User Manual

RT7800
Host Board Manual v1.1

October 2020

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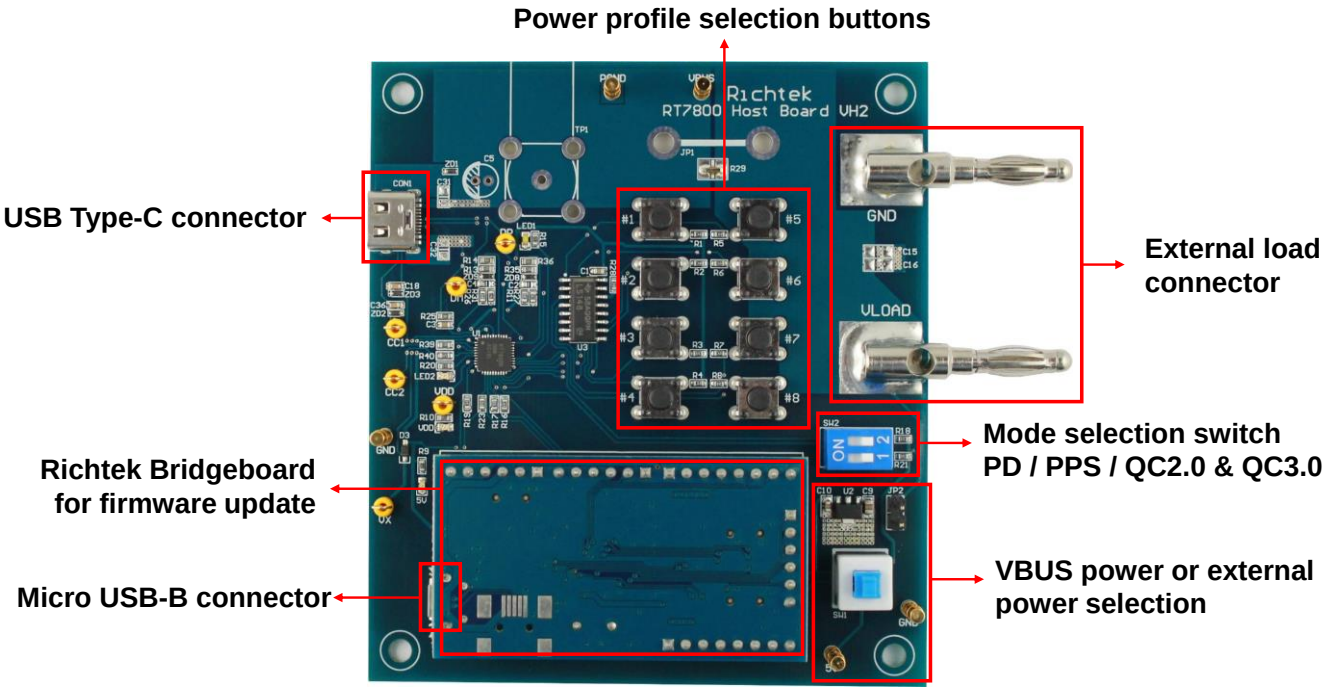
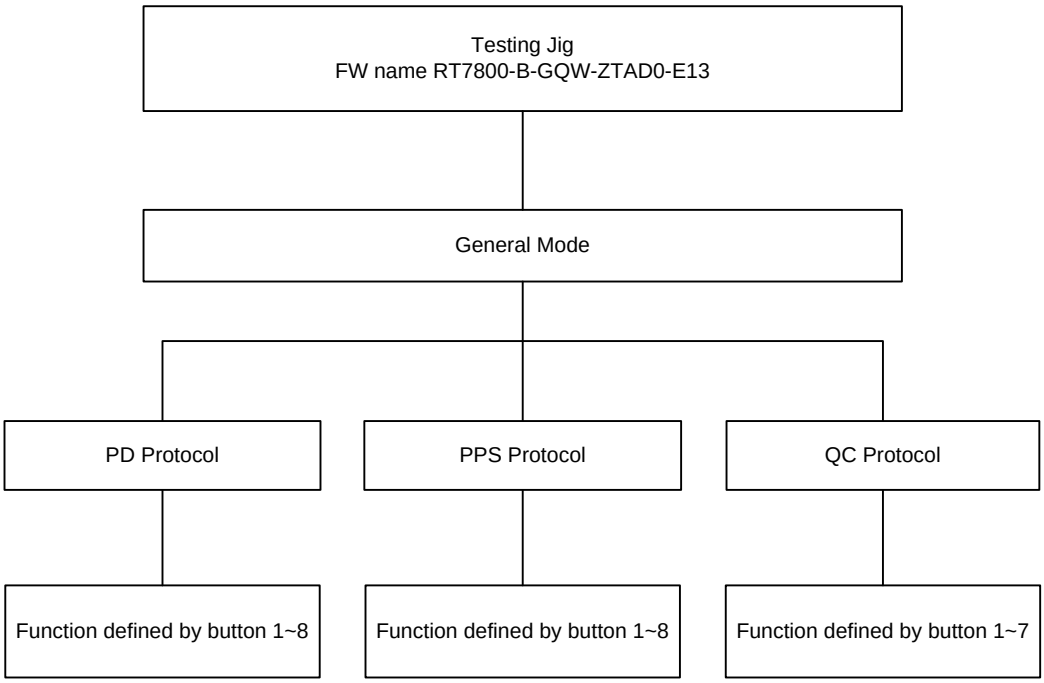
1. Host Board Overview



RT7800 Host Board VH2

- The Richtek RT7800 Host board is a versatile tool for testing USB type-C PD systems (like RT(Q)7880, RT7202, RT7207) that support Power Delivery (PD), Programmable Power Supply (PPS) and legacy charging modes like QC2.0/3.0. The Host board acts as a USB PD Sink, and allows the user to select various Power Profiles in PD, PPS and QC2.0/3.0 modes.
- Ideal for debugging, EMI testing and thermal testing of USB PD systems.

2. Support Feature



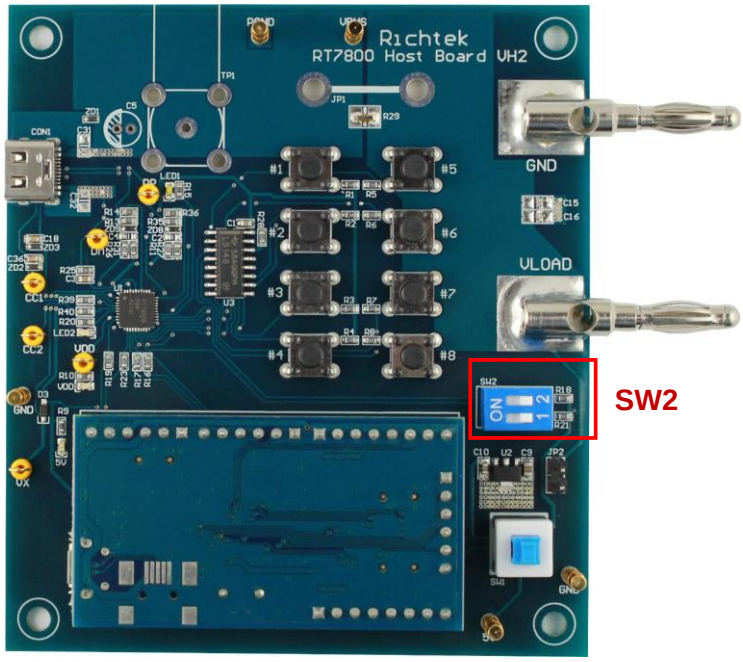
3. Support Feature Brief

- **Protocol Selection**
  - ▶ PD
  - ▶ PPS
  - ▶ QC2.0 & QC3.0

- **General Mode**
  - ▶ PD : Request different PD profile by button.
  - ▶ PPS : Request different PPS profile by button.
  - ▶ QC2.0 & QC3.0 : Request different QC voltage by button.

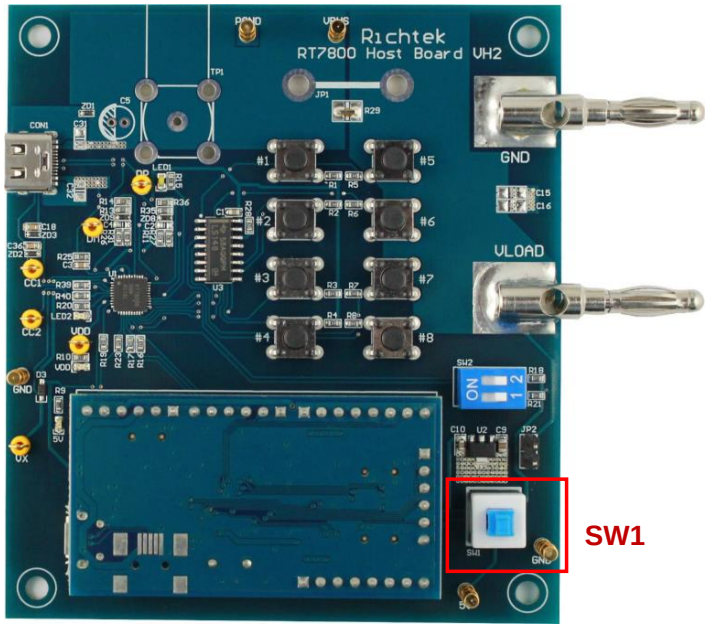
4. Protocol Selection

Protocol Selection		General Mode
	1 Off 2 Off	PD
	1 Off 2 On	PPD
	1 On 2 On	QC
	1 On 2 Off	Reserved



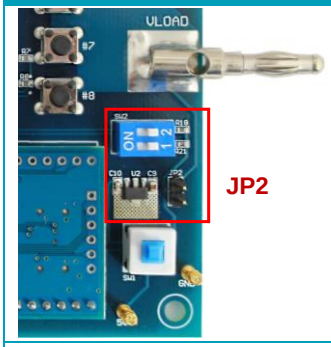
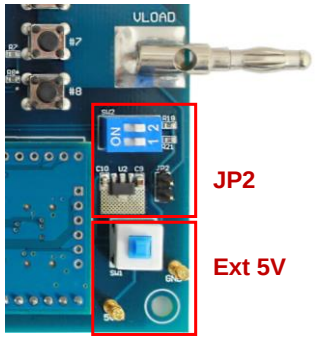
- Note : It is recommended that the Host board power is OFF and USB cable is disconnected when making changes to the switches.

5. Power On/Off of Testing Jig



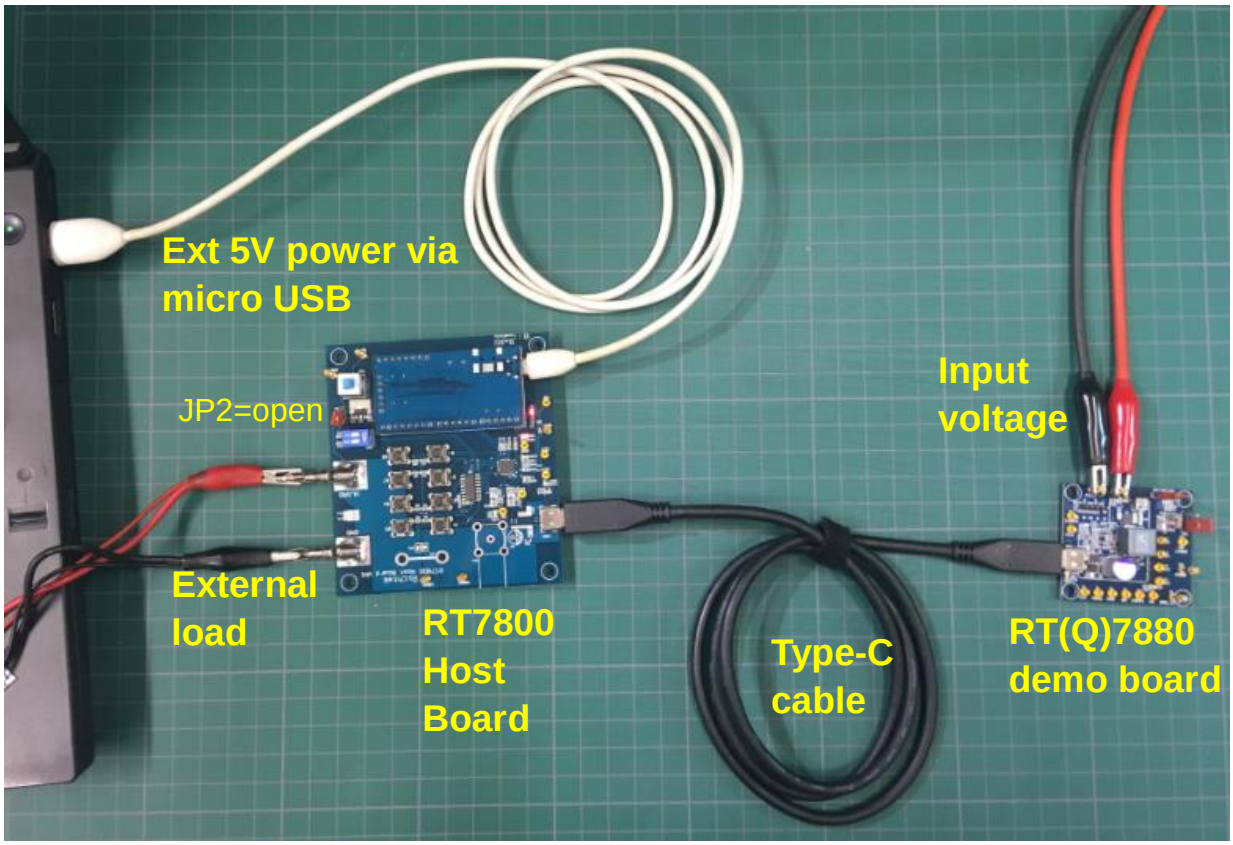
- SW1 Hi position Jig power is Off.
- SW1 Lo position Jig power is On.

6. Testing Jig Power Source

Testing Jig Power Source		General Mode
	JP2 close	Testing Jig Power Source taken form Type-C VBUS (Only for VBUS 5V or lager)
	JP2 open	Testing Jig Power Source taken form Micro-B VBUS or external 5V supply connected to 5V and GND pins

- When the source power is taken from Type-C VBUS, too low VBUS conditions may cause RT7800B undervoltage protection (~4V). When testing VBUS at 5V with high load or PPS mode with low VBUS voltage, you must use “JP2 open” setting and use external power from Mirco-B USB or external power connected to 5V pin to avoid RT7800B undervoltage protection trigger.

7. Typical Test Setup



- Above setup shows the host board with external power source for testing PPS and low VBUS condition without risk of Host board undervoltage.

8. General Mode

Protocol	PD	PPS	QC
Button #1	PD profile 1	Entry PPS (3.3V) Or PPS Profile Down	QC 2.0 5V
Button #2	PD profile 2	Entry PPS (3.3V) Or PPS Profile Up	QC 2.0 9V
Button #3	PD profile 3	Step Up (+20mV)	QC 2.0 12V
Button #4	PD profile 4	Step Down (–20mV)	QC 2.0 20V (If supported)
Button #5	PD profile 5	Step Up (+50mA)	Enable QC3.0
Button #6	PD profile 6	Step Down (–50mA)	QC 3.0 (+200mV)
Button #7	PD profile 7	Current PPS Profile (Max Voltage & Max Current)	QC 3.0 (-200mV)
Button #8	Enable/Disable Idle mode (if supported)	Current PPS Profile (Min Voltage & Max Current)	Reserved

USB-C PD power profiles depend on the maximum output power of the supply : Po ≤ 15W : 5V/3A; Po ≤ 27W : 5V/3A, 9V/3A; Po ≤ 45W : 5V/3A, 9V/3A, 15V/3A; Po ≤ 60W : 5V/3A, 9V/3A, 15V/3A, 20V/3A; Po ≤ 100W: 5V/3A, 9V/3A, 15V/3A, 20V/5A; additional profiles like 12V/3A or 20V/2.25A for 45W are optional.

USB-C PPS profiles also depend on maximum output power: Po ≤ 15W : 3.3V to 5.9V/3A; Po ≤ 27W : 3.3V to 11V/3A; Po ≤ 45W : 3.3V to 16V/3A; Po ≤ 60W : 3.3V to 21V/3A; Po ≤ 100W : 3.3V to 21V/5A;

PPS 50mA current step-up/down will increase or reduce the maximum current limit where constant current mode is activated.

QC2.0 output voltages : 5V/2A, 9V/2A, 12V/1.6A (and 20V/0.9A optional)

QC3.0 output voltage can be adjusted between 3.6V and 12V (up to 20V optional). Output limited to 3A or 18W.

9. General Mode of PPS

Button #1 and #2 function

Function 1 : Entry PPS (starts in 3.3V mode).

Function 2 : User can choose PPS profile by button #1 or #2 after Entry PPS.

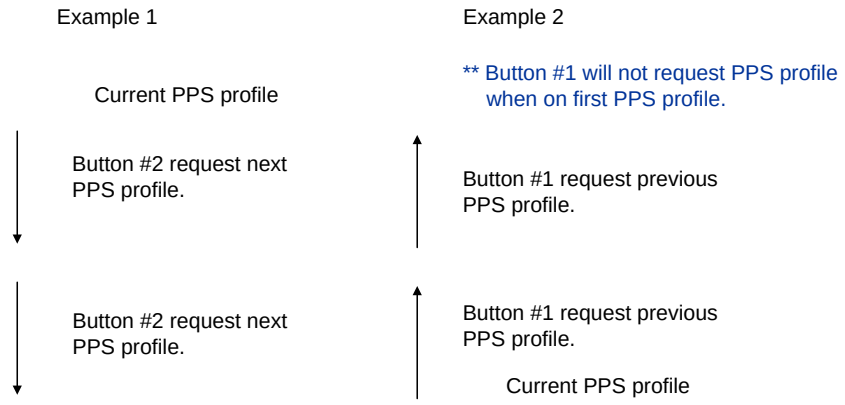
Button #1 or #2 will request that PPS profile max voltage and current.

*** This example has 3 PPS profiles**

PDO Type	Prog Power Supply	Augmented
Augmented	0	3.00V to 5.90V Max 3.00A

PDO Type	Prog Power Supply	Augmented
Augmented	0	3.00V to 11.00V Max 3.00A

PDO Type	Prog Power Supply	Augmented
Augmented	0	3.00V to 15.00V Max 3.00A



** Button #2 will not request PPS profile when on last PPS profile.

*** Some models will only have 1 PPS profile.

Button #3 or #4 increase or decrease DUT output voltage

Button #3 increase 20mV to reach max voltage of PPS profile.

Button #4 decrease 20mV to reach min voltage of PPS profile.

Button #5 or #6 increase or decrease DUT output current limit.

Button #5 increase 50mA to reach Max current of PPS profile.

Button #6 decrease 50mA to reach 0A.

Button #7 and #8 function

Button #7 request max voltage and current of PPS profile.

Button #8 request min voltage and current of PPS profile (3.3V).

* Note : If the Source does not support PPS, the PPS function will not work correctly.

10. General Mode of QC

Button #1 , #2, #3, #4, #5, #6, #7 function

Button #1 requests QC2.0 and starts 5V profile (communicated via D+/D- voltage level)

Button #2 requests QC2.0 9V profile (communicated via D+/D- voltage level)

Button #3 requests QC2.0 12V profile (communicated via D+/D- voltage level)

Button #4 requests QC2.0 20V profile (if supported) (communicated via D+/D- voltage level)

Button #5 enables QC3.0, and starts from the last chosen QC2.0 profile (communicated via D+/D- voltage level)

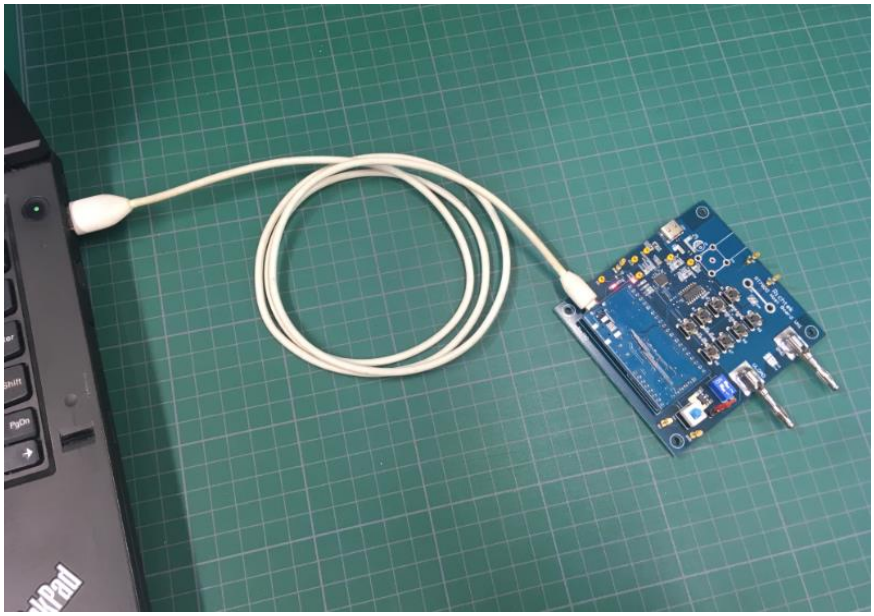
Button #6 increases the QC3.0 profile with 200mV (communicated via D+/D- pulses)

Button #7 decreases the QC3.0 profile with 200mV (communicated via D+/D- pulses)

* Note : If the Source does not support QC2.0/3.0, this function will not work correctly.

11. Firmware Update of RT7800 Host board

The RT7800 Host board can simply be updated via the mico-USB cable connected to the USB port of a NB or PC.

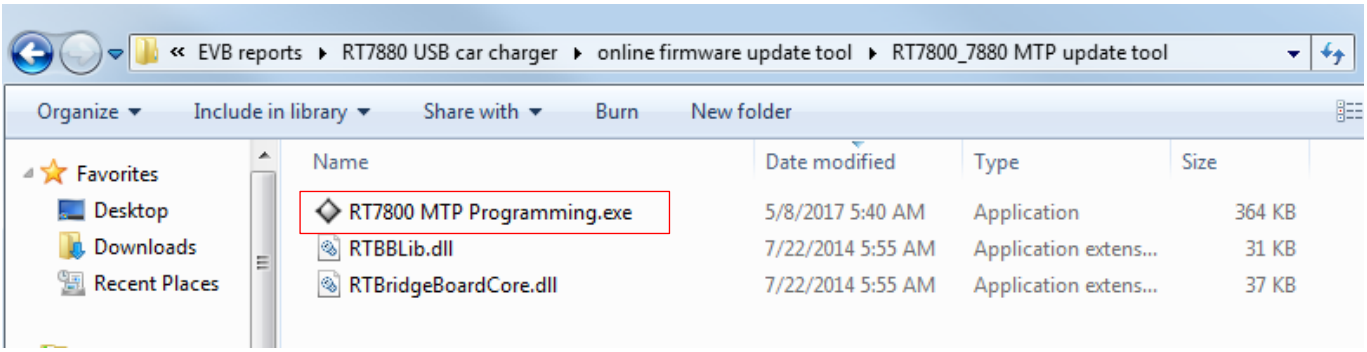


Step of firmware update

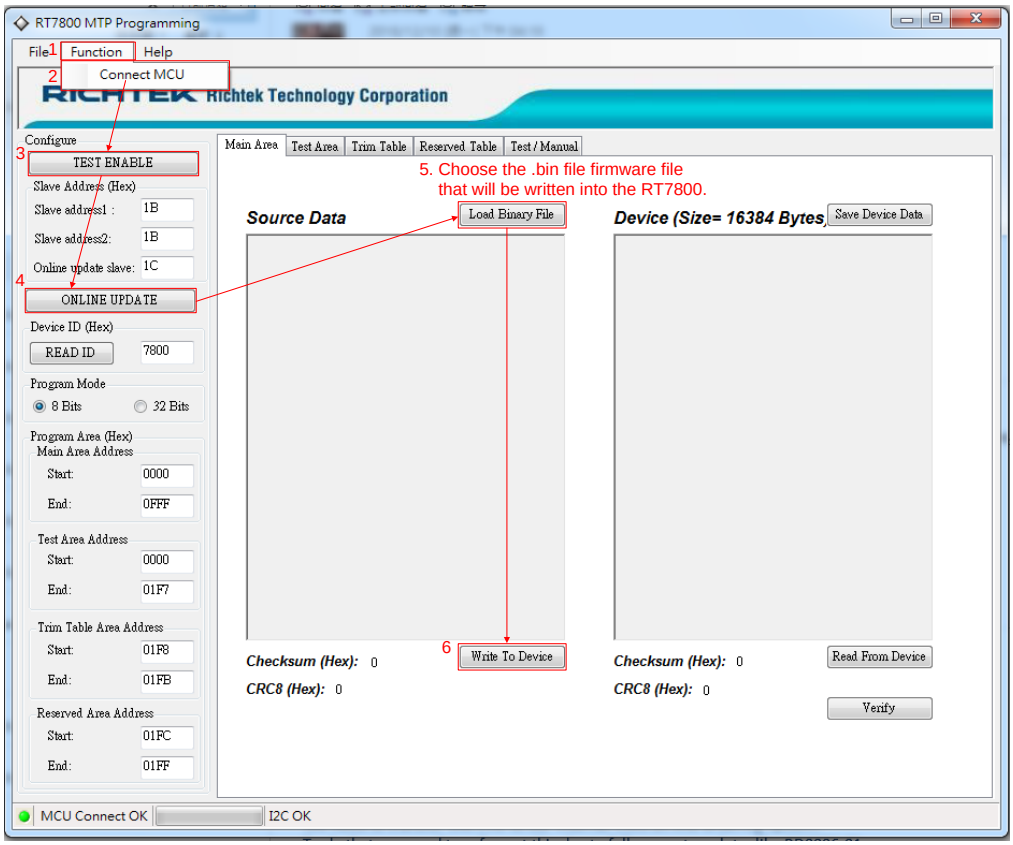
Step1. Download and install RT bridge board driver

http://www.richtek.com/shareEVB/RTBridgeboardUtilitiesV137.exe

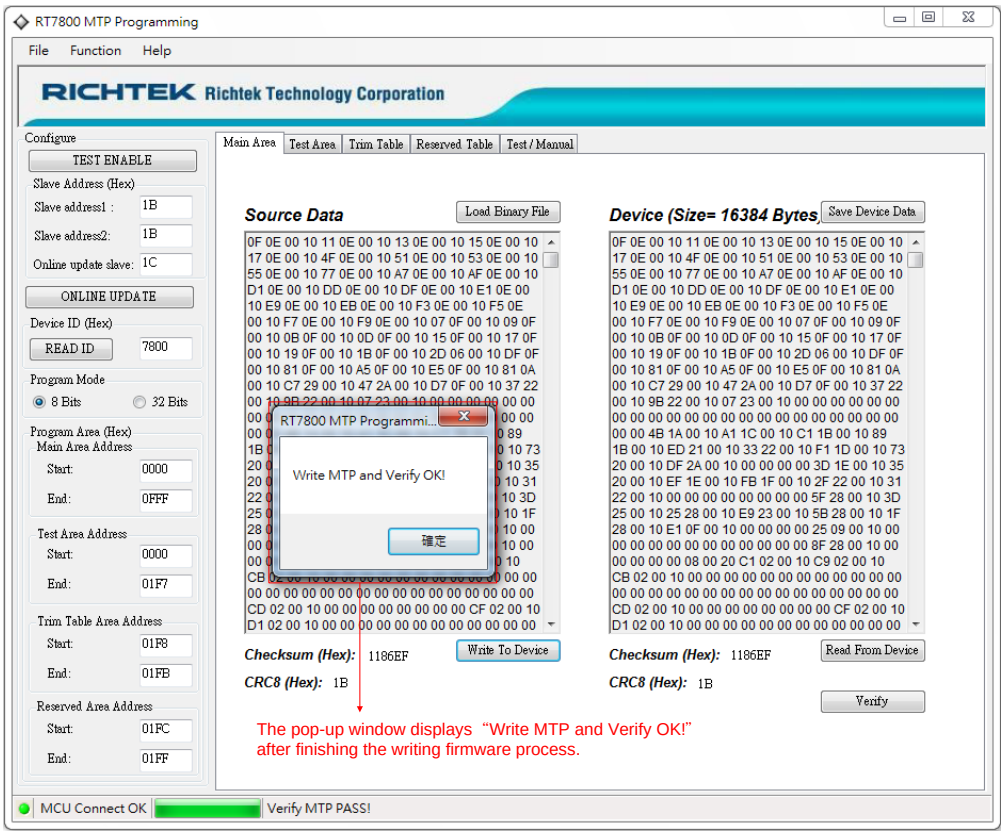
Step2. Open ” RT7800 MTP Programming.exe” (version 0.6.1)



Step3. Update firmware according to the following steps of figure below :



Step4. Cycle power to make the new firmware active.



More Information

For more information, please find the related datasheet or application notes from Richtek website http://www.richtek.com.

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