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TITLE :

DV320FHB-R00 Product Specification

BEIJING BOE Display TECHNOLOGY CO., LTD

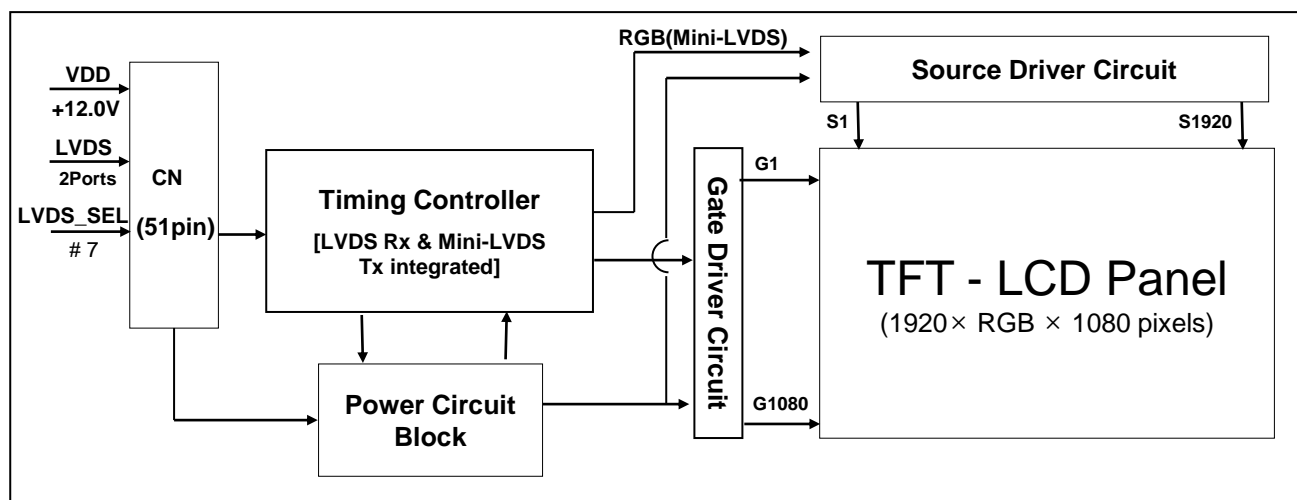
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1.0 GENERAL DESCRIPTION

1.1 Introduction

DV320FHB-R00 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
- High TNI 105°C

1.3 Application

- Commercial Digital Display
- Display Terminals for Control System
- Landscape and Portrait Display

Remark : This product only supports dynamic screen.

1.4 General Specification

< Table 1. General Specifications >

Parameter	Specification	Unit	Remarks
Active area	698.4(H) × 392.85 (V)	mm	
Number of pixels	1920(H) × 1080(V)	pixels	
Pixel pitch	121.25(H) × 363.75(V)	um	
Pixel arrangement	Pixels RGB Vertical stripe		
Display colors	16.7M	colors	8bits True
Display mode	Normally Black		
Dimensional outline	708.4(H)*405.4(V)*1.355(B)	mm	Detail refer to drawing
Weight	850	g	
Power Consumption	4.0	Watt	Typ.
BM Size(L/R/U/D)	5/5/7.5/5	mm	
Surface Treatment	Haze 1%		
LC Tni	105	°C	

2.0 ABSOLUTE MAXIMUM RATINGS

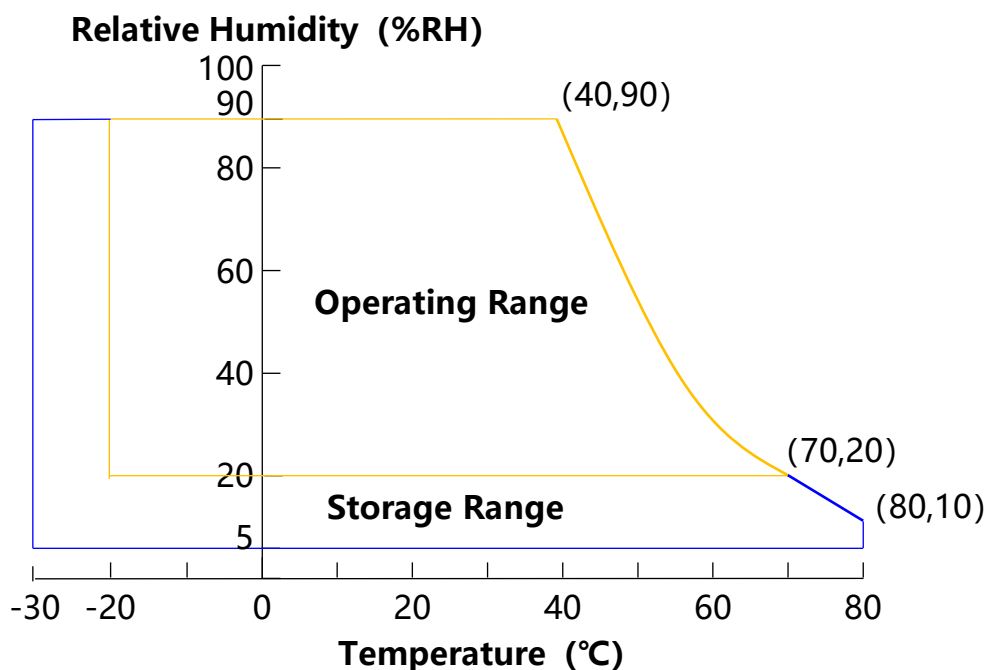
The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2.

< Table 2. Open Cell Electrical Specifications >

[VSS=GND=0V]

Parameter	Symbol	Min.	Max.	Unit	Remark
Power Supply Voltage	VDD	VSS-0.3	13.5	V	Ta = 25 °C
Operating Temperature	T _{OP}	-20	+70	°C	Note 1
Storage Temperature	T _{SUR}	-20	+70	°C	
	T _{ST}	-20	+70	°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±2 °C]

Parameter		Symbol	Values			Unit	Remark
			Min	Typ	Max		
Power Supply Input Voltage		VDD	10.8	12	14	Vdc	
Power Supply Ripple Voltage		VRP			300	mV	
Power Supply Current		IDD	-	333	630	mA	Note 1
Power Consumption		PDD		4.0	7.6	Watt	
Rush current		IRUSH	-	-	3.3	A	Note 2
LVDS Interface	LVDS Swing Voltage	VID	±100		±300	mV	Note 3
	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.

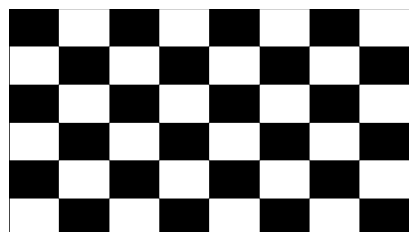
The current draw and power consumption specified is for VDD=12.0V,

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

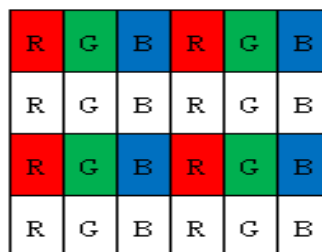
Test Pattern of power supply current

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

Pattern(L0/L255)



b) Max : H- Stripe



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

Note 3 : The LVDS test point is at each terminal resistor

4.0 INTERFACE CONNECTION

4.1 Module Input Signal & Power

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

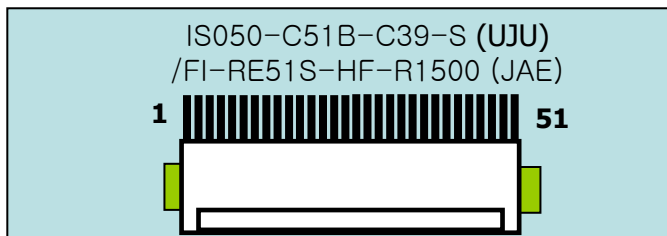
< Table 4. Open Cell Input Connector Pin Configuration >

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 or GND	Not Connected
7	SELLVDS	High: JEIDA Low or Open: VESA	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-	Second pixel negative LVDS clock
16	CH1[2]-	First pixel negative LVDS differential data input. Pair2	36	CH2CLK+	Second 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			

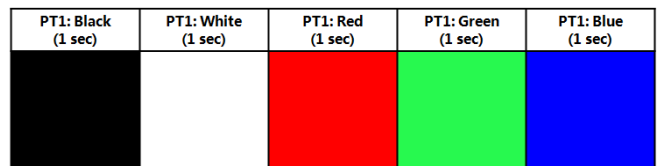
Pin No	Symbol	Description	Pin No	Symbol	Description
40	NC	Not Connected	46	GND	Ground
41	NC	Not Connected	47	NC	Not Connected
42	NC or GND	Not Connected	48	VCC	Input Voltage +12V
43	NC or GND	Not Connected	49	VCC	Input Voltage +12V
44	NC or GND	Ground	50	VCC	Input Voltage +12V
45	GND	Ground	51	VCC	Input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



4.2 LVDS Interface

- LVDS Receiver : Timing Controller (LVDS Rx merged) / LVDS Data : Pixel Data
 < Table 5. Open Cell Input Connector Pin Configuration >

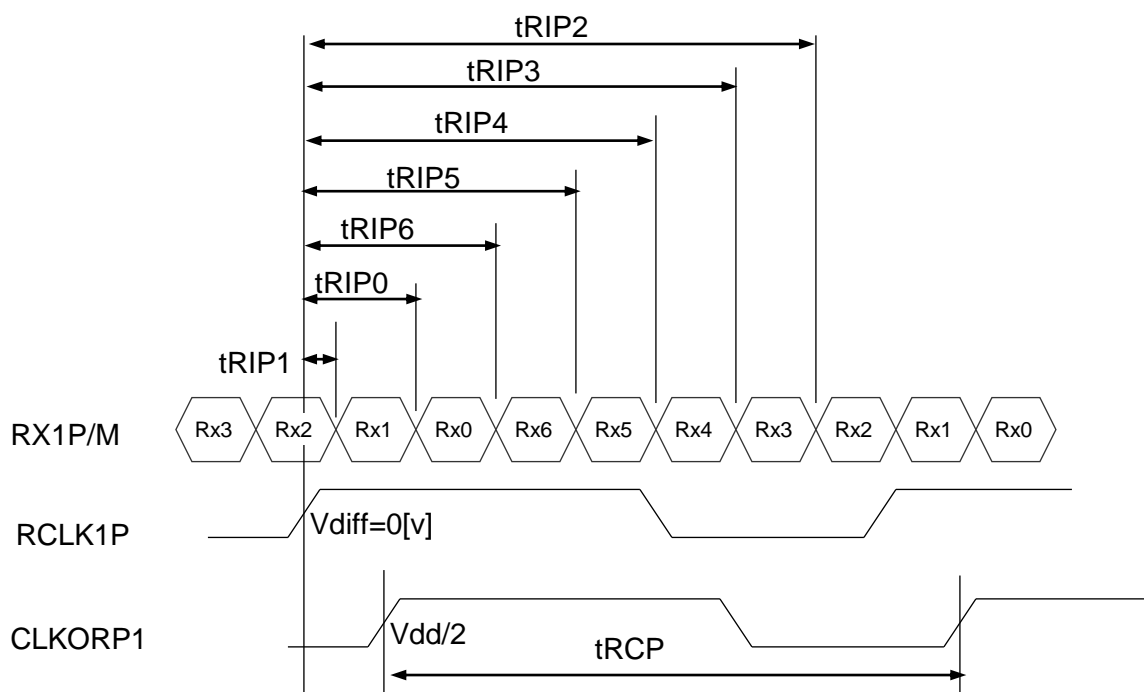
Channel No.	Data No.	8-bit LVDS Type	
		NS	JEIDA
0	Bit-0	R0	R2
	Bit-1	R1	R3
	Bit-2	R2	R4
	Bit-3	R3	R5
	Bit-4	R4	R6
	Bit-5	R5	R7
	Bit-6	G0	G2
1	Bit-0	G1	G3
	Bit-1	G2	G4
	Bit-2	G3	G5
	Bit-3	G4	G6
	Bit-4	G5	G7
	Bit-5	B0	B2
	Bit-6	B1	B3
2	Bit-0	B2	B4
	Bit-1	B3	B5
	Bit-2	B4	B6
	Bit-3	B5	B7
	Bit-4	HS	HS
	Bit-5	VS	VS
	Bit-6	DE	DE
3	Bit-0	R6	R0
	Bit-1	R7	R1
	Bit-2	G6	G0
	Bit-3	G7	G1
	Bit-4	B6	B0
	Bit-5	B7	B1
	Bit-6	-	

4.3 LVDS Rx Interface Timing Parameter

The specification of the LVDS Rx interface timing parameter is shown in Table 6.

<Table 6. LVDS Rx Interface Timing Specification>

Item	Symbol	Min	Typ	Max	Unit	Remark
CLKIN Period	tRCP	9.09	T	25	nsec	
Receiver Data Input Margin	tRMG	-0.40	-	0.40	nsec	fCLKIN=65MHz
Input Data 0	tRIP1	- tRMG	0.0	tRMG	Clock	
Input Data 1	tRIP0	T/7- tRMG	T/7	T/7+ tRMG	Clock	
Input Data 2	tRIP6	2 T/7- tRMG	2T/7	2T/7+ tRMG	Clock	
Input Data 3	tRIP5	3T/7- tRMG	3T/7	3T/7+ tRMG	Clock	
Input Data 4	tRIP4	4T/7- tRMG	4T/7	4T/7+ tRMG	Clock	
Input Data 5	tRIP3	5T/7- tRMG	5T/7	5T/7+ tRMG	Clock	
Input Data 6	tRIP2	6T/7- tRMG	6T/7	6T/7+ tRMG	Clock	

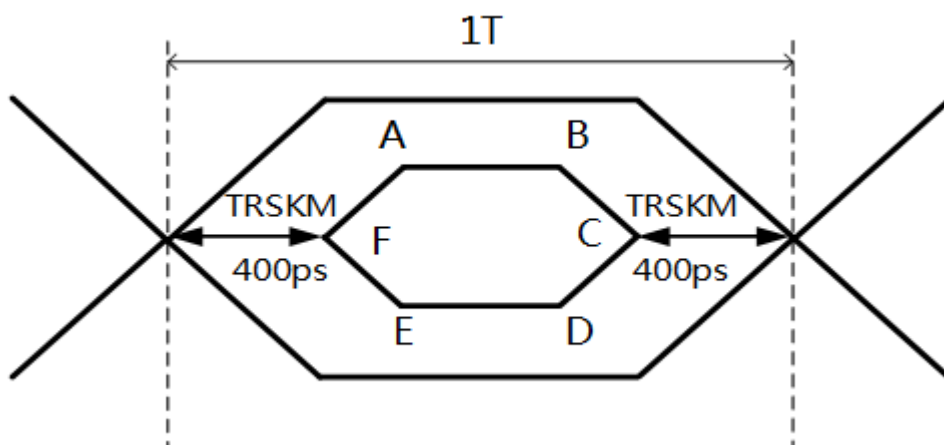


* $V_{diff} = (RX_{z+}) - (RX_{z-}), \dots, (RX_{CLK+}) - (RX_{CLK-})$

4.4 LVDS Rx Interface Eye Diagram

< Table 7. LVDS Rx Interface Eye Diagram >

Symbol	Min	Typ	Max	Unit	Note
A	—	150	—	mV	
B	—	150	—	mV	
C	—	0	—	mV	
D	—	-150	—	mV	
E	—	-150	—	mV	
F	—	0	—	mV	



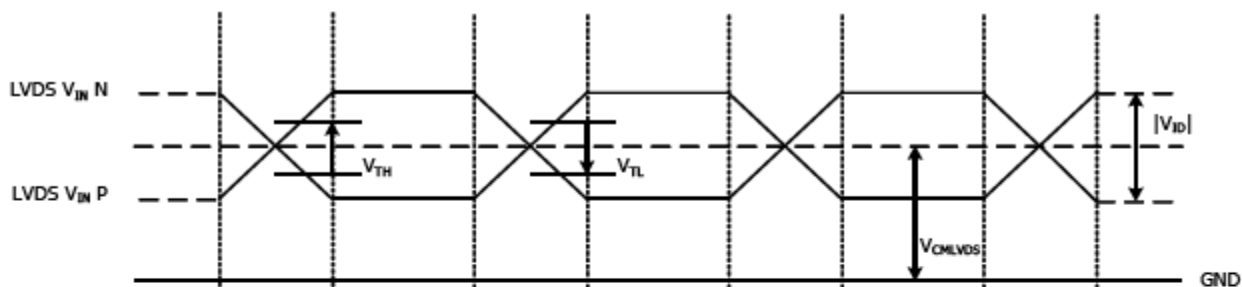
- Notes: 1. Time F to A, B to C, C to D, E to F is 150ps.
- 2. LVDS clock=85Mhz.
- 3. The time A to B=1T-2*TRSKM-2*150ps.

4.5 LVDS Receiver Differential Input

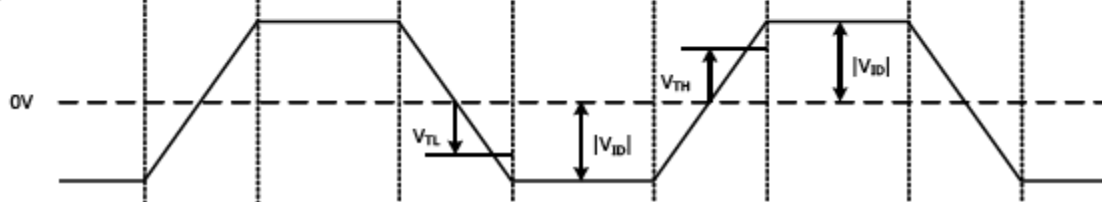
< Table 7-1. LVDS Receiver Differential Input >

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
LVDS Input High Threshold	V_{TH}	$V_{CMLVDS} = 1.2V$			+100	mV
LVDS Input Low Threshold	V_{TL}	$V_{CMLVDS} = 1.2V$	-100			mV
Single-End Input Voltage Range	V_{IN}		0		V_{CC_LVDS}	V
LVDS Input Common Mode Voltage	V_{CMLVDS}			1.2	$V_{CC_LVDS} - 0.4 \cdot V_{ID} / 2$	V
Differential Input Voltage	$ V_{ID} $		100		600	mV
Input Leakage Current	I_N		-10		+10	μA

Single-End



Differential Signal



5.0 SIGNAL TIMING SPECIFICATION

5.1 Timing Parameters (DE only mode)

< Table 8. Timing Table >

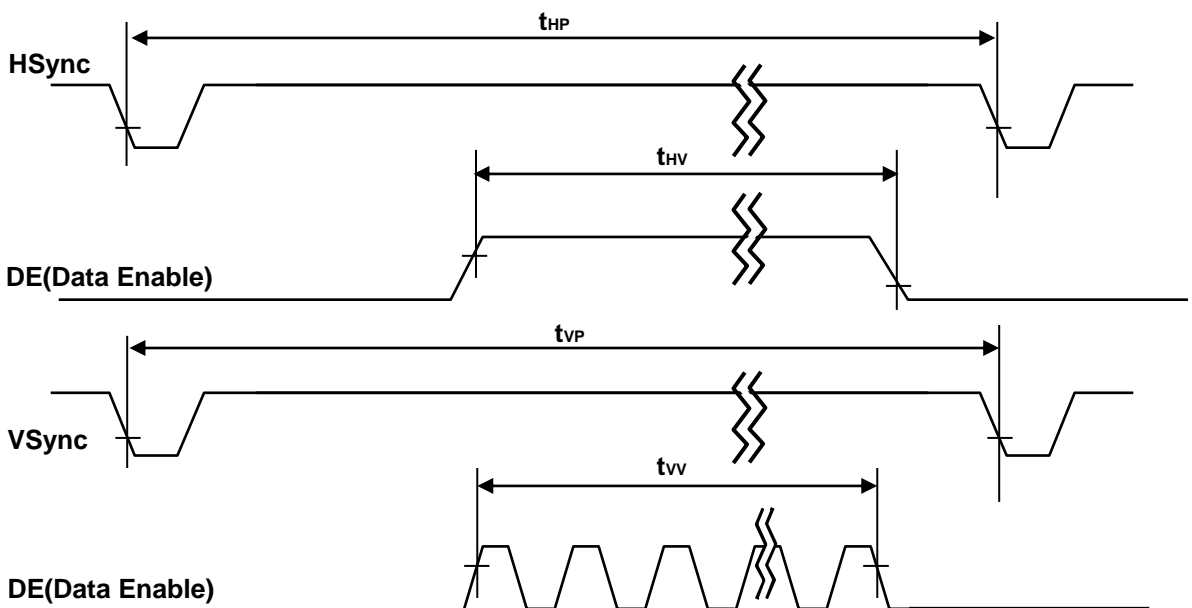
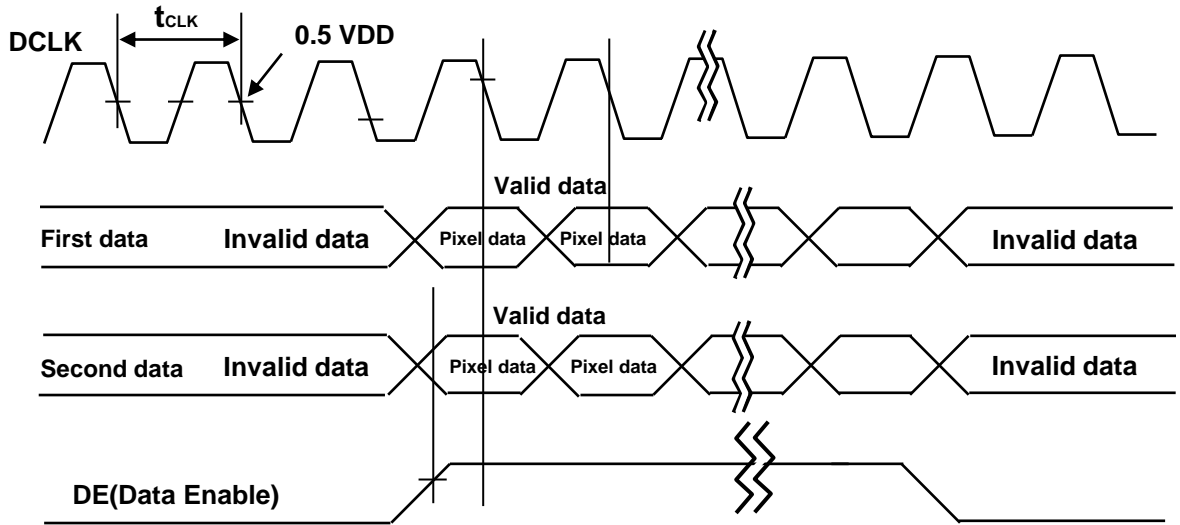
Item		Symbols		Min	Typ	Max	Unit
Clock	Frequency	1/Tc		60	74.25	78	MHz
	High Time	Tch		-	4/7Tc	-	
	Low Time	Tcl		-	3/7Tc	-	
Frame Period		Tv		1100	1125	1149	lines
				48.5	60	63	Hz
Horizontal Active Display Term		Valid	t _{HV}	-	960	-	t _{CLK}
		Total	t _{HP}	1060	1100	1200	t _{CLK}
Vertical Active Display 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.

< Table 9. LVDS Input SSCG >

Symbol	Parameter	Condition	Min	Typ	Max	Unit
F	LVDS Input frequency	-	45	74.25	85	MHz
T _{LVSK}	LVDS channel to channel skew	F=100MHz V _{IC} =1.2V V _{ID} =±400mV	-380	-	+380	ps
F _{LVMOD}	Modulating frequency of input clock during SSC		60	-	85	KHz
F _{LVDEV}	Maximum deviation of input clock frequency during SSC		-3	-	+3	%
T _{CY-CY}	Cycle to Cycle jitter		-	-	100	ps

5.2 Signal Timing Waveform



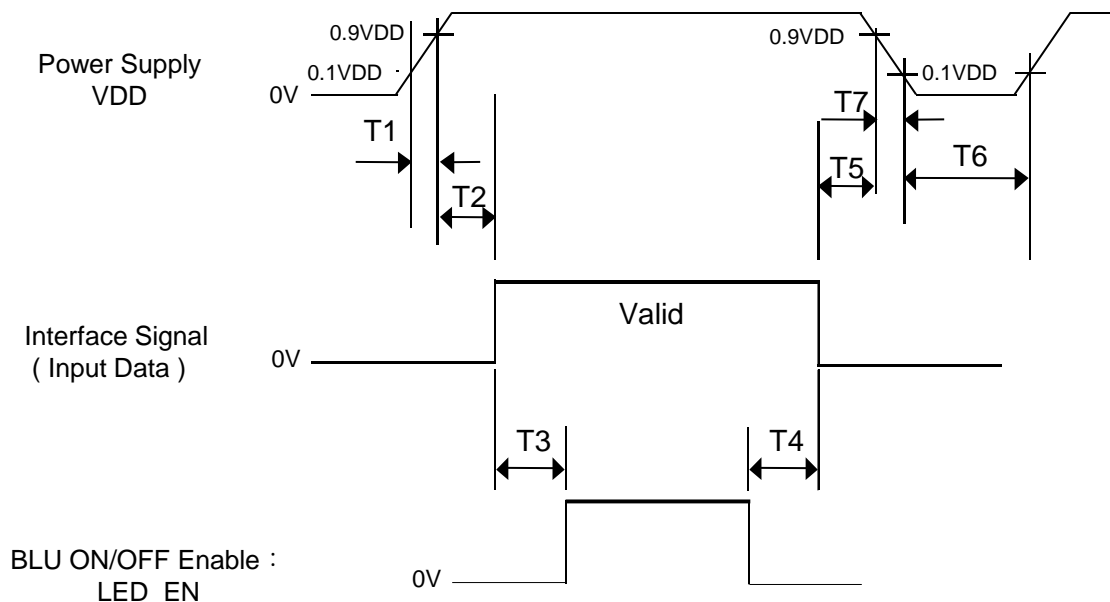
5.3 Input Signals, Basic Display Colors and Gray Scale of Colors

< Table 10. 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	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	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	1	0	0	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	1	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	0	1	0	0	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	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	1	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	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	0
	△	↑								↑				↑											
	▽	↓								↓				↓											
	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	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	Darker	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
	△	↑								↑				↑											
	▽	↓								↓				↓											
	Brighter	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	1	1	1	1	1	1	1	0	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 11. Sequence Table >

Parameter	Values			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.
 3. When $VDD < 0.9VDD$ (Typ.), Power off.
 4. T7 decreases smoothly, if there were rebounding voltage, it must smaller than 5 volts.

6.0 OPTICAL SPECIFICATIONS

The test of optical specifications shall be measured in a dark room (ambient luminance ≤ 1 lux and temperature $= 25 \pm 2^\circ\text{C}$) with the equipment of Luminance meter system (Goniometer system and PR730) and test unit shall be located at an approximate distance 180cm 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 at 25°C . Optimum viewing angle direction is 6 'clock.

< Table 12. Optical Table >

[VDD = 12.0V, Frame rate = 60Hz, Ta = $25 \pm 2^\circ\text{C}$]

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.	
Brightness		Lv		-	-	-		
Contrast ratio		CR		800:1	1200:1	-		Note 2
White luminance uniformity		ΔY		-	-	-	%	Note 3
Reproduction of color	White	W_x	$\Theta = 0^\circ$ (Center) Normal Viewing Angle	TYP. - 0.03	0.28	TYP. + 0.03		Note 4
		W_y			0.29			
	Red	R_x			0.645			
		R_y			0.332			
	Green	G_x			0.280			
		G_y			0.640			
	Blue	B_x			0.150			
		B_y			0.045			
Color Gamut				70	72	-	%	
Response Time	G to G	T_g		-	15	16	ms	Note 5
Gamma Scale				2.0	2.2	2.4		
Cell Transmittance				-	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 $\theta = 0^\circ$ 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 White luminance uniformity on LCD surface is then expressed as :

$$\Delta Y = (\text{Minimum Luminance of 9 points} / \text{Maximum Luminance of 9 points}) * 100$$

(See Figure 5 shown in Appendix).

4. 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.
5. Response time T_g is the average time required for display transition by switching the input signal as below table and is based on Frame rate $f_V = 60\text{Hz}$ to optimize.
Each time in below table is defined as Figure 3 and shall be measured by switching the input signal for "any level of gray(bright)" and "any level of gray(dark)".
6. 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 MECHANICAL CHARACTERISTICS

7.1 Dimensional Requirements

Figure 3(located in Appendix) shows mechanical outlines for the model DV366FBM-N10 . Other parameters are shown in Table 13.

< Table 13. Dimensional Parameters >

Parameter	Specification	Unit
Dimensional outline	708.4(H)*405.4(V)*1.35(B)	mm
Weight	850	gram
Active area	698.4(H) × 392.85 (V)	mm
Pixel pitch	121.25(H) × 363.75(V)	um
Number of pixels	1920(H) × 290(V)(1 pixel = R + G + B dots)	pixels

7.2 Mounting

See FIGURE 3. (shown in Appendix)

7.3 Anti-Glare and Polarizer Hardness.

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

8.0 RELIABILITY TEST

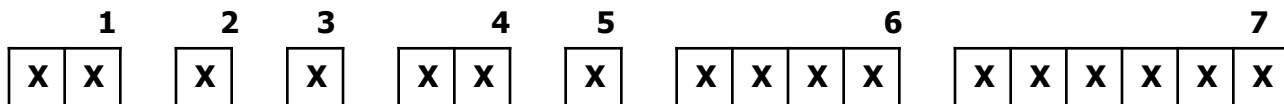
The Reliability test items and its conditions are shown in below.

< Table 14. Reliability Test Parameters >

No	Test Items	Conditions
1	High temperature storage test	Ta = 60 °C, 240 hrs
2	Low temperature storage test	Ta = -20 °C, 240 hrs
3	High temperature & high humidity operation test	Ta = 50 °C, 80%RH, 240hrs
4	High temperature operation test	Ta = 70 °C, 240hrs
5	Low temperature operation test	Ta = -20 °C, 240hrs
6	Thermal shock	Ta = -20 °C ↔ 60 °C (0.5 hr), 100 cycle
7	Vibration test (non-operating)	Frequency 10 ~ 200 Hz, Sweep rate 30 min Gravity / AMP 1.2 G Period X/60min, Y/30min, Z /30 min

This test condition is based on BOE module.

9.0 PRODCUT SERIAL NUMBER



- 1. Control Number
- 2. Rank / Grade
- 3. Line Classification
- 4. Year (2011 : 11, 2012 : 12, ...)

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

10.0 PACKING INFORMATION

BOE provides the standard shipping container for customers, unless customer specifies their packing information. The standard packing method and Barcode information are shown in below.

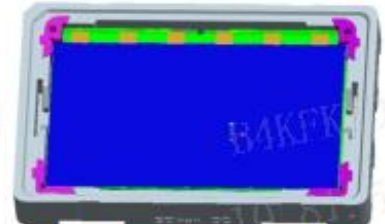
10.1 Packing Order



Put 1Pcs 4t EPE pad.



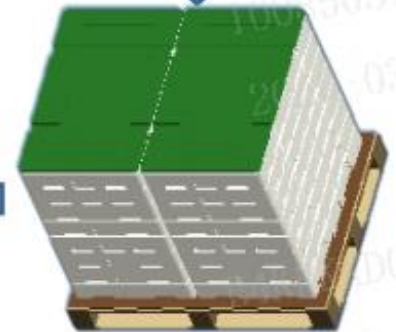
Put one open cell on EPE pad.



Put 1Pcs 2t EPE pad , ... , totally 17 pcs open cell and 18 pcs EPE pad in one box



Place out box and wrap film around the boxes.
Pack with 4 packing belts.



Put one paper pad on the pallet,
Put totally 16 boxes and 2 cover,
Pack with 2 Package belt.
(8ea boxes per pallet)

厢车装载方式：双层码放
Pallet摆放方式：两竖
12m厢车装载量：14144Pcs
(52托)

10.2 Packing Note

- Box Dimension : 860mm(L)×560mm(W)×143mm(H)
- Package Quantity in one Box : 17pcs

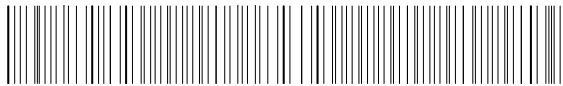
10.3 Box Label



- Label Size : 100 mm (L) × 50 mm (W)
 - Contents
 - Model : DV320FHB-R00
 - Q`ty : OC 17 Q`ty in one box
 - Serial No. : Box Serial No.
 - Date : Packing Date

BOE
FUZHOU BOE OPTOELECTRONICS TECHNOLOGY Co.,LTD

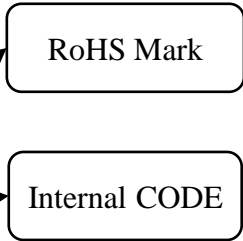
MODEL: XXXXXXXX-XXX Q'TY: XXX

SERIAL NO: XXXXXXXXXXXXX DATE: XXXX.XX.XX



XXXXXXXXXXXXXXXX XXXX



Digit	1	2	3	4	5	6	7							
Code	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Des.	1. Model Code GBN 2. Grade 3. Line 4. Year(2016:16, 2017:17, ...) 5. Month(1, 2, 3, ..., 9, X, Y, Z) 6. Revision Code 7. Serial Number													

11.0 PRECAUTIONS

Please pay attention to the followings when you use this TFT LCD Panel.

11.1 Mounting Precautions

- Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
- You must mount a Panel using specified mounting holes (Details refer to the drawings)
- You should consider the mounting structure so that uneven force (ex. Twisted stress, Concentrated stress) is not applied to the Panel. And the case on which a Panel is mounted should have sufficient strength so that external force is not transmitted directly to the Panel.
- Do not apply mechanical stress or static pressure on Panel; Abnormal display cause by pressing some parts of Panel during assembly process, do not belong to product failure, the press should be agreed by two sides.
- Determine the optimum mounting angle, refer to the viewing angle range in the specification for each model.
- Do not apply mechanical stress or static pressure on Panel, and avoid impact, vibration and falling.
- Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
- Protection film for polarizer on the Panel should be slowly peeled off before display.
- Be careful to prevent water & chemicals contact the Panel surface.
- You should adopt radiation structure to satisfy the temperature specification.
- Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment. Do not touch the surface of polarizer for bare hand or greasy cloth. (Some cosmetics are detrimental to the polarizer.)
- When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzine. Normal-hexane & alcohol is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene, because they cause chemical damage to the polarizer.
- Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading..

- This Panel has its circuitry PCB's on the rear side and Driver IC, should be handled carefully in order not to be stressed.
- Avoid impose stress on PCB and Driver IC during assembly process ,Do not drawing, bending, COF package & wire
- Do not disassemble the Panel.

11.2 Operating Precautions

- Do not connector or disconnect the cable to/from the Panel at the "Power On" Condition.
- When the Panel is operating, do not lose CLK, ENAB signals. If any one of these signals is lost, the Panel would be damaged.
- Obey the supply voltage sequence. If wrong sequence is applied, the Panel would be damaged.
- Do not allow to adjust the adjustable resistance or switch
- The electrochemical reaction caused by DC voltage will lead to LCD Panel degradation, so DC drive should be avoided.
- The LCD Panels 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 equipment to protect against static electricity.
- Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the Panel may be damaged.
- Panel has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimized the interference.
- Design the length of cable to connect between the connector for back-light and the converter as shorter as possible and the shorter cable shall be connected directly , The long cable between back-light and Converter may cause the Luminance of LED to lower and need a higher startup voltage
- The cables should be as short as possible between System Board and PCB interface.
- Connectors are precision devices to transmit electrical signals, and operators should plug in parallel
- Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.

11.3 Electrostatic Discharge Precautions

- Avoid the use work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.
- Since a Panel is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc.
- Do not close to static electricity to avoid product damage.
- Do not touch interface pin directly.

11.4 Precautions for Strong Light Exposure

- Do not leave the Panel operation or storage in Strong light . Strong light exposure causes degradation of polarizer and color filter.

11.5 Precautions for Storage

A. Atmosphere Requirement

ITEM	UNIT	MIN	MAX
Storage Temperature	(°C)	5	40
Storage Humidity	(%rH)	40	75
Storage Life	6 months		
Storage Condition	<ul style="list-style-type: none"> • The storage room should be equipped with a dark and good ventilation facility. • Prevent products from being exposed to the direct sunlight, moisture and water. • The product need to keep away from organic solvent and corrosive gas. • Be careful for condensation at sudden temperature change. • Storage condition is guaranteed under packing conditions. 		

B. Package Requirement

- The product should be placed in a sealed polythene bag.
- Product Should be placed on the pallet, Which is away from the floor, Be cautions not to pile the product up.
- The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.
- As the original protective film, do not use the adhesive protective film to avoid change of Pol color and characteristic.

11.6 Precautions for protection film

- 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.
- People who peeled off the protection film should wear anti-static strap and grounded well.

11.7 Appropriate Condition for Commercial Display

-Generally large-sized LCD Panels are designed for consumer applications . Accordingly, long-term display like in Commercial Display application, can cause uneven display including image sticking. To optimize Panel's lifetime and function, several operating usages are required.

1. Normal operating condition

- Temperature: $20 \pm 15^{\circ}\text{C}$
- Operating Ambient Humidity : $55 \pm 20\%$
- Display pattern: dynamic pattern (Real display)
- Well-ventilated place is recommended to set up Commercial Display system

2. Special operating condition

a. Ambient condition

- Well-ventilated place is recommended to set up Commercial Display system.

b. Power and screen save

- Periodical power-off or screen save is needed after long-term display.

c. As the low temperature, the response time is greatly delayed. As the high temperatures (higher than the operating temperature) the LCD Panel may turn black screen. The above phenomenon cannot explain the failure of the display. When the temperature returns to the normal operating temperature, the LCD Panel will return to normal display.

d. When expose to drastic fluctuation of temperature (hot to cold or cold to hot) ,the LCD Panel may be affected; Specifically, drastic temperature fluctuation from cold to hot ,produces dew on the LCD Panel 's surface which may affect the operation of the polarizer and LCD Panel

e. Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the Panel may be damaged.

f. Product reliability and functions are only guaranteed when the product is used under right operation usages. If product will be used in extreme conditions such as high temperature, high humidity, high altitude, special display images, running time, long time operation, outdoor operation, etc. It is strongly recommended to contact BOE for filed application engineering advice. Otherwise, its reliability and function may not be guaranteed. Extreme conditions are commonly found at airports, transit stations, banks, stock market and controlling systems.

3. Operating usages to protect against image sticking due to long-term static display.

a. Suitable operating time: under 20 hours a day.

b. Static information display recommended to use with moving image.

- Cycling display between 5 minutes' information(static) display and 10 seconds' moving image.

c. Background and character (image) color change

- Use different colors for background and character, respectively.

- Change colors themselves periodically.

d. Avoid combination of background and character with large different luminance.

1) Abnormal condition just means conditions except normal condition.

2) Black image or moving image is strongly recommended as a screen save

4. Lifetime in this spec. is guaranteed only when Commercial Display is used according to operating usages.

11.8 Other Precautions

A. LC Leak

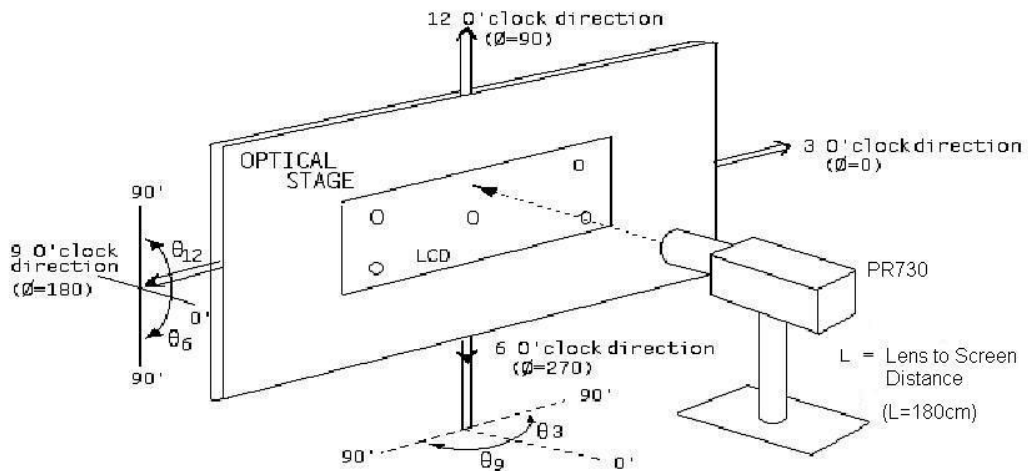
- If the liquid crystal material leaks from the panel, it is recommended to wash the LC with acetone or ethanol and then burn it.
- If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.
- If LC in mouth, mouth need to be washed, drink plenty of water to induce vomiting and follow medical advice.
- If LC touch eyes, eyes need to be washed with running water at least 15 minutes.

B. Rework

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

12.0 APPENDIX

< Figure 1. Measurement Set Up >



< Figure 2. Response Time Testing >

