




## Product Specification

AU OPTRONICS CORPORATION

( V ) Preliminary Specifications

( ) Final Specifications

Module	10.1”(10.1”) HD 16:9 Color TFT-LCD with LED Backlight design
Model Name	B101XAN01.0
Note (  )	<i>LED Backlight without driving circuit design</i>

Customer

Date

Checked &  
Approved by

Date

Note: This Specification is subject to change  
without notice.

Approved by

Date

Trista Jiang

07/11/2012

Prepared by

Date

Singing Lee

07/11/2012

**NBBU Marketing Division  
AU Optronics corporation**



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## Record of Revision

Version and Date	Page	Old description	New Description	Remark
0.0 2012/04/16	All	First Edition		
0.1 2012/07/13			Coerct Qty and part no. on carton label. Erased waterprint from LVDS Signal Waveform	

## 1. Handling Precautions

- 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 human earth when handling.
- 7) Do not open nor modify the Module Assembly.
- 8) Do not press the reflector sheet at the back of the module to any directions.
- 9) 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 (Notebook PC Bezel, for example), do not twist nor bend the TFT Module even momentarily. 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.
- 13) Disconnecting power supply before handling LCD modules, it can prevent electric shock, DO NOT TOUCH the electrode parts, cables, connectors and LED circuit part of TFT module that a LED light bar build in as a light source of back light unit. It can prevent electrostatic breakdown.

## 2. General Description

B101XAN01.0 is a Color Active Matrix Liquid Crystal Display composed of a TFT LCD panel, a driver circuit, and LED backlight system. The screen format is intended to support the 16:9 WXGA, 1,366(H) x768(V) screen and 16.7M colors (RGB 6bits+FRC data driver) without LED backlight driving circuit. All input signals are LVDS interface compatible.

B101XAN01.0 is designed for a display unit of notebook style personal computer and industrial machine.

## 2.1 General Specification

The following items are characteristics summary on the table at 25 °C condition:

Items	Unit	Specifications			
Screen Diagonal	[mm]	255.28			
Active Area	[mm]	222.5214X 125.1072 typ			
Pixels H x V		1,366x3(RGB) x 768			
Pixel Pitch	[mm]	0.1629x 0.1629			
Pixel Format		R.G.B. Vertical Stripe			
Display Mode		AHVA, Normally Black			
White Luminance (ILED=20mA) (Note: ILED is LED current)	[cd/m <sup>2</sup> ]	400 nits (typ) 340 nits (min)			
Luminance Uniformity		1.25 max. (5 points)			
Contrast Ratio		800 typ			
Response Time	[ms]	25 typ / 35 Max			
Nominal Input Voltage VDD	[Volt]	+3.3 typ.			
Power Consumption (Column Inversion)	[Watt]	2.9W max. (w/o LED driver) BLU power 1.9 W (w/o efficiency)			
Weight	[Grams]	135g max (Panel Only)			
Physical Size	[mm]		Min.	Typ.	Max.
		Length	233.5	233.8	234.1
		Width	138.7	139	139.3
		Thickness	-	-	2.4 (Panel Side) 4.4 (PCBA Side)
Electrical Interface		40 pin LVDS, w/o LED driver			



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Glass Thickness	[mm]	0.25
Surface Treatment		Glare, Hardness 3H,
Support Color		16.7M colors ( RGB 6-bits+FRC)
Temperature Range		
Operating	[°C]	-20 to +60
Storage (Non-Operating)	[°C]	-30 to +70
RoHS Compliance		RoHS Compliance



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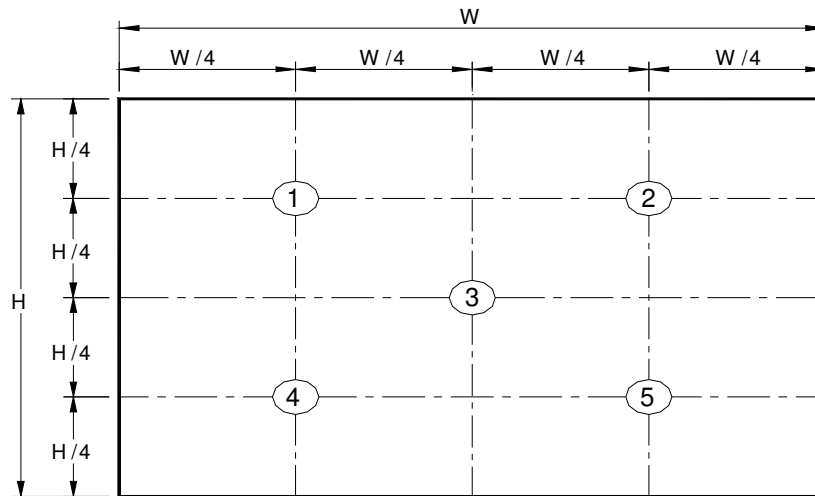
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## 2.2 Optical Characteristics

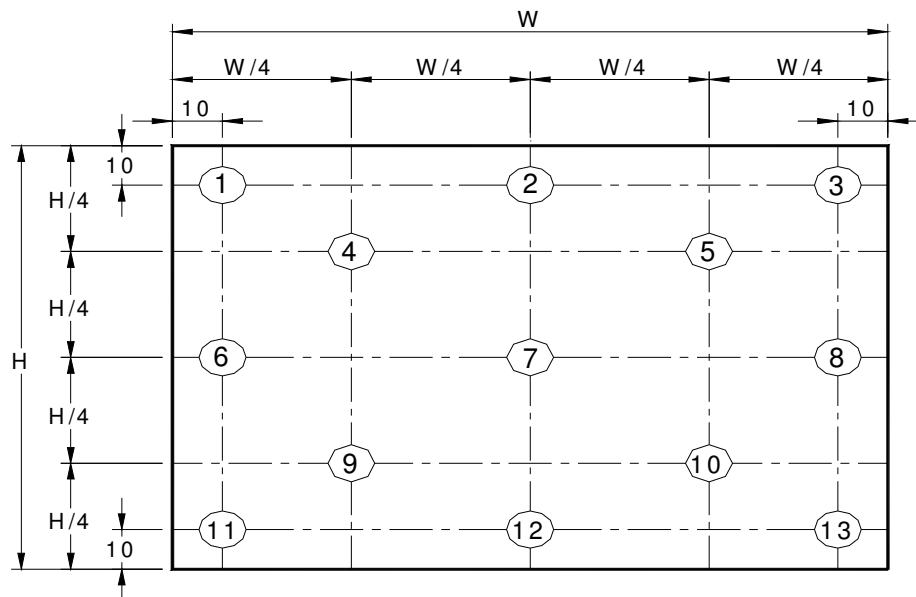
The optical characteristics are measured under stable conditions at 25°C (Room Temperature) :

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit	Note
White Luminance I <sub>LED</sub> =20mA (Base Panel Only)		5 points average	340	400	-	cd/m <sup>2</sup>	1, 4, 5.
Viewing Angle	θ <sub>R</sub>	Horizontal (Right)	80	85	-	degree	4, 9
	θ <sub>L</sub>	CR = 10 (Left)	80	85	-		
	ψ <sub>H</sub>	Vertical (Upper)	80	85	-		
	ψ <sub>L</sub>	CR = 10 (Lower)	80	85	-		
Luminance Uniformity	δ <sub>5P</sub>	5 Points	-	-	1.25		1, 3, 4
Luminance Uniformity	δ <sub>13P</sub>	13 Points	-	-	1.5		2, 3, 4
Contrast Ratio	CR		-	800	-		4, 6
Cross talk	%				4		4, 7
Response Time	T <sub>r</sub>	Rising	-	15	20	msec	4, 8
	T <sub>f</sub>	Falling	-	10	15		
	T <sub>RT</sub>	Rising + Falling	-	25	35		
Color / Chromaticity Coordinates	Red	R <sub>x</sub>		TBD	TBD		4
		R <sub>y</sub>		TBD	TBD		
	Green	G <sub>x</sub>		TBD	TBD		
		G <sub>y</sub>		TBD	TBD		
	Blue	B <sub>x</sub>		TBD	TBD		
		B <sub>y</sub>		TBD	TBD		
	White	W <sub>x</sub>		0.283	0.313	0.343	
		W <sub>y</sub>		0.299	0.329	0.359	
	NTSC	%		-	50	-	

**Note 1:** 5 points position (Ref: Active area)



**Note 2:** 13 points position (Ref: Active area)



**Note 3:** The luminance uniformity of 5 or 13 points is defined by dividing the maximum luminance values by the minimum test point luminance

$$\delta_{W5} = \frac{\text{Maximum Brightness of five points}}{\text{Minimum Brightness of five points}}$$

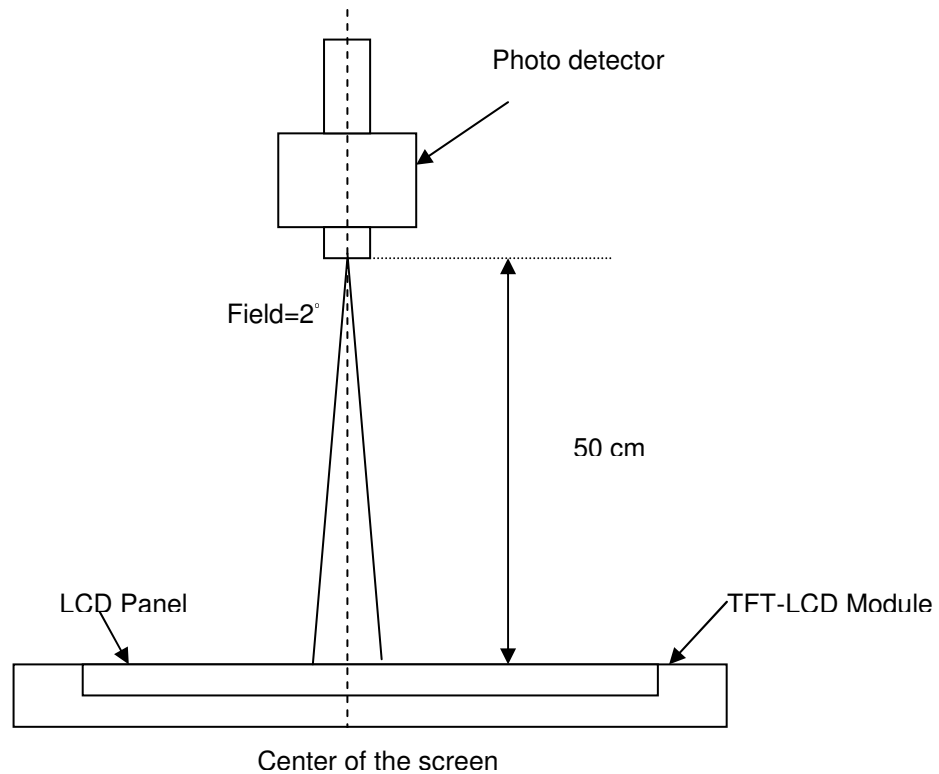
$$\delta_{W13} = \frac{\text{Maximum Brightness of thirteen points}}{\text{Minimum Brightness of thirteen points}}$$

**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 lighting



Backlight for 30 minutes in a stable, windless and dark room, and it should be measured in the center of screen.



**Note 5 :** Definition of Average Luminance of White ( $Y_L$ ):

Measure the luminance of gray level 63 at 5 points ,  $Y_L = [L(1) + L(2) + L(3) + L(4) + L(5)] / 5$

$L(x)$  is corresponding to the luminance of the point X at Figure in Note (1).

**Note 6 :** Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "White" state}}{\text{Brightness on the "Black" state}}$$

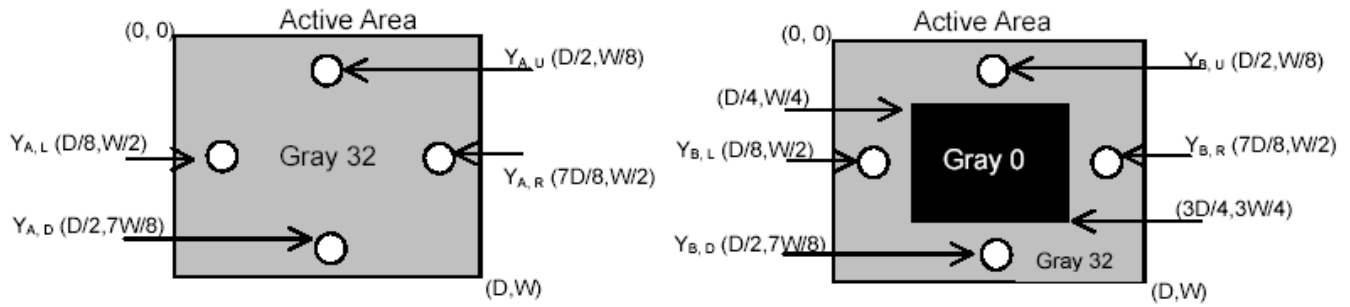
**Note 7 :** Definition of Cross Talk (CT)

$$\text{CT} = |Y_B - Y_A| / Y_A \times 100 (\%)$$

Where

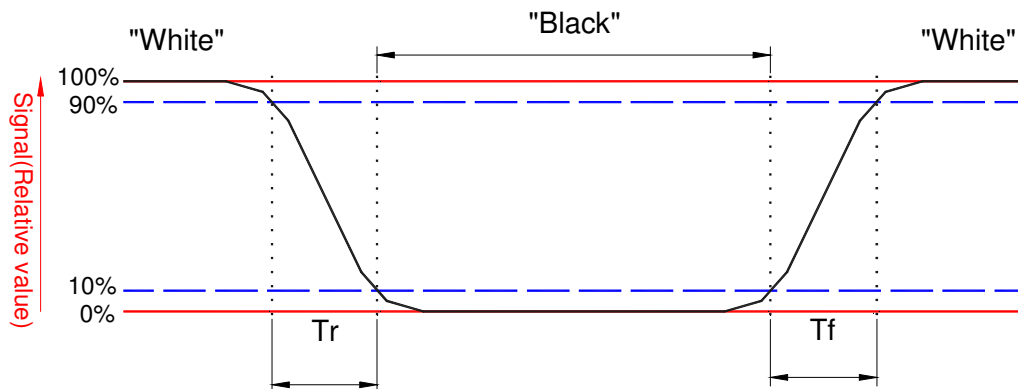
$Y_A$  = Luminance of measured location without gray level 0 pattern ( $\text{cd/m}^2$ )

$Y_B$  = Luminance of measured location with gray level 0 pattern ( $\text{cd/m}^2$ )



**Note 8:** Definition of response time:

The output signals of BM-7 or equivalent are measured when the input signals are changed from "Black" to "White" (falling time) and from "White" to "Black" (rising time), respectively. The response time interval between the 10% and 90% of amplitudes. Refer to figure as below.



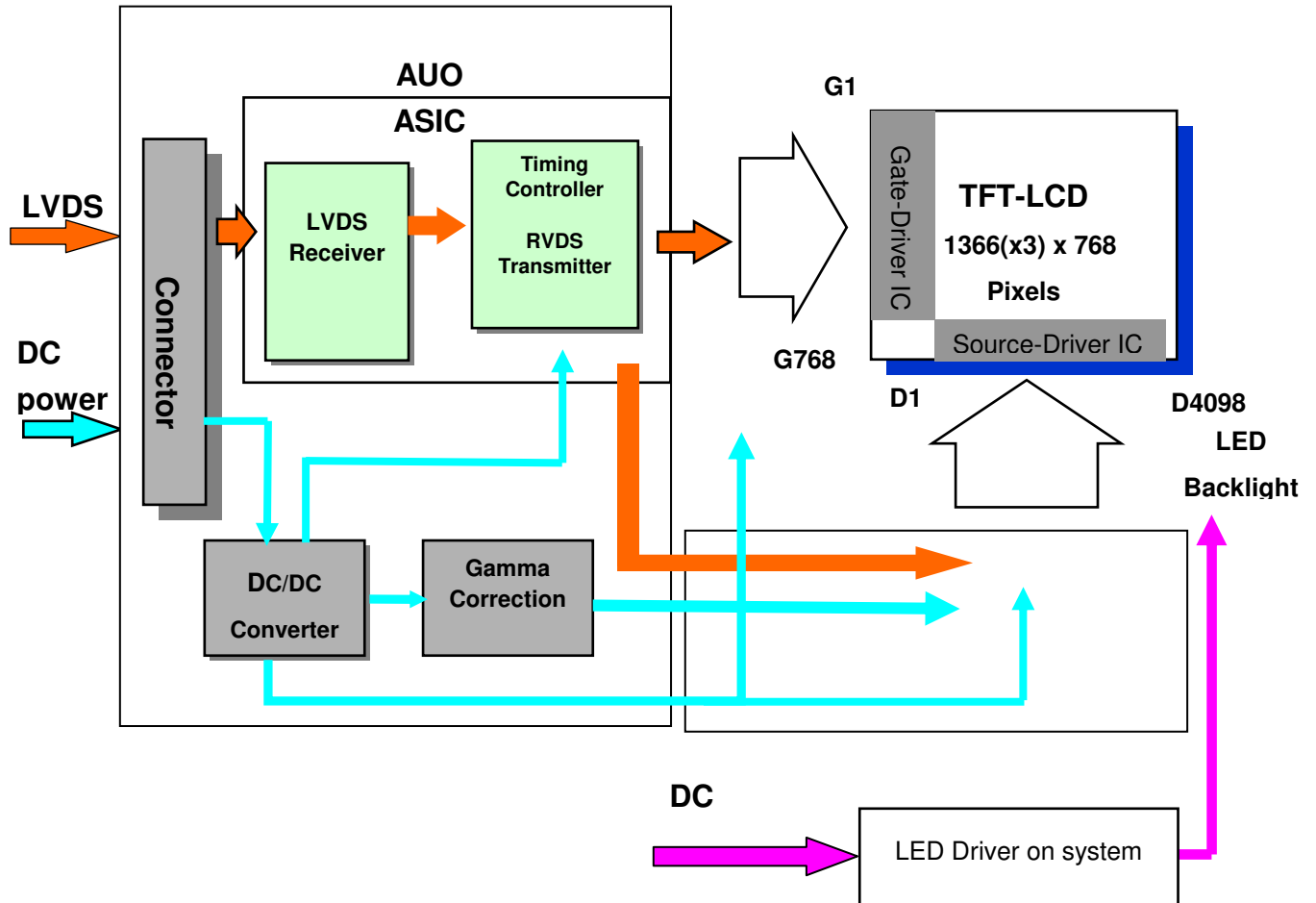
## Note 9. Definition of viewing angle

Viewing angle is the measurement of contrast ratio  $\geq 10$ , at the screen center, over a  $180^\circ$  horizontal and  $180^\circ$  vertical range (off-normal viewing angles). The  $180^\circ$  viewing angle range is broken down as follows;  $90^\circ$  ( $\theta$ ) horizontal left and right and  $90^\circ$  ( $\phi$ ) vertical, high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated about its center to develop the desired measurement viewing angle.



## 3. Functional Block Diagram

The following diagram shows the functional block of the 10.1 inches wide Color TFT/LCD 40 Pin one channel Module



## 4. Absolute Maximum Ratings

An absolute maximum rating of the module is as following:

### 4.1 Absolute Ratings of TFT LCD Module

Item	Symbol	Min	Max	Unit	Conditions
Logic/LCD Drive Voltage	Vin	-0.3	+4	[Volt]	Note 1,2

### 4.2 Absolute Ratings of Environment

Item	Symbol	Min	Max	Unit	Conditions
Operating Temperature	TOP	-20	+60	[°C]	Note 4
Operation Humidity	HOP	5	95	[%RH]	Note 4
Storage Temperature	TST	-30	+70	[°C]	Note 4
Storage Humidity	HST	5	95	[%RH]	Note 4

Note 1: At Ta (25°C )

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

Note 3: LED specification refer to section 5.2

Note 4: For quality performance, please refer to AUO IIS (Incoming Inspection Standard).

## 5. Electrical Characteristics

### 5.1 TFT LCD Module

#### 5.1.1 Power Specification

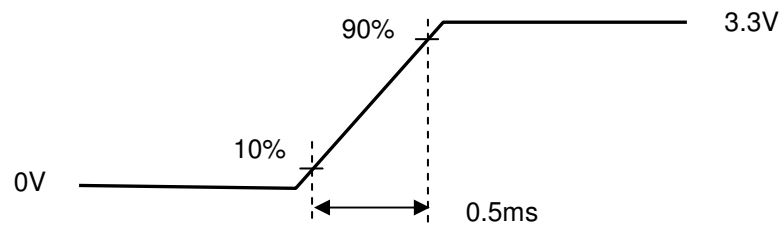
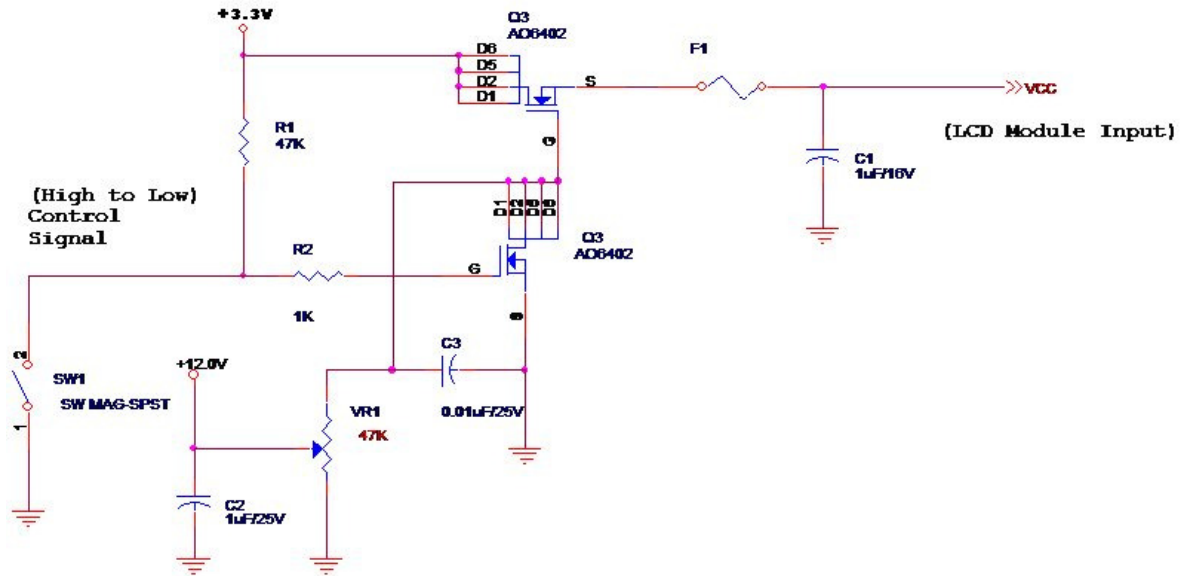
Input power specifications are as follows;

The power specification are measured under 25°C and frame frequency under 60Hz

Symble	Parameter	Min	Typ	Max	Units	Note
VDD	Logic/LCD Drive Voltage	3.0	3.3	3.6	[Volt]	
PDD	VDD Power	-	-	0.8	[Watt]	Note 1
IDD	IDD Current	-	272	303	[mA]	Note 1
IRush	Inrush Current	-	-	2000	[mA]	Note 2
VDDrp	Allowable Logic/LCD Drive Ripple Voltage	-	-	100	[mV] p-p	

Note 1 : Maximum Measurement Condition : White Pattern at 3.3V driving voltage. ( $P_{max}=V_{3.3} \times I_{white}$ )

Note 2 : Measure Condition



Vin rising time

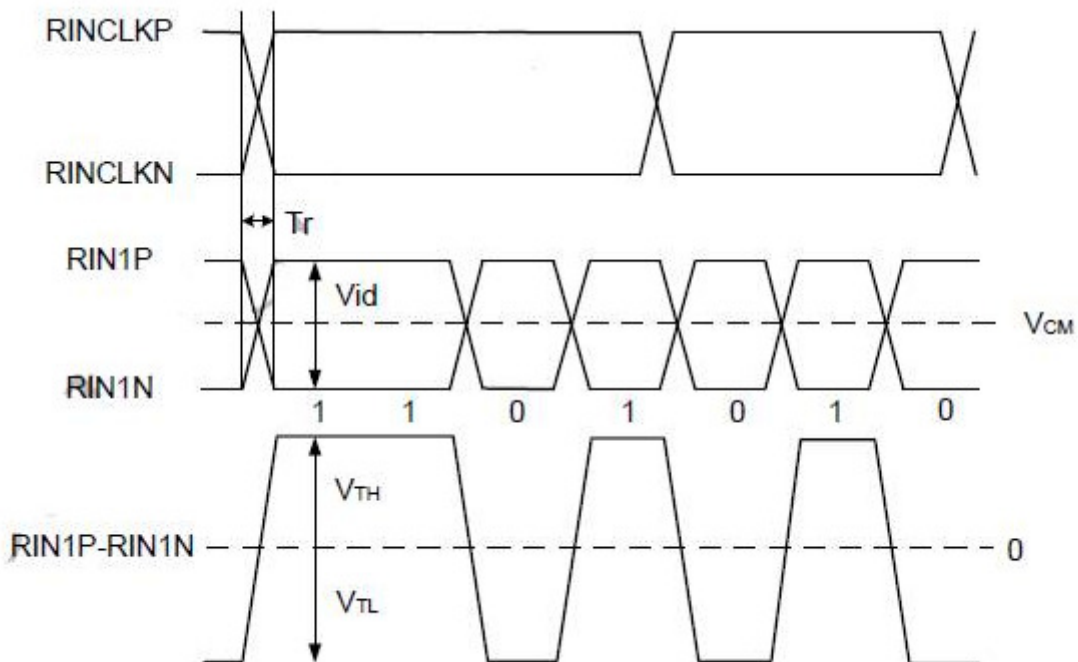
## 5.1.2 Signal Electrical Characteristics

Input signals shall be low or High-impedance state when VDD is off.

Signal electrical characteristics are as follows;

Parameter	Condition	Min	Max	Unit
$V_{th}$	Differential Input High Threshold ( $V_{cm}=+1.2V$ )	-	100	[mV]
$V_{tl}$	Differential Input Low Threshold ( $V_{cm}=+1.2V$ )	-100		[mV]
$V_{ID}$	Differential Input Voltage	100	600	[mV]
$V_{cm}$	Differential Input Common Mode Voltage	0.2	2.2	[V]

Note: LVDS Signal Waveform





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### 5.2 Backlight Unit

#### 5.2.1 LED characteristics

Parameter	Symbol	Min	Typ	Max	Units	Condition
Backlight Power Consumption	PLED	-	-	1.9 W (w/o efficiency)	[Watt]	(Ta=25°C), Note 1
LED Life-Time	N/A	15K		-	Hour	(Ta=25°C), Note 2 I <sub>F</sub> =20 mA

**Note 1:** Calculator value for reference  $P_{LED} = V_F$  (Normal Distribution) \*  $I_F$  (Normal Distribution) / Efficiency and depends on system LED driver design.

**Note 2:** The LED life-time define as the estimated time to 50% degradation of initial luminous.

#### 5.2.2 Backlight input signal characteristics

Parameter	Symbol	Min	Typ	Max	Units	Remark
LED Power Supply	VLED (Note 1)	TBD	TBD	TBD	[Volt]	Define as Connector Interface (Ta=25°C)
LED Enable Input High Level	VLED_EN	2.5	-	5.5	[Volt]	
LED Enable Input Low Level		-	-	0.8	[Volt]	
PWM Logic Input High Level	VPWM_EN	2.5	-	5.5	[Volt]	
PWM Logic Input Low Level		-	-	0.8	[Volt]	
PWM Input Frequency	FPWM	TBD		TBD	Hz	
PWM Duty Ratio	Duty	5		100	%	

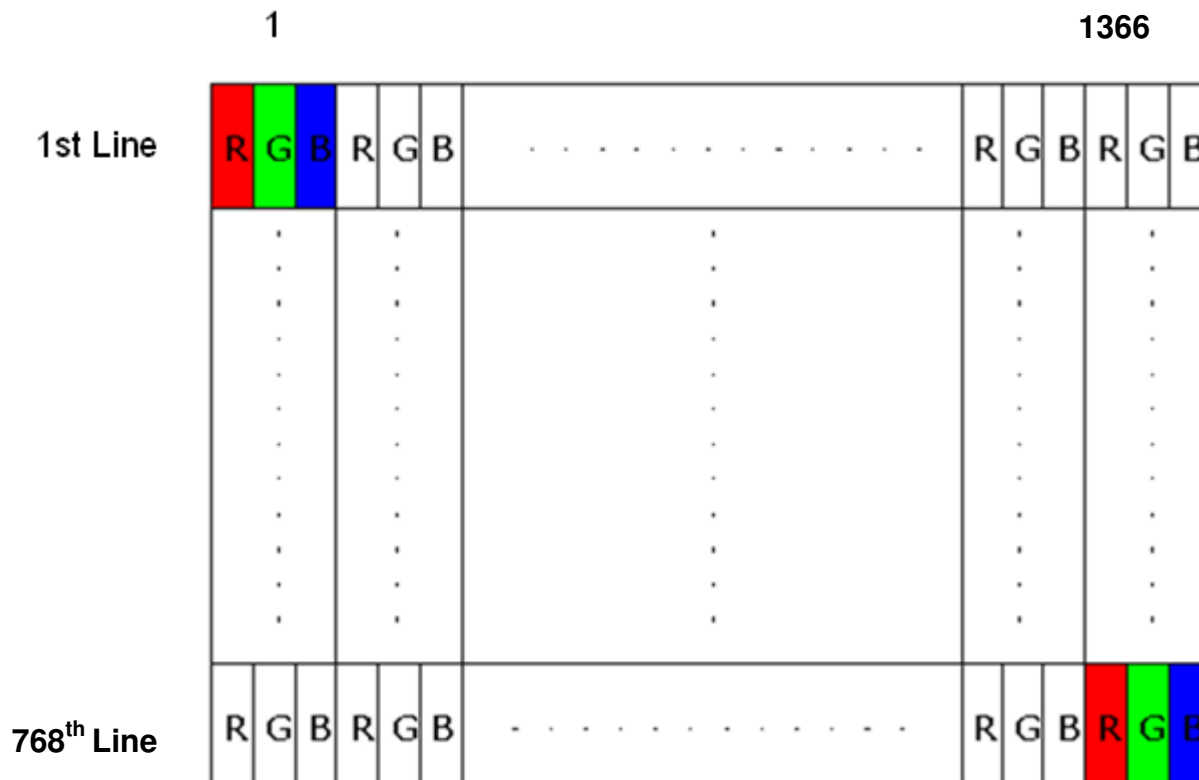
**Note1:** LED Power Supply is evaluated by Nichia LED.



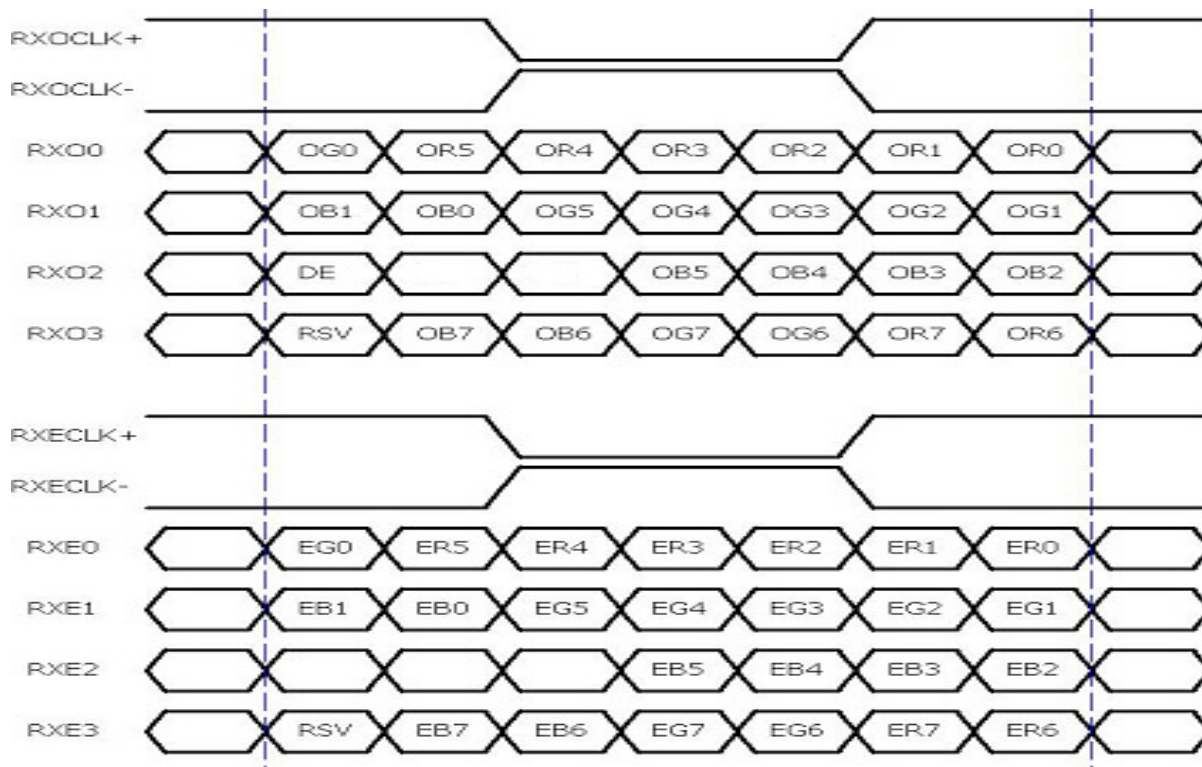
## 6. Signal Interface Characteristic

### 6.1 Pixel Format Image

Following figure shows the relationship of the input signals and LCD pixel format.



## 6.2 The Input Data Format



Signal Name	Description	
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) Green Data 6 Green Data 5 Green Data 4 Green Data 3 Green Data 2 Green Data 1 Green Data 0 (LSB)	Green-pixel Data Each green pixel's brightness data consists of these 8 bits pixel data.
B7 B6 B5 B4 B3 B2	Blue Data 8(MSB) Blue Data 7 Blue Data 5 Blue Data 4 Blue Data 3 Blue Data 2	Blue-pixel Data Each blue pixel's brightness data consists of these 8 bits pixel data.



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B1 B0	Blue Data 1 Blue Data 0 (LSB)  Blue-pixel Data	
RxCLKIN	Data Clock	The signal is used to strobe the pixel data and DE signals. All pixel data shall be valid at the falling edge when the DE signal is high.
DE	Display Timing	This signal is strobed at the falling edge of RxCLKIN. When the signal is high, the pixel data shall be valid to be displayed.
VS	Vertical Sync	The signal is synchronized to RxCLKIN .
HS	Horizontal Sync	The signal is synchronized to RxCLKIN .

Note1: DE Mode Only.

Note 2: Output signals from any system shall be low or High-impedance state when VDD is off.

## 6.3 Integration Interface Requirement

### 6.3.1 Connector Description

Physical interface is described as for the connector on module.

These connectors are capable of accommodating the following signals and will be following components.

Connector Name / Designation	For Signal Connector
Manufacturer	IPEX or compatible
Type / Part Number	IPEX 20455-040E-12R or compatible
Mating Housing/Part Number	IPEX 20453-040T-11

### 6.3.2 Pin Assignment

LVDS is a differential signal technology for LCD interface and high speed data transfer device.

PIN#	Signal Name	Description
1	NC	No connection
2	VDD	Power Supply +3.3V
3	VDD	Power Supply +3.3V
4	VDDEDID	EDID +3.3V Power
5	AGING	Aging Mode Power Supply (AUO only)
6	CLK_EDID	EDID Clock Input
7	DATA_EDID	EDID Data Input
8	RXOIN0N	Negative LVDS Differential Data INPUT for odd pixel
9	RXOIN0P	Positive LVDS Differential Data INPUT for odd pixel
10	GND	Ground
11	RXOIN1N	Negative LVDS Differential Data INPUT for odd pixel
12	RXOIN1P	Positive LVDS Differential Data INPUT for odd pixel
13	GND	Ground
14	RXOIN2N	Negative LVDS Differential Data INPUT for odd pixel
15	RXOIN2P	Positive LVDS Differential Data INPUT for odd pixel
16	GND	Ground
17	RXOCLKINN	Negative LVDS Differential Clock INPUT for odd pixel
18	RXOCLKINP	Positive LVDS Differential Clock INPUT for odd pixel
19	GND	Ground
20	NC	No connection
21	NC	No connection



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22	GND	Ground
23	NC	No connection
24	NC	No connection
25	GND	Ground
26	NC	No connection
27	NC	No connection
28	NC	No connection
29	NC	No connection
30	NC	No connection
31	LED_CA1	LED Cathode 1
32	LED_CA2	LED Cathode 2
33	LED_CA3	LED Cathode 3
34	LED_CA4	LED Cathode 4
35	LED_CA5	LED Cathode 5
36	LED_CA6	LED Cathode 6
37	NC	No connection
38	VLED Output	LED Backlight power
39	VLED Output	LED Backlight power
40	VLED Output	LED Backlight power

## 6.4 Interface Timing

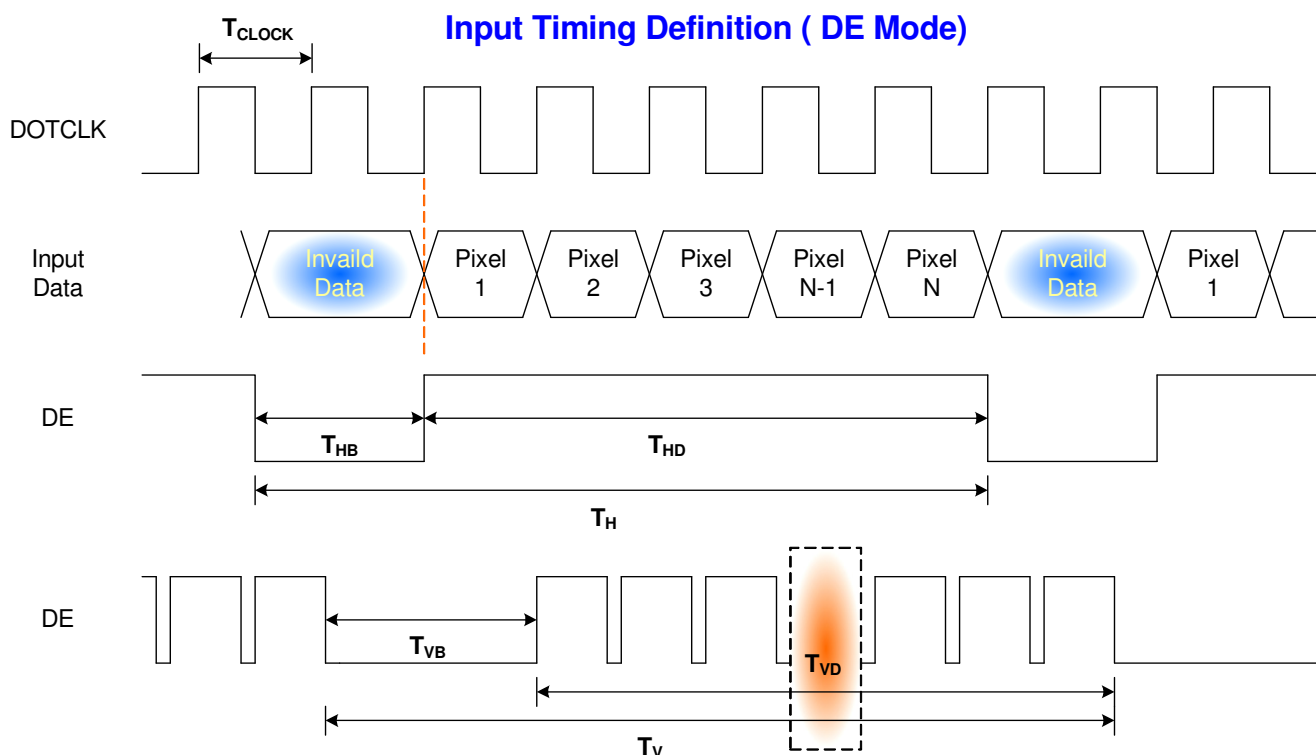
### 6.4.1 Timing Characteristics

Basically, interface timings should match the 1366x768 /60Hz manufacturing guide line timing.

Parameter		Symbol	Min.	Typ.	Max.	Unit
Frame Rate		---	--	60	---	Hz
Clock frequency		1/ T <sub>Clock</sub>	20	69.3	110	MHz
Vertical Section	Period	T <sub>V</sub>	774	-	1536	T <sub>Line</sub>
	Active	T <sub>VD</sub>	768			
	Blanking	T <sub>VB</sub>	6	-	768	
Horizontal Section	Period	T <sub>H</sub>	1494	-	2732	T <sub>Clock</sub> (Note 2)
	Active	T <sub>HD</sub>	1366			
	Blanking	T <sub>HB</sub>	128	-	1366	

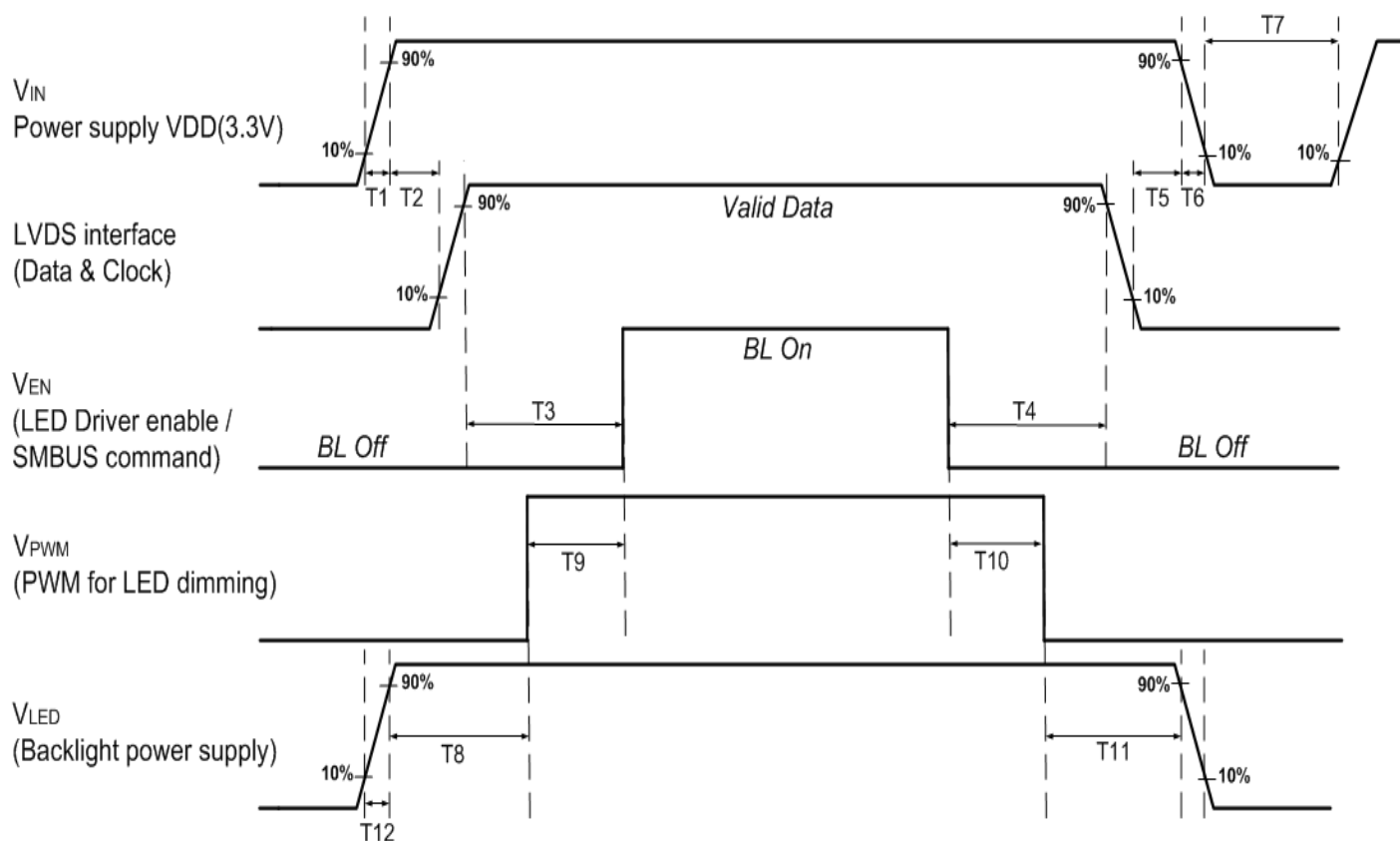
Note1 : DE mode only

### 6.4.2 Timing diagram



## 6.5 Power ON/OFF Sequence

Power on/off sequence is as follows. Interface signals and LED on/off sequence 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		Units
	Min.	Max.	
T1	0.5	10	ms
T2	0	50	
T3	200	-	
T4	200	-	
T5	0	50	
T6	0	10	
T7	500	-	
T8	10	-	
T9	10	-	
T10	10	-	
T11	10	-	
T12	0.5	10	

## 7. Panel Reliability Test

### 7.1 Vibration Test

**Test Spec:**

- Test method: Non-Operation
- Acceleration: 1.5 G
- Frequency: 10 - 500Hz Random
- Sweep: 30 Minutes each Axis (X, Y, Z)

### 7.2 Shock Test

**Test Spec:**

- Test method: Non-Operation
- Acceleration: 220 G , Half sine wave
- Active time: 2 ms
- Pulse: X,Y,Z .one time for each side

### 7.3 Reliability Test

Items	Required Condition	Note
Temperature Humidity Bias	Ta= 40°C, 90%RH, 240h	
High Temperature Operation	Ta= 60°C, Dry, 240h	
Low Temperature Operation	Ta=-20°C, 240h	
High Temperature Storage	Ta= 70°C, 240h	
Low Temperature Storage	Ta= -20°C, 240h	
Thermal Shock Test	Ta=-30°C (30min) ~70°C (30min), 20cycles condition.	
ESD	Contact : ±8 KV Air : ±15 KV	Note 1

**Note1:** According to EN 61000-4-2 , ESD class B: Some performance degradation allowed. No data lost  
 . Self-recoverable. No hardware failures.

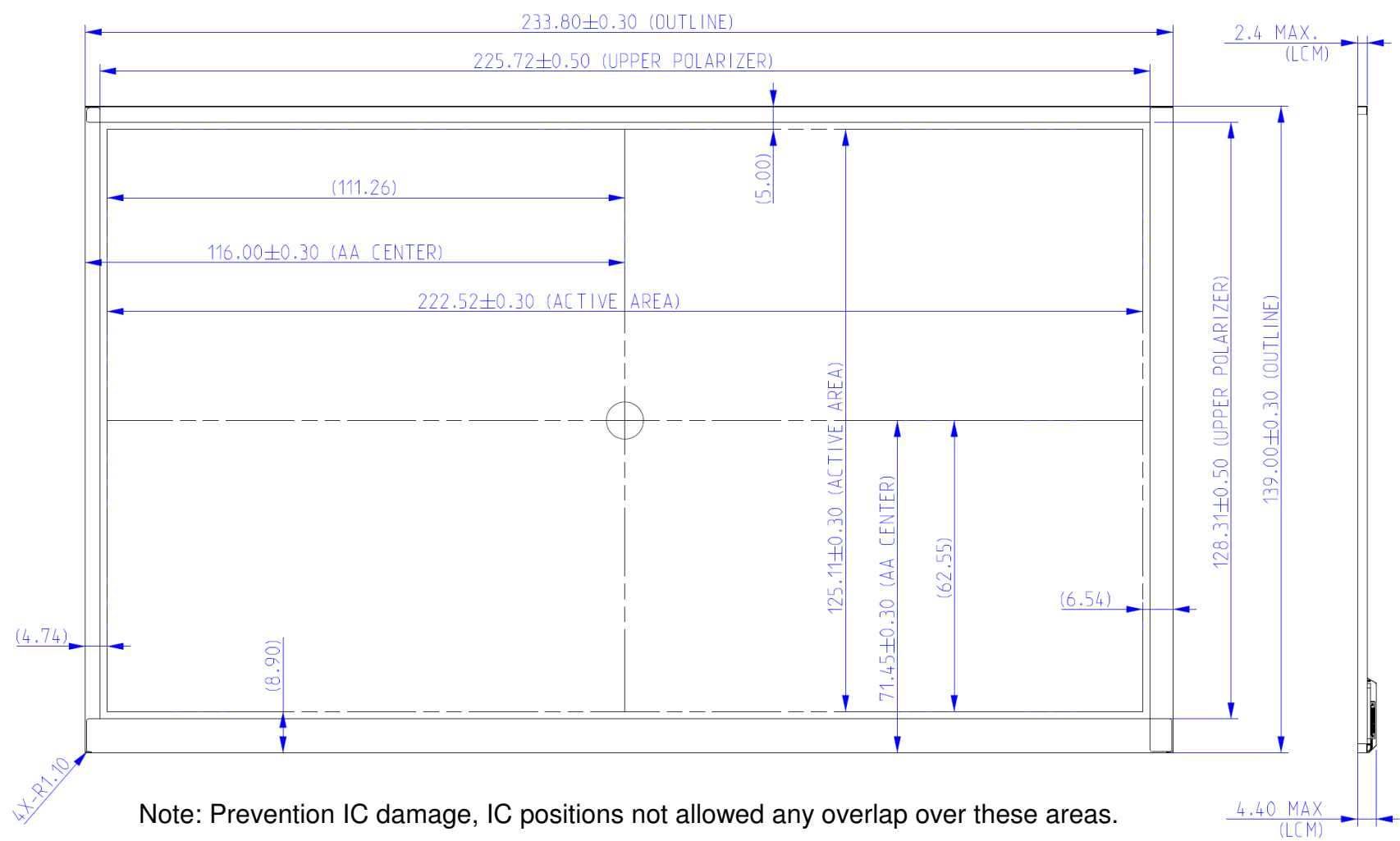
**Remark:** MTBF (Excluding the LED): 30,000 hours with a confidence level 90%



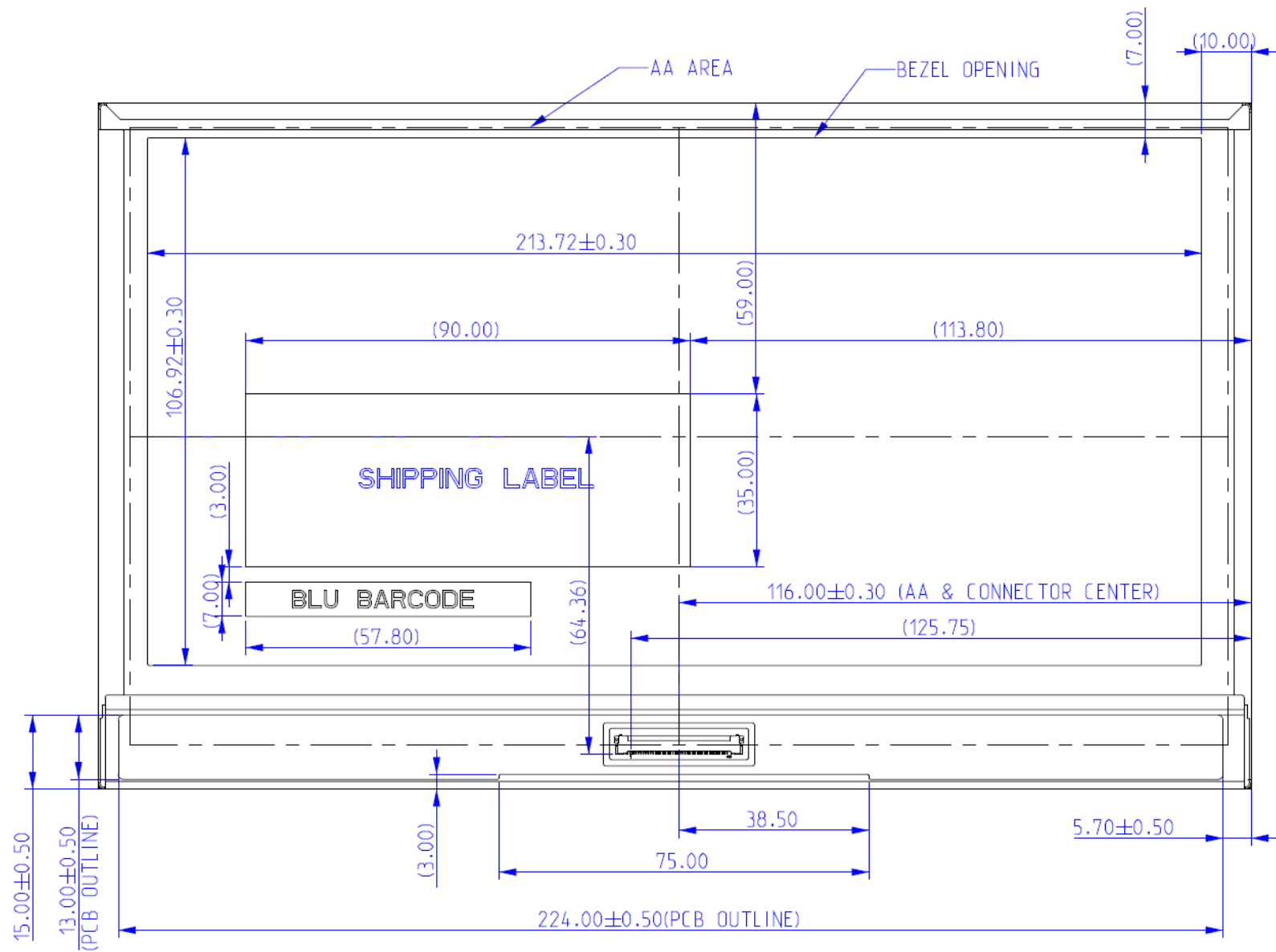
8. Mechanical Characteristics

8.1 LCM Outline Dimension

8.1.1 Front View








8.1.2 Rear View




## 9. Shipping and Package

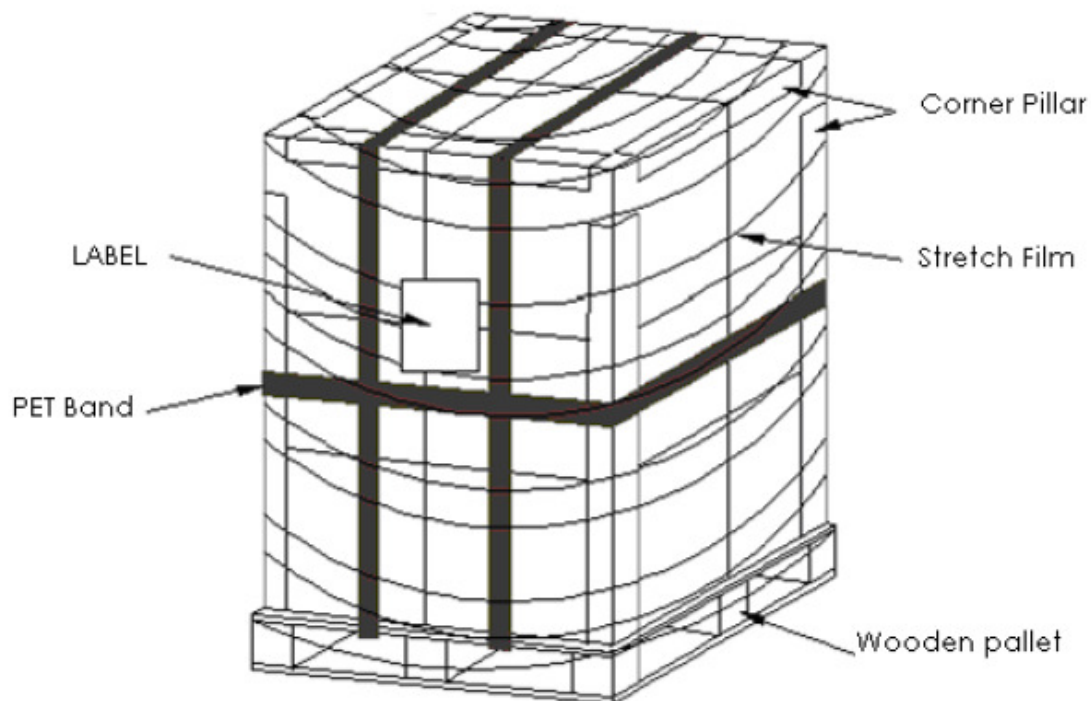
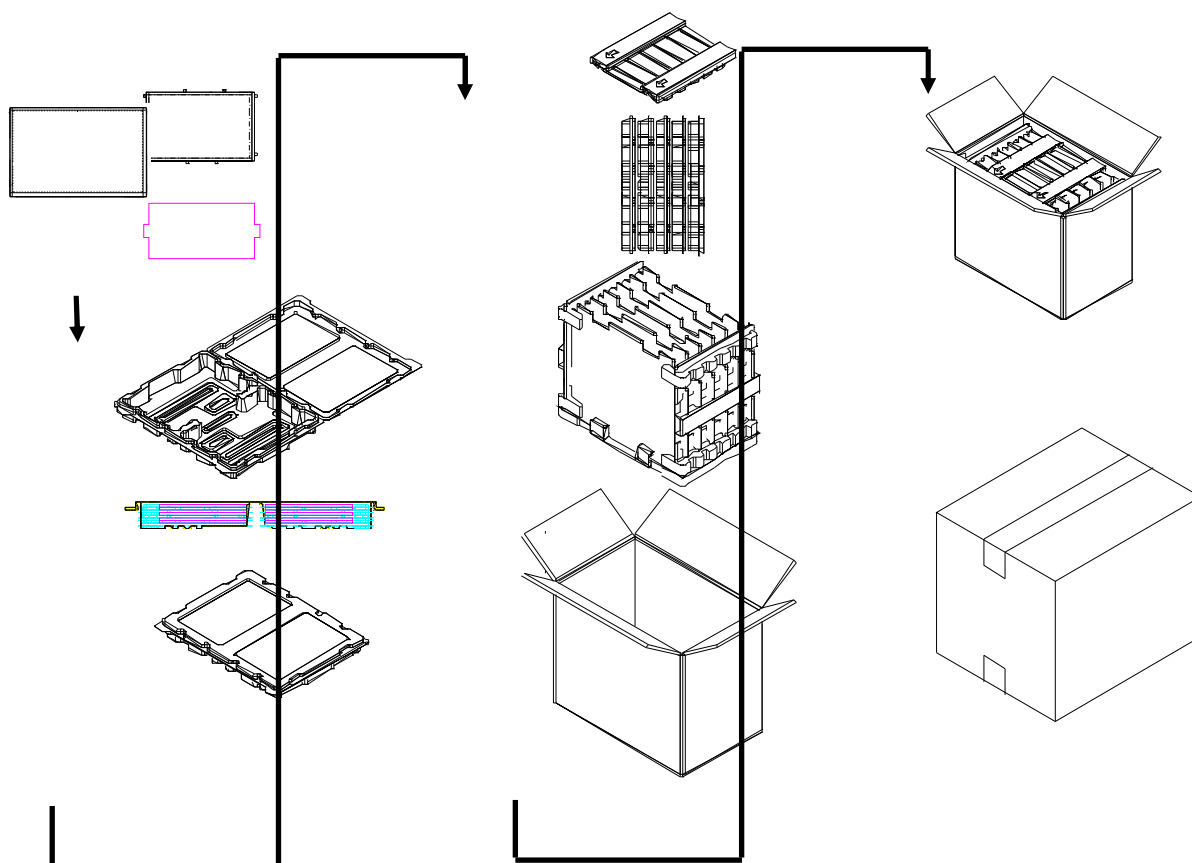
### 9.1 Shipping Label Format

 XXXXXXXXXXXX-XXXXX	Manufactured YY/WW Model No: B101XAN01.0 AU Optronics MADE IN CHINA (S01)  H/W: 0A F/W:0	C US E204356		  
---	---	--------------------	---	---

### 9.2 Carton Label Format

AU Optronics	QTY : 60		 
MODEL NO : B101XAN01.0			
PART NO :			
CUSTOMER NO :			
CARTON NO :			
Made in China	*ZS0100-0652300205*		

### 9.3 Shipping Package of Palletizing Sequence



**10. Appendix: EDID Description**

TBD