



Slide for DEMO9S08SC4

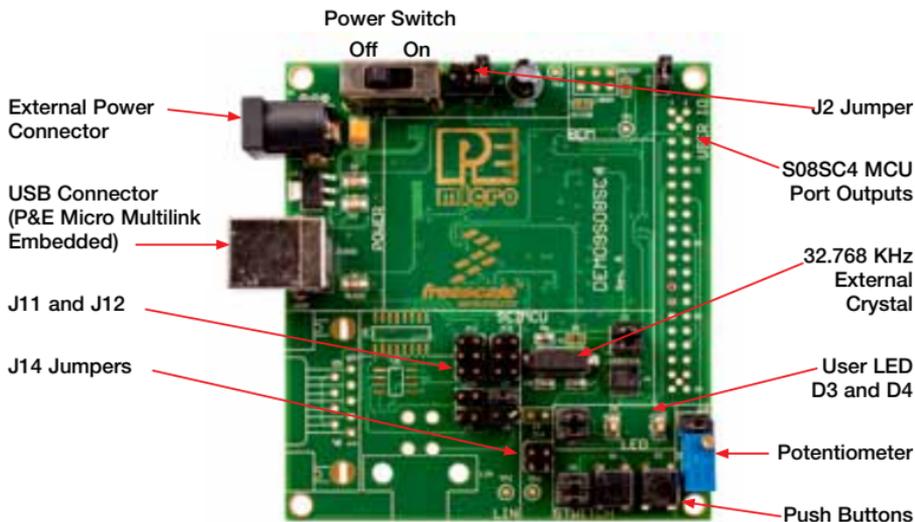


DEMO9S08SC4

Simplicity with substance



Get to know the DEMO9S08SC4 board



NOTE: For additional details, refer to the DEMO9S08SC4 User Manual and Board Schematics from the accompanying CD. You will find useful information such as default jumper settings and 9S08SC4 device signal mapping to the MCU port outputs.



Introduction

The DEMO9S08SC4 is a cost-effective kit targeting quick microcontroller evaluation. This quick start guide is designed to prepare you to develop your SC4 application within minutes.

Step-by-Step Installation Instructions



Install CodeWarrior for Microcontrollers 6.3

CodeWarrior is a powerful microcontroller (MCU) software development tool that maximizes your time to market. In order to run a project for the MC9S08SC4 device, a one-time installation of CodeWarrior 6.3 is required.

1. Insert the Getting Started CD into a computer and a menu will appear.
2. Click on “Install CodeWarrior Development Studio for Microcontrollers 6.3.” Follow the on-screen instructions until installation is complete.

To learn more about this tool, open CodeWarrior via the start menu “Programs > Freescale CodeWarrior > CodeWarrior Development Studio for Microcontrollers V6.3 > CodeWarrior IDE.exe” path.

Click “Run Getting Started Tutorial” from the startup dialog, select a tutorial

and follow the on-screen instructions. Take advantage of several CodeWarrior tutorials that will walk you through various development tool features, such as “C Programming,” “Assembly Programming,” “Using Processor Expert” and more.

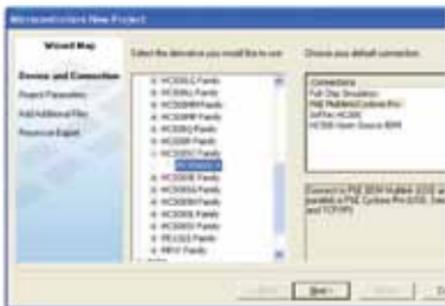


Figure 2. After the completion of STEP1, you will be able to create a new MC9S08SC4 project in CodeWarrior 6.3.



Figure 3. Showing startup dialog that appears when you start CodeWarrior. You can choose to Load Example Project from other various S08 devices.

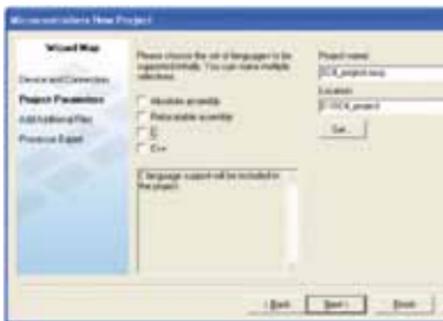


Figure 4. Showing the option to create a C/C++/Assembly base project.

P&E Embedded Multilink Toolkit Features:

- Logic Analyzer
- Accelerometer Demo
- Serial Grapher
- Terminal Window
- Unsecure Utility

For further details, refer to the DEMO9S08SC4 User Manual (DEMO9S08SC4_User_Manual_1_00.pdf).

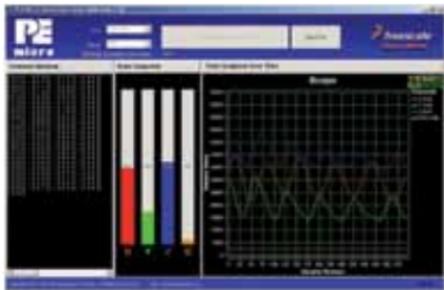


Figure 5. Serial Grapher Utility interface. This can be used to graph waveform from data sent from the MCU's SCI module.



Figure 6. P&E Terminal window interface. Interact with the MCU's SCI module.

STEP 2 Install P&E Embedded Multilink Toolkit

This P&E Embedded Multilink Toolkit includes graphical utilities that run on your computer and help speed your development. These utilities take development beyond the hardware and interact with the target MCU. The DEMO9S08SC4 USB connector has multi-function capabilities. It's a BDM connector, UART-USB-UART bridge and logic capturer.

Debug your MCU in CodeWarrior using just the USB connection while simultaneously running one of the following utilities: Logic Analyzer, Serial Grapher or Terminal window.

1. Insert the provided Getting Started CD into a computer and a menu will appear.
2. Click on "DEMO9S08SC4," then click on "Install P&E Embedded Multilink Toolkit." This will launch the installer.
3. Follow the on-screen instructions to complete installation.

For more information on P&E Embedded Multilink Toolkit, read the board user manual (DEMO9S08SC4_User_Manual_1_00.pdf) included in the CD under menu “DEMO9S08SC4 >DEMO9S08SC4 User Manual.” Or visit the following link for the latest updates. www.pemicro.com/fixedlinks/demoQEtoolkit.html



Connect Board to Computer

USB driver installation is a one-time required step which first requires CodeWarrior installation.

1. Connect the provided USB cable from a free USB port on your computer to the USB connector on the board.
2. Allow the PC to automatically configure the USB drivers as needed. Choose the recommended option to install the drivers.
3. Once USB driver installations are complete, the green USB LED next to the USB connector should illuminate.



Figure 7. Showing Logic Analyzer interface used by DEMO9S08SC4 Application Demo to display the signal output from the MC9S08SC4 PTA1 port (IN0) and PTB5(IN1).

Programming the MCU with CodeWarrior

1. Copy the CodeWarrior project file by selecting the Software tab from the CD menu and clicking the DEMO9S08SC4 Application Demo link. This will begin extraction of the project files. Place the project in a new folder, e.g., C:\...\My Documents\SC4 Project\.
2. Open CodeWarrior for Microcontrollers from the start menu “Programs > Freescale CodeWarrior > CodeWarrior Development Studio for Microcontrollers V6.3 > CodeWarrior IDE.exe.”
3. Close the Startup and Tip of the Day dialog.
4. From the CodeWarrior menu near the right corner, choose “File > Open” and choose the DEMO9S08SC4_APP.mcp. This file is in the folder that you created in STEP 4 procedure 1. Click “Open” to open the project. Alternatively, you can also drag the “DEMO9S08SC4_APP.mcp” file into the CodeWarrior IDE to open the project.
5. The main portion of the C code for this example is contained in the “DEMO9S08SC4_APP.c” file. Open this file to review the code.
6. Turn board power switch to the On position and close any previously opened debugger window.
7. Compile and program the MC9S08SC4 with the Demo Application by clicking on the Debug button . This launches PEMICRO Connection Manager.
8. From the Connection Manager menu, select “USB HCS08/HCS12/CFV1 Multilink-USB Port.” Check the box for “Use custom trim reference frequency” then enter 31250. Click on “Connect (Reset).”
9. From Erase and Program Flash menu, click “Yes” to allow the debugger to mass erase the microcontroller’s on-chip flash memory and program it with this application.

STEP
5

Run and Debug Code

Once the chip is programmed successfully, you will be led to the “True-Time Simulator and Real-Time Debugger” window.

1. From the main menu, choose “Run> Start/Continue” or click  to execute the program in real time.
2. From the main menu, choose “Run > Halt” or click  to halt the execution. The next instruction to be executed is highlighted in the source window.
3. From the main menu, choose “Run > Single Step” or click . The instruction highlighted in the source window will be executed and the program execution will be halted in the next line of code.
4. From the main menu, choose “Run > Start/Continue” or . The application will resume real-time execution from where it was previously halted.
5. Congratulations! You have successfully completed the software and hardware setup and acquired the basic debug environment. In the next section, we will focus on how the DEMO9S08SC4 Application Demo works.



DEMO9S08SC4 Application Demo

The DEMO9S08SC4 Application Demo is a digital light dimming application that controls the board's LED D3 and D4 brightness. You can control LED D3 brightness via the on-board push buttons or the P&E Terminal window that communicates with the MCU's SCI module.

You can control LED D4 brightness by rotating the potentiometer on the board. To help rotate the potentiometer you may need a thin Phillips screwdriver. Please follow the steps below to properly run this demonstration.

Controlling LED D3

1. Download and start the DEMO9S08SC4 Application Demo code as mentioned in STEP 4 and STEP 5.
2. Launch Terminal Utility from the start menu "Programs > P&E Embedded Multilink Toolkit > Utilities > Terminal Utility." *See DEMO9S08SC4 User Manual for more details on the Terminal Utility.
3. In the utility, select "USB COM" for Port and "4800" for Baud. Then, click "Connect Serial Port." The MCU will print the welcome menu to the Terminal window. Press the spacebar to display the full menu.
4. Enter "a" to enable controls of LED D3 via the Terminal window. The Terminal window will also display a sub menu.
5. The LED D3 has four levels of brightness. The brightness is increased by about 25 percent each time you press button S1 or enter 1 from the Terminal window until full brightness is reached.
6. LED D3 brightness is decreased by about 25 percent each time you press button S2 or enter 2 from the Terminal window until it is completely turned off.
7. LED D3 brightness may be turned up to full at any time by entering 3 in the Terminal window.
8. LED D3 may be completely turned off at any time by entering 4 in the Terminal window.

Controlling LED D4

9. In the Terminal window, enter “e” to return to main menu. Select option b to enable LED D4 control by the potentiometer. This will enter a sub menu.
10. Rotate the potentiometer clockwise to dim the LED D4 or counter clockwise to brighten up the LED D4. The LED D4 is based on the 10-bit ADC value and has 1,023 levels of brightness. The human eye may not be able to detect the change of brightness in 10-bit resolution, therefore you may need to rotate the potentiometer numerous times in one direction to see the change of brightness.
11. To read the 10-bit digital representation of the potentiometer voltage at a given moment, enter 1 in the sub menu. If you rotate the potentiometer, then enter 1 again in the sub menu, a new ADC value will be printed to the Terminal window.

Analyzing LEDs Signals with Logic Analyzer Utility

12. Enable the LED D4 controlled by the potentiometer from the Terminal window in procedure 8 on the previous page.
13. Close the Terminal window before opening the Logic Analyzer Utility.
14. Launch Logic Analyzer utility from the start menu “Programs > P&E Embedded Multilink Toolkit > Utilities > Logic Analyzer Utility.” *See DEMO9S08SC4 User Manual for more details on the Logic Analyzer Utility.
15. In the utility, click “Connect to Embedded Multilink Analyzer and Graph Pins” to begin graphing IN0 and IN1. These signals will be continually graphed at a sampling rate of 10 kHz.
16. As you push buttons S1 and S2, you will see IN1 duty cycle changes. As you rotate the potentiometer you will see IN0 duty cycle changes. Logic analyzer channel IN1 displays a

mirror PWM signal that controls LED D3. IN0 displays a mirror PWM signal that controls LED D4.

17. On the right side of either the IN0 or the IN1 waveform, click  to pause the waveform. The  becomes . If you click , the waveform will resume in 10 KHz real-time capture.
18. Click  to zoom in the corresponding waveform until the waveform is viewable. Click  to zoom out the corresponding waveform. Alternately, you may zoom in on a specific area of the waveform by holding down the left button on your mouse and drawing a square/rectangle over your area of interest.

Learn more at freescale.com/8bitauto.

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