User Manual

IDK-2121W Series

TFT-LCD 21.5" FHD (LED Backlight)

ADVANTECH

Enabling an Intelligent Planet

Copyright

The documentation and the software included with this product are copyrighted 2016 by Advantech Co., Ltd. All rights are reserved. Advantech Co., Ltd. reserves the right to make improvements in the products described in this manual at any time without notice. No part of this manual may be reproduced, copied, translated or transmitted in any form or by any means without the prior written permission of Advantech Co., Ltd. Information provided in this manual is intended to be accurate and reliable. However, Advantech Co., Ltd. assumes no responsibility for its use, nor for any infringements of the rights of third parties, which may result from its use.

Acknowledgements

AMI is a trademark of American Megatrends Inc.

IBM and PC are trademarks of International Business Machines Corporation.

Intel® Core 2 Quad, Pentium Dual Core and Celeron are trademarks of Intel Corporation.

WinBond is a trademark of Winbond Corporation.

All other product names or trademarks are properties of their respective owners.

A Message to the Customer

Advantech Customer Services

Each and every Advantech product is built to the most exacting specifications to ensure reliable performance in the harsh and demanding conditions typical of industrial environments. Whether your new Advantech equipment is destined for the laboratory or the factory floor, you can be assured that your product will provide the reliability and ease of operation for which the name Advantech has come to be known.

Your satisfaction is our primary concern. Here is a guide to Advantech's customer services. To ensure you get the full benefit of our services, please follow the instructions below carefully.

Technical Support

We want you to get the maximum performance from your products. So if you run into technical difficulties, we are here to help. For the most frequently asked questions, you can easily find answers in your product documentation. These answers are normally a lot more detailed than the ones we can give over the phone.

So please consult this manual first. If you still cannot find the answer, gather all the information or questions that apply to your problem, and with the product close at hand, call your dealer. Our dealers are well trained and ready to give you the support you need to get the most from your Advantech products. In fact, most problems reported are minor and are able to be easily solved over the phone.

In addition, free technical support is available from Advantech engineers every business day. We are always ready to give advice on application requirements or specific information on the installation and operation of any of our products.

Product Warranty (2 years)

Advantech warrants to you, the original purchaser, that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products which have been repaired or altered by persons other than repair personnel authorized by Advantech, or which have been subject to misuse, abuse, accident or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

Because of Advantech's high quality-control standards and rigorous testing, most of our customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, you will be billed according to the cost of replacement materials, service time and freight. Please consult your dealer for more details.

If you think you have a defective product, follow these steps:

1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any onscreen messages you get when the problem occurs.

2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.

3. If your product is diagnosed as defective, obtain an RMA (return merchandise authorization) number from your dealer. This allows us to process your return more quickly.

4. Carefully pack the defective product, a fully-completed Repair and Replacement Order Card and a photocopy proof of purchase date (such as your sales receipt) in a shippable container. A product returned without proof of the purchase date is not eligible for warranty service.

5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

Contents

Chapter 1

Overview

1.1 General Description

IDK-2121W series is a Color Active Matrix Liquid Crystal Display composed of a TFT-LCD panel, a driver circuit, and backlight system. The screen format is intended to support the FHD (1920 (H) x 1080 (V)) screen and 16.7M colors (RGB 8-bit data). All input signals are dual-LVDS interface. Driver board for the backlight is included.

1.2 Display Characteristics

The following are characteristics offer a summary under 25°C condition:

Table 1.1: Display Characteristics		
Item	**Unit**	**Description**
Screen Diagonal	[mm]	546.86 (21.53")
Active Area	[mm]	476.64 (H) x 268.11 (V)
Pixels H x V		1920 (x3) x 1080
Pixel Pitch		248.25 (per one triad) × 248.25
Pixel Arrangement	[um]	RGB Vertical Stripe
Display Mode		VA Mode, Normally Black
White Luminance (Center)	[cd/m^2]	1200 (Typ.)
Contrast Ratio		5000:1 (Typ.)
Optical Response Time	[msec]	25 ms (Typ., on/off)
Input Voltage VDD	[Volt]	+5.0 V
Backlight Input Voltage	[Volt]	+12.0 V
Power Consumption (VDD line + LED line)	[Watt]	46.8 (Typ.) (with LED driver board, all white pattern)
Weight	[Grams]	R series: 3200 (Typ.) N series: 2400 (Typ.)
Physical Size	[mm]	R series: 495.6(W) × 292.2(H) × 15.58(D) Typ. N series: 495.6(W) × 292.2(H) × 11.63(D) Typ.
Electrical Interface		Dual channel LVDS
Support Color		16.7M colors (RGB 8 bits)
Surface Treatment		Anti-Glare, 3H
Temperature Range		N-series/R series
Operating	[°C]	0 to 55
Storage (Shipping)	[°C]	0 to 60
RoHS Compliance		RoHS Compliance

1.3 Optical Characteristics

| Table 1.2: Display Characteristics						
Item	**Unit**	**Conditions**	**Min.**	**Typ.**	**Max.**	**Note**
Viewing Angle	[degree]	Horizontal CR = 1	150	178	-	1, 2
		Vertical CR = 10	150	178	-	
Contrast Ratio		Normal Direction	-	5000	-	3
Response Time	[msec]	Raising Time (TrR)	-	20	25	4
		Falling Time (TrF)	-	5	10	
		Raising + Falling	-	25	35	
Color Temperature			6500K	8500K	11000K	5
Central Luminance	[cd/m^2]		1100	1200	-	6
Luminance Uniformity	[%]		75	80	-	7
Crosstalk (in 60Hz)	[%]				1.5	8
Flicker	dB				-20	9

Note 1: Measurement Method

Before measuring, the LCD module should be turned on for 30 minutes at room temperature. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 30 minutes in a stable, windless and dark room.
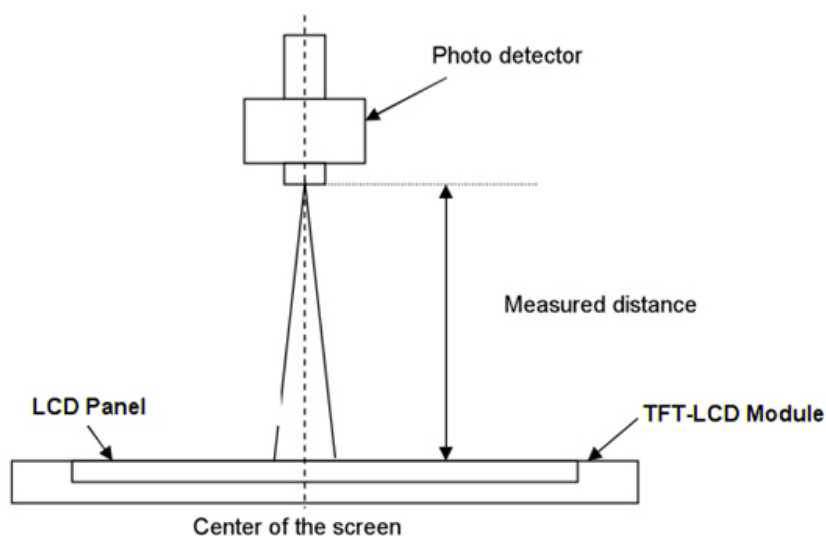
**Note 2**: Definition of viewing angle measured by ELDIM (EZContrast 88)

Viewing angle is the measurement of contrast ratio at the screen center, over a 180° horizontal and 180° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as : 90° (θ)? horizontal left and right, and 90° (Φ) vertical high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated to its center to develop the desired measurement viewing angle.
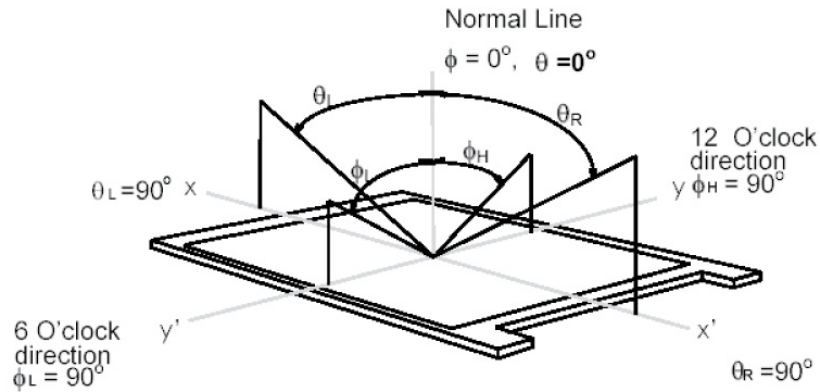
Note 3: Contrast ratio is measured by TOPCON SR-3

Note 4: Definition of Response time measured by Westar TRD-100A

The output signals of photo detector are measured when the input signals are changed from "Full Black" to "Full White" (rising time, T_{rR}), and from "Full White" to "Full Black" (falling time, T_{rF}), respectively. The response time is interval between the 10% and 90% (1 frame at 60Hz) of amplitudes.
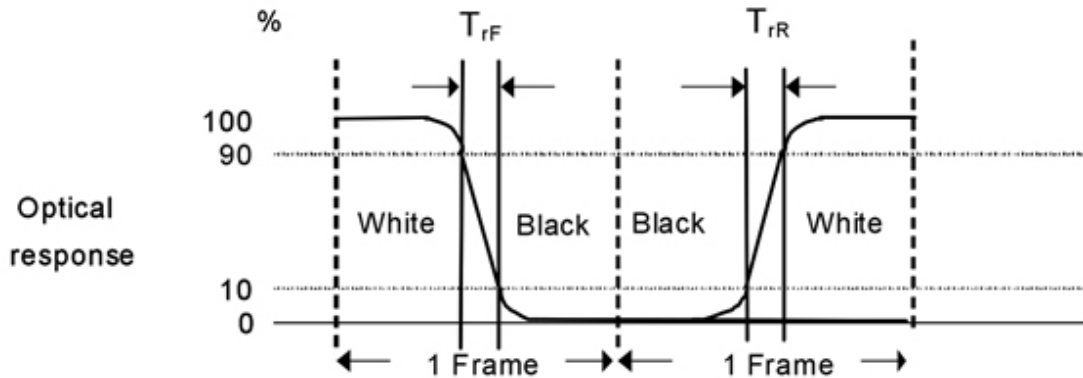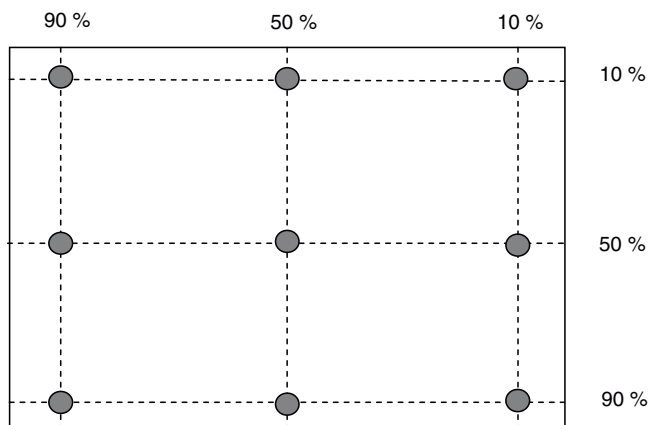

$T_{rR} + T_{rF} = 16$msec (typ.)

Note 5: Color chromaticity and coordinates (CIE) is measured by TOPCON SR-3

Note 6: Central luminance is measured by TOPCON SR-3

Note 7: Luminance uniformity of these 9 points is defined as below and measured by TOPCON SR-3

$$\text{Uniformity} = \frac{\text{Minimum Luminance in 9 points (1 - 9)}}{\text{Maximum Luminance in 9 Points (1 - 9)}}$$

Note 8: Crosstalk is defined below and is measured by TOPCON SR-3

CT = | YB- YA| / YA * 100 (%)

Where

YA = Luminance of measured location without gray level 0 pattern (cd/m2)

YB = Luminance of measured location with gray level 0 pattern (cd/m2)
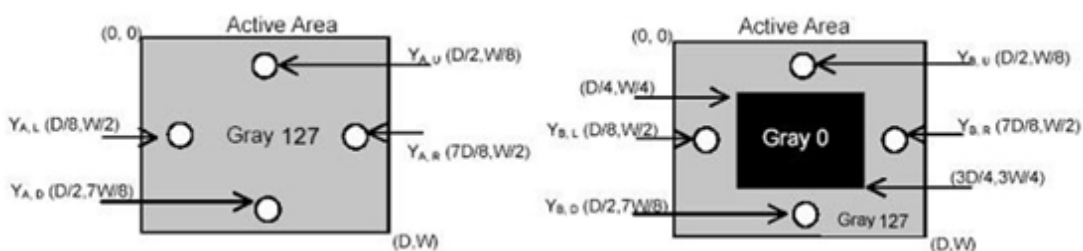
Note 9: Test Pattern: subchecker pattern measured by TOPCON SR-3
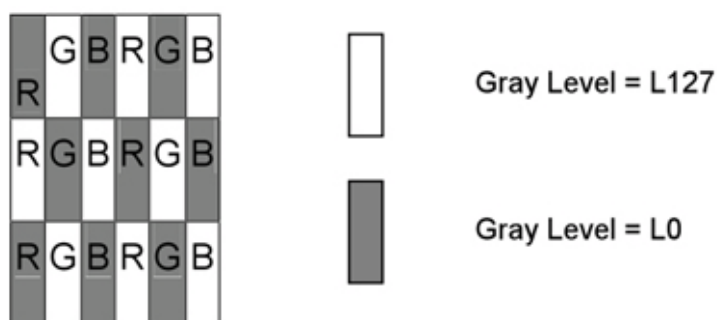
Method: Record dB value with TRD-100

$$\text{Flicker (dB)} = 20\log\frac{\text{AC Level(at 30 Hz)}}{\text{DC Level}}$$
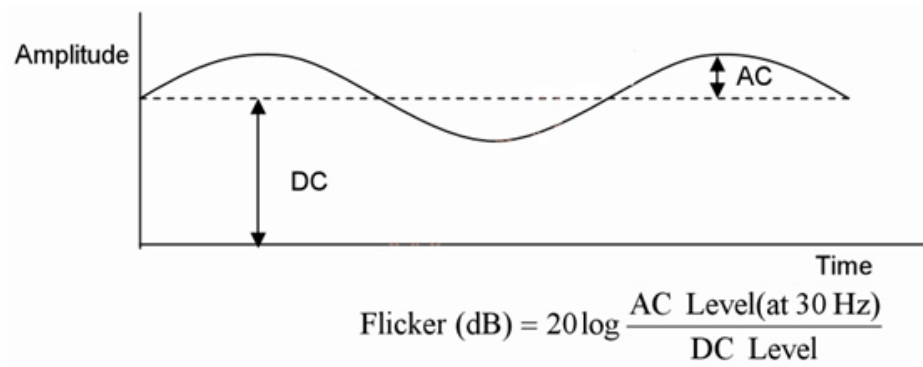
1.4 Functional Block Diagram

The following diagram shows the functional block diagram of the 21.5 inch Color TFT-LCD Module:
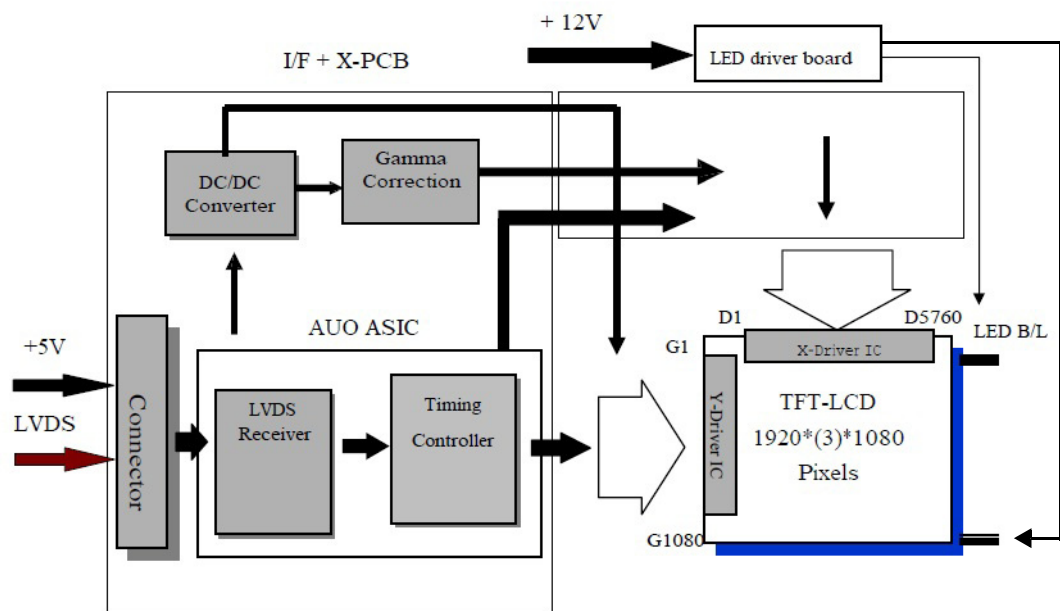
Figure 1.1 Functional Block Diagram

1.5 Absolute Maximum Ratings

Absolute maximum ratings of the module is as following:

1.5.1 Absolute Ratings of TFT LCD Module

Item	Symbol	Min.	Max.	Unit	Conditions
Logic/LCD Drive Voltage	VDD	0	5.5	[Volt]	Note 1,2

1.5.2 Absolute Ratings of Environment

Item	Symbol	Min.	Max.	Unit	Conditions
Operating Temperature	TOP	0	55	[°C]	
Operating Humidity	HOP	10	+90	[%RH]	Note 3, 4
Storage Temperature	TST	-20	60	[°C]	
Storage Humidity	HST	5	90	[%RH]	

Note 1: Within Ta (25°C)

Note 2: Permanent damage to the device may occur if exceeding maximum values

Note 3: For quality performance, please refer to AUO IIS (Incoming Inspection Standard).

1.6 Outline Dimensions

1.6.1 IDK-2121WR-K2FHA2E

Front View
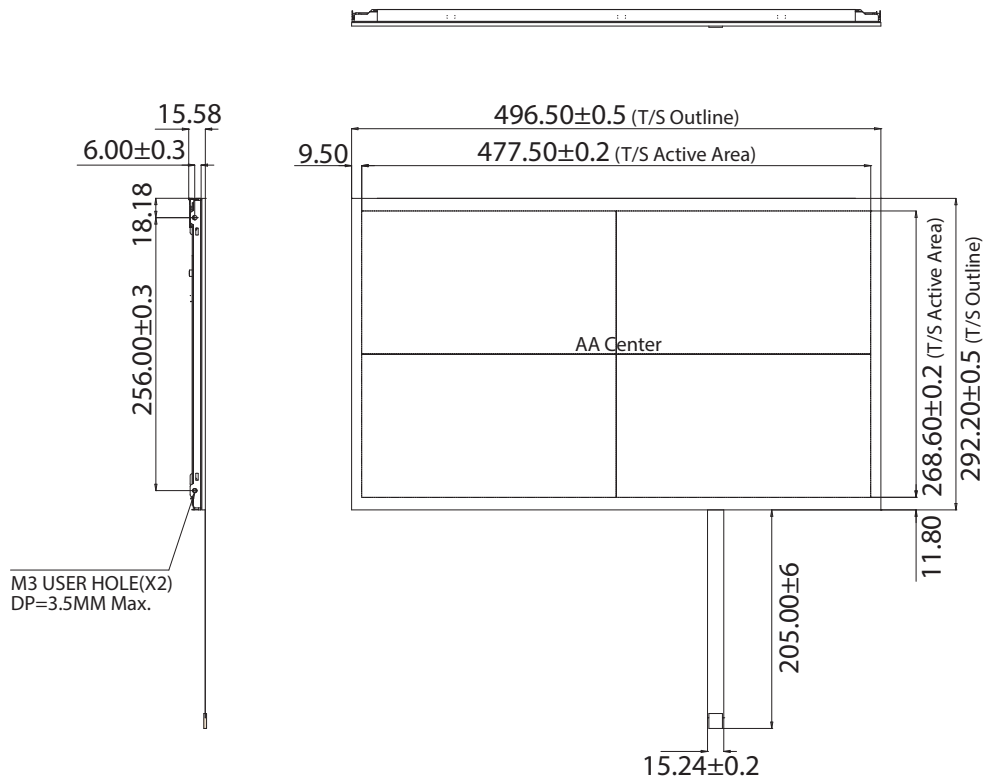
Rear View
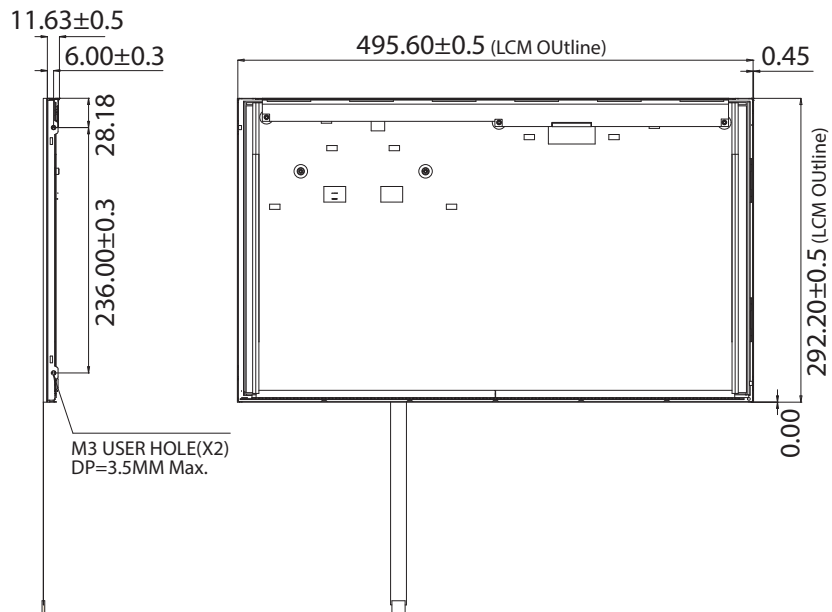
1.6.2 IDK-2121WN-K2FHA2E

Front View

495.60±0.5 (Outline)
479.84±0.5 (Bezel Outline)
476.64 (Active Area)

6.00±0.3
18.18
256.00±0.3
146.10
135.66
134.06
AA Center
268.11
271.31±0.5 (Bezel OUtline)
292.20±0.5 (OUtline)

M3 USER HOLE(X2)
DP=3.5MM Max.

Rear View

11.63±0.5
6.00±0.3
28.18
236.00±0.3

M3 USER HOLE(X2)
DP=3.5MM Max.
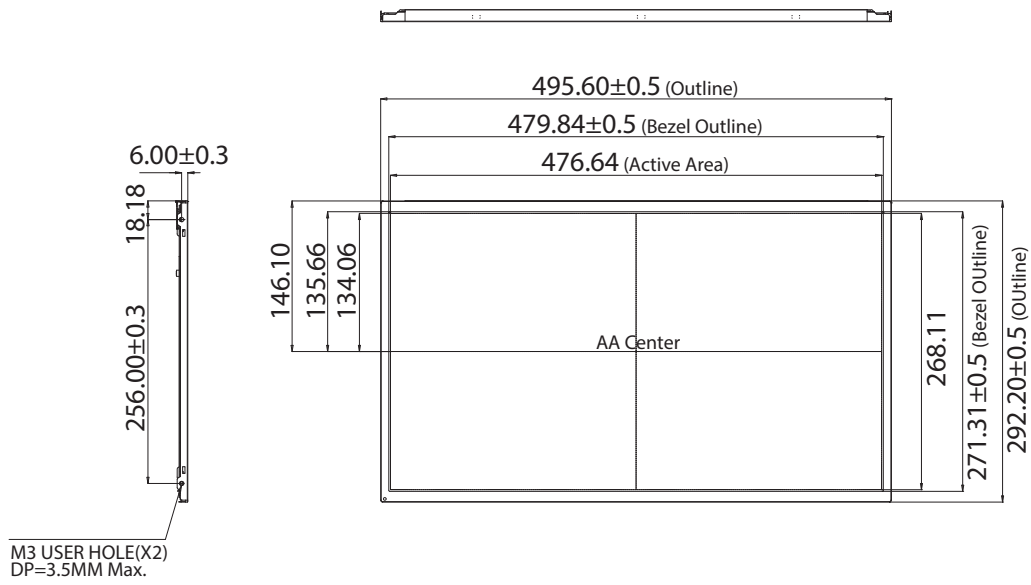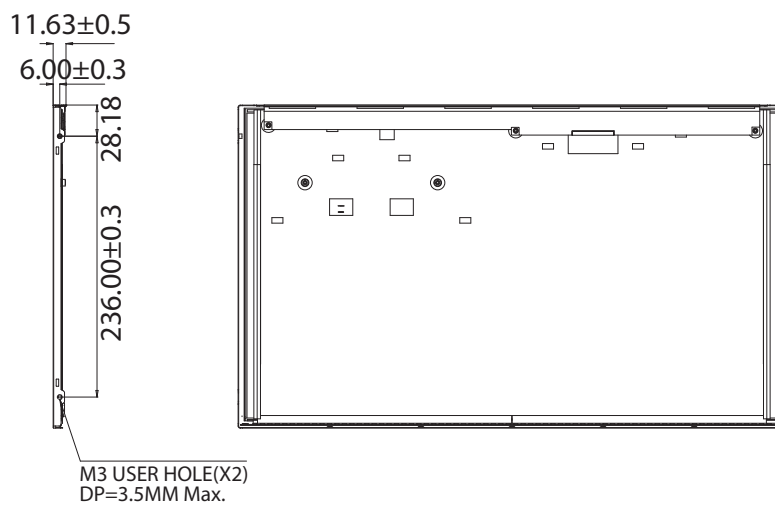
Chapter 2

Electrical Characteristics

2.1 TFT LCD Power Consumption

Input power specifications are as follows:

Table 2.1: Power Specification						
Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
VDD	Logic/LCD Drive Voltage	4.5	5.0	5.5	[Volt]	$\pm10\%$
IDD	Input Current	-	0.7	0.8	[A]	VDD= 5.0V,All white pattern, At 60Hz
PDD	VDD Power	-	3.5	4.4	[Watt]	VDD= 5.0V,All white pattern, At 60Hz
IRush	Inrush Current	-	-	3	[A]	Note 1

Note 1: Measurement condition: The duration of raising time of power input is 47us.

VDD rising time
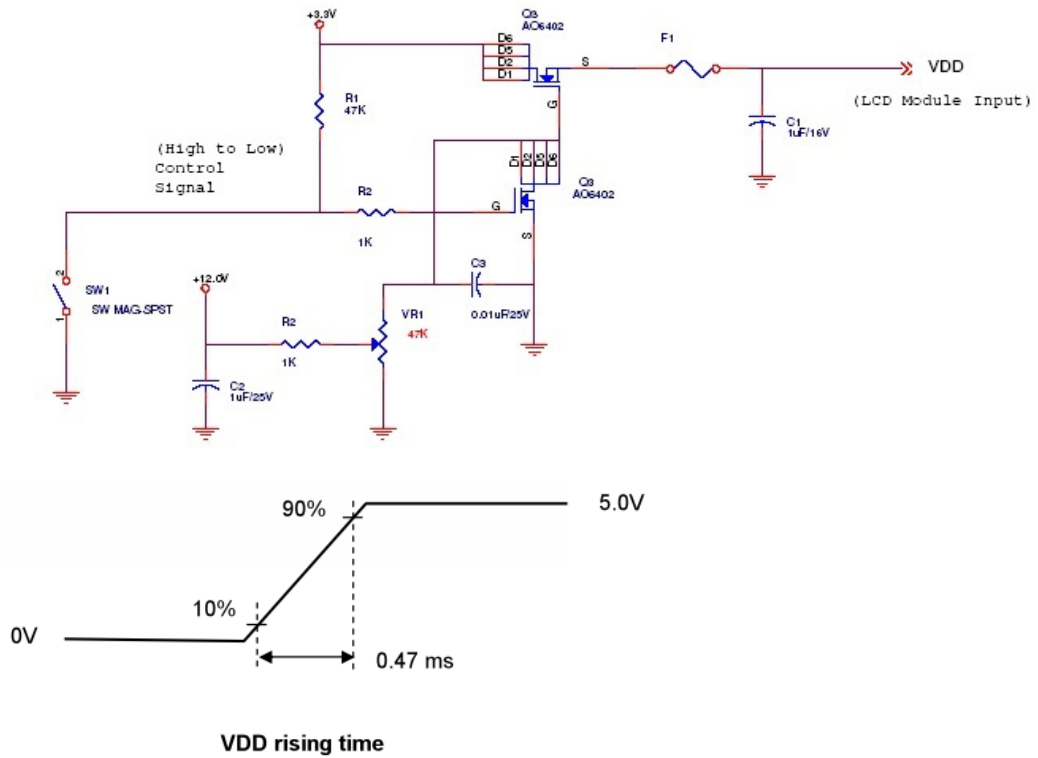
2.1.1 Signal Electrical Characteristics

Input signals shall be low or Hi-Z state when VDD is off.

Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
V$_{TH}$	Differential Input High Threshold	-	-	+100	[mV]	VCM = 1.2V, Note 1
V$_{TL}$	Differential Input Low Threshold	-100	-	-	[mV]	VCM = 1.2V Note 1
| V$_{ID}$ |	Input Differential Voltage	100	-	600	[mV]	Note 1
V$_{CM}$	Differential Input Common Mode Voltage	+1.0	+1.2	+1.5	[V]	VTH-VTL = 200MV (max) Note 1

Table 2.2: Signal Electrical Characteristics

Note: LVDS Signal Waveform.

2.2 Backlight Driving Conditions
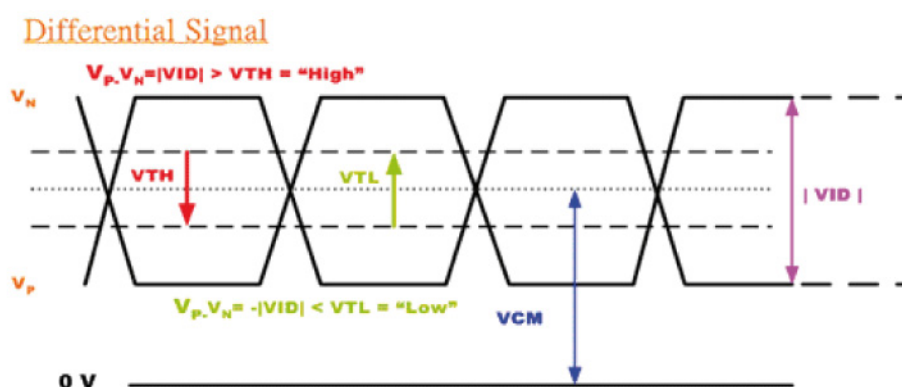
Parameter guideline for LED Light Bar Driver is under stable conditions at 25°C (Room Temperature):

Table 2.3: Backlight Driving Conditions

Item	Symbol	Values			Unit	Condition
		Min.	Typ.	Max.		
LED Voltage	VL	-	-	39	V	Note 2
LED Current	IL	-	-	600 x 2	mA	Note 2
LED life time	-	50,000	-	-	Hr	Note 1

Note 1: The "LED lifetime" is defined as the module brightness decreased to 50% original brightness and the ambient temperature is 25°C and typical LED Current at 950 mA.

Note 2: The LED driving condition is defined for each LED module (10 LED Serial).

Note 3: The variance of LED Light Bar power consumption is 10%. Calculator value for reference (IL x VL x 2 = PLED)
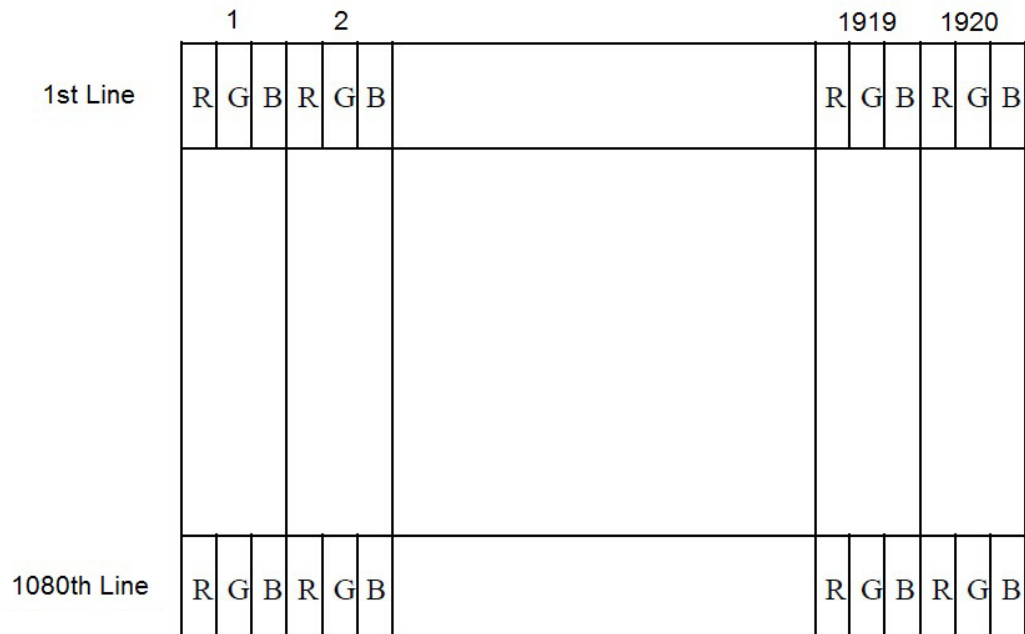
Chapter 3

Signal Characteristics

3.1 Pixel Format Image

The following figure shows the relationship between input signal and LCD pixel format.

3.2 Pin Description

The module uses a pair of LVDS receivers SN75LVDS82 (Texas Instruments) or compatible. LVDS is a differential signal technology for LCD interface and high speed data transfer device. Transmitter shall be SN75LVDS83 (negative edge sampling) or compatible. The first LVDS port (RxOxxx) transmits odd pixels while the second LVDS port (RxExxx) transmits even pixels.

Table 3.1: Pin Description		
Pin No.	Symbol	Description
1	RxO0-	Negative LVDS differential data input (Odd data)
2	RxO0+	Positive LVDS differential data input (Odd data)
3	RxO1-	Negative LVDS differential data input (Odd data)
4	RxO1+	Positive LVDS differential data input (Odd data)
5	RxO2-	Negative LVDS differential data input (Odd data, H-Sync,V-Sync,DSPTMG)
6	RxO2+	Positive LVDS differential data input (Odd data, H-Sync,V-Sync,DSPTMG)
7	GND	Power Ground
8	RxOC-	Negative LVDS differential clock input (Odd clock)
9	RxOC+	Positive LVDS differential clock input (Odd clock)
10	RxO3-	Negative LVDS differential data input (Odd data)
11	RxO3+	Positive LVDS differential data input (Odd data)
12	RxE0-	Negative LVDS differential data input (Even data)
13	RxE0+	Positive LVDS differential data input (Even data)
14	GND	Power Ground

Table 3.1: Pin Description		
15	RxE1-	Negative LVDS differential data input (Even data)
16	RxE1+	Positive LVDS differential data input (Even data)
17	GND	Power Ground
18	RxE2-	Negative LVDS differential data input (Even data)
19	RxE2+	Positive LVDS differential data input (Even data)
20	RxEC-	Negative LVDS differential clock input (Even clock)
21	RxEC+	Positive LVDS differential clock input (Even clock)
22	RxE3-	Negative LVDS differential data input (Even data)
23	RxE3+	Positive LVDS differential data input (Even data)
24	GND	Power Ground
25	NC	No connection (for AUO test only. Do not connect)
26	NC	No connection (for AUO test only. Do not connect)
27	NC	No connection (for AUO test only. Do not connect)
28	VDD	Power +5V
29	VDD	Power +5V
30	VDD	Power +5V

Note 1: Input signals for odd and even clock shall use the same timing.
Note 2: Please follow VESA standard.

3.3 The Input Data Format
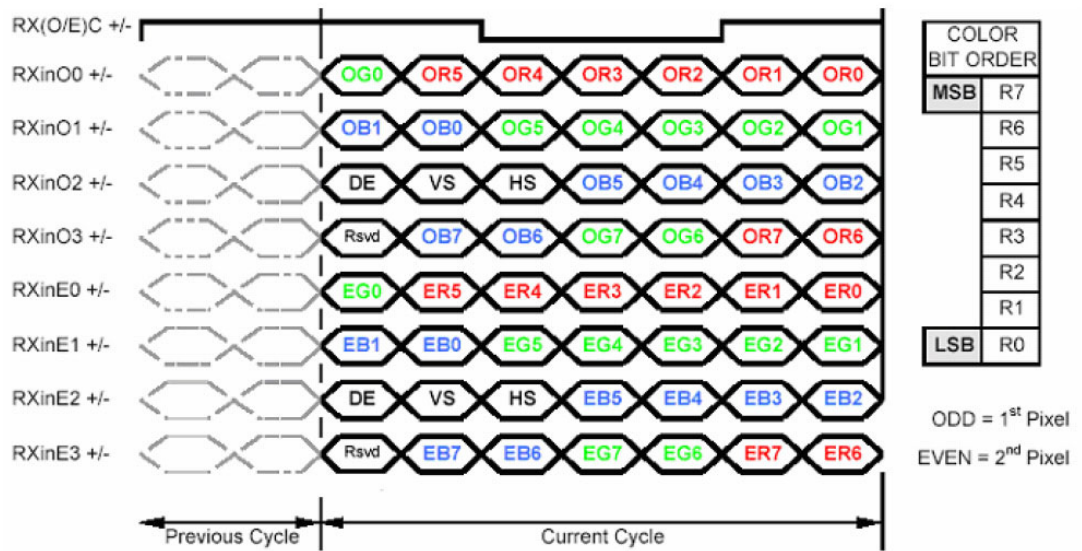
Note 1: Normally DE mode only. VS and HS on EVEN channel are not used.
Note 2: Please follow VESA standard.
Note 3: 8-bit In
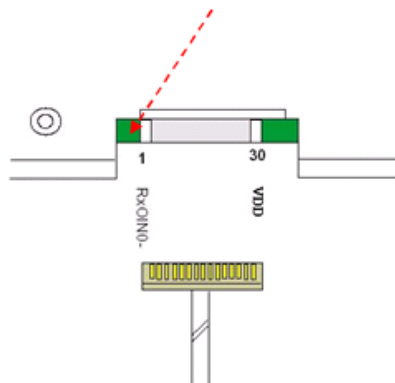
3.4 Interface Timing

3.4.1 Timing Characteristics

Signal Name	Item	Symbol	Min.	Typ.	Max.	Unit
Clock	Frequency	1/ TClock	40	72	83	MHz
Frame Rate	Frequency	1/Tv	50	60	75	Hz
Vertical Section	Period	TV	1092	1130	1653	T_line
	Active	TVD	1080	1080	1080	
	Blanking	TVB	12	50	573	
Horizontal Section	Period	TH	1004	1050	1100	T_clock
	Active	THD	960	960	960	
	Blanking	THB	44	90	1140	

Note: DE mode.

3.4.2 Input Timing Diagram
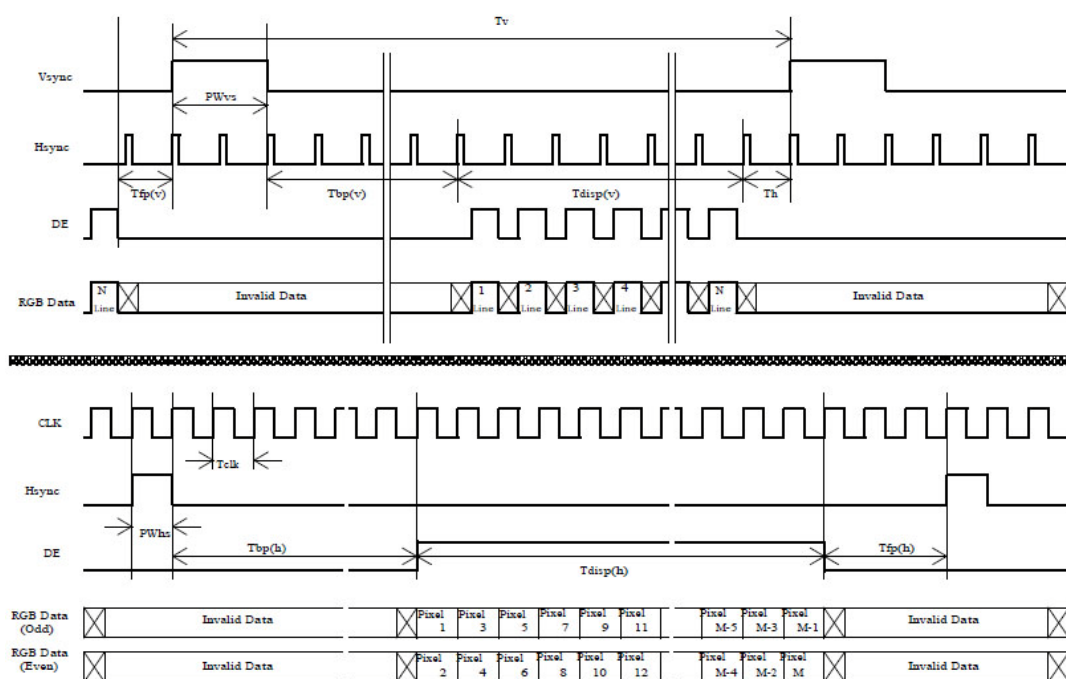
3.5 Power ON/OFF Sequence

VDD power and lamp on/off sequence is shown below. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off.
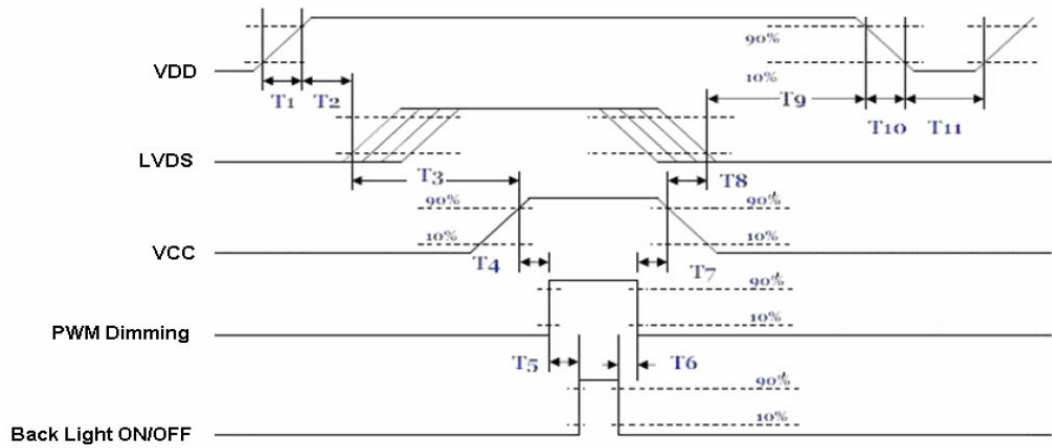
Power Sequence Timing

Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	0.5	-	10	[ms]
T2	30	40	50	[ms]
T3	200	-	-	[ms]
T4	0.5	-	10	[ms]
T5	10	-	-	[ms]
T6	10	-	-	[ms]
T7	0	-	-	[ms]
T8	10	-	-	[ms]
T9	-	-	10	[ms]
T10	110	-	-	[ms]
T11	0	16	50	[ms]
T12	-	-	10	[ms]
T13	1000	-	-	[ms]

Chapter 4

Connector & Pin Assignment

4.1 TFT LCD Module

The physical connector interface is described below. These connectors are capable of accommodating the following signals and components.

4.1.1 Connector

Table 4.1: Connector	
Connector Name / Description	**Interface Connector / Interface card**
Manufacturer	JAE or compatible
Type Part Number	JAE (FI-XB30SRL-HF11) or equivalent
Mating Housing Part Number	FI-X30HL (JAE) or compatible

4.1.2 Pin Assignment

Table 4.2: Pin Assignment			
Pin No.	**Signal Name**	**Pin No.**	**Signal Name**
1	RxOIN0-	2	RxOIN0+
3	RxOIN1-	4	RxOIN1+
5	RxOIN2-	6	RxOIN2+
7	GND	8	RxOCLKIN-
9	RxOCLKIN+	10	RxOIN3-
11	RxOIN3+	12	RxEIN0-
13	RxEIN0+	14	GND
15	RxEIN1-	16	RxEIN1+
17	GND	18	RxEIN2-
19	RxEIN2+	20	RxECLKIN-
21	RxECLKIN+	22	RxEIN3-
23	RxEIN3+	24	GND
25	NC	26	NC
27	NC	28	VDD
29	VDD	30	VDD

4.2 Backlight Unit

The physical connector interface is described below. These connectors are capable of accommodating the following signals and components.

4.2.1 Input Connector for LED Driver Board

Connector Name / Designation	**Interface Connector / Interface card**
Manufacturer	JST or compatible
Type Part Number	PHR-6 or compatible

4.2.1.1 LED driver board input connector pin define (CN4):

Pin No.	Pin Definition
1	Vin (+12V)
2	Vin (+12V)
3	GND
4	GND
5	ON/OFF(0V: Off ; +5V: On)
6	Dimming (PWM)

4.2.1.2 LED driver board output connector pin define

(CN3) Input Connector

Pin No.	Symbol	Description
1	Vin	Input Voltage 12V
2	Vin	Input Voltage 12V
3	GND	Ground
4	GND	Ground

(CN1) Input Connector

Pin No.	Symbol	Description
1	Variable Resistor	VR High Voltage
2	Variable Resistor	VR
3	Variable Resistor	VR Low Voltage

(CN2) Input Connector

Pin No.	Symbol	Description
1	Light sensor	Sensor High Voltage
2	Light sensor	Sensor Low Voltage

(CN5, CN6) Output Connector

Pin No.	Symbol	Description
1	Output	Lamp High Voltage
2	Output	Lamp Low Voltage

4.2.2 LED Driver Board

4.2.2.1 Specifications:

Table 4.3: Specifications						
Symbol	Characteristics	Condition	Min.	Typ.	Max.	Unit
Input	Voltage		10.8	12	13.2	V
	Efficiency	Vin=12V, Iout=950mA, Vout=19V		85		%
	Power	1 port output	23		24	W
Output	Voltage			39		V
	Current	1 port output	60		1200	mA
	Current Accuracy	150mA≤Iout≤950mA		±5	±10	%

Table 4.3: Specifications

	Protection	OVP		
Environment	Operating Temperature	-20	+70	°C
	Storage Temperature	-40	+ 85	°C
Dimmer (Note 1)	Dimmer range	5	100	%
	Dimmer Frequency	0.5	40	KHz
ON/OFF Voltage	Von	1.5	5	V
	Voff	0	0.8	V

4.2.2.2 LED driver board dimensions
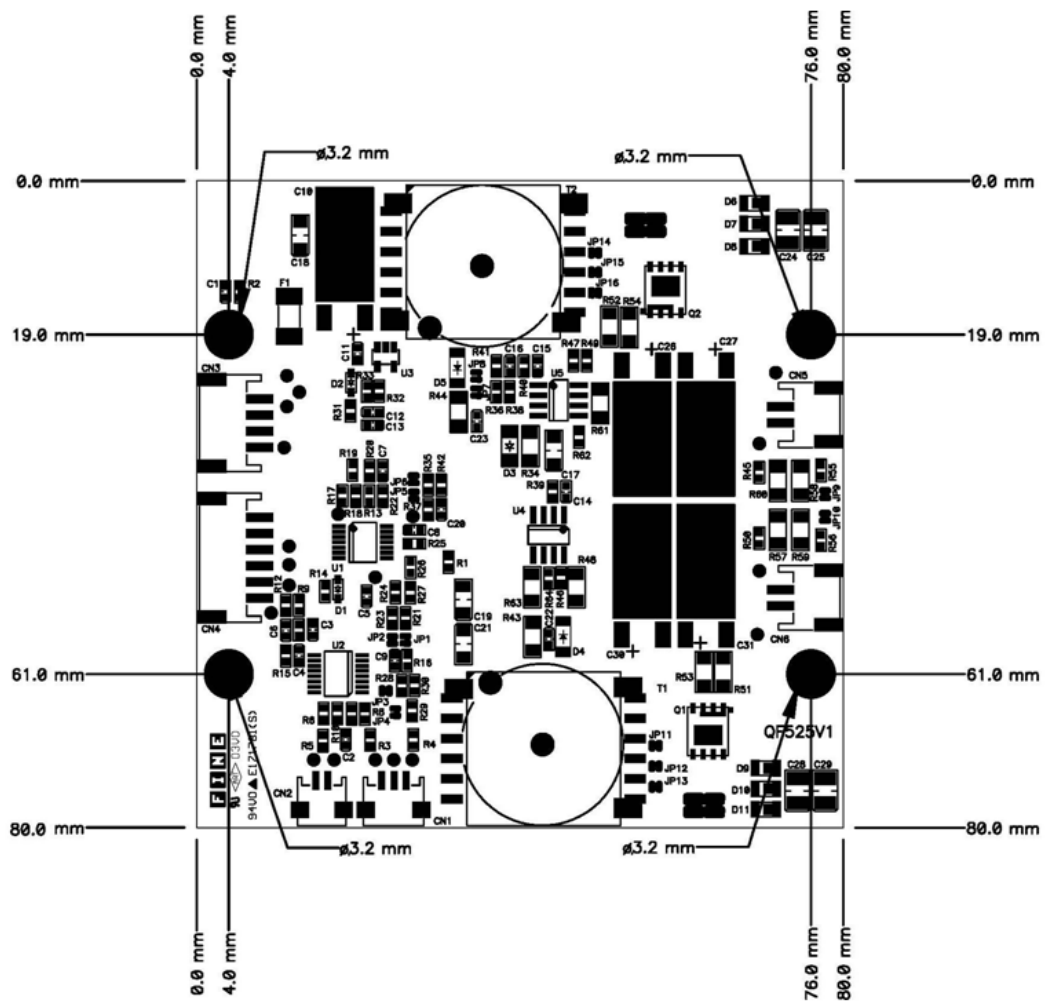
Figure 4.1 Dimensions

Appendix A

Handling Precautions

A.1 Optical Characteristics

The optical characteristics are measured under stable conditions at 25°C (Room Temperature)

1. Since the front polarizer is easily damaged, pay attention not to scratch it.
2. Be sure to turn off the power supply when inserting or disconnecting from the input connector.
3. Wipe off water drops immediately. Long contact with water may cause discoloration or spots.
4. When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
5. Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface.
6. Since CMOS LSI is used in this module, take care of static electricity and insure you are grounded to an earth ground when handling.
7. Do not open or modify the Module Assembly.
8. Do not press the reflector sheet at the back of the module from any direction.
9. In case a module has to be put back into the packing container slot after it was taken out, please press the far end of the LED light bar reflector edge softly, otherwise the TFT Module may be damaged.
10. At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.
11. After installation of the TFT Module into an enclosure, no bending/twisting forces should be applied to the TFT Module. Otherwise the TFT Module may be damaged.
12. Small amounts of materials having a no flammability grade are used in the LCD module. The LCD module should be supplied by power complying with the requirements of Limited Power Source (IEC60950 or UL1950)

ADVANTECH

Enabling an Intelligent Planet

www.advantech.com