDI002V2 also consists of a dual-EEPROM M24LR64E from STMicroelectronics. This dual EEPROM enables the multi-sensor RF platform to store the data from the sensors and provides an option for the user to access this data using any smartphone enabled with NFC.

The STEVAL-IDI003V2 contains of a host of sensors from STMicroelectronics. These include the MEMS accelerometer LIS3DH, the MEMS pressure sensor LPS25HB, the MEMS humidity sensor HTS221, and MEMS microphone MP34DT01. In addition to these, it also contains a light sensor from AVAGO technologies.

Together, these sensors enable a wide array of applications that can be developed on the multi-sensor RF platform.

2 Getting started

2.1 Package contents

The multi-sensor RF platform sensor board includes the following items:

- Hardware:
 - STEVAL-IDI003V2 board.
- Documentation:
 - User manual for the STEVAL-IDI003V2 board

2.2 Hardware installation

Connecting STEVAL-IDI002V2 and STEVAL-IDI003V2

The two boards are connected using the 10-pin male connector J4 on STEVAL-IDI002V2 and 10-pin female connector J1 on the STEVAL-IDI003V2.

These 10-pin connector provides for connecting some I2C, ADC & GPIO pins from the STM32L152RBT6 on the STEVAL-IDI002V2 with the various sensors on the STEVAL-IDI003V2. The STEVAL-IDI003V2, derives power from the STEVAL-IDI002V2 using this 10-pin connector.

Below is a table describing the pins of the J4 connector on the STEVAL-IDI002V2.

Table 1: J4 connector

Pin	J4	Description
1	3V3	VDD connection for the daughterboard (STEVAL-IDI003V2)
2	I2C1_SCL	I2C1 clock pin
3	I2C1_SDA	I2C1 data pin
4	I2C2_SCL	I2C2 clock pin
5	I2C2_SDA	I2C2 data pin
6	GPIO0	PA3 pin of the STM32L152RBT6
7	GPIO1	PB0 pin of the STM32L152RBT6
8	ADC0	PA0 pin of the STM32L152RBT6 connected to the photo diode output of the STEVAL-IDI003V2
9	ADC1	PA1 pin of the STM32L152RBT6 connected to the microphone amplifier output of the STEVAL-IDI003V2
10	GND	Ground connection for the daughterboard (STEVAL-IDI003V2)

Power supply

The STEVAL-IDI002V2 board can be powered from a PC using a USB mini B-type connector J7. Alternatively, it can be powered with a Li-Ion battery connected to the 2-pin connector J8. The 3-pin SPDT switch J5 is used to turn the board ON or OFF.

The STEVAL-IDI003V2 derives power from the STEVAL-IDI002V2 through the 10-pin connector.



For a detailed description of the STEVAL-IDI003V2, please refer to the user manual for STEVAL-IDI002V2.

3 Schematic diagrams

Figure 4: STEVAL-IDI003V2 circuit schematic (1 of 5)

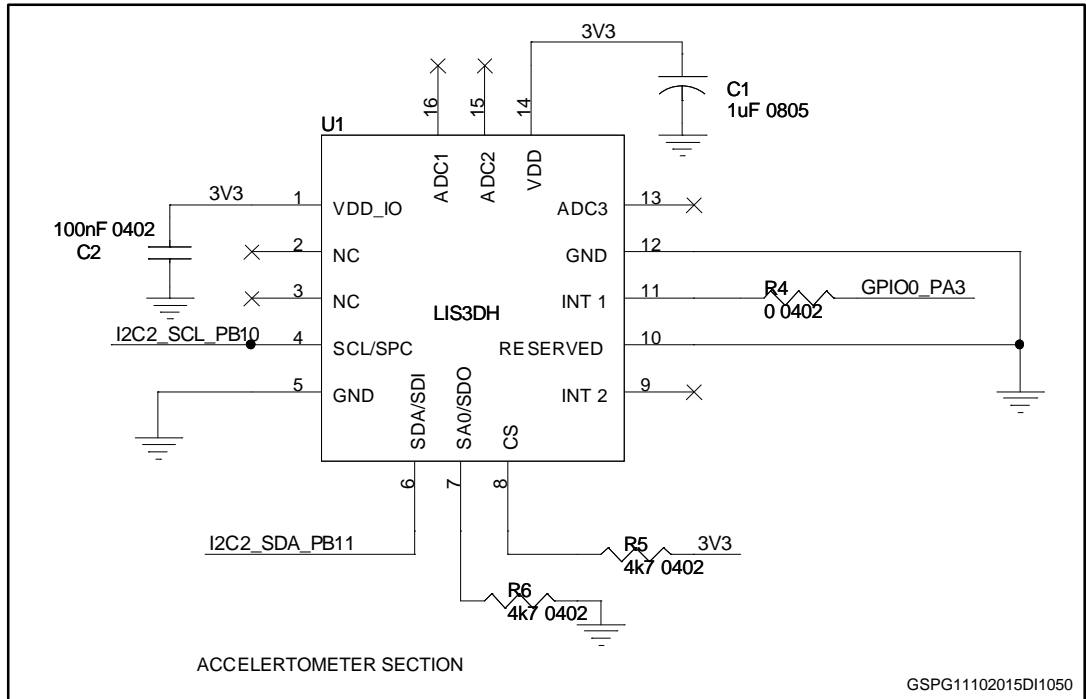


Figure 5: STEVAL-IDI003V2 circuit schematic (2 of 5)

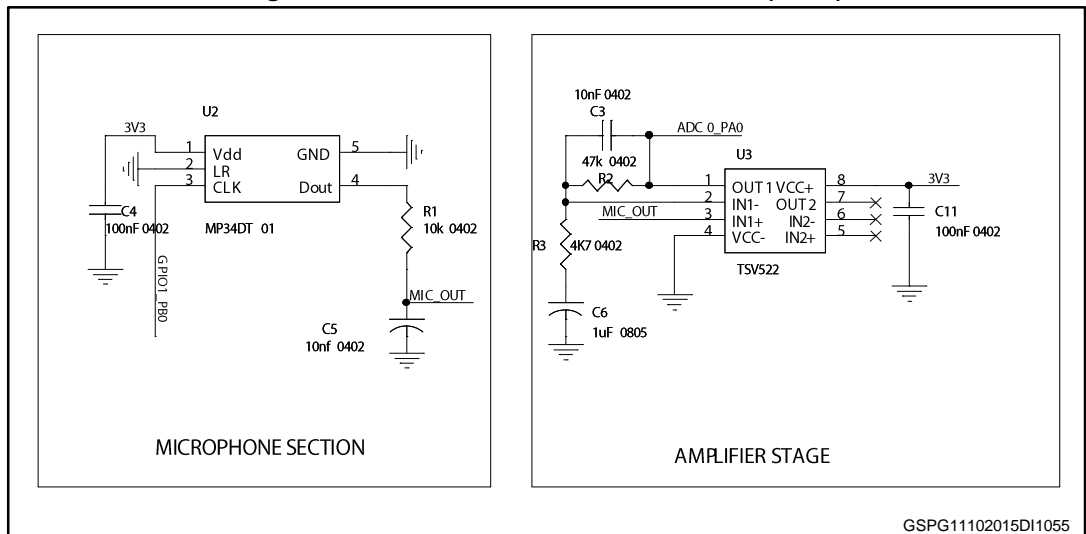


Figure 6: STEVAL-IDI003V2 circuit schematic (3 of 5)

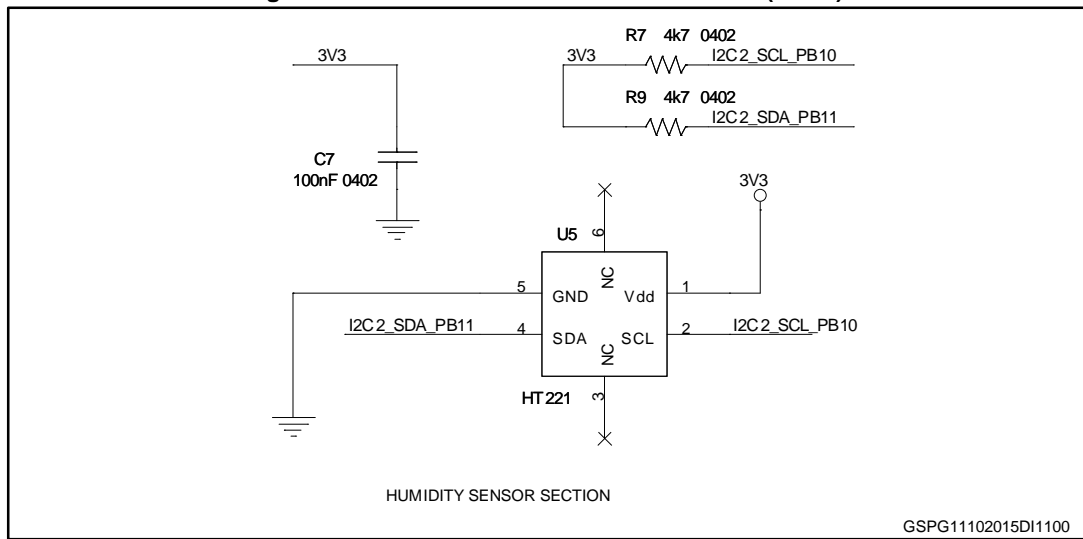


Figure 7: STEVAL-IDI003V2 circuit schematic (4 of 5)

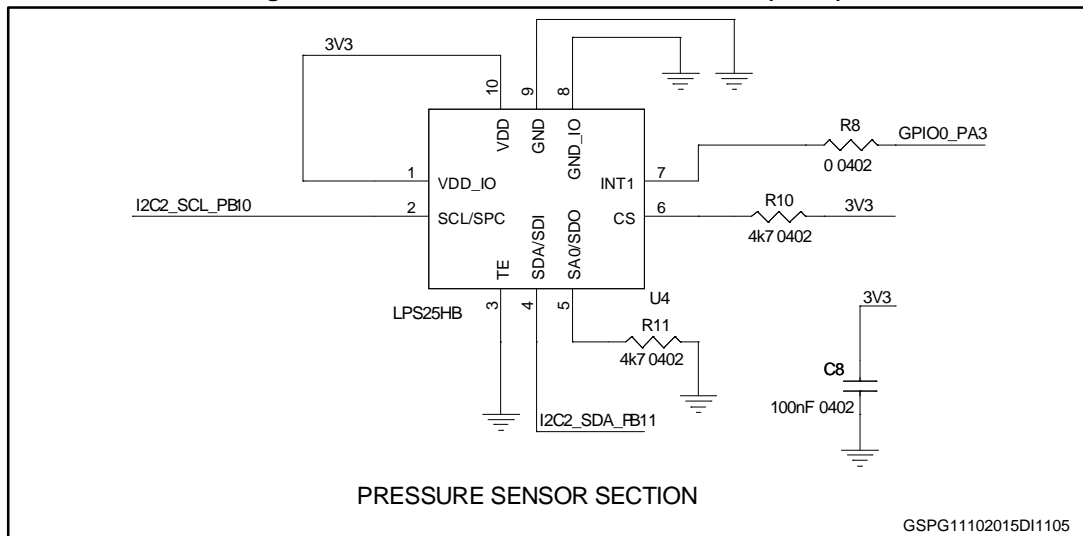
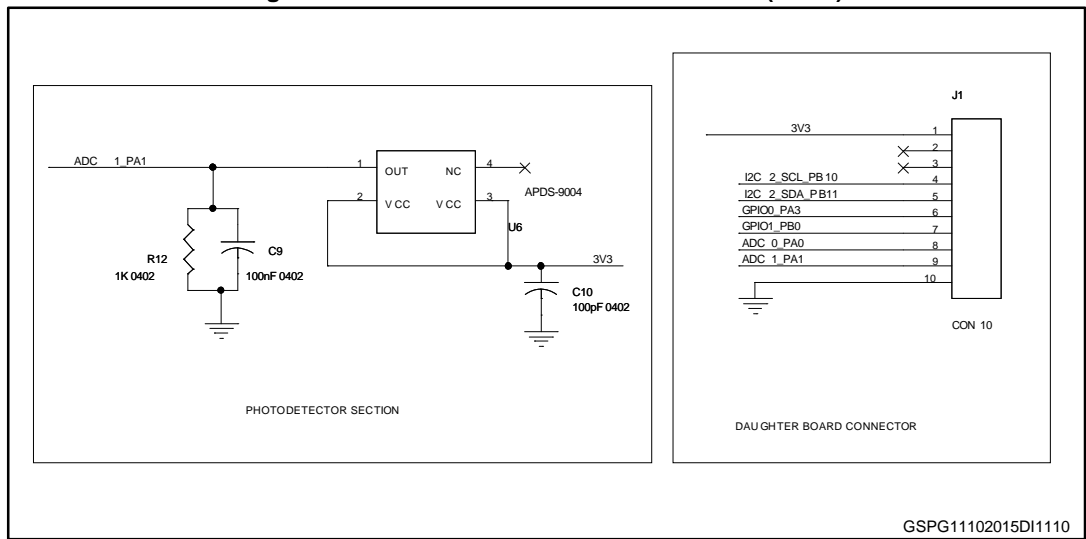


Figure 8: STEVAL-IDI003V2 circuit schematic (5 of 5)



4 Revision history

Table 2: Document revision history

Date	Revision	Changes
26-Nov-2015	1	Initial release.
06-Jun-2016	2	Updated: <i>Figure 7: "STEVAL-IDI003V2 circuit schematic (4 of 5)"</i>

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