CYW20829 manufacturing flow

About this document

Scope and purpose

This document provides instructions on the manufacturing flow for the CYW20829 AIROC™ Bluetooth® LE 5.4 MCU, or CYW20829. This includes:

- Provisioning the CYW20829
- Programming firmware onto the CYW20829
- Checking RF performance on the CYW20829
- Programming an application onto the CYW20829
- Optionally applying security to the CYW20829

Intended audience

This document is intended for OEMs provisioning, programming, and testing the CYW20829 during the manufacturing process.

Table of contents

About this document . . . 1
Table of contents . . . 2
1 Introduction . . . 3
2 Prerequisites . . . 4
2.1 Hardware prerequisites . . . 4
2.1.1 HCI UART . . . 4
2.1.2 SWD . . . 4
2.2 Software prerequisites . . . 4
3 Enabling HCI UART and downloading RF Test Firmware . . . 5
4 Testing RF performance on the CYW20829 . . . 10
4.1 Testing LE1M Tx output power on the CYW20829 . . . 10
4.2 Testing LE1M RX receiver sensitivity on the CYW20829 . . . 11
4.3 Testing LE2M Tx output power on the CYW20829 . . . 13
4.4 Testing LE2M RX receiver sensitivity on the CYW20829 . . . 14
5 Provisioning the CYW20829 to NORMAL_NO_SECURE LCS . . . 17
6 Optional: Provisioning the CYW20829 to NORMAL_SECURE LCS . . . 18
7 Programming applications on the CYW20829 via OPENOCD . . . 19
7.1 Programming applications on the CYW20829 via OPENOCD . . . 19
References . . . 20
Revision history . . . 21
Trademarks . . . 22
Disclaimer . . . 23

1 Introduction

This document provides details about the manufacturing flow of the CYW20829.

The following sections are covered in this document:

- Downloading the RF Test Firmware (FW) onto the CYW20829
- Testing the CYW20829 for Bluetooth® LE1M and LE2M transmitter output power and receiver sensitivity performance
- Provisioning the CYW20829 from NORMAL to NORMAL_NO_SECURE LCS
- Optionally provisioning the CYW20829 to SECURE LCS as per the eFuse AN
- Programming application code on the CYW20829

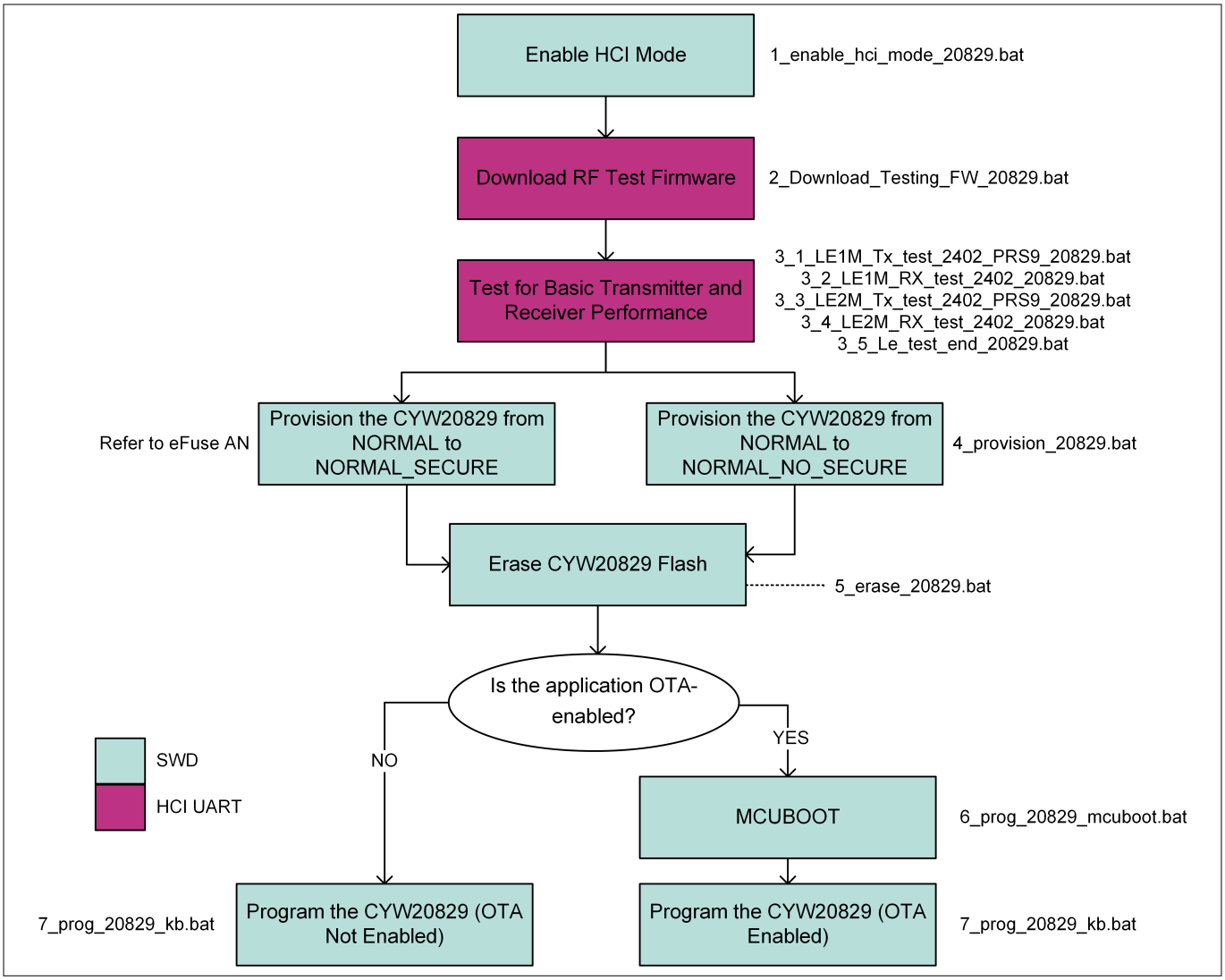

Figure 1 CYW20829 manufacturing flowchart

2 Prerequisites

The CYW20829 manufacturing flow has several hardware and software prerequisites.

2.1 Hardware prerequisites

The CYW20829 requires HCI UART and Serial Wire Debug (SWD) for programming and RF testing. Ensure that the following signals are carried out from the CYW20829, in addition to a shared common ground. In addition to your production operating voltage, ensure that there is a 2.5 V supply for eFuse programming.

2.1.1 HCI UART

Connect HCI UART from the CYW20829 to your Windows PC via a USB-UART transceiver.

- P4.0 – BT_UART_CTS
- P3.1 – BT_UART_RTS
- P3.2 – BT_UART_RXD
- P3.3 – BT_UART_TXD

2.1.2 SWD

Connect SWD from the CYW20829 to your Windows PC via a MiniProg4 Kit.

- 3.0-3.3 V voltage supply
- P1.2 - SWCLK
- P1.3 - SWDIO
- XRES
- Ground

2.2 Software prerequisites

Download the Infineon-CYW20829_Manufacturing_Support_Scripts-DevelopmentTools-v01_00-EN.zip folder before starting the manufacturing process.

3 Enabling HCI UART and downloading RF Test Firmware

1. Select the *Infineon-CYW20829_Manufacturing_Support_Scripts-DevelopmentTools-v01_00-EN.zip* folder and click **Extract all**, as shown in the following figure

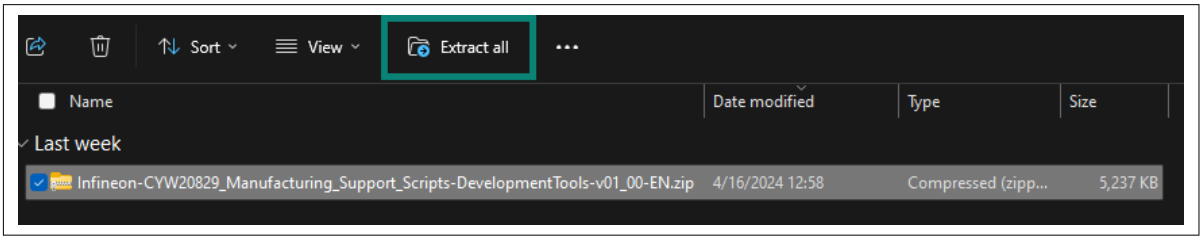

Figure 2 Selecting the CYW20829 zip folder for extraction

2. In the **Select a Destination and Extract Files** pop-up window, click **Browse** to select the folder to extract the files, and click the **Extract** button

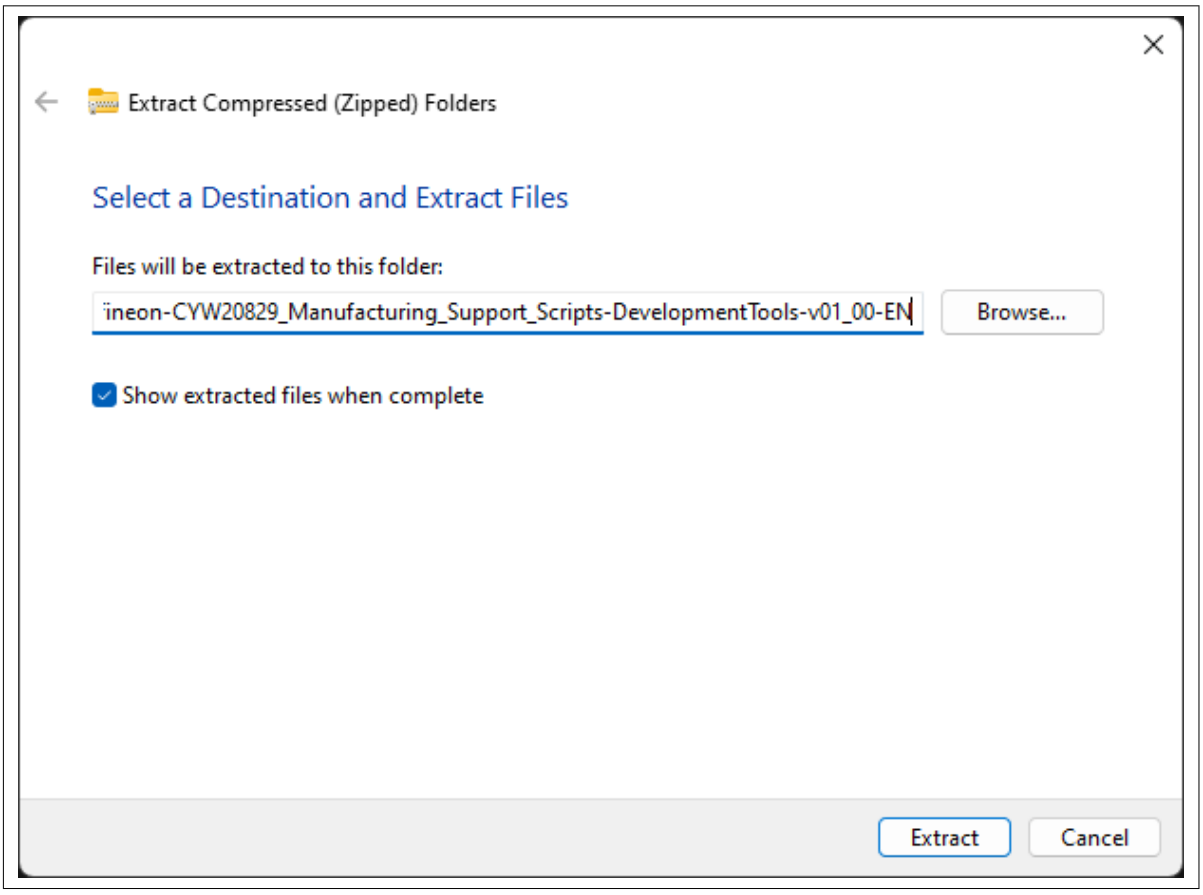

Figure 3 Selecting the folder and extracting files

3. In the Windows search, type *device manager* and click **Device Manager** in the search result, as shown in the following figure

3 Enabling HCI UART and downloading RF Test Firmware

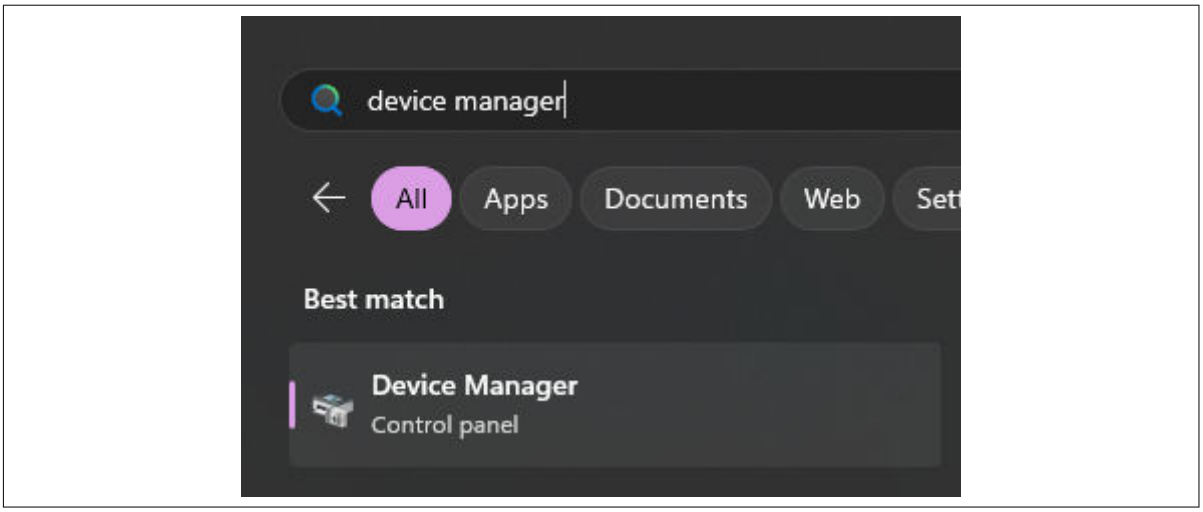

Figure 4 Opening the Device Manager

4. Find the CYW20829 COM port in the **Device Manager** under **Ports (COM & LPT)**, as shown in the following figure

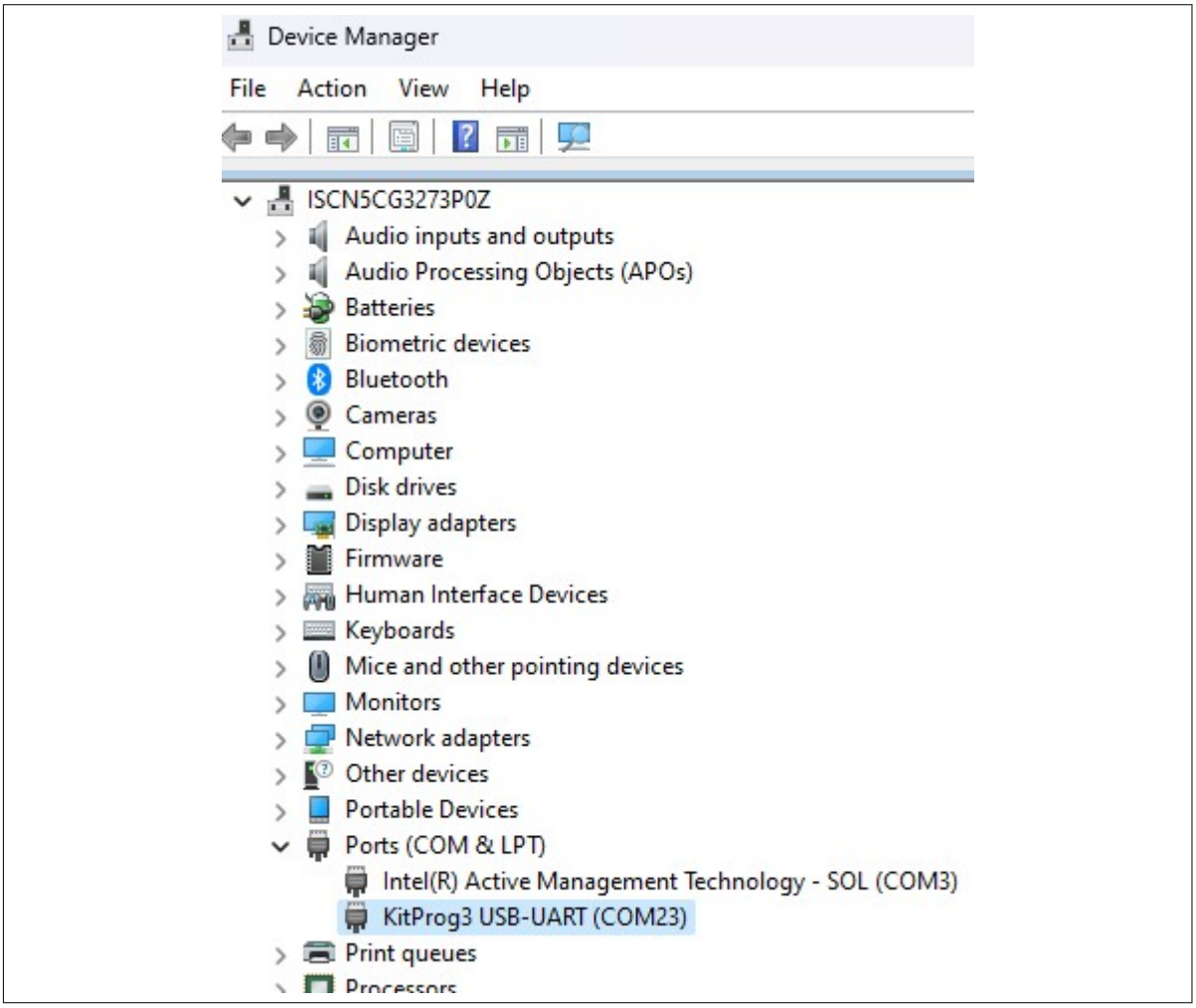

Figure 5 Checking the CYW20829 COM port

5. Navigate to the *cyw20829_scripts* folder inside the *Infineon-CYW20829_Manufacturing_Support_Scripts-DevelopmentTools-v01_00-EN* folder. Open the **2_Download_Testing_FW_20829.bat** file in a text editor, specify the COM port for your CYW20829, and save your file

3 Enabling HCI UART and downloading RF Test Firmware

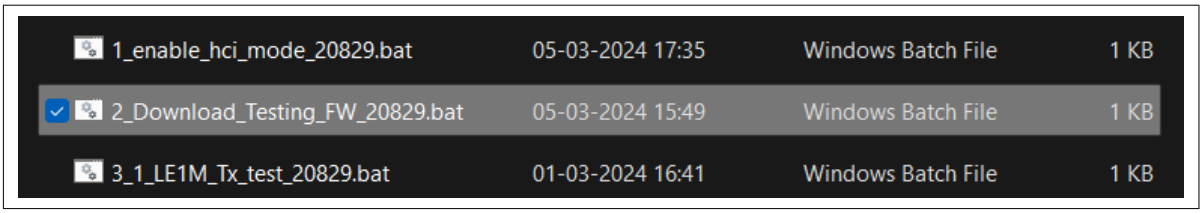

Figure 6 Updating 2_Download_Testing_FW_20829.bat file

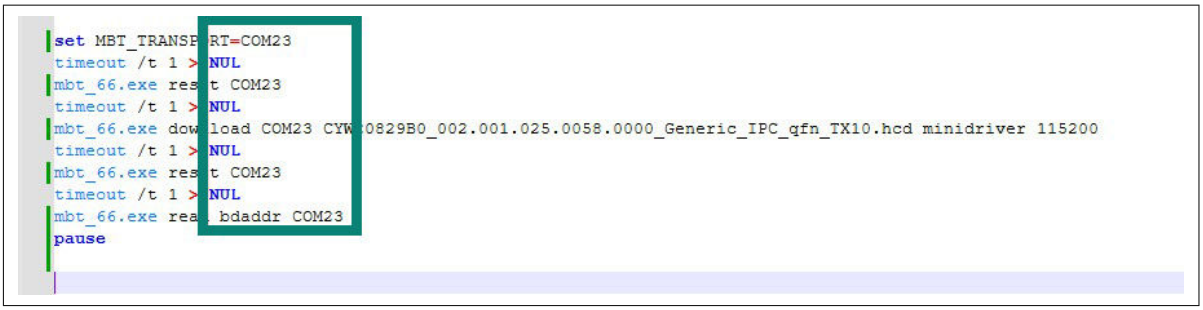

Figure 7 Setting the CYW20829 COM port

6. Specify the .hcd file (ensure you have the correct .hcd firmware for your product) as shown in Figure 8 and save your file

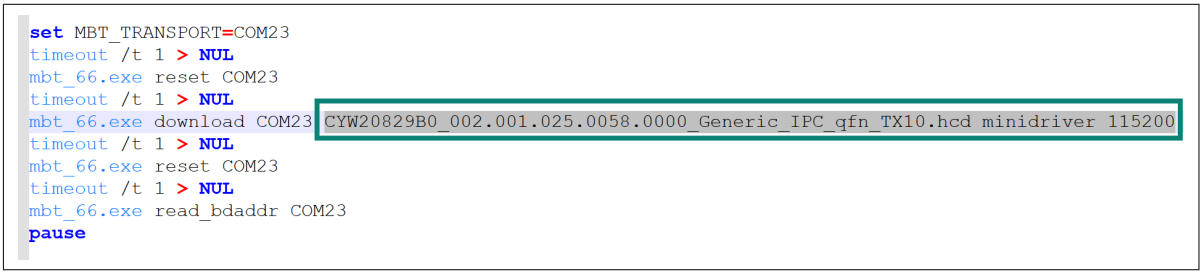

Figure 8 Specifying the correct CYW20829 RF Test Firmware

7. Double-click the **1_enable_hci_mode_20829.bat** file to enable HCI mode on the CYW20829
8. Observe the terminal output for a **NORMAL** life cycle

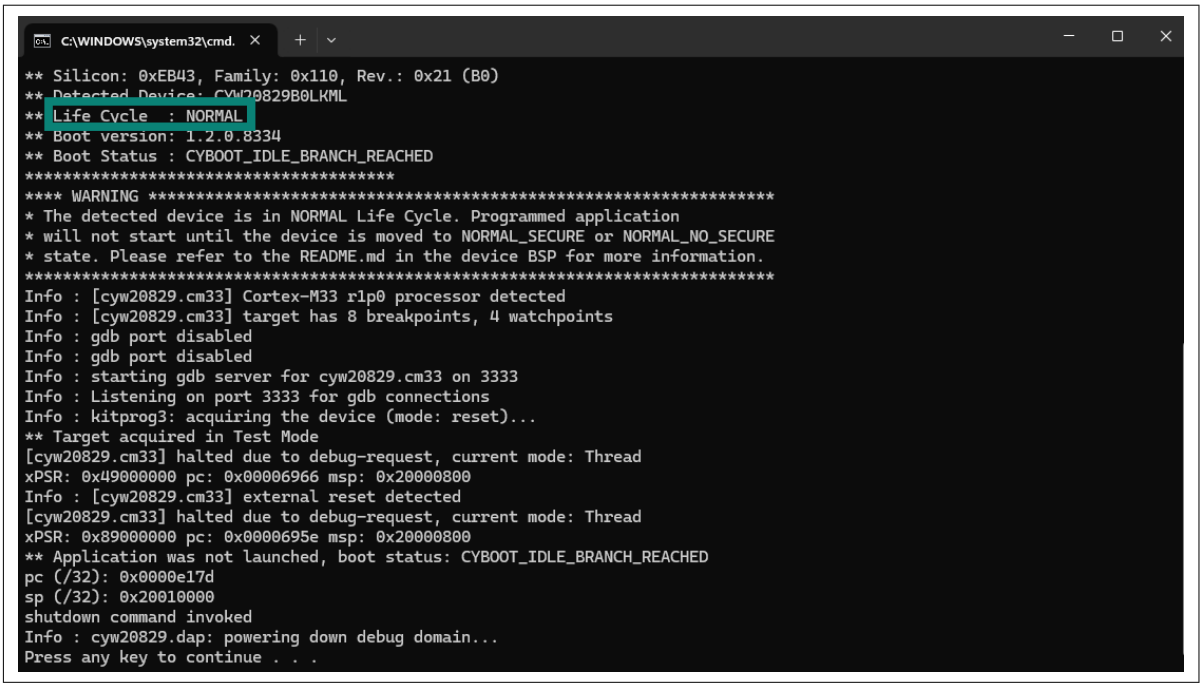

Figure 9 Confirm the NORMAL life cycle

9. Within 30 seconds, double-click the **2_Download_Testing_FW_20829.bat** file to download the RF Test Firmware to the CYW20829

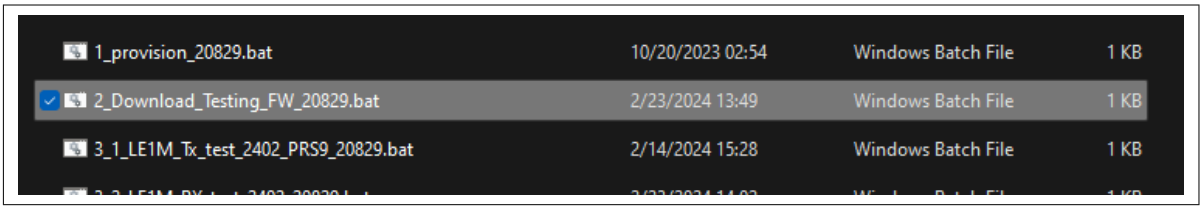

Figure 10 2_Download_Testing_FW_20829.bat file

a. If you miss this 30-second window, re-run Steps 6., 7., and 8.

b. This batch file will download the RF Test Firmware and check the CYW20829 device BD address

10. Confirm that the FW has downloaded successfully by observing your console for "Download .hcd file success" and for the BD address, which should contain "20829B0", as shown in Figure 11

3 Enabling HCI UART and downloading RF Test Firmware

```
C:\Users\choj\Downloads\Testing_script_Factory\Testing_script_Factory>set MBT_TRANSPORT=COM23

C:\Users\choj\Downloads\Testing_script_Factory\Testing_script_Factory>timeout /t 1  1>NUL

C:\Users\choj\Downloads\Testing_script_Factory\Testing_script_Factory>mbt_66.exe reset COM23
Sending HCI Command :
0000 < 01 03 0C 00 >
Received HCI Event:
0000 < 00 04 10 01 FE 04 0E 04 01 03 0C 00 >

C:\Users\choj\Downloads\Testing_script_Factory\Testing_script_Factory>timeout /t 1  1>NUL

C:\Users\choj\Downloads\Testing_script_Factory\Testing_script_Factory>mbt_66.exe download COM23 CYW20829B0_002.001.025.0
058.0000_Generic_IPC_qfn_TX10.hcd minidriver 115200
Sending reset Command:
Reset HCI Event
0000 < 04 0E 04 01 03 0C 00 >
Success
Download minidriver HCI Event
The size of HCD file is 23168 bytes
100% [||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||]
Download .hcd file success

C:\Users\choj\Downloads\Testing_script_Factory\Testing_script_Factory>timeout /t 1  1>NUL

C:\Users\choj\Downloads\Testing_script_Factory\Testing_script_Factory>mbt_66.exe reset COM23
Sending HCI Command :
0000 < 01 03 0C 00 >
Received HCI Event:
0000 < 04 0E 04 01 03 0C 00 >
Success

C:\Users\choj\Downloads\Testing_script_Factory\Testing_script_Factory>timeout /t 1  1>NUL

C:\Users\choj\Downloads\Testing_script_Factory\Testing_script_Factory>mbt_66.exe read_bdaddr COM23
Sending read bdaddr Command :
0000 < 01 09 10 00 >
HCI Event
0000 < 04 0E 0A 01 09 10 00 93 76 0A 9B 82 20 >
BD_AdDDR = 0020829B0A76
C:\Users\choj\Downloads\Testing_script_Factory\Testing_script_Factory>pause
Press any key to continue . . .
```

Figure 11 Confirming firmware has been successfully downloaded to the CYW20829

4 Testing RF performance on the CYW20829

***Note**: Testing RF performance requires HCI UART.*

For the following scripts, edit the COM port for your CYW20829. You can choose which tests to run.

1. LE1M Transmitter Test
   a. 3_1_LE1M_Tx_test_20829.bat
2. LE1M Receiver Test
   a. 3_2_LE1M_RX_test_20829.bat
3. LE2M Transmitter Test
   a. 3_3_LE2M_Tx_test_20829.bat
4. LE2M Receiver Test
   a. 3_4_LE2M_RX_test_20829.bat
5. 3_5_Le_test_end_20829.bat

4.1 Testing LE1M Tx output power on the CYW20829

1. Double-click the **3_1_LE1M_Tx_test_20829.bat** file in your File Explorer to run it

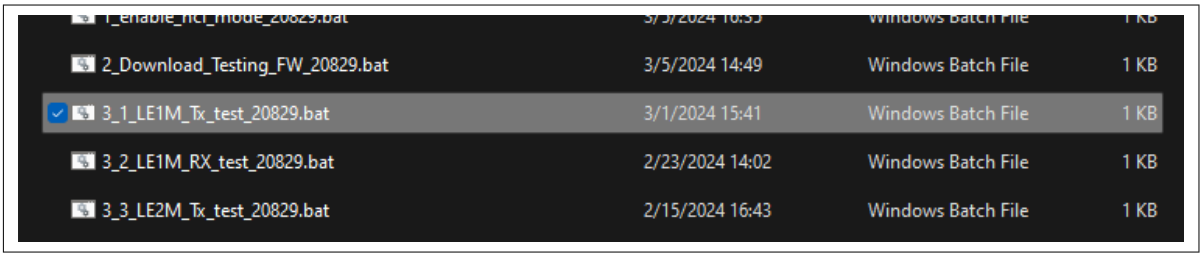

Figure 12 3_1_LE1M_Tx_test_20829.bat file

   a. Choose 2402 MHz, 2440 MHz, or 2480 MHz as your desired transmit frequency by changing the first number following the COM port specification. See the highlighted parameter (green box) in Figure 13
   b. Change the payload type by changing the third number following the COM port specification
   c. You can change both the frequency and payload type at the same time, as shown in Table 1 and Table 2

```
set MBT_TRANSPORT=COM33

timeout /t 1 > NUL
mbt_66.exe le_transmitter_test COM33 0 25 0

:: 2402 MHz - 0 25 0
:: 2440 MHz - 19 25 0
:: 2480 MHz - 39 25 0

:: PRBS9 - 0 25 0
:: 11110000 - 0 25 1
:: 10101010 - 0 25 2

pause
```

Figure 13 3_1_LE1M_Tx_test_20829.bat parameters

Table 1 LE1M transmitter frequency selection

Frequency (MHz)	Parameter
2402	0 25 0
2440	19 25 0
2480	39 25 0

Table 2 LE1M transmitter payload type selection

Payload type	Parameter
PRBS9	0 25 0
11110000	0 25 1
10101010	0 25 2

2. Check the LE1M transmitter output power and the related modulation performance of the CYW20829 board with a Bluetooth® tester
3. Double-click the **3_5_Le_test_end_20829.bat** file to end your test

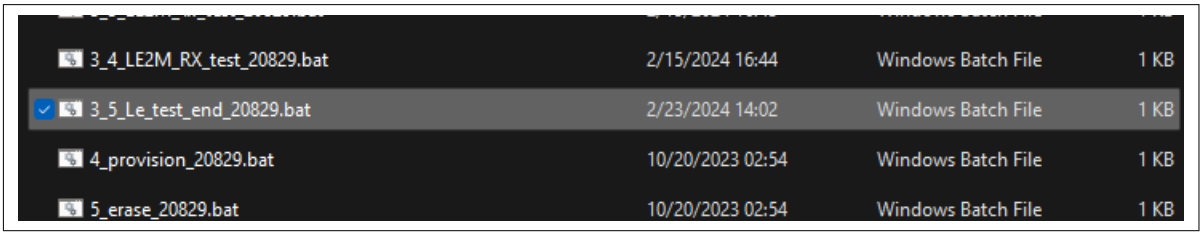

Figure 14 3_5_Le_test_end_20829.bat file

4.2 Testing LE1M RX receiver sensitivity on the CYW20829

1. Double-click the **3_2_LE1M_RX_test_20829.bat** file in your File Explorer to run it



Figure 15 3_2_LE1M_RX_test_20829.bat file

a. Choose 2402 MHz, 2440 MHz, or 2480 MHz as your desired receive frequency by changing the first number following the COM port specification. See the highlighted parameter (green box) in Figure 16 and refer to Table 3 to select your frequency

```
1
2  set MBT_TRANSPORT=COM33
3
4  timeout /t 1 > NUL
5  mbt_66.exe le_receiver_test COM33 39
6
7  :: 2402 MHz - 0
8  :: 2440 MHz - 19
9  :: 2480 MHz - 39
10
11 pause
12
13
```

Figure 16 3_2_LE1M_RX_test_20829.bat parameters

Table 3 LE1M receiver payload type selection

Payload type	Parameter
2402	0
2440	19
2480	39

2. Send 1500 bytes at -70 dBm from your Bluetooth® tester to the CYW20829

3. Double-click the **3_5_Le_test_end_20829.bat** file to end your test



Figure 17 3_5_Le_test_end_20829.bat file

a. Observe the number of completed packets in your command prompt window after ending the test

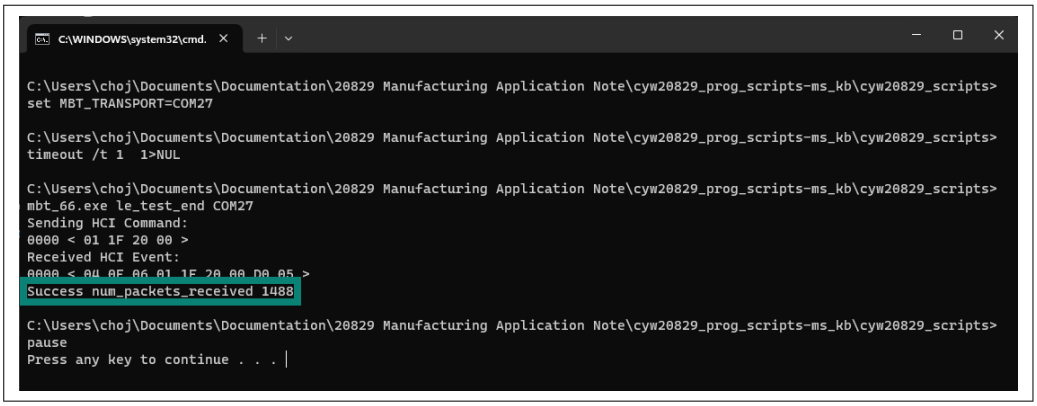

Figure 18 Observe the number of packets received

b. Your packet error rate, or PER, must be below 30.8%

***Note**: PER is calculated as: 100*(# Of Received Packets)/(# Of Sent Packets)*

4.3 Testing LE2M Tx output power on the CYW20829

1. Double-click the **3_3_LE2M_Tx_test_20829.bat** file in your File Explorer to run it



Figure 19 3_3_LE2M_Tx_test_20829.bat file

a. Choose 2402 MHz, 2440 MHz, or 2480 MHz as your desired transmit frequency by changing the first number following the COM port specification. See the highlighted parameter (green box) in Figure 20

b. Change the payload type by changing the third number following the COM port specification

c. You can change both the frequency and payload type at the same time, as shown in Table 4 and Table 5

```
1
2  set MBT_TRANSPORT=COM33
3
4  timeout /t 1 > NUL
5  mbt_66.exe le_enhenced_transmitter_test COM33 39 25 1 2
6
7  :: 2402 MHz - 0 25 0 2
8  :: 2440 MHz - 19 25 0 2
9  :: 2480 MHz - 39 25 0 2
10
11 :: PRBS9 - 0 25 0 2
12 :: 11110000 - 0 25 1 2
13 :: 10101010 - 0 25 2 2
14
15 pause
16
```

Figure 20 3_3_LE2M_Tx_test_20829.bat parameters

Table 4 LE2M transmitter frequency selection

Frequency (MHz)	Parameter
2402	0 25 0 2
2440	19 25 0 2
2480	39 25 0 2

Table 5 LE2M transmitter payload type selection

Payload type	Parameter
PRBS9	0 25 0 2
11110000	0 25 1 2
10101010	0 25 2 2

2. Check the LE2M transmitter output power and the related modulation performance of the CYW20829 board with a Bluetooth® tester
3. Double-click the **3_5_Le_test_end_20829.bat** file to end your test



Figure 21 3_5_Le_test_end_20829.bat file

4.4 Testing LE2M RX receiver sensitivity on the CYW20829

1. Double-click the **3_4_LE2M_RX_test_20829.bat** file in your File Explorer to run it

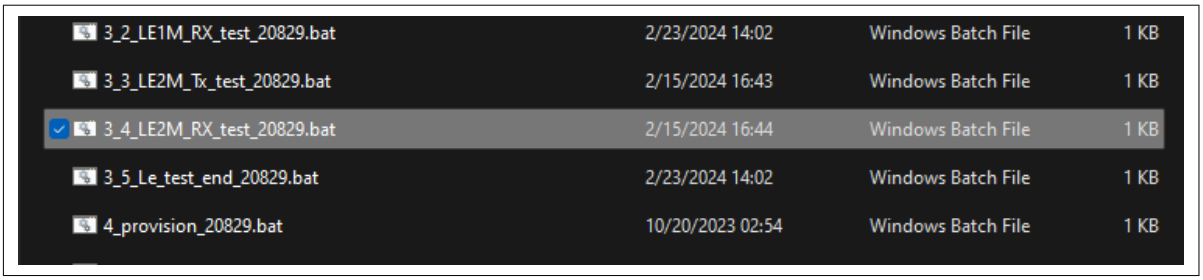

Figure 22 3_4_LE2M_RX_test_20829.bat file

a. Choose 2402 MHz, 2440 MHz, or 2480 MHz as your desired receive frequency by changing the first number following the COM port specification. See the highlighted parameter (green box) in Figure 23 and refer to Table 6

b. Choose standard or stable modulation by changing the third number following the COM port specification. See the highlighted parameter (green box) in Figure 23 and refer to Table 7

```
1
2  set MBT_TRANSPORT=COM33
3
4  timeout /t 1 > NUL
5  mbt_66.exe le_enhenced_receiver_test COM33 39 2 0
6
7  :: 2402 MHz - 0 2 0
8  :: 2440 MHz - 19 2 0
9  :: 2480 MHz - 39 2 0
10
11 :: Standard Modulation - 0 2 0
12 :: Stable Modulation - 0 2 1
13
14 pause
15
```

Figure 23 3_4_LE2M_RX_test_20829.bat parameters

Table 6 LE2M receiver frequency selection

Frequency (MHz)	Parameter
2402	0 2 0
2440	19 2 0
2480	39 2 0

Table 7 LE2M receiver modulation type selection

Modulation type	Parameter
Standard	0 2 0
Stable	0 2 1

2. Send 1500 bytes at -70 dBm from your Bluetooth® tester to the CYW20829

3. Double-click the **3_5_Le_test_end_20829.bat** file to end your test



Figure 24 3_5_Le_test_end_20829.bat file

a. Observe the number of completed packets in your command prompt window after ending the test

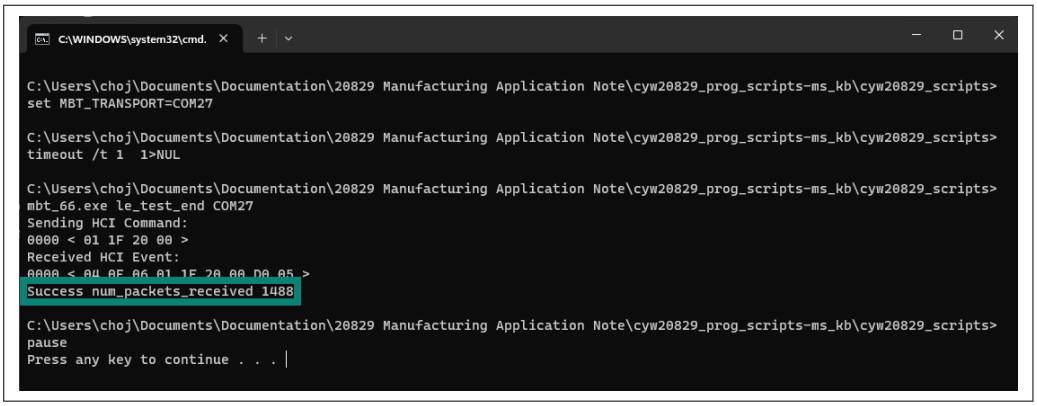

Figure 25 Observe the number of packets received

b. Your packet error rate, or PER, must be below 30.8%

***Note**: PER is calculated as: 100*(# Of Received Packets)/(# Of Sent Packets)*

5 Provisioning the CYW20829 to NORMAL_NO_SECURE LCS

***Note**: Provisioning is permanent. Ensure you are provisioning for your desired lifecycle stage. If you require NORMAL_SECURE LCS, see Optional: Provisioning the CYW20829 to NORMAL_SECURE LCS section.*

Before provisioning, ensure that VDDIO is set to 2.5 V.

1. Double-click the **4_provision_20829.bat** file to provision the CYW20829 from Normal to Normal Non-Secure
   a. Ensure the Current Life Cycle is NORMAL_NO_SECURE, as shown in Figure 26

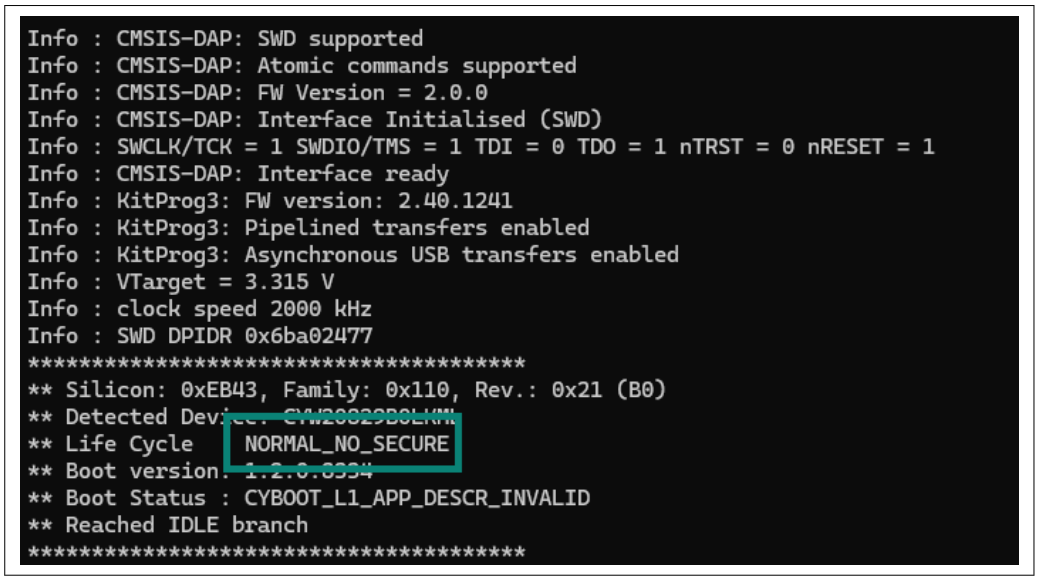

Figure 26 Provisioning the CYW20829 from Normal to Normal Non-Secure

2. After provisioning, set VDDIO back to its original voltage

6 Optional: Provisioning the CYW20829 to NORMAL_SECURE LCS

Refer to Provision CYW20829/CYW89829 to SECURE LCS document for SECURE LCS provisioning.

7 Programming applications on the CYW20829 via OPENOCD

***Note**: Ensure you are programming your desired type of application.*

7.1 Programming applications on the CYW20829 via OPENOCD

1. Plug in your MiniProg4
2. Double-click the **5_erase_20829.bat** file to erase the flash on the CYW20829



Figure 27 5_erase_20829.bat file

3. Double-click the **6_prog_20829_mcuboot.bat** file

***Note**: This step is only required for OTA-enabled applications*



Figure 28 6_prog_20829_mcuboot.bat file

4. Double-click the **7_prog_20829_kb.bat** file to program your desired application onto the CYW20829
   a. Ensure that this application is specific to your product



Figure 29 7_prog_20829_kb.bat file

   b. Paste your .hex file application into this directory, right-click the **7_prog_20829_kb.bat** file, specify this app name as app_name, and save your file

```
@echo off
set openocd_path=./tools/openocd
set app_name=mtb-example-btstack-freertos-findme.final.hex
set openocd_exe=%openocd_path:/=\%\bin\openocd.exe
rem set other_options=-c "gdb_port 3333 -c telnet_port 4444
rem %openocd_exe% -s "%openocd_path%/scripts" -s bsps/TARGE
%openocd_exe% -s "%openocd_path%/scripts" -f "%openocd_path
pause
```

Figure 30 7_prog_20829_kb.bat app_name

References

[1] Datasheet
– 002-37795: CYW89829 AIROC™ Automotive Bluetooth® LE system, Ultra-low-power, Secure MCU

Revision history

Document revision	Date	Description of changes
**	2024-05-06	Initial release

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