LoRa Pico Gateway Transceiver Module (Type1QM)

User manual v1.2

 22 March 2018

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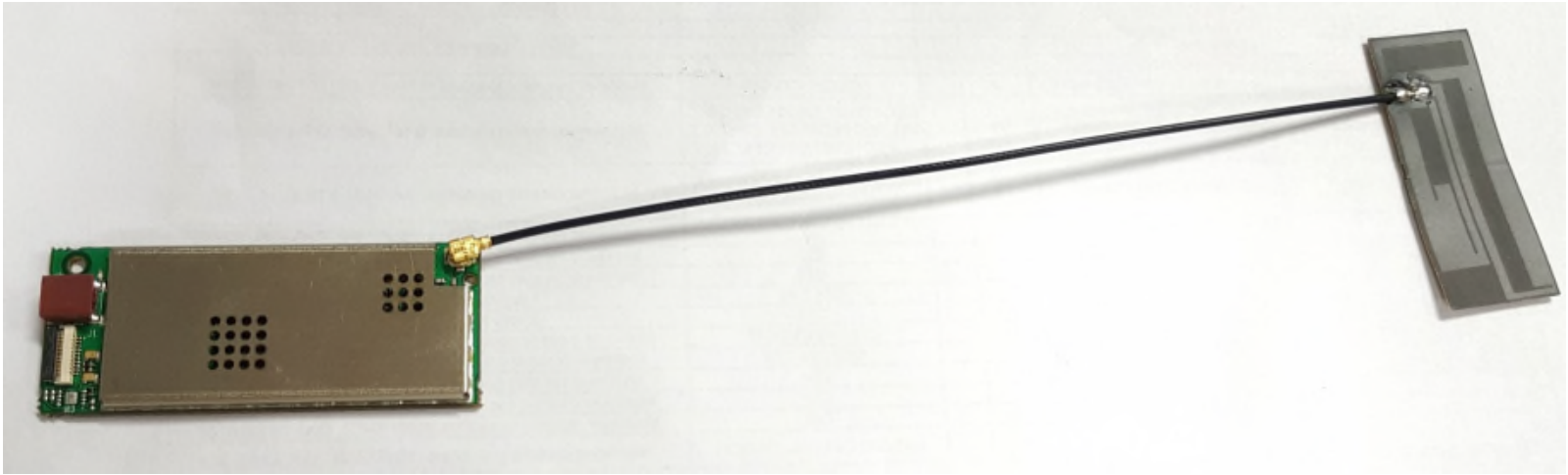
Introduction

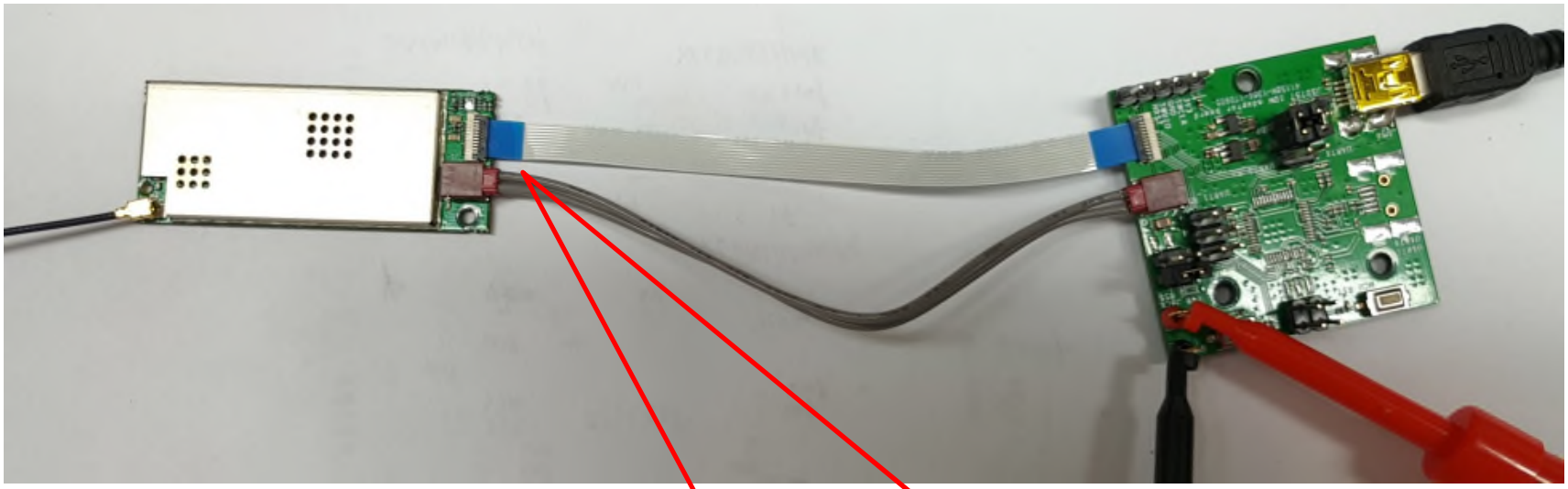
This user guide introduces Murata LoRa Pico Gateway Transceiver Module called ***Type1QM*** and how to set up the adapter board. The host interface which the module supports includes USB and UART.



Type1QM is a multi-channel high performance transceiver designed to simultaneously receive several LoRa packets using random spreading factors. This design is for USA/Australia 915 MHz ISM band [902 MHz - 928 MHz]

Hardware presentation

The adapter board can be used to easily evaluate ***Type1QM*** via the host interface. The adapter board brings USB and UART signals, power supply, and some control signals from 10pin cable to mini USB connector and other connectors.



Type1QM connects adapter board with 10 pins cable and 2 pins power cable.

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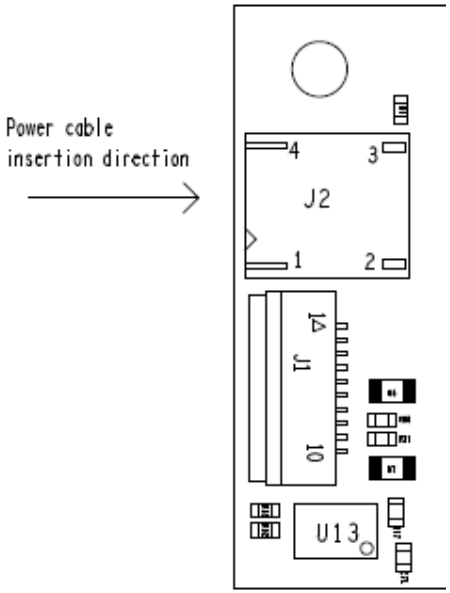
Module Pin Assignment

J1 connector

Pin No.	Terminal Name	Type	Connection to IC terminal	Description
1	PWR_EN	I	BD9141MUV_EN	Power enable/disable 1:Enable 0:Disable
2	USART1_TX	I/O	STM32F401_PA9	GPIO Mode:PA9 USART1_TX
3	USART1_RX	I/O	STM32F401_PA10	GPIO Mode:PA10 USART1_RX
4	GND	Ground	-	Ground
5	USB_DM/USART1_CTS	I/O	STM32F401_PA11	GPIO Mode:PA11 USB_DM USART_CTS
6	USB_DP/USART1_RTS	I/O	STM32F401_PA12	GPIO Mode:PA12 USB_DP USART_RTS
7	GND	Ground	-	Ground
8	MCU_RST	I	STM32F401_NRST	NRST
9	SWDIO	I/O	STM32F401_PA13	GPIO Mode:PA13 SWDIO
10	SWCLK	I/O	STM32F401_PA14	GPIO Mode:PA14 SWCLK



J2 connector

Pin No.	Terminal Name	Type	Connection to IC terminal	Description
1	GND	Ground	-	Ground input
2	GND	Ground	-	Ground input
3	VCC	Power	-	5V~12V power input
4	NC	-	-	NC

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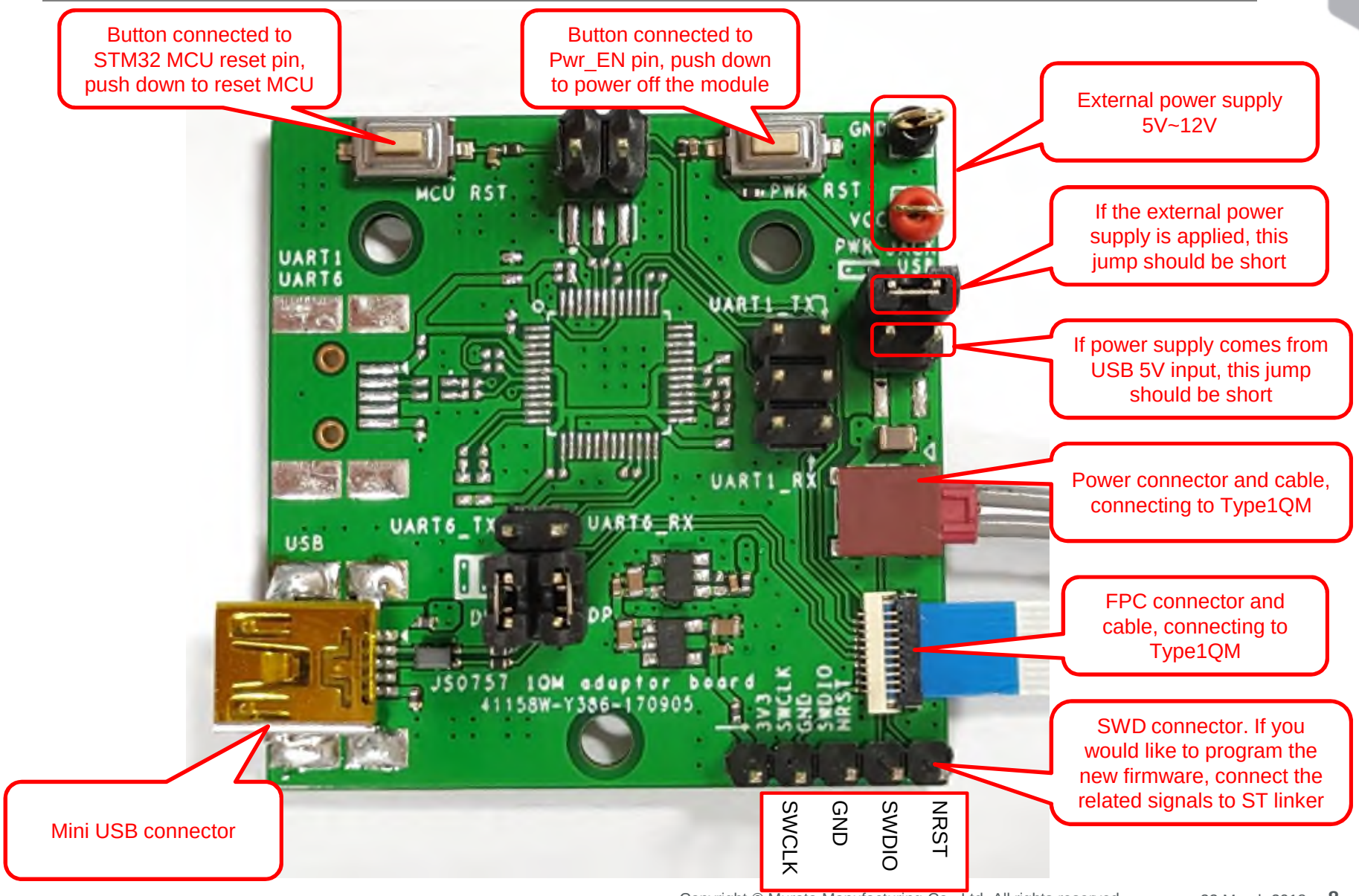
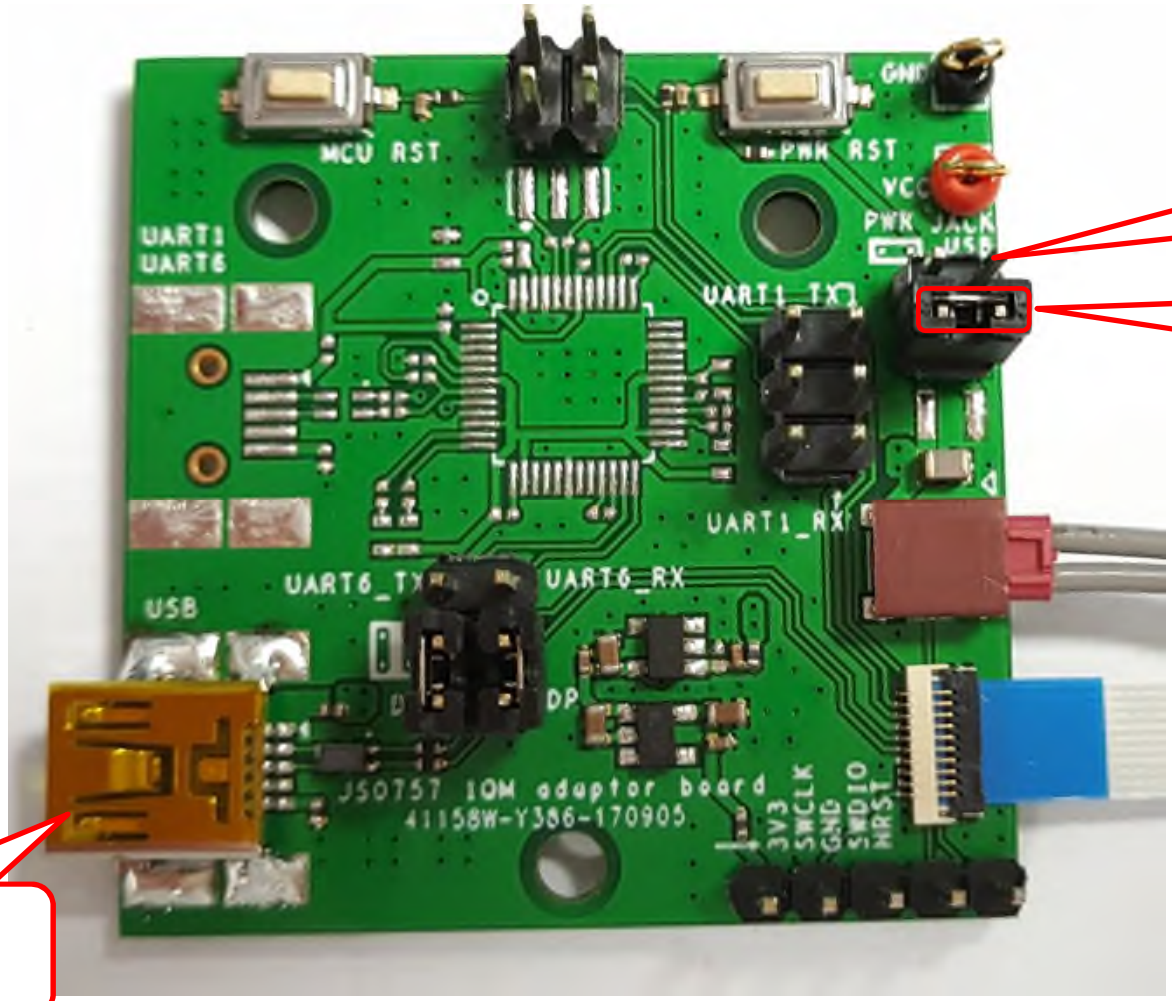
Descriptions of Adapter Board for USB interface



In Case of Using USB Power Supply

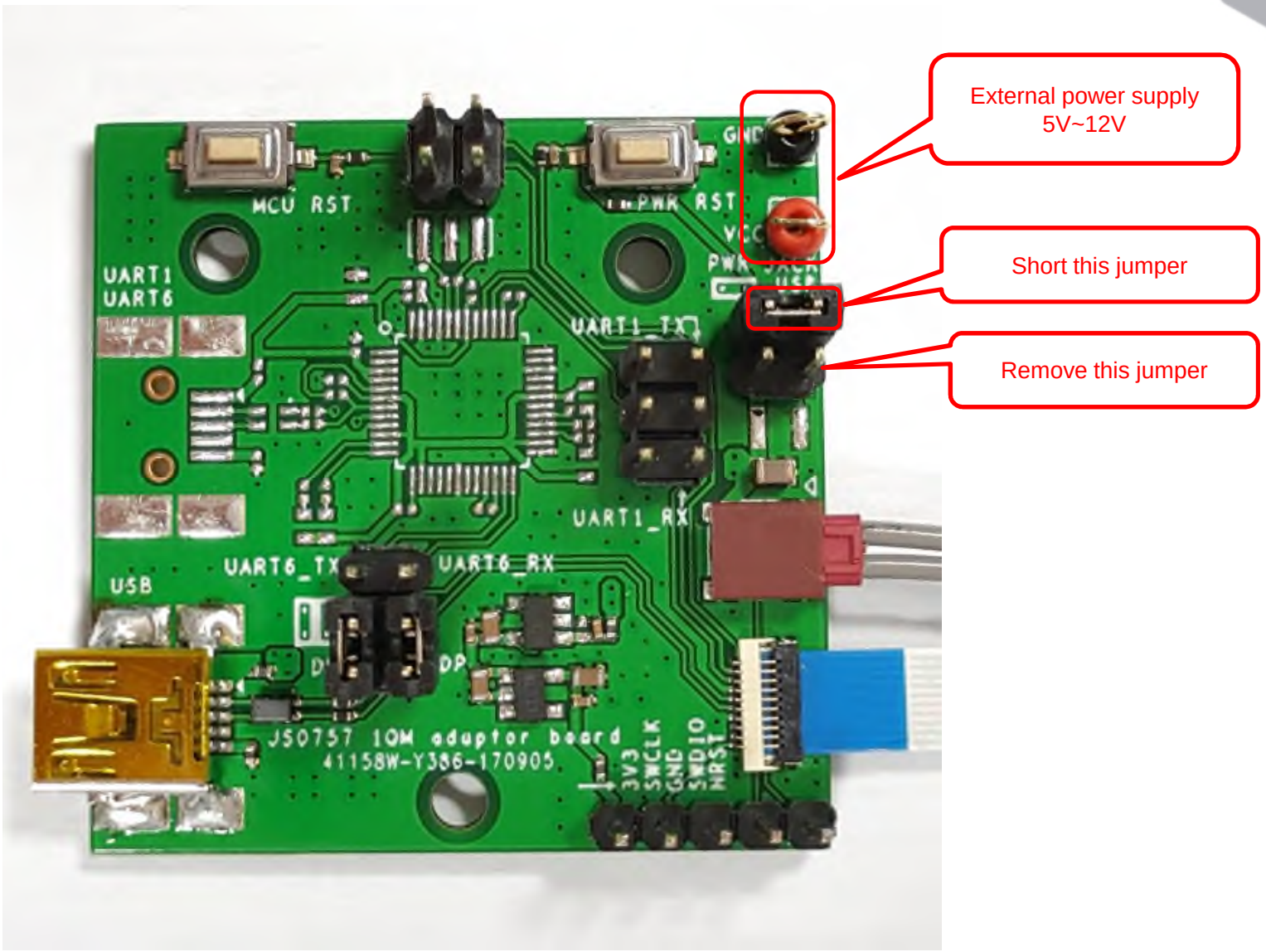


Remove this jumper

Short this jumper

Power supply from USB connector

In Case of Using External Power Supply



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Firmware in Type1QM

- Test firmware which can be verify electrical performance is preprogrammed in Type1QM.
- The following slides provide how to update the firmware in Type1QM.

NOTE:
Only Test firmware is programmed in our production line. Customers must update the FW which is released by Semtech formally.

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Get Semtech software package

Get the lastest Semtech software package from LoRa Github

- mkdir lora-net
- cd lora-net
- sudo apt-get update
- sudo apt-get install git
- git clone http://github.con/Lora-net/picoGW_packet_forwarder.git
- git clone http://github.con/Lora-net/picoGW_mcu.git
- git clone http://github.con/Lora-net/picoGW_hal.git

Install Dfu-util Tool

- cd ~/lora-net/
- sudo apt-get install autoconf
- git clone https://git.code.sf.net/p/dfu-util/dfu-util
- cd dfu-util
- ./autogen.sh
- sudo apt-get install linusb-1.0-0-dev
- ./configure
- make
- sudo make install

Enter DFU mode in Linux

- **Enter DFU mode in Linux (SW method)**
  - lsusb
  - cd ~/lora-net/picoGW_hal/util_boot
  - ./util_boot –d /dev/ttyACM0
  - lsusb

ttyACM0 is the serial port device under /dev, which is created after inserting the USB able. It maybe different on your platform.

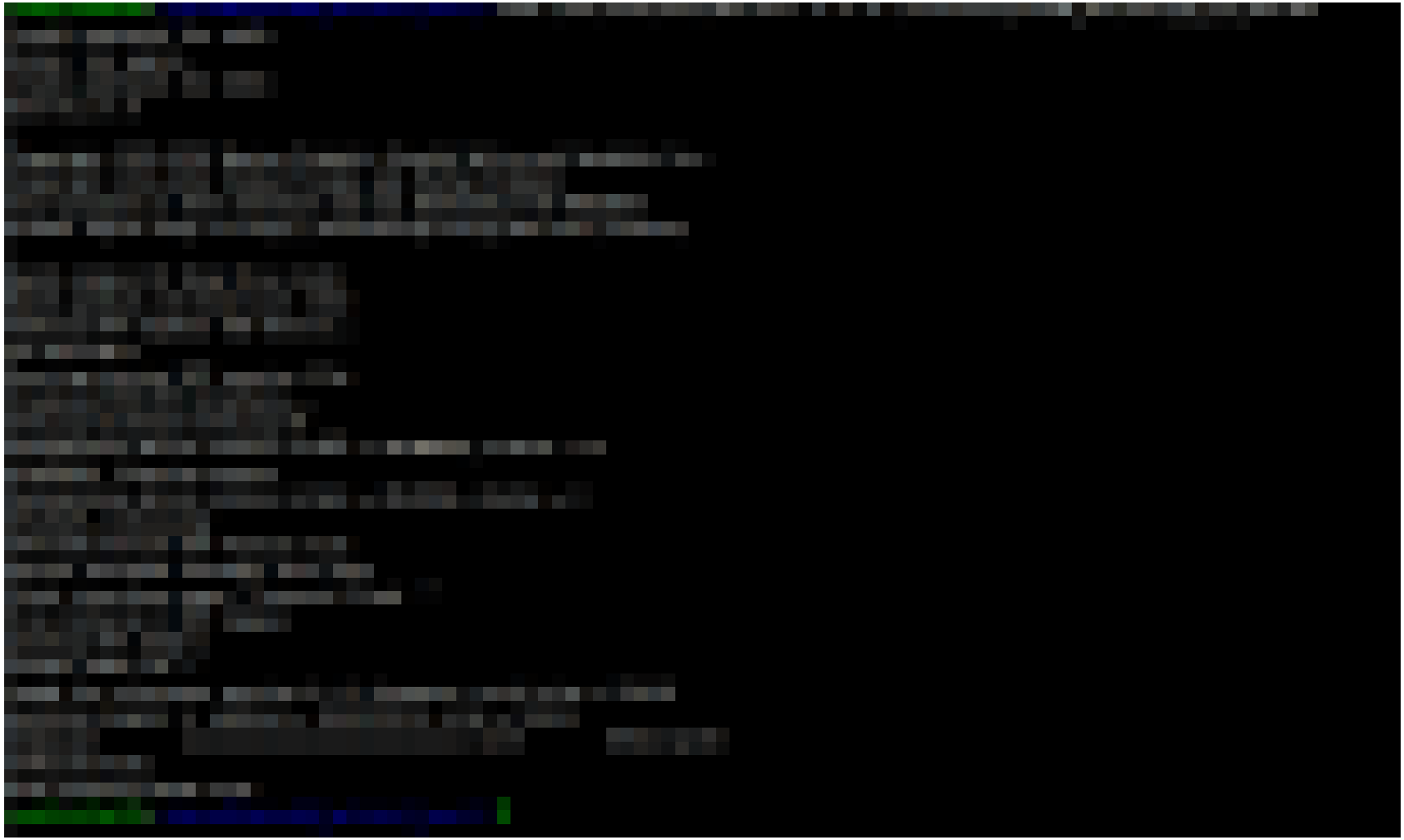
```
rxhf@rhf2s001:~/picoGW/picoGW_hal/util_boot $ ./util_boot -d /dev/ttyACM0
rxhf@rhf2s001:~/picoGW/picoGW_hal/util_boot $ lsusb
Bus 001 Device 037: ID 0483:df11 STMicroelectronics STM Device in DFU Mode
Bus 001 Device 003: ID 0424:ec00 Standard Microsystems Corp. SMSC9512/9514 Fast Ethernet Adapter
Bus 001 Device 002: ID 0424:9514 Standard Microsystems Corp.
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
```

- **Start FW update:**
  - sudo /usr/local/bin/dfu-util –a 0 –D ~/lora-net/picoGW_mcu/bin/PGW_new.dfu

The path and name of the fw file to be flashed, can be different on your platform.

Upgrade MCU FW in Linux

Screen shot of upgrading MCU FW…



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The ST-Linker Tool – HW & SW

- When customers want to update the firmware, the following tools can be used
  - HW: STM32 ST-LINK (http://www.st.com/en/development-tools/st-link-v2.html) or compatible
  - SW: STM32 ST-LINK utility should be used to download the firmware. (http://www.st.com/content/st_com/en/products/embedded-software/development-tool-software/stsw-link004.html)

The ST-Linker and Adapter Connection

The following connection should be followed.

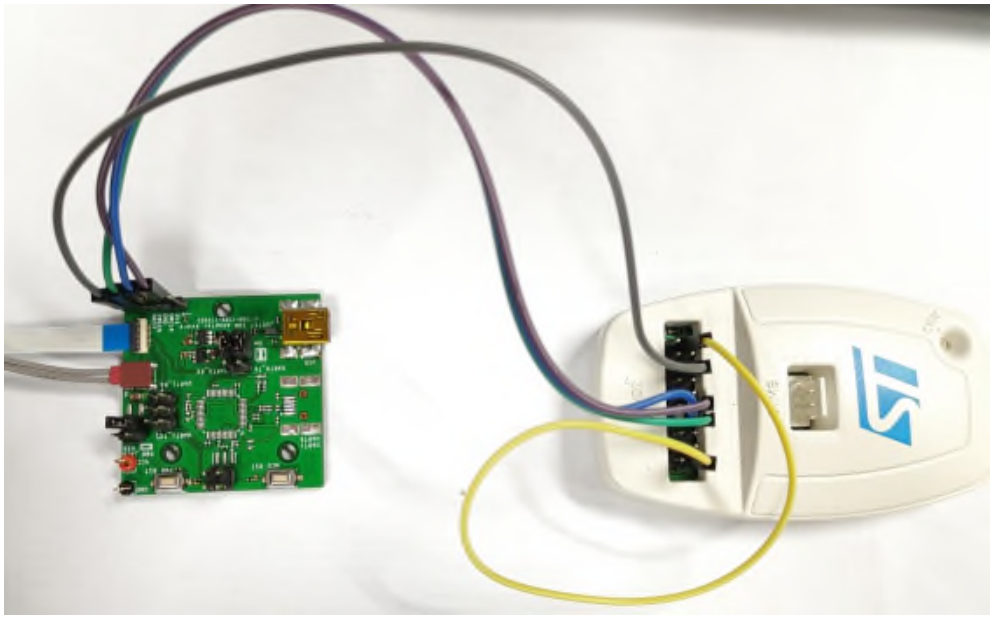

Table 3. JTAG/SWD cable connections

Pin no.	ST-LINK/V2 connector (CN3)	ST-LINK/V2 function	Target connection (JTAG)	Target connection (SWD)
1	VAPP	Target VCC	MCU VDD[1]	MCU VDD[1]
2				
3	TRST	JTAG TRST	JNTRST	GND[2]
4	GND	GND	GND[3]	GND[3]
5	TDI	JTAG TDO	JTDI	GND[2]
6	GND	GND	GND[3]	GND[3]
7	TMS_SWDIO	JTAG TMS, SW IO	JTMS	SWDIO
8	GND	GND	GND[3]	GND[3]
9	TCK_SWCLK	JTAG TCK, SW CLK	JTCK	SWCLK
10	GND	GND	GND[3]	GND[3]
11	NC	Not connected	Not connected	Not connected
12	GND	GND	GND[3]	GND[3]
13	TDO_SWO	JTAG TDI, SWO	JTDO	TRACESWO[4]
14	GND	GND	GND[3]	GND[3]
15	NRST	NRST	NRST	NRST
16	GND	GND	GND[3]	GND[3]
17	NC	Not connected	Not connected	Not connected
18	GND	GND	GND[3]	GND[3]
19	VDD	VDD (3,3V)	Not connected	Not connected
20	GND	GND	GND[3]	GND[3]

Adapter board ST Linker

SWCLK---------- Pin9
SWDIO---------- Pin7
NRST---------- Pin15
GND---------- GND
Pin1-----Pin19

Important: Pin 1 and Pin19 of ST linker should be short. Showed in the yellow line in the above picture

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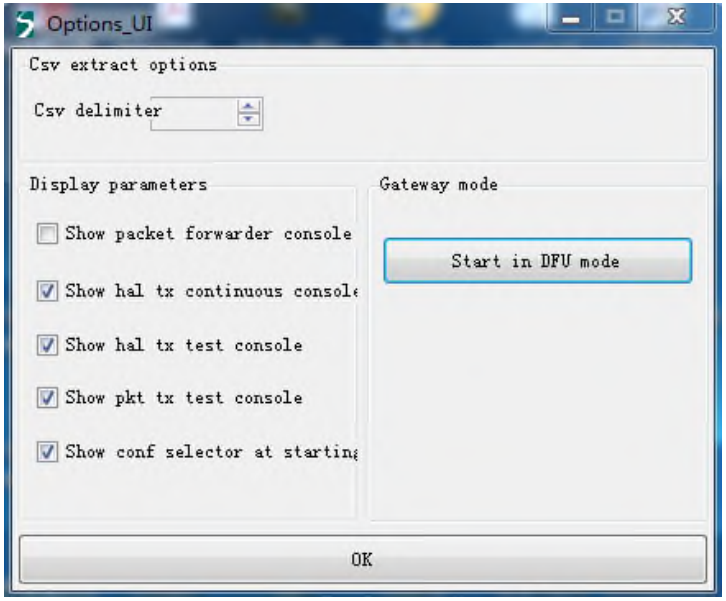
DFU mode

- **In case that customers don’t have ST-linker and can not upgrade firmware with this method, DFU mode can be used. There are two ways to enter DFU mode.**
  - Option in PicoGW_UI (SW method)
  - Boot0 pin (HW method)

How to enter DFU mode (software method)

1. Install on Windows PC PicoGW_UI v1.0.1 (available from Semtech)
2. Connect the module to PC via USB
3. Install STM virtual COM driver.
4. Execute PicoGW-UI.exe
5. Select *options* from menu.
6. Click *Start in DFU mode* (right-top picture).
   - The module will reboot into DFU mode.
7. In the device manager (right-bottom picture).
   - "STM Device in DFU mode" will appear

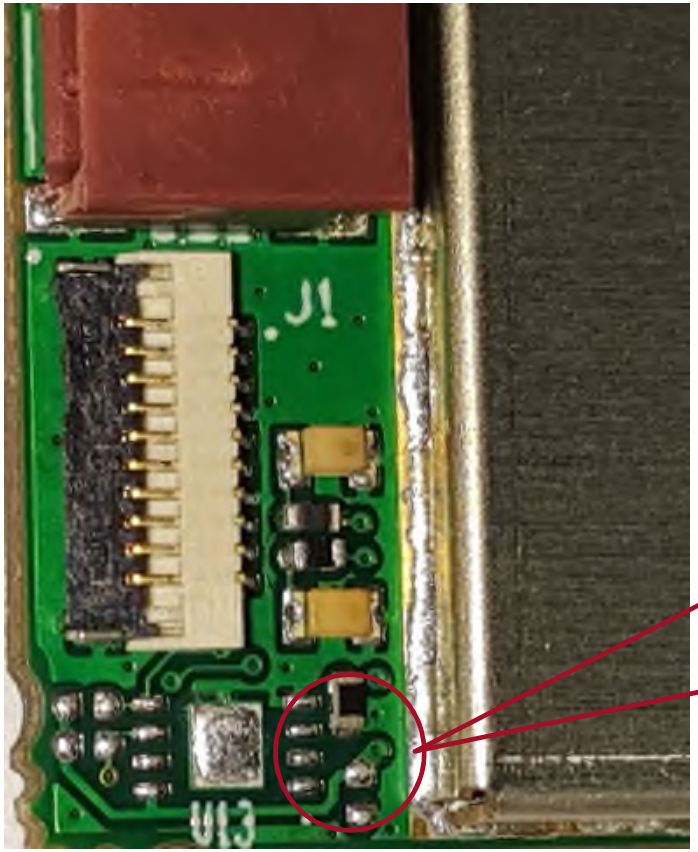


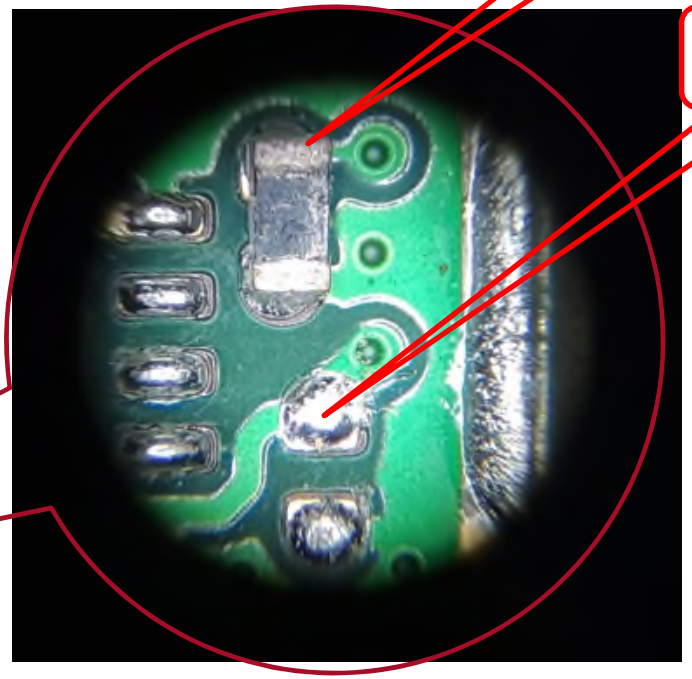
How to Enter DFU mode – HW Method (1)

In case there is no ST-linker tool and the module does not have a valid/working FW loaded, following the steps here can put the module into DFU mode.

The pictures below show the location of the Boot0 pin of the MCU

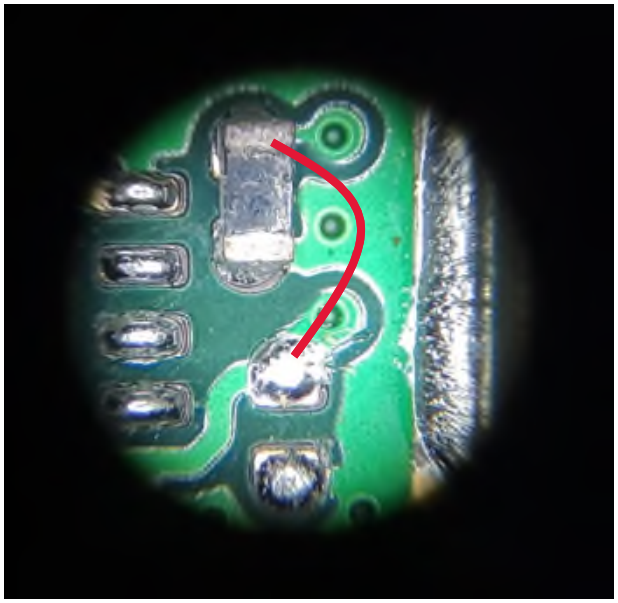
- Boot0 = 0 when power up, normal working mode (default mode)
- Boot0 = 1 when power up, module into DFU mode





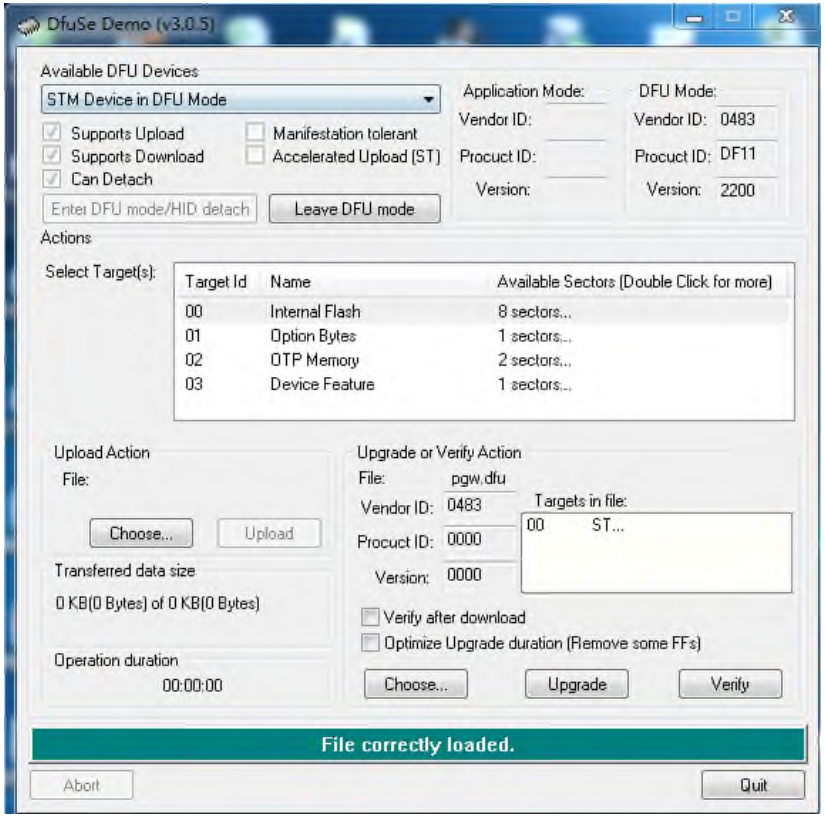
How to Enter DFU mode – HW Method (2)

1. Before power up the module, connect the 3.3V and Boot signal as following picture using iron nipper or other conduct line.
2. Power up the module, then “STM Device in DFU mode” will appear in the device manager.
3. After the module enters DFU mode, remove iron nipper or conduct line used in #1 above.



How to update MCU FW in DFU

1. Install ST DfuSe Demo tool in PC and open it.
   - The tools is available from Semtech
2. Choose new MCU firmware and click upgrade.
3. The MCU firmware will be updated.



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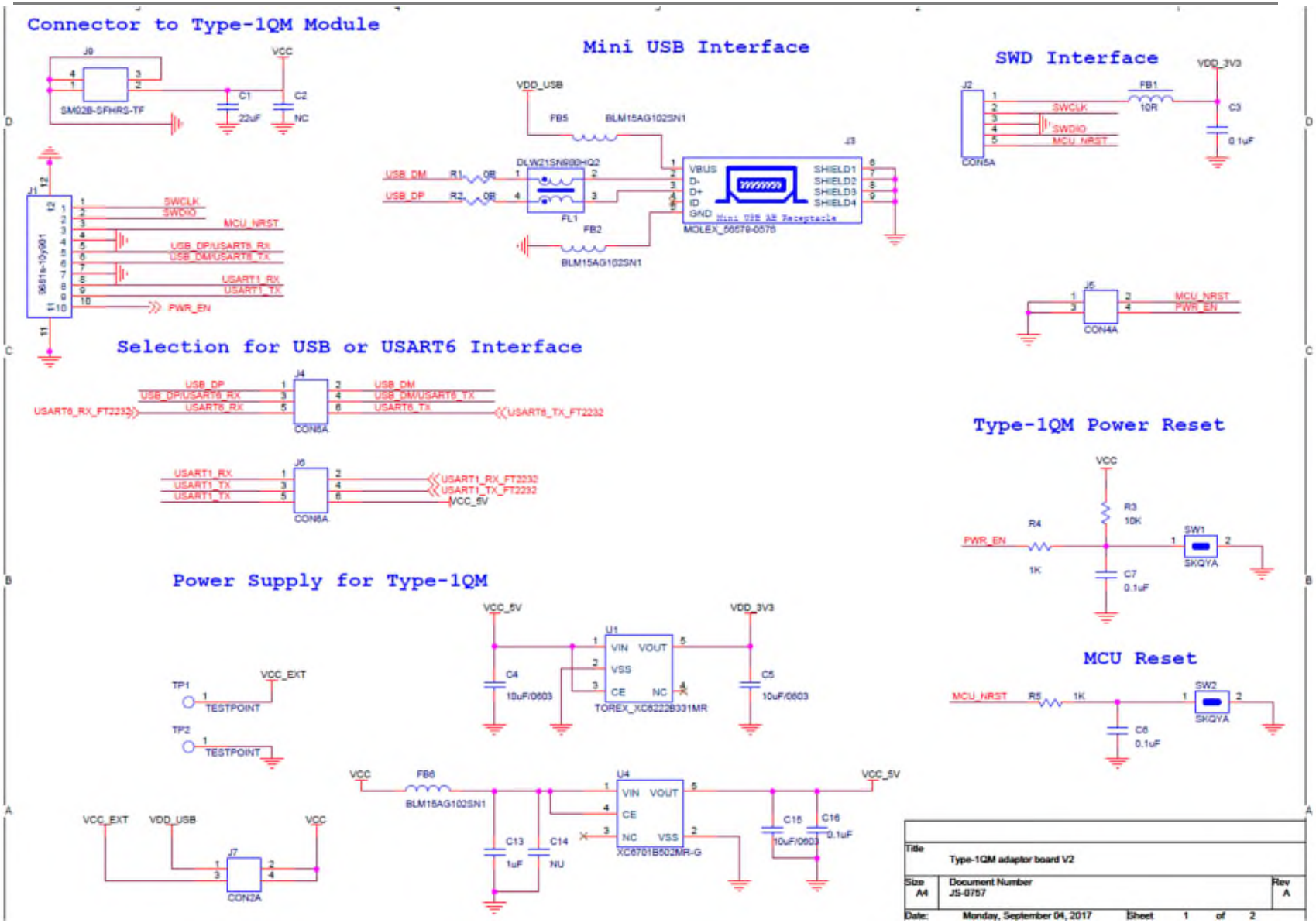
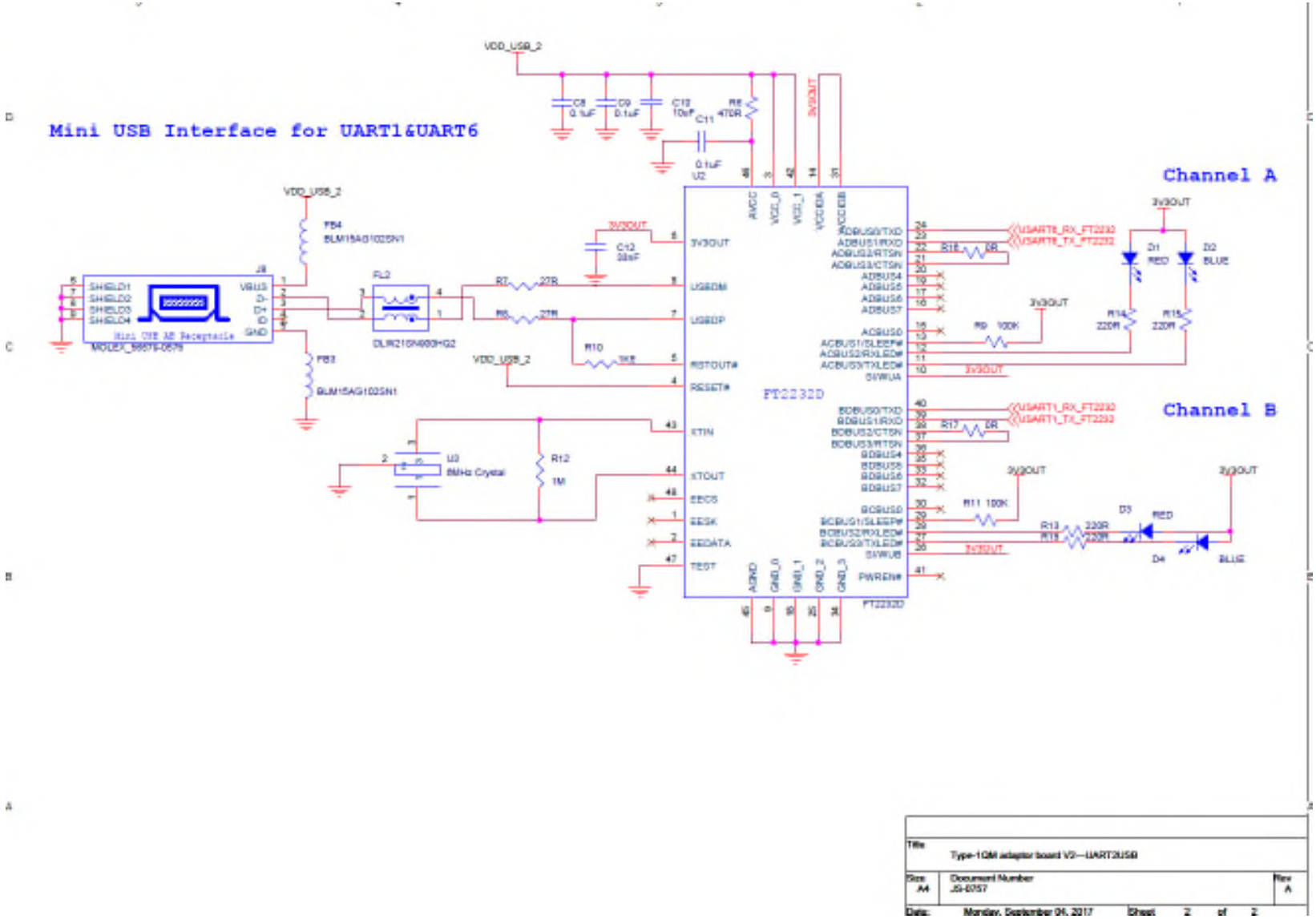
Schematic (1) of Adapter Board



Schematic (2) of Adapter Board



FCC Caution (1)

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

IMPORTANT NOTE:
FCC Radiation Exposure Statement:
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 25cm between the radiator & your body.

The module is limited to OEM installation ONLY.
This module is intended for OEM integrators under the following conditions:
This module is restricted to installation in products for use only in mobile and fixed applications.
The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 25 cm from all persons.
The antenna(s) used for this transmitter must not transmit simultaneously with any other antenna or transmitter.
The OEM integrator is still responsible for
ensuring that the end-user has no manual instructions to remove or install module
the FCC compliance requirement of the end product, which integrates this module.
Appropriate measurements (e.g. 15 B compliance) and if applicable additional equipment authorizations (e.g. Verification, Doc) of the host device to be addressed by the integrator/manufacturer.
The separate approval is required for all other operating configurations, including portable configurations with respect to Part 2.1093 and different antenna configurations

FCC Caution (2)

Guidance to the Host Manufacturer:
We hereby acknowledge our responsibility to provide guidance to the host manufacturer in the event that they require assistance for ensuring compliance with the Part 15 Subpart B requirements.
The host manufacturer is responsible for additional testing to verify compliance as a composite system. When testing the host device for compliance with the Part 15 Subpart B requirements, the host manufacturer is required to show compliance with the Part 15 Subpart B while the transmitter module(s) are installed and operating. The modules should be transmitting and the evaluation should confirm that the module's intentional emissions are compliant (i.e. fundamental and out of band emissions) with the Radio essential requirements. The host manufacturer must verify that there are no additional unintentional emissions other than what is permitted in the Part 15 Subpart B or emissions are complaint with the Radio aspects.

The user manual of the end product should include
Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.
the restriction of operating this device in indoor could void the user's authority to operate the equipment.
This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.
This equipment should be installed and operated with minimum distance 25cm between the radiator & your body.
The FCC part 15.19 statement: This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Label of the end product:
The final end product must be labeled in a visible area with the following " Contains TX FCC ID: **G95LORMOD01**".
The end product shall bear the following 15.19 statement: This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
If the labelling area is considered too small and therefore it is impractical (smaller than the palm of the hand) to display the compliance statement, then the statement may be placed in the user manual or product packaging.

END