B3 EV101WUM-N80 Product Specification Rev.P0

BUYER	
SUPPLIER	HEFEI BOE Optoelectronics Technology CO., LTD
FG-Code	EV101WUM-N80

ITEM	BUYER SIGNATURE	DATE
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ITEM	SUPPLIER SIGNATURE	DATE
Prepared	_____	_____
Reviewed	_____	_____
Approved	_____	_____

REVISION HISTORY

(√)preliminary specification

( )Final specification

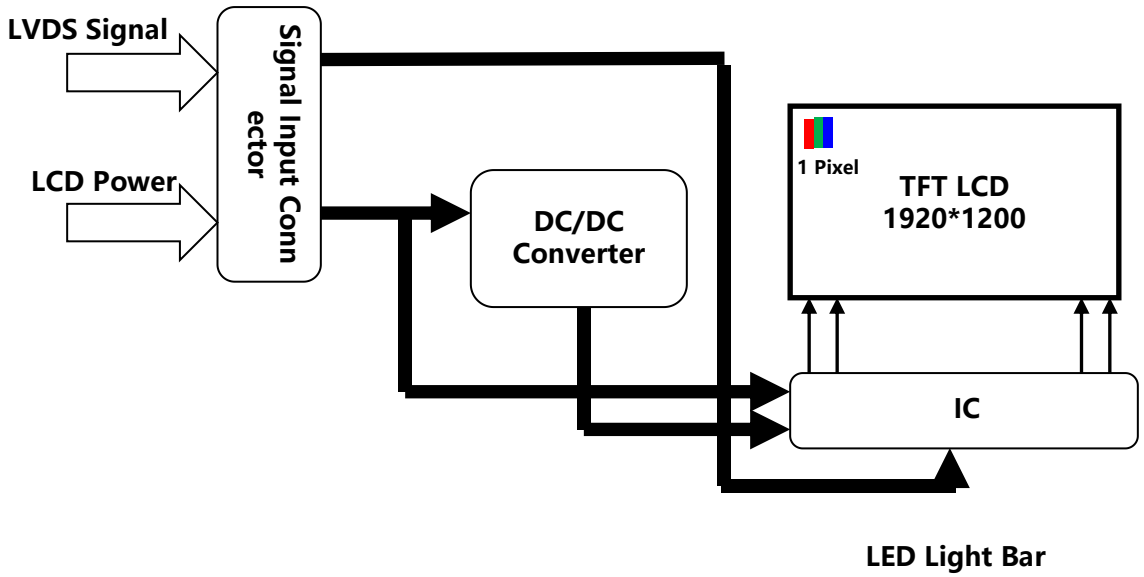
REV.	ECN No.	DESCRIPTION OF CHANGES	DATE	PREPARED
P0		Initial Release	2024-01-12	刘贵阳

Contents

1.0 GENERAL DESCRIPTION

1.1 Introduction

EV101WUM-N80 is a color active matrix TFT LCD module using amorphous silico n TFT ‘s (Thin Film Transistors) as an active switching devices. This module has a 10.1 inch diagonally measured active area with WUXGA resolutions (1920(H)x120 0(V)). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in verti cal stripe and this module can display 16.7M colors.



1.2 Features

- 0.4T Glass (Single)
- 8-bit color depth, display 16. 7M colors
- LVDS Interface with 2 clock
- DE (Data Enable) only
- Reverse Type
- Thin and light weight
- High Tr. and contrast ratio, low reflection and wide viewing angle
- RoHS compliant
- Landscape usage support

1.3 Application

- HMI

1.4 General Specification

The followings are general specifications at the EV101WUM-N80

<Table 1. LCD Module Specifications>

Parameter	Specification	Unit	Remarks
Active Area	216.8064(H)x135.504(V)	mm	
Number Of Pixels	1920(H)x1200(V)	pixels	
Pixel Pitch	0.11292(H)x0.11292(V)	mm	
Pixel Arrangement	RGB Vertical stripe		
Display Mode	Normally black		
Display Colors	16.7M	colors	6+FRC
Surface Treatment	HC		
Contrast Ratio	Typ. 1000		
Viewing Angle(CR>10)	Typ. 80/80/80/80	deg.	
Response Time	Typ. 30，Max. 35	ms	
Color Gamut	NTSC 72% typ.		
Brightness	1000 typ.	cd/m2	
Brightness Uniformity	85 typ. 75 min.		
Power Consumption	1.08	watt	
Outline Dimension	228.56(H)*149.06(V)*4.3（B）	mm	
Weight	252 (Estimate value)	gram	
Back-light	Down edge side, one LED Light bar		

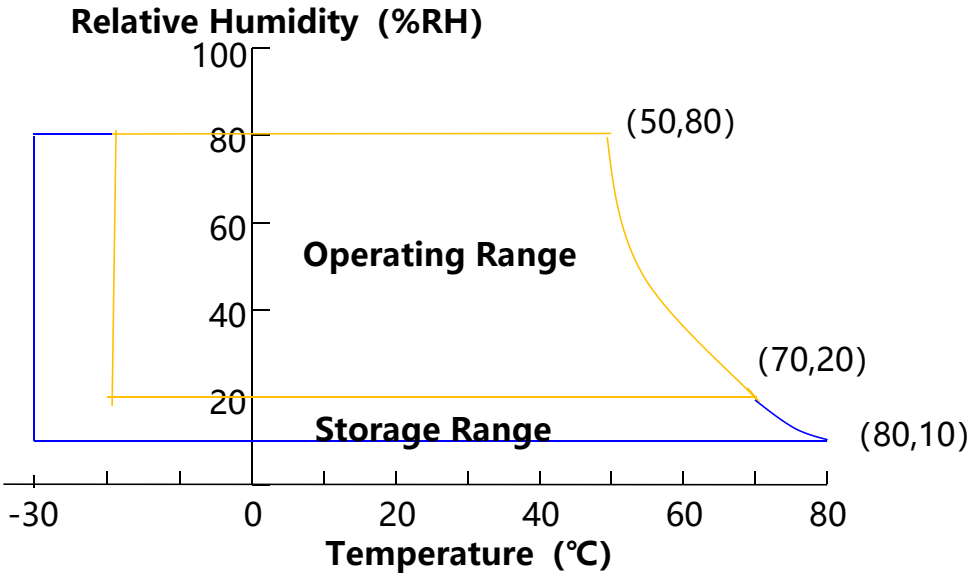
2.0 ABSOLUTE MAXIMUM RATINGS

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

< Table 2. Absolute Maximum Ratings>

Parameter	Symbol	Min.	Max.	Unit	Remark
Power Supply Voltage	VDD	VSS-0.3	5	V	Ta = 25 ℃
	VBLU	VSS-0.3	26.7	V	Ta = 25 ℃
Operating Temperature	T_{OP}	0	+50	℃	Note 1
	T_{SUR}	-	+65	℃	
Storage Temperature	T_{ST}	-20	+60	℃	
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 ℃ max. and no condensation of water.
T_{SUR} : Panel surface Temperature is measured at 50℃ Dry Condition



3.0 ELECTRICAL SPECIFICATIONS

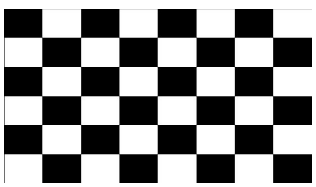
3.1 TFT LCD Module

< Table 3. LCD Module Electrical specifications > [Ta =25±2 ℃]

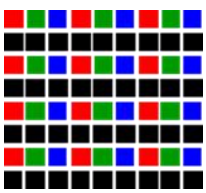
Parameter		Symbol	Values			Unit	Notes
			Min.	Typ.	Max.		
Power Supply Voltage		VDD	3.0	3.3	3.6	V	Note 1
Power Supply Ripple Voltage		VRP	-	-	300	mV	
Power Supply Current		IDD	-	330	520	mA	
Rush current		IRUSH	-	-	2	A	Note 2
	Differential Input High Threshold Voltage	VLVTH		-	+100	mV	
	Differential Input Low Threshold Voltage	VLVTL	-100	-	-	mV	
	Input Differential Voltage	| VID |	200	400	600	mV	
	Common Input Voltage	VLVC	0.6	1.2	1.6	V	
BLU Supply Voltage		V_{LED}	-	27	28	V	
BLU Supply Current		I_{LED}	-	240	-	mA	
Power Consumption		P_D	-	1.08	1.7	W	Note 1
		P_{LED}	-	-	6.72	W	
		P_{total}	-	-	8.32	W	

Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.
The current draw and power consumption specified is for VDD=3.3V, Frame rate f_V=60Hz and Clock frequency = 77.56MHz. Test Pattern of power supply current

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



b) Max : H 1 Line



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

4.0 INTERFACE CONNECTION

4.1 Interface Input Signal & Power :
- LVDS Connector : FH34SRJ-45S-0.5SH(50) (HRS) or equivalent

< Table5. Pin Assignment for LCM Connector >

Pin No.	Symbol	Description	I/O
1	VLED-	LED Cathode	P
2	VLED-	LED Cathode	P
3	VLED+	LED Anode	P
4	VLED+	LED Anode	P
5	NC	NC	-
6	GND	GROUND	P
7	ELV3P	EVEN LVDS Positive data signal (+)	I
8	ELV3N	EVEN LVDS Negative data signal (-)	I
9	GND	GROUND	P
10	ELV2P	EVEN LVDS Positive data signal (+)	I
11	ELV2N	EVEN LVDS Negative data signal (-)	I
12	GND	GROUND	P
13	ELVCLKP	EVEN LVDS Positive CLK signal (+)	I
14	ELVCLKN	EVEN LVDS Negative CLK signal (-)	I
15	GND	GROUND	P
16	ELV1P	EVEN LVDS Positive data signal (+)	I
17	ELV1N	EVEN LVDS Negative data signal (-)	I
18	GND	GROUND	P
19	ELV0P	EVEN LVDS Positive data signal (+)	I
20	ELV0N	EVEN LVDS Negative data signal (-)	I

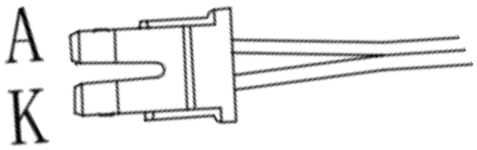
Pin No.	Symbol	Description	I/O
21	GND	GROUND	P
22	OLV3P	Odd LVDS Positive data signal (+)	I
23	OLV3N	Odd LVDS Negative data signal (-)	I
24	GND	GROUND	P
25	OLV2P	Odd LVDS Positive data signal (+)	I
26	OLV2N	Odd LVDS Negative data signal (-)	I
27	GND	GROUND	P
28	OLVCLKP	Odd LVDS Positive CLK signal (+)	I
29	OLVCLKN	Odd LVDS Negative CLK signal (-)	I
30	GND	GROUND	P
31	OLV1P	Odd LVDS Positive data signal (+)	I
32	OLV1N	Odd LVDS Negative data signal (-)	I
33	GND	GROUND	P
34	OLV0P	Odd LVDS Positive data signal (+)	I
35	OLV0N	Odd LVDS Negative data signal (-)	I
36	GND	GROUND	P
37	NC	Reserved for BOE use	I
38	NC	Reserved for BOE use	I
39	NC	Reserved for BOE use	P
40	NC	Not Connection	I
41	VDDIN	Power supply VDDIN=3.3V (Typ.)	P
42	VDDIN		P
43	VDDIN		P
44	VDDIN		P
45	VDDIN		P

4.2 Pin assignment for LED Bar

Connector : JST BHSR-02VS-1 or equivalent

< Table6. Pin assignment for LED Bar >

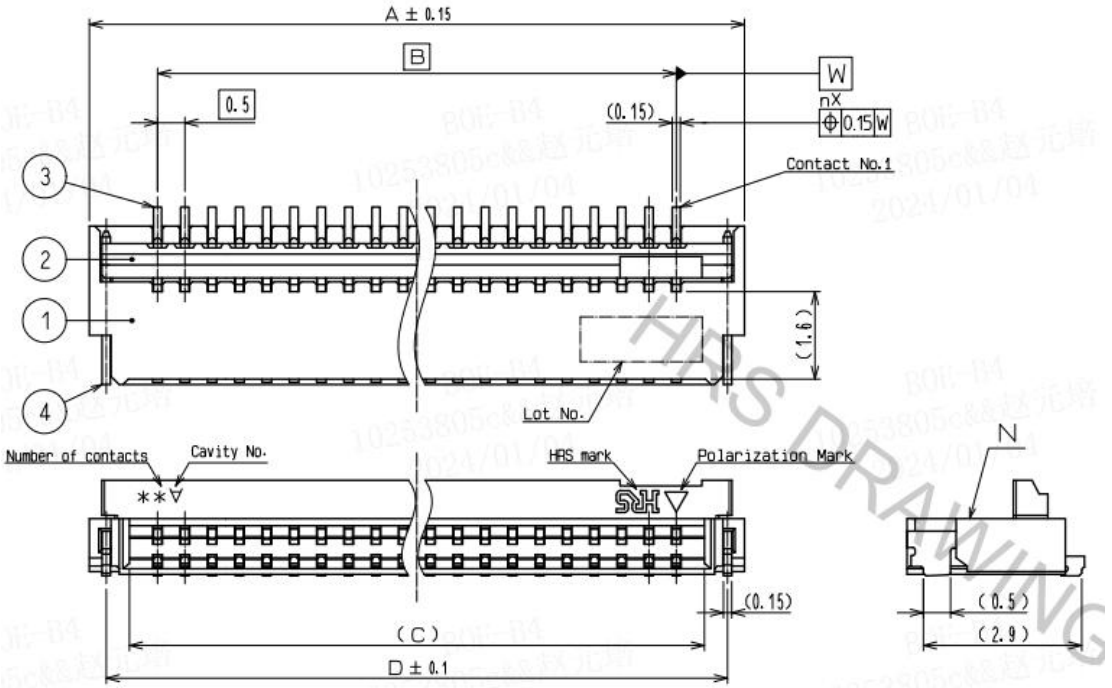
Pin No	Symbol	Description	Remarks
1	VLED+	Channel 2 Current Feedback	A
2	VLED-	LED power supply	K

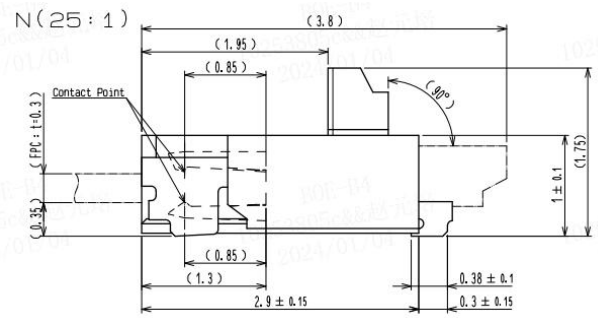


4.3 Dimension

CNT Dimension

-45 pin Connector: FH34SRJ-45S-0.5SH(50) (HRS)





NOTE
1. The dimensions in parentheses are for reference.
2. Lead coplanarity including reinforced metal fittings shall be 0.1 MAX.
3. To be delivered with tape and reel packages.
   See attached packaging specifications for details.
4. Note that preventive hole for sink mark could be added for improvement.
5. The quality remains good even with the dark spots which could occasionally occur on molded plastic.
6. This product satisfies halogen free requirements defined as 900 ppm maximum chlorine.
   900 ppm maximum bromine, and 1500 ppm maximum total of chlorine and bromine.
7. Material of the actuator for 8 pos. is LCP, and the material of other positions is Polyamide.
8. 'n' represents the number of contacts.

4.3 Dimension

CNT Dimension

-45 pin Connector: FH34SRJ-45S-0.5SH(50) (HRS)

PART NUMBER	CODE NUMBER	NUMBER OF CONTACTS	DIMENSION OF CONNECTOR, FPC,PCB MOUNTING PATTERN AND STENCIL							DIMENSION OF DRAWING FOR PACKING				
			A	B	C	D	E	F	G	H	J	K	L	M
FH34SRJ-4S-0.5SH(50)	CL580-1238-7-50	4	4	1.5	2.53	3.38	3.1	3.9	2.5	16	7.5	–	17.4	21.4
FH34SRJ-5S-0.5SH(50)	CL580-1264-7-50	5	4.5	2	3.03	3.88	3.6	4.4	3	16	7.5	–	17.4	21.4
FH34SRJ-6S-0.5SH(50)	CL580-1236-1-50	6	5	2.5	3.53	4.38	4.1	4.9	3.5	16	7.5	–	17.4	21.4
FH34SRJ-7S-0.5SH(50)	CL580-1200-0-50	7	5.5	3	4.03	4.88	4.6	5.4	4	16	7.5	–	17.4	21.4
FH34SRJ-8S-0.5SH(50)	CL580-1231-8-50	8	6	3.5	4.53	5.38	5.1	5.9	4.5	16	7.5	–	17.4	21.4
FH34SRJ-9S-0.5SH(50)	CL580-1262-1-50	9	6.5	4	5.03	5.88	5.6	6.4	5	16	7.5	–	17.4	21.4
FH34SRJ-10S-0.5SH(50)	CL580-1251-5-50	10	7	4.5	5.53	6.38	6.1	6.9	5.5	16	7.5	–	17.4	21.4
FH34SRJ-11S-0.5SH(50)	CL580-1258-4-50	11	7.5	5	6.03	6.88	6.6	7.4	6	16	7.5	–	17.4	21.4
FH34SRJ-12S-0.5SH(50)	CL580-1253-0-50	12	8	5.5	6.53	7.38	7.1	7.9	6.5	24	11.5	–	25.4	29.4
FH34SRJ-14S-0.5SH(50)	CL580-1252-8-50	14	9	6.5	7.53	8.38	8.1	8.9	7.5	24	11.5	–	25.4	29.4
FH34SRJ-16S-0.5SH(50)	CL580-1259-7-50	16	10	7.5	8.57	9.38	9.1	9.9	8.5	24	11.5	–	25.4	29.4
FH34SRJ-18S-0.5SH(50)	CL580-1248-0-50	18	11	8.5	9.57	10.38	10.1	10.9	9.5	24	11.5	–	25.4	29.4
FH34SRJ-20S-0.5SH(50)	CL580-1256-9-50	20	12	9.5	10.57	11.38	11.1	11.9	10.5	24	11.5	–	25.4	29.4
FH34SRJ-22S-0.5SH(50)	CL580-1254-3-50	22	13	10.5	11.57	12.38	12.1	12.9	11.5	24	11.5	–	25.4	29.4
FH34SRJ-24S-0.5SH(50)	CL580-1255-6-50	24	14	11.5	12.57	13.38	13.1	13.9	12.5	24	11.5	–	25.4	29.4
FH34SRJ-26S-0.5SH(50)	CL580-1247-8-50	26	15	12.5	13.57	14.38	14.1	14.9	13.5	24	11.5	–	25.4	29.4
FH34SRJ-30S-0.5SH(50)	CL580-1232-0-50	30	17	14.5	15.57	16.38	16.1	16.9	15.5	32	14.2	28.4	33.4	37.4
FH34SRJ-32S-0.5SH(50)	CL580-1257-1-50	32	18	15.5	16.53	17.38	17.1	17.9	16.5	32	14.2	28.4	33.4	37.4
FH34SRJ-34S-0.5SH(50)	CL580-1261-9-50	34	19	16.5	17.53	18.38	18.1	18.9	17.5	32	14.2	28.4	33.4	37.4
FH34SRJ-40S-0.5SH(50)	CL580-1260-6-50	40	22	19.5	20.53	21.38	21.1	21.9	20.5	44	20.2	40.4	45.4	49.4
FH34SRJ-45S-0.5SH(50)	CL580-1265-0-50	45	24.5	22	23.03	23.88	23.6	24.4	23	44	20.2	40.4	45.4	49.4
FH34SRJ-50S-0.5SH(50)	CL580-1266-2-50	50	27	24.5	25.53	26.38	26.1	26.9	25.5	44	20.2	40.4	45.4	49.4

4.4 LVDS Interface

- LVDS Receiver : Timing Controller (LVDS Rx merged) / LVDS Data : Pixel Data

< Table 7. LVDS Input Data Mapping >

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

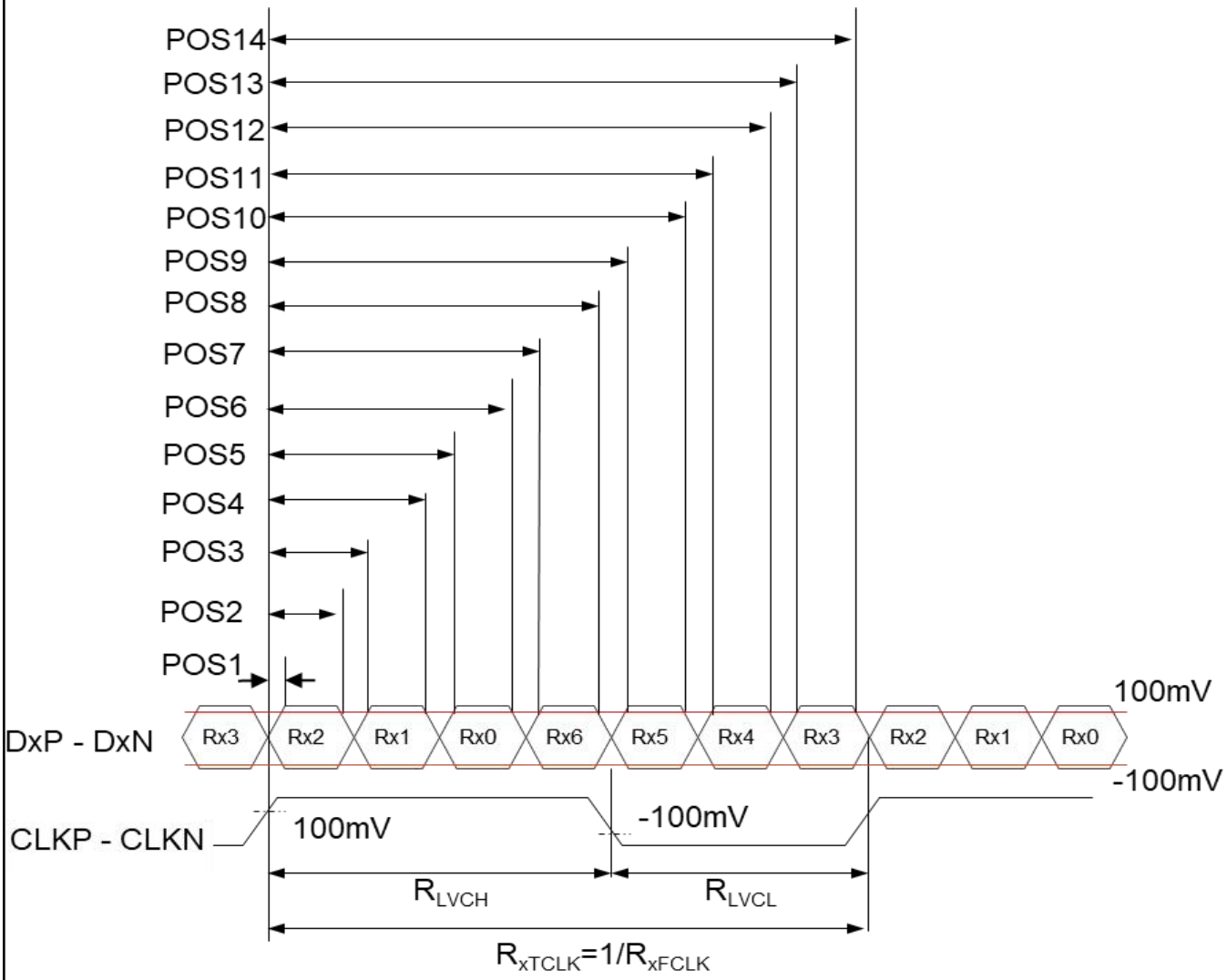
4.5 LVDS Rx Interface Timing Parameter

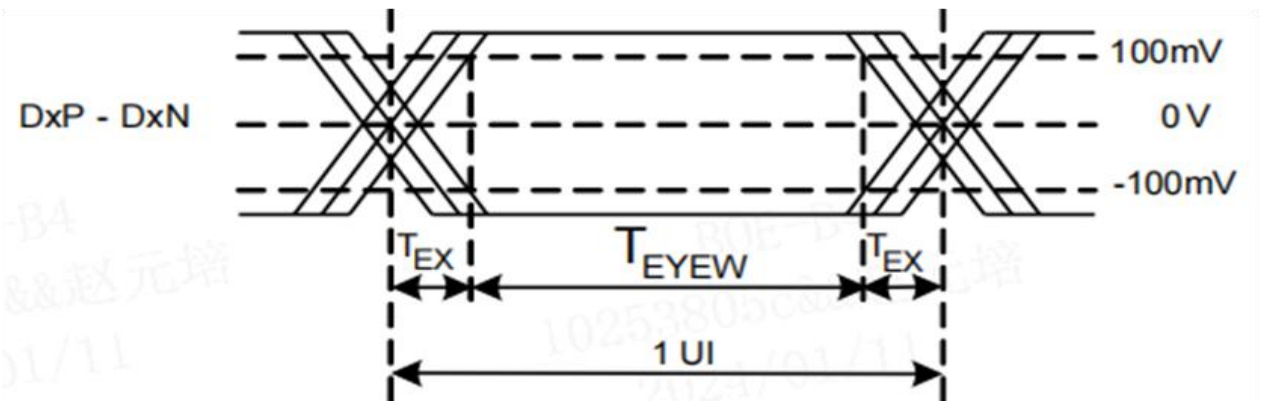
The specification of the LVDS Rx interface timing parameter is shown in Table 8.

<Table 8. LVDS Rx Interface Timing Specification>

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Clock Frequency	R_{xFCLK}	20	-	100	MHz	
Clock Period	R_{xTCLK}	10	-	50	ns	
1 Data bit time	UI	-	1/7	-	R_{xTCLK}	
Clock high time	T_{LVCH}		4		UI	
Clock low time	T_{LVCL}		3			
Position 1	T_{POS1}	-0.25	-	0.25		
Position 2	T_{POS2}	0.75	-	1.25		
Position 3	T_{POS3}	0.75	1	1.25		
Position 4	T_{POS4}	1.75	-	2.25		
Position 5	T_{POS5}	1.75	2	2.25		
Position 6	T_{POS6}	2.75	-	3.25		
Position 7	T_{POS7}	2.75	3	3.25		
Position 8	T_{POS8}	3.75	-	4.25		
Position 9	T_{POS9}	3.75	4	4.25		
Position 10	T_{POS10}	4.75	-	5.25		
Position 11	T_{POS11}	4.75	5	5.25		
Position 12	T_{POS12}	5.75	-	6.25		
Position 13	T_{POS13}	5.75	6	6.25		
Position 14	T_{POS14}	6.75	-	7.25		
Input eye width	T_{EYEW}	0.5	-	-		
Input eye border	T_{EX}	-	-	0.25		

4.5 LVDS Rx Interface Timing Parameter



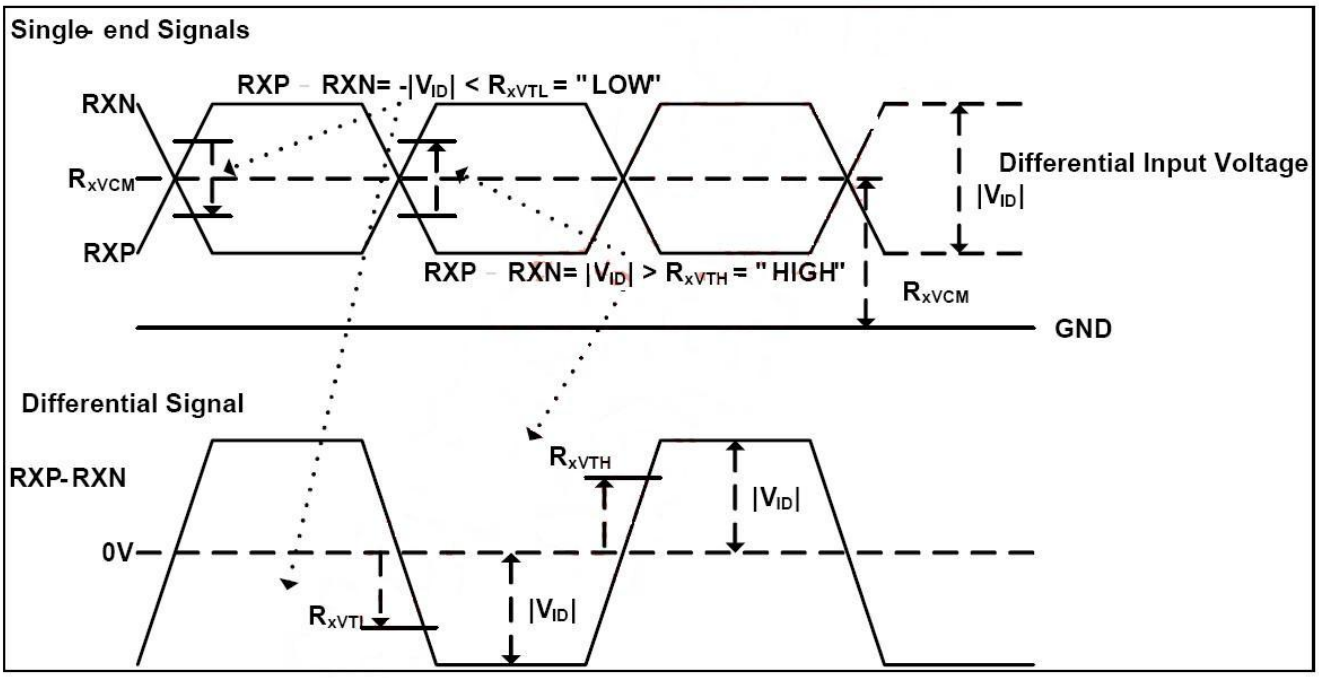


4.6 DC Specification

- LVDS Receiver Differential Input (DC Characteristics)

< Table 9-1. LVDS Rx DC Characteristics >

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Differential Input High Threshold Voltage	VTH	-	-	+100	mV	VCM=1.2V
Differential Input Low Threshold Voltage	VTL	-100	-	-	mV	
Differential Input Common Mode Voltage	VCM	0.6	1.2	1.6	V	
Differential Input Voltage	| VID |	200	400	600	mV	



5.0 SIGNAL TIMING SPECIFICATION

5.1 Timing Parameters (DE only mode)

< Table10. Timing Parameter >

Item	Symbol		Value			Unit
			Min.	Typ.	Max.	
DCLK	DCLK Frequency	Fdclk	74.5	77.56	85	MHz
Horizontal	Horizontal display area	Thd		960		DCLK
	HSYNC period time	Th	989	1040	1248	DCLK
	Horizontal Blank	THB	29	80	288	DCLK
Vertical	Vertical display area	Tvd		1200		H
	VSYNC period time	Tv	1243	1243	1560	H
	Vertical Blank	TVB	43	43	360	H
	Frequency	fV	-	60	-	Hz

Note

1. DE Only Mode, While operation, DE signal should be have the same cycle. The input of HSYNC & VSYNC signal does not have an effect on normal operation.
2. Best operation clock frequency is 77.56Mhz.
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 85Mhz MHz without spread spectrum

< Table 11. LVDS Input SSCG>

Symbol	Parameter	Condition	Min	Typ	Max	Unit
F_{LVMOD}	Modulating frequency of input clock during SSC	-	1	-	100	KHz
F_{LVDEV}	Maximum deviation of input clock frequency during SSC	F=70MHz	-3	-	+3	%

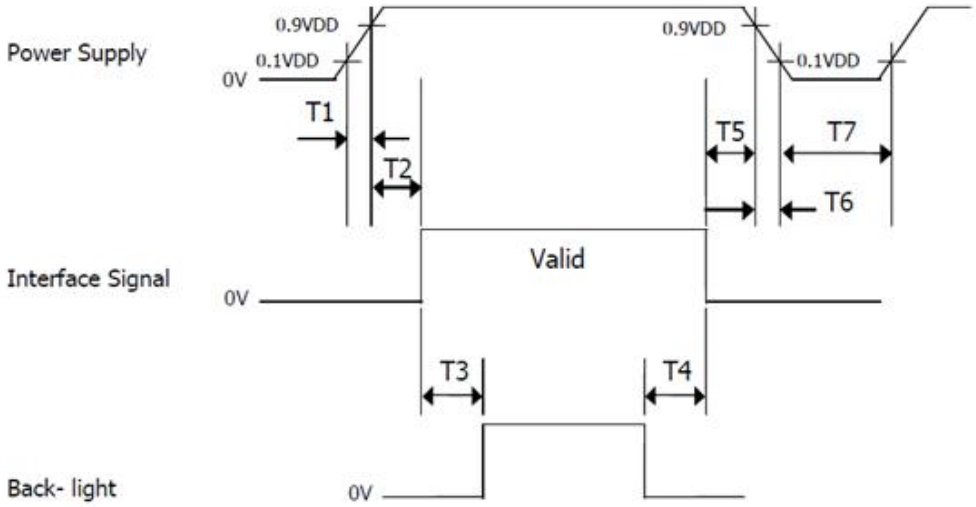
5.3 Input Signals, Basic Display Colors and Gray Scale of Colors

< Table 12. 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 b e as shown in below



< Table 13. Sequence Table >

Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5	-	10	(ms)
T2	0	-	50	(ms)
T3	200	-	-	(ms)
T4	200	-	-	(ms)
T5	0	-	50	(ms)
T6	0	-	10	(ms)
T7	500	-	-	(ms)

Note 1: Even though T1 is over the specified value, there is no problem if the rush current is within Spec.

Note 2: When the power supply VDD is 0V, keep the level of input signals on the low or high impedance;

※ Please avoid floating state of interface signal at invalid period.

※ When the power supply for LCD (VDD) is off, be sure to pull down the valid and invalid data to 0V.

Note 3: The T3 / T4 is recommended value, the case when failed to meet a minimum specification, abnormal display would be shown. There is no reliability problem.

Note 4: T5 should be measured after the Module has been fully discharged between power off and on period

Note 5: If the on time of signals (Interface signal and user control signals) precedes the on time of Power (VLCD),it w ill be happened abnormal display. When T6 is NC status, T6 doesn’ t need to be measured

6.0 OPTICAL SPECIFICATIONS

6.1 Overview

The test of optical specifications shall be measured in a dark room (ambient luminance ≤ 1lux and temperature = 25±2℃) with the equipment of Luminance meter system (Gonio meter system and TOPCON BM-5) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0°. We refer to θØ =0 (=θ3) as the 3 o′ clock direction (the "right"), θØ=90 (= θ12) as the 12 O′ clock direction ("upward"), θØ=180 (= θ9) as the 9 O′ clock direction ("left") and θØ=270(= θ6) as the 6 O′ clock direction ("bottom"). While scanning θ and/or Ø, the center of the measuring spot on the Display surface shall stay fixed.

6.2 Optical Specifications

< Table15. Optical Table >

Item	Symbol	Condition	Min	Typ.	Max	Unit	Note
Brightness Center	Lv	θ=0°	800	1000	--	cd/m2	Note 1
Brightness Uniformity	▵Bp		75	85	--	%	Note 2
Viewing Angle	θL	Cr≥10	70	80	--	deg	Note 3
	θ_R		70	80	--		
	ψ_T		55	65	--		
	ψ_B		65	75	--		
Contrast Ratio	Cr	θ=0° FF=0°	600	800		-	Note 4
Response Time	Tr+Tf		-	30	35	ms	Note 5
Color Coordinate of CIE1931	Rx	θ=0°	0.616	0.646	0.676	-	Note 6
	Ry		0.322	0.352	0.382		
	Gx		0.294	0.324	0.354		
	Gy		0.605	0.635	0.665		
	Bx		0.120	0.150	0.180		
	By		0.054	0.084	0.114		
	Wx		0.290	0.320	0.350		
	Wy		0.310	0.340	0.370		
NTSC Ratio	NTSC	CIE1931	67	72	--	%	Note 7
Gray inversion angle				6点钟			Note 8
Gamma Scale			2.0	2.2	2.4		

Note1:Luminance measurement

The test condition is at ILED=240mA and measured on the surface of LCD module at 25℃.

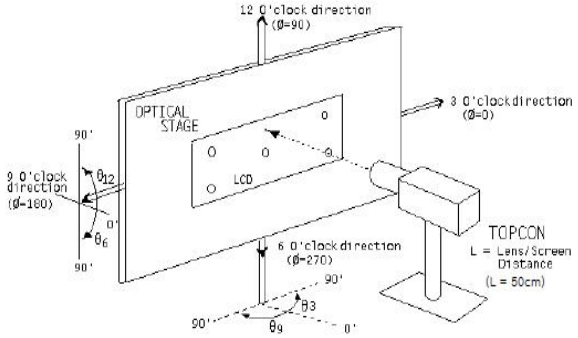
●The data are measured after LEDs are lighted on for more than 5 minutes and LCM displays are fully white. The brightness is the center of the LCD. Measurement equipment CS2000 or similar equipments (Field of view:1deg,Distance:50cm)

●Measuring surroundings: Dark room.

●Measuring temperature: Ta=25℃.

●Adjust operating voltage to get optimum contrast at the center of the display.

●Measured value at the center point of LCD panel must be after more than 5 minutes while backlight turning on.



Note2:Uniformity

●The test condition is at ILED=240mA and measured on the surface of LCD module at 25℃.

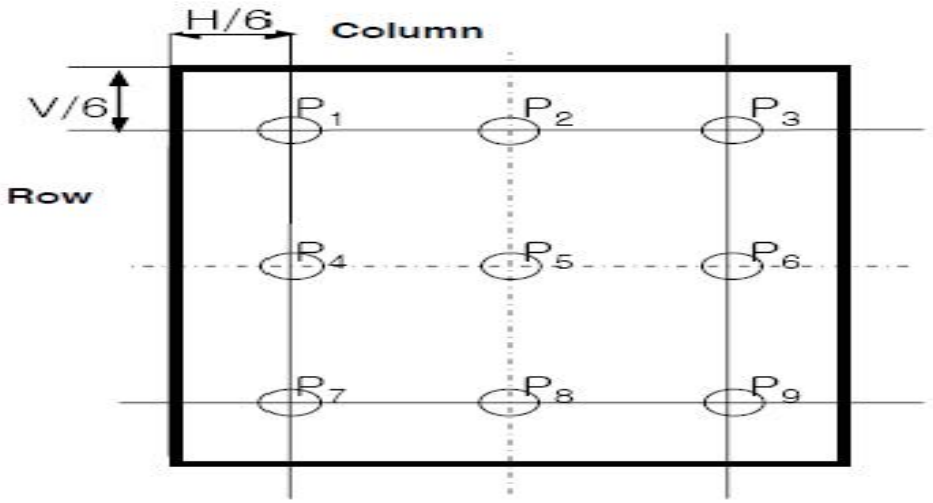
●Measurement equipment:CS2000 or similar equipments

●The luminance uniformity is calculated by using following formula:

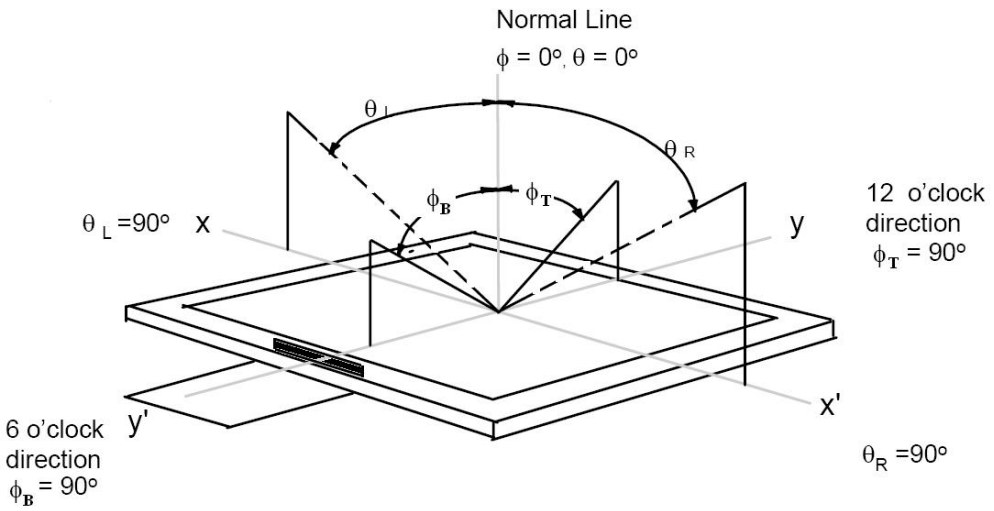
●▵Bp = Bp (Min.) / Bp (Max.)×100 (%)

●Bp (Max.) = Maximum brightness in 9 measured spots

●Bp (Min.) = Minimum brightness in 9 measured spots.



Note 3:**The definition of Viewing Angle**
Refer to the graph below marked by θ and Φ.

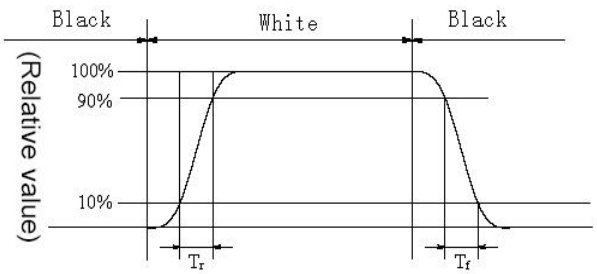


Note4:**ThedefinitionofContrastRatio** (Test LCM using CS2000 or similar equipments):

$$\text{Contrast Ratio(CR)} = \frac{\text{Luminance When LCD is at “White” state}}{\text{Luminance When LCD is at “Black” state}}$$

(Contrast Ratio is measured in optimum common electrode voltage)

Note5:**Definitionof Response time.**(Test LCD using DMS501 or similar equipments):
The output sign also photo detector are measured when the input sign also are changed from “black” to “white” (Voltage falling time)and from “white” to “black” (Voltage rising time), respectively .Th e response time is defined as the time interval between the 10% and 90% of amplitudes . Refer to figu res below.

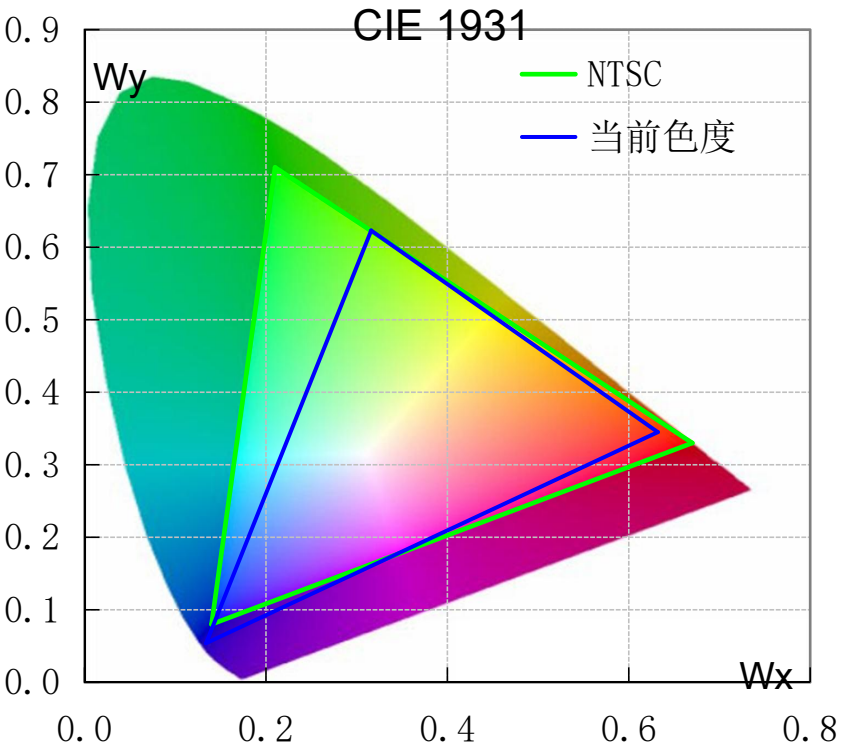


Response time of gray to gray:
Response time Tg is the average time required for display transition by switching the input signal as below table and is based on Frame rate fV =60Hz to optimize. Each time in below table is defined as Figure 2 and shall be measured by switching the signals for “any level of gray（bright）”and any levelof gray（dark）
5. Theoutputsignalsofphotodetectoraremeasuredwhentheinputsignalsarechanged from “Lx” to “Ly”, x, y= [0, 7]. The response time is defined as the time interval between the 10% and 90% of amplitudes. The result of the test can be noted as below:

Note 6: Color Coordinates of CIE 1931
The test condition is at ILED=240mA and measured on the surface of LCD module at 25℃.
Measurement equipment: CS2000 or similar equipments
The Color Coordinate (CIE 1931) is the measurement of the center of the display shown in below figure.

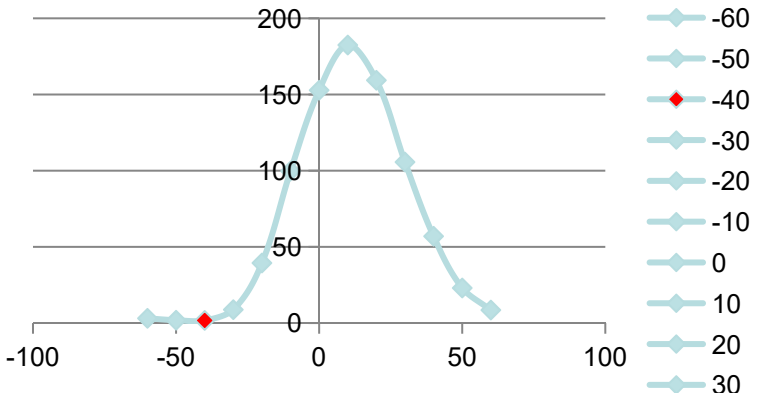
Note 7: Definition of Color of CIE Coordinate and NTSC Ratio.

$$S = \frac{\text{area of RGB triangle}}{\text{area of NTSC triangle}} \times 100\%$$



Note 8: **Definition of gray inversion angle**

- Refer to the graph of note 9.
- Using luminance test method.
- Test pattern : 128 gray
- If the viewing direction is 12 o' clock ,then test the luminance while θ=-60°,θ=-50°, θ=-40°, θ=-30°, θ=-20°, θ=-10°, θ=0°, θ=10°, θ=20°, θ=30°, θ=40°, θ=-50°, θ=60°. The luminance test as figure below:



7.0 MECHANICAL CHARACTERISTICS

7.1 Dimensional Requirements

As shown in Table 13.

< Table 13. Dimensional Parameters >

Parameter	Specification	Unit
Dimensional outline	228.56 (H)*149.06(V)*4.3 (Body)	mm
Weight	252 (Estimate value)	gram
Active area	216.8064(H)x135.504(V)	mm
Pixel pitch	112.92(H)x112.92(V)	um
Number of pixels	1920(H) ×1200(V)(1 pixel = R + G + B dots)	pixels
Back-light	Down edge side 2-LED Light bar Type	

7.2 Mounting

See FIGURE 5. (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.

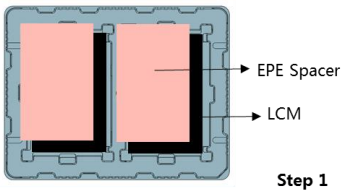
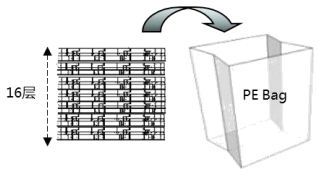
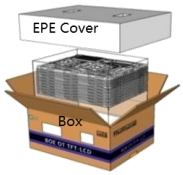
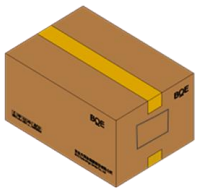
8.0 RELIABLITY TEST

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

<Table 12. Reliability Test Parameters >

No	Test Items	Conditions
1	High temperature storage test	80℃，240hr
2	Low temperature storage test	-30℃，240hr
3	High temperature & high humidity (operation test)	50℃，80%RH，240hr
4	Low temperature operation test	-20℃，240hr
5	High temperature operation test	70℃，240hr
6	Thermal Shock Test	-30℃~80℃，1hr/cycle，100cycle
7	ESD	150pF,330Ω，+/-4KV Contact ，+/-8K V Air ，100Points
8	Packing VIB	1.47G，1-200hz，X，Y，±Z，30min/A xis

9.0 PACKING INFORMATION(产品形态： LCM)

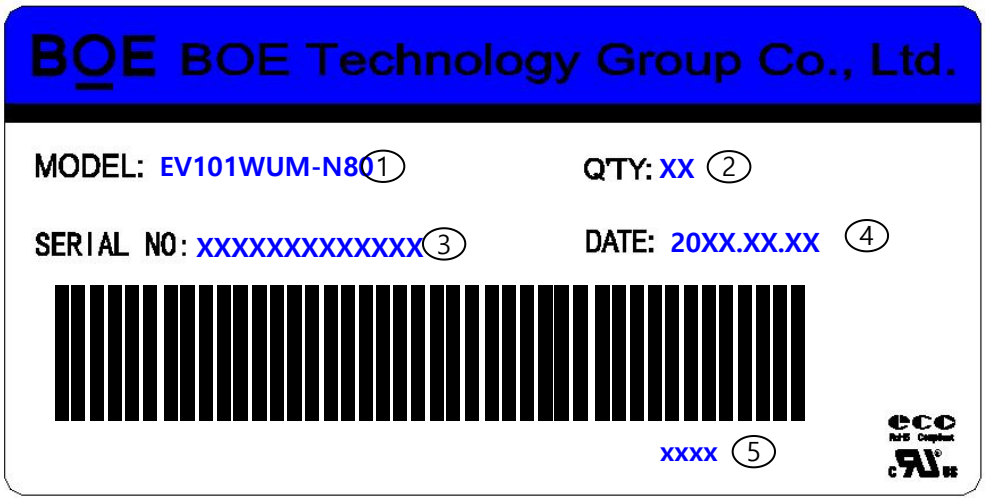
在Tray两个穴内分别平放入1pcs LCM（显示面朝上）,再在LCM上各放置1pcs EPE Spacer 容量：2pcs LCM/Tray 2pcs EPE Spacer/Tray	堆叠放置15pcs Tray（不旋转堆叠），顶部再放置1pcs空Tray，将堆叠好的16pcs Tray平放入PE Bag	在Box内放置1pcs EPE Cover，将堆叠好的16pcs Tray平放入Box，再放置1pcs EPE Cover 容量：30pcs LCM/Box
 Step 1	 Step 2	 Step 3
对Box进行封箱，并粘贴Box标签	每个Pallet上2排3列码放，共堆码3层Box，使用8ea纸护角，缠绕膜包裹（≥3层），打包带“井”字形打拍 容量：18 Inner Box/Pallet 540pcs LCM/Pallet	厢车装载方式：一横一竖双层码放 厢车装载量_12m：21600pcs（40托）
 Step 4	 Step 5	 Step 6

9.1 Packing Note(产品形态：LCM)

- Box Dimension: 495mm(W) x 395mm(D) x 313mm(H)
- Package Quantity in one Box: 30pcs

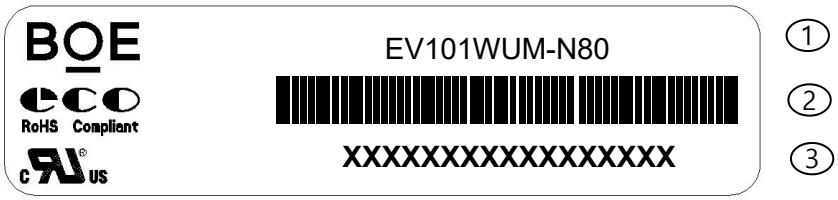
9.2 Box label (产品形态：LCM)

- Label Size :110mm*55mm
- Contents
  Model : LCM
  Q`ty : 35pcs/Box
  Serial No. : Box Serial No. as shown below.
  Date : Packing Date
  FG Code : FG Code of Product



No.	1	2	3	4	5	6	7	8	9	10	11	12	13
Code	X	X	X	X	X	X	X	X	X	X	X	X	X
	GBN		Grade	B3	Year		Month	Rev	Serial number				

9.3 Product Label



标签尺寸: 48mm × 12mm, 厚度0.075mm

1. FG-CODE: EV101WUM-N80-DHP0
2. MDL ID 条形码
3. MDL ID

BOE MDL ID rule

序列号	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
代码	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
描述	GBN		等级	B3	年		月	FG Code后四位				序列号（流水码36位，去除I,O,Q,U）					

10.0 Handling & Cautions

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

10.1 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.
- Do not apply mechanical stress or static pressure on module , 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 module should be slowly peeled off before display.
- Be careful to prevent water & chemicals contact the module 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 module has its circuitry PCBs 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.

10.2 Operating Precautions

- Do not connect or disconnect the cable to/from the Module at the "Power On" Co ndition.
- When the module is operating, do not lose CLK, ENAB signals. If any one of these si gnals is lost, the module would be damaged.
- Obey the supply voltage sequence. If wrong sequence is applied, the module would be damaged.
- Do not allow to adjust the adjustable resistance or switch.
- The electrochemical reaction caused by DC voltage will lead to LCD module degrad ation, so DC drive should be avoided.
- The LCD modules use C-MOS LSI drivers, so customers are recommended that any u nused input terminal would be connected to Vdd or Vss, do not input any signals be fore power is turn on, and ground you body, work/assembly area, assembly equipme nt to protect against static electricity.
- Do not exceed the absolute maximum rating value. (supply voltage variation, input v oltage variation, variation in part contents and environmental temperature, and so o n) Otherwise the Module may be damaged.
- Module has high frequency circuits. Sufficient suppression to the electromagnetic int erference shall be done by system manufacturers. Grounding and shielding methods may be important to minimized the interference.

- 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.

- For long-term lighting products, it is recommended to shut down periodically.
- If the product is used for a long time under the condition of 7*24 hrs, it is strongly recommended to contact BOE for filed application engineering advice.
- Long time and large angle forward use or unconventional use , It is strongly recommended to contact BOE for filed application engineering advice.
- Products exposed to low temperature environment for a long time, need to carry out necessary protection , low temperature environment is usually refrigerators , vending machine Etc…

10.3 Electrostatic Discharge Precautions

- Avoid the use work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.
- 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 close to static electricity to avoid product damage.
- Do not touch interface pin directly.

10.4 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.

10.5 Precautions for Storage

A. Atmosphere Requirement

ITEM	UNIT	MIN	TYP	MAX
Storage Temperature	(℃)	5	25	40
Storage Humidity	(%rH)	40	50	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.
- 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.

10.6 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.

10.7 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)
   - 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 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, highlight, 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.

10.8 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 ey es 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.

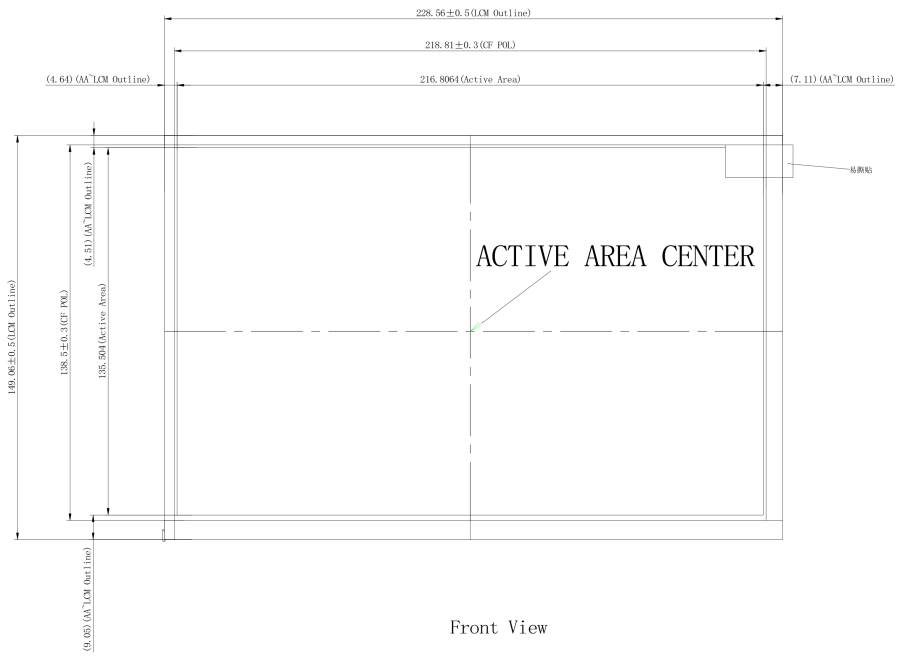
B. Rework

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

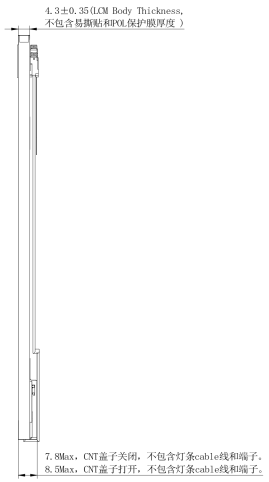
11.0 APPENDIX

Mechanical Drawing

Drawing Attachment: Landscape Front View



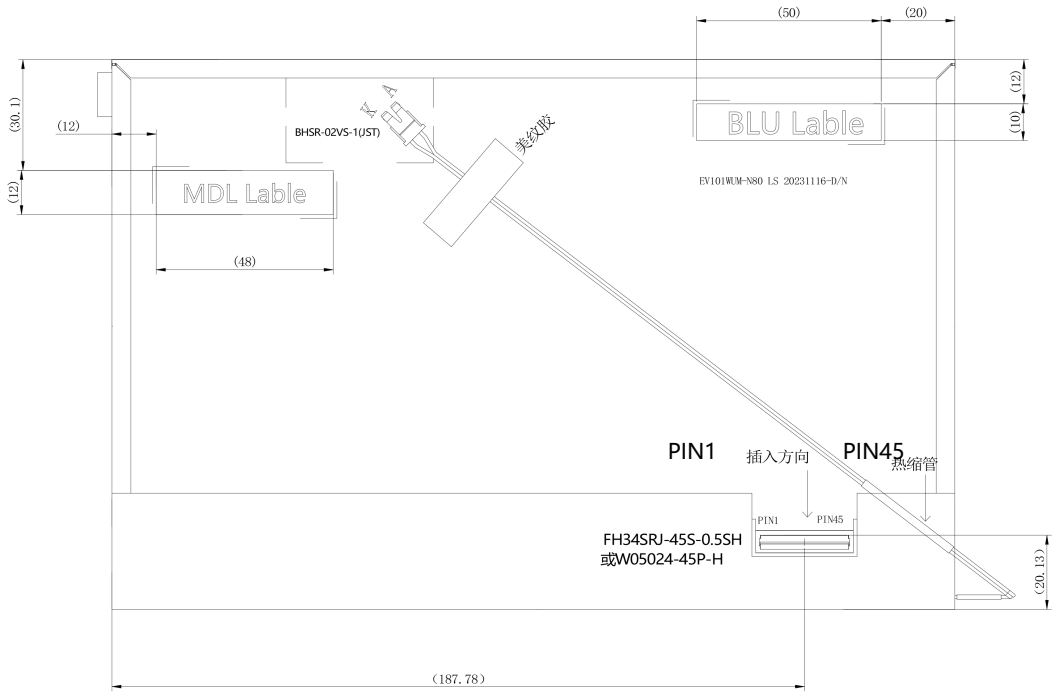
Front View



Right View

Mechanical Drawing

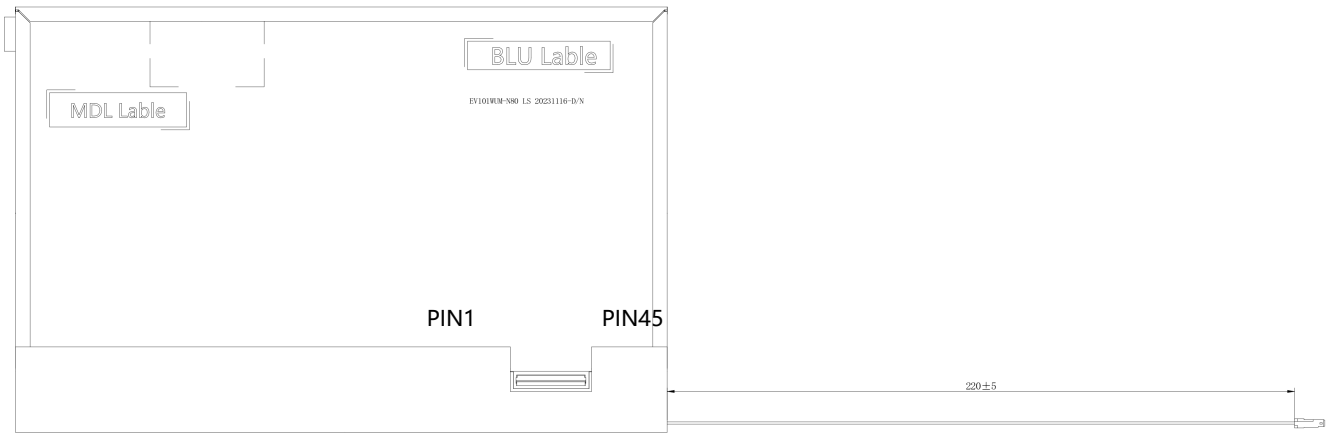
Drawing Attachment: Landscape Back View



Back View(出货方式)

Mechanical Drawing

Drawing Attachment: Landscape Back View



Back View(cable线长度)