AB1561/AB1562/AB1563 Get Started Guide

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Document revision history

Revision	Date	Description
1.0	11 March 2020	• Initial version
1.1	30 June 2020	• Fixed link error and modify section 2.3.2
1.2	19 August 2020	• Added support AB1561/AB1563, document renamed to “AB1561_AB1562_AB1563_Get_Started_Guide”.

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Lists of tables and figures

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1. Overview

The software development kit (SDK) contains the software that are necessary for developing applications with the EVK. The complete SDK is organized into several general-purpose subsystems and a set of Bluetooth profiles.

This document provides instructions on how to use the SDK and its supported features.

1.1. Architecture of the platform

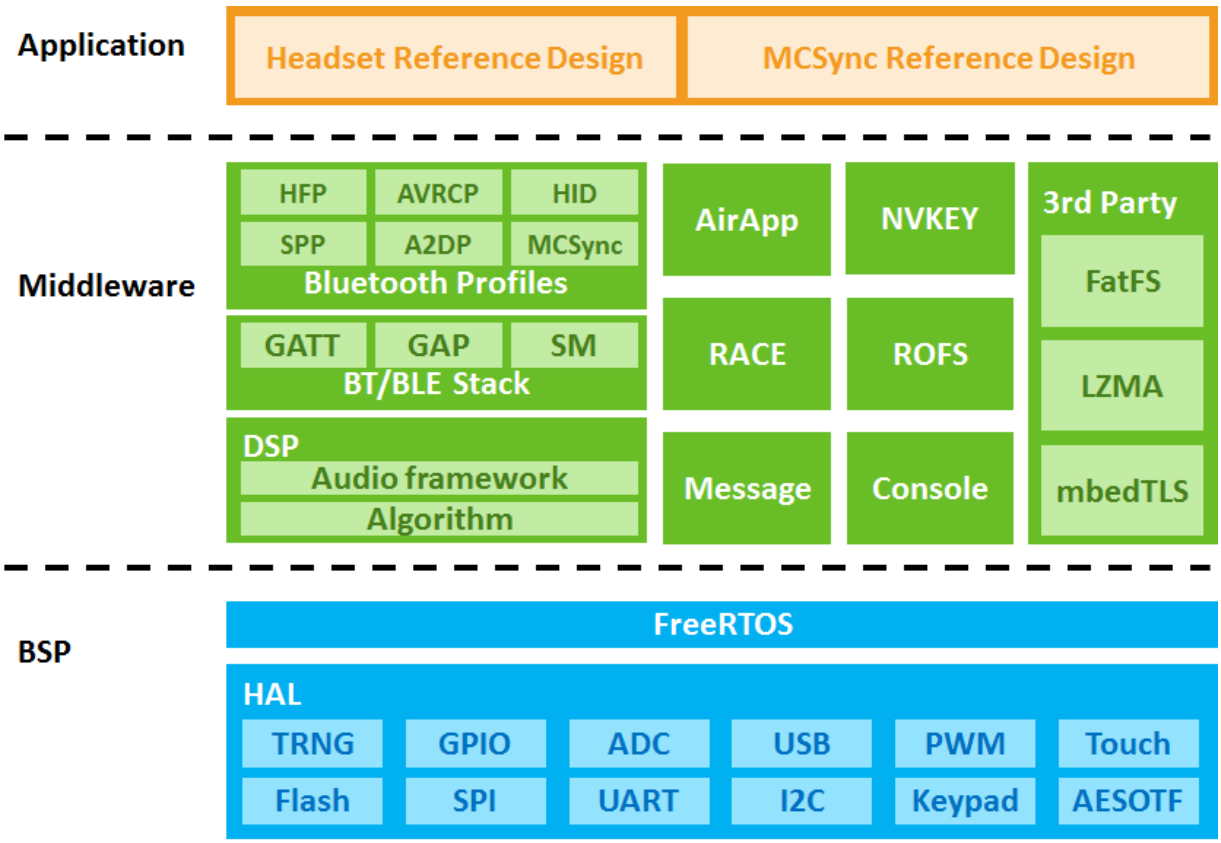

Figure 1. Architecture layout of the platform

1.2. Supported key components

This section introduces each of the SDK components.

1.2.1. Bluetooth profiles

The Bluetooth profile is a specification related to a specific component of the Bluetooth-based wireless communication between devices, such as Hands-Free Profile (HFP), Audio/Video Remote Control Profile (AVRCP), Human Interface Device Profile (HID), Serial Port Profile (SPP), Advanced Audio Distribution Profile (A2DP) and Airoha Wireless Stereo – MultiCast Synchronization (MCSync).

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1.2.2. BT/BLE stack

The BT/BTE provides a stack and protocol-layer for accessing profiles related to the transfer and management control of data, such as Generic Access Profile (GAP), Generic Attribute Profile (GATT), and Security Manager (SM).

1.2.3. DSP

The DSP provides an audio framework for users to implement self-developed software codec/algorithms. Users can then build specific audio scenarios.

1.2.4. 3rd Party

- FatFS – FatFs is a generic FAT file system for small embedded systems. It is used to control data storage and retrieval in a file system.
- LZMA – LZMA is the default and general compression method used to perform lossless data compression. LZMA is also suitable for embedded applications because it provides fast decompression and a high compression ratio.
- mbedTLS – Transport Layer Security (TLS) and Secure Sockets Layer (SSL) are cryptographic protocols designed to provide communications security over a computer network. mbed TLS is an open source implementation for developers to include cryptographic and SSL/TLS capabilities in embedded products with a minimal coding footprint.

1.2.5. AirApp

AirApp provides an environment for users to use Run-time Application Command Environment (RACE) module through Bluetooth BR/EDR or LE.

1.2.6. RACE

Run-time Application Command Environment (RACE) provides an interface for a host to send commands and receive responses from the connected hardware device.

1.2.7. Message

Message provide a message mechanism for application development. Sending and receiving messages isolates the modules and triggers interactions between different modules. It also allows us to define a timer delay for the real message dispatching. This mechanism helps achieve timer effects.

1.2.8. NVKEY

NVKEY provides a mechanism for storing run-time changeable small data items, such as miscellaneous user configuration data, etc.

1.2.9. ROFS

Voice prompts or voice commands media files are gathered into a region in the internal flash. Programmers can use APIs to read them.

1.2.10. Console

The console is a terminal-like environment for user command input and system information read out. Users can add their console commands here.

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1.2.11. FreeRTOS

FreeRTOS is an open source software operating system for middleware components and applications.

1.3. Project source structure

The SDK provides a set of reference applications (e.g., projects with a single function showing how to use drivers or other module features).

Example applications are under <SDK installation path>\<SDK version>\project\AB1562\apps\<project name>. The following figure shows the folder structure.

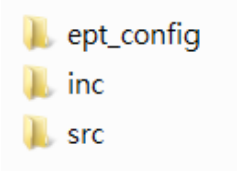

Figure 2. Project folder structure

1) ept_config – Project GPIO setting files.
2) inc – Project general header files.
3) src – Project source files, header files and related project configuration files.

You can apply the necessary reference applications to your development.

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2. Setting up the Development Environment

This section provides a guide to getting started with the EVK and covers the following items:

- The supported environments for development
- Configuring the Xtensa toolchain
- Building the project using the SDK
- Downloading and running the project from Microsoft Windows
- Debugging the project from Microsoft Windows
- Creating your own project

2.1. Environment

The Xtensa toolchain can be used with Microsoft Windows 7 and 8, and is provided as 32-bit (x86) binaries. It support by 32-bit (x86) systems, and on recent 64-bit (x86-64) systems that have the necessary 32-bit compatibility packages installed.

- Disk space requirement: 3.6GB (maximum)
- RAM requirement: at least 2GB (4GB is recommended)

2.2. SDK installation

We integrated the SDK package and installation helpers into a single exe file - AB1561_AB1562_AB1563_SDK_Vx.x.x_Setup.exe. Developers just need to execute the exe file and follow the GUI instructions to complete the installation. The helper will extract the SDK package to the specified location.

To install the SDK, please get **AB1561_AB1562_AB1563_SDK_Vx.x.x from MOL,** please do the following steps

1) Double-click **AB1561_AB1562_AB1563_SDK_Vx.x.x_Setup.exe (e.g., AB1561_AB1562_AB1563_SDK_V1.3.0_Setup.exe**) application to start installing.
2) Select the **Next** button to confirm the installation.

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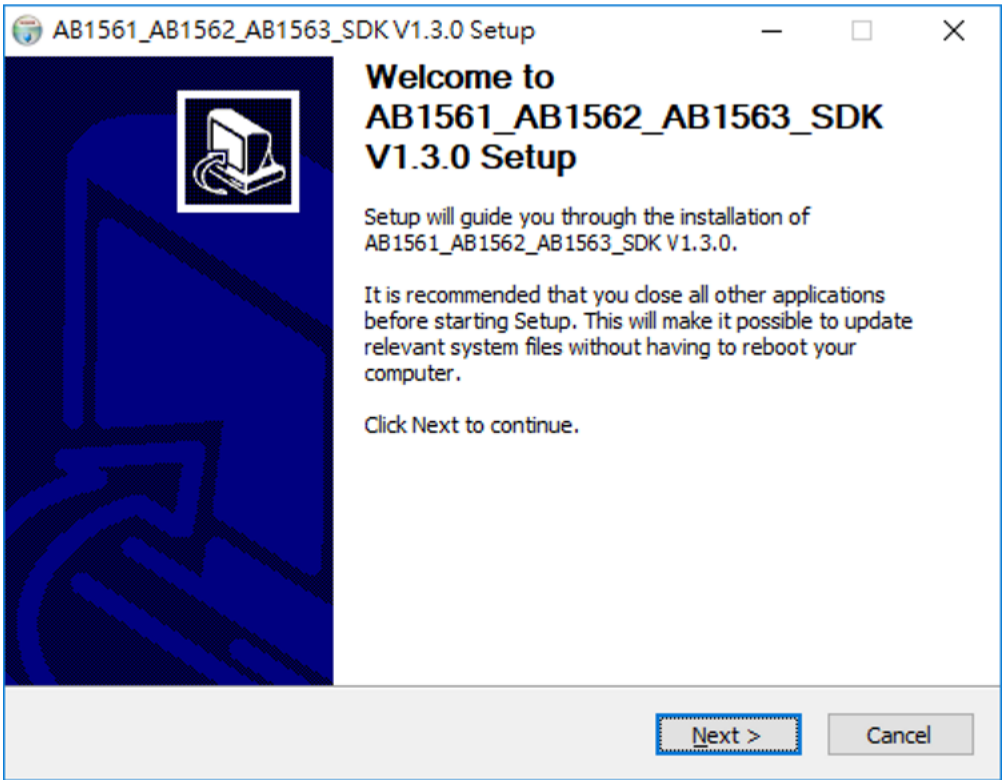

Figure 3. AB1561_AB1562_AB1563 SDK installation – confirm the installation

3) Select the **I Agree** button to confirm the license agreement.

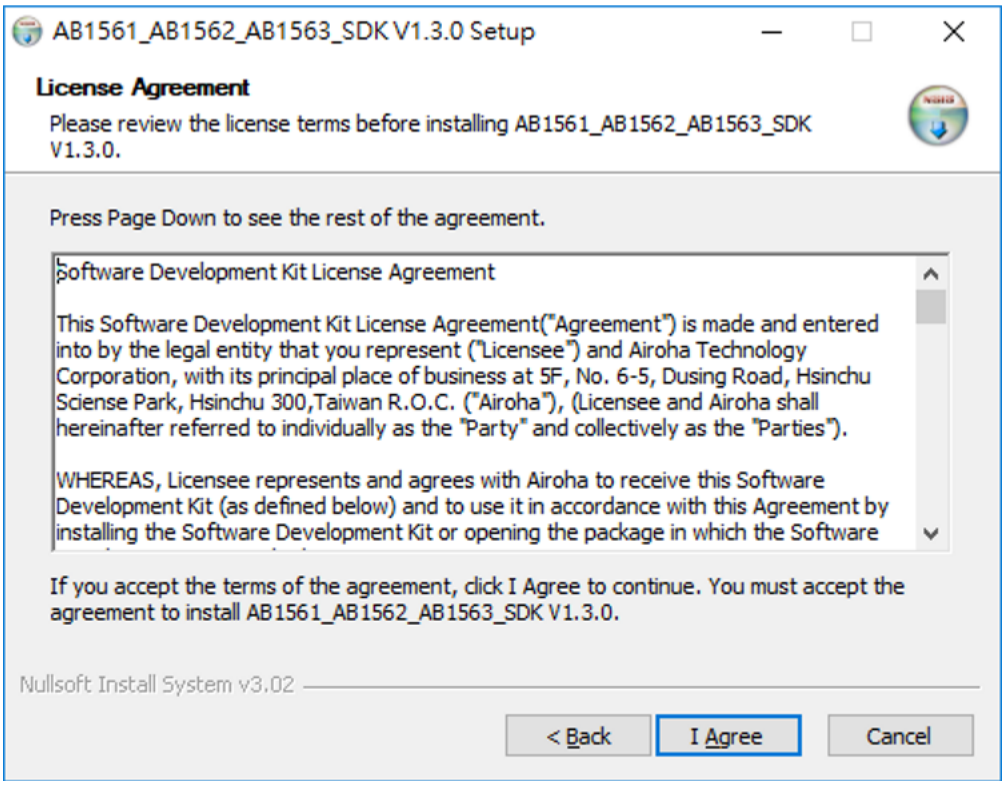

Figure 4. AB1561_AB1562_AB1563 SDK installation – confirm the license agreement

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4) Choose the install location and click the **Install** button.

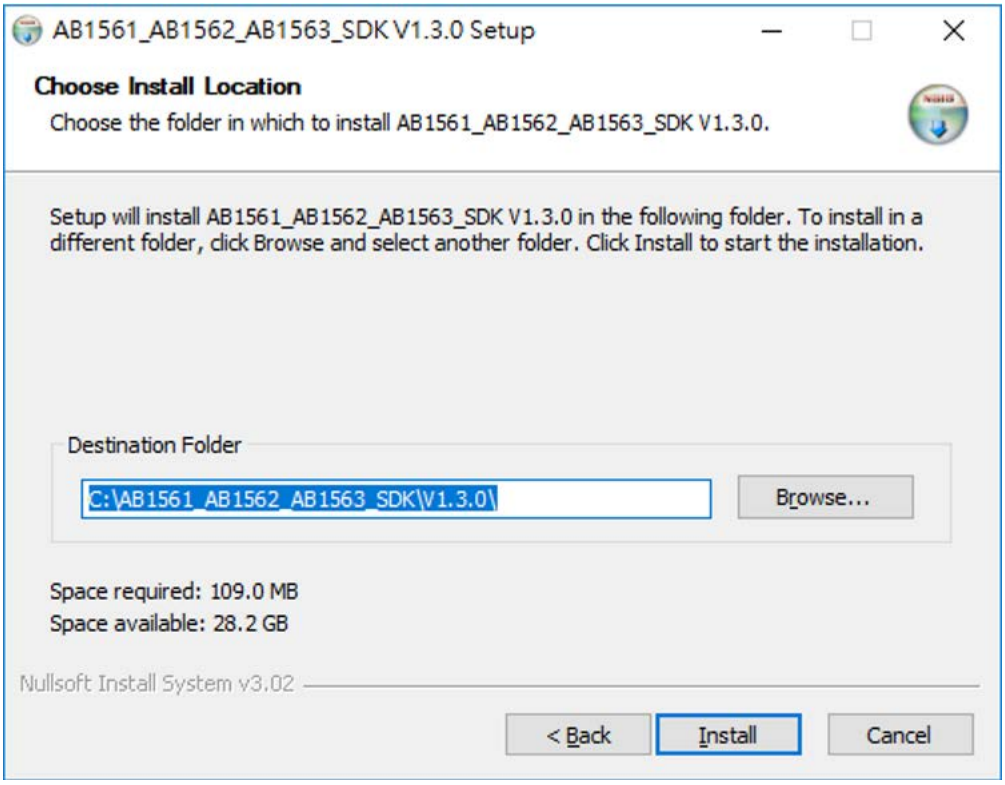

Figure 5. AB1561_AB1562_AB1563 SDK installation – choose the install location

5) AB1561_AB1562_AB1563 SDK is installed. Click **Finish** to complete the setup procedure.

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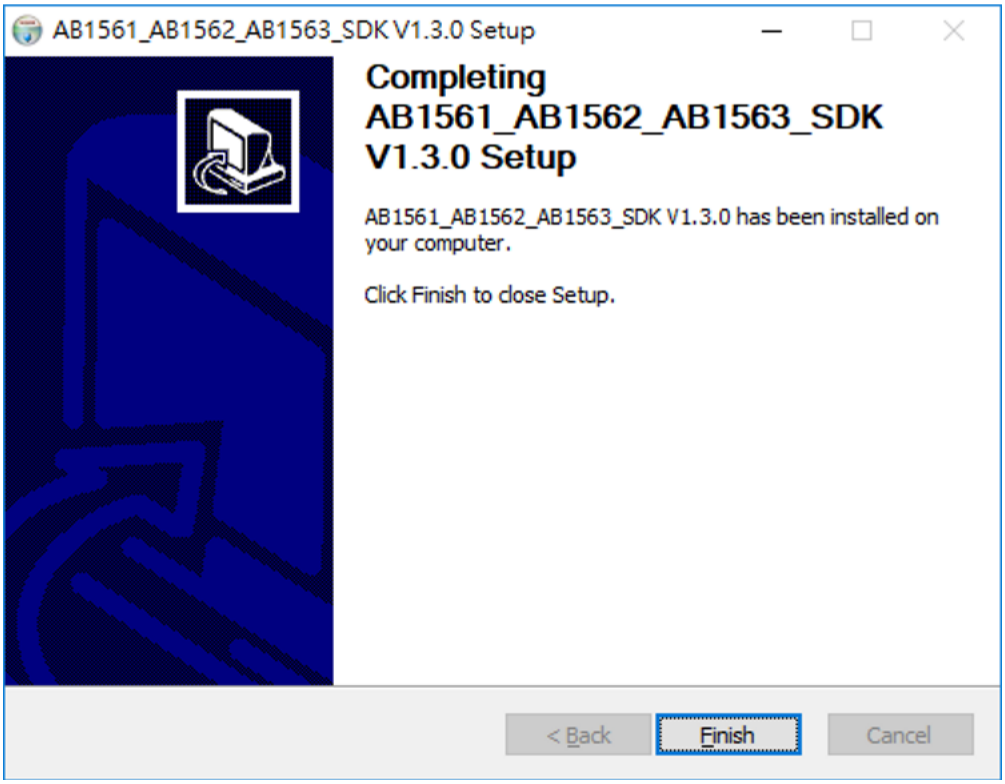

Figure 6. AB1561_AB1562_AB1563 SDK installation – close setup

2.3. Xtensa Toolchain installation

AB1561_AB1562_AB1563 uses Xtensa toolchain to compile source files and build the target binary. We provide two methods for the installation: 1. Command line install with auto setup script. 2. Xplorer IDE install using windows GUI. Since the installation steps of approach 1 is simpler than approach 2, we recommend using method 1 if the developer does not need to use the IDE.

2.3.1. Xtensa command line install with auto setup script

Please do the following steps to install Xtensa command line environment

1. Get latest Airoha_AB1561_AB1562_AB1563_Toolchain_Setup from MOL. Unzip the package in the directory where you want install the toolchain.
2. Execute install_cadence.bat. The script will do AB1561_AB1562_AB1563 related configuration, and set environment variable of tool chain path, which is used in AB1561_AB1562_AB1563 build batch. The script will also install the Cadence toolchain license automatically. Please note that the process needs an internet connection to get the license of Cadence's Tensilica toolchain from the Airoha server. When the installation is complete, the toolchain can work offline.

When the process is complete, the command prompt window shows "Done: cadence tool chain installed successfully". You can now start building your first project.

2.3.2. Xtensa Xplore IDE installation

If the customer wants to debug through IDE, please first contact Cadence to obtain a license and Cadence Xtensa Explorer.
AB1561_AB1562_AB1563 uses Xtensa Xplorer as the integrated development environment. The current version (at the time of writing) of Xtensa Xplorer is V8.0.9.

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The software installation has two parts:

1) Xtensa Xplorer
2) The Xtensa configuration for AB1561_AB1562_AB1563

Installation files:

“Xplorer-8.0.9-Tools-RG-2019.12-windows-installer.exe” is for setting up Xtensa Xplorer.

“AB1561_AB1562_AB1563_i64B_d32B_win32_redist.tgz” is for configuring Xtensa Xplorer.

“xt-ocd-12.0.12-windows-installer.exe” is for installing XOCD debug daemon.

2.3.2.1. Setting up Xtensa Xplorer

To install Xtensa Xplorer, please use the **default settings** to complete the installation procedure.

1) Double-click “Xplorer-8.0.9-Tools-RG-2019.12-windows-installer.exe” to start the Xtensa Xplorer installation process.

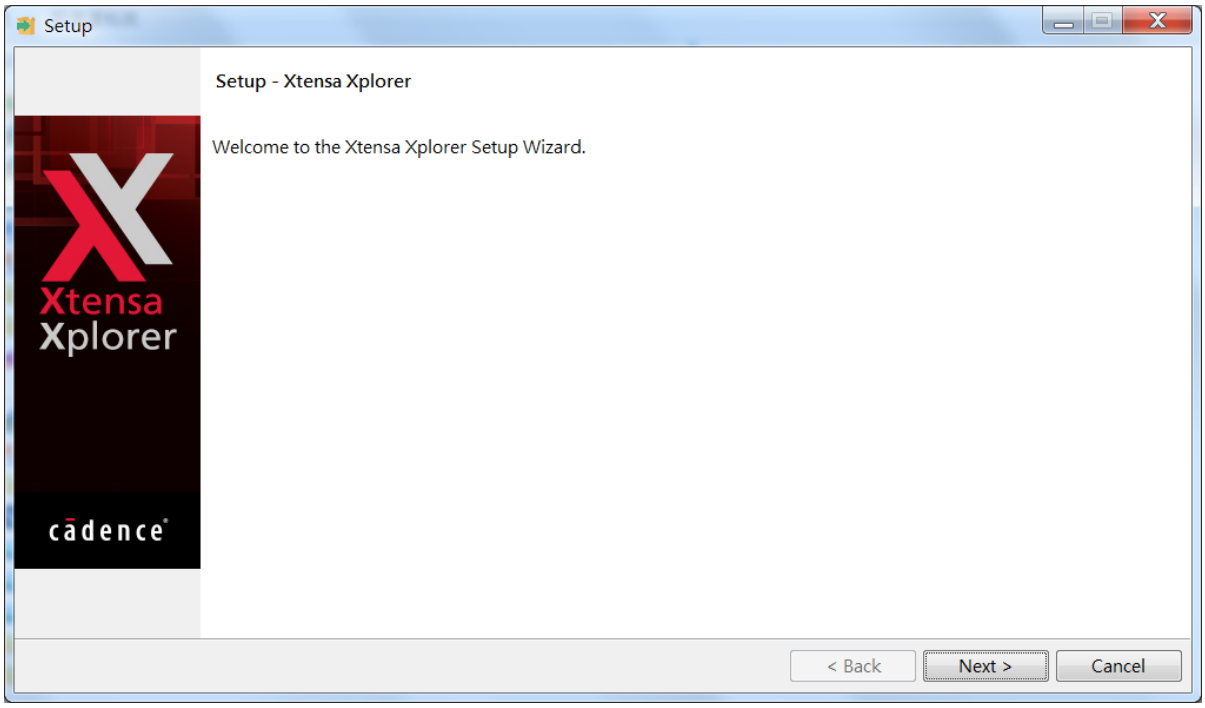

Figure 7. Xtensa Xplorer setup

2) Select the Installation Directory. We strongly suggest that you use the default directory. You must change some of the paths if you do not use the default directory. Please refer to Section 2.3.2.2., “Configuring Xtensa Xplorer” and Section 2.8., “Building the project using the SDK” for more information.

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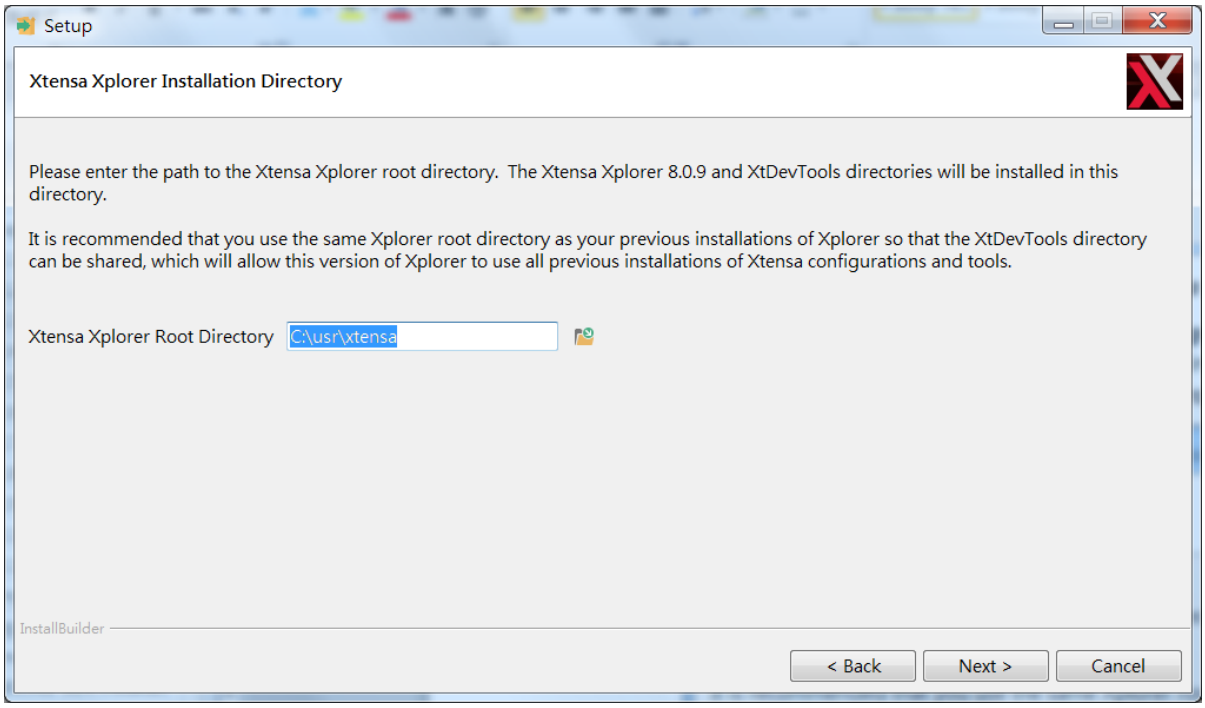

Figure 8. Xtensa Xplorer setup – setup installation directory

3) Select all components and click the **Next** button.

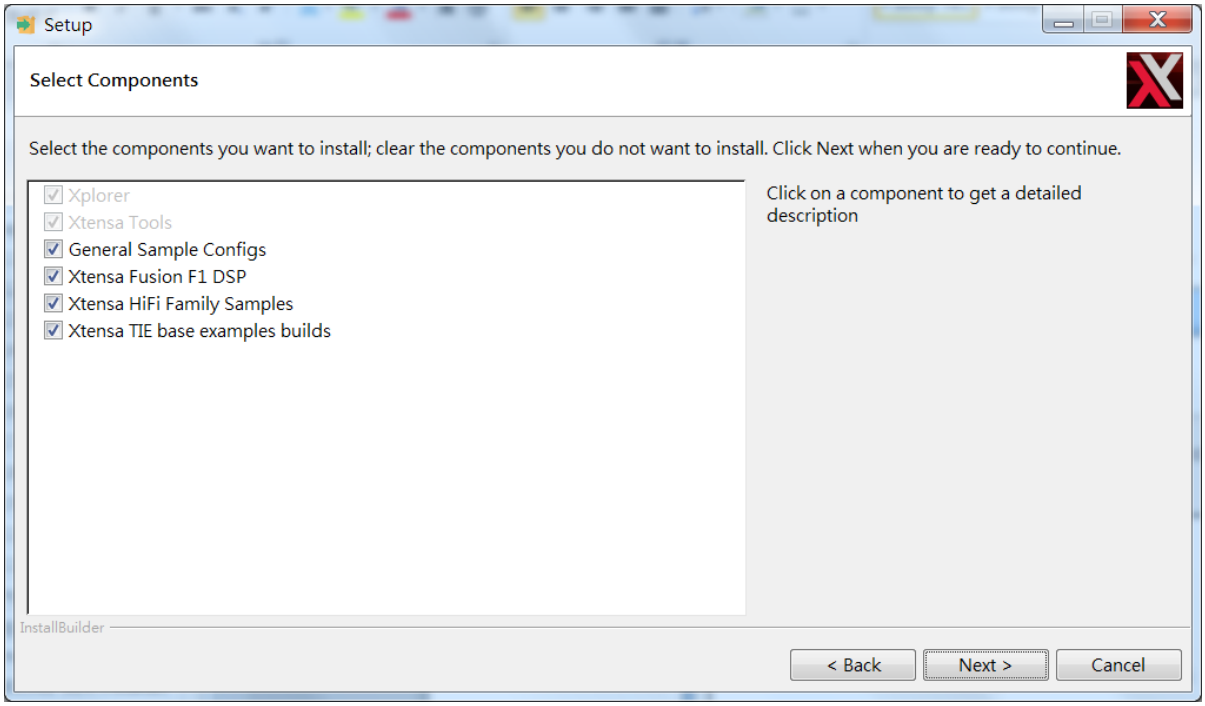

Figure 9. Xtensa Xplorer setup – select components

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4) Select the **Next** button to confirm the Installation Summary.

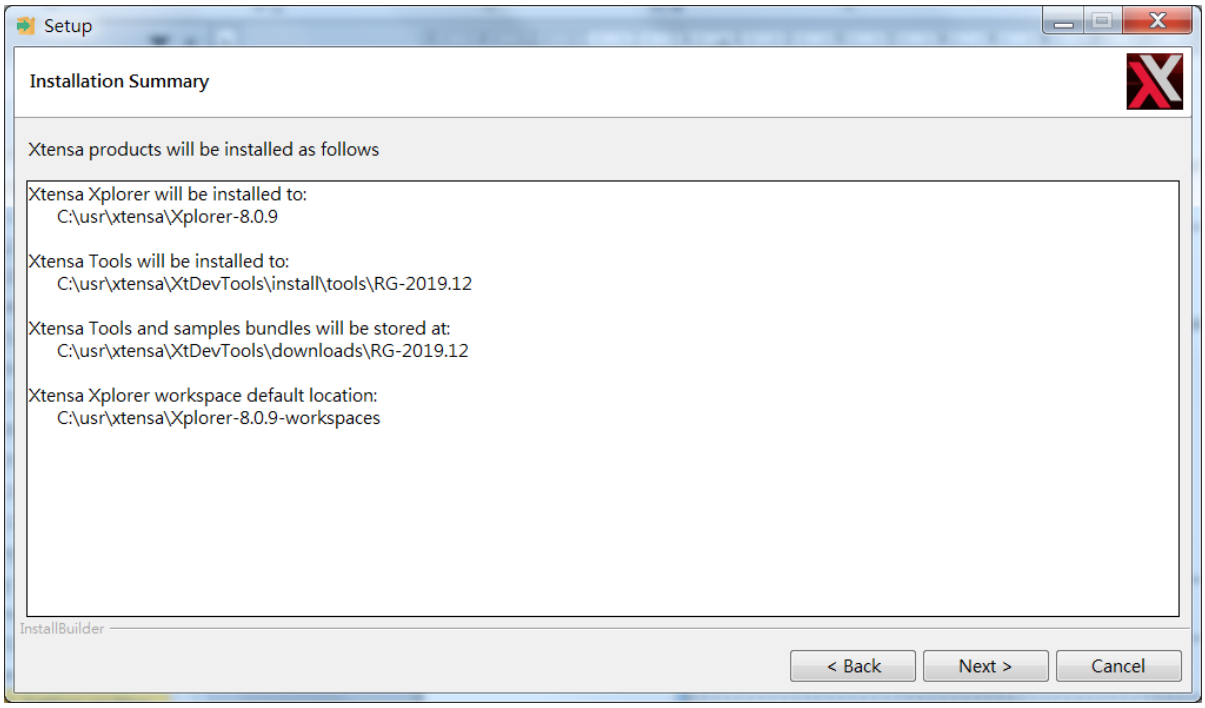

Figure 10. Xtensa Xplorer setup – installation summary

5) Select **OK** to confirm the result.

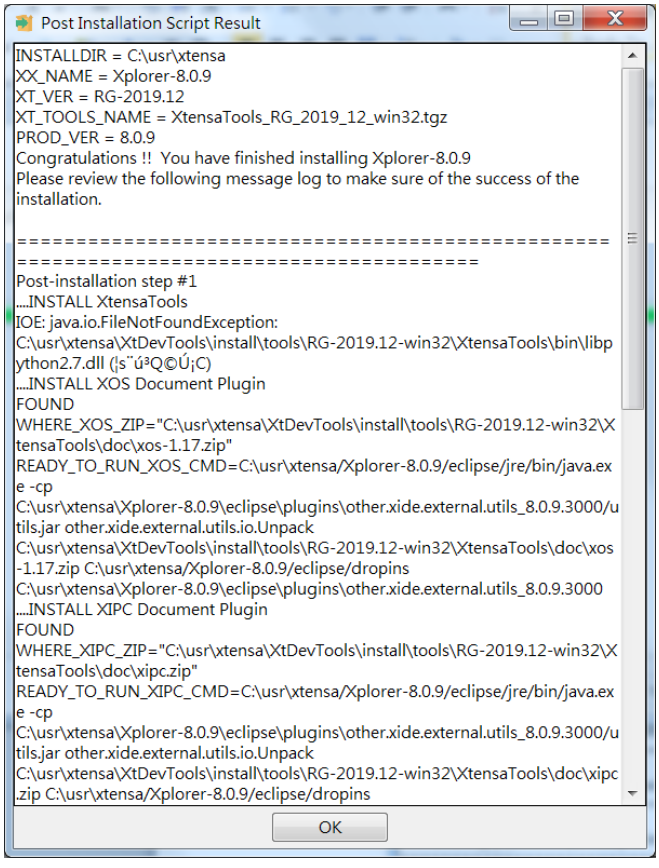

Figure 11. Xtensa Xplorer setup – installation result

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6) Select **Finish** to complete the Xtensa Xplorer IDE installation procedure.

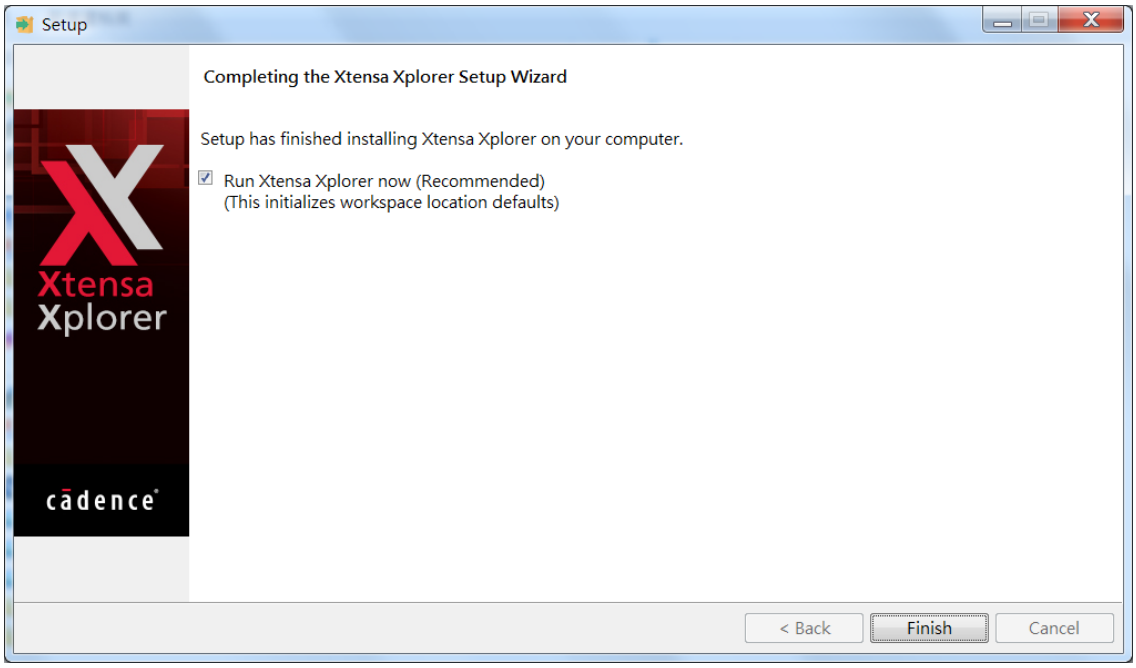

Figure 12. Xtensa Xplorer setup – complete the Xtensa Xplorer setup

2.3.2.2. Configuring Xtensa Xplorer

To configure Xtensa Xplorer for AB1561_AB1562_AB1563:

1) Copy the AB1561_AB1562_AB1563_i64B_d32B_win32_redist.tgz file to <Xtensa Xplorer Root Directory>\XtDevTools\downloads\RG-2019.12\builds. This gives the IDE access to the AB1561_AB1562_AB1563 configuration file. **The Default Xtensa Xplorer Root Directory is C:\usr\xtensa.**

2) Right-click in the **System Overview** panel and select **New Configuration** on the pop-up menu as shown in the following image.

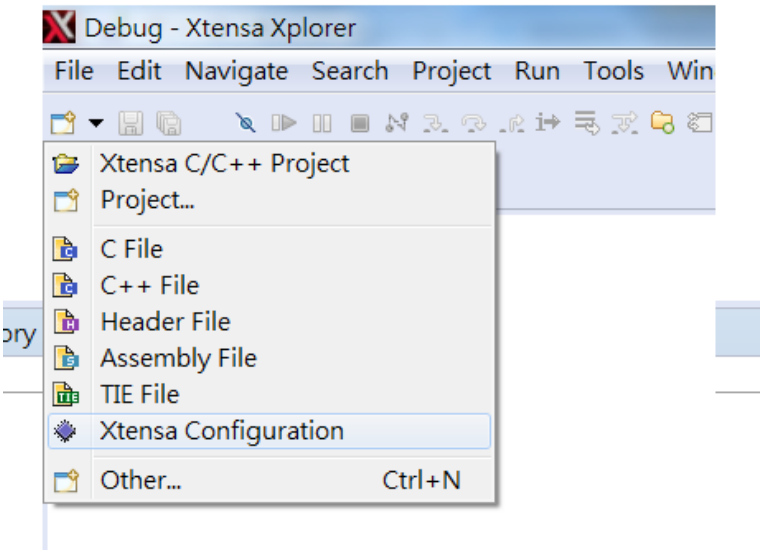

Figure 13. Xtensa Xplorer configuration – select new configuration

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3) Select **Install a new build from downloaded bundle as the new configuration** as shown in the following image, and click the **Next** button to open the Install Xtensa Build window

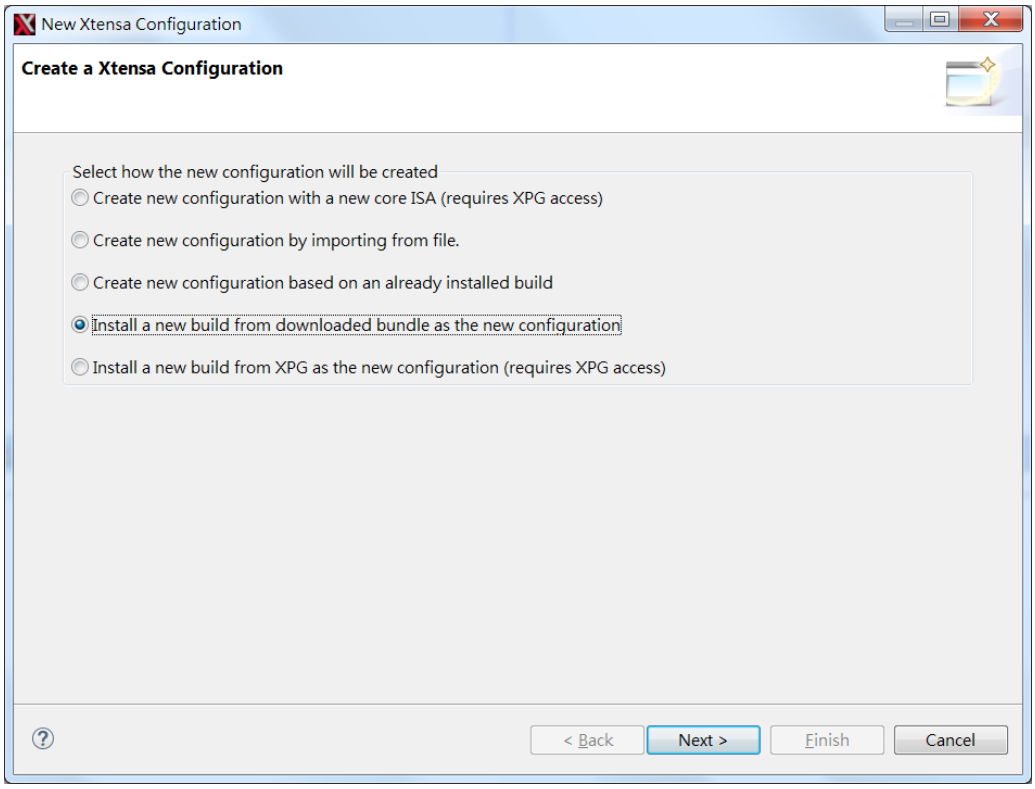

Figure 14. Xtensa Xplorer configuration – select how the new configuration will be created

4) Click the **Browse** button to navigate to the <Xtensa Xplorer Root Directory > \XtDevTools\downloads\ RG-2019.12\builds folder and select the AB1561_AB1562_AB1563_i64B_d32B_win32_redist.tgz file.

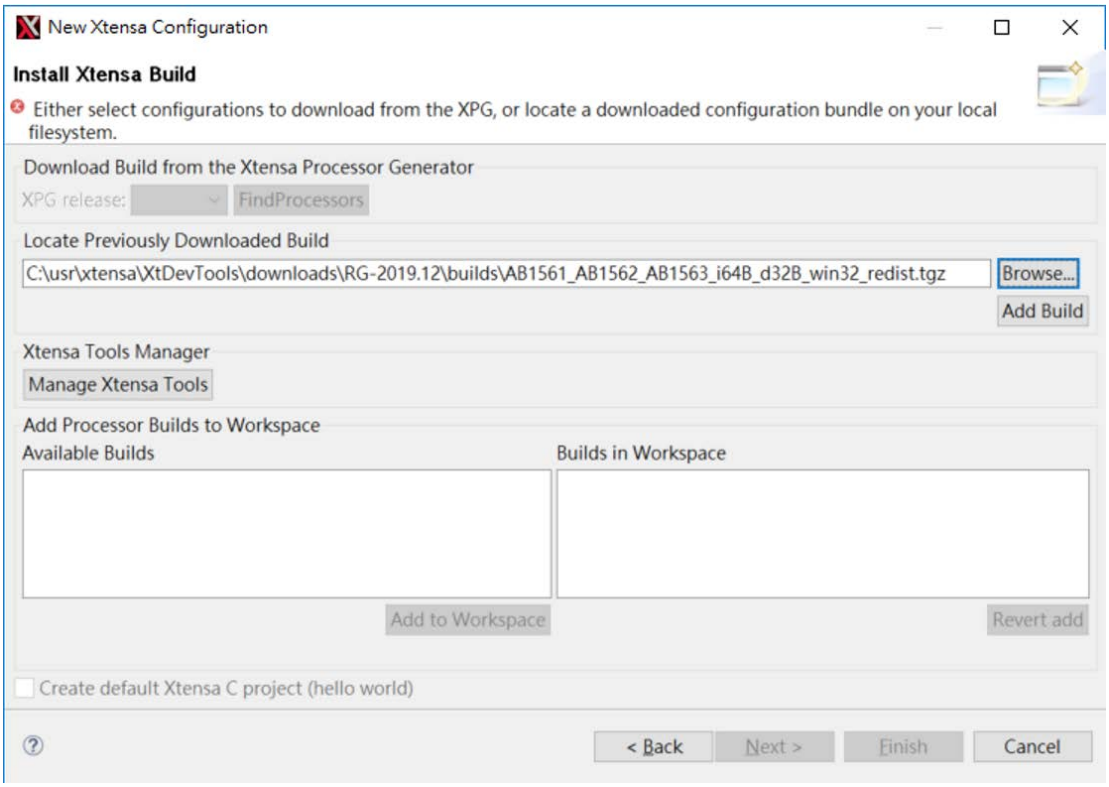

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Figure 15. Xtensa Xplorer configuration – select the download build

5) Select the **Add Build** button. The **AB1562_i64B_d32B** build is added to the **Available Builds** and **Builds in Workspace** textboxes, as shown in the following image.

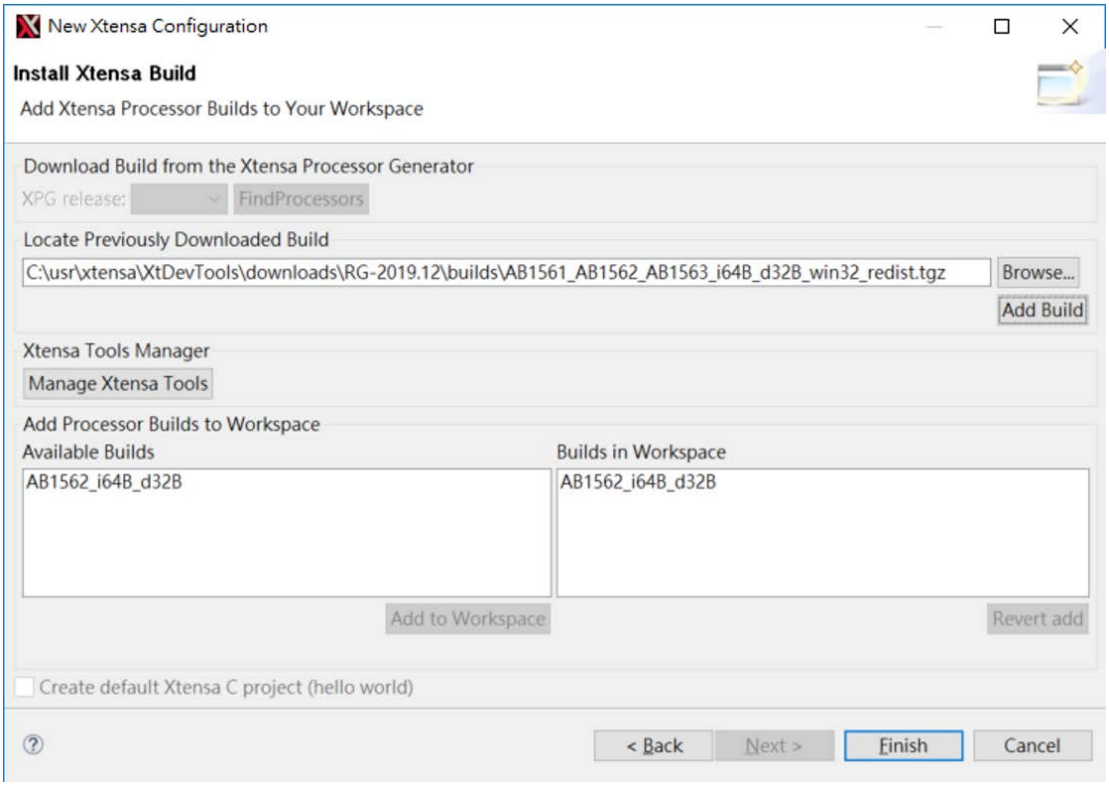

Figure 16. Xtensa Xplorer configuration – add processor builds to workspace

6) Select the **Finish** button. The **Progress Information** window is shown. After that, you must set the correct path of the license server address to set up the related license server.

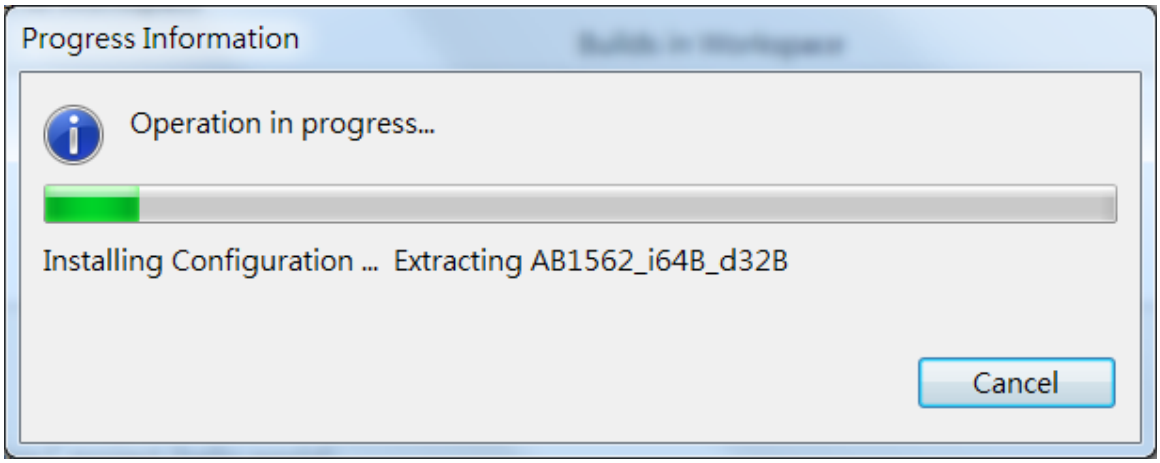

Figure 17. Xtensa Xplorer configuration – progress information

7) Select **Xplorer License Keys** on the **Help** menu to open the **Xplorer License Keys** window.

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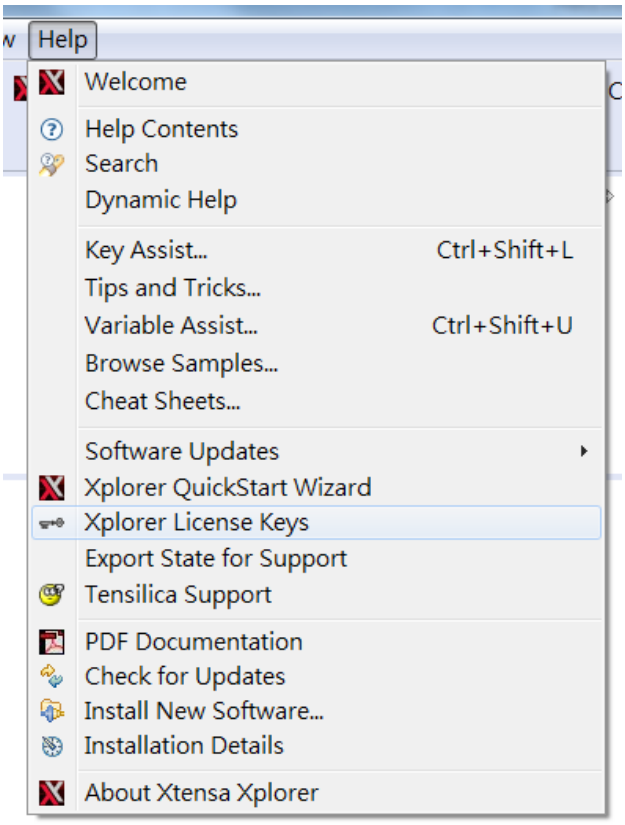

Figure 18. Xplorer License Keys – open the Xplorer license keys

8) Click the **License Options**.

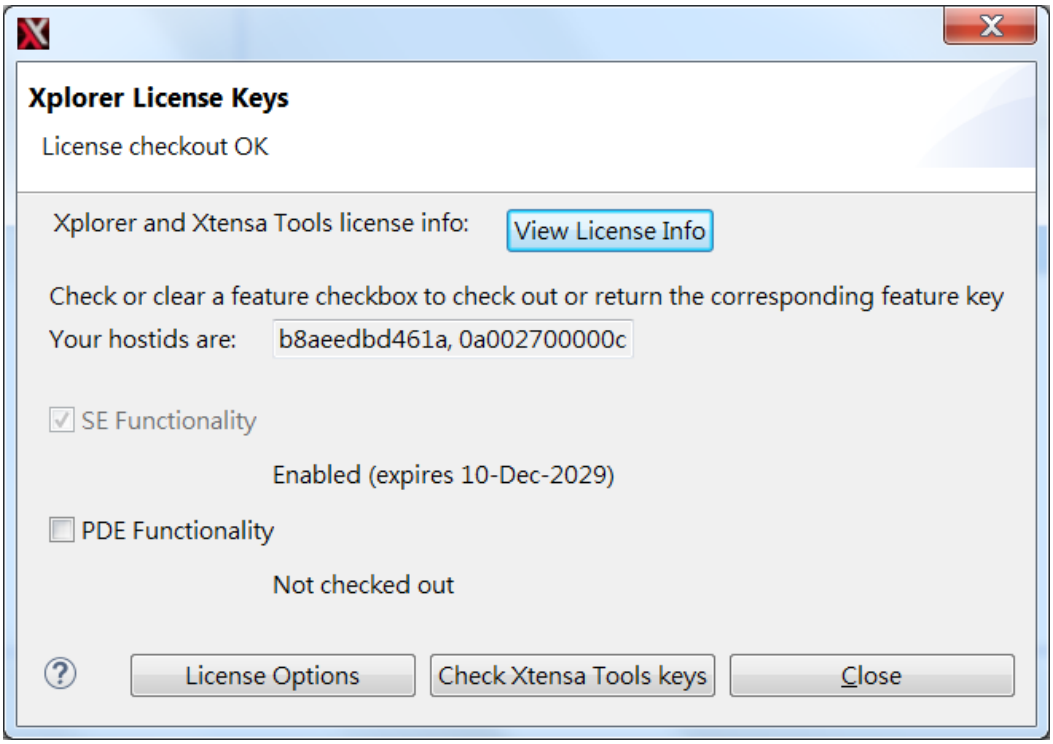

Figure 19. Xplorer License Keys – Xplorer license keys window

9) Click the **Install Software Keys** button.

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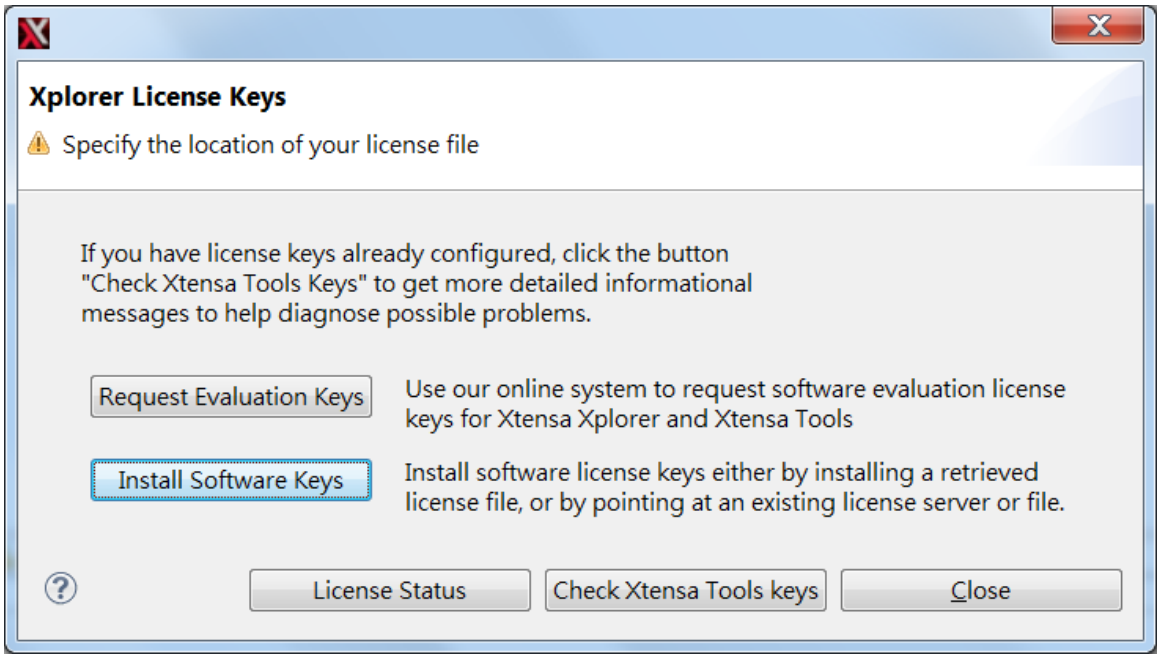

Figure 20. Xplorer License Keys – click the Install Software Keys button

10) Complete the license server setting. You must key in your own license server IP (Ex: **5280@10.84.20.6**) into the textbox and select **Point to the selected license file in its current location**.

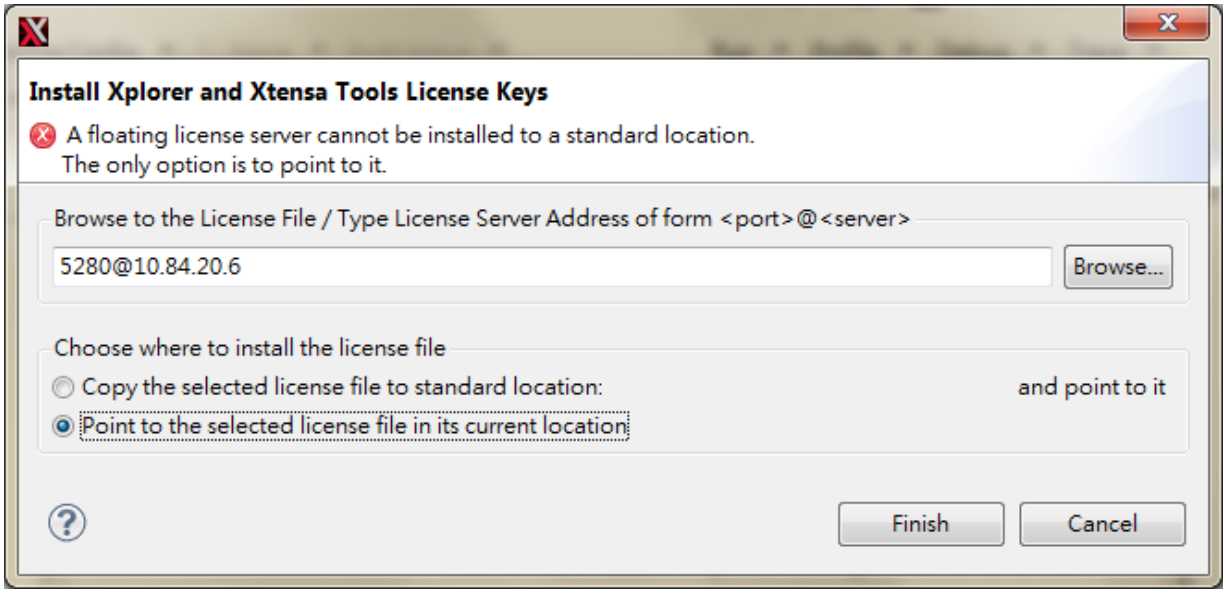

Figure 21. Xplorer License Keys – type license server address

11) Click the **Finish** button. The following window shows that you “Successfully installed the license file”.

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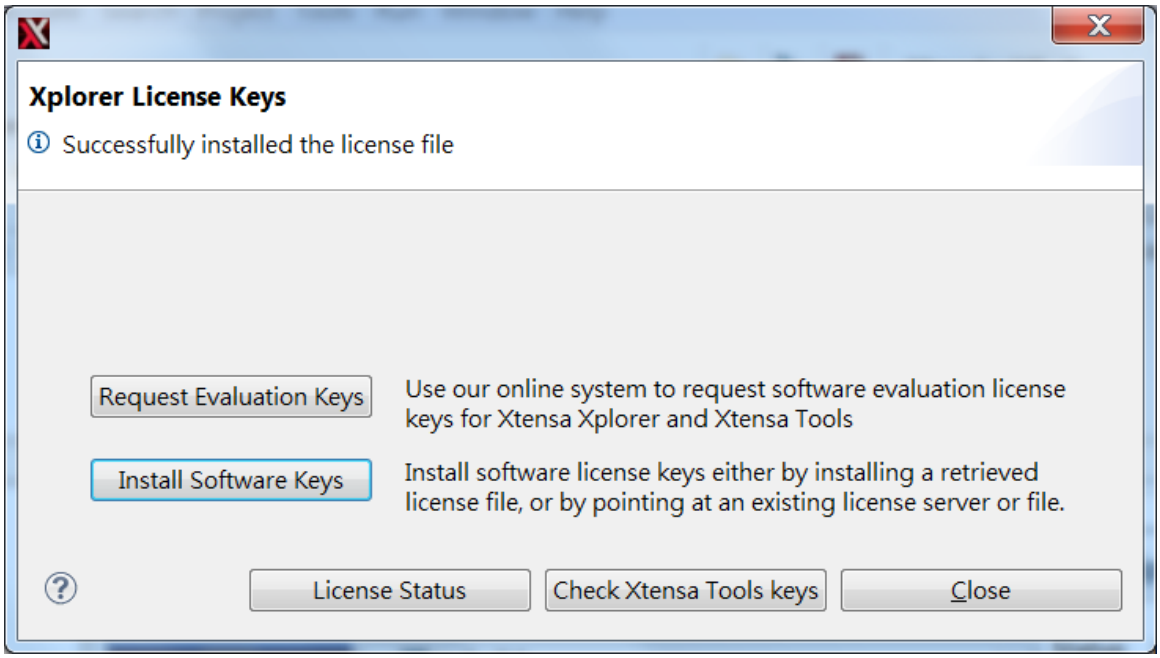

Figure 22. Xplorer License Keys – license installed successfully

12) Right-click “xt-ocd-12.0.12-windows-installer.exe” to open the Setup Wizard and install XOCD debug daemon.

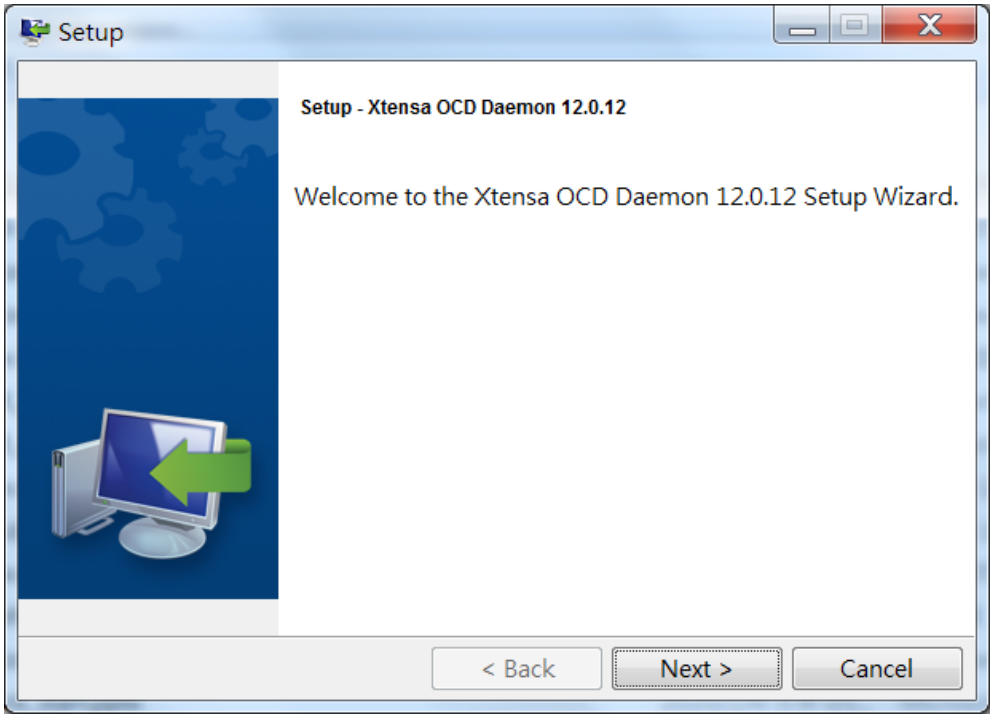

Figure 23. Xtensa OCD Daemon setup

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13) "Xtensa OCD Daemon" and "Xtensa Xplorer" are installed when you complete this procedure. Open the following window in Microsoft Windows (via Control Panel\Programs\Programs and Features) to confirm that components are installed.

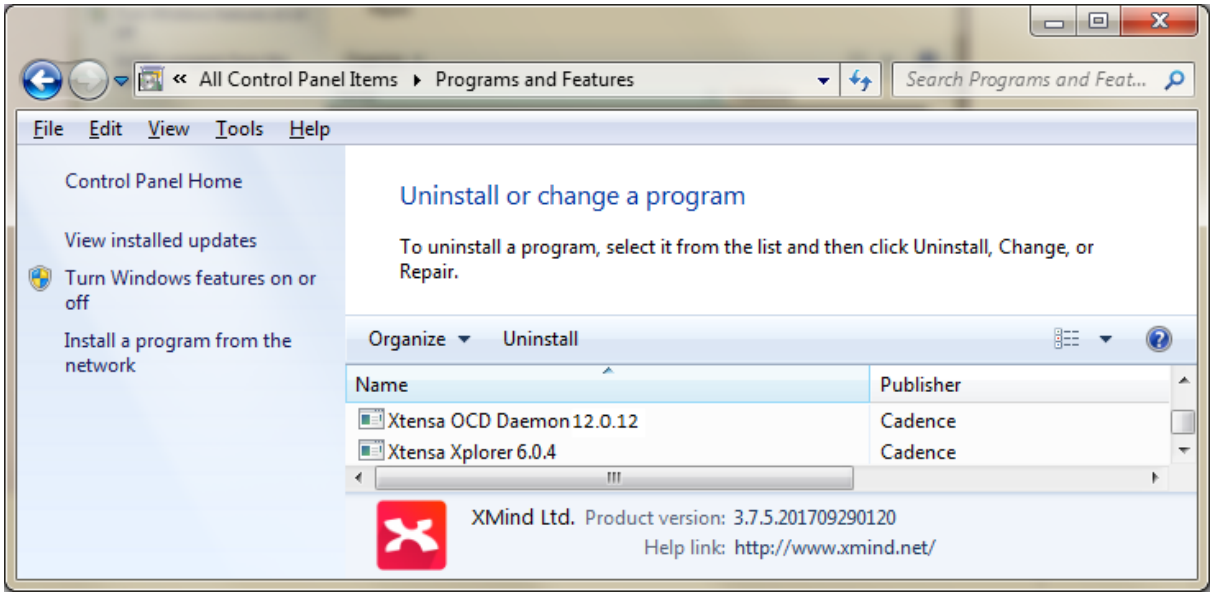

Figure 24. Confirm the components are installed

2.4. Installing the EVK drivers on Microsoft Windows

You must complete the following procedure to install the EVK drivers:

1) Open the following link to gather the FTDI FT2232H driver: http://www.ftdichip.com/Drivers/VCP.htm.
2) Download the driver according to whether your PC is x86 or x64.

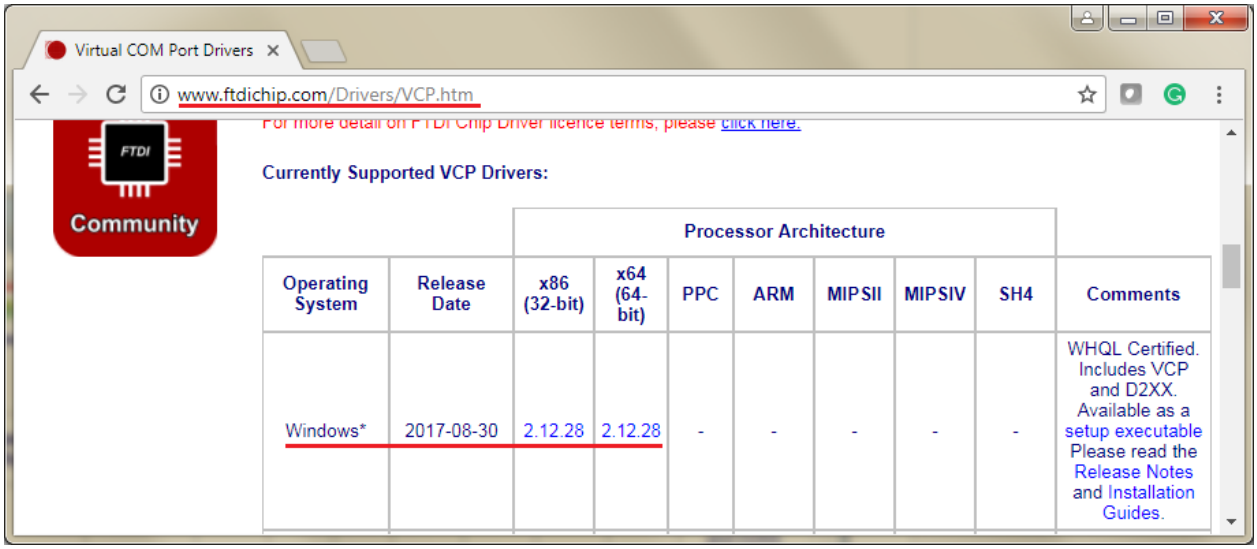

Figure 25. Drivers download page

3) Download the x64 ZIP and decompress the file to a temp directory.

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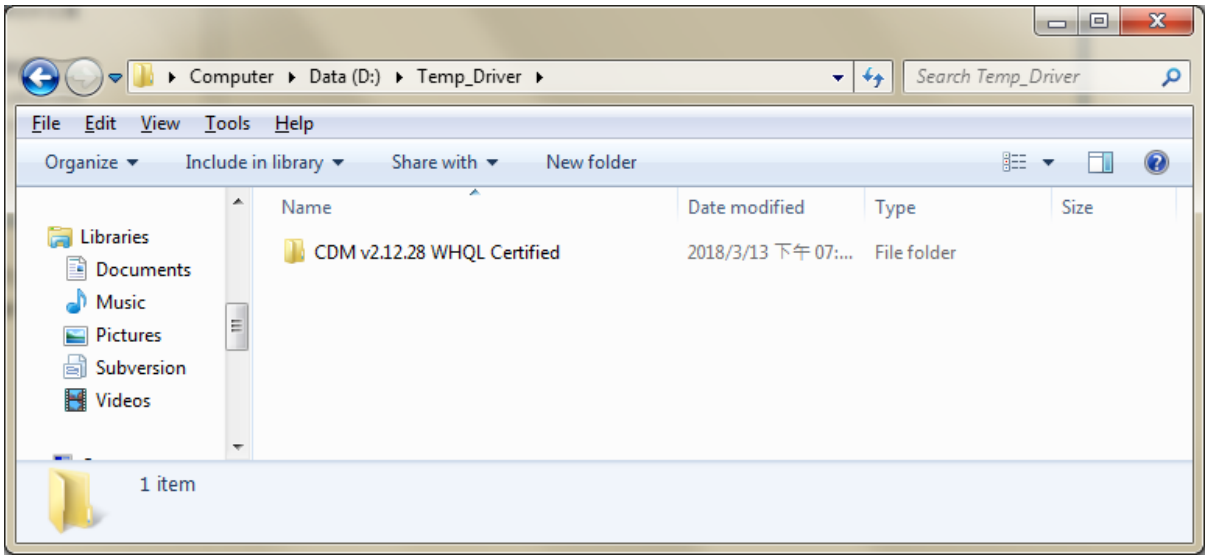

Figure 26. Virtual COM Port Drivers

4) Connect your board to the host, and when prompted for the driver, direct the system to locate the driver in temp directory in Step 3.

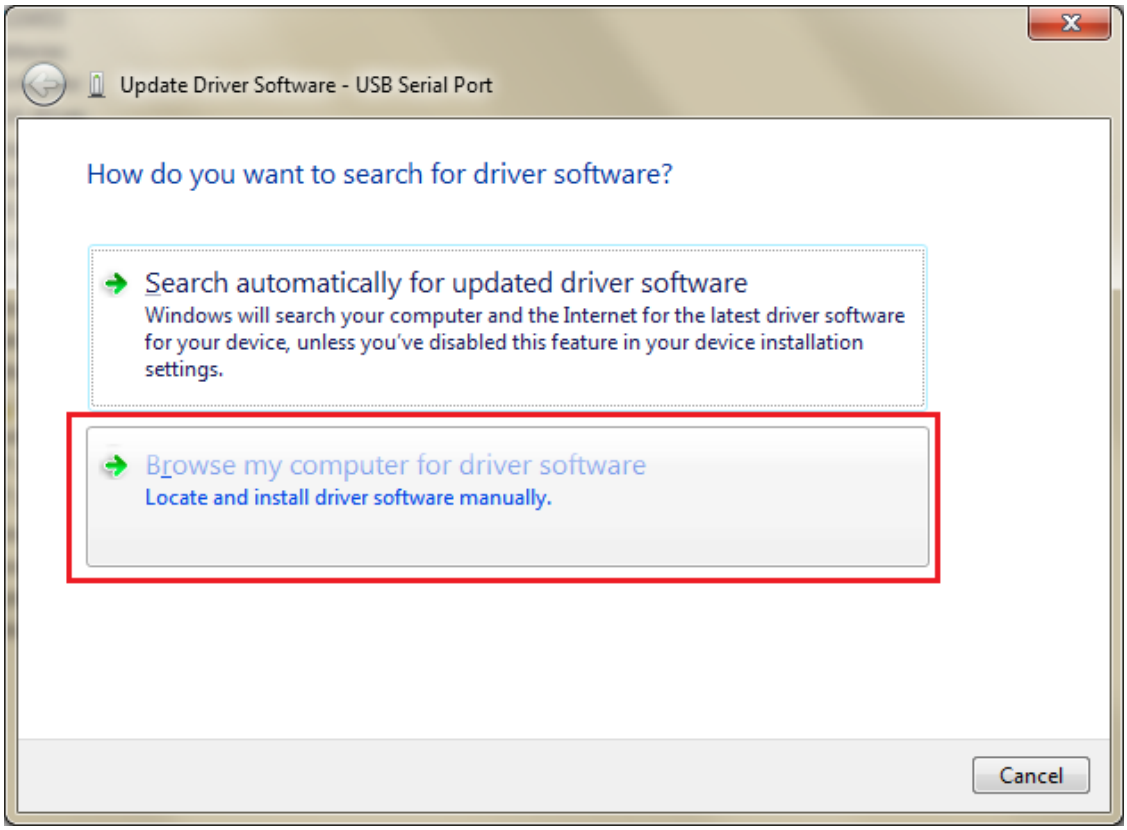

Figure 27. Search for driver software

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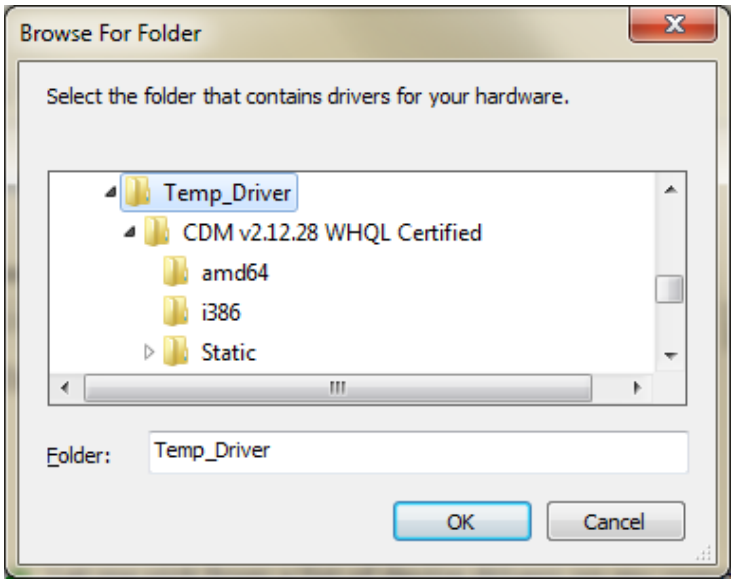

Figure 28. Select the folder that contains drivers for your hardware

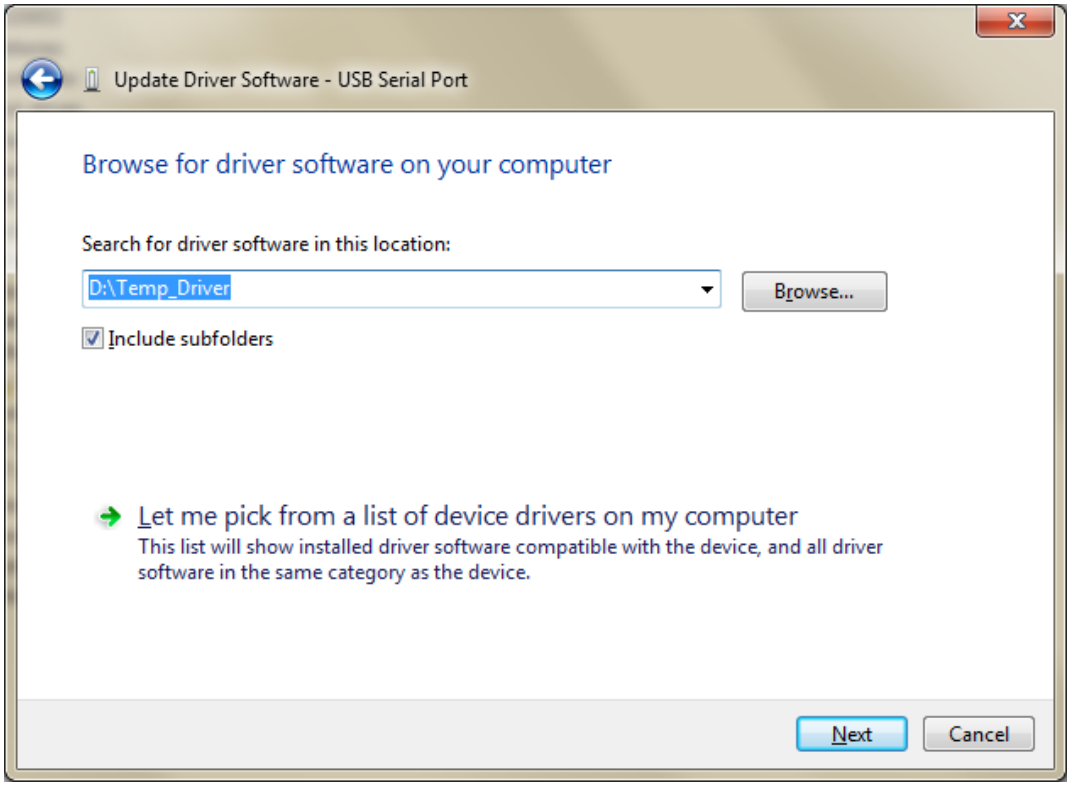

Figure 29. Search for driver software

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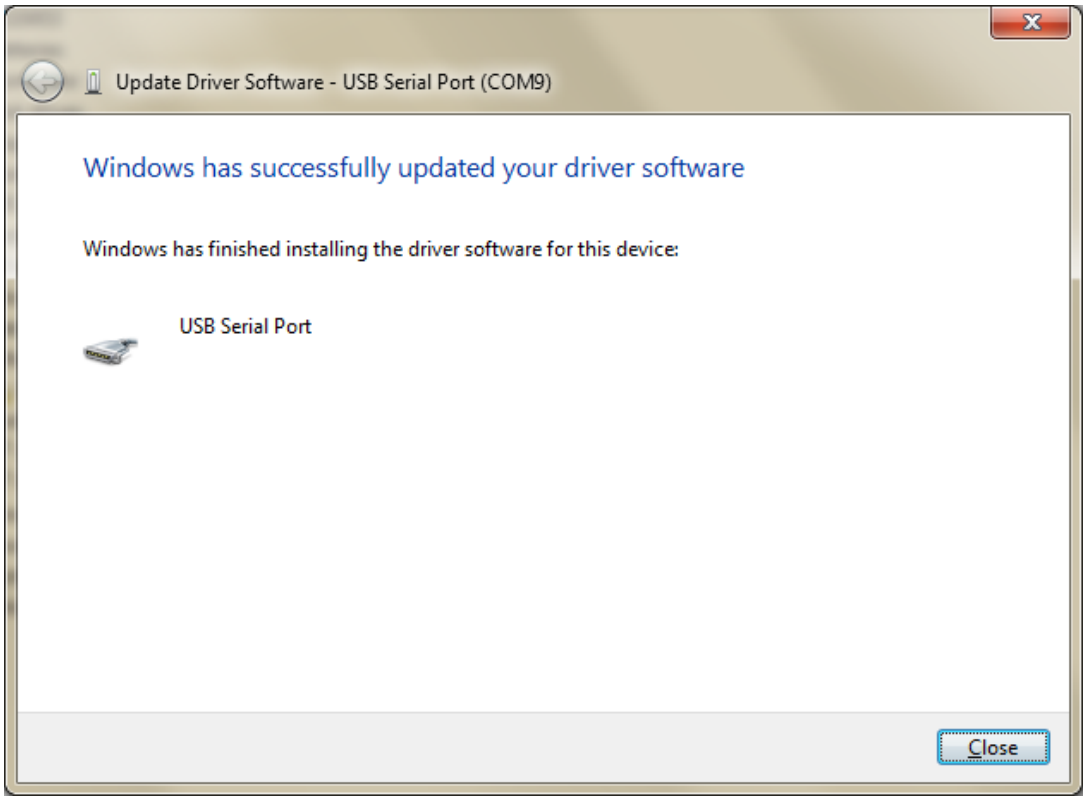

Figure 30. Successfully updated the driver software

5) Reboot the PC and connect your board to the host (i.e. a personal computer). Make sure that the drivers for the board are installed. The USB Serial Port is visible when the drivers are correctly installed.

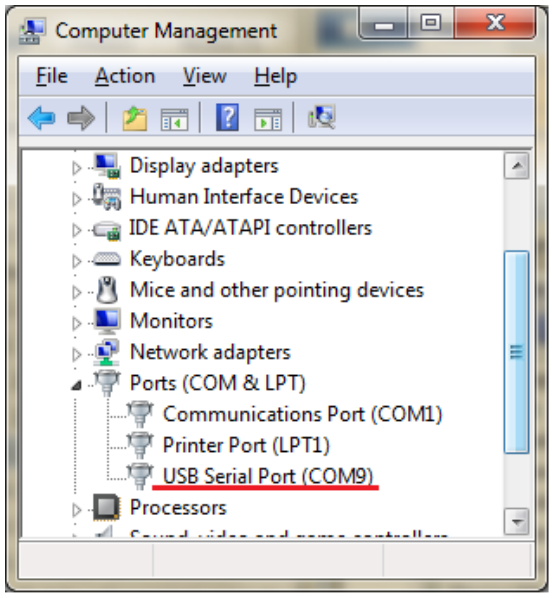

Figure 31. Check USB serial port

6) You can see the driver's version is the same as we just installed (2.12.28.0) when you right-click on it check the driver information through the menu. The driver installation for the board is now complete.

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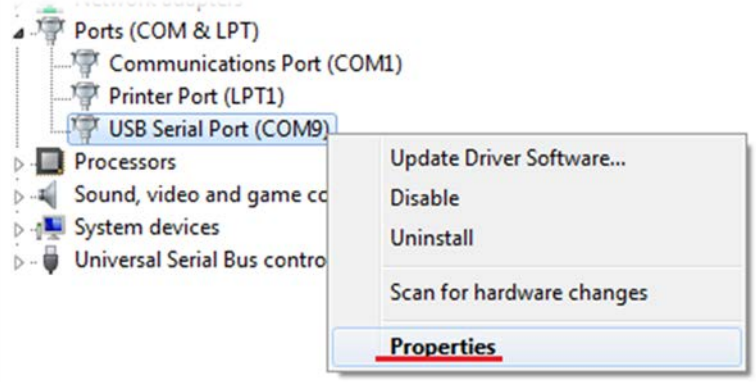

Figure 32. Check port properties

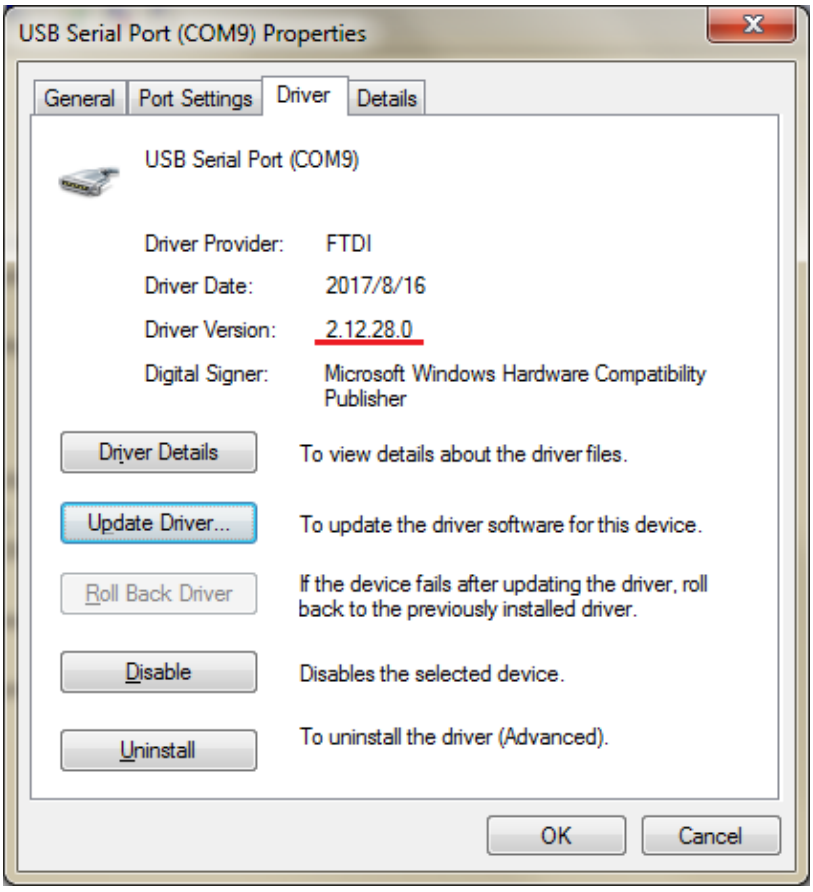

Figure 33. USB serial port properties

2.5. Flashing the image to the EVK

You must have a pre-built Airoha flash file (*.bin) or build your own project to get one before using the AB1561_AB1562_AB1563 Flash Tool. Please refer to Section 2.8., “Building the project using the SDK” for more information.

Please contact Airoha AE to get Airoha.Tool.Kit.exe tool. Use the Airoha.Tool.Kit.exe application and select **Config Tool** to flash the image for AB1561_AB1562_AB1563 EVK.

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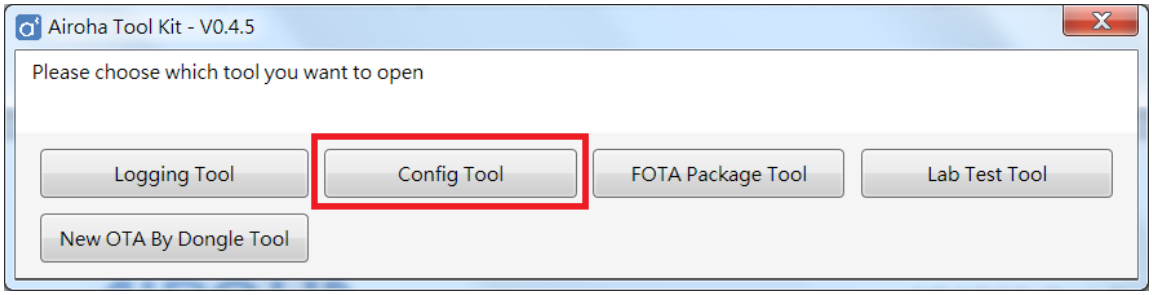

Figure 34. Flashing the image – tool selection

1) Click **open** button to select the image file, which is usually named as AB1561_AB1562_AB1563.bin and is generated during the build process.

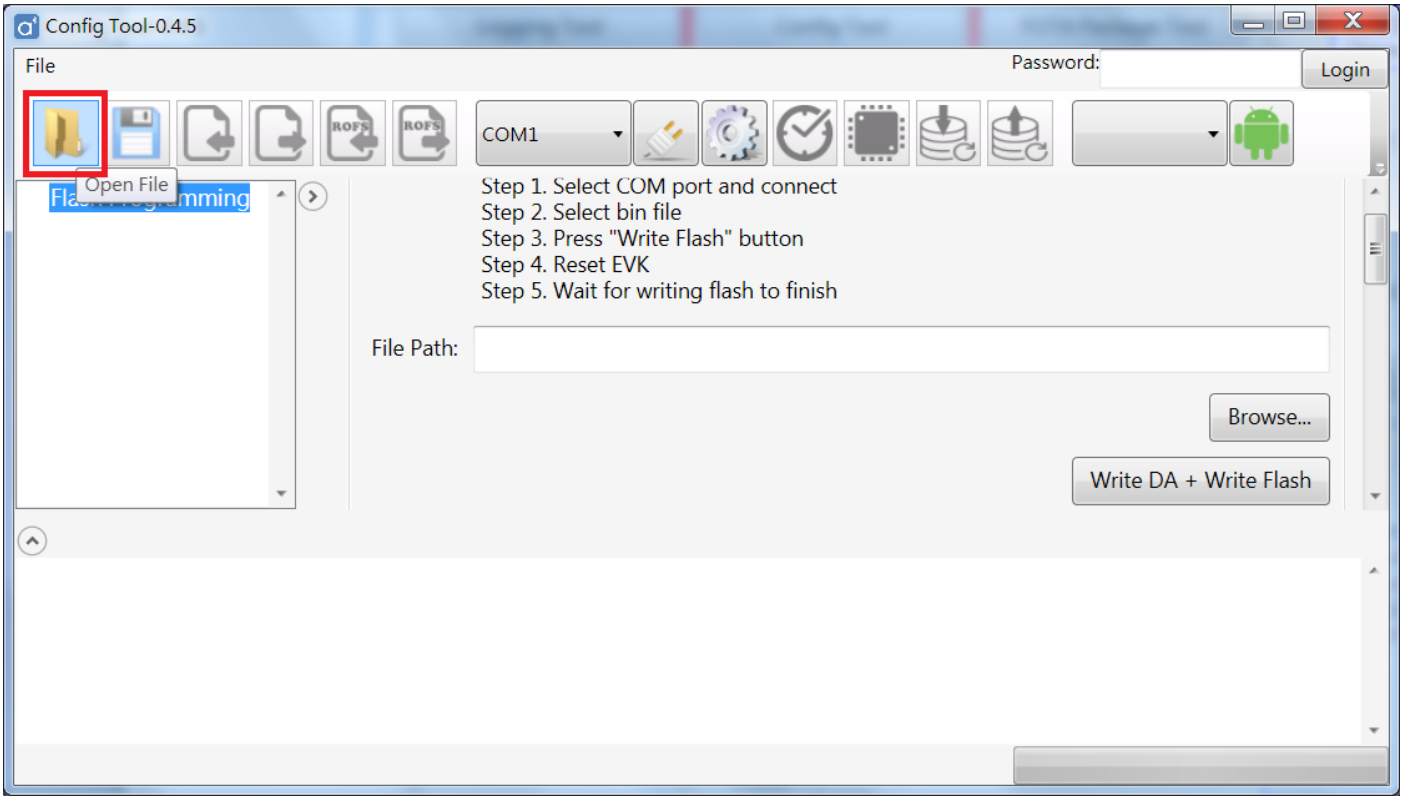

Figure 35. Flashing the image – select the image

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2) Connect your board to the host, attach the adaptor (top-left green box), and switch to power on mode (middle=left green box).

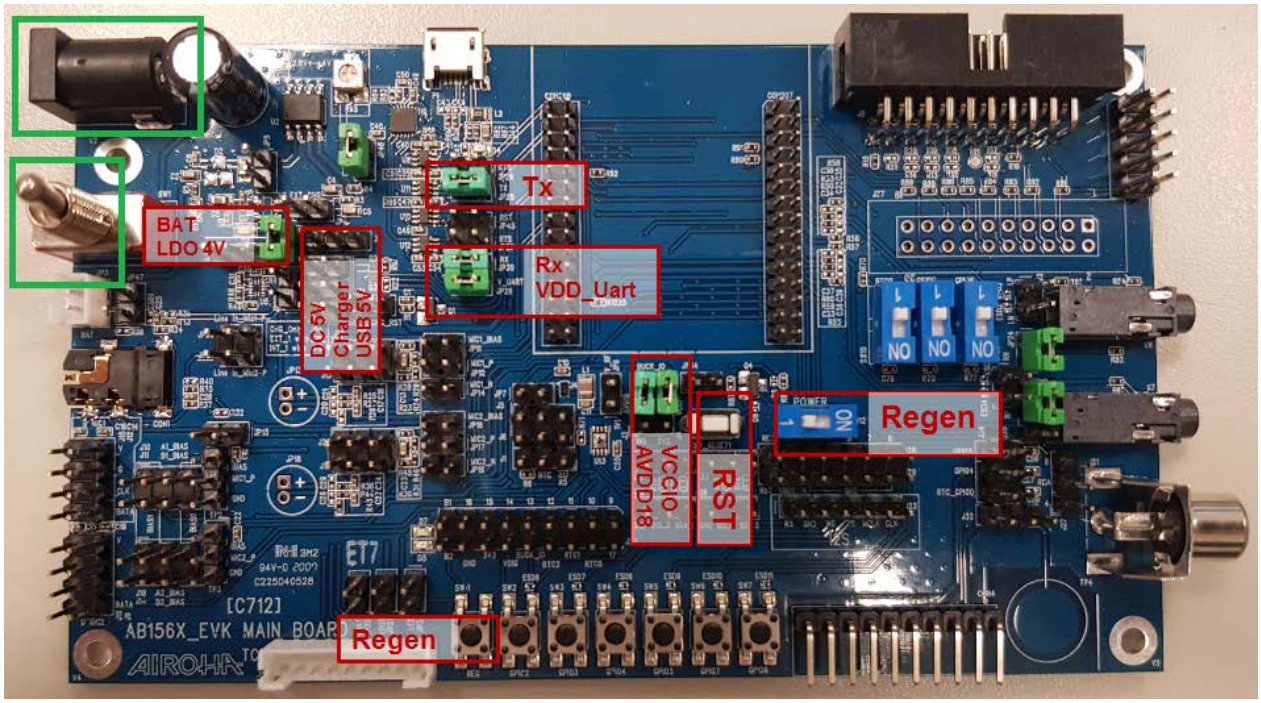

Figure 36. Flashing the image – hardware settings on AB156X_EVK

3) Make sure you connect a micro USB cable to your PC.

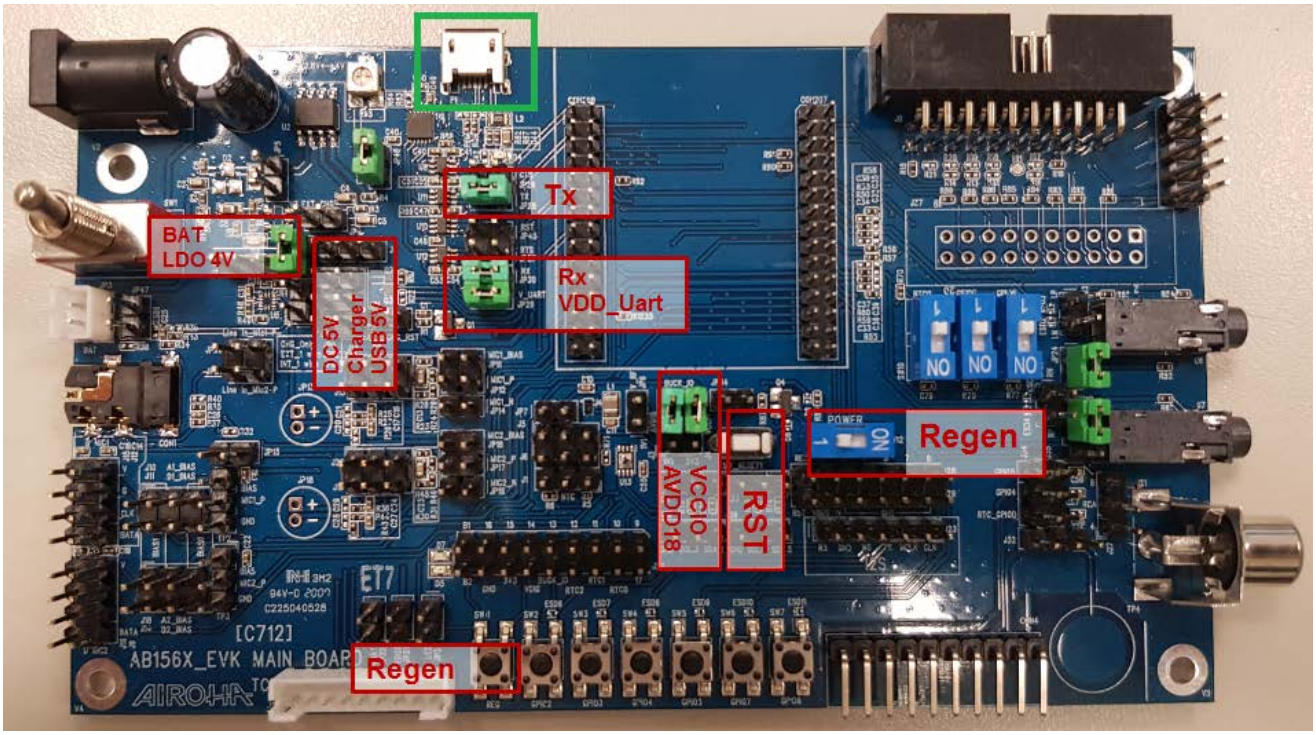

Figure 37. Flashing the image – jumpers on AB156X_EVK for chip version-C

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4) Click **Browse** to provide the same image again and select USB on the COM Port drop-down list.

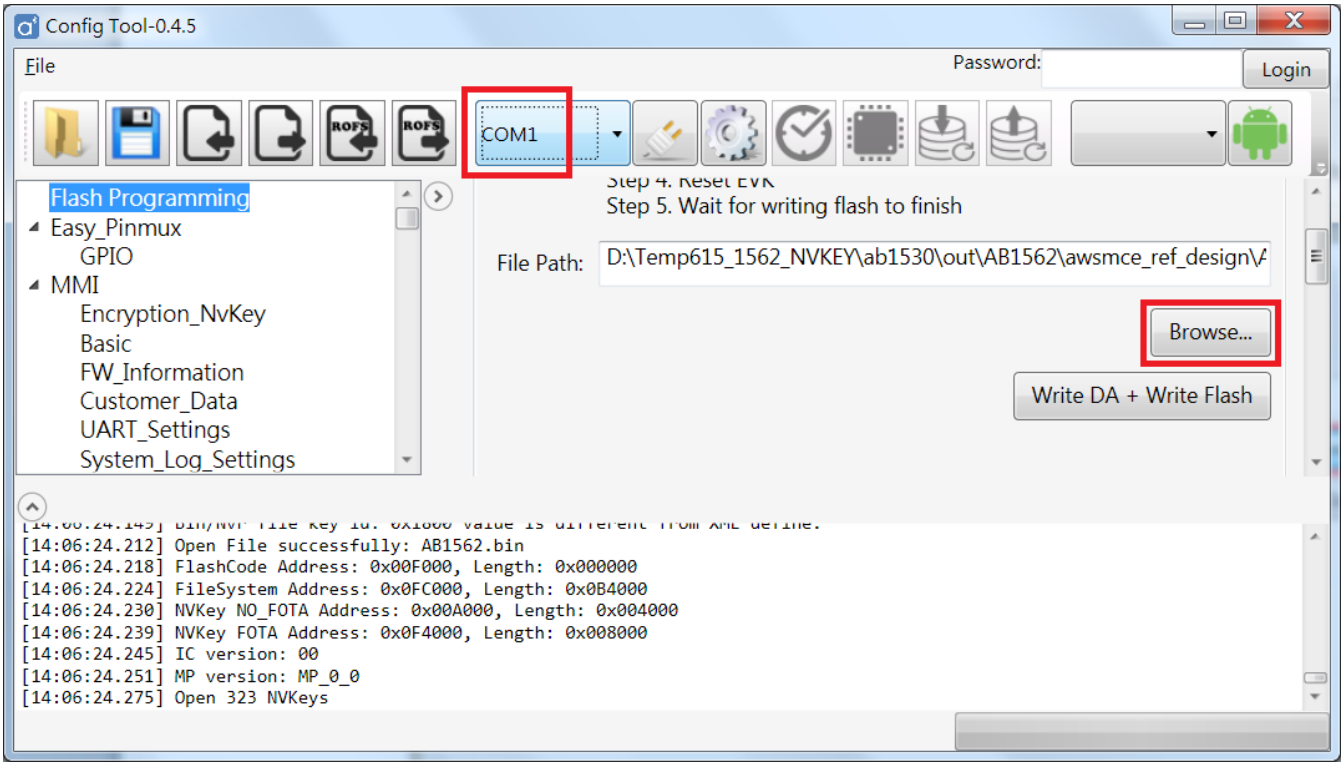

Figure 38. Flashing the image – choose file path and COM port

5) Click the **plug icon** to open the COM Port, and make sure COM Port is correct.

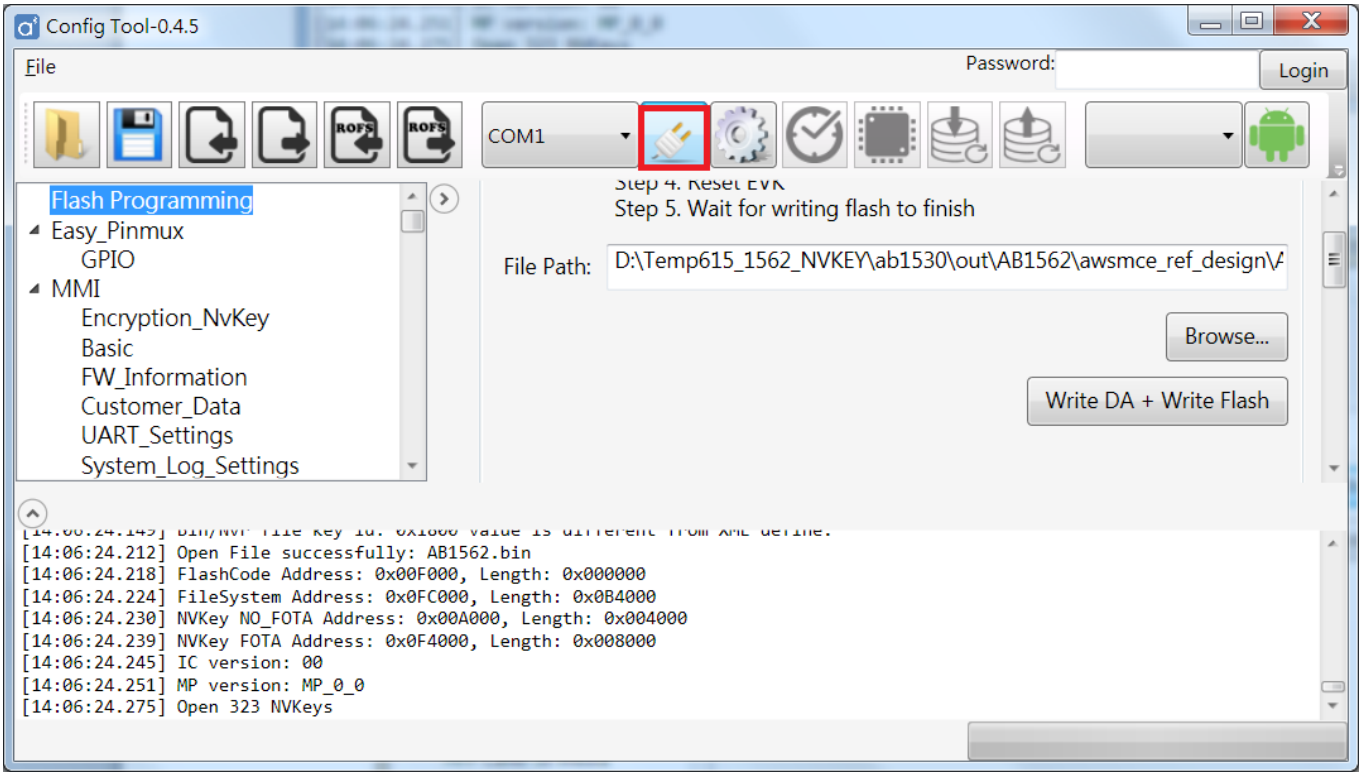

Figure 39. Flashing the image – click the plug icon

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6) Click **Write Data** on the Config Tool to start downloading. The process will start automatically.

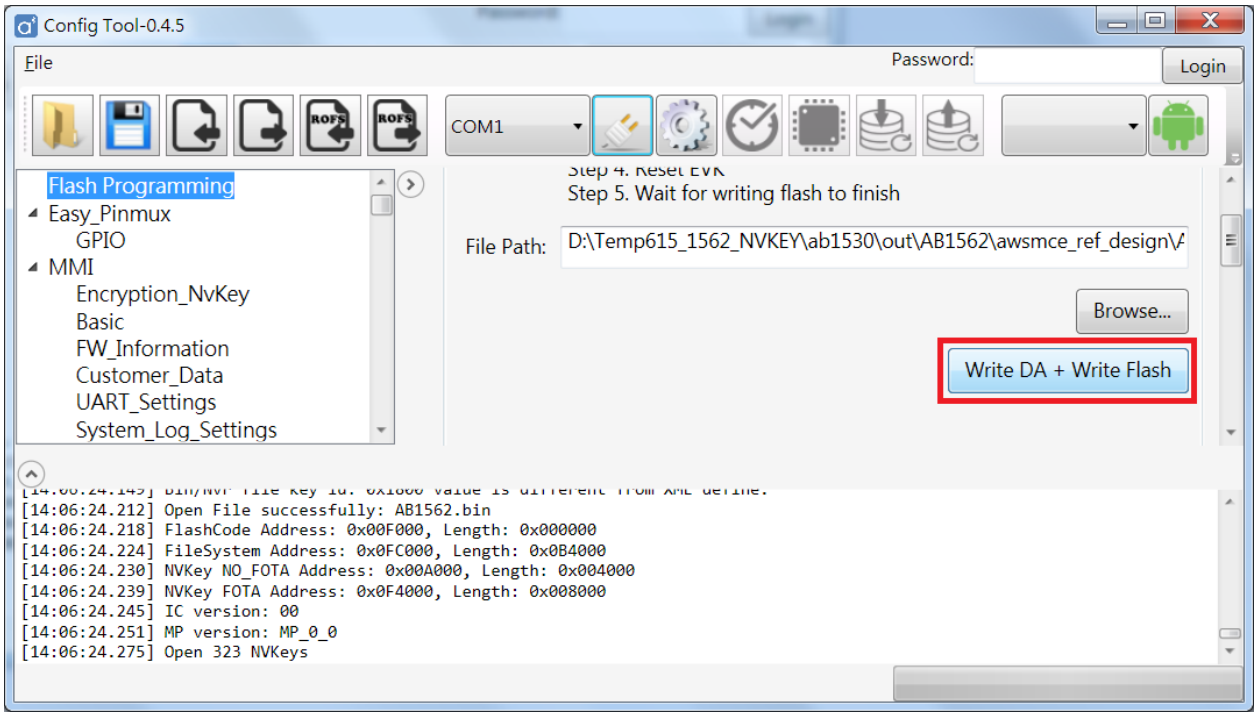

Figure 40. Flashing the image – click Write Data to start downloading

7) Click **RST** first, and then click **REGEN** to start the flashing process.

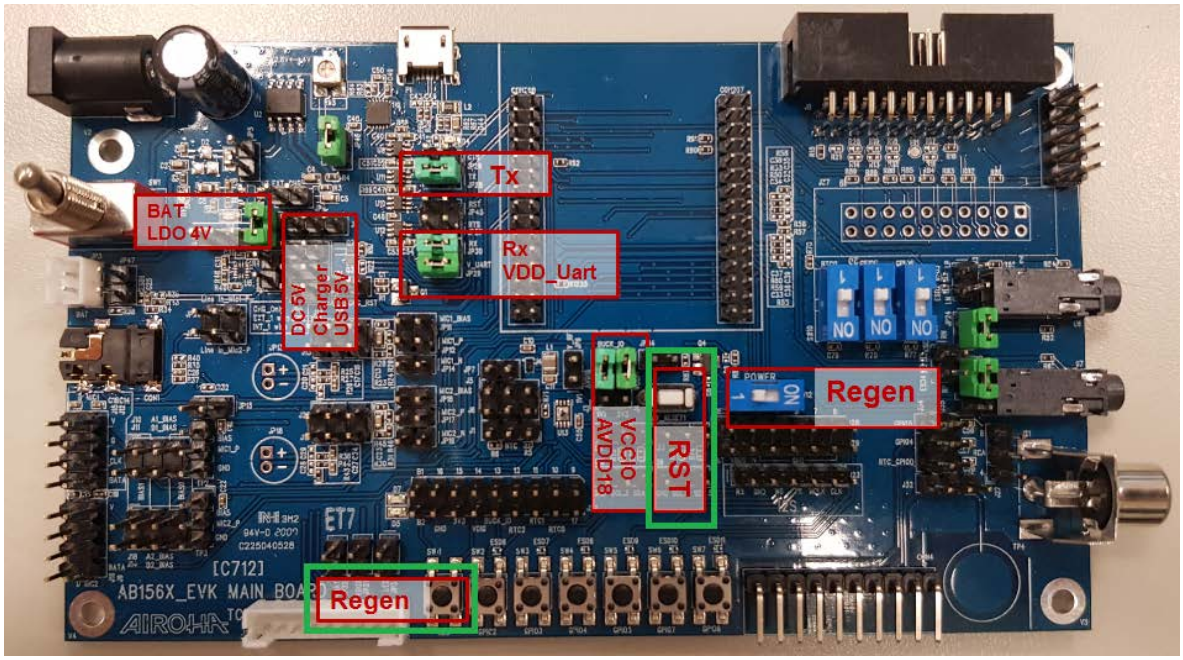

Figure 41. Flashing the image – reset hardware

Wait for around 30 seconds. The window then shows that Flash programming was successful.

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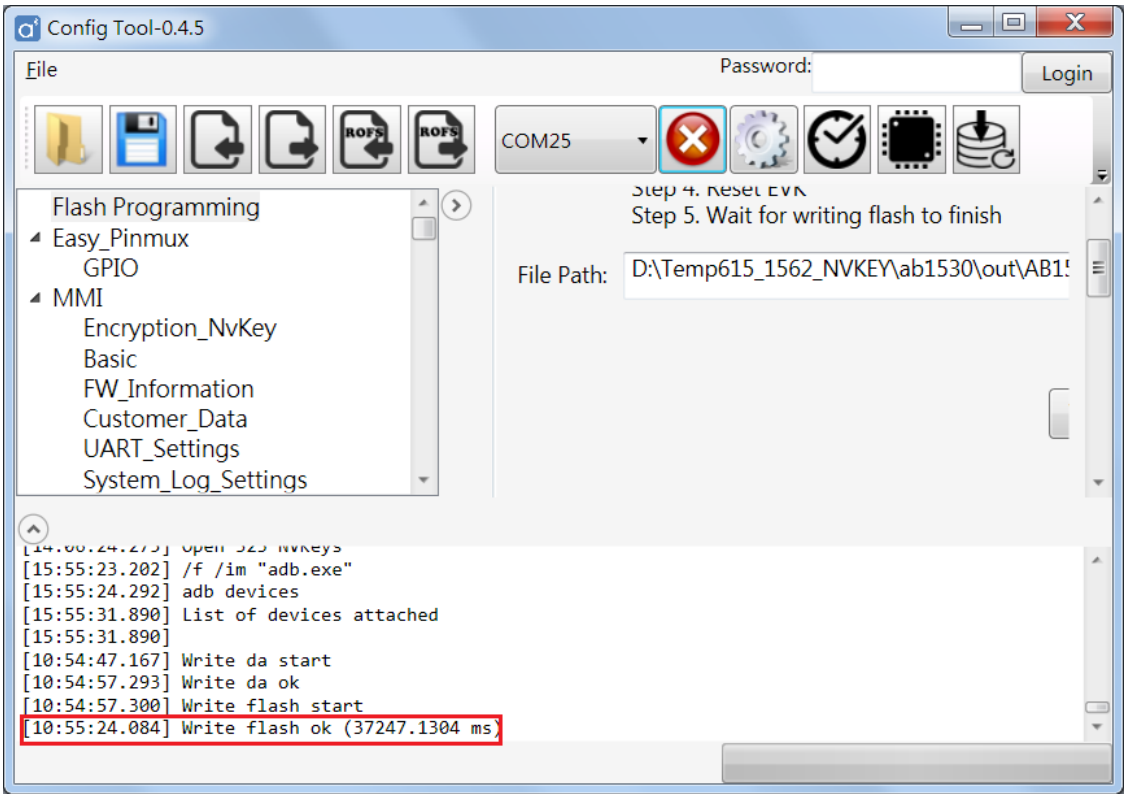

Figure 42. Flashing the image – download successfully

Note:

Added FW and IC packaging consistency check, if inconsistency, it will cause errors and cannot be downloaded.

2.6. Running the project on the EVK

To run the project on the EVK:

1) Attach the adaptor to the board.
2) Switch to power ono mode.

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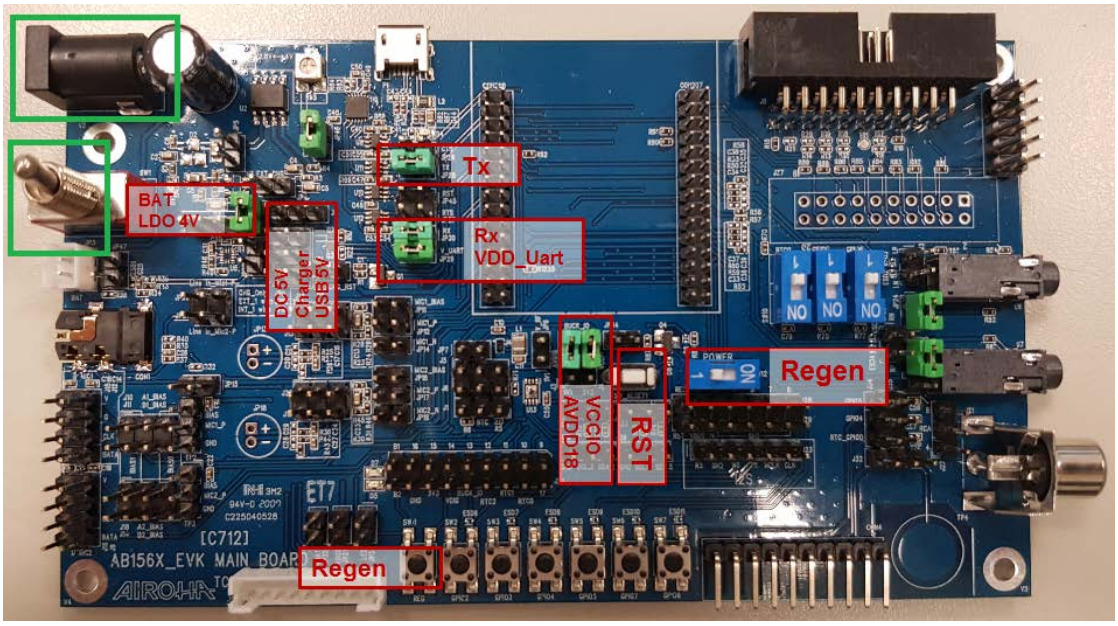

Figure 43. Running the project – hardware settings on AB156X_EVK when running the project

3) Press the RST button first and long press the REGEN button for 5 seconds to reboot the board.

4) Wait for the board to boot up. There are then three methods for checking whether the board boots.

   - LED display: LED D5 blinks 3 times
   - Plug an earphone into Audio Jack L (as shown as below). You can hear the voice prompt when the board boots up.

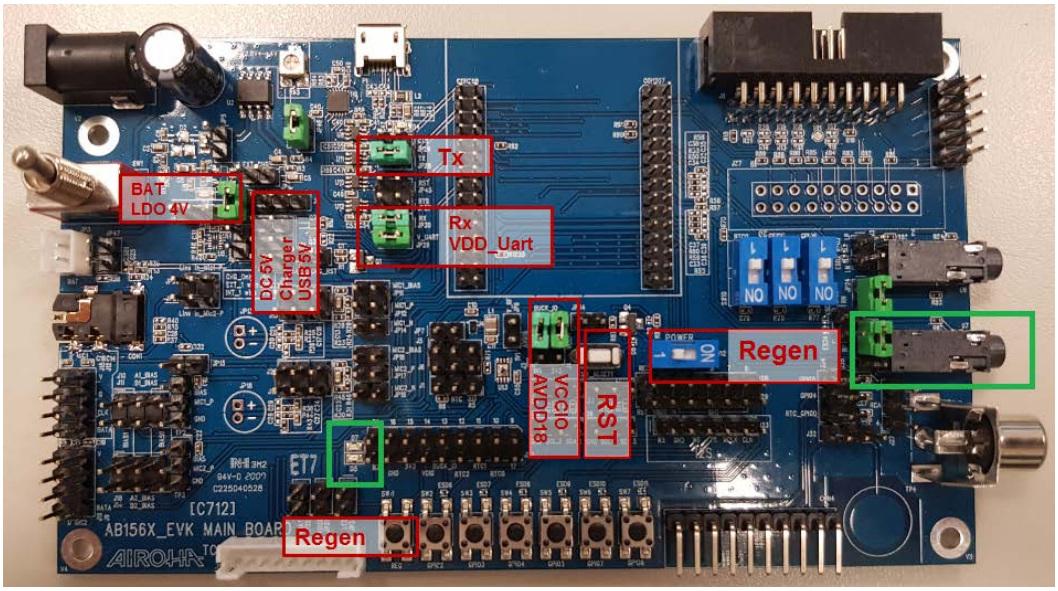

Figure 44. Running the project – voice prompt

   - Observe the log with **Config Tool**.

5) To view the system log, you can complete the following procedure:

   - Open the **Airoha.UI.View** application and select **Config Tool**.

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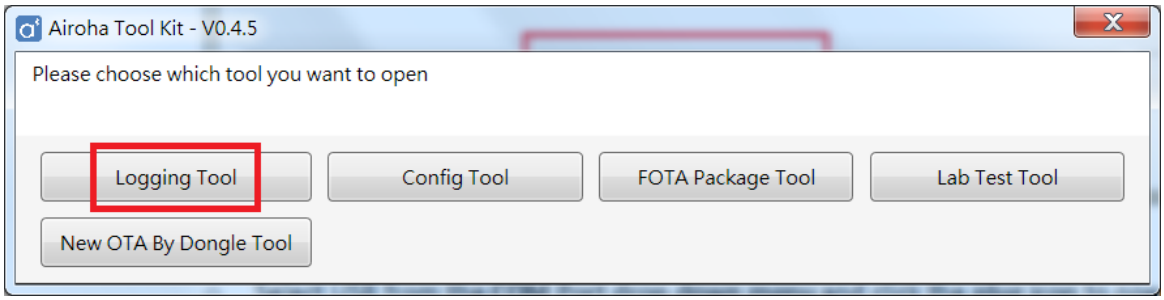

Figure 45. Running the project – tool selection

o Select USB from the **COM Port drop** down menu, select the right red box icon to select the right log bin, and click the plug icon to open the com port.

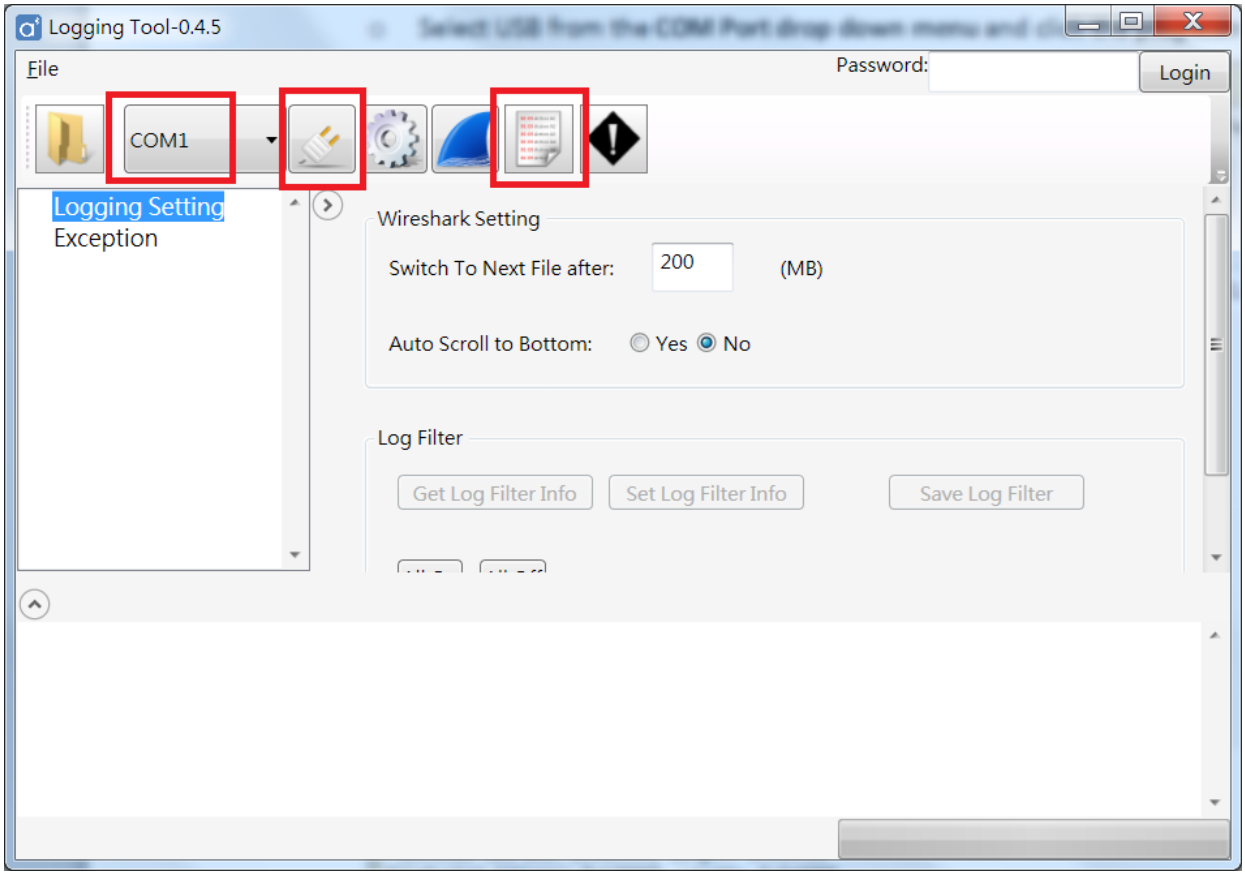

Figure 46. Running the project – select and open the COM Port

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- Click the blue icon to open Wireshark. You can now see the system log.

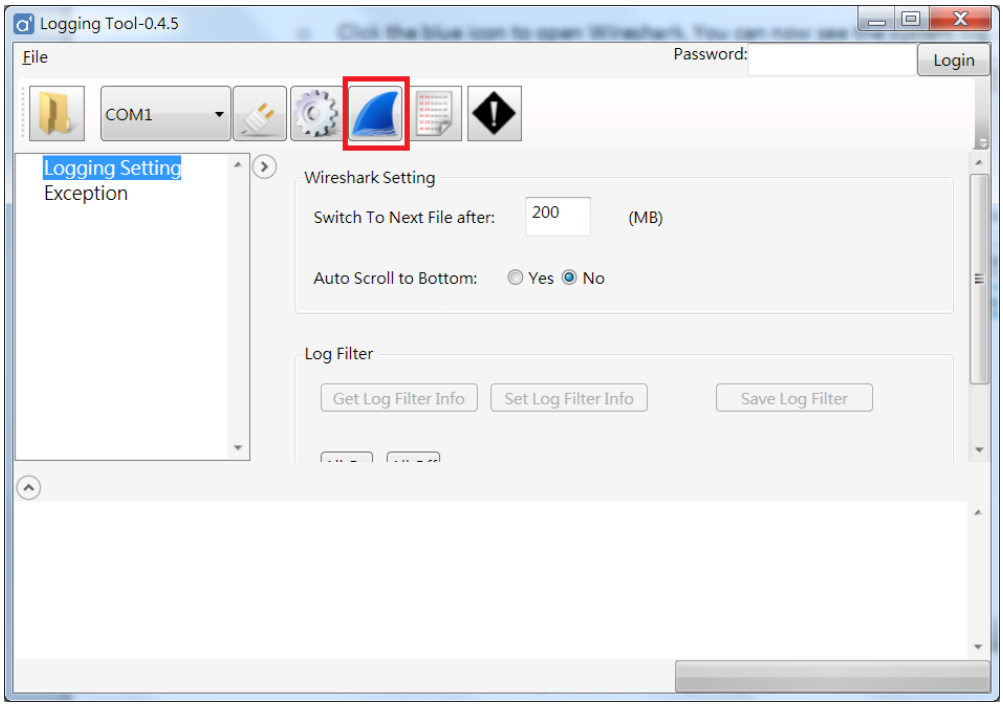

Figure 47. Running the project – open Wireshark

2.7. Debugging with the EVK from Microsoft Windows

This section describes the ICE hardware setup and the Xtensa Xplorer operations related to the debugging process. You must have the following hardware items to set up the Hardware:

- A JTAG enabled debug pod, such as Flyswatter2. (http://www.tincantools.com/JTAG/Flyswatter2.html)

Attach the adaptor to the board and switch to power on mode.

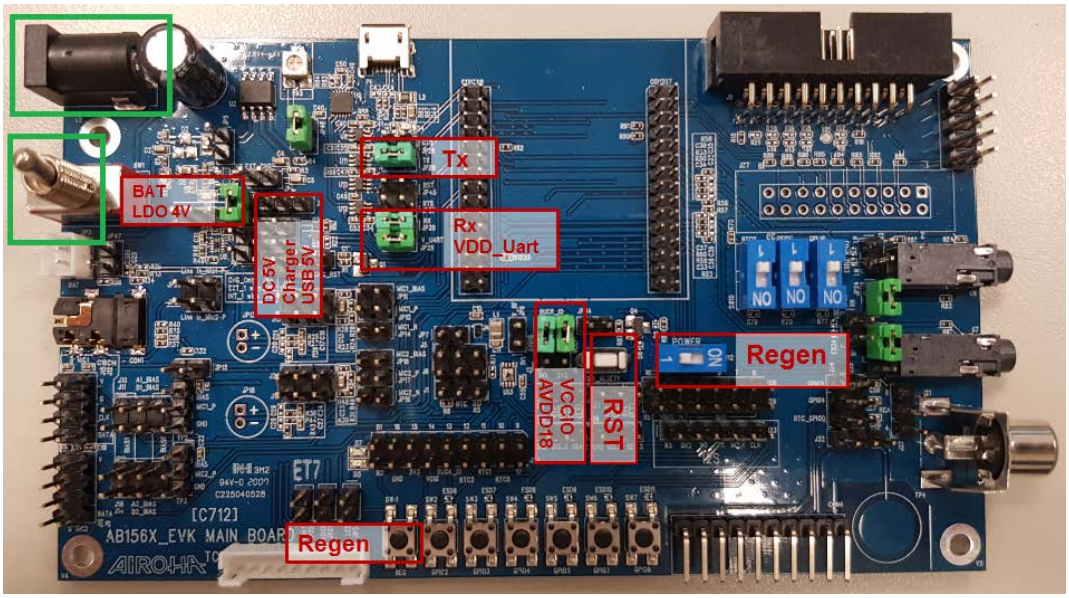

Figure 48. Debugging with the EVK – hardware settings

The following image shows the connection between ICE and the debugging board.

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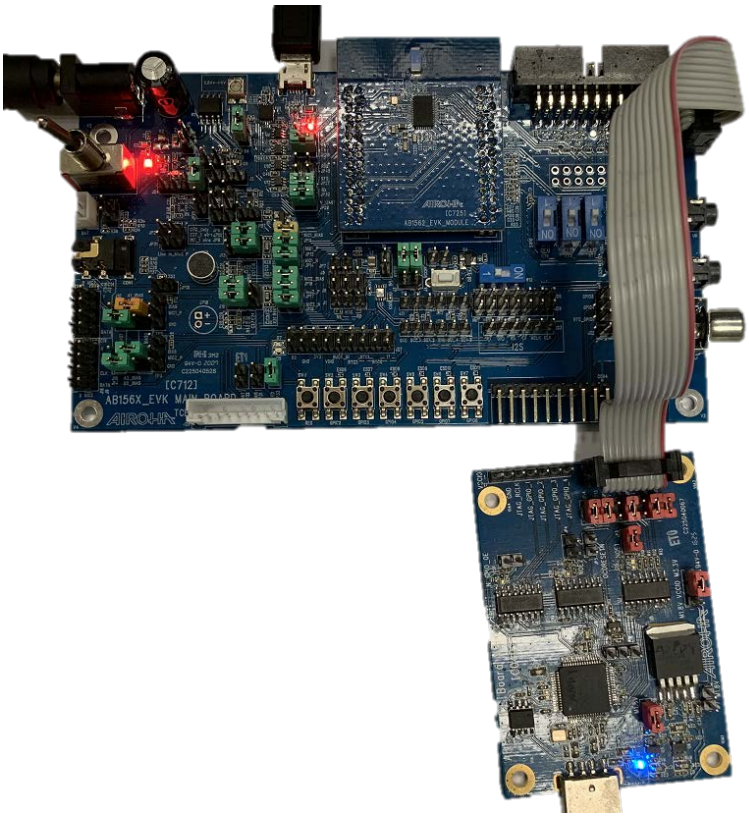

Figure 49. Debugging with the EVK – connection between ICE and the debug board

These hardware settings put AB1561_AB1562_AB1563 into the waiting for ICE downloading status.

1) Open Xtensa Xplorer and use C:\usr\xtensa\Xplorer-8.0.9-workspaces\workspace as the workspace path.

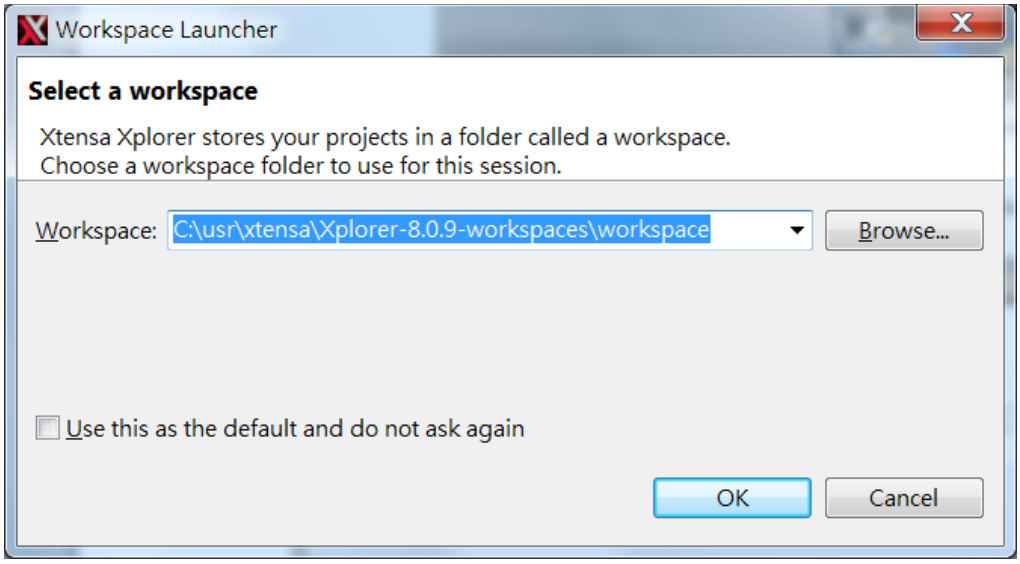

Figure 50. Debugging with the EVK – select a workspace

2) Click the button at the top of the window to change to the Debug perspective.

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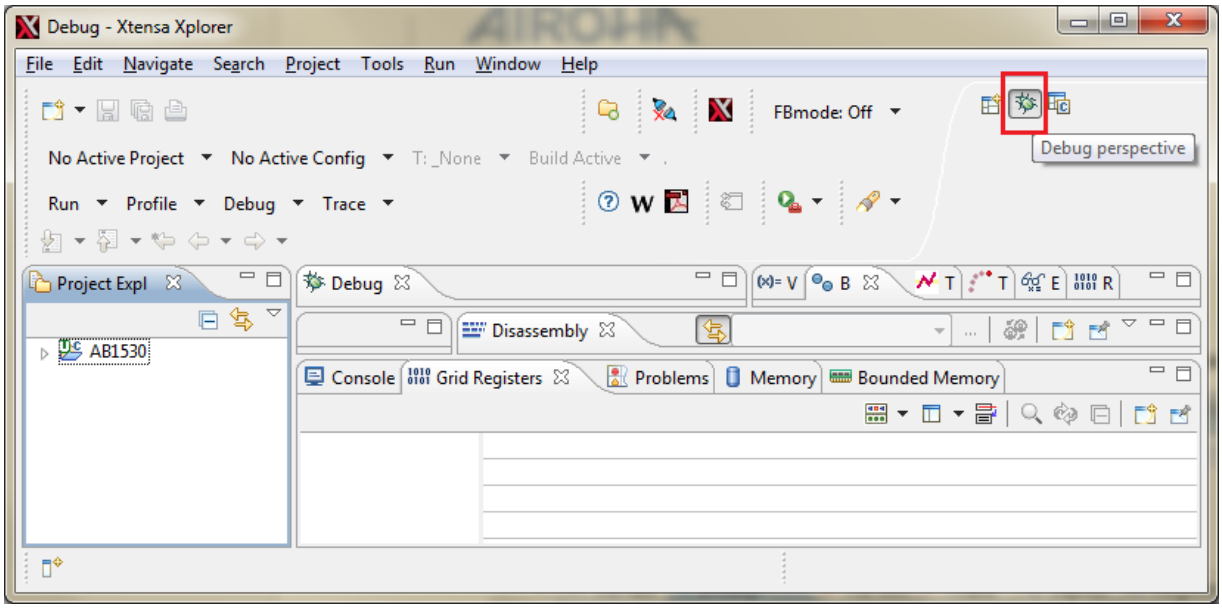

Figure 51. Debugging with the EVK – click Debug perspective

3) Select Debug > **Debug Configurations** to set debug configurations.

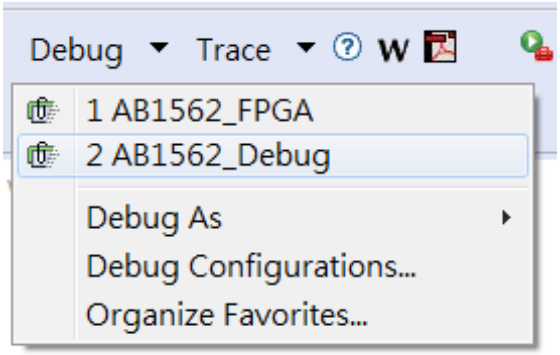

Figure 52. Debugging with the EVK – select Debug Configurations

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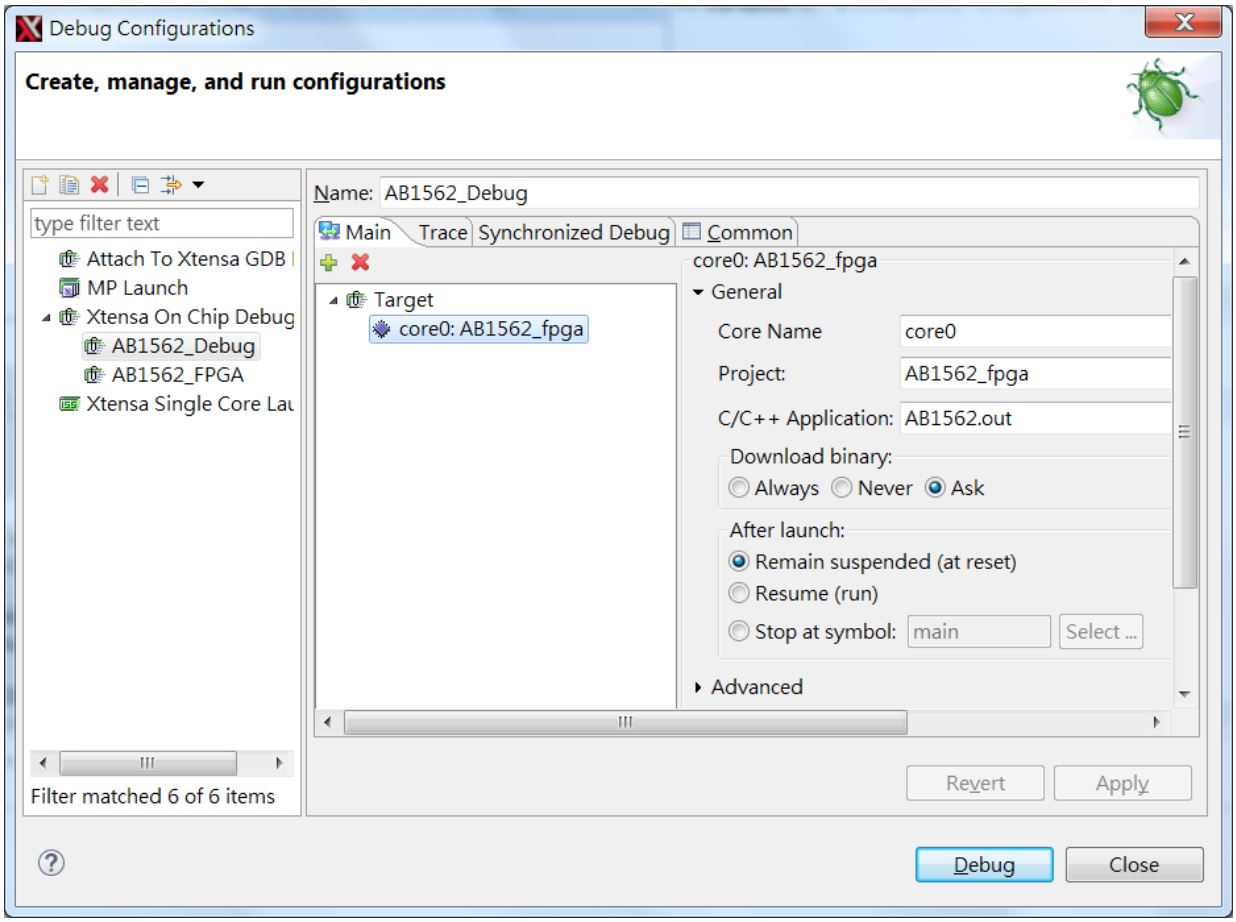

Figure 53. Debugging with the EVK – set AB1561_AB1562_AB1563 Debug Configurations

4) Press **REGEN** and **RST** button on the board, then select Debug > **AB1561_AB1562_AB1563_Debug** to start debugging. You must make sure that your image for the board is the same location as your project for debugging. If you are not sure, you can use the Config Tool to flash the image again.

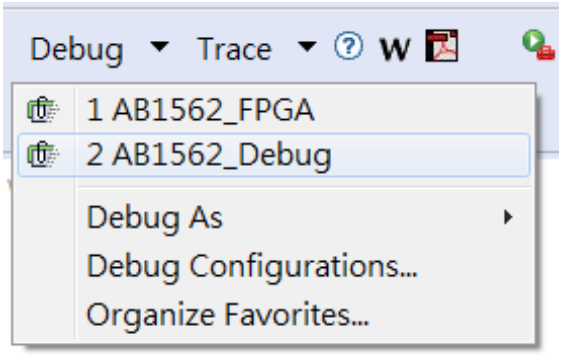

Figure 54. Debugging with the EVK – select AB1561_AB1562_AB1563_Debug

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When the load process is complete, it then waits at the reset vector address.

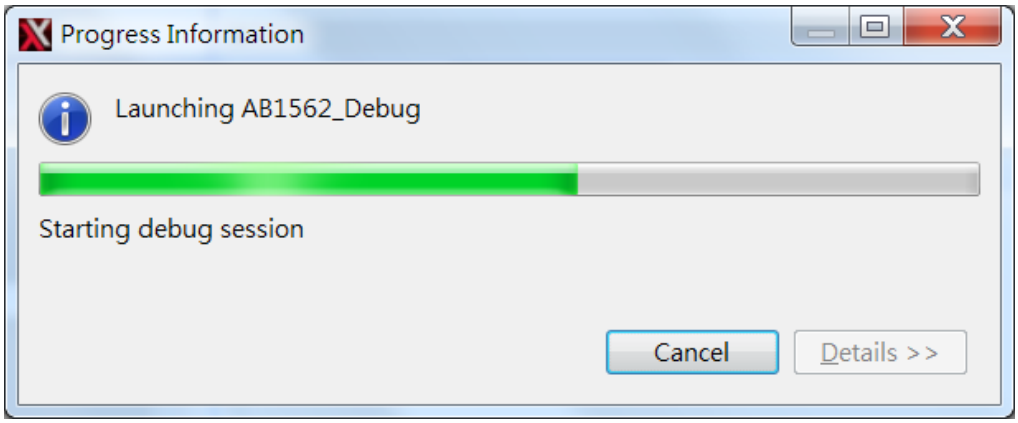

Figure 55. Debugging with the EVK – launching AB1561_AB1562_AB1563_Debug

5) Click Core Hardware Reset to all cores (RE-2012.0 or later hardware) to reset hardware settings.

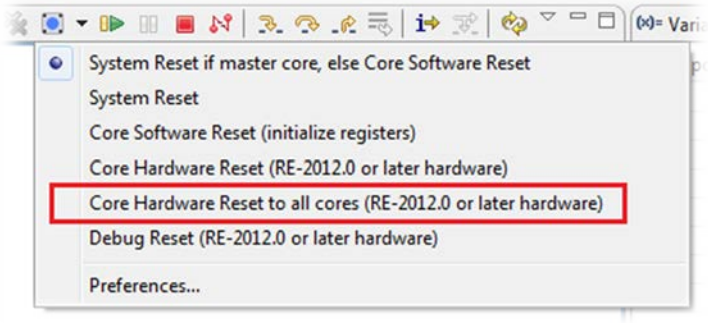

Figure 56. Debugging with the EVK – reset hardware settings

You can now start the debugging process.

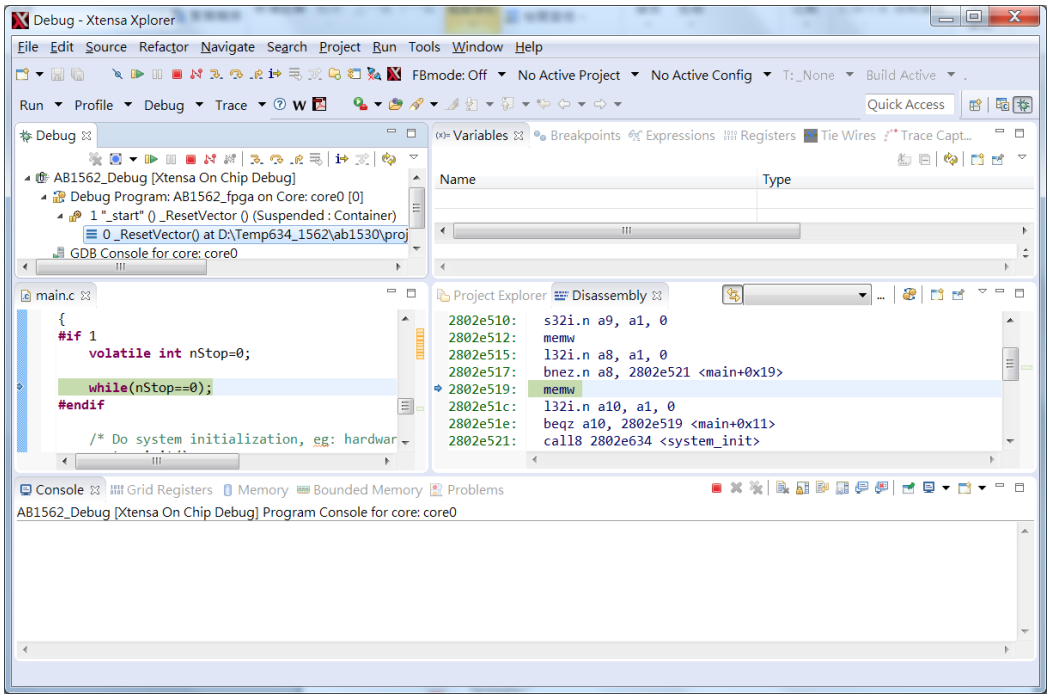

Figure 57. Debugging with the EVK – debug mode

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6) The following buttons are the primary buttons for controlling the debugging software.


Reset


Resume


Pause


Terminate

Note: If you click the Terminate button to terminate the debugging process, you must select Debug > AB1561_AB1562_AB1563_Debug to start the debugging process again.

To open a source file and set a breakpoint for debug:

1) Select **Open File**... on the **File** menu.

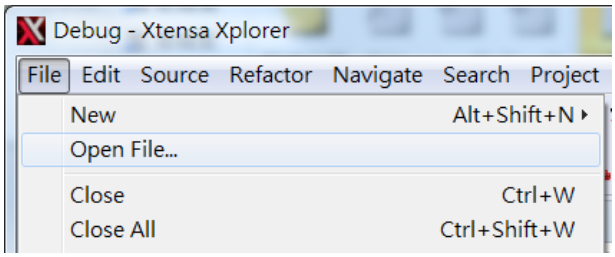

Figure 58. Debugging with the EVK – open file for debug

2) Move the cursor to the left boundary of the line where you want to set the breakpoint.

3) Right-click where you want to set the breakpoint and select **Toggle Hardware Breakpoint**.

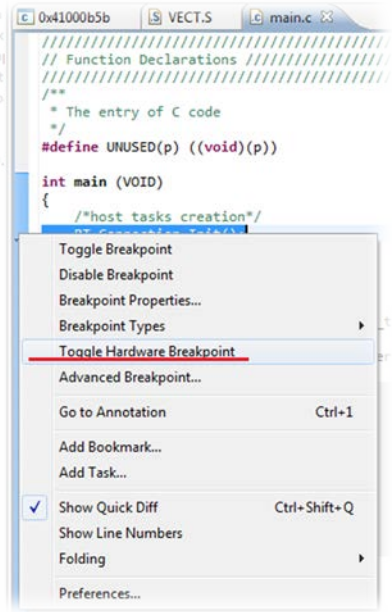

Figure 59. Debugging with the EVK – toggle hardware breakpoint

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2.8. Building the project using the SDK

This section shows how to build a project.

1) Build the project using the script at <AB1561_AB1562_AB1563 SDK installation path>\<SDK version>**.Build_AB1561_AB1562_AB1563.bat**

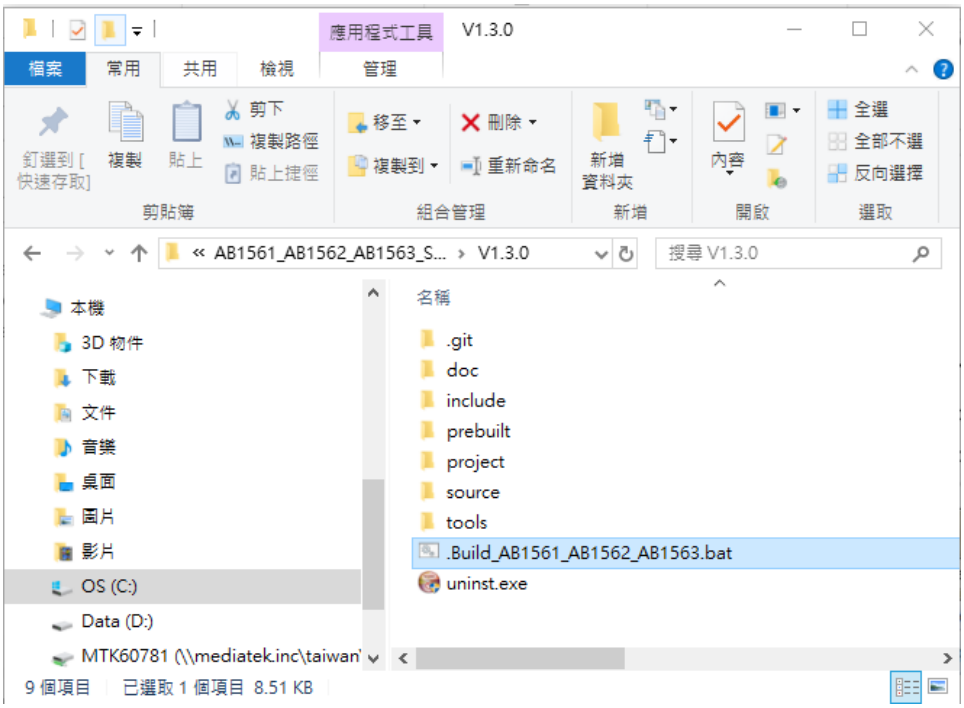

Figure 60. Script for build the project

2) Double-click ".Build_AB1561_AB1562_AB1563.bat" to execute the script.

Note: If you are not using default path (C:\usr\xtensa) to install Xtensa Xplorer, you must set the PATH and XTENSA_SYSTEM path here.

3) Select **1.Build**.

```
AB1562 Auto Build Script
1.Build
2.Clean
99.Exit
```

4) Select your target board.

```
Choose Target Board
1.AB1562
99.Exit
```

5) Select your application.

```
Choose Application
1.awsmce_ref_design
99.Exit
```

When you successfully complete the procedure, the results will generate in the out folder and separate by chips. The window will also show "Building Completed" as shown in the following image.

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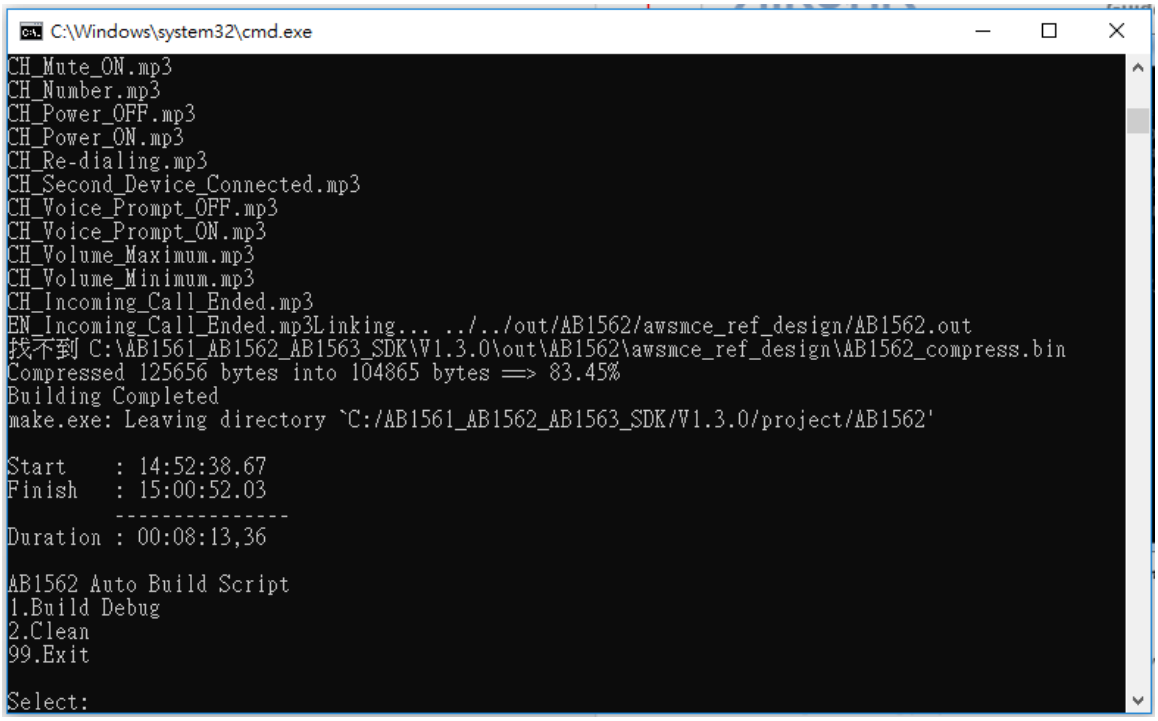

Figure 61. Building completed

2.9. Create your own project

This section shows how to use an existing project to create your own project.

2.9.1. Using an existing project

1) Copy an existed application folder in <SDK installation path>\<SDK version>\project\AB1562 to create your own project. This example project is called “your_application” as a reference.
2) Make any necessary changes to the source code in the new application folder.
3) Make any necessary changes to <SDK installation path>\<SDK version>\ AB1561_AB1562_AB1563.bat to add your application to the auto build script, as shown in the following images.

```
echo Choose Application
echo 1.awsmce_ref_design
echo 2.your_application
echo 99.Exit
```

```
IF "%select3%"=="1" (
xt-make -C .\project\AB1562 %target% %mode1% APP=awsmce_ref_design
APPROOTDIR=project/AB1562/apps/headset_ref_design %action%echo.
) ELSE IF "%select3%"=="2" (
xt-make -C .\project\AB1562 %target% %mode1% APP=your_application
APPROOTDIR=project/AB1562/apps/your_application %action%
echo.
```

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2.9.2. Add the source and header files

User defined project source and header files can be put under any folder.
To compile the added source code, simply add the .c source files to variable "C_SRC" in.source_app.mak file. The corresponding variables support compiling the source files of the module is C_SRC. This example used a project named host as a reference.
<SDK installation path>\<SDK version>\project\AB1561_AB1562_AB1563\apps\mcsync_ref_design\src\.source_app.mak

```
…
C_SRC           +=    \
$(addprefix src/APP/APP_System/APP_Pairing/, \
App_Pairing.c \
Pairing_NvkeyHandler.c \
)
…
C_SRC           +=    \
$(addprefix src/APP/APP_System/APP_RaceCmd/, \
App_RaceCmd.c \
App_RaceCmd_AudioBist.c \
App_RaceCmd_Anc.c \
App_RaceCmd_Connection.c \
App_RaceCmd_KeyCode.c \
…
)
…
```

To compile the added header code, simply add the header search path to the variable "APPINC" in the project .include.mak Makefile. The corresponding variable that support compiling the header files of the module is APPINC. This example uses a project named host as a reference.
<SDK installation path>\<SDK version>\project\AB1561_AB1562_AB1563\apps\mcsync_ref_design\src\ .include.mak

```
APPINC          +=  inc
APPINC          +=  src
APPINC          +=  src/APP
APPINC          +=  src/APP/APP_DspControl
APPINC          +=  src/APP/APP_DspControl/AudioDSP_A2dp
…
```

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