

SEGGER Embedded Studio

User Guide

SUMMARY: SEGGER Embedded Studio (SES) is an Integrated Development Environment with project management tools and editor. This document provides the installation and configuration required to use SES for the Atmotic ATM2/ATM3/ATM33e/ATM34e Wireless SoC Series Software Development Kit (SDK).



Atmotic™

SEGGER Embedded Studio User Guide

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Acronyms and Abbreviations

Acronyms	Definition
ATMx2xx	ATM2201 ATM2202 ATM2221 ATM2231 ATM2251 ATM3201 ATM3202 ATM3221 ATM3231
ATM33	ATM3330 ATM3325
ATM33e	ATM3330e
ATM33/e	ATM33/ATM33e
ATM34	ATM3405 ATM3425
ATM34e	ATM3430e
ATM34/e	ATM34/ATM34e
BD	Bluetooth Device
EVK	Evaluation Kit
IDE	Integrated Development Environment
NVDS	Non-Volatile Data Storage
OB	On Board
OTP	One Time Programmable
SDK	Software Development Kit
SES	SEGGER Embedded Studio

1. Overview

This document provides the installation and configuration required to use SES with the Atmosic SDK. SES is a cross-platform IDE, which supports different operating systems.

This document is applicable to:

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

1.1 Prerequisite

- 1) Atmosic SDK 5.2 or later
- 2) ATM2/ATM3 Series Evaluation Kit or
- 3) ATM33/e Series Evaluation Kit or
- 4) ATM34/e Series Evaluation Kit

[Table 1](#) lists the 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) SEGGER J-Link Plus debug probes with pin override support
Note: Pin override is required for chip reset. Some J-Link models (e.g. J-Trace) do not support this feature and will generate an error during the target init process.
- 6) [SEGGER Embedded Studio](#) (version: V6.32 and older)
- 7) One of the following operating systems:
 - Windows 10, 11
 - macOS Monterey 12.5
 - Linux ubuntu 20.04.3 LTS

Refer to the [Reference Documents](#) section for a list of related documents, available on the Atmosic Support website. Please [submit a support request](#) for access credentials.

1.2 Compiler and Atmosic SDK support

- Compiler: Supports gcc toolchain only:
 The SES projects work with the specific GNU gcc toolchain version (13.2.Rel1) only.
- Atmosic SDK functionality:
 The SES projects support the building of the bootloader, example firmware, and NVDS data. For the other SDK makefile functions (such as program OTP, pull firmware/NVDS/OTP, show NVDS/OTP data, etc.), please use the MSYS2 console in the SDK.
 For ATM33/e and ATM34/e, changing the J-Link OB driver for openocd use might be required if accessing devices with openocd.

2. ATM2/ATM3 Series

2.1 Set Up Tool Chain

2.1.1 Set up the Atmosic SDK

Follow the Atmosic SDK Quick Start Guide to set up the SDK. Enter the make BOARD=<chip> run_all command in the command line to ensure that GNU/GCC can build an Atmosic SDK example, then download the example image into the Atmosic Evaluation Board.

2.1.2 Install SEGGER Tools

Plug the SEGGER J-Link debug probes into your laptop or PC and install the most recent release of the SES. Please make a note of the SES installation destination path in the setup wizard. This path is required to put the J-Link flash loader file. Please also make sure the J-Link driver is installed correctly.

2.2 Create SES Application Project

Please refer to the IDE Auxiliary Flash Programming Tool User Guide to generate the project file with the IDE auxiliary tool. You will see a new folder named ses. This is the SES project file for this example.

2.3 Compile Application

Compile the application from the SES project

- 1) Open your project in SES
SES projects are located in the ses subfolder of the example, such as

**SDK_root\platform\atm2\ATM22xx-x1x\examples\BLE_adv\ses\example
.emProject**

- 2) Select Build>Build example

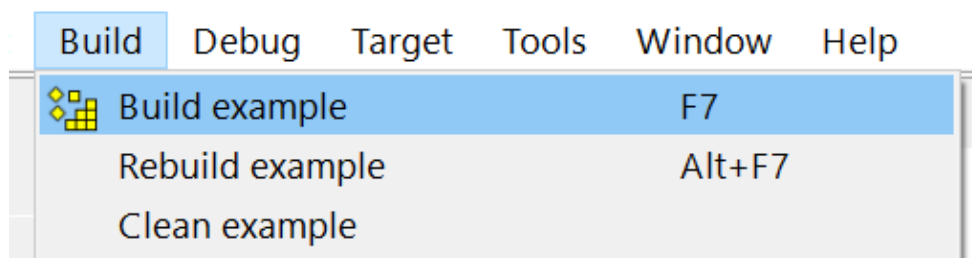


Figure 1 - Build Example

Make sure that there are no build errors. The output should look similar to [Figure 2](#):

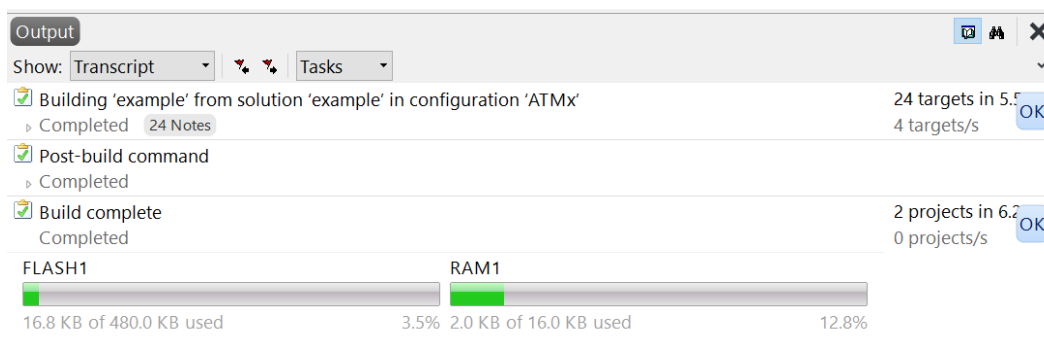


Figure 2 - Build Output with No Errors

The GNU/GCC toolchain will use Atmosic SDK's path for SES by default. If users want to modify the toolchain path, users need to modify it in SES ID, see [Figure 3](#). To get to this UI, select Project -> Options.

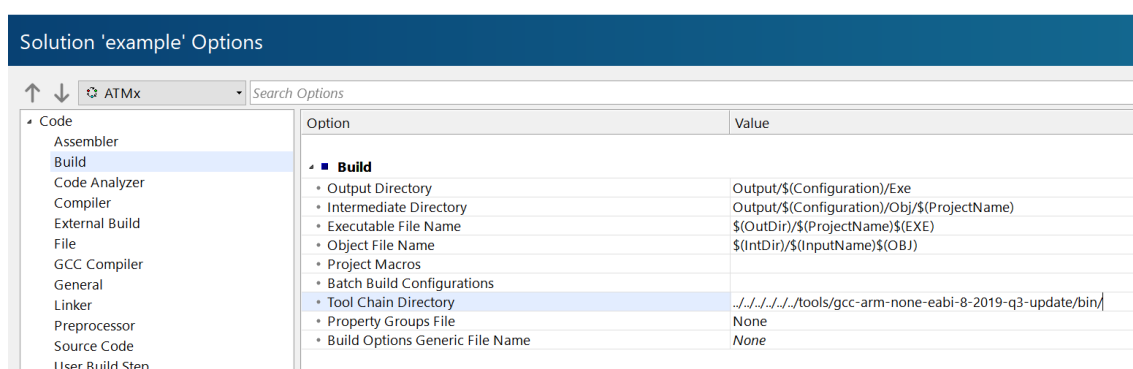


Figure 3 - Tool Chain Directory

Users also need to modify the post-build script named postbuild.js in the ses folder.

2.4 Program Firmware (IDE Auxillary Flash Programming Tool)

2.4.1 Hardware Setup

Connect J-link debug probes through the Atmosic Interface Board (part of the ATM2/ATM3 evaluation kit) and Atmosic IO Adapter Board (ATMIAB).

J-Link debug probes will not provide power to the interface board. Please plug the USB cable into USB1 of the EVK to supply the power.

- 1) Connect the USB cable to USB1 of the EVK
- 2) Remove jumper for P32 on J3 header (J3 is Boot Mode connector, see item 5 in [Figure 4](#))

- 3) Remove jumper for SWD (see items 3 and 4 in [Figure 4](#))
- 4) Connect Jlink adapter board (see item 1 in [Figure 4](#))

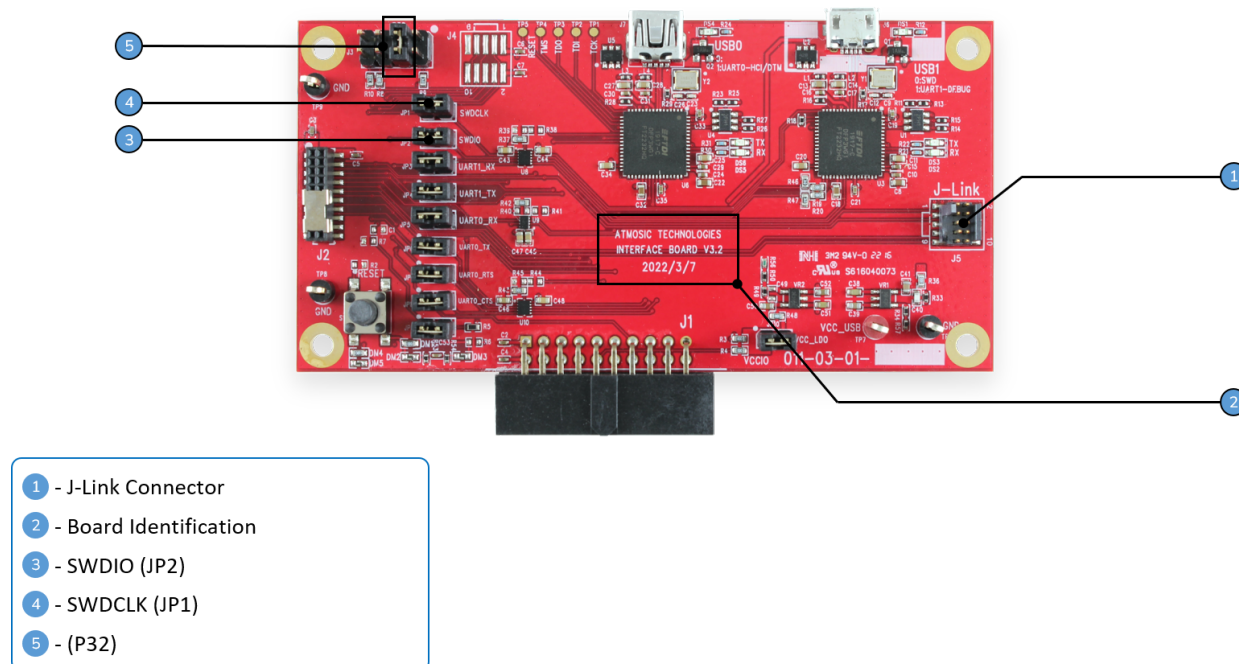


Figure 4 - Atmosic Interface Board V3.x

The Atmosic I/O Adapter Board is shown in [Figure 5](#).

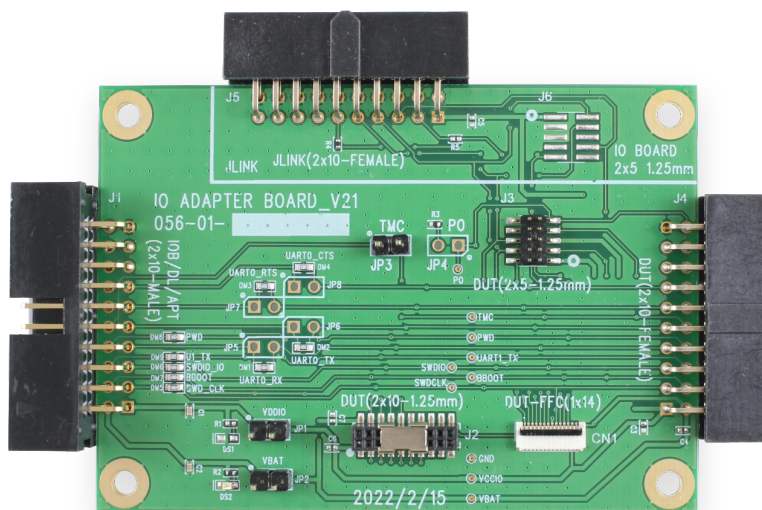


Figure 5 - Atmosic I/O Adapter Board

Figure 6 shows the connection for the Atmosic interface board, I/O adapter board, and J-Link probes.

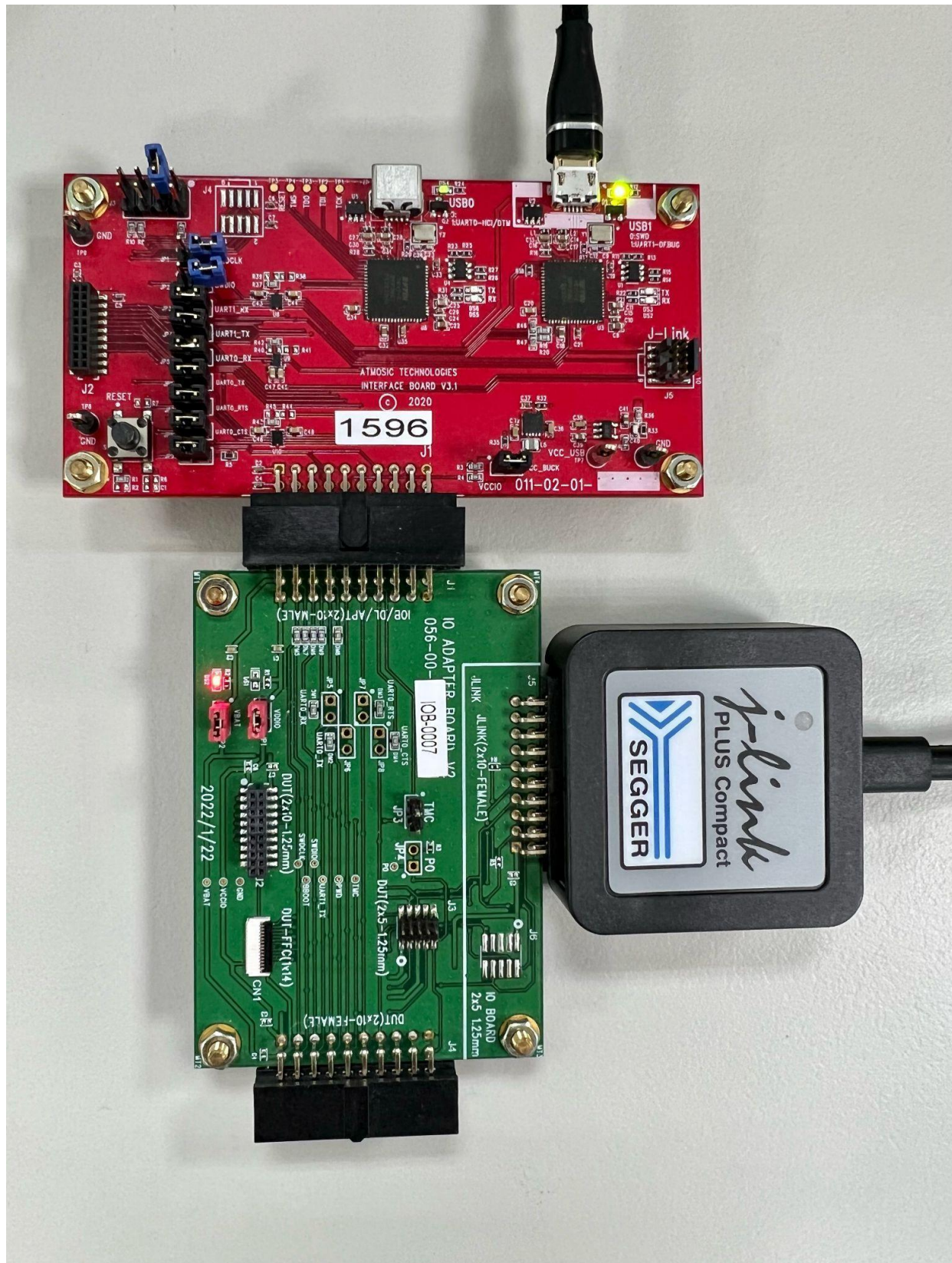


Figure 6 - Atmosic Interface Board with I/O Adapter Board, J-Link Probes

Refer to the Install J-Link section of the **IDE Auxiliary Tool User Guide** for more information.

2.4.2 Download Firmware and Flash NVDS

After building successfully, please download FW and NVDS with the IDE Auxiliary Flash Programming tool. For more details, please refer to the IDE Auxiliary Flash Programming tool User Guide.

2.5 Debug

You must set up a J-Link debugging session. SES has an integrated debugger that can be to step through your application. Select Debug>Go

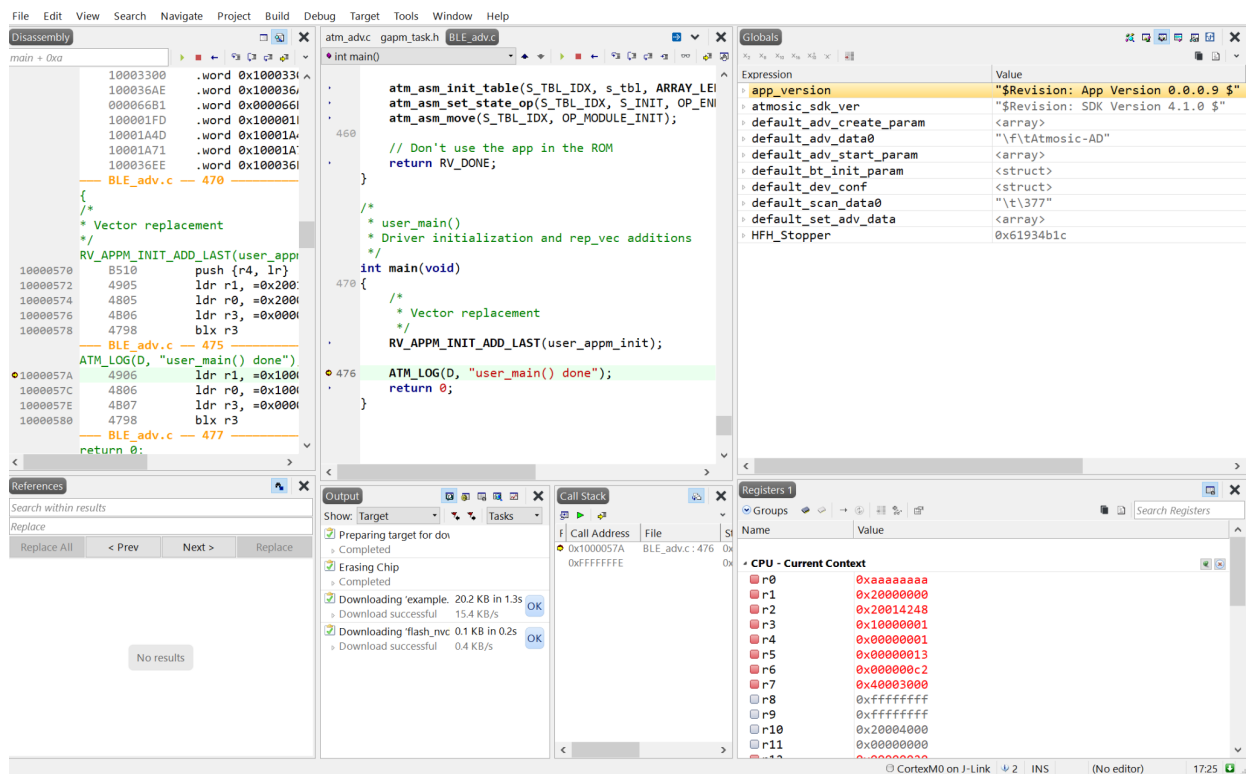


Figure 7 - SES Debug Session Windows

3. ATM33/e and ATM34/e Series

3.1 Installation

3.1.1 Hardware Setup

Connect the Micro-B USB cable to the ATM33/e Evaluation Board. See [Figure 8](#).

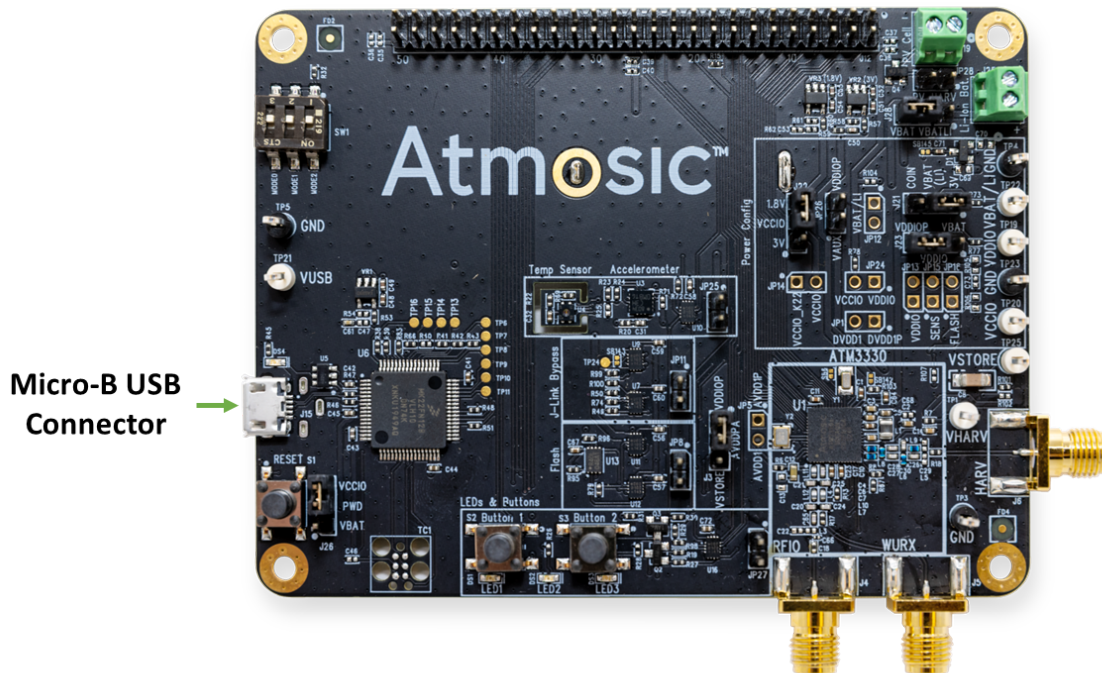


Figure 8 - ATM33/e Evaluation Board

3.1.2 Setup Driver and Environment Setting

- Linux/macOS

- 1) Setup IDE environment

Replace `[ATM_SDK]` name with the actual installation folder name of Atmosic SDK

- a) Install GNU Arm Embedded Toolchain, Version 13.2.rel1 to `[ATM_SDK]\tools\`

Please refer to README/README.macOS for the related version.

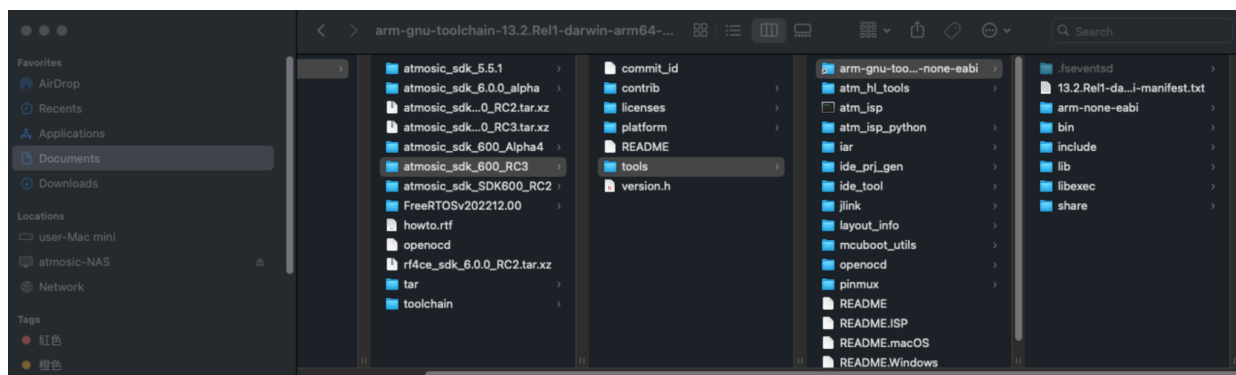


Figure 9 - Install Toolchain to SDK/tools Folder in macOS

2) Install SEGGER Embedded Studio

• Windows

- 1) Confirm J-Link driver is showing in Windows Device Manager. If the SDK RDI driver is installed, it would display as “BULK interface” and not the J-Link driver. Please remove the BULK driver with the below steps.

a) Find the BULK interface in the Device Manager

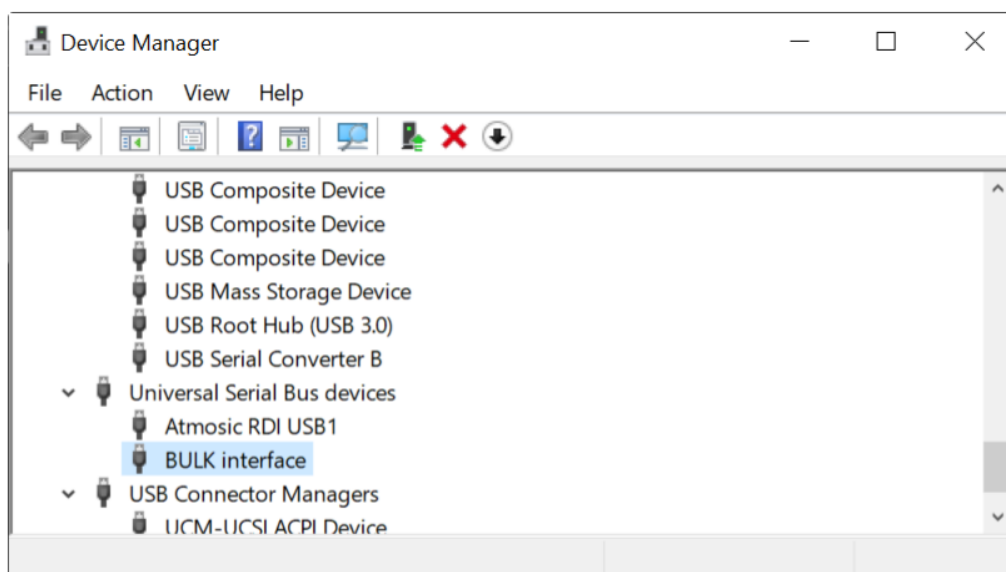


Figure 10 - BULK Interface

- b) Uninstall the BULK interface device. Press the right mouse button and select uninstall.

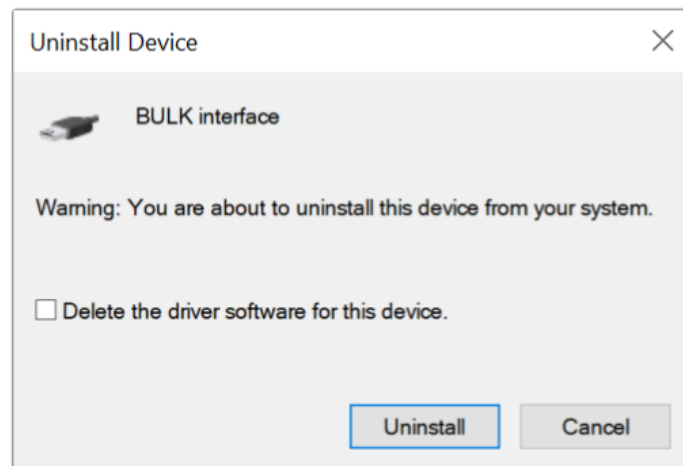


Figure 11 - Uninstall BULK Interface

- c) Click the Scan for hardware changes icon and the J-Link driver will be installed automatically

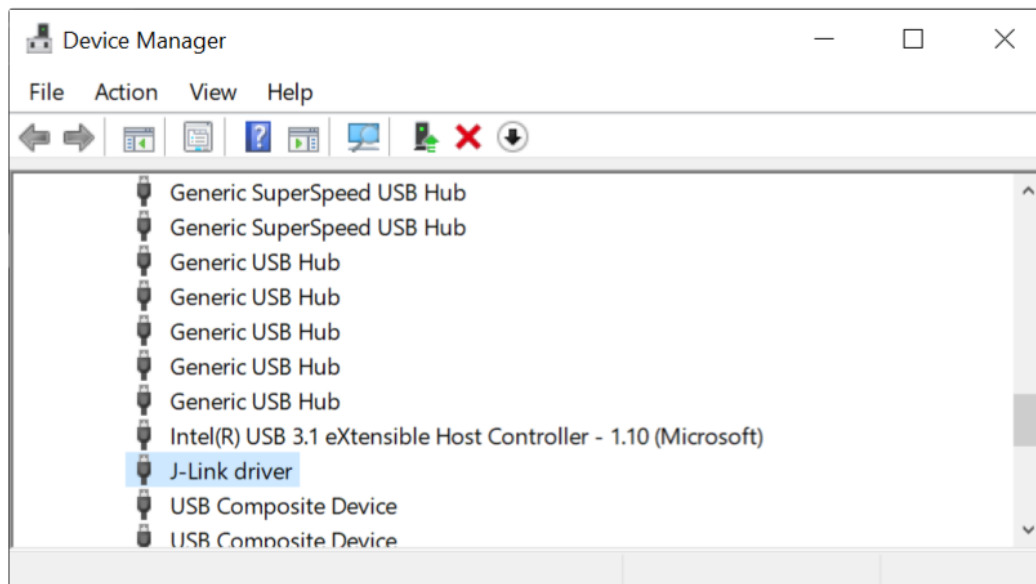


Figure 12 - Install J-Link Driver

2) Setup IDE environment

Windows Start -> Atmosic SDK, run Setup IDE Environment

3) Reboot the PC for system environment variable update.

4) Install SEGGER Embedded Studio

3.2 Generate SES Project File and NVDS

Please refer to the IDE Auxiliary Flash Programming tool User Guide to generate the project file with the IDE auxiliary tool. You will see a new folder named ses. This is the SES project file for this example.

NVDS bin file would be generated to the ses folder as generating SES project file. The NVDS bin file would not be updated as building examples. To change the BD address, please add `USER_BD_ADDR:="xx xx xx xx xx xx"` to generate the SES project.

3.3 Build and Download

3.3.1 Build

- 1) Example project (under ses folder)
- 2) Edit/Compile firmware in SES IDE, see [Figure 13](#)

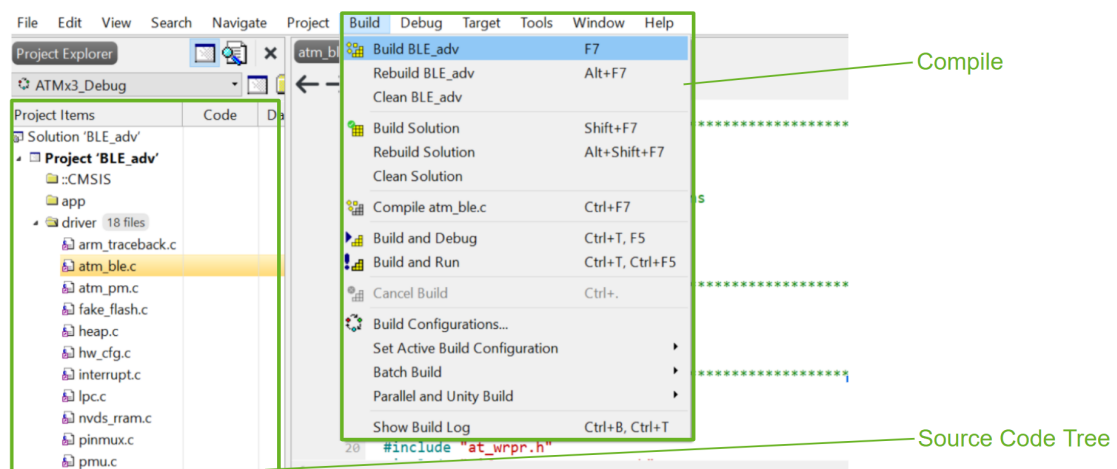


Figure 13 - SES IDE GUI - Compile

3.3.2 Download FW

After building successfully, please download FW and NVDS with the IDE Auxiliary Flash Programming tool. For more details, please refer to the IDE Auxiliary Flash Programming Tool User Guide.

3.4 Bootloader

The pre-link process would generate the bootloader binary file as [Figure 14](#).

```

2> Pre-link command
2> ATM33 SES Build type:undefined
2> Prebuild in Windows system
2> rm -f tag_data/18-PROG_DELAY/default.tds
2> rm -f tag_data/*/*.bin
2> rm -f flash_nvds_resize.bin
2> rm -f flash_nvds.ihex
2> rm -f bootloader.{asm,bin,elf,hex,ihex,map}
2> rm -f *.o
2> rm -f *.d
2> rm -f *.gcno *.gcda
2> rm -f *.gcov
2> rm -f merged_bootloader.{asm,bin,elf,hex,ihex,map}
2> rm -f signed_bootloader.{asm,bin,elf,hex,ihex,map,ubin}

...

2> /c/Projects/atmosic_sdk/tools/gcc-arm-none-eabi-10.3-2021.07/bin/arm-none-eabi-gcc --
specs=nosys.specs --specs=nano.specs -Wl,--fatal-warnings,--warn-common -mthumb -march=armv8-
m.main+fp+dsp -mcpu=cortex-m33 -mfloat-abi=hard -mfp16-format=ieee -Wl,--gc-sections -Wl,-z,max-page-
size=2048 -L/c/Projects/atmosic_sdk/platform/atm33/ATM33xx-5/user -Wl,--
defsym=RRAM_PROGRAM_SIZE=0x7F800 -Wl,--defsym=__s_user_rram_size=0x5000 -Wl,--defsym=USER_SIZE=0 -Wl,--
defsym=NVDs_START=583680 -Wl,--defsym=NVDs_SIZE=0x1000 -Xlinker -Map=bootloader.map -mcmse -Wl,--cmse-
implib -Wl,--out-implib=Secure_Functions.o -Tsecure.ld common.o bootloader.o retarget_uart.o
exception_handler_armv8mml.o sec_hw_cfg.o spi.o sec_jrnl.o arm_traceback.o sec_service.o -o
bootloader.elf
2> /c/Projects/atmosic_sdk/tools/gcc-arm-none-eabi-10.3-2021.07/bin/arm-none-eabi-objcopy -O binary
bootloader.elf bootloader.bin
2> /c/Projects/atmosic_sdk/tools/gcc-arm-none-eabi-10.3-2021.07/bin/arm-none-eabi-objdump -d
bootloader.elf >bootloader.asm

```

Figure 14 - Build Bootloader in the Pre-link Process

3.5 Debugging

Please don't use the Debug->Go button for debugging. Pressing Debug ->Go in SES IDE, would trigger the program FW process. The FW would be updated unexpectedly. Please use Attach Debugger as per the below steps.

- 1) Select Target -> Attach Debugger

BLE_adv - SEGGER Embedded Studio for ARM V5.42b (32-bit) - Non-Commercial License

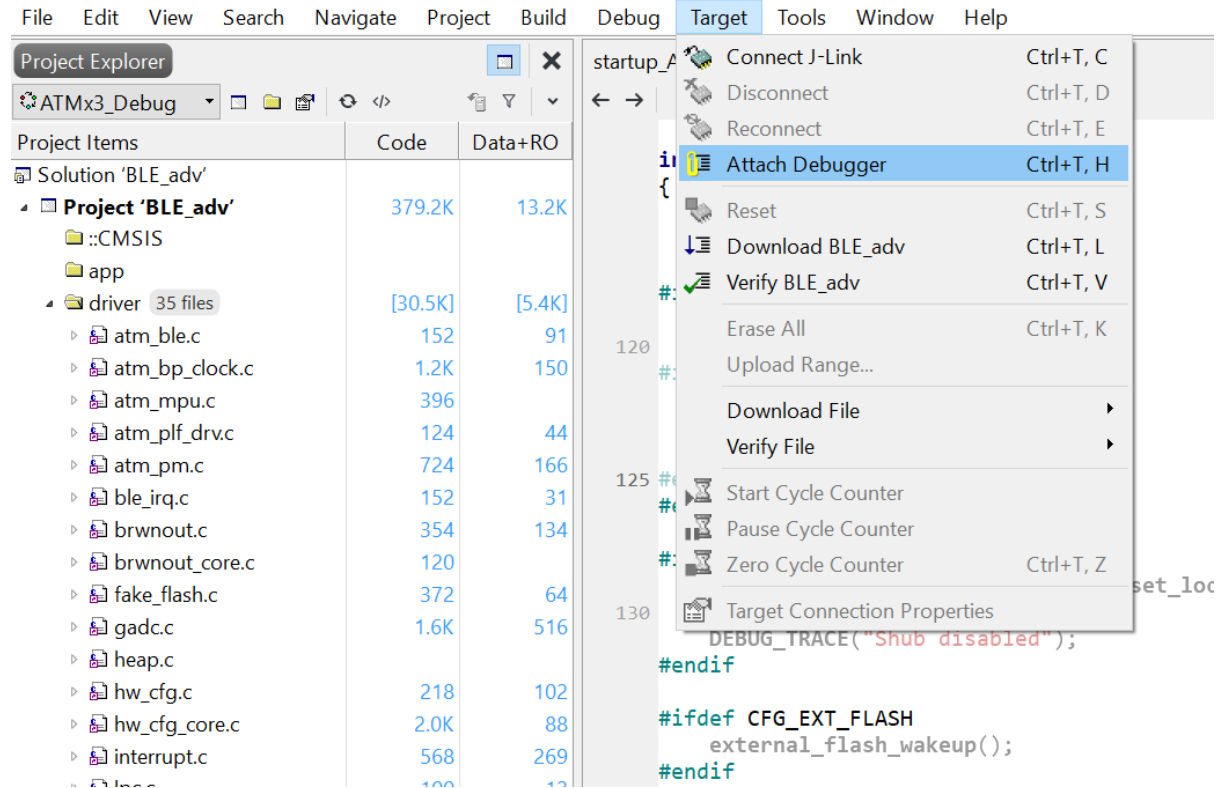


Figure 15 - Attach Debugger

2) Set a breakpoint and press break and continue

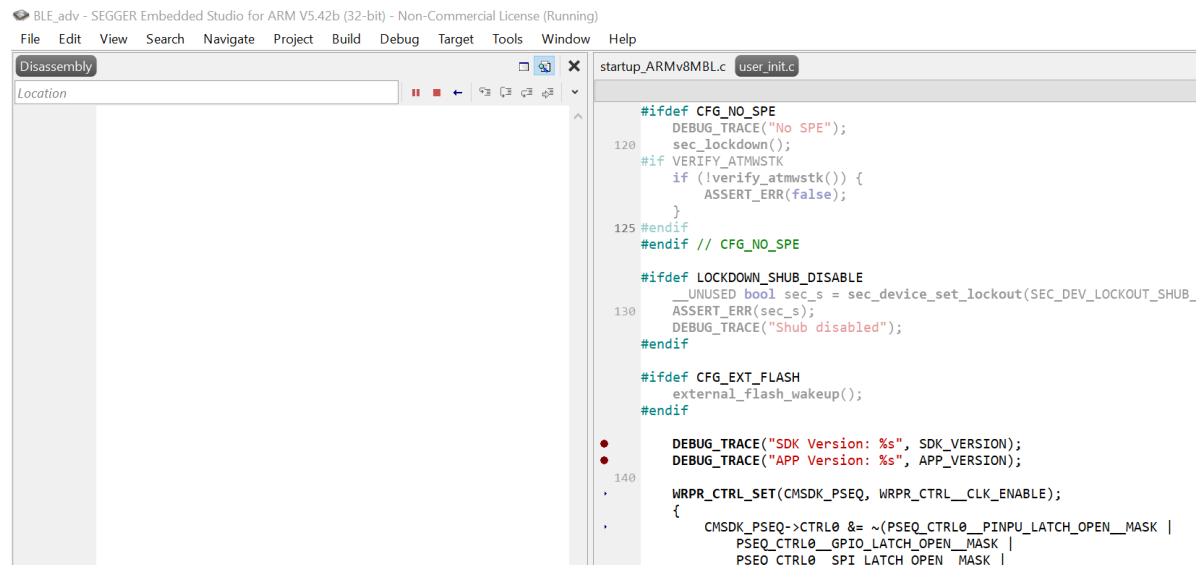


Figure 16 - Debug Mode - breakpoint and break

BLE_adv - SEGGER Embedded Studio for ARM V5.42b (32-bit) - Non-Commercial License (Stopped)

File
Edit
View
Search
Navigate
Project
Build
Debug
Target
Tools
Window
Help

Disassembly

main + 0x0

0001A02E 2A01 cmp r2, #1

0001A030 D90B b1s 0x0001A04A

— user_init.c — 97 —

return NVDS_LENGTH_OUT_OF_RANGE;

// Copy data to output buffer

memcpy(buf, user_params[i].data, data_len);

0001A032 2232 movs r2, #0x32

0001A034 8022 strh r2, [r4]

— user_init.c — 102 —

// Return bytes copied

*lengthPtr = data_len;

0001A036 2202 movs r2, #2

0001A038 2000 movs r0, #0

0001A03A 700A strb r2, [r1]

— user_init.c — 105 —

return NVDS_OK;

0001A03C F85D4B04 pop.w {r4}

0001A040 4770 bx lr

— user_init.c — 106 —

}

// Did not find it - fall back to NVDS

USER_PARAM_DBG("get param %x", param_id);

return nvds_get8(param_id, lengthPtr, buf);

0001A042 F85D4B04 pop.w {r4}

0001A046 F04EBDA8 b.w 0x00068B9A <nvds_get8>

0001A04A 2004 movs r0, #4

0001A04C E7F6 b 0x0001A03C

0001A04E 0000 movs r0, r0

— user_init.c — 112 —

int main(void)

{

// Initialize MPU

common_mpu_cfg();

0001A050 B57F push {r0-r6, lr}

0001A052 2501 movs r5, #1

0001A054 2400 movs r4, #0

0001A056 F000F8B1 b1 0x0001A1BC <common_mpu_cfg>

— user_init.c — 134 —

#ifdef CFG_EXT_FLASH

external_flash_wakeup();

#endif

DEBUG_TRACE("SDK Version: %s", SDK_VERSION);

0001A05A 4923 ldr r1, =0x0006F8B3

0001A05C 4823 ldr r0, =0x0006F8B9

0001A05E F002FBF1 b1 0x0001C844 <debug_trace>

— user_init.c — 139 —

DEBUG_TRACE("APP Version: %s", APP_VERSION);

0001A062 4923 ldr r1, =0x0006F8C9

0001A064 4823 ldr r0, =0x0006F8D1

0001A066 F002FBED b1 0x0001C844 <debug_trace>

— user_init.c — 140 —

WRPR_CTRL_SET(CMSDK_PSEQ, WRPR_CTRL_CLK_ENABLE);

0001A06A 4A23 ldr r2, =0x40153000

0001A06C 4923 ldr r1, =0x40158000

0001A06E 6215 str r5, [r2, #32]

— user_init.c — 142 —

}

startup_ARMv8MBL.c user_init.c

int main()

#ifdef CFG_NO_SPE

DEBUG_TRACE("No SPE");

sec_lockdown();

#if VERIFY_ATMNSTK

if (!verify_atmwstk()) {

ASSERT_ERR(false);

}

#endif

#endif // CFG_NO_SPE

#ifdef LOCKDOWN_SHUB_DISABLE

_UNUSED bool sec_s = sec_device_set_lockout(SEC_DEV_LOCKOUT_SHUB_D

130 ASSERT_ERR(sec_s);

DEBUG_TRACE("Shub disabled");

#endif

#ifdef CFG_EXT_FLASH

external_flash_wakeup();

#endif

138 DEBUG_TRACE("SDK Version: %s", SDK_VERSION);

DEBUG_TRACE("APP Version: %s", APP_VERSION);

140

WRPR_CTRL_SET(CMSDK_PSEQ, WRPR_CTRL_CLK_ENABLE);

{

CMSDK_PSEQ->CTRL0 &= ~(PSEQ_CTRL0_PINPU_LATCH_OPEN_MASK |

PSEQ_CTRL0_GPTO_LATCH_OPEN_MASK |

PSEQ_CTRL0_SPT_LATCH_OPEN_MASK |

PSEQ_CTRL0_PINSEL_LATCH_OPEN_MASK);

}

WRPR_CTRL_SET(CMSDK_PSEQ, WRPR_CTRL_CLK_DISABLE);

150 #ifdef CFG_EXT_FLASH

external_flash_init();

ext_flash_init();

Output

Show: Transcript Output

Checking project status

Project up to date

Figure 17 - Debug Mode

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Reference Documents

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
Keil MDK Configuration Guide	4252-xxxx-xxxx

Revision History

Date	Version	Description
July 3, 2023	0.63	Updated for SDK 6.0.0.
July 19, 2023	0.62	Updated Overview , Table 1 - ATM2/ATM3 and ATM33/e Evaluation Kits , Create SES application project , Download Firmware and Flash NVDS , Generate SES Project File and NVDS , Build and Download , Bootloader , Debugging sections, Figure 4 - Atmosic Interface Board V3.x , Figure 5 - Atmosic I/O Adapter Board , Figure 6 - Atmosic Interface Board with I/O Adapter Board , J-Link Probe , Figure 8 - ATM33/e Evaluation Board , Figure 14 - Build Bootloader in the Pre-link Process . Added Acronyms and Abbreviations , Hardware Setup , Driver and Environment Setting Setup , Reference Documents sections.
June 24, 2022	0.61	Updated Overview item 4),
May 13, 2022	0.60	Initial version created for SDK 5.1 which supports ATM2/ATM3 and ATM33.



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