

TITLE : DV550QUM-N10**Product Specification****Rev. P0****Fuzhou BOE Optoelectronics Technology Co., Ltd**SPEC. NUMBER
S8-65-8D-157PRODUCT GROUP
TFT-LCD

Rev. P0

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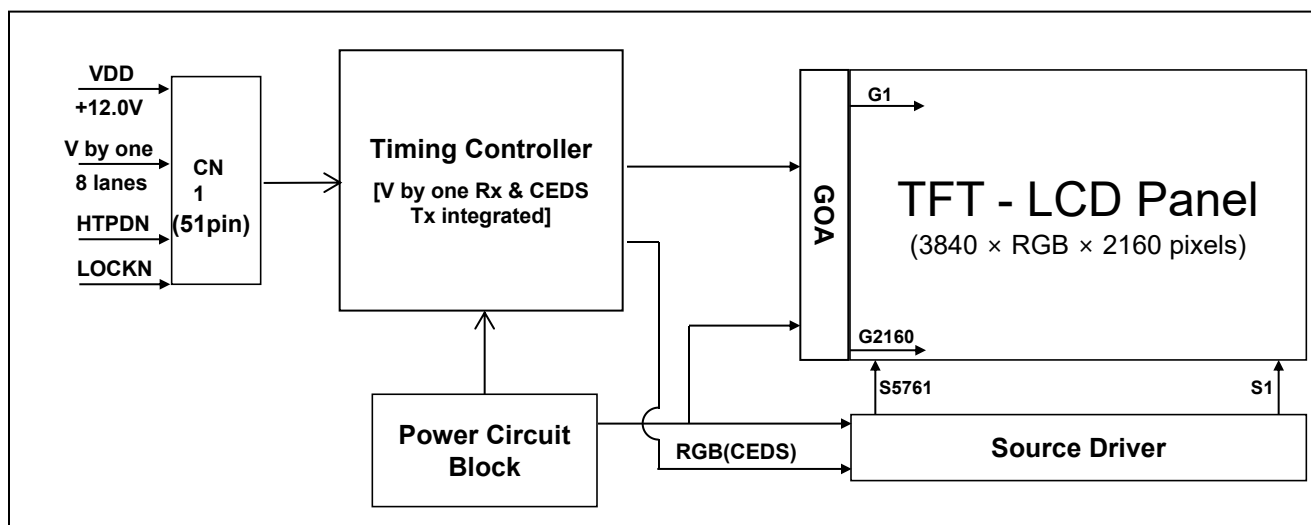
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1.0 GENERAL DESCRIPTION

1.1 Introduction

DV550QUM-N10 is a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as an active switching device. This module has a 54.64 inch diagonal 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 1.07G colors. The TFT-LCD panel used for this module is adapted for a low reflection and higher color type.



1.2 Features

- V by one interface with 8 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
- DE (Data Enable) only mode
- ADS technology is applied for high display quality
- RoHS compliant
- Horizontal and Perpendicular compatibility (Vertical Spec: Rotate 90° clockwise facing the LCM front)

1.0 GENERAL DESCRIPTION**1.3 Application**

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

1.4 General Specification

< Table 1. General Specifications >

Parameter	Specification	Unit	Remarks
Active Area	1209.6(H) × 680.4(V)	mm	
Number of Pixels	3840*(RGB)*2160	pixels	
Pixel Pitch	105(H)×315(V)	μm	
Pixel Arrangement	Pixels RGB Island		
Display Colors	1.07G (8bits + FRC)	colors	
Viewing Angle	R/L 178 (Typ.), U/D 178 (Typ.)		CR>10
Open Cell Transmittance	5.4	%	At center point with BOE BLU
Display Mode	Transmission Mode, Normally Black		
Weight	15	Kg	Module
Dimensional Outline	1232.4(H) x 703.2(V) x 17(B)	mm	Detail refer to drawing
Bezel Width	L/R/U/D≤8.9	mm	
Luminance, White	Min650, Typ. 800	nit	
Power Consumption	Total: Typ:111.8 , Max:143.8 Logic: Typ:12 , Max:36 BLU: Typ:99.8 , Max:107.8	Watt	
Surface Treatment	Haze 1% , 3H, Anti-Glare Layer (for Front Polarizer)		
Back-Light	Side-edge Backlight Module, 2-LED Light Bar Type		
Possible Display Type	Landscape and Portrait Enabled		

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.

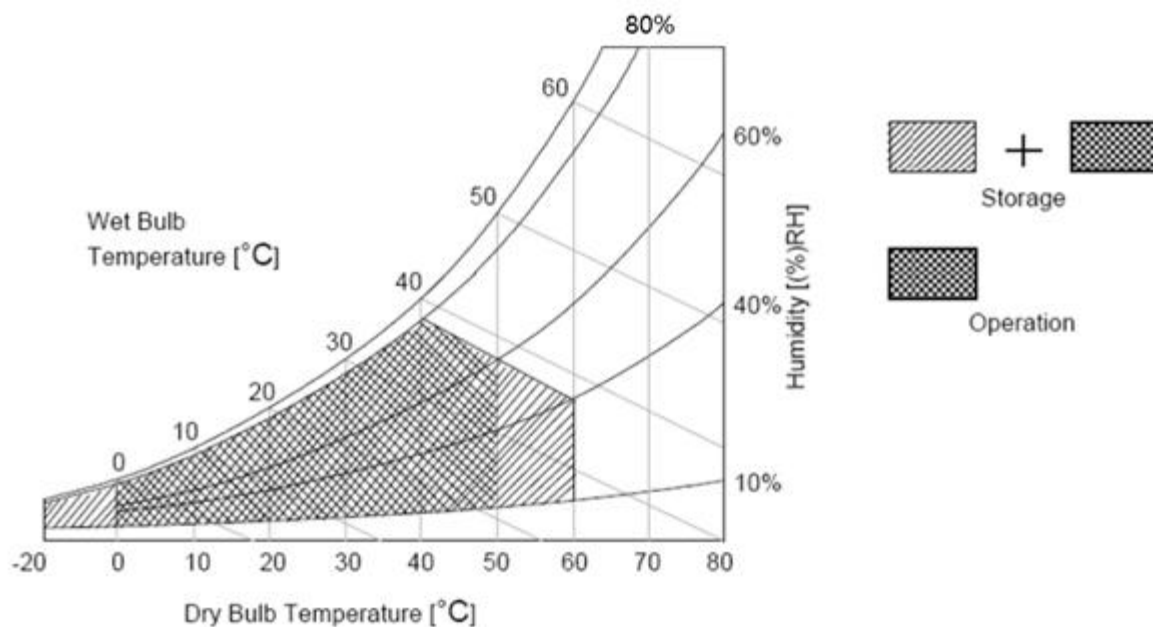
< Table 2. Open Cell Absolute Maximum Ratings >

[VSS=GND=0V]

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

Note 1 : Temperature and relative humidity range are shown in the figure below.

Note 2 : Wet bulb temperature should be 39 °C max. and no condensation of water.



3.0 ELECTRICAL SPECIFICATIONS

3.1 TFT LCD Open Cell

< Table 3. Open Cell Electrical Specifications >

[Ta =25±2 °C]

Parameter	Symbol	Values			Unit	Remark	
		Min	Typ	Max			
Power Supply Input Voltage	VDD	10.8	12	13.2	Vdc		
Power Supply Ripple Voltage	VRP	-	-	600	mV		
Power Supply Current	IDD	-	1	3	A	Note 1	
Power Consumption	PDD		12	36	Watt		
Rush current	IRUSH	-	-	10	A	Note 2	
V by One Interface	Differential Input High Threshold Voltage	VLVTH	-	-	+50	mV	
	Differential Input Low Threshold Voltage	VLVTL	-50	-	-	mV	
	Common Input Voltage	VLVC	-	-	-	V	
	Terminating Resistor	Rt	90	100	110	ohm	
CMOS Interface	Input High Threshold Voltage	VIH	2.0	-	3.3	V	
	Input Low Threshold Voltage	VIL	0	-	0.8	V	

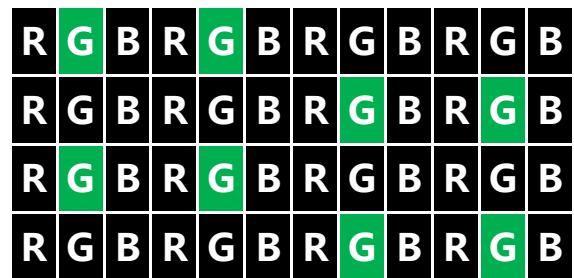
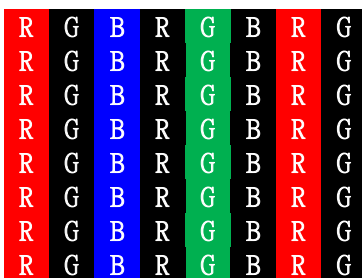
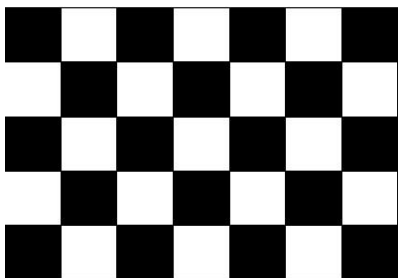
Note 1 : The supply voltage is measured and specified at the interface connector of LCM.

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

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

b) Max : Vertical Sub Line(L255)

c) Flicker Test Pattern



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

3.0 ELECTRICAL SPECIFICATIONS

3.2 IC Characteristics

< Table 4. TCON Characteristics >

Parameter	Symbol	Values			Unit	Remark
		Min	Typ	Max		
TCON Surface Temperature	T_{TS}	-	-	110	°C	Note

Note 1 : Any point on the TCON surface must be less than 110 °C under any conditions.

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

< Table 5. Driver Characteristics >

Parameter	Symbol	Values			Unit	Remark
		Min	Typ	Max		
Driver Surface Temperature	T_{DS}	-	-	125	°C	Note

Note 3 : Any point on the driver surface must be less than 125 °C under any conditions.

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

< Table 6. PMIC Characteristics >

Parameter	Symbol	Values			Unit	Remark
		Min	Typ	Max		
PMIC Surface Temperature	T_{PS}	-	-	100	°C	Note

Note 5 : Any point on the PMIC surface must be less than 100 °C under any conditions.

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

3.0 ELECTRICAL SPECIFICATIONS

3.3 VCOM I2C Bus Format

Step1 Reset

*Device Address is 0x74 or 0x75(7Bits)

S	Slave Address	W	A	Index Address 0	A	Control Byte	A	P
	<u>1 1 1 0 1 0 0 0</u>			<u>0 0 0 0 0 0 0 0</u>		<u>0 0 0 1 0 0 1 0</u>		
	0xE8			0x00		0x12		
	Device Address + W			Control Address		Reset + OUT EN		

Step2 Read VCOM

*Data = 7Bits

S	Slave Address	W	A	Index Address 1	SR	Slave Address	R	A	DATA 0/1	NA	P
	<u>1 1 1 0 1 0 0 0</u>			<u>0 0 0 0 0 0 0 1</u>		<u>1 1 1 0 1 0 0 1</u>			<u>X X X X X X X X</u>		
	0XE8			0X01		0XE9					
	Device address + W			VCOM Address		Device address + R			Data		

Step3 Adjust VCOM

*DVCOM= 8Bits

S	Slave Address	W	A	Index Address 1	A	DVCOM	A	P
	<u>1 1 1 0 1 0 0 0</u>			<u>0 0 0 0 0 0 0 1</u>		<u>0000000X~1111111X</u>		
	0XE8			0X01		0x00~0xFF		
	Device address + W			VCOM Address		VCOM value		

Step4 Write VCOM

S	Slave Address	W	A	Index Address 1	A	Control Byte (0x02)	A	P
	<u>1 1 1 0 1 0 0 0</u>			<u>0 0 0 0 0 0 0 0</u>		<u>0 0 0 0 1 0 1 0</u>		
	0xE8			0x00		0X0A		
	Device Address + W			Control Address		Write DAC to NVM + OUT_EN		

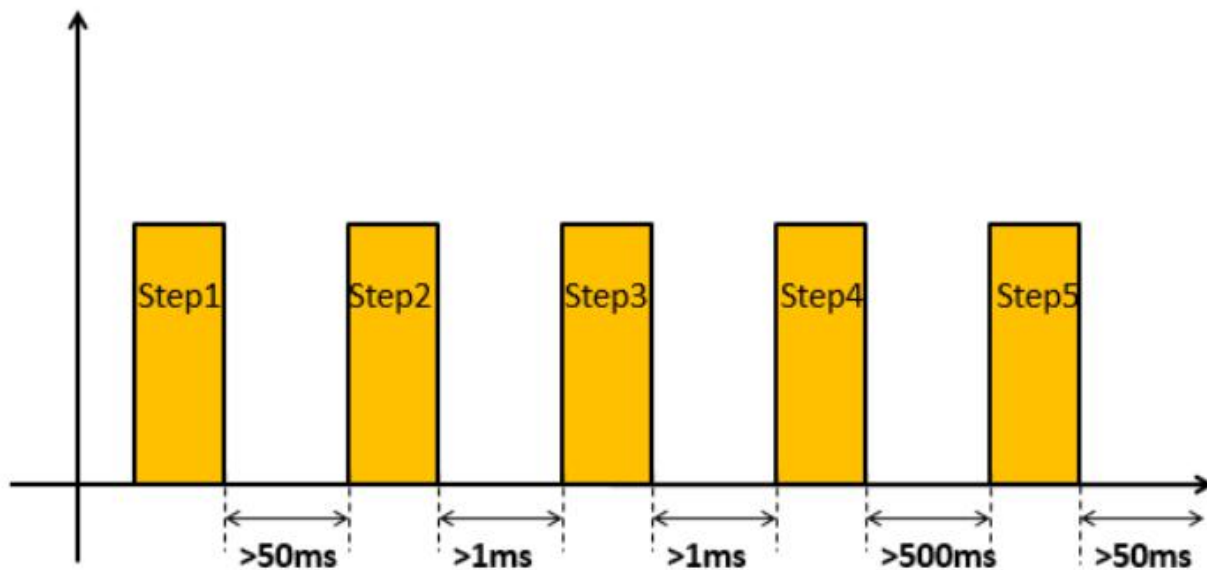
Step5 Reset

*Device Address is 0x74 or 0x75(7Bits)

S	Slave Address	W	A	Index Address 0	A	Control Byte	A	P
	<u>1 1 1 0 1 0 0 0</u>			<u>0 0 0 0 0 0 0 0</u>		<u>0 0 0 1 0 0 1 0</u>		
	0xE8			0x00		0x12		
	Device Address + W			Control Address		Reset + OUT_EN		

3.0 ELECTRICAL SPECIFICATIONS

3.4 Interval of step to step



3.0 ELECTRICAL SPECIFICATIONS

3.5 Backlight Module

< Table 7. LED LIGHTBAR UNIT CHARACTERISTICS > [Ta =25±2 °C]

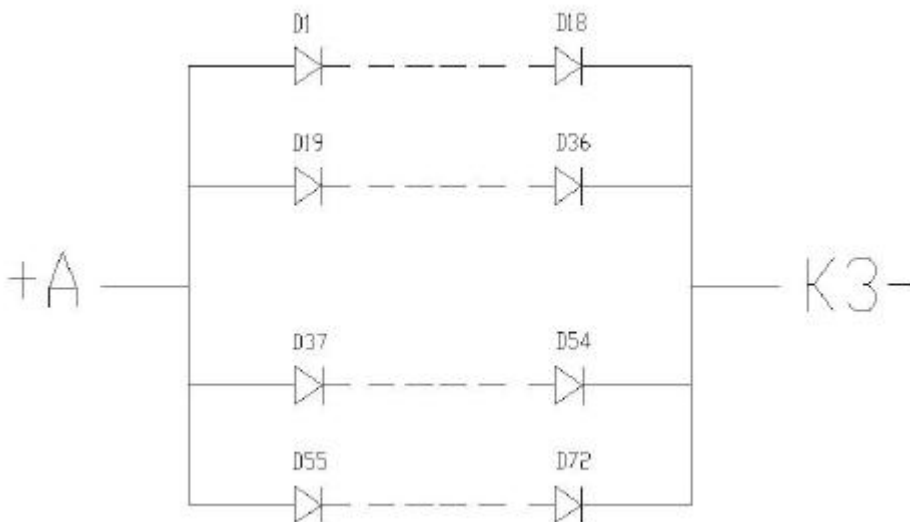
Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
LED Forward Voltage	V	104.4	113.4	122.4	V	-
LED Forward Current	I	-	880		mA	-
LED Power Consumption	W	91.9	99.8	107.8	W	-
LED Life-Time	L	50,000	-	-	Hour	Note 1

Note1 :The lifetime is defined as the time which luminance of the LED decays to 50% compared to the initial value, Operating condition: Continuous operating at Ta = 25±2°C

-LED Bar Block Diagram

LED Numbers: 2bar / BLU

Total : 144LED / BLU



3.0 ELECTRICAL SPECIFICATIONS

3.6 LED Constant Current Source

This DC-DC LED Inverter was developed for LCD back lighting system witch lighting use LED.

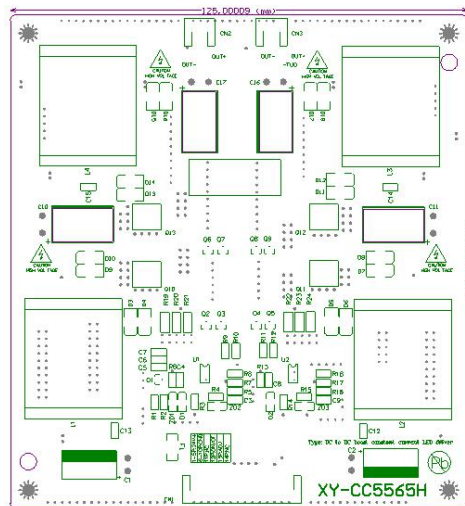
(1) Pin Assignments

< Table 8. Pin Definition of LED Constant Current Source >

Input connector : CN1			
Pin No.	Symbol	Description	Parameter
1,2,3,4,5	+24V	Supply voltage/	22~26V
6,7,8,9,10	GND	Ground	0 V
11,14	NC		
12	N/F	Standby/Operation	On =1.5-5.0V Off=0-0.5V
13	ADJ	Dimming control	0V=Brightness Max 5V=Brightness Min
Output socket CN2.3			
Pin No.	Symbol	Description	Parameter
1	OUT+	Output voltage	60-185V
2	OUT-	Ground	0

The above output parameters are determined according to the optical requirement. The products are not intended for use in systems in which failures of product could result in personal injury.

(2) Mechanical Dimension



The thickness of the board is 11MM (including components)

3.0 ELECTRICAL SPECIFICATIONS

3.6 LED Constant Current Source

(3) Environmental Condition

< Table 9. LED Constant Current Source Working Condition >

Operating temperature	Storage temperature	Operating humidity	Storage humidity	Remark
-50°C -- 65°C	-20°C-- 70°C	10% -- 95%RH	10% -- 95%RH	Note1
-20°C -- 70°C		10% -- 95%RH		Note2

Note1: The DC to DC back-light inverter suggested working in the condition.

Note2: It can be work 300 thousand hours at least in the condition.

(4) Electrical Characteristics

< Table 10. LED Constant Current Source Electrical Characteristics >

NO	Item	Symbol	Test Conditions	Min	Type	Max	Unit
1	Input Voltage	Vin		22	24	26	V
2	Input Current	Iin			4.75	6	A
3	Input Power	Pin			104	142	W
4	Brightness Voltage	Vadj		0(Bright)	-	5(Dark)	V
5	Control Voltage	Enable Von=1.5~5.0V Disable Voff=0~0.5V					
6	Output Current (per group)	Iout	Vin=24.0V; Vout=57V; Ta=28°C		440	600	mA
7	Output Voltage	Vout	Vin=24.0V; Ta=28°C	60	118.8	185	V
8	Efficiency	η	Vin=24.0V; Vout=118V;		92.5		%
9	Output Total Group	Ggp			2		
10	Total Output Current	R			880	1200	mA
11	Output Power	Wout	Vin=24.0V; Vout=122.4V;		104	142	W

3.0 ELECTRICAL SPECIFICATIONS**3.6 LED Constant Current Source**

(5) Sample Test Report

SAMPLE TEST REPORT

CUSTOMER:

MOOEL NO.

XY-CC5565H

1.Input Characteristics

Parameter	Symbol/	Min	Typ	Max	Unit	Remark	Spec.Limit	Pass/Fail
Input Voltage	Vin	22	24	26	V	Input DC	22~26V	Pass
Input Current	Iin		4.75	6	A	Vadj=0V	4.75~6 A	Pass
Input Power	Pin		104	142	W		90~142W	Pass
Input Voltage ON /offcontrol	Von/Off	2.5~5	2.5~5	2.5~5	V	On	2.5~5V	Pass
		0~0.5	0~0.5	0~0.5	V	Off	0~0.5V	Pass

2.Output Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Remark	Spec.Limit	Pass/Fail
Output Voltage	+	60	118.8	185	V		60~185	Pass
Output Current	+		880	1200	mA		880~1200	Pass
Low temperature test	0°C,(24VDC±10%) The sample OK							

Please do not live in the assembly of the product, so as to avoid short circuit caused the product damage and other circuit board fault

Use this product to correspond to the required voltage, current parameter, otherwise cause the load capacity is insufficient or excessive flow, the impact of LED life

SPEC. NUMBER

S8-65-8D-157

SPEC. TITLE

DV550QUB-N10 Product Specification

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4.0 INTERFACE CONNECTION

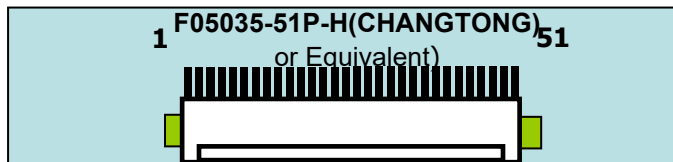
4.1 V by One CN (51Pin) Connector : F05035-51P-H(CHANGTONG) or Equivalent.

< Table 7. 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	NC	No Connection	42	GND	Ground
17	NC	No Connection	43	Rx5n	V-by-One HS Data Lane 5
18	SDA	SDA	44	Rx5p	V-by-One HS Data Lane 5
19	SCL	SCL	45	GND	Ground
20	NC	No Connection	46	Rx6n	V-by-One HS Data Lane 6
21	NC	No Connection	47	Rx6p	V-by-One HS Data Lane 6
22	SEL_SECTION	Low or NC: 1 section(default) High: 2 section	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	GND	Ground	51	GND	Ground
26	LOCKN	Lock detect			

Note : NC(Not Connected) : These pins are only used for BOE internal operations.

Rear view of LCM



BIST Pattern

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

4.0 INTERFACE CONNECTION

4.2 V by one Misc. Setting for 1 Section.

- a) System side has to put pull high resistor on LOCKN pin.
- b) V by one data mapping as follows.

< Table 8. V by one setting & data mapping table >

1 Section								
Hactive = 3840								
	Port0		Port1		Port2		Port3	
	Lane0	Lane1	Lane2	Lane3	Lane4	Lane5	Lane6	Lane7
V Blanking	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS
	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
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 3833	Pixel 3834	Pixel 3835	Pixel 3836	Pixel 3837	Pixel 3838	Pixel 3839	Pixel 3840
H Blanking	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS
	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP

	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP
	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 3833	Pixel 3834	Pixel 3835	Pixel 3836	Pixel 3837	Pixel 3838	Pixel 3839	Pixel 3840

4.0 INTERFACE CONNECTION

4.3 V by one Misc. Setting for 2 Section.

- a) System side has to put pull high resistor on LOCKN pin.
- b) V by one data mapping as follows.

< Table 9. V by one setting & data mapping table >

2 Section								
Hactive = 3840								
	Port0		Port1		Port2		Port3	
	Lane0	Lane1	Lane2	Lane3	Lane4	Lane5	Lane6	Lane7
V Blanking	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS
	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
Line 1	Pixel 1	Pixel 2	Pixel 3	Pixel 4	Pixel 1921	Pixel 1922	Pixel 1923	Pixel 1924
	Pixel 5	Pixel 6	Pixel 7	Pixel 8	Pixel 1925	Pixel 1926	Pixel 1927	Pixel 1928

	Pixel 1917	Pixel 1918	Pixel 1919	Pixel 1920	Pixel 3837	Pixel 3838	Pixel 3839	Pixel 3840
H Blanking	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS
	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP

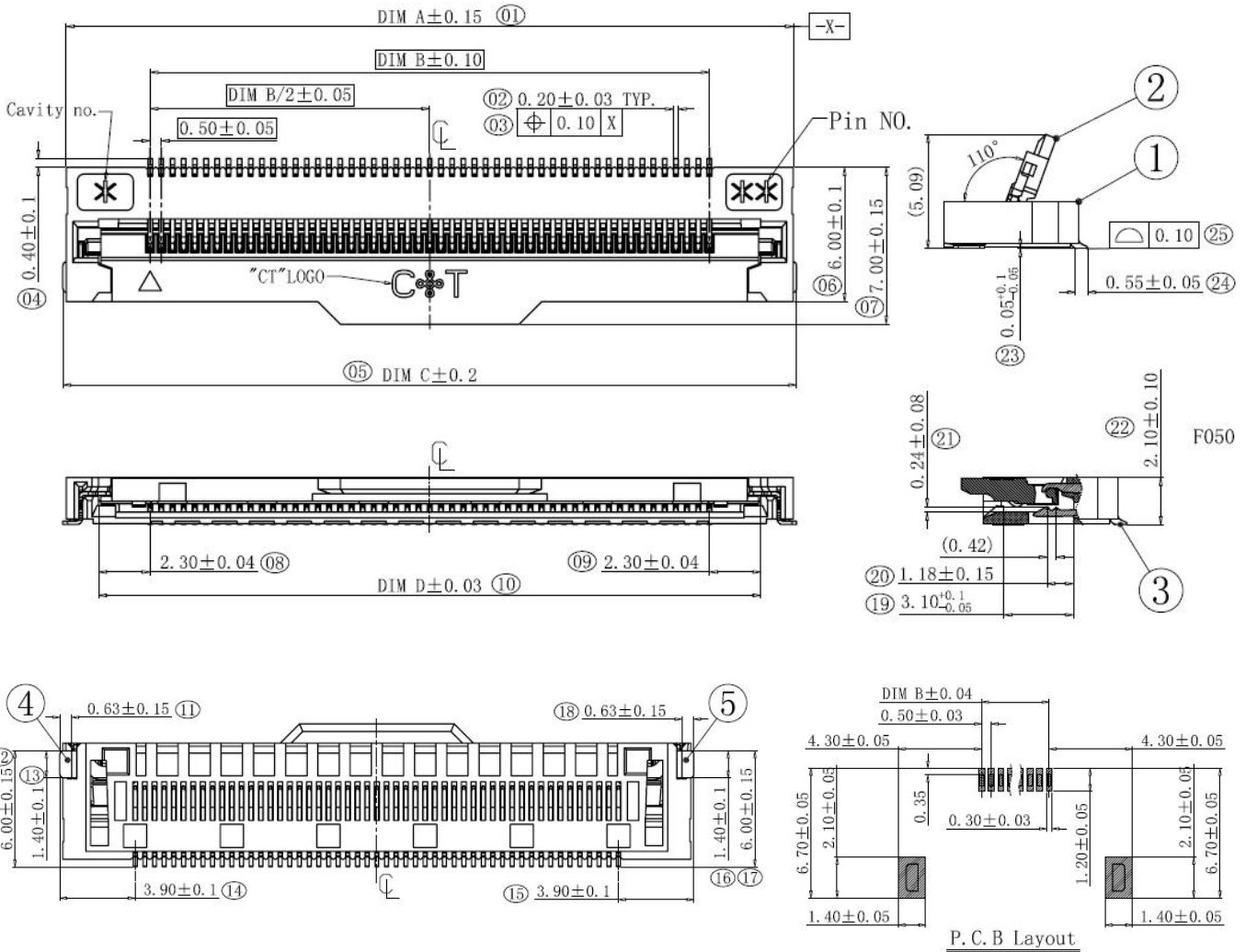
	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP
	FSBE	FSBE	FSBE	FSBE	FSBE	FSBE	FSBE	FSBE
Line 2	Pixel 1	Pixel 2	Pixel 3	Pixel 4	Pixel 1921	Pixel 1922	Pixel 1923	Pixel 1924
	Pixel 5	Pixel 6	Pixel 7	Pixel 8	Pixel 1925	Pixel 1926	Pixel 1927	Pixel 1928

	Pixel 1917	Pixel 1918	Pixel 1919	Pixel 1920	Pixel 3837	Pixel 3838	Pixel 3839	Pixel 3840

4.0 INTERFACE CONNECTION

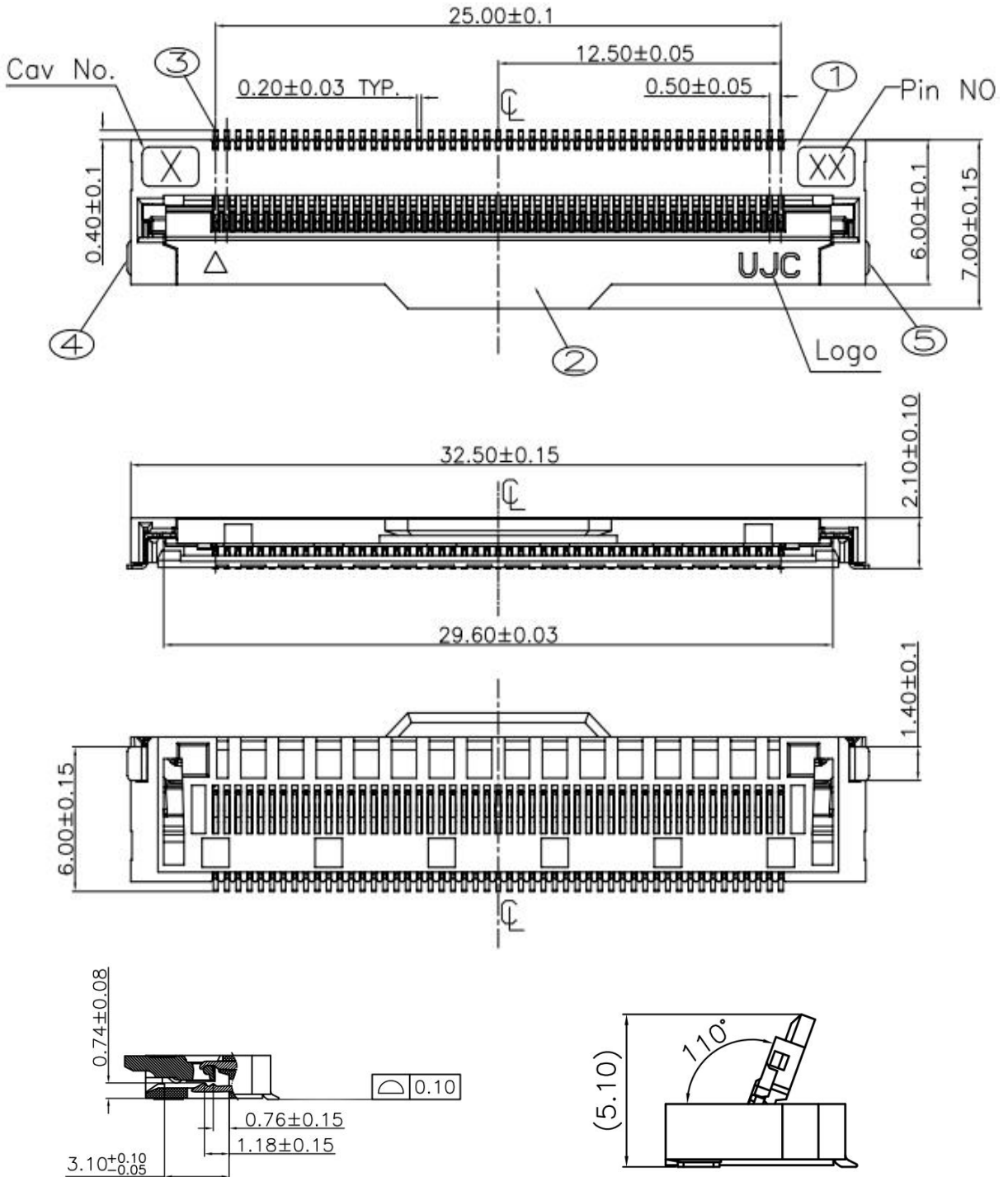
4.4 TCON Board Input CNT & FFC Drawing

-51pin Connector Drawing-F05035-51P-H (Changtong)



PIN NO.	DIM A	DIM B	DIM C	DIM D
30	22.00	14.50	22.30	19.10
41	27.50	20.00	27.80	24.60
51	32.50	25.00	32.80	29.60

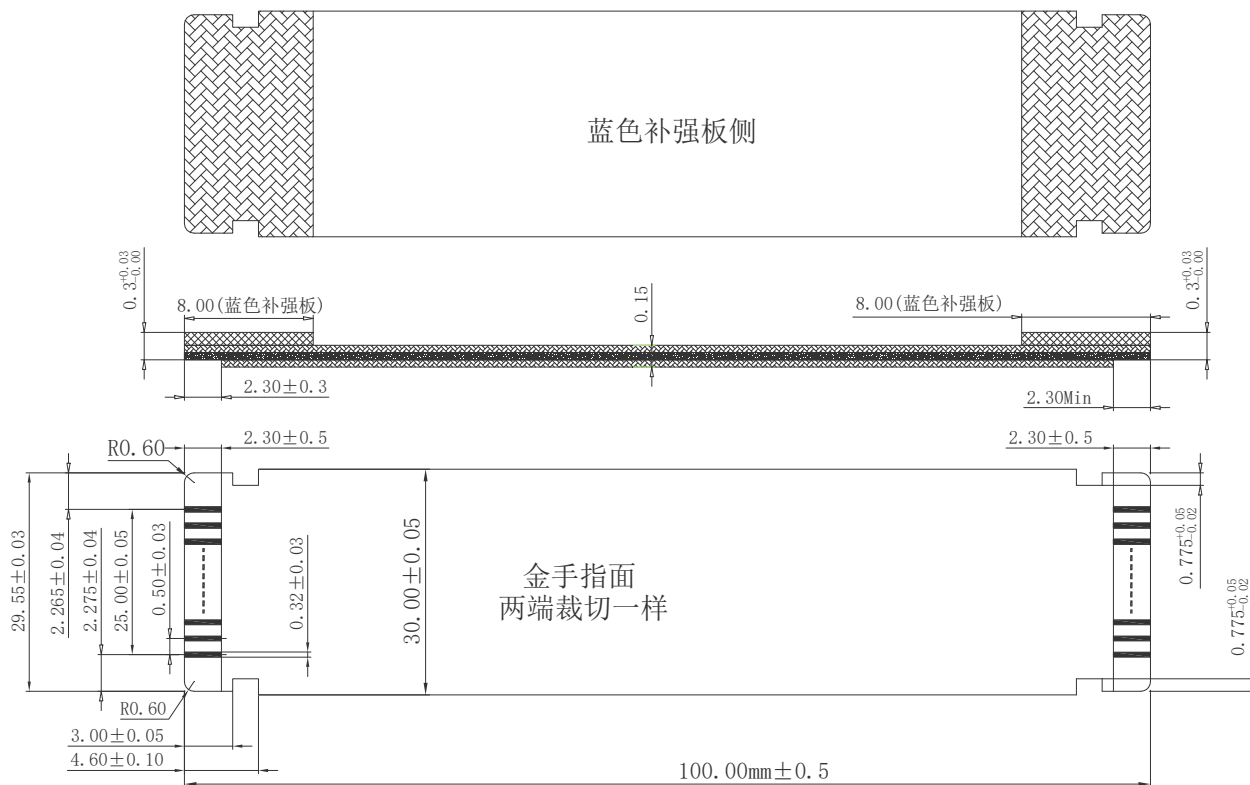
-51pin Connector Drawing-PM.FPC.LVS0505101(UJC)



4.0 INTERFACE CONNECTION

4.4 TCON Board Input CNT & FFC Drawing

-FFC Drawing

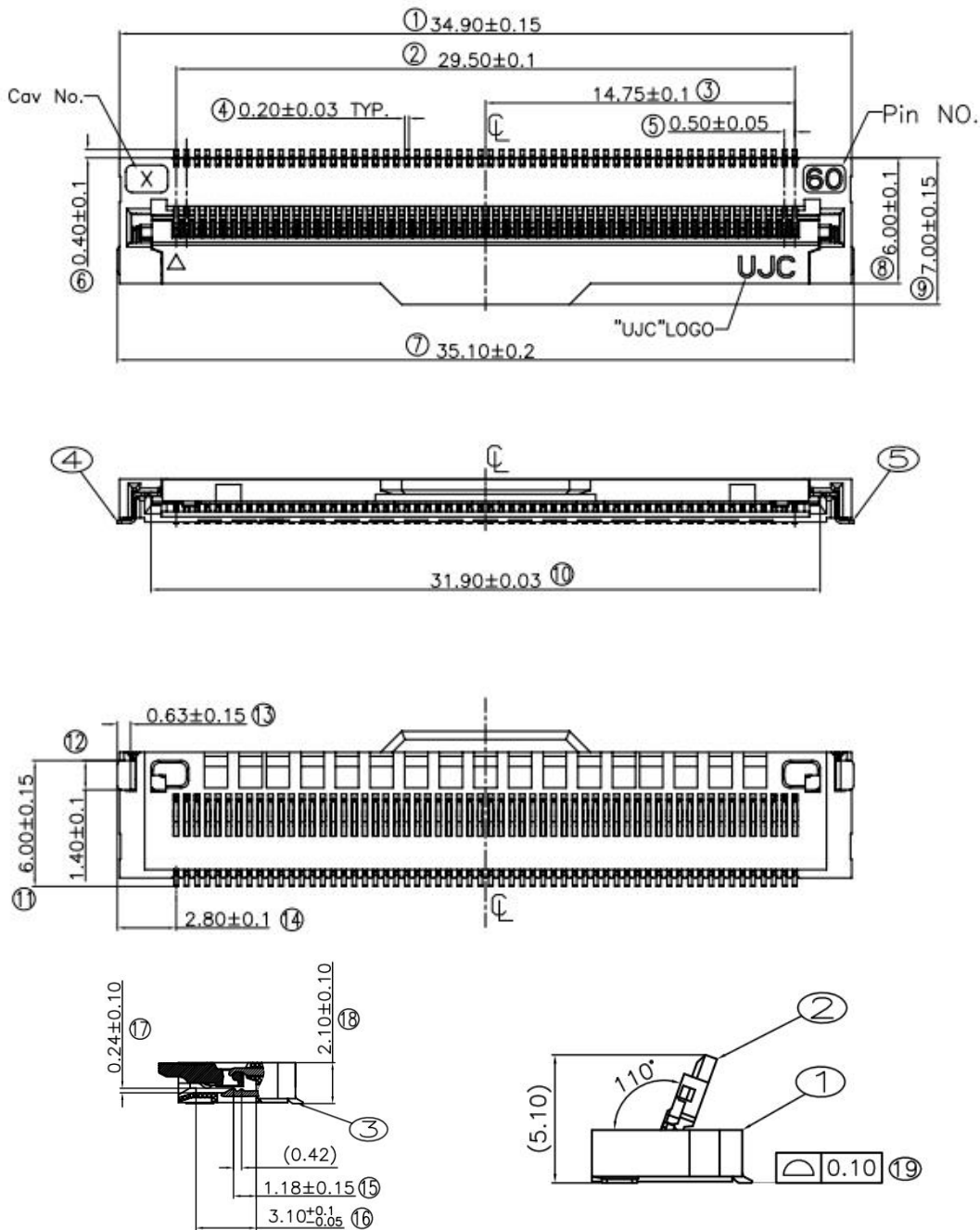


Note: It is BOE FFC drawing. Please refer to only one side for T-con Board.

4.0 INTERFACE CONNECTION

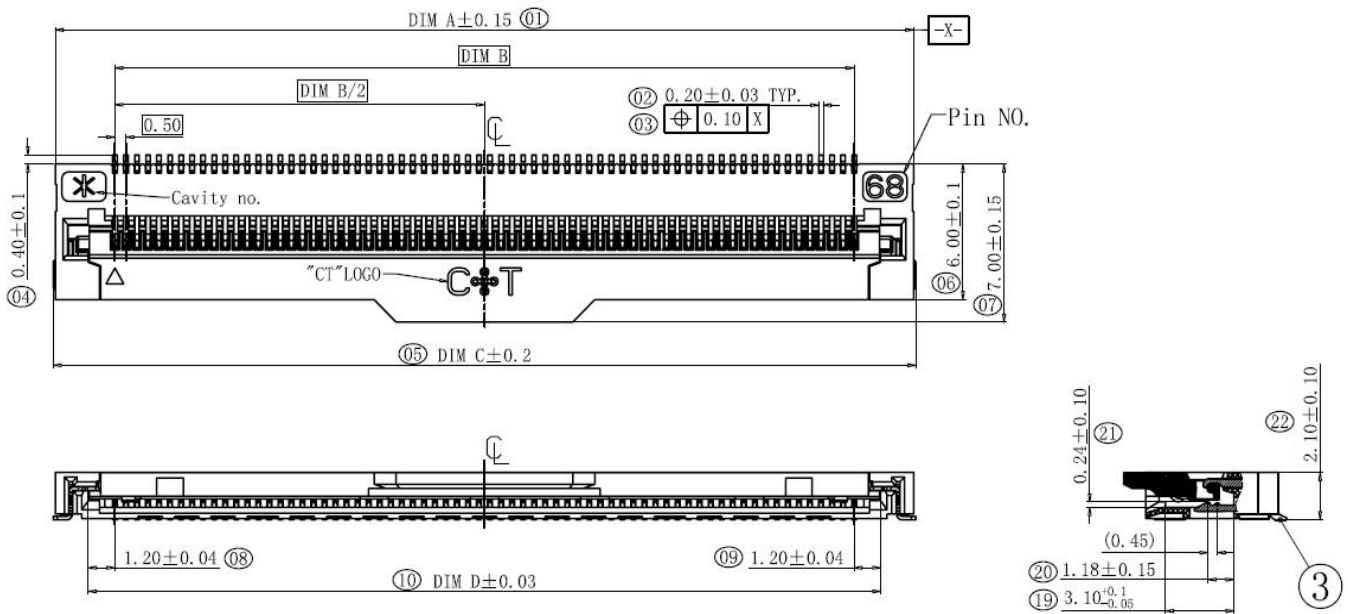
4.5 TCON Board Output CNT & FFC Drawing

-60pin Connector Drawing-PM.FPC.LVS0506001(UJC)



Note: TCON Board output CNT = XPCBA Input CNT.

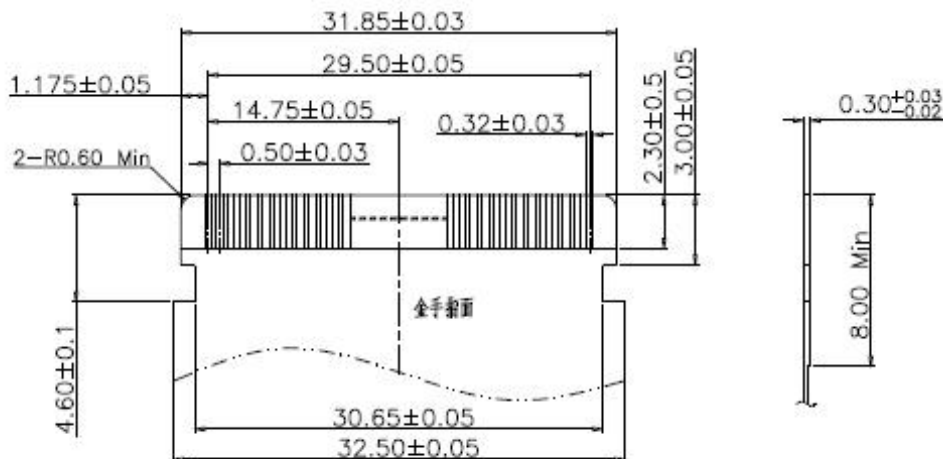
-60pin Connector Drawing-F05039-60P-H(Changtong)



PIN NO.	DIM A	DIM B	DIM C	DIM D
60	34.90	29.50	35.10	31.90

Note: TCON Board output CNT = XPCBA Input CNT.

-FFC Drawing



Notes: This FFC drawing is supplied by the connector vendor.

5.0 SIGNAL TIMING WAVEFORMS OF INTERFACE SIGNAL**5.1 Input data specification**

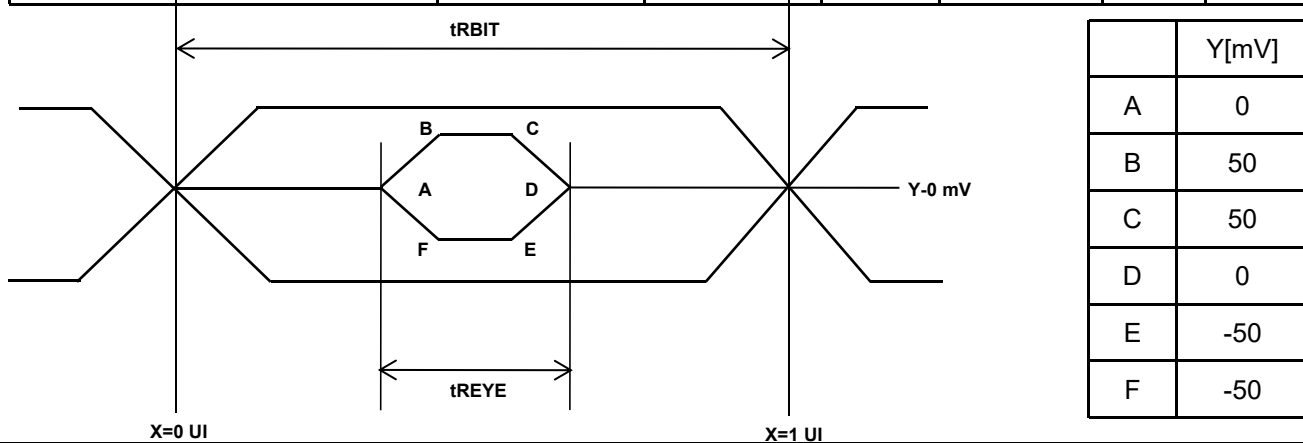
<Table 10. Vx1 Byte length and Color mapping>

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

5.2 Vx1 Input Signal Timing

< Table 11. Signal Timing Waveforms Table >

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Unit Interval(VBO Operation Bit Rate)	tRBIT	3-byte	380	tTCIP/30	1667	PS
		4-byte	285	tTCIP/40	1250	PS
		5-byte	266	tTCIP/50	1000	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	%



6.0 SIGNAL TIMING SPECIFICATION**6.1 Timing Parameters(DE only mode)**

< Table 12. Timing Table >

Item		Symbols	Min	Typ	Max	Unit
Frequency		1/Tc	69	74.25	77	MHz
Vertical	Frame Rate	F	57	60	62	Hz
	Total	T _V	2180	2250	2450	T _H
	Display	T _{VD}	2160			T _H
	Blank	T _{VB}	20	90	290	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}

Item		Symbols	Min	Typ	Max	Unit
Frequency		1/Tc	69	74.25	77	MHz
Vertical	Frame Rate	F	47	50	51	Hz
	Total	T _V	2180	2700	2715	T _H
	Display	T _{VD}	2160			T _H
	Blank	T _{VB}	20	540	555	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}

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

6.0 SIGNAL TIMING SPECIFICATION

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

< Table 13. 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
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
	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
	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
	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
	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
	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
	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
	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
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	
	RED(001)	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	

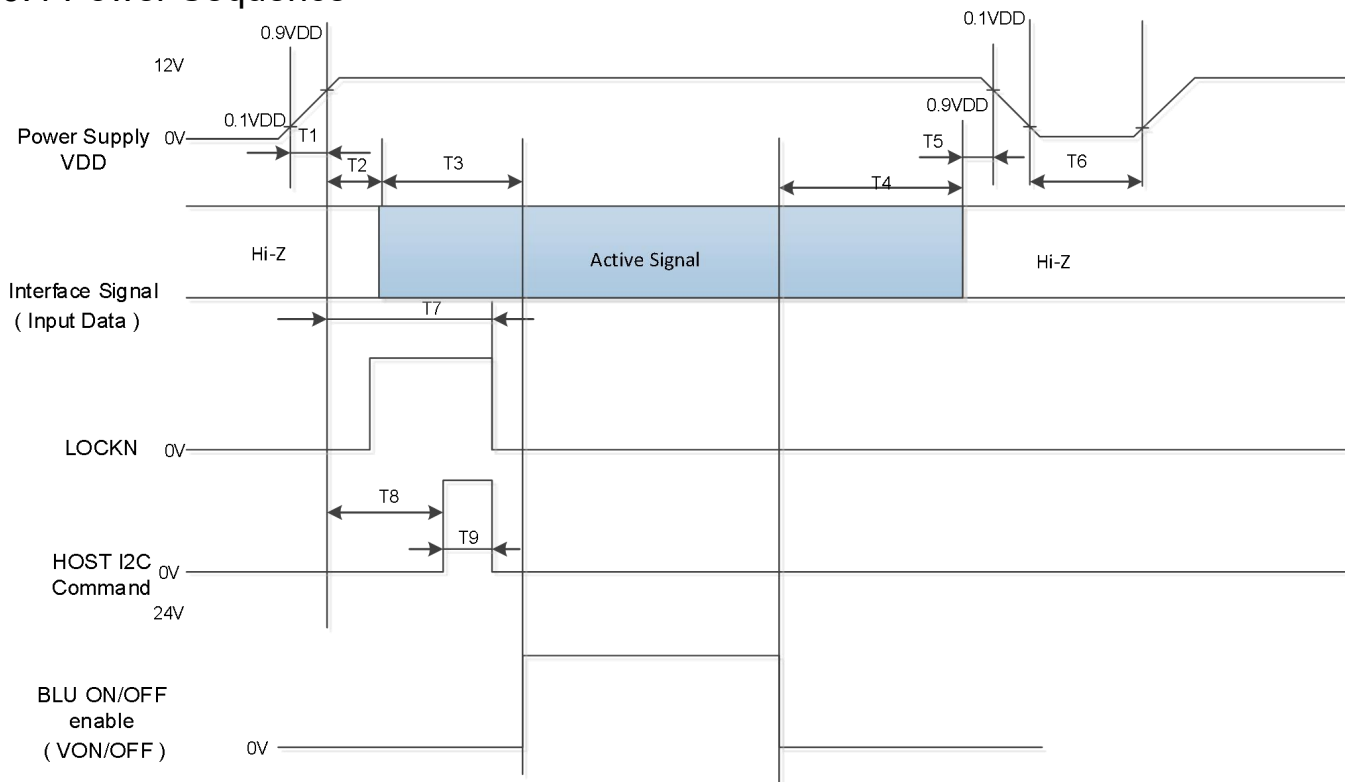
	RED(1022)	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	RED(1023)	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
G	Green (000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Green (000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	

	Green (1022)	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	
	Green (1023)	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	
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	
	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	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	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	

6.0 SIGNAL TIMING SPECIFICATION

6.4 Power Sequence



< Table 14. Sequence Table >

Parameter	Values			Units
	Min	Typ	Max	
T1	0.5	-	10	ms
T2	0	-	-	ms
T3	200	-	-	ms
T4	100	-	-	ms
T5	0	-	-	ms
T6	1	-	-	s
T7	-	-	200	ms
T8	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.

7.0 OPTICAL SPECIFICATION

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

< Table 19. Optical Table >

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

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Remark
Viewing Angle	Horizontal	Θ_3	CR > 10	-	89	-	Deg.	Note 1
		Θ_9		-	89	-	Deg.	
	Vertical	Θ_{12}		-	89	-	Deg.	
		Θ_6		-	89	-	Deg.	
Contrast ratio		CR		1000:1	1200:1	-	-	Note 2
Reproduction of color	White	W_x	$\Theta = 0^{\circ}$ (Center) Normal Viewing Angle	TYP. - 0.03	0.280	TYP. + 0.03	-	Note 3
		W_y			0.290		-	
	Red	R_x			0.641		-	
		R_y			0.340		-	
	Green	G_x			0.302		-	
		G_y			0.619		-	
	Blue	B_x			0.154		-	
		B_y			0.052		-	
Response Time	G to G	T_g		-	8	10	ms	Note 4
Gamma Scale				2.0	2.2	2.4	-	2.2 \pm 0.3 (50~128 Gray)
Cell Transmittance				4.8	5.4	-	%	Note 5
Surface Luminance, white		L_{WH}		650	800	-	cd/m ²	Note 6
Luminance Variation		δ_{WHITE}	gP	72	75	-	%	Note 7

Note :

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface.
2. Contrast measurements shall be made at viewing angle of $\theta = 0^\circ$ and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. (See Figure 1 shown in Appendix) Luminance Contrast Ratio (CR) is defined mathematically.

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

3. The color chromaticity coordinates specified in Table 15 shall be calculated from the spectral data measured with all pixels first in red, green, blue. Measurements shall be made at the center of the panel. The BLU is used by BOE.
4. Response time T_g is the average time required for display transition by switching the input signal as below table and is based on Frame rate $f_V = 60\text{Hz}$ to optimize. Each time in below table is defined as Figure 2 and shall be measured by switching the input signal for "any level of gray(bright)" and "any level of gray(dark)"

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

5. Definition of Transmittance (T%) :

Module is with white(L255) signal input

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

Note :

6. Surface luminance are determined after the unit has been 'ON' and 1 Hour after lighting the backlight in a dark environment at $25\pm 2^{\circ}\text{C}$. Surface luminance is the luminance value at center 1-point across the LCD surface 50cm from the surface with all pixels displaying white.
7. The variation in surface luminance, δ WHITE is define as:

$$\delta \text{ WHITE}(9P) = \text{Minimum}(L_{\text{on}1}, L_{\text{on}2}, L_{\text{on}3}, L_{\text{on}4}, L_{\text{on}0}) / \text{Maximum}(L_{\text{on}1}, L_{\text{on}2}, L_{\text{on}3}, L_{\text{on}4}, L_{\text{on}9})$$

Where $L_{\text{on}1}$ to $L_{\text{on}9}$ are the luminance with all pixels displaying while at 9 locations.

For more information, see the Figure 3(located in Appendix).

8.0 MECHANICAL CHARACTERISTICS

8.1 Dimensional Requirements

Figure 4(located in Appendix) shows mechanical outlines for the model DV550QUM-N10. Other parameters are shown in Table 20.

< Table 20. Dimensional Parameters >

Parameter	Specification	Unit
Active area	1209.6 (H) × 680.4(V)	mm
Pixel pitch	105(H) × 315 (V)	μm
Number of pixels	3840(H) × 2160(V) (TFT pixel) 3840(H) × 2160(V) (1 CF pixel= R + G + B dots)	pixels
MDL Dimensional outline	1232.4(H) x 703.2(V) x 17(B)	mm
Back-Light	Side-edge Backlight Module, 2-LED Light Bar Type	
Weight	15	kg

8.2 Mounting

See Figure 5. (Shown in Appendix)

8.3 Anti-Glare and Polarizer Hardness

The surface of the LCD has an low haze coating to reduce scratching. Front Polarizer hardness is at less 3H.

9.0 RELIABILITY TEST

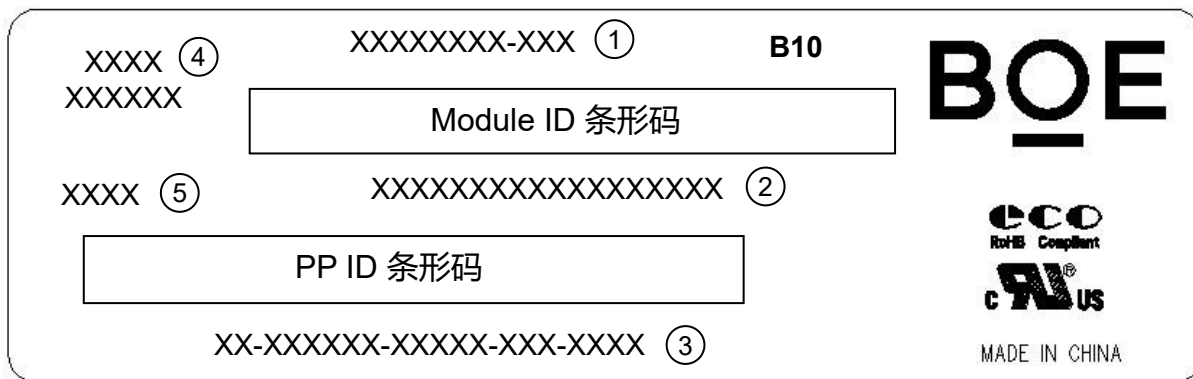
The Reliability test items and its conditions are shown in below.

< Table 21. Reliability Test Parameters >

No	Test Items	Conditions
1	High temperature storage test	Ta = 60 °C, 240 hrs
2	Low temperature storage test	Ta = -20 °C, 240 hrs
3	High temperature & high humidity operation test	Ta = 50 °C, 80%RH, 240hrs
4	High temperature operation test	Ta = 50 °C, 240hrs
5	Low temperature operation test	Ta = -5 °C, 240hrs
6	Thermal shock	Ta = -20 °C ↔ 60 °C (0.5 hr), 100 cycle
7	Packing VIB	1.20Grms, 1-200Hz, Random +Z 1hr
8	Electro-static discharge test	Air : ±15kV ,150pF/330Ω ,100Point ,1time/Point Contact : ±8kV ,150pF/330Ω ,100Point ,1time/Point Non operation Contact: ±4KV~±6KV,150pF/330Ω, 100Point, Input connector Pin, 3 times/pin with no function loss

10.0 PRODUCT SERIAL NUMBER

- Label Size : 80 mm (L) × 25 mm (W)
- Label Picture:



打印内容，说明如下:

- 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)

Module ID编码原则

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						

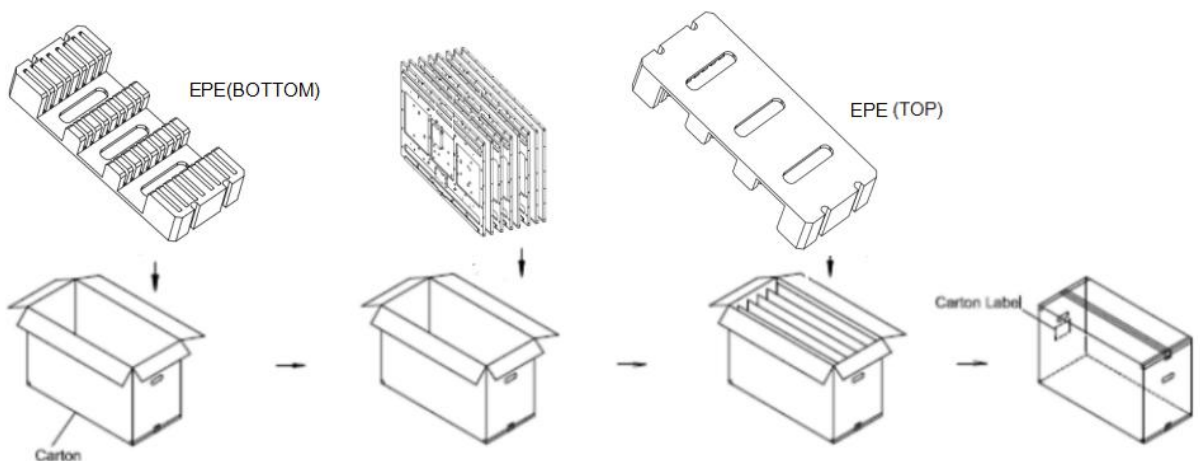
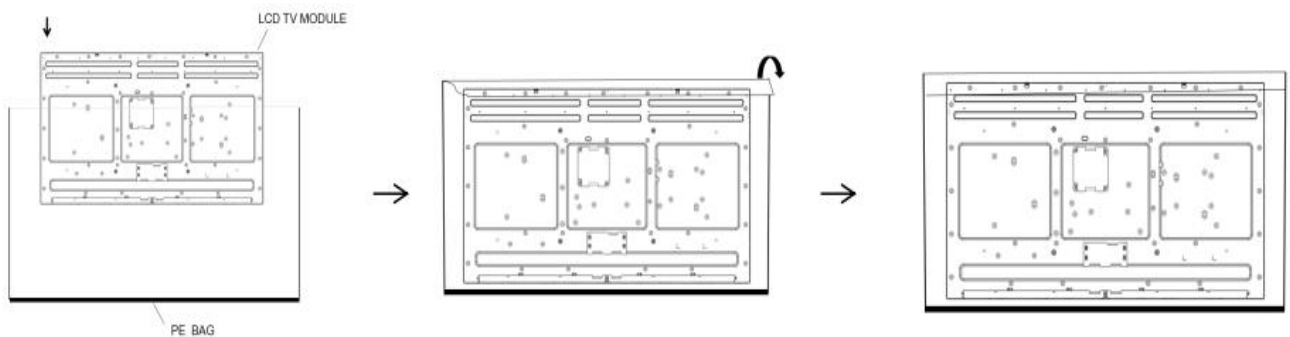
11.0 PACKING

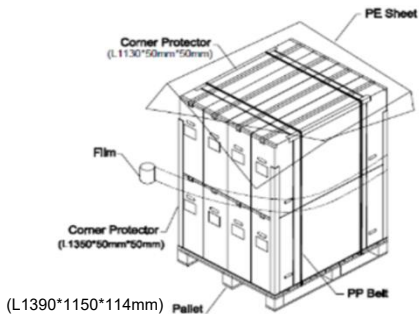
BOE provides the standard shipping container for customers, unless customer specifies their packing information. The standard packing method and Barcode information are shown in below.

11.1 Packing Specifications

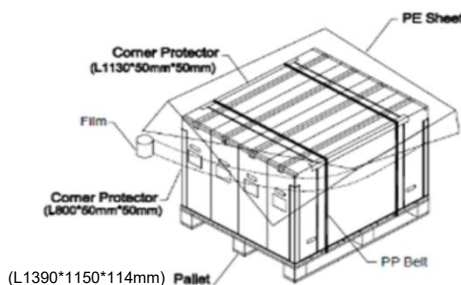
- 8 LCD TV modules/ 1 Box
- Box dimensions: 1370(L) x565(W) x787(H)mm
- Weight: approximately 126Kg (8 modules per box)
- 2 Boxes / 1 Pallet
- Pallet dimensions : 1390(L) x1150(W) x901(H)mm (with boxes)

11.2 Packing Method





Sea/ Land Transportation



Air Transportation

11.3 Box Label

- Label Size : 100 mm (L) × 50 mm (W)
- Contents
 - Model : DV550QUM-N10 (FG-CODE)
 - Q`ty : 8 Module in one box.
 - Serial No. : Box Serial No.
 - Date : Packing Date
 - FG Code : FG Code of Product

- Label Picture:

BOE
FUZHOU BOE OPTOELECTRONICS TECHNOLOGY Co.,LTD

MODEL: XXXXXXXX-XXX ① Q'TY: XXX ②

SERIAL NO: XXXXXXXXXXXXX ③ DATE: XXXX.XX.XX ④

Box ID 条形码

XXXXXXXXXXXX ⑤ XXXX ⑥

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

RoHS Mark

BOX ID 编码原则

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

12.0 PRECAUTIONS

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

12.1 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 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.

12.2 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.
- Do not allow to adjust the adjustable resistance or switch
- 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.

12.3 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.

12.4 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.

12.5 Precautions for Storage

A. Atmosphere Requirement

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

B. Package Requirement

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

12.6 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.

12.7 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: $20 \pm 15^{\circ}\text{C}$
- Operating Ambient Humidity : $55 \pm 20\%$
- Display pattern: dynamic pattern (Real display)
- Well-ventilated place is recommended to set up Commercial Display system

2. Special operating condition

a. Ambient condition

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

b. Power and screen save

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

c. As the low temperature, the response time is greatly delayed. As the high temperatures (higher than the operating temperature) the LCD 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. Products should be protected from high and low temperature, water vapor and ultraviolet radiation, in order to avoid direct exposure to the extreme environment for a long time.

g. Long time and large angle forward use or unconventional use , It is strongly recommended to contact BOE for filed application engineering advice.

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

12.8 Other Precautions

A. LC Leak

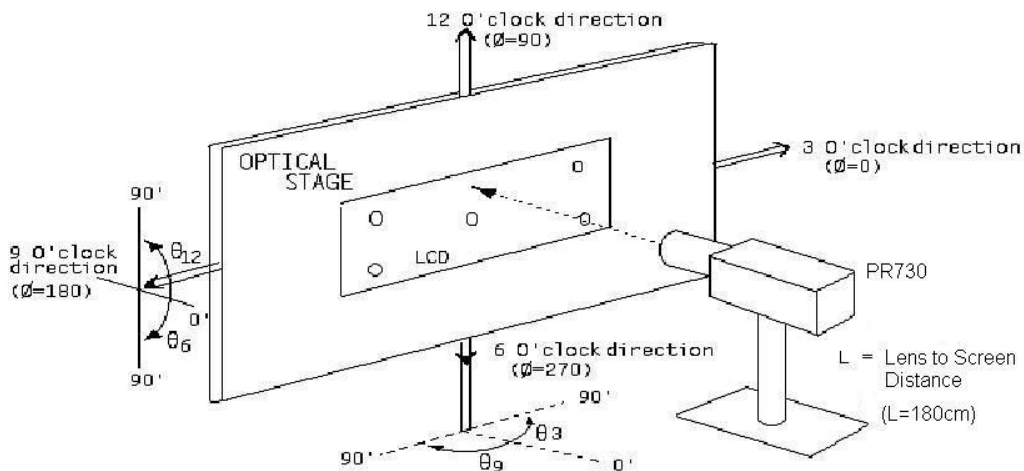
- If the liquid crystal material leaks from the panel, it is recommended to wash the LC with acetone or ethanol and then burn it.
- If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away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

B. Rework

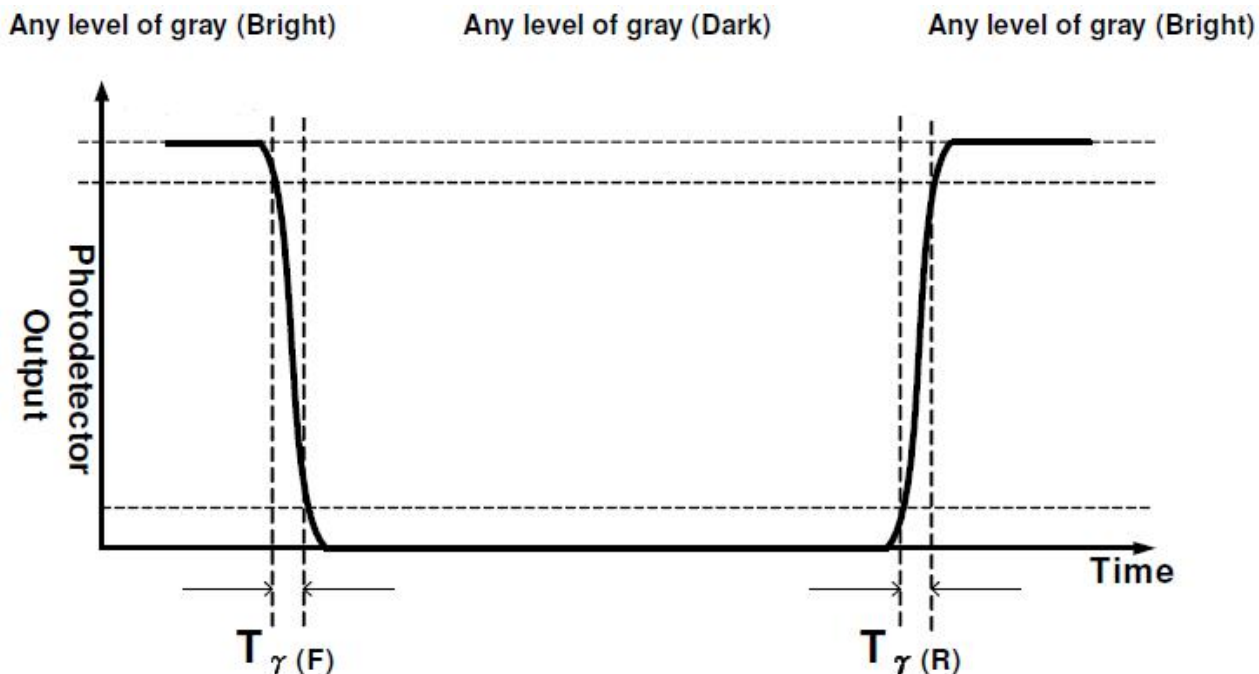
- When returning the module for repair or etc., Please pack the module not to be broken. We recommend to use the original shipping packages.

13.0 APPENDIX

< Figure 1. Measurement Set Up >

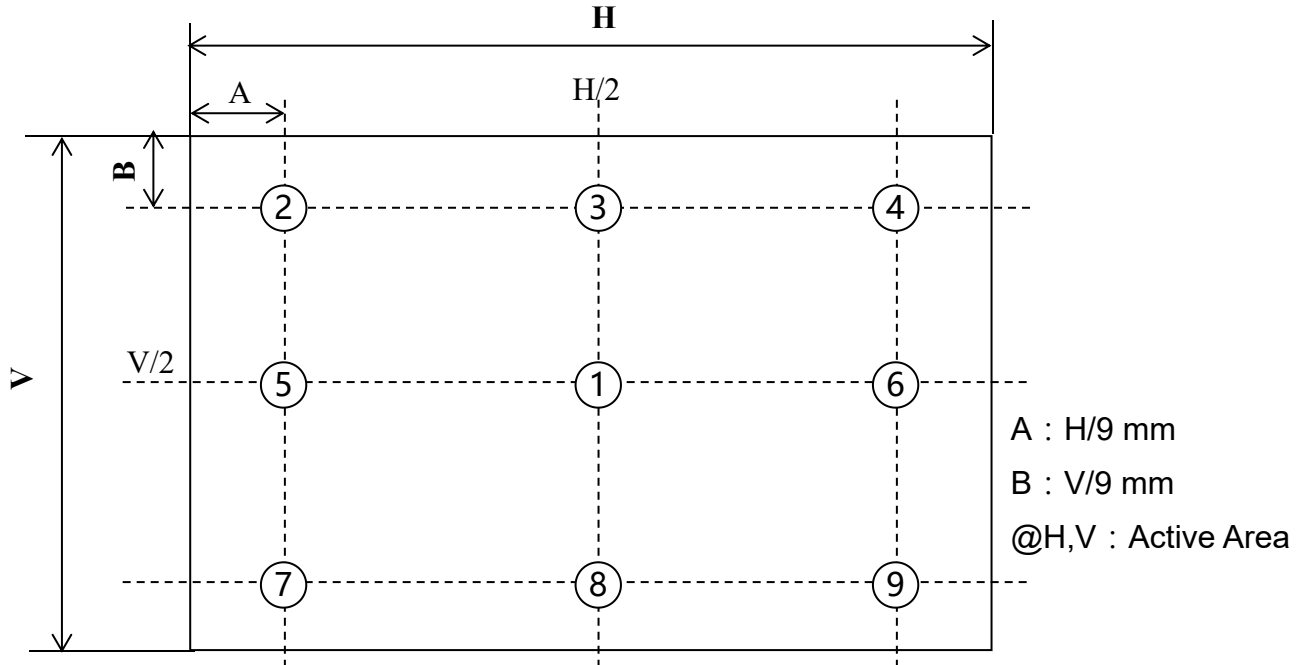


< Figure 2. Response Time Testing >



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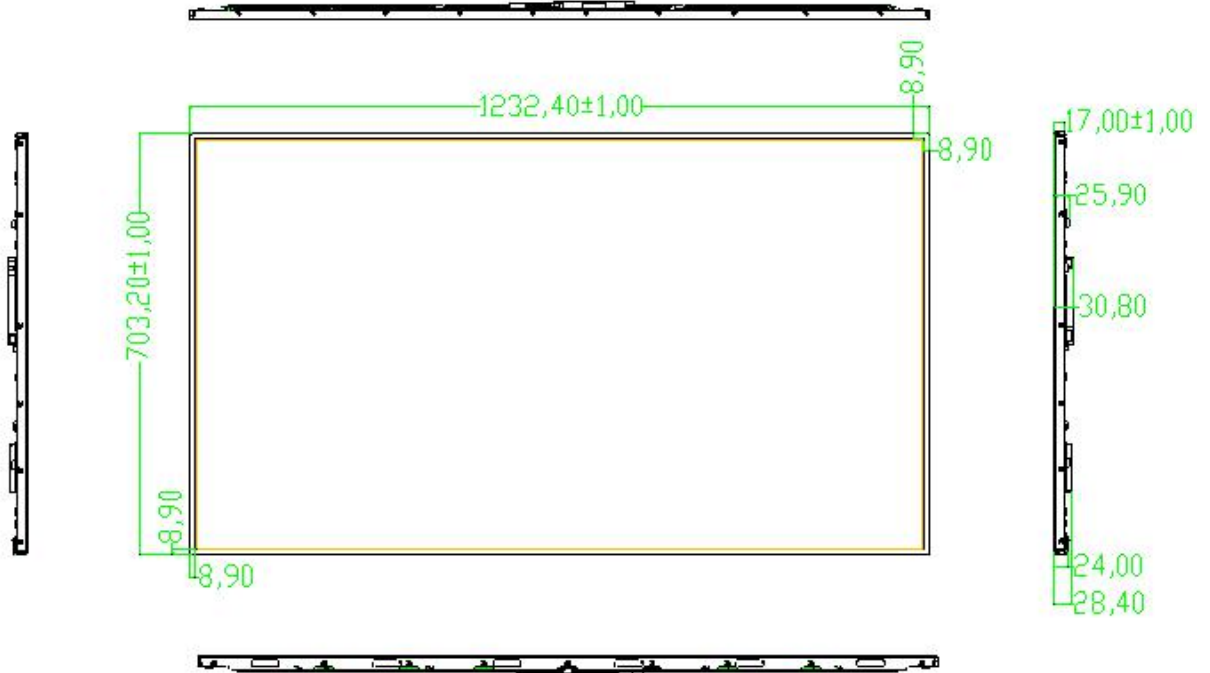
< Figure 3. Point for Luminance Measure >



Measuring point for surface luminance & luminance variation CA-310 , Contact method

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< Figure 4. TFT-LCD Module Outline Dimensions (Front View) >



< Figure 5. TFT-LCD Module Outline Dimensions (Rear View) >

