FRONTGRADE

# APPLICATION NOTE

## UT32M0R500

Creating a Project in the Keil IDE UT32M0R500
32-bit Arm™ Cortex® M0+ Microcontroller

8/15/2018
Version #: 1.1.0

**Table 1: Cross Reference of Applicable Products**

| Product Name | Manufacturer Part Number | SMD # | Device Type | Internal Pic Number |
|---|---|---|---|---|
| Arm Cortex M0+ | UT32M0R500 | 5962-17212 | Project Setup | QS30 |

# 1.0 Overview

This document details the process of creating a **UT32M0R500**-based embedded software project using the **Keil ARM** development tools. For the purposes of this document, we will create a project named **helloworld** and configure the **Keil** tools to include all the source modules required for a successful build. Using this template, the user should be able to create projects using (a) their preferred application source directory structures and (b) the directory structure for the **Keil**-supplied files.

# 2.0 Creating a design project with Keil uVision IDE

1. Download **UT32M0R500_API_vx_x_x.zip** from www.frontgrade.com/hirel. Once the download has completed, unzip the files. Create a directory of your choice for the **helloworld** project.
2. Launch Keil uVision 
3. From the Project menu, select New uVision Project….
4. Under the directory of choice, specify the project name as **helloworld** and click **Save,** see Figure 1.

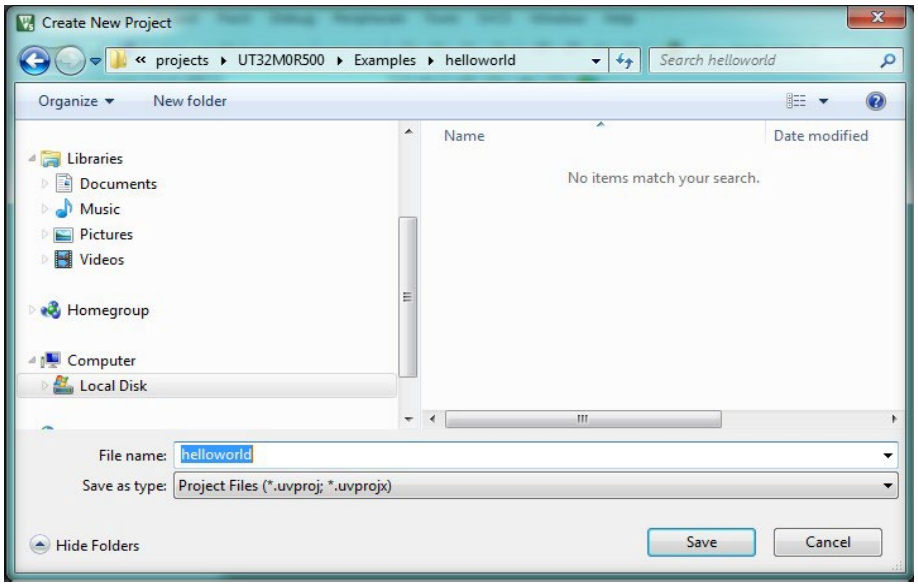


Figure 1: Project Setup

5. Select **Device** and click **OK,** see Figure 2.

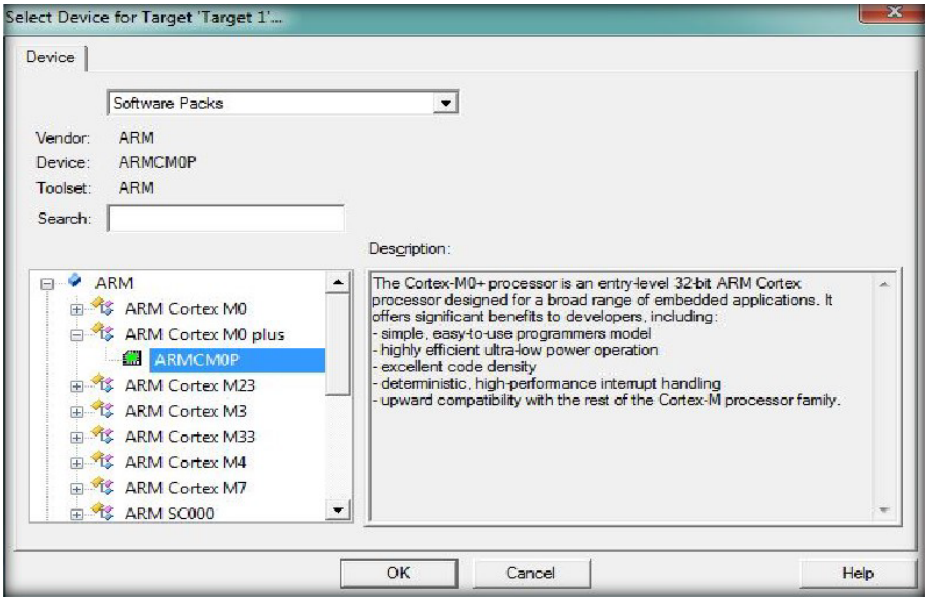


Figure 2: Select Device

6. Click the **Manage Run-Time Environment** symbol  and under **Software Component,** select the appropriate components and click **OK,** see Figure 3.

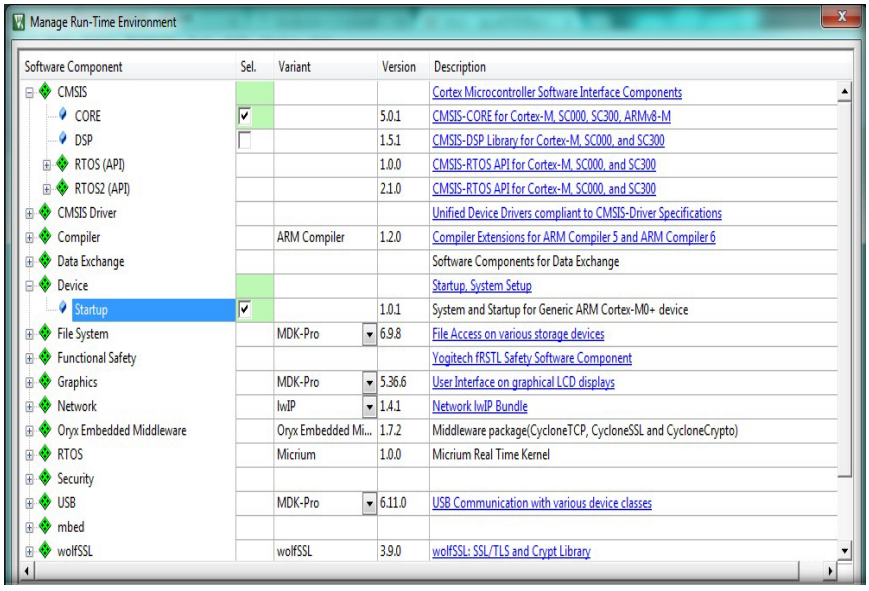


Figure 3: Software Components

7. Under the folder where the project was created, browse to RTE\Device\ARMCM0P and replace startup_ARMCM0plus.s and system_ARMCM0plus.c with the files from UT32M0R500_API_vx_x_x\UT32M0SpecificARM\src\.
   **NOTE:** Files under UT32M0R500_API_vx_x_x\UT32M0SpecificARM\src are specific startup files for Frontgrade' UT32M0R500.
8. Under the folder where the project was created, create a **src** folder for the **.c** files. In the **Project,** double-click **Source Group 1** and rename it to **hello_src**.
9. Right-click on **hello_src** and click on **Add New Item to Group 'hello_src'**…. Add a new **C** source file, **hello_test.c** and copy the source code from Code 1.

```
#include <stdio.h>
#include "UT32M0R500.h"
#include "ut32m0_uart.h"

UART_TypeDef *UART0 = (UART_TypeDef *) UART0_BASE;
UART_InitTypeDef UART_InitStruct;
uint32_t ActualBaudRate;

int main (void){
        UART_StructInit (&UART_InitStruct);
        ActualBaudRate=UART_Init (UART0, &UART_InitStruct);
        UART_Cmd (UART0, ENABLE, ENABLE);

        for(;;){
                printf("Hello World!!!\r\n");
        }
}
```

**Code 1: Hello World Source Code**

10. Right-click on **Target1** and select **Add Group…** to create groups for source and include files from Frontgrade's Standard Peripheral Library, <your working dir>\StdPeriphLib\src and <your working dir>\StdPeriphLib\inc. Add sources and include files to their respective directories, see Figure 4.

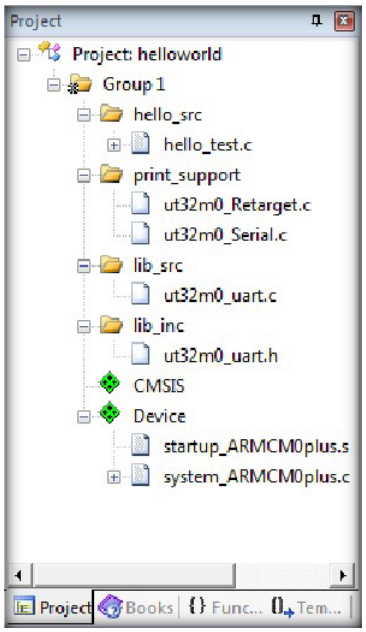


Figure 4: Add source and include files

11. Right-click on **Target1** and select **Options for Target 'Target 1'**…. see Figure 6-11 for basic settings—Change settings according to the particular project. For **C/C++** and **Asm** tabs, click  and setup the compiler include paths; see Figure 6 and Figure 7.

    **NOTE:** the **System Viewer File** path in Figure 5 is:

    <your working dir>\UT32M0R500_SpecificARM\SVD\Wolverine_BasiCAN.SFR

    If your project requires the use of **PeliCAN,** set the path to:

    <your working dir>\UT32M0R500_SpecificARM\SVD\Wolverine_PeliCAN.SFR

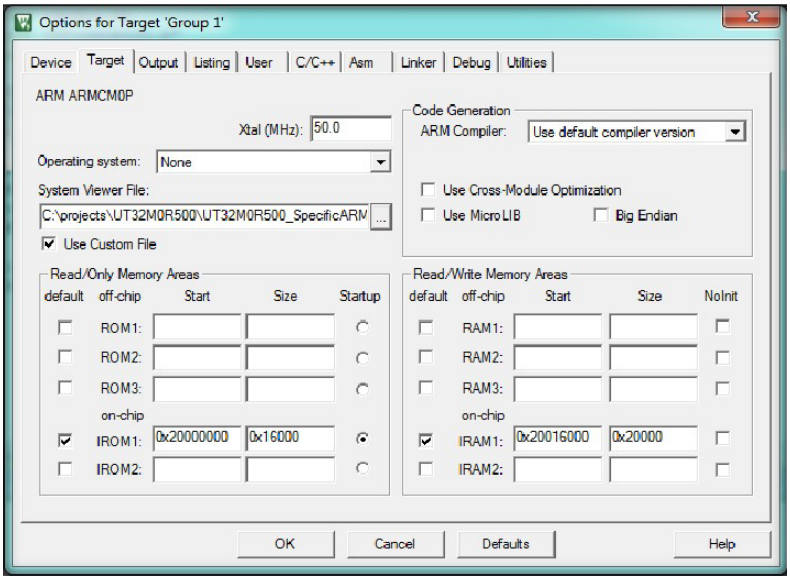


Figure 5: Target

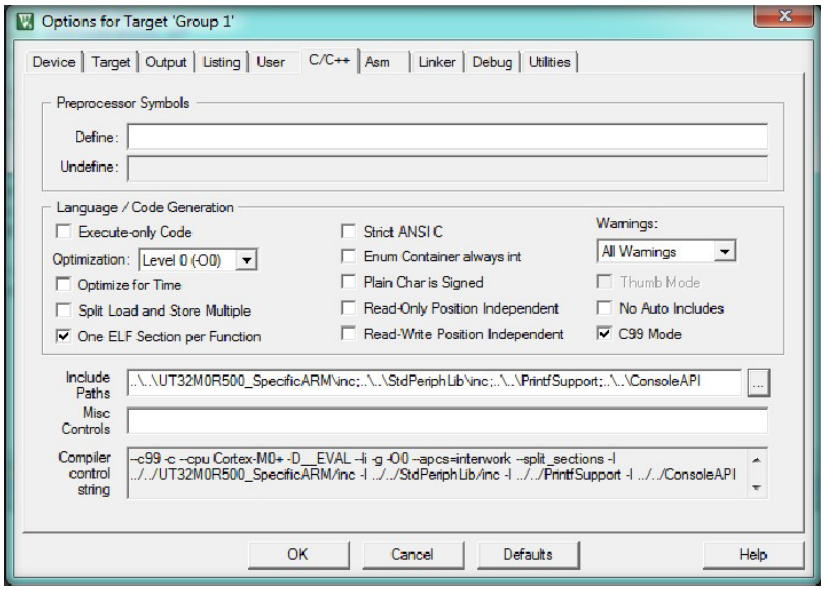


Figure 6: C/C++ Include Paths

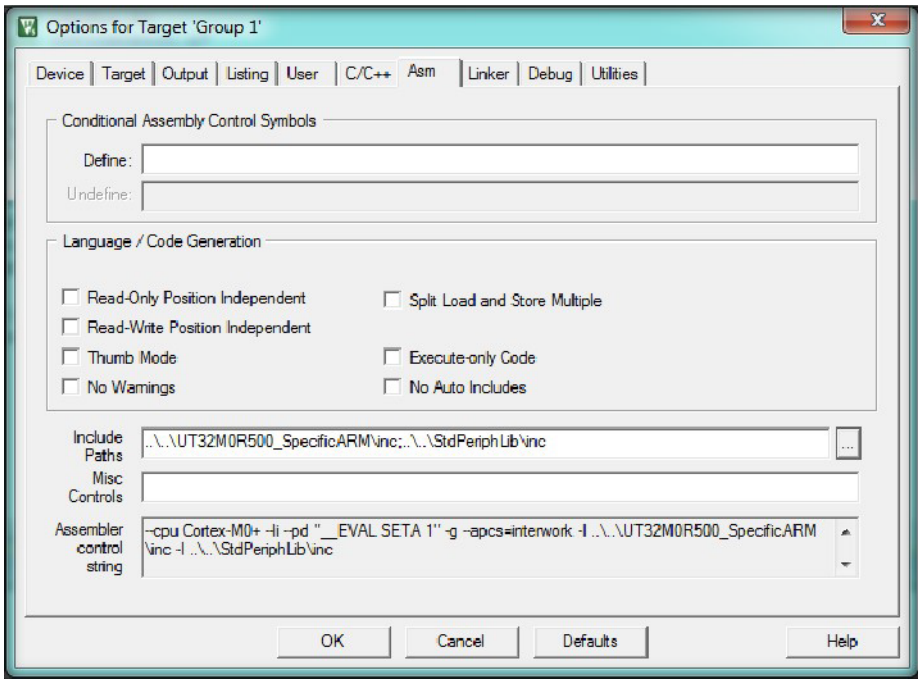


Figure 7: ASM Include Paths

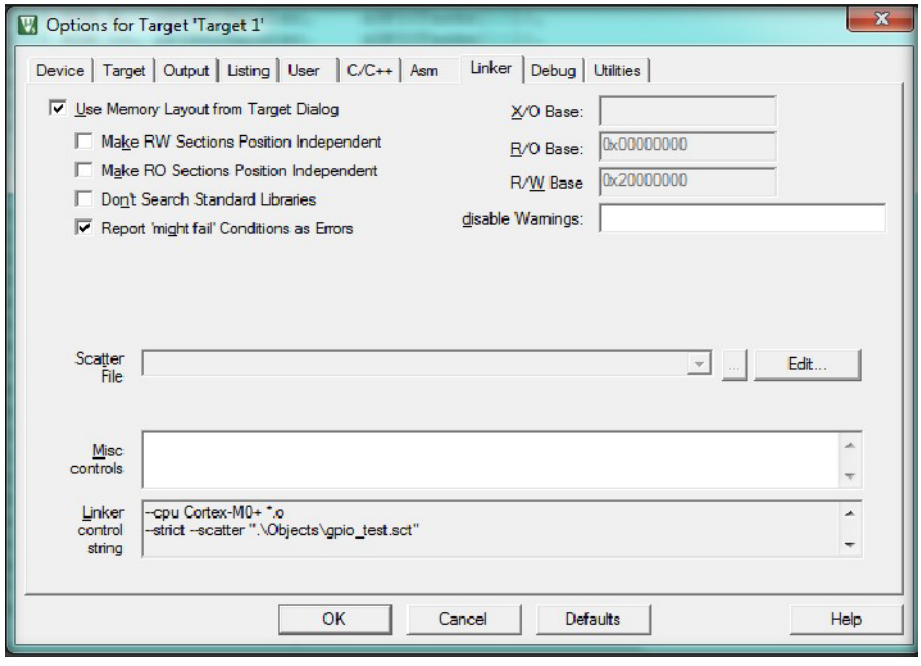


Figure 8: Linker

**NOTE:** the Initialization File path is: <your working dir>\UT32M0R500_SpecificARM\Wolv_SRAM_Debug.ini

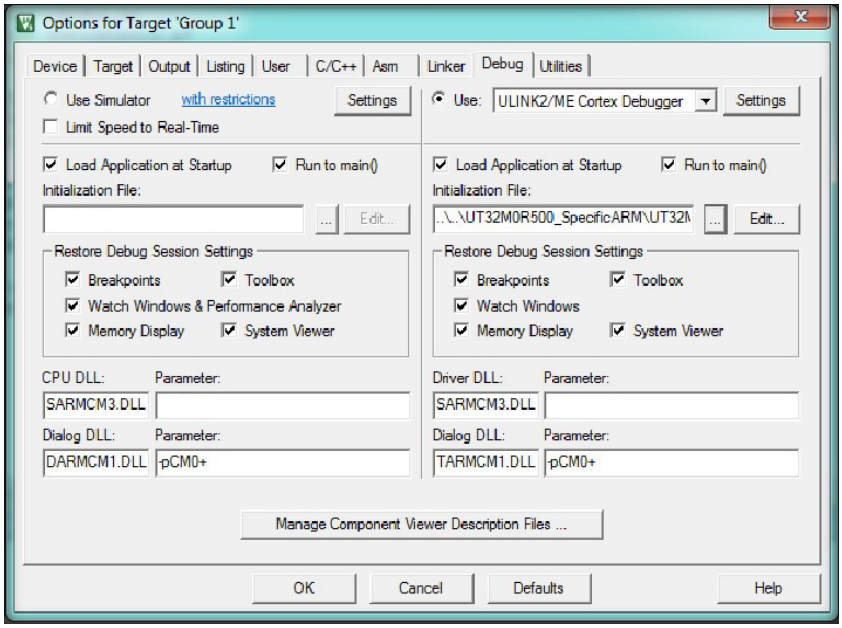


Figure 9: Debugger

**NOTE:** the serial for your **JTAG** pod will appear in the **Serial No:** box.

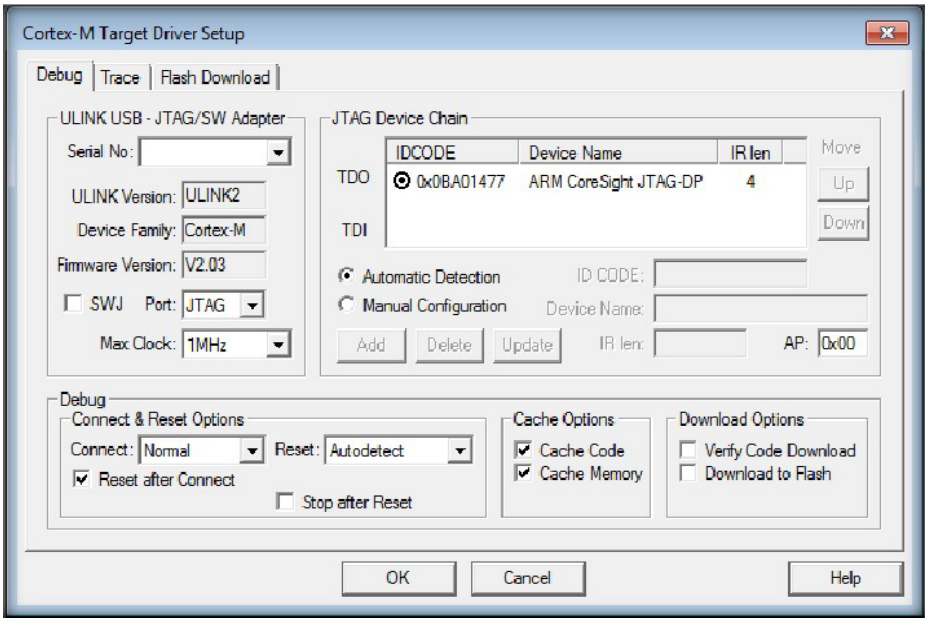


Figure 10: Debugger Settings

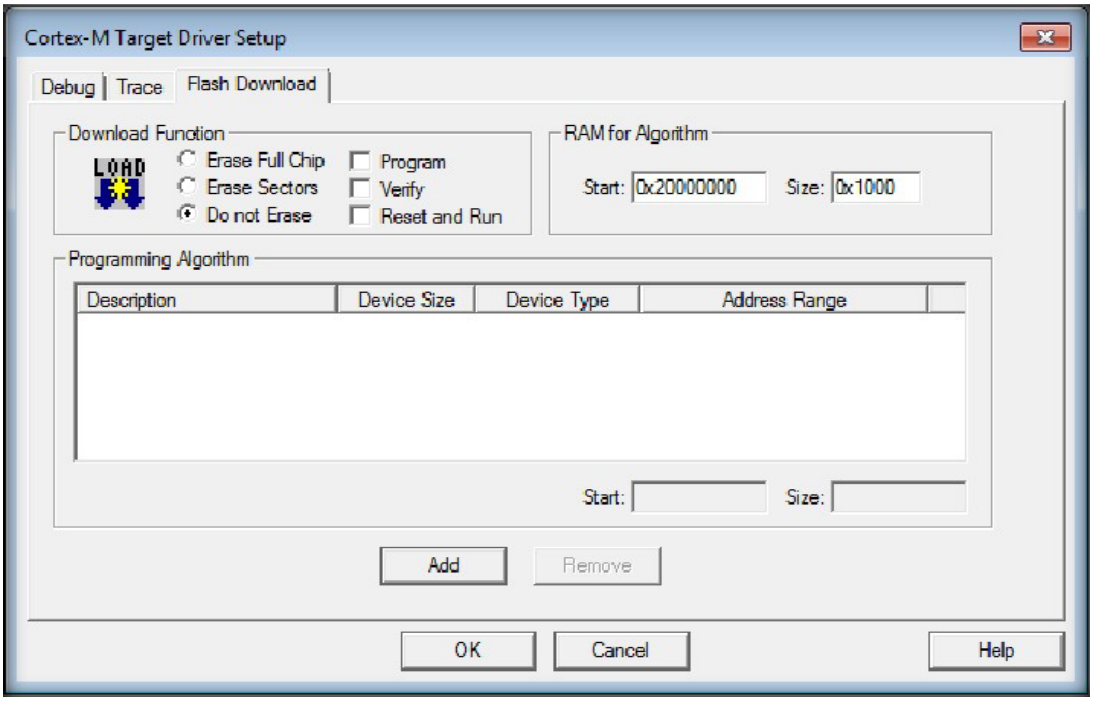


Figure 11: Flash Download

12. In the Project Explorer view, click on  and Build Project.
13. Start the debugger  and run  the application. Display the output using your favorite Terminal, see Figure 12.

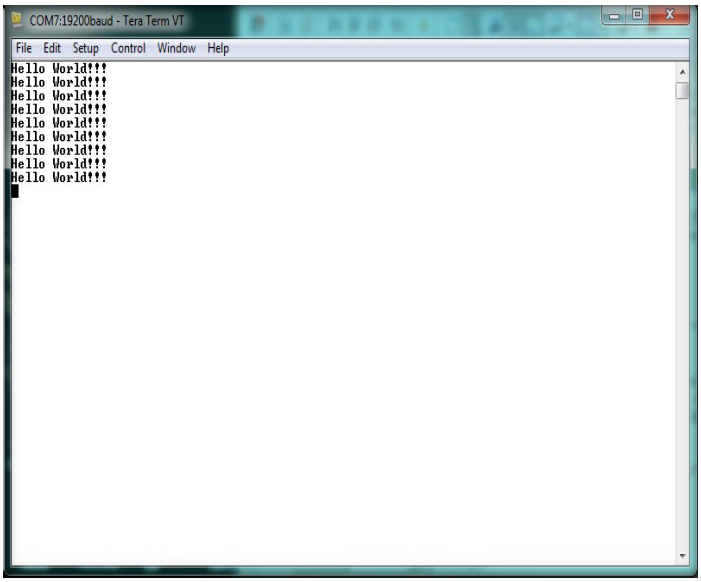


Figure 12: Hello World Display

## 3.0 Revision History

| Date | Revision # | Author | Change Description | Page # |
|---|---|---|---|---|
| 5/17 | 1.0.0 | SW | Initial Release | |
| 12/17 | 1.0.1 | AW | Minor edits for directory names | |
| 2/18 | 1.0.2 | AW | Additional edits for directory names and dialog settings box | |
| 8/15/18 | 1.1.0 | JA | Second release | |

## Datasheet Definitions

| | Definition |
|---|---|
| Advanced Datasheet | Frontgrade reserves the right to make changes to any products and services described herein at any time without notice. The product is still in the development stage and the **datasheet is subject to change**. Specifications can be **TBD** and the part package and pinout are **not final.** |
| Preliminary Datasheet | Frontgrade reserves the right to make changes to any products and services described herein at any time without notice. The product is in the characterization stage and prototypes are available. |
| Datasheet | Product is in production and any changes to the product and services described herein will follow a formal customer notification process for form, fit or function changes. |