User Manual

IDK-2112 Series

12.1" SVGA (LED Backlight)

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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-2112N/R-K2SVA2E 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 an SVGA (800(H) x 600(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 Specifications

1.2.1 LCD Panel

- **Display Size:** 12.1" LED backlight panel
- **Resolution:** 800 x 600
- **Viewing Angle (U/D/L/R):** 65°/75°/80°/80°
- **Brightness:** 1200 cd/m^2
- **Contrast Ratio:** 700:1
- **Response Time (ms):** 35ms
- **Colors:** 262K/16.2M
- **Voltage:** 3.3V
- **Power Consumption:** 8.924W
- **Signal Interface:** 1 channel LVDS
- **Weight:** R series: 980 +/-10 (Typ.)
          N series: 600 +/-10 (Typ.)
- **Dimensions (W x H x D):** R series:279.0(H) x 209.0(V) x (11.3)(D) (Typ.)
                          N series:279.0(H) x 209.0(V) x (9.0)(D) (Typ.)

1.2.2 LED Driver Board

- **Efficiency:** 90%
- **Output Current & Voltage:** 400mA/18V
- **Dimensions (W x H x D):** 62 x 16 x 6 mm

1.2.3 Touch Screen (R series)

- **Touch Screen:** 5-Wire Resistive
- **Light Transmission:** 80% ± 3%
- **Durability:** 10 million times

1.2.4 Environment

- **Operating Temperature:** -30~85°C (IDK-2112N-K2SVA2E) / -20~70°C (IDK-2112N/R-K2SVA2E)
- **Storage Temperature:** -30~85°C (IDK-2112N-K2SVA2E) / -25~80°C (IDK-2112N/R-K2SVA2E)
- **Humidity:** 95% @ 39°C, non-condensing

1.3 Mechanical Characteristics

IDK-2112N Series
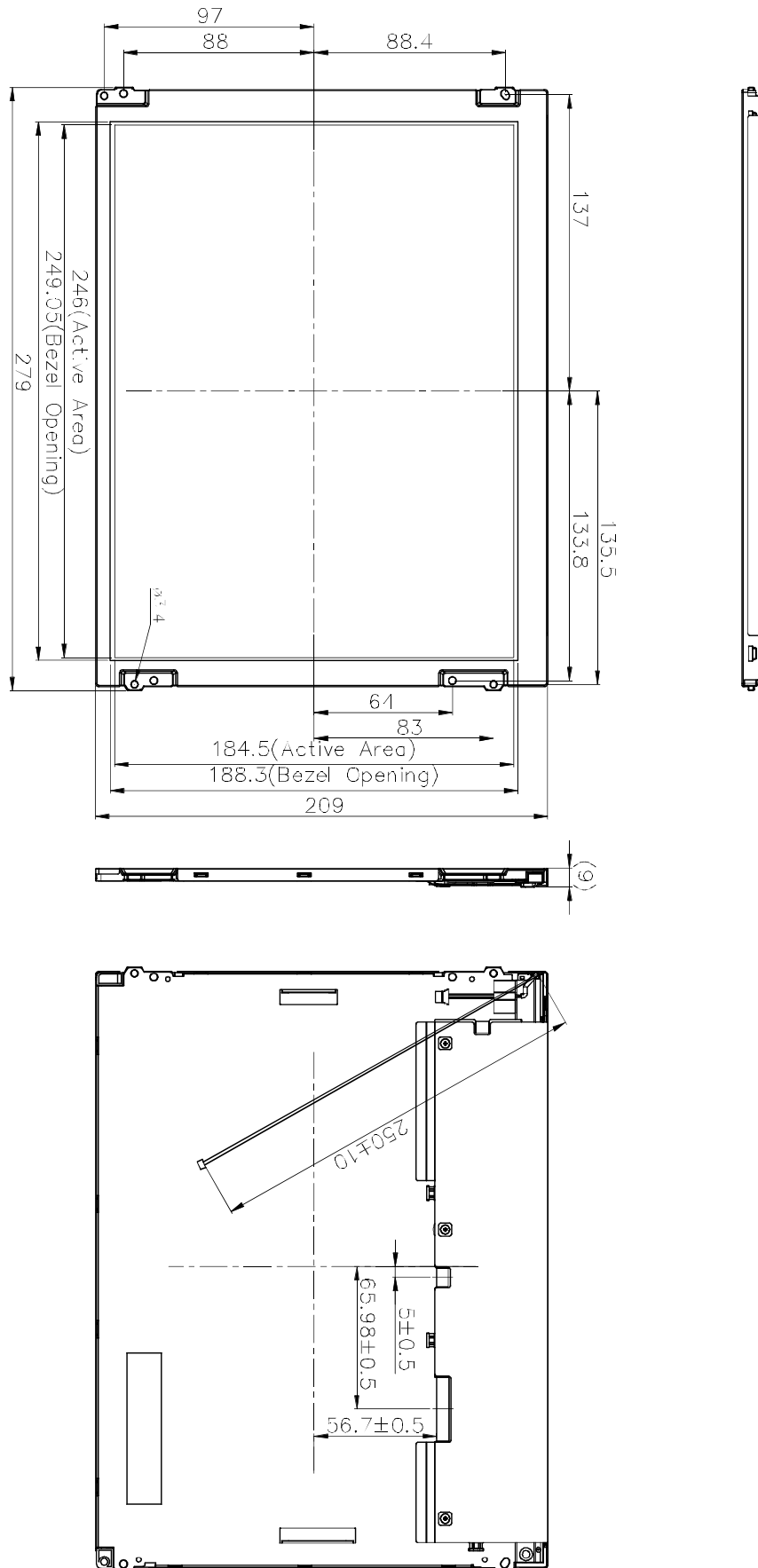
IDK-2112R Series
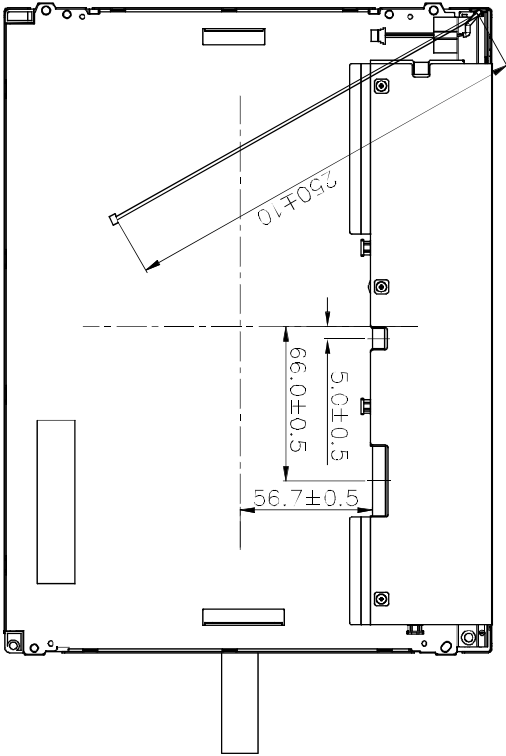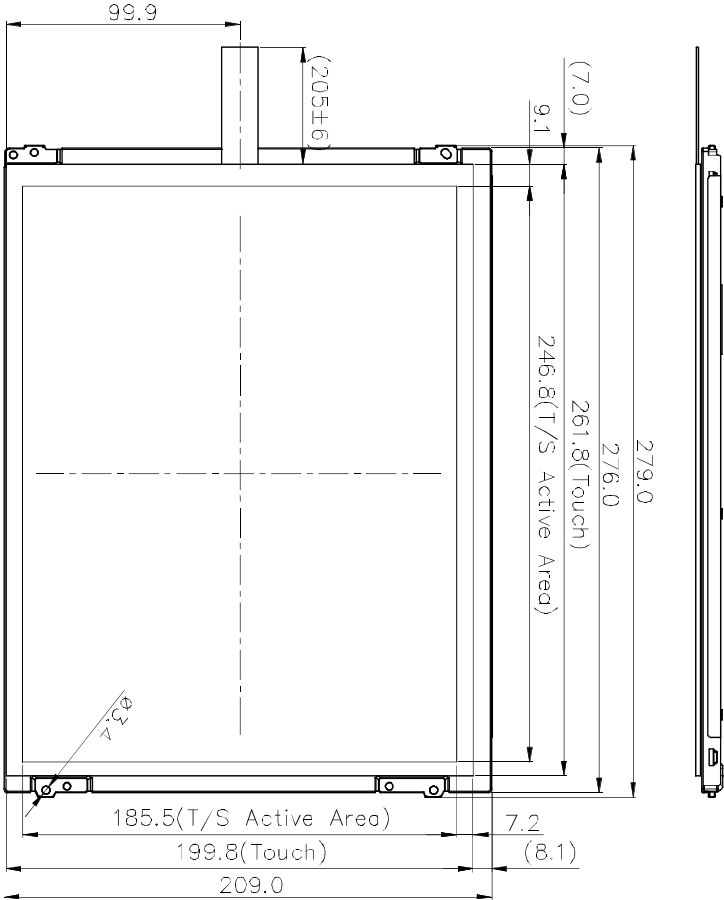
1.4 Functional Block Diagram

The following diagram shows the functional block of the 12.1 inches Color TFT-LCD Module:
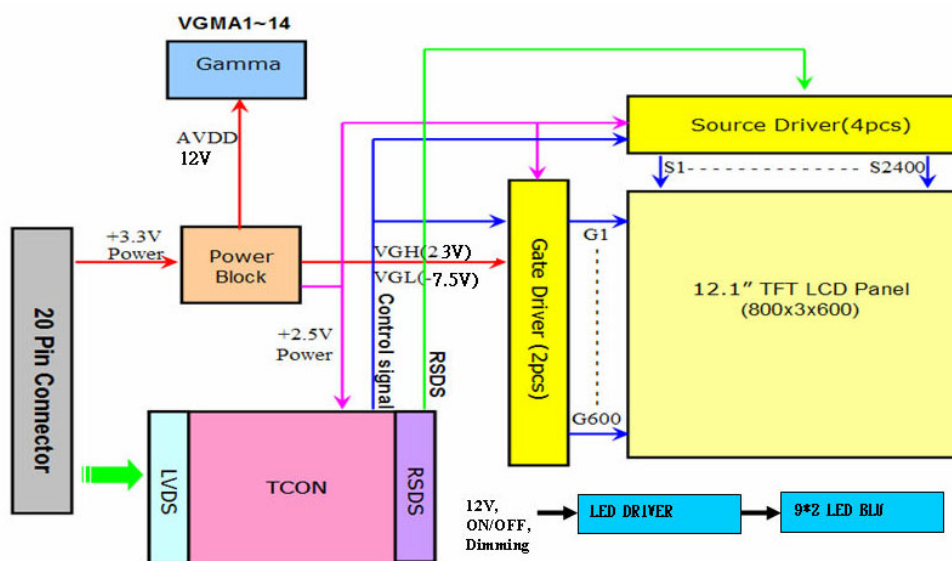
Figure 1.1 Function block diagram

1.5 Absolute Maximum Ratings

Absolute maximum ratings of the module are as follows:

1.5.1 Absolute Ratings of TFT LCD Module

Item	Symbol	Min.	Max.	Unit	Conditions
Logic/LCD Drive Voltage	Vin	0.3	+3.6	[Volt]	Note 1, 2

1.5.2 Absolute Ratings of Backlight Unit

Item	Symbol	Min.	Max.	Unit	Conditions
LED Light Bar Current	ILed		800	[mA]	Note 1, 2

1.5.3 Absolute Ratings of Environment

Item	Symbol	Min.	Max.	Unit	Conditions
Operating Temperature	TOP	-30	+85	[°C]	for IDK-2112N-K2SVA2E only
		-20	+70	[°C]	
Operation Humidity	HOP		95	[%RH]	Note 1
Storage Temperature	TST	-30	+85	[°C]	For IDK-2112N-K2SVA2E only
		-25	+80	[°C]	For IDK-2112R-K2SVA2E only
Storage Humidity	HST		95	[%RH]	Note 1

Note1: With in Ta= 39°C

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

Chapter 2

Electrical
Characteristics

2.1 Power Specification

Input power specifications are as follows:

Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
VDD	Logic/LCD Drive Voltage	3.0	3.3	3.6	[Volt]	10%
IDD	Input Current	-	280		[mA]	64 Gray Bar Pattern (VDD=3.3V, at 60Hz)
PDD	VDD Power	-	0.924		[Watt]	64 Gray Bar Pattern (VDD=3.3V, at 60Hz)
IRush	Inrush Current	-	-	1.5	[A]	Note 1

Note1 Measurement condition:

VDD rising time

64 Gray pattern
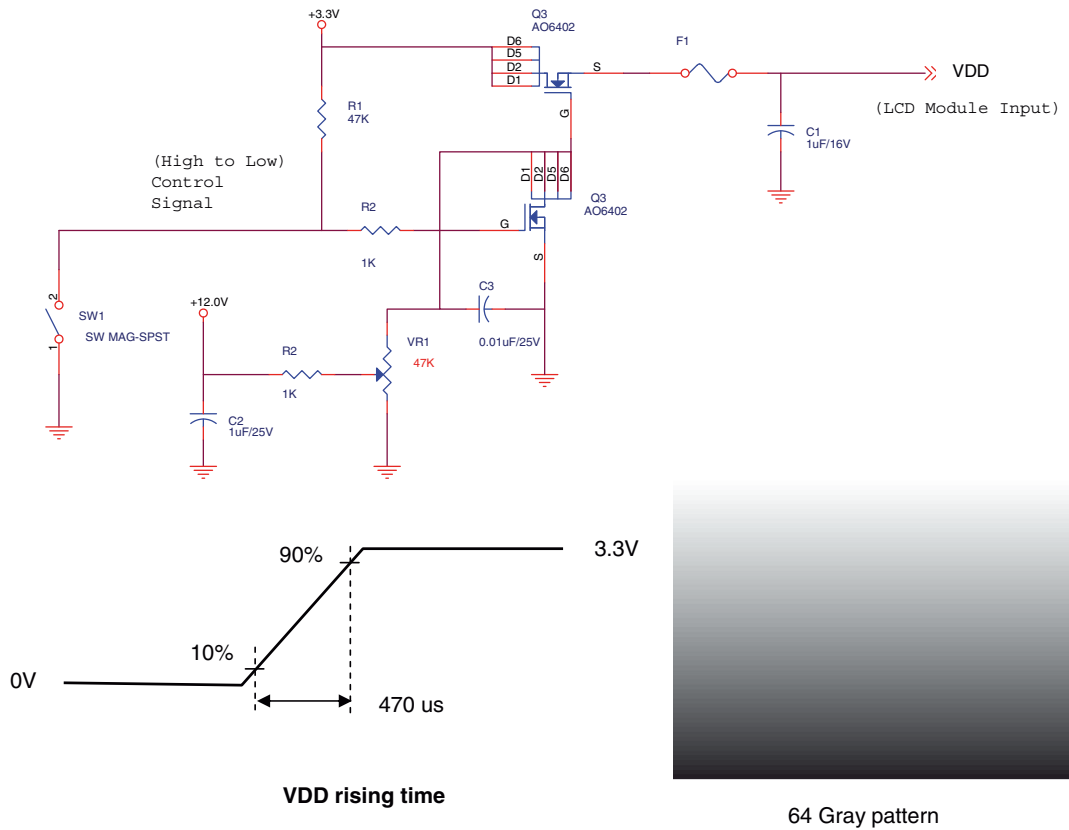
2.1.1 Signal Electrical Characteristics

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

Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
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	-	1.45	[V]	VTH / VTL = ±100mV

Note LVDS Signal Waveform.

Single-end Signal

Differential Signal
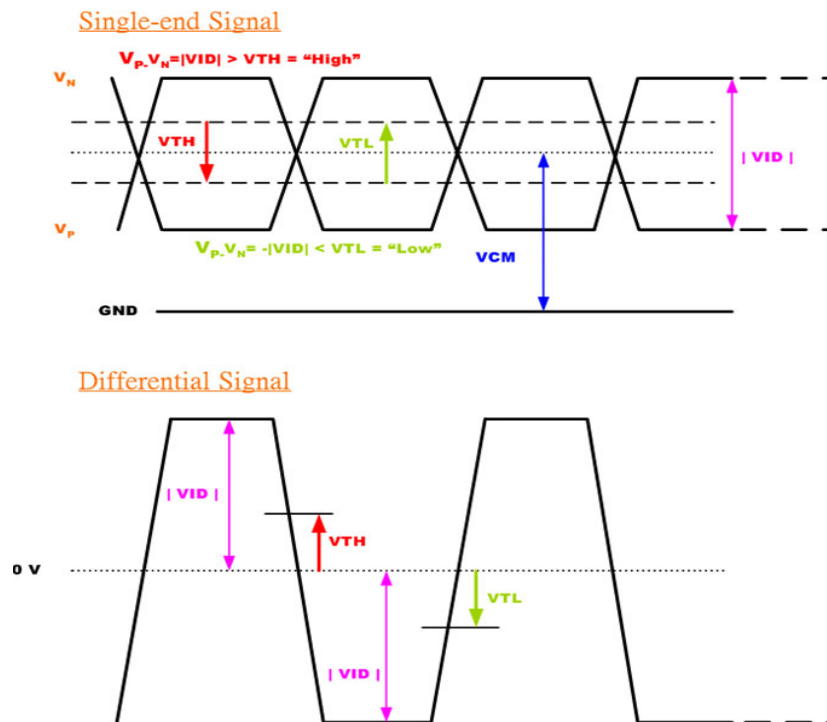
2.2 Backlight Driving Conditions

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

Item	Symbol	Values			Unit	Condition
		Min.	Typ.	Max.		
LED Voltage	VL		18		V	Note 2, 3
LED Current	IL			400	mA	Note 2
LED life time	-	50,000	-	-	Hr	Note 1

Table 2.3: Backlight driving conditions

Note1. The "LED life time" is defined as the module brightness decrease to 50% original brightness so that the ambient temperature is 25°C and typical LED Current at 400mA.

Note 2. The LED driving condition is defined for each LED module (6 LED serial).

Note 3. The variance of LED Light Bar power consumption is 10%. To calculate a value use this for reference (IL x VL = PLED).
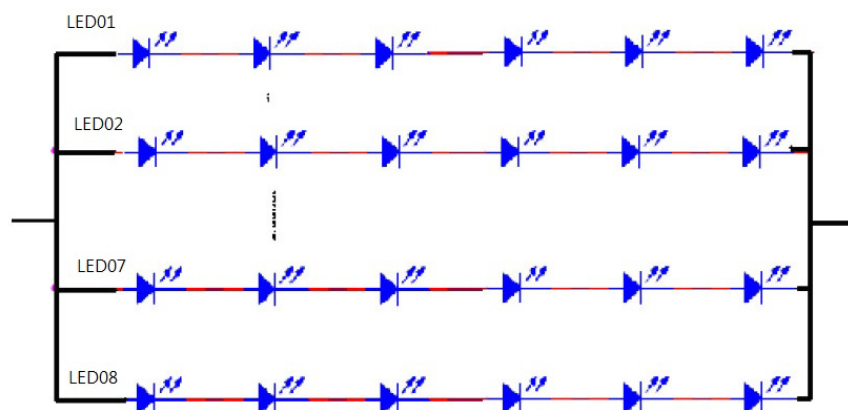
Chapter 3

Signal Characteristics

3.1 Pixel Format Image

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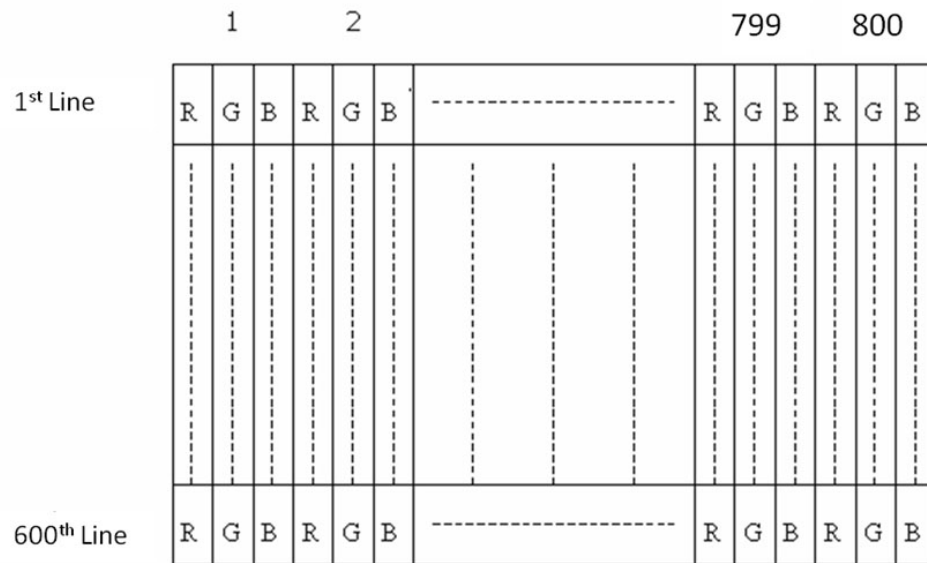
3.2 Signal Description

Table 3.1: Symbol 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/ 8bits LVDS data input selection [H: 8bits L/NC: 6bit]
5	RIN0-	LVDS receiver signal channel 0
6	RIN0+	LVDS Differential Data Input (R0, R1, R2, R3, R4, R5, G0)
7	GND	Ground
8	RIN1-	LVDS receiver signal channel 1
9	RIN1+	LVDS Differential Data Input (G1, G2, G3, G4, G5, B0, B1)
10	GND	Ground
11	RIN2-	LVDS receiver signal channel 2
12	RIN2+	LVDS Differential Data Input (B2, B3, B4, B5, HS, VS, DE)
13	GND	Ground
14	CLKIN-	LVDS receiver signal clock
15	CLKIN+	
16	GND	Ground
17	RIN3-	LVDS receiver signal channel 3, NC for 6 bit LVDS Input
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.

Note1 Input Signals shall be in low status when VDD is off.

Note2 High stands for "3.3V", Low stands for "0V", NC stands for "No Connection".

Note3 RSV stands for "Reserved".

3.3 The Input Data Format

3.3.1 SEL68

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

RxCLKIN							
RxIN1	G0	R5	R4	R3	R2	R1	R0
RxIN2	B1	B0	G5	G4	G3	G2	G1
RxIN3	DE	VS	HS	B5	B4	B3	B2
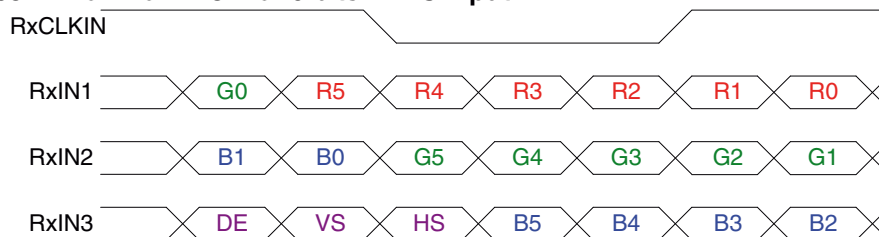
SEL68 = "High" for 8 bits LVDS Input

RxCLKIN							
RxIN1	G0	R5	R4	R3	R2	R1	R0
RxIN2	B1	B0	G5	G4	G3	G2	G1
RxIN3	DE	VS	HS	B5	B4	B3	B2
RxIN4	RSV	B7	B6	G7	G6	R7	R6
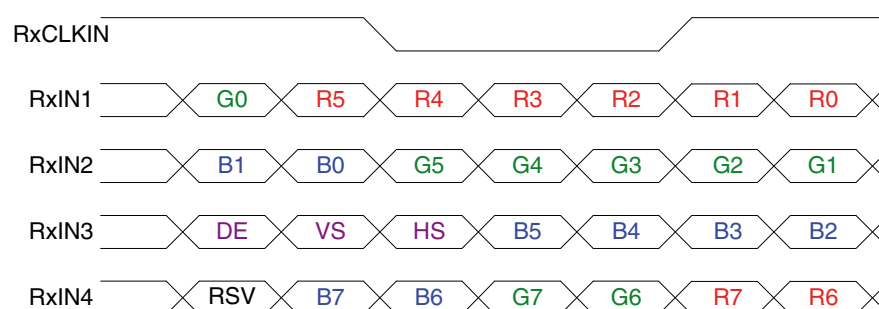
Note1: Please follow PSWG.

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

Signal Name	Description	Remark
+RED5(R5)	Red Data 5 (MSB)	
+RED4(R4)	Red Data 4	
+RED3(R3)	Red Data 3	Red-pixel Data
+RED2(R2)	Red Data 2	Each red pixel's brightness data consists of
+RED1(R1)	Red Data 1	these 6 bits pixel data.
+RED0(R0)	Red Data 0 (LSB)	
	Red-pixel Data	
+GREEN5(G5)	Green Data 5 (MSB)	
+GREEN4(G4)	Green Data 4	
+GREEN3(G3)	Green Data 3	Green-pixel Data
+GREEN2(G2)	Green Data 2	Each green pixel's brightness data consists of
+GREEN1(G1)	Green Data 1	these 6 bits pixel data.
+GREEN0(G0)	Green Data 0 (LSB)	
	Green-pixel Data	

+BLUE5(B5)	Blue Data 5 (MSB)	
+BLUE4(B4)	Blue Data 4	
+BLUE3(B3)	Blue Data 3	Blue-pixel Data
+BLUE2(B2)	Blue Data 2	Each blue pixel's brightness data consists of these 6 bits pixel data.
+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.

3.4 Interface Timing

3.4.1 Timing Characteristics

Table 3.2: Timing Characteristics						
Signal		Symbol	Min.	Typ.	Max.	Unit
Clock frequency		$1/T_{Clock}$	34	40	48.3	MHz
Vertical Section	Period	T_V	608	628	1024	T_{Line}
	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	

Note1 Frame rate is 60 Hz.
Note2 DE mode.

3.4.2 Input Timing Diagram
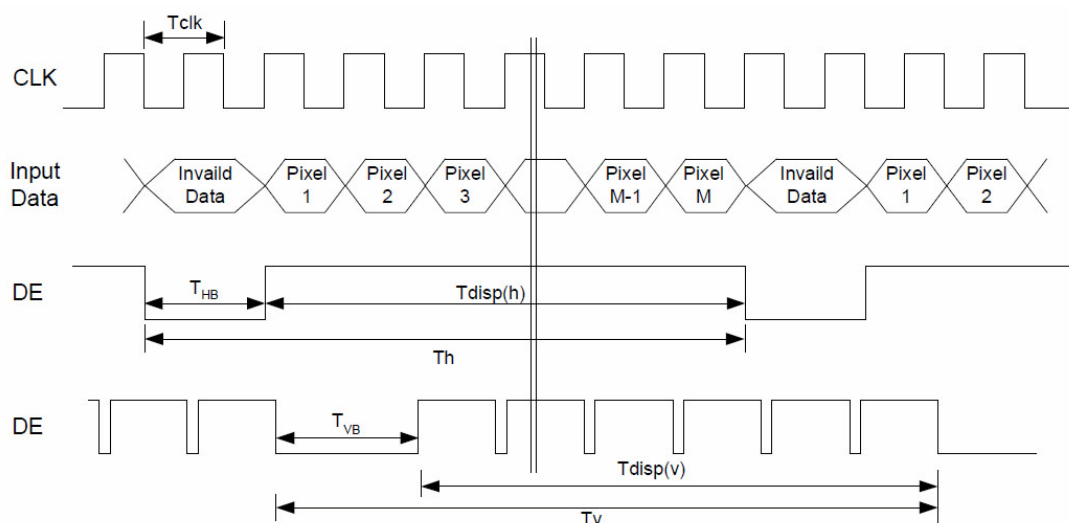
3.5 Power ON/OFF Sequence

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.
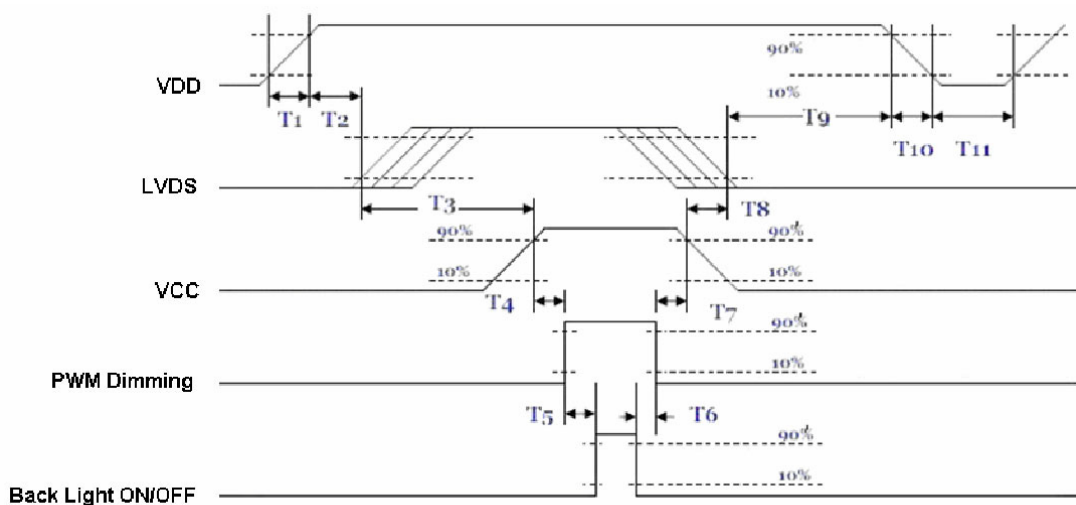
Power Sequence Timing

Parameter	Value			Unit
	Min.	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 functioning 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

The physical interface connectors are capable of accommodating the following signals and components.

4.1.1 Connector

Table 4.1: Connector	
Connector Name / Description	Signal Connector
Manufacture	STM
Connector Model Number	MSB240420-E
Adaptable Plug	P240420 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	SEL68
5	RIN0-	6	RIN0+
7	GND	8	RIN1-
9	RIN1+	10	GND
11	RIN2-	12	RxIN2+
13	GND	14	CLKIN-
15	CLKIN+	16	GND
17	RIN3-	18	RIN3+
19	RSV	20	NC/GND

4.2 Backlight Unit

These connectors are capable of accommodating the following signals and components.

Connector Name / Designation	LED Light Bar Connector / Backlight lamp
Manufacturer	JST or compatible
Type Part Number	WF-SMT90 1.5mm Wire to board Heater

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.	Typ.	Max.	Unit
Input	Voltage		11.2	12	13.2	V
	Efficiency			90		%
Output	Voltage		17	18	19	V
	Current		380	400	420	mA
	Current Accuracy			±5		%
	Protection	OVP, UVLO				
Environment	Operating Temperature		-30		85	°C
	Storage Temperature		-40		105	°C
PWM Dimmer	Dimmer range (Note. 1)		5		100	%
	Dimmer VH			5		V
	Dimmer VL			0		V
	Dimmer Frequency		0.5		40	KHz
ON/OFF	Von		3		5	V
	off		0		0.8	V
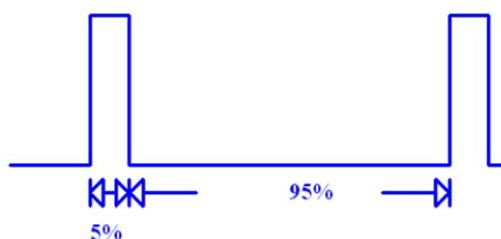
Note1: When the input uses a PWM signal, the high-level digital output must be greater than the total output level of only 5% out.

4.2.2.2 Input Connector Pin Definition

Table 4.4: Input Connector Pin Definition (CN1)	
Pin No.	Pin Definition
1	Vin(+12V)
2	Vin(+12V)
3	GND
4	GND
5	ON/OFF(ON:+3~5V, OFF=0~0.8V)
6	Dimming (PWM)

CN1

S6B-ZR-SM4

(pin1)
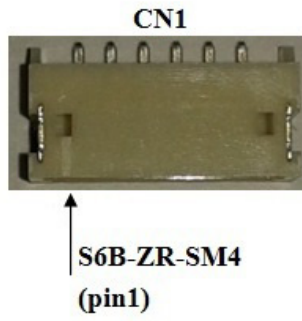
4.2.2.3 Output Connector Pin Definition

Table 4.5: Output Connector Pin Definition (CN4)	
Pin No.	Pin Definition
1	VLED+
2	VLED-

CN4

S2B-ZR-SM4

(pin1)

4.2.2.4 Light Sensor Connector Pin Definition

Table 4.6: Light Sensor Connector Pin Definition (CN2)	
Pin No.	Pin Definition
1	Sensor High Voltage
2	Sensor Low Voltage

CN2

S2B-ZR-SM4

(pin1)
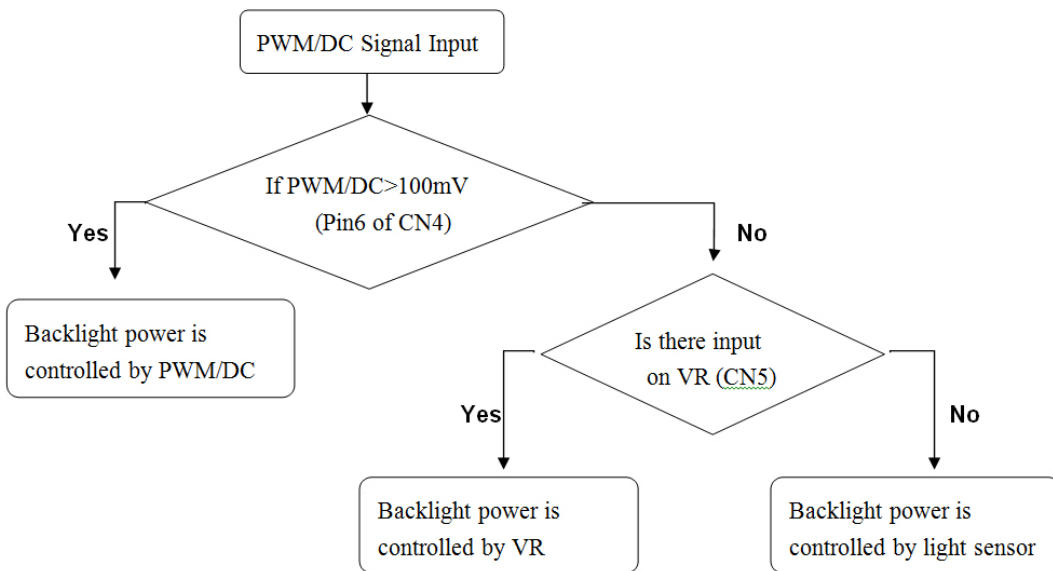
4.2.2.5 Variable Resistor Connector Pin Definition

Table 4.7: Variable Resistor Connector Pin Definition (CN3)	
Pin No.	**Pin Definition**
1	VR High Voltage
2	VR
3	VR Low Voltage

CN3

S3B-ZR-SM4
(pin1)

4.2.2.6 Brightness Control Signal Flow Chart

PWM/DC Signal Input

If PWM/DC>100mV
(Pin6 of CN4)

Yes

No

Backlight power is controlled by PWM/DC

Is there input on VR (CN5)

Yes

No

Backlight power is controlled by VR

Backlight power is controlled by light sensor
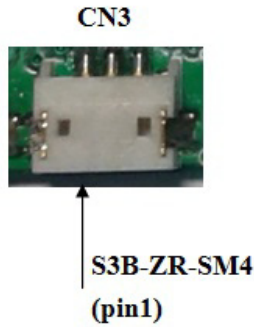
Figure 4.1 Brightness Control Signal Flow Chart
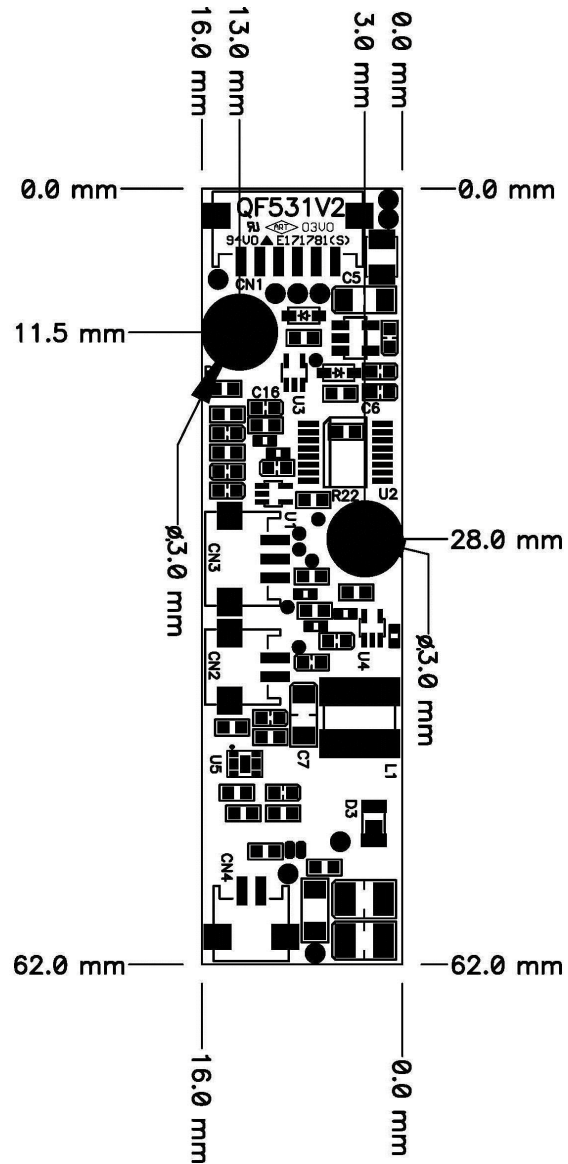
4.2.2.7 Dimensions

Figure 4.2 Dimensions

Chapter 5

Touch Screen & Touch Controller

5.1 Touch Screen (Optional: for IDK-2112R only)

5.1.1 Touch Characteristics

The touch panel is a resistance type that customers use with flat displays like LCDs. Once an operator touches it, the circuit will send coordinate points to the PC from the voltage changes at the contact points.

5.1.2 Optical Characteristics

	Item	Specification	Remarks
1	TRANSPARENCY	80% ± 3%	BYK-Gardner
2	HAZE	8.0% ± 3%	BYK-Gardner

5.1.3 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 temperature	20% ~ 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 (5~200gf)	Dot-Spacer Within "guaranteed active area", but not on the edge and Dot-Spacer.
		Finger		

5.1.5 Electronic Characteristics

|	Item	Specification	Remarks
1	Rated Voltage	DC 7V max.	
2	Resistance	X axis: 200Ω ~ 500Ω (Figure as below)	FPC connector
		Y axis: 200Ω ~ 800Ω (Figure as below)	
3	Linearity	X ≤1.5% (Figure as below) Y ≤1.5% (Figure as below)	Reference: 250gf
4	Chattering	≤ 15ms Max	
5	Insulation Resistance	≥ 20MΩ min (DC 25V)	
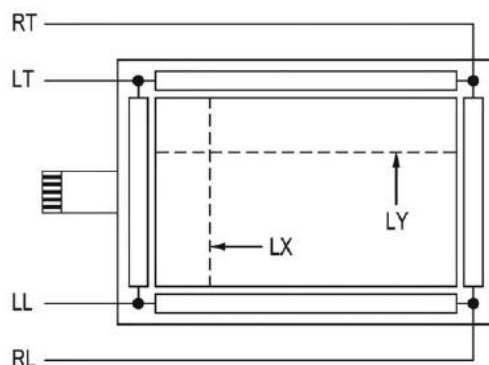
5.1.6 General specification

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

5.2 Touch controller (Optional: for IDK-2112R only)

Advantech ETM-RES04C Touch Control Board is the ultimate combo board. This touch panel controller provides optimum performance for your analog resistive touch panels for 5-wire models. Communication with the PC is directly through USB and RS-232 connector. The touch panel driver emulates mouse left and right button functions.
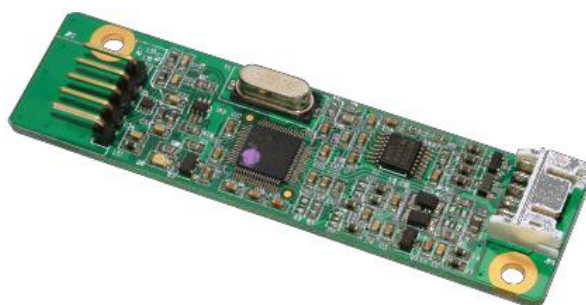
5.2.1 Touch Controller Characteristics

5.2.1.1 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.), 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.
- 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

5.2.1.2 Environmental Feature

Reliability

- MTBF is 200,000 hours

Temperature Ranges

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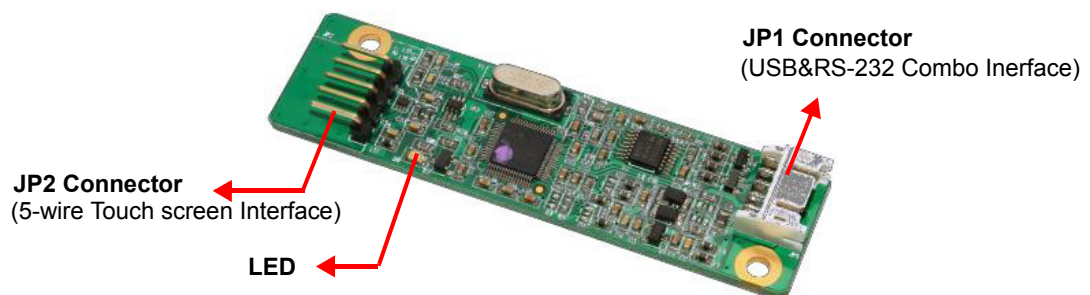
Relative Humidity

- 95% at 60°C, RH Non-condensing

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

5.2.2 Pin Assignment and Description

5.2.2.1 Connector and LED Location

JP1 Connector
(USB&RS-232 Combo Inerface)
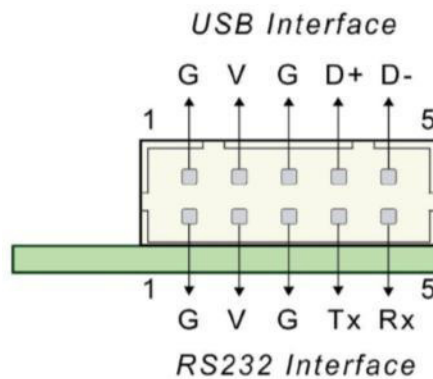
JP2 Connector
(5-wire Touch screen Interface)

LED

5.2.2.2 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

Figure 5.1 Board mounted header

5.2.2.3 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.
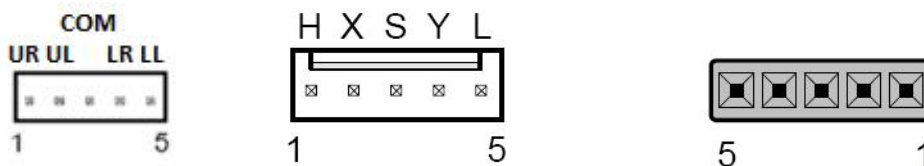
5.2.3 Physical dimension

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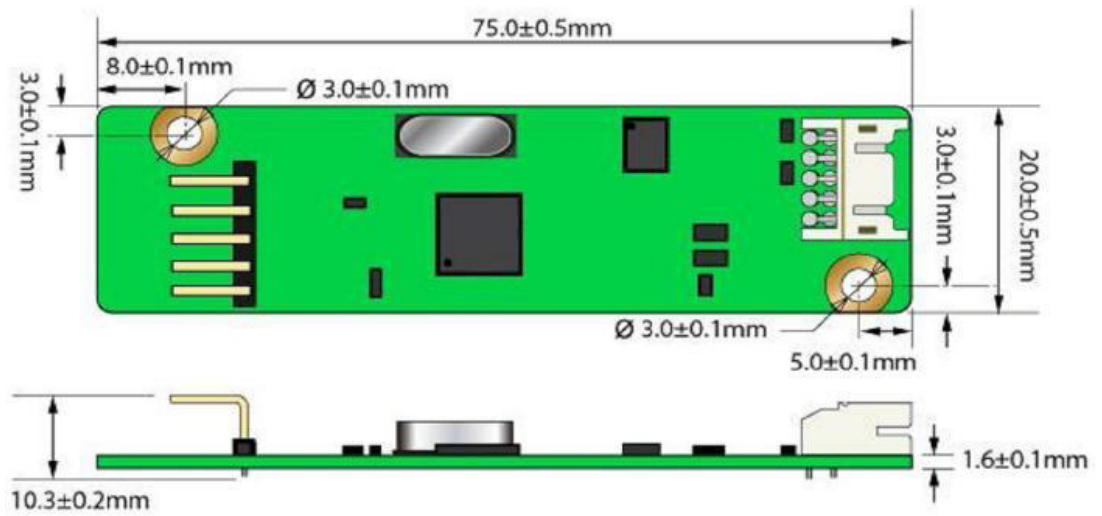
# Appendix A

Optical Characteristics

A.1 Test Conditions

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	3.3	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Converter Voltage	V_i	12	V
Converter Duty		100%	

A.2 Optical Specifications

The relative measurement methods of optical characteristics are shown below. The following items should be measured under the test conditions and stable environment shown in Note 5.

Item	Conditions	Min.	Typ.	Max.	Unit	Remarks
White Luminance	I_F= 800mA/1 LED Line (center point)	-	1200	-	[cd/m2]	Note 4
Uniformity	5 Points	80	-	-	%	Note 5, 6
Contrast Ratio		500	700	-		Note 2
Response Time	Rising	-	25	35	[msec]	Note 3
	Falling	-	10	20	[msec]	
	Raising + Falling	-	35	55	[msec]	
Viewing Angle	Horizontal(Right) CR = 10 (Left)	70 70	80 80	- -	[degree] [degree]	Note 1
	Vertical(Upper) CR = 10 (Lower)	55 65	65 75	- -	[degree] [degree]	
Color / Chromaticity Coordinates (CIE 1931)	Red x	0.556	0.606	0.656		
	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	-	%	

Note 1 Definition of Viewing Angle (θ_X, θ_Y)
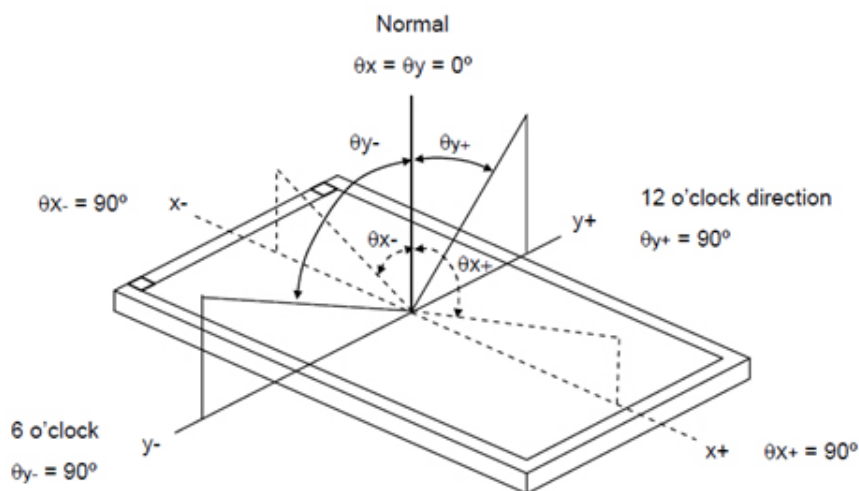
Note 2 Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L255 / L0

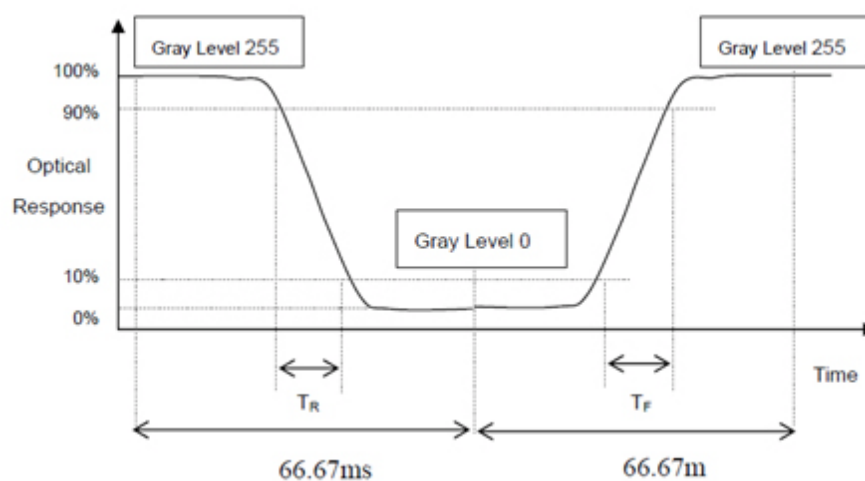L255: Luminance of gray level 255

L0: Luminance of gray level 0

CR = CR (5)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note 6.

Note 3 Definition of Response Time (TR, TF):
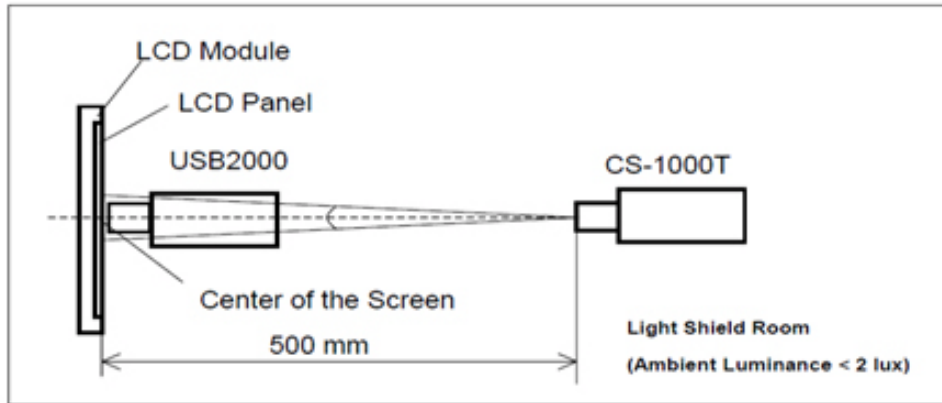

Note 4 Definition of Luminance of White (LC):

Measure the luminance of gray level 255 at center point

LC = L (5)

L (x) is corresponding to the luminance of the point X at Figure in Note (6).

Note 5 Measurement Setup:

The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after the Backlight has been on for 20 minutes in a windless room.

Note 6   Definition of White Variation (δW):

Measure the luminance of gray level 255 at 5 points

$$\delta W = \frac{\text{Maximum } [L\,(1),\, L\,(2),\, L\,(3),\, L\,(4),\, L\,(5)]}{\text{Minimum } [L\,(1),\, L\,(2),\, L\,(3),\, L\,(4),\, L\,(5)]}$$
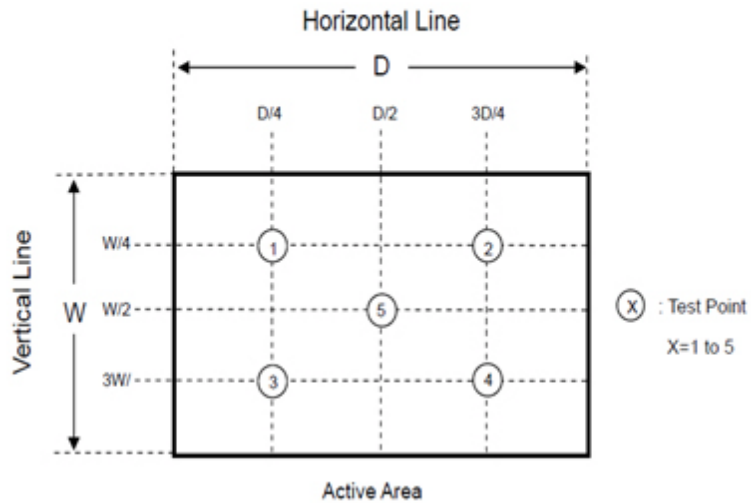
Appendix B

Handling Precautions

B.1 Handling Precautions

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 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 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 directions.
9. In case a module has to be put back into the packing container slot after it was taken out from the container, please press 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 grades are used in the LCD module. The LCD module should be supplied with power complying with requirements of Limited Power Source (IEC60950 or UL1950), or have applied for exemption.

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