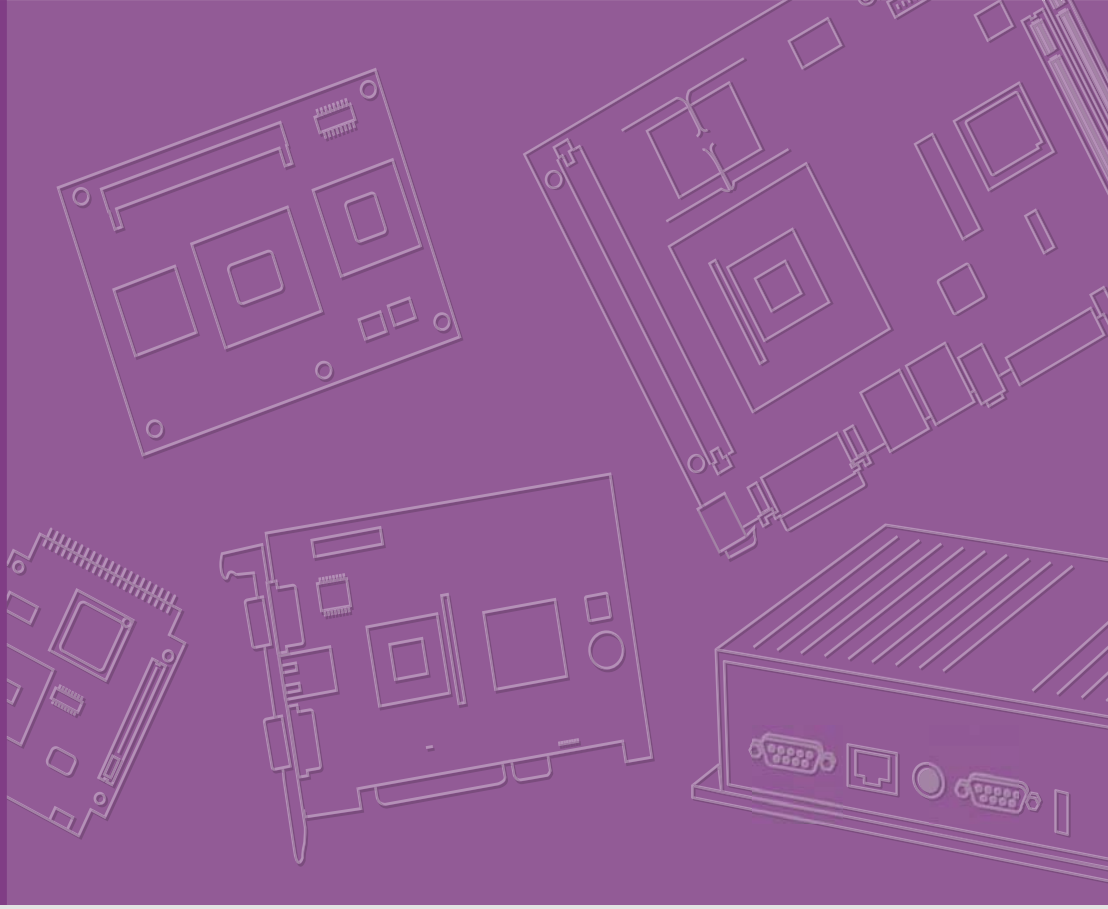

User Manual

IDK-2121W Series

TFT-LCD 21.5” FHD (LED Backlight)

ADVANTECH

Enabling an Intelligent Planet

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2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
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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		3500:1 (Typ.)
Optical Response Time	[msec]	16 ms (Typ., on/off)
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: 43.56 = 48 (Typ.) (with LED driver board, all white pattern)
Weight	[Grams]	R series: 3200 (Typ.) N series: 2400 (Typ.)
Physical Size	[mm]	R series: 495.6(W) × 292.2(H) × 21.65(D) Typ. N series: 495.6(W) × 292.2(H) × 17.7(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 55 -20 to 60
RoHS Compliance		RoHS Compliance

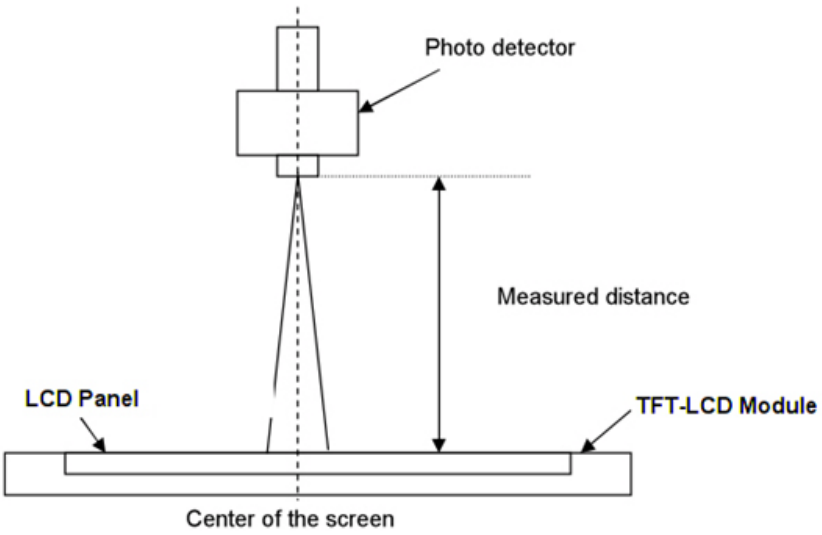
1.3 Optical Characteristics

Table 1.2: Display Characteristics

Item	Unit	Conditions	Min.	Typ.	Max.	Note
Viewing Angle	[degree]	Horizontal CR = 1	150	178	-	1, 2
		Vertical CR = 10	150	178	-	
Contrast ratio		Normal Direction	-	3500	-	3
Response Time	[msec]	Raising Time (TrR)	-	10	12	4
		Falling Time (TrF)	-	6	7	
		Raising + Falling	-	16	19	
Color temperature			6500K	8500K	11000K	5
Central Luminance	[cd/m^2]		1100	1200	-	6
Luminance Uniformity	[%]		75	85	-	7
Crosstalk (in 60Hz)	[%]				1.5	8
Flicker	dB				-20	9

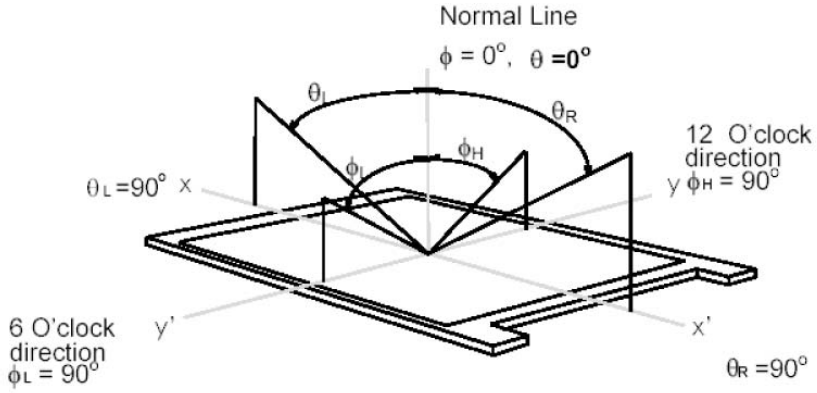
Note 1: **Measurement Method**

Before measuring, the LCD module should be turn on 30 minutes at room temperature. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30 minutes in a stable, windless and dark room.



Note 2: Definition of viewing angle measured by ELDIM (EZContrast 88)

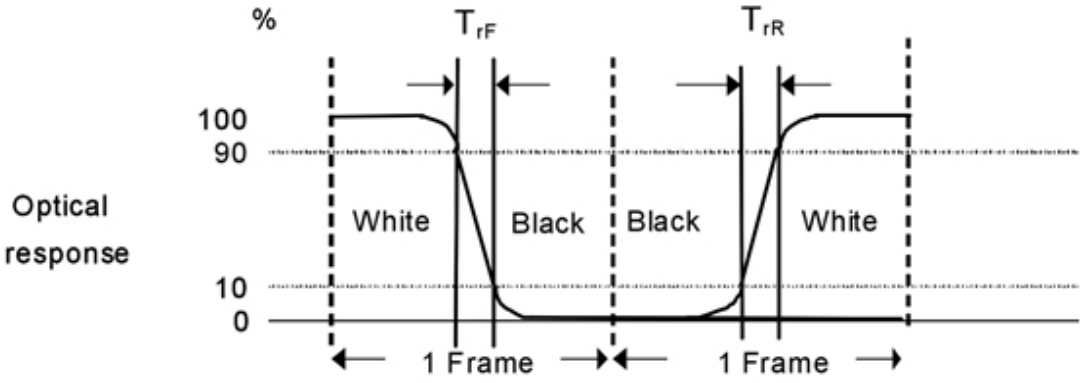
Viewing angle is the measurement of contrast ratio at the screen center, over a 180°horizontal and 180°vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as below: 90° (θ)? horizontal left and right, and 90° (Φ) vertical high (up) and low (down). The measurement direction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



Note 3: Contrast ratio is measured by TOPCON SR-3

Note 4: Definition of Response time measured by Westar TRD-100A

The output signals of photo detector are measured when the input signals are changed from "Full Black" to "Full White" (rising time, T_{rR}), and from "Full White" to "Full Black" (falling time, T_{rF}), respectively. The response time is interval between the 10% and 90% (1 frame at 60Hz) of amplitudes.

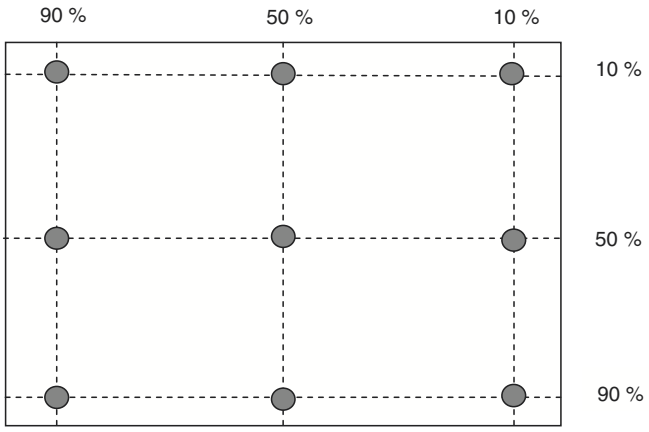


$T_{rR} + T_{rF}$ = 16msec (typ.)

Note 5: Color chromaticity and coordinates (CIE) is measured by TOPCON SR-3

Note 6: Central luminance is measured by TOPCON SR-3

Note 7: Luminance uniformity of these 9 points is defined as below and measured by TOPCON SR-3



$$\text{Uniformity} = \frac{\text{Minimum Luminance in 9 points (1 - 9)}}{\text{Maximum Luminance in 9 Points (1 - 9)}}$$

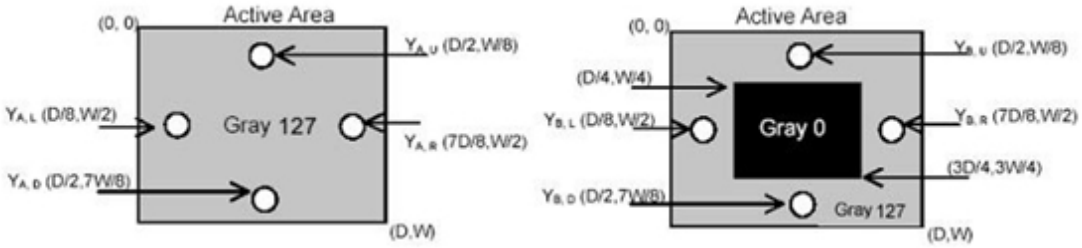
Note 8: **Crosstalk** is defined as below and measured by TOPCON SR-3

CT = | YB- YA| / YA * 100(%)

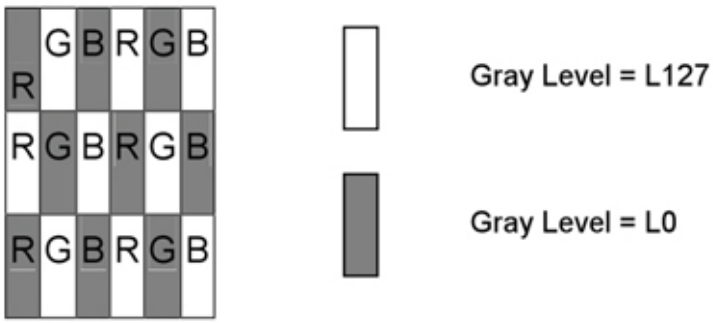
Where

YA = Luminance of measured location without gray level 0 pattern (cd/m2)

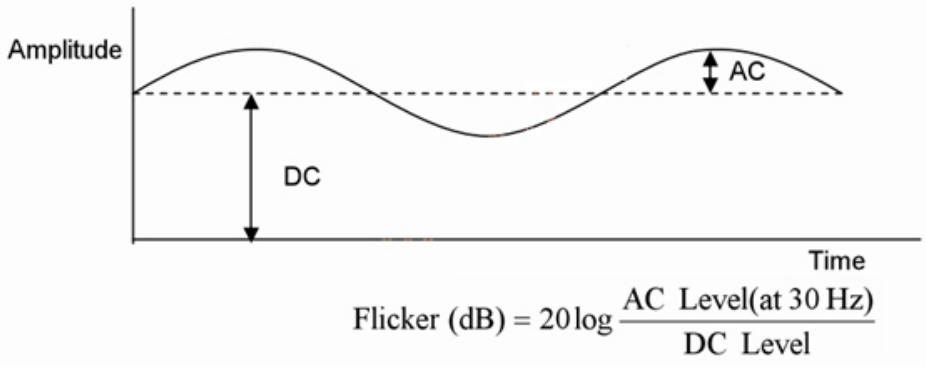
YB = Luminance of measured location with gray level 0 pattern (cd/m2)



Note 9: Test Patern: subchecker pattern measured by TOPCON SR-3



Method: Record dB value with TRD-100



1.4 Functional Block Diagram

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

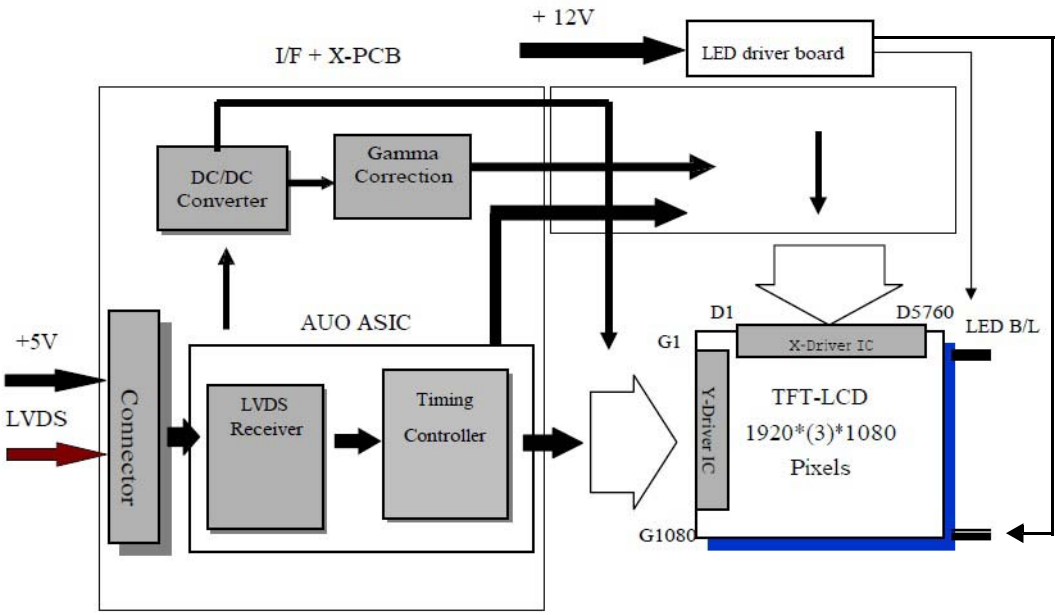


Figure 1.1 Function block diagram

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 Environment

Item	Symbol	Min.	Max.	Unit	Conditions
Operating Temperature	TOP	0	55	[°C]	Note 3
Operation Humidity	HOP	10	+90	[%RH]	
Storage Temperature	TST	-20	60	[°C]	
Storage Humidity	HST	5	90	[%RH]	

Note 1: Within Ta (25°C)

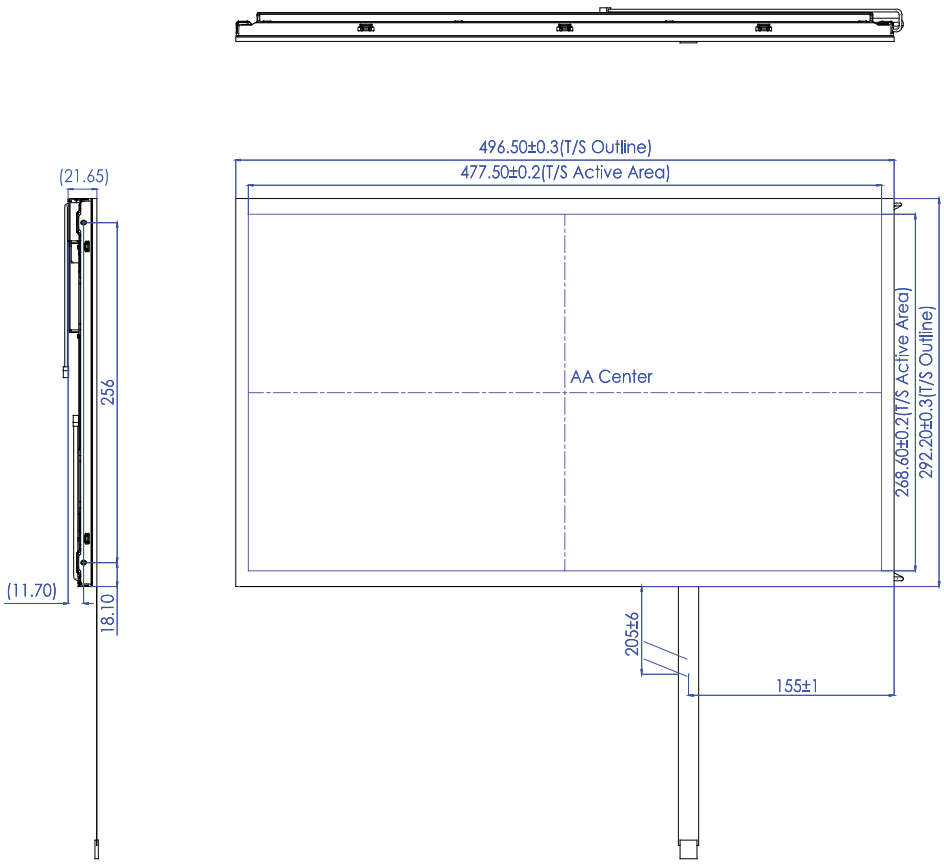
Note 2: Permanent damage to the device may occur if exceeding maximum values

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

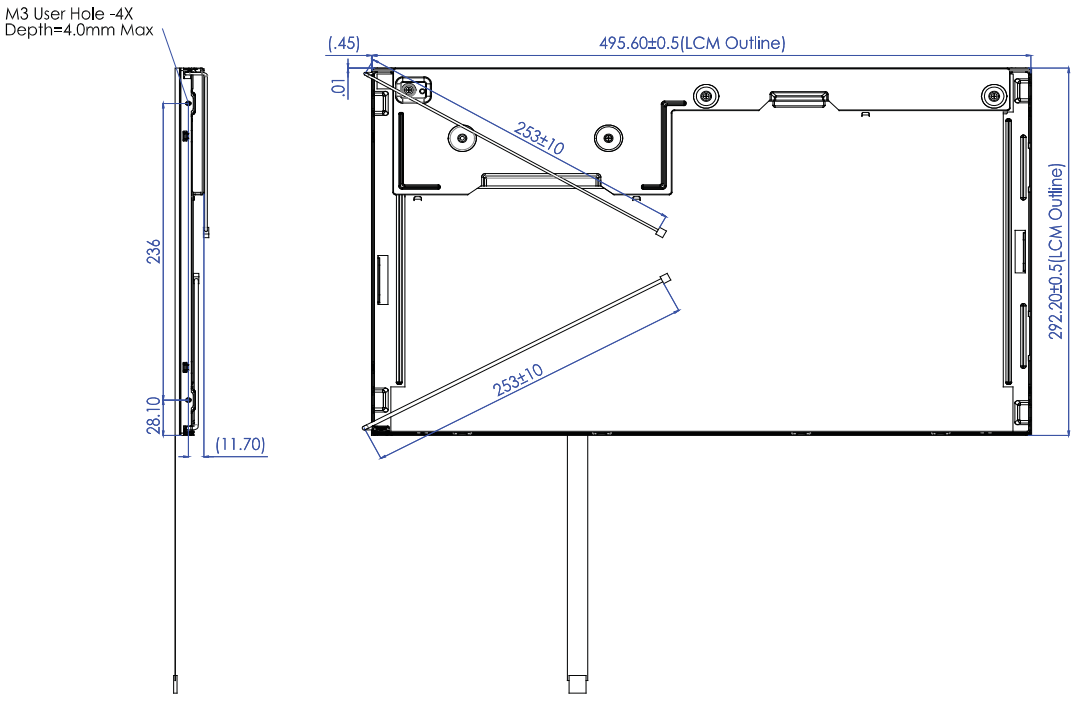
1.6 Outline Dimension

1.6.1 IDK-2121WR-K2FHA2E

Front View

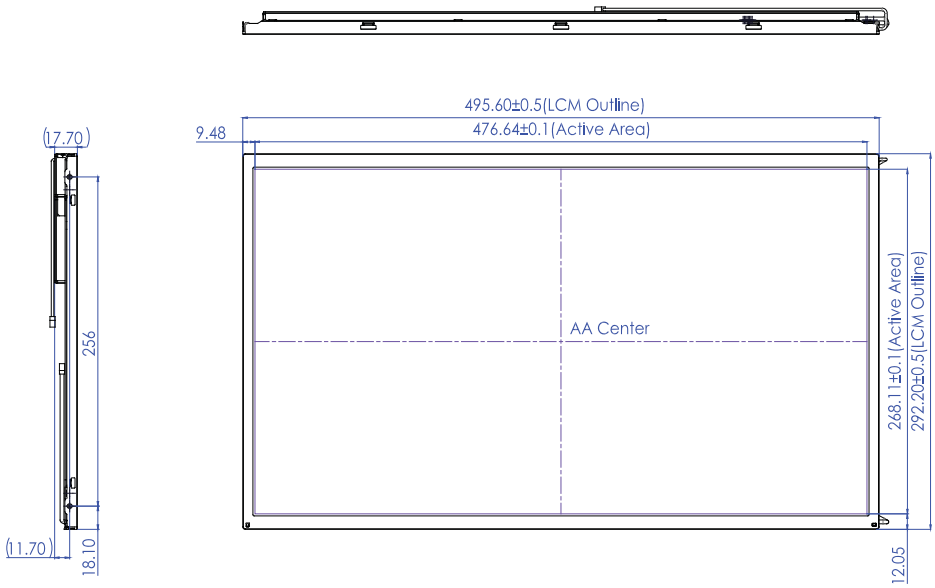


Rear View

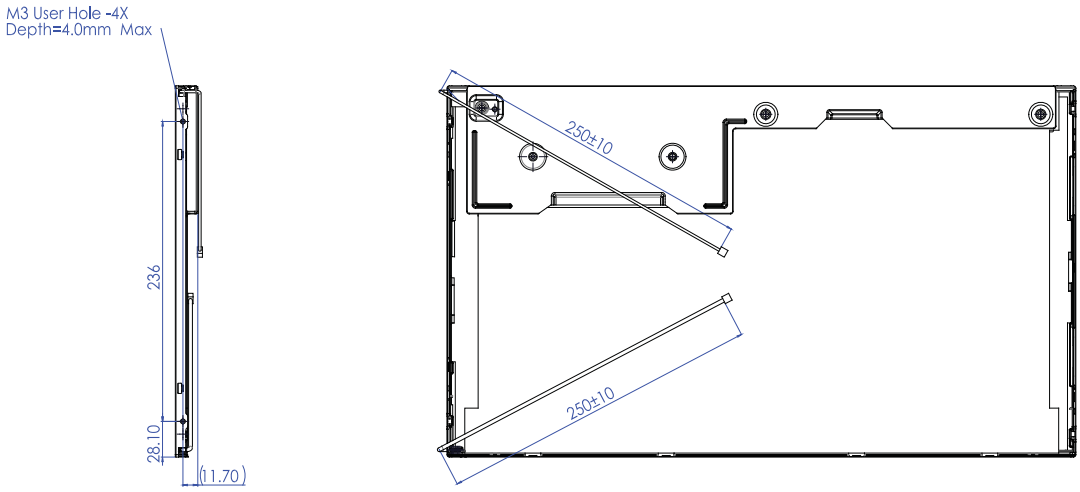


1.6.2 IDK-2121WN-K2FHA2E

Front View



Rear View



Chapter 2

Electrical Characteristics

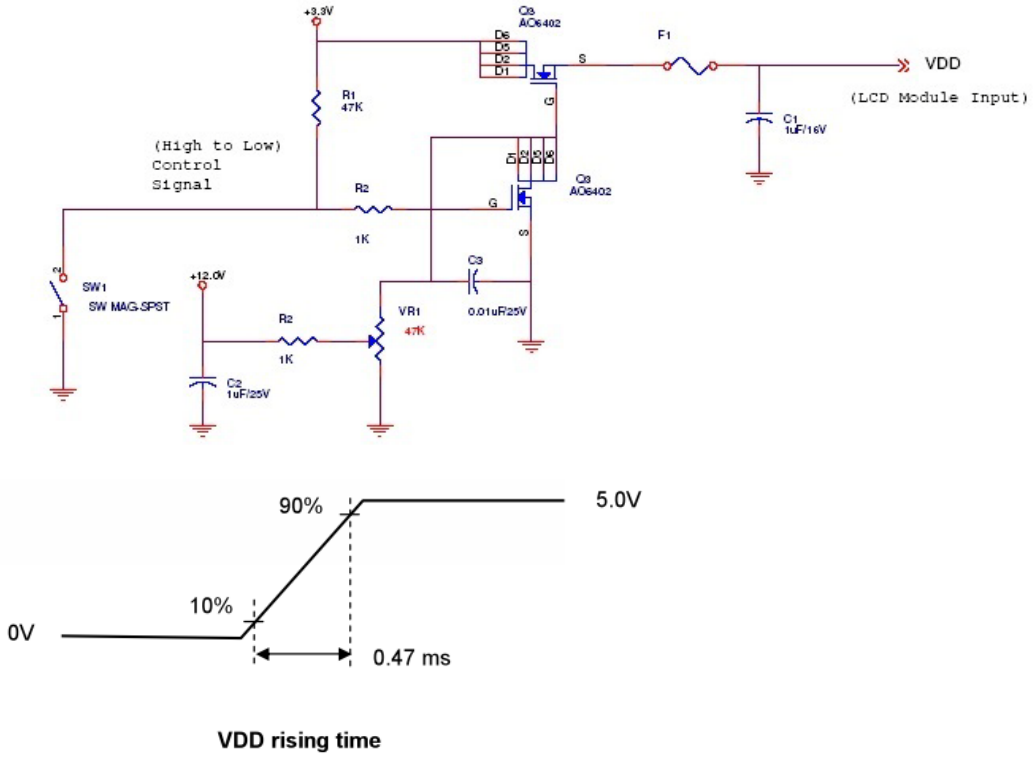
2.1 TFT LCD Power Consumption

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: The duration of raising time of power input is 47us.



VDD rising time

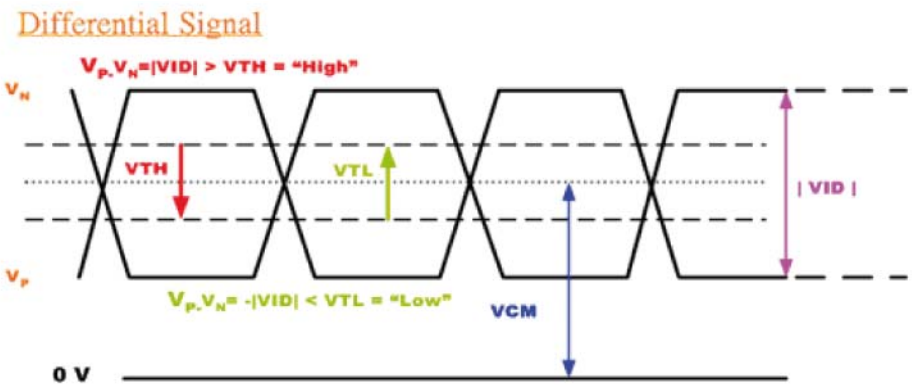
2.1.1 Signal Electrical Characteristics

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	-	-	1000*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).

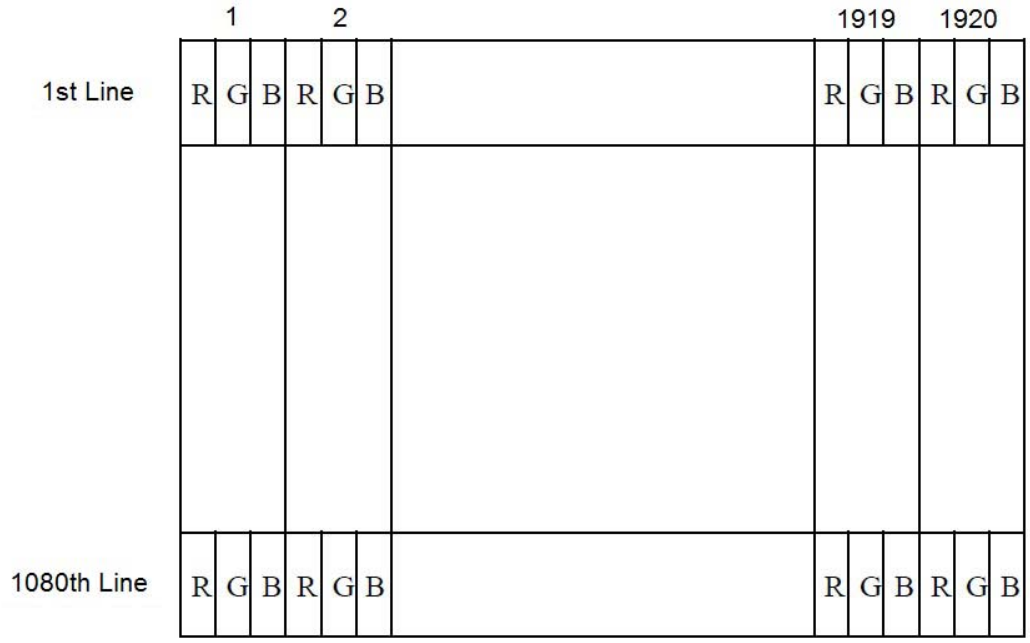
Note3 The variance of LED Light Bar power consumption is 10%. Calculator value for reference (IL x VL x 2 = PLED)

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

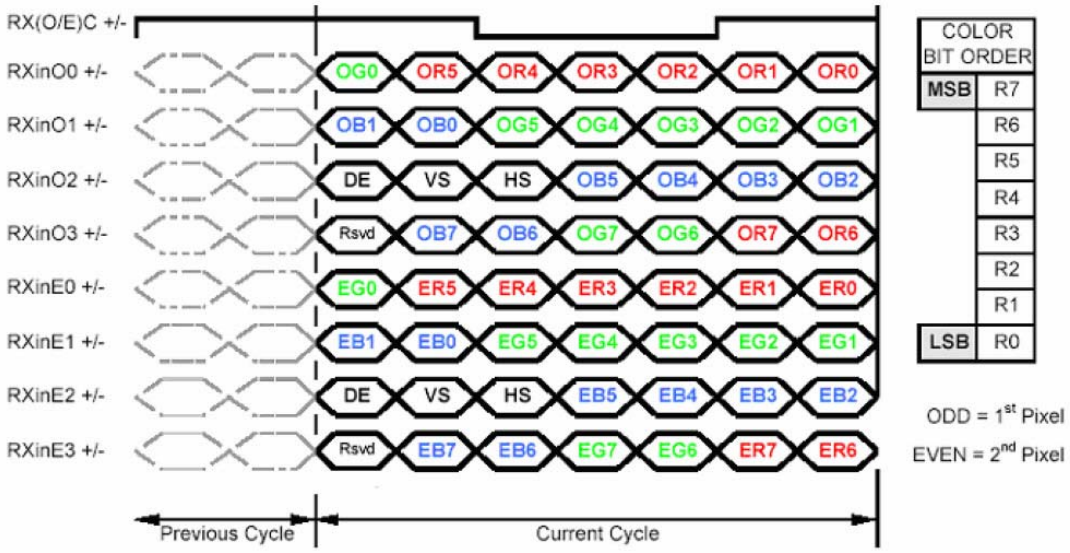
Pin No.	Symbol	Description
1	RxO0-	Negative LVDS differential data input (Odd data)
2	RxO0+	Positive LVDS differential data input (Odd data)
3	RxO1-	Negative LVDS differential data input (Odd data)
4	RxO1+	Positive LVDS differential data input (Odd data)
5	RxO2-	Negative LVDS differential data input (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

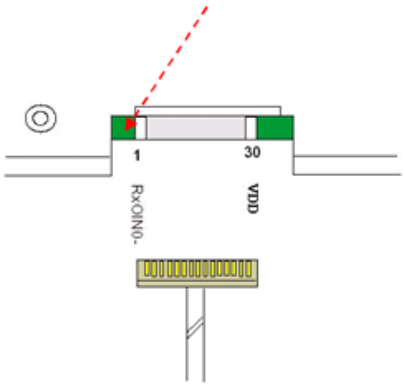
Note1: Input signals of odd and even clock shall be the same timing.

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



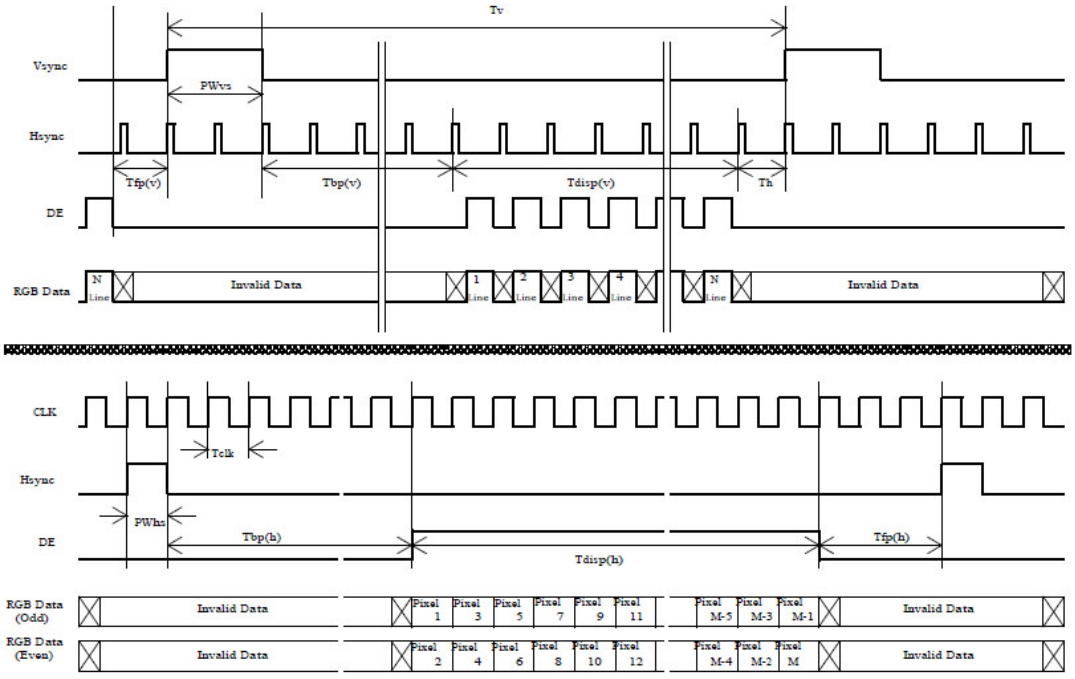
3.4 Interface Timing

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	

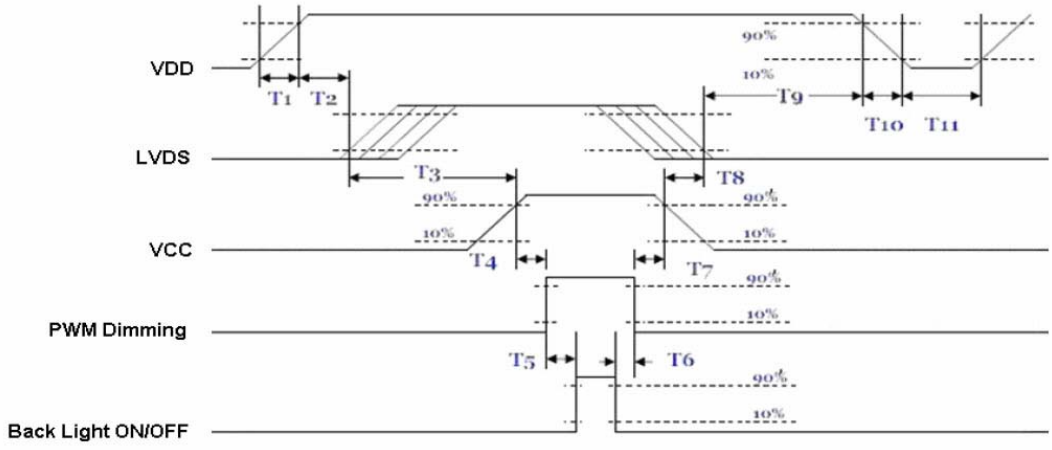
Note: DE mode.

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 Input Connector for LED Driver Board

Connector Name / Designation	**Interface Connector / Interface card**
Manufacturer	JST or compatible
Type Part Number	PHR-6 or compatible

4.2.1.1 LED driver board input connector pin define (CN4):

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 driver board output connector pin define (CN1,CN2):

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		10.8	12	13.2	V
	Efficiency	Vin=12V, Iout=950mA, Vout=19V		90		%
	Power	1 port output	3		30	W
Output	Voltage			19.8		V
	Current	1 port output	100		1000	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		0.5		40	KHz
ON/OFF Voltage	Von		3		5.5	V
	Voff		0		2	V

4.2.2.2 LED driver board dimension

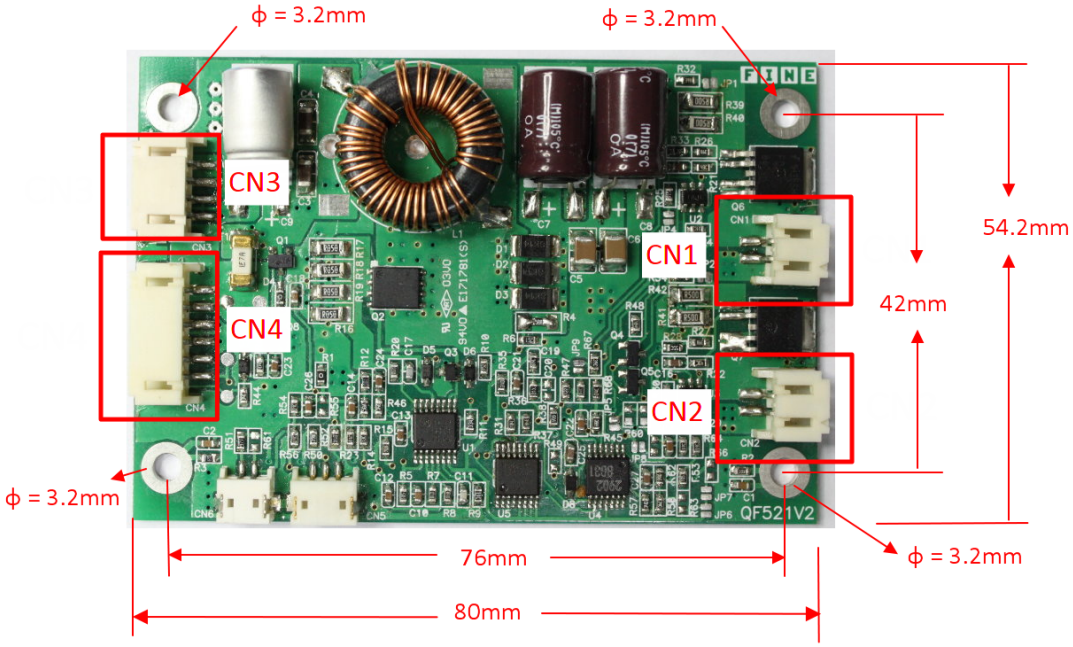


Figure 4.1 Dimension

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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