QUINTIC

QN9020 Mini Development Board

User Guide

Version 0.6

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1. Introduction

The purpose of this document is to describe how to set up and use QN9020 Mini Development Kit and give an overview of the hardware. This guide is only used for the version of "QN9020_MINIDK_V5" board.

1.1 MiNiDK Hardware

The QN9020 MiNi Development Kit contains the following hardware components:

- QN9020 MiNi Development Board
- QN9020 USB dongle
- USB cable

1.2 System Requirements

To use the QN9020 MiNiDK, please follow the system requirements below:
- ☐ A PC running with Windows XP SP3
- ☐ Keil MDK-ARM
- J-Link Software

2. Getting Started

Before connecting the QN9020 Mini Development board, PC should have installed the Keil MDK-ARM lite and Segger J-Link software (Setup_JLinkARM_V470a), which can be down load from www.segger.com. The Segger ID for each board is attached at the back side.

During the J-link soft installation, a choose option will come up and select" install USB Driver for J-Link-OB with CDC". As shown in figure 1.
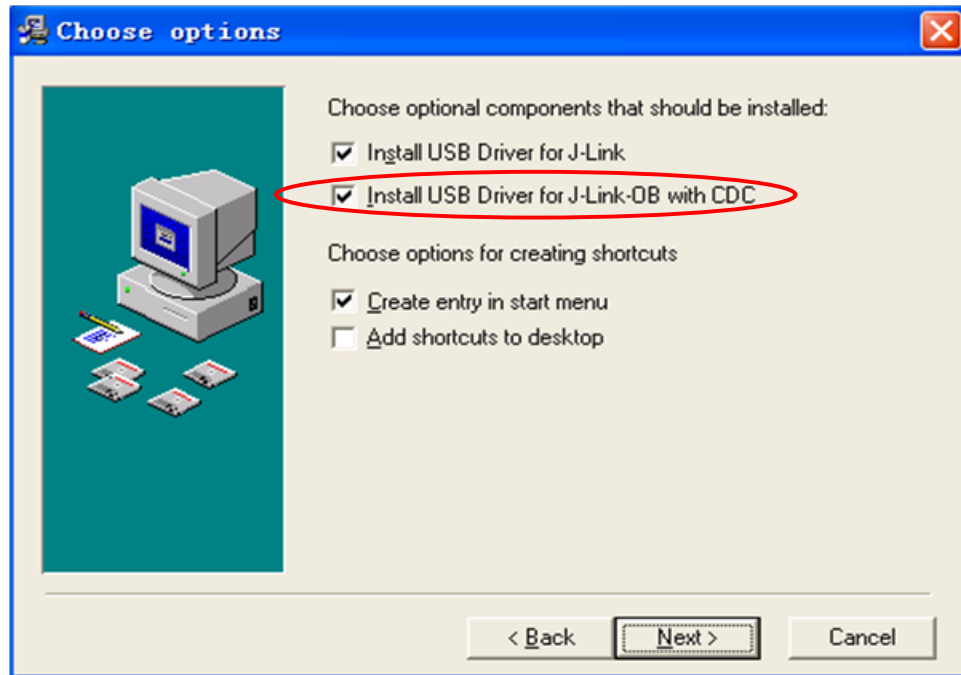

Figure1 choose option during the J-Link soft installation

2.1 Install Drivers

2.1.1 Install J-Link driver for QN9020 MiNi Development board

After the J-Link software installation is completed, there will be two possibilities to install J-Link driver for QN9020 MiNi Development board when connect the board to PC port with USB cable. One is auto installed driver by PC, the other is as follows introduced.

The PC will pop up "Found New Hardware Wizard" as shown in Figure 2 when in connecting the MiNi board to PC port with USB cable.

Figure 2 Found New Hardware Wizard

When prompted whether to use Windows Update search for software, select "No, not this time" and press the "Next" button. On the next screen in Figure 3, select the option "Install from a list or specific location (Advanced)", and press the "Next" button,
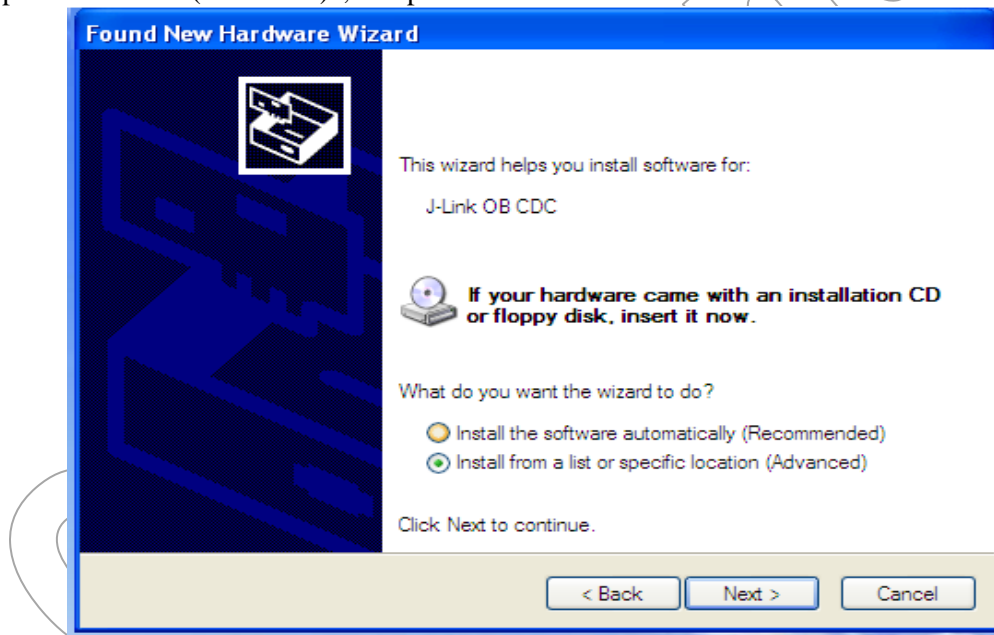
Figure 3 Install J-link Driver

On the next screen in Figure 4, click the checkbox labeled "Include this location in the search:", and click the "Browse" button. Select the installation directory
C:\Program Files\SEGGER\JLinkARM_V470a\USBDriver\CDC
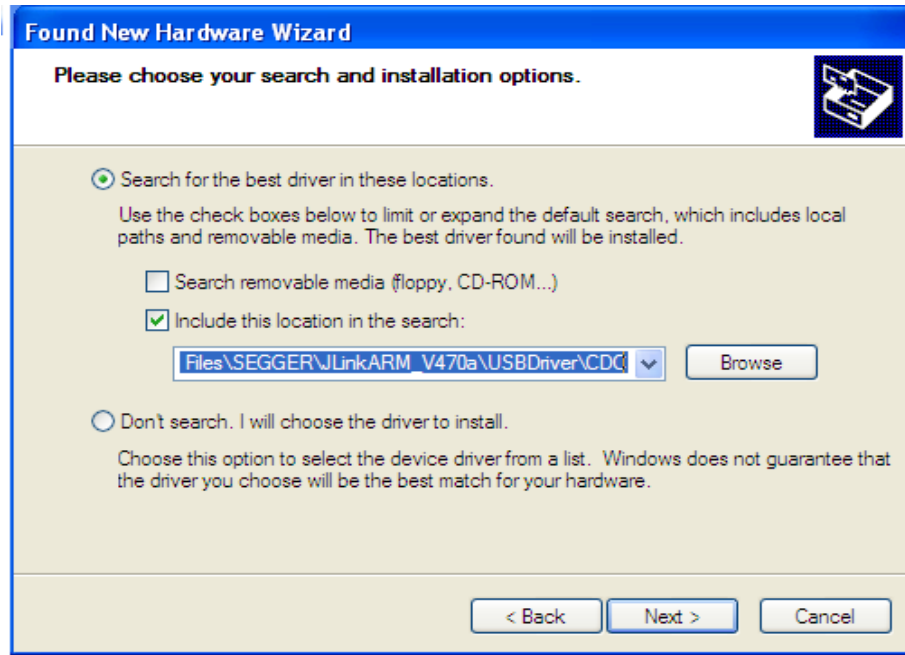
Figure 4 Select J-link Driver

Click the "Next" button to install the driver. It will take a few seconds for the file to load. If the installation is successful, you should see the screen in Figure 5. Click the "Finish" button to complete the installation.

Figure 5 CDC Driver Installation Complete

You can verify that the driver is properly installed by opening the Device Manager as in Figure 6.
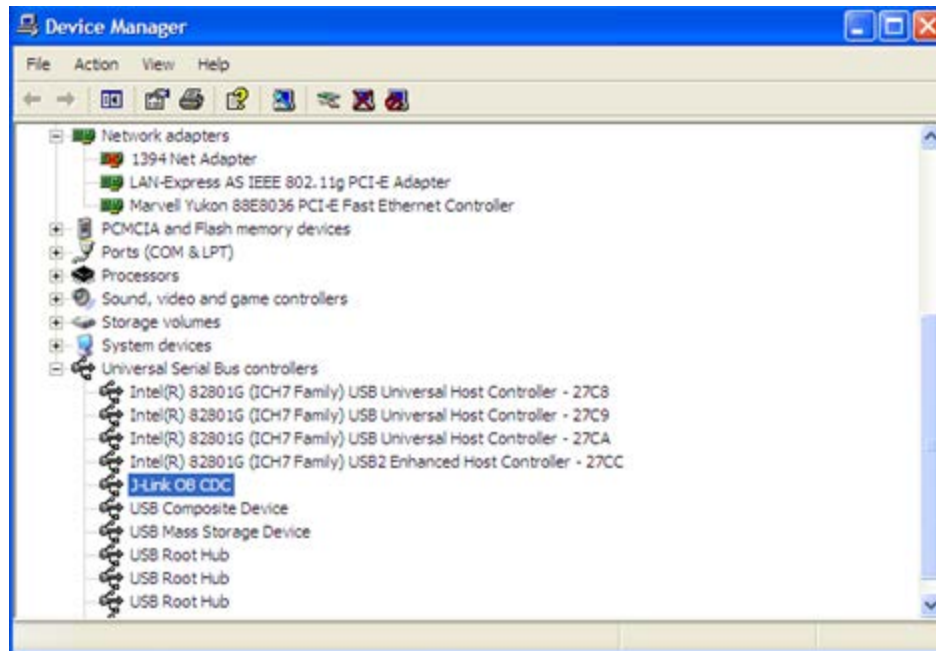
Figure 6 Verify CDC Driver Installation

In the same way, you can install the CDC UART Port driver and verify whether the driver installed successfully.
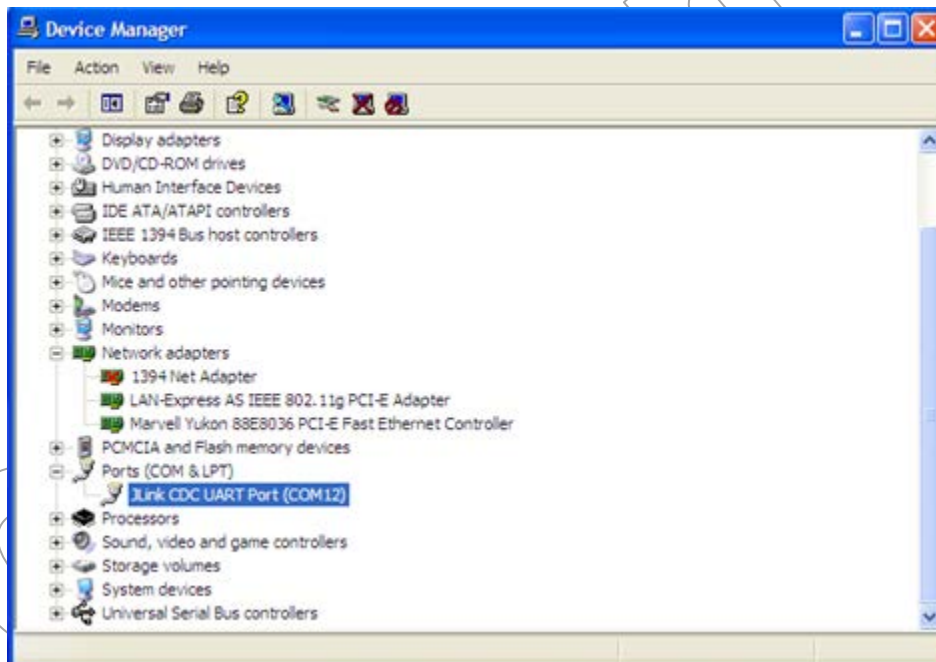
Figure 7 Verify CDC UART Port Driver Installation

2.1.2 Install FT232R virtual COM port Driver for Dongle

Please refer to Application Note AN-104 for detailed installation, which is downloaded from FTDI website http://www.ftdichip.com/Support/Documents/AppNotes.htm. This guide will help you how to install the FTDI's combined driver model (CDM) driver for the Microsoft Windows XP operating system.

3. Hardware Description

The QN9020 Mini Development board can be divided into several segments: Power Supplies, Segger J-Link OB part, QN9020 device, GPIO interface, LED, BUTTON, Piezo Buzzer and option sensor board connector.

3.1 Hardware Overview

The real photos of the QN9020 Mini Development board both sides are shown in Figure 8 and 9 below, as well as the detailed components information list in Table 1.
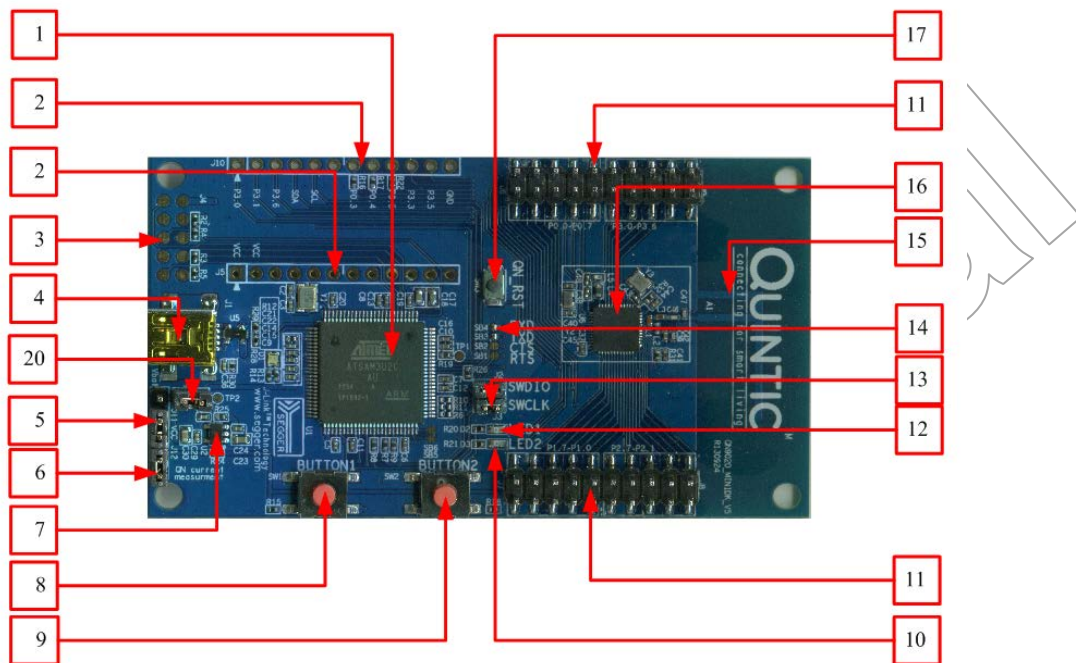
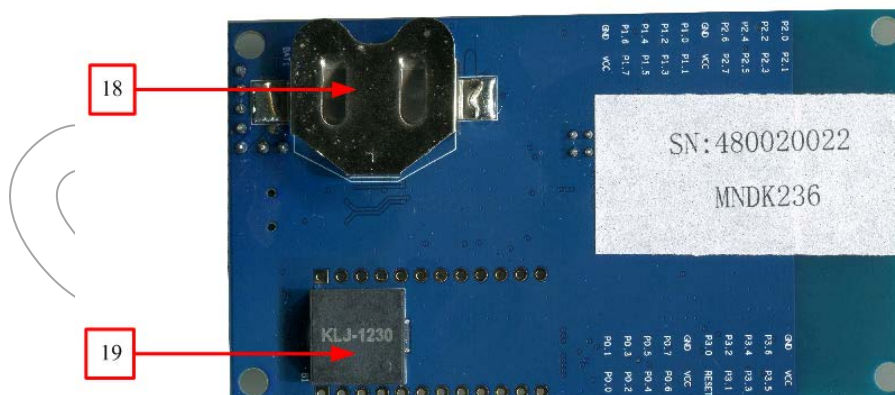

Figure 8 Mini Development Board Top View

Figure 9 Mini Development Board Bottom View

Table 1 QN9020 Mini Development Board Components List

NO.	Name	Description
1	J-Link OB	ATSAM3U2C. Used to offer SWD and UART interface for QN9020
2	Connector	Option. Used for connecting sensor board
3	Debugger port	Debugger port for ATSAM3U2CA
4	MiNi USB port	Power and communication port
5	Power source select jumper	Select power source for MiNi Development. Refer to section 3.2 for detail.
6	Current measurement jumper	Used to measure the QN9020 device current.
7	LDO(TPS73630)	5V to 3V regulator
8	Button1	Button. Refer to section 3.8 for detail
9	Button2	Button. Refer to section 3.8 for detail
10	LED2	LED. Refer to section 3.7 for detail
11	QN9020 GPIO Port	GPIO Port
12	LED1	LED. Refer to section 3.7 for detail
13	SWD jumper	Debugger interface for QN9020 device
14	UART interface	Debugger interface for QN9020 device
15	PCB antenna	PCB antenna
16	QN9020 device	QN9020 device
17	QN9020 reset button	Used for QN9020 hardware reset
18	CR2032 battery holder	CR2032 battery holder
19	Piezo buzzer	KLJ-1230
20	Jumper	Power-on or Power-off for Atsam3u2ca

3.2 Power Supplies

The QN9020 Mini Development board has two power supply interfaces:

1. USB interface
The USB interface powers the external voltage regulator changed the voltage from 5V to 3V. Then the regulator outputs 3V voltage to supply all parts on board.

2. CR2032 coil cell battery
The CR2032 only supplies for QN9020 device and option sensor board.

When using USB interface as a power supply, we should connect the jumper J11 pin2 and pin3, as shown in Figure 10.
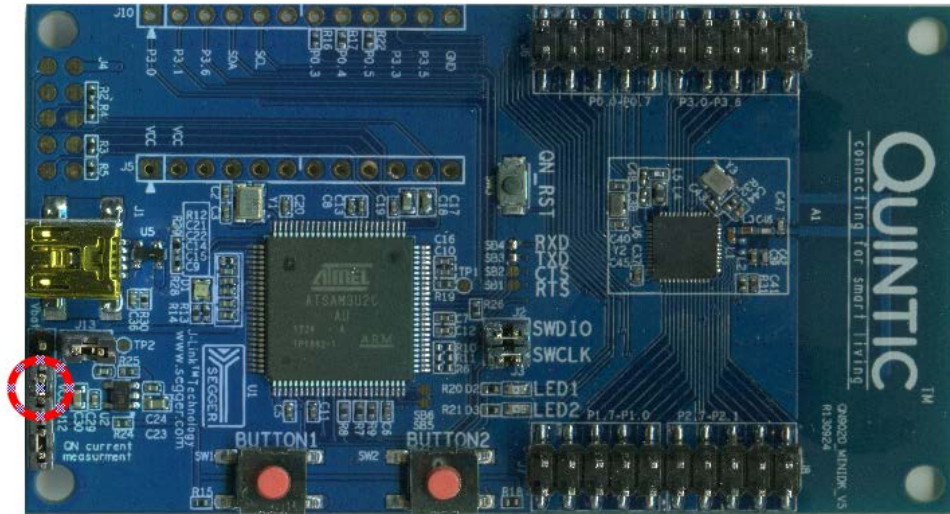
Figure 10 Connect jumper J11 pin2 and pin3 to select USB as power supply

When using CR2032 coin cell as a power supply, we should connect the jumper J11 pin1 and pin2, as shown in Figure 11.
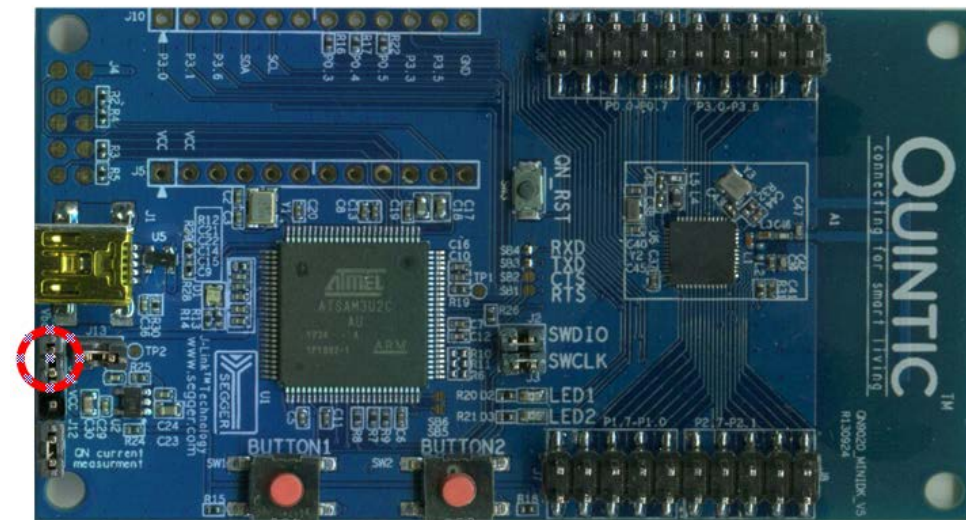
Figure 12 Connect jumper J11 pin1 and pin2 to select CR2032 coil cell as power supply

3.3   Segger J-Link OB part

The Segger J-link OB offers the SWD and UART interface. We can download or update firmware for QN9020 device using the UART and SWD interface. Furthermore, it is convenient to debug the program for QN9020 device using SWD interface.

To program or debug the QN9020 device using the Segger J-Link OB, the jumper J2, J3 should be connected, as shown in Figure 12.
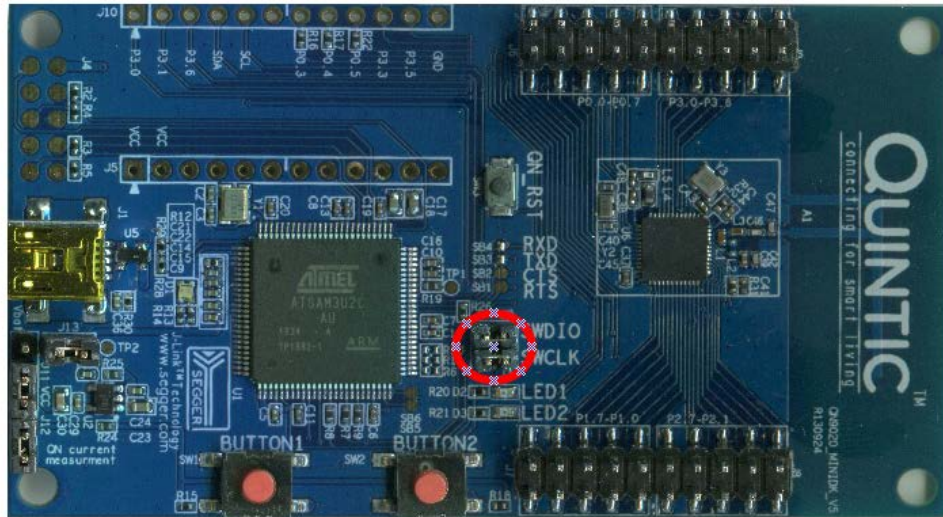

Figure 12 Connect the J2, J3

In order to use USB to UART bridge for QN9020 download, the solder bridge SB3, SB4 should be short, as shown in Figure 13.
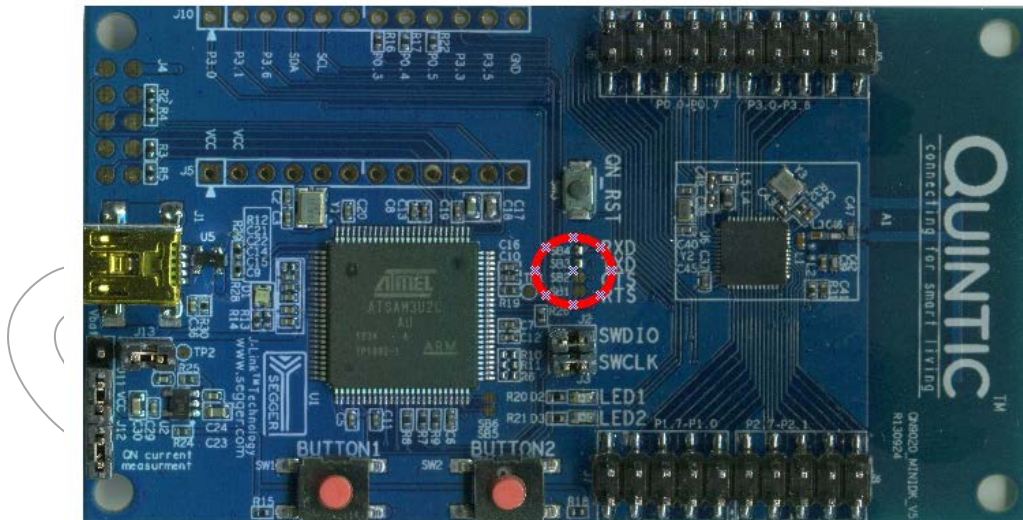
Figure 13 short the SB3, SB4

3.4 QN9020 Device

The QN9020 device integrates a BLE radio, controller, protocol stack and profile software and a high performance MCU on a single chip, as shown in Figure 14.
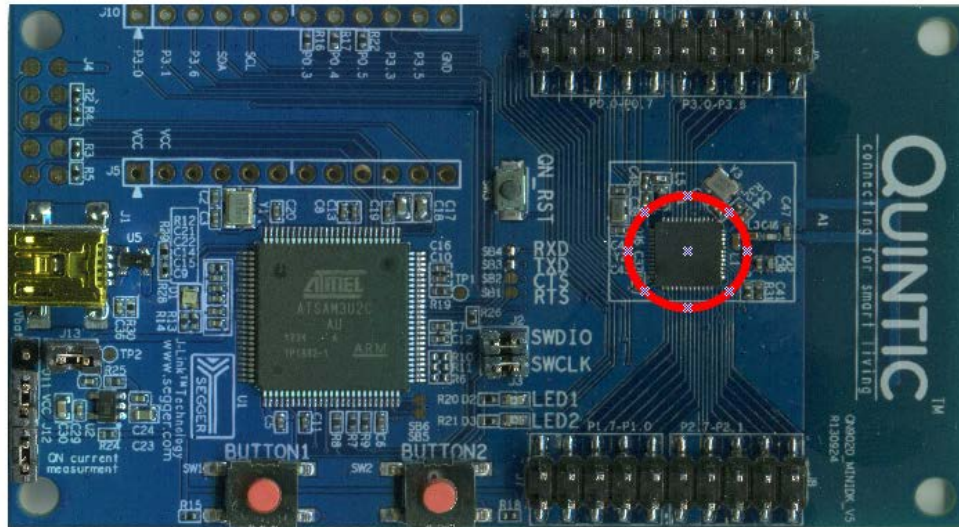
Figure 14 QN9020 Device

3.5 GPIO Interface

The connectors J6, J7, J8 and J9 define the QN9020 GPIO net names, as shown in Figure 15.
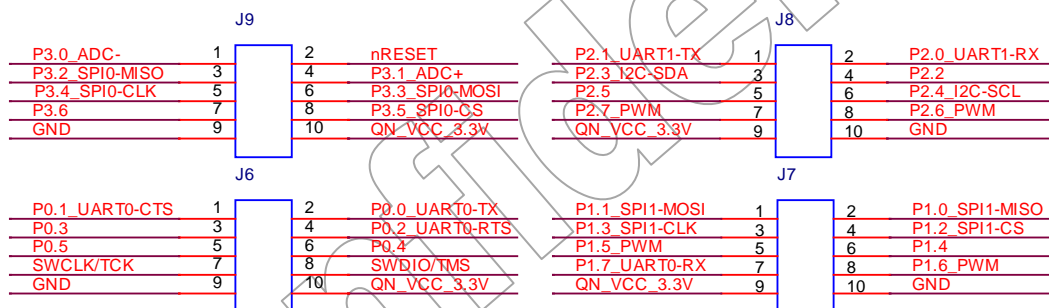
Figure 15 QN9020 GPIO Definition

3.6 QN9020 Reset Button

The reset button used to hardware reset the QN9020 device. When programmed the QN9020 using UART interface of Segger J-Link OB, we should use reset function to establish connection between hardware and ISP Studio offered by Quintic Corp.

Figure 16 QN9020 Reset Circuit

3.7   LED

The QN9020 Mini Development board offers the two programmed LEDs with connecting to QN9020 device GPIO.
The GPIO P0.5 and P0.6 connect the LED1 and LED2. The connection is shown as following Figure17, the GPIO outputs logical low to illuminate the corresponding LED.
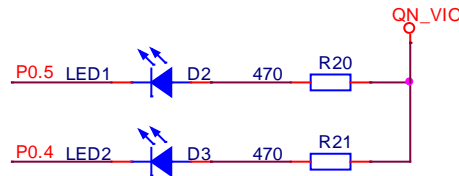
Figure 17 LED Circuit

3.8   Button

The QN9020 Mini Development board also offers the two Buttons with connecting to QN9020 device GPIO. The GPIO P1.4 and P1.5 connect the Button1 and Button2.

When using buttons functions, the GPIO P1.4 and P1.5 must be configured as an input. Push button means giving a logical low input to QN9020.
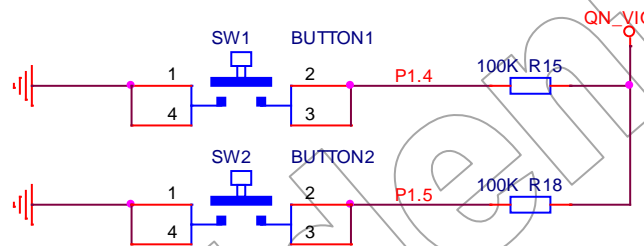
Figure 18 Button Circuit

3.9   Piezo Buzzer

The QN9020 GPIO P2.6 connects the input of Piezo Buzzer. Please refer to KLJ-1230 datasheet for detail information.
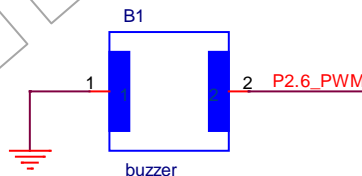
Figure 19 Piezo Buzzer Circuit

3.10 Option Sensor Connector

These connectors used as an interface to connect Steval sensor board. The pin names definition is shown as following Figure 20.
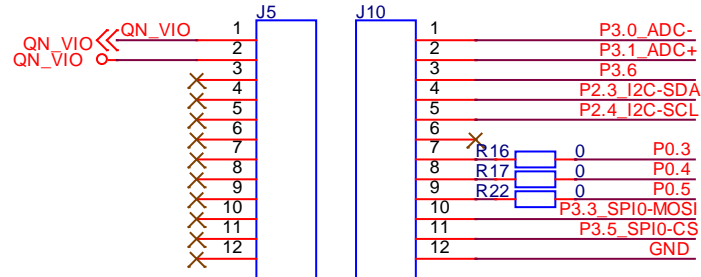
Figure 20 Connect for Connecting Sensor Board

3.11 Current measurement

The jumper J12 used to measure QN9020 device current. When in normal work mode, the Jumper pin1 and pin2 should connect to a jumper cap. When in current test mode, the digital ammeter should connect J12 in series.

4. QN9020 Mini Development Board Schematics

Please refer to QN9020 Mini Development Board schematics in appendix.

Bill of Material

Table 2 QN9020 Mini Development Board BOM

| QN9020_48_MINIDK Bom					
Item	**Part Description**	**Footprint**	**Reference**	**Qty**	**Mfg Part No.**
Capacitor					
1	C_SMD, 100nF, X7R, ±10%, 16V, 0402	0402	C5,C6,C7,C8,C9,C10,C11,C12,C13,C14,C15,C19,C20,C22,C24,C29,C37,C38,C43,C44	20	GRM155R71E104KE14
2	C_SMD, 10nF, X7R, ±10%, 16V, 0402	0402	C17,C18,C23,C30	4	GRM155R71E103KA01
3	C_SMD, 10uF, X7R, ±10%, 16V, 0402	0402	C41,C48	2	GRM188R61C106MA73
4	C_SMD,1uF, X5R, ±10%, 6.3V, 0402	0402	C41,C48	2	GRM155R61C105KA12
5	C_SMD,1nF, X5R, ±10%, 6.3V, 0402	0402	C36	1	GRM155R61H102KA01
6	C_SMD, 10pF, NP0, 5%, 50V, 0402	0402	C21	1	GRM1555C1H100JZ01
7	C_SMD, 22pF, NP0, 5%, 50V, 0402	0402	C40,C45	2	GRM1555C1H220JA01
8	C_SMD, 18pF, NP0, 5%, 50V, 0402	0402	C2,C3	2	GRM1555C1H180JZ01
Resistor					
9	R_SMD,4.7K, ±5%, 0402	0402	R2,R3,R4,R5	4	
10	R_SMD,6K8, ±1%, 0402	0402	R12	1	
11	R_SMD,1K, ±5%, 0402	0402	R19,R13,R14,R20,R21	5	
12	R_SMD,39R, ±1%, 0402	0402	R28,R29	2	
13	R_SMD,100R, ±5%, 0402	0402	R7,R8	2	
16	R_SMD,0R, ±5%, 0402	0402	R9,R16,R17,R22,R24,R25,R26	7	
17	R_SMD,56K, ±1%, 0402	0402	R32	1	
18	R_SMD,100K, ±5%, 0402	0402	R15,R18,R31	3	
19	R_SMD,1M, ±5%, 0402	0402	R30	1	
Inductor					
20	L_SMD,15nH,5%,0402	0402	L5	1	LQG15HN15NJ02
21	L_SMD,10uH,5%,0603	0603	L4	1	LQM18FN100M00
Oscillator					
22	Crystal, 12MHz, ±20ppm, 12pF, 3.2x2.5x0.7mm	SMD3225	Y1	1	FA-238V
23	Crystal, 32.768K, ±20ppm, 15pF, 2.05x1.2x0.6 mm	SMD2012	Y2	1	FC-12M
24	Crystal, 16MHz, ±20ppm, 12pF, 2.5x2.0x0.55mm	SMD2520	Y3	1	FA-20H
IC					
25	IC, 2.4G SOC, 64KB system memory, QFN48,QN9020	QFN48	U6	1	QN9020
26	IC, Jlink OB, LQFP100, ATSAM3U2CA	LQFP100	U1	1	ATSAM3U2CA
27	IC, LDO, SOT23,TPS73630	SOT23	U2	1	TPS73630
28	IC, ESD protection, SOT143,PRTR5VOU2X	SOT143	U5	1	PRTR5VOU2X
RF matching					

29	L_SMD, 6.2nH, ±0.1nH,0402	0402	L2	1	LQP15MN6N2B02
30	L_SMD, 2.0nH, ±0.1nH,0402	0402	L3	1	LQP15MN2N0B02
31	L_SMD, 1.1nH, ±0.1nH,0402	0402	L1	1	LQP15MN1N1B02
32	C_SMD, 2.2nF, X7R, ±10%, 50V, 0402	0402	C39	1	GRM155R71H222KA01
33	C_SMD, 8.2pF, COG, ±0.5pF, 50V, 0402	0402	C42	1	GRM1555C1H8R2DA01
34	C_SMD, 1.5pF, COG, ±0.25pF, 50V, 0402	0402	C46	1	GRM1555C1H1R5CA01
35	C_SMD, 1.0pF, COG, ±0.25pF, 50V, 0402	0402	C47	1	GRM1555C1H1R0CA01
Others					
36	LED_4P	0603	D1	1	LTST-C195KGJRKT
37	LED_2P,GREEN	0603	D2,D3	2	
38	MINIUSB,TYPEB	smd	J1	1	
39	SOLDER BRIDGE		SB1,SB2,SB3,SB4,SB5,SB6	6	
40	BUTTON_4P	smd	SW1,SW2	2	
41	BUTTON_2P	smd	SW3	1	
42	BATTERY HOLDER	smd	BAT1	1	
43	BUZZER	smd	B1	1	KLJ-1230
44	CONNECTOR_2*5P_2MM54	smd	J6,J7,J8,J9	4	
45	JUMPER_2P_2MM54	thu	J12	1	
46	JUMPER_3P_2MM54	thu	J11	1	
47	JUMPER_2P_2MM0	thu	J2,J3	2	
48	JUMPER_2P_2MM54	thu	J13	1	
49	Antenna		A1	1	

Release History

REVISION	CHANGE DESCRIPTION	DATE
0.1	Initial release	2013-06-28
0.2	Add section 1.1 and 1.2.Add section 2.1.2 for driver installation of Dongle.	2013-07-09
0.3	Modified the Net name in section 3.5; Redefined the GPIO1.4、1.5 as connecting the Button1、2 in section 3.8; Update the Bill of material; Update the schematic in appendix.	2013-07-11
0.4	Update the Bill of material.	2013-08-19
0.5	Add the jumper J13 for power-on or power-off Atsam3u2ca	2014-01-16
0.6	Update the Table1 on page 10	2014-03-03

Appendix

The schematic for QN9020 MINI Development board