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S3 Family of Microcontrollers

S3F80QB Development Kit

User Manual

UM026704-0816

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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	04	Updated for ZDS-S3 version 5.3.0. Removed ISP I support	All
Oct 2014	03	Updated the Establish a Connection with the PC and High-Power Infrared-Emitting Diode sections; added sample projects to Table 3.	4, 17, 21
Sep 2014	02	Updated the sections Start the Ledblink Sample Program and Install the S3 Flash ISP Driver for improved usability.	7, 23
Jun 2014	01	Original issue.	n/a

Overview

Zilog's S3F80QB Development Kit, part number S3F80QB0100ZCOG, allows you to evaluate your S3F80QB-based designs and applications. The Kit features a Development Board consisting of the following components:

- Four LEDs
- Seventeen pushbuttons
- Buzzer/speaker
- Four high-power infrared (IR) emitting diodes
- IR receiver module
- Device pin headers

This user manual provides instructions for setting up and configuring the S3F80QB Development Board. It includes schematic diagrams and a discussion of the Board features and ZDSII.

The S3F80QB Development Board features an S3F80QB MCU in a 44-pin QFP package, plus an S3 PGM connector to connect the Board to a host development PC using the S3 Flash In-System Programmer II (ISP). To learn more about the S3F80QB MCU, refer to the S3F80QB Product Specification (PS0308) and/or the S3 Flash In-System Programmer.

This document guides you through the following tasks:

- Downloading and installing ZDSII software and documentation
- Connecting the S3 Flash ISP II and S3F80QB Development Board to your PC
- Starting the S3F80QB Ledblink sample program

Figure 1 shows the contents of the S3F80QB Development Kit.

Figure 1. The S3F80QB Development Kit

Kit Contents

The S3F80QB Development Kit contains the following items:

- S3F80QB Development Board
- S3 Flash ISP II
- 10-circuit ribbon cable
- USB A (male) to Mini-B USB cable (2)
- S3F80QB Development Kit hardcopy insert

Features

The S3F80QB Development Kit includes the following key items.

- S3F80QB Development Board, which contains the following features:
  - S3F80QB 44-pin QFP MCU operating at 8MHz, with 63KB of internal Flash memory and 1KB of internal RAM memory
  - USB interface that provides power to the Board
  - High-power infrared emitting diode
  - Buzzer/Speaker
  - IR receiver module
  - Test points for all pins of the MCU
  - MCU current measurement test points J7 and J8
  - Power supply level adjustable with potentiometer R18
- S3 Flash In-System Programmer II
- ZDSII software, samples, and documentation available free for download
  - Sample programs

Supported Host Environments

The S3F80QB 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 (FL0166), skip ahead to the next section.

1. Prior to connecting the S3F80QB Development Board to your development PC, download ZDSII for S3 Family devices version 5.3.0 (or later) from the **Downloadable Software** category in the Zilog Store.
2. When the download is complete, unzip the file to your hard drive. Double-click the installation file named ZDSII – S3_<version>.exe, and follow the on-screen instructions.

Establish a Connection with the PC

Observe the following procedure to connect the S3 Flash ISP II and S3F80QB Development Board to your PC.

Caution: Disconnect or turn off the power to the S3F80QB 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. Connect 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. Connect the 10-Pin Ribbon Cable to the S3 Flash ISP II

3. Connect the other end of the ribbon cable to Jumper J6 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.

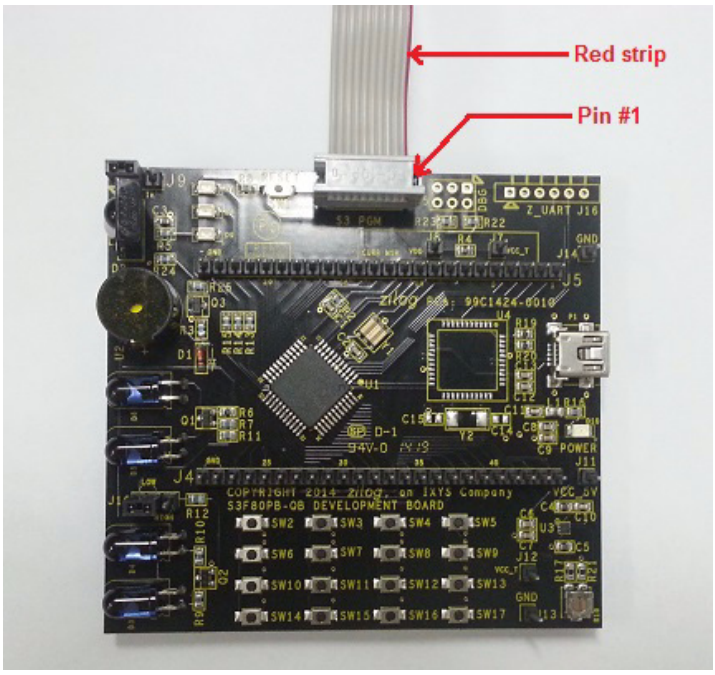

Figure 4. Debug Connector J6

Caution: When connecting the 10-pin ribbon cable, be sure to use the correct orientation to prevent damage to the S3 Flash ISP II.

4. With the USB A (male) to Mini-B cable, connect Port P1 on the S3F80QB Development Board to a USB port on the development PC to apply power to the Development Board, as indicated in Figure 5.

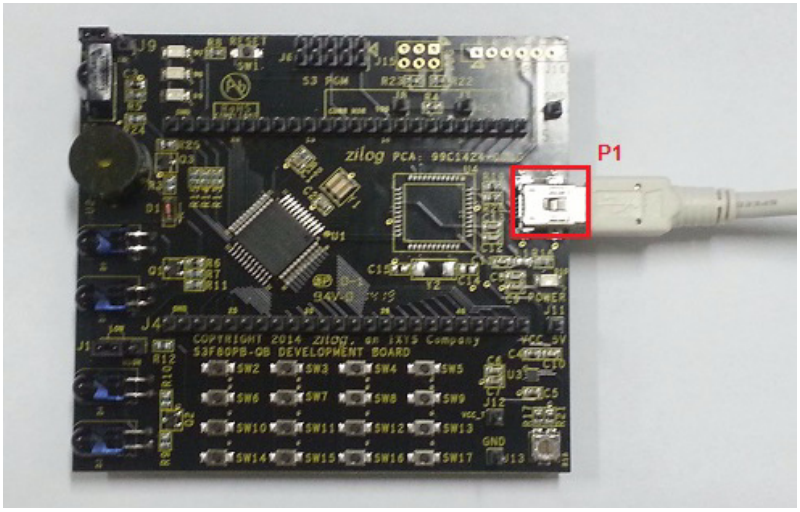

Figure 5. The Power Supply Port P1 Connector

After completing the procedure to connect the S3F80QB Development Board to the PC, the complete setup appears as shown in Figure 6.

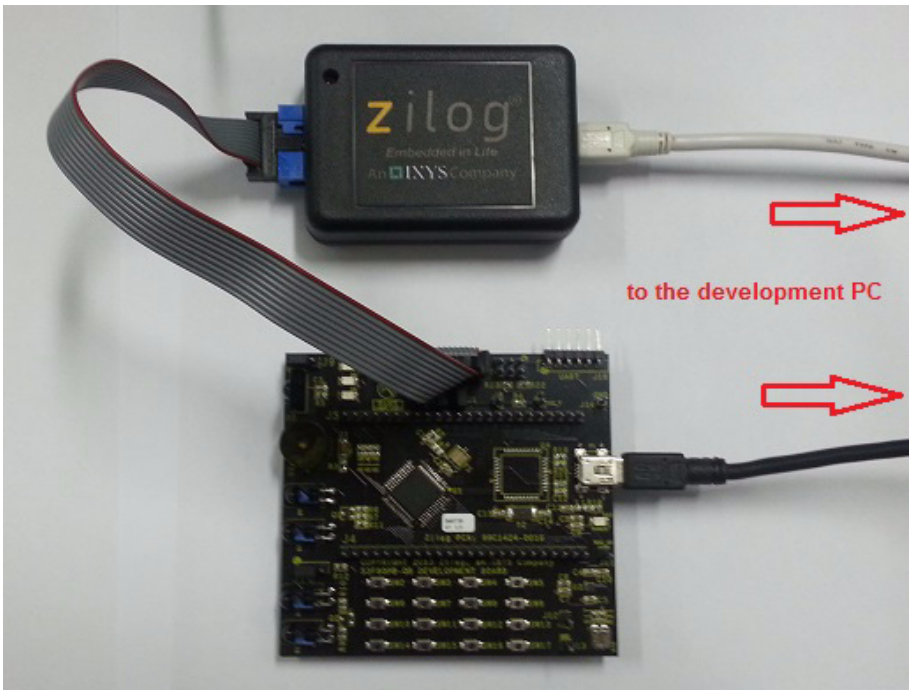

Figure 6. The Completed ISP II and Development Board Assembly

Start the Ledblink Sample Program

The S3F80QB Development Kit includes a sample program that demonstrates an LED blinking application. To get started with the S3F80QB 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 7, and navigate to the following filepath:

   `<ZDS Install>\samples\S3F80QB\ledblink_asm`

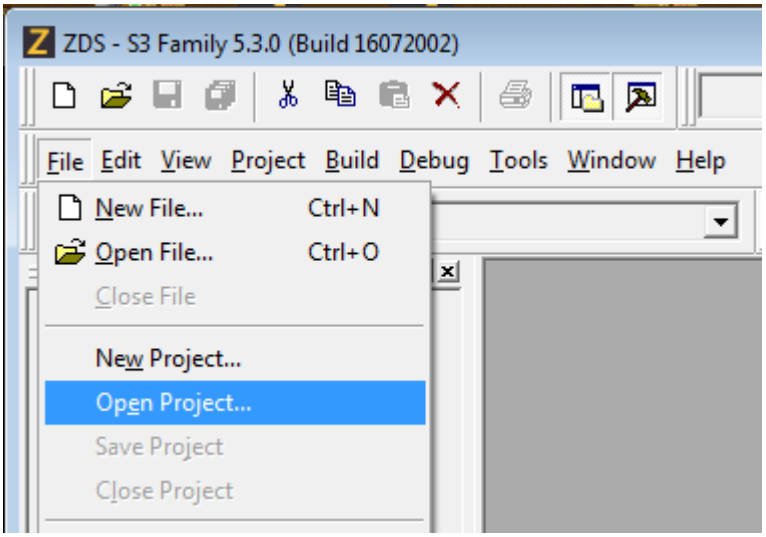

Figure 7. The Open Project Selection in the File Menu

3. Select the `ledblink.zdsproj` project from within the `ledblink_asm` folder as indicated in Figure 8 and click **Open**. A list of source files will appear in the Workspace panel.

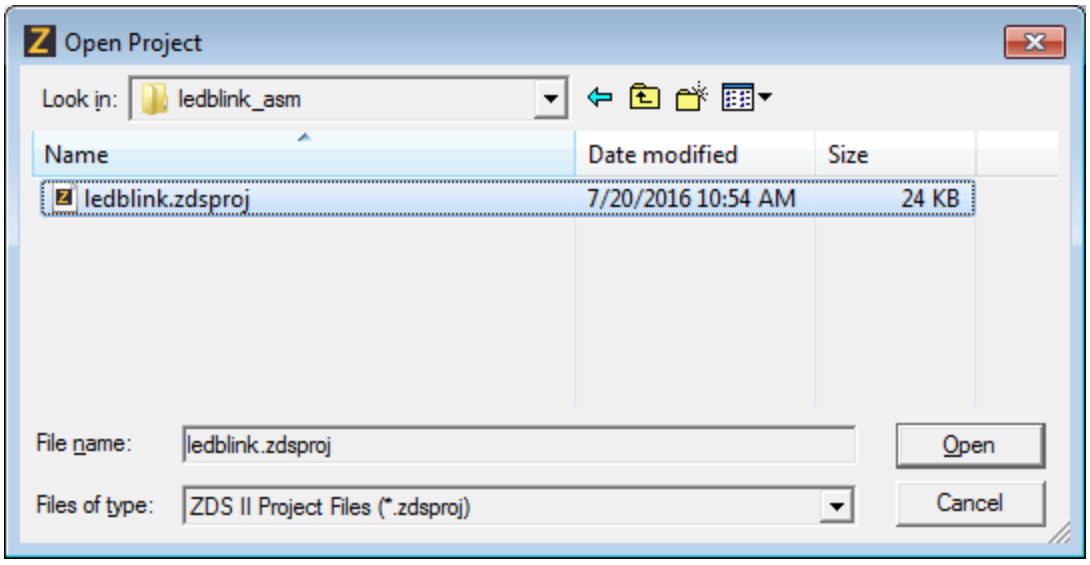

Figure 8. Select the ledblink.zdsproj Project

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 ZDSII, 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 **S3F80QX_FlashIspII** from the Target list, then select **S3FlashIspII** from the **Debug Tool** drop-down menu, as indicated in Figure 9.

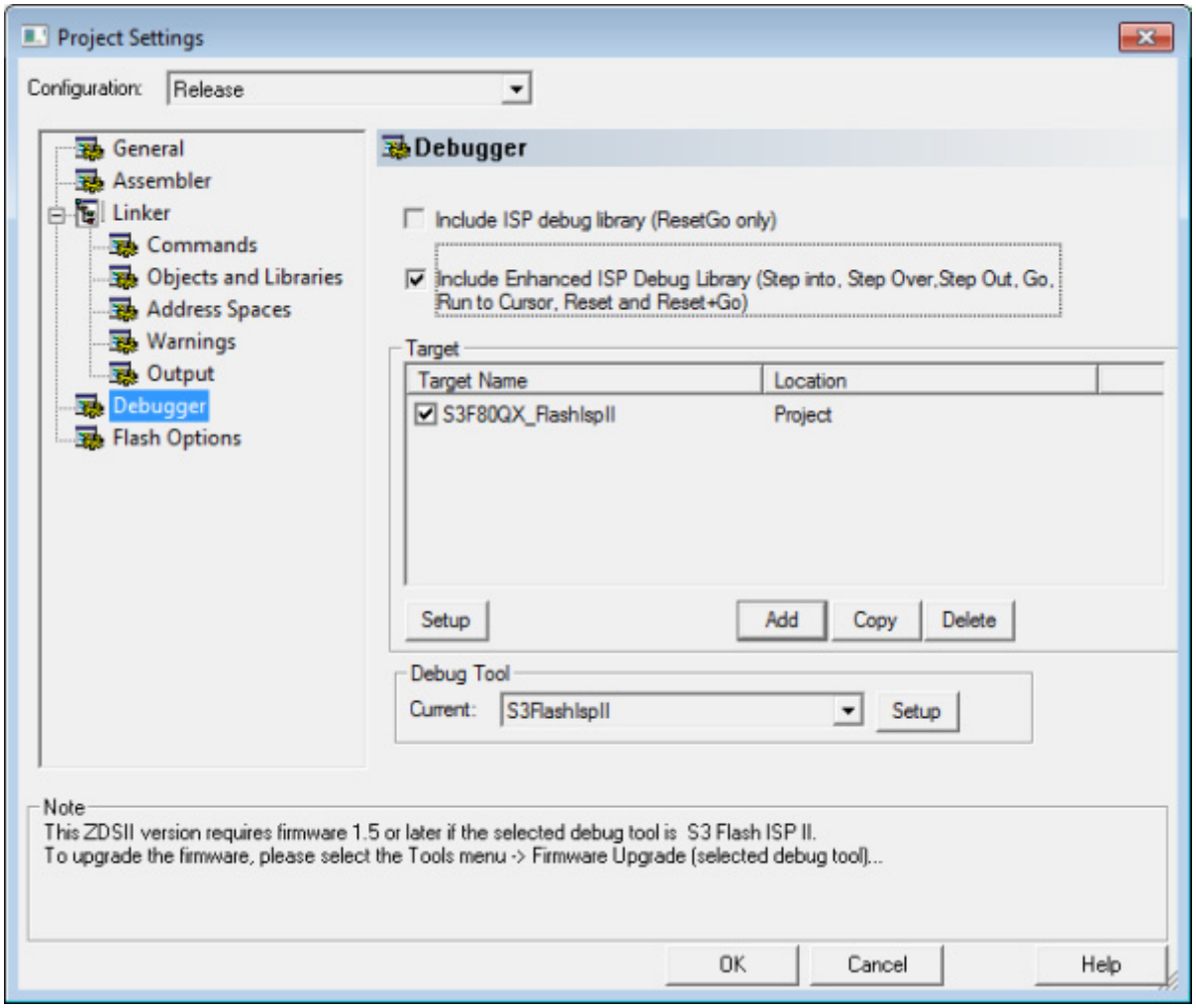

Figure 9. Select the Target and the Debug Tool

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 10.

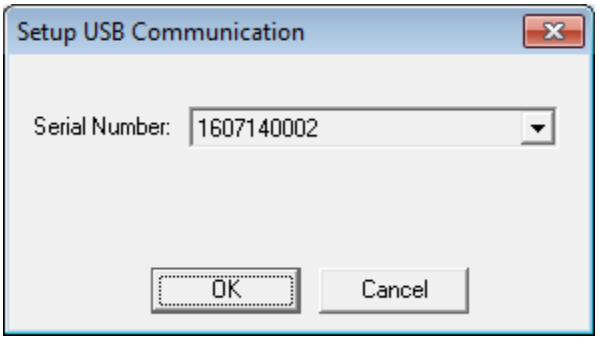

Figure 10. The Setup USB Communication Dialog

Note: The serial number you see on your screen will be different from the serial number shown in Figure 10.

9. Click **OK** to close the Setup USB Communication dialog box.
10. Make sure tat the Enhanced ISP Debug Library is selected..
11. Click **OK** to close the Project Settings dialog box.
12. 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          E909
ledblink.lod          E909

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.

13. To run the application, select **Reset+Go** from the **Debug** menu, as indicated in Figure 11. As a result, LEDs D7, D8, and D9 will blink in sequence.

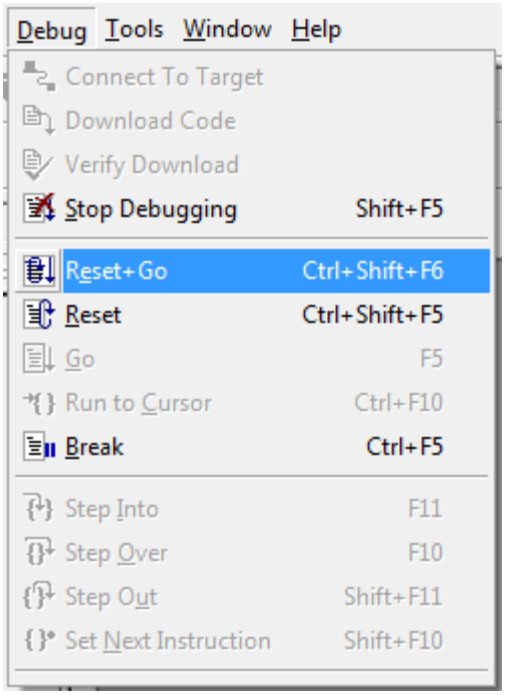

Figure 11. Select Reset+ Go from the Debug Menu

Trouble Shooting Tips

The following trouble-shooting tips are useful when starting the S3F80QB Ledblink sample program.

- Ensure that the LED indicator on the S3 Flash ISP II lights up upon connecting to the USB port of your PC.

- 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 Table 1 on page 15 to learn more about the jumper settings for the S3F80QB Development Board.

S3F80QB Development Board

The purpose of the S3F80QB Development Kit is to provide a set of hardware and software tools for the development of hardware and firmware for applications based on the S3F80QB microcontroller. An image of the S3F80QB Development Board is shown in Figure 12; a block diagram is shown in Figure 13.

Note: U4 is for factory use only and is intentionally not populated.

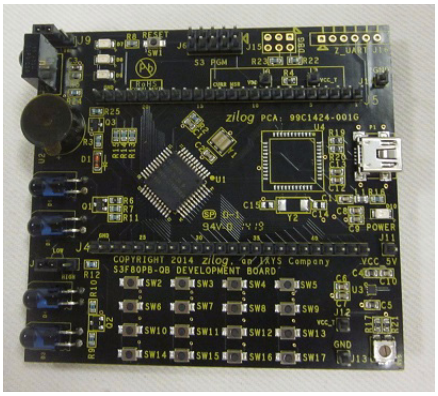

Figure 12. The S3F80QB Development Board

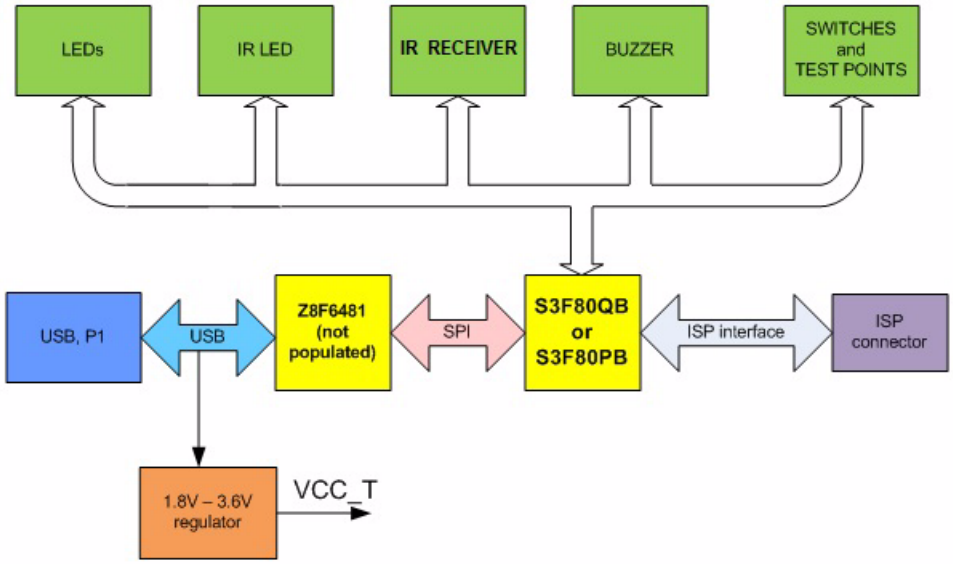

Figure 13. S3F80QB Development Board Block Diagram

Power Sources

The Board features two power source options:

- Connecting Port P1 (USB Mini-B) to the USB port of the PC using the USB A-to-USB Mini-B cable included in the Kit
- Connecting an external 5 VDC source to J11 (5VDC) and J13 (GND)

S3F80QB MCU

Key features of the S3F80QB MCU include:

- SAM8 RC CPU core
- 63 KB internal Flash memory, which is user programmable by LDC instruction
- 2 KB or 3.75 KB internal RAM
- Endurance of 10,000 Erase/Program cycles
- 1 KB RAM executable memory
- 272 byte general purpose RAM data memory
- 78 instructions

- IDLE and STOP instructions added for power-down modes
- 125 ns at 8 MHz f_{OSC} (minimum)
- 24 interrupt sources with 18 vectors and 9 levels
- Four 8-bit I/O ports (P0-P2, P4) and 6-bit port (P3) for a total of 38 bit-programmable pins (44-pin QFP)
- Three 8-bit n-channel open-drain pins (P1, P2, P4) and one 2-bit n-channel open-drain pins (P3 on the 44-pin QFP package)
- One 8-bit counter with auto-reload function and one-shot or repeat control (Counter A)
- One programmable 8-bit basic timer (BT) for oscillation stabilization control or watch-dog timer (software reset) function
- One 8-bit timer/counter (Timer 0) with three operating modes: Interval, Capture, and PWM
- One 16-bit timer/counter (Timer 1) with two operating modes: Interval and Capture
- One 16-bit timer/counter (Timer 2) with two operating modes: Interval and Capture

To learn more about the S3F80QB MCU, refer to the S3F80QB Product Specification (PS0308).

Jumper Settings

Jumper settings for the S3F80QB Development Kit are listed in Table 1.

Table 1. Jumper Settings

Jumper Name	Description	State	Function	Factory Setting
J9	P3.0	1-2 IN	Buzzer	IN
		2-3 IN	IR RX In	OUT
J10	IR TX IN	1-2 IN	LOW	IN
		2-3 IN	HIGH	OUT

Magnetic Buzzer

The CEM1206S magnetic buzzer (U2) manufactured by CUI Inc. is rated at a frequency of 2400 Hz and an operating voltage of 3.0–8.0 V zero-to-peak (V_{0-P}). An image of the CEM1206S device is shown in Figure 14.

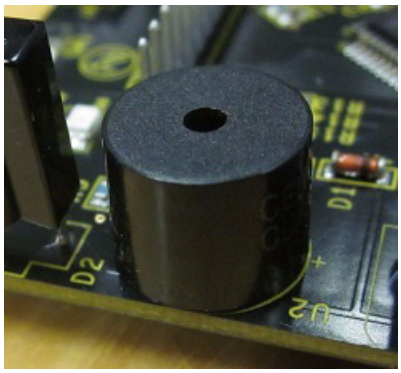

Figure 14. The CEM1206S Magnetic Buzzer

This buzzer is activated by setting the jumper J9 to the 1-2 position that connects the buzzer to the P3.0 pin of the S3F80QB MCU in the Development Kit.

To learn more about the CEM1206S device, visit http://www.cui.com/product/resource/cem-1206s.pdf.

IR Receiver for Remote Control Systems

The TSOP31238 device is a member of the TSOP312–TSOP314 Series IR receivers (D2), which are miniaturized IR receivers designed to work with infrared remote control systems. A PIN diode and a preamplifier are assembled on a lead frame. The epoxy package contains an IR filter. The demodulated output signal can be directly connected to a microprocessor for decoding. See Figure 15 for an image of an IR receiver module.

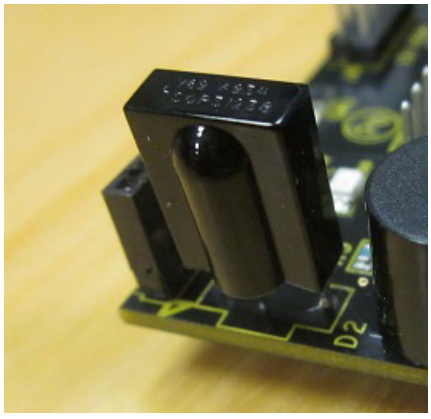

Figure 15. The TSOP31238 IR Receiver Module

This IR receiver is connected to the P3.0 pin of the MCU by placing J9 into the 2-3 position. To learn more about the TSOP31238 device, visit http://www.vishay.com/docs/82492/tsop312.pdf.

High-Power Infrared-Emitting Diode

The TSAL6200 diode (D3, D4, D5, D6) is an infrared (940nm wavelength) emitting diode employing GaAlAs/GaAs technology with high radiant power, and molded in a blue-gray plastic package. An image of the TSAL6200 device is shown in Figure 16.

Figure 16. TSAL6200 Infrared Emitting Diodes

Of two pairs of IR LEDs, D3/D4 and D5/D6, the D3/D4 pair is activated by placing Jumper J10 into the 2-3 position for an active High transmission. The D5/D6 pair is activated by placing a shunt onto J10 position 1-2 for an active Low transmission. Either of these jumper settings connects its correlated pair to P3.1 on the MCU.

To learn more about the TSAL6200 device, visit http://www.vishay.com/docs/81010/tsal6200.pdf.

Reset Circuit

The reset circuit features a 100KΩ pull-up resistor R8 and SW1. This circuit resets the S3F80QB MCU when SW1 is pressed. See Figure 17 for a representation of the reset circuit.

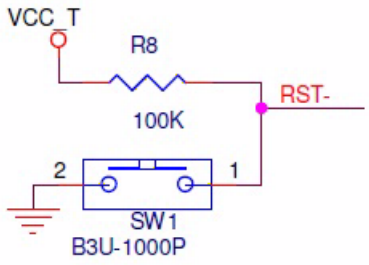

Figure 17. The Reset Circuit

Keypad Circuit

The keypad circuit features 16 switches connected to eight pins on the MCU. These pins are configured as outputs for P1.3–P1.0, and are configured as inputs with pull-ups enabled for P0.7–P0.4. The keypad circuit is shown in Figure 18.

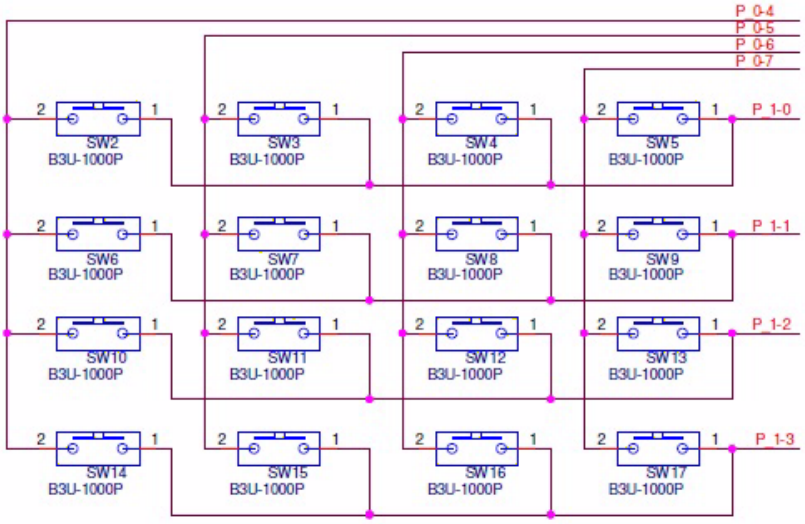

Figure 18. The Keypad Circuit

ISP II Connector

The ISP II connector (J6) provides an interface between the S3 Flash ISP II tool and the S3F80QB device. See Figure 19 for an illustration of the ISP II connector.

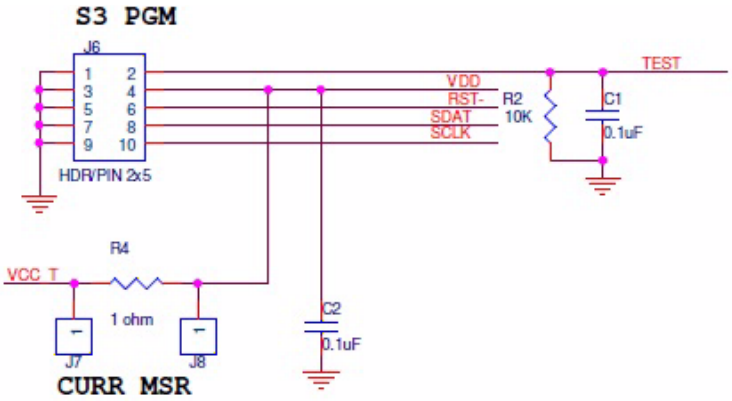

Figure 19. The ISP II Connector

ZDS Flash Loader Utility

A Flash Loader utility is included in Zilog Developer Studio II via the Tools menu. Figure 20 shows an image of the Flash Programming screen.

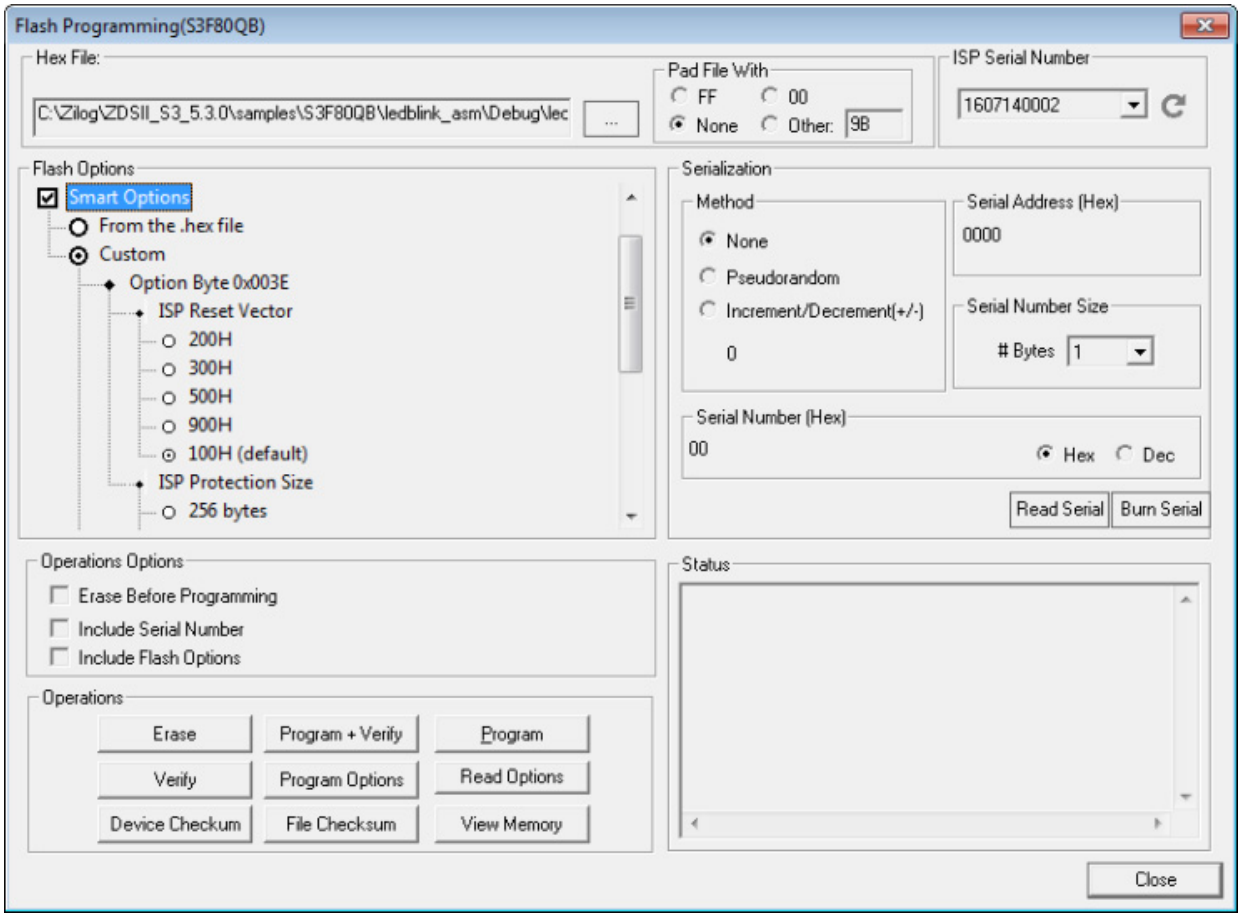

Figure 20. The Flash Programming Screen

S3F80QB Development Kit Documentation

The documents associated with the S3F80QB Development Kit are listed in Table 2. 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 2. S3F80QB Development Kit Documentation

Document	Description	Location
PS0308	S3F80QB Product Specification	Documentation\Chip_Documentation
UM0266	S3 Flash In-System Programmer User Manual	Documentation\Tools_Documentation
UM0267	This S3F80QBDevelopment Kit User Manual	Documentation\Tools_Documentation
Online Help	ZDSII – S3 IDE, Assembler and C Compiler online help	ZDSII – S3 > Help > Help Topics
FL0165	S3 Flash In-System Programmer insert	Documentation\Tools_Documentation
FL0166	S3F80QB Development Kit insert	Documentation\Tools_Documentation

Table 3 lists the two sample projects developed for this application. Follow the filepath listed in the Location column to access the associated project.

Table 3. S3F80QB Sample Projects

Project	Location
Ledblink	Samples\S3F80QB\ledblink_asm
Ledblink	Samples\S3F80QB\ledblink_c
Ledblink	Samples\S3F80QB\ISP_BL_Demo
Demo	Samples\S3F80QB\Demo_asm
ExeRam	Samples\S3F80QB\executableRAM

Appendix A. Schematic Diagrams

Figures 21 and 22 present schematic diagrams of the S3F80QB Development Board.

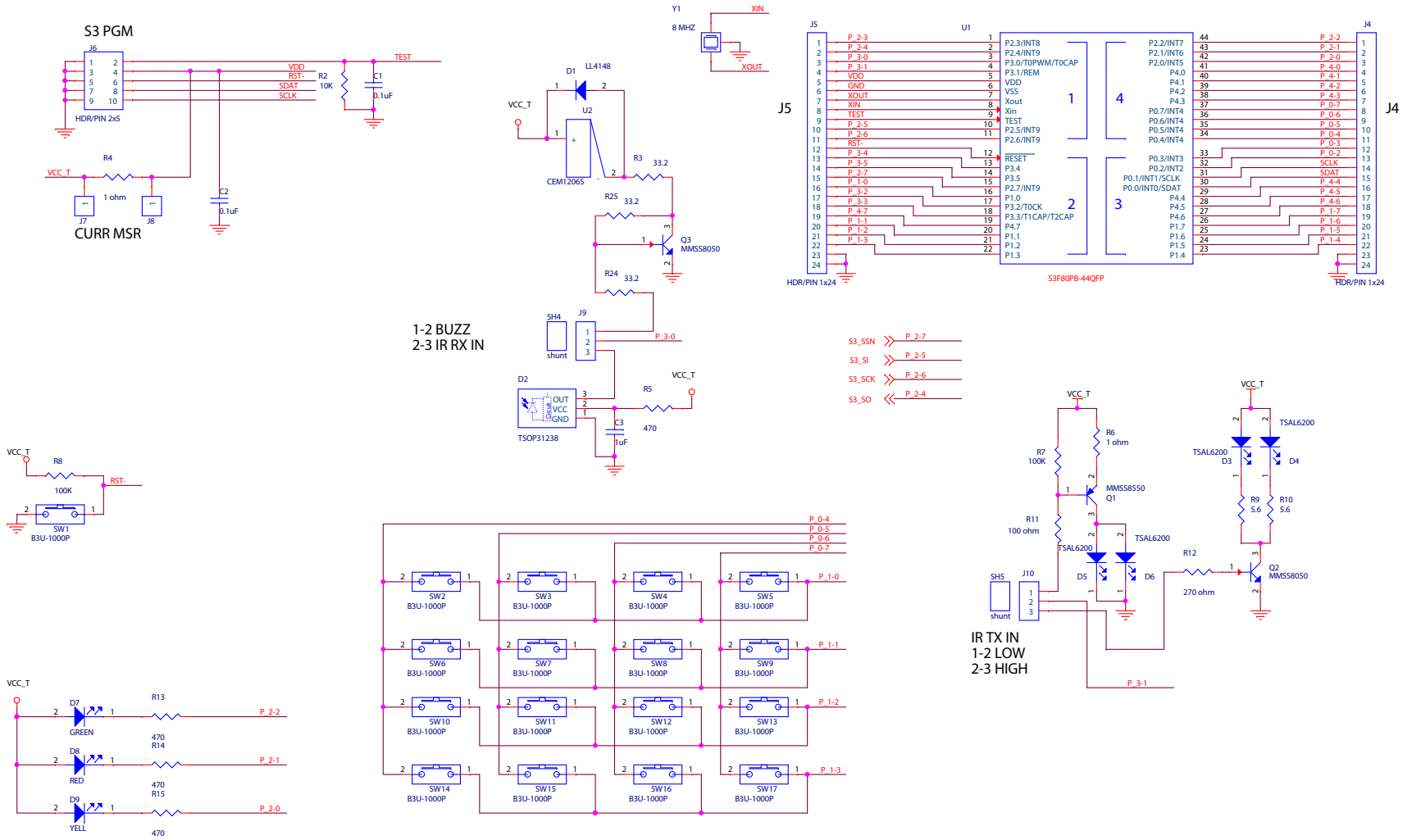

Figure 21. S3F80QB Development Board Schematic Diagram, #1 of 2

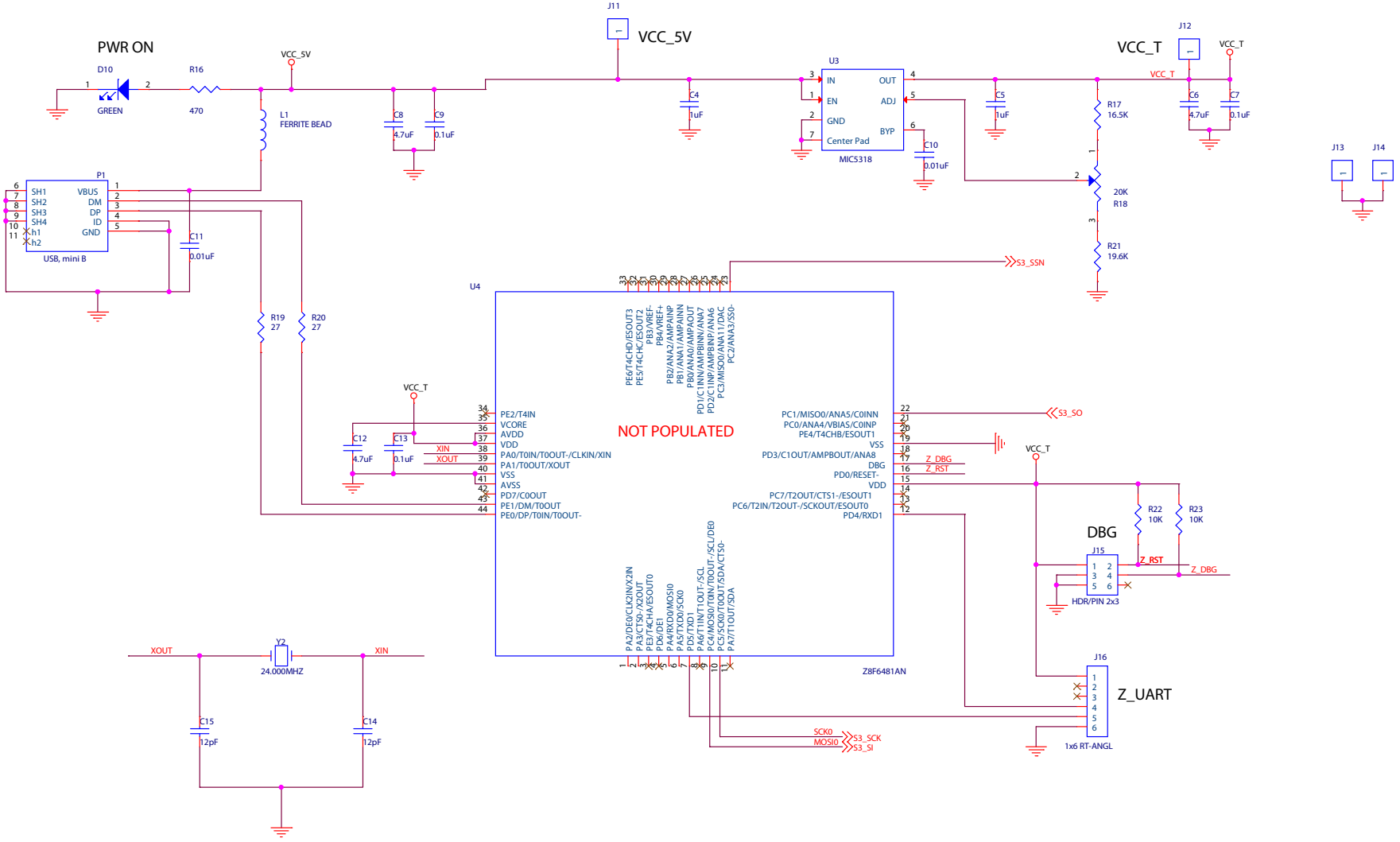

Figure 22. S3F80QB Development Board Schematic Diagram, #2 of 2

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