



# Reference Manual

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## Mpression MIPI LCD Card

Revision 1.0

2014/09/26

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# 1. Read This First

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## 1.1 Important Information

### READ FIRST:

- **READ** this Reference Manual before using this product.
- **KEEP** the Reference Manual handy for future reference.
- **Do not attempt** to use the product until you fully understand its mechanism.

### Purpose of the Product:

- The purpose of this product is to support the evaluation of MIPI D-PHY DSI interface LCD monitor on a system that uses an Altera FPGA. It provides support for system development in both software and hardware.

### For Users of This Product:

- This product can only be used by operators who have carefully read the "Getting Started" and "Reference Manual" manuals and understand how to use it. Use of this product requires a basic knowledge of electric circuits, logic circuits, and FPGAs.

### Precautions to be taken when using This Product:

- This product is to be used for evaluation of a program, and the evaluation stage. You cannot install this Board in your product and cannot use this Board for mass-production. When mass-producing a program you have finished developing, be sure to decide at your own responsibility whether it can be put to practical use by performing integration test, evaluation, or some other experiment.
- In no event shall Macnica Inc. be liable for any consequence arising from the use of this product.
- Macnica Inc. cannot anticipate every possible circumstance that might involve a potential hazard. The warnings in this reference manual and on the product are therefore not all-inclusive. The user is therefore responsible for the safe use of the product at the user's own responsibility.
- The operation of any specific USB memories or SD cards cannot be guaranteed.
- Connection with the apparatus of any specific LAN interfaces cannot be guaranteed.
- This product does not guarantee device functionality.
- Remodeling by the customer is not guaranteed.
- This product is a lead-free mounting product.
- Generally, the brand names carried in this reference manual each constitute a maker's trademark or registered trademark.

### Improvement Policy:

- Macnica Inc. pursues a policy of continuous improvement in design, performance, and safety of the product. Macnica Inc. reserves the right to change, wholly or partially, specifications, design, reference manual, and other documentation at any time without notice.

### Warranty:

- Macnica Inc. offers exchange of this product free of charge only in a set range of cases of initial trouble for this product, and within 30 days from when the customer received delivery of the Board.

Macnica Inc. cannot exchange products in cases where breakdown is caused for the following reasons:

- (1) Misuse, abuse of the product or use under abnormal conditions
- (2) Remodeling or repair
- (3) A fire, earthquake, fall or other accidents

### Figures:

- Some figures in this reference manual may differ from your system as purchased.

## 1.2 Developer Information

The Developer of this product is:

Macnica Inc.

1-6-3 Shin-Yokohama, Kouhoku-ku, Yokohama, 222-8561 JAPAN

## 1.3 Inquires

In case you have any inquiries about the use this product, please contact your local Macnica company or make inquiries through the contact form in the following web site:

<http://www.m-pression.com/contact>




Macnica companies:

- |                  |                       |   |
|------------------|-----------------------|---|
| • China & HK:    | Cytech Technology     | <a href="http://www.cytech.com/">http://www.cytech.com/</a>                     |
| • ASEAN & India: | Cytech Global         | <a href="http://www.cytechglobal.com/">http://www.cytechglobal.com/</a>         |
| • Taiwan:        | Galaxy Far East Corp. | <a href="http://www.gfec.com.tw/">http://www.gfec.com.tw/</a>                   |
| • North America: | Macnica Americas      | <a href="http://www.macnica-na.com/">http://www.macnica-na.com/</a>             |
| • Brazil:        | Macnica DHW           | <a href="http://www.macnicadhw.com.br/en/">http://www.macnicadhw.com.br/en/</a> |
| • Japan:         | Altima                | <a href="http://www.altima.co.jp">http://www.altima.co.jp</a>                   |
|                  | Elsena                | <a href="http://www.elsena.co.jp">http://www.elsena.co.jp</a>                   |



## 2. For Ensuring Safe Use



Be sure to follow the instructions given in this Manual which are intended to prevent harm to the user and others as well as material damage.


### 2.1 Legend

 <b>Danger</b>	Indicates an imminent hazardous situation which if not avoided will result in death or serious injury.
 <b>Warning</b>	Indicates a potentially hazardous situation which if not avoided could result in death or serious injury.
 <b>Caution</b>	Indicates a potentially hazardous situation which if not avoided may result in minor or moderate injury or in property damage.

### 2.2 Cautions

 <b>Danger</b>	<p>If an AC adapter is required, make sure to use one that meets the specification described in this manual, or one that is included in the package.</p> <p>Using an AC adapter not meeting the specifications described in this Manual may cause the kit to emit heat, explode, or ignite.</p>
 <b>Warning</b>	<p>Do not apply strong impacts or blows to the kit.</p> <p>Doing so may cause the kit to emit heat, explode, or ignite, or the equipment in the kit to fail or malfunction. This may also cause fire.</p>
	<p>Do not put the main unit or the AC adapter in cooking appliances such as microwave ovens, or high-pressure containers.</p> <p>Doing so might cause the main unit or AC adapter to emit heat, explode, ignite, or emit smoke, or its parts to break or warp.</p>
	<p>Do not wrap the main unit that is in use with cloth or other materials that are likely to allow heat to build up inside the wrapping.</p> <p>This will cause heat to build up inside the wrapping which may cause the main unit to ignite or malfunction.</p>
	<p>When disposing of the main unit, do not dispose of it along with general household waste.</p> <p>Throwing the main unit into fire may cause it to explode. Dispose of the main unit following the laws, regulations, and ordinances governing waste disposal.</p>
	<p>Do not pull the power supply cable with excessive force or place heavy items on it.</p> <p>Do not damage, break, bundle, or tamper with the power supply cable.</p> <p>Damaged parts of the power supply cable might cause a short circuit resulting in fire or accidents involving electrical shock.</p>
	<p>Do not plug or unplug the power plug with wet or moist hands.</p> <p>This might cause injuries or equipment malfunctions or failures due to electrical shock.</p>

 <b>Warning</b> (Continued from previous page)	<p>Plug the power plug securely into the outlet.</p> <p>If the power plug is not securely plugged into the outlet, it may cause accidents involving electrical shock or fire due to heat emitted.</p>
	<p>Do not connect many electrical cords to a single socket or connect an AC adapter to an outlet that is not rated for the specified voltage.</p> <p>Doing so may cause the equipment to malfunction or fail, or lead to accidents involving electrical shock or fire due to heat emitted.</p>
	<p>Periodically remove any dust accumulated on the power plug and around the outlet (socket).</p> <p>Do not use a power plug with dust accumulated on it because doing so will lead to insulation failure due to moisture which may lead to fire.</p> <p>Remove any dust on the power plug and around the outlet with dried cloth.</p>
	<p>Do not place any containers such as cups or vases filled with water or other liquid on this Board.</p> <p>If this Board is exposed to water or other liquids it may cause the Board to malfunction or lead to accidents involving electrical shock. If you spilled water or other liquid on this Board, immediately stop using the Board, turn off the power, and unplug the power plug. If you have any requests for repairs or technical consultation, please contact the local Macnica company or Mpression inquiry URL.</p>
	<p>Keep this board and accessories out of reach of children. Failure to do so may lead to injuries.</p>
 <b>Caution</b>	<p>Do not place the kit on unstable places such as shaky stands or tilted locations. Doing so may cause injuries or cause this Board to malfunction if the Board should fall.</p>
	<p>Do not attempt to use or leave the kit in places subject to strong direct sunlight or other places subject to high temperatures such as in cars in hot weather. Doing so might cause the kit to emit heat, break, ignite, run out of control, warp, or malfunction.</p> <p>Also, some parts of the equipment might emit heat causing burn injuries.</p>
	<p>Do not use the kit in places subject to extremely high or low temperatures or severe temperature changes.</p> <p>Doing so may cause the kit to fail or to malfunction.</p> <p>Always be sure to use the kit within a temperature range of 5°C to 35°C and a humidity range of 0% to 85%.</p>
	<p>Unplug the power supply cable when carrying out maintenance of devices in which the main unit is embedded.</p> <p>Failure to do so may lead to accidents involving electrical shock.</p>
	<p>Do not place this Board in locations where excessive force is applied to the Board.</p> <p>Doing so may cause the PC board to warp, leading to breakage of the PC board, missing parts or malfunctioning parts.</p>
	<p>When using the kit together with expansion boards or other peripheral devices, be sure to carefully read each of their manuals and to use them correctly.</p> <p>Developer does not guarantee the operation of specific expansion boards or peripheral devices when used in conjunction with this Board unless they are specifically mentioned in this Manual or their successful operation with this Board has been confirmed in separate documents.</p>

 <p><b>Caution</b> (Continued from previous page)</p>	<p>Be sure to turn off the power switch when moving this Board to connect to other devices. Failure to do so may cause this Board to fail or lead to accidents involving electrical shock.</p>
	<p>Do not clean this Board by using a rag containing chemicals such as benzine or thinner. Failure to do so will likely to cause this Board to deteriorate. When using a chemical cloth be sure to comply with any directions or warnings.</p>
	<p>Do not immediately turn on the power if you find that water or moisture had condensed onto the main unit after removing the board from the package. Condensation might occur on this Board when taking it out of the box, if the board is cool yet the room temperature is warm.</p> <p>Do not apply power to the Board while water or moisture has condensed on it because the moisture may cause the Board to break or may shorten the service life of the parts.</p> <p>When you first take this Board out of the box be sure to leave it at room temperature for a while before using it. If condensation or moisture has occurred on this Board, first wait for the moisture to fully evaporate before installing or connecting the Board to other devices.</p>
	<p>Do not disassemble, dismantle, modify, alter, or recycle parts unless they are clearly described as customizable in this Manual.</p> <p>Although this kit is customizable, if parts not specified in this Manual as customizable are modified in any way, then the overall product operation cannot be guaranteed.</p> <p>Please contact the local Macnica company or Mpression inquiry URL beforehand if you wish to customize or modify any parts that are not described in this Manual as customizable.</p>



## 3. Unboxing

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When you open the package, please confirm that all of the components are included and that none are broken or damaged. If any component is missing, or if there is any visible breakage, please contact our sales representative within 30 days of the package's arrival.

MIPI LCD Card: 1 pc	
Spacer: 2 sets	
Packing List/Directions : 1pc	
This Reference Manual	Download these files from the URL specified in the Packing List/Directions.
Schematics	
MIPI LCD Card Reference Design .sof file	
MIPI LCD Card Getting Started	

## 4. Functions and Features

### 4.1 Main Features

This card can be connected to an HSMC port. It can be used with an FPGA board equipped with an HSMC port.

- You can use various types of FPGA boards and their functions and evaluate your design and connection with an LCD panel via the MIPI DSI interface.

### 4.2 Product Specifications

Table 1 shows the product specifications of this Card.

Table 1 MIPI LCD Card product specifications

Product Specification	ALTHSMCMIPILCD
Size	78mm x 156 mm
HSMC	Samtec ASP-122952-01
TFT-LCD panel	Ortustech COM48H4M87ULC
MIPI D-PHY connector	Panasonic ATX526124
PCB	FR4 6 layers
I2C EEPROM	ATMEL AT24C04C-SSHM-B or equivalent
MIPI D-PHY DSI transmitter	Meticom MC20002
DVI receiver	Texas Instruments TFP401A
TTL/CMOS to V-by-One®HS conversion	THine THCV217
Interface	DVI x 1

## 4.3 Block Diagram

Figure 1 shows the block diagram of this card.

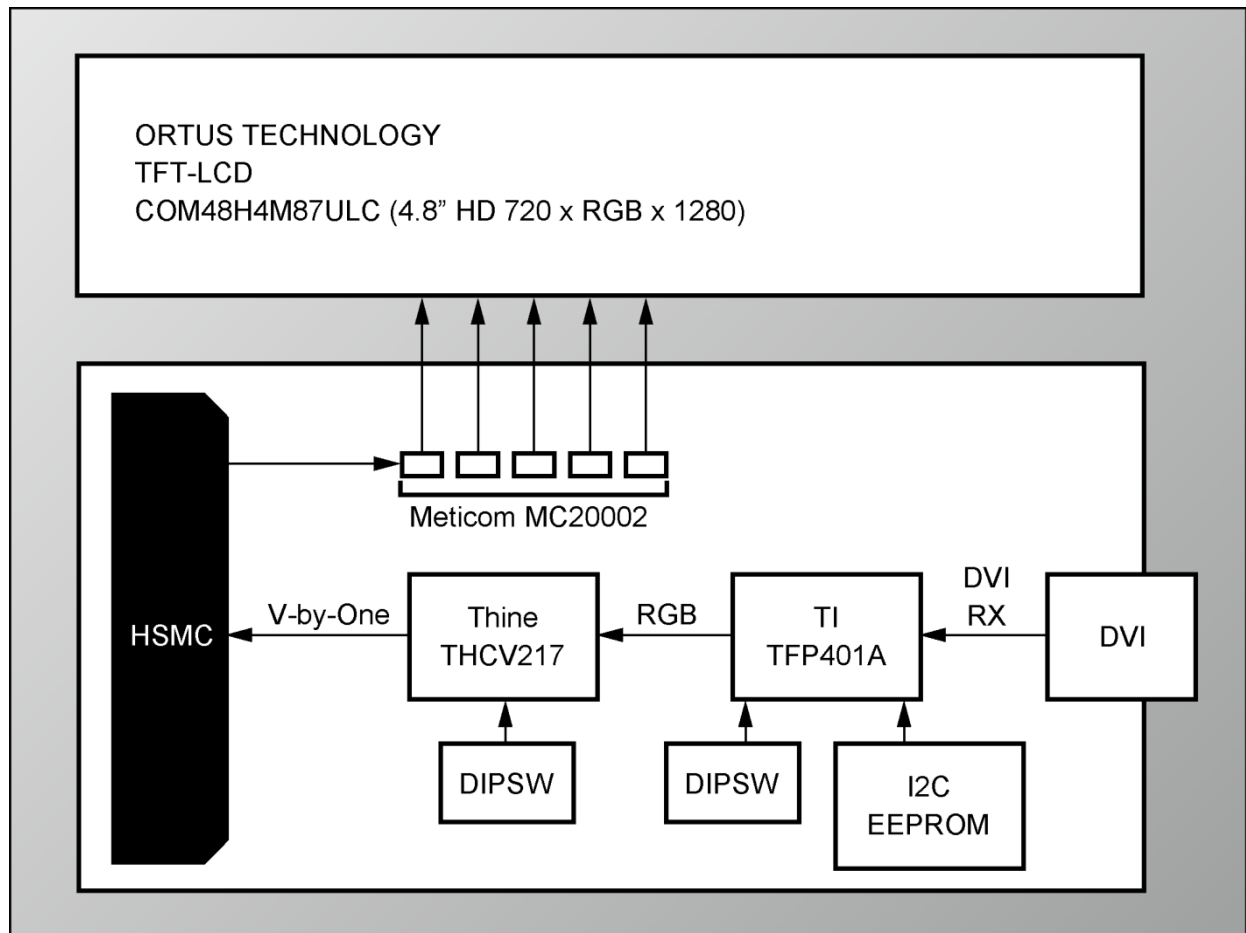


Figure 1 MIPI LCD Card Block Diagram

## 4.4 Card Specifications

Figure 2 and Figure 3 show the layout of this Card.

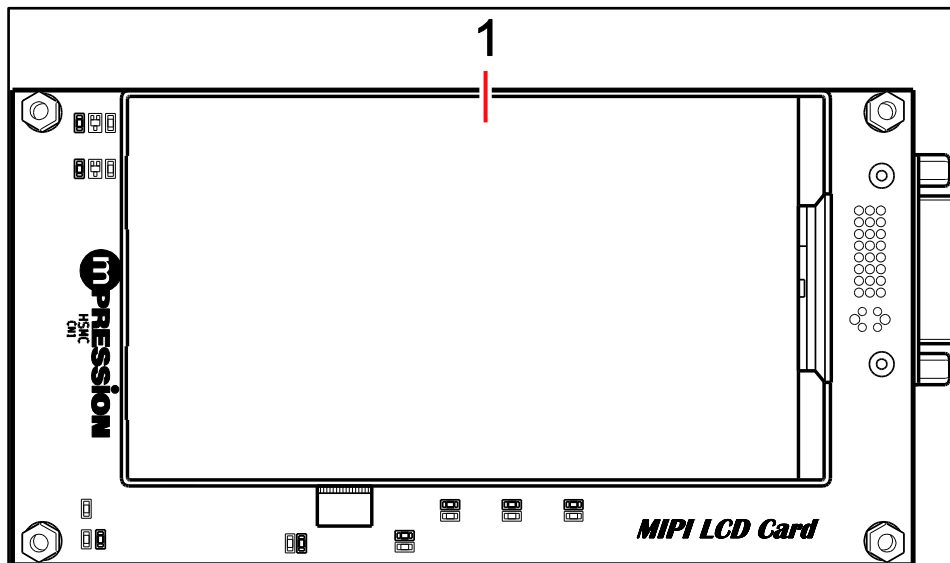


Figure 2 MIPI LCD Card Layout (front)

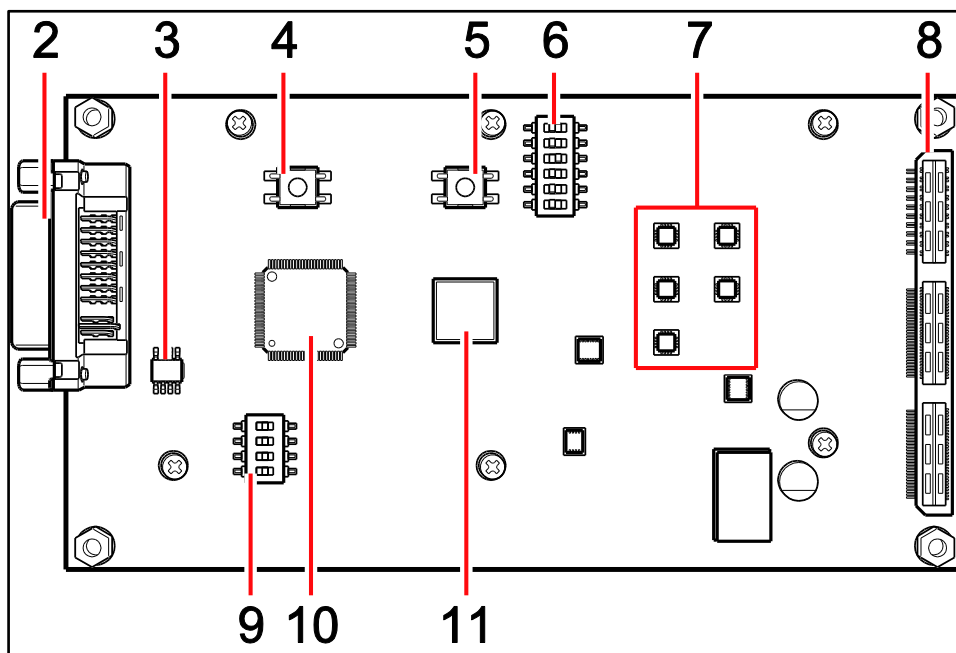


Figure 3 MIPI LCD Card Layout (back)

- |                           |  |
|---------------------------|--|
| 1 TFT-LCD                 | 7 MIPI D-PHY DSI Transmitter (x5) (U4, U5, U6, U7, U8) |
| 2 DVI port (CN2)          | 8 HSMC (CN1)   |
| 3 I2C EEPROM (U3)         | 9 DIP switches (x4) (SW4)                              |
| 4 Push Switch (SW2)       | 10 DVI receiver (U2)                                   |
| 5 Push Switch (SW1)       | 11 TTL/CMOS to V-by-One® HS Transmitter (U1)           |
| 6 DIP switches (x6) (SW3) |  |

## 5. Card Components

### 5.1 Connector Pin Assignment

Figure 4 shows the layout of connectors.

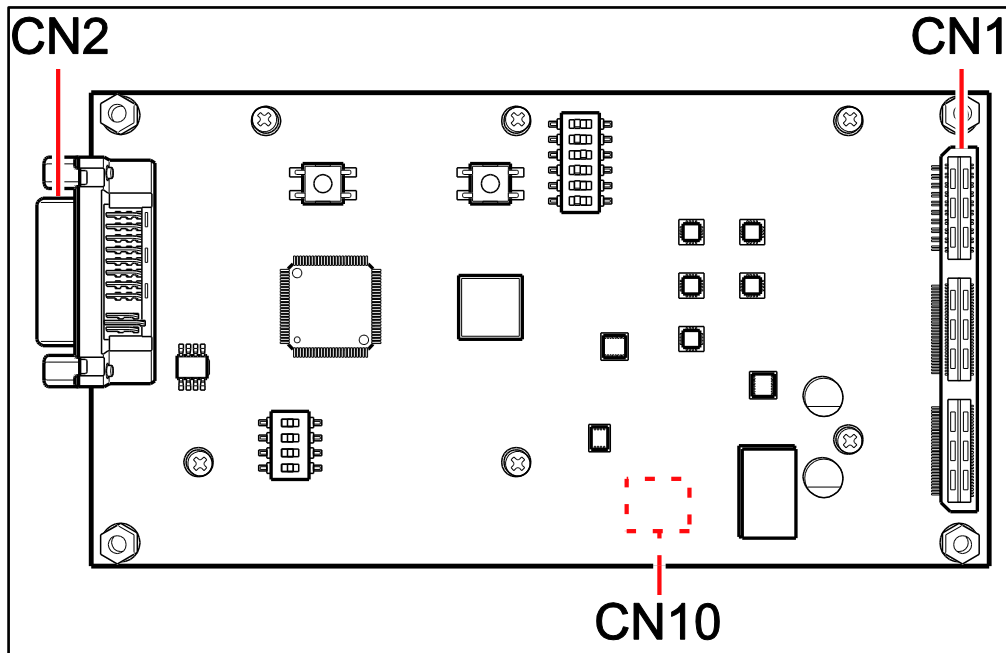
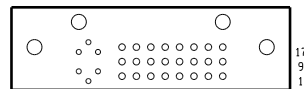


Figure 4 MIPI LCD Card Connector Layout

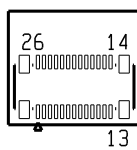
CN2 (DVI port)

Pin No.	Pin Name	Pin No.	Pin Name
1	DATA2-	16	DETECT
2	DATA2+	17	DATA0-
3	GND	18	DATA0+
4		19	GND
5		20	
6	DDC_CLK	21	
7	DDC_DAT	22	GND
8	VSYNC (N.C)	23	CLK+
9	DATA1-	24	CLK-
10	DATA1+	C1	
11	GND	C2	
12		C3	
13		C4	
14	+5V	C5	GND
15	GND		

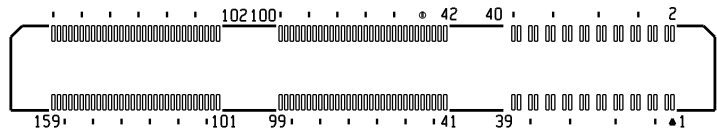


## CN10

Pin No.	Pin Name	Pin No.	Pin Name
1	VSS	14	VSS
2	LED+	15	D2P
3	LED-	16	D2N
4	VSS(GPIO)	17	VSS
5	VCC	18	CP
6	IOVCC	19	CN
7	VPP	20	VSS
8	RESX	21	D1P
9	PWM	22	D1N
10	VSS	23	VSS
11	D3N	24	D0P
12	D3P	25	D0N
13	VSS	26	VSS



## CN1 (HSMC)



Pin No.	Pin Name	Pin No.	Pin Name	Pin No.	Pin Name	Pin No.	Pin Name
1		44		87	3.3V	130	12V
2		45	3.3V	88	12V	131	MIPI_DSI_TXD_HP1_p
3		46	12V	89	MIPI_DSI_TXD_LP0_p	132	
4		47	PWM	90		133	MIPI_DSI_TXD_HP1_n
5		48	RESX	91	MIPI_DSI_TXD_LP0_n	134	
6		49	GPIO_1	92		135	3.3V
7		50	GPIO_0	93	3.3V	136	12V
8		51	3.3V	94	12V	137	MIPI_DSI_TXD_HP0_p
9		52	12V	95	MIPI_DSI_TXCLK_LP_p	138	
10		53		96	GND	139	MIPI_DSI_TXD_HP0_n
11		54		97	MIPI_DSI_TXCLK_LP_n	140	
12		55		98	GND	141	3.3V
13		56		99	3.3V	142	12V
14		57	3.3V	100	12V	143	
15		58	12V	101		144	
16		59	MIPI_DSI_TXD_LP3_p	102		145	
17		60		103		146	
18		61	MIPI_DSI_TXD_LP3_n	104		147	3.3V
19		62		105	3.3V	148	12V
20		63	3.3V	106	12V	149	
21		64	12V	107	MIPI_DSI_TXD_HP3_p	150	
22		65		108		151	
23		66		109	MIPI_DSI_TXD_HP3_n	152	
24		67		110		153	3.3V
25		68		111	3.3V	154	12V
26	Vx1_RX_D1_p	69	3.3V	112	12V	155	MIPI_DSI_TXCLK_HP_p
27		70	12V	113	MIPI_DSI_TXD_HP2_p	156	GND
28	Vx1_RX_D1_n	71	MIPI_DSI_TXD_LP2_p	114		157	MIPI_DSI_TXCLK_HP_n
29		72		115	MIPI_DSI_TXD_HP2_n	158	GND
30	Vx1_RX_D0_p	73	MIPI_DSI_TXD_LP2_n	116		159	3.3V
31		74		117	3.3V	160	GND
32	Vx1_RX_D0_n	75	3.3V	118	12V	161	GND
33		76	12V	119		162	GND
34		77		120		163	GND
35		78		121		164	GND
36		79		122		165	GND
37		80		123	3.3V	166	GND
38		81	3.3V	124	12V	167	GND
39		82	12V	125		168	GND
40	GND	83	MIPI_DSI_TXD_LP1_p	126		169	GND
41	Vx1_RX_HTPDn	84		127		170	GND
42	Vx1_RX_LOCKn	85	MIPI_DSI_TXD_LP1_n	128		171	GND
43		86		129	3.3V	172	GND

## 5.2 Switch Specifications

Figure 5 shows the layout of switches.

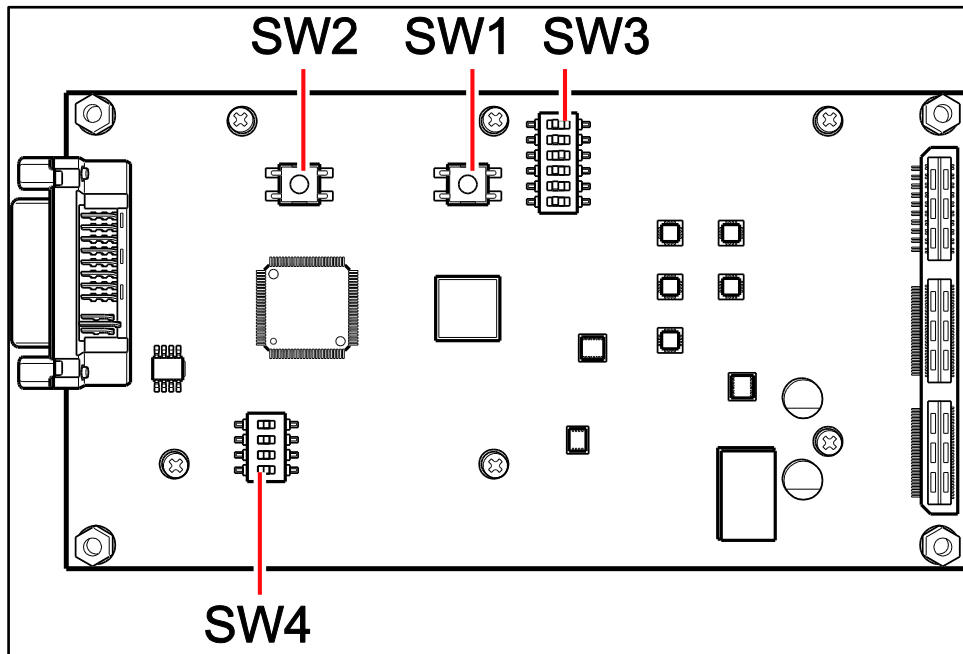


Figure 5 MIPI LCD Card Switch Layout

Functions of the switches are explained below.

Location	Function name	Default	Function
SW1	THCV217 Power management	–	OFF: Normal operation; ON: Power down
SW2	TFP401A Power management	–	OFF: Normal operation; ON: Power down
SW3	THCV217_Setting	DEMUX=ON, MODE=ON, RF=OFF, BET=ON, PRE=ON, COL=ON	DEMUX/MODE: Mode selection ON/ON: Dual-in/Dual-out ON/OFF: Single-in/Single-out OFF/ON: Single-in/Dual-out OFF/OFF: Reserved (Do not use) RF: Input clock triggering edge select input for latching input data OFF: Latch input data on the rising edge ON: Latch input data on the falling edge BET: Field Bit Enable ON: Normal operation, OFF: Field BET (bit error tester) Enabled PRE: Pre-emphasis level selection ON: 0%, OFF: 100% COL: Color bit depth selection ON: 10 bit, OFF: 8 bit
SW4	TFP401A_Setting	STAG=OFF, DFO=ON, OCK_INV=OFF, ST=ON	STAG: Staggered pixel select ON: Time-staggered even/odd pixel output OFF: Normal simultaneous even/odd pixel output DFO: Output clock data format ON: TFT support/ODCK runs continuously. OFF: DSTN support/ODCK is kept "Low" when DE is "Low". OCK_INV: ODCK polarity ON: Latch output data on the falling edge of ODCK OFF: Latch output data on the rising edge of ODCK ST: Output drive strength selection ON: Low drive strength, OFF: High drive strength

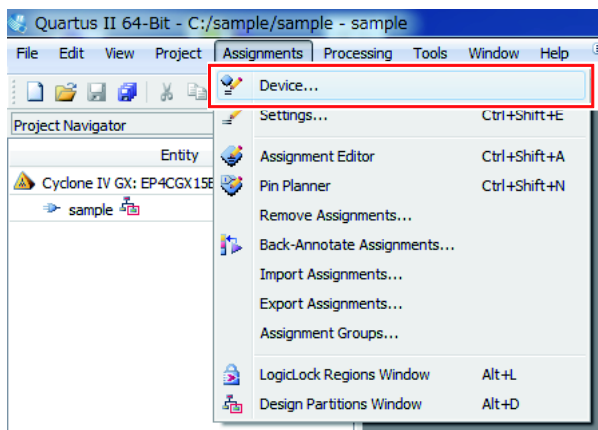


## 6. Operating Precautions

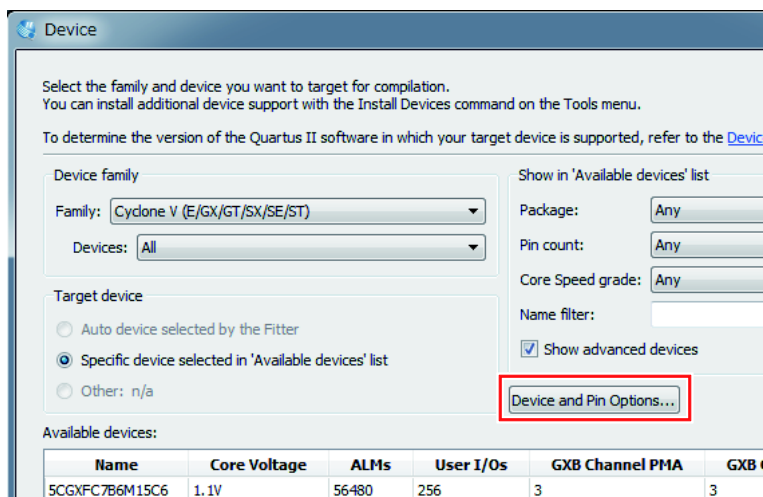
### 6.1 Mode Selection for Unused Pins

It is recommended that you set the pins which are not used on the hardware design to the tri-stated mode. Follow the steps below to configure unused pins in Quartus II.

- 1) Select the **"Assignments"** menu and then **[Device]**.

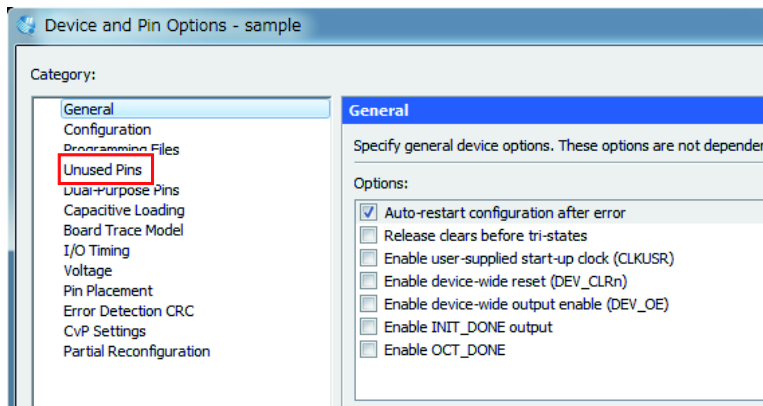


- 2) Click the **[Device & Pin Options]** button.

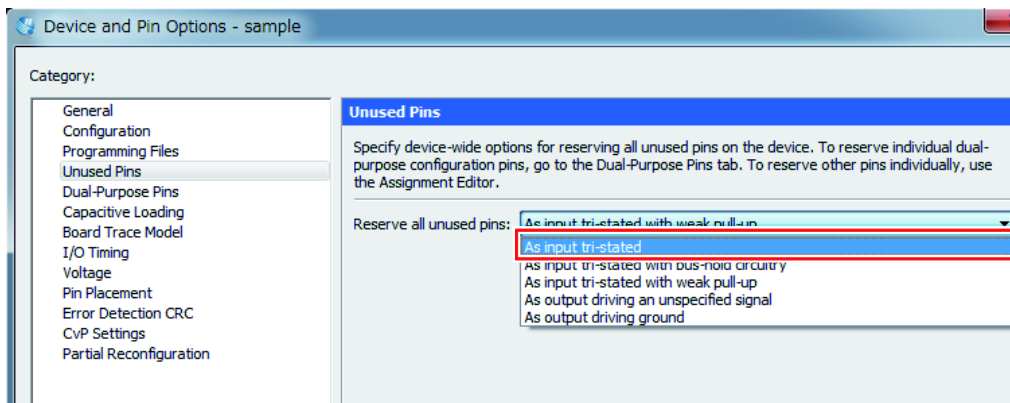


The **Device & Pin Options** window is displayed.

- 3) Select **[Unused Pins]**.



- 4) For "Reserve all unused pins", select **[As input tri-stated]**.



- 5) Click the **[OK]** button.
- 6) Click the **[OK]** button to close the **Device & Pin Options** window.

## 7. Document Revision History

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Date	Revision	Changes
September, 2014	1	<ul style="list-style-type: none"><li>• Document created</li></ul>
		<ul style="list-style-type: none"><li>• </li></ul>
		<ul style="list-style-type: none"><li>• </li></ul>