TV101QUM-N00

Product Specification

Rev. P1

BEIJING BOE OPTOELECTRONICS TECHNOLOGY CO.,LTD

REVISION HISTORY

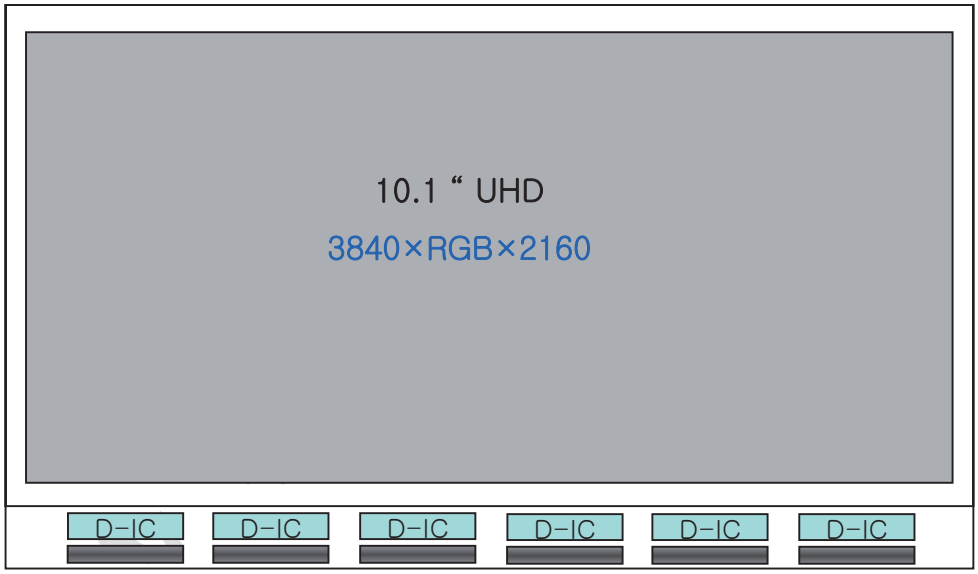
REV.	ECN No.	DESCRIPTION OF CHANGES	DATE	PREPARED
P0	-	Initial Release	2015.03.13	Ma Lei
P1	-	Initial Release	2015.04.09	Ma Lei

Contents

1.0 General Description

1.1 Introduction

10.1" UHD is a color active matrix TFT LCD module using amorphous silicon TFT ' s (Thin Film Transistors) as an active switching devices. It is a transmissive type display operating in the normal black. The TFT-LCD has a 10.1 inch diagonally measu red active area with UHD resolutions (3840 horizontal by 2160 vertical pixel arrays). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this panel can display 16.7M colors. The TFT-LCD panel used for this module is a dapted for a low reflection and higher color type.



1.2 Features

-High PPI: 438
-NTSC: 100%
-CR: Typ. 1500:1
-Brightness: Typ. 400nit
-Module Thickness: 1.93T(WO/PCB)

1.3 Application

Tablet PC and Mini PC

1.4 General Specification

1.4.1.General Total Solution Specification(Table 1.)

<Table 1. General Specifications>

Parameter	Specification	Unit	Remarks
Active area	222.912(H) ×125.388(V)	mm	
Number of pixels	3840 (H) ×2160(V)	pixels	
Pixel pitch	0.01935 (H) X 0.05805(V)	mm	
Pixel arrangement	RGB Vertical stripe		
Display colors	16.7M	colors	
Display mode	Normally Black		
Dimensional outline	231.6(H)*140.9(V) *1.93(WO/PCB)	mm	
Weight	TBD	g	
Back-light	1-LED Lighting Bar type		Note 1
Power consumption	P_D : 1.1	W	Estimate
	P_{BL} :2.7	W	
	P_{total} :3.8	W	

Notes : 1. LED Lighting Bar (48*LED Array)

2.0 ABSOLUTE MAXIMUM RATINGS

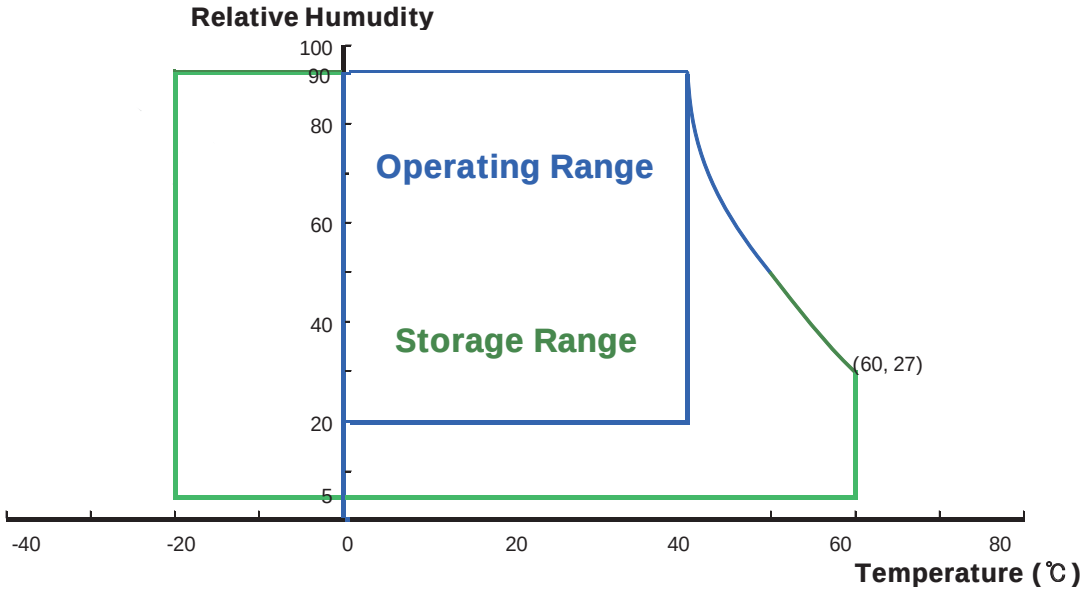
The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2.

< Table 2. Absolute Maximum Ratings> Ta=25+/-2°C

Parameter	Symbol	Min.	Max.	Unit	Remarks
Power Supply Voltage	V_{DD}	3.0	3.6	V	Note 1
Operating Temperature	T_{OP}	0	40	℃	Note 2
Storage Temperature	T_{ST}	-20	60	℃	

Notes : 1. Permanent damage to the device may occur if maximum values are exceeded functional operation should be restricted to the condition described under normal operating conditions.

2. Temperature and relative humidity range are shown in the figure below.
90% RH Max. (40 ^{O}C ≥ Ta)
Maximum wet bulb temperature at 39 ^{O}C or less. (Ta > 40 ^{O}C) No condensation.



3.0 ELECTRICAL SPECIFICATIONS

3.1 Electrical Specifications

< Table 3. Electrical specifications > Ta=25+/-2°C

Parameter		Min.	Typ.	Max.	Unit	Remarks
Power Supply Voltage	V_{DD}	3.0	3.3	3.6	V	Note 1
Permissible Input Ripple Voltage	V_{RF}	-	-	100	mV	At V_{DD} = 3.3V
Power Supply Current	I_{DD}	-	TBD	-	mA	Note 1
Differential Input Voltage	V_{ID}	200	-	600	mV	
Power Consumption	P_D	-	1.1	-	W	Note 1
	P_{BL}	-	2.7	-	W	Note 2
	P_{total}	-	3.8	-	W	

Notes : 1. The supply voltage is measured and specified at the interface connector of LCM. The current draw and power consumption specified is for 3.3V at 25℃.
a) Typ : Mosaic Pattern
b) Max : Skip sub pixel255
2. Calculated value for reference (V_{LED} × I_{LED})

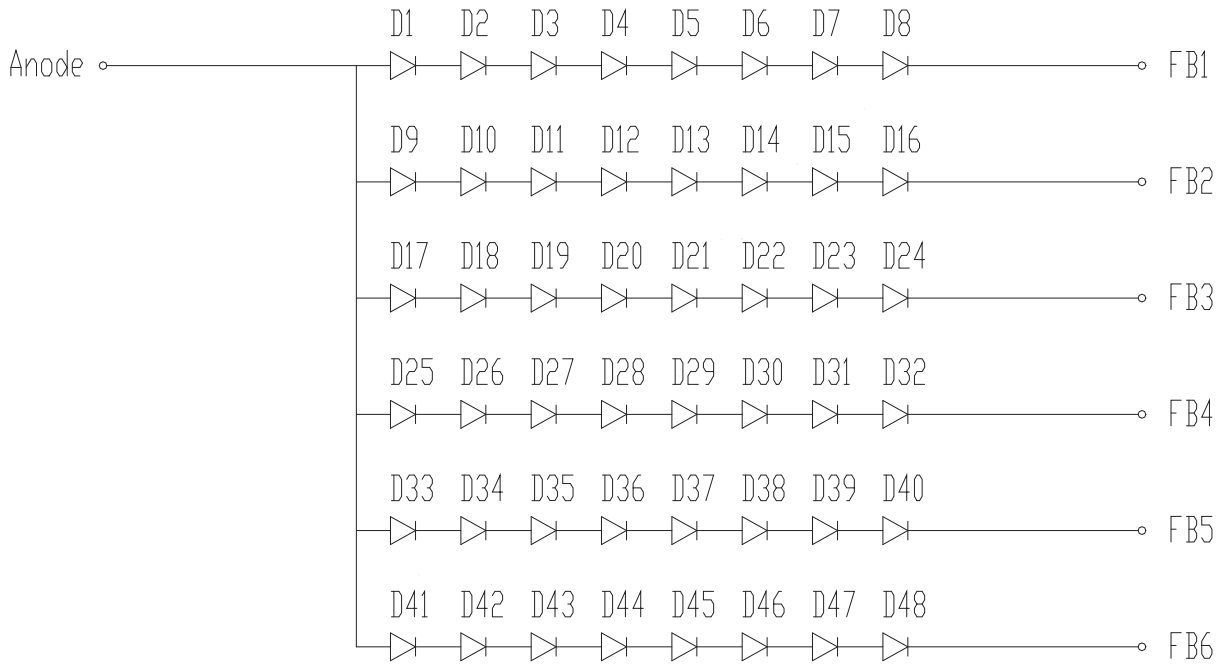
3.2 Backlight Unit

< Table 4. LED Driving guideline specifications > Ta=25+/-2°C

Parameter		Min.	Typ.	Max.	Unit	Remarks
LED Forward Voltage	V_F	-	-	3.0	V	-
LED Forward Current	I_F	-	19	-	mA	-
LED Power Consumption	P_{LED}	-	-	2.7	W	
LED Life-Time	N/A	15,000	-	-	Hour	I_F = 20mA Note 1
Power supply voltage for LED Driver	V_{LED}	-	-	24	V	

Notes :The LED Life-time define as the estimated time to 50% degradation of initial luminous.

3.3 LED structure



48(8S6P) WHITE LED DIAGRAM

4.0 OPTICAL SPECIFICATION

4.1 Overview

The test of Optical specifications shall be measured in a dark room (ambient luminance ≤ 1lux and temperature = 25±2℃) with the equipment of Luminance meter system (Goniometer system and TOPCON BM-5) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0°. The center of the measuring spot on the Display surface shall stay fixed.

The backlight should be operating for 30 minutes prior to measurement.

4.2 Optical Specifications

<Table 5. Optical Specifications>

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle range	Horizontal	Θ_3	CR > 10	-	80	-	Deg.	Note 1
		Θ_9		-	80	-	Deg.	
	Vertical	Θ_{12}		-	80	-	Deg.	
		Θ_6		-	80	-	Deg.	
Luminance Contrast ratio		CR	Θ = 0°	-	1500	-		Note 2
Luminance of White	5 Points	Y_w	Θ = 0° I_{LED} = 19mA	350	400	-	cd/m^2	Note 3
White Luminance uniformity	5 Points	ΔY5		-	-	20%		Note 4
	13 Points	ΔY13		-	-	35%		
White Chromaticity		x_w	Θ = 0°	-	0.30	-		Note 5
		y_w		-	0.32	-		
Reproduction of color	Red	x_R	Θ = 0°	-0.03	0.681	+0.03		
		y_R			0.312			
	Green	x_G			0.231			
		y_G			0.690			
	Blue	x_B			0.150			
		y_B			0.055			
Gamut				95	100		%	
Response Time (Rising + Falling)		T_{RT}	Ta= 25℃ Θ = 0°	-	30	35	ms	Note 6
Cross Talk		CT	Θ = 0°	-	-	2.0	%	Note 7

Notes :

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3, 9 o' clock direction and the vertical or 6, 12 o' clock direction with respect to the optical axis which is normal to the LCD surface (see FIGURE 1).

2. Contrast measurements shall be made at viewing angle of Θ= 0 and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state .
(see FIGURE 1) Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. Center Luminance of white is defined as luminance values of 5 point average across the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.

4. The White luminance uniformity on LCD surface is then expressed as : ΔY13 =1- Minimum Luminance of 13 points /Maximum Luminance of 13 points
(see FIGURE 2 and FIGURE 3).

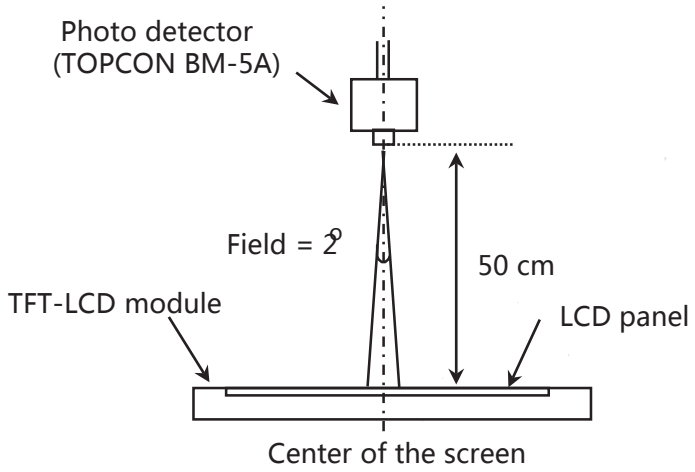
5. The color chromaticity coordinates specified in Table 5 shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.

6. The electro-optical response time measurements shall be made as FIGURE 4 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Td.

7. Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance (YA) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (YB) of that same area when any adjacent area is driven dark.
(See FIGURE 5).

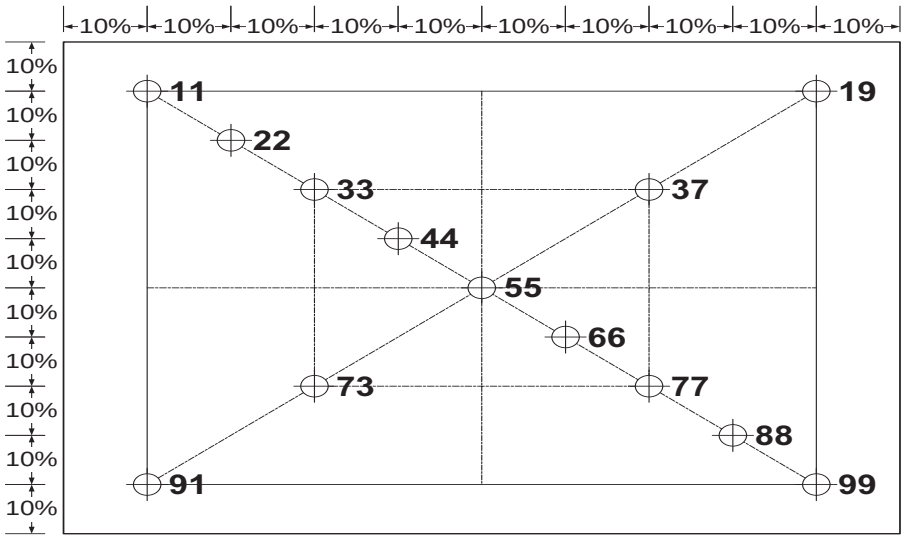
4.3 Optical measurements

Figure 1. Measurement Set Up



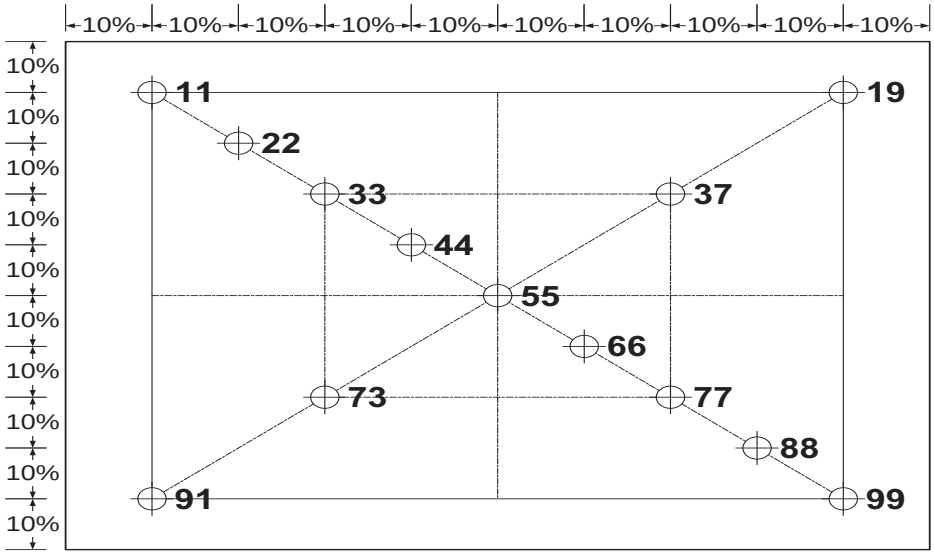
Optical characteristics measurement setup

Figure 2. White Luminance and Uniformity Measurement Locations (5 points)



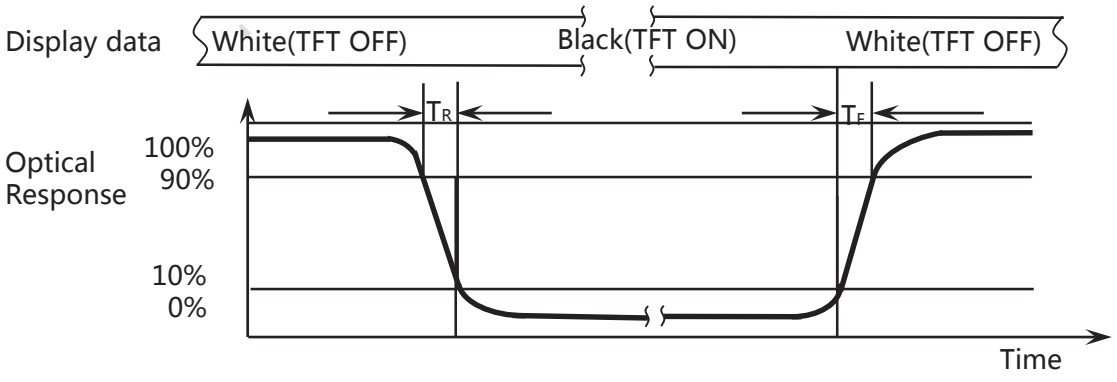
Center Luminance of white is defined as luminance values of center 5 points (33,37,55,73,77)across the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.

Figure 3. Uniformity Measurement Locations (13 points)



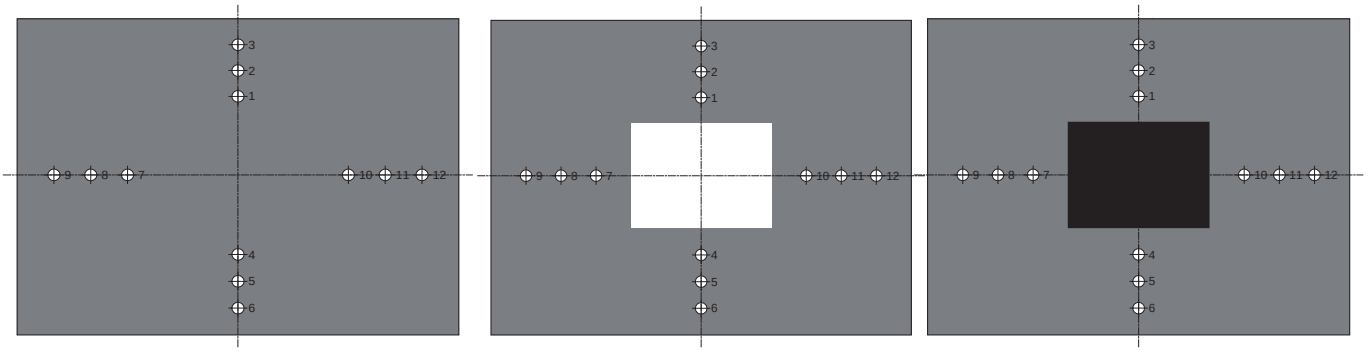
The White luminance uniformity on LCD surface is then expressed as : ΔY5 = 1-Minimum Luminance of five points / Maximum Luminance of five points (see FIGURE 2) , ΔY13 =1- Minimum Luminance of 13 points /Maximum Luminance of 13 points (see FIGURE 3).

Figure 4. Response Time Testing



The electro-optical response time measurements shall be made as shown in FIGURE 4 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Td and 90% to 10% is Tr.

Figure 5. Cross Modulation Test Description



$$CrossTalk_{WonG} = (L_{WonG} - L_{Gray}) / L_{Gray} * 100\%$$
$$CrossTalk_{BonG} = (L_{BonG} - L_{Gray}) / L_{Gray} * 100\%$$

Where:

L_{Gray}= the luminance of full mid gray screen at that point (cd/m^2)

$L_{WonG\ or\ Bon\ G}$ = Subsequent luminance of that point with the white box displayed or with the black box displayed(cd/m^2)

The location measured will be exactly the same in both patterns

Point	x	y
1	0	3/12 h
2	0	4/12 h
3	0	5/12 h
4	0	-3/12 h
5	0	-4/12 h
6	0	-5/12 h
7	-3/12 w	0
8	-4/12 w	0
9	-5/12 w	0
10	0	3/12 w
11	0	4/12 w
12	0	5/12 w

Calculate shadowing for each point by comparing the luminance of full mi d gray screen at that point to the luminance of the same point with the wh ite box displayed and to the luminance of the same point with the black b ox displayed. (Refer to FIGURE 5).

5.0 INTERFACE CONNECTION.

5.1 Electrical Interface Connection

The electronics interface connector is I-PEX 20455-040E-66 or Compatible.
The connector interface pin assignments are listed in Table 6.

<Table 6. Pin Assignments for the Interface Connector>

Pin No.	Symbol	Description
1	NC	Reserved for LCD manufacturer’ s use
2	H_GND	High Speed Ground
3	Lane3_N	Complement Signal Link Lane 3
4	Lane3_P	Complement Signal Link Lane 3
5	H_GND	High Speed Ground
6	Lane2_N	Complement Signal Link Lane 2
7	Lane2_P	Complement Signal Link Lane 2
8	H_GND	High Speed Ground
9	Lane1_N	Complement Signal Link Lane 1
10	Lane1_P	Complement Signal Link Lane 1
11	H_GND	High Speed Ground
12	Lane0_N	Complement Signal Link Lane 0
13	Lane0_P	Complement Signal Link Lane 0
14	H_GND	High Speed Ground
15	AUX_CH_P	Complement Signal Auxiliary Channel
16	AUX_CH_N	Complement Signal Auxiliary Channel
17	H_GND	High Speed Ground
18	Hsync	Hsync Out signal pin
19	H_GND	High Speed Ground
20	HPD	HPD signal pin
21	VDD	LCD logic and driver power(3.3V)
22	VDD	LCD logic and driver power(3.3V)

5.0 INTERFACE CONNECTION.

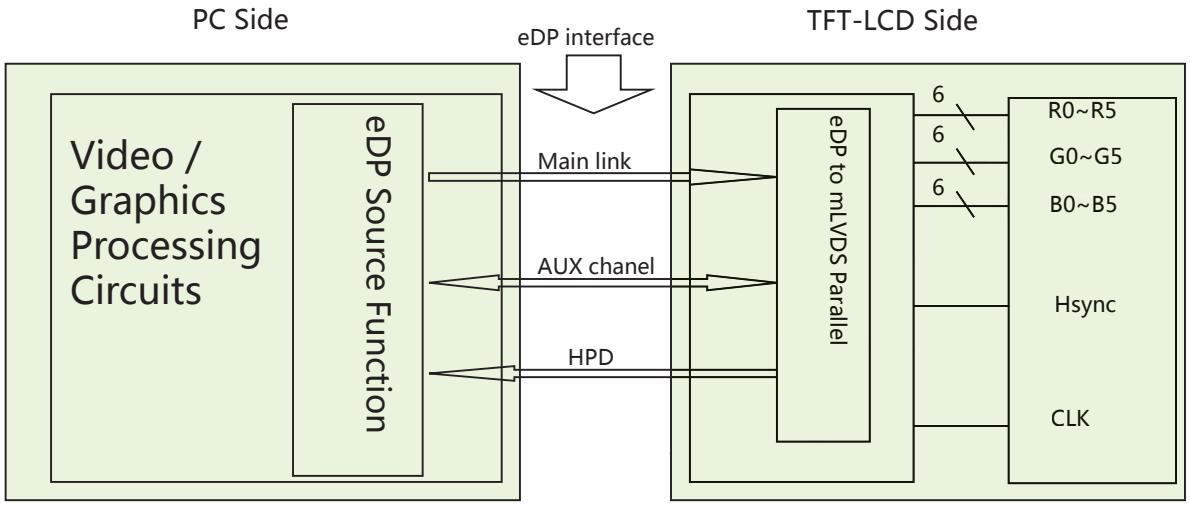
5.1 Electrical Interface Connection

The electronics interface connector is I-PEX 20455-040E-66 or Compatible.
The connector interface pin assignments are listed in Table 6.

<Table 6. Pin Assignments for the Interface Connector>

Pin No.	Symbol	Description
23	VDD	LCD logic and driver power(3.3V)
24	BIST	LCD Panel Self Test Enable
25	LCD_GND	LCD logic and driver ground
26	LCD_GND	LCD logic and driver ground
27	LCD_GND	LCD logic and driver ground
28	VLED	VLED_FB1
29	VLED	VLED_FB2
30	VLED	VLED_FB3
31	VLED	VLED_FB4
32	VLED	VLED_FB5
33	VLED	VLED_FB6
34	VBL	Backlight power
35	VBL	Backlight power
36	VBL	Backlight power
37	NC	Reserved for LCD manufacturer’ s use
38	NC	Reserved for LCD manufacturer’ s use
39	NC	Reserved for LCD manufacturer’ s use
40	NC	Reserved for LCD manufacturer’ s use

5-2. eDP Interface



Note. Transmitter : HX8887-A or equivalent.

5.3.eDP Input signal

Lane 0	
R0-5:0	G0-5:4
G0-3.0	B0-5:2
B0-1:0	R1-5:0
G1-5:0	B1-5:4
B1-3:0	R2-5:2
R2-1:0	G2-5:0
B2-5:0	R3-5:4
R3-3:0	G3-5:2
G3-1:0	B3-5:0

5.4 Back-light & LCM Interface Connection

Interface Connector: UJU PF040-B09B-C09

<Table 7. Pin Assignments for the BLU & LCM Connector>

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	VBL	LED anode connection	6	FB4	LED cathode connection
2	VBL	LED anode connection	7	FB3	LED cathode connection
3	VBL	LED anode connection	8	FB2	LED cathode connection
4	FB6	LED cathode connection	9	FB1	LED cathode connection
5	FB5	LED cathode connection			

6.0 SIGNAL TIMING SPECIFICATION

<Table 8. Signal Timing Specification>

Item		Symbols	Min	Typ.	Max	Unit
Clock	Frequency	1/Tc	TBD	TBD	TBD	MHz
	High Time	Tch	TBD	TBD	TBD	Tc
	Low Time	Tcl	TBD	TBD	TBD	Tc
Frame Period		Tv	TBD	TBD	TBD	lines
			TBD	TBD	TBD	Hz
			TBD	TBD	TBD	ms
Vertical Display Period		Tvd	TBD	TBD	TBD	lines
One line Scanning Period		Th	TBD	TBD	TBD	clocks
Horizontal Display Period		Thd	TBD	TBD	TBD	clocks

7.0 Connector Description

Physical interface is described as for the connector on LCM.
These connectors are capable of accommodating the following signals and will be following components.

<Table 9. Connector Description>

Connector Name /Description	**For Signal Connector**
Manufacturer	STM or Compatible
Type/ Part Number	UJU PF040-B09B-C09 or Compatible
Mating housing/ Part Number	I-PEX 20455-040E-66 or Compatible

8.0 RELIABILITY TEST

The Reliability test items and its conditions are shown in below.

<Table 10. Reliability test>

No	Test Items	Conditions
1	High temperature storage test	Ta = 80 ℃, 240 hrs
2	Low temperature storage test	Ta = -30℃, 240 hrs
3	High temperature & high humidity operation test	Ta = 60 ℃, 90%RH, 240hrs
4	High temperature operation test	Ta = 70 ℃, 240hrs
5	Low temperature operation test	Ta = -20℃, 240hrs
6	Thermal shock	Ta = -30℃ ↔ 80 ℃ (0.5 hr), 100 cycle
7	Vibration test	5-200Hz,1.47G,Random，±X±Y±Z,60min
8	Packing Drop Test	1Angle,3Edge,6Face，Height: JIS-Z-0200 Level 1

9.0 HANDLING & CAUTIONS

(1) Cautions when taking out the module

Pick the pouch only, when taking out module from a shipping package.

(2) Cautions for handling the module

As the electrostatic discharges may break the LCD module, handle the LCD module with care. Peel a protection sheet off from the LCD panel surface as slowly as possible.

As the LCD panel and back - light element are made from fragile glass material, impulse and pressure to the LCD module should be avoided.

As the surface of the polarizer is very soft and easily scratched, use a soft dry cloth without chemicals for cleaning.

Do not pull the interface connector in or out while the LCD module is operating.

Put the module display side down on a flat horizontal plane.

Handle connectors and cables with care.

(3) Cautions for the operation

When the module is operating, do not lose CLK, ENAB signals. If any one of these signals is lost, the LCD panel would be damaged.

Obey the supply voltage sequence. If wrong sequence is applied, the module would be damaged.

(4) Cautions for the atmosphere

Dew drop atmosphere should be avoided.

Do not store and/or operate the LCD module in a high temperature and/or humidity atmosphere. Storage in an electro-conductive polymer packing pouch and under relatively low temperature atmosphere is recommended.

(5) Cautions for the module characteristics

Do not apply fixed pattern data signal to the LCD module at product aging.

Applying fixed pattern for a long time may cause image sticking.

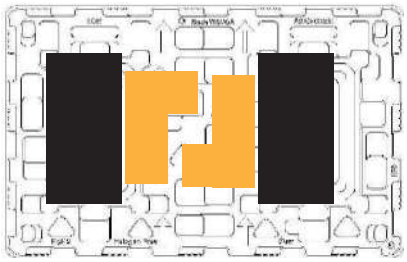
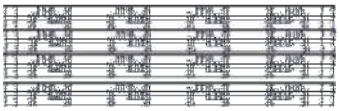
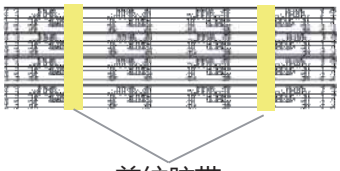
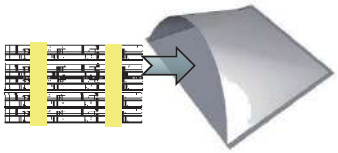
(6) Other cautions

Do not disassemble and/or re-assemble LCD module.

Do not re-adjust variable resistor or switch etc.

When returning the module for repair or etc., Please pack the module not to be broken. We recommend to use the original shipping packages.

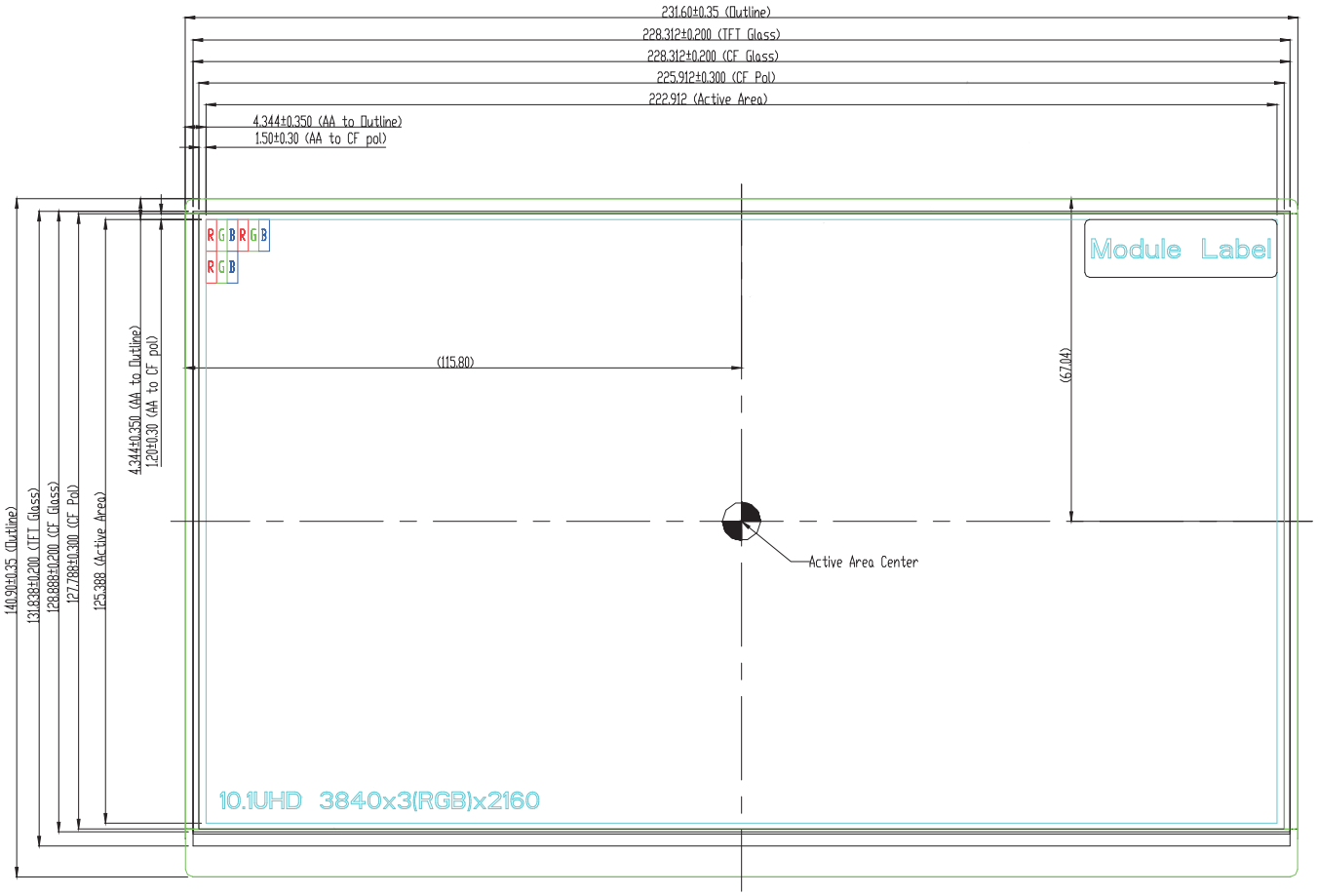
10.0 PACKING INFORMATION

将Module放入到Tray中 2 Module/Tray	将盛装Module的Tray叠码20层，然后加放1个Tray作盖。(Tray要互旋180°) 40 Module/21 Tray	用美纹胶带延平行于Tray的宽边方向捆绑两道，每道至少缠绕胶带3圈。（捆绑前确认Tray是否每一层都旋转叠码）
		
将21层 Tray放入一个PE Bag 40 Module/PE Bag	在Inner Box底部放入1个EPE Board，然后将一包Panel放入Box，并在Panel上方加盖一个EPE Board。	采用“H”形封箱方式，对Box进行封箱，并在Box的Mark处粘贴相应标签。 40 Module/Inner Box
		
按“田”字型码拍。 12 Inner Box/Pallet	套上Dual Cover和Paper Corner，并用打包带打包。 480 MDL/Pallet	
		

11. MECHANICAL OUTLINE DIMENSION

11.1 Total Solution Outline Dimension

Figure 6. Total Solution Outline Dimensions (Front view)



11.2 Total Solution Outline Dimension

Figure 7. Total Solution Outline Dimensions (Rear view)