

S1D13C00

# **S5U13C00P00CX00 Customer Development Board User Manual**

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## 1. Introduction

The S5U13C00P00CX00 is the **S1D13C00 BoosterPack MDC Customer Development Board**. It is a BoosterPack board intended to be directly connected to the TI Tiva C Series EK-TM4C1294XL Launchpad evaluation board for evaluating and developing embedded memory LCD display applications using the Epson S1D13C00 Memory Display Controller IC.

Figure 1 shows the S5U13C00P00CX00 Customer Development Board.

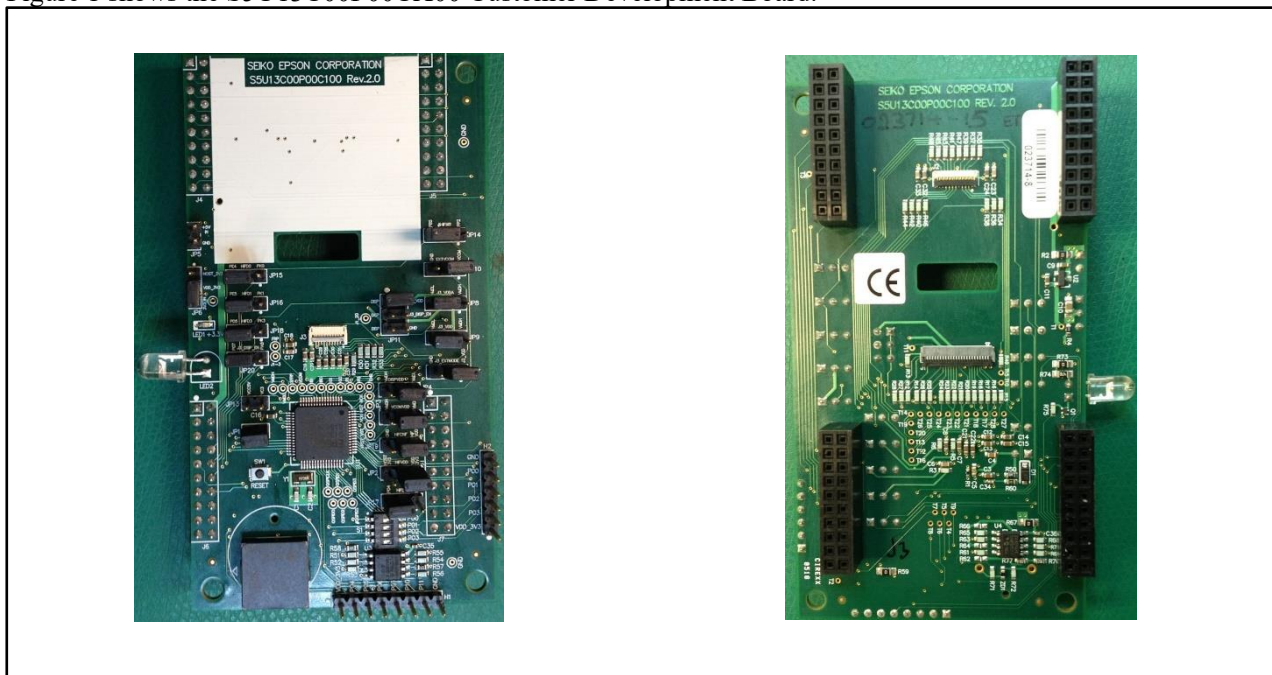


Figure 1 – S5U13C00P00CX00 Customer Development Board

The S5U13C00P00CX00 Customer Development Board consists of:

- A S1D13C00 Memory Display Controller (U1)
- Four 2x10 connectors for Host Interface connection (J4, J5, J6 and J7) and +5V/+3.3V power
- A 16Mbytes QSPI Serial Flash (U3)
- A 1Kbit 400Kbps I<sup>2</sup>C EEPROM (U4)
- A Buzzer (BZ1)
- An IR emitter with driving FET (LED2 & Q1)
- Three LCD panel interface flexible cable connectors:
  - 24 positions, 0.5mm top and bottom contacts connector (J1)
  - 21 positions, 0.3mm bottom contact connector (J2)
  - 10 positions, 0.5mm top and bottom contacts connector (J3)

### 1.1 Ordering Information

The S5U13C00P00CX00 board is part of a package of two boards consisting of:

- S5U13C00P00C200 (S1D13C00 BoosterPack MDC Customer Development Board)
- S5U13C00M00C100 (adapter board for ST Nucleo boards)

The ordering number for the package is S5U13C00K00C100.

For details of the S5U13C00M00C100 adapter board for ST Nucleo boards, please refer to the [“S5U13C00M00C100 Adapter Board User Manual”](#).

## 2. LCD Module Options and Parts List

The S5U13C00P00CX00 Customer Development Board can interface to two types of LCD modules. One type of LCD module has a parallel RGB interface and the other type has a SPI interface.

The following table shows some of the two LCD module options, their respective interface connectors and their manufacturer part numbers:

Type	Connector	Manufacturer Part Number
6-bit Color RGB 240x240	J1 (24 pins)	JDI LPM012M134B
6-bit Color RGB 240x240	J2 (21 pins)	Sharp LS012B7DD06
6-bit Color RGB 260x260	J2 (21 pins)	Sharp LS013B7DD02
6-bit Color RGB 280x280	J2 (21 pins)	Sharp LS014B7DD01
6-bit Color RGB 240x320	J2 (21 pins)	Sharp LS021B7DD02
3-bit Color SPI 128x128	J3 (10-pins)	Sharp LS13B7DH06
1-bit BW SPI 128x128	J3 (10-pins)	Sharp LS010B7DH01
1-bit BW SPI 240x240	J3 (10-pins)	Sharp LS012B7DH02
3-bit Color SPI 176x176	J3 (10-pins)	JDI LPM013M126C
3-bit Color SPI 400x240	J3 (10-pins)	JDI LPM027M128C

### 3. Connecting the LCD Modules

#### 3.1 J1 – 24-pin RGB Type Connector

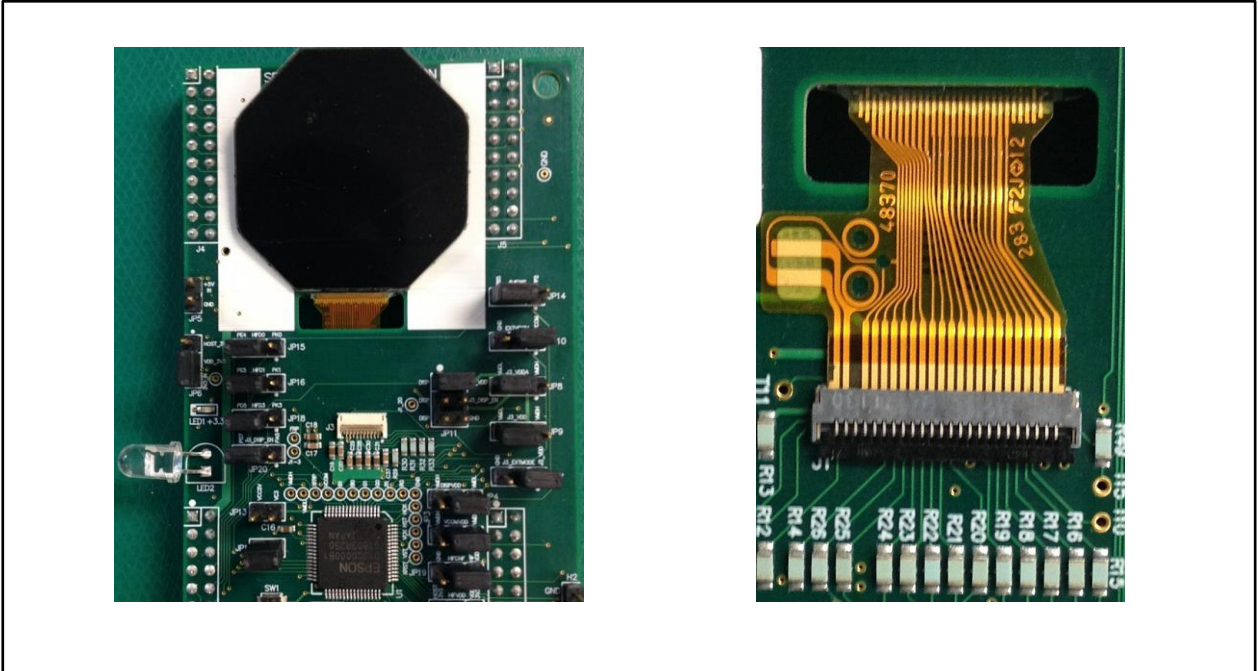


Figure 2 – Example of connecting the JDI LPM012M134B LCD module

#### 3.2 J2 – 21-pin RGB Type Connector

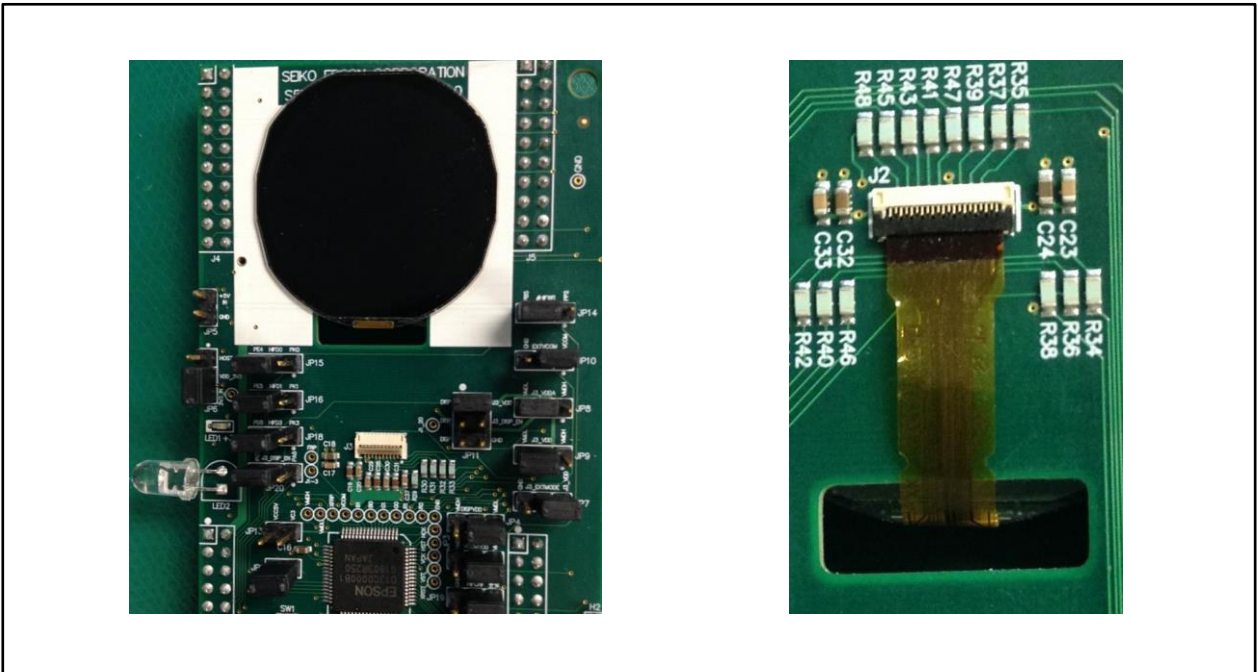


Figure 3 – Example of connecting the Sharp LS012B7DD06 LCD module



### 3.3 J3 – 10-pin SPI Type Connector

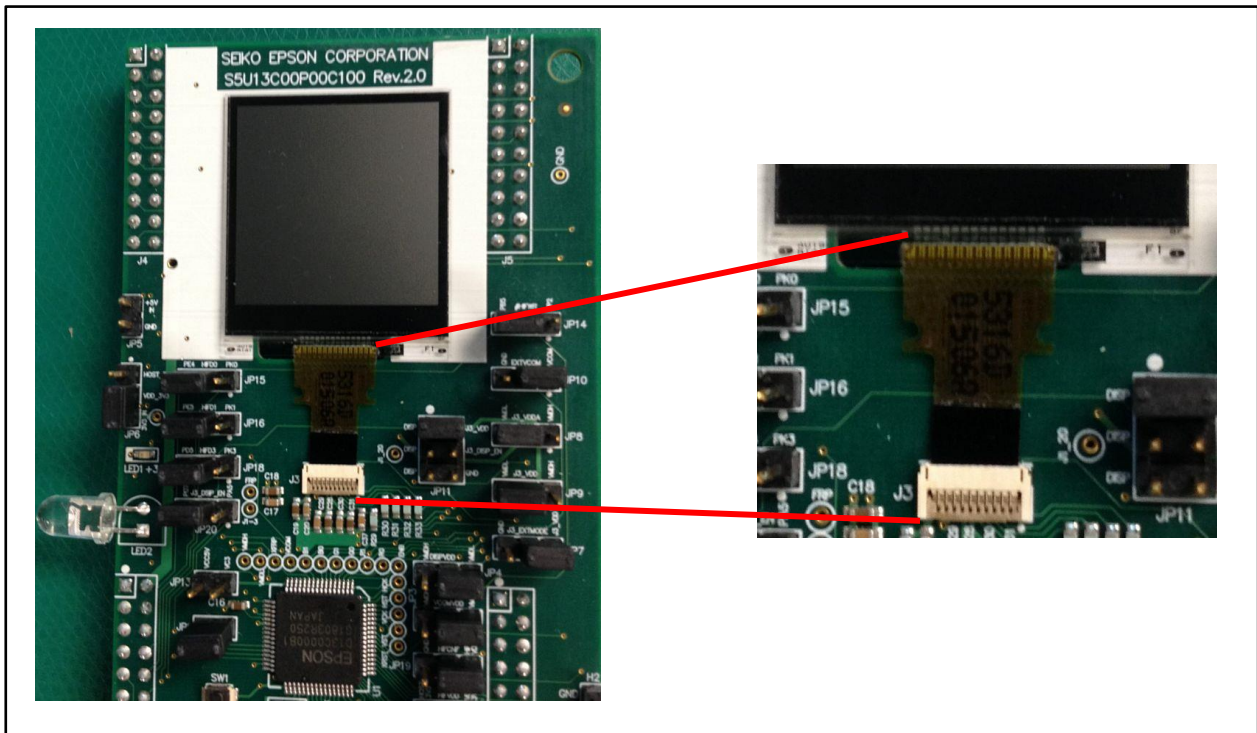


Figure 4 – Example of connecting the Sharp LS13B7DH06 LCD module

## 4. Connecting the Host Interface Board

Position the S5U13C00P00CX00 Customer Development Board on TOP of the EK-TM4C1294XL Launchpad Host Interface Board, press the two boards together with J4 connecting to X8, J5 connecting to X9, J6 connecting to X6, and J7 connecting to X7 respectively.

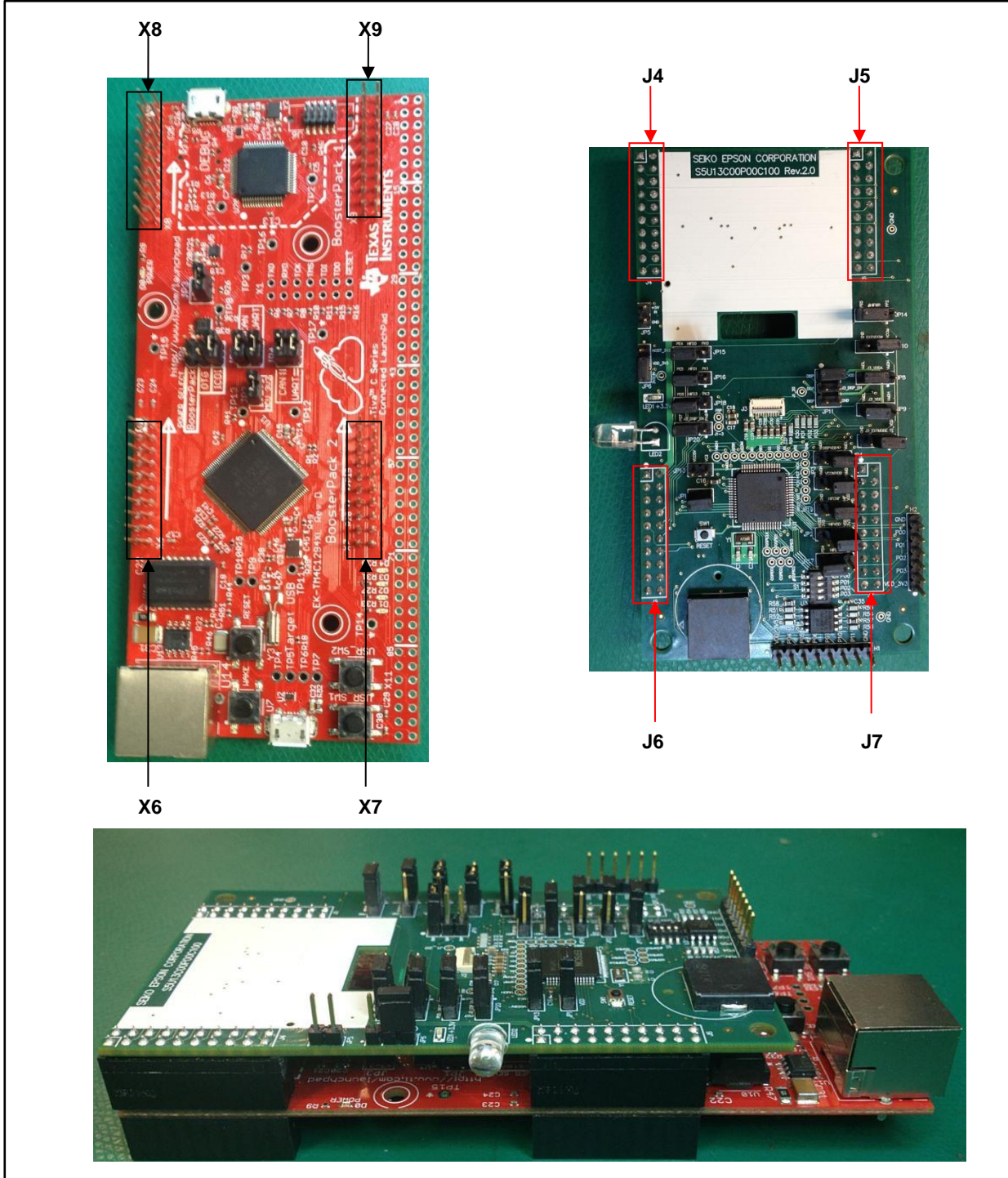


Figure 5 – Connecting the S5U13C00P00CX00 to the EK-TM4C1294XL

## 5. Jumpers Settings

The following tables show the jumpers settings for the S5U13C00P00CX00 Customer Development Board. The jumpers are divided into three groups: Host Interface, LCD Interface, and Power Supply.

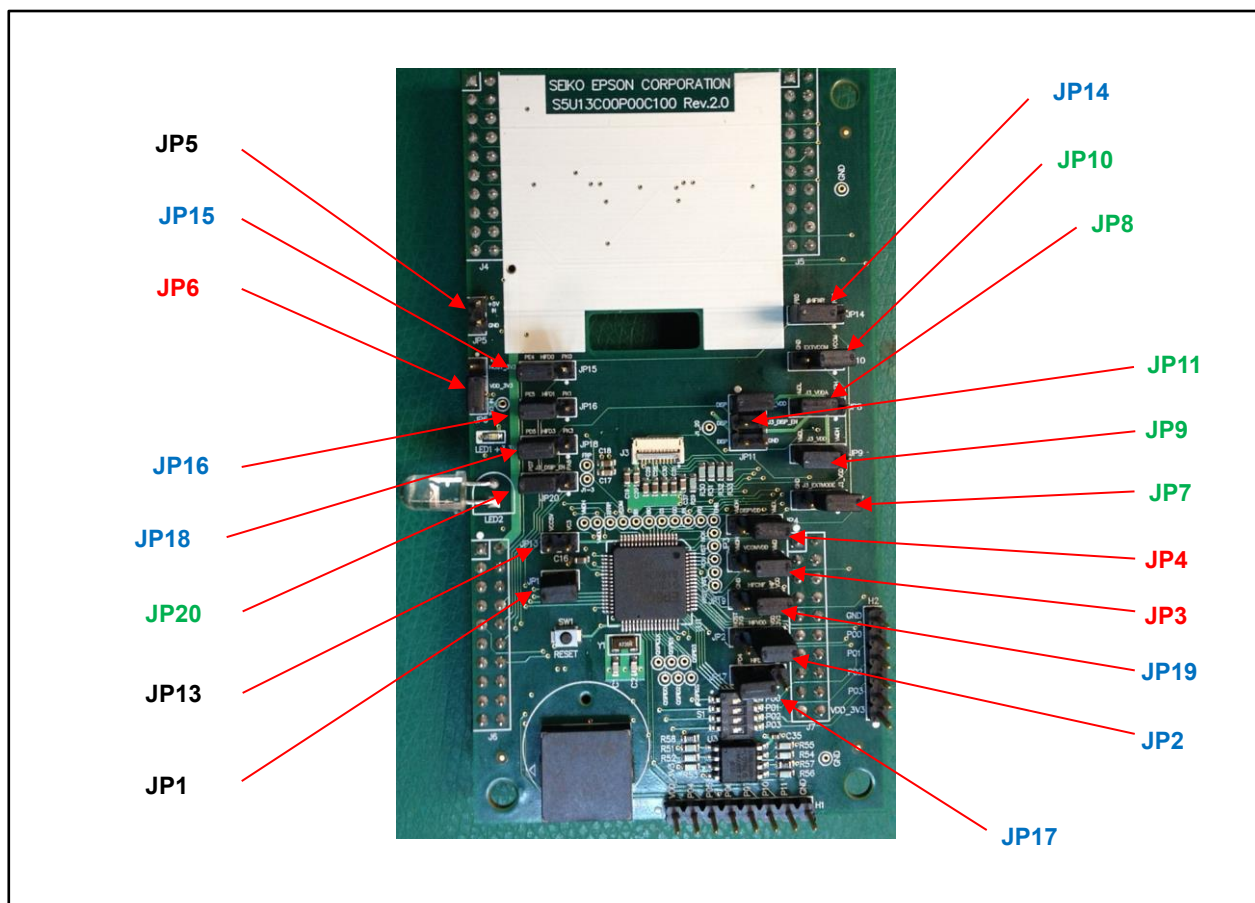


Figure 6 – S5U13C00P00CX00 Jumpers Locations

### 5.1 Host Interface

Jumpers	Descriptions	1-2 Position	2-3 Position	Default Position
JP2	HIFVDD Selection	VDD_3V3	HOST_3V3	1-2 (VDD_3V3)
JP14	#HIFWR Selection	8-bit Indirect	SPI/QSPI	2-3 (SPI/QSPI)
JP15	HIFD0 Selection	8-bit Indirect	SPI/QSPI	2-3 (SPI/QSPI)
JP16	HIFD1 Selection	8-bit Indirect	SPI/QSPI	2-3 (SPI/QSPI)
JP17	HIFD2 Selection	8-bit Indirect	SPI/QSPI	2-3 (SPI/QSPI)
JP18	HIFD3 Selection	8-bit Indirect	SPI/QSPI	2-3 (SPI/QSPI)
JP19	HIFCNF Selection	SPI/QSPI	8-bit Indirect	1-2 (SPI/QSPI)

## Jumpers Settings

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### 5.2 LCD Interface

#### 5.2.1 S1D13C00 VDD and Panel I/O Supply Selection

Jumpers	Descriptions	1-2 Position	2-3 Position	Default Position
JP3	VCOMVDD Selection	VMDL	VMDH	1-2 (VMDL)
JP4	DISPVDD Selection	VMDL	VMDH	1-2 (VMDL)
JP6	VDD Selection	VDD_3V3	HOST_3V3	1-2 (VDD_3V3)

#### 5.2.2 SPI Panels (on J3) Power and Control Selection

Jumpers	Descriptions	1-2 Position	2-3 Position	Default Position
JP7	EXTMODE Selection	External VCOM	Internal VCOM	1-2 (External VCOM)
JP8	VDDA Selection	VMDH	VMDL	2-3 (VMDL)
JP9	VDD Selection	VMDH	VMDL	2-3 (VMDL)
JP10	EXTVCOM Selection	VCOM (for JP7 = 1-2)	GND (for JP7 = 2-3)	1-2 (VCOM)
JP20	J3_DISP_EN Selection	PA5 of Host MCU (pin 20 on J6)	P07 of S1D13C00 (pin 30)	2-3 (P07 of S1D13C00)

Jumpers	Descriptions	1-2 Position	3-4 Position	5-6 Position	Default Position
JP11	Display Enable Control Selection	J3_VDD (Always enable)	J3_DISP_EN (see JP20)	GND (Disable)	3-4 (controlled by JP20)

### 5.3 Power Supply

Jumpers	Descriptions	Default Settings
JP1	VDD Supplies on pin 22 and pin 34 of S1D13C00 (used for current measurement)	Install
JP5	External 5V Power Supply JP5-1 = +5V in JP5-2 = GND	No Connection (NC)
JP13	External VC3 Supply connection	No Connection (NC)

## 6. DIP-Switch and Headers

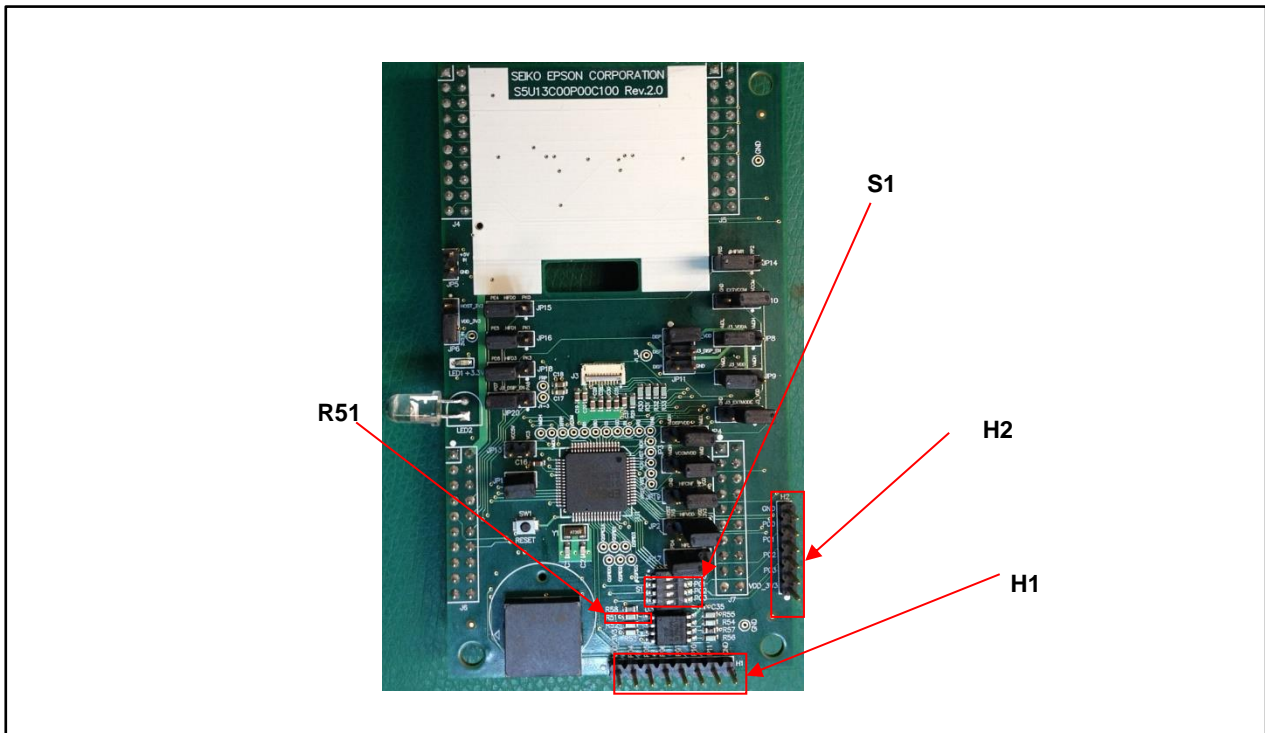


Figure 7 – S5U13C00P00CX00 DIP-Switch and Headers Locations

### 6.1 DIP-Switch (S1)

The main purpose of the DIP-switch is used to perform a loopback test on both of the SPI interfaces of the S1D13C00. During normal operations, all the switches should be OFF (default setting).

The table below shows the pin assignments of S1. When the switch is ON, the corresponding signals are connected.

S1 Pin	S1D13C00 Pin Name	S1 ON Connection	S1D13C00 Pin Name	S1 Pin
1	#QSPISS	< -- >	P00 (#SPISS)	8
2	QSPICLK	< -- >	P01 (SPICLK)	7
3	QSPID0	< -- >	P02 (SPIDI)	6
4	QSPID1	< -- >	P03 (SPIDO)	5

- (1) When performing loopback test, R51 in series of #QSPISS needs to be removed

### 6.2 Headers

The main purpose of the headers is to provide a convenient way for users to access different GPIO port functions of the S1D13C00 other than those components pre-installed on the S5U13C00P00CX00 Customer Development Board.

Please refer to the *S1D13C00 Hardware Functional Specification*, document XB8A-A-001-xx, for enabling and using of the functions.

#### 6.2.1 H1

The table below shows the pin assignments of H1.

H1 Pin	S1D13C00 Pin name	S1D13C00 Pin assignment	S1D13C00 functions (other than GPIO)
1	VDD	VDD_3V3	VDD_3V3
2	P04	27	I <sup>2</sup> C interface – SCL (1)
3	P05	28	I <sup>2</sup> C interface - SDA (1)
4	P06	29	IR / EL control – REMO (2) (3)
5	P07	30	EL control – CLPLS (3)
6	P10	38	Buzzer control – BZOUT (4) or RTC1S output of RTC
7	P11	39	Buzzer control – #BZOUT (4) or FOUT output of CLG
8	GND	GND	GND

- (1) See section 7.2 below about pre-installed on-board components for this function
- (2) See section 7.4 below about pre-installed on-board components for this function
- (3) No pre-installed on-board components for EL control function
- (4) See section 7.3 below about pre-installed on-board components for this function

#### 6.2.2 H2

External SPI device (master or slave) can be connected through H2 to the S1D13C00.

The table below shows the pin assignments of H2.

H2 Pin	S1D13C00 Pin name	S1D13C00 Pin assignment	S1D13C00 functions (other than GPIO)
1	VDD	VDD_3V3	VDD_3V3
2	P03	26	SPIDO (1)
3	P02	25	SPIDI (1)
4	P01	24	SPICLK (1)
5	P00	23	#SPISS (1)
6	GND	GND	GND

- (1) No pre-installed on-board components for this function, see section 6.1 above for additional information

## 7. Pre-installed On-board Components

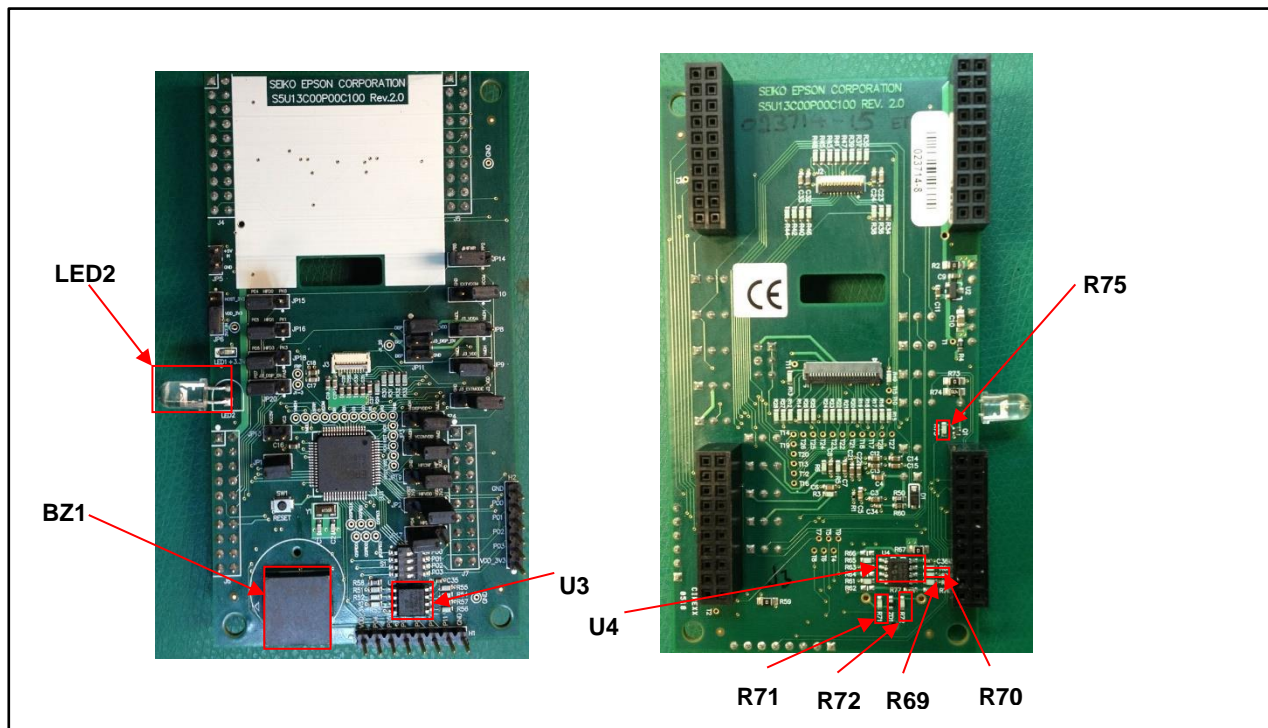


Figure 8 – S5U13C00P00CX00 pre-installed on-board components locations

### 7.1 16Mbytes QSPI Serial Flash (U3)

This serial flash is directly connected to the QSPI interface of the S1D13C00. The flash can be optionally accessed (read-only) through the Memory-Mapped Access area on the memory map of the S1D13C00.

### 7.2 1Kbit 400Kbps I<sup>2</sup>C EEPROM (U4)

This I<sup>2</sup>C EEPROM is directly connected to the I<sup>2</sup>C interface (P04 & P05) of the S1D13C00 with default address at “000”. If an external I<sup>2</sup>C device need to be accessed by these two pins through Header H1, R69 and R70 need to be removed to avoid conflict if the external device has the same slave address as the I<sup>2</sup>C EEPROM.

### 7.3 Buzzer (BZ1)

This buzzer is directly connected to the Sound Generator interface (P10 & P11) of the S1D13C00. If external devices need to be accessed by these two pins through Header H1, R71 and R72 need to be removed to avoid conflict.

### 7.4 IR Emitter (LED2)

This IR emitter is driven by a FET (Q1), which in turn is controlled by the REMC interface (P06) of the S1D13C00. Resistor R75 can optionally be removed if external devices need to be accessed by this pin through Header H1.

### 8. Tiva C Series EK-TM4C1294XL Launchpad Connections

The following tables show the signals of the Tiva C Series EK-TM4C1294XL Launchpad connectors which are used by the S5U13C00P00CX00 Customer Development Board:

<b>J4</b>	<b>EK-TM4C1294XL Connector X8 Signals</b>	<b>S1D13C00 MDC BoosterPack Usage</b>
1	3V3	-
2	5V	HOST_5V
3	PE4	to JP15-3 as HIFSPID0
4	GND	GND
5	PC4	HIFD7
6	PE0	-
7	PC5	HIFD6
8	PE1	-
9	PC6	HIFD5
10	PE2	-
11	PE5	to JP16-3 as HIFSPID1
12	PE3	-
13	PD3	-
14	PD7	-
15	PC7	HIFD4
16	PA6	-
17	PB2	-
18	PM4	-
19	PB3	#HIFRD
20	PM5	HIFIRQ

<b>J5</b>	<b>EK-TM4C1294XL Connector X9 Signals</b>	<b>S1D13C00 MDC BoosterPack Usage</b>
1	PF1	-
2	GND	GND
3	PF2	-
4	PM3	-
5	PF3	-
6	PH2	-
7	PG0	-
8	PH3	-
9	PL4	-
10	TARGET_RST#	#RESET_IN
11	PL5	-
12	PD1	-
13	PL0	-
14	PD0	-
15	PL1	-
16	PN2	-
17	PL2	-
18	PN3	-
19	PL3	-
20	PP2	to JP14-1 as #HIFWR



## Tiva C Series EK-TM4C1294XL Launchpad Connections

<b>J6</b>	<b>EK-TM4C1294XL Connector X6 Signals</b>	<b>S1D13C00 MDC BoosterPack Usage</b>
1	3V3	HOST_3V3
2	5V	HOST_5V
3	PD2	-
4	GND	GND
5	PP0	-
6	PB4	#HIFDE
7	PP1	-
8	PB5	to JP14-3 as HIFSPICKL
9	PD4	to JP17-3 as HIFSPID2
10	PK0	to JP15-1 as HIFD0
11	PD5	to JP18-3 as HIFSPID3
12	PK1	to JP16-1 as HIFD1
13	PQ0	-
14	PK2	to JP17-1 as HIFD2
15	PP4	-
16	PK3	to JP18-1 as HIFD3
17	PN5	-
18	PA4	-
19	PN4	-
20	PA5	To JP20-1 as J3_DISP_EN

<b>J7</b>	<b>EK-TM4C1294XL Connector X7 Signals</b>	<b>S1D13C00 MDC BoosterPack Usage</b>
1	PG1	-
2	GND	GND
3	PK4	-
4	PM7	-
5	PK5	-
6	PP5	-
7	PM0	-
8	PA7	-
9	PM1	-
10	TARGET_RST#	-
11	PM2	-
12	PA3/PQ2	-
13	PH0	-
14	PA2/PQ3	-
15	PH1	-
16	PP3	#HIFCS
17	PK6	-
18	PQ1	-
19	PK7	-
20	PM6	-

### 9. Pinout for LCD Interfaces

#### 9.1 J1 - 24-pin RGB LCD Interface

The following table shows the pinout and signal connections of the 24-pin FPC:

J1 Pin	S1D13C00 Pin name	S5U13C00P00CX00 Connection name	Example LCD module FPC name (JDI LPM012M134B)
1	GND	GND	GND
2	VMDH	VMDH	VDD2
3	-	T10 (test point)	NC
4	VST	J1_VST	VST
5	VCK	J1_VCK	VCK
6	ENB	J1_ENB	ENB
7	XRST	J1_XRST	XRST
8	VCOM	FRP	FRP
9	XFRP	J1_XFRP	XFRP
10	VMDL	VMDL	VDD1
11	GND	GND	GND
12	HST	J1_HST	HST
13	HCK	J1_HCK	HCK
14	RED0	J1_R1	R1
15	RED1	J1_R2	R2
16	GRN0	J1_G1	G1
17	GRN1	J1_G2	G2
18	BLU0	J1_B1	B1
19	BLU1	J1_B2	B2
20	-	T11 (test point)	NC
21	VCOM	J1_VCOM	VCOM
22	-	(1)	NC
23	-	(2)	NC
24	-	(3)	NC

- (1) Connect through R28 to GND
- (2) Connect through R27 to GND
- (3) Connect through R12 to GND

## 9.2 J2 - 21-Pin RGB LCD Interface

The following table shows the pinout and signal connections of the 21-pin FPC:

J2 Pin	S1D13C00 Pin name	S5U13C00P00CX00 Connection name	Example LCD module FPC name (Sharp LS012B7DD06)
1	VDMH	VDMH	VDD2
2	-	-	NC
3	VST	GSP	GSP
4	VCK	GCK	GCK
5	ENB	GEN	GEN
6	XRST	INTB	INTB
7	VCOM	VB	VB
8	XFRP	VA	VA
9	VMDL	VMDL	VDD1
10	GND	GND	VSS
11	HST	BSP	BSP
12	HCK	BCK	BCK
13	RED0	R[0]	R[0]
14	RED1	R[1]	R[1]
15	GRN0	G[0]	G[0]
16	GRN1	G[1]	G[1]
17	BLU0	B[0]	B[0]
18	BLU1	B[1]	B[1]
19	-	-	NC
20	VCOM	J2_VCOM	VCOM
21	-	-	NC

## Pinout for LCD Interfaces

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### 9.3 J3 - 10-Pin SPI LCD Interface

The following table shows the pinout and signal connections of the 10-pin FPC:

J3 Pin	S1D13C00 Pin name	S5U13C00P00CX00 Connection name	Example LCD module FPC name (Sharp LS012B7DH02)
1	VST	J3_SCLK	SCLK
2	ENB	J3_SI	SI
3	HST	J3_SCS	SCS
4	(VCOM)	J3_EXTCOMIN (1)	EXTCOMIN
5	(P07)	J3_DISP (2)	DISP
6	(VMDL)	J3_VDDA (3)	VDDA
7	(VMDL)	J3_VDD (4)	VDD
8	-	J3_EXTMODE (5)	EXTMODE
9	GND	GND	VSS
10	GND	GND	VSSA

- (1) JP10 selects J3\_EXTCOMIN to either VCOM of S1D13C00 or GND
- (2) JP11 selects J3\_DISP to one the followings
  - J3\_VDD
  - J3\_DISP\_EN
  - GNDAnd JP20 in turn selects J3\_DISP\_EN to either P07 (pin 30) of S1D13C00 or PA5 (pin 20 of J6) of the Host Interface
- (3) JP8 selects J3\_VDDA to either VMDH or VMDL of S1D13C00
- (4) JP9 selects J3\_VDD to either VMDH or VMDL of S1D13C00
- (5) JP7 selects J3\_EXTMODE to either J3\_VDD or GND

See Section 5.2.2, SPI Panels and Control Selection for details.

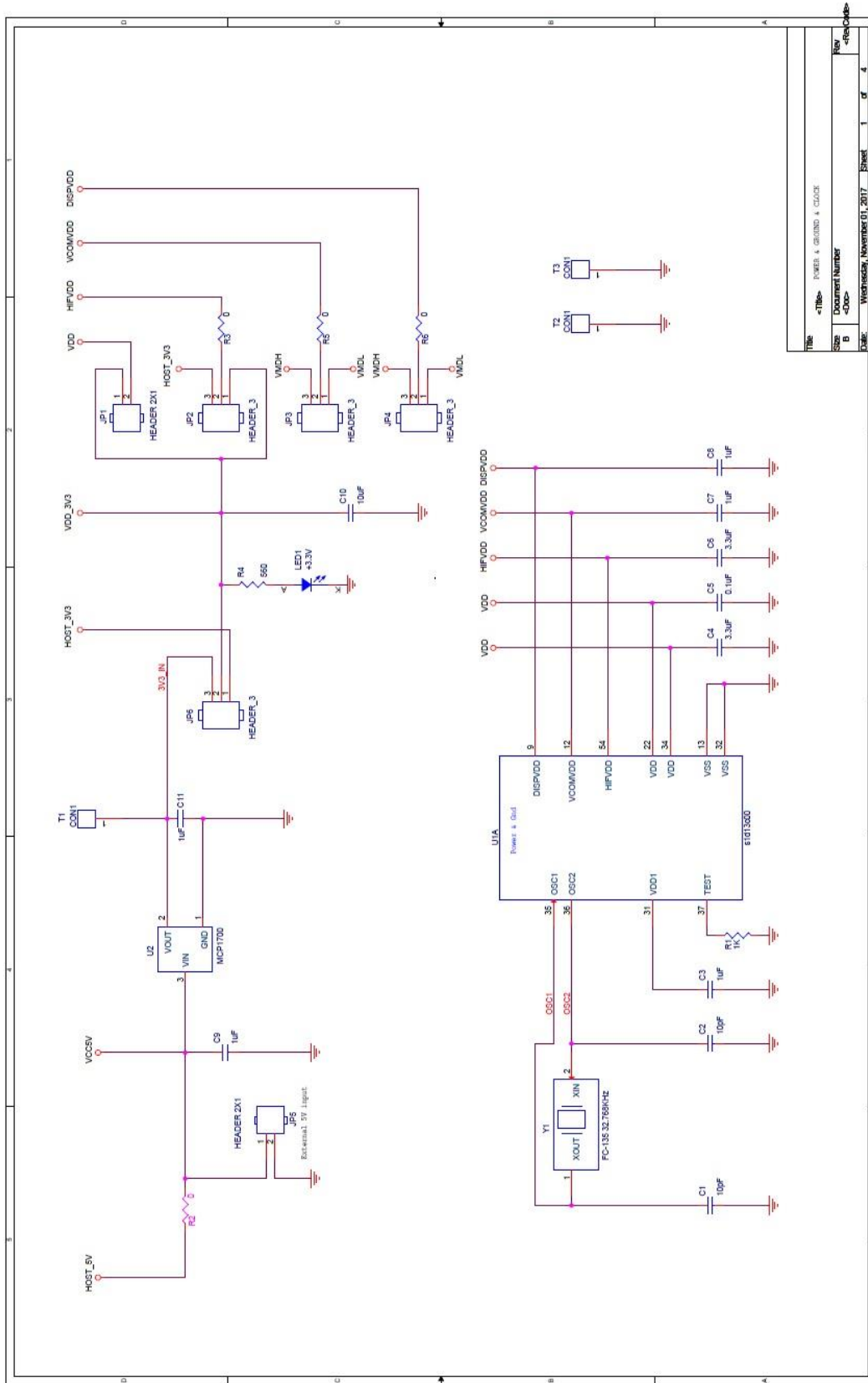
## 10. Parts List

Item	Qty	Reference	Part	Description	Manufacturer Part No. / Comments
1	1	BZ1	BUZZER	1.2cm x 1.2cm SMD Buzzer	Murata PKLCS1212E4001-R1
2	2	C1,C2	10pF	10pF Ceramic 1% 50V COG/NPO C0603	Murata GRM1885C1H100FA01
3	18	C3,C7,C8,C9,C11,C12, C13,C14,C15,C16, C18,C19,C21,C22, C24,C28,C31,C32	1uF	1.0uF Ceramic 10% 16V X5R C0603	Kemet C0603C105K4PACTU
4	2	C4,C6	3.3uF	3.3uF Ceramic 10% 16V X5R C0603	TDK C1608X5R1C335K080AC
5	2	C5,C37	0.1uF	0.1uF Ceramic 10% 16V X5R C0603	Kemet C0603C104K4PAC7867
6	1	C10	10uF	10uF Ceramic 10% 25V X5R C0805	Kemet C0805C106K3PAC7800
7	6	C17,C20,C23,C29, C30,C33	1nF	1nF Ceramic 10% 16V X7R C0604	Murata GRM188R71C102KA01D
8	3	C34,C35,C36	0.1uF	0.1uF Ceramic 10% 16V X7R C0402	Kemet C0402C104K4RACTU
9	1	D1	DIODE SCHOTTKY	DIODE SCHOTTKY 30V 200MA	Micro Commercial Co. BAT42W-TP
10	1	H1	HEADER 8x1	CONN HEADER 8POS .100 STR 30AU	Amphenol FCI 68000-108HLF
11	1	H2	HEADER 6x1	CONN HEADER 6POS .100 STR 30AU	Amphenol FCI 68000-106HLF
12	3	JP1,JP5,JP13	HEADER 2x1	BERGSTIK II .100" SR STRAIGHT	Amphenol FCI 68000-102HLF
13	15	JP2,JP3,JP4,JP6,JP7, JP8,JP9,JP10,JP14, JP15,JP16,JP17,JP18, JP19,JP20	HEADER 3x1	BERGSTIK II .100" SR STRAIGHT	Amphenol FCI 68000-103HLF
14	1	JP11	HEADER_3X2	CONN HEADER 6POS .100 STR 15AU	Amphenol FCI 67997-206HLF
15	1	J1	CONN_FLEX_24	CONN FPC/FPC 24POS 0.50MM	Hirose FH34SRJ-24S-0.5SH(99)
16	1	J2	CONN_FLEX_21	CONN FPC BOTTOM 21POS 0.30MM R/A	Molex 503566-2100
17	1	J3	CONN_FLEX_10	CONN FPC 10POS 0.50MM R/A	Omron XF2W-1015-1A
18	4	J4,J5,J6,J7	HEADER_10X2	CONN HOUSING 20POS 2.54MM DUAL	Hirose HIF3H-20DA-2.54DSA(71)
19	1	LED1	LED +3.3V Green	LED GREEN DIFFUSED 0603 SMD	Stanley Electric PY111C-TR
20	1	LED2	EMITTER IR	EMITTER IR 940NM 100MA T 1 3/4	LITEON LTE-5208A
21	1	Q1	MOSFET	MOSFET N-CH 20V 0.25A	Toshiba SSM3K37MFV,L3F
22	1	R1	1K	1K OHM 5% 1/16W SMD R0402	Yageo C0402JR-071KL
23	4	R2,R59,R67,R73	0	0 OHM 1/8W SMD R0805	Yageo RC0805JR-070RL
24	56	R3,R5,R6,R12,R13,R14, R15,R16,R17,R18,R19, R20,R21,R22,R23,R24, R25,R26,R27,R28,R29, R30,R31,R32,R33,R34, R35,R36,R37,R38,R39, R40,R41,R42,R43,R44, R45,R46,R47,R48,R49, R51,R52,R53,R54,R55, R56,R61,R63,R65,R68, R69,R70,R71,R72,R75	0	0 OHM 1/8W SMD R0603	Vishay MCT06030Z0000ZP500
25	1	R4	560	560 OHM 1% 1/8W SMD R0603	Vishay MCT06030C5600FP500
Item	Qty	Reference	Part	Description	Manufacturer Part No. / Comments
26	2	R50,R58	10K	10K OHM 5% 1/10W SMD R0603	Yageo RC0603JR-0710KL

## Parts List

27	1	R57	100K	100K OHM 5% 1/10W SMD R0603	Yageo RC0603JR-07100KL
28	1	R60	10	10 OHM 5% 1/10W SMD R0603	Yageo RC0603JR-0710RL
29	3	R62,R64,R66	NP_0	0 OHM 1/8W SMD R0603	NOT POPULATED
30	1	R74	47	47 OHM 5% 1/8W SMD R0805	Yageo RC0805JR-0747RL
31	2	R76,R77	1K	1K OHM 5% 1/10W SMD R0603	Yageo RC0603JR-071KL
32	1	SW1	SW TACT	SWITCH TACTILE SPST-NO 0.05A 12V	Omron B3U-1000P
33	1	S1	SW_DIP_4	SWITCH DIP HALF PITCH 4POS 24V	Grayhill Inc. 97C04ST
34	28	T1,T2,T3,T4,T5,T6,T7,T8, T9,T10,T11,T12,T13,T14, T15,T16,T17,T18,T19,T20,T 21,T22,T23,T24,T25,T26,T2 7,T28	CON1	TEST POINT	Test Point, not a part
35	1	U1	s1d13c00	Epson MDC S1D13C00 TQFP13-64	Epson S1D13C0000B
36	1	U2	MCP1700	3.3V LDO	Microchip MCP1700T-3302E/TT
37	1	U3	S25FL127S or IS25LP-128	16Mbytes SPI Flash Memory	Cypress S25FL127SABMF110X or ISSI IS25LP128-JBLE
38	1	U4	24AA014	1Kbit 400K I2C EEPROM	Microchip 24AA014H-I/SN
39	1	Y1	FC-135	32.768KHz Crystal	Epson FC-135 32.7680KA-K
40	1	ZD1	AVRL	Surge and static protector	TDK AVRL161A6R8GTA

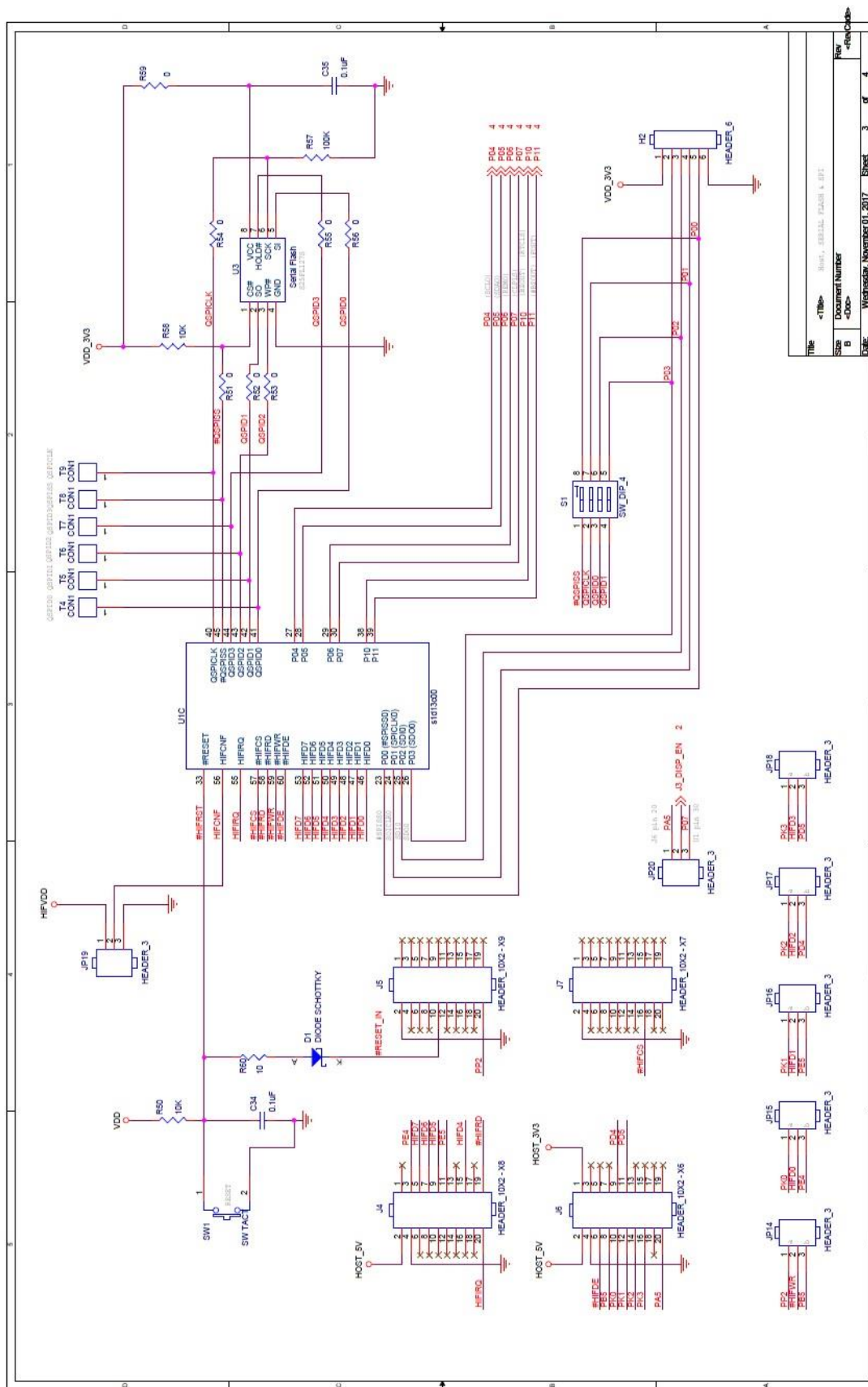
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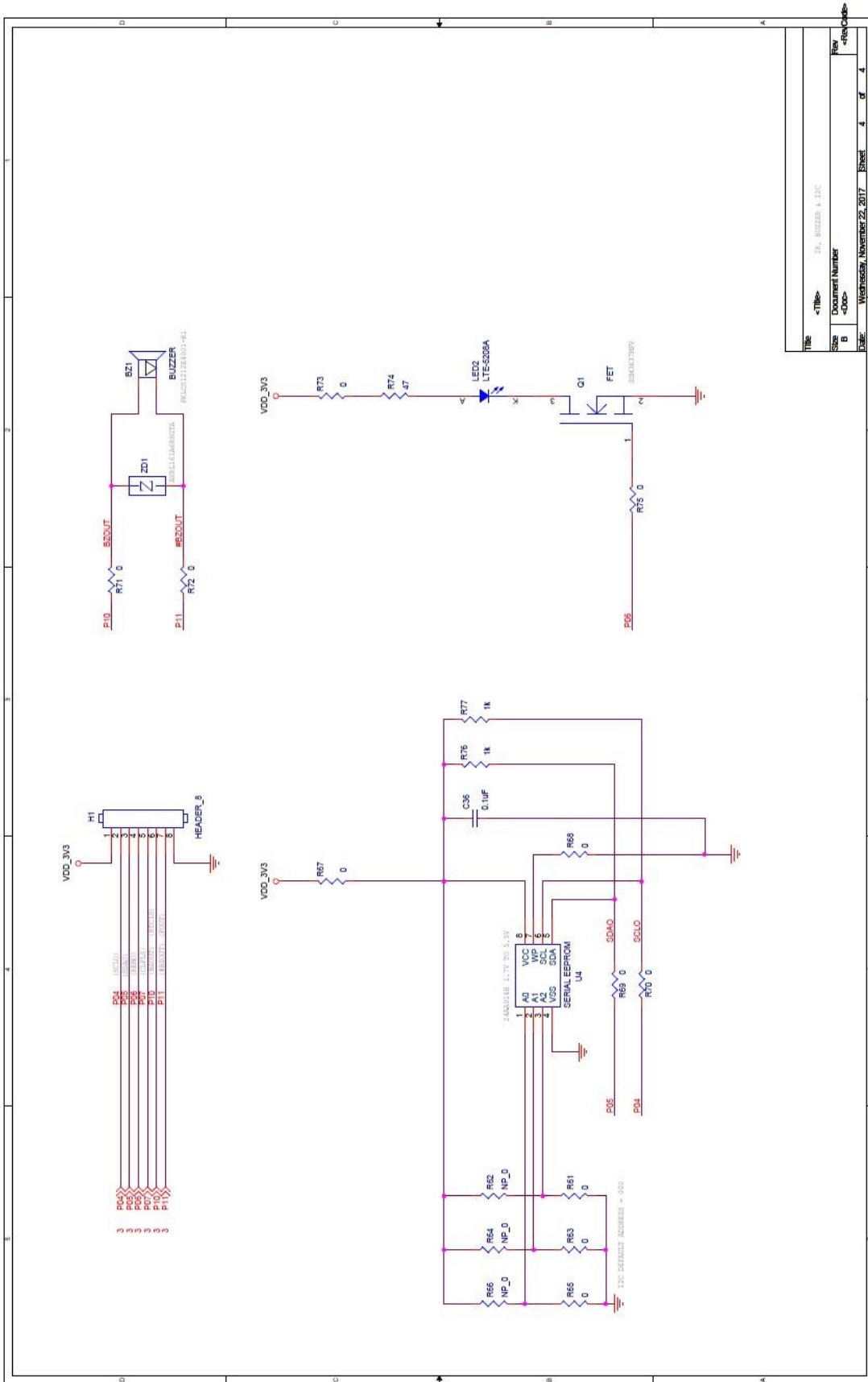




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## 12. Revision History

Rev. No.	Date	Page	Category	Contents
1.2	04/02/2022			<ul style="list-style-type: none"><li>• Added ordering information.</li><li>• Added reference to the S5U13C00M00C100 adapter board for ST Nucleo boards.</li><li>• Added newer supported LCD panels to the table list in Section 2.</li></ul>
1.01	12/09/2018			<ul style="list-style-type: none"><li>• Minor update to text.</li></ul>
1.0	20/03/2018			<ul style="list-style-type: none"><li>• Initial release of document</li><li>• Minor formatting and edits</li></ul>
				<ul style="list-style-type: none"><li>•</li></ul>



For more information on the S1D13C00 and other Epson Display Controllers, visit the Epson Global website.

[https://global.epson.com/products\\_and\\_drivers/semicon/products/display\\_controllers/](https://global.epson.com/products_and_drivers/semicon/products/display_controllers/)



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