

## TPM541 series EVK USER GUIDE

**Revision 1.4**

**Oct. 2020**

Specifications are subject to change without notice and should not be construed as a commitment by  
Sercomm Corporation

Copyright© 2017 by Sercomm Corporation ® All rights reserved.

### Frequency Bands

- One SKU for all, Supported Bands are configurable (B2/3/4/5/8/12/13/20/25/26/28)
- Only Bands 2/4/12 are enabled and available for this device; all other bands are disabled via software when sold/marketed to the USA

### Data

- Data rate:  
Max throughput UL/DL (23dBm): UL: 375kbps/DL: 300kbps (peak)
- Protocol stack:  
COAP\*/IPV4/IPV6/MQTT\*/HTTPS\*/LWM2M  
PPP/UDP/TCP/TLS/DTLS
- Firmware Download Method: UART, FOTA

### Electrical Specification

- Maximum RF output power: 23 dBm (tolerance 20.3~25dBm)

### Power Consumption

- PSM flow: 1.3uA@3.6V
- eDRX (81.92s): 40uA@3.6V
- I-DRX(1.28s): 1.5mA@3.6V
- Transmission (23dBm): 150mA@3.6V

### Interfaces

- 3 x UART port (1 reserve for option)
- 1 x USIM port
- 1 x PCM\*
- 18 x GPIO (maximum)\*
- 1 x USB 2.0\*
- 2 x ADC\*
- 1 x I2C

\*Reserved for the SKU supporting embedded MCU.

### General Features

- LTE eDRX and PSM supported
- Low power consumption for longer battery life

### Key Benefits

- Extremely Compact Form-Factor
- Ultra Low Power Consumption
- OpenCPU & Rich Interface Design for System on Module
- Multiple Internet Service Protocols Supported
- LTE-M and NB-IoT Dual Mode Supported
- One for All Design Supporting Multibands
- Embedded GNSS and Cellular Positioning Technology

### Temperature Range:

- -40~+85°C

### Supply voltage Range:

- 3.1~4.3V

### Package:

- LGA, 104 pads
- Dimension: 13.4 x 14.6 x 1.85mm
- Weight: 1.0g

### AT command:

- 3GPP Rel.13 LTE Cat-M1 compliant

### Applications

- Utilities: Smart Metering, Smart City, Smart Grid
- Tracking: Asset, People, Pet Trackers
- Remote Monitoring: Traffic, Environmental, Agricultural

### Table of contents

|                                               |    |
|-----------------------------------------------|----|
| Data .....                                    | 2  |
| Electrical Specification.....                 | 2  |
| Power Consumption .....                       | 2  |
| Interfaces .....                              | 2  |
| General Features .....                        | 2  |
| Temperature Range: .....                      | 2  |
| Supply voltage Range: .....                   | 2  |
| Package: .....                                | 2  |
| AT command: .....                             | 2  |
| Applications .....                            | 2  |
| 1. Introduction .....                         | 2  |
| 1.1. Document Purpose .....                   | 2  |
| 1.2. Kit contents.....                        | 2  |
| 2. EVK functions introduce.....               | 3  |
| 2.1. EVK Interfaces .....                     | 3  |
| 3. Starting with TPM541 series EVK.....       | 4  |
| 3.1. Hardware preparation and setup .....     | 4  |
| 3.2. Software preparation and setup .....     | 5  |
| 3.3. Starting to access EVK and TPM541.....   | 5  |
| 4. Button/Jumper introduce.....               | 6  |
| 4.1. RECOVERY button : .....                  | 6  |
| 4.2. RESET button : .....                     | 6  |
| 4.3. WAKEUP Jumper : .....                    | 6  |
| 4.4. JP18 : .....                             | 6  |
| 5. LED status .....                           | 7  |
| 5.1. Module_PWR1 LED: .....                   | 7  |
| 5.2. Module_LED1:.....                        | 7  |
| 5.3. Module_LED2:.....                        | 7  |
| 6. Special hardware configuration pins.....   | 8  |
| 6.1. SWD(JP17): .....                         | 8  |
| 6.2. Isolation control(JP3):.....             | 8  |
| 6.3. Debug Selection(JP12): .....             | 8  |
| 6.4. Anti Tamper(JP11): TBD .....             | 8  |
| 7. RF matching diagram example .....          | 9  |
| 8. Firmware Upgrade .....                     | 10 |
| 8.1. Install RK firmware image .....          | 10 |
| 8.2. Environment setup .....                  | 12 |
| 8.3. Firmware upgrade with ImageBurnTool..... | 13 |
| 9. Message view and Debug view usage .....    | 18 |
| 9.1. Configuration Tool Setup .....           | 18 |
| 9.2. Debug view .....                         | 20 |
| 9.3. Message view.....                        | 21 |
| 9.4. WiresharkMSGview.....                    | 21 |
| 9.5. Collect Logs of modem .....              | 22 |
| - FCC Caution: .....                          | 26 |

## 1. Introduction

### 1.1. Document Purpose

The purpose of this document is to introduce TPM541 series EVK and to provide a design reference. EVK also enables users to make a prototype on TPM541 platform which resembles the actual target during the design and build phases of a project. It makes the design efforts of a user simple, cost-effective and fast. Various interfaces which is included on the board make the development board ideal for a wide variety of applications. The EVK leverages the capability of the TPM541 LTE Cat. M1 cellular module and provides access to a variety of interfaces including UART, USB, USIM.

### 1.2. Kit contents

- Three USB to Micro USB Cables
- TPM541 series EVK
- One SMA-type LTE Dipole Antenna
- One SMA-type GPS Antenna (except TPM541S)



Figure 1.2 Kit contents

## 2. EVK functions introduce

### 2.1. EVK Interfaces

Table 2.2 lists TPM541 series available interfaces on EVK for reference .

| Interface | Note                                                           |
|-----------|----------------------------------------------------------------|
| UART0/J3  | AT commands UART interface, default baud rate: 115200          |
| UART1/J2  | Console Log UART interface, default baud rate: 115200          |
| UART2/J7  | CLI/Firmware upgrade UART interface, default baud rate: 115200 |
| USIM/J17  | SIM card slot, supports 3FF, micro SIM card                    |
| JP5       | UART0 to USB/external MCU switch jump.                         |
| JP2       | UART1 to USB/external MCU switch jump.                         |
| JP1       | UART2 to USB/external MCU switch jump.                         |
| J19       | Reserved                                                       |
| S2        | Power switch when use DC input of J1                           |
| J8/J21    | RF_GNSS interface                                              |
| J6/J11    | RF_LTE interface                                               |
| J1        | 5V DC input                                                    |

Table 2.2 list of TPM541 series interface

### 3. Starting with TPM541 series EVK

#### 3.1. Hardware preparation and setup

- Attach the included antenna to the SMA connector J21
- Plug-in the included DC adapter to DC Jack J1
- Or each UART to USB cable.
- Plug-in 3FF SIM card to J17(back side of EVK)
- Switch on S2(Power switch) to turn on the module.
- There is no need to turn on S2 while using USB cable to power up EVK

Module PWR1 LED will be lighted when power EVK successfully. After modem boot up, the three LED will be lighted.



Figure 3.1 LED status

## 3.2. Software preparation and setup

- Prepare and install Silicon Lab CP210X UART to USB Driver, Version 6.7  
(Please access Silicon Lab website to download driver.)
- Prepare Serial Port Terminal Tool (Putty, SecureCRT, Teraterm..etc)

## 3.3. Starting to access EVK and TPM541

- Turn on EVK
- Connect UART0 to PC via USB cable.
- Setup Terminal tools, please refer figure 3.3  
(COM port: com port will be enumerated on Windows device manager)



- Setting Baud rate for UART0: default is 115200.

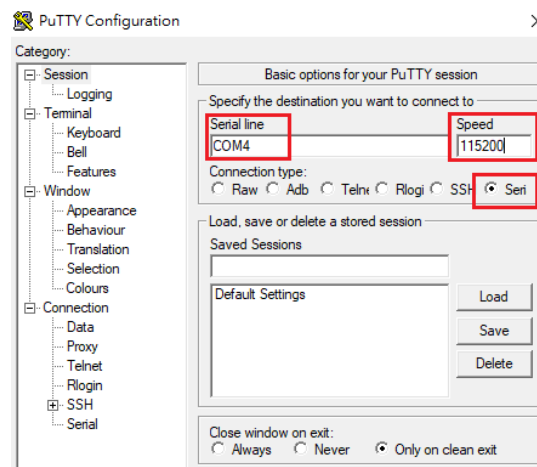
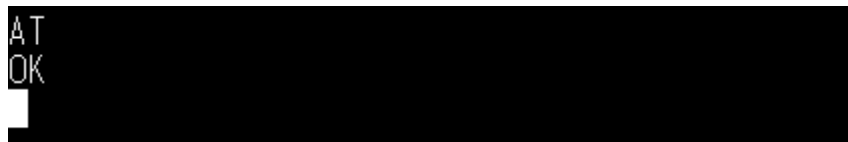


Figure 3.3 for putty setting.

- Opening terminal tools and sending **AT** command from UART.



## 4. Button/Jumper introduce

### 4.1. RECOVERY button :

This button is used to enter boot ROM mode for firmware upgrade and recovery system when device cannot boot up by some reason.

Please visit Sercomm technical support website and issue a ticket when you have problem with booting up your TPM541.

### 4.2. RESET button :

This button is connected to PMU\_SHUTDOWN pin for initiating power cycle that resets the device or shutdowns device. (For reset function, please pull low button at least 100ms)

### 4.3. WAKEUP Jumper :

This jumper is connected to PMU\_WAKEUP pin and is used to wakeup TPM541 while device is under power saving mode.

When there is no traffic, TPM541 will get into power saving mode immediately when remove the jumper and TPM541 cannot receive and deal any commands from host. Please plugin the jumper to wakeup module and send AT commands.

### 4.4. JP18 :

This jumper is usage to power by USB or DC(J1) when plugin. When user want to measure the current consumption, please remove this jumper and connect to HV\_BAT&GND pin header with current meter for monitoring the current log of module.

## 5. LED status

### 5.1. Module\_PWR1 LED:

For VCC status indication.

- ON: VCC is present.
- OFF: VCC is absent.
- VCC is provided by 5V to 3.3V LDO.

### 5.2. Module\_LED1:

This LED is controlled by PMU\_EXT\_ALARM pin, it can be used for alarming an external host.

| Output | Conditions       |
|--------|------------------|
| High   | Active , LS, DS  |
| Low    | DH0, DH1 and DH2 |

### 5.3. Module\_LED2:

Reserved

## 6. Special hardware configuration pins

### 6.1. SWD(JP17):

TBD

### 6.2. Isolation control(JP3):

3.3V to 1.8V level shift ICs(U3,U10,U11) control :

- H: Turn off level shift ICs
- L: Turn on level shift ICs

Default is connected to Low.

### 6.3. Debug Selection(JP12):

HW pin for EJTAG chain select :

- PD for MIPS chain.
- PU for ARM chain.

Default setting is internal PD in TPM541.

### 6.4. Anti Tamper(JP11): TBD

User can connect PMU\_AT\_OUT to PMU\_AT\_IN in order to protect its device or module from tampering.

Default setting is floating on EVK.

### 7. RF matching diagram example

LTE\_ANT port is the primary (main) antenna pin and carries TX and RX signals. Connect 50 Ohm transmission lines from this pins to the 50 Ohm Primary Antenna/Antenna-connector. Figure 7.1 shows the connection between LTE\_ANT port and the antenna connectors please also follow up matching network to fine tune antenna matching.

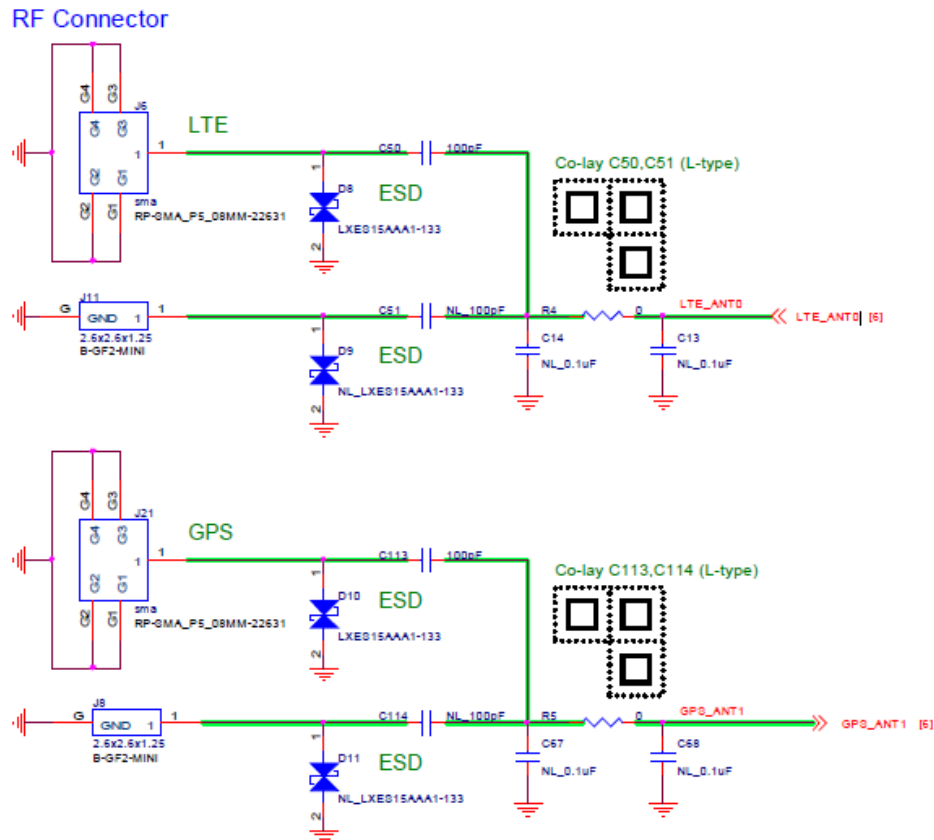


Figure 7.1 RF matching typical circuit.

## 8. Firmware Upgrade

Please access <https://supportiot.sercomm.com/> to download and install PC Tools for local firmware upgrade. And you will find **ImageBurnTool** in program after finish installation.

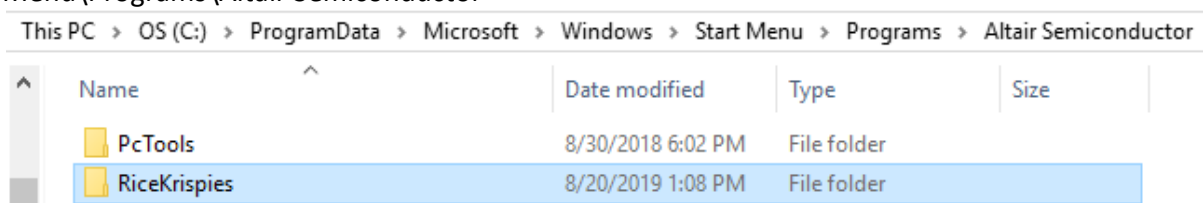
ImageBurnTool is used for local firmware upgrade via UART\_2

In the mean time, please also download images that have two parts need to be installed in your PC/Laptop.

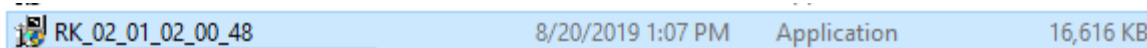
- RK\_02\_01\_02\_00\_xx
- TPM540G\_05.00x

### 8.1. Install RK firmware image

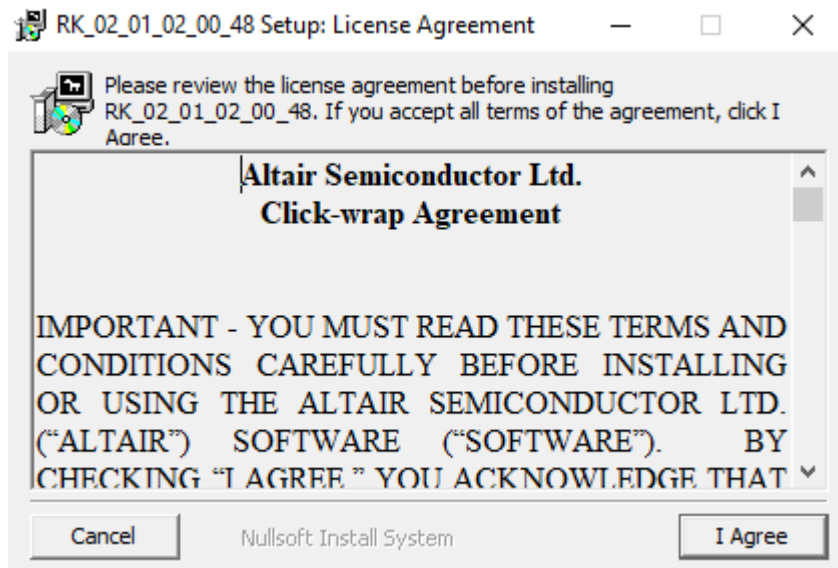
1. Please create folder **"RiceKrispies"** under C:\ProgramData\Microsoft\Windows\Start Menu\Programs\Altair Semiconductor



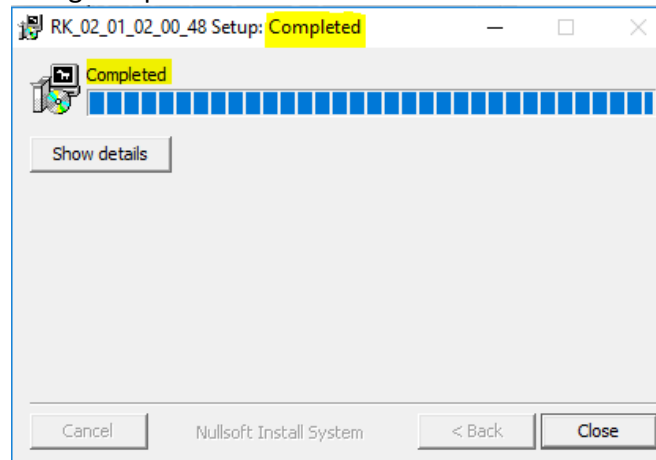
2. Install RK\_02\_01\_02\_xx which downloaded from Sercomm support IOT website



3. Click Agree button.



4. Click Close after installing completed



5. Unzip Sercomm firmware image “TPM540G\_05.00x.zip” that downloaded from Sercomm support IoT website.

| Name                         | Date modified     | Type         | Size     |
|------------------------------|-------------------|--------------|----------|
| AppFW_flash.bin              | 7/31/2019 5:40 PM | BIN File     | 3,660 KB |
| ConfigFS.bin                 | 7/31/2019 5:40 PM | BIN File     | 512 KB   |
| partmap.bin                  | 7/31/2019 5:40 PM | BIN File     | 4 KB     |
| sysHeader.bin.alt1250        | 7/31/2019 5:40 PM | ALT1250 File | 4 KB     |
| sysHeader_backup.bin.alt1250 | 7/31/2019 5:40 PM | ALT1250 File | 1 KB     |
| u-boot.bin                   | 7/31/2019 5:40 PM | BIN File     | 380 KB   |
| ue_lte.fw                    | 7/31/2019 5:40 PM | FW File      | 3,671 KB |
| ue_lte.fw2                   | 7/31/2019 5:40 PM | FW2 File     | 2,730 KB |

6. COPY all files and replace files under folder path: C:\Program Files (x86)\Altair Semiconductor\RiceKrispies\RK\_02\_01\_02\_00\_XX\Images

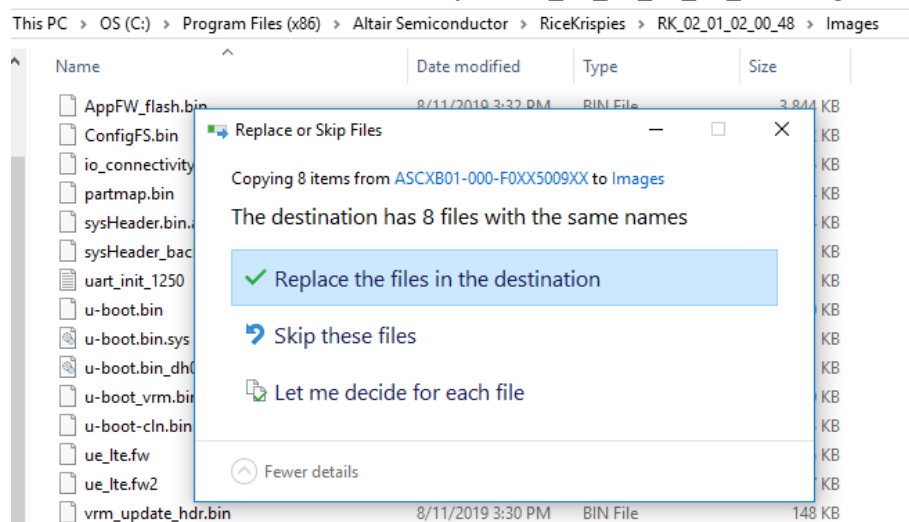
**Note :**

a).For 64bit windows OS, the folder path is

“C:\Program Files (x86)\Altair Semiconductor\RiceKrispies\RK\_02\_01\_02\_00\_XX\Images”

b).For 32bit windows OS, the folder path is

“C:\Program Files\Altair Semiconductor\RiceKrispies\RK\_02\_01\_02\_00\_XX\Images”



Now, all the necessary firmware images are installed well in your PC/Laptop.

### 8.2. Environment setup

Local upgrade is flashed the firmware through local UART\_2 port.

Please follow this instruction step by step to setup your environment for upgrade.

#### 8.2.1. Open your UART\_0 with terminal tools.

- Turn on EVK
- Connect UART\_0 to PC via USB cable.
- Setup Terminal tools, please refer figure 7.2.1. COM port: com port will be enumerated on Windows device manager



- Setting Baud rate for UART0: default is 115200.

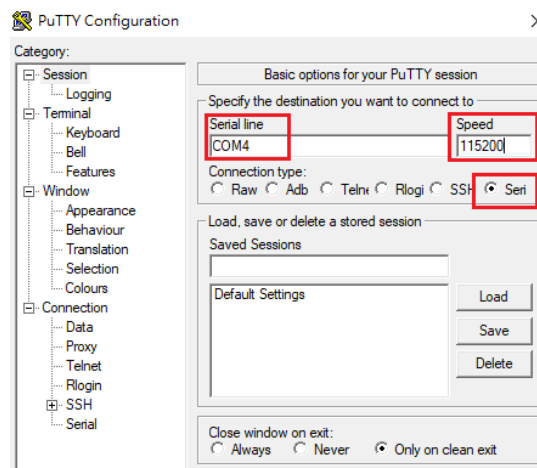


Figure 7.2.1 for putty setting

#### 8.2.2. Setup BootDelay time to 10s

Before we start to upgrade firmware, TPM541 need to be configured the boot delay time to 10s by sending AT%SETBDelay=10 through AT port(UART\_0) to make sure Image Burn Tool has enough time to put TPM541 into UBOOT mode for firmware upgrade.

```
at
OK
at%setbdelay=10
OK
```

#### 8.2.3. Connect UART\_2 to PC

UART\_2 is also used to upgrade TPM541 firmware, be sure UART\_2 is connected well with USB cable between PC and EVK.

#### 8.2.4. Enter U-BOOT mode

- TPM541 series firmware upgrade need to be executed under u-boot mode. So user shall login UART2 to interrupt boot-up procedure and force TPM541 into u-boot mode for flashing image. After reboot the modem, the modem boot delay will be 10sec. Please process the steps as below.

- b. After power to the module. User need to **“Hit any key to stop autoboot”** within 10s and you will see “#” prompt that means TPM541 is successfully into U-BOOT mode.

```
U-Boot 2012.10-svn148 (Aug 07 2019 - 20:01:55)

Board: ALT1250 Ver: 0.32-TG-D0 (PMP CPU Speed 120 MHz)
DRAM: 2.5 MiB
Now running in RAM - U-Boot at: 902a8000
Boot mode 3
Flash Manufacturer/Device ID is: 0xc86018
Enable QUAD mode
Flash: 16 MiB
map import OK
In: serial
Out: serial
Err: serial
Configuring Flash Write Protection (offset 0x1e00)
new_cs_val = 0x2a0001f0
Hit any key to stop autoboot: 1
map import OK
In: serial
Out: serial
Err: serial
Configuring Flash Write Protection (offset 0x1e00)
Hit any key to stop autoboot: 0
#
#
#
```

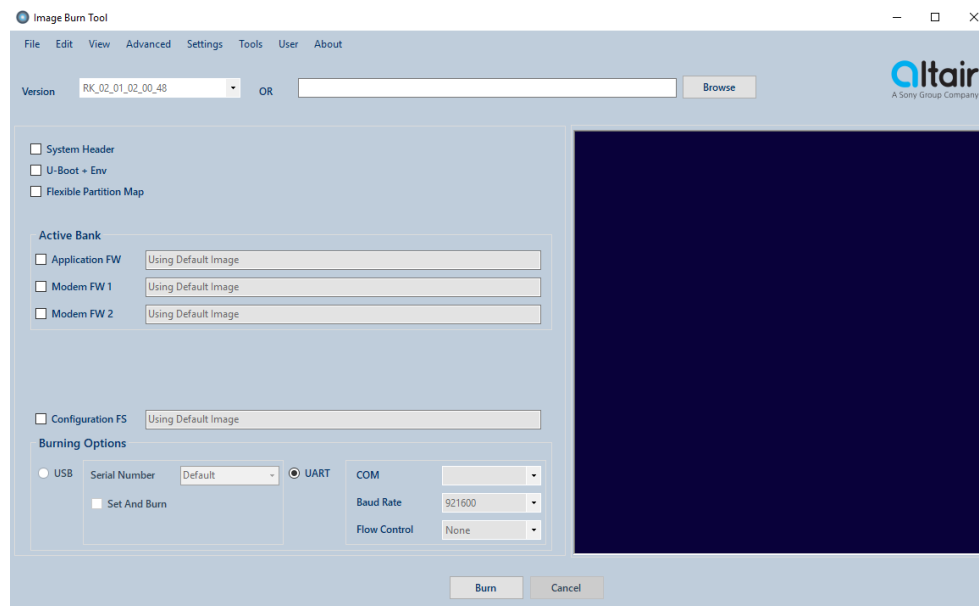
**Before starting flashing image, User need to disconnect the connection between UART2 and terminal tool.**

### 8.3. Firmware upgrade with ImageBurnTool

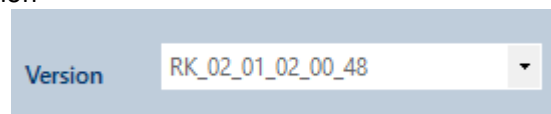
This chapter is introduced how to setup configuration of ImageBurnTool. ImageBurnTool is used to upgrade your TPM541 through UART\_2, please make sure all steps are done.

#### 8.3.1. Setup “ImageBurnTool”

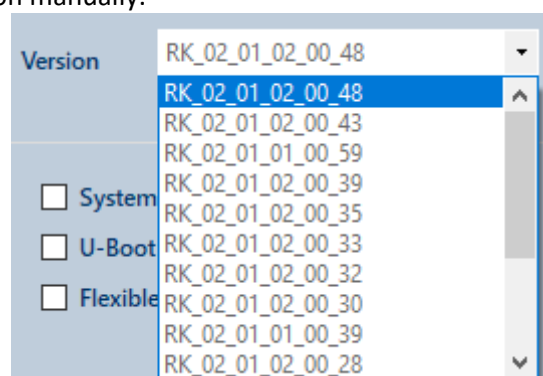
- a. Execute C:\ProgramData\Microsoft\Windows\Start Menu\Programs\Altair Semiconductor\PcTools\ ImageBurnTool.exe



- b. If you already have installed RK image well, ImageBurnTool will detect latest RK image automatically in “Version”



- c. Please go through all steps of chapter 7.1 again if tool cannot detect firmware version. Or you can select the version manually.



Then you need to select images that need to be upgraded.

Here we recommend to upgrade all parts **EXCEPT “Configuration FS”**.

**Be Caution, to upgrade “Configuration FS” that will cause all calibration data are erased after firmware upgrade.**

- d. Please select “System Header, U-Boot+Env and Flexible Partition Map”, above three images would be auto select, once your click any of each.  
And Application FW, Modem FW1 and Modem FW2 SHALL be selected as well, Modem FW1 is used for CAT-M1 firmware and Modem FW2 is for NB-IoT.

System Header  
U-Boot + Env  
Flexible Partition Map

Active Bank

Application FW Using Default Image  
Modem FW 1 Using Default Image  
Modem FW 2 Using Default Image

Configuration FS Using Default Image

**Warning, DO NOT select Configuration FS, in case the calibration data will be erased after firmware upgrade.**

### 8.3.2. Setup “Burn Options”

Currently TPM541 series only supports Firmware upgrade through UART, USB hasn't supported yet. Please select COM NO. With UART\_2 and also enable Flow Control with RTS\_CTS.

Burning Options

USB Serial Number Default Set And Burn

UART COM COM163 Baud Rate 921600 Flow Control RTS\_CTS

Burn

### 8.3.3. Start to upgrade firmware

- a. Click “Burn” to start firmware upgrade

Burning Options

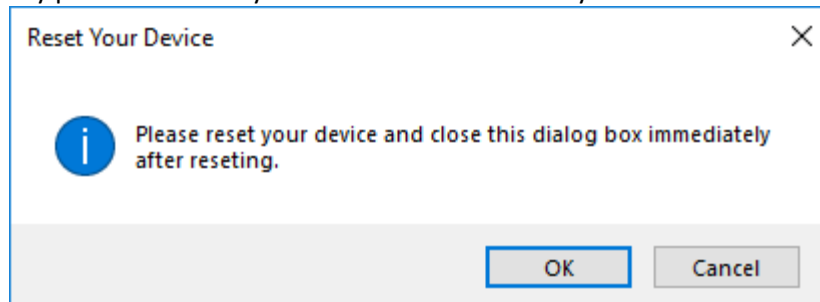
USB Serial Number Default Set And Burn

UART COM COM163 Baud Rate 921600 Flow Control RTS\_CTS

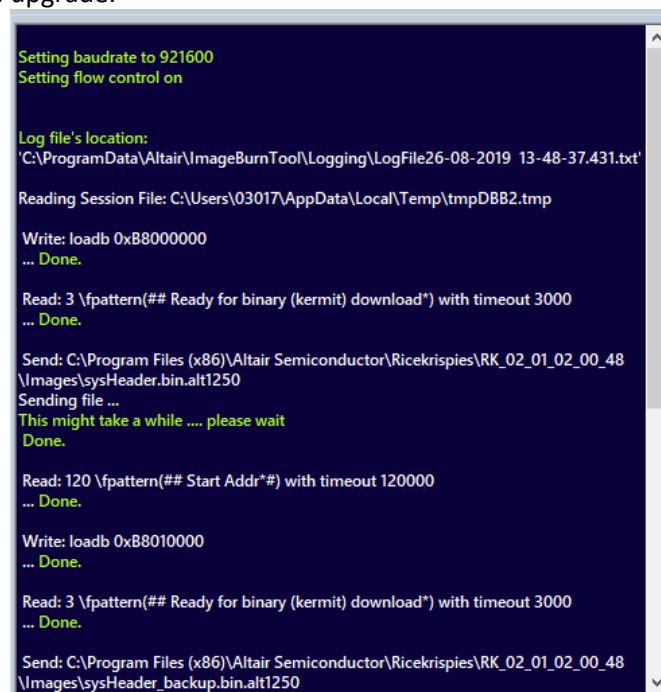
Burn

- b. After click “Burn”, ImageBurnTool will pop-out tip to inform user to reset TPM541.

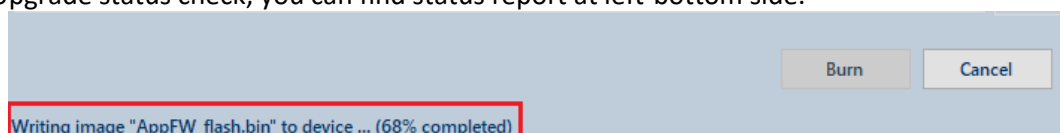
Please reset EVK by push "RESET" key and close box immediately



c. Starting firmware upgrade.



d. Upgrade status check, you can find status report at left-bottom side.



- e. TPM541 will reboot automatically after upgrade complete, and it will take around 3mins to do configuration. Please check AT commands response in UART\_0 COM port.

```
Write: loadb modem_fw2
... Done.

Read: 3 \fpattern(## Ready for binary (kermit) download*) with timeout 3000
... Done.

Send: C:\Program Files (x86)\Altair Semiconductor\Ricekrispies\RK_02_01_02_00_48
\Images\ue_lte.fw2
Sending file ...
This might take a while .... please wait
Done.

Read: 120 \fpattern(## Start Addr*#) with timeout 120000
... Done.

--- Second phase completed ---

SUCCESS:
The burning process completed successfully

***** Complete *****

Resetting device ...
```

### 9. Message view and Debug view usage

This chapter is introduced how to use message and debug view to investigate and collect log from TPM541. The message view is used for monitoring the Network message and debug view is used to collect TPM541 modem log for Sercomm debug.

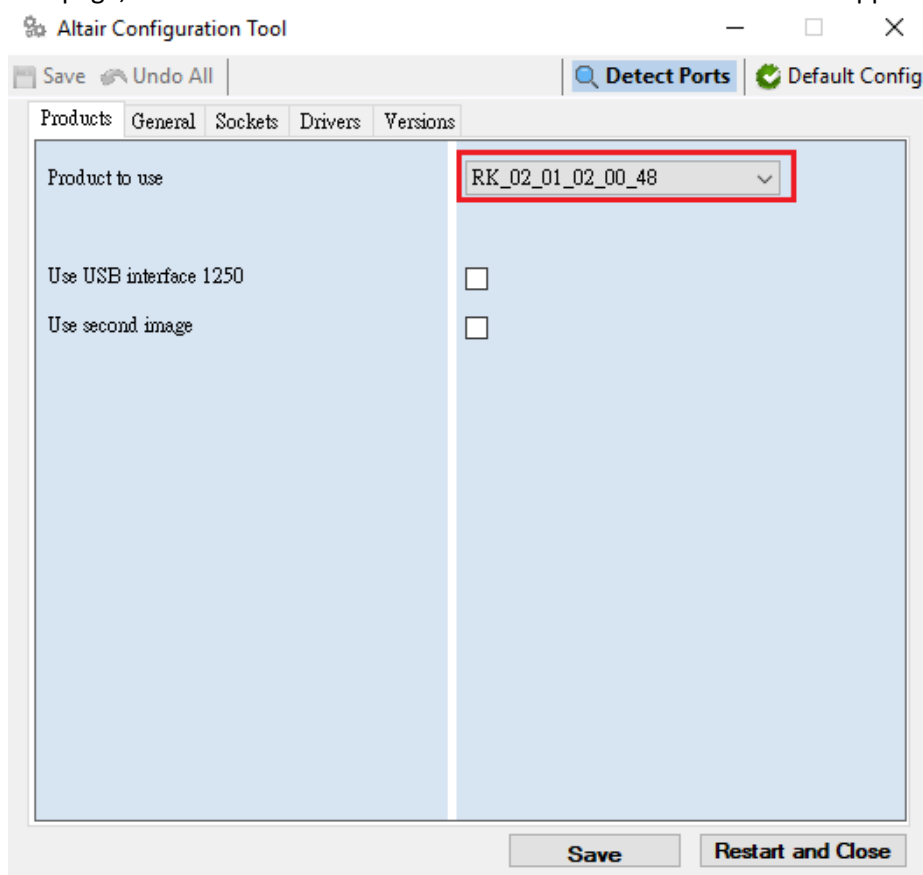
Before starting to use message and debug view, user need to setup "Configuration Tool" by follow instruction step by step. And both tools are using UART\_1 for collecting logs.

#### 9.1. Configuration Tool Setup

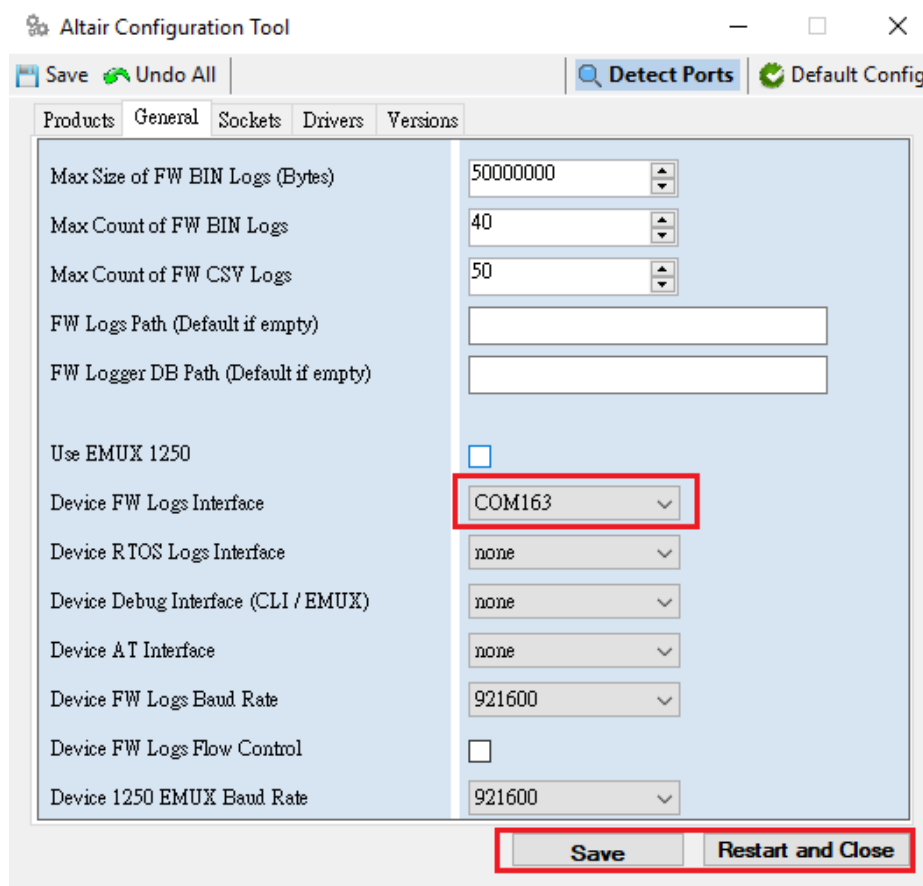
Please connect UART\_1 port via USB cable between TPM541 EVK and PC well.

Execute "C:\ProgramData\Microsoft\Windows\Start Menu\Programs\Altair Semiconductor\PcTools\Configuration Tool.exe

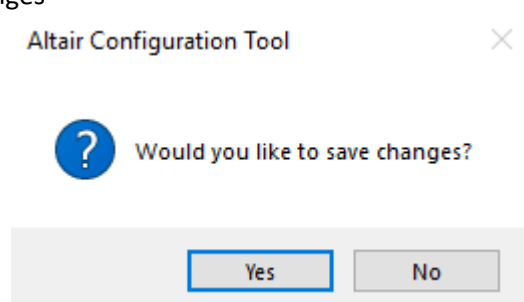
- a. In Products page, select correct RK version that downloaded from Sercomm supportIoT website.



- b. In General Page, select UART\_1 COM port NO, Click “SAVE” button then clicking “Restart and Close”



- c. Click “Yes” to save changes



a. Please execute the clear all session file first



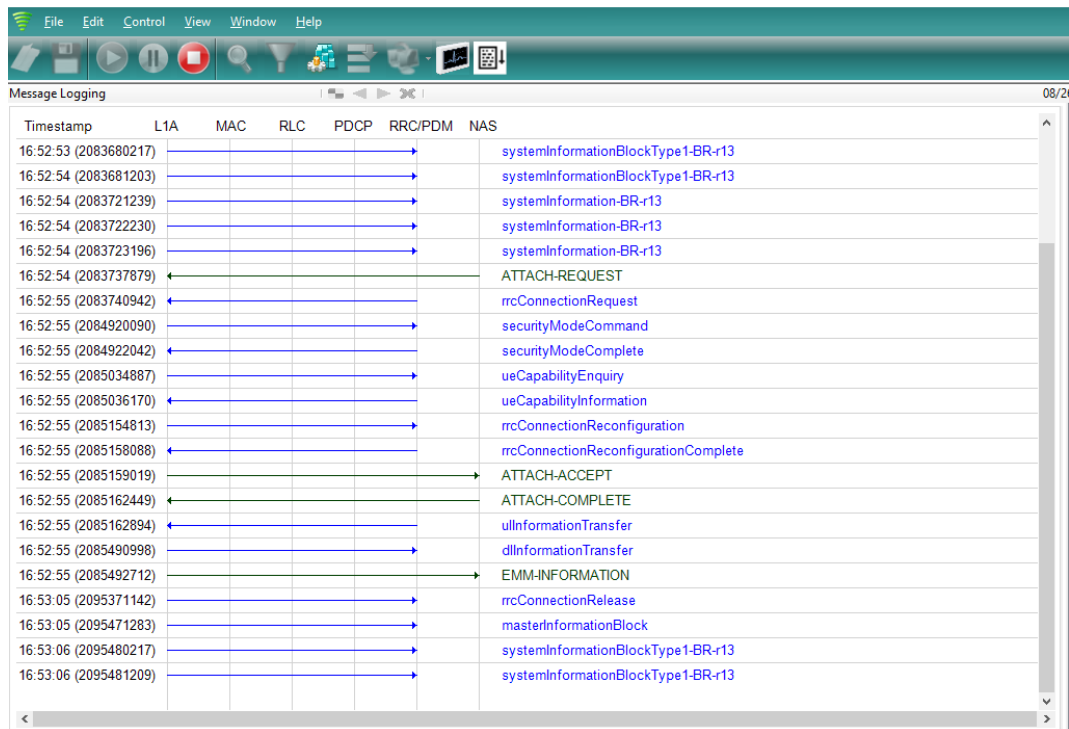
Clear All Session Files

Are you sure you want to delete all session log files ? (Y / N)

[illegible]

### 9.3. Message view

After setting up configuration tool, user can execute "C:\ProgramData\Microsoft\Windows\Start Menu\Programs\Altair Semiconductor\PcTools\Msg View.exe to collect and save message log.



| Timestamp             | L1A | MAC | RLC | PDCP | RRC/PDM | NAS                                  |
|-----------------------|-----|-----|-----|------|---------|--------------------------------------|
| 16:52:53 (2083680217) |     |     |     |      |         | systemInformationBlockType1-BR-r13   |
| 16:52:54 (2083681203) |     |     |     |      |         | systemInformationBlockType1-BR-r13   |
| 16:52:54 (2083721239) |     |     |     |      |         | systemInformation-BR-r13             |
| 16:52:54 (2083722230) |     |     |     |      |         | systemInformation-BR-r13             |
| 16:52:54 (2083723196) |     |     |     |      |         | systemInformation-BR-r13             |
| 16:52:54 (2083737879) |     |     |     |      |         | ATTACH-REQUEST                       |
| 16:52:55 (2083740942) |     |     |     |      |         | rrcConnectionRequest                 |
| 16:52:55 (2084920090) |     |     |     |      |         | securityModeCommand                  |
| 16:52:55 (2084922042) |     |     |     |      |         | securityModeComplete                 |
| 16:52:55 (2085034887) |     |     |     |      |         | ueCapabilityEnquiry                  |
| 16:52:55 (2085036170) |     |     |     |      |         | ueCapabilityInformation              |
| 16:52:55 (2085154813) |     |     |     |      |         | rrcConnectionReconfiguration         |
| 16:52:55 (2085158088) |     |     |     |      |         | rrcConnectionReconfigurationComplete |
| 16:52:55 (2085159019) |     |     |     |      |         | ATTACH-ACCEPT                        |
| 16:52:55 (2085162449) |     |     |     |      |         | ATTACH-COMplete                      |
| 16:52:55 (2085162894) |     |     |     |      |         | ullInformationTransfer               |
| 16:52:55 (2085490998) |     |     |     |      |         | dllInformationTransfer               |
| 16:52:55 (2085492712) |     |     |     |      |         | EMM-INFORMATION                      |
| 16:53:05 (2095371142) |     |     |     |      |         | rrcConnectionRelease                 |
| 16:53:05 (2095471283) |     |     |     |      |         | masterInformationBlock               |
| 16:53:06 (2095480217) |     |     |     |      |         | systemInformationBlockType1-BR-r13   |
| 16:53:06 (2095481209) |     |     |     |      |         | systemInformationBlockType1-BR-r13   |

### 9.4. WiresharkMSGview

#### 9.4.1. Install Python and Wireshark tool

WiresharkMSGview tool can be used to collect packets with the installed Wireshark tool on the user's PC.

Before executing WiresharkMSGview, the user needs to install Python and Wireshark tools on the PC.

For Python, the user can access the website below to download Python 2.7 version.

<https://www.python.org/downloads/release/python-2716/>

#### 9.4.2. Enable Wireshark configuration by sending AT command

- After installing Python and Wireshark, the user needs to enable TPM541 All2msgv configuration by sending the AT command `at%exe="config -s modem_apps.LteSniff.All2msgv 1"` via UART\_0 port.

```
at%exe="config -s modem_apps.LteSniff.All2msgv 1"
Done

OK
atz
OK
```

- Then performing ATZ to restart TPM541 to enable All2msgv configuration.

### 9.4.3. Execute AltairWiresharkMSGview

User can execute following path to run program.

C:\Program Files (x86)\Altair Semiconductor\PcTools\AltairPyTools\AltairWiresharkMsgview

| No. | Time            | TTI  | TimeStampTs | Source       | Destination | Length | Protocol                | CID | Info                      |
|-----|-----------------|------|-------------|--------------|-------------|--------|-------------------------|-----|---------------------------|
| 21  | 17:14:55.089000 | 4229 | 877055319   | 4.4.4.4      | 4.4.4.4     | 63     | LTE RRC UL_DCCH/NAS-EPS |     | RRCConnectionSetupCompl   |
| 22  | 17:14:55.168000 | 4272 | 877099026   | 7.7.7.7      | 7.7.7.7     | 63     | LTE RRC DL_DCCH         |     | SecurityModeCommand       |
| 23  | 17:14:55.230000 | 4274 | 877100964   | 4.4.4.4      | 4.4.4.4     | 58     | LTE RRC UL_DCCH         |     | SecurityModeComplete      |
| 24  | 17:14:55.293000 | 4336 | 877163034   | 7.7.7.7      | 7.7.7.7     | 85     | LTE RRC DL_DCCH         |     | RRCConnectionReconfigur   |
| 25  | 17:14:55.496000 | 4339 | 877166080   | 4.4.4.4      | 4.4.4.4     | 58     | LTE RRC UL_DCCH         |     | RRCConnectionReconfigur   |
| 26  | 17:14:55.589000 | 4853 | 877680138   | 8.8.8.8      | 10.59.62... | 136    | ICMP                    |     | 1 Echo (ping) reply id    |
| 27  | 17:15:05.556000 | 4850 | 887917315   | 7.7.7.7      | 7.7.7.7     | 58     | LTE RRC DL_DCCH         |     | RRCConnectionRelease [c   |
| 28  | 17:15:06.556000 | 4941 | 888006451   | 7.7.7.7      | 7.7.7.7     | 59     | LTE RRC BCCH_BCH        |     | MasterInformationBlock    |
| 29  | 17:15:06.869000 | 4949 | 888015378   | 7.7.7.7      | 7.7.7.7     | 153    | LTE RRC DL_SCH_BR       |     | SystemInformationBlockT   |
| 30  | 17:15:07.118000 | 4951 | 888016525   | 7.7.7.7      | 7.7.7.7     | 153    | LTE RRC DL_SCH_BR       |     | SystemInformationBlockT   |
| 31  | 17:15:24.490000 | 3224 | 906943843   | 10.59.62...  | 8.8.8.8     | 109    | DNS                     |     | 1 Standard query 0x5db4 A |
| 32  | 17:15:24.552000 | 3224 | 906944748   | 4.4.4.4      | 4.4.4.4     | 52     | NAS-EPS                 |     | Service request           |
| 33  | 17:15:24.755000 | 3224 | 906947629   | 4.4.4.4      | 4.4.4.4     | 62     | LTE RRC UL_CCCH         |     | RRCConnectionRequest      |
| 34  | 17:15:24.834000 | 3436 | 906982888   | 7.7.7.7      | 7.7.7.7     | 105    | LTE RRC DL_CCCH         |     | RRCConnectionSetup        |
| 35  | 17:15:25.036000 | 3440 | 906986217   | 4.4.4.4      | 4.4.4.4     | 63     | LTE RRC UL_DCCH/NAS-EPS |     | RRCConnectionSetupCompl   |
| 36  | 17:15:25.099000 | 3499 | 907046057   | 7.7.7.7      | 7.7.7.7     | 63     | LTE RRC DL_DCCH         |     | SecurityModeCommand       |
| 37  | 17:15:25.162000 | 3501 | 907048010   | 4.4.4.4      | 4.4.4.4     | 58     | LTE RRC UL_DCCH         |     | SecurityModeComplete      |
| 38  | 17:15:25.224000 | 3536 | 907083057   | 7.7.7.7      | 7.7.7.7     | 85     | LTE RRC DL_DCCH         |     | RRCConnectionReconfigur   |
| 39  | 17:15:25.412000 | 3539 | 907086083   | 4.4.4.4      | 4.4.4.4     | 58     | LTE RRC UL_DCCH         |     | RRCConnectionReconfigur   |
| 40  | 17:15:25.505000 | 3985 | 907532166   | 8.8.8.8      | 10.59.62... | 141    | DNS                     |     | 1 Standard query response |
| 41  | 17:15:25.568000 | 3987 | 907533966   | 10.59.62...  | 104.28.1... | 96     | TCP                     |     | 1 64656 → 80 [SYN] Seq=0  |
| 42  | 17:15:25.771000 | 4609 | 908156211   | 104.28.18... | 10.59.62... | 96     | TCP                     |     | 1 80 → 64656 [SYN, ACK] S |
| 43  | 17:15:25.833000 | 4610 | 908157036   | 10.59.62...  | 104.28.1... | 92     | TCP                     |     | 1 64656 → 80 [ACK] Seq=1  |
| 44  | 17:15:25.896000 | 4611 | 908157869   | 10.59.62...  | 104.28.1... | 146    | HTTP                    |     | 1 GET /json HTTP/1.1      |
| 45  | 17:15:26.146000 | 4993 | 908540146   | 104.28.18... | 10.59.62... | 92     | TCP                     |     | 1 80 → 64656 [ACK] Seq=1  |
| 46  | 17:15:26.568000 | 5441 | 908988053   | 104.28.18... | 10.59.62... | 635    | HTTP                    |     | 1 HTTP/1.1 200 OK (appli  |
| 47  | 17:15:26.646000 | 5487 | 909033898   | 10.59.62...  | 104.28.1... | 92     | TCP                     |     | 1 64656 → 80 [ACK] Seq=55 |
| 48  | 17:15:36.970000 | 5561 | 919348304   | 7.7.7.7      | 7.7.7.7     | 58     | LTE RRC DL_DCCH         |     | RRCConnectionRelease [c   |
| 49  | 17:15:38.001000 | 5671 | 919456486   | 7.7.7.7      | 7.7.7.7     | 59     | LTE RRC BCCH_BCH        |     | MasterInformationBlock    |
| 50  | 17:15:38.313000 | 5679 | 919465393   | 7.7.7.7      | 7.7.7.7     | 153    | LTE RRC DL_SCH_BR       |     | SystemInformationBlockT   |
| 51  | 17:15:38.532000 | 5681 | 919466517   | 7.7.7.7      | 7.7.7.7     | 153    | LTE RRC DL_SCH_BR       |     | SystemInformationBlockT   |
| 52  | 17:15:56.544000 | 4504 | 938989196   | 10.59.62...  | 104.28.1... | 92     | TCP                     |     | 1 64656 → 80 [FIN, ACK] S |

### 9.5. Collect Logs of modem

It is the modem logs of Altair format. User can capture the logs via UATR2 and provide the files to SERCOMM AE for analysis.

Note :

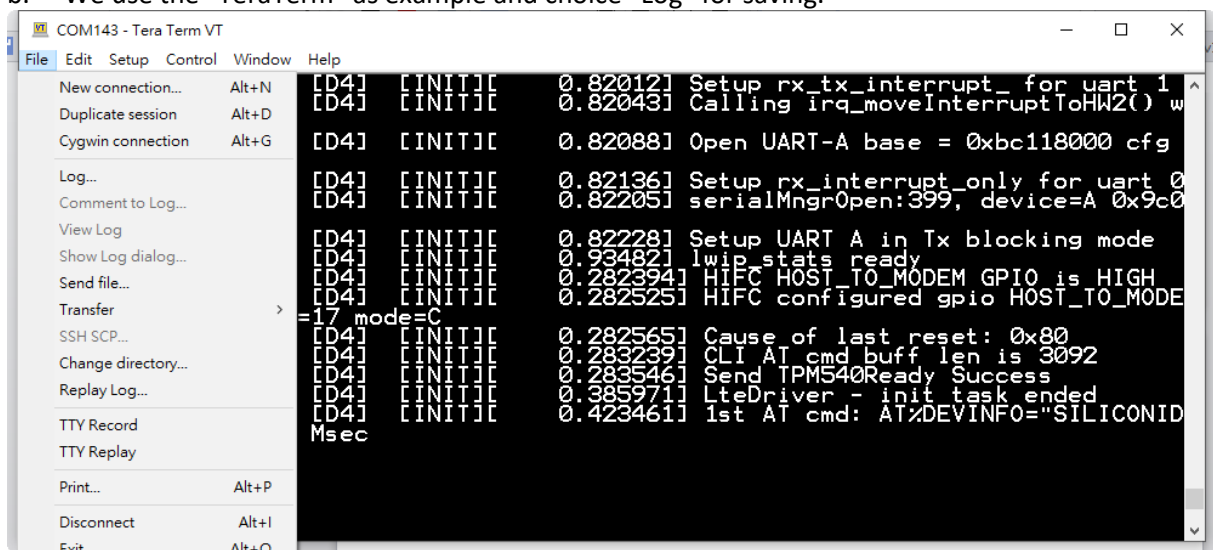
- The logs should start at modem boot-up to the end of test and save it. You can press "ENTER" bottom and get ">" symbol to make sure that the modem is work.

```

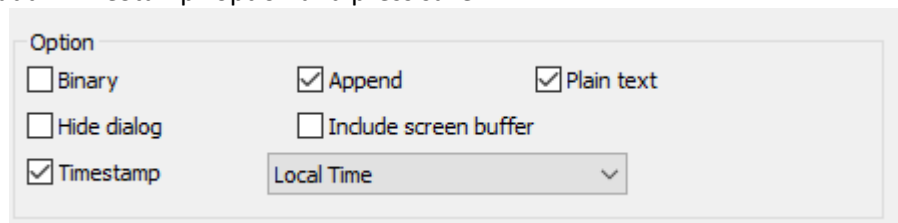
COM143 - Tera Term VT
File Edit Setup Control Window Help
Mar 03 00:28:32.050 [D4] [INIT][ 0.82012] Setup rx_tx_interrupt_for uart 1
Mar 03 00:28:32.050 [D4] [INIT][ 0.82043] Calling irq_moveInterruptToHW2() w
ith uart id=1
Mar 03 00:28:32.050 [D4] [INIT][ 0.82088] Open UART-A base = 0xbc118000 cfg
=0x0 intrp=72
Mar 03 00:28:32.050 [D4] [INIT][ 0.82136] Setup rx_interrupt_only for uart 0
Mar 03 00:28:32.050 [D4] [INIT][ 0.82205] serialMngrOpen:399, device=A 0x9c0
bld0
Mar 03 00:28:32.050 [D4] [INIT][ 0.82228] Setup UART A in Tx blocking mode
Mar 03 00:28:32.061 [D4] [INIT][ 0.93482] lwip_stats ready
Mar 03 00:28:32.250 [D4] [INIT][ 0.282394] HIFC HOST_TO_MODEM GPIO is HIGH
Mar 03 00:28:32.250 [D4] [INIT][ 0.282525] HIFC configured gpio HOST_TO_MODE
M=61, MODEM TO HOST=17 mode=C
Mar 03 00:28:32.250 [D4] [INIT][ 0.282565] Cause of last reset: 0x80
Mar 03 00:28:32.251 [D4] [INIT][ 0.283239] CLI AT cmd buff len is 3092
Mar 03 00:28:32.251 [D4] [INIT][ 0.283546] Send TPM540Ready Success
Mar 03 00:28:32.354 [D4] [INIT][ 0.385971] LteDriver - init task ended
Mar 03 00:28:32.391 [D4] [INIT][ 0.423461] 1st AT cmd: AT+DEVIDF0="SILICONID
" - sent/rcv -> 0/0 Msec

>>
>>
  
```

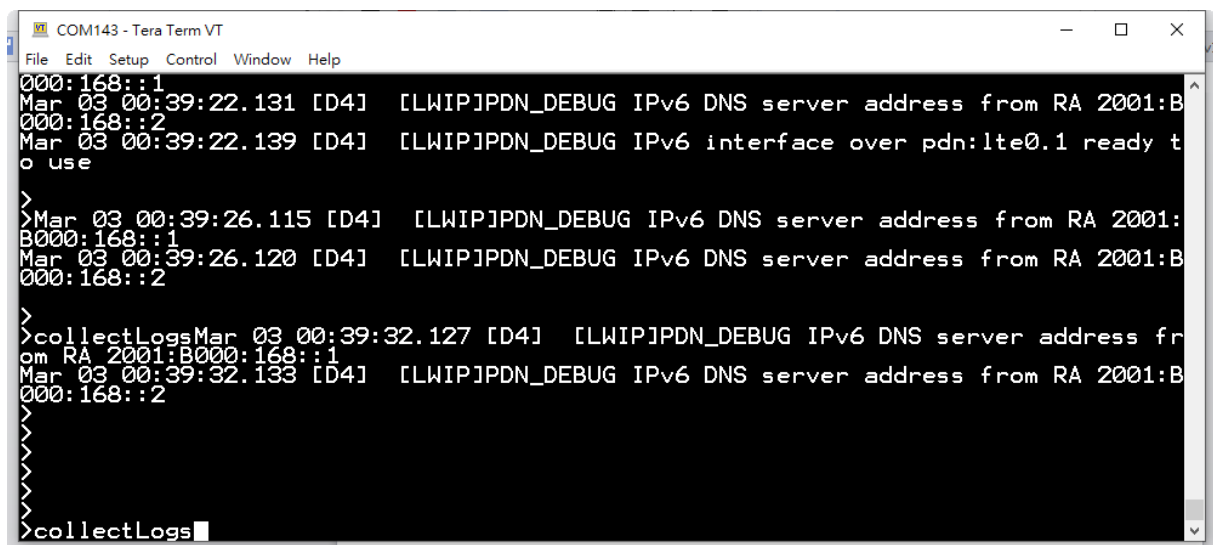
b. We use the “TeraTerm” as example and choice “Log” for saving.



c. Please add “TimeStamp” option and press save.

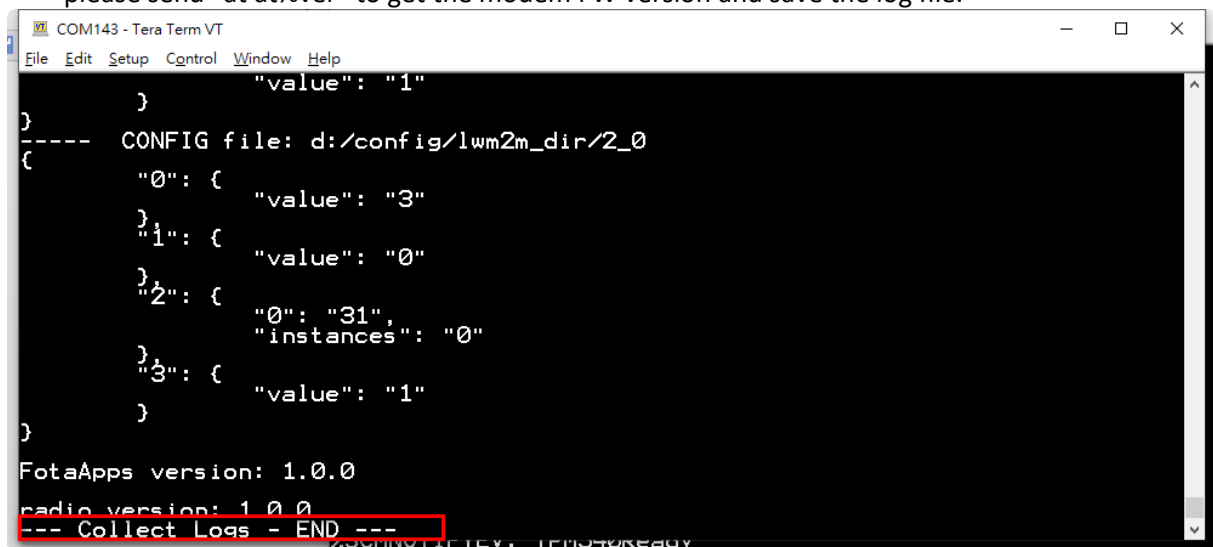


d. Please send “collectLogs” to do the logs capturing.



```
COM143 - Tera Term VT
File Edit Setup Control Window Help
000:168::1
Mar 03 00:39:22.131 [D4] [LWIP]PDN_DEBUG IPv6 DNS server address from RA 2001:B
000:168::2
Mar 03 00:39:22.139 [D4] [LWIP]PDN_DEBUG IPv6 interface over pdn:lte0.1 ready t
o use
>
>Mar 03 00:39:26.115 [D4] [LWIP]PDN_DEBUG IPv6 DNS server address from RA 2001:
B000:168::1
Mar 03 00:39:26.120 [D4] [LWIP]PDN_DEBUG IPv6 DNS server address from RA 2001:B
000:168::2
>
>collectLogsMar 03 00:39:32.127 [D4] [LWIP]PDN_DEBUG IPv6 DNS server address fr
om RA 2001:B000:168::1
Mar 03 00:39:32.133 [D4] [LWIP]PDN_DEBUG IPv6 DNS server address from RA 2001:B
000:168::2
>
>
>
>
>collectLogs
```

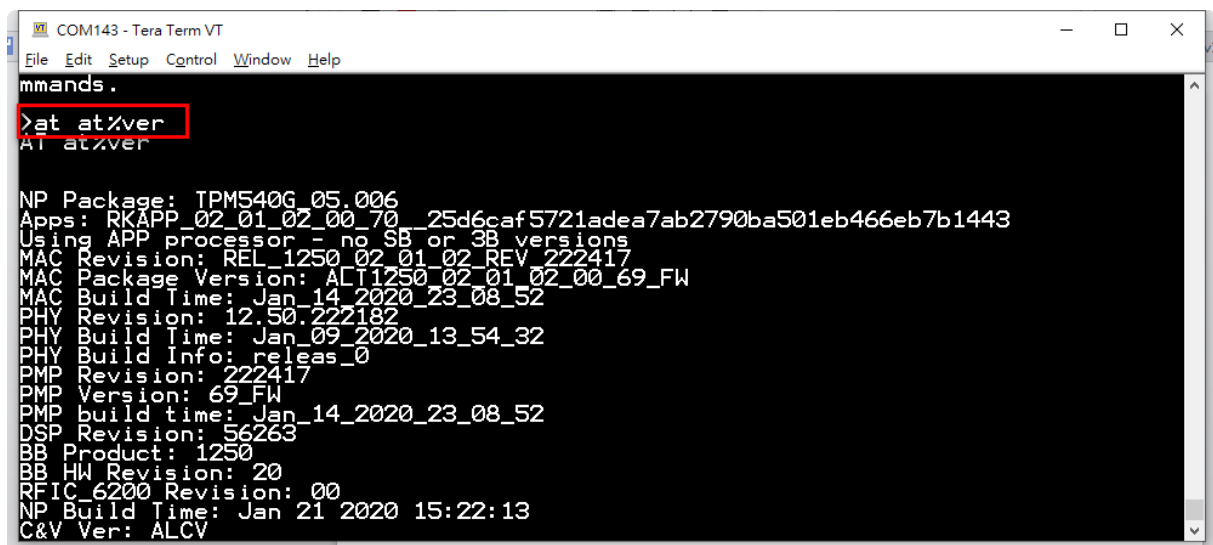
- e. When the processed done, you will can get the “=== Collect Logs - END ===” string. Finally, please send “at+at%ver” to get the modem FW version and save the log file.



```
COM143 - Tera Term VT
File Edit Setup Control Window Help
    "value": "1"
}
}
---- CONFIG file: d:/config/lwm2m_dir/2_0
{
  "0": {
    "value": "3"
  }
  "1": {
    "value": "0"
  }
  "2": {
    "0": "31",
    "instances": "0"
  }
  "3": {
    "value": "1"
  }
}
}
FotaApps version: 1.0.0
radio version: 1.0.0
--- Collect Logs - END ---
%SCNNOTATLEV: TPM340ready
```

# TPM541 series

Cat-M1/NB Module



The screenshot shows a Tera Term VT window titled 'COM143 - Tera Term VT'. The window has a menu bar with 'File', 'Edit', 'Setup', 'Control', 'Window', and 'Help'. The main text area displays the following information:

```
mmands.  
>at at%ver  
AT at%ver  
  
NP Package: TPM540G_05_006  
Apps: RKAPP_02_01_02_00_70_25d6caf5721adea7ab2790ba501eb466eb7b1443  
Using APP processor - no SB or 3B versions  
MAC Revision: REL_1250_02_01_02_REV_222417  
MAC Package Version: ALI1250_02_01_02_00_69_FW  
MAC Build Time: Jan_14_2020_23_08_52  
PHY Revision: 12.50.222182  
PHY Build Time: Jan_09_2020_13_54_32  
PHY Build Info: releas_0  
PMP Revision: 222417  
PMP Version: 69_FW  
PMP build time: Jan_14_2020_23_08_52  
DSP Revision: 56263  
BB Product: 1250  
BB HW Revision: 20  
RFIC_6200 Revision: 00  
NP Build Time: Jan 21 2020 15:22:13  
C&V Ver: ALCV
```

## Federal Communication Commission Interference 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.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

### **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 transmitter is certified under the standalone operation condition and may not be installed to co-transmission with other transmitter without separate reassessment. It is OEM/Host manufacturer's responsibility to conduct a separate compliance reevaluation for confirming that final system continuously complies with the applicable FCC rules under that circumstance.

### **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 20cm between the radiator & your body.

**This module is intended for OEM integrators only. Per FCC KDB 996369 D03 OEM Manual v01 guidance, the following conditions must be strictly followed when using this certified module:**

This module has been tested for compliance to FCC Part 24, 27.

The module is tested for standalone mobile RF exposure use condition. Any other usage conditions such as co-location with other transmitter(s) or being used in a portable condition will need a separate reassessment through a class II permissive change application or new certification.

Any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify the module grantee that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the grantee, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

This equipment complies with FCC mobile radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator & your body. If the module is installed in a portable host, a separate SAR evaluation is required to confirm compliance with relevant FCC portable RF exposure rules.

The antenna must be installed such that 20 cm can be maintained between the antenna and users, and the maximum antenna gain allowed for use with this device is 1.7dBi for band 2 and 4, 1.2dBi for band 12. Only dipole antenna can be used for this device.

The final end product must be labeled in a visible area with the following: "Contains FCC ID: P27-TPM541". The grantee's FCC ID can be used only when all FCC compliance requirements are met.

This transmitter is tested in a standalone mobile RF exposure condition and any co-located or simultaneous transmission with other transmitter(s) or portable use will require a separate class II permissive change re-evaluation or new certification.

This transmitter module is tested as a subsystem and its certification does not cover the FCC Part 15 Subpart B (unintentional radiator) rule requirement applicable to the final host. The final host will still need to be reassessed for compliance to this portion of rule

requirements if applicable.

As long as all conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

**IMPORTANT NOTE:** In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

### Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

### OEM/Host manufacturer responsibilities

OEM/Host manufacturers are ultimately responsible for the compliance of the Host and Module. The final product must be reassessed against all the essential requirements of the FCC rule such as FCC Part 15 Subpart B before it can be placed on the US market. This includes reassessing the transmitter module for compliance with the Radio and EMF essential requirements of the FCC rules. This module must not be incorporated into any other device or system without retesting for compliance as multi-radio and combined equipment.