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S5U13781R01C100 Shield TFT Board Users Manual

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SEIKO EPSON CORPORATION

Rev. 1.02

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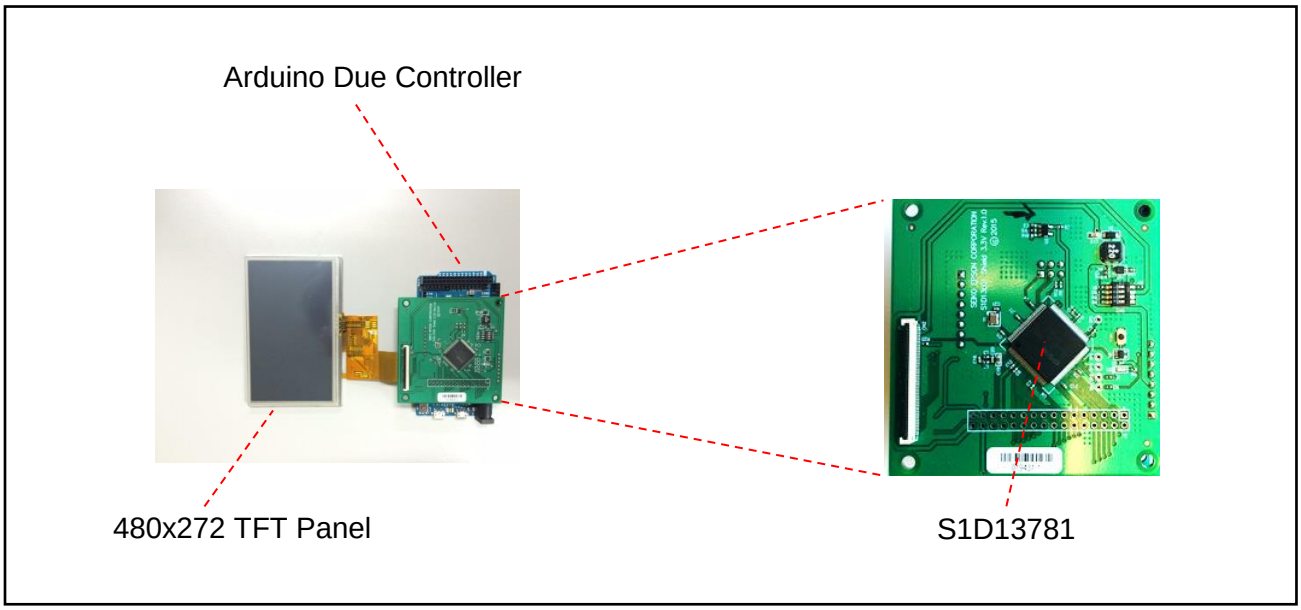
1 Introduction

This manual describes the setup and configuration of the S1D13781 Shield TFT board, part number S5U13781R01C100, which includes an Epson S1D13781 Simple LCD Controller.

The S1D13781 Shield TFT board is used to add a WQVGA (480x272) or QVGA (320x240) LCD display (not included on the board) to a microcontroller board such as:

- Arduino Due (or compatible) platform, see section 2.1, “Arduino Board Support
- Some mbed compatible platforms (i.e. STM Nucleo F411RE). Note that for mbed compatible platforms, hardware modifications to the S1D13781 Shield TFT board are required. For more information, see section 2.2, “mbed Compatible Board Support”.
- Infineon XMC4700 (or compatible) platform, see section 2.3, “Infineon Board Support”.

The following image shows an example usage of the S1D13781 Shield TFT board.



S1D13781 Shield TFT Board Overview

2 Platform Support

2.1 Arduino Board Support

The S1D13781 Shield TFT board will work with the **Arduino Due board only**. It will not work with Arduino MEGA, Arduino Uno, or Arduino Leonardo boards. Although the connectors are compatible, the IO on these boards are 5V and the S1D13781 Shield TFT board only supports 3.3V IO.

NOTE:
Connecting the S1D13781 Shield TFT board to a board other than the Arduino Due board may result in damage to the S1D13781 Shield board.

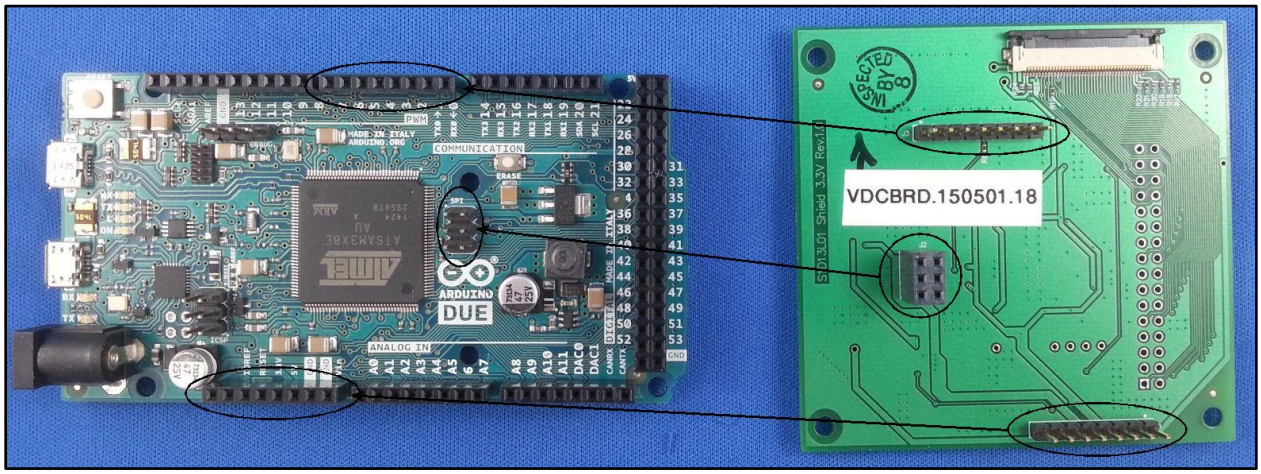
For more information on the Arduino Due, visit https://www.arduino.cc/.

2.1.1 Connection to Arduino Due

The S1D13781 Shield TFT board plugs into the Arduino Due board using 3 connectors:

- J1 - which also provides power
- J2 - which has the SPI signals
- J3 – which has the slave select signal for the Arduino Due

The S1D13781 is configured to use the SPI host interface. The board will connect on the SPI bus to the Atmel MCU on the Arduino Due.



S1D13781 Shield to Arduino Due Connections

2.2 mbed Compatible Board Support

The S1D13781 Shield TFT board can be modified to work with some mbed compatible platforms. The S1D13781 Shield Graphics Library is available for the mbed online compiler and is designed for use with compatible platforms (see https://developer.mbed.org/).

More information on the following subjects can be found in the document "Using the S5U13781R01C100 Shield TFT Board with mbed Compatible Platforms", document number X94A-G-011-xx, available at vdc.epson.com:

- mbed compatibility
- required hardware modifications
- hardware connection details
- using the S1D13781 Shield Graphics Library with the mbed compiler

2.3 Infineon Board Support

The S1D13781 Shield TFT board can be used with the XMC4700 Relax Kit (or compatible platform).

The S1D13781 Shield Graphics Library is available for the Infineon Dave IDE v4.1.x with Dave Apps. The graphics library relies on the Dave Apps for configuration of the SPI interface used by the S1D13781 Shield TFT board. The following signals are configured on the listed XMC4700 pins.

For SPI_MASTER_0:

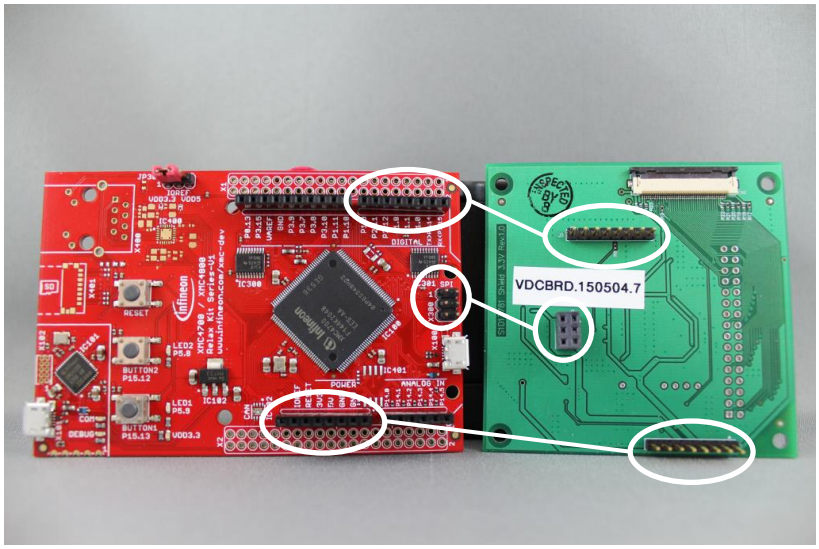
- MOSI – P3.8
- MISO – P3.7
- SCLKOUT – P3.9
- Slave Select 0 – P3.10 (configured but not used)

For DIGITAL_IO_O:

- Chip Select – P1.8 (manually controls chip select)

2.3.1 Connection to Infineon XMC4700

The S1D13781 Shield TFT board plugs into the Infineon XMC4700 board using the Arduino compatible headers shown in the following image.



S1D13781 Shield to Infineon XMC4700 Connections

3 LCD Displays Supported

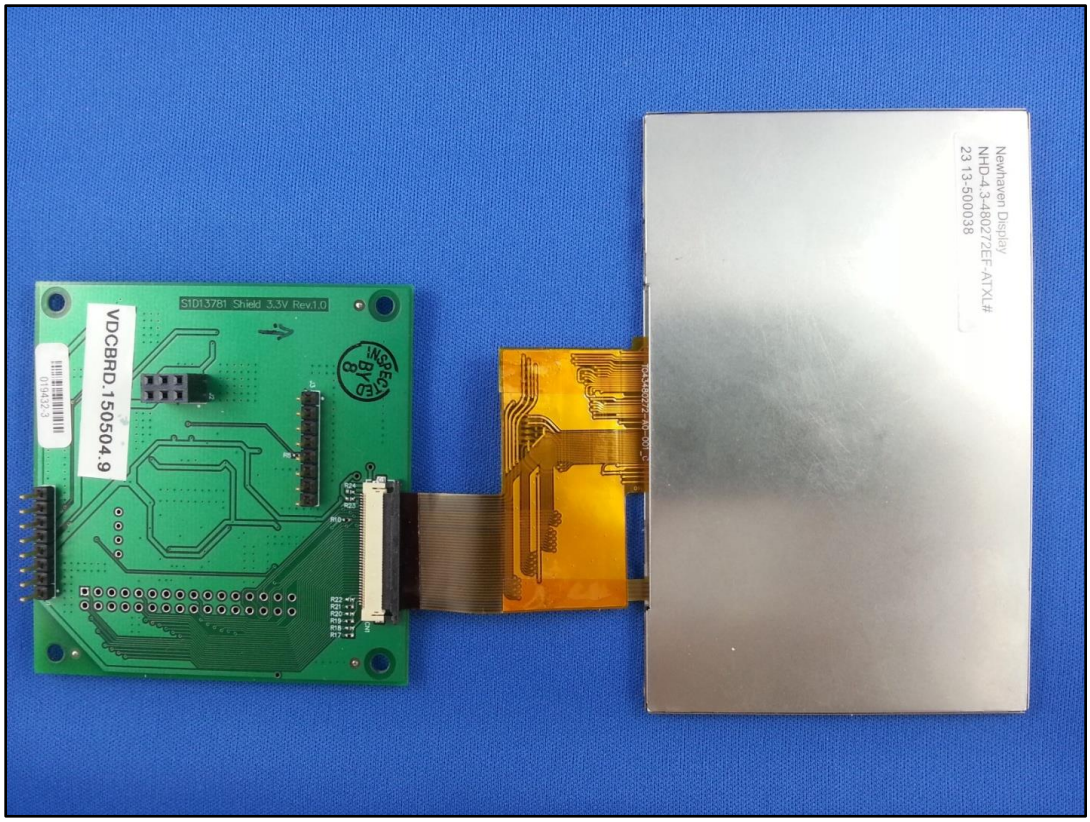
The S1D13781 Shield TFT board does not include a LCD display. The board has FPC connectors, CN1 and CN2, which allow direct connection of compatible WQVGA or QVGA LCD displays.

3.1 WQVGA Displays

The following lists some of the compatible WQVGA (480x272) LCD displays supported:

- Newhaven Display NHD-4.3-480272MF-ATXI#-1
- Kyocera TCG043WQLBAANN-GN00
- KOE TX11D06VM2AAA
- Tianma TM043NDH02
- Tianma TM043NBH02
- Imagin Orient IO04310006_v2
- Hantronix HDA430-3GH-1 – this panel will require some hardware changes (moving 0 ohm resistors) on the boards – see details below
- All Shore ASI-X-48027B43Q-R-VWD/H
- AZ Displays ATM0430D5(-T)

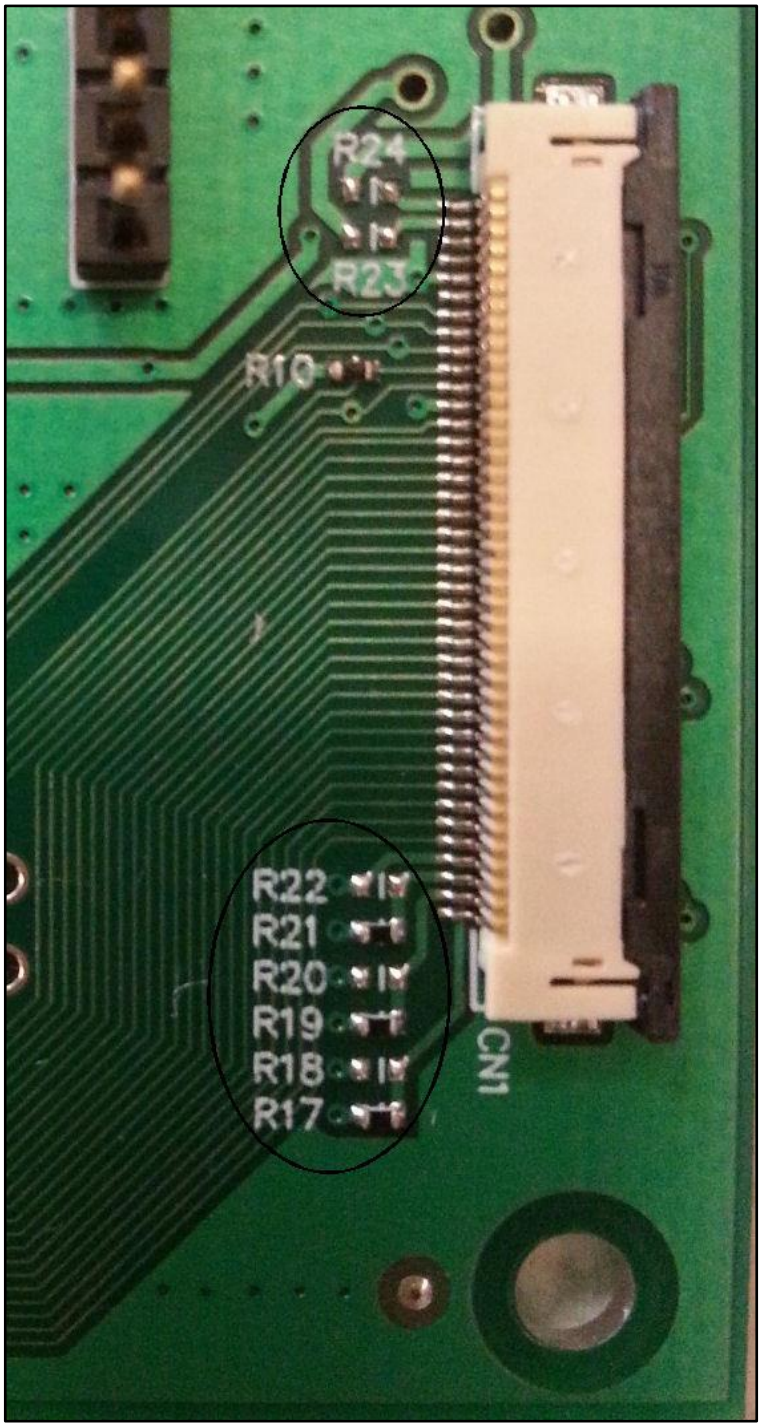
To connect WQVGA displays, use connector CN1 which is located on the bottom of the board. The panel flex cable must have the contact pads facing toward the PCB.



Typical WQVGA Panel Connection

In order to connect a Hantronix HDA430-3GH-1 WQVGA display to CN1, the following modifications to the S1D13781 Shield TFT board are required. The resistors are located on the bottom of the board.

- Remove 0 ohm resistors R17, R19 and R21
- Solder 0 ohm resistors R18, R20, R22, R23 and R24



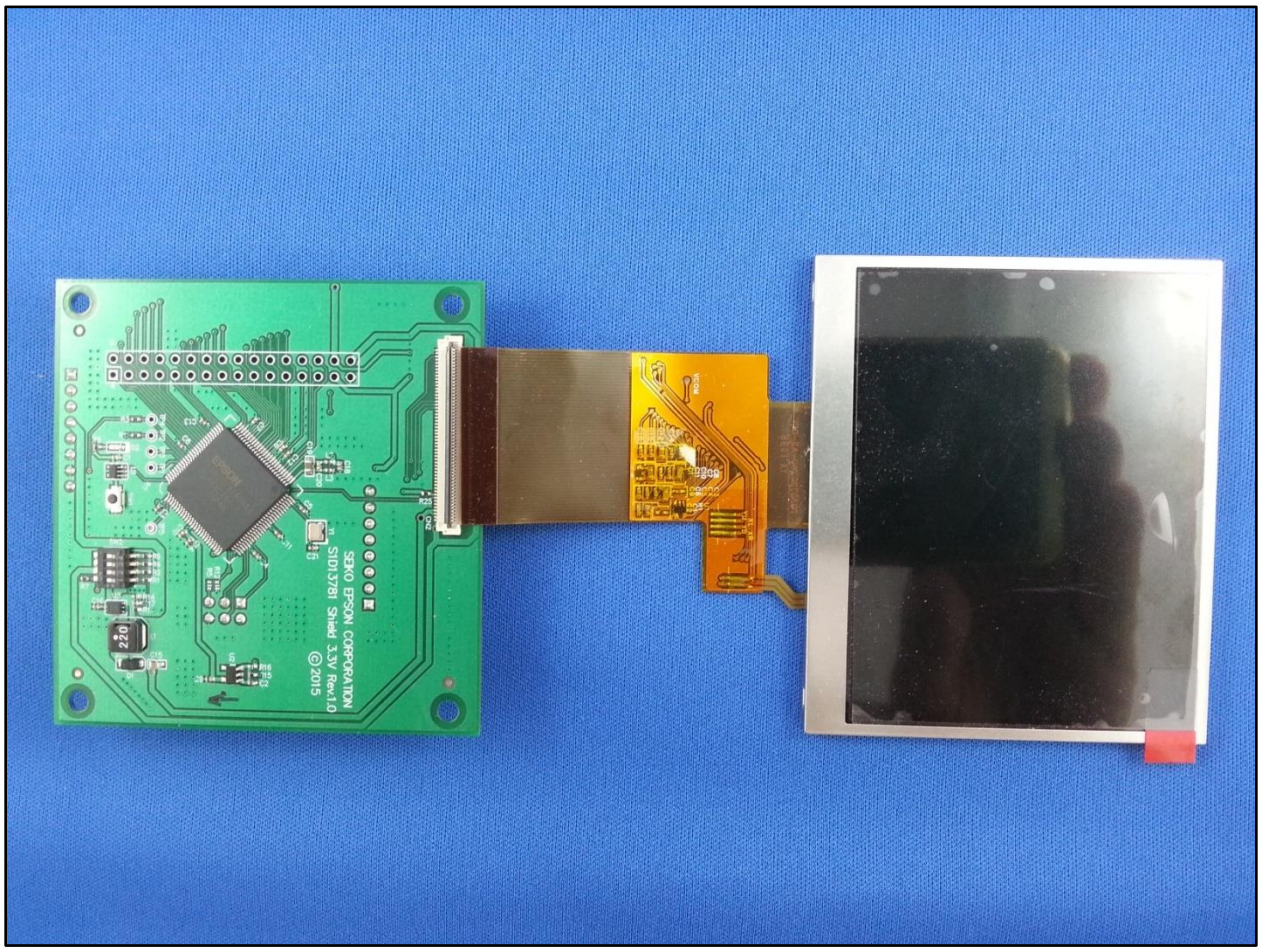
S1D13781 Shield TFT Board Modifications for Hantronix HDA430-3GH-1 WQVGA

3.2 QVGA Displays

The following lists some of the compatible QVGA (320x240) LCD displays supported:

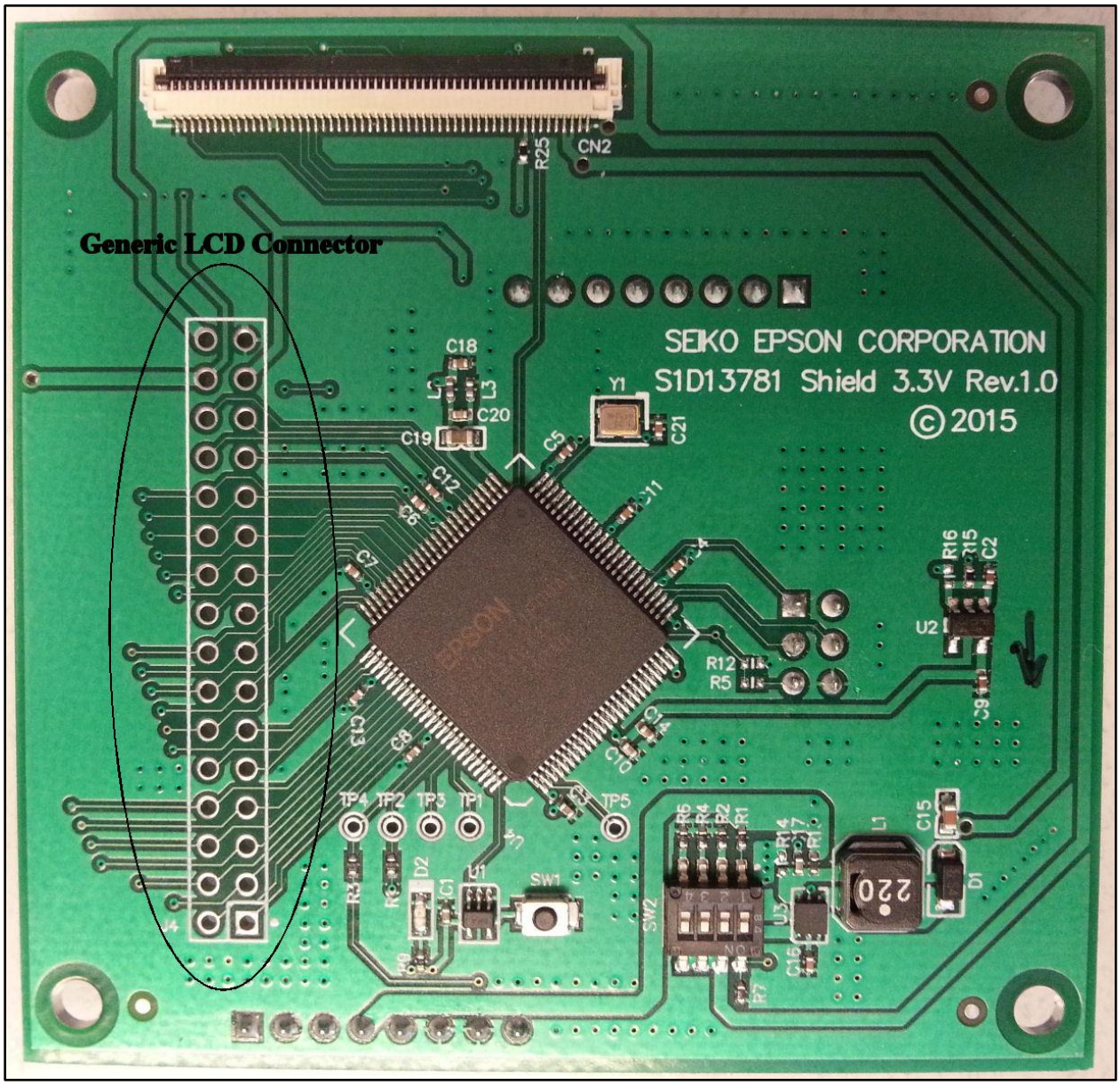
- Newhaven Display NHD-3.5-320240MF-ATXL#-1
- Hantronix HDA351-LV
- Tianma TM035KDH03
- EvervisionVGG3222425-6UFLWA
- Topway LMT035KDH03
- All Shore ASI-T-350EA3NN/D
- Powertip PH320240T-006-I-Q
- Ampire Am320240L2TMQW-TB0H
- Logic Tech LTTD320240035-L1RT
- US Micro USMP-TT035Q-01D
- Tech Toys LVC75Z779V2S
- Microtips MTF-TQ35SP741-AV

To connect QVGA displays, use connector CN2 which is located on top of the board. The panel flex cable must have the contact pads toward the PCB.



Typical QVGA Panel Connection

The S1D13781 Shield TFT board also has a generic LCD connector (16x2, 0.1”x0.1” header) which contains all the LCD signals, but is unpopulated on the board. If the connector is added it allows the user to design and build adapter board to support a wide range of LCD display that are not directly supported.



Generic LCD Connector, J4 (Unpopulated)

4 Power, Clock and Reset

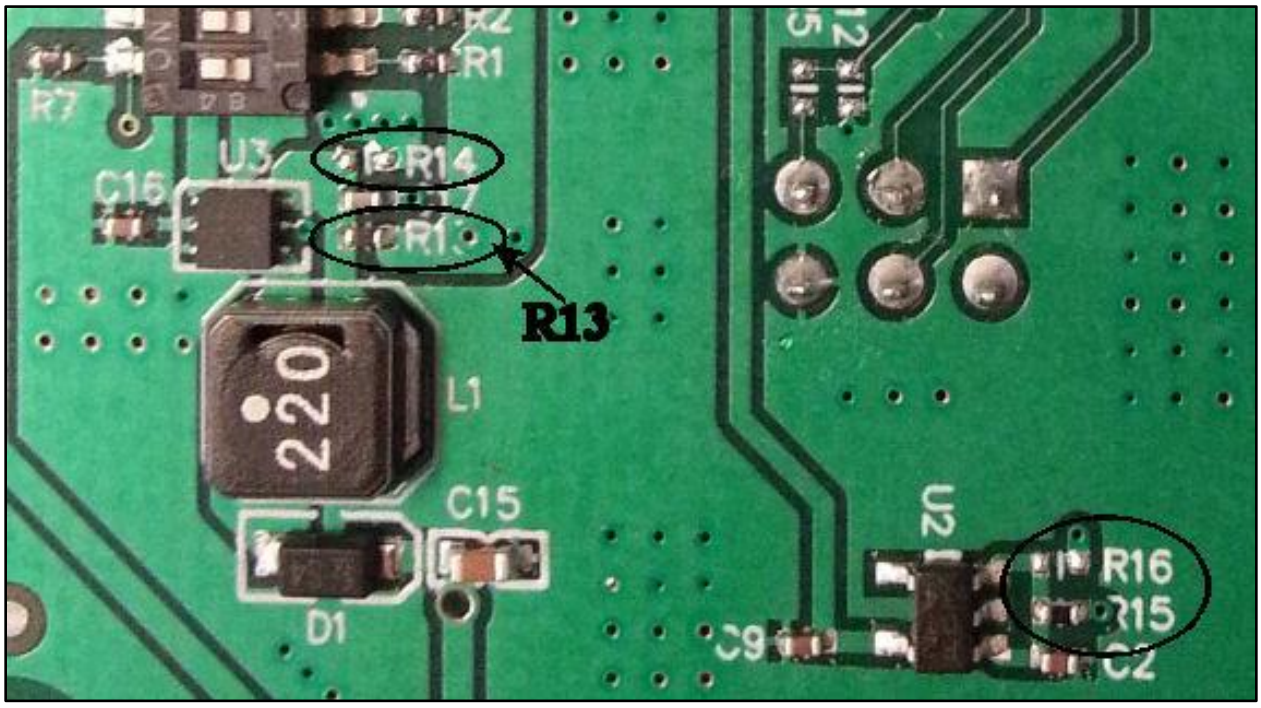
4.1 Power

The IO voltage supported by the S1D13781 LCD controllers mounted on the S1D13781 Shield TFT board supports 3.3V only, so the Arduino board must be able to provide 3.3V IO. The board has a green LED to indicate when 3.3V power is present.

Depending on the current required by the LCD display backlight, the current required may be from around 100mA to a maximum 850mA. If the 3.3V power is not capable of providing the required current, the board can use 5V power, in addition to 3.3V. In this case, the maximum current required on 3.3V power can be 30mA (assuming the LCD display logic power supply does not need more than 30mA) and the maximum current required on 5V power can be up to 600mA (depending on the LCD display backlight current requirement). Both 3.3V and 5V power is provided to the board on connector J1 and it will be provided by the Arduino CPU boards.

In order to use +5V power for the display backlight, some modifications are required to the S1D13781 Shield TFT board. These resistors are located on the top of the board.

- Remove 0 ohm resistor R15 and R13
- Solder 0 ohm resistors R16 and R14

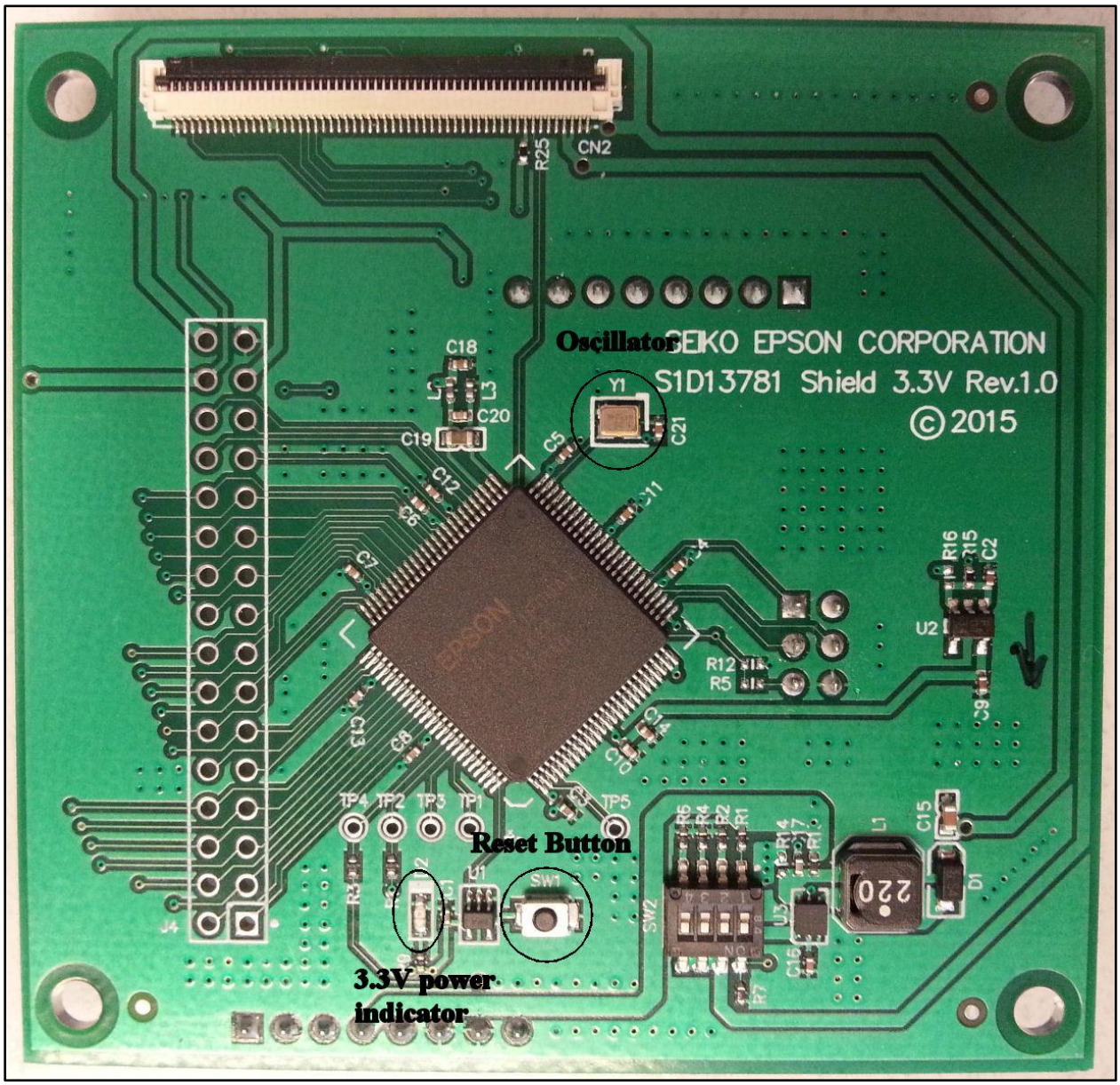


Required Modifications for +5V Power for Backlight

4.2 Clock and Reset

The LCD controller has the clock provided by an Epson 1MHz oscillator, Y1. The LCD controller can be reset by a reset button, SW1, on the S1D13781 Shield TFT board.

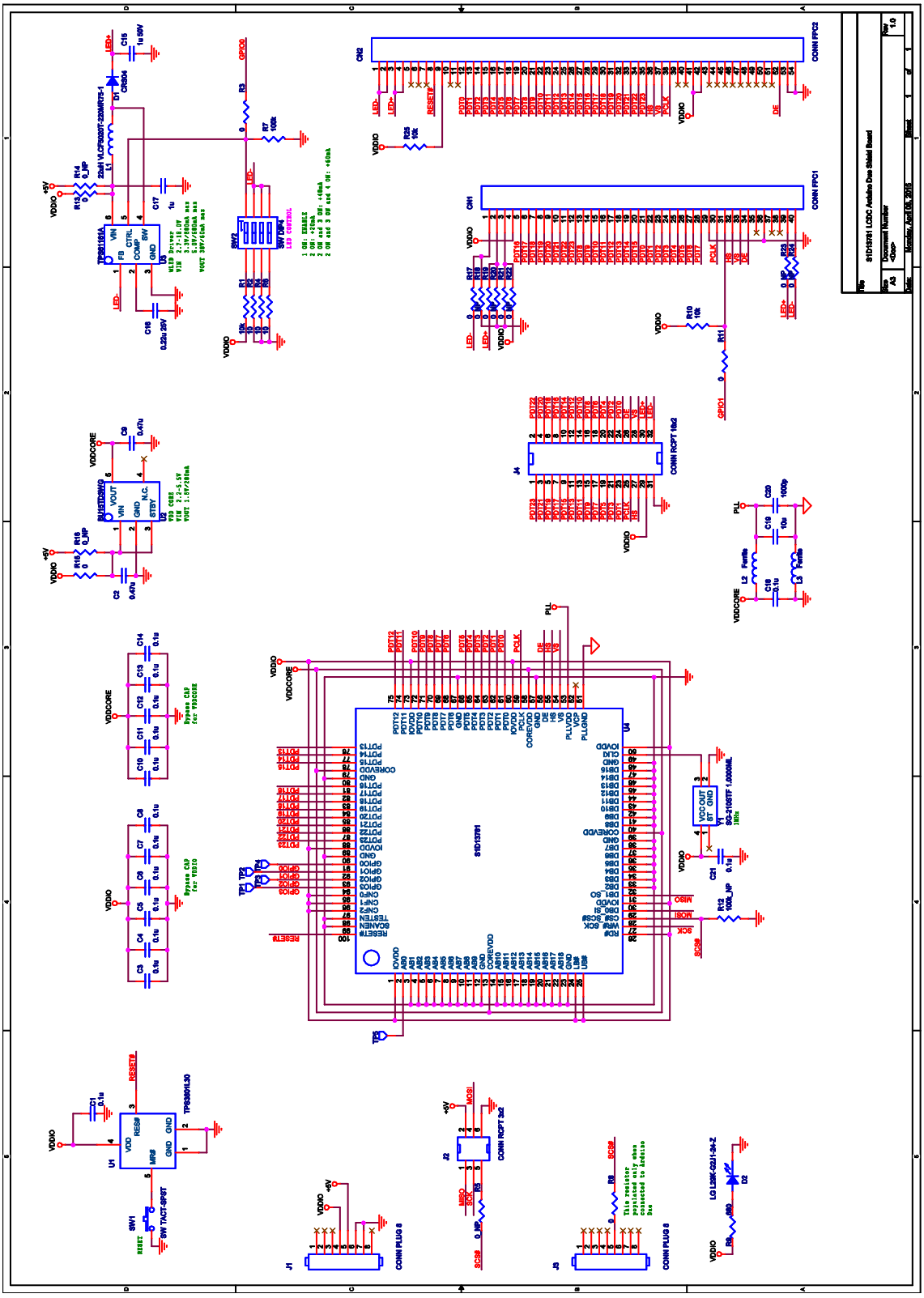
The following picture shows the position of each component.



5 Parts List

Item	Quantity	Reference	Part	Description	Manufacturer Part No. / Comments
1	14	C1,C3,C4,C5,C6,C7,C8, C10,C11,C12,C13,C14, C18,C21	0.1u	CAP CERAMIC .10UF 16V X7R 0402	Kemet C0402C104K4RACTU or equivalent(better)
2	1	C17	1u	CAP CER 1UF 16V 10% X5R 0402	TDK C1005X5R1C105K050BC or equivalent(better)
3	2	C2,C9	0.47u	CAP CER 0.47UF 16V 10% X5R 0402	TDK C1005X5R1C474K050BC or equivalent(better)
4	1	C15	1u 50V	CAP CER 1UF 50V 10% X5R 0603	Taiyo Yuden UMK107BJ105KA-T or equivalent(better)
5	1	C16	0.22u 25V	CAP CER 0.22UF 25V 10% X5R 0402	TDK C1005X5R1E224K050BC or equivalent(better)
6	1	C19	10u	CAP CER 10UF 10V X5R 20% 0603	Taiyo Yuden LMK107BJ106MALTD or equivalent(better)
7	1	C20	1000p	CAP CER 1000PF 50V 10% C0G 0402	TDK C1005C0G1H102K050BA or equivalent(better)
8	1	D2	LG L29K-G2J1-24-Z	LED SMARTLED GREEN 570NM 0603	Osram LG L29K-G2J1-24-Z
9	1	D1	CRS04	DIODE SCHOTTKY 40V 1A SFLAT	Toshiba CRS04(TE85L,Q,M)
10	2	L2,L3	Ferrite	FERRITE CHIP 30 OHM 2200MA 0402	Murata Electronics North America BLM15PD300SN1D
11	1	L1	22uH VLCF5020T-220MR75-1	FIXED IND 22UH 750MA 496 MOHM	TDK VLCF5020T-220MR75-1
12	1	Y1	SG-210STF 1.0000ML	OSCILLATOR 1.000MHZ SMD	Epson SG-210STF 1.0000ML
13	1	U1	TPS3801L30	IC 2.64V SUPPLY MON SC-70-5	Texas Instruments TPS3801L30DCKR
14	1	U2	BU15TD3WG	IC REG LDO 1.5V 0.2A 5SSOP	Rohm Semiconductor BU15TD3WG-TR
15	1	U3	TPS61161A	IC LED DRIVER WHITE BCKLGT 6SON	Texas Instruments TPS61161ADRVT
16	1	U4	S1D13781	QFP15-100 .5mm pitch 14x14mm	Epson S1D13781F00A100
17	1	J2	CONN RCPT 3x2	CONN RCPT .1" 3POS DUAL	Samtec SSW-103-01-F-D or equivalent
18	2	J1,J3	CONN PLUG 8	CONN HEADER 8POS .1"	Samtec TSW-108-07-F-S or equivalent
19	1	CN1	CONN FPC1	CONN FFC BOTTOM 40POS 0.50MM R/A	Molex 0541324062
20	1	CN2	CONN FPC2	CONN FFC BOTTOM 54POS 0.50MM R/A	Molex 0512965494
21	1	J4	CONN RCPT 16x2	CONN RCPT .1" 16POS DUAL	Samtec SSW-116-01-F-D or equivalent
22	1	SW1	SW TACT-SPST	SWITCH TACTILE SPST-NO 0.05A 12V	Omron B3U-1000P
23	1	SW2	SW DIP4	SWITCH DIP VERT 4POS SMT 24V	Omron A6H-4102-P
24	5	TP1,TP2,TP3,TP4,TP5	TP SIP	PCB .025" hole .045" pad	Thru-hole Test Point, not part
25	8	R3,R8,R11,R13,R15,R17, R19,R21	0	RES 0.0 OHM 0402 SMD	
26	8	R5,R14,R16,R18,R20, R22,R23,R24	0_NP	RES 0.0 OHM 0402 SMD	/ Do not buy, do not populate
27	3	R2,R4,R6	10	RES 10.0 OHM 1/16W 1% 0402 SMD	
28	1	R9	680	RES 680 OHM 1/16W 1% 0402 SMD	
29	3	R1,R10,R25	10k	RES 10.0K OHM 1/16W 1% 0402 SMD	
30	1	R7	100k	RES 100K OHM 1/16W 1% 0402 SMD	
31	1	R12	100k_NP	RES 100K OHM 1/16W 1% 0402 SMD	/ Do not buy, do not populate

6 Schematic Diagram



7 Change Record

X94A-G-010-01 Revision 1.02 - Issued: March 30, 2018

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

X94A-G-010-01 Revision 1.01 - Issued: February 26, 2016

- Section 1, added references to mbed compatible and Infineon options
- Section 2.2, added information on mbed and reference to specific S1D13781 Shield for mbed document
- Section 2.3, added information on Infineon connections
- Released document as rev 1.01

X94A-G-010-01 Revision 1.0 - Issued: July 17, 2015

- Released document as rev 1.0

8 Sales and Technical Support

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

https://global.epson.com/products_and_drivers/semicon/products/display_controllers/

For Sales and Technical Support, contact the Epson representative for your region.

https://global.epson.com/products_and_drivers/semicon/information/support.html