



**User Manual**

# **IDK-121R-42XGA1**

**TFT-LCD 12" XGA (LED Backlight)**

**ADVANTECH**

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# Chapter 1

Overview

## 1.1 General Description

IDK-121R-42XGA1 is a Color Active Matrix Liquid Crystal Display composed of a TFT-LCD panel, a driver circuit, backlight system and 5-wire resistive touch. The screen format is intended to support the XGA (1024(H) x 768(V)) screen and 16.2M/262k colors (RGB). All input signals are LVDS interface compatible. A driver board for the backlight is included.

## 1.2 Display Characteristics

The following items are display characteristics under 25°C conditions.

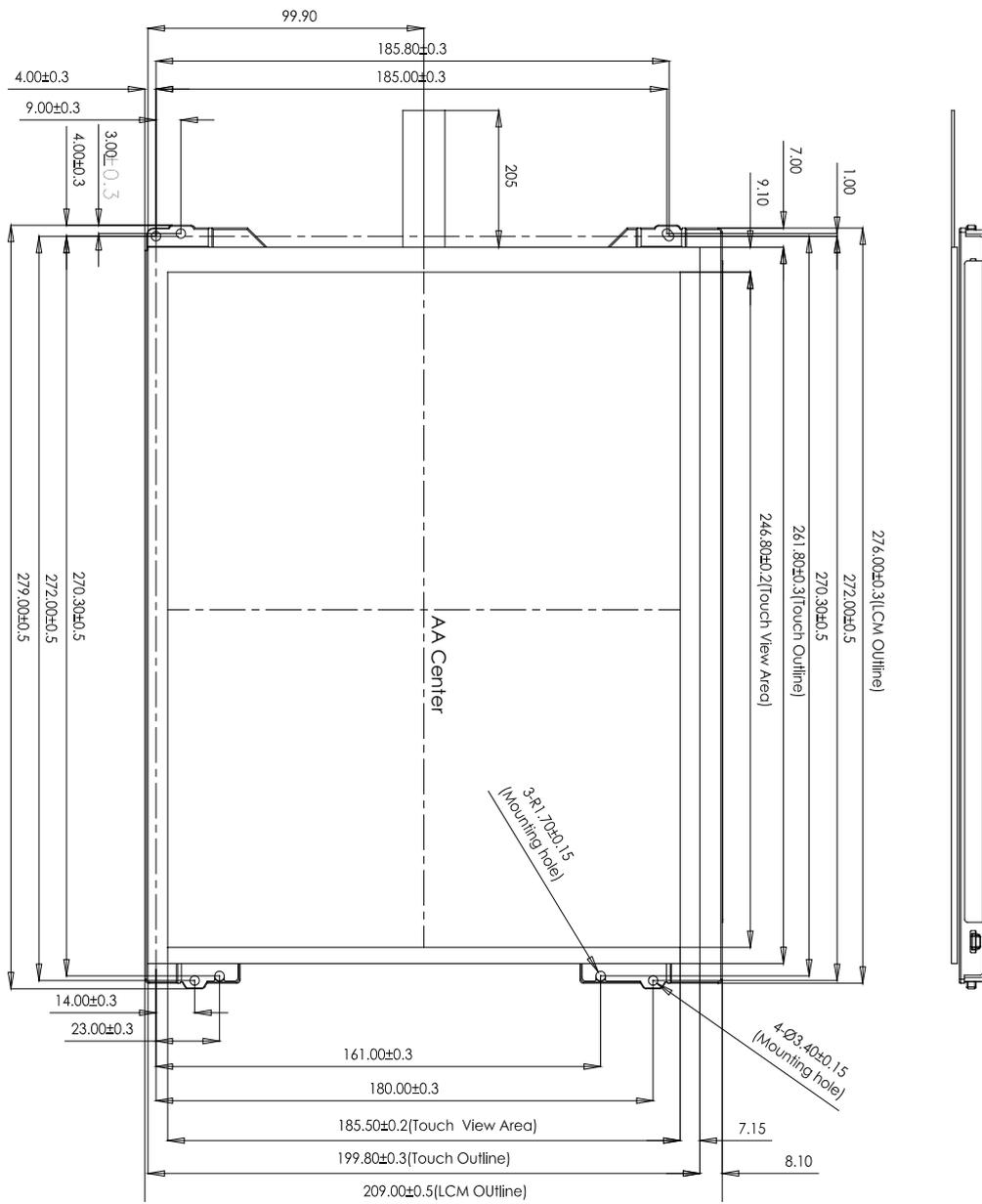
Items	Specifications	Unit
Screen Diagonal	12.1	inch
Active Area	245.76(H) x 184.32(V)	mm
Pixels H x V	1024 x 3 (RGB) x 768	-
Pixel Pitch	0.24 x 0.24	mm
Pixel Arrangement	R.G.B. Vertical Stripe	-
Display Mode	TN, Normally White	-
Nominal Input Voltage VDD	3.3 (typ)	Volt
Typical Power Consumption	9.23 (typ) All black pattern	Watt
Weight	740 (Max.)	Grams
Physical Size	276.0(H) x 209.0(V) x 11.84(D) (Typ.)	mm
Electrical Interface	1 channel LVDS	
Surface Treatment	Anti-glare, Hardness 3H	
Support Color	16.2M / 262K colors	
Temperature Range		
Operating	-20 to +70	°C
Storage (Non-Operating)	-30 to +80	°C
RoHS Compliance	RoHS Compliance	

## 1.3 Mechanical Specification

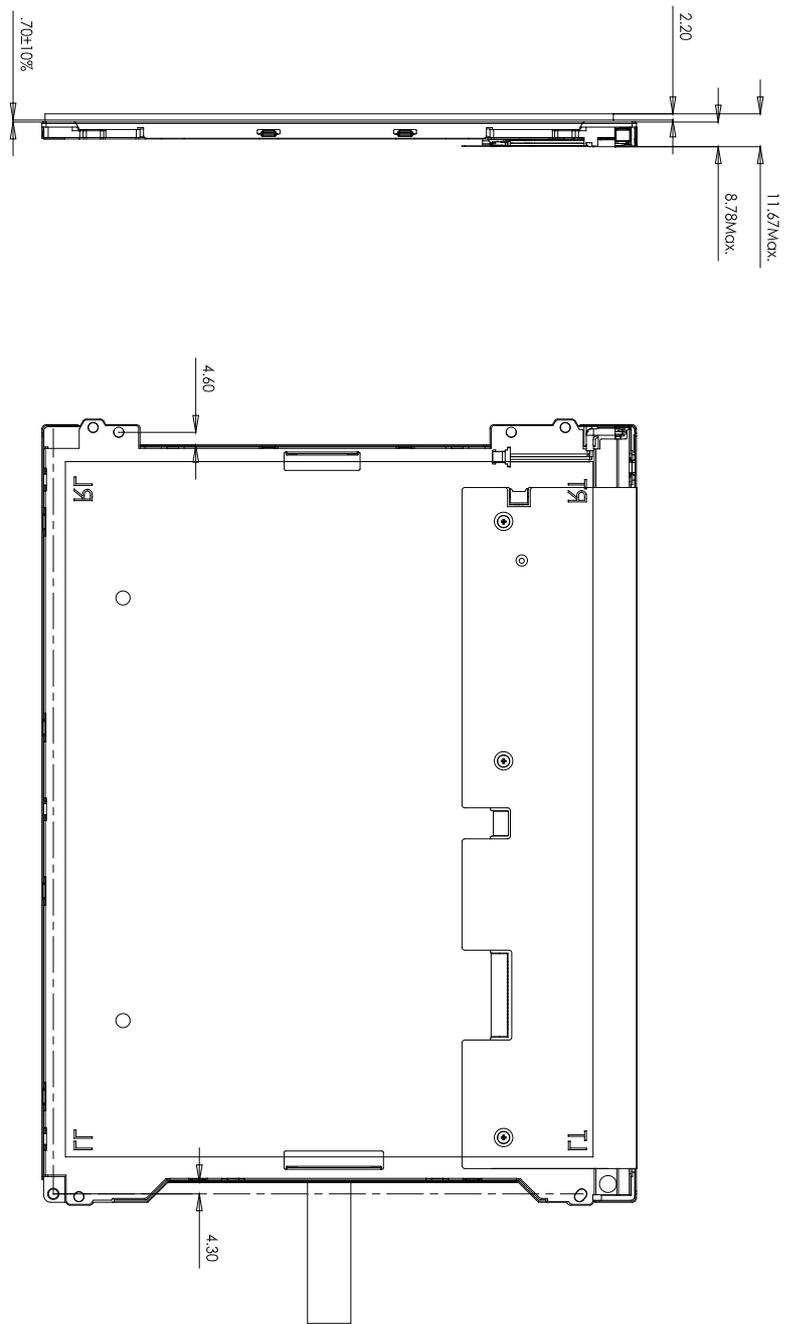
Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	-	276	-	mm	
	Vertical(V)	-	209	-	mm	
	Depth(D)	-	11.84	-	mm	
Weight		-	740	-	g	-

# 1.4 Mechanical Dimension

## 1.4.1 Frontview



## 1.4.2 Rearview



## 1.5 Absolute Maximum Ratings

### 1.5.1 Absolute Ratings of the TFT LCD Module

Item	Symbol	Value		Unit
		Min.	Max.	
Logic/LCD Drive Voltage	Vin	-0.3	+3.6	[Volt]

### 1.5.2 Absolute Environment Ratings

Item	Symbol	Value		Unit
		Min.	Max.	
Operating Temperature	TOP	-20	+70	°C
Operation Humidity	HOP	5	90	[%RH]
Storage Temperature	TST	-30	+80	°C
Storage Humidity	HST	5	90	[%RH]

**Note:** Maximum wet-bulb should be 39°C with no condensation.

## 1.6 Functional Block Diagram

The following diagram shows the functional block of the 12.1 inch color TFT/LCD module:

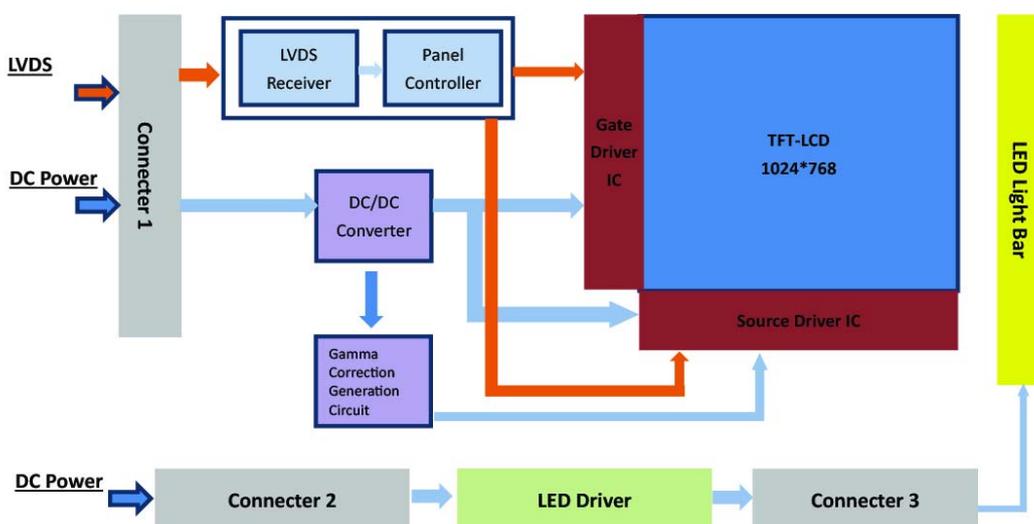


Figure 1.1 TFT LCD module



# Chapter 2

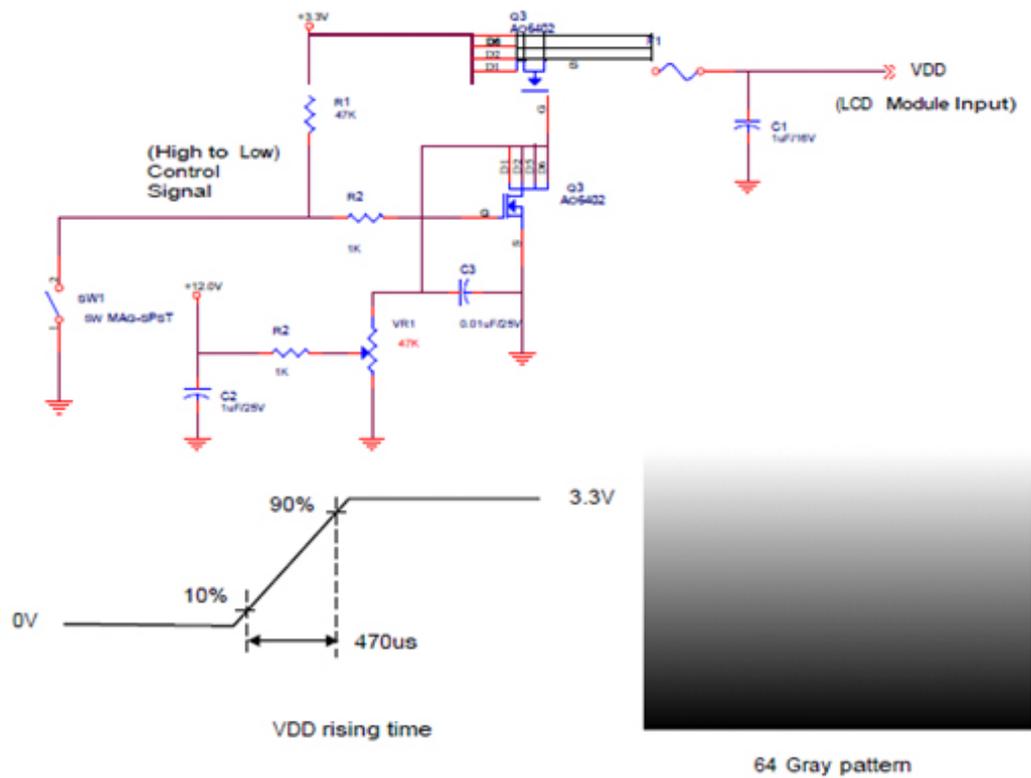
Electrical  
Characteristics

## 2.1 TFT LCD Module

### 2.1.1 Power specification

Parameter	Symbol	Value			Unit	Remark
		Min.	Typ.	Max.		
Logic/LCD Input Voltage	VDD	3.0	3.3	3.6	[Volt]	-
LCD Input Current	$I_{VDD}$	-	590	710	[mA]	VDD=3.3V at 60 HZ, all Black Pattern
LCD Power	$P_{VDD}$	-	1.95	2.34	[Watt]	VDD=3.3V at 60 HZ, all Black Pattern
LCD Inrush Current	$I_{rush\ LCD}$	-	-	3	[A]	Note 1; VDD=3.3V Black Pattern, Rising time=470us
Allowable Logic/LCD Drive Ripple Voltage	VDDrp	-	-	100	[mV]	VDD=3.3V at 60 HZ, all Black Pattern

**Note 1** Measurement condition.



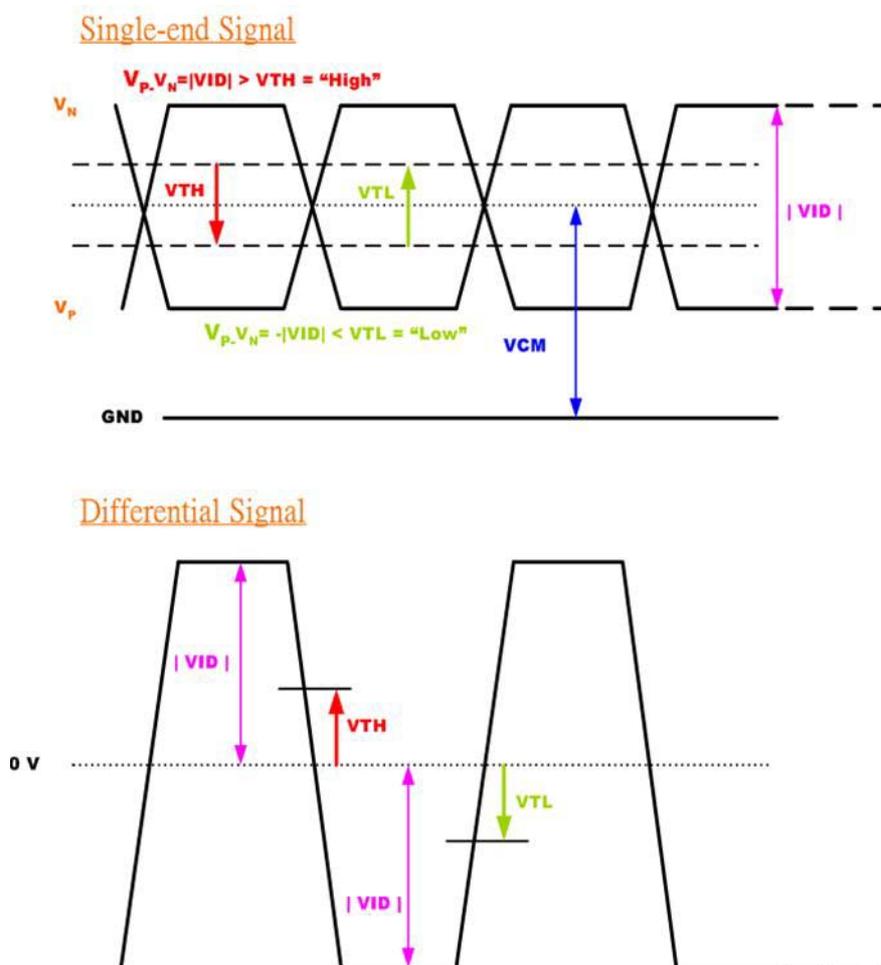
### 2.1.2 Signal Electrical Characteristics

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

Parameter	Symbol	Value			Unit	Remark
		Min.	Typ.	Max.		
Differential Input High Threshold	VTH	-	-	100	[mV]	VICM=1.2V

Differential Input Low Threshold	VTL	100	-	-	[mV]	VICM=1.2V
Input Differential Voltage	VID	100	400	600	[mV]	
Differential Input Common Mode Voltage	VICM	1.15	1.2	1.45	[V]	VTH/VTL=±100mV

**Note** LVDS Signal Waveform.



## 2.2 Backlight Unit

### 2.2.1 Parameter guideline for LCD

The following characteristics are measured under a stable conditions using an inverter at 25°C (Room Temperature):

Parameter	Symbol	Value			Unit	Remark
		Min.	Typ.	Max.		
Input Voltage	VCC	10.8	12	12.6	[Volt]	
Input Current	I <sub>VCC</sub>	-	0.6	-	[A]	100% PWM Duty
Power Consumption	P <sub>VCC</sub>	-	7.2	10	[Watt]	100% PWM Duty
Dimming Frequency	F <sub>PWM</sub>	200	-	20K	[Hz]	
Swing Voltage		3	3.3	5.5	[Volt]	
Dimming Duty Cycle		5	-	100	%	

LED Forward Current	$I_F$	-	110	-	[mA]	$T_a = 25^\circ\text{C}$
LED Forward Voltage	$V_F$	-	(30.33)	36	[Volt]	$I_F = 110\text{mA}, a = -30^\circ\text{C}$
		-	(27.81)	36	[Volt]	$I_F = 110\text{mA}, a = 25^\circ\text{C}$
		-	(26.1)	36	[Volt]	$I_F = 110\text{mA}, a = 85^\circ\text{C}$
LED Power Consumption	$P_{LED}$	-	(6.12)	7.92	[Watt]	
Operation Lifetime		50,000	-	-	Hrs	$I_F = 110\text{mA}, T_a = 25^\circ\text{C}$

**Note 1**  $T_a$  means ambient temperature of TFT-LCD module.

**Note 2**  $V_{CC}, I_{VCC}, I_{rush\ LED}, P_{VCC}$  are defined for LED B/L.(100% duty of PWM dimming)

**Note 3**  $I_F, V_F$  are defined for one channel LED. There are two LED channel in back light unit.

**Note 4** If IDK-1112R-45SVA1E module is driven by high current or at high ambient temperature & humidity condition. The operating life will be reduced.

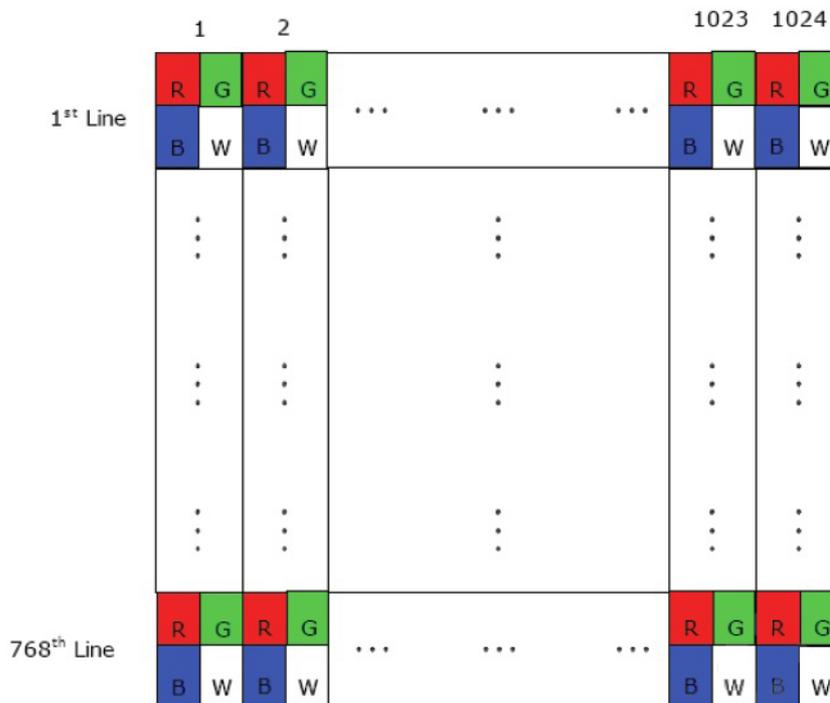
**Note 5** Operating life means brightness goes down to 50% initial brightness. Minimum operating life time is estimated data.

# Chapter 3

## Signal Characteristics

## 3.1 Pixel Format Image

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



### 3.1.1 Pin Description

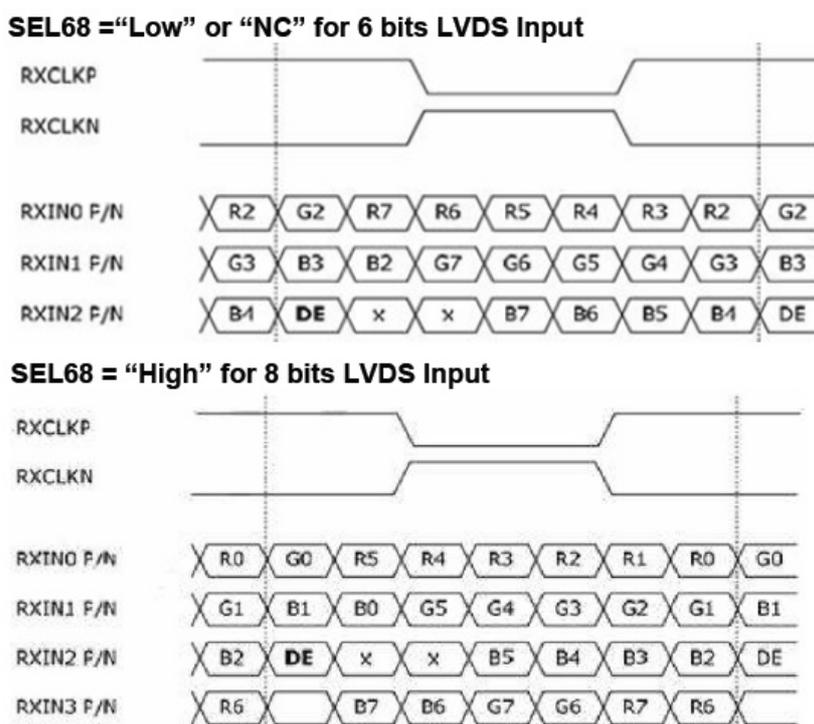
**Table 3.1: Pin Description**

Pin No.	Symbol	Description
1	VDD	Power supply,3.3V (typical)
2	VDD	Power supply,3.3V (typical)
3	GND	Ground
4	SEL68	6 / 8-bits LVDS data input selection [H: 8bits L/NC: 6bit] *Note 4
5	RIN0-	LVDS differential signal channel 0
6	RIN0+	LVDS differential data input (R0, R1, R2, R3, R4, R5, G0)
7	GND	Ground
8	RIN1-	LVDS differential signal channel 1
9	RIN1+	LVDS differential data input (G1, G2, G3, G4, G5, B0, B1)
10	GND	Ground
11	RIN2-	LVDS differential signal channel 2
12	RIN2+	LVDS differential data input (B2, B3, B4, B5, HS, VS, DE)
13	GND	Ground
14	RCLKIN-	LVDS receiver signal clock
15	RCLKIN+	
16	GND	Ground
17	RIN3-	LVDS receiver signal channel 3, NC for 6 bit LVDS Input *Note 5
18	RIN3+	LVDS differential data input (R6, R7, G6, G7, B6, B7, RSV)
19	RSV	Reverse scan function [H: Enable; L/NC: Disable]
20	NC/GND	Reserved for AUO internal test. Please treat it as NC.

- Note 1** Input signals shall be in low status when VDD is off.
- Note 2** High stands for “3.3V”, Low stands for “0V”, NC stands for “No Connection”.
- Note 3** RSV stands for “Reserved”.
- Note 4** Input signals shall be in low status when VDD is off.
- Note 5** If in 6-bit mode, please keep pin 17 & pin 18 NC or make sure that the voltage of pin 17 is always higher than the Voltage of pin 18.

## 3.2 The Input Data Format

### 3.2.1 SEL68



- Note1** Please follow PSWG.
- Note2** R/G/B data 7:MSB, R/G/B data 0:LSB

Signal Name	Description	Remark
+RED5(R5)	Red Data 5(MSB)	Each red pixel's brightness data consists of these 6 bits pixel data.
+RED4(R4)	Red Data 4	
+RED3(R3)	Red Data 3	
+RED2(R2)	Red Data 2	
+RED1(R1)	Red Data 1	
+RED0(R0)	Red Data 0 (LSB) Red-pixel Data	

+GREEN5(G5)	Green Data 5(MSB)	Green-pixel Data Each green pixel's brightness data consists of these 6 bits pixel data.
+GREEN4(G4)	Green Data 4	
+GREEN3(G3)	Green Data 3	
+GREEN2(G2)	Green Data 2	
+GREEN1(G1)	Green Data 1	
+GREEN0(G0)	Green Data 0(LSB) Green-pixel Data	
+BLUE5(B5)	Blue Data 5(MSB)	Blue-pixel Data Each blue pixel's brightness data consists of these 6 bits pixel data.
+BLUE4(B4)	Blue Data 4	
+BLUE3(B3)	Blue Data 3	
+BLUE2(B2)	Blue Data 2	
+BLUE1(B1)	Blue Data 1	
+BLUE0(B0)	Blue Data 0(LSB) Blue-pixel Data	
CLK	Data Clock	The typical frequency is 65MHz. The signal is used to strobe the pixel data and DE signals. All pixel data shall be valid at the falling edge when the DE signal is high.
DE	Display Timing	This signal is strobed at the falling edge of CLK. When the signal is high, the pixel data shall be valid to be displayed.

**Note:** Output signals from any system shall be low or Hi-Z state when VDD is off.

## 3.3 TFT-LCD Interface Timing

### 3.3.1 Timing Characteristics

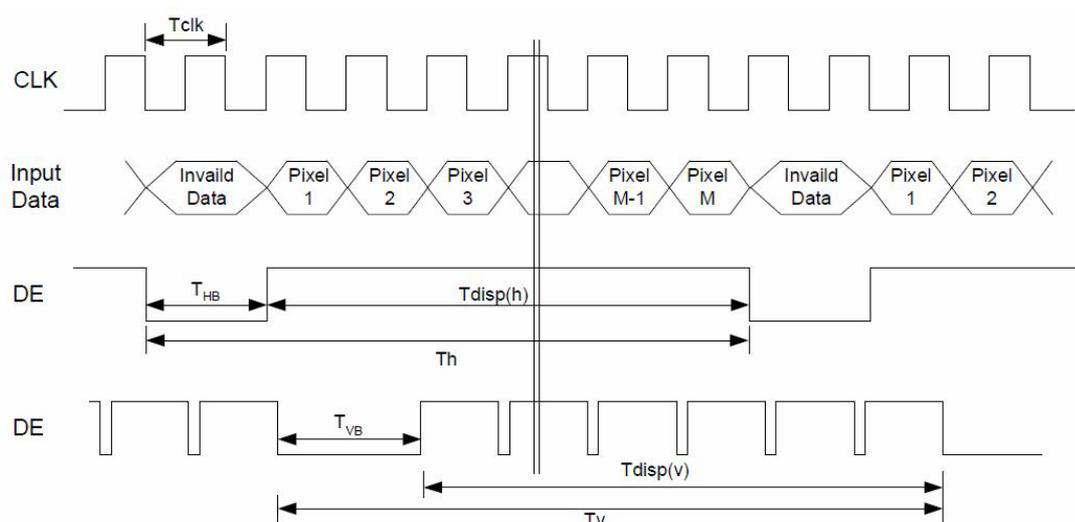
**Table 3.2: Timing Characteristics**

Parameter	Symbol	Min.	Typ.	Max.	Unit	
Clock frequency	$1/T_{\text{Clock}}$	50	65	80	MHz	
Vertical Section	Period	$T_V$	776	806	1023	
	Active	$T_{VD}$	-	768	-	$T_{\text{Line}}$
	Blanking	$T_{VB}$	8	38	255	
Horizontal Section	Period	$T_H$	1054	1344	2047	
	Active	$T_{HD}$	-	1024	-	$T_{\text{Clock}}$
	Blanking	$T_{HB}$	40	320	1023	

**Note** Frame rate is 60 Hz.

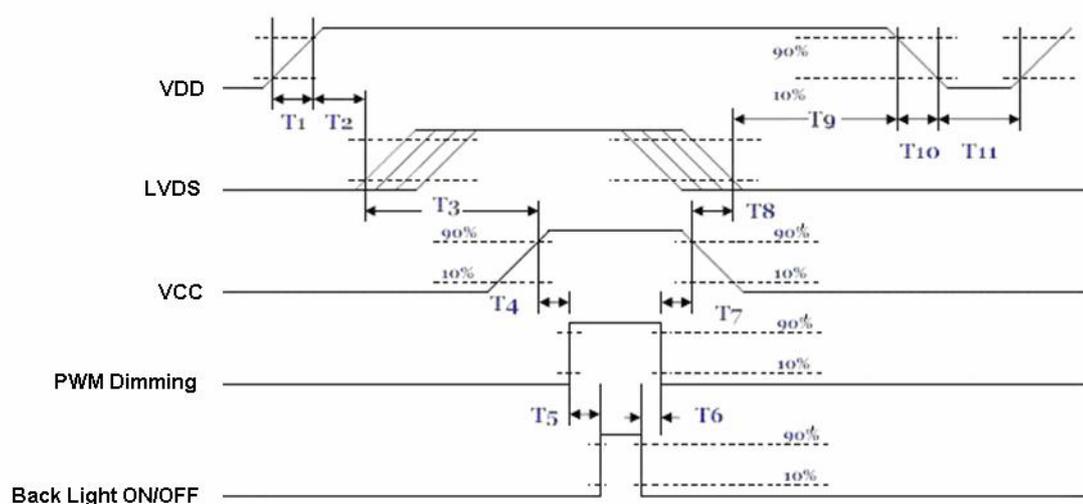
**Note** DE mode.

### 3.3.2 Input Timing Diagram



### 3.4 Power ON/OFF Sequence

VDD power and lamp on/off sequence is as follows. 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 ON/OFF Sequence Timing

Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	0.5	-	10	[ms]
T2	30	40	50	[ms]
T3	200	-	-	[ms]
T4	10	-	-	[ms]
T5	10	-	-	[ms]
T6	0	-	-	[ms]
T7	10	-	-	[ms]
T8	100	-	-	[ms]

---

T9	0	16	50	[ms]
T10	-	-	10	[ms]
T11	1000	-	-	[ms]

The above on/off sequence should be applied to avoid abnormal functions in the display. Please make sure to turn off the power when you plug the cable into the input connector or pull the cable out of the connector.

# Chapter 4

Connector & Pin  
Assignment

The physical interface is described as below for the connector on module. These connectors are capable of accommodating the following signals.

## 4.1 TFT-LCD Signal (CN1): LCD Connector

**Table 4.1: Connector**

Connector Name / Description	Signal Connector
Manufacturer	STM or compatible
Connector Model Number	MSB240420-E or compatible
Adapable Plug	P240420 or compatible

**Table 4.2: Pin Assignment**

Pin No.	Signal Name	Pin No.	Signal Name
1	VDD	2	VDD
3	GND	4	SEL68
5	RIN0-	6	RIN0+
7	GND	8	RIN1-
9	RIN1+	10	GND
11	RIN2-	12	RIN2+
13	GND	14	CLKIN-
15	CLKIN+	16	GND
17	RIN3-	18	RIN3+
19	RSV	20	NC/GND

## 4.2 LED Backlight Unit (CN2): Driver Connector

Connector Name / Designation	LED Light Bar Connector / Backlight lamp
Manufacturer	ENTERY or compatible
Connector Model Number	3808K-F05N-02R or compatible
Mating Model Number	H208K-P05N-02B or compatible

Pin No.	Symbol	Description
Pin1	VCC	12V input
Pin2	GND	GND
Pin3	On/OFF	5V/3.3-ON,0V-OFF
Pin4	Dimming	PWM
Pin5	NA	

## 4.3 LED Backlight Unit(CN4): Light Bar Connector

Connector Name / Description	Signal Connector
Manufacturer	ENTERY or compatible
Connector Model Number	H208K@CP03N-02B or compatible

Mating Model Number(CN3)	3808K-F03N-02R or compatible
--------------------------	------------------------------

Pin No.	Symbol	Description	Color
Pin1	H	LED anode	Red
Pin2	L	LED cathode	White
Pin3	L	LED cathode	Black



# Chapter 5

Touch Screen

## 5.1 Touch Characteristics

This touch panel is a resistance type used with flat LCD type displays. Once touched by stylus or finger, it sends coordinate points to PC from the voltage changes at the contact point.

## 5.2 Optical Characteristics

Item	Specification	Remarks
1 Transparency	80% ± 3%	BYK-Gardner
2 Haze	8.0% ± 3%	BYK-Gardner

## 5.3 Environment Characteristics

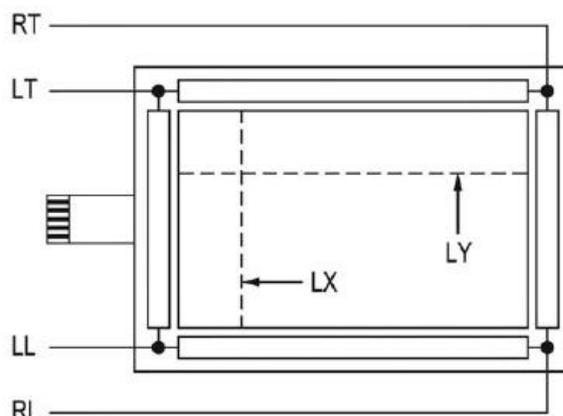
Item	Specification	Remarks
1 Operation temperature	-20°C ~ 70°C	Note: All terms under 1 atmosphere
2 Storage temperature	-40°C ~ 80°C	
3 Operation humidity	20% ~ 80%RH	
4 Storage humidity	20% ~ 90%RH	

## 5.4 Mechanical Characteristics

Item	Specification	Remarks
1 Hardness of surface	Pencil hardness 3H.	JIS K-5600-5-4 150gf, 45 degree
2 FPC peeling strength	1) 5N (5N Min.) 2) 19.6N (19.6N Min.)	1) Peeling upward by 90° 2) Peeling downward by 90°
3 Operation force	Pen 0.05N~1.96N (5~200gf) Finger	Dot-Spacer Within "guaranteed active area", but not on the age and Dot-Spacer.

## 5.5 Electronic Characteristics

Item	Specification	Remarks
1 Rated voltage	DC 7V max.	
2 Resistance	X axis: 200Ω ~ 500Ω (Glass side) Y axis: 200Ω ~ 800Ω (Film side)	FPC connector
3 Linearity	X ≤ 1.5% (Figure as below) Y ≤ 1.5% (Figure as below)	Reference: 250gf
4 Chattering	≤ 15ms	
5 Insulation resistance	10MΩ min (DC 25V)	



## 5.6 General Specification

Item	Specification
1	Frame size 261.80±0.30 X 199.80±0.30 mm
2	View Area 249.80±0.20 X 188.50±0.20 mm
3	Active Area 246.80±0.20 X 185.50±0.20 mm
4	Total Thickness 2.20±0.20 mm
5	Tail length 205.00±6.00 mm

## 5.7 Environment Test Criteria for Touch Screen

Item	Specification	Remarks
1	High temperature storage 70°C /240 hrs allow panel stays in normal environment for 4 hrs	Operation force, insulation resistance & resistance must be within spec. *Input life test condition (by finger).
2	Low temperature storage -40°C /240 hrs allow panel stays in normal environment for 4 hrs	
3	High temperature & high humidity operation 70°C /90%RH, 240 hrs, allow panel stays in normal environment for 4 hrs	By silicone rubber tapping at same point. - Sharp of rubber end: R8 Hardness 60°(Refer fig.2)
4	Temperature cycling --40°C ~70°C [60 min./cycle] *50 cycles allow panel stays in normal environment for 4 hrs	- Load: 200g - Frequency: 5Hz



# Chapter 6

Touch Controller

Mtouch/Chenmtech Co., Ltd MTC7000C touch control board meets latest Restriction of Hazardous Substances (ROHS) directive. This touch panel controller provides excellent performance of your analog resistive touch panels for 4/5 wire models. The touch panel driver emulates mouse left and right button functions and supports the following.

## 6.1 Touch Controller Characteristics

### 6.1.1 Specifications

#### Electrical Features

- Input Voltage: +5Vdc, normal (+4.75~+5.25Vdc) 16MA, typical at +5VDC. Average power consumption (@ stand by mode) is 0.08W, typical. Supply must be capable of sourcing 100MA, minimum. Total noise and ripple requirement must be less than 100mV (p-p) for frequencies below 1MHz, and less than 50mV (p-p) for frequencies above 1MHz.

#### Serial Interface

- EIA 232E (Serial RS-232), DCE configuration.
- No parity, 8 data bits, 1 stop bit, 9600 baud (N, 8, 1, 9600)
- Support Windows 2000/ Vista/ XP/ 7, Windows CE 5.0/ 6.0/ 7.0, Windows NT4, Linux, DOS, QNX

#### USB Interface

- HID-USB model: USB 2.0 Full speed
- If the USB is connected to the controller, the controller will communicate over the USB, and will not communicate over the serial port.
- Supports Windows 2000/ Vista/ XP/ 7, Windows CE 5.0/ 6.0/ 7.0, Linux, QNX

#### Touch Resolution

- 2,048 x 2,048 resolution

#### Response Time

- Max. 20 ms

### 6.1.2 Environmental Features

#### Reliability

- MTBF is 200,000 hours

#### Temperature Ranges

- Operating: -40°C ~ 85°C
- Storage: -40°C ~ 85°C

#### Relative Humidity

- 10% to 90%, RH Non-condensing

#### Acquired RoHS certificate

#### Regulatory FCC-B, CE approvals

#### Dimension: 70 mm x 20 mm x 5 mm

## 6.2 Pin Assignment and Description

### 6.2.1 Photo



### 6.2.2 Combo Interface Connector, JP1, Pins and Signal Descriptions

The combo interface connector, USB and RS-232, is a box 2.0mm 10-pins 90 degree, Male type with lock connector, intended to be used with single wired pins in 5+5 pins header. The pins are numbered as shown in the table below.

J1			J6		
USB Pin#	Signal Name	Signal Function	RS-232 Pin#	Signal Name	Signal Function
1	G	Ground	1	G	Ground
2	V	USB Power	2	V	Power
3	G	Ground	3	G	Ground
4	D+	USB D+	4	TxD	Serial Port
5	D-	USB D-	5	RxD	Serial Port

Signal Name	DB-9 pin #	RS-232 pin #	Sourced by	Signal Description
RxD	2	5	ctlr	serial data from controller to host
TxD	3	4	host	serial data from host to controller

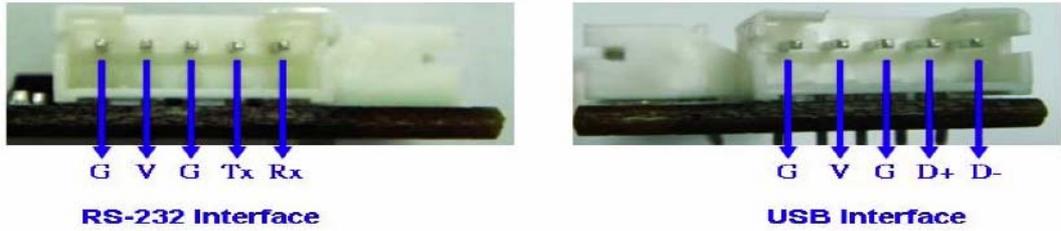
### 6.2.3 Connectors and Pin Definitions

The connector configuration permits the controller to be placed in-line between the touch screen and serial I/O attachments.

### 6.2.4 USB, Serial connector, and Signal Descriptions

The serial and USB I/O connector, J1/J6 is a 5-pins header (2.0mm pitch). Refer to the following figure for pin number locations.

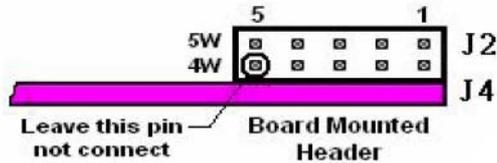
Pin diagram for USB and serial connector, J1/J6, as viewed from connector mating surface.



### 6.2.5 Touch Screen Connector, JP2, Pins and Signal Descriptions

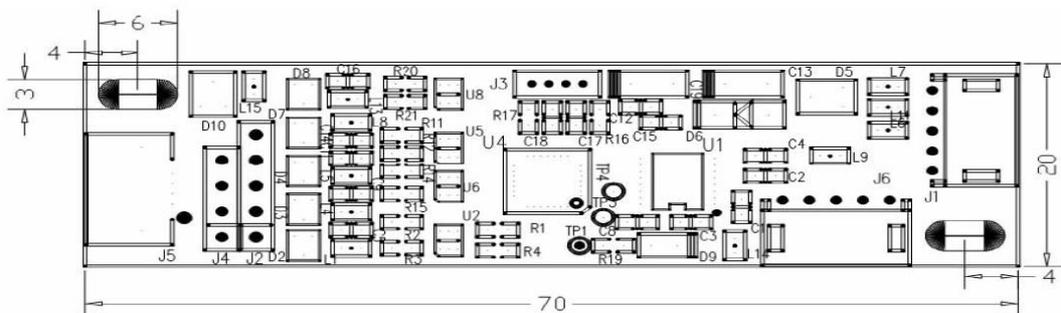
Touch screen connector, J2(J4 for MTC7000C), is a dual row by five-position header with 0.025-inch square pins spaced on 0.100 centers. 5W sensor must be connected to the upper row of the connector. 4W sensor must be connected to the low row of the connector. The pins are numbered as shown in the figure.

Pin diagram from touch screen connector, J2(J4 for MTC7000C), as viewed from connector mating surfaces



## 6.3 Physical Dimensions

MTC7000C Touch Control Board (Unit: mm)



# Appendix **A**

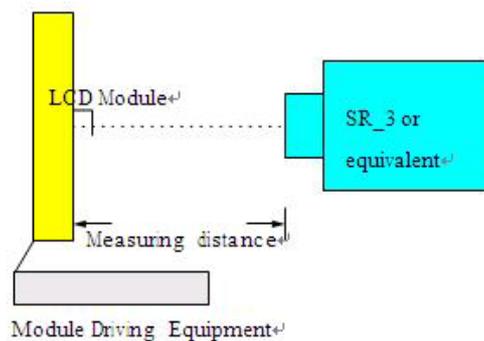
## Optical Characteristics

## A.1 Optical Characteristics

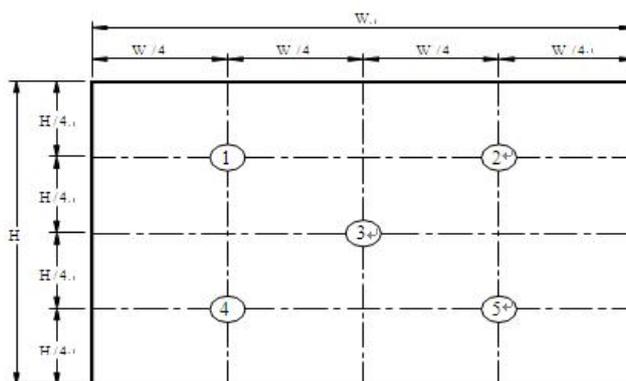
The optical characteristics are measured under stable conditions at 25°C (Room Temperature):

Item	Conditions	Min.	Typ.	Max.	Unit	Note
White Luminance	IF= 80mA/1 LED Line (center point)	375	500	-	[cd/m <sup>2</sup> ]	Note 1
Uniformity	5 Points	75	-	-	%	Note 2, 3
Contrast Ratio		500	700	-		Note 4
Response Time	Rising	-	25	35	[msec]	Note 5
	Falling	-	10	20	[msec]	
	Raising + Falling	-	35	55	[msec]	
Viewing Angle	Horizontal (Right)	70	80	-	[degree]	Note 6
	CR ≥ 10 Left)	70	80	-	[degree]	
	Vertical (Upper)	70	80	-	[degree]	
	CR ≥ 10 (Lower)	70	80	-	[degree]	
Color / Chromaticity Coordinates (CIE 1931)	Red x	0.592	0.642	0.692		1
	Red y	0.292	0.342	0.392		
	Green x	0.276	0.326	0.376		
	Green y	0.565	0.615	0.665		
	Blue x	0.098	0.148	0.198		
	Blue y	0.006	0.056	0.106		
	White x	0.260	0.310	0.360		
	White y	0.280	0.330	0.380		
Color Gamut		70	-		%	

**Note1** Measurement Method Equipment Pattern Generator, Power Supply, Digital Voltmeter, Luminance meter (SR\_3 or equivalent) Aperture  
 Test Point Center  
 Environment < 1 lux



**Note2** Definition of 5 points position (Display active area: 246mm (H) x 184.5mm(V))



**Note3** The luminance uniformity of 5 points is defined by dividing the minimum luminance values by the maximum test point luminance.

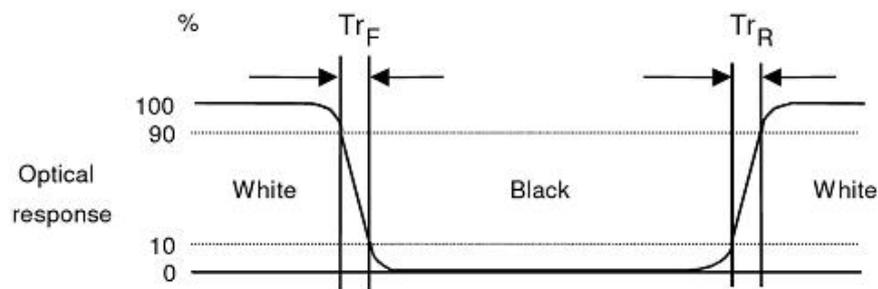
$$\delta_{wb} = \frac{\text{Minimum Brightness of five points}}{\text{Maximum Brightness of five points}}$$

**Note4** Definition of contrast ratio (CR):

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "White" state}}{\text{Brightness on the "Black" state}}$$

**Note5** Definition of response time:

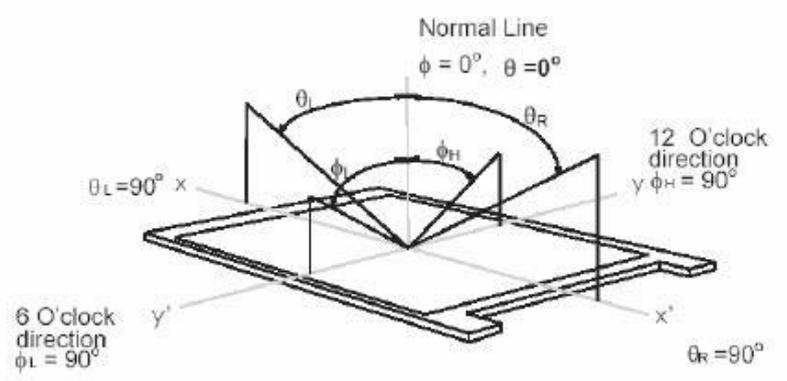
The output signals of photo detector are measured when the input signals are changed from "White" to "Black" (falling time) and from "Black" to "White" (rising time), respectively. The response time interval is between 10% and 90% of amplitudes. Please refer to the figure as below.



**Note6** Definition of viewing angle

Viewing angle is the measurement of contrast ratio 10, 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 below:

90° ( $\theta$ ) horizontal left and right, and 90° ( $\theta$ ) 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.



# Appendix **B**

## Handling Precautions

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## B.1 Handling Precautions

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

1. Since front polarizer is easily damaged, pay attention not to scratch it.
2. Be sure to turn off power supply when inserting or disconnecting from input connector.
3. Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
4. When the panel surface is soiled, wipe it with an absorbent cotton or other soft cloth.
5. Since the panel is made of glass, it may break or crack if dropped on a hard surface.
6. Since CMOS LSI is used in this module, take care of static electricity and insure human earth when handling.
7. Do not open or modify the module assembly.
8. Do not press the reflector sheet at the back of the module in any direction.
9. If a module has to be put back into the packing container slot for any reason, gently press down on only the far ends of the LED light bar reflector. Otherwise the TFT Module may get damaged.
10. At 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, do not twist nor bend the TFT Module even momentary. When designing your enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT Module otherwise it may get damaged.
12. A small amount of materials that have no flammability grade are used in the LCD module. The LCD module should be supplied by power that complies with the requirements of Limited Power Source (IEC60950 or UL1950).

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