User's Guide
SLAU799B–January 2019–Revised July 2019

Programming the Bootloader of MSP430™ and SimpleLink™ MSP432™, CC13xx, CC26xx, and CC32xx MCUs Using UniFlash

UniFlash is a stand-alone tool that can program the on-chip flash memory on TI MCUs and on-board flash memory for Sitara processors. UniFlash has a GUI, a command line, and a scripting interface. For a full description of UniFlash, see the UniFlash Standalone Flash Tool page.

This user's guide describes how to use UniFlash with MSP430™ microcontrollers (MCUs) and select SimpleLink™ MCUs.

Contents

1 Introduction 2
2 Preparing the Image 2
3 Supported Devices 3
4 GUI Default Settings 3
5 Bootloader Programming of MSP430 MCUs 4
5.1 Programming the Firmware Image to the Target Bootloader 4
5.2 Reading the Memory of the Target Bootloader 7
6 Bootloader Programming for SimpleLink MSP432P4 MCUs 8
6.1 Programming the Firmware Image to the Target Bootloader 8
6.2 Reading the Memory of the Target Bootloader 10
7 Bootloader Programming for SimpleLink MSP432E4 MCUs 12
7.1 Programming the Firmware Image to the Target Bootloader 12
8 Bootloader Programming for SimpleLink CC13xx and CC26xx MCUs 14
8.1 Handling the CCFG Configuration Under Firmware Image 14
8.2 Programming the Firmware Image Into the Target Bootloader 15
8.3 Reading the Memory of the Target Bootloader 17
9 Bootloader Programming for SimpleLink CC32xx Family 18
9.1 Preparing the .SLI Firmware Image for Bootloader Programming 18
9.2 Programming the Firmware Image Into the Target Bootloader 18
10 Related Documents 20

List of Figures

1 Device Selection 3
2 Select the Device MSP430FR2355 4
3 Enter the File of password.txt and the Firmware Image of Blink LED 4
4 Content of password.txt 4
5 Content of blink_2355.txt 5
6 Setting COM Port Number in the Settings & Utilities Tab 5
7 Wrong Password Execution 6
8 Correct Password Execution Followed by Successful Programming 6
9 Concatenation of the Bytes Into Password Format 7
10 Enter the Configuration on Read Section 7
11 Console View for Reading the Memory Successfully 7
12 Select the Device MSP432P4111 8

13 Loading a File Using the 256-Byte Default Password 8
14 Setting COM Port Number in the Settings & Utilities Tab 9
15 Sending Wrong Password Case 9
16 Console View for Programming the Data Block Successfully With the 256-Byte Default Password........ 10
17 Loaded Image on the Target Device 10
18 Concatenation of the Bytes Into Password Format 10
19 Enter the Configuration on Read Section 11
20 Console View for Reading the Memory Successfully 11
21 Select the Device MSP432E401Y 12
22 Enter the Firmware Image 12
23 Configure the COM Port and Use the Default Settings for Other Configurations 12
24 Console View of Downloading the UART Bootloader Flash-Based Application 13
25 Uncheck "Apply auto baud rate for speed initialization" 13
26 Select the Firmware Image of Blink Application 13
27 Console View of Downloading the Blink Application 14
28 Apply "Exclude from Build" for ccfg.c 14
29 Location Where CCFG is Programmed and Needs to be Deleted 15
30 Select Device CC2652R1F 15
31 Load the Image 16
32 Configure the COM Port and Use the Default Settings for Other Configuration 16
33 Console View of Downloading the pwmled Application 16
34 Image Valid Address Configuration 17
35 Enter the Configuration on Read Section 17
36 Console View for Reading the Memory Successfully 17
37 Select the CC3235S MCU for Bootloader Programming 18
38 Enter the Firmware Image 18
39 XDS COM Port Manual Selection With Given COM Port Number 19
40 Console View of Downloading the UART Bootloader Application 19

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1 Introduction

This document describes how to use UniFlash to program the bootloader of the following MCUs.

UniFlash 4.6.0 supports:

- MSP430 microcontrollers
- SimpleLink MSP432P4 microcontrollers
- SimpleLink MSP432E4 microcontrollers

UniFlash 5.0.0 adds support for:

- SimpleLink CC13xx microcontrollers
- SimpleLink CC26xx microcontrollers

2 Preparing the Image

Bootloader programming supports the following firmware image file formats:

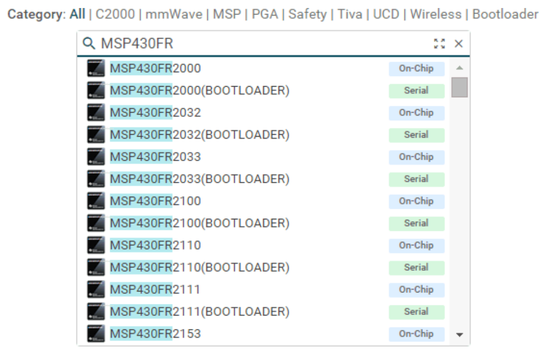
- TI TXT file (.txt)
- Intel Hex file (.hex)

- Binary (.bin)

These file formats are generated by tools such as Code Composer Studio™ IDE and IAR Embedded Workbench® IDE.

3 Supported Devices

In UniFlash, devices with bootloader support are listed with the suffix (BOOTLOADER) in the device selection (see Figure 1). The "Serial" label means that the supported protocol is serial communication, such as UART, I^{2}C, or SPI. The "On-Chip" label means that the debug programming is already available in UniFlash.


Category: All | C2000 | mmWave | MSP | PGA | Safety | Tiva | UCD | Wireless | Bootloader
MSP430FR

MSP430FR2000	On-Chip
MSP430FR2000(BOOTLOADER)	Serial
MSP430FR2032	On-Chip
MSP430FR2032(BOOTLOADER)	Serial
MSP430FR2033	On-Chip
MSP430FR2033(BOOTLOADER)	Serial
MSP430FR2100	On-Chip
MSP430FR2100(BOOTLOADER)	Serial
MSP430FR2110	On-Chip
MSP430FR2110(BOOTLOADER)	Serial
MSP430FR2111	On-Chip
MSP430FR2111(BOOTLOADER)	Serial
MSP430FR2153	On-Chip

Figure 1. Device Selection

4 GUI Default Settings

The GUI has been configured with default values. Therefore, the only configurations required are selecting the firmware image to download and the COM port number that is connected to the target device.

5 Bootloader Programming of MSP430 MCUs

5.1 Programming the Firmware Image to the Target Bootloader

For the MSP430 MCUs, the following example downloads a blink LED application to an MSP430FR2355 MCU.

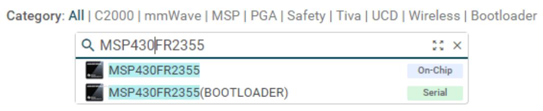
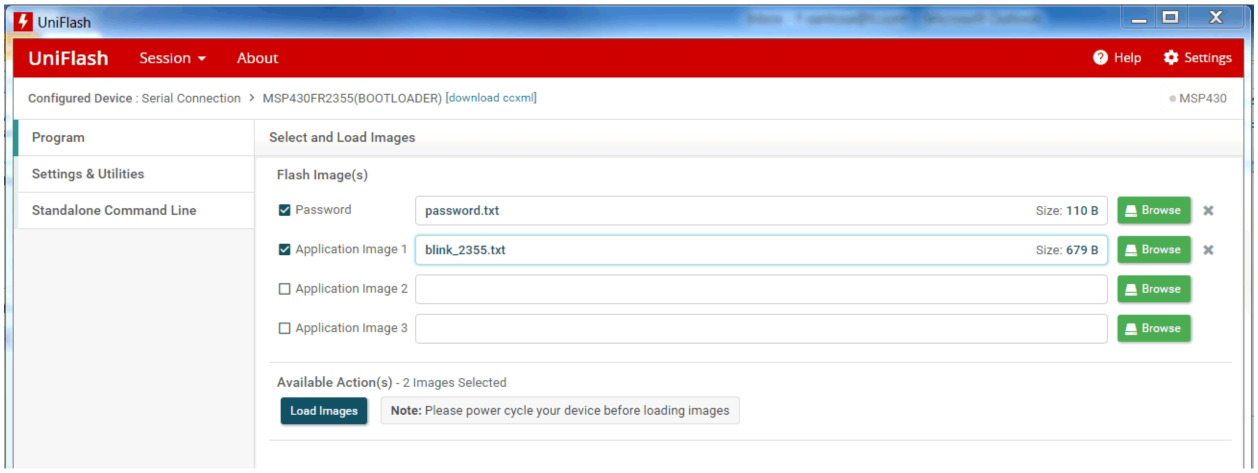

Category: All | C2000 | mmWave | MSP | PGA | Safety | Tiva | UCD | Wireless | Bootloader
MSP430FR2355
MSP430FR2355 On-Chip
MSP430FR2355(BOOTLOADER) Serial

Figure 2. Select the Device MSP430FR2355

The Program tab displays three text fields for the firmware image. The Password field is to load the image of the bootloader password, to unlock the bootloader before the communication is established. The password is the first 32 bytes of data starting at memory address 0xFFE0h, where the interrupt vector is located. For more information about the password for the bootloader, see the *MSP430™ Flash Device Bootloader (BSL) User's Guide* or the *MSP430™ FRAM Device Bootloader (BSL) User's Guide*.

When the Password field is empty, the default password is used during execution. The default password is 0xFF for all 32 bytes.

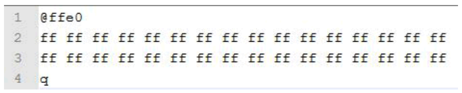
This example uses the default password, which is stored in the file password.txt.


UniFlash
UniFlash Session About Help Settings
Configured Device : Serial Connection > MSP430FR2355(BOOTLOADER) [download ccxml] MSP430
Program
Settings & Utilities
Standalone Command Line
Select and Load Images
Flash Image(s)
Browse
Available Action(s) - 2 Images Selected
Load Images
Note: Please power cycle your device before loading images

✓ Password	password.txt	Size: 110 B
✓ Application Image 1	blink_2355.txt	Size: 679 B
Application Image 2		
Application Image 3		

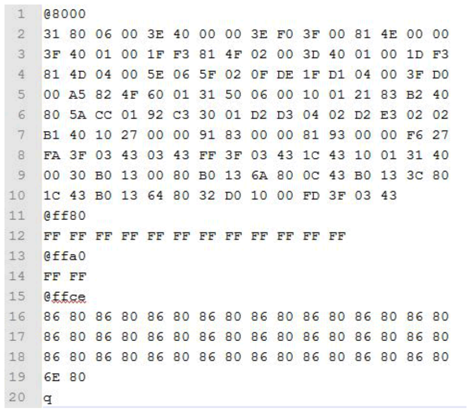
Figure 3. Enter the File of password.txt and the Firmware Image of Blink LED

For the following example, Figure 4 shows the content of password.txt, and Figure 5 shows the content of blink_2355.txt.



```
@ffe0
ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff
ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff
q
```

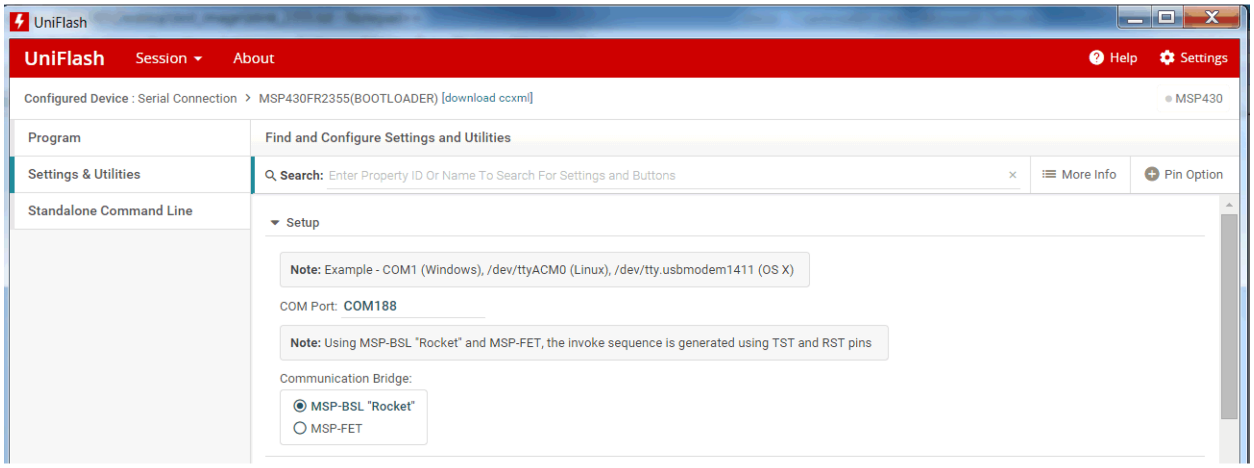
Figure 4. Content of password.txt



```
@8000
31 80 06 00 3E 40 00 00 3E F0 3F 00 81 4E 00 00
3F 40 01 00 1F F3 81 4F 02 00 3D 40 01 00 1D F3
81 4D 04 00 5E 06 5F 02 0F DE 1F D1 04 00 3F D0
00 A5 82 4F 60 01 31 50 06 00 10 01 21 83 B2 40
80 5A CC 01 92 C3 30 01 D2 D3 04 02 D2 E3 02 02
B1 40 10 27 00 00 91 83 00 00 81 93 00 00 F6 27
FA 3F 03 43 03 43 FF 3F 03 43 1C 43 10 01 31 40
00 30 B0 13 00 80 B0 13 6A 80 0C 43 B0 13 3C 80
1C 43 B0 13 64 80 32 D0 10 00 FD 3F 03 43
@ff80
FF FF FF FF FF FF FF FF FF FF FF FF
@ffa0
FF FF
@ffce
86 80 86 80 86 80 86 80 86 80 86 80 86 80 86 80
86 80 86 80 86 80 86 80 86 80 86 80 86 80 86 80
86 80 86 80 86 80 86 80 86 80 86 80 86 80 86 80
6E 80
q
```

Figure 5. Content of blink_2355.txt

The minimum requirement in the Settings & Utilities tab is the COM port and correct protocol.



Configured Device : Serial Connection > MSP430FR2355(BOOTLOADER) [download ccxml]

Find and Configure Settings and Utilities

Search: Enter Property ID Or Name To Search For Settings and Buttons

Setup

Note: Example - COM1 (Windows), /dev/ttyACM0 (Linux), /dev/tty.usbmodem1411 (OS X)

COM Port: COM188

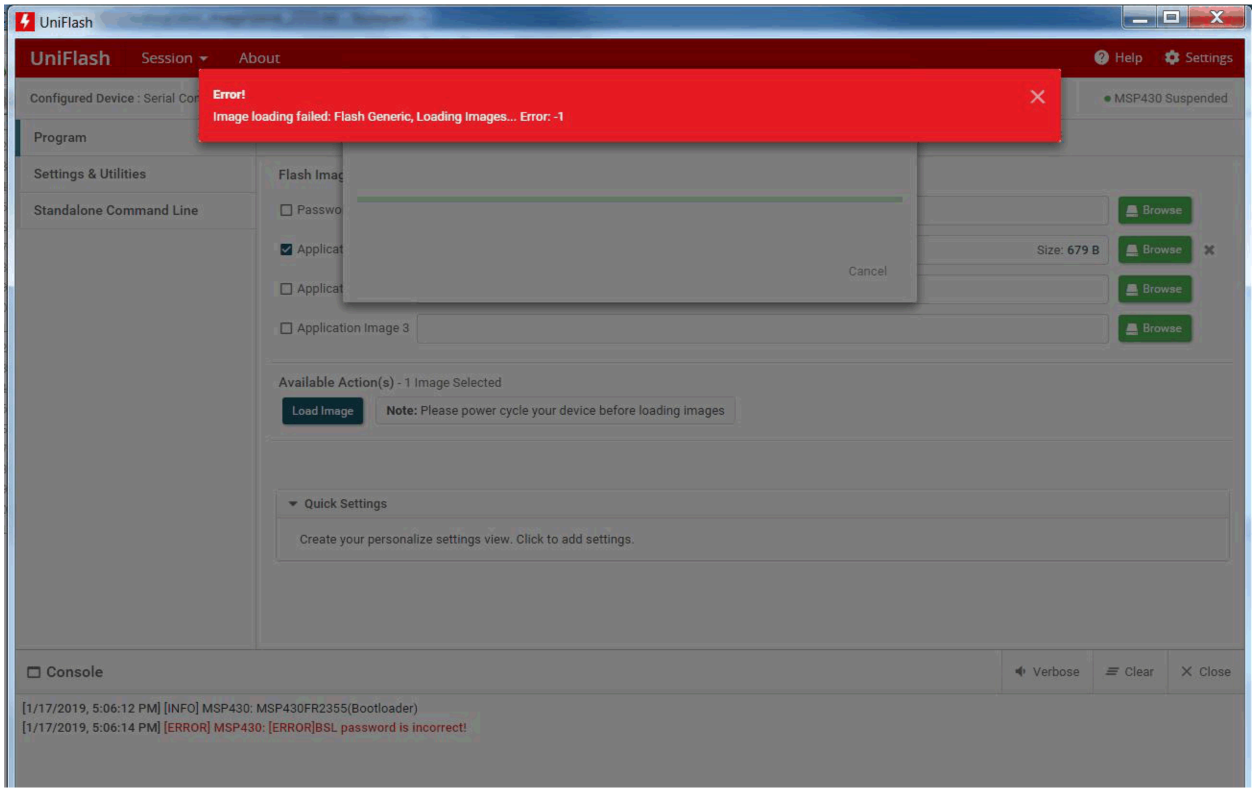
Note: Using MSP-BSL "Rocket" and MSP-FET, the invoke sequence is generated using TST and RST pins

Communication Bridge:

[✓ MSP-BSL "Rocket"] MSP-FET

Figure 6. Setting COM Port Number in the Settings & Utilities Tab

If the device was programmed and the interrupt vector sector is not empty, an error will be returned with status "BSL Password is incorrect!" (see Figure 7). Sending a wrong password triggers a mass erase on the device.



Error!
Image loading failed: Flash Generic, Loading Images... Error: -1

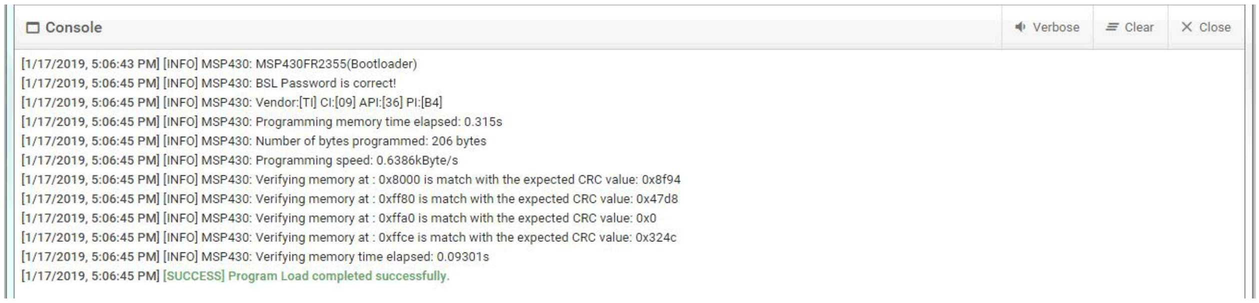
Note: Please power cycle your device before loading images

Create your personalize settings view. Click to add settings.

```
[1/17/2019, 5:06:12 PM] [INFO] MSP430: MSP430FR2355(Bootloader)
[1/17/2019, 5:06:14 PM] [ERROR] MSP430: [ERROR]BSL password is incorrect!
```

Figure 7. Wrong Password Execution

If the device is empty, the programming is successfully executed and the console shows the log result (see Figure 8).

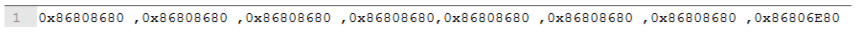


```
[1/17/2019, 5:06:43 PM] [INFO] MSP430: MSP430FR2355(Bootloader)
[1/17/2019, 5:06:45 PM] [INFO] MSP430: BSL Password is correct!
[1/17/2019, 5:06:45 PM] [INFO] MSP430: Vendor:[TI] CI:[09] API:[36] PI:[B4]
[1/17/2019, 5:06:45 PM] [INFO] MSP430: Programming memory time elapsed: 0.315s
[1/17/2019, 5:06:45 PM] [INFO] MSP430: Number of bytes programmed: 206 bytes
[1/17/2019, 5:06:45 PM] [INFO] MSP430: Programming speed: 0.6386kByte/s
[1/17/2019, 5:06:45 PM] [INFO] MSP430: Verifying memory at : 0x8000 is match with the expected CRC value: 0x8f94
[1/17/2019, 5:06:45 PM] [INFO] MSP430: Verifying memory at : 0xff80 is match with the expected CRC value: 0x47d8
[1/17/2019, 5:06:45 PM] [INFO] MSP430: Verifying memory at : 0xffa0 is match with the expected CRC value: 0x0
[1/17/2019, 5:06:45 PM] [INFO] MSP430: Verifying memory at : 0xffce is match with the expected CRC value: 0x324c
[1/17/2019, 5:06:45 PM] [INFO] MSP430: Verifying memory time elapsed: 0.09301s
[1/17/2019, 5:06:45 PM] [SUCCESS] Program Load completed successfully.
```

Figure 8. Correct Password Execution Followed by Successful Programming

5.2 Reading the Memory of the Target Bootloader

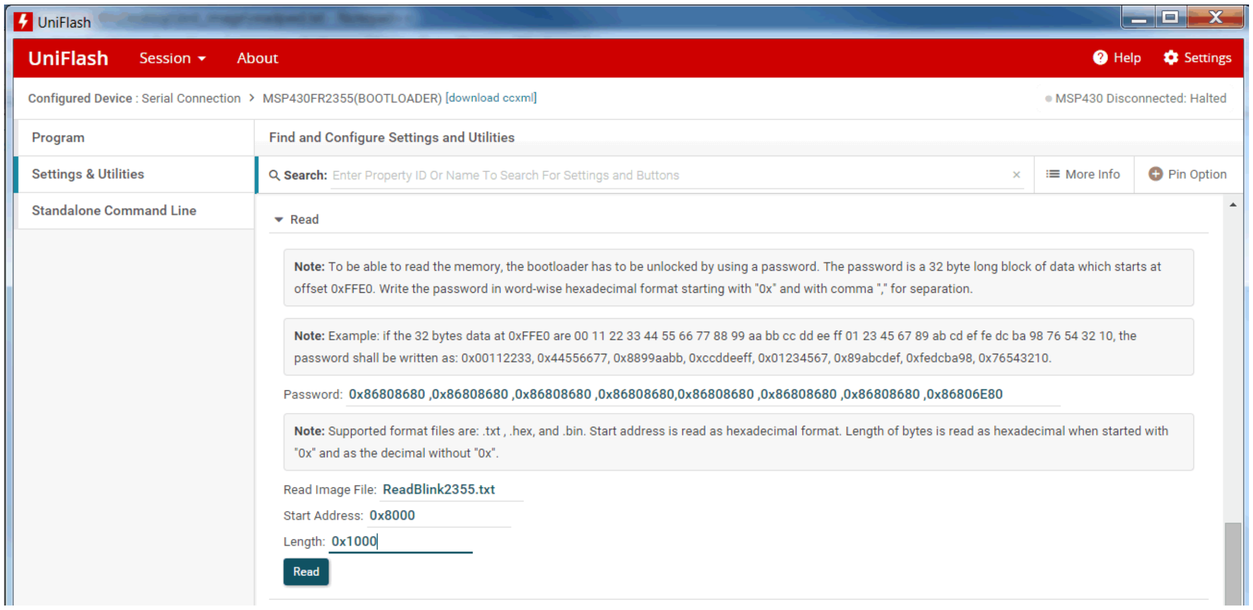
To be able to read the content of the memory of target bootloader, the bootloader must be unlocked using the password. The password is 32 bytes that are entered manually in a 32-bit word format (see Figure 9). Concatenate the bytes into 32-bit format using the LSB format with separation of 32 bytes each. The password translates into the hex format in Figure 9.



```
0x86808680 ,0x86808680 ,0x86808680 ,0x86808680,0x86808680 ,0x86808680 ,0x86808680 ,0x86806E80
```

Figure 9. Concatenation of the Bytes Into Password Format

Copy the password to the Read section in the Settings & Utilities tab. The Read Image File field specifies the file where UniFlash writes the binary. Enter the start address and number of bytes to read in the following fields.


UniFlash
UniFlash
Session
About
Help
Settings
Configured Device : Serial Connection > MSP430FR2355(BOOTLOADER) [download ccxml]
MSP430 Disconnected: Halted
Program
Settings & Utilities
Standalone Command Line
Find and Configure Settings and Utilities
Search: Enter Property ID Or Name To Search For Settings and Buttons
More Info
Pin Option
Read
Read

Note: To be able to read the memory, the bootloader has to be unlocked by using a password. The password is a 32 byte long block of data which starts at offset 0xFFE0. Write the password in word-wise hexadecimal format starting with "0x" and with comma "," for separation.

Note: Example: if the 32 bytes data at 0xFFE0 are 00 11 22 33 44 55 66 77 88 99 aa bb cc dd ee ff 01 23 45 67 89 ab cd ef fe dc ba 98 76 54 32 10, the password shall be written as: 0x00112233, 0x44556677, 0x8899aabb, 0xccddeeff, 0x01234567, 0x89abcdef, 0xfedcba98, 0x76543210.

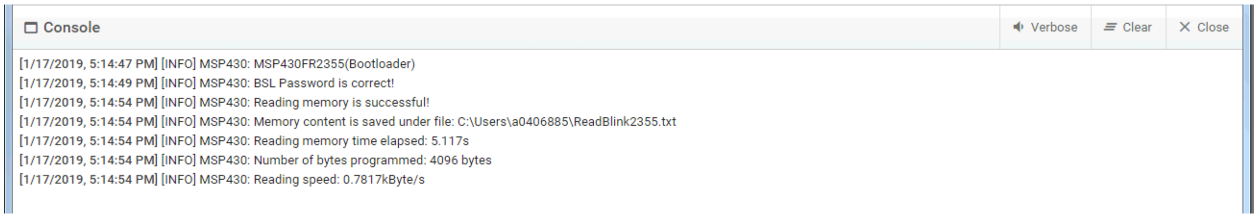
Password: 0x86808680 ,0x86808680 ,0x86808680 ,0x86808680,0x86808680 ,0x86808680 ,0x86808680 ,0x86806E80

Note: Supported format files are: .txt , .hex, and .bin. Start address is read as hexadecimal format. Length of bytes is read as hexadecimal when started with "0x" and as the decimal without "0x".

Read Image File: ReadBlink2355.txt
Start Address: 0x8000
Length: 0x1000

Figure 10. Enter the Configuration on Read Section

Successful reading memory execution show the log in Figure 11.



```
[1/17/2019, 5:14:47 PM] [INFO] MSP430: MSP430FR2355(Bootloader)
[1/17/2019, 5:14:49 PM] [INFO] MSP430: BSL Password is correct!
[1/17/2019, 5:14:54 PM] [INFO] MSP430: Reading memory is successful!
[1/17/2019, 5:14:54 PM] [INFO] MSP430: Memory content is saved under file: C:\Users\a0406885\ReadBlink2355.txt
[1/17/2019, 5:14:54 PM] [INFO] MSP430: Reading memory time elapsed: 5.117s
[1/17/2019, 5:14:54 PM] [INFO] MSP430: Number of bytes programmed: 4096 bytes
[1/17/2019, 5:14:54 PM] [INFO] MSP430: Reading speed: 0.7817kByte/s
```

Figure 11. Console View for Reading the Memory Successfully

6 Bootloader Programming for SimpleLink MSP432P4 MCUs

6.1 Programming the Firmware Image to the Target Bootloader

For the MSP432P4 family, the following example downloads a data block to the memory and reads back the programmed area.

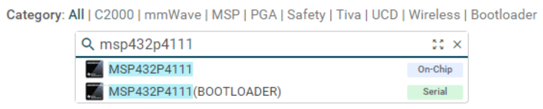
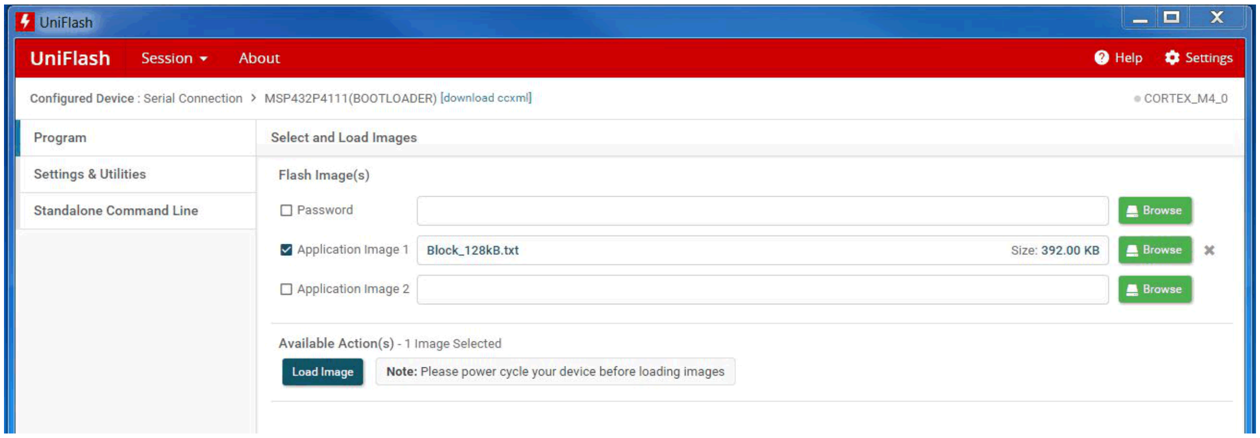

Category: All | C2000 | mmWave | MSP | PGA | Safety | Tiva | UCD | Wireless | Bootloader
msp432p4111
MSP432P4111 On-Chip
MSP432P4111(BOOTLOADER) Serial

Figure 12. Select the Device MSP432P4111

The Program tab has three text fields for the firmware image. The Password field specifies a file with the bootloader password, to unlock the bootloader before the communication is established. The password is the first 256 bytes of data starting at memory address 0x0. For more information about the password for the bootloader, see *MSP432P4xx SimpleLink™ Microcontrollers Bootloader (BSL) User's Guide*.

If the Password field is empty, the default password is used during execution. The default password is 0xFF for all 256 bytes.

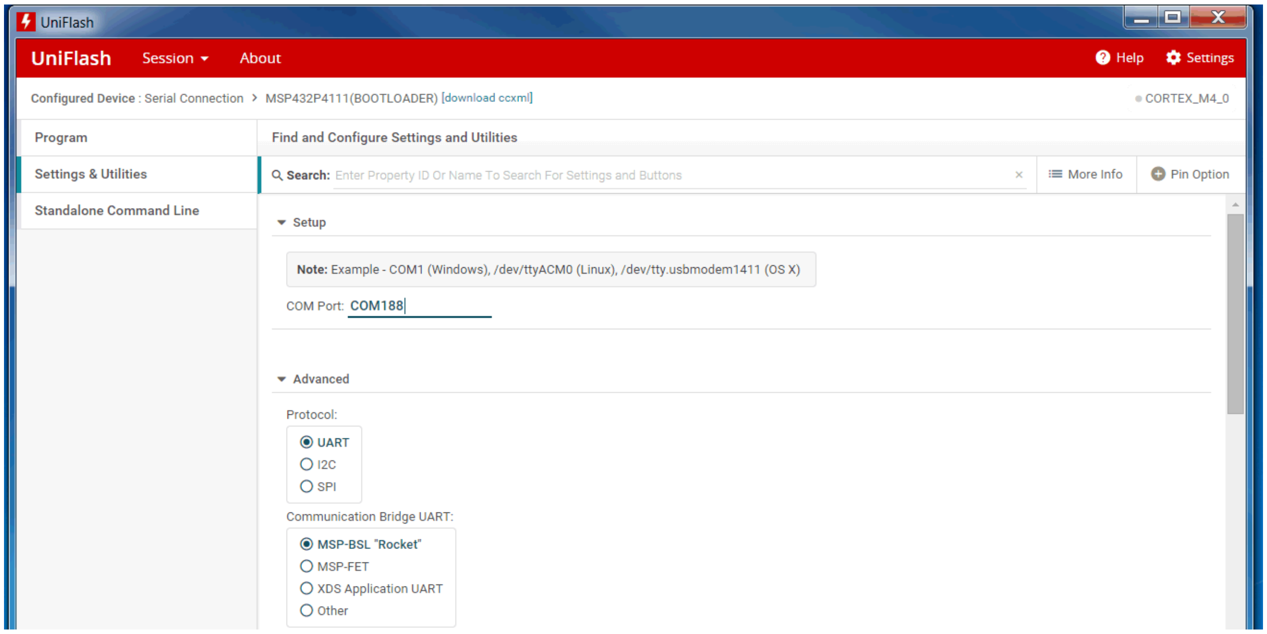

UniFlash
UniFlash Session About Help Settings
Configured Device : Serial Connection > MSP432P4111(BOOTLOADER) [download ccxml] CORTEX_M4_0
Program
Settings & Utilities
Standalone Command Line
Select and Load Images
Flash Image(s)
Password Browse
Application Image 1 Browse
Application Image 2 Browse
Available Action(s) - 1 Image Selected
Load Image

Application Image 1: Block_128kB.txt Size: 392.00 KB

Note: Please power cycle your device before loading images

Figure 13. Loading a File Using the 256-Byte Default Password

The minimum configuration to enter in the Setting & Utilities tab is the COM port (see Figure 14).


UniFlash
Session
About
Help
Settings
Configured Device : Serial Connection > MSP432P4111(BOOTLOADER) [download ccxml]
CORTEX_M4_0
Program
Settings & Utilities
Standalone Command Line
Find and Configure Settings and Utilities
Search: Enter Property ID Or Name To Search For Settings and Buttons
More Info
Pin Option
Setup
Advanced

Note: Example - COM1 (Windows), /dev/ttyACM0 (Linux), /dev/tty.usbmodem1411 (OS X)

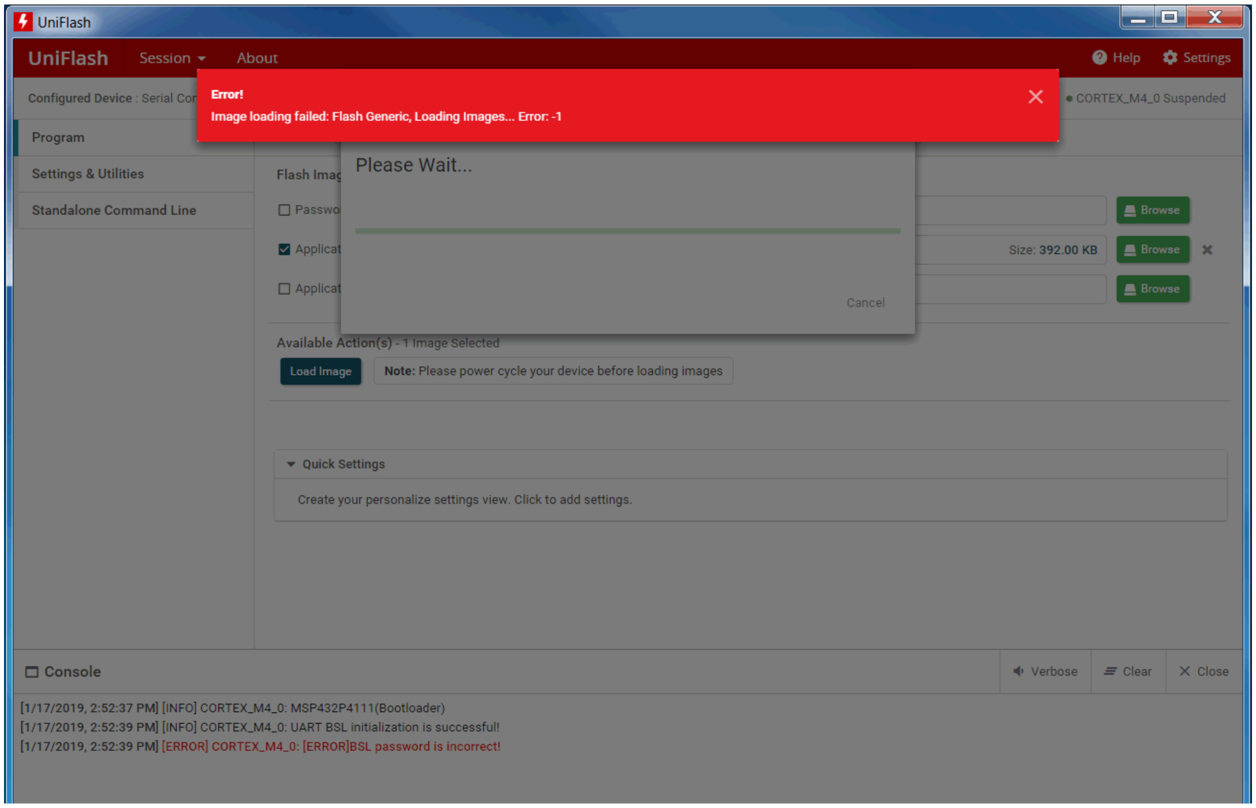
COM Port: COM188

Protocol: [✓ UART] I2C SPI

Communication Bridge UART: [✓ MSP-BSL "Rocket"] MSP-FET XDS Application UART Other

Figure 14. Setting COM Port Number in the Settings & Utilities Tab

If the device is not empty, sending the default password is the same as sending a wrong password. The console shows the BSL password is incorrect, and the program stops execution. When the bootloader receives the wrong password, a mass erase is executed for all of the main memory area.



Error!
Image loading failed: Flash Generic, Loading Images... Error: -1

Please Wait...

Size: 392.00 KB

Available Action(s) - 1 Image Selected

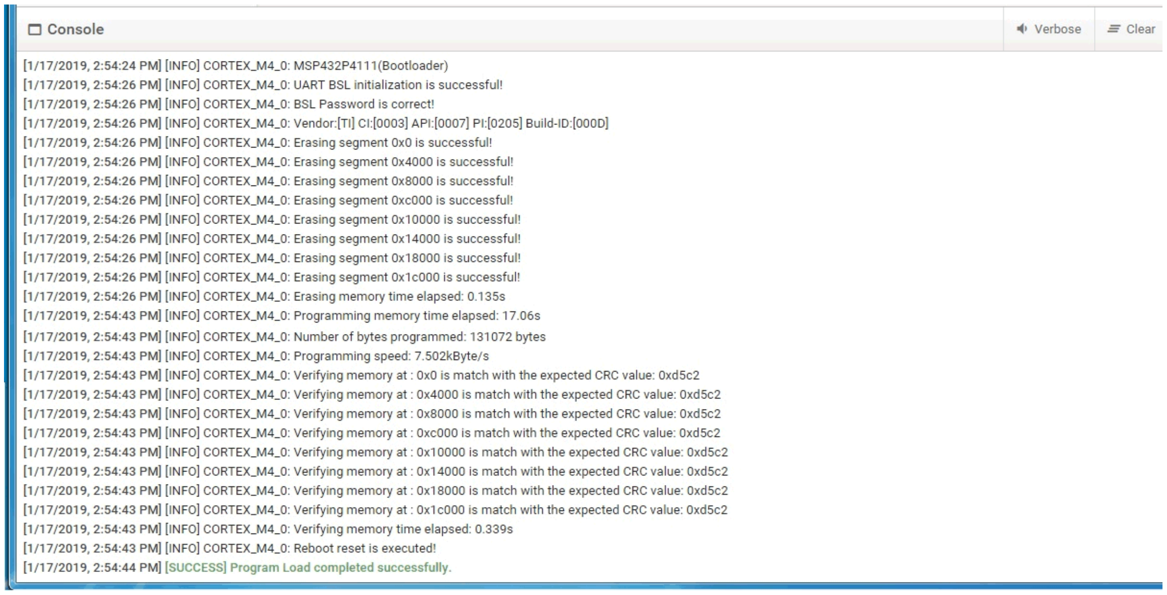
Note: Please power cycle your device before loading images

Create your personalize settings view. Click to add settings.

```
[1/17/2019, 2:52:37 PM] [INFO] CORTEX_M4_0: MSP432P4111(Bootloader)
[1/17/2019, 2:52:39 PM] [INFO] CORTEX_M4_0: UART BSL initialization is successful!
[1/17/2019, 2:52:39 PM] [ERROR] CORTEX_M4_0: [ERROR]BSL password is incorrect!
```

Figure 15. Sending Wrong Password Case

If you repeat the process with the same configuration, the process executes successfully, because the memory is now empty.



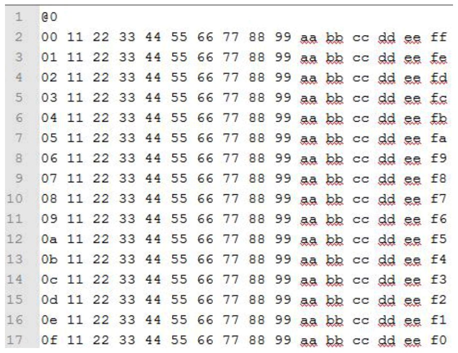
```
[1/17/2019, 2:54:24 PM] [INFO] CORTEX_M4_0: MSP432P4111(Bootloader)
[1/17/2019, 2:54:26 PM] [INFO] CORTEX_M4_0: UART BSL initialization is successful!
[1/17/2019, 2:54:26 PM] [INFO] CORTEX_M4_0: BSL Password is correct!
[1/17/2019, 2:54:26 PM] [INFO] CORTEX_M4_0: Vendor:[TI] CI:[0003] API:[0007] PI:[0205] Build-ID:[000D]
[1/17/2019, 2:54:26 PM] [INFO] CORTEX_M4_0: Erasing segment 0x0 is successful!
[1/17/2019, 2:54:26 PM] [INFO] CORTEX_M4_0: Erasing segment 0x4000 is successful!
[1/17/2019, 2:54:26 PM] [INFO] CORTEX_M4_0: Erasing segment 0x8000 is successful!
[1/17/2019, 2:54:26 PM] [INFO] CORTEX_M4_0: Erasing segment 0xc000 is successful!
[1/17/2019, 2:54:26 PM] [INFO] CORTEX_M4_0: Erasing segment 0x10000 is successful!
[1/17/2019, 2:54:26 PM] [INFO] CORTEX_M4_0: Erasing segment 0x14000 is successful!
[1/17/2019, 2:54:26 PM] [INFO] CORTEX_M4_0: Erasing segment 0x18000 is successful!
[1/17/2019, 2:54:26 PM] [INFO] CORTEX_M4_0: Erasing segment 0x1c000 is successful!
[1/17/2019, 2:54:26 PM] [INFO] CORTEX_M4_0: Erasing memory time elapsed: 0.135s
[1/17/2019, 2:54:43 PM] [INFO] CORTEX_M4_0: Programming memory time elapsed: 17.06s
[1/17/2019, 2:54:43 PM] [INFO] CORTEX_M4_0: Number of bytes programmed: 131072 bytes
[1/17/2019, 2:54:43 PM] [INFO] CORTEX_M4_0: Programming speed: 7.502kByte/s
[1/17/2019, 2:54:43 PM] [INFO] CORTEX_M4_0: Verifying memory at : 0x0 is match with the expected CRC value: 0xd5c2
[1/17/2019, 2:54:43 PM] [INFO] CORTEX_M4_0: Verifying memory at : 0x4000 is match with the expected CRC value: 0xd5c2
[1/17/2019, 2:54:43 PM] [INFO] CORTEX_M4_0: Verifying memory at : 0x8000 is match with the expected CRC value: 0xd5c2
[1/17/2019, 2:54:43 PM] [INFO] CORTEX_M4_0: Verifying memory at : 0xc000 is match with the expected CRC value: 0xd5c2
[1/17/2019, 2:54:43 PM] [INFO] CORTEX_M4_0: Verifying memory at : 0x10000 is match with the expected CRC value: 0xd5c2
[1/17/2019, 2:54:43 PM] [INFO] CORTEX_M4_0: Verifying memory at : 0x14000 is match with the expected CRC value: 0xd5c2
[1/17/2019, 2:54:43 PM] [INFO] CORTEX_M4_0: Verifying memory at : 0x18000 is match with the expected CRC value: 0xd5c2
[1/17/2019, 2:54:43 PM] [INFO] CORTEX_M4_0: Verifying memory at : 0x1c000 is match with the expected CRC value: 0xd5c2
[1/17/2019, 2:54:43 PM] [INFO] CORTEX_M4_0: Verifying memory time elapsed: 0.339s
[1/17/2019, 2:54:43 PM] [INFO] CORTEX_M4_0: Reboot reset is executed!
[1/17/2019, 2:54:44 PM] [SUCCESS] Program Load completed successfully.
```

Figure 16. Console View for Programming the Data Block Successfully With the 256-Byte Default Password

6.2 *Reading the Memory of the Target Bootloader*

To read the contents of the target bootloader from memory, the bootloader must be unlocked using the password. The password is 256 bytes that are entered manually in a 32-bit word format.

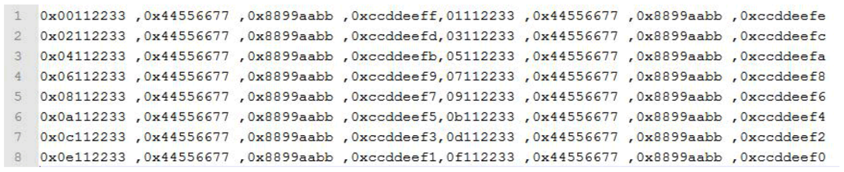
The image loaded in the MCU starts at address 0x0 and is 128KB long. The password is the first 256 bytes (see Figure 17).



```
@0
00 11 22 33 44 55 66 77 88 99 aa bb cc dd ee ff
01 11 22 33 44 55 66 77 88 99 aa bb cc dd ee fe
02 11 22 33 44 55 66 77 88 99 aa bb cc dd ee fd
03 11 22 33 44 55 66 77 88 99 aa bb cc dd ee fc
04 11 22 33 44 55 66 77 88 99 aa bb cc dd ee fb
05 11 22 33 44 55 66 77 88 99 aa bb cc dd ee fa
06 11 22 33 44 55 66 77 88 99 aa bb cc dd ee f9
07 11 22 33 44 55 66 77 88 99 aa bb cc dd ee f8
08 11 22 33 44 55 66 77 88 99 aa bb cc dd ee f7
09 11 22 33 44 55 66 77 88 99 aa bb cc dd ee f6
0a 11 22 33 44 55 66 77 88 99 aa bb cc dd ee f5
0b 11 22 33 44 55 66 77 88 99 aa bb cc dd ee f4
0c 11 22 33 44 55 66 77 88 99 aa bb cc dd ee f3
0d 11 22 33 44 55 66 77 88 99 aa bb cc dd ee f2
0e 11 22 33 44 55 66 77 88 99 aa bb cc dd ee f1
0f 11 22 33 44 55 66 77 88 99 aa bb cc dd ee f0
```

Figure 17. Loaded Image on the Target Device

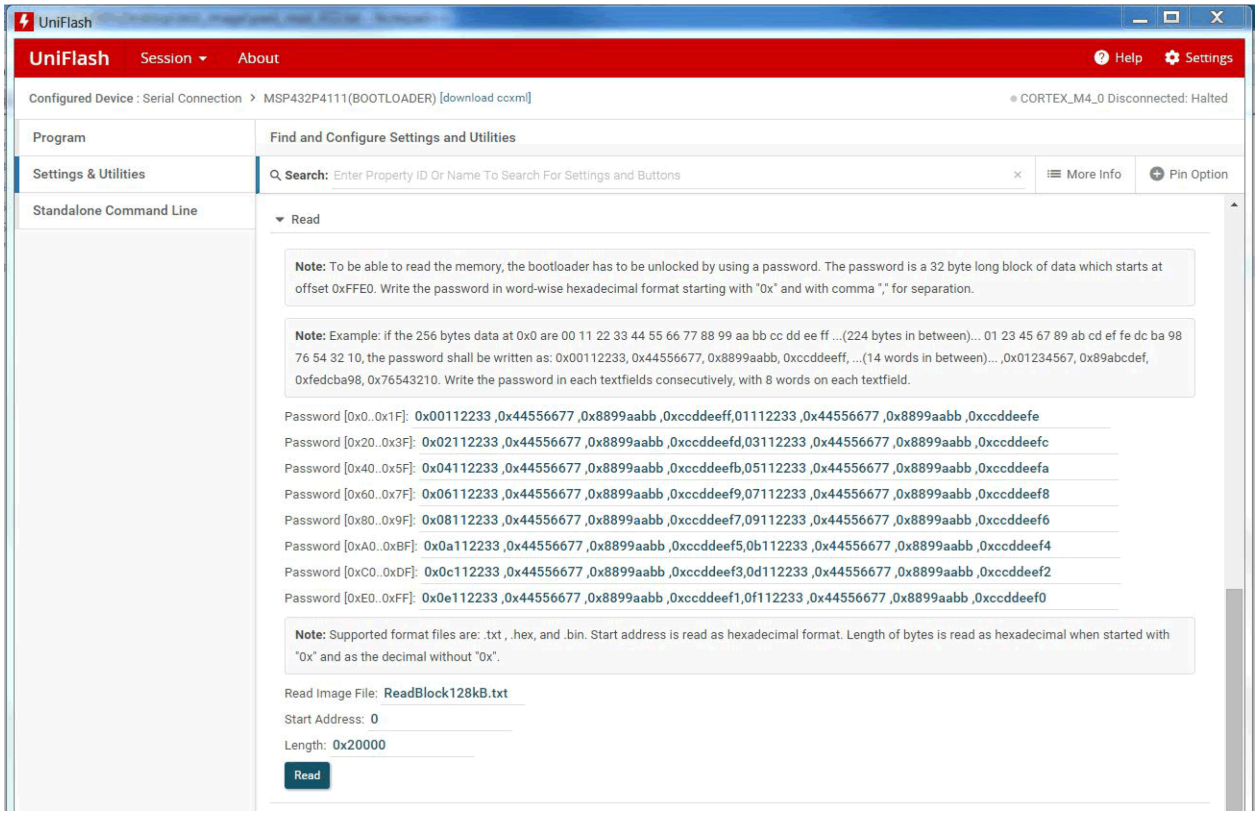
Concatenate the bytes into a 32-bit format using the LSB format with separation of 32 bytes each. The password in Figure 17 is translated into hex format as shown in Figure 18.



```
0x00112233 ,0x44556677 ,0x8899aabb ,0xccddeeff,01112233 ,0x44556677 ,0x8899aabb ,0xccddeefe
0x02112233 ,0x44556677 ,0x8899aabb ,0xccddeefd,03112233 ,0x44556677 ,0x8899aabb ,0xccddeefc
0x04112233 ,0x44556677 ,0x8899aabb ,0xccddeefb,05112233 ,0x44556677 ,0x8899aabb ,0xccddeefa
0x06112233 ,0x44556677 ,0x8899aabb ,0xccddeef9,07112233 ,0x44556677 ,0x8899aabb ,0xccddeef8
0x08112233 ,0x44556677 ,0x8899aabb ,0xccddeef7,09112233 ,0x44556677 ,0x8899aabb ,0xccddeef6
0x0a112233 ,0x44556677 ,0x8899aabb ,0xccddeef5,0b112233 ,0x44556677 ,0x8899aabb ,0xccddeef4
0x0c112233 ,0x44556677 ,0x8899aabb ,0xccddeef3,0d112233 ,0x44556677 ,0x8899aabb ,0xccddeef2
0x0e112233 ,0x44556677 ,0x8899aabb ,0xccddeef1,0f112233 ,0x44556677 ,0x8899aabb ,0xccddeef0
```

Figure 18. Concatenation of the Bytes Into Password Format

Copy the password to the Read section in the Settings & Utilities tab. The filename specifies a file where UniFlash can write the binary and save in the users folder automatically. Type the start address and how many bytes to read in the following text fields.



Configured Device : Serial Connection > MSP432P4111(BOOTLOADER) [download ccxml]

CORTEX_M4_0 Disconnected: Halted

Find and Configure Settings and Utilities

Search: Enter Property ID Or Name To Search For Settings and Buttons

Note: To be able to read the memory, the bootloader has to be unlocked by using a password. The password is a 32 byte long block of data which starts at offset 0xFFE0. Write the password in word-wise hexadecimal format starting with "0x" and with comma "," for separation.

Note: Example: if the 256 bytes data at 0x0 are 00 11 22 33 44 55 66 77 88 99 aa bb cc dd ee ff ...(224 bytes in between)... 01 23 45 67 89 ab cd ef fe dc ba 98 76 54 32 10, the password shall be written as: 0x00112233, 0x44556677, 0x8899aabb, 0xccddeeff, ...(14 words in between)... ,0x01234567, 0x89abcdef, 0xfedcba98, 0x76543210. Write the password in each textfields consecutively, with 8 words on each textfield.

Password [0x0..0x1F]: 0x00112233 ,0x44556677 ,0x8899aabb ,0xccddeeff,01112233 ,0x44556677 ,0x8899aabb ,0xccddeefe

Password [0x20..0x3F]: 0x02112233 ,0x44556677 ,0x8899aabb ,0xccddeefd,03112233 ,0x44556677 ,0x8899aabb ,0xccddeefc

Password [0x40..0x5F]: 0x04112233 ,0x44556677 ,0x8899aabb ,0xccddeefb,05112233 ,0x44556677 ,0x8899aabb ,0xccddeefa

Password [0x60..0x7F]: 0x06112233 ,0x44556677 ,0x8899aabb ,0xccddeef9,07112233 ,0x44556677 ,0x8899aabb ,0xccddeef8

Password [0x80..0x9F]: 0x08112233 ,0x44556677 ,0x8899aabb ,0xccddeef7,09112233 ,0x44556677 ,0x8899aabb ,0xccddeef6

Password [0xA0..0xBF]: 0x0a112233 ,0x44556677 ,0x8899aabb ,0xccddeef5,0b112233 ,0x44556677 ,0x8899aabb ,0xccddeef4

Password [0xC0..0xDF]: 0x0c112233 ,0x44556677 ,0x8899aabb ,0xccddeef3,0d112233 ,0x44556677 ,0x8899aabb ,0xccddeef2

Password [0xE0..0xFF]: 0x0e112233 ,0x44556677 ,0x8899aabb ,0xccddeef1,0f112233 ,0x44556677 ,0x8899aabb ,0xccddeef0

Note: Supported format files are: .txt , .hex, and .bin. Start address is read as hexadecimal format. Length of bytes is read as hexadecimal when started with "0x" and as the decimal without "0x".

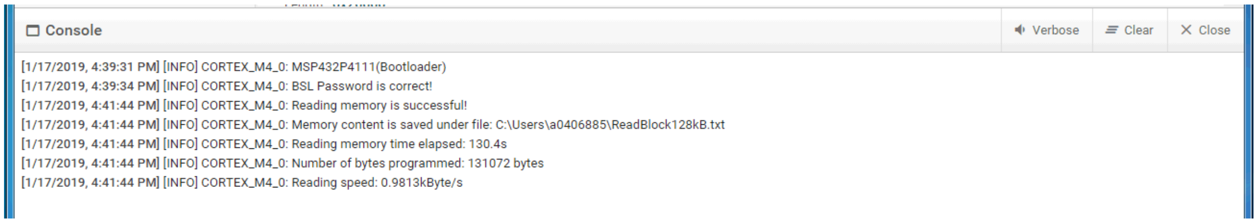
Read Image File: ReadBlock128kB.txt

Start Address: 0

Length: 0x20000

Figure 19. Enter the Configuration on Read Section

Figure 20 shows the console view after successful reading of the memory.



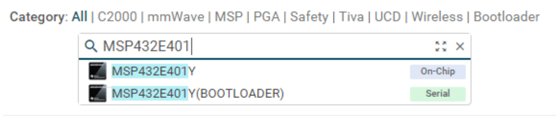
```
[1/17/2019, 4:39:31 PM] [INFO] CORTEX_M4_0: MSP432P4111(Bootloader)
[1/17/2019, 4:39:34 PM] [INFO] CORTEX_M4_0: BSL Password is correct!
[1/17/2019, 4:41:44 PM] [INFO] CORTEX_M4_0: Reading memory is successful!
[1/17/2019, 4:41:44 PM] [INFO] CORTEX_M4_0: Memory content is saved under file: C:\Users\a0406885\ReadBlock128kB.txt
[1/17/2019, 4:41:44 PM] [INFO] CORTEX_M4_0: Reading memory time elapsed: 130.4s
[1/17/2019, 4:41:44 PM] [INFO] CORTEX_M4_0: Number of bytes programmed: 131072 bytes
[1/17/2019, 4:41:44 PM] [INFO] CORTEX_M4_0: Reading speed: 0.9813kByte/s
```

Figure 20. Console View for Reading the Memory Successfully

7 Bootloader Programming for SimpleLink MSP432E4 MCUs

7.1 Programming the Firmware Image to the Target Bootloader

For the MSP432E4 MCU, the following example downloads the UART bootloader flash-based application from the SDK. The device must be fully erased to run this example.

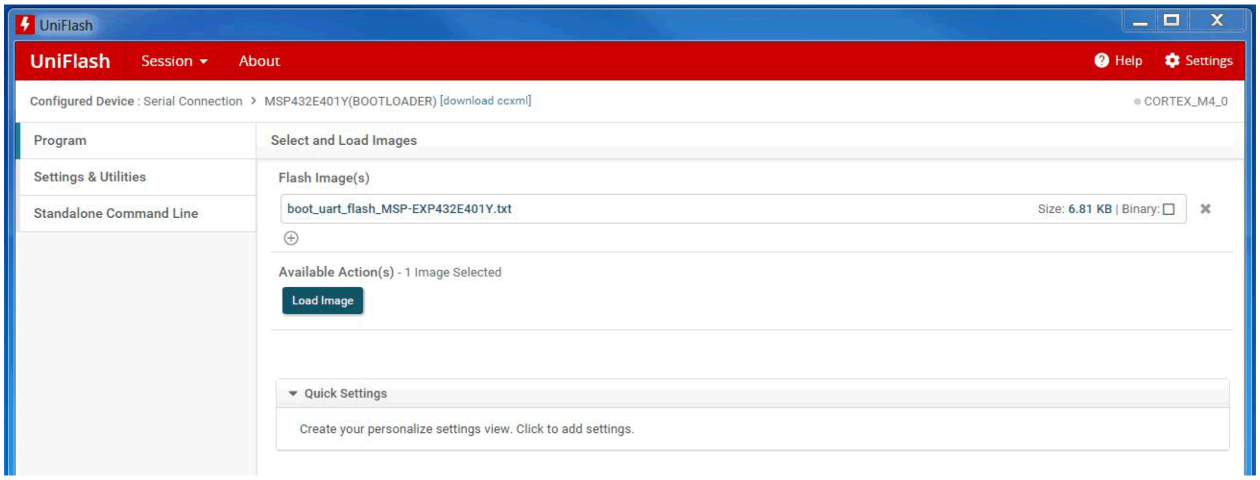

Category: All | C2000 | mmWave | MSP | PGA | Safety | Tiva | UCD | Wireless | Bootloader

MSP432E401

MSP432E401Y On-Chip

MSP432E401Y(BOOTLOADER) Serial

Figure 21. Select the Device MSP432E401Y


UniFlash | Session | About | Help | Settings

Configured Device : Serial Connection > MSP432E401Y(BOOTLOADER) [download ccxml] CORTEX_M4_0

Program / Settings & Utilities / Standalone Command Line

Select and Load Images

Flash Image(s)

boot_uart_flash_MSP-EXP432E401Y.txt Size: 6.81 KB | Binary: ☐

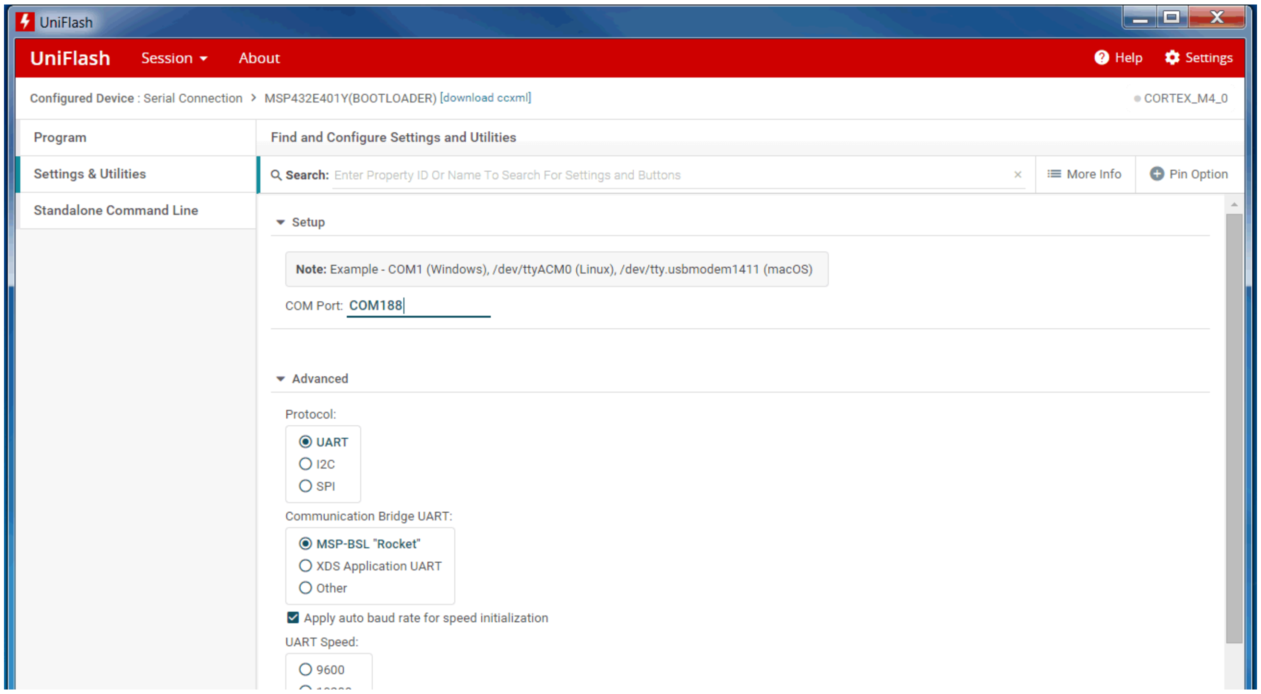
Available Action(s) - 1 Image Selected

Load Image

Quick Settings

Create your personalize settings view. Click to add settings.

Figure 22. Enter the Firmware Image


UniFlash | Session | About | Help | Settings

Configured Device : Serial Connection > MSP432E401Y(BOOTLOADER) [download ccxml] CORTEX_M4_0

Program / Settings & Utilities / Standalone Command Line

Find and Configure Settings and Utilities

Search: Enter Property ID Or Name To Search For Settings and Buttons | More Info | Pin Option

Setup

Note: Example - COM1 (Windows), /dev/ttyACM0 (Linux), /dev/tty.usbmodem1411 (macOS)

COM Port: COM188

Advanced

Protocol: [✓ UART] I2C SPI

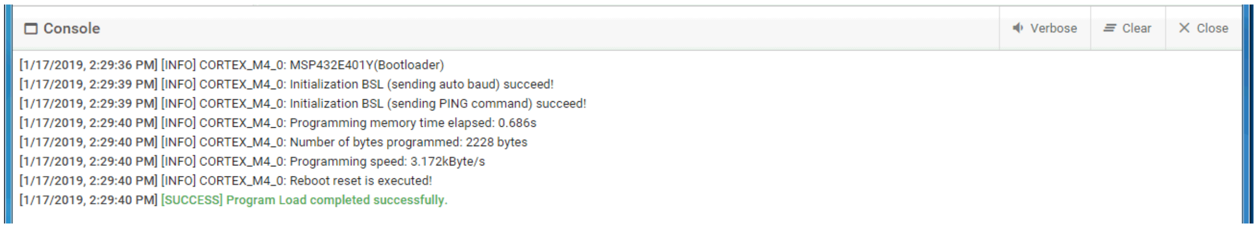
Communication Bridge UART: [✓ MSP-BSL "Rocket"] XDS Application UART Other

[✓] Apply auto baud rate for speed initialization

UART Speed: 9600

Figure 23. Configure the COM Port and Use the Default Settings for Other Configurations

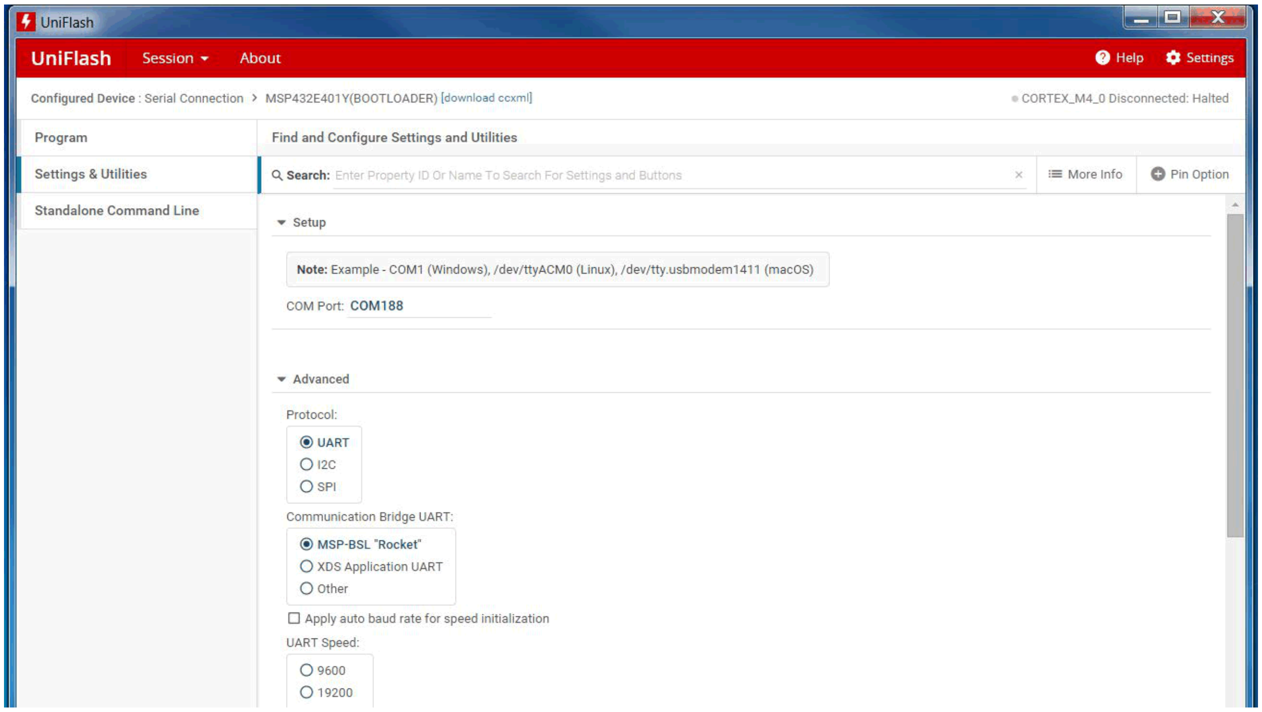
Select Load Image to start the programming process. The console shows the log of each operation (see Figure 24).



```
[1/17/2019, 2:29:36 PM] [INFO] CORTEX_M4_0: MSP432E401Y(Bootloader)
[1/17/2019, 2:29:39 PM] [INFO] CORTEX_M4_0: Initialization BSL (sending auto baud) succeed!
[1/17/2019, 2:29:39 PM] [INFO] CORTEX_M4_0: Initialization BSL (sending PING command) succeed!
[1/17/2019, 2:29:40 PM] [INFO] CORTEX_M4_0: Programming memory time elapsed: 0.686s
[1/17/2019, 2:29:40 PM] [INFO] CORTEX_M4_0: Number of bytes programmed: 2228 bytes
[1/17/2019, 2:29:40 PM] [INFO] CORTEX_M4_0: Programming speed: 3.172kByte/s
[1/17/2019, 2:29:40 PM] [INFO] CORTEX_M4_0: Reboot reset is executed!
[1/17/2019, 2:29:40 PM] [SUCCESS] Program Load completed successfully.
```

Figure 24. Console View of Downloading the UART Bootloader Flash-Based Application

After the first programming successfully executes, the UART bootloader flash-based application runs each time the device is reset. The next step is to program a blink LED application that is provided in the SDK examples with no auto-baud rate configuration.



Configured Device : Serial Connection > MSP432E401Y(BOOTLOADER) [download ccxml] CORTEX_M4_0 Disconnected: Halted

Find and Configure Settings and Utilities

Search: Enter Property ID Or Name To Search For Settings and Buttons

Note: Example - COM1 (Windows), /dev/ttyACM0 (Linux), /dev/tty.usbmodem1411 (macOS)

COM Port: COM188

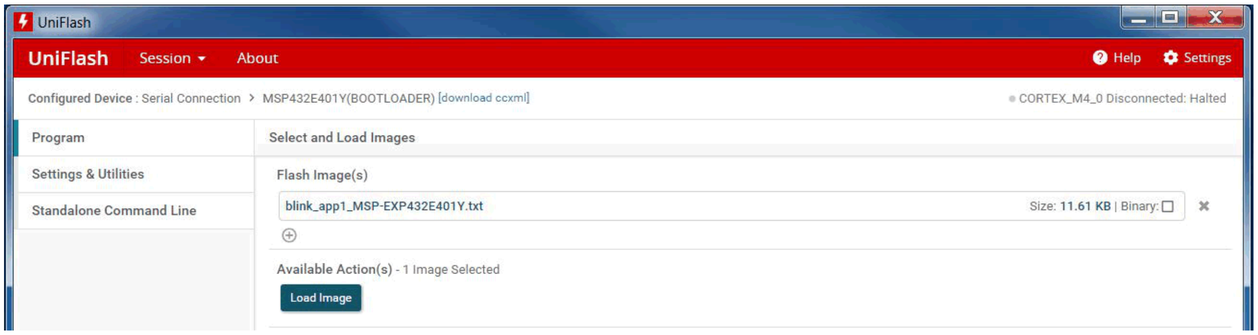
Protocol: [✓ UART] I2C SPI

Communication Bridge UART: [✓ MSP-BSL "Rocket"] XDS Application UART Other

☐ Apply auto baud rate for speed initialization

UART Speed: 9600 19200

Figure 25. Uncheck "Apply auto baud rate for speed initialization"



Configured Device : Serial Connection > MSP432E401Y(BOOTLOADER) [download ccxml] CORTEX_M4_0 Disconnected: Halted

Select and Load Images

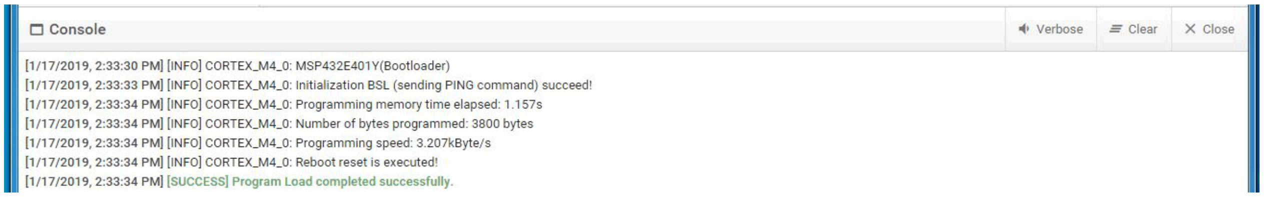
Flash Image(s)

blink_app1_MSP-EXP432E401Y.txt Size: 11.61 KB | Binary: ☐

Available Action(s) - 1 Image Selected

Figure 26. Select the Firmware Image of Blink Application

The console output after a successful operation shows that the initialization only executes the PING command without auto baud rate (see Figure 27).



```
[1/17/2019, 2:33:30 PM] [INFO] CORTEX_M4_0: MSP432E401Y(Bootloader)
[1/17/2019, 2:33:33 PM] [INFO] CORTEX_M4_0: Initialization BSL (sending PING command) succeed!
[1/17/2019, 2:33:34 PM] [INFO] CORTEX_M4_0: Programming memory time elapsed: 1.157s
[1/17/2019, 2:33:34 PM] [INFO] CORTEX_M4_0: Number of bytes programmed: 3800 bytes
[1/17/2019, 2:33:34 PM] [INFO] CORTEX_M4_0: Programming speed: 3.207kByte/s
[1/17/2019, 2:33:34 PM] [INFO] CORTEX_M4_0: Reboot reset is executed!
[1/17/2019, 2:33:34 PM] [SUCCESS] Program Load completed successfully.
```

Figure 27. Console View of Downloading the Blink Application

8 Bootloader Programming for SimpleLink CC13xx and CC26xx MCUs

8.1 Handling the CCFG Configuration Under Firmware Image

By default, creating a firmware image based on examples in the SDK create the CCFG configuration. CCFG configuration is programmed at these addresses:

- 0x57FA8h for CC13x2 and CC26x2 devices
- 0x1FFA8h for CC13x0 and CC26x0 devices

UniFlash supports CCFG configuration during bootloader programming. Therefore, any CCFG configuration from the firmware image is discarded. To not build the CCFG section during compilation, set the "Exclude from Build" option on the ccfg.c file that is automatically imported to the project when using the example from the SDK.

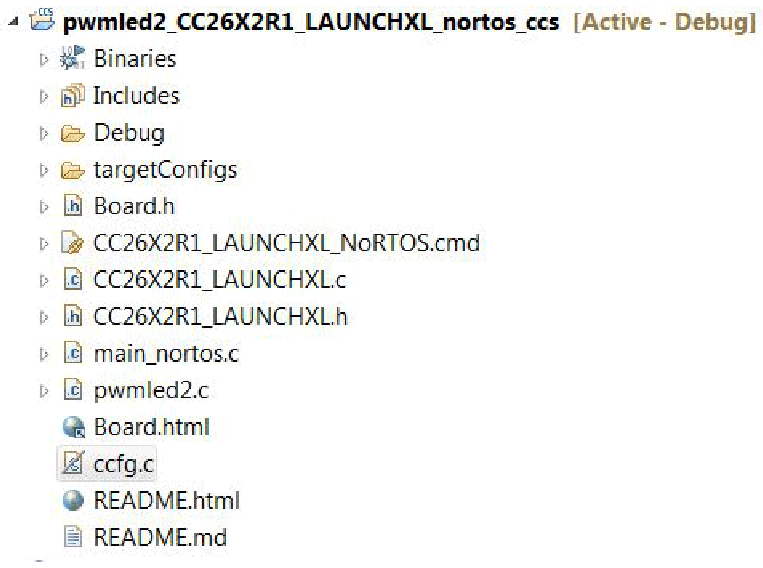
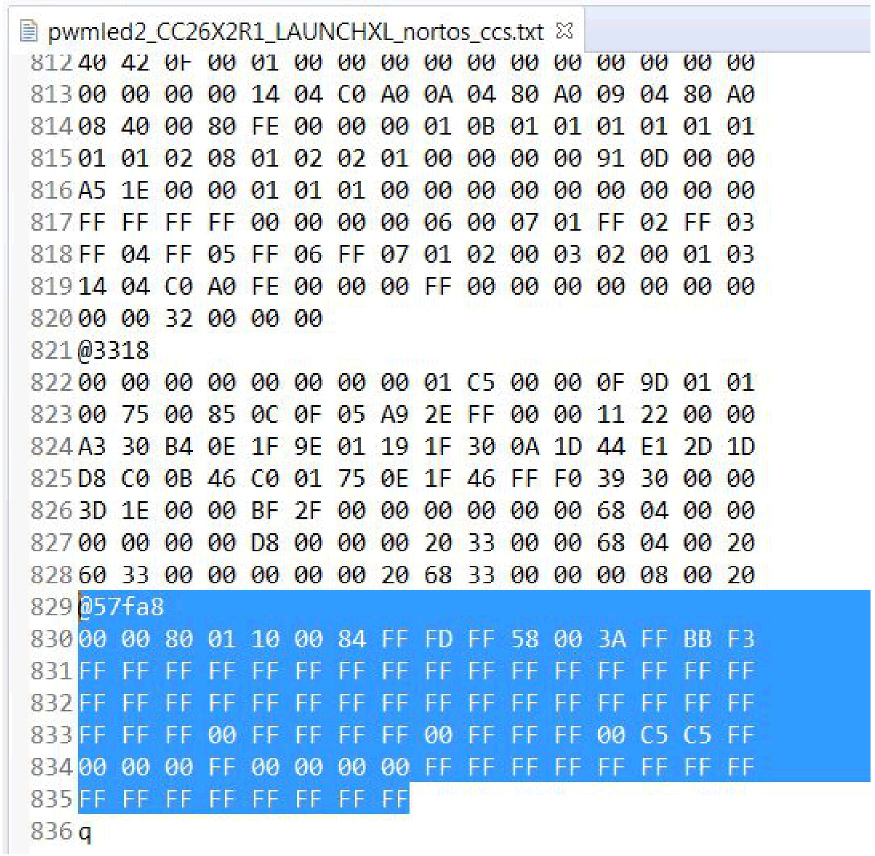


Figure 28. Apply "Exclude from Build" for ccfg.c

Another option to is to manually delete the CCFG section from the generated firmware image. The CCFG section is last in the file (see Figure 29).



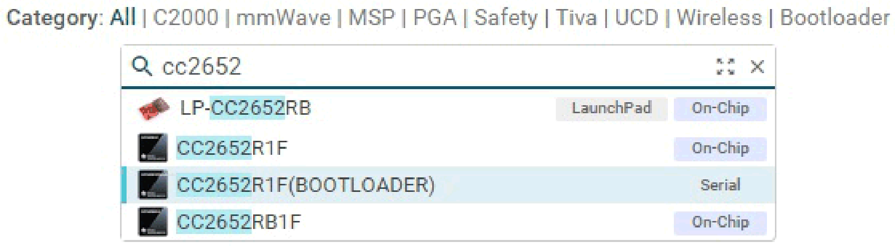
pwmled2_CC26X2R1_LAUNCHXL_nortos_ccs.txt

```
40 42 0F 00 01 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 14 04 C0 A0 0A 04 80 A0 09 04 80 A0
08 40 00 80 FE 00 00 00 01 0B 01 01 01 01 01 01
01 01 02 08 01 02 02 01 00 00 00 00 91 0D 00 00
A5 1E 00 00 01 01 01 00 00 00 00 00 00 00 00 00
FF FF FF FF 00 00 00 00 06 00 07 01 FF 02 FF 03
FF 04 FF 05 FF 06 FF 07 01 02 00 03 02 00 01 03
14 04 C0 A0 FE 00 00 00 FF 00 00 00 00 00 00 00
00 00 32 00 00 00
@3318
00 00 00 00 00 00 00 00 01 C5 00 00 0F 9D 01 01
00 75 00 85 0C 0F 05 A9 2E FF 00 00 11 22 00 00
A3 30 B4 0E 1F 9E 01 19 1F 30 0A 1D 44 E1 2D 1D
D8 C0 0B 46 C0 01 75 0E 1F 46 FF F0 39 30 00 00
3D 1E 00 00 BF 2F 00 00 00 00 00 00 68 04 00 00
00 00 00 00 D8 00 00 00 20 33 00 00 68 04 00 20
60 33 00 00 00 00 00 20 68 33 00 00 00 08 00 20
@57fa8
00 00 80 01 10 00 84 FF FD FF 58 00 3A FF BB F3
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF 00 FF FF FF FF 00 FF FF FF 00 C5 C5 FF
00 00 00 FF 00 00 00 00 FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF
q
```

Figure 29. Location Where CCFG is Programmed and Needs to be Deleted

8.2 *Programming the Firmware Image Into the Target Bootloader*

To select one of the CC13xx and CC26xx wireless MCUs, type the device name and then select the entry that ends with "(BOOTLOADER)" and that has a label of "Serial" next to it (see Figure 30). The "On-Chip" label is a programming feature that uses a supported debugger. On this example, the LaunchXL-CC26x2R1 with CC2652R1F is used.



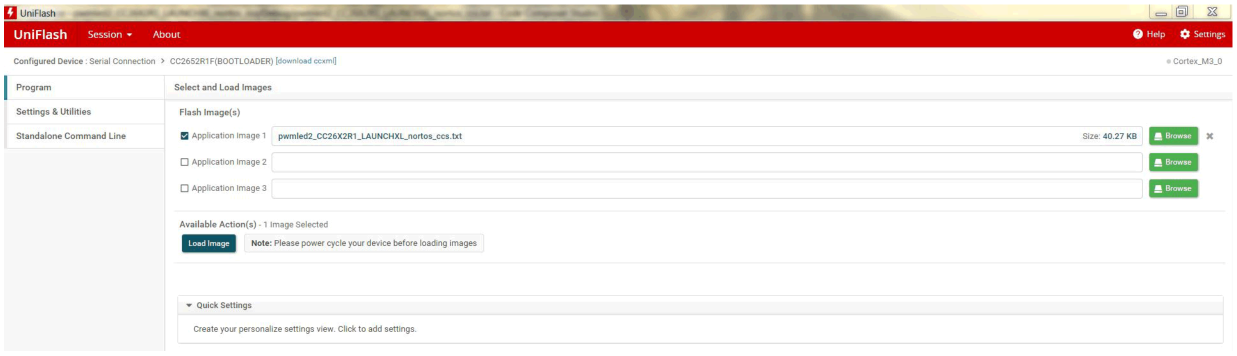
Category: All | C2000 | mmWave | MSP | PGA | Safety | Tiva | UCD | Wireless | Bootloader

cc2652

LP-CC2652RB LaunchPad On-Chip
CC2652R1F On-Chip
CC2652R1F(BOOTLOADER) Serial
CC2652RB1F On-Chip

Figure 30. Select Device CC2652R1F

Up to three separated images can be programmed on the device.



Configured Device : Serial Connection › CC2652R1F(BOOTLOADER) [download ccxml] Cortex_M3_0

Select and Load Images

Flash Image(s)

Application Image 1: pwmled2_CC26X2R1_LAUNCHXL_nortos_ccs.txt Size: 40.27 KB

Application Image 2

Application Image 3

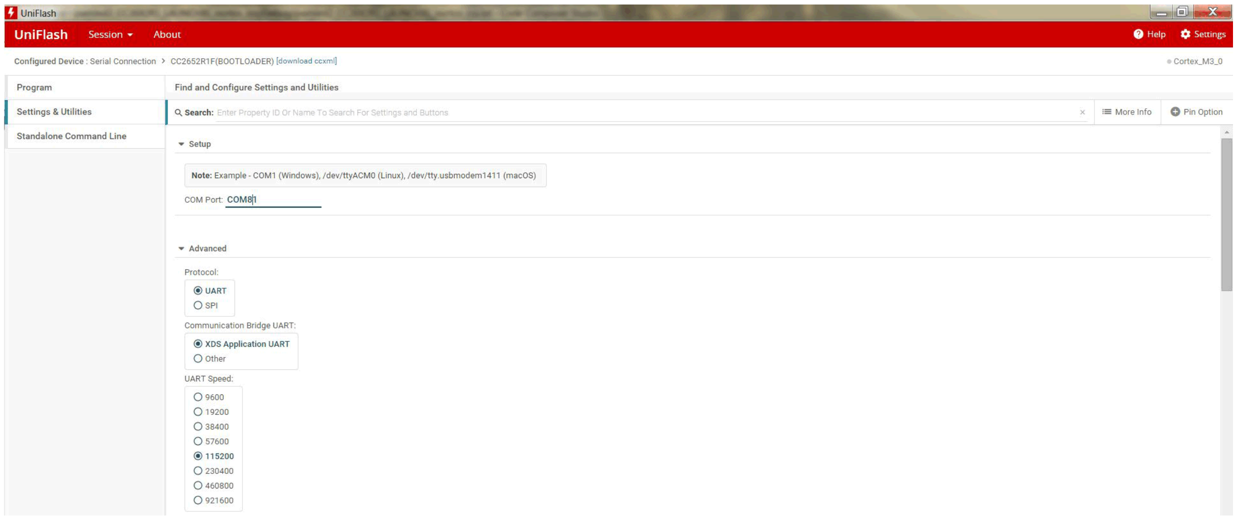
Available Action(s) - 1 Image Selected

Note: Please power cycle your device before loading images

Quick Settings

Create your personalize settings view. Click to add settings.

Figure 31. Load the Image



Configured Device : Serial Connection › CC2652R1F(BOOTLOADER) [download ccxml] Cortex_M3_0

Find and Configure Settings and Utilities

Search: Enter Property ID Or Name To Search For Settings and Buttons

Setup

Note: Example - COM1 (Windows), /dev/ttyACM0 (Linux), /dev/tty.usbmodem1411 (macOS)

COM Port: COM81

Advanced

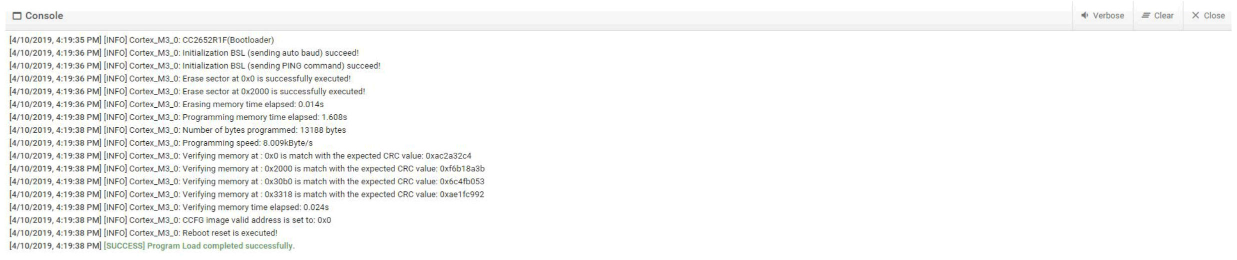
Protocol: [✓ UART] SPI

Communication Bridge UART: [✓ XDS Application UART] Other

UART Speed: 9600 19200 38400 57600 [✓ 115200] 230400 460800 921600

Figure 32. Configure the COM Port and Use the Default Settings for Other Configuration

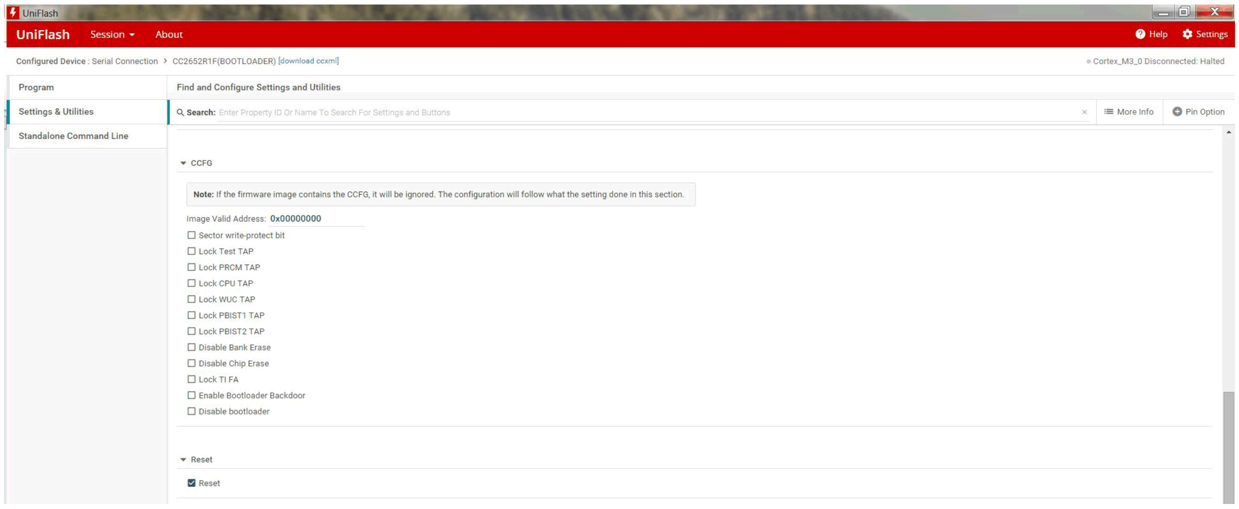
After you click "Load Image", UniFlash starts the programming process and the console shows the log of each operation.



```
[4/10/2019, 4:19:35 PM] [INFO] Cortex_M3_0: CC2652R1F(Bootloader)
[4/10/2019, 4:19:36 PM] [INFO] Cortex_M3_0: Initialization BSL (sending auto baud) succeed!
[4/10/2019, 4:19:36 PM] [INFO] Cortex_M3_0: Initialization BSL (sending PING command) succeed!
[4/10/2019, 4:19:36 PM] [INFO] Cortex_M3_0: Erase sector at 0x0 is successfully executed!
[4/10/2019, 4:19:36 PM] [INFO] Cortex_M3_0: Erase sector at 0x2000 is successfully executed!
[4/10/2019, 4:19:36 PM] [INFO] Cortex_M3_0: Erasing memory time elapsed: 0.014s
[4/10/2019, 4:19:38 PM] [INFO] Cortex_M3_0: Programming memory time elapsed: 1.608s
[4/10/2019, 4:19:38 PM] [INFO] Cortex_M3_0: Number of bytes programmed: 13188 bytes
[4/10/2019, 4:19:38 PM] [INFO] Cortex_M3_0: Programming speed: 8.009kByte/s
[4/10/2019, 4:19:38 PM] [INFO] Cortex_M3_0: Verifying memory at : 0x0 is match with the expected CRC value: 0xac2a32c4
[4/10/2019, 4:19:38 PM] [INFO] Cortex_M3_0: Verifying memory at : 0x2000 is match with the expected CRC value: 0xf6b18a3b
[4/10/2019, 4:19:38 PM] [INFO] Cortex_M3_0: Verifying memory at : 0x30b0 is match with the expected CRC value: 0x6c4fb053
[4/10/2019, 4:19:38 PM] [INFO] Cortex_M3_0: Verifying memory at : 0x3318 is match with the expected CRC value: 0xae1fc992
[4/10/2019, 4:19:38 PM] [INFO] Cortex_M3_0: Verifying memory time elapsed: 0.024s
[4/10/2019, 4:19:38 PM] [INFO] Cortex_M3_0: CCFG image valid address is set to: 0x0
[4/10/2019, 4:19:38 PM] [INFO] Cortex_M3_0: Reboot reset is executed!
[4/10/2019, 4:19:38 PM] [SUCCESS] Program Load completed successfully.
```

Figure 33. Console View of Downloading the pwmled Application

In the default setting of CCFG, the Image Valid Configuration in the CCFG section is required. Set the Image Valid Configuration to 0x0000:0000 to enable the boot sequence to transfer control to the user application image. Any other value forces the boot sequence to call the bootloader instead.


UniFlash
UniFlash
Session
About
Help
Settings
Configured Device : Serial Connection › CC2652R1F(BOOTLOADER) [download ccxml]
Cortex_M3_0 Disconnected: Halted
Program
Settings & Utilities
Standalone Command Line
Find and Configure Settings and Utilities
Search: Enter Property ID Or Name To Search For Settings and Buttons
More Info
Pin Option

CCFG

Note: If the firmware image contains the CCFG, it will be ignored. The configuration will follow what the setting done in this section.

Image Valid Address: 0x00000000

- ☐ Sector write-protect bit
- ☐ Lock Test TAP
- ☐ Lock PRCM TAP
- ☐ Lock CPU TAP
- ☐ Lock WUC TAP
- ☐ Lock PBIST1 TAP
- ☐ Lock PBIST2 TAP
- ☐ Disable Bank Erase
- ☐ Disable Chip Erase
- ☐ Lock TI FA
- ☐ Enable Bootloader Backdoor
- ☐ Disable bootloader

Reset

- ☑ Reset

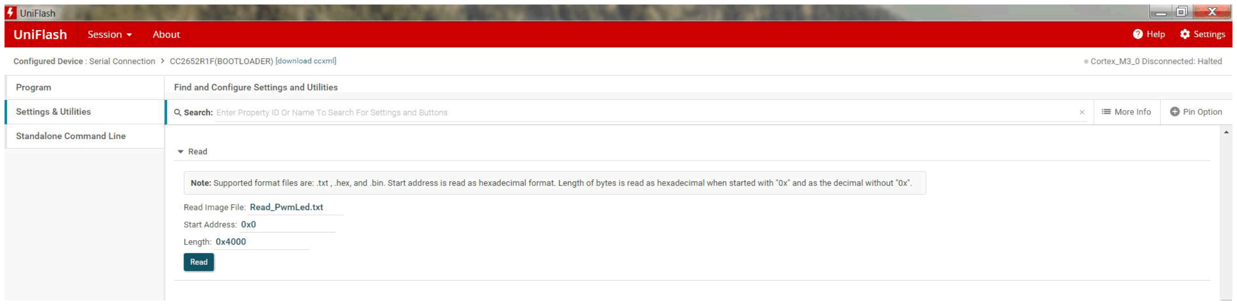
Figure 34. Image Valid Address Configuration

8.3 *Reading the Memory of the Target Bootloader*

Reading the programmed memory is possible by using the bootloader backdoor invocation. To enable bootloader backdoor invocation, the CCFG configuration must be done during the initial programming.

Parameters needed to do the reading are:

- File name that ends with .txt, .hex, or .bin according with the expected file format
- Start address of the memory to read
- Number of bytes to read


UniFlash
UniFlash
Session
About
Help
Settings
Configured Device : Serial Connection › CC2652R1F(BOOTLOADER) [download ccxml]
Cortex_M3_0 Disconnected: Halted
Program
Settings & Utilities
Standalone Command Line
Find and Configure Settings and Utilities
Search: Enter Property ID Or Name To Search For Settings and Buttons
More Info
Pin Option
Read

Read

Note: Supported format files are: .txt , .hex, and .bin. Start address is read as hexadecimal format. Length of bytes is read as hexadecimal when started with "0x" and as the decimal without "0x".

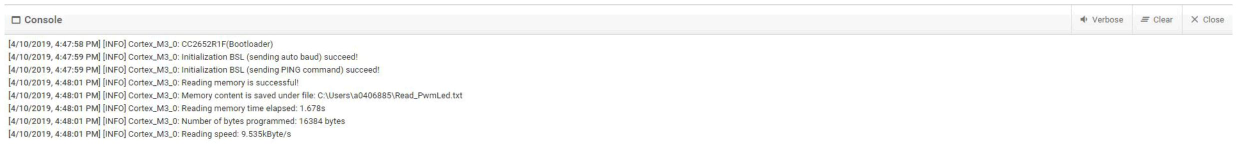
Read Image File: Read_PwmLed.txt

Start Address: 0x0

Length: 0x4000

Figure 35. Enter the Configuration on Read Section

Successful reading memory execution will show the log in the console as shown below.



```
[4/10/2019, 4:47:58 PM] [INFO] Cortex_M3_0: CC2652R1F(Bootloader)
[4/10/2019, 4:47:59 PM] [INFO] Cortex_M3_0: Initialization BSL (sending auto baud) succeed!
[4/10/2019, 4:47:59 PM] [INFO] Cortex_M3_0: Initialization BSL (sending PING command) succeed!
[4/10/2019, 4:48:01 PM] [INFO] Cortex_M3_0: Reading memory is successful!
[4/10/2019, 4:48:01 PM] [INFO] Cortex_M3_0: Memory content is saved under file: C:\Users\a0406885\Read_PwmLed.txt
[4/10/2019, 4:48:01 PM] [INFO] Cortex_M3_0: Reading memory time elapsed: 1.678s
[4/10/2019, 4:48:01 PM] [INFO] Cortex_M3_0: Number of bytes programmed: 16384 bytes
[4/10/2019, 4:48:01 PM] [INFO] Cortex_M3_0: Reading speed: 9.535kByte/s
```

Figure 36. Console View for Reading the Memory Successfully

9 Bootloader Programming for SimpleLink CC32xx Family

9.1 Preparing the .SLI Firmware Image for Bootloader Programming

Bootloader programming requires the .SLI image that is generated by the Image Creator tool, which is available with UniFlash. The ~~!~CC2564B~~ !~UniFlash CC3x2~~!~to CC2564C Migration Guide~~0, *CC3x35 SimpleLink™ Wi-Fi® and Internet-on-a chip™ Solution ImageCreator and Programming Tool* explains the process to generate the .SLI image.

9.2 Programming the Firmware Image Into the Target Bootloader

UniFlash 5.1.0 supports bootloader programming for the CC3220S, CC3220SF, CC3235S, and CC3235SF MCUs. As shown in Figure 37, select the device by typing the device name, and then select the listing that ends with "(BOOTLOADER)" and that has a "Serial" label. In this example, CC3235S(BOOTLOADER) is chosen.

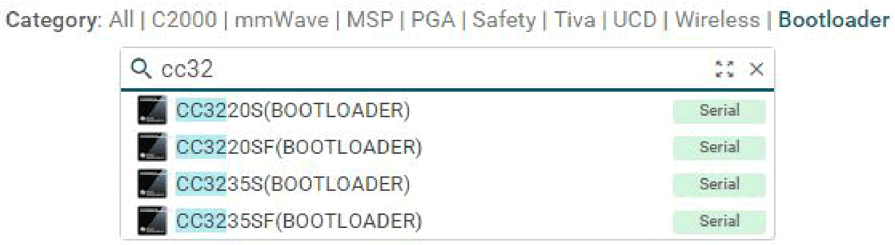

Category: All | C2000 | mmWave | MSP | PGA | Safety | Tiva | UCD | Wireless | Bootloader
cc32
CC3220S(BOOTLOADER) Serial
CC3220SF(BOOTLOADER) Serial
CC3235S(BOOTLOADER) Serial
CC3235SF(BOOTLOADER) Serial

Figure 37. Select the CC3235S MCU for Bootloader Programming

After you select the device, UniFlash shows the "Program" tab with a file browser field. Enter the firmware image to be programmed. Select the .SLI image, which in the example in Figure 38 is 3235S_Board1_Programming_PwmLedExample.sli.

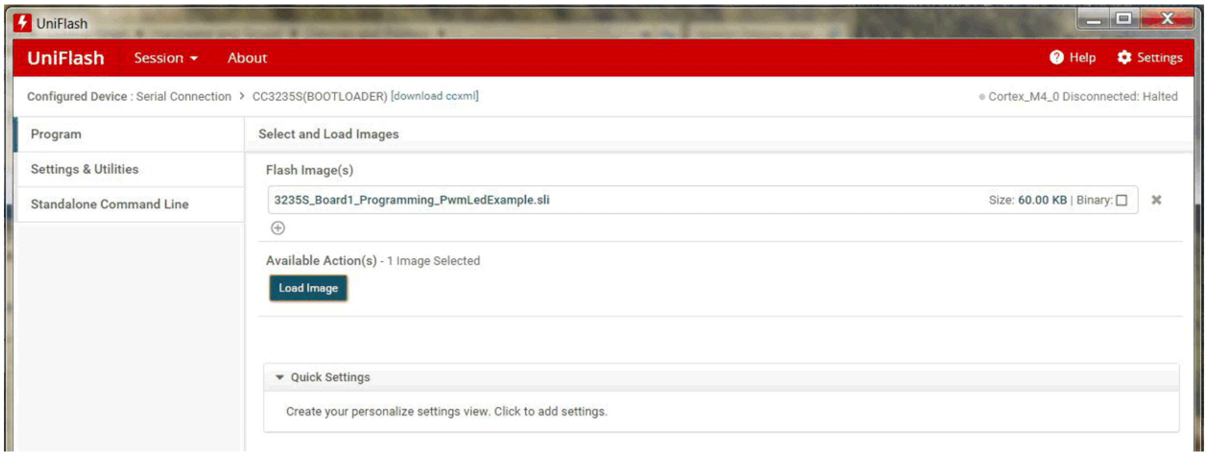
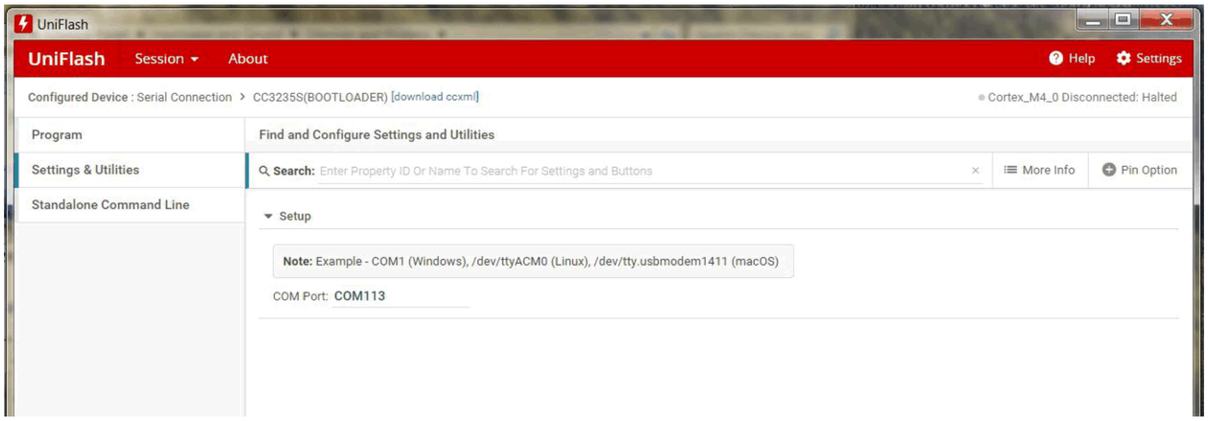

UniFlash
UniFlash Session About Help Settings
Configured Device : Serial Connection › CC3235S(BOOTLOADER) [download ccxml]
Cortex_M4_0 Disconnected: Halted
Program
Settings & Utilities
Standalone Command Line
Select and Load Images
Flash Image(s)
3235S_Board1_Programming_PwmLedExample.sli
Size: 60.00 KB | Binary:
Available Action(s) - 1 Image Selected
Load Image
Quick Settings
Create your personalize settings view. Click to add settings.

Figure 38. Enter the Firmware Image

UniFlash 5.1.0 supports bootloader programming for only the CC3220S-LAUNCHXL, CC3220SF-LAUNCHXL, LAUNCHXL-CC3235SF, and LAUNCHXL-CC3235SF. The bootloader invocation requires the reset sequence that is generated by the XDS110 on the LaunchPad™ development kits.

NOTE: For LaunchPad kit versions other than Rev.A, the programming might encounter known timing problems. Therefore, TI recommends using the Image Creator to run the programming with LaunchPad kits other than Rev.A.

Under the Settings & Utilities tab, the COM port configuration needs to be specified (see Figure 39).

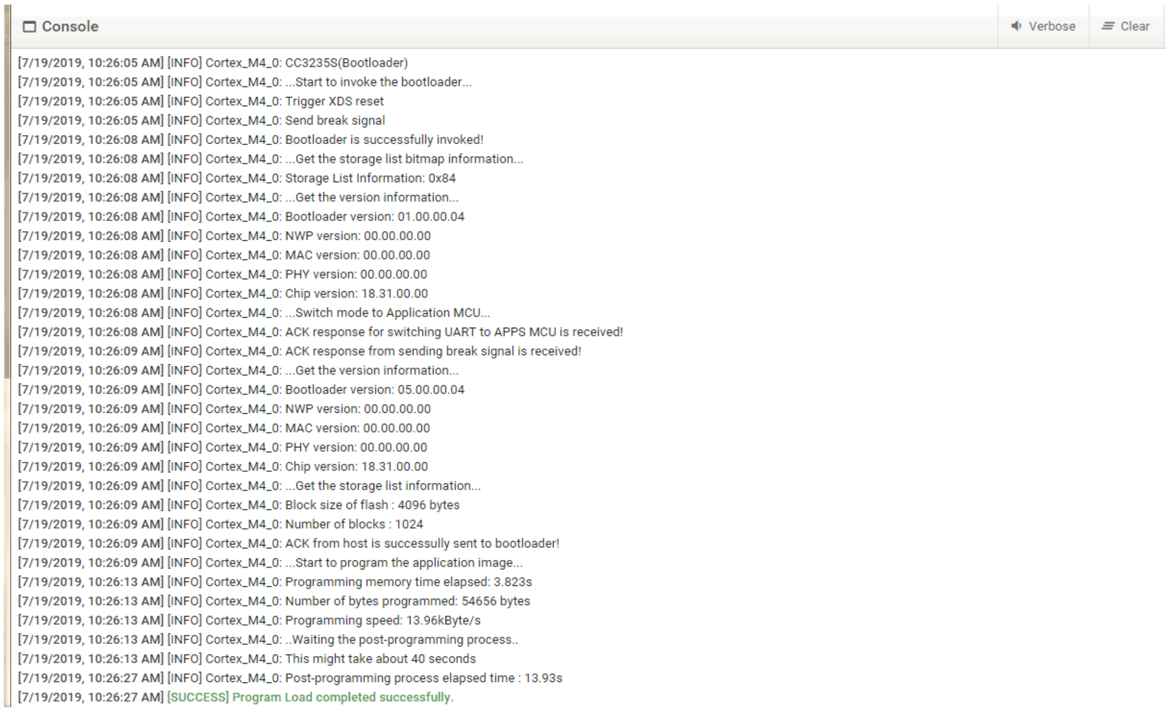

UniFlash
UniFlash
Session
About
Help
Settings
Configured Device : Serial Connection > CC3235S(BOOTLOADER) [download ccxml]
Cortex_M4_0 Disconnected: Halted
Program
Settings & Utilities
Standalone Command Line
Find and Configure Settings and Utilities
Search: Enter Property ID Or Name To Search For Settings and Buttons
More Info
Pin Option
Setup

Note: Example - COM1 (Windows), /dev/ttyACM0 (Linux), /dev/tty.usbmodem1411 (macOS)

COM Port: COM113

Figure 39. XDS COM Port Manual Selection With Given COM Port Number

After configuration is complete, select the "Load Image" button on the "Program" tab to load the program into the target device. Figure 40 shows an example of the console output during programming.



```
[7/19/2019, 10:26:05 AM] [INFO] Cortex_M4_0: CC3235S(Bootloader)
[7/19/2019, 10:26:05 AM] [INFO] Cortex_M4_0: ...Start to invoke the bootloader...
[7/19/2019, 10:26:05 AM] [INFO] Cortex_M4_0: Trigger XDS reset
[7/19/2019, 10:26:05 AM] [INFO] Cortex_M4_0: Send break signal
[7/19/2019, 10:26:08 AM] [INFO] Cortex_M4_0: Bootloader is successfully invoked!
[7/19/2019, 10:26:08 AM] [INFO] Cortex_M4_0: ...Get the storage list bitmap information...
[7/19/2019, 10:26:08 AM] [INFO] Cortex_M4_0: Storage List Information: 0x84
[7/19/2019, 10:26:08 AM] [INFO] Cortex_M4_0: ...Get the version information...
[7/19/2019, 10:26:08 AM] [INFO] Cortex_M4_0: Bootloader version: 01.00.00.04
[7/19/2019, 10:26:08 AM] [INFO] Cortex_M4_0: NWP version: 00.00.00.00
[7/19/2019, 10:26:08 AM] [INFO] Cortex_M4_0: MAC version: 00.00.00.00
[7/19/2019, 10:26:08 AM] [INFO] Cortex_M4_0: PHY version: 00.00.00.00
[7/19/2019, 10:26:08 AM] [INFO] Cortex_M4_0: Chip version: 18.31.00.00
[7/19/2019, 10:26:08 AM] [INFO] Cortex_M4_0: ...Switch mode to Application MCU...
[7/19/2019, 10:26:08 AM] [INFO] Cortex_M4_0: ACK response for switching UART to APPS MCU is received!
[7/19/2019, 10:26:09 AM] [INFO] Cortex_M4_0: ACK response from sending break signal is received!
[7/19/2019, 10:26:09 AM] [INFO] Cortex_M4_0: ...Get the version information...
[7/19/2019, 10:26:09 AM] [INFO] Cortex_M4_0: Bootloader version: 05.00.00.04
[7/19/2019, 10:26:09 AM] [INFO] Cortex_M4_0: NWP version: 00.00.00.00
[7/19/2019, 10:26:09 AM] [INFO] Cortex_M4_0: MAC version: 00.00.00.00
[7/19/2019, 10:26:09 AM] [INFO] Cortex_M4_0: PHY version: 00.00.00.00
[7/19/2019, 10:26:09 AM] [INFO] Cortex_M4_0: Chip version: 18.31.00.00
[7/19/2019, 10:26:09 AM] [INFO] Cortex_M4_0: ...Get the storage list information...
[7/19/2019, 10:26:09 AM] [INFO] Cortex_M4_0: Block size of flash : 4096 bytes
[7/19/2019, 10:26:09 AM] [INFO] Cortex_M4_0: Number of blocks : 1024
[7/19/2019, 10:26:09 AM] [INFO] Cortex_M4_0: ACK from host is successully sent to bootloader!
[7/19/2019, 10:26:09 AM] [INFO] Cortex_M4_0: ...Start to program the application image...
[7/19/2019, 10:26:13 AM] [INFO] Cortex_M4_0: Programming memory time elapsed: 3.823s
[7/19/2019, 10:26:13 AM] [INFO] Cortex_M4_0: Number of bytes programmed: 54656 bytes
[7/19/2019, 10:26:13 AM] [INFO] Cortex_M4_0: Programming speed: 13.96kByte/s
[7/19/2019, 10:26:13 AM] [INFO] Cortex_M4_0: ..Waiting the post-programming process..
[7/19/2019, 10:26:13 AM] [INFO] Cortex_M4_0: This might take about 40 seconds
[7/19/2019, 10:26:27 AM] [INFO] Cortex_M4_0: Post-programming process elapsed time : 13.93s
[7/19/2019, 10:26:27 AM] [SUCCESS] Program Load completed successfully.
```

Figure 40. Console View of Downloading the UART Bootloader Application

10 Related Documents

The following documents include additional information about the bootloader protocol for the MCUs mentioned in this guide.

1. MSP430™ Flash Device Bootloader (BSL) User's Guide
2. MSP430™ FRAM Device Bootloader (BSL) User's Guide
3. MSP432P4xx SimpleLink™ Microcontrollers Bootloader (BSL) User's Guide
4. MSP432E4 SimpleLink™ Microcontrollers Bootloader (BSL) User's Guide
5. CC13x2, CC26x2 SimpleLink™ Wireless MCU Technical Reference Manual
6. CC13x0, CC26x0 SimpleLink™ Wireless MCU Technical Reference Manual
7. CC2538/CC26x0/CC26x2 Serial Bootloader Interface
8. CC2564B to CC2564C Migration Guide
9. CC3120 and CC3220 Simplelink™ Wi-Fi® Embedded Programming User's Guide
10. CC313x and CC323x Simplelink™ Wi-Fi® Embedded Programming User's Guide

Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from April 16, 2019 to July 29, 2019 **Page**

- Updated the document title to add CC32xx MCUs 1
- Added Section 9, *Bootloader Programming for SimpleLink CC32xx Family* 18
- Added references 8, 9, and 10 to Section 10, *Related Documents* 20