



FM4 S6E2G-Series

Pioneer Kit Guide

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Contents



1. Introduction.....	4
1.1 Kit Contents	5
1.2 Board Details	6
1.3 Jumpers and Connectors	7
1.4 Getting Started	8
1.5 Additional Learning Resources.....	8
1.6 Technical Support.....	8
1.7 Acronyms.....	9
2. Installation and Test Operation	10
2.1 Install Software	10
2.2 Uninstall Software.....	14
2.3 Test Operation.....	14
3. Hardware	23
3.1 System Block Diagram	23
3.2 Hardware Features.....	24
3.3 Hardware Details	24
4. Software Development.....	37
4.1 Tool Options	37
4.2 Example Projects.....	42
4.3 Flash Programming	66
A. Appendix	72
A.1 Schematic.....	72
A.2 Bill of Materials	77
Revision History.....	81
Document Revision History	81

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

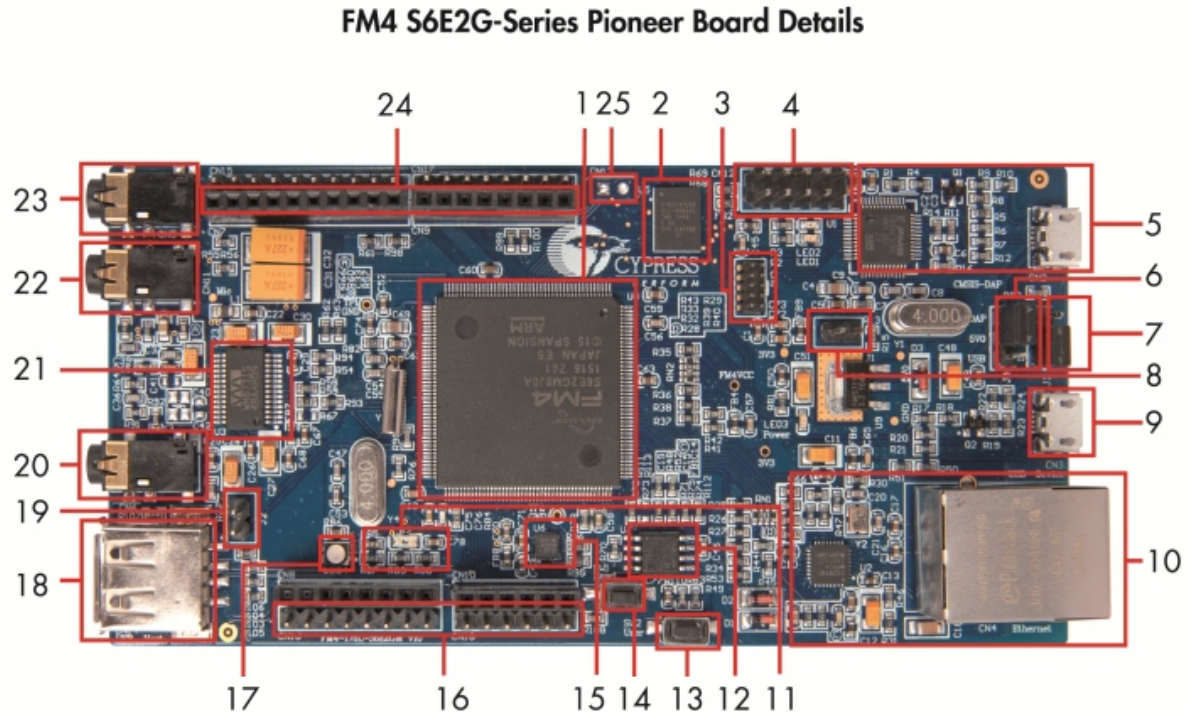
Figure 1-1. Kit Contents



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

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

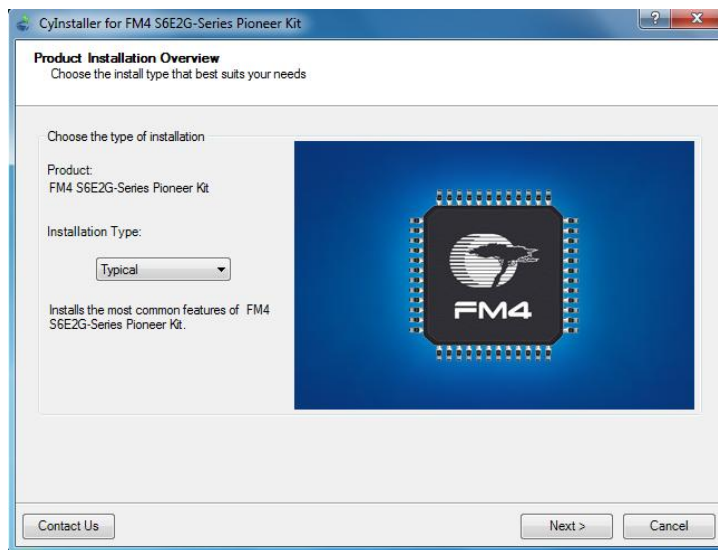
Figure 2-1. Kit Installation Window



- Select the default installation folder, or click **Browse** to select a different folder, and click **Next**.
- 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

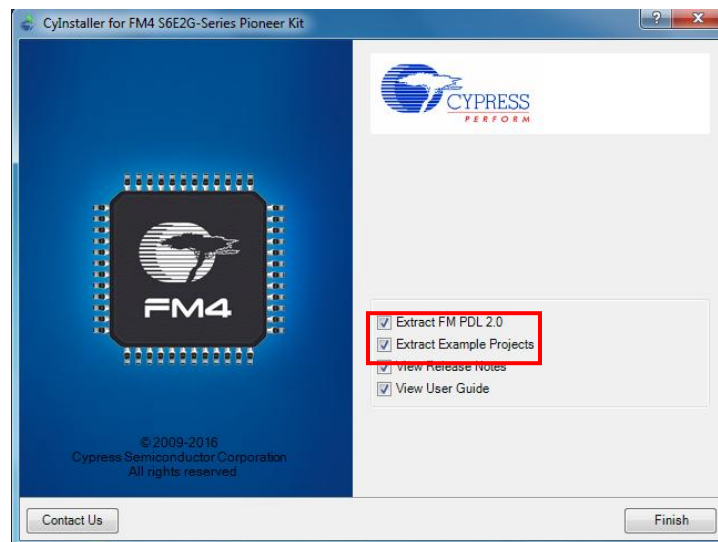


- Read the License agreement and select **I accept the terms** in the license agreement to continue with installation.

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

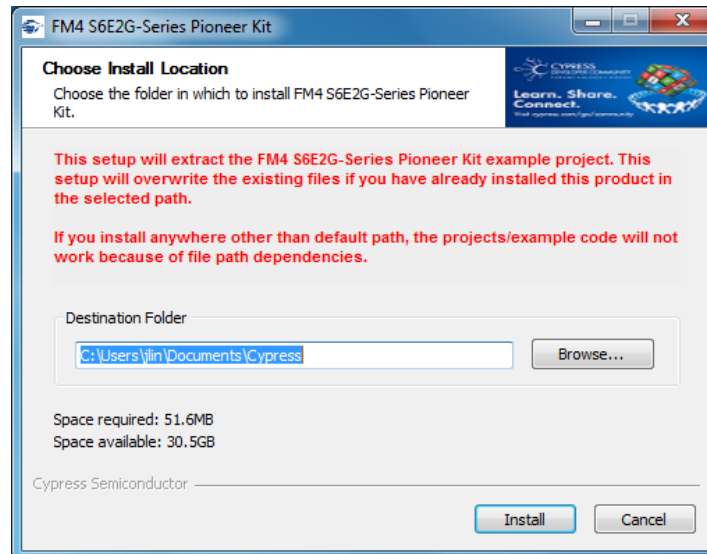
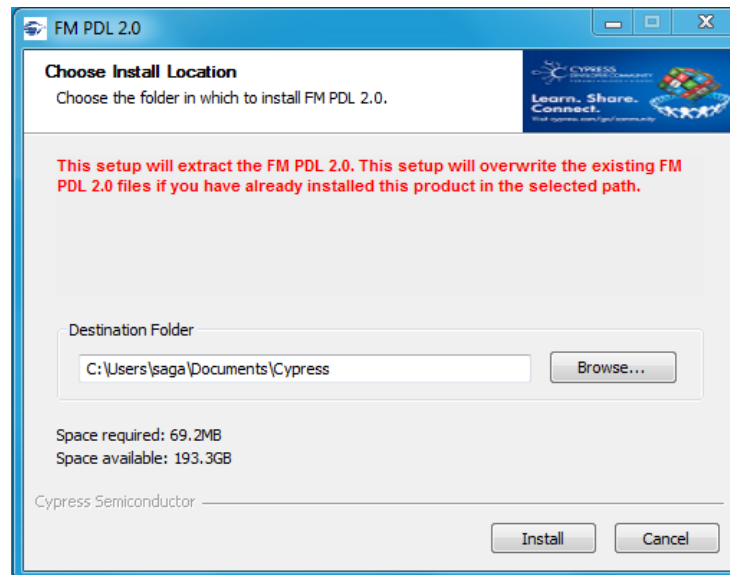


Figure 2-5. Extract FM PDL 2.0



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\\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\\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:

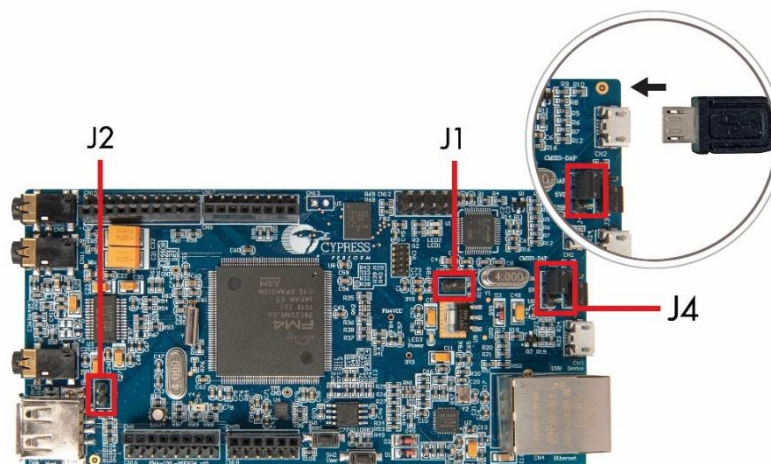
```
<User_Directory>:\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware\Demo Projects\Test_Demo_Code
```

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



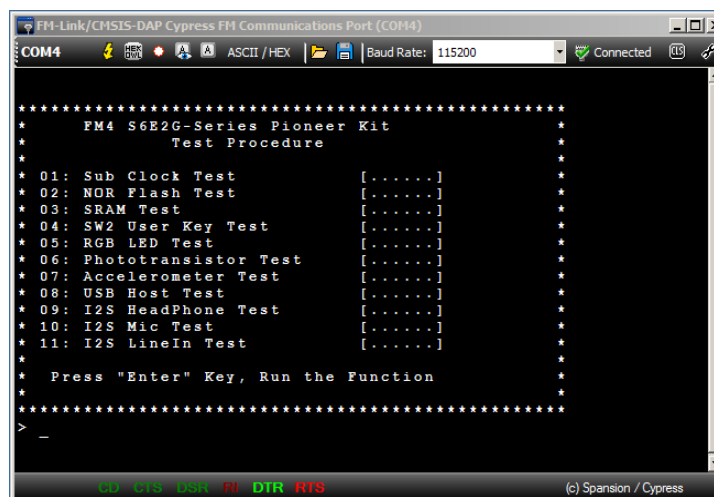
5. Select the baud rate of **115200**, and click the **Disconnected** button to connect to the board.

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

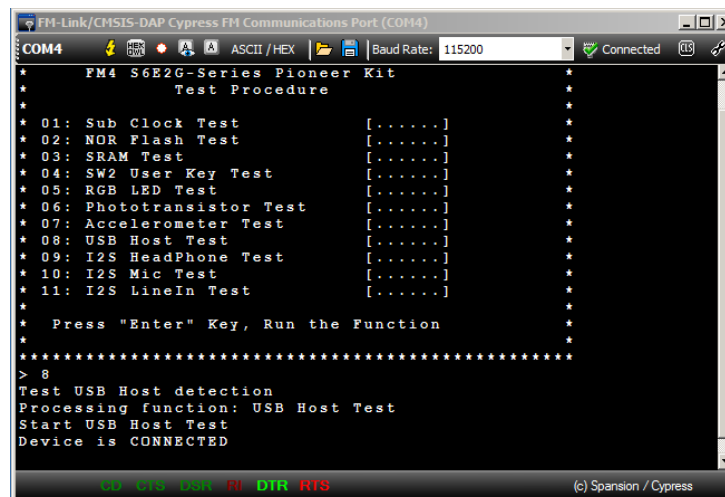


```

FM-Link/CMSIS-DAP Cypress FM Communications Port (COM4)
COM4  Baud Rate: 115200  Connected
*****
*      FM4 S6E2G-Series Pioneer Kit      *
*      Test Procedure                     *
*****
* 01: Sub Clock Test      [.....]      *
* 02: NOR Flash Test     [.....]      *
* 03: SRAM Test          [.....]      *
* 04: SW2 User Key Test  [.....]      *
* 05: RGB LED Test       [.....]      *
* 06: Phototransistor Test [.....]      *
* 07: Accelerometer Test [.....]      *
* 08: USB Host Test      [.....]      *
* 09: I2S HeadPhone Test [.....]      *
* 10: I2S Mic Test       [.....]      *
* 11: I2S LineIn Test    [.....]      *
*                                     *
* Press "Enter" Key, Run the Function *
*                                     *
*****
> 8
Test USB Host detection
Processing function: USB Host Test
Start USB Host Test
  
```

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



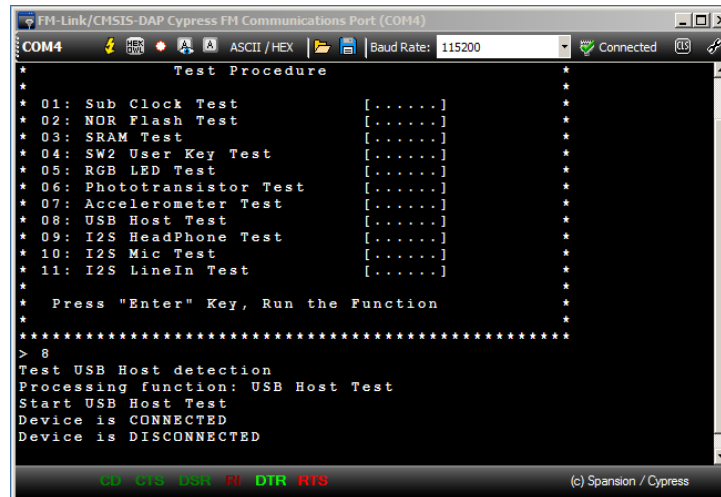
```

FM-Link/CMSIS-DAP Cypress FM Communications Port (COM4)
COM4  Baud Rate: 115200  Connected
*****
*      FM4 S6E2G-Series Pioneer Kit      *
*      Test Procedure                     *
*****
* 01: Sub Clock Test      [.....]      *
* 02: NOR Flash Test     [.....]      *
* 03: SRAM Test          [.....]      *
* 04: SW2 User Key Test  [.....]      *
* 05: RGB LED Test       [.....]      *
* 06: Phototransistor Test [.....]      *
* 07: Accelerometer Test [.....]      *
* 08: USB Host Test      [.....]      *
* 09: I2S HeadPhone Test [.....]      *
* 10: I2S Mic Test       [.....]      *
* 11: I2S LineIn Test    [.....]      *
*                                     *
* Press "Enter" Key, Run the Function *
*                                     *
*****
> 8
Test USB Host detection
Processing function: USB Host Test
Start USB Host Test
Device is CONNECTED
  
```

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

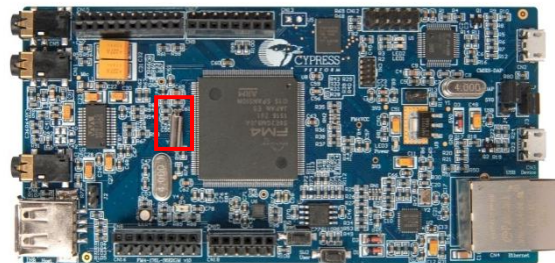
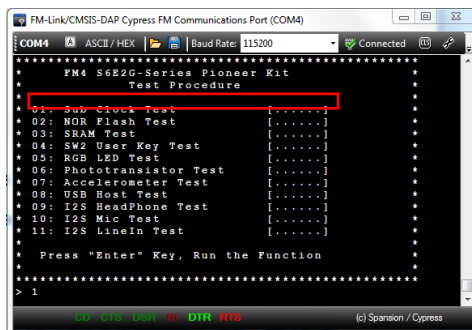


2.3.2 Test Procedure Explanation

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:

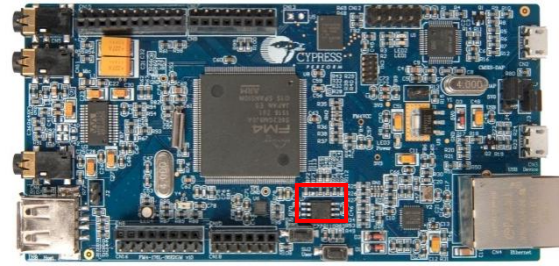
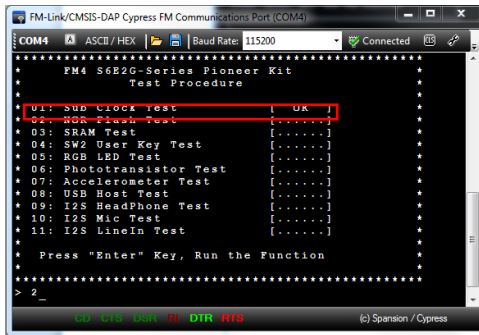
- **Sub Clock Test:** This procedure will test whether the sub clock is at 32.768 kHz. Key in **1** and press the **[Enter]** key. The main routine will shift the system clock to sub clock, and shift back to main clock after the sub clock is confirmed to run at 32.768 kHz. It displays **OK** if the sub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

Figure 2-13. Sub Clock Test



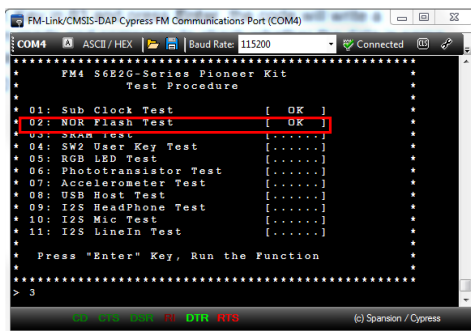
- **NOR Flash Test:** This procedure tests the NOR flash. Key in **2** and press the **[Enter]** key on the PC key. The code will write a pre-determined set of data into the flash and then will read and compares to check whether the data is the same. If the data is the same, then it will display **OK**,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

Figure 2-14. NOR Flash Test



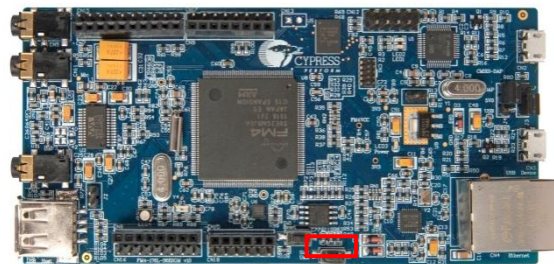
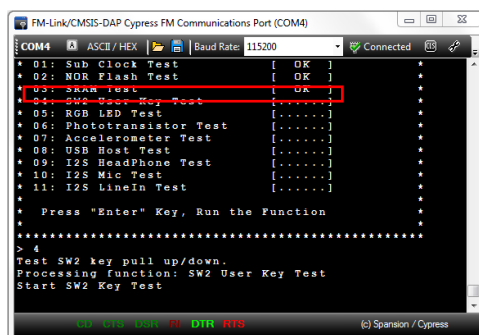
- **SRAM Test:** This procedure tests the SRAM. Key in **3** and press the **[Enter]** key. The code will write a pre-determined set of data into the SRAM and then will read and compare to check whether the data is the same. If it is the same, then it will display **OK**, otherwise it will display **Fail**.

Figure 2-15. SRAM Test



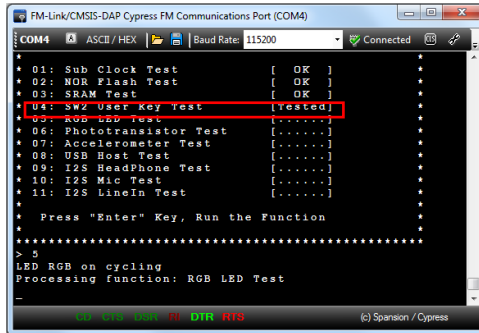
- **SW2 User Key Test:** This procedure tests the switch **SW2**. Key in **4** and press the **[Enter]** key. The test routine will detect the press and release status of the **SW2** key. Press the **[Enter]** key again to return to the main menu.

Figure 2-16. SW2 User Key Test



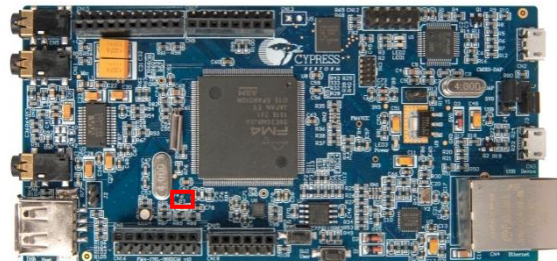
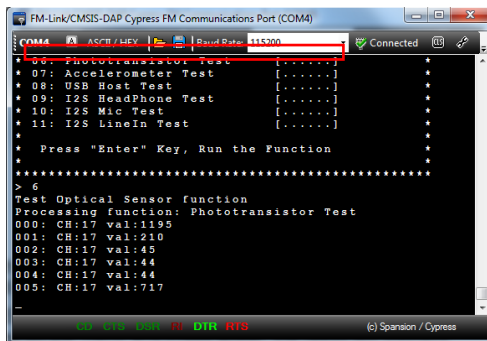
- **RGB LED Test:** This procedure tests the RGB LED (LED4). Key in **5** and press the **[Enter]** key. The RGB LED (LED4) color will change from Red to Green to Blue. The sequence will repeat until you press the **[Enter]** key to return to the main menu.

Figure 2-17. RGB LED Test



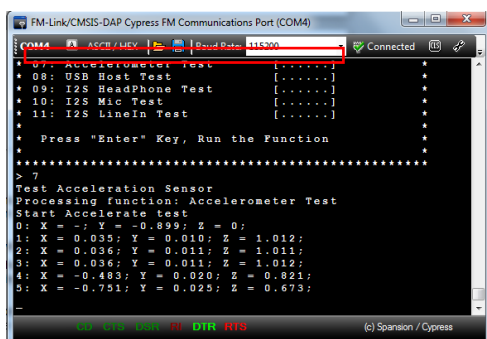
- **Phototransistor Test:** This procedure tests the phototransistor. Key in **6** and press the **[Enter]** key. The terminal will display an ADC value for the phototransistor about once per second. Use your hand to block light from reaching the phototransistor. The value of the ADC when the phototransistor 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



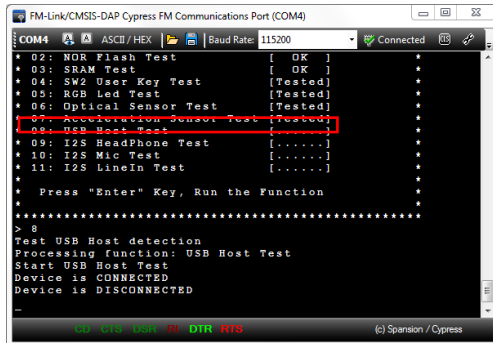
- **Accelerometer Test:** This procedure tests the accelerometer. Key in **7** and press the **[Enter]** key. The terminal will display the data of each of the three axes about once per second. This data will change if there is any change in the board's position. Press the **[Enter]** key to return to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

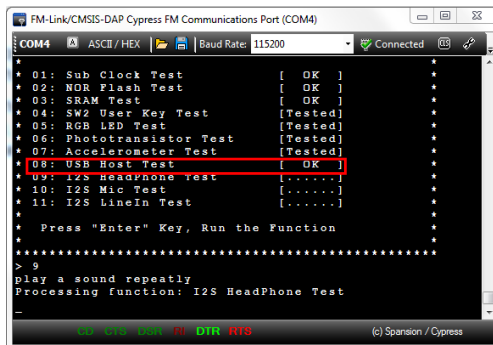
Figure 2-20. USB Host Test



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

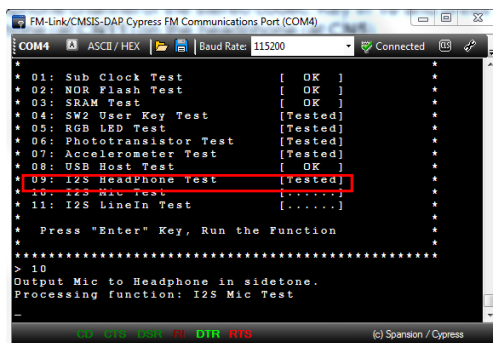
- **I2S Headphone Test:** This procedure tests the headphone channel of the stereo codec. Key in **9** and press the **[Enter]** key. A pre-defined calling bell sound will be heard on the headphone connected to **CN5**. Press the **[Enter]** key again to return to the main menu.

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.

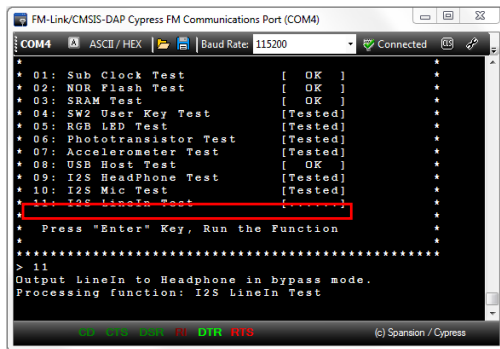
Figure 2-22. I2S Mic Test



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

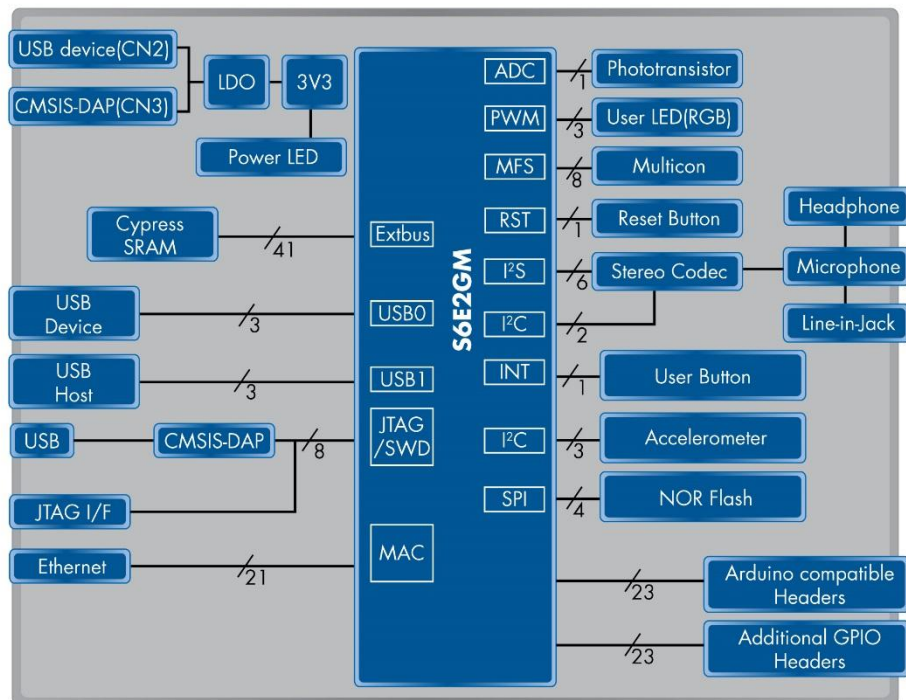


This chapter describes the features and hardware details of the FM4 S6E2G-Series Pioneer Kit.

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), I²C, 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

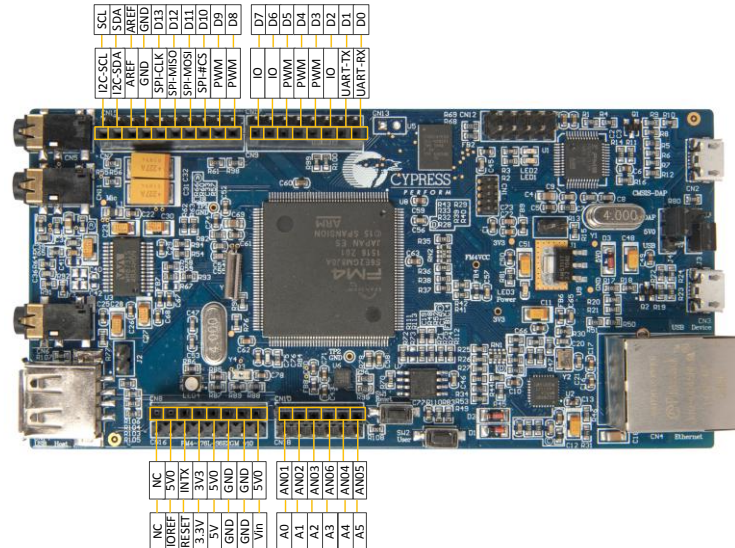


Table 3-2 shows full functions of the pins connected with the Arduino headers.

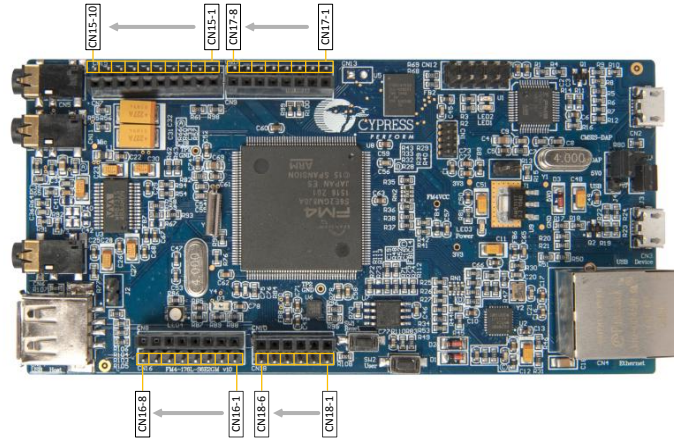
Table 3-2. Pins of Arduino Compatible Interface

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/DTT1X_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

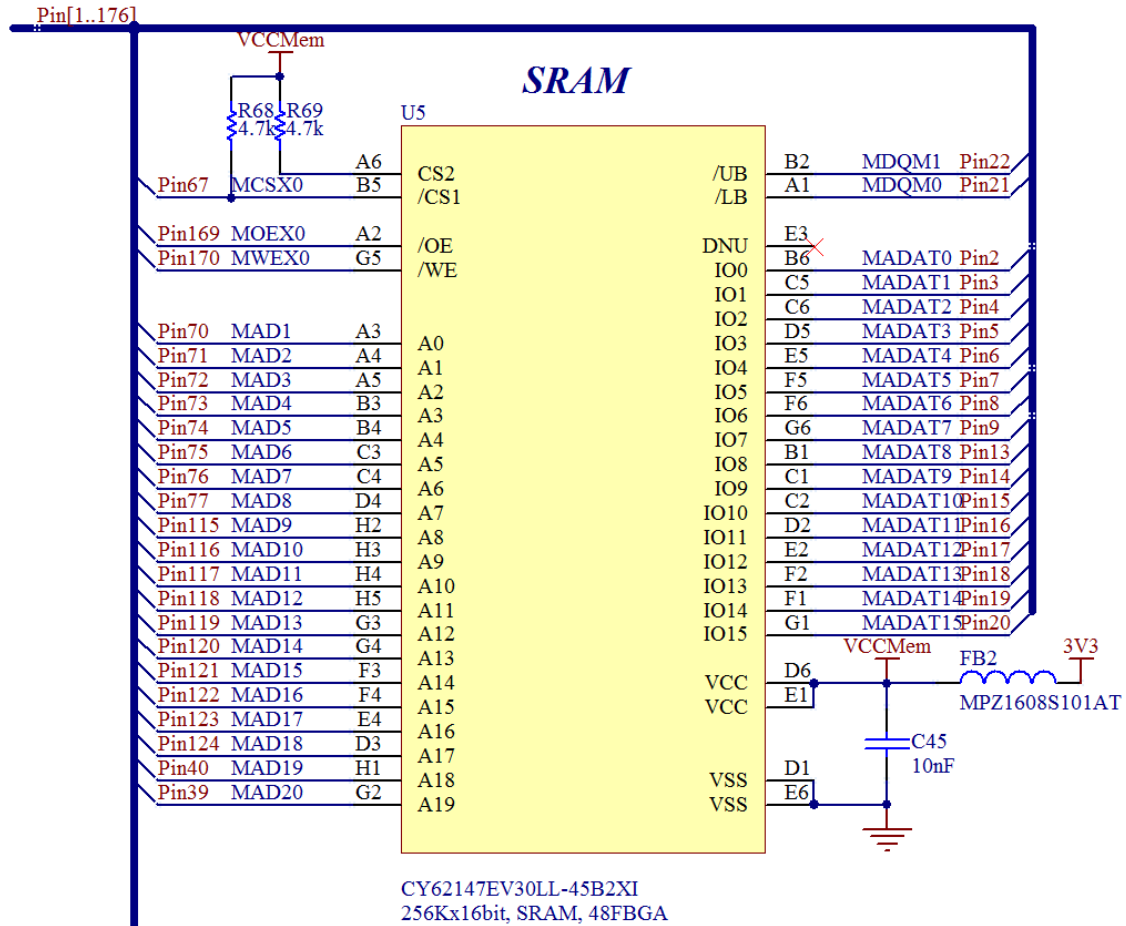
Pin No.	Port	Function
62	I2SCK_0	Bit clock out
61	I2SDO_0	Audio data out
60	I2SDI_0	Audio data in
63	I2SWS_0	Word select output pin
64	I2SMCLK_0	Master clock I/O pin

[illegible]

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.

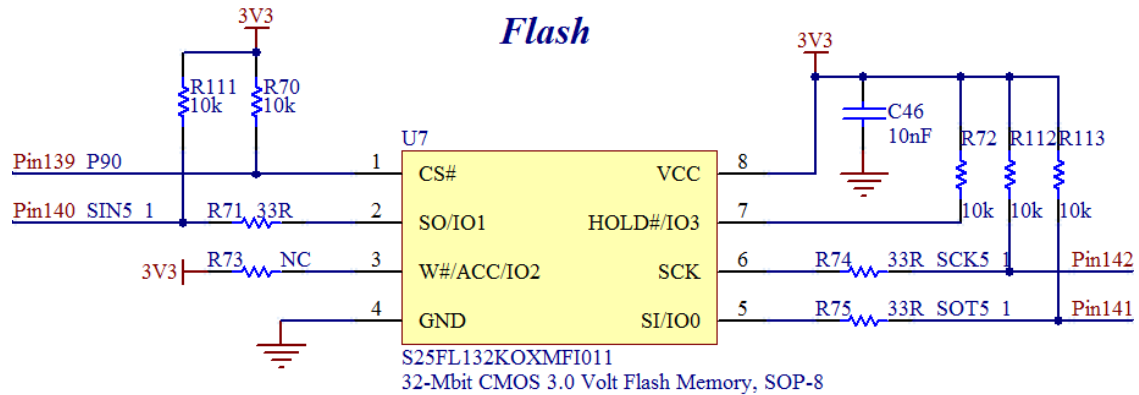
Figure 3-5. SRAM Circuit



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 resistors 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



3.3.9 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

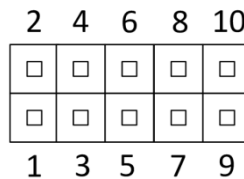
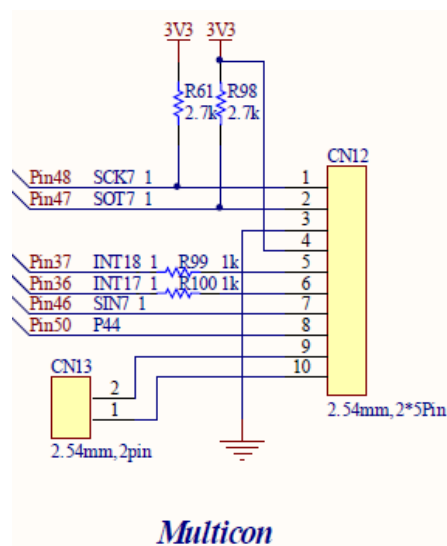


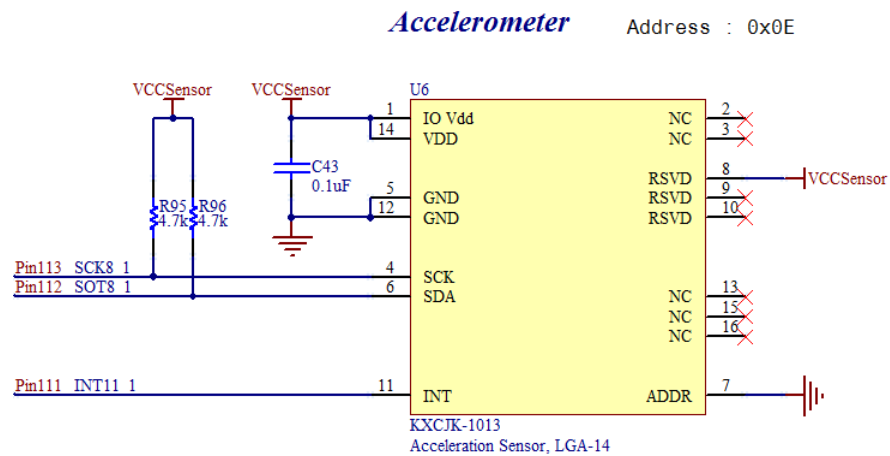
Figure 3-9. Multicon Interface



3.3.10 Accelerometer

The KXCJK-1013 is a 3-axis $\pm 2g$, $\pm 4g$ or $\pm 8g$ 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.

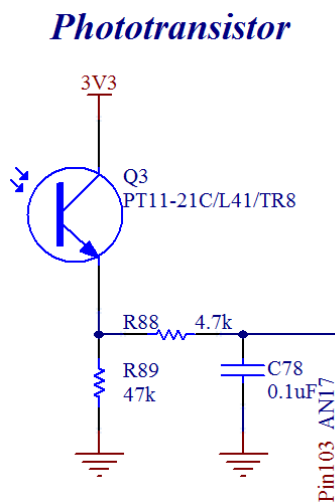
Figure 3-10. Accelerometer



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

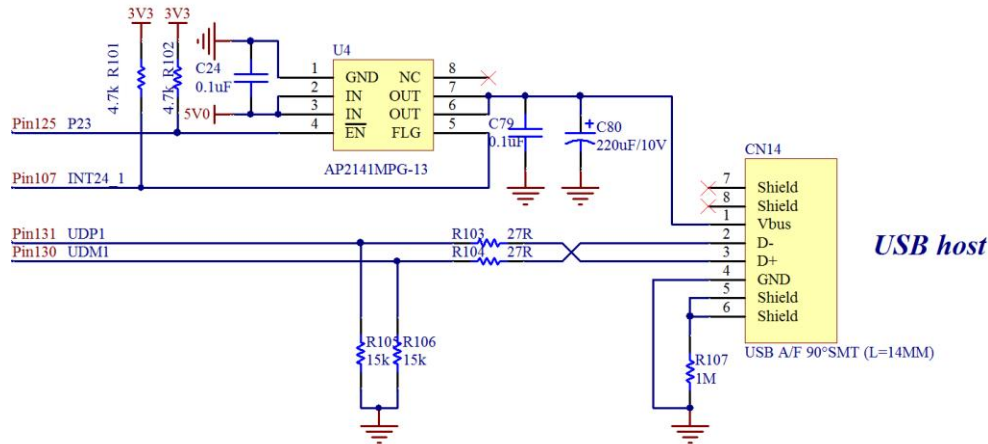


3.3.12 USB Interfaces

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.

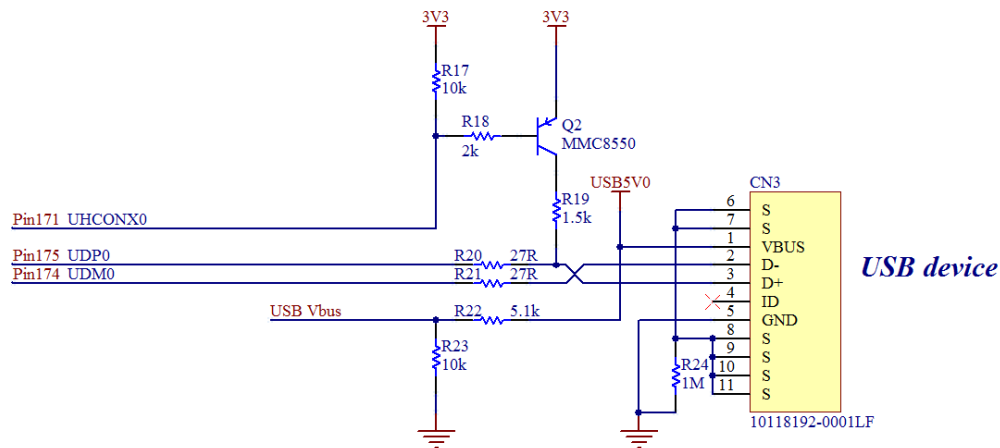
The FM4 S6E2G-Series Pioneer Kit can provide a maximum current of 500 mA to the connected USB device via connector CN14.

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

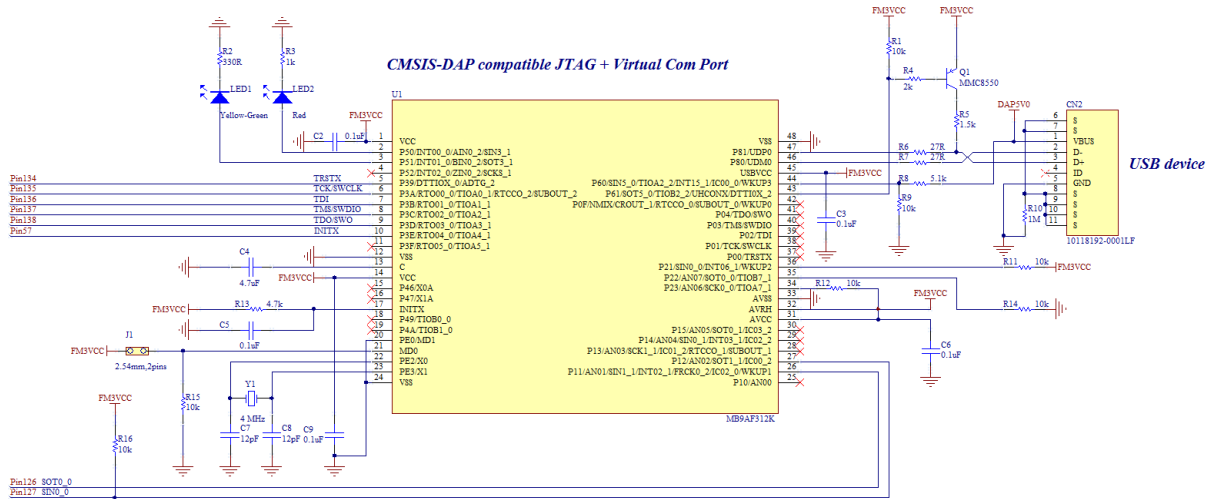


3.3.13 CMSIS-DAP

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.

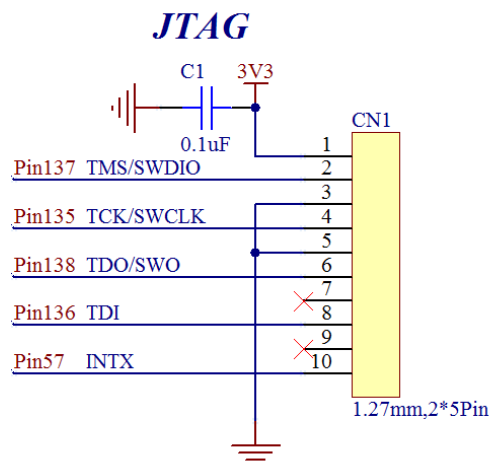
Figure 3-14. CMSIS DAP Circuit



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.

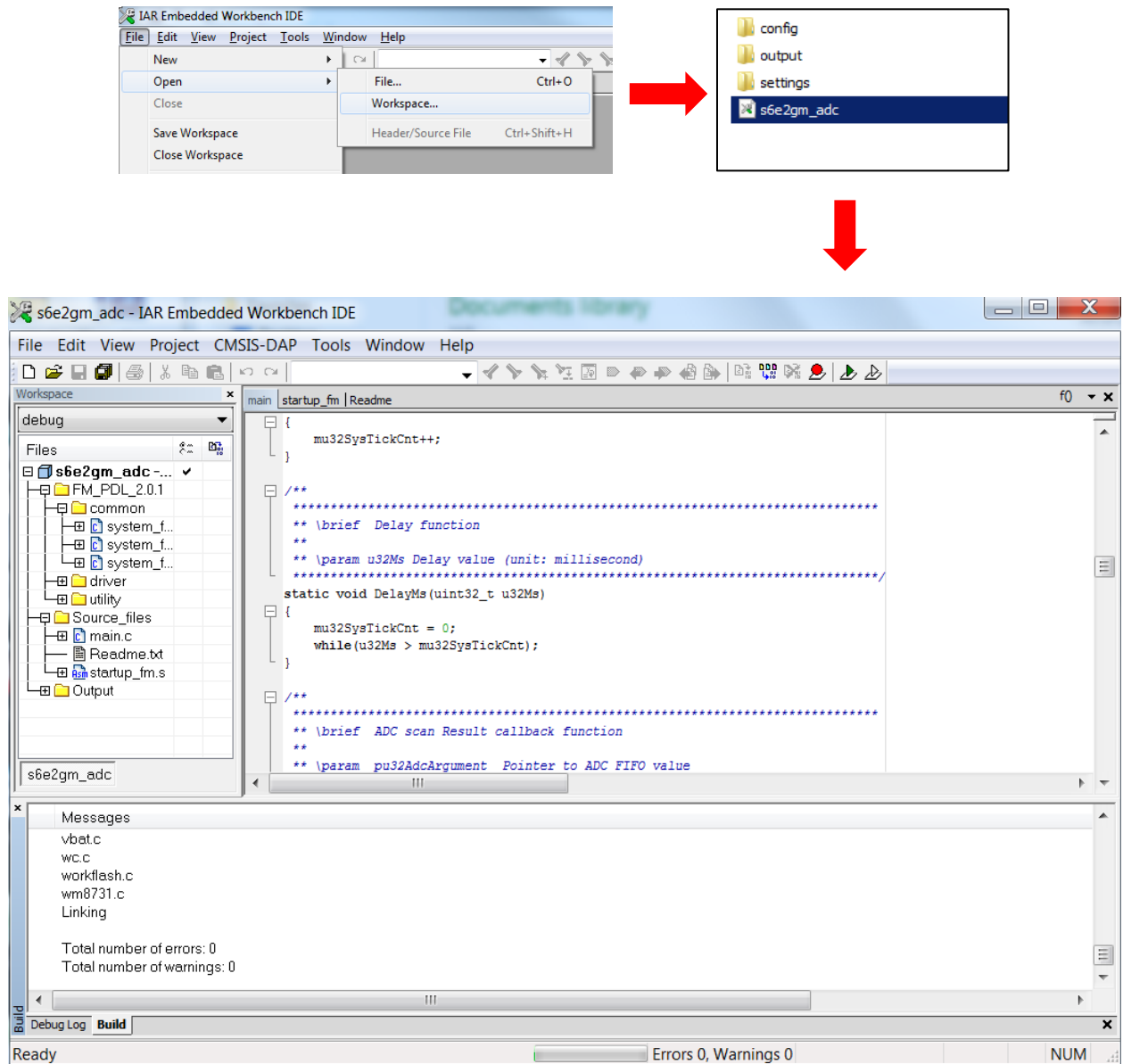
4.1.1 Build an Example Project with IAR IDE

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

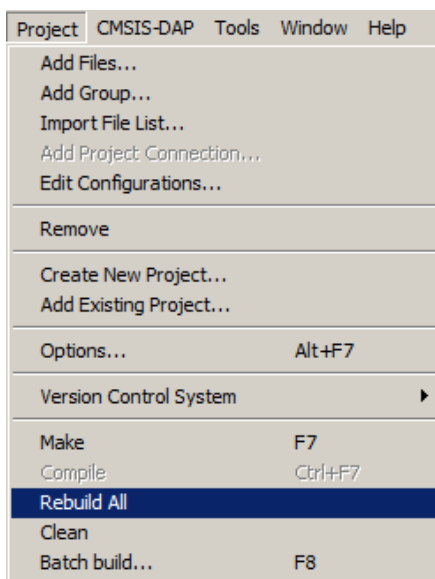
The *s6e2gm_adc* is one example project that is available after successful installation.

1. Launch IAR Embedded Workbench IDE V7.40.5.9739 (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](#).

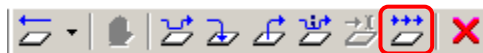
Table 4-1. Debugging Jumper Settings

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 **Ctrl+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 μ Vision IDE

The following steps describe how to open, build, and run an example project in the Keil μ Vision 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`.

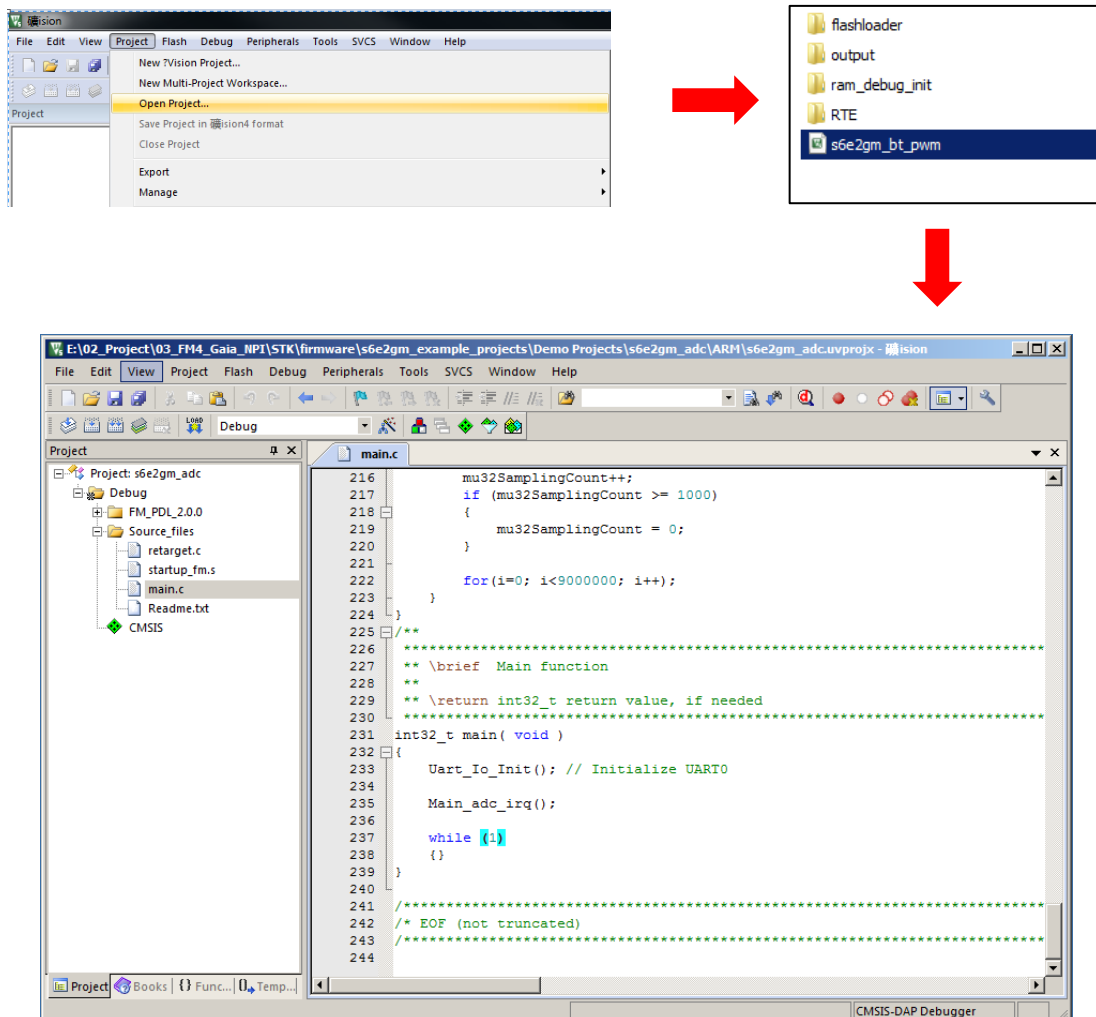
2. If the flash loader file does not exist, copy it to the above folder from:

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

3. Launch Keil μ Vision IDEv5.16a (or later).

4. Click **Project > Open Project**, and select the workspace files *6e2gm_adc.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 **Ctrl+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 μ Vision 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 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 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) Description: This project demonstrates the DMA operation of the S6E2GM device. The program configures DMA to move the data from a source array (<i>au32SourceData</i>) to a destination array (<i>au32DestinationData</i>), 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 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 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 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 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 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 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 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 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 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 blink the Green LED of the RGB LED (LED4).
13	s6e2gm_I2S_hp	Title: Audio I2S Headphone 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 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 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 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 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 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 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 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 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
```

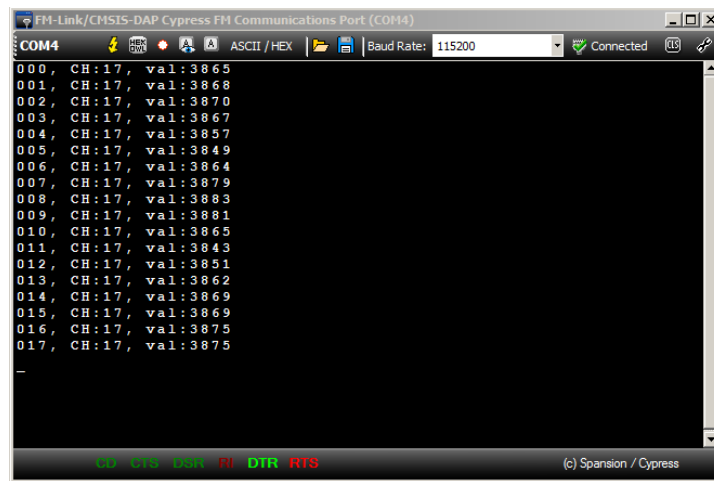
3. Build the project and download the code into the S6E2GM device.
4. Run the Serial Port Viewer Tool, set the baud rate to **115200**, and click the **Disconnected** button to connect the board to the PC, as described in [Run the Test Demo](#).

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

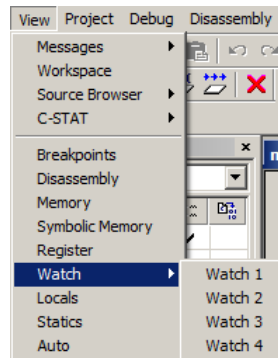
4.2.2.3.1 Using IAR Embedded Workbench

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.

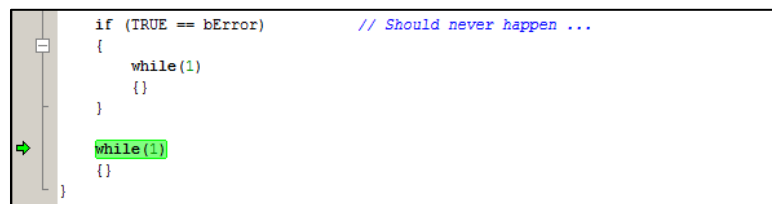
4. Open Watch1 window from **View > Watch**.



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

Watch 1			
Expression	Value	Location	Type
<code>au32SourceData</code>	<array>	0x1FFE0000	uint32_t[256]
<code>au32DestinationD...</code>	<array>	0x1FFE0400	uint32_t[256]
<click to edit>			

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 μ Vision 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 μ Vision IDE from the following directory:

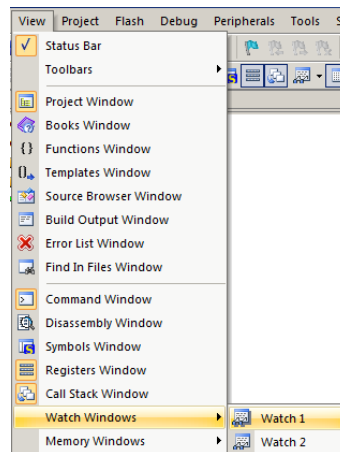
```

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.

Watch 1		
Name	Value	Type
 <code>au32SourceData</code>	<code>0x20038014 au32SourceData</code>	<code>unsigned int[256]</code>
 <code>au32DestinationData</code>	<code>0x20038414 au32DestinationData</code>	<code>unsigned int[256]</code>
<Enter expression>		

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.

```

180     if (TRUE == bError)           // Should never happen ...
181     {
182         while(1)
183         {}
184     }
185
186     while(1)
187     {}
188 }
```

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.

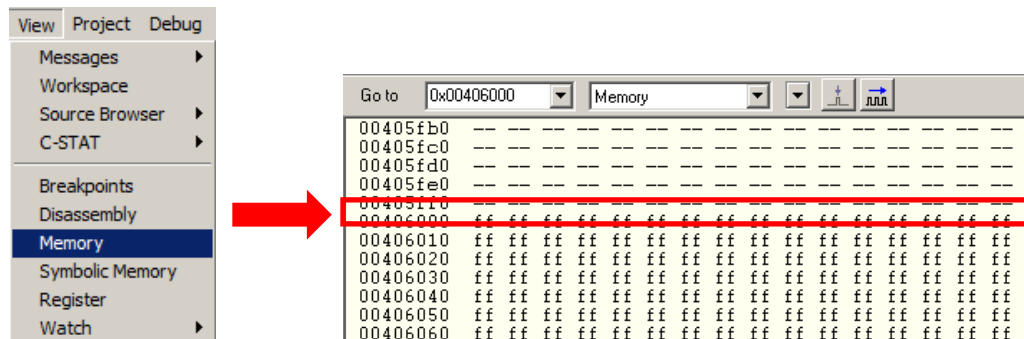
4.2.3.2 Hardware Connection

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

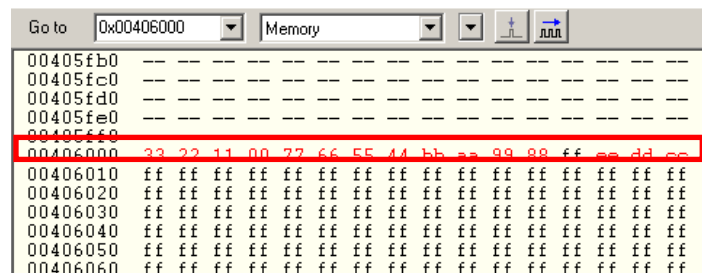
4.2.3.3 Verify Output

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.

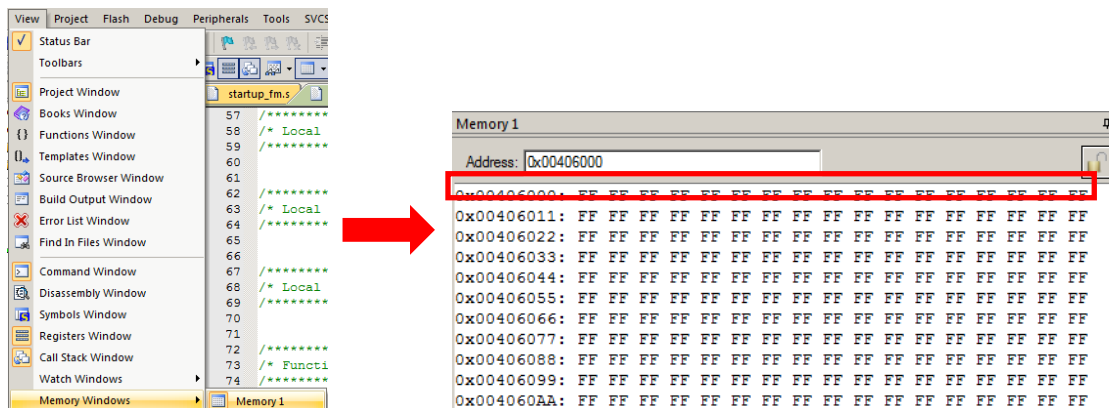


5. Run the program for a while (>10 seconds).
6. Stop the program and check the content of 0x00406000 in flash.

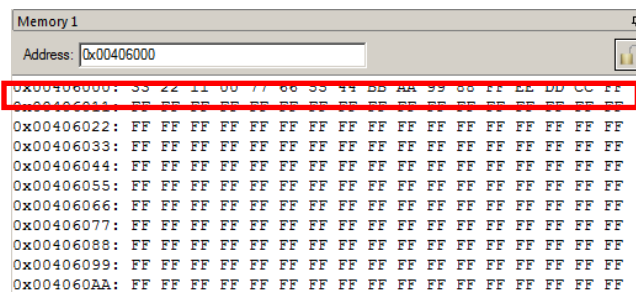


4.2.3.3.2 Using Keil μ Vision IDE

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 μ Vision 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

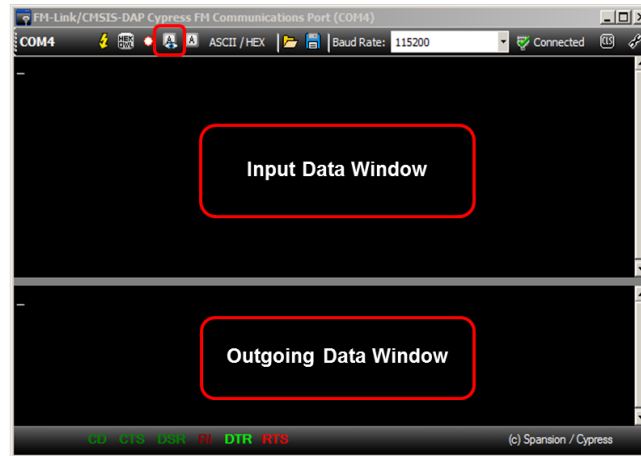
1. Power the FM4 S6E2G-Series Pioneer board from **CN2** using a USB cable, refer to [Figure 2-6](#).
2. Open the project in the IAR Embedded Workbench or the Keil µVision IDE from the following directory:
 IAR project: <User_Directory>:
 \FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware
 \Demo Projects\s6e2gm_mfs_uart\IAR\s6e2gm_mfs_uart.eww
 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.

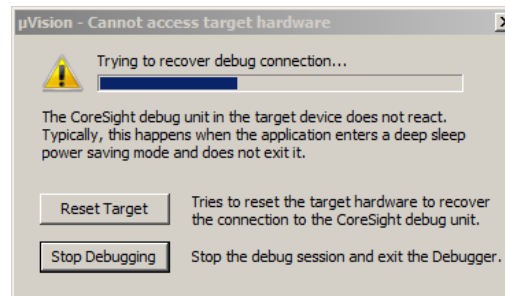
4.2.5.2 Hardware Connection

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_SWWDI->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.

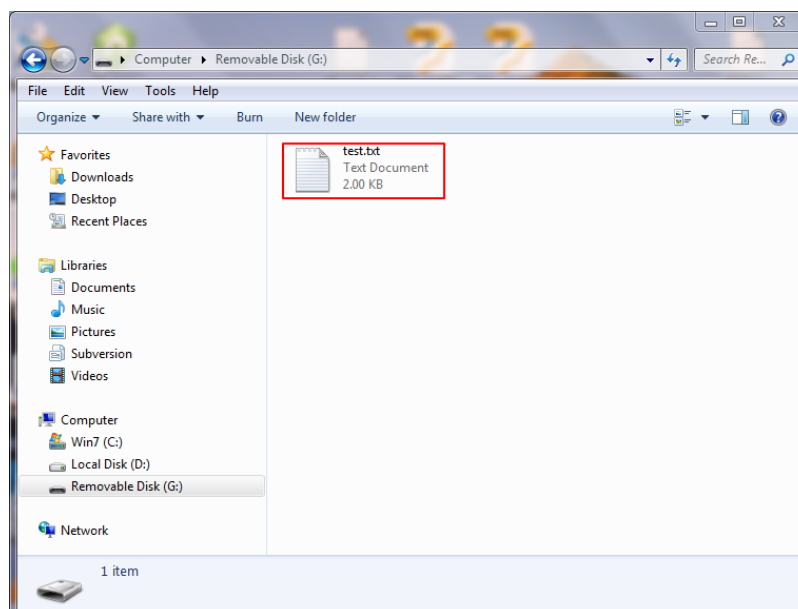
4.2.11.2 Hardware Connection

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.

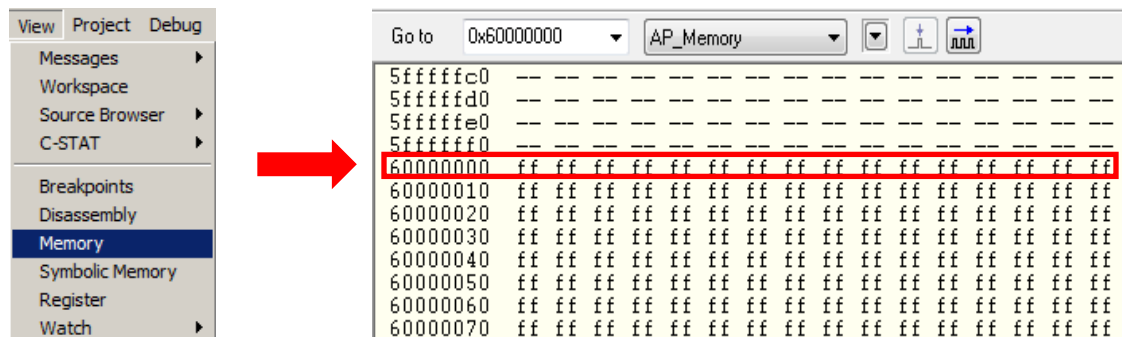
4.2.13.2 Hardware Connection

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

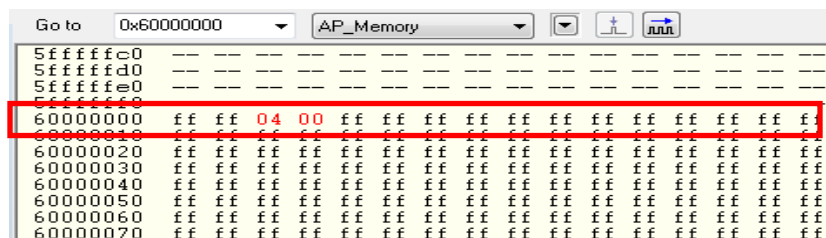
4.2.13.3 Verify Output

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.



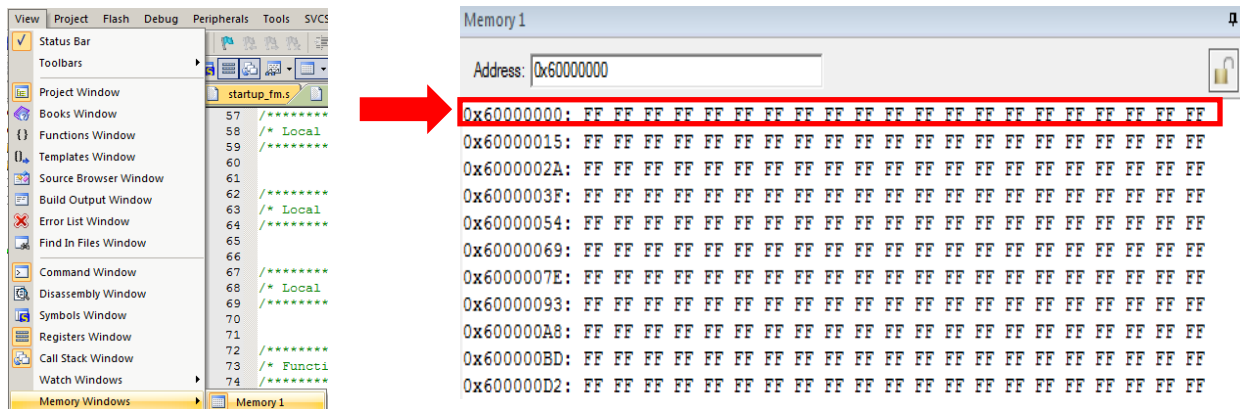
5. Run the program for a while.
6. Press the **SW2** to start the SRAM write and read, compare, erase operation.
7. Stop the program and check the content of 0x60000000 in flash memory.



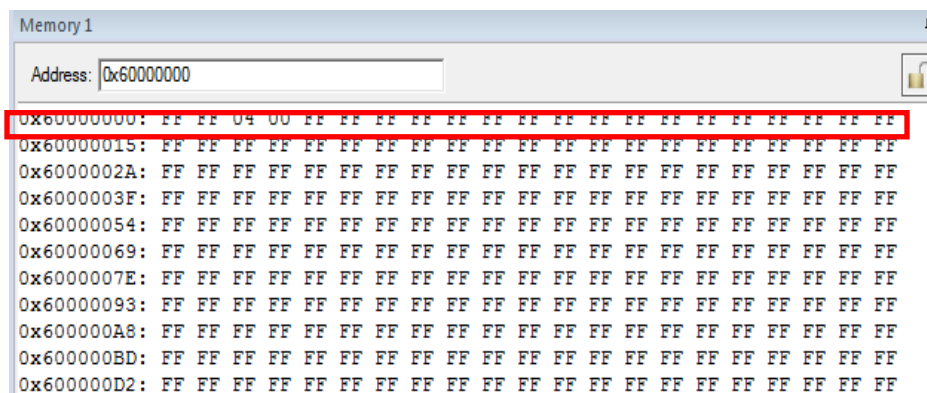
8. If reading and writing all data succeeded, LED4 will be Green. Otherwise, LED4 will be Red.

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.

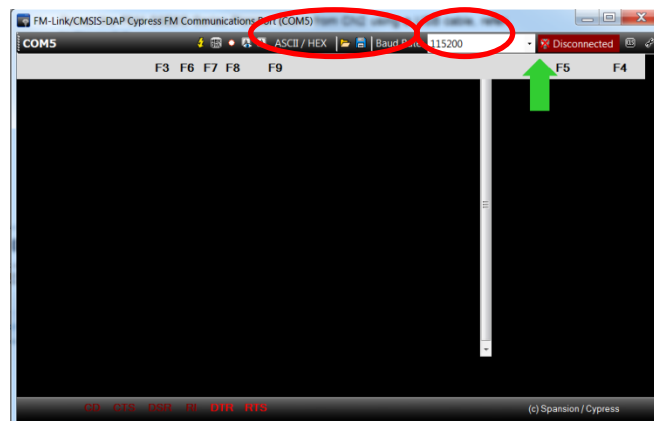
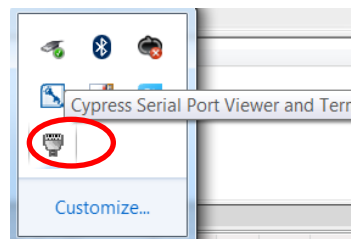
4.2.14.2 Hardware Connection

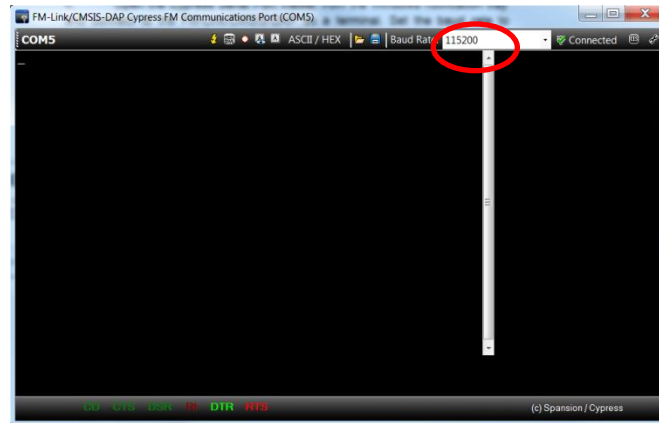
No specific hardware connections are required for this project. All connections are hardwired on the board.

4.2.14.3 Verify Output

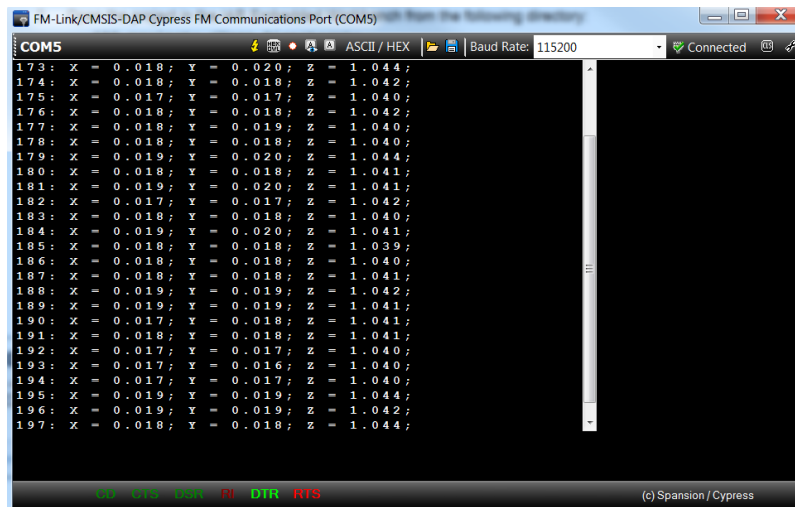
1. Power the FM4 S6E2G-Series Pioneer board from **CN2** using a USB cable, refer to [Figure 2-6](#).
2. Open the project in the IAR Embedded Workbench or the Keil µVision IDE from the following directory:
 IAR project: <User_Directory>:
 \FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware
 \Demo Projects\s6e2gm_sram\IAR\s6e2gm_acc.eww

 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.

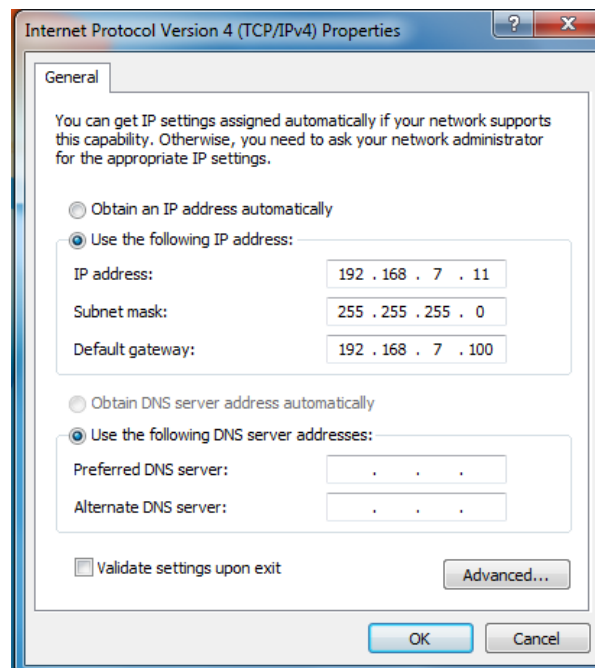
4.2.15.3 Verify Output

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 μ Vision IDE from the following directory:

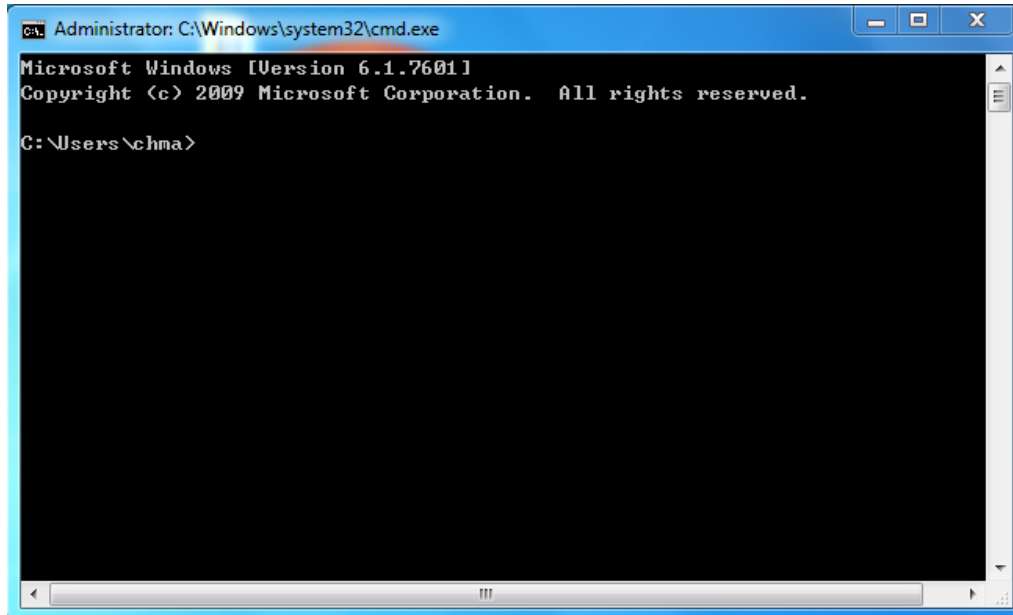
```
IAR project: <User_Directory>:
\FM4 S6E2G-Series Pioneer Kit_Ver01\Firmware\Demo
Projects\s6e2gm_ethernet\IAR\s6e2gm_ethernet.eww
```

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

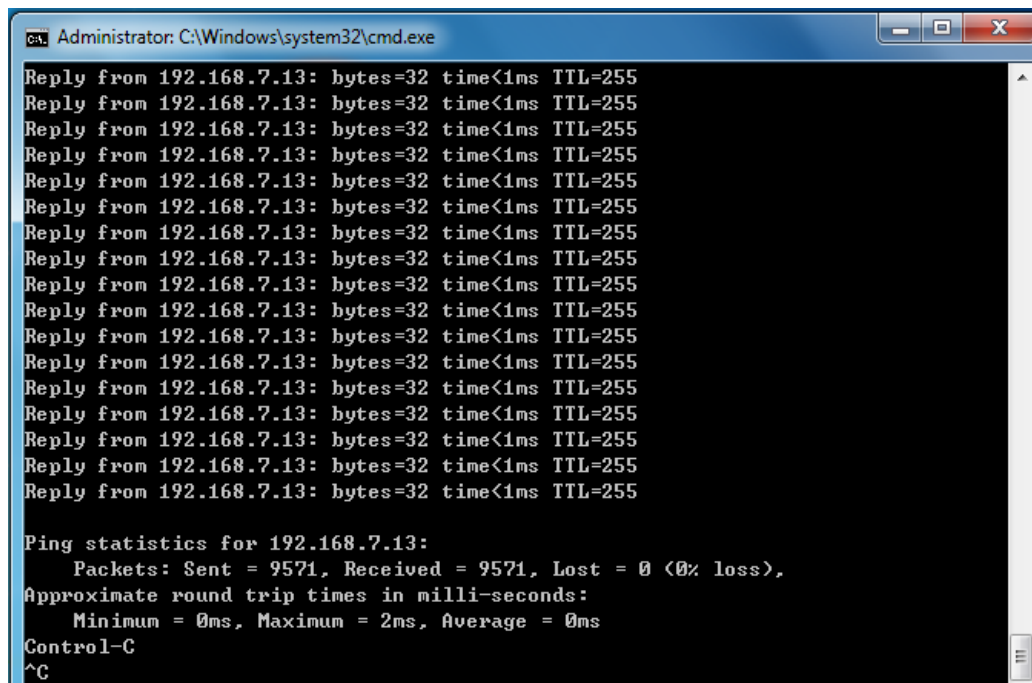
3. Build the project and download the code into the S6E2GM device.
4. Set the local area network IP address as shown below.



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 μ Vision, 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

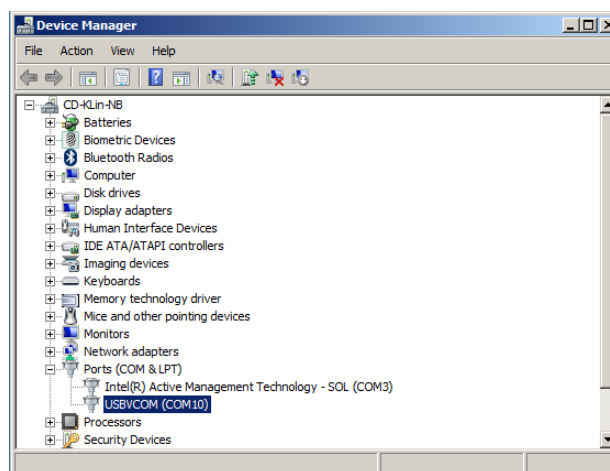
This method will program over the USB connection to the S6E2GM.

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

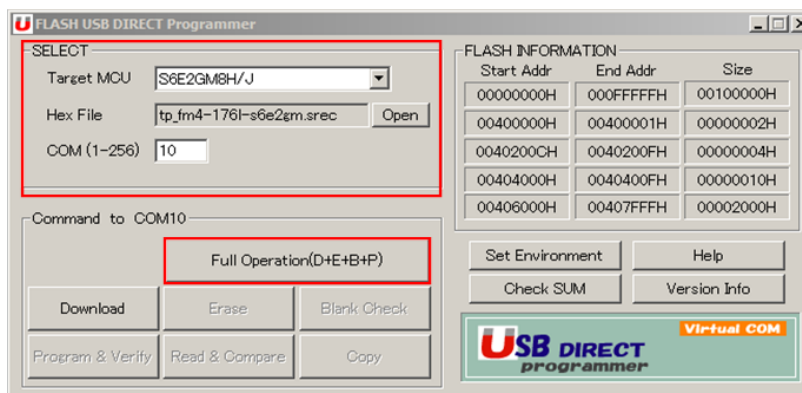
Jumper	Position	Description
J1	Open	Sets MB9AF312K (CMSIS-DAP) in run mode.
J2	Closed	Sets S6E2GM in programming mode.
J3	Pin 2 to Pin 3	Sets for USB programming mode.
J4	Pin 2 to Pin 3	Power from USB port of S6E2GM

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.

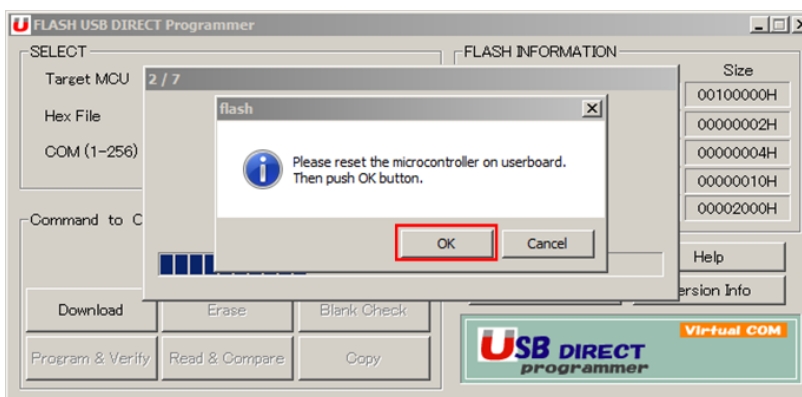


9. Enter the Virtual COM Port listed under Ports in the Device Manager, in the **COM** field.

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.

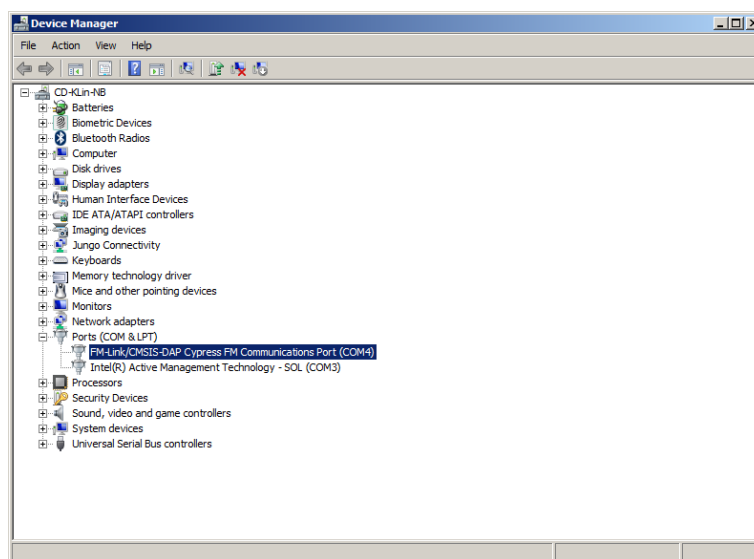
1. Install the FM4 S6E2G-Series Pioneer Kit as per the [Install Software](#) section. The FLASH MCU Programmer gets installed in your PC as part of the kit installer.
2. Ensure the jumpers on the FM4 S6E2G-Series Pioneer board are placed according to [Table 4-5](#).

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

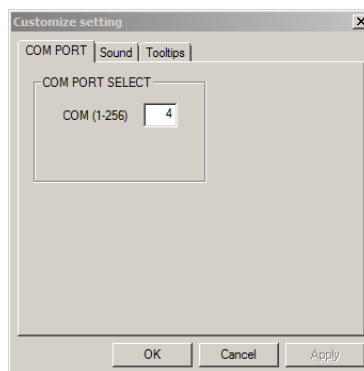
Jumper	Position	Description
J1	Open	Sets MB9AF312K (CMSIS-DAP) in run mode.
J2	Closed	Sets S6E2GM in programming mode.
J3	Pin 1 to Pin 2	Sets for UART programming mode.
J4	Pin 1 to Pin 2	Power from USB port of CMSIS-DAP

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

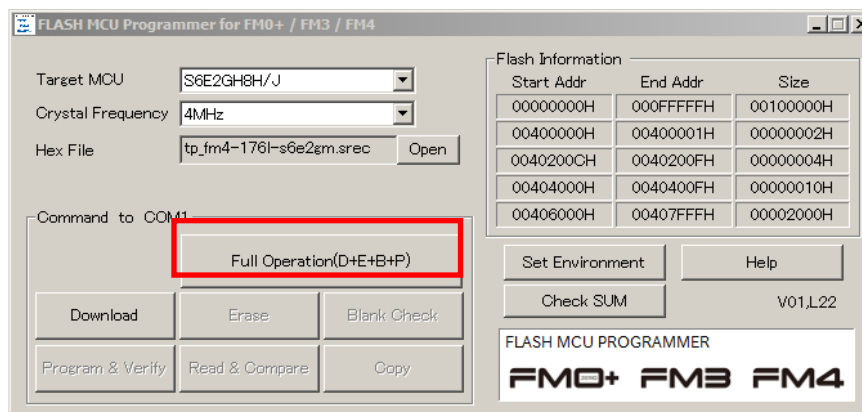
5. Launch the FLASH MCU Programmer from **Start Menu > All Programs > Cypress > FLASH MCU Programmer > FM0+FM3FM4**.
6. Select **Target MCU** to S6E2GM8H/J.
7. Select **Crystal Frequency** to 4 MHz.
8. Select the Motorola-S format file or Intel-HEX format file to be programmed to the FLASH memory in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



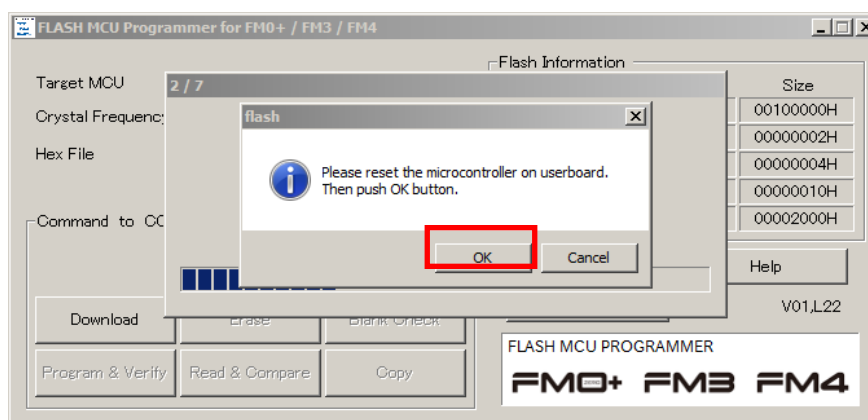
10. Click the **Set Environment** button and enter the Virtual COM Port listed in the Ports of Device Manager, in the **COM** field.



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

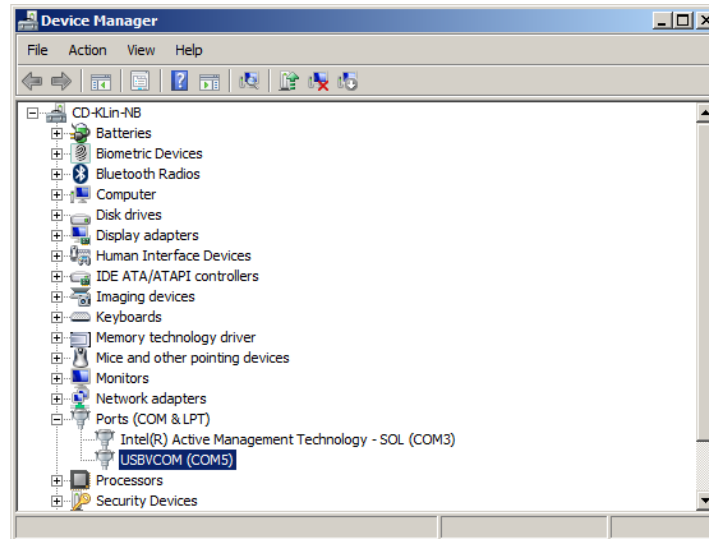
Jumper	Position	Description
J1	Closed	Sets MB9AF312K (CMSIS-DAP) in programming mode.
J2	Open	Sets S6E2GM in run mode.
J4	Pin 1 to Pin 2	Power from USB port of CMSIS-DAP.

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

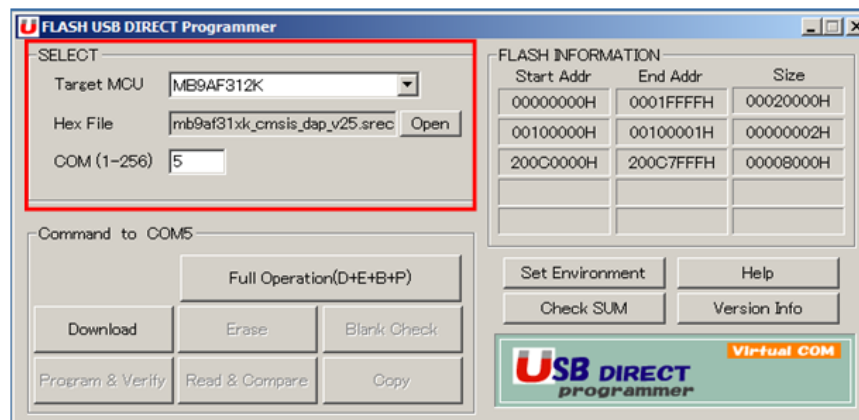
5. Launch the FLASH USB DIRECT Programmer from Windows **Start Menu > All Programs > Cypress > FLASH USB DIRECT Programmer > USBDirect**.
6. Set **Target MCU** to MB9AF312K.
7. Select the Motorola-S format file or Intel-HEX format file to be programmed into the FLASH memory in the MCU. The *hex* file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

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

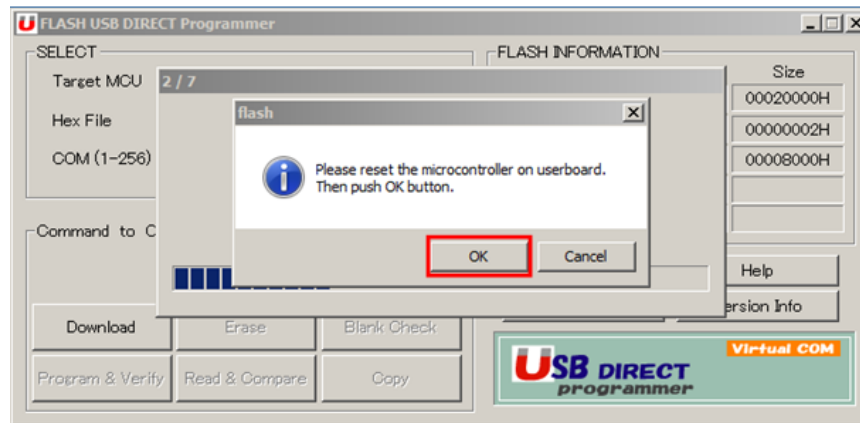
8. Check the COM Port number from the **Device Manager** or from the **Serial Port Viewer** icon in the task bar.



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.

The schematic diagram illustrates a USB-to-JTAG adapter circuit. It is divided into three main functional blocks:

- USB device interface (top right):** This section uses a MAX3232 IC to interface the USB D+ and D- lines with the JTAG TDI and TDO pins. It includes a USB-to-UART bridge and a virtual COM port interface.
- JTAG/Virtual Com Port interface (center):** This section features a JTAG controller IC (JTAG-VCP) that manages the JTAG protocol and provides a virtual COM port interface. It includes a JTAG-to-UART bridge and a virtual COM port interface.
- USB host interface (bottom):** This section uses a MAX3232 IC to interface the USB D+ and D- lines with the JTAG TDI and TDO pins. It includes a USB-to-UART bridge and a virtual COM port interface.

The circuit also includes various passive components like resistors, capacitors, and LEDs for status indication.

Figure A-4. Stereo Codec

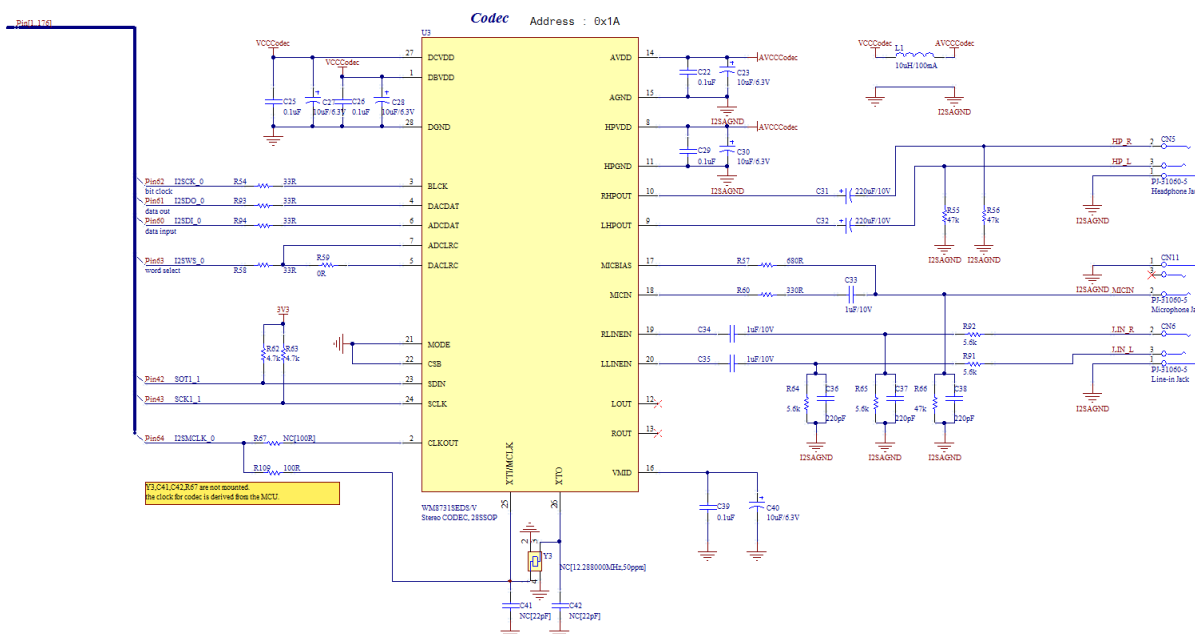
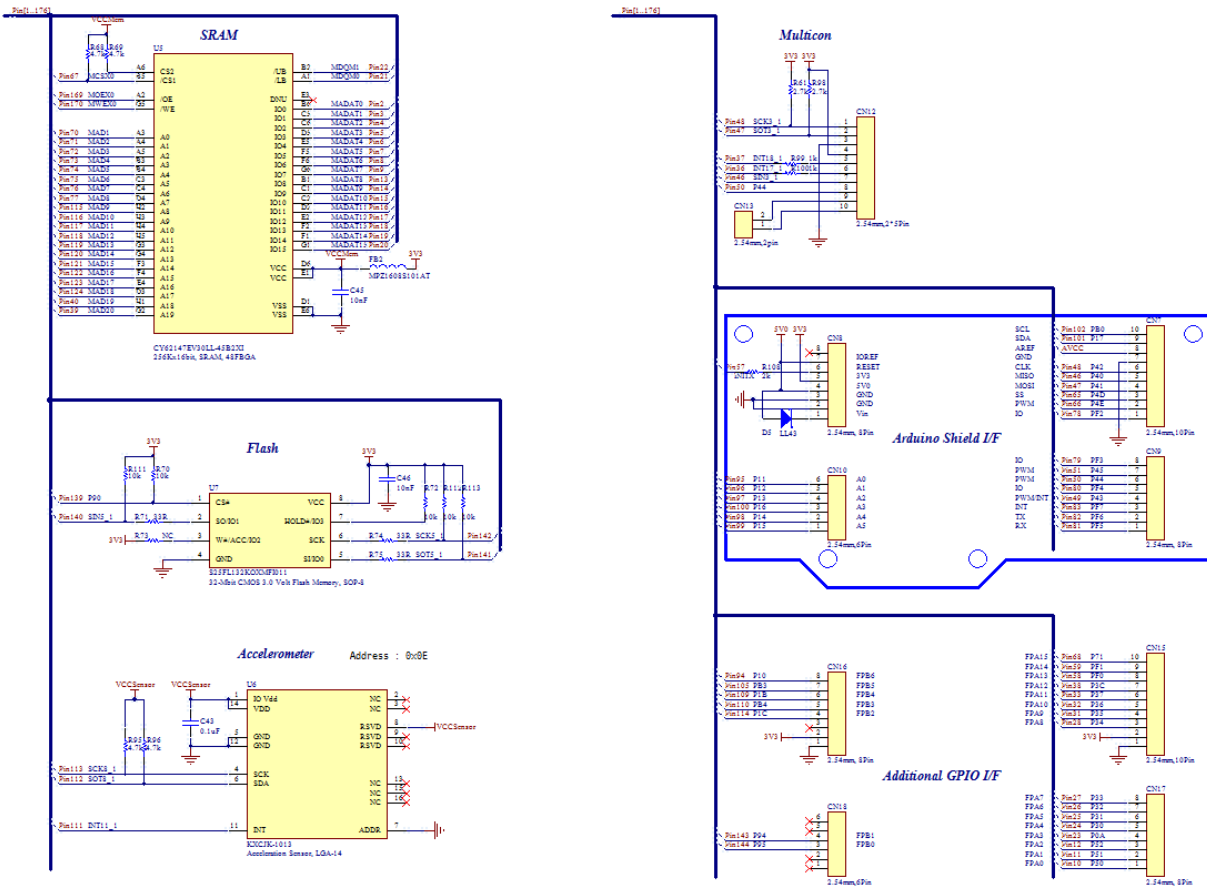


Figure A- 5. Memory, Sensor and Interfaces



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	Socketty 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-C4 SA-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	S25FL132K0XMF011

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

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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". Updated Introduction: Updated Kit Contents: Updated Figure 1-1. Updated Board Details: Updated Figure 1-2. Updated Jumpers and Connectors: Updated Table 1-1. Updated Installation and Test Operation: Updated Install Software: Updated description. Updated Figure 2-1. Updated Uninstall Software: Updated description. Updated Test Operation: Updated Run the Test Demo (Updated description). Updated Hardware: Updated Hardware Features: Updated description. Updated Hardware Details: Updated User Button and LED (Updated Table 3-1). Updated Software Development: Updated Tool Options: Updated Build an Example Project with Keil µVision IDE (Updated description).

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*D	5353023	07/15/2016	SAGA	Updated Figure 2-1 . Updated template.
*E	5600004	1/24/2017	ZQLI	Update Table 3-5 . Update Figure 3-9 . Updated Disclaimer.
*F	5749732	05/25/2017	AESATMP9	Updated logo and copyright.