

UDP C8051F850 MCU CARD USER'S GUIDE FOR C8051F85x/86x MCUs

1. Introduction

The Unified Development Platform (UDP) provides a development and demonstration platform for Silicon Laboratories microcontrollers, short-range wireless devices, and software tools, including the Silicon Laboratories Integrated Development Environment (IDE).

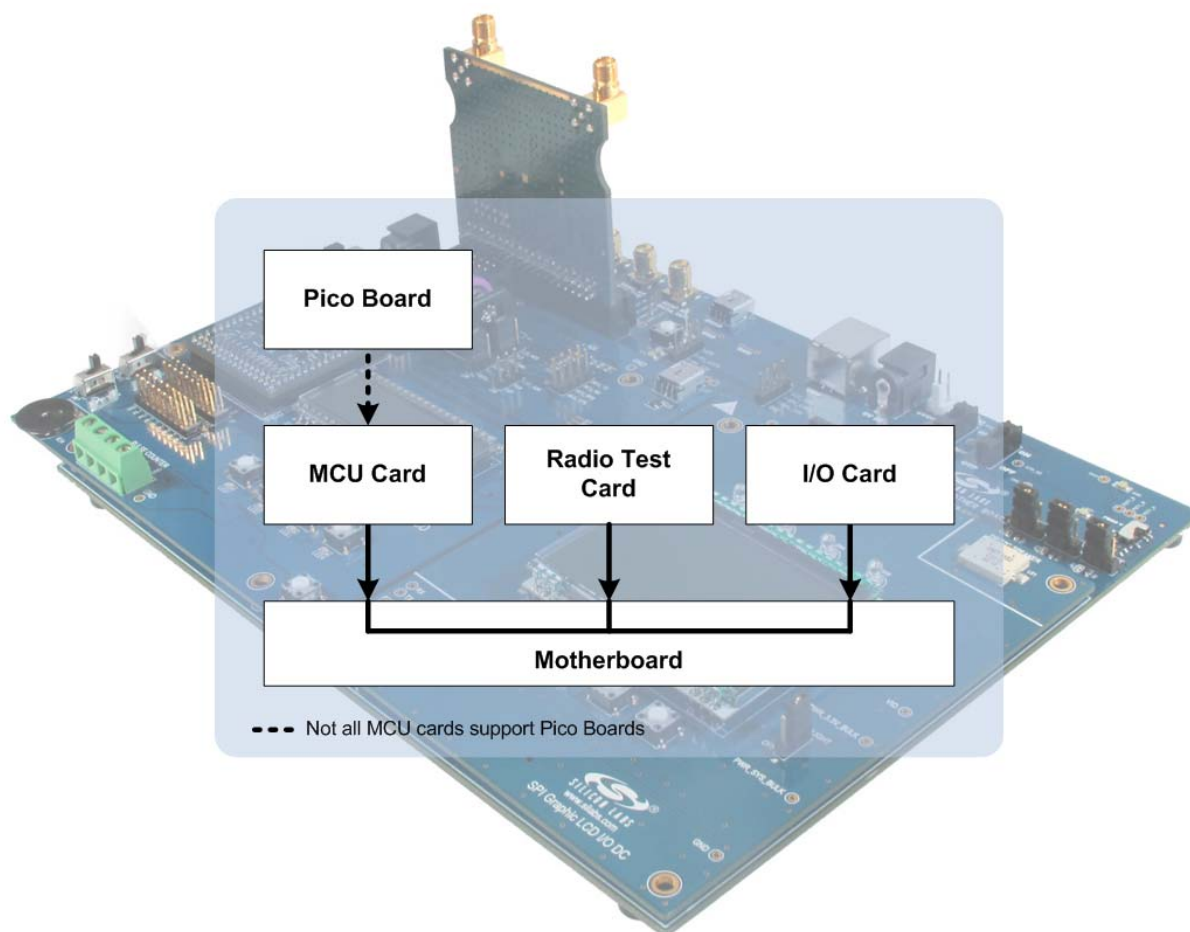


Figure 1. Unified Development Platform Block Diagram

2. Relevant Documents

This document provides a hardware overview for the Unified Development Platform (UDP) system C8051F85x/86x MCU card. Additional information on the UDP system and the Silicon Labs 8-bit MCUs can be found in the documents listed in this section.

2.1. Motherboard User's Guide

The UDP Motherboard User's Guide contains information on the motherboard features and can be found at www.silabs.com/udp.

2.2. Card User's Guides

The UDP MCU, I/O, and radio test card user's guides can be found at www.silabs.com/udp.

2.3. Application Notes

All 8-bit Application Notes can be found at www.silabs.com/8bit-appnotes.

3. Hardware Setup

3.1. Using the MCU Card Alone

Refer to Figure 2 for a diagram of the hardware configuration when using the MCU card without a UDP motherboard.

1. Connect the USB Debug Adapter to the 10-pin debug connector (J23) on the MCU card using the 10-pin ribbon cable.
2. Connect the USB Debug Adapter to a USB Port on the PC.
3. Move the SW1 VDD Select switch to the top **+3.3V_VREG** position.
4. Verify that the JP2 Imeasure jumper is populated.
5. Power the MCU card through the power connector (J6) using the supplied 9 V ac/dc adapter.

Notes:

- Use the **Reset** button in the IDE to reset the target when connected using a USB Debug Adapter.
- Remove power from the MCU card and the USB Debug Adapter before connecting or disconnecting the ribbon cable from the MCU card. Connecting or disconnecting the cable when the devices have power can damage the device and/or the USB Debug Adapter.

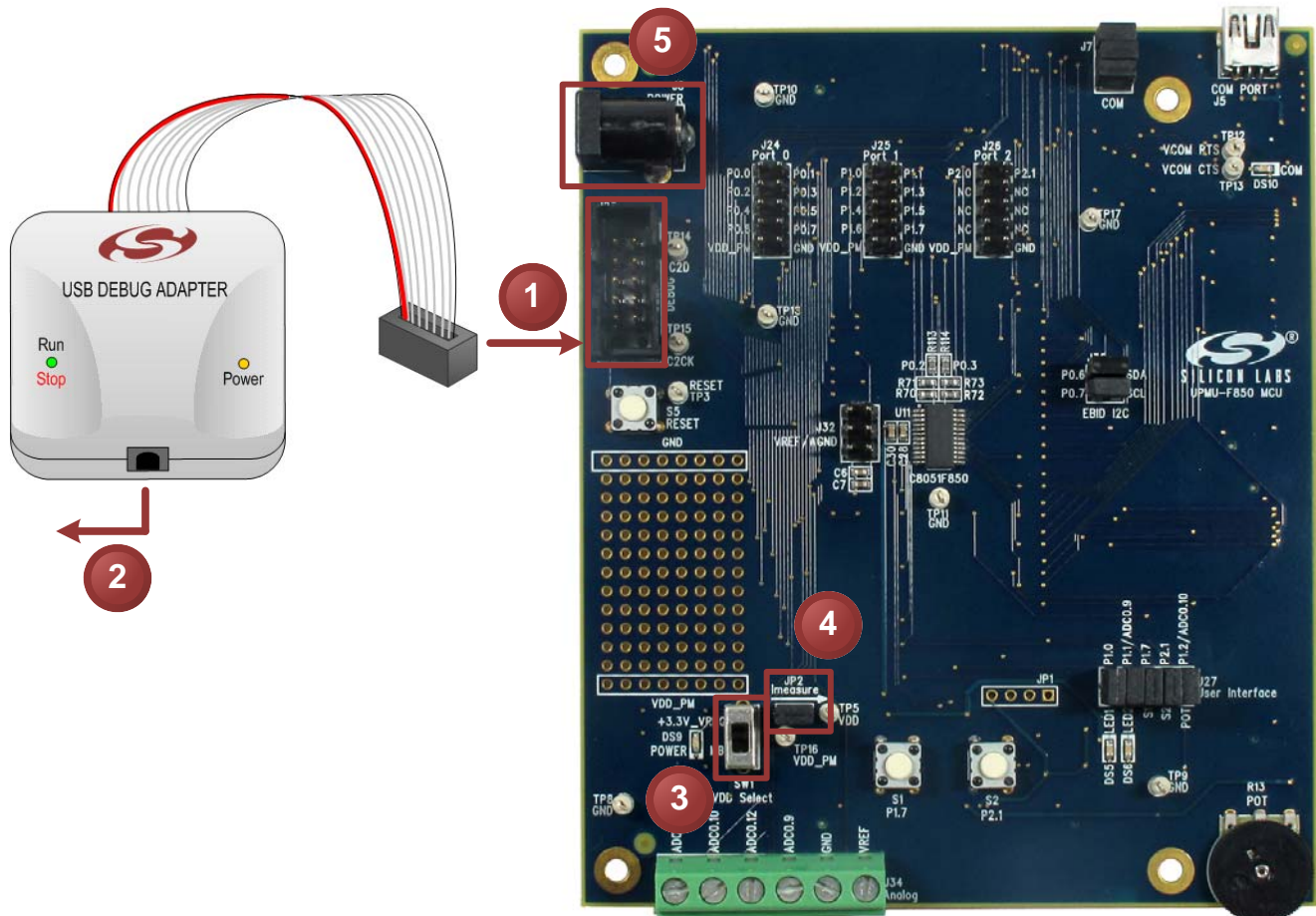


Figure 2. Hardware Setup Using the MCU Card Alone

3.2. Using the MCU Card with the UDP Motherboard

Refer to Figure 3 for a diagram of the hardware configuration when using the MCU card with a UDP motherboard.

1. Connect the MCU card to the UDP motherboard slot.
2. (Optional) Connect an I/O card to the UDP motherboard slot.
3. (Optional) Connect a radio test card to the radio test card slot in the UDP motherboard.
4. (Optional) Connect an EZLink card to the EZLink card slot in the UDP motherboard.
5. Connect the USB Debug Adapter to the 10-pin debug connector (J23) on the MCU card using the 10-pin ribbon cable.
6. Connect the USB Debug Adapter to a USB Port on the PC.
7. Move the SW1 VDD Select switch to the lower **MB** position.
8. Verify that the JP2 Imeasure jumper is populated.
9. Connect the ac/dc power adapter to power jack J20 on the UDP motherboard. The board can also be powered from the J16 USB, J1 mini USB connectors, or J11 battery connector socket.
10. Move the S3 power switch on the UDP motherboard to the ON position.
11. Update the motherboard firmware as described in Section 3.3.

Notes:

- Use the **Reset** button in the IDE to reset the target when connected using a USB Debug Adapter.
- Remove power from the target board and the USB Debug Adapter before connecting or disconnecting the ribbon cable from the target board. Connecting or disconnecting the cable when the devices have power can damage the device and/or the USB Debug Adapter.
- The MCU card can be used alone without the motherboard. However, the motherboard must be powered if an MCU card is connected.

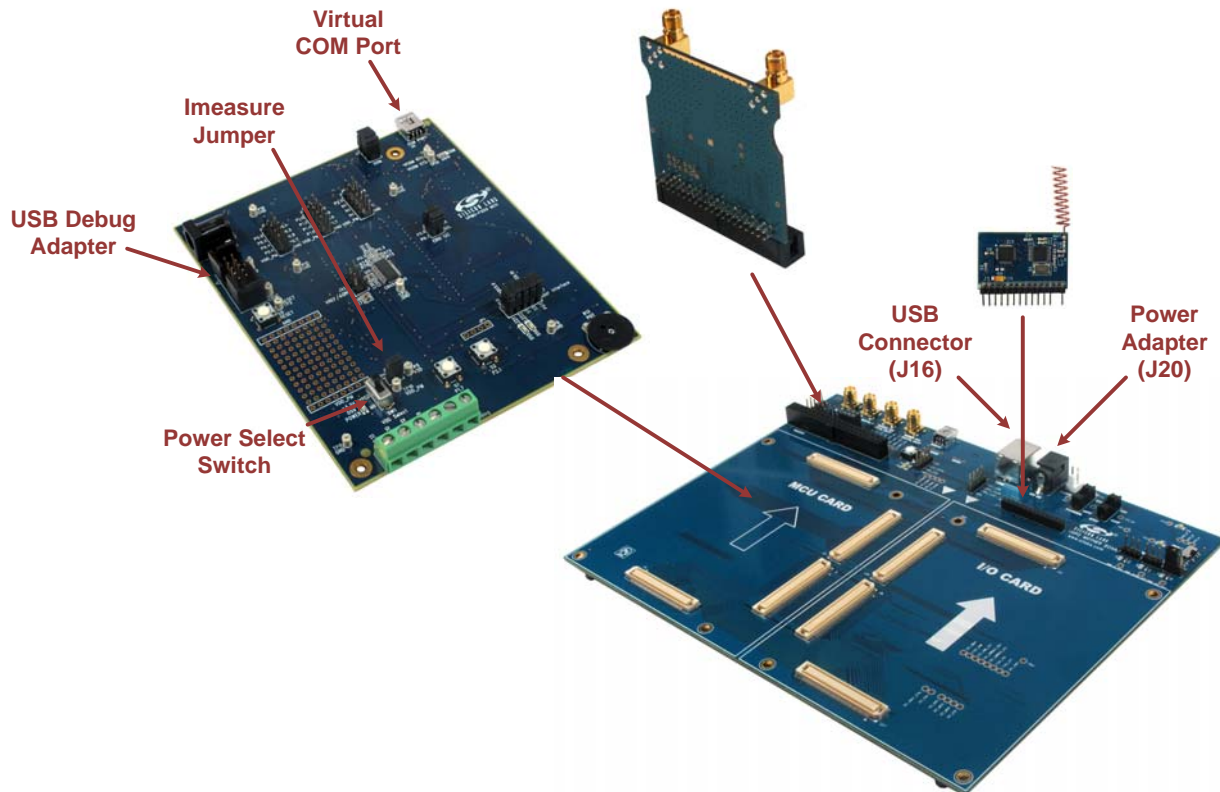


Figure 3. Hardware Setup Using the Unified Development Platform

3.3. Updating the UDP Motherboard Firmware

To ensure the UDP Motherboard supports the C8051F85x/86x MCU card, run the UDP Motherboard Firmware Update Utility shown in Figure 4. This utility can be downloaded from www.silabs.com/udp.

1. Connect the UDP motherboard to a PC using a regular USB cable connected to the UDS connector (J16).
2. Run the utility.
3. Select the desired motherboard if more than one is connected to the PC.
4. Press the **Update Selected Device** button.

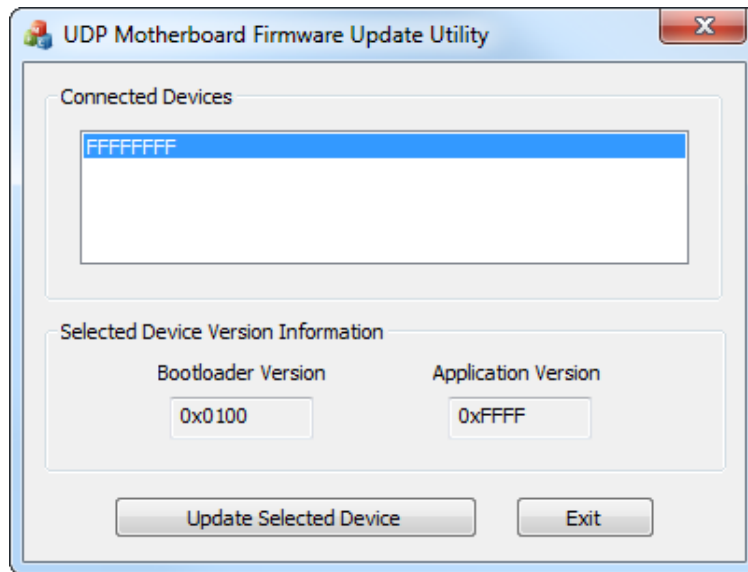


Figure 4. UDP Motherboard Firmware Update Utility

4. Software Setup

Simplicity Studio greatly reduces development time and complexity with Silicon Labs EFM32 and 8051 MCU products by providing a high-powered IDE, tools for hardware configuration, and links to helpful resources, all in one place.

Once Simplicity Studio is installed, the application itself can be used to install additional software and documentation components to aid in the development and evaluation process.

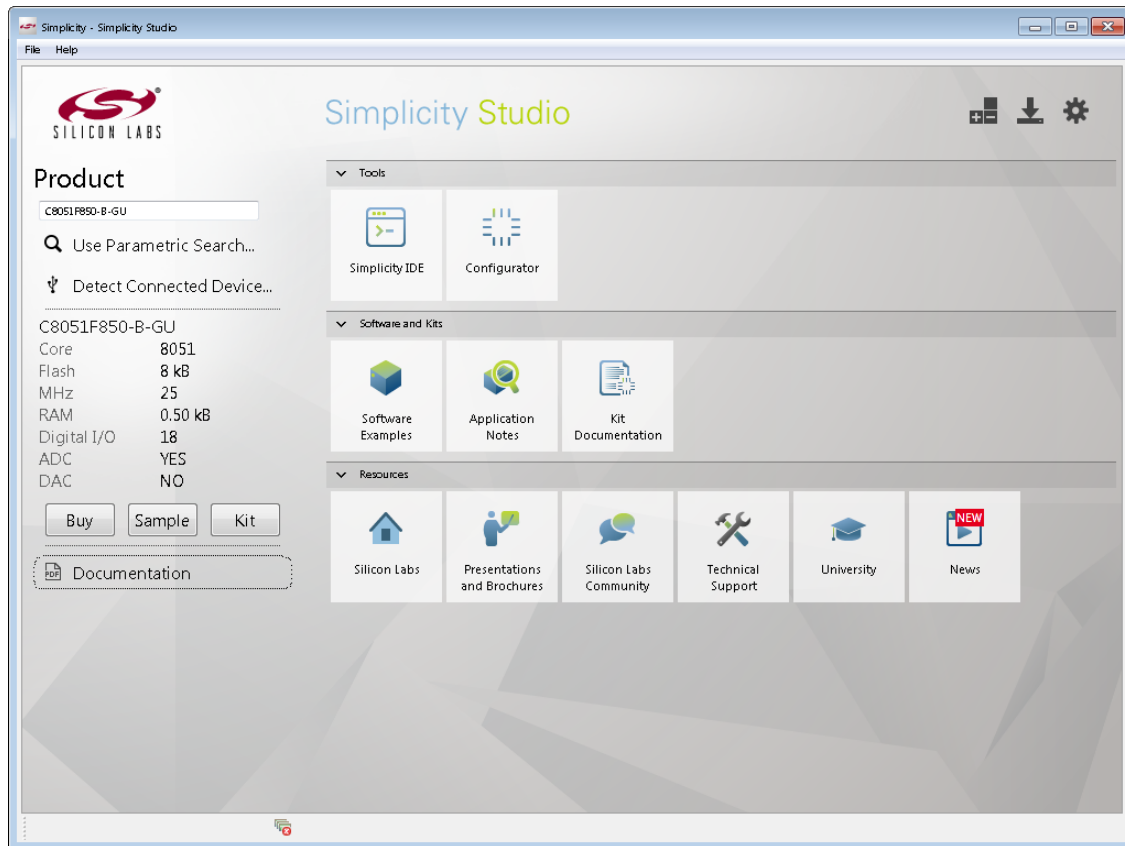


Figure 5. Simplicity Studio

The following Simplicity Studio components are required for the C8051F850 Development Kit:

- 8051 Products Part Support
- Simplicity Developer Platform

Download and install Simplicity Studio from www.silabs.com/8bit-software or www.silabs.com/simplicity-studio. Once installed, run Simplicity Studio by selecting **Start**→**Silicon Labs**→**Simplicity Studio**→**Simplicity Studio** from the start menu or clicking the **Simplicity Studio** shortcut on the desktop. Follow the instructions to install the software and click **Simplicity IDE** to launch the IDE.

The first time the project creation wizard runs, the **Setup Environment** wizard will guide the user through the process of configuring the build tools and SDK selection.

In the **Part Selection** step of the wizard, select from the list of installed parts only the parts to use during development. Choosing parts and families in this step affects the displayed or filtered parts in the later device selection menus. Choose the C8051F85x family by checking the **C8051F85x/86x** check box. Modify the part selection at any time by accessing the **Part Management** dialog from the **Window**→**Preferences**→**Simplicity Studio**→**Part Management** menu item.

Simplicity Studio can detect if certain toolchains are not activated. If the **Licensing Helper** is displayed after completing the **Setup Environment** wizard, follow the instructions to activate the toolchain.

4.1. Running Blinky

Each project has its own source files, target configuration, SDK configuration, and build configurations such as the **Debug** and **Release** build configurations. The IDE can be used to manage multiple projects in a collection called a workspace. Workspace settings are applied globally to all projects within the workspace. This can include settings such as key bindings, window preferences, and code style and formatting options. Project actions, such as build and debug are context sensitive. For example, the user must select a project in the **Project Explorer** view in order to build that project.

To create a project based on the Blinky example:

1. Click the **Simplicity IDE** tile from the Simplicity Studio home screen.
2. Click the **Create new project** link from the welcome screen or go to **File→New→Silicon Labs MCU Project**.
3. In the **Kit** drop-down, select **C8051F850 Development Kit**, in the **Part** drop-down, select **C8051F850**, and in the **SDK** drop-down, select the desired SDK. Click **Next**.
4. Select **Example** and click **Next**.
5. Under **C8051F850 Development Kit** in the **Blinky** folder, select **F85x-86x Blinky** and click **Finish**.
6. Click on the project in the **Project Explorer** and click **Build**, the hammer icon in the top bar. Alternatively, go to **Project→Build Project**.
7. Click **Debug** to download the project to the hardware and start a debug session.
8. Press the **Resume** button to start the code running. The LED should blink.



9. Press the **Suspend** button to stop the code.



10. Press the **Reset the device** button to reset the target MCU.



11. Press the **Disconnect** button to return to the development perspective.



4.2. Simplicity Studio Help

Simplicity Studio includes detailed help information and device documentation within the tool. The help contains descriptions for each dialog window. To view the documentation for a dialog, click the question mark icon in the window:



This will open a pane specific to the dialog with additional details.

The documentation within the tool can also be viewed by going to **Help→Help Contents** or **Help→Search**.

4.3. Simplicity Configurator

The Simplicity Configurator is a configuration and code generation tool. This utility helps accelerate development by automatically generating initialization source code to configure and enable the on-chip resources needed by most design projects. In just a few steps, the wizard creates complete startup code for a specific Silicon Labs MCU.

To create a new Simplicity Configurator project:

1. Click the **Create new project** link from the welcome screen or go to **File→New→Silicon Labs MCU Project**.
2. In the **Kit** drop-down, select **C8051F850 Development Kit** or **None**, in the **Part** drop-down, select **C8051F850**, and in the **SDK** drop-down, select the desired SDK. Click **Next**.
3. Select **Simplicity Configurator Program** and click **Next**.
4. Fill in the **Project name** and select the desired device. The **C8051F850-C-GU-QSOP** device is on the C8051F850 Target Board. Click **Finish**.

The Simplicity Configurator project displays properties for each peripheral. To configure a peripheral, click on the **DefaultMode Peripherals** tab at the bottom and click on a peripheral. Checking the box for a peripheral will add it to code generation. Once a peripheral is selected, configure the registers using the **Properties** view. Select a new value for a property with either an input box or a drop-down menu and press **Enter** to set it.

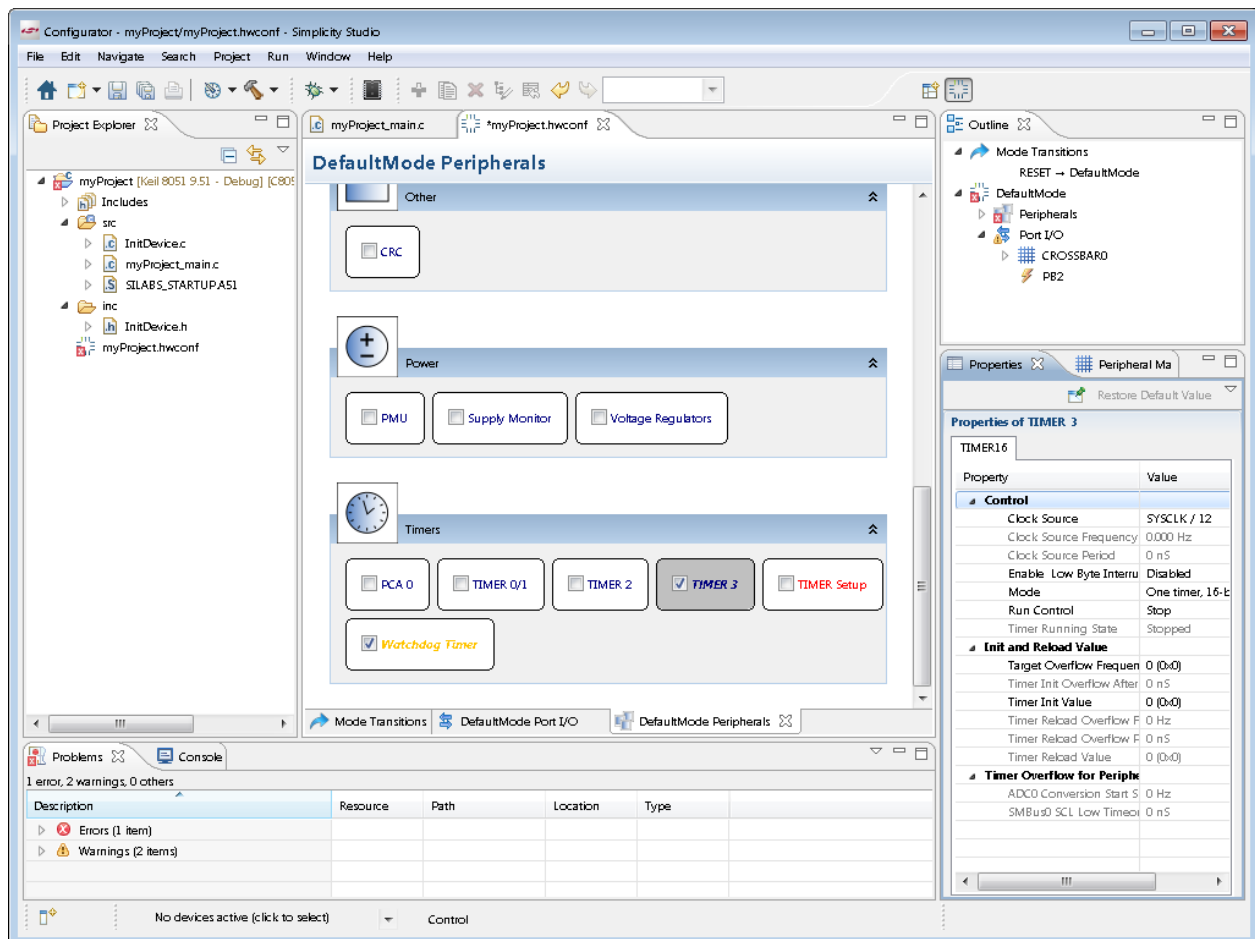


Figure 6. Simplicity Configurator – Configuring Peripheral Properties

To configure pins, click on the **DefaultMode Port I/O** tab at the bottom of main window. Clicking on a pin brings up a property window for the pin. Clicking anywhere else in the main window opens a property window for the crossbar. Select multiple pins with **Ctrl + left click** or mouse dragging over the desired set of pins. The package diagram displays the configured peripherals on the pins, including non-crossbar signals (i.e. ADC inputs).

Code generation updates every time the configuration project saves. After configuring the device, add any non-initialization code, build, and debug the same as with any other project.

More information on Simplicity Configurator can be found in **AN0823: Simplicity Configurator User's Guide** and **AN0821: Simplicity Studio C8051F85x Walkthrough**. Application notes can be found on www.silabs.com/8bit-appnotes.

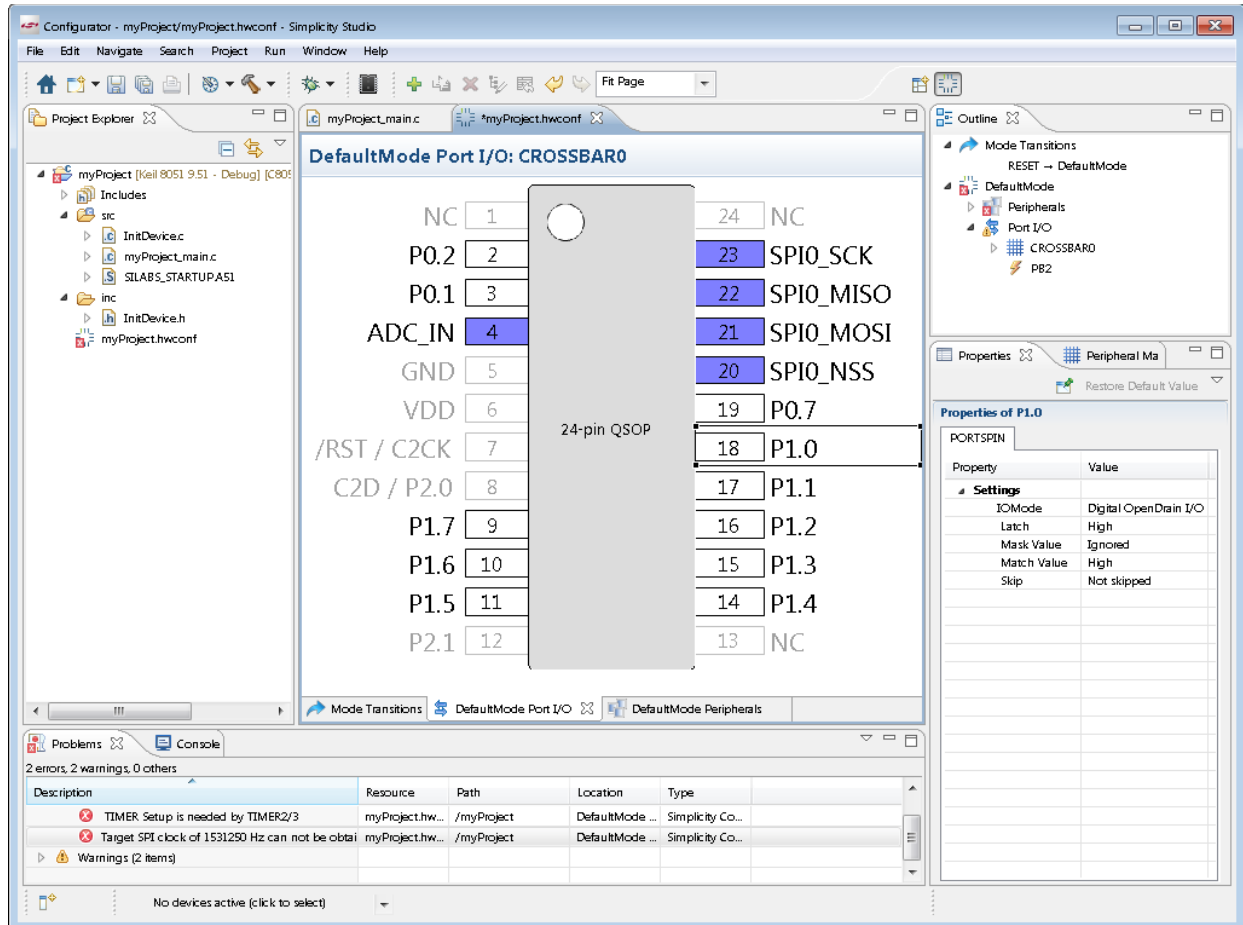


Figure 7. Simplicity Configurator – Configuring Port I/O

4.4. Legacy 8-bit IDE

Note: Using the Simplicity Studio tools with the C8051F850 Development Kit is recommended. See section 4. "Software Setup," on page 6 for more information.

Download the 8-bit software from the website (www.silabs.com/8bit-software) or use the provided installer on the CD-ROM to install the software tools for the C8051F85x/86x devices. After installation, examples can be found in ...\\Examples\\C8051F85x_86x in the installation directory. At a minimum, the C8051F850 DK requires:

- **Silicon Labs IDE**—Software enabling initial evaluation, development, and debugging.
- **Configuration Wizard 2**—Initialization code generation software for the C8051F85x/86x devices.
- **Keil C51 Tools**—Keil 8051 Compiler/Assembler/Linker toolchain.
- **CP210x Drivers**—Virtual COM Port (VCP) drivers for the CP210x COM interface. More information on this installation process can be found in Section 4.5.

Other software available includes:

- **Keil µVision Driver**—Driver for the Keil µVision IDE that enables development and debugging on C8051Fxxx MCUs.
- **Flash Programming Utilities and MCU Production Programmer**—Programming utilities for the production line. More information on the available programming options can be found on the website: <http://www.silabs.com/products/mcu/Pages/ProgrammingOptions.aspx>.
- **ToolStick Development Tools**—Software and examples for the ToolStick development platform. More information on this platform can be found at www.silabs.com/toolstick.

The development kit includes the latest version of the C51 Keil 8051 toolset. This toolset is initially limited to a code size of 2 kB and programs start at code address 0x0800. After registration, the code size limit is removed entirely and programs will start at code address 0x0000.

To register the Keil toolset:

1. Find the **Product Serial Number** printed on the CD-ROM. If you no longer have this serial number, register on the Silicon Labs website (www.silabs.com/8bit-software) to obtain the serial number.
2. Open the Keil µVision4 IDE from the installation directory with administrative privileges.
3. Select **File**→**License Management** to open the License Management window.

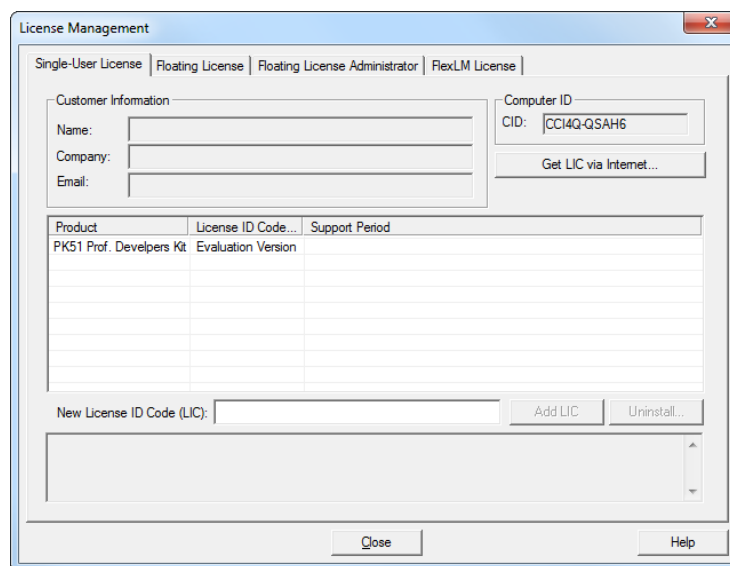


Figure 8. Keil µVision4 IDE License Management Window

4. Click on the **Get LIC via Internet...** button to open the Obtaining a License IDE Code (LIC) window.
5. Press **OK** to open a browser window to the Keil website. If the window doesn't open, navigate to

www.keil.com/license/install.htm.

6. Enter the Silicon Labs **Product Serial Number** printed on the CD-ROM, along with any additional required information.
7. Once the form is complete, click the **Submit** button. An email will be sent to the provided email address with the license activation code.
8. Copy the License ID Code (LIC) from the email.
9. Paste the LIC into the **New License ID Code (LIC)** text box at the bottom of the License Management window in μ Vision4.
10. Press the **Add LIC** button. The window should now list the **PK51 Prof. Developers Kit for Silabs** as a licensed product.
11. Click the **Close** button.

4.5. CP210x USB to UART VCP Driver Installation

The MCU Card includes a Silicon Labs CP210x USB-to-UART Bridge Controller. Device drivers for the CP210x need to be installed before the PC software can communicate with the MCU through the UART interface. Use the drivers included CD-ROM or download the latest drivers from the website (www.silabs.com/interface-software).

1. If using the CD-ROM, the **CP210x Drivers** option will launch the appropriate driver installer. If downloading the driver package from the website, unzip the files to a location and run the appropriate installer for the system (x86 or x64).
 2. Accept the license agreement and follow the steps to install the driver on the system. The installer will let you know when your system is up to date. The driver files included in this installation have been certified by Microsoft.
 3. To complete the installation process, connect the included USB cable between the host computer and the **COM PORT** USB connector (J5) on the MCU Card. Windows will automatically finish the driver installation. Information windows will pop up from the taskbar to show the installation progress.
- If needed, the driver files can be uninstalled by selecting **Windows Driver Package—Silicon Laboratories...** option in the **Programs and Features** window.

5. C8051F85x/86x MCU Card Overview

The C8051F850 MCU card enables application development on the C8051F85x/86x MCU device family. The card connects to the MCU card expansion slot on the UDP motherboard and provides complete access to the MCU resources. Each expansion board has a unique ID that can be read out of an EEPROM or MCU on the board, which enables software tools to recognize the connected hardware and automatically select the appropriate firmware image. The target MCU card can also be detached from the UDP and used alone as a development or demonstration tool.

Figure 9 and Figure 10 highlight the C8051F850 MCU card features.

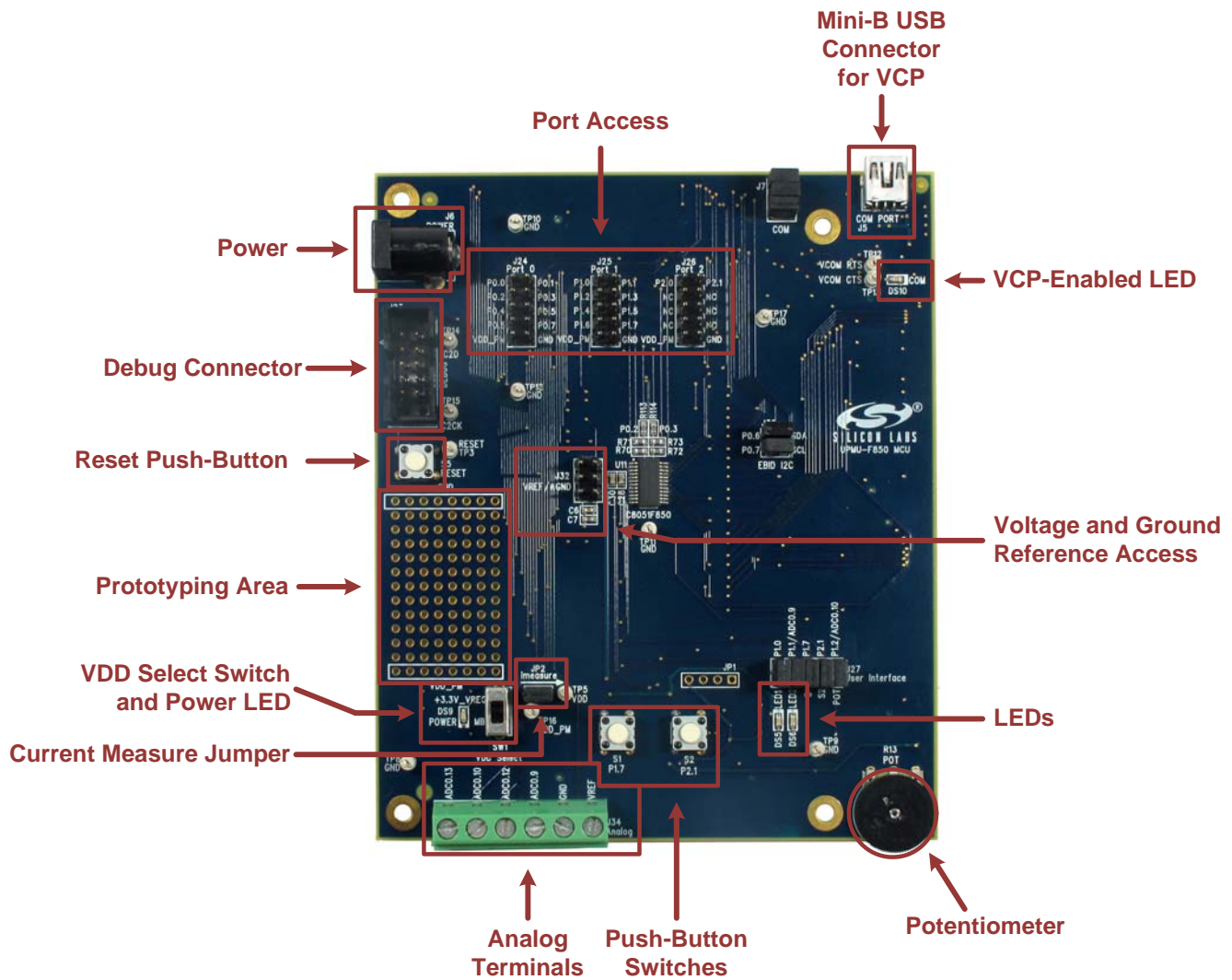


Figure 9. C8051F850 MCU Card Features—Front

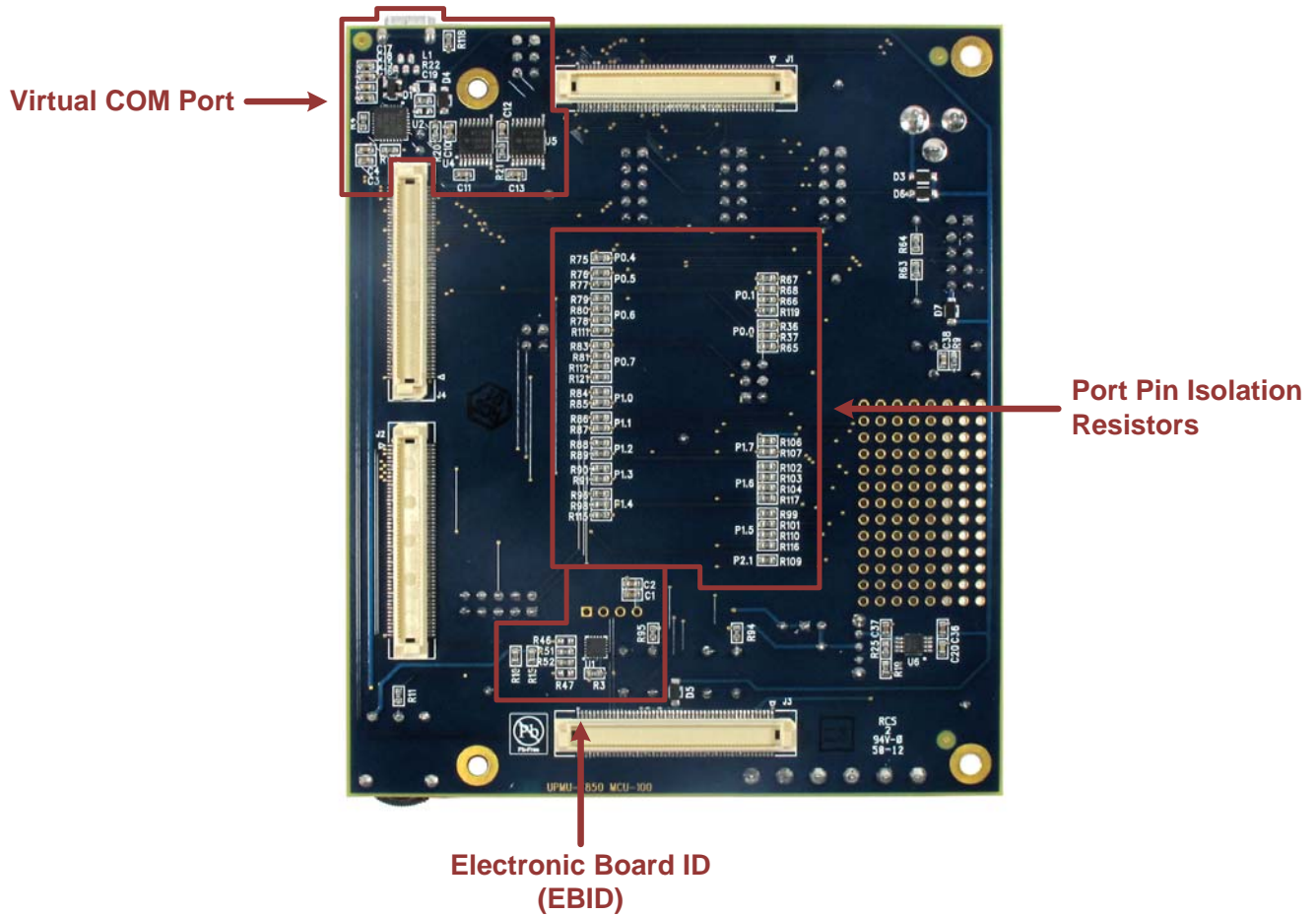


Figure 10. C8051F850 MCU Card Features—Back

5.1. Push-Button Switches and LEDs (S1-2, DS5-6)

The UDP C8051F850 MCU Card has two push-button switches and two LEDs. The two LEDs connect to P1.0 and P1.1, and the two switches connect to P1.7 and P2.1. The switches are normally open and pull the pin voltage to ground when pressed. The LEDs connect to VDD through a current-limiting resistor and turn on when the corresponding port pin is low.

The header J27 can be used to disconnect the switches and LEDs from the GPIO pins.

Table 1. Switch and LED Pin Descriptions

| MCU Pin | Function |
|---------|--------------------|
| PB1.0 | Red LED DS5 (LED1) |
| PB1.1 | Red LED DS6 (LED2) |
| PB1.7 | Switch S1 |
| PB2.1 | Switch S2 |

5.2. Analog Terminals (J34)

Several of the C8051F850 port pins used for analog functions are connected to the J34 terminal block. Refer to Table 2 for the J34 terminal block connections.

Table 2. Terminal Block Pin Descriptions (J34)

| Terminal Pin | MCU I/O |
|--------------|----------------|
| 1 | VREF / P0.0 |
| 2 | GND |
| 3 | ADC0.9 / P1.1 |
| 4 | ADC0.12 / P1.4 |
| 5 | ADC0.10 / P1.2 |
| 6 | ADC0.13 / P1.5 |

5.3. Potentiometer (R13)

The potentiometer is available on P1.2 (ADC0.10). To use the potentiometer, install a shorting block on J27 pins 9 and 10 to connect P1.2 to the potentiometer.

5.4. Voltage and Ground Reference (J32)

The C8051F850 has options to use an external voltage reference on the P0.0 / VREF pin and an external analog ground reference on the P0.1 / AGND pin. The J32 header allows an external supply to clip to pin 1 for AGND and pin 2 for VREF. These signals can then be connected to the MCU by populating a shorting block between pins 3 and 5 for AGND and pins 4 and 6 for VREF. Populating this shorting block for VREF connects P0.0 to the required capacitors for the external reference.

Table 3. Terminal Block Pin Descriptions (J25)

| MCU Pin | Analog Signal | Description |
|---------|---------------|--|
| P0.0 | VREF | Clip external source to J32 pin 2, apply shorting block between pins 4 and 6 to connect to the MCU |
| P0.1 | AGND | Clip external ground to J32 pin 1, apply shorting block between pins 3 and 5 to connect to the MCU |

5.5. VDD Power Select Switch (SW1)

The VDD power supply has two power options: UDP motherboard (PWR_VDD_OUT) and on-board +3.3 V regulator power. The VDD Power Select switch is used to select between the two options. The +3.3 V regulator power option is the upper **+3.3_VREG** position and allows the board to be powered from a diode-OR of four power sources: 9 V Power Adapter (J6), the USB connector labeled **COM PORT** (J5), the USB Debug Adapter (J23), or from the UDP motherboard bulk supply (PWR_5.0V_BULK).

5.6. Power LED (DS9)

The blue power LED provides visual feedback when the board is powered through USB, the 9 V power adapter, the USB Debug Adapter, or from the UDP motherboard. The power LED indicates that power is available on the board and the VDD Power Select switch must be configured properly to power the MCU.

5.7. Imeasure Jumper (JP2)

The Imeasure jumper (JP2) allows for easy access to measure the VDD current of the MCU. The shorting block for this header is populated by default, and the direction of current is shown with a silk screen arrow. To measure the supply current, remove the corresponding shorting block and connect a current measurement device across the unpopulated header.

The voltage supply prior to the Imeasure jumper is the VDD pre-measure (VDD_PM) net, which supplies all of the external LEDs, switches, USB COM, and reset pull-up. The VDD after the Imeasure jumper only connects to the MCU.

5.8. Debug Header (J23)

The shrouded 10-pin debug header supports the Silicon Labs USB Debug Adapter. This connector provides a C2 debug connection to the C8051F85x/86x on the MCU card.

5.9. Reset Button (S5)

The reset push-button switch is just below the debug header (J23). Pushing this button will always reset the MCU. Note that pushing this button while the IDE is connected to the MCU will result in the IDE disconnecting from the target.

5.10. UART Connection Options (J7, U2, U4, U5)

The MCU card features a USB virtual COM port (VCP) UART connection via the mini-B USB connector (J5) labeled **COM PORT**. The VCP connection uses the CP210x USB-to-UART bridge chip (U2). The GPIO pins connected to the CP210x device can be enabled or disabled through the J7 header. Table 4 shows the GPIO pins that are routed to the CP210x.

In addition to the CP210x USB-to-UART connection, the MCU card can connect the C8051F850 UART signals with the UDP Motherboard UART signals UART_TX_SYS and UART_RX_SYS using U5. The signals to switch between the two interfaces are UART_VCP_EN and UART_SYS_EN and are controlled by the motherboard. The default selection with or without the motherboard is the CP210x VCP interface using a pull-down resistor R20.

Table 4. CP210x Controlled GPIO Pins

| MCU Pin | COM Function |
|---------|---------------|
| P0.4 | UART Transmit |
| P0.5 | UART Receive |
| VDD | COM VIO |

5.11. Port Pin Headers (J24, J25, J26)

All of the MCU port pins are available on the 0.100-inch headers on MCU card. Each connector provides connections to each port, VDD, and ground. Any unused pins on the P2 header are not connected. Some of these port pins are shared with other functions on the board and may be modified as explained in Section 5.13.

5.12. Electronic Board ID (EBID) (U1, J35)

The MCU card has a unique ID that can be read out from the Silicon Labs C8051F990 MCU (U1). This MCU enables software tools to recognize the connected hardware and automatically select the appropriate firmware image.

The EBID device uses two I²C signals to communicate: UDPBUS_SDA_A and UDPBUS_SCL_A. These signals are connected to P0.6 and P0.7 on the C8051F850 MCU through the J25 header. These signals can be disconnected from the MCU during power measurements.

Table 5. Terminal Block Pin Descriptions (J25)

| MCU Pin | EBID / UDP Signal |
|---------|-------------------|
| P0.6 | UDPBUS_SDA_A |
| P0.7 | UDPBUS_SCL_A |

5.13. MCU Port Pin Connections

The MCU card has many UDP connections for use with different I/O cards and the UDP motherboard. Table 6 describes all functions connected to each pin on the C8051F850 MCU. All of the UDP connections are made with populated 0 Ω ohm resistors on the back of the MCU card. To disconnect a signal from the pin, remove the 0 Ω resistor.

Table 6. MCU Card and UDP Pin Functions

| MCU Pin | MCU Card Function or UDP Signal | | | | |
|---------|---------------------------------|--------------|--------------|-------------|----------------|
| P0.0 | VREF | SPI_SCK_EZR | ADC_VREF | GPIO05 | |
| P0.1 | AGND | SPI_MISO_EZR | ADC_VREFGND | GPIO06 | EPCA_CH1_MOTOR |
| P0.2 | | EXT_INT0 | SPI_MOSI_EZR | CP_POS_A | |
| P0.3 | | EXT_INT1 | SPI_NSS0_EZR | CP_NEG_A | |
| P0.4 | | UART_TX_SYS | UART_TX_A | | |
| P0.5 | | UART_RX_SYS | UART_RX_A | WAKEUP0 | |
| P0.6 | UDPBUS_SDA_A | UART_RTS_SYS | UART_RTS_A | I2C_SDA_EZR | EPCA_CH3_MOTOR |
| P0.7 | UDPBUS_SCL_A | UART_CTS_SYS | UART_CTS_A | I2C_SCL_EZR | EPCA_CH5_MOTOR |
| P1.0 | LED1 | ADC_IN0 | CP_OUT_A | | |
| P1.1 | LED2 | ADC0.9 | ADC_IN1 | CP_OUTA_A | |
| P1.2 | Potentiometer | ADC0.10 | ADC_IN2 | CLKOUT0 | |
| P1.3 | | PCA_CH0_A | ADC_IN3 | | |
| P1.4 | ADC0.12 | PCA_CH1_A | | GPIO02 | EPCA_CH0_MOTOR |
| P1.5 | ADC0.13 | PCA_CH0_B | WAKEUP1 | GPIO03 | EPCA_CH2_MOTOR |
| P1.6 | | PCA_ECI_A | TIMER_CT_A | GPIO04 | EPCA_CH4_MOTOR |
| P1.7 | Switch S1 | TIMER_CT_B | | GPIO01 | |
| P2.0 | C2D | | | | |
| P2.1 | Switch S2 | GPIO00 | | | |

6. Using the C8051F850 MCU Card with the UDP Motherboard

6.1. MCU Card Header Connections

The MCU card has four connectors with 100 pins each. These 400 pins are directly tied to the UDP motherboard and I/O cards. These signals are named and designed to support a wide variety of features and applications, and the C8051F850 MCU card implements a subset of these connections.

The MCU cards and I/O cards are designed so that a maximum number of functions are shared between each card. This allows a particular type of I/O card to be shared amongst all MCU cards that connect to the same signals.

The MCU card slot includes the following components:

| | |
|----|-----------------------|
| J1 | MCU card connector H1 |
| J2 | MCU card connector H2 |
| J3 | MCU card connector H3 |
| J4 | MCU card connector H4 |

The C8051F850 MCU card implements the signals described in Table 8, Table 9, Table 10, and Table 11 in the Appendix.

6.2. Shorting Blocks: Factory Defaults

The C8051F850 MCU card comes from the factory with pre-installed shorting blocks on several headers. Figure 11 shows the positions of the factory default shorting blocks.

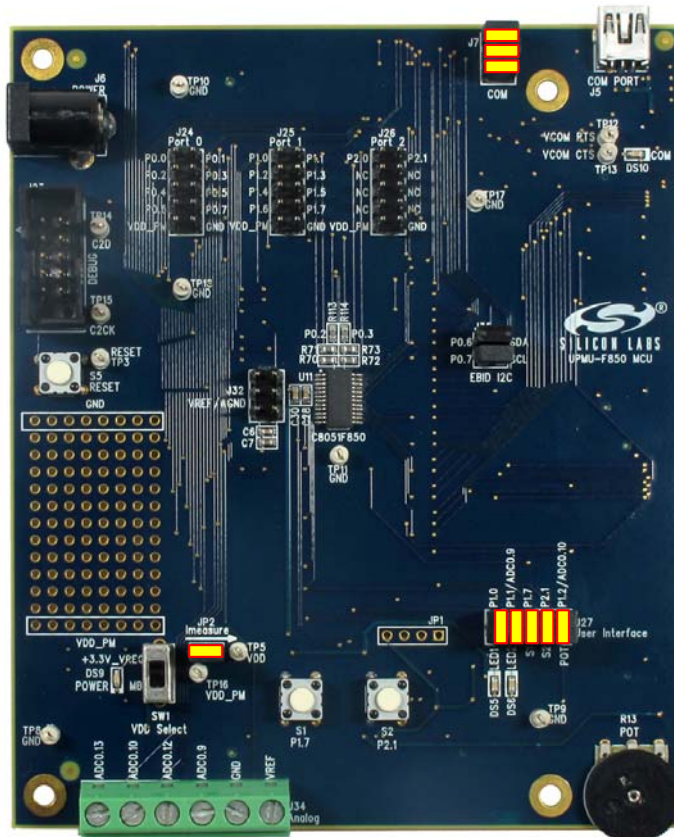


Figure 11. Shorting Blocks: Factory Defaults

A shorting block is installed across the JP2 Imeasure header to enable power to the MCU. Shorting blocks are installed on J7 to enable the virtual COM port. Shorting blocks are also installed on J27 to enable the switches, LEDs, and potentiometer to be connected to GPIO pins.

7. Power Measurement

The C8051F850 MCU card includes a JP2 **Imeasure** jumper for MCU power measurement purposes. The VDD supply on pin 2 of the header connects only to the MCU on the board. The VDD pre-measure (VDD_PM) supply on pin 1 of the JP2 header powers the external LEDs, switches, reset switch, potentiometer, and VCP COM.

7.1. Measuring Power with Fixed VDD

To measure the power of the C8051F850 MCU using the MCU card at a fixed 3.3 V:

1. Connect a USB Debug Adapter to the 10-pin shrouded debug connector (J23).
2. Remove the three shorting blocks from J7.
3. Remove the JP2 **Imeasure** shorting block.
4. Connect a multimeter across (positive side on the left pin, current flow indicated by the silk screen arrow).
5. Move the **VDD Select** switch (SW2) to the upper **+3.3V_VREG** position.
6. Connect the 9 V power adapter to **POWER** (J6).
7. Download the code to the board.
8. Remove the debug adapter connection.
9. Measure the power of the device.

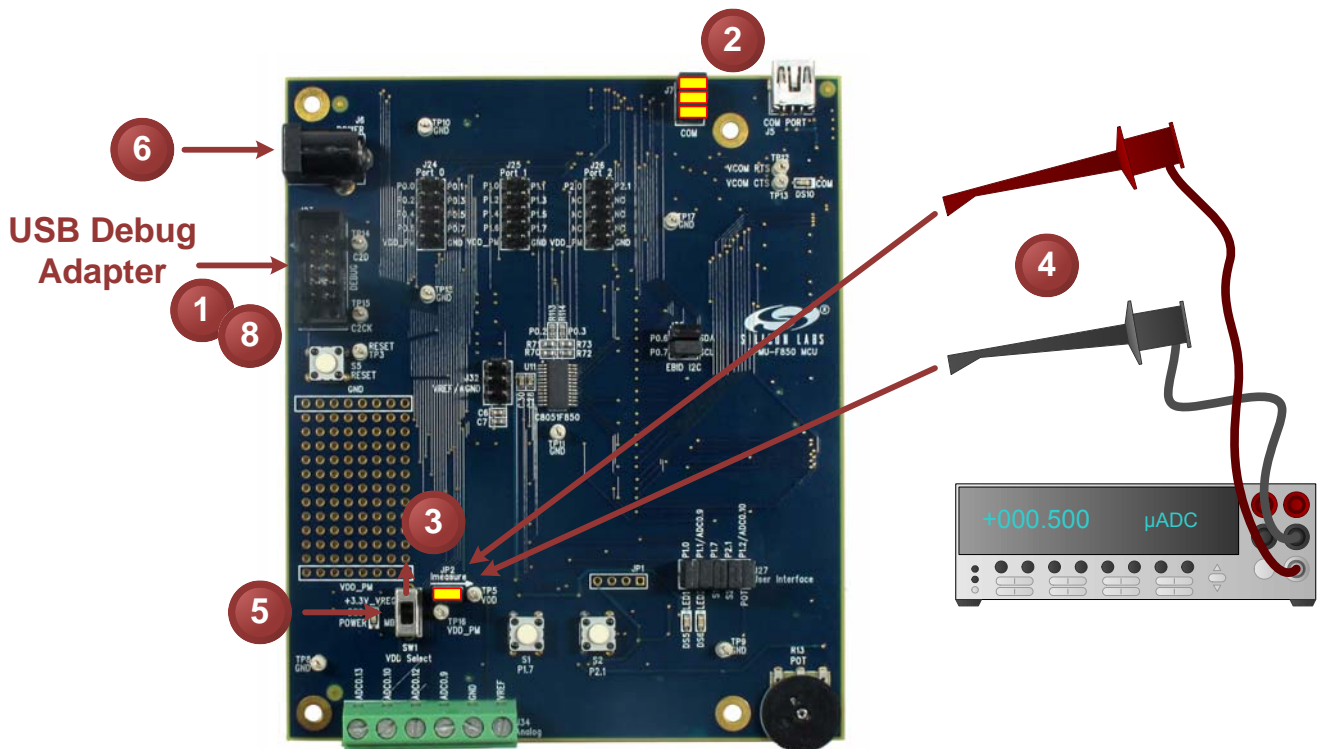


Figure 12. C8051F850 MCU Card Power Measurement Configuration— Fixed VDD

7.2. Measuring Power with Varying VDD

To measure power with a varying VDD:

1. Connect a USB Debug Adapter to the 10-pin shrouded debug connector (J23).
2. Remove the three shorting blocks from J7.
3. Remove the JP2 **Imeasure** shorting block.
4. Connect a multimeter across the JP2 **Imeasure** jumper (positive side on the left pin, current flow indicated by the silk screen arrow).
5. Move the **VDD Select** switch (SW2) to the lower **MB** position.
6. Connect the negative terminal of a bench power supply to board ground.
7. Connect the positive terminal of a bench power supply to the positive side (left pin) of the **Imeasure** jumper. This will ensure that the /RST pin pull-up is powered.

Note: The pull-up resistor on /RST is powered by the VDD pre-measure (VDD_PM) net, which is separated from the VDD net with the **Imeasure** shorting block (JP2) removed. Powering the MCU using VDD without powering the VDD_PM net will prevent the IDE from communicating with the MCU.

8. Download the code to the board.
9. Remove the debug adapter connection.
10. Measure the power of the device.

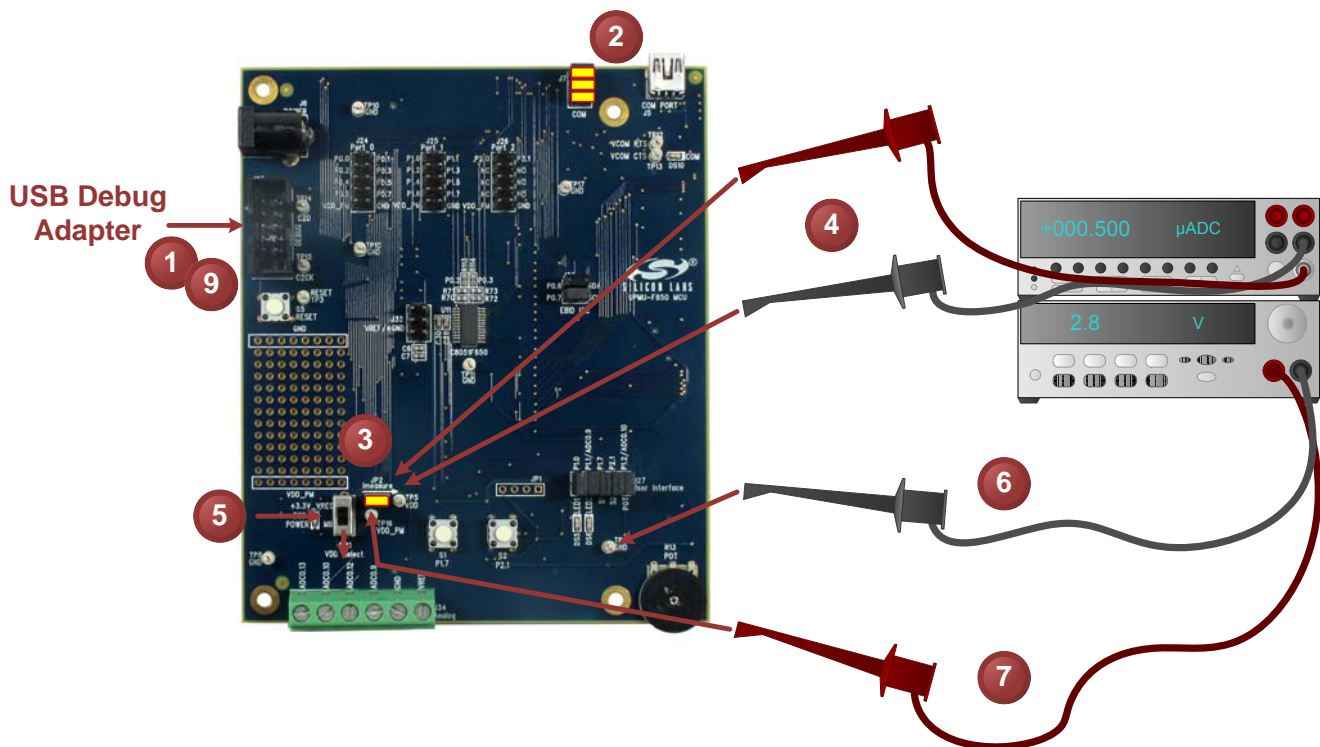


Figure 13. C8051F850 MCU Card Power Measurement Configuration—Varying VDD

8. Known Board Issues

There are no known issues with Revision 200 of the C8051F850 MCU card.

9. Schematics

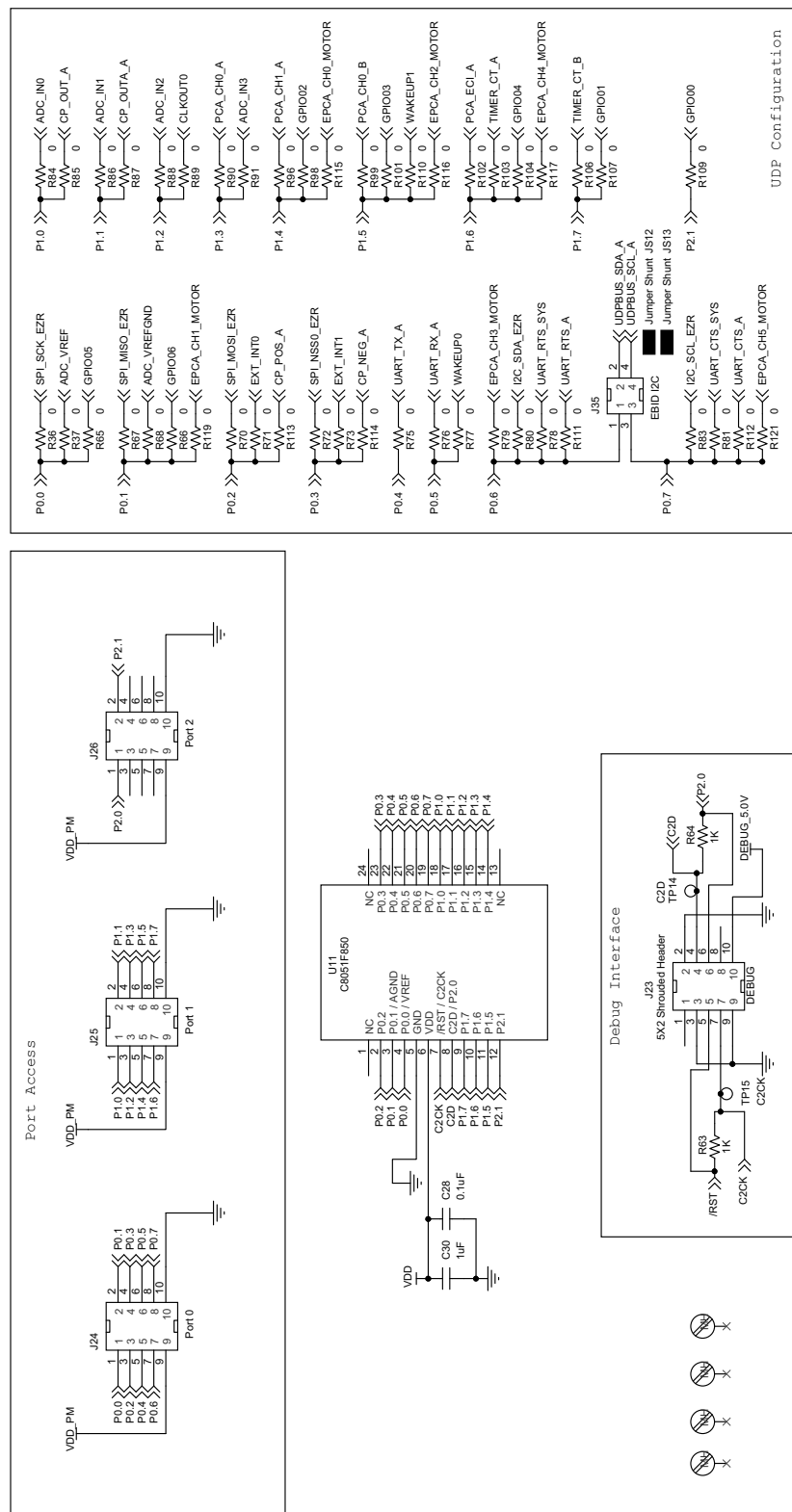


Figure 14. C8051F850 UDP MCU Card Schematic (Revision 200) (1 of 5)

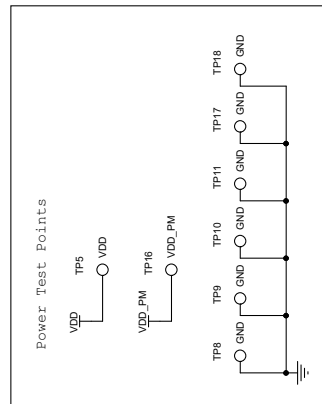


Figure 15. C8051F850 UDP MCU Card Schematic (Revision 200) (2 of 5)

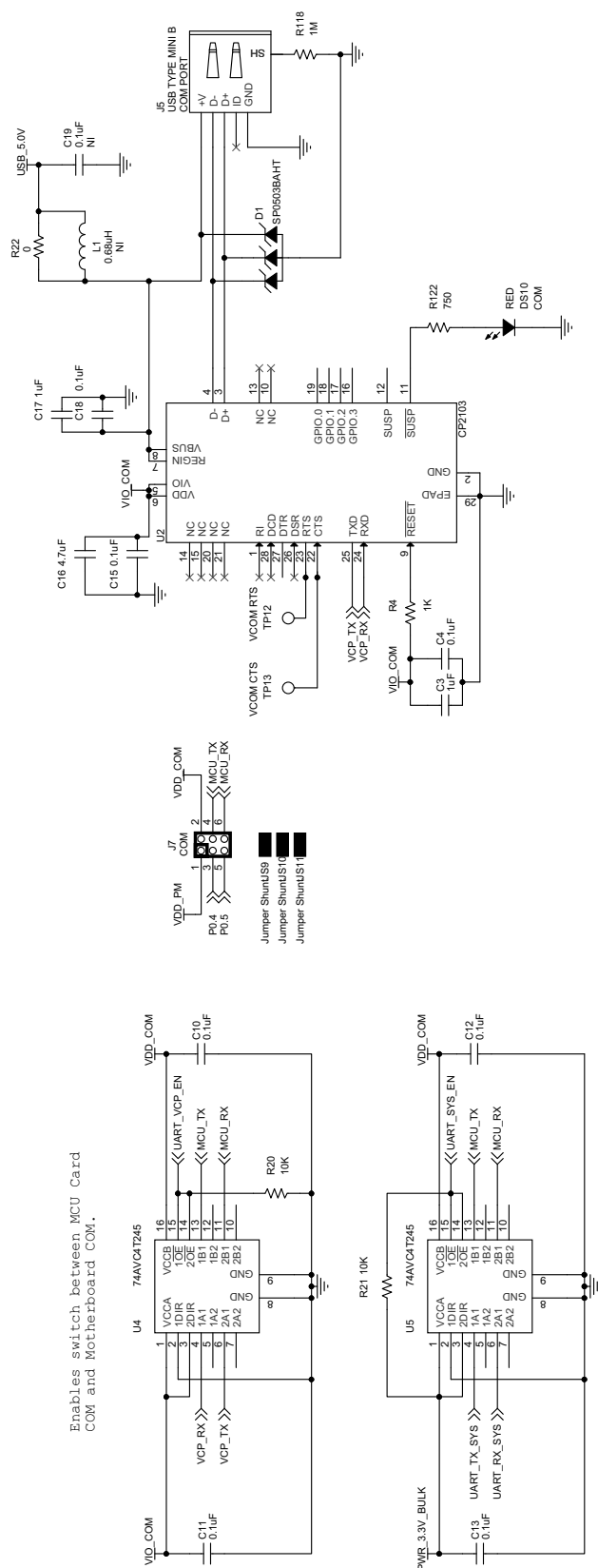


Figure 16. C8051F850 UDP MCU Card Schematic (Revision 200) (3 of 5)

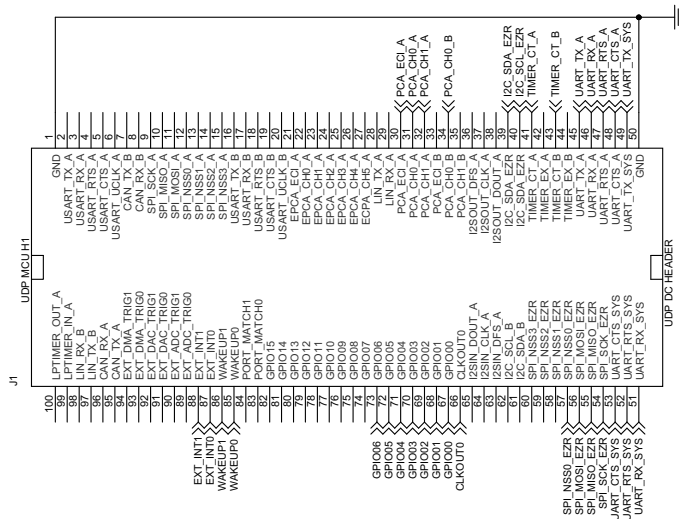


Figure 17. C8051F850 UDP MCU Card Schematic (Revision 200) (4 of 5)

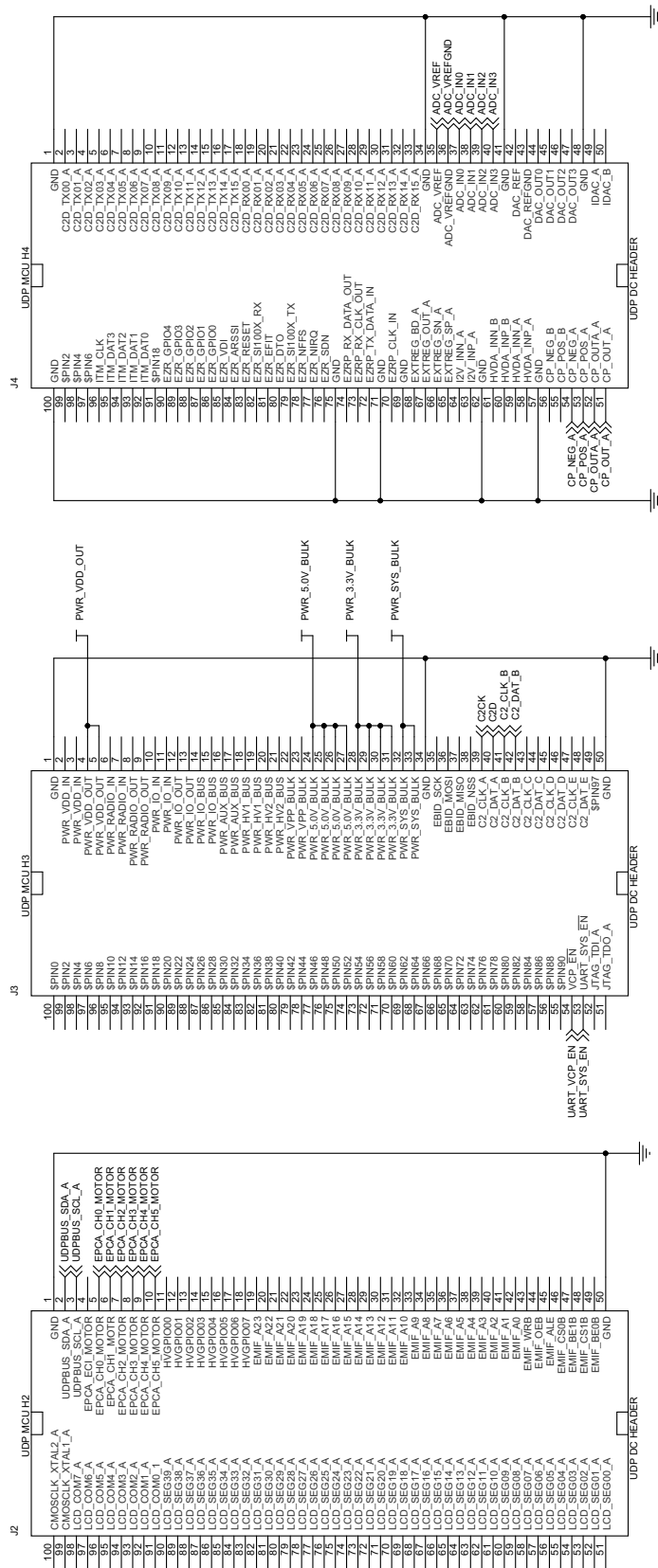


Figure 18. C8051F850 UDP MCU Card Schematic (Revision 200) (5 of 5)

10. Bill of Materials**Table 7. C8051F850 UDP MCU Card Bill of Materials**

| Reference | Part Number | Source | Description |
|---|--------------------------|-------------------------|---|
| C1 C3 C17 C30 | C0603X7R100-105K | Venkel | 1 μ F 10 V \pm 10% X7R 0603 |
| C2 C4 C6 C10 C11 C12 C13 C15 C18 C28 C38 | C0603X7R100-104K | Venkel | 0.1 μ F 10 V \pm 10% X7R 0603 |
| C20 | C0603X7R100-103M | Venkel | 0.01 μ F 10 V \pm 20% X7R 0603 |
| C7 C16 C36 C37 | C0603X5R6R3-475K | Venkel | 4.7 μ F 6.3 V \pm 10% X5R 0603 |
| D1 | SP0503BAHTG | Littlefuse | 300 mW 20 V TVS SOT143 |
| D3 D4 D5 D7 | STPS140Z | ST Semiconductor | 1.0 A 40 V Schottky SOD-123 |
| D6 | MMSZ5245BT1 | On Semiconductor | 15 V 500 mW 15 V 5% Zener SOD-123 |
| DS5 DS6 DS10 | SML-LX0603IW | LUMEX INC | RED 30 mA LED 0603 |
| DS9 | LTST-C190TBKT | LITE-ON Technology Corp | BLUE LED 0603 |
| J1 J2 J3 J4 | FX8-100P-SV1 | Hirose Electric | UDP DC Header |
| J23 | 5103309-1 | Tyco | 0.1 in. 5x2 Shrouded Header |
| J24 J25 J26 J27 | TSW-105-07-T-D | Samtec | 0.1 in. 5x2 Header |
| J34 | 1729160 | Phoenix Contact | Analog Header Terminal Block 1x6 |
| J35 | TSW-102-07-T-D | Samtec | 0.1 in. 2x2 Header |
| J5 | 54819-0519 | Molex | USB Mini B |
| J6 | RAPC722X | Switchcraft Inc. | Power Jack 5 A BARREL |
| J7 J32 | TSW-103-01-L-D | Samtec | 0.1 in. 2x3 Header |
| JP2 | TSW-102-07-T-S | Samtec | 0.1 in. 1x2 Header |
| JS1 JS2 JS3 JS4 JS5 JS6 JS9 JS10 JS11 | SNT-100-BK-T | Samtec | Jumper Shunt |
| R118 | CR0603-16W-1004F | Venkel | 1 M Ω 1/16 W \pm 1% ThickFilm 0603 |
| R13 | RV100F-30-4K1B-B10K-B301 | Alpha (Taiwan) | 10 k Ω 0.03 W 30% Thumbwheel Potentiometer |
| R15 R16 R122 | CR0603-16W-7500F | Venkel | 750 Ω 1/10 W \pm 1% ThickFilm 0603 |
| R19 | CR0603-10W-1501F | Venkel | 1.5 k Ω 1/10 W \pm 1% ThickFilm 0603 |
| R20 R21 | CR0603-10W-103J | Venkel | 10 k Ω 1/10 W \pm 5% ThickFilm 0603 |

C8051F850-DK-UG

Table 7. C8051F850 UDP MCU Card Bill of Materials (Continued)

| Reference | Part Number | Source | Description |
|---|---------------------|------------------------|--|
| R22 R36 R37 R51 R52 R65 R66 R67 R68 R70 R71 R72 R73 R75 R76 R77 R78 R79 R80 R81 R83 R84 R85 R86 R87 R88 R89 R90 R91 R96 R98 R99 R101 R102 R103 R104 R106 R107 R109 R110 R111 R112 R113 R114 R115 R116 R117 R119 R121 | CR0603-16W-000 | Venkel | 0 Ω 1 A ThickFilm 0603 |
| R25 | CR0603-10W-104J | Venkel | 100 k Ω 1/10 W \pm 5% ThickFilm 0603 |
| R3 R4 R9 R11 R63 R64 R94 R95 | CR0603-10W-1001F | Venkel | 1 k Ω 1/10 W \pm 1% ThickFilm 0603 |
| S1 S2 S5 | EVQ-PAD04M | Panasonic Corp | Momentary Tactile Switch |
| SW1 | OS102011MS2QN1 | C&K | .1 A @ 12 V Slide Switch |
| U1 | C8051F990-GM | Silicon Labs | C8051F990 MCU QFN20 |
| U11 | C8051F850-A-GU | Silicon Labs | C8051F850 MCU QSOP24 |
| U2 | CP2103-GM | Silicon Labs | CP2103 USB-to-UART Bridge QFN28 |
| U4 U5 | SN74AVC4T245PW | TI | 1.2–3.6 V Translator TSSOP16 |
| U6 | LP2989AIMM-3.3/NOPB | National Semiconductor | 500 mA LDO MSOP8 |
| Components Not Installed | | | |
| C19 | C0603X7R100-104K | Venkel | 0.1 μ F 10 V \pm 10% X7R 0603 Not Installed (NI) |
| JP1 | SSQ-104-23-T-S | Samtec | CONN SOCKET 4X1 Not Installed (NI) |
| JS12 JS13 JS14 JS15 | SNT-100-BK-T | Samtec | Jumper Shunt Not Installed (NI) |
| L1 | NLV25T-R68J-PF | TDK | 0.68 μ H 300 mA \pm 5% GP Not Installed (NI) |
| R46 R47 | CR0603-16W-000 | Venkel | 0 Ω 1 A ThickFilm 0603 Not Installed (NI) |

APPENDIX—MCU CARD HEADER PIN DESCRIPTIONS

Table 8. C8051F850 MCU Card H1 Pin Descriptions (J1)

| MCU Card Pin | Signal Name | Description | C8051F850 Pin / Signal |
|--------------|--------------|---|------------------------|
| 1 | GND | | |
| 2 | USART_TX_A | | |
| 3 | USART_RX_A | | |
| 4 | USART_RTS_A | | |
| 5 | USART_CTS_A | | |
| 6 | USART_UCLK_A | | |
| 7 | CAN_TX_B | | |
| 8 | CAN_RX_B | | |
| 9 | SPI_SCK_A | SPI A clock | |
| 10 | SPI_MISO_A | SPI A master-in, slave-out | |
| 11 | SPI_MOSI_A | SPI A master-out, slave-in | |
| 12 | SPI_NSS0_A | SPI A slave select 0 | |
| 13 | SPI_NSS1_A | SPI A slave select 1 | |
| 14 | SPI_NSS2_A | SPI A slave select 2 | |
| 15 | SPI_NSS3_A | SPI A slave select 3 | |
| 16 | USART_TX_B | USART B transmit | |
| 17 | USART_RX_B | USART B receive | |
| 18 | USART_RTS_B | USART B hardware handshaking | |
| 19 | USART_CTS_B | USART B hardware handshaking | |
| 20 | USART_UCLK_B | USART B clock | |
| 21 | EPCA_ECI_A | EPCA A external clock input | |
| 22 | EPCA_CH0_A | | |
| 23 | EPCA_CH1_A | | |
| 24 | EPCA_CH2_A | | |
| 25 | EPCA_CH3_A | | |
| 26 | EPCA_CH4_A | | |
| 27 | EPCA_CH5_A | | |
| 28 | LIN_TX_A | | |
| 29 | LIN_RX_A | | |
| 30 | PCA_ECI_A | PCA A external clock input | P1.6 |
| 31 | PCA_CH0_A | | P1.3 |
| 32 | PCA_CH1_A | | P1.4 |
| 33 | PCA_ECI_B | PCA B external clock input | |
| 34 | PCA_CH0_B | | P1.5 |
| 35 | PCA_CH1_B | | |
| 36 | I2SOUT_DFS_A | I ² S A transmitter word sync (WS) | |

Table 8. C8051F850 MCU Card H1 Pin Descriptions (J1) (Continued)

| MCU Card Pin | Signal Name | Description | C8051F850 Pin / Signal |
|--------------|---------------|--|------------------------|
| 37 | I2SOUT_CLK_A | I ² S A transmitter clock (SCK) | |
| 38 | I2SOUT_DOUT_A | I ² S A transmitter data (SD) | |
| 39 | I2C_SDA_EZR | EZRadio I ² C data | P0.6 |
| 40 | I2C_SCL_EZR | EZRadio I ² C clock | P0.7 |
| 41 | TIMER_CT_A | | P1.6 |
| 42 | TIMER_EX_A | | |
| 43 | TIMER_CT_B | | P1.7 |
| 44 | TIMER_EX_B | | |
| 45 | UART_TX_A | UART A transmit | P0.4 |
| 46 | UART_RX_A | UART A receive | P0.5 |
| 47 | UART_RTS_A | UART A hardware handshaking | P0.6 |
| 48 | UART_CTS_A | UART A hardware handshaking | P0.7 |
| 49 | UART_TX_SYS | System UART transmit | P0.4 |
| 50 | GND | | |
| 51 | UART_RX_SYS | System UART receive | P0.5 |
| 52 | UART_RTS_SYS | System UART hardware handshaking | P0.6 |
| 53 | UART_CTS_SYS | System UART hardware handshaking | P0.7 |
| 54 | SPI_SCK_EZR | EZRadio SPI clock | P0.0 |
| 55 | SPI_MISO_EZR | EZRadio SPI master-in, slave-out | P0.1 |
| 56 | SPI_MOSI_EZR | EZRadio SPI master-out, slave-in | P0.2 |
| 57 | SPI_NSS0_EZR | EZRadio SPI slave select 0 | P0.3 |
| 58 | SPI_NSS1_EZR | EZRadio SPI slave select 1 | |
| 59 | SPI_NSS2_EZR | EZRadio SPI slave select 2 | |
| 60 | SPI_NSS3_EZR | EZRadio SPI slave select 3 | |
| 61 | I2C_SDA_B | I ² C B data | |
| 62 | I2C_SCL_B | I ² C B clock | |
| 63 | I2SIN_DFS_A | I ² S A receiver word sync (WS) | |
| 64 | I2SIN_CLK_A | I ² S A receiver clock (SCK) | |
| 65 | I2SIN_DOUT_A | I ² S A receiver data (SD) | |
| 66 | CLKOUT0 | clock | P1.2 |
| 67 | GPIO00 | General purpose I/O 0 | P2.1 |
| 68 | GPIO01 | General purpose I/O 1 | P1.7 |
| 69 | GPIO02 | General purpose I/O 2 | P1.4 |
| 70 | GPIO03 | General purpose I/O 3 | P1.5 |
| 71 | GPIO04 | General purpose I/O 4 | P1.6 |
| 72 | GPIO05 | General purpose I/O 5 | P0.0 |
| 73 | GPIO06 | General purpose I/O 6 | P0.1 |

Table 8. C8051F850 MCU Card H1 Pin Descriptions (J1) (Continued)

| MCU Card Pin | Signal Name | Description | C8051F850 Pin / Signal |
|---------------------|--------------------|-------------------------------------|-------------------------------|
| 74 | GPIO07 | General purpose I/O 7 | |
| 75 | GPIO08 | General purpose I/O 8 | |
| 76 | GPIO09 | General purpose I/O 9 | |
| 77 | GPIO10 | General purpose I/O 10 | |
| 78 | GPIO11 | General purpose I/O 11 | |
| 79 | GPIO12 | General purpose I/O 12 | |
| 80 | GPIO13 | General purpose I/O 13 | |
| 81 | GPIO14 | General purpose I/O 14 | |
| 82 | GPIO15 | General purpose I/O 15 | |
| 83 | PORT_MATCH0 | | |
| 84 | PORT_MATCH1 | | |
| 85 | WAKEUP0 | MCU low-power wakeup input signal 0 | P0.5 |
| 86 | WAKEUP1 | MCU low-power wakeup input signal 1 | P1.5 |
| 87 | EXT_INT0 | External interrupt 0 | P0.2 |
| 88 | EXT_INT1 | External interrupt 1 | P0.3 |
| 89 | EXT_ADC_TRIG0 | External ADC trigger 0 | |
| 90 | EXT_ADC_TRIG1 | External ADC trigger 1 | |
| 91 | EXT_DAC_TRIG0 | External DAC trigger 0 | |
| 92 | EXT_DAC_TRIG1 | External DAC trigger 1 | |
| 93 | EXT_DMA_TRIG0 | External DMA trigger 0 | |
| 94 | EXT_DMA_TRIG1 | External DMA trigger 1 | |
| 95 | CAN_TX_A | | |
| 96 | CAN_RX_A | | |
| 97 | LIN_TX_B | | |
| 98 | LIN_RX_B | | |
| 99 | LPTIMER_IN_A | | |
| 100 | LPTIMER_OUT_A | | |

Table 9. C8051F850 MCU Card H2 Pin Descriptions (J2)

| MCU Card Pin | Signal Name | Description | C8051F850 Pin / Signal |
|--------------|----------------|--|------------------------|
| 1 | GND | | |
| 2 | UDPBUS_SDA_A | UDP motherboard I ² C A data | P0.6 |
| 3 | UDPBUS_SCL_A | UDP motherboard I ² C A clock | P0.7 |
| 4 | EPCA_ECI_MOTOR | Motor EPCA external clock input | |
| 5 | EPCA_CH0_MOTOR | | P1.4 |
| 6 | EPCA_CH1_MOTOR | | P0.1 |
| 7 | EPCA_CH2_MOTOR | | P1.5 |
| 8 | EPCA_CH3_MOTOR | | P0.6 |
| 9 | EPCA_CH4_MOTOR | | P1.6 |
| 10 | EPCA_CH5_MOTOR | | P0.7 |
| 11 | HVGPI00 | High Drive I/O 0 | |
| 12 | HVGPI01 | High Drive I/O 1 | |
| 13 | HVGPI02 | High Drive I/O 2 | |
| 14 | HVGPI03 | High Drive I/O 3 | |
| 15 | HVGPI04 | High Drive I/O 4 | |
| 16 | HVGPI05 | High Drive I/O 5 | |
| 17 | HVGPI06 | High Drive I/O 6 | |
| 18 | HVGPI07 | High Drive I/O 7 | |
| 19 | EMIF_A23 | EMIF muxed AD23m pin (non-muxed A15) | |
| 20 | EMIF_A22 | EMIF muxed AD22m pin (non-muxed A14) | |
| 21 | EMIF_A21 | EMIF muxed AD21m pin (non-muxed A13) | |
| 22 | EMIF_A20 | EMIF muxed AD20m pin (non-muxed A12) | |
| 23 | EMIF_A19 | EMIF muxed AD19m pin (non-muxed A11) | |
| 24 | EMIF_A18 | EMIF muxed AD18m pin (non-muxed A10) | |
| 25 | EMIF_A17 | EMIF muxed AD17m pin (non-muxed A9) | |
| 26 | EMIF_A16 | EMIF muxed AD16m pin (non-muxed A8) | |
| 27 | EMIF_A15 | EMIF muxed AD15m pin (non-muxed A7) | |
| 28 | EMIF_A14 | EMIF muxed AD14m pin (non-muxed A6) | |
| 29 | EMIF_A13 | EMIF muxed AD13m pin (non-muxed A5) | |
| 30 | EMIF_A12 | EMIF muxed AD12m pin (non-muxed A4) | |
| 31 | EMIF_A11 | EMIF muxed AD11m pin (non-muxed A3) | |
| 32 | EMIF_A10 | EMIF muxed AD10m pin (non-muxed A2) | |
| 33 | EMIF_A9 | EMIF muxed AD9m pin (non-muxed A1) | |
| 34 | EMIF_A8 | EMIF muxed AD8m pin (non-muxed A0) | |
| 35 | EMIF_A7 | EMIF muxed AD7m pin (non-muxed D7) | |
| 36 | EMIF_A6 | EMIF muxed AD6m pin (non-muxed D6) | |
| 37 | EMIF_A5 | EMIF muxed AD5m pin (non-muxed D5) | |

Table 9. C8051F850 MCU Card H2 Pin Descriptions (J2) (Continued)

| MCU Card Pin | Signal Name | Description | C8051F850 Pin / Signal |
|---------------------|--------------------|------------------------------------|-------------------------------|
| 38 | EMIF_A4 | EMIF muxed AD4m pin (non-muxed D4) | |
| 39 | EMIF_A3 | EMIF muxed AD3m pin (non-muxed D3) | |
| 40 | EMIF_A2 | EMIF muxed AD2m pin (non-muxed D2) | |
| 41 | EMIF_A1 | EMIF muxed AD1m pin (non-muxed D1) | |
| 42 | EMIF_A0 | EMIF muxed AD0m pin (non-muxed D0) | |
| 43 | EMIF_WRB | EMIF write signal | |
| 44 | EMIF_OEB | EMIF output enable | |
| 45 | EMIF_ALE | EMIF address latch enable | |
| 46 | EMIF_CS0B | EMIF chip select 0 | |
| 47 | EMIF_BE1B | EMIF output byte enable 1 | |
| 48 | EMIF_CS1B | EMIF chip select 1 | |
| 49 | EMIF_BE0B | EMIF output byte enable 0 | |
| 50 | GND | | |
| 51 | LCD_SEG00_A | | |
| 52 | LCD_SEG01_A | | |
| 53 | LCD_SEG02_A | | |
| 54 | LCD_SEG03_A | | |
| 55 | LCD_SEG04_A | | |
| 56 | LCD_SEG05_A | | |
| 57 | LCD_SEG06_A | | |
| 58 | LCD_SEG07_A | | |
| 59 | LCD_SEG08_A | | |
| 60 | LCD_SEG09_A | | |
| 61 | LCD_SEG10_A | | |
| 62 | LCD_SEG11_A | | |
| 63 | LCD_SEG12_A | | |
| 64 | LCD_SEG13_A | | |
| 65 | LCD_SEG14_A | | |
| 66 | LCD_SEG15_A | | |
| 67 | LCD_SEG16_A | | |
| 68 | LCD_SEG17_A | | |
| 69 | LCD_SEG18_A | | |
| 70 | LCD_SEG19_A | | |
| 71 | LCD_SEG20_A | | |
| 72 | LCD_SEG21_A | | |
| 73 | LCD_SEG22_A | | |
| 74 | LCD_SEG23_A | | |

Table 9. C8051F850 MCU Card H2 Pin Descriptions (J2) (Continued)

| MCU Card Pin | Signal Name | Description | C8051F850 Pin / Signal |
|--------------|-----------------|--|------------------------|
| 75 | LCD_SEG24_A | | |
| 76 | LCD_SEG25_A | | |
| 77 | LCD_SEG26_A | | |
| 78 | LCD_SEG27_A | | |
| 79 | LCD_SEG28_A | | |
| 80 | LCD_SEG29_A | | |
| 81 | LCD_SEG30_A | | |
| 82 | LCD_SEG31_A | | |
| 83 | LCD_SEG32_A | | |
| 84 | LCD_SEG33_A | | |
| 85 | LCD_SEG34_A | | |
| 86 | LCD_SEG35_A | | |
| 87 | LCD_SEG36_A | | |
| 88 | LCD_SEG37_A | | |
| 89 | LCD_SEG38_A | | |
| 90 | LCD_SEG39_A | | |
| 91 | LCD_COM0_A | | |
| 92 | LCD_COM1_A | | |
| 93 | LCD_COM2_A | | |
| 94 | LCD_COM3_A | | |
| 95 | LCD_COM4_A | | |
| 96 | LCD_COM5_A | | |
| 97 | LCD_COM6_A | | |
| 98 | LCD_COM7_A | | |
| 99 | CMOSCLK_XTAL1_A | MCU XTAL1 pin for external oscillators | |
| 100 | CMOSCLK_XTAL2_A | MCU XTAL2 pin for external oscillators | |

Table 10. C8051F850 MCU Card H3 Pin Descriptions (J3)

| MCU Card Pin | Description | Description | C8051F850 Pin / Signal |
|--------------|---------------|---|------------------------|
| 1 | GND | | |
| 2 | PWR_VDD_IN | Power input for powering the MCU card from a power source other than the UDP motherboard | |
| 3 | PWR_VDD_IN | | |
| 4 | PWR_VDD_OUT | Power input for the MCU card | |
| 5 | PWR_VDD_OUT | | |
| 6 | PWR_RADIO_IN | Power input for powering the radio test card from a power source other than the UDP motherboard | |
| 7 | PWR_RADIO_IN | | |
| 8 | PWR_RADIO_OUT | Power input for the radio test card | |
| 9 | PWR_RADIO_OUT | | |
| 10 | PWR_IO_IN | Power input for powering the I/O card from a power source other than the UDP motherboard | |
| 11 | PWR_IO_IN | | |
| 12 | PWR_IO_OUT | Power input for the I/O card | |
| 13 | PWR_IO_OUT | | |
| 14 | PWR_IO_BUS | Connects power from the MCU card to the radio and I/O cards | |
| 15 | PWR_IO_BUS | | |
| 16 | PWR_AUX_BUS | Connects power from the MCU card to the radio and I/O cards | |
| 17 | PWR_AUX_BUS | | |
| 18 | PWR_HV1_BUS | High Drive I/O power 1 | |
| 19 | PWR_HV1_BUS | | |
| 20 | PWR_HV2_BUS | High Drive I/O power 2 | |
| 21 | PWR_HV2_BUS | | |
| 22 | PWR_VPP_BULK | VPP programming voltage | |
| 23 | PWR_VPP_BULK | | |
| 24 | PWR_5.0_BULK | 5.0 V power from the UDP motherboard | |
| 25 | PWR_5.0_BULK | | |
| 26 | PWR_5.0_BULK | | |
| 27 | PWR_5.0_BULK | | |
| 28 | VCC_3.3V | 3.3 V power from the UDP motherboard | |
| 29 | VCC_3.3V | | |
| 30 | VCC_3.3V | | |
| 31 | VCC_3.3V | | |
| 32 | PWR_SYS_BULK | 3.3 V power supply for EBID devices | |
| 33 | PWR_SYS_BULK | | |
| 34 | GND | | |
| 35 | EBID_SCK | EBID SPI clock | |
| 36 | EBID_MOSI | EBID SPI master-out, slave in | |
| 37 | EBID_MISO | EBID SPI master-in, slave-out | |

Table 10. C8051F850 MCU Card H3 Pin Descriptions (J3) (Continued)

| MCU Card Pin | Description | Description | C8051F850 Pin / Signal |
|--------------|-------------|---|------------------------|
| 38 | EBID_NSS | EBID SPI slave select | |
| 39 | C2_CLK_A | C2 interface A clock, JTAG interface A TCK, Serial Wire SWCLK | RST/C2CK |
| 40 | C2_DAT_A | C2 interface A data, JTAG interface A TMS, Serial Wire SWDIO | C2D/P2.0 |
| 41 | C2_CLK_B | C2 interface B clock | |
| 42 | C2_DAT_B | C2 interface B data | |
| 43 | C2_CLK_C | C2 interface C clock | |
| 44 | C2_DAT_C | C2 interface C data | |
| 45 | C2_CLK_D | C2 interface D clock | |
| 46 | C2_DAT_D | C2 interface D data | |
| 47 | C2_CLK_E | C2 interface E clock | |
| 48 | C2_DAT_E | C2 interface E data | |
| 49 | nc | no connect | |
| 50 | GND | | |
| 51 | JTAG_TDO_A | JTAG interface A data out (TDO), Serial Wire SWO | |
| 52 | JTAG_TDI_A | JTAG interface A data in (TDI) | |
| 53 | VCP_EN | Selects the USB-to-USART motherboard path | |
| 54 | UART_SYS_EN | Selects the USB-to-USART motherboard path | |
| 55 | H3_55 | General purpose signal | |
| 56 | H3_56 | General purpose signal | |
| 57 | H3_57 | General purpose signal | |
| 58 | H3_58 | General purpose signal | |
| 59 | H3_59 | General purpose signal | |
| 60 | H3_60 | General purpose signal | |
| 61 | H3_61 | General purpose signal | |
| 62 | H3_62 | General purpose signal | |
| 63 | H3_63 | General purpose signal | |
| 64 | H3_64 | General purpose signal | |
| 65 | H3_65 | General purpose signal | |
| 66 | H3_66 | General purpose signal | |
| 67 | H3_67 | General purpose signal | |
| 68 | H3_68 | General purpose signal | |
| 69 | H3_69 | General purpose signal | |
| 70 | H3_70 | General purpose signal | |
| 71 | H3_71 | General purpose signal | |
| 72 | H3_72 | General purpose signal | |
| 73 | H3_73 | General purpose signal | |

Table 10. C8051F850 MCU Card H3 Pin Descriptions (J3) (Continued)

| MCU Card Pin | Description | Description | C8051F850 Pin / Signal |
|---------------------|--------------------|------------------------|-------------------------------|
| 74 | H3_74 | General purpose signal | |
| 75 | H3_75 | General purpose signal | |
| 76 | H3_76 | General purpose signal | |
| 77 | H3_77 | General purpose signal | |
| 78 | H3_78 | General purpose signal | |
| 79 | H3_79 | General purpose signal | |
| 80 | H3_80 | General purpose signal | |
| 81 | H3_81 | General purpose signal | |
| 82 | H3_82 | General purpose signal | |
| 83 | H3_83 | General purpose signal | |
| 84 | H3_84 | General purpose signal | |
| 85 | H3_85 | General purpose signal | |
| 86 | H3_86 | General purpose signal | |
| 87 | H3_87 | General purpose signal | |
| 88 | H3_88 | General purpose signal | |
| 89 | H3_89 | General purpose signal | |
| 90 | H3_90 | General purpose signal | |
| 91 | H3_91 | General purpose signal | |
| 92 | H3_92 | General purpose signal | |
| 93 | H3_93 | General purpose signal | |
| 94 | H3_94 | General purpose signal | |
| 95 | H3_95 | General purpose signal | |
| 96 | H3_96 | General purpose signal | |
| 97 | H3_97 | General purpose signal | |
| 98 | H3_98 | General purpose signal | |
| 99 | H3_99 | General purpose signal | |
| 100 | H3_100 | General purpose signal | |

Table 11. C8051F850 MCU Card H4 Pin Descriptions (J4)

| MCU Card Pin | Description | Description | C8051F850 Pin / Signal |
|--------------|-------------|------------------------------|------------------------|
| 1 | GND | | |
| 2 | C2D_TX00_A | Capacitive Sensing output 0 | |
| 3 | C2D_TX01_A | Capacitive Sensing output 1 | |
| 4 | C2D_TX02_A | Capacitive Sensing output 2 | |
| 5 | C2D_TX03_A | Capacitive Sensing output 3 | |
| 6 | C2D_TX04_A | Capacitive Sensing output 4 | |
| 7 | C2D_TX05_A | Capacitive Sensing output 5 | |
| 8 | C2D_TX06_A | Capacitive Sensing output 6 | |
| 9 | C2D_TX07_A | Capacitive Sensing output 7 | |
| 10 | C2D_TX08_A | Capacitive Sensing output 8 | |
| 11 | C2D_TX09_A | Capacitive Sensing output 9 | |
| 12 | C2D_TX10_A | Capacitive Sensing output 10 | |
| 13 | C2D_TX11_A | Capacitive Sensing output 11 | |
| 14 | C2D_TX12_A | Capacitive Sensing output 12 | |
| 15 | C2D_TX13_A | Capacitive Sensing output 13 | |
| 16 | C2D_TX14_A | Capacitive Sensing output 14 | |
| 17 | C2D_TX15_A | Capacitive Sensing output 15 | |
| 18 | C2D_RX00_A | Capacitive Sensing input 0 | |
| 19 | C2D_RX01_A | Capacitive Sensing input 1 | |
| 20 | C2D_RX02_A | Capacitive Sensing input 2 | |
| 21 | C2D_RX03_A | Capacitive Sensing input 3 | |
| 22 | C2D_RX04_A | Capacitive Sensing input 4 | |
| 23 | C2D_RX05_A | Capacitive Sensing input 5 | |
| 24 | C2D_RX06_A | Capacitive Sensing input 6 | |
| 25 | C2D_RX07_A | Capacitive Sensing input 7 | |
| 26 | C2D_RX08_A | Capacitive Sensing input 8 | |
| 27 | C2D_RX09_A | Capacitive Sensing input 9 | |
| 28 | C2D_RX10_A | Capacitive Sensing input 10 | |
| 29 | C2D_RX11_A | Capacitive Sensing input 11 | |
| 30 | C2D_RX12_A | Capacitive Sensing input 12 | |
| 31 | C2D_RX13_A | Capacitive Sensing input 13 | |
| 32 | C2D_RX14_A | Capacitive Sensing input 14 | |
| 33 | C2D_RX15_A | Capacitive Sensing input 15 | |
| 34 | GND | | |
| 35 | ADC_VREF | ADC voltage reference | P0.0 |
| 36 | ADC_VREFGND | ADC VREF ground | P0.1 |
| 37 | ADC_IN0 | | P1.0 |

Table 11. C8051F850 MCU Card H4 Pin Descriptions (J4) (Continued)

| MCU Card Pin | Description | Description | C8051F850 Pin / Signal |
|---------------------|--------------------|--|-------------------------------|
| 38 | ADC_IN1 | | P1.1 |
| 39 | ADC_IN2 | | P1.2 |
| 40 | ADC_IN3 | | P1.3 |
| 41 | GND | | |
| 42 | DAC_VREF | DAC voltage reference | |
| 43 | DAC_VREFGND | DAC voltage reference ground | |
| 44 | DAC_OUT0 | | |
| 45 | DAC_OUT1 | | |
| 46 | DAC_OUT2 | | |
| 47 | DAC_OUT3 | | |
| 48 | GND | | |
| 49 | IDAC_A | IDAC A output | |
| 50 | IDAC_B | IDAC B output | |
| 51 | CP_OUT_A | Comparator A synchronous output | P1.0 |
| 52 | CP_OUTA_A | Comparator A asynchronous output | P1.1 |
| 53 | CP_POS_A | Comparator A positive input | P0.2 |
| 54 | CP_NEG_A | Comparator A negative input | P0.3 |
| 55 | CP_POS_B | Comparator B positive input | |
| 56 | CP_NEG_B | | |
| 57 | GND | | |
| 58 | HVDA_INP_A | High Voltage Differential Amplifier A positive input | |
| 59 | HVDA_INN_A | High Voltage Differential Amplifier A negative input | |
| 60 | HVDA_INP_B | High Voltage Differential Amplifier B positive input | |
| 61 | HVDA_INN_B | High Voltage Differential Amplifier B negative input | |
| 62 | GND | | |
| 63 | I2V_INP_A | Current-to-Voltage converter A input 0 | |
| 64 | I2V_INN_A | Current-to-Voltage converter A input 1 | |
| 65 | EXTREG_SP_A | External Voltage Regulator SP input | |
| 66 | EXTREG_SN_A | External Voltage Regulator SN input | |
| 67 | EXTREG_OUT_A | External Voltage Regulator OUT output | |
| 68 | EXTREG_BD_A | External Voltage Regulator base drive output | |
| 69 | GND | | |
| 70 | EZRP_CLK_IN | Radio test card clock input (SMA connector) | |
| 71 | GND | | |
| 72 | EZRP_TX_DATA_IN | Radio test card transmit data input (SMA connector) | |
| 73 | EZRO_RX_CLK_OUT | Radio test card receive clock output (SMA connector) | |
| 74 | EZRP_RX_DATA_OUT | Radio test card receive data output (SMA connector) | |

Table 11. C8051F850 MCU Card H4 Pin Descriptions (J4) (Continued)

| MCU Card Pin | Description | Description | C8051F850 Pin / Signal |
|--------------|---------------|---|------------------------|
| 75 | GND | | |
| 76 | EZRP_SDN | Radio test card peripheral shutdown | |
| 77 | EZRP_NIRQ | Radio test card peripheral interrupt status | |
| 78 | EZR_NFFS | | |
| 79 | EZR_SI100X_TX | Radio test card Si100x transmit | |
| 80 | EZR_DTO | | |
| 81 | EZR_FFIT | | |
| 82 | EZR_SI100X_RX | Radio test card Si100x receive | |
| 83 | EZR_RESET | Radio test card reset | |
| 84 | EZR_ARSSI | | |
| 85 | EZR_VDI | | |
| 86 | EZR_GPIO0 | Radio test card general purpose I/O 0 | |
| 87 | EZR_GPIO1 | Radio test card general purpose I/O 1 | |
| 88 | EZR_GPIO2 | Radio test card general purpose I/O 2 | |
| 89 | EZR_GPIO3 | Radio test card general purpose I/O 3 | |
| 90 | EZR_GPIO4 | Radio test card general purpose I/O 4 | |
| 91 | H4_91 | General purpose signal | |
| 92 | ITM_DAT0 | | |
| 93 | ITM_DAT1 | | |
| 94 | ITM_DAT2 | | |
| 95 | ITM_DAT3 | | |
| 96 | ITM_CLK | | |
| 97 | H4_97 | General purpose signal | |
| 98 | H4_98 | General purpose signal | |
| 99 | H4_99 | General purpose signal | |
| 100 | GND | | |

CONTACT INFORMATION

Silicon Laboratories Inc.
400 West Cesar Chavez
Austin, TX 78701

Please visit the Silicon Labs Technical Support web page:

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