DV650QUM-NV0 Product Specification Rev.P0

Fuzhou BOE Optoelectronics CO., LTD

REVISION HISTORY

(√) Preliminary specification
( ) Final specification

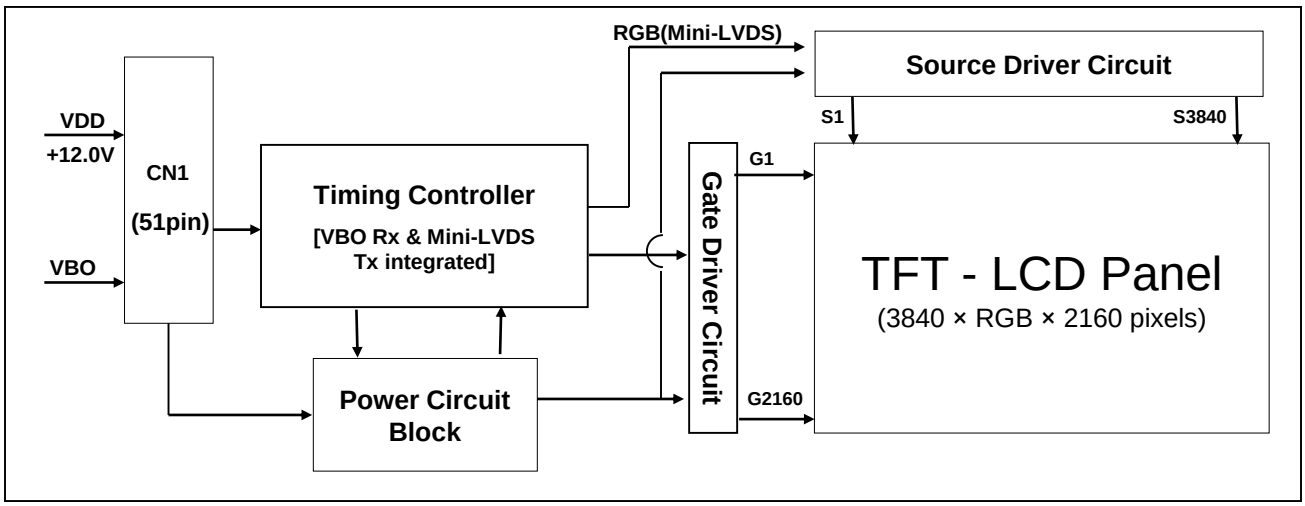
Revision No.	Page	Description of changes	Date	Prepared
P0	-	Initial Release	2019/08/15	NA.AN

Contents

1.0 GENERAL DESCRIPTION

1.1 Introduction

DV650QUM-NV0 is a color active matrix TFT LCD Panel using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This Panel has a 65.00 inch diagonally measured active area with UHD resolutions (3840 horizontal by 2160 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in island and this module can display 16.7M colors. The TFT-LCD panel used for this Panel is adapted for a low reflection and higher color type.



1.2 Features

- V by one interface with 8 lanes
- High-speed response
- 8-bit color depth, display 16.7M colors
- Low power consumption
- ADS technology is applied for high display quality
- RoHS compliant

1.3 Application

- Home Alone Multimedia TFT-LCD TV
- Display Terminals for Control System
- Ultra High Definition TV(UHD TV)
- SLFD application Products

1.4 General Specification

< Table 1. General Specifications >

Parameter	Specification	Unit	Remark
MDL Outline	**1432.58mm(H) X 807.62mm(V)**	mm	
Active area	1209.6 (H) ×680.4(V)	mm	
Number of pixels	1428.48(H) × 803.52 (V)	pixels	
Pixel pitch	3840(H) ×2160(V)	μm	
Pixel arrangement	372(H) ×RGB×372(V)		
Display colors	Pixels RGB Island	colors	
Display mode	16.7M(8bits-true)		
Brightness	500(Typ.)	nit	Center point
MDL Thickness	**39.9mm**	mm	Body
Weight	**15.1Kg(Typ.)**	gram	
Power Consumption	**216W(Typ.)**	Watt	BLU Power
Surface Treatment	Haze25% ,3H, (Front Polarizer) Clear (Bottom Polarizer)		
Life time	**30000**	Hrs	Note 1

Note 1：The life time is determined as the time which luminance of LED is 50% compare to the initial value at the typical LED current on condition of continuous operating in LCM state at 25±2 ℃

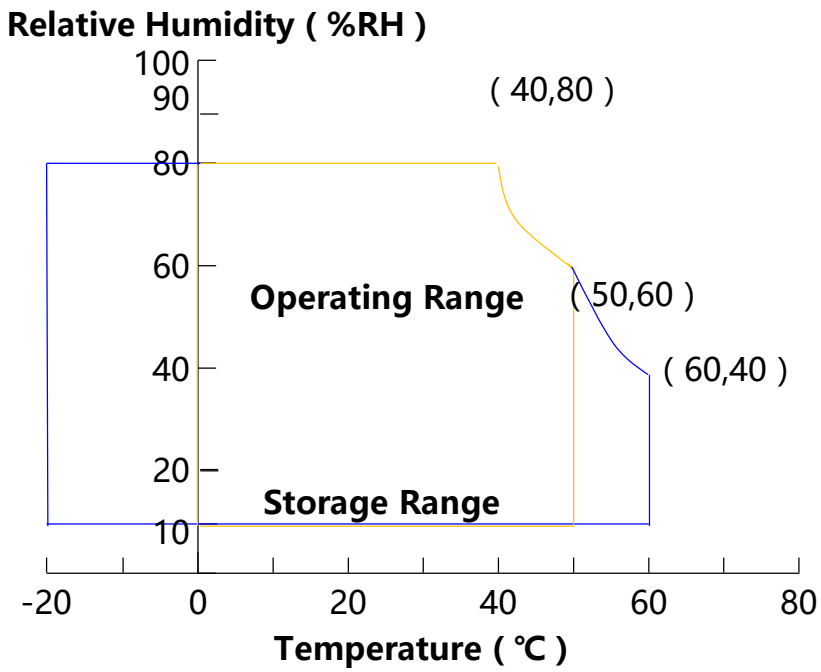
2.0 ABSOLUTE MAXIMUM RATINGS

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 Absolute Maximum Ratings > [VSS=GND=0V]

Parameter	Symbol	Min.	Max.	Unit	Remark
Power Supply Voltage	VDD	VSS-0.3	13.2	V	Ta = 25 ℃
Operating Temperature	T_{OP}	0	+50	℃	Note 1
Storage Temperature	T_{SUR}	-20	+60	℃	
	T_{ST}	-20	+60	℃	
Operating Ambient Humidity	Hop	10	80	%RH	
Storage Humidity	Hst	10	90	%RH	

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



3.0 ELECTRICAL SPECIFICATIONS

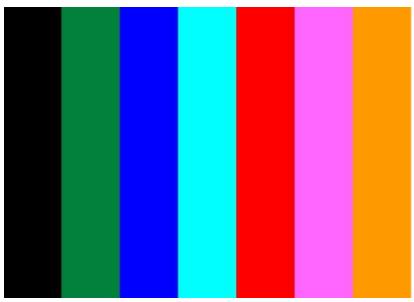
3.1 Open Cell Electrical Specifications

< Table 3. Open Cell Electrical Specifications > [Ta =25+2 ℃]

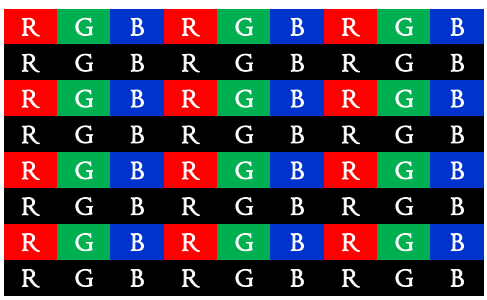
Parameter		Symbol	Values			Unit	Remark
			Min	Typ	Max		
Power Supply Input Voltage		VDD	10.8	12	13.2	Vdc	
Power Supply Ripple Voltage		VRP	-	-	300	mV	
Power Supply Current		IDD	-	1500	2400	mA	Note 1
Power Consumption		PDD	-	17	28.8	Watt	
Rush current		IRUSH	-	-	5	A	Note 2
VBO Interface	Differential Input High Threshold Voltage	VLVTH			+50	mV	
	Differential Input Low Threshold Voltage	VLVTL	-50			mV	
	Common mode Bias Voltage	VRCT	0		3.3	V	
	Differntial Input Resistance	Rt	80	100	120	ohm	
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=60Hz and Clock frequency = 74.25MHz.
Test Pattern of power supply current

a) Typ : Color Test (L0/L255)



b) Max : Horizontal 1 Line (L0/L255)



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

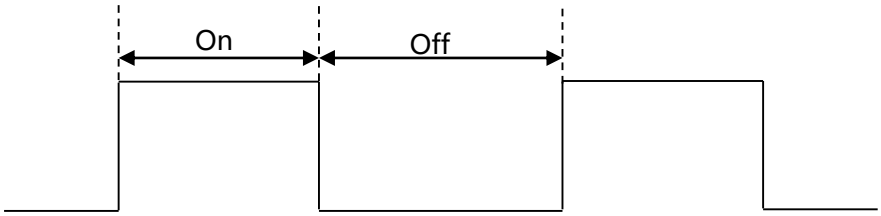
3.2 Converter Electrical Specifications

< Table 4. Converter Electrical Specifications > [Ta =25±2 ℃]

Parameter	Symbol	Values			Unit	Remark
		Min	Typ	Max		
Power Supply Input Voltage	V_{BL}	22	24	26	Vdc	
Power Supply Ripple Voltage	V_{RP}	-	-	300	mV	
Power Supply Current	I_{DD}	-	9	11	A	
Power Consumption	P_{DD}	-	216	264	Watt	Note 1
Backlight On/Off Control Voltage	V_{BLON} (off)	0	-	0.3	V	
	V_{BLON} (on)	2.4	3.3	3.6	V	
Backlight PWM	High Level	2.4	3.3	3.6	V	On duty
	Low Level	0	-	0.3	V	Off duty
	Dimming Ratio	1	-	99.9	%	Note 2
	PWM Frequency	100	-	300	Hz	

Note 1 : The specified current and power consumption are under the typical supply Input voltage, 24V. It is total power consumption.

Note 2 : High-duty = On/(On+Off) * 100 %



4.0 INTERFACE CONNECTION

4.1 Open Cell Input Signal & Power

- Connector：PF050-O51B-C20-S(UJU)

< Table 5. Input Connector Pin Configuration >

Pin No	Symbol	Description	Pin No	Symbol	Description
1	VDD	12V	20	RX0P	Positive VBO differential data input
2	VDD	12V	21	GND	GROUND
3	VDD	12V	22	RX1N	Negative VBO differential data input
4	VDD	12V	23	RX1P	Positive VBO differential data input
5	VDD	12V	24	GND	<<
6	VDD	12V	25	RX2N	Negative VBO differential data input
7	VDD	12V	26	RX2P	Positive VBO differential data input
8	VDD	12V	27	GND	GROUND
9	VDD	12V	28	RX3N	Negative VBO differential data input
10	VDD	12V	29	RX3P	Positive VBO differential data input
11	NC	<<	30	GND	GROUND
12	GND	GROUND	31	RX4N	Negative VBO differential data input
13	GND	GND	32	RX4P	Positive VBO differential data input
14	GND	GND	33	GND	GROUND
15	GND	GND	34	RX5N	Negative VBO differential data input
16	MODE0	-	35	RX5P	Positive VBO differential data input
17	MODE1	-	36	GND	GROUND
18	GND	GROUND	37	RX6N	Negative VBO differential data input
19	RX0N	Negative VBO differential data input	38	RX6P	Positive VBO differential data input

Pin No	Symbol	Description	Pin No	Symbol	Description
39	GND	GROUND	46	NC	<<
40	RX7N	Negative VBO differential data input	47	SDA_T	I2C
41	RX7P	Positive VBO differential data input	48	SCL_T	I2C
42	GND	GROUND	49	NC	<<
43	NC	<<	50	SDA_D	I2C
44	SDA_G	I2C	51	SCL_D	I2C
45	SCL_G	I2C			

Notes : 1. NC(Not Connected) : This pins are only used for BOE internal operations.

Rear view of LCM

4.2 BLU Input Signal & Power

- BLU Connector(CON05 & CON06) : CI0114M1HR0-NH (Cvilux)or Equivalent.

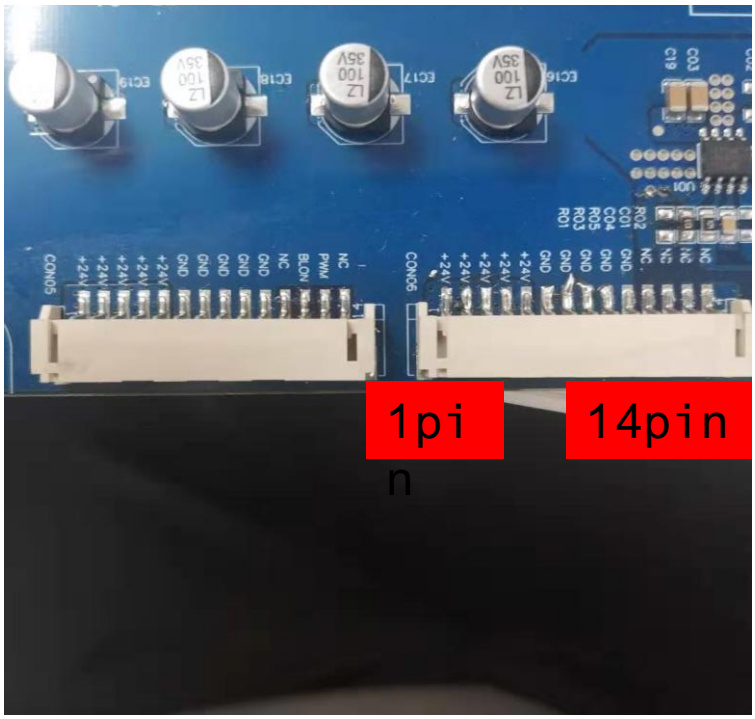
< Table 6. Input Connector Pin Configuration CON05>

Pin No	Symbol	Description	Pin No	Symbol	Description
1	VIN	Operating Voltage Supply, +24V DC regulated	8	GND	Ground and Current Return
2	VIN	Operating Voltage Supply, +24V DC regulated	9	GND	Ground and Current Return
3	VIN	Operating Voltage Supply, +24V DC regulated	10	GND	Ground and Current Return
4	VIN	Operating Voltage Supply, +24V DC regulated	11	NC	No Connection
5	VIN	Operating Voltage Supply, +24V DC regulated	12	BLON	BLU On-Off control: DC 0 to 0.3V off，DC 2.4 to 3.6V On
6	GND	Ground and Current Return	13	PWM	1%≤Duty≤100%
7	GND	Ground and Current Return	14	NC	No Connection

< Table 7. Input Connector Pin Configuration CON06>

Pin No	Symbol	Description	Pin No	Symbol	Description
1	VIN	Operating Voltage Supply, +24V DC regulated	8	GND	Ground and Current Return
2	VIN	Operating Voltage Supply, +24V DC regulated	9	GND	Ground and Current Return
3	VIN	Operating Voltage Supply, +24V DC regulated	10	GND	Ground and Current Return
4	VIN	Operating Voltage Supply, +24V DC regulated	11	NC	No Connection
5	VIN	Operating Voltage Supply, +24V DC regulated	12	NC	No Connection
6	GND	Ground and Current Return	13	NC	No Connection
7	GND	Ground and Current Return	14	NC	No Connection

Example：



< Table 7. Input Connector Pin Configuration CON08>

Pin No	Symbol	Description	Pin No	Symbol	Description
1	BLON	BLU on-off control:high(Type=3.3V):BL ON ； Low（0~0.8V/GND）：BL OFF （Recerved）	8	SO2	Serial interface for data output（接TCON的串行数据输入）
2	LD_EN_BL	Local dimming enable（L:ON,H:off）	9	GND	Ground
3	GND	GND	10	VSYNC	同步信号
4	PWMI	PWM Intput（暂不用）			
5	SCK2	Serial interface for clock			
6	SCS2	Serial interface for chip select			
7	SI2	Serial interface for data intput（接TCON的串行数据输出）			

4.3 VBO Interface

- VBO Receiver : Timing Controller (VBO Rx merged)

< Table 8. Input Connector Pin Configuration >

Mode		Packer Input & unpacker output		30bpp RGB/YCBCr444	24bpp RGB/YCBCr444
4Byte Mode	3Byte mode	0	Bit-0	R/Cr[2]	R/Cr[0]
			Bit-1	R/Cr[3]	R/Cr[1]
			Bit-2	R/Cr[4]	R/Cr[2]
			Bit-3	R/Cr[5]	R/Cr[3]
			Bit-4	R/Cr[6]	R/Cr[4]
			Bit-5	R/Cr[7]	R/Cr[5]
			Bit-6	R/Cr[8]	R/Cr[6]
			Bit-7	R/Cr[9]	R/Cr[7]
		1	Bit-8	G/Y[2]	G/Y[0]
			Bit-9	G/Y[3]	G/Y[1]
			Bit-10	G/Y[4]	G/Y[2]
			Bit-11	G/Y[5]	G/Y[3]
			Bit-12	G/Y[6]	G/Y[4]
			Bit-13	G/Y[7]	G/Y[5]
			Bit-14	G/Y[8]	G/Y[6]
			Bit-15	G/Y[9]	G/Y[7]
		2	Bit-16	B/Cb[2]	B/Cb[0]
			Bit-17	B/Cb[3]	B/Cb[1]
			Bit-18	B/Cb[4]	B/Cb[2]
			Bit-19	B/Cb[5]	B/Cb[3]
			Bit-20	B/Cb[6]	B/Cb[4]
			Bit-21	B/Cb[7]	B/Cb[5]
			Bit-22	B/Cb[8]	B/Cb[6]
			Bit-23	B/Cb[9]	B/Cb[7]
		3	Bit-24	(3DLR)	-
			Bit-25	(3DEN)	-
			Bit-26	R/Cr[0]	-
			Bit-27	R/Cr[1]	-
			Bit-28	G/Y[0]	-
			Bit-29	G/Y[1]	-
			Bit-30	B/Cb[0]	-
			Bit-31	B/Cb[1]	-

5.0 SIGNAL TIMING SPECIFICATION

5.1 Timing Parameters (DE only mode)

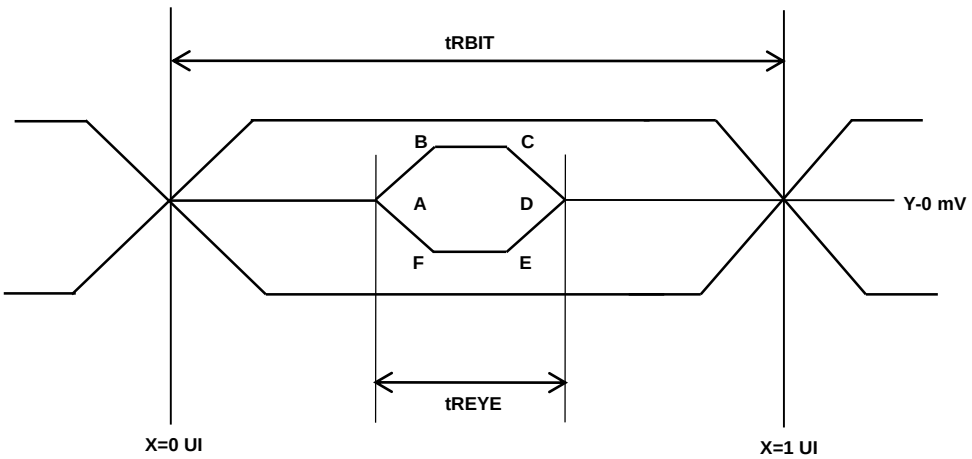
< Table 9. Timing Table >

Item		Symbols	Min	Typ	Max	Unit
Frequency		1/Tc	69	74.25	75	MHz
Vertical	Frame Rate	F	57	60	63	Hz
	Total	T_V	2200	2250	2330	T_H
	Display	T_{VD}	2160			T_H
	Blank	T_{VB}	40	90	170	T_H
Horizontal	Total	T_H	530	550	570	T_{CLK}
	Display	T_{HD}	-	480	-	T_{CLK}
	Blank	T_{HB}	50	70	90	T_{CLK}

5.2 Vx1 Input Signal Timing

< Table 7. Signal Timing Waveforms Table >

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Unit Interval(VBO Operation Bit Rate)	tRBIT	4-byte	294	tTCIP/40	1667	PS
Eye Width at Package Pin	tREYE	-	-	0.5	-	UI
Eye Width Position A at Package Pin	tA	-	-	0.25	-	UI
Eye Width Position B at Package Pin	tB	-	-	0.3	-	UI
Eye Width Position Cat Package Pin	tC	-	-	0.7	-	UI
Eye Width Position D at Package Pin	tD	-	-	0.75	-	UI
Eye Width Position E at Package Pin	tE	-	-	0.7	-	UI
Eye Width Position F at Package Pin	tF	-	-	0.3	-	UI
Intra – pair Skew	TTOSK_intra	-	-0.3	-	0.3	UI
Inter – pair Skew	TTOSK_inter	-	-5	-	5	UI
SSCG	-	30KHz modulation	-0.5		0.5	%



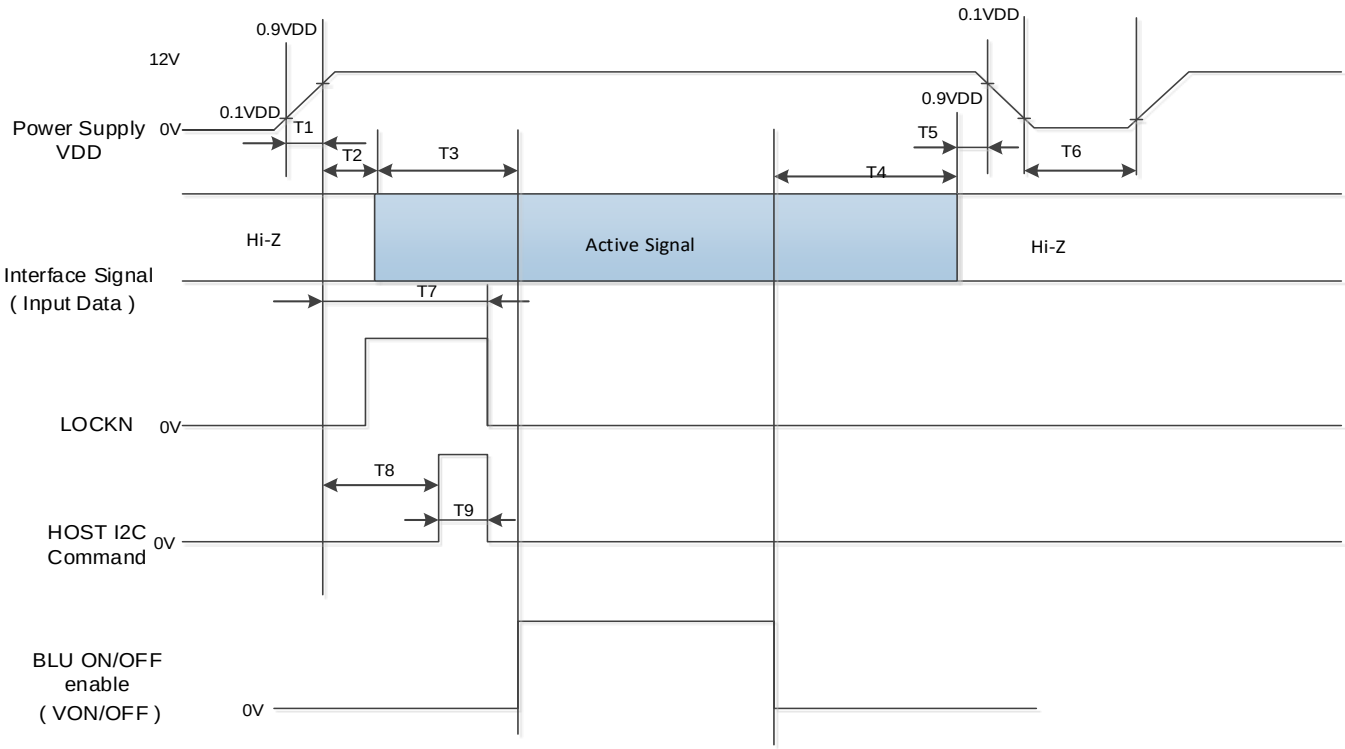
	Y[mV]
A	0
B	50
C	50
D	0
E	-50
F	-50

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

< Table 8. 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



< Table 9. Sequence Table >

Parameter	Values			Units
	Min	Typ	Max	
T1	0.5	-	10	ms
T2	0	-	-	ms
T3	200	-	-	ms
T4	100	-	-	ms
T5	0	-	50	ms
T6	1	-	-	s
T7	200	-	-	ms
T8	0	-	1200	ms
T9	Depends on I2C command			ms

Notes: 1. Even though T1 is over the specified value, there is no problem if I2T spec of fuse is satisfied.
2. Back Light must be turn on after power for logic and interface signal are valid.

6.0 OPTICAL SPECIFICATIONS

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 (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 $\theta_{Ø=0}$ (=θ_3) as the 3 o'clock direction (the "right"), $\theta_{Ø=90}$ (= θ_{12}) as the 12 o'clock direction ("upward"), $\theta_{Ø=180}$ (= θ_9) as the 9 o'clock direction ("left") and $\theta_{Ø=270}$(= θ_6) as the 6 o'clock direction ("bottom"). While scanning θ and/or Ø, 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 'clock.

< Table 11. Optical Table >

[VDD = 12.0V, Frame rate = 60Hz, Ta =25±2 ℃]

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	Θ = 0° (Center) Normal Viewing Angle	900:1	1200:1	-		Note 2
Chromaticity coordinate	White	W_x		TYP. - 0.03	0.280	TYP. + 0.03		Note 3
		W_y			**0.290**			
	Red	R_x			0.647			
		R_y			0.341			
	Green	G_x			0.316			
		G_y			0.612			
	Blue	B_x			0.150			
		B_y			0.051			
Response Time	G to G	T_g		-	8	10	ms	Note 4
Color Gamut					72		%	
Gamma Scale				2.0	2.2	2.4		
Brightness				400	500		nit	
Uniformity				80	85		%	Note 5

Notes :

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 color chromaticity coordinates specified in Table 11.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.
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 ti me in below table is defined as Figure2 and shall be measured by switching the input signal;

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. Brightness Uniformity measurement shall be taken at the locations shown in Figure 3.

7.0 MECHANICAL CHARACTERISTICS

7.1 Dimensional Requirements

Table 12 provides general mechanical characteristics.
Other parameters are shown in Figure 4、Figure 5.

< Table 12. Dimensional Parameters >

Parameter	Specification	Unit
MDL Outline	**1432.58mm(H) X 807.62mm(V)**	mm
Active area	1428.48(H) × 803.52 (V)	mm
MDL Thickness	**39.9**	mm
Weight	**15100(Typ.)**	gram

7.2 Surface treatment

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 13. Reliability Test Parameters >

No	Test Items	Conditions
1	High temperature storage test	Ta = 60 ℃, 240 hrs
2	Low temperature storage test	Ta = -20 ℃, 240 hrs
3	High temperature & high humidity operation test	Ta = 50 ℃, 80%RH, 240hrs
4	Low temperature operation test	Ta =0 ℃, 240hrs
5	High temperature operation test	Ta =50 ℃, 240hrs
6	Vibration test (non-operating)	Frequency : 5~ 200 Hz, Random Gravity / AMP : 1.05Grms Period : +Z
7	Electro-static discharge test	Air : ±15kV ,150pF/330Ω ,100Point ,1time/Point MDL Contact :±8kV ,150pF/330Ω ,100Point , 1time/Point Pin Contact:±5KV，150pF/330Ω，Input connector Pin, 3 times/pin with no function loss

9.0 PRODCUT SERIAL NUMBER

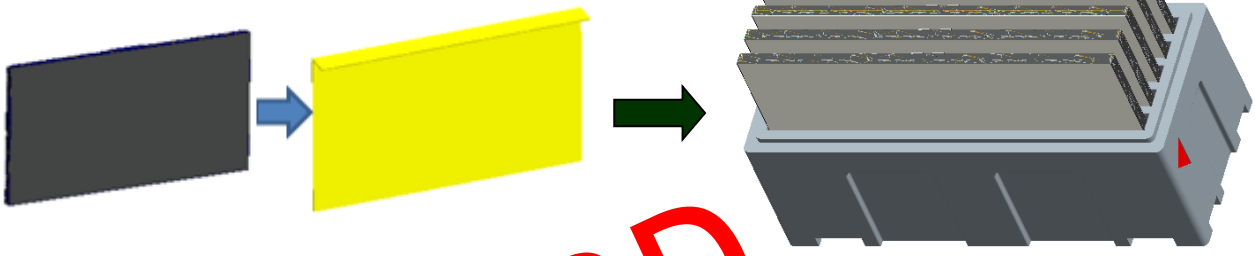
1	2	3	4	5	6	7
X X	X	X	X X	X	X X X X	X X X X X X

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

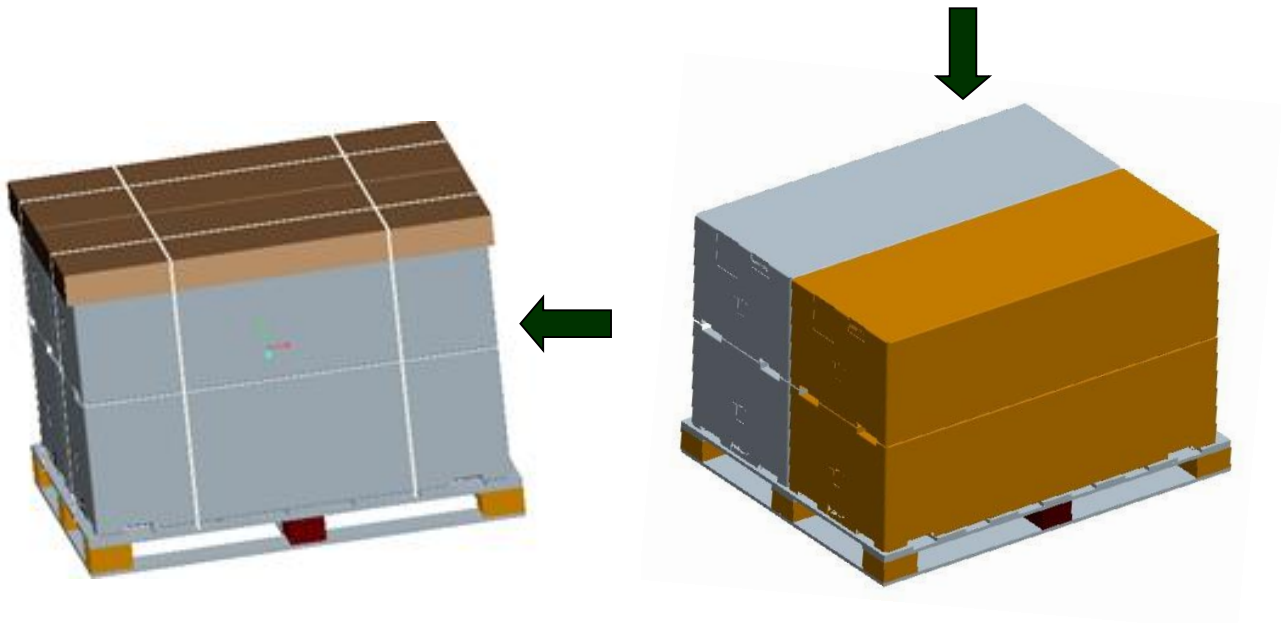
BOE provides the standard shipping container for customers, unless customer specifies their packing information. The standard packing method and Barcode information are shown in below.

10.1 Packing Order



Put one Pcs into the PE Bag

Put Five Pcs LCD MDL in the EPS BOX.



Put 2 EPS BOX on the pallet.

Put the Top-cover on the Box (10ea MDLs per ballet) and Pack with 4 packing belts.

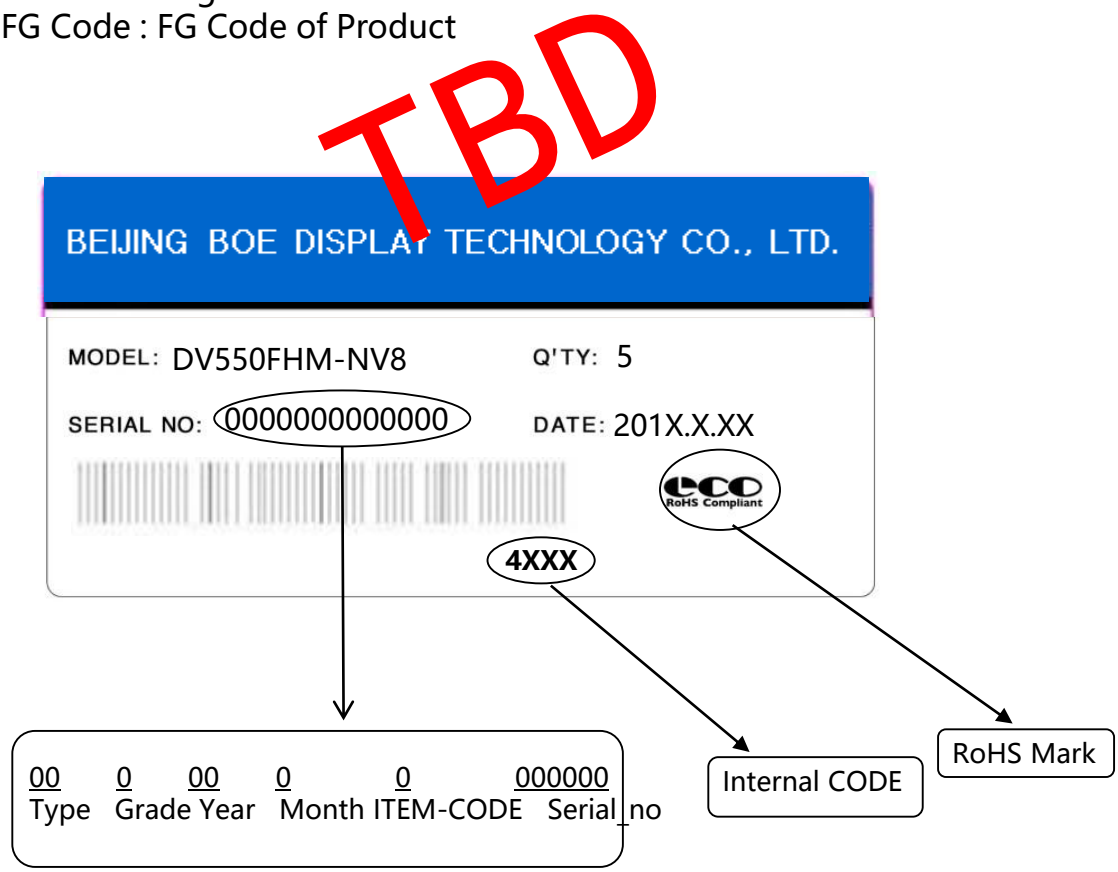
10.2 Packing Note

- Box Dimension : 1362mm (L) × 567mm (W) × 884.5mm (H)
- Package Quantity in one Box : 5pcs

10.3 Box Label

- Label Size : 110 mm (L) × 55 mm (W)
- Contents

  Model : DV550FHM-NV8
  Q`ty : Module 5 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



11.0 PRECAUTIONS

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

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 module 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 module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
- Do not apply mechanical stress or static pressure on module; Abnormal display cause by pressing some parts of module 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.
- You should adopt radiation structure to satisfy the temperature specification.
- 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.
- 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.
- Do not apply static pressure on module , and avoid impact, vibration and falling.
- This module 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 module.

11.2 Operating Precautions

- Do not connector or disconnect the cable to/from the Module at the "Power On" Condition.
- When the module is operating, do not lose CLK, ENAB signals. If any one of these signals is lost, the module would be damaged.
- Obey the supply voltage sequence. If wrong sequence is applied, the module would be damaged.
- The electrochemical reaction caused by DC voltage will lead to LCD module degradation, so DC drive should be avoided.
- 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 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 Module may be damaged.
- Module 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

- Since a module 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 touch interface pin directly.

11.4 Precautions for Strong Light Exposure

- Do not leave the module 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	(℃)	5	40
Storage Humidity	(%rH)	35	75
Storage Life	6 months		
Storage Condition	• 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.
- 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 modules are designed for consumer applications . Accordingly, long-term display like in Commercial Display application, can cause uneven display including image sticking. To optimize module's lifetime and function, several operating usages are required.

1. Normal operating condition
   - -. Temperature: 20±15℃
   - -. Operating Ambient Humidity : 55±20%
   - -. Display pattern: dynamic pattern (Real display)
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 module 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 module will return to normal display.

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

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 Module 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 24 hours a day.
(The moving picture can be allowed for 24 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.

-. Abnormal condition just means conditions except normal condition.

-. 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.

5. Module should be turned clockwise based on front view when used in portrait mode.

11.8 Other Precautions

A. LC Leak

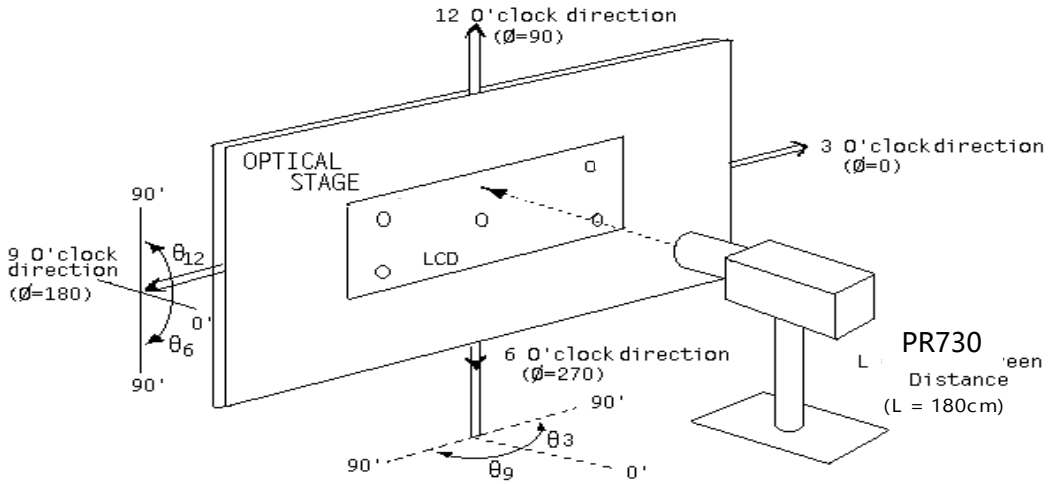
- If the liquid crystal material leaks from the panel, it is recommended to wash the LC with acetone or ethanol and then burn it.
- In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.
- If LC in mouth, mouth need to be washed, drink plenty of water to induce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

B. Rework

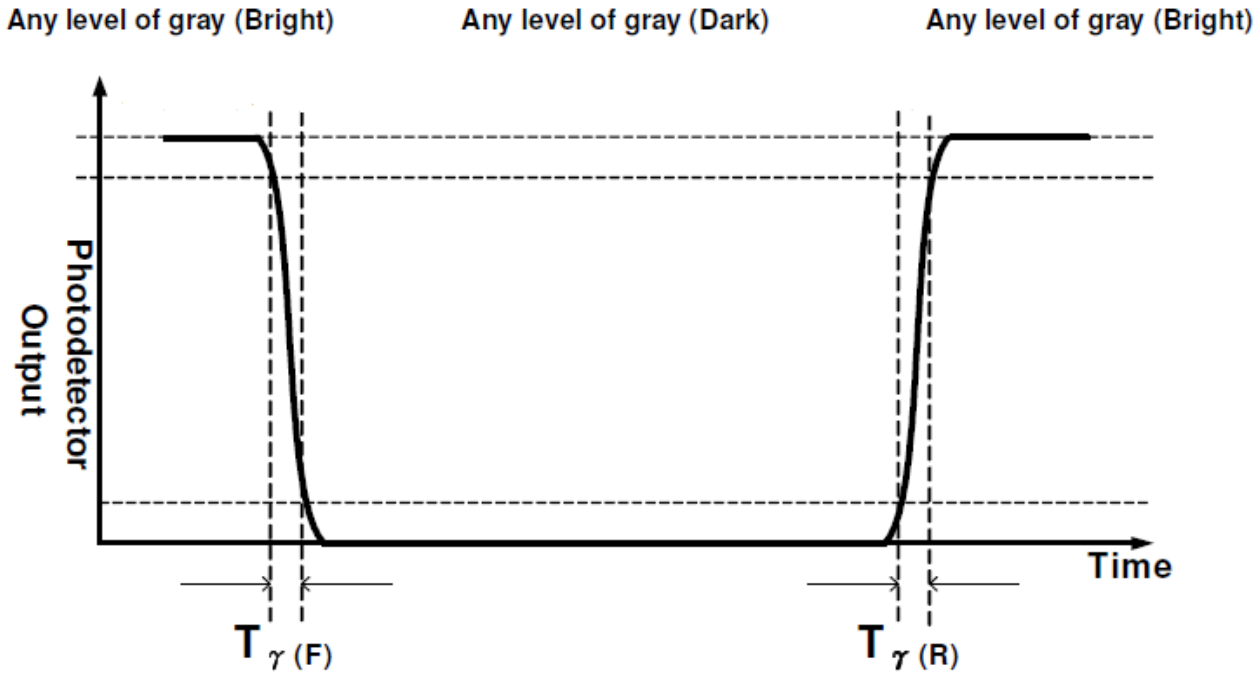
- When returning the module for repair or etc., Please pack the module not to be broken. We recommend to use the original shipping packages.

12.0 APPENDIX

< Figure 1. Measurement Set Up >



< Figure 2. Response Time Testing >



12.0 APPENDIX

< Figure 3. Uniformity Measurement Locations >

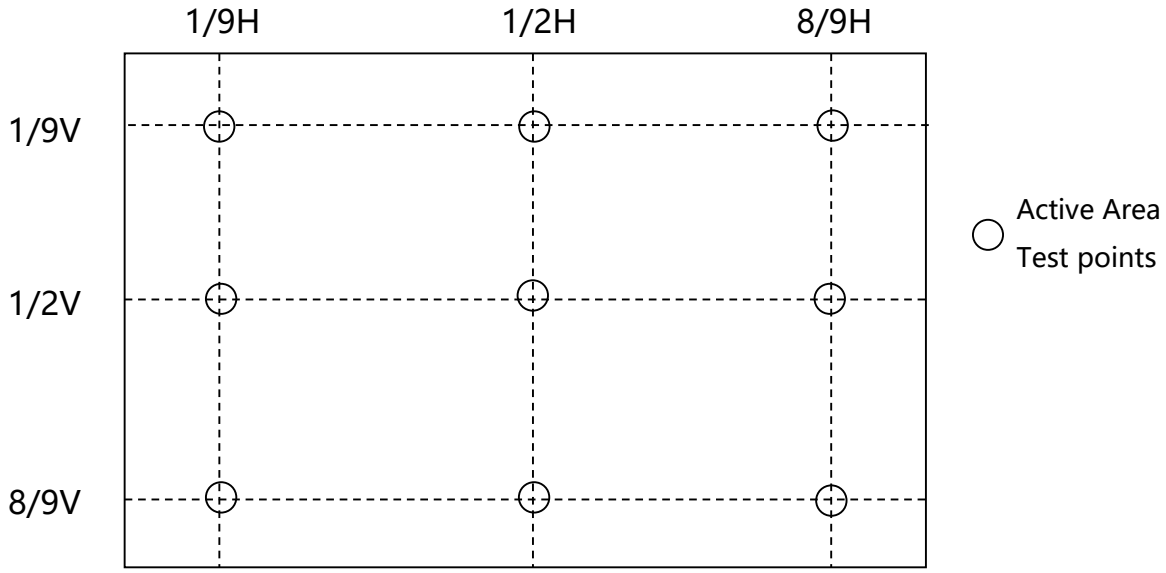


Figure 4. TFT-LCD Module Outline Dimensions (Front view)

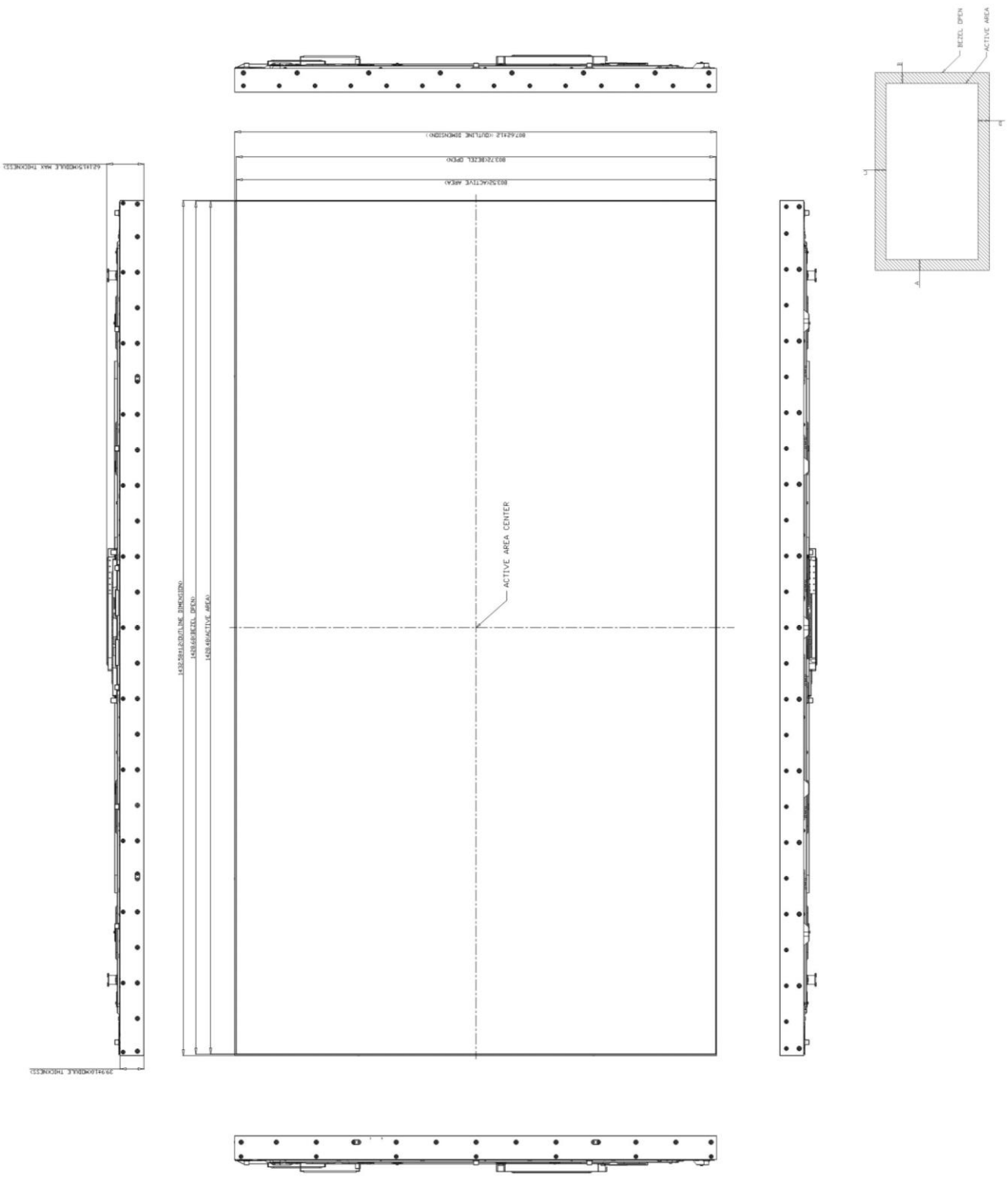


Figure 5. TFT-LCD Module Outline Dimensions (Back view)