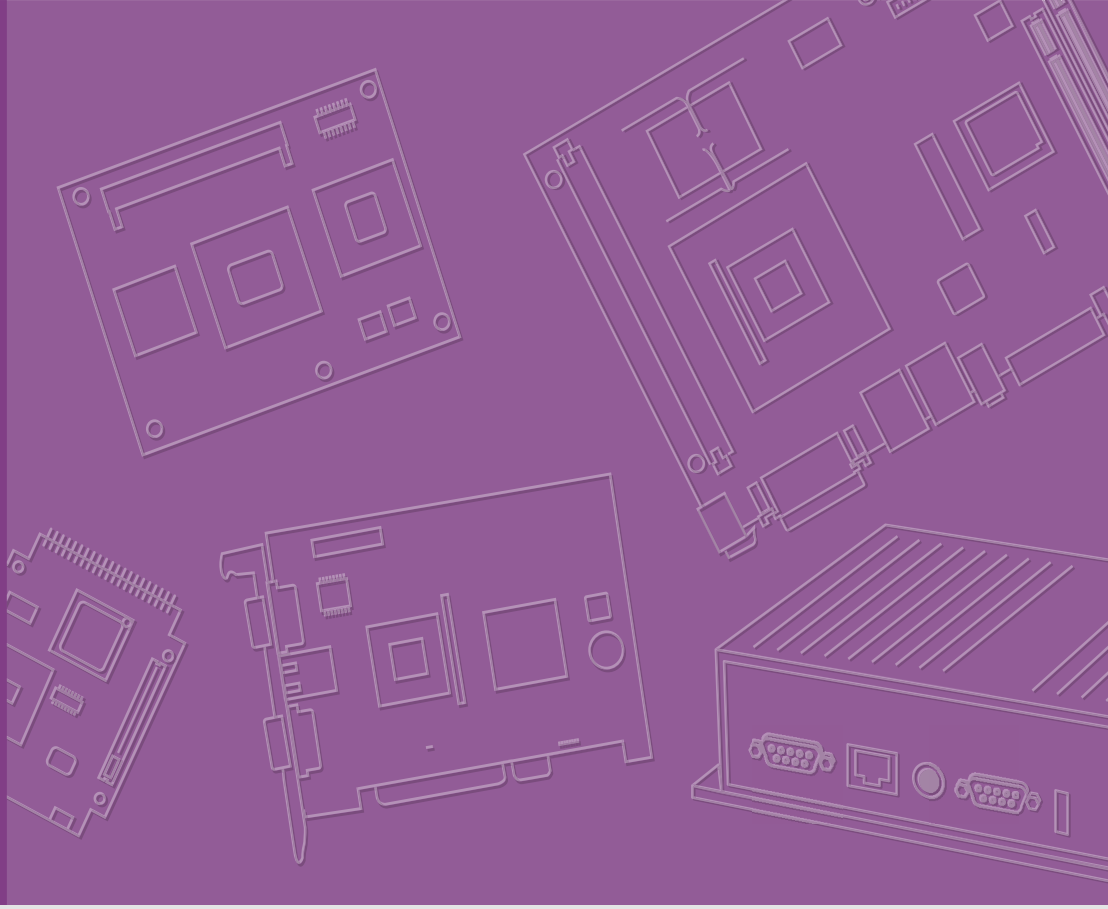

User Manual

IDK-1112R-50XGA1

12.1” XGA Industrial Display Kit with 5-Wire Resistive Touch Solution

ADVANTECH

Enabling an Intelligent Planet

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Product Warranty (2 years)

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

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

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

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

1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any onscreen messages you get when the problem occurs.
2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain an RMA (return merchandise authorization) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a fully-completed Repair and Replacement Order Card and a photocopy proof of purchase date (such as your sales receipt) in a shippable container. A product returned without proof of the purchase date is not eligible for warranty service.
5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

Contents

Chapter 1

Overview

1.1 General Description

The Advantech IDK-1112R-50XGA1 comes with a 12.1" industrial grade LCD display with 5-wire resistive touch.

1.2 Specifications

1.2.1 LCD Panel

- **Display Size:** 12.1", 4:3
- **Resolution:** 1024 x 768
- **Display Mode:** Normally Black (IPS like)
- **Viewing Angle (Horizontal/Vertical):** 178°/178°
- **Brightness:** 500 cd/m^2
- **Contrast Ratio:** 1000:1
- **Response Time**: 25 ms
- **Colors:** 262k (6bit) / 16.7M (8bit)
- **LCD Nominal Input Voltage / Current:** 3.3V / 370mA
- **Backlight Input Voltage/ Current:** 12V / 0.7A
- **Power Consumption:** 9.62W (white pattern)
- **Signal Interface:** LVDS
- **Weight:** 490g
- **Dimensions (W x H x D):** 260.5 x 204 x 8.4mm

1.2.2 Touch Screen

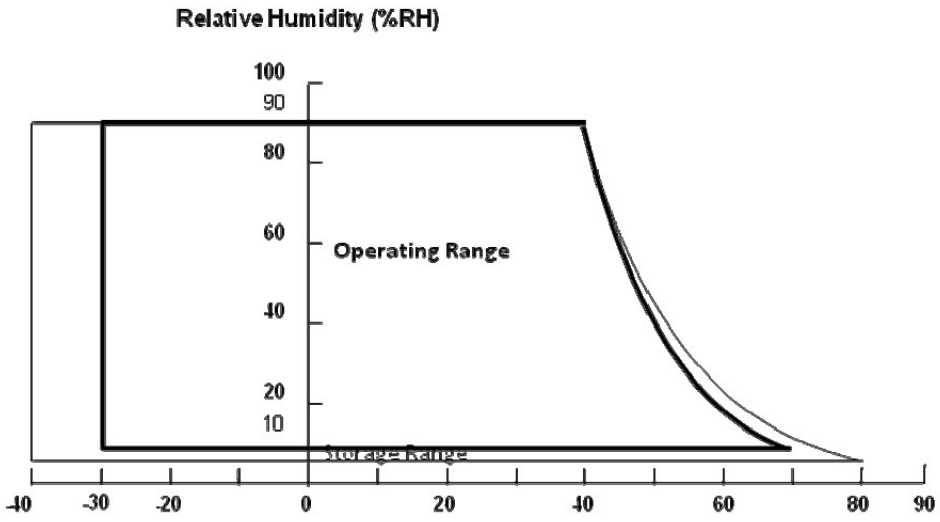
- **Touch Screen:** 5-wire Resistive
- **Light Transmission:** 80 ± 2%
- **Interface:** USB
- **Surface Hardness:** 3H
- **Durability:** 10 million times

1.2.3 Environment

- **Operating Temperature:** -20 ~ 70°C
- **Storage Temperature:** -30 ~ 80°C

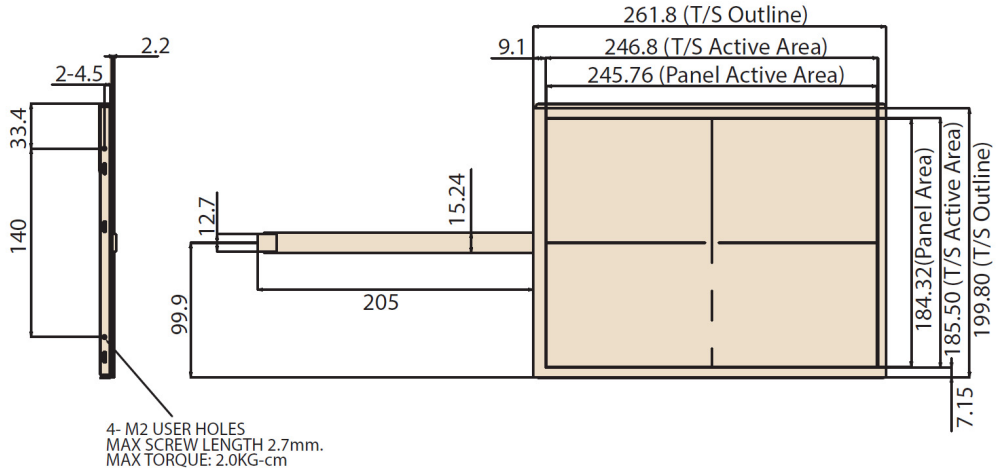
Note! *Temperature and relative humidity range is shown in the figure below.*

- 90% RH Max. (Ta ≤40 °C).
- Wet-bulb temperature should be 39 °C Max. (Ta > 40 °C).

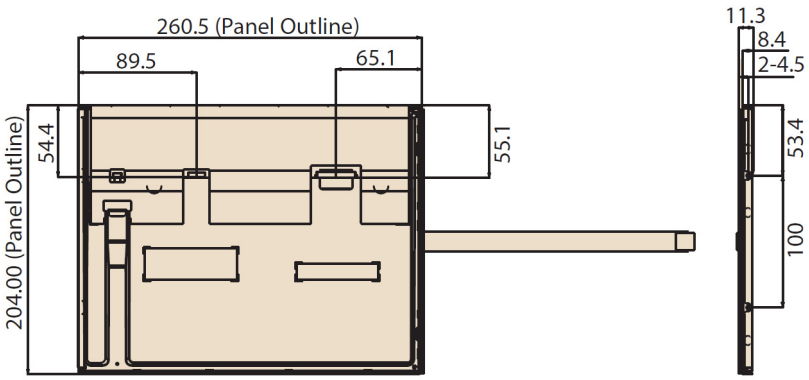


1.3 Mechanical Characteristics

Front View **Unit: mm**



Rear View



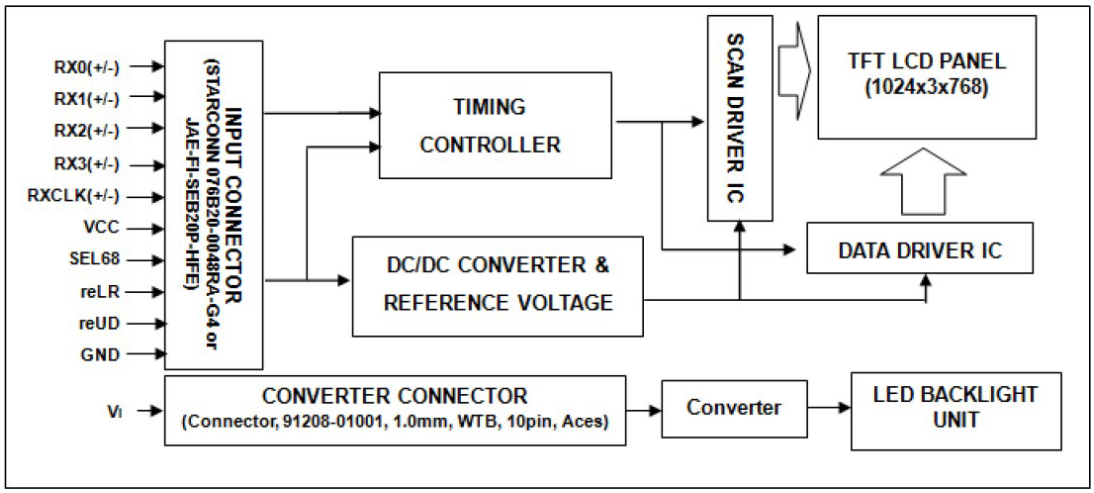
Tolerance: +/- 0.5mm

Chapter 2

LCD Display

2.1 Functional Block Diagram

The following diagram shows the functional block of the 12.1" Color TFT-LCD Module:



2.2 Absolute Maximum Ratings

2.2.1 TFT LCD Module

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	VCC	-0.3	4	[Volt]	

2.2.2 Backlight Unit

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Converter Voltage	V_i	-0.3	18	[Volt]	
Enable Voltage	EN	-	5.5	[Volt]	
Backlight Adjust	ADJ	-	5.5	[Volt]	

Note! *Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.*

2.3 LCD Electronics Specifications

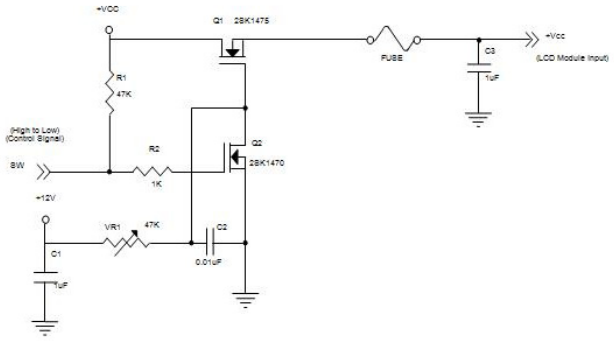
Input power specifications are as follows:

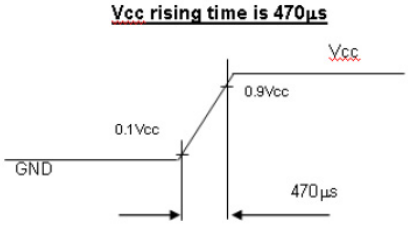
Table 2.1: Power Specifications

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power Supply Voltage	VCC	3.0	3.3	3.6	[Volt]	(1) at Vcc=3.3V
Rush Current	IRUSH	-	-	4	[A]	
Input Current	White	-	370	450	[mA]	(3)a, at Vcc=3.3V
	Black	-	300	380		(3)b, at Vcc=3.3V
Power Consumption	PLCD	-	1.22	1.49	[Watt]	
LVDS Differential Input Voltage	VID	100	-	600	[mV]	
LVDS Common Input Voltage	VICM	0.7	-	1.6	[V]	

Note (1) *The assembly should be always operated within above ranges*

Note (2) *Measurement conditions:*





Note (3) *The specified power supply current is under the conditions at Vcc = 3.3V, Ta = 25±2 °C, fv = 60 Hz, whereas a power dissipation check pattern below is displayed.*

a. White Pattern

Active Area

b. Black Pattern

Active Area

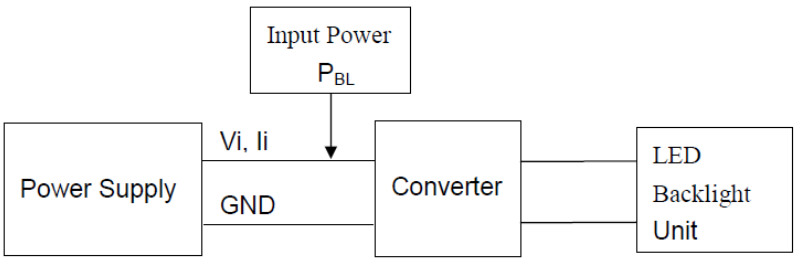
2.4 Backlight Unit

The following characteristics are measured under stable conditions at 25°C

Table 2.2: Backlight Driving Conditions

Parameter		Symbol	Values			Unit	Note
			Min.	Typ.	Max.		
Converter Power Supply Voltage		Vi	10.8	12	13.2	V	
Converter Power Supply Ripple Voltage		ViRP	-	-	500	mV	
Converter Power Supply Current		Ii	-	0.7	0.85	A	@ Vi = 12V (Duty 100%)
Converter Inrush Current		IiRUSH	-	-	3.0	A	@ Vi rising time =10ms (Vi =12V)
Backlight Power Consumption		PBL	-	8.4	10.2	W	@ Vi = 12V (Duty 100%)
EN Control Level	Backlight On	BLON	2.5	3.3	5	V	
	Backlight Off		0	-	0.3	V	
PWM Control Level	PWM High Level	E_PWM	2.5	3.3	5	V	
	PWM Low Level		0	-	0.15	V	
PWM Noise Range		VNoise	-	-	0.1	V	
PWM Control Duty Ratio		-	2	-	100	%	@200Hz
PWM Control Frequency		fPWM	190	200	20k	Hz	(3)
LED Life Time		LL	30,000	-	-	Hrs	(2)

Note (1) *LED current is measured by utilizing a high frequency current meter as shown below:*



Note (2) *The lifetime of LED is estimated data and defined as the time when it continues to operate under the conditions at Ta = 25±2 °C and Duty 100% until the brightness becomes ≤50% of its original value. Operating LED at high temperature conditions reduces lifetime and leads to color shifts.*

Note (3) *At 200Hz PWM control frequency, duty ratio range is restricted from 2% to 100%, When PWM control frequency is 20kHz, duty ratio range is restricted from 10% to 100%.*

2.5 Input Terminal Pin Assignments

2.5.1 TFT LCD MODULE

Table 2.3: Table 3.3: Pin Description

Pin	Name	Description	Remark
1	RX3+	Differential Data Input, CH3 (Positive)	
2	RX3-	Differential Data Input, CH3 (Negative)	
3	NC	NC	
4	SEL68	LVDS 6/8 Bit Select Function Control, Low→6 Bit Input Mode High→8 Bit Input Mode	Note (3) (4)
5	GND	Ground	
6	RXC+	Differential Clock Input (Positive)	
7	RXC-	Differential Clock Input (Negative)	
8	GND	Ground	
9	RX2+	Differential Data Input, CH2 (Positive)	
10	RX2-	Differential Data Input, CH2 (Negative)	
11	GND	Ground	
12	RX1+	Differential Data Input, CH1 (Positive)	
13	RX1-	Differential Data Input, CH1 (Negative)	
14	GND	Ground	
15	RX0+	Differential Data Input, CH0 (Positive)	
16	RX0-	Differential Data Input, CH0 (Negative)	
17	reLR	Horizontal Reverse Scan Control, Low →Normal Mode High→ Horizontal Reverse Scan	Note (3) (4)
18	reUD	Vertical Reverse Scan Control, Low→Normal Mode High→ Vertical Reverse Scan	Note (3) (4)
19	VCC	Power Supply	
20	VCC	Power Supply	

Note (1) *Connector Part No.: STARCONN 076B20-0048RA-G4 or equivalent.*

Note (2) *User's Connector Part No.: JAE FI-SE20ME or equivalent.*

Note (3) *"Low" stands for 0V. "High" stands for 3.3V.*

Note (4) *SEL68, reLR, reUD.*

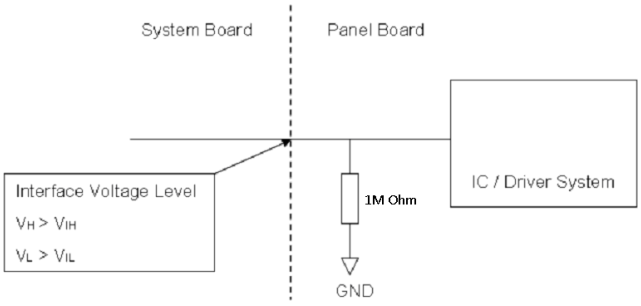


Table 2.4: Backlight Pin Assignments

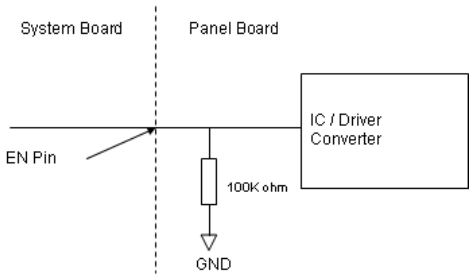
Pin	Symbol	Description	Remark
1	Vi	Converter Input Voltage	12V
2	Vi	Converter Input Voltage	12V
3	Vi	Converter Input Voltage	12V
4	Vi	Converter Input Voltage	12V
5	VGND	Converter Ground	Ground
6	VGND	Converter Ground	Ground
7	VGND	Converter Ground	Ground
8	VGND	Converter Ground	Ground
9	EN	Enable Pin	3.3 V, Note (3)
10	ADJ	Backlight Adjust	PWM Dimming (190-210Hz, Hi: 3.3VDC, Lo: 0VDC) , Note (3)

Note (1) *Connector Part No.: 91208-01001-H01 (ACES) or equivalent.*

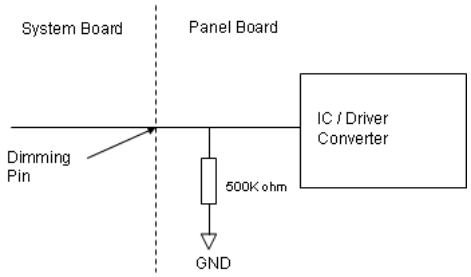
Note (2) *User's connector Part No.: 91209-01011 (ACES) or equivalent .*

Note (3) *EN(BLON), ADJ(E_PWM) as shown below:*

BLON Pin



E_PWM Pin



2.6 Color Data Input Assignment

The brightness of each primary color (red, green and blue) is based on the 6-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

Table 2.5: Color Data Input Assignments

Color		Data Signal																	
		Red						Green						Blue					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
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	Green (61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green (62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green (63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
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	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

Note (1) *0: Low Level Voltage, 1: High Level Voltage*

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

Table 2.6: Color Data Input Assignment

Color		Data Signal																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
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	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green (253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green (254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green (255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
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	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Note (1) *0: Low Level Voltage, 1: High Level Voltage*

2.7 Interface Timing

2.7.1 Input Signal Timing Specifications

The input signal timing specifications are shown as the following table and timing diagram.

Table 2.7: Display Timing Specifications

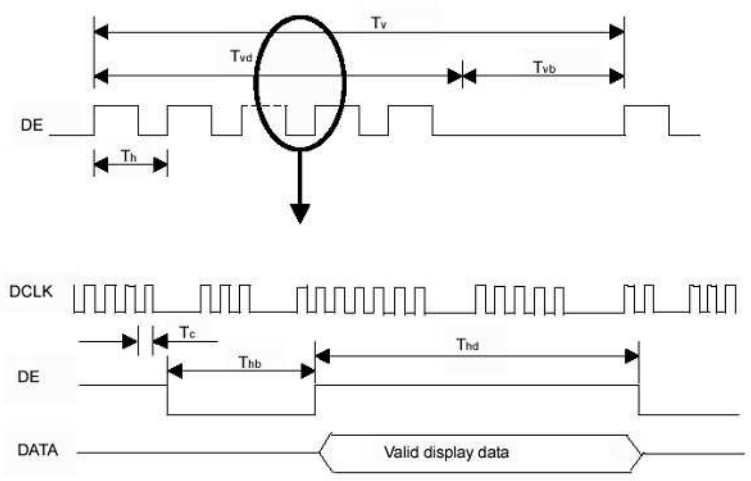
Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Frequency	Fc	57.5	64.9	74.4	MHz	
Vertical Active Display Term	Total	Tv	774	806	848	Th	Th=Tvd+Tvb
	Display	Tvd	-	768	-	Th	-
	Blank	Tvb	6	38	80	Th	-
Horizontal Active Display Term	Total	Th	1240	1344	1464	Tc	Th=Thd+Thb
	Display	Thd	-	1024	-	Tc	
	Blank	Thb	216	320	440	Tc	-

Note (1) *Since this assembly is operated in DE only mode, Hsync and Vsync input signals should be set to low logic level. Otherwise, this assembly would operate abnormally.*

Note (2) *Frame rate is 60Hz*

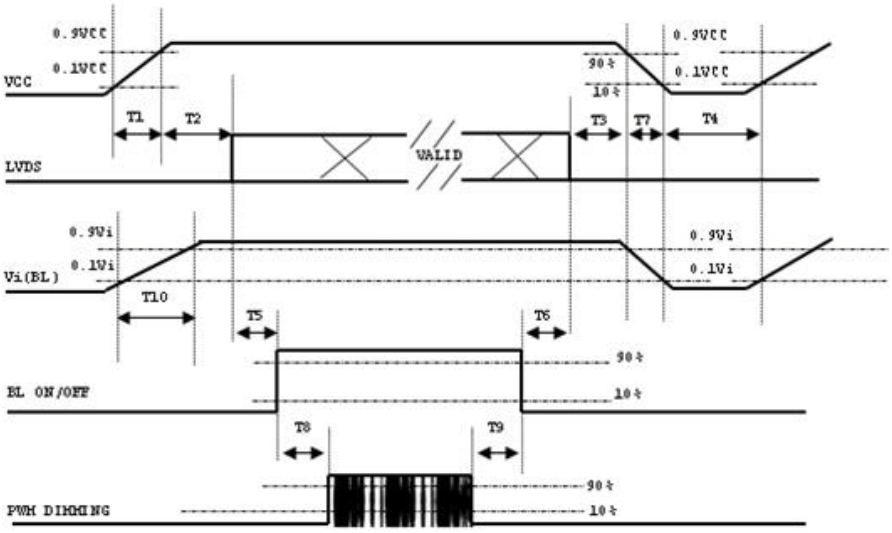
Note (3) *The Tv(Tvd+Tvb) must be integer, otherwise, this module would operate abnormally.*

INPUT SIGNAL TIMING DIAGRAM



2.8 Power On/Off Sequence

The power sequence specifications are shown as the following table and diagram.



Note (1) *Please avoid floating state of interface signal at invalid periods.*

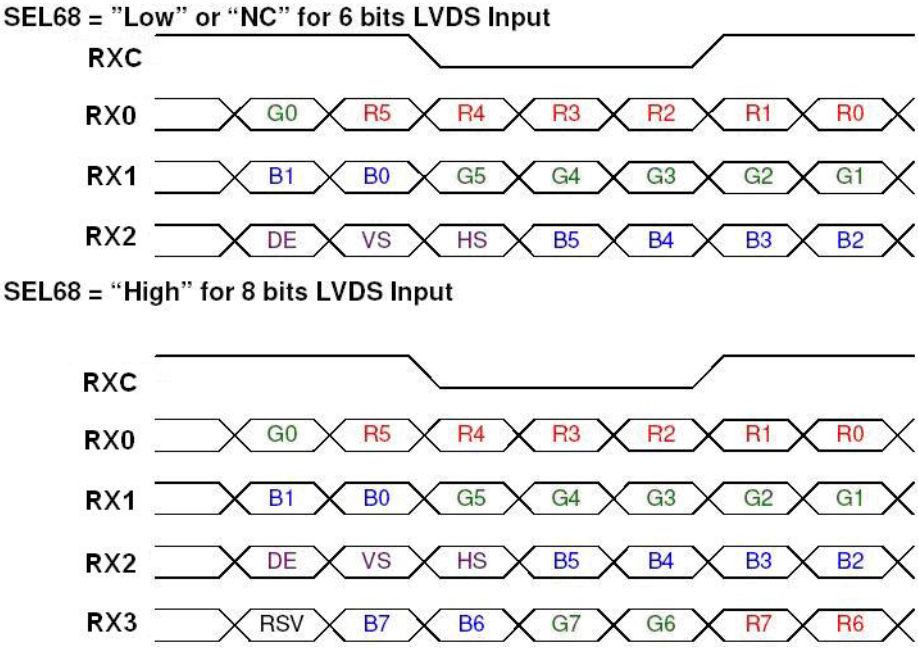
Note (2) *When the interface signal is invalid, be sure to pull down the power supply of LCD VCC to 0 V.*

Note (3) *The backlight converter power must be turned on after the power supply for the logic and the interface signal to be valid. The backlight converter power must be turned off before the power supply for the logic and the interface signal is invalid.*

Table 2.8: Timing Specifications:

Parameter	Value			Units
	Min	Typ	Max	
T1	0.5	-	10	ms
T2	0	-	50	ms
T3	0	-	50	ms
T4	500	-	-	ms
T5	450	-	-	ms
T6	200	-	-	ms
T7	10	-	100	ms
T8	10	-	-	ms
T9	10	-	-	ms
T10	20	-	50	ms

2.9 The Input Data Format



Note (1) *R/G/B data 7: MSB, R/G/B data 0: LSB*

Note (2) *Please follow PSWG*

Signal Name	Description	Remark
R7 R6 R5 R4 R3 R2 R1 R0	Red Data 7 (MSB) Red Data 6 Red Data 5 Red Data 4 Red Data 3 Red Data 2 Red Data 1 Red Data 0 (LSB)	Red-pixel Data Each red pixel's brightness data consists of these 8 bits pixel data.
G7 G6 G5 G4 G3 G2 G1 G0	Green Data 7 (MSB) GreenData 6 GreenData 5 GreenData 4 GreenData 3 GreenData 2 GreenData 1 GreenData 0 (LSB)	Green-pixel Data Each green pixel's brightness data consists of these 8 bits pixel data.
B7 B6 B5 B4 B3 B2 B1 B0	Blue Data 7 (MSB) Blue Data 6 Blue Data 5 Blue Data 4 Blue Data 3 Blue Data 2 Blue Data 1 Blue Data 0 (LSB)	Blue-pixel Data Each blue pixel's brightness data consists of these 8 bits pixel data.
RXCLKIN+ RXCLKIN-	LVDS Clock Input	
DE	Display Enable	
VS	Vertical Sync	
HS	Horizontal Sync	

Note (3) *Output signals from any system shall be low or Hi-Z state when VCC is off.*

2.10 Scanning Direction

The following figures show the image seen from the front view. The arrow indicates the direction of the scan.

Fig.1 Normal Scan	Fig.2 Reverse Scan
	
Fig.3 Reverse Scan	Fig.4 Reverse Scan
	

Fig. 1 Normal scan (pin 17, reLR = Low, pin 18, reUD = Low)

Fig. 2 Reverse scan (pin 17, reLR = High, pin 18, reUD = Low)

Fig. 3 Reverse scan (pin 17, reLR = Low, pin 18, reUD = High)

Fig. 4 Reverse scan (pin 17, reLR = High, pin 18, reUD = High)

Chapter 3

Touch Screen

3.1 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.

3.2 Optical Characteristics

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

3.3 Environment Characteristics

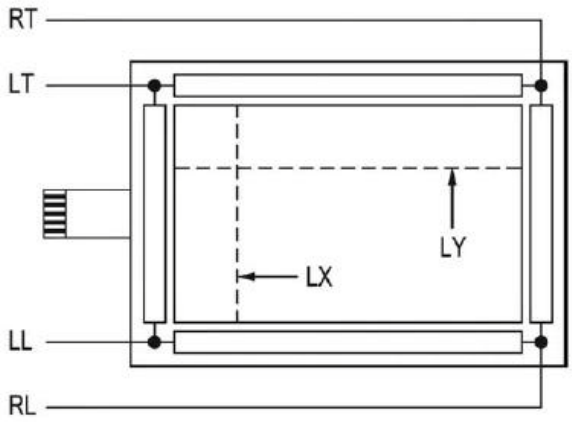
	Item	Specification	Remarks
1	Operation temperature	-20°C ~ 70°C	Note: All terms under 1 atmosphere
2	Storage temperature	-40°C ~ 80°C	
3	Operation humidity	20% ~ 80%RH	
4	Storage temperature	20% ~ 90%RH	

3.4 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		

3.5 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 bellow) Y ≤ 1.5% (Figure as bellow)	Reference: 250gf
4	Chattering	≤ 15ms	
5	Insulation resistance	10MΩ min(DC 25V)	



3.6 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

3.7 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 4

Touch Controller

Advantech ETM-RES04C Touch Control Board is the ultimate combo board. This touch panel controller provides optimal performance of your analog resistive touch panels for 5-wire models. It communicates with the PC system directly through USB and RS-232 connectors. The touch panel driver emulates the mouse left and right button functions and supports the following OS.

4.1 Touch Controller Characteristics

4.1.1 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

4.1.2 Environmental Features

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

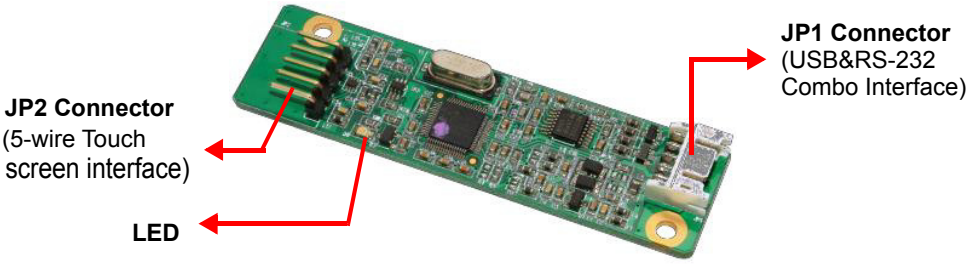
Acquired RoHS certificate

Requlatory FCC-B, CE approvals

Dimension: 75 mm x 20 mm x 10 mm

4.2 Pin Assignment and Description

4.2.1 Connector and LED Location



4.2.2 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
1	G	Ground
2	V	USB Power
3	G	Ground
4	D+	USB D+
5	D-	USB D-

RS-232 Pin#	Signal Name	Signal Function
1	G	Ground
2	V	Power
3	G	Ground
4	TxD	Serial Port
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

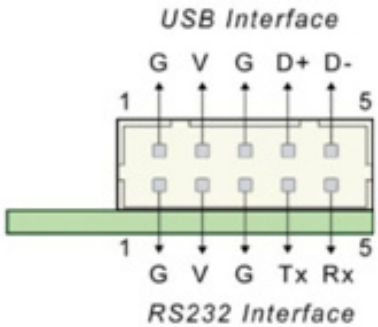
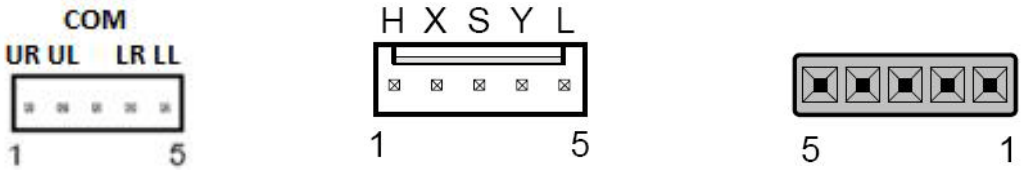


Figure 4.1 Board mounted header

4.2.3 Touch Screen Connector, JP2, Pins and Signal Descriptions

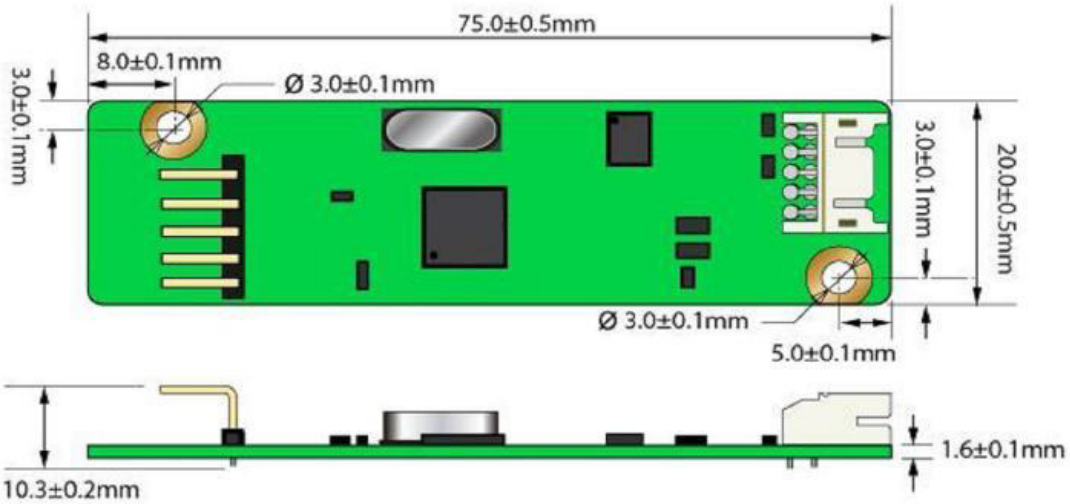
The Touch Screen connector, JP2, is a single row by 2.54mm 5-pins 90 degree, Male type connector. The pins are numbered as shown in the table below.

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.



4.3 Physical Dimension

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



Appendix A

LCD Optical Characteristics

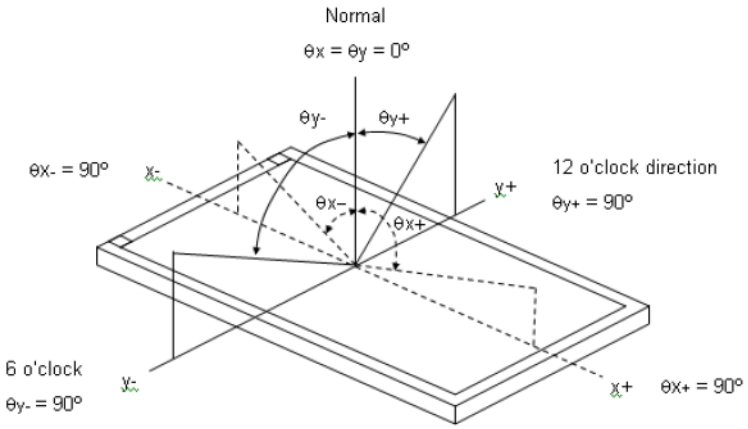
A.1 LCD Module Optical Characteristics

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

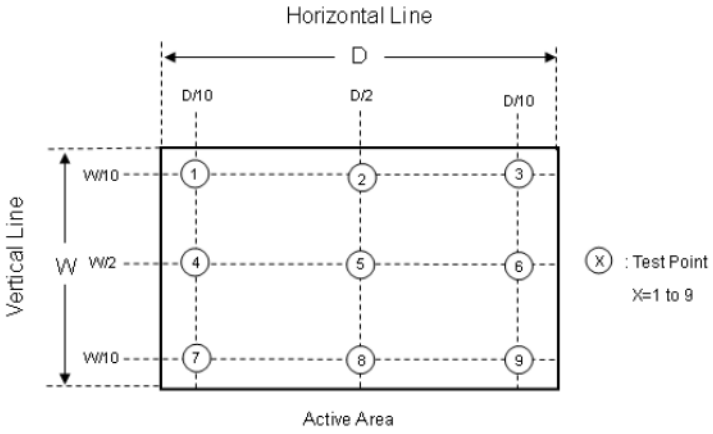
Table A.1: Optical Characteristics

Item	Conditions	Min.	Typ.	Max.	Unit	Note
Viewing Angle	Horizontal CR ≧ 10	170	178	-	[degree]	
	Vertical CR ≧ 10	170	178	-		
Luminance Uniformity		70	-	-	[%]	
Color Coordinates (CIE 1931)	White x	Typ – 0.045	0.313	Typ + 0.045	-	
	White y		0.329			
Response Time	Rising	-	13	18	[ms]	
	Falling	-	12	17		
White Luminance		400	500	-	[cd/m^2]	
Contrast Ratio		700	1000	-		

Note! *Definition of viewing angle*



Note! *5-points position*

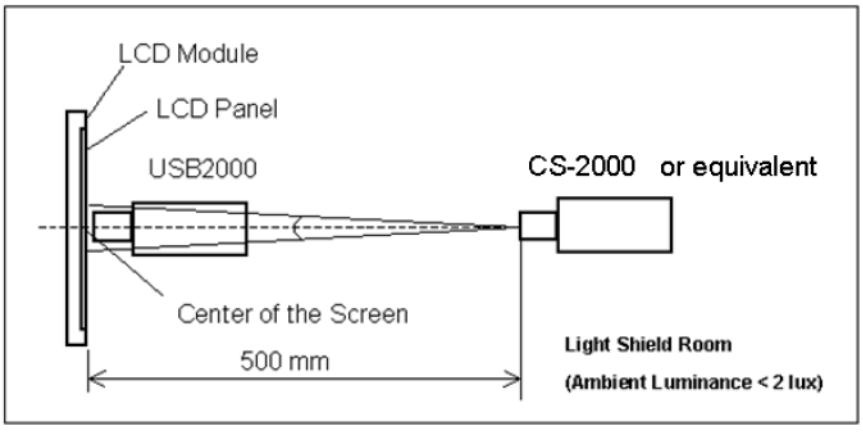


Note! *5-point luminance uniformity is defined by dividing the maximum luminance values by the minimum test point luminance*

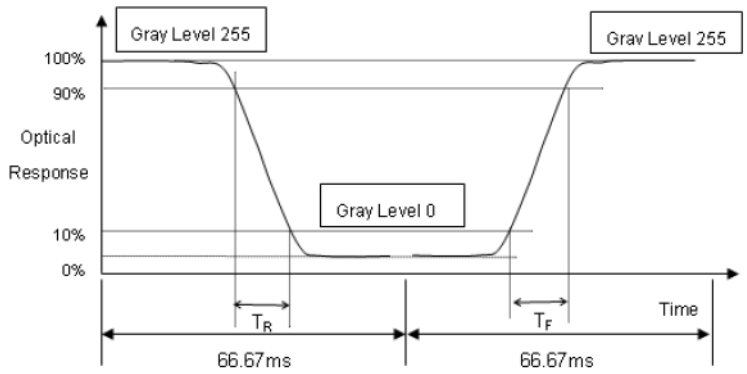
$$\delta_{W5} = \frac{\text{Minimum [L (1) ~ L (5)]}}{\text{Maximum [L (1) ~ L (5)]}}$$

Note! *Measurement method*

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 lighting the backlight for 20 minutes in a stable, windless and dark room.



Note! *Definition of response time*



Note! *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

L 0: Luminance of gray level 0

CR = CR (5)

CR (X) is corresponding to the Contrast Ratio of the point X (See Figure A2)

Appendix B

Safety Precautions

B.1 Safety Precautions

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

1. Since the front polarizer is easily damaged, be very careful not to scratch it.
2. Be sure to turn off the power supply when inserting or disconnecting from the input connector.
3. Wipe off water drops immediately. Long contact with water may cause discoloration or spots.
4. When the panel surface is soiled, wipe it with absorbent cotton or another soft cloth.
5. Since the panel is made of glass, it may break or crack if dropped or bumped on a hard surface.
6. Since the CMOS LSI is used in this module, be careful of static electricity and ensure you ground yourself first before 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. In case a Module has to be put back into the packing container slot after it has been taken, please touch the far ends of the LED light bar reflector edge softly, otherwise the TFT Module may get damaged.
10. At the insertion or removal of the signal interface connector, be sure not to rotate nor tilt the Interface Connector on the TFT Module.
11. After installation of the TFT Module into an enclosure, do not twist nor bend the TFT Module even momentary. During integration of 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 get damaged.
12. A small amount of materials having no flammability grade are used in the LCD module. The LCD module should be supplied by power compliant with the requirements of Limited Power Source (IEC60950 or UL1950), or be applied exempt thereof.

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