UM11635

OM2385/SF002US development kit

Rev. 1.0 — 22 June 2021 **User manual**

Document information

Information	Content
Keywords	Sigfox, FRDM-K32L2B3, MCUXpresso, OL2385, NCF
Abstract	The OM2385/SF002US development kit provides an evaluation platform for designing SIGFOX network applications that use NXP's OL2385 single-chip RF transceiver.

Revision history

Revision	Date	Description of changes
1.0	20210622	Initial release

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1 Overview of the OM2385/SF002US development kit

The OM2385/SF002US development kit provides an evaluation platform for designing SIGFOX network applications that use NXP's OL2385 single-chip RF transceiver.

The kit consists of three boards: the OL2385 Shield Board, the OL2385 Innocomm Module and a FRDM-K32L2B3 board. The OL2385 Innocomm Module is permanently affixed to the surface of the OL2385 Shield Board. The Innocomm Module contains an embedded OL2385 transceiver and serves as a wireless modem. When connected to an antenna (included in the kit), it provides all the functionality required to communicate with the SIGFOX network. The OL2385 Shield Board contains connectors for external communication. The Shield Board is mounted by means of four Arduino connectors to the FRDM-K32L2B3. The FRDM-K32L2B3 acts as the communication link between the development kit and a PC. It comes pre-loaded with microcode that manages the interface between the PC and the OL2385 Innocomm Module .

Users must initially register their device with SIGFOX using a unique ID and access code provided with the kit. Once the device has been registered, the kit can be used to connect to the SIGFOX network and test the functionality of the OL2385-based application under development.

To interact with the development kit, users must connect the kit to a PC through the OpenSDA port on the FRDM-K32L2B3. A terminal emulator (such as HyperTerminal) provides the interface, allowing users to login to the network and send and receive messages. Designers can also use the MCUXpresso IDE to develop and download microcode to the K32L2B.

2 Getting started

2.1 Kit contents/packing list

The OM2385/SF002US development kit contents includes:

- Assembled and tested OM2385/SF002US FRDM board mounted to a firmware-loaded FRDM-K32L2B3 board
- 2 x 8 cable
- 2 x 6 cable
- 2 x 10 cable
- Antenna
- USB cable
- Quick Start Guide

2.2 System requirements

The kit requires the following to function properly with the software:

- USB enabled computer running Windows XP, Vista, 7, 8, or 10 (32-bit or 64-bit)
- Terminal emulation software (such as TeraTerm or HyperTerminal)

2.3 Setting up hardware and software

A detailed description of how to set up the hardware and software can be found in the OL2385SWUG application note (https://www.nxp.com/webapp/Download?colCode=OL2385SWUG).

3 Getting to know the hardware

3.1 Board overview

The OM2385/SF002US consists of a base board (the OL2385 shield board) with a permanently attached module (the Innocomm module). The combination—along with the attached FRDM-K32L2B3 board—serves as a development platform that provides wireless modem access to the SIGFOX network. Once properly registered, the board allows users to send and receive messages across the network.

3.2 Board features

The board features:

- Arduino connector compatibility with other Freedom boards
- Support for UART, SPI, MDI and GPIO communication
- SIGFOX Communication Library for RC1 through RC7 (Note: if RC2 or RC4 are configured, PA is enabled as standard, otherwise PA is off and output power is 14 dBm.)

3.3 Block diagram

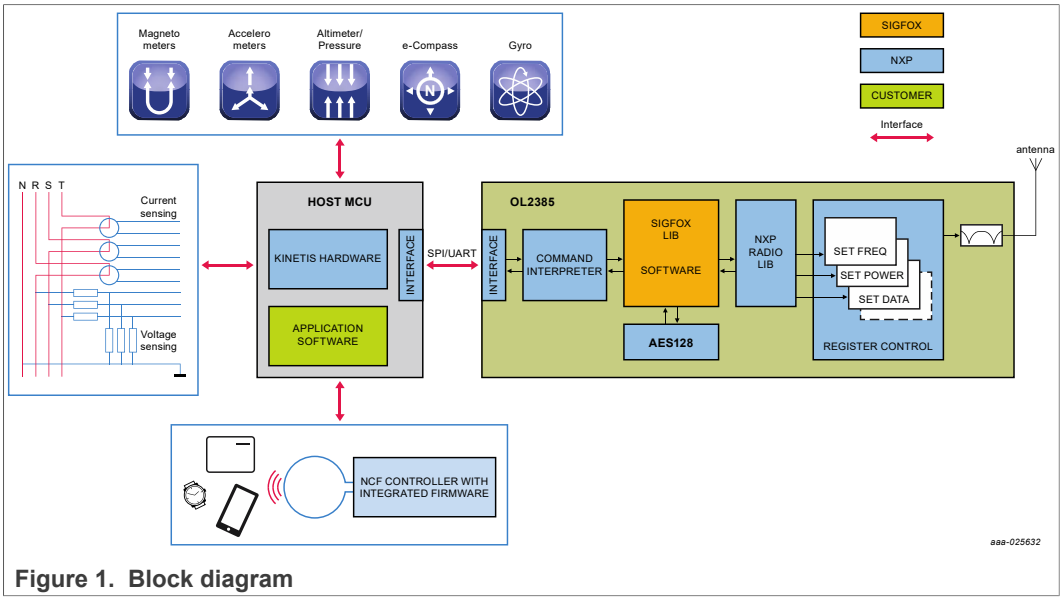


Figure 1. Block diagram

3.4 Device features

The SN10-12 Innocomm module includes the OL2385, Low-Power Multi-Channel UHF RF Wireless.

Table 1. Device features

SN10-12	The SN10-12 is a transceiver module that complies with SIGFOX network specifications. The SN10-12 is based on the NXP OL2385 chip, which is a sub-GHz wireless SoC transceiver. The SN10-12 module provides a wide range of frequency selections for IoT applications network service platforms.	• High performance low power RISC micro-controller – Memory – 32 kB EROM – 7 kB RAM – Ultra Narrow Band Radio Frequency Band – TX: 902.200 MHz – RX: 905.200 MHz – Output Power – 23 dBm • Excellent Receiving Sensitivity: – 125 dBm @600 bps 2 GFSK • Excellent Image Rejection: 60 dB • Excellent Blocking Performance: 58 dB

3.5 Board description

Figure 2 describes the main elements on the OM2385/SF002US board.

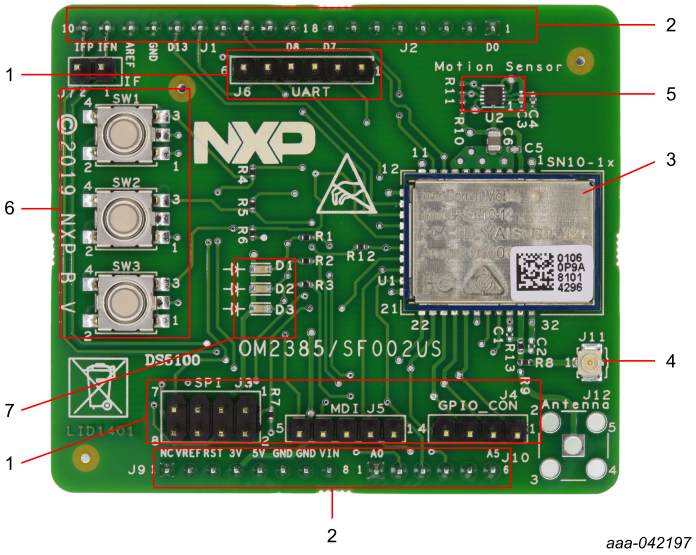


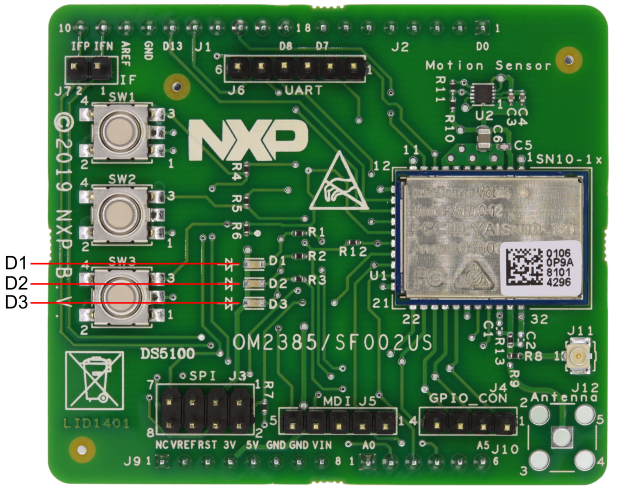
Figure 2. Board description

Table 2. Board description

Number	Name	Description
1	Communication connectors	Provide connectivity for SPI, MDI, GPIO and UART support
2	Arduino connectors	Provide connectivity to FRDM-K32L2B3 and other Freedom boards
3	Innocomm module	Low-Power Multi-Channel UHF RF Wireless Platform
4	µFL connector	Provides connectivity to UHF antenna
5	Motion sensor	Provides wake-up functionality for the Innocomm module
6	Button switches	Control digital inputs to Arduino connectors
7	LEDs	Indicate status

3.6 LED display

The board contains the following LED:



aaa-042198

Figure 3. LED locations

Table 3. LED locations

LED ID	Description
D1	LED Green. Not used
D2	LED Yellow. On by default.
D3	LED Red. On by default. Blinks six times to indicate an error in initialization.

3.7 Switch definitions

Figure 4 shows the location of switches on the OM2385/SF002US Shield Board.

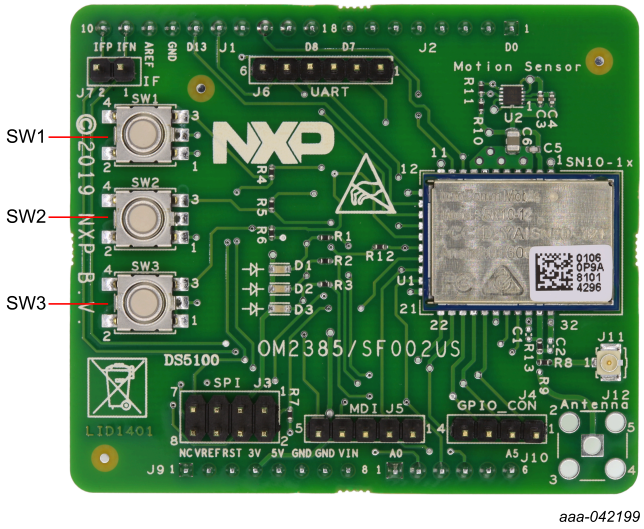


Figure 4. Switch locations

Table 4 describes the function of the three switches.

Table 4. Switch definitions

Switch	Description	Function
SW1	Can be used to drive host pins	Open to customer use
SW2	Can be used to drive host pins	Open to customer use
SW3	Can be used to drive host pins	Open to customer use

3.8 Connectors

The board has the following connectors:

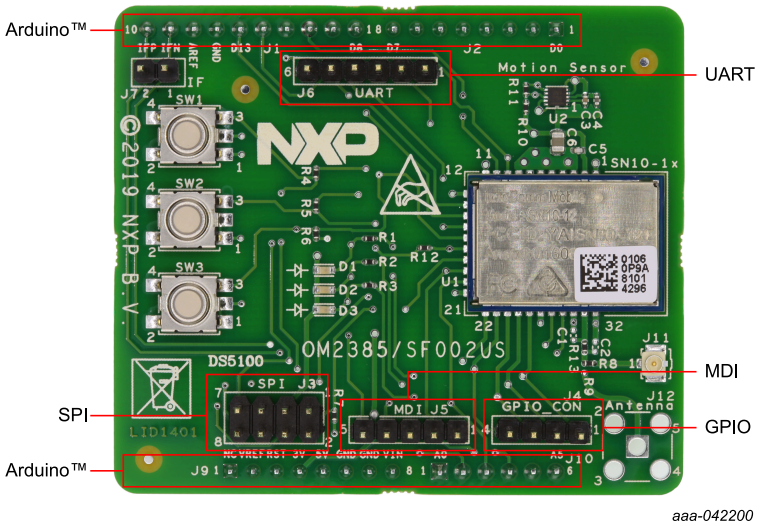


Figure 5. Connector locations

Table 5. Connectors

Banana connector name	Description
Arduino	Arduino connections to FRDM-K32L2B3 board
UART	Universal Asynchronous Receiver/Transmiter (UART) port
SPI	Serial-Parallel Interface (SPI) port
MDI	Monitor and Debug Interface (MDI) port
GPIO	General Purpose Input/Output (GPIO) port

4 FRDM-K32L2B3

The FRDM-K32L2B3 Freedom development board provides a platform for evaluation and development of the K32 L2B MCU Family. The board includes onboard debug probe, segment LCD, accelerometer/magnetometer, a full-speed USB and easy access to K32 L2B's MCU I/O. The FRDM-K32L2B3 board is fully supported by the MCUXpresso suite of tools, which provides device drivers, middleware and examples to allow rapid development, plus configuration tools and an optional free IDE.

Figure 6 shows a top view of the FRDM-K32L2B3 and highlights its main components.

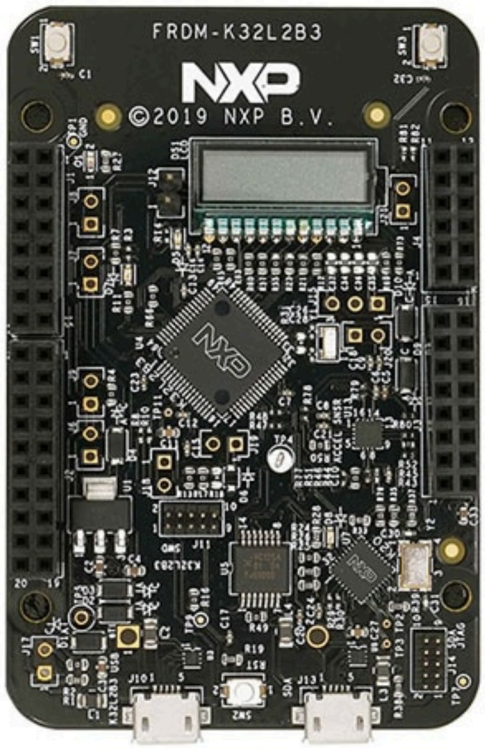


Figure 6. FRDM-K32L2B3

A single row of Arduino connectors on the OM2385/SF002 connects to the outer row (even numbers) of the Arduino connectors on the FRDM-K32L2B3 . Table 6 describes the connections between the two boards.

Table 6. OM2385/SF002 to FRDM-K32L2B3 connections

OM2385/SF002		FRDM-K32L2B3		Pin hardware name		Description OM2385/SF002
Header	Pin	Header	Pin	OM2385/SF002	FRDM-K32L2B3	
J2	Not used	J1	1	Not used	PTB18	Not used
J2	1	J1	2	D00	PTA1	GPIO (UART0_RX)
J2	Not used	J1	3	Not used	PTB19	Not used
J2	2	J1	4	D01	PTA2	GPIO (UART1_TX)
J2	Not used	J1	5	Not used	PTC0	Not used

Table 6. OM2385/SF002 to FRDM-K32L2B3 connections*...continued*

OM2385/SF002		FRDM-K32L2B3		Pin hardware name		Description OM2385/SF002
Header	Pin	Header	Pin	OM2385/SF002	FRDM-K32L2B3	
J2	3	J1	6	D02	PTD3	GPIO
J2	Not used	J1	7	Not used	PTC4	Not used
J2	4	J1	8	D03	PTA12	Digital input (SW1), connects Switch 1
J2	Not used	J1	9	Not used	PTC6	Not used
J2	5	J1	10	D04	PTA4	Digital input (SW2), connects Switch 2
J2	Not used	J1	11	Not used	PTC7	Not used
J2	6	J1	12	D05	PTA5	Digital input (SW3), connect Switch 3
J2	Not used	J1	13	Not used	N/C	Not used
J2	7	J1	14	D06	PTE29	GPIO (I2C0_SCL)
J2	Not used	J1	15	Not used	PTC5	Not used
J2	8	J1	16	D07	PTE30	GPIO (2C0_SDA)
J1	Not used	J2	1	Not used	N/C	Not used
J1	1	J2	2	D08	PTA13	GPIO
J1	Not used	J2	3	Not used	N/C	Not used
J1	2	J2	4	D09	PTD2	Digital input (SPI_ACK)
J1	Not used	J2	5	Not used	N/C	Not used
J1	3	J2	6	D10	PTD4	Digital output (SPI_CS), required for SPI communication
J1	Not used	J2	7	Not used	N/C	Not used
J1	4	J2	8	D11	PTD6	SPI0_MOSI, required for SPI communication (MISO expected on FRDM-K32L2B3 side)
J1	Not used	J2	9	Not used	N/C	Not used
J1	5	J2	10	D12	PTD7	SPI0_MISO, required for SPI communication (MISO expected on FRDM-K32L2B3 side
J1	Not used	J2	11	Not used	N/C	Not used
J1	6	J2	12	D13	PTD5	SPI0_SCK, required for SPI communication
J1	Not used	J2	13	Not used	N/C	Not used
J1	7	J2	14	GND	GND	Ground
J1	Not used	J2	15	Not used	N/C	Not used
J1	8	J2	16	AREF	AREF	Voltage reference
J1	Not used	J2	17	Not used	PTB17	Not used
J1	9	J2	18	D14	PTE0	GPIO (UART1_TX)

Table 6. OM2385/SF002 to FRDM-K32L2B3 connections...*continued*

OM2385/SF002		FRDM-K32L2B3		Pin hardware name		Description OM2385/SF002
Header	Pin	Header	Pin	OM2385/SF002	FRDM-K32L2B3	
J1	Not used	J2	19	Not used	PTB16	Not used
J1	10	J2	20	D15	PTE1	GPIO (UART1_RX)
J10	Not used	J4	1	Not used	PTE20	Not used
J10	1	J4	2	A0	PTB0	GPIO (ADC0 / I2C0_SCL)
J10	Not used	J4	3	Not used	PTE21	Not used
J10	2	J4	4	P11 (A1)	PTB1	GPIO (P11)
J10	Not used	J4	5	Not used	PTE22	Not used
J10	3	J4	6	MSCL (A2)	PTB2	GPIO (MSCL)
J10	Not used	J4	7	Not used	PTE23	Not used
J10	4	J4	8	MSDA (A3)	PTB3	GPIO (MSDA)
J10	Not used	J4	9	Not used	PTE0	Not used
J10	5	J4	10	A4	PTC2	GPIO (ADC4 / I2C1_SDA)
J10	Not used	J4	11	Not used	PTE30	Not used
J10	6	J4	12	A5	PTC1	GPIO (ADC5 / I2C1_SCL)
J9	Not used	J3	1	Not used	N/C	Not used
J9	1	J3	2	N/C	SDA_PTD5	No Connection
J9	Not used	J3	3	Not used	N/C	Not used
J9	2	J3	4	IOREF	P3V3	IO reference voltage
J9	Not used	J3	5	Not used	N/C	Not used
J9	3	J3	6	RESET	RST	Reset
J9	Not used	J3	7	Not used	N/C	Not used
J9	4	J3	8	V+	P3V3	Voltage reference
J9	Not used	J3	9	Not used	N/C	Not used
J9	5	J3	10	5V_USB	P5V	USB voltage
J9	Not used	J3	11	Not used	N/C	Not used
J9	6	J3	12	GND	GND	Ground
J9	Not used	J3	13	Not used	N/C	Not used
J9	7	J3	14	GND	GND	Ground
J9	Not used	J3	15	Not used	N/C	Not used
J9	8	J3	16	VIN	5V_VIN	VIN

5 Schematics, board layout and bill of materials

OM2385/SF002US board schematics, board layout and bill of materials are available in the Documents and Software section of the Tool summary page at the following URL: https://www.nxp.com/OM2385/SF002.

6 Appendix A—Downloading microcode to the FRDM-K32L2B3

The OM2385/SF002US development kit comes with microcode already loaded on the FRDM-K32L2B3 . This appendix is intended for use only if the factory installed microcode is no longer functional and a fresh copy needs to be flashed to the board.

This procedure involves downloading the FRDM-K32L2B3 driver from the P&E Microcomputer Systems website and installing it on the host PC.

1. Go to the P&E Microcomputer Systems OpenSDA page at http://www.pemicro.com/opensda and in the **Windows USB Drivers** box, click to download the **PEDrivers_install.exe** file.
2. When the download completes, run the **PEDrivers_install.exe** file and follow the instructions to install the driver.
3. Connect a USB cable between the host PC and the FRDM-K32L2B3 USB port labeled SDA (J13).
4. Open Windows Explorer on the host PC. An icon labeled **FRDM-K32L2B3** appears as a removable drive on the PC.
5. Go to the OM2385/SF002 Tool Summary page at https://www.nxp.com/OM2385/SF002 and download the microcode file for **SIGFOX Console Control application (SF_K32L2B3_OL2385_ConsoleControl.bin)** under **Documents and Software** section.
6. Drag and drop the microcode file **SF_K32L2B3_OL2385_ConsoleControl.bin** onto the **FRDM-K32L2B3** icon on the host PC.
7. Unplug the USB mini-B plug from the SDA port. The microcode is now installed and launches automatically each time the board is turned on.

7 References

The following URLs reference related NXP products and application solutions:

NXP.com support pages	Description	URL
OM2385/SF002US	Tool summary page	https://www.nxp.com/OM2385/SF002

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