S3 Family of Microcontrollers

S3F8S28 Development Kit

User Manual

S³ Microcontrollers

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Document Disclaimer

Revision History

Each instance in this document's revision history reflects a change from its previous edition. To learn more, refer to the corresponding page(s) or appropriate links furnished in the table below.

Date	Revision Level	Description	Page
Aug 2016	02	Updated for ZDS-S3 version 5.3.0. Removed ISP I support	All
Jul 2015	01	Original issue.	n/a

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Overview

Zilog's S3F8S28 Development Kit, part number S3F8S280100ZCOG, allows you to evaluate your S3F8S28-based designs and applications. The Kit features a Development Board consisting of the following components:

- Four LEDs

- Two pushbuttons

- UART

- Header Pins

This user manual provides instructions for setting up and configuring the S3F8S28 Development Board. It includes schematic diagrams and a discussion of the Board features and ZDS II.

The S3F8S28 Development Board features an S3F8S28 MCU in a 24-pin SOP package, plus an S3 PGM connector to connect the Board to a host development PC using the S3 Flash In-System Programmer (ISP) II. To learn more about the S3F8S28 MCU, refer to the S3F8S28 Product Specification (PS0313) and/or the S3 Flash In-System Programmer User Manual (UM0266).

This document guides you through the following tasks:

- Downloading and installing ZDS II software and documentation

- Connecting the S3 Flash ISP II and S3F8S28 Development Board to your PC

- Starting the S3F8S28 Ledblink sample program

Kit Contents

The S3F8S28 Development Kit contains the following items:

- S3F8S28 Development Board

- S3 Flash ISP II

- 10-circuit ribbon cable

- USB A (male) to Mini-B USB cable (2)

- S3F8S28 Development Kit hardcopy insert

Figure 1 shows the contents of the S3F8S28 Development Kit.

Figure 1. The S3F8S28 Development Kit

Features

The S3F8S28 Development Kit includes the following key items.

- S3F8S28 Development Board, which contains the following features:
    - S3F8S28 24-pin SOP MCU operating at 12 MHz, with 8 KB of internal Flash memory and 2 KB of internal RAM memory
    - USB interface to supply power to the board
    - UART header at J8
    - Test Points header for all pins of MCU
    - MCU current measurement Test Points J1-1 and J1-2
    - ADC4/P0.4 adjustable input voltage (using potentiometer R8)

- S3 Flash In-System Programmer II
- ZDS II software, samples, and documentation available free for download
    - Sample programs

Supported Host Environments

The S3F8S28 Development Board supports the following operating systems:

- Microsoft Windows 7 (32-bit/64-bit)
- Microsoft Windows 8 (32-bit/64-bit)

Install the ZDSII Software and Documentation

Observe the following steps to download and install your ZDSII software and documentation.

> **Note:** If you have already installed ZDSII – S3 <version> and have downloaded the software and documentation by following the procedure on the paper insert in your kit (FL0172), skip ahead to the next section.

1. Prior to connecting the S3F8S28 Development Board to your development PC, download ZDS II for S3 v5.3.0 (or later) from the Downloadable Software category in the Zilog Store.

2. When the download is complete, unzip the file to your hard drive, then double-click the installation file named `ZDS2_S3_<Version>.exe` and follow the on-screen instructions.

3. When the ZDS II installation is complete, double-click the installation file named `DOCS_S3<version>.exe` and follow the on-screen instructions.

4. When these installations are complete, view the S3F8S28 Development Kit User Manual (UM0274); this document will be located in the following path, by default:
`C:\Zilog\ZDSII_ S3 _<version>\Documentation\Tools_Documentation`

Establish a Connection with the PC

Observe the following procedure to connect the S3 Flash ISP II and the S3F8S28 Development Board to your PC.

⚠️ **Caution:** Disconnect or turn off the power to the S3F8S28 Development Board before connecting or disconnecting the S3 Flash ISP II.

1. Connect the Mini-B side of the USB A (male)-to-Mini-B cable to the S3 Flash ISP II. Connect the other end of this cable to the PC, as shown in Figure 2.

Figure 2. Connecting the S3 Flash ISP II to the Development PC

2. Connect the 10p 5x2 ribbon cable to the S3 Flash ISP II, as shown in Figure 3.

Figure 3. Connecting the 10-pin Ribbon Cable to the S3 Flash ISP II

3. Connect the other end of the ribbon cable to Jumper J4/J5 on the Development Board. Ensure that Pin 1 on the ribbon cable is aligned with Pin 1 on the target connector, as indicated in Figure 4.
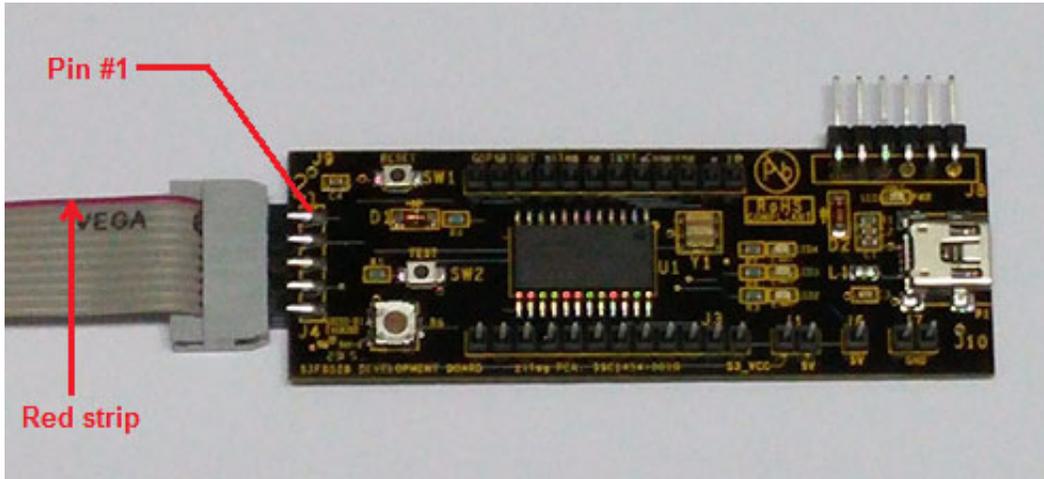
Figure 4. Debug Connectors J4 and J5

⚠️ **Caution:** Ensure that you connect the 10 pin ribbon cable using the correct orientation to prevent damage to the S3 Flash ISP II.

4. After completing the procedure to connect the S3F8S28 Development Board to the PC, the complete setup appears as shown in Figure 5.

Figure 5. The Completed ISP II and Development Board Assembly

Start the S3F8S28 Ledblink Sample Program

The S3F8S28 Development Kit includes a sample program that demonstrates an LED blinking application. To start the S3F8S28 Ledblink sample program, observe the following procedure.

1. Launch ZDSII by navigating from the Windows Start menu to **Programs → Zilog ZDSII − S3 <Version> → ZDSII − S3 <Version>**.

2. From the **File** menu in ZDSII, select **Open Project** as indicated in Figure 6, and navigate to the following filepath:

   ```
   <ZDS Install>\samples\S3F8S28\ledblink_asm
   ```
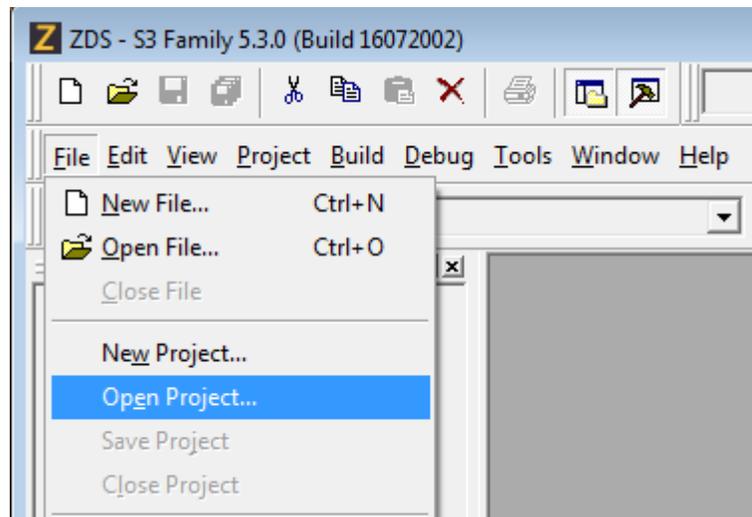

Figure 6. The Open Project Selection in the File Menu

3. Select the `ledblink.zdsproj` project from within the `ledblink_asm` folder as indicated in Figure 7 and click **Open**. A list of source files will appear in the Workspace panel.

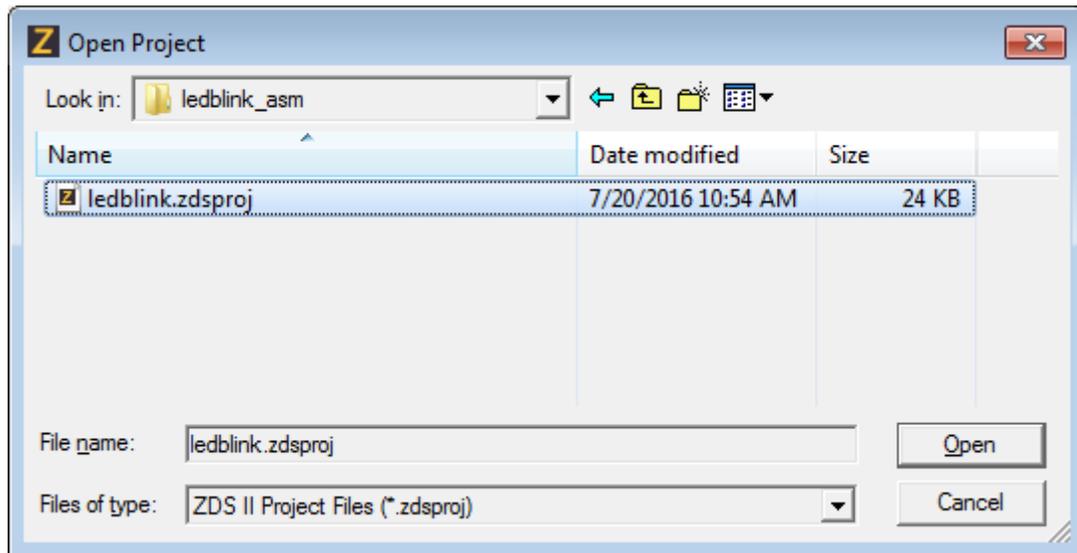**Figure 7. Select the ledblink.zdsproj Project**

4. From the **Build** menu, select **Set Active Configuration** to open the Select Configuration dialog box.

5. Select **Debug**, then click **OK** to close the Select Configuration dialog box.

6. From the **Project** menu in ZDS II, select **Settings** to open the Project Settings dialog box. In the Project Settings dialog box, click the **Debugger** tab.

7. On the Debugger page, select **S3F8S2X_FlashIspII** from the Target list, then select **S3FlashIspII** from the **Debug Tool** drop-down menu, as indicated in Figure 8.
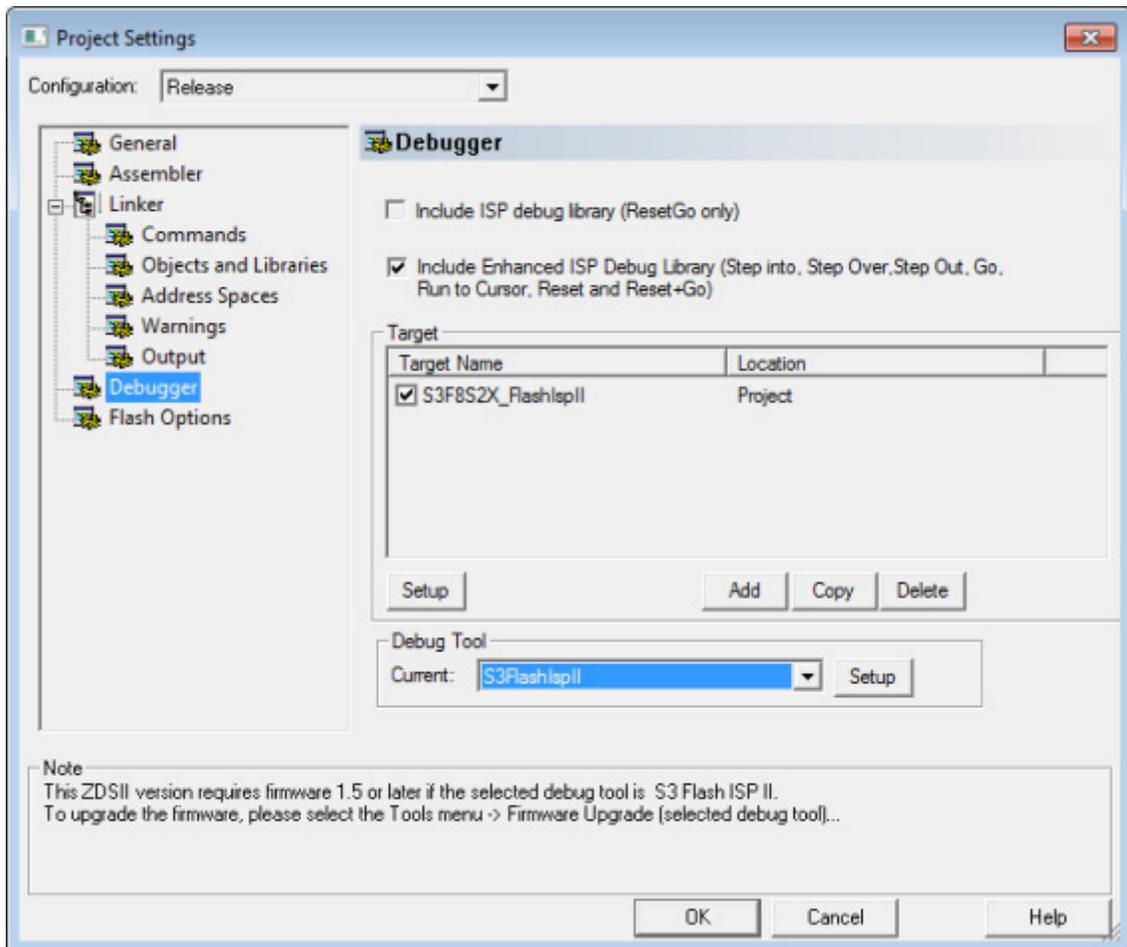

Figure 8. Select the Target and Debug Tool

8. After selecting **S3FlashIspII** from the Debug Tool drop-down menu, click **Setup** to select the serial number of the S3 Flash ISP II you are using, as indicated in Figure 9. Click OK to close the Setup USB Comunication dialog box.
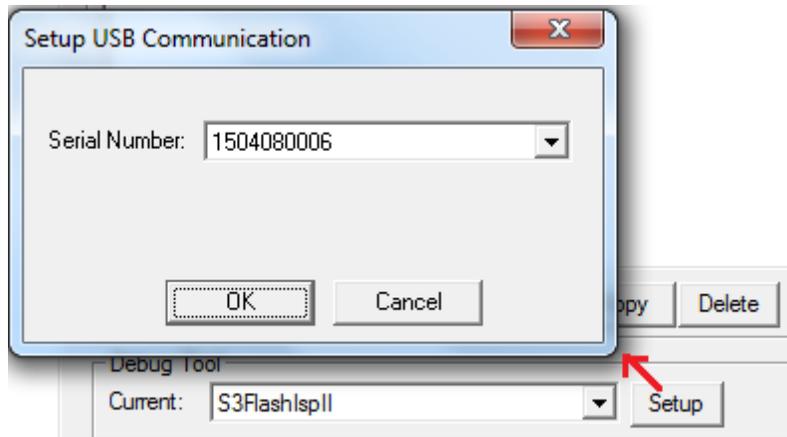
Figure 9. The Setup USB Communication Dialog

> ❯ **Note:** The serial number you see on your screen will be different from the serial number shown in Figure 9.

9. After selecting the serial number of the S3 Flash ISP II that you are using, select **Setup** from the Target field to select the Target Voltage.

10. From the Target Configuration dialog, enter "**0**" on **ISP_DBG_IDX** and select the **3.3V by ISP** button and Click **OK**. See Figure 10.
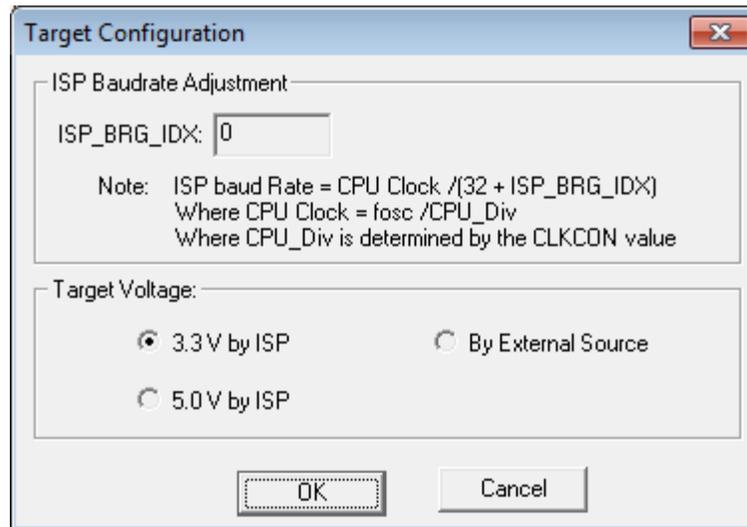
Figure 10. The Target Configuration Dialog

11. Make sure that the **Enhanced ISP Debug Library** is selected fom the Debugger window.

12. Click **OK** to close the Project Settings dialog box.

13. If you are prompted to rebuild any affected files, click **Yes**. Otherwise, choose **Build** from the menu bar, then click **Rebuild All**. The following example message is displayed.

```
OUTPUT CHECKSUM
ledblink.hex    B4D5
ledblink.lod    B4D5

0 warning(s)
0 error(s)
Build succeeded.
```

▶ **Note:** This Output Checksum message is an example and may not match the actual checksum of the project for a particular release of the ZDS installation software.

> ➤ **Note:** At this point, before executing a **Reset+Go** on the next step, the mini USB on P1 is disconnected.

14. To run the application, select **Reset+Go** from the **Debug** menu, as indicated in Figure 11. As a result, power LED1 will light up. LED2, LED3, and LED4 will blink in sequence.
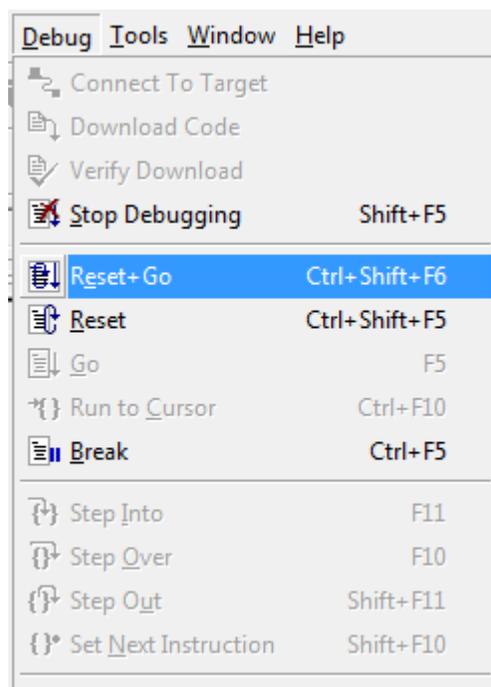
Figure 11. Select Reset+ Go from the Debug Menu

Troubleshooting Tips

The following troubleshooting tips are useful when starting the S3F8S28 Ledblink sample program.

- LED PWR indicator on the S3 Flash ISP II lights up when in debug mode and J1 is shunted.

- Navigate to **Project → Settings → Debugger → Debug Tool → Setup**. Upon clicking **Setup** on the Setup USB Communication dialog box, verify that **S3FlashIspII** is displayed.

- Remove and reconnect the ISP II on the USB port of your PC.

- Refer to to learn more about the operations and power options of the S3F8S28 Development Board.

S3F8S28 Development Board

The purpose of the S3F8S28 Development Kit is to provide a set of hardware and software tools for the development of hardware and firmware for applications based on the S3F8S28 microcontroller. An image of the S3F8S28 Development Board is shown in Figure 12; a block diagram is shown in Figure 13.
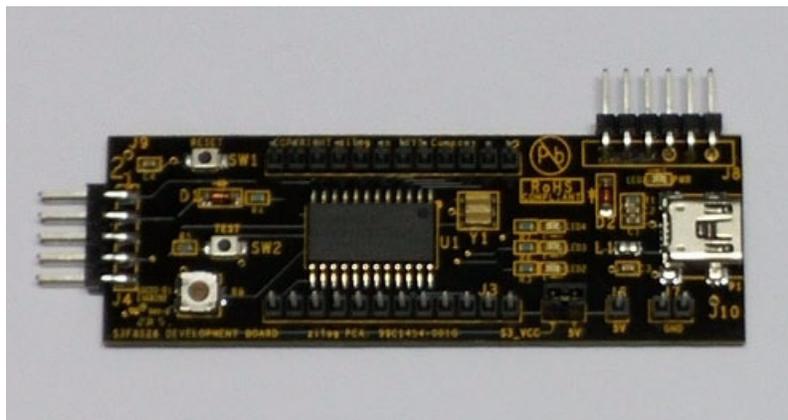

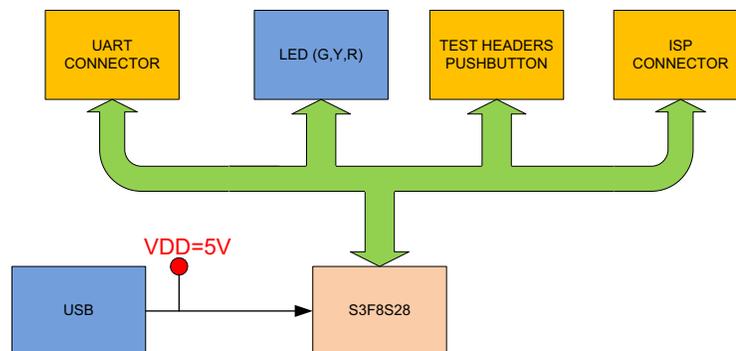**Figure 12. The S3F8S28 Development Board**

Figure 13. The S3F8S28 Development Board Block Diagram

Operations and Power Options

The operations and power options of the S3F8S28 Development Board are listed in Figure 14.

Operations and Power Options

Option	Operations	ISP II cable on J4/J5	USB Cable on P1	J1	Target Voltage	Power	Notes
1	Programming/ Debugging	ON	OFF	ON	3.3V by ISP	S3_VCC = 3.3V / VCC_5V = 3.3V	MCU power from S3 ISP II cable
2	Programming/ Debugging	ON	OFF	OFF	3.3V by ISP	S3_VCC = 3.3V / VCC_5V = N/A	MCU power from S3 ISP II cable
3	Programming/ Debugging	ON	OFF	ON	5.0V by ISP	S3_VCC = 5.0V / VCC_5V = 5.0V	MCU power from S3 ISP II cable
4	Programming/ Debugging	ON	OFF	OFF	5.0V by ISP	S3_VCC = 5.0V / VCC_5V = N/A	MCU power from S3 ISP II cable
5	Standalone VCC_5V	OFF	ON	ON	VCC = 5V	S3_VCC = VCC_5V	Apply VCC_5V using USB cable on P1
6	Standalone VCC_5V = Vin	OFF	OFF	ON	VCC_5V = Vin at J6	S3_VCC = VCC_5V = Vin	Apply Vin at J6

Figure 14. Operations and Power Options of the S3F8S28 Development Board

S3F8S28 MCU

Key features of the S3F8S28 MCU include:

- SAM88RC CPU core

- 8K x 8 bits program memory

- Endurance: 10,000 Erase/Program cycles

- 78 instructions

- Three I/O ports (maximum 22 pins)

- 8 interrupt levels and 17 interrupt sources (8 external interrupt and 9 internal interrupt)

- One 16-bit timer(Timer 0) or two 8-bit timers A/B with time interval mode

- Thirteen analog input pins (maximum)

- 12-bit conversion resolution

- Support serial data transmit/receive operations with 8-bit, 9-bit UART

To learn more about the S3F8S28 MCU, refer to the S3F8S28 Product Specification ([PS0313](#)).

Reset Circuit

The reset circuit features a 49.9KΩ pull-up resistor R4 and SW1. This circuit resets the S3F8S28 MCU when SW1 is pressed. See Figure 15 for a representation of the reset circuit.
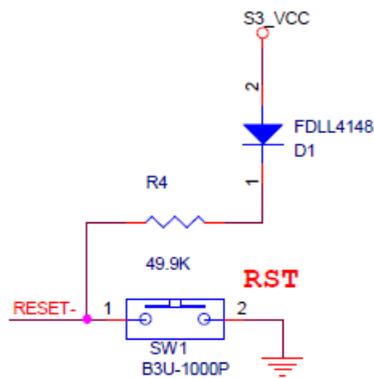
Figure 15. The Reset Circuit

ISP II Connector

The ISP II connector (J4/J5) provides an interface between the S3 Flash ISP II tool and the S3F8S28 device. See Figure 16 for an illustration of the ISP II connector.
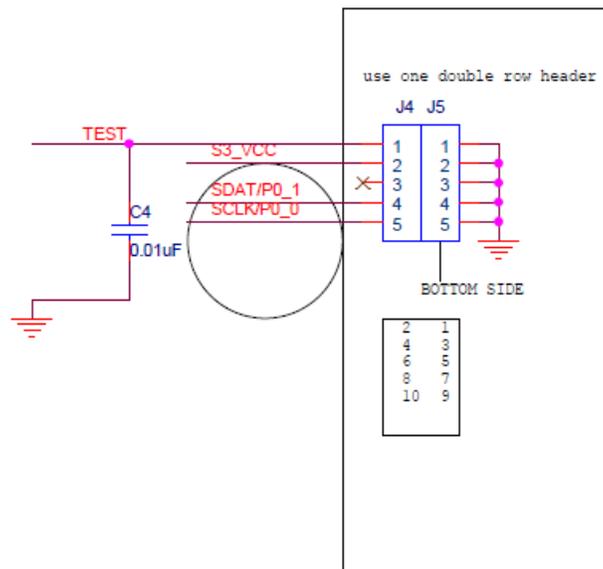
Figure 16. The ISP II Connector

ZDS Flash Loader Utility

A Flash Loader utility is included in Zilog Developer Studio II via the Tools menu. Figure 17 shows an image of the Flash Programming screen.
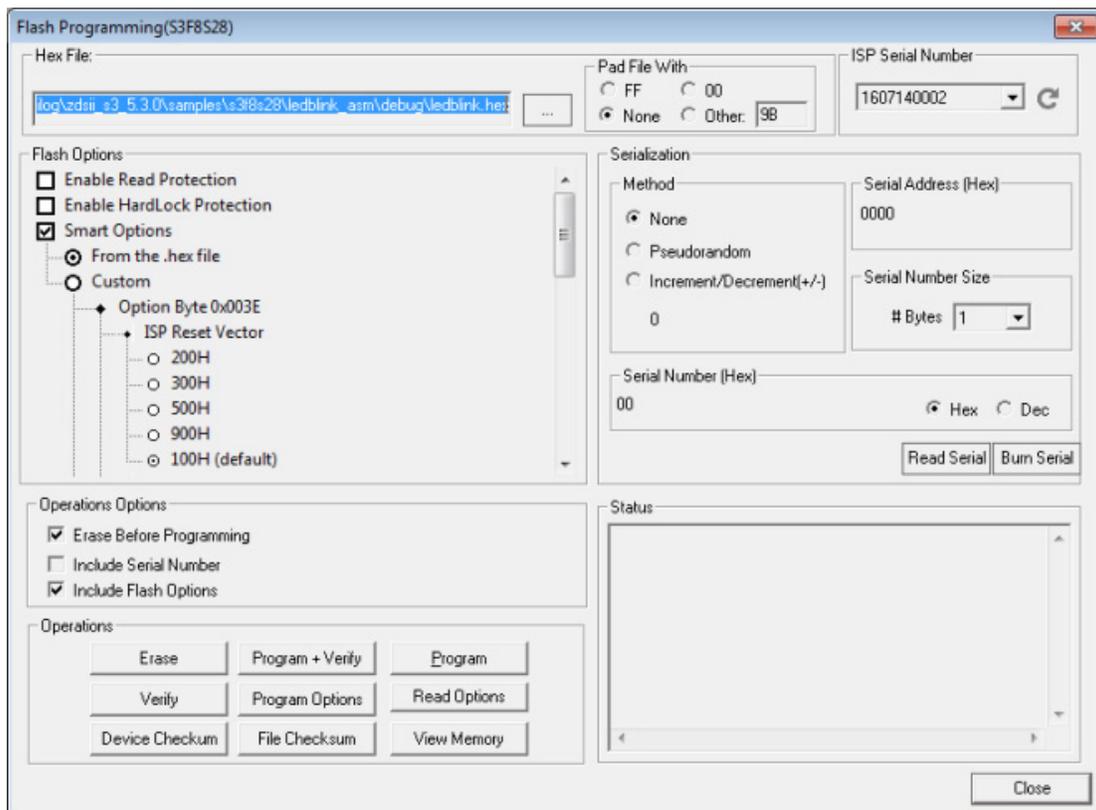

Figure 17. The Flash Programming Screen

You can program the S3F8S28 MCU directly using the hex code generated from the ZDS IDE tools.

S3F8S28 Development Kit Documentation

The documents associated with the S3F8S28 Development Kit are listed in Table 1. Each of these documents can be obtained from the Zilog website by clicking the link associated with its Document Number. Alternatively, navigate to the directory listed in the Location column in your installed application.

Table 1. S3F8S28 Development Kit Documentation

Document	Description	Location
UM0274	S3F8S28 Development Kit User Manual	Documentation\Tools_Documentation
PS0313	S3F8S28 Product Specification	Documentation\Chip_Documentation
UM0266	S3 Flash In-System Programmer User Manual	Documentation\Tools_Documentation
FL0172	S3F8S280100ZCOG Development Kit Insert	Documentation\Tools_Documentation
FL0165	S3 Flash In-System Programmer Insert	Documentation\Tools_Documentation
Online Help	ZDS II-S3 IDE, Assembler and C Compiler On-Line Help	ZDS II-S3 >Help >Help Topics

S3F8S28 Sample Projects

Table 2 lists the sample projects developed for this application. Follow the filepath stated in the Location column to access the associated project.

Table 2. S3F8S28 Sample Projects

Project	Location
ledblink	samples\ledblink_asm
ledblink	samples\ledblink_c
S28_Demo	samples\ISP_BL_Demo

Appendix A. Schematic Diagram

Figure 18 presents a schematic diagram of the S3F8S28 Development Board.
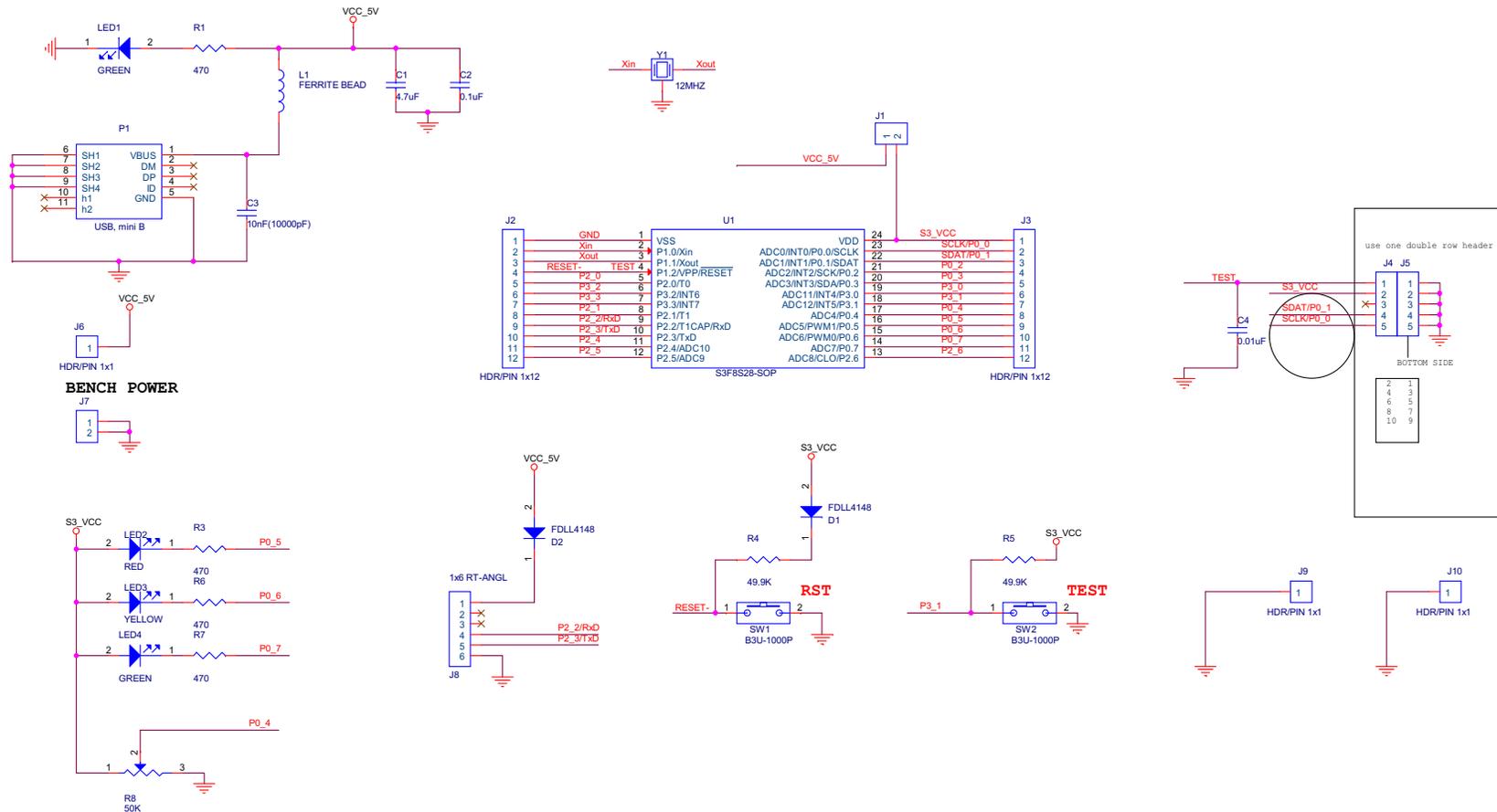

Figure 18. S3F8S19 Development Board Schematic Diagram

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