User Manual

IDK-1115R-40XGC2E

TFT-LCD 15" XGA (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-1115R-K2XGA1E 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 the XGA (1024(H) x 768(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	Note
Active Area	303.5(H) x 227.5(V) (15.0" diagonal)	mm	(1)
Bezel Opening Area	326(H) x 253.5(V)mm	mm	
Driver Element	a-Si TFT active matrix	-	-
Pixel Number	1024 x R.G.B x 768	pixel	-
Pixel Pitch	0.297(H) x 0.297(W)	mm	-
Pixel Arrangement	R.G.B. Vertical Stripe	-	-
Display Colors	16,194,277 / 262,144	color	-
Display Mode	Normally White	-	-
Surface Treatment	Hard Coating (3H), Anti-Glare (Haze 25)	-	-
Module Power Consumption	10.8 (Black pattern)	W	Typical

1.3 Mechanical Specification

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	326	326.5	327	mm	
	Vertical(V)	253	253.5	254	mm	
	Depth(D)	-	14.4	-	mm	
Weight			1335	-	g	-

1.4 Mechanical Dimension

Unit:mm
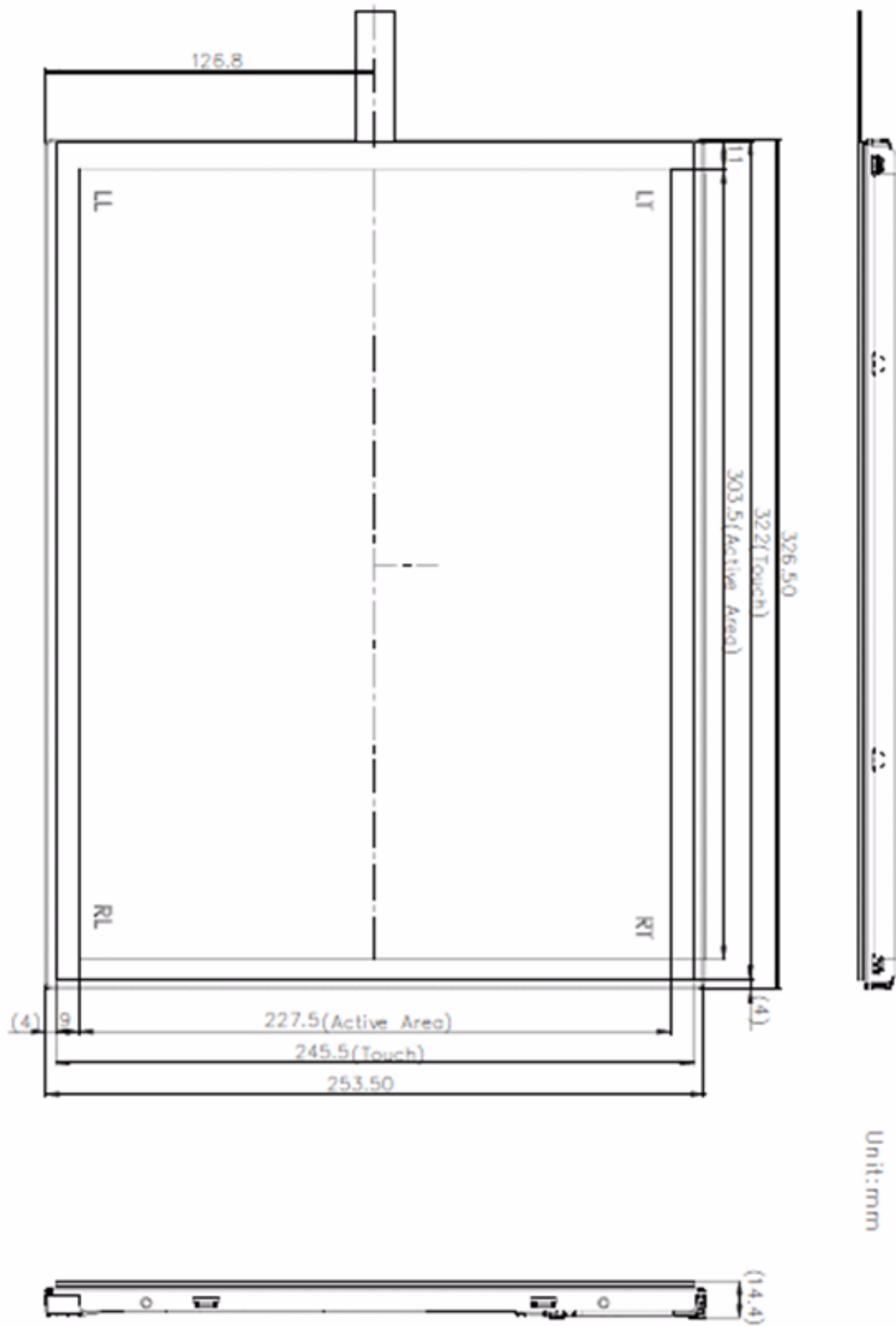
1.5 Absolute Maximum Ratings

1.5.1 Absolute Ratings of Environment

Item	Symbol	Value Min.	Value Max.	Unit	Note
Operating Ambient Temperature	T_{OP}	-20	+70	°C	
Storage Temperature	H_{ST}	-40	+80	°C	(4)

Note: (1) Temperature and relative humidity range is shown in the figure below

(2) 90%RH Max. (Ta $\leq$40°C)

(3) Wet-bulb temperature should be 39° C Max. (Ta > 40°C).

(4) Humidity 8%~90%

(5) No condensation.

1.5.2 Electrical Absolute Ratings

1.5.2.1 TFT LCD Module

Item	Symbol	Value Min.	Value Max.	Unit	Note
Power Supply Voltage	VCC	-0.3	4	V	(1)

1.5.2.2 Backlight Unit

Item	Symbol	Value Min.	Value Max.	Unit	Note
Converter Voltage	V_i	-0.3	18	V	(1),(2)
Enable Voltage	EN	-	5.5	V	
Backlight Adjust	ADJ	-	5.5	V	

Note: (1) 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) Specified values are for lamp (Refer to 3.2 for further information).

1.6 Block Diagram
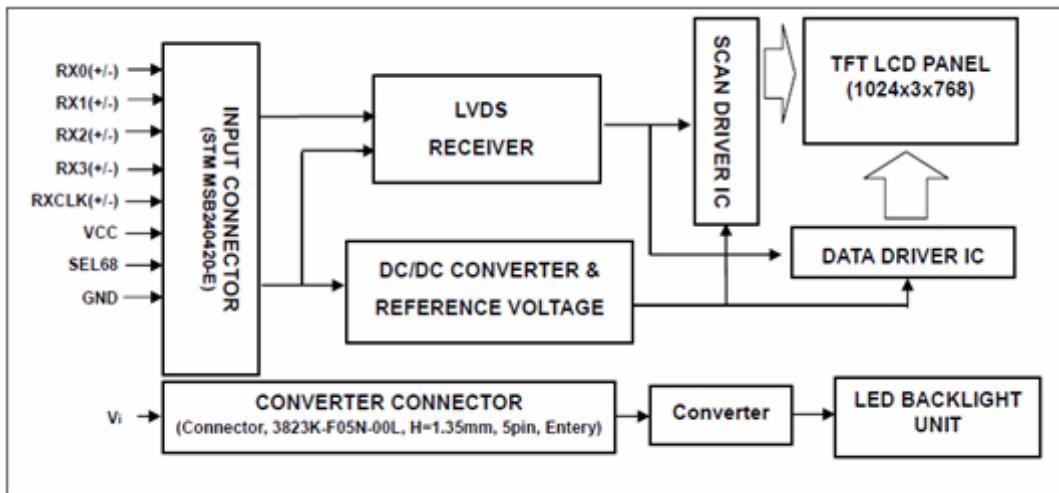
Figure 1.1 TFT LCD module

Chapter 2

Electrical Characteristics

2.1 TFT LCD Module

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		V_{CC}	3.0	3.3	3.6	V	-
Ripple Voltage		V_{RP}	-	-	100	mVp-p	
Rush Current		I_{RUSH}	-	-	2.0	A	(2)
Power Supply Current	White	1c c	-	410	510	mA	(3)a
	Black		-	590	690	mA	(3)b
Differential Input Voltage for LVDS Receiver Threshold	"H" Level	V_{IH}	-	-	100	mV	-
	"L" Level	V_{IL}	-100	-	-	mV	-
Terminating Resistor		R_T		100	-	Ohm	-

Note1: The module should be always operated within above ranges

Note2: Measurement Conditions:
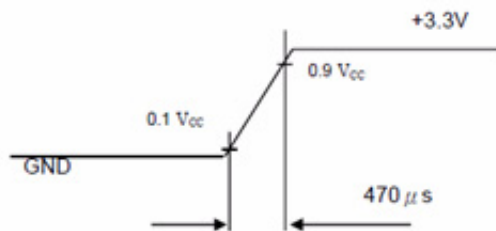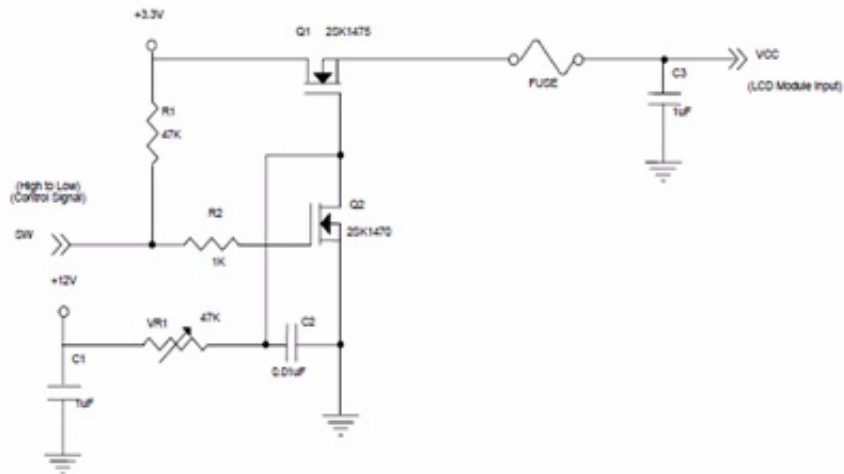
Note 3: The specified power supply current is under the conditions at V_{DD} =3.3 V, Ta = 25 ± 2°C, DC Current and f_v = 60 Hz, whereas a power dissipation check pattern below is displayed

a. White Pattern

Active Area

b. Black Pattern

Active Area
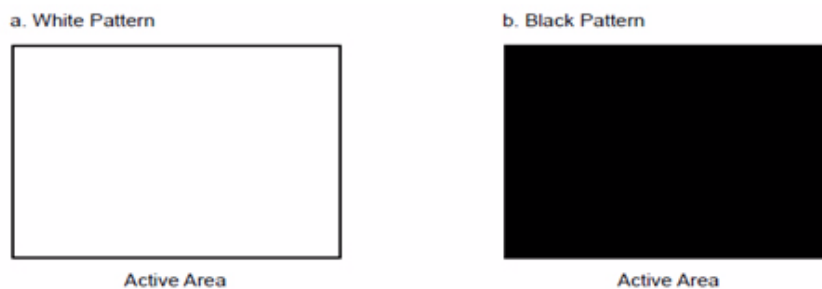
2.2 Backlight Unit

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Converter Power Supply Voltage		V_i	10.8	12.0	13.2	V	
Converter Power Supply Current		I_i	-	0.73	0.83	A	@ Vi = 12V
Backlight Power Consumption		P_{PBL}	-	8.76	-	W	@ Vi = 12V
EN Control Level	Backlight on	-	2.0	3.3	5.0	V	
	Backlight off		0	-	0.8	V	
PWM Control Level	PWM High Level	-	2.0	3.3	5.0	V	
	PWM Low Level		0	-	0.15	V	
PWM Control Duty Ratio		-	1	-	100	%	@200Hz
PWM Control Frequency		f_{PWM}	190	200	20k	Hz	(2)
LED Life Time		L_L	50,000	-	-	Hrs	(3)

Note1: LED current is measured by utilizing a high frequency current meter as shown below

Input Power P_{BL}

Power Supply — Vi, Ii / GND — Converter — LED Backlight Unit
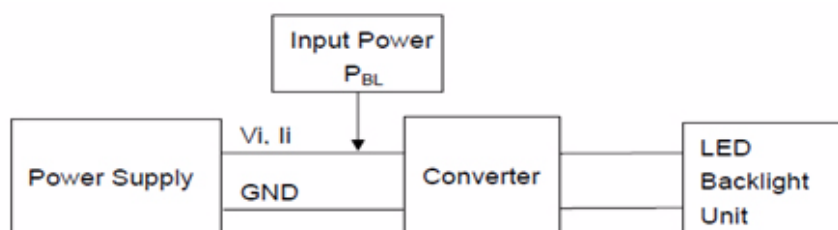
Note2: At 20k Hz PWM control frequency, duty ratio range is restricted from 20% to 100%

Note3: The lifetime of an LED is 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 an LED under a high temperature environment will reduce its life time and lead to color shift.

Chapter 3

Input Terminal Pin Assignment

3.1 TFT LCD Module

Table 3.1: Symbol Description

Pin No.	Symbol	Description	Polarity	Note
1	VCC	Power Supply, 3.3V(typical)		
2	VCC	Power Supply, 3.3V(typical)		
3	GND	Ground		
4	NC	No Connection		
5	RX0-	LVDS Differential Data Input	Negative	
6	RX0+	LVDS Differential Data Input	Positive	
7	GND	Ground		
8	RX1-	LVDS Differential Data Input	Negative	
9	RX1+	LVDS Differential Data Input	Positive	
10	GND	Ground		
11	RX2-	LVDS Differential Data Input	Negative	
12	RX2+	LVDS Differential Data Input	Positive	
13	GND	Ground		
14	RXCLK-	LVDS Differential Data Input	Negative	
15	RXCLK+	LVDS Differential Data Input	Positive	
16	GND	Ground		
17	RX3-	LVDS Differential Data Input	Negative	
18	RX3+	LVDS Differential Data Input	Positive	
19	GND	Ground		
20	SEL68	LVDS 6/8 bit select function control, High: 6bit Input Mode Low or NC: 8bit Input Mode		Note (3)

Note1 Connector Part No.: STM MSB240420G, Enter 3804K-F20N-10L or equivalent.

Note2 User's connector Part No.: STM P240420, Enter H204K-D20N-02B or equivalent.

Note3 "Low" stands for 0V. "High" stands for 3.3V. "NC" stands for "No Connection".

3.2 Backlight Unit (Converter Connector Pin)

Pin	Symbol	Description	Remark
1	V_i	Converter input voltage	12V
2	V_{GND}	Converter ground	Ground
3	EN	Enable pin	3.3V
4	ADJ	Backlight Adjust	PWM Dimming (Hi: 3.3VDC, Lo: 0VDC)
5	NC	Not Connect	

Note1 Connector Part No.: 3808K-F05N-03L (Enter) or equivalent.

Note2 User's connector Part No.: H208K-P05N-02B (Enter) or equivalent

3.3 Color Data Input Assignment

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.

Color		Data Signal																						
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	R7	R6	G5	G4	G3	G2	G1	G0	R7	R6	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 Green	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Cyan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Magenta	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
		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
		0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	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(252)	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(252) Red(252)	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
		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(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	Green(2)	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	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(252)	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(252) Green(252)	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
		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(1)	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(2)	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
	Blue(252)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0
	Blue(252) Blue(252)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1

Note 0: Low Level Voltage, 1: High Level Voltage

Chapter 4

Interface Timing

4.1 Input Signal Timing Specifications

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

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Pixel Clock	$1/T_C$	-	65	80	MHz	-
DE	Vertical Total Time	T_V	780	806	1200	T_H	-
	Vertical Address Time	T_{VD}	768	768	768	T_H	-
	Horizontal Total Time	T_H	1140	1344	1600	T_C	-
	Horizontal Address Time	T_{HD}	1024	1024	1024	T_C	-

Note Because this module is operated by DE only mode, Hsync and Vsync input signals should be set to low logic level or ground. Otherwise, this module will operate abnormally.

INPUT SIGNAL TIMING DIAGRAM

TIMING DIAGRAM of LVDS
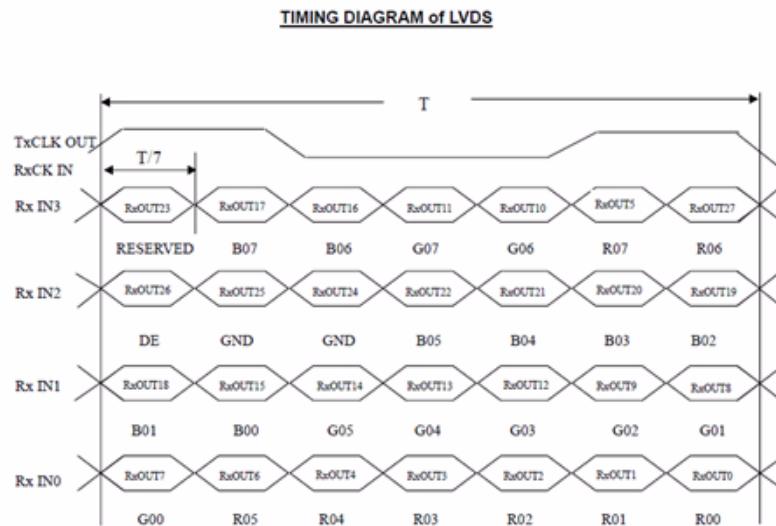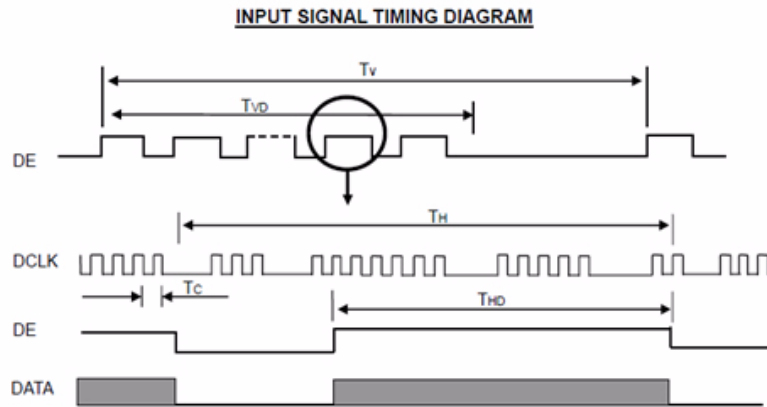
4.2 Power On/Off Sequence

To prevent a latch-up or DC operation of LCD assembly, the power on/off sequence should be as in the diagram below.
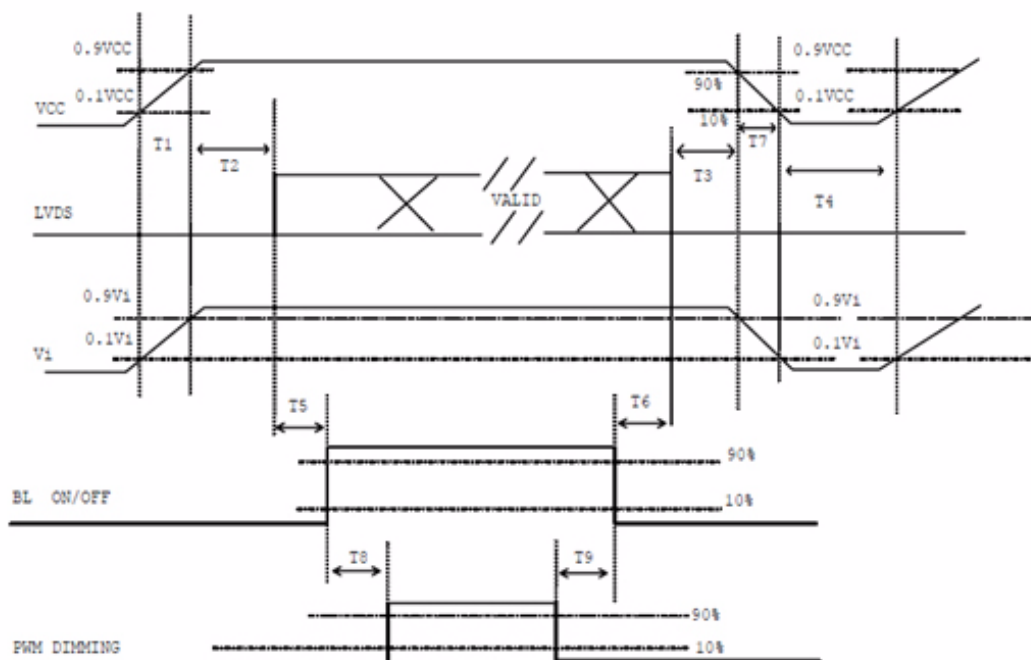
Power ON/OFF sequence

Note 1 Please avoid floating state of interface signal at invalid period

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 to be invalid.

Parameter	Value			Unites
	Min.	Typ.	Max.	
T1	0.5	-	10	ms
T2	0	-	50	ms
T3	0	-	50	ms
T4	500	-	-	ms
T5	200	-	-	ms
T6	200	-	-	ms
T7	5	-	300	ms
T8	10	-	-	ms
T9	10	-	-	ms

Chapter   5

Touch Screen

5.1 Touch Characteristics

5-wire analog resistance type touch panels are used with flat displays like LCDs. Once touched by stylus or finger, the circuit sends coordinate points to the PC from voltage contact points.

5.2 Optical Characteristics

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

5.3 Environmental Characteristics

	Item	Specification	Remarks
1	Operation temperature	-20°C ~ 70°C	
2	Storage temperature	-40°C ~ 80°C	Note: All terms under 1 atmo-sphere
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(Figure as below)	FPC connector
		Y axis: 200Ω ~ 800Ω(Figure as below)	
3	Linearity	X ≤1.5%(Figure as below) Y ≤2.0%(Figure as below)	Reference: 250gf
4	Chattering	≤20ms	
5	Insulation Resistance	≥ 20MΩ min(DC 25V)	
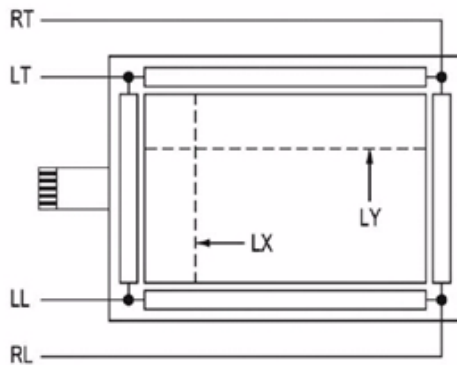
5.6 General Specification

	Item	Specification
1	Frame size	322.00±0.30 X 245.50±0.30 mm
2	View Area	309.00±0.30 X 233.50±0.20 mm
3	Active Area	303.00±0.30 X 227.50±0.20 mm
4	Total Thickness	2.20±0.20 mm
5	Tail length	205.00±6.00 mm

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 your PC system directly through USB and RS-232 connectors. 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 the following OS.

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)
- Supports 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

6.1.2 Environmental Features

Reliability

■ MTBF is 200,000 hours

Temperature Ranges

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

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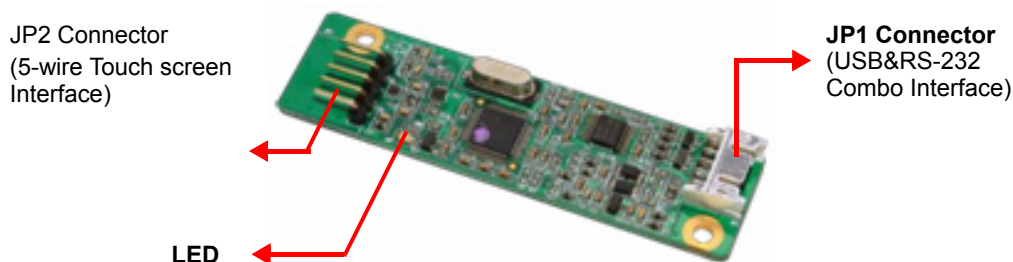
■ 95% at 60°C, RH Non-condensing

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

6.2 Pin Assignment and Description

6.2.1 Connector and LED Location

JP2 Connector
(5-wire Touch screen
Interface)

JP1 Connector
(USB&RS-232
Combo 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 pin header. The pins are numbered as 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

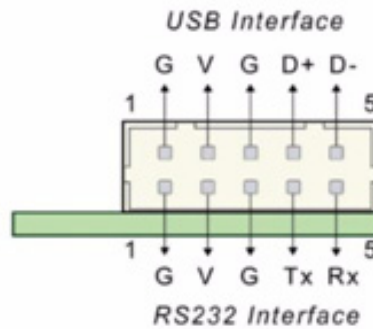| Signal Name	DB-9 pin #	RS-232 pin #	Sourced by	Signal Description
RxD	2	5	ctlr	serial data from controller to host
TxD	3	4	host	serial data from host to controller

Figure 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 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.
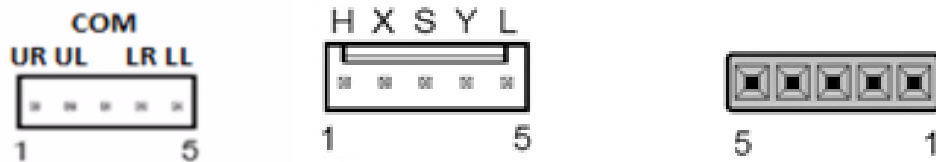
6.3 Physical Dimension
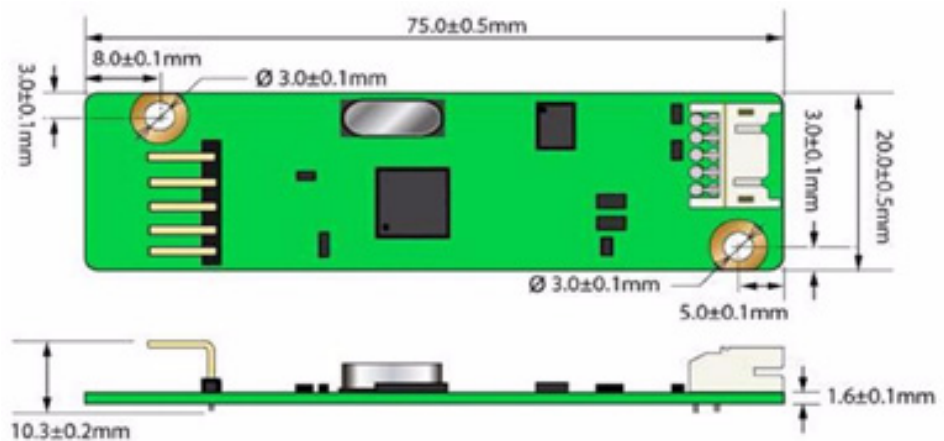
Appendix A

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		Symbol	Conditions	Min.	Typ.	Max.	Unit	Note
Color Chromaticity	Red	Rx	$\theta_X = 0°$, $\theta_Y = 0°$ CS-1000T	Typ - 0.05	0.604	Typ+ 0.05	-	(1), (5)
		Ry			0.356			
	Green	Gx			0.338			
		Gy			0.590			
	Blue	Bx			0.148			
		By			0.098			
	Green	Wx			0.313			
		Wy			0.329			
Center Luminance of White		L_C		300	400		cd/m^2	(4),(5)
Contrast Ratio		CR		450	700		-	(2),(5)
Response Time		T_R	$\theta_X = 0°$, $= 0°$	-	8	13	ms	(3)
		T_F		-	17	22		
White Variation		δW	$\theta_X = 0°$, $\theta_Y = 0°$	-	1.25	1.4	-	(5),(6)
Viewing Angle	Horizontal	$\theta X+$	$CR \geq 10$ USB2000	70	80	-	Deg.	(1),(5)
		$\theta X-$		70	80	-		
	Vertical	$\theta Y+$		60	70	-		
		$\theta Y-$		60	70	-		

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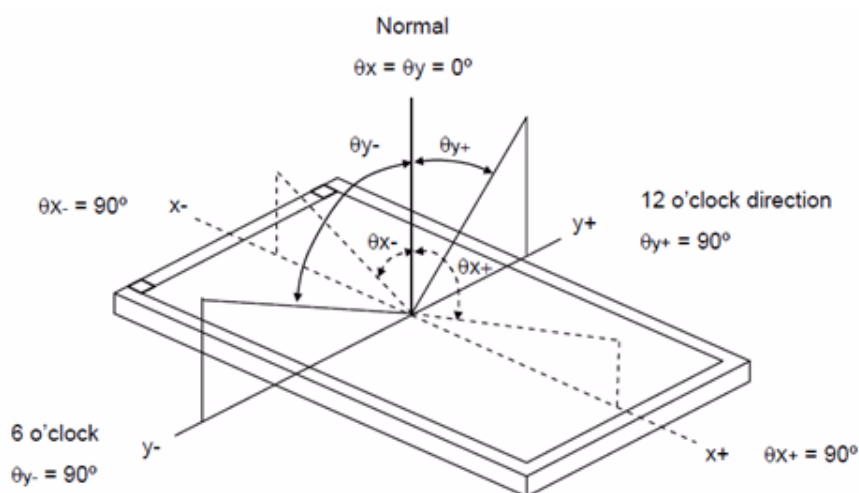
Note 2 Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L255 / L0

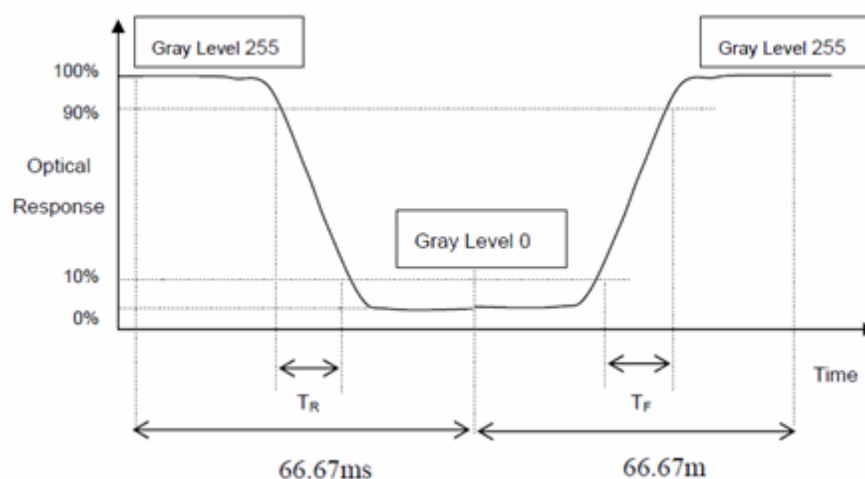L255: Luminance of gray level 255

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):
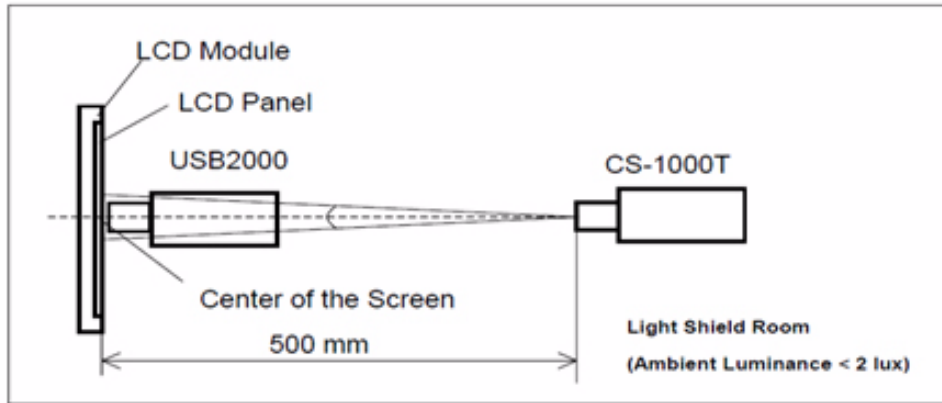

Note 4 Definition of Luminance of White (LC):

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 lighting Backlight for 20 minutes in a windless room.

Note 6 Definition of White Variation (δW):

Measure the luminance of gray level 255 at 5 points

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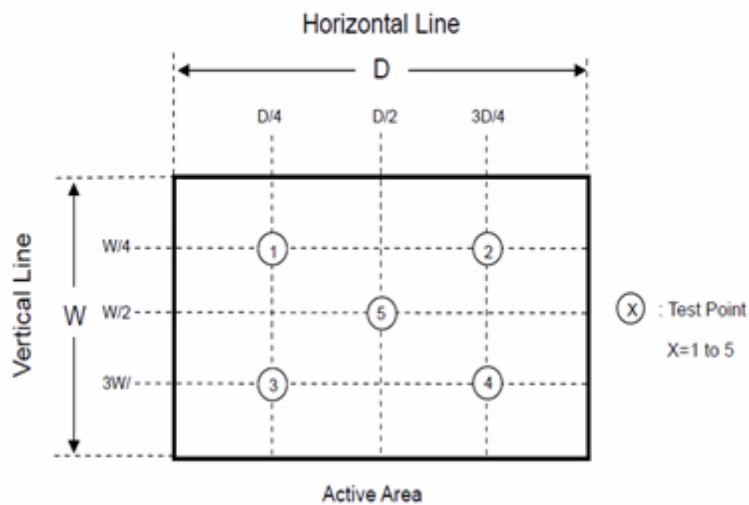
Appendix B

Handling Precautions

B.1 Handling Precautions

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

1. Since 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 people are earthed 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 end 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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