

TITLE:**HV320FHB-N00 Preliminary Product Specification**

BEIJING BOE DISPLAY TECHNOLOGY

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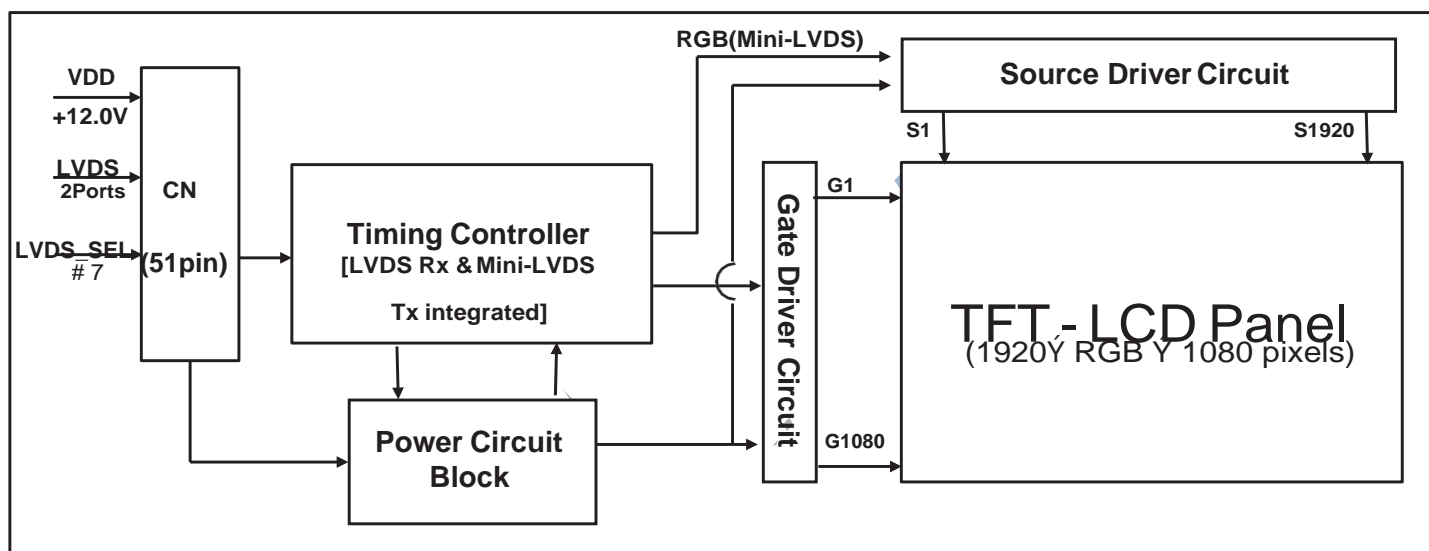
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1.0 GENERAL DESCRIPTION

1.1 Introduction

HV320FHB-N00 is a color active matrix TFT LCD open cell using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This open cell has a 31.51 inch diagonally measured active area with FHD 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 open cell can display 16.7M colors. The TFT-LCD panel used for this open cell is adapted for a low reflection and higher color type.



1.2 Features

- LVDS interface with 2 pixel / clock
- High-speed response
- Low color shift image quality
- 8-bit color depth, display 16.7M colors
- High luminance and contrast ratio, low reflection and wide viewing angle
- DE (Data Enable) only mode
- ADSDS technology is applied for high display quality
- RoHS compliant

1.3 Application

- Home Alone Multimedia TFT-LCD TV
- Display Terminals for Control System
- High Definition TV(FHD TV)
- AV application Products

1.4 General Specification

< Table 1. General Specifications >

Parameter	Specification	Unit	Remark
Active area	698.4(H) × 392.85 (V)	mm	
Number of pixels	1920(H) × 1080(V)	pixels	
Pixel pitch	121.25(H) × RGB × 363.75(V)	?	
Pixel arrangement	Pixels RGB Vertical stripe		
Display colors	16.7M(8bits-true)	colors	
Display mode	Transmission mode, Normally Black		
Dimensional outline	726.4(H) × 420.9(V) × 13.1(D) typ	mm	Detail refer to drawing
Weight	3750	gram	CM
Power Consumption	34	Watt	CM
Surface Treatment	Haze 1%		
Back-light	ower side 2- ED ight bar Type		

2.0 ABSOLUTE MAXIMUM RATINGS

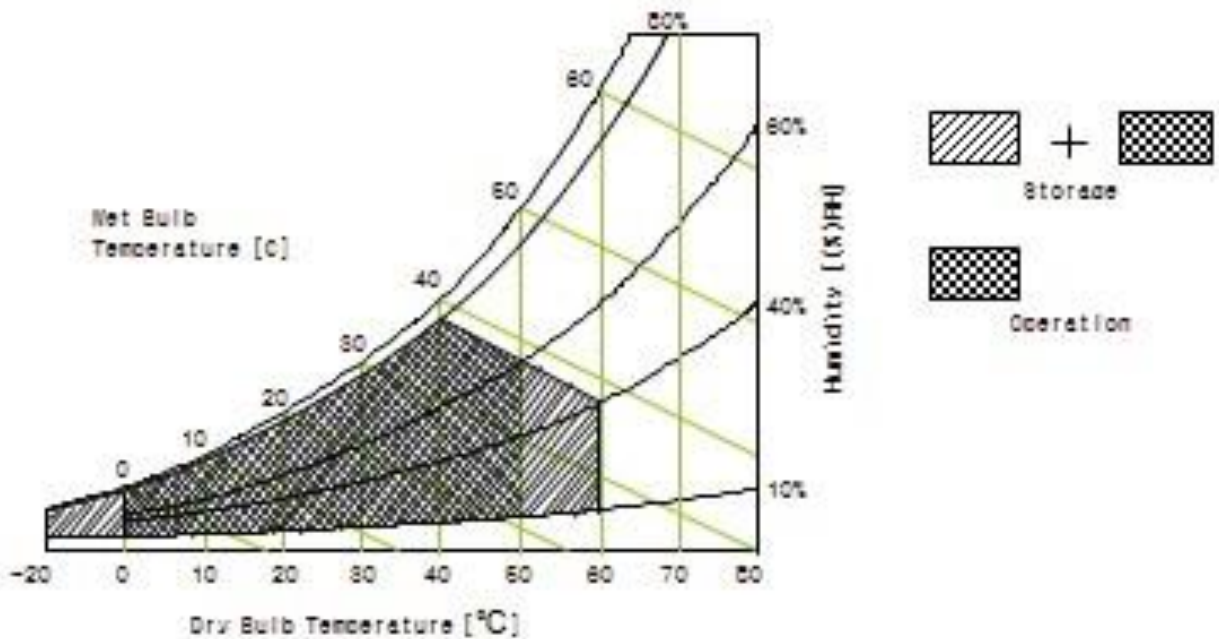
The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2.

< Table 2. Open Cell Electrical Specifications >

[VSS=GND=0V]

Parameter	Symbol	Min.	Max.	Unit	Remark
Power Supply Voltage	VDD	VSS-0.3	13.2	V	Ta = 25 °C
Operating Temperature	T _{OP}	0	+50	°C	Note 1
	T _{SUR}	0	+60	°C	
Storage Temperature	T _{ST}	-20	+60	°C	
Operating Ambient Humidity	Hop	10	80	%RH	
Storage Humidity	Hst	10	80	%RH	

Note 1 : Temperature and relative humidity range are shown in the figure below.
Wet bulb temperature should be 39 °C max. and no condensation of water.



3.0 ELECTRICAL SPECIFICATIONS

3.1 TFT LCD Open Cell

< Table 3. Open Cell Electrical Specifications >

[Ta = 25°C]

Parameter	Symbol	Values			Unit	Remark	
		Min	Typ	Max			
Power Supply Input Voltage	VDD	10.8	12	13.2	Vdc		
Power Supply Ripple Voltage	VRP			300	mV		
Power Supply Current	IDD	-	333	592	mA	Note 1	
Power Consumption	PDD		4.0	7.1	Watt		
Rush current	IRUSH	-	-	3.0	A	Note 2	
LVDS Interface	Differential Input High Threshold Voltage	VLVTH	+100		+300	mV	
	Differential Input Low Threshold Voltage	VLVTL	-300		-100	mV	
	Common Input Voltage	VLVC	1.0	1.2	1.4	V	
CMOS Interface	Input High Threshold Voltage	VIH	2.7	-	3.3	V	
	Input Low Threshold Voltage	VIL	0	-	0.6	V	

Note 1 : The supply voltage is measured and specified at the interface connector of LCM.

The current draw and power consumption specified is for VDD=12.0V,

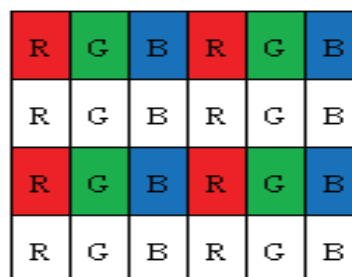
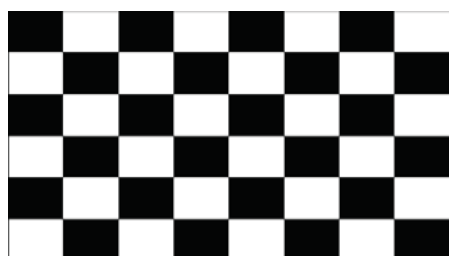
Frame rate $f_v=60\text{Hz}$ and Clock frequency = 75.4MHz.

Test Pattern of power supply current

a) Typ : Mosaic 8 x 6 Pattern(L0/L255)

b) Max : H- Stripe

Pattern(L0/L255)



Note 2 : The duration of rush current is about 2ms and rising time of Power Input is 1ms(min)

4.0 INTERFACE CONNECTION

4.1 Module Input Signal & Power

- Connector : IS050-C51B-C39-S (UJU) / FI-RE51S-HF-R1500 (JAE) or Equivalent.

< Table 4. Open Cell Input Connector Pin Configuration >

Pin No	Symbol	Description	Pin No	Symbol	Description
1	NC	No Connection	21	GND	Ground
2	SDA	I ² C Data	22	CH1[3]-	First pixel negative LVDS differential data input. Pair3
3	SCL	I ² C Clock	23	CH1[3]+	First pixel positive LVDS differential data input. Pair3
4	NC	Not Connected	24	NC	Not Connected
5	NC	Not Connected	25	NC	Not Connected
6	NC	Not Connected	26	NC	Not Connected
7	SELLVDS	High: JEIDA Low or Open: NS	27	NC	Not Connected
8	NC	Not Connected	28	CH2[0]-	Second pixel negative LVDS differential data input. Pair0
9	NC	Not Connected	29	CH2[0]+	Second pixel positive LVDS differential data input. Pair0
10	NC	Not Connected	30	CH2[1]-	Second pixel negative LVDS differential data input. Pair1
11	GND	Ground	31	CH2[1]+	Second pixel positive LVDS differential data input. Pair1
12	CH1[0]-	First pixel negative LVDS differential data input. Pair0	32	CH2[2]-	Second pixel negative LVDS differential data input. Pair2
13	CH1[0]+	First pixel positive LVDS differential data input. Pair0	33	CH2[2]+	Second pixel positive LVDS differential data input. Pair2
14	CH1[1]-	First pixel negative LVDS differential data input. Pair1	34	GND	Ground
15	CH1[1]+	First pixel positive LVDS differential data input. Pair1	35	CH2CLK-	First pixel negative LVDS clock
16	CH1[2]-	First pixel negative LVDS differential data input. Pair2	36	CH2CLK+	First pixel positive LVDS clock
17	CH1[2]+	First pixel positive LVDS differential data input. Pair2	37	GND	Ground
18	GND	Ground	38	CH2[3]-	Second pixel negative LVDS differential data input. Pair3
19	CH1CLK-	First pixel negative LVDS clock	39	CH2[3]+	Second pixel positive LVDS differential data input. Pair3
20	CH1CLK+	First pixel positive LVDS clock			

Pin No	Symbol	Description	Pin No	Symbol	Description
40	NC	Not Connected	46	GND	Ground
41	NC	Not Connected	47	NC	Not Connected
42	NC	Not Connected	48	VCC	Input Voltage +12V
43	NC	Not Connected	49	VCC	Input Voltage +12V
44	GND	Ground	50	VCC	Input Voltage +12V
45	GND	Ground	51	VCC	Input Voltage +12V

- Notes :
1. NC(Not Connected) : This pins are only used for BOE internal operations.
 2. Input Level of LVDS signal is based on the IEA 664 Standard.
 3. LVDS_SEL : This pin is used for selecting LVDS signal data format.
 If this Pin : High (3.3V) @JEIDA LVDS format
 Otherwise : Low (GND) or Open (NC) @ Normal NS LVDS format

Rear view of LCM



BIST Pattern



5.0 SIGNAL TIMING SPECIFICATION

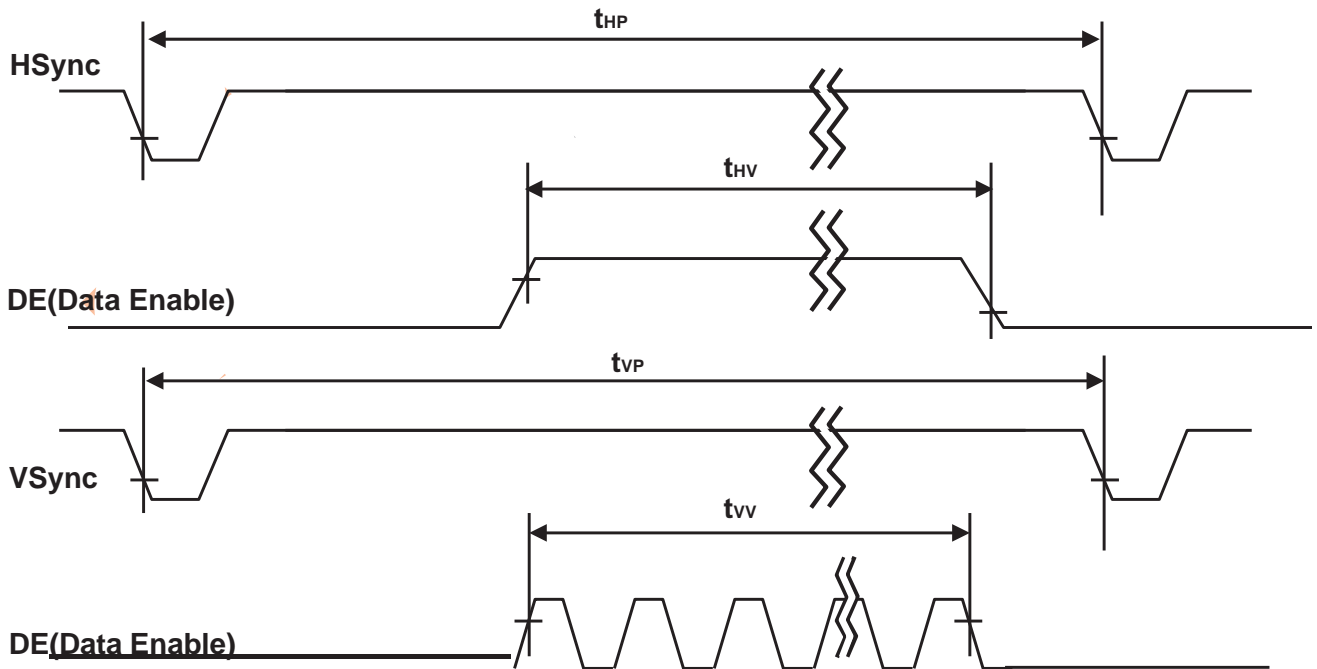
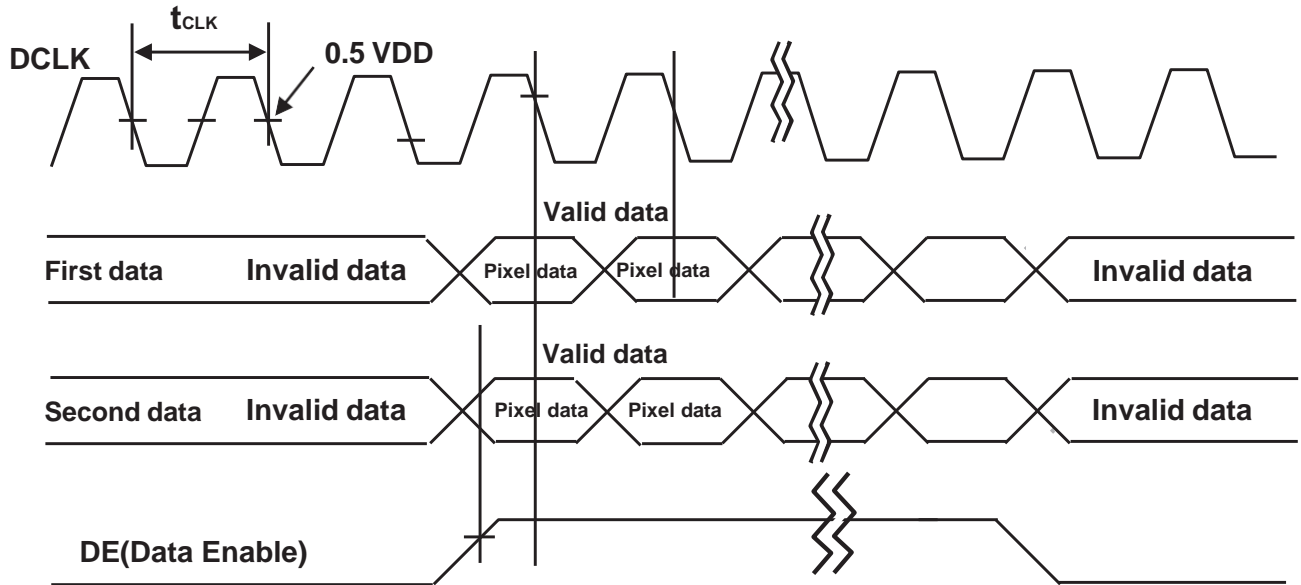
5.1 Timing Parameters (DE only mode)

< Table 6. Timing Table >

Item		Symbols	Min	Typ	Max	Unit	
Clock	Frequency	1/Tc	63	74.25	78	MHz	
	High Time	Tch	-	4/7Tc	-		
	Low Time	Tcl	-	4/7Tc	-		
Frame Period		Tv	1100 (1308)	1125 (1350)	1149 (1380)	lines	
			57 (47)	60 (50)	63 (53)	Hz	
Horizontal Active Display Term		Valid	t _{HV}	-	960	-	t _{CLK}
		Total	t _{HP}	1060	1100	1200	t _{CLK}
Vertical Active Display Term		Valid	t _{VV}	-	1080	-	t _{HP}
		Total	t _{VP}	1100	1125	1149	t _{HP}

Notes: This product is DE only mode. The input of Hsync & Vsync signal does not have an effect on normal operation.

5.2 Signal Timing Waveform



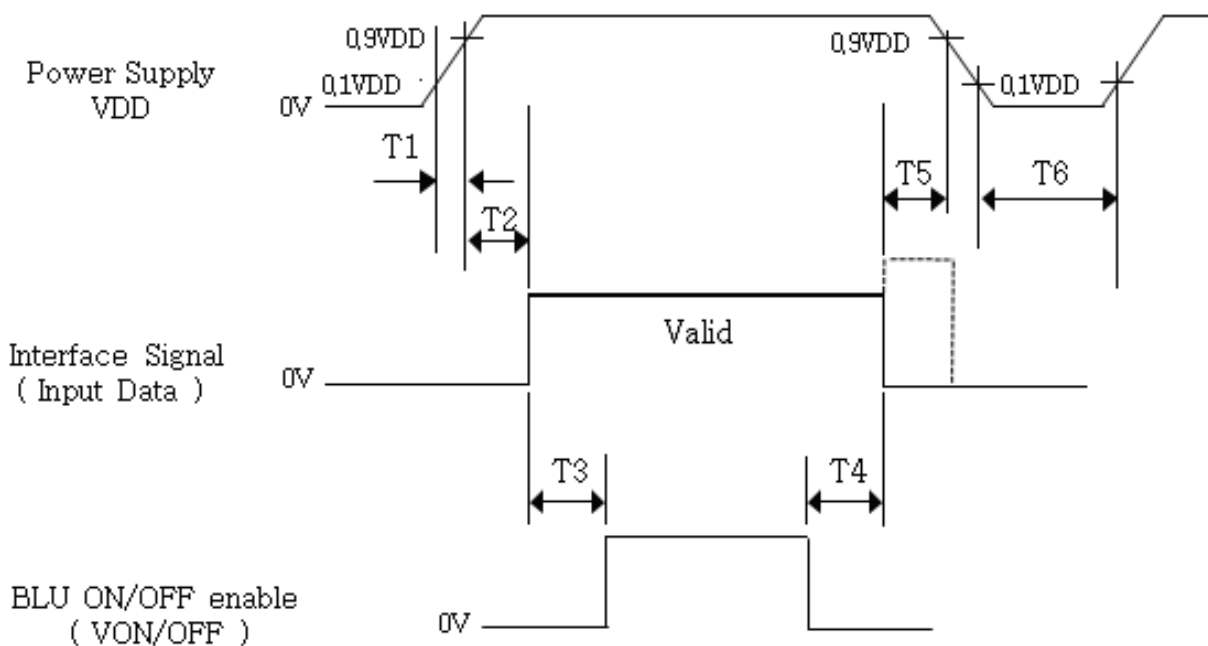
5.3 Input Signals, Basic Display Colors and Gray Scale of Colors

< Table 7. Input Signal and Display Color Table >

Color & Gray Scale		Input Data Signal																							
		Red Data								Green Data								Blue Data							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale of Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	□	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Darker	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	□	↑								↑								↑							
	☉	↓								↓								↓							
	Brighter	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	☉	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	□	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
	□	↑								↑								↑							
	☉	↓								↓								↓							
	Brighter	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	☉	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale of Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	□	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
	□	↑								↑								↑							
	☉	↓								↓								↓							
	Brighter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	☉	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Gray Scale of White	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	□	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	
	Darker	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	
	□	↑								↑								↑							
	☉	↓								↓								↓							
	Brighter	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1
	☉	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

5.4 Power Sequence

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



< Table 8. Sequence Table >

Parameter				Units
	Min	Typ	Max	
T1	0.5	-	20	ms
T2	10	-	100	ms
T3	200	-	-	ms
T4	200	-	-	ms
T5	0	-	-	ms
T6	1	-	-	s

Notes: 1. Back Light must be turn on after power for logic and interface signal are valid.

2. Even though T1 is out of SPEC, it is still ok if the inrush current of VDD is below the limit.

6.0 OPTICAL SPECIFICATIONS

The test of optical specifications shall be measured in a dark room (ambient luminance ≤ 1 lux and temperature $=25 \pm 2 \text{ }^\circ\text{C}$) with the equipment of Luminance meter system (Goniometer system and PR730) 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 $\theta_{\phi=0}$ ($=\theta_3$) as the 3 o'clock direction (the "right"), $\theta_{\phi=90}$ ($=\theta_{12}$) as the 12 o'clock direction ("upward"), $\theta_{\phi=180}$ ($=\theta_9$) as the 9 o'clock direction ("left") and $\theta_{\phi=270}$ ($=\theta_6$) as the 6 o'clock direction ("bottom"). While scanning θ and/or ϕ , the center of the measuring spot on the Display surface shall stay fixed. The measurement shall be executed after 30 minutes warm-up period. VDD shall be 12.0V +/-10% at 25°C. Optimum viewing angle direction is 6 o'clock.

< Table 9. Optical Table >

[VDD = 12.0V, Frame rate = 60Hz, Ta = 25 - 2 °C]

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Remark
Viewing Angle	Horizontal	Θ_3	CR > 10		89		Deg.	Note 1
		Θ_9			89		Deg.	
	Vertical	Θ_{12}			89		Deg.	
		Θ_6			89		Deg.	
Contrast ratio		CR		900:1	1200:1	-		Note 2
Reproduction of color	White	W_x	$\Theta = 0^\circ$ (Center) Normal Viewing Angle	TYP. - 0.03	0.269	TYP. + 0.03		Note 3 (With BOE BLU)
		W_y			0.271			
	Red	R_x			0.620			
		R_y			0.346			
	Green	G_x			0.318			
		G_y			0.634			
	Blue	B_x			0.154			
		B_y			0.037			
Response Time	G to G	T_g		-	8	10	ms	Note 4
Gamma Scale				2.0	2.2	2.4		
Cell Transmittance					5.0		%	Note 5

Note :

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing 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.
2. Contrast measurements shall be made at viewing angle of 0= 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 shown in Appendix) Luminance Contrast Ratio (CR) is defined mathematically.

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

3. The color chromaticity coordinates specified in Table 9 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. The BLU is used by BOE.
4. Response time Tg is the average time required for display transition by switching the input signal as below table and is based on Frame rate fV =60Hz to optimize.
Each time in below table is defined as Figure 2 and shall be measured by switching the

Measured Response Time	Target																
	0	15	31	47	63	79	95	111	127	143	159	175	191	207	223	239	255
Start	0																
	15																
	31																
	47																
	63																
	79																
	95																
	111																
	127																
	143																
	159																
	175																
	191																
	207																
	223																
	239																
	255																

5. Definition of Transmittance (T%) :

Module is with white(L255) signal input

$$\text{Transmittance} = \frac{\text{Luminance of LCD Module}}{\text{Luminance of BLU}} \times 100\%$$

7.0 Reliability Test Condition

< Table 10. Reliability Test Condition >

Item	Test Condition
High-Temp/STG	Ta = 60 ℃, 240 hrs
Low-Temp/STG	Ta = -20 ℃, 240 hrs
High-Temp/HMD	Ta = 50 ℃, 80%RH, 240hrs
High-Temp/OP	Ta = 50 ℃, 240hrs
Low-Temp/OP	Ta = 0 ℃, 240hrs
TST	Ta = -20 ℃ ↔ 60 ℃ (0.5 hr), 100 cycle

8.0 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.

9.0 PRODUCT SERIAL NUMBER

HR230WU3-400



XXXXXXXXXXXXXXXXXXXXXXXXXXXX



- 1. Control Number
- 2. Rank / Grade
- 3. Line Classification
- 4. Year (2001 : 01, 2002 : 02, ...)

- 5. Month (1,2,3, ... , 9, X, Y, Z)
- 6. Internal Use
- 7. Serial Number

10.0 Packing

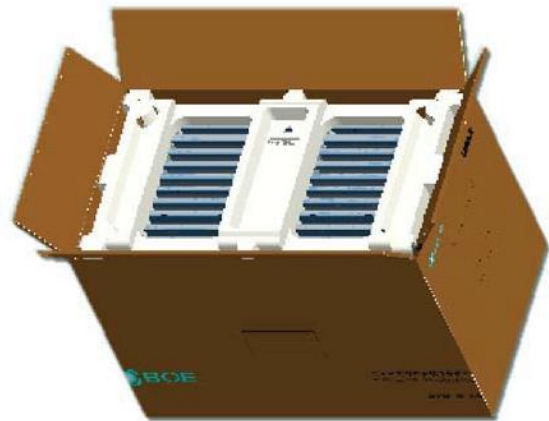
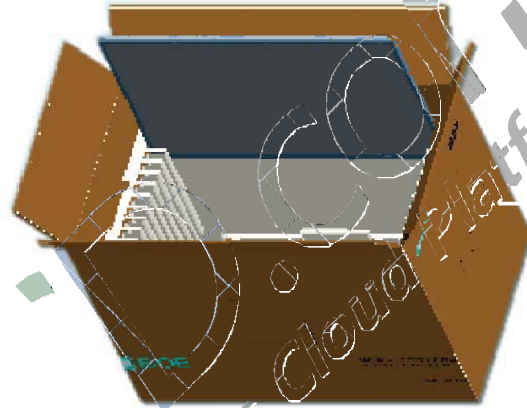
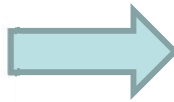
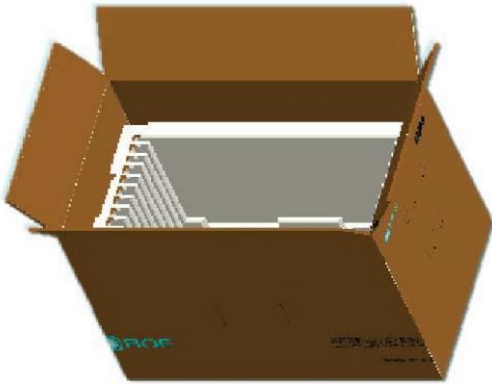
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10.1 Packing Order

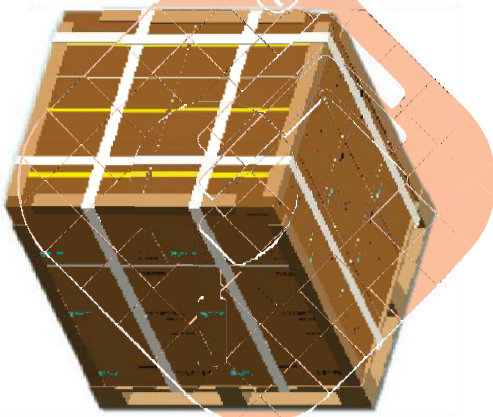
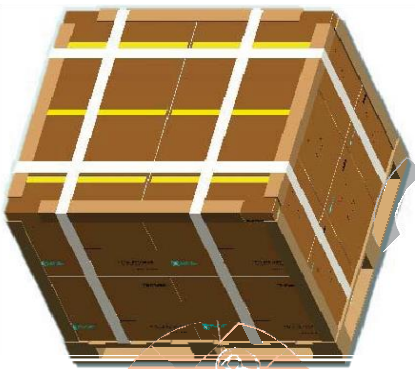
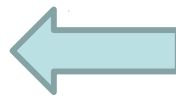
-Put 1Pcs EPO Bottom into the box

-Put each module into a PE bag

- Put 7Pcs MD into the box



-Put 1 Pcs EPO cover in and seal the box.



-Put the boxes on the Pallet

8boxes/Pallet:4boxes per layer, total 2 layers

12boxes/Pallet:4Boxes per layer, total 3 layers

-Place paper corners and wrap film around the boxes

-Pack with 4 packing belts

10.2 Packing Specification and Note

Item	Specification			Remark
	Q'ty	Dimension(mm)	Weight (kg)	
Panel	1	726.4(H) × 420.9(V) × 13.1(D) typ	3.75	-
Box	1	785()×260(W)×500(H)	2	without Panel & cushion
Packing Box	7pcs/Box	785()×260(W)×500(H)	28.25	with panel & cushion
Pallet	1	1140(L)×980(W)×130(H)	19	-
Packing Pallet	8Box/Pallet	1140(H)×980(H)×1130H)	49.25	-

10.3 Box label

- Label Size : 108 mm (L) × 56 mm (W)
- Contents
 - Model : HV320FHB-N00
 - Q`ty : Module Q`ty in one box
 - Serial No. : Box Serial No. See next page for detail description.
 - Date : Packing Date
 - FG Code : FG Code of Product



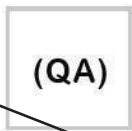
MODEL : HV320FHB-N00 **Q'TY :** 10

SERIAL NO. : 000000000000 **DATE :** 20XX.X.XX



• QAA0330000268 •

5940



00	0	00	0	0	000000
Type	Grade	Year	Month	ITEM-CODE	Serial_no

Internal Use

RoHS Mark

11.0 APPENDIX

Figure 1. Measurement Set Up

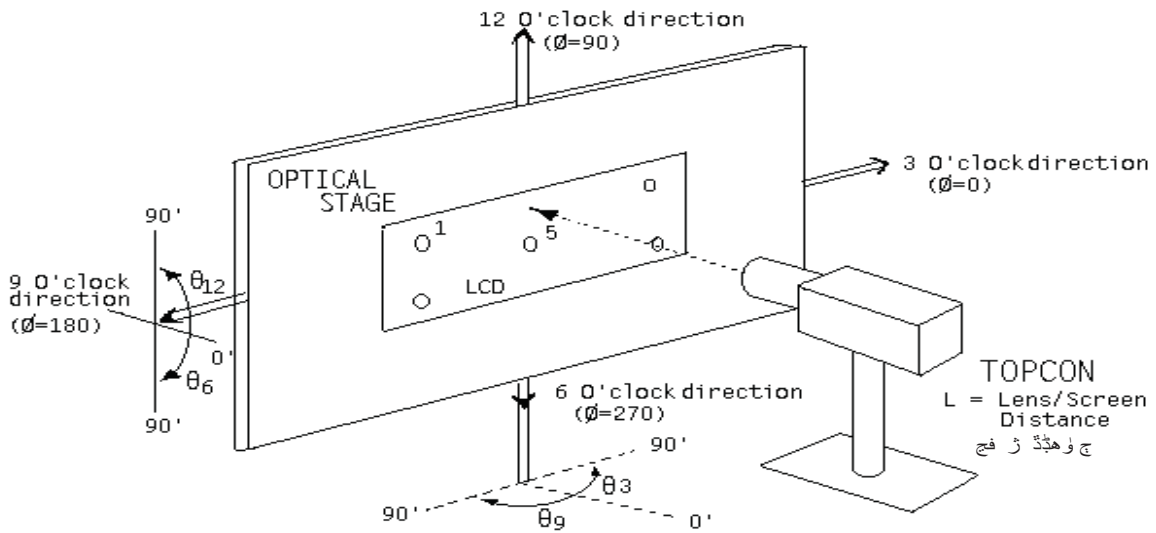


Figure 2. White Luminance and Uniformity Measurement Locations (9 points)

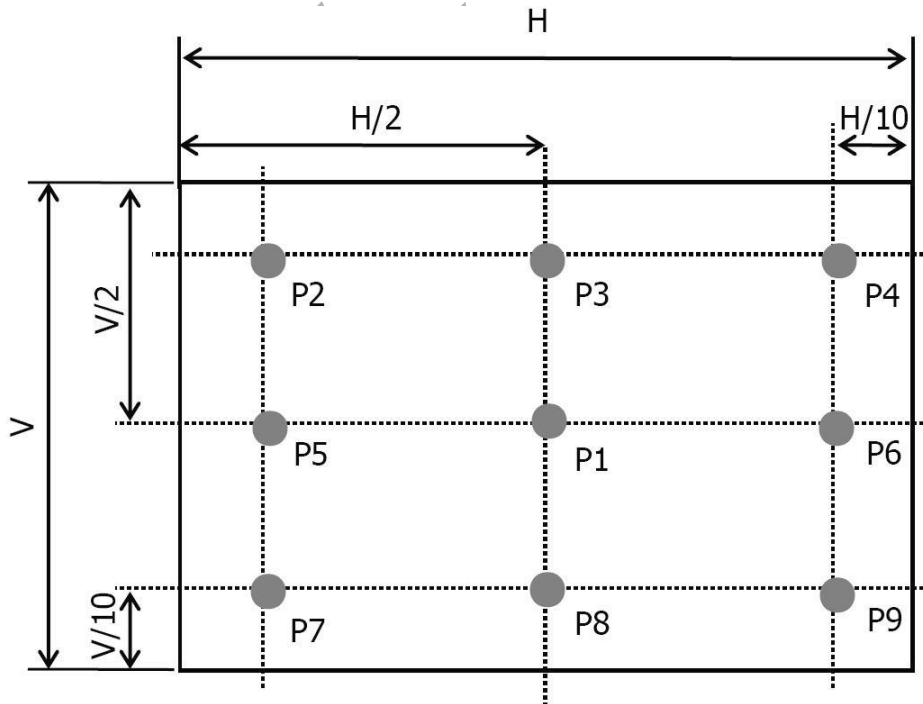


Table 12. LED Light Bar

Symbol	Unit	Symbol	Unit	Symbol			Symbol
				Symbol	Symbol	Symbol	
A	cd/m ²	Symbol	cd/m ²	260	280	---	Symbol
				72	75	---	Symbol
V	Symbol	Symbol	???	Symbol	Symbol	Symbol	Symbol
			???	Symbol	Symbol	Symbol	Symbol

The center brightness data is the maximum Minimum(1-9)/Maximum(5) value of 9 point divided by the center ,

11.1 Electrical Interface Connection

11.1.1 LED Light Bar

-LED connector PH-6P

< Table 12. LED Light Bar >

Pin No	Symbol	Description
1	IRLED1	LED current sense for string1
2	IRLED2	LED current sense for string2
3	VLED	LED power supply
4	VLED	LED power supply
5	IRLED3	LED current sense for string3
6	IRLED4	LED current sense for string4

Parameter		Min.	Typ.	Max.	Unit	Remarks
LED Light Bar Input Voltage Per Input Pin	VPIN	45	46.6	49.5	V	Duty 100%
LED Light Bar Input Current Per Input Pin	IPIN	---	80	90	mA	Note1,2,
LED Power Consumption	PBL	---	29.8	35.6	W	Note 3
LED Life-Time	---	30,000	---	---	Hrs	Note 4
Impulse current	---	800			mA	

ED bar consists of 120 ED packages,4*2 strings(parallel)*15packages(serial)

Note1: There are two light bars ,and the specified current is input ED chip 100% duty current

Note2: The sense current of each input pin is 80mA

Note3: $P_B = 4 * 2 \text{ Input pins} * V_{P\ IN} \times I_{P\ IN}$

Note4: The lifetime is determined as the time at which luminance of ED become 50% of the initial brightness or not normal lighting at $I_{PIN}=90\text{mA}$ on condition of continuous operating at $25 \pm 2 \text{ C}$

