1 INTRODUCTION

The Quad SPI Evaluation Kit from Winbond Electronics is consist of Mbed enabled MCU board which has an Arduino UNO R3 compatible terminal and Shield Board, Daughter Board. This document describes how to use the Quad SPI Evaluation Kit.
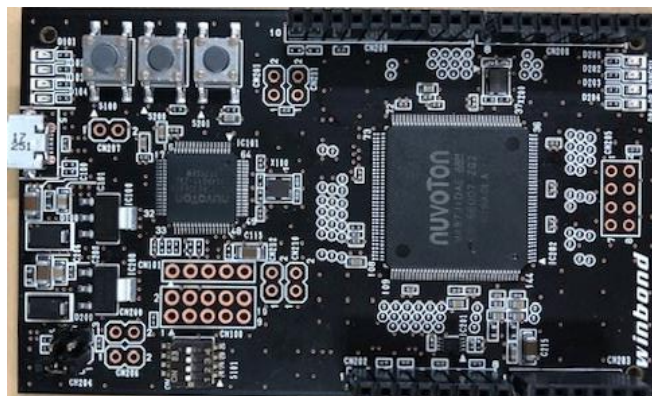
2 GENERAL DESCRIPTION

The Quad SPI Evaluation Kit is consist of following three kinds of board.
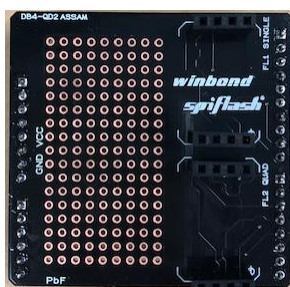
A) Mbed enabled MCU Board

One Mbed enabled MCU Board mounted with the following MCU.

MCU Supplier	MCU
Nuvoton Technology	M487JIDAE

B) Shield Board

One Shield Board to connect the Mbed enabled MCU Board and the Daughter Board.

C) Daughter Board

Three Daughter Boards with following Flash Memories.

Part Number	Density	Product Type	Operation Temperature
W25Q128JVEIQ	128Mb	3.3V Serial NOR Flash Memory	Industrial (-40'C to +85'C)
W25N01GVZEIG	1Gb	3.3V Serial NAND Flash Memory	Industrial (-40'C to +85'C)
W25M321AVEIT	32Mb + 1Gb	SpiStack 3.3V Serial NOR + Serial NAND Flash Memory	Industrial (-40'C to +85'C)

3 HOW TO USE

Besides the Quad SPI Evaluation Kit, you will need: [1, 2]

- Computer with Internet access and USB port.

- USB cable with standard A to micro B connectors.

- Sample program source code.

3.1 Firmware update

1. Please access URL below to get the one-click firmware update package (v6674r).

   http://www.nuvoton.com/hq/resource-download.jsp?tp_GUID=SW0520171227090749
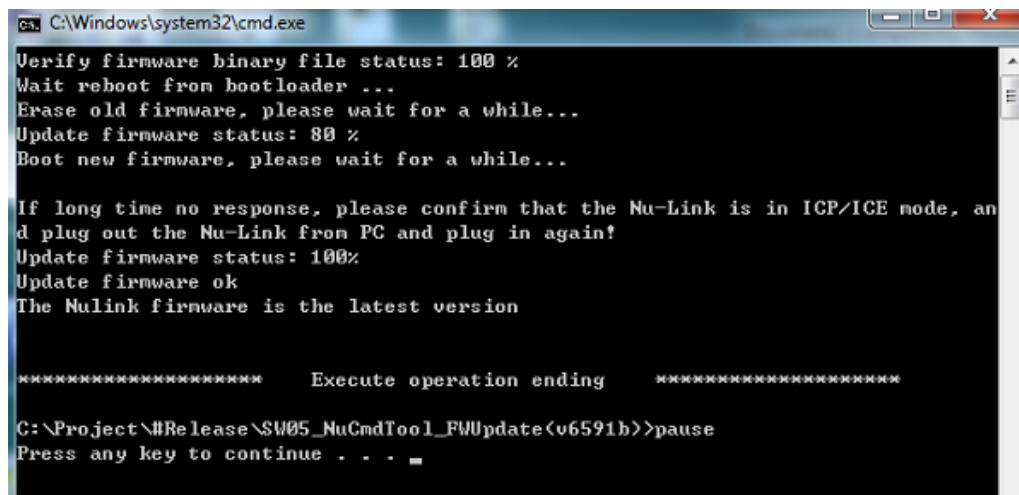
2. Set MSG switch (No.4 of S101) to OFF.

---
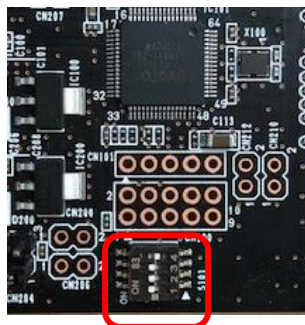
[1] Please install "Arm Mbed Windows serial port driver" as necessary. https://os.mbed.com/handbook/Windows-serial-configuration

[2] Please install "NuMaker USB Driver (including Nu-Link)" as necessary. http://www.nuvoton.com/resource-files/Nu-Link_USB_Driver_V1.4.zip

3. Connect the USB port to Windows PC.

4. Extract the downloaded package to a directory then open the directory.

5. Click update.bat to execute the batch file. A new DOS window will open and update the firmware automatically.

6. When done, press a key to exit the window.

7. Un-plug the USB cable and set MSG switch (No.4 of S101) to ON.

8. Done.

3.2 Solder the terminal to each boards

3.2.1 Mbed enabled MCU Board

Solder the pin-socket and pin-header as shown in the red frame in the following picture. All pin-socket and pin-header should be mounted on top side of the board.
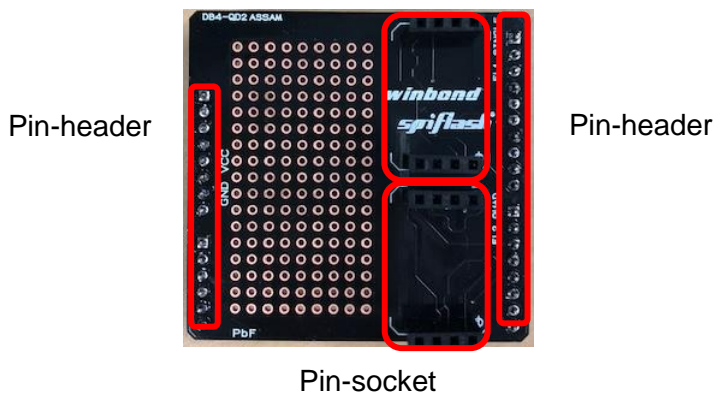

Pin-socket: CN208, CN209

Pin-header: CN204

Pin-socket: CN202, CN203
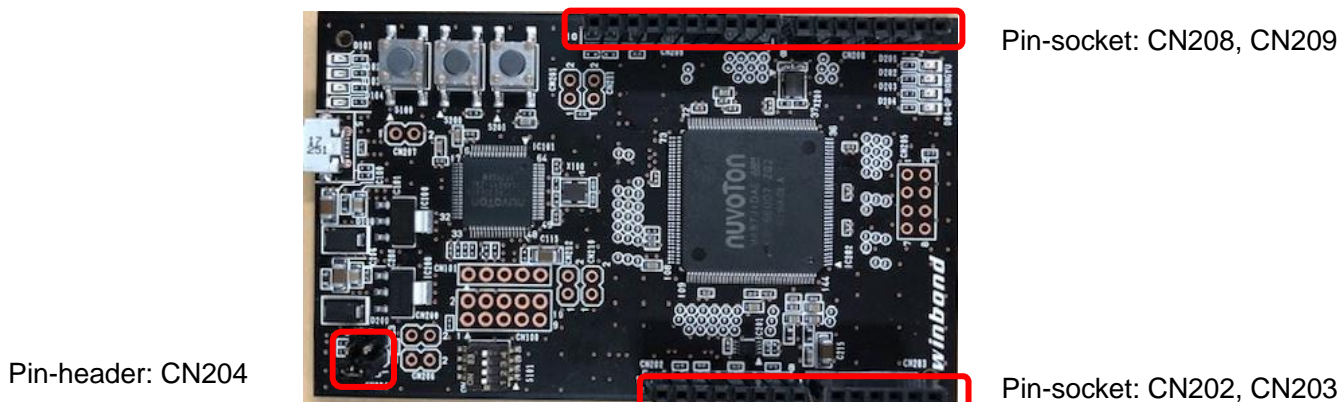
3.2.2 Shield Board

Solder the pin-socket and pin-header as shown in the red frame in the following picture. The pin-socket should be mounted on top side of the board. The pin-header should be mounted bottom side of the board.

Pin-header   Pin-header
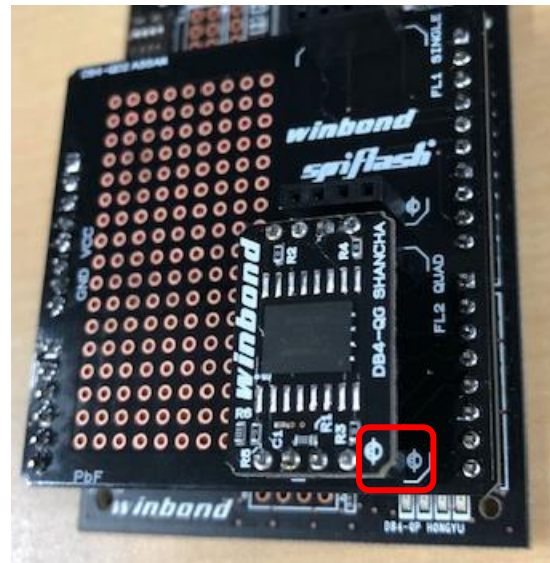
Pin-socket

3.2.3 Daughter Board

Solder the pin-header as shown in the red frame in the following picture. All pin-header should be mounted bottom side of the board. When soldering is completed, attach the Shield Board and Daughter Board to the MCU Board.

Pin-header   Pin-header

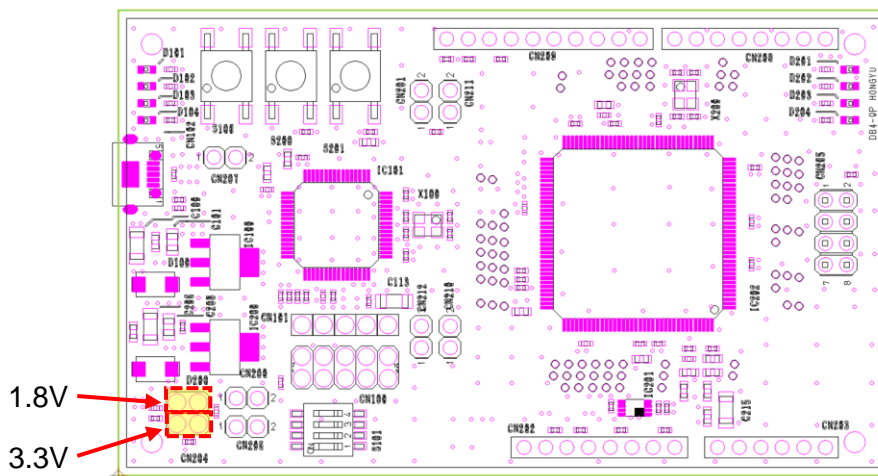### 3.2.4 Place the Shield Board and the Daughter Board on Mbed enabled MCU Board

Please align the mark Shield Board and Daughter Board.

3.3 Place the jumper pin of Mbed enabled MCU Board

It is possible to change the voltage to be supplied to M487JIDAE by short-circuiting either of CN204.

In the following, we will explain by placing a jumper pin on 3.3 V side as an example.

3.4 Get sample program source code

Please access URL below to get sample program source code.

http://www.winbond.com.tw/hq/about-winbond/news-and-events/events/product-promotion/promotion00020.html?__locale=en

When you get sample program source code "QSPI_EVB_sample.zip" then unzip it. It contains main.cpp and compressed file QuadSPI_FLASH.zip.

3.5 Plug in the Quad SPI Evaluation Kit to your computer

Connect the Quad SPI Evaluation Kit to your computer using USB cable. The Quad SPI Evaluation Kit will enumerate as a composite USB device that includes a built in debugger, storage device and a virtual com port. A new drive will be created on your computer with a drive name as assigned by the Mbed enabled MCU Board.
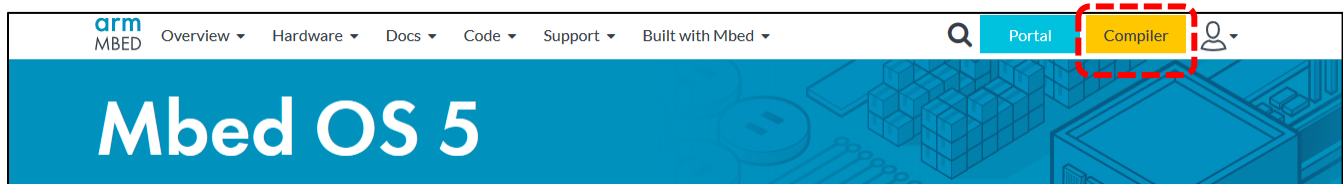
Quad SPI Evaluation Kit

3.6 Log in to ARM Mbed and create a Workspace

Log in to Mbed (If you don't have an mbed account, please create it.)
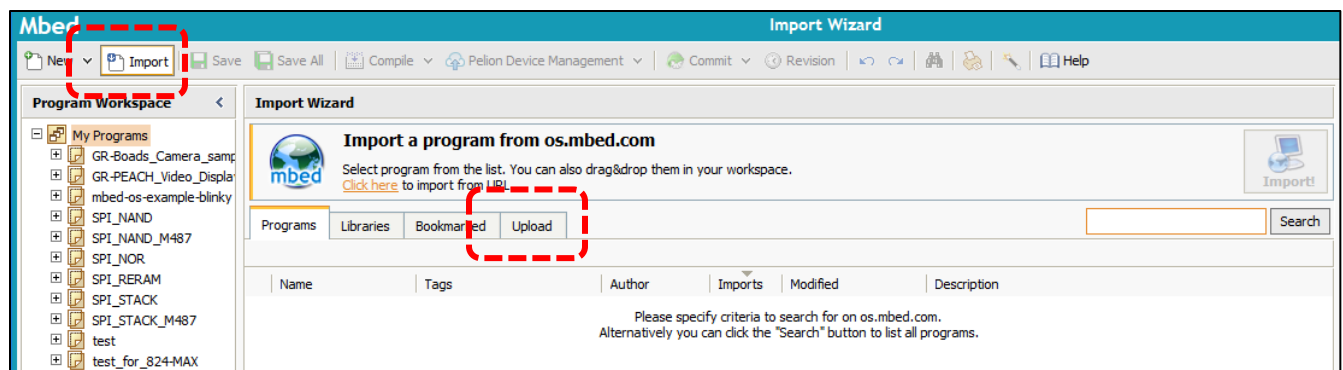
https://os.mbed.com/

After log in, click on the Compiler button, then the mbed compiler will bring up the Workspace.

3.7 Import the sample program source code

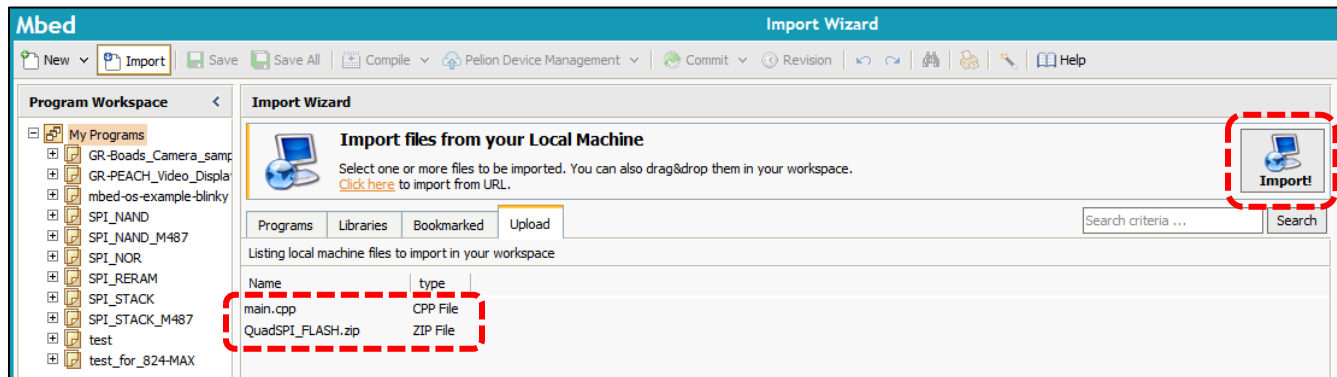Select "Import" from the menu and select the "Upload" tab on the displayed screen.

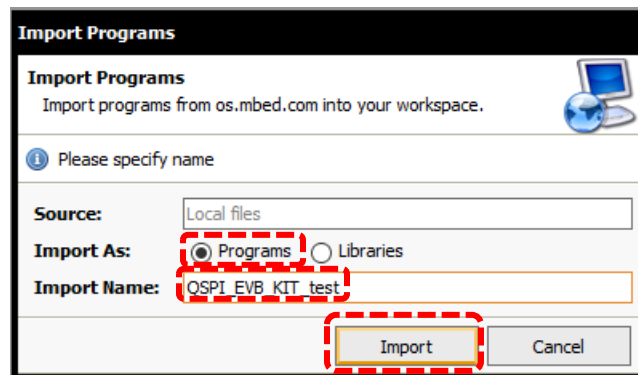Select the "Select file" button at the bottom of the screen.

When the "Open" window appears, select main.cpp and compressed file SPI_FLASH.zip and press the "Open" button.

Quad SPI Evaluation Kit

After confirming that main.cpp and compressed file SPI_FLASH.zip are listed, press the "Import" button.
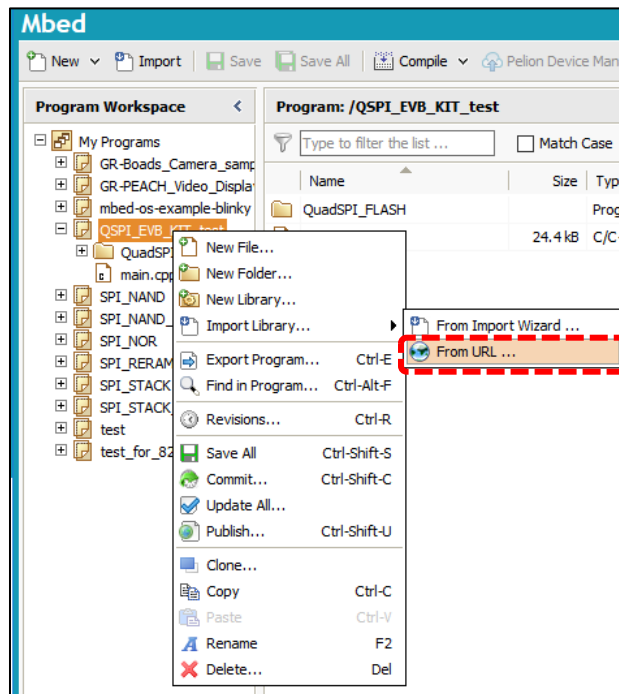

Select Program, enter Import Name and press the "Import" button.

Confirm that the project was created.
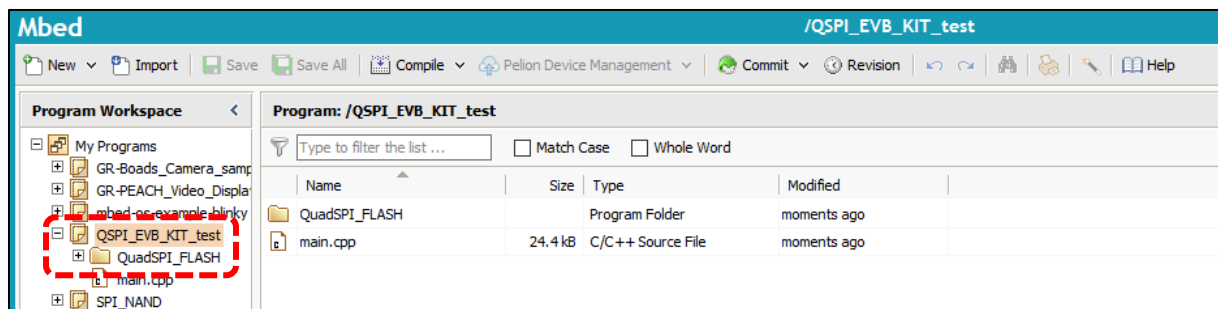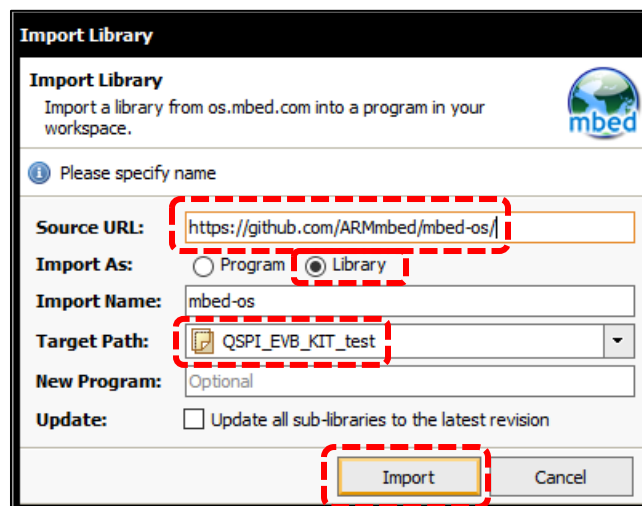
3.8 Import the library

Select the project and choose "Import from URL" from the right-click menu.

In the Sourse URL, enter https://github.com/ARMmbed/mbed-os/. Select Library, check Target Path and press "Import" button.

3.9 Compile the sample program source code and load to the board

Change the Target board to "NuMaker-PFM-M487" and execute "Compile".
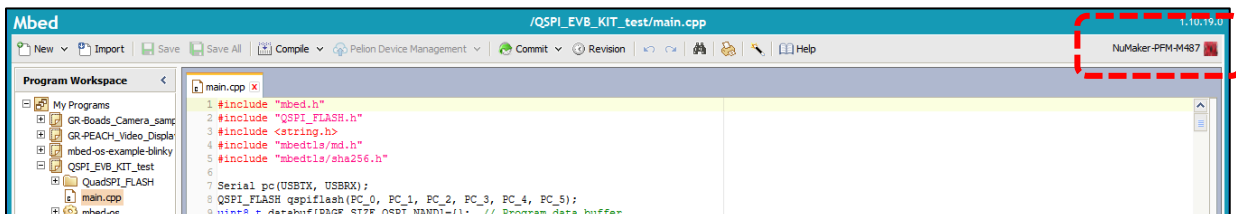
The program will be compiled and the binary (.bin) file created will automatically be downloaded to your computer's designated download location.

Drag and drop the binary file into the host board drive that you created. When the file is dropped into the folder, your host board will begin to program. When the program is fully loaded, the binary file will automatically delete from your host board drive.

3.10 Run sample program by terminal emulator

Use your favorite terminal emulator. For this example, we used the Tera Term.

Open Tera Term and select the serial port associated with your host board to create a new connection.
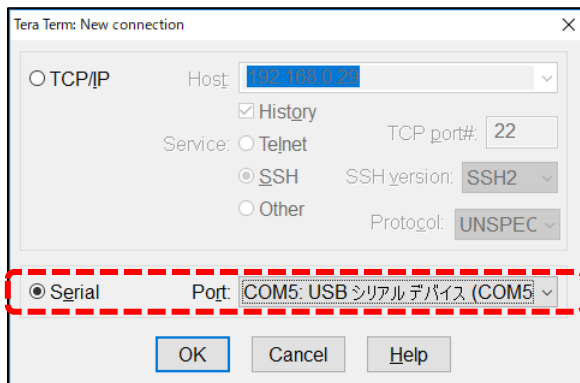
Configure the serial port under Setup->Serial port with: 9600 baud, Setup->Terminal with: line feed code as LF.
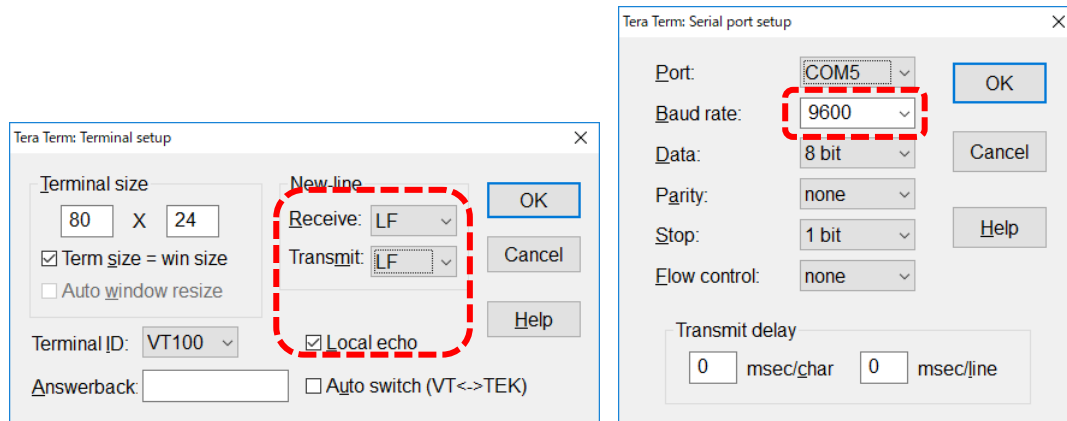
Press the Reset button (S201) on the Mbed enabled MCU Board to run the sample program.

The following screen captcha shows when you put the Daughter Board which has Serial NAND on the Shield Board and Mbed enabled MCU Board.

Quad SPI Evaluation Kit

To operate, please input the command character from the terminal then press the return key.

In case of Serial NOR

Command	Function
1	Fast Read Quad I/O (EBh) Enter the 32 bit address in hexadecimal
2	Sector Erase (20h) Enter the 32 bit address in hexadecimal (Address lower 8 bits are handled as 00h)
3-6	Quad Input Page Program (32h) Enter the 32 bit address in hexadecimal Write the following data for one page according to the command number 3：0x00, 0x01, 0x02, … 4：0xAA,0x55,0xAA, … 5：0xFF,0x00, 0xFF, … 6：0x00, 0x00, 0x00, …
7	Enable Reset(66h) and Reset Device(99h)
8	Read Status Register-1 (05h), Read Status Register-2 (35h) and Read Status Register-3 (15h)

Quad SPI Evaluation Kit

In case of Serial NAND

Command	Function
1	Page Data Read (13h) and Read Data (EBh) Enter the page address in hexadecimal
2	Block Erase (D8h) Enter the page address in hexadecimal (Address lower 8 bits are handled as 00h)
3-6	Program Data Load (32h) and Program Execute (10h) Execution Enter the page address in hexadecimal Write the following data for one page according to the command number 3：0x00, 0x01, 0x02, … 4：0xAA,0x55,0xAA, … 5：0xFF,0x00, 0xFF, … 6：0x00, 0x00, 0x00, …
7	Detect Initial Bad Block
8	Read BBM LUT (A5h)
9	Device Reset (FFh)
10	Read Status Register-1 (05h)

In case of SpiStack, in addition to the above, the following command will be added.

Command	Function
0	Software Die Select (C2h)

4 SCHEMATIC

4.1 Mbed ebabled MCU Board 1/2
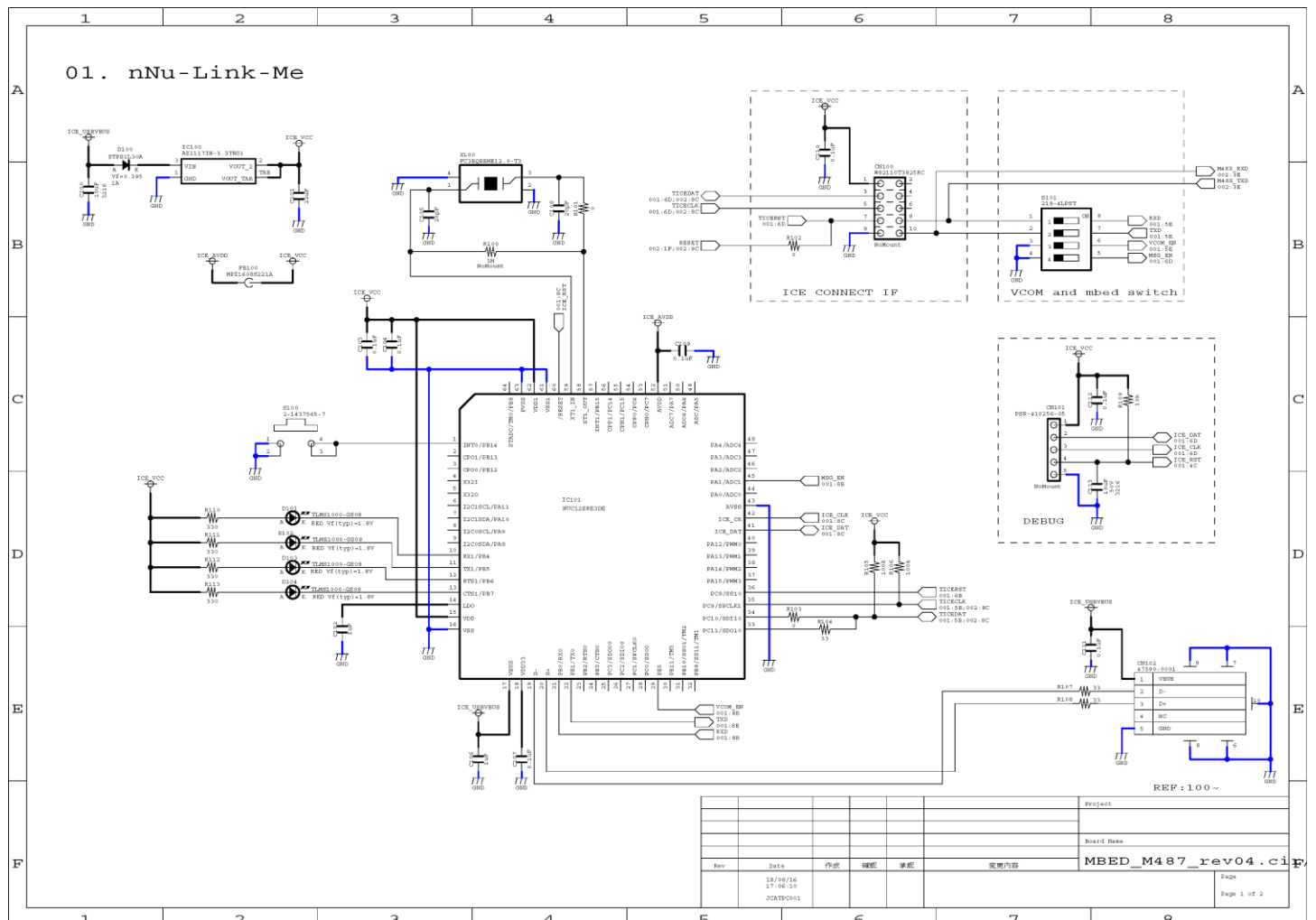
4.2 Mbed ebabled MCU Board 2/2
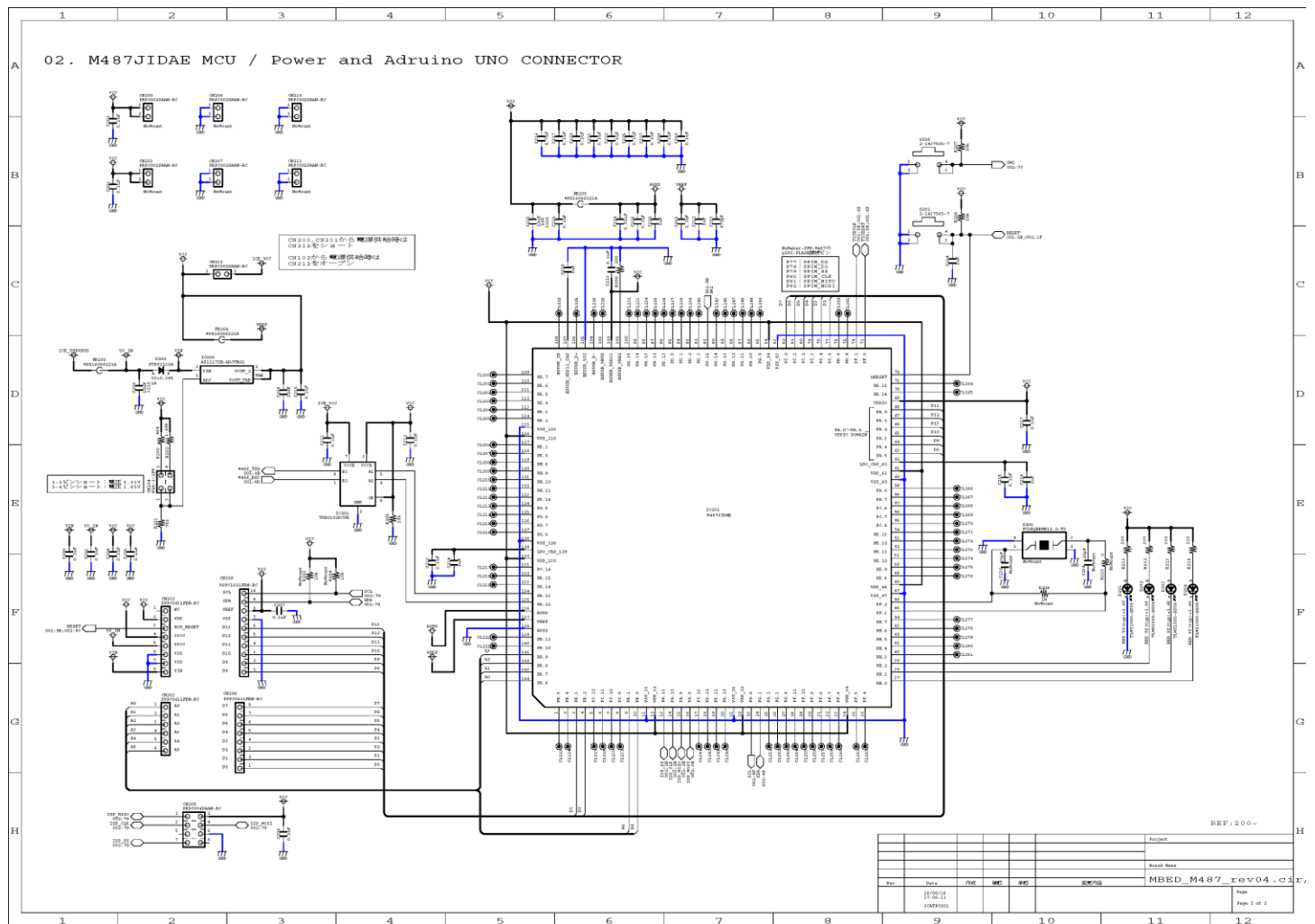
5 PCB LAYOUT

5.1 Shield Board

GR-PEACH SPI Multi-I/O 1
SSL
SCK
IO3
IO2
IO1
IO0

FL2 is only available
for GR-PEACH
with Quad SPI

SCK
DO
DI
/CS
/WP
/HOLD

Arduino UNO R3 SPI
SCK
MISO
MOSI
SS
PB1
PB0

FL1 is available
for various board with Arduino R3
compatible header by Single SPI

Mbed enabled MCU Board in QSPI Evaluation Kit
IO0
IO1
SCK
/CS
IO3
IO2

FL2 is available
for Mbed enabled MCU Board
in QSPI Evaluation Kit by Quad SPI

Please to match the position of the mark
with Shield Board and Daughter Board

5.2 Daughter Board

/HOLD(IO3)
VCC
/CS
DO(IO1)

CLK
DI(IO0)
GND
/WP(IO2)

Please to match the position of the mark
with Shield Board and Daughter Board

6 REFERENCE

1. 3.3V Serial NOR Flash Memory W25Q128JVEIQ Datasheet

   https://www.winbond.com/resource-files/w25q128jv%20revf%2003272018%20plus.pdf

2. 3.3V Serial NAND Flash Memory W25N01GVZEIG Datasheet

   https://www.winbond.com/resource-files/w25n01gv%20revg%20032116.pdf

3. SpiStack 3.3V Serial NOR + Serial NAND Flash Memory W25M321AVEIT Datasheet

   https://www.winbond.com/resource-files/w25m321av_combo_reva%20091317.pdf

4. Arm Mbed Windows serial port driver

   https://os.mbed.com/handbook/Windows-serial-configuration

   https://os.mbed.com/docs/latest/tutorials/windows-serial-driver.html

5. NuMaker USB Driver (including Nu-Link)

   http://www.nuvoton.com/resource-files/Nu-Link_USB_Driver_V1.4.zip

6. NuMaker-PFM-M487 | Mbed

   https://os.mbed.com/platforms/NUMAKER-PFM-M487/

Quad SPI Evaluation Kit

Revision History

Version	Date	Page	Description
1.0	11/11/2018	NA	New Create

Trademarks

Winbond, *SpiFlash* and *SpiStack* are trademarks of *Winbond Electronics Corporation.*
All other marks are the property of their respective owner.

Important Notice

Winbond products are not designed, intended, authorized or warranted for use as components in systems or equipment intended for surgical implantation, atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, or for other applications intended to support or sustain life. Furthermore, *Winbond* products are not intended for applications wherein failure of *Winbond* products could result or lead to a situation wherein personal injury, death or severe property or environmental damage could occur. *Winbond* customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify *Winbond* for any damages resulting from such improper use or sales.

Information in this document is provided solely in connection with Winbond products. Winbond reserves the right to make changes, corrections, modifications or improvements to this document and the products and services described herein at any time, without notice.