Product Specification

AU OPTRONICS CORPORATION

( ) Preliminary Specifications
(V) Final Specifications

Module	**7” (7.00”)SD 16:10 Color TFT-LCD with LED Backlight design**
Model Name	B070ATN01.0 (H/W:0A)
Note ( )	***LED Backlight without driving circuit design***

Customer	**Date**	**Approved by**	**Date**
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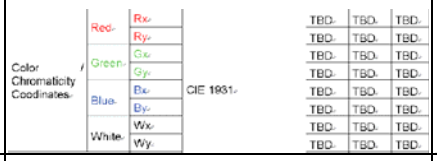
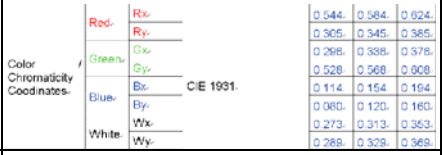
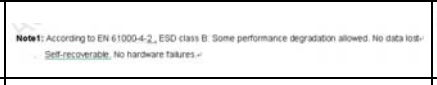
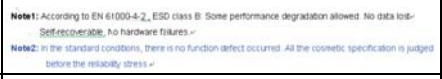
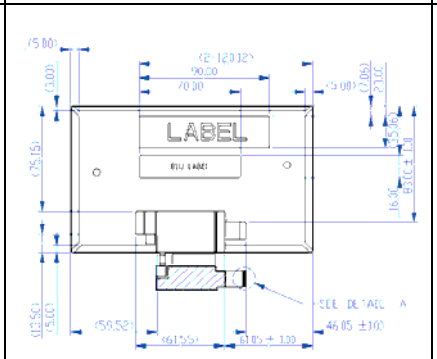
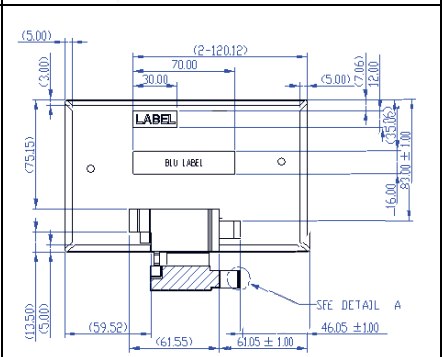
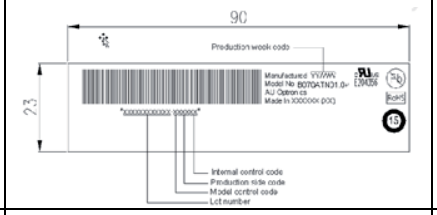
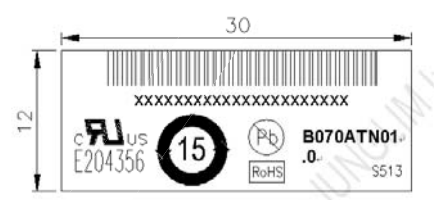
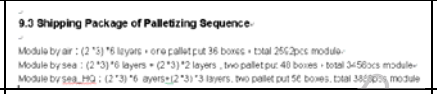
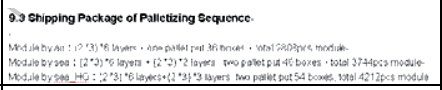
Note: This Specification is subject to change without notice.		**NBBU Marketing Division AU Optronics corporation**	

Contents

Record of Revision

Version and Date	Page	Old description	New Description	Remark
0.1 2014/10/09	All	First Edition		
0.2 2014/11/07	6			
	23			
	24			
	26			
1.0 2015/01/19	27	Update: 9.2 Carton Package Max capacity：72 TFT-LCD module per carton	Max capacity：78 TFT-LCD module per carton	
	28			

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 momentary. 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

B070ATN01.0 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 16:10 SD, 1024(H) x600(V) screen and RGB 6-bits data driver without LED backlight driving circuit. All input signals are LVDS interface compatible.

B070ATN01 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 ℃ condition:

Items	**Unit**	**Specifications**			
Screen Diagonal	[mm]	178.03			
Active Area	[mm]	153.6 X 90			
Pixels H x V		1024x3(RGB) x 600			
Pixel Pitch	[mm]	0.150 x 0.150			
Pixel Format		R.G.B. island			
Display Mode		Normally White			
White Luminance	[cd/m^2]	350 typ. (5 points average) 300 min. (5 points average)			
Luminance Uniformity		1.25 max. (5 points)			
Contrast Ratio		700 typ			
Response Time	[ms]	16 typ			
Nominal Input Voltage VDD	[Volt]	+3.3 typ.			
Power Consumption	[Watt]	Logic power 0.7 max. BLU power 1.6 typ			
Weight	[Grams]	100 max.			
Physical Size **Include bracket**	[mm]		Min.	Typ.	Max.
		Length	167.1	167.25	167.4
		Width	104.5	104.65	104.8
		Thickness	-	-	2.9
Electrical Interface		1 channel LVDS			
Glass Thickness	[mm]	0.4			
Surface Treatment		Glare, Hardness 3H, Reflection 4.3%			

Support Color		RGB 6-bit
Temperature Range Operating Storage (Non-Operating)	 [°C] [°C]	 -20 to +60 -30 to +70
RoHS Compliance		RoHS Compliance

Note 1: Not include LABEL, FPCA & SHIELDING TAPE.

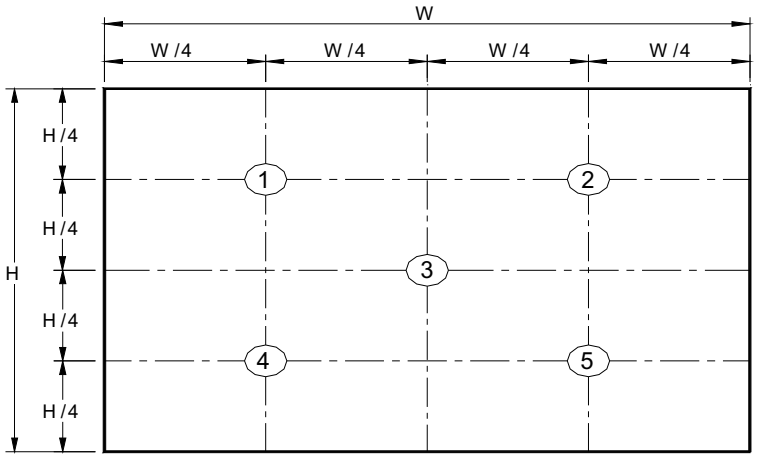
Note 2: Physical size tolerance include bracket is +-0.15.

2.2 Optical Characteristics

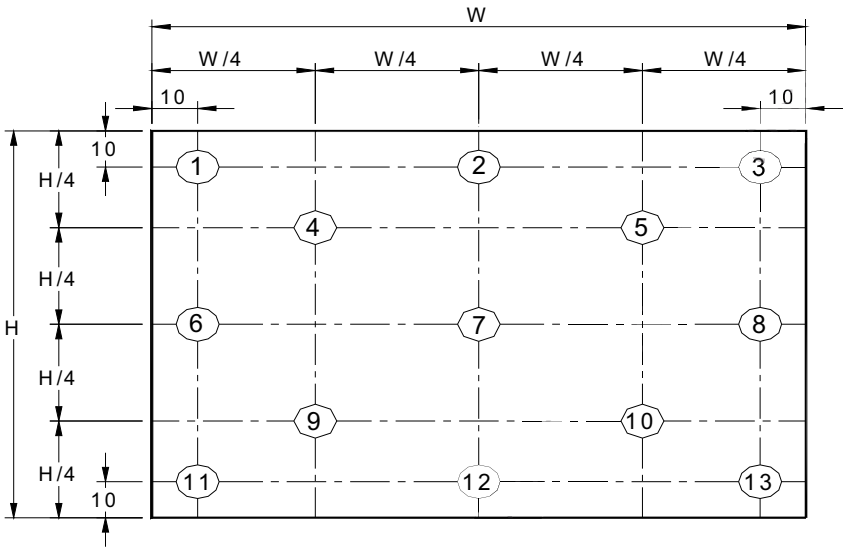
The optical characteristics are measured under stable conditions at 25°C (Room Temperature) :

Item		Symbol	Conditions	Min.	Typ.	Max.	Unit	Note
White Luminance ILED=20mA			5 points average	300	350	-	cd/m^2	1, 4, 5.
Viewing Angle		θ_R θ_L	Horizontal (Right) CR = 10 (Left)	65 65	75 75	- -	degree	4, 9
		ψ_H ψ_L	Vertical (Upper) CR = 10 (Lower)	50 50	70 75	- -		
View direction (Gray Inversion)			6 O'Clock	-	-	-		10
Luminance Uniformity		δ_{5P}	5 Points	80	85	-		1, 3, 4
Luminance Uniformity		δ_{13P}	13 Points	70	75	-		2, 3, 4
Contrast Ratio		CR		500	700	-		4, 6
Cross talk		%				4		4, 7
Response Time		T_{RT}	Rising + Falling	-	16	25		
Color / Chromaticity Coodinates	Red	Rx	CIE 1931	0.544	0.584	0.624		4
		Ry		0.305	0.345	0.385		
	Green	Gx		0.296	0.336	0.376		
		Gy		0.528	0.568	0.608		
	Blue	Bx		0.114	0.154	0.194		
		By		0.080	0.120	0.160		
	White	Wx		0.273	0.313	0.353		
		Wy		0.289	0.329	0.369		
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 or13 points is defined by dividing the maximum luminance values by the minimum test point luminance

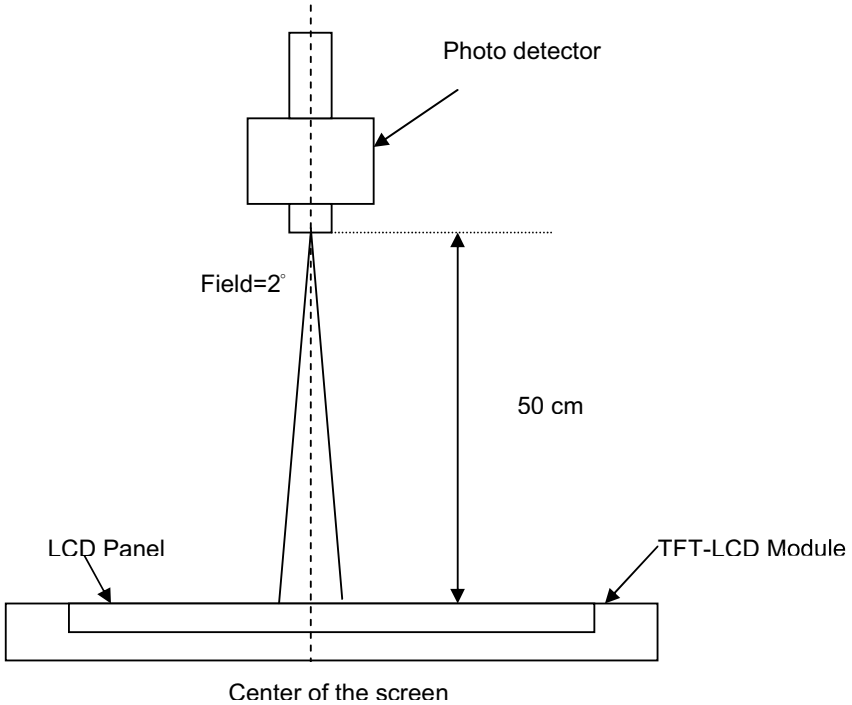
$$\delta_{W5} = \frac{\text{Maximum Brightness of five points}}{\text{Minimum Brightness of five points}}$$

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

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, measurement should be executed in the center of screen unless otherwise noted.



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.

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

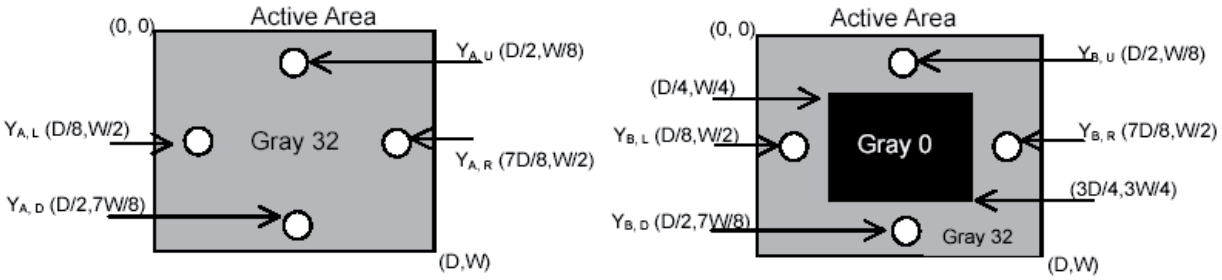
Note 7： Definition of Cross Talk (CT)

$CT = | Y_B – Y_A | / Y_A \times 100$ (%)

Where

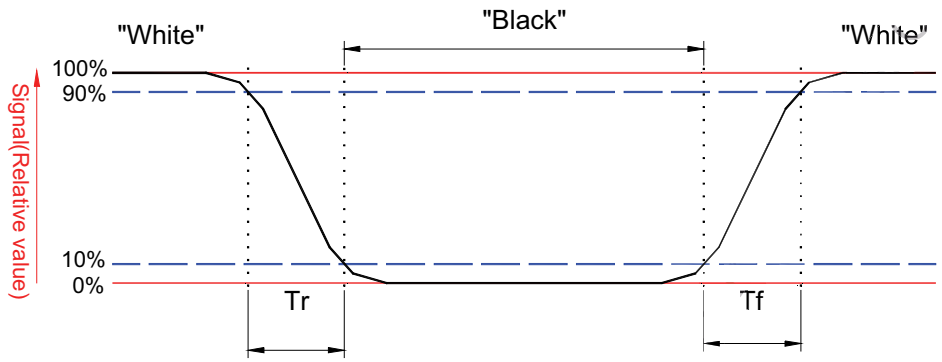
Y_A = Luminance of measured location without gray level 0 pattern (cd/m2)

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



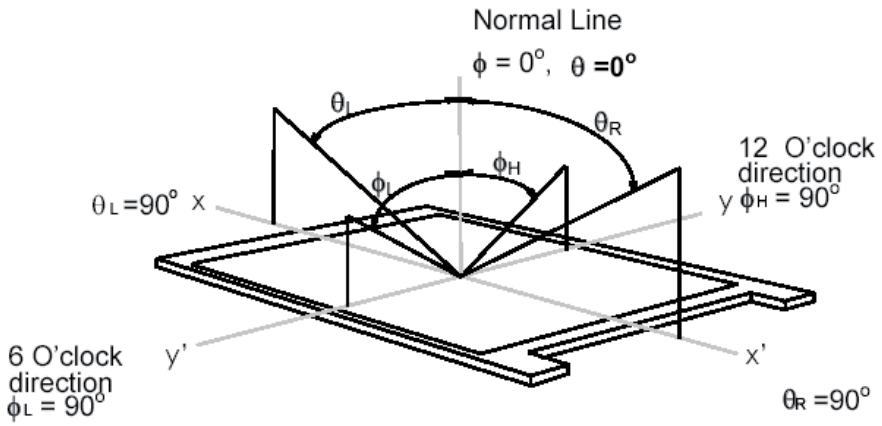
Note 8: Definition of response time:

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 is interval between the 10% and 90% of amplitudes. Refer to figure as below.



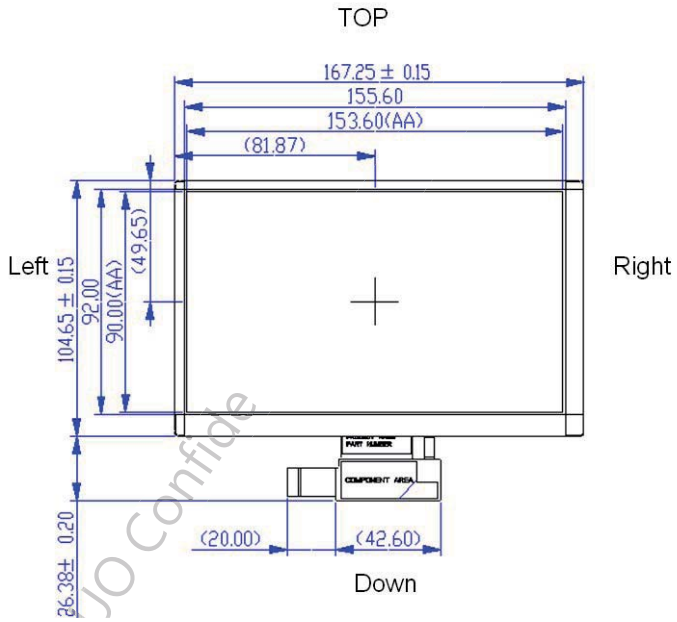
Note 9. Definition of viewing angle

Viewing angle is the measurement of contrast ratio ≧ 10, 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 follows; 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 about its center to develop the desired measurement viewing angle.



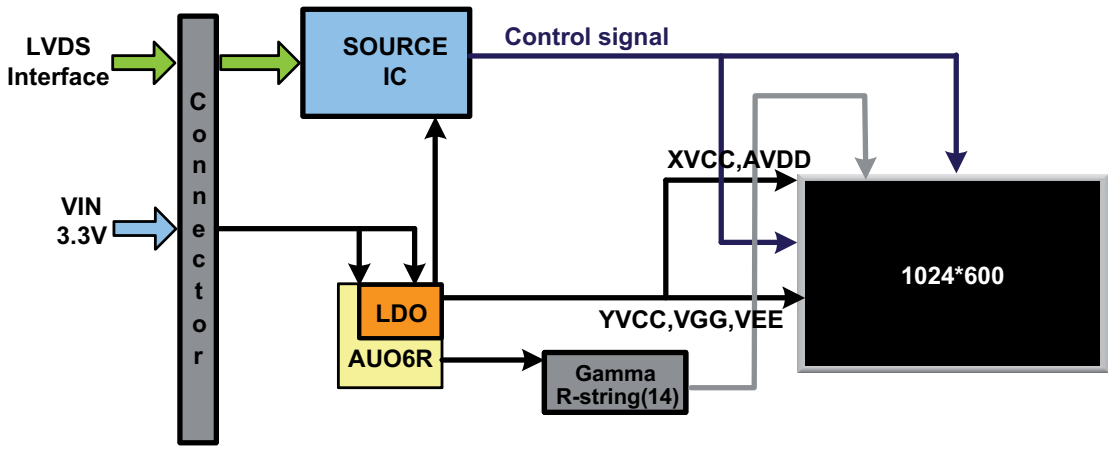
Note 10. Definition of scanning direction.

Refer to the figure as below:



3. Functional Block Diagram

The following diagram shows the functional block of the 7 inches wide Color TFT/LCD 39 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	+3.0	+3.6	[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	0	90	[%RH]	Note 4
Storage Temperature	TST	-30	+70	[°C]	Note 4
Storage Humidity	HST	5	90	[%RH]	Note 4

Note 1: At Ta (25℃)

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

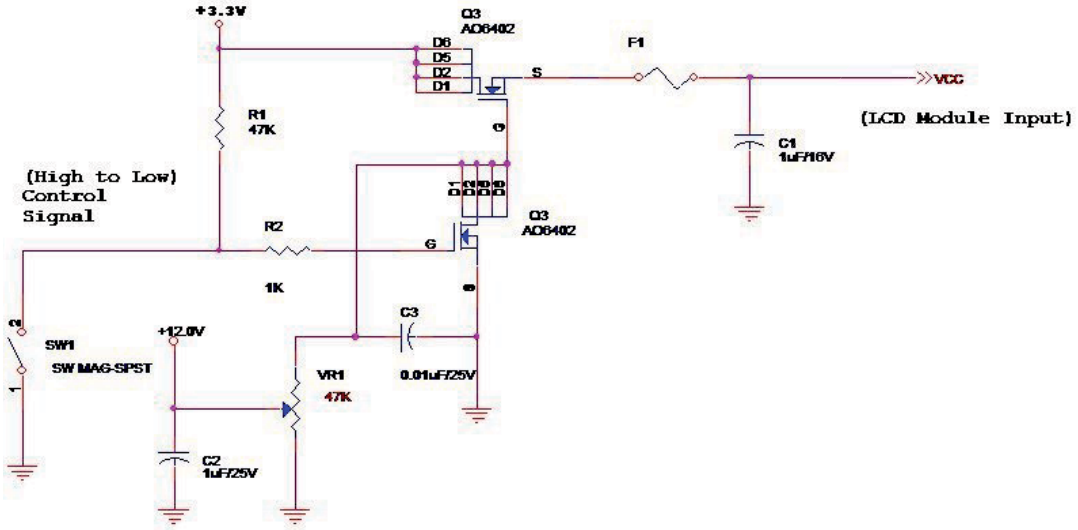
Input power specifications are as follows;

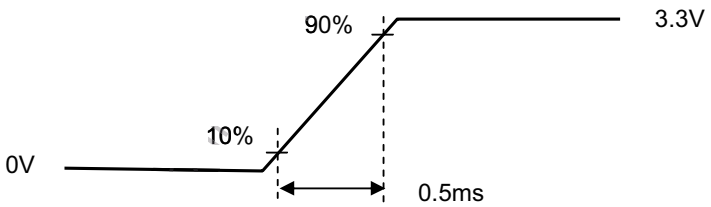
The power specification are measured under 25℃ and frame frenquency under 60Hz

Symble	Parameter	Min	Typ	Max	Units	Note
VDD	Logic/LCD Drive Voltage	3.0	3.3	3.6	[Volt]	
PDD	VDD Power	-	-	0.5	[Watt]	Note 1
IDD	IDD Current	-	-	139	[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：Black Pattern at 3.3V driving voltage. ($P_{max}=V_{3.3} \times I_{black}$)

Note 2：Measure Condition





Vin rising time

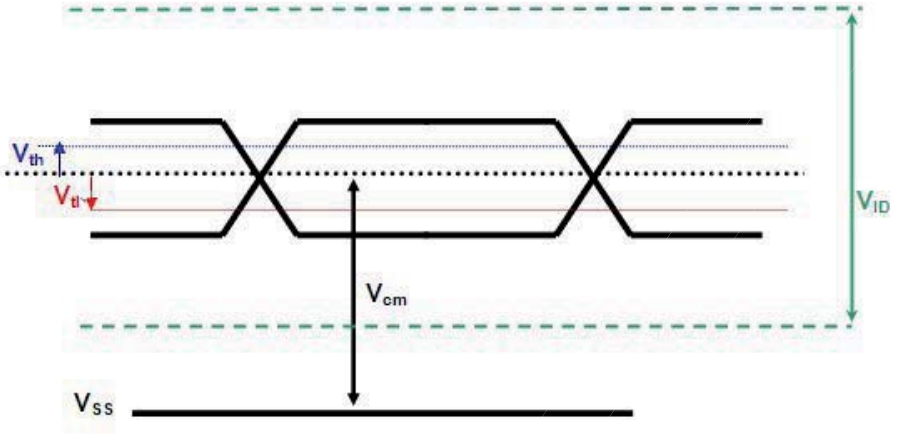
5.1.2 Signal Electrical Characteristics

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 (Vcm=+1.2V)		100	[mV]
V_{tl}	Differential Input Low Threshold (Vcm=+1.2V)	-100	-	[mV]
V_{ID}	Differential Input Voltage	100	600	[mV]
V_{cm}	Differential Input Common Mode Voltage	1.125	1.375	[V]

Note: LVDS Signal Waveform



5.2 Backlight Unit

5.2.1 LED characteristics

Parameter	Symbol	Min	Typ	Max	Units	Condition
Backlight Power Consumption	PLED	-	-	1.72	[Watt]	(Ta=25℃), Note 1
LED Life-Time	N/A	15,000	-	-	Hour	(Ta=25℃), Note 2 I_F=20 mA
Input Voltage	$V_{Light-bar}$	-	12.4	13.2	V	I_F=20mA per String
Input current	$I_{Light-bar}$	-	120	-	mA	I_F=20mA per String
Reverse Current Ignore	I_R	-	-	-	uA	V_R=XV
Light-bar Power	P_L	-	1.488	1.584	Watt	P_L-I_Fx VF

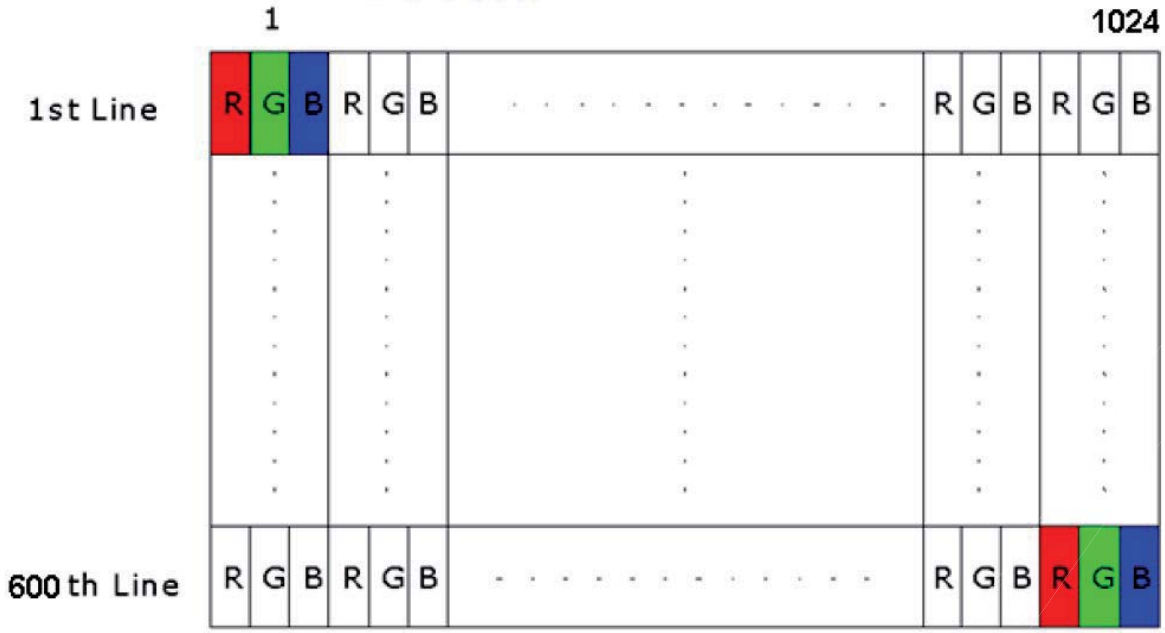
Note 1: Calculator value for reference P_{LED} = V_F (Normal Distribution) * I_F (Normal Distribution), and PLED include driving circuit loss.

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

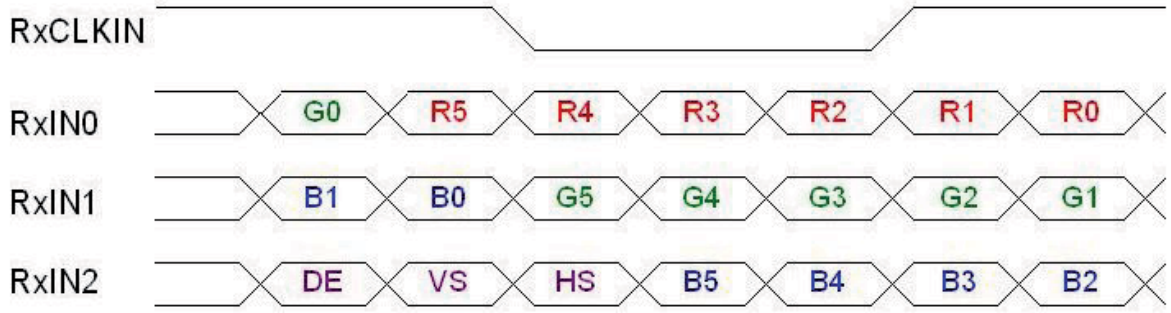
6. Signal Interface Characteristic

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	
R5 R4 R3 R2 R1 R0	Red Data 5 (MSB) Red Data 4 Red Data 3 Red Data 2 Red Data 1 Red Data 0 (LSB) Red-pixel Data	Red-pixel Data Each red pixel's brightness data consists of these 6 bits pixel data.
G5 G4 G3 G2 G1 G0	Green Data 5 (MSB) Green Data 4 Green Data 3 Green Data 2 Green Data 1 Green Data 0 (LSB) Green-pixel Data	Green-pixel Data Each green pixel's brightness data consists of these 6 bits pixel data.
B5 B4 B3 B2 B1 B0	Blue Data 5 (MSB) Blue Data 4 Blue Data 3 Blue Data 2 Blue Data 1 Blue Data 0 (LSB) Blue-pixel Data	Blue-pixel Data Each blue pixel's brightness data consists of these 6 bits 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 .

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

6.3 Integration Interface Requirement

6.3.1 Pin Assignment

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

PIN#	Signal Name	I/O	Description	Remark
1	GND	P	Ground	
2	GND	P	Ground	
3	VDD	P	Power Voltage for digital circuit	VDD=3.3V
4	VDD	P	Power Voltage for digital circuit	VDD=3.3V
5	LCD-ID	I	Custom ID identification pin, voltage=1.8	
6	RESET	I	Global reset pin	
7	STBYB	P	Standby mode, normally pulled high	
8	GND	P	Ground	
9	RXIN0-	I	-LVDS differential data input	
10	RXIN0+	I	+LVDS differential data input	
11	GND	P	Ground	
12	RXIN1-	I	-LVDS differential data input	
13	RXIN1+	I	+LVDS differential data input	
14	GND	P	Ground	
15	RXIN2-	I	-LVDS differential data input	
16	RXIN2+	I	+LVDS differential data input	
17	GND	P	Ground	
18	CLKIN-	I	-LVDS differential clock input	
19	CLKIN+	I	+LVDS differential clock input	
20	GND	P	Ground	
21	RXIN3-	I	-LVDS differential data input	
22	RXIN3+	I	+LVDS differential data input	
23	GND	P	Ground	
24	SELB	I	6bit/8bit mode selec	
25	SHLR	I	Horizontal inversion	
26	UPDN	I	Vertical inversion	
27	GND	P	Ground	
28	DIMO	I	Backlight CABC controller signal output	
29	CABSN1	I	CABC H/W enable	
30	CABCEN2	P	CABC H/W enable	
31	GND	P	Ground	

32	LED-	P	-LED Cathode	
33	LED-	P	-LED Cathode	
34	LED-	P	-LED Cathode	
35	LED+	P	+LED Anode	
36	LED+	P	+LED Anode	
37	LED+	P	+LED Anode	
38	GND	P	Ground	
39	GND	P	Ground	

6.4 Interface Timing

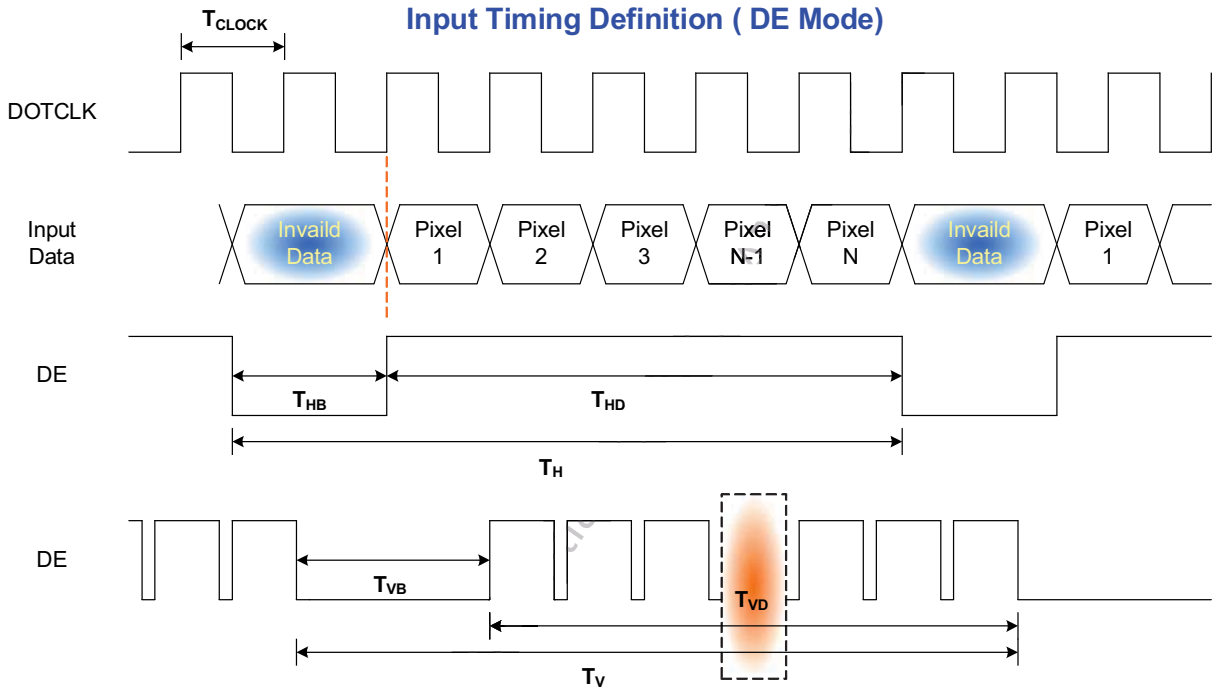
6.4.1 Timing Characteristics

Basically, interface timings should match the 1024x600 manufacturing guide line timing.

Parameter		Symbol	Min.	Typ.	Max.	Unit
Frame Rate		-	-	60	-	Hz
Clock frequency		1/ T_{Clock}	40.8	51.2	67.2	MHz
Vertical Section	Period	T_V	610	635	800	T_{Line}
	Active	T_{VD}	600			
	Blanking	T_{VB}	10	35	200	
Horizontal Section	Period	T_H	1114	1344	1400	T_{Clock}
	Active	T_{HD}	1024			
	Blanking	T_{HB}	90	320	376	

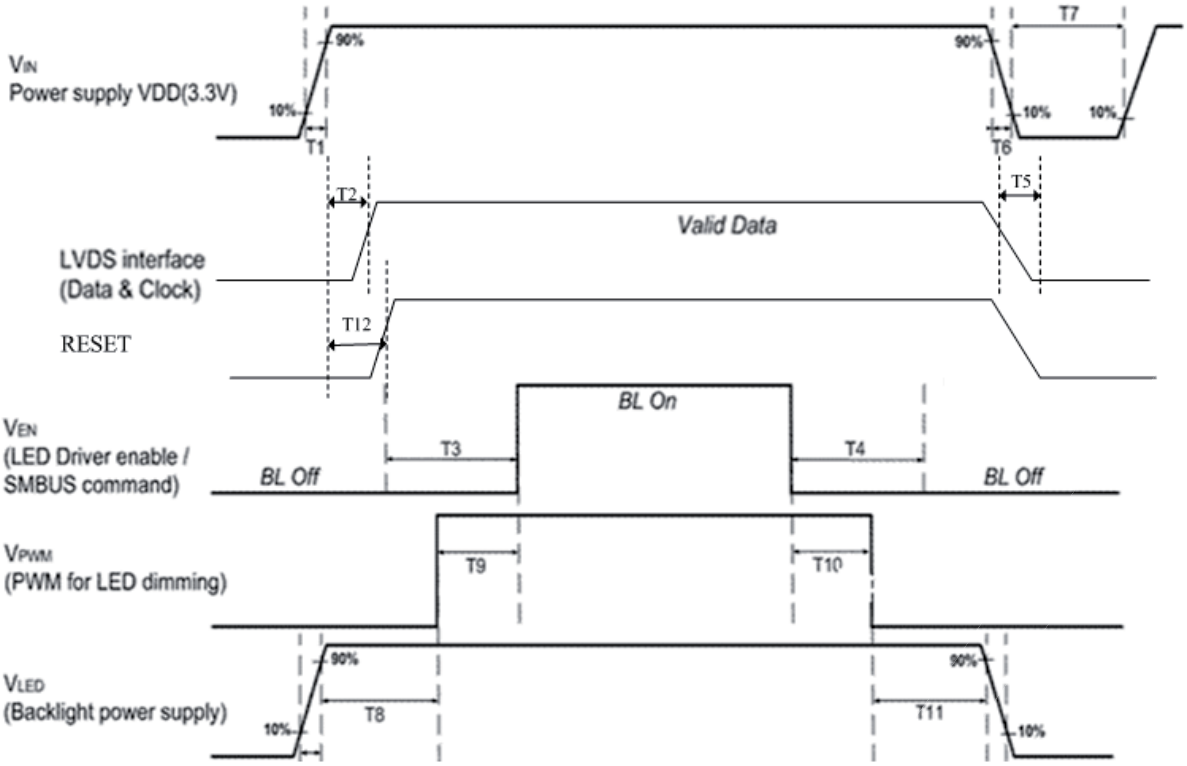
Note1: DE mode only
Note2: Support customer LVDS

6.4.2 Timing diagram

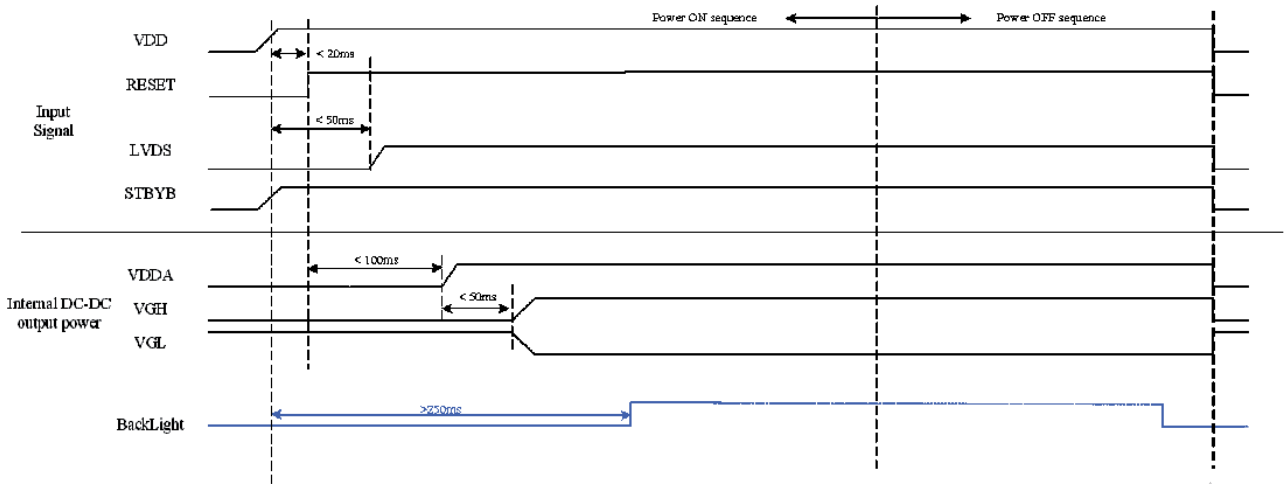


6.5 Power ON/OFF Sequence

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.	Typ.	Max.	
T1	0.5	-	10	ms
T2	0	-	50	
T3	230	-	-	
T4	200	-	-	
T5	0	-	-	
T6	0	-	10	
T7	750	-	-	
T8	0	-	-	
T9	0	-	-	
T10	0	-	-	
T11	0	-	-	
T12	1	-	20	


Power ON sequence
Power OFF sequence
VDD
< 20ms
RESET
Input Signal
< 50ms
LVDS
STBYB
< 100ms
VDDA
Internal DC-DC output power
< 50ms
VGH
VGL
>250ms
BackLight

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: 100 G , Half sine wave
- Active time: 6 ms
- Pulse: ±X, ±Y, ±Z .3 time for each side

7.3 Reliability Test

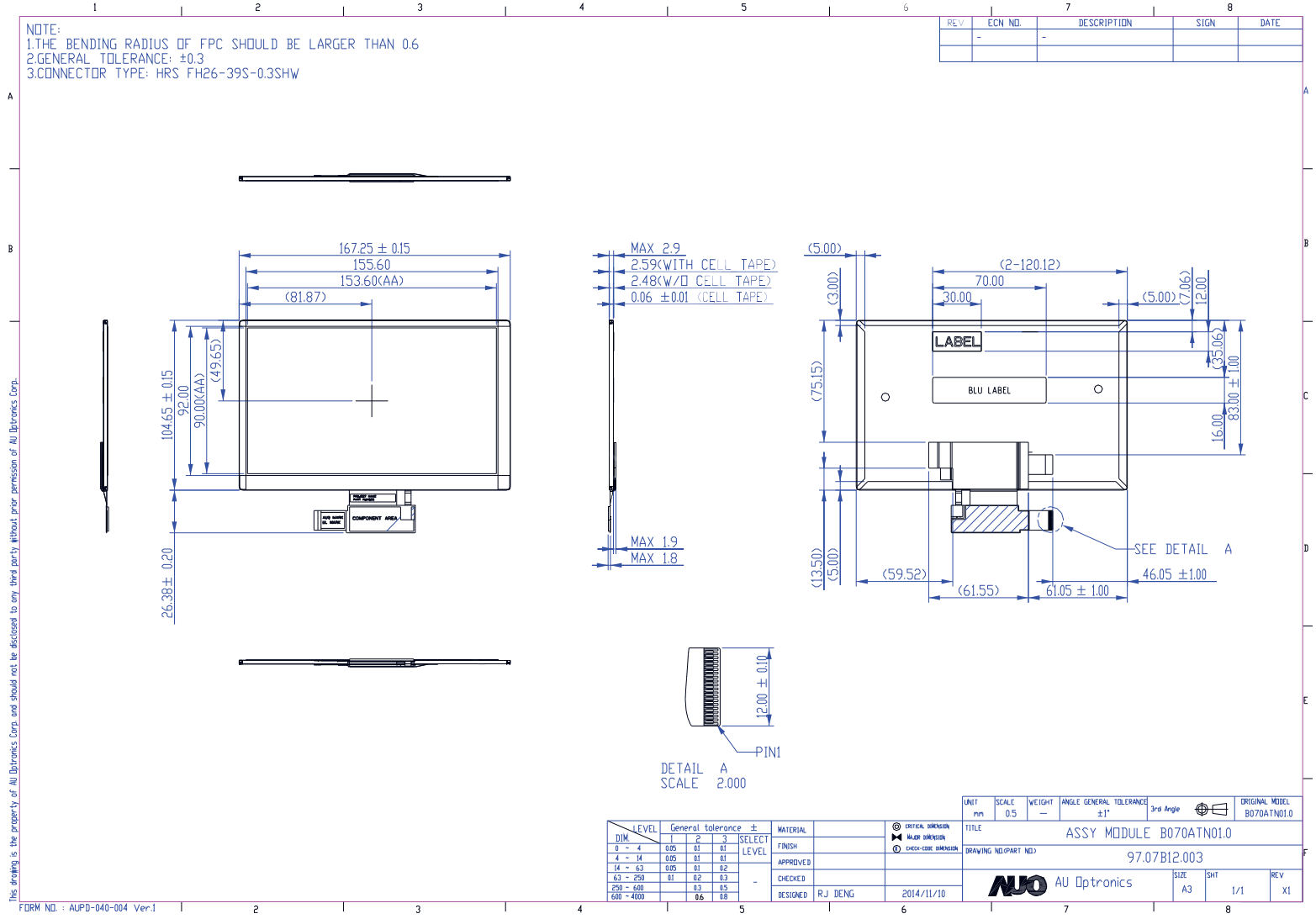
Items	Required Condition	Note
Temperature Humidity Bias	Ta= 40℃, 90%RH, 120h	
High Temperature Operation	Ta= 60℃, Dry, 120h	
Low Temperature Operation	Ta= -20℃, 120h	
High Temperature Storage	Ta= 70℃, 120h	
Low Temperature Storage	Ta= -30℃, 120h	
Thermal Shock Test	Ta=-20℃to 60℃, Duration at 30 min, 100 cycles	
ESD	Contact : ±8 KV Air : ±15 KV	Note 1

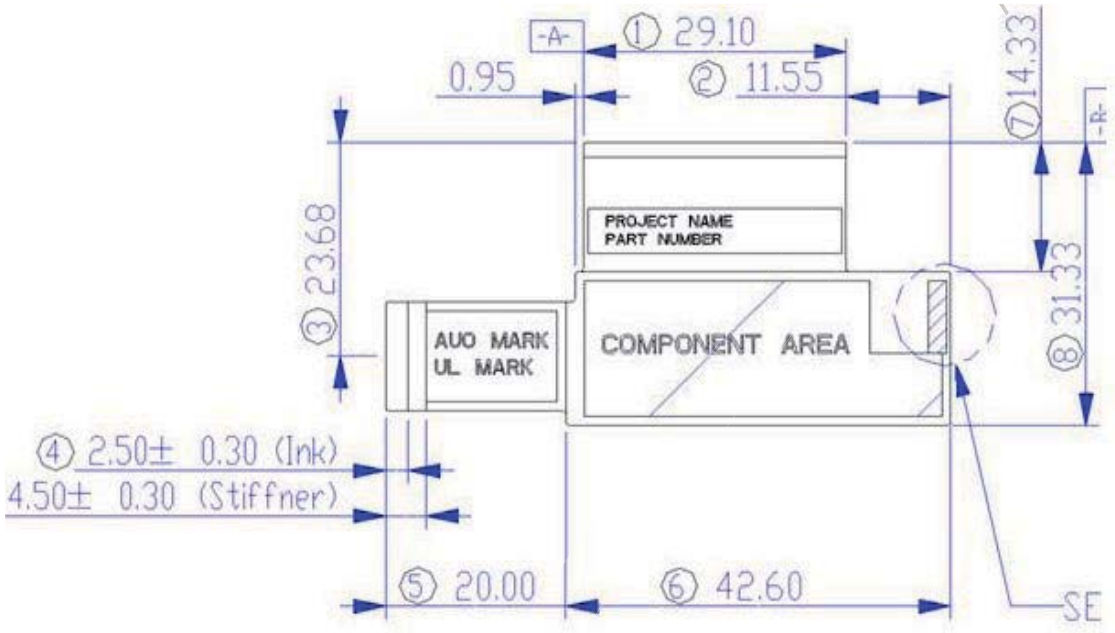
Note1: According to EN 61000-4-2 , ESD class B: Some performance degradation allowed. No data lost . Self-recoverable. No hardware failures.

Note2: In the standard conditions, there is no function defect occurred. All the cosmetic specification is judged before the reliability stress.

8. Mechanical Characteristics

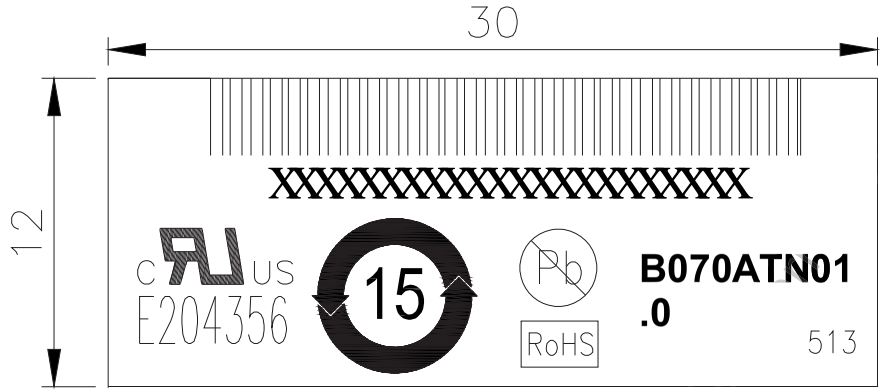
8.1 LCM Outline Dimension



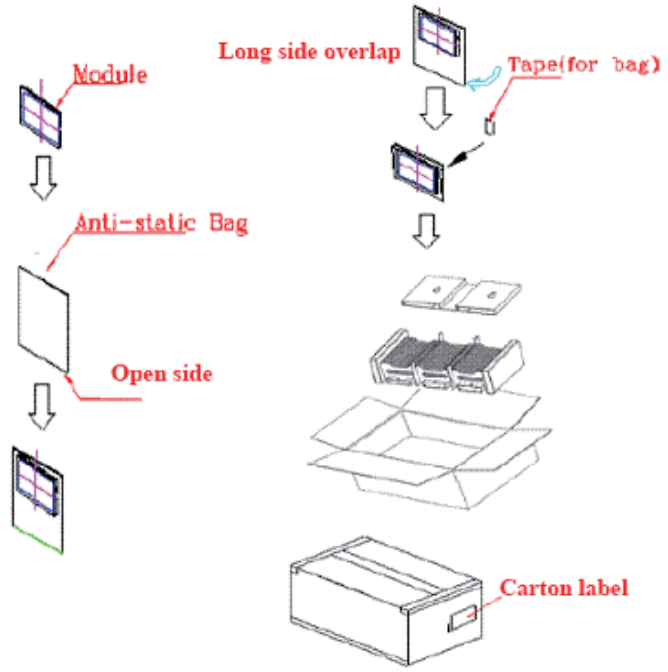

-A-
① 29.10
② 11.55
0.95
⑦ 14.33
-B-
PROJECT NAME
PART NUMBER
③ 23.68
AUO MARK
UL MARK
COMPONENT AREA
⑧ 31.33
④ 2.50± 0.30 (Ink)
4.50± 0.30 (Stiffner)
⑤ 20.00
⑥ 42.60
SE

9. Shipping and Package

9.1 Shipping Label Format



9.2 Carton Package



Max capacity：78 TFT-LCD module per carton

Max weight: 11.0 kg per carton

Outside dimension of carton: 584mm(L)* 379mm(W)*226mm(H)

Pallet size： 1180 mm *1150 mm * 135mm

9.3 Shipping Package of Palletizing Sequence

Module by air：(2 *3) *6 layers，one pallet put 36 boxes，total 2808pcs module
Module by sea：(2 *3) *6 layers + (2 *3) *2 layers , two pallet put 48 boxes，total 3744pcs module
Module by sea_HQ：(2 *3) *6 layers+(2 *3) *3 layers, two pallet put 54 boxes, total 4212pcs module