Freescale Semiconductor
Quick Start Guide

Document Number: S12XFSTARTUG
Rev. 1, 09/2007

S12XF Starter Kit

Quick Start Guide

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1 Introduction

Thank you for your interest in the Freescale Semiconductor S12XF starter kit. This kit helps you gain experience with the M9S12XF family of microcontrollers. By following the instructions in this guide, you can establish a FlexRay network in approximately 1 hour, depending on the speed of your PC and the installation time of the CodeWarrior™ Development Studio software.

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2 Kit Contents

Unpack the kit and verify all of the items listed are present. Please contact your Freescale representative if your kit is incomplete.

The S12XF kit contains:

- Freescale EVB9S12XF512E information CD
- Two 12 Vdc 500 mA DC power supplies with interchangeable AC prongs
- Two EVB9S12XF512E boards (EVBs) fit with jumpers
- One P&E USB BDM Multilink with USB and BDM cable
- One CAN cable assembly in plastic bag
- Two FlexRay cable assemblies in plastic bag
- Eight aluminum standoffs, eight screws, and four 9-pin headers
- Decomsys Designer Pro Evaluation version CD
- Warranty registration card
- Technical information center support sheet
- CodeWarrior Special Edition Tri-pak including Development Studio for HCS12(x) v. 4.6 CD, Development Studio for Microcontrollers v. 6.0 CD, and a service pack CD

3 Information CD

The information CD for the product is included in the S12XFSTARTERKITE box. The CD includes:

- Data sheets
  - Link to M9S12XF512 reference manual (covers M9S12XF512, M9S12XF384, M9S12XF256, and M9S12XF128 microcontrollers)
  - MC33742 system basis chip technical data
- Documentation
  - EVB9S12XF512E user guide
  - EVB9S12XF512E quick start guide
  - S12XF Starter Kit quick start guide
- Hardware
  - EVB9S12XF512E schematics
  - EVB9S12XF512E bill of materials
- Software
  - EVB9S12XF512E_StandAlone_LS.zip application example
  - EVB9S12XF512E_Node1_LS.zip application example
  - EVB9S12XF512E_Node2_LS.zip application example
  - EVB9S12XF512E_StandAlone_FS.zip application example
  - EVB9S12XF512E_Node1_FS.zip application example

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  - EVB9S12XF512E_Node2_FS.zip application example
- Web links
  - M9S12XF512 product summary page
  - MCZ33742 product summary page
  - EVB9S12XF512E tool summary page
  - S12XF starter kit tool summary page
  - S12XF512 service pack download page
  - M9S12XF512 reference manual (covers M9S12XF512, M9S12XF384, M9S12XF256, and M9S12XF128 microcontrollers)
  - EVB9S12XF512E application example codes
  - S12XFSTARTERKITE application example codes

The Decomsys Designer Pro CD (evaluation version) is also included in the EVB9S12XF512E box. All the information related to the Decomsys tool is on the Decomsys CD.

4 Connecting the USB Multilink

NOTE

Install the CodeWarrior Development Studio for HCS12(x) v. 4.6 software before you proceed. This will download the required P&E drivers to your computer for installation.

Connect the P&E USB Multilink to one of the available USB ports on your PC using the supplied cable. This automatically starts the driver installation process, which differs slightly between Windows® XP and 2000. Complete the on-screen prompts, selecting not to search the web for drivers (if asked) and to install the drivers automatically. The correct drivers are automatically located and installed for the P&E Multilink. If the driver installation is successful, the blue LED on the Multilink illuminates.

If you have problems at this stage, re-install the P&E drivers. The drivers should be located in "<FSL Install Path>\P&E Tools\USB Driver"*). Please refer to the P&E documentation for further references and assistance.

NOTE

<P&E Install Path> is the P&E debugger installation directory, default "c:\pemicro."

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5 Connecting the EVB

NOTE

Before programming the EVBS12XF512E, remove jumper J27. After the programming sequence is finished, jumper J27 must be connected to enable the reset line to the system basis chip. This procedure must be performed every time the EVB9S12XF512E is programmed. The signals of the FlexRay transceivers are present on the drill holes of connectors J11 and J14. For pin connections, 9-pin connectors can be assembled to the board in these places.

Using anti-static precautions, remove both EVBs from their packages and place them on a smooth, level surface. The EVBs are ready to use and do not require switch or jumper re-configuration. The EVB9S12XF512Es are pre-flashed with the low-speed FlexRay network application examples. Connect the EVBs as detailed:

1. Connect the USB Multilink to the J2 BDM connector on the EVB using connector polarization. Align the red strip on the ribbon cable to the pin marked ‘1’ on connector J2. This indicates correct polarization, which does not damage the MCU.
2. Verify the EVB switch SW4 (slide) on the upper part of the EVB is in the stand-alone position and connect the DC power supply to connector J25. Repeat with the second EVB.
3. Connect the supplied FlexRay cables from J12 and J15 of one EVB to the same connector in the second EVB.
4. Connect the CAN cable included in the kit to connectors J29 of each EVB. The CAN cable is required for application examples 3 and 4 only, or for any other application that uses the CAN features on the board.
5. Connect the DC power supply to the mains using the appropriate mains plug. If connected correctly, various EVB power LEDs illuminate and the Freescale logo LEDs flash from the FlexRay frames being sent and received from both boards. If the LEDs are not illuminated, check the power supply connections and reset the boards by pressing and releasing SW1.

Figure 1 shows how the two EVBs look after connection.

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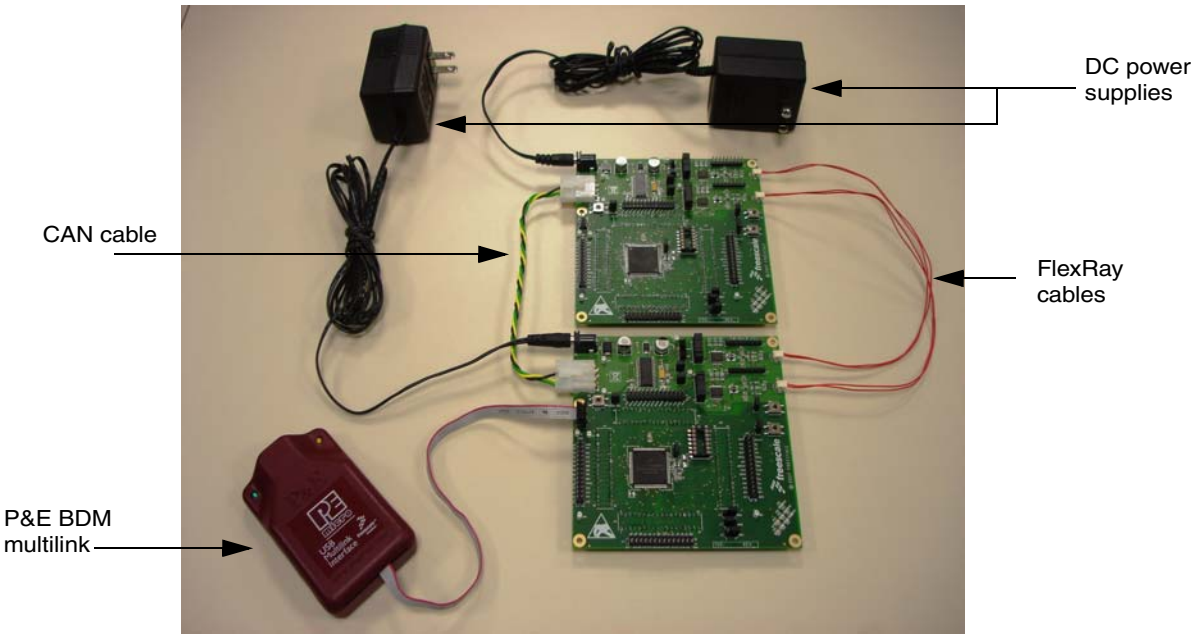

Figure 1. Connected EVBs

6 Application Example 1—Low-Speed Stand Alone

NOTE

For a detailed description of how to download the code to the EVB9S12XF512E, refer to Section 4 of the EVB9S12XF512E User Manual (document number EVB9S12XF512EUM) included on the user documentation CD.

Load the EVB9S12XF512E_StandAlone_LS.mcp project into the board. In this example project the EVB9S12XF512E is configured to operate as an isolated board. Its local communication modules and the input/output capabilities are exercised to allow basic tests of the EVB hardware integrity as well as verifying the code downloading procedure.

The functions performed in this example project are:

- Real-time interrupt configured to 500 ms period and used as the base time for the task scheduler
- SPI master operating at 500 kHz
- System basis chip (SBC) initialized in debug mode
- FlexRay module configured for wake-up frames transmission at 1.25 Mbit/s
- IRQ detection when SW2 is pressed; interrupt service indicated by toggling D26
- Input capture IOC7 stimulated by SW3; interrupt serviced by the XGATE and indicated by toggling D24
- Microcontroller successive tasks are separated by 1 s intervals, the general-purpose LEDs are continuously toggled by columns in this sequence:
  - LEDs D22, D27, and D29

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— LEDs D23, D25, and D28 (FlexRay wake-up frames transmission)
— D24 and D26 toggle

7 Application Example 2—Low-Speed FlexRay Network

For this example you need two EVBs, because each acts as a FlexRay node, exchanging frames in a simple network. One EVB must be programmed using the EVB9S12XF512E_Node1_LS.mcp project and the other must be programmed with the EVB9S12XF512E_Node2LS.mcp code. Also, the FlexRay channels must be properly interconnected between the EVBs.

The main functions performed in this example project are:

- Real-time interrupt configured to 500 ms period and used as the base time for the task scheduler
- SPI master operating at 500 kHz
- System basis chip (SBC) initialized in debug mode
- FlexRay module fully configured for frames transmission and reception at 1.25 Mbit/s. In Node1 the FlexRay events are interrupt driven; whereas, in Node2 there is a polling procedure for the frames handling
- LED indicators D22, D27, and d29 are sequentially turned on and activated
- FlexRay activity and frames interchange are indicated by the toggling of LEDs D23, D25, and D28 at 1 s intervals; to ease visual perception, the LEDs are turned on each time the RTI is serviced and turned off when a FlexRay function is performed

  For Node1 the LED activation is:

  — Slot 1 transmission, D23
  — Slot 4 reception, D25
  — Slot 62 reception, D28

  For Node2 the LED activation is:

  — Slot 1 reception, D23
  — Slot 4 transmission, D25
  — Slot 62 transmission, D28
- IRQ detection when SW2 is pressed; interrupt service indicated by toggling D26.
- Input capture IOC7 stimulated by SW3, interrupt serviced by the XGATE and indicated by toggling D24.

8 Application Example 3—Full-Speed Stand Alone

Load the EVB9S12XF512E_StandAlone_FS.mcp project into the board. In this example project, the EVB9S12XF512E is configured to operate as an isolated board. Its local communication modules and the input/output capabilities are exercised to allow basic tests of the EVB hardware integrity and to verify the code downloading procedure.

The main functions performed in this example project are:

- Real-time interrupt configured to 75 ms period and used as the base time for the task scheduler

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- SPI master operating at 2.5 MHz
- SBC initialized in debug mode
- CAN module configured for internal loopback transmission and reception at 500 Kbit/s
- FlexRay module configured for wake-up frames transmission
- Periodic XGATE access to SBC through SPI channel, 75 ms period
- Microcontroller successive tasks are separated by 225 ms intervals for a total period of 900 ms; the general-purpose LEDs are activated by columns to indicate the task executed in the following sequence:
  - CAN internal loopback transmission/ reception, LED indicators D22, D27 and D29
  - FlexRay wake-up frames transmission, LED indicators activated D23, D25 and D28
  - D24 and D26 toggled
  - LED indicators off
- IRQ detection when SW2 is pressed, interrupt service indicated by toggling D26
- Input capture IOC7 stimulated by SW3, interrupt serviced by the XGATE and indicated by toggling D24

9 Application Example 4—Full-Speed FlexRay and CAN Networks

For this example you need two EVBs, because each acts as a CAN and FlexRay node, exchanging frames in a simple network. One EVB must be programmed using the EVB9S12XF512E_Node1_FS.mcp project. The other must be programmed with the EVB9S12XF512E_Node2_FS.mcp code (these files are in the EVB9S12XF512E_Node1_FS.zip and EVB9S12XF512E_Node2_FS.zip files, respectively). The CAN and FlexRay channels must be properly connected between the EVBs.

The main functions performed in this example project are:

- Real-time interrupt configured to 75 ms period and used as the base time for the task scheduler
- SPI master operating at 2.5 MHz
- SBC initialized in debug mode
- CAN module configured for transmission and reception at 500 Kbit/s rate
- FlexRay module fully configured for frames transmission and reception at 10 Mbit/s. In Node1 the FlexRay events are interrupt driven, whereas in Node2 there is a polling procedure for the frames handling
- LED D22 toggled each time the RTI is serviced (75 ms period)
- Periodic XGATE access to SBC through SPI channel (75 ms period)
- CAN frames transmission every 150 ms; LED D27 activated
- CAN reception is interrupt based; LED D29 is activated to indicate a CAN frame received
- FlexRay activity is indicated by the fast toggling of LEDs D23, D25, and D28. To ease visual perception, these LEDs are turned on each time the RTI is serviced and turned off when a FlexRay function is performed. For Node1 the LED activation is:

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— Slot 1 transmission, D23
— Slot 4 reception, D25
— Slot 62 reception, D28

For Node2 the LED activation is as follows:

— Slot 1 reception, D23
— Slot 4 transmission, D25
— Slot 62 transmission, D28

- IRQ detection when SW2 is pressed, interrupt service indicated by toggling D26
- Input capture IOC7 stimulated by SW3, interrupt serviced by the XGATE and indicated by toggling D24

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Document Number: S12XFSTARTUG
Rev. 1
09/2007

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