# Getting Started with MCUXpresso SDK for LPCXpresso54S018M

**Contents**



## 1 Overview

The MCUXpresso Software Development Kit (SDK) provides comprehensive software support for Kinetis and LPC Microcontrollers. The MCUXpresso SDK includes a flexible set of peripheral drivers designed to speed up and simplify development of embedded applications. Along with the peripheral drivers, the MCUXpresso SDK provides an extensive and rich set of example applications covering everything from basic peripheral use case examples to full demo applications. The MCUXpresso SDK contains FreeRTOS, a USB host and device stack, and various other middleware to support rapid development.

For supported toolchain versions, see the *MCUXpresso SDK Release Notes Supporting LPCXpresso54S0XXM* (document MCUXSDKLPC54S0XXMRN). After opening SDK_2.6.0_LPCXpresso54S018M\docs, consult the *MCUXpresso SDK Release Notes Supporting LPC540XXM*.

For more details about MCUXpresso SDK, refer to MCUXpresso-SDK: Software Development Kit for MCUXpresso.

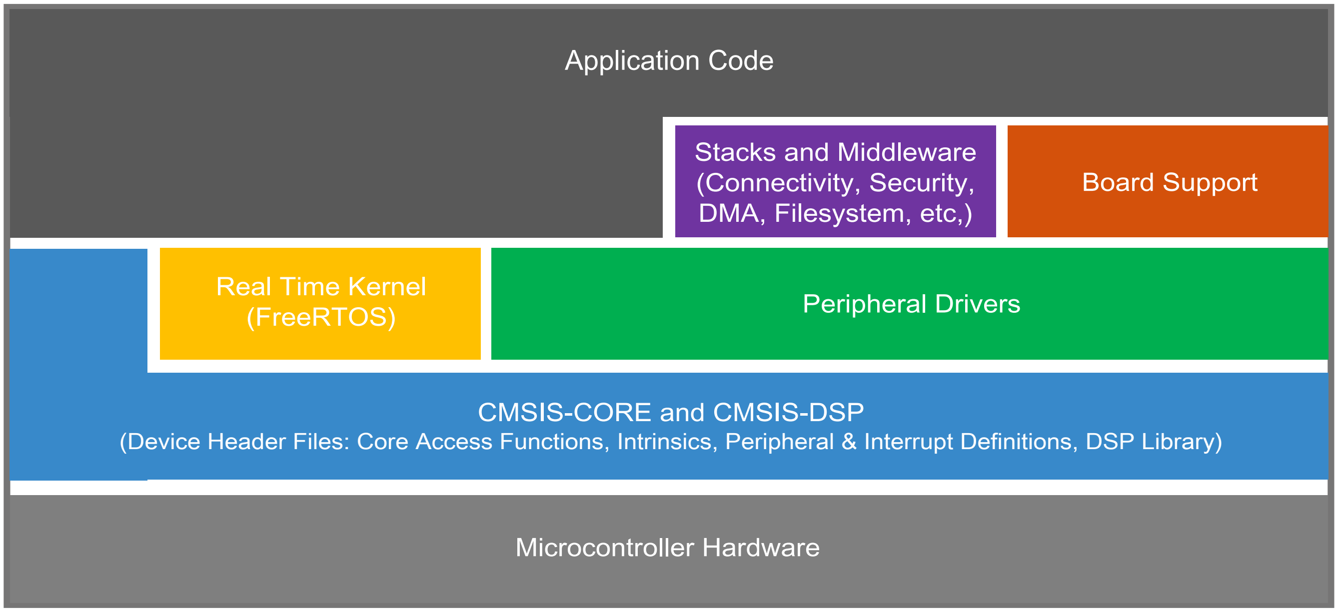


**Figure 1. MCUXpresso SDK layers**

# 2 MCUXpresso SDK board support package folders

MCUXpresso SDK board support package provides example applications for NXP development and evaluation boards for Arm® Cortex®-M cores including Freedom, Tower System, and LPCXpresso boards. Board support packages are found inside the top level boards folder and each supported board has its own folder (an MCUXpresso SDK package can support multiple boards). Within each `<board_name>` folder, there are various sub-folders to classify the type of examples it contain. These include (but are not limited to):

- `demo_apps`: Full-featured applications that highlight key functionality and use cases of the target MCU. These applications typically use multiple MCU peripherals and may leverage stacks and middleware.
- `driver_examples`: Simple applications that show how to use the MCUXpresso SDK's peripheral drivers for a single use case. These applications typically only use a single peripheral but there are cases where multiple peripherals are used (for example, SPI conversion using DMA).
- `rtos_examples`: Basic FreeRTOS™ OS examples that show the use of various RTOS objects (semaphores, queues, and so on) and interfaces with the MCUXpresso SDK's RTOS drivers
- `usb_examples`: Applications that use the USB host/device/OTG stack.

## 2.1 Example application structure

This section describes how the various types of example applications interact with the other components in the MCUXpresso SDK. To get a comprehensive understanding of all MCUXpresso SDK components and folder structure, see *MCUXpresso SDK API Reference Manual* (document ID: MCUXSDKAPIRM).

Each `<board_name>` folder in the boards directory contains a comprehensive set of examples that are relevant to that specific piece of hardware. Although we use the `hello_world` example (part of the `demo_apps` folder), the same general rules apply to any type of example in the `<board_name>` folder.

In the `hello_world` application folder you see the following contents:

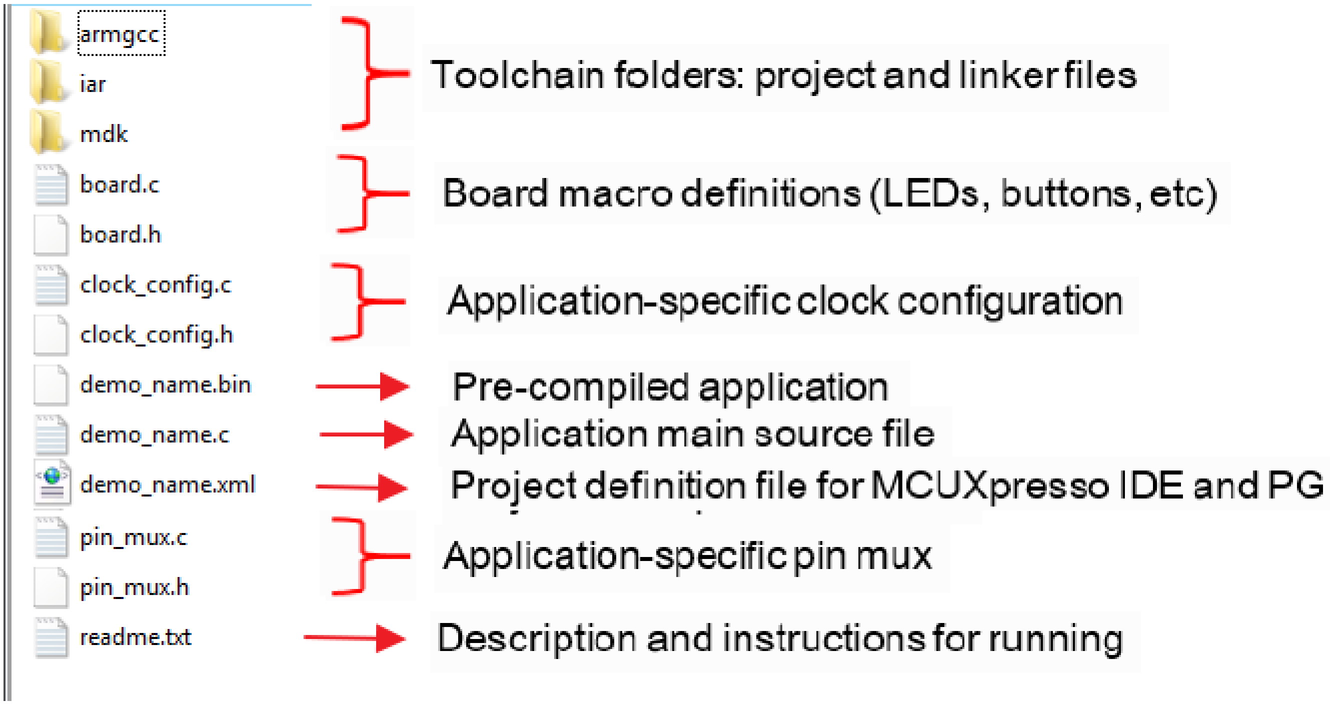


**Figure 2. Application folder structure**

All files in the application folder are specific to that example, so it is easy to copy and paste an existing example to start developing a custom application based on a project provided in the MCUXpresso SDK.

## 2.2 Locating example application source files

When opening an example application in any of the supported IDEs, a variety of source files are referenced. The MCUXpresso SDK devices folder is the central component to all example applications. It means the examples reference the same source files and, if one of these files is modified, it could potentially impact the behavior of other examples.

The main areas of the MCUXpresso SDK tree used in all example applications are:

- `devices/<device_name>`: The device's CMSIS header file, MCUXpresso SDK feature file and a few other files
- `devices/<device_name>/drivers`: All of the peripheral drivers for your specific MCU
- `devices/<device_name>/<tool_name>`: Toolchain-specific startup code, including vector table definitions
- `devices/<device_name>/utilities`: Items such as the debug console that are used by many of the example applications

For examples containing an RTOS, there are references to the appropriate source code. RTOSes are in the `rtos` folder. The core files of each of these are shared, so modifying one could have potential impacts on other projects that depend on that file.

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### 2.3.1 What is the plain load image?

The plain load image is linked to SRAMX. When building, it needs to be programmed to the external onboard flash. After reset, the bootloader starts to run. Then, it checks the image type (which is set in the image header, which resides in the startup code). If the type is plain load image, the bootloader copies the image to SRAMX, then jumps to SRAMX to run.

### 2.3.2 What is the XIP image?

When an XIP (Execute-in-Place) image is used, the MCU executes instructions and uses data directly from external (quad) SPI flash. When building, it needs to be programmed to the external onboard flash. After reset, the bootloader starts to run. Then, it checks the image type (which is set in the image header, which resides in the startup code). If the type is XIP image, the device executes in the external flash.

### 2.3.3 What is the SRAM target image?

The SRAM target image is linked to the SRAM address when building. When debugging, the SRAM target, the IDE just loads the image into SRAM to run.

# 3 Run a demo application using IAR

This section describes the steps required to build, run, and debug example applications provided in the MCUXpresso SDK. The hello_world demo application targeted for the LPCXpresso54S018M hardware platform is used as an example, although these steps can be applied to any example application in the MCUXpresso SDK.

Before downloading and running the application, perform these steps:

1. Download and install LPCScrypt or the Windows® operating systems driver for LPCXpresso boards from www.nxp.com/lpcutilities. This installs the required drivers for the board.
2. Connect the development platform to your PC via USB cable between the Link2 USB connector (named Link for some boards) and the PC USB connector. If you are connecting for the first time, allow about 30 seconds for the devices to enumerate.
3. Open the terminal application on the PC, such as PuTTY or TeraTerm, and connect to the debug COM port (to determine the COM port number, see Appendix A). Configure the terminal with these settings:
   a. 115200 or 9600 baud rate, depending on your board (reference BOARD_DEBUG_UART_BAUDRATE variable in board.h file)
   b. No parity
   c. 8 data bits

d. 1 stop bit

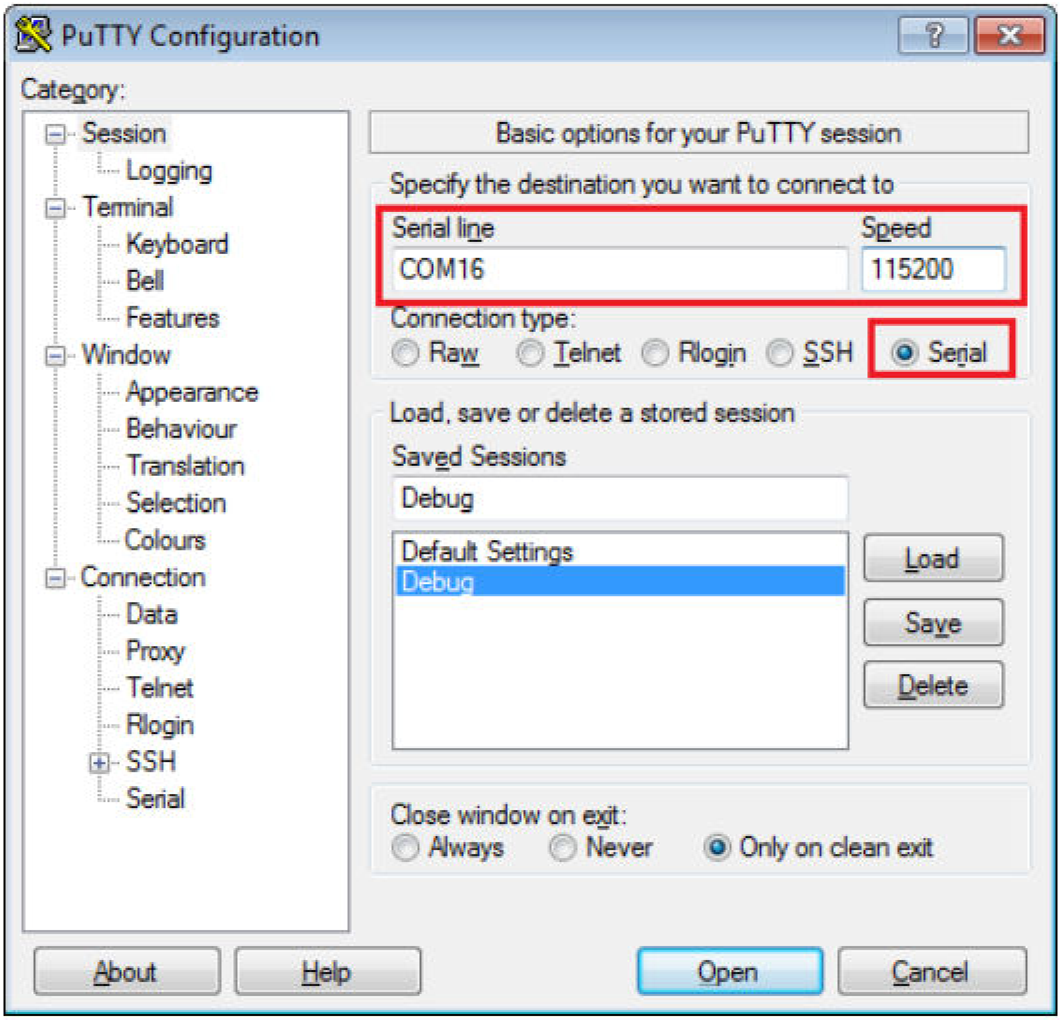



**Figure 3. Terminal (PuTTY) configuration**

## 3.1 Build an non-XIP (plain load) example application

Do the following steps to build the `hello_world` example application.

1. Open the desired demo application workspace. Most example application workspace files can be located using the following path:

   ```
   <install_dir>/boards/<board_name>/<example_type>/<application_name>/iar
   ```

   Using the LPCXpresso54S018M hardware platform as an example, the `hello_world` workspace is located in:

   ```
   <install_dir>/boards/lpcxpresso54s018m/demo_apps/hello_world/iar/hello_world.eww
   ```

   Other example applications may have additional folders in their path.

2. Select the desired build target from the drop-down menu.

   For this example, select the **hello_world – debug** target.

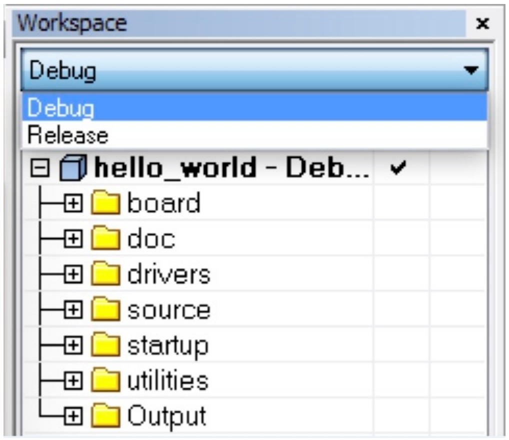



**Figure 4. Demo build target selection**

3. To build the demo application, click **Make**, highlighted in red, as shown in Figure 5.

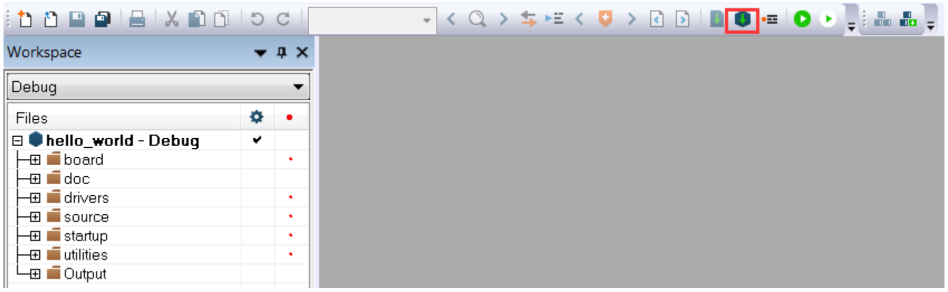



**Figure 5. Build the demo application**

4. The build completes without errors.

## 3.2 Run a non-XIP (plain load) example application using CMSIS DAP

1. In IAR, click the "Download and Debug" button to download the application to the target.

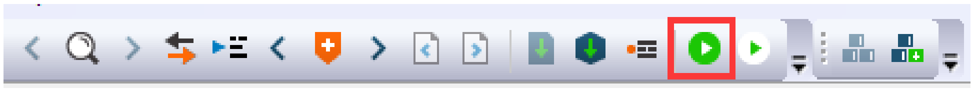


**Figure 6. Download and Debug button**

2. The application is then downloaded to the target and automatically runs to the main() function.

**NOTE**

The application is programmed to the external on board flash, then jumped to SRAM to run

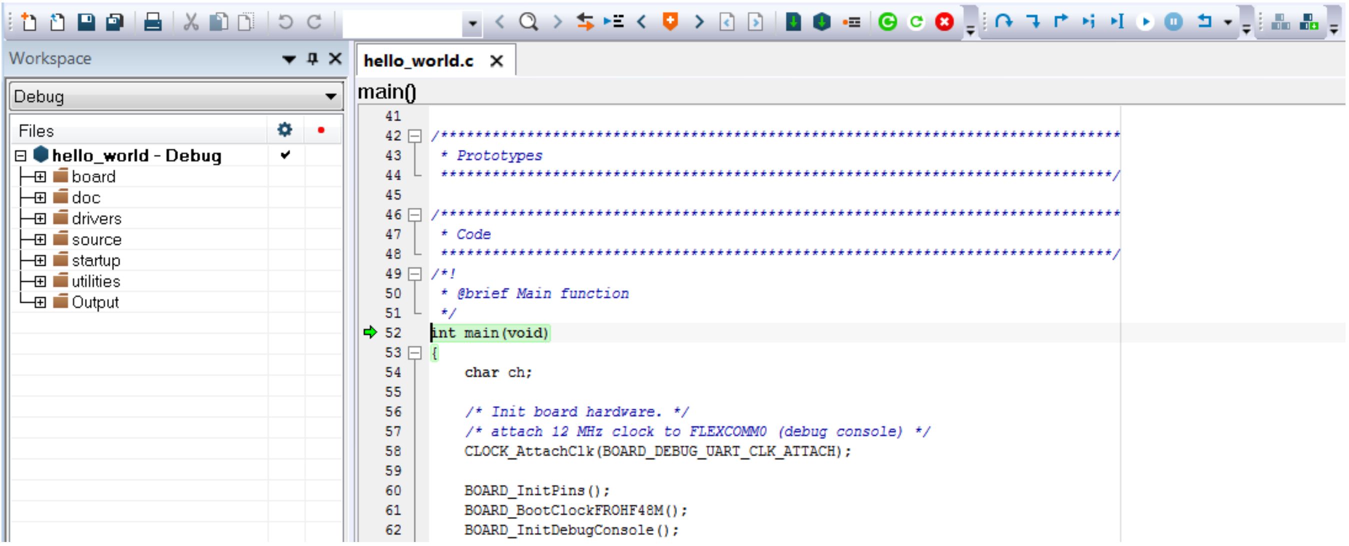



**Figure 7. Stop at main() when running debugging**

3. Run the code by clicking the "Go" button to start the application.

**Figure 8. Go button**

4. The hello_world application is now running and a banner is displayed on the terminal. If this does not occur, check your terminal settings and connections.

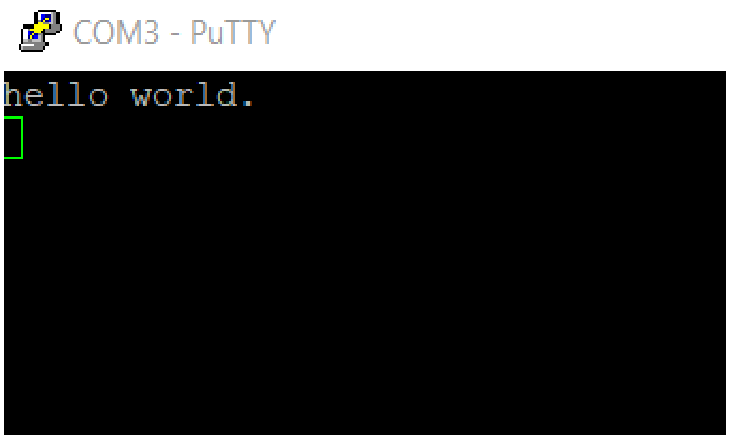



**Figure 9. Text display of the hello_world demo**

## 3.3 Run a non-XIP (plain load) example application using J-Link/J-Trace

This section describes how to configure EWARM if using a J-link/J-Trace debug probe, or a probe which has been programmed with J-link firmware.

1. Select "J-Link/J-Trace" and "Use macro file(s)".

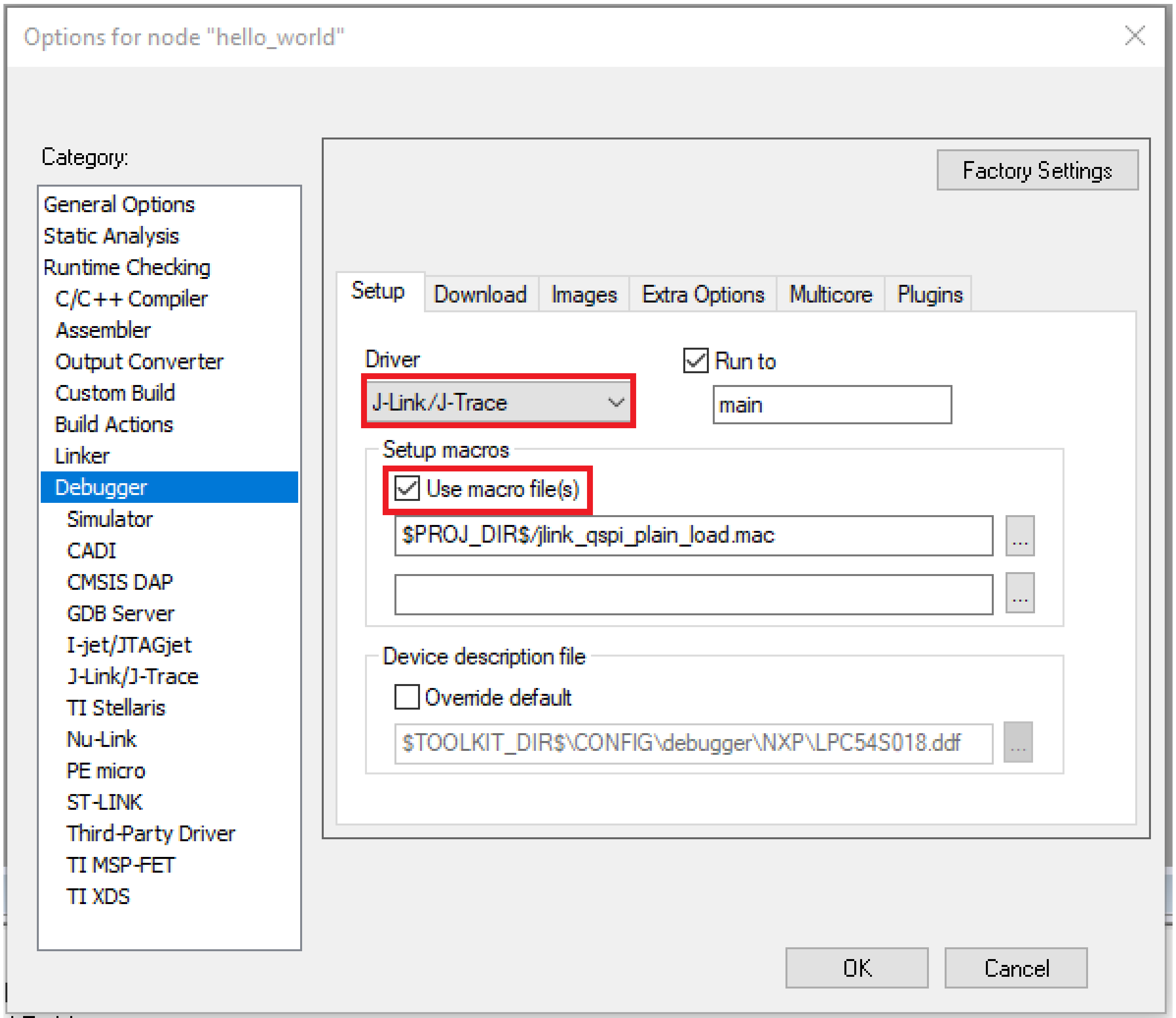



**Figure 10. Select “J-Link/J-Trace” and “Use macro file(s)”**

2. Unselect “Use flash loader(s)” to use SEGGER J-Link flashloaders. Then, click the "OK” button.

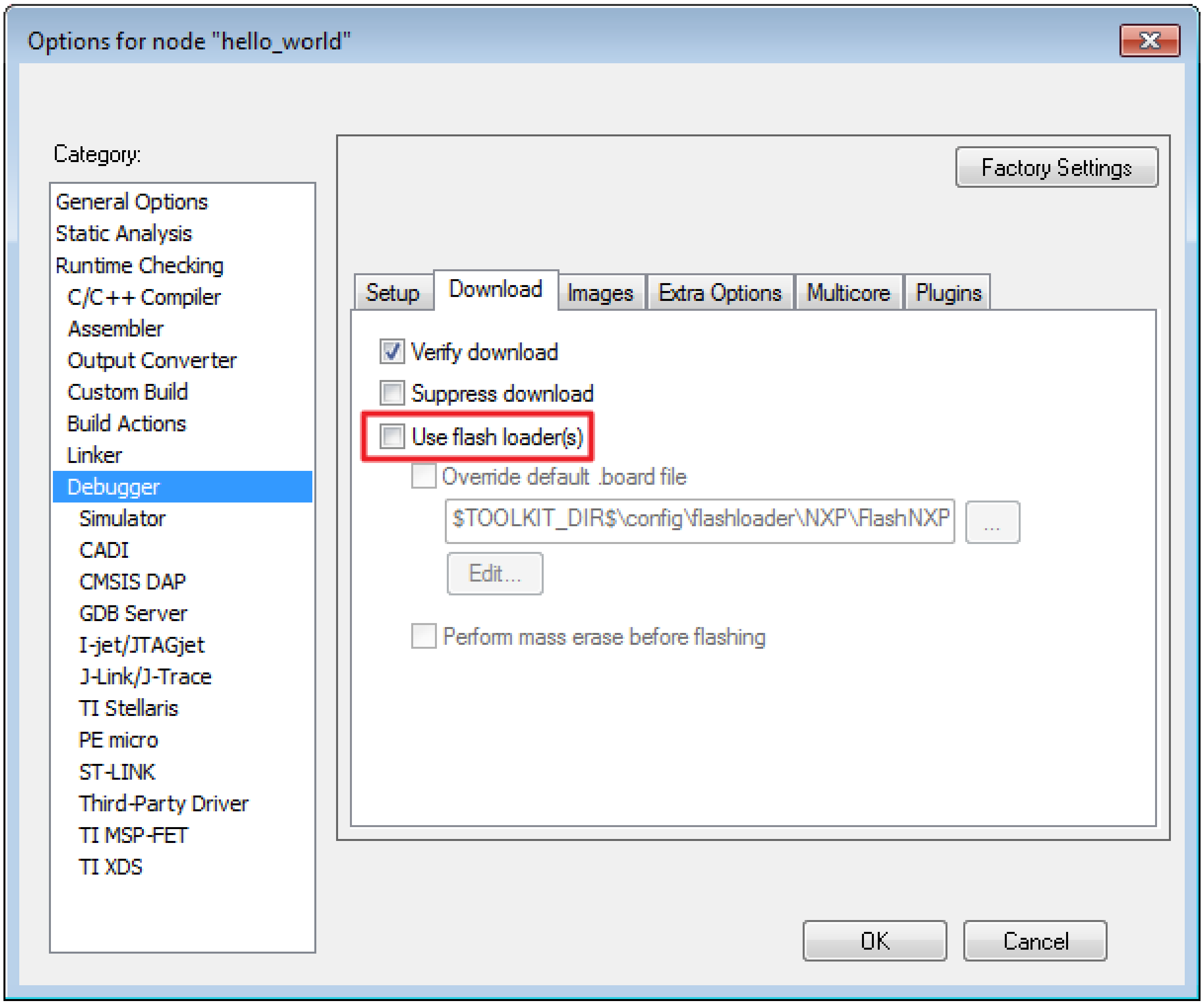



**Figure 11. Unselect “Use flash loader(s)”**

3. In IAR, click the "Download and Debug" button to download the application to the target.

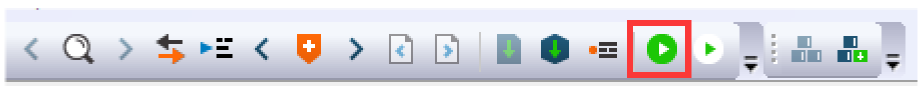


**Figure 12. Download and Debug button**

4. The application is then downloaded to the target and automatically runs to the main() function.

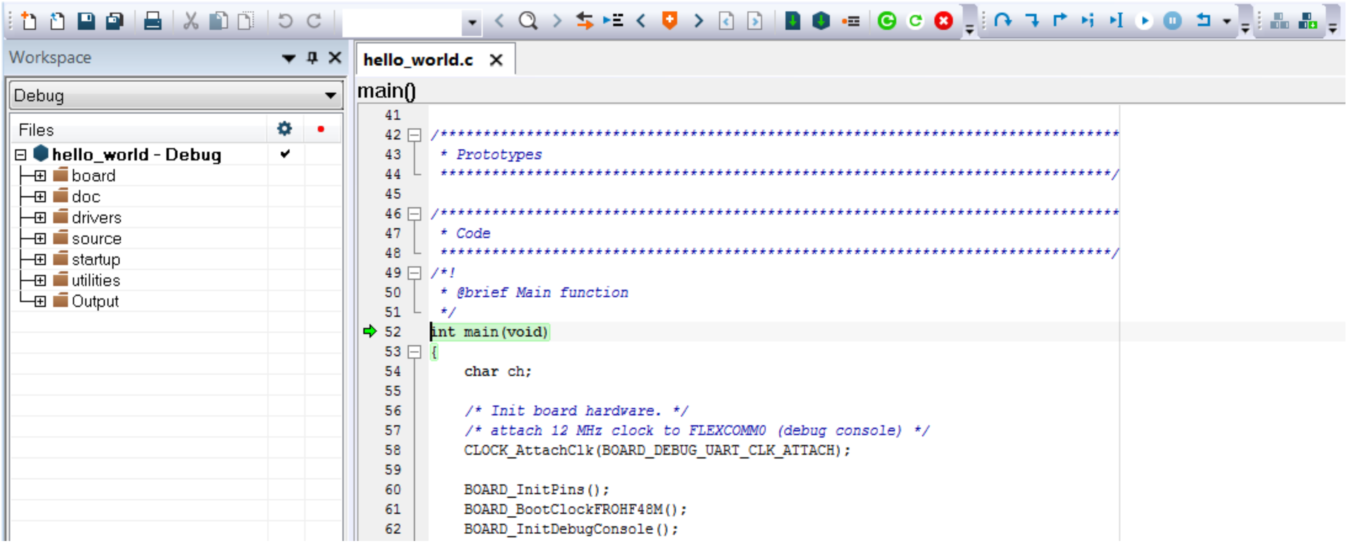


**Figure 13. Stop at main() when running debugging**

5. Run the code by clicking the "Go" button to start the application.

**Figure 14. Go button**

6. The hello_world application is now running and a banner is displayed on the terminal. If this is not true, check your terminal settings and connections.

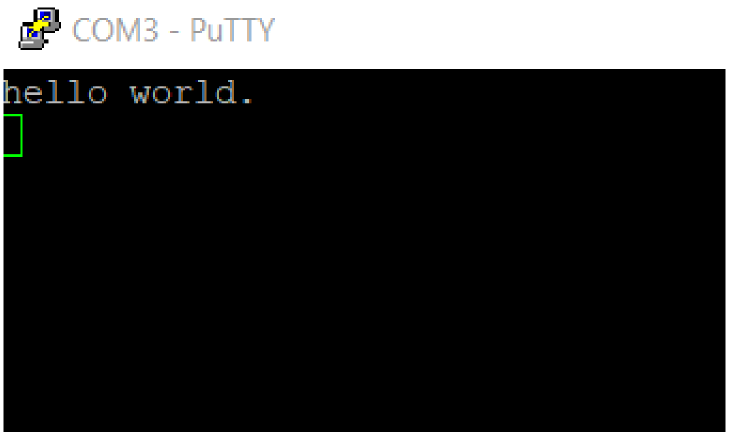



**Figure 15. Text display of the hello_world demo**

## 3.4 Build an XIP example application

The following steps guide you through opening the hello_world_qspi_xip example application. These steps may change slightly for other example applications, as some of these applications may have additional layers of folders in their paths.

1. If not already done, open the desired demo application workspace. Most example application workspace files can be located using the following path:

   *<install_dir>/boards/<board_name>/<example_type>/<application_name>/iar*

   Using the LPCXpresso54S018M hardware platform as an example, the hello_world workspace is located in

*<install_dir>/boards/lpcxpresso54s018m/demo_apps/hello_world/iar/hello_world_qspi_xip.eww*

2. Select the desired build target from the drop-down. For this example, select the “hello_world_qspi_xip – Debug” target.

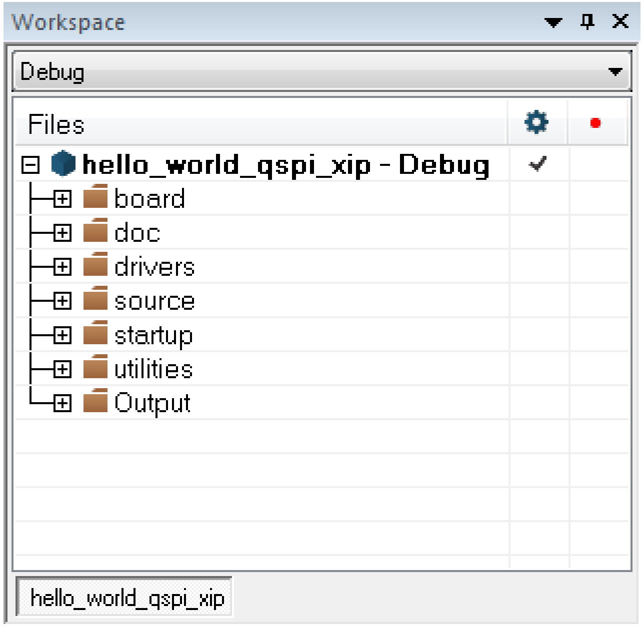



**Figure 16. Demo build target selection**

3. Select "Reset and halt after bootloader", highlighted in red below.

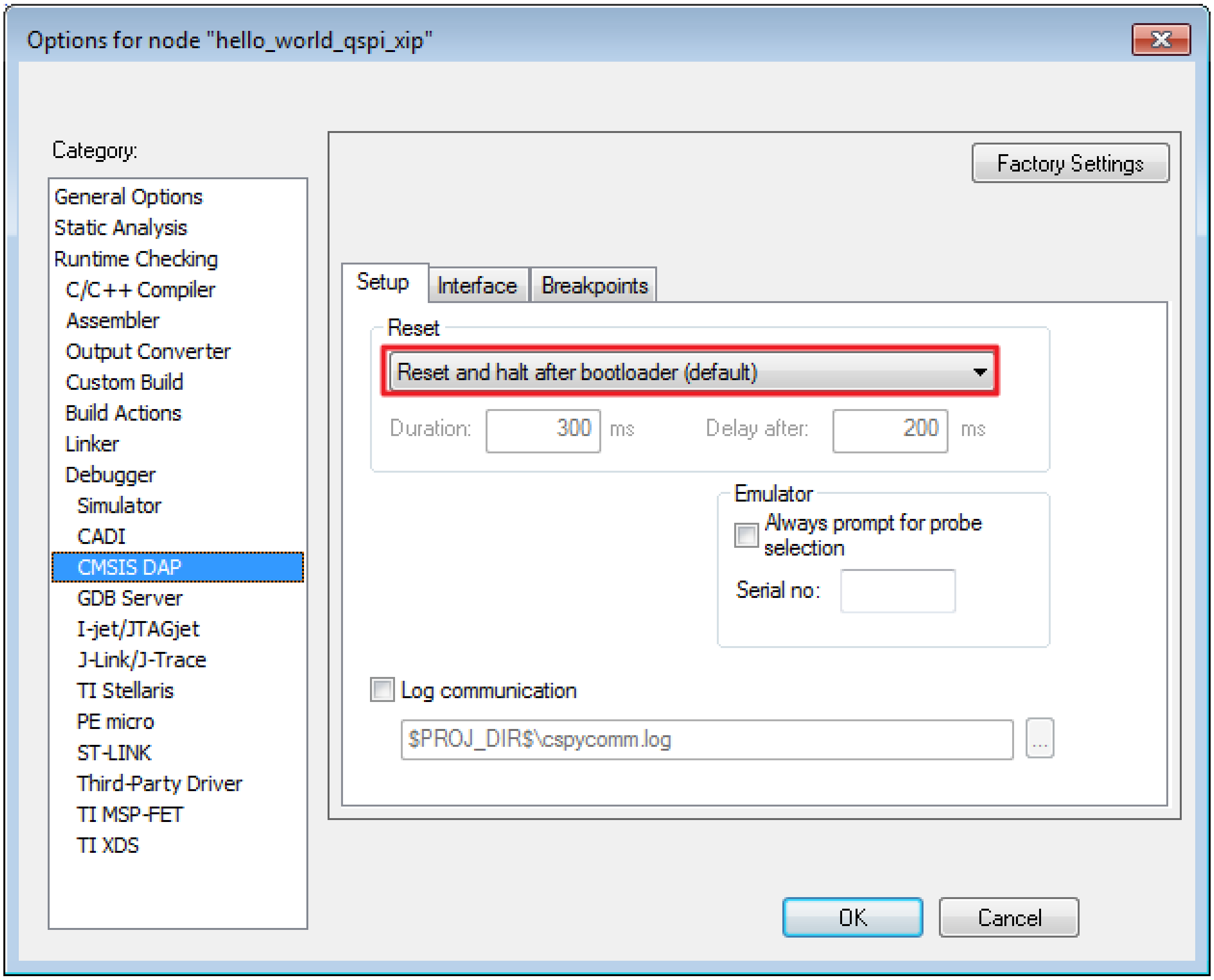



**Figure 17. Reset and half after bootloader**

4. To build the demo application, click the “Make” button, highlighted in red below.

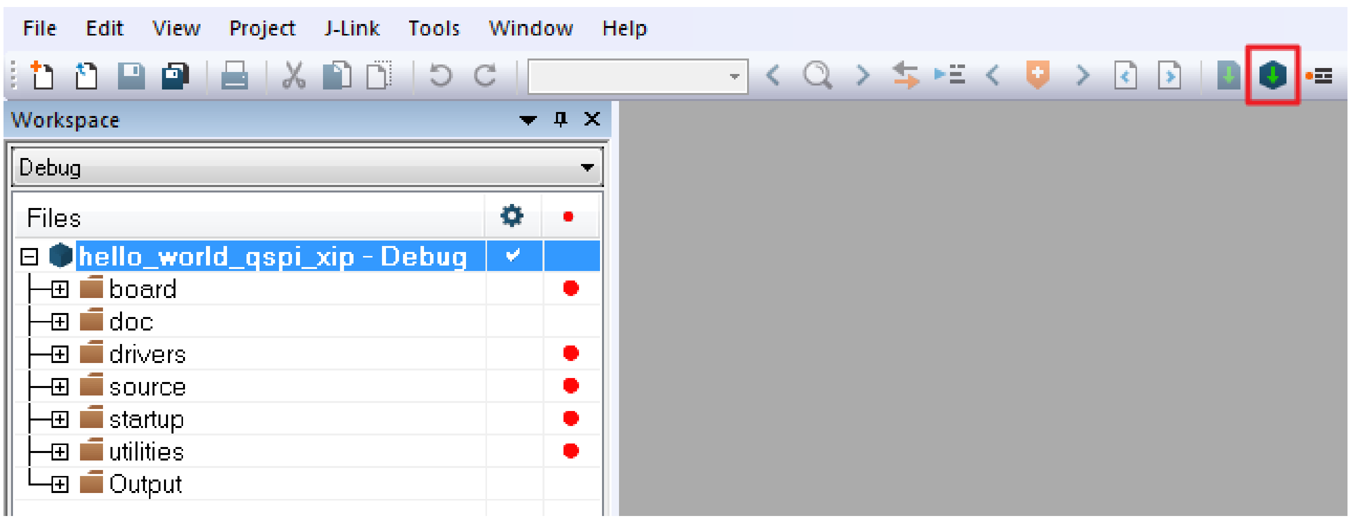



**Figure 18. Build the demo application**

## 3.5 Run an XIP example application

1. In IAR, click the "Download and Debug" button to download the application to the target.

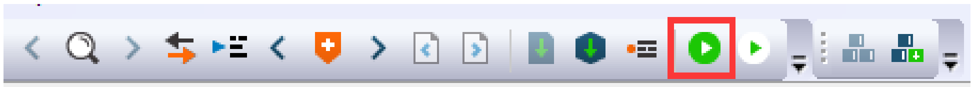


**Figure 19. Download and Debug button**

2. The application is then downloaded to the target and automatically runs to the main() function.

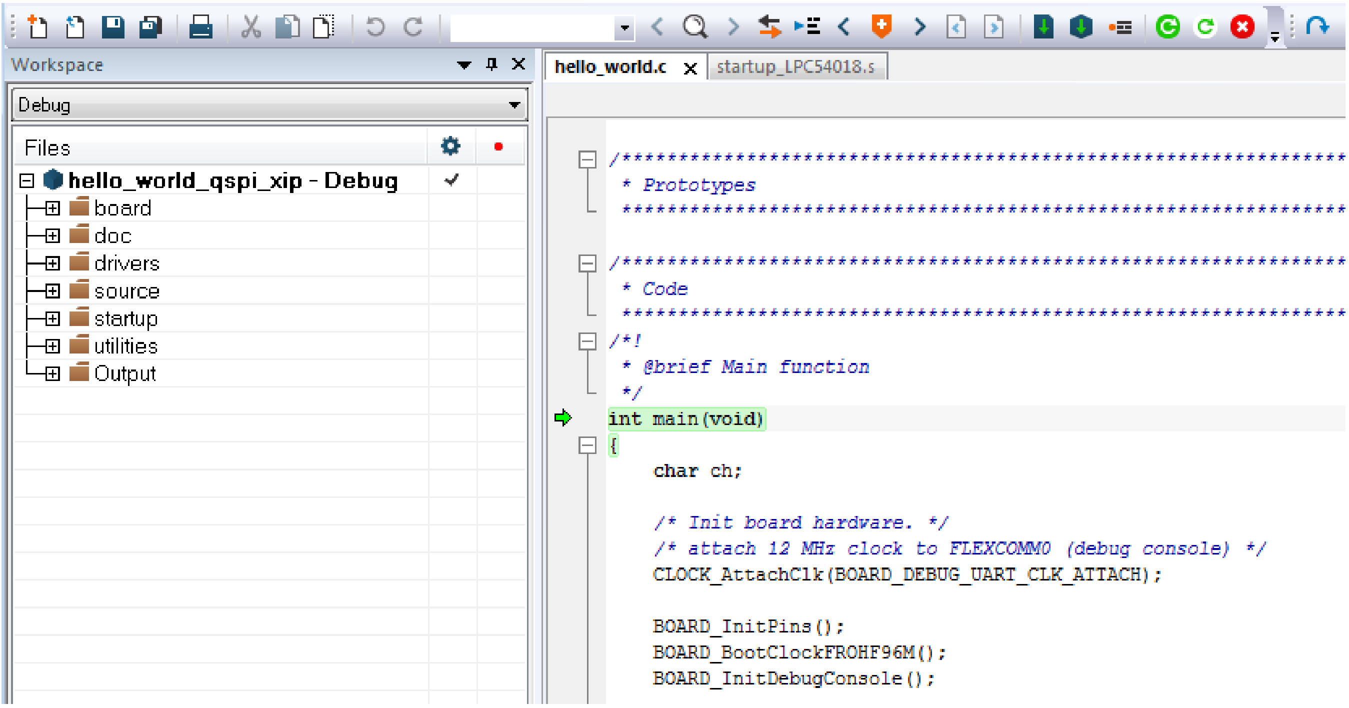



**Figure 20. Stop at main() when running debugging**

3. Run the code by clicking the "Go" button to start the application.

**Figure 21. Go button**

4. The hello_world_qspi_xip application is now running and a banner is displayed on the terminal. If this is not true, check your terminal settings and connections.

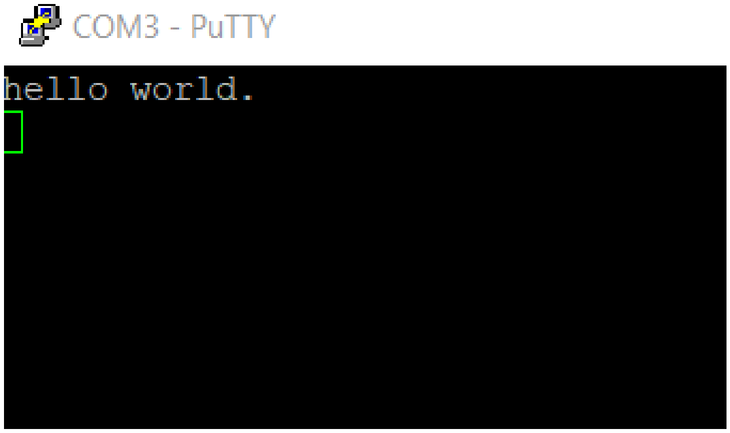



**Figure 22. Text display of the hello_world_qspi_xip demo**

# 4 Run a demo using Keil® MDK/µVision

This section describes the steps required to build, run, and debug example applications provided in the MCUXpresso SDK.

The hello_world demo application targeted for the LPCXpresso54S018M hardware platform is used as an example, although these steps can be applied to any demo or example application in the MCUXpresso SDK.

Before downloading and running the application, perform these steps:

1. Download and install LPCScrypt or the Windows® operating systems driver for LPCXpresso boards from www.nxp.com/lpcutilities. This installs the required drivers for the board.
2. Connect the development platform to your PC via USB cable between the Link2 USB connector (named Link for some boards) and the PC USB connector. If you are connecting for the first time, allow about 30 seconds for the devices to enumerate.
3. Open the terminal application on the PC, such as PuTTY or TeraTerm, and connect to the debug COM port (to determine the COM port number, see Appendix A). Configure the terminal with these settings:
    a. 115200 or 9600 baud rate, depending on your board (reference BOARD_DEBUG_UART_BAUDRATE variable in board.h file)
    b. No parity
    c. 8 data bits
    d. 1 stop bit

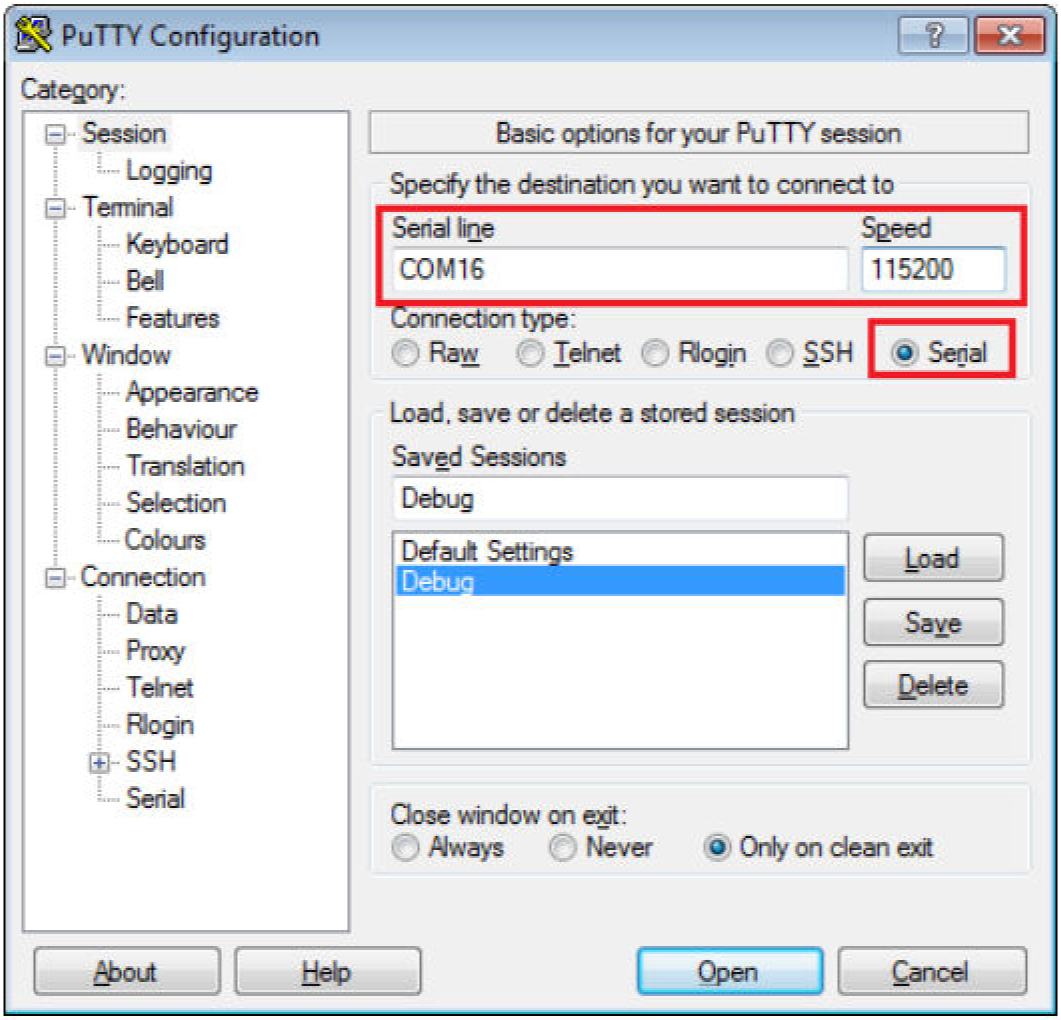



**Figure 23. Terminal (PuTTY) configuration**

## 4.1 Install CMSIS device pack

After the MDK tools are installed, Cortex® Microcontroller Software Interface Standard (CMSIS) device packs must be installed to fully support the device from a debug perspective. These packs include things such as memory map information, register definitions, and flash programming algorithms. Follow these steps to install the appropriate CMSIS pack.

1. Open the MDK IDE, which is called µVision. In the IDE, select the **Pack Installer** icon.

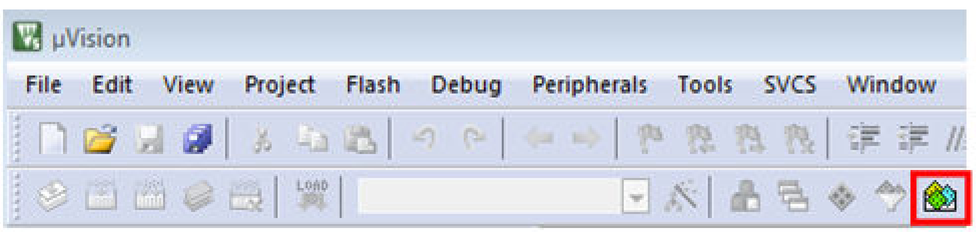



**Figure 24. Launch the Pack Installer**

2. After the installation finishes, close the Pack Installer window and return to the µVision IDE.

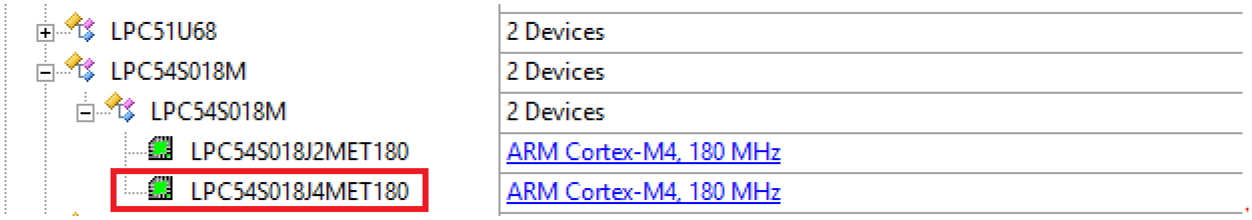



**Figure 25. Install CMSIS pack**

## 4.2 Build a non-XIP (plain load) example application

- Open the desired example application workspace in: <install_dir>/boards/<board_name>/<*example_type*>/<application_name>/mdk

  The workspace file is named <demo_name>.uvmpw, so for this specific example, the actual path is:

  <install_dir>/boards/lpcxpresso54s018m/demo_apps/hello_world/mdk/hello_world.uvmpw
- To build the demo project, select the "Rebuild" button, highlighted in red.


**Figure 26. Build the demo**

- The build completes without errors.

## 4.3 Run a non-XIP (plain load) example application

1. To debug the application, click the “Start/Stop Debug Session” button, highlighted in red.

**NOTE**

The application is only downloaded into the SRAM when debugging. If you need to program the image to external flash, see *Section 4.4, "How to program the non-XIP (plain load) example application to external flash"*.

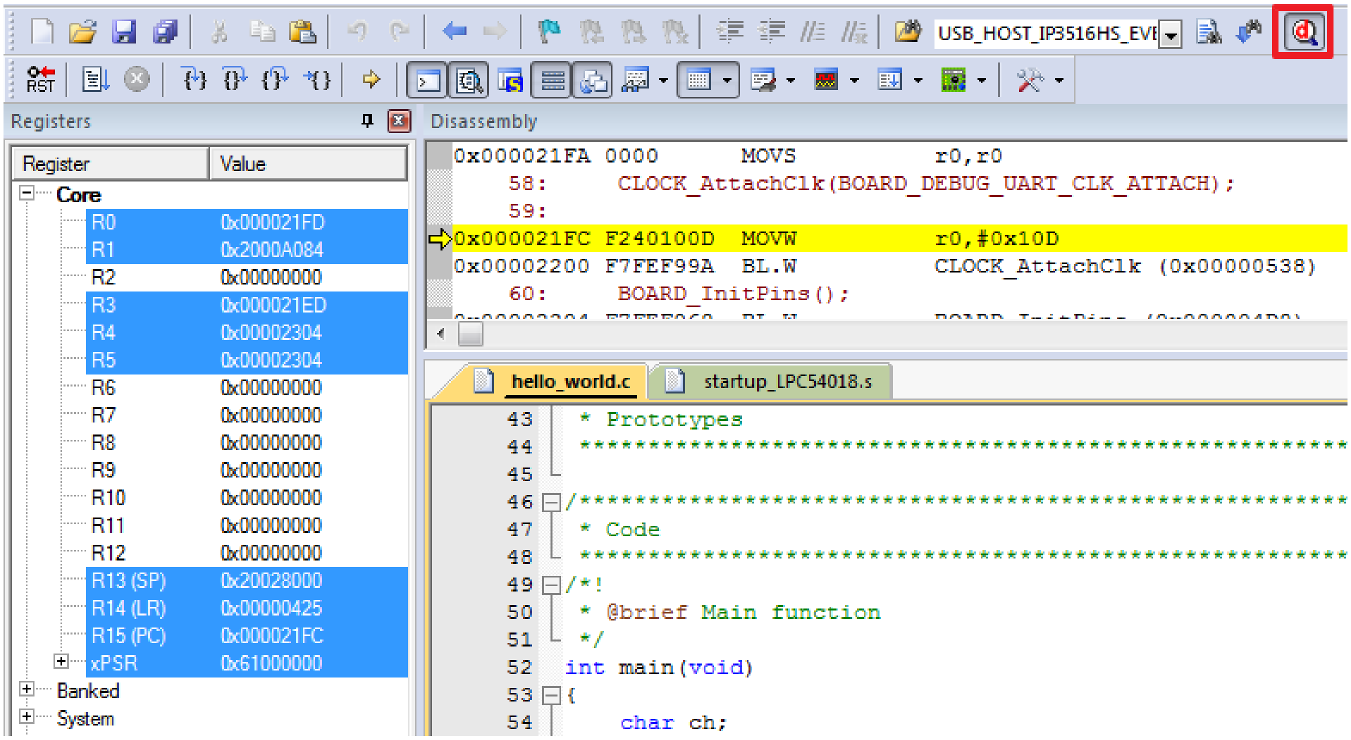


Figure 27. Stop at main() when run debugging

2. Run the code by clicking the “Run” button to start the application.

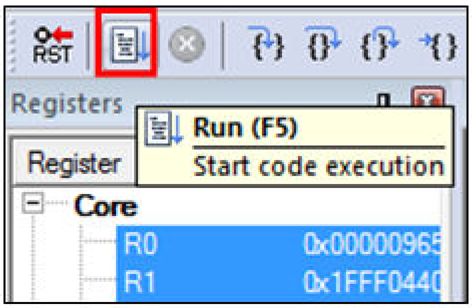



Figure 28. Go button

The hello_world application is now running and a banner is displayed on the terminal. If this is not true, check your terminal settings and connections.

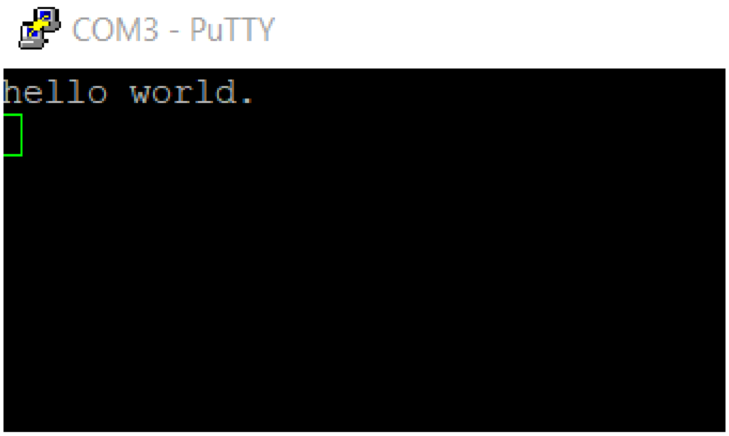



**Figure 29. Text display of the hello_world demo**

## 4.4 How to program the non-XIP (plain load) example application to external flash

1. Click the configure target option button and select the “SYSRESETREQ” reset option.

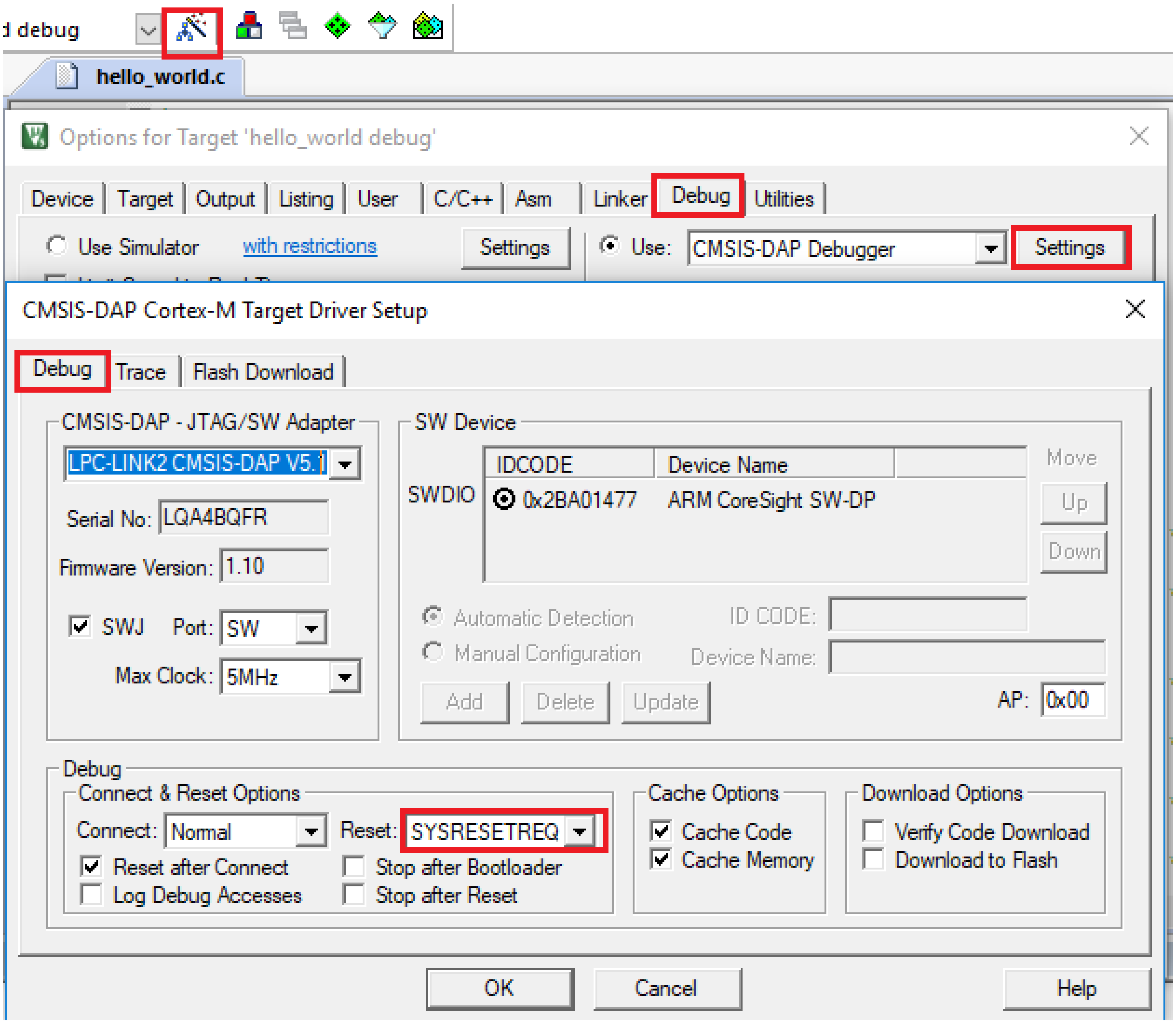



**Figure 30. Select “SYSRESETREQ” reset option**

2. Select the “Flash Download” option and click the “Add” button.

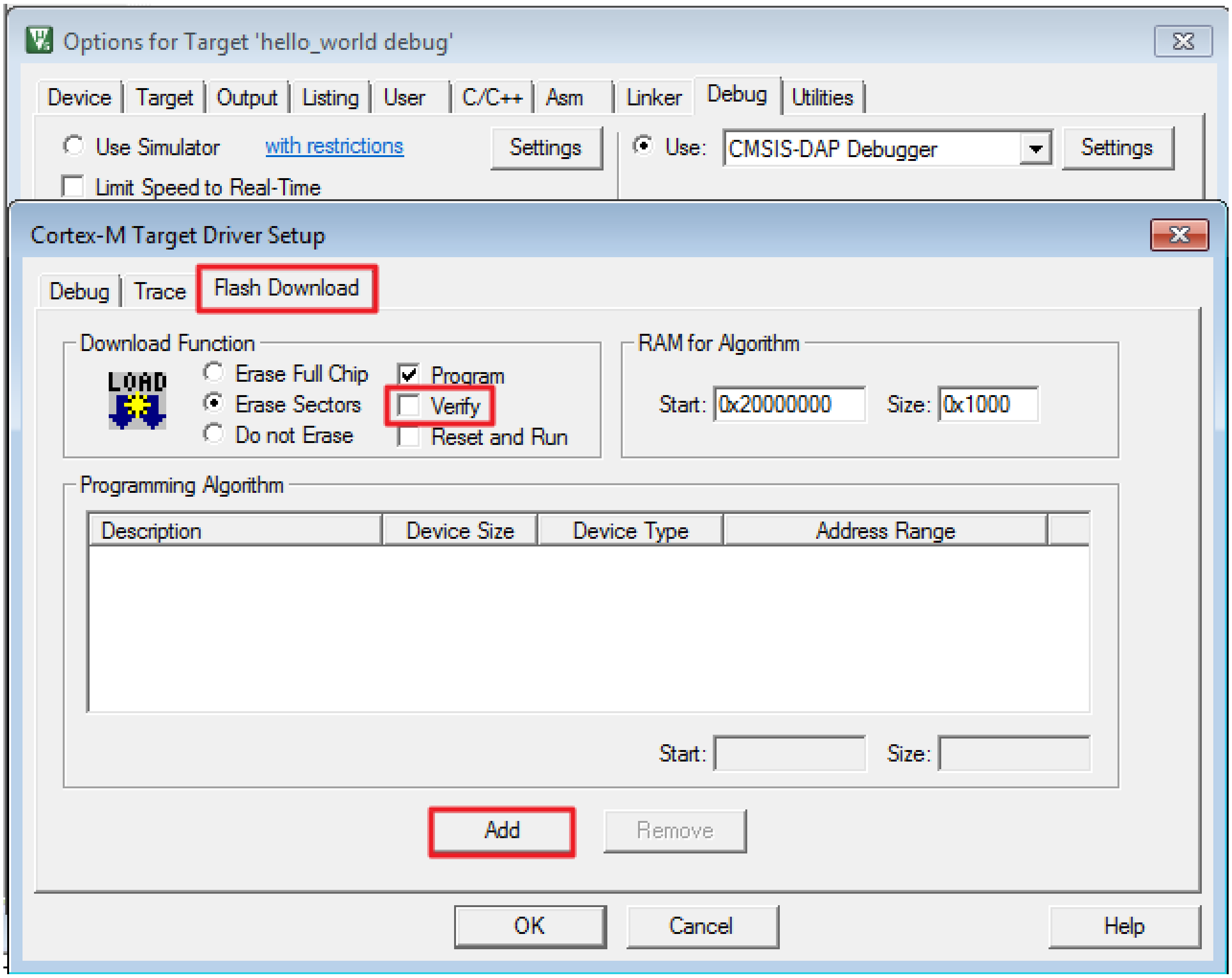



**Figure 31. Select “Flash Download” option**

3. Select the “LPC540xx W25Q128JVFM SPIF” option. For the LPCXpresso54S018M board, . Then, click the “Add” button.

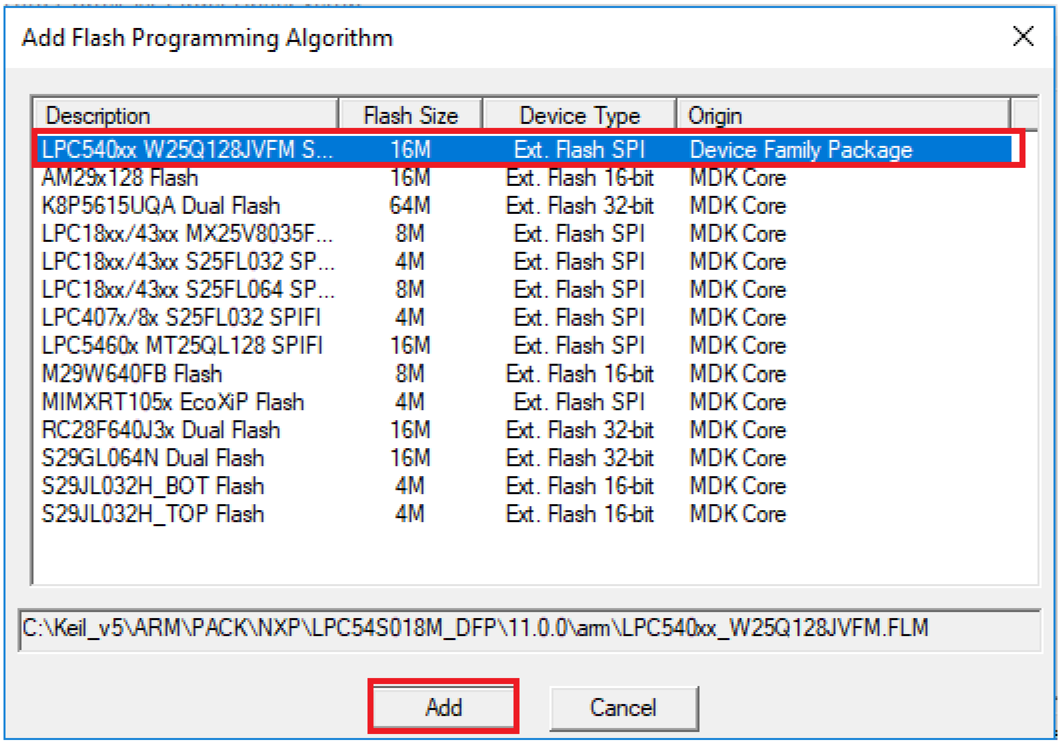



**Figure 32. Select "LPC540xx W25Q128JVFM SPIF" option**

4. Set 0x00000000 as the start address and click the "OK" button.

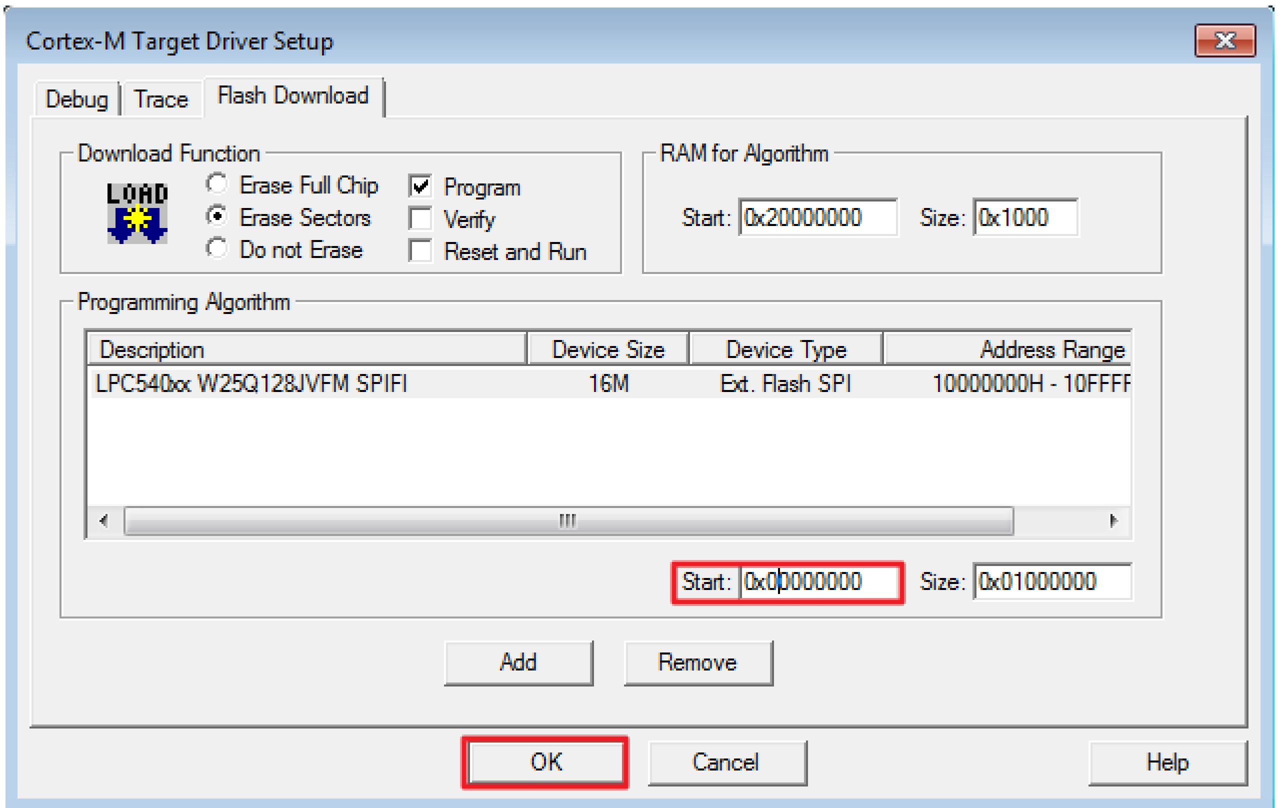



**Figure 33. Set 0x00000000 as the start address**

5. Click the "LOAD" button.

**NOTE**

If 'LOAD' fails, press the SW4 button on the board, then repower the board or reset the board (get into ISP mode). Keep pressing SW4 when clicking the 'LOAD' button again to program the application into the external flash.

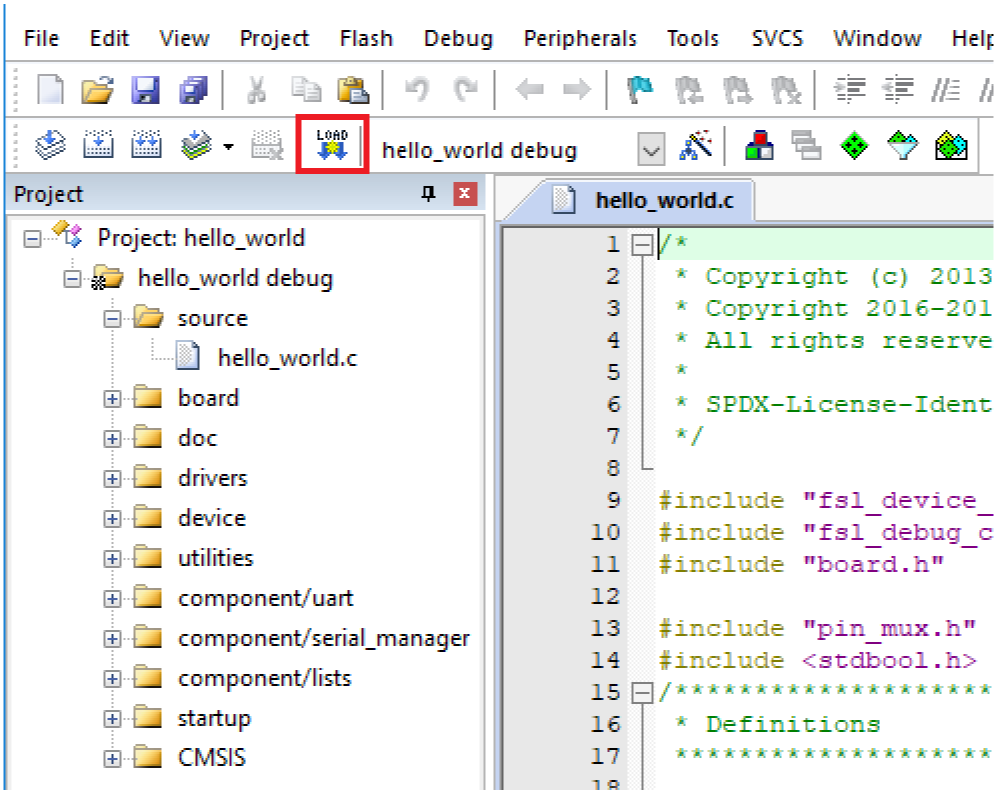



**Figure 34. Click the “LOAD” button.**

6. Press the reset button on the board to run the example.

   The hello_world application is now running and a banner is displayed on the terminal. If this is not true, check your terminal settings and connections.

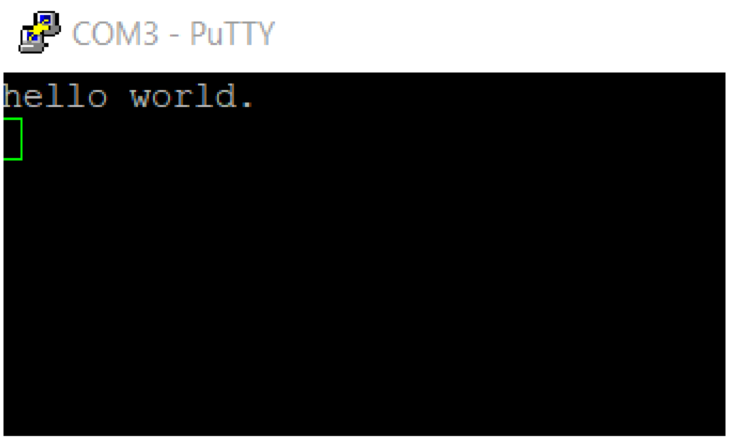



**Figure 35. Text display of the hello_world demo**

## 4.5 How to program the non-XIP (plain load) example application to external flash using J-Link

1. Click the configure target option button and select the "Normal" reset option.

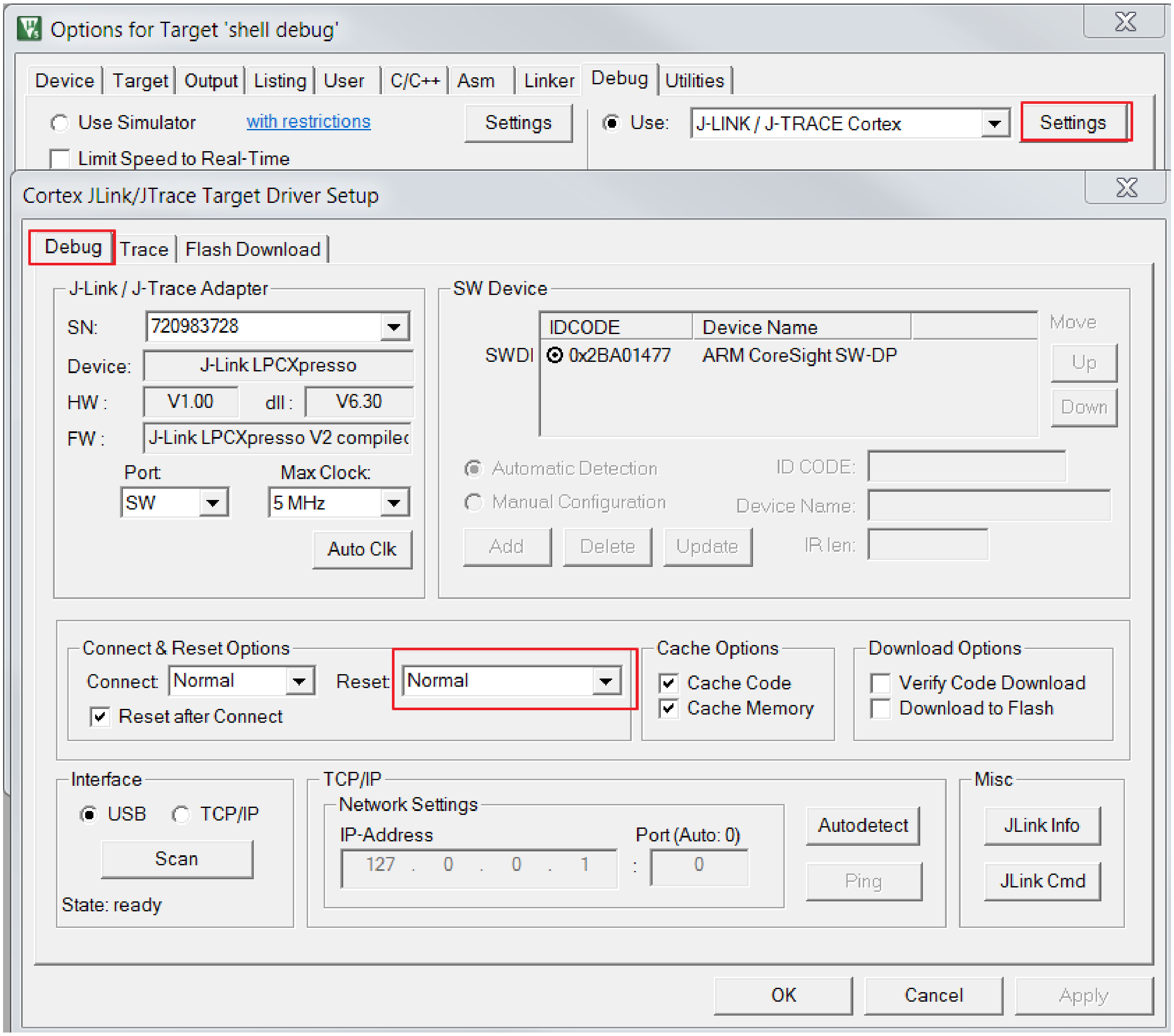



**Figure 36. Select "Normal" reset option**

2. Select the "Flash Download" option and click the "Add" button.

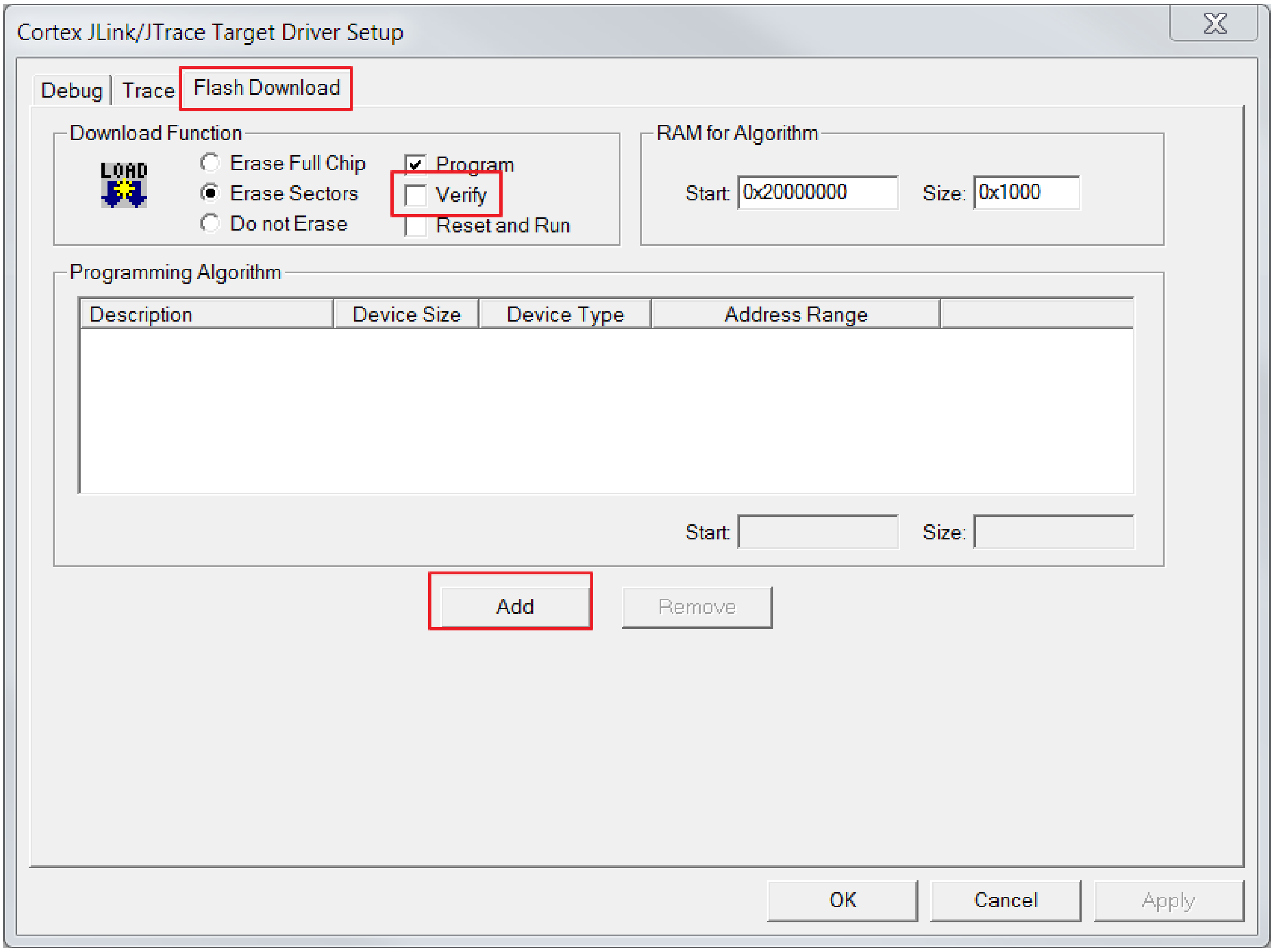



**Figure 37. Select "Flash Download" option**

3. Select the "LPC540xx W25Q128JVFM SPIF" for the LPCXpresso54S018M board , and click the "Add" button.

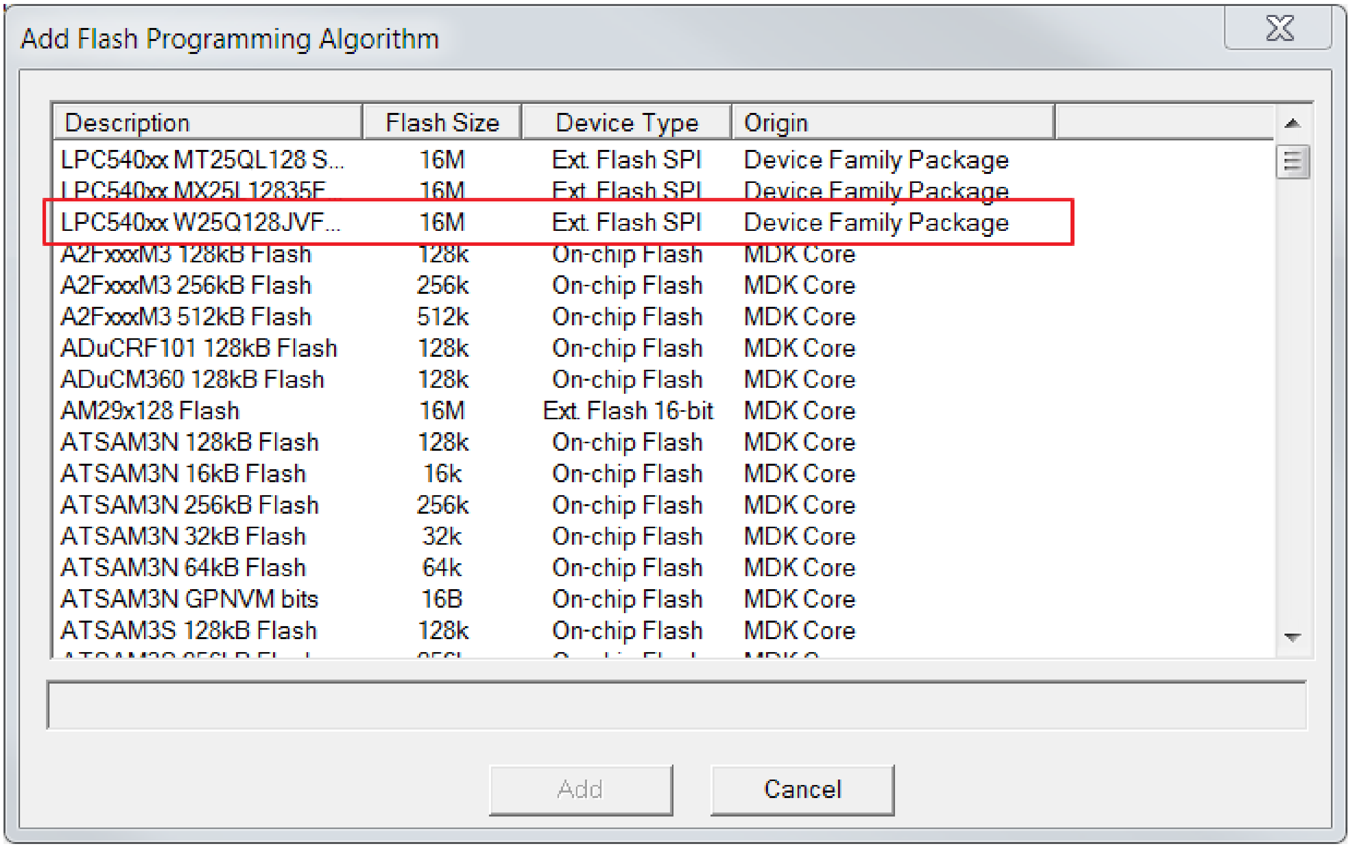



**Figure 38. Select "LPC540xx W25Q128JVFM SPIF" option**

4. Set 0x00000000 as the start address and click the "OK" button.

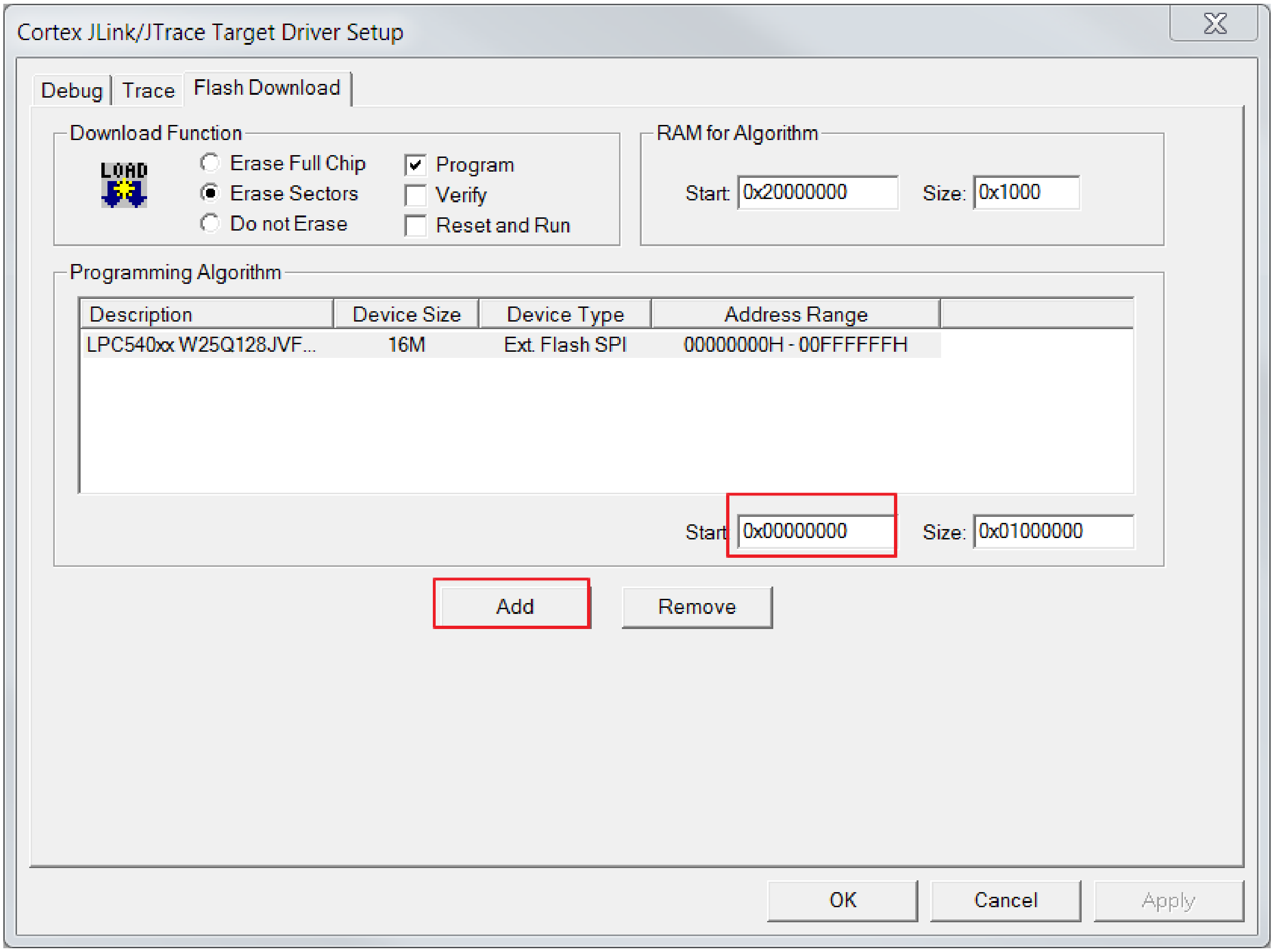



**Figure 39. Set 0x00000000 as the start address**

5. Click the “LOAD” button.

**NOTE**

If 'LOAD' fails, press the SW4 button on the board, then repower the board or reset the board (get into ISP mode). Keep pressing SW4 when clicking the 'LOAD' button again to program the application into the external flash.

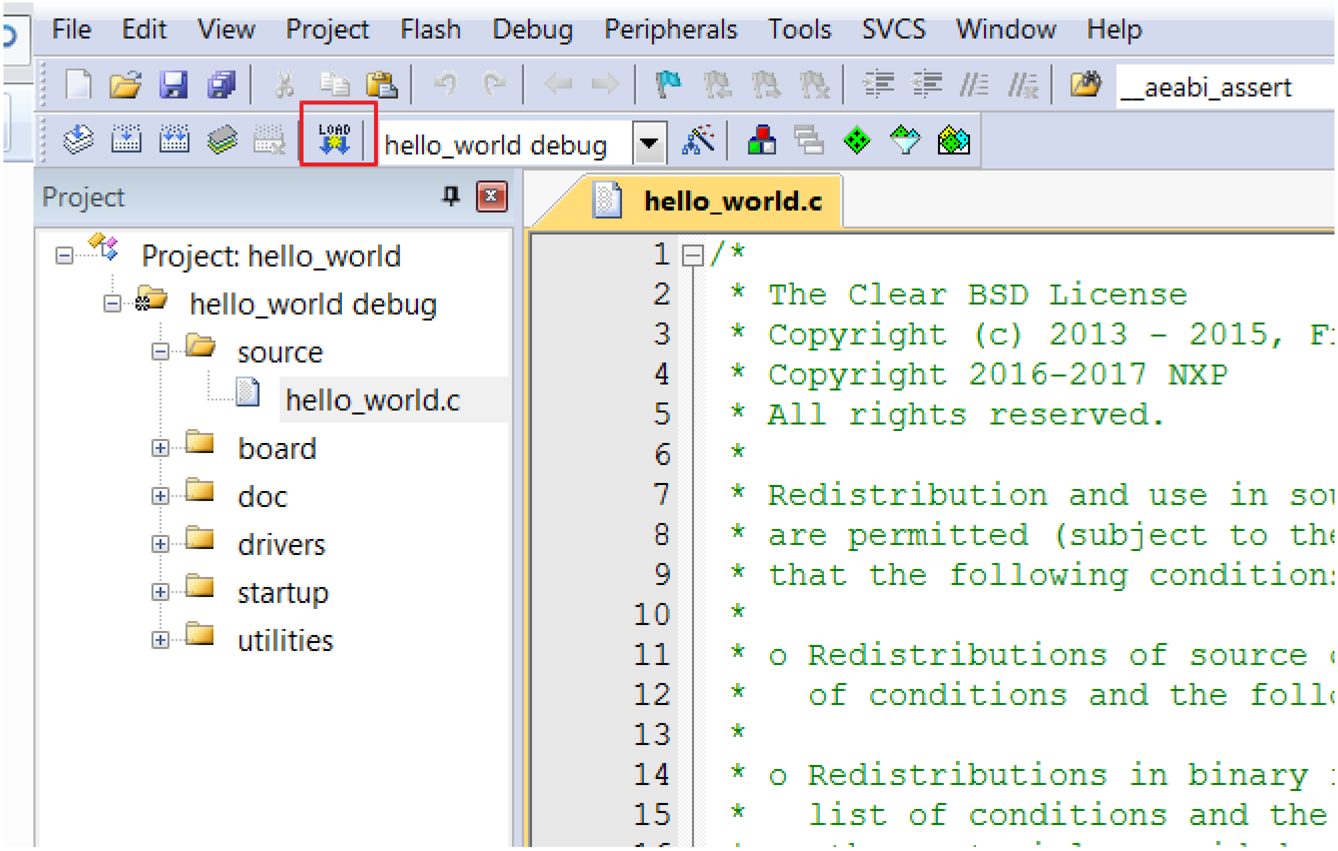



**Figure 40. Click the "LOAD" button.**

6. Press the reset button on the board to run the example.

   The hello_world application is now running and a banner is displayed on the terminal. If this is not the case, check your terminal settings and connections.

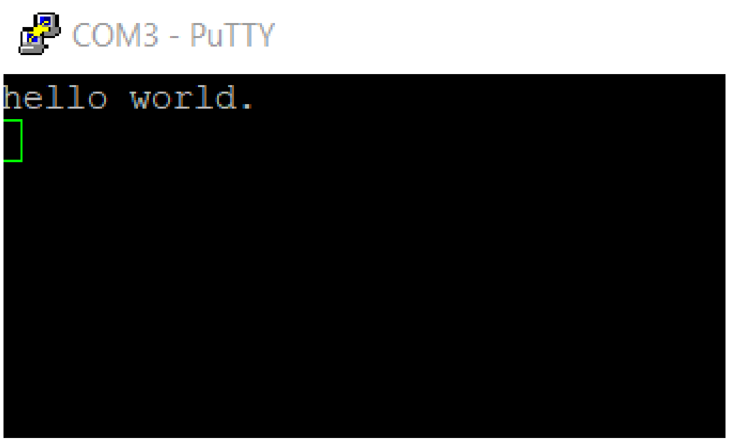



**Figure 41. Text display of the hello_world demo**

## 4.6 Build an XIP example application

1. Open the desired example application workspace in: <install_dir>/boards/<board_name>/<*example_type*>/<application_name>/mdk

   The workspace file is named <demo_name>.uvmpw, so for this specific example, the actual path is:

   <install_dir>/boards/lpcxpresso54s018m/demo_apps/hello_world_qspi_xip/mdk/hello_world_qspi_xip.uvmpw

2. To build the demo project, select the "Rebuild" button, highlighted in red.

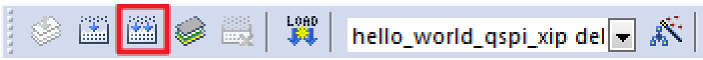



**Figure 42. Select “Flash Download” option**

3. The build completes without errors

## 4.7 Run an XIP example application

1. Click the “LOAD” button, highlighted in red.

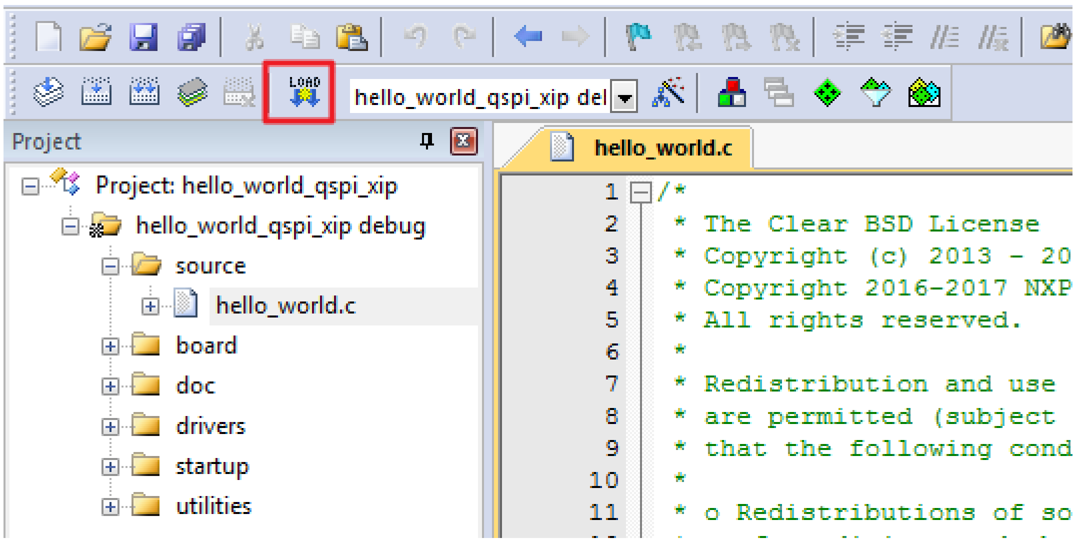



**Figure 43. Click "LOAD" button**

2. Press the reset button on the board to run the example.

   The hello_world application is now running and a banner is displayed on the terminal. If this is not true, check your terminal settings and connections.

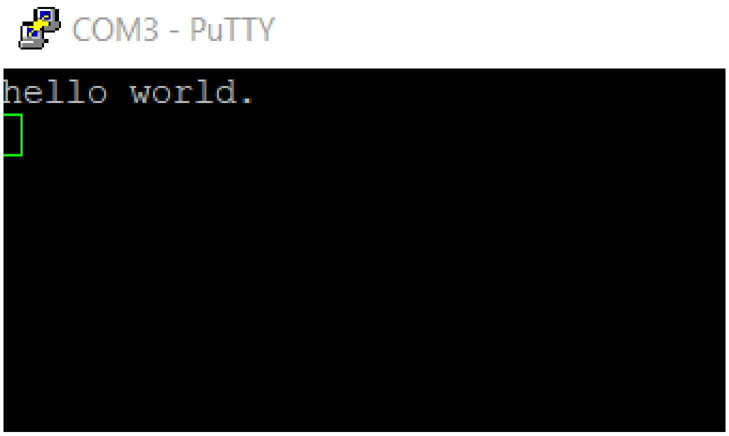



**Figure 44. Text display of the hello_world demo**

# 5 Run a demo using Arm® GCC

This section describes the steps to configure the command line Arm® GCC tools to build, run, and debug demo applications and necessary driver libraries provided in the MCUXpresso SDK. The hello_world demo application is targeted for the LPCXpresso54S018M hardware platform which is used as an example.

## 5.1 Set up toolchain

This section contains the steps to install the necessary components required to build and run an MCUXpresso SDK demo application with the Arm GCC toolchain, as supported by the MCUXpresso SDK. There are many ways to use Arm GCC tools, but this example focuses on a Windows operating system environment.

### 5.1.1 Install GCC ARM Embedded tool chain

Download and run the installer from launchpad.net/gcc-arm-embedded. This is the actual toolset (in other words, compiler, linker, etc.). The GCC toolchain should correspond to the latest supported version, as described in the *MCUXpresso SDK Release Notes Supporting LPCXpresso54S018M*. (document MCUXSDKLPC54S0XXMRN).

### 5.1.2 Install MinGW (only required on Windows OS)

The Minimalist GNU for Windows (MinGW) development tools provide a set of tools that are not dependent on third-party C-Runtime DLLs (such as Cygwin). The build environment used by the MCUXpresso SDK does not use the MinGW build tools, but does leverage the base install of both MinGW and MSYS. MSYS provides a basic shell with a Unix-like interface and tools.

1. Download the latest MinGW mingw-get-setup installer from sourceforge.net/projects/mingw/files/Installer/.
2. Run the installer. The recommended installation path is `C:\MinGW`, however, you may install to any location.

**NOTE**

The installation path cannot contain any spaces.

3. Ensure that the **mingw32-base** and **msys-base** are selected under **Basic Setup**.

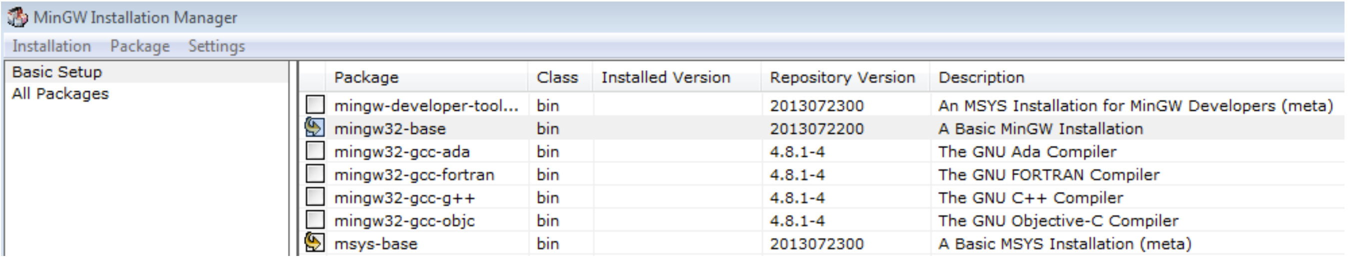



**Figure 45. Set up MinGW and MSYS**

4. In the **Installation** menu, click **Apply Changes** and follow the remaining instructions to complete the installation.

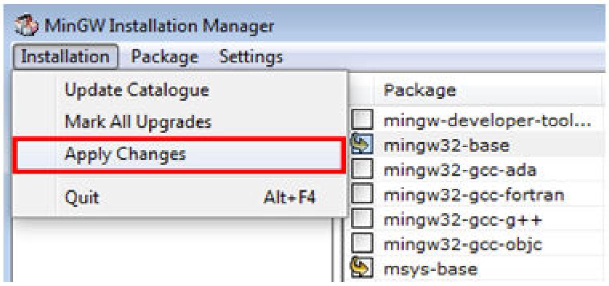



**Figure 46. Complete MinGW and MSYS installation**

5. Add the appropriate item to the Windows operating system path environment variable. It can be found under **Control Panel->System and Security->System->Advanced System Settings** in the **Environment Variables...** section. The path is:

   `<mingw_install_dir>\bin`

   Assuming the default installation path,`C:\MinGW`, an example is shown below. If the path is not set correctly, the toolchain will not not work.

**NOTE**

If you have `C:\MinGW\msys\x.x\bin` in your PATH variable (as required by Kinetis SDK 1.0.0), remove it to ensure that the new GCC build system works correctly.

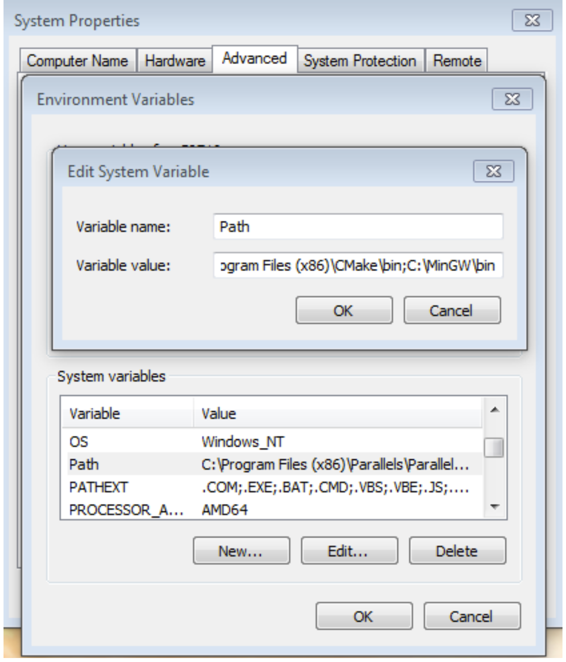



**Figure 47. Add Path to systems environment**

### 5.1.3 Add a new system environment variable for `ARMGCC_DIR`

Create a new *system* environment variable and name it as `ARMGCC_DIR`. The value of this variable should point to the Arm GCC Embedded tool chain installation path. For this example, the path is:

```
C:\Program Files (x86)\GNU Tools ARM Embedded\6 2017q2
```

See the installation folder of the GNU Arm GCC Embedded tools for the exact path name of your installation.

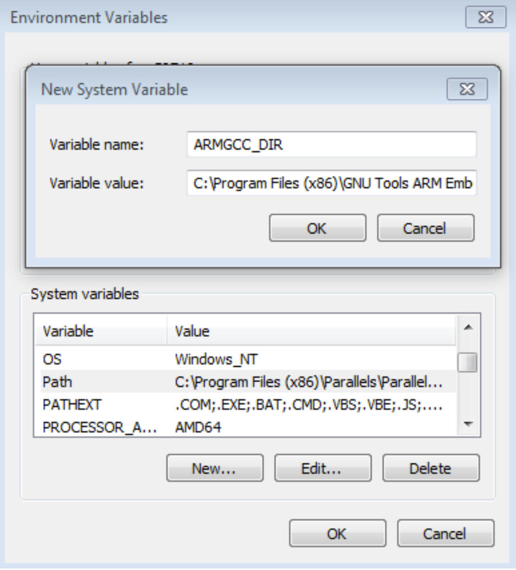



**Figure 48. Add `ARMGCC_DIR` system variable**

### 5.1.4 Install CMake

1. Download CMake 3.0.x from www.cmake.org/cmake/resources/software.html.
2. Install CMake, ensuring that the option **Add CMake to system PATH** is selected when installing. The user chooses to select whether it is installed into the PATH for all users or just the current user. In this example, it is installed for all users.

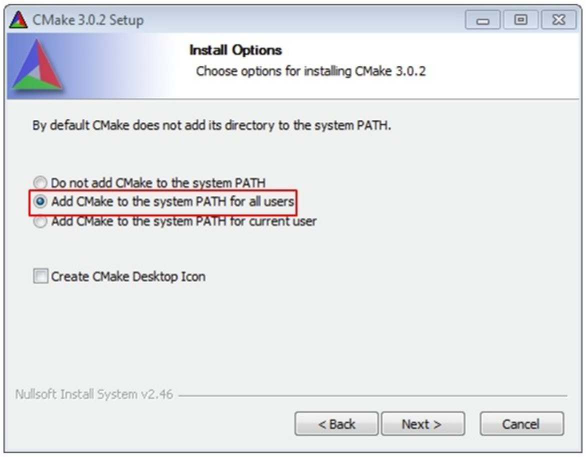



**Figure 49. Install CMake**

3. Follow the remaining instructions of the installer.
4. You may need to reboot your system for the PATH changes to take effect.
5. Make sure `sh.exe` is not in the Environment Variable PATH. This is a limitation of `mingw32-make`.

## 5.2 Build an example application

To build an example application, follow these steps.

1. Open a GCC Arm Embedded tool chain command window. To launch the window, from the Windows operating system Start menu, go to **Programs ->GNU Tools ARM Embedded <version>** and select **GCC Command Prompt**.

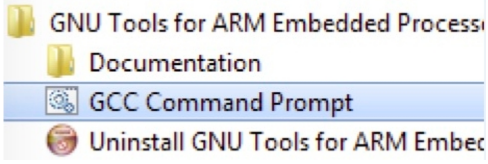



**Figure 50. Launch command prompt**

2. Change the directory to the example application project directory which has a path similar to the following:

   `<install_dir>/boards/<board_name>/<example_type>/<application_name>/armgcc`

   For this example, the exact path is:

   `<install_dir>/examples/lpcxpresso54s018m/demo_apps/hello_world/armgcc`

**NOTE**

To change directories, use the `cd` command.

3. Type **build_debug.bat** on the command line or double click on **build_debug.bat** file in Windows Explorer to build it. The output is shown in this figure:


**Figure 51. `hello_world` demo build successful**

## 5.3 Run an example application

This section describes steps to run a demo application using J-Link GDB Server application. To perform this exercise, two things must be done:

- Make sure that:
  - You have a standalone J-Link pod that is connected to the debug interface of your board. Note that some hardware platforms require hardware modification in order to function correctly with an external debug interface.

After the J-Link interface is configured and connected, follow these steps to download and run the demo applications:

1. Connect the development platform to your PC via USB cable between the Link2 USB connector and the PC USB connector. If you are connecting for the first time, allow about 30 seconds for the devices to enumerate.
2. Open the terminal application on the PC, such as PuTTY or TeraTerm, and connect to the debug serial port number (to determine the COM port number, see Appendix A). Configure the terminal with these settings:
   a. 115200 or 9600 baud rate, depending on your board (reference BOARD_DEBUG_UART_BAUDRATE variable in board.h file)
   b. No parity
   c. 8 data bits
   d. 1 stop bit

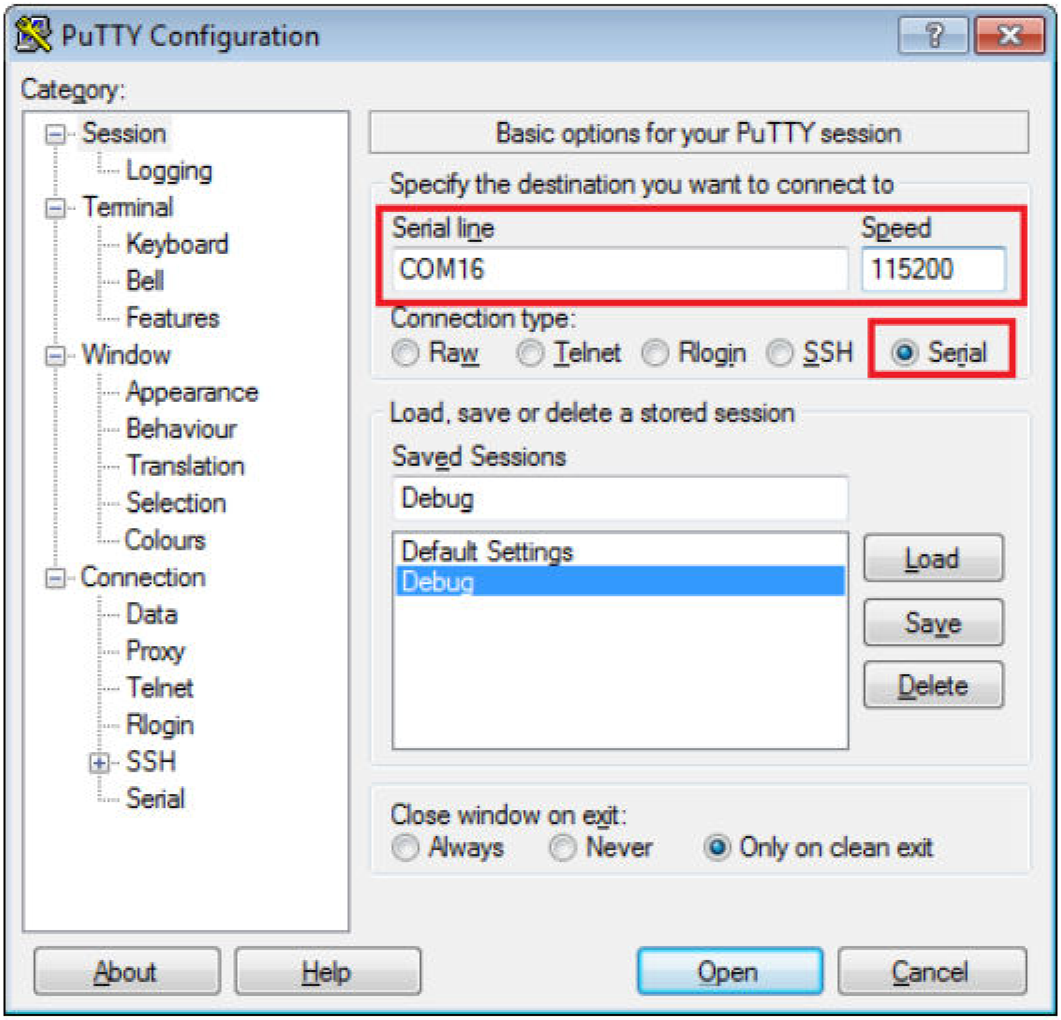



**Figure 52. Terminal (PuTTY) configurations**

3. Open the J-Link GDB Server application. Assuming the J-Link software is installed, the application can be launched by going to the Windows operating system Start menu and selecting "Programs -> SEGGER -> J-Link <version> J-Link GDB Server".
4. Modify the settings as shown below. The target device selection chosen for this example is the Cortex-M4
5. After it is connected, the screen should resemble this figure:

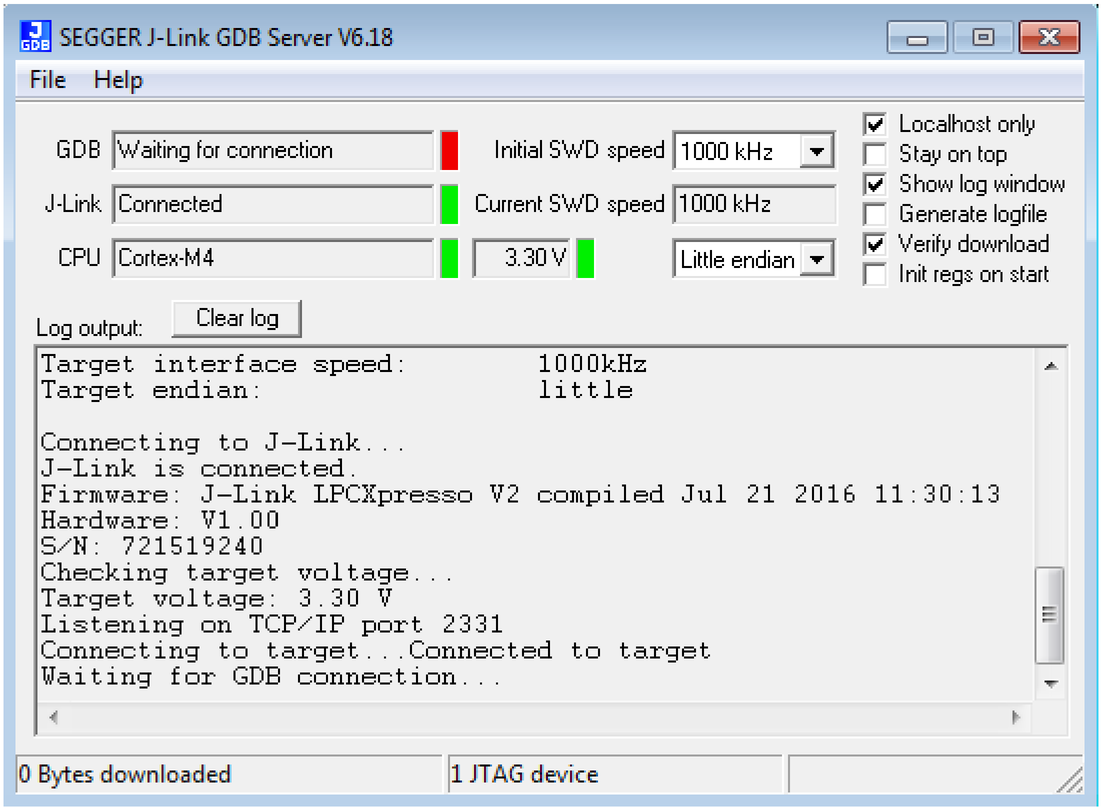



**Figure 53. SEGGER J-Link GDB Server screen after successful connection**

6. If not already running, open a GCC ARM Embedded tool chain command window. To launch the window, from the Windows operating system Start menu, go to "Programs -> GNU Tools ARM Embedded <version>" and select "GCC Command Prompt".

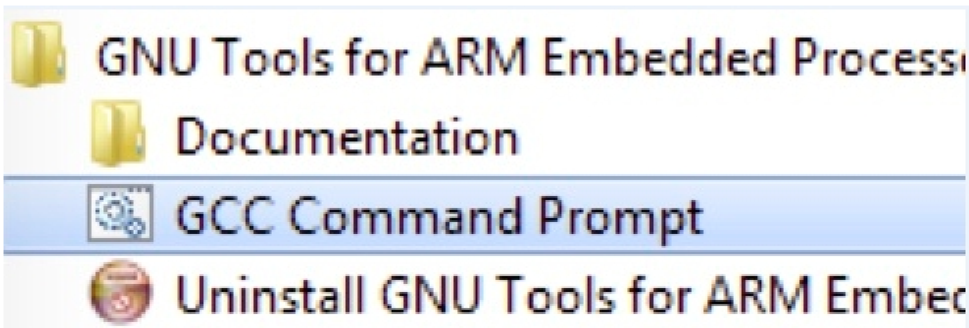



**Figure 54. Launch command prompt**

7. Change to the directory that contains the example application output. The output can be found in using one of these paths, depending on the build target selected:

   *<install_dir>/boards/<board_name>/<example_type>/<application_name>/armgcc/debug*

   *<install_dir>/boards/<board_name>/<example_type>/<application_name>/armgcc/release*

   For this example, the path is:

   *<install_dir>/boards/lpcxpresso54s018m/demo_apps/hello_world/armgcc/debug*

8. Run the command "arm-none-eabi-gdb.exe <application_name>.elf". For this example, it is "arm-none-eabi-gdb.exe hello_world.elf".

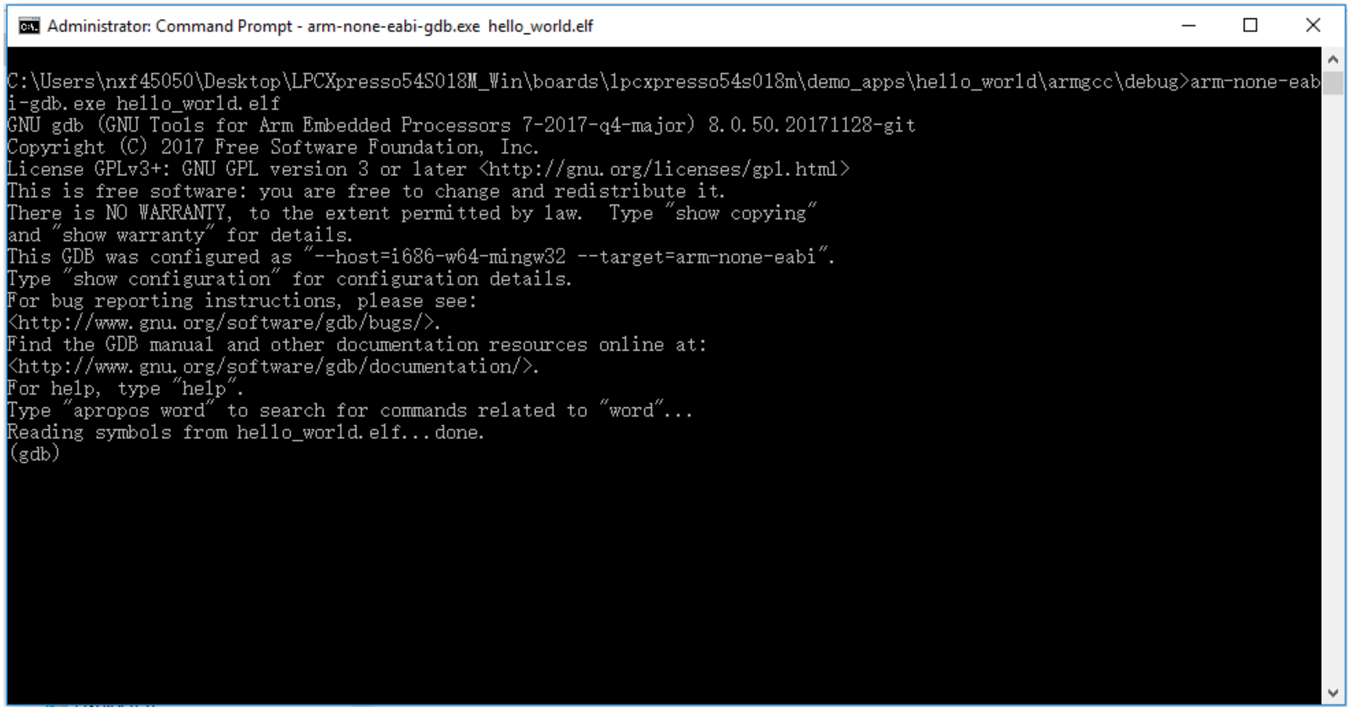



**Figure 55. Run arm-none-eabi-gdb**

9. Run these commands:
   a. "target remote localhost:2331"
   b. "monitor reset"
   c. "monitor go"
   d. "monitor halt"
   e. "load"
   f. "monitor reg pc=(0x4)"
   g. "monitor reg msp=(0x0)"
10. The application is now downloaded and halted at the reset vector. Execute the "monitor go" command to start the demo application.

    The hello_world application is now running and a banner is displayed on the terminal. If this is not true, check your terminal settings and connections.

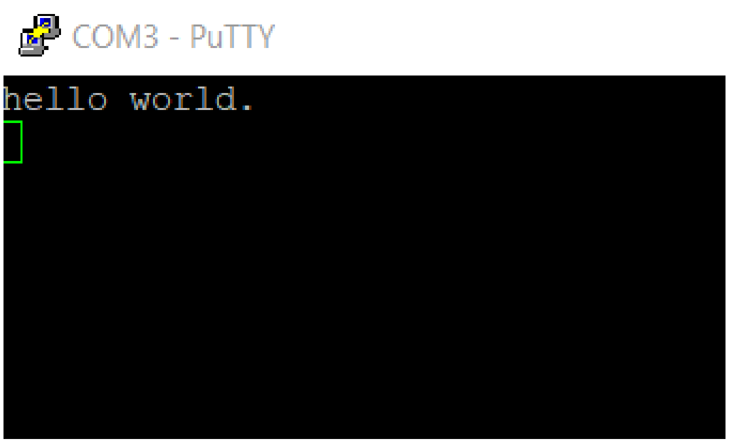



**Figure 56. Text display of the hello_world demo**

## 5.4 How to program the non-XIP (plain load) example bin file to external flash

**External flash**

1. Use the J-FLASH-Lite (version high thatnV6.22) to erase the chip.

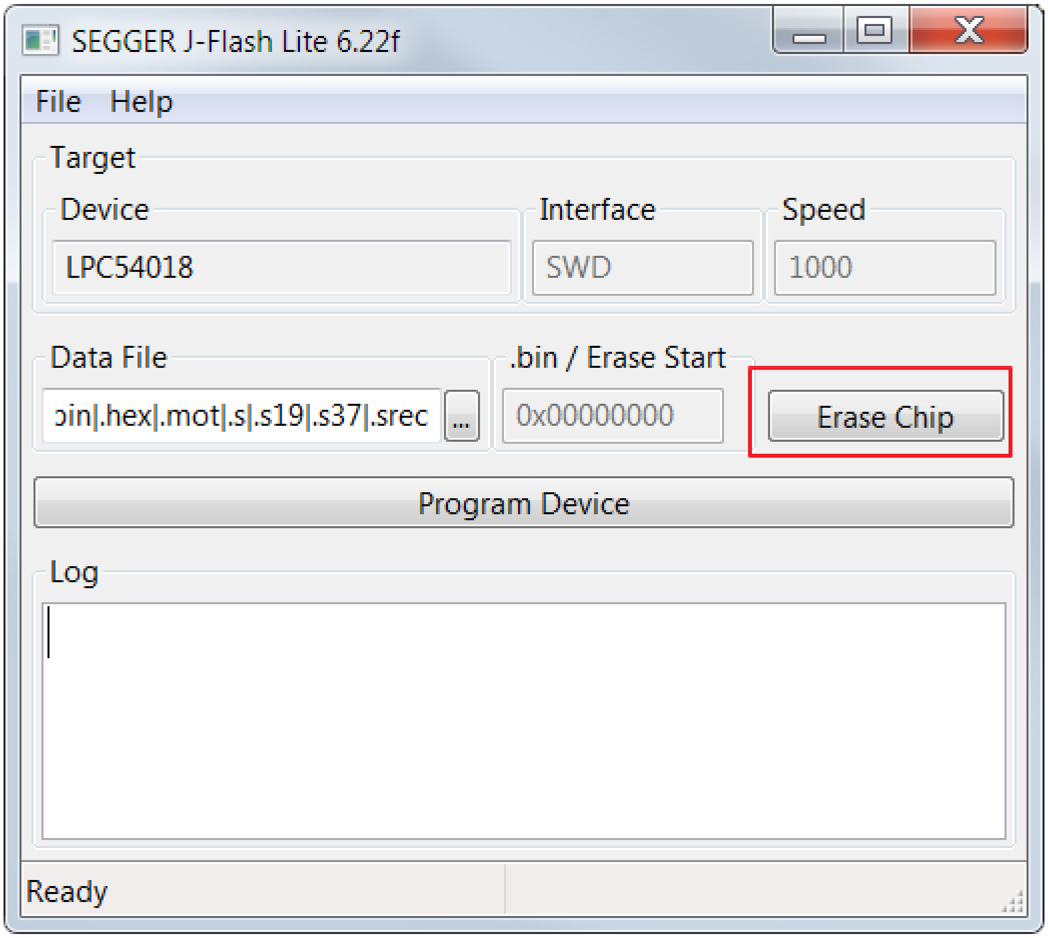



**Figure 57. Erase the external flash**

2. Wait for the flash erase finish.

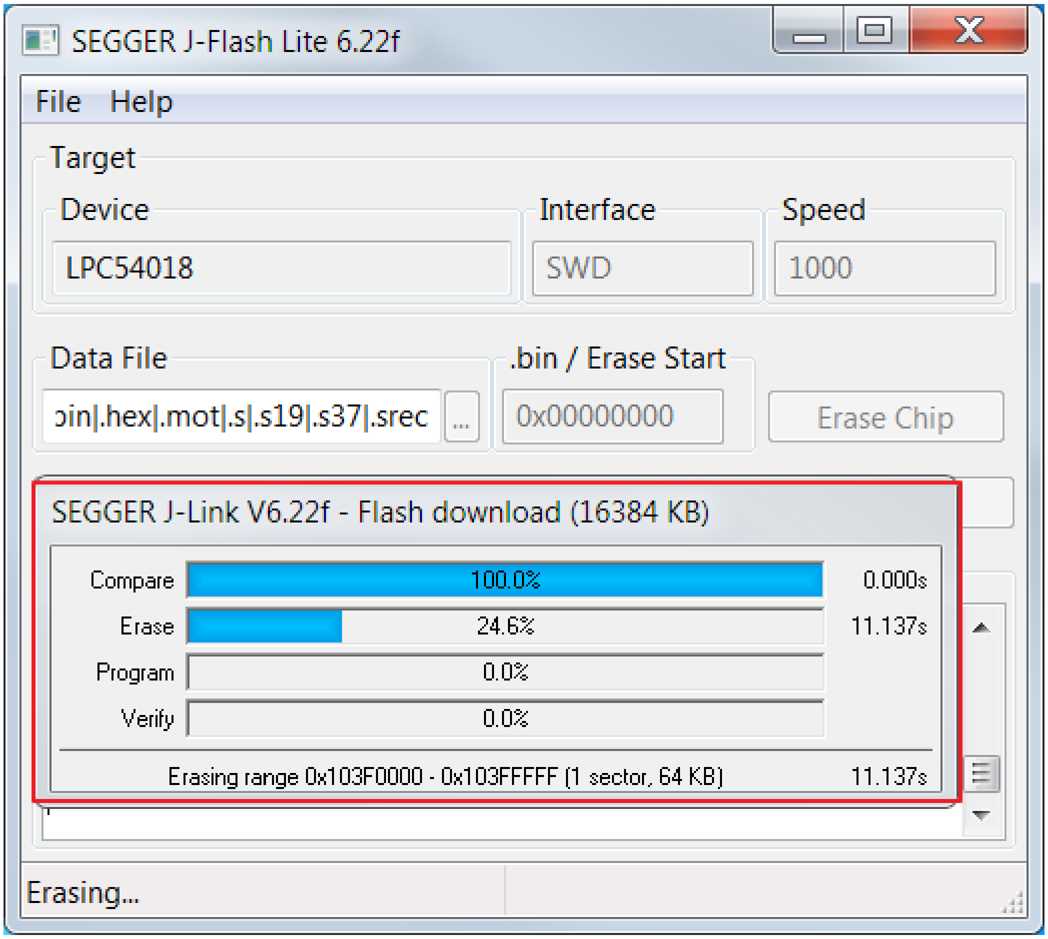



**Figure 58. Erase in progress**

**NOTE**

If you cannot erase, press the SW4 button then press the reset button to enter ISP mode. Then, click the "Erase" button again (keep pressing the SW4 button all the time).

3. Click ‘Program Device’ to program the binary file into external flash.

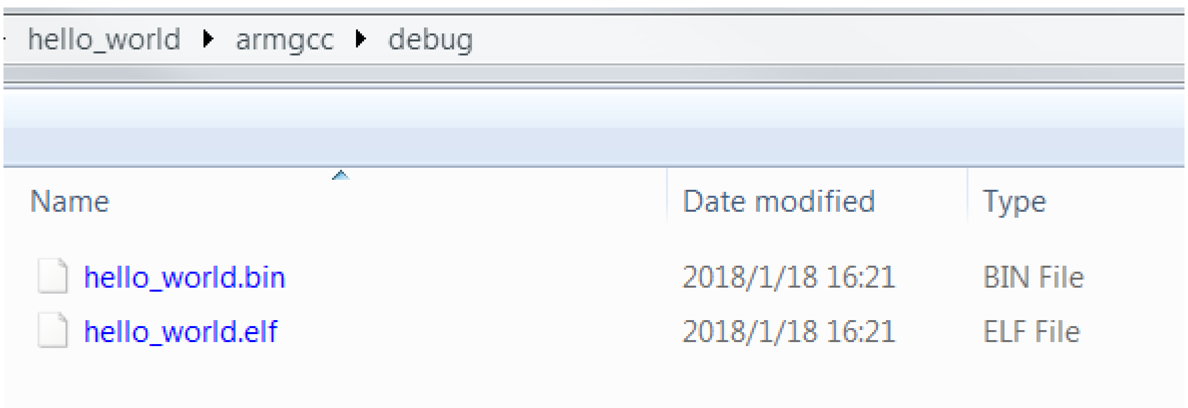



**Figure 59. Binary built by armgcc**

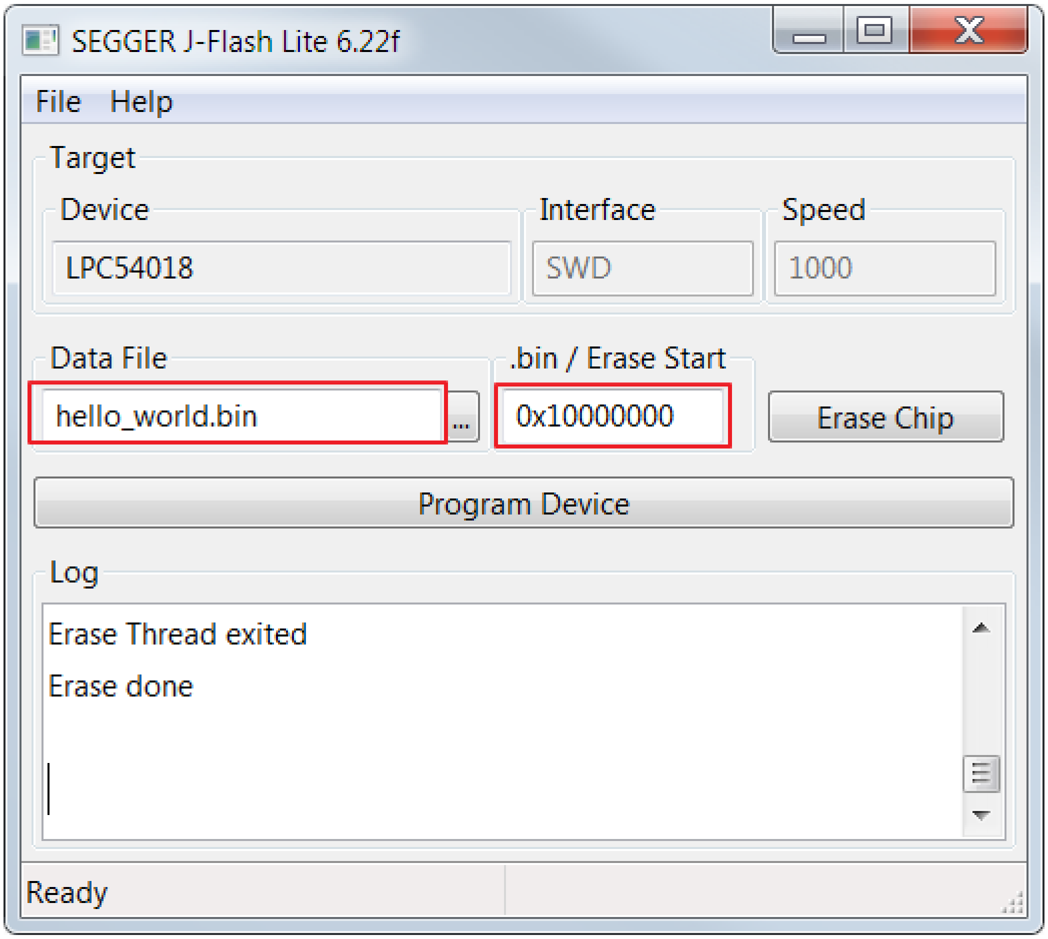



**Figure 60. Program the binary to external flash**

**NOTE**

Make sure the '.bin/Erase Start' address is 0x10000000 (external flash base address).

4. After programming, press the reset button on the board to run.

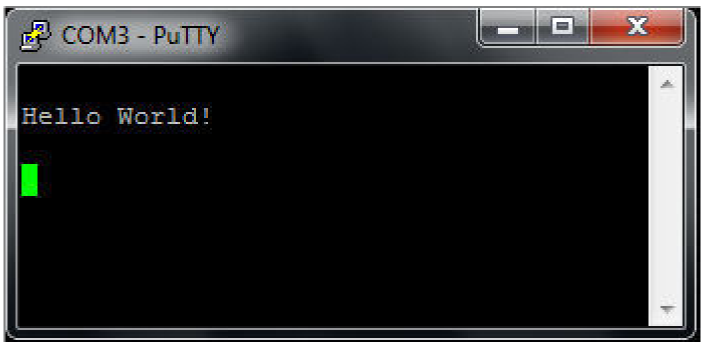



**Figure 61. Text display of the hello_world _qspi_xip demo**

## 5.5 Build an XIP example application

1. Following the same steps as *Section 5.3, "Run an non-xip (plain load) example application"*, type “build_debug.bat” on the command line or double click the "build_debug.bat" file in Windows Explorer to perform the build.

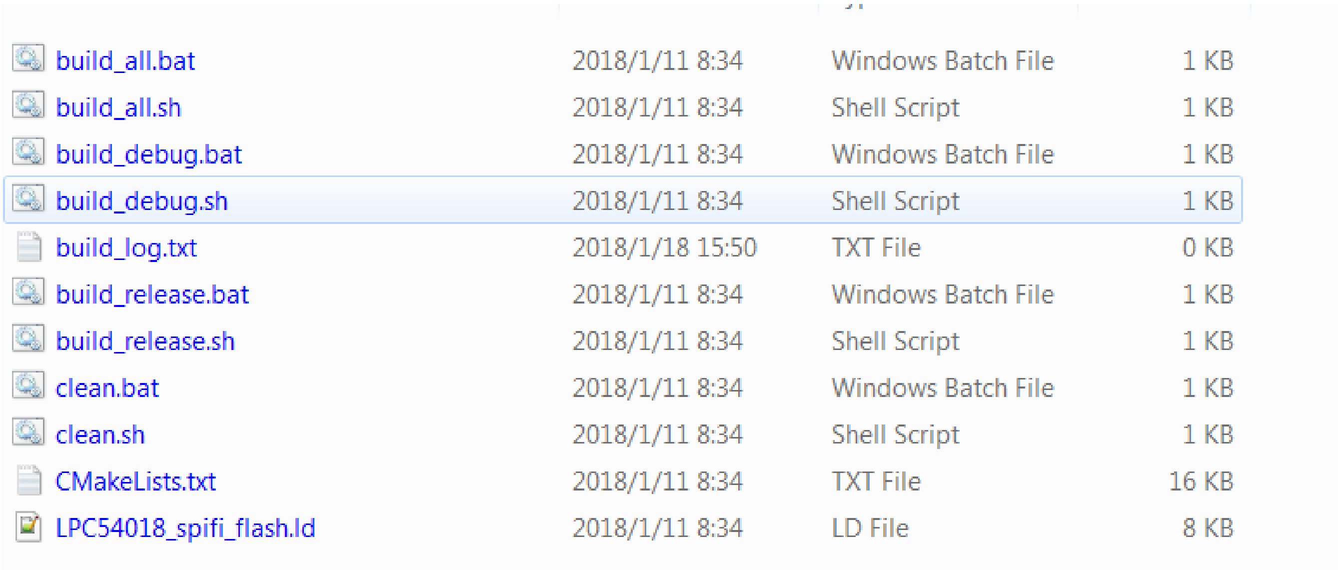



**Figure 62. Click build_debug.bat to build the demo**

2. The build output is shown in this figure:

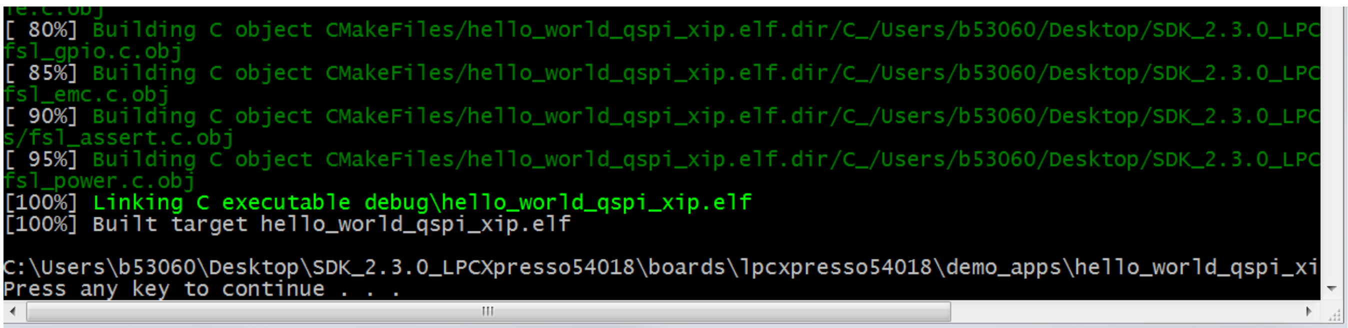



**Figure 63. hello_world_qspi_xip demo build successful**

## 5.6 Run an XIP example application

1. Use the J-FLASH-Lite (with version higher than V6.22) to erase the chip.

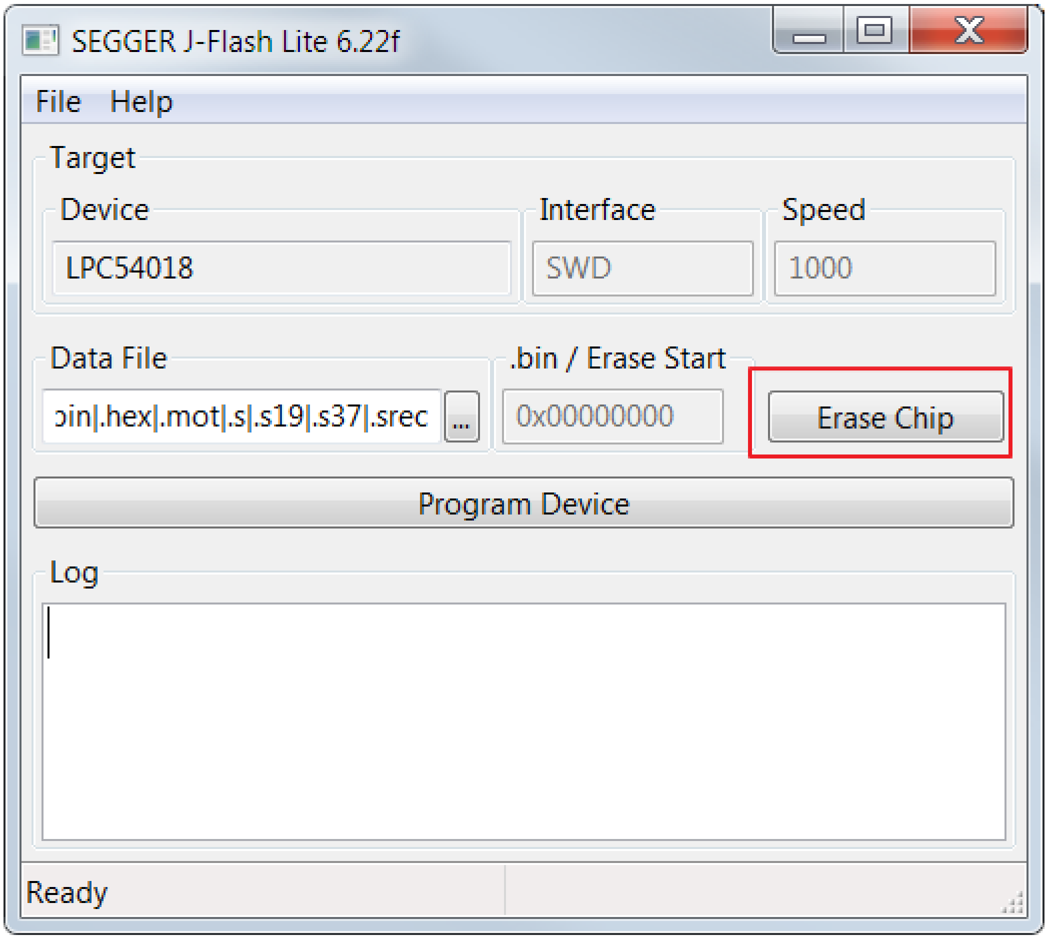



**Figure 64. Erase the external flash**

2. Wait for the flash erase finish.

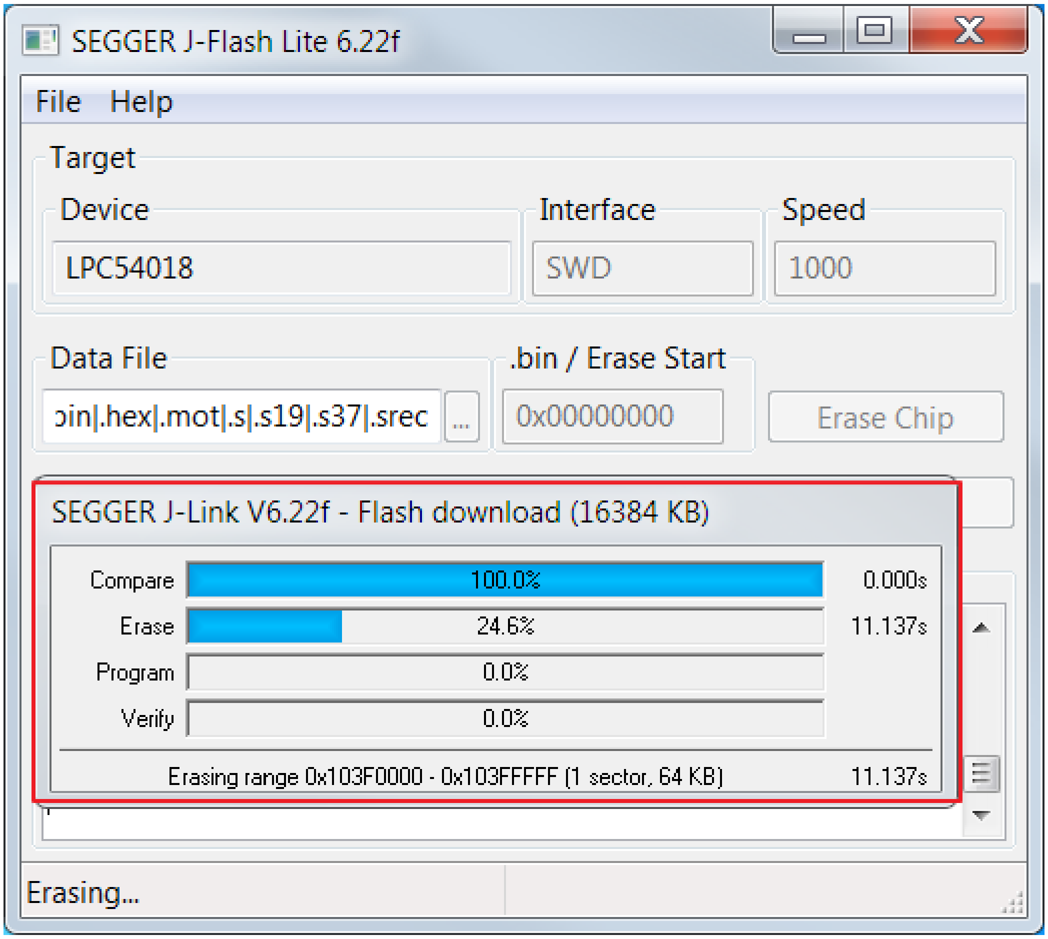



**Figure 65. Erase in progress**

**NOTE**

If you cannot erase, press the SW4 button then press the reset button to enter ISP mode. Then, click erase again (keep pressing the SW4 button all the time).

3. Program the binary file into external flash.

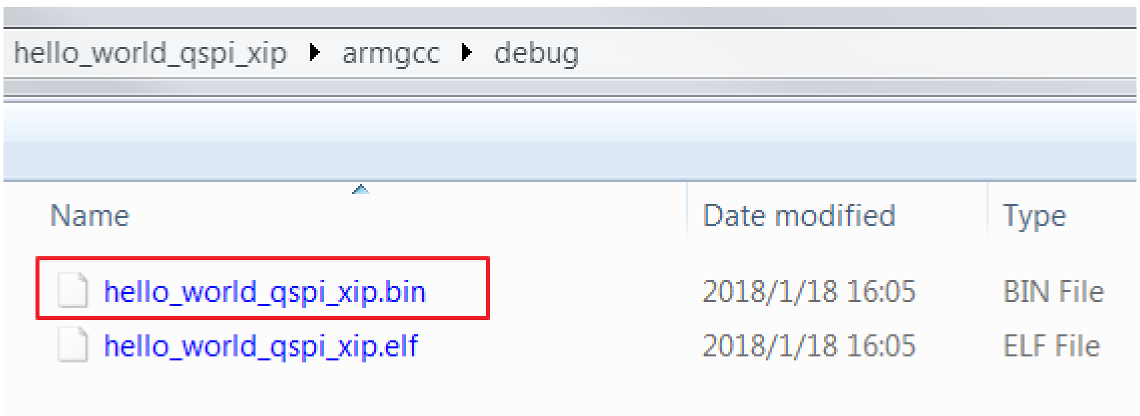



**Figure 66. Binary built by armgcc**

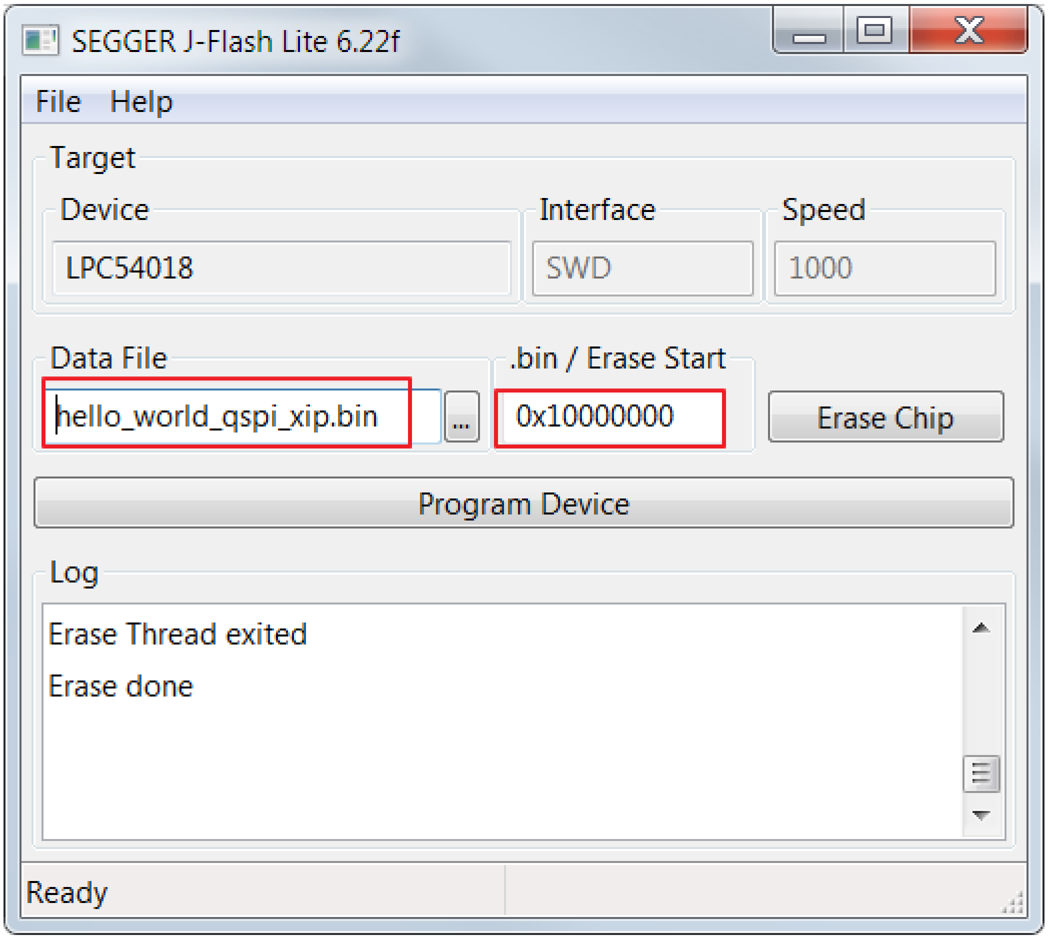



**Figure 67. Program the binary to external flash**

**NOTE**

Make sure the '.bin/Erase Start' address is 0x10000000 (the external flash base address).

4. After programming, press the reset button to run.

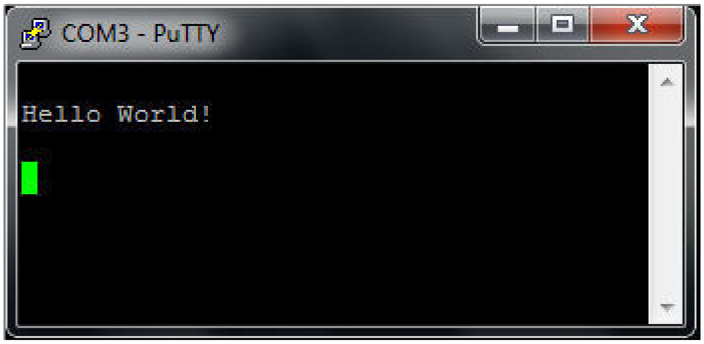



**Figure 68. Text display of the hello_world_qspi_xip demo**

# 6 Run a demo using MCUXpresso IDE

**NOTE**

Ensure that the MCUXpresso IDE toolchain is included when generating the MCUXpresso SDK package.

This section describes the steps required to configure MCUXpresso IDE to build, run, and debug example applications. The hello_world demo application targeted for the LPCXpresso54S018M hardware platform is used as an example, though these steps can be applied to any example application in the MCUXpresso SDK.

## 6.1 Select the workspace location

Every time MCUXpresso IDE launches, it prompts the user to select a workspace location. MCUXpresso IDE is built on top of Eclipse which uses workspace to store information about its current configuration, and in some use cases, source files for the projects are in the workspace. The location of the workspace can be anywhere, but it is recommended that the workspace be located outside of the MCUXpresso SDK tree.

## 6.2 Build a non-XIP (plain load) example application

To build an example application, follow these steps.

1. Drag and drop the SDK zip file into the “Installed SDKs” view to install an SDK. In the window that appears, click the “OK” button and wait until the import has finished.

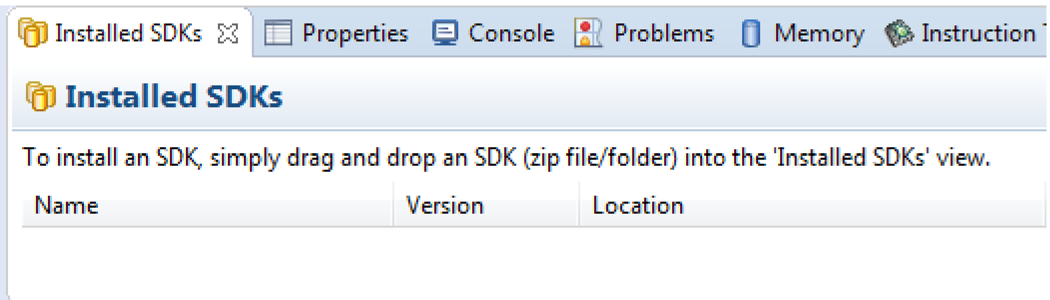



**Figure 69. Install an SDK**

2. On the *Quickstart Panel*, click “Import SDK example(s)…”.

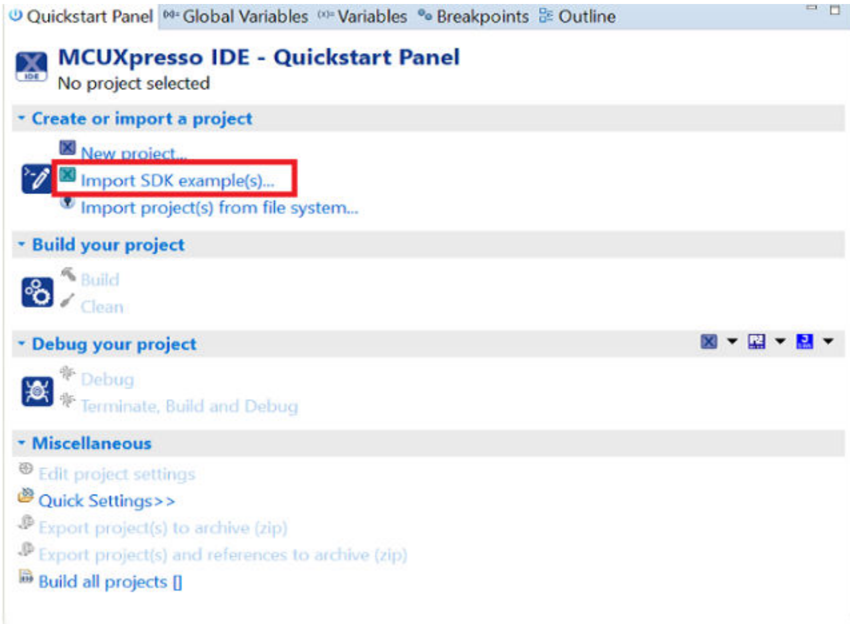



**Figure 70. Import an SDK example**

3. In the window that appears, expand the “LPC54S0xxM folder and select “LPC54S018M" . Then, select “lpcxpresso54s018m” and click the “Next” button.

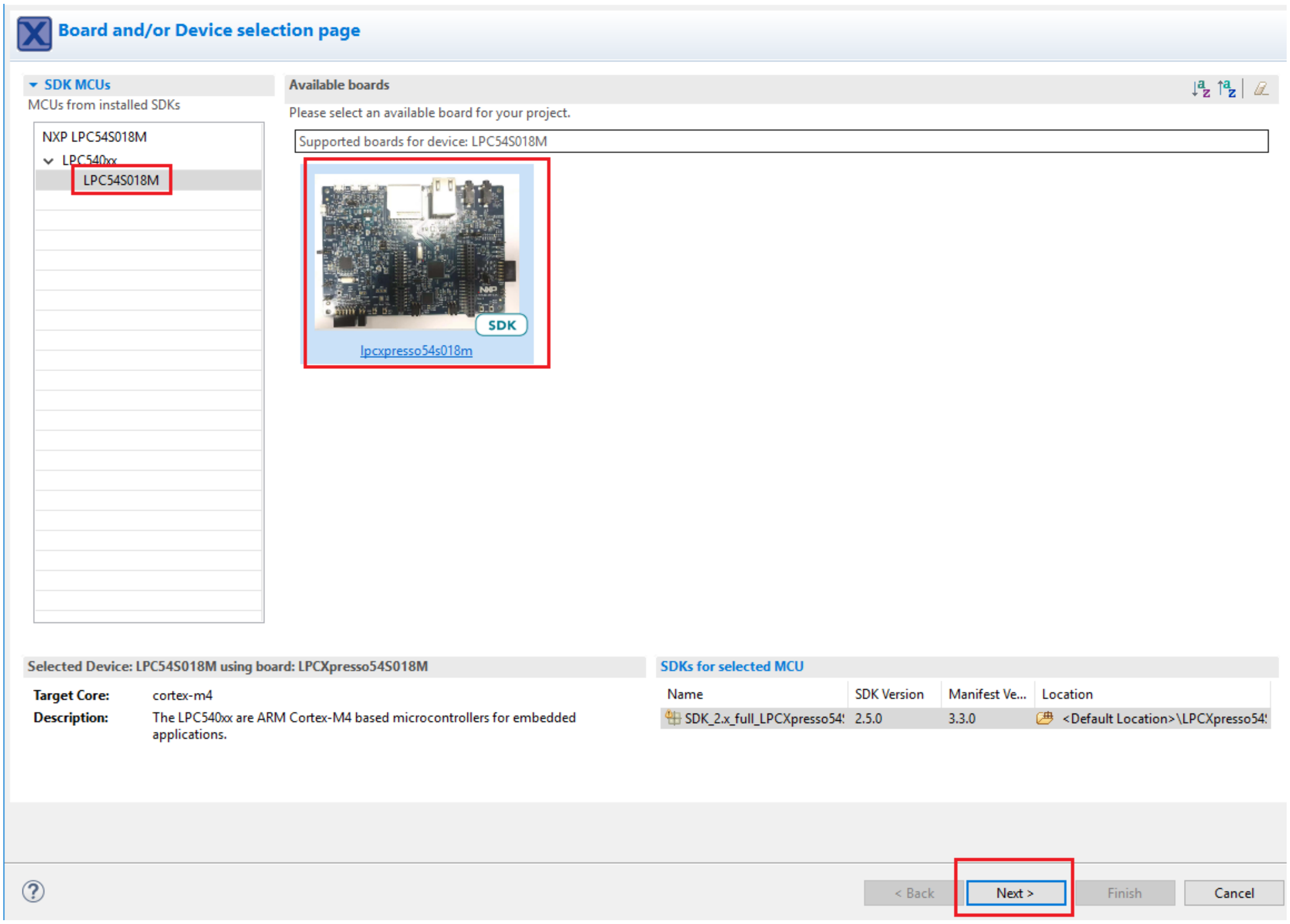



**Figure 71. Select LPCXpresso54S018M board**

4. Expand the “demo_apps” folder and select “hello_world”. Then, click the "Next” button.

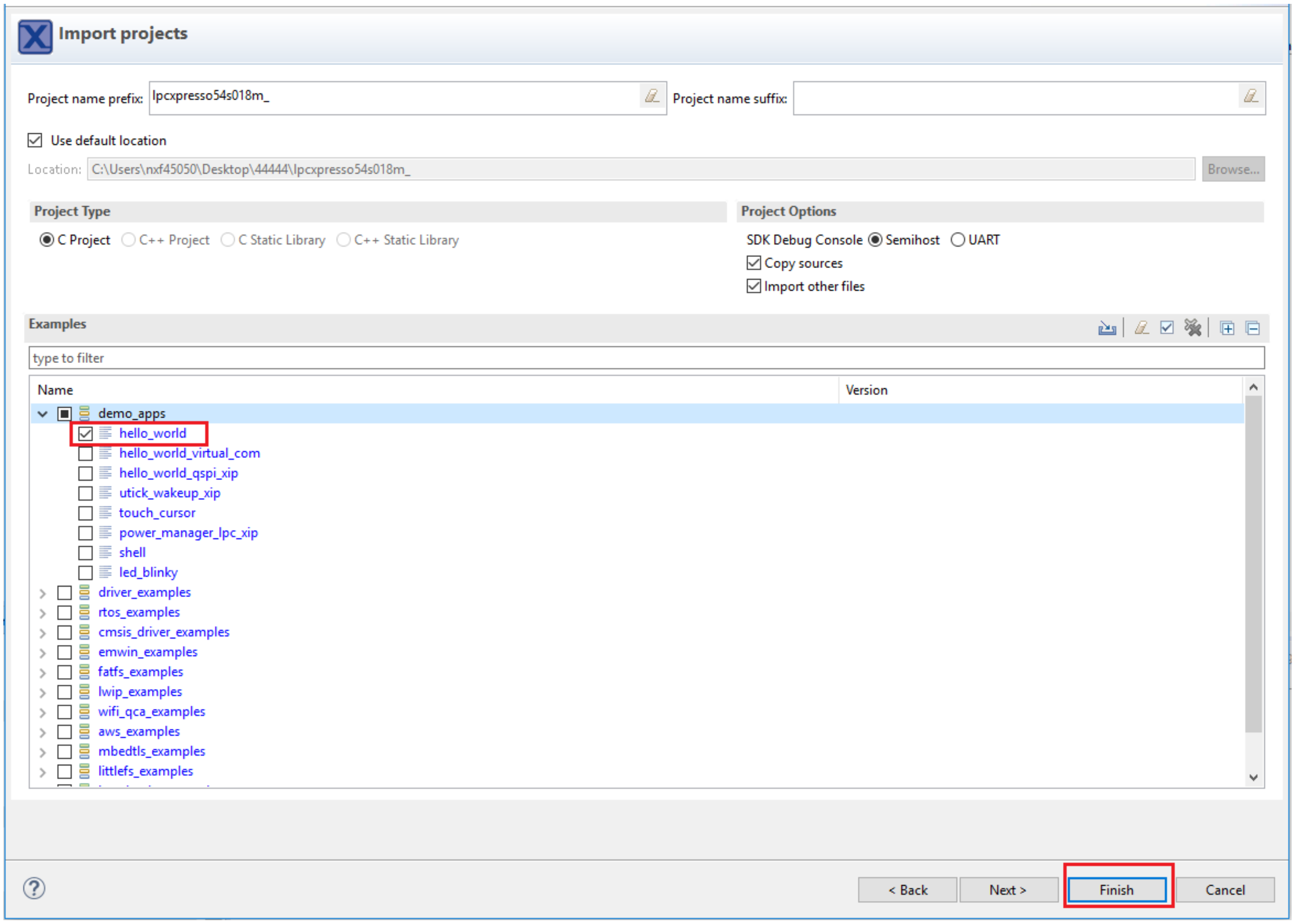



**Figure 72. Select "hello_world"**

5. Ensure the option “Redlib: Use floating point version of printf” is selected if the cases print floating point numbers on the terminal (for demo applications such as adc_basic, adc_burst, adc_dma, and adc_interrupt). Otherwise, there is no need to select it. Click the “Finish” button.

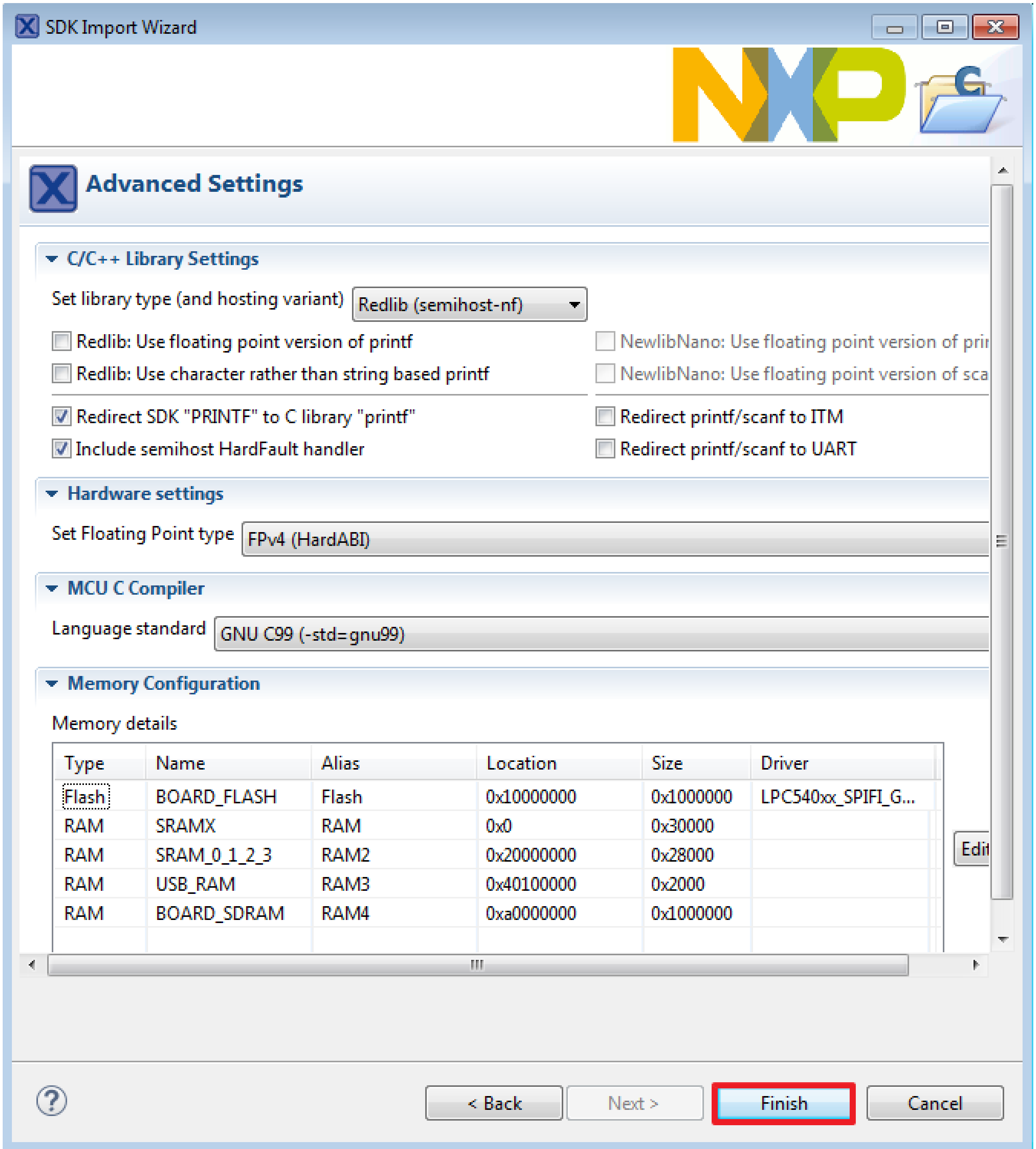



**Figure 73. Select "User floating print version of printf"**

## 6.3 Run a non-XIP (plain load) example application

For more information on debug probe support in the MCUXpresso IDE v10.1.1, visit community.nxp.com.

To download and run the application, perform these steps:

1. Reference the table in Appendix B to determine the debug interface that comes loaded on your specific hardware platform. For LPCXpresso boards, install the DFU jumper for the debug probe, then connect the debug probe USB connector.
2. Open the terminal application on the PC, such as PuTTY or TeraTerm, and connect to the debug serial port number (to determine the COM port number, see Appendix A). Configure the terminal with these settings:
   a. 115200 or 9600 baud rate, depending on your board (reference BOARD_DEBUG_UART_BAUDRATE variable in board.h file)
   b. No parity
   c. 8 data bits
   d. 1 stop bit

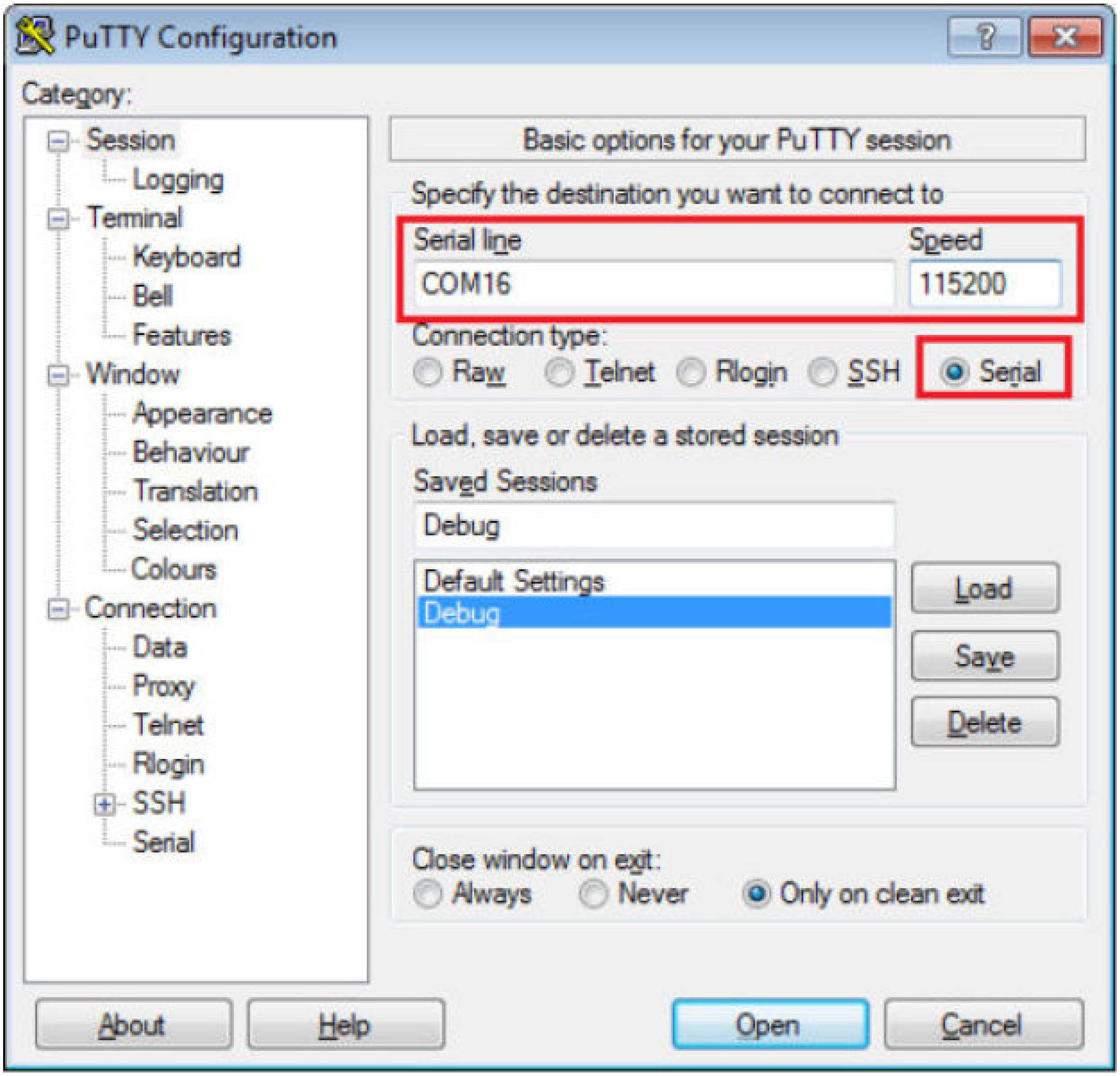



**Figure 74. Terminal (PuTTY) configurations**

3. On the *Quickstart Panel*, click on "Debug 'lpcxpresso54s018m_demo_apps_hello_world' [Debug]".

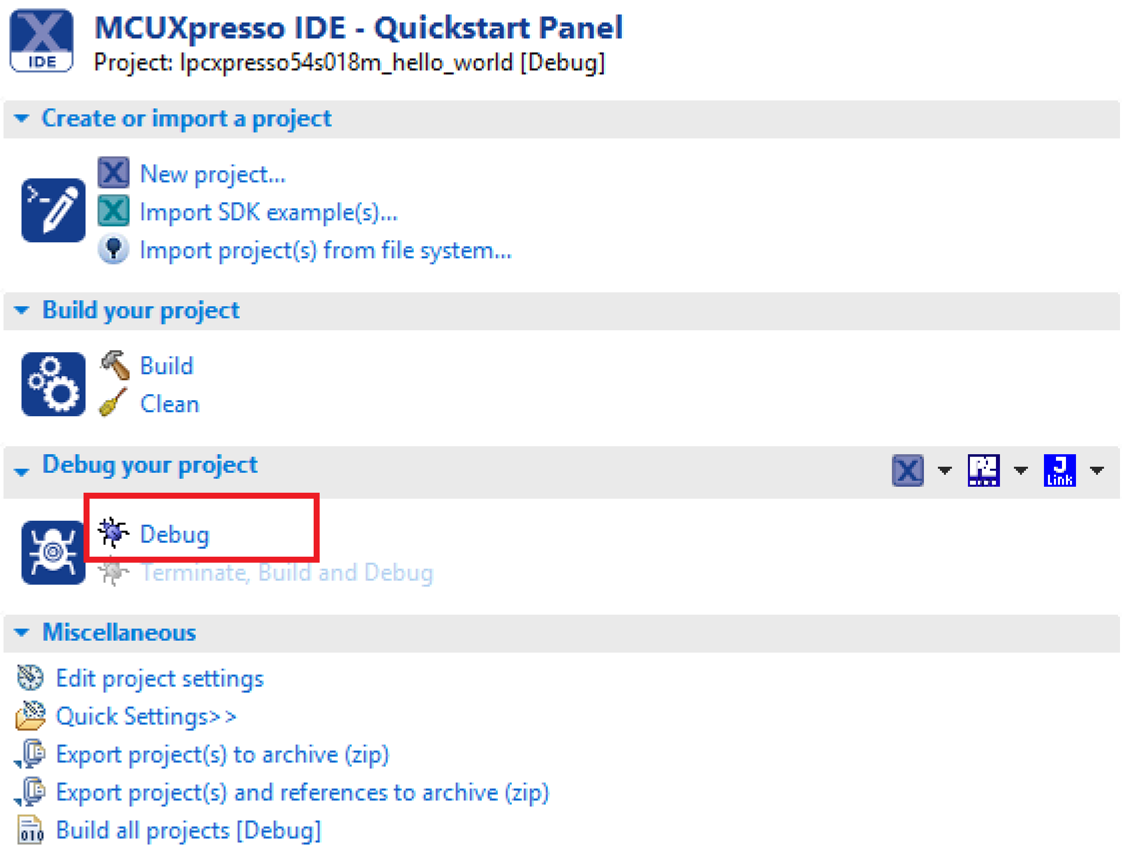



**Figure 75. Debug "hello_world" case**

4. The first time you debug a project, the Debug Emulator Selection Dialog is displayed, showing all supported probes that are attached to your computer. Select the probe through which you want to debug and click the “OK” button. (For any future debug sessions, the stored probe selection is automatically used, unless the probe cannot be found.)

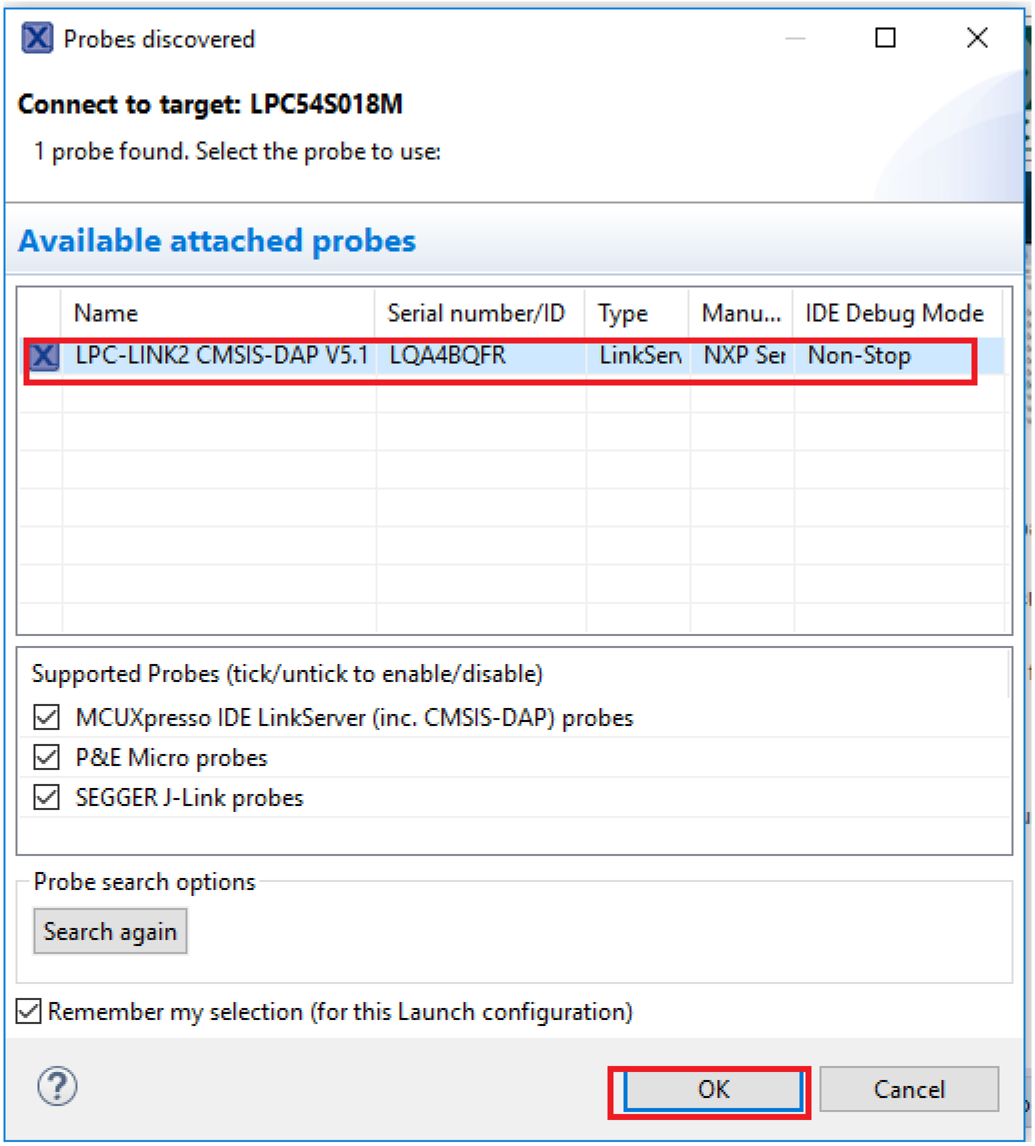



**Figure 76. Attached Probes: debug emulator selection**

5. The application is downloaded to the target and automatically runs to main():

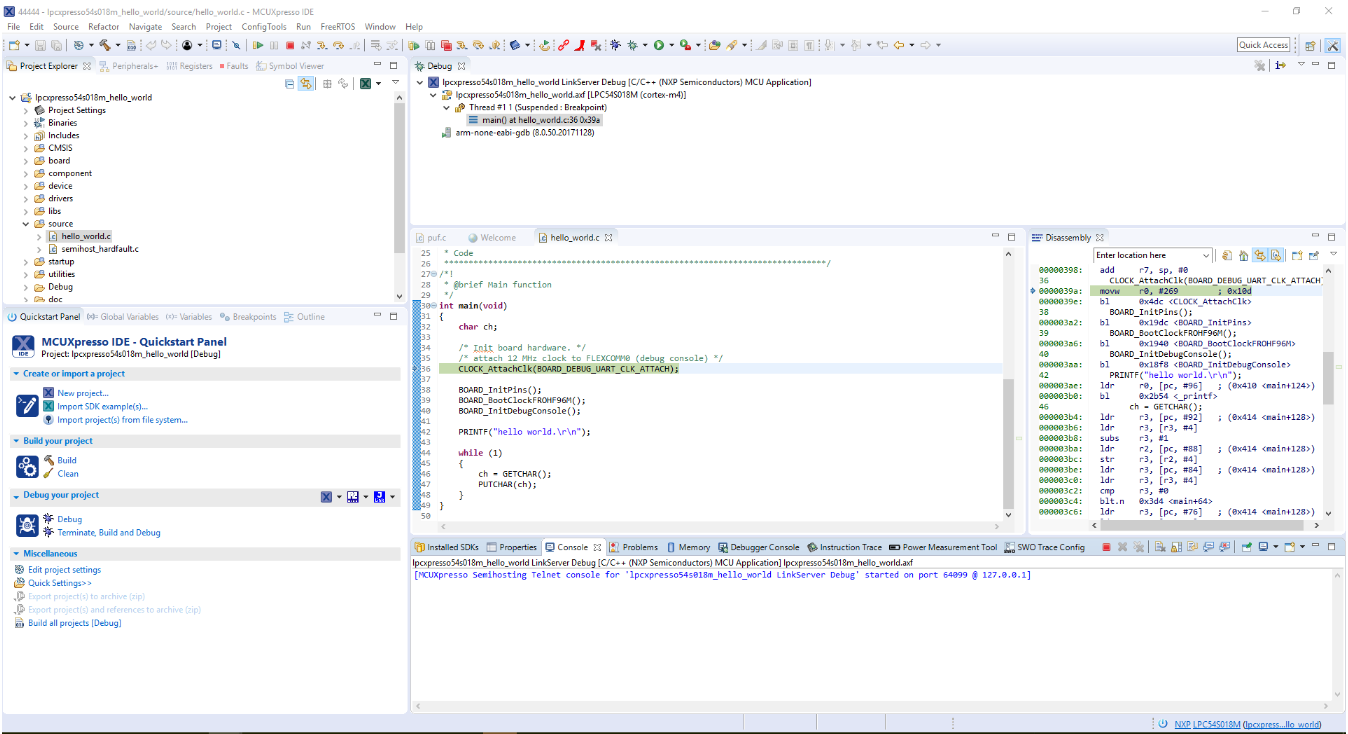


Figure 77. Stop at main() when running debugging

**NOTE**

The application is only downloaded into the SRAM when debugging. If you need to program the image to external flash, see *Section 6.4, "How to program the non-XIP (plain load) example bin file to external flash"*.

6. Start the application by clicking the "Resume" button.

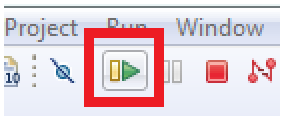



Figure 78. Resume button

The hello_world application is now running and a banner is displayed on the console.

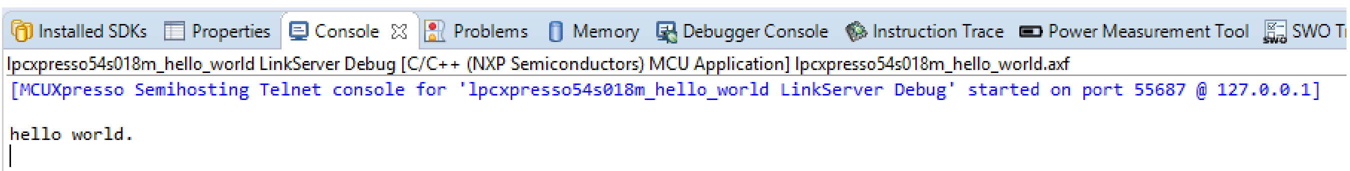



Figure 79. Text display of the hello_world demo

## 6.4 How to program the non-XIP (plain load) example bin file to external flash

To build an example application, follow these steps.

1. Create a bin file for non-XIP (plain load) demo from *.axf file.

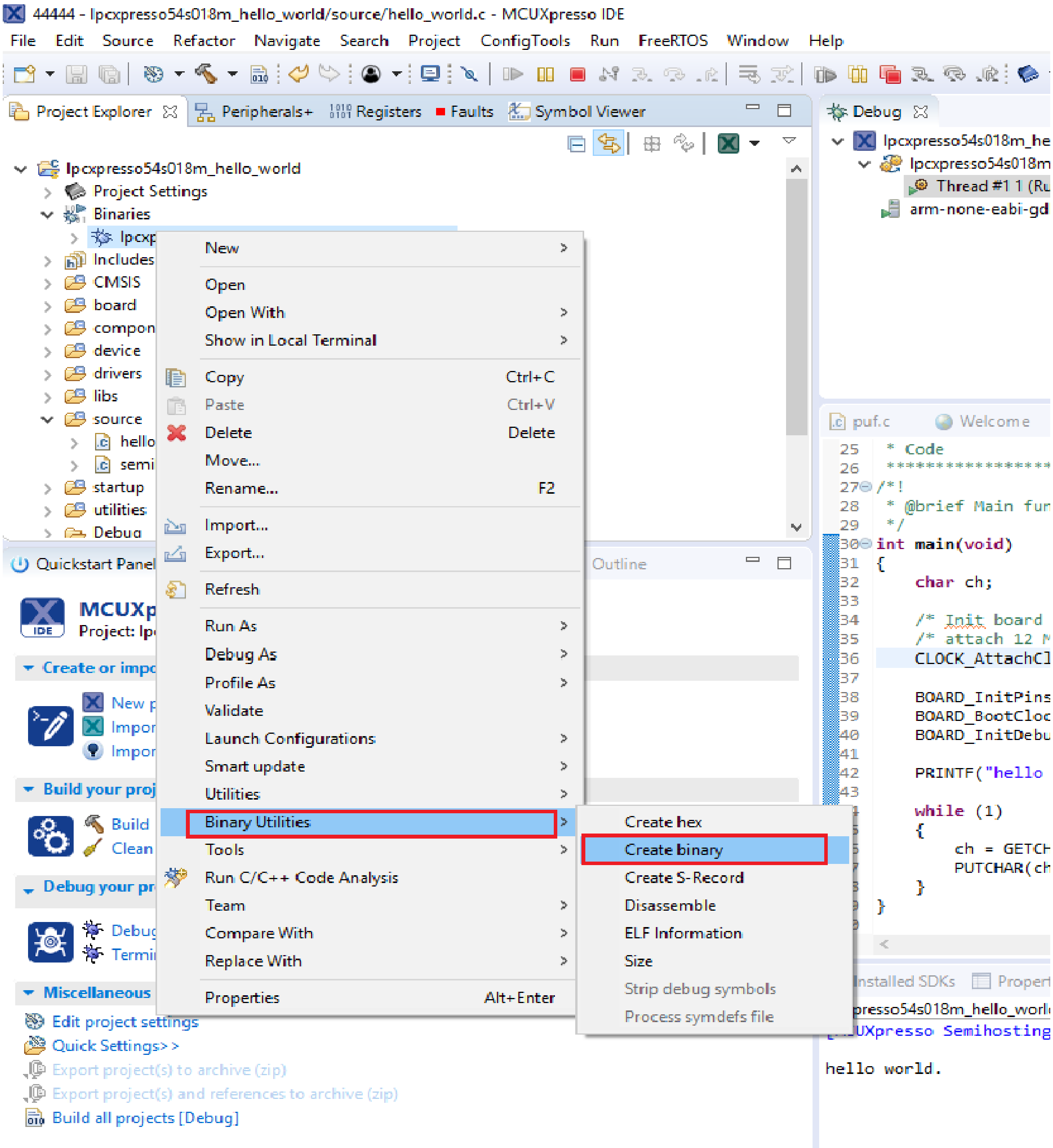



**Figure 80. Create a bin file**

2. Click the “LinkServer GUI Flash Programmer” button.

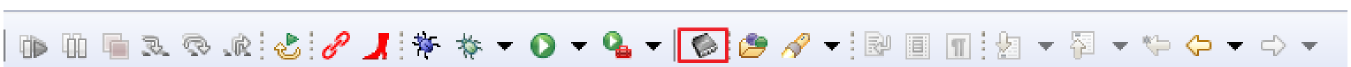


**Figure 81. Click “LinkServer GUI Flash Programmer” button**

3. Select LPC-LINK2 CMSIS-DAP.

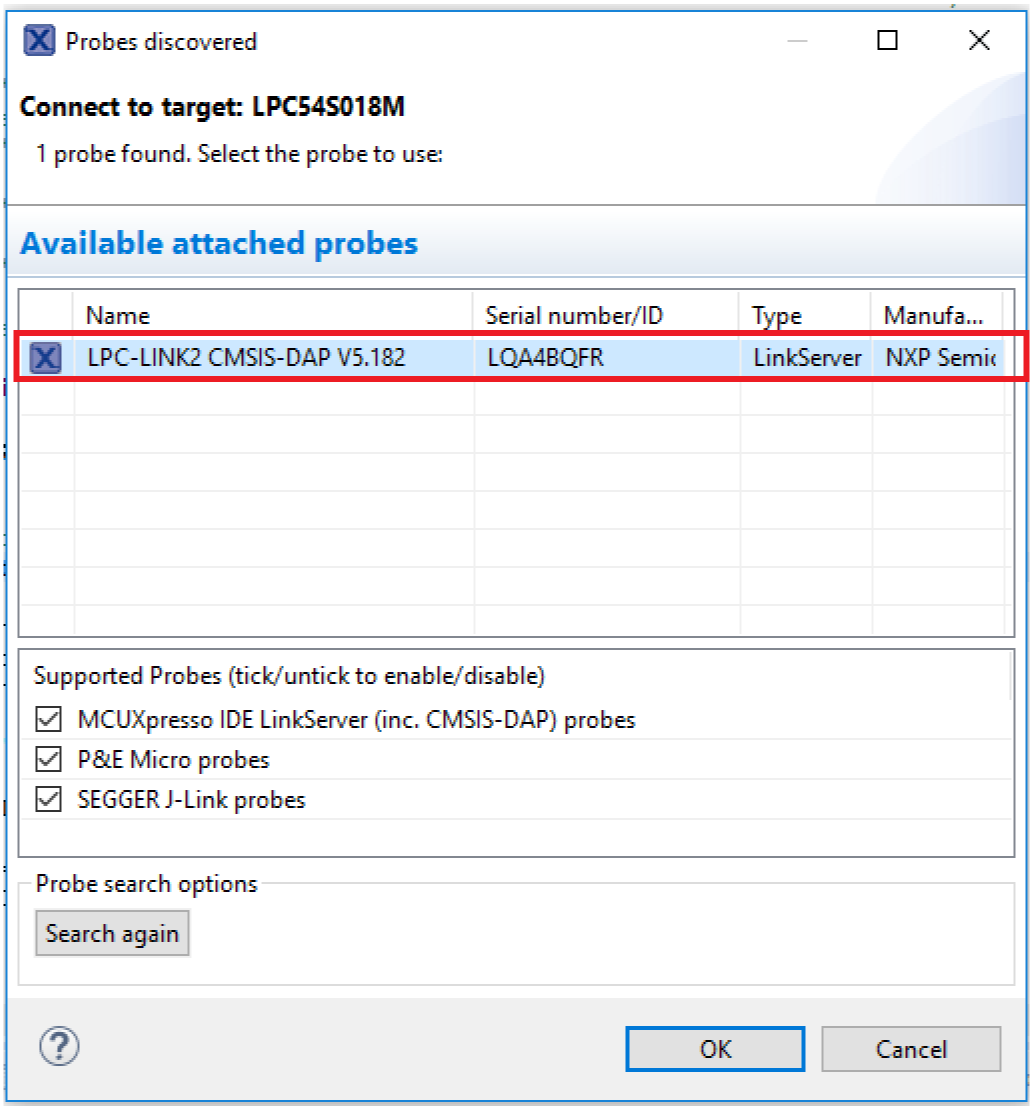



**Figure 82. Select LPC-LINK2 CMSIS-DAP**

4. Select the flash driver, bin file, and external flash program address, then click the "OK" button to program the bin file to external flash.

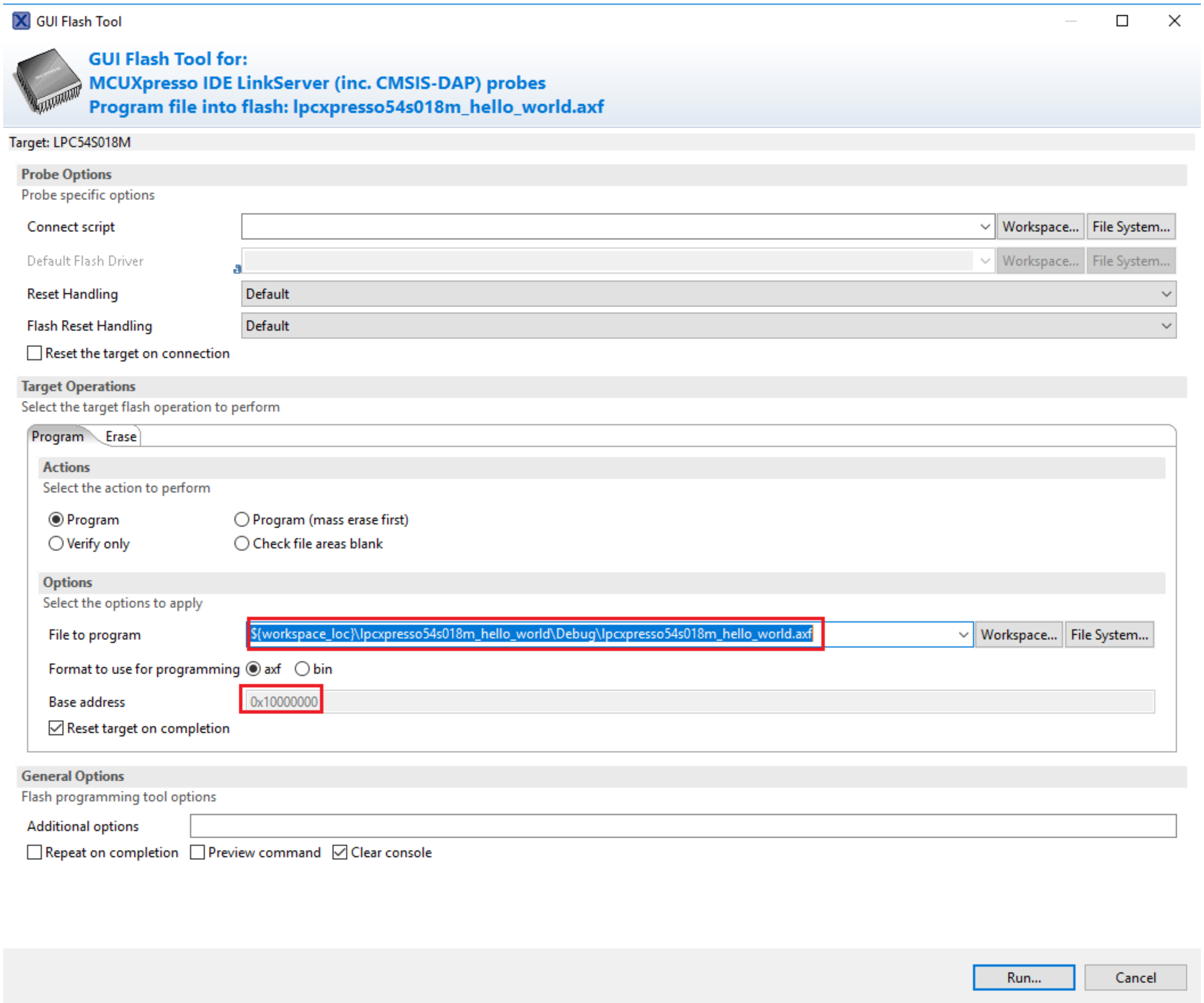



**Figure 83. Select the flash driver, bin file, and external flash program address**

5. After programming, press the reset button on the board to run the example.

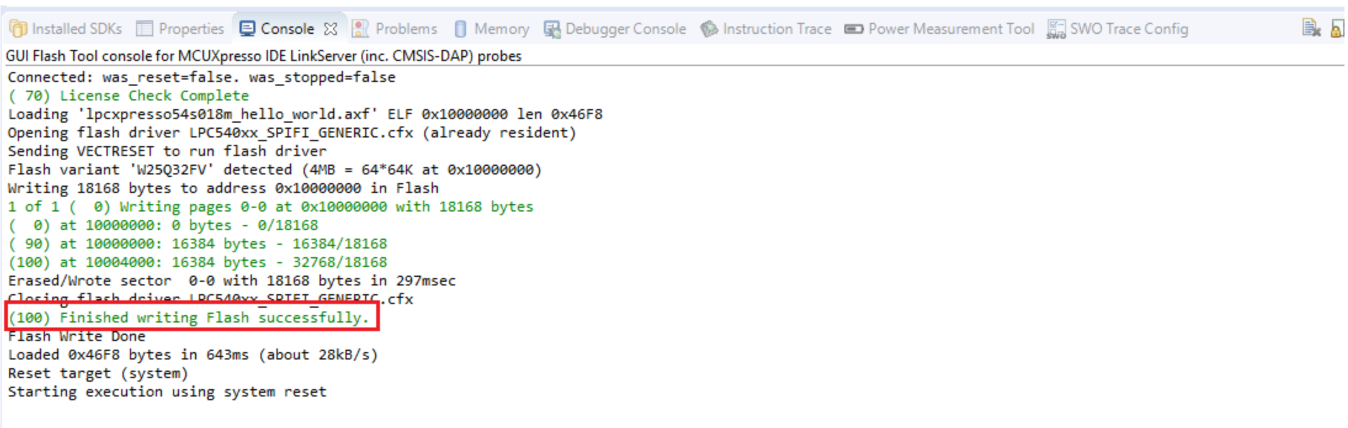



**Figure 84. GUI Flash Program result**

## 6.5 Build an XIP example application

To build an example application, follow these steps.

1. Drag and drop the SDK zip file into the "Installed SDKs" view to install an SDK. In the window that appears, click the "OK" button and wait until the import has finished.

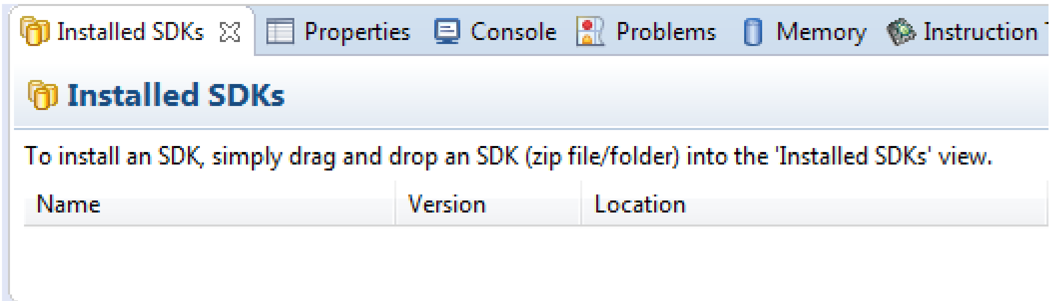



**Figure 85. Install an SDK**

2. On the Quickstart Panel, click "Import SDK example(s)...".

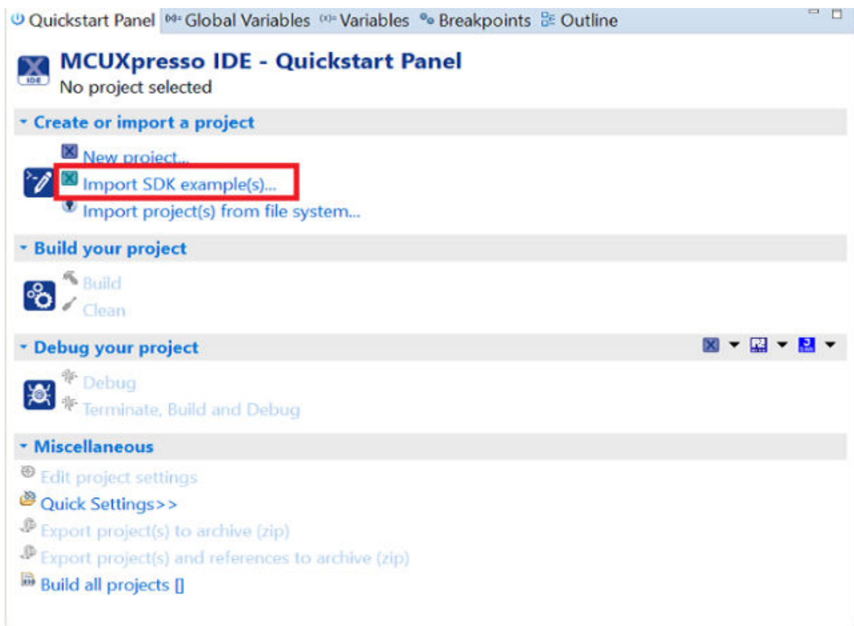



**Figure 86. Import an SDK example**

3. In the window that appears, expand the “LPC54S0xxM folder and select “LPC54S018M". Then, select “lpcxpresso54s018m” and click the “Next” button.

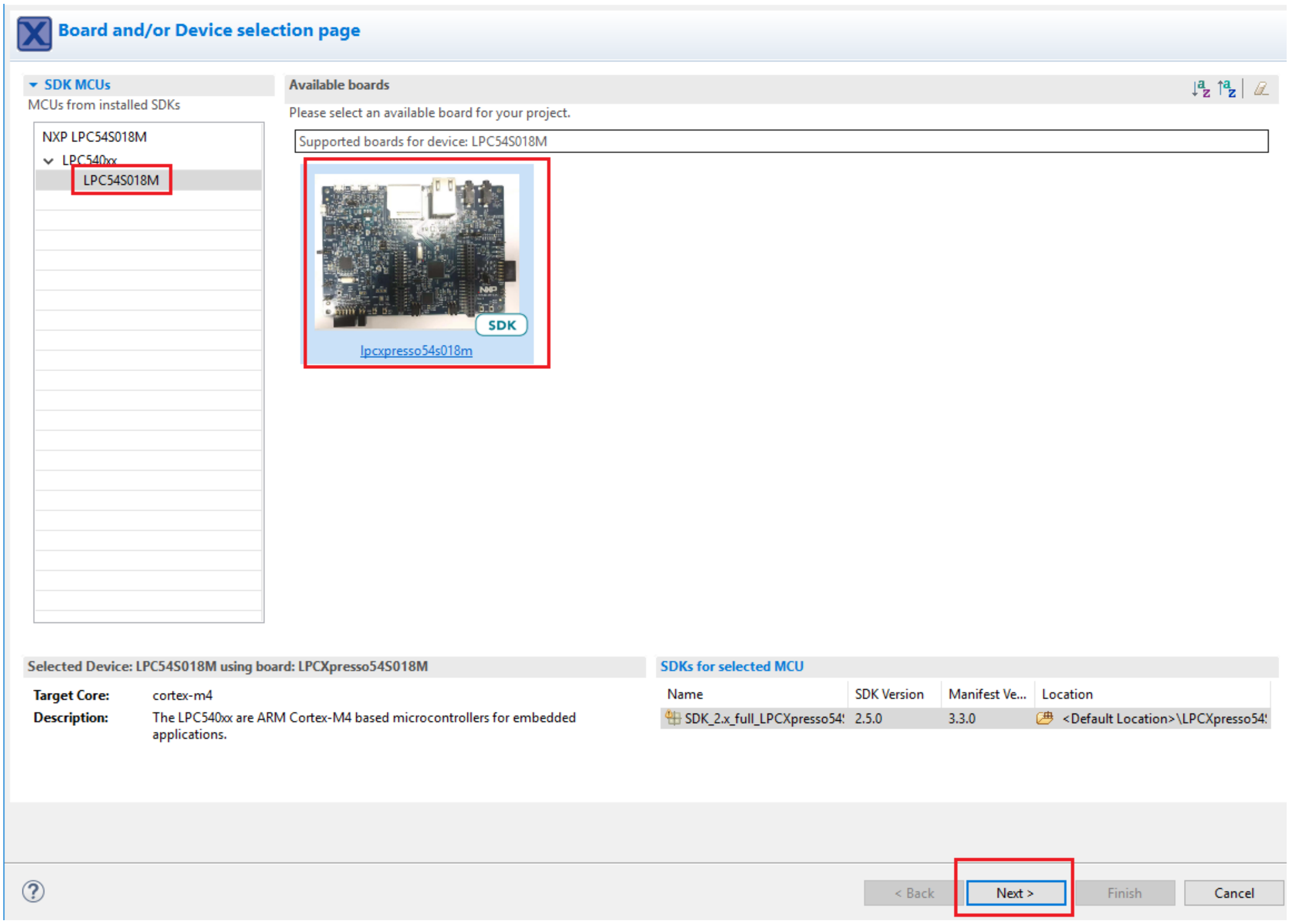



**Figure 87. Select LPCXpresso54S018M board**

4. Expand the “demo_apps” folder and select “hello_world_qspi_xip”. Then, click the "Next” button.

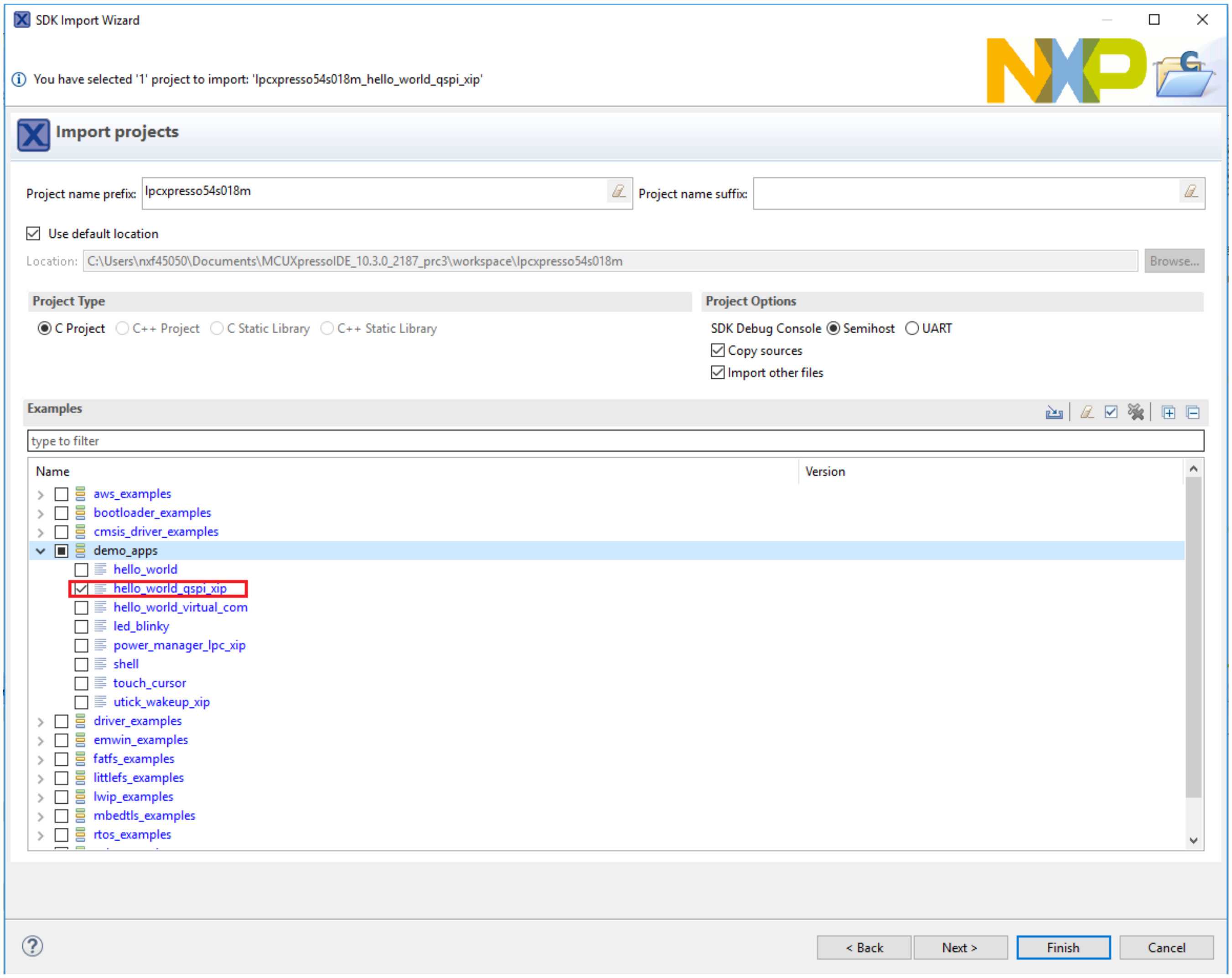



Figure 88. Select "hello_world_qspi_xip"

5. Ensure the option “Redlib: Use floating point version of printf” is selected if the cases print floating point numbers on the terminal (for demo applications such as adc_basic, adc_burst, adc_dma, and adc_interrupt). Otherwise, there is no need to select it. Click the “Finish” button.

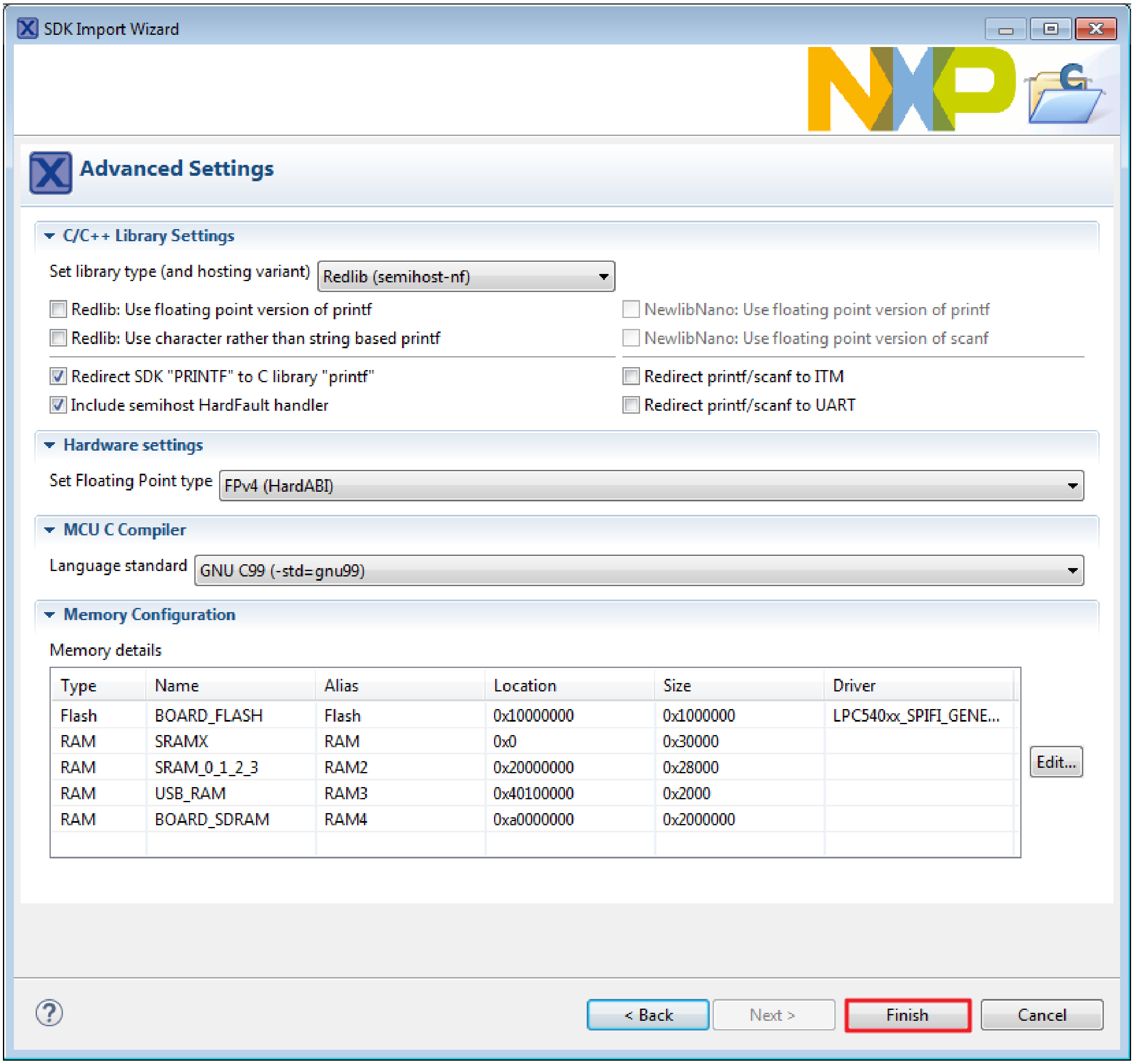



**Figure 89. User floating print version of printf**

## 6.6 Run an XIP example application

1. Click the "Debug" button on the tool bar to run the XIP example.

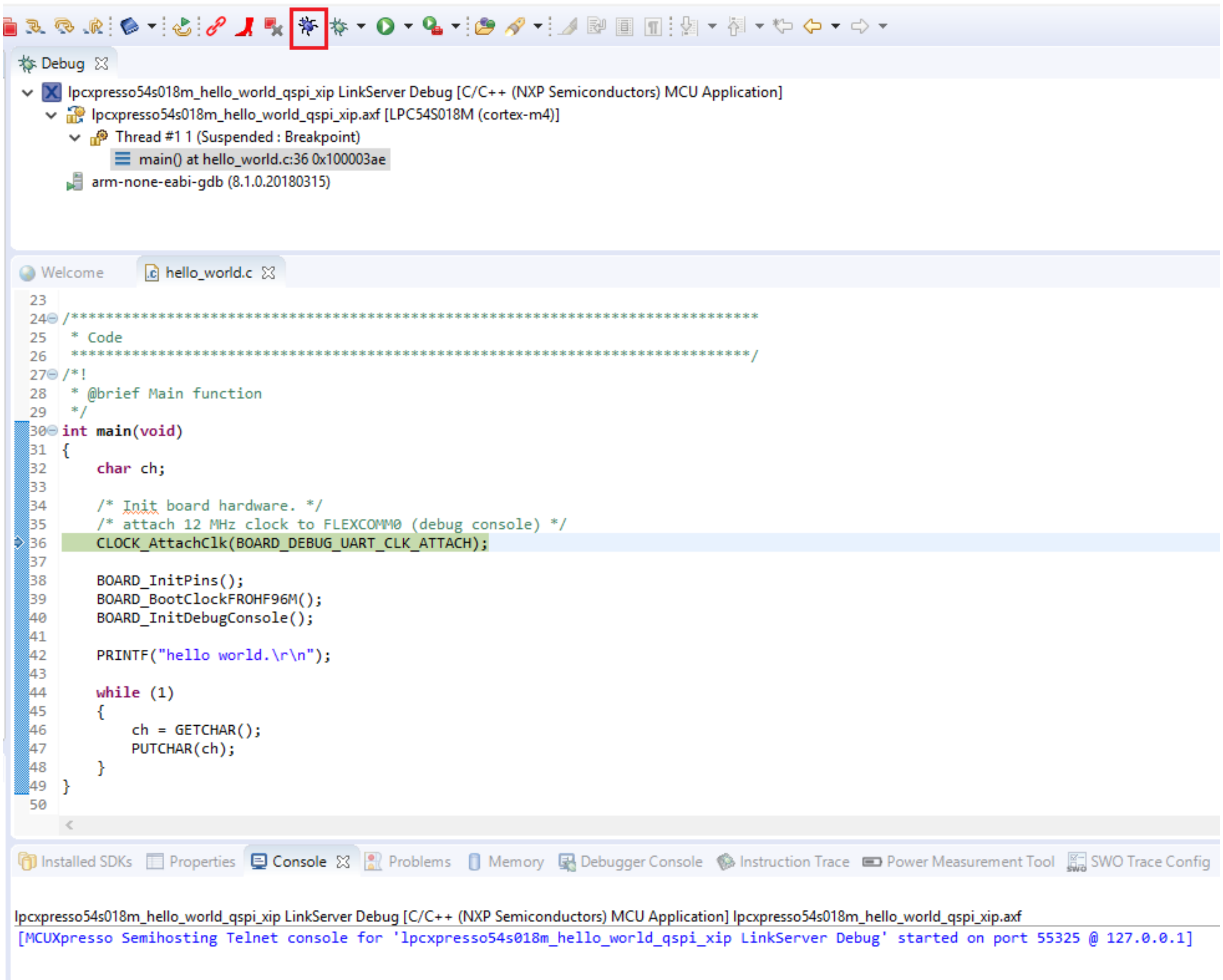



**Figure 90. Run an XIP example**

# 7 MCUXpresso Config Tools

MCUXpresso Config Tools can help configure the processor and generate initialization code for the on chip peripherals. The tools are able to modify any existing example project, or create a new configuration for the selected board or processor. The generated code is designed to be used with MCUXpresso SDK version 2.x.

The MCUXpresso Config Tools consist of the following (only pins tool is supported in this release):

**Table 1. MCUXpresso Config Tools**

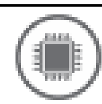
| Config Tool | Description | Image |
|---|---|---|
| **Pins tool** | For configuration of pin routing and pin electrical properties. |  |

*Table continues on the next page...*

**Table 1. MCUXpresso Config Tools (continued)**

| Config Tool | Description | Image |
| --- | --- | --- |
| **Clock tool** | For system clock configuration |  |
| **Peripherals tools** | For configuration of other peripherals |  |
| **Project Cloner** | Allows creation of standalone projects from MCUXpresso SDK examples. |  |

MCUXpresso Config Tools can be accessed in the following products:

- **Integrated** in the MCUXpresso IDE. Config tools are integrated with both compiler and debugger which makes it the easiest way to begin the development.
- **Standalone version** available for download from www.nxp.com. Recommended for customers using IAR Embedded Workbench, Keil MDK µVision, or Arm GCC.
- **Online version** available on mcuxpresso.nxp.com. Recommended to do a quick evaluation of the processor or use the tool without installation.

Each version of the product contains a specific “Quick Start Guide” document MCUXpresso IDE Config Tools installation folder that can help start your work.

# 8 MCUXpresso IDE New Project Wizard

MCUXpresso IDE features a new project wizard. The wizard provides functionality for the user to create new projects from the installed SDKs (and from pre-installed part support). It offers user the flexibility to select and change multiple builds. The wizard also includes a library and provides source code options. The source code is organized as software components, categorized as drivers, utilities, and middleware.

To use the wizard, start the MCUXpresso IDE. This is located in the **QuickStart Panel** at the bottom left of the MCUXpresso IDE window. Select **New project**, as shown in Figure 91.


**Figure 91. MCUXpresso IDE Quickstart Panel**

For more details and usage of new project wizard, see the *MCUXpresso_IDE_User_Guide.pdf* in the MCUXpresso IDE installation folder.

# 9 Appendix A - How to determine COM port

This section describes the steps necessary to determine the debug COM port number of your NXP hardware development platform.

1. To determine the COM port, open the Windows operating system Device Manager. This can be achieved by going to the Windows operating system Start menu and typing "Device Manager" in the search bar, as shown below:

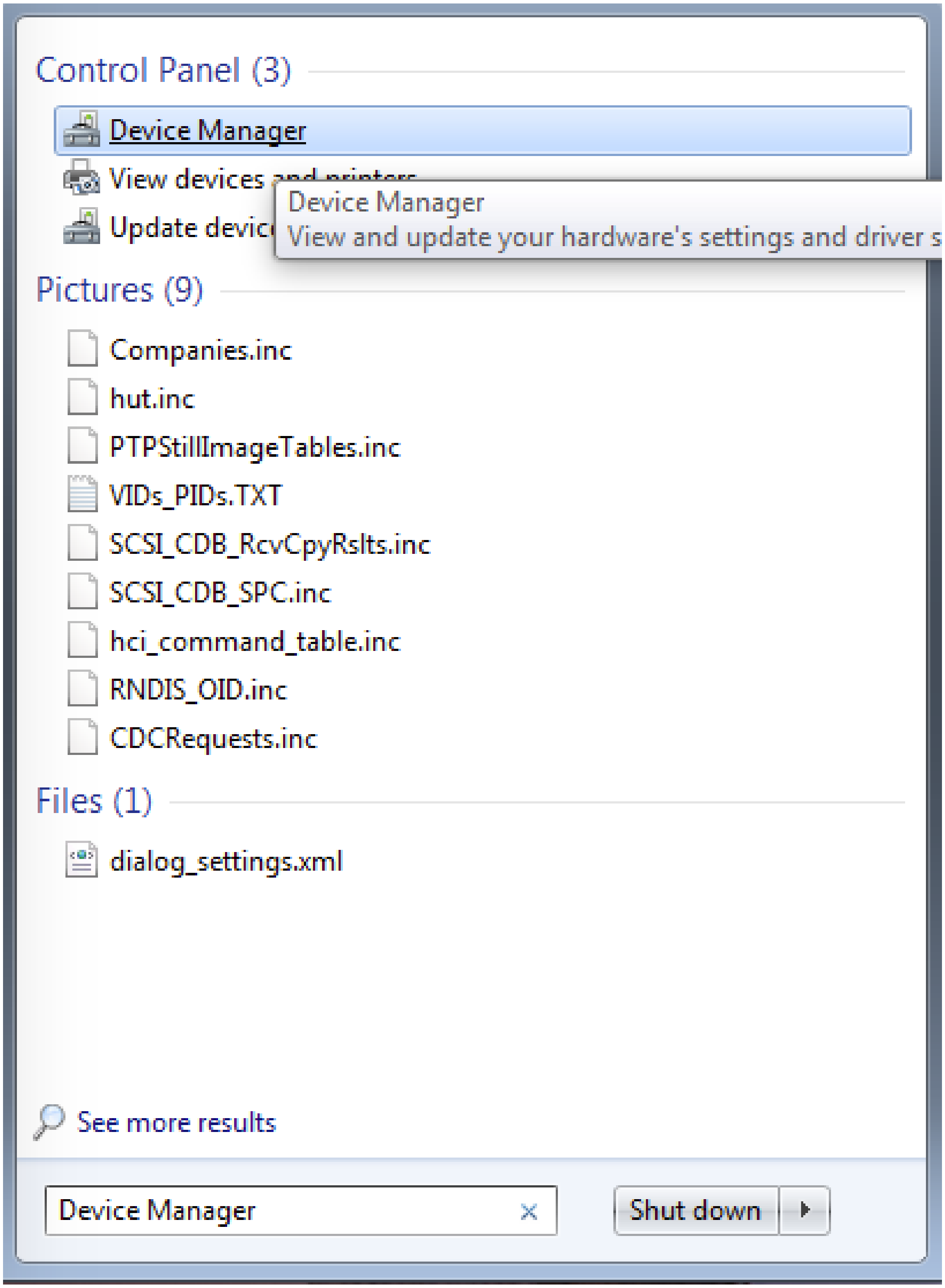



**Figure 92. Device manager**

2. In the Device Manager, expand the “Ports (COM & LPT)” section to view the available ports. Depending on the NXP board you’re using, the COM port can be named differently:
    a. LPC-Link2

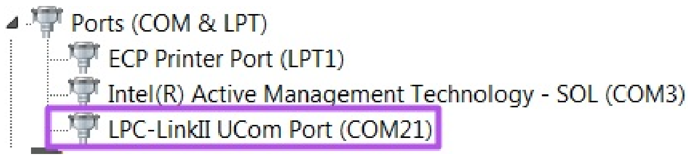



**Figure 93. LPC-Link2**

# 10 Default debug interfaces

The MCUXpresso SDK supports various hardware platforms that come loaded with a variety of factory programmed debug interface configurations. Table 2 lists the hardware platforms supported by the MCUXpresso SDK, their default debug interface, and any version information that helps differentiate a specific interface configuration.

**NOTE**

The OpenSDA details column in Table 2 is not applicable to LPC.

**Table 2. Hardware platforms supported by SDK**

| Hardware platform | Default interface | OpenSDA details |
|---|---|---|
| EVK-MIMXRT595 | CMSIS-DAP | N/A |
| EVK-MIMXRT685 | CMSIS-DAP | N/A |
| FRDM-K22F | CMSIS-DAP/mbed/DAPLink | OpenSDA v2.1 |
| FRDM-K28F | DAPLink | OpenSDA v2.1 |
| FRDM-K32L2A4S | CMSIS-DAP | OpenSDA v2.1 |
| FRDM-K32L2B | CMSIS-DAP | OpenSDA v2.1 |
| FRDM-K32W042 | CMSIS-DAP | N/A |
| FRDM-K64F | CMSIS-DAP/mbed/DAPLink | OpenSDA v2.0 |
| FRDM-K66F | J-Link OpenSDA | OpenSDA v2.1 |
| FRDM-K82F | CMSIS-DAP | OpenSDA v2.1 |
| FRDM-KE15Z | DAPLink | OpenSDA v2.1 |
| FRDM-KE16Z | CMSIS-DAP/mbed/DAPLink | OpenSDA v2.2 |
| FRDM-KL02Z | P&E Micro OpenSDA | OpenSDA v1.0 |
| FRDM-KL03Z | P&E Micro OpenSDA | OpenSDA v1.0 |
| FRDM-KL25Z | P&E Micro OpenSDA | OpenSDA v1.0 |
| FRDM-KL26Z | P&E Micro OpenSDA | OpenSDA v1.0 |
| FRDM-KL27Z | P&E Micro OpenSDA | OpenSDA v1.0 |
| FRDM-KL28Z | P&E Micro OpenSDA | OpenSDA v2.1 |
| FRDM-KL43Z | P&E Micro OpenSDA | OpenSDA v1.0 |
| FRDM-KL46Z | P&E Micro OpenSDA | OpenSDA v1.0 |
| FRDM-KL81Z | CMSIS-DAP | OpenSDA v2.0 |
| FRDM-KL82Z | CMSIS-DAP | OpenSDA v2.0 |
| FRDM-KV10Z | CMSIS-DAP | OpenSDA v2.1 |
| FRDM-KV11Z | P&E Micro OpenSDA | OpenSDA v1.0 |
| FRDM-KV31F | P&E Micro OpenSDA | OpenSDA v1.0 |

*Table continues on the next page...*

**Table 2. Hardware platforms supported by SDK (continued)**

| Hardware platform | Default interface | OpenSDA details |
|---|---|---|
| FRDM-KW24 | CMSIS-DAP/mbed/DAPLink | OpenSDA v2.1 |
| FRDM-KW36 | DAPLink | OpenSDA v2.2 |
| FRDM-KW41Z | CMSIS-DAP/DAPLink | OpenSDA v2.1 or greater |
| Hexiwear | CMSIS-DAP/mbed/DAPLink | OpenSDA v2.0 |
| HVP-KE18F | DAPLink | OpenSDA v2.2 |
| HVP-KV46F150M | P&E Micro OpenSDA | OpenSDA v1 |
| HVP-KV11Z75M | CMSIS-DAP | OpenSDA v2.1 |
| HVP-KV58F | CMSIS-DAP | OpenSDA v2.1 |
| HVP-KV31F120M | P&E Micro OpenSDA | OpenSDA v1 |
| JN5189DK6 | CMSIS-DAP | N/A |
| LPC54018 IoT Module | N/A | N/A |
| LPCXpresso54018 | CMSIS-DAP | N/A |
| LPCXpresso54102 | CMSIS-DAP | N/A |
| LPCXpresso54114 | CMSIS-DAP | N/A |
| LPCXpresso51U68 | CMSIS-DAP | N/A |
| LPCXpresso54608 | CMSIS-DAP | N/A |
| LPCXpresso54618 | CMSIS-DAP | N/A |
| LPCXpresso54628 | CMSIS-DAP | N/A |
| LPCXpresso54S018M | CMSIS-DAP | N/A |
| LPCXpresso55s16 | CMSIS-DAP | N/A |
| LPCXpresso55s28 | CMSIS-DAP | N/A |
| LPCXpresso55s69 | CMSIS-DAP | N/A |
| MAPS-KS22 | J-Link OpenSDA | OpenSDA v2.0 |
| TWR-K21D50M | P&E Micro OSJTAG | N/AOpenSDA v2.0 |
| TWR-K21F120M | P&E Micro OSJTAG | N/A |
| TWR-K22F120M | P&E Micro OpenSDA | OpenSDA v1.0 |
| TWR-K24F120M | CMSIS-DAP/mbed | OpenSDA v2.1 |
| TWR-K60D100M | P&E Micro OSJTAG | N/A |
| TWR-K64D120M | P&E Micro OpenSDA | OpenSDA v1.0 |
| TWR-K64F120M | P&E Micro OpenSDA | OpenSDA v1.0 |
| TWR-K65D180M | P&E Micro OpenSDA | OpenSDA v1.0 |
| TWR-K65D180M | P&E Micro OpenSDA | OpenSDA v1.0 |
| TWR-KV10Z32 | P&E Micro OpenSDA | OpenSDA v1.0 |
| TWR-K80F150M | CMSIS-DAP | OpenSDA v2.1 |
| TWR-K81F150M | CMSIS-DAP | OpenSDA v2.1 |
| TWR-KE18F | DAPLink | OpenSDA v2.1 |
| TWR-KL28Z72M | P&E Micro OpenSDA | OpenSDA v2.1 |
| TWR-KL43Z48M | P&E Micro OpenSDA | OpenSDA v1.0 |
| TWR-KL81Z72M | CMSIS-DAP | OpenSDA v2.0 |

*Table continues on the next page...*

**Table 2. Hardware platforms supported by SDK (continued)**

| Hardware platform | Default interface | OpenSDA details |
|---|---|---|
| TWR-KL82Z72M | CMSIS-DAP | OpenSDA v2.0 |
| TWR-KM34Z75M | P&E Micro OpenSDA | OpenSDA v1.0 |
| TWR-KV10Z32 | P&E Micro OpenSDA | OpenSDA v1.0 |
| TWR-KV11Z75M | P&E Micro OpenSDA | OpenSDA v1.0 |
| TWR-KV31F120M | P&E Micro OpenSDA | OpenSDA v1.0 |
| TWR-KV46F150M | P&E Micro OpenSDA | OpenSDA v1.0 |
| TWR-KV58F220M | CMSIS-DAP | OpenSDA v2.1 |
| TWR-KW24D512 | P&E Micro OpenSDA | OpenSDA v1.0 |
| USB-KW24D512 | N/A External probe | N/A |
| USB-KW41Z | CMSIS-DAP\DAPLink | OpenSDA v2.1 or greater |

# 11 Updating debugger firmware

## 11.1 Updating LPCXpresso board firmware

The LPCXpresso hardware platform comes with a CMSIS-DAP-compatible debug interface (known as LPC-Link2). This firmware in this debug interface may be updated using the host computer utility called LPCScrypt. This typically used when switching between the default debugger protocol (CMSIS-DAP) to SEGGER J-Link, or for updating this firmware with new releases of these. This section contains the steps to re-program the debug probe firmware.

**NOTE**

If MCUXpresso IDE is used and the jumper making DFUlink is installed on the board (JP5 on some boards, but consult the board user manual or schematic for specific jumper number), LPC-Link2 debug probe boots to DFU mode, and MCUXpresso IDE automatically downloads the CMSIS-DAP firmware to the probe before flash memory programming (after clicking **Debug**). Using DFU mode ensures most up-to-date/compatible firmware is used with MCUXpresso IDE.

NXP provides the LPCScrypt utility, which is the recommended tool for programming the latest versions of CMSIS-DAP and J-Link firmware onto LPC-Link2 or LPCXpresso boards. The utility can be downloaded from www.nxp.com/lpcutilities.

These steps show how to update the debugger firmware on your board for Windows operating system. For Linux OS, follow the instructions described in LPCScrypt user guide (www.nxp.com/lpcutilities, select **LPCScrypt**, and then the documentation tab).

1. Install the LPCScript utility.
2. Unplug the board's USB cable.
3. Make the DFU link (install the jumper labelled DFUlink).
4. Connect the probe to the host via USB (use Link USB connector).
5. Open a command shell and call the appropriate script located in the LPCScrypt installation directory (`<LPCScrypt install dir>`).
    a. To program CMSIS-DAP debug firmware: `<LPCScrypt install dir>/scripts/program_CMSIS`
    b. To program J-Link debug firmware: `<LPCScrypt install dir>/scripts/program_JLINK`
6. Remove DFU link (remove the jumper installed in Step 3).

7. Re-power the board by removing the USB cable and plugging it in again.

***How to Reach Us:***

**Home Page:**
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**Web Support:**
nxp.com/support



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