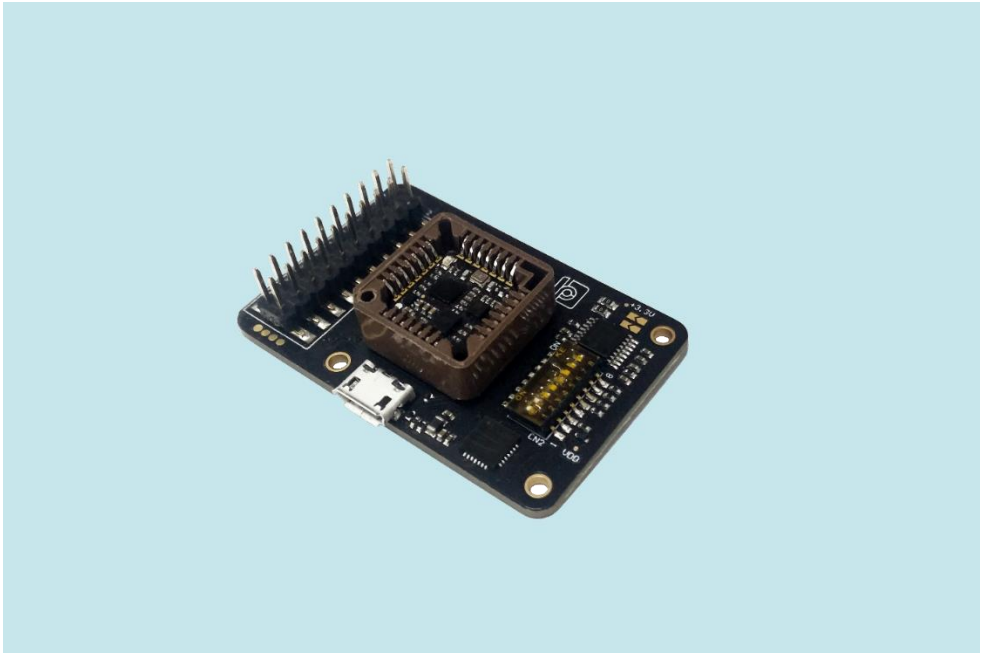
LPMS-ME1 DK
Manual Ver.1.6



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Revision History

Date	Revision	Changes
2019-11-14	1.6	- update the switch setting information
2018-12-13	1.5	- manual update based on new hardware revision
2017-10-04	1.4	- to revise document version no. - to revise the page layout
2017-5-25	1.3	- to add RS232 output description
2016-8-29	1.2	- to add ADC pins description - to add schematics - to add logic level definition
2016-8-26	1.1	- Initial release.

Table of Contents

1. Introduction

LPMS-ME1 Development Kit (DK) contains a LPMS-ME1 sensor, a base board and GUI software for sensor manipulation. The base board is designed for hosting LPMS-ME1 sensor, and multiple communication interfaces are available on the base board, such as USB, UART and RS232. A 20-pins header connector is used for accessing all signals of LPMS-ME1. The GUI software LpmsControl can visualize/save sensor data, and change the sensor parameters.

Main features：

- LPMS-ME1 DK base board
  - interface：USB, UART, RS232 (optional), I2C, SPI
  - status LED
  - setting switches, including settings of start mode, and data output interfaces
  - 20-pins header to layout all LPMS-ME1 signals

- LpmsControl software
  - sensor parameter setting
  - sensor calibration
  - 7 types of data output
  - 3D data visualization
  - data saving and replay

NOTE: RS232 interface is not available in default, please contact us if you need RS232 functionality.

2. Hardware Functionality

2.1 Hardware Structure

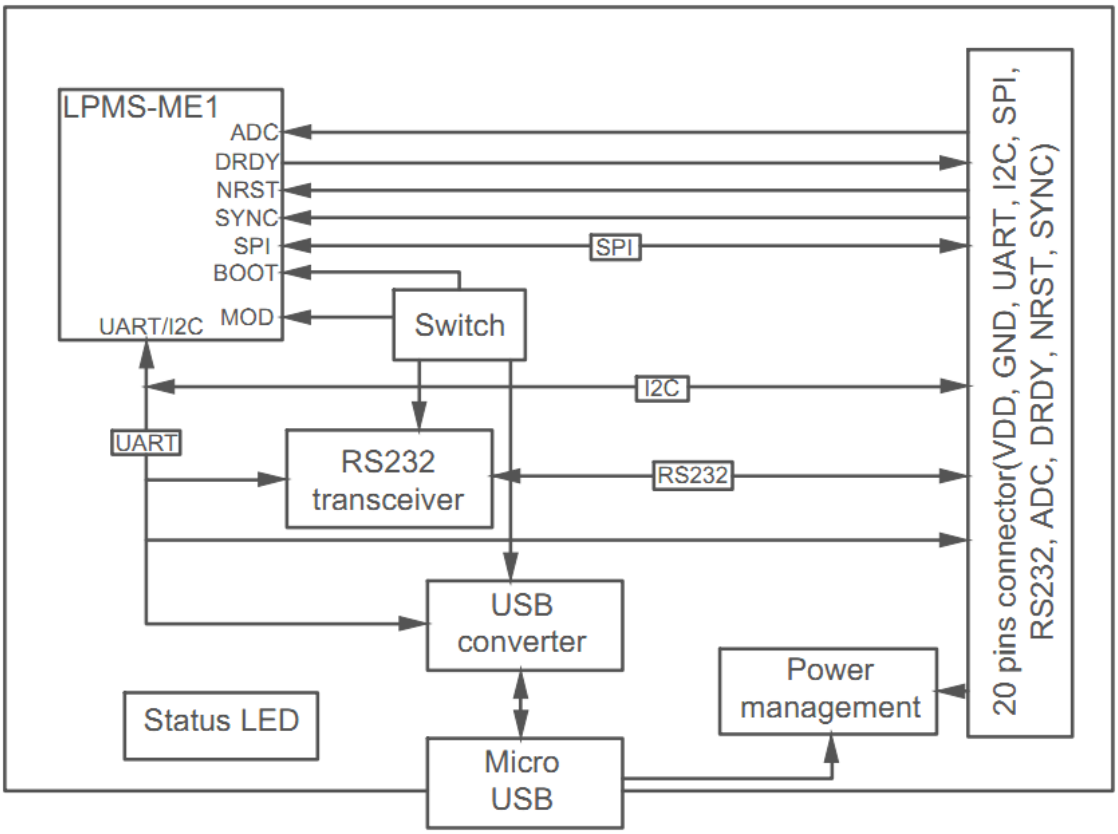


Fig. 2.1 Development kit hardware structure

2.2 Interfaces and Switches

LPMS-ME1 DK primarily provides 3 interfaces for users to set up the communication signals: a USB port, a 20-pins header connector (pitch 2.54mm), and a 8-channel switch.

2.2.1 Signals of 20-pins Header Connector

Table 2-1 20-pins Header Connector Pinout

No.	Name		No.	Name
1	5V_IN		2	GND
3	RTS		4	RS232_TX
5	CTS		6	RS232_RX
7	RX/SDA		8	ADC0
9	TX/SCL		10	A-SDA
11	SPI_CS		12	A-SDL
13	SPI_SDI		14	NRST
15	SPI_SDO		16	SYNC
17	SPI_SCK		18	DRDY
19	3.3V_OUT		20	GND

Table 2-2 Description of 20-pins Header Connector

No.	Name	Description		Remark
1	5V_IN	Power supply		Power input (3.3V~5.5V)
4	RS232_TX	RS232_TX		RS232 TX
6	RS232_RX	RS232_RX		RS232 RX
7	RX/SDA	UART mode	UART_RX	UART RX
		I2C mode	I2C_SDA	I2C SDA
9	TX/SCL	UART mode	UART_TX	UART TX
		I2C mode	I2C_SCL	I2C SCL
11	SPI_CS	Chip select		Active low
13	SPI_SDI	Slave Data Input		
15	SPI_SDO	Slave Data Output		
17	SPI_SCK	Serial Clock		
14	NRST	reset		Active low
19	3.3V_OUT	-		+3.3V output
2, 20	GND	-		Signal ground

3	RTS	-	Reserved
5	CTS	-	Reserved
8	ADC0	-	Reserved
10	A-SDA	-	Reserved
12	A-SDL	-	Reserved
16	SYNC	-	Reserved
18	DRDY	-	Reserved

2.2.2 Setting of 8-channel Switch

Table 2-3 Communication interface setting by using the switch

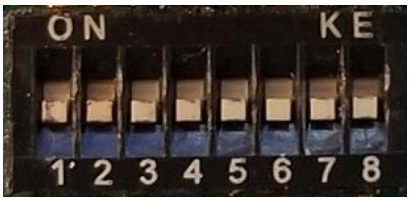
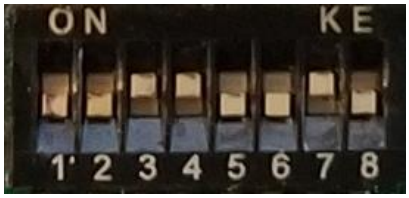
Channel No.	Name	Description
1	USB/TX	Both channels switched to "ON": USB enabled. Both channels switched to "OFF": USB disabled. **Default: USB disabled**
2	USB/RX	
3	SCL	Both channels switched to "ON": I2C enabled. Both channels switched to "OFF": I2C disabled. **Default: I2C disabled**
4	SDA	
5	RS232EN	Channel switched to "ON": RS232 enabled. Channel switched to "OFF": RS232 disabled. **Default: RS232 disabled**
6	BOOT	reserved. **Default: OFF**
7	MODE0	Channel switched to "ON": pull high. Channel switched to "OFF": pull low **Default: both OFF** These two signals are corresponded to the signals of MOD0 and MOD1 of LPMS- ME1, respectively. For detailed information of mode settings, please refer to Table 2-4.
8	MODE1	

Table 2-4 LPMS-ME1 mode setting

MODE0	MODE1	Communication interface
0	0	UART (default)
0	1	SPI
1	0	I2C (ADD0=0)
1	1	I2C (ADD0=1)

The following table list up all the setting scenarios of the 8-channel switch.

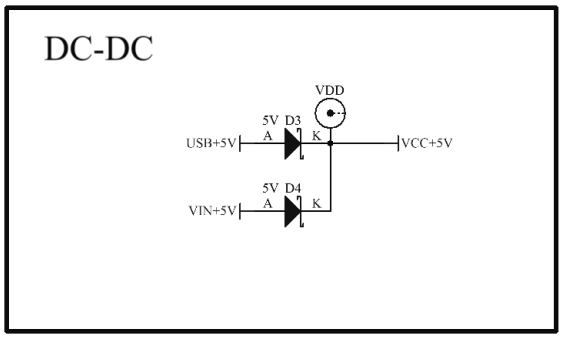
Table 2-5 Switch setting for different interface settings

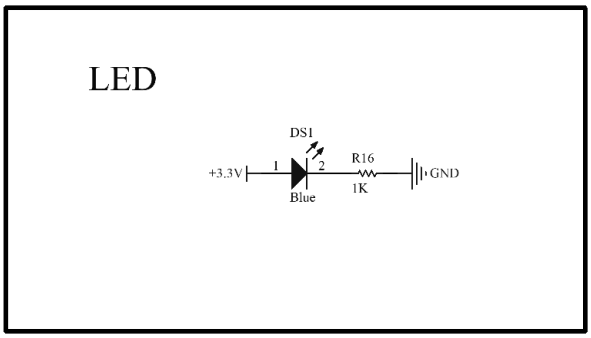
Interface	Switch setting
UART (TTL), default	
USB	
RS232	
I2C (ADD0=0)	
SPI	

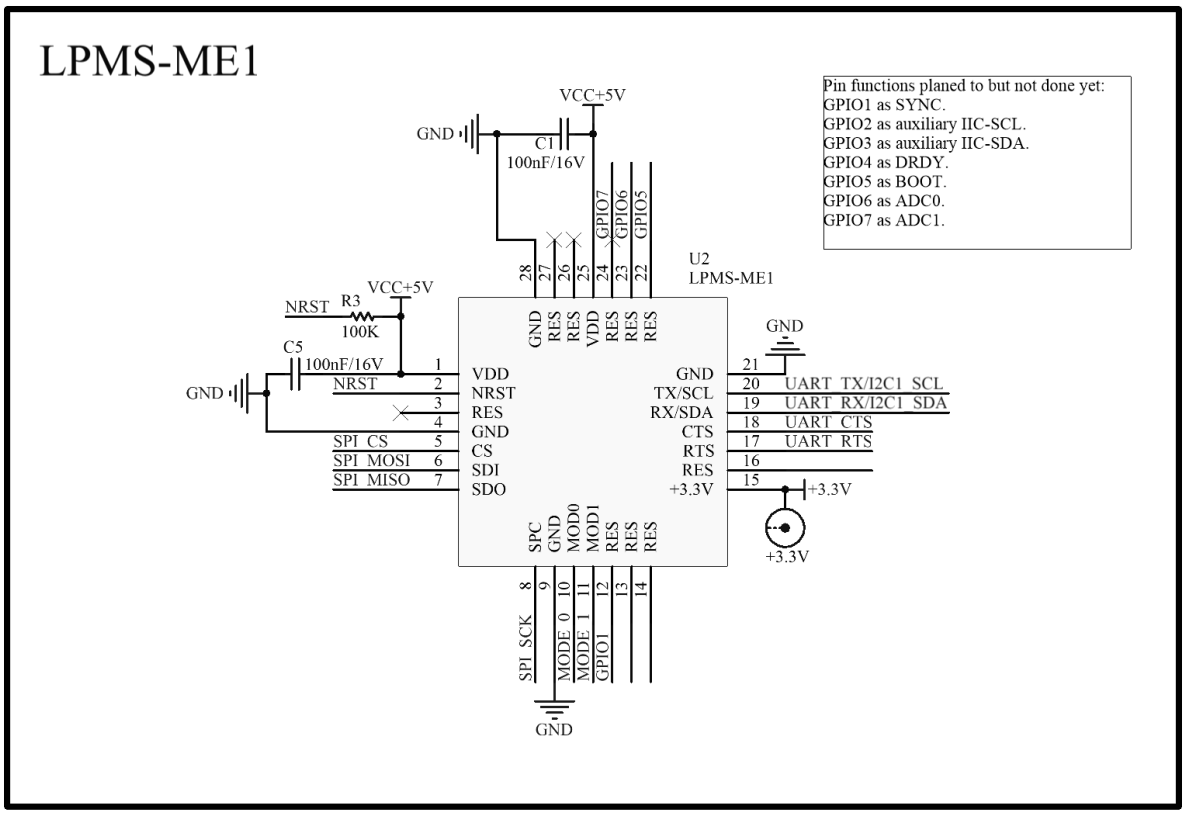
WARNING: Never enable 2 or above interfaces simultaneously.

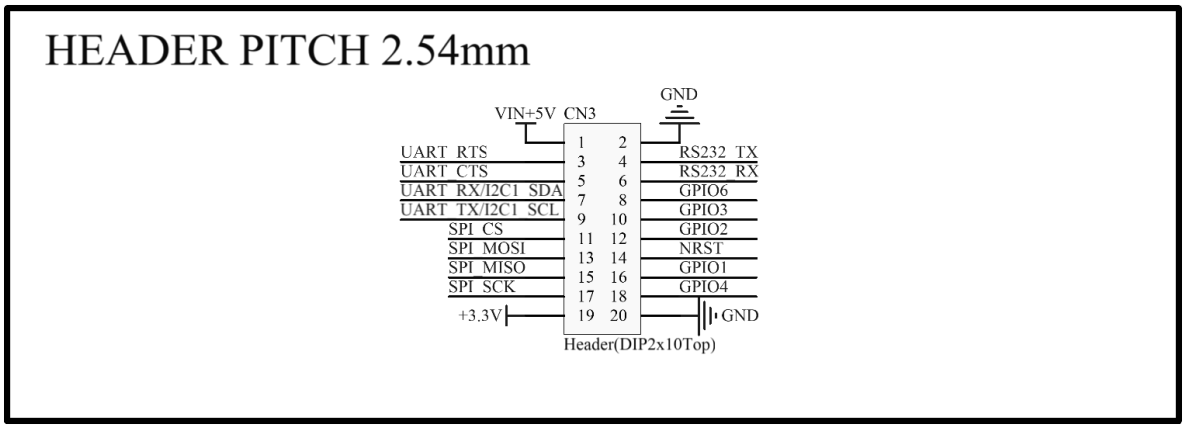
For more information of communication protocols, please refer to the manuals of LPMS-ME1.

2.3 Schematics









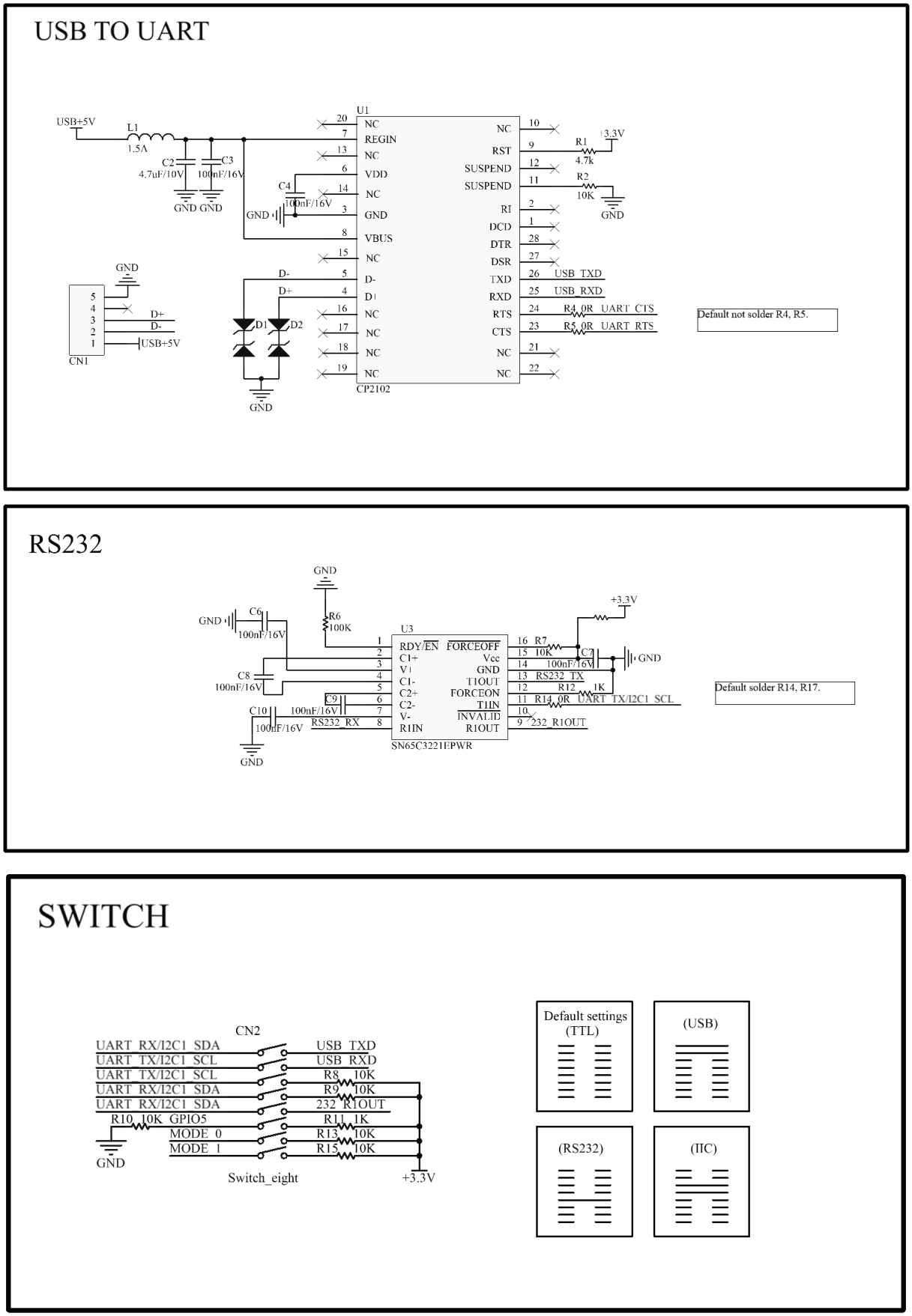


Fig. 2.2 Development kit schematics

The following image shows the component distribution on the base board.

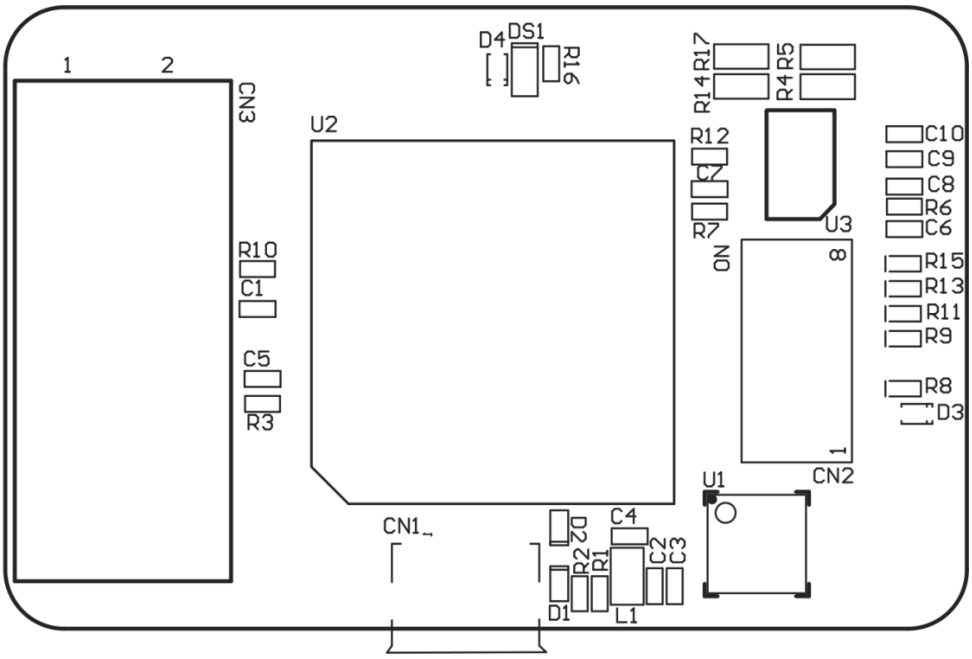


Fig. 2.3 Component distribution

2.4 Mechanical Information

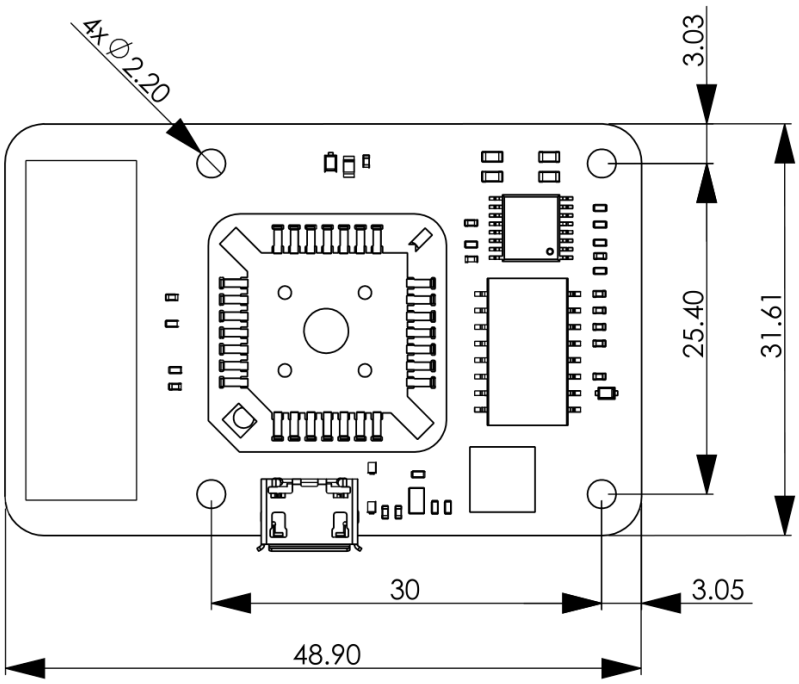


Fig. 2.4 Board dimension (unit: mm)

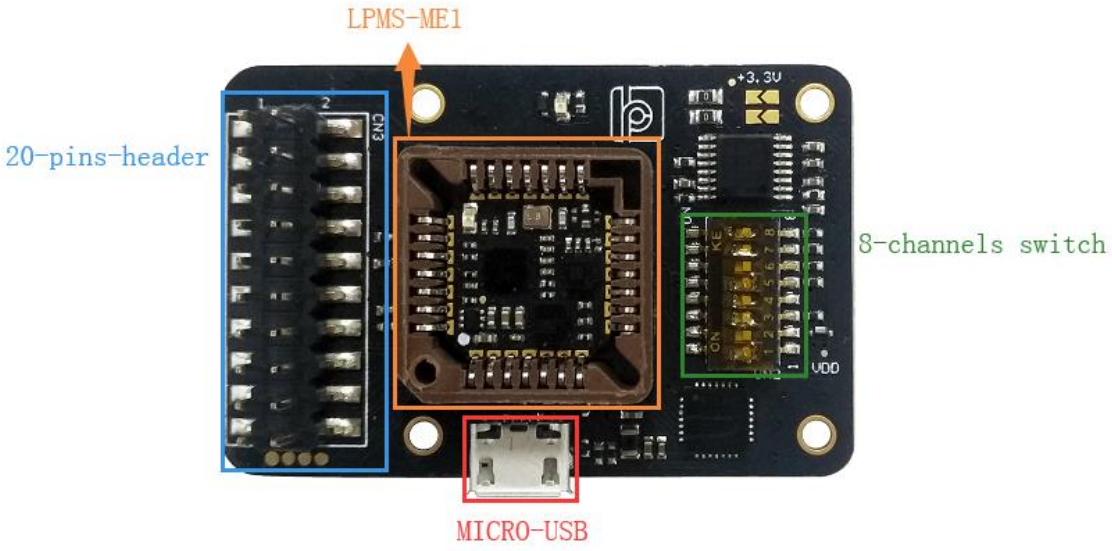


Fig. 2.5 Layout of main components

Fig. 2.6 Bottom view of base board

2.5 Coordinate System

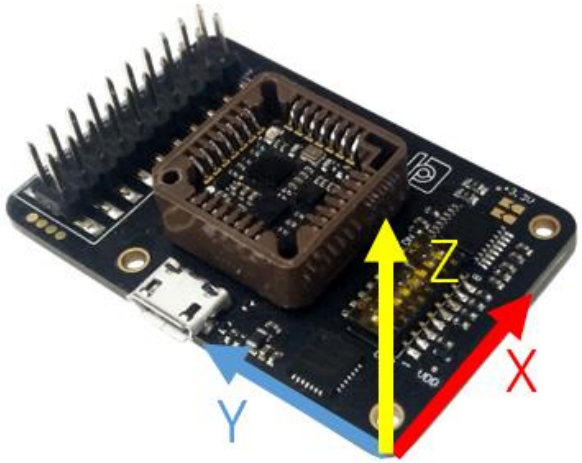


Fig. 2.7 Coordinate

2.6 Working Condition

Table 2-6 Working condition

Item	Value	Unit
Power supply	5.0~5.5	V
Temperature	-40~85	°C

3 Quick Start Guide

3.1 Software Installation

We offer windows OS based software called LpmsControl for users to easily manipulate the sensor. The LpmsControl software is a sub program of OpenMAT software. Please choose a correct version of OpenMAT software from our homepage based on the operation system specification. The followings show an example of installing the OpenMAT software under Windows 7 32bit system.

1) Go to: http://www.lp-research.com/support/, and download the latest version of OpenMAT for the sensor, like OpenMAT Version 1.3.5 (Windows 32-bit binary).
2) Run the installer after the download process is finished, and push the "I Agree" button for the next step.

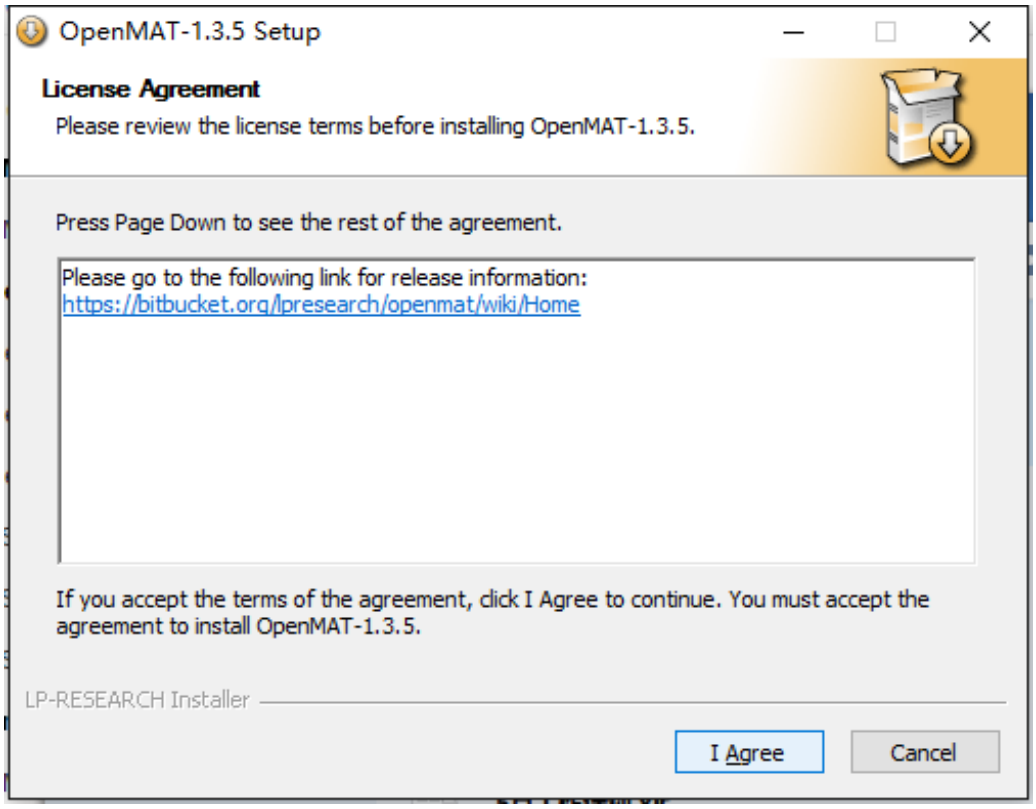


Fig. 3.1 OpenMAT installer

3) Push the "Browse" button to select the installation path of the program, and then push "Install" to start the installation process.

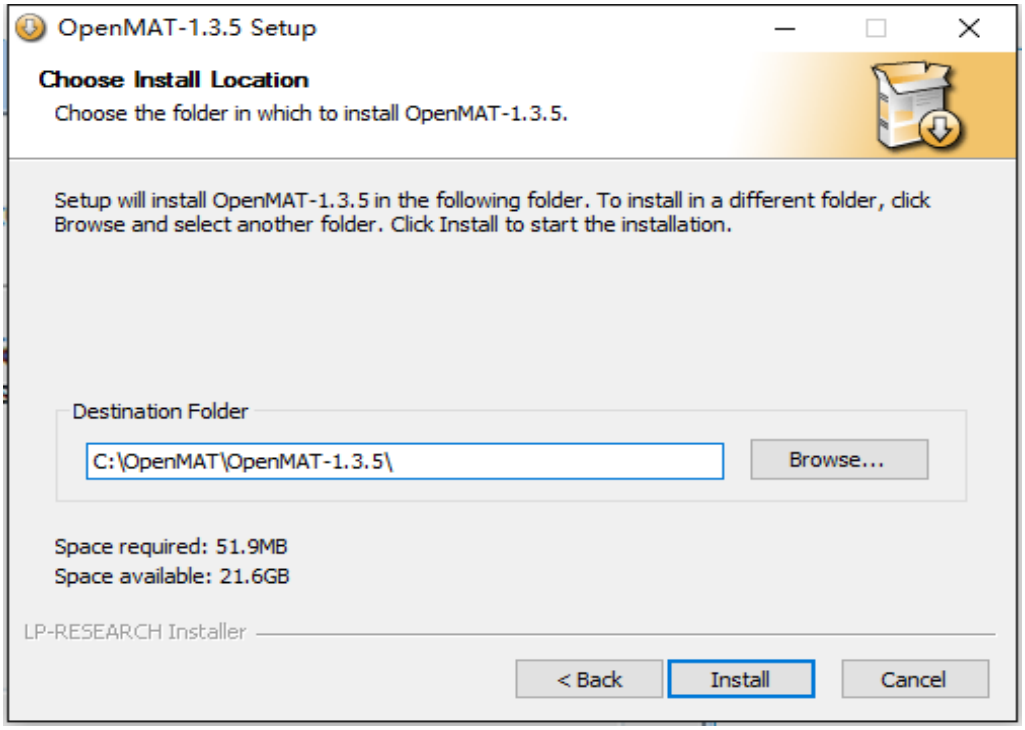


Fig. 3.2 Installation path

4) Push the "Close" button to complete the installation.

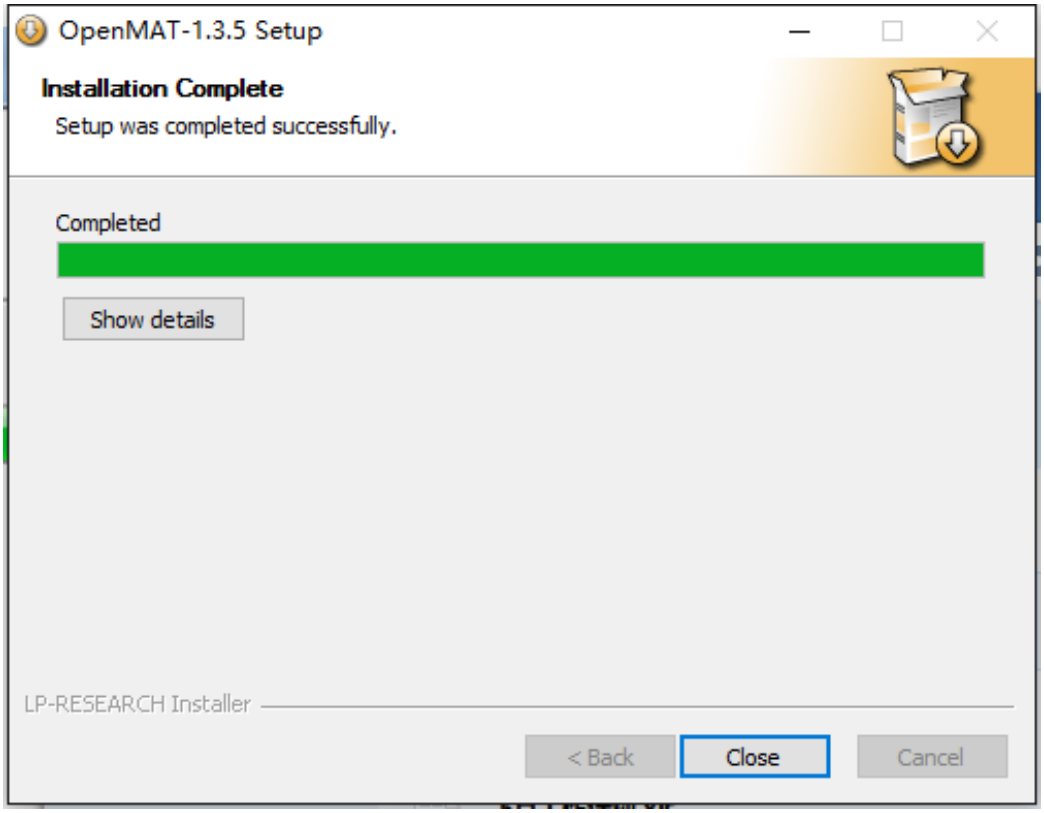


Fig. 3.3 Installation completed

To run the LpmsControl software from the start menu of your windows system, you can see the following interface.

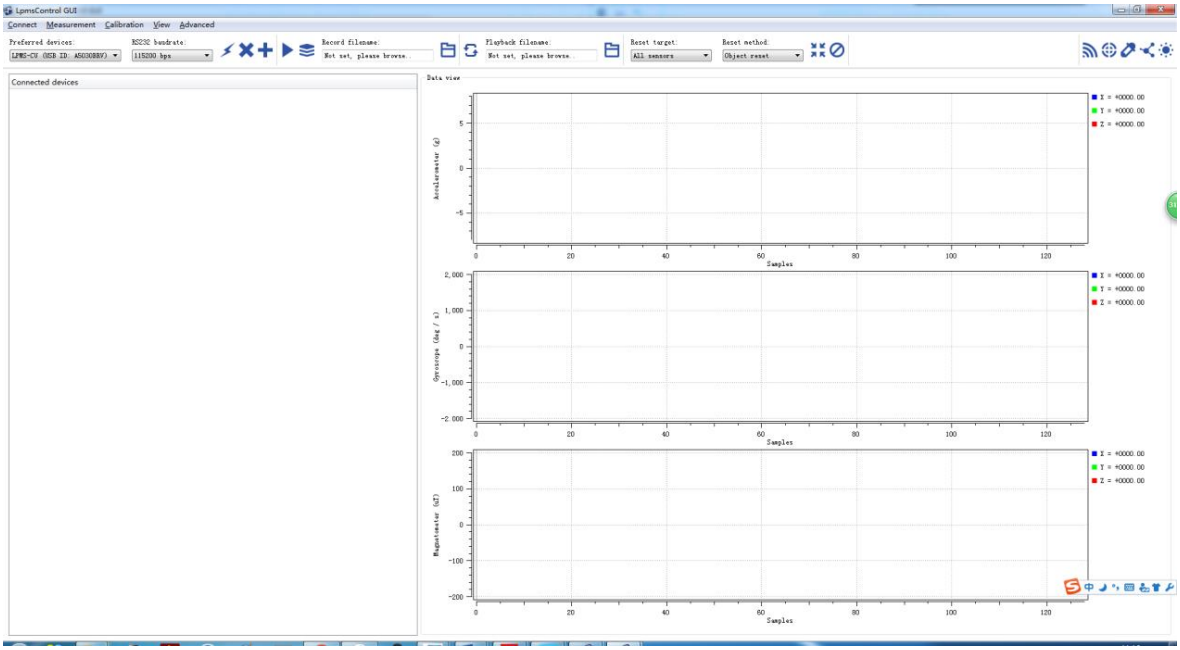


Fig. 3.4 LpmsControl GUI

3.2 USB Drivers

In order to connect LPMS-ME1 development kit to your Windows system via USB interface, a proper hardware driver must be installed. The development kit is embedded with a CP210X-series USB chip from Silicon Labs. In default, this chip is working at the virtual COM mode. Therefore, the host Windows system needs to install the VCP drivers which could be downloaded from:

- our webpage: https://lp-research.com/support/
- to search "CP210x_Windows_Drivers" on webpage of Silicon Labs

The following section introduces the process of the USB driver installation, as illustrated from Fig. 3.5 to Fig. 3.7 as well.

1) After plugging the sensor, Windows will pop out a message of "New hardware discovered", and the hardware will be listed up on the device manager window as showed in Fig. 3.5.
2) Right-clicking on the device to choose the menu of driver installation, and on the pop out window please select the folder where the driver is placed, for example the folder of " CP210x_Windows_Drivers " as showed in Fig. 3.6.

3) After installation is completed, the sensor USB connection will be recognized as COM port as showed in Fig. 3.7.

NOTE: Windows might automatically install a wrong USB driver for the SUB interface while the sensor is connected for the first time. In this case, user has to manually confirm the driver version and reinstall the correct one as introduced from step 1 to 3 above.

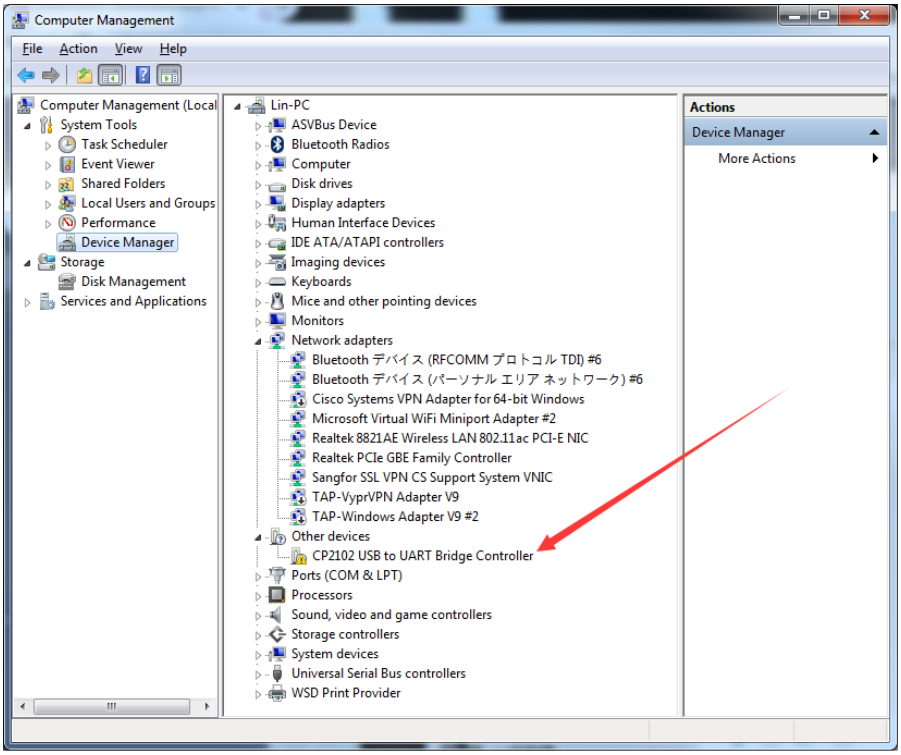


Fig.3.5 . USB driver installation-1

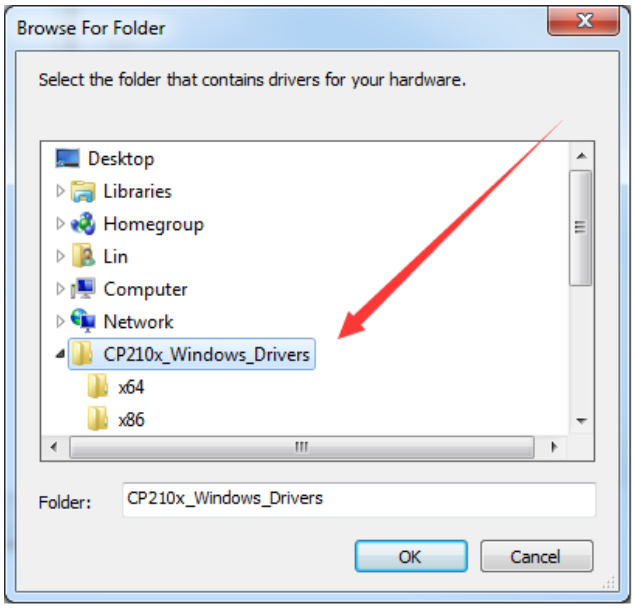


Fig.3.6 . USB driver installation-2

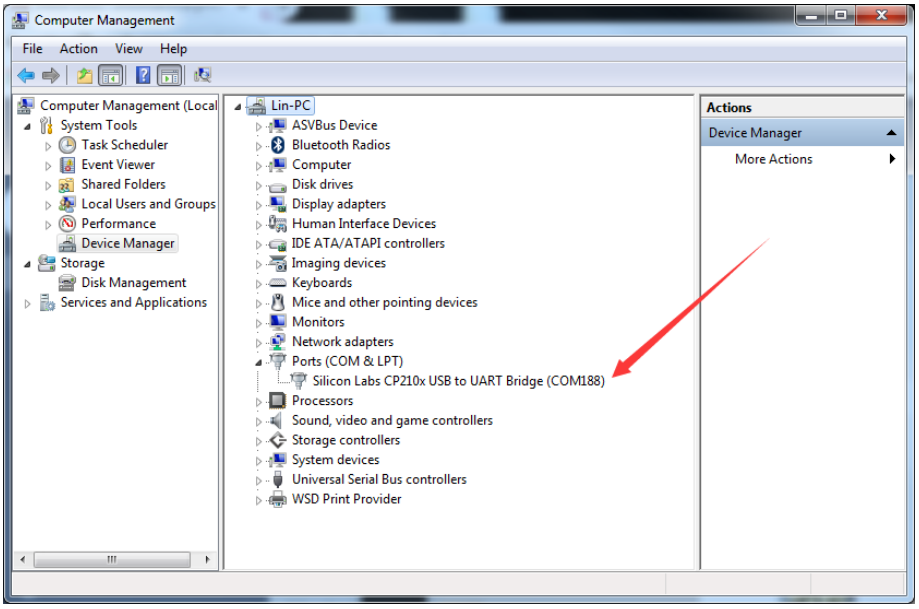


Fig.3.7 . USB driver installation-3

3.3 Software Operation

Please follow the instructions below to complete the remaining steps.

1) To select the "Add/remove sensor" under "Connect" menu or click the "+" button on toolbar.

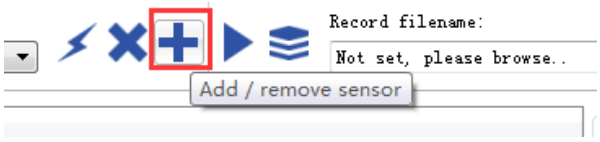


Fig. 3.8 To add a sensor

The "add device" window will pop out, as following.

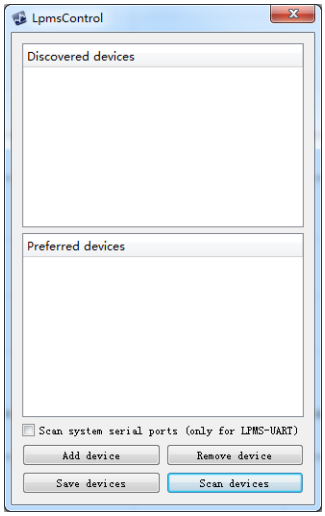


Fig. 3.9 Device discovery

2) To check the option of "Scan system serial ports (only for LPMS-UART)" and click the "Scan devices" button to start the device discovery process. Please wait until the process is finished.
3) To select the target sensor ID from the "Discovered devices" list, for example, "LPMS-CUR(Port:COM9)" in the following image. This COM port should be same as the one showed in the device manager of Windows.
4) To add the selected sensor to "Preferred devices" list by clicking the "Add device" button.
5) To click the "Save devices" button to save the preferred devices list, and return to main interface of LpmsControl.

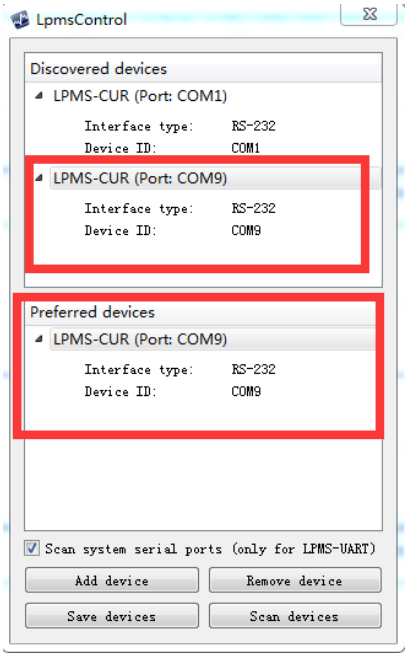


Fig. 3.10 Discovered device

6) To select the target sensor ID from the Preferred devices list, and click Connect function under "Connect" menu or click the lightning button on toolbar to connect the sensor. Note: The default baudrate of communication is 115200bps.

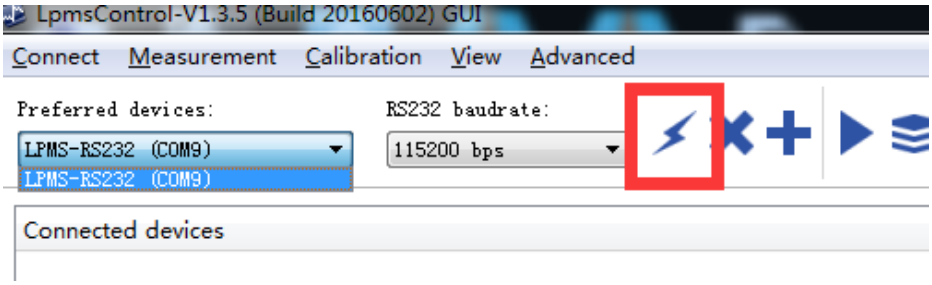


Fig. 3.11 Connection activation

After completing all the steps above, the LPMS-ME1 development kit should have been connecting with Windows system. Users can check all the data visualization and parameter settings of the sensor from LpmsControl.

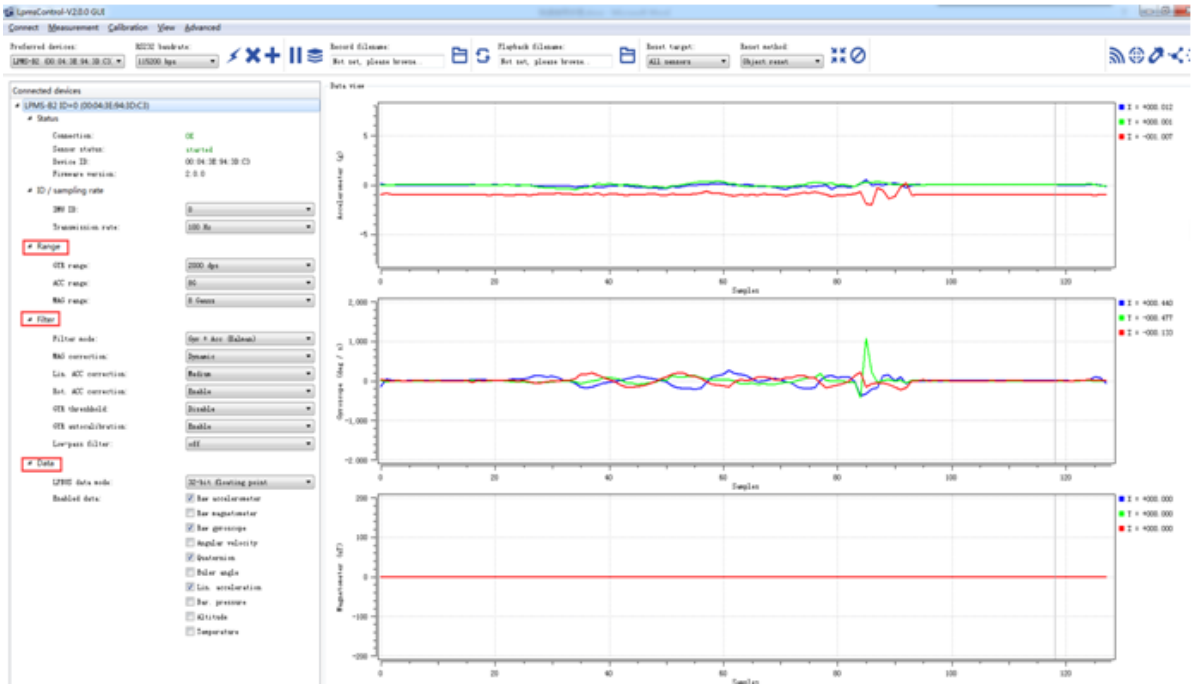


Fig. 3.12 Data visualization

On the left side of the main interface of LpmsControl, users can change the sensor settings, like measurement range, filter modes, data updating rate, etc. Moreover, the types of output data can be modified by checking or unchecking the check box of each parameter. For example, in the following image the "raw magnetometer" is checked so that the acquisition of magnetic data is enabled.

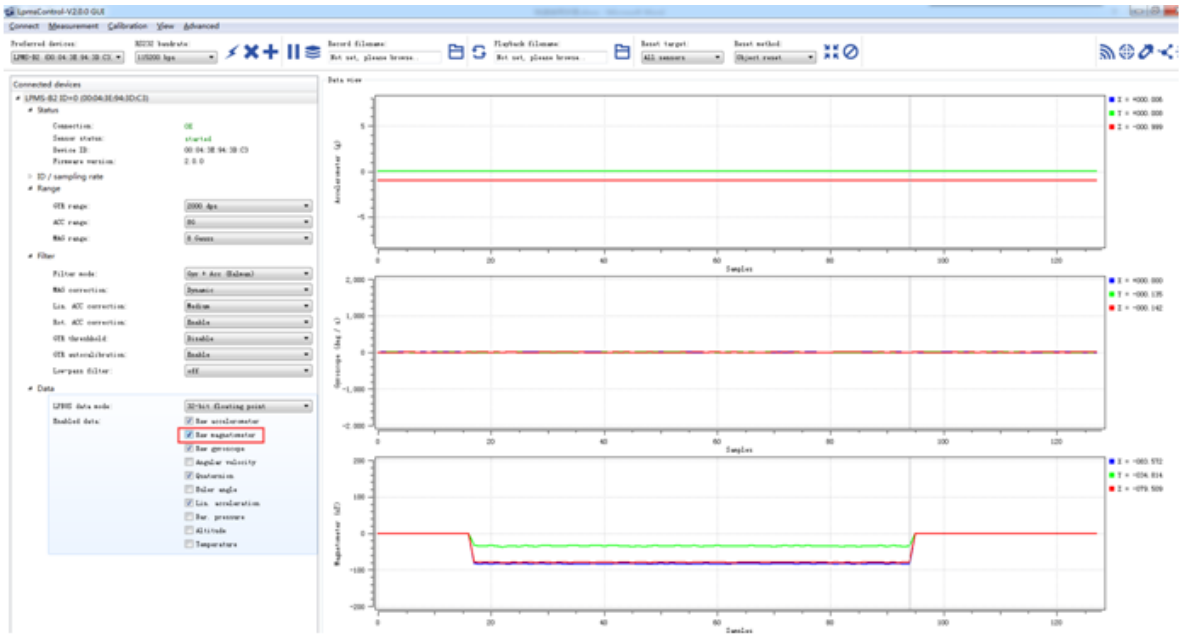


Fig. 3.13 Transmitted data selection