

## UDP SiM3L1xx LCD MCU CARD USER'S GUIDE

### 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).

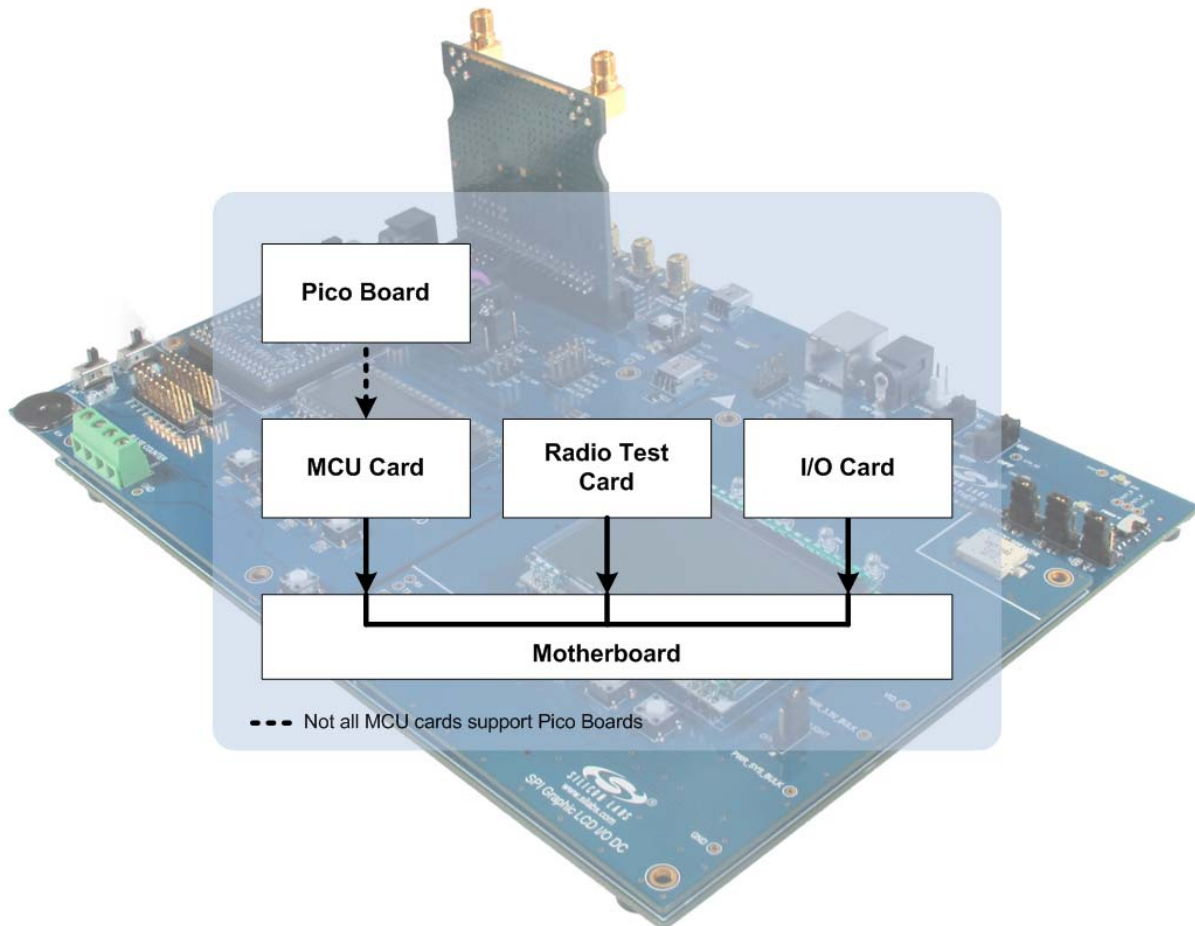


Figure 1. Unified Development Platform Block Diagram

# SiM3L1xx LCD UG

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## 2. Relevant Documents

This document provides a hardware overview for the Unified Development Platform (UDP) system SiM3L1xx LCD MCU card. Additional information on the UDP system and the Precision32™ 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](http://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](http://www.silabs.com/udp).

### 2.3. Application Notes

All Precision32 Application Notes can be found at [www.silabs.com/32bit-appnotes](http://www.silabs.com/32bit-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 (J14) 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 SW2 VBAT Select switch to the middle **+3.3V\_VREG** position.
4. Verify that the J14 Imeasure jumper is populated.
5. Verify that the VIO and VIORF Selection switches (SW8 and SW9) are in the lower position selecting **VBAT** as the supply voltage for the VIO and VIORF power rails.
6. 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.

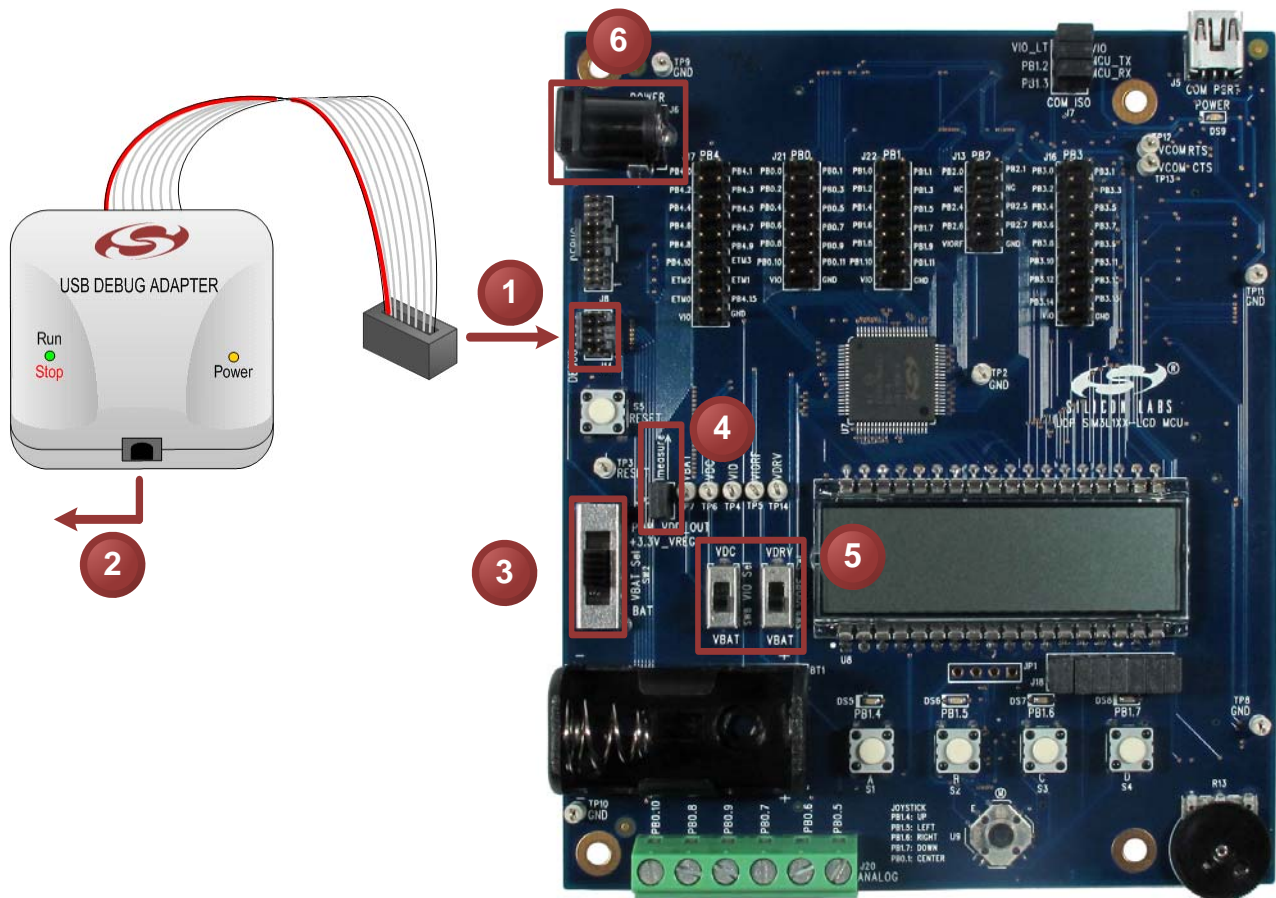


Figure 2. Hardware Setup using the MCU Card Alone

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## 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 (J31) 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 SW2 VBAT Select switch to the upper **PWR\_VDD\_OUT** position.
8. Verify that the J14 Imeasure jumper is populated.
9. Verify that the VIO and VIORF Selection switches (SW8 and SW9) are in the lower position selecting **VBAT** as the supply voltage for the VIO and VIORF power rails.
10. 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.
11. Move the S3 power switch on the UDP motherboard to the ON position.
12. Update the motherboard firmware as described in Section 3.4.

### 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.

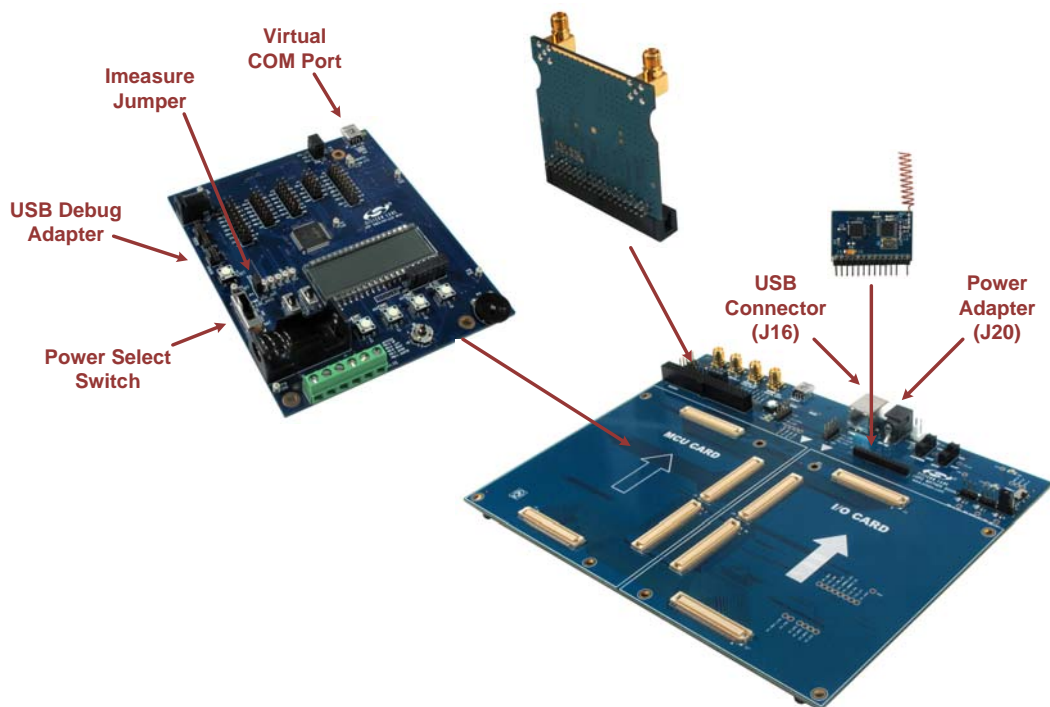


Figure 3. Hardware Setup using the Unified Development Platform

## 3.3. 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. If the "Install CP210x Drivers" option is selected during installation, a driver "unpacker" utility will launch.

1. Follow the steps to copy the driver files to the desired location. The default directory is `C:\SiLabs\MCU\CP210x`.
2. The final window will give an option to install the driver on the target system. Select the "Launch the CP210x VCP Driver Installer" option if you are ready to install the driver.
3. If selected, the driver installer will now launch, providing an option to specify the driver installation location. After pressing the "Install" button, the installer will search your system for copies of previously installed CP210x Virtual COM Port drivers. It will let you know when your system is up to date. The driver files included in this installation have been certified by Microsoft.
4. If the "Launch the CP210x VCP Driver Installer" option was not selected in step 3, the installer can be found in the location specified in step 2, by default `C:\SiLabs\MCU\CP210x\Windows_2K_XP_S2K3_Vista`. At this location, run `CP210xVCPInstaller.exe`.
5. 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.
6. If needed, the driver files can be uninstalled by selecting "Silicon Labs CP210x USB to UART Bridge Driver Removal" option in the "Add or Remove Programs" window.

## 3.4. Updating the UDP Motherboard Firmware

To ensure the UDP Motherboard supports the SiM3L1xx MCU card, run the UDP Motherboard Firmware Update Utility shown in Figure 4. This utility can be downloaded from [www.silabs.com/udp](http://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.

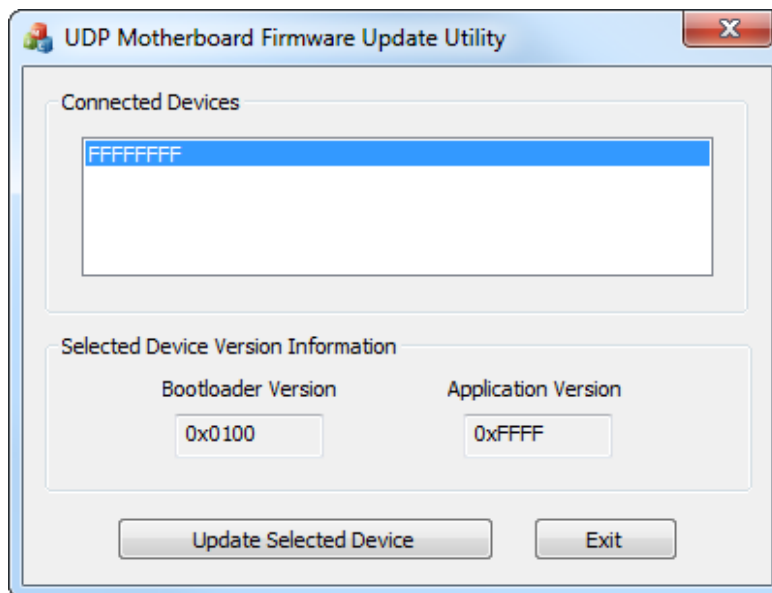


Figure 4. UDP Motherboard Firmware Update Utility

## 4. SiM3L1xx LCD MCU Card Overview

The SiM3L1xx LCD MCU card enables application development on the SiM3L1xx MCU. 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 5 shows the SiM3L1xx LCD MCU card, and Figure 6 highlights the SiM3L1xx LCD MCU card features.

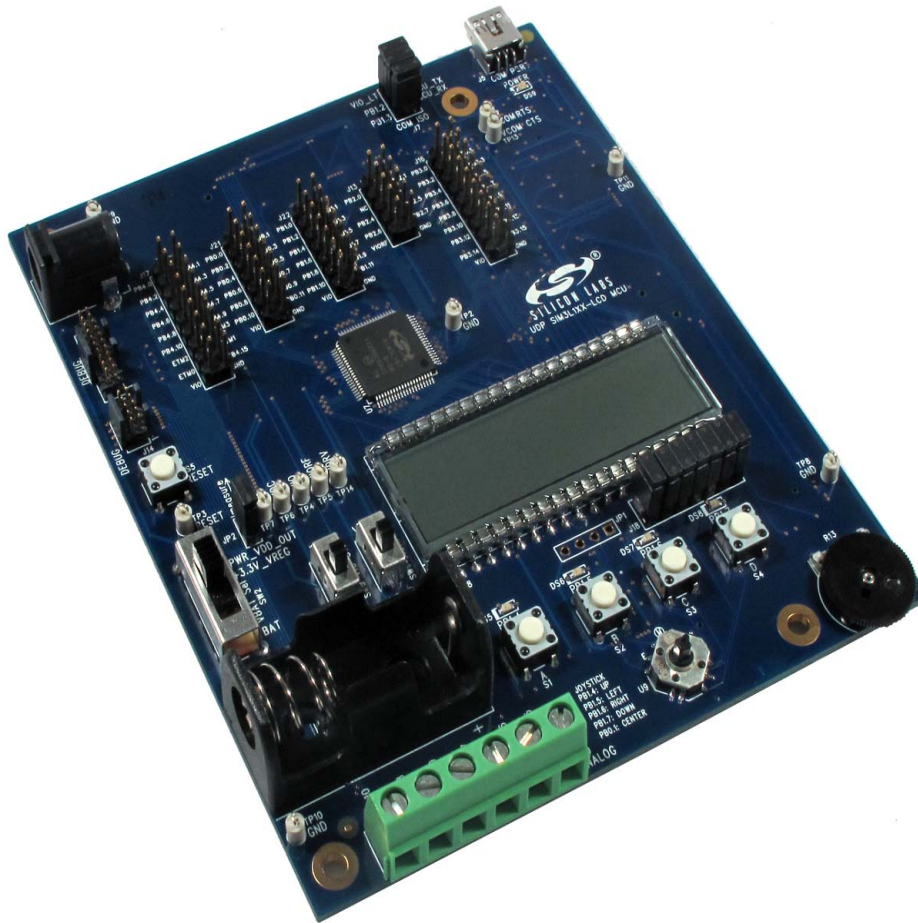


Figure 5. SiM3L1xx LCD MCU Card

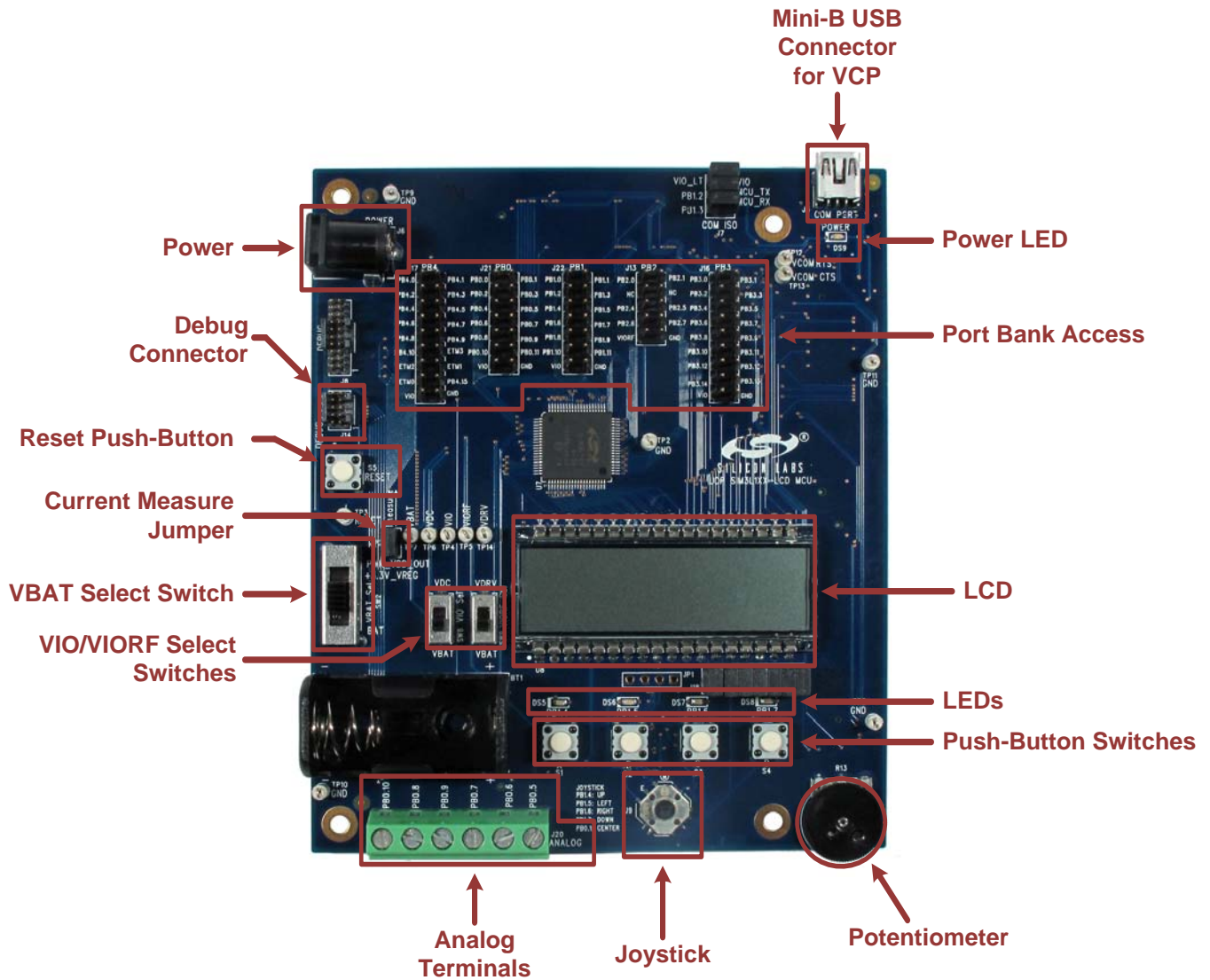


Figure 6. SiM3L1xx LCD MCU Card Features

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## 4.1. Push-Button Switches and LEDs (S1-4, DS5-8)

The UDP SiM3L1xx LCD MCU Card has four push-button switches and four LEDs. The four switches and LEDs connect to PB1.4, PB1.5, PB1.6, and PB1.7. The switches are normally open and pull the pin voltage to ground when pressed. The LEDs connect to VIO through a current-limiting resistor and turn on when the corresponding Port Bank pin is low.

A 5-way joystick is also connected to PB1.4, PB1.5, PB1.6, and PB1.7. Selecting one of the directions in the joystick has the same effect as pressing the push button switch. Pressing down on the joystick will connect PB0.1 to ground.

The header J18 can be used to disconnect the switches, LEDs, and joystick from the GPIO pins.

**Table 1. Switch and LED Pin Descriptions**

MCU Pin	Function		
	LEDs	Joystick	Switch
PB0.1	—	CENTER	—
PB1.4	Red LED DS5	UP	Switch S1
PB1.5	Red LED DS6	RIGHT	Switch S2
PB1.6	Red LED DS7	DOWN	Switch S3
PB1.7	Red LED DS8	LEFT	Switch S4

## 4.2. Analog Terminals (J20)

Several of the SiM3L1xx port pins used for analog functions are connected to the J20 terminal block. Refer to Table 2 for the J20 terminal block connections.

**Table 2. Terminal Block Pin Descriptions (J20)**

Terminal Pin	MCU I/O
1	PB0.5 / PC0
2	PB0.6 / PC1
3	PB0.7 / LC0
4	PB0.8 / LC1
5	PB0.9 / LCPUL0
6	PB0.10 / LCPUL1

## 4.3. Potentiometer (R13)

The potentiometer is available on PB0.3. To facilitate a low-power potentiometer, PB0.4 connects to the bottom of the potentiometer as a potentiometer enable. To use the potentiometer, install a shorting block on J18 pins 11 and 12 to connect PB0.3 to the potentiometer and J18 pins 13 and 14 to connect the potentiometer enable to PB0.4. Drive PB0.4 low to enable the potentiometer.

## 4.4. VBAT Power Select Switch (SW2)

The VBAT Power Supply has three power options: UDP motherboard (PWR\_VDD\_OUT), +3.3 V Regulator Power, and Battery Power. The VBAT Power Select Switch is used to select between the three options. The +3.3 V Regulator power option allows the board to be powered from a diode-OR of three power sources: 9 V Power Adapter (J6), the USB connector labeled “COM PORT” (J5), or from the UDP motherboard bulk supply.

## 4.5. Power LED (DS9)

The blue power LED provides visual feedback when the board is powered through USB, the 9 V power adapter, or from the UDP Motherboard. The power LED indicates that power is available on the board and the VBAT, VIO, and VIORF switches must be configured properly to power the MCU.



## 4.6. Battery Holder (BT1)

The battery holder is designed to accept a 3.6 V lithium thionyl chloride battery. The VBAT Power Select Switch may be used to power the system from the battery. The Power LED does not turn on when battery powered.

## 4.7. Imeasure Jumper (J19)

The Imeasure jumper (J19) allows for easy access to measure the VBAT current of the MCU. The shorting block for this header is populated by default. To measure the supply current, remove the corresponding shorting block and connect a current measurement device across the unpopulated header.

## 4.8. VIO and VIORF Selection Switches (SW8 and SW9)

The VIO and VIORF switches allow for the VIO and VIORF pins on the MCU to be connected to the VDC or the VBAT supply. By default, both switches will power VIO and VIORF from VBAT.

## 4.9. Debug Header (J14)

The mini 10-pin debug header supports the Silicon Labs USB Debug Adapter. This connector provides a Serial Wire (SW) debug connection to the SiM3L1xx on the MCU card.

## 4.10. Reset Button (S5)

The reset push-button switch is in the lower-left corner. Pushing this button will always reset the MCU. Pushing this button while the IDE is connected to the MCU will result in IDE disconnecting from the target.

## 4.11. UART VCP Connection Options (J7, U2, J5)

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 3 shows the GPIO pins that are routed to the CP210x.

**Table 3. CP210x Controlled GPIO Pins**

GPIO Pin	User Control Function
PB1.2	UART Transmit
PB1.3	UART Receive
VIO	VIO

## 4.12. LCD Display (U8)

The LCD display is a 4-mux, 128-segment alphanumeric LCD. The LCD has eight 14-segment characters and includes decimal points and apostrophes. The LCD is controlled by the on-chip LCD0 peripheral.

## 4.13. Port Pin Headers (J21, J22, J13, J16, J17)

All of the MCU port pins are available on the 0.100-inch headers on MCU card. Some of these port pins are shared with other functions on the board and may be modified as explained in Section 4.14.

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## 4.14. MCU Card Default and Optional Connections

The MCU card has many default and optional connections for use with different I/O cards and the UDP motherboard. Some of the default connections are via shorting jumpers. The shorting jumpers are a 603 resistor footprint with a cut trace between pads. To disconnect, cut the trace with a sharp utility knife. To reconnect, install a 0 Ω 603 resistor or connect the two pads with solder. The optional connections are non-populated (no-pop) resistor footprints. To connect, install a 0 Ω 603 resistor or connect the two pads with solder.

The LCD connections on the SiM3L1xx LCD MCU Card route to the on-board, populated LCD.

**Table 4. MCU Pin Functions**

MCU Pin	MCU Card Function	
	Default	Optional
PB0.0	VREF (C6, C7)	
PB0.1	Joystick Center (J18)	
PB0.2		Analog Input (R37)
PB0.3	Potentiometer Input (J18)	Analog Input (R35)
PB0.4	IDAC Output (C5) Potentiometer Enable (J18)	IDAC Output (R10)
PB0.5	PC0 (J20)	
PB0.6	PC1 (J20)	
PB0.7	LC0 (J20)	
PB0.8	LC1 (J20)	
PB0.9	LCPUL0 (J20)	
PB0.10	LCPUL1 (J20)	
PB0.11	TDO (R33)	
PB1.0		
PB1.1		
PB1.2	UART Transmit (J7)	
PB1.3	UART Receive (J7)	
PB1.4	Joystick Up S1 Red LED (J18)	
PB1.5	Joystick Right S2 Red LED (J18)	SPI_SCK_EZR (R58)
PB1.6	Joystick Down S3 Red LED (J18)	
PB1.7	Joystick Left S4 Red LED (J18)	SPI_MISO_EZR (R56)
PB1.8	LCD Pin 21	SPI_MOSI_EZR (R62)
PB1.9	LCD Pin 16	SPI_NSS0_EZR (R60)
PB1.10	LCD Pin 22	
PB1.11	LCD Pin 15	
PB2.0	EZRP_NIRQ (R44)	EZRP_RX_CLK_OUT(R41)
PB2.1	EZRP_SDN (R42)	EZRP_RX_DATA_OUT (R39)
PB2.4	SPI_SCK_EZR (R57)	

Table 4. MCU Pin Functions (Continued)

MCU Pin	MCU Card Function	
	Default	Optional
PB2.5	SPI_MISO_EZR (R55)	
PB2.6	SPI_MOSI_EZR (R61)	
PB2.7		
PB3.0	LCD Pin 23	
PB3.1	LCD Pin 14	
PB3.2	LCD Pin 24	
PB3.3	LCD Pin 13	
PB3.4	LCD Pin 25	
PB3.5	LCD Pin 12	
PB3.6	LCD Pin 26	
PB3.7	LCD Pin 11	
PB3.8	LCD Pin 27	
PB3.9	LCD Pin 10	
PB3.10	LCD Pin 28	
PB3.11	LCD Pin 9	
PB3.12	LCD Pin 29	
PB3.13	LCD Pin 8	
PB3.14	LCD Pin 20 (COM3)	
PB3.15	LCD Pin 19 (COM4)	
PB4.0	LCD Pin 18 (COM1)	
PB4.1	LCD Pin 17 (COM0)	
PB4.2	LCD Pin 30	
PB4.3	LCD Pin 7	
PB4.4	LCD Pin 31	
PB4.5	LCD Pin 6	
PB4.6	LCD Pin 32	
PB4.7	LCD Pin 5	
PB4.8	LCD Pin 33	
PB4.9	LCD Pin 4	
PB4.10	LCD Pin 34	
PB4.11	LCD Pin 3	ETM3 (R31)
PB4.12	LCD Pin 35	ETM2 (R30)
PB4.13	LCD Pin 2	ETM1 (R29)
PB4.14	LCD Pin 36	ETM0 (R28)
PB4.15	LCD Pin 1	TRACECLK (R27)

## 5. Using the SiM3L1xx MCU Card with the UDP Motherboard

### 5.1. Current Measurement

The power measurement circuitry on the UDP motherboard consists of a Silicon Labs C8051F351 8051 MCU that measures both input voltage and current consumption of the MCU card, I/O expander, and radio test card. Install a shorting block on the UDP Motherboard J13 and J15 and connect the two left pins together when using the motherboard with the SiM3L1xx MCU card.

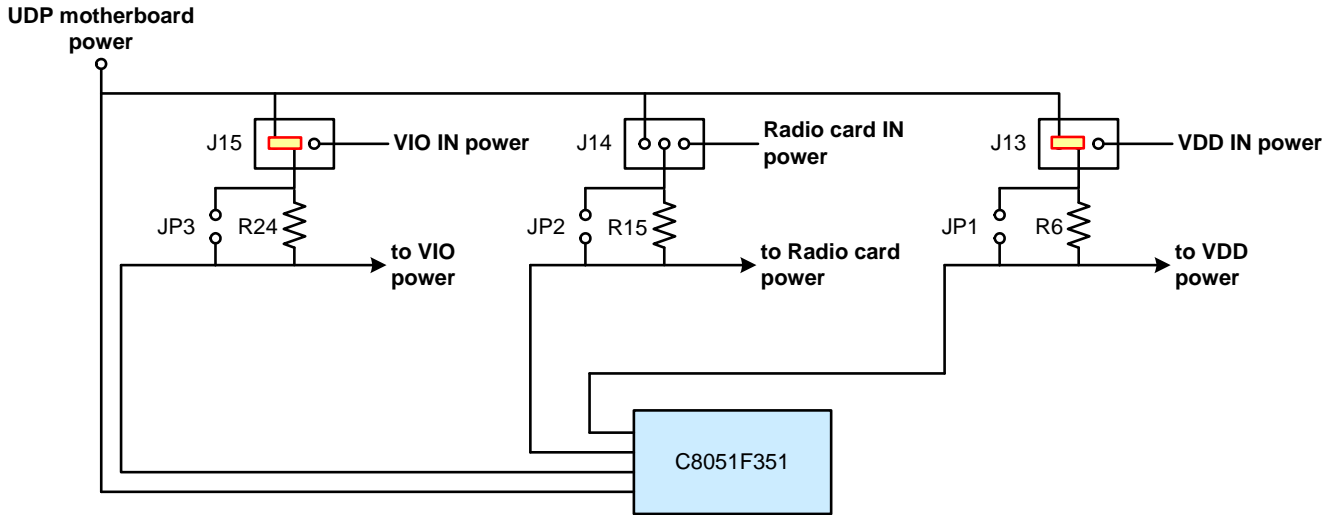


Figure 7. Power Measurement Diagram with Shorting Blocks

### 5.2. 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 SiM3L1xx LCD UG 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.

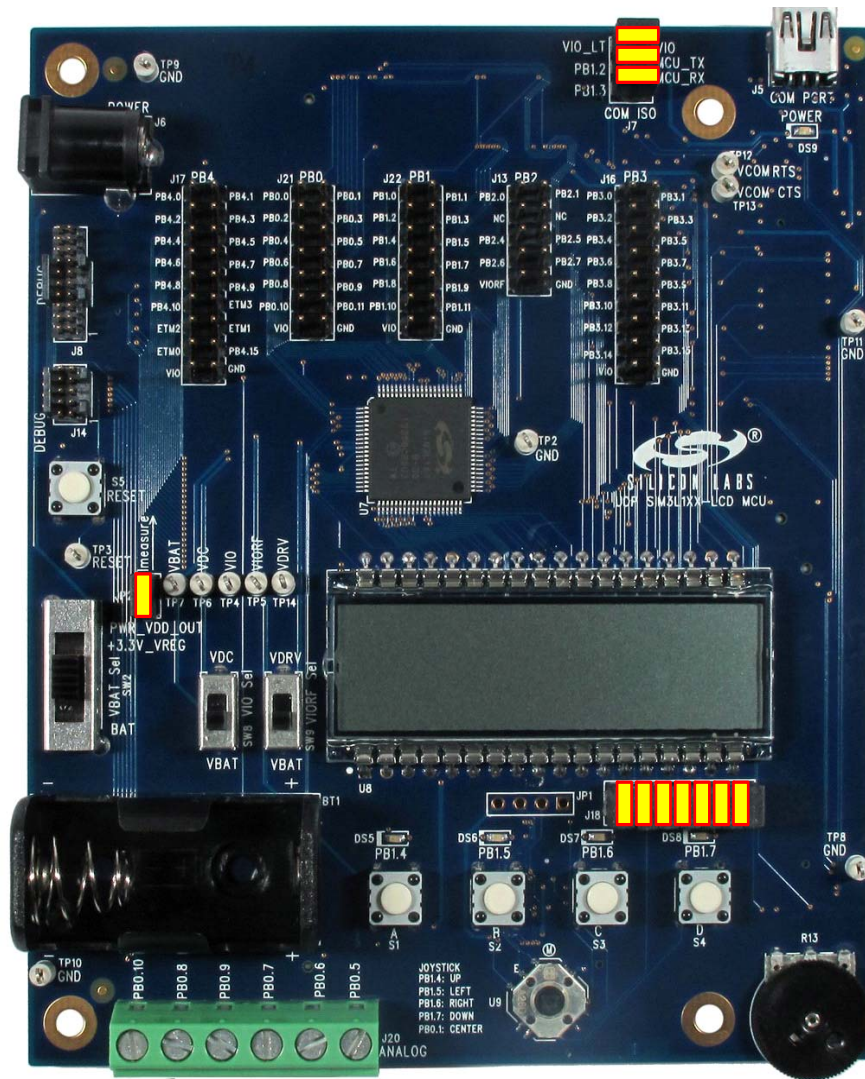
The MCU card slot includes the following components:

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

The SiM3L1xx LCD UG card implements the signals described in Table 6, Table 7, Table 8, and Table 9 in the Appendix.

## 6. Shorting Blocks: Factory Defaults

The SiM3L1xx LCD UG MCU card comes from the factory with pre-installed shorting blocks on several headers. Figure 8 shows the positions of the factory default shorting blocks.



**Figure 8. Shorting Blocks: Factory Defaults**

A shorting block is installed across the J19 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 J18 to enable the switches, LEDs, and potentiometer to be connected to GPIO pins.

## 7. Schematics

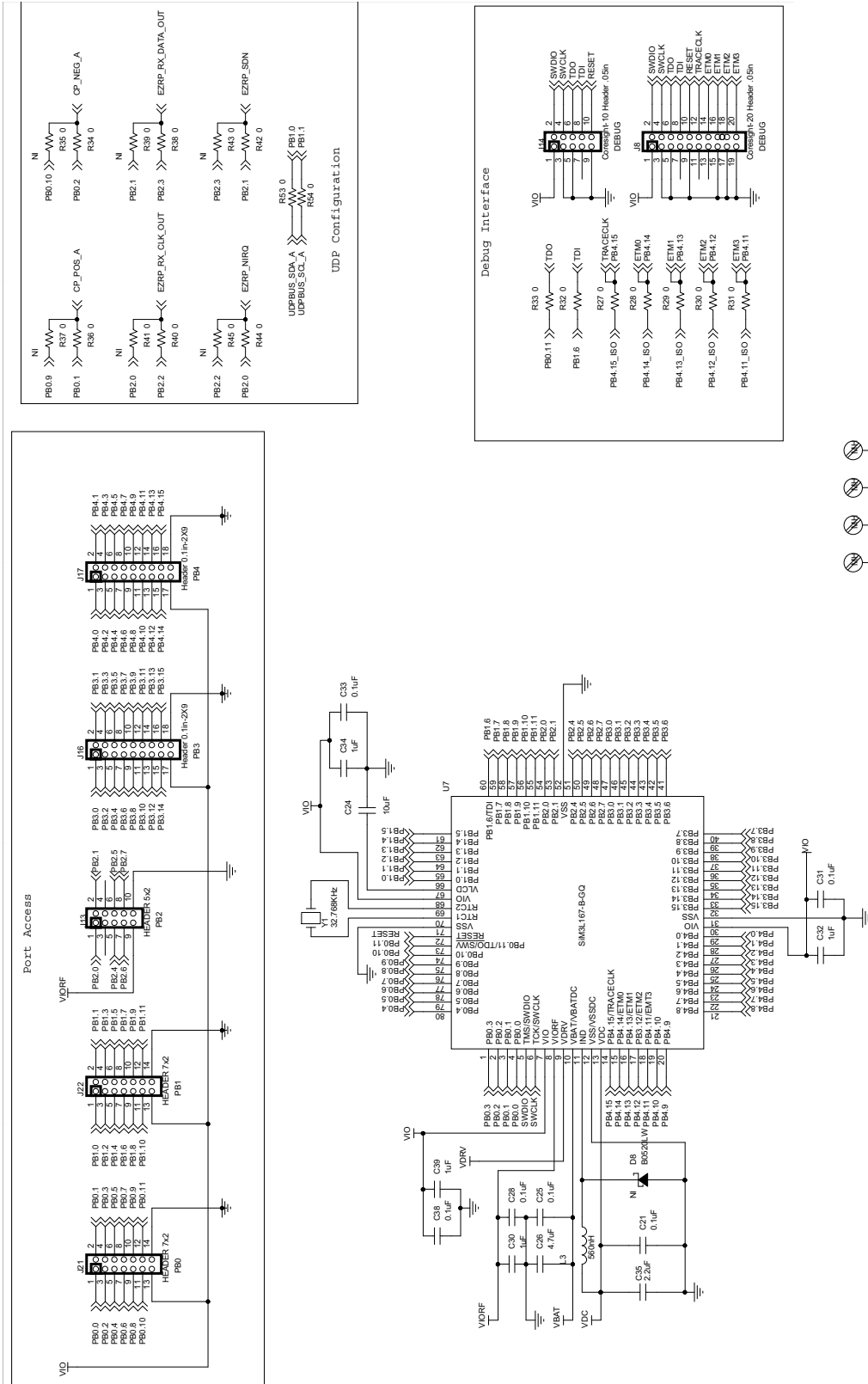


Figure 9. Sim3L1xx UDP MCU Card Schematic (1 of 6)

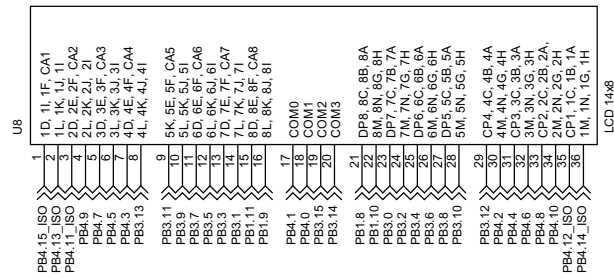


Figure 10. SIM3L1xx UDP MCU Card Schematic (2 of 6)

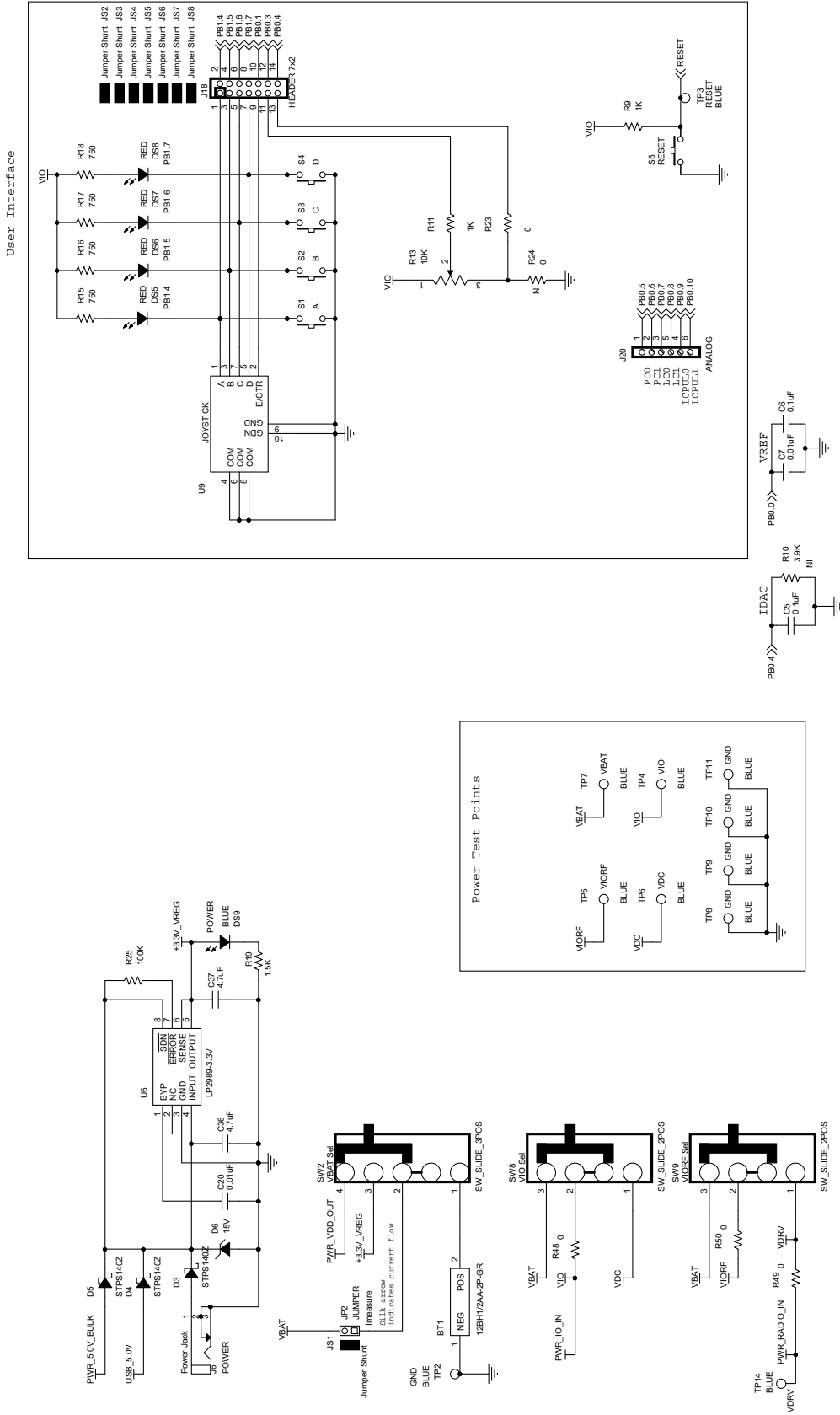


Figure 11. SiM3L1xx UDP MCU Card Schematic (3 of 6)



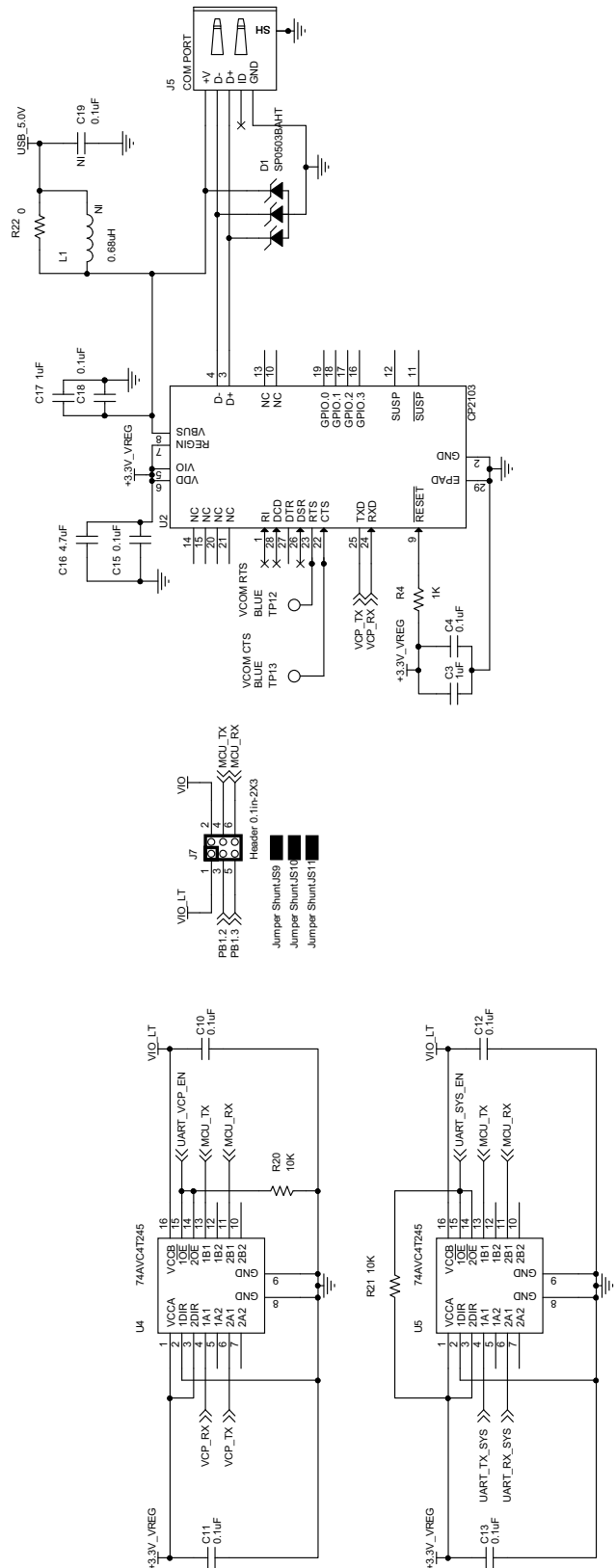


Figure 12. SIM3L1xx UDP MCU Card Schematic (4 of 6)

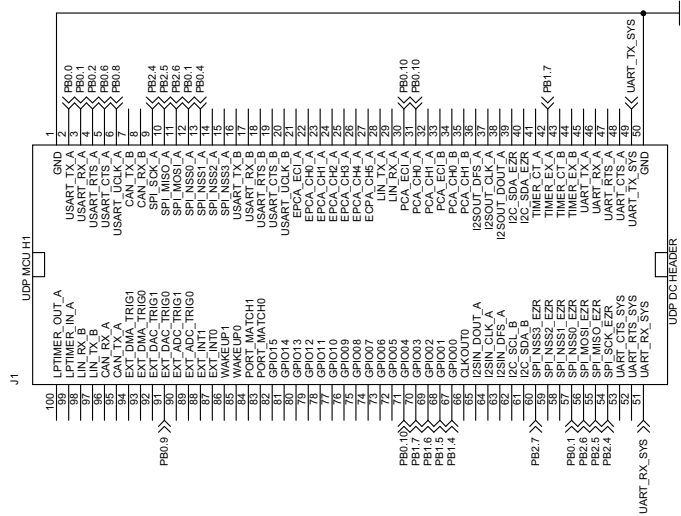
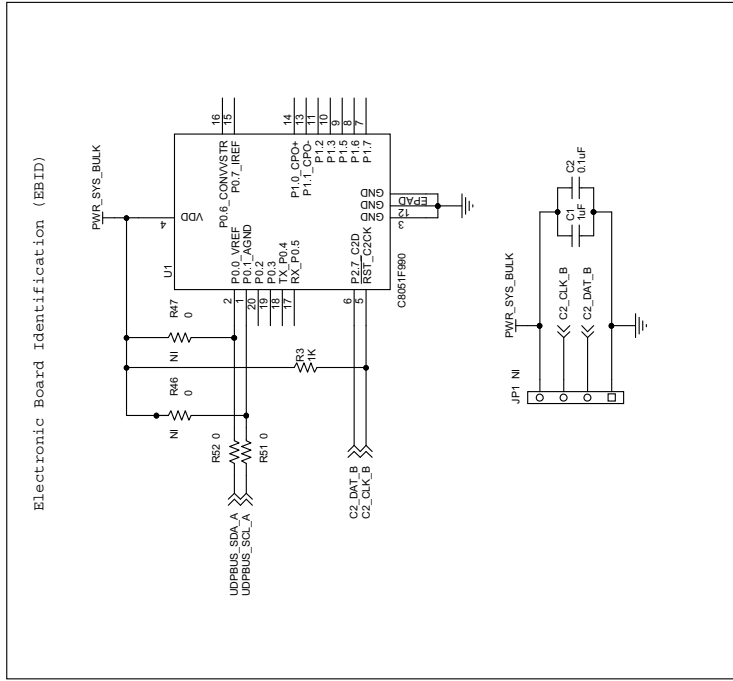


Figure 13. SiM3L1xx UDP MCU Card Schematic (5 of 6)

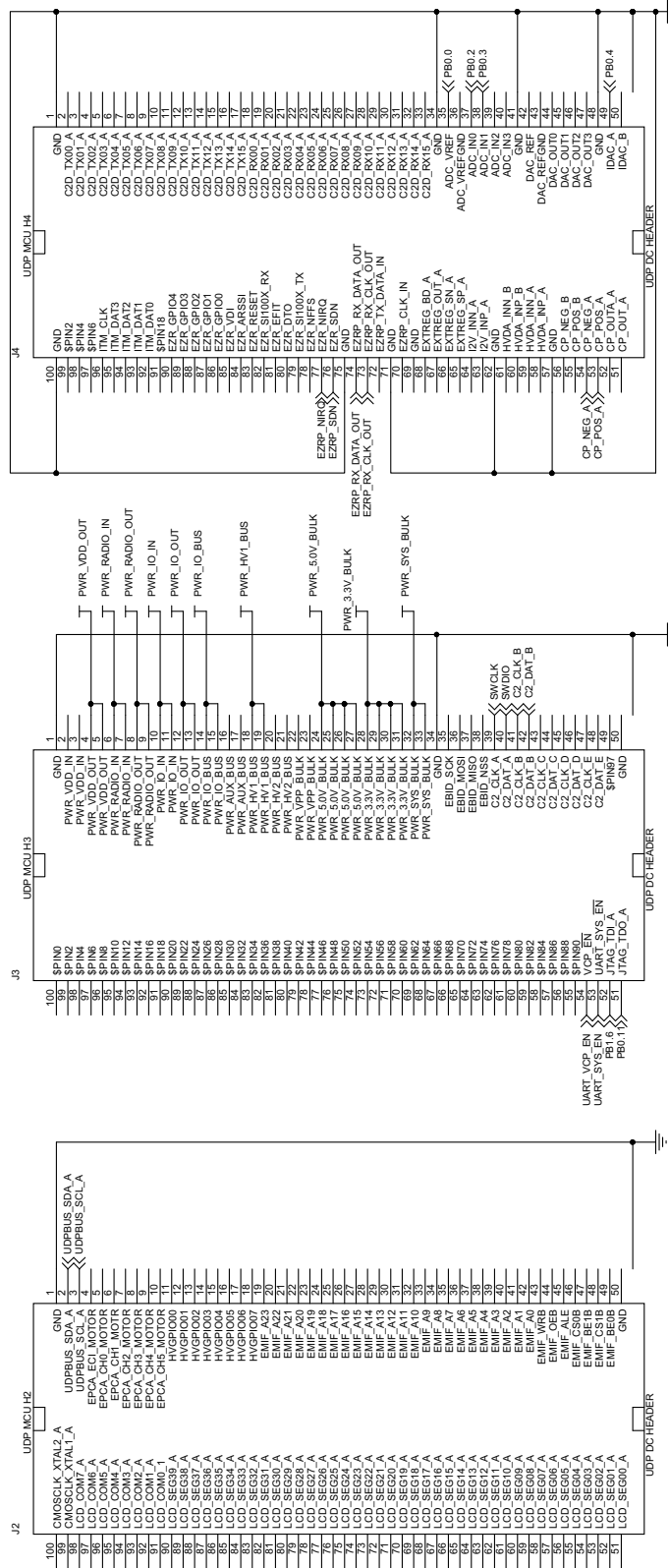


Figure 14. SiM3L1xx UDP MCU Card Schematic (6 of 6)

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## 8. Bill of Materials

**Table 5. SiM3L1xx UDP MCU Card Bill of Materials**

Reference	Part Number	Source	Description
BT1	12BH1/2AA-2P-GR	EAGLE PLASTIC DEVICES	3.6 V lithium thionyl chloride battery holder
C1 C3 C17 C30 C32 C34 C39	C0603X7R100-105K	Venkel	1uF 10V ±10% X7R 0603
C16 C26 C36 C37	C0603X5R6R3-475K	Venkel	4.7uF 6.3V ±10% X5R 0603
C2 C4 C5 C6 C10 C11 C12 C13 C15 C18 C21 C25 C28 C31 C33 C38	C0603X7R100-104K	Venkel	0.1uF 10V ±10% X7R 0603
C24	C0603X5R6R3-106M	Venkel	10uF 6.3V ±20% X5R 0603
C35	C0603X7R100-225K	Venkel	2.2uF 10V ±10% X7R 0603
C7 C20	C0603X7R100-103M	Venkel	0.01uF 10V ±20% X7R 0603
D1	SP0503BAHTG	Littlefuse	300mW 20V TVS SOT143
D3 D4 D5	STPS140Z	ST Semiconductor	1.0A 40V Schottky SOD-123
D6	MMSZ5245BT1	On Semiconductor	15V 500mW 15V 5% Zener SOD-123
DS5 DS6 DS7 DS8	SML-LX0603IW	LUMEX INC	RED 30mA LED 0603
DS9	LTST-C190TBKT	LITE-ON TECHNOLOGY CORP	BLUE LED 0603
J1 J2 J3 J4	FX8-100P-SV1	HIROSE ELECTRIC	UDP Daughter Card Header 100 pin
J13	TSW-105-07-T-D	Samtec	5x2 Header
J14	FTSH-105-01-F-D-K	Samtec	Coresight-10 Header .05in CONN2X5
J16 J17	TSW-109-01-T-D	Samtec	0.1in-2X9 Header
J18 J21 J22	TSW-107-07-T-D	Samtec	7x2 Header
J20	1729160	PHOENIX CONTACT	Analog Header Terminal Block 1X6
J5	UX60-MB-5ST	HIROSE	USB mini connector
J6	RAPC722X	Switchcraft Inc.	Power Jack 5A BARREL
J7	M22-5320305	Harwin	2 mm-2X3 Header
J8	FTSH-110-01-L-D-K	Samtec	Coresight-20 Header .05in CONN2X10
JP2	TSW-102-07-T-S	Samtec	1x2 Header
JS1 JS2 JS3 JS4 JS5 JS6 JS7 JS8 JS9 JS10 JS11	SNT-100-BK-T	Samtec	Jumper Shunt
L3	ELJ-FBR56MF	Panasonic	560nH 560mA ±20% Unshielded 1812
R13	RV100F-30-4K1B-B10K-B301	Alpha (Taiwan)	10K 0.03W 30% Thumbwheel Pot 10MM
R15 R16 R17 R18	CR0603-16W-7500F	Venkel	750 1/10W ±1% ThickFilm 0603
R19	CR0603-10W-1501F	Venkel	1.5K 1/10W ±1% ThickFilm 0603

**Table 5. SiM3L1xx UDP MCU Card Bill of Materials (Continued)**

Reference	Part Number	Source	Description
R20 R21	CR0603-10W-103J	Venkel	10K 1/10W ±5% ThickFilm 0603
R22 R23 R27 R28 R29 R30 R31 R32 R33 R34 R36 R38 R40 R42 R44 R48 R49 R50 R51 R52 R53 R54	CR0603-16W-000	Venkel	0 1A ThickFilm 0603
R25	CR0603-10W-104J	Venkel	100K 1/10W ±5% ThickFilm 0603
R3 R4 R9 R11	CR0603-10W-1001F	Venkel	1K 1/10W ±1% ThickFilm 0603
S1 S2 S3 S4 S5	EVQ-PAD04M	PANASONIC CORP	Momentary Tactile Switch
SW2	OS103012MU1QP1	C&K	Switch SLIDE 3POS .2A @ 30V
SW8 SW9	OS102011MS2QN1	C&K	Switch SLIDE 2POS .1A @ 12V
TP2 TP3 TP4 TP5 TP6 TP7 TP8 TP9 TP10 TP11 TP12 TP13 TP14	151-205-RC	Kobiconn	BLUE Loop TESTPOINT
U1	C8051F990-GM	Silicon Laboratories	EBID C8051F990 MCU QFN20 3X3 P0.5
U2	CP2103-GM	Silicon Laboratories	CP2103 USB-to-UART bridge QFN28 5X5 P0.5
U4 U5	SN74AVC4T245PW	TI	IC bus transceiver
U6	LP2989AIMM-3.3/NOPB	National Semiconductor	3.3V 500mA LDO
U7	SiM3L167-A-GQ	Silicon Laboratories	SiM3L167 MCU QFP80 14X14 P0_5
U8	VIM-878-DP-RC-S-LV	Varitronix	LCD 14x8 PTH VIM-878
U9	EVQ-Q7GA50	PANASONIC CORP	JOYSTICK Switch 5POS
Y1	ABS07-32.768KHZ-7	Abracon Corporation	32.768KHz XTAL
Components Not Installed			
C19	C0603X7R100-104K	Venkel	0.1uF 10V ±10% X7R 0603 Not Installed (NI)
D8	B0520LW-7-F	Diodes Inc.	500mA 20V Schottky SOD-123 Not Installed (NI)
JP1	SSQ-104-23-T-S	Samtec	CONN SOCKET 4X1 Not Installed (NI)
L1	NLV25T-R68J-PF	TDK	0.68uH 300mA ±5% GP Not Installed (NI)
R10	CR0603-16W-392J	Venkel	3.9K 1/16W ±5% ThickFilm 0603 Not Installed (NI)
R24 R35 R37 R39 R41 R43 R45 R46 R47	CR0603-16W-000	Venkel	0 1A ThickFilm 0603 Not Installed (NI)

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## APPENDIX—MCU CARD HEADER PIN DESCRIPTIONS

Table 6. SiM3L1xx LCD MCU Card H1 Pin Descriptions (J1)

MCU Card Pin	Signal Name	Description	SiM3L167 Pin / Signal
1	GND		
2	USART_TX_A	USART A transmit	PB0.0
3	USART_RX_A	USART A receive	PB0.1
4	USART_RTS_A	USART A hardware handshaking	PB0.2
5	USART_CTS_A	USART A hardware handshaking	PB0.6
6	USART_UCLK_A	USART A clock	PB0.8
7	CAN_TX_B		
8	CAN_RX_B		
9	SPI_SCK_A	SPI A clock	PB2.4
10	SPI_MISO_A	SPI A master-in, slave-out	PB2.5
11	SPI_MOSI_A	SPI A master-out, slave-in	PB2.6
12	SPI_NSS0_A	SPI A slave select 0	PB0.1
13	SPI_NSS1_A	SPI A slave select 1	PB0.4
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	PB0.10
31	PCA_CH0_A		PB0.10
32	PCA_CH1_A		
33	PCA_ECI_B	PCA B external clock input	
34	PCA_CH0_B		

**Table 6. SiM3L1xx LCD MCU Card H1 Pin Descriptions (J1) (Continued)**

MCU Card Pin	Signal Name	Description	SiM3L167 Pin / Signal
35	PCA_CH1_B		
36	I2SOUT_DFS_A	I <sup>2</sup> S A transmitter word sync (WS)	
37	I2SOUT_CLK_A	I <sup>2</sup> S A transmitter clock (SCK)	
38	I2SOUT_DOUT_A	I <sup>2</sup> S A transmitter data (SD)	
39	I2C_SDA_EZR	EZRadio I <sup>2</sup> C data	
40	I2C_SCL_EZR	EZRadio I <sup>2</sup> C clock	
41	TIMER_CT_A		
42	TIMER_EX_A		PB1.7
43	TIMER_CT_B		
44	TIMER_EX_B		
45	UART_TX_A	UART A transmit	
46	UART_RX_A	UART A receive	
47	UART_RTS_A	UART A hardware handshaking	
48	UART_CTS_A	UART A hardware handshaking	
49	UART_TX_SYS	System UART transmit	PB1.2
50	GND		
51	UART_RX_SYS	System UART receive	PB1.3
52	UART_RTS_SYS	System UART hardware handshaking	
53	UART_CTS_SYS	System UART hardware handshaking	
54	SPI_SCK_EZR	EZRadio SPI clock	PB2.4
55	SPI_MISO_EZR	EZRadio SPI master-in, slave-out	PB2.5
56	SPI_MOSI_EZR	EZRadio SPI master-out, slave-in	PB2.6
57	SPI_NSS0_EZR	EZRadio SPI slave select 0	PB0.1
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	PB2.7
61	I2C_SDA_B	I <sup>2</sup> C B data	
62	I2C_SCL_B	I <sup>2</sup> C B clock	
63	I2SIN_DFS_A	I <sup>2</sup> S A receiver word sync (WS)	
64	I2SIN_CLK_A	I <sup>2</sup> S A receiver clock (SCK)	
65	I2SIN_DOUT_A	I <sup>2</sup> S A receiver data (SD)	
66	CLKOUT0	clock	
67	GPIO00	General purpose I/O 0	PB1.4
68	GPIO01	General purpose I/O 1	PB1.5
69	GPIO02	General purpose I/O 2	PB1.6
70	GPIO03	General purpose I/O 3	PB1.7
71	GPIO04	General purpose I/O 4	PB0.10

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Table 6. SiM3L1xx LCD MCU Card H1 Pin Descriptions (J1) (Continued)

MCU Card Pin	Signal Name	Description	SiM3L167 Pin / Signal
72	GPIO05	General purpose I/O 5	
73	GPIO06	General purpose I/O 6	
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	
86	WAKEUP1	MCU low-power wakeup input signal 1	
87	EXT_INT0	External interrupt 0	
88	EXT_INT1	External interrupt 1	
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	PB0.9
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 7. SiM3L1xx LCD MCU Card H2 Pin Descriptions (J2)

MCU Card Pin	Signal Name	Description	SiM3L167 Pin / Signal
1	GND		
2	UDPBUS_SDA_A	UDP motherboard I <sup>2</sup> C A data	PB1.0
3	UDPBUS_SCL_A	UDP motherboard I <sup>2</sup> C A clock	PB1.1
4	EPCA_ECI_MOTOR	Motor EPCA external clock input	
5	EPCA_CH0_MOTOR		
6	EPCA_CH1_MOTOR		
7	EPCA_CH2_MOTOR		
8	EPCA_CH3_MOTOR		
9	EPCA_CH4_MOTOR		
10	EPCA_CH5_MOTOR		
11	HVGPIO0	High Drive I/O 0	
12	HVGPIO1	High Drive I/O 1	
13	HVGPIO2	High Drive I/O 2	
14	HVGPIO3	High Drive I/O 3	
15	HVGPIO4	High Drive I/O 4	
16	HVGPIO5	High Drive I/O 5	
17	HVGPIO6	High Drive I/O 6	
18	HVGPIO7	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)	

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Table 7. SiM3L1xx LCD MCU Card H2 Pin Descriptions (J2) (Continued)

MCU Card Pin	Signal Name	Description	SiM3L167 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 7. SiM3L1xx LCD MCU Card H2 Pin Descriptions (J2) (Continued)**

MCU Card Pin	Signal Name	Description	SiM3L167 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	

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**Table 8. SIM3L1xx LCD MCU Card H3 Pin Descriptions (J3)**

MCU Card Pin	Description	Description	SIM3L167 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 8. SiM3L1xx LCD MCU Card H3 Pin Descriptions (J3) (Continued)**

MCU Card Pin	Description	Description	SiM3L167 Pin / Signal
38	EBID_NSS	EBID SPI slave select	
39	C2_CLK_A	C2 interface A clock, JTAG interface A TCK, Serial Wire SWCLK	SWCLK / TCK
40	C2_DAT_A	C2 interface A data, JTAG interface A TMS, Serial Wire SWDIO	SWDIO / TMS
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	PB0.11
52	JTAG_TDI_A	JTAG interface A data in (TDI)	PB1.6
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	

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Table 8. SiM3L1xx LCD MCU Card H3 Pin Descriptions (J3) (Continued)

MCU Card Pin	Description	Description	SiM3L167 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 9. SiM3L1xx LCD MCU Card H4 Pin Descriptions (J4)**

MCU Card Pin	Description	Description	SiM3L167 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	PB0.0
36	ADC_VREFGND	ADC VREF ground	
37	ADC_IN0		PB0.2

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Table 9. SiM3L1xx LCD MCU Card H4 Pin Descriptions (J4) (Continued)

MCU Card Pin	Description	Description	SiM3L167 Pin / Signal
38	ADC_IN1		PB0.3
39	ADC_IN2		
40	ADC_IN3		
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	PB0.4
50	IDAC_B	IDAC B output	GND
51	CP_OUT_A	Comparator A synchronous output	
52	CP_OUTA_A	Comparator A asynchronous output	
53	CP_POS_A	Comparator A positive input	PB0.1
54	CP_NEG_A	Comparator A negative input	PB0.2
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)	PB2.2
74	EZRP_RX_DATA_OUT	Radio test card receive data output (SMA connector)	PB2.3



**Table 9. SiM3L1xx LCD MCU Card H4 Pin Descriptions (J4) (Continued)**

MCU Card Pin	Description	Description	SiM3L167 Pin / Signal
75	GND		
76	EZRP_SDN	Radio test card peripheral shutdown	PB2.0
77	EZRP_NIRQ	Radio test card peripheral interrupt status	PB2.1
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		

## DOCUMENT CHANGE LIST

### Revision 0.1 to Revision 0.2

- Updated 3.1. "Using the MCU Card Alone," on page 3, Figure 2, Figure 6, and Figure 8 to show the correct VBAT Sel switch (SW2) position.
- Updated 3.2. "Using the MCU Card with the UDP Motherboard," on page 4 to show the correct VBAT Sel switch (SW2) position.

**NOTES:**

# SIM3L1xx LCD UG

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