QBLUE Development Kit Motherboard User Guide

Version 0.4

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1. Introduction

QBLUE Development Kit is a complete solution for Quintic QBLUE Bluetooth series development, testing and evaluation. The motherboard in Bluetooth Development Kit is the development platform to support QN902x EVB. This motherboard has a wide range of user interfaces and abundant optional resources, including:

- 128x128 matrix STN LCD
- Full speed USB2.0 interface
- JTAG Debug interface
- UART RS232 interface
- Serial Flash
- Rheostat
- Joy stick
- Buttons
- LEDS

1.1 About this manual

This manual contains reference information of QBLUE Bluetooth development platform installation and the hardware description of the motherboard. It starts with a quick introduction to how to get started with the Bluetooth development platform, followed by the hardware details of the platform. Also the schematics and PCB silkscreen of the motherboard are included.

1.2 Acronyms and Abbreviations

LCD	Liquid Crystal Display
LED	Light Emitting Diode
MCU	Micro Controller Unit
SPI	Serial Peripheral Interface
UART	Universal Asynchronous Receiver/Transmitter
USB	Universal Serial Bus

2. Getting started

2.1 Install Quintic_BLE and Setup_JLinkARM

Before plugging the DK platform into the PC via the USB cable or RS232 interface, it is highly recommended to install Quintic_BLE.exe and Setup_JLinkARM.exe to your PC first. The Setup_JLinkARM.exe installation package can be down load from www.segger.com. The Segger ID for each board is attached at the back side.

2.2 Install drivers

You can now connect your DK platform to the computer with a USB cable or RS232 interface and turn it on. A "Found new Hardware" dialog box will pop out as shown in Figure 1, for you to locate the driver needed. Please select "No, not this time" and continue with "Next".

Figure 1 Found New Hardware Window (Windows XP)

After clicking next, the window as shown in Figure 2 will appear. Please select "Install from a list of specific location" to install the driver for the virtual COM.

On the board, virtual COM and JLINK OB debugger use the same USB port though a USB hub (marked as Unit 21 in Figure 7). So the user should make sure which driver is installing now.

This section is only about installing virtual COM driver. You can see the www.segger.com for more information about installing JLINK OB driver.

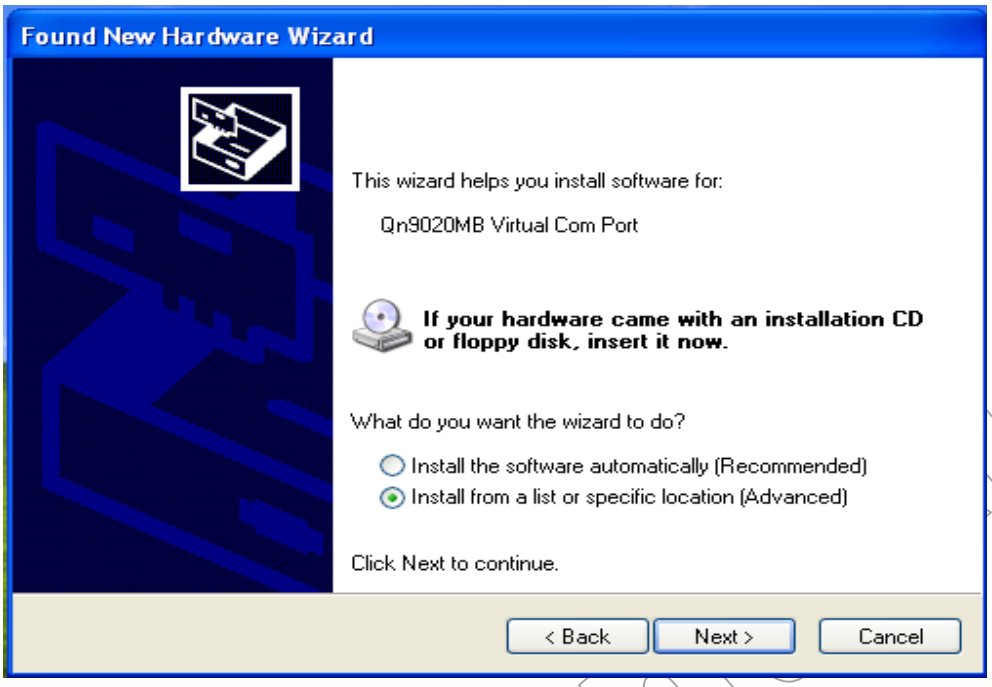

Figure 2 Select automatic installation of software (Windows XP)

The drivers for the platform are normally located in the directory C:\Program Files\Quintic Corporation\QBlue\USBCdcDrv, as shown in Figure 3 below.

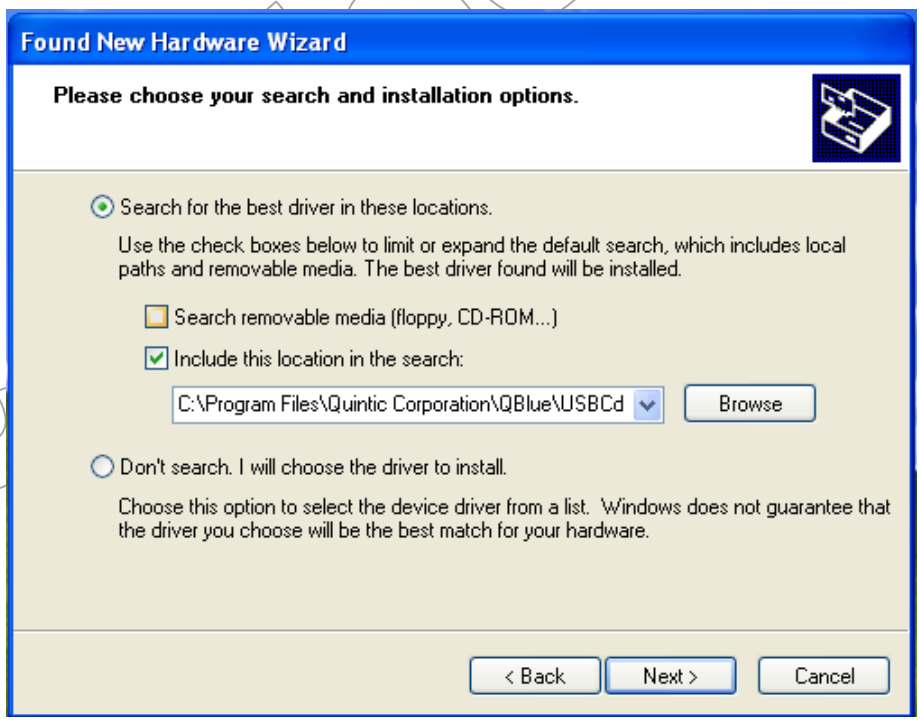

Figure 3 Manually locate driver

The driver is now installed and the computer should be ready for use virtual COM.

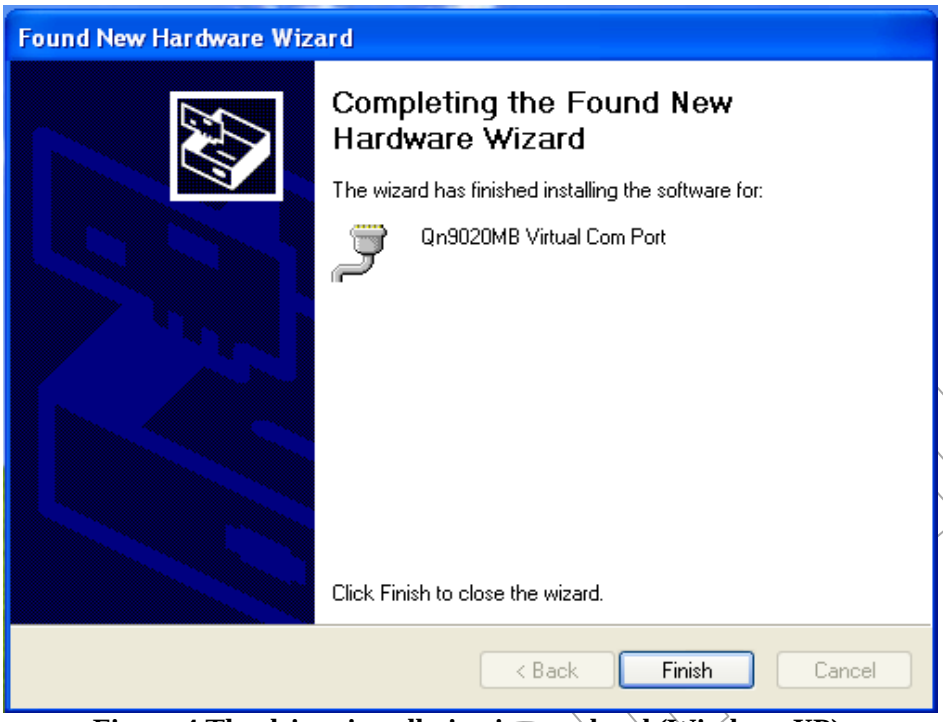

Figure 4 The driver installation is completed (Windows XP)

You can verify that the driver is properly installed by opening the Device Manager (Figure 5). When the platform is connected, the "COM and LPT" list contains "QN9020 virtual COM".

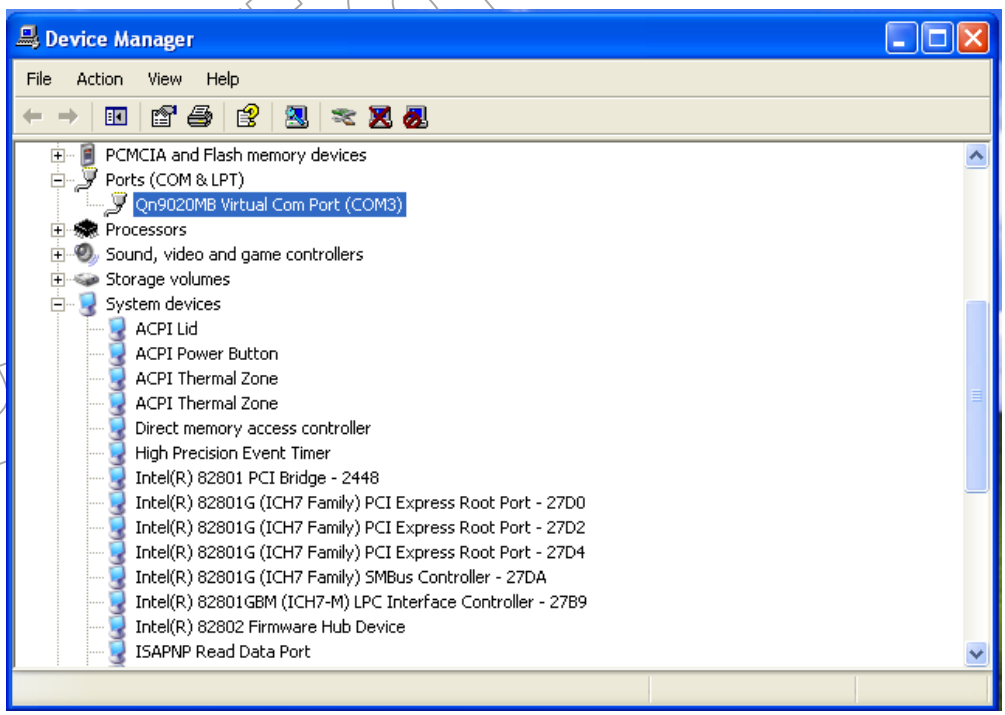

Figure 5 Properly installed virtual COM driver (Windows XP)

3. Bluetooth DK Motherboard Overview

QBLUE Bluetooth DK motherboard has several user interfaces and connections to external interfaces allowing fast prototyping and testing of both software and hardware. This chapter will give an overview of the general architecture of the board and describe the available IO and hardware resources. The following sub-sections will explain the IO in more detail.

The main components and interfaces of the motherboard are shown in Figure 6 below.

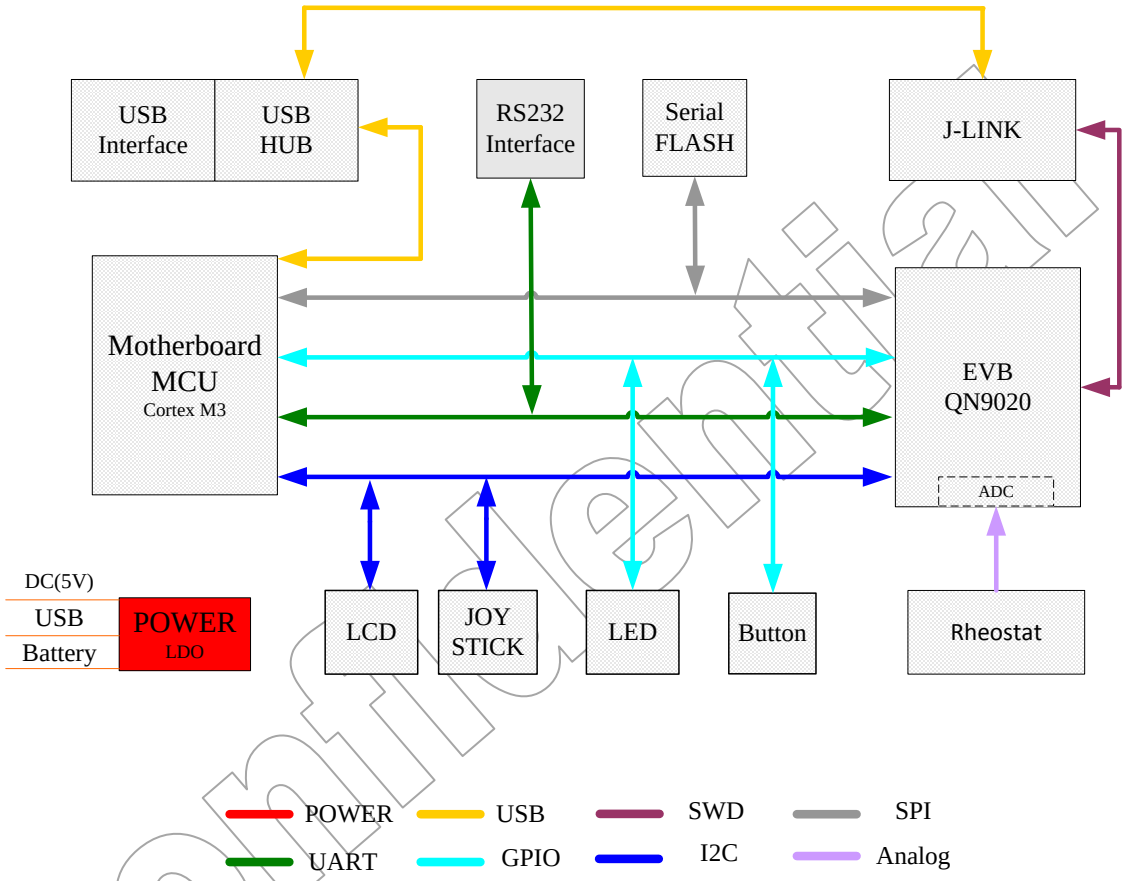

Figure 6 DK Motherboard Architecture

The real photos of DK motherboard both sides are shown in Figure 7 and Figure 8, as well as the detailed components information list in Table 1.

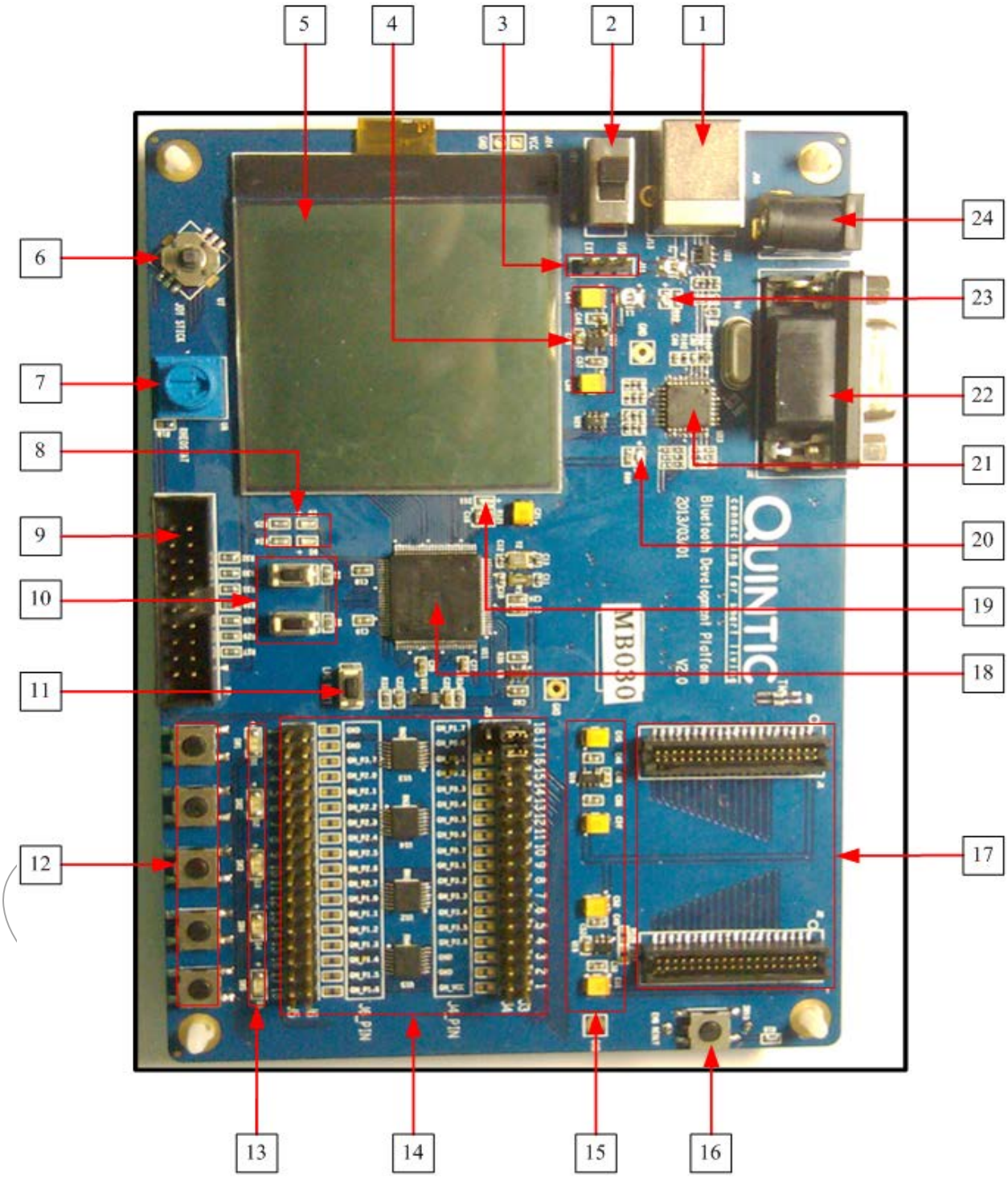

Figure 7 DK Motherboard Top View

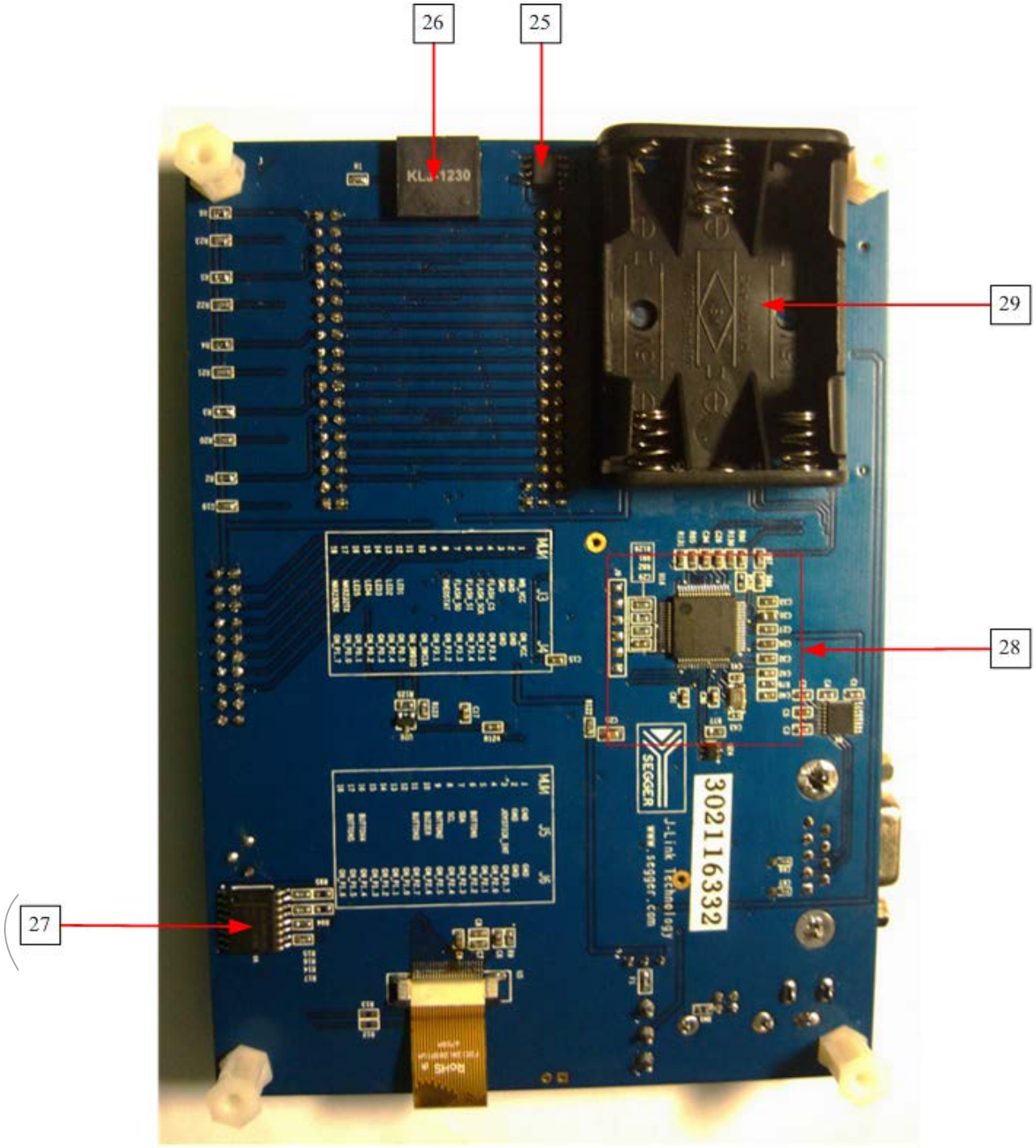

Figure 8 DK Motherboard Bottom View

Table 1 DK Motherboard Component List

NO.	Name	Description
1	USB Port	Communication port
2	Power switch	See section 3.2 for the detail
3	Power source select jumper	Select power source for platform. See section 3.2 for the detail
4	platform power	The power for platform all the devices except the EVB
5	LCD	Show the message, See section 3.7 for the detail
6	JOY stick	See section 3.5 for the detail
7	Rheostat	See section 3.9 for the detail
8	LED for platform MCU	Only control by platform MCU. See section 3.10 for the detail
9	LPC JTAG socket	The debugger port for platform MCU.
10	platform Buttons	Only controlled by platform MCU. See section 3.11 for the detail
11	Platform MCU reset button	Reset platform MCU. See section 3.11 for the detail
12	EVB buttons	Only controlled by EVB MCU. See section 3.11 for the detail
13	EVB LEDs	Only controlled by EVB MCU. See section 3.10 for the detail
14	Break-out headers	See section 3.12 for the detail.
15	EVB Power	Offer power to EVB
16	EVB MCU reset button	Reset EVB MCU. See section 3.11 for the detail
17	EVB connectors	Connect EVB to the platform. See section 3.13 for the detail
18	Platform MCU	See 3.1 for the detail
19	Virtual COM led	Show the Virtual COM work state
20	JLINK OB LED	Show the JLINK work state .See section 3.10 for the detail
21	USB hub	Merge the virtual COM USB port and JLINK USB port
22	RS232 connector	See section 3.4 for the detail
23	Power LED	Show power state.
24	DC power connector	See section 3.2 for the detail
25	SPI flash	See section 3.6 for the detail
26	Buzzer	See section 3.8 for the detail
27	2-wire port extension IC	See section 3.5 for the detail
28	JLINK OB circuit	The debugger for EVB MCU.
29	Battery case	3 X AAA. See section 3.2 for the detail

3.1 Platform MCU

The Platform MCU (marked as 18 in Figure 7) is NXP LPC1768. Please visit www.nxp.com for detailed information about this controller.

The Platform MCU is programmed with the standard virtual COM firmware when it is shipped out from the factory. The MCU is used to be a bridge between USB port and UART port. The

user can switch the virtual COM and RS232 COM by short circuit pins. Find more details please refer to section 3.4.

3.2 Power Source

There are three possible solutions to apply power to the motherboard. The power source can be selected by the power source selection jumper on header J11 (marked as 3 in Figure 7). The main power supply switch (marked as 2 in Figure 7) controls the turn-off or turn-on of the power sources.

3.2.1 Battery power

The motherboard includes a battery case (marked as 29 in Figure 7) for three 1.5V AAA batteries on the reverse side of the board. If using battery power, the power source selection jumper (marked as 3 in Figure 7) should be configured by short circuit pin as shown in Figure 9.

3.2.2 DC power

The motherboard has a connector with standard DC power connector (marked as 24 in Figure 7) with a 1.95 mm center pin. A 5V DC power supply should be applied here. The center pin is used as the positive pole. The onboard LDO supplies approx 3.3 V and 3.0 V to the board. If using DC power, the power source selection jumper should be configured by short circuit pin as shown in Figure 9.

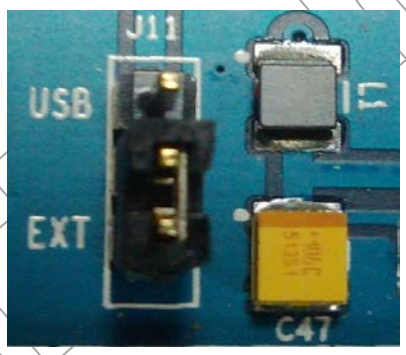

Figure 9 Select DC or Battery Power Source

3.2.3 USB power

When the motherboard is connected to a PC via a USB cable, it can draw power from the USB bus. The onboard LDO supplies approx 3.3 V and 3.0 V to the board. If using USB power, the power source selection jumper should short circuit pin as shown in Figure 10.

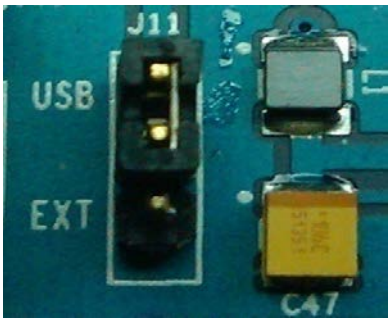

Figure 10 Select USB power source

3.3 J-Link onboard

J-Link onboard circuit (marked as 28 in Figure 8) from SEGGER is used to program and debug for EVB MCU (for example Cortex M0 in Qn9020). Please see www.segger.com for more information.

3.4 RS232 COM and virtual COM

The UART can be used to communicate with PC or printing debug information by user's applications. As shown in Figure 5, there are two ways to connect PC to EVB MCU with UART interface below:

A shown in Figure 11 and 13, if connecting j3-17 pin to j4-17 pin, j3-18 pin to j4-18 pin, RS232 COM selected.
A shown in Figure 11 and 12, if connecting j25-17 pin to j4-17 pin, j25-18 pin to j4-18 pin, virtual COM is selected.

Figure 11 Select Virtual COM or RS232 COM

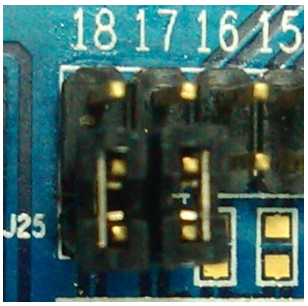

Figure 12 Select Virtual COM

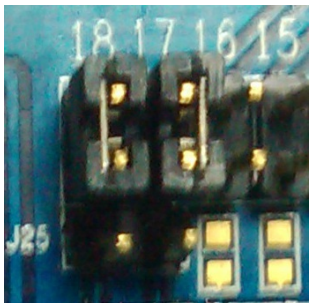

Figure 13 Select RS232 COM

3.5 Joystick

The joystick (marked as 6 in Figure 7) is connected to a 2-wire port extension IC (marked as 27 in Figure 8), which is Maxim MAX7329. The 2-wire port extension IC uses the slave address 0x3F on the 2-wire bus and it also has an interrupt line that signals use of the joystick. When using the joystick, the jumper should be configured by short circuit pin as shown in Figure 14.

When connecting j5-7 pin to j6-7 pin, j5-8 pin to j6-8 pin, j5-3 pin to j6-3, the joystick is selected.

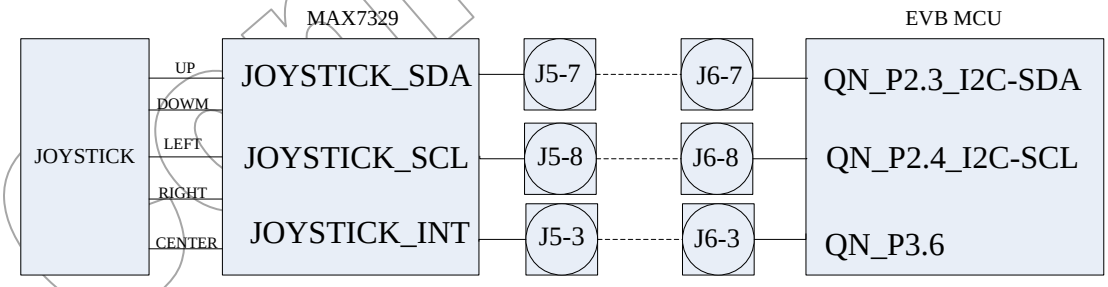

Figure 14 Select Joystick

3.6 Serial Flash

The motherboard has a SST25VF010A flash device (marked as 25 in Figure 8) on the reverse side of the PCB. This is a 1Mbit serial paged flash memory. This serial flash can be used for general purpose data and parameter storage.

The serial flash can be accessed over the SPI bus from the EVB. The jumper should be configured by short circuit pin as in Figure 15 when using the serial flash.

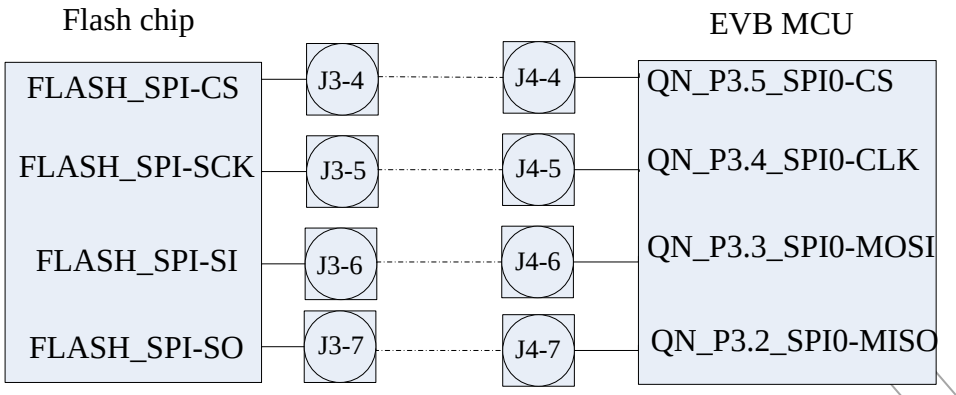

Figure 15 Select Serial Flash

3.7 LCD

The LCD (marked as 5 in Figure 7) on the platform is a 128 x 128 4S STN with ULTRACHIP driver chip (UC1617). The LCD is accessed over the I2C bus from the EVB, and the slave address is 0xff. The jumper should be configured by short circuit pin as shown in Figure 16 When using the LCD.

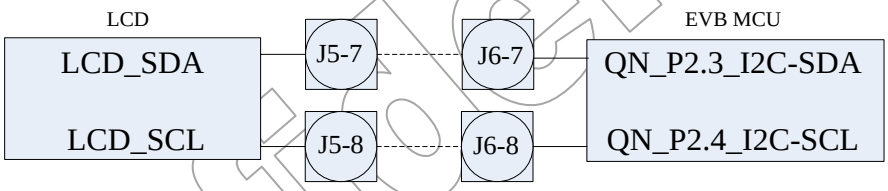

Figure 16 Select LCD

3.8 BUZZER

A SMD buzzer (marked as 26 in Figure 8) is on the platform. Its working frequency is 6 kHz. The buzzer can be accessed over one PWM port from the EVB. The jumper should be configured by short circuit pin as in Figure 17 when using the buzzer.

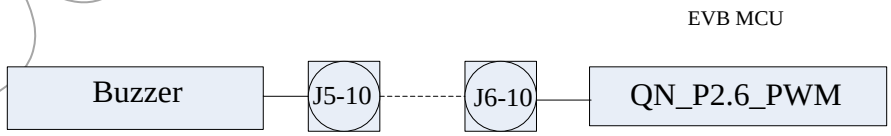

Figure 17 Select Buzzer

3.9 RHEOSTAT

Rheostat (marked as 7 in Figure 7) can be used to simulate the analog outputs of some sensors. The resistance value of rheostat is 10k ohm.It can connect to EVB MCU's ADC pin by configuring shorting circuit pins as in Figure 18.

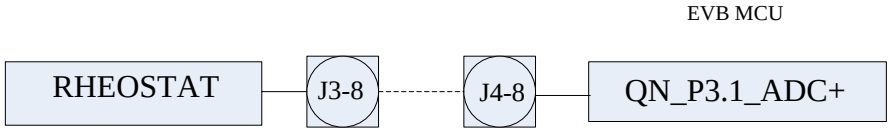

Figure 18 Select Rheostat

3.10 LEDs

3.10.1 General Purpose LEDs

The five LEDs D1, D2, D3, D4 and D5 (marked as 13 in Figure 7) can be controlled by the EVB MCU. The LEDs are active low. The jumpers should be configured by short circuit pin as shown in Figure 19 when using the LEDs.

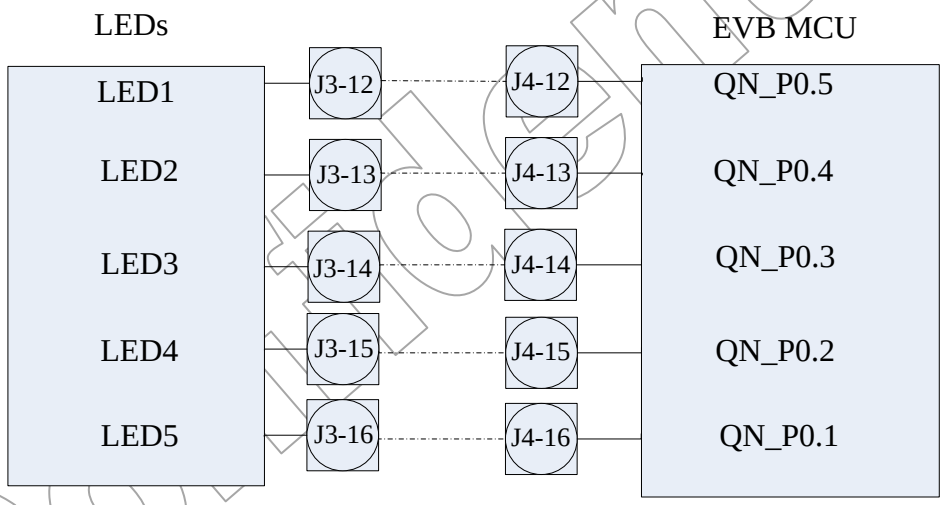

Figure 19 Select LEDs

3.10.2 Platform MCU LED

LED D6 and LED D7 (marked as 8 in Figure 7) are only connected to the platform MCU controller.

3.11 Buttons

3.11.1 EVB buttons

The five buttons SW1, SW2, SW3, SW4 and SW5 (marked as 12 in Figure 7) can only be controlled by the EVB MCU. The buttons are active low. The jumpers should be configured by short circuit pin as shown in Figure 20 when using the buttons.

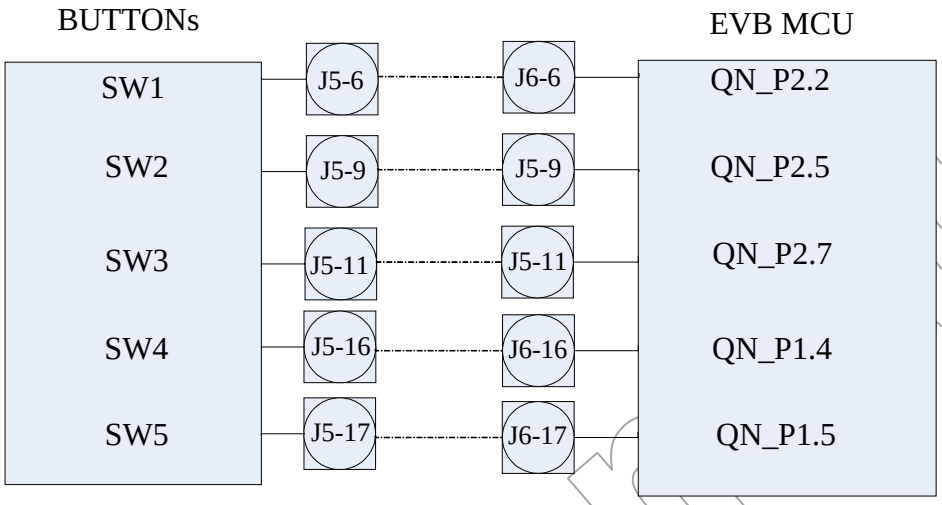

Figure 20 Select Buttons

3.11.2 Platform MCU buttons

Button SW6 and SW7 (marked as 10 in Figure 7) are only connected to the motherboard MCU controller.

3.11.3 Reset buttons

There are two reset buttons on the board. One (marked as 11 in Figure 7) is used to reset platform MCU. The other one (marked as 16 in Figure 7) is used to reset EVB MCU.

3.12 Break-out headers

All the IOs of EVB are connected to J4 and J6 headers. And all the device interfaces of available source on motherboard are connected to J3 and J5 headers. The user can select proper sources according to the project requirement by shorting corresponding jumpers. For selecting of available sources onboard, please refer to section 3.4~3.11.

The pin-out for these connectors is shown in Table 2 below.

Table 2 J3, J4, J5, J6 Pin-out

Pin Name	J3	J4	Pin Name

Pin Name	J5	J6	Pin Name

VCC_3.3V	**1**	**1**	VCC_3.0V
GND	**2**	**2**	GND
GND	**3**	**3**	GND
FLASH _SPI-CS	**4**	**4**	QN_P3.5
FLASH_SPI-SCK	**5**	**5**	QN_P3.4
FLASH_SPI-SI	**6**	**6**	QN_P3.3
FLASH_SPI-SO	**7**	**7**	QN_P3.2
RHEOSTAT	**8**	**8**	QN_P3.1
NC	**9**	**9**	QN_P3.0
NC	**10**	**10**	QN_P0.7
NC	**11**	**11**	QN_P0.6
LED1	**12**	**12**	QN_P0.5
LED2	**13**	**13**	QN_P0.4
LED3	**14**	**14**	QN_P0.3
LED4	**15**	**15**	QN_P0.2
LED5	**16**	**16**	QN_P0.1
RS232 -TX	**17**	**17**	QN_P0.0
RS232-RX	**18**	**18**	QN_P1.7

GND	**1**	**1**	GND
GND	**2**	**2**	GND
JOYSTICK_INT	**3**	**3**	QN_P3.6
NC	**4**	**4**	QN_P2.0
NC	**5**	**5**	QN_P2.1
SW1	**6**	**6**	QN_P2.2
SDA	**7**	**7**	QN_P2.3
SCL	**8**	**8**	QN_P2.4
SW2	**9**	**9**	QN_P2.5
BUZZER	**10**	**10**	QN_P2.6
SW3	**11**	**11**	QN_P2.7
NC	**12**	**12**	QN_P1.0
NC	**13**	**13**	QN_P1.1
NC	**14**	**14**	QN_P1.2
NC	**15**	**15**	QN_P1.3
SW4	**16**	**16**	QN_P1.4
SW5	**17**	**17**	QN_P1.5
NC	**18**	**18**	QN_P1.6

3.13 EVB connectors

The EVB connectors (marked as 17 in Figure 7) are used for connecting an EVB to the motherboard. The connectors J1 and J2 are used as the main interface. The pin-out for these connectors is shown in Table 3 below.

Table 3 EVB ConnectorsJ1, J2 Pin-out

EVB connector J1 pin-out

Pin Name	Pin	Pin	Pin Name
5.0V	**1**	**2**	5.0V
GND	**3**	**4**	GND
GND	**5**	**6**	GND
VCC_3.0V	**7**	**8**	VCC_3.0V
GND	**9**	**10**	GND
GND	**11**	**12**	QN_P3.5
GND	**13**	**14**	QN_P3.4
GND	**15**	**16**	QN_P3.3
GND	**17**	**18**	QN_P3.2
GND	**19**	**20**	QN_P3.1
GND	**21**	**22**	QN_P3.0
GND	**23**	**24**	QN_P0.7
GND	**25**	**26**	QN_P0.6

EVB connector J2 pin-out

Pin Name	Pin	Pin	Pin Name
AVCC_3.0V	**1**	**2**	AVCC_3.0V
GND	**3**	**4**	GND
GND	**5**	**6**	GND
QN_RST	**7**	**8**	GND
QN_P3.6	**9**	**10**	GND
QN_P2.0	**11**	**12**	GND
QN_P2.1	**13**	**14**	GND
QN_P2.2	**15**	**16**	GND
QN_P2.3	**17**	**18**	GND
QN_P2.4	**19**	**20**	GND
QN_P2.5	**21**	**22**	GND
QN_P2.6	**23**	**24**	GND
QN_P2.7	**25**	**26**	GND

GND	**27**	**28**	QN_P0.5
GND	**29**	**30**	QN_P0.4
GND	**31**	**32**	QN_P0.3
GND	**33**	**34**	QN_P0.2
GND	**35**	**36**	QN_P0.1
GND	**37**	**38**	QN_P0.0
GND	**39**	**40**	QN_P1.7

QN_P1.0	**27**	**28**	GND
QN_P1.1	**29**	**30**	GND
QN_P1.2	**31**	**32**	GND
QN_P1.3	**33**	**34**	GND
QN_P1.4	**35**	**36**	GND
QN_P1.5	**37**	**38**	GND
QN_P1.6	**39**	**40**	GND

4. Schematics of DK Motherboard

Please refer to DK motherboard schematics in appendix.

Release History

REVISION	CHANGE DESCRIPTION	DATE
0.1	Initial release	2013-03-25
0.2	Correct errors on jumper connecting description	2013-04-18
0.3	Correct some spelling and typing errors	2013-05-14
0.4	Update the P3 num (p3.1-p3.7 to p3.0-p3.6)	2013-08-27

Appendix

