

User Manual

IDK-2110 Series

**10.4" SVGA Ultra High
Brightness display kit with 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.

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Chapter 1

Overview

1.1 General Description

The Advantech IDK-2110 series comes with a 10.4" 1200 cd/m² industrial grade LCD display, and an LED driving board. The series is also available with flexible options for touch screens and enhanced treatment such as AR surface treatment and optical bonding solution. IDK-2110 series supports 1200 cd/m² high brightness with low power consumption at the maximum consumption of 8W. Equipped with high level of brightness and wide operating temperature, IDK-2110 provides superior sunlight readability and is perfect for applications whether in semi-outdoor or outdoor environments.

1.2 Specifications

1.2.1 LCD Panel

- **Display Size:** 10.4" LED backlight panel
- **Resolution:** 800 x 600
- **Viewing Angula/D/L/R):** 60°/70°/80°/80°
- **Brightness:** 1200 cd/m²
- **Contrast Ratio:** 500:1
- **Response Timings):** 35ms
- **Colors:** 262K/16.2M
- **Voltage:** 3.3V
- **Power Consumption:** 7.1W
- **Signal Interface:** 1 channel LVDS
- **Weight:** R series: 470 g
N series: 350 g
- **Dimensionless x H x D):** R series: 236 x 176.9 x 8.5 mm
N series: 236 x 176.9 x 5.7 mm

1.2.2 LED Driver Board

- **Efficiency:** 85%
- **Output Current & Voltage:** 700mA/9V
- **Dimensionless x H x D):** 60 x 16 x 5mm

1.2.3 Touch Screen (R series)

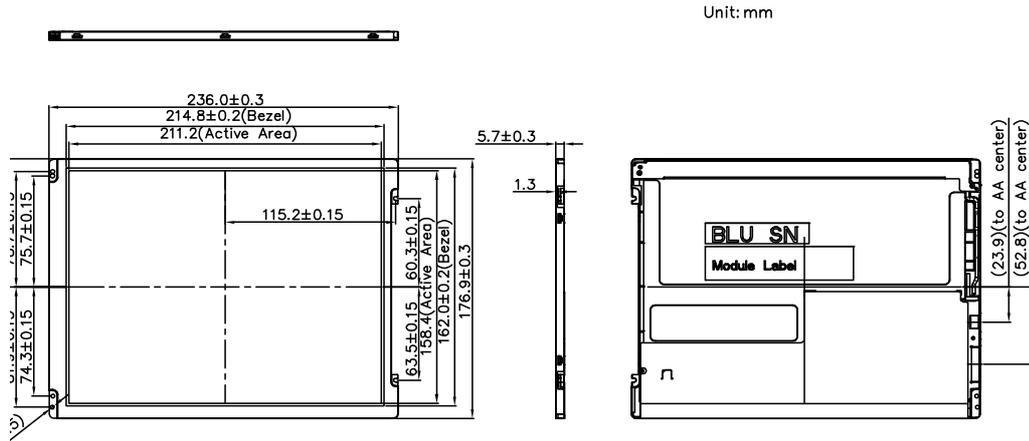
- **Touch Screen:** 4-Wire Resistive
- **Light Transmission:** 82.5% Typ.
- **Durability:** 10 millions times

1.2.4 Environment

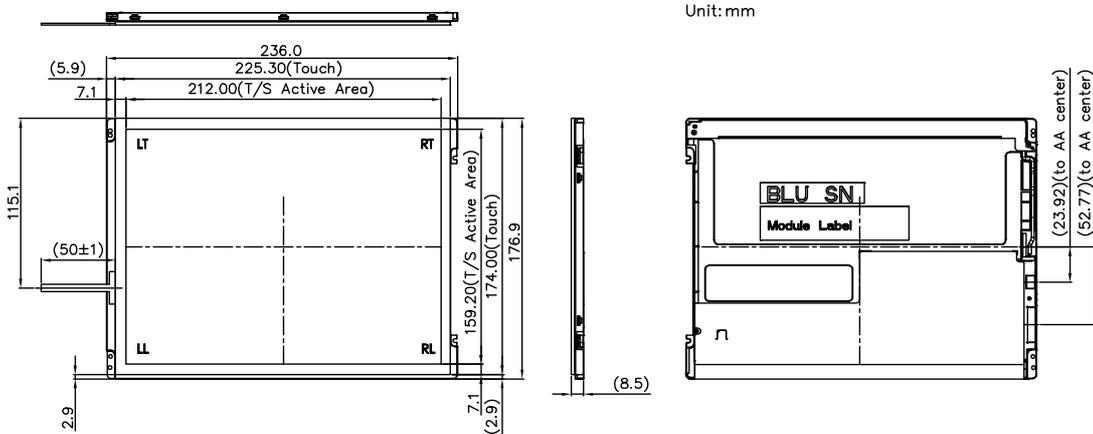
- **Operating Temperature:** -10 to +60°C (R-series)
-20 to +70°C (N-series)
- **Storage Temperature:** -20 to 70°C (R-series)
-20 to 70°C (N-series)
- **Humidity:** 10~ 90% @ 39°C, non-condensing

1.3 Mechanical Characteristic

IDK-2110N Series



IDK-2110R Series



1.4 Functional Block Diagram

The following diagram shows the functional block of the 10.4" Color TFT-LCD Module:

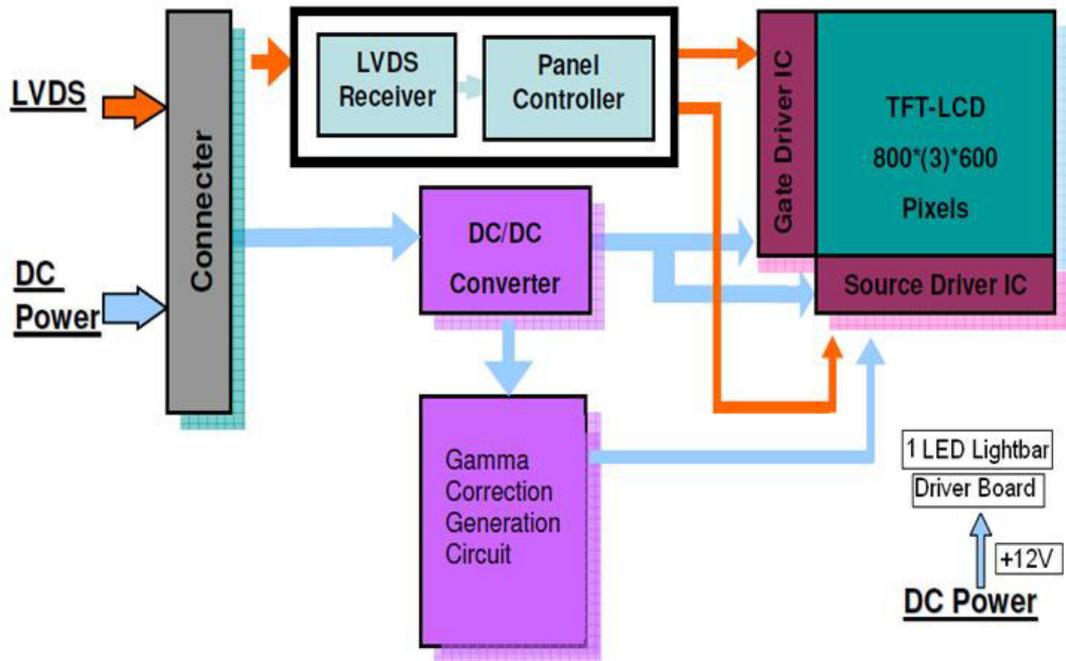


Figure 1.1 Function block diagram

1.5 Touch Screen driver

The T/S driver CD-ROM is in the accessory box and comes with the product.

1.6 Absolute Maximum Ratings

Absolute maximum ratings of the module is as following:

1.6.1 Absolute Ratings of TFT LCD Module

Item	Symbol	Min.	Max.	Unit	Conditions
Logic/LCD Drive Voltage	Vin	0.3	+4.0	[Volt]	Note 1, 2

1.6.2 Absolute Ratings of Backlight Unit

Item	Symbol	Min.	Max.	Unit	Conditions
LED Light Bar Current	ILed	690	700	[mA]	Note 1, 2

1.6.3 Absolute Ratings of Environment

Item	Symbol	Min.	Max.	Unit	Conditions
Operating Temperature	TOP	-10	60	[of]	
Operation Humidity	HOP	8	90	[%RH]	
Storage Temperature	TST	-20	70	[of]	
Storage Humidity	HST	10	90	[%RH]	

Note1: Maximum Wet-Bulb should be 39°C and no condensation.

Note2: Permanent damage to the device may occur if exceed maximum values.

Note3: For quality performance, please refer to AUO IIS (Incoming Inspection Standard).

Chapter 2

Electrical
Characteristics

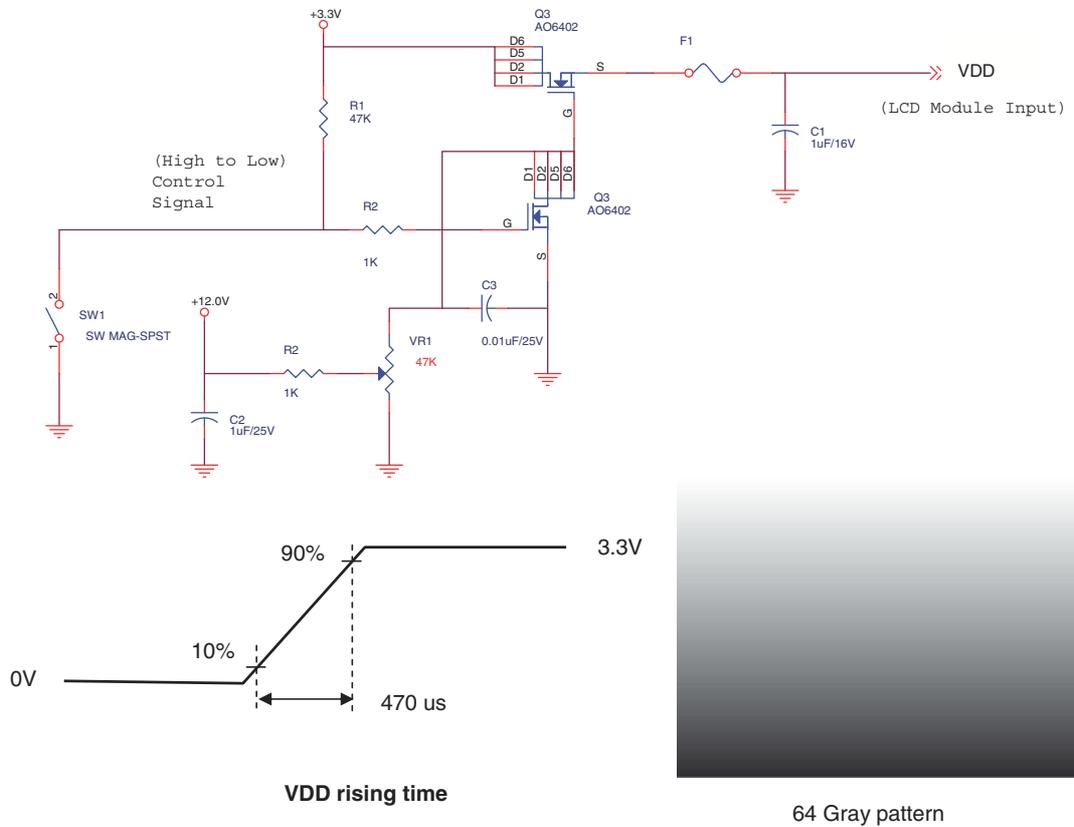
2.1 Power Specification

Input power specifications are as follows:

Table 2.1: Power specification

Symbol	Parameter	Min.	Type.	Max.	Unit	Condition
VDD	Logic/LCD Drive Voltage	3.0	3.3	3.6	[Volt]	10%
IDD	Input Current	-	240	-	[mA]	64 Gray Bar Pattern (VDD=3.3V, at 60Hz)
PDD	VDD Power	-	0.8	-	[Watt]	64 Gray Bar Pattern (VDD=3.3V, at 60Hz)
IRush	Inrush Current	-	-	1.5	[A]	Note 1

Note1 Measurement condition:



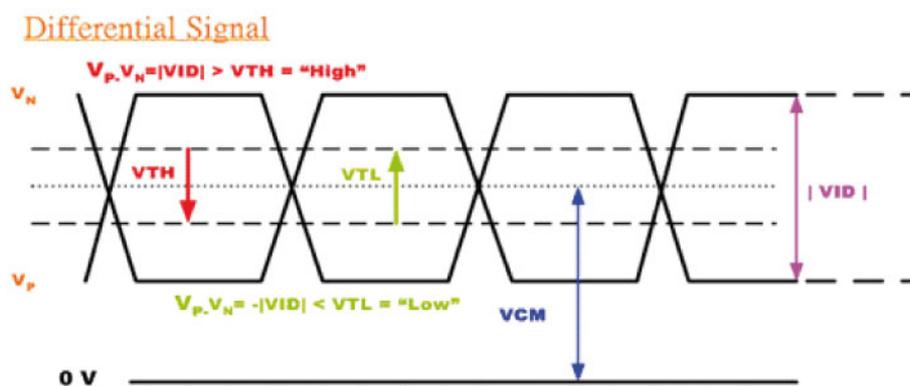
2.1.1 Signal Electrical Characteristics

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

Table 2.2: Signal electrical characteristics

Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
VTH	Differential Input High Threshold	-	-	100	[mV]	VCM=1.2V
VTL	Differential Input Low Threshold	-100	-	-	[mV]	VCM=1.2V
VID	Input Differential Voltage	100	400	600	[mV]	
VICM	Differential Input Common Mode Voltage	1.1	-	1.6	[V]	VTH / VTL = 100mV

Note LVDS Signal Waveform.



2.2 Backlight Driving Conditions

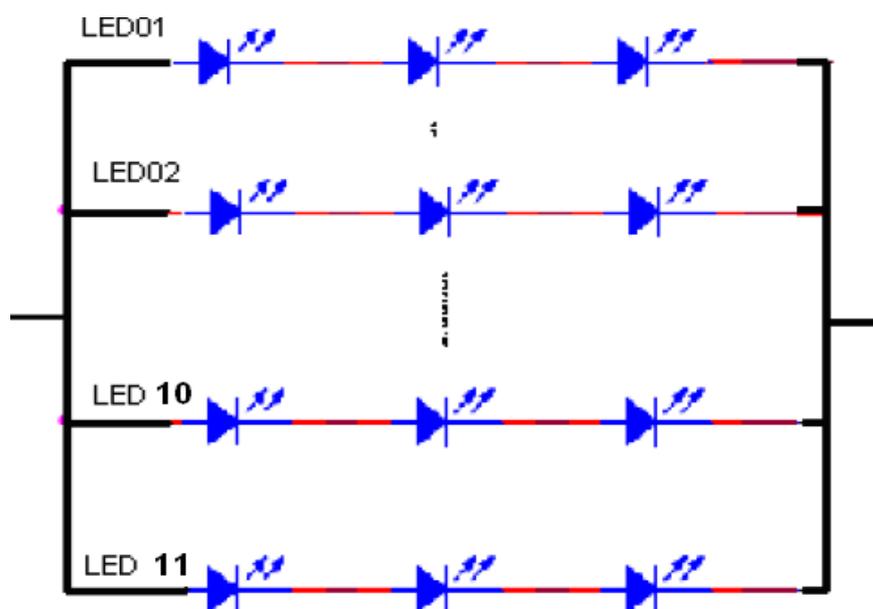
Parameter guideline for LED Light Bar Driver is under stable conditions at 25°C (Room Temperature):

Table 2.3: Backlight driving conditions

Item	Symbol	Values			Unit	Condition
		Min.	Typ.	Max.		
LED Voltage	VL	9		9	V	Note 2
LED Current	IL	690		700	mA	Note 2
LED life time	-	50,000	-	-	Hr	Note 1

Note1 The "LED lift time" is defined as the module brightness decrease to 50% original brightness that the ambient temperature is 25°C and typical LED Current at 700mA.

Note2 The LED driving condition is defined for each LED module.(3 LED Serial, a LED includes 1 Chip).



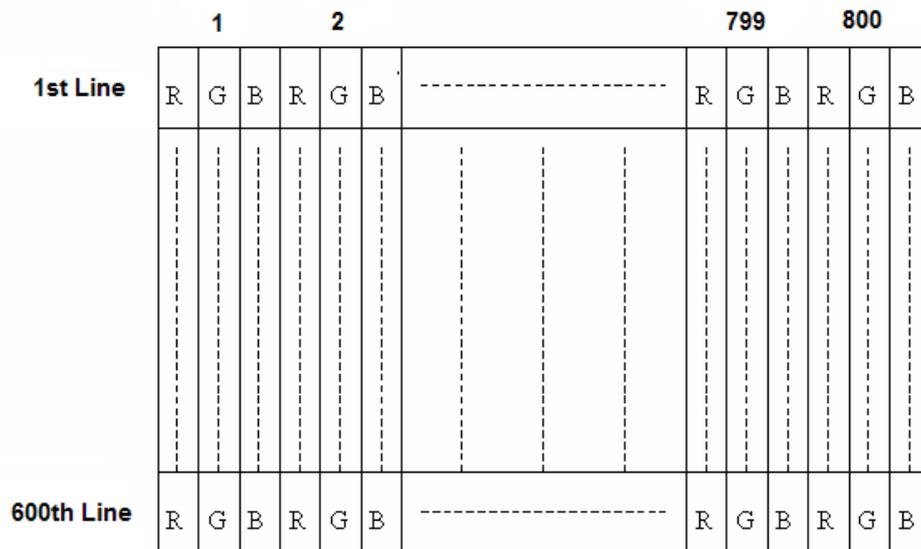
Note3 The variance of LED Light Bar power consumption is $\pm 10\%$. Calculator value for reference ($IL \times VL = P_{LED}$).

Chapter 3

Signal Characteristics

3.1 Pixel Format Image

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



3.2 Pin Description

Table 3.1: Pin Description

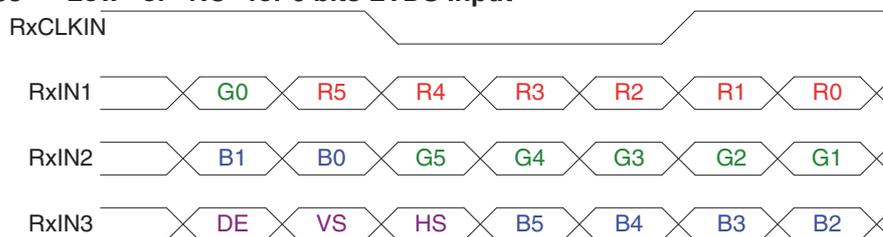
Pin No.	Symbol	Description
1	VDD	Power Supply,3.3V(typical)
2	VDD	Power Supply,3.3V(typical)
3	GND	Ground
4	DPS	Reverse Scan Function [H: Enable; L/NC: Disable]
5	RxIN0-	LVDS differential data input Pair 0
6	RxIN0+	LVDS Differential Data Input (R0, R1, R2, R3, R4, R5, G0)
7	GND	Ground
8	RxIN1-	LVDS differential data input Pair 1
9	RxIN1+	LVDS Differential Data Input (G1, G2, G3, G4, G5, B0, B1)
10	GND	Ground
11	RxIN2-	LVDS differential data input Pair 2
12	RxIN2+	LVDS Differential Data Input (B2, B3, B4, B5, HS, VS, DE)
13	GND	Ground
14	RxCLKIN-	LVDS differential Colock input Pair
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	Reserved for AUO internal test. Please treat it as NC.
20	SEL68	6/ 8bits LVDS data input selection [H: 8bits L/NC: 6bit]

Note: "Low" stands for 0V. "High" stands for 3.3V. "NC" stands for no connected.

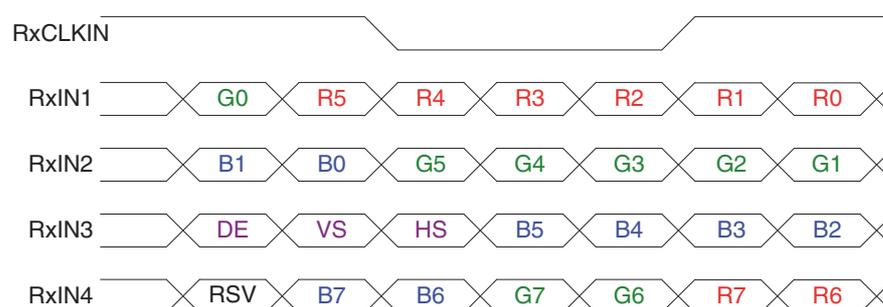
3.3 The Input Data Format

3.3.1 SEL68

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



SEL68 = "High" for 8 bits LVDS Input



Note1: Please follow PSWG.

Note2: R/G/B data 7:MSB, R/G/B data 0:LSB

Signal Name	Description	Remark
R7	Red Data 7	
R6	Red Data 6	
R5	Red Data 5	
R4	Red Data 4	Red-pixel Data, For 8 bits LVDS input, MSB: R5;
R3	Red Data 3	LSB:R0
R2	Red Data 2	
R1	Red Data 1	
R0	Red Data 0	
G7	Green Data 7	
G6	Green Data 6	
G5	Green Data 5	
G4	Green Data 4	Green-pixel Data, For 8 bits LVDS input, MSB:
G3	Green Data 3	G7; LSB:G0
G2	Green Data 2	
G1	Green Data 1	
G0	Green Data 0	

B7	Blue Data 7	
B6	Blue Data 6	
B5	Blue Data 5	
B4	Blue Data 4	Blue-pixel Data, For 8 bits LVDS input, MSB: B7; LSB:B0
B3	Blue Data 3	
B2	Blue Data 2	
B1	Blue Data 1	
B0	Blue Data 0	
RxCLKIN	LVDS Data Clock	
DE	Data Enable Signal	When the signal is high, the pixel data shall be valid to be displayed.
VS	Vertical Synchronous Signal	
HS	Horizontal Synchronous Signal	

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

3.4 Interface Timing

3.4.1 Timing Characteristics

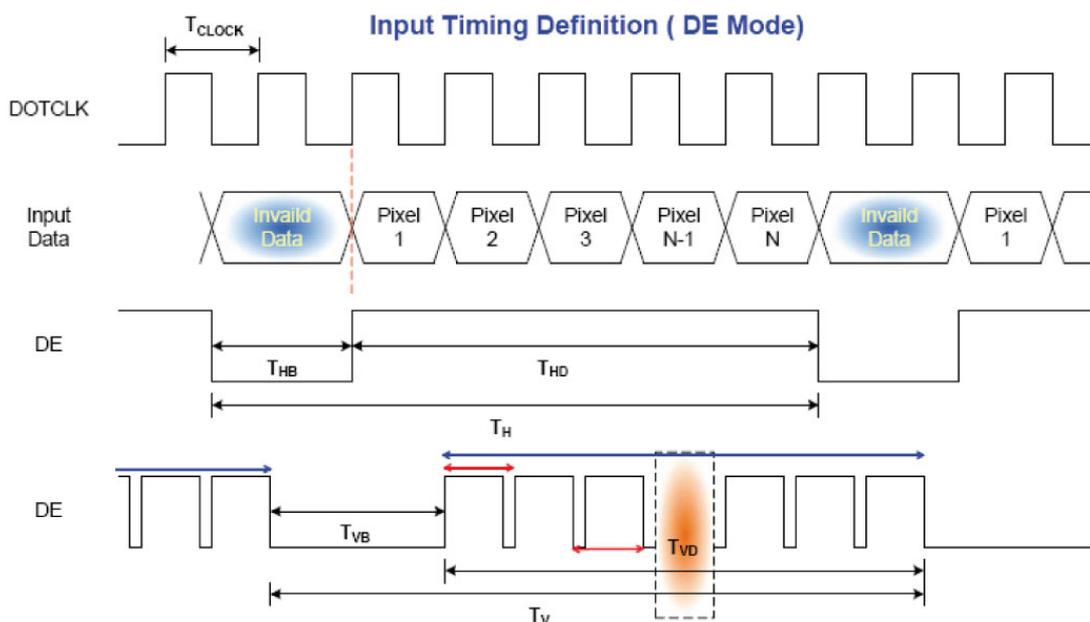
Table 3.2: Timing Characteristics						
Signal	Parameter	Symbol	Min.	Type.	Max.	
Clock Timing	Clock frequency	$1/T_{\text{Clock}}$	33.6	39.8	48.3	
Vsync Timing	Vertical Section	Period	T_V	608	628	650
		Active	T_{VD}	600	600	600
		Blanking	T_{VB}	8	28	50
Hsync Timing	Horizontal Section	Period	T_H	920	1056	1024
		Active	T_{HD}	800	800	800
		Blanking	T_{HB}	120	256	440

Note Frame rate is 60 Hz.

Note DE mode.

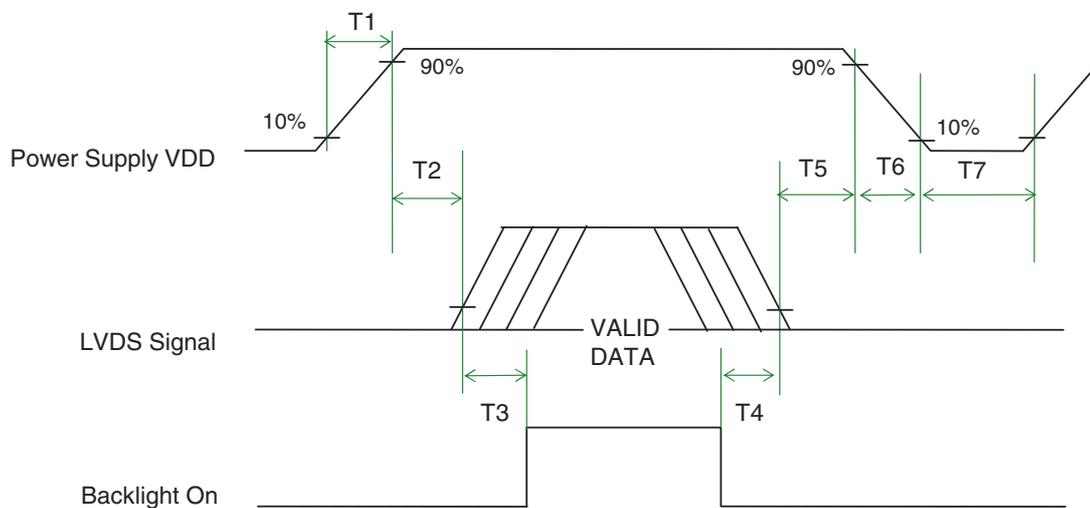
Note Typical value refer to VESA STANDARD

3.4.2 Input Timing Diagram



3.5 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 Sequence Timing

Parameter	Value			Unit
	Min.	Type.	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]

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

4.1 TFT LCD Module

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

4.1.1 Connector

Table 4.1: Connector

Connector Name / Description	Signal Connector
Manufacture	STM or compatible
Connector Model Number	STM-MSB24013P20HA or Compatible
Adaptable Plug	STM-P24013P20 or compatible

4.1.2 Pin Assignment

Table 4.2: Pin Assignment

Pin No.	Signal Name	Pin No.	Signal Name
1	VDD	2	VDD
3	GND	4	DPS
5	RxIN0-	6	RxIN0+
7	GND	8	RxIN1-
9	RxIN1+	10	GND
11	RxIN2-	12	RxIN2+
13	GND	14	RxCLKIN-
15	RxCLKIN+	16	GND
17	RxIN3-	18	RxIN3+
19	RSV	20	SEL68

4.2 Backlight Unit

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

Connector Name / Designation	LED Light Bar Connector / Backlight lamp
Manufacturer	SPEEDCON
Type Part Number	WF-SMT90 1.5mm Wire to board Heater
Mating Type Part Number	NA

4.2.1 Signal for LED light bar connector

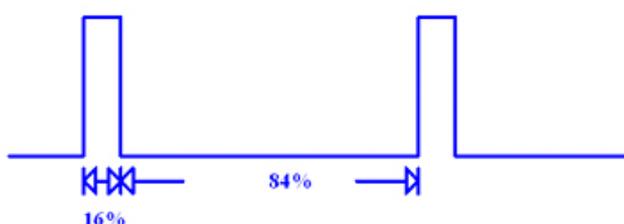
Connector No.	Pin No.	Input	Color	Function
Lower CN2	1	HI 2	Red	Power supply for backlight unit
	2	GND 2	Black	Ground for backlight unit

Cable Length: 250mm+/-10mm

4.2.2 LED Driver Board

4.2.2.1 Specification:

Table 4.3: Specification						
Symbol	Characteristics	Condition	Min.	Type.	Max.	Unit
Input	Voltage		10	12	15	V
	Efficiency	Vin=12V, Iout=700mA, Vout=9V		85		%
	Power		0.3		20	W
Output	Voltage		9	9	10.5	V
	Current		100		700	mA
	Current Accuracy	100mA≤Iout≤700mA		±5	±10	%
Environment	Protection	OVP				
	Thermal Shutdown			165		°C
	Operating Junction Temperature				125	°C
	Operating Temperature		-20		70	°C
	Storage Temperature		-40		85	°C
PWM Dimmer	Dimmer range(Note. 1)		16		100	V
	Dimmer VH		3.5		5.5	V
	Dimmer VL		0		2.5	V
	Dimmer Frequency		0.25	0.5	1	KHz
ON/OFF	Von		3.5		5.5	V
	Voff		0		2.5	



Note1: When the input PWM signal, the high-level digital output must be greater than the total output level of only 16% of out.

4.2.2.2 Input connector pin define

Table 4.4: Input connector pin define	
Pin No.	Pin Define
1	Vin(+12V)
2	Vin(+12V)
3	GND
4	GND
5	ON/OFF(0V: Off ; +5V: On)
6	Dimming(PWM)

4.2.2.3 Output connector pin definition

Table 4.5: Output connector pin define

Pin No.	Pin Define
1	VLED-
2	VLED+

4.2.2.4 Dimension

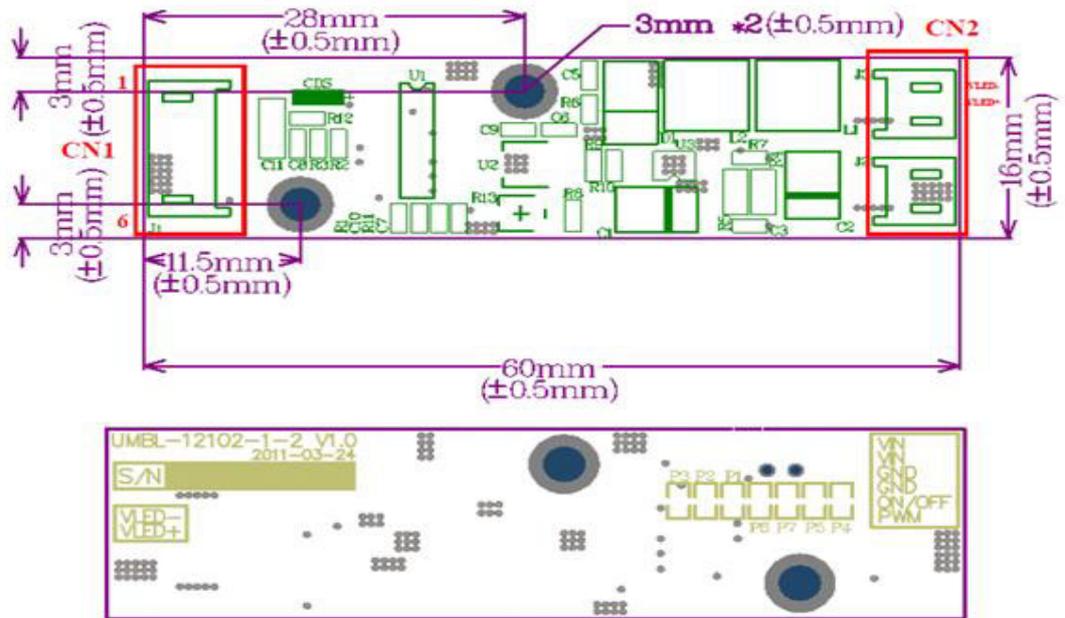


Figure 4.1 Dimension

Chapter 5

Touch Screen & Touch
Controller

5.1 Touch Screen (Optional: for IDK-2110R only)

5.1.1 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.

5.1.2 Optical Characteristics

Item	Specification	Remarks	
1	TRANSPARENCY	82.5% Typ. 80% Min. (Active area) (Inside of guaranteed active area)	JIS K-7105
2	HAZE	8.0% Typ. (Anti-glare)	JIS K-7105

5.1.3 Environment Characteristics

Item	Specification	Remarks	
1	Operation temperature	-10°C ~ 60°C	Max. wet Temp is 38°C (No dew)
2	Storage temperature	-30°C ~ 70°C	
3	Operation Humidity	20% ~ 90%RH	
4	Storage temperature	10% ~ 90%RH	

5.1.4 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 Finger (5~200gf)	Dot-Spacer Within "guaranteed active area", but not on the age and Dot-Spacer.

5.1.5 Electronic Characteristics

Item	Specification	Remarks	
1	Rated Voltage	DC 7V max.	
2	Resistance	X axis: 200Ω ~ 1000Ω(Glass side) Y axis: 100Ω ~ 800Ω(Film side)	FPC connector
3	Linearity	±1.5%max initial value ±2.0%max (after environmental & life test)	Reference: 250gf
4	Chattering	20ms Max At connector pin	
5	Insulation Resistance	10MΩ @ (DC 25V) 10MΩ min(DC 25V)	

5.2 Touch controller (Optional: - for IDK-2110R only)

5.2.1 Touch Controller Characteristics

Advantech ETM-RES05C Touch Control Board, the ultimate combo board. This touch panel controller provides the optimistic performance of your analog resistive touch panels for 4 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.

5.2.2 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 4-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

5.2.3 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

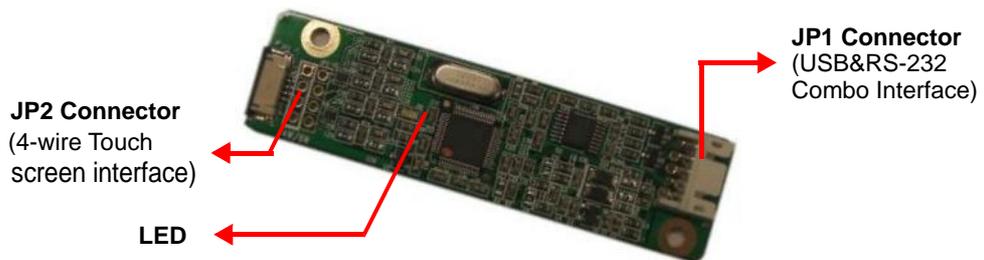
Acquired RoHS certificate

Regulatory FCC-B, CE approvals

Dimension: 75 mm x 20 mm x 10 mm

5.2.4 Pin Assignment and Description

5.2.4.1 Connector and LED Location



5.2.4.2 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	ctr	serial data from controller to host
TxD	3	4	host	serial data from host to controller

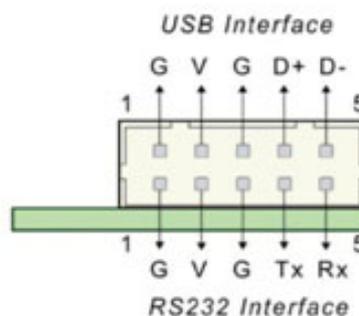
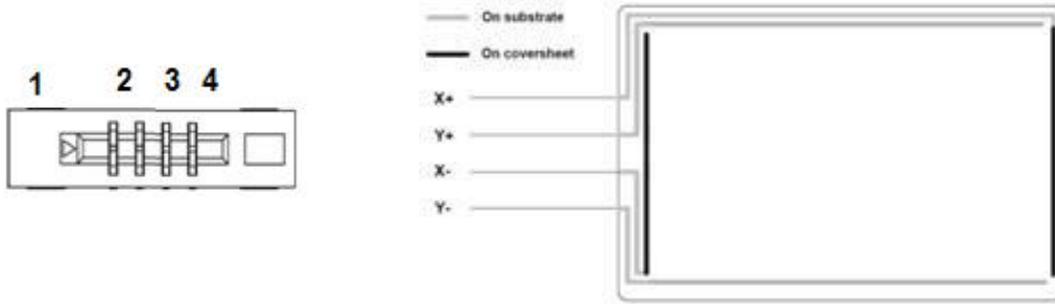


Figure 5.1 Board mounted header

5.2.4.3 Touch Screen Connector, JP2, Pins and Signal Descriptions

The Touch Screen connector, JP2, is a FFC/FPC SMD 1.0mm 4-pins 90 degree, Female type connector. The pins are numbered as shown in the table below.

TS4 Pin #	Signal Name	Signal Description
1	YB	Bottom
2	XL	Left
3	YT	Top
4	XR	Right



4-Wire Touch Screen ZIF connector

4-Wire Screen viewed from coversheet side

Appendix **A**

Optical Characteristics

A.1 Optical Characteristics

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

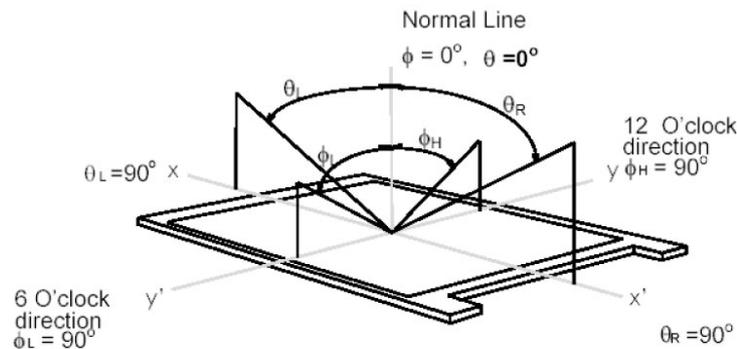
Table A.1: Optical Characteristics

Item	Unit	Conditions	Min.	Typ.	Max.	Note
Viewing Angle	[degree]	Horizontal (Right)	70	80	-	1
		CR = 10 (Left)	70	80	-	
	Vertical (Upper)	50	60	-		
		CR = 10 (Lower)	60	70	-	
Luminance Uniformity	[%]	9 Points	65	75	-	2, 3
Optical Response Time	[msec]	Rising	-	25	30	
		Falling	-	10	20	5
		Rising + Falling	-	35	50	
Color/Chromaticity Coordinates (CIE 1931)		White x	-	0.300	-	4
		White y	-	0.331	-	
Color Temp.	K		-	7000		
White Luminance	[cd/m ²]		1100	1200	-	4
Contrast Ratio			-	500	-	4

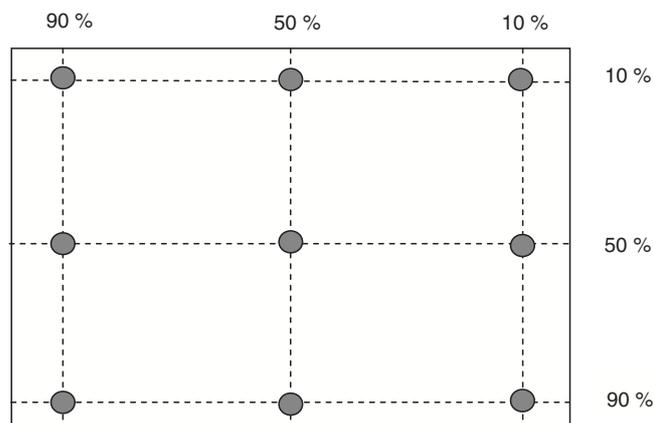
Note Optical Equipment: BM-7, DT-101, or equivalent

Note1 Definition of viewing angle

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 below: 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.



Note2 9 points position

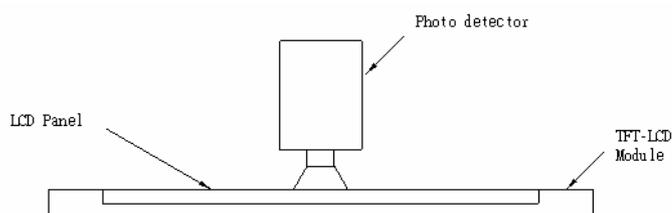


Note3 The luminance uniformity of 9 points is defined by dividing the maximum luminance values by the minimum test point luminance

$$\delta_{w9} = \frac{\text{Minimum Brightness of nine points}}{\text{Maximum Brightness of nine points}}$$

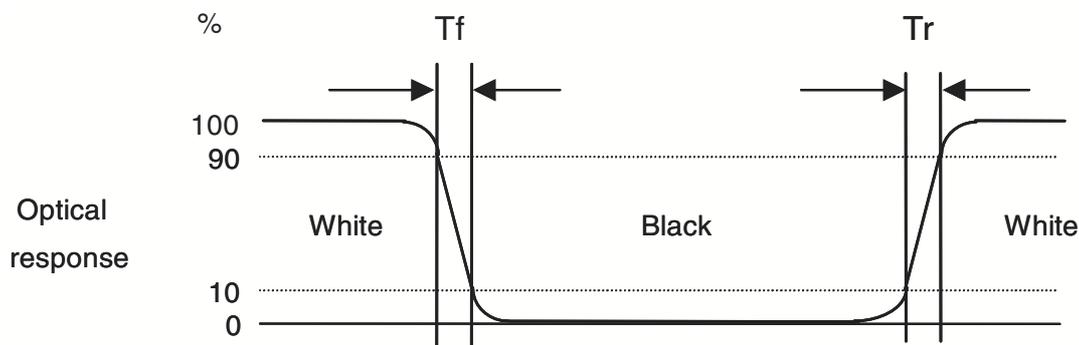
Note4 Measurement method

The LCD module should be stabilized at given temperature for 30 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30 minutes in a stable, windless and dark room. Optical Equipment: DT-100, or equivalent



Note5 Definition of response time

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



Appendix **B**

Handling Precautions

B.1 Optical Characteristics

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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