

**User Manual**

# **IDK-2110R XGA Series**

**TFT-LCD 10.4" XGA (LED  
Backlight)**

**ADVANTECH**

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# Chapter 1

Overview

## 1.1 General Description

This user manual is for the 10.4 inch color TFT LCD module IDK-2110R XGA-series. IDK-2110R XGA is designed with a wide viewing angle, wide operating temperature and long life LED backlight which is well suited for Industrial Applications. The LED driving board for the backlight unit is included in this panel and the LED units are replaceable. Also, IDK-2110R XGA-series has an LVDS interface and 4-wire resistive touch solution. The screen format supports: XGA (1024 (H) x 768 (V)) screens and 16.2M (RGB 8-bits) or 262k colors (RGB 6-bits). IDK-2110R XGA is a RoHS product.

## 1.2 Display Characteristics

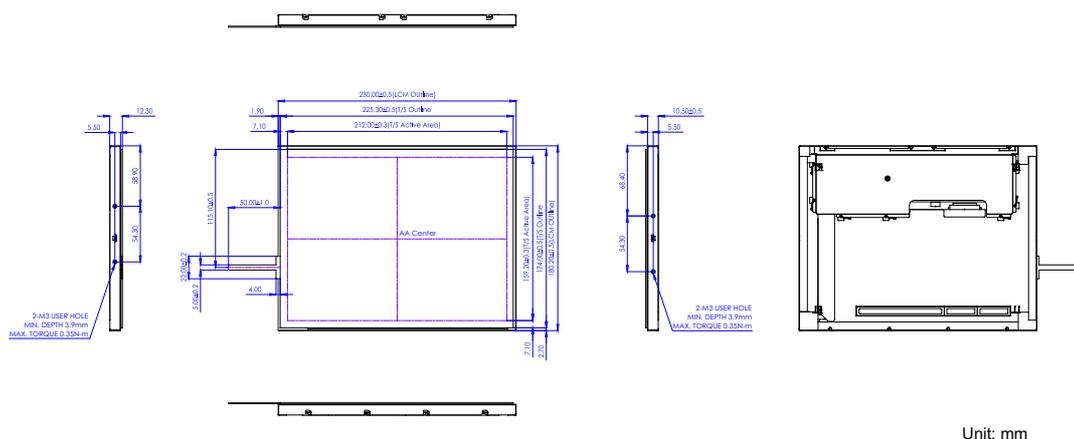
The following items are product characteristics under 25°C conditions.

Items	Specifications	Unit
Screen Diagonal	10.4	inch
Active Area	210.432(H) x 157.824(V)	mm
Pixels H x V	1024 x 3(RGB) x 768	-
Pixel Pitch	0.2055 x 0.0685	mm
Pixel Arrangement	R.G.B. Vertical Stripe	-
Display Mode	Normally Black	-
Nominal Input Voltage VDD	3.3 (typ)	Volt
Typical Power Consumption	16.05W (typ)	Watt

## 1.3 Mechanical Specification

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	-	230	-	mm	
	Vertical(V)	-	180.2	-	mm	
	Depth(D)	-	12.3	-	mm	
Weight		-	600	-	g	-

## 1.4 Mechanical Dimension



## 1.5 Absolute Maximum Ratings

### 1.5.1 Absolute Ratings of the TFT LCD Module

Item	Symbol	Value		Unit	Conditions
		Min.	Max.		
Logic/LCD Drive Voltage	VDD	-0.3	+4.0	[Volt]	

### 1.5.2 Absolute Environment Ratings

Item	Symbol	Value		Unit	Conditions
		Min.	Max.		
Operating Temperature	TOP	-10	+60	°C	
Operation Humidity	HOP		90	[%RH]	
Storage Temperature	TST	-30	+70	°C	
Storage Humidity	HST		90	[%RH]	

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

## 1.6 Block Diagram

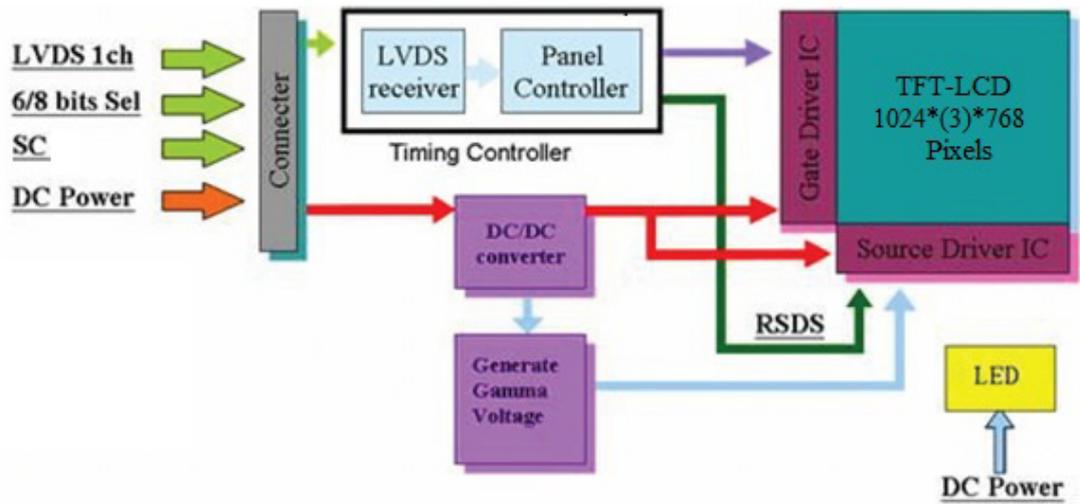


Figure 1.1 TFT LCD module

# Chapter 2

Electrical  
Characteristics

## 2.1 TFT LCD Module

### 2.1.1 Electrical characteristics\

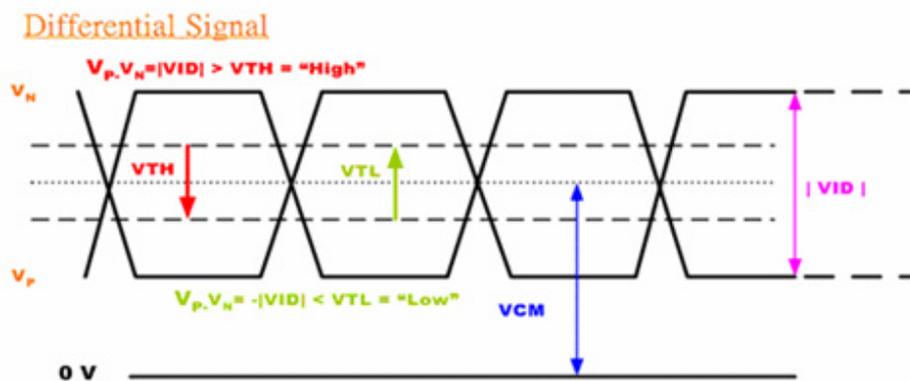
Parameter	Symbol	Value			Unit	Condition
		Min.	Typ.	Max.		
Supply voltage	$V_{DD}$	3.0	3.3	3.6	V	
Current consumption	$I_{DD}$	-	270	350	mA	
Permissive input ripple voltage	$V_{RP}$	-	-	100	mVp-p	$V_{DD}=3.3V$
Input signal voltage	$V_{IL}$	0.0	-	$0.3V_{DD}$	V	"Low" level
	$V_{IH}$	$0.7V_{DD}$	-	$V_{DD}$	V	"High" level
Input leak current	$I_{OL}$	-10	-	10	$\mu A$	$V_{I3}=0V$
	$I_{OH}$	-	-	400	$\mu A$	$V_{I3}=3.3V$
LVDS Input voltage	$V_L$	0	-	1.9	V	
Differential input voltage	$V_{ID}$	200	-	600	mV	
Differential input threshold voltage	$V_{TL}$	$V_{CM}-100$	-	-	mV	"Low" level
	$V_{TH}$	-	-	$V_{CM}+100$	mV	"High" level
Terminator	$R_1$	-	100.0	-	$\Omega$	
VDD-turn-on conditions	t1	0.1	-	20	ms	
	t2	10.0	-	-	ms	
	t3	0.0	-	-	ms	
	t4	2.0	-	-	s	
	t5	200.0	-	-	ms	
	t6	200.0	-	-	ms	

### 2.1.2 Signal Electrical Characteristics

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

Parameter	Symbol	Value			Unit	Remark
		Min.	Typ.	Max.		
Differential Input High Threshold	$V_{TH}$	-	-	100	[mV]	$V_{CM}=1.25V$
Differential Input Low Threshold	$V_{TL}$	100	-	-	[mV]	$V_{CM}=1.25V$
Input Differential Voltage	$V_{ID}$	200	-	600	[mV]	

**Note** LVDS Signal Waveform.



## 2.2 Backlight Unit

### 2.2.1 Parameter guideline for LED backlight

The following characteristics are measured under stable conditions using an inverter at 25°C (Room Temperature):

Parameter	Symbol	Value			Unit	Remark
		Min.	Typ.	Max.		
Input Voltage	VCC	10.8	12	13.2	[Volt]	
Input Current	I <sub>VCC</sub>	-	870	1120	[mA]	100% PWM Duty
Power Consumption	P <sub>VCC</sub>	-	10.44	14.784	[Watt]	100% PWM Duty
Dimming Frequency	F <sub>PWM</sub>	200	-	10K	[Hz]	
Swing Voltage		3	3.3	5.5	[Volt]	
Dimming Duty Cycle		1	-	100	%	fPWM=200Hz
Operation Lifetime			70,000	-	Hrs	IF = 80mA, Ta = 25°C

**Note** VCC, I<sub>VCC</sub>, P<sub>VCC</sub>, are defined for LED B/L.(100% duty of PWM dimming)

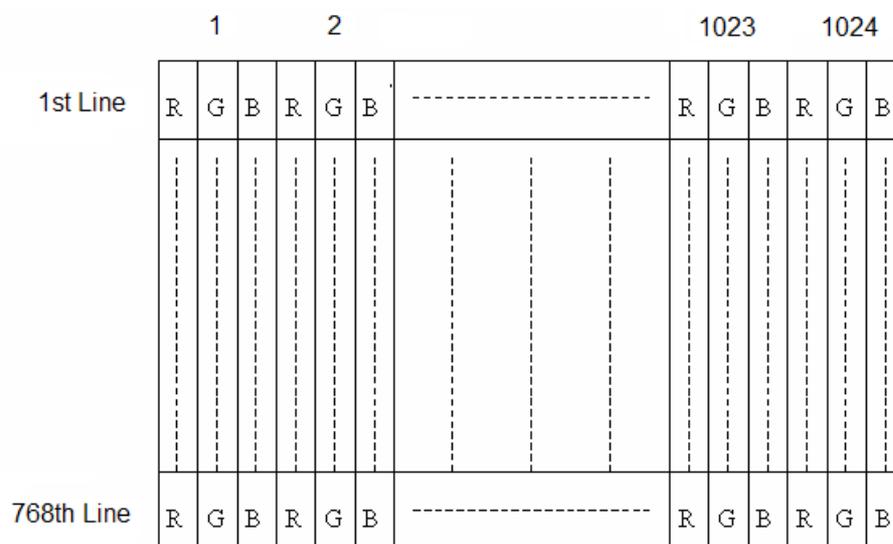


# Chapter 3

## Signal Characteristics

## 3.1 Pixel Format Image

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



## 3.2 Pin Description

LVDS is a differential signal technology for LCD interface and high speed data transfer devices. The connector pin definition is as below.

**Note** “Low” stands for 0V. “High” stands for 3.3V. “NC” stands for “Not Connected.”

**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	GND	Ground
5	RxIN0-	LVDS receiver signal channel 0
6	RxIN0+	
7	GND	Ground
8	RxIN1-	LVDS receiver signal channel 1
9	RxIN1+	
10	GND	Ground
11	RxIN2-	LVDS receiver signal channel 2
12	RxIN2+	
13	GND	Ground
14	CK IN1-	LVDS receiver signal CK
15	CK IN1+	
16	GND	Ground
17	RxIN3-	LVDS receiver signal channel 3
18	RxIN3+	
19	MODE	Bit data select signal (GND: 6bit mode, High:8bit mode)
20	SC	Scan direction control (GND: Normal, High: Reverse)

## 3.3 The Input Data Format

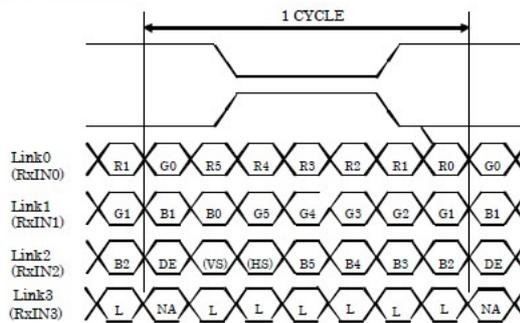
### 3.3.1 MODE

Data mapping(6bit input)

1) Location of MODE (THC63LVDM83R(THine Electronics) or compatible)

Transmitter		MODE
Pin No.	Data	= L(GND)
51	TA0	R0(LSB)
52	TA1	R1
54	TA2	R2
55	TA3	R3
56	TA4	R4
3	TA5	R5(MSB)
4	TA6	G0(LSB)
6	TB0	G1
7	TB1	G2
11	TB2	G3
12	TB3	G4
14	TB4	G5(MSB)
15	TB5	B0(LSB)
19	TB6	B1
20	TC0	B2
22	TC1	B3
23	TC2	B4
24	TC3	B5(MSB)
27	TC4	(HS)
28	TC5	(VS)
30	TC6	DE
50	TD0	GND
2	TD1	GND
8	TD2	GND
10	TD3	GND
16	TD4	GND
18	TD5	GND
25	TD6	(NA)

MODE=L(GND)



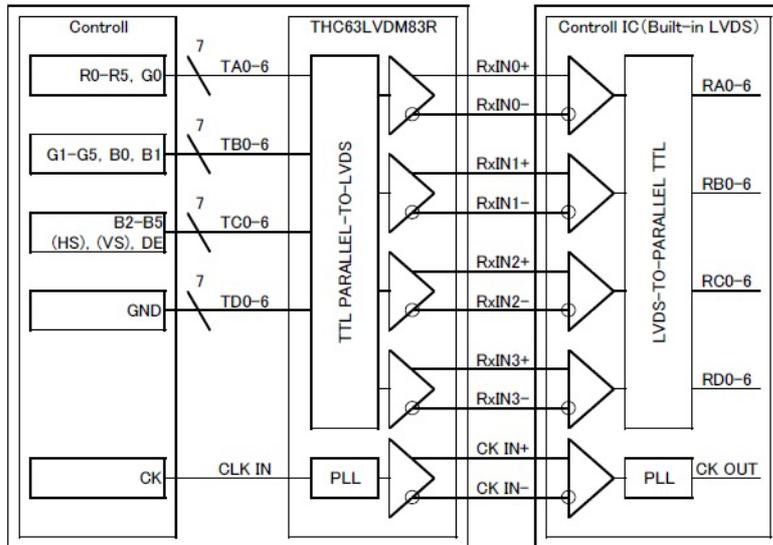
DE : DATA ENABLE

HS : Hsync

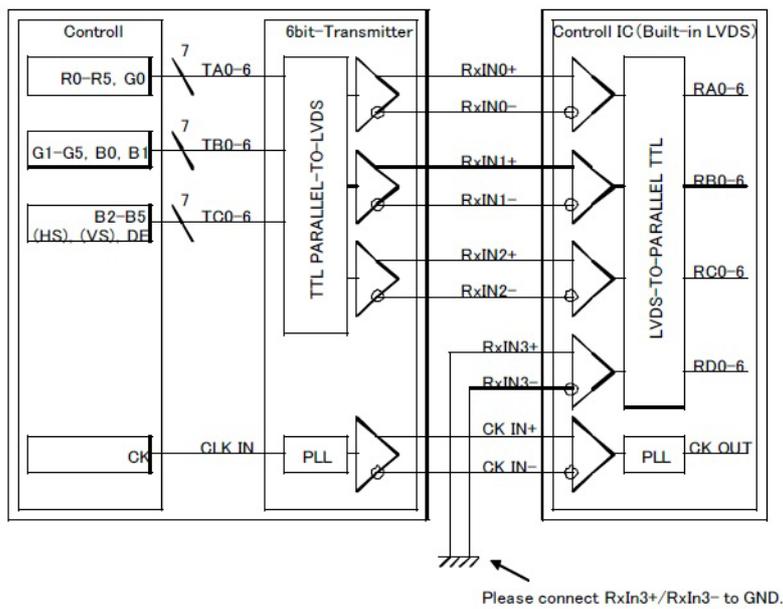
VS : Vsync

2) Block Diagram

MODE=L(GND)



When using “6-bit Transmitter”, please connect the unused channel of the control IC receiver as described in the diagram below.

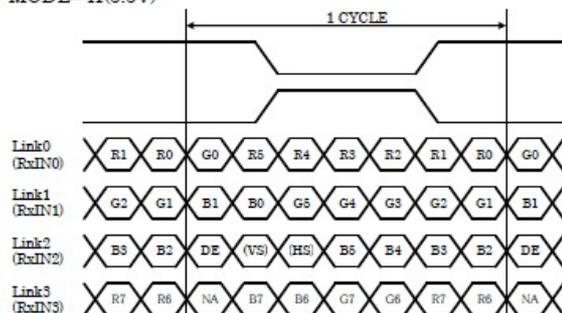


Data mapping(8bit input)

1) Location of MODE (THC63LVDM83R(THine Electronics) or compatible)

Transmitter		MODE
Pin No.	Data	= H(3.3V)
51	TA0	R0(LSB)
52	TA1	R1
54	TA2	R2
55	TA3	R3
56	TA4	R4
3	TA5	R5
4	TA6	G0(LSB)
6	TB0	G1
7	TB1	G2
11	TB2	G3
12	TB3	G4
14	TB4	G5
15	TB5	B0(LSB)
19	TB6	B1
20	TC0	B2
22	TC1	B3
23	TC2	B4
24	TC3	B5
27	TC4	(HS)
28	TC5	(VS)
30	TC6	DE
50	TD0	R6
2	TD1	R7(MSB)
8	TD2	G6
10	TD3	G7(MSB)
16	TD4	B6
18	TD5	B7(MSB)
25	TD6	(NA)

MODE= H(3.3V)



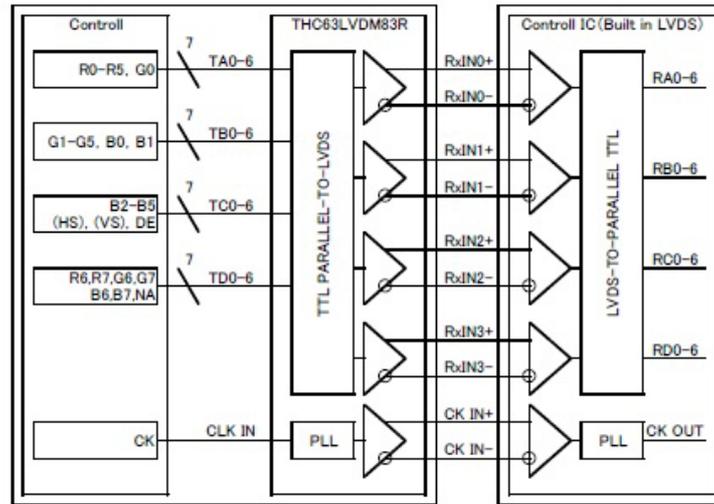
DE : DATA ENABLE

HS : H<sub>SYNC</sub>

VS : V<sub>SYNC</sub>

2) Block Diagram

MODE= H(3.3V)



**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	Red-pixel Data
R5	Red Data 5	
R4	Red Data 4	For 8 bits LVDS input, MSB: R7; LSB:R0
R3	Red Data 3	
R2	Red Data 2	For 6 bits LVDS input, MSB: R5; LSB:R0
R1	Red Data 1	
R0	Red Data 0	
G7	Green Data 7	
G6	Green Data 6	Green-pixel Data,
G5	Green Data 5	
G4	Green Data 4	For 8 bits LVDS input, MSB: G7; LSB:G0
G3	Green Data 3	
G2	Green Data 2	For 8 bits LVDS input, MSB: G5; LSB:G0
G1	Green Data 1	
G0	Green Data 0	
B7	Blue Data 7	
B6	Blue Data 6	Blue-pixel Data
B5	Blue Data 5	
B4	Blue Data 4	For 8 bits LVDS input, MSB: B7; LSB:B0
B3	Blue Data 3	
B2	Blue Data 2	For 6 bits LVDS input, MSB: B5; LSB:B0
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.

**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

DE mode only

**Table 3.2: Timing Characteristics**

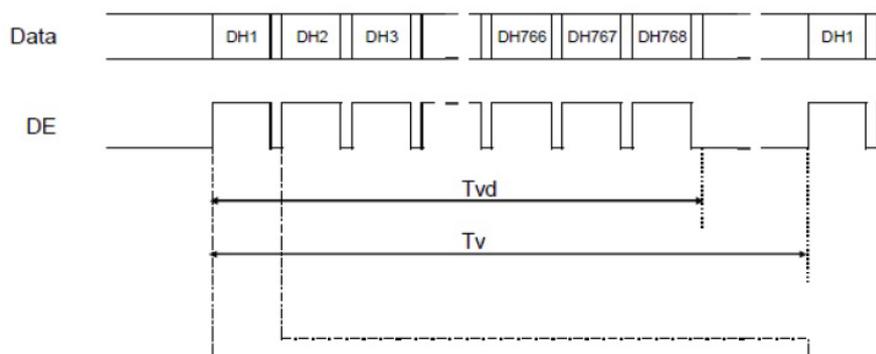
Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Clock frequency	$1/T_{\text{Clock}}$	52	65	71	MHz	
Vertical Section	Period	$T_V$	778	806	845	
	Active	$T_V$	-	768	-	$T_H$
	Blanking	$T_V$	10	38		
Horizontal Section	Period	$T_H$	1,114	1,344	1,400	
	Active	$T_H$	-	1024	-	$T_{\text{Clock}}$
	Blanking	$T_H$	90	320		

**Note1** If the refresh rate reaches less than the Min. value, deterioration of the display - quality, flicker etc, may occur.

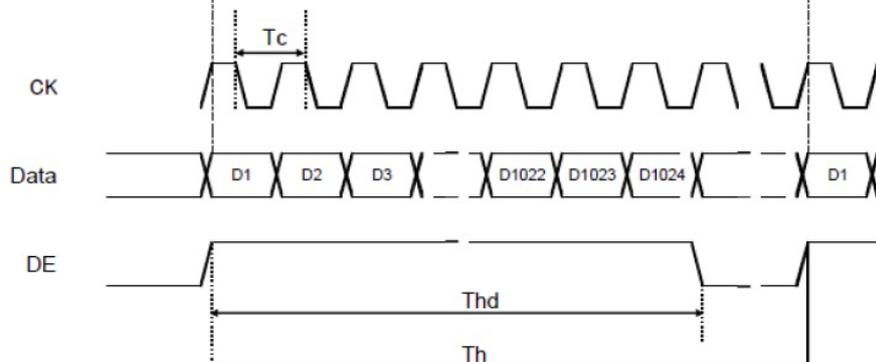
**Note2** DE mode.

### 3.4.2 Input Timing Diagram

**Vertical Timing Diagram**

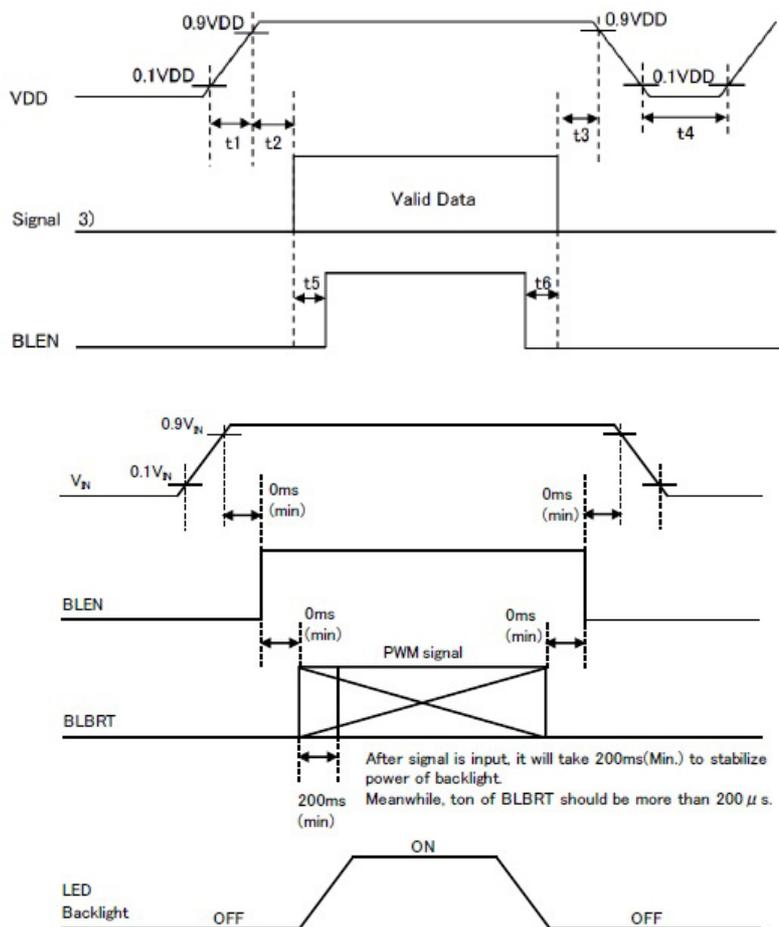


**Horizontal Timing Diagram**



## 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 will be Hi-Z state or low level when VDD is off.



### Power Sequence Timing

Parameter	Value			Unit
	Min.	Typ.	Max.	
T1		0.1		[ms]
T2		10		[ms]
T3		0	-	[ms]
T4		2	-	[s]
T5		200	-	[ms]
T6		200	-	[ms]

The above on/off sequence should be applied to avoid abnormal functions 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

## Display Connector Definition

## 4.1 TFT LCD Signal(CN1): LVDS Connector

**Table 4.1: Connector**

Connector Name / Description	Signal Connector
Manufacturer	I-PEX or compatible
Connector Model Number	20186-020E-11F or Compatible
Adaptable Plug	20197-020U-F, 20197-T20U-F or compatible

**Table 4.2: Pin Assignment**

Pin No.	Signal Name	Pin No.	Signal Name
1	VDD	2	VDD
3	GND	4	GND
5	RxIN0-	6	RxIN0+
7	GND	8	RxIN1-
9	RxIN1+	10	GND
11	RxIN2-	12	RxIN2+
13	GND	14	CK IN1-
15	CK IN1+	16	GND
17	RxIN3-	18	RxIN3+
19	MODE	20	SC

## 4.2 LED Backlight Unit Connector(CN3)

Connector Name / Designation	LED Light Bar Connector / Backlight lamp
Manufacturer	JST or compatible
Connector Model Number	SM06B-SHLS-G-TF(LF)(SN) or compatible
Mating Model Number	SHLP-6V-S-B or compatible

Pin No.	Symbol	Description
Pin1	VIN	+12V power supply
Pin2	VIN	+12V power supply
Pin3	BLBRT	PWM
Pin4	BLEN	ON/OFF terminal voltage
Pin5	GND	GND
Pin6	GND	GND

# Chapter 5

Touch Screen

## 5.1 Touch Characteristics

This touch panel is a resistance type that customers use with flat displays like LCDs. Once an operator touches it with a stylus or finger, the circuit sends coordinate points to the PC in voltages from the contact point.

## 5.2 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

## 5.3 Environment Characteristics

Item	Specification	Remarks
1 Operation temperature	-10°C ~ 60°C	
2 Storage temperature	-30°C ~ 70°C	Max. wet temp. is
3 Operation humidity	20% ~ 90%RH	38°C (No dew)
4 Storage humidity	10% ~ 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) Finger	Dot-Spacer Within "guaranteed active area", but not on the age and Dot-Spacer.

## 5.5 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	±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 min(DC 25V)	

# Chapter 6

## Touch Controller

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## 6.1 Touch Controller Characteristics

Advantech ETM-RES05C Touch Control Board is the ultimate combo board. This touch panel controller provides optimum performance for your analog resistive touch 4-wire model panels. It communicates with the PC directly through USB and RS-232 connectors. You can see how superior the design is through its sensitivity accuracy and friendly operation. The touch panel driver emulates mouse left and right button functions and supports the following OS.

## 6.2 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)
- 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

## 6.3 Environmental Feature

### Reliability

- MTBF is 200,000 hours

### Temperature Ranges

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

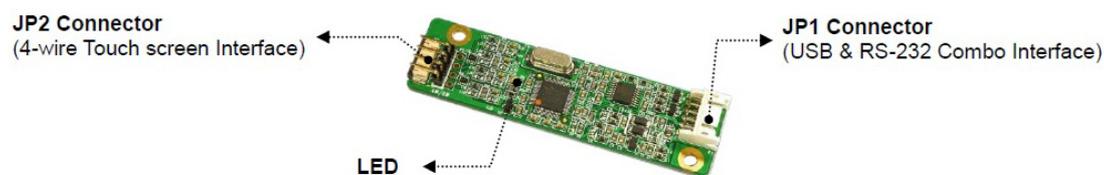
**Relative Humidity**

- 95% at 60°C, RH Non-condensing

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

## 6.4 Pin Assignment and Description

### 6.4.1 Connector and LED Location

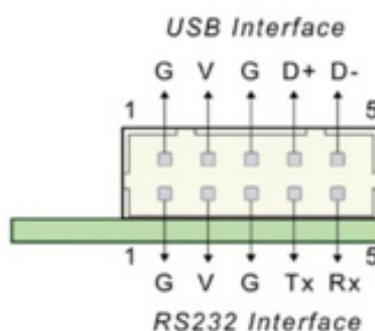


### 6.4.2 Combo Interface Connector, JP1, Pins and Signal Descriptions

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

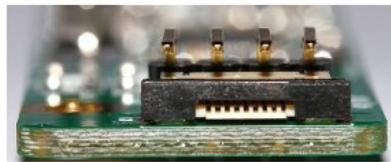
Signal Name	DB-9 pin #	RS-232 pin #	Sourced by	Signal Description
RxD	2	5	ctrl	serial data from controller to host
TxD	3	4	host	serial data from host to controller

**Figure 6.1 Board mounted header**

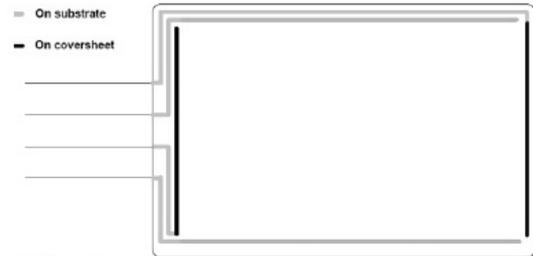
### 6.4.3 Touch Screen Connector, JP2, Pins and Signal Descriptions

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

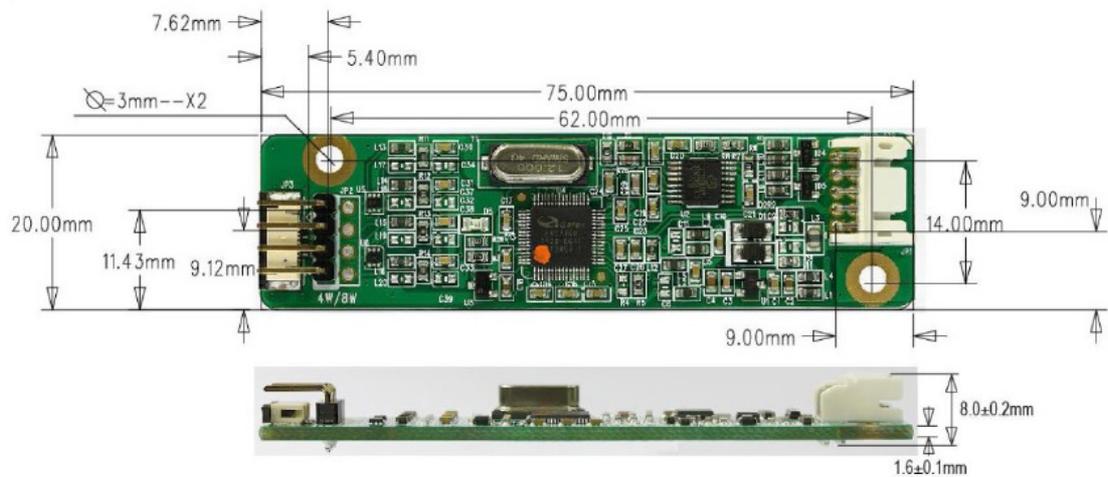


ZIF type and 4P Pin Header connector for 4-Wire Touch Screen usage



4-Wire Screen viewed from coversheet side

### 6.5 Physical Dimension



# Appendix **A**

## Optical Characteristics

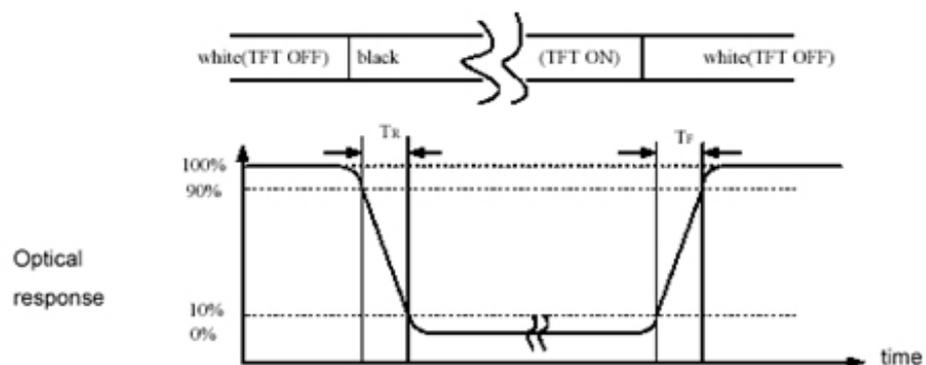
## A.1 Optical Characteristics

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

Item	Conditions	Min.	Typ.	Max.	Unit	Note
White Luminance	IF= 50mA (center point)	910	1300	-	[cd/m <sup>2</sup> ]	1
Uniformity	9 Points	70	-	-	%	1, 2, 3
Contrast Ratio		490	700	-		4
Response Time	Rising	-	18		[msec]	5
	Falling	-	12		[msec]	
	Raising + Falling	-	30		[msec]	
Viewing Angle	Horizontal (Right)		85	-	[degree]	6
	CR ≥ 10 Left)		85	-	[degree]	
	Vertical (Upper)		85	-	[degree]	
	CR ≥ 10 (Lower)		85	-	[degree]	
Color / Chromaticity Coordinates (CIE 1931)	Red x	0.550	0.600	0.650		1
	Red y	0.300	0.350	0.400		
	Green x	0.285	0.335	0.385		
	Green y	0.520	0.570	0.620		
	Blue x	0.100	0.150	0.200		
	Blue y	0.070	0.120	0.170		
	White x	0.265	0.315	0.365		
	White y	0.265	0.340	0.390		

**Note** These items are measured by BM-5A (TOPCON) or CA-1000 (MINOLTA) in the dark room (no ambient light). After 5 minutes of operation, the optical properties are measured at the center point of the LCD screen.

**Note1** Definition of Response Time (White-Black)



**Note2** Definition of Contrast Ratio

Contrast ratio is calculated with the following formula:

Contrast Ratio (CR)=(White) Luminance of ON ÷ (Black) Luminance of OFF

**Note3** Definition of Luminance:

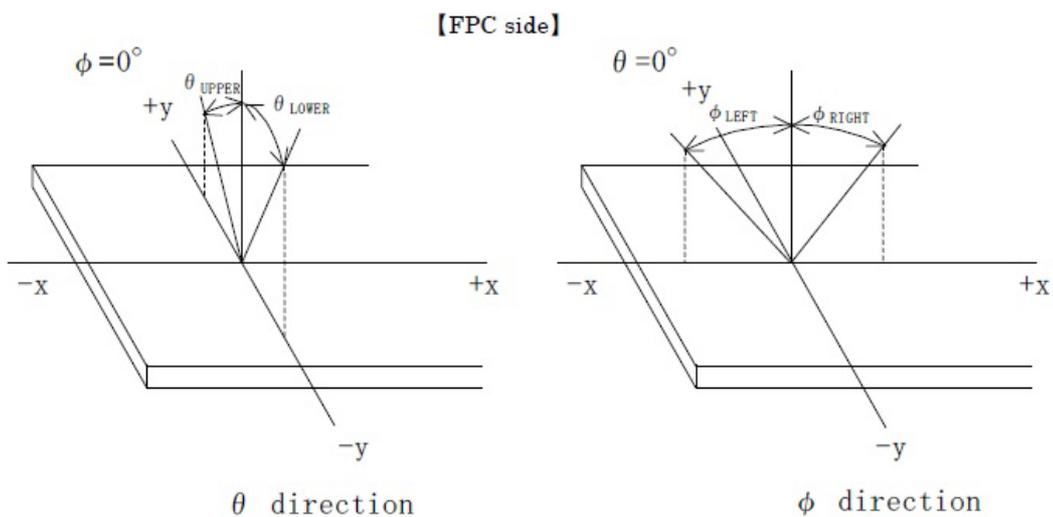
Measure the luminance of white state at center point.

**Note4** Definition of Luminance Uniformity:  
 Measured Maximum luminance [L(MAX)] and Minimum luminance [L(MIN)]  
 on the 9 points

Luminance Uniformity is calculated with the following formula:

$$\Delta L = [ L(MIN) / L (MAX) ] \times 100\%$$

**Note5** Definition of Viewing Angle





# Appendix **B**

## Handling Precautions

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## 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 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. When designing your 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 amounts of materials having no flammability grade are used in the LCD module. The LCD module should be supplied by power that complies with the requirements of Limited Power Source (IEC60950 or UL1950), or be applied as exempt.

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