



SSD1963 EVK Rev4A User Guide

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1. Introduction

SSD1963 EVK is a development board for Solomon SSD1963 display controller (www.Solomon-systech.com) which provides 1,215K byte frame buffer with parallel MCU interfaces for RAM-less LCD panels up to 864x480 at 24-bit per pixel resolution. All necessary circuits including the voltage regulators and a backlight circuit are onboard to facilitate testing the chip. Basically, only two components are required to finish the setup for a content-rich graphical user interface (GUI) application: a microcontroller to contain the GUI firmware and a TFT panel to display the GUI.

The board layout is shown in Figure 1.1 with key features on next page.

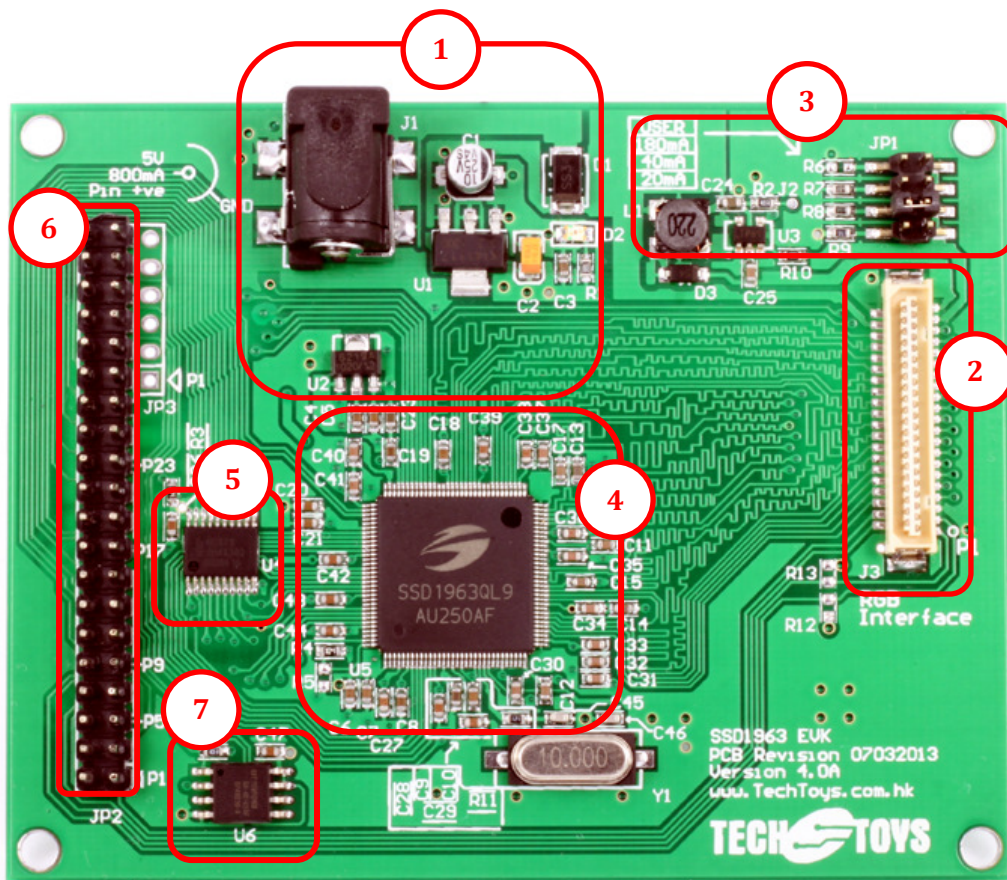


Figure 1.1 Board Layout (PCB Rev 07032013)

- 1
 - 1.1.1 J1 is a 2.1mm DC power input. A 5V regulated DC voltage with pin positive is recommended for most operations. This power source is also routed to the backlight circuit (U3: CAT4139D) and the power input for the microcontroller board via pin headers JP2 at the left.
 - 1.1.2 U1 is a low-drop-out (LDO) linear voltage regulator to generate 3.3V for the whole board. Devices requiring 3.3V will be sourced from this LDO including SSD1963QL9, 74HC573D, TFT panel, and the microcontroller board too.
 - 1.1.3 U2 is a linear voltage regulator to generate 1.2V from U1 for the core supply voltage of SSD1963.
- 2 J3 is a Hirose 1mm pitch SMT board-to-board connector (part# DF9-41P-1V) of 41 pins. There are over hundreds of TFT manufacturers in the world without a unique standard for TFT interface connections. Since SSD1963 EVK serves as a general purpose evaluation platform, a single connector for all SSD1963 TFT interface connections is provided. Adapter boards for various TFT sizes from 4.3" to 7" panels are provided at no additional cost with bundle purchase. An adapter kit (part# SSD1963EVK-UTFT-ADPT) for your own TFT panel is available as an option.
- 3 LED backlight circuit with jumper selectable current settings. CAT4139 (U3) is a 22V high current boost white LED driver chip. LEDs connected in series are driven with a regulated current set by the external resistor connected to FB pin. The CAT4139 is capable of driving parallel strings of up to five white LEDs in series or up to 22V. A jumper (JP1) in 2.00mm pitch is provided for three resistor values which regulate constant LED current of 180mA, 40mA, and 20mA to fit our panels of 7", 4.3", and 5". Footprint in 0603 package (R6) is provided for your own TFT panel.

FB feedback pin is regulated at 0.3V. A resistor connected between the FB pin and ground sets the LED current according to the formula:

$$I_{LED} = 0.3V / R6$$

Say, if you want to set the I_{LED} at 80mA for your TFT panel,
 $R6 = 0.3V / 80mA = 3.75\Omega$.

Solder a resistor of 3.3 or 3.90 Ω of 1% precision will suit your application. Finally, close the jumper at pin 7 & pin 8 to complete the circuit.
- 4 U5 is the SSD1963 in TQFP128 package with an external crystal of 10MHz. This oscillation frequency will be multiplied by a PLL for an operation frequency up to 120MHz.

- 5 U4 is a 74HC573D latch device for low-pin-count microcontrollers. This is actually an optional device. For microcontrollers of high pin-count this latch device may sound redundant. This is why U4 is disabled by default with its output enable pin (OE) pulled up to VDD for high impedance output. However, for microcontrollers of low-pin-count, sparing all 16 pins as the data-bus may be difficult. This latch device will serve the purpose of latching the low byte D0:7 for D8:15 by strobing LE in the first cycle, and the next cycle for D0:7 to complete the whole 16-bit color in 5-6-5 format.
- 6 JP2 is a standard 40-pin 2.54mm pin header as the MCU interface. All control signals together with data bus D0 to D17 are wired to this 2x20 2.54mm pin header for microcontroller boards. Interface for SPI serial Flash is routed to pin 31, 33, 35, & 37. Please refer to schematic for details.
- 7 U6 is a SPI serial Flash (16Mbit SST25VF016B) or compatible device, useful for data storage such as calibration for Touch Panel, bitmaps, etc.

2. Installing different TFT Panels

SSD1963 supports up to 864x480x24bit RAM-less TFT panels. Common TFT sizes are 3.5" of 320x240 pixels, 4.3" of 480x272 pixels, 5" & 7" of 800x480 pixels. At time of writing, there are three options available from us.

2.1 7" TFT panel TY700TFT800480 Rev03

The TFT panel (model # TY700TFT800480Rev03) is a 7" WVGA 262k color LCD module with touch panel. An adapter is provided with the bundle offer of part number SSD1963EVK-R4A-TY700TFT to stack on J3. Schematic of the adapter is available from our web site under Doc 09. Please refer to schematic for wiring.

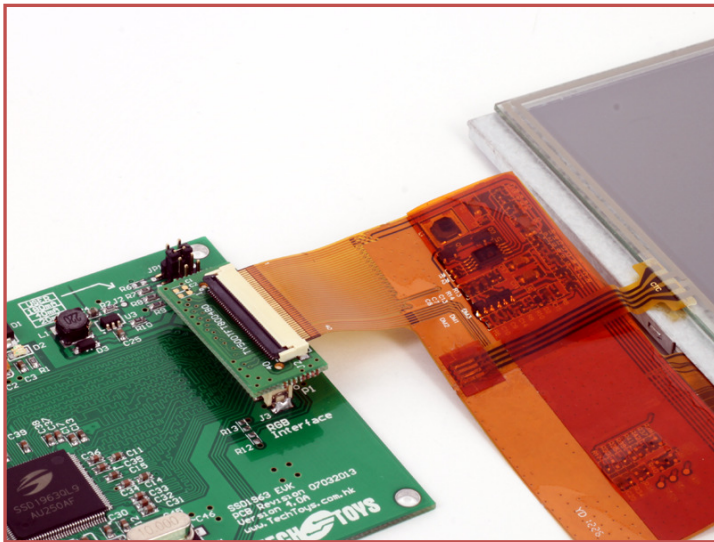


Figure 2.1.0 Adapter kit for TY700TFT800480 is included in the part # SSD1963EVK-R4A-TY700TFT

LED current of 180mA is required for the backlight of TY700TFT800480 Rev03. Resistor R7 of 1.65Ohm 1% should be selected to regulate the current at 180mA.

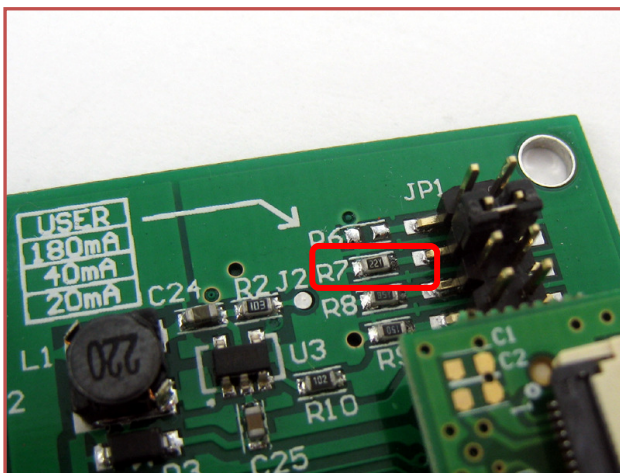


Figure 2.1.1 Set JP1 at R7 for 7" TFT panel

2.2 5" TFT panel TY500TFT800480

The TFT panel (model # TY500TFT800480) is a 5" WVGA 262k color LCD module of 800x480 pixels with touch panel integrated. The same adapter as 7" TFT is used to convert a 40pin FPC to Hirose DF9-41S receptacle mating J3. This adapter is provided with the bundle offer of part number SSD1963EVK-R4A-TY500TFT.

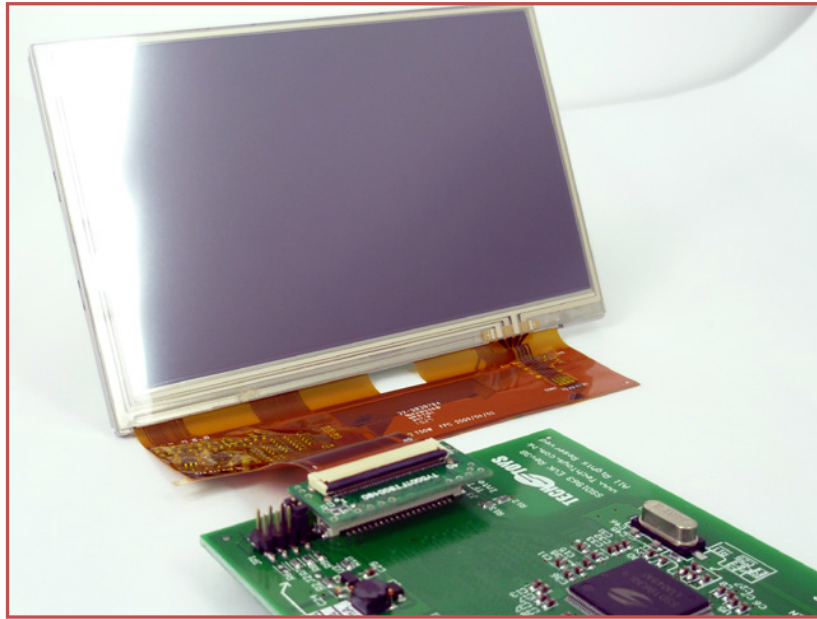


Figure 2.2.0 Connect 5" TFT to SSD1963EVK

A LED current of 40mA is required for the backlight of TY500TFT800480. Resistor R8 of 7.50ohm should be selected to regulate the current at 40mA.

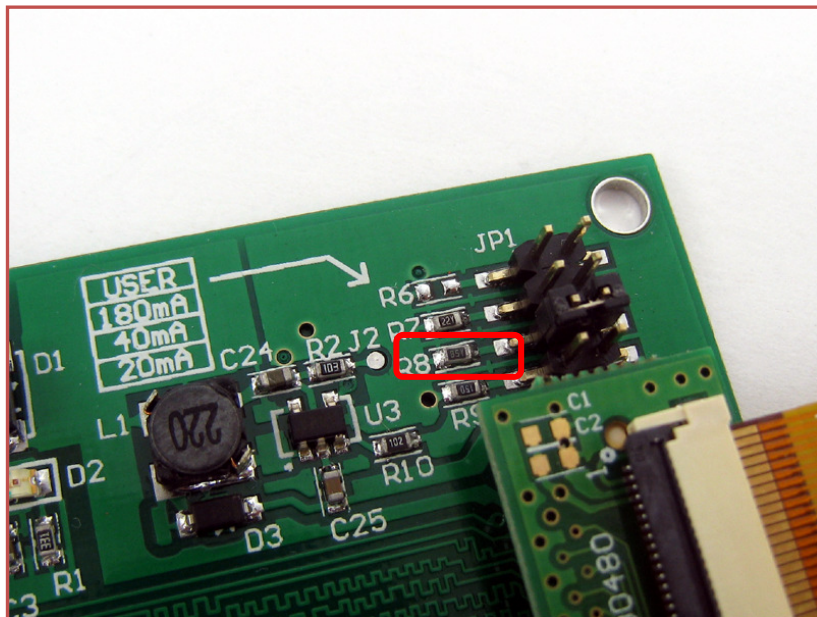


Figure 2.2.1 Set JP1 at R9 for 40mA LED current for 5" TFT panel

2.3 4.3" TFT panel TY430TFT480272 Rev04

TY430TFT480272 is a 4.3" TFT panel with touch panel of resolution 480x272. The same adapter can be used to convert the 40pin FPC to Hirose DF9-41S receptacle is provided in the bundle offer of part number SSD1963EVK-R4A-TY430TFT. Because TY430TFT shares the same FPC connection as TY500TFT, this adapter is actually the same as that for TY500TFT & TY700TFT.

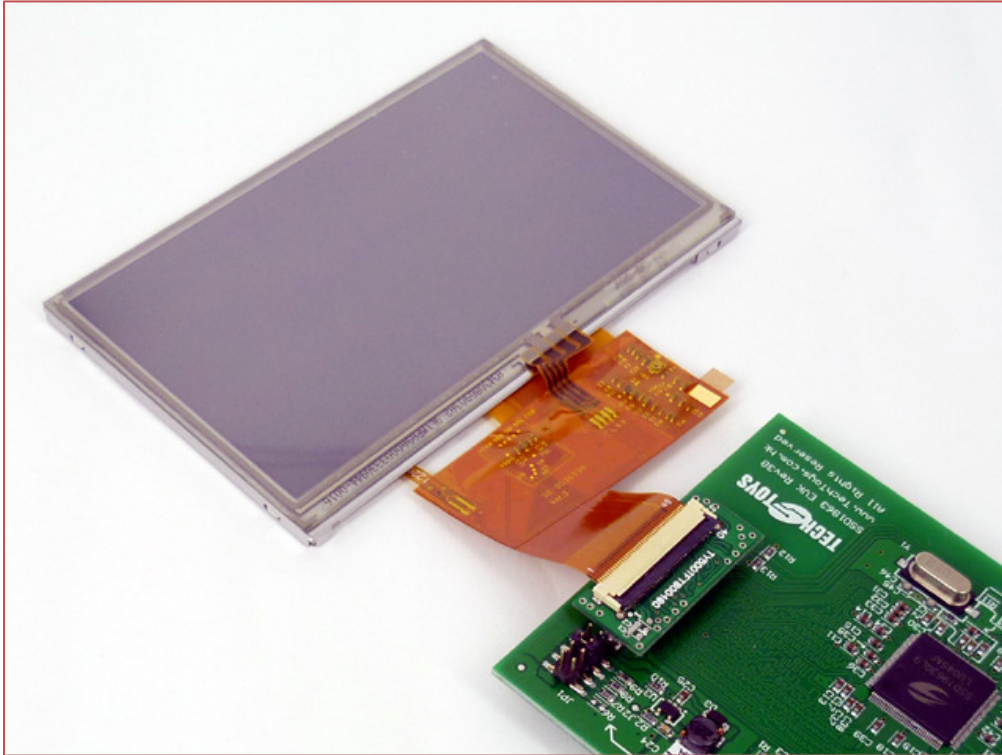


Figure 2.3.0 Connecting a TY430TFT480272 4.3" panel to SSD1963EVK

A LED current of 40mA is required for the backlight of TY430TFT480272. Resistor R8 of 7.50ohm should be selected to regulate the current at 40mA.

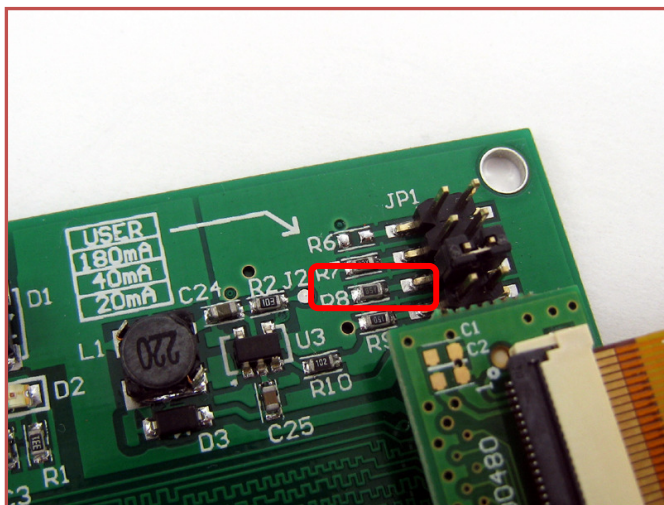


Figure 2.3.1 Set JP1 at R8 for 40mA LED current for 4.3" TFT panel

2.4 Universal adapter for your TFT panels

As an alternative to our offer on TFT panels, an optional universal adapter for your own panel is available. The universal adapter kit consists of two PCBs: an adapter to stack on J3 of the SSD1963EVK and a bare PCB with footprints for major connectors in 0.5mm, 1.00m, and 0.3mm pitch for pin 1 to pin 60. Strip wires are required to connect the boards. Soldering is required for this kit.

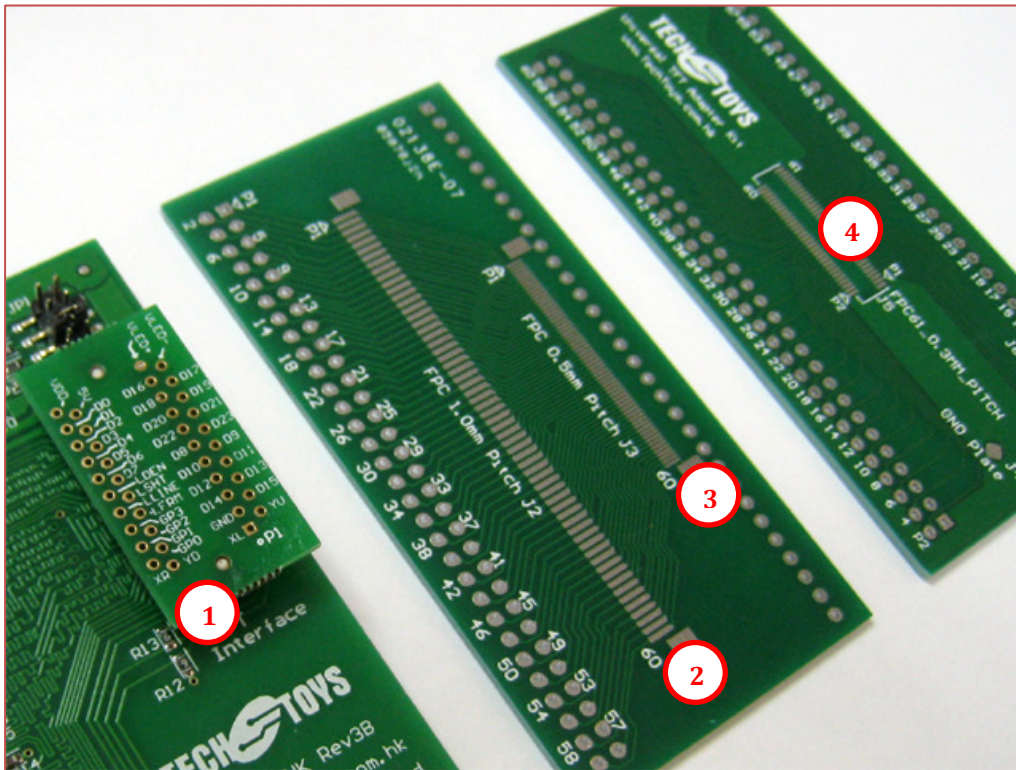


Figure 2.4.0 Adapter kit for third-party TFT panels
(1) Adapter board with DF9-41S receptacle
(2) Connector footprint of 1.00mm pitch from pin 1 to pin 60
(3) Connector footprint of 0.5mm pitch from pin 1 to pin 60
(4) Connector footprint of 0.3mm pitch from pin 1 to pin 61 in double row on the bottom side

A footprint of resistor in 0603 package (R6) is available. CAT4139 is capable of driving parallel strings of up to five white LEDs in series or up to 22V.

FB feedback pin is regulated at 0.3V. A resistor connected between the FB pin and ground sets the LED current according to the formula:

$$I_{LED} = 0.3V / R6$$

Say, if you want to set the I_{LED} at 80mA for your TFT,
 $R6 = 0.3V/80mA = 3.75\Omega$.

Solder a resistor of 3.3 or 3.90 Ω of 1% precision will suit your application. Finally, close the jumper at pin 7 & pin 8 to complete the circuit.

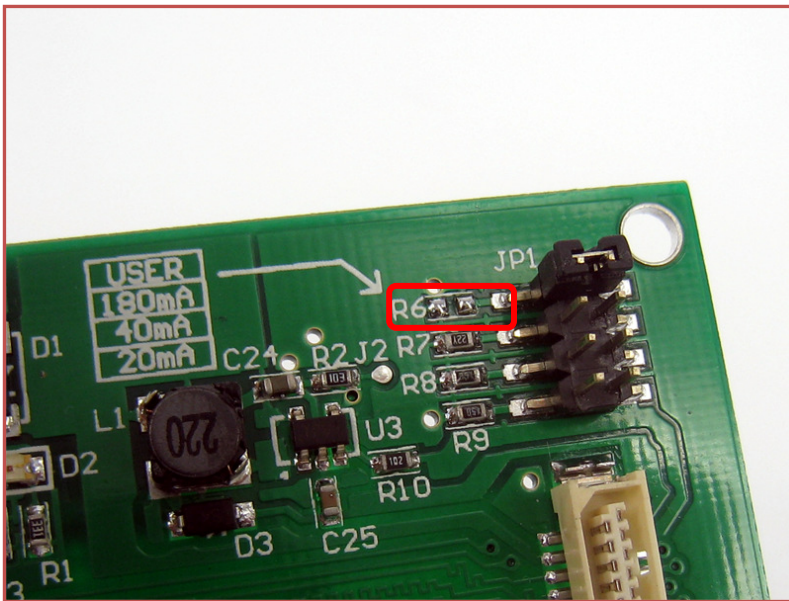


Figure 2.4.1 User defined LED current

3. MCU Interface

MCU interface of SSD1963 is wired to a standard 2x20 2.54mm pin header (JP2). Figure 3.1 shows a snapshot of the schematic. All critical interface pins are available on JP2. Optional development boards of different microcontrollers are available from us to drive the SSD1963EVK. As an alternative, one may use solder-less jumper cables for quick and easy prototyping if there are 2.54mm pin headers from your own MCU demo kit. Figure 3.2 shows how the Texas Instruments Stellaris LaunchPad LM4F120XL is connected to SSD1963EVK by jumper cables.

There are 40 pieces 2.54mm pitch jumper cables included in each SSD1963EVK-R4A kit. Additional jumper cable set is available from our store at the following hyperlink:

<http://www.techtoys.com.hk/Components/JumperCable/JumperCable.htm>

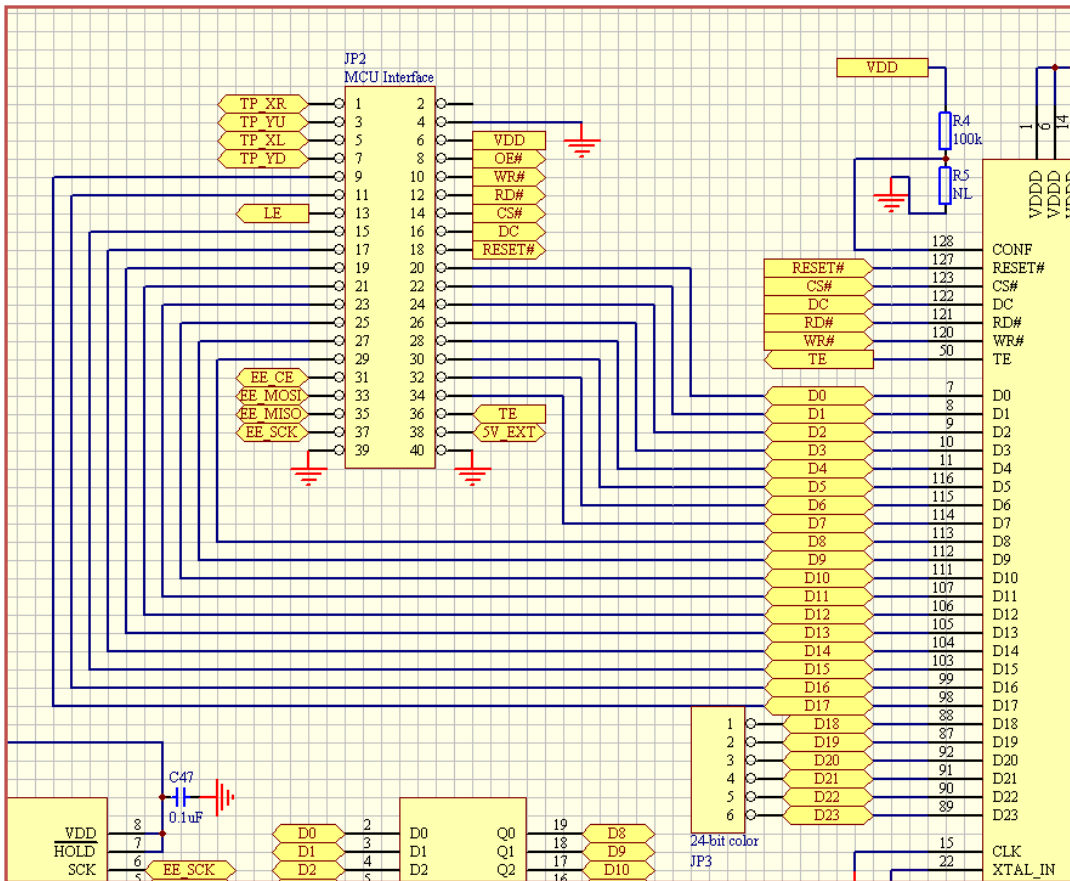


Figure 3.1 MCU interface

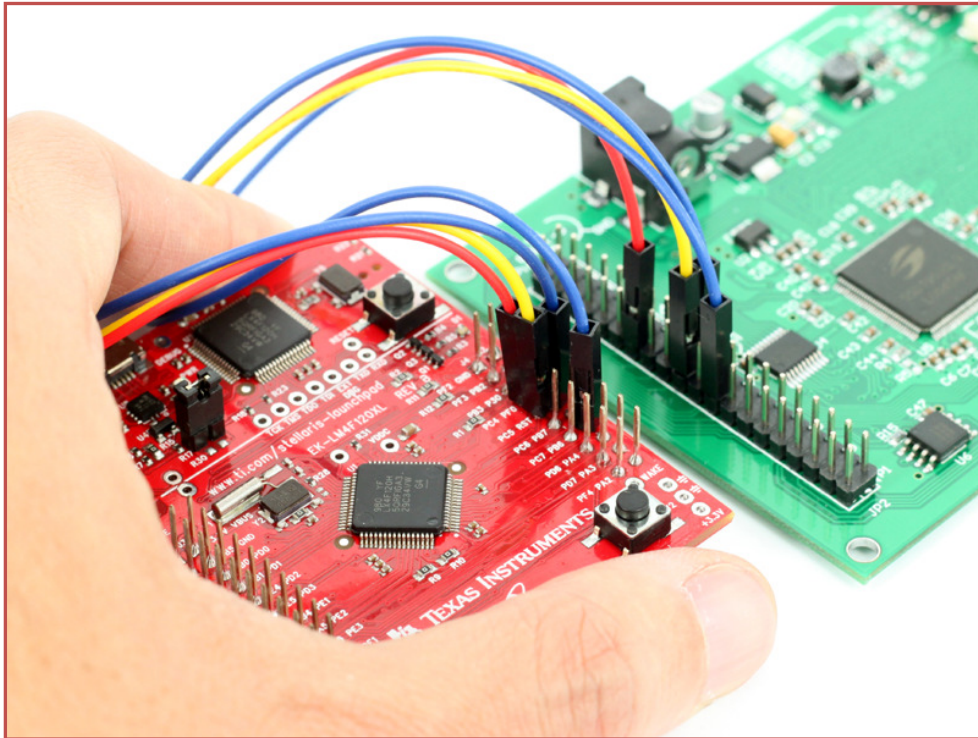


Figure 3.2 Connect SSD1963 to your favorite MCU. Picture shows how a TI's Stellaris LaunchPad is connected to SSD1963 with solder-less jumper cables.

Development kits for Microchip PIC24 & PIC32 microcontroller series are available from us with compatible receptacle for SSD1963EVK board. From time to time we will have new boards for various applications. Please check our web site for further details.

4. Software

Open source demo programs are provided for startup. These programs have been developed under Microchip Graphics Library version 3.0x with a low level driver for SSD1963 developed by us.

It is not restricted to Microchip's microcontrollers to interface the SSD1963. Any microcontroller or processor that is able to generate the required control signal (CS#, DC, RD#, WR#, and D[23:0]) will be able to drive it. There are few Graphical Libraries such as:

- Luminary (now belongs to Texas Instruments) Micro Graphics Library
 - http://www.luminarymicro.com/products/stellaris_graphics_library.html
- Renesas Graphics Library
 - http://america.renesas.com/fmwk.jsp?cnt=sw_lib_child.htm&fp=/products/mpumcu/h8_family/h8_lcd/child_folder/&title=Graphic%20Animation%20Software
- PEG embedded Graphical User Interface
 - <http://swellsoftware.com/products/>
- Easy GUI by IBIS Solution ApS
 - <http://www.easygui.com>
- emWin supplied by Segger Microcontroller GmbH & Co. KG
 - www.segger.com

Some of these libraries are free as long as you would use their products while the others provide port to various MCUs at a certain cost. User may select his favorite host and decide which GUI is the best for the application. Microchip Graphics Library has been chosen because it is free as long as the library will be embedded to Microchip products.

Please refer to separate sections on the same web page you have downloaded this user guide for application notes and source code.