# TWR-PIM-41WVGA
## Product Brief

Release: May 2nd 2012

# Table of content



# Revision History

| Name | Date | Description | Version |
|---|---|---|---|
| Cindy Zhao | May 2nd 2012 | First release | 0.0 |

# 1 General Description

Very often designing LCD display systems can be quite challenging and time consuming because each LCD panel requires different hardware interface and dedicated software to drive the panel. Future Electronics has developed a LCD kit TWR-PIM-41WVGA based on Freescale K70 Tower platform. Freescale K70 is a MCU from their Kinetis family with embedded Graphic LCD Controller, combined with using PEG GUI development tools, the design process can be much easier and faster.

The kit TWR-PIM-41WVGA was designed to drive NLT 4.1" WVGA LCD Panel (P/N#NL8048HL11-01B), but can also be used to drive other LCD panels. As shown in Figure1, the main adaptor board (TWR-PIM) connects to the Tower Secondary Elevator, and a SLAB (Small LCD Adaptor Board) is used as the interface between the LCD panel and TWR-PIM. Each SLAB is designed for a specific panel and needs to be changed when changing the LCD panels. This provides the possibility for customers to be able to quickly evaluate the performance/ looking of different LCD panels.

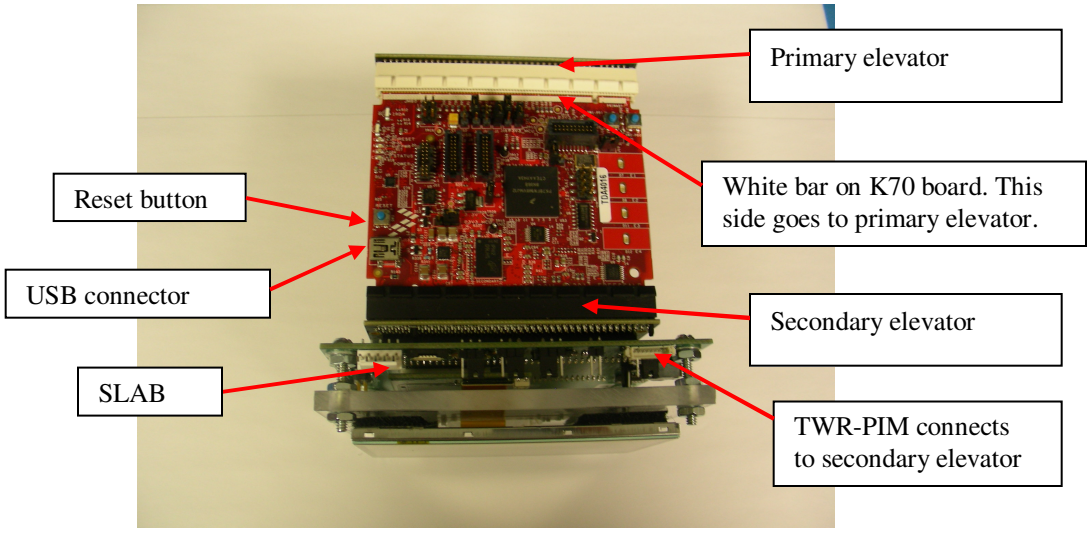


**Figure 1: K70 Tower System with TWR-PIM-41WVGA kit Connected**

## *1.1 Features of TWR-PIM*

- Designed to work with Freescale K70 Tower System
- Supporting TFT LCD displays with 18/24 bits TTL or 24 bits LVDS interface
- Dedicated touch control IC working with 4-wire or 5-wire resistive touch screen
- Constant current backlight LED driver, use switch to select current up to 160mA
- 12 Volt output to drive an LED backlight board/inverter

## *1.2 Main Components Used in the Design*

- CRTouch touch screen controller from Freescale
- LVDS transmitter FIN3385MTDX from Fairechild
- LDOs LDS3985M33R, LDS3985M30R from ST-micro
- Boost controller MIC2253-06YML from Micrel
- Constant current switching regulator CAT4106HV4-GT2 from On Semi
- Hirose connectors DF9-51S-1V(69), DF9-51P-1V(69)) and FPCs

# 2 Description of the Design

## *2.1 TWR-PIM*

Figure2 is the block diagram of TWR-PIM(Rev1). The DC-DC block generates 3V and 3.3V for display power supply coming from USB through Tower system. Also it has 12V and selectable constant current outputs to drive the backlight LEDs of different LCD panels. In case some panels require higher power supply which exceeds the capability of a standard USB port can provide, an external 5V power supply can be used by connecting to connector P4.

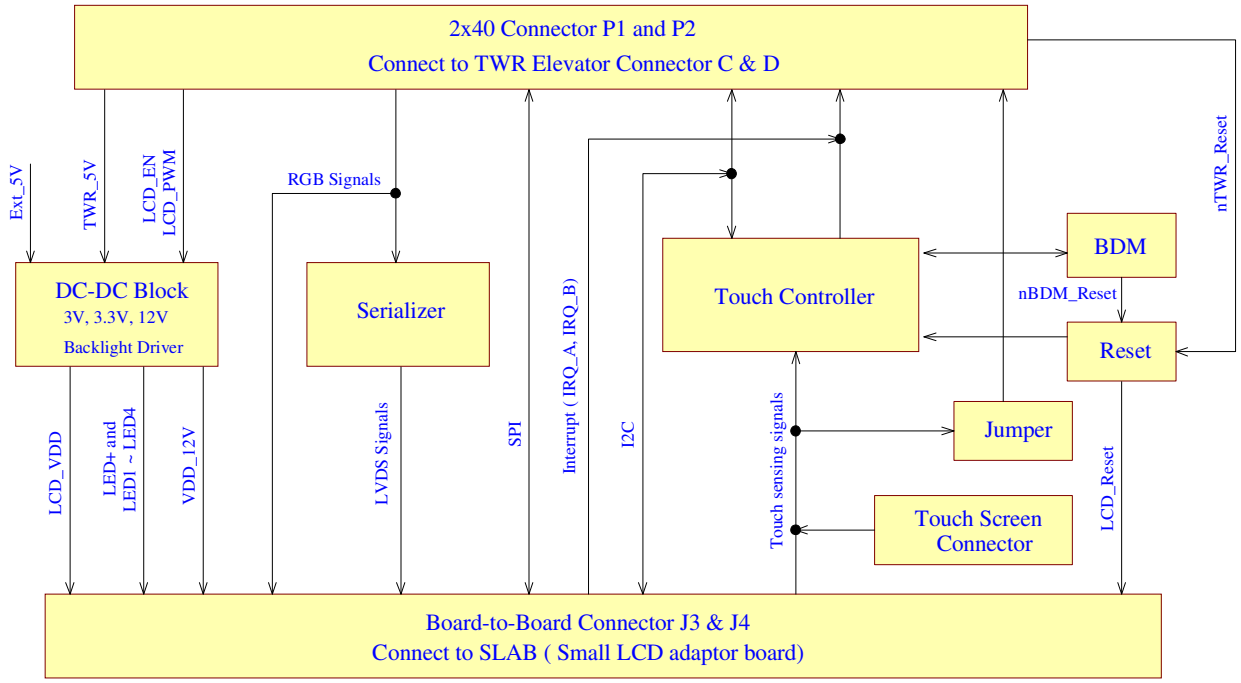


**Figure 2: Block Diagram of TWR-PIM(Rev1)**

The TWR-PIM incorporates Fairchild FIN3385MTDX transmitter which converts 24 bits TTL data into four differential pairs of LVDS signals at a clock frequency up to 85 MHz. This chipset can be used for both 18 bits and 24 bits LVDS panels. But due to the RGB bit mapping of K70, the current design (TWR-PIM Rev1) only has 24 bits LVDS output.

The touch controller is the CRTouch IC from Freescale which works with 4-wire or 5-wire resistive touch screen for both single touch and dual-touch. In addition, the module is designed with two 51-pin board-to-board connectors J3 and J4( P/N#DF9-51S-1V(69)) interfacing to a SLAB which connects to the LCD panel.

## *2.2 SLABs(Small LCD Adaptor Board)*

Many SLABs will be available for the TWR-PIM. Two different types of currently available SLABs are shown below. One is the panel specific SLAB which is designed to work with a certain LCD panel and use PFC to connect to the flex cable on the panel. Another one is the cable SLAB which provides both TTL and LVDS outputs through 2 connectors. Figure3 shows two SLABs. On the left side is the SLAB for NLT panel (P/N# NL8048HL11-01B), on the right side is the cable SLAB.


**Figure 3: SLABs**

# 3 Jumpers and Settings

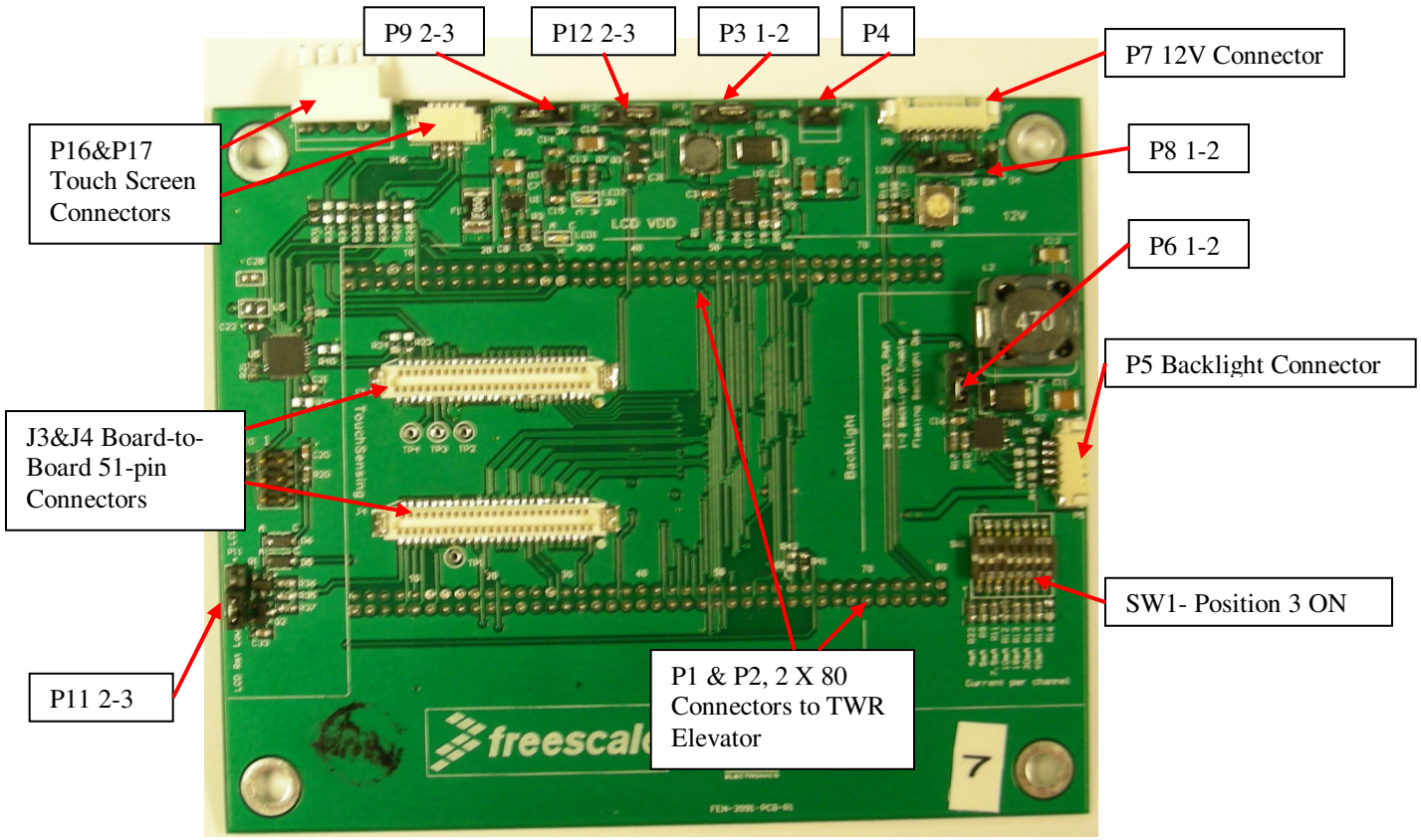


**Figure 4: Jumpers and Connectors on TWR-PIM Board**

In order for TWR-PIM board to work properly, all jumpers on board need to be set correctly. The locations of the jumpers and connectors are shown in Figure4. Table1 and Table2 describe the usage as well as the right settings for each of them.

| Item | Name | Connector Description |
|---|---|---|
| 1 | P1, P2 | Connectors to TWR secondary elevator |
| 2 | J3, J4 | Board-to-board connectors to SLAB |
| 3 | P16, P17 | Touch screen |
| 4 | P4 | External 5V power supply |
| 5 | P5 | Backlight constant current output |
| 6 | P7 | 12V output for backlight power |

**Table 1: Connector Description**

| Item | Name | Jumper Description | Position 1-2 | Position 2-3 |
|---|---|---|---|---|
| 1 | P3 | Select 5V input from TWR or from external connector | Use TWR 5V | Use external 5V |
| 2 | P6 | Constant current backlight enable/dimming | Enabled | Controlled by PWM from TWR MCU |
| 3 | P8 | 12V backlight supply enable/disable | Enabled | Disabled |
| 4 | P9 | LCD_VDD select from 3.3V or 3V | 3V3 | 3V |
| 5 | P11 | LCD_RESET select | Active high | Active low |
| 6 | P12 | LCD_VDD enable/disable | Enabled | Disabled |

**Table 2: Jumper Description**

# 4 Characteristics and Specifications

## *4.1 Electrical Specifications*

| **LCD Panel Interface** | | | | | | |
|---|---|---|---|---|---|---|
| Description | Symbol | Min | Typ | Max | Units | Comment |
| Color input bits | - | - | 18/24 | - | bit | |
| Input Signals | - | - | TTL/ CMOS | - | - | |
| TTL output | - | - | 18/24 | - | - | For 18 or 24 bits TTL panels |
| LVDS output pairs # | - | - | 4 | - | - | For 24 bits LVDS panels |
| LVDS operating Frequency | $F_{LVDSmax}$ | - | - | 85 | MHz | |
| **Constant Current Backlight LED Driver** | | | | | | |
| Description | Symbol | Min | Typ | Max | Units | Comment |
| Backlight Output Voltage | Vo | - | - | 36 | V | The output voltage equals to the total Vf of LEDs in series |
| Switching frequency | Fs | 0.7 | 1 | 1.3 | MHz | |
| Total output current for all 4 channels | $I_{LED}$ | 16 | - | 160 | mA | If the desired current is different from those in the schematics, R16 can be installed and position8 of SW1 should be on. Please do not exceed the maximum current rating of the design. |
| **12V Backlight LED Boost Converter** | | | | | | |
| Description | Symbol | Min | Typ | Max | Units | Comment |
| Output voltage | Vo | 11.7 | 12 | 12.4 | V | |
| Backlight booster switching frequency | Fs | - | 1 | - | MHz | |
| Switching duty cycle | | 10% | - | 90% | | |
| Over voltage protection | | 12.6 | 13.4 | 15.1 | V | |

**Table 3: Electrical Specification**

## *4.2 Mechanical Specifications*

Figure5 shows the dimensions of TWR-PIM. P1 and P2 are the 2X40 connectors to Tower. J3 and J4 are the 51-pin board-to-board connectors(P/N# DF9-51S-1V(69)) connecting to the SLAB. The transparent blue block shows how the SLAB will be connected to TWR-PIM.

As shown in Figure6, the maximum size of the SLABs is limited due to the height of some connectors and headers on TWR-PIM. It can be shrunk on all four directions as long as the relative positions of the two 51-pin connectors P3 and P4 are respected. Basically it's recommended to put all components on top side of the SLAB except P3 and P4. The height constrain for the bottom side of SLABs is 0.16 inch. P1 is the PFC to the flex cable on a LCD panel which is normally on top side of the SLAB for easy connection, and its location and orientation need to be determined by considering the form factors of that panel.

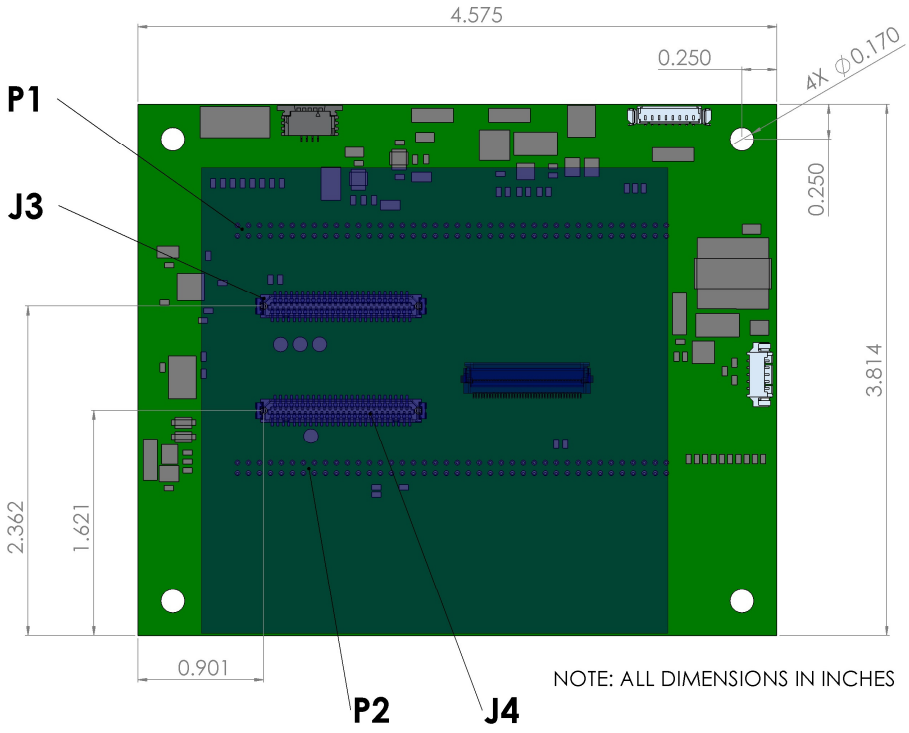


**Figure 5: Form Factors of TWR-PIM**

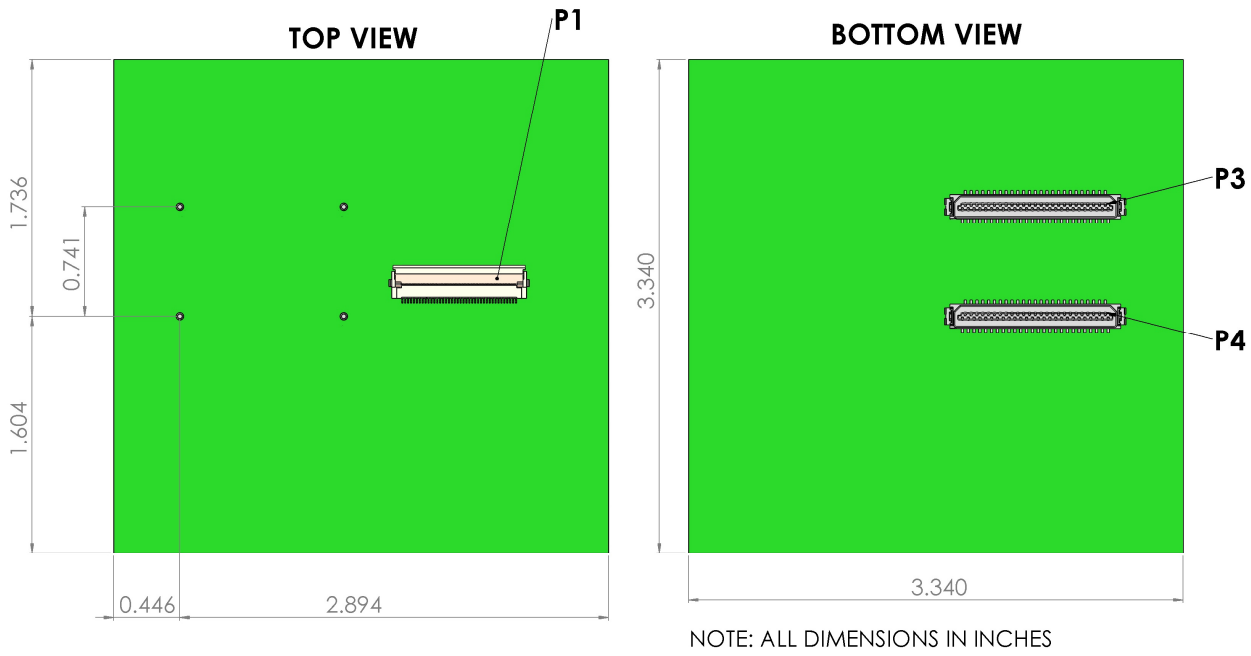


**Figure 6: Mechanical Constrains for SLABs**

For any issues or questions regarding the TWR-PIM-41WVGA kit, please contact **LCDTechnicalSupport@FutureElectronics.com**