

AN13206

Modifying Debug Firmware on i.MX RT10xx Boards Featuring an LPC4322-based Debug Probe

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Application note

Document information

Information	Content
Keywords	AN13206, LINK2-CMSIS or J-Link firmware, OpenSDA
Abstract	This application note describes how to program the on-board debug probe board firmware with LINK2-CMSIS or J-Link firmware and how to switch back to the OpenSDA firmware (factory default).



1 Introduction

Several NXP evaluation boards in the i.MX RT10xx series have a debug circuit based on the LPC4322 MCU. Besides the default firmware, this circuit can use an NXP-proprietary CMSIS-DAP based image that also supports SWO features and this firmware is referred to as LPC-Link2. This image also provides higher performance flash programming but does not include drag-drop programming capability. The LPC4322 debug circuit also has an option for an evaluation version of SEGGER’s popular J-Link probe. i.MX RT10xx EVKs are factory programmed with an OpenSDA based CMSIS-DAP implementation with drag-drop programming capability, but it is possible to run any of the three firmware options on these i.MX RT10xx boards.

[Table 1](#) describes the differences among the three firmware options.

Note: When the LPC-Link2 CMSIS-DAP and LPC-Link2 Segger Jlink firmware are used, the board must switch power to `USB_OTG` or external power adapter. Or, add a resistor to R212 (RT1060-EVK), R97 (RT1060-EVKB), R97 (RT1040-EVK), and R154 (RT1170-EVK).

Table 1. Comparison of firmware options

	OpenSDA Daplink	LPC-Link2 CMSIS-DAP	LPC-Link2 Segger J-link
Power via USB (automatic target regulator control)	√	X	X
SWD debug with MCUXpresso IDE	√	√	√
SWO trace/profiling/ITM	X	√	X
Drag/drop programming	√	X	X
UART-USB (VCOM)	√	√	√
Flash programming speed (relative to Open SDA)	1X	3-4X	4X

Only the OpenSDA firmware version controls the regulator which powers the target processor. When using the firmware other than the default one, the power must be provided by other power sources. Such as a barrel-type power connector or USB1 connector. For the power information, the hardware users guide can be a reference. The supply is at least 500 mA so that brownouts do not occur in high current applications (such as graphics with backlit displays).

This application note describes how to the program the on-board debug probe board firmware with LINK2-CMSIS or J-Link firmware and how to switch back to the OpenSDA firmware (factory default.)

The hardware used in this application note is MIMXRT1060-EVK (Rev.A1) but the same techniques can be used with any i.MX RT10xx EVK with an LPC4322 debug probe. The utility used to update the firmware of LPC43xx/18xx devices is called LPCScript, and this utility can be found at [LPCScript v2.1.2](#).

Note: When programming the J-link firmware with LPCScript, use an updated firmware image from [SEGGER](#), as updates to their firmware are required from time to time.

2 Programming LINK2 CMSIS

To program LINK2 CMSIS, perform the following steps:

1. Download and install [LPCScript](#).
2. Install the LPC4322 DFU jumper, **J42** on MIMXRT1060-EVK, to force DFU boot mode.

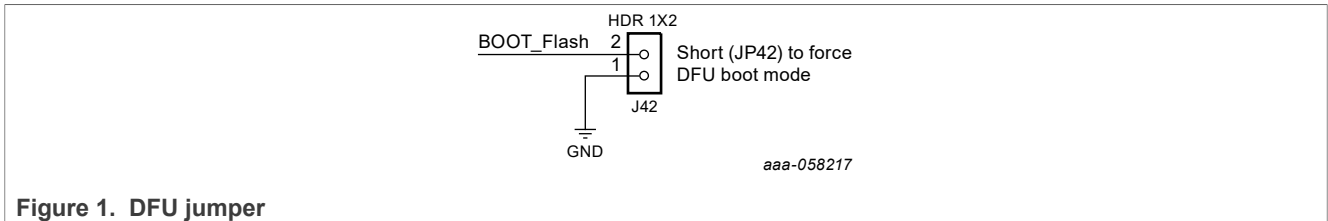


Figure 1. DFU jumper

3. Power on the board through the on-board debug probe USB connector, **J41** on MIMXRT1060-EVK.

Note: Connect 3-4 of J1 to power the board from USB port and then connect LINK2 to LPC4322 debug port, **J34**.
4. Go to the scripts subdirectory and run the `program_CMSIS.cmd` to run the script to program the debug probe for CMSIS. The default path for `.cmd` files is:

```
C:\nxp\LPCScript_2.1.2_57\scripts
```

aeskey.cmd	2018/6/19 9:51	Windows Command ...	1 KB
boot_lpcscript.cmd	2018/6/19 9:51	Windows Command ...	2 KB
encrypt_and_program.cmd	2018/6/19 9:51	Windows Command ...	1 KB
encrypt_and_program.scy	2018/6/19 9:51	SCY File	1 KB
ListComPorts.cmd	2018/6/19 9:51	Windows Command ...	1 KB
ListLPCComPorts.cmd	2018/6/19 9:51	Windows Command ...	1 KB
LPCScript_CLI.cmd	2018/6/19 9:51	Windows Command ...	2 KB
program_CMSIS.cmd	2018/6/19 9:51	Windows Command ...	5 KB
program_LINK2.cmd	2018/6/19 9:51	Windows Command ...	4 KB

Figure 2. Select program_cmsis

5. Follow the on-screen instructions. Press any key to load the program and the script output shows that the firmware is updated successfully.



Figure 3. CMSIS firmware image programming output

6. As shown in [Figure 3](#), there is a log showing the firmware has been programmed successfully. Then, remove the jumper of J42 to exit the DFU mode and re-power the board.

3 Programming LPC-Link2 Segger J-Link

The procedure of updating the mode into J-link is the same as LPC-Link2 CMSIS-DAP, except for running the Program_JLINK.cmd.

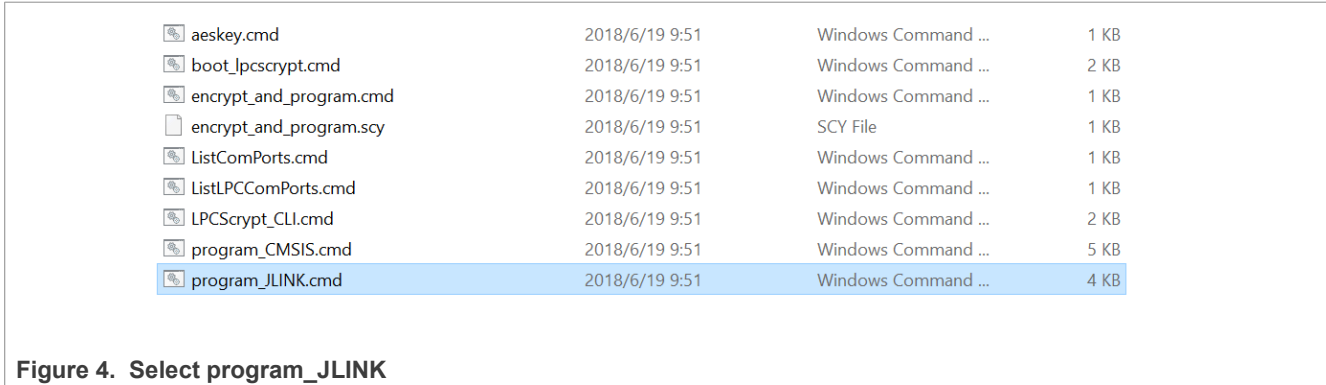


Figure 4. Select program_JLINK

Figure 5 shows the output of a successful programming session.

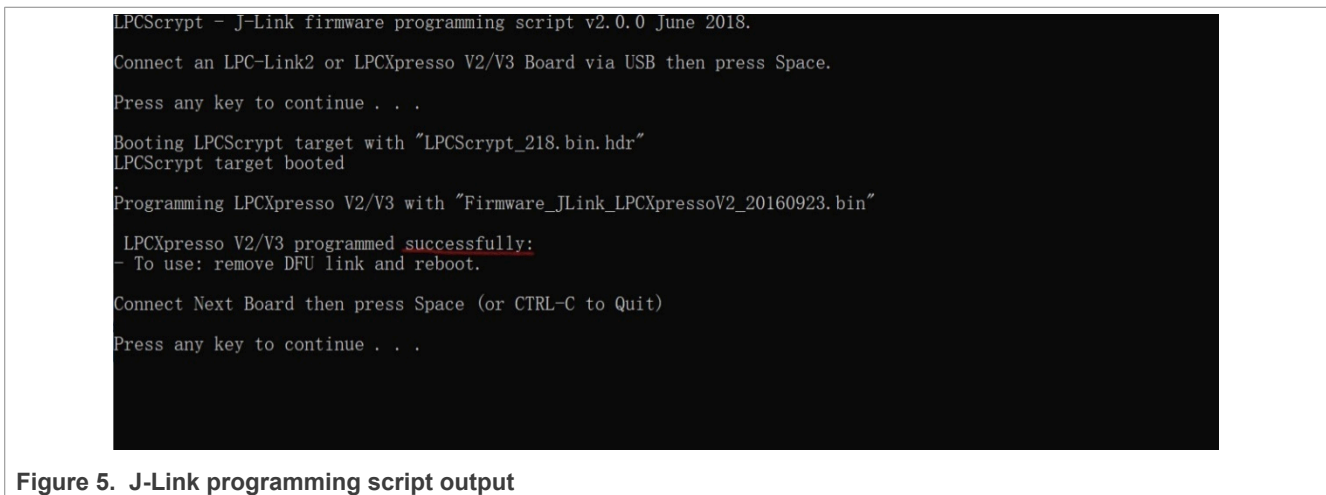


Figure 5. J-Link programming script output

4 Switching back to OpenSDA DapLink firmware (factory default firmware)

After updating to LINK2 CMSIS or J-Link mode, to switch back to the default firmware, follow the steps as below.

1. Install a bootloader using `LPCScrypt` before loading the actual OpenSDA image.
2. Use the drag-drop programming.

4.1 Getting the firmware images

1. Download the bootloader and default firmware application from [OpenSDA Serial and Debug Adapter](#).
2. Select the board from the dropdown menu, as shown in [Figure 6](#).

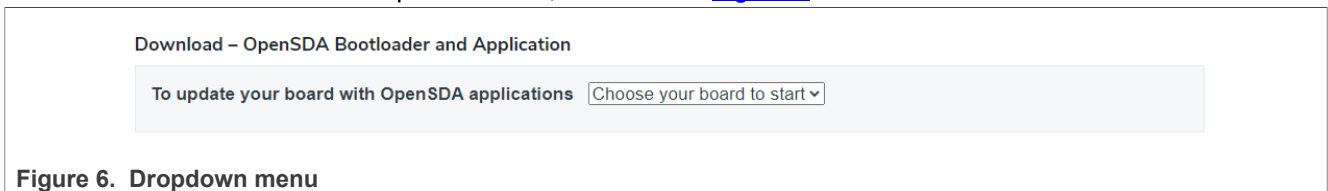


Figure 6. Dropdown menu

3. After selecting the board, the screen changes to show available images for that board.

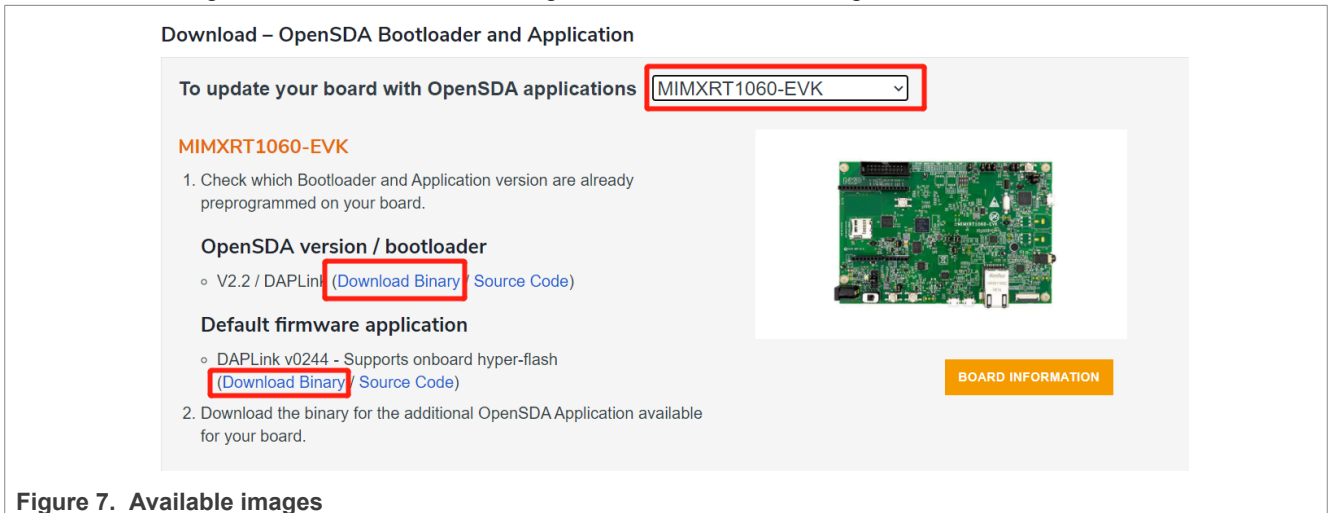


Figure 7. Available images

4. Place the bootloader binary in a temporary directory without spaces in the path, such as, `c:\Temp\bootloader`.
5. Enter the DFU mode with connector **J42** and then power on the board.
6. Open a command window and go to the LPCScrypt installation directory. Go to the `bin` subdirectory and run the script `boot_lpcscrypt.cmd`. [Figure 8](#) shows the result.

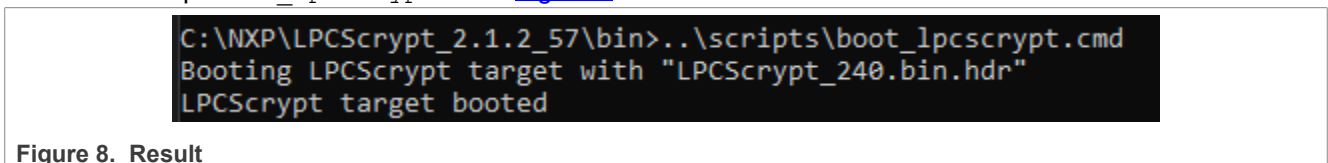


Figure 8. Result

7. Enter the command:

```
lpcscrypt erase all
```

Errors may be reported but can be ignored.

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8. Enter the command to program the bootloader into BankA (address 0x1a000000):

```
lpcscript program c:\Temp\bootloader\lpc4322_bl_crc_20180810.bin 0x1a000000
```

9. After a few seconds, the result in a message is as shown in [Figure 9](#).

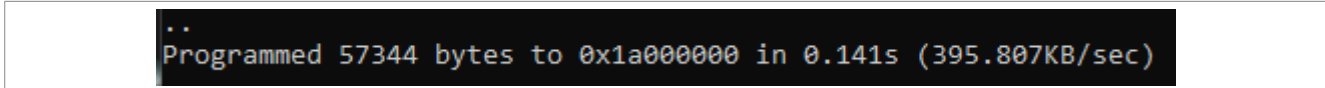


Figure 9. Result in message

- 10. Now remove **J42**, and power cycle the board. The board counts as a mass storage device called **MAINTENANCE**.
- 11. To install the OpenSDA firmware, drag and drop the binary file onto the MAINTENANCE drive mentioned above. The board (mass storage device) drive name changes to a board-specific name, such as, RT1060-EVK.

Now, the debug probe is ready to be used.

5 Note about the source code in the document

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6 Revision history

[Table 2](#) summarizes the revisions to this document.

Table 2. Revision history

Document ID	Release date	Description
AN13206 v.1.0	05 November 2021	Add a note in Section 1
AN13206 v.0	April 2021	Initial public release

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