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BOE

EV133FHM-N40 V8.0

BO-01-016

BOE

To :	BOE	REQ. Date	2021-4-14
		REF. No.	

APPROVAL

INSPECTED BY	
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DATE	

No	PART NO.	DESCRIPTION	SPECIFICATION
	EV133FHM-N40	13.3 Inch MDL	B8 Product Spec-EV133FHM-N40 -8D30_0 SPEC VISUAL INSPECTION CRITERIA FOR ALL CUSTOMERS (13.3" HD&FHD-A Grade)

PLEASE KINDLY FIND AND APPROVE THE SPECIFICATIONS INSERTED HEREIN AND RETURN ONE COPY HERE OF WITH YOUR SIGNATURE OF APPROVAL.

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CHONGQING BOE OPTOELECTRONICS TECHNOLOGY CO.,LTD

EV133FHM-N40 V8.0

Final Product Specification

Rev. 0

BOE Optoelectronics Technology Co., Ltd

REVISION HISTORY

Revision No.	Page	Description of Changes	Date	Prepared
P0	-	Frist Release	2020.12.28	Wang Xin
0	-	Final Release	2021.04.14	Wang Xin

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Contents

1.0 GENERAL DESCRIPTION

1.1 Introduction

EV133FHM-N40 V8.0 is a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module has a 13.3inch diagonally measured active area with Full-HD resolutions (1920 horizontal by 1080 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 16.7 M (8bit) colors and color gamut 72%. The TFT-LCD panel used for this module is a low reflection and higher color type. Therefore, this module is suitable for Notebook PC. The LED driver for back-light driving is built in this model.
All input signals are eDP1.2 interface compatible.

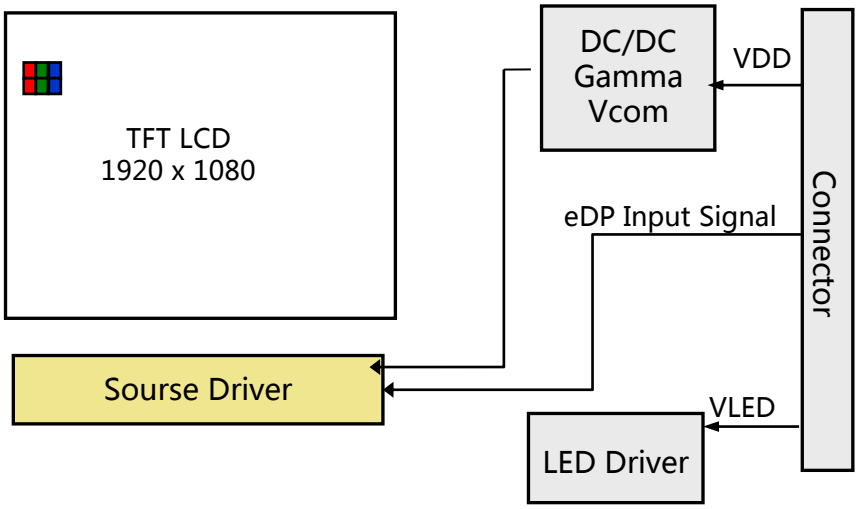


Figure 1. Drive Architecture

1.2 Features

- 2 lane eDP interface with 2.7Gbps link rates
- Thin and light weight
- 16.7M color depth, color gamut 72%
- Single LED lighting bar (Bottom side/Horizontal Direction)
- Data enable signal mode
- Side mounting frame
- Green product (RoHS & Halogen free product)
- On board LED driving circuit
- Low driving voltage and low power consumption
- On board EDID chip

1.3 Application

- Notebook PC (Wide type)

1.4 General Specification

The followings are general specifications at the model EV133FHM-N40 V8.0. (listed in Table 1)

<Table 1. General Specifications>

Parameter	Specification	Unit	Remarks
Active area	293.76 (H) x 165.24 (V)	mm	
Number of pixels	1920 (H) ×1080 (V)	pixels	
Pixel pitch	153(H) ×153(V)	um	
Pixel arrangement	RGB Vertical stripe		
Display colors	16.7M	Colors	8Bit
Color gamut	72%		
Display mode	Normally Black		
Dimensional outline	300.56(H)*188.25(V) (w/PCB)*2.4 (max) 300.56(H)*177.69(V)*2.4 (max)	mm	
Weight	215(max)	g	
Surface treatment	Fine AG		
Surface hardness	3H		
Back-light	Bottom edge side, 1-LED lighting bar type		Note 1
Power consumption	P_D : 0.9(typ.)	W	@Mosaic
	P_{BL} : 2.9(max)	W	
	P_{Total} : 3.8(typ.)	W	@Mosaic

Notes : 1. LED Lighting Bar (36*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
Logic Supply Voltage	V_{IN}	V_{SS}-0.3	V_{DD}+0.3	V	
Operating Temperature	T_{OP}	0	+50	˚C	Note 2
Storage Temperature	T_{ST}	-20	+60	˚C	

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 ˚C ≥ Ta) Maximum wet - bulb temperature at 39 ˚C or less. (Ta > 40 ˚C) No condensation.

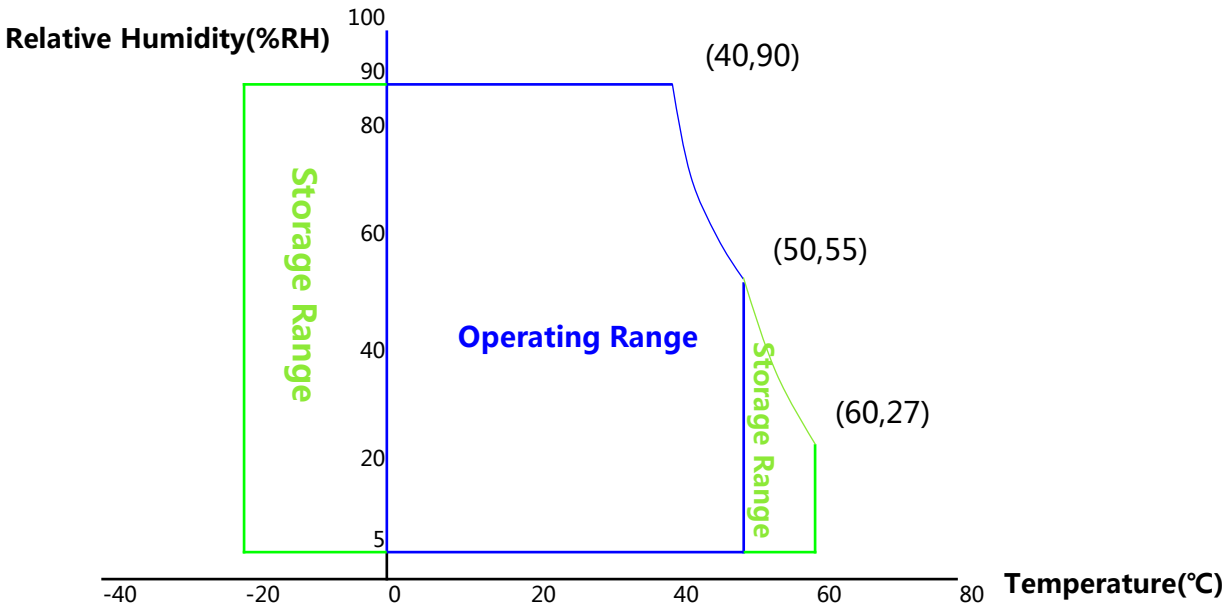


Figure 2. Temperature and Relative Humidity Range

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	@ V_{DD} = 3.3V
BIST Control Level	High Level	-	2.5	-	V	-
	Low Level	-	0	-	V	-
Power Supply Current	I_{DD}	180	260	420	mA	Note 1
Power Supply Inrush Current	Inrush	-	-	2	A	Note3
Power Consumption	P_D	-	0.9	-	W	Note 1
	P_{BL}	-	-	2.9	W	Note 2
	P_{total}	-	-	3.82	W	Note 1

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 ˚C.
   a) Typ : Mosaic pattern 8*8
   b) Max : R/G/B patterns

(a) (b)

Figure 3. Power Measure Patterns

2. Calculated value for reference (V_{LED} × I_{LED})
3. Measure condition (Figure 4)

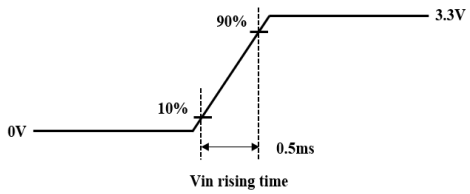


Figure 4. Inrush Measure Condition

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	-	-	2.9	V	-
LED Forward Current		I_F	-	23.5	-	mA	-
LED Power Consumption		P_{LED}	-	-	2.9	W	Note 1
LED Life-Time		N/A	15,000	-	-	Hour	I_F = 23.5mA
Power Supply Voltage for LED Driver		V_{LED}	2.7	4.2	24	V	-
Power Supply Voltage for LED Driver Inrush		Iled inrush	-	-	2	A	Note 4
EN Control Level	Backlight On		1.2	-	5.0	V	-
	Backlight Off		0	-	0.6	V	-
PWM Control Level	High Level		1.2	-	5.0	V	-
	Low Level		0	-	0.6	V	-
PWM Control Frequency		F_{PWM}	0.1	-	1.6	MHz	-
Duty Ratio			10	-	95	%	Note 3

Notes :

1. Power supply voltage12V for LED driver.
   Calculator value for reference IF × VF ×36 /driver efficiency = PLED
2. The LED life-time define as the estimated time to 50% degradation of initial luminous.
3. 1% duty cycle is achievable with a dimming frequency less than 1KHz.
4. Measure condition (Figure 5)

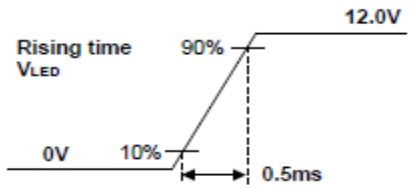


Figure 5. Inrush Measure Condition

3.3 LED Structure

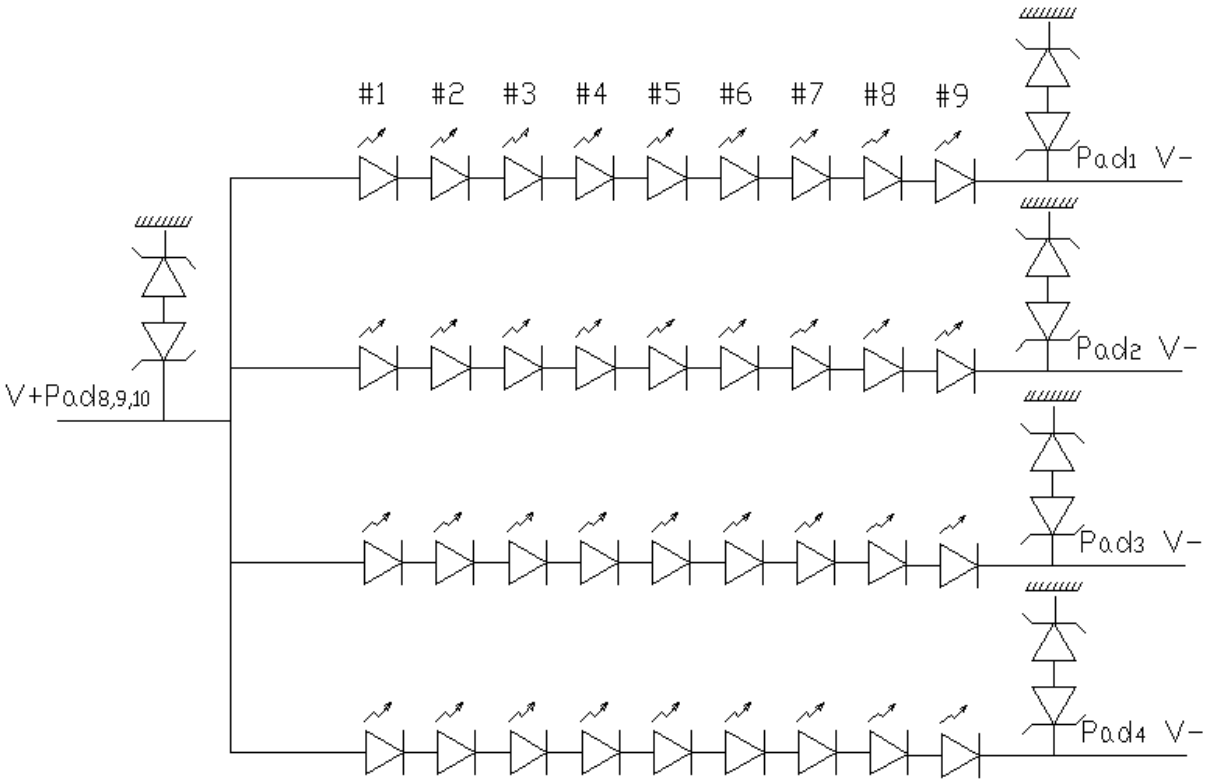


Figure 6. LED Structure

4.0 OPTICAL SPECIFICATION

4.1 Overview

The test of optical specifications shall be measured in a dark room (ambient luminance ≤ 1 lux and temperature = 25±2℃) with the equipment of luminance meter system (PR730&PR810) 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°. We refer to θØ=0 (=θ3) as the 3 o'clock direction (the "right"), θØ=90 (= θ12) as the 12 o'clock direction ("upward"), θØ=180 (= θ9) as the 9 o'clock direction ("left") and θØ=270(= θ6) as the 6 o'clock direction ("bottom"). While scanning θand/or Ø, the center of the measuring spot on the display surface shall stay fixed. The backlight should be operating for 30 minutes prior to measurement. VDD shall be 3.3+/- 0.3V at 25°C. Optimum viewing angle direction is 6 'clock.

4.2 Optical Specifications

<Table 5. Optical Specifications>

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle Range	Horizontal	Θ_3	CR > 10	-	85	-	Deg.	Note 1
		Θ_9		-	85	-	Deg.	
	Vertical	Θ_{12}		-	85	-	Deg.	
		Θ_6		-	85	-	Deg.	
Luminance Contrast Ratio		CR	Θ = 0°	600	800	-		Note 2
Luminance of White	5 Points	Y_w	Θ = 0° I_{LED} = 23.5mA	255	300	-	cd/m²	Note 3
White Luminance Uniformity	5 Points	ΔY5		80	-	-	%	Note 4
	13 Points	ΔY13		62.5	-	-	%	
White Chromaticity		W_x	Θ = 0°	0.283	0.309	0.343	-	Note 5
		W_y		0.299	0.340	0.359	-	
Reproduction of Color	Red	R_x	Θ = 0°	-0.03	0.648	+0.03	-	-
		R_y			0.345		-	-
	Green	G_x			0.330		-	-
		G_y			0.623		-	-
	Blue	B_x			0.153		-	-
		B_y			0.059		-	-
Color Gamut		-	-	-	72	-	%	-
Response Time (Rising + Falling)		T_{RT}	Ta= 25℃ Θ = 0°	-	30	35	ms	Note 6
Cross Talk		CT	Θ = 0°	-	-	4.7	%	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 7).

2. Contrast measurements shall be made at viewing angle of $\Theta = 0$ 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 7) 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 8 for a total of the measurements per display.

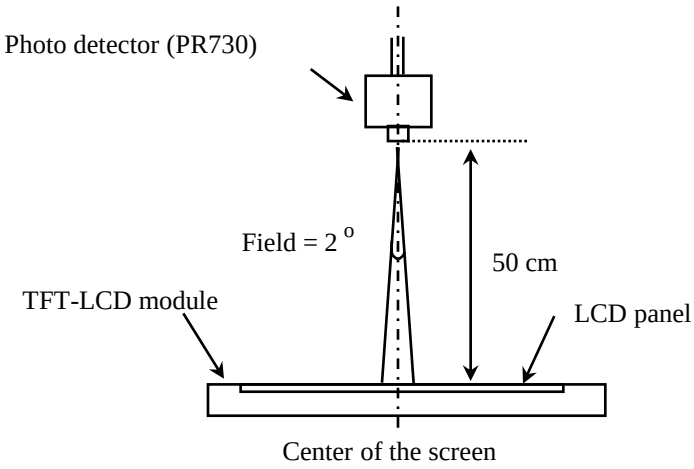
4. The White luminance uniformity on LCD surface is then expressed as : ΔY =Minimum Luminance of 5(or 13) points / Maximum Luminance of 5(or 13) points.(see Figure 8 and Figure 9).

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 10 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is T_f, and 90% to 10% is T_r.

7. Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance (YA) of a 10 ± 1mm diameter area, with all display pixels set to gray 127(of 0 to 255), to the luminance (YB) of that same area when any adjacent area is driven dark.The luminance ratio shall not exceed 1:1.05 (See Figure 11).

4.3 Optical Measurements



Optical characteristics measurement setup

Figure 7. Measurement Set Up

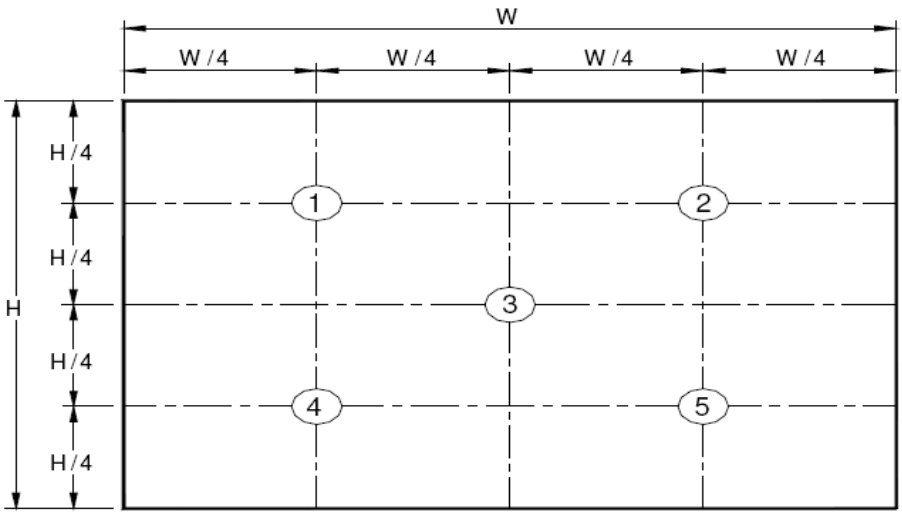


Figure 8. White Luminance and Uniformity Measurement Locations (5 points)

Center Luminance of white is defined as luminance values of center 5 points 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 7 for a total of the measurements per display.

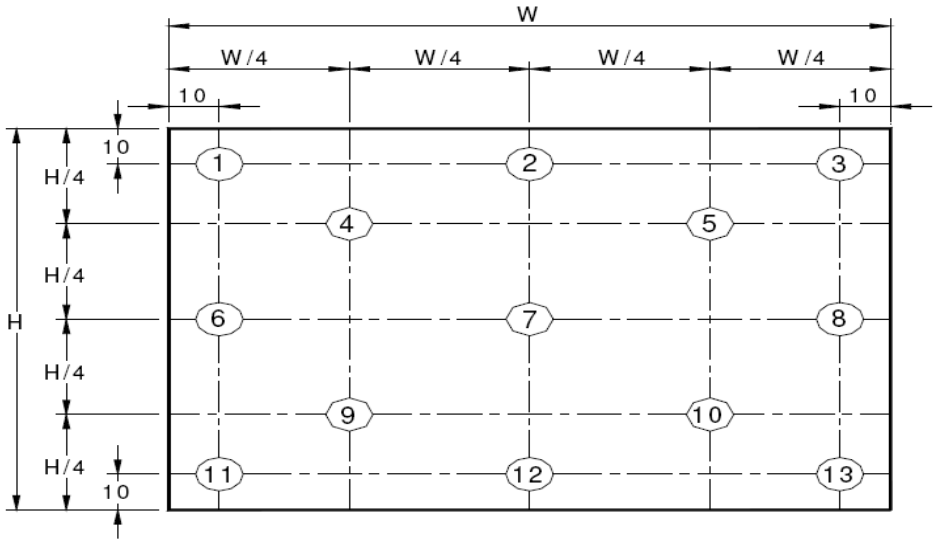


Figure 9. Uniformity Measurement Locations (13 points)

The White luminance uniformity on LCD surface is then expressed as : ΔY5 = Minimum Luminance of five points / Maximum Luminance of five points (see Figure 8) , ΔY13 = Minimum Luminance of 13 points /Maximum Luminance of 13 points (see Figure 9).

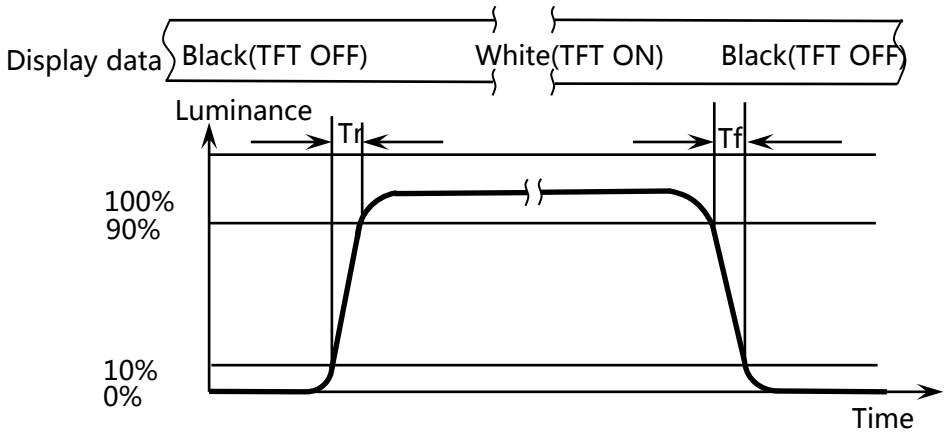
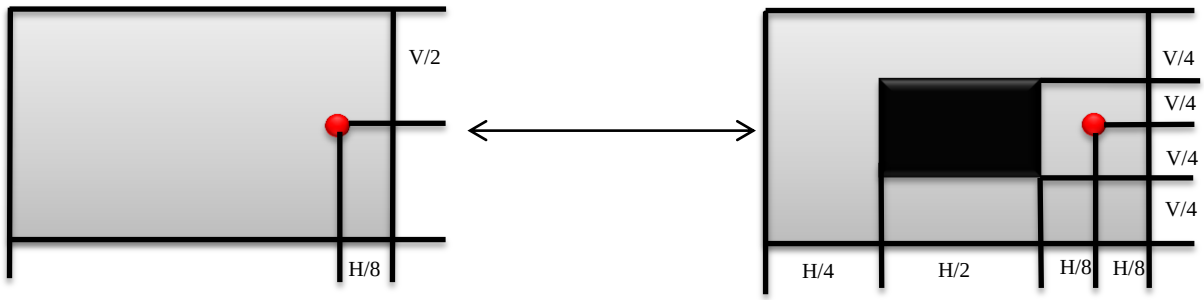


Figure 10. Response Time Testing

The electro-optical response time measurements shall be made as shown in Figure 10 by switching the "data" input signal ON and OFF. Tr: The luminance to change from 10% to 90% ,Tf: The luminance to change from 90% to 10% .

The test system : LMS PR810



$$\text{Cross Talk (\%)} = \left| \frac{Y_B - Y_A}{Y_B} \right| \times 100$$

Figure 11. Cross Talk Modulation Test Description

Where:

Y_A = Initial luminance of measured area (cd/m^2)

Y_B = Subsequent luminance of measured area (cd/m^2)

The location measured will be exactly the same in both patterns. The test background gray is L127.

Cross Talk of one area of the LCD surface by another shall be measured by comparing the luminance (YA) of a 10±1mm diameter area, with all display pixels set to a gray level 127, to the luminance (YB) of that same area when any adjacent area is driven dark.(Refer to Figure 11)
The test system: PR730

5.0 INTERFACE CONNECTION

5.1 Electrical Interface Connection

The electronics interface connector is STM IS050-L30B-C10(30P)
The connector interface pin assignments are listed in Table 6.

<Table 6. Pin Assignments for the Interface Connector>

Terminal	Symbol	Functions
Pin No.	Symbol	Description
1	NC	No Connection
2	H_GND	Ground
3	LANE1_N	eDP RX Channel 1 Negative
4	LANE1_P	eDP RX Channel 1 Positive
5	H_GND	Ground
6	LANE0_N	eDP RX Channel 0 Negative
7	LANE0_P	eDP RX Channel 0 Positive
8	H_GND	Ground
9	AUX_CH_P	eDP AUX CH Positive
10	AUX_CH_N	eDP AUX CH Negative
11	H_GND	Ground
12	LCD_VCC	Power Supply, 3.3V (typ.)
13	LCD_VCC	Power Supply, 3.3V (typ.)
14	BIST	Panel Self Test Enable
15	H_GND	Ground
16	H_GND	Ground
17	HPD	Hot Plug Detect Output
18	BL_GND	LED Ground
19	BL_GND	LED Ground
20	BL_GND	LED Ground
21	BL_GND	LED Ground
22	BL_ENABLE	LED Enable Pin(+3.3V Input)
23	BL_PWM	System PWM Signal Input
24	NC	No Connection
25	NC	No Connection
26	BL_POWER	LED Power Supply 5V-21V
27	BL_POWER	LED Power Supply 5V-21V
28	BL_POWER	LED Power Supply 5V-21V
29	BL_POWER	LED Power Supply 5V-21V
30	NC	No Connection

5.2 eDP Interface

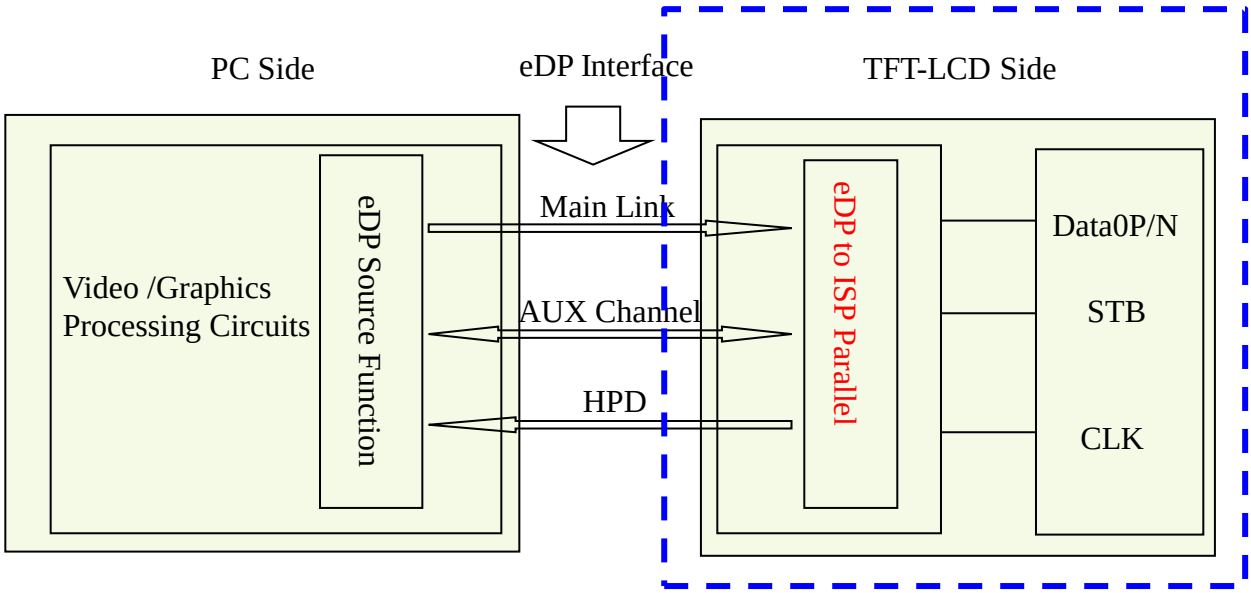


Figure 12. eDP Interface Architecture

Note:
Transmitter : Parade DP501 or equivalent.
Transmitter is not contained in module.

5.3 Data Input Format

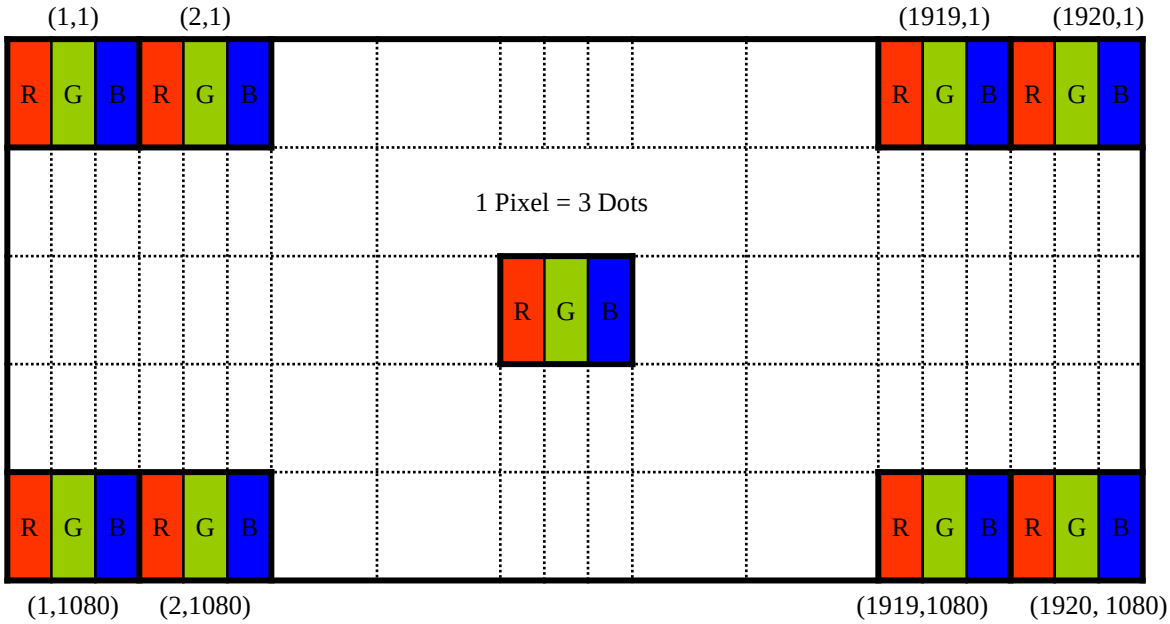


Figure 13. Display Position of Input Data (V-H)

5.4 Back-light & LCM Interface Connection

BLU Interface Connector:MASK24037P9.

<Table 7. Pin Assignments for the BLU Connector>

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	LED	LED cathode connection	6	NC	No Connection
2	LED	LED cathode connection	7	Vout	LED anode connection
3	LED	LED cathode connection	8	Vout	LED anode connection
4	LED	LED cathode connection	9	Vout	LED anode connection
5	NC	No Connection			

6.0 SIGNAL TIMING SPECIFICATION

6.1 The EV133FHM-N40 V8.0 Is Operated By The DE Only

< Table 8. Signal Timing Specification >

Item		Symbols	Min	Typ	Max	Unit
Clock	Frequency	1/Tc	100	147.8	160	MHz
Frame Period		Tv	1112	1125	1238	lines
			40	60	66	Hz
			25	16.67	15.15	ms
Vertical Display Period		Tvd	-	1080	-	lines
One line Scanning Period		Th	2080	2200	2400	clocks
Horizontal Display Period		Thd	-	1920	-	clocks

Note : The above is as optimized setting.

6.2 eDP Rx Interface Timing Parameter

The specification of the eDP Rx interface timing parameter is shown in Table 9.

<Table 9. eDP Main-Link RX TP4 Package Pin Parameters>

Item	Symbol	Min	Typ	Max	Unit	Remark
Spread spectrum clock (Link clock down-spreading)	SSC	-	-	0.5	%	
Differential peak-to-peak input voltage at package pins	$V_{RX-DIFFp-p}$	100	-	1320	mV	
Rx input DC common mode voltage	$V_{RX\_DC\_CM}$	0	-	2	V	
Differential termination resistance	$R_{RX-DIFF}$	80	-	120	Ω	
Single-ended termination resistance	R_{RX-SE}	40	-	60	Ω	
Rx short circuit current limit	I_{RX_SHORT}	-	-	50	mA	
Intra-pair skew at Rx package pins (HBR) RX intra-pair skew tolerance at HBR	$L_{RX\_SKEW\_INTRA\_PAIR}$	-	-	60	ps	

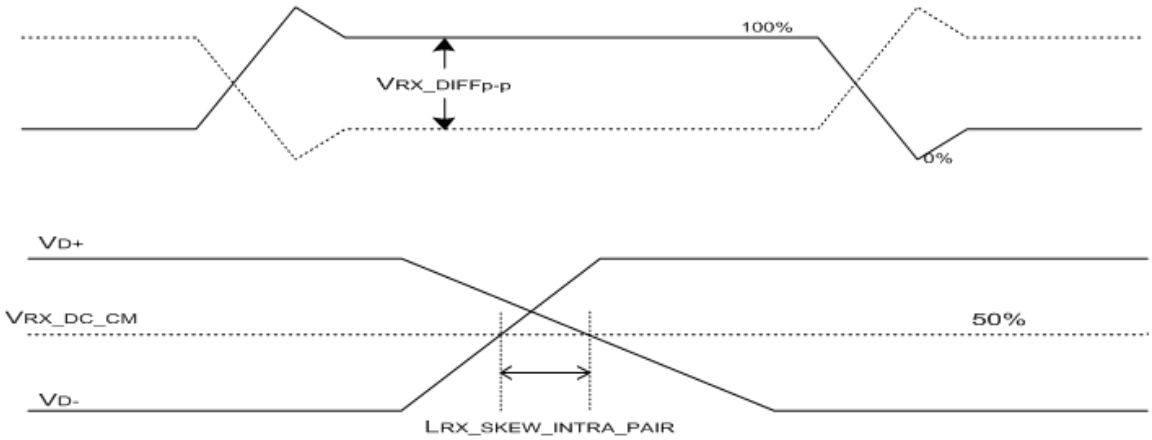


Figure 14. $V_{RX-DIFFp-p}$ & $L_{RX\_SKEW\_INTRA\_PAIR}$

7.0 POWER SEQUENCE

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence shall be as shown in below.

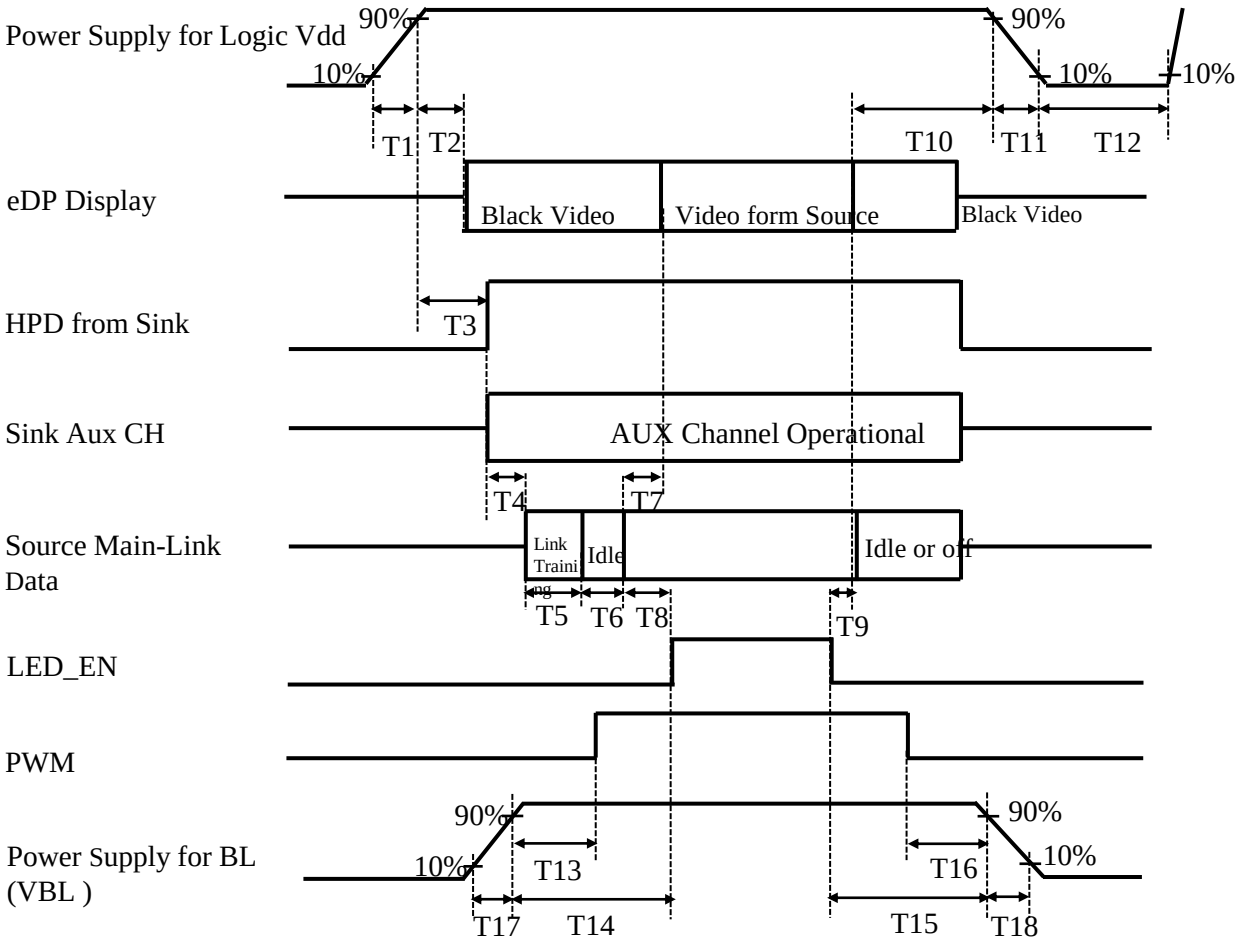


Figure 15. Power Sequence

- 0.5ms ≤ T1 ≤ 10 ms
- 0ms ≤ T2 ≤ 200 ms
- 0ms ≤ T3 ≤ 200 ms
- 0ms ≤ T13
- 0ms ≤ T14
- 0ms ≤ T17
- 80ms ≤ T8
- 0ms ≤ T7 ≤ 50ms
- 0ms ≤ T10 ≤ 500 ms
- 0.5ms ≤ T11 ≤ 10 ms
- 500ms ≤ T12
- 0ms ≤ T15
- 0ms ≤ T16
- 0ms ≤ T18

Notes:

1. When the power supply VDD is 0V, keep the level of input signals on the low or keep high impedance.
2. Do not keep the interface signal high impedance when power is on. Back Light must be turn on after power for logic and interface signal are valid.

8.0 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.

9.1 TFT LCD Module

< Table 11. Signal Connector >

Connector Name /Description	For Signal Connector
Manufacturer	STM
Type/ Part Number	IS050-L30B-C10(30P)
Mating Housing/ Part Number	MASK24037P9

9.0 MECHANICAL CHARACTERISTICS

9.1 Dimensional Requirements

Figure 23 shows mechanical outlines for the model EV133FHM-N40 V8.0
Other parameters are shown in Table 12.

<Table 12. Dimensional Parameters>

Parameter	Specification	Unit
Active Area	293.76 (H) x 165.24 (V)	mm
Number of pixels	1920 (H) X 1080 (V) (1 pixel = R + G + B dots)	pixels
Pixel pitch	153(H) ×153(V)	um
Pixel arrangement	RGB Vertical stripe	
Display colors	16.7G(8bit)	
Display mode	Normally Black	
Dimensional outline	300.56(H)*188.25(V) (w/PCB)*2.4 (max) 300.56(H)*177.69(V)*2.4 (max)	mm
Weight	215 (max)	g

10.2 Mounting

See Figure 20.

10.3 Anti-Glare and Polarizer Hardness.

The surface of the LCD has an Anti-Glare coating to minimize reflection and a coating to reduce scratching.

10.4 Light Leakage

There shall not be visible light from the back-lighting system around the edges of the screen as seen from a distance 50cm from the screen with an overhead light level of 350lux.

10.0 RELIABILITY TEST

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

<Table 13. Reliability Test>

No	Test Items	Conditions
1	High temperature storage test	Ta = 60˚C , 60%RH, 240 hrs
2	Low temperature storage test	Ta = -20˚C , 240 hrs
3	High temperature & high humidity operation test	Ta = 50˚C , 80%RH, 240 hrs
4	High temperature operation test	Ta = 50˚C , 60%RH, 240 hrs
5	Low temperature operation test	Ta = 0˚C , 240 hrs
6	Thermal shock	Ta = -20 ˚C ↔ 60 ˚C (0.5 hr), 60%±3%RH, 100 cycle
7	Vibration test (non-operating)	Ta = 25˚C , 60%RH, 1.5G, 10~500Hz, Half Sine X,Y,Z / Sweep rate : 1 hour
8	Shock test (non-operating)	Ta = 25˚C , 60%RH, 220G, Half Sine Wave 2msec ± X, ± Y, ± Z Once for each direction
9	Electro-static discharge test (non-operating)	Air : 150 pF, 330Ω, 15 KV Contact : 150 pF, 330Ω, 8 KV Ta = 25˚C , 60%RH,

11.0 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.

12.0 LABEL

(1) Product Label

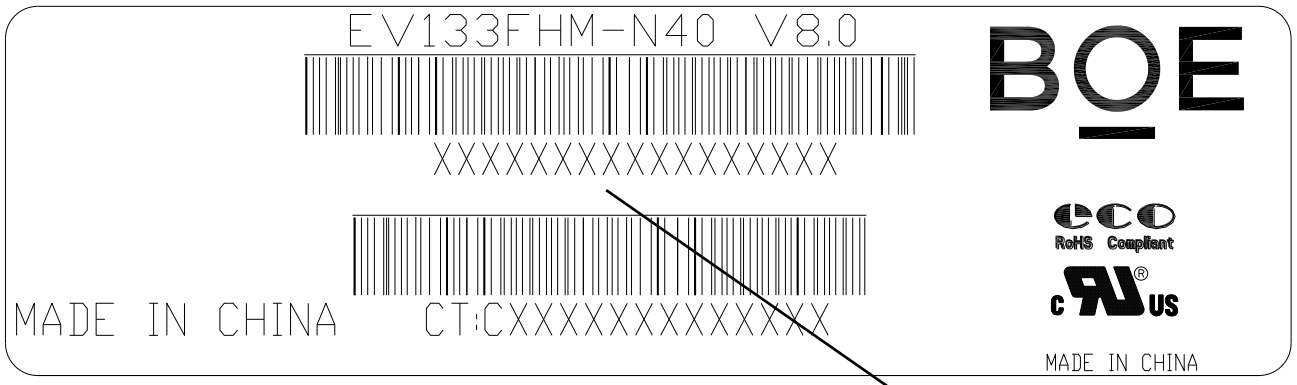


Figure 16. Product Label

Module ID Naming Rule:

<Table 14. Module ID Naming Rule>

Digit / Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Code	S	L	S	5	1	2	3	5	9	4	2	0	0	0	1	D	B
Description	Model Code /GBN		Grade	Line	Year		Month	Model Extension Code (Last 4 Digits Of FGCOD)				Serial No 00001-ZZZZZZ					

(2) High voltage caution label

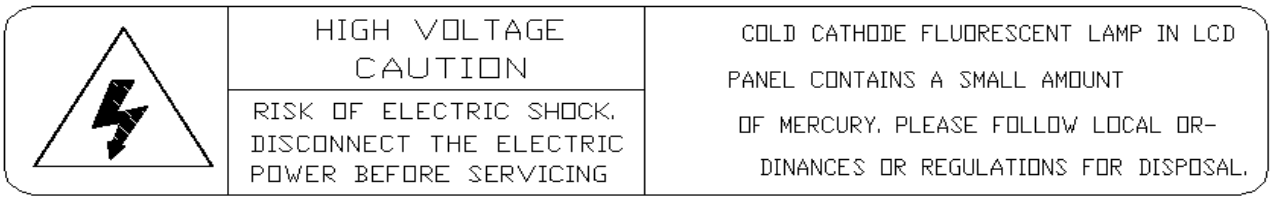


Figure 17. High Voltage Caution Label

(3) Box Label

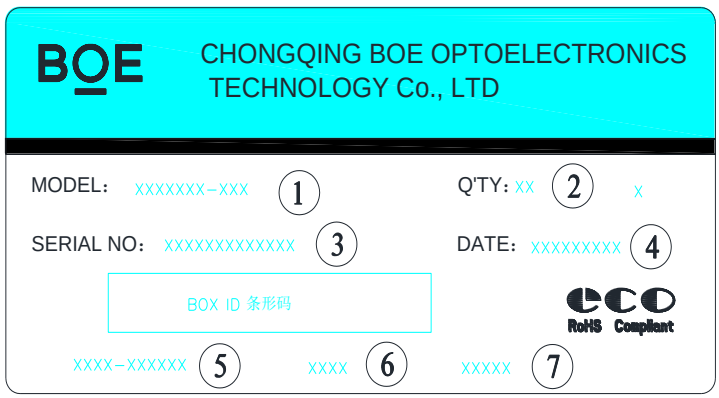


Figure 18. Box Label

Serial number marked part needs to print, show as follows:

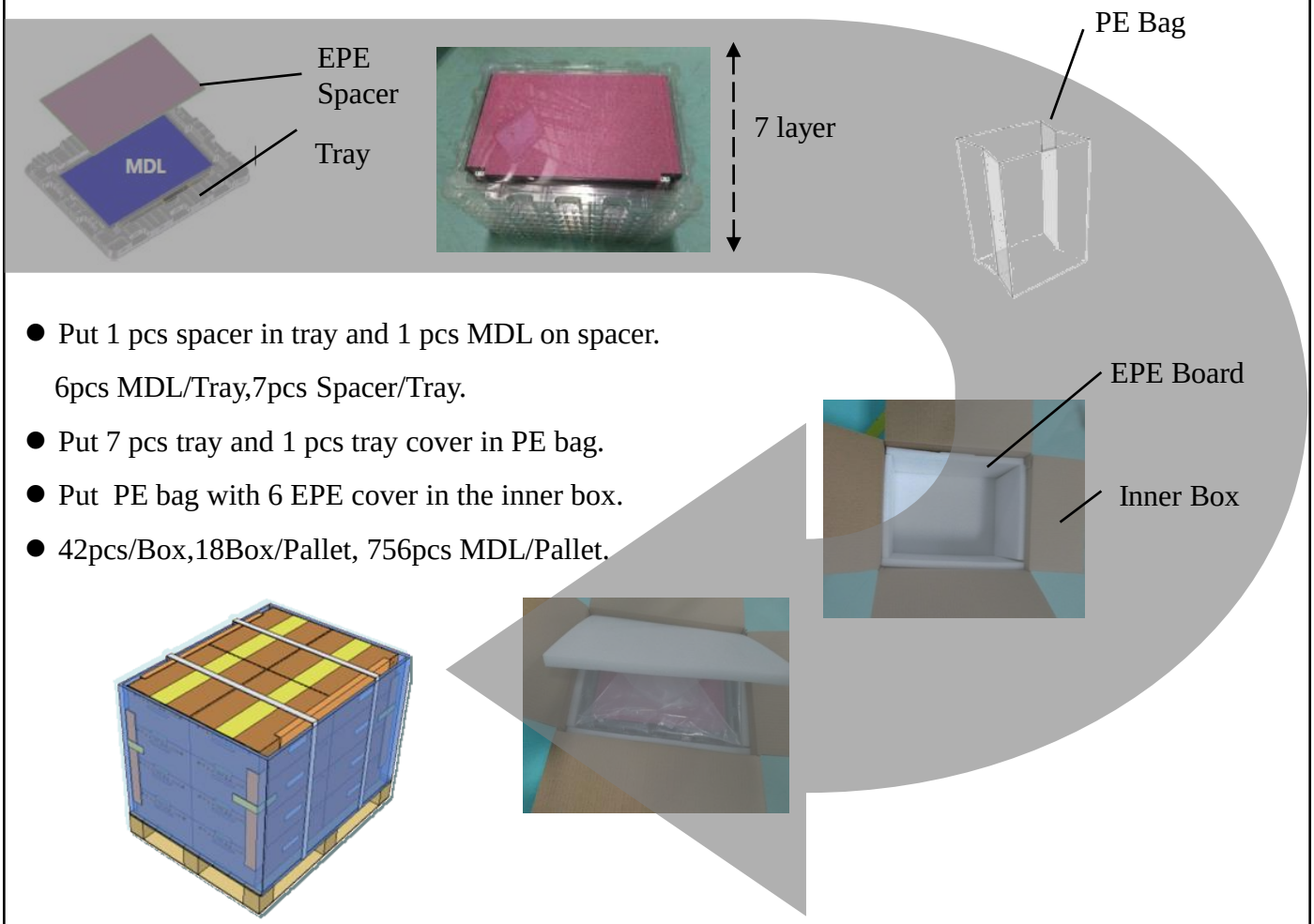
1. FG-CODE(Before 12 bit)
2. Product quantity
3. Box ID
4. Date
5. The client section material number(The client)---919668-L32
6. FG-Code After four ---8942
7. The supplier code
8. Total Size:100×50mm

<Table 15. Box Label Naming Rule >

Digit / Code	1	2	3	4	5	6	7	8	9	10	11	12	13
Code	S	L	S	F	1	2	3	D	0	0	0	6	8
Description	Products GBN		Grade	Line	Year		Month	Revision Code	Serial No				

13.0 PACKING INFORMATION

13.1 Packing Order



- Put 1 pcs spacer in tray and 1 pcs MDL on spacer.
  6pcs MDL/Tray,7pcs Spacer/Tray.
- Put 7 pcs tray and 1 pcs tray cover in PE bag.
- Put PE bag with 6 EPE cover in the inner box.
- 42pcs/Box,18Box/Pallet, 756pcs MDL/Pallet.

Figure 19. Packing Order

14.2 Note

- Box dimension: 480mm*350mm*285mm
- Package quantity in one box: 42pcs
- Total weight: 10.7kg/Box

14.0 MECHANICAL OUTLINE DIMENSION

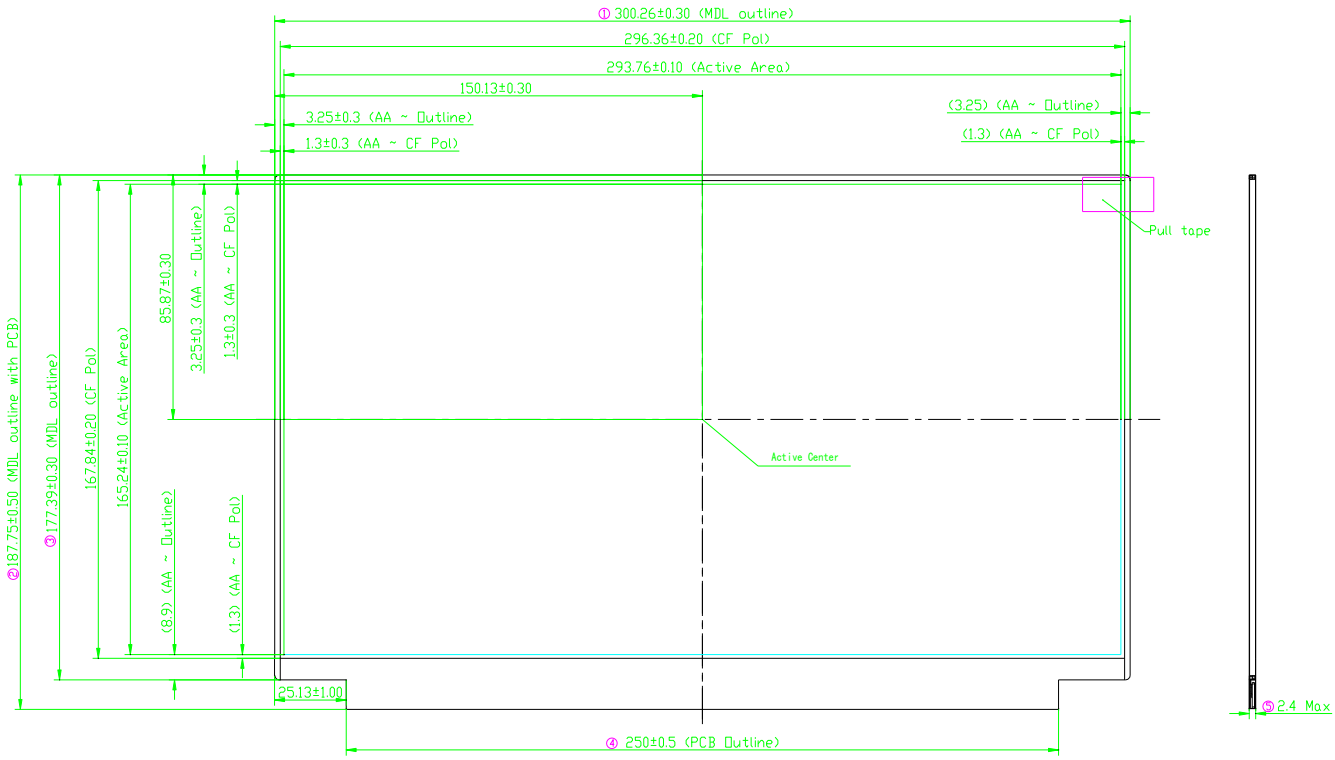


Figure 20. TFT-LCD Module Outline Dimension (Front View)

Note:

1. Top Polarizer is the highest part.
2. Curve Spec: 0<=d<=0.5mm.
3. No light leakage from all 4 corners of LCM.
4. Size Unit: mm.
5. General Tolerance:±0.3mm.
6. The MDL dimension measurement tool is a Vernier Caliper;

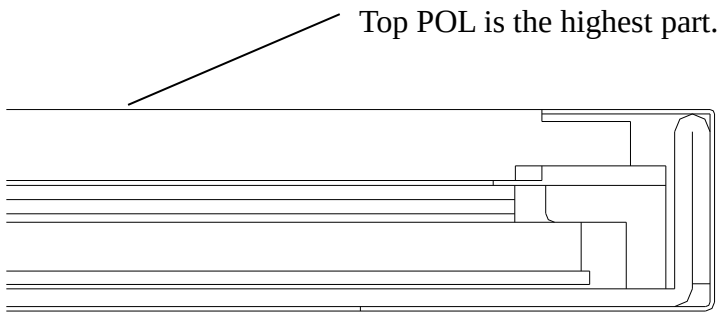


Figure 21. Highest Point Position

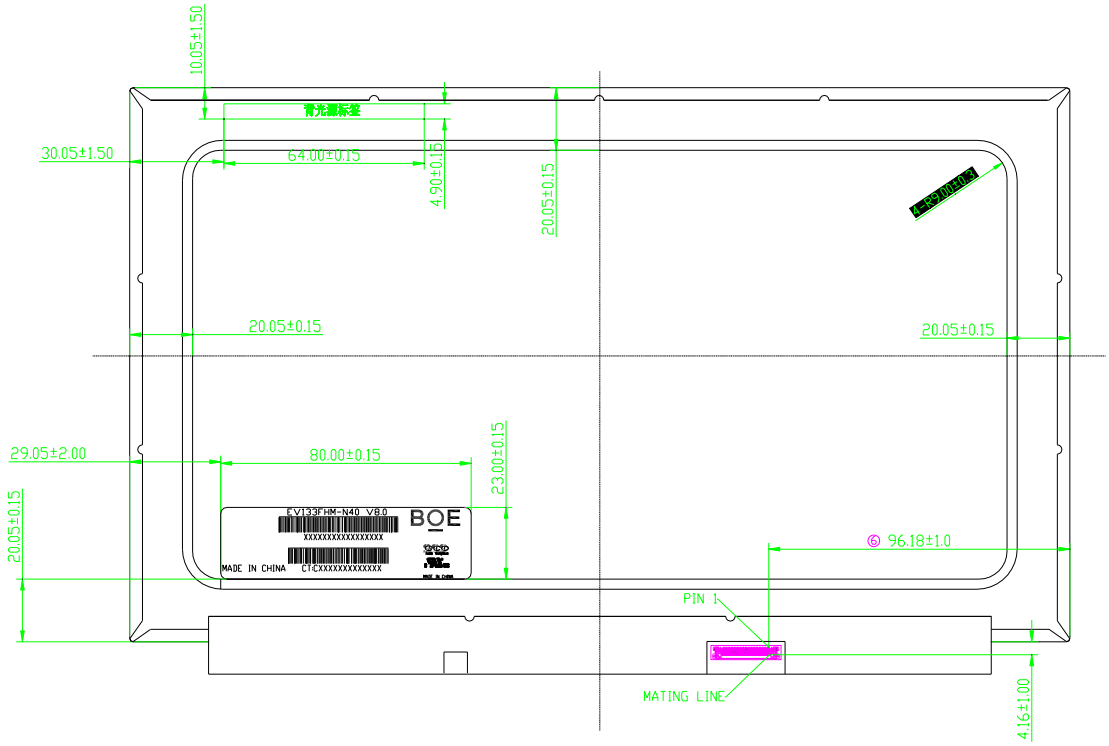


Figure 22. TFT-LCD Module Outline Dimensions (Rear view)

Note:

1. Top Polarizer is the highest part.
2. Curve Spec: 0<=d<=0.5mm.
3. No light leakage from all 4 corners of LCM.
4. Size Unit: mm.
5. General Tolerance: ±0.3mm.
6. The MDL dimension measurement tool is a Vernier Caliper;

15.0 EDID Table

Address (HEX)	Function	Hex	Dec	Input values.	Notes
00	Header	00	0	0	EDID Header
01		FF	255	255	
02		FF	255	255	
03		FF	255	255	
04		FF	255	255	
05		FF	255	255	
06		FF	255	255	
07		00	0	0	
08	ID Manufacturer Name	09	9	BOE	ID = BOE
09		E5	229		
0A	ID Product Code	E7	231	2535	ID = 2535
0B		09	9		
0C	32-bit serial No.	00	0	0	
0D		00	0	0	
0E		00	0	0	
0F		00	0	0	
10	Week of manufacture	1B	27	27	
11	Year of Manufacture	1E	30	2020	Manufactured in 2020
12	EDID Structure Ver.	01	1	1	EDID Ver 1.0
13	EDID revision #	04	4	4	EDID Rev. 0.4
14	Video input definition	95	149	-	
15	Max H image size	1D	29	29	29 cm (Approx)
16	Max V image size	10	16	17	17 cm (Approx)
17	Display Gamma	78	120	2.2	Gamma curve = 2.2
18	Feature support	02	2		RGB display, Preferred Timming mode
19	Red/Green low bits	11	17	-	Red / Green Low Bits
1A	Blue/White low bits	9C	156	-	Blue / White Low Bits
1B	Red x high bits	A6	166	0.651	Red (x) = 10100110 (0.651)
1C	Red y high bits	58	88	0.345	Red (y) = 01011000 (0.345)
1D	Green x high bits	54	84	0.328	Green (x) = 01010100 (0.328)
1E	Green y high bits	9F	159	0.622	Green (y) = 10011111 (0.622)
1F	Blue x high bits	26	38	0.151	Blue (x) = 00100110 (0.151)
20	BLue y high bits	0E	14	0.057	Blue (y) = 00001110 (0.057)
21	White x high bits	4D	77	0.301	White (x) = 01001101 (0.301)
22	White y high bits	55	85	0.334	White (y) = 01010101 (0.334)
23	Established timing 1	00	0	-	
24	Established timing 2	00	0	-	

25	Established timing 3	00	0	-	
26	Standard timing #1	01	1		Not Used
27		01	1		
28	Standard timing #2	01	1		Not Used
29		01	1		
2A	Standard timing #3	01	1		Not Used
2B		01	1		
2C	Standard timing #4	01	1		Not Used
2D		01	1		
2E	Standard timing #5	01	1		Not Used
2F		01	1		
30	Standard timing #6	01	1		Not Used
31		01	1		
32	Standard timing #7	01	1		Not Used
33		01	1		
34	Standard timing #8	01	1		Not Used
35		01	1		
36	Detailed timing/monitor descriptor #1	C0	192	147.8	147.84MHz Main clock
37		39	57		
38		80	128	1920	Hor Active = 1920
39		18	24	280	Hor Blanking = 280
3A		71	113	-	4 bits of Hor. Active + 4 bits of Hor. Blanking
3B		38	56	1080	Ver Active = 1080
3C		28	40	40	Ver Blanking = 40
3D		40	64	-	4 bits of Ver. Active + 4 bits of Ver. Blanking
3E		30	48	48	Hor Sync Offset = 48
3F		20	32	32	H Sync Pulse Width = 32
40		36	54	3	V sync Offset = 3 line
41		00	0	6	V Sync Pulse width : 6 line
42		24	37	294	Horizontal Image Size = 293.76 mm (Low 8 bits)
43		A5	165	165	Vertical Image Size = 165.24 mm (Low 8 bits)
44		10	16	-	4 bits of Hor Image Size + 4 bits of Ver Image Size
45		00	0	0	Hor Border (pixels)
46		00	0	0	Vertical Border (Lines)
47		1A	26	-	Refer to right table

48	Detailed timing/monitor descriptor #2	00	0	0	0MHz Main clock
49		00	0		
4A		00	0	0	Hor Active = 0
4B		00	0	0	Hor Blanking = 0
4C		00	0	-	4 bits of Hor. Active + 4 bits of Hor. Blanking
4D		00	0	0	Ver Active = 0
4E		00	0	0	Ver Blanking = 0
4F		00	0	-	4 bits of Ver. Active + 4 bits of Ver. Blanking
50		00	0	0	Hor Sync Offset = 0
51		00	0	0	H Sync Pulse Width = 0
52		00	0	0	V sync Offset = 0 line
53		00	0	0	V Sync Pulse width : 0 line
54		00	0	0	Horizontal Image Size = 0 mm (Low 8 bits)
55		00	0	0	Vertical Image Size = 0 mm (Low 8 bits)
56		00	0	-	4 bits of Hor Image Size + 4 bits of Ver Image Size
57		00	0	0	Hor Border (pixels)
58		00	0	0	Vertical Border (Lines)
59		00	0	-	
5A	Detailed timing/monitor descriptor #3	00	0		Indicates descriptor #3 is a display Descriptor
5B		00	0		
5C		00	0		Reserved
5D		FE	254		Tag：ASCII String
5E		00	0		Reserved
5F		42	66	B	Manufacture name : BOECQ
60		4F	79	O	
61		45	69	E	
62		20	32		
63		43	67	C	
64		51	81	Q	
65		0A	10		
66		20	32		
67		20	32		
68		20	32		
69		20	32		
6A		20	32		
6B		20	32		

6C	Detailed timing/monitor descriptor #4	00	0		Indicates descriptor #4 is a display Descriptor
6D		00	0		
6E		00	0		Reserved
6F		FE	254		Tag：ASCII String
70		00	0		Reserved
71		4E	69	E	Model name:EV133FHM-N40
72		56	86	V	
73		31	49	1	
74		33	51	3	
75		33	51	3	
76		46	70	F	
77		48	72	H	
78		4D	77	M	
79		2D	45	-	
7A		4E	78	N	
7B		36	54	4	
7C		32	50	0	
7D		0A	10	0	
7E	Extension flag	00	0	1	0 ：1個EDID；N-1：N个EDID
7F	Checksum	1C	28	28	

Incoming Inspection Spec Approval Sheet

Product Description： _____

___ Product Name:_____

Customer :_____

Customer Signature	Date	BOE Signature	Date

Record of Revision

Version	Issue Date	Content	Page
2	2018.12.29	Rev.2	ALL

Content

A: Incoming Inspection Specification

1.0 Introduction

1.1. Scope

This incoming Inspection Standard is limited to the TFT-LCD LCD which supplied by BOE Technology Group Co.,Ltd. (hereinafter called the "Supplier") to its Customer.

1.2. Incoming inspection Right

The buyer (customer) shall inspect the LCD within twenty days from receiving as inspection period at its own cost. The results of the inspection, acceptance or rejection shall be notified to Supplier .

The buyer may, under commercially reasonable reject procedures, reject an entire lot within inspection period, define unacceptable LCD number in accordance with incoming inspection standard. Should the buyer fail to notify the result of the inspection to supplier within the inspection period, the buyer's right to reject the LCD shall lapse and whole lot shall be deemed to have been accepted by the buyer.

1.3. Operation Instruction

1.3.1 Mounting Method

- As the panel of LCD which consists of two thin glasses with polarizers was easily get Damaged, please handling LCD cautiously。
- Excessive stress or pressure on the glass of the LCD should be avoided. Please insure that no torsional or compressive forces are applied to the LCD unit when it is mounted.
- Abnormal display may occur under press setting problem from customer, which does not mean the malfunction of the LCD and should be verified by both party.
- Optimum mounting angle was determined based on specified viewing angle range.
- Please assemble LCD module in accordance with the specification.
- Please mark condition of humiture.

1.3.2 Caution of LCD Handling and Cleaning

- Since the LCD is made of glass, do not apply strong mechanical impact or static load onto it. Handling with care since shock, vibration, and careless handling may seriously affect the product. If it falls from a high place or receives a strong shock, the glass may be broken.
- The polarizers on the surface of panel are made from organic substances. Be very careful for chemicals that not to touch the polarizers or it may leads the polarizers to be deteriorated.
- If the use of a chemical is unavoidable, use soft cloth with solvent（recommended below） to clean the LCD's surface with wipe lightly.
  -IPA(Isopropyl Alcohol),Ethyl Alcohol, Trichlorotriflorothane
- Do not wipe the LCD's surface with dry or hard materials that will damage the polarizers

and others. Do not use the following solvent.
-Water, Ketone, Aromatics

- It is recommended that the LCD be handled with soft material during assembly, etc. The polarizers on the LCD's surface are vulnerable to scratch and thus to be damaged by sharp particles.
- Do not drop water or any chemicals onto the LCD's surface.
- A protective film is supplied on the LCD and should be left in place until the LCD is required for operation.
- The ITO pad area needs special careful caution because it could be easily corroded. Do not contact the ITO pad area with HCFC, Soldering flux, Chlorine, Sulfur, saliva or fingerprint. To prevent the ITO corrosion, customers are recommended that the ITO area would be covered by UV or silicon.
  LCD should be stored in static-protective & vacuum polythene bag, please assemble it When it expose to the air within 3 days to avoid ITO corrosion
- Please clean the LCD without ultrasonic to avoid line open.
- Temperature of clean and bake should be less than 80℃.

1.3.3 Caution Against Static Charge

- The LCD modules use C-MOS LSI drivers, so customers are recommended that any unused input terminal would be connected to Vdd or Vss, do not input any signals before power is turn on, and ground you body, work/assembly area, assembly equipments to protect against static electricity.
- Remove the protective film slowly, keeping the removing direction approximate 30-degree not vertical from panel surface, if possible, under ESD control device like ion blower, and the humidity of working room should be kept over 50%RH to reduce the risk of static charge.
- Avoid the use work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.
- In handling the LCD, wear non-charged material gloves. And the conducting wrist to the earth and the conducting shoes to the earth are necessary.

1.3.4 Caution For operation

- It is indispensable to drive the LCD within the specified voltage limit since the higher Voltage than the limit causes the shorter LCD's life. An electro-chemical reaction due to DC causes undesirable deterioration of the LCD so that the use of DC drive should avoid.
- Do not connect or disconnect the LCD to or from the system when power is on.
- Never use the LCD under abnormal conditions of high temperature and high humidity.
- When expose to drastic fluctuation of temperature(hot to cold or cold to hot），the LCD may be affected; specifically, drastic temperature fluctuation from cold to hot ,produces dew on the LCD's surface which may affect the operation of the polarizer and the LCD.
- Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD may turn black at

temperature above its operational range. However those phenomena do not mean malfunction or out of order with the LCD. The LCD will revert to normal operation once the temperature returns to the recommended temperature range for normal operation.

- Do not display the fixed pattern for a long time because it may develop image sticking due to the LCD structure. If the screen is displayed with fixed pattern, use a screen saver.
- Static electricity (ESD) will damage the panel,. Please make sure that operators wear static-protective glove effectively and working tables &device are effectively grounded during operation and other ESD protective method
- Please place LCD on the tray provided by BOE while moving it, in order to avoid mechanical damage.
- LCD should be stored in required humidity. Low humidity may add static, while high humidity may corrode the ITO circuit of LCD product.
- Before use the LCD. Please check the Engineering specification.
- Please keep the LCD in the specified, original packing boxes when storage.
- LCD contain a small amount of Liquid Crystal and Mercury. Please follow local ordinances or regulations for disposal.
- DO NOT press the area covered with PET or such materials. These are weak point of LCD since of TCPs (Driver ICs) and PWBs.
- Please DO NOT touch the surface of glass (Polarizer).

2.0 Generals

2.1. Sampling Method

Unless otherwise agreed upon in writing ,the sampling inspection shall be applied to the customer's Incoming inspection.

2.1.1. Lot Size: 1 pallet per same model;

2.1.2. Sampling type: Random sampling;

2.1.3. Inspection level: II

2.1.4. Sampling table: MIL-STD-105E

Major Defect: AQL=0.65

Minor Defect: AQL=1.5

2.2. Inspection Environment

2.2.1.Inspection environment conditions:

a. Room temperature: 23±2 ℃;

b. Humidity: 60 ± 10% RH;

c. Inspection Ambient Illumination : 300~700 Lux (150~250 Lux for function test);

2.2.2. Viewing Distance

The distance between the panel and the inspector's eyes shall be at 30CM~50CM;

2.2.3. Viewing Angle

performing in front of the panel All directions for inspecting the sample should be:

ADS Production： within 10º to perpendicular line.;

2.2.4. Inspection Area :

Display Area (Active Area)

2.3. Main Defect Definitions

2.3.1 Black / White Spots

Points on display which appear Black/ white at L0/L127/L255 .

2.3.2. Dark / Bright Lines

Lines on display which appear dark/bright at R/G/B. such as vertical, horizontal, or cross lines.

2.3.3. Bright Dot Defects

Dots(sub-pixels) on display which appear bright in the display area at R/G/B.

2.3.4. Dark Dot Defects

Dots(sub-pixels) on display which appear dark in the display area at R,G,B Color Pattern.

2.3.5. Mura

Mura on display which appears darker / brighter against background brightness on parts of display area at L0/L127/L255

2.3.6. Visual Inspection

Inspect PNL in operation

2.3.7. Appearance Inspection

External inspection for Panel in Non Operation

3.0 Inspection Criteria

3.1. Visual Inspection Criteria

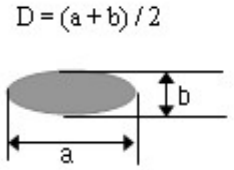
Dimensional unit: mm

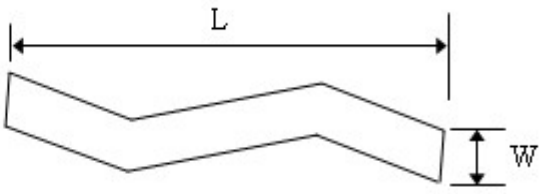
Items		Details	Inspection Criteria		Type
			A Area	B/C Area	
Visual (Function) Inspection	Foreign Material /Dent/ Bubble/ Spots//Extraneous Substances/Dot	Circular Type	D≤0.2,Ignore 0.2<D≤0.5,N≤2	Ignore	Minor
		Linear Type	W≤0.03,Ignore 0.03<W ≤0.10,1 < L≤5,N≤3		
	Pixel Defects	Bright Dot	N≤0	Ignore	Major
		Dark Dot	N≤5		
		Bright + Dark Dot	N≤5		
		2S	N≤3		
	Line Defects	Bright Line, Dark Line	Not Allowed		
	No Display		Not Allowed		
	Abnormal Display		Not Allowed		
	Mura		5%ND not visible, or reference limit samples		Minor

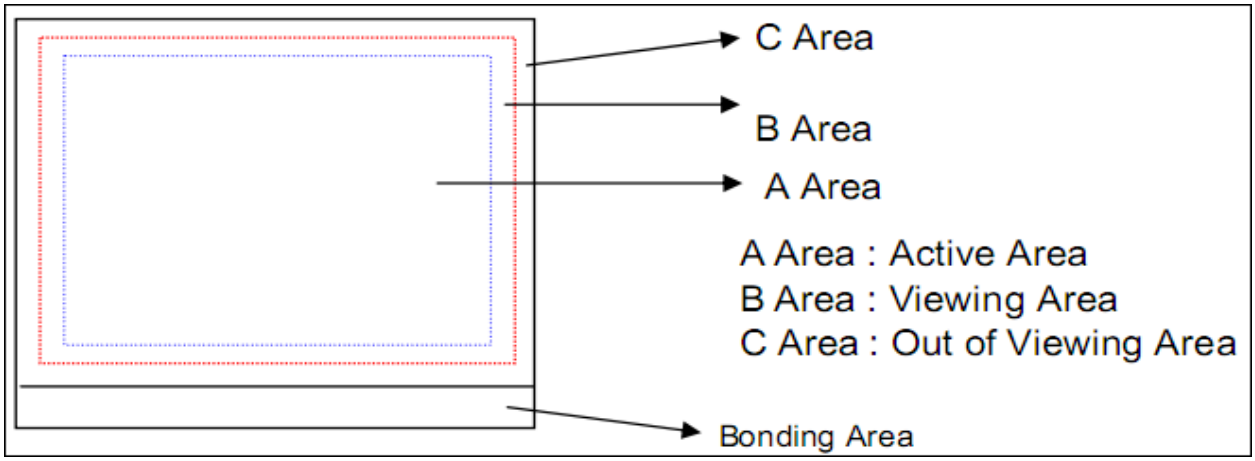
Remark: The determination of all defects is based on the panel with Polarizer.

※ Note 1) D = Diameter, L = Length, W = Width, N = Number

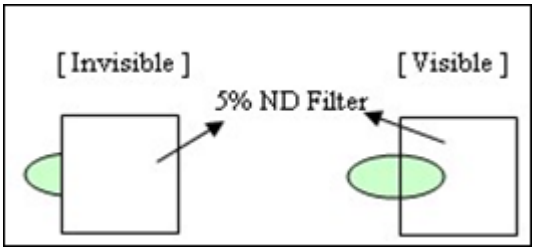
※ Note 2) Definition of the Area A Area: Display area B/C Area: No display area





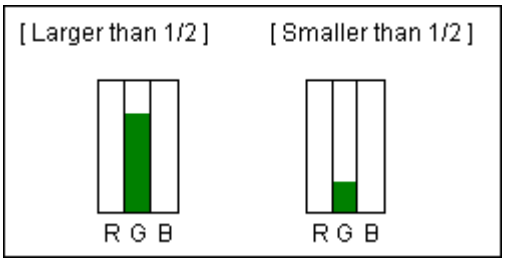


※Note 3) For pixel defect, dot means a sub-pixel. Dot defects should be larger than half size of a sub-pixel. Dot which is invisible through 5% ND filter or smaller than 1/2 of sub-pixel size will not counted as "1 dot" defect.



"No dot defect" (=ignored)

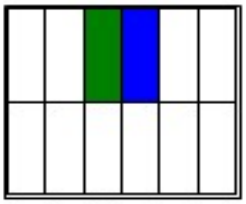
"1 dot defect" (=counted)



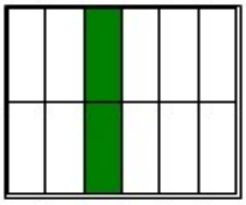
"1 dot defect" (=counted)

"No dot defect" (=ignored)

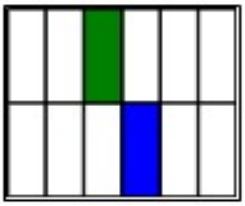
[2 adjacent dots defect]



Type 1

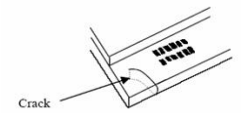
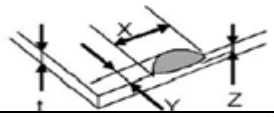
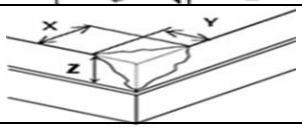
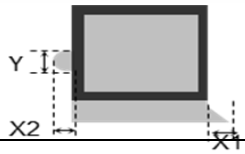
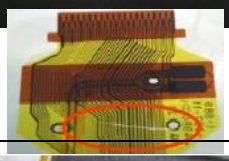
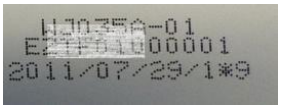


Type 2



Type 3

3.2. Appearance Inspection Criteria

location	Items	Criterion for Defects		Type	scope
All	Stain		Removable stain is OK	-	All
Be related to PNL	Crack		Not Allowed	Major	Shipment status：Single Cell/FOG /MDL Production
	Side Chipping		Function and assembly are not affected	Minor	
	Corner Chipping		Function and assembly are not affected	Minor	
	Burr		Function and assembly are not affected	Minor	
	Scratch		PNL with POL，based on point/line foreign (scratch) standard to determine,	Minor	
Be related to FPC/PCB	short circuit / open circuit		Not Allowed	Major	Shipment status：FOG/MDL Production
	components and parts		Component missing is not allowed	Minor	
Be related to Backlight	Code-spurting		Key information can be identified is OK	Minor	Shipment status：MDL Production
	Scratch		Limit Sample	Minor	
	Stain		Removable stain is OK	Minor	

Bezel	Scratches / dents	-	Function and assembly are not affected,	Minor
POL	Deviation	-	No access to AA area No access to glass edge	Minor
	Dirty	-	Erasable ok	Minor
	POL Bubble Line	-	Distance from AA area ≥0.65mm	Minor
	Scratch/Dent	-	Followed Circular/Linear spec	Minor

B : BOE Customer Quality Service Process

In order to provide better service to Customer, BOE shall apply the after-sales product quality service process as below:

1.0. According to the P/O from Customer, BOE should deliver required product to the place appointed by Customer.

2.0. Customer will do IQC for the incoming product.

3.0. Inspection standard should be provided by BOE, and it will be valid after confirmed by Customer. Inspection and Defects determination should be carried out according to the standard agreed by both Parties.

4.0. In order to guarantee in-time communication of product quality information and effective service, QA staff on Customer side should send Weekly Quality Report to the appointed CS staff in BOE.

5.0.. BOE should cooperate with Customer for special quality requirement.

6.0. After confirmed by both side, BOE should be responsible for the defect products which caused by its quality problem.

7.0.. Customer should use the LCD product according to the instruction. BOE will not be responsible for the defect product caused by violation of Users' Instruction.

8.0. Both parties should deal with the quality problem with friendly cooperative policy. And both parties should negotiate to deal with the defect products of which the responsibility is not very clear.

9.0. The warranty of the product is 12 months after the delivery date.

The warranty will be avoided in cases of below:

a. When the warranty period is expired.

b. When the LCMs were repaired by 3rd party without Supplier's approval.

c. When the LCMs were treated like disassemble and rework by the Customer and/or customer's representatives without Supplier's approval.

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