RS9116W with NXP_RT595 User's Guide

RS9116 Firmware and Software Releases

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1 About this Document:

This document explains about the following Information:

1. Getting Started guide with EVB (Evaluation Board)
2. Evaluating RS9116W EVK in **WiSeConnect** mode with Host MCU as NXP RT595

2 Getting Started with NXP_RT595 and RS9116W EVK

About this Document

This document provides the information about

1. The RS9116W Module's Evaluation Kit (EVK)
2. Evaluating RS9116W EVK in **WiSeConnect** mode with Host MCU as NXP RT595.
3. RS9116W Interface pin configurations (for SDIO and Powersave) with NXP RT595 .
4. NXP RT595 projects execution on the IAR Embedded Workbench .

2.1 RS9116W Evaluation Kit Contents

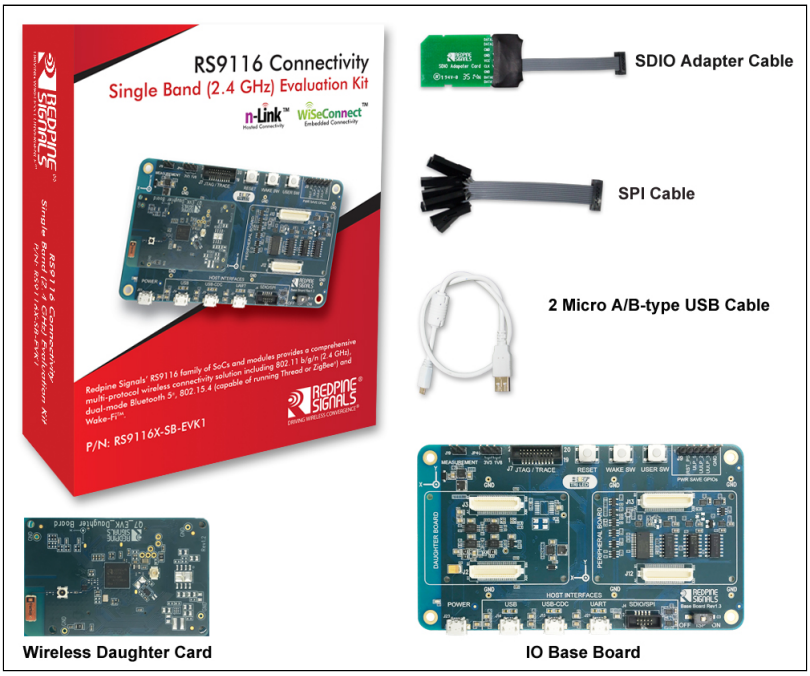
The RS9116 Module Evaluation Kit comes with the following components:

1. RS9116 I/O Baseboard
2. RS9116 Wireless Daughter Card
3. Micro A/B-type USB cable
4. SDIO Connector*
5. SPI Connector

> **Note:**
>
> *The SDIO host interface is currently not supported.

1) Single Band EVK:

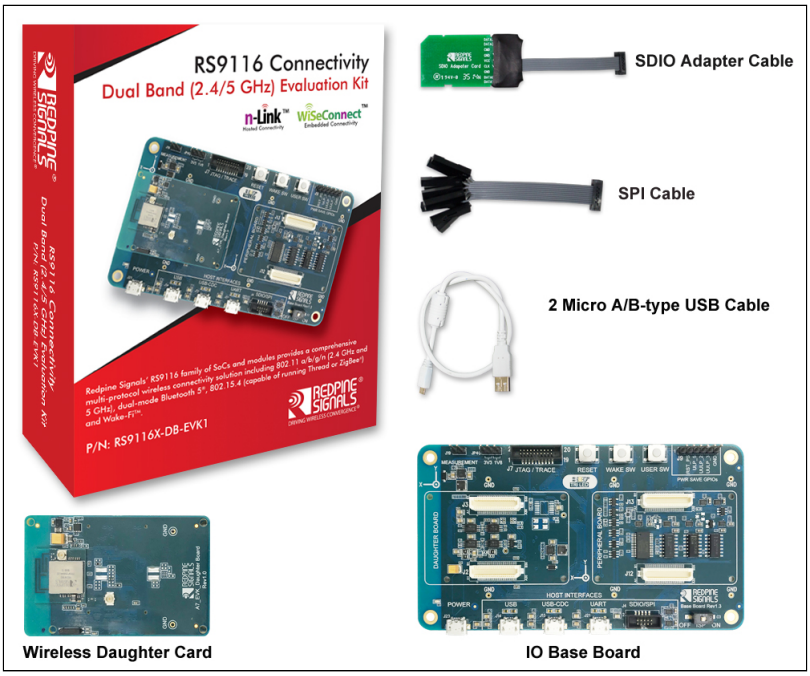
The below image is for the RS9116 connectivity Single Band (2.4Ghz) Evaluation kit. This contains the SDIO adaptor cable, SPI cable, IO baseboard, and Wireless daughter card.



1 Single band Evaluation Kit Contents

2) Dual Band EVK:

The below image is for the RS9116 connectivity Dual Band (2.4/5 GHz) Evaluation kit. This contains the SDIO adaptor cable, SPI cable, IO baseboard, and Wireless daughter card.



2 Dual Band Evaluation Kit Contents

It is highly recommended to use the Micro A/B type USB cable that comes with the kit. If a longer cable is needed, ensure to use a USB-IF certified cable which can supply a peak current of at least 500mA.

> **Note:**
>
> For WiSeConnect, the user needs only the Micro A/B-type USB cable and the SPI connector.
>
> For n-link, the user needs only the Micro A/B-type USB cable.

Latest EVK user guide, firmware and reference projects can be downloaded from our website https://docs.silabs.com/rs9116/[1]

2.2 RS9116W EVK Overview

2.2.1 The RS9116 WiSeConnect

The RS9116 WiSeConnect module family is based on Silicon Labs RS9116 ultra-low-power, single spatial stream, dual-band 802.11n + BT 5/BLE Convergence SoC. The RS9116 Module Evaluation Kit (EVK) is a platform for

1 https://docs.silabs.com/rs9116/RS9116W_Guide_for_SAPI_Application_Examples_vX.X.pdf

evaluating the RS9116 modules with multiple Host Processors/MCUs over interfaces like SDIO*, USB, USB-CDC, SPI and UART.

The EVK includes sample driver, supplicant, applications to test the following:

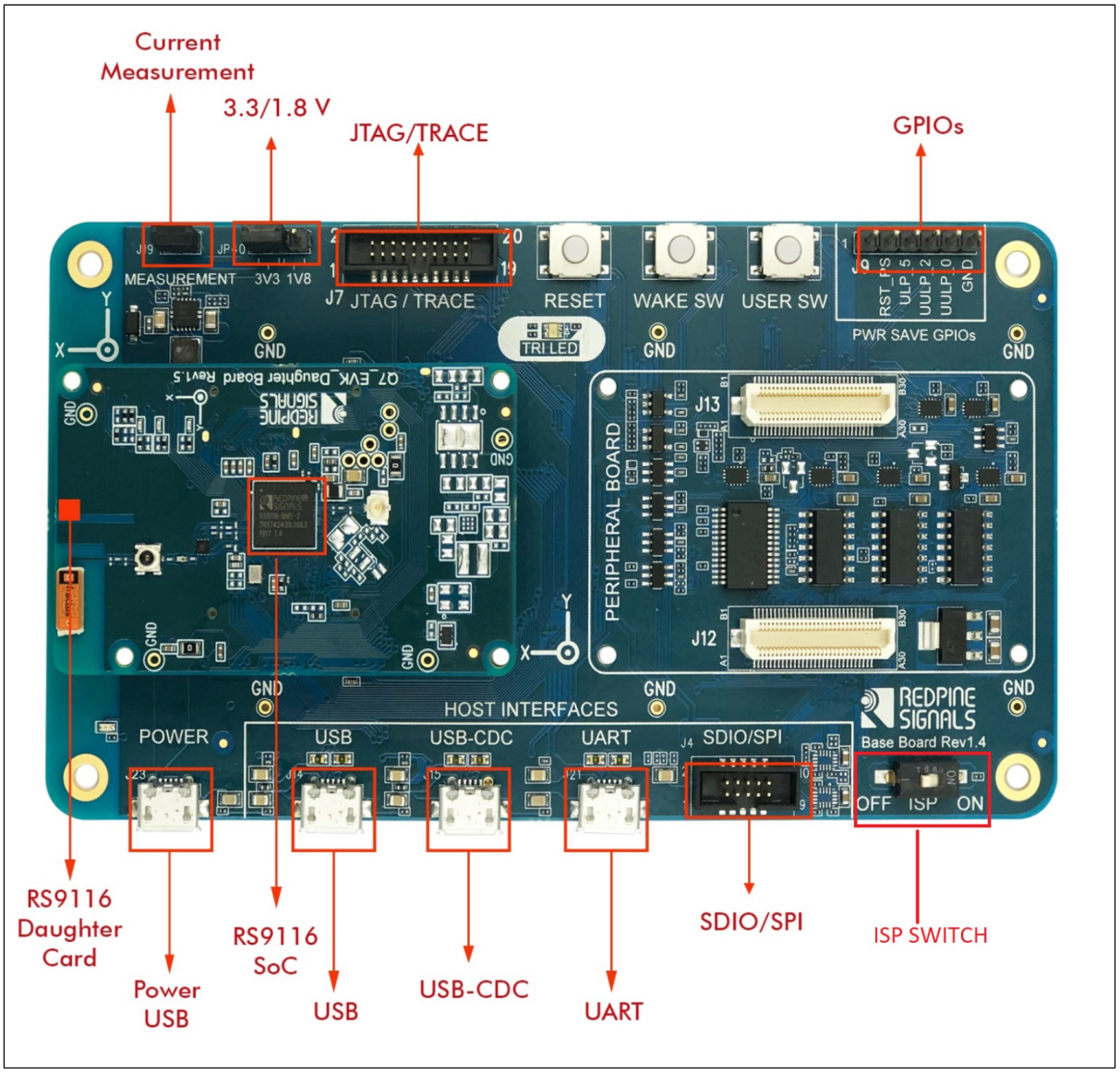
- Wireless Functionality for Wi-Fi, BT/BLE
- Wireless co-existence
- Security modes
- Throughputs
- Power Consumption
- Firmware Upgrade

Solution Highlights

- Offers WLAN, and Bluetooth protocols along with Wi-Fi Direct™, WPA/WPA2-PSK, WPA/WPA2-Enterprise (EAP-TLS, EAP-FAST, EAP-TTLS, PEAP-MS-CHAP-V2, LEAP).
- Provides a feature-rich networking stack embedded in the device, thus providing a fully-integrated solution for embedded wireless applications.
- Can be interfaced to 8/16/32-bit host processors through SPI, SDIO*, UART, USB and USB-CDC interfaces.
- Integrates a multi-threaded MAC processor with integrated analog peripherals and support for digital peripherals, baseband digital signal processor, analog front-end, crystal oscillator, calibration OTP memory, dual-band RF transceiver, dual-band high-power amplifiers, baluns, diplexers, diversity switch and Quad-SPI Flash thus providing a fully-integrated solution for embedded wireless applications.
- Operates in industrial (-40°C to +85°C) temperature range.
- Choice of several module packages (with and without antenna) options depending on system requirements.
- Co-existence of multiple wireless protocols managed by an internal protocol arbitration manager.

2.2.2 Hardware Details

This section describes RS9116 EVK's various components and headers.
The OneBox-Embedded software for the WiSeConnect modules supports UART, SPI, USB and USB-CDC interfaces to connect to the Host MCU.
As shown in the image below, the RS9116 EVK has four USB connectors for the Power, USB, USB-CDC and UART connections. The UART signals of the module are converted to USB using an onboard circuit. The board also has SDIO*/SPI Header.



2 RS9116 EVK

2.2.3 Supported Interfaces

The board is designed to configure the EVK module to use the interface on which the power supply is detected. The SDIO* and SPI interfaces require a power supply to be provided to the EVK module over the POWER port using a USB cable. Hence, for these interfaces on the EVK module, it is required that the USB Power connection will be provided first, followed by the SDIO* or SPI connection.

Follow the below steps to use the EVK module with different interfaces:

1. USB, UART, USB-CDC Modes
   a. Connect the Micro A/B-type USB cable between a USB port of a PC/Laptop and the micro-USB port labeled USB, UART or USB-CDC on the EVK.
2. SPI Mode

   a. Connect the Micro A/B-type USB cable between a USB port of a PC/Laptop and the micro-USB port labeled POWER on the EVK.
   b. Connect the 10-pin header of the SPI Adaptor Cable to the EVK. Connect the other wires of this connector to the SPI signals of a Host MCU platform. The details of the SPI header are given in RS9116 W SPI headers on the EVK[2].
3. SDIO Mode*
   a. Connect the Micro A/B-type USB cable between a USB port of a PC/Laptop and the micro-USB port labeled POWER on the EVK.
   b. SDIO* adaptor cable connector has two ends. Connect the one end 10-pin header of the SDIO* Adaptor Cable to the EVK module. And Connect the other end of the connector to the SDIO* signals of the Host MCU platform. The details of the 10-pin Header are given in the following sections.
4. ISP Switch
   ISP switch shall be used for In-system programming firmware downloading utility.
   Make sure the ISP switch is in the OFF state. If it is ON state you will not get the boot loader messages.

There is a 2-pin inline jumper available for measuring the current being sourced by the module during different stages of operation. This is labeled as "MEASUREMENT" on the baseboard. The user may connect a power meter or an ammeter to this jumper to measure the current.

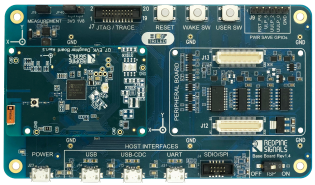
*The SDIO host interface is currently not supported.

Note

If the baseboard Rev is 1.1 or below, then follow the below procedure:

1. For SDIO*/SPI, insert the USB into the Power port first before the SDIO*/SPI connector is connected to the Host platform.
2. For USB and USB-CDC, please connect the USB port to the Host platform first before connecting the USB for the Power port.

2.3 RS9116W Hardware Requirements

	RS9116W EVK
	NXP RT595 board (not included in EVK Kit)

2 https://confluence.silabs.com/display/RAE/RS9116W+SPI+headers+on+the+EVK

	10 pin header cable
	Two Micro A/B-type USB Cables (One Micro A/B-type USB cable to connect between PC and NXP RT595 board) (Second cable connect between PC and EVK power port)
	For IAR Embedded Workbench IDE: PC with 32/64 bit Windows OS (x86 arch).

Note

All the user documents, firmware release packages, certifications of the module and other materials related to the RS9116 based Modules are available on the website https://docs.silabs.com/rs9116[3].

2.4 RS9116W Software Requirements

Requirement for IAR Embedded Workbench IDE

1 .IAR Embedded Workbench latest version .

3 https://docs.silabs.com/rs9116/RS9116W_Guide_for_SAPI_Application_Examples_vX.X.pdf

Note

After installation of IAR, use below patch for compilation and board detection in given sample projects .

Click (iar_segger_support_patch_rt500_evk0522.zip[4]) to download patch

About the patch

arm.zip enables i.MX8 series Cortex-M4 cores debugging in IAR v8.22.1

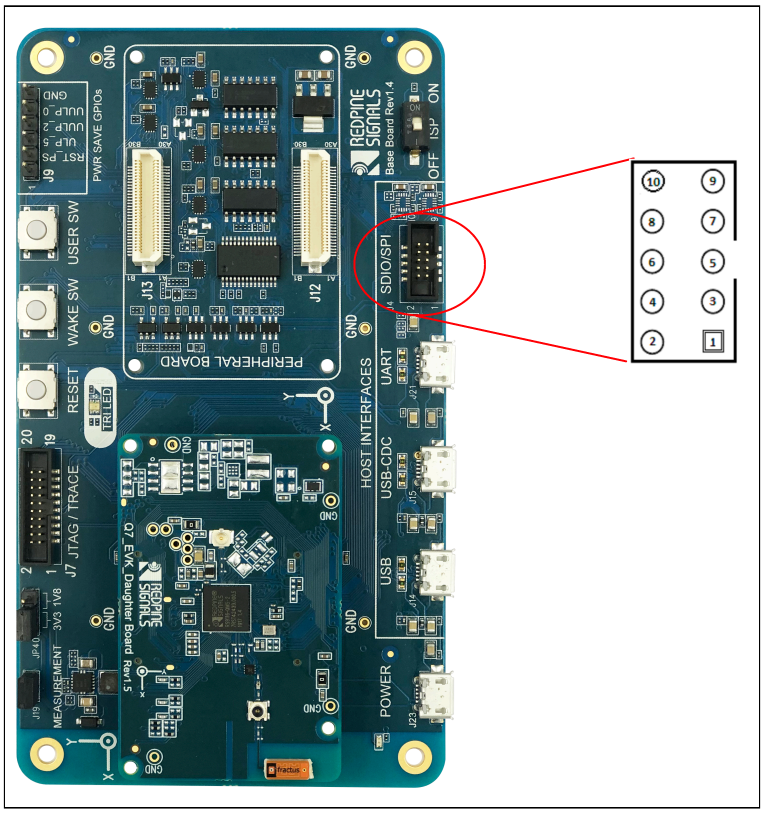
How to use arm.zip patch

Please unzip the arm.zip and override all the existing files in the arm folder in your IAR installer path.

For example : C:\Program Files (x86)\IAR Systems\Embedded Workbench 8.0\arm.

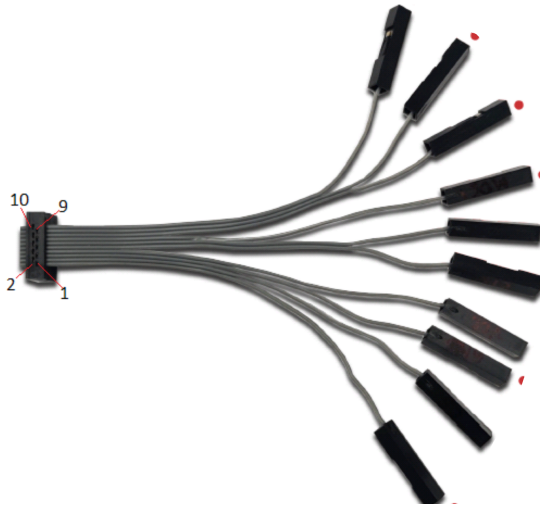
2.5 RS9116W SDIO headers on the EVK

2.5.1 Header Pin Orientations



3 SDIO header Pin Orientations

4 https://confluence.silabs.com/download/attachments/134267447/iar_segger_support_patch_rt500_evk0522.zip?api=v2&modificationDate=1597825064533&version=1



4 10 Pin Header Cable With Pin Names

2.5.2 Pin Description

Pin Number	Pin Name	Description
1	DATA3	SDIO data_3 line
2	CMD	SDIO Command line
3	GND	Ground
4	VDD	Supply voltage
5	SDIO_CLK	Serial clock input from the host.
6	NC	No Connection
7	DATA0	SDIO data_0 line
8	DATA1	SDIO data_1 line

Pin Number	Pin Name	Description
9	DATA2	SDIO data_2 line
10	NC	No Connection

1 SDIO Header Pins

> **Note**
>
> Signal Integrity Guidelines for SPI/SDIO interface: Glitches in the SPI/SDIO clock can potentially take the SPI/SDIO interface out of synchronization. The quality and integrity of the clock line need to be maintained. In case a cable is used for the board to board connection, the following steps are recommended (please note that this is not an exhaustive list of guidelines and depending on individual cases additional steps may be needed.):
>
> a. Minimize the length of the SPI/SDIO bus cable to as small as possible, preferably to within an inch or two.
> b. Increase the number of ground connections between the EVB and the Host processor PCB.

2.6 RS9116W Assembling and Accessing NXP_RT595 Board

2.6.1 Interfacing the NXP RT595 with RS9116W EVK

2.6.1.1 Steps for Interfacing via **SDIO Interface**.

1. Connect the RS9116W EVK to the NXP RT595 board using the 10-pin SDIO header connector.
2. Connect the NXP RT595 with Mini USB cable to the Windows PC.
   With this connection, NXP RT595 is powered-up and also power-up the 9116EVK via SDIO connected.
3. It is also recommended to power-up the RS9116 EVK by connecting the USB cable between the PC and POWER interface of the 9116 EVK.

Now the NXP RT595 board is operational to execute projects using IAR Embedded Workbench IDE on the Windows PC.

Pin Interfacing details - RS9116 EVK to NXP RT595

SDIO PIN Name	NXP Board	RS9116_EVK
DATA3	M2_SD1_DATA3(R506) (PIO3_13)	J4 PIN 1 (DATA3)
CMD	M2_SD1_CMD(R502) (PIO3_9)	J4 PIN 2 (CMD)
GND	JP26 -PIN5	J4 PIN 3 (VSS1(GND))
VCC	JP26 -PIN6	J4 PIN 4 (VCC)
Clock	M2_SD1_CLK(R501) (PIO3_8)	J4 PIN 5 (CLK)
DATA0	M2_SD1_DATA0(R503) (PIO3_10)	J4 PIN 7 (DATA0)
DATA1	M2_SD1_DATA1(R504) (PIO3_11)	J4 PIN 8 (DATA1)
DATA2	M2_SD1_DATA2(R505) (PIO3_12)	J4 PIN 9 (DATA2)

2 SDIO Connections

> **Note**
>
> RS9116 should operate at 1.8V . Base board should be Rev 1.3 .

2.7 Getting Started with IAR Embedded Workbench IDE

Introduction to IAR

IAR Embedded Workbench is a high-performance C/C++ compiler and debugger tool suite for applications .

Please follow the Steps for executing NXP RT595 reference projects on the IAR IDE

1. Connect the setup environment of RS9116 EVK and NXP RT595 with the PC
   a. Make sure 10 pin header cable connected between RS9116 EVK and NXP RT595 board
   b. Connect the NXP RT595 board power port to the PC (via USB cable)
   c. It is recommended to connect the POWER port of RS9116 EVK to the PC (via USB cable)
2. Download and Install IAR Embedded Workbench IDE from below link
3. Download link :https://www.iar.com/iar-embedded-workbench/#!?architecture=Arm .
   Get the **license** of the IAR Embedded Workbench IDE to execute NXP RT595 Reference projects in the package.

   Note

   After installation of IAR, use below patch for compilation and board detection in given sample projects .

   Click (iar_segger_support_patch_rt500_evk0522.zip[5]) to download patch

   About the patch

   arm.zip enables i.MX8 series Cortex-M4 cores debugging in IAR vx.y.z

   How to use arm.zip patch

   Please unzip the arm.zip and override all the existing files in the arm folder in your IAR installer path.

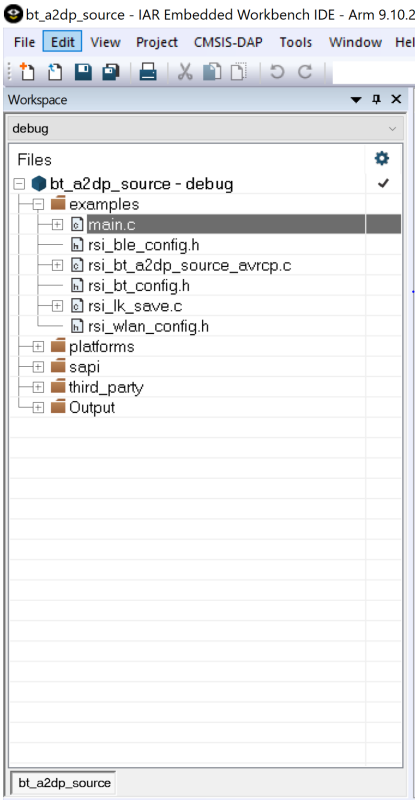
   For example : C:\Program Files (x86)\IAR Systems\Embedded Workbench x.y\arm.

4. Navigate to the below Release package link for accessing IAR Embedded Workbench project .
   RS9116.NB0.WC.GENR.OSI.x.x.x\examples\snippets\bt\bt_a2dp_source_with_avrcp\projects\iar
5. Open any project folder as per the user requirement and double-click the "IAR IDE Workbench" and then it will be redirected to IAR Embedded Workbench IDE for viewing the project source .

Run an application using IAR

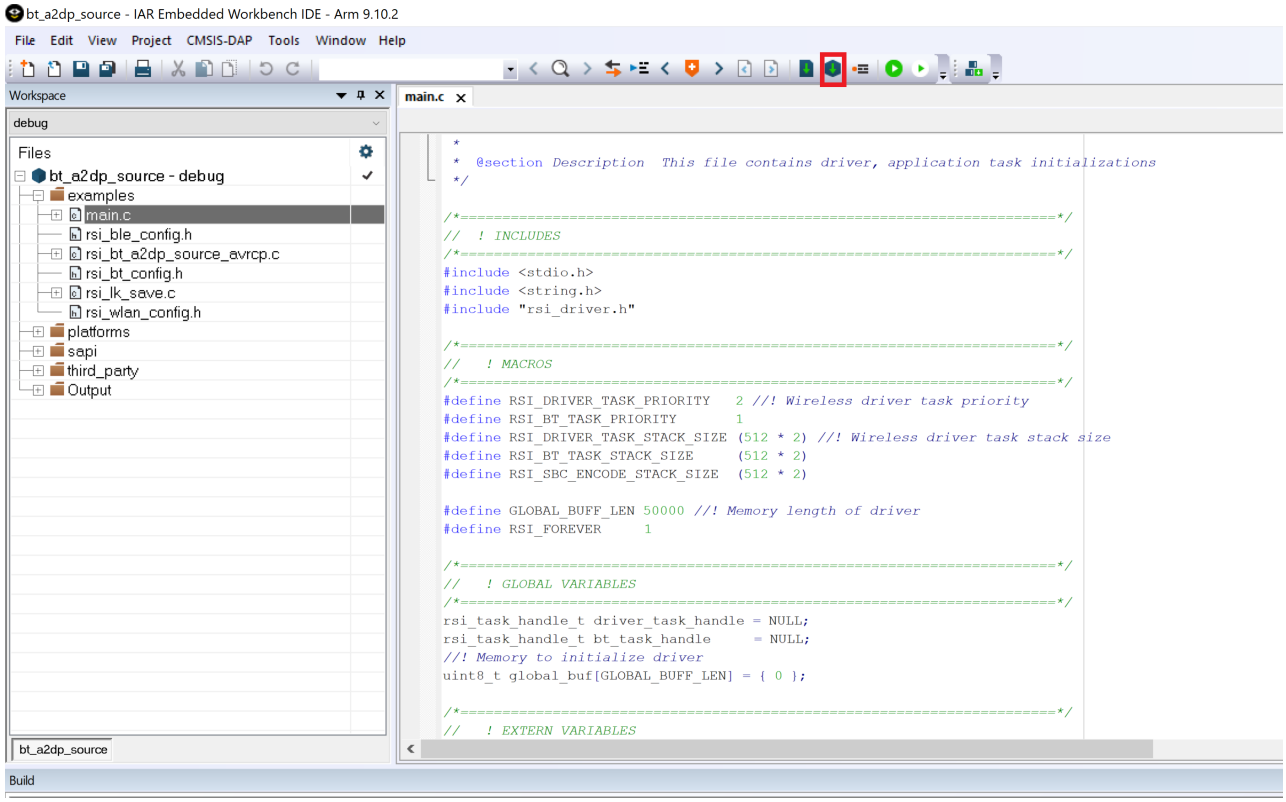
1. Select the desired build target from the drop-down menu. For this example, select the “bt_a2dp_source– Debug” target

5 https://confluence.silabs.com/download/attachments/134267447/iar_segger_support_patch_rt500_evk0522.zip?api=v2&modificationDate=1597825064533&version=1



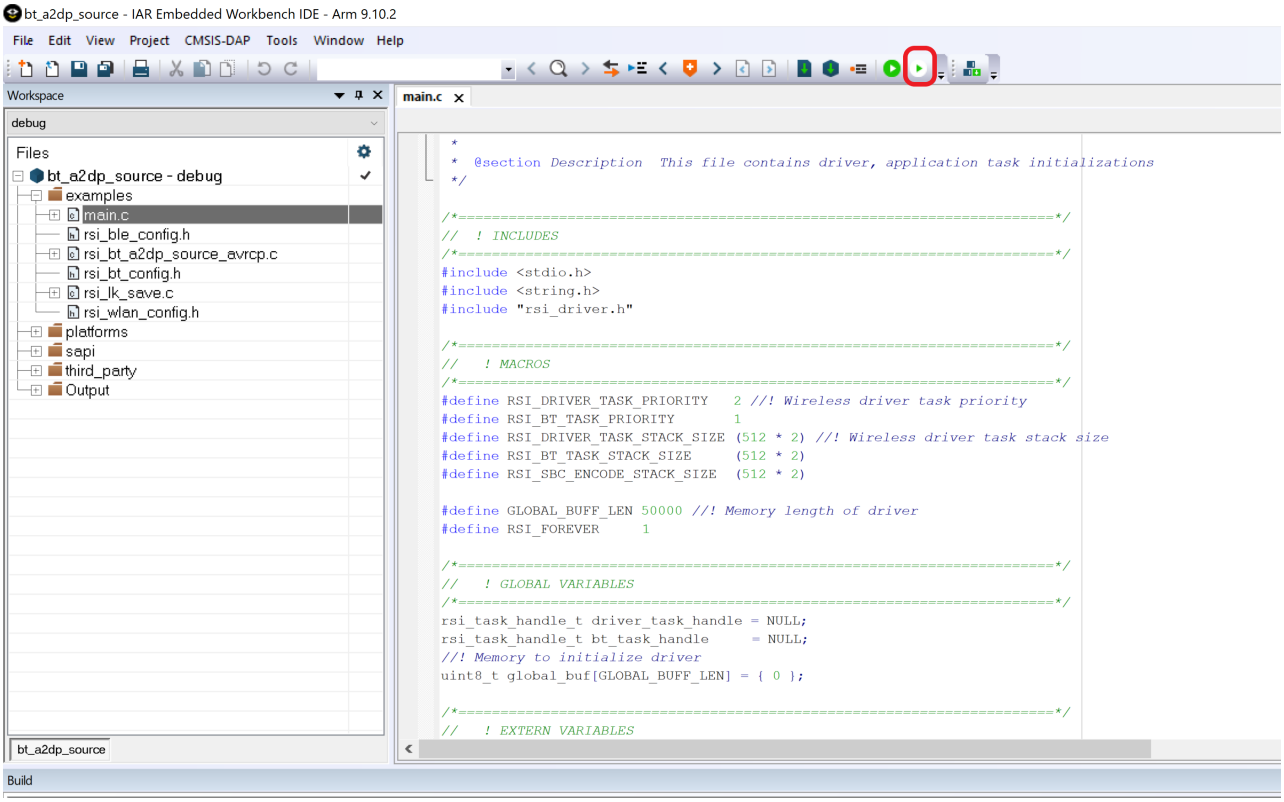
5 Demo build target selection

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



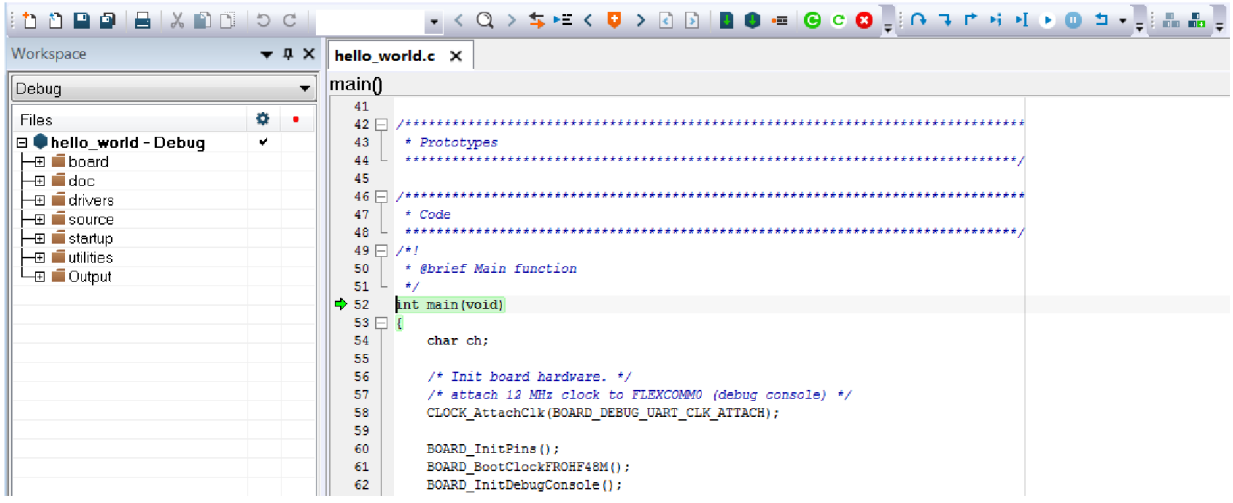
6 Build the demo application

3. Click the "Download and Debug" button to download the application to the target



7 Download and Debug button

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



7 Stop at main() when running debugging

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

8 Go button