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S1D13L03 Simple LCDC

S5U13L03P00C100 Evaluation Board User Manual

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SEIKO EPSON CORPORATION

Rev. 1.1

Evaluation Board/Kit and Development Tool Important Notice

1. This evaluation board/kit or development tool is designed for use for engineering evaluation, demonstration, or development purposes only. Do not use it for other purposes. It is not intended to meet the requirements of design for finished products.
2. This evaluation board/kit or development tool is intended for use by an electronics engineer and is not a consumer product. The user should use it properly and in a safe manner. Seiko Epson does not assume any responsibility or liability of any kind of damage and/or fire caused by the use of it. The user should cease to use it when any abnormal issue occurs even during proper and safe use.
3. The part used for this evaluation board/kit or development tool may be changed without any notice.

NOTICE

Table of Contents

1 Introduction

This manual describes the setup and operation of the S5U13L03P00C100 Evaluation Board. The evaluation board is designed as an evaluation platform for the S1D13L03 Simple LCD Controller.
The S5U13L03P00C100 Evaluation Board can also connect to the S5U13U00P00C100 USB Adapter board so that it can be used with a laptop or desktop computer, via USB 2.0. However, if you do not use the S5U13U00C100 USB Adapter board, there is no headers mounted for the other host interface. (only allocated space) Please use the allocated space mount the headers for the host interface.

This document is updated as appropriate. Please check for the latest revision of this document before beginning any development. The latest revision can be downloaded at vdc.epson.com.

We appreciate your comments on our documentation. Please contact us via email at vdc-documentation@ea.epson.com.

2 Features

The S5U13L03P00C100 Evaluation Board includes the following features:

- 176-pin QFP S1D13L03 Simple LCD Controller
- Headers for connection to the S5U13U00P00C100 USB Adapter board
- Header with all S1D13L03 Host Bus Interface signals (optional)

Note
These headers are not mounted. There are allocated areas for mounting.

- Headers for connecting to LCD panels
- Header for S1D13L03 GPIO pins (optional)

Note
These headers are not mounted. There are allocated areas for mounting

- On-board 4MHz oscillator
- 3.3V input power
- On-board voltage regulator with 1.5V output
- On-board voltage regulator with adjustable 38V/60mA max, to provide power for LED back-light of LCD panel.

3 Installation and Configuration

The S5U13L03P00C100 Evaluation Board incorporates a DIP switch, jumpers, and 0 ohm resistors which allow it to be used with a variety of different configurations.

3.1 Configuration DIP Switch

The S1D13L03 has 3 configuration inputs (CNF[2:0]). A DIP switch (SW1) is used to configure CNF[2:0] as described below.

Table 3-1: Summary of Power-On/Reset Options

S5U13L03P00C100 SW1-[4:1] Config	S1D13L03 CNF[2:0] Config	Power-On/Reset State	
		1 (ON)	0 (OFF)
SW1-[1]	CNF0	Host Data lines are normal	Host data lines are swapped
SW1-[2]	CNF1	Host Data is 16-bit	Host data is 8-bit
SW1-[3]	CNF2	PIOVDD output current = 6.5mA	PIOVDD output current = 2.5mA
SW1-[4]	-	not used	

= Required settings when using S5U13U00P00C100 USB Adapter board

The following figure shows the location of DIP switch SW1 on the S5U13L03P00C100 board.

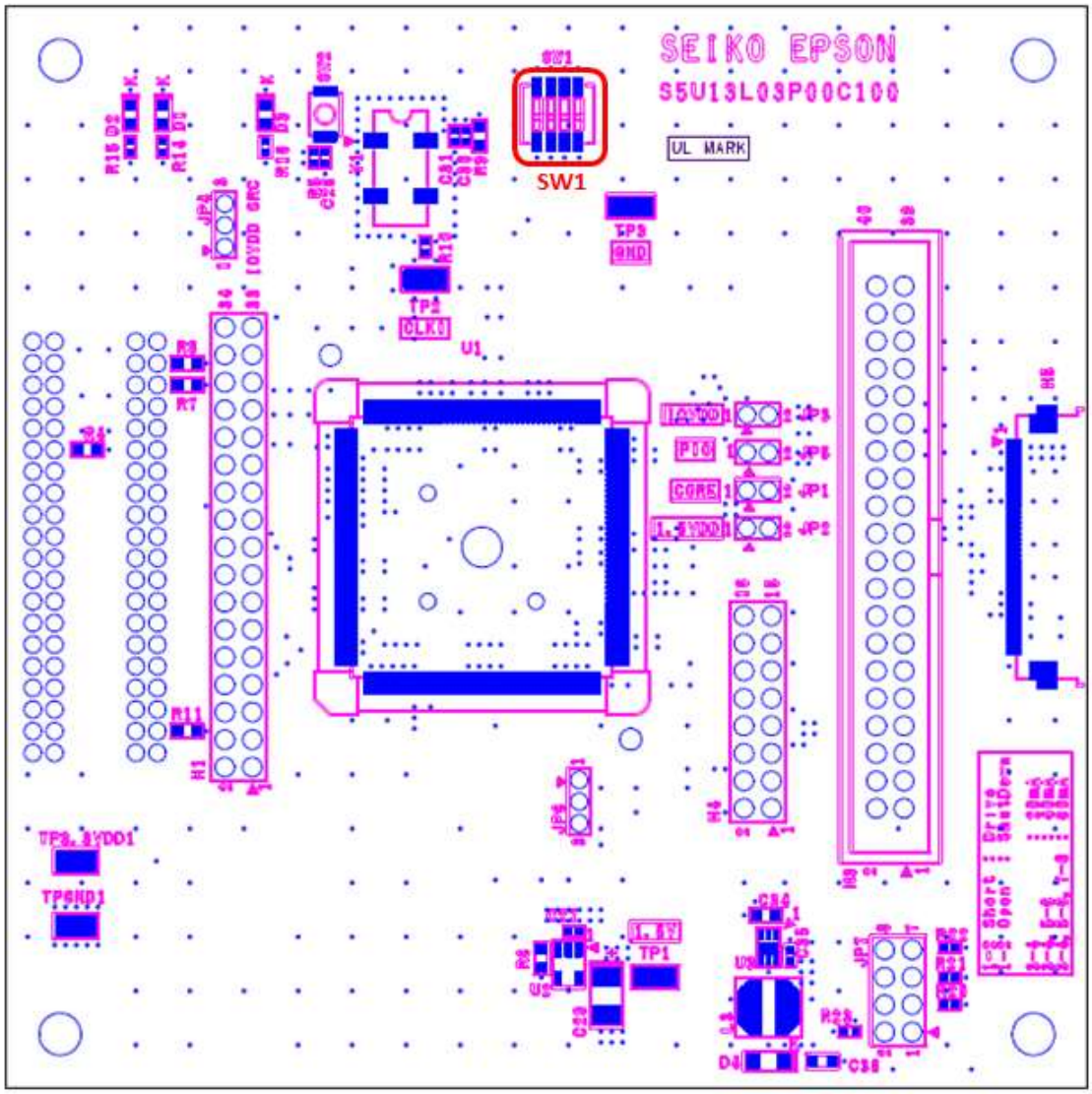

Figure 3-1: Configuration DIP Switch (SW1) Location

3.2 Configuration Jumpers

The S5U13L03P00C100 Evaluation Board has 6 jumpers which configure various board settings. And this board has 8-pin jumper for setting back-light of the LDC panel. The jumper positions for each function are shown below.

Table 3-2: Configuration Jumper Setting

Jumper	Function	Position 1-2	Position 2-3	No Jumper
JP1	COREVDD	Normal	—	COREVDD current measurement
JP2	PLLVDD	Normal	—	PLLVDD current measurement
JP3	IOVDD	Normal	—	IOVDD current measurement
JP4	IOVDD Source	H1 connector, pin 32	3.3VDD	—
JP5	PIOVDD	Normal	—	PIOVDD current measurement
JP6	PIOVDD Source	H4 connector, pin 8	3.3VDD	—

= Required settings when using S5U13U00P00C100 USB Adapter board

Table 3-3: 8-PinJumper Setting

Jumper	Position		Function
JP7	Position 1-2	No Jumper	In connect case, TPS61161A is Enable
	Position 3-4	No Jumper	In connect case, Vout = 20mA
	Position 5-6	No Jumper	In connect case, Vout = 40mA (add connect Position 3-4)
	Position 7-8	No Jumper	In connect case, Vout = 60mA (add connect Position3-4 and Position5-6)

= suggested settings

JP1, JP2, JP3, JP5 - Power Supplies for the S1D13L03

JP1, JP2, JP3, JP5 can be used to measure the current consumption of each S1D13L03 power supply.
When the jumper is at position 1-2, normal operation is selected.
When no jumper is installed, the current consumption for each power supply can be measured by connecting an ammeter to pin 1 and 2 of the jumper.

The jumper associated with each power supply is as follows:

JP1 for COREVDD
JP2 for PLLVDD
JP3 for IOVDD
JP5 for PIOVDD

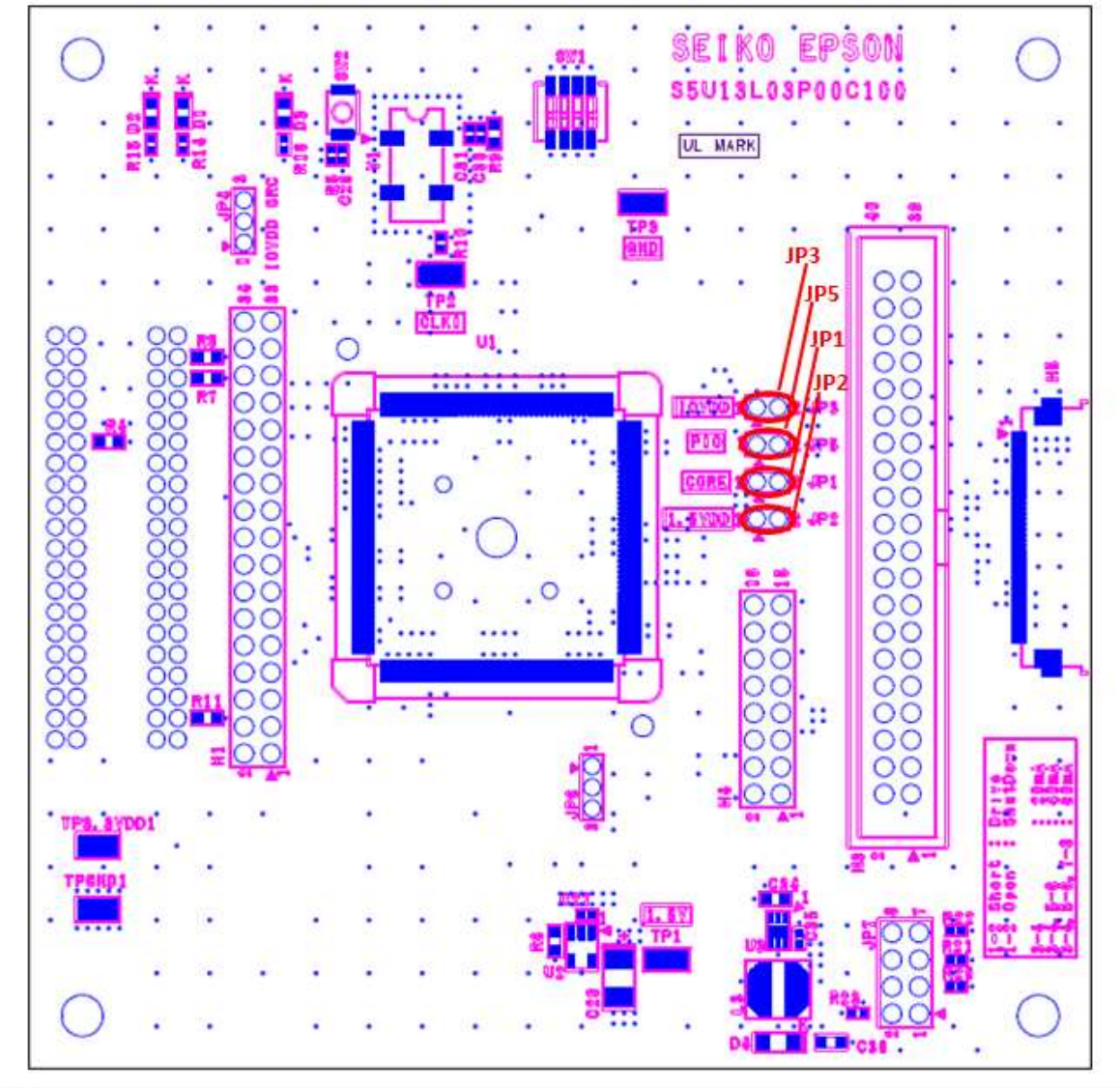

Figure 3-2: Configuration Jumper Locations (JP1, JP2, JP3, JP5)

JP4 - IOVDD Source

JP4 is used to select the source for the IOVDD supply voltage.
When the jumper is at position 1-2, the IOVDD voltage must be provided to the H1 connector, pin 32.
When the jumper is at position 2-3, the IOVDD voltage is provided by the 3.3V power supply of the board.

Note
H1 connector is not mounted. There is an allocated area for mounting.

JP6 - SIOVDD Source

JP6 is used to select the source for the PIOVDD supply voltage.
When the jumper is at position 1-2, the PIOVDD voltage must be provided to the H4 connector, pin 8.
When the jumper is at position 2-3, the PIOVDD voltage is provided by the 3.3V power supply of the board.

Note
H4 connector is not mounted. There is an allocated area for mounting.

JP7 - Backlight Power Supply for LCD Panel

The S5U13L03P00C100 Evaluation Board is designed to generate backlight power supply for LCD panels from 3.3V via the S5U13U00P00C100 USB Adapter Board or connector H1. The 3.3V must be supplied from the S5U13U00P00C100 or H1. The S5U13L03P00C100 has incorporated a White LED Driver Controller (TPS61161A) for the panel backlighat. The White LED Driver Controller drives the panel at a constant current. The S5U13L03P00C100 is capable of changing the output current (20mA, 40mA, 60mA/Max 38V). The current is adjusted by connection of JP7 “See Table 3.3: 8-Pin Jumper Setting”

Note
H1 connector is not mounted. There is an allocated area for mounting

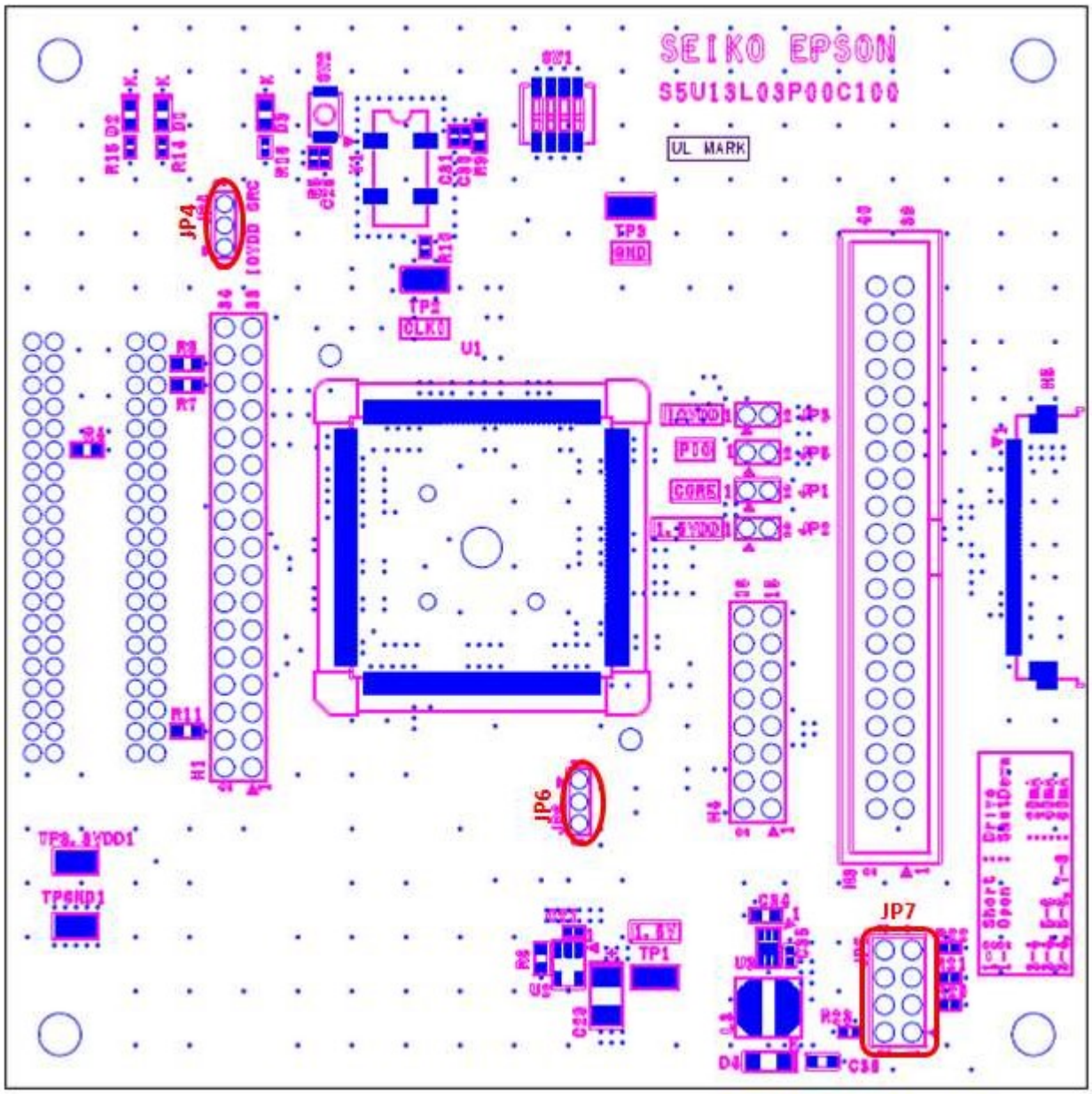

Figure 3-3: Configuration Jumper Location (JP4, JP6, JP7)

4 Technical Description

4.1 Power

4.1.1 Power Requirements

The S5U13L03P00C100 Evaluation Board requires an external regulated power supply (3.3V / 0.5A). The power is supplied to the evaluation board through pin 34 of the H1 header, or pin 5 of the P2 header.

The green LED '3.3V Power' is turned on when 3.3V power is applied to the board.

Note
H1 connector is not mounted. There is an allocated area for mounting.

4.1.2 Voltage Regulators

The S5U13L03P00C100 Evaluation Board has an on-board linear regulator to provide the 1.5V power required by the S1D13L03 Simple LCD Controller. It also has a step-up switching voltage regulator to generate adjustable 12~38V, which can be used to power the LED backlight on some LCD panels.

4.1.3 S1D13L03 Power

The S1D13L03 Simple LCD Controler requires 1.5V and 1.65~3.6V power supplies.

1.5V power for COREVDD and PLLVDD is provided by an on-board linear voltage regulator.

IOVDD range of S1D13L03 isin the range of 1.65~3.6V. However, IOVDD of the S5U13L03 P00C100 Evaluation Board can range from 3.0V to 3.6V. When JP4 is set to the 2-3 position, IOVDD is connected to 3.3V. If a different voltage is required for IOVDD, set JP4 to the 1-2 position and connect the external power supply to pin 32 of connector H1.

Note
HI connector is not mounted. It is only land.

PIOVDD of S1D13L03 is the power used by the LCD interface and can be in the range of 1.65~3.6V. However, PIOVDD of the S5U13L03P00C100 Evaluation Board can range from 3.0V to 3.6V. When JP6 is set to the 2-3 position, PIOVDD is connected to 3.3V. If a different voltage is needed for PIOVDD because of the LCD panel requirements, set JP6 to the 1-2 position and connect the external power supply to pin 8 of connector H4.

Note
H4 connector is not mounted. There is an allocated area for mounting.

4.2 Clocks

The clock for the S1D13L03 Simple LCD Controller is provided by a 4MHz oscillator.

Note
The on-board 4MHz oscillator is not specified to work below a 3.0V supply voltage.

The S1D13L03 can output the input clock on the CLKOUT pin depending on the state of the CLKOUTEN input. Both these signals are available on the H4 connector: CLKOUT on pin 1 and CLKOUTEN on pin 4. On the board the CLKOUTEN pin is pulled down which disables the CLKOUT signal.

Note
H4 connector is not mounted. There is an allocated area for mounting.

4.3 Reset

The S1D13L03 Simple LCD Controller on the S5U13L03P00C100 Evaluation Board can be reset using a push-button (SW2), or via an active low reset signal from the host development platform (pin 33 on the H1 connector).

Note
H1 connector is not mounted. There is an allocated area for mounting..

4.4 Power Save

The S1D13L03 chip has an input called PWRSVE that will enable (when high) or disable (when low) the power save mode. This signal is available on pin 5 of the H4 connector. On the board the PWRSVE pin is pulled down which means power save mode is controlled only by the S1D13L03 register setting.

Note
H4 connector is not mounted. There is an allocated area for mounting.

4.5 Host Interface

4.5.1 Direct Host Bus Interface Support

All S1D13L03 host interface pins are available on connector H1 which allows the S5U13L03P00C100 Evaluation Board to be connected to a variety of development platforms. For detailed S1D13L03 pin mapping, refer to the *S1D13L03 Hardware Functional Specification*, document number xxxxxxxxxx.

The following figure shows the location of host bus connector H1. H1 is not mounted. H1 connector is optional. Therefore H1 connector is an allocated area for mounting. To use this mounting area, it is recommended to attach the 0.1 inch x 0.1 inch, 34-pin header (17x2).

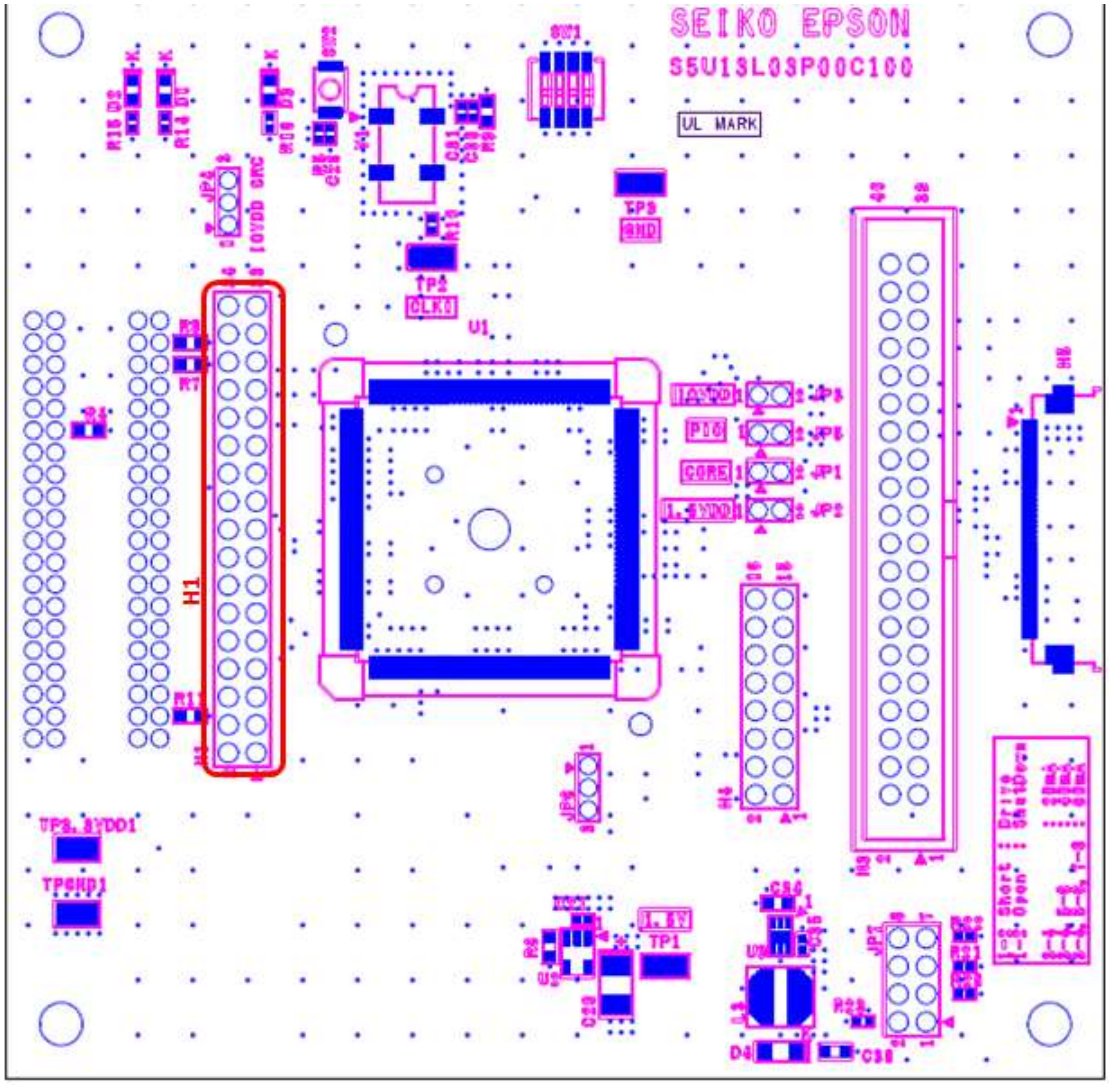

Figure 4-1: Host Bus Connector Location (H1)

For the pinout of connector H1, see "Schematic Diagrams" on page 22.

4.5.2 Connecting to the Epson S5U13U00P00C100 USB Adapter Board

The S5U13L03P00C100 Evaluation Board is designed to connect to a S5U13U00P00C100 USB Adapter Board. The USB adapter board provides a simple connection to any computer via a USB 2.0 connection. The S5U13L03P00C100 directly connects to the USB adapter board through connectors P1 and P2.

The USB adapter board also supplies the 3.3V power required by the S5U13L03P00C100. IOVDD should be selected for 3.3V and JP4 should be set to the 2-3 position.

When the S5U13L03P00C100 is connected to the S5U13U00P00C100 USB Adapter board, there are 2 LEDs on S5U13L03P00C100 which provide a quick visual status of the USB adapter. HB (D300) blinks to indicate that the USB adapter board is active. ENUM (D301)turns on to indicate that the USB has been enumerated by the PC.

The following diagram shows the location of connectors P1 and P2. P1 and P2 are 2mm x 2mm, 40-pin headers (20x2).

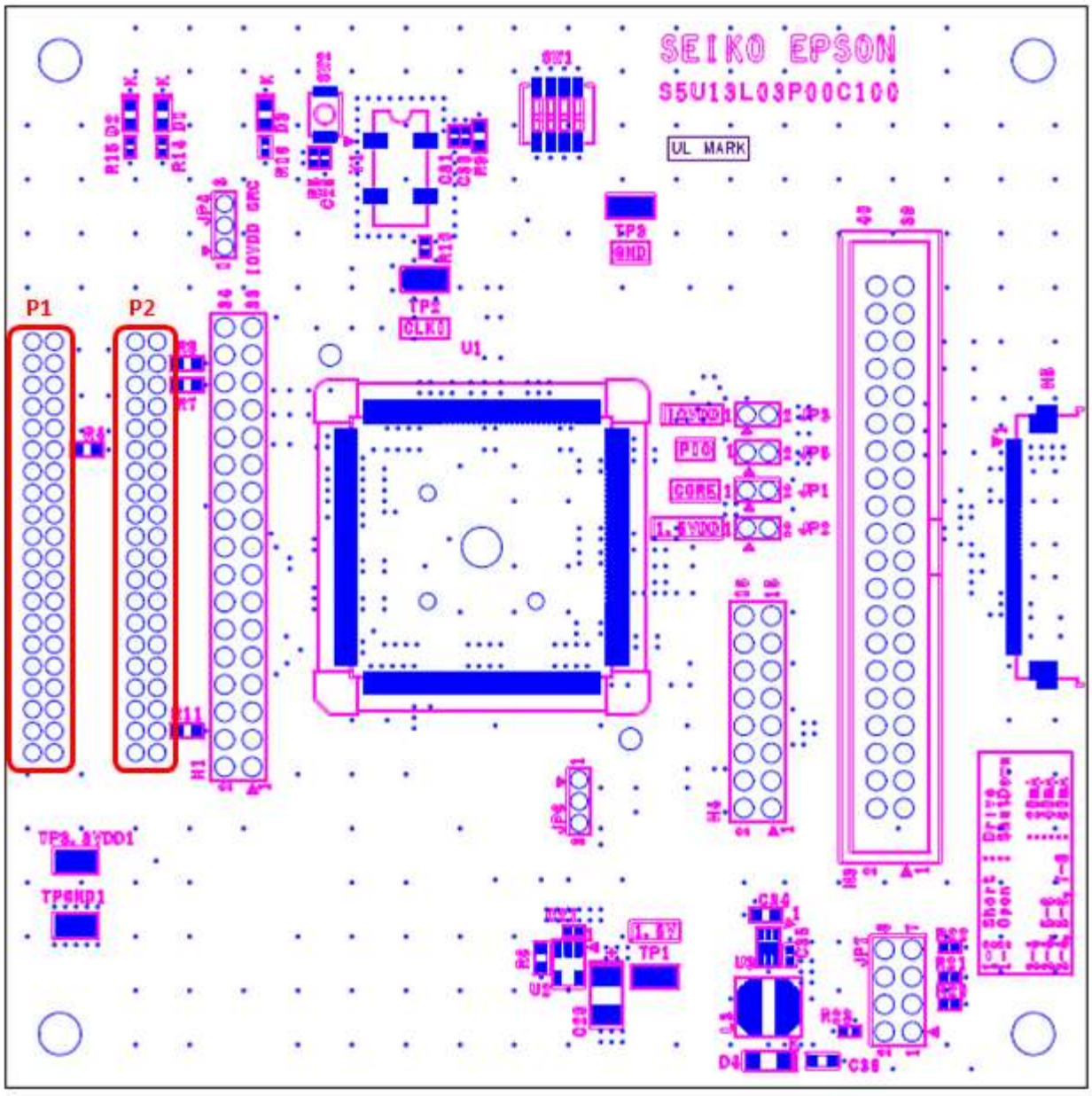

Figure 4-2: USB Adapter Connector Locations (P1 and P2)

For the pinout of connectors P1 and P2, see “Schematic Diagrams” on page 22.

Note

A windows driver must be installed on the PC when the S5U13L03P00C100 is used with the S5U13U00P00C100 USB Adapter Board. The S1D13xxxUSB driver is available at vdc.epson.com.

4.6 LCD Panel Interface

The LCD interface signals are available on connectors H3 and H5. For S1D13L03 LCD interface pin mapping, refer to the *S1D13L03Hardware Functional Specification*, document number xxxxxxxxxx.

ConnectorH3 is 0.1x0.1” 40-pin header (20x2), Connector H5 is 0.5mm pitch FPC connector. For the pinout of connectorsH3 and H5, see “Schematic Diagrams” on page 22.

Note

Connector H3 is no mounted. Connector H3 is optional. Therefore Connector H3 is only allocated are for mounting. To use this area for mounting H3, it is recommended to use the header of the size mentioned above.

The following diagram shows the location of the LCD panel connectors H3 and H5.

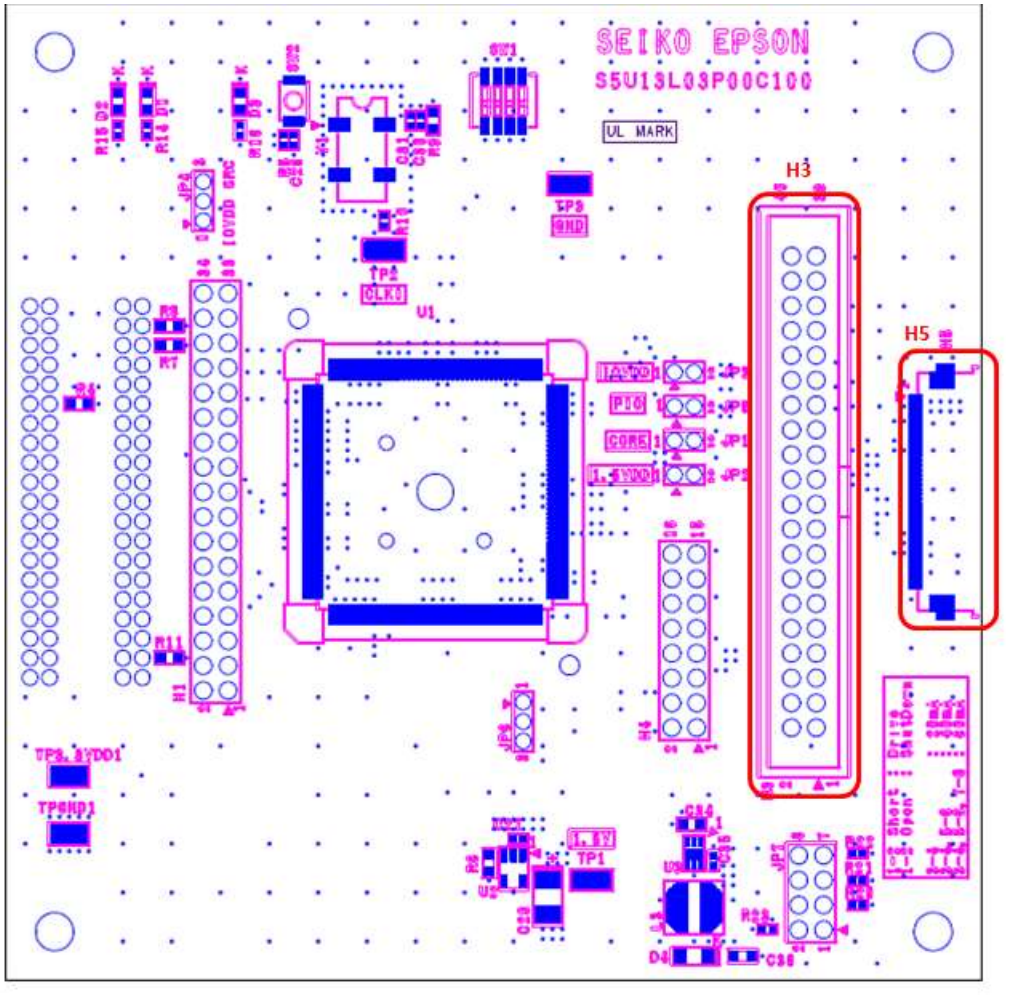

Figure 4-3: LCD Panel Connectors Location (H3, H5)

For the pinout of connectorsH3 and H5, see “Schematic Diagrams” on page 22.

4.7 GPIO Connections

The S1D13L03 Simple LCD Controller has 8 GPIO pins. All the GPIO pins are routed to the H4 connector. Note that connector H4 is not populated on the S5U13L03P00C100 Evaluation Board.

The following figure shows the location of the GPIO connector, H4. Connector H4 is 0.1 inch x 0.1 inch" 16-pin header (8x2).

Note

Connector H4 is not mounted. Connector H4 is optional. Therefore Connector H4 is only allocated area for mounting. Toto use this allocated are for mounting H4, it is recommended to use the header of the size mentioned above.

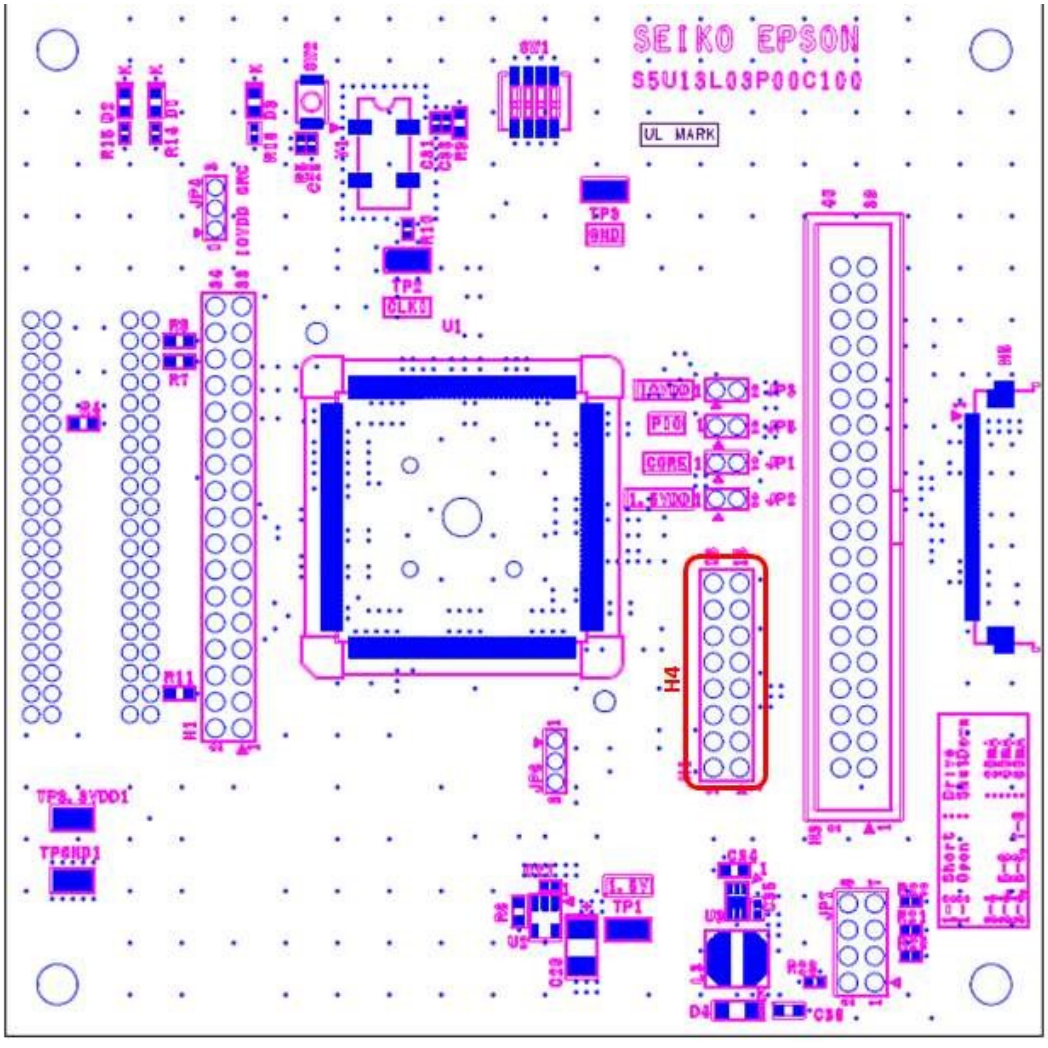

Figure 4-4: GPIO Connector Location (H4)

For the pinout of connector H4, see "Schematic Diagrams" on page 22.

5 Parts List

Table 5-1: Parts List

Item	Qty	Reference	Part	Description	Mfg / Mfg PN / Notes
1	16	C1, C2, C3, C4, C9, C12, C13, C14, C18, C19, C20, C21, C26, C27, C30, C35	0.1uF	C0402	Yageo America 04022F104Z7B20D
2	13	C5, C6, C7, C8, C15, C16, C17, C22, C23, C24, C25, C31, C33	0.01uF	C0402	Yageo America 0402ZRY5V7BB103
3	1	C10	1nF	C0402	Yageo America 04022R102K9B20D
4	1	C11	10uF	C0805	Panasonic - ECG ECJ-CV50J106M
5	1	C34	0.22uF/25V		
6	1	C36	1uF/50V		
7	1	C29	4.7uF 10V T	C3528	Kemet T491B475K010AS
8	3	D1, D2, D3	LED	LED0603	ROHM SML-310VTT86
9	1	D4	CRS04	Schottky Barrier Rectifier	TOSHIBA CRS04
10	0	H1	HEADER_17X2	Not mounted	AMP 1-87215-7
11	0	H3	LCD Connector	Not mounted	Samtec TST-120-01-G-D
12	0	H4	HEADER 8X2	Not mounted	Samtec TSW-108-07-G-D
13	1	H5	WM3436CT-ND	FPC Connector	Molex
14	4	JP1, JP2, JP3, JP5		SIP2	CONN HEADER VERT 2POS .100 TIN or GENERIC
15	2	JP4, JP6		SIP3	CONN HEADER VERT 3POS .100 TIN or GENERIC
16	1	JP7	67997-108HLF	Pin Header 2.54mm 4x2	FCI
17	2	L1, L2	Ferrite	R0603	Steward HZ0603B751R-10 FERRITE 200MA 938 OHMS 0603 SMD
18	1	L3	10uH	IND_ELL6	Panasonic - ECG ELL-6SH100M COIL 10UH 1300MA CHOKE SMD
19	2	P1, P2	HEADER_20X2	HDR2X20/2MM	3M 151240-8422-RB
20	3	R1, R2, R3, R23	10k	R0402	
21	6	R4, R6, R7, R8, R9, R11,R19	0	R0603	
22	1	R5	150k 1%	R0402	
23	1	R10	33 1%	R0402	
24	0	R12, R13	NP	R0402	

Table 5-1: Parts List

Item	Qty	Reference	Part	Description	Mfg / Mfg PN / Notes
25	3	R14, R15, R16	270 1%	R0402	
26	2	R17, R18	47koro	R0402	
27	3	R20, R21, R22	10	RC0603	
28	6	SH1, SH2, SH3, SH4, SH5, SH6, SH7, SH8, SH9, SH10	.100 in. Jumper Shunt	Not Applicable	Sullins Electronics Corp. STC02SYAN JUMPER SHORTING TIN
29	1	SW1	CHS-04A	DIPSW4	COPAL
30	1	SW2	SW TACT-SPST	SW_EVQQW	ITT Industries KSC241GLFS SWITCH TACT SILVER PLT GULLWING
31	2	TPGND1, TP3.3VDD1	TP_SMT	TP_1206	Keystone 5015 PC TEST POINT MINIATURE SMT
31	4	TP1, TP2, TP3, TP4	T POINT F	SIP1	
33	1	U1	S1D13L03	Ultralow Power Low Dropout Linear Regulator	EPSON
34	1	U2	TPS76915DBVT	SOT23-5	Texas Instruments TPS76915DBVT IC 1.5V 100MA LDO REG SOT-23-5
35	1	U3	TPS61161A	White LED Driver with Digital and PWM Brightness Control	TI TPS61161ADRVT
38	1	Y1	4M OSC	OSC 4.0000MHz 3.3V 50ppm SMD	EPSON SG-636

6 Schematic Diagrams

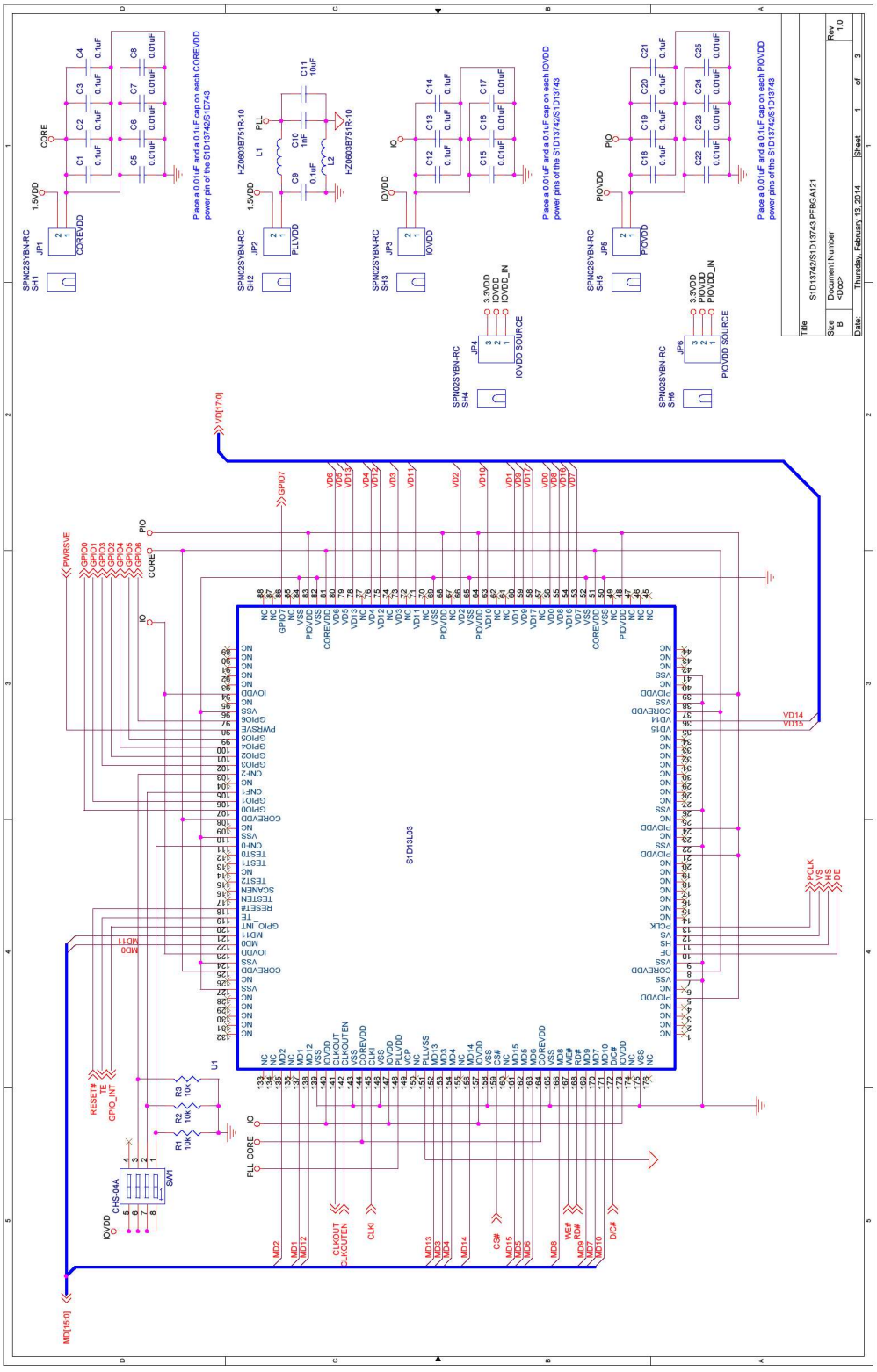

Figure 6-1: S5U13L03P00C100 Schematics (1 of 3)

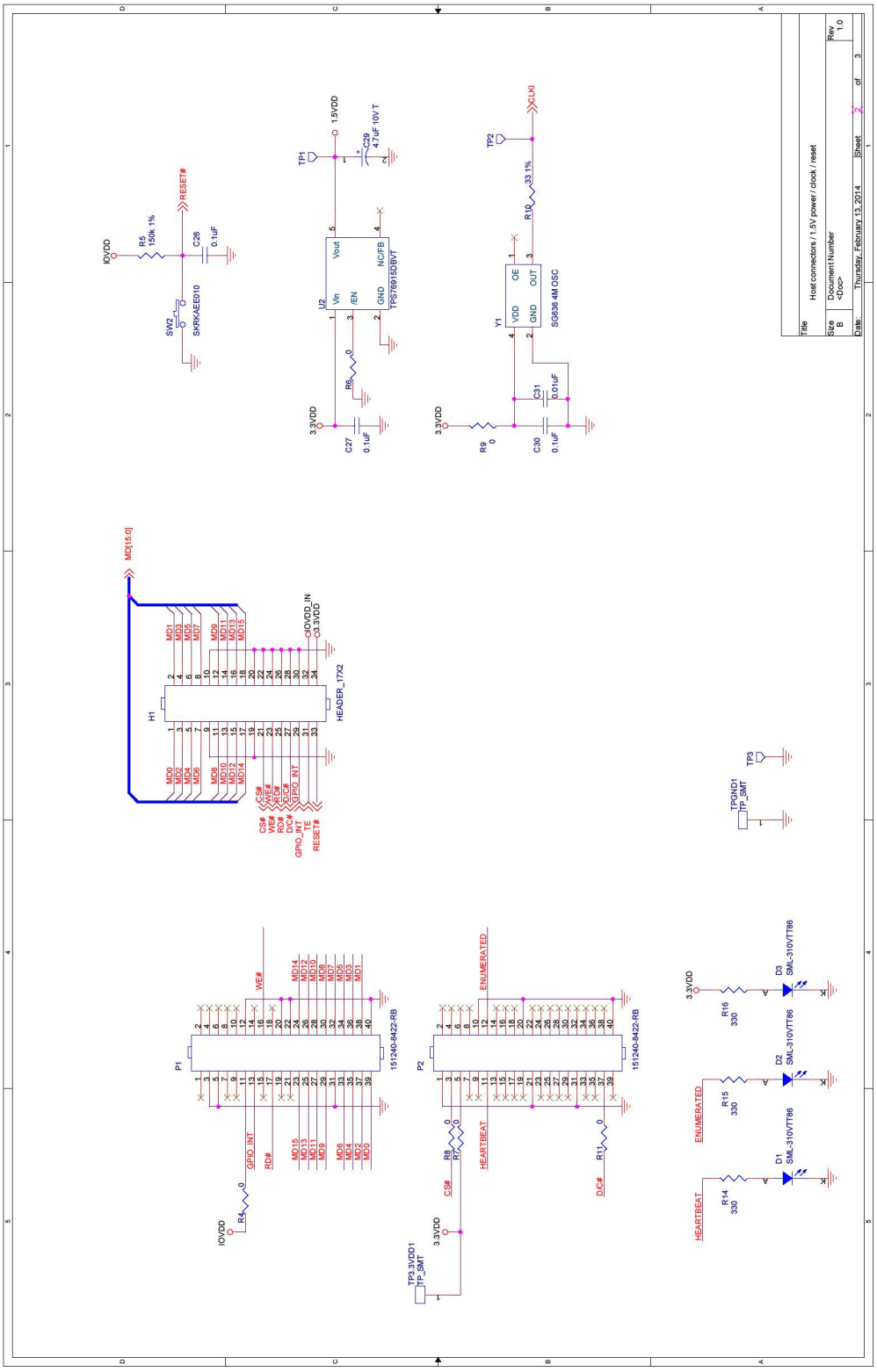

Figure 6-2: S5U13L03P00C100 Schematics (2 of 3)

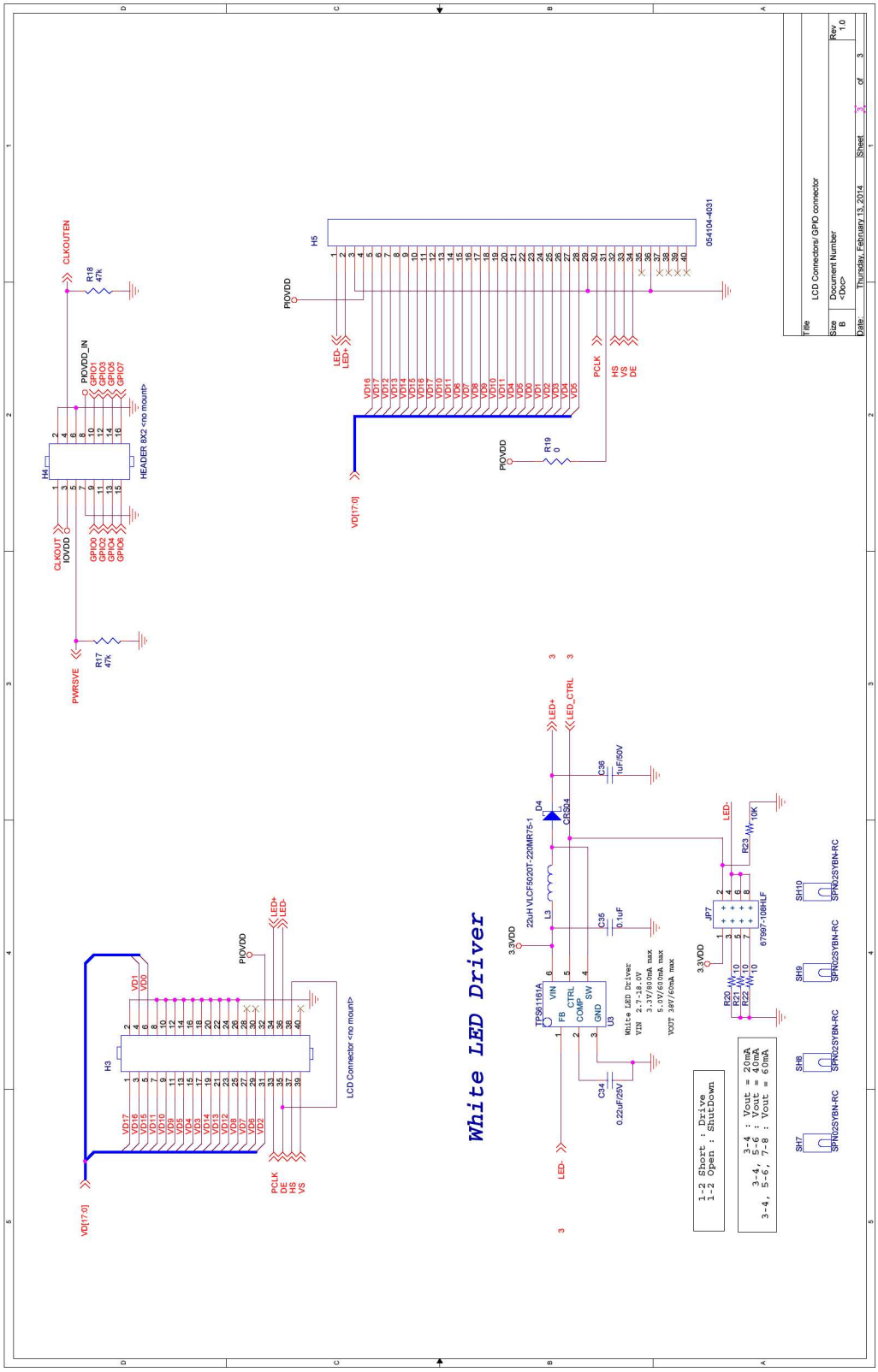

Figure 6-3: S5U13L03P00C100 Schematics (3 of 3)

7 Board Layout

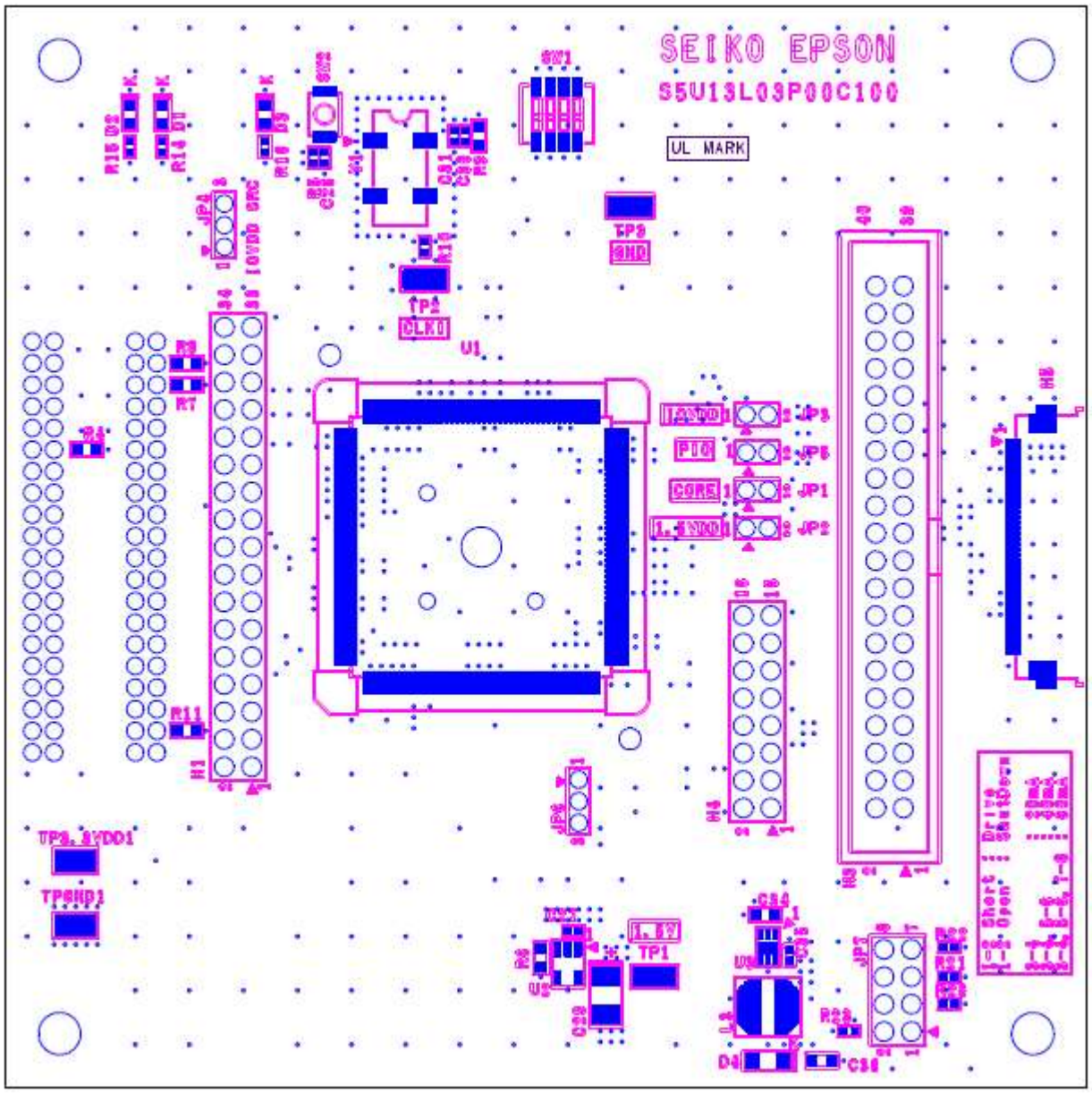

Figure 7-1: S5U13L03P00C100 Board Layout - Top View

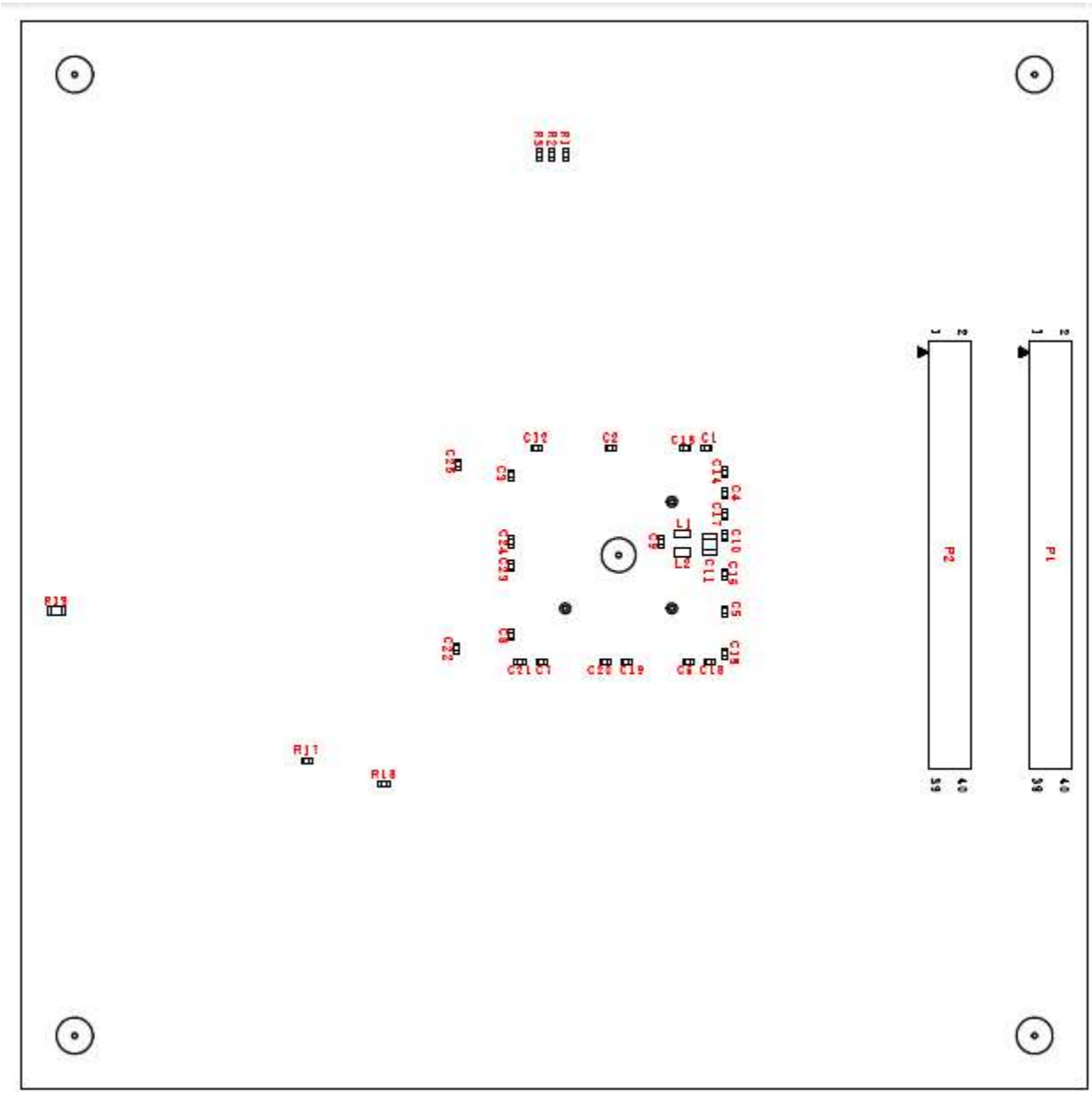

Figure 7-2: S5U13L03P00C100 Board Layout - Bottom View

8 Change Record

XB1A-G-001-01 Revision 1.1 - Issued: April 09, 2018

- Updated address/contact page
- Updated Epson web page and email address
- Minor formatting changes