

WyzBee™

User Manual

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About this Document

This document describes general information of WyzBee™ along with the board bring up and installation procedure for software tools for developing applications, including a sample TriLED demo programmed using Keil IDE platform. This document elaborates all the features and steps for using the WyzBee™ platform.

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1 Introduction

The WyzBee™IoT platform is an industry-first single source offering with fully inclusive sensing, computing, communicating, and cloud support. The compact WyzBee™ board includes Redpine's Wireless Secure MCU (WiSeMCU™) with multi-protocol wireless module providing Wi-Fi, Bluetooth 4.1, and ZigBee connectivity, nine-axis inertial sensors, onboard temperature/humidity sensors, 3 axis accelerometer, an infrared receiver, a USB (debug) port, push-buttons, LEDs, and WyzBee™ THING™ expansion connector. The WiSeMCU module runs an embedded TCP/IP networking stack with SSL/TLS/HTTPS security, apart from complete Wi-Fi, BT 4.1, and ZigBee stacks.

The WyzBee™ THING expansion headers accommodate a host of other symbiotic devices, with a number of peripherals – called 'THINGS' – already available from Redpine including audio, GSM, GPS, capacitive touch display, rechargeable battery, and additional sensors. Application development is supported with a choice of development environments – IAR, Keil, and the free ColIDE from CoCoX.

The WiSeMCU™ module integrates PUF-based hardware security block that provides for unique, individual device entities – ensuring that each IoT device can be individually authenticated and software delivered to it that cannot run on any other device.

1.1 Features

1.1.1 MCU Features

- ARM Cortex-M4F processor, running at a frequency of up to 160 MHz
- Integrated Floating Point Unit (FPU), Memory Protection Unit (MPU), Built-in Nested Vectored Interrupt Controller (NVIC)
- Debug options: JTAG and Embedded Trace Macrocells (ETM)
- 1MB on-chip flash program memory with flash accelerator and 32KB work flash memory
- 128 KB SRAM for code and data use
- CAN Interface with support for up to 2 channels
- Up to 32 high speed general purpose I/O ports.
- Multi-function Serial Interface with support for up to 6 channels (UART, CSIO (SPI), and I2C).
- Base timer (maximum 8 channels) supporting PWM, PPG, reload timer, PWC (up to 6 channels).
- Comprehensive Timers: Multi-function timer (MFT) with FRT, WFG, ICU, OCU modes supported.
- RTC, QPRC, Dual Timer supported.
- Up to 2 configurable Watchdog Timers.
- Analog peripherals: 12-bit, 11-channel Analog-to-Digital Converter (ADC)
- Security: Unique ID of the device (41 bit) is set
- Six low-power consumption modes: SLEEP, Timer, RTC, STOP, Deep Standby RTC, Deep Standby stop.

- 12-bit Digital to Analog Converter (DAC) with support for 1 channel
- DMA Controller with support for up to 8 channels
- CRC (Cyclic Redundancy Check) Accelerator
- External interrupt input pins: up to 14 pins
- Low-Voltage Detector (LVD) current: 100nA
- CMSIS-DAP Debug adapter: WyzBee™ comes with an on board CMSIS-DAP debug adapter for downloading and debugging applications, without the need for an external debugger.

1.1.2 WLAN Features

- Compliant to single-spatial stream IEEE 802.11 a/b/g/n with dual band (2.4 and 5 GHz) support.
- Support for 20MHz channel bandwidth.
- Transmit power up to +18dBm with integrated PA.
- Receive sensitivity of -97dBm.
- Supports Wi-Fi Direct™, Access point mode, WPA/WPA2-PSK, WPA/WPA2-Enterprise (EAP-TLS, EAP-FAST, EAP-TTLS, PEAP-MS-CHAP-V2).

1.1.3 Bluetooth

- Compliant to dual-mode Bluetooth 4.0.
- Transmit power up to 15dBm (class-1) with integrated PA.
- Receive sensitivity of -94 dBm.
- Basic Bluetooth profile embedded in device.

1.1.4 ZigBee

- Compliant to IEEE 802.15.4
- Transmit power up to 15 dBm with integrated PA.
- Receive sensitivity of -102 dBm.
- ZigBee Pro stack embedded

1.1.5 General

- U.FL connector for external antenna connection.
- Operating temperature range: -40°C to +85°C
- TCP/IP stack (IPv4/IPv6), HTTP/HTTPS, DHCP, ICMP, SSL 3.0/TLS1.2, Web sockets, IGMP, FTP Client, SNTP, DNS, embedded in the device.
- On Board Peripherals:
 - Tri Color LED

| LED Color | Pin |
|-----------|-----|
| Red | P41 |

| | |
|-------|-----|
| Blue | P3F |
| Green | P3E |

- Two push buttons (One for Reset and one for an External interrupt)

| Push Button | Pin |
|-------------------------|-------------|
| SW1(External Interrupt) | P50 |
| SW2 (Reset) | MCU_RESET_N |

- IR receiver

| IR Receiver | Pin |
|-------------|-----|
| IR_OUT | P42 |

- 9 Axis Sensor
- 3 Axis Accelerometer
- Humidity and Temperature Sensor

| Sensor | Pin |
|---|-----|
| All three sensors use the I2C interface to interact with the MCU. | |
| Clock | P33 |
| Data | P32 |

- Micro-B USB Full Speed Interface

1.2 WyzBee™ Board

WyzBee™ is a USB-powered device. Shown below is a WyzBee™ baseboard with the micro-B USB cable plugged in.

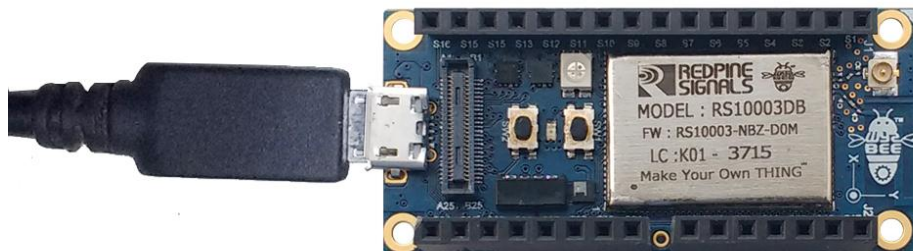


Figure 1: WyzBee™ Baseboard with micro-B USB Cable

1.3 WyzBee™ Top View

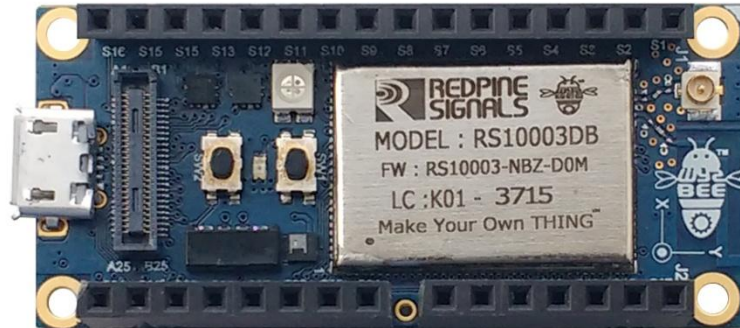


Figure 2: WyzBee™ Baseboard's Top View

1.4 WyzBee™ Bottom View

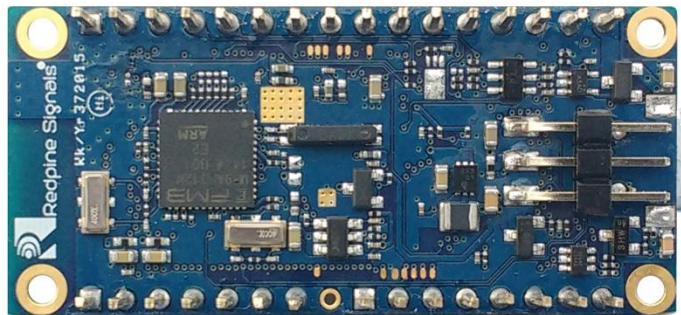


Figure 3: WyzBee™ Baseboard's Bottom View

2 Setting up WyzBee™

2.1 Setup Requirements

Setting up and working with WyzBee™ is easy. Before you start, make sure you have the following hardware and software components:

Hardware:

- The WyzBee™ baseboard
- 32/64-bit PC with minimum 2GB RAM and USB Port for Power, Downloading and Debugging

Software:

- Windows 7/8/8.1 Operating System.
- The CMSIS-DAP driver provided by Spansion. You can download the driver from <https://www.spansion.com/Support/microcontrollers/developmentenvironment/Pages/board-SK-FM4-U120-9B560.aspx>. More details are given in [Section 2.2](#).
- An IDE like Keil uVision, IAR Embedded Workbench or CoCoX CoIDE.

2.2 Installing the CMSIS-DAP Drivers

Follow the steps below to download and install the CMSIS-DAP Drivers.

- 1) Download the complete set of drivers and tools from the following link:

(USB drivers for virtual COM port and CMSIS-DAP)

<https://www.spansion.com/Support/microcontrollers/developmentenvironment/Pages/board-SK-FM4-U120-9B560.aspx>

Note: If the device gets detected as an unknown device, update the drivers from the device manager and point to the location of the newly downloaded drivers.

- 2) Windows USB drivers that are specific to WyzBee™ need to be installed for the detection of debugging port. In the downloaded folder, navigate to the “drivers” folder and double-click on the driverinstaller.exe file. The window below will appear.



Figure 4: CMSIS-DAP Drivers Installation Window

- 3) Click the Next button.
- 4) A “Publisher cannot be verified”, warning might appear depending on the Windows Security Settings. Select the “Install this driver software anyway” option. This installs the cmsis-dap and usbdirect drivers.
- 5) Click the Finish button after the drivers’ installation is completed.
- 6) Connect the micro-B USB cable between the WyzBee™ USB port and the PC. Verify that the board is detected under the “Ports” section of the Windows Device Manager.



Figure 5: WyzBee™ CMSIS-DAP Debug Port Detection

2.3 Installing IDEs

WyzBee™ applications can be developed using various IDEs like CoIDE, Keil and IAR. Refer to [Appendix A](#) for instructions on downloading and installing these tools..

3 Getting Started

This section helps in getting started quickly with WyzBee™. It describes the process for starting a project, configuring the IDE for WyzBee™ and then working with an example project.

It is necessary to know your way around one of the supported IDE's in order to work on WyzBee™. The steps below use the Keil uVision 4 IDE as an example to download and debug a sample application on WyzBee™.

3.1 Starting a New Project

- 1) Start the Keil uVision 4 IDE.
- 2) Click on “New uVision Project” from the “Project” dropdown menu. A popup window appears giving you an option to select the location of the project. Select the path you would like and click “Save”.
- 3) A new window opens for selecting the device. Scroll down the list and select “MB9BF568N” as shown below.

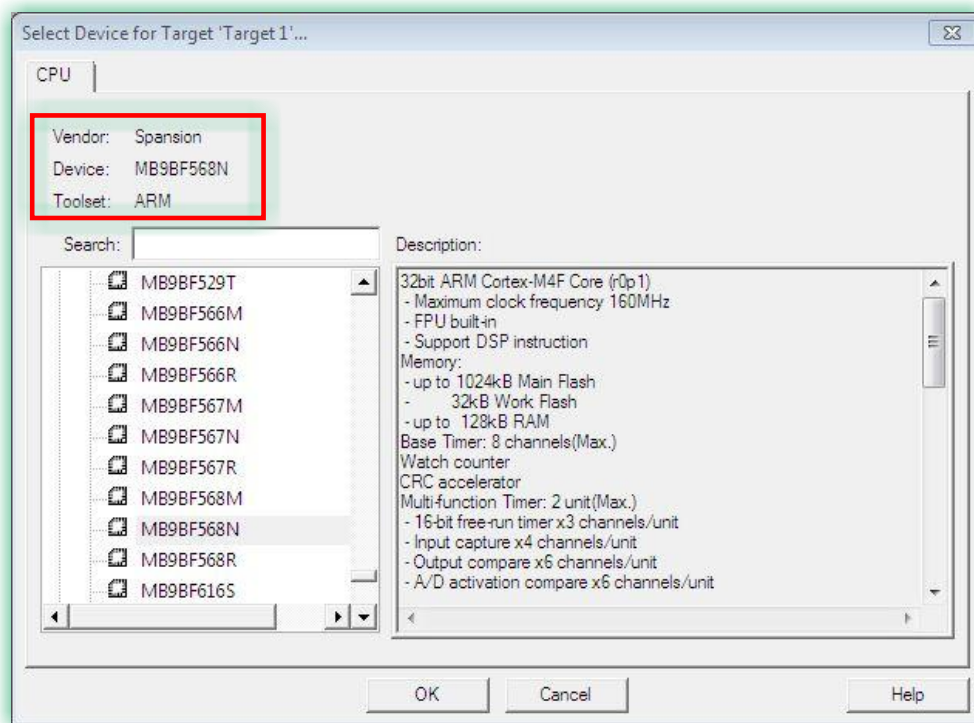


Figure 6: Keil uVision: Selecting the Device

- 4) Click OK and you are now ready to start configuring the IDE for WyzBee™.

3.2 Configuring IDE for WyzBee™

The Keil IDE is used here as an example. The process for CoIDE and IAR Embedded Workbench is explained in [Appendix A](#).

- 1) In the Keil uVision IDE window, click on “Options for Target”.
- 2) In the new window that opens, click on the “Utilities” tab. Uncheck the “Use Debug Driver” option.
- 3) Next, in the dropdown menu for “Use Target Driver for Flash Programming”, select “CMSIS-DAP Debugger” and click “Settings”.

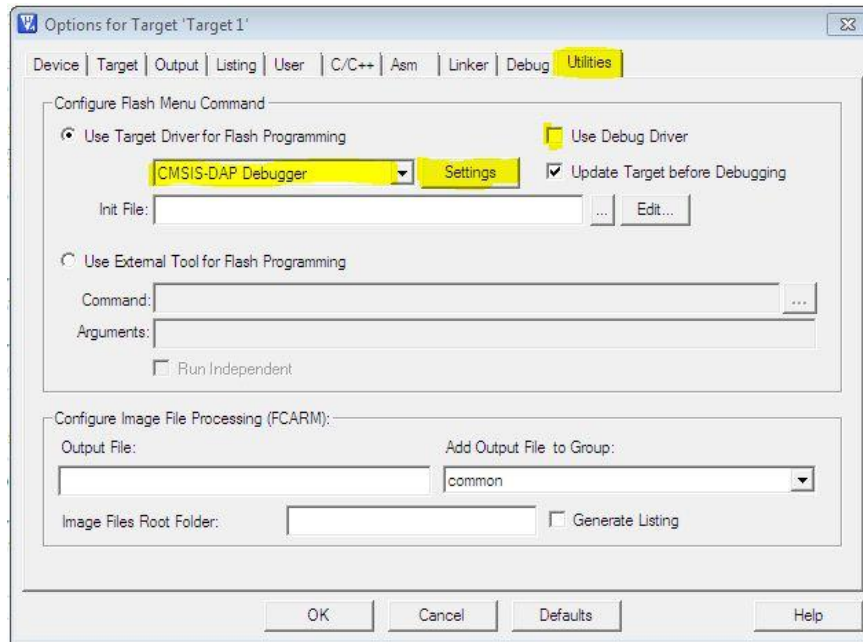


Figure 7: Keil uVision: Options for Target – Utilities

- 4) In the popup window, click “Add” and select the device name highlighted in the image below. Click OK.

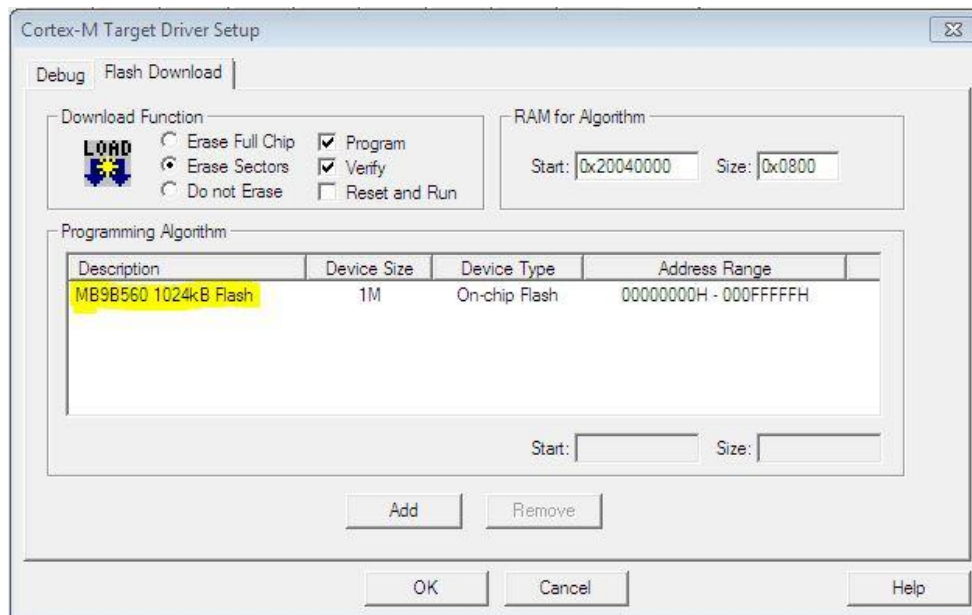


Figure 8: Keil uVision: CMSIS-DAP Debugger Settings

- 5) Next, click the “Debug” tab and select “Use” and “CMSIS-DAP Debugger” as shown below.

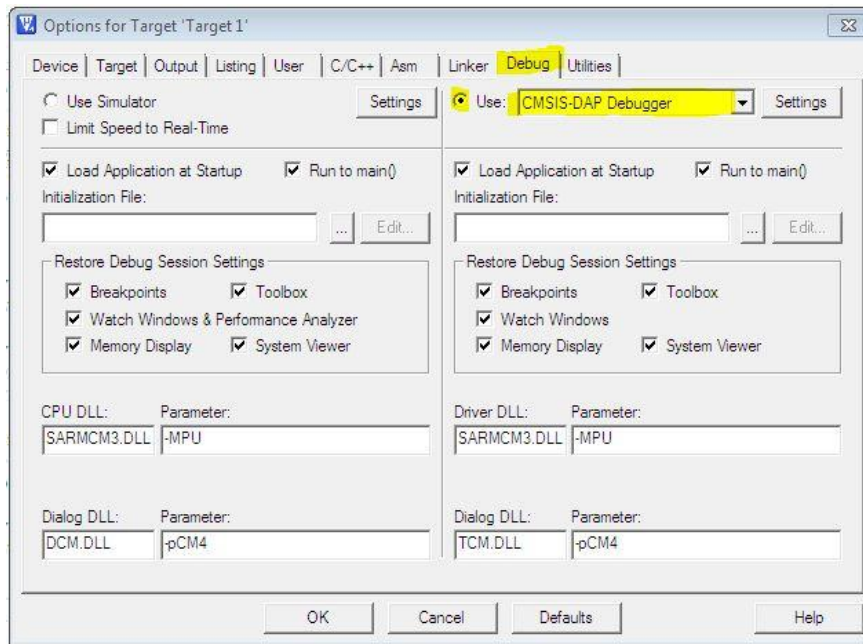


Figure 9: Keil uVision: Options for Target – Debug

- 6) Click on the “Device” tab and ensure that the settings are as shown in the image below.

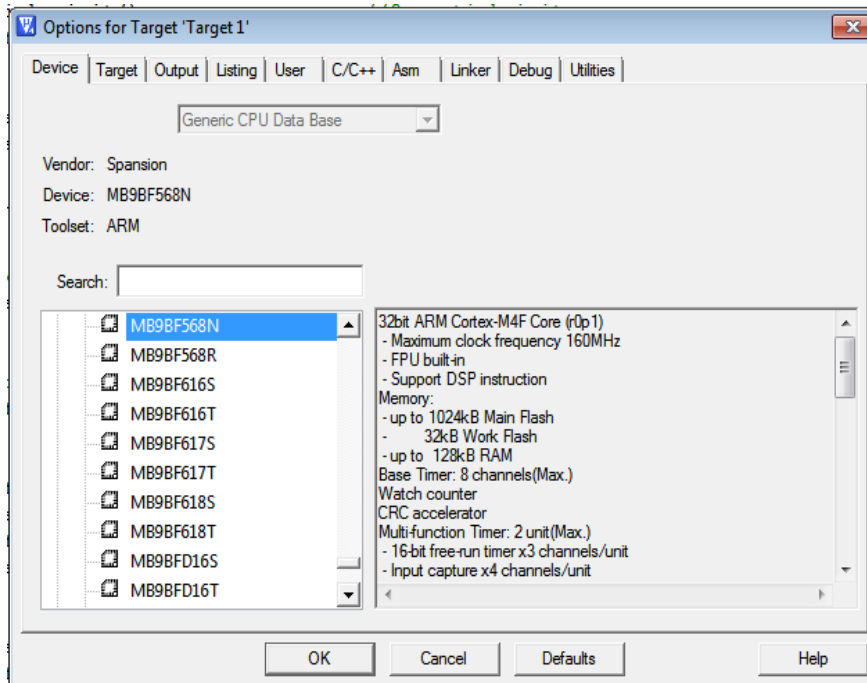


Figure 10: Keil uVision: Options for Target – Debug

- 7) Click on the “Target” tab and ensure all settings are as shown in the image below.

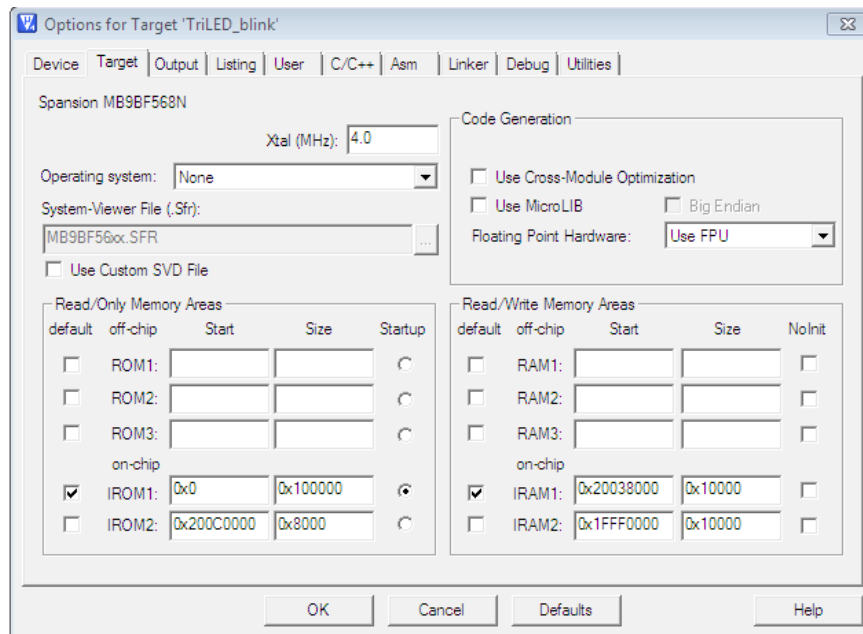


Figure 11: Keil uVision: Options for Target – Target

- 8) Click on the “Output” tab and ensure all settings are as shown in the image below.

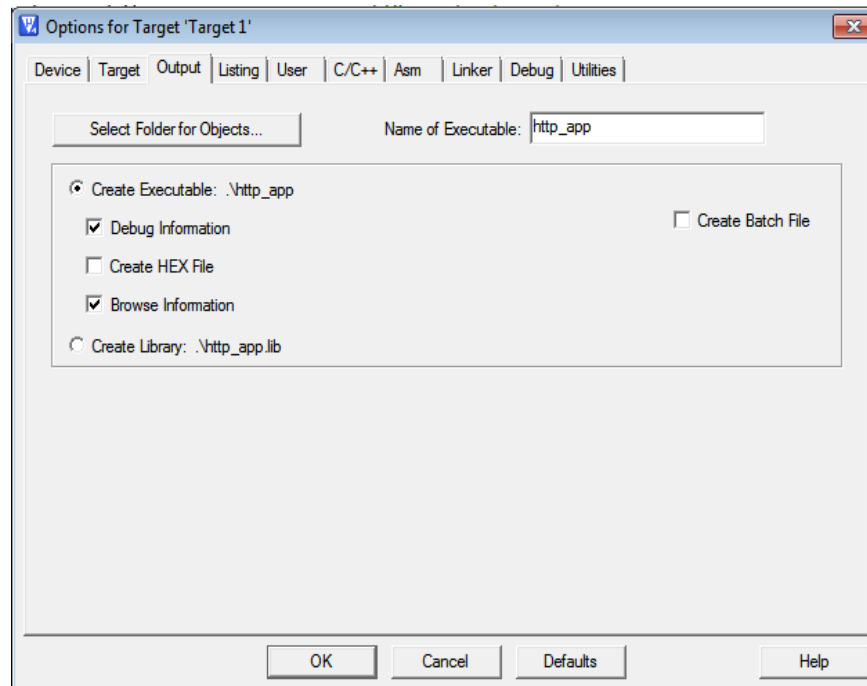


Figure 12: Keil uVision: Options for Target – Output

- 9) Click on the “Linker” tab and ensure all settings are as shown in the image below.

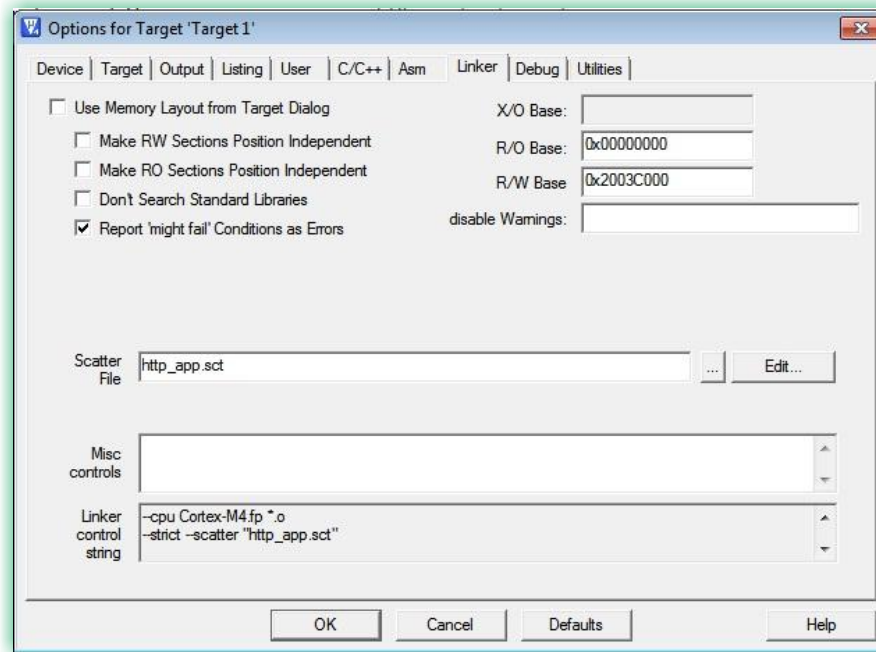


Figure 13: Keil uVision: Options for Target – Linker

The IDE is now configured for WyzBee™. You can now start writing your application!

3.3 Sample Project

A sample project, TriLED.zip, which blinks the onboard TriLED is provided to help you quickly get started on WyzBee™. The details of the pins of the MCU connected to the TriLED are given below:

| LED Color | MCU Pin |
|-----------|---------|
| Red | P41 |
| Green | P3E |
| Blue | P3F |

Table 1: TriLED Connections to MCU

The project, when run, blinks the LEDs one at a time with a certain delay. Follow the steps below to compile, flash and run the example project.

- 1) Download the blinky project (TriLED.zip) from the URL above and extract it.
- 2) Double-click the Keil uVision4 project file. This opens the Keil IDE.
\$(Extracted_Folder)\TriLed\IDE\Keil\TriLed.uvproj
- 3) Open main.c in the IDE from the Project menu, as shown in the image below.

```

16 /*
17 .....
18 *
19 *
20 *
21 * File      : main.c
22 * Version   : V1.00
23 * History   :
24 * 2015-09-01 : V1.00   First version.
25 .....
26 * Note(s)   :
27 .....
28 */
29
30
31 /*
32 .....
33 *
34 *
35 *
36 .....
37 #include <Board_Init.h>
38 #include <TriLED_App.h>
39
40 int main()
41 {
42
43     Board_init();
44
45     TriLED_App();
46
47     return 0;
48 }
49
50

```

Figure 14: main.c of TriLED Project in Keil uVision4

- 4) The TriLED_App() function controls all the frontend functioning of the application. It initializes the necessary drivers and configures WyzBee™. The source code is shown in the image below.

```

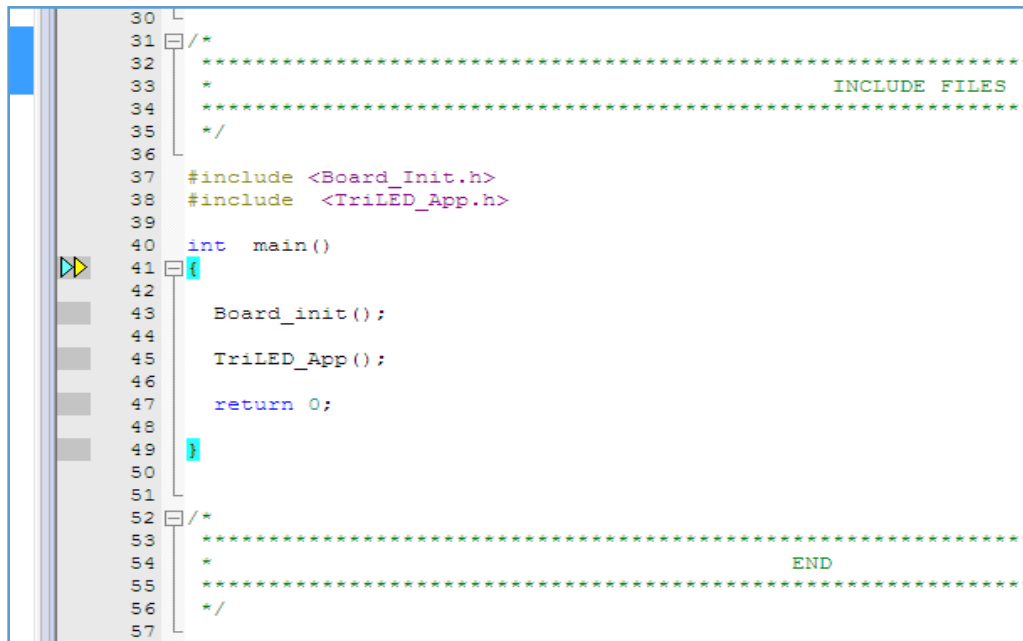
100 void TriLED_App(void)
101 {
102     while(1)
103     {
104         TriLEDGpio_Put(3E,GPIO_LOW);           // Toggling Red led
105         Delay(1000);                           // delay
106         TriLEDGpio_Put(3E,GPIO_HIGH);
107         Delay(1000);
108         TriLEDGpio_Put(3F,GPIO_LOW);           // Toggling Green led
109         Delay(1000);
110         TriLEDGpio_Put(3F,GPIO_HIGH);
111         Delay(1000);
112         TriLEDGpio_Put(41,GPIO_LOW);          // Toggling Blue led
113         Delay(1000);
114         TriLEDGpio_Put(41,GPIO_HIGH);
115         Delay(1000);
116     }
117 }
118
119

```

Figure 15: TriLED_App Function

- 5) TriLED_App() Function:
 - a. The TriLEDGpio_Put function is used to change the value assigned to the pins. GPIO_LOW indicates LED On and GPIO_HIGH indicates LED Off.

- 6) Configure Keil for WyzBee™ as explained in Section 3.2.
- 7) Compile the project by clicking on Project → Build Target.
- 8) After successful compilation, click on Flash → Erase to Erase the MCU's Flash contents.
- 9) Next, click on Debug → Start/Stop Debug Session to download the application to the MCU. The IDE now shows the debug cursor pointing to the main function in the main.c file.



```
30 L
31 /*
32 .....
33 *                               INCLUDE FILES
34 .....
35 */
36
37 #include <Board_Init.h>
38 #include <TriLED_App.h>
39
40 int main()
41 {
42
43     Board_init();
44
45     TriLED_App();
46
47     return 0;
48
49 }
50
51
52 /*
53 .....
54 *                               END
55 .....
56 */
57
```

Figure 16: Debug Cursor at main Function

- 10) Use the Run (Ctrl+F5), Step-in (F11), Step-out (F10) and Step-over (Ctrl+F11) options to execute and debug the application.

For more details on how to use Keil uVision4 IDE, refer the document from the following link:

<http://www.keil.com/product/brochures/uv4.pdf>

You can now start writing your own Application using the API libraries provided. The APIs are explained in WyzBee API Guide document.

3.4 Adding THINGS

The WyzBee™ THING expansion headers accommodate a host of other symbiotic devices, with a number of peripherals – called ‘Things’ – already available from Redpine including audio, GSM, GPS, capacitive touch display, rechargeable battery, and additional sensors.

Adding THINGS is as simple as stacking one board on top of the other. Care needs to be taken to ensure that the interfaces being used for one THING are not being used by another THING when stacking multiple THINGS.

Details on the THINGS are available in their individual documents.

4 Appendix A: Installing IDEs

This section describes the steps for downloading and installing the IDEs¹ which can be used with WyzBee™.

4.1 Keil IDE

The Keil IDE from ARM can be used for IoT application development and supports both C and C++ languages.

4.1.1 Download and Installation

Evaluation version of Keil IDE can be downloaded from <https://www.keil.com>. The following steps have been described for Keil version 4.7.4.

We strongly recommend ensuring you are downloading the MDK-ARM V4.74 setup file.

You need to register yourself to generate the setup file to be downloaded.

- 1) Start the installer. If any security warnings appear, click on Run.
- 2) In the Installer window, click Next.
- 3) Click Next again to continue the installation.

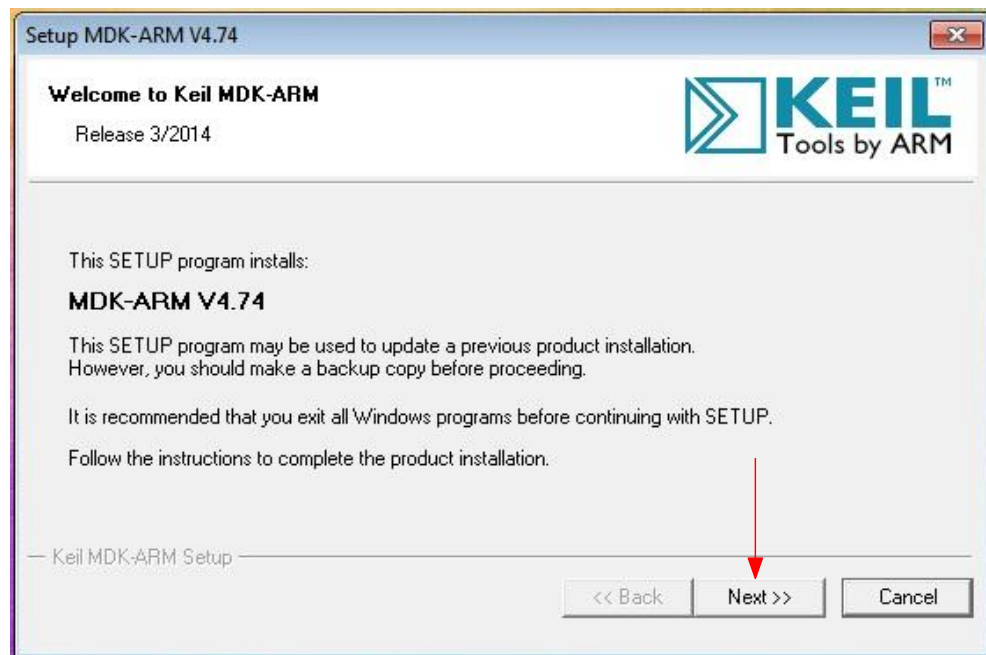


Figure 17: Keil IDE Installation Window

- 4) Check the “I agree to all the terms...” option and click Next.

¹ Keil and IAR impose a code size limitation of 32KB on the evaluation versions of their IDEs

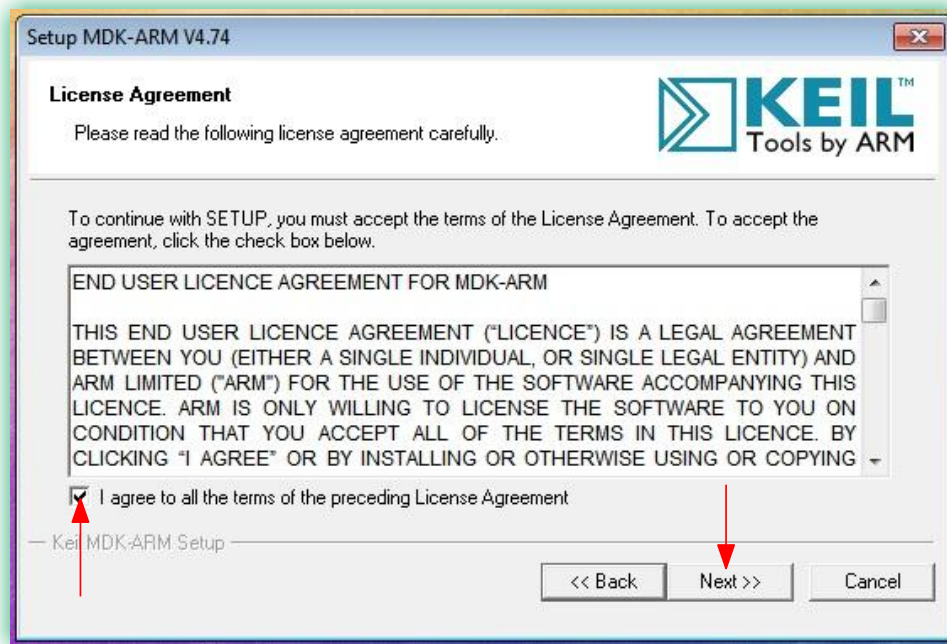


Figure 18: Keil IDE Installation License Agreement

- 5) In the next window, you have the option of changing the folder in which the IDE will be installed. Change it if required and click Next.

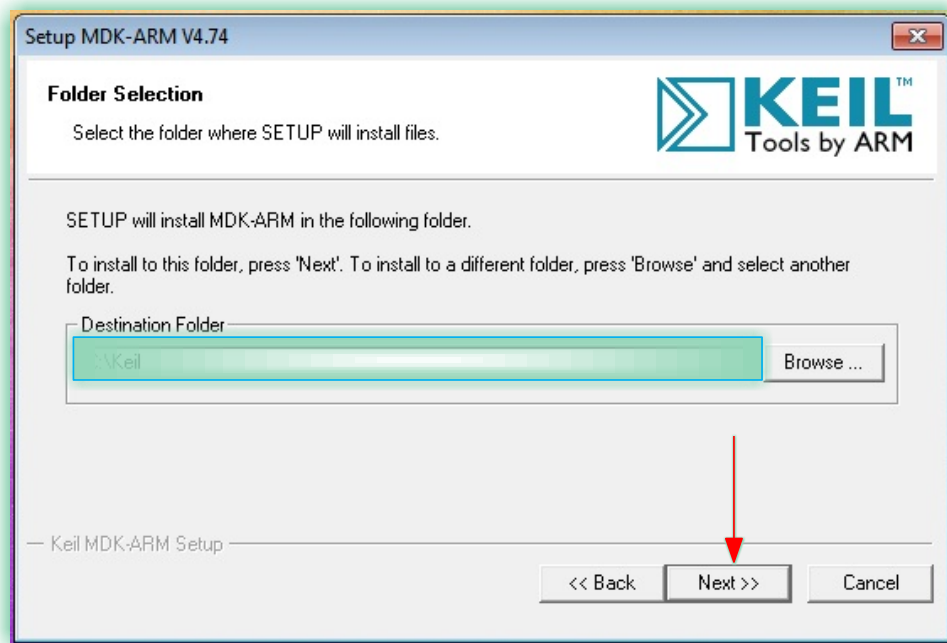


Figure 19: Keil IDE Installation Folder Selection

- 6) Enter your details in the next window and click Next to start the installation process.

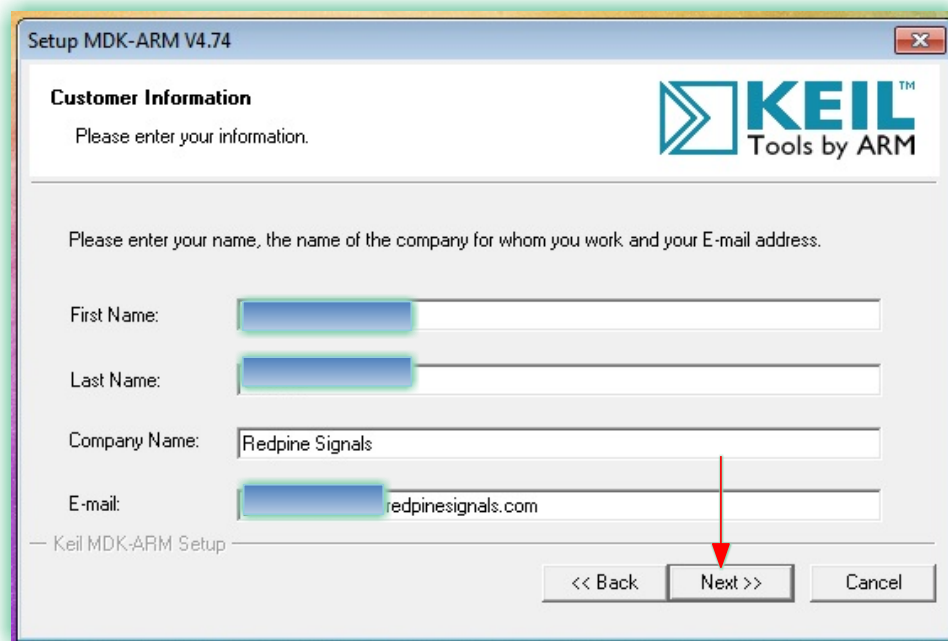


Figure 20: Keil IDE Customer Information

- 7) After the installation is completed, click Next again.

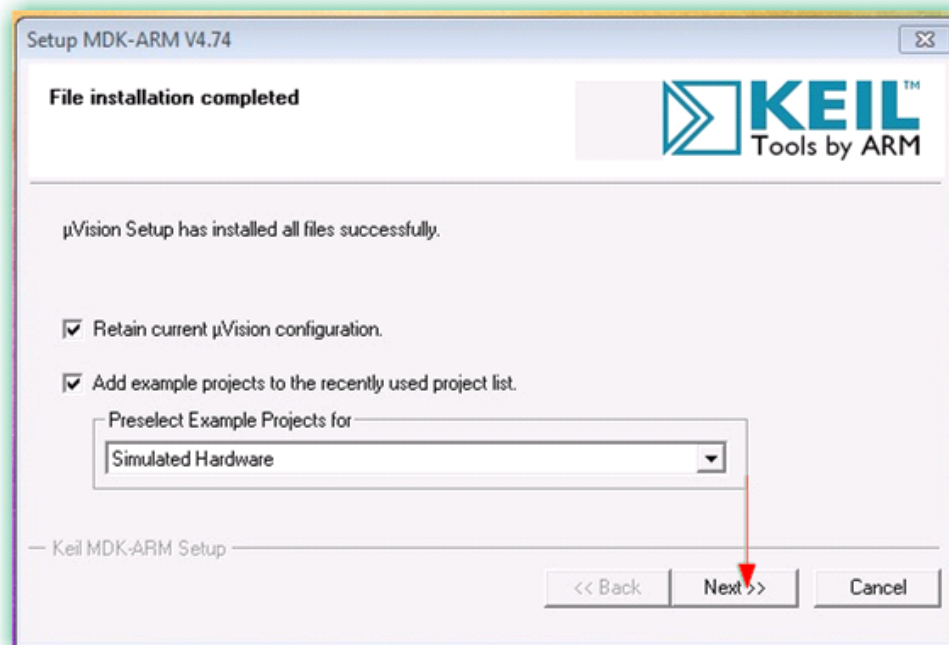


Figure 21: Keil IDE Installation Completed

- 8) Now, select the "Launch Driver Installation: ULINK Pro Driver V1.0" option and click Finish.

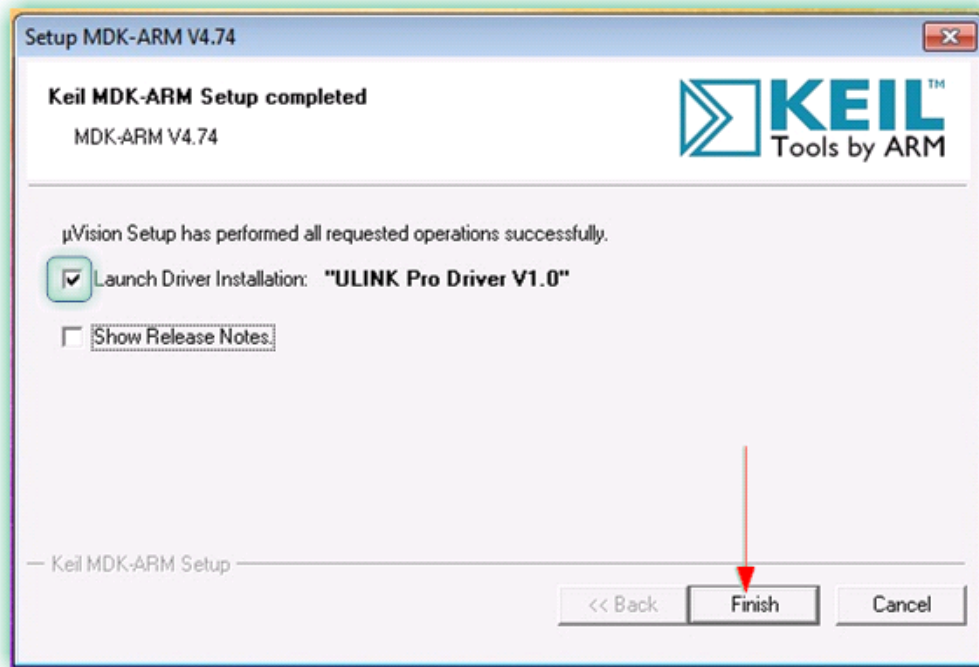


Figure 22: Keil IDE Installation Completed

- 9) In the new window that opens, click Install to continue with the installation of the ULINK drivers.



Figure 23: ULINK Driver Installation

4.1.2 Configuring Keil IDE for WyzBee™

The process for configuring Keil IDE for WyzBee™ is explained in [Section 3.2](#).

4.2 CoIDE

The CoIDE from Coocox is a free IDE and can be used for IoT application development. CoIDE supports both C and C++ languages and does not have any code size limitations.

4.2.1 Download and Installation

CoIDE can be downloaded from <http://www.coocox.org> . The following steps have been described for CoIDE version 1.7.8.

- 1) Start the installer. If any security warnings appear, click on Run.
- 2) In the Installer window, click Next.

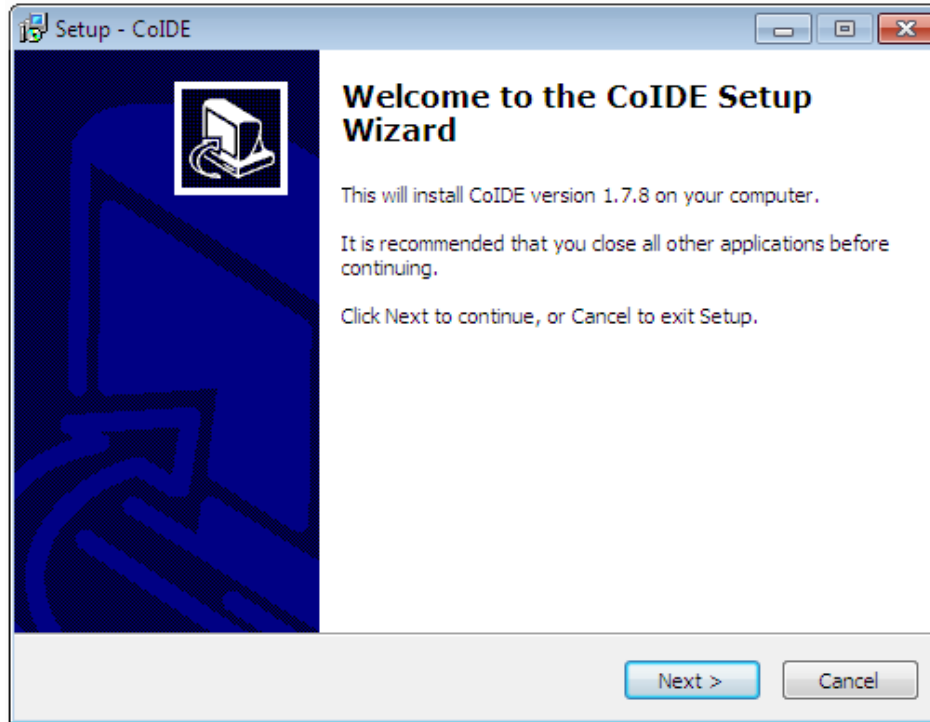


Figure 24: CoIDE Installation Window

- 3) In the next window, you have the option of changing the folder in which the IDE will be installed. Change it if required and click Next.

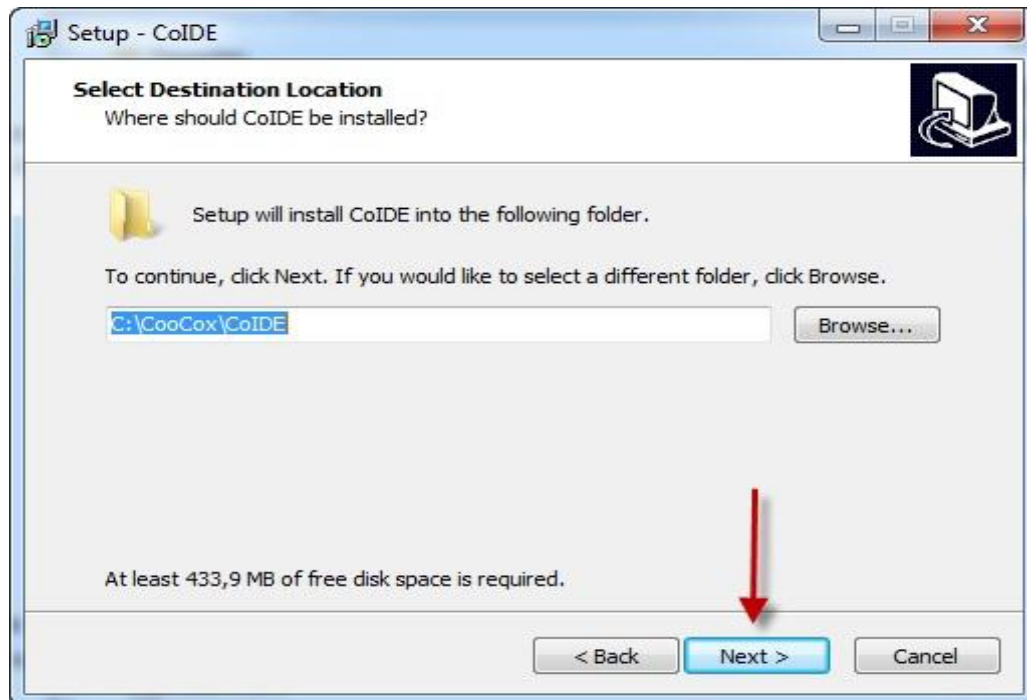


Figure 25: CoIDE Installation Folder Selection

- 4) In the new window, click Install to start the Installation of CoIDE.



Figure 26: CoIDE Installation Start

- 5) Click Finish after the installation is completed.

- 6) CoIDE doesn't come with an integrated GCC compiler. Download and install the relevant GCC toolchain for Windows from <https://launchpad.net/gcc-arm-embedded/>
- 7) Once the installation of the GCC Toolchain is completed, open CoIDE and click on "Select Toolchain Path" under "Project". In the new dialog box that opens, enter the path where the GCC Toolchain was installed.

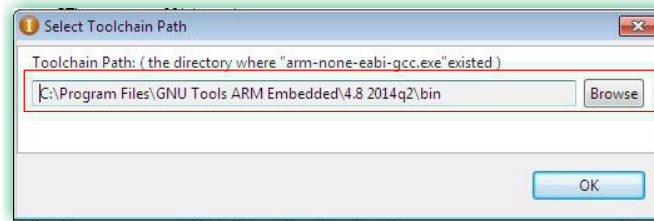


Figure 27: GCC Toolchain Path for CoIDE

- 8) To verify the downloaded version, click Help -> About CoIDE

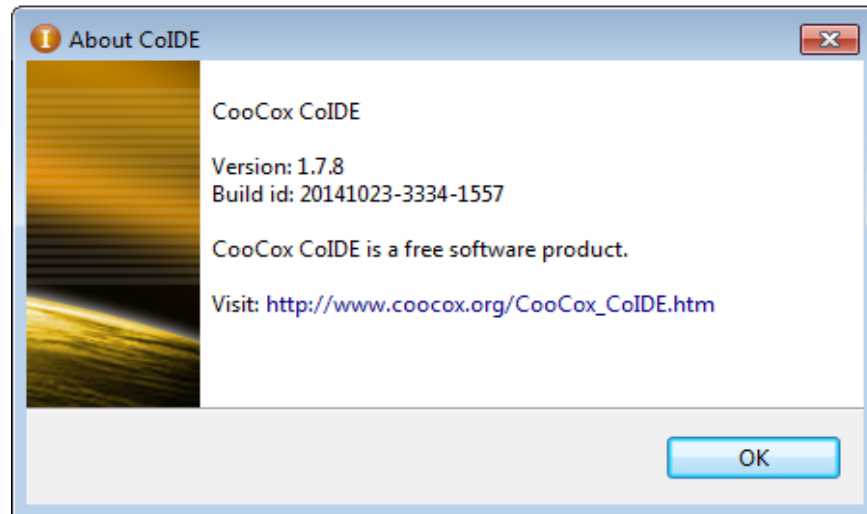


Figure 28: CoIDE Version

4.2.2 Configuring CoIDE for WyzBee™

Follow the steps below to configure CoIDE for WyzBee™.

- 1) Open CoIDE and click on the Configuration button.



Figure 29: CoIDE Configuration Button

- 2) In the new window that opens, ensure that the settings on each tab match the settings in the images below.

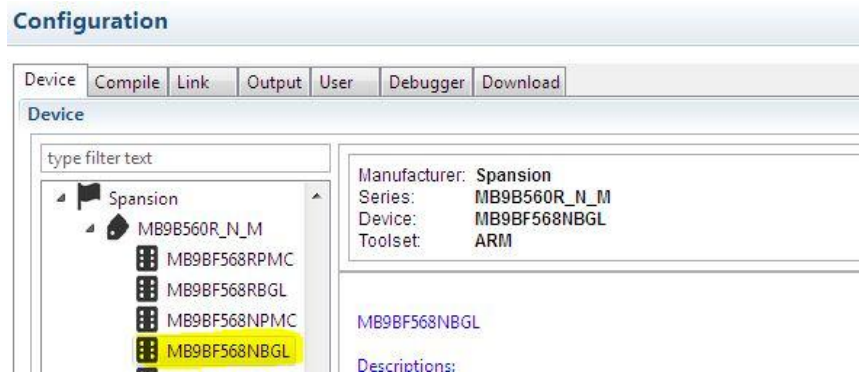


Figure 30: CoIDE Configuration – Device

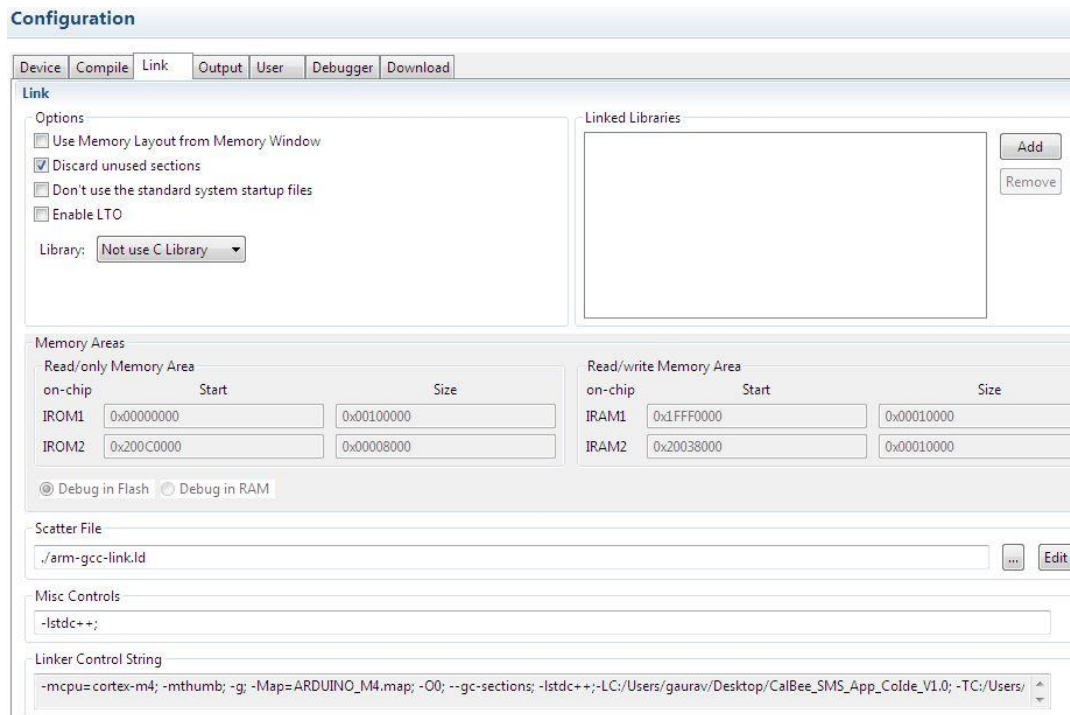


Figure 31: CoIDE Configuration – Link

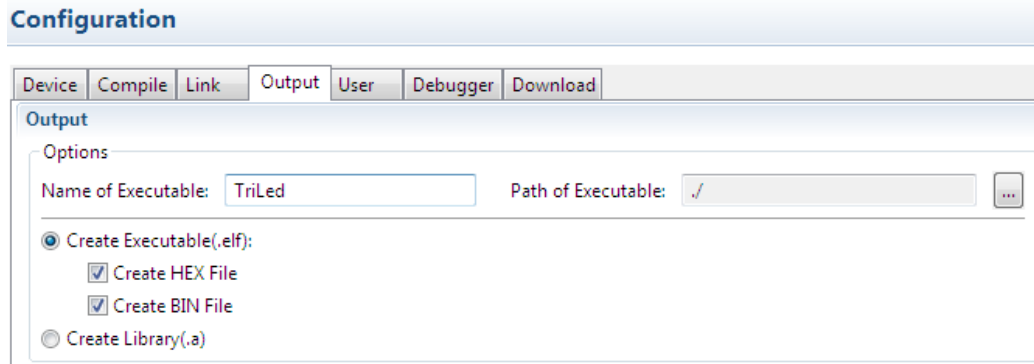


Figure 32: CoIDE Configuration – Output

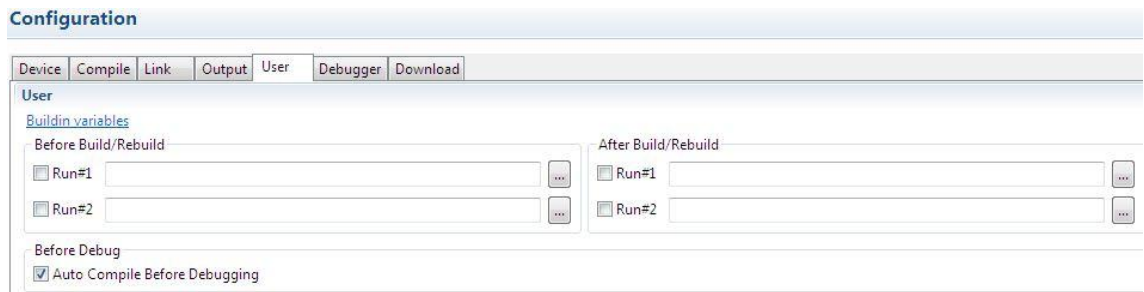


Figure 33: CoIDE Configuration – User

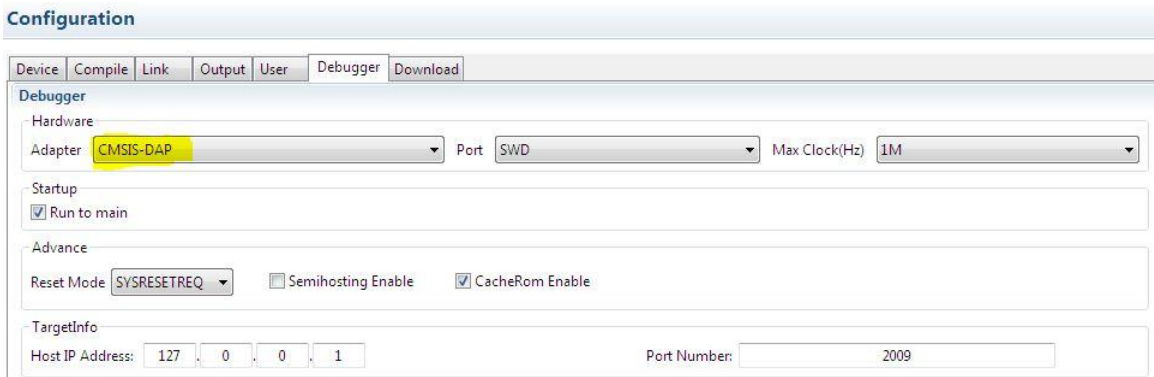


Figure 34: CoIDE Configuration – Debugger

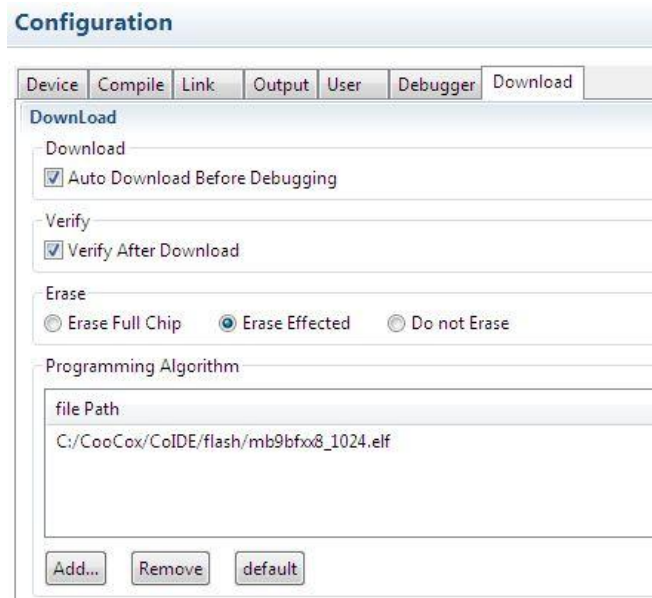


Figure 35: CoIDE Configuration – Download

4.3 IAR Embedded Workbench

IAR Embedded Workbench is a development environment that includes a C/C++ compiler and debugger.

4.3.1 Download and Installation

The IAR Embedded Workbench can be downloaded from <https://www.iar.com>. The following steps have been described for IAR version 7.30.

- 1) Start the installer. If any security warnings appear, click on Run.
- 2) In the installation window, selection the “Install IAR Embedded Workbench” option.

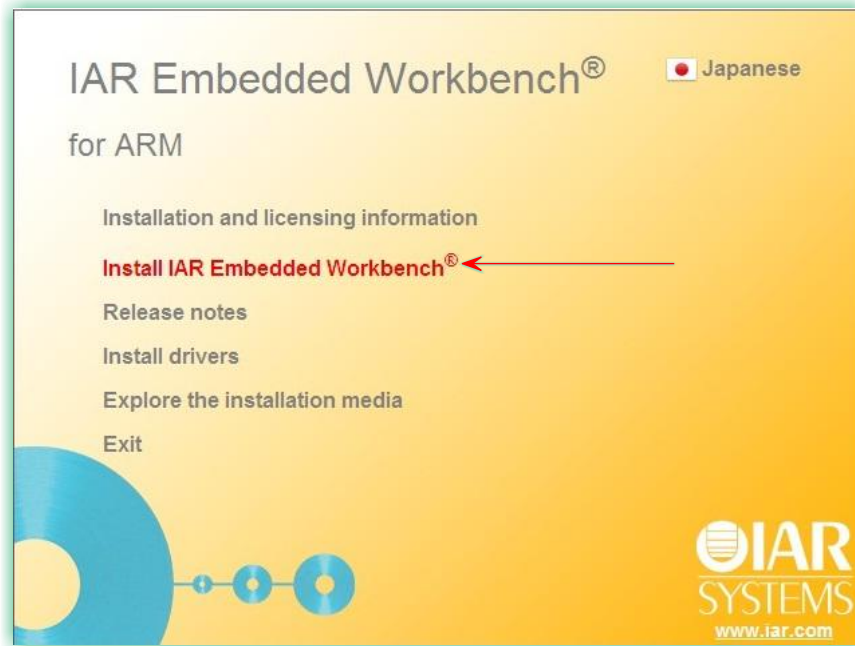


Figure 36: IAR Embedded Workbench Installation Window

- 3) In the new window, click Next.

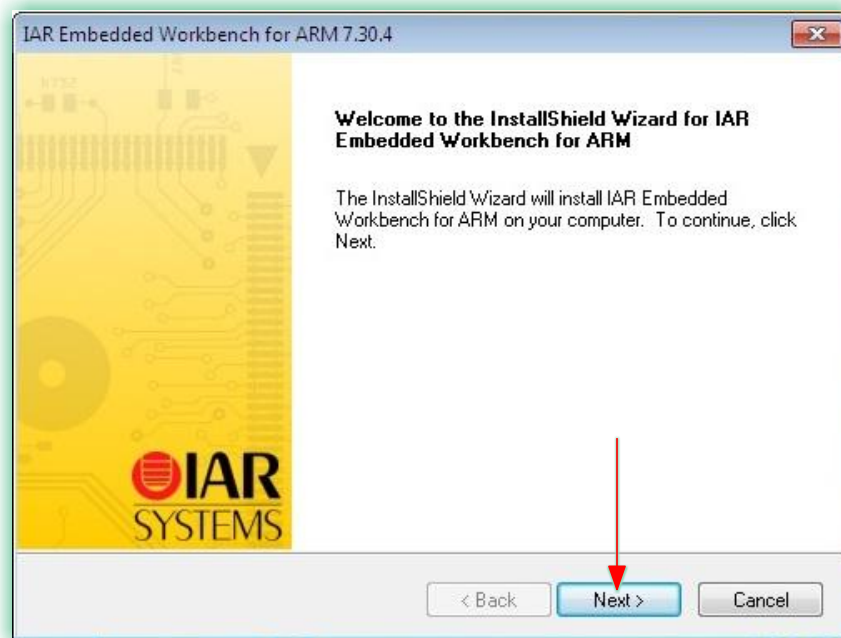


Figure 37: IAR Embedded Workbench Installation Window

- 4) Check the “I accept the terms of the license agreement” option and click Next.

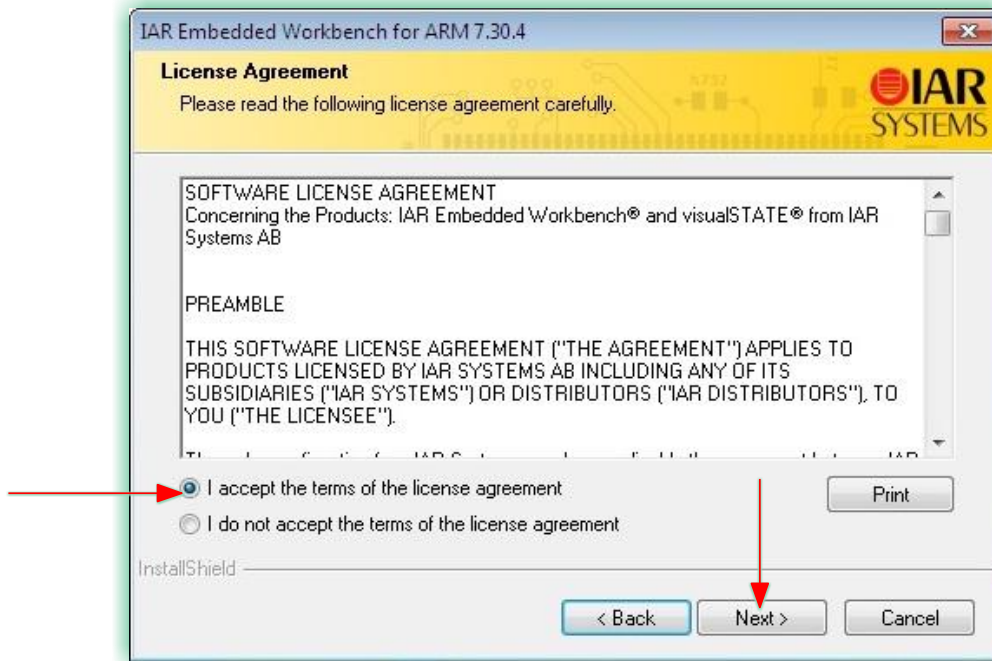


Figure 38: IAR Embedded Workbench License Agreement

- 5) In the next window, you have the option of changing the folder in which the IDE will be installed. Change it if required and click Next.

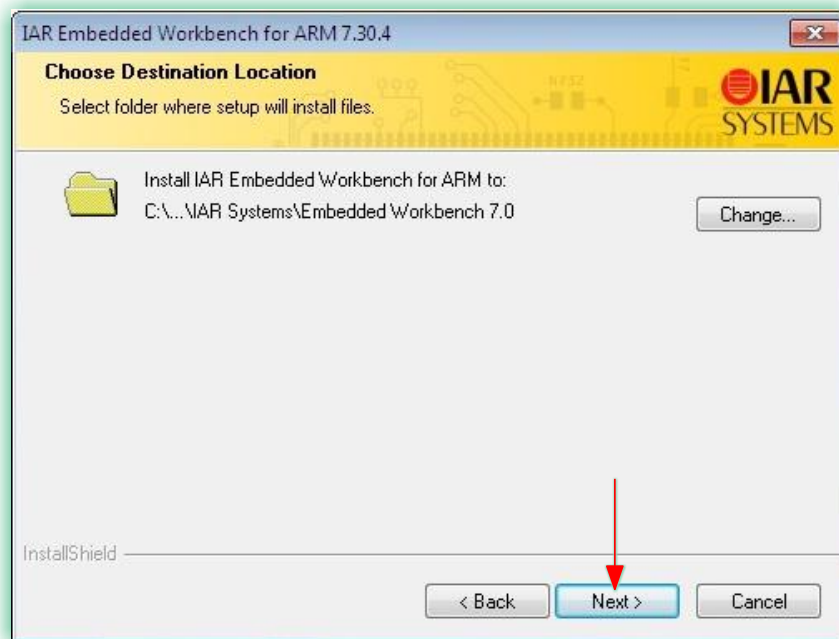


Figure 39: IAR Embedded Workbench Installation Folder

- 6) Click Next in the new window and then click Install to start the installation process.

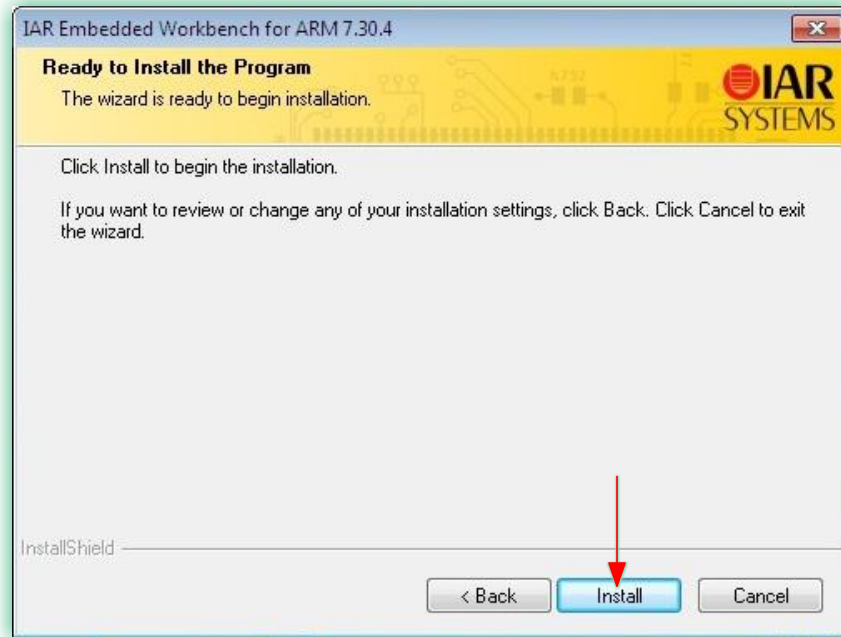


Figure 40: IAR Embedded Workbench Installation Start

- 7) Wait for the installation to be completed. You will be requested to remove any USB dongles connected to the PC. Remove them and click Yes.



Figure 41: IAR Embedded Workbench – Dongle Drivers Installation

- 8) This will start the installation of the dongle drivers. Once completed, select the “Launch IAR Embedded Workbench for ARM” option and click Finish to complete the installation of IAR Embedded Workbench.

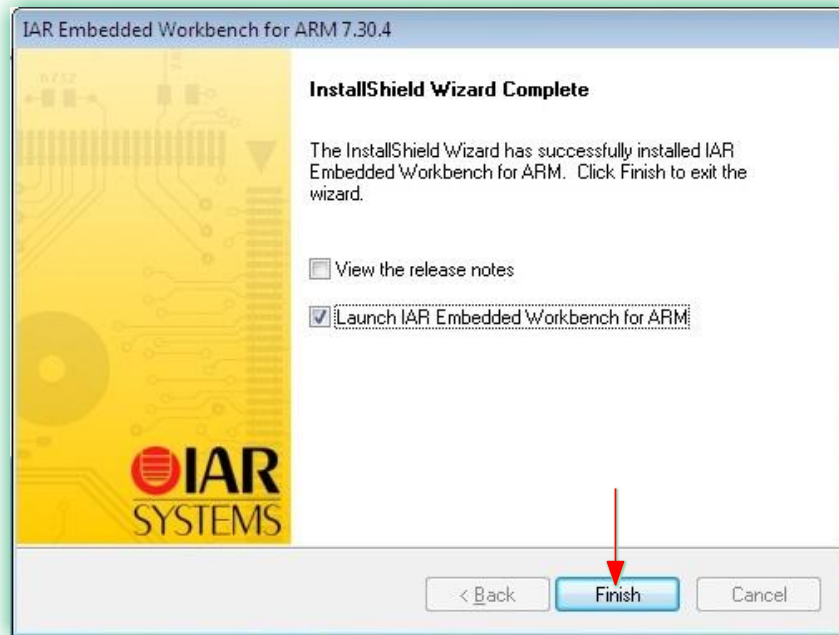


Figure 42: IAR Embedded Workbench Installation Completed

- 9) Next, you will be prompted for installation of device software. Click Install.



Figure 43: IAR Embedded Workbench – Device Software – 1



Figure 44: IAR Embedded Workbench – Device Software – 2

10) Select the Language of your preference and click OK.

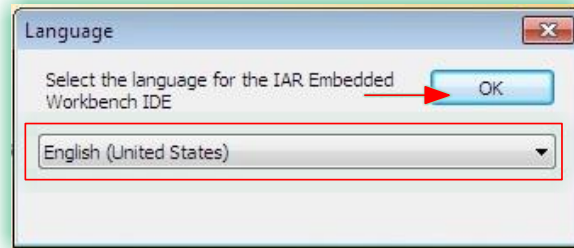


Figure 45: IAR Embedded Workbench – Language Selection

11) The IAR Embedded Workbench window opens, followed by the License Wizard. Click Next.

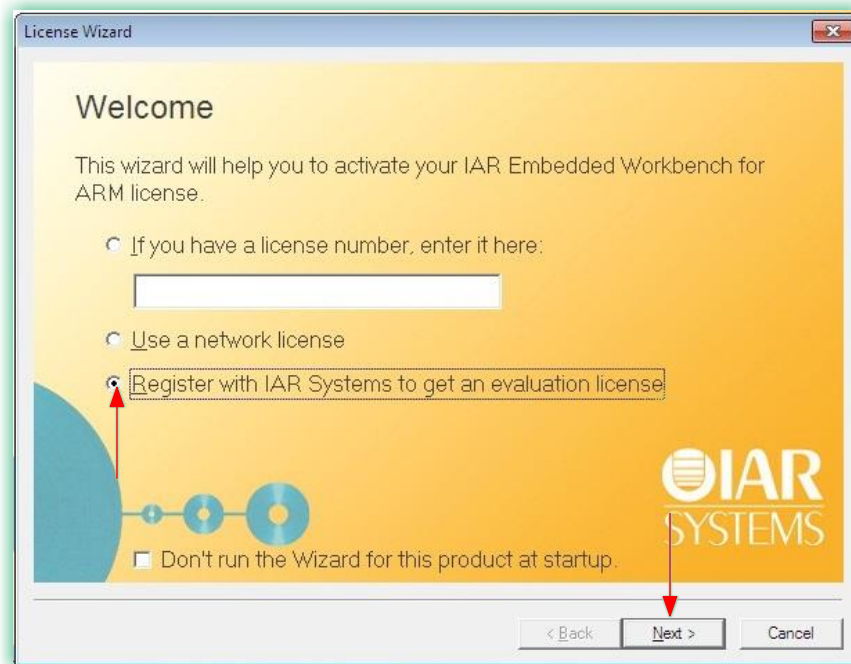


Figure 46: IAR Embedded Workbench – License Wizard

12) Click Next again.

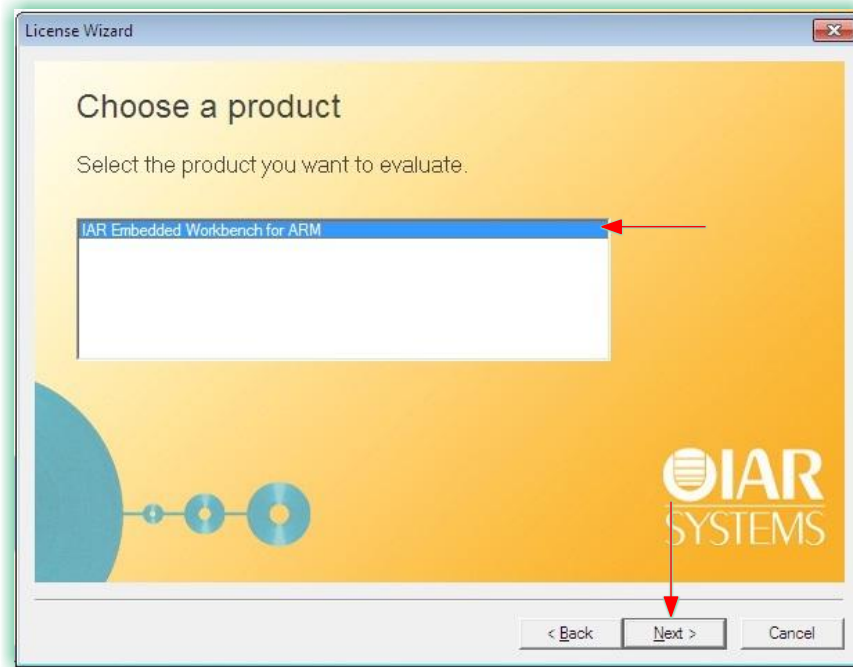


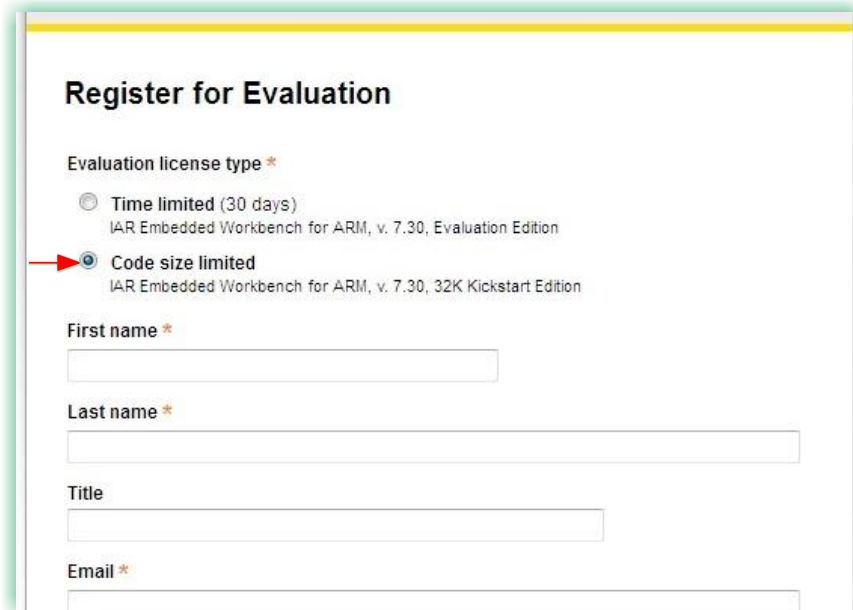
Figure 47: IAR Embedded Workbench – License Wizard (Choose a Product)

13) In the new window, click Register.



Figure 48: IAR Embedded Workbench – License Wizard (Register)

- 14) Clicking Register opens a web browser for the Registration process. Select the “Code Size Limited” option and enter the rest of the details.



Register for Evaluation

Evaluation license type *

Time limited (30 days)
IAR Embedded Workbench for ARM, v. 7.30, Evaluation Edition

Code size limited
IAR Embedded Workbench for ARM, v. 7.30, 32K Kickstart Edition

First name *

Last name *

Title

Email *

Figure 49: IAR Embedded Workbench: Registration

- 15) Once the details are submitted, a confirmation email is sent to the registered email address. Open the confirmation email and click on the confirmation link.
- 16) Next, a page opens with a License Key.



Figure 50: IAR Embedded Workbench: Registration Complete

- 17) Copy this key and paste it in the License Wizard and click Next to complete the installation and registration process for IAR Embedded Workbench.

4.3.2 Configuration IAR Embedded Workbench for WyzBee™

- 1) Open the IAR Embedded Workbench and click on Project → Options

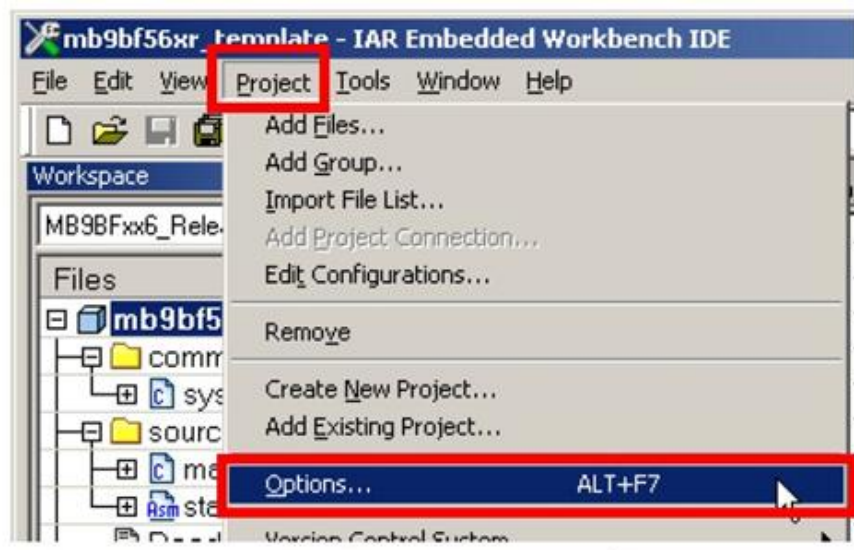


Figure 51: IAR Embedded Workbench – Project Options

- 2) In the Options window that opens, ensure that all settings are as per the images shown below.

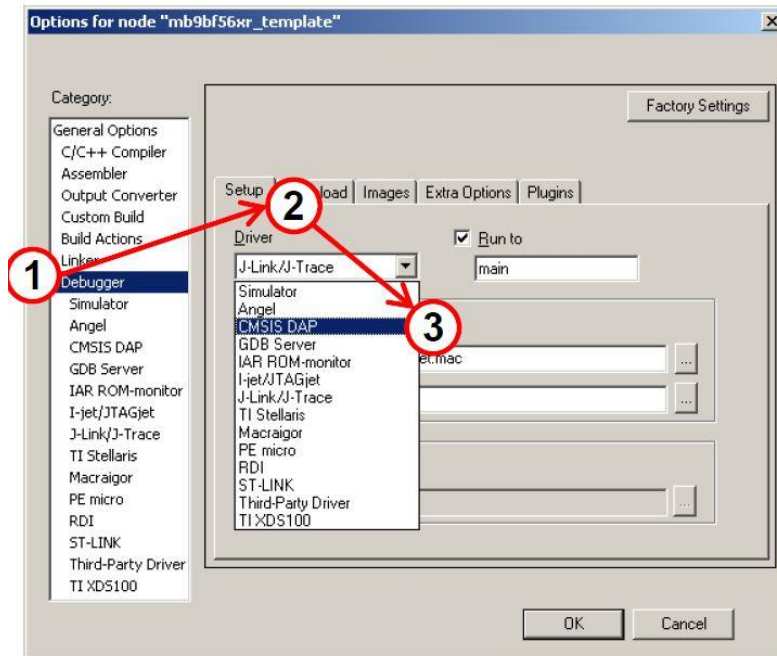


Figure 52: IAR Embedded Workbench – Options – 1

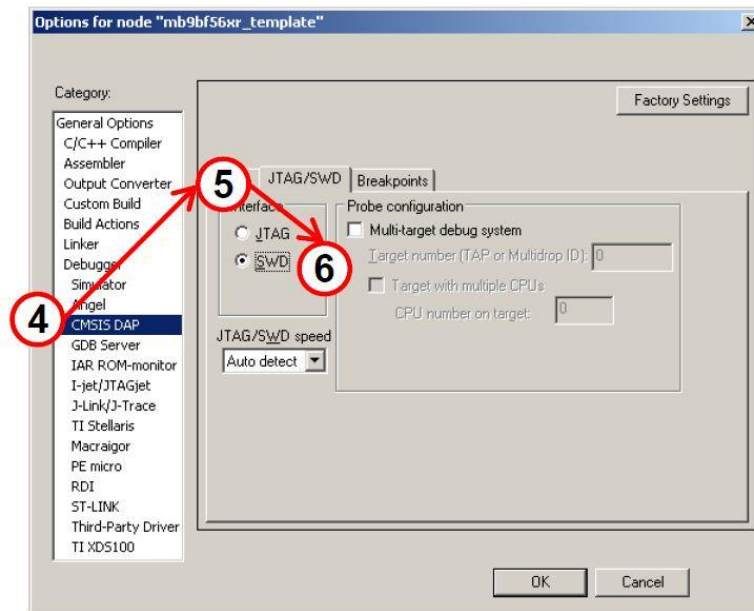


Figure 53: IAR Embedded Workbench – Options – 2

- 3) Click OK to complete the configuration for WyzBee™.

5 Appendix B: WyzBee™ Headers

The WyzBee™ baseboard comes with 2 16-pin THING™ Headers. These headers can be used to add a combination of multiple THING™ boards.

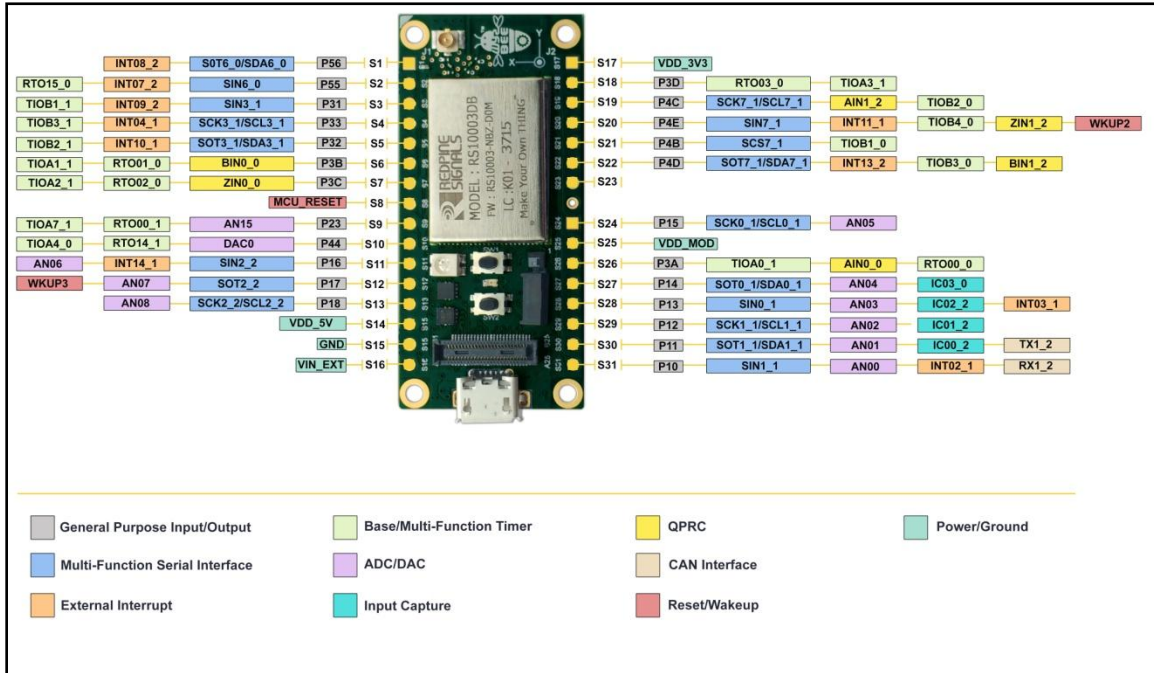


Figure 54: 32-pin WyzBee™ THING Header

5.1 Pin Description

The table below describes the pins of the WyzBee™ baseboard's Headers.

| Pin Name | Function | Direction | Description |
|----------------------|---------------|--------------|--|
| THING Headers | | | |
| S1 | P56 | Inout | General-purpose Input/Output |
| | SOT6_0/SDA6_0 | Output/Inout | Multi-function Serial Interface Channel 6 Output/Inout |
| | INT08_2 | Input | External Interrupt 8 |
| S2 | P55 | Inout | General-purpose Input/Output |
| | SIN6_0 | Input | Multi-function Serial interface Channel 6 Input |
| | RTO15_0 | Output | Waveform generator output of Multi-function timer 15 |

| Pin Name | Function | Direction | Description |
|----------|---------------|--------------|---|
| | INT07_2 | Input | External Interrupt 7 |
| S3 | P31 | Inout | General-purpose Input/Output |
| | TIOB1_1 | Inout | Base Timer Channel 1 TIOB pin. This can be used only if S16 is not configured as TIOB1_0. |
| | SIN3_1 | Input | Multi-function Serial interface Channel 3 Input |
| | INT09_2 | Input | External Interrupt 9 |
| S4 | P33 | Inout | General-purpose Input/Output |
| | TIOB3_1 | Inout | Base Timer Channel 3 TIOB pin. This can be used only if S17 is not configured as TIOB3_0. |
| | SCK3_1/SCL3_1 | Output | Multi-function Serial interface Channel 3 Clock output |
| | INT04_1 | Input | External Interrupt 4 |
| S5 | P32 | Inout | General-purpose Input/Output |
| | TIOB2_1 | Inout | Base Timer Channel 2 TIOB pin. This can be used only if S14 is not configured as TIOB2_0. |
| | SOT3_1/SDA3_1 | Output/Inout | Multi-function Serial Interface Channel 3 Output/Inout |
| | INT10_1 | Input | External Interrupt 10 |
| S6 | P3B | Inout | General-purpose Input/Output |
| | TIOA1_1 | Inout | Base Timer Channel 1 TIOA pin |
| | BIN0_0 | Input | QPRC Channel 0 BIN Input |
| | RTO01_0 | Output | Waveform generator output of Multi-function timer 1 |
| S7 | P3C | Inout | General-purpose Input/Output |
| | TIOA2_1 | Inout | Base Timer Channel 2 TIOA pin |

| Pin Name | Function | Direction | Description |
|----------|---------------|-----------|--|
| | ZIN0_0 | Input | QPRC Channel 0 ZIN Input |
| | RTO02_0 | Output | Waveform generator output of Multi-function timer 2 |
| S8 | MCU_RESET_N | Input | External reset |
| S9 | P23 | Inout | General-purpose Input/Output |
| | TIOA7_1 | Inout | Base Timer Channel 7 TIOA pin |
| | RTO00_1 | Output | Waveform generator output of Multi-function timer 0 |
| | AN15 | Input | ADC Input Channel 15 |
| S10 | P44 | Inout | General-purpose Input/Output |
| | TIOA4_0 | Inout | Base Timer Channel 4 TIOA pin |
| | RTO14_1 | Output | Waveform generator output of Multi-function timer 14 |
| | DAC0 | Output | DAC Output Channel 0 |
| S11 | P16 | Inout | General-purpose Input/Output |
| | SIN2_2 | Input | Multi-function Serial interface Channel 2 Input |
| | INT14_1 | Input | External Interrupt 14 |
| | AN06 | Input | ADC Input Channel 6 |
| S12 | P17 | Inout | General-purpose Input/Output |
| | SOT2_2 | Output | Multi-function Serial Interface Channel 2 Output |
| | AN07 | Input | ADC Input Channel 7 |
| | WKUP3 | Input | Deep standby mode return Channel 3 Input |
| S13 | P18 | Inout | General-purpose Input/Output |
| | SCK2_2/SCL2_2 | Output | Multi-function Serial interface |

| Pin Name | Function | Direction | Description |
|----------|---------------|-----------|---|
| | | | Chanel 2 Clock output |
| | AN08 | Input | ADC Input Channel 8 |
| S14 | VDD_5V | Output | 5V Output Power Supply for THING boards. |
| S15 | GND | Ground | Ground |
| S16 | VIN_EXT | Input | External Power Supply. This can be from different sources like battery THING. |
| S12 | P15 | Inout | General-purpose Input/Output |
| | SCK0_1/SCL0_1 | Output | Multi-function Serial interface Chanel 0 Clock output |
| | AN05 | Input | ADC Input Channel 5 |
| S17 | VDD_3V3 | Output | 3.3V Output Power supply |
| S18 | P4C | Inout | General-purpose Input/Output |
| | TIOB2_0 | Inout | Base Timer Channel 2 TIOB pin |
| | SCK7_1/SCL7_1 | Output | Multi-function Serial interface Chanel 7 Clock output |
| | AIN1_2 | Input | QPRC Channel 1 AIN Input |
| S19 | P4E | Inout | General-purpose Input/Output |
| | TIOB4_0 | Inout | Base Timer Channel 4 TIOB pin |
| | SIN7_1 | Input | Multi-function Serial interface Channel 7 Input |
| | ZIN1_2 | Input | QPRC Channel 1 ZIN Input |
| | INT11_1 | Input | External Interrupt 11 |
| | WKUP2 | Input | Deep standby mode return Channel 2 Input |
| S20 | P4B | Inout | General-purpose Input/Output |

| Pin Name | Function | Direction | Description |
|----------|---------------|--------------|---|
| | TIOB1_0 | Inout | Base Timer Channel 1 TIOB pin. This can be used only if S12 is not configured as TIOB1_1. |
| | SCS7_1 | Output | Multi-function Serial interface Channel 7 Chip Select |
| S21 | P4D | Inout | General-purpose Input/Output |
| | TIOB3_0 | Inout | Base Timer Channel 3 TIOB pin. This can be used only if S3 is not configured as TIOB3_0. |
| | SOT7_1/SDA7_1 | Output/Inout | Multi-function Serial Interface Channel 2 Output/Inout |
| | BIN1_2 | Input | QPRC Channel 1 BIN Input |
| | INT13_2 | Input | External Interrupt 13 |
| S22 | Ground | Ground | Ground |
| S23 | MCU_VCC33 | Output | 3.3V Power Supply |
| S24 | P3D | Inout | General-purpose Input/Output |
| | TIOA3_1 | Inout | Base Timer Channel 3 TIOA pin |
| | RTO03_0 | Output | Waveform generator output of Multi-function timer 3 |
| S25 | VDD_MOD | Output | 3.3V Output Power supply |
| S26 | P3A | Inout | General-purpose Input/Output |
| | TIOA0_1 | Inout | Base Timer Channel 0 TIOA pin |
| | AIN0_0 | Input | QPRC Channel 0 AIN Input |
| | RTO00_0 | Inout | Waveform generator output of Multi-function timer 0 |
| S27 | P14 | Inout | General-purpose Input/Output |
| | SOT0_1/SDA0_1 | Output/Inout | Multi-function Serial Interface Channel 0 Output/Inout |

| Pin Name | Function | Direction | Description |
|----------|---------------|--------------|--|
| | IC03_2 | Input | 16-bit input capture Channel 3 input pin of Multi-function timer 0 |
| | AN04 | Input | ADC Input Channel 4 |
| S28 | P13 | Inout | General-purpose Input/Output |
| | SIN0_1 | Input | Multi-function Serial interface Channel 0 Input |
| | IC02_2 | Input | 16-bit input capture Channel 2 input pin of Multi-function timer 0 |
| | INT03_1 | | External Interrupt 3 |
| | AN03 | Input | ADC Input Channel 3 |
| S29 | P12 | Inout | General-purpose Input/Output |
| | SCK1_1/SCL1_1 | Output | Multi-function Serial interface Channel 1 Clock output |
| | IC01_2 | Input | 16-bit input capture Channel 1 input pin of Multi-function timer 0 |
| | RTCC0_1 | Output | Reserved |
| | AN02 | Input | ADC Input Channel 2 |
| S30 | P11 | Inout | General-purpose Input/Output |
| | TX1_2 | Output | CAN interface Channel 1 TX output |
| | SOT1_1/SDA1_1 | Output/Inout | Multi-function Serial Interface Channel 1 Output/Inout |
| | IC00_2 | Input | 16-bit input capture Channel 0 input pin of Multi-function timer 0 |
| | AN01 | Input | ADC Input Channel 1 |

| Pin Name | Function | Direction | Description |
|----------|----------|-----------|---|
| S31 | P10 | Inout | General-purpose Input/Output |
| | INT02_1 | Input | External Interrupt 2 |
| | RX1_2 | Output | CAN interface Channel 1 RX input |
| | SIN1_1 | Input | Multi-function Serial interface Channel 1 Input |
| | AN00 | Input | ADC Input Channel 0 |

Table 2: Headers Pins Description

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- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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JONHON

«JONHON» (основан в 1970 г.)

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