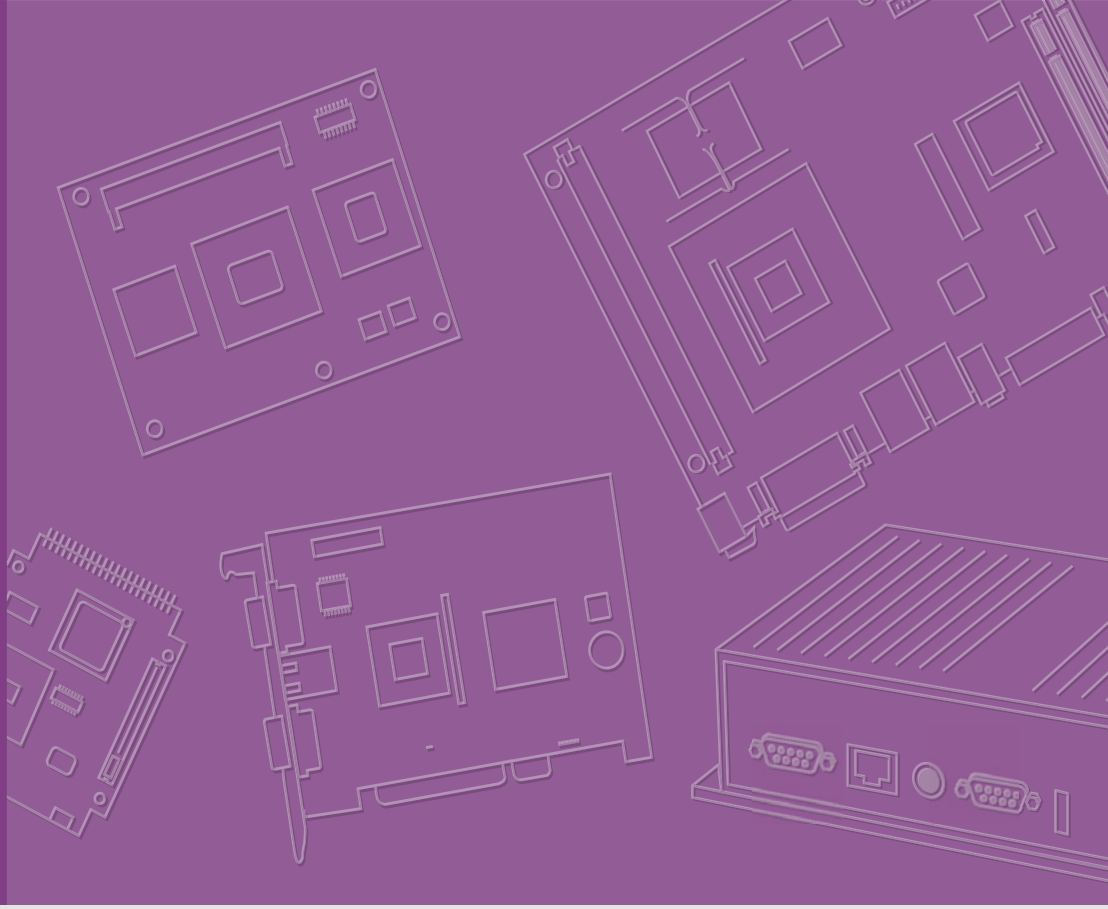

User Manual

IDK2121WNK2FHA2E-ES

TFT-LCD 21.5” FHD (LED Backlight)

ADVANTECH

Enabling an Intelligent Planet

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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

IDK-2121W series 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 FHD (1920(H) x 1080(V)) screen and 16.7M colors (RGB 8-bits data). All input signals are dual LVDS interface. Driver board for the backlight is included.

1.2 Display Characteristics

The following are characteristics summary under 25°C condition:

Table 1.1: Display Characteristics

Item	Unit	Description
Screen Diagonal	[mm]	546.86(21.53”)
Active Area	[mm]	476.64 (H) x 268.11 (V)
Pixels H x V		1920 (x3) x 1080
Pixel Pitch		248.25 (per one triad) × 248.25
Pixel Arrangement	[um]	R.G.B. Vertical Stripe
Display Mode		VA Mode, Normally Black
White Luminance (Center)	[cd/m^2]	1200 (Typ.)
Contrast Ratio		2500 (Typ.)
Optical Response Time	[msec]	16 ms (Typ., on/off)
Nominal Input Voltage VDD	[Volt]	+5.0 V
Backlight Input Voltage	[Volt]	+12.0 V
Power Consumption (VDD line + LED line)	[Watt]	VDD: 4.4 + PLED: 36.1 = 40.5 (Typ.) (with LED driver board, all white pattern)
Weight	[Grams]	R series: 2600 (Typ.) N series: 1200 (Typ.)
Physical Size	[mm]	R series: 495.6(W) × 292.2(H) × 19.8(D) Typ. N series: 495.6(W) × 292.2(H) × 16.9(D) Typ.
Electrical Interface		Dual channel LVDS
Support Color		16.7M colors (RGB 8 bits)
Surface Treatment		Anti-Glare, 3H
Temperature Range Operating Storage (Shipping)	 [°C] [°C]	N-series/R series 0 to +50-2 0 to +60
RoHS Compliance		RoHS Compliance
TCO Compliance		TCO 5.1 Compliance

1.3 Optical Characteristics

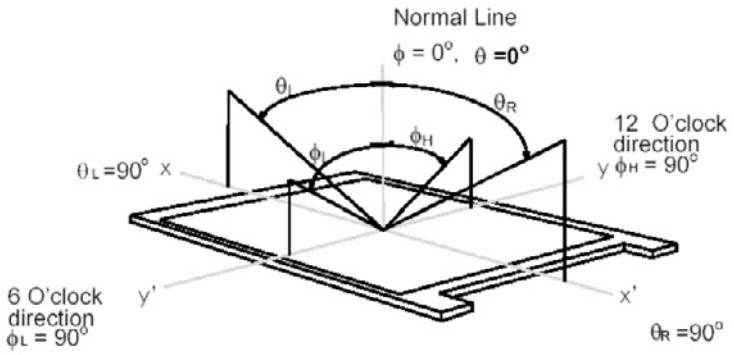
Table 1.2: Display Characteristics

Item	Unit	Conditions	Min.	Typ.	Max.	Note
Viewing Angle	[degree]	Horizontal(Right) CR = 10 (Left)	150	178	-	1
		Vertical (Up) CR = 10 (Down)	150	178	-	
Contrast ratio		Normal Direction	-	3500	-	1
Response Time	[msec]	Raising Time (TrR)	-	10	12	5
		Falling Time (TrF)	-	6	7	
		Raising + Falling	-	16	19	
Color / Chromaticity Coordinates (CIE)		Red x	0.589	0.639	0.689	4
		Red y	0.283	0.333	0.383	
		Green x	0.284	0.334	0.384	
		Green y	0.573	0.623	0.673	
		Blue x	0.105	0.155	0.205	
		Blue y	0.000	0.048	0.098	
Color Coordinates (CIE) White		White x	0.263	0.313	0.363	
		White y	0.279	0.329	0.379	
Central Luminance	[cd/m^2]		-	1200	-	3
Luminance Uniformity	[%]		-	85	-	3
Crosstalk (in 60Hz)	[%]				1.5	
Flicker	dB				-20	

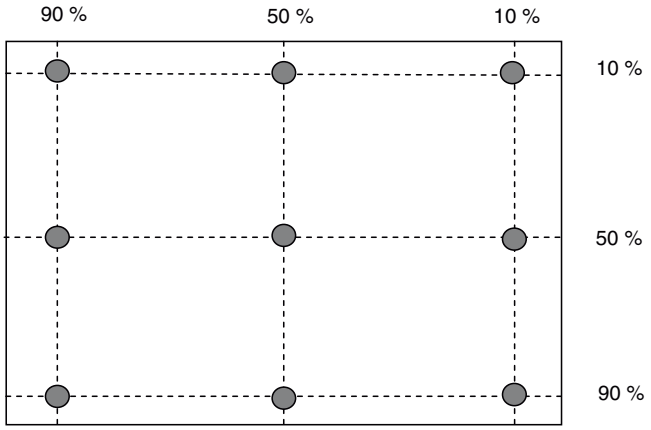
Optical Equipment: BM-7, DT-101, or equivalent

Note 1: Definition of viewing angle

Viewing angle is the measurement of contrast ratio at the screen center, over a 180°horizontal and 180°vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as below: 90° (θ)? horizontal left and right, and 90° (Φ) vertical high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated to its center to develop the desired measurement viewing angle.



Note 2: 9 points position

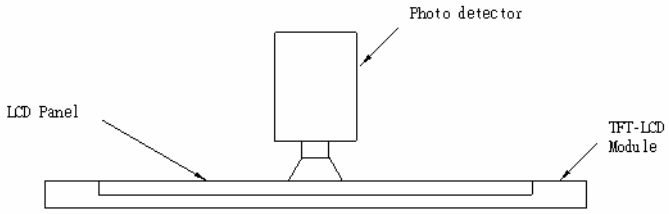


Note 3: The luminance uniformity of 9 points is defined by dividing the maximum luminance values by the minimum test point luminance

$$\delta_{W9} = \frac{\text{Minimum Brightness of nine points}}{\text{Maximum Brightness of nine points}}$$

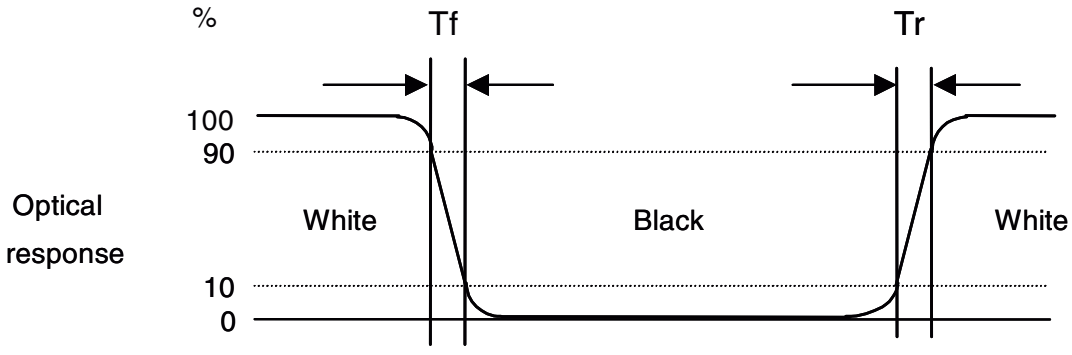
Note 4: Measurement method

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



Note 5: Definition of response time:

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



1.4 Functional Block Diagram

The following diagram shows the functional block of the 21.5 inches Color TFT-LCD Module:

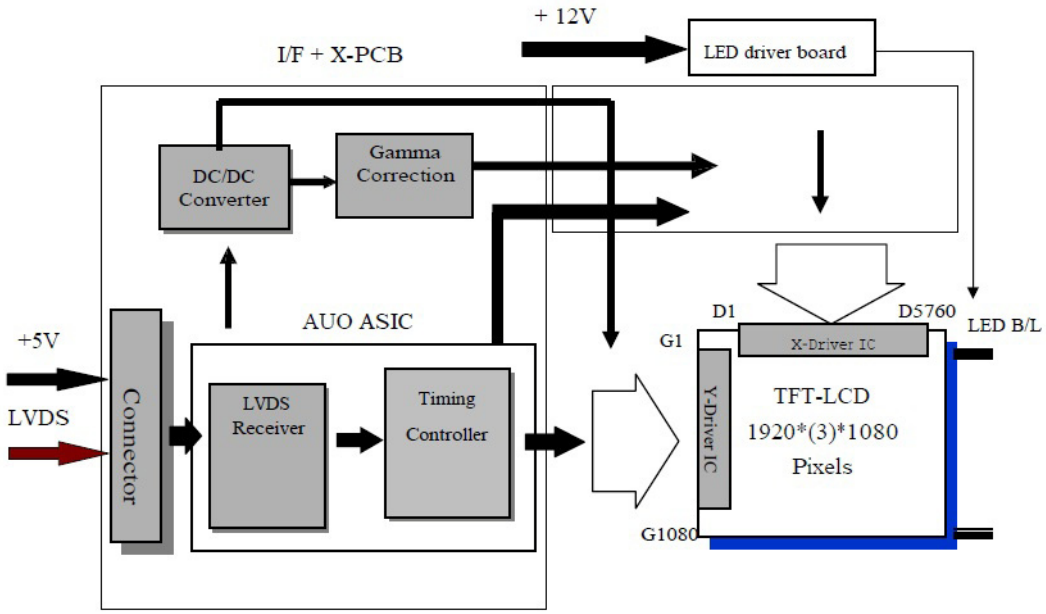


Figure 1.1 Function block diagram

1.5 Absolute Maximum Ratings

Absolute maximum ratings of the module is as following:

1.5.1 Absolute Ratings of TFT LCD Module

Item	Symbol	Min.	Max.	Unit	Conditions
Logic/LCD Drive Voltage	VDD	0	5.5	[Volt]	Note 1,2

1.5.2 Absolute Ratings of Backlight Unit

Item	Symbol	Min.	Max.	Unit	Conditions
LED light bar Input Voltage	VLED	-	50	[Volt]	Note 1,2

1.5.3 Absolute Ratings of Environment

Item	Symbol	Min.	Max.	Unit	Conditions
Operating Temperature	TOP	0	+50	[oC]	Note 3
Operation Humidity	HOP	5	+90	[%RH]	
Storage Temperature	TST	-20	+60	[oC]	
Storage Humidity	HST	5	90	[%RH]	

Note 1: Within Ta (25°C)

Note 2: Permanent damage to the device may occur if exceeding maximum values

Note 3: For quality performance, please refer to AUO IIS (Incoming Inspection Standard).

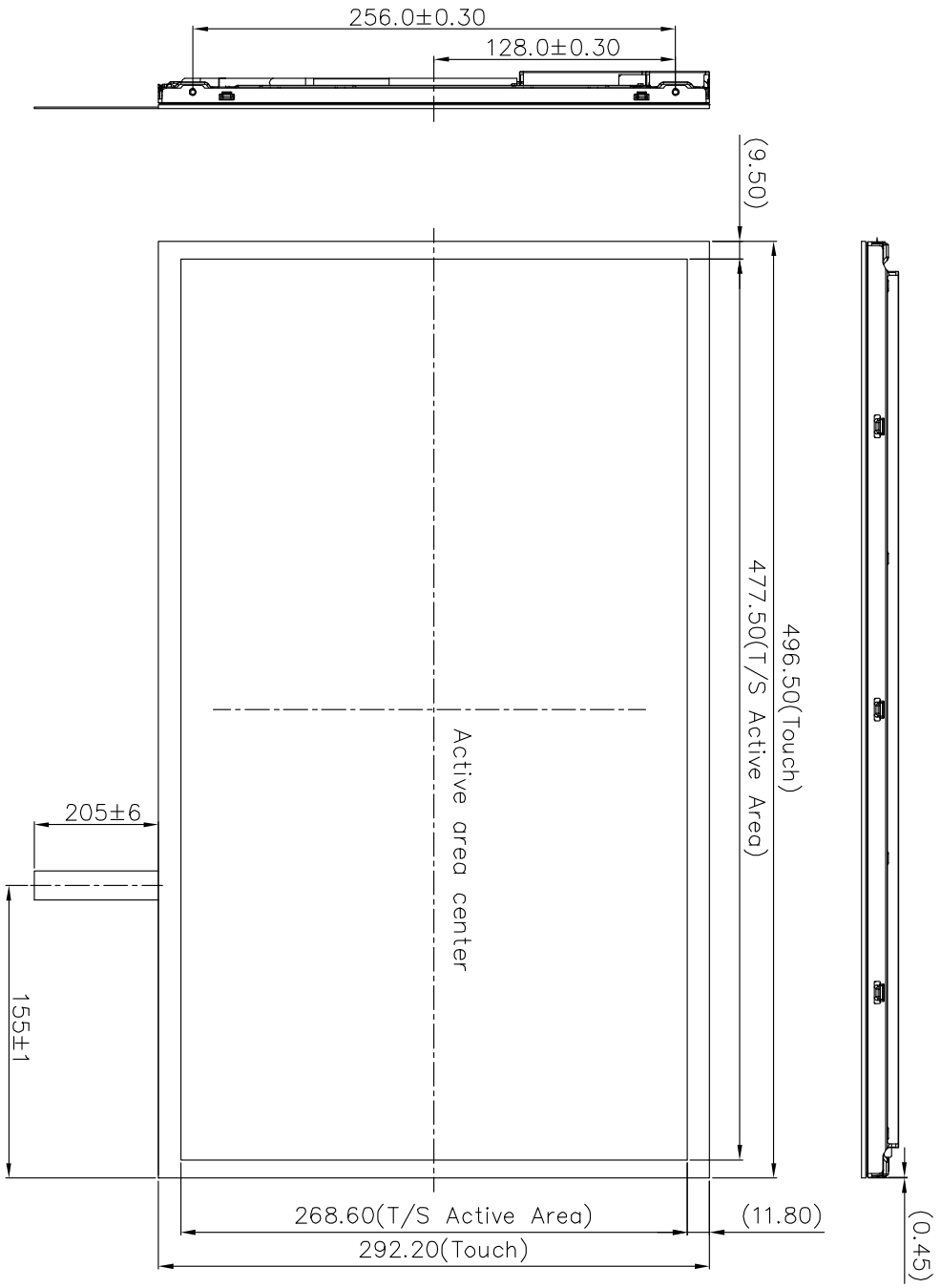
1. 90% RH Max (Ta ≤ 39°C)
2. Max wet-bulb temperature at 39°C or less. (Ta ≤ 39°C))
3. No condensation.

Note 4: Function judge only.

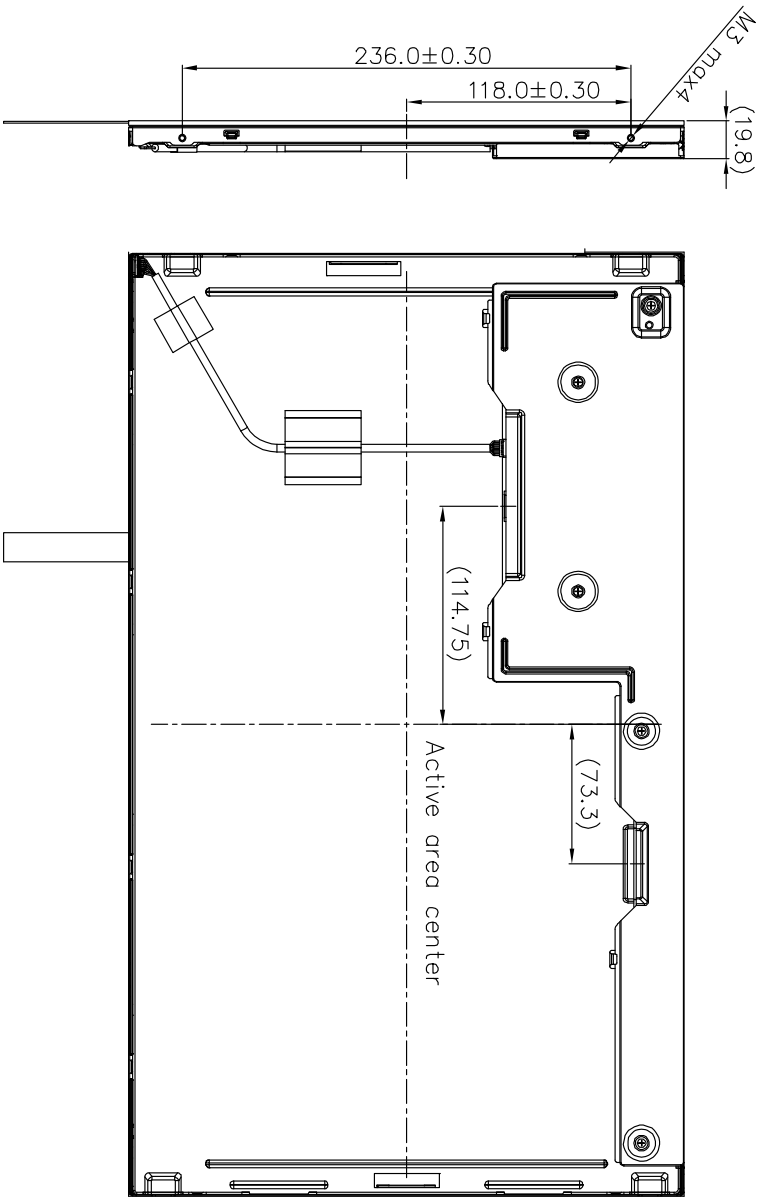
1.6 Outline Dimension

1.6.1 IDK-2121WR-1KFHA1E

Front View

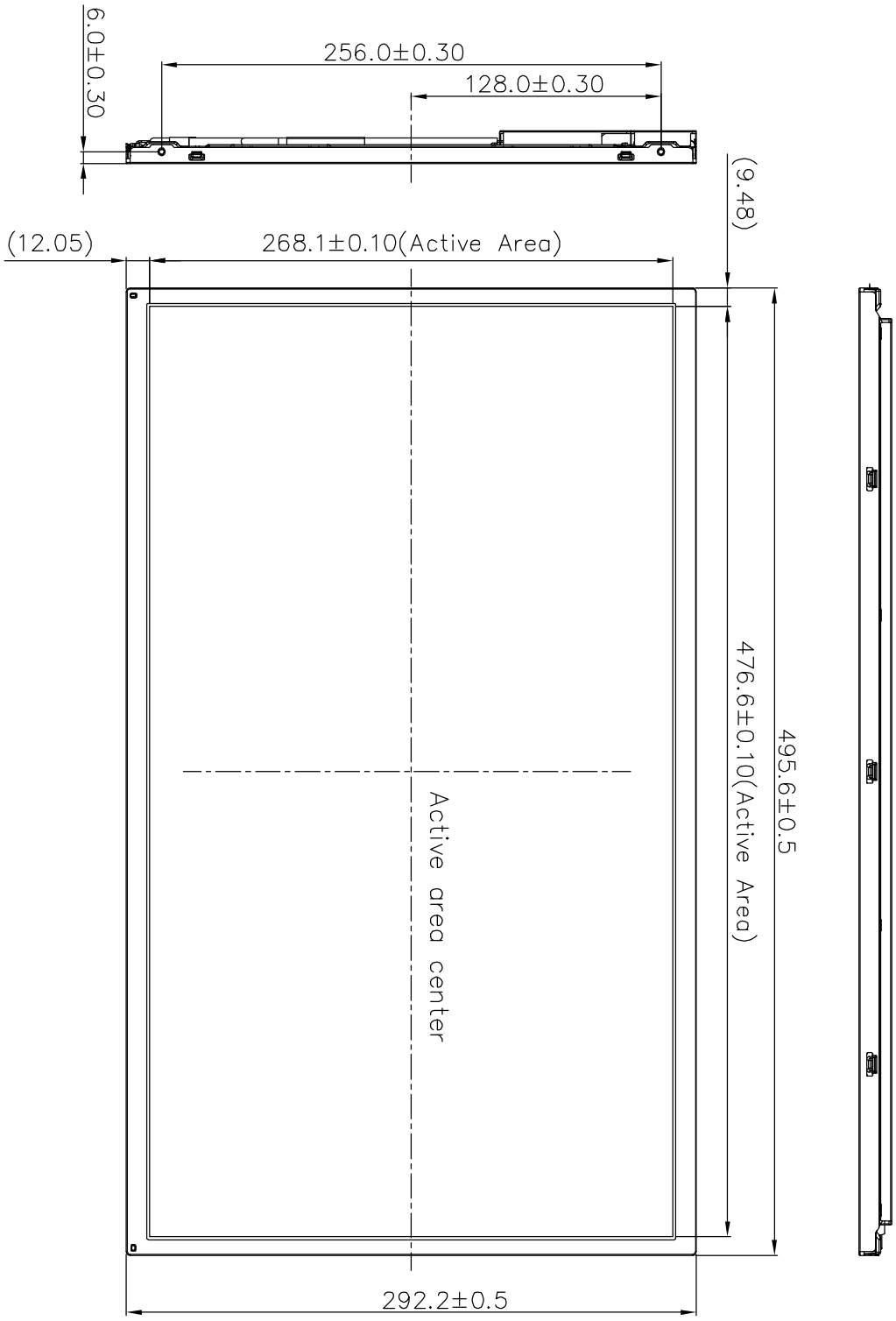


Rear View

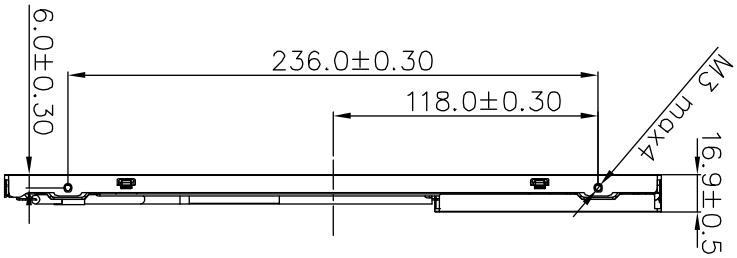


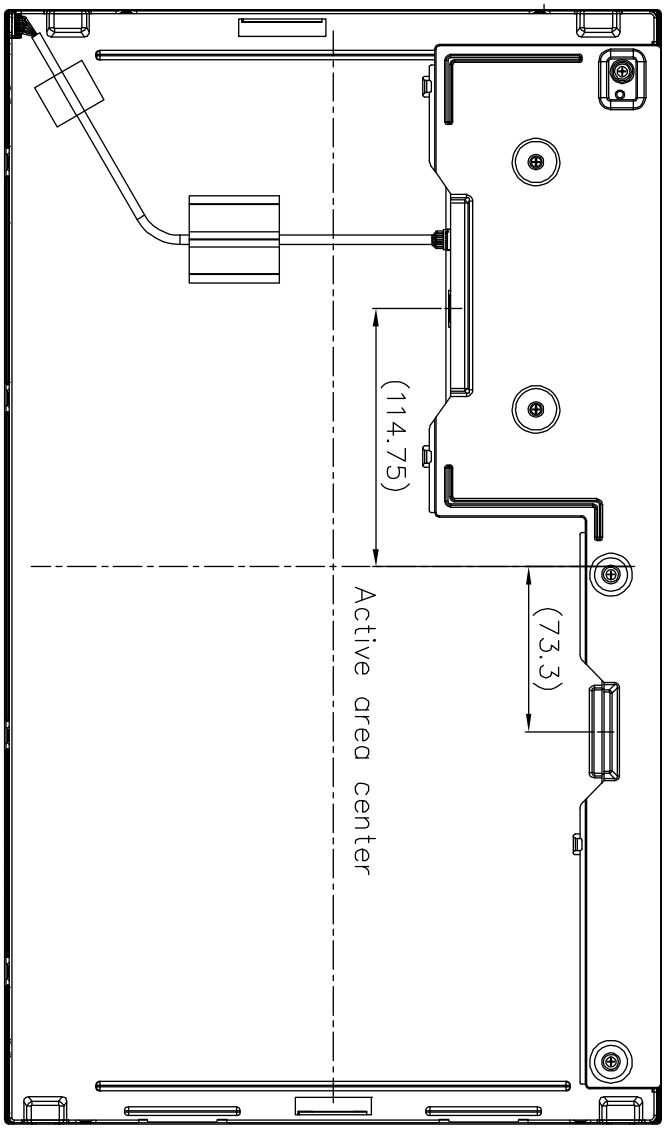
1.6.2 IDK-2121WN-1KFHA1E

Front View



Rear View


6.0±0.30
236.0±0.30
118.0±0.30
M3 max4
16.9±0.5


(114.75)
(73.3)
Active area center

Chapter 2

Electrical Characteristics

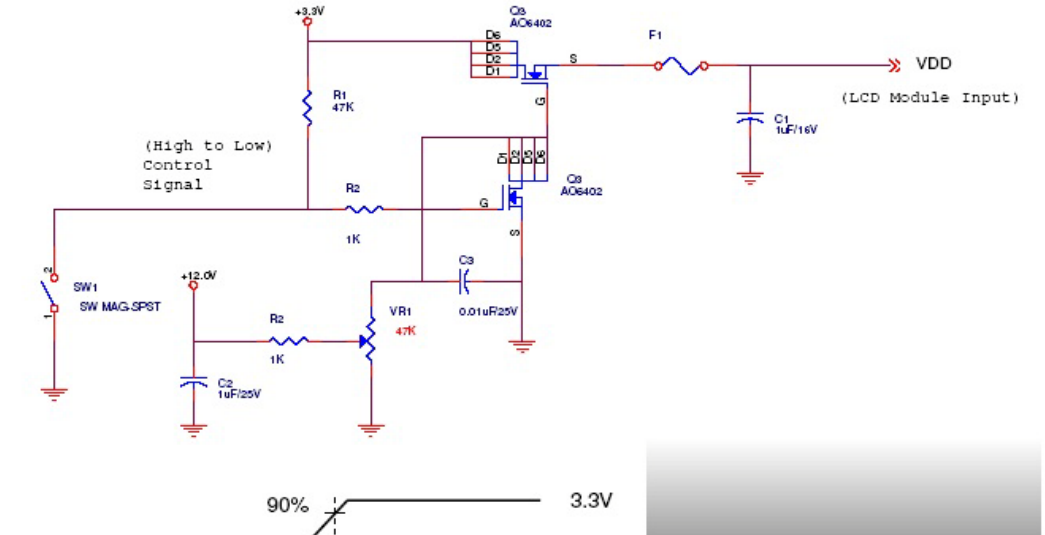
2.1 Power Specification

Input power specifications are as follows:

Table 2.1: Power specification

Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
VDD	Logic/LCD Drive Voltage	4.5	5.0	5.5	[Volt]	±10%
IDD	Input Current	-	0.7	0.8	[A]	VDD= 5.0V,All white pattern, At 60Hz
			0.81	0.89	[A]	VDD= 5.0V, All white pattern At 75Hz
PDD	VDD Power	-	3.5	4.4	[Watt]	VDD= 5.0V,All white pattern, At 60Hz
			4.05	4.9	[Watt]	VDD= 5.0V, All white pattern At 75Hz
IRush	Inrush Current	-	-	3	[A]	Note 1
VDDrp	Allowable Logic/ LCD Drive Ripple Voltage	-	-	500	[mV] p-p	VDD= 5.0V, All white Pattern At 75Hz

Note1 Measurement condition:



VDD rising time

64 Gray pattern

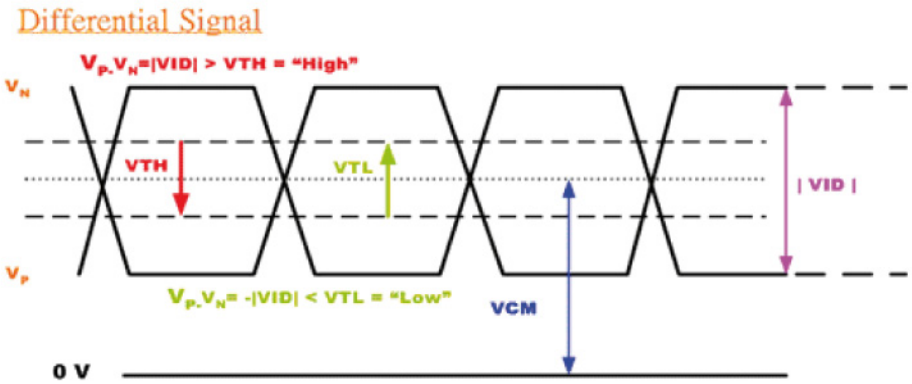
2.1.1 Signal Electrical Characteristics

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

Table 2.2: Signal electrical characteristics

Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
V_{TH}	Differential Input High Threshold	-	-	+100	[mV]	VCM = 1.2V, Note 1
V_{TL}	Differential Input Low Threshold	-100	-	-	[mV]	VCM = 1.2V Note 1
$\| V_{ID} \|$	Input Differential Voltage	100	-	600	[mV]	Note 1
V_{CM}	Differential Input Common Mode Voltage	+1.0	+1.2	+1.5	[V]	VTH-VTL = 200MV (max) Note 1

Note LVDS Signal Waveform.



2.2 Backlight Driving Conditions

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

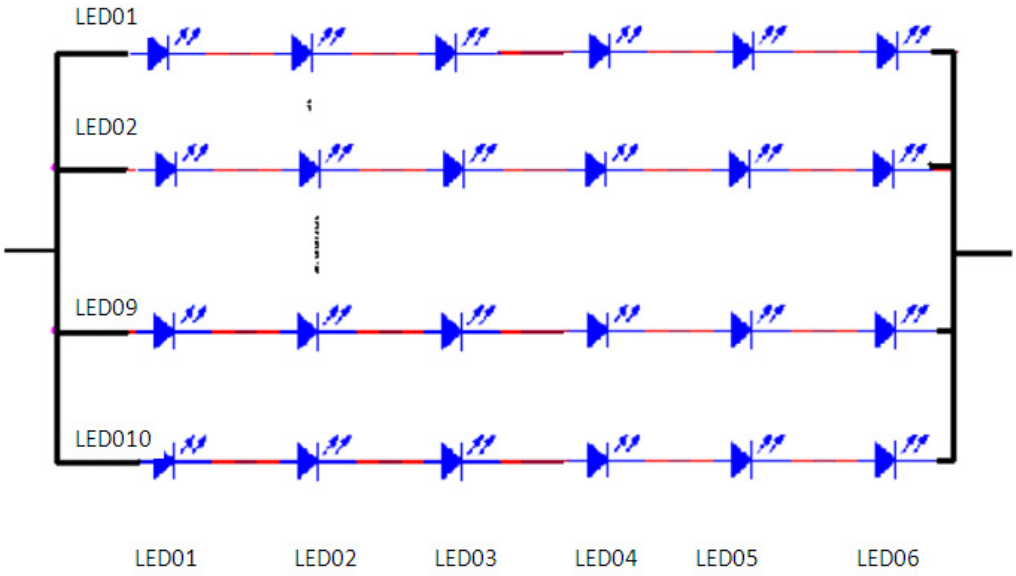
Table 2.3: Backlight driving conditions

Item	Symbol	Values			Unit	Condition
		Min.	Typ.	Max.		
LED Voltage	VL	-	-	19	V	Note 2
LED Current	IL	-	-	950*2	mA	Note 2
LED life time	-	50,000	-	-	Hr	Note 1

Note1 The "LED life time" is defined as the module brightness decreased to 50% original brightness and the ambient temperature is 25°C and typical LED Current at 950 mA.

Note2 The LED driving condition is defined for each LED module.(10 LED Serial).

Note3 The variance of LED Light Bar power consumption is 10%. Calculator value for reference (IL x VL x 2 = PLED)

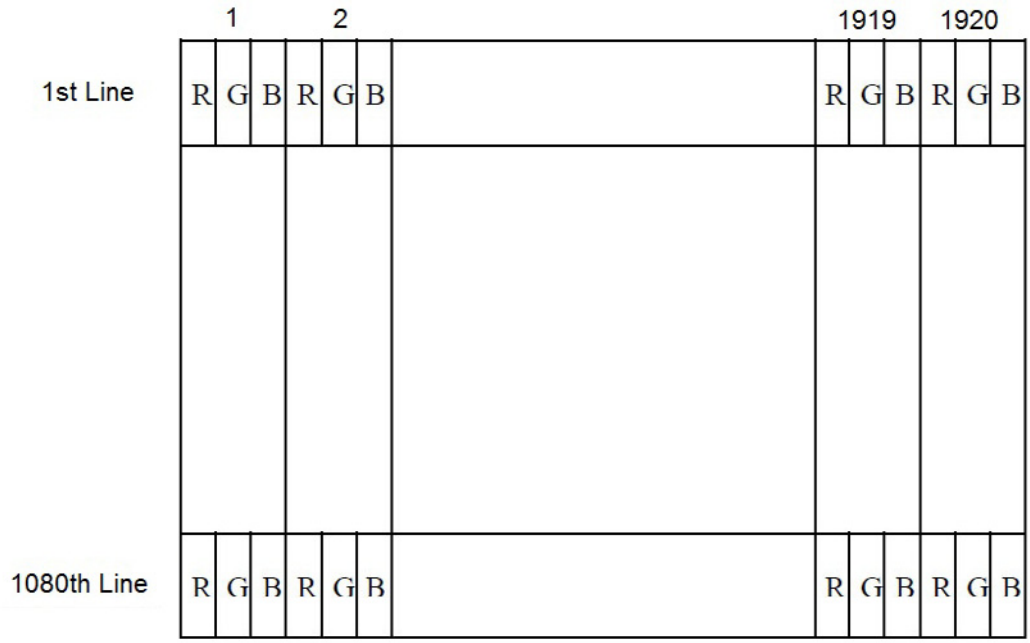

LED01
LED02
LED09
LED010
LED01
LED02
LED03
LED04
LED05
LED06

Chapter 3

Signal Characteristics

3.1 Pixel Format Image

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



3.2 Pin Description

The module using a pair of LVDS receiver SN75LVDS82 (Texas Instruments) or compatible. LVDS is a differential signal technology for LCD interface and high speed data transfer device. Transmitter shall be SN75LVDS83 (negative edge sampling) or compatible. The first LVDS port (RxOxxx) transmits odd pixels while the second LVDS port (RxExxx) transmits even pixels.

Table 3.1: Pin Description

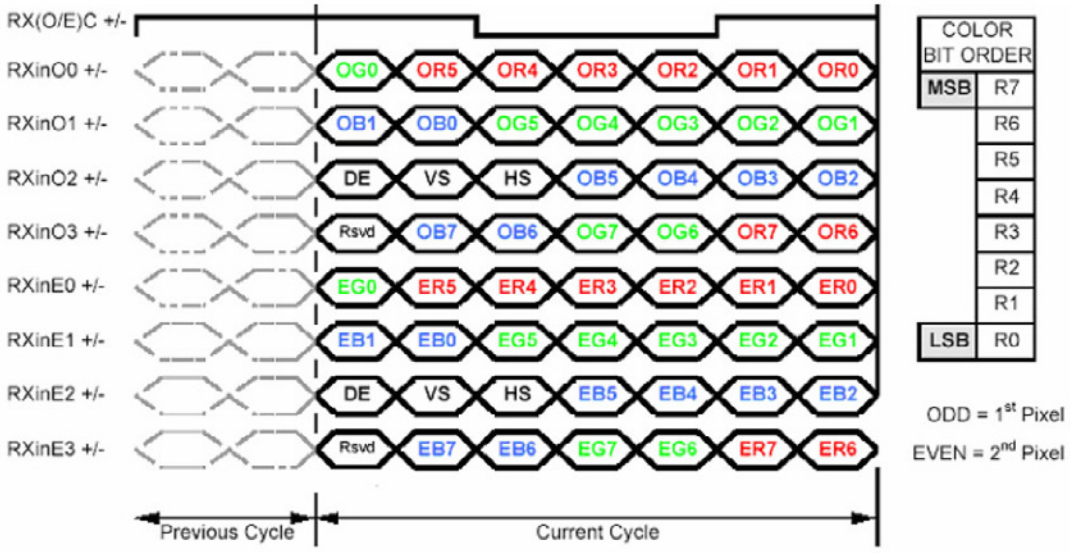
Pin No.	Symbol	Description
1	RxO0-	Negative LVDS differential data input (Odd data)
2	RxO0+	Positive LVDS differential data input (Odd data)
3	RxO1-	Negative LVDS differential data input (Odd data)
4	RxO1+	Positive LVDS differential data input (Odd data)
5	RxO2-	Negative LVDS differential data input (Odd data, H-Sync,V-Sync,DSPTMG)
6	RxO2+	Positive LVDS differential data input (Odd data, H-Sync,V-Sync,DSPTMG)
7	VSS	Power Ground
8	RxOC-	Negative LVDS differential clock input (Odd clock)
9	RxOC+	Positive LVDS differential clock input (Odd clock)
10	RxO3-	Negative LVDS differential data input (Odd data)
11	RxO3+	Positive LVDS differential data input (Odd data)
12	RxE0-	Negative LVDS differential data input (Even data)
13	RxE0+	Positive LVDS differential data input (Even data)
14	VSS	Power Ground

Table 3.1: Pin Description		
15	RxE1-	Negative LVDS differential data input (Even data)
16	RxE1+	Positive LVDS differential data input (Even data)
17	VSS	Power Ground
18	RxE2-	Negative LVDS differential data input (Even data)
19	RxE2+	Positive LVDS differential data input (Even data)
20	RxEC-	Negative LVDS differential clock input (Even clock)
21	RxEC+	Positive LVDS differential clock input (Even clock)
22	RxE3-	Negative LVDS differential data input (Even data)
23	RxE3+	Positive LVDS differential data input (Even data)
24	VSS	Power Ground
25	NC	No connection (for AUO test only. Do not connect)
26	NC	No connection (for AUO test only. Do not connect)
27	NC	No connection (for AUO test only. Do not connect)
28	VDD	Power +5V
29	VDD	Power +5V
30	VDD	Power +5V

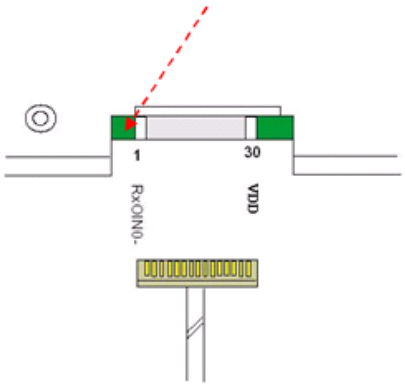
Note1: Input signals of odd and even clock shall be the same timing.

Note2: Please follow VESA.

3.3 The Input Data Format



Note1: Normally DE mode only. VS and HS on EVEN channel are not used.
Note2: Please follow VESA.
Note3: 8-bit in



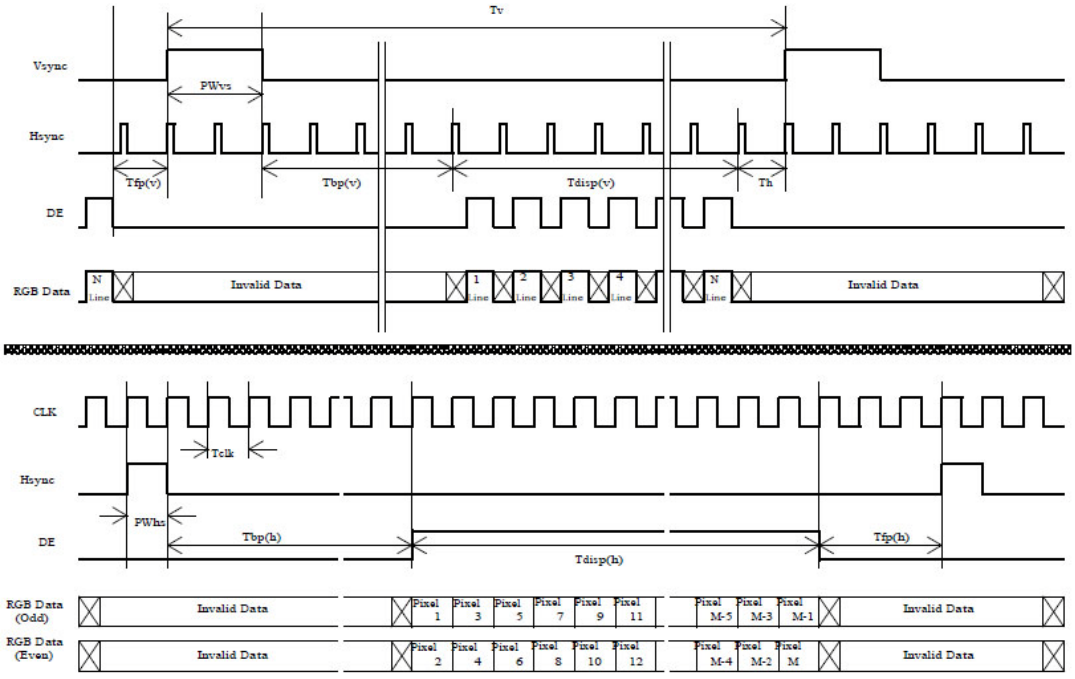
3.4 Interface Timing

3.4.1 Timing Characteristics

Signal Name	Item	Symbol	Min.	Typ.	Max.	Unit
Clock	Frequency	1/ TClock	40	72	83	MHz
Frame Rate	Frequency	1/Tv	50	60	75	Hz
Vertical Section	Period	TV	1088	1120	2047	T_line
	Active	TVD	1080	1080	1080	
	Blanking	TVB	8	40	967	
Horizontal Section	Period	TH	1034	1060	2047	T_clock
	Active	THD	960	960	960	
	Blanking	THB	74	100	1087	

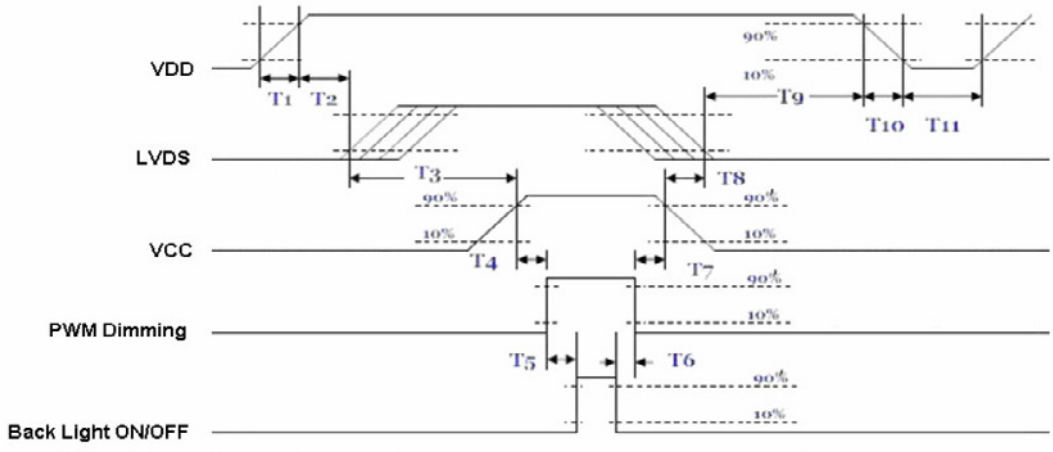
Note: DE mode.

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	0.5	-	10	[ms]
T5	10	-	-	[ms]
T6	10	-	-	[ms]
T7	0	-	-	[ms]
T8	10	-	-	[ms]
T9	-	-	10	[ms]
T10	110	-	-	[ms]
T11	0	16	50	[ms]
T12	-	-	10	[ms]
T13	1000	-	-	[ms]

Chapter 4

Connector & Pin Assignment

4.1 TFT LCD Module

The physical connector interface is described below. These connectors are capable of accommodating the following signals and components.

4.1.1 Connector

Table 4.1: Connector	
Connector Name / Description	**Interface Connector / Interface card**
Manufacture	JAE or compatible
Type Part Number	JAE (FI-XB30SRL-HF11) or equivalent
Mating Housing Part Number	FI-X30HL (JAE) or compatible

4.1.2 Pin Assignment

Table 4.2: Pin Assignment			
Pin No.	**Signal Name**	**Pin No.**	**Signal Name**
1	RxOIN0-	2	RxOIN0+
3	RxOIN1-	4	RxOIN1+
5	RxOIN2-	6	RxOIN2+
7	GND	8	RxOCLKIN-
9	RxOCLKIN+	10	RxOIN3-
11	RxOIN3+	12	RxEIN0-
13	RxEIN0+	14	GND
15	RxEIN1-	16	RxEIN1+
17	GND	18	RxEIN2-
19	RxEIN2+	20	RxECLKIN-
21	RxECLKIN+	22	RxEIN3-
23	RxEIN3+	24	GND
25	NC	26	NC
27	NC	28	VDD
29	VDD	30	VDD

4.2 Backlight Unit

The physical connector interface is described below. These connectors are capable of accommodating the following signals and components.

4.2.1 Signal for LED light bar connector

Connector Name / Designation	**Interface Connector / Interface card**
Manufacturer	SPEEDCON
Type Part Number	WF-SMT90 2.0mm Wire to board Heater Type or equivalent

4.2.1.1 LED input connector pin define (CN1):

Pin No.	Pin Definition
1	Vin(+12V)
2	Vin(+12V)
3	GND
4	GND
5	ON/OFF(0V: Off ; +5V: On)
6	Dimming (PWM)

4.2.1.2 LED output connector pin define (CN2,CN3):

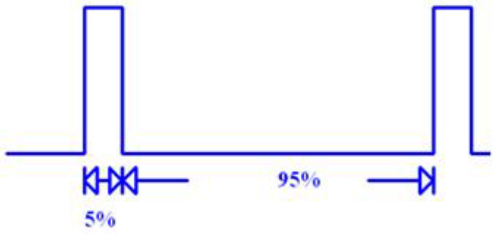
Pin No.	Pin Definition
1	VLED-
2	VLED+

4.2.2 LED Driver Board

4.2.2.1 Specification:

Table 4.3: Specification

Symbol	Characteristics	Condition	Min.	Typ.	Max.	Unit
Input	Voltage		-	-	19	V
	Efficiency	Vin=12V, Iout=950mA, Vout=19V		85		%
	Power	1 port output	3		30	W
Output	Voltage		18		24	V
	Current		150		950	mA
	Current Accuracy	150mA≤Iout≤950mA		±5	±10	%
	Protection			OVP		
Environment	Thermal Shutdown			165		°C
	Operation Junction Temperature				125	°C
	Operating Temperature		-20		+70	°C
	Storage Temperature		-40		+ 85	°C
Dimmer (Note 1)	Dimmer range		5		100	%
	Dimmer VH		3		5	V
	Dimmer VL		0		1.5	V
	Dimmer Frequency		0.25	0.5	1	KHz
ON/OFF Voltage	Von		3		5.5	V
	Voff		0		2	V



Note1: When the input ≤ 1KHz, the high-level digital output must be greater than the total output level of only 5%.

4.2.2.2 LED driver board dimension

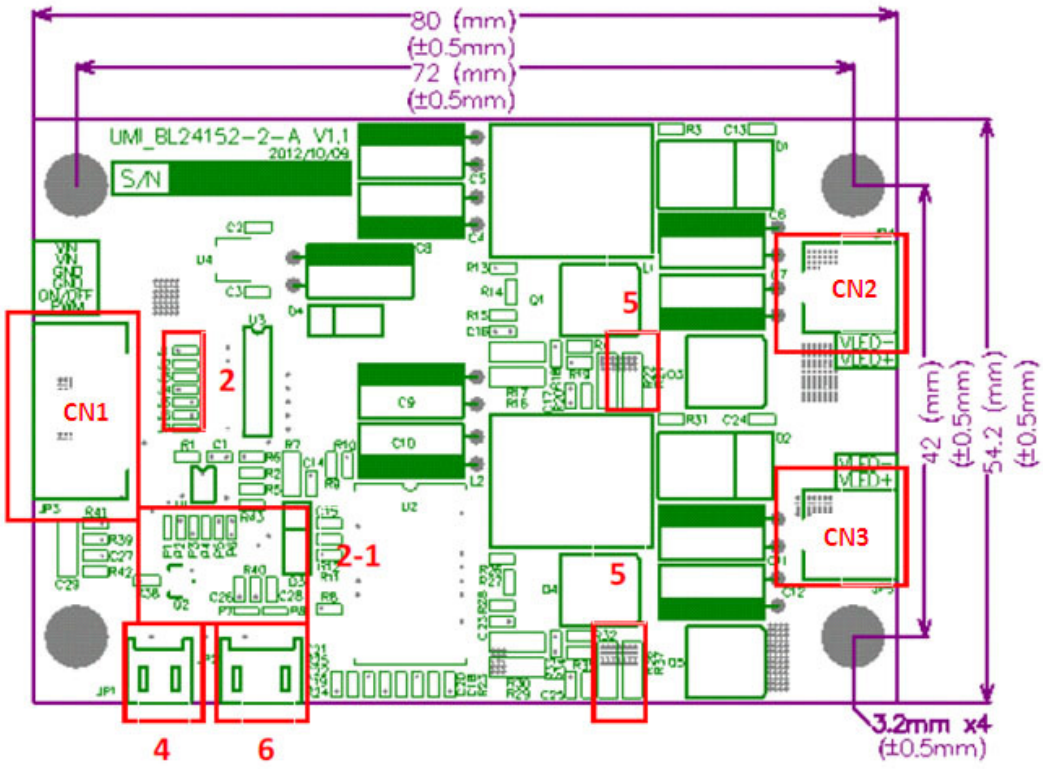


Figure 4.1 Dimension

Chapter 5

Touch Screen & Touch Controller

5.1 Touch Screen

5.1.1 Touch Characteristics

The touch panel is a resistance type used with flat LCD displays. Touches via finger or stylus send coordinate points to the PC from voltage changes at the contact point.

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

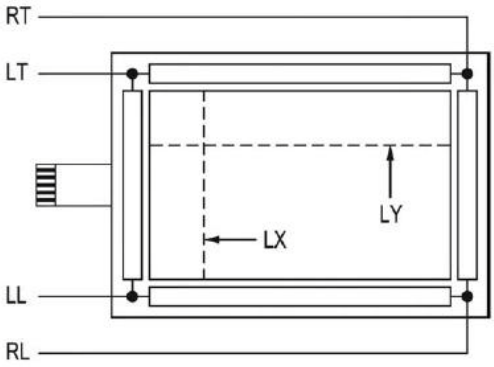
	Item	Specification	Remarks
1	Operation temperature	-20°C ~ 70°C	Note: All terms under 1 atmosphere
2	Storage temperature	-40°C ~ 80°C	
3	Operation Humidity	20% ~ 80%RH	
4	Storage temperature	20% ~ 90%RH	

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 age 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 bellow)	FPC connector
		Y axis: 200Ω ~ 800Ω(Figure as bellow)	
3	Linearity	X ≤1.5% (Figure as bellow) Y ≤1.5% (Figure as bellow)	Reference: 250gf
4	Chattering	≤ 15ms Max	
5	Insulation Resistance	≥ 20MΩ min (DC 25V)	

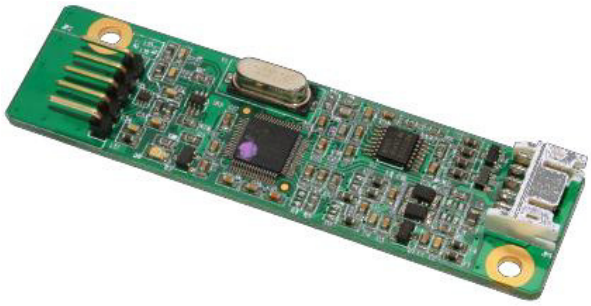


5.1.6 General specification

	Item	Specification
1	Frame size	496.50±0.50 X 292.20±0.30 mm
2	View Area	481.50±0.20 X 272.60±0.20 mm
3	Active Area	477.50±0.20 X 268.60±0.20 mm
4	Total Thickness	3.20±0.20 mm
5	Tail length	205.00±6.00 mm

5.2 Touch controller

Advantech ETM-RES04C Touch Control Board, is the ultimate combo board. This touch panel controller provides optimum 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 design is superior in sensitivity, accuracy and friendly operation. 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.). 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.
- Support Windows 2000/ Vista/ XP/ 7, Windows CE 5.0/ 6.0/ 7.0, Linux, QNX

Touch Resolution

- 2,048 x 2,048 resolution

Response Time

- Max. 20 ms

5.2.1.2 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

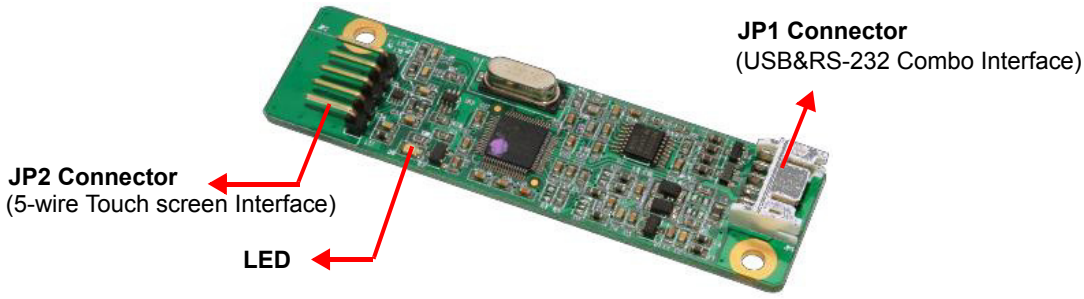
Acquired RoHS certificate

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



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
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

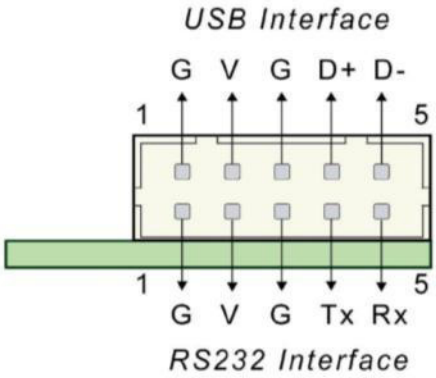
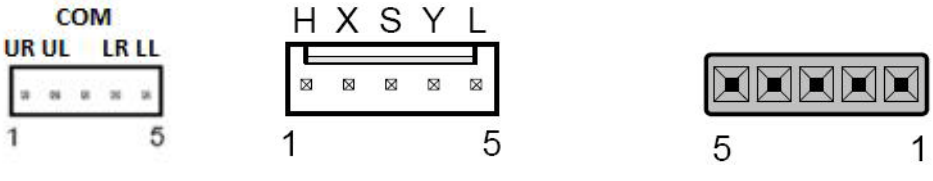


Figure 5.1 Board mounted header

5.2.2.3 Touch Screen Connector, JP2, Pins and signal descriptions

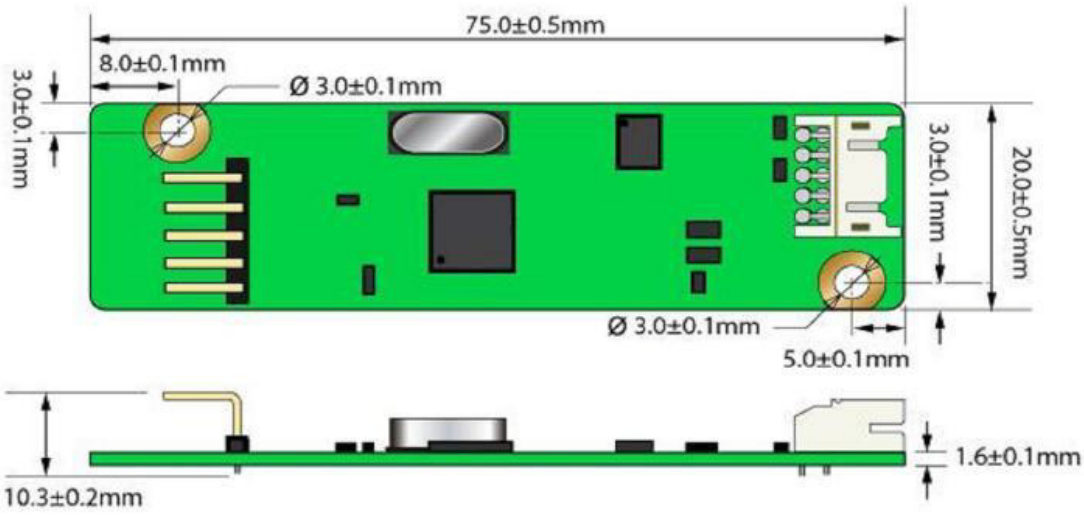
The Touch Screen connector, JP2, is a single row by 2.54mm 5-pins 90 degree, Male type connector. The pins are numbered as shown in the table below.

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

Handling Precautions

A.1 Optical Characteristics

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 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 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 you 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 from any direction.
9. In case if a Module has to be put back into the packing container slot after it was taken out, please press 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, no bending/twisting forces should be applied to the TFT Module. Otherwise the TFT Module may be damaged.
12. Small amounts of materials having a no flammability grade are used in the LCD module. The LCD module should be supplied by power complying with the requirements of Limited Power Source (IEC60950 or UL1950)

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