Keil MDK Configuration

User Guide

SUMMARY: This document provides the installation and configuration required to use Keil MDK for Atmosic ATM2/ATM3, ATM33/e, and ATM34/e Wireless SoC Series SDK on Windows OS.

Atmosic™

Keil MDK Configuration User Guide
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Acronyms and Abbreviations

Acronyms	Definition
ATM2	ATM2201 ATM2202 ATM2221 ATM2251
ATM3	ATM3201 ATM3202 ATM3221
ATM33	ATM3325 ATM3330
ATM33e	ATM3330e
ATM33/e	ATM33/ATM33e
ATM34	ATM3405 ATM3425
ATM34e	ATM3430e
ATM34/e	ATM34/ATM34e
EVB	Evaluation Board
EVK	Evaluation Kit
IDE	Integrated Development Environment
NVDS	Non-Volatile Data Storage
OTP	One Time Programmable
SDK	Software Development Kit
SWD	Serial Wire Debug

1. Overview

This document provides the installation and configuration required to use Keil MDK for the Atmosic SDK on Windows OS.

This document is applicable to:

- ATM2/ATM3 series
- ATM33/e series
- ATM34/e series

1.1 Prerequisite

1) Atmosic SDK 5.5 or later
2) ATM2/ATM3 Series Evaluation Kit or
3) ATM33/e Series Evaluation Kit or
4) ATM34/e Series Evaluation Kit

Note: For hardware setup details, please refer to the 3.1 Environment Setup section in the **IDE Auxiliary Flash Programming Tool User Guide** (listed in the References section) for more information.

See Table 1 for a list of applicable Evaluation Kits.

EVK	SoC Package	SoC Part Number	Kit Part Number
Evaluation Kit for ATM2202	40-pin 5x5 mm QFN	ATM2202	ATMEVK-M2202-02
Evaluation Kit for ATM2221	64-pin 6x6 mm DR-QFN	ATM2221	ATMEVK-M2221-02
Evaluation Kit for ATM2251	37L WLCP	ATM2251	ATMEVK-M2251-01
Evaluation Kit for ATM3201	40-pin 5x5 mm QFN	ATM3201	ATMEVK-M3201-02
Evaluation Kit for ATM3202	40-pin 5x5 mm QFN	ATM3202	ATMEVK-M3202-02
Evaluation Kit for ATM3221	64-pin 6x6 mm DR-QFN	ATM3221	ATMEVK-M3221-02
Evaluation Kit for ATM3325	40-pin 5x5 mm QFN	ATM3325-5DCAQK	ATMEVK-3325-QK

Evaluation Kit for ATM3325 w/ Extended Storage	40-pin 5x5 mm QFN	ATM3325-5LCAQK	ATMEVK-3325-LQK
Evaluation Kit for ATM3330	56-pin 7x7 mm QFN	ATM3330-5DCAQN	ATMEVK-3330-QN
Evaluation Kit for ATM3330e	56-pin 7x7 mm QFN	ATM3330E-5DCAQN	ATMEVK-3330e-QN
Evaluation Kit for ATM3405	40-pin 5x5 mm QFN	ATM3405-2PCAQK	ATMEVK-3405-PQK
Evaluation Kit for ATM3425	40-pin 5x5 mm QFN	ATM3425-2PCAQK	ATMEVK-3425-PQK
Evaluation Kit for ATM3430e	56-pin 7x7 mm QFN	ATM3430E-2WCAQN	ATMEVK-3430e-WQN

Table 1 - ATM2/ATM3, ATM33/e, and ATM34/e Evaluation Kits

5) J-Link Plus device (SWD Interface) with pin override support

   (Pin override is required for chip reset. Some J-Link models e.g. J-Trace do not support this feature and would get an error during the target init process.)

6) J-Link Software Pack

7) Keil MDK-ARM

8) Toolchain
   - SDK6.0.0: Arm GNU Toolchain 13.2.Rel1, built-in in Atmosic SDK Windows installer or
   - SDK5.x.0: Arm GNU Toolchain 10.3-2021.07, built-in in Atmosic SDK Windows installer

1.2 Limitations

Certain examples (e.g. extra_flash, bootloader, and ATM_MCUboot) cannot support Keil and other IDEs. Those examples are not the main application and their images would be programmed into different memory or partitions instead of the application partition in the Flash/RRAM. The bootloader and ATM_MCUboot (if USE_MCUBOOT=1 build option is included) would be built in the pre-build process of the Keil project of the other ATM33/e and ATM34/e examples.

- Limited SDK functionality in IDE

For the specific memory access functions (such as program OTP, pull firmware/NVDS/OTP, show NVDS/OTP data, etc.), please use the MSYS2 console in the SDK. Changing the J-Link driver for openocd use might be required for the functions needed to communicate with the device. Refer to Using J-Link Debug Probes with openocd section.

2. ATM2/ATM3 Series

2.1 Generate ATM2/ATM3 Keil Project

Please use the Atmosic IDE AUX Tool to generate the Keil project in SDK. Refer to the **How to Generate IDE project** section in the **IDE Auxiliary Flash Programming Tool User Guide** (listed in the References section) for more information.

Open the Keil project in the following paths to start the development in Keil.

- GCC toolchain:
  <ATM_SDK>\platform\atm2\ATM22xx-x1x\examples\<APP>\keil_gcc

2.2 Build and Program Examples

1) Program Flash NVDS data for each example (refer to Flash NVDS Writer section).

2) Edit/Compile/Program/Debug Code at Keil IDE, see Figure 1 and Figure 2.

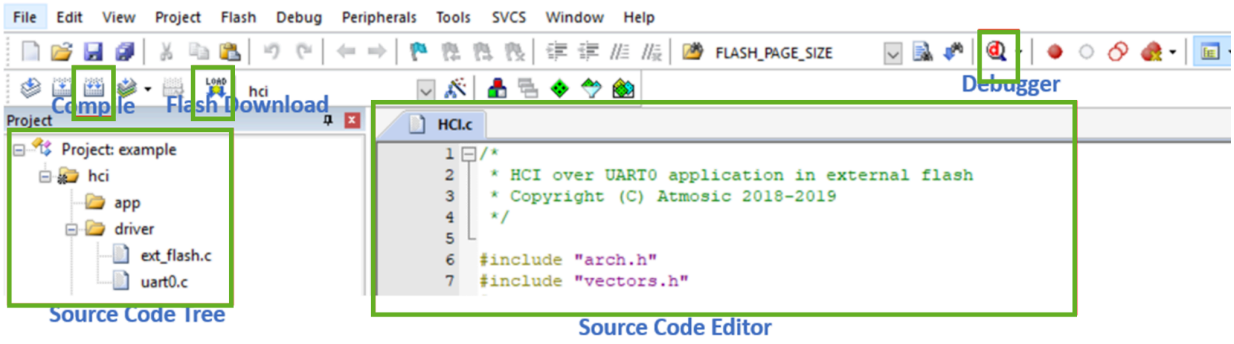

Figure 1 - Keil MDK IDE GUI

3) Run-time debugger

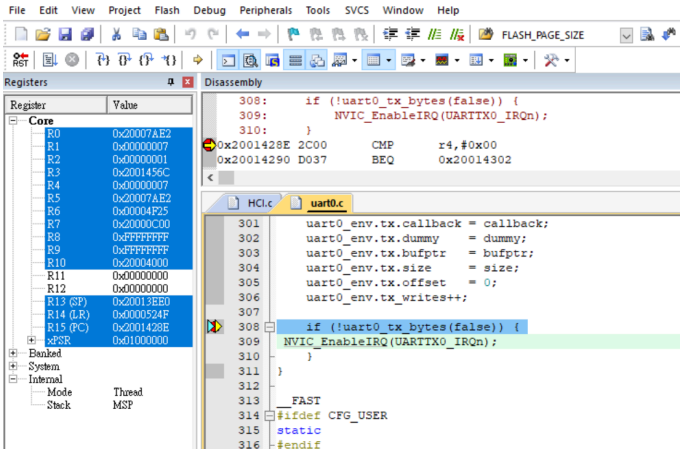

Figure 2 - Debug Session

2.2.1 Compiler Setting

Go to `Manage Project Items` >> `Folder/Extensions` to check which compiler is used.

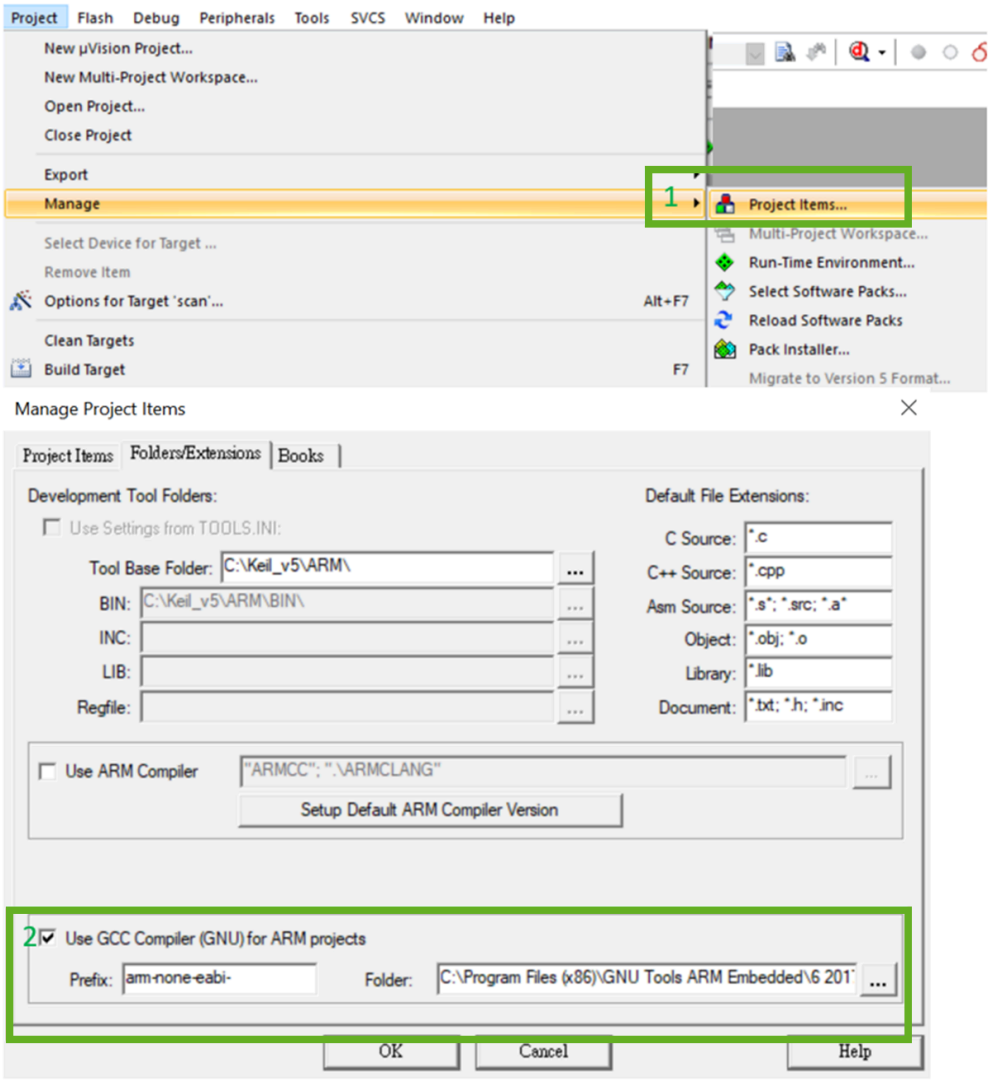

Figure 3 - Check Compiler

2.2.2 Flash Programming Algorithm

Go to `Options for Target >> Debug >> J-LINK / J-TRACE Cortex Settings >> Flash Download` to check the Flash Programming Algorithm setting. It shall be `ATMx2 Flash` for ATM2/ATM3 devices.

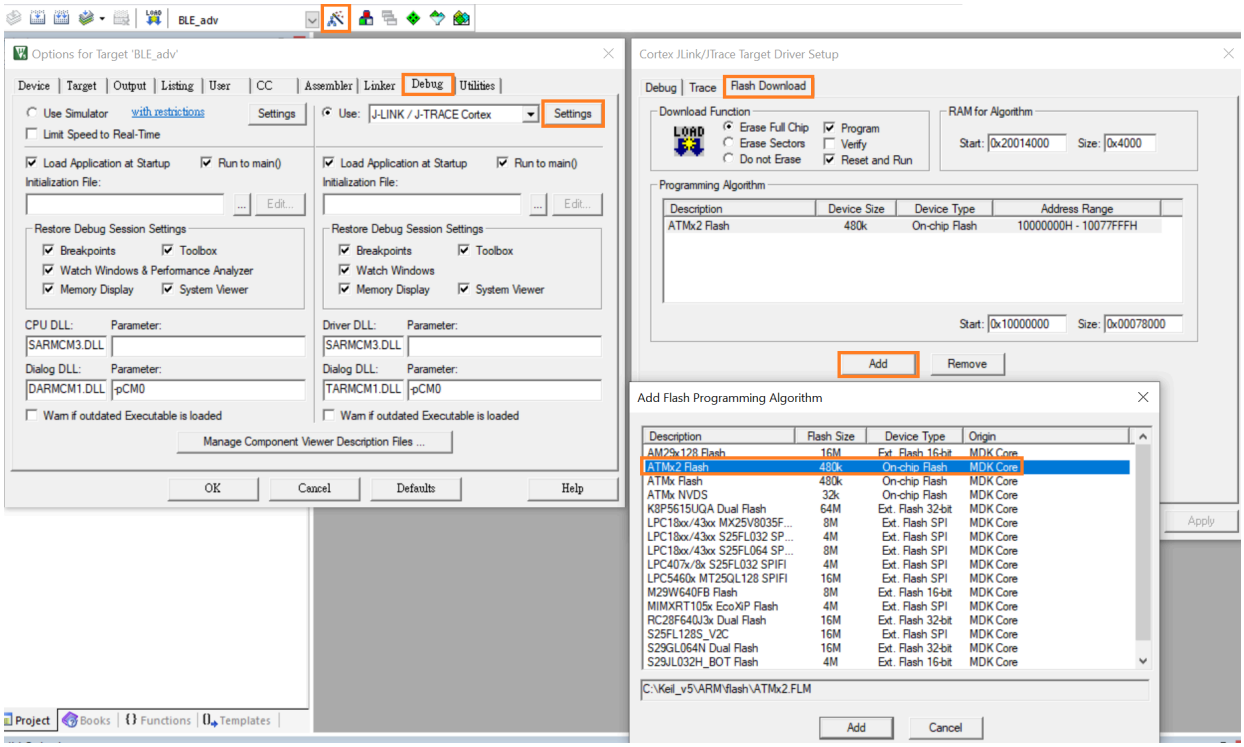

Figure 4 - Check Flashloader

2.3 Release Build

1) Open the `Options of Target` dialog of Keil IDE and select the CC tab page
2) Remove `CFB_DBG` of `Preprocessor Symbols Define`
3) Modify compile options (Misc Controls): remove `-g3` and use `-flto`
4) Open the `Option for Target` dialog of Keil IDE and select the Linker tag page. Add compile option (Misc Controls): `-flto`

2.4 Flash NVDS Writer

The corresponding NVDS data (flash_nvds.bin) would be built with the Keil project generating make command (keil_gcc_gen) and applying the NVDS-related make options to the NVDS bin file. To program NVDS data, click `Flash NVDS Writer` in the Tools menu or execute the atmosic_nvds.bat batch file in the Keil project folder. This batch file is added to Keil's customized tools menu in the SDK installation as Figure 5.

To update NVDS data in the Keil project, please refer to the **How to Modify NVDS Setting** section in the **IDE Auxiliary Flash Programming Tool User Guide**.

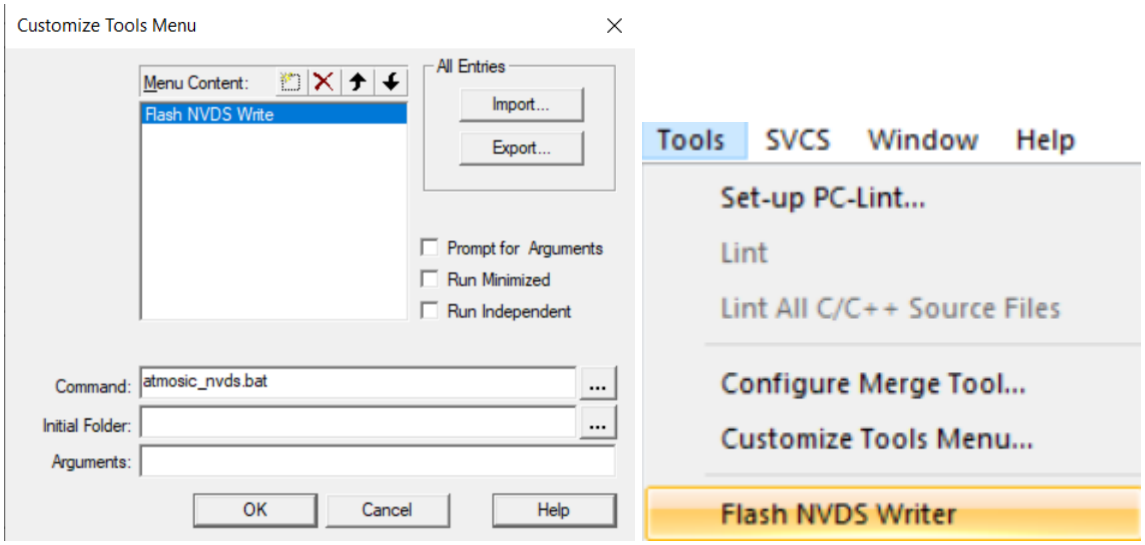

Figure 5 - Customize Tools Menu

2.5 Using J-Link Debug Probes with Openocd

The Atmosic SDK toolchain consists of many makefile targets. It can be used on J-Link Debug Probes just as the Atmosic Interface Board's SWD interface. "Zadig" can be used to replace the J-Link driver for the WinUSB driver.

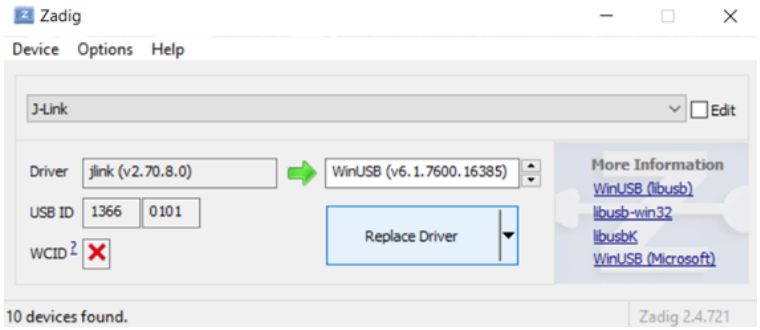

Figure 6 - Zadig Driver Replacement

After successful installation, J-Link device configuration will move to "Universal Serial Bus devices"

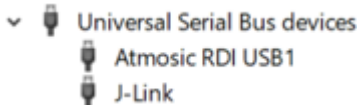

Figure 7 - Zadig Driver Installation Successfully

The usage of Makefile helper targets is the same, just appends “SWDIF=JLINK” for each command. (for example: make run_all **SWDIF=JLINK**)

3. ATM33 or ATM34 Series

3.1 Generate ATM33 or ATM34 Keil Project

Please use the Atmosic IDE AUX Tool to generate the Keil project in SDK. Refer to the **How to Generate IDE Project** section in **the IDE Auxiliary Flash Programming Tool User Guide** for more information.

Open the Keil project in the following paths to start the development in Keil.

- GCC toolchain:
  <ATM_SDK>\platform\atm33\ATM33xx-5\examples\<APP>\keil_gcc

  <ATM_SDK>\platform\atm34\ATM34xx-2\examples\<APP>\keil_gcc

3.2 Build Examples

1) Ensure the `J-Link driver` is showing in the Windows Device Manager under USB devices.

2) Edit and compile firmware in Keil IDE

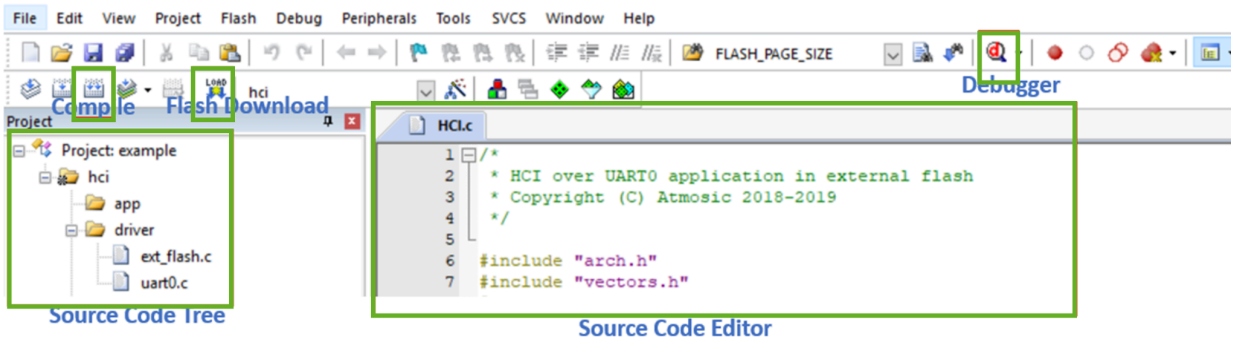

Figure 8 - Keil MDK IDE GUI

3.2.1 Compiler Setting

Go to `Manage Project Items` >> `Folder/Extensions` to check which compiler is used. See Figure 9.

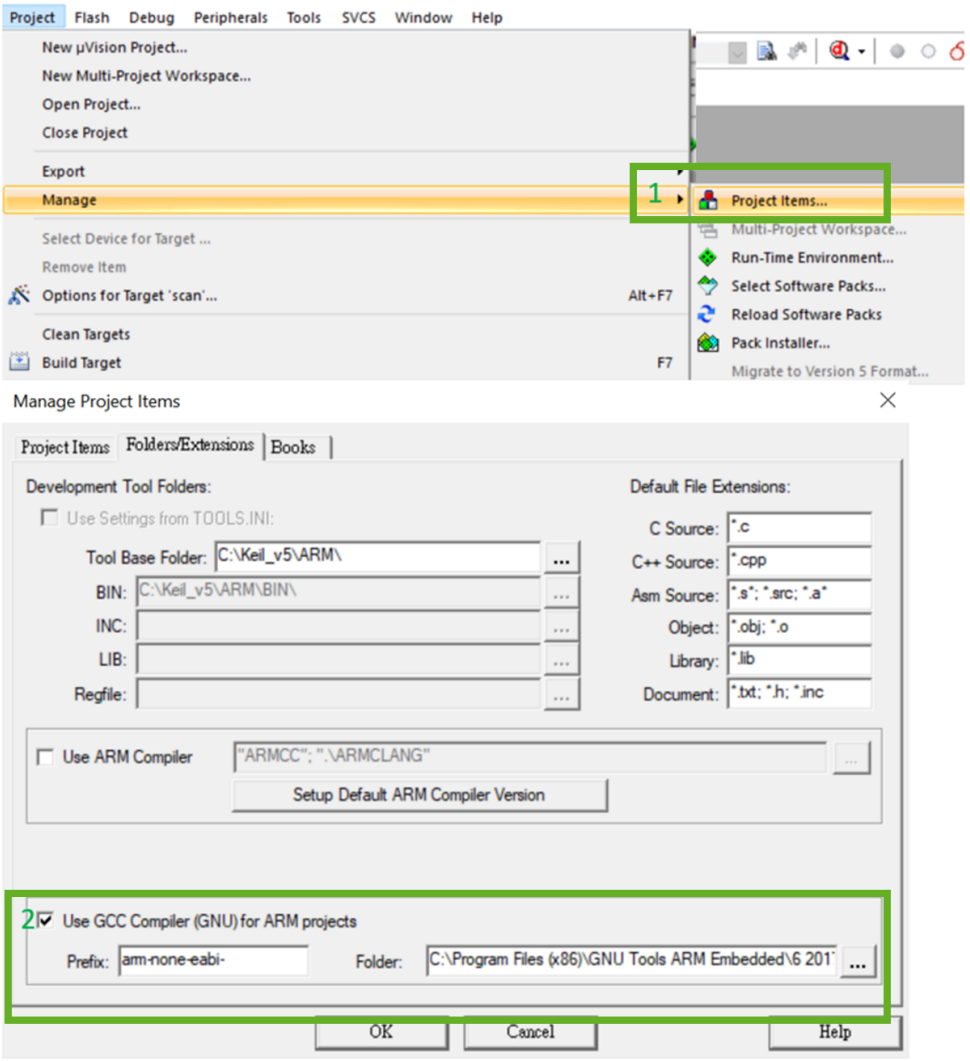

Figure 9 - Check Compiler

3.3 Firmware Download

Please use the Atmosic IDE AUX Tool to download the firmware into ATM33/e or ATM34/e devices. Refer to **How to Write Flash File to EVB** section in the **IDE Auxiliary Flash Programming Tool User Guide** for more information.

3.4 Release Build

Open the `Option of Target` dialog of Keil IDE

- CC tab:
    - Remove `CFB_DBG` in Preprocessor Symbols Define
    - Add `-flto` option in Misc Controls
- Linker tab:
    - Add `-flto` option in Misc Controls

3.5 Bootloader and NVDS

The corresponding NVDS data (flash_nvds.bin) would be built with the Keil project during the IDE project generation and applying the NVDS-related make options to the NVDS bin file. The pre-build process would build the bootloader and MCUboot (if OTA is enabled) binary files. To update NVDS data in the Keil project, please refer to the **How to Modify NVDS Setting** section in the **IDE Auxiliary Flash Programming Tool User Guide**.

Use IDE Auxiliary Flash Programming Tool to download bootloader, MCUboot, and NVDS into ATM33/e or ATM34/e devices.

3.6 Using J-Link Debug Probes with Openocd

Atmosic SDK toolchain consists of many makefile targets in MSYS2 to perform the functionalities for firmware development. It can be used on J-Link Debug Probes just as the Atmosic Interface Board's SWD interface. Uninstall the original J-Link driver first and then run Start Menu > AtmosicSDK > Install RDI Interface (<SDK_VERSION>).

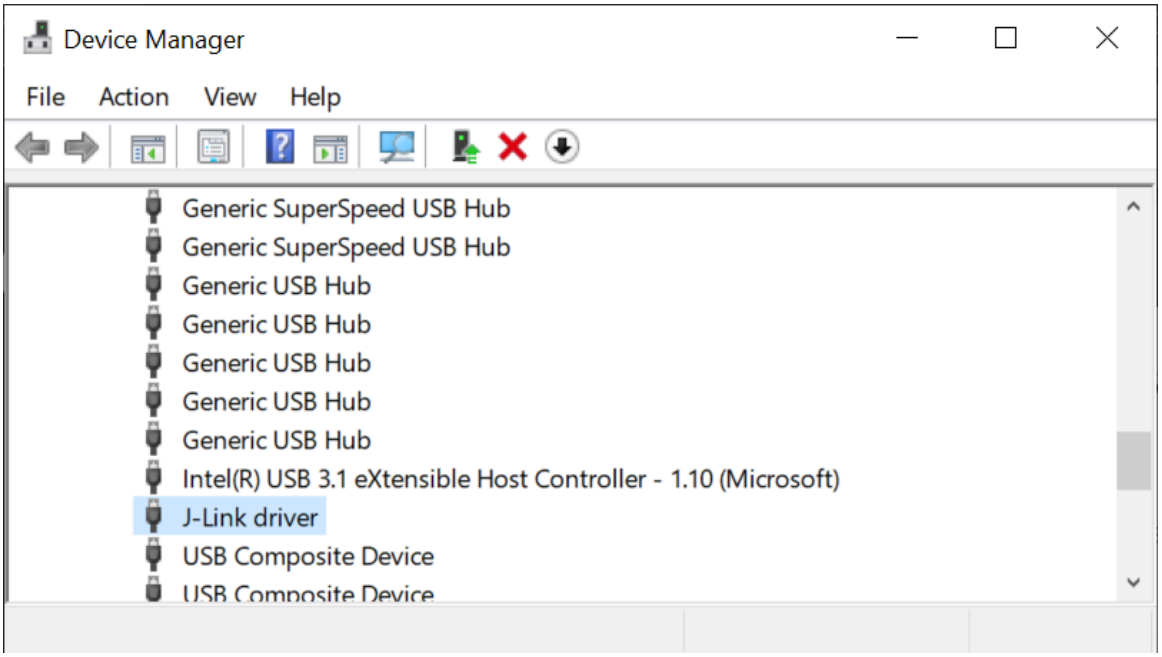

Figure 10 - Uninstall J-Link Driver

After successful installation, there would be a BULK interface in Universal Serial Bus devices.

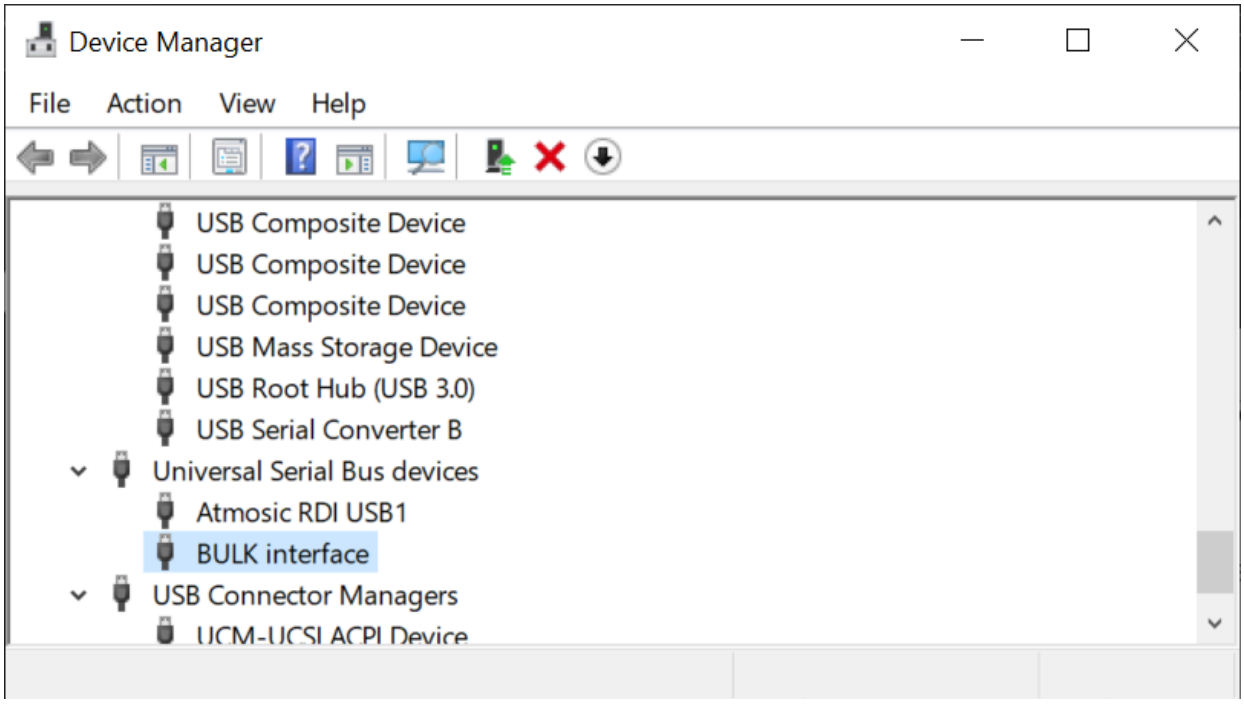

Figure 11 - BULK Interface Driver for Openocd Use in MSYS2

The usage of Makefile helper targets is the same, just appends `SWDIF=JLINK` for each command (for example: make run_all SWDIF=JLINK). `SWDIF=JLINK` is not required for ATM33/e or ATM34/e devices since Openocd uses J-Link to access ATM33/e or ATM34/e by default.

References

Title	Document Number
ATM33/e Series Evaluation Kit User Guide	ATM33_e-UGEVK
ATM34/e Series Evaluation Kit User Guide	6441-0063-0011
Atmosic SDK User Guide	6844-xxxx-xxxx
EVK User's Guide for ATMx221	ATMx221-UG
EVK User's Guide for ATMx301/ATMx202	ATMx201-UG
IAR Workbench User Guide	4247-xxxx-xxxx
IDE Auxiliary Flash Programming Tool User Guide	4381-xxxx-xxxx
SEGGER Embedded Studio User Guide	4286-xxxx-xxxx
Tool	**Link**
Arm GNU Embedded Toolchain built-in Atmosic SDK Windows installer	SDK 6.0.0: Arm GNU Toolchain 13.2.Rel1 SDK 5.5.0: Arm GNU Toolchain 10.3-2021.07
J-Link Software Pack	J-Link Software Pack
Keil MDK-ARM	Keil MDK-ARM

Revision History

Date	Version	Description
July 3, 2024	0.62	Updated for SDK 6.0.0.
July 19, 2023	0.61	Updated Table 1 - ATM2/ATM3 and ATM33/e Evaluation Kits, Prerequisite, ATM2/ATM3 Build and Program Examples, Flash NVDS Writer, ATM33 Build Examples, Release Build and Bootloader and NVDS sections. Added Generate ATM2/ATM3 Keil Project, Generate ATM33 Keil Project, and ATM33 Firmware Download sections. Renamed to Configuration User Guide.
May 13, 2022	0.60	Initial version created for SDK 5.1.0, which supports ATM2/ATM3 and ATM33 platforms.

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