TITLE :

UV810CLM-N10 Product Specification

Fuzhou BOE Optoelectronics Technology Co.,Ltd

REVISION HISTORY

REV.	ECN No.	DESCRIPTION OF CHANGES	DATE	PREPARED
P0	-	Initial Release	2022.02.24	Yang Mengmeng

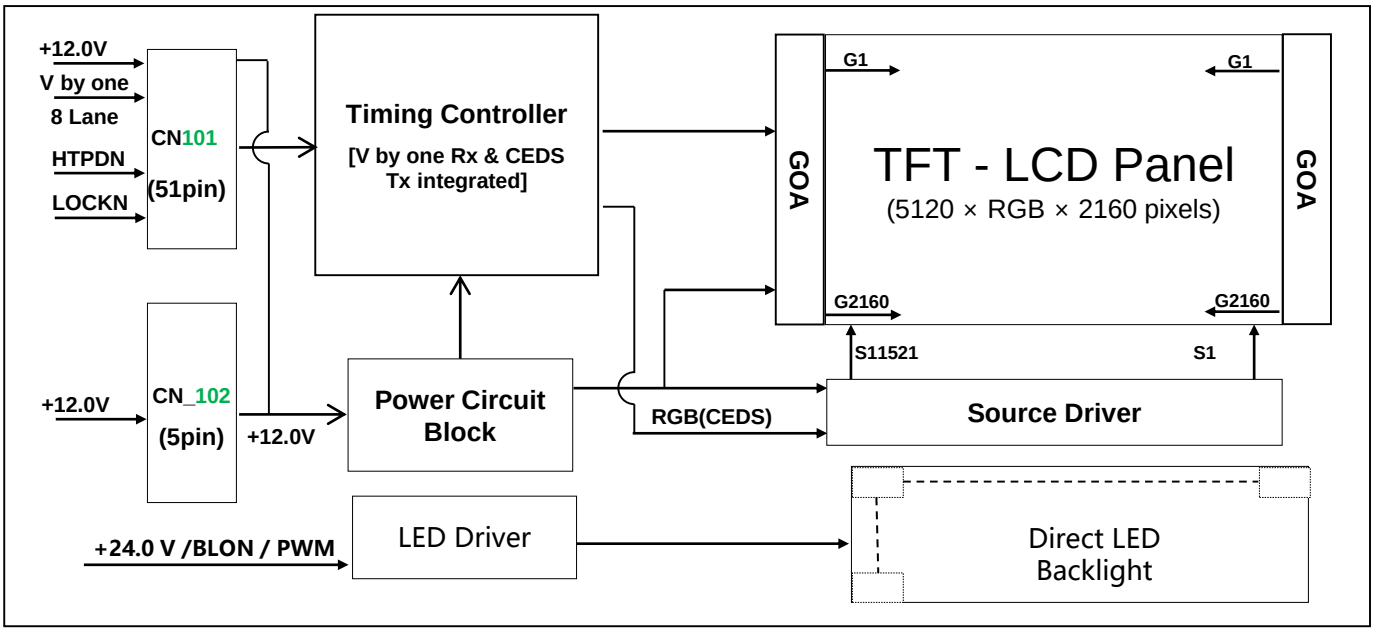
Contents

No	ITEM	Page
	REVISIONS HISTORY	2
	CONTENTS	3
1	GENERAL DESCRIPTION	4
	1.1 Introduction	
	1.2 Features	
	1.3 Application	
	1.4 General Specification	
2	ABSOLUTE MAXIMUM RATINGS	6
3	ELECTRICAL SPECIFICATIONS	7
	3.1 TFT LCD Open Cell	
	3.2 T-con Characteristics	
	3.3 Driver Characteristics	
	3.4 PMIC Characteristics	
	3.5 Converter Electrical Specifications	
4	INTERFACE CONNECTION	10
	4.1 Open Cell Input Signal & Power	
	4.2 V by one Interface	
	4.3 BLU Input Signal & Power	
5	SIGNAL TIMING WAVEFORMS OF INTERFACE SIGNAL	15
	5.1 Input data specification CN1	
6	SIGNAL TIMING SPECIFICATION	16
	6.1 Timing Parameters	
	6.2 Vx1 Input Signal Timing	
	6.3 Input Signals, Basic Display Colors and Gray Scale of Colors	
	6.4 Power Sequence	
7	OPTICAL SPECIFICATIONS	20
8	MECHANICAL CHARACTERISTICS	22
9	RELIABILITY TEST	23
10	PRODCUT SERIAL NUMBER	24
11	PACKING INFORMATION	25
12	HANDING & CAUTIONS	27
13	APPENDIX	31

1.0 GENERAL DESCRIPTION

1.1 Introduction

UV810CLM-N10 is a color active matrix TFT LCD module using amorphous silicon TFT‘s (Thin Film Transistors) as an active switching devices. This OC has a 81 inch diagonally measured active area with resolutions (5120 horizontal by 2160 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this OC can display 1.07G colors. The TFT-LCD panel used for this OC is adapted for a low reflection and higher color type.



1.2 Features

- V by one interface with 16 lanes
- High-speed response
- Low color shift image quality
- 8-bit + FRC color depth, display 1.07G colors
- High luminance and contrast ratio, low reflection and wide viewing angle
- GOA mode
- ADS technology is applied for high display quality
- RoHS compliant
- Supports Local Dimming，block number : 144

1.3 Application

- Home Alone Multimedia TFT-LCD TV
- Display Terminals for Control System
- Ultra High Definition TV(5120*2160)
- AV application Products

1.4 General Specification

< Table 1. General Specifications >

Parameter	Specification	Unit	Remarks
MDL Outline	1919.2(H) × 828.7(V)	mm	
Active area	1886.208(H) × 795.744(V)	mm	
Number of pixels	5120(H) ×2160(V)	pixels	
Pixel pitch	122.8(H) ×368.4(V)	um	
Pixel arrangement	Pixels RGB Vertical stripe		
Display mode	Normally Black		
Display colors	1.07G (8bits+FRC)	colors	Center point
Brightness	500(Typ.)		(min:450nit)
MDL Thickness	76.7	mm	Bezel to wall mount
Weight	31,000(Max.)	gram	
Power Consumption	328	Watt	Typ. Note 1
Surface Treatment	AG25/Clear(CF /TFT POL)		
Life time	30000	Hrs	Note 2
Possible Display Type	Landscape and Portrait Enabled		
Remark	7*16Hrs Continuous Operation Horizo ntal and Perpendicular Compatibility		

Note 1 : Total power consumption =P_{DD}*144.
BLU power efficiency is calculated as 90% , P_{BLU}= P_{DD}*144*90%

Note 2 : 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

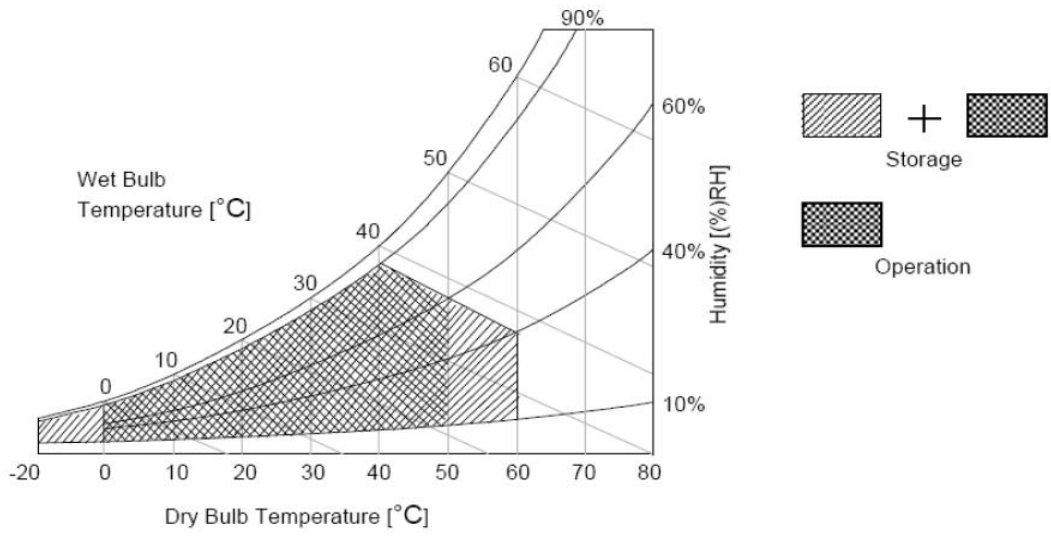
The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2.

< Table 2. Open Cell Electrical Specifications >

[VSS=GND=0V]

Parameter	Symbol	Min.	Max.	Unit	Remark
Power Supply Voltage	VDD	VSS-0.3	13.5	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	
Panel Surface Temperature	PST	-	65	℃	Note 2

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.
Note 2 : Surface temperature is measure at 50℃ Dry condition



3.0 ELECTRICAL SPECIFICATIONS

3.1 TFT LCD Open Cell

< Table 3. Open Cell Electrical Specifications >

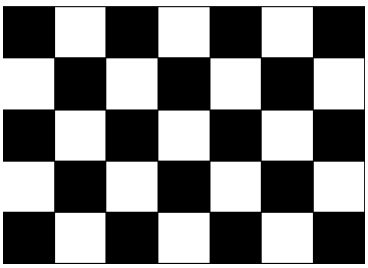
[Ta =25±2 ℃]

Parameter		Symbol	Values			Unit	Remark
			Min	Typ	Max		
Power Supply Input Voltage		VDD	10.8	12	13.2	Vdc	
Power Supply Ripple Voltage		VRP	-	-	600	mV	
Power Supply Current		IDD	-	1167	3602	mA	Note 1
Power Consumption		PDD	-	14	39	Watt	
Rush current		IRUSH	-	-	4	A	Note 2
V by One Interface	Differential Input High Threshold Voltage	VLVTH	-	-	+50	mV	Note3
	Differential Input Low Threshold Voltage	VLVTL	-50	-	-	mV	
	Common Input Voltage	VLVC	-	0	-	V	
	Terminating Resistor	Rt	90	100	110	ohm	
CMOS Interface	Input High Threshold Voltage	VIH	2.7	-	3.3	V	
	Input Low Threshold Voltage	VIL	0	-	0.6	V	

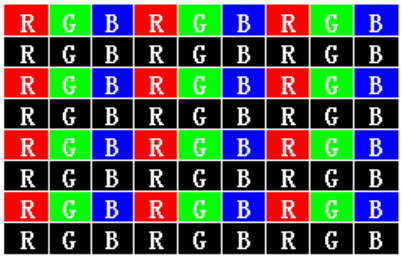
Note 1 : The supply voltage is measured and specified at the interface connector of LCM.
The current draw and power consumption specified is for VDD=12.0V,
Frame rate f_V=60Hz and Clock frequency = 37.125MHz.
Test Pattern of power supply current

Note 2 : The duration of rush current is about 2ms and rising time of Power Input is 0.5ms(min)

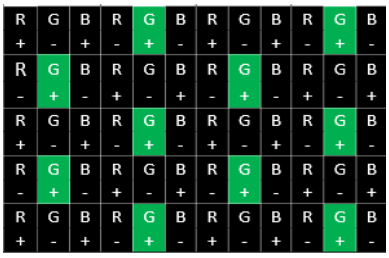
a) Typ : Mosaic 7X5 (L0/L255)



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



c) Flicker Test Pattern



Note 3 : V By one signal Eye diagram should be OK. Otherwise, there will be abnormal display.

3.0 ELECTRICAL SPECIFICATIONS

3.2 T-con Characteristics

< Table 4. TCON Characteristics >

Parameter	Symbol	Values			Unit	Remark
		Min	Typ	Max		
TCON Surface Temperature	T_{TS}	-	-	100	℃	Note

Note 1 : Any point on the TCON surface must be less than 104 ℃ under any conditions.

Note 2 : This test condition is based on BOE module.

3.3 Driver Characteristics

< Table 5. Driver Characteristics >

Parameter	Symbol	Values			Unit	Remark
		Min	Typ	Max		
Driver Surface Temperature	T_{DS}	-	-	145	℃	Note

Note 3 : Any point on the driver surface must be less than 110 ℃ under any conditions.

Note 4: This test condition is based on BOE module.

3.4 PMIC Characteristics

< Table 6. PMIC Characteristics >

Parameter	Symbol	Values			Unit	Remark
		Min	Typ	Max		
PMIC Surface Temperature	T_{PS}	-	-	110	℃	Note

Note 5 : Any point on the PMIC surface must be less than 110 ℃ under any conditions.

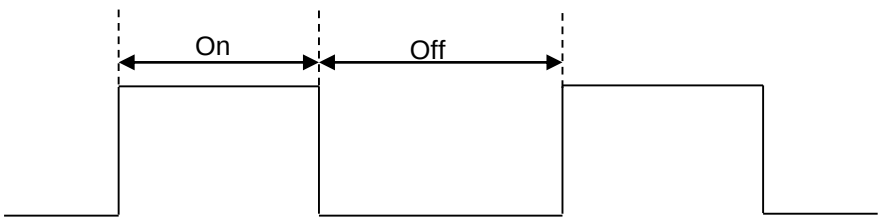
Note 6: This test condition is based on BOE module.

3.5 Converter Electrical Specifications

< Table 7. Converter Electrical Specifications > [Ta =25±2 ℃]

Parameter	Symbol	Values			Unit	Remark
		Min	Typ	Max		
Power Supply Input Voltage	V_{BL}	-	24	-	Vdc	
Power Supply Ripple Voltage	V_{RP}	-	-	-	mV	
Power Supply Current	I_{DD}	-	13.6	15	A	
Power Consumption	P_{DD}	-	328	359	Watt	Note 1
Backlight On/Off Control Voltage	V_{BLON} (off)	-	-	-	V	
	V_{BLON} (on)	-	-	-	V	
Backlight PWM	High Level	-	-	-	V	On duty
	Low Level	-	-	-	V	Off duty
	Dimming Ratio	-	-	-	%	Note 2
	PWM Frequency	-	-	-	Hz	

Note 1:The specified current and power consumption are under the typical supply Input voltage, 24V.
It is power consumption for each board .Total power consumption = P_{DD}*144.
BLU power efficiency is calculated as 90% , P_{BLU}= P_{DD}*144*90%
Note 2 : High-duty = On/(On+Off) * 100



4.0 INTERFACE CONNECTION

4.1 Open Cell Input Signal & Power

- V by one Connector : IS050-C51B-C39-S (UJU).

< Table 8. Open Cell Input Connector Pin Configuration >

Pin No	Symbol	Description	Pin No	Symbol	Description
1	VDD	Power Supply +12.0V	27	GND	Ground
2	VDD	Power Supply +12.0V	28	Rx0n	V-by-One HS Data Lane 0
3	VDD	Power Supply +12.0V	29	Rx0p	V-by-One HS Data Lane 0
4	VDD	Power Supply +12.0V	30	GND	Ground
5	VDD	Power Supply +12.0V	31	Rx1n	V-by-One HS Data Lane 1
6	VDD	Power Supply +12.0V	32	Rx1p	V-by-One HS Data Lane 1
7	VDD	Power Supply +12.0V	33	GND	Ground
8	VDD	Power Supply +12.0V	34	Rx2n	V-by-One HS Data Lane 2
9	NC	No Connection	35	Rx2p	V-by-One HS Data Lane 2
10	GND	Ground	36	GND	Ground
11	GND	Ground	37	Rx3n	V-by-One HS Data Lane 3
12	GND	Ground	38	Rx3p	V-by-One HS Data Lane 3
13	GND	Ground	39	GND	Ground
14	GND	Ground	40	Rx4n	V-by-One HS Data Lane 4
15	NC	No Connection	41	Rx4p	V-by-One HS Data Lane 4
16	SDA_T	SDA_T	42	GND	Ground
17	SCL_T	SCL_T	43	Rx5n	V-by-One HS Data Lane 5
18	SDA_P	SDA_P	44	Rx5p	V-by-One HS Data Lane 5
19	SCL_P	SCL_P	45	GND	Ground
20	NC	No Connection	46	Rx6n	V-by-One HS Data Lane 6
21	Aging (BIST)	H : Enable (Default) L : Disable	47	Rx6p	V-by-One HS Data Lane 6
22	SEL_SECTION	H : 2 Section L : 1 Section (Default)	48	GND	Ground
23	NC	No Connection	49	Rx7n	V-by-One HS Data Lane 7
24	GND	Ground	50	Rx7p	V-by-One HS Data Lane 7
25	HTPDN	Hot Plug Detect	51	GND	Ground
26	LOCKN	Lock Detect			

IS050-C51B-C39-S (UJU)

BIST Pattern

PT1: Black (2 sec)	PT2: White (2 sec)	PT3:Red (2 sec)	PT4:Green (2 sec)	PT5:Blue (2 sec)

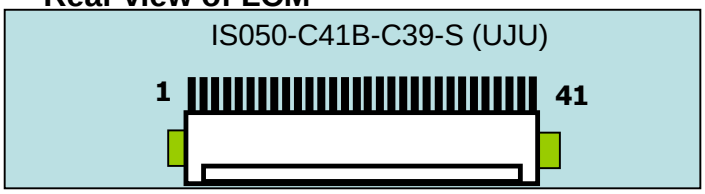
- V by one 41Pin Connector : IS050-C41B-C39-S (UJU).

< Table 4-2. Open Cell Input Connector 41Pin Configuration >

Pin No	Symbol	Description	Pin No	Symbol	Description
1	GND	Ground	27	NC	No Connection
2	Rx8n	V-by-One HS Data Lane 8	28	SDA_G	SDA_G
3	Rx8p	V-by-One HS Data Lane 8	29	SCL_G	SCL_G
4	GND	Ground	30	GND	Ground
5	Rx9n	V-by-One HS Data Lane 9	31	NC	No Connection
6	Rx9p	V-by-One HS Data Lane 9	32	NC	No Connection
7	GND	Ground	33	NC	No Connection
8	Rx10n	V-by-One HS Data Lane 10	34	NC	No Connection
9	Rx10p	V-by-One HS Data Lane 10	35	NC	No Connection
10	GND	Ground	36	NC	No Connection
11	Rx11n	V-by-One HS Data Lane 11	37	NC	No Connection
12	Rx11p	V-by-One HS Data Lane 11	38	NC	No Connection
13	GND	Ground	39	NC	No Connection
14	Rx12n	V-by-One HS Data Lane 12	40	NC	No Connection
15	Rx12p	V-by-One HS Data Lane 12	41	NC	No Connection
16	GND	Ground			
17	Rx13n	V-by-One HS Data Lane 13			
18	Rx13p	V-by-One HS Data Lane 13			
19	GND	Ground			
20	Rx14n	V-by-One HS Data Lane 14			
21	Rx14p	V-by-One HS Data Lane 14			
22	GND	Ground			
23	Rx15n	V-by-One HS Data Lane 15			
24	Rx15p	V-by-One HS Data Lane 15			
25	GND	Ground			
26	NC	No Connection			

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

Rear view of LCM



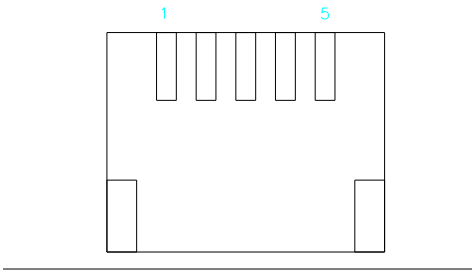
Notes : 1. NC (Not Connected) : This pins are only used for BOE internal operations.
2.BIST : This pin is used for selecting display pattern mode when input DE or input CLOCK quits toggling.

- Power Input Connector : 20037WR-05 (Yeonho).

< Table 9. Open Cell Power Input Connector Pin Configuration >

Pin No	Symbol	Description
1	GND	Ground
2	GND	Ground
3	VDD	Power Supply +12.0V
4	VDD	Power Supply +12.0V
5	VDD	Power Supply +12.0V

Rear view of LCM



4.2 VBO Interface

a) System side have to put pull high resistor on LOCKN/HTPDN pins.

b) V by one data mapping as follows.

< Table 10. V by one setting &data mapping Table >

1Section																
Hactive=5120																
	port0		port1		port2		port3		port4		port5		port6		port7	
	Lane 0	Lane 1	Lane 2	Lane 3	Lane 4	Lane 5	Lane 6	Lane 7	Lane 8	Lane 9	Lane 10	Lane 11	Lane 12	Lane 13	Lane 14	Lane 15
V Blanking	PSBS	PSBS	PSBS	PSBS	PSBS	PSBS	PSBS	PSBS	PSBS	PSBS	PSBS	PSBS	PSBS	PSBS	PSBS	PSBS
	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP
	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP
	FSBE SR	FSBE SR	FSBE SR	FSBE SR	FSBE SR	FSBE SR	FSBE SR	FSBE SR	FSBE SR	FSBE SR	FSBE SR	FSBE SR	FSBE SR	FSBE SR	FSBE SR	FSBE SR
Line 1	Pixel 1	Pixel 2	Pixel 3	Pixel 4	Pixel 5	Pixel 6	Pixel 7	Pixel 8	Pixel 9	Pixel 10	Pixel 11	Pixel 12	Pixel 13	Pixel 14	Pixel 15	Pixel 16
	Pixel 17	Pixel 18	Pixel 19	Pixel 20	Pixel 21	Pixel 22	Pixel 23	Pixel 24	Pixel 25	Pixel 26	Pixel 27	Pixel 28	Pixel 29	Pixel 30	Pixel 31	Pixel 32
	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Pixel 5105	Pixel 5106	Pixel 5107	Pixel 5108	Pixel 5109	Pixel 5110	Pixel 5111	Pixel 5112	Pixel 5113	Pixel 5114	Pixel 5115	Pixel 5116	Pixel 5117	Pixel 5118	Pixel 5119	Pixel 5120
H Blanking	PSBS	PSBS	PSBS	PSBS	PSBS	PSBS	PSBS	PSBS	PSBS	PSBS	PSBS	PSBS	PSBS	PSBS	PSBS	PSBS
	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP
	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP
	FSBE	FSBE	FSBE	FSBE	FSBE	FSBE	FSBE	FSBE	FSBE	FSBE	FSBE	FSBE	FSBE	FSBE	FSBE	FSBE
Line 2	Pixel 1	Pixel 2	Pixel 3	Pixel 4	Pixel 5	Pixel 6	Pixel 7	Pixel 8	Pixel 9	Pixel 10	Pixel 11	Pixel 12	Pixel 13	Pixel 14	Pixel 15	Pixel 16
	Pixel 17	Pixel 18	Pixel 19	Pixel 20	Pixel 21	Pixel 22	Pixel 23	Pixel 24	Pixel 25	Pixel 26	Pixel 27	Pixel 28	Pixel 29	Pixel 30	Pixel 31	Pixel 32
	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Pixel 5105	Pixel 5106	Pixel 5107	Pixel 5108	Pixel 5109	Pixel 5110	Pixel 5111	Pixel 5112	Pixel 5113	Pixel 5114	Pixel 5115	Pixel 5116	Pixel 5117	Pixel 5118	Pixel 5119	Pixel 5120

4.3 BLU Input Signal & Power

-BLU Connector(CN7 & CN8) : CN7~8:20022WR-H14B2,2.0mm-14Pin or Equivalent

< Table 11. Input Connector Pin Configuration CN7 & CN8 >

Pin No	Symbol	Description
1	VDD	Power Supply +24.0V
2	VDD	Power Supply +24.0V
3	VDD	Power Supply +24.0V
4	VDD	Power Supply +24.0V
5	VDD	Power Supply +24.0V
6	GND	Ground
7	GND	Ground
8	GND	Ground
9	GND	Ground
10	GND	Ground
11	NC	No Connection
12	BLON	Ground
13	PWM	Ground
14	NC	No Connection

5.0 SIGNAL TIMING WAVEFORMS OF INTERFACE SIGNAL

5.1 Input data specification CN1

< Table 12. Vx1 Byte length and Color mapping >

Byte	Packer input	Color data mapping
		30 bpp RGB
0	Bit-0	R2
	Bit-1	R3
	Bit-2	R4
	Bit-3	R5
	Bit-4	R6
	Bit-5	R7
	Bit-6	R8
	Bit-7	R9
1	Bit-8	G2
	Bit-9	G3
	Bit-10	G4
	Bit-11	G5
	Bit-12	G6
	Bit-13	G7
	Bit-14	G8
	Bit-15	G9
2	Bit-16	B2
	Bit-17	B3
	Bit-18	B4
	Bit-19	B5
	Bit-20	B6
	Bit-21	B7
	Bit-22	B8
	Bit-23	B9
3	Bit-24	-
	Bit-25	-
	Bit-26	B0
	Bit-27	B1
	Bit-28	G0
	Bit-29	G1
	Bit-30	R0
	Bit-31	R1

6.0 SIGNAL TIMING SPECIFICATION

6.1 Timing Parameters(DE only mode)

< Table 13. Timing Table >

Item		Symbols	Min	Typ	Max	Unit
Frequency		1/Tc	43.69	48.6	53	MHz
Vertical	Frame Rate	F	57	60	62	Hz
	Total	T_V	2180	2250	2310	T_H
	Display	T_{VD}	2160			T_H
	Blank	T_{VB}	30	90	150	T_H
Horizontal	Total	T_H	350	360	370	T_{CLK}
	Display	T_{HD}	-	320	-	T_{CLK}
	Blank	T_{HB}	30	40	50	T_{CLK}

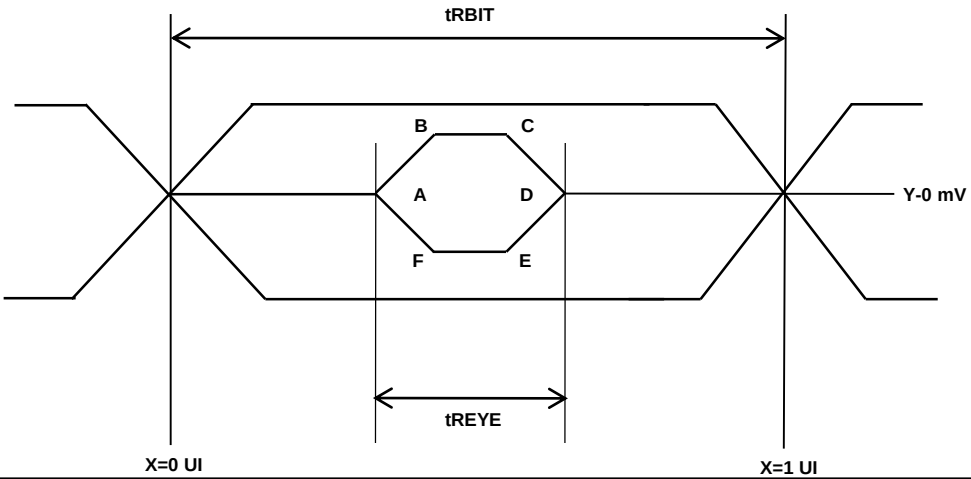
Note

1. While operation, DE signal should be have the same cycle. The input of HSYNC & VSYNC signal does not have an effect on normal operation (DE Only Mode, but the signals of Hsync and Vsync must be inputted even though this TCON is operated at DE Only Mode.
2. Best operation clock frequency is 48.6 Mhz.
3. Frequency] = [H Total] * [V Total] * [vertical Frame rate]
   H Total, V Total]and Frame rate]should operate within the range between Frequency_Min and Frequency_Max
4. Except Best operation clock frequency, FOS(Flicker & Brightness & Crosstalk, Etc.) are not guaranteed.
5. Main frequency Max is 48.6MHz without spread spectrum

6.2 Vx1 Input Signal Timing

< Table 14. Signal Timing Table >

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Unit Interval(VBO Operation Bit Rate)	tRBIT	3-byte	417	tTCIP/30	625	PS
		4-byte	313	tTCIP/40	469	PS
		5-byte	250	tTCIP/50	375	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	-	-0.5	-	0.5	UI
Inter – pair Skew	TTOSK_inter	-	-1	-	1	UI
SSCG	-	30KHz modulation	-0.5		0.5	%



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

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

< Table 15. Input Signal and Display Color Table >

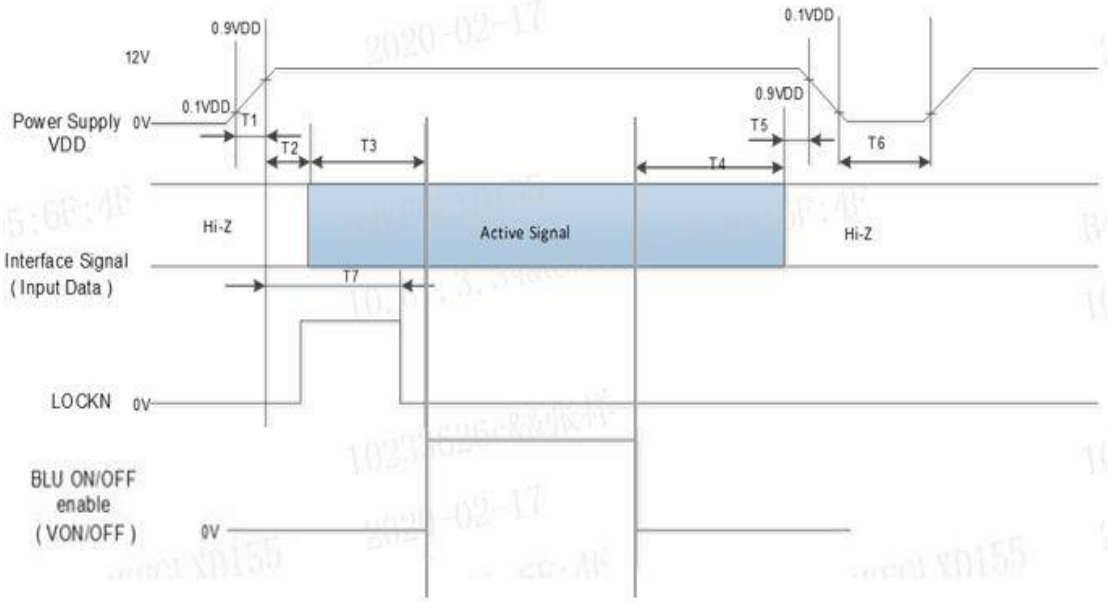
Color		Input Color Data																													
		MSB RED LSB										MSB GREEN LSB										MSB BLUE LSB									
		R9	R8	R7	R6	R5	R4	R3	R2	R1	R0	G9	G8	G7	G6	G5	G4	G3	G2	G1	G0	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1023)	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1023)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
	Blue(1023)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	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	1	1	1	1	0	0	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	1	1	1	1	1	1
R	RED(000)	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
	RED(001)	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	0	0	0	0

	RED(1022)	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(1023)	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G	Green (000)	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
	Green (000)	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

	Green (1022)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
	Green (1023)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
B	Blue(000)	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
	Blue(000)	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

	Blue(1022)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0
	Blue(1023)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1

6.4 Power Sequence



< Table 16. 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

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.

3.If T7 is over the specified value,please ensure the invalid data will not be seen when the BLU is turned on.

7.0 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 180cm 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 at 25°C. Optimum viewing angle direction is 6 'clock.

< Table 17. 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.	
Cell Transmittance			Θ = 0° (Center) Normal Viewing Angle	-	4.5		%	Note 5
Contrast ratio		CR		-	1200:1	-		Note 2
Reproduction of color	White	W_x		TYP. - 0.03	0.280	TYP. + 0.03		Note 3
		W_y			0.390			
	Red	R_x			0.6784			
		R_y			0.3109			
	Green	G_x			0.2707			
		G_y			0.6572			
	Blue	B_x			0.1532			
		B_y			0.0573			
Color Gamut				80	85	-	%	
Response Time	G to G	T_g		-	8	10	ms	Note 4
Gamma Scale				2.0	2.2	2.4		
Brightness		Lv		450	500	-	nit	
White luminance uniformity		ΔY		75	-	-	%	

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 $\theta = 0°$ 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 17.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 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. Definition of Transmittance (T%) :
   OC is with white(L255) signal input

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

8.0 MECHANICAL CHARACTERISTICS

8.1 Dimensional Requirements

Table 15 provides general mechanical characteristics.
Other parameters are shown in Figure 4、Figure 5.

< Table 18. Dimensional Parameters >

Parameter	Specification	Unit
MDL Outline	1919.2(H)X 828.7(V)	mm
Active area	1886.2(H)X 795.74(V)	mm
Pixel pitch	122.8(H) ×368.4(V)	
MDL Thickness	76.7 (Bezel to wall mount)	mm
Weight	31000(Max.)	gram

8.2 Surface Treatment of the front polarizer

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

Items	Min	Typ	Max	Unit.	Remark
Haze	17	25	30	%	Note 1
Hardness	3H	-	-	-	
Roughness (Ra)	0.25	0.4	0.6	um	Note 2

Note 1： Hardness is tested at 500G weight pressure.
Note 2： Roughness measure system：CS-5000CNC/CS-H5000CNC manufactured by Mitutoyo.

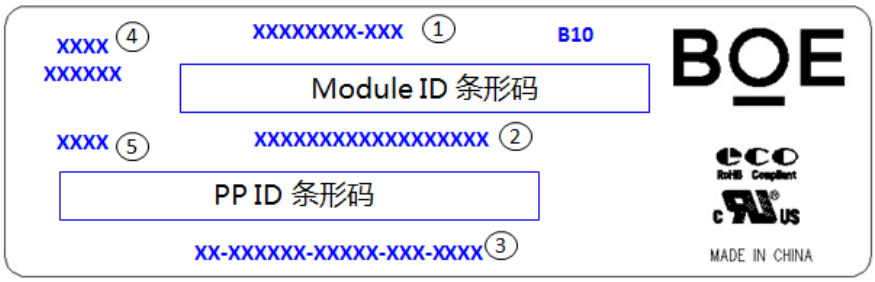
9.0 RELIABILITY TEST

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

< Table 19. 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 =-5 ℃, 240hrs
5	High temperature operation test	Ta =60 ℃, 240hrs
6	On-off	50℃ 3sec(on)/3sec(off)，1000times， 10sec(on)/5sec(off)，3000times
7	TST-1	-20℃~60℃（Per 30min）,100Cycle
8	常温残像	1h/（3h+5min）/（10h+5min）/24h/48h•••144h/（168+1h） 要求：10h小于Level 1，10h+5min残像需消失， 168+1hr不能出现Level 2及以上残像
9	Vibration test (non-operating)	1.07Grms, 5~300Hz, Random +Z,2hr/一侧固定式跌落(40cm)
10	Box存储	60℃，90%RH，Storage
11	静压测试	环境时间：依产品运输存储环境选择， 压力：TL=Wt×（S-1）×9.8 Wt：包装件的毛重（kg） S：包装件的堆码层数，包括最底下的一层（按实际最大堆码层数验证）38℃ 85%湿度 72hr → 60℃ 30%湿度 6hr
12	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

10.0 PRODCUT SERIAL NUMBER



① FG-CODE
② Module ID，最后一位为Revision Code（扫描不显示），前17位编码规则如下
③ PPID（客户端ID）
④ D/PN码，规格待确定
⑤ 生产年份+生产周别（中间无空格）

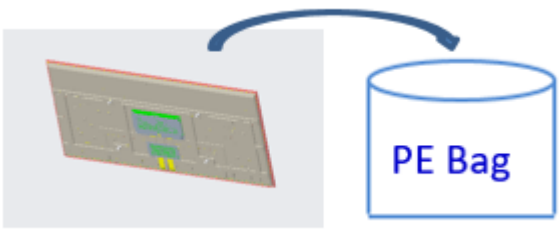
MDL ID Naming Rule:

Digit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Code	S	L	S	A	1	0	8	5	9	4	2	0	0	0	1	D	B
Description	Product Code/GBN→FG-CODE一一对应		Grade	line	Year	Month	Model Extension Code (Last 4 Digits of FG-CODE)					Serial No. Hex-Decimal 000000-FFFFFF					

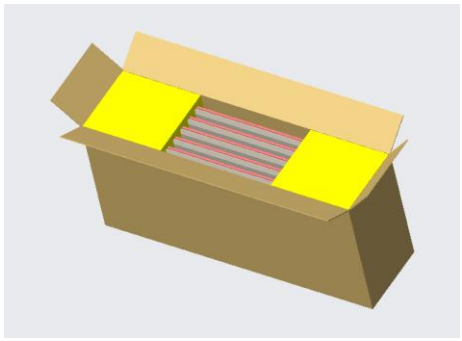
11.0 PACKING INFORMATION

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.

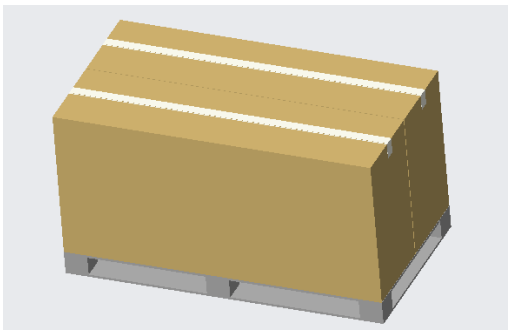
11.1 Packing Order



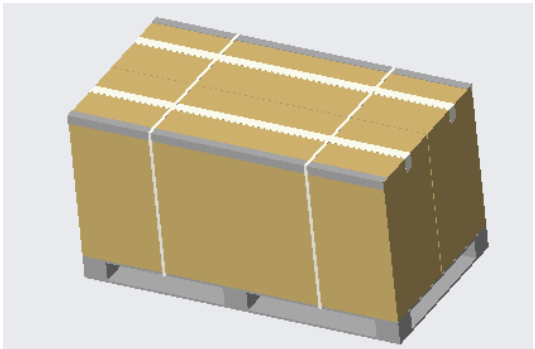
Put one Pcs into the PE Bag



Put 5 Pcs LCD MDL in the EPE With Carton BOX.



Put 2 BOX on the pallet.



Put the Top-cover on the Box (10ea MDLs per ballet) and Pack with 2 packing belts.

11.2 Packing Note

- Box Dimension : 2044mm(L)×540mm(W)×960mm(H)
- Package Quantity in one Box : 5pcs

11.3 Box Label

- Label Size : 100 mm (L) × 50mm (W)
  - Contents

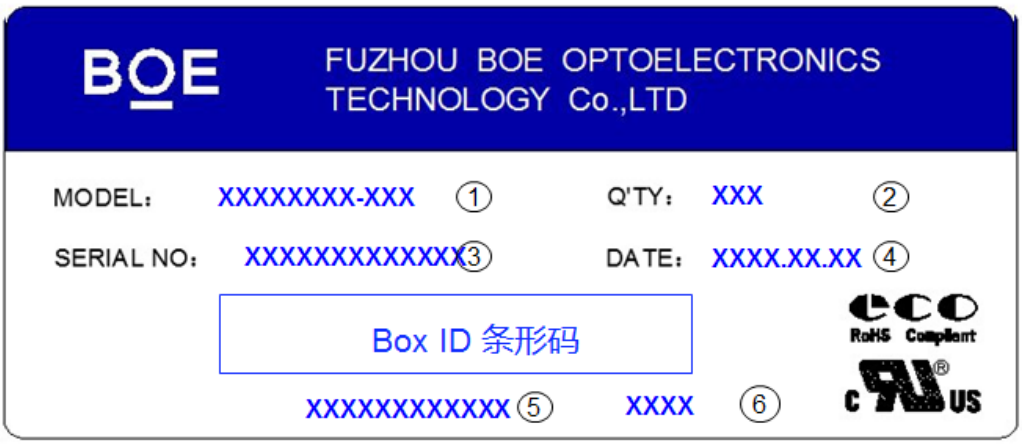
    Module: UV810CLM-N10

    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



打印内容，说明如下:

① FG-CODE
② 产品数量
③ Box ID, 编码规则如下
④ Box Packing 日期
⑤ 产品物料号(客户端)
⑥ FG-CODE 后四位

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

12.0 HANDLING & CAUTIONS

12.1 Handing

(1) Use fingerstalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
(2) You must mount a module using specified mounting holes (Details refer to the drawings).
(3) Please make sure to avoid external forces applied to the Source PCB and D-IC during the process of handling or assembling. If not, It causes panel damage or malfunction.
(4) Note that polarizers are very fragile and could be easily damaged. 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.
(5) Do not pull or fold the source D-IC which connect the source PCB and the panel. Do not pull or fold the LED wire.
(6) After removing the protective film, when the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with alcohol or purified water. Do not strong polar solvent because they cause chemical damage to the polarizer.
(7) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
(8) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.
(9) 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 pro duct. If it falls from a high place or receives a strong shock, the glass may be broken.
(10) To determine the optimum mounting angle, refer to the viewing angle range in the specification for each model.
(11) If the customer's set presses the main parts of the LCD, the LCD may show the abnormal display. But this phenomenon does not mean the malfunction of the LCD and should be pressed by the way of mutual agreement.
(12)Do not drop water or any chemicals onto the LCD’s surface.

12.2 Operating Precautions

(1) 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.
(2) 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.
(3) The electrochemical reaction caused by DC voltage will lead to LCD degradation, so DC drive should be avoided.
(4) The LCD module 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.
(5) 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
(6) Design the length of cable to connect between the connector for back-light and the converter as short as possible and the shorter cable shall be connected directly.
The longer cable between that of back-light and that of converter may cause the luminance of LED to lower and need a higher startup voltage(Vs).
(7) Connectors are precise devices for connecting PCB and transmitting electrical signals. Operators should insert and unplug MDL in parallel when assembling MDL.
(8) Do not connect or disconnect the cable to/ from the Open cell at the "Power On" condition.
(9) When the Open cell is operating, do not lose CLK, ENAB signals. If any one these signals is lost, the LCD panel would be damaged.
(10) Obey the supply voltage sequence. If wrong sequence is applied, the Open cell would be damaged.
(11) Do not re-adjust variable resistor or switch etc.

12.3 Electrostatic Discharge Control

(1) Since a Open cell 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. And don't touch interface pin directly. Keep products as far away from static electricity as possible.
(2) Avoid the use work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.

12.4 Precautions for Strong Light Exposure

Strong light exposure causes degradation of polarizer and color filter. It is not allowed to store or run directly in strong light or in high temperature and humidity for a long time.

12.5 Storage Precautions

When storing Open cells as spares for a long time, the following precautions are necessary.
(1) 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.
Temperature : 5 ~ 40 ℃
(2) Humidity : 35 ~ 75 %RH
(3) Period : 6 months
(4) Control of ventilation and temperature is necessary.
(5) Please make sure to protect the product from strong light exposure, water or moisture.
Be careful for condensation.
(6) Store in a polyethylene bag with sealed.
(7)Do not store the LCD near organic solvents or corrosive gasses.
(8) Please keep the Open cells at a circumstance shown below Fig.

12.6 Handling Precautions for Protection Film

(1) 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.
(2) 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.

12.7 Operation Condition Guide

(1) Normal operating condition
- Temperature: 20±15℃
- Operating Ambient Humidity : 55±20 %
- Display pattern: dynamic pattern (Real display)
-Suitable operating time: under 20 hours a day.

(2)If the product will be used in extreme conditions such as high temperature, humidity, display patterns or operation time etc.., It is strongly recommended to contact BOE for 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)Black image or moving image is strongly recommended as a screen save.

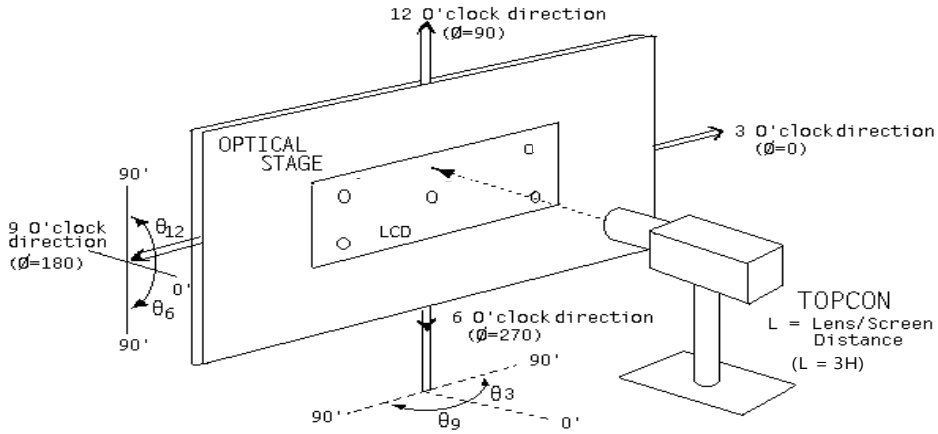
(4) Lifetime in this spec. is guaranteed only when Commercial Display is used according to operating usages.
(5) Please contact BOE in advance for outdoor operation.
(6) Please contact BOE in advance when you display the same pattern for a long time.
(7) If the Open cell keeps displaying the same pattern for a long period of time, the image may be "sticked" to the screen. To avoid image sticking, it is recommended to use a screen saver.
(8) 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 Open cell may be damaged.
(9) Dew drop atmosphere should be avoided.
(10) The storage room should be equipped with a good ventilation facility, which has a temperatu re controlling system.
(11) 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.
(12) 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.
(13) For long-term lighting products, it is recommended to shut down periodically.
(14) If the product is used for a long time under the condition of 7*24 hr, it is strongly recommended to contact BOE for filed application engineering advice.
(15) Long time and large angle forword use or unconventional use , It is strongly recommended to contact BOE for filed application engineering advice.

12.8 Others

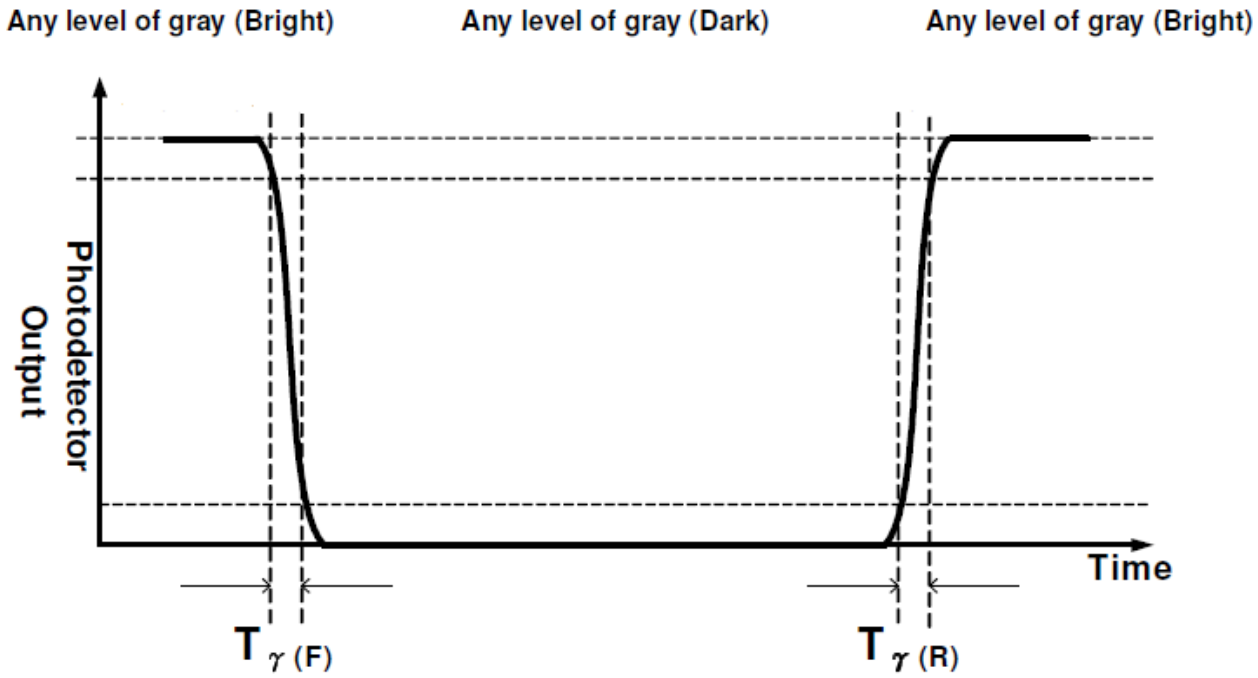
(1)When returning the Open cell for repair or etc., Please pack the Open cell not to be broken. We recommend to use the original shipping packages.
(2) In order to prevent potential problems, flicker should be adjusted by optimizing the Vcom value in customer LCM Line through the I2C Interface.
(3) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs or clothes, it must be washed away thoroughly with soap.
(4) For the crash damaged or unnecessary LCD, it is recommended to wash off liquid crystal by either of solvents such as acetone and ethanol an should be burned up later.
(5) If you should swallow the liquid crystal, first, wash your mouth thoroughly with water, then drink a lot of water and induce vomiting, and then, consult a physician.
(6) If the liquid crystal should get in your eyes, flush your eyes with running water for at least fifteen minutes.

13.0 APPENDIX

< Figure 1. Measurement Set Up >

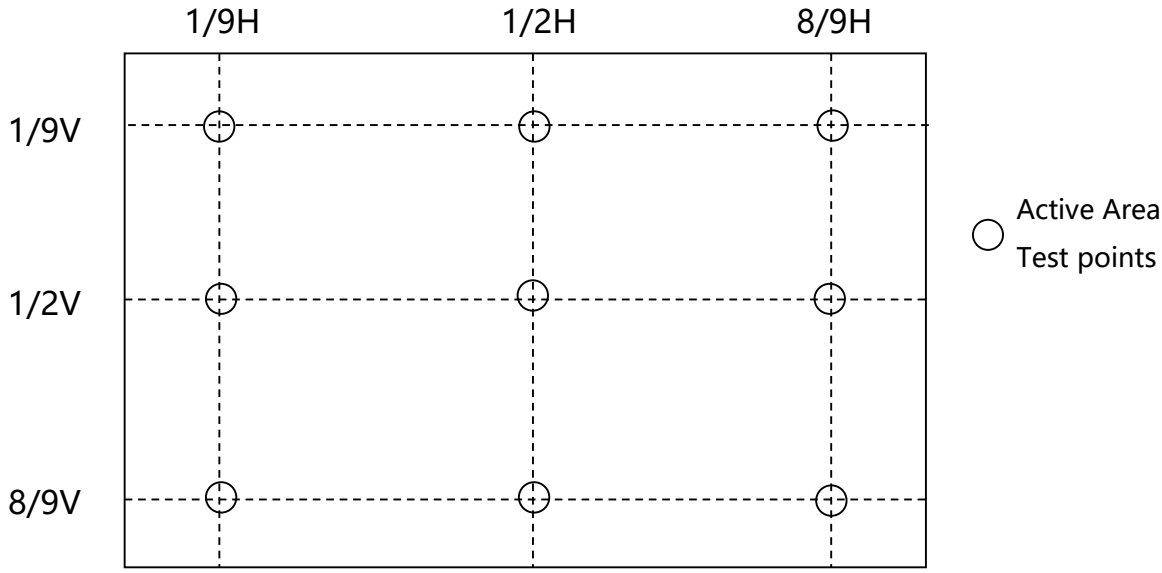


< Figure 2. Response Time Testing >



13.0 APPENDIX

< Figure 3. Uniformity Measurement Locations >



Definition of White Variation($L_{-un`iformity}$) :

OC is with white(L255) signal input

$$L_{-un`iformity} = \frac{\text{Minimum}\{L(1),L(2)\ldots L(9)\}}{\text{Maximum}\{L(1),L(2)\ldots L(9)\}} \times 100\ \%$$

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

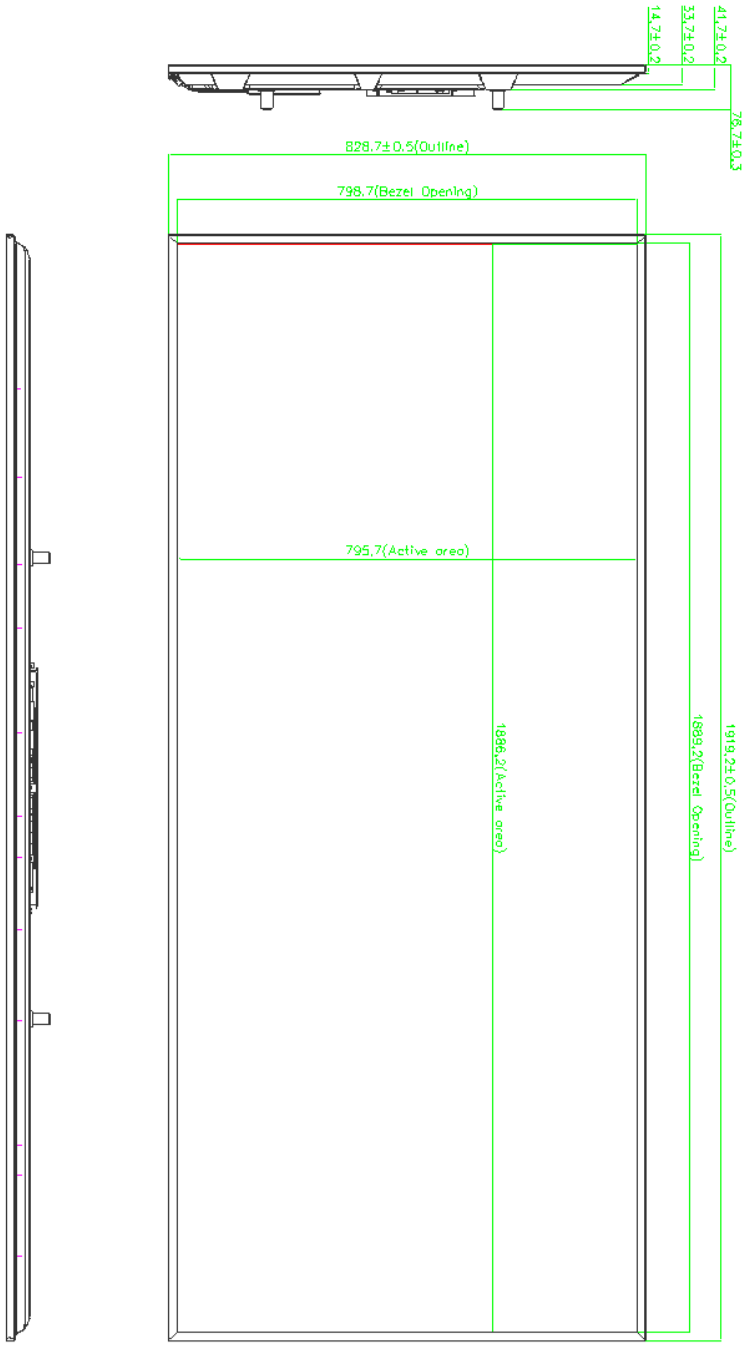


Figure 5. TFT-LCD Module Outline Dimensions (Back view)