Application Note : Assembly And Maintenance Manual for Telink BLE 1x1 Test System 2.1

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Ver 1.2.0

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Brief:

This document is the assembly and maintenance guide for Telink BLE 1x1 Test System 2.1.

TELINK SEMICONDUCTOR

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Revision History

Version	Major Changes	Date	Author
1.0.0	Initial release	2016/5	H.Z.F., L.X., Cynthia
1.1.0	Updated buzzer related contents, including: buzzer module photo, cable connection between buzzer and EVK daughter board, cable connection chart, test system photo, Amic test item, buzzer spec in hardware list, and dimension chart of buzzer board.	2016/8	T.J.B., Cynthia
1.2.0	Updated the “spec” column in hardware list.	2016/9	H.Z.F., Cynthia

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1 Overall Architecture Of 1x1 Test System 2.1

Telink BLE 1x1 Test System 2.1 consists of test bench and mechanical structure. The test bench includes hardware platform and firmware folder, and it's provided by Telink; while customer needs to make the mechanical structure suitable for DUT (Device Under Test), and connect cables according to the guide in this document.

A set of 1x1 Test Bench mainly contains the following hardware resources.

1) An EVK daughter board provided by Telink. The EVK board should be burned with the EVK firmware for test bench.

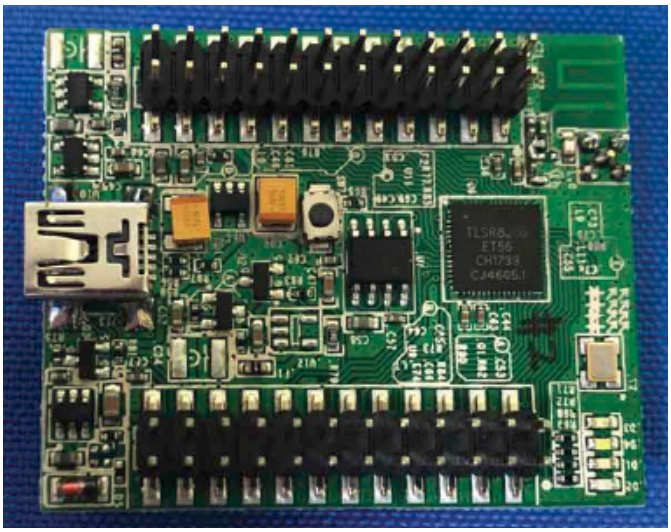


Figure 1 EVK daughter board

3) A buzzer module (Dimension: 50.2x16mm): The buzzer is connected to corresponding GPIO and 3V3DUT of the EVK daughter board via Dupont cables.

The buzzer module is used for Amic test, and it should be placed as close to Amic as possible.

Note: Do not contact buzzer board with Amic directly, and there should be no obstacle between them.

Figure 3 Buzzer module

4) A PC. On PC side, the EvkMonitor tool can be used to burn firmware for EVK daughter board (refer to **Section 3**), and user can also observe test result via the EvkMonitor (refer to **Section 4**).

Figure below shows the system connection chart.

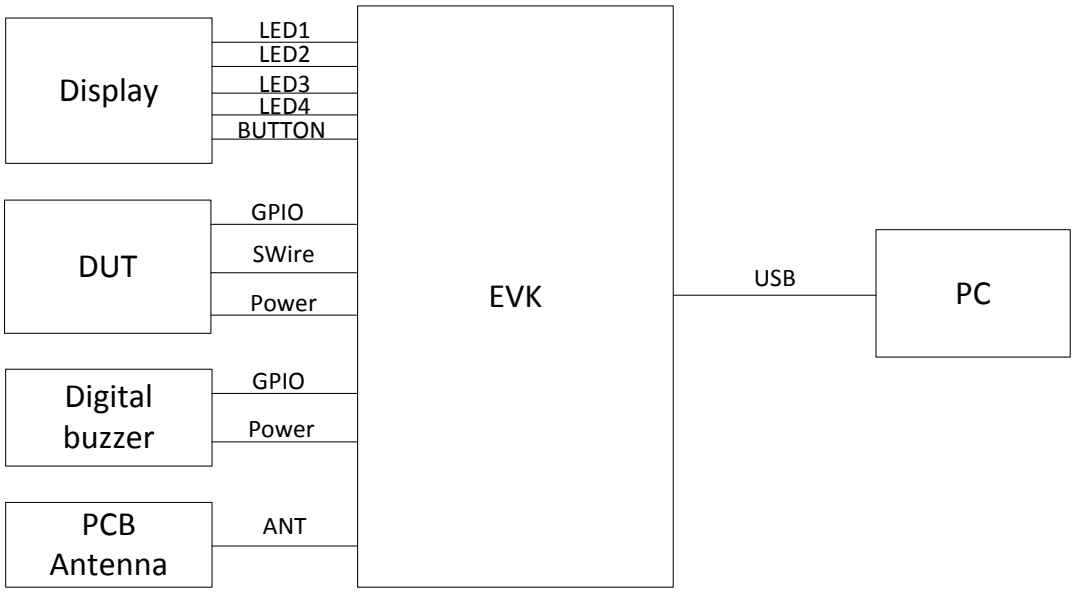


Figure 4 System connection chart

2.2 Cable connection

2.2.1 Connection points on EVK daughter board

Figure 7 marks connection points on EVK daughter board to be connected with DUT, PCB antenna and mechanical structure in any application.

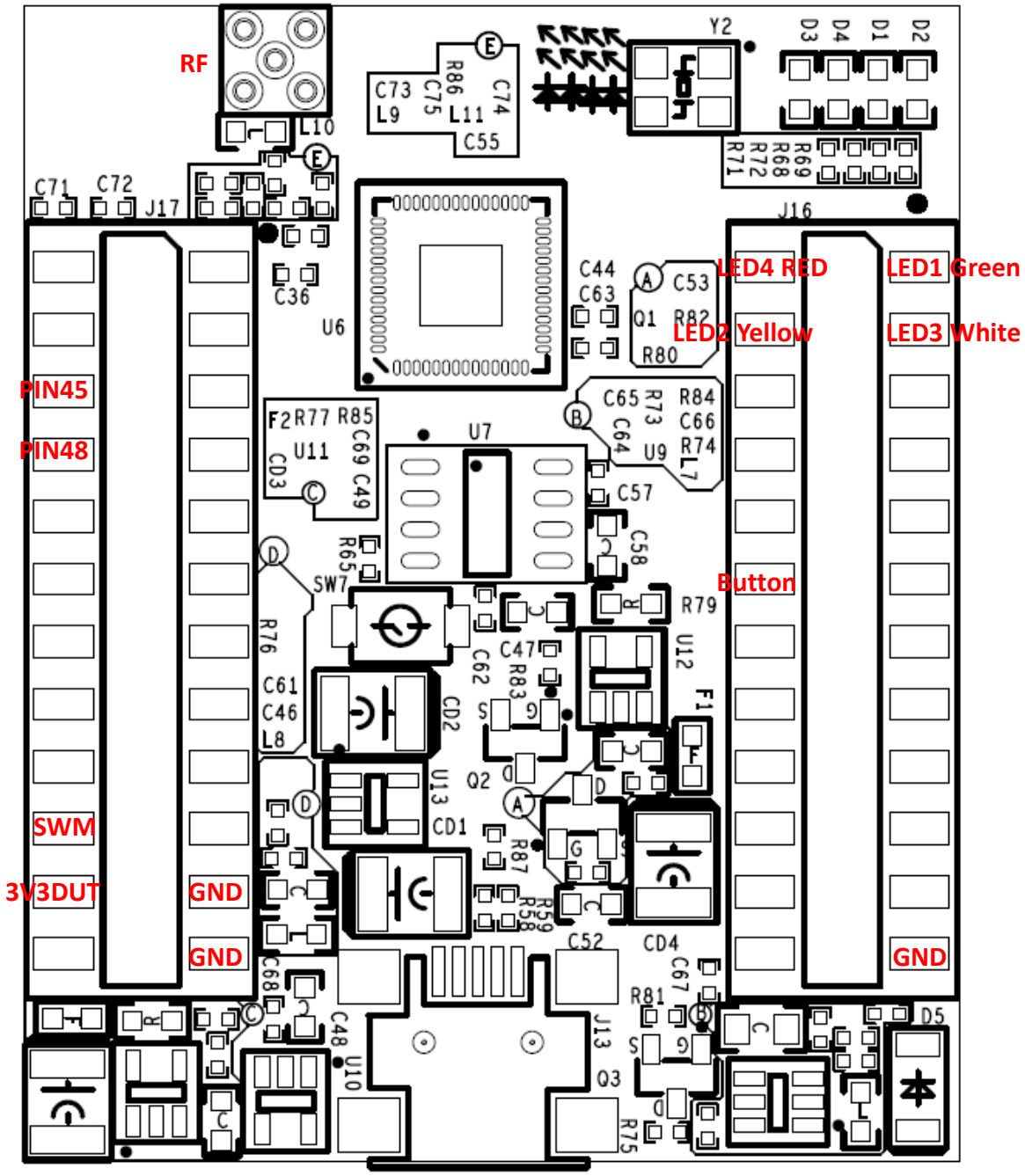


Figure 7 Connection points on EVK daughter board

2.2.2 Cable connection between EVK daughter board and PCB antenna

The connection point “RF” on EVK daughter board should be connected with PCB antenna board via an RF cable.

2.2.3 Cable connection between EVK daughter board and buzzer

Table 1 shows the connection correspondence between EVK daughter board and buzzer board.

Table 1 Cable connection between EVK and buzzer

Connection points on EVK daughter board	Connection points on buzzer board
PIN48	VCC
3V3DUT	3V3B
GND	GND

2.2.4 Cable connection between EVK daughter board and Mechanical structure

Table 2 shows the connection correspondence between EVK daughter board and Mechanical structure.

Table 2 Cable connection between EVK and Mechanical structure

Connection points on EVK daughter board	Connection points on Mechanical structure
LED1 Green	Green LED+
LED2 Yellow	Yellow LED+
LED3 White	White LED+
LED4 RED	Red LED+
Button	Button+
GND	Green LED-, Yellow LED-, White LED-, Red LED-, Button-

2.2.5 Cable connection between EVK daughter board and DUT

Table 3 shows the connection correspondence between EVK daughter board and DUT.

Table 3 Cable connection between EVK and DUT

Connection points on EVK daughter board	Connection points on DUT
3V3DUT	BAT+
GND	BAT-
SWM	SWS (DUT)

If the DUT is a remote control board, it's also needed to connect wakeup pin of the DUT with PIN45 of the EVK board.

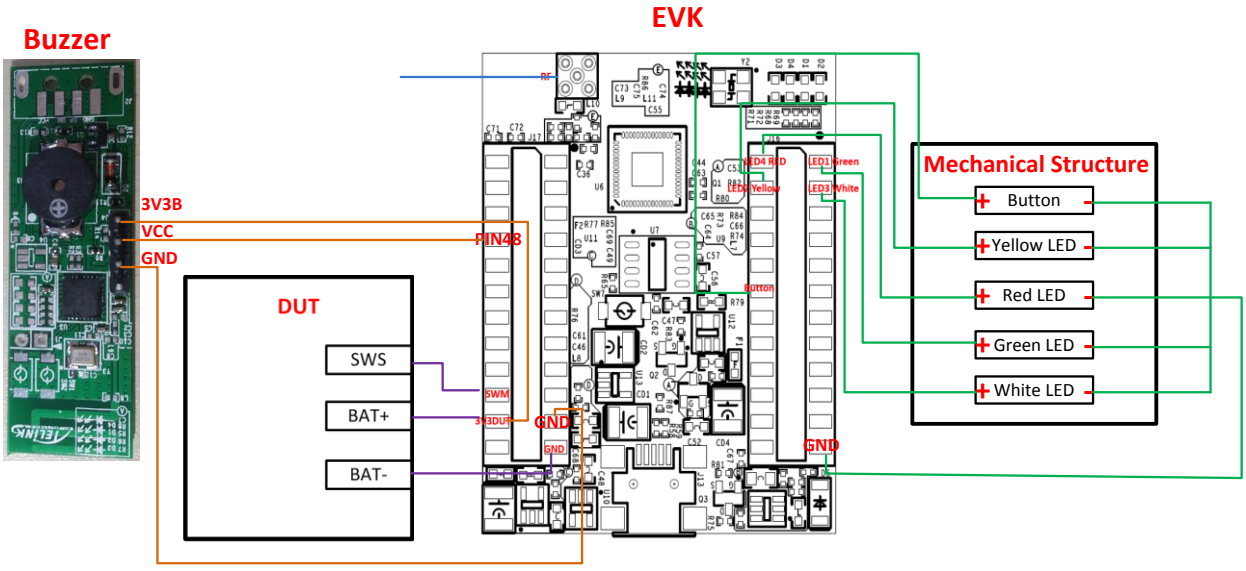
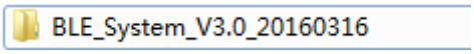


Figure 8 Cable connection chart

3 Firmware Burning For EVK Daughter Board

3.1 Folder structure for Test Bench Firmware

Telink test bench firmware folder is generally named as “BLE_System_V3.0_xxx”.

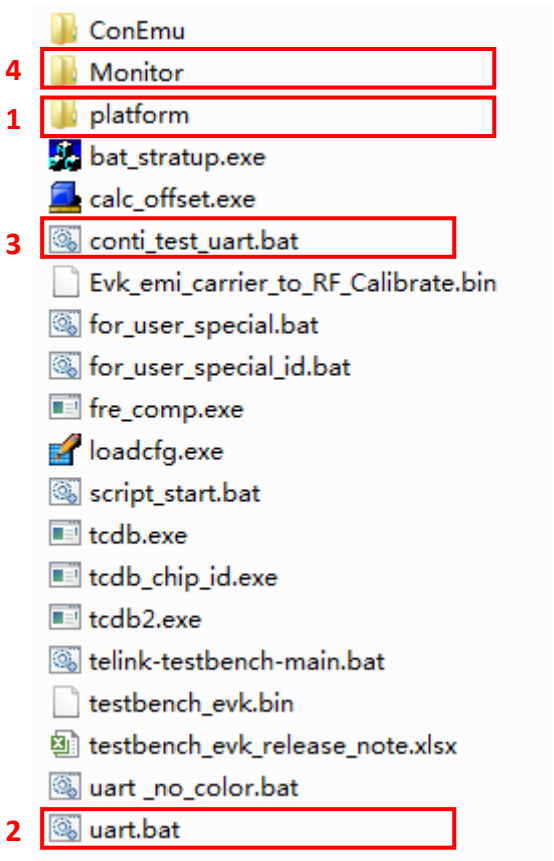


The structure of the “BLE_System_V3.0_xxx” folder is shown as below:

“DB”: This folder contains db files.

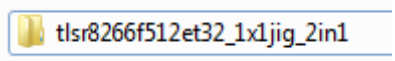
“Sch”: This folder contains schematics, cable connection illustration, and etc.

The structure of the “Script” folder is shown as below:

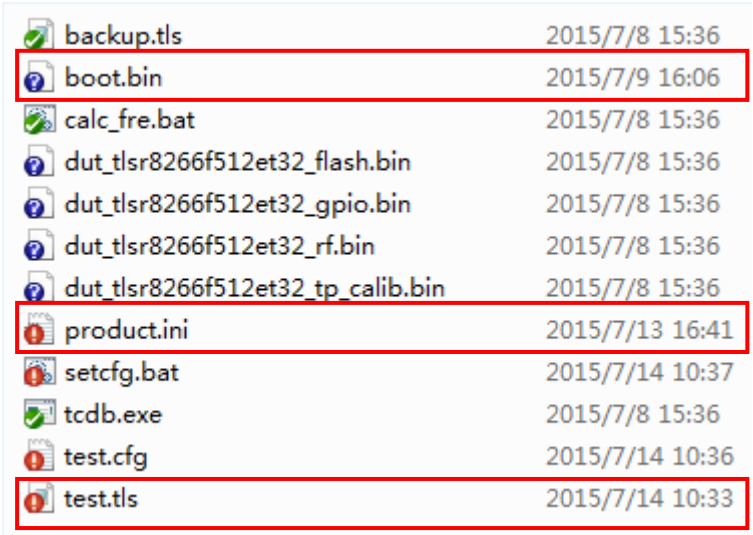


1) platform: This folder contains project files.

E.g.

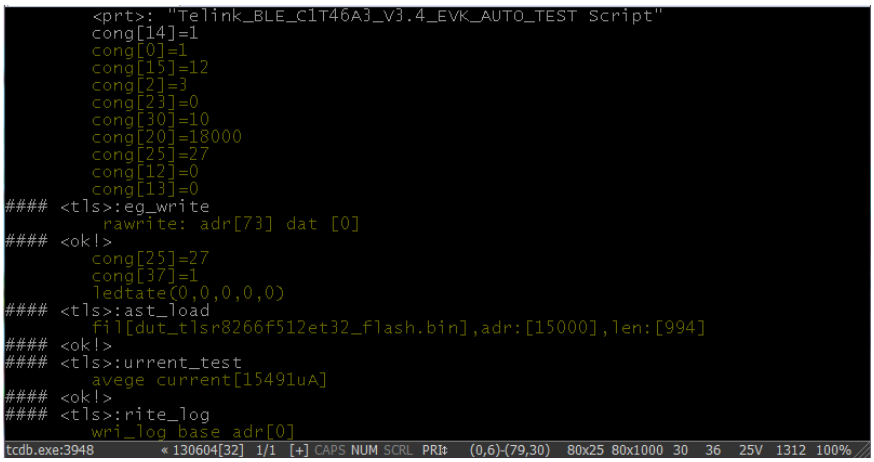


Double click “tlsr8266f512et32_1x1Jig_2in1” to open the following interface.

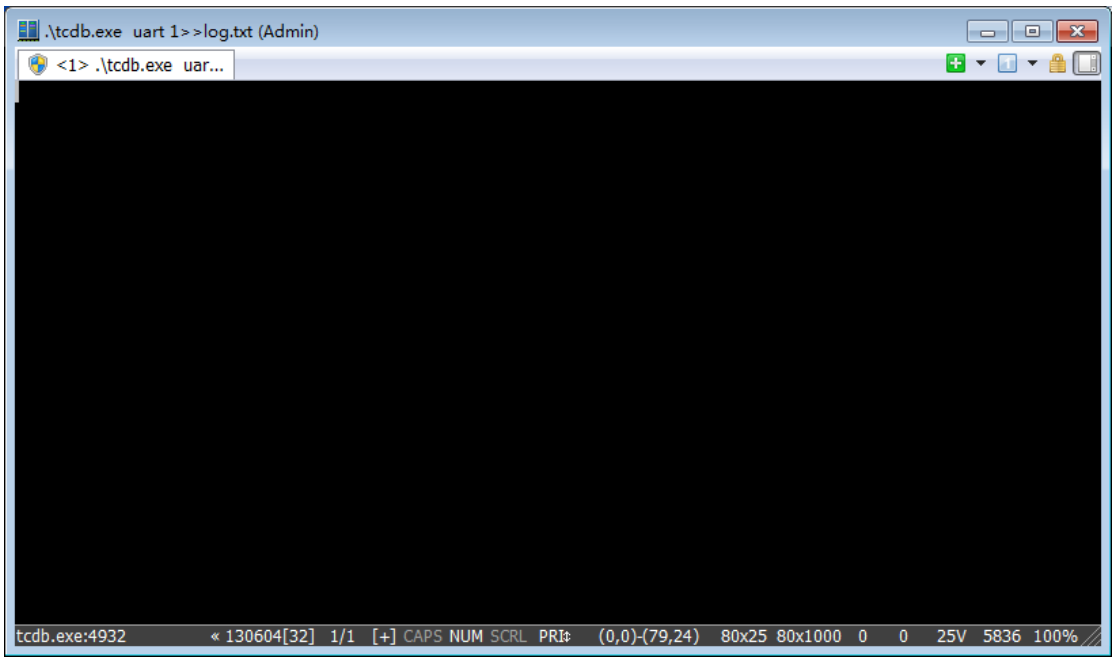


- ✧ test.tls: Jig test script to determine PCBA test items.
- ✧ product.ini: EVK product information to determine PCBA RF test frequency point and ID.
- ✧ boot.bin: Image file to download into PCBA finally.

2) uart: Double click “uart.bat” to open uart window and display real-time log for the convenience of test status check. Only one uart window is allowed at the same time.



3) conti_test_uart.bat: Double click the file, a uart window will pop up; data won’t be available on the window, but only saved in “log.txt” under this directory for convenience of analysis.



4) Monitor: This folder contains the “EvkMonitor” tool on PC side.

3.2 Firmware burning for EVK daughter board

EVK daughter board should be burned with firmware before it's ready for use.

First connect the EVK daughter board with PC via an USB cable, as shown in Figure 10.

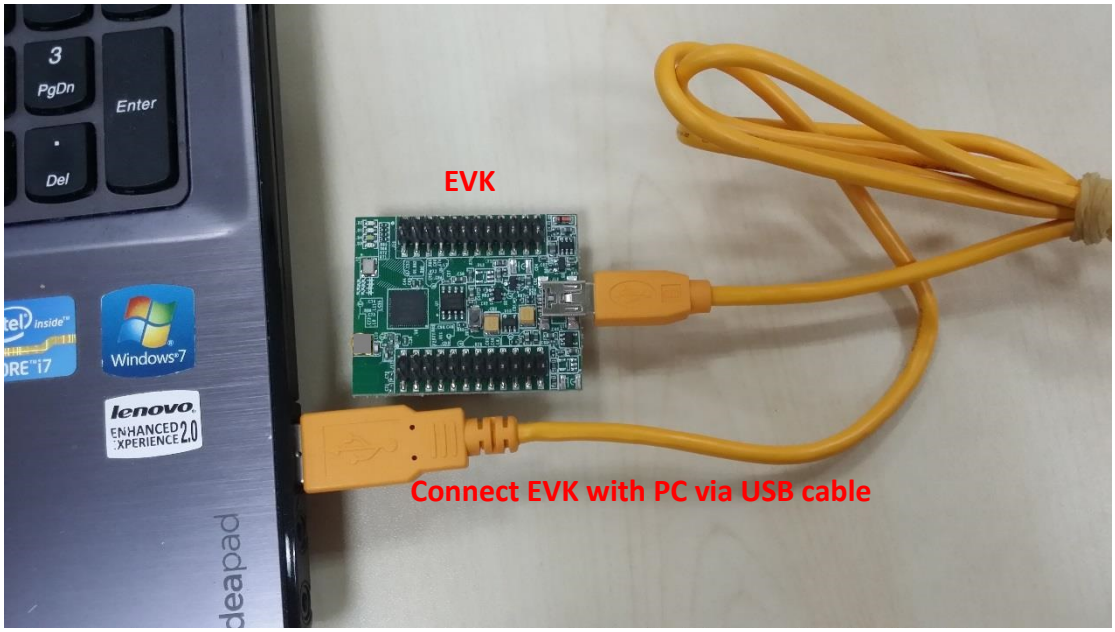
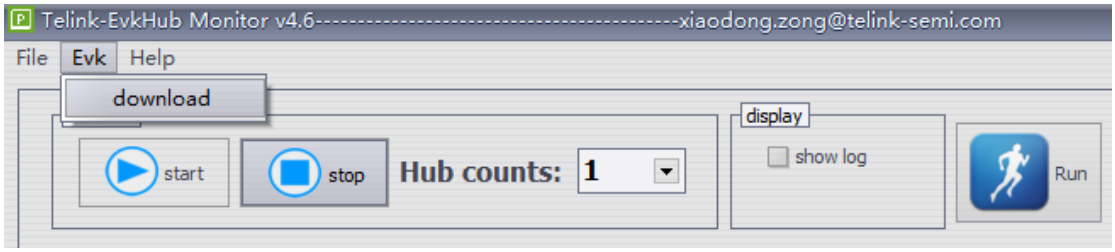


Figure 10 Connection chart between EVK daughter board and PC

Then double click the "EvkMonitor.exe" under the "BLE_System_V3.0_xxx\Script\Monitor" folder.



Click "download" under the menu "Evk" to open the burning interface.

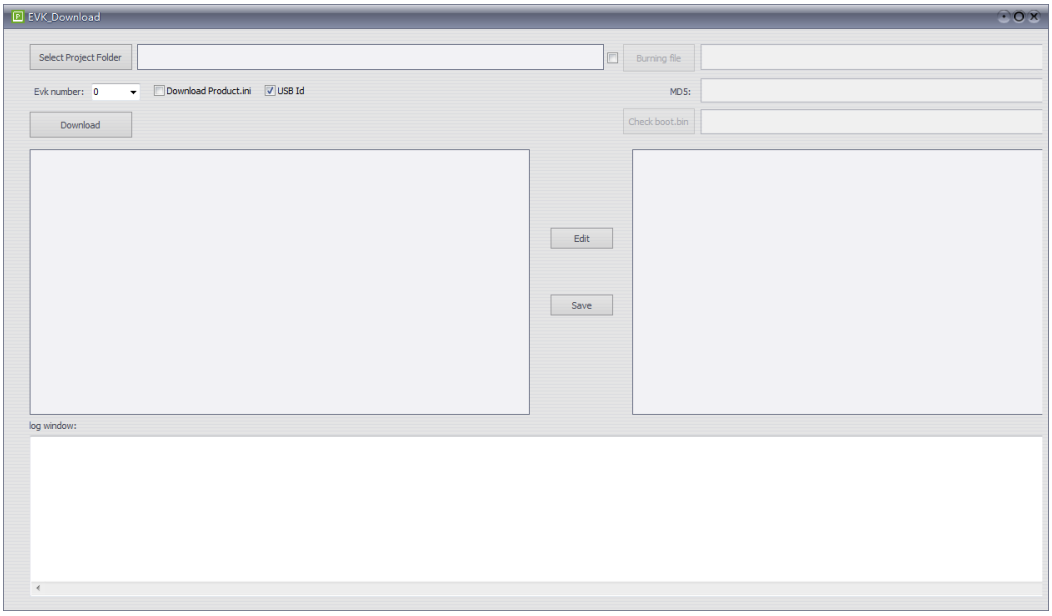


Figure 11 Firmware burning interface 1 for EVK daughter board

First click the "**Select Project Folder**" button and select the target project folder (i.e. the project under "platform") in the pop-out window. The selected project path will be available in the box next to the "Select Project Folder" button; test script and product configuration information files will be available in the "test.tls" and "product.ini" editing window, respectively.

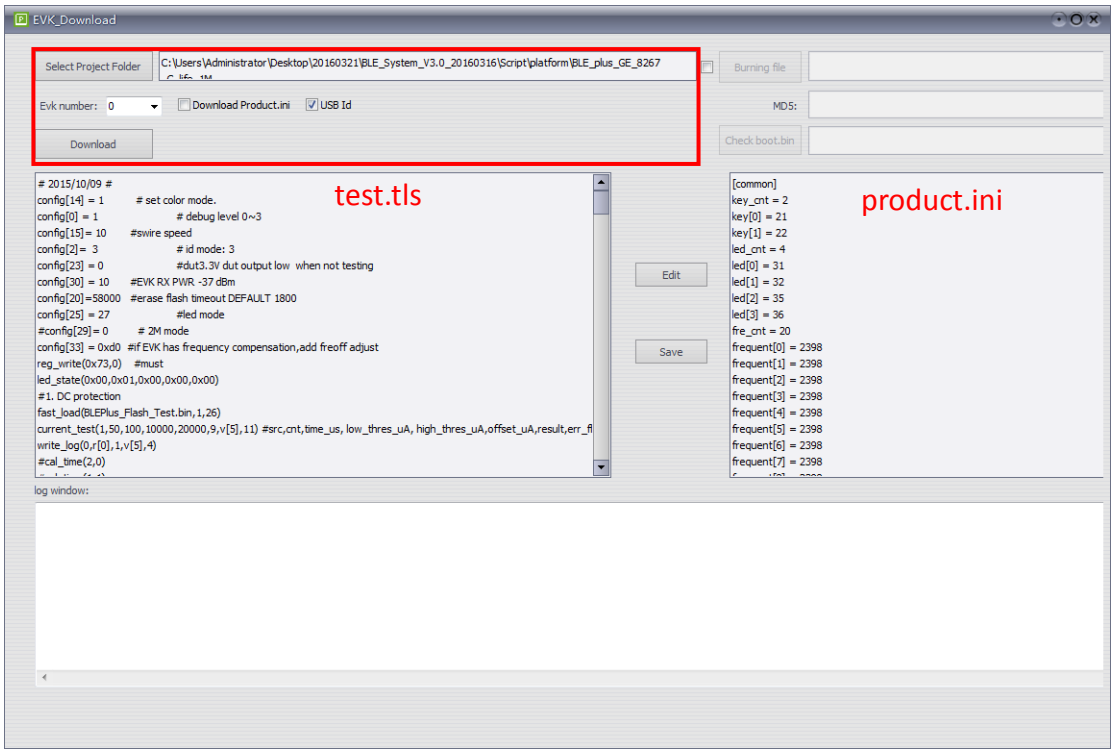
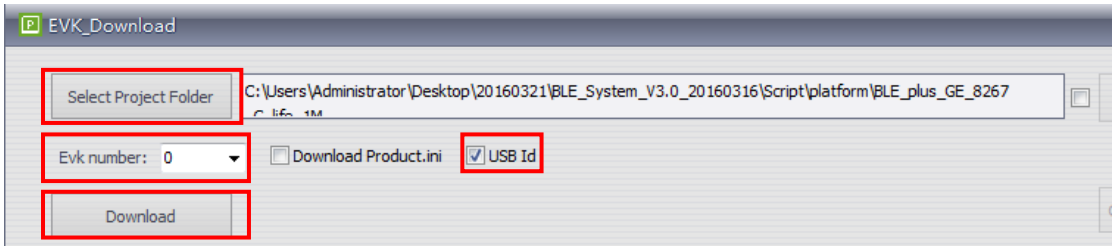
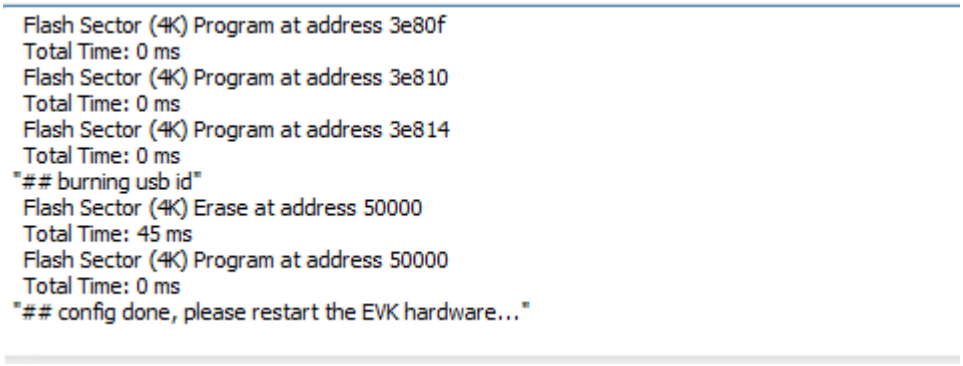


Figure 12 Firmware burning interface 2 for EVK daughter board

During first time of firmware burning, it's needed to configure product information (product.ini) for the EVK daughter board. Tick the "**USB Id**" box and set "**Evk number**" as "0" (always).



Then click the "**Download**" button to start burning. The log window keeps scrolling until it's as shown in the figure below.

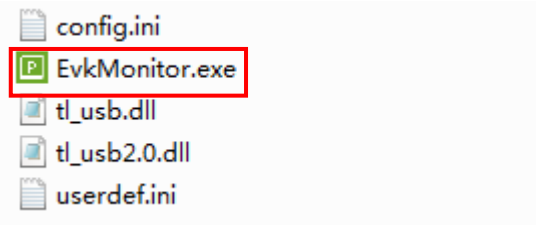


Now the EVK daughter board is already burned with evk_testbench.bin, test.tls, product.ini, id and other bin files in the folder.

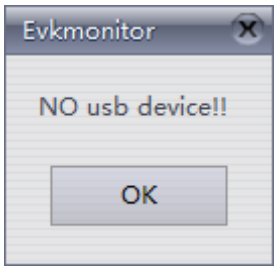
After power cycle, the EVK daughter board is ready for use.

4 Observe Test Result Via PC Software EvkMonitor

Double click the “Monitor” folder under “BLE_System_V3.0_xxx\Script”.



Double click the “EvkMonitor.exe” to open the software interface. If a prompt information of “NO usb device” pops up as shown below, it indicates communication problem such as USB cable connection with the EVK and PC; though software interface still pops up, user must check and make sure the connection is OK, then restart the software.



After the software is started properly, the interface is shown as below:

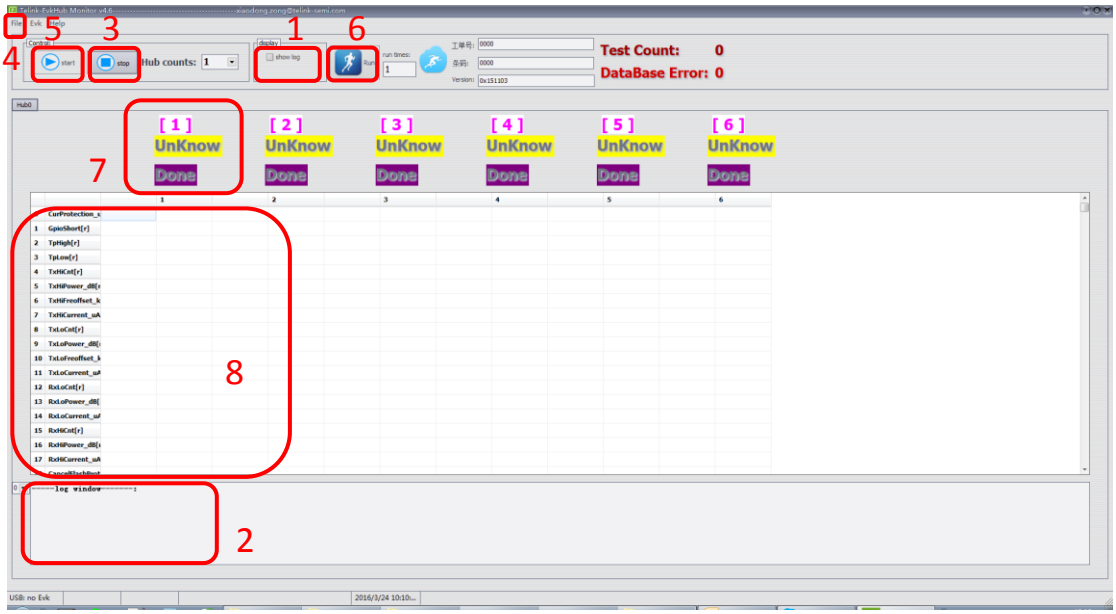
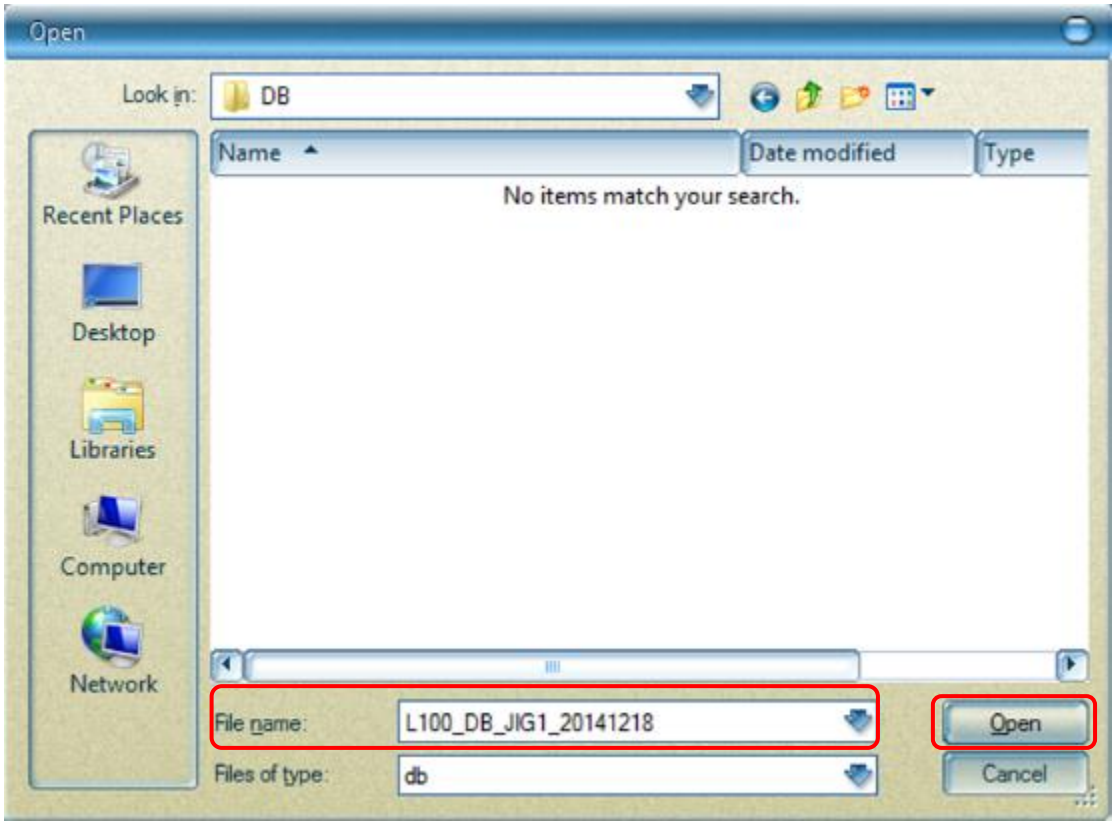


Figure 13 EvkMonitor tool interface

- ✧ show log: Tick the “show log” box (as shown in mark 1 of Figure 13) to enable the “log window” to display dynamic information.
- ✧ log window: As shown in mark 2 of Figure 13, it’s the area to display dynamic information.
- ✧ Stop: As shown in mark 3 of Figure 13, the software is in the state of stop by default.
- ✧ File: Click “open” under the “File” menu (as shown in mark 4 of Figure 13), a window to set the storage path for database files will pop up.

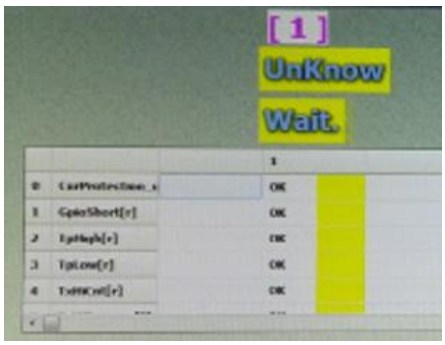


Select the storage path as needed, input file name and then click the “Open” button. Test result will be automatically stored under the directory by the software.

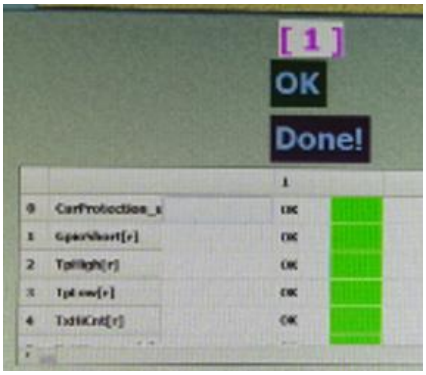
Note： Only storage path and file name in English are allowed, otherwise it will invalidate the database creation.

- ✧ start: Click the “start” icon (as shown in mark 5 of Figure 13), the software enters the state waiting for receiving the test result.
- ✧ Run: Click the “Run” icon (as shown in mark 6 of Figure 13) to start testing.

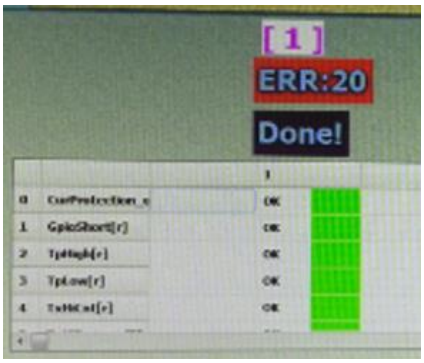
✧ status: As shown in mark 7 of Figure 13, it serves to display running state of the EVK.



The figure above indicates the state of “Ongoing”.



The figure above indicates the state of “Success”.



The figure above indicates the state of “Failure”.

For convenience of subsequent maintenance, it’s highly recommended to mark the error items and classify them.

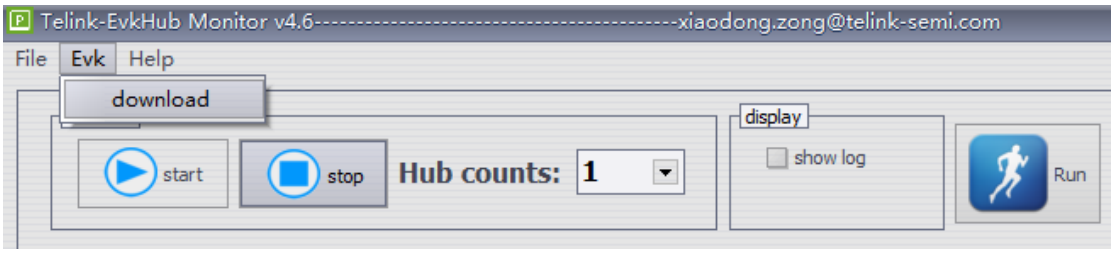
✧ data: As shown in mark 8 of Figure 13, it serves to display test result.

Please refer to **Appendix 1** Test Item List On PC Software “EvkMonitor” for details about test items and corresponding maintenance suggestions.

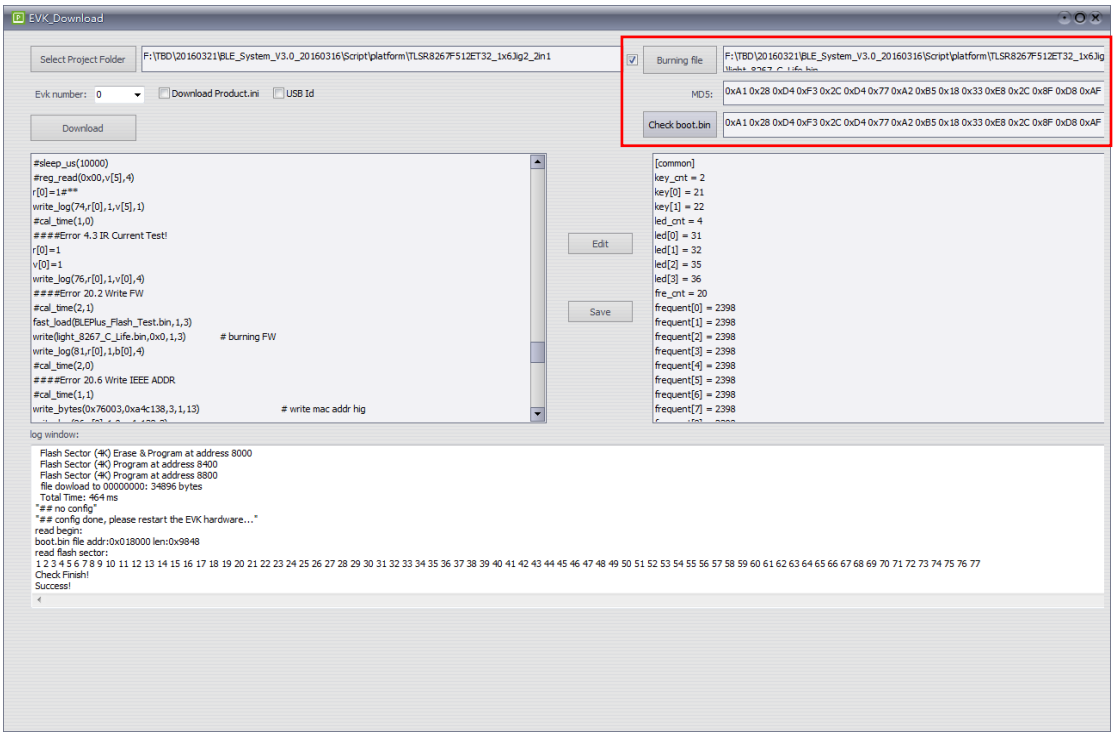
5 Update PCBA (DUT) Firmware

Connect the EVK daughter board with PC via an USB cable.

Double click the "EvkMonitor.exe" under the folder "BLE_System_V3.0_20160316\Script\Monitor".



Click "download" under the menu "Evk" to open the burning interface.



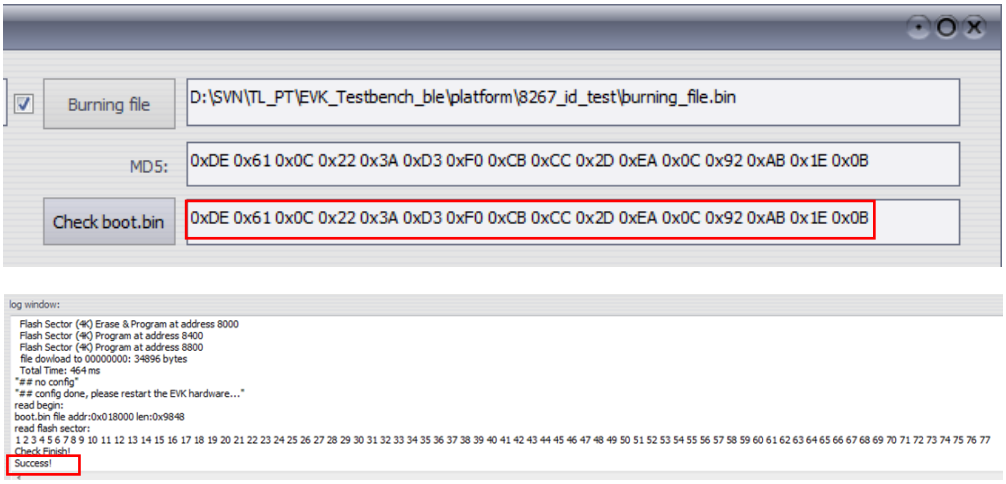
To update firmware only, it's not needed to modify test.tls and product.ini for the EVK daughter board.

1. Tick the box in front of "Burning file". Then click the "Burning file" button and select the target bin file (no limitation to the file name) in the pop-out window. The path of the selected bin file will be available in the box behind the "Burning file" button. The MD5 code calculated by the bin file will be available in the box

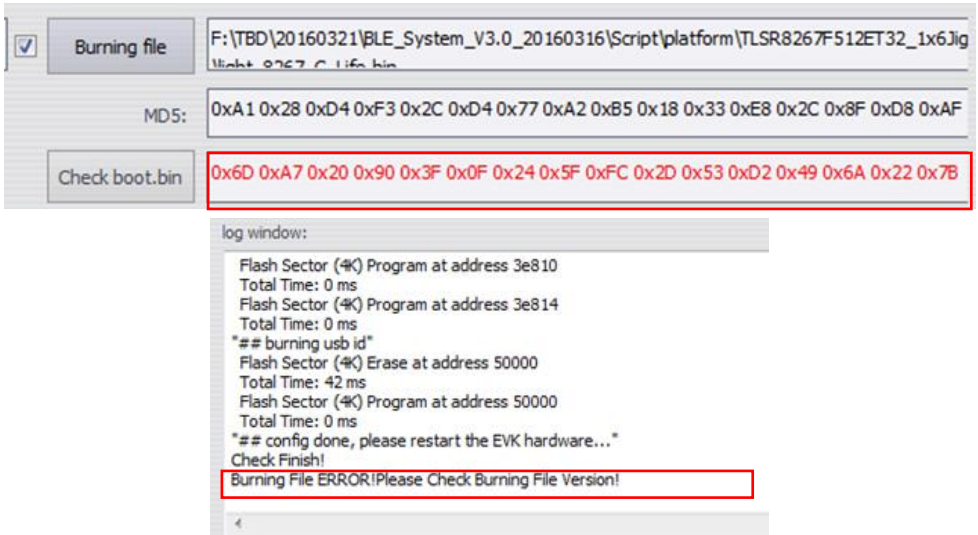
next to the “MD5”.

2. Click the “Download” button. The target bin file automatically replaces the previous boot.bin under the project directory, and it will be burned into the EVK daughter board.

After firmware is burned, user can check if the firmware is successfully updated in the EVK daughter board by clicking the “Check boot.bin” button. The result will be available in the log window and the box next to the “Check boot.bin” button.



Firmware update success



Firmware update failure

After the firmware is successfully updated, power cycle the EVK daughter board, then it’s ready for use.

Appendix 1 Test Item List On PC Software "EvkMonitor"

Index	Name	Description	Parameter	Maintenance Suggestion
0	CurProtection	current protection: test DUT current	current value	Maybe soldering problem. Re-solder IC.
1	GpioShort	test if there is any GPIO pins short wired	show the two pins if there is a short; if not, its value will be 0	
2	TpHigh	TP high/ low frequency test: Carry out Tx modulation calibration to ensure RF Tx quality	cap value	RF related. Test again; if failed, temporarily mark it as rejected product, and wait for subsequent analysis.
3	TpLow		cap value	
4	TxHiCnt	tx high frequency counting value/power/frequency offset/current test: EVK receives packets transmitted by DUT at high frequency point, and thus to test DUT Tx performance at high frequency point. Test parameters are DUT Tx packet number, DUT Tx power, DUT Tx frequency offset and DUT Tx current, successively.	cnt num	
5	TxHiPower		rf energy	
6	TxHiFreoffset		frequency offset	
7	TxHiCurrent		current value	
8	TxLoCnt	tx low frequency counting value/power/frequency offset/current test: EVK receives packets transmitted by DUT at low frequency point, and thus to test DUT Tx performance at low frequency point. Test parameters are DUT Tx packet number, DUT Tx power, DUT Tx frequency offset and DUT Tx current, successively.	cnt num	
9	TxLoPower		rf energy	
10	TxLoFreoffset		frequency offset	
11	TxLoCurrent		current value	

Index	Name	Description	Parameter	Maintenance Suggestion
12	RxLoCnt	rx low frequency counting value/power/current test: DUT receives packets transmitted by EVK at low frequency point, and thus to test DUT Rx performance at low frequency point. Test parameters are EVK Tx packet number, EVK Tx power and EVK Tx current, successively.	cnt num	RF related. Test again; if failed, temporarily mark it as rejected product, and wait for subsequent analysis.
13	RxLoPower		rf energy	
14	RxLoCurrent		current value	
15	RxHiCnt	rx high frequency counting value/power/current test: DUT receives packets transmitted by EVK at high frequency point, and thus to test DUT Rx performance at high frequency point. Test parameters are EVK Tx packet number, EVK Tx power and EVK Tx current, successively.	cnt num	
16	RxHiPower		rf energy	
17	RxHiCurrent		current value	
18	CancleFlashProtection	cancel flash protection: Cancel DUT flash write protection for following flash erase and test.	0, always	Flash related. Maybe soldering problem, re-solder pins related to Flash.
19	FlashZero	set flash as 0/ 0xff: Write DUT flash with all “0” or all “1” to test flash write operation.	size	
20	FlashErase		size	
21	DsSlpCur	deep sleep current/wakeup, suspend current/wakeup test: Make DUT enter low-power mode (deep sleep/suspend) and then wake it up via EVK, thus to test current in deep sleep mode, wakeup function from deep sleep mode, current in suspend mode and wakeup function from suspend mode.	current value	Maybe bad contact with thimble. Check if there’s enough solder paste for the test points of thimble and PCBA.
22	DsSlpWkp		reg value	
23	SuspendCur		current value	
24	SuspendWkp		reg value	

Index	Name	Description	Parameter	Maintenance Suggestion
25	IRCur	IR current test: Make DUT enter IR state via EVK and test the current at IR state.	current value	IR current problem. Check IR circuit.
26	Amic	Amic test: 3V3DUT of EVK supplies power for buzzer, while PIN48 outputs high level to make buzzer board generate square wave signal which drives buzzer to beep. Test DUT register value at this state.	register value	Detect Amic circuit
27	FlashWrite	write flash: write bin file into DUT flash	If err, err address; if ok it's 0	Flash related. Maybe soldering problem, re-solder pins related to Flash.
28	WriteID	write id(part of ieee id): write ID information into DUT flash	id	IEEE address to verify Jig status. Index 27 is fixed value; Index 28 is dynamically increasing value
29	WriteBytes	write bytes (part of ieee id): write specific information into DUT flash	id	
30	FlashProtect	protect flash: carry out write protect operation for DUT flash	1, always	Flash related. Maybe soldering problem, re-solder pins related to Flash.
31	FlashWriteLarger	write flash: check DUT flash content to ensure correct burning operation	If err, err address; if ok it's 0	
32	Load	load status: test connection between EVK and DUT	No para	Contact problem. Check contact between thimble and PCBA.

Appendix 2：Hardware List

Type	Number	Spec
BLE EVK daughter board	1	C1T42A20_V3.3
Buzzer board	1	C1T64A3_V2.0
Long RF cable	1	SMA-MMCX dual-shielded cable -30cm
Dupont cable	Several	
Mini USB cable	1	USB2.0/28AWG/30cm, 30V/80℃/A3-B

Appendix 3：Dimension chart of EVK daughter board and buzzer board

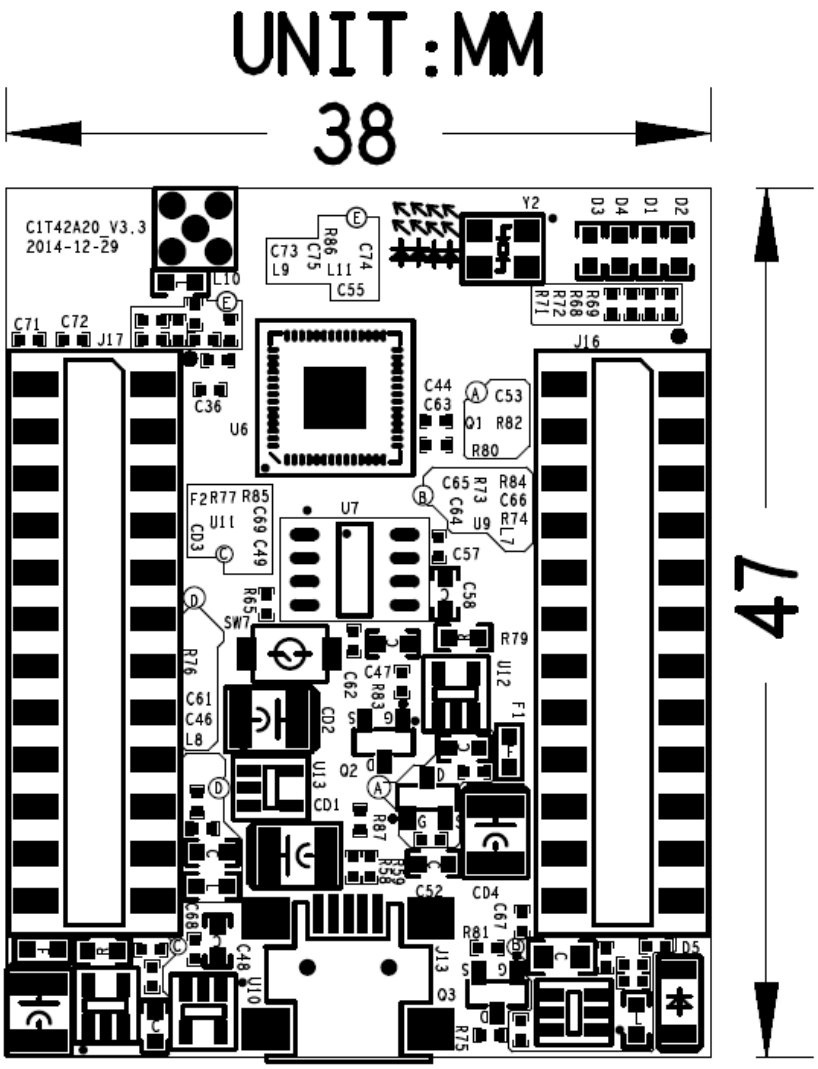


Figure 14 Dimension chart of EVK daughter board

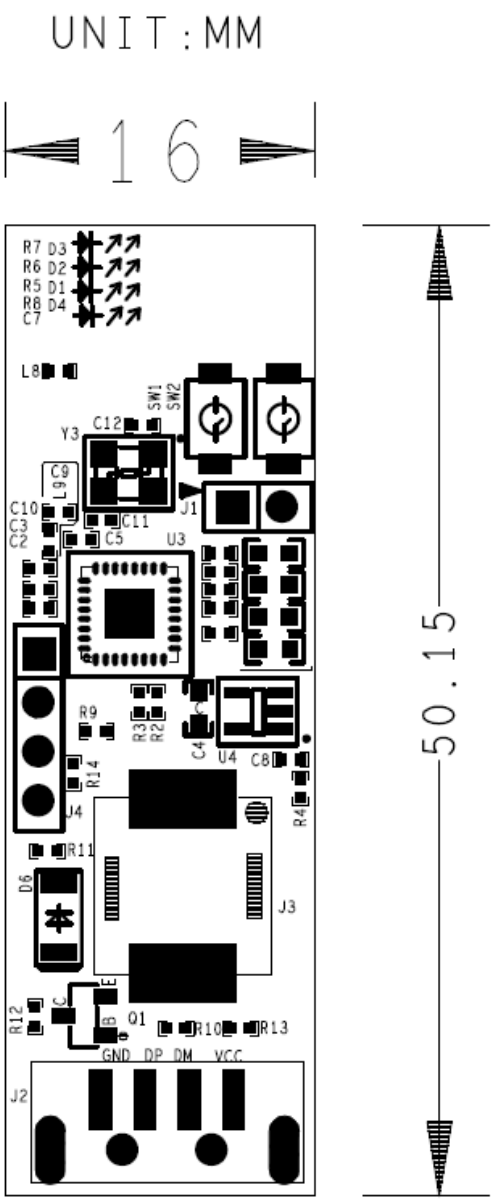


Figure 15 Dimension chart of buzzer board

FCC COMPLIANCE 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.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.