# FM4 S6E2G-Series

# Pioneer Kit Guide

Doc. # 002-10541 Rev. *F

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# Contents

# 1. Introduction

Thank you for your interest in the FM4-176L-S6E2GM FM4 S6E2G-Series Pioneer Kit. The FM4 S6E2G-Series Pioneer Kit enables customers to evaluate and develop projects using the FM4 device family. Flexible MCU 4 (FM4) is a portfolio of high-performance ARM® Cortex®-M4 MCUs that includes hardware support for digital signal processing and floating-point operations, designed for safety-critical, industrial systems and home appliance applications. There are multiple series of device families in this portfolio. The S6E2C-Series, S6E2G-Series and S6E2H-Series are few of the prominent series of device families. This kit uses a device from the S6E2G-Series.

Devices in the S6E2G-Series are highly integrated 32-bit microcontrollers with high performance and competitive cost. This series is based on the ARM Cortex-M4 processor, including floating point instructions, with on-chip flash memory and SRAM. The series has peripherals such as motor control timers, A/D converters, and communications interfaces like USB, CAN, UART, CSIO (SPI), I2C and LIN. The S6E2G-Series of FM4 devices offers up to a 180-MHz CPU, 1MB flash, 192KB SRAM, 153 GPIOs, 20 communication peripherals, 33 digital peripherals and 3 analog peripherals.

The S6E2G-Series of FM4 devices is designed to meet the high performance requirements of today's industrial customers. Such needs not only include the support and enabling of international safety standards but also the inclusion of IoT concepts for distributed control, to deliver fast, secure and reliable communication interfaces. In order to properly target this high performance market, the S6E2G-Series Pioneer Kit features the industry standard communication interfaces such as Ethernet (IEEE 802.3), a full-speed USB Host and a full-speed USB device. The FM4 S6E2G-Series Pioneer Kit offers footprint compatibility with Arduino™ shields, which provides options for application development. This S6E2G-Series Pioneer Kit also features multiple on-board sensors like an accelerometer, and a phototransistor, as well as peripherals like a stereo codec which can be used to quickly prototype data acquisition systems while showcasing external SRAM and Flash for data logging applications.

In order to properly enable our customers, the FM4 S6E2G-Series Pioneer Kit is aligned to our low cost development systems, aligning this kit with our successful line of Pioneer Kits in form, price and flexibility.

## 1.1 Kit Contents

The FM4 S6E2G-Series Pioneer Kit contains the following, as shown in Figure 1-1.

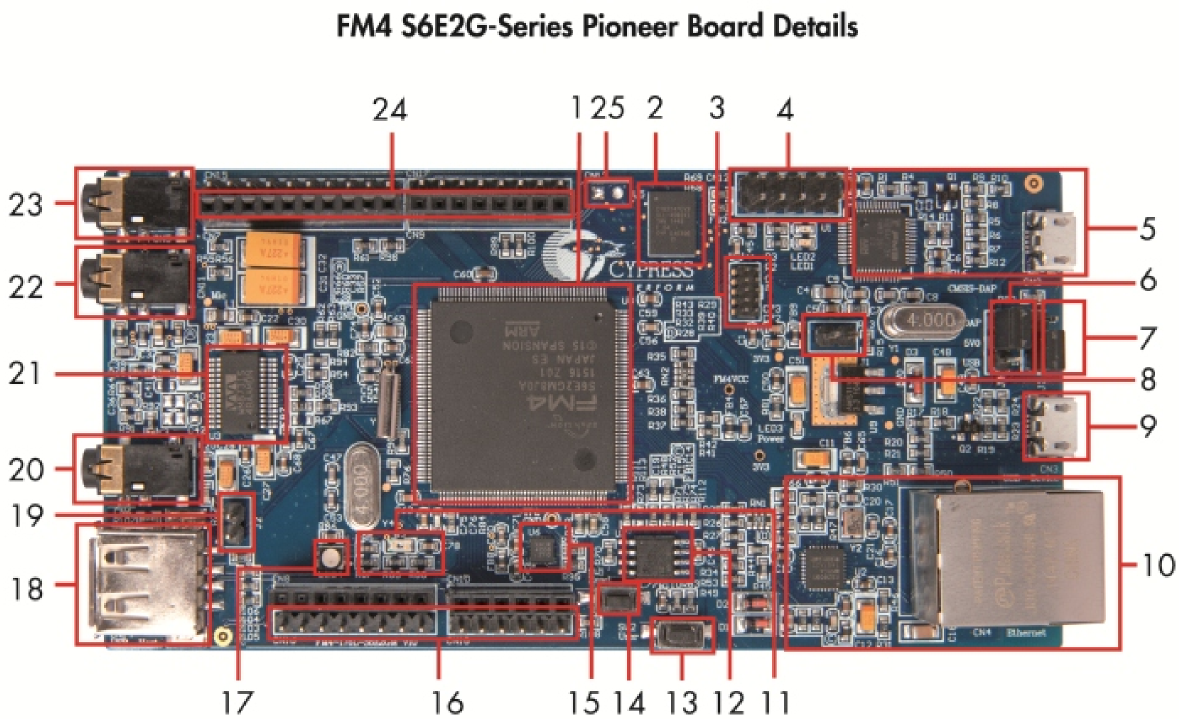
- FM4 S6E2G-Series Pioneer board
- USB Standard-A to Micro-B cable
- Quick Start Guide

Figure 1-1. Kit Contents

Inspect the contents of the kit; if you find any part missing, contact your nearest Cypress sales office for help: www.cypress.com/support.

## 1.2 Board Details

Figure 1-2. FM4 S6E2G-Series Pioneer Kit Markup




1. Cypress FM4 S6E2GM8J0A MCU
2. 4-Mb SRAM
3. 10-pin JTAG connector (CN1)
4. Multicon Interface connector (CN12)
5. MB9F312K Programmer and Debugger (CMSIS-DAP) (CN2)
6. Power supply source select (J4)
7. Serial programming mode select (J3)
8. Programming mode jumper of MB9F312K (J1)
9. USB device connector (CN3)
10. Ethernet PHY and RJ45 connector (CN4)
11. Phototransistor
12. 32-Mb Quad-SPI NOR Flash
13. User button (SW2)
14. Reset button (SW1)
15. Accelerometer
16. Additional GPIO headers (CN15-CN18)
17. RGB LED (LED4)
18. USB host connector (CN14)
19. Programming mode jumper of S6E2GM (J2)
20. Line-in jack (CN6)
21. Stereo codec
22. Microphone jack (CN11)
23. Headphone jack (CN5)
24. Arduino™ interface (CN7-CN10)
25. Additional-pins for Multicon Interface connector (CN13)

## 1.3 Jumpers and Connectors

Table 1-1. Jumper Description

| Jumper | Function | Setting |
|---|---|---|
| J1 | Sets the programming mode of MB9AF312K (CMSIS-DAP) | Open: User mode |
| | | Closed: Serial programming mode |
| J2 | Sets the programming mode of S6E2GM | Open: User mode |
| | | Closed: Serial programming mode |
| J3 | Sets the serial programming mode for the S6E2GM | Pin 2 to Pin 1: UART programming mode via UART0 connected to MB9AF312K |
| | | Pin 2 to Pin 3: USB programming mode |
| J4 | Sets the power supply source | Pin 2 to Pin 1: Power from CMSIS-DAP (CN2) |
| | | Pin 2 to Pin 3: Power from USB port of FM4 (CN3) |

Table 1-2. Connector Description

| Connector | Description |
|---|---|
| CN1 | 10-pin JTAG interface |
| CN2 | USB port of CMSIS-DAP (MB9F312K) |
| CN3 | USB port of FM4 MCU |
| CN4 | RJ45 connector |
| CN5 | Headphone jack |
| CN6 | Line-in jack |
| CN7,CN8,CN9,CN10 | Arduino compatible headers |
| CN11 | Microphone jack |
| CN12, CN13 | Multicon connectors |
| CN14 | USB host connector |
| CN15, CN16, CN17, CN18 | Additional GPIO headers |

## 1.4 Getting Started

This guide will help you get started with the FM4 S6E2G-Series Pioneer Kit:

- The Installation and Test Operation chapter describes the installation of the kit, and the test procedures for testing the board.
- The Hardware chapter describes the major features of the FM4 S6E2G-Series Pioneer Kit and functionalities such as CMSIS-DAP debugger, Ethernet, USB, stereo codec, memories and sensors.
- The Software Development chapter describes how to open and run an example project in the IAR Embedded Workbench or Keil µVision IDE; it also describes how to use the example projects and how to program devices using the USB DIRECT Programmer or the FLASH MCU Programmer.
- The Appendix provides the kit schematics, and the bill of materials (BOM).

## 1.5 Additional Learning Resources

Cypress provides a wealth of data at www.cypress.com to help you to select the right MCU device for your design, and to help you to quickly and effectively integrate the device into your design.

Visit www.cypress.com/FM4-176L-S6E2GM for the following documents of the S6E2G-Series MCU:

- **Overview**: S6E2G-Series fact sheet
- **Device Selector**: Microcontroller Select Guide
- **Datasheets**: S6E2G-Series datasheet and handling precautions.
- **FM4 Peripheral Manual**: Main section, Ethernet section, Communication Macro section, Analog Macro section and Timer section.

## 1.6 Technical Support

For assistance, visit Cypress Support or contact customer support at +1(800) 541-4736 Ext. 2 (in the USA) or +1 (408) 943-2600 Ext. 2 (International).

## 1.7 Acronyms

Table 1-3. Acronyms Used in this Document

| Acronym | Description |
|---|---|
| ADC | Analog-to-Digital Converter |
| CAN | Controlled Acess Network |
| CMSIS-DAP | Debug Access Port |
| GPIO | General Purpose Input/Output |
| I2C | Inter-Integrated Circuit |
| I2S | Inter-IC Sound |
| IDE | Integrated Development Environment |
| IoT | Internet of Things |
| JTAG | Joint Test Action Group |
| LDO | Low Drop Out (voltage regulator) |
| LED | Light-Emitting Diode |
| LIN | Local Interconnect Network |
| PDL | Peripheral Driver Library |
| PWM | Pulse Width Modulation |
| RGB | Red Green Blue |
| SPI | Serial Peripheral Interface |
| SRAM | Static Random Access Memory |
| SWD | Serial Wire Debug |
| UART | Universal Asynchronous Receiver Transmitter |
| USB | Universal Serial Bus |

# 2. Installation and Test Operation

This chapter describes the steps to install the software tools and drivers on a PC for using the FM4 S6E2G-Series Pioneer Kit. After the successful installation, the user can run the test demo code that was pre-programmed in the device.

## 2.1 Install Software

Follow these steps to install the FM4 S6E2G-Series Pioneer Kit software:

1. Download the FM4 S6E2G-Series Pioneer Kit installer from the web page www.cypress.com/FM4-176L-S6E2GM. The Kit software is available for download in three formats:
   - **FM4 S6E2G-Series Pioneer Kit Complete Setup**: This installation package contains the files related to the kit, including the Documentation, Hardware, Firmware, Software tools and drivers. However, it does not include the Windows Installer or Microsoft .NET Framework packages. If these packages are not on your computer, the installer directs you to download and install them from the Internet.
   - **FM4 S6E2G-Series Pioneer Kit Only**: This executable file installs only the kit contents, which include kit code examples, hardware files, and user documents. This package can be used if all the software prerequisites (listed in step 7) are installed on your PC.
   - **FM4 S6E2G-Series Pioneer Kit DVD ISO**: This file is a complete package, stored in a DVD-ROM image format, which you can use to create a DVD or extract using an ISO extraction program such as WinZip® or WinRAR. The file can also be mounted like a virtual CD/DVD using virtual drive programs such as Virtual CloneDrive and MagicISO. This file includes all the required software, utilities, drivers, hardware files, and user documents.
2. If you have downloaded the ISO file, mount the ISO file as a virtual drive. Extract the ISO contents if you do not have a virtual drive to mount. Double-click `cyautorun.exe` in the root directory of the extracted content or the mounted ISO if “Autorun from CD/DVD” is not enabled on the PC. The installation window will appear automatically.

   **Note:** If you are using the “Kit Complete Setup” or “Kit Only” package, then go to step 4 for installation.

3. Click **Install FM4 S6E2GM Kit** to start the kit installation, shown in Figure 2-1.

Figure 2-1. Kit Installation Window


4. Select the default installation folder, or click **Browse** to select a different folder, and click **Next**.
5. Select the **Installation Type** (see Figure 2-2). The drop-down menu contains three options: **Typical** (installs all the required features), **Custom** (lets you choose the features to be installed), and **Complete** (installs all the contents). Click **Next** after you select the Installation Type.

   **Note:** It is recommended that you choose the **Typical** Installation Type.

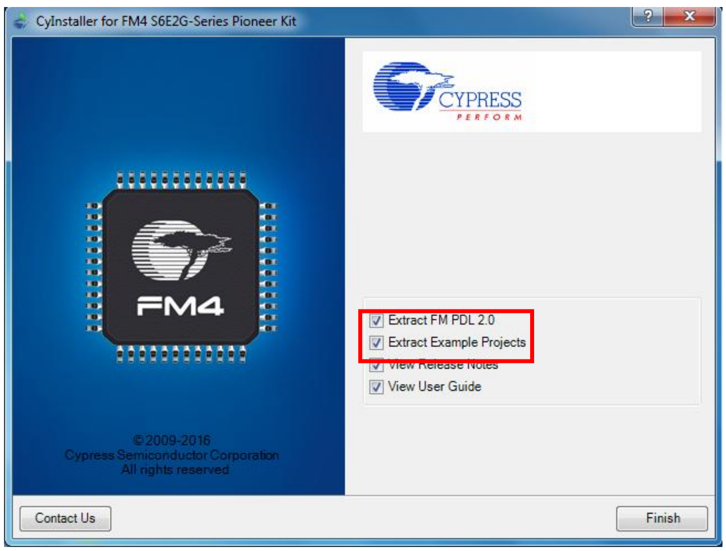
Figure 2-2. Product Installation Overview


6. Read the License agreement and select **I accept the terms** in the license agreement to continue with installation.

7. After you click **Next**, the installation begins, a list of packages appears on the Installation page. A Green check mark appears next to each package after successful installation. Following are the required software and driver:
   - FM Universal Peripheral Driver Library (PDL)
   - Serial Port Viewer Tool
   - FLASH USB DIRECT Programmer
   - FLASH MCU Programmer
   - CMSIS-DAP driver
8. If you are an un-registered user either enter your contact information, or click in the checkbox **Continue without Contact Information**. If you are a registered user, then the installation procedure will not request you to enter the contact information. Click **Finish** to complete the kit installation.

   **Note:** Be sure to select the checkbox Extract Example Projects and Extract FM PDL 2.0.

Figure 2-3. Launch the Contents



9. Click **Install**.

Figure 2-4. Extract the Example Projects

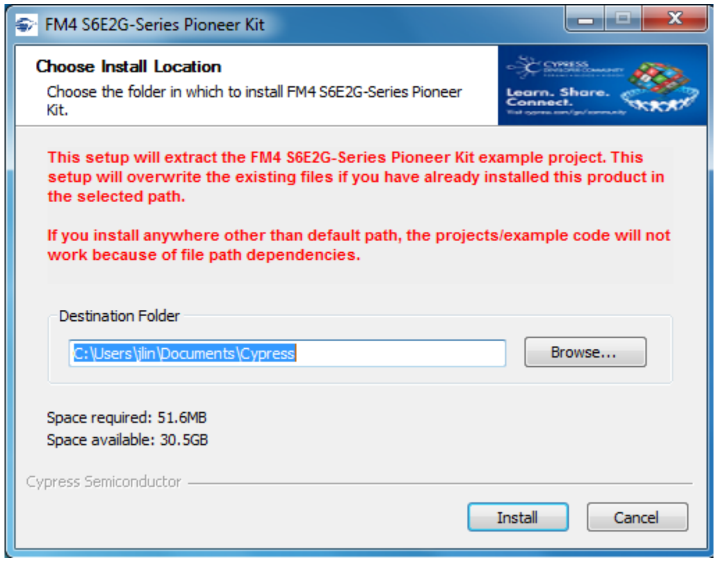
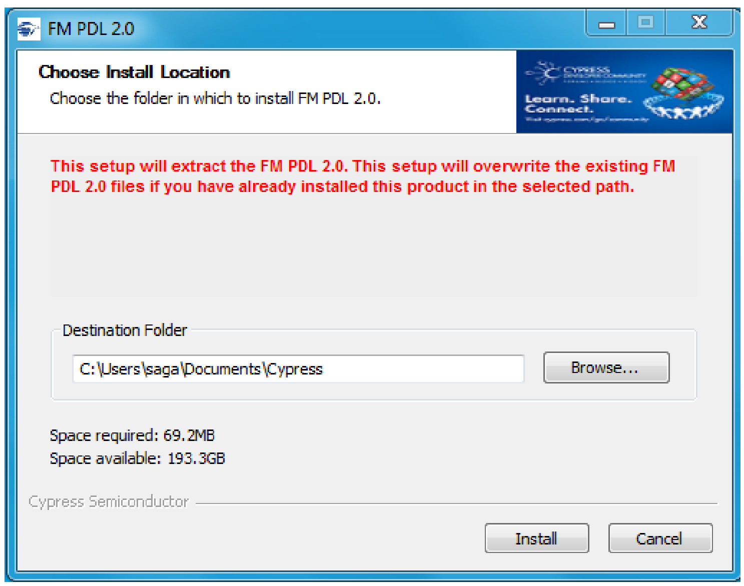



Figure 2-5. Extract FM PDL 2.0




10. Click **Close** to complete the extraction.

    After the installation is complete, kit documentation and hardware files are available at the following default location:

```
Windows OS (64-bit): C:\Program Files (x86)\Cypress
\FM4 S6E2G-Series Pioneer Kit
Windows OS (32-bit): C:\Program Files\Cypress
\FM4 S6E2G-Series Pioneer Kit
```

    The Peripheral Driver Library (PDL) will be extracted to the following default directory:

```
C:\Users\<User Name>\My Documents\Cypress\FM_PDL_2.0.1
```

And, the example projects will be extracted to the following default directory:

```
C:\Users\<User Name>\My Documents\Cypress
\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware
```

In the rest of the document, the following directory is termed as <User_Directory>:

```
C:\Users\<User Name>\My Documents\Cypress
```

## 2.2 Uninstall Software

The software can be uninstalled using one of the following methods:

- Go to **Start** > **All Programs** > **Cypress** > **Cypress Update Manager**, and click the **Uninstall** button that corresponds to the kit software.
- Go to **Start** > **Control Panel** > **Programs and Features** for Windows 7 or **Add/Remove Programs** for Windows XP; select the **Uninstall** button.

**Note:** Uninstalling the Kit software will not remove the FM PDL 2.0 and FM4 S6E2G-Series Pioneer Kit Example Projects from `<User_Directory>`.

## 2.3 Test Operation

The FM4 S6E2G-Series Pioneer Kit has been pre-programmed with a test demo code, which helps to test many of the on-board features. The Motorola s-record file, *tp_fm4-176l-s6e2gm.srec*, is provided in the following directory and can be programmed on the MCU by using the FLASH USB DIRECT Programmer or the FLASH MCU Programmer:

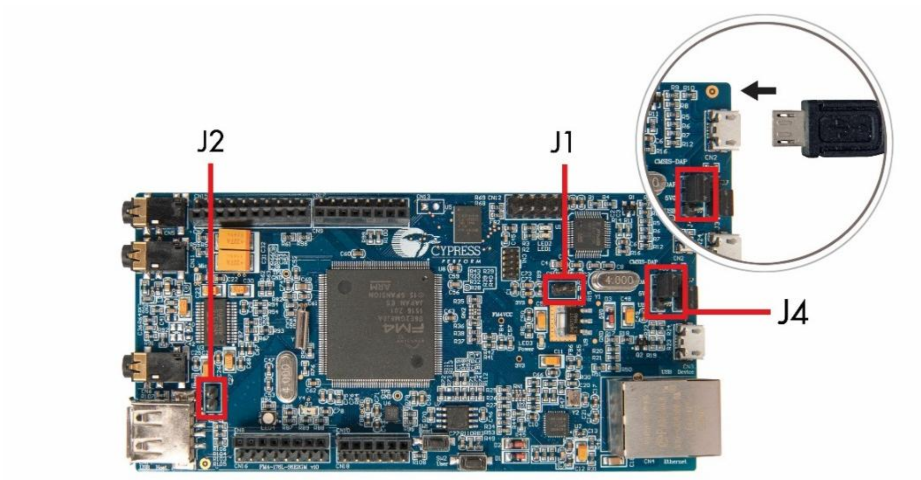
```
<User_Directory>:\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware\Demo Projects\Test_Demo_Code
```

### 2.3.1 Run the Test Demo

Follow the instructions to run the test demo code:

1. Ensure the jumpers, J1 and J2, are open. Close Pin 1 and Pin 2 of J4 (default) and connect the board to a PC via the CN2 connector using the USB cable provided with the FM4 S6E2G-Series Pioneer Kit.

Figure 2-6. Jumper Settings for Test Code



2. Ensure the power LED (LED3) is **ON**.
3. Launch the Serial Port Viewer Tool from **Start** > **All Programs** > **Cypress** > **Serial Port Viewer Tool**.
4. Click on the Serial Port Viewer icon in the task bar and select FM-Link/CMSIS-DAP Cypress FM Communications Port.

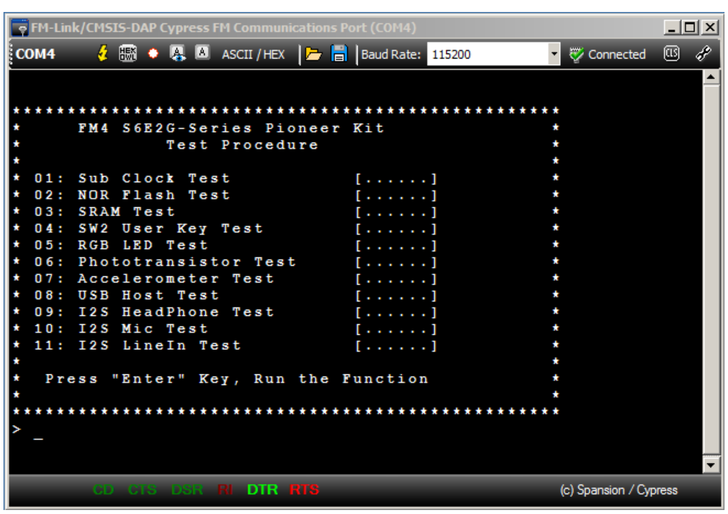
Figure 2-7. FM-Link/CMSIS-DAP Cypress FM Communications Port


5. Select the baud rate of **115200**, and click the **Disconnected** button to connect to the board.

Figure 2-8. Select the Baud Rate

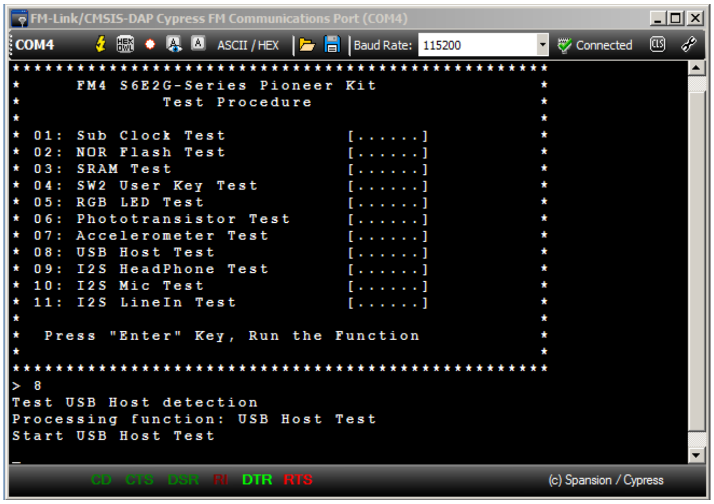

6. Press the **[Enter]** key on your keyboard to run the test procedure. Key in the option number and press the **[Enter]** key to run any of the functions.

Figure 2-9. Test Procedure



7. For example, key in **8** and press the **[Enter]** key.

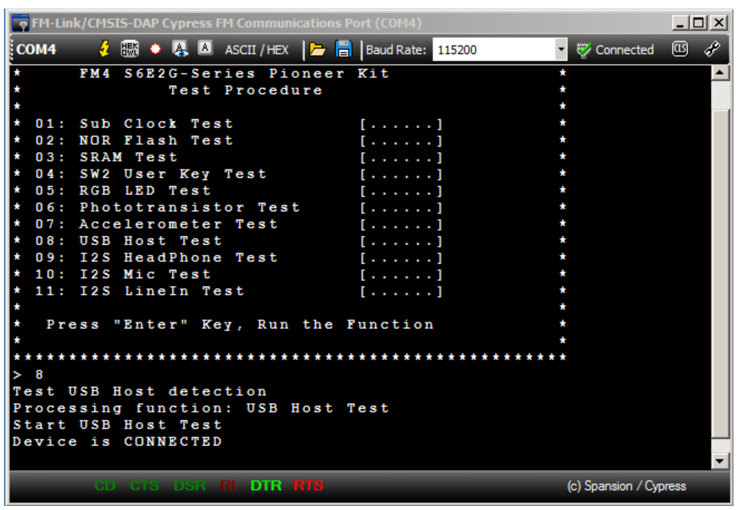
Figure 2-10. USB Host Test-1




8. Insert a USB device into the USB Type-A connector (CN14).

9. Once the USB device is detected, **Device is CONNECTED** will be displayed in the terminal as shown in Figure 2-11.

Figure 2-11. USB Host Test-2

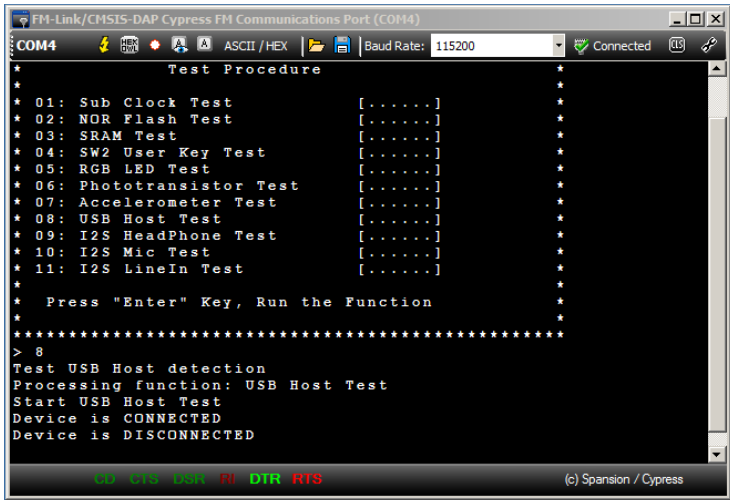



10. Remove USB device from CN14. **Device is DISCONNECTED** will be displayed in the terminal as shown in

11.

12. Figure 2-12. Press **[Enter]** to return to the main menu.

Figure 2-12. USB Host Test-3

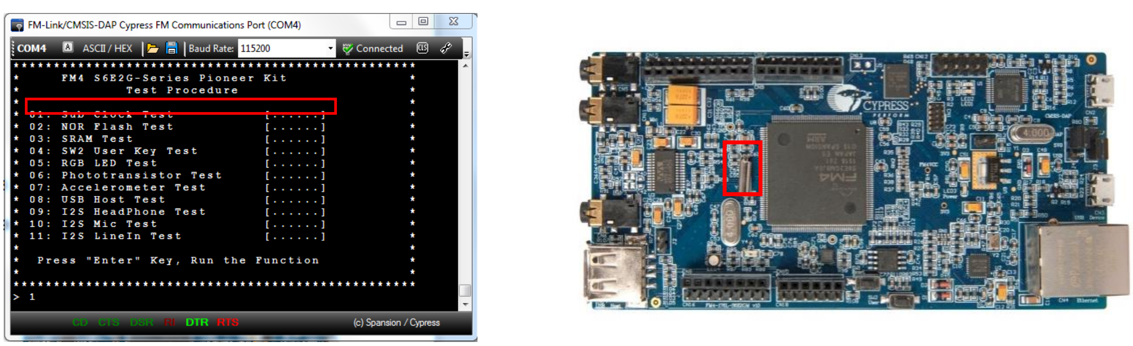



## 2.3.2 Test Procedure Explanation

This section explains the test procedure. This test procedure is based on the Serial Port Viewer Tool. The user has to key-in the test procedure number displayed on the menu and then press the **[Enter]** key on the PC. The firmware on the board will run the test procedure and display the results. As shown in Figure 2-13, there are eleven test procedures. A short description of each test procedure is given below:

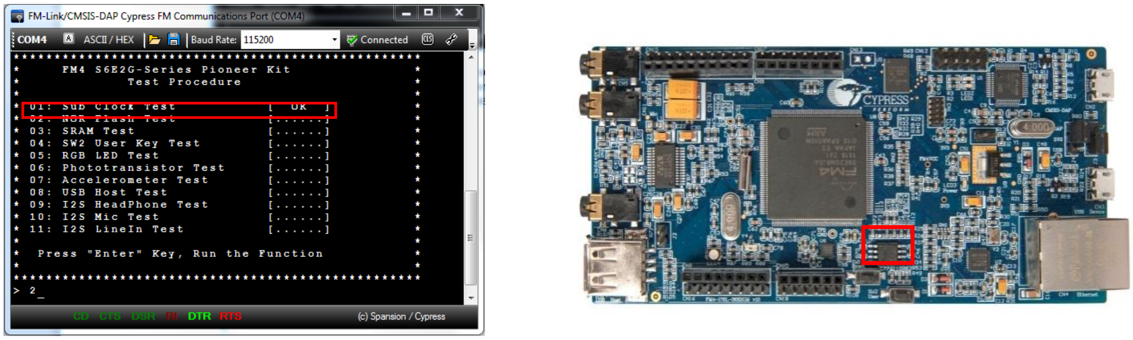
- **Sub Clock Test**: This procedure will test whether the sub clock is at 32.768 kHz. Key in **1** and press the **[Enter]** key. The main routine will shift the system clock to sub clock, and shift back to main clock after the sub clock is confirmed to run at 32.768 kHz. It displays **OK** if the sub clock runs at 32.768 kHz, otherwise it will display **Fail**.

Figure 2-13. Sub Clock Test



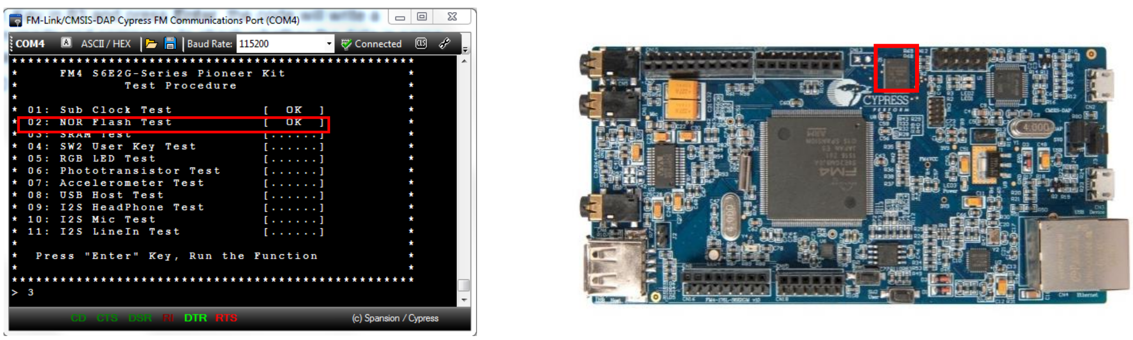

- **NOR Flash Test**: This procedure tests the NOR flash. Key in **2** and press the **[Enter]** key on the PC key. The code will write a pre-determined set of data into the flash and then will read and compares to check whether the data is the same. If the data is the same, then it will display **OK**, otherwise it will display **Fail**.

Figure 2-14. NOR Flash Test



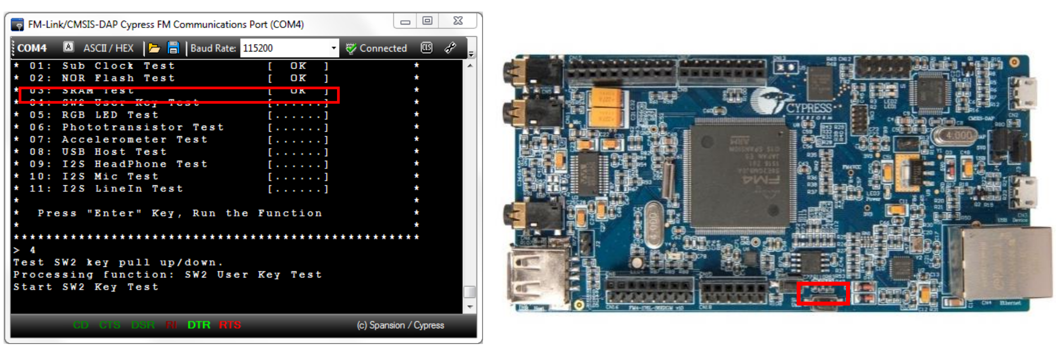

- **SRAM Test**: This procedure tests the SRAM. Key in **3** and press the **[Enter]** key. The code will write a pre-determined set of data into the SRAM and then will read and compare to check whether the data is the same. If it is the same, then it will display **OK**, otherwise it will display **Fail**.

Figure 2-15. SRAM Test



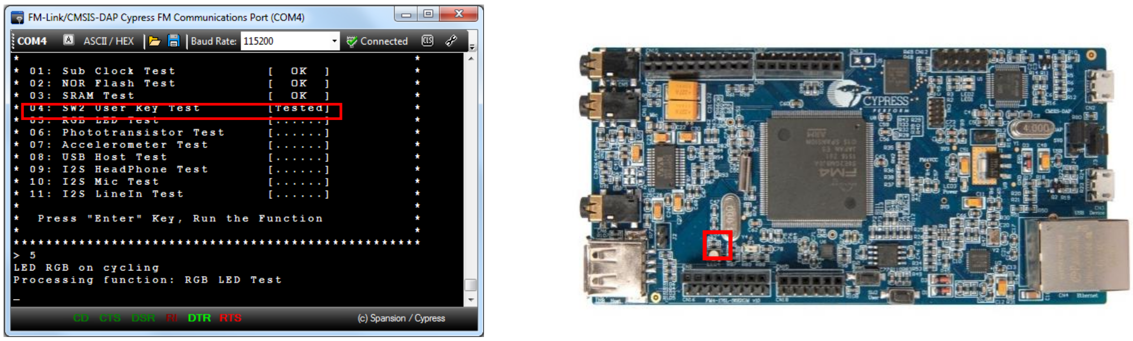

- **SW2 User Key Test**: This procedure tests the switch **SW2**. Key in **4** and press the **[Enter]** key. The test routine will detect the press and release status of the **SW2** key. Press the [**Enter**] key again to return to the main menu.

Figure 2-16. SW2 User Key Test



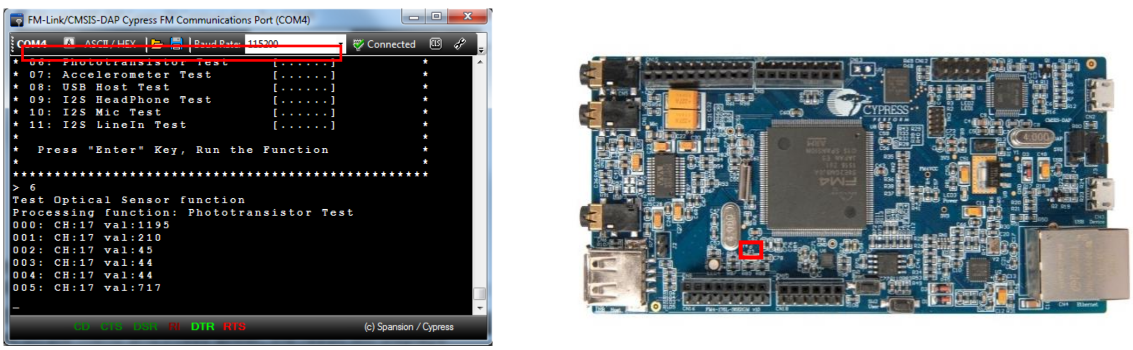
- **RGB LED Test**: This procedure tests the RGB LED (LED4). Key in **5** and press the **[Enter]** key. The RGB LED (LED4) color will change from Red to Green to Blue. The sequence will repeat until you press the **[Enter]** key to return to the main menu.

Figure 2-17. RGB LED Test



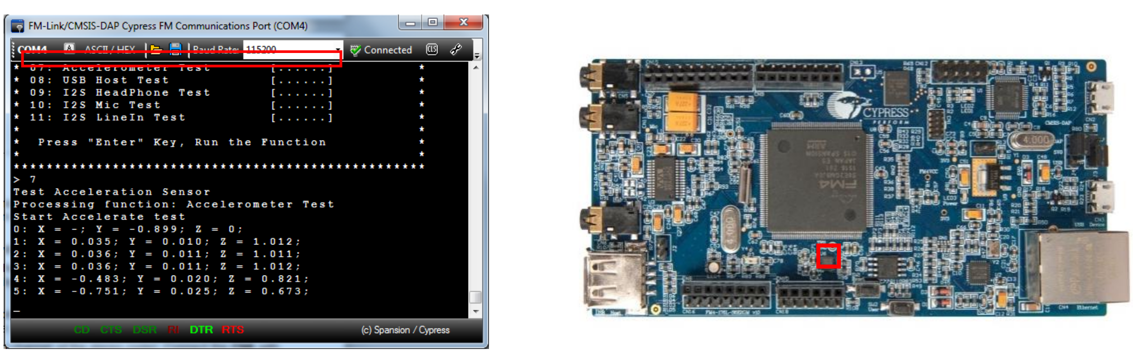

- **Phototransistor Test**: This procedure tests the phototransistor. Key in **6** and press the **[Enter]** key. The terminal will display an ADC value for the phototransistor about once per second. Use your hand to block light from reaching the phototransistor. The value of the ADC when the phototransistor is not covered should be larger than the one when it is covered. Press the **[Enter]** key to return to the main menu.

Figure 2-18. Phototransistor Test



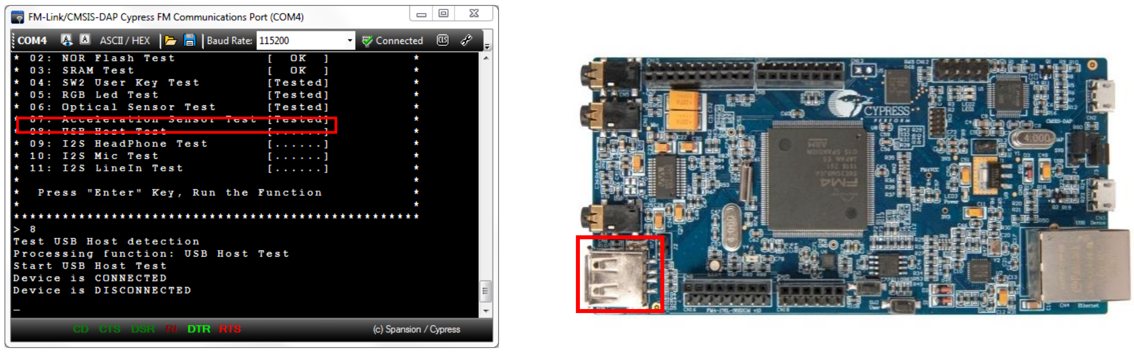

- **Accelerometer Test**: This procedure tests the accelerometer. Key in **7** and press the **[Enter]** key. The terminal will display the data of each of the three axes about once per second. This data will change if there is any change in the board's position. Press the **[Enter]** key to return to the main menu.

Figure 2-19. Accelerometer Test



- **USB Host Test**: This procedure tests the USB host circuitry. Key in **8** and press the **[Enter]** key. A message indicating that the Device is CONNECTED will be displayed on the terminal if a USB device is connected to the USB Type-A connector (CN14). Disconnect the device and a message indicating that the Device is DISCONNECTED will be displayed on the terminal. Press the **[Enter]** key to return to the main menu.

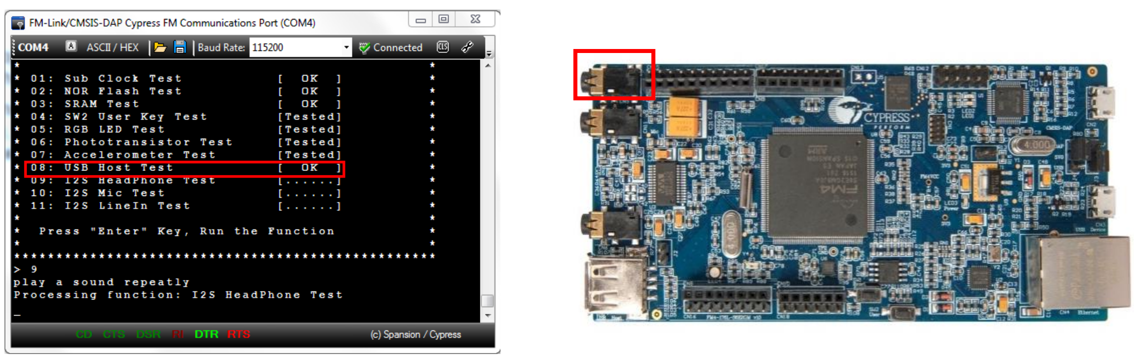
Figure 2-20. USB Host Test




**Note:** Ensure you have connected a USB device to **CN14**.

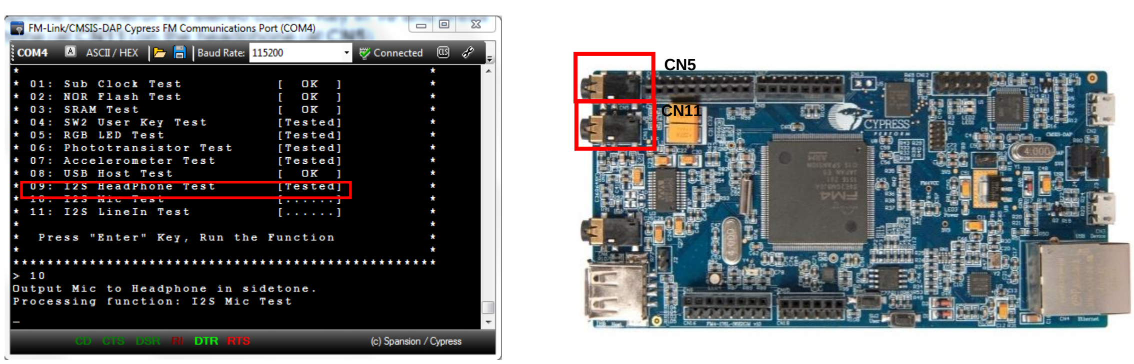
- **I2S Headphone Test**: This procedure tests the headphone channel of the stereo codec. Key in **9** and press the [**Enter**] key. A pre-defined calling bell sound will be heard on the headphone connected to **CN5**. Press the **[Enter]** key again to return to the main menu.

Figure 2-21. I2S Headphone Test




- **I2S Mic Test**: This procedure tests the microphone channel of the stereo codec. Key in **10** and press the **[Enter]** key to hear your voice from the microphone connected to the **CN11** connector on the headphone connected to **CN5**. Press the **[Enter]** key again to return to the main menu.

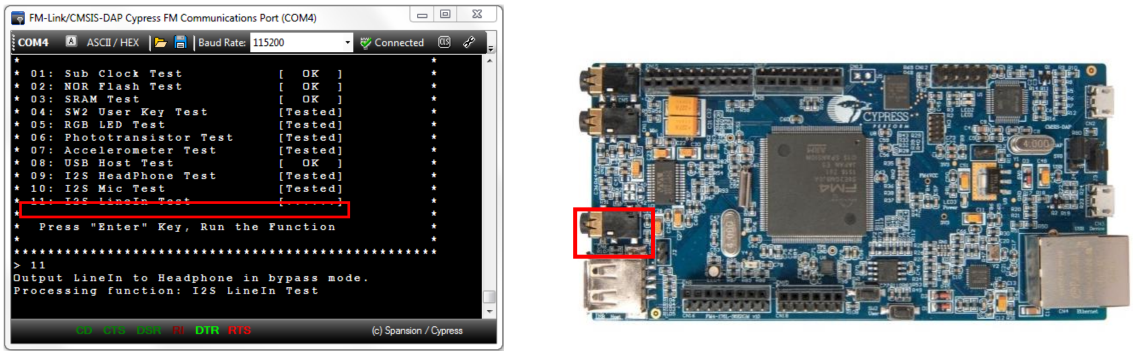
Figure 2-22. I2S Mic Test



**Note:** Please connect a stereo microphone to **CN11** and a headphone to **CN5**. A microphone integrated with a headphone will not work properly for this demonstration.

- **I2S Line-in Test**: This procedure is to test the line-in channel of the stereo codec. Connect **CN6** to the line-out jack of computer using an audio cable, connect a headphone to **CN5**. Play music on the computer. Key in **11** and press the **[Enter]** key to hear the music from the headphone connected to **CN5**. Press the **[Enter]** key again to return to the main menu.

Figure 2-23. I2S Line-in Test



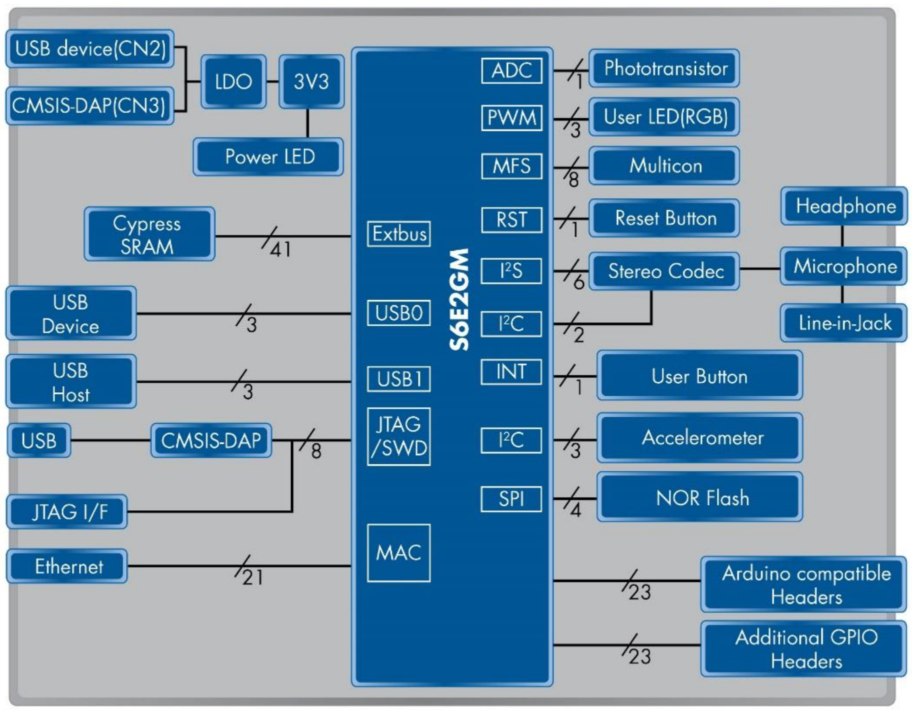
# 3. Hardware

This chapter describes the features and hardware details of the FM4 S6E2G-Series Pioneer Kit.

## 3.1 System Block Diagram

Figure 3-1 shows the system block diagram of the FM4 S6E2G-Series Pioneer Kit.

Figure 3-1. System Block Diagram



## 3.2 Hardware Features

- Cypress FM4 S6E2GM MCU
- On-board ICE (CMSIS-DAP compatible)
- 10-pin JTAG interface
- Ethernet PHY and RJ45 connector (IEEE802.3)
- USB device interface
- USB host interface
- 32Mb NOR flash
- 4Mb external SRAM
- Stereo codec
- Accelerometer
- Phototransistor
- RGB LED
- User button
- Arduino compatible interface
- Additional GPIO headers

## 3.3 Hardware Details

### 3.3.1 FM4 Series MCU

FM4 S6E2GM MCU is a family of highly integrated 32-bit microcontrollers dedicated for embedded controllers with high performance and competitive cost.

This series is based on the ARM® Cortex®-M4 processor with on-chip flash memory and SRAM, and has peripherals such as motor control timers, analog-to-digital converters (ADC), and communication interfaces like USB, CAN, Ethernet, CSIO (SPI), $I^2C$, and LIN.

### 3.3.2 User Button and LED

The FM4 S6E2G-Series Pioneer Kit features a user button and a RGB LED. The User button (**SW2**) and the LED are connected to the S6E2GM MCU device via the pins listed in Table 3-1.

Table 3-1. Button and LED

| Pin No. | Pin Name | External Device |
|---|---|---|
| 128 | P20/NMIX/WKUP0 | SW2 |
| 108 | P1A/AN10/SCK2_0/TIOA4_2/TRACED6 | LED4 – RED |
| 104 | PB2/AN18/SCS61_1/TIOA10_1/BIN0_2/INT09_1/TRACED10 | LED4 – GREEN |
| 106 | P18/AN08/SIN2_0/TIOA3_2/INT10_0/TRACED4 | LED4 – BLUE |

The port P1A/PB2/P18 pins are also assigned as PWM output pins, the user can dim the LED by configuring the base timers in PWM mode to output PWM signals from the pins (i.e. TIOA4_2, TIOA10_1, and TIOA3_2).

### 3.3.3 Arduino Compatible Interface

The FM4 S6E2G-Series Pioneer Kit provides footprint compatibility with the Arduino interface. These headers expand the possibility for the user to develop more applications based on this development kit and using Arduino compatible shields. Figure 3-2 shows the pins.

Figure 3-2. Pins of Arduino Compatible Interface

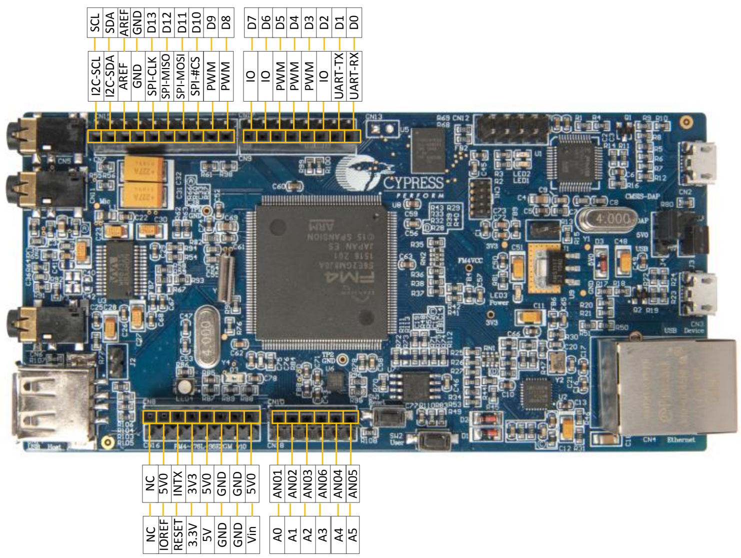


Table 3-2 shows full functions of the pins connected with the Arduino headers.

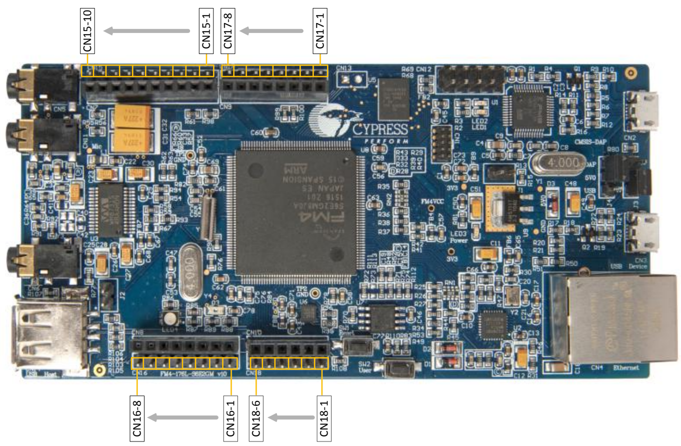
Table 3-2. Pins of Arduino Compatible Interface

| Pin No. | Pin Name | Arduino Designation | Function (Part) |
|---|---|---|---|
| 81 | PF5/SIN3_1/IC11_1/TIOB7_1/INT07_1/IC1_RST_1 | D0 | UART – RX |
| 82 | PF6/SOT3_1/IC12_1/TIOA14_1/INT20_1/IC1_DATA_1 | D1 | UART – TX |
| 83 | PF7/SCK3_1/IC13_1/TIOB14_1/INT21_1/IC1_CIN_1 | D2 | IO |
| 49 | P43/SCS70_1/RTO13_0/TIOA3_0/INT04_0/MCSX4_0 | D3 | PWM |
| 80 | PF4/IC10_1/TIOA7_1/INT06_1/IC1_VPEN_1 | D4 | IO |
| 50 | P44/SCS71_1/RTO14_0/TIOA4_0/MCSX3_0 | D5 | PWM |
| 51 | P45/SCS72_1/RTO15_0/TIOA5_0/MCSX2_0 | D6 | PWM |
| 79 | PF3/SCS63_0/FRCK1_1/TIOB6_1/INT05_1/IC1_VCC_1 | D7 | IO |
| 78 | PF2/SCS62_0/DTTI1X_1/TIOA6_1/IC1_CLK_1 | D8 | PWM |
| 66 | P4E/SCK9_0/INT05_0/WKUP2/MCSX1_0 | D9 | PWM |
| 65 | P4D/FRCK1_0/INT07_0/MSDCLK_0 | D10 | SPI -- #CS |
| 47 | P41/SOT7_1/RTO11_0/TIOA1_0/BIN0_0/MCSX6_0 | D11 | SPI -- MOSI |
| 46 | P40/SIN7_1/RTO10_0/TIOA0_0/AIN0_0/INT23_0/MCSX7_0 | D12 | SPI -- MISO |
| 48 | P42/SCK7_1/RTO12_0/TIOA2_0/ZIN0_0/MCSX5_0 | D13 | SPI -- CLK |
| 101 | P17/AN07/SOT6_1/TX0_0/TRACED3 | SDA | I2C -- SDA |
| 102 | PB0/AN16/SCK6_1/TIOA9_1/TRACED8 | SCL | I2C -- SCL |
| 95 | P11/AN01/TIOB0_2/MNWEX_0/IC1_VCC_0 | A0 | AN01 |
| 96 | P12/AN02/TIOA1_2/MNCLE_0/IC1_VPEN_0 | A1 | AN02 |
| 97 | P13/AN03/SIN9_1/TIOB1_2/INT25_1/MNALE_0/IC1_RST_0 | A2 | AN03 |
| 100 | P16/AN06/SIN6_1/RX0_0/INT09_0/TRACED2 | A3 | AN06 |
| 98 | P14/AN04/SOT9_1/TIOA2_2/IC1_DATA_0/TRACED0 | A4 | AN04/I2C--SDA |
| 99 | P15/AN05/SCK9_1/TIOB2_2/IC1_CIN_0/TRACED1 | A5 | AN05/I2C--SCL |
| 57 | INITX | RESET | RESET |

### 3.3.4 Additional GPIO Headers

The unused pins of the S6E2GM MCU are routed to the CN15, CN16, CN17, and CN18 I/O headers.

Figure 3-3. Additional GPIO Pins




These additional GPIO headers make it easy for the user to access more GPIOs and peripherals, such as the MFS (Multi-Function Serial), PWM and I2S. Table 3-3 shows details of the pins.

Table 3-3. Additional GPIO Pins

| Pin No. | Pin Name | Designation | Functions (part) |
|---|---|---|---|
| 10 | P50/SCS72_0/IC01_1/TIOA8_2 | CN17-1 | PWM |
| 11 | P51/SCS73_0/IC02_1/TIOB8_2 | CN17-2 | PWM |
| 12 | P52/IC03_1/TIOA9_2 | CN17-3 | PWM |
| 23 | P0A/ADTG_1/MCLKOUT_0 | CN17-4 | IO |
| 24 | P30/MI2SWS1_1/RX0_1/TIOB11_2/INT01_2 | CN17-5 | I2S, INT |
| 25 | P31/MI2SMCK1_1/TX0_1/TIOA12_2 | CN17-6 | I2S, PWM |
| 26 | P32/INT19_0/S_DATA1_0 | CN17-7 | INT |
| 27 | P33/FRCK0_0/S_DATA0_0 | CN17-8 | IO |
| N/A | N/A | CN15-1 | GND |
| N/A | N/A | CN15-2 | 3V3 |
| 28 | P34/IC03_0/INT00_1/S_CLK_0 | CN15-3 | INT |
| 31 | P35/IC02_0/INT01_1/S_CMD_0 | CN15-4 | INT |
| 32 | P36/IC01_0/INT02_1/S_DATA3_0 | CN15-5 | INT |
| 33 | P37/IC00_0/INT03_1/S_DATA2_0 | CN15-6 | INT |
| 38 | P3C/SIN2_1/RTO03_0/TIOA3_1/INT19_1/MAD21_0 | CN15-7 | PWM, INT |
| 58 | PF0/SCS73_1/RX0_2/TIOA15_1/INT22_1 | CN15-8 | PWM, INT |
| 59 | PF1/TX0_2/TIOB15_1/INT23_1 | CN15-9 | INT |

| Pin No. | Pin Name | Designation | Functions (part) |
|---|---|---|---|
| 68 | P71/ADTG_8/SIN9_0/INT04_1/MRDY_0 | CN15-10 | INT |
| N/A | N/A | CN18-6 | N/A |
| N/A | N/A | CN18-5 | N/A |
| 144 | P95/RTS5_1/RTO15_1/TIOB5_1/IC0_CIN_1 | CN18-4 | IO |
| 143 | P94/CTS5_1/RTO14_1/TIOB4_1/IC0_DATA_1 | CN18-3 | IO |
| N/A | N/A | CN18-2 | N/A |
| N/A | N/A | CN18-1 | N/A |
| N/A | N/A | CN16-1 | GND |
| N/A | N/A | CN16-2 | 3V3 |
| N/A | N/A | CN16-3 | N/A |
| 114 | P1C/AN12/SCK0_1/TIOA5_2/TRACECLK | CN16-4 | ADC, PWM |
| 110 | PB4/AN20/SCS63_1/TIOA11_1/INT10_1/TRACED12 | CN16-5 | ADC, PWM, INT |
| 109 | P1B/AN11/TIOB4_2/INT11_0/TRACED7 | CN16-6 | ADC, INT |
| 105 | PB3/AN19/SCS62_1/TIOB10_1/ZIN0_2/TRACED11 | CN16-7 | ADC |
| 94 | P10/AN00/TIOA0_2/INT08_0/MNREX_0/IC1_CLK_0 | CN16-8 | ADC, PWM, INT |

### 3.3.5 Stereo Codec

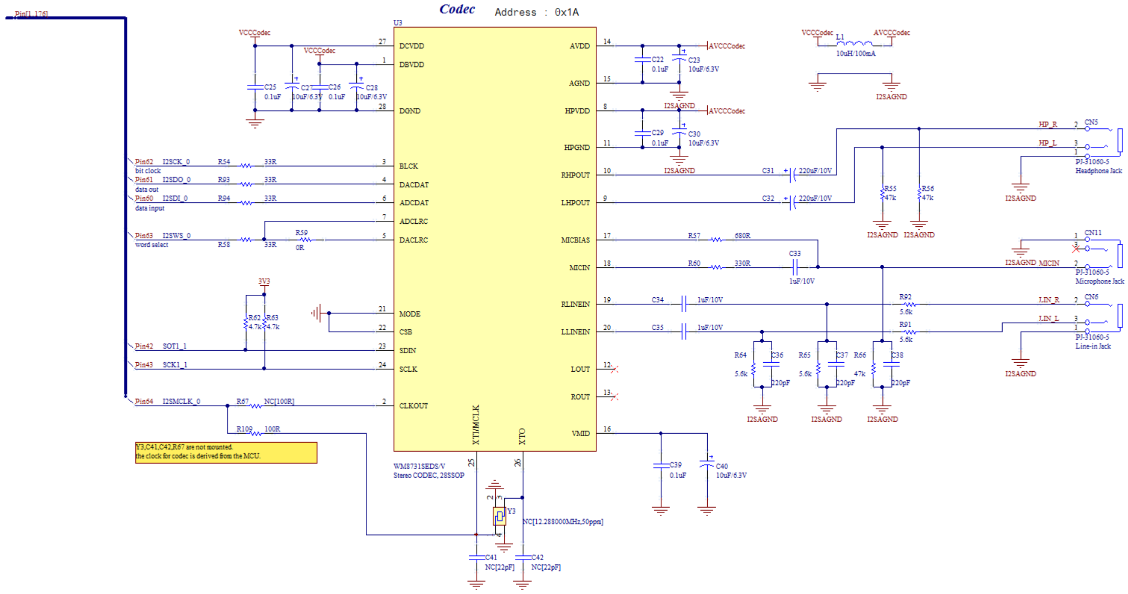
WM8731 is a low power stereo codec with an integrated headphone driver. On the digital side, it has an Inter-IC Sound interface (I2S) which is connected with the I2S macro. Table 3-4 explains the details of the connections. The codec also has an I2C interface for configuring the device and an I2S interface for audio data transmission. The I2C address for configuring the stereo codec is 0x1A.

On the analog side, the codec has headphone, microphone, line-in and line-out channels. On this kit, only the headphone, microphone and line-in channels are routed to the jacks.

Table 3-4. I2S interface

| Pin No. | Port | Function |
|---|---|---|
| 62 | I2SCK_0 | Bit clock out |
| 61 | I2SDO_0 | Audio data out |
| 60 | I2SDI_0 | Audio data in |
| 63 | I2SWS_0 | Word select output pin |
| 64 | I2SMCLK_0 | Mast clock I/O pin |

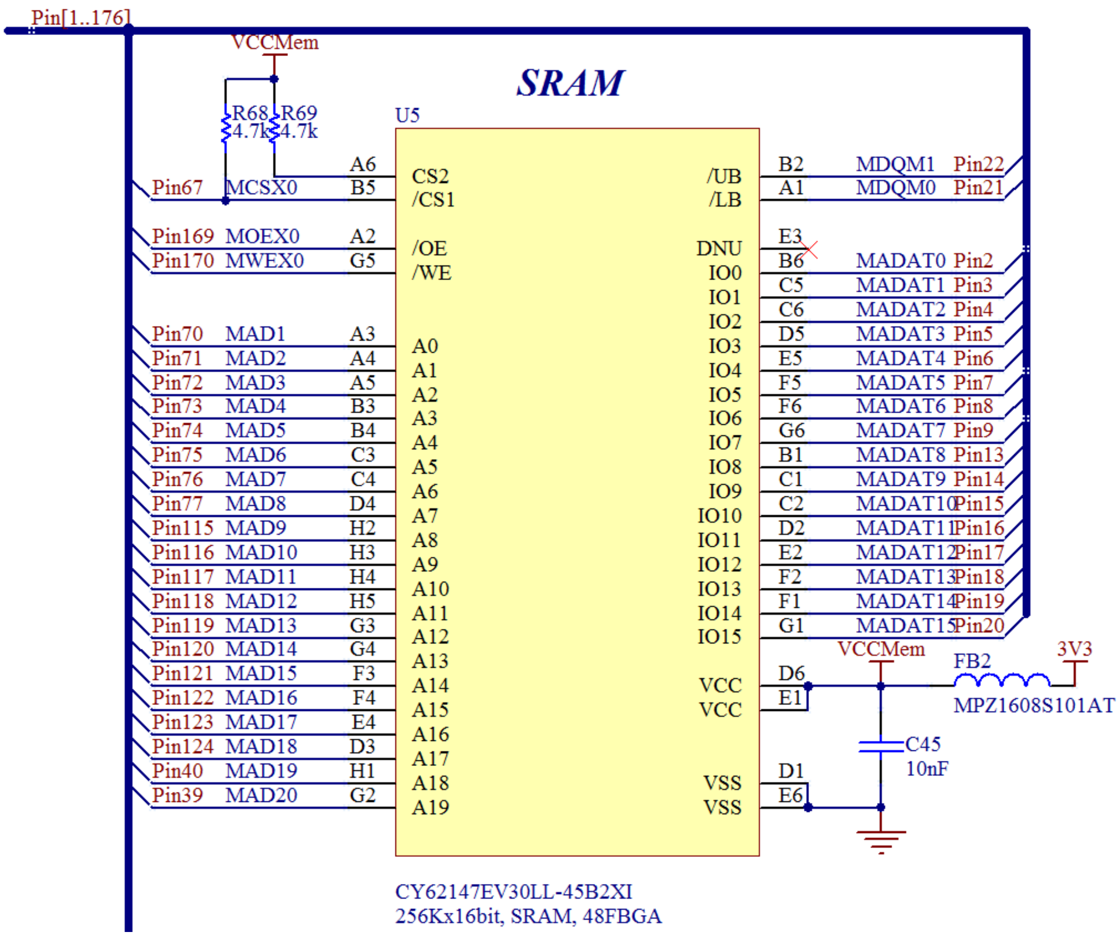
Figure 3-4. Stereo Codec Circuit



### 3.3.6 SRAM

The CY62147EV30 is a high performance CMOS Static RAM (SRAM) organized as 256K words of 16 bits each. This device uses advanced circuit design to provide ultra-low active current. This device also has an automatic power down feature that significantly reduces the power consumption when addresses are not toggling.

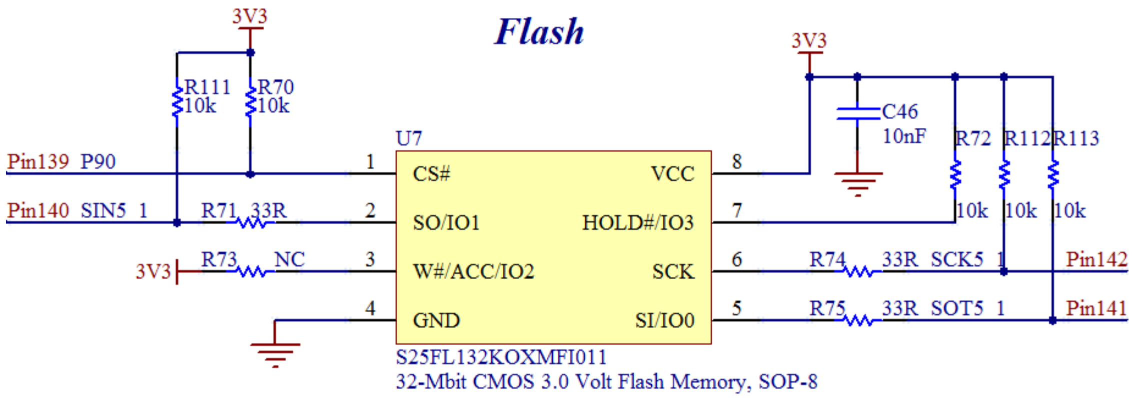
Figure 3-5. SRAM Circuit



### 3.3.7 NOR Flash

The S25FL132K non-volatile flash memory device connects to the S6E2GM device via a Serial Peripheral Interface (SPI). The NOR Flash supports SPI single bit serial input and output (single I/O or SIO) as well as optional two bit (Dual I/O or DIO) and four bit (Quad I/O or QIO) serial protocols. This multiple width interface is called SPI Multi-I/O or MIO. The 33Ω resisters are used to reduce Electromagnetic Interference. In this kit, the flash can be operated in single or dual IO modes.

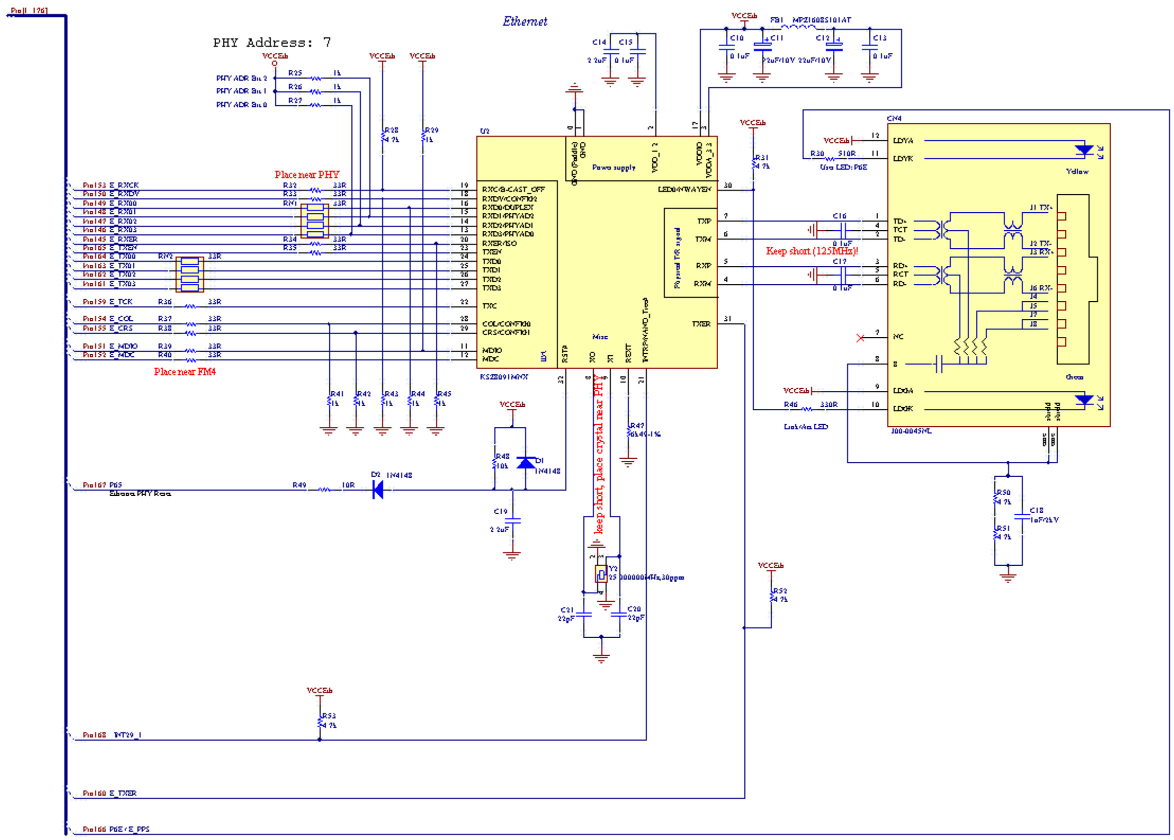
Figure 3-6. NOR Flash Circuit



### 3.3.8 Ethernet MAC

The Ethernet MAC of the FM4 S6E2GM MCU is connected to an Ethernet circuit consisting of a PHY and an RJ45 connector to enable full Ethernet application development. The KSZ8091 is a single-supply 10Base-T/100Base-TX Ethernet PHY for transmission and reception of data over standard CAT-5 unshielded twisted pair cable. The J00-0045NL (CN4) is a standard 10/100 Base-TX RJ45 connector with integrated magnetics compliant with IEEE 802.3.

Figure 3-7. Ethernet Circuit



### 3.3.9 Multicon I/F

The Multicon interface, CN12, is a 2x5 pin connector interface that brings the appropriate signals for UART, SPI, I2C and external interrupts. A simple 10-pin cable can be used to route the serial signals and power to a secondary board or another system. Pins 9 and 10 connect to an additional connector (CN13) to provide another connection point.

Table 3-5. Serial Ports in Multicon Interface

| Pin No. | Pin | Port | UART | SPI | I2C | Interrupt |
|---|---|---|---|---|---|---|
| CN12_1 | Pin48 | SCK7_1 | | CLK | SCL | |
| CN12_2 | Pin47 | SOT7_1 | TX | MOSI | SDA | |
| CN12_3 | GND | | | | | |
| CN12_4 | 3V3 | | | | | |
| CN12_5 | Pin37 | INT18_1 | | | | INT18_1 |
| CN12_6 | Pin36 | INT17_1 | | | | INT17_1 |
| CN12_7 | Pin46 | SIN7_1 | RX | MISO | | |
| CN12_8 | Pin50 | P44 | | #CS | | |
| CN12_9 | CN13_2 | | | | | |
| CN12_10 | CN13_1 | | | | | |

Figure 3-8. Pin Placement of Multicon Interface

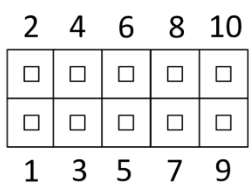
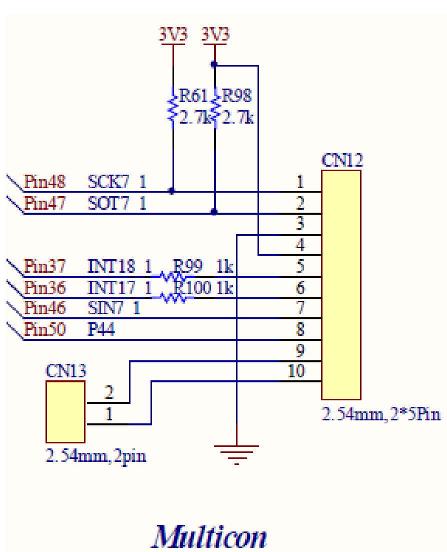


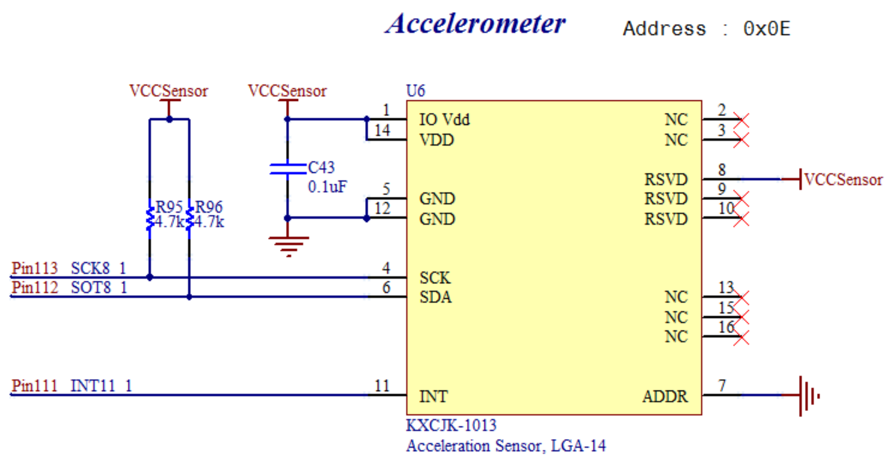

Figure 3-9. Multicon Interface



### 3.3.10 Accelerometer

The KXCJK-1013 is a 3-axis ±2g, ±4g or ±8g silicon micro-machined accelerometer. This sensor communicates with the MCUs via an I2C interface. The I2C address for the accelerometer is 0x0E. The accelerometer can also interrupt the FM4 S6E2GM MCU when a change is detected in either of the three axes.

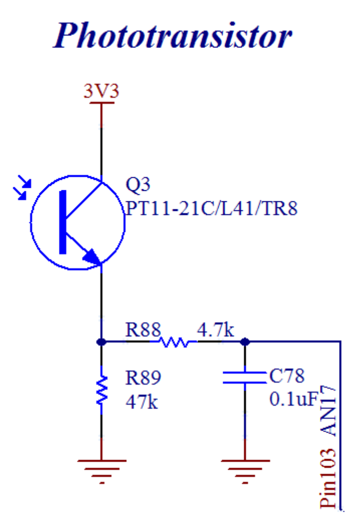
Figure 3-10. Accelerometer




### 3.3.11 Phototransistor

PT11-21C/L41/TR8 is a phototransistor in a miniature SMD package that can be used for applications like opto-electronic switches, video and infrared applied systems. PT11-21C/L41/TR8 (Q3) interfaces to the FM4 S6E2GM MCU via the analog input at pin 103, AN17.

Figure 3-11. Phototransistor

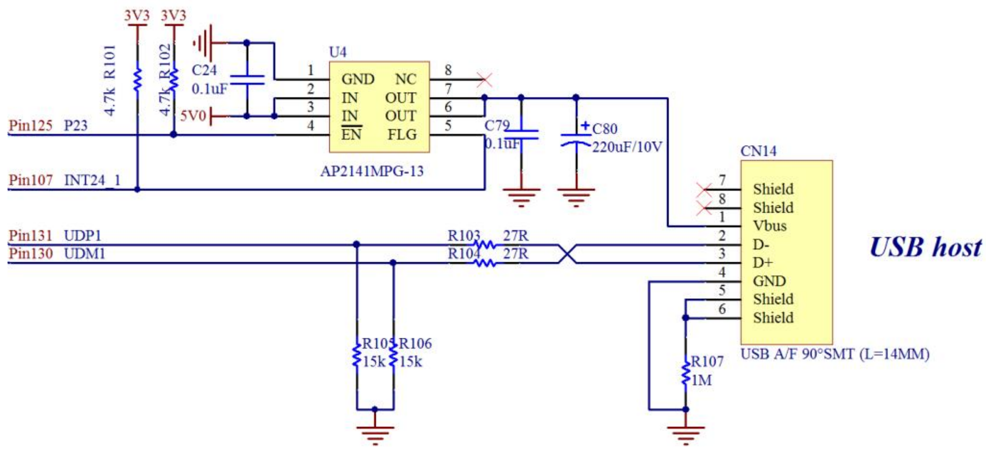


### 3.3.12 USB Interfaces

The FM4 S6E2GM MCU has two USB channels that can work as a host or a device. In the FM4 S6E2G-Series Pioneer Kit, USB0 is configured as a USB device and is connected to CN3, and USB1 is configured as a USB host and is connected to CN14.

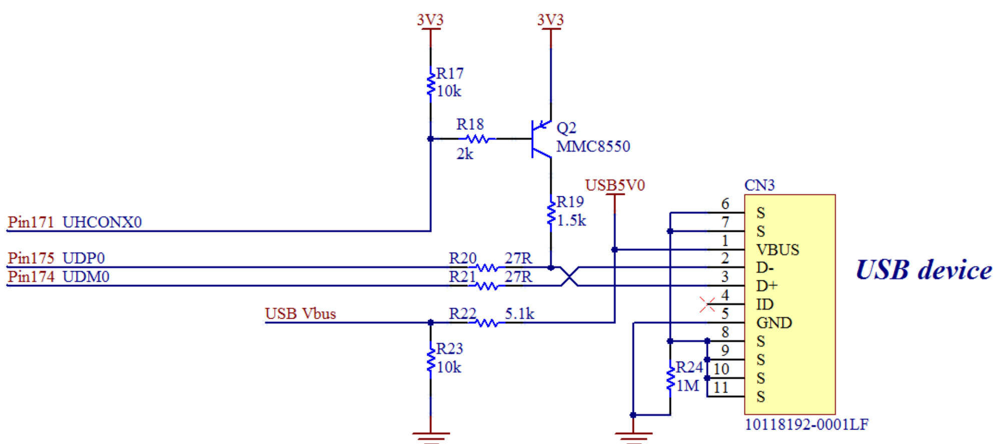
The FM4 S6E2G-Series Pioneer Kit can provide a maximum current of 500 mA to the connected USB device via connector CN14.

Figure 3-12. USB Host




The FM4 S6E2G-Series Pioneer Kit can also be powered via the USB device connector CN3 when jumper J4 is set to short pins 2 and 3.

Figure 3-13. USB Device

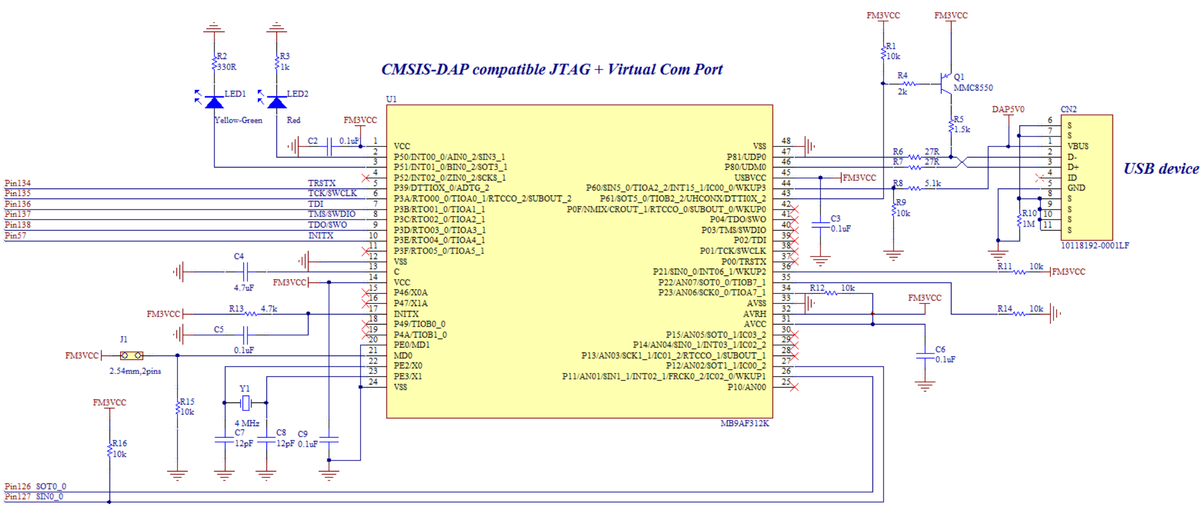


### 3.3.13 CMSIS-DAP

The FM4 S6E2G-Series Pioneer Kit features an on-board CMSIS-DAP module to enable programming and debugging of the FM4 S6E2GM MCU. The CMSIS-DAP firmware solution supports a full JTAG configuration and a two-wire Serial Wire Debug (SWD) interface.

The CMSIS-DAP module can also power the FM4 S6E2G-Series Pioneer kit via the CN2 connector when jumper J4 is set to short pins 1 and 2.

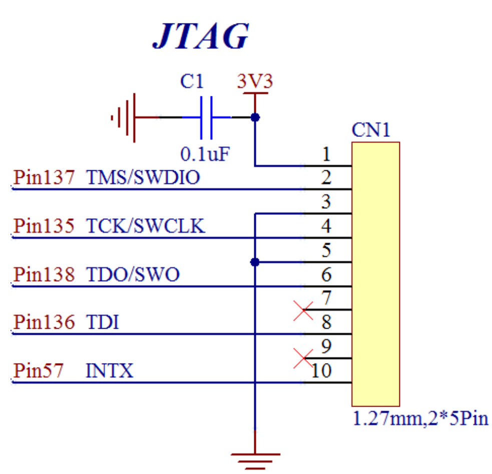
Figure 3-14. CMSIS DAP Circuit




### 3.3.14 JTAG

The FM4 S6E2G-Series Pioneer Kit provides an interface, CN1, to connect an external programmer for programming the FM4 S6E2GM MCU. CN1 is a standard ARM 0.05” 10-pin Cortex debug header.

Figure 3-15. 10-pin JTAG I/F



# 4. Software Development

## 4.1 Tool Options

The FM4 S6E2G-Series device is supported by several 3rd party tools, and the user can select their preferred tool. The example projects can be opened and compiled in the following two IDEs:

- IAR Embedded Workbench for ARM
- Keil ARM RealView® Microcontroller Development System

Download evaluation versions of these tools from the vendor's website. A full license may be required to build or debug some of the examples. For detailed information on using the tools, see the documentation in the Help section of the tool chain or the website of the tool supplier.

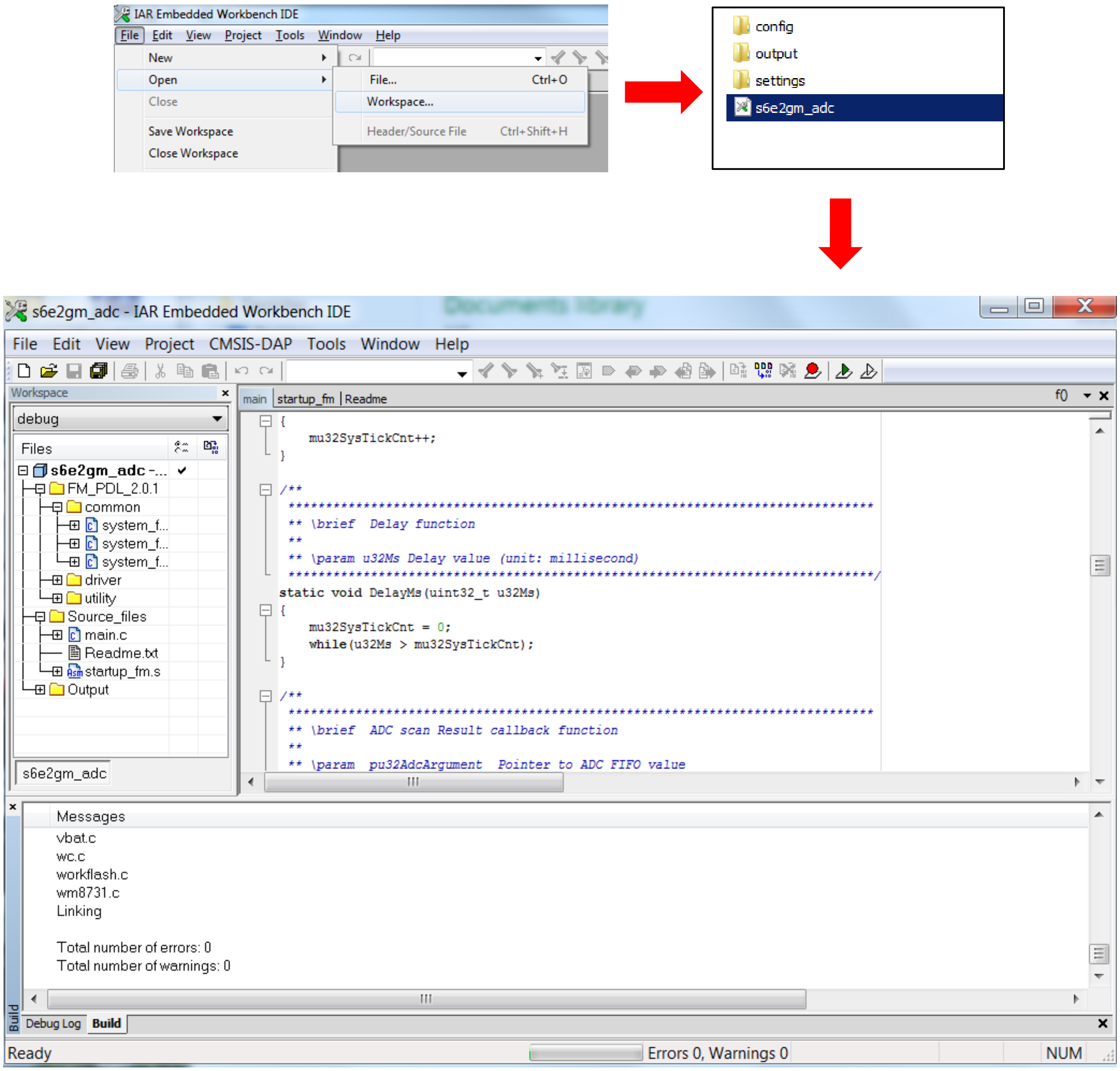
### 4.1.1 Build an Example Project with IAR IDE

The following steps describe how to open, build, and run an example project in the IAR IDE:

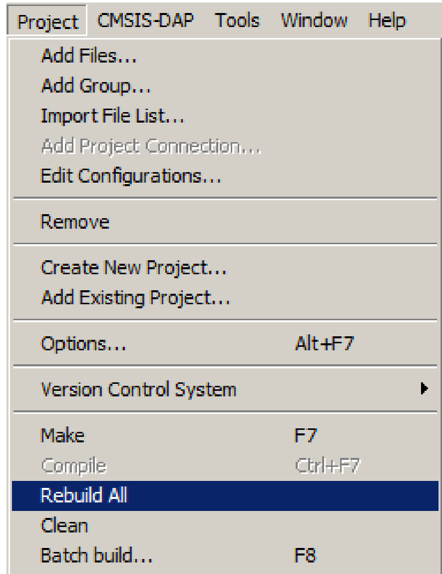
The *s6e2gm_adc* is one example project that is available after successful installation.

1. Launch IAR Embedded Workbench IDEV7.40.5.9739 (or later).

2. Click **File** > **Open** > **Workspace** and select the workspace file *s6e2gm_adc.eww* from `<User_Directory>:\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware\Demo Projects\s6e2gm_adc\IAR`.



3. Click **Project** > **Rebuild All** to build the project.



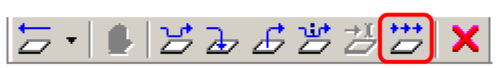

4. Ensure the jumpers on the FM4 S6E2G-Series Pioneer board are placed according to Table 4-1.

Table 4-1. Debugging Jumper Settings

| Jumper | Position | Description |
|---|---|---|
| J1 | Open | Sets MB9AF312K (CMSIS-DAP) in run mode. |
| J2 | Open | Sets S6E2GM in run mode. |
| J4 | Pin 1 to Pin 2 | Power from CMSIS-DAP (CN2) |

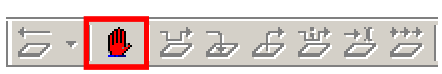
5. Connect the USB cable to the CN2 port.
6. Observe that the Power LED (LED3) is glowing Green.
7. Click the **Download and Debug** icon, or use the Shortcut key **Crtl+D**, or choose **Project** > **Download and Debug** to start downloading and debugging.

8. Click the **Run** icon to run the program once it has downloaded successfully.



Example Projects describes the functionality of various kit example projects.

9. Click the **Stop** icon to stop the program.



For more information about the IAR Embedded Workbench IDE, click **Help** in the IAR Embedded Workbench.

### 4.1.2 Build an Example Project with Keil µVision IDE

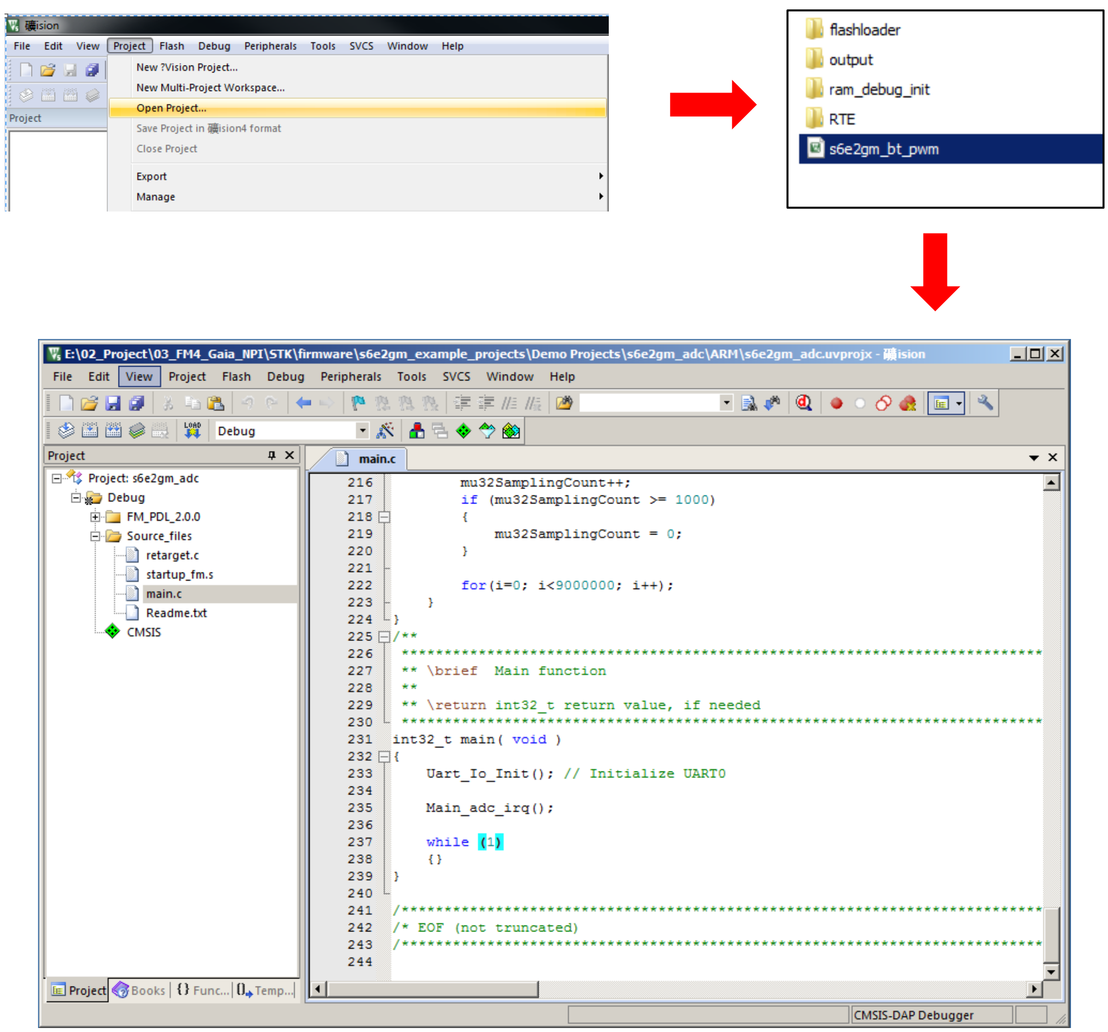
The following steps describe how to open, build, and run an example project in the Keil µVision IDE:

1. Before doing this, check the availability of the flash loader file of the S6E2GM device (*S6E2GMXXA1024KB.FLM*) in this directory: `<Keil_Install_Directory>:\ARM\Flash`.
2. If the flash loader file does not exist, copy it to the above folder from:

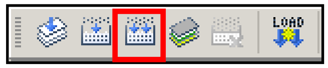
   `<User_Directory>:\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware\Demo Projects\<Project>\ARM\flashloader\S6E2GMXXA1024KB.FLM`

3. Launch Keil µVision IDEv5.16a (or later).
4. Click **Project** > **Open Project**, and select the workspace files *6e2gm_dac.uvprojx* from

   `<User_Directory>:\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware \Demo Projects\s6e2gm_adc\ARM`



5. Click the **Build** icon to build the project.

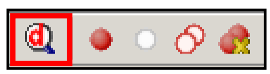



6. Ensure that the jumpers on the FM4 S6E2G-Series Pioneer board are placed according to Table 4-2.

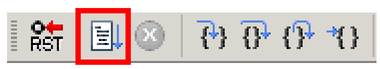
Table 4-2: Debugging Jumper Settings

| Jumper | Position | Description |
|---|---|---|
| J1 | Open | Sets the MB9AF312K (CMSIS-DAP) in run mode. |
| J2 | Open | Sets the S6E2GM in run mode. |
| J4 | Pin 1 to Pin 2 | Power from CMSIS-DAP (CN2) |

7. Connect the USB cable to the **CN2** port.
8. Observe that the Power LED (LED3) is glowing Green.
9. Click the **Debug** icon, use the shortcut **Crtl+F5**, or choose **Debug** > **Start/Stop Debug** Session to start the downloading and debugging.

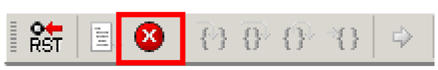


10. Click the **Run** icon to run the program once it has downloaded successfully.




Example Projects describe the functionality of various kit example projects.

11. Click the **Stop** icon to stop the program.




For more information about the Keil µVision IDE, click **Help**.

## 4.2 Example Projects

The FM4 S6E2G-Series Pioneer Kit includes twenty one example projects to help the user get a quick start with the S6E2GM device. The example projects are available in the following directory:

```
<User_Directory>:\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware\Demo Projects
```

The example projects listed in Table 4-3 are based on the Peripheral Driver Library (PDL). The PDL provides APIs for initializing and operating on-chip peripherals. PDL documentation is available in the following directory:

```
<User_Directory>:\FM_PDL_2.0.1\doc
```

Use either IAR Embedded Workbench v7.40.5.9739 (or later) or Keil µVision IDE v5.16a (or later) to open these example projects.

Table 4-3. Example Projects

| # | Projects | Title/Description |
|---|---|---|
| 1 | s6e2gm_adc | **Title: Analog-to-Digital Converter**<br>Description: This project demonstrates the AD conversion of the S6E2GM device. This project enables ADC channel AN17 to measure the voltage of the phototransistor output. The measured value is sent out using UART0. Refer to Analog-to-Digital Converter for details. |
| 2 | s6e2gm_bt_pwm | **Title: Base Timer**<br>Description: This project demonstrates the base timer operation of the S6E2GM device. This project configures a base timer in PWM mode to generate a PWM sequence. The PWM outputs from the TIOA10_1 pin to drive the Green LED of LED4. The PWM duty cycle is updated every 1 ms by a second base timer to produce a breathing LED effect. |
| 3 | s6e2gm_dma | **Title: Direct Memory Access (DMA)**<br>Description: This project demonstrates the DMA operation of the S6E2GM device. The program configures DMA to move the data from a source array (*au32SourceData*) to a destination array (*au32DestinationData*), and then compares the content of the arrays to verify the data. Refer to Direct Memory Access (DMA) for details. |
| 4 | s6e2gm_ext_int | **Title: External Interrupt**<br>Description: This project demonstrates the external interrupt operation of the S6E2GM device. The **SW2** key press is detected by the non-maskable external interrupt (NMIX). Pressing the **SW2** key on the board will change the color of RGB LED (LED4) from Red to Green to Blue. |
| 5 | s6e2gm_flash | **Title: Flash Write**<br>Description: This project demonstrates the flash writing operation of the S6E2GM device. A specific set of four values each of four bytes in size will be written into a specific address location (0x00406000) in the flash memory. Refer to Flash Write for the details. |
| 6 | s6e2gm_gpio | **Title: GPIO**<br>Description: This project demonstrates GPIO operations of the S6E2GM device by driving an LED. The PB2 pin sinks current from the Green LED of the RGB LED (LED4). The PB2 pin will output a pulse sequence to blink the LED continuously. |

| # | Projects | Title/Description |
|---|---|---|
| 7 | s6e2gm_mfs_uart | **Title: Multi-function Serial Interface**<br>Description: This project demonstrates the UART communication of the S6E2GM device. This program enables the MFS0 as a UART to communicate with the CMSIS-DAP device. The CMSIS-DAP device serves as a UART to USB bridge between the MCU and the PC. Refer to UART Communication for details. |
| 8 | s6e2gm_mft_frt | **Title: Multi-function Timer**<br>Description: This project demonstrates the multi-function timer (MFT) operation of the S6E2GM device. This project configures the multi-function timer unit 0 in free-run timer mode. An interrupt is triggered at the peak point and zero point of the counter respectively. The state of the PB2 pin is changed in the interrupt service routines which causes the Green LED of the RGB LED (LED4) to blink. |
| 9 | s6e2gm_rtc | **Title: Real Time Clock**<br>Description: This project demonstrates the RTC operation of the S6E2GM device. The program enables the RTC in calendar mode, and sends out the current calendar through UART0.The calendar starts from 2015/9/13 23:59:01 Wednesday. Run the Serial Port Viewer, set the baud rate as 115200, and click the **Disconnected** button to connect the board with PC. After the program is run, the calendar data will be displayed in the window of the Serial Port Viewer. |
| 10 | s6e2gm_sleep_mode | **Title: Sleep Mode**<br>Description: This project demonstrates the sleep mode operation of the S6E2GM device. The MCU will enter sleep mode after blinking the Green LED five times. It can be woken up by pressing the **SW2** switch. After wakeup, the Green LED will turn on. Refer to Sleep Mode for the details. |
| 11 | s6e2gm_sw_wdt | **Title: Software Watchdog**<br>Description: This project demonstrates the operation of the the S6E2GM watchdog. The project will demonstrate the impact of two different situations with watchdog enabled: (a) when the watchdog is fed; and (b) when the watchdog is not fed. If the watchdog is enabled, but the watchdog is fed in time, the program will run properly, and the RGB LED (LED4) will blink Green. If the watchdog is enabled, but the watchdog is not fed in time, the chip is reset, and the Green LED will remain continuously on. Refer to Software Watchdog for the details. |
| 12 | s6e2gm_wc | **Title: Watch Timer**<br>Description: This project demonstrates the Watch Timer function of the S6E2GM devices. The Watch Timer generates an interrupt every second. In the interrupt service routine, pin PB2 is used to bilnk the Green LED of the RGB LED (LED4). |
| 13 | s6e2gm_I2S_hp | **Title: Audio I2S Headphone**<br>Description: This project demonstrates the operation of the S6E2GM audio codec I2S headphone. The project will demonstrate a function connecting a headphone to the headphone jack to hear a repeated tone. |
| 14 | s6e2gm_I2S_mic | **Title: Audio I2S Microphone**<br>Description: This project demonstrates the operation of the S6E2GM audio codec I2S microphone. The project will demonstrate a function that starts or stops microphone function through pressing the **SW2**. When starting the microphone, if speaking into the microphone, you will hear the voice through the headphone. When stoping the microphone, if speaking into the microphone, you will not hear the voice through the headphone. |

| # | Projects | Title/Description |
|---|---|---|
| 15 | s6e2gm_I2S_line | **Title: Audio I2S Line**<br>Description: This project demonstrates the operation of the S6E2GM audio codec I2S Line. The project will demonstrate a function that starts or stops Line function through pressing the **SW2**. When starting the Line function, if playing music with PC, you will hear the music through the headphone. When stopping the Line function, if playing music with PC, you will not hear the music through the headphone. |
| 16 | s6e2gm_usb_device | **Title: USB Device**<br>Description: This example demonstrates the USB peripheral operation as an HID mouse device. The MCU of Gaia start kit includes two USB channels; the board uses the USB0 as device interface. This example sets the endpoint0 of the USB0 as control endpoint, and sets the endpoint1 as the HID mouse data input endpoint. Connect CN3 port of the board to PC by USB cable. The PC will identify this device as a HID mouse. When pressing the SW2 button, the PC cursor will move to the left. Refer to Sleep Mode for the details. |
| 17 | s6e2gm_usb_host | **Title: USB Host**<br>Description: This example demonstrates how the USB host reads and writes a USB flash drive. The MCU of Gaia start kit includes two USB channels; the board use the USB1 as host interface. This example implements the USB mass storage class. When inserting the USB flash drive (FAT filesystem) to CN14 of the board, the program enumerates devices, and lights the Blue LED. Then the program will mount the FATFS and create the test.txt file in the root directory, write 2K bytes of data to this file, then read the data to buffer from the file. Check whether the read and write are equal, the Green light is on if they are equal, the Red LED will turn on if they are not equal or operation failed. |
| 18 | s6e2gm_nor_flash | **Title: Nor flash**<br>Description: This project demonstrates the usage of an external flash (S25FL132K nor flash) for data storage controlled by the MCU using SPI interface CSIO. Refer to NOR Flash for the details. |
| 19 | s6e2gm_sram | **Title: s6e2gm sram**<br>Description: This project demonstrates how to set the EXTIF use for write and read function of external SRAM CY62147EV30 on the S6E2GM, This project writes to every address location of the CY62147EV30 and then reads back the data to verify. The project is started by pressing button SW2. When the test is in progress, the Blue LED is on. Once the test completes, the Green LED will be on if the test passed, and the Red LED will be on if the test failed. |
| 20 | s6e2gm_ accelerometer | **Title: Accelerometer**<br>Description: This example project demonstrates the usage of accelerometer sensor module; the data of each of axes (X, Y, Z) of the board position will be output to Cypress Serial Port Viewer respectively. This data will change if there is any change of board position. |
| 21 | s6e2gm_ethernet | **Title: Ethernet**<br>Description: This project demonstrates the Ethernet-MAC function of the S6E2GM device. The PHY layer uses KSZ8091MNX chip, the TCP/IP layer uses LwIP. When ping the board, it will receive the ping-reply. |

## 4.2.1 Analog-to-Digital Converter

### *4.2.1.1 Project Description*

This project demonstrates the ADC conversion of the S6E2GM device. The project enables ADC channel AN17 to measure the voltage from the phototransistor output. It is converted to a decimal value and sent out using UART0.

### *4.2.1.2 Hardware Connection*

No specific hardware connections are required for this project. All connections are hardwired on the board.

### *4.2.1.3 Verify Output*

1. Power the FM4 S6E2G-Series Pioneer board from CN2 using a USB cable, see Figure 2-6.
2. Open the project file in IAR Embedded Workbench or Keil µVision IDE from the following directory:

   IAR project:

   ```
   <User_Directory>:\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware\Demo
   Projects\s6e2gm_adc\IAR\s6e2gm_adc.eww
   ```

   Keil project:

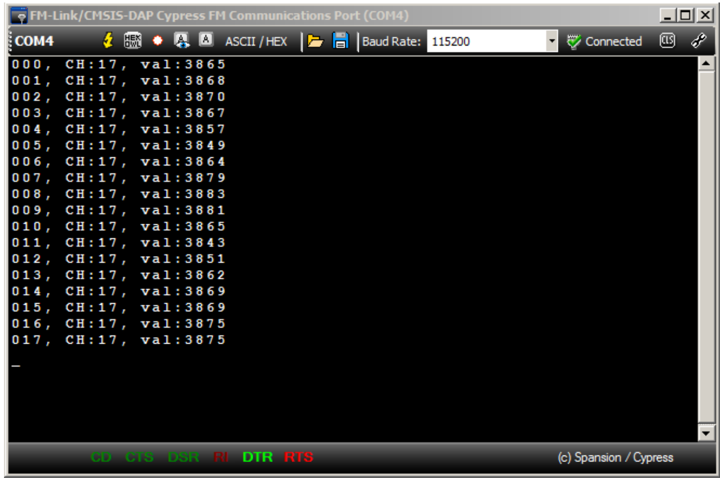
   ```
   <User_Directory>:\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware
   \Demo Projects\s6e2gm_adc\ARM\s6e2gm_adc.uvprojx
   ```

3. Build the project and download the code into the S6E2GM device.
4. Run the Serial Port Viewer Tool, set the baud rate to **115200**, and click the **Disconnected** button to connect the board to the PC, as described in Run the Test Demo.

Figure 4-1. Select the Baud Rate and Connect


5. Run the program and the ADC value will display in the Serial Port Viewer Tool window.

Figure 4-2. ADC value




6. Place your hand over the board to block some light from the phototransistor. Observe the values change in the Serial Port Viewer.

## 4.2.2 Direct Memory Access (DMA)

### *4.2.2.1 Project Description*

This project demonstrates the DMA operation of the S6E2GM device. The program configures the DMA to move the data from the *au32SourceData* (source array) to the *au32DestinationData* (destination array), and then compares the content of the arrays to verify the data.

### *4.2.2.2 Hardware Connection*

No specific hardware connections are required for this project. All connections are hardwired on the board.

### *4.2.2.3 Verify Output*

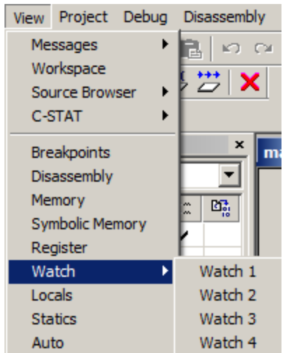
#### *4.2.2.3.1 Using IAR Embedded Workbench*

1. Power the FM4 S6E2G-Series Pioneer board from CN2 using a USB cable, refer to Figure 2-6.
2. Open the project file in IAR Embedded Workbench from the following directory:

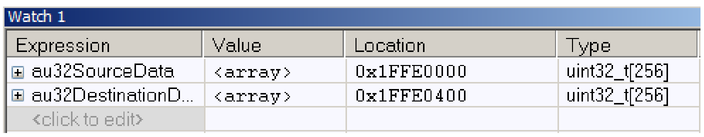
```
IAR project: <User_Directory>:
\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware
\Demo Projects\s6e2gm_dma\IAR\s6e2gm_dma.eww
```

3. Build the project and download the code into the S6E2GM device using the debugger.

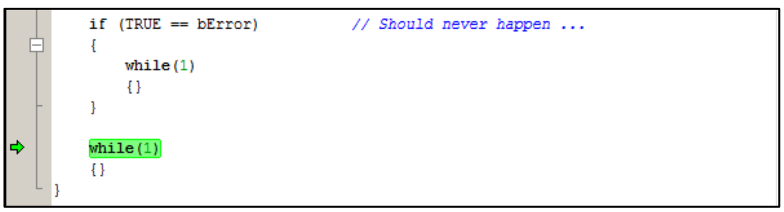
4. Open Watch1 window from **View** > **Watch**.




5. Add the arrays *au32SourceData* and *au32DestinationData* in **Watch1** window.




6. Run the program for a while (>10 seconds).
7. Stop the program and check the arrays mentioned above. The Program Counter (PC) will stop at the routine as shown below which means the content of the arrays are the same.



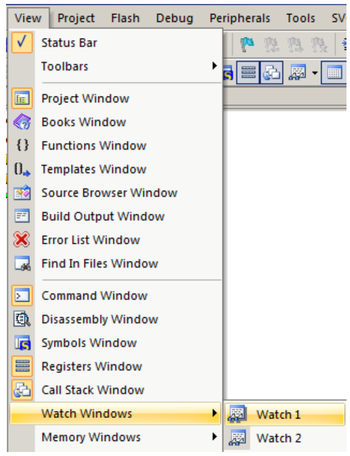

### 4.2.2.3.2 Using Keil µVision IDE

1. Power the FM4 S6E2G-Series Pioneer board from CN2 using a USB cable, refer to Figure 2-6.
2. Open the project s6e2gm_dmain Keil µVision IDE from the following directory:

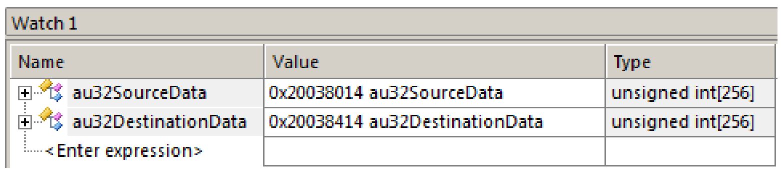
```
Keil project: <User_Directory>:
\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware
\Demo Projects\s6e2gm_dma\ARM\s6e2gm_dma.uvprojx
```

3. Build the project and download the code into the S6E2GM device using the debugger.

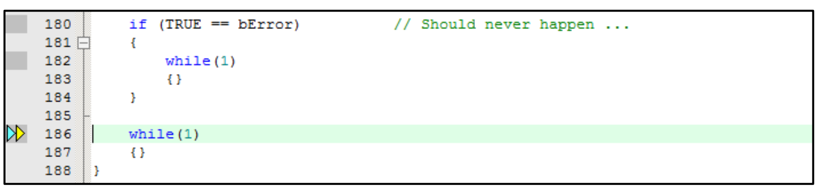
4. Open **Watch1** window from **View** > **Watch** Windows.




5. Add the arrays au32SourceData and au32DestinationData in **Watch1** window.




6. Run the program for a while (>10 seconds).
7. Stop the program and check the arrays mentioned above. The Program Counter (PC) will stop at the routine as shown below which means the content of the arrays are the same.



## 4.2.3 Flash Write

### *4.2.3.1 Project Description*

This project demonstrates the flash writing operation of the S6E2GM device. Four data values (0x00112233, 0x44556677, 0x8899aabb, 0xccddeeff) will be written starting at the 0x00406000 address in flash.

### *4.2.3.2 Hardware Connection*

No specific hardware connections are required for this project. All connections are hardwired on the board.

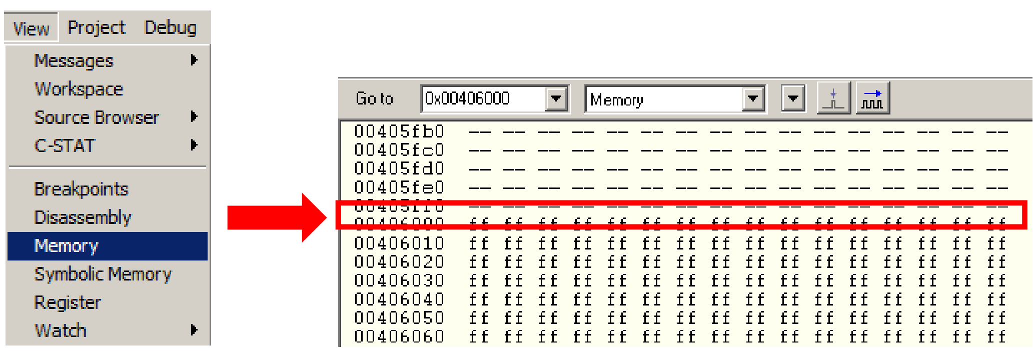
### *4.2.3.3 Verify Output*

#### *4.2.3.3.1 Using IAR Embedded Workbench*

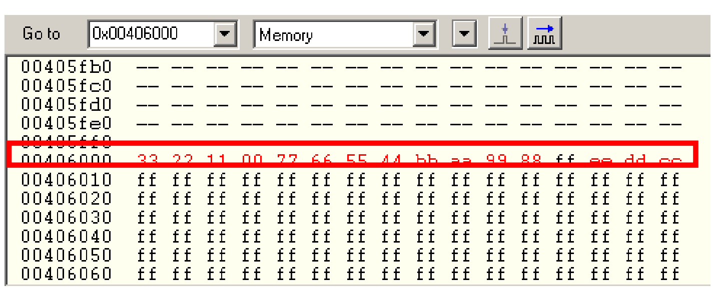
1. Power the FM4 S6E2G-Series Pioneer board from CN2 using a USB cable, refer to Figure 2-6.
2. Open the project in the IAR Embedded Workbench from the following directory:

```
IAR project: <User_Directory>:
\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware
\Demo Projects\s6e2gm_flash\IAR\s6e2gm_flash.eww
```

3. Build the project and download the code into the S6E2GM device using the debugger.
4. Open the memory window from **View** > **Memory**. Enter 0x00406000 in the **Go to** field and press the [**Enter**] key on your PC.




5. Run the program for a while (>10 seconds).
6. Stop the program and check the content of 0x00406000 in flash.

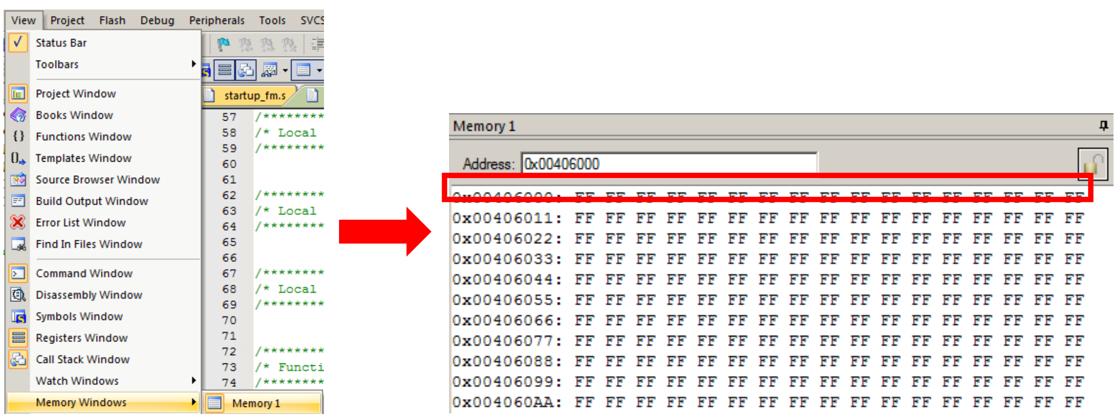


#### *4.2.3.3.2 Using Keil µVision IDE*

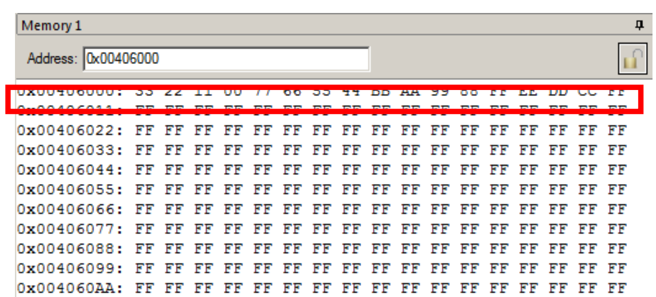
1. Power the FM4 S6E2G-Series Pioneer board from CN2 using a USB cable, refer to Figure 2-6.
2. Open the project *s6e2gm_flash* in the Keil µVision IDE from the following directory:

```
Keil project: <User_Directory>:
\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware
\Demo Projects\s6e2gm_flash\ARM\s6e2gm_flash.uvprojx
```

3. Build the project and download the code into the S6E2GM device using the debugger.
4. Open the **Memory1** window from **View** > **Memory Windows**. Enter 0x00406000 in the **Address** field and press the **[Enter]** key on your PC.




5. Run the program for a while (>10 seconds).
6. Stop the program and check the content of 0x00406000 in flash.



## 4.2.4 UART Communication

### *4.2.4.1 Project Description*

This project demonstrates the UART communication of the S6E2GM device. This program enables the MFS0 as a UART to communicate with the CMSIS-DAP device. The CMSIS-DAP device serves as a UART to USB Bridge between the MCU and the PC.

### *4.2.4.2 Hardware Connection*

No specific hardware connections are required for this project. All connections are hardwired on the board.

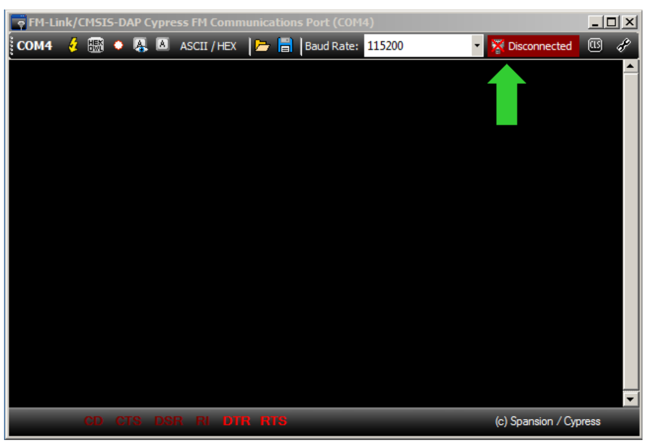
### *4.2.4.3 Verify Output*

1. Power the FM4 S6E2G-Series Pioneer board from **CN2** using a USB cable, refer to Figure 2-6.
2. Open the project in the IAR Embedded Workbench or the Keil µVision IDE from the following directory:

```
IAR project: <User_Directory>:
\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware
\Demo Projects\s6e2gm_mfs_uart\IAR\s6e2gm_mfs_uart.eww
Keil project: <User_Directory>:
\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware
\Demo Projects\s6e2gm_mfs_uart\ARM\s6e2gm_mfs_uart.uvprojx
```

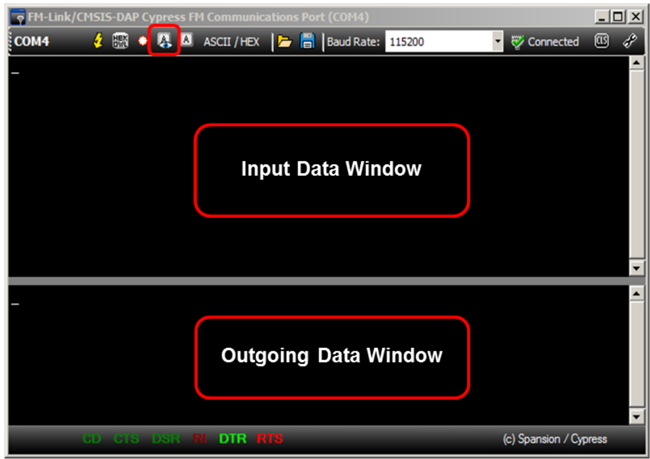
3. Build the project and download the code into the S6E2GM device.
4. Run the program.
5. Run the Serial Port Viewer Tool, set the baud rate as **115200**, and click the **Disconnected** button to connect the board with PC, as described in Run the Test Demo.

Figure 4-3. Select the Baud Rate and Connect



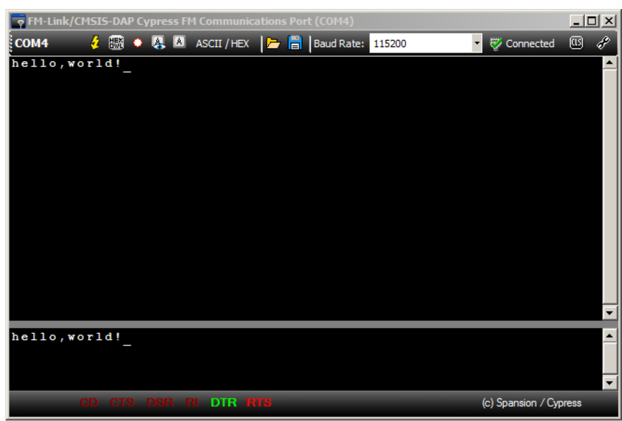
6. Click the **Toggle** icon to toggle the Outgoing Data Window.

Figure 4-4. Toggle the Output Data Window




7. Key in any characters in the Outgoing Data Window, the same characters will be echoed in the Input Data Window.

Figure 4-5. Echo Test



### 4.2.5 Sleep Mode

#### *4.2.5.1 Project Description*

This project demonstrates the sleep mode operation of the S6E2GM device. The MCU will enter into the sleep mode after blinking the Green LED 5 times. After it is asleep, the device is woken up by pressing **SW2** key. After wakeup, the Green LED will turn on.

#### *4.2.5.2 Hardware Connection*

No specific hardware connections are required for this project. All connections are hardwired on the board.

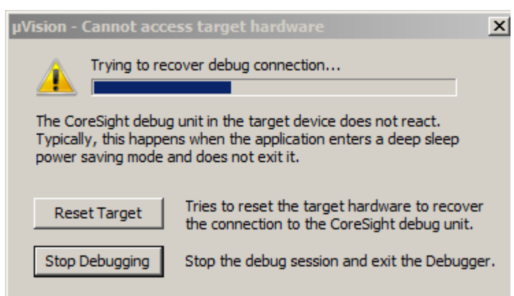
#### *4.2.5.3 Verify Output*

1. Power the FM4 S6E2G-Series Pioneer board from **CN2** using a USB cable, refer to Figure 2-6.
2. Open the project file in the IAR Embedded Workbench or the Keil µVision IDE from the following directory:

```
IAR project: <User_Directory>:\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware\Demo
Projects\s6e2gm_sleep_mode\IAR\s6e2gm_sleep_mode.eww
Keil project: <User_Directory>:\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware\Demo
Projects\s6e2gm_sleep_mode\ARM\s6e2gm_sleep_mode.uvprojx
```

3. Build the project and download the code into the S6E2GM device.
4. Run the program.
5. The RGB LED (LED4) will blink five times (Green color), and then the MCU enters sleep mode.

Figure 4-6. MCU in Sleep Mode




6. Press the **SW2** key to wake up the MCU. The RGB LED (LED4) will glow with Green color.

### 4.2.6 Software Watchdog

#### *4.2.6.1 Project Description*

This project demonstrates the operation of the S6E2GM watchdog. The project will demonstrate the impact of two different watchdog situations: when the watchdog is fed and when the watchdog is not fed.

If the watchdog is enabled, but the watchdog is fed in time, the program will run properly, and the RGB LED (LED4) will blink Green.

If the watchdog is enabled, but the watchdog is not fed in time, the chip is reset, and the Green LED will remain on constantly.

#### *4.2.6.2 Hardware Connection*

No specific hardware connections are required for this project. All connections are hardwired on the board.

#### *4.2.6.3 Verify Output*

1. Power the FM4 S6E2G-Series Pioneer board from **CN2** using a USB cable, refer to Figure 2-6.
2. Open the project in the IAR Embedded Workbench or the Keil µVision IDE from the following directory:

```
IAR project: <User_Directory>:
\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware
\Demo Projects\s6e2gm_st_wdt\IAR\s6e2gm_st_wdt.eww
Keil project: <User_Directory>:
\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware
\Demo Projects\s6e2gm_st_wdt\ARM\s6e2gm_st_wdt.uvprojx
```

3. Build the project and download the code into the S6E2GM device.
4. Run the program.
5. The RGB LED (LED4) will blink with Green color.
6. Stop the program, comment out the line *Swwdg_Feed();* in the watchdog interrupt service routine in *main.c*, and click **File** > **Save**.

```
static void WdgSwCallback(void)
{
    // Comment following to see software reset
    //Swwdg_Feed();    // Clear Irq and Reset Timer
    ++u32CountWdg;
    if (TRUE != FM_SWWDT->WDOGRIS_f.RIS)
    {
        SetLed(u32CountWdg);
    }
}
```

7. Repeat the steps 3 and 4.
8. The RGB LED (LED4) will glow with a steady Green color.

## 4.2.7 Audio I2S Headphone

### *4.2.7.1 Project Description*

This project demonstrates the operation of the S6E2GM audio codec I2S headphone. The project will demonstrate a function connecting a headphone to the headphone jack to hear a repeated tone.

### *4.2.7.2 Hardware Connection*

In this project, you only need to connect a headphone to the headphone jack **CN5**.

### *4.2.7.3 Verify Output*

1. Power the FM4 S6E2G-Series Pioneer board from **CN2** using a USB cable. For details, refer to Figure 2-6.
2. Open the project in the IAR Embedded Workbench or the Keil µVision IDE from the following directory:

```
IAR project: <User_Directory>:\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware\Demo
Projects\ s6e2gm_I2S_hp \IAR\ s6e2gm_I2S_hp.eww
Keil project: <User_Directory>:\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware\Demo
Projects\ s6e2gm_I2S_hp \ARM\ s6e2gm_I2S_hp.uvprojx
```

3. Insert the headphone to the headphone jack **CN5** of the S6E2GM board.
4. Build the project and download the code into the S6E2GM device and execute it.
5. You will hear a repeated tone through the headphone.

## 4.2.8 Audio I2S Microphone

### *4.2.8.1 Project Description*

This project demonstrates the operation of the S6E2GM audio codec i2s microphone. The project will demonstrate a function that start or stop microphone function through press the **SW2**. When start the microphone, if speaking into the microphone and you will hear the voice through the headphone. When stop the microphone, if speaking into the microphone and you will not hear the voice through the headphone.

### *4.2.8.2 Hardware Connection*

There will connect a microphone to the microphone jack **CN11**. And connect a headphone to the headphone jack **CN5.**

### *4.2.8.3 Verify Output*

1. Power the FM4 S6E2G-Series Pioneer board from **CN2** using a USB cable. For details, refer to Figure 2-6.
2. Open the project in the IAR Embedded Workbench or the Keil µVision IDE from the following directory:

```
IAR project: <User_Directory>:\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware\Demo
Projects\ s6e2gm_I2S_mic\IAR\ s6e2gm_I2S_mic.eww
Keil project: <User_Directory>:\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware\Demo
Projects\ s6e2gm_I2S_mic \ARM\ s6e2gm_I2S_mic.uvprojx
```

3. Insert the headphone to the headphone jack **CN5** of the S6E2GM board.
4. Insert the microphone to the microphone jack **CN11** of the S6E2GM board.
5. Build the project and download the code into the S6E2GM device and execute it.
6. Press the **SW2** to start the microphone function and speak into the microphone. You will hear your voice through the headphones. Press **SW2** again to stop the microphone function and speak into the microphone. You won't hear your voice through the headphones. You can start or stop the microphone function through pressing **SW2**.

### 4.2.9 Audio I2S Line

#### *4.2.9.1 Project Description*

This project demonstrates the operation of the S6E2GM audio codec I2S Line. The project will demonstrate a function that starts or stops Line function through pressing the **SW2**. When starting the Line function, if playing music with PC, you will hear the music through the headphone. When stopping the Line function, if playing music with PC, you will not hear the music through the headphone.

#### *4.2.9.2 Hardware Connection*

Connect an audio line to the line-out jack **CN6**. And then connect a headphone to the headphone jack **CN5.**

#### *4.2.9.3 Verify Output*

1. Power the FM4 S6E2G-Series Pioneer board from **CN2** using a USB cable. For details, refer to Figure 2-6.
2. Open the project in the IAR Embedded Workbench or the Keil µVision IDE from the following directory:

```
IAR project: <User_Directory>:\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware\Demo
Projects\ s6e2gm_I2S_line\IAR\ s6e2gm_I2S_line.eww
Keil project: <User_Directory>:\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware\Demo
Projects\ s6e2gm_I2S_line\ARM\ s6e2gm_I2S_line.uvprojx
```

3. Insert the headphone to the headphone jack **CN5** of the S6E2GM board.
4. Insert the audio- line to the line output jack **CN6** of the S6E2GM board.
5. Build the project and download the code into the S6E2GM device and execute it. First, play a MP3 music with PC; then press **SW2** to start line function and you will hear the music from the headphone. Press **SW2** again to stop the line function and you won't hear the music from the headphone. You can start or stop the line function through pressing the **SW2**.

## 4.2.10 USB Device

### *4.2.10.1 Project Description*

This example demonstrates the USB peripheral operation as an HID mouse device. The MCU of Gaia start kit includes two USB channels; the board uses the USB0 as device interface. This example sets the endpoint0 of the USB0 as control endpoint, and sets the endpoint1 as the HID mouse data input endpoint. Connect **CN3** port of the board to PC by USB cable. The PC will identify this device as a HID mouse. When pressing the **SW2** button, the PC cursor will move to the left.

### *4.2.10.2 Hardware Connection*

No specific hardware connections are required for this project. All connections are hardwired on the board.

### *4.2.10.3 Verify Output*

1. Short pins 2 and 3 of **J3** to enable the device's USB port. Connect USB port **CN3** to a PC via a USB cable. This is the device's USB port.
2. Power the FM4 S6E2G-Series Pioneer board from **CN2** using a USB cable, see Figure 2-6.
3. Open the project file in IAR Embedded Workbench or Keil µVision IDE from the following directory:

```
IAR project: <User_Directory>:
\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware\Demo
Projects\s6e2gm_usb_device\IAR\s6e2gm_usb_device.eww
Keil project: <User_Directory>:
\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware
\Demo Projects\s6e2gm_usb_device\ARM\s6e2gm_usb_device.uvprojx
```

4. Build the project and download the code into the S6E2GM device.
5. Move the cursor to the center of the PC screen.
6. Press button **SW2**. This will cause the cursor to move on the PC screen.
7. Once the device is programmed, you can remove the USB cable from **CN2**. In this case, you must short pins 2 and 3 of **J4** to power the kit from **CN3**.

### 4.2.11 USB Host

#### *4.2.11.1 Project Description*

This example demonstrates how the USB host reads and writes a USB flash drive. The MCU of FM4 S6E2G-Series Pioneer Board Kit includes two USB channels; the board uses the USB1 as host interface. This example implements the USB mass storage class. When inserting the USB flash drive (FAT file system) to **CN14** of the board, the program enumerates devices, lights the Blue LED. Then the program will mount the FATFS and create the test.txt file in the root directory, write 2K bytes of data to this file, then read the data to buffer from the file. Check whether the read and write are equal, the Green light is on if they are equal, the Red LED will turn on if they are not equal or operation failed.

#### *4.2.11.2 Hardware Connection*

No specific hardware connections are required for this project. All connections are hardwired on the board.

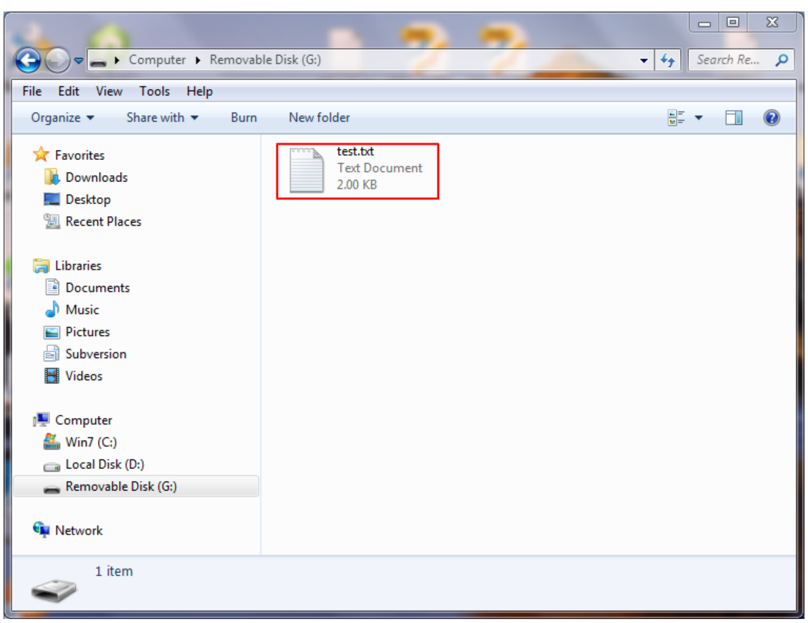
#### *4.2.11.3 Verify Output*

1. Power the FM4 S6E2G-Series Pioneer board from **CN2** using a USB cable, see Figure 2-6.
2. Open the project file in IAR Embedded Workbench or Keil µVision IDE from the following directory:

```
IAR project: <User_Directory>:
\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware\Demo
Projects\s6e2gm_adc\IAR\s6e2gm_usb_host.eww
Keil project: <User_Directory>:
\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware
\Demo Projects\s6e2gm_adc\ARM\s6e2gm_usb_host.uvprojx
```

3. Build the project and download the code into the S6E2GM device.
4. Insert a USB flash drive to USB port **CN14**. The Blue LED of **LED4** will turn on while the drive is being read / written.
5. If the file operation is successful, the Green LED of **LED4** will turn on. If the file operation failed, the Red LED of **LED4** will turn on. Remove the USB flash drive, **LED4** will turn off.
6. Remove the USB flash drive and connect it to a PC. You will see a file named *test.txt* on the flash drive.

Figure 4-7. *test.txt* File



## 4.2.12 NOR Flash

### *4.2.12.1 Project Description*

This example shows the usage of an external flash (S25FL132K NOR flash) for data storage controlled by the MCU using SPI interface CSIO.

The test performs the following actions once on startup:

1. Read the device ID
2. Sector Erase
3. Page Write
4. Page Read
5. Compare read data with expected data

If any operation fails, the Red LED will light. If any operation is successful, the Green LED will light.

### *4.2.12.2 Hardware Connection*

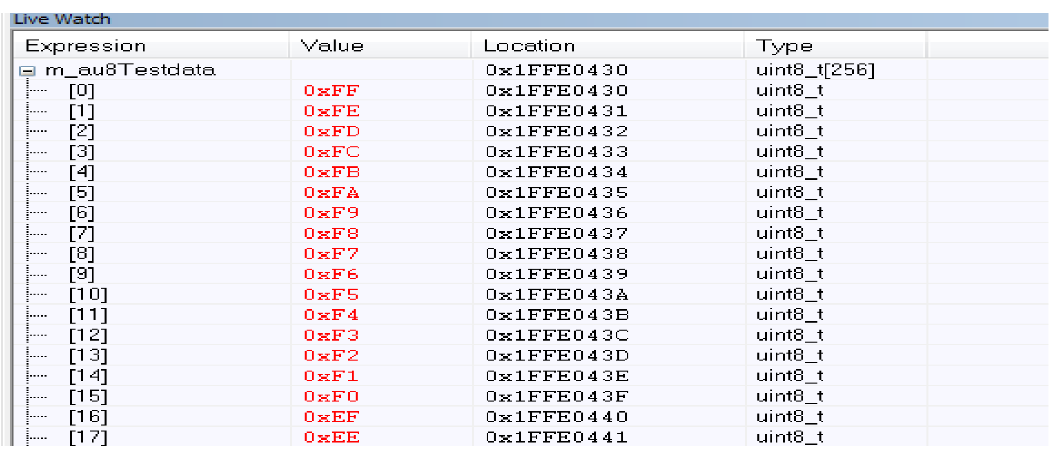
No specific hardware connections are required for this project. All connections are hardwired on the board.

### *4.2.12.3 Verify Output*

1. Power the FM4 S6E2G-Series Pioneer board from **CN2** using a USB cable, refer to Figure 2-6.
2. Open the project in the IAR Embedded Workbench from the following directory:

```
IAR project: <User_Directory>:
\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware
\Demo Projects\s6e2gm_st_wdt\IAR\ s6e2gm_nor_flash.eww
Keil project: <User_Directory>:
\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware
\Demo Projects\s6e2gm_st_wdt\ARM\ s6e2gm_nor_flash.uvprojx
```

3. Build the project and download the code into the S6E2GM device.
4. Run the program.
5. Stop the program and check the buffer of *m_au8Testdata*.


Live Watch

| Expression | Value | Location | Type |
|---|---|---|---|
| m_au8Testdata | | 0x1FFE0430 | uint8_t[256] |
| [0] | 0xFF | 0x1FFE0430 | uint8_t |
| [1] | 0xFE | 0x1FFE0431 | uint8_t |
| [2] | 0xFD | 0x1FFE0432 | uint8_t |
| [3] | 0xFC | 0x1FFE0433 | uint8_t |
| [4] | 0xFB | 0x1FFE0434 | uint8_t |
| [5] | 0xFA | 0x1FFE0435 | uint8_t |
| [6] | 0xF9 | 0x1FFE0436 | uint8_t |
| [7] | 0xF8 | 0x1FFE0437 | uint8_t |
| [8] | 0xF7 | 0x1FFE0438 | uint8_t |
| [9] | 0xF6 | 0x1FFE0439 | uint8_t |
| [10] | 0xF5 | 0x1FFE043A | uint8_t |
| [11] | 0xF4 | 0x1FFE043B | uint8_t |
| [12] | 0xF3 | 0x1FFE043C | uint8_t |
| [13] | 0xF2 | 0x1FFE043D | uint8_t |
| [14] | 0xF1 | 0x1FFE043E | uint8_t |
| [15] | 0xF0 | 0x1FFE043F | uint8_t |
| [16] | 0xEF | 0x1FFE0440 | uint8_t |
| [17] | 0xEE | 0x1FFE0441 | uint8_t |

## 4.2.13 SRAM Operation

### 4.2.13.1 Project Description

This project demonstrates how to set the EXTIF use for write and read function of external SRAM CY62147EV30 on the S6E2GM, and how to set EXTIF 16-bit data width, and 20-bit address bus. The CY62147EV30 is a high performance CMOS static RAM (SRAM) organized as 256K words by 16 bits (4-Mbit). This example writes to every address location of the CY62147EV30 and then reads back the data to verify.

### 4.2.13.2 Hardware Connection

No specific hardware connections are required for this project. All connections are hardwired on the board.

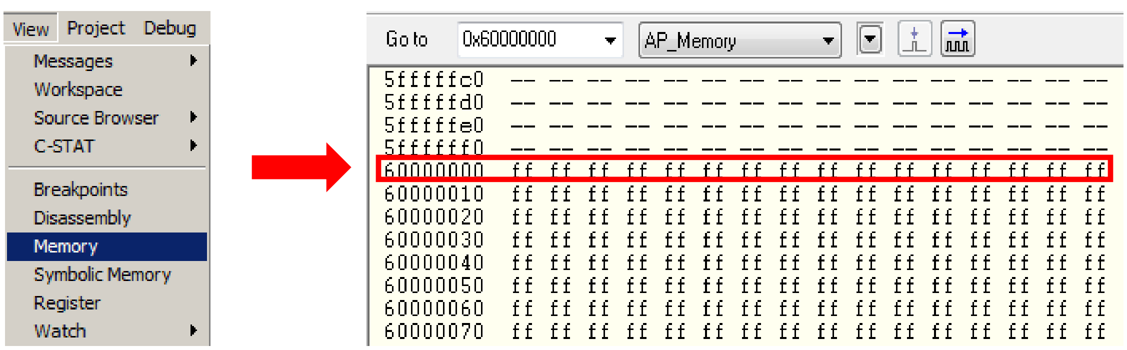
### 4.2.13.3 Verify Output

#### 4.2.13.3.1 Using IAR Embedded Workbench

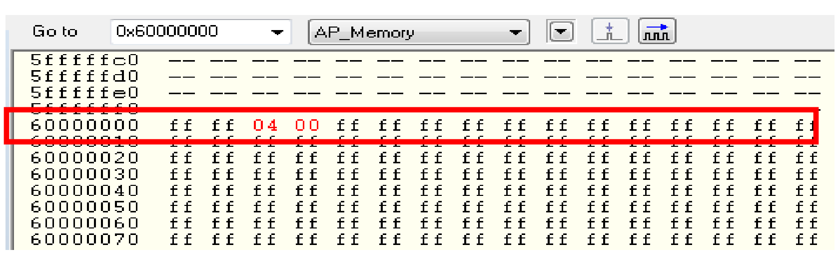
1. Power the FM4 S6E2G-Series Pioneer board from **CN2** using a USB cable, refer to Figure 2-6.
2. Open the project in the IAR Embedded Workbench from the following directory:

```
IAR project: <User_Directory>:
\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware
\Demo Projects\s6e2gm_sram\IAR\s6e2gm_sram.eww
```

3. Build the project and download the code into the S6E2GM device using the debugger.
4. Open the memory window from **View** > **Memory**. Enter 0x60000000 in the **Go to** field and press the **[Enter]** key on your PC.




5. Run the program for a while.
6. Press the **SW2** to start the SRAM write and read, compare, erase operation.
7. Stop the program and check the content of 0x60000000 in flash memory.



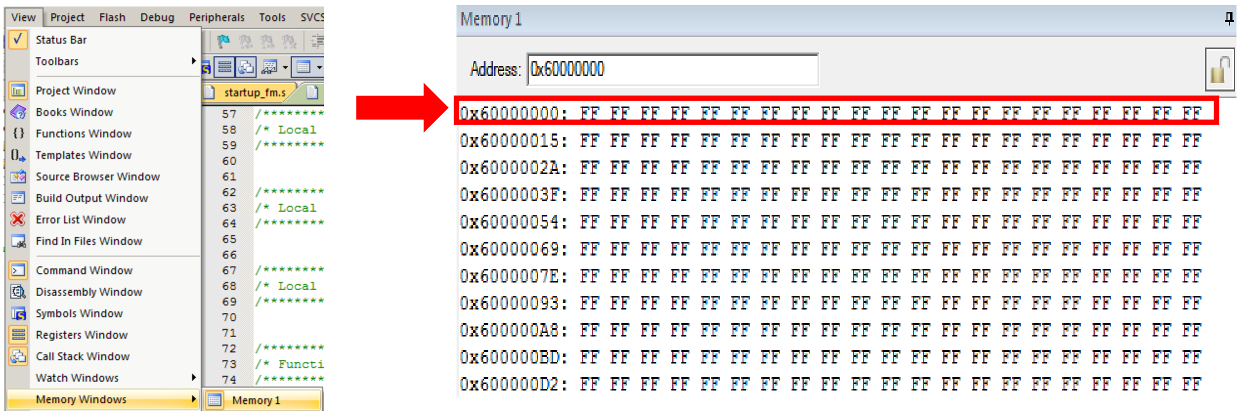

8. If reading and writing all data succeeded, LED4 will be Green. Otherwise, LED4 will be Red.

### 4.2.13.3.2 Using Keil µVision IDE

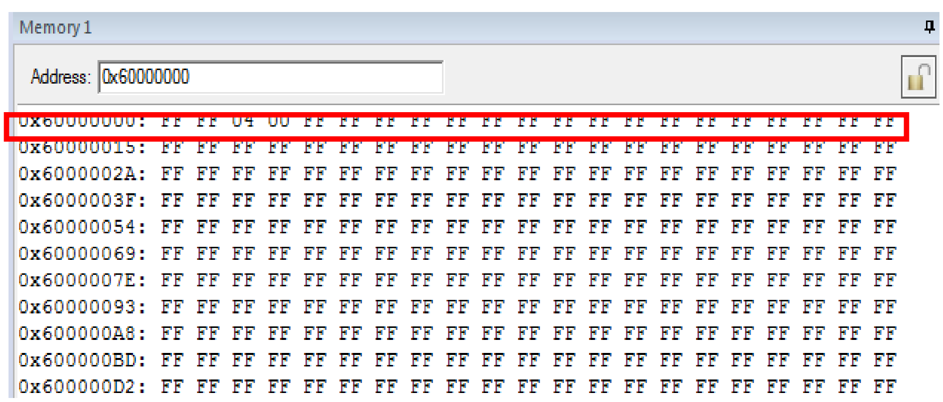
1. Power the FM4 S6E2G-Series Pioneer board from **CN2** using a USB cable, refer to Figure 2-6.
2. Open the project *s6e2gm_flash* in the Keil µVision IDE from the following directory:

```
Keil project: <User_Directory>:
\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware
\Demo Projects\s6e2gm_sram\ARM\s6e2gm_sram.uvprojx
```

3. Build the project and download the code into the S6E2GM device using the debugger.
4. Open the **Memory1** window from **View** > **Memory Windows**. Enter 0x60000000 in the **Address** field and press the **[Enter]** key on your PC.




5. Run the program for a while.
6. Press the **SW2** to start the SRAM write and read, compare, erase operation.
7. Stop the program and check the content of **0x60000000** in flash.




If reading and writing all data succeeded, **LED4** will be Green. Otherwise, **LED4** will be Red.

## 4.2.14 Accelerometer Operation

### 4.2.14.1 Project Description

This example project demonstrates the usage of accelerometer sensor module; the data of each of axes (X, Y, Z) of the board position will be output to Cypress Serial Port Viewer respectively. This data will change if there is any change of board position.

### 4.2.14.2 Hardware Connection

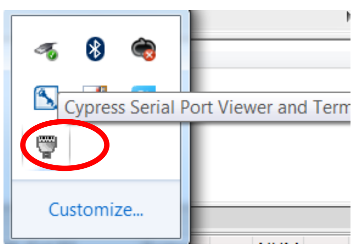
No specific hardware connections are required for this project. All connections are hardwired on the board.

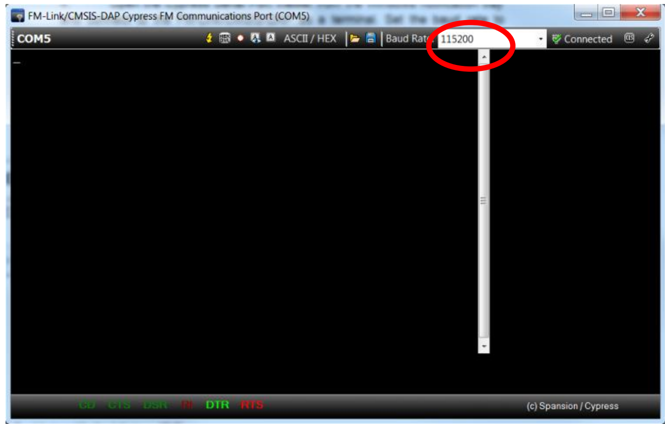
### 4.2.14.3 Verify Output

1. Power the FM4 S6E2G-Series Pioneer board from **CN2** using a USB cable, refer to Figure 2-6.
2. Open the project in the IAR Embedded Workbench or the Keil µVision IDE from the following directory:

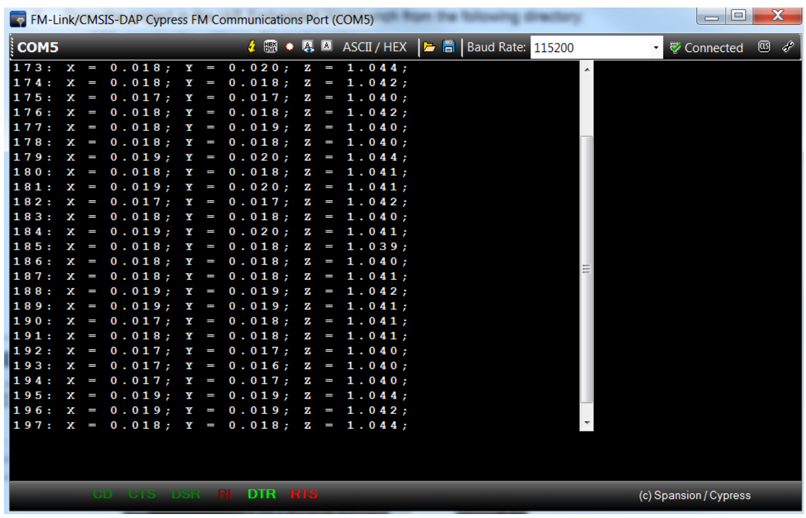
```
IAR project: <User_Directory>:
\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware
\Demo Projects\s6e2gm_sram\IAR\s6e2gm_acc.eww

Keil project: <User_Directory>:
\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware
\Demo Projects\s6e2gm_sram\ARM\s6e2gm_acc.uvprojx
```

3. Build the project and download the code into the S6E2GM device using the debugger.
4. Open the **Cypress Serial Port Viewer** from the Windows notification tray and connect to the FM-Link/CMSIS-DAP as a terminal. Set the baud rate to **115200**, and click on **Disconnected** to connect to the kit.




5. Run the program.
6. The data of each of axes (X, Y, Z) of the board position will be output to **Cypress Serial Port Viewer** respectively.



### 4.2.15 Ethernet Converter

#### *4.2.15.1 Project Description*

This project demonstrates the Ethernet-MAC function of the S6E2GM device. The PHY layer uses KSZ8091MNX chip, the TCP/IP layer uses LwIP. When ping the board, it will receive the ping-reply.

#### *4.2.15.2 Hardware Connection*

Connect **CN4** to PC network interface via Ethernet cable.

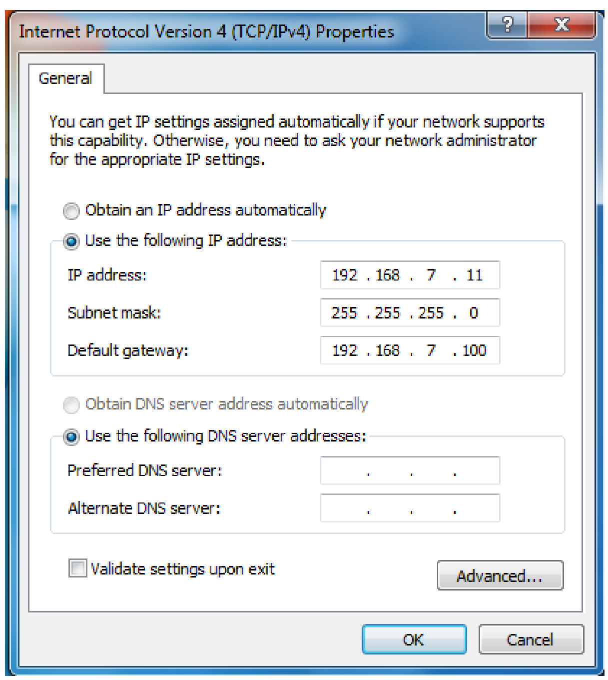
#### *4.2.15.3 Verify Output*

1. Power the FM4 S6E2G-Series Pioneer board from CN2 using a USB cable, see Figure 2-6.
2. Open the project file in IAR Embedded Workbench or Keil µVision IDE from the following directory:

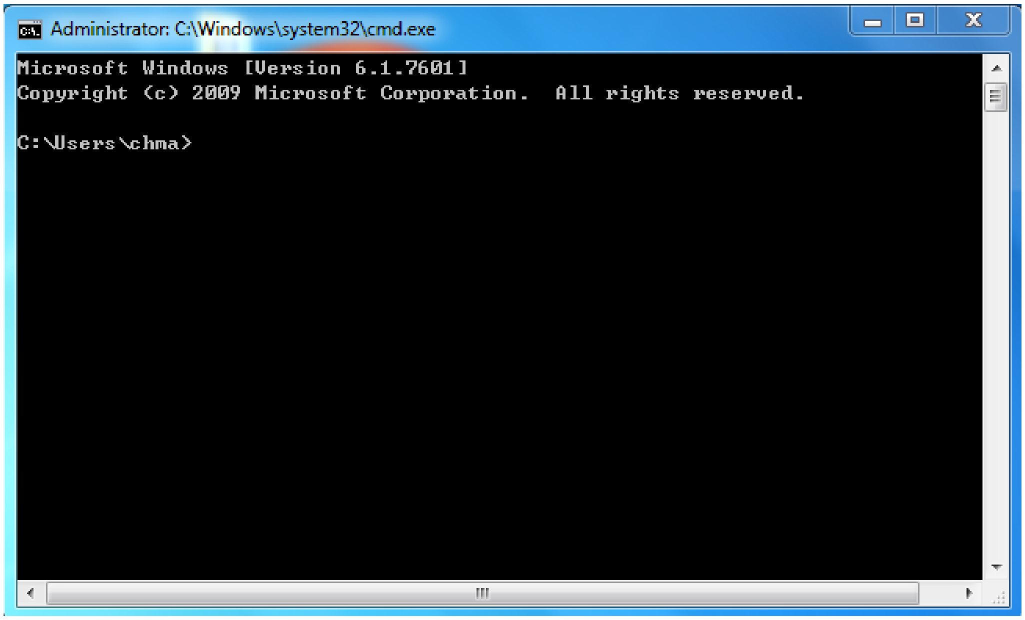
```
IAR project: <User_Directory>:
\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware\Demo
Projects\s6e2gm_ethernet\IAR\s6e2gm_ethernet.eww
```

```
Keil project: <User_Directory>:
\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware
\Demo Projects\s6e2gm_ethernet\ARM\s6e2gm_ethernet.uvprojx
```

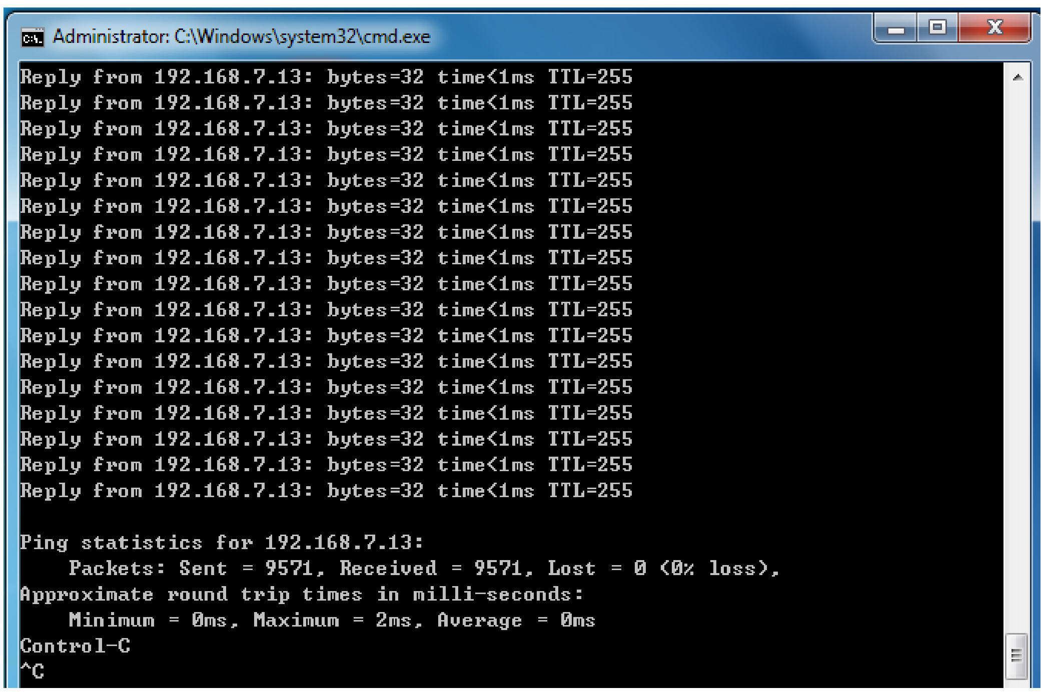
3. Build the project and download the code into the S6E2GM device.
4. Set the local area network IP address as shown below.




5. Run the program and open the CMD tool.




6. Ping the board and observe the reply.



## 4.3 Flash Programming

Most IDEs, including IAR and Keil µVision, are capable of programming the embedded flash. If that option is not desirable for some reason, the following section shows you how to program the embedded flash using either a serial or a USB connection. It also shows how to re-program the firmware in the CMSIS-DAP device should it be necessary.

### 4.3.1 Programming the S6E2GM Using the FLASH USBDIRECT Programmer

This method will program over the USB connection to the S6E2GM.

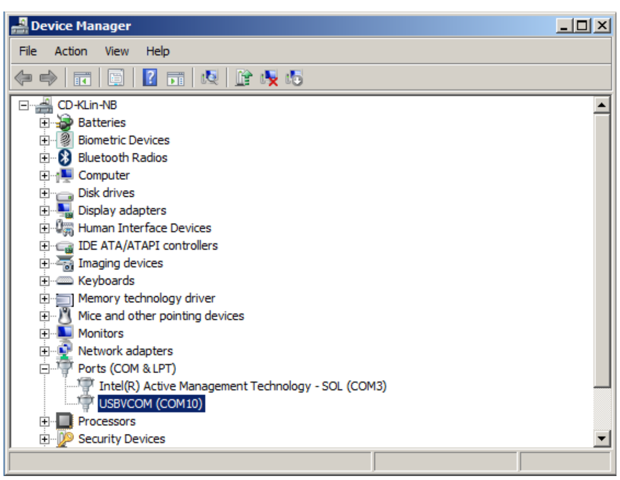
1. Install the FM4 S6E2G-Series Pioneer Kit as per Install Software. The FLASH USB DIRECT Programmer gets installed in your PC as part of the kit installer.
2. Make sure the jumpers on the FM4 S6E2G-Series Pioneer board are placed according to Table 4-4.

Table 4-4. Programming Jumper Settings for S6E2GM Programming via USB

| Jumper | Position | Description |
|---|---|---|
| J1 | Open | Sets MB9AF312K (CMSIS-DAP) in run mode. |
| J2 | Closed | Sets S6E2GM in programming mode. |
| J3 | Pin 2 to Pin 3 | Sets for USB programming mode. |
| J4 | Pin 2 to Pin 3 | Power from USB port of S6E2GM |

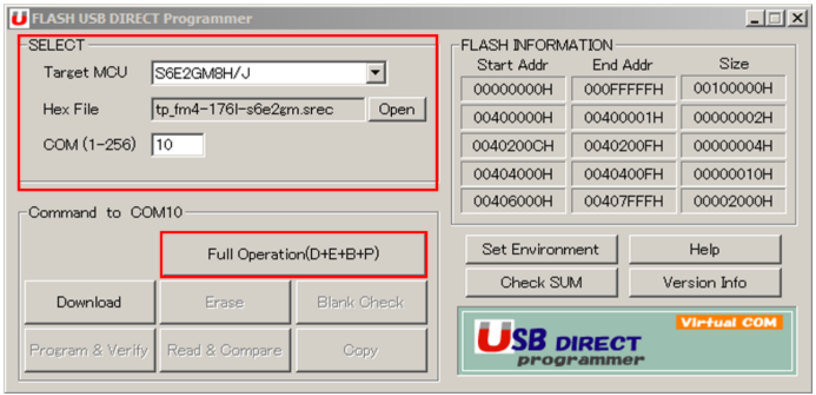
3. Connect the USB cable to the **CN3** port.
4. Observe that the Power LED (LED3) is glowing Green.
5. Launch the FLASH USB DIRECT Programmer from **Start** Menu > **All Programs** > **Cypress** > **FLASH USB DIRECT Programmer** > **USBDirect**.
6. Select **Target MCU** to S6E2GM8H/J.
7. Select the Motorola-S format file or Intel-HEX format file to be programmed to the FLASH memory in the MCU.

   **Note:** The *hex* file selected in this example is the *Test Demo firmware*.
8. Check the COM Port number from the Device Manager or from the Serial Port Viewer icon in the task bar.

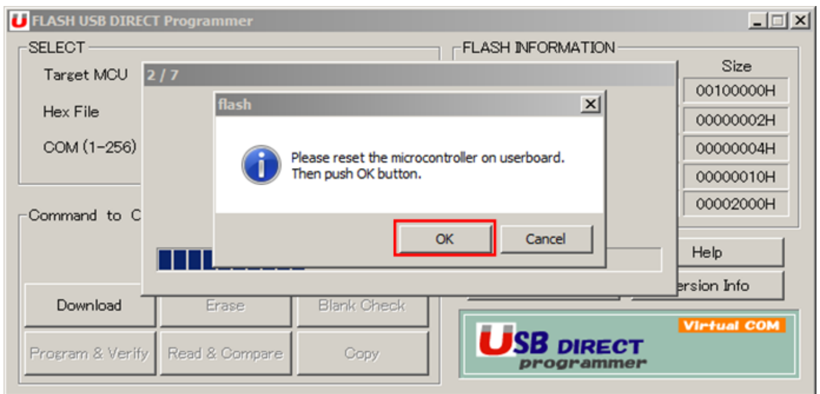



9. Enter the Virtual COM Port listed under Ports in the Device Manager, in the **COM** field.

10. Click the **Full Operation (D+E+B+P)** button to start programming.




11. Reset the S6E2GM by pressing the reset button (**SW1**) on the board, and click **OK**.




**Note:** Click on **Help** for any issues or errors encountered during programming.

### 4.3.2 Programming the S6E2GM MCU using the FLASH MCU Programmer

This method will program using the USB connection to the CMSIS-DAP device which then acts as a USB-UART bridge to the S6E2GM serial interface.

1. Install the FM4 S6E2G-Series Pioneer Kit as per the Install Software section. The FLASH MCU Programmer gets installed in your PC as part of the kit installer.
2. Ensure the jumpers on the FM4 S6E2G-Series Pioneer board are placed according to Table 4-5.

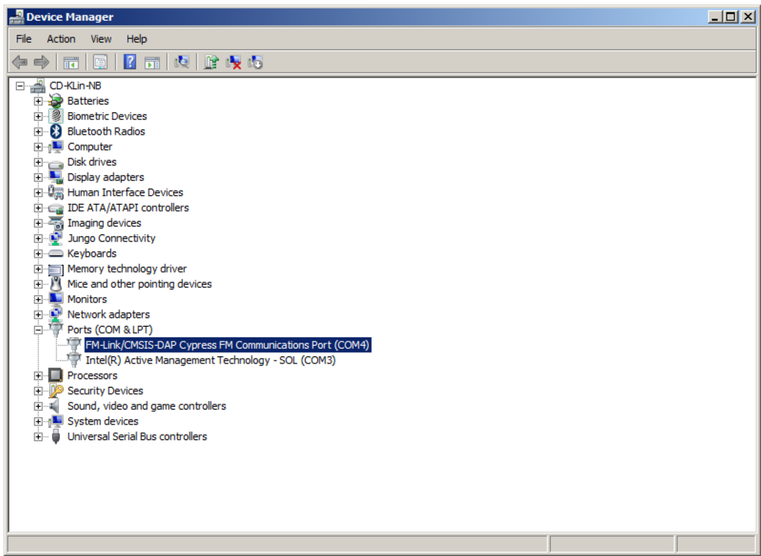
Table 4-5. Jumper Settings for S6E2GM programming using FLASH MCU Programmer

| Jumper | Position | Description |
|---|---|---|
| J1 | Open | Sets MB9AF312K (CMSIS-DAP) in run mode. |
| J2 | Closed | Sets S6E2GM in programming mode. |
| J3 | Pin 1 to Pin 2 | Sets for UART programming mode. |
| J4 | Pin 1 to Pin 2 | Power from USB port of CMSIS-DAP |

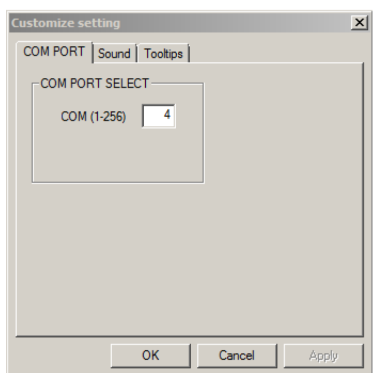
3. Connect the USB cable to the **CN2** port.
4. Observe that the Power LED (LED3) is glowing Green.

5. Launch the FLASH MCU Programmer from **Start** Menu > **All Programs** > **Cypress** > **FLASH MCU Programmer** > **FM0+FM3FM4**.
6. Select **Target MCU** to S6E2GM8H/J.
7. Select **Crystal Frequency** to **4 MHz**.
8. Select the Motorola-S format file or Intel-HEX format file to be programmed to the FLASH memory in the MCU.

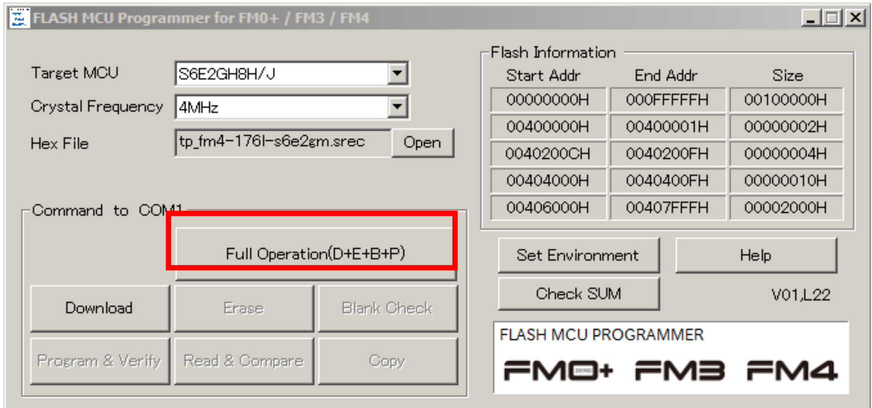
   **Note:** The *hex* file selected in this example is the Test Demo firmware.
9. Check the COM Port number in the Device Manager or from the Serial Port Viewer icon in the task bar.



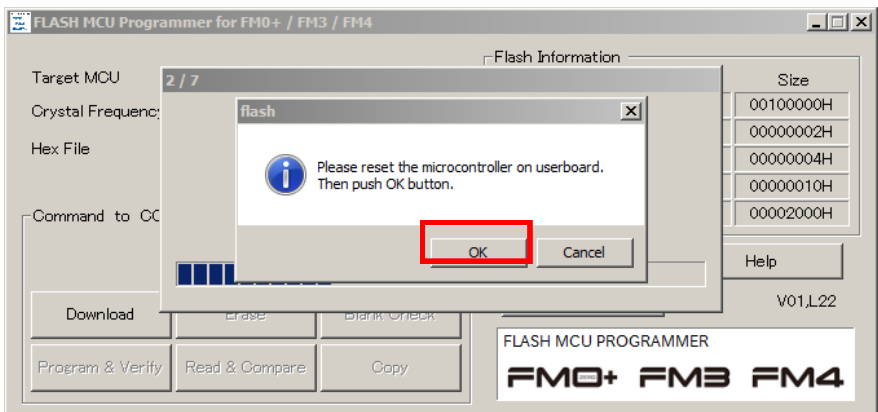

10. Click the **Set Environment** button and enter the Virtual COM Port listed in the Ports of Device Manager, in the **COM** field.




11. Click the **Full Operation (D+E+B+P)** button to start programming.




12. Reset the S6E2GM by pressing the reset button (**SW1**) on the board, and click **OK**.




**Note:** Click on **Help** for any issues or errors encountered during programming.

### 4.3.3 Programming the CMSIS-DAP Device using the FLASH USBDIRECT Programmer

By default, the latest CMSIS-DAP firmware is programmed on the MB9AF312K. It is not normally required for the user to re-program this device before running the CMSIS-DAP debugger.

Follow these steps to update the firmware if needed:

1. Install the FM4 S6E2G-Series Pioneer Kit as per Install Software.
2. Make sure the jumpers on the FM4 S6E2G-Series Pioneer board are placed according to Table 4-6.

Table 4-6. Programming Jumper Settings

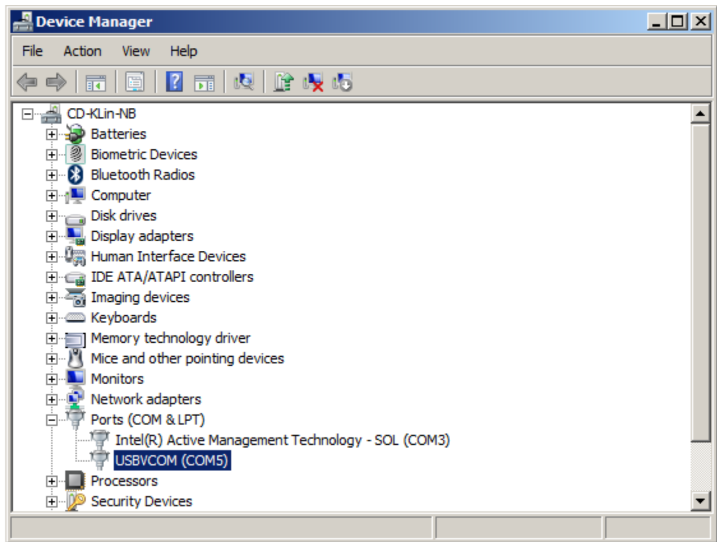
| Jumper | Position | Description |
|---|---|---|
| J1 | Closed | Sets MB9AF312K (CMSIS-DAP) in programming mode. |
| J2 | Open | Sets S6E2GM in run mode. |
| J4 | Pin 1 to Pin 2 | Power from USB port of CMSIS-DAP. |

3. Connect the USB cable to the **CN2** port.
4. Observe that the Power LED (LED3) is glowing Green.

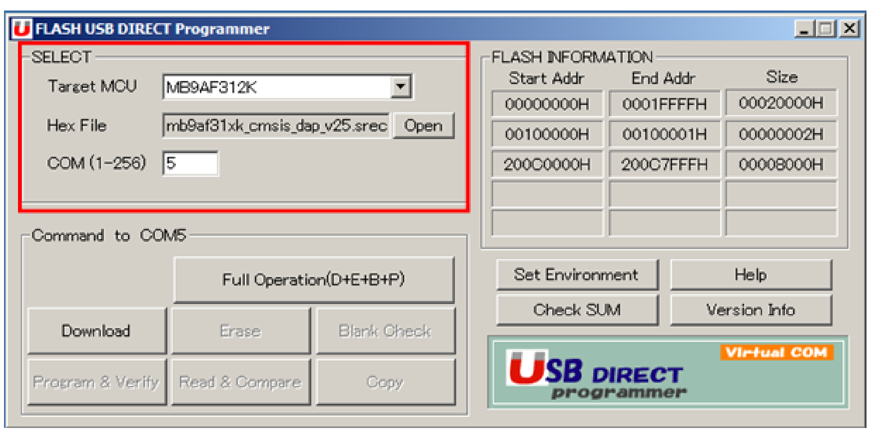
5. Launch the FLASH USB DIRECT Programmer from Windows **Start** Menu > **All Programs** > **Cypress** > **FLASH USB DIRECT Programmer** > **USBDirect**.
6. Set **Target MCU** to MB9AF312K.
7. Select the Motorola-S format file or Intel-HEX format file to be programmed into the FLASH memory in the MCU. The *hex* file is included in following directory:

```
<User_Directory>:
\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware\CMSIS-DAP
```

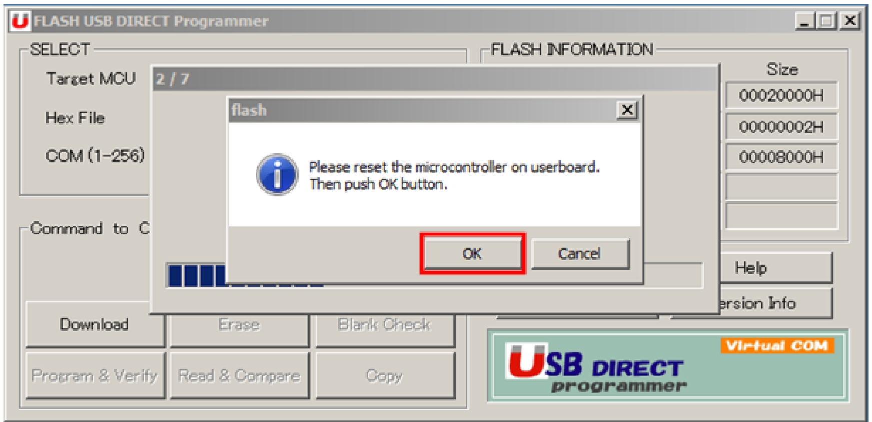
8. Check the COM Port number from the **Device Manager** or from the **Serial Port Viewer** icon in the task bar.




9. Enter the Virtual COM Port listed under Ports of the Device Manager in the **COM** field.
10. Click the **Full Operation (D+E+B+P)** button to start programming.




11. Reset the CMSIS-DAP microcontroller by removing the USB cable and reconnecting the USB cable, and click **OK**.




**Note:** Click on **Help** for any issues or errors encountered during programming.

# A. Appendix

## A.1 Schematic

Figure A-1. MCU

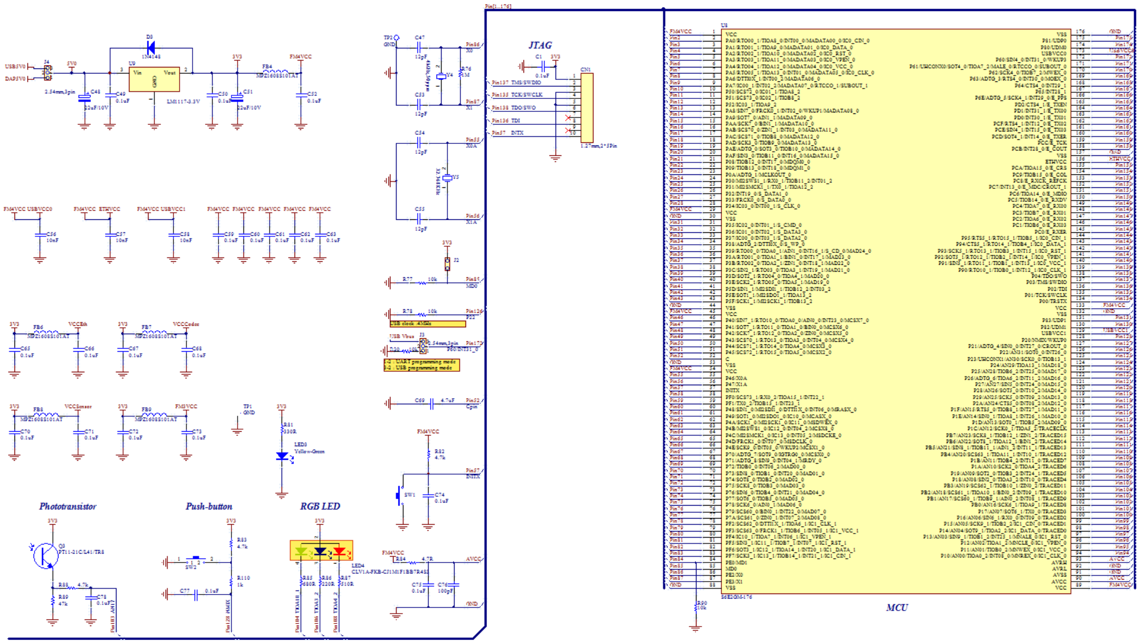


Figure A-2. CMSIS-DAP and USB

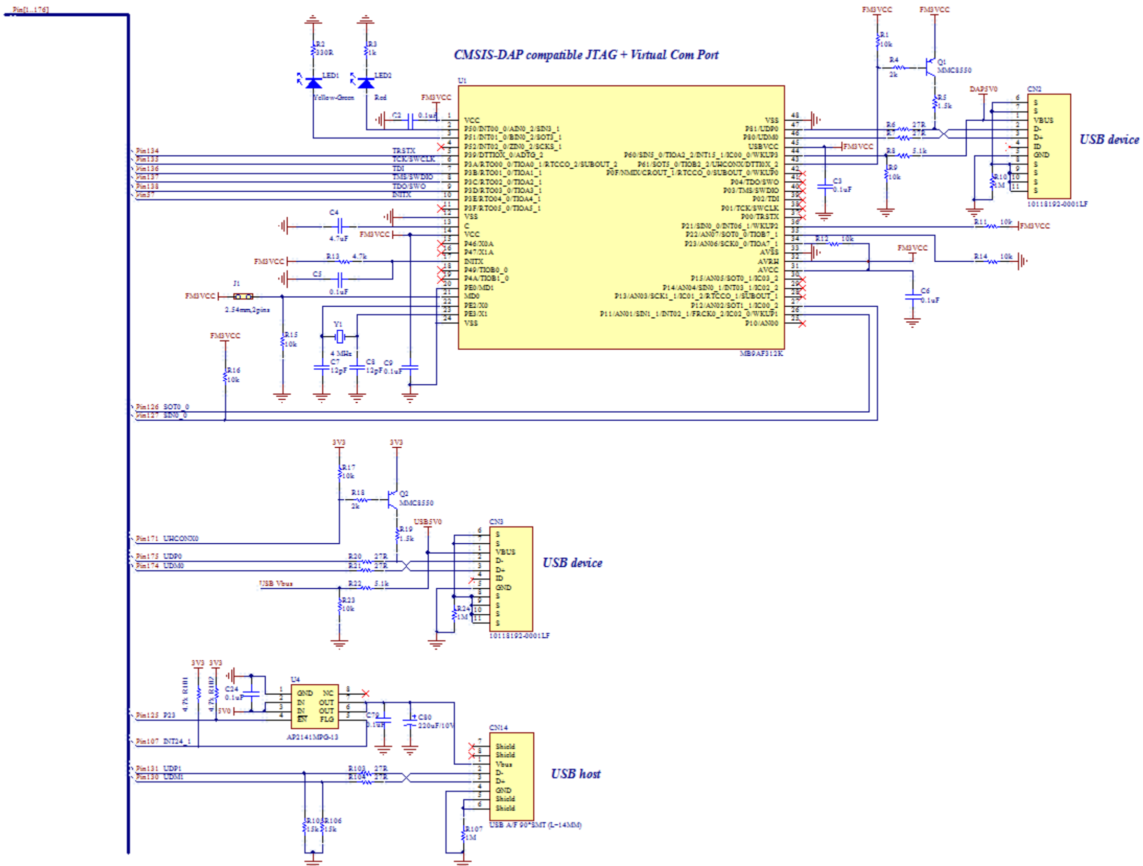


Figure A-3. Ethernet

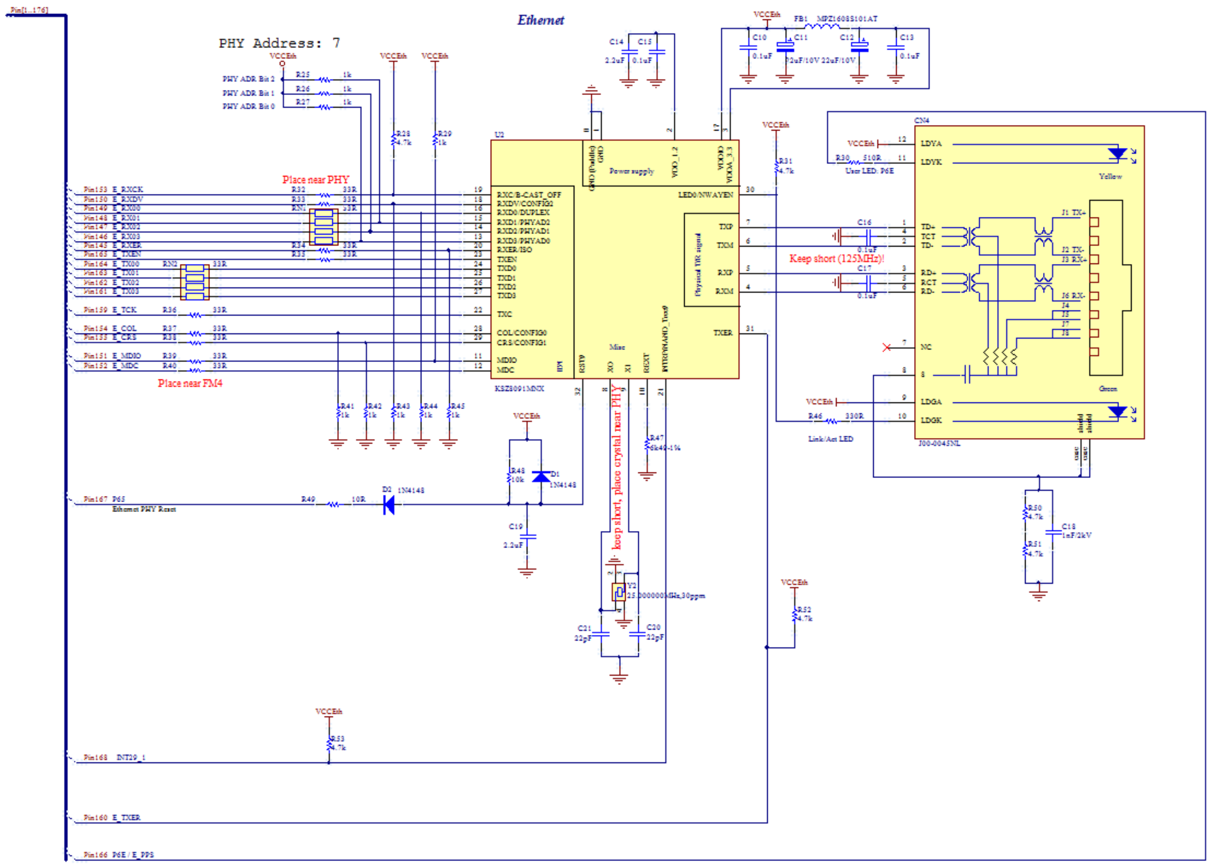


Figure A-4. Stereo Codec

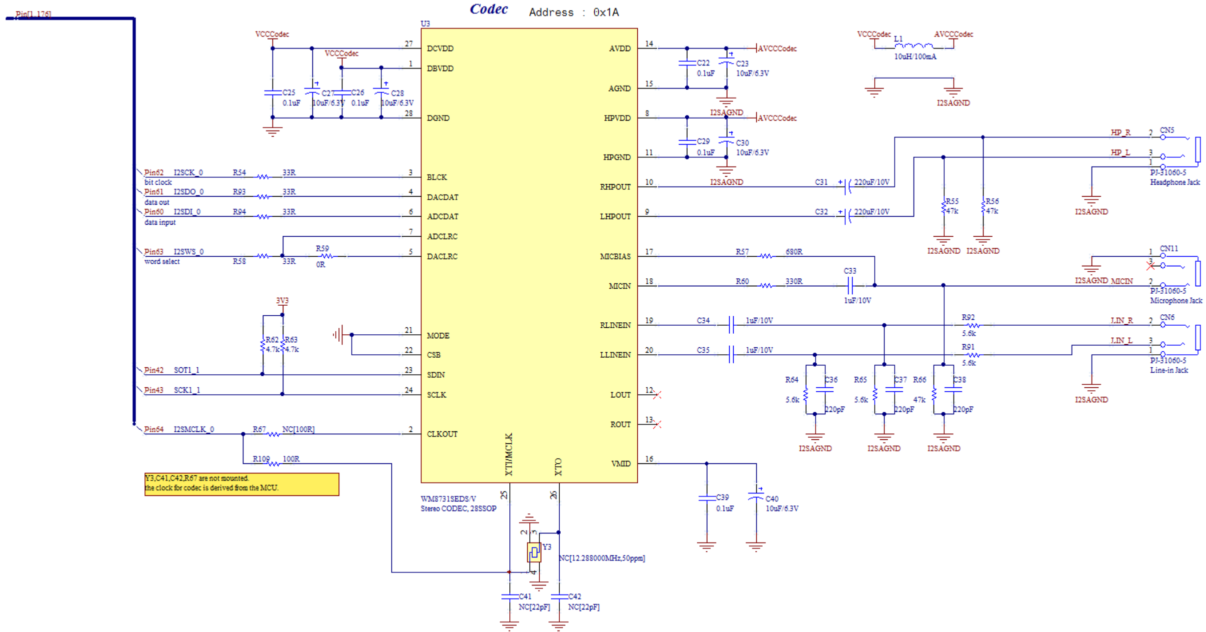
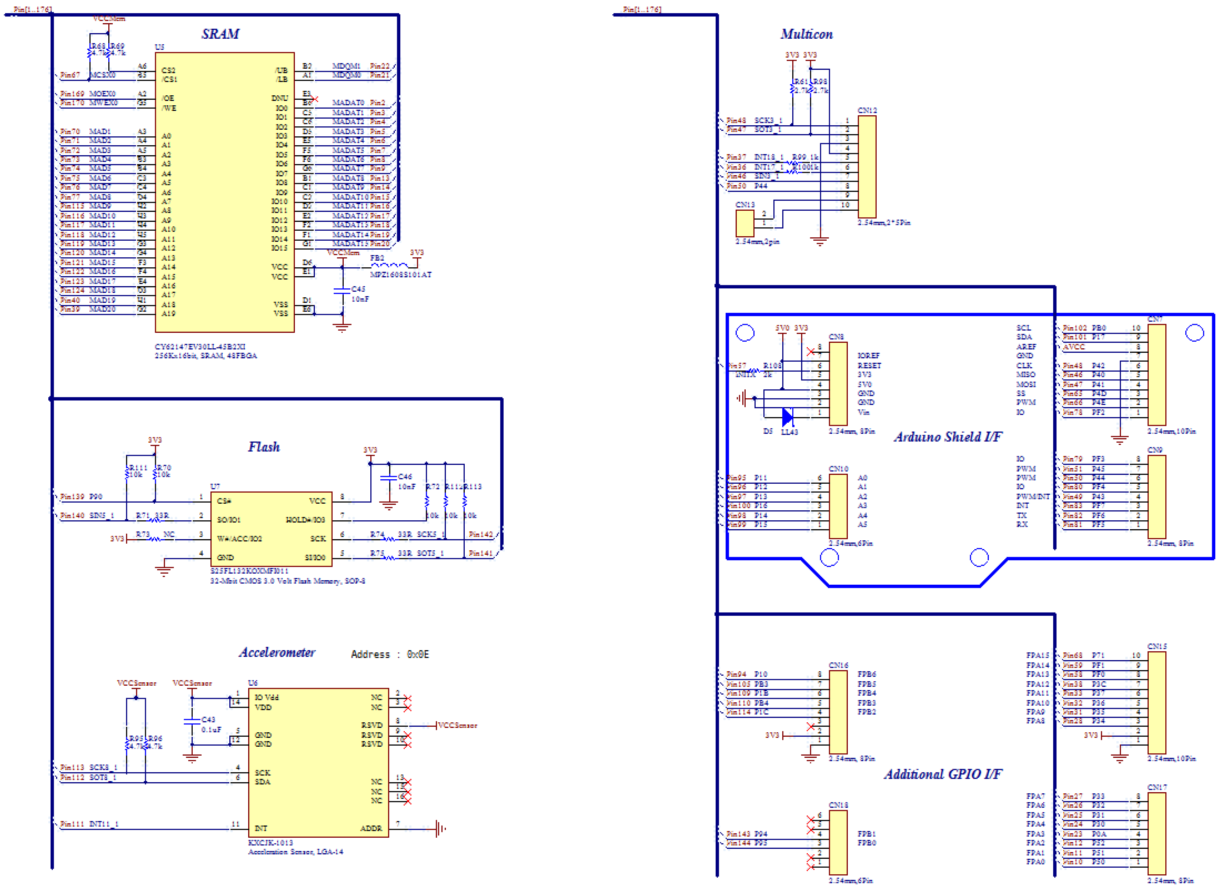


Figure A- 5. Memory, Sensor and Interfaces



## A.2 Bill of Materials

| Item | Qty | Reference | Value | Description | Mfg | Mfg Part Number |
|---|---|---|---|---|---|---|
| 1 | 39 | C1, C2, C3, C5, C6, C9, C10, C13, C15, C16, C17, C22, C24, C25, C26, C29, C39, C43, C49, C50, C52, C59, C60, C61, C62, C63, C65, C66, C67, C68, C70, C71, C72, C73, C74, C75, C77, C78, C79 | 0.1uF | Ceramic Capacitor | YAGEO | CC0603KRX5R8BB104 |
| 2 | 2 | C4, C69 | 4.7uF | Ceramic Capacitor | YAGEO | CC0805KKX5R8BB475 |
| 3 | 6 | C7, C8, C47, C53, C54, C55 | 12pF | Ceramic Capacitor | YAGEO | CC0603JRNPO9BN120 |
| 4 | 4 | C11, C12, C48, C51 | 22uF/10V | Tan Capacitor | AVX | TAJA226K010RNJ |
| 5 | 2 | C14, C19 | 2.2uF | Ceramic Capacitor | YAGEO | CC0603KRX5R7BB225 |
| 6 | 1 | C18 | 1nF/2kV | Tan Capacitor | AVX | 1206GC102KAT1A |
| 7 | 4 | C20, C21 | 22pF | Ceramic Capacitor | YAGEO | CC0603JRNPO9BN220 |
| 8 | 5 | C23, C27, C28, C30, C40 | 10uF/6.3V | Tan Capacitor | AVX | TAJA106K006RNJ |
| 9 | 4 | C31, C32, C80 | 220uF/10V | Tan Capacitor | AVX | TAJD227K010R |
| 10 | 3 | C33, C34, C35 | 1uF/10V | Ceramic Capacitor | Murata | GRM21BR71A105KA01L |
| 11 | 3 | C36, C37, C38 | 220pF | Ceramic Capacitor | YAGEO | CC0603JRNPO9BN221 |
| 12 | 5 | C45, C46, C56, C57, C58 | 10nF | Ceramic Capacitor | YAGEO | CC0603KRX7R9BB103 |
| 13 | 1 | C76 | 100pF | Ceramic Capacitor | YAGEO | CC0603JRNPO9BN101 |
| 14 | 1 | CN1 | 1.27mm,2*5Pin | JTAG I/F | AIMO | 1415-1205CNGOS3.01.52.301 |
| 15 | 2 | CN2, CN3 | 10118192AC | Micro USB-B type, FCI, | FCI | 10118192-0001LF |
| 16 | 1 | CN4 | J00-0045NL | RJ45 connector, Pulse | Pulse | J00-0045NL |
| 17 | 3 | CN5, CN6, CN11 | PJ-31060-5 | 3.5mm, linein jack | AIMO | PJ-31060-5 |
| 18 | 2 | CN7, CN15 | 2.54mm,10Pin | CONNECTOR,wafer, 1*10PIN,Pitch=2.54 | AIMO | 2285-0110ANGO01 |
| 19 | 4 | CN8, CN9, CN16, CN17 | 2.54mm, 8Pin | CONNECTOR,wafer, 1*8IN,Pitch=2.54 | AIMO | 2285-0108ANGO01 |
| 20 | 2 | CN10, CN18 | 2.54mm,6Pin | CONNECTOR,wafer, 1*6PIN,Pitch=2.54 | AIMO | 2285-0106ANGO01 |
| 21 | 1 | CN15 | 2.54mm,10Pin | CON,header,1*6PIN, 180°,DIP,MALE | AIMO | 1125-1110ANGOS11.5001 |
| 22 | 2 | CN16,CN17 | 2.54mm, 8Pin | CON,header,1*6PIN, 180°,DIP,MALE | AIMO | 1125-1108ANGOS11.5001 |

| Item | Qty | Reference | Value | Description | Mfg | Mfg Part Number |
|---|---|---|---|---|---|---|
| 23 | 1 | CN18 | 2.54mm,6Pin | CON,header,1*6PIN, 180°,DIP,MALE | AIMO | 1125-1106ANGOS11.5001 |
| 24 | 1 | CN12 | 2.54mm,2*5Pin | Pin header, 2*5Pin,2.54mm, male | AIMO | 1225-1210ANG0S11501 |
| 25 | 0 | CN13 | 2.54mm,2pin | Pin header, 2Pin,2.54mm,male | AIMO | |
| 26 | 1 | CN14 | USB-TYPE-A | Type-A USB connector | AIMO | USB A/F 90°SMT (L=14MM) |
| 27 | 3 | D1, D2, D3 | DL4148 | Recifier diode | MCC | DL4148 |
| 28 | 2 | D5 | LL43 | Socktety diode | Vishay | LL43-GS08 |
| 29 | 7 | FB1, FB2, FB4, FB6, FB7, FB8, FB9 | MPZ1608S101 AT | Ferrite bead, 3A,100R@100MHz,T DK | TDK | MPZ1608S101AT |
| 30 | 2 | J1, J2 | 2.54mm,2pins | CONN,PIN HEADER, 1*2PIN,DIP,180°, | AIMO | 1225-1102ANGOS11.501 |
| 31 | 2 | J3, J4 | 2.54mm,3pin | CONN,PINHEADER, 1*3PIN,DIP,180°, | AIMO | 1225-1103ANGOS11.501 |
| 32 | 1 | L1 | MLZ2012N100L T | Ferrite Bead,TDK | TDK | MLZ2012N100LT |
| 33 | 2 | LED1, LED3 | Yellow-Green | LED,Yellow-Green | Everlight | 19-21SYGC/S530-E3/TR8 |
| 34 | 1 | LED2 | red | LED, red | Everlight | 19-21SURC/S530-A5/TR8 |
| 35 | 1 | LED4 | CLV1A-FKB-CJ 1M1F1BB7R4S 3 | RGB LED,SMD,4pin | Cree | CLV1A-FKB-CJ1M1F1BB7R 4S3 |
| 36 | 2 | Q1, Q2 | MMC8550 | PNP transistor | MCC | MMS8550-H-TP |
| 37 | 1 | Q3 | PT11-21C/L41/ TR8 | Phototransistor | Everlight | PT11-21C/L41/TR8 |
| 38 | 19 | R1, R9, R11, R12, R14, R15, R16, R17, R23, R48, R70, R72, R77, R78, R80, R90, R111, R112, R113 | 10k | Resistor | YAGEO | RC0603FR-0710KL |
| 39 | 4 | R2, R46, R60, R81 | 330R | Resistor | YAGEO | RC0603FR-07330RL |
| 40 | 13 | R3, R25, R26, R27, R29, R41, R42, R43, R44, R45, R99, R100, R110 | 1k | Resistor | YAGEO | RC0603FR-071KL |
| 41 | 3 | R4, R18, R108 | 2k | Resistor | YAGEO | RC0603FR-072KL |
| 42 | 2 | R5, R19 | 1.5k | Resistor | YAGEO | RC0603FR-071K5L |
| 43 | 6 | R6, R7, R20, R21, R103, | 27R | Resistor | YAGEO | RC0603FR-0727RL |

| Item | Qty | Reference | Value | Description | Mfg | Mfg Part Number |
|---|---|---|---|---|---|---|
| | | R104 | | | | |
| 44 | 2 | R8, R22 | 5.1k | Resistor | YAGEO | RC0603FR-075K1L |
| 45 | 4 | R10, R24, R76, R107 | 1M | Resistor | YAGEO | RC0603FR-071ML |
| 46 | 18 | R13, R28, R31, R50, R51, R52, R53, R62, R63, R68, R69, R82, R83, R88, R95, R96, R101, R102 | 4.7k | Resistor | YAGEO | RC0603FR-074K7L |
| 47 | 2 | R30, R87 | 510R | Resistor | YAGEO | RC0603FR-07510RL |
| 48 | 16 | R32, R33, R34, R35, R36, R37, R38, R39, R40, R54, R58, R71, R74, R75, R93, R94 | 33R | Resistor | YAGEO | RC0603FR-0733RL |
| 49 | 1 | R47 | 6k49-1% | Resistor | YAGEO | RC0603FR-076K49L |
| 50 | 1 | R49 | 10R | Resistor | YAGEO | RC0603FR-0710RL |
| 51 | 4 | R55, R56, R66, R89 | 47k | Resistor | YAGEO | RC0603FR-0747KL |
| 52 | 2 | R57, R85 | 680R | Resistor | YAGEO | RC0603FR-07680RL |
| 53 | 1 | R59 | 0R | Resistor | YAGEO | RC0603FR-070RL |
| 54 | 2 | R61, R98 | 2.7k | Resistor | YAGEO | RC0603FR-072K7L |
| 55 | 4 | R64, R65, R91, R92 | 5.6k | Resistor | YAGEO | RC0603FR-075K6L |
| 56 | 1 | R109 | 100R | Resistor | YAGEO | RC0603FR-07100RL |
| 57 | 1 | R84 | 4.7R | Resistor | YAGEO | RC0603FR-074R7L |
| 58 | 1 | R86 | 220R | Resistor | YAGEO | RC0603FR-07220RL |
| 59 | 2 | R105, R106 | 15k | Resistor | YAGEO | RC0603FR-0715KL |
| 60 | 2 | RN1, RN2 | 33R | Resister array | YAGEO | YC164-JR-0733R |
| 61 | 2 | SW1, SW2 | K2-1101ST-C4SA-01 | 6*35mm, Button, 2pin, SMT | HANRO | K2-1101ST-C4SA-01 |
| 62 | 1 | U1 | MB9AF312K | MB9AF314KPMC | Cypress | MB9AF314KPMC |
| 63 | 1 | U2 | KSZ8091MNX | Ethernet PHY | Micrel | KSZ8091MNXCA |
| 64 | 1 | U3 | WM8731SEDS/V | Stereo codec | Wolfson | WM8731SEDS/RV |
| 65 | 1 | U4 | AP2141MPG-13 | USB power supply switch,MSOP-8 | Diode | AP2141MPG-13 |
| 66 | 1 | U5 | CY62147EV30LL-45B2XI | 256KB SRAM | Cypress | CY62147EV30LL-45B2XI |
| 67 | 1 | U6 | KXCJK-1013 | Acceleration Sensor, Rohm, LGA-14 | Rohm | KXCJK-1013 |
| 68 | 1 | U7 | S25FL132K0X | 32-Mbit CMOS 3.0 | Cypress | S25FL132K0XMFI011 |

| Item | Qty | Reference | Value | Description | Mfg | Mfg Part Number |
|---|---|---|---|---|---|---|
| | | | MFI011 | Volt Flash Memory, SOP-8 | | |
| 69 | 1 | U8 | S6E2GM8J0A | MCU, Cypress | Cypress | S6E2GM8J0A |
| 70 | 1 | U9 | LM1117-3.3V | LDO | TI | LM1117IMPX-3.3/NOPB |
| 71 | 1 | Y1 | 4 MHz,50ppm | Crystal Oscillator | Wisdom | QRS-4M00A5020B |
| 72 | 1 | Y2 | 25.0000MHz,30 ppm | Crystal | Aker | CXA-025000-3X2X20 |
| 73 | 1 | Y4 | 4MHz,50ppm | Crystal Oscillator | Wisdom | QRS-4M00A5020B |
| 74 | 1 | Y5 | 32.768 kHz | Crystal Oscillator | Wisdom | QRA-32768A20125B |
| 75 | 5 | | 10.5*5.5 | Rubber | | |

# Revision History

## Document Revision History

| Document Title: FM4 S6E2G-Series Pioneer Kit Guide<br>Document Number: 002-10541 | | | | |
|---|---|---|---|---|
| **Revision** | **ECN** | **Issue Date** | **Origin of Change** | **Description of Change** |
| ** | 5062170 | 01/04/2016 | ZQLI | Initial revision. |
| *A | 5151140 | 02/29/2016 | ZQLI | Replaced PDL 2.0.0 with PDL 2.0.1 in all instances across the document. |
| *B | 5162532 | 03/04/2016 | ZQLI | Updated to new template. |
| *C | 5201204 | 04/01/2016 | ZQLI | Updated Document Title to read as "FM4 S6E2G-Series Pioneer Kit Guide".<br>Updated Introduction:<br>Updated Kit Contents:<br>Updated Figure 1-1.<br>Updated Board Details:<br>Updated Figure 1-2.<br>Updated Jumpers and Connectors:<br>Updated Table 1-1.<br>Updated Installation and Test Operation:<br>Updated Install Software:<br>Updated description.<br>Updated Figure 2-1.<br>Updated Uninstall Software:<br>Updated description.<br>Updated Test Operation:<br>Updated Run the Test Demo (Updated description).<br>Updated Hardware:<br>Updated Hardware Features:<br>Updated description.<br>Updated Hardware Details:<br>Updated User Button and LED (Updated Table 3-1).<br>Updated Software Development:<br>Updated Tool Options:<br>Updated Build an Example Project with Keil µVision IDE (Updated description). |

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| **Revision** | **ECN** | **Issue Date** | **Origin of Change** | **Description of Change** |
| *D | 5353023 | 07/15/2016 | SAGA | Updated Figure 2-1.<br>Updated template. |
| *E | 5600004 | 1/24/2017 | ZQLI | Update Table 3-5.<br>Update Figure 3-9.<br>Updated Disclaimer. |
| *F | 5749732 | 05/25/2017 | AESATMP9 | Updated logo and copyright. |