

# WB2072E00A

**WB2072-00 Bluetooth® Low Energy**

**Wireless MCU Module**

**Evaluation Kit**

## User Guide

**Draft 0.1**

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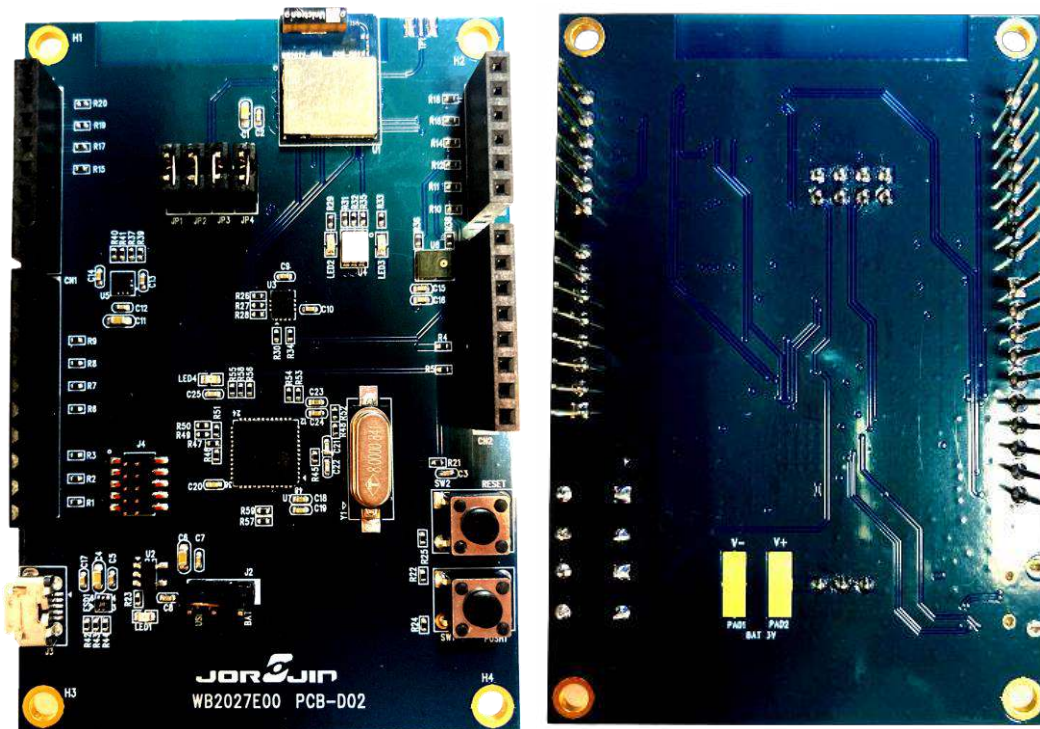
## 1. INTRODUCTION

The WB2072-00 is a low power Bluetooth® wireless MCU module, compliant with the Bluetooth® specification and supports master, slave and simultaneous master-and-slave roles. The device also supports the Bluetooth Low Energy data length extension feature, 2 Mbps, Long Range and extended advertising features.

The following WB2072E00A kit is available:

- WB2072-00 LGA-42 package development platform

The WB2072E00A development platform embeds a CMSIS-DAP programming/debugging interface and features hardware resources for a wide range of application scenarios: sensor data (accelerometer, pressure and temperature sensor), human interface (buttons and LEDs), digital MEMS microphone and serial communication through USB virtual COM. Three power options are available (USB only, battery only and external power supply plus USB) for high application development and testing flexibility.



TOP side

Bottom side

Figure 1-1. WB2072-00 BLE wireless MCU Module Evaluation Kit

## 2. HARDWARE DESCRIPTION

### 2.1 WB2072E00A board overview

The WB2072E00A development kit lets you experiment with WB2072-00 BLE wireless MCU module functions. It features:

- Bluetooth® low energy board based on the WB2072-00 BLE wireless MCU module (LGA-42 package)
- Associated development kit SW package (STSW-BNRGLP-DK) including firmware and documentation
- Bluetooth® low energy compliant, supports master, slave and simultaneous master-and-slave roles
- 3 user LEDs
- 1 user buttons
- 3D digital accelerometer and 3D digital gyroscope
- MEMS pressure sensor with embedded temperature sensor
- MEMS audio sensor omnidirectional digital microphone
- Battery pads
- CMSIS-DAP debugger/programmer via micro USB connector
- USB to serial bridge to create an I/O channel with the WB2072-00 BLE wireless MCU module
- Jumper to measure WB2072-00 BLE wireless MCU module current
- RoHS compliant

The following figure and table describe physical sections of the board.

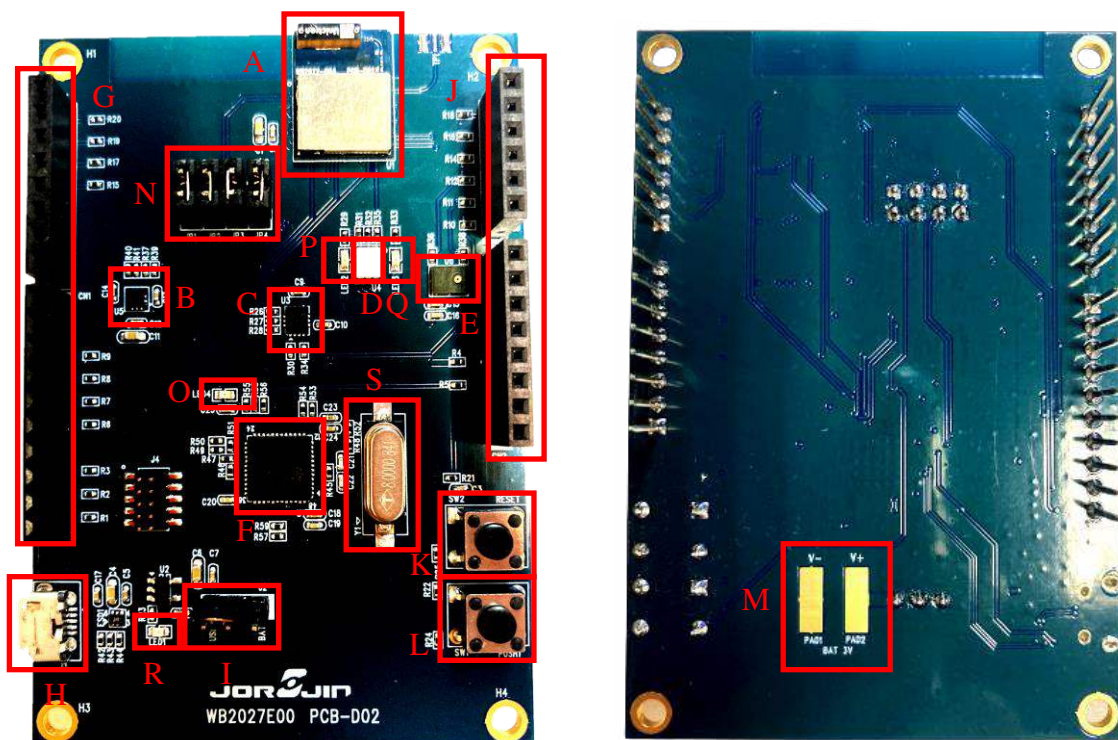


Figure 2-1. Hardware description of Evaluation Kit

**Table 2-1. Evaluation Kit component descriptions list**

Region	Description
A	WB2072-00 BLE wireless MCU module.
B	LPS22HB MEMS pressure sensor with embedded temperature
C	LSM6DSOX 3D digital accelerometer and 3D digital gyroscope
D	3-color LED
E	MP34DT05-A digital microphone
F	USB CMSIS-DAP program/debug channel and serial bridge for I/O channel to PC communication (STM32F103xx 64-pin microcontroller) <sup>(1)</sup>
G, J	Two rows of Arduino connectors.
H	Micro USB connector for power supply and I/O, and CMSIS-DAP debugger/programmer
I	Power options (USB, battery)
K	Reset button
L	user buttons
M	Battery pads for two AAA batteries
N	Board jumpers
O	Programmer/debugger and communication activity (LED4)
P	User LED (LED2)
Q	User LED (LED3)
R	Power LED (LED1)
S	8 MHz crystal

1. STM32 is not intended to be programmed by users.

## 2.2 WB2072-00 BLE wireless MCU module connections

**Table 2-2. WB2072-00 Module pin description with board functions**

Module		Board function										
Pin name	Pin no.	LEDs	Micro	Buttons	Micro phone	LPS22HB	LSM6DSOX	SWD	CN1	CN2	CN3	CN4
GND	1,10,1 2,16,2 0,27,2 9									6,7		
PA3	2		SWDIO					SWCLK				
PA2	3		SWDIO					SWDIO				

PA1	4					I2C_SDA			9			
PA0	5					I2C_CLK			10			
PB15	6	LED2										6
PB14	7	LED3										5
VDD	8,9								2,4			
PB5	11		SPI_MOSI				SPI_MOSI		4			
RSTN	13		RSTN	RESET						3		
PB7	14		SPI_CLK				SPI_CLK		6			
PB6	15		SPI_CS						3			
PB4	17		SPI_MISO				SPI_MISO		5			
PB3	18						SPI_CS					4
PB2	19				DOUT							3
PB1	21				CLK							2
PB0	22						INT1					1
PA11	23	U4										4
PA10	24		BOOT	PUSH1								3
PA9	25		UART_TX D									2
PA8	26		UART_RX D									1
TP1	28											

### 2.3 Power supply

LED1 green LED (Figure 2-1, region R) signals the board is being powered, either via:

- micro USB connector J3 (Figure 2-1, region H)
- two AAA batteries on BAT region at the rear of the board
- an external DC power supply

**Table 2-3. WB2072E00A kit platform power supply modes**

Power supply mode	J2 settings	Description
USB	USB position	USB supply through J3 connector (Figure 2-1, region H)
Battery	BAT position	The supply voltage must be provided through batteries (at the rear of the board)
External DC power supply	Removed	The supply voltage must be provided through J2 pin 2. USB connection is not needed

## 2.4 Jumpers

The following jumpers are available (Figure 2-1, region N).

**Table 2-4. WB2072E00A kit platform jumpers**

Jumper	Description
J2	It is a switch between two power domains: <ul style="list-style-type: none"> <li>• BAT position - to provide power from battery holder</li> <li>• USB position - to provide power from USB connector</li> </ul>
JP1	It provides the voltage to the WB2072-00 circuit. It must be adapted and can be used for WB2072-00 current measurements.
JP2	It connects the WB2072-00 BLE_SWCLK pin with the USB_CMSISDAP SWCLK pin. It must be adapted.
JP3	It connects the WB2072-00 BLE_SWDIO pin with the USB_CMSISDAP SWDIO pin. It must be adapted.
JP4	It connects the WB2072-00 BLE_RSTN pin a pin of the USB_CMSISDAP. It must be adapted.

## 2.5 Sensors

The following sensors are available on the platform:

1. An LPS22HB (Figure 2-1, region B) piezoresistive absolute pressure sensor which functions as a digital output barometer. The device comprises a sensing element and an IC interface which communicates through I<sup>2</sup>C from the sensing element to the application.
2. An LSM6DSOX (Figure 2-1, region C) 3D digital accelerometer and 3D digital gyroscope with embedded temperature sensor which communicates via SPI interface. One line for interrupt is also connected.
3. An MP34DT05-A MEMS audio sensor omnidirectional digital microphone connected to the WB2072-00 PDM port.

## 2.6 Extension connector

WB2072-00 signal test points are shared on two Arduino connector rows: CN1, CN3 (Figure 2-1, region G) and CN2, CN4 (Figure 2-1, region J).

## 2.7 Push buttons

The board has one user button to reset the microcontroller (Figure 2-1, region K) and one further button for application purposes (Figure 2-1, region L).

## 2.8 LEDs

LEDs LED1 (green power LED), LED2 (red), LED3 (green), U4 (blue) and LED4 (USB\_CMSISDAP activity green)

LED) are available on the board (Figure 2-1, regions R, O, P, Q and D).

## 2.9 CMSIS-DAP and Virtual COM

The most important features of the STM32F103xx microcontroller (Figure 2-1, region F) are:

- CMSIS-DAP debugging/programming capability through the USB micro connector
- USB-to-serial bridge providing an I/O communication channel with the WB2072-00 Module (to interface with a USB host device as a PC)
- drag and drop capability to program the WB2072-00 Module

Note: The on-board STM32F103xx microcontroller is not intended to be programmed by users. ST provides a pre-programmed firmware image (USB\_CMSISDAP.hex) to interface the WB2072-00 Module with a USB host device with the highlighted features.

### 2.9.1 Virtual COM port driver setup for Windows

In Windows 7, the driver installation for the Virtual COM port requires the installation of the driver files available at <https://os.mbed.com/docs/mbed-os/v5.7/tutorials/windows-serial-driver.html> In Windows 10, no installation is required.

### 2.9.2 System functionality checks

To check if the system is ready to use, follow the steps below.

**Step 1.** Check whether the CMSIS-DAP device is present in the Windows Device Manager.



Figure 2-2. Windows Device Manager - CMSIS-DAP

Note: The composite device (WebUSB: CMSIS-DAP) installation is not required, as this functionality is not used.

**Step 2.** Check under [Devices and drives] whether the ST IDB011VX mass storage device is present (if the board is powered by USB cable and connected to a PC).





Figure 2-3. ST IDB011VX mass storage device

**Step 3.** Check whether LED1 LED is on (if the board is powered by USB).

### 2.9.3 USB\_CMSISDAP programming/debugging feature

The WB2072E00A enables the on-board programming/debugging feature (USB\_CMSISDAP). To use it, you have to choose CMSIS DAP as debugger/programmer in IAR EWARM or KEIL  $\mu$ Vision development environments.

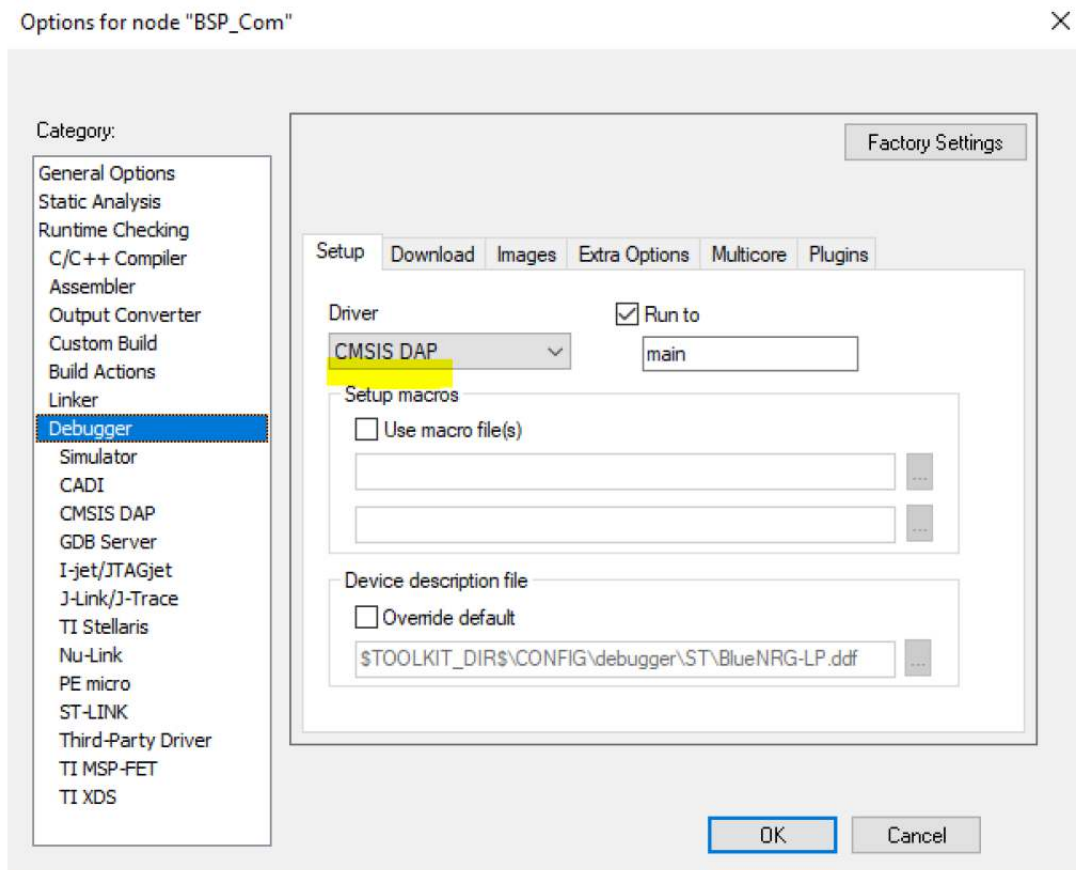


Figure 2-4. IAR EWARM project - Debugger option

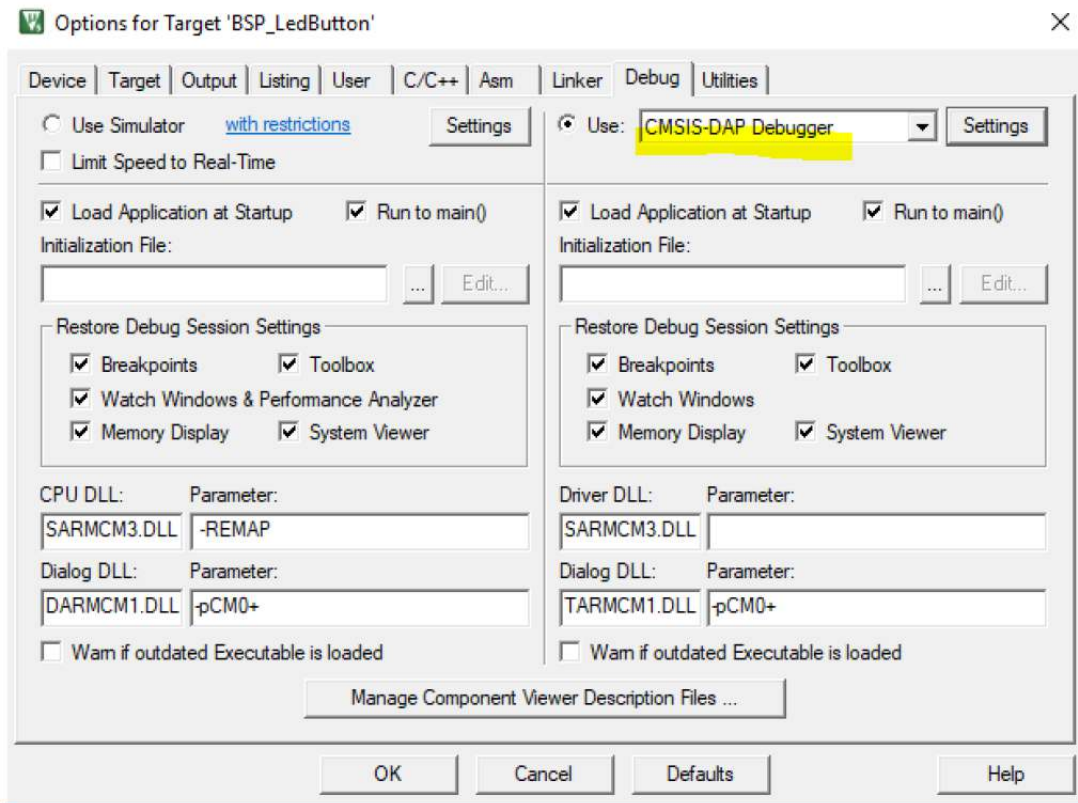


Figure 2-5. KEIL μVision project - Debugger option

You can load a binary image (.bin or .hex) to the WB2072-00 Module by copying and pasting (or dragging and dropping) the binary file into the ST IDB011VX mass storage device.

### 2.9.4 USB\_CMSISDAP firmware update

If an updated version of the USB\_CMSISDAP firmware is released, you should follow the procedure below for firmware update.

**Step 1.** Unplug the USB cable (if plugged).

**Step 2.** Press and hold the [RESET] button.

**Step 3.** Plug the USB cable.

**Step 4.** Release the [RESET] button.

A new mass storage device ([MAINTENANCE]) appears.



Figure 2-6. USB\_CMSISDAP firmware - MAINTENANCE mass storage device

**Step 5.** Copy and paste the new binary image into the [MAINTENANCE] mass storage device.

**Step 6.** At the end of the operation, unplug and then plug the USB cable again to start the board up.

## 2.10 WB2072-00 module programming and debugging

To program and debug the WB2072-00 module embedded in the WB2072E00A board, you can use an external SWD programmer/debugger tool after removing JP3, JP4 and JP5 jumpers from the WB2072E00A kit platform and connecting the SWD tool to the board as listed in the table below.

**Table 2-5. External SWD and STEVAL-IDB011V1 pin connections**

SWD pins	WB2072-00 kit platform pins
SWDIO	JP3 pin 1
SWCLK	JP2 pin 1
NRST	JP4 pin 1
GND	GND
Target VCC	VBAT

Remember:

Before using the supported IDE toolchains, select the related SWD programmer/debugger tool from the IAR EWARM project (Option/Debugger) and from the KEIL  $\mu$ Vision project (Option/Debug).

The CMSIS-DAP debugging/programming capability via the USB micro-connector can also be used to program/debug a WB2072-00 module on a different board. Remove JP2, JP3 and JP4 jumpers and connect the WB2072E00A kit platform to the board SWD pins, GND and Target VCC as follows:

**Table 2-6. WB2072E00A kit platform and user board pin connection**

WB2072E00A kit platform pins	User board SWD pins
JP3 pin 2	SWDIO
JP2 pin 2	SWCLK
JP4 pin 2	NRST
GND	GND
VBAT	Target VCC

Then connect the WB2072E00A kit platform USB to a PC USB port to start programming and debugging the WB2072-00 module on your board.

## 2.11 Current measurements

To monitor the WB2072-00 module power consumption, you must remove the jumper from JP1 and insert an ammeter between the connector pins 1 and 2.

Since WB2072-00 module power consumption is usually very low, an accurate instrument in the range of few micro amps is recommended.

## ***2.12 Hardware setup***

- Step 1. Configure the WB2072E00A board to USB power supply mode as per Table 2-3
- Step 2. Connect the WB2072E00A board to a PC via USB cable (J3 connector)
- Step 3. Check whether the LED1 power indication LED is on.

### 3. SOFTWARE DESCRIPTION

#### 3.1 WB2072E00A GPIO configuration

WB2072E00A GPIO configuration in attached file.



WB2072EVB\_IO\_  
Config.zip

Update four files as below

File Name	Count	File Name	Count
bluenrg_lp_evb_button.h	0	bluenrg_lp_evb_button.h	0
bluenrg_lp_evb_com.h	0	bluenrg_lp_evb_com.h	0
bluenrg_lp_evb_i2c.h	0	bluenrg_lp_evb_i2c.h	0
bluenrg_lp_evb_io.h	0	bluenrg_lp_evb_io.h	0
bluenrg_lp_evb_led.h	0	bluenrg_lp_evb_led.h	0
bluenrg_lp_evb_mic.h	0	bluenrg_lp_evb_mic.h	0
bluenrg_lp_evb_spi.h	0	bluenrg_lp_evb_spi.h	0
steval_jdb011V1_config.h	14	steval_jdb011V1_config.h	14
bluenrg_lp_evb_button.c	12	bluenrg_lp_evb_button.c	12
bluenrg_lp_evb_com.c	0	bluenrg_lp_evb_com.c	0
bluenrg_lp_evb_i2c.c	0	bluenrg_lp_evb_i2c.c	0
bluenrg_lp_evb_io.c	6	bluenrg_lp_evb_io.c	6
bluenrg_lp_evb_led.c	0	bluenrg_lp_evb_led.c	0
bluenrg_lp_evb_mic.c	4	bluenrg_lp_evb_mic.c	4
bluenrg_lp_evb_spi.c	0	bluenrg_lp_evb_spi.c	0
README.txt	0	README.txt	0

#### 3.2 ST STSW-BNRGLP-DK

References ST DK1.0.0. link as below

[https://www.st.com/content/st\\_com/en/products/embedded-software/evaluation-tool-software/stsw-bnr-glp-dk.html](https://www.st.com/content/st_com/en/products/embedded-software/evaluation-tool-software/stsw-bnr-glp-dk.html)

### 4. SCHEMATIC DIAGRAMS

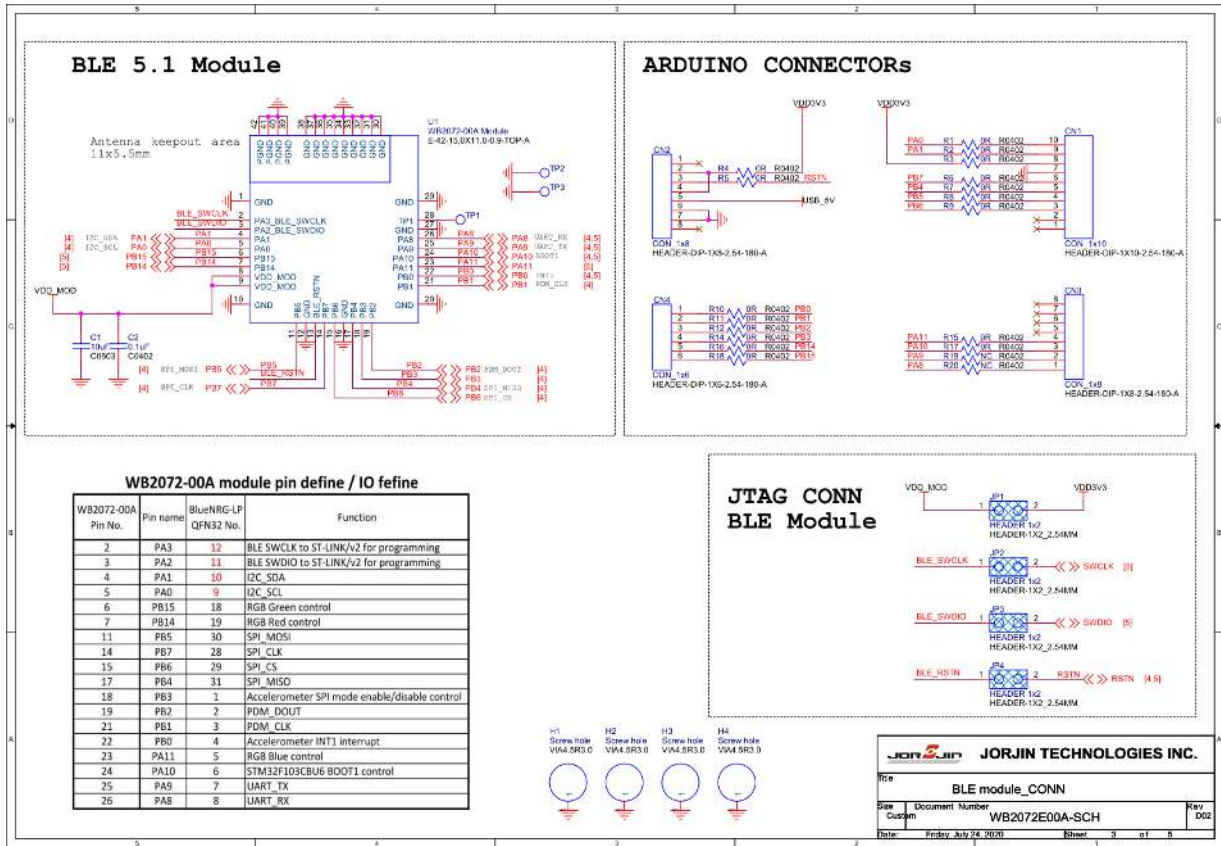


Figure 3-1. WB2072E00A circuit schematic (1 of 3)

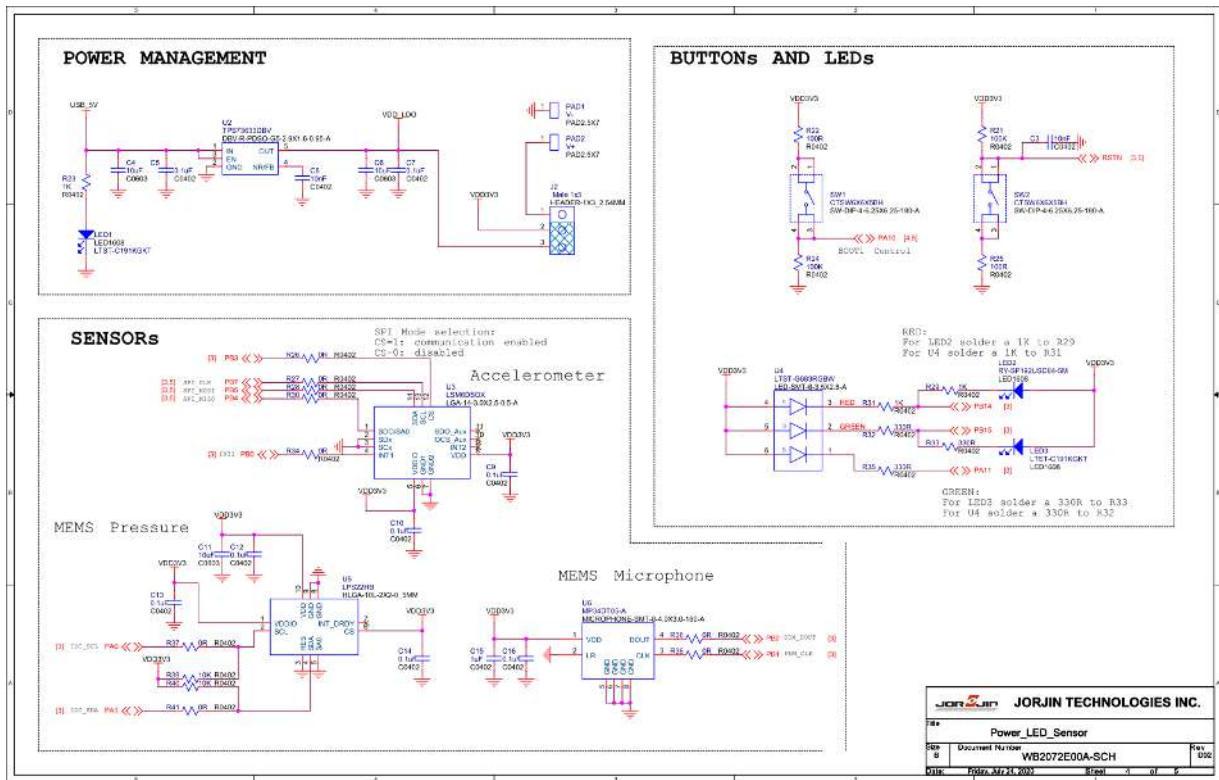


Figure 3-1. WB2072E00A circuit schematic (2 of 3)

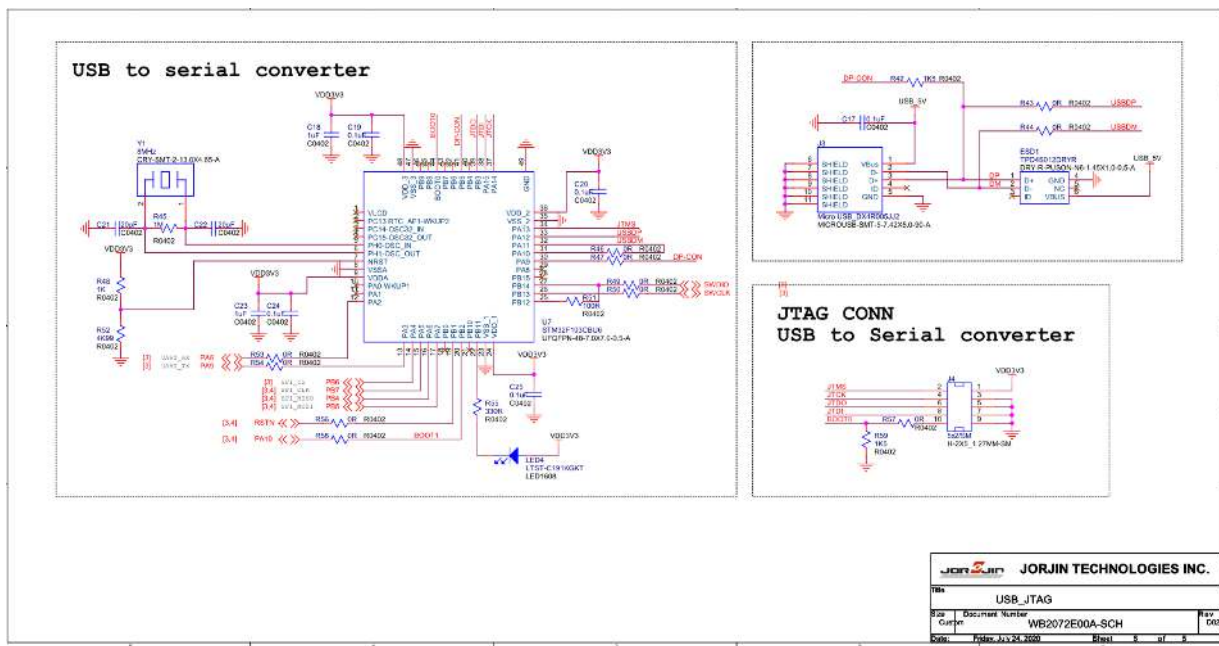


Figure 3-1. WB2072E00A circuit schematic (3 of 3)

## 5. DIMENSION

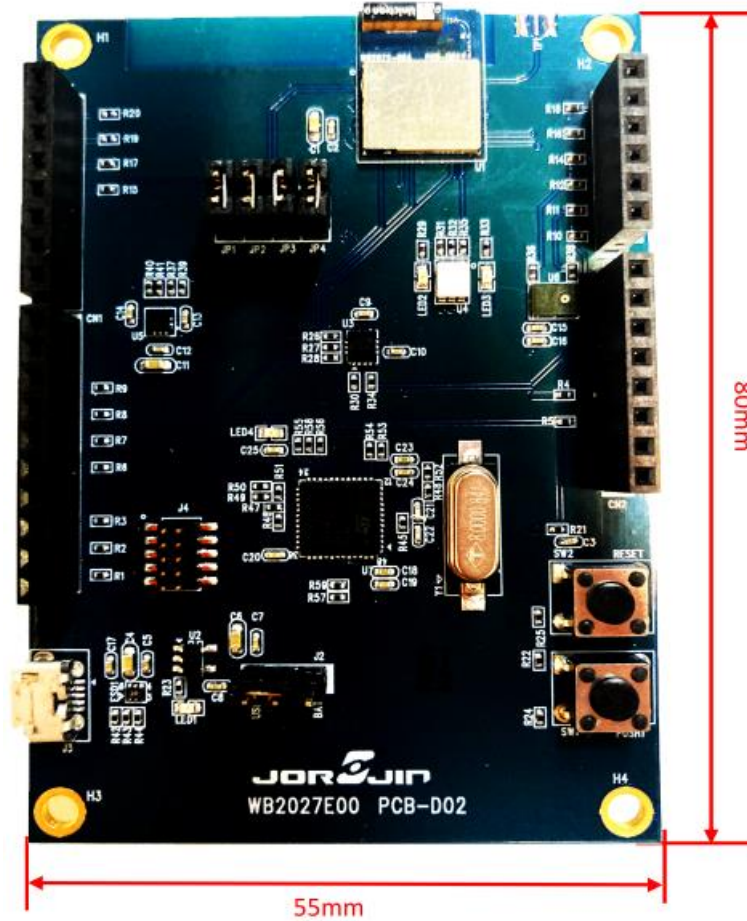


Figure 4-1. Board Dimension

## 6. HISTORY CHANGE

Revision	Date	Description
Draft 0.1	2020-11-03	Draft version.