User Manual

IDK-1112R-45SVA1E

TFT-LCD 12" SVGA (LED Backlight)

ADVANTECH

Enabling an Intelligent Planet

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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-1112R-45SVA1E 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 SVGA (800(H) x 600(V)) screen and 16.2M/ 262k colors (RGB). All input signals are LVDS interface compatible. Driver board of backlight is included.

1.2 Display Characteristics

The following items are characteristics summary on the table under 25°C condition.

Items	Specifications	Unit
Screen Diagonal	12.1	inch
Active Area	246(H) x 184.5(V)	mm
Pixels H x V	800x3(RGB) x 600	-
Pixel Pitch	0.3075x 0.3075	mm
Pixel Arrangement	R.G.B. Vertical Stripe	-
Display Mode	TN, Normally White	-
Nominal Input Voltage VDD	3.3 (typ)	Volt
Typical Power Consumption	6.7 W All black pattern	Watt
Weight	980 (Max.)	Grams
Physical Size	276.0(H) x 209.0(V) x 11.3(D) (Typ.)	mm
Electrical Interface	1 channel LVDS	
Surface Treatment	Anti-glare, Hardness 3H	
Support Color	16.2M / 262K colors	
Temperature Range Operating Storage (Non-Operating)	-20 to +70 -25 to +80	°C °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)	-	11.3	-	mm	
Weight		-	980	-	g	-

1.4 Mechanical Dimension

1.4.1 Frontview
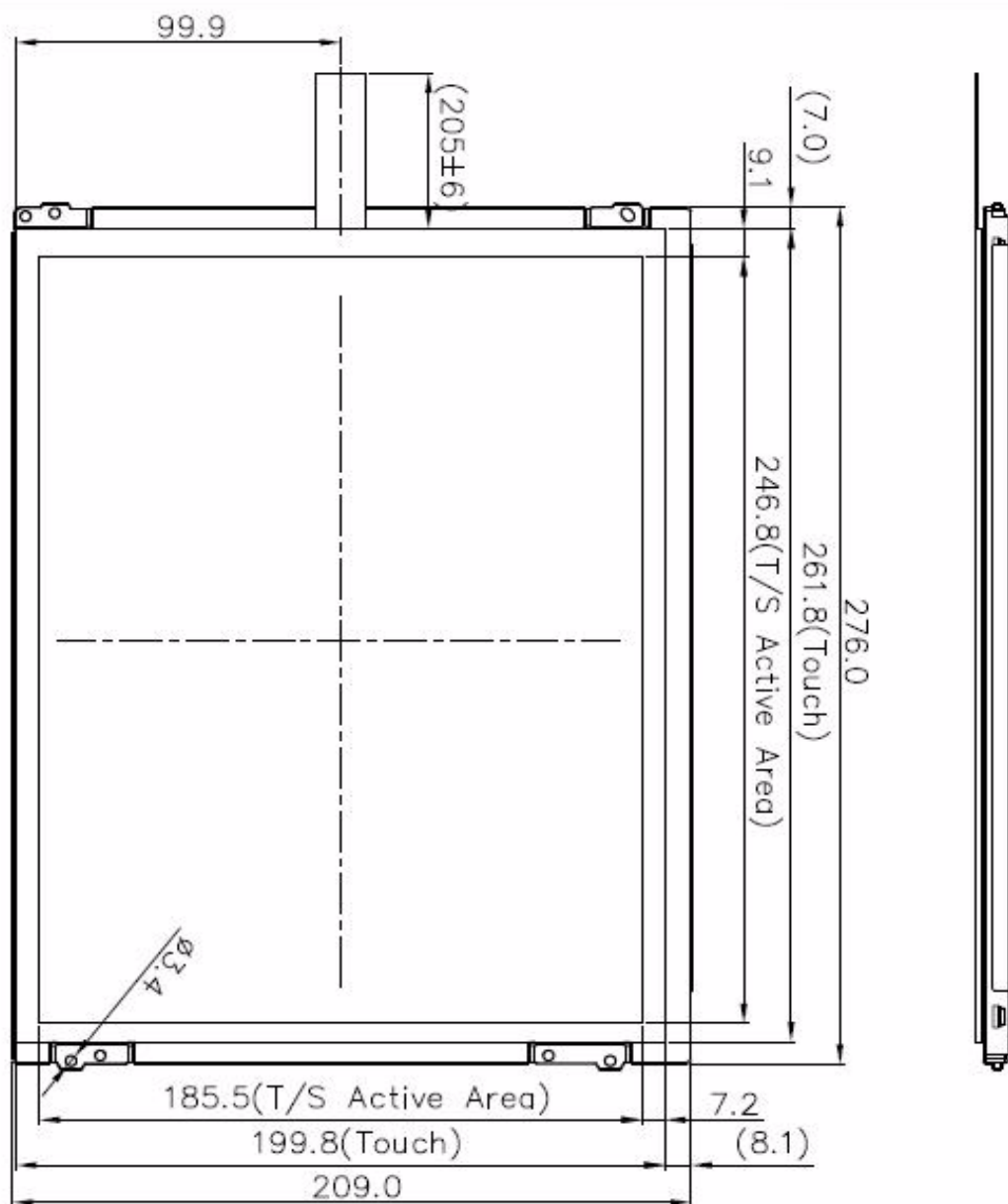
1.4.2 Rearview
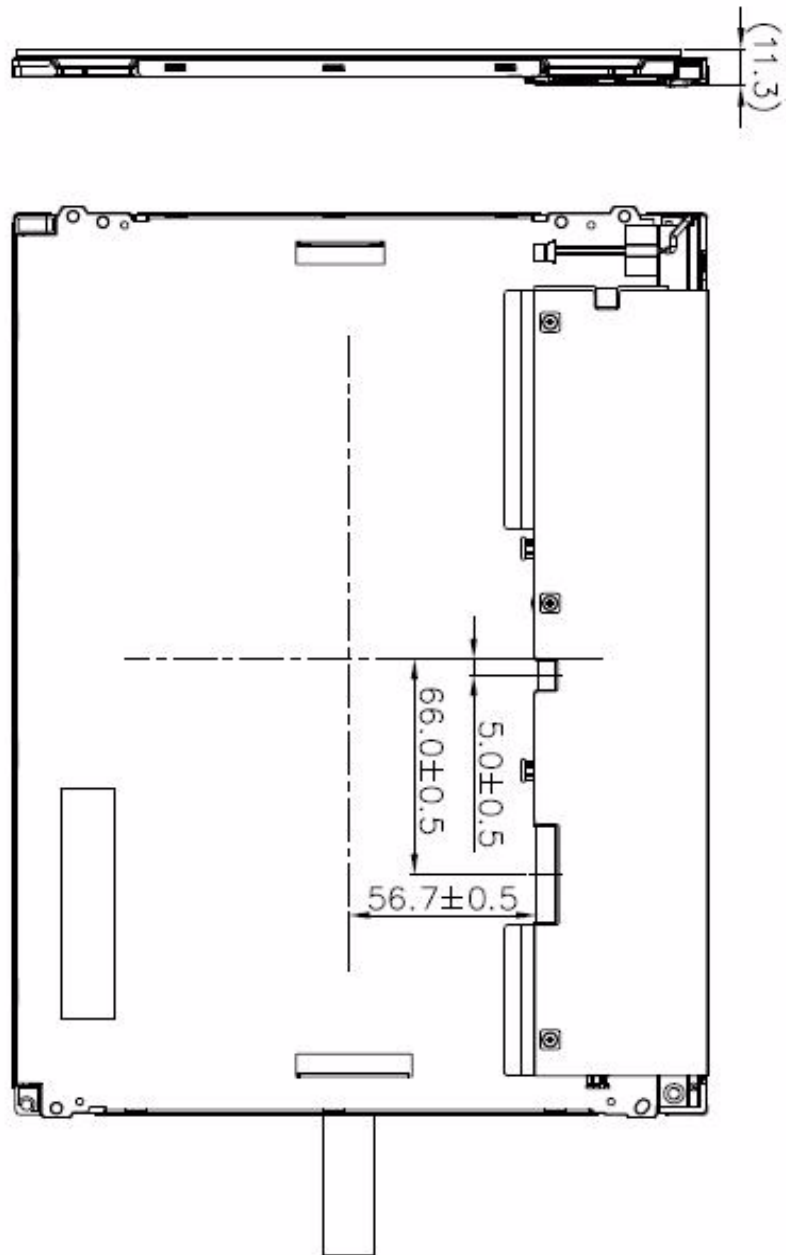
1.5 Absolute Maximum Ratings

1.5.1 Absolute Ratings of TFT LCD Module

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

1.5.2 Absolute Ratings of Environment

Item	Symbol	Value Min.	Value Max.	Unit
Operating Temperature	TOP	-20	+70	°C
Operation Humidity	HOP	5	90	[%RH]
Storage Temperature	TST	-25	+85	°C
Storage Humidity	HST	5	90	[%RH]

Note: Maximum Wet-Bulb should be 39°C and no condensation.

1.6 Functional Block Diagram

The following diagram shows the functional block of the 12.1 inch color TFT/LCD module:
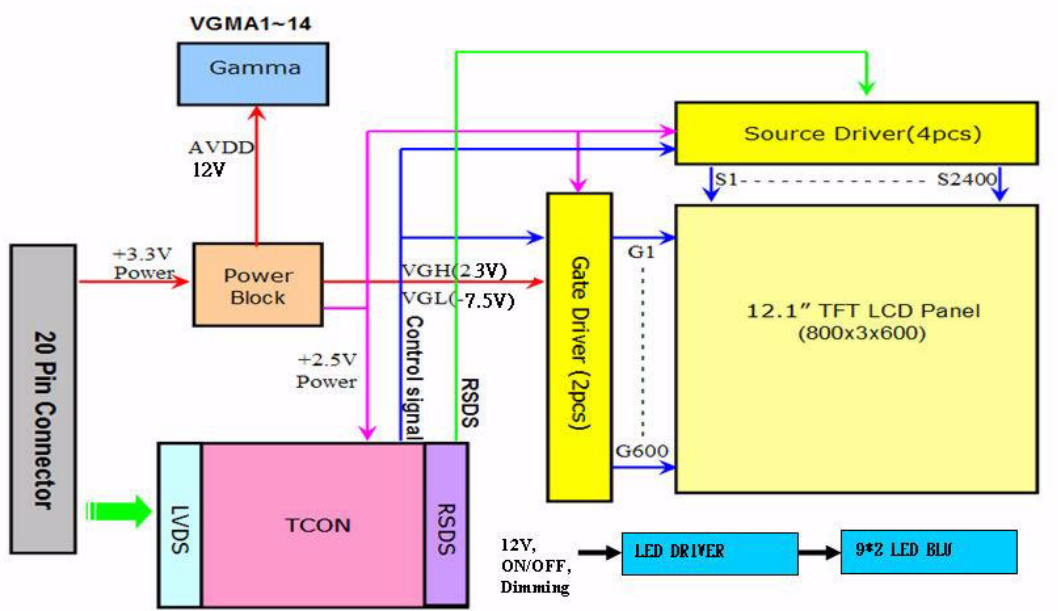
Figure 1.1 TFT LCD module

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}	-	280	-	[mA]	VDD=3.3V at 60 HZ, all Black Pattern
LCD Power	P_{VDD}	-	0.924	-	[Watt]	VDD=3.3V at 60 HZ, all Black Pattern
LCD Inrush Current	$I_{rush\ LCD}$	-	-	1.5	[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.

64 Gray pattern
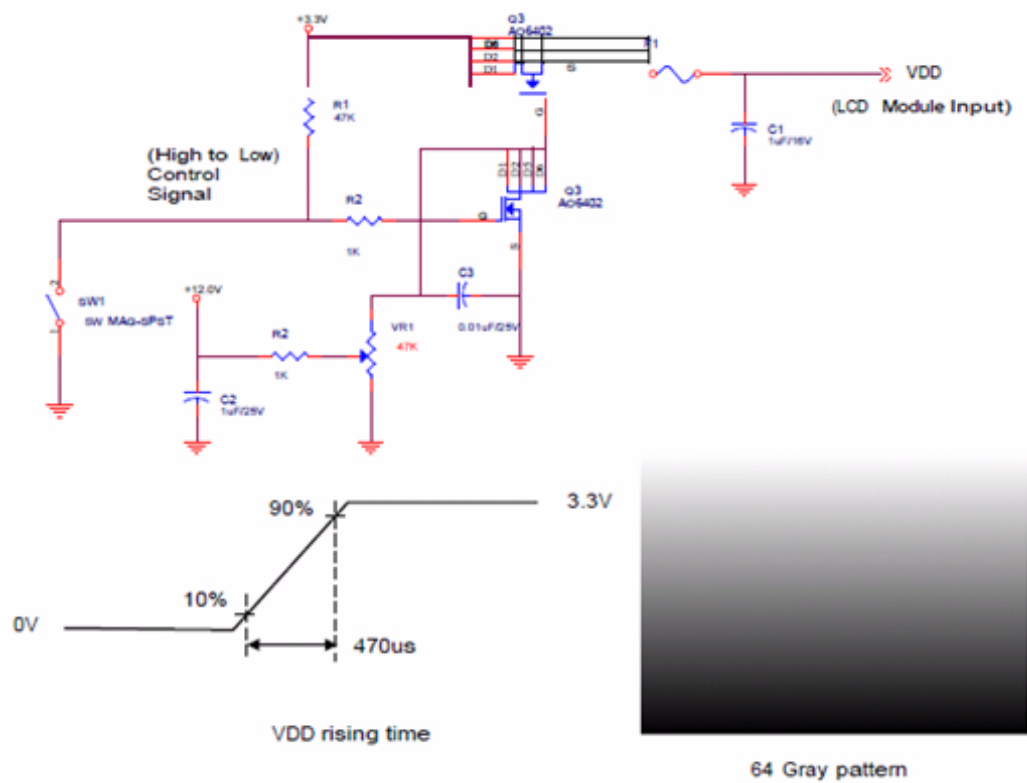
2.1.2 Signal Electrical Characteristics

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	1.1	-	1.45	[V]	VTH/VTL=±100mV

Note LVDS Signal Waveform.
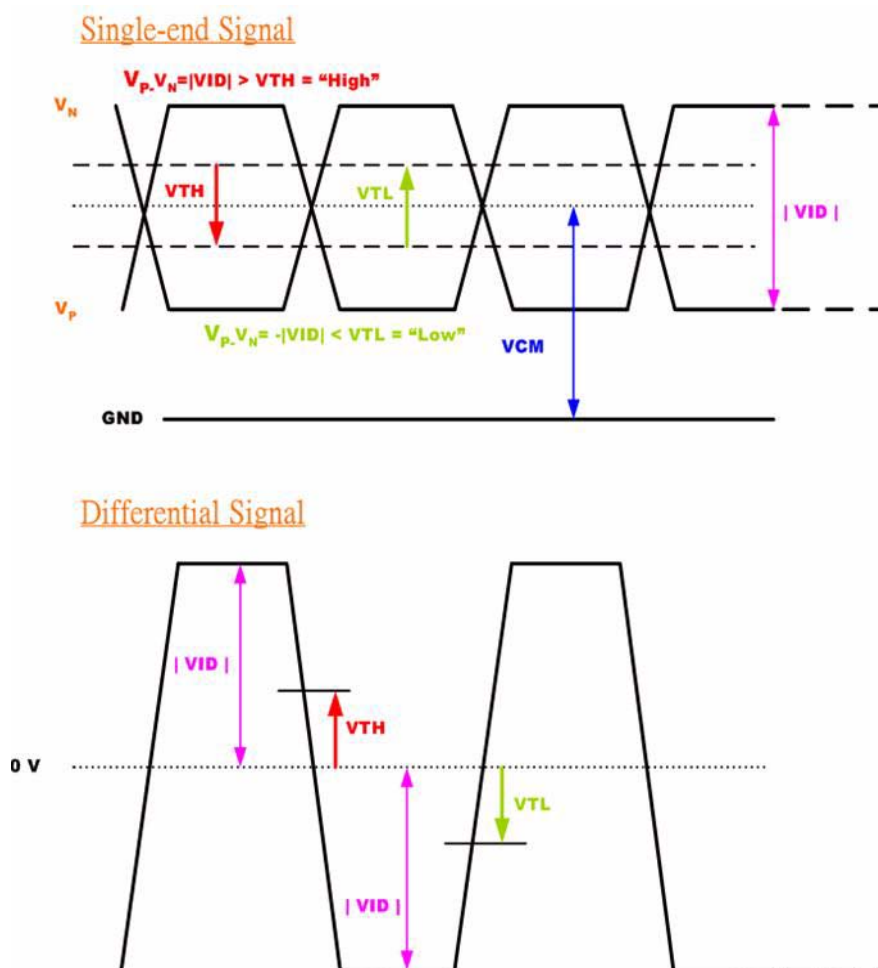
2.2 Backlight Unit

2.2.1 Parameter guideline for LCD

Following characteristics are measured under a stable condition using an inverter at 25°C (Room Temperature):

Parameter	Symbol	Value Min.	Typ.	Max.	Unit	Remark
Input Voltage	VCC	10.8	12	12.6	[Volt]	
Input Current	I_VCC	-	0.48	-	[A]	100% PWM Duty
Power Consumption	P_VCC	-	5.76	6	[Watt]	100% PWM Duty
Inrush Current	I_rush LED	-	-	1.5	[A]	at rising time=470us
Dimming Frequency	F_PWM	200	-	20K	[Hz]	
Swing Voltage		3	3.3	5.5	[Volt]	

		Min	Typ	Max	Unit	Condition
Dimming Duty Cycle		5	-	100	%	
LED Forward Current	I_F	-	80	-	[mA]	Ta = 25°C
LED Forward Voltage	V_F	-	27.9	31.5	[Volt]	I_F = 80mA, a = -30°C
		-	28.8	32.9	[Volt]	I_F = 80mA, a = -25°C
		-	30.6	35.1	[Volt]	I_F = 80mA, a = 85°C
LED Power Consumption	P_{LED}	-	4.9	5.6	[Watt]	
Operation Lifetime		50,000	-	-	Hrs	IF = 80mA, Ta = 25°C

Note1 Ta means ambient temperature of TFT-LCD module.

Note2 VCC, I_{VCC}, $I_{rush\ LED}$, P_{VCC} are defined for LED B/L.(100% duty of PWM dimming)

Note3 I_F, V_F are defined for one channel LED. There are two LED channel in back light unit.

Note4 If IDK-1112R-45SVA1E module is driven by high current or at high ambient temperature & humidity condition. The operating life will be reduced.
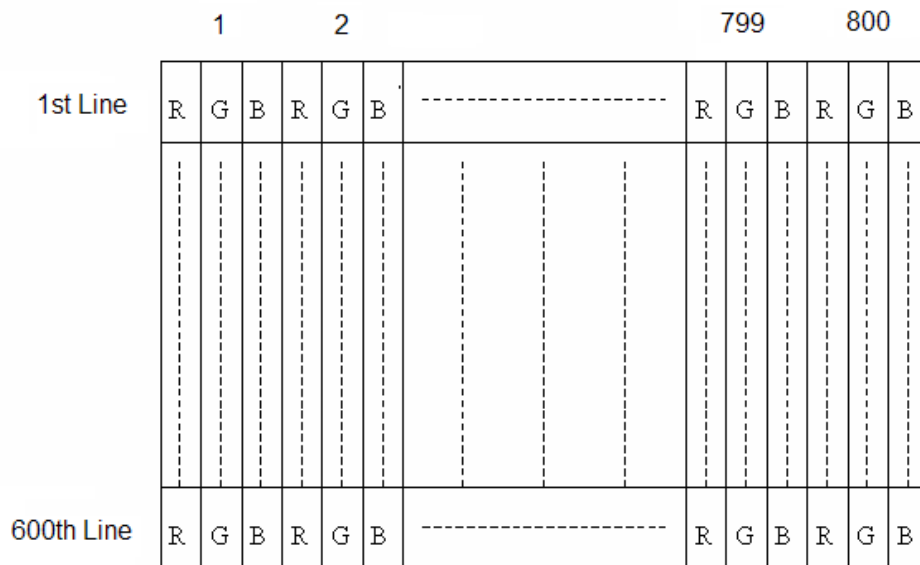
Note5 Operating life means brightness goes down to 50% initial brightness. Minimum operating life time is estimated data.

Chapter   3

Signal Characteristics

3.1 Pixel Format Image

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

3.1.1 Pin Description

Pin No.	Symbol	Description
Table 3.1: Pin Description		
1	VDD	Power Supply,3.3V(typical)
2	VDD	Power Supply,3.3V(typical)
3	GND	Ground
4	SEL68	6 / 8bits LVDS data input selection [H: 8bits L/NC: 6bit]
5	RxIN0-	LVDS differential signal channel 0
6	RxIN0+	LVDS Differential Data Input (R0, R1, R2, R3, R4, R5, G0)
7	GND	Ground
8	RxIN1-	LVDS differential signal channel 1
9	RxIN1+	LVDS Differential Data Input (G1, G2, G3, G4, G5, B0, B1)
10	GND	Ground
11	RxIN2-	LVDS differential signal channel 2
12	RxIN2+	LVDS Differential Data Input (B2, B3, B4, B5, HS, VS, DE)
13	GND	Ground
14	RxCLKIN-	LVDS differential signal clock
15	RxCLKIN+	
16	GND	Ground
17	RxIN3-	LVDS receiver signal channel 3, NC for 6 bit LVDS Input
18	RxIN3+	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.

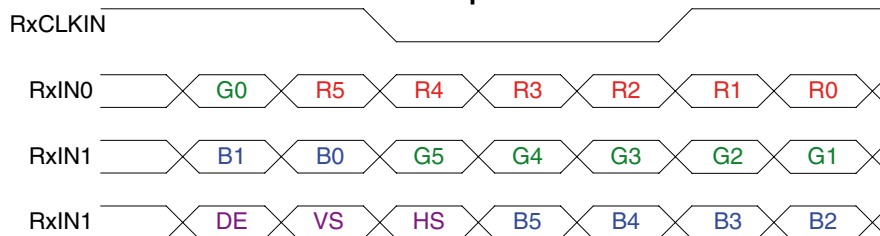**Note 1**   Input Signals shall be in low status when VDD is off.

Note 2   High stands for "3.3V", Low stands for "0V", NC stands for "No Connection".
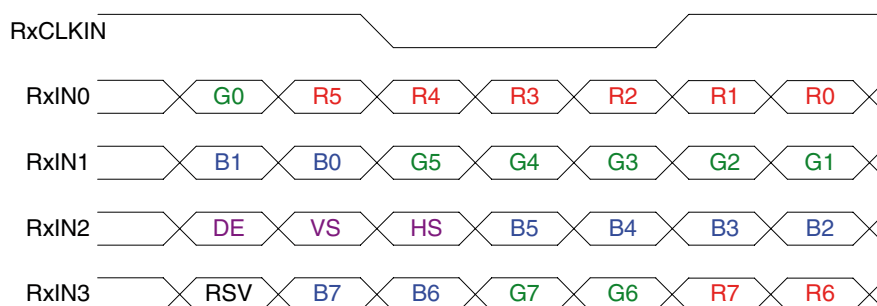
Note 3 RSV stands for "Reserved".

3.2 The Input Data Format

3.2.1 SEL68

SEL68 = "Low" or "NC" for 6 bits LVDS Input

RxCLKIN							
RxIN0	G0	R5	R4	R3	R2	R1	R0
RxIN1	B1	B0	G5	G4	G3	G2	G1
RxIN1	DE	VS	HS	B5	B4	B3	B2

SEL68 = "High" for 8 bits LVDS Input

RxCLKIN							
RxIN0	G0	R5	R4	R3	R2	R1	R0
RxIN1	B1	B0	G5	G4	G3	G2	G1
RxIN2	DE	VS	HS	B5	B4	B3	B2
RxIN3	RSV	B7	B6	G7	G6	R7	R6

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)	Red-pixel Data
+RED4(R4)	Red Data 4	Each red pixel's brightness data consists of these 6 bits pixel data.
+RED3(R3)	Red Data 3	
+RED2(R2)	Red Data 2	
+RED1(R1)	Red Data 1(LSB)	
+RED0(R0)	Red Data 0 Red-pixel Data	
+GREEN5(G5)	Green Data 5(MSB)	Green-pixel Data
+GREEN4(G4)	Green Data 4	Each green pixel's brightness data consists of these 6 bits pixel data.
+GREEN3(G3)	Green Data 3	
+GREEN2(G2)	Green Data 2	
+GREEN1(G1)	Green Data 1(LSB)	
+GREEN0(G0)	Green Data 0 Green-pixel Data	

+BLUE5(B5)	Blue Data 5(MSB)	Blue-pixel Data	
+BLUE4(B4)	Blue Data 4	Each blue pixel's brightness data consists of these 6 bits pixel data.	
+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 40MHz. 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		$1/T_{Clock}$	34	40	48.3	MHz
Vertical Section	Period	T_V	608	628	1024	T_H
	Active	T_{VD}	-	600	-	
	Blanking	T_{VB}	8	28	423	
Horizontal Section	Period	T_H	960	1056	1060	T_{Clock}
	Active	T_{HD}	-	800	-	
	Blanking	T_{HB}	220	256	440	

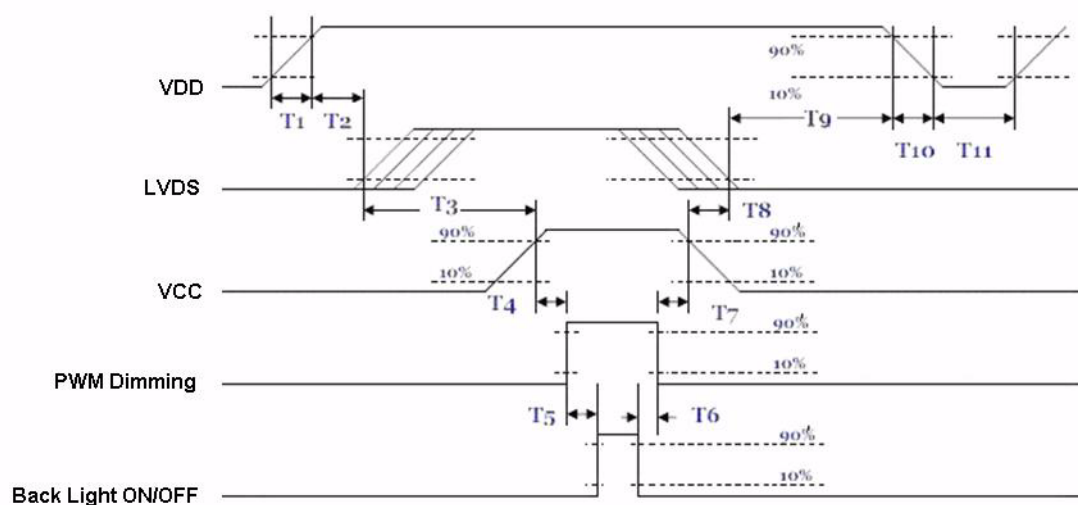**Note** Frame rate is 60 Hz.
Note DE mode.

3.3.2 Input Timing Diagram
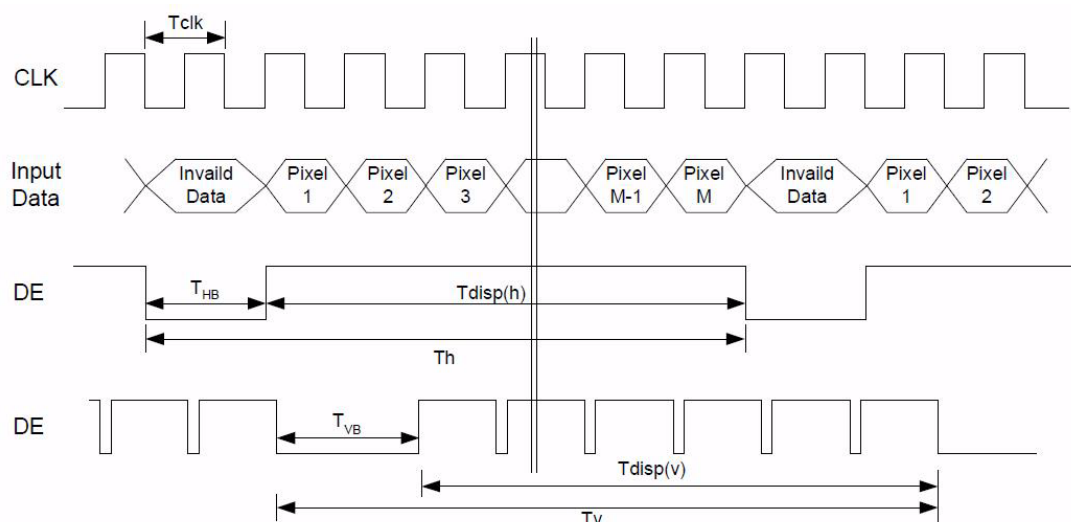
3.4 Power ON/OFF Sequence

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 function 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

Physical interface is described as for the connector on module. These connectors are capable of accommodating the following signals and will be following components.

4.1 TFT-LCD Signal (CN1): LCD Connector

Table 4.1: Connector	
Connector Name / Description	**Signal Connector**
Manufacture	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-ON,0V-OFF
Pin4	Dimming	PWM
Pin5	NA	

4.3 LED Backlight Unit(CN4): Light bar Connector

Connector Name / Description	**Signal Connector**
Manufacture	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

TOUCH PANEL is resistance type that customer uses with flat display like LCD. Once operator touches it by resin PEN with round end or FINGER, the circuit for TOUCH PANEL sends coordinate point to PC from voltage at 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	
2	Storage temperature	-40°C ~ 80°C	Note: All terms under 1 atmosphere
3	Operation Humidity	20% ~ 80%RH	
4	Storage temperature	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)	Dot-Spacer Within "guaranteed active area", but not on the age and Dot-Spacer.
		Finger		

5.5 Electronic Characteristics

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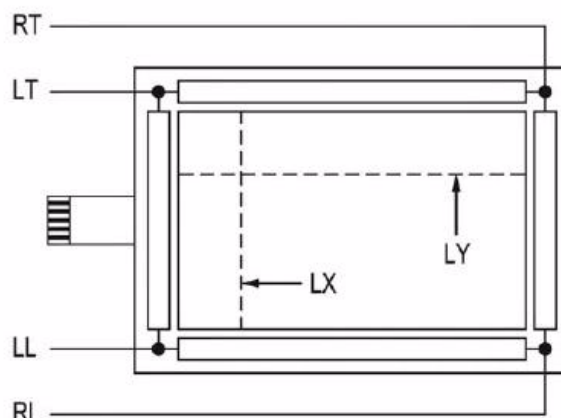
5.6 General Specification

	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 stated before as bellow must be within spec. *Input life test condition(by finger). By silicone rubber tapping at same point. - Sharp of rubber end: R8 Hardness 60°(Refer fig.2) - Load : 200g - Frequency : 5Hz
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	
4	Temperature Cycling	--40°C ~70°C [60 min./cycle] *50 cycles allow panel stays in normal environment for 4 hrs	

Chapter 6

Touch Controller

Advantech ETM-RES04C Touch Control Board, the ultimate combo board. This touch panel controller provides the optimistic performance of your analog resistive touch panels for 5 wire models. It communicates with PC system directly through USB and RS-232 connector. You can see how superior the design is in sensitivity°¢accuracy and friendly operation. The touch panel driver emulates mouse left and right button function and supports operation systems as following.

6.1 Touch Controller Characteristics

6.1.1 Specifications

Electrical Features

- +5 Vdc/ 100 mA typical, 50mV peak to peak maximum ripple and noise.
- Bi-directional RS-232 serial communication and USB 1.1 full speed
- Report rate of RS-232 is 180 points/sec (max.). And, USB is 200 points/sec (max.)
- Unaffected by environmental EMI
- Panel resistance of 5-wire resistive model is from 50 to 200 ohm (Pin to pin on same layer)
- Touch resistance under 3K ohm

Serial Interface

- EIA 232E (Serial RS-232)
- 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

- Conforms to USB Revision 1.1 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.
- Support 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 Feature

Reliability

- MTBF is 200,000 hours

Temperature Ranges

- Operating : -25°C ~ 85°C
- Storage: -25°C ~ 85°C

Relative Humidity
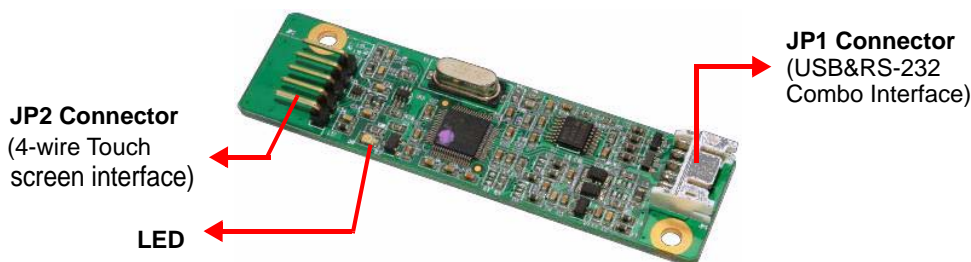
■ 95% at 60°C, RH Non-condensing

Acquired RoHS certificate
Requlatory FCC-B, CE approvals
Dimension: 75 mm x 20 mm x 10 mm

6.2 Pin Assignment and Description

6.2.1 Connector and LED Location

JP1 Connector
(USB&RS-232
Combo Interface)

JP2 Connector
(4-wire Touch
screen interface)

LED

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.

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

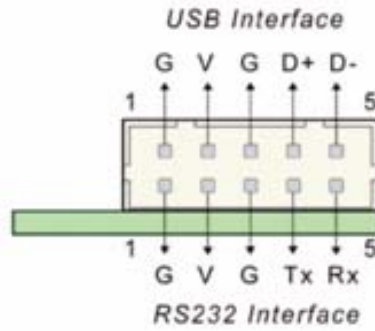USB Interface

RS232 Interface

Figure 6.1 Board mounted header

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

The Touch Screen connector, JP2, is a single row by 2.54mm 5-pins 90 degree, Male type connector. The pins are numbered as shown in the table below.

JP2 Pin #	Signal Name	Signal Description
1	H / UR	Drive signal attached to the touchscreen substrate upper right corner when viewed from a user's perspective.
2	Y / UL	Drive signal attached to the substrate upper left corner.
3	COM	-
4	X / LR	Drive signal attached to the substrate lower right corner.
5	L / LL	Drive signal attached to the substrate lower left corner.
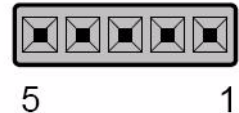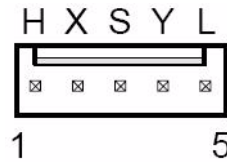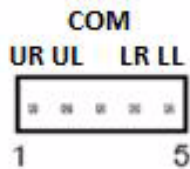
6.3 Physical dimension

ETM-RES04C-EEH4EE Touch Control Board (Unit: mm)
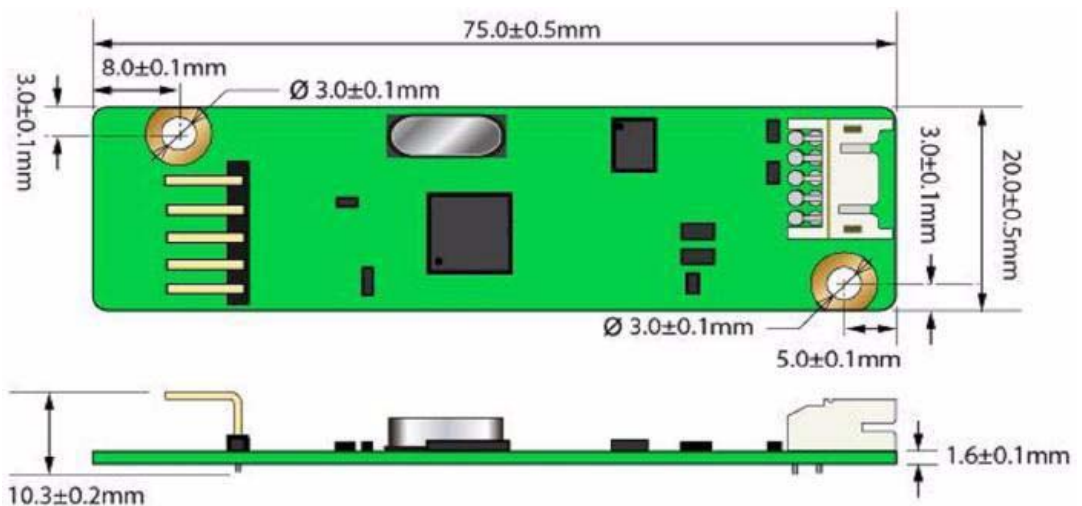
Appendix A

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)	330	450	-	[cd/m2]	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) CR $\geq$ 10 Left)	70	80	-	[degree]	Note 6
		70	80	-	[degree]	
	Vertical (Upper) CR $\geq$ 10 (Lower)	55	65	-	[degree]	
		65	75	-	[degree]	
Color / Chromaticity Coordinates (CIE 1931)	Red x	0.556	0.606	0.656		1
	Red y	0.300	0.350	0.405		
	Green x	0.254	0.304	0.354		
	Green y	0.527	0.577	0.627		
	Blue x	0.099	0.149	0.199		
	Blue y	0.077	0.127	0.177		
	White x	0.263	0.313	0.363		
	White y	0.279	0.329	0.379		
Color Gamut			55	-	%	1

Note1 Measurement method Equipment Pattern Generator, Power Supply, Digital Voltmeter, Luminance meter (SR_3 or equivalent) Aperture

Test Point Center

Environment < 1 lux
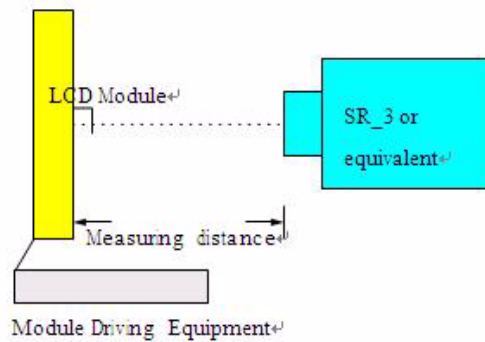
Note2 Definition of 5 points position (Display active area: 246mm (H) x 184.5mm(V))
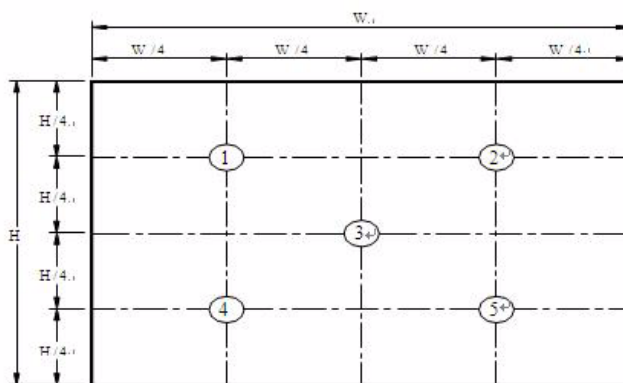
Note3 The luminance uniformity of 5 points is defined by dividing the minimum luminance values by the maximum test point luminance.

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

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.
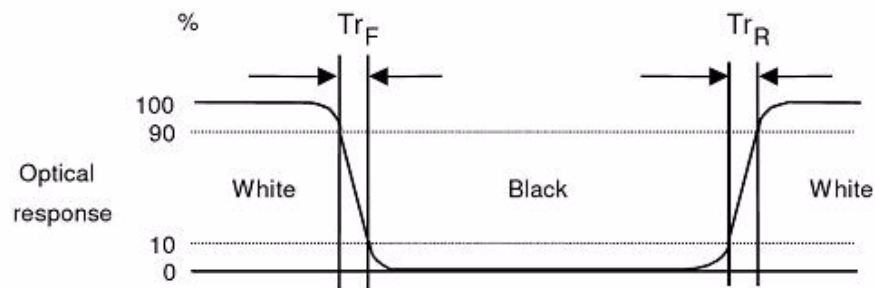
Note6 Definition of viewing angle

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° (θ) horizontal left andright, and 90° (θ) 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.
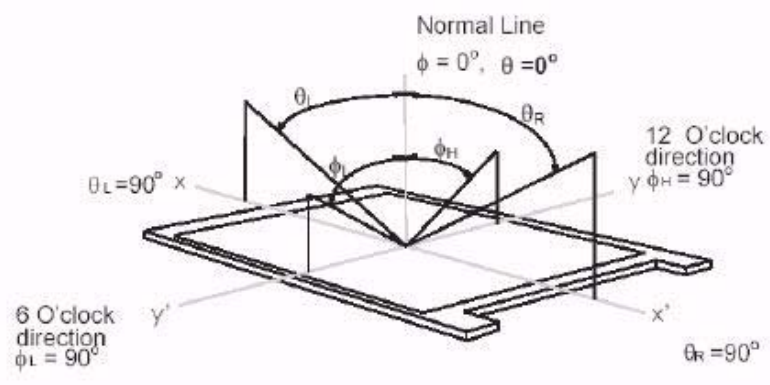
Appendix B

Handling Precautions

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 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 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 to any directions.
9. In case if a Module has to be put back into the packing container slot after once it was taken out from the container, please press at the far ends 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, do not twist nor bend the TFT Module even momentary. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT Module from outside. Otherwise the TFT Module may be damaged.
12. Small amount of materials having no flammability grade is used in the LCD module. The LCD module should be supplied by power complied with requirements of Limited Power Source (IEC60950 or UL1950), or be applied exemption.

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