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S1D13719 Mobile Graphics Engine

S5U13719P00C100 Evaluation Board User Manual

SEIKO EPSON CORPORATION

Rev. 1.1

NOTICE

Table of Contents

Chapter 1 Introduction

This manual describes the setup and operation of the S5U13719P00C100 Evaluation Board. The evaluation board is designed as an evaluation platform for the S1D13719 Mobile Graphics Engine.

The S5U13719P00C100 evaluation board can connect to the S5U13U00P00C100 USB Adapter board so that it can be used with a laptop or desktop computer, via USB 2.0. The S5U13719P00C100 evaluation board can also be used with many other native platforms via the host connectors which provide the appropriate signals to support a variety of CPUs.

This user manual is updated as appropriate. Please check the Epson Research and Development Website at www.erd.epson.com for the latest revision of this document before beginning any development.

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

Chapter 2 Features

The S5U13719P00C100 Evaluation Board includes the following features:

- 180-pin PFBGA S1D13719 Mobile Graphics Engine

- Headers for connection to the S5U13U00P00C100 USB Adapter board

- Headers for connecting to various Host Bus Interfaces

- Headers for connecting to LCD panels

- Headers for connecting to cameras

- On-board 32.768kHz oscillator

- 14-pin DIP socket (if an oscillator other than 32.768kHz must be used)

- SD Card interface (optional)

- 3.3V input power

- On-board voltage regulators for 1.8V and for 2.7V

- On-board voltage regulator with adjustable 12~25V output, 60~100mA max., to provide power for LED back-light of LCD panels.

Chapter 3 Installation and Configuration

The S5U13719P00C100 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 S1D13719 has configuration inputs (CNF[7:0]) which are read on the rising edge of RESET#. An 8-position DIP switch (SW1) is used to configure the S1D13719 for multiple Host Bus Interfaces. The following figure shows the location of DIP switch SW1 on the S5U13719P00C100.
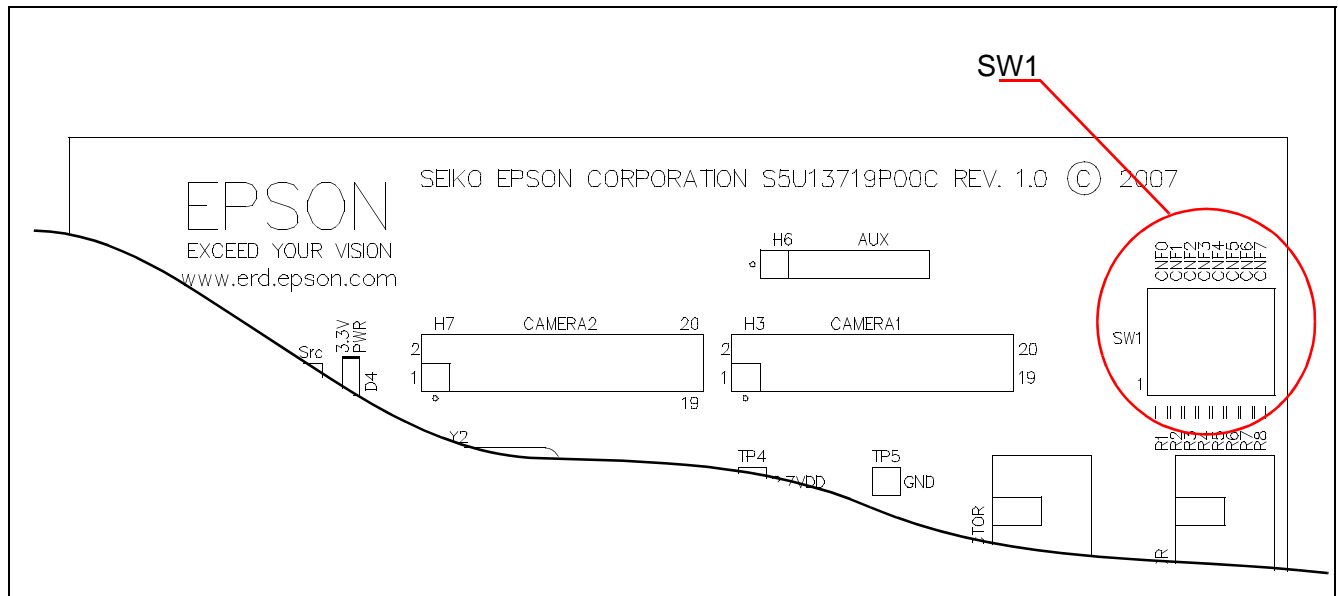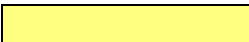

Figure 3-1: Configuration DIP Switch (SW1) Location

All S1D13719 configuration inputs (CNF[7:0]) are fully configurable using DIP switch SW1 as described below.

S5U13719P00C100 SW1-[8:1] Config	S1D13719 CNF[7:0] Config	Power-On/Reset State	
		1 (ON)	0 (OFF)
SW1-[8]	CNF7	Camera2 power supply OFF	Camera2 power supply ON
SW1-[7]	CNF6	Parallel 2 CS# mode	Parallel 1 CS# mode
SW1-[6]	CNF5	Big endian	Little Endian
SW1-[5:3]	CNF[4:2]	000b	Direct 80 Type 2 host interface
		001b	Direct 80 Type 3 host interface
		010b	Indirect 80 Type 2 host interface
		011b	Indirect 80 Type 3 host interface
		100b	Direct 80 Type 1 host interface
		101b	Direct 68 host interface
		110b	Indirect 80 Type 1 host interface
		111b	Indirect 68 host interface
SW1-[2]	CNF5	GPIO[21:0] configured as inputs	GPIO[21:0] configured as outputs
SW1-[1]	CNF6	Camera1 power supply ON	Camera1 power supply ON

☐ = Required settings when using S5U13U00P00C100 USB Adapter board (SW1-[8:1] = 000000x0b)

3.2 Configuration Jumpers

The S5U13719P00C100 has 9 jumpers which configure various board settings. The jumper positions for each function are shown below.

Jumper	Function	Position 1-2	Position 2-3	No Jumper
JP1	COREVDD	Normal	—	COREVDD current measurement
JP2	PLLVDD	Normal	—	PLLVDD current measurement
JP3	HIOVDD	Normal	—	HIOVDD current measurement
JP4	PIOVDD	Normal	—	PIOVDD current measurement
JP5	HIOVDD Source	H1 connector, pin 32	3.3VDD	—
JP6	PIOVDD Source	H4 connector, pin 8	3.3VDD	—
JP7	CIO1VDD	Normal	—	CIO1VDD current measurement
JP8	CIO2VDD	Normal	—	CIO2VDD current measurement
JP9	SIOVDD	Normal	—	SIOVDD current measurement

☐ = Required settings when using S5U13U00P00C100 USB Adapter board

JP1-JP4 and JP7-JP9 - Power Supplies for S1D13719

JP1-JP4 and JP7-JP9 can be used to measure current consumption of each S1D13719 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 to each power supply is as follows:

  JP1 for COREVDD
  JP2 for PLLVDD
  JP3 for HIOVDD
  JP4 for PIOVDD
  JP7 for CIO1VDD
  JP8 for CIO2VDD
  JP9 for SIOVDD

Figure 3-2: Configuration Jumper Locations (JP1-JP4 and JP7-JP9)

JP5 - HIOVDD Source

JP5 is used to select the source for the HIOVDD supply voltage.
When the jumper is at position 1-2, the HIOVDD voltage must be provided to the H1 connector, pin 32.
When the jumper is at position 2-3, the HIOVDD voltage is provided by the 3.3V power supply of the board.

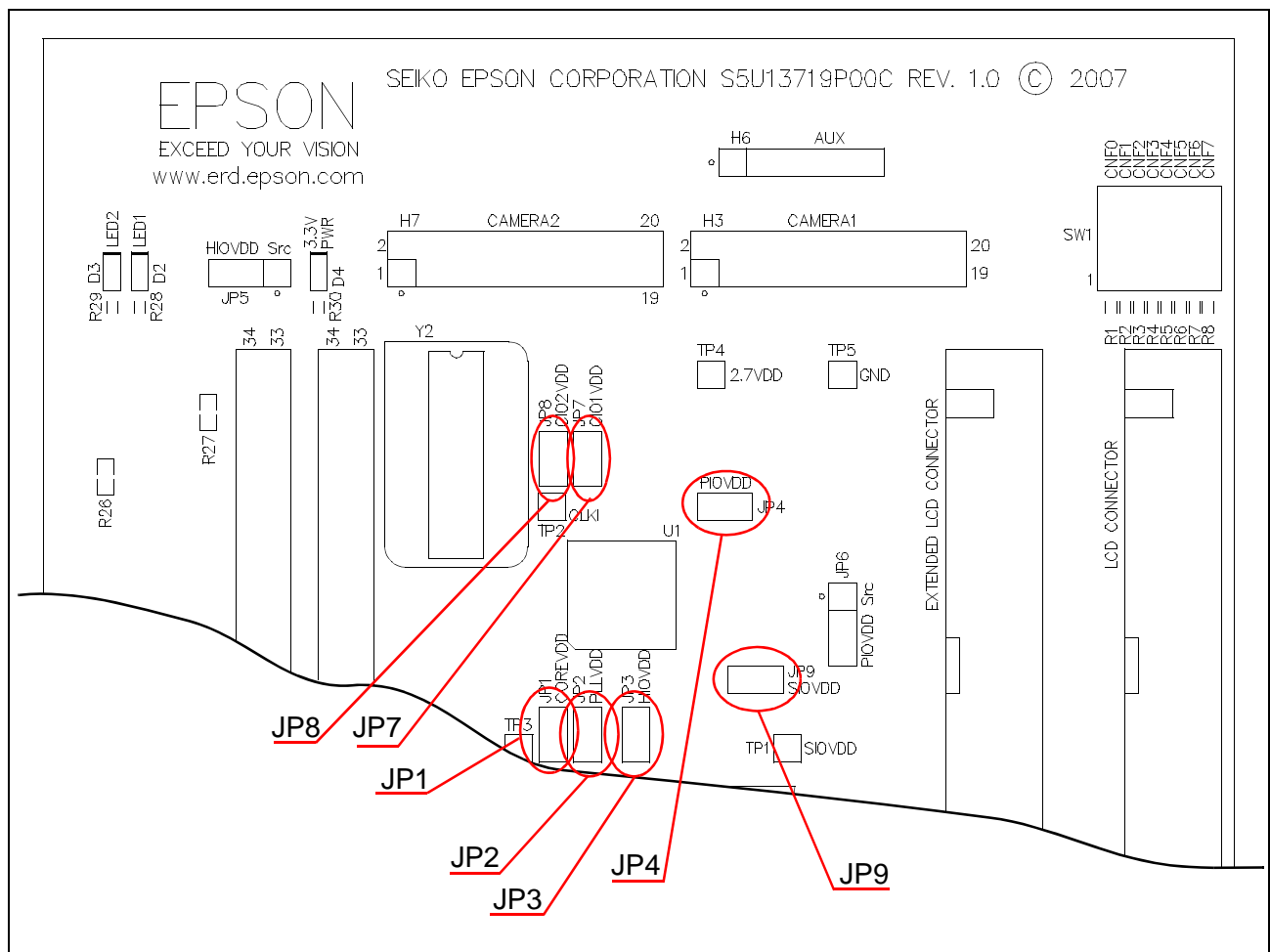*Figure 3-3: Configuration Jumper Location (JP5)*

JP6 - PIOVDD 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 H6 connector, pin 1.
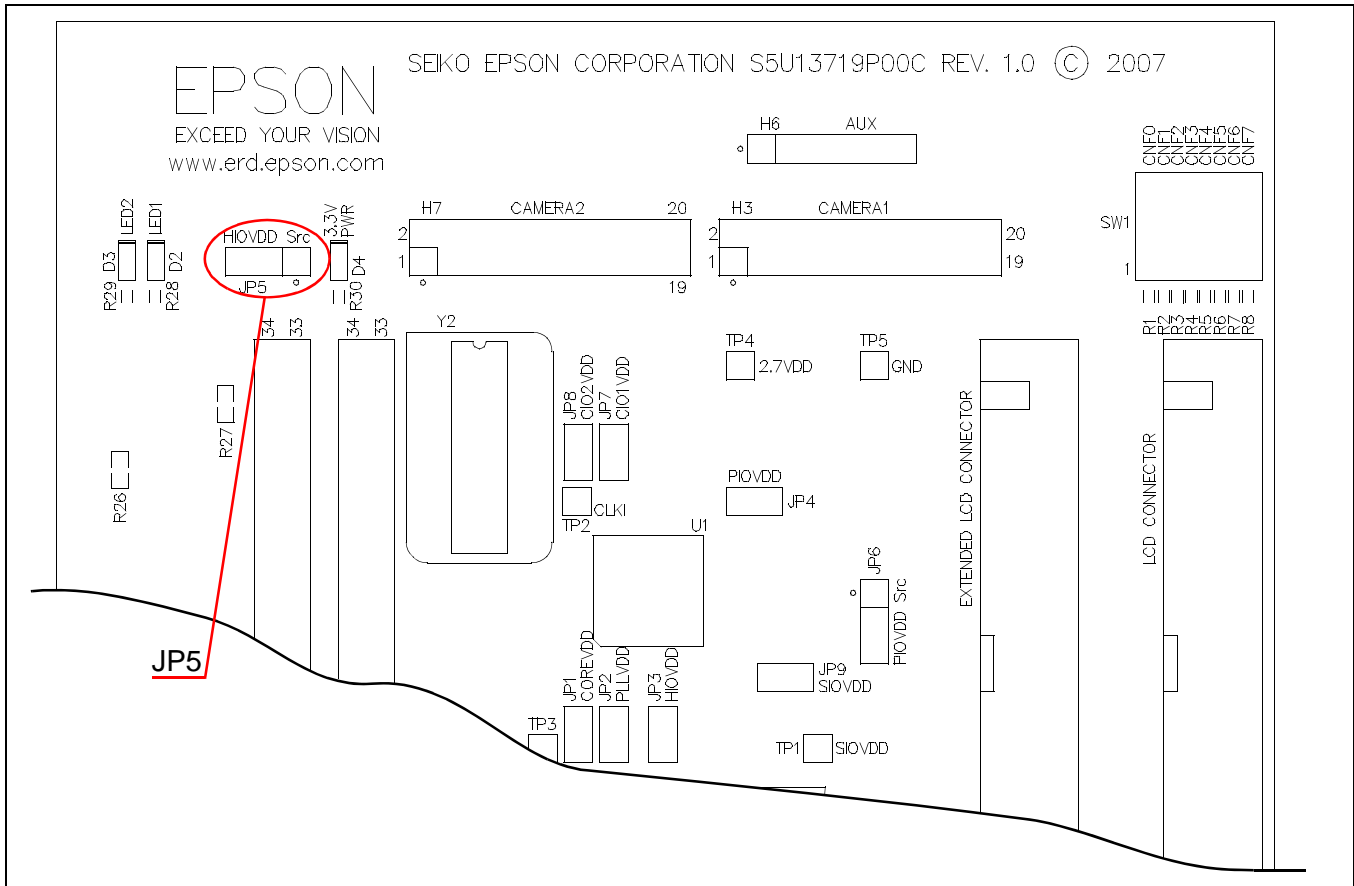When the jumper is at position 2-3, the PIOVDD voltage is provided by the 3.3V power supply of the board.
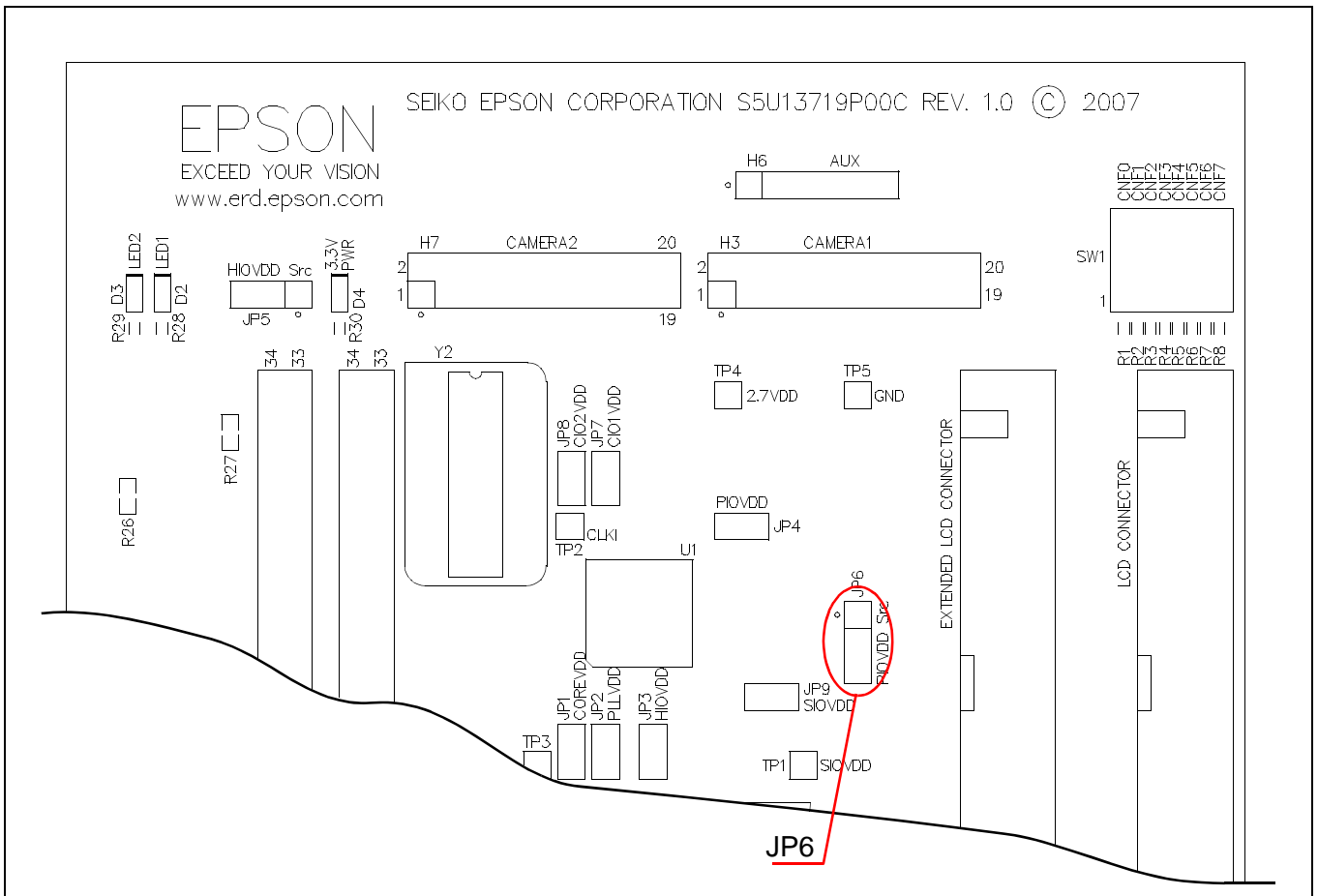

Figure 3-4: Configuration Jumper Location (JP6)

Chapter 4 Technical Description

4.1 Power

4.1.1 Power Requirements

The S5U13719P00C100 evaluation board requires an external regulated power supply (3.3V at 1A). The power is supplied to the evaluation board through pin 5 of the P2 header, or pin 29 of the H1 header.

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

4.1.2 Voltage Regulators

The S5U13719P00C100 evaluation board has on-board linear regulators to provide the different voltage required by the S1D13719 Mobile Graphics Engine. It also has a step-up switching voltage regulator to generate adjustable 12~25V, which can be used to power the LED backlight on some LCD panels.

4.1.3 S1D13719 Power

The S1D13719 Mobile Graphics Engine requires 1.8V and 2.5V or 3.0V power supplies.

COREVDD and PLLVDD use 1.8V power, which is provided by an on-board linear voltage regulator.

HIOVDD power can be selected with jumper JP5. When JP5 is set to the 2-3 position, HIOVDD is connected to 3.3V. If a different voltage is required for HIOVDD, set JP5 to the 1-2 position and connect the external power supply to pin 32 of connector H1.

PIOVDD power can be selected with jumper JP6. 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 1 of connector H6.

CIO1VDD is connected to 2.7V, which is provided by an on-board linear regulator, through a 0 ohm resistor, R9. If it is desired to have a different voltage for CIO1VDD, R9 must be removed and the desired supply connected to pin 15 of connector H3.

CIO2VDD is connected to 2.7V, which is provided by an on-board linear regulator, through a 0 ohm resistor, R10. If it is desired to have a different voltage for CIO1VDD, R10 must be removed and the desired supply connected to pin 15 of connector H7.

SIOVDD is connected to PIOVDD through a 0 ohm resistor, R11. If it is desired to have a different voltage for SIOVDD, R11 must be removed and the desired supply connected to pin 4 of connector J1.

4.2 Clocks

The clock for the S1D13719 Mobile Graphics Engine is provided by a 32.768kHz oscillator.

The S5U13719P00C100 evaluation board has a DIP14 footprint for an optional second oscillator, Y2. This is provided for cases requiring a different clock frequency for the S1D13719 Mobile Graphics Engine. To use Y2, an oscillator must be populated in the Y2 footprint and the following board modifications must be made.

1. Remove R20 (33 ohm resistor, size 0402) to cut the output of Y1.

2. Populate R23 with a 33 ohm resistor, size 0402, to connect the output of Y2 to the CLKI input of the S1D13719 Mobile Graphics Engine.

4.3 Reset

The S5U13719P00C100 evaluation board can be reset using a push-button, or via an active low reset signal from the host development platform, on pin 30 of connector H1.

The reset signal will reset the S1D13719 Mobile Graphics Engine and is also available on the H3 and H7 connectors, so that camera modules connected to the board can be reset.

4.4 Host Interface

4.4.1 Direct Host Bus Interface Support

All S1D13719 host interface pins are available on connector H1 and H2 which allows the S5U13719P00C100 evaluation board to be connected to a variety of development platforms. For detailed S1D13719 pin mapping, refer to the *S1D13719 Hardware Functional Specification*, document number X59A-A-001-xx.

The following figure shows the location of host bus connector H1 and H2. H1 and H2 are 0.1x0.1", 34-pin headers (17x2).
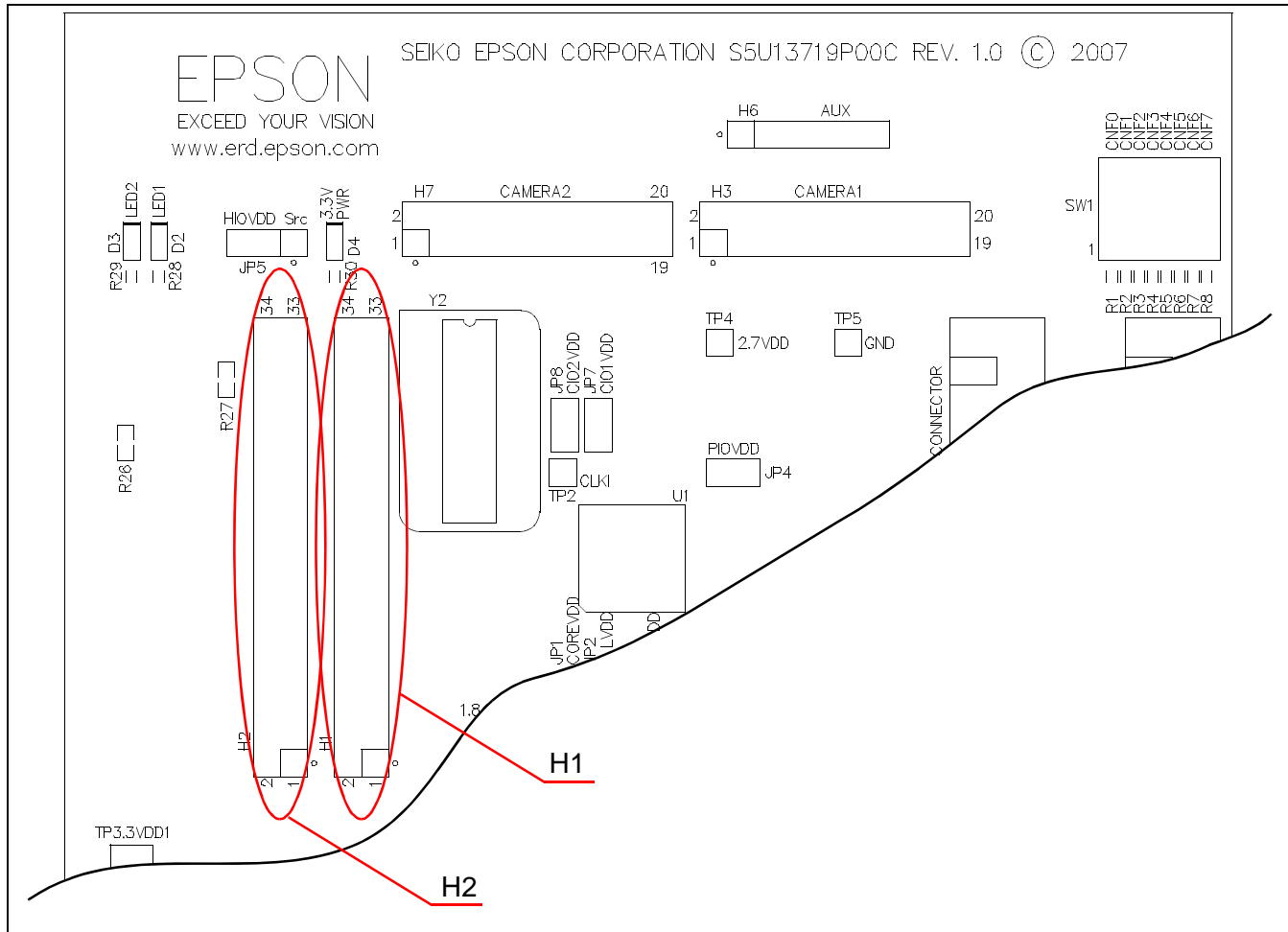
Figure 4-1: Host Bus Connector Location (H1 and H2)

For the pinout of connectors H1 and H2, see Section Chapter 6, "Schematic Diagrams" on page 23.

4.4.2 Connecting to the Epson S5U13U00P00C100 USB Adapter Board

The S5U13719P00C100 evaluation board is designed to connect to the S5U13U00P00C100 USB Adapter Board. The USB adapter board provides a simple connection to any computer via a USB 2.0 connection. The S5U13719P00C100 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 S5U13719P00C100. HIOVDD should be selected for 3.3V and JP5 should be set to the 2-3 position.

When the S5U13719P00C100 is connected to the S5U13U00P00C100 USB Adapter board, there are 2 LEDs on S5U13719P00C100 which provide a quick visual status of the USB adapter. LED1 blinks to indicate that the USB adapter board is active. LED2 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).
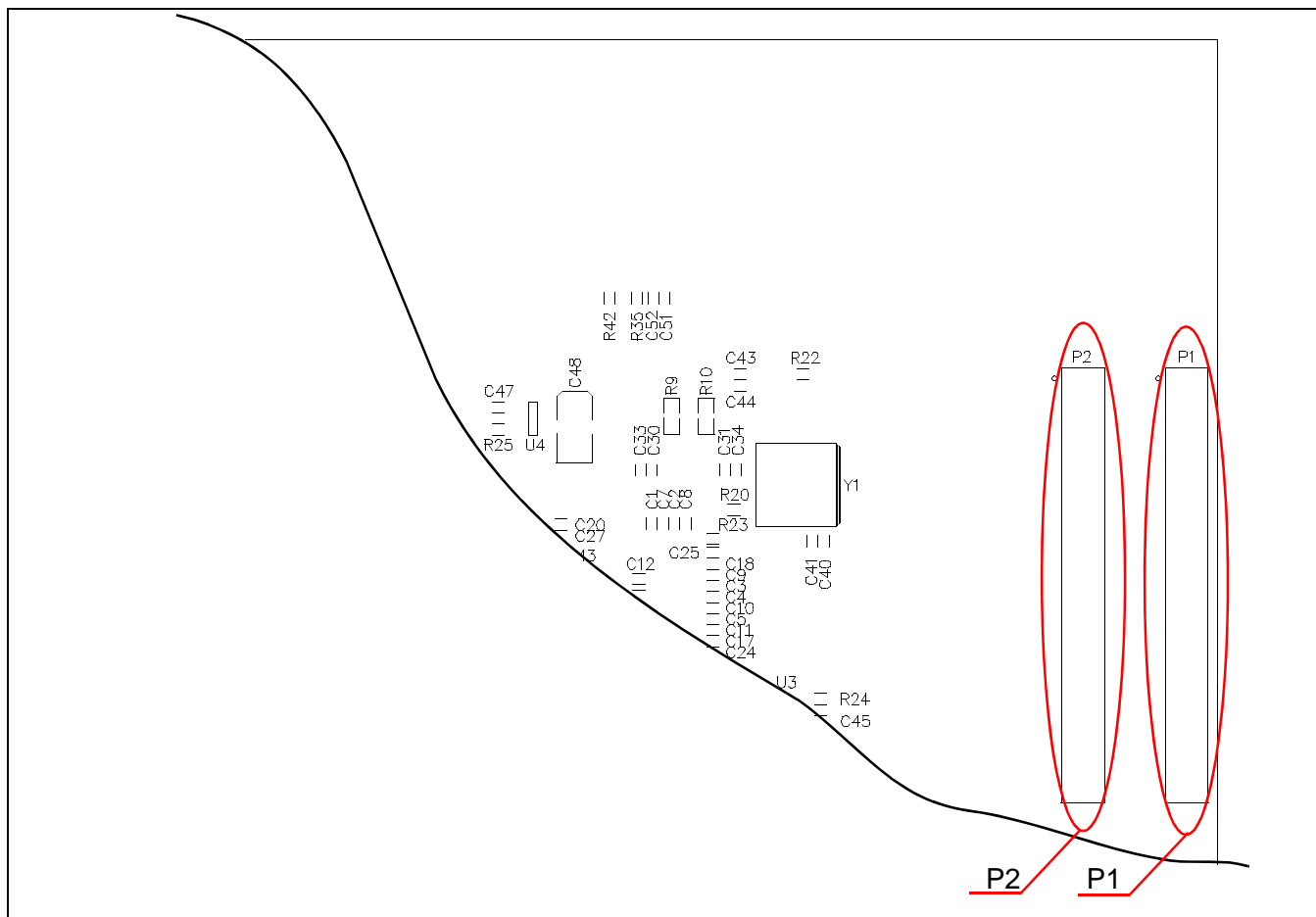
Figure 4-2: USB Adapter Connector Locations (P1 and P2 - Board Bottom)

For the pinout of connectors P1 and P2, see Section Chapter 6, "Schematic Diagrams" on page 23.

Note
A windows driver must be installed on the PC when the S5U13719P00C100 is used with the S5U13U00P00C100 USB Adapter Board. The S1D13xxxUSB driver is available at www.erd.epson.com.

4.5 LCD Panel Interface

The LCD interface signals are available on connectors H4 and H5. For S1D13719 LCD interface pin mapping, refer to the *S1D13719 Hardware Functional Specification*, document number X59A-A-001-xx.

On the evaluation board there is an adjustable 12~25V power supply. At 12V, the maximum current available is 100mA. At 25V, the maximum current available is 60mA. This power supply is intended to use to power the LED backlight on some LCD panels. The voltage is adjusted by the R36 pot.

Note
For LCD panels that use CCFL backlight, an external power supply must be used to provide power to the inverter for CCFL backlight. Usually, the inverter current consumption is higher than the maximum 100mA current available from the on-board voltage regulator.

The following diagram shows the location of the LCD panel connectors H4 and H5. H4 and H5 are both 0.1x0.1", 40-pin headers (20x2).
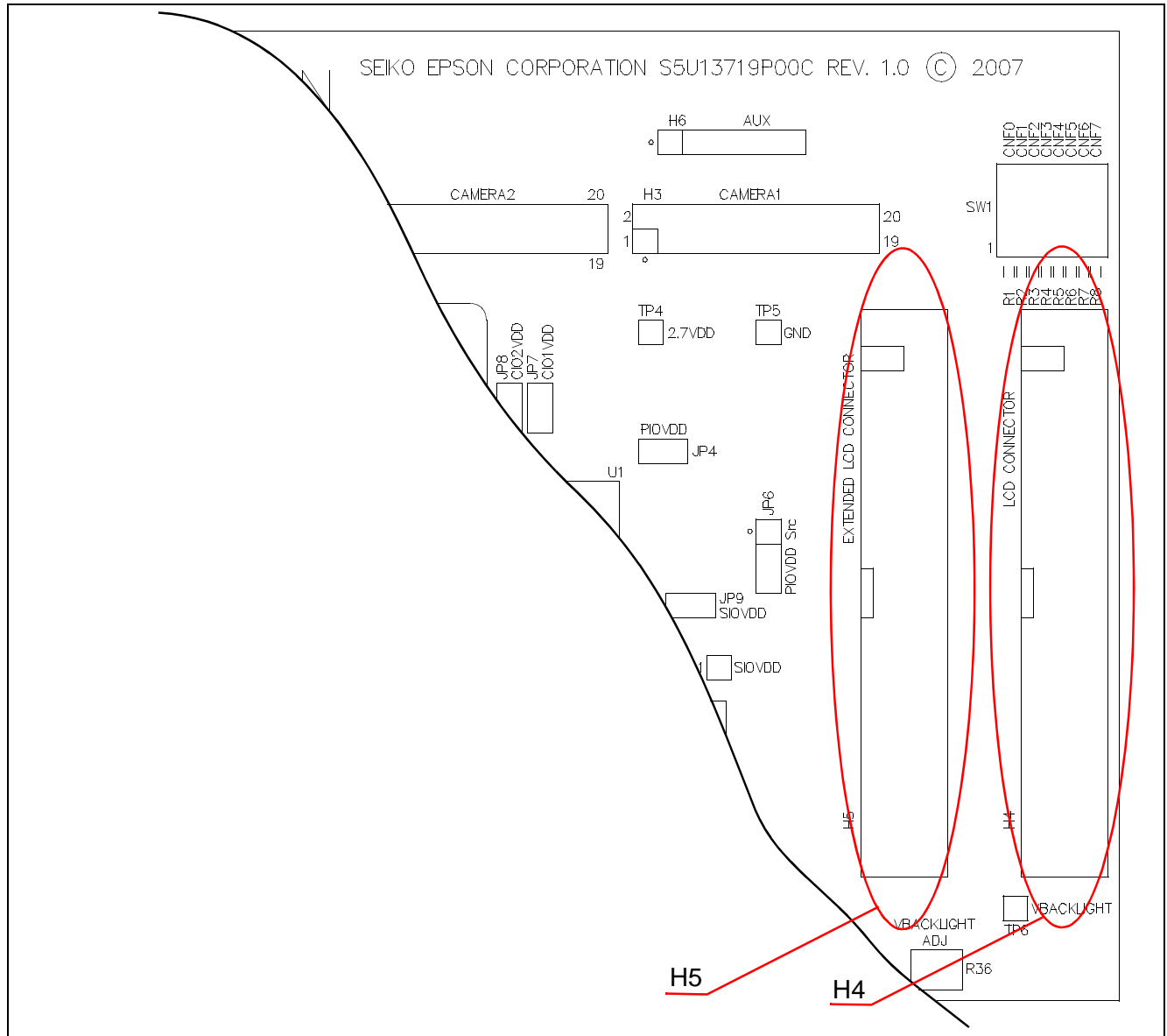
Figure 4-3: LCD Panel Connectors Locations (H4, H5)

For the pinout of connectors H4 and H5, see Section Chapter 6, "Schematic Diagrams" on page 23.

4.6 Camera Interface

All the signals for the Camera1 interface are available on connector H3. All the signals for the Camera2 interface are available on connector H7.

Camera modules are programmed using an I2C type bus. The S1D13719 does not have an I2C interface, but it has GPIOs that can be used to emulate the I2C bus. By default, the board uses GPIO17 as SCL signal of I2C bus and GPIO18 as SDA signal of I2C bus. If GPIO17 and GPIO18 must be used for some other function, for example SD Card interface, than GPIO1 can be selected for SCL by removing R38 and populating R37 with a 0Ω resistor, size 0402. GPIO2 can be selected for SDA by removing R44 and populating R43 with a 0Ω resistor, size 0402.

The I2C bus lines must be pulled high. The default configuration of the evaluation board has the I2C lines, SCL and SDA, pulled high to CIO1VDD. If the I2C lines must be pulled high to CIO2VDD, R34 and R41 must be removed and 2.2kΩ resistors, size 0402, must be mounted for R35 and R42.

The reset signal provided on H3 and H7 is active low and is pulled to HIOVDD when inactive.

The S1D13719 camera interface has a strobe output, CMSTROUT, that is available on H6 connector. Note that connector H6 is not populated on the S5U13719P00C100 evaluation board.

The following diagram shows the location of the camera connectors H3, H6 and H7. H3 and H7 are 0.1x0.1", 20-pin headers (10x2). H6 is 0.1", 6-pin header (6x1).
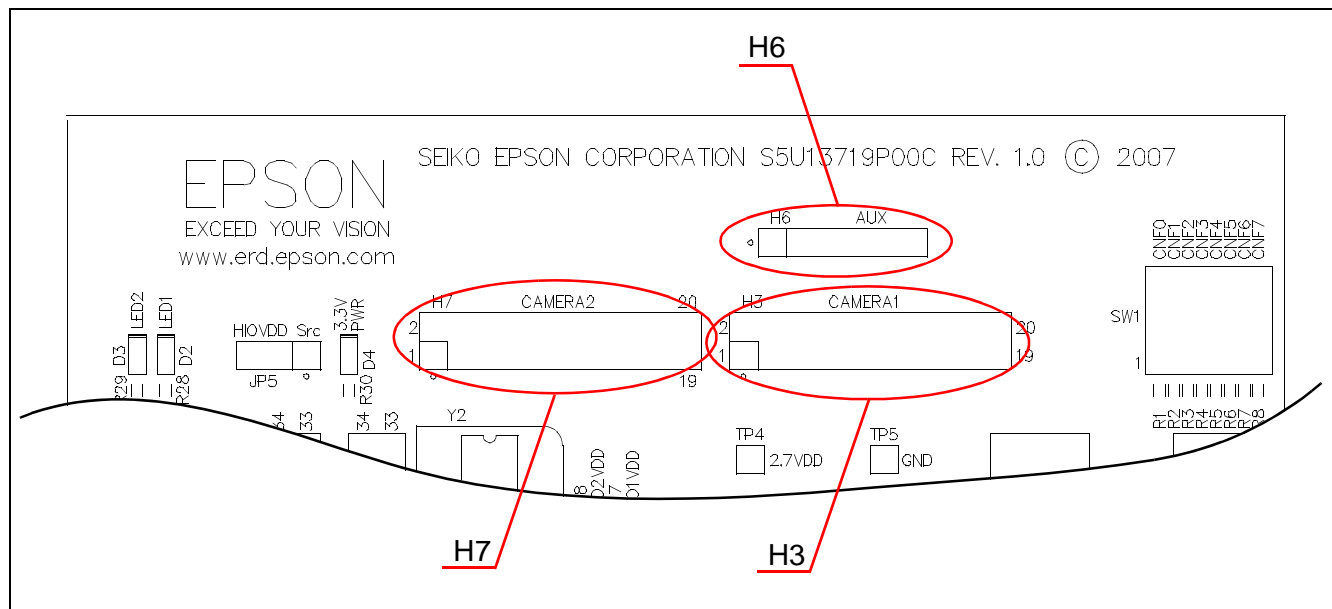

Figure 4-4: Camera Expansion Connector Locations (H3, H6 and H7)

For the pinout of connectors H3, H6 and H7, see Section Chapter 6, "Schematic Diagrams" on page 23.

4.7 SD Card Interface

The S1D13719 Mobile Graphics Engine has a SD Card interface. The S5U13719P00C100 evaluation board is designed with a SD Card socket, J1. Note that J1 socket and related components, R13-R19 and C37-39, are not populated on the S5U13719P00C100 evaluation board.

The SD Card interface has a general purpose output pin GPIO19/SDGPO, which is used to turn on a LED (D1). Note that D1 LED and related components, U2, C42 and R21, are not populated on the S5U13719P00C100 evaluation board.

The following figure shows the location of the SD Card connector (J1) and the SD Card LED (D1).
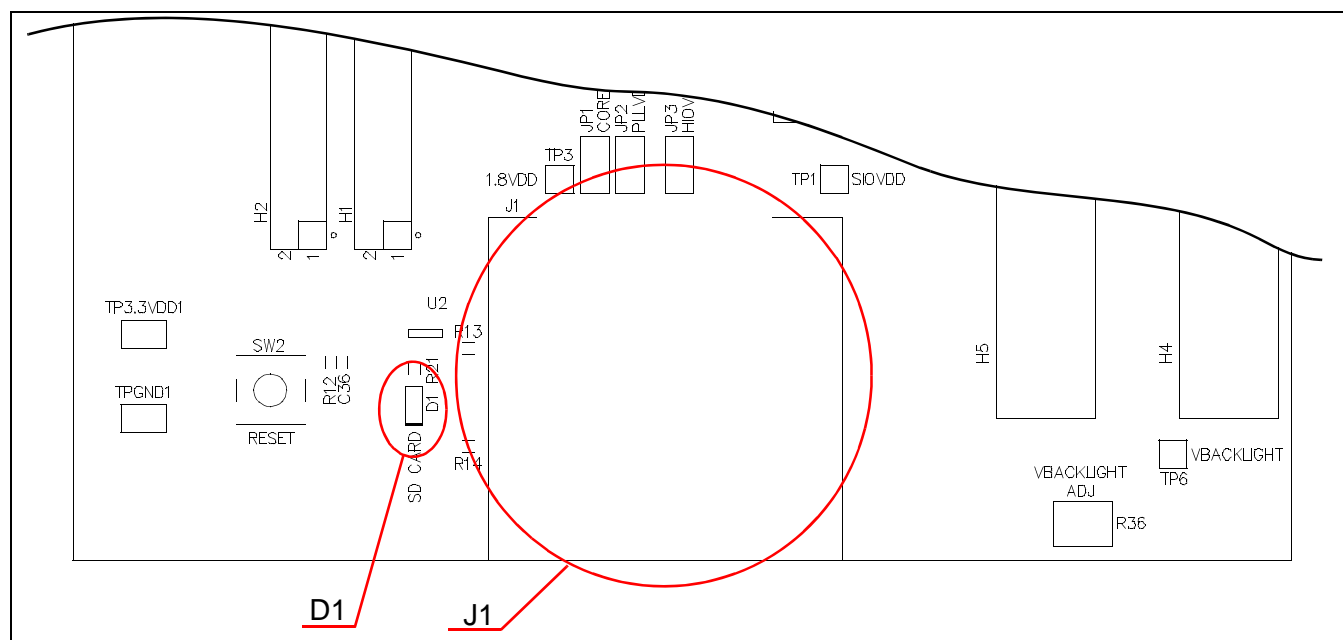
Figure 4-5: SD Card J1 Connector Location

4.8 GPIO Connections

The S1D13719 Mobile Graphics Engine has 22 GPIO pins. Some GPIOs have multiple functions. The GPIO pins are routed to the connectors on the S5U13719P00C100 evaluation board. If any pin is configured as a GPIO, it will be available on the connectors as listed below:

- GPIO[10:0] pins are routed to connector H5.

- GPIO[18:11] pins are routed to connector J1. Note that connector J1 is not populated on the S5U13719P00C100 evaluation board.

- GPIO[19] pin is not routed to any connector on the board. It is routed only to pin 2 of U2 footprint on the board. Note that U2 is not populated on the S5U13719P00C100 evaluation board.

- GPIO[21:20] pins are routed to connector H6. Note that connector H6 is not populated on the S5U13719P00C100 evaluation board.

Chapter 5   Parts List

Table 5-1: Parts List

Item	Qty	Reference	Part	Description	Manufacturer Part No
1	24	C1,C2,C3,C4,C5,C6, C13,C16,C17,C18, C19,C20,C21,C22, C30,C31,C32,C36, C40,C43,C45,C47, C50,C52	0.1uF	C0402	Yageo America 04022F104Z7B20D
2	18	C7,C8,C9,C10,C11, C12,C23,C24,C25, C26,C27,C28,C29, C33,C34,C35,C41, C44	0.01uF	CAP 10000PF 16V CERAMIC X7R 0402 C0402	Kemet C0402C103K4RACTU
3	1	C14	1nF	C0402	Yageo America 04022R102K9B20D
4	1	C15	10uF	C0805	Panasonic - ECG ECJ-CV50J106M
5	0	C37	NP_10uF	C0805	Panasonic - ECG ECJ-2FB1A106K
6	0	C38,C42	NP_0.1uF	C0402	Yageo America 04022F104Z7B20D
7	0	C39	NP_0.01uF	C0402	Kemet C0402C103K4RACTU
8	2	C46,C48	4.7uF 10V T	CAPACITOR TANT 4.7UF 10V 10% SMD C3528	Kemet T494B475K010AT
9	2	C49,C51	1uF	C0402	Panasonic - ECG ECJ-0EB0J105M
10	1	C53	2.2uF 10V	CAP CER 2.2UF 10V X7R 0805 C0805	Taiyo Yuden LMK212BJ225KG-T
11	1	C54	10uF 35V	CAP CER 10UF 35V X5R 1210 C1206	Taiyo Yuden GMK325BJ106KN-T
12	1	C55	150pF	C0402	Panasonic - ECG ECJ-0EC1H151J
13	0	D1	NP_SD Card	LED GREEN SS TYPE LOW CUR SMD LED0603	Panasonic - SSG LNJ308G8LRA
14	3	D2,D3,D4		LED GREEN SS TYPE LOW CUR SMD LED0603	Panasonic - SSG LNJ308G8LRA
15	1	D5	MBR0540	SOD-123	Micro Commercial Co. MBR0540-TP
16	1	F1	ACH32C-333-T	FILTR 3TERM 10MHZ TO 300MHZ SMD	TDK ACH32C-333-T
17	1	F2	ACF451832-222	FILTER 3-TERM 60MHZ 300MA SMD	TDK ACF451832-222
18	2	H1,H2	HEADER_17X2		Samtec TSW-117-07-G-D
19	2	H3,H7	HEADER_10X2		Samtec TSW-110-07-G-D

Table 5-1: Parts List

Item	Qty	Reference	Part	Description	Manufacturer Part No
20	1	H4	HEADER_20X2 Shrouded	LCD Connector	Samtec TST-120-01-G-D
21	1	H5	HEADER_20X2 Shrouded	Extended LCD Connector	Samtec TST-120-01-G-D
22	0	H6	AUX	CONN HEADER VERT 6POS .100 TIN or GENERIC	
23	7	JP1,JP2,JP3,JP4, JP7,JP8,JP9		CONN HEADER VERT 2POS .100 TIN or GENERIC SIP2	
24	2	JP5,JP6		CONN HEADER VERT 3POS .100 TIN or GENERIC SIP3	
25	0	J1	NP_DMM1AA-SF-PEJ		Hirose DM1AA-SF-PEJ
26	2	L1,L2	Ferrite	FERRITE 200MA 938 OHMS 0603 SMD R0603	Steward HZ0603B751R-10
27	1	L3	10uH	COIL 10UH 1300MA CHOKE SMD IND_ELL6	Panasonic - ECG ELL-6SH100M
28	2	P1,P2	HEADER_20X2	HDR2X20/2MM	3M 151240-8422-RB
29	9	R1,R2,R3,R4,R5,R6, R7,R8,R33	10k	R0402	
30	6	R9,R10,R11,R26,R27,R31	0	R0603	
31	1	R12	150k 1%	R0402	
32	0	R13,R14,R15,R16, R17,R18,R19	NP_47k	R0402	
33	1	R20	33 1%	R0402	
34	0	R21	NP_180	R0402	
35	0	R22,R23,R35,R37, R42,R43	NP	R0402	
36	4	R24,R25,R38,R44	0	R0402	
37	3	R28,R29,R30	270 1%	R0402	
38	1	R32	120k	R0402	
39	1	R39	56k	R0402	
40	2	R34,R41	2.2k	R0402	
41	1	R36	200k	POT 200K OHM 3MM CARBON TRIM SMD	Panasonic - ECG EVN-5ESX50B25
42	1	R40	13.3k 1%	R0402	
43	9	SH1,SH2,SH3,SH4, SH5,SH6,SH7,SH8, SH9	.100 in. Jumper Shunt	JUMPER SHORTING TIN	Sullins Electronics Corp. STC02SYAN
44	1	SW1	SW8_DIPSW8	DIPSW8	
45	1	SW2	SW TACT-SPST	SWITCH TACT SILVER PLT GULLWING SW_EVQQW	ITT Industries KSC241GLFS
46	2	TPGND1, TP3.3VDD1	TP_SMT	PC TEST POINT MINIATURE SMT TP_1206	Keystone 5015

Table 5-1: Parts List

| Item	Qty	Reference	Part	Description	Manufacturer Part No
47	1	U1	S1D13719PFBGA		
48	0	U2	NP_74LVC1G126	IC BUS BUFFER GATE 3-ST SOT-23-5	Texas Instruments SN74LVC1G126DBVR
49	1	U3	TPS76918DBVR	IC 1.8V 100MA LDO REG SOT-23-5	Texas Instruments TPS76918DBVR
50	1	U4	TPS76927DBVT	IC 2.7V 100MA LDO REG SOT-23-5	Texas Instruments TPS76927DBVT
51	1	U5	LM2733Y	IC CONV BOOST 40V FET SW SOT23-5	National Semiconductor LM2733YMF/NOPB
52	1	Y1	32.768kHz OSC	OSC 32.768KHZ 523PPM SMD	Epson SG-3030JC 32.7680KB3:ROHS
53	0	Y2	14-Pin DIP		AMP 2-641609-1

Chapter 6 Schematic Diagrams
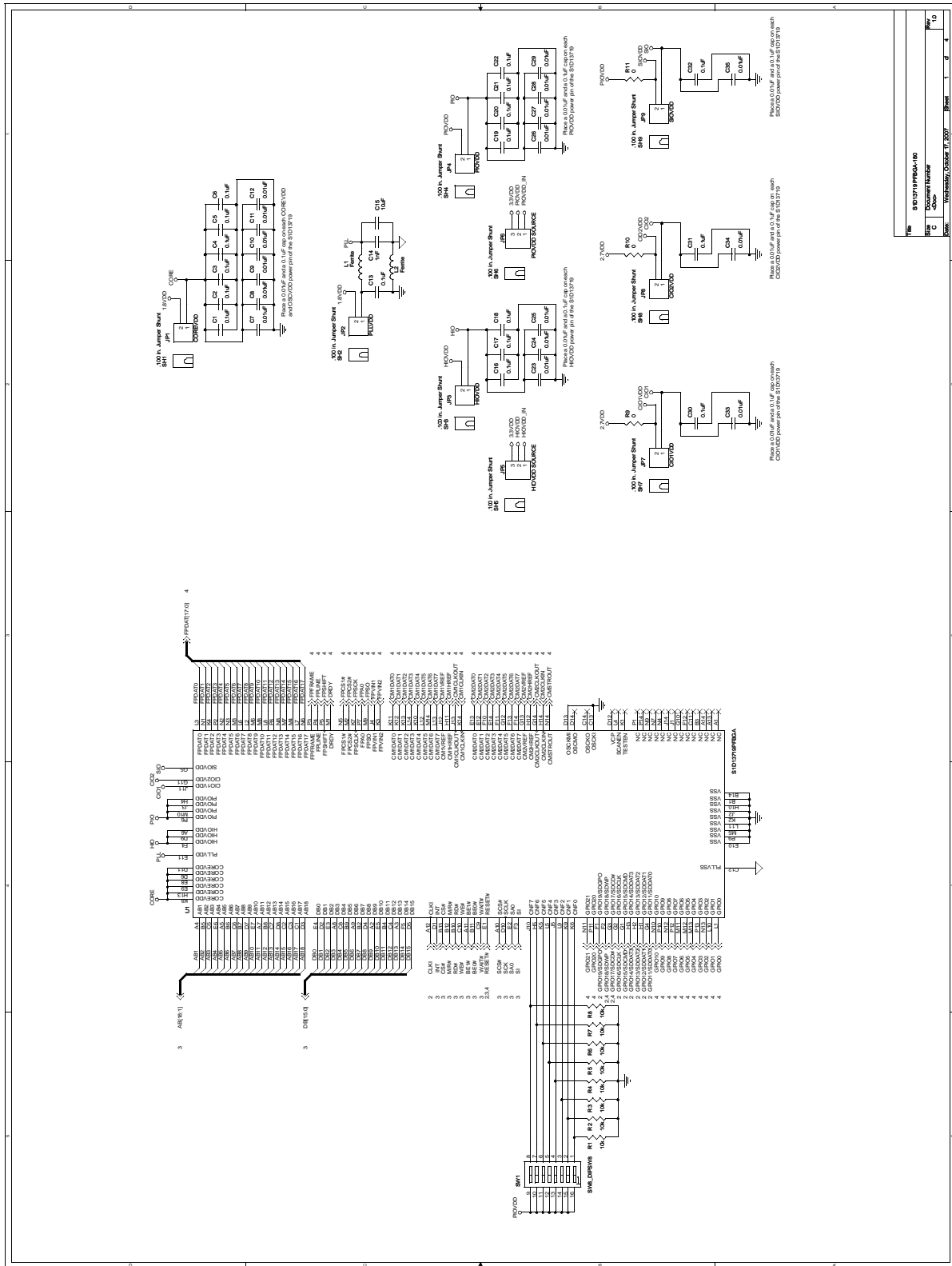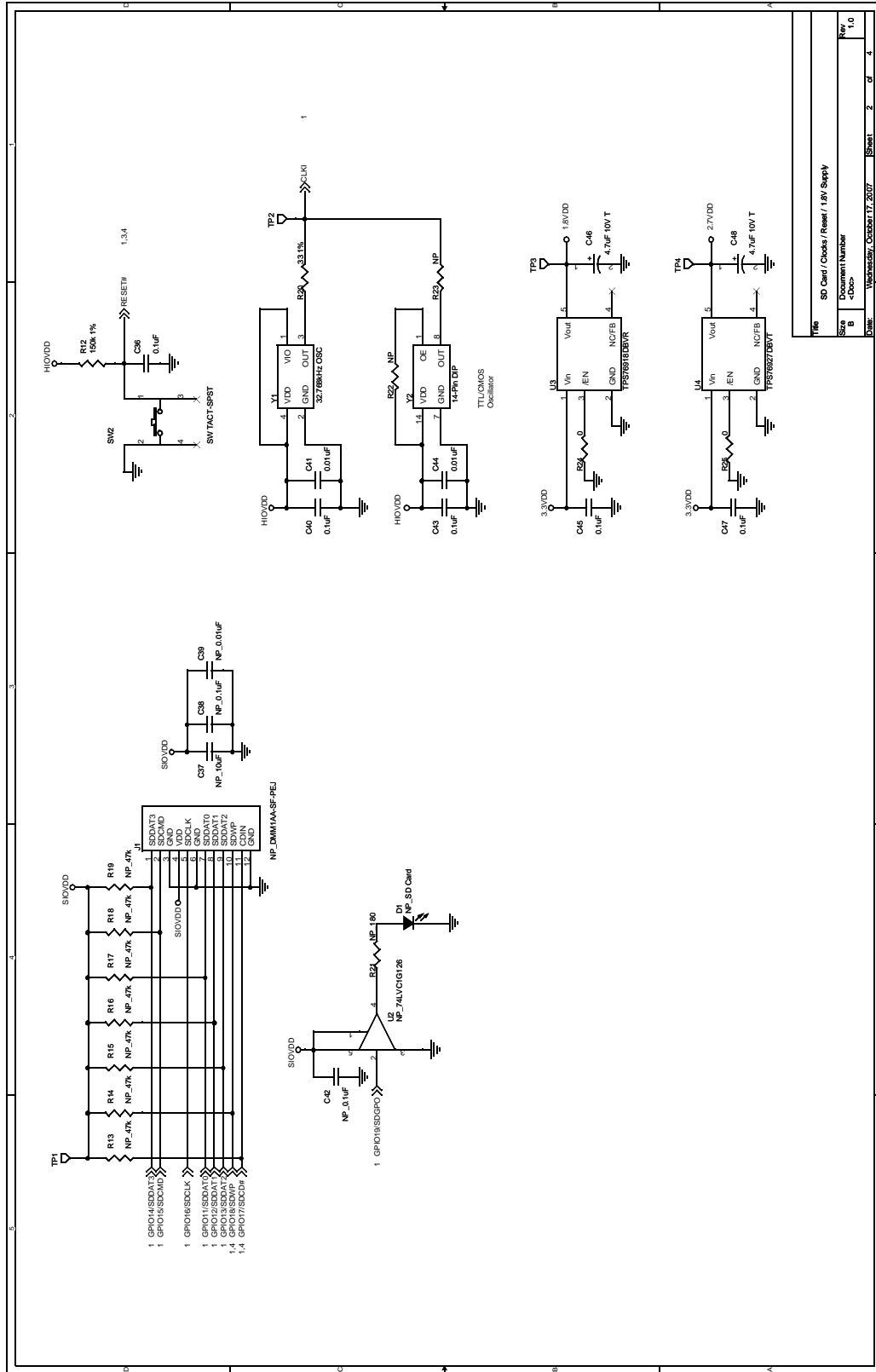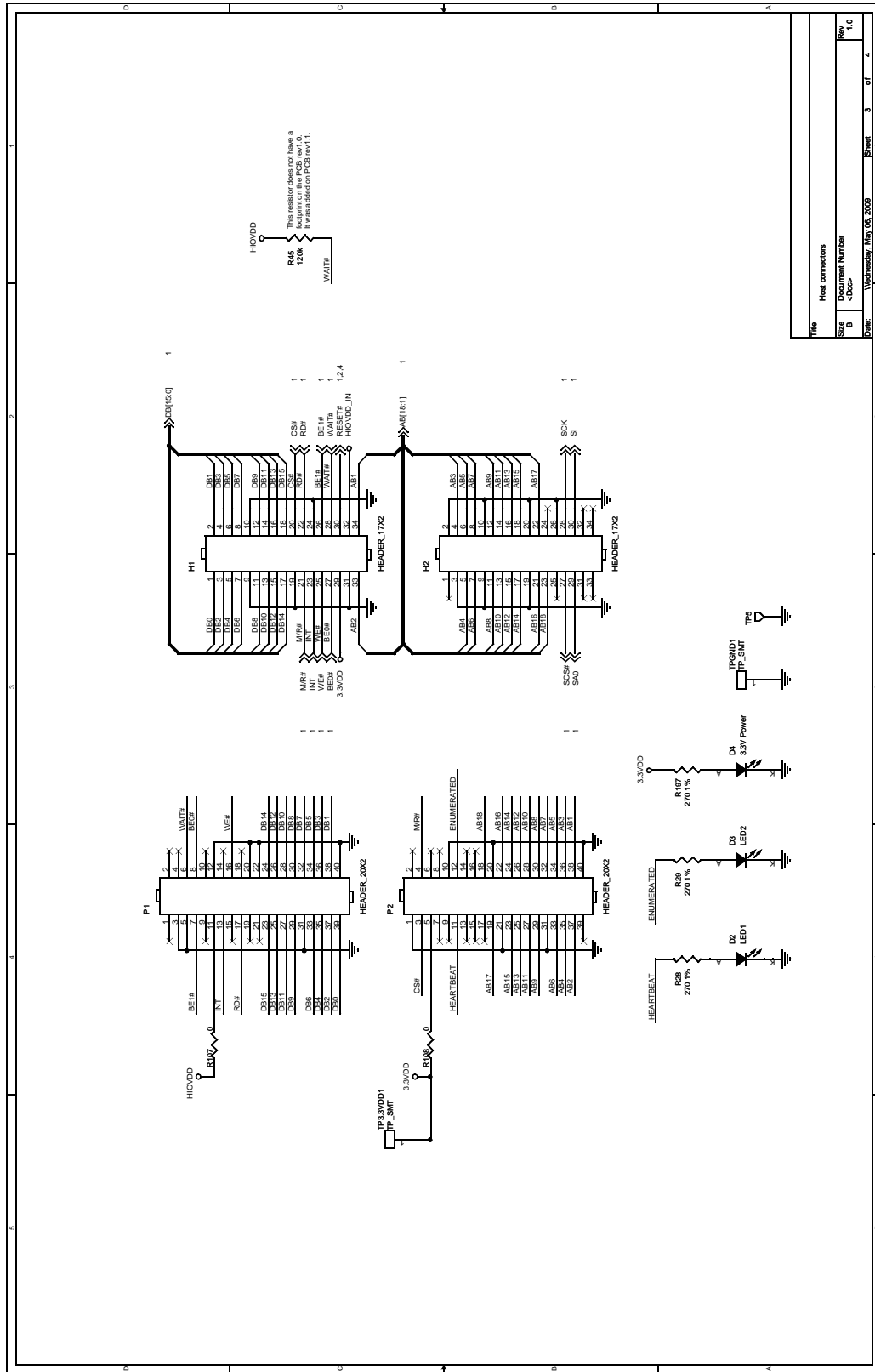

Figure 6-1: S5U13719P00C100 Schematics (1 of 4)

Figure 6-2: S5U13719P00C100 Schematics (2 of 4)

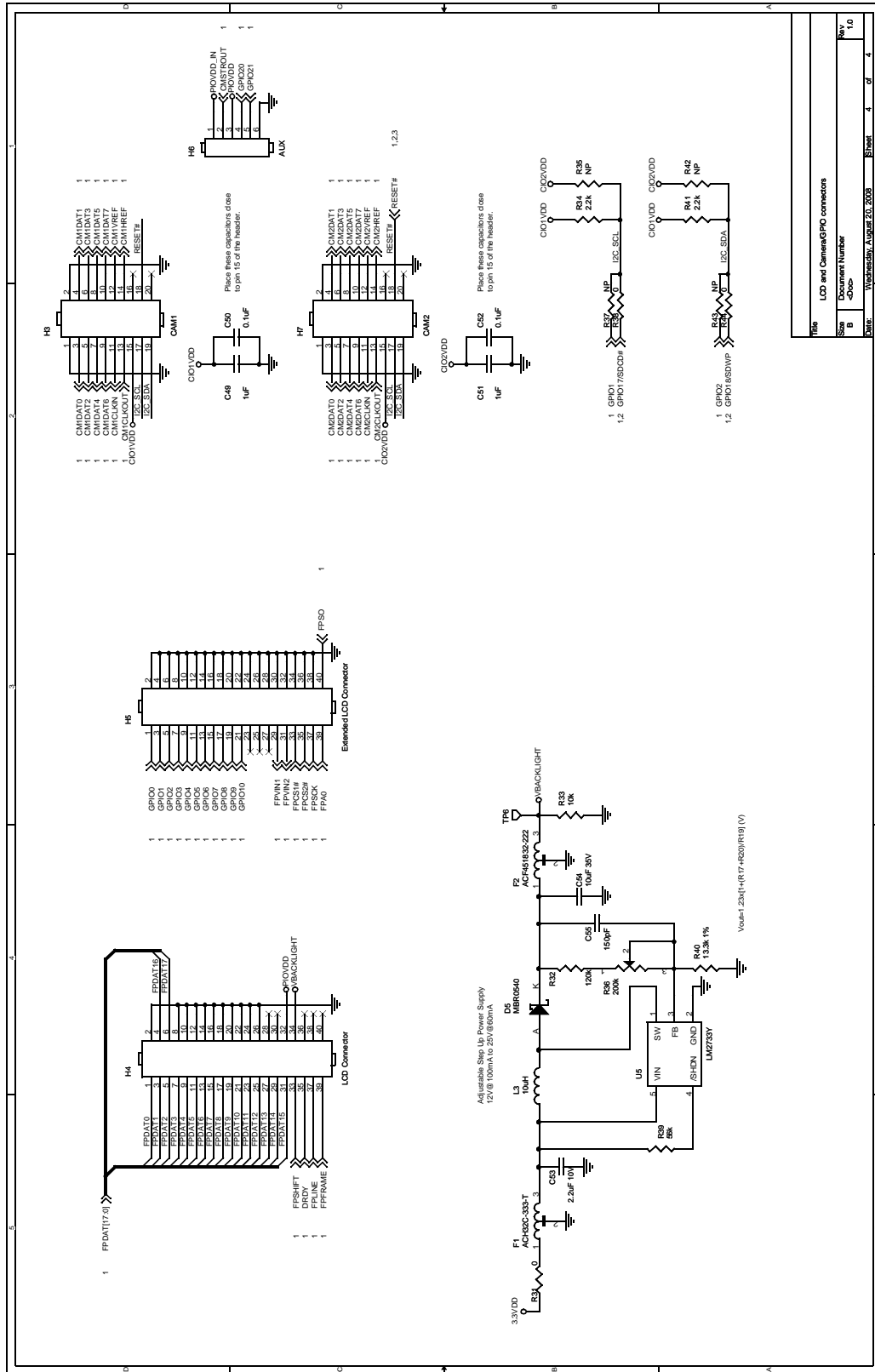*Figure 6-3: S5U13719P00C100 Schematics (3 of 4)*

Figure 6-4: S5U13719P00C100 Schematics (4 of 4)
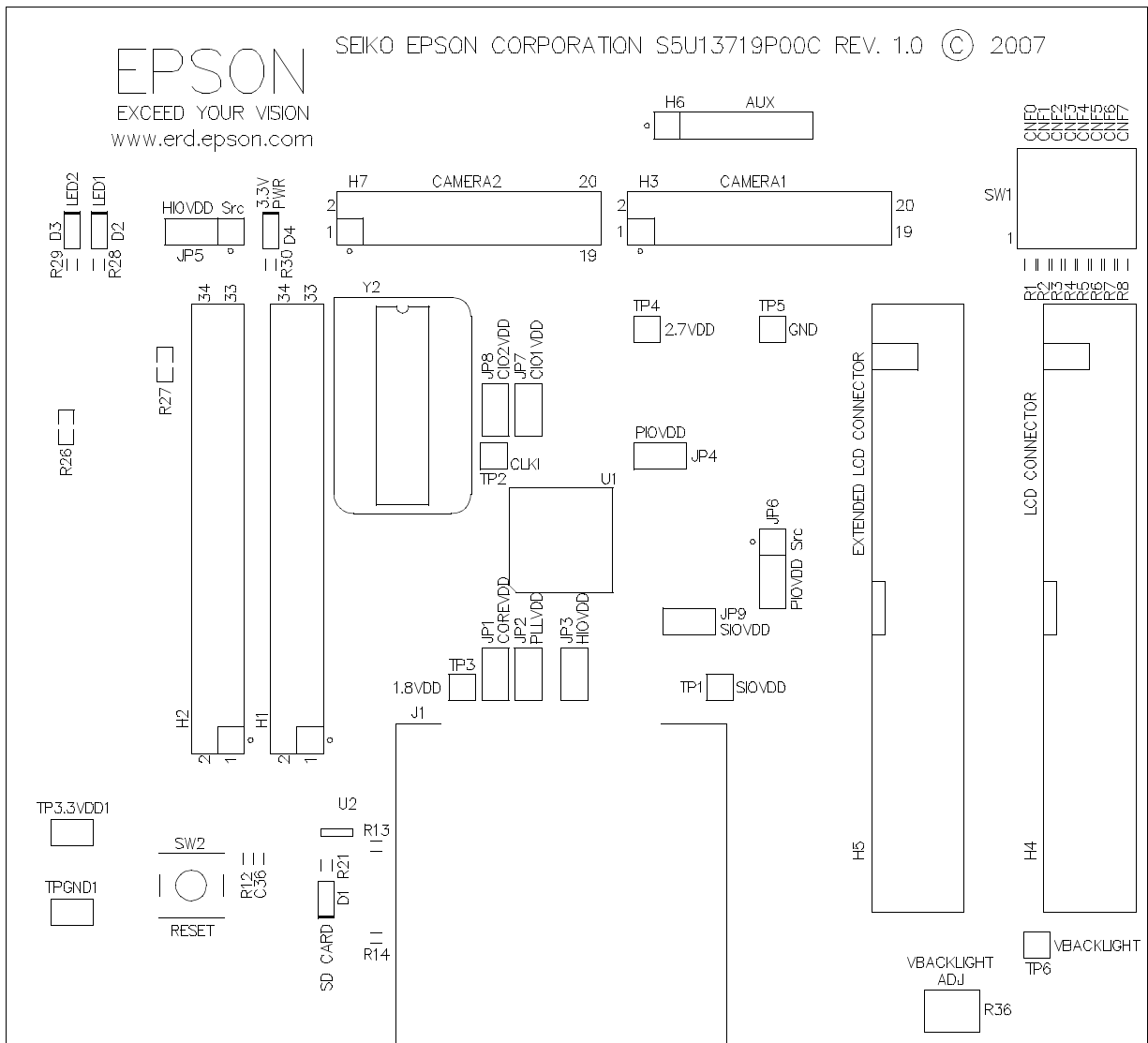
Chapter 7 S5U13719P00C100 Board Layout

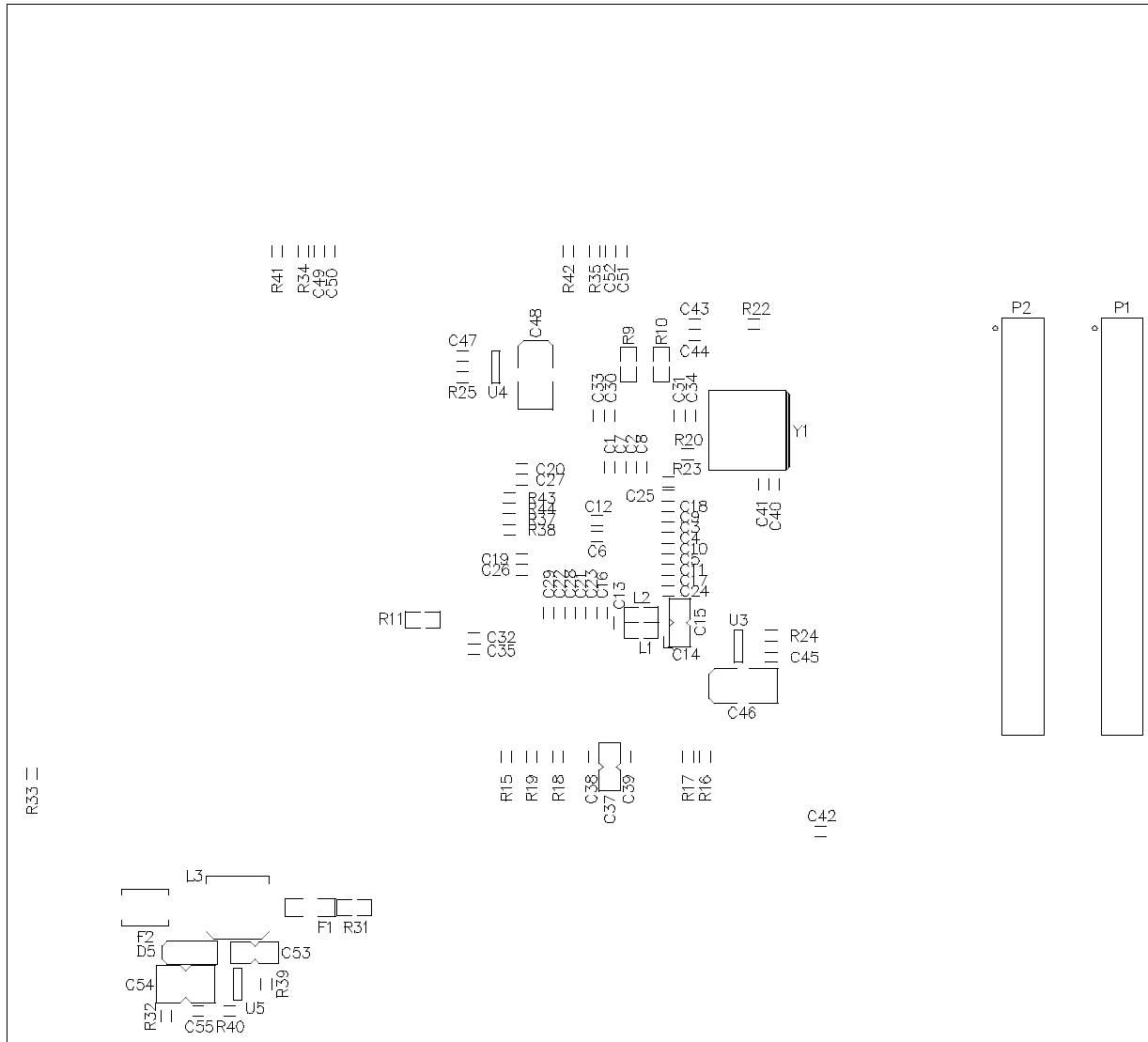*Figure 7-1: S5U13719P00C100 Board Layout - Top View*

Figure 7-2: S5U13719P00C100 Board Layout - Bottom View

Chapter 8 References

8.1 Documents

• Epson Research and Development, Inc., *S1D13719 Hardware Functional Specification*, document number X59A-A-001-xx.

8.2 Document Sources

• Epson Research and Development Website: http://www.erd.epson.com.

Chapter 9 Change Record

X59A-G-003-01 Revision 1.1 - Issued: May 6, 2009

• chapter 6 Schematic Diagrams - update all schematic diagrams wit new diagrams

X59A-G-003-01 Revision 1.0 - Issued: January 14, 2008

• Initial release of this manual

X59A-G-003-00 Revision 0.01 - Issued: October 19, 2007

• Initial draft of this manual

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