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TITLE : HV430QUB-F1A**Product Specification****Rev.P0**

Fuzhou BOE Optoelectronics Technology Co., Ltd

SPEC. NUMBER

PRODUCT GROUP
TFT-LCD

Rev. P0

ISSUE DATE
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DAS-RD-2019018-O

A4(210 X 297)

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT- LCD PRODUCT	Rev. P0	2019.12.20

REVISION HISTORY			
(√)preliminary specification			
()Final specification			

Revision No.	Page	Description of changes	Date	Prepared
P0	All	Initial Release	2019.12.20	Li Senwang
...				

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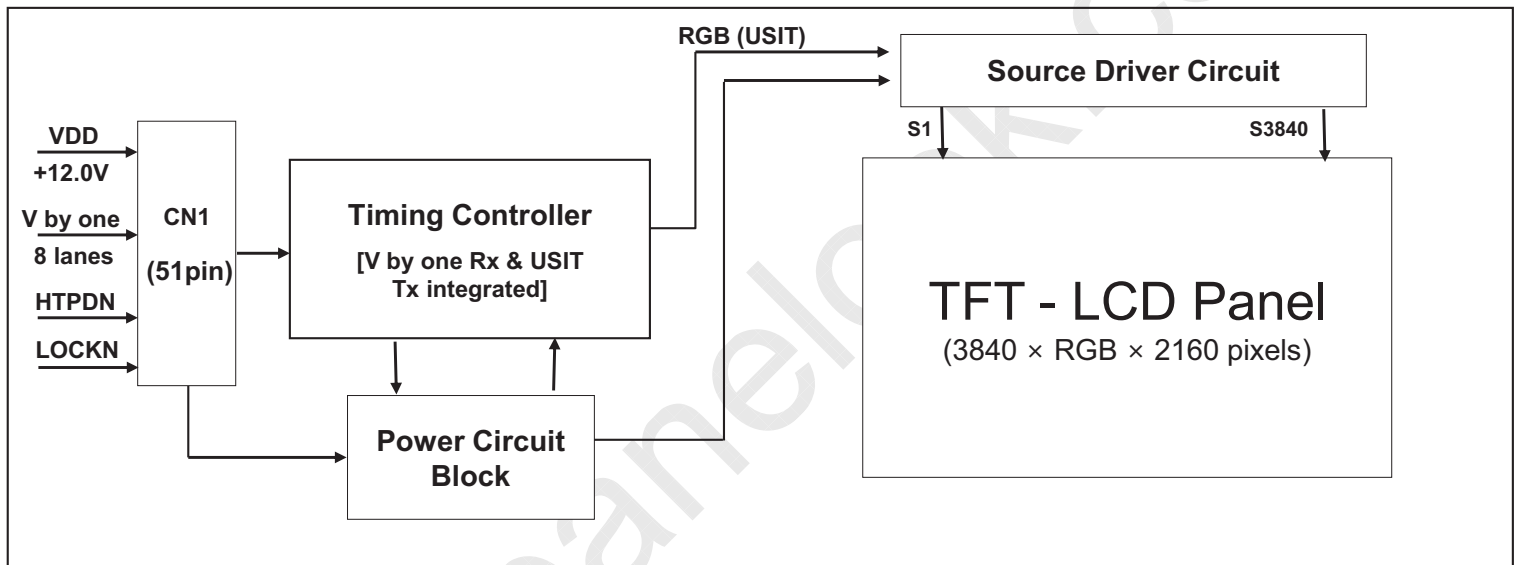
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1.0 GENERAL DESCRIPTION**1.1 Introduction**

HV430QUB-F1A is a color active matrix TFT LCD open cell using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module has a 43 inch diagonally measured active area with UHD resolutions (3840 horizontal by 2160 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe 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**

- 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
- ADS technology is applied for high display quality
- RoHS compliant

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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	Remark
Active area	941.184(H) × 529.416 (V)	mm	
Number of pixels	3840(RGB)*2160	pixels	
Pixel pitch	81.7(H) ×245.1(V)	μm	
Pixel arrangement	Pixels RGB Vertical stripe		
Display colors	1.07G (8bits + FRC)	colors	8bit driver IC
Display mode	Transmission mode, Normally Black		
Open Cell Transmittance	4.3%(TYP)	%	At center point with BOE BLU
Weight	TBD	gram	
Power Consumption	7	Watt	With TCON board
Surface Treatment	Haze 1%		

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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.

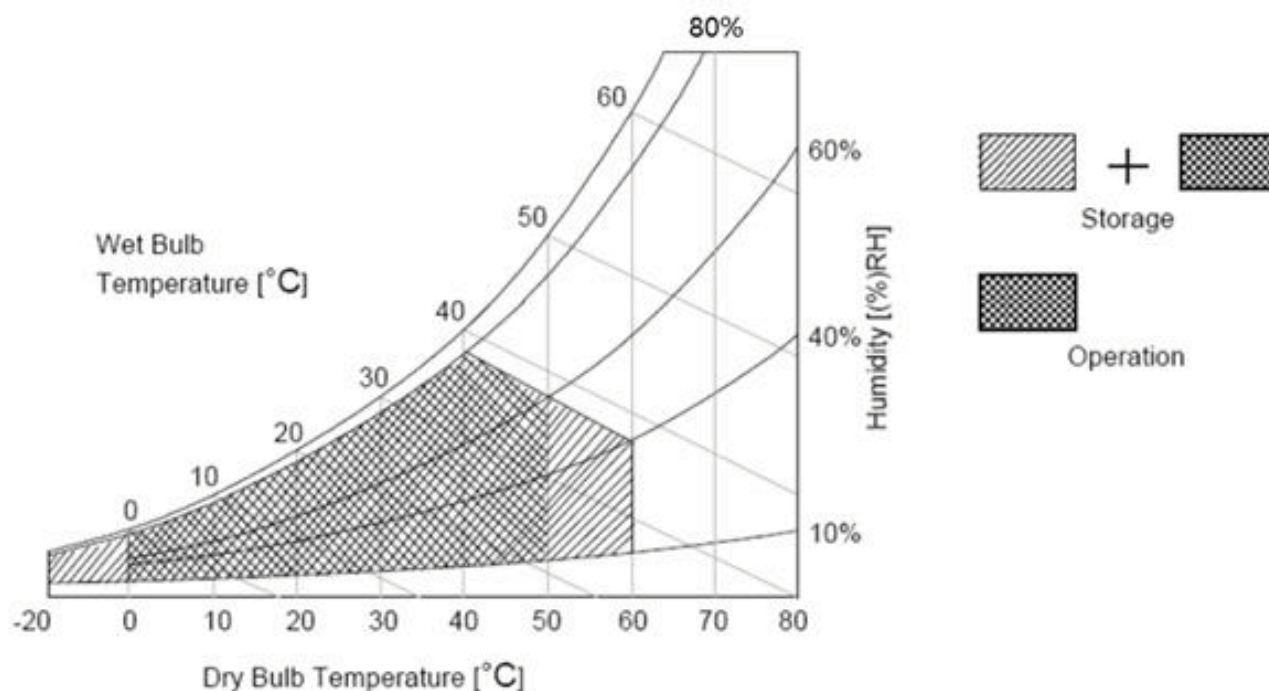
< Table 2. Open Cell Absolute Maximum Ratings >

[VSS=GND=0V]

Parameter	Symbol	Min.	Max.	Unit	Remark
Operating Temperature	T _{OP}	0	+50	°C	Note 1
Storage Temperature	T _{SUR}	-20	+60	°C	
	T _{ST}	-20	+60	°C	
Operating Ambient Humidity	H _{OP}	10	80	%RH	
Storage Humidity	H _{st}	10	80	%RH	

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

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



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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	-	0.58	1.67	A	Note 1
Power Consumption		PDD	-	7	20	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	2.7	-	3.3	V	
	Input Low Threshold Voltage	VIL	0	-	0.6	V	

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

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

Frame rate $f_v=60\text{Hz}$ and Clock frequency = 74.25MHz.

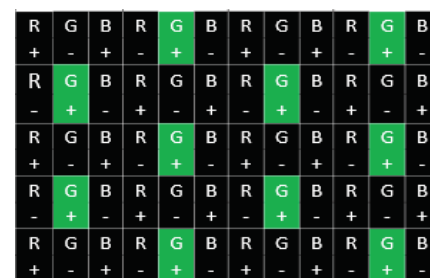
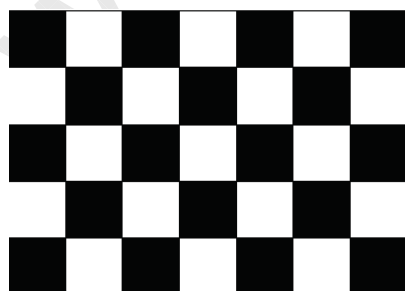
Test Pattern of power supply current

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

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

c) Flicker Test Pattern

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



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3.2 TCON Characteristics

< Table 4. TCON Characteristics >

Parameter	Symbol	Values			Unit	Remark
		Min	Typ	Max		
TCON Surface Temperature	T _{TS}	-	-	100	°C	Note

Note 1 : Any point on the TCON surface must be less than 100 °C 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}	-	-	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.

3.4 PMIC Characteristics

< 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.

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3.5 VCOM I2C Bus Format**Slave Address**

Bit7	Bit6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0 = LSB
0	1	0	0	0	0	0	R/ $\overline{W}$

Write Command**(a) Write single byte of data to Register**

Slave Address									Register Address								Data From Master											
Start	0	1	0	0	0	0	0	0	Slave ACK	0	0	0	R4	R3	R2	R1	R0	Slave ACK	D7	D6	D5	D4	D3	D2	D1	D0	Slave ACK	Stop

(b) Write multiple bytes of data to Registers

Slave Address								Register Address n_{th}								n_{th} Data From Master											
Start	0	1	0	0	0	0	0	Slave ACK	0	0	0	R4	R3	R2	R1	R0	Slave ACK	D7	D6	D5	D4	D3	D2	D1	D0	Slave ACK	
								$(n+1)_{th}$ Data From Master								Last Data From Master											
								D7	D6	D5	D4	D3	D2	D1	D0	Slave ACK	-----	D7	D6	D5	D4	D3	D2	D1	D0	Slave ACK	Stop

(c) Write All Registers into EEPROM

Slave Address									Register Address									Data From Master										
Start	0	1	0	0	0	0	0	0	Slave ACK	1	1	1	1	1	1	1	1	Slave ACK	0	0	0	0	0	0	0	0	Slave ACK	Stop

Slave Address									Register Address									Data From Master										
Start	0	1	0	0	0	0	0	0	Slave ACK	1	1	1	1	1	1	1	1	Slave ACK	1	0	0	0	0	0	0	0	Slave ACK	Stop

(d) Write VCOM data Registers into EEPROM

Slave Address									Register Address									Data From Master								
Start	0	1	0	0	0	0	0	Slave ACK	1	1	1	1	1	1	1	Slave ACK	0	0	0	0	0	0	0	Slave ACK	Stop	

Slave Address									Register Address									Data From Master										
Start	0	1	0	0	0	0	0	0	Slave ACK	1	1	1	1	1	1	1	1	Slave ACK	0	1	0	0	0	0	0	0	Slave ACK	Stop

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4.0 INTERFACE CONNECTION**4.1 Open Cell Input Signal & Power**

- V by one Connector

< 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(For Vcom Tuning)	44	Rx5p	V-by-One HS Data Lane 5
19	SCL	SCL(For Vcom Tuning)	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&NC:1 Section 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	HTPDN	Hot plug detect	51	GND	Ground
26	LOCKN	Lock detect			

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.

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)

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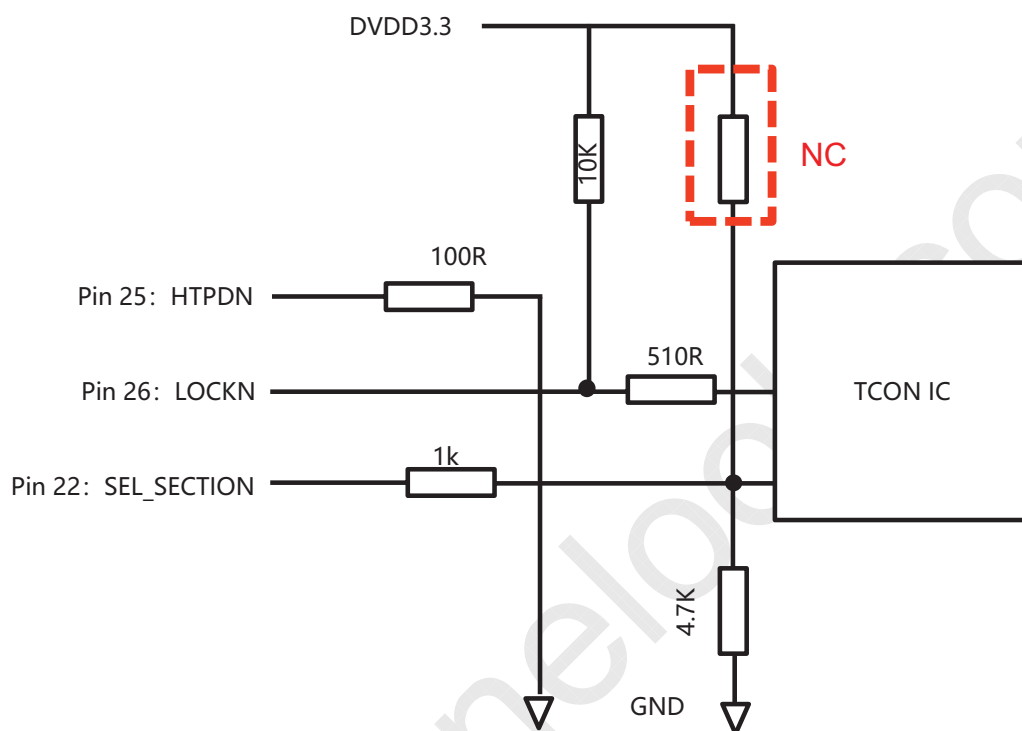
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Notes : 1. NC (Not Connected) : This pins are only used for BOE internal operations.

2.BIST : This pin is used for selecting display pattern mode when input DE or input CLOCK quits toggling.

3. Circuit Block Diagram of HTPDN/LOCKN/SEL_SECTION.



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4.0 INTERFACE CONNECTION**4.2 V by one Misc. Setting.-1 Section**

a) 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

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4.0 INTERFACE CONNECTION**4.3 V by one Misc. Setting.-2 Section**

- a) System side have to put pull high to 3.3V on pin22.
- 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

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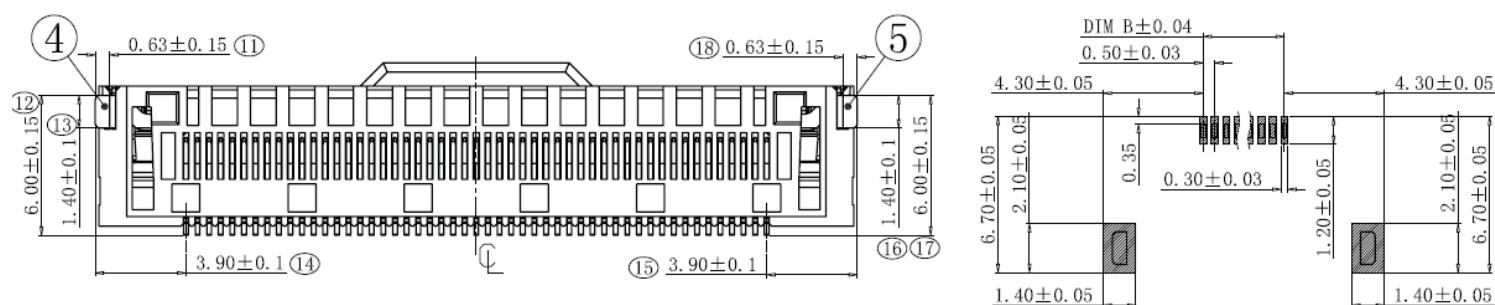
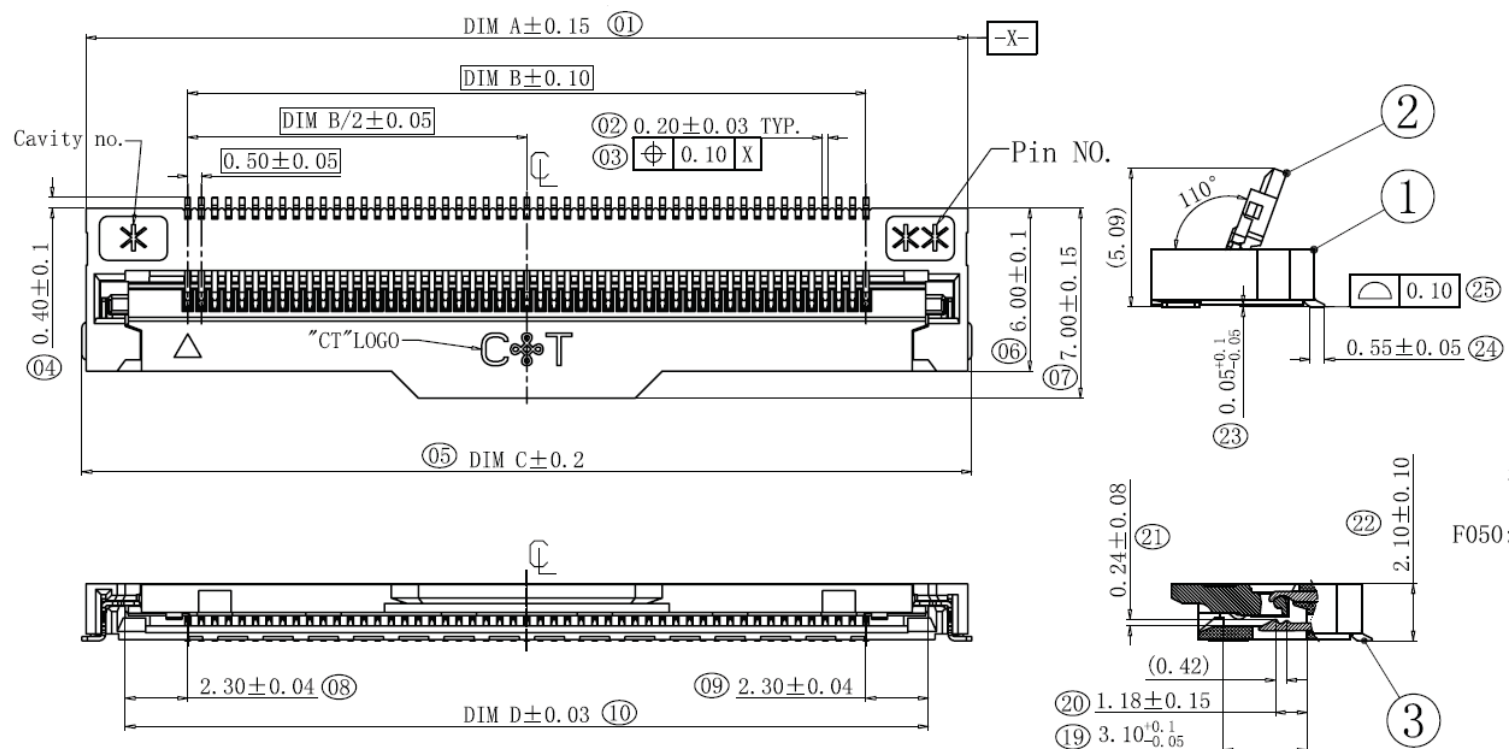
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-51pin Connector

VBO Connector F05035-51P-H (Changtong)

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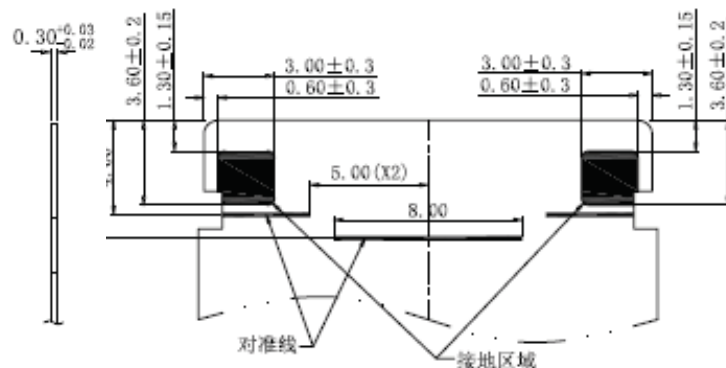
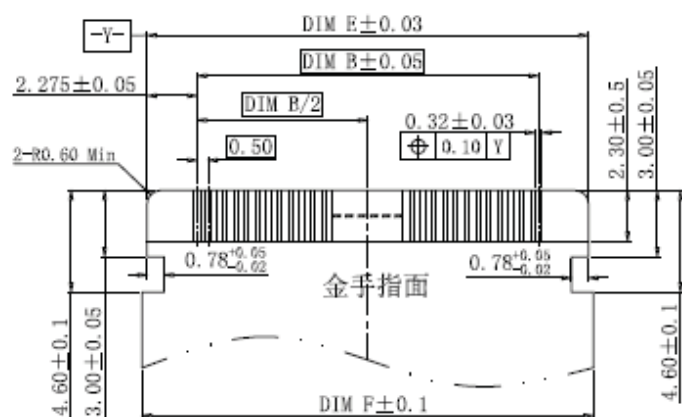
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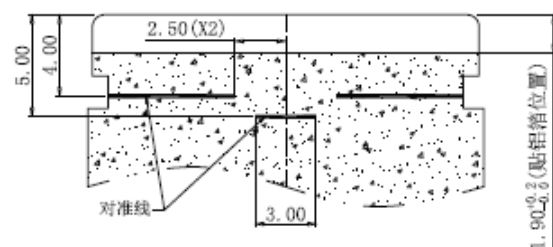
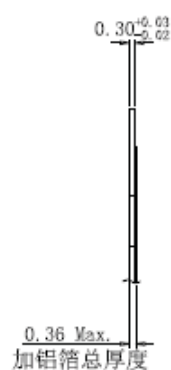
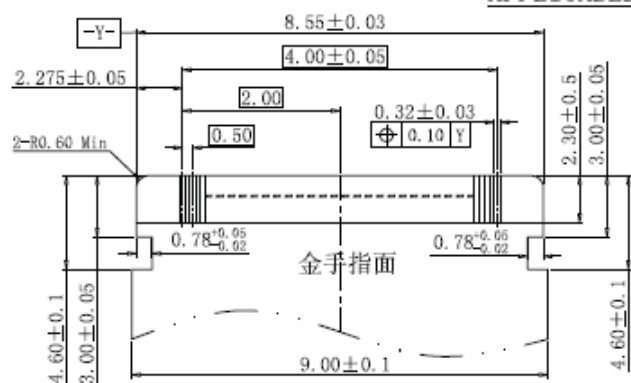
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-51pin Recommend FFC



APPLICABLE FPC RECOMMENDED DIMENSION

一体覆膜FFC线



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One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

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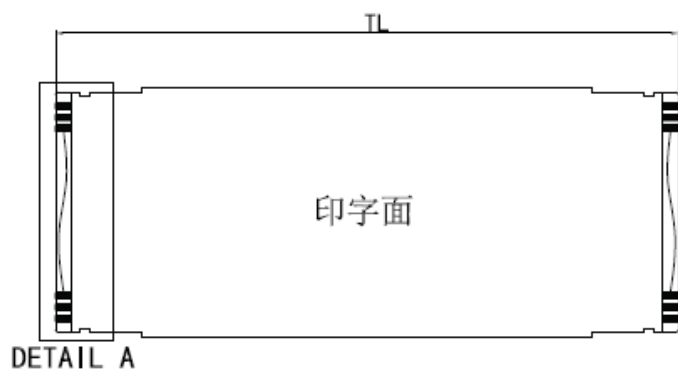
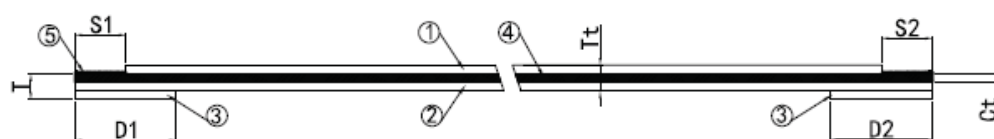
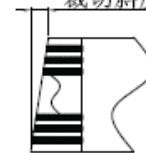
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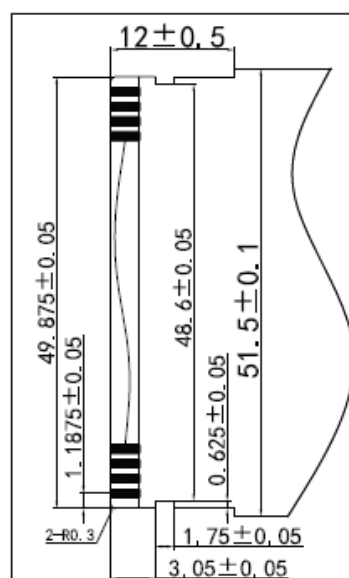
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裁切斜度A 0~0.3



DETAIL A



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5.0 SIGNAL TIMING WAVEFORMS OF INTERFACE SIGNAL**5.1 Input data specification CN1**

- 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

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6.0 SIGNAL TIMING SPECIFICATION**6.1 Timing Parameters**

< Table 10. Timing Table >

Item		Symbols	Min	Typ	Max	Unit
Frequency		1/Tc	66	74.25	75	MHz
Vertical	Frame Rate	F	57	60	61	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	55	61.87	62.5	MHz
Vertical	Frame Rate	F	47	50	52	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}

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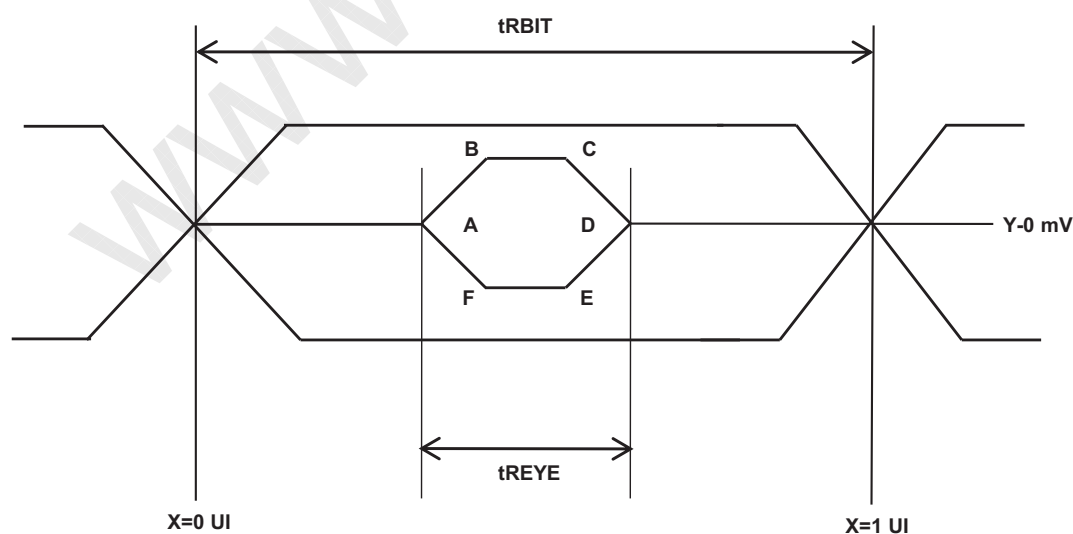
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< Table 11. Signal Timing Table >

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	-	-500	-	500	UI
SSCG	-	30KHz modulation	-0.5		0.5	%



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

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

< Table 12. 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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	0	0	0	1	0

	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	1	1	1	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	1	1	1	1

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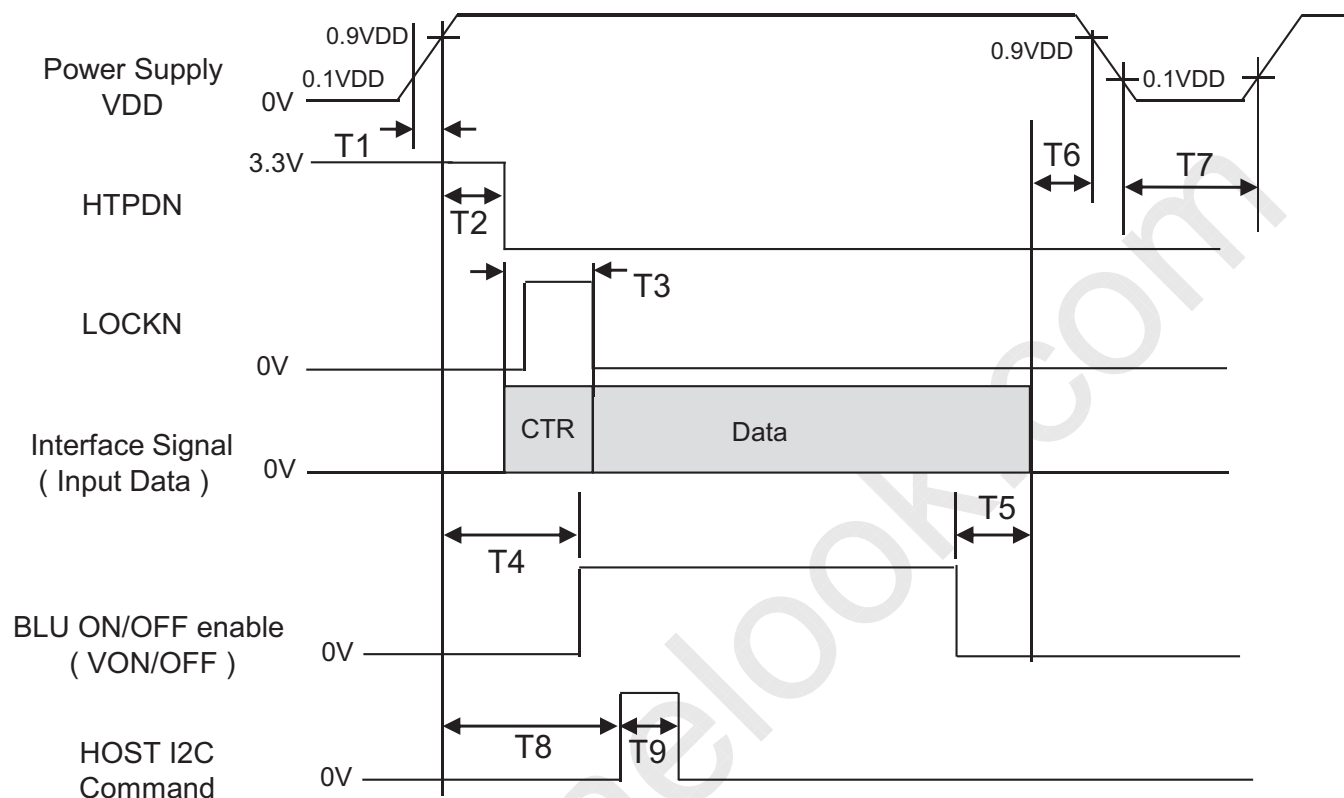
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6.3 Power Sequence



< Table 13. Sequence Table >

Parameter	Values			Units
	Min	Typ	Max	
T1	0.5	-	10	ms
T2	0	-	-	ms
T3	-	-	500	ms
T4	T2+T3	-	-	-
T5	100	-	-	ms
T6	0	-	-	ms
T7	1	-	-	s
T8	1	-	-	s
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.
 3. BLU enable must after input data.
 4. HOST I2C operate after BLU enable.

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7.0 OPTICAL SPECIFICATION

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

< Table 14. 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.	-
		Θ_9			89		Deg.	
	Vertical	Θ_{12}			89		Deg.	
		Θ_6			89		Deg.	
Contrast ratio		CR	$\Theta = 0^\circ$ (Center) Normal Viewing Angle	800:1	1000:1			-
Reproduction of color	White	W_x		TYP. - 0.03	0.269	TYP. + 0.03		Based on BOE Backlight
		W_y			0.279			
	Red	R_x			0.646			
		R_y			0.332			
	Green	G_x			0.298			
		G_y			0.609			
	Blue	B_x			0.151			
		B_y			0.055			
Response Time	G to G	T_g		-	8	10	ms	-
Gamma Scale				2.0	2.2	2.4		
Cell Transmittance				3.9	4.3		%	Note 5

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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 12.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 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 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
Start	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

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

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8.0 RELIABILITY TEST

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

< Table 13. Reliability Test Parameters >

No	Test Items	Conditions
1	High temperature storage test	Ta = 60 °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

This test condition is based on BOE module.

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9.0 HANDLING & CAUTIONS**(1) Cautions when taking out the Panel**

- Pick the pouch only, when taking out panel from a shipping package.

(2) Cautions for handling the panel

- As the electrostatic discharges may break the LCD panel, handle the LCD panel with care. Peel a protection sheet off from the LCD panel surface as slowly as possible.
- As the LCD panel and back - light element are made from fragile glass material, impulse and pressure to the LCD panel should be avoided.
- As the surface of the polarizer is very soft and easily scratched, use a soft dry cloth without chemicals for cleaning.
- Do not pull the interface connector in or out while the LCD panel is operating.
- Put the panel display side down on a flat horizontal plane.
- Handle connectors and cables with care.

(3) Cautions for the operation

- When the panel is operating, do not lose CLK, ENAB signals. If any one of these signals is lost, the LCD panel would be damaged.
- Obey the supply voltage sequence. If wrong sequence is applied, the panel would be damaged.

(4) Cautions for the atmosphere

- Dew drop atmosphere should be avoided.
- Do not store and/or operate the LCD panel in a high temperature and/or humidity atmosphere. Storage in an electro-conductive polymer packing pouch and under relatively low temperature atmosphere is recommended.

(5) Cautions for the panel characteristics

- Do not apply fixed pattern data signal to the LCD panel at product aging.
- Applying fixed pattern for a long time may cause image sticking.

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19.0 HANDLING & CAUTIONS**(6) Other cautions**

- In particular in winter, Before putting Panel boxes on the line, aging process is required to make the temperature of products similar to the temperature of workplace.
- Response time depends on the temperature.(In lower temperature, it becomes longer.)
- Do not disassemble and/or re-assemble LCD panel.
- Do not re-adjust variable resistor or switch etc.
- When returning the panel for repair or etc., Please pack the panel not to be broken. We recommend to use the original shipping packages.
- Product assembled into module should be stored in the bag(cover case).
- 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.
- Be careful not to give any extra mechanical stress to the panel when designing the set, and BLU.
- Do not pull, fold or bend the source COF and the gate COF in any processes
- If the liquid crystal material leaks from the panel, this should be kept away from the eyes or mouth. If this contacts to hands, legs, or clothes, you must washed it away with soap thoroughly and see a doctor for the medical examination.

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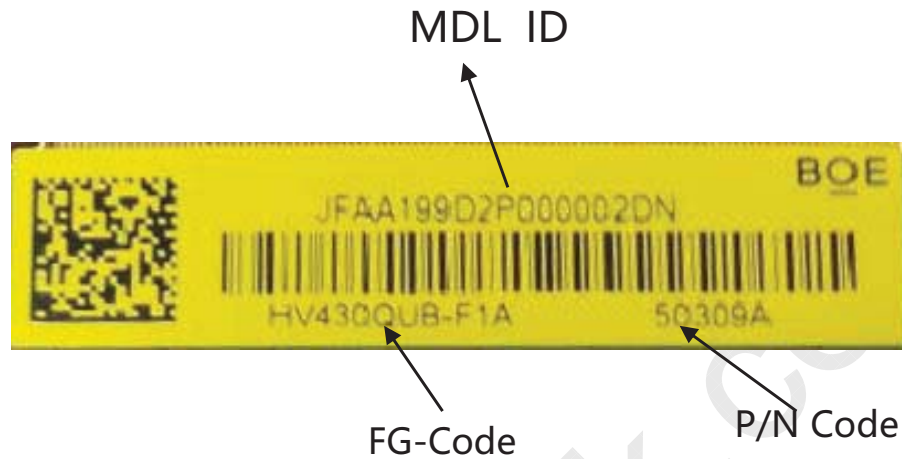
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10.0 PRODUCT SERIAL NUMBER

MDL ID Naming Rule:

Digit Code	1	2	3	4	5	6	7	8	9	10	11
Description	Model Code GBN		Grade	Line	Year		Month	Model Extension Code			
Digit Code	12	13	14	15	16	17	18				
Description	Serial No						扫码不显示，BOE厂内用				

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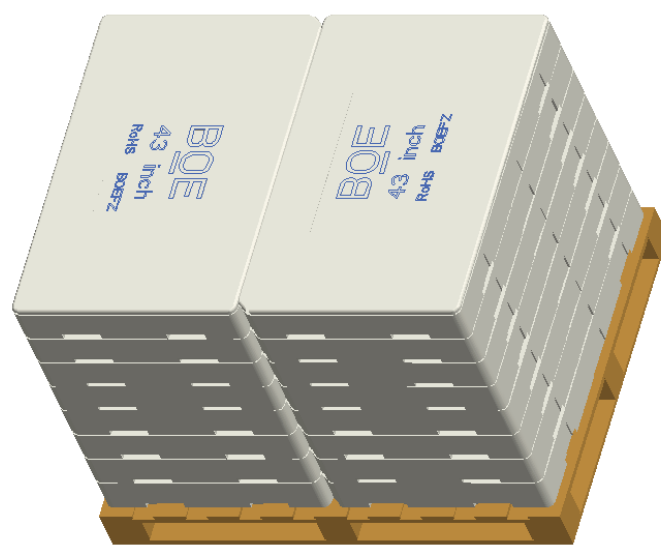
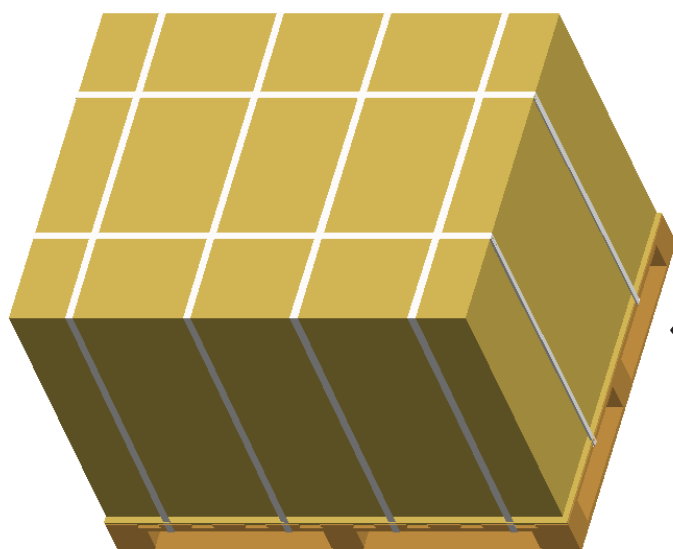
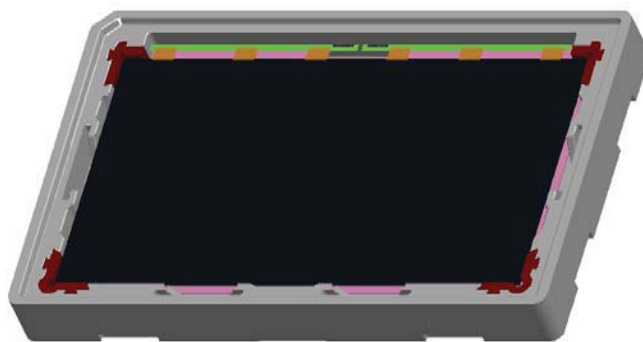
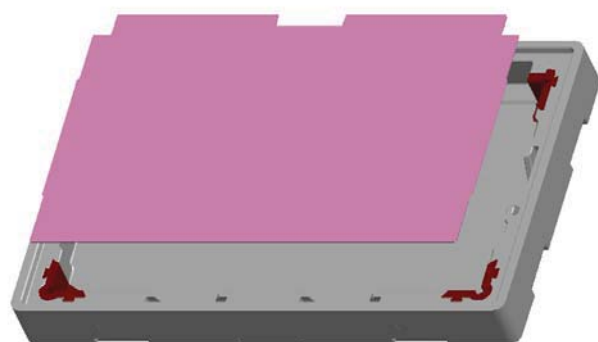
11.0 PACKING

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 Order

Put 1Pcs EPE Pad in the box, then put 1Pcs Panel into the box

Totally 17pcs panels and 18Pcs EPE Pad per box



Fix one paper pad on the pallet, Put totally 16 boxes and 2 cover. (16ea boxes per pallet)

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11.2 Packing Note

- Box Dimension : 1100mmL×705mmW×127mmH
- Package Quantity in one Box : 17pcs

13.3 Box Label

- Label Size : 70 mm (L) × 30 mm (W)
- Contents

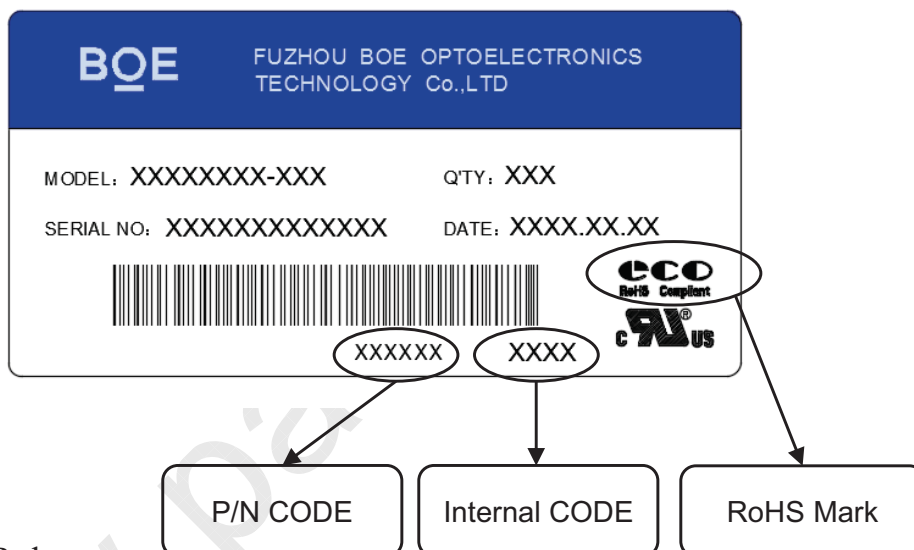
Model : HV430QUB-F1A

Q`ty : 17 Open Cell in one box.

Serial No. : Box Serial No. See next page for detail description.

Date : Packing Date

FG Code : FG Code of Product



Box ID Naming Rule:

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

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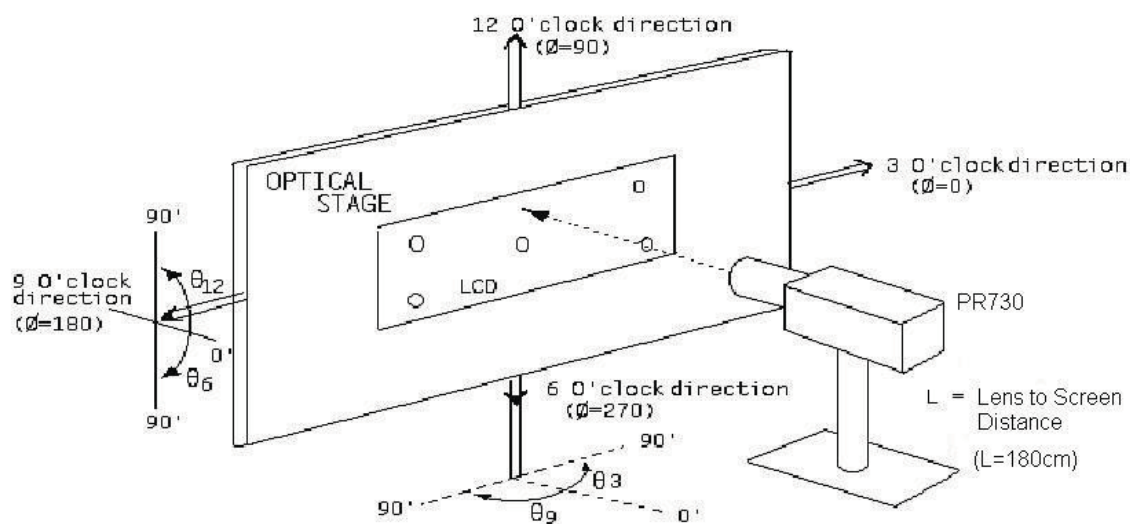
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12.0 APPENDIX

< Figure 1. Measurement Set Up >

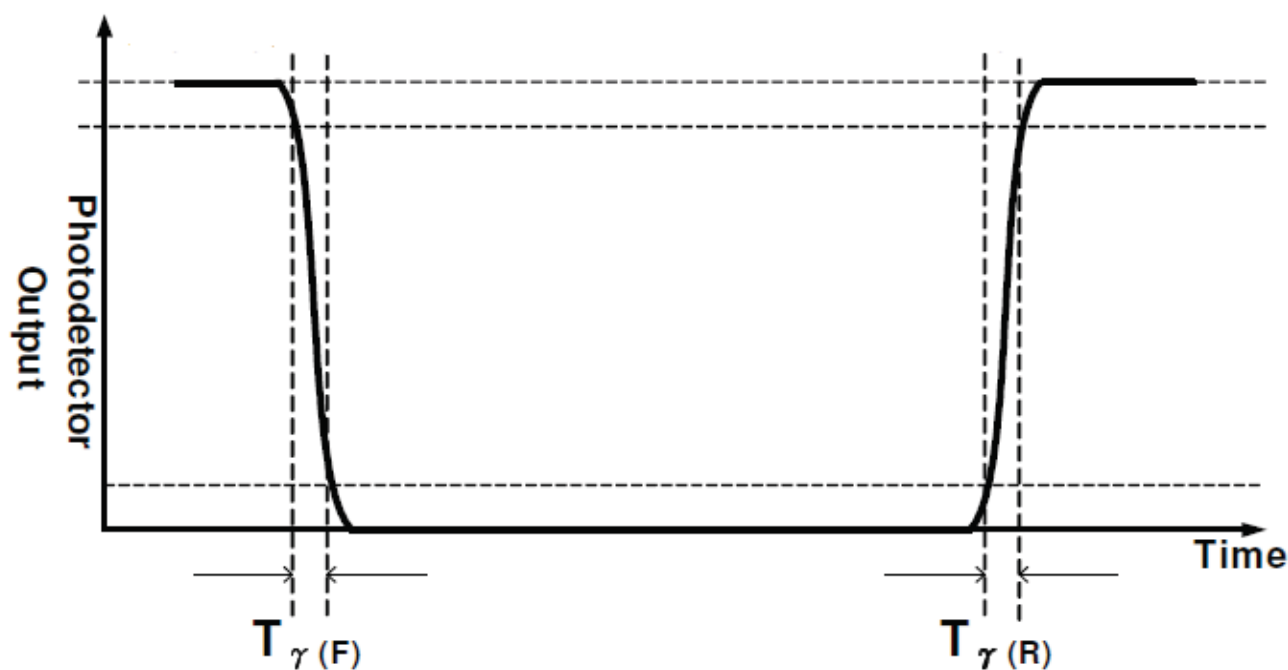


< Figure 2. Response Time Testing >

Any level of gray (Bright)

Any level of gray (Dark)

Any level of gray (Bright)



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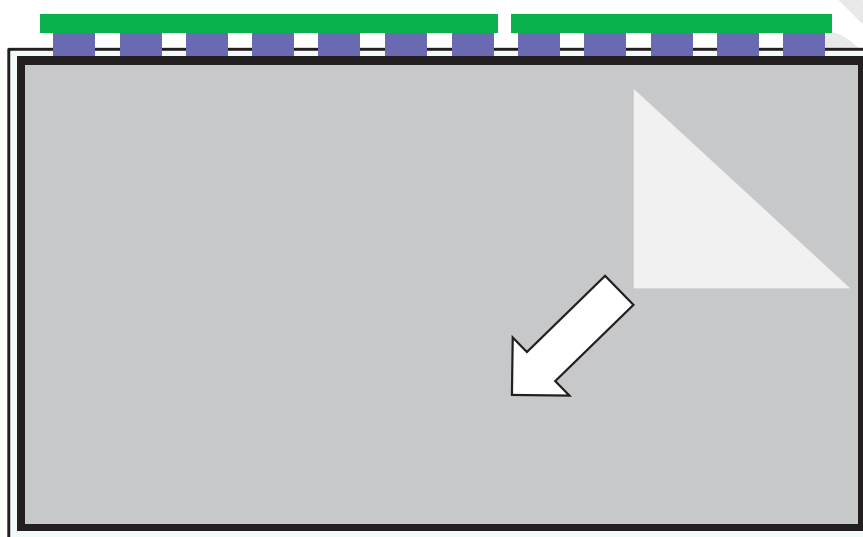
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13.0 APPENDIX

< Figure 4. TFT POL Protect Film Peeling Method >



1. Be sure to peel off slowly(recommended more than 7sec) and constant speed.
2. Peeling direction shows in Figure 4.
3. Be sure to ground person with adequate methods such as the anti-static wrist band.
4. Be sure to ground each S-PCB while peeling off the protection film.
5. Ionized air should be blown over during peeling action.
6. The protection film must not touch drivers and S-PCBs.
7. If adhesive may remain on the polarizer after the protection film peeling off, please remove with isopropyl-alcohol.

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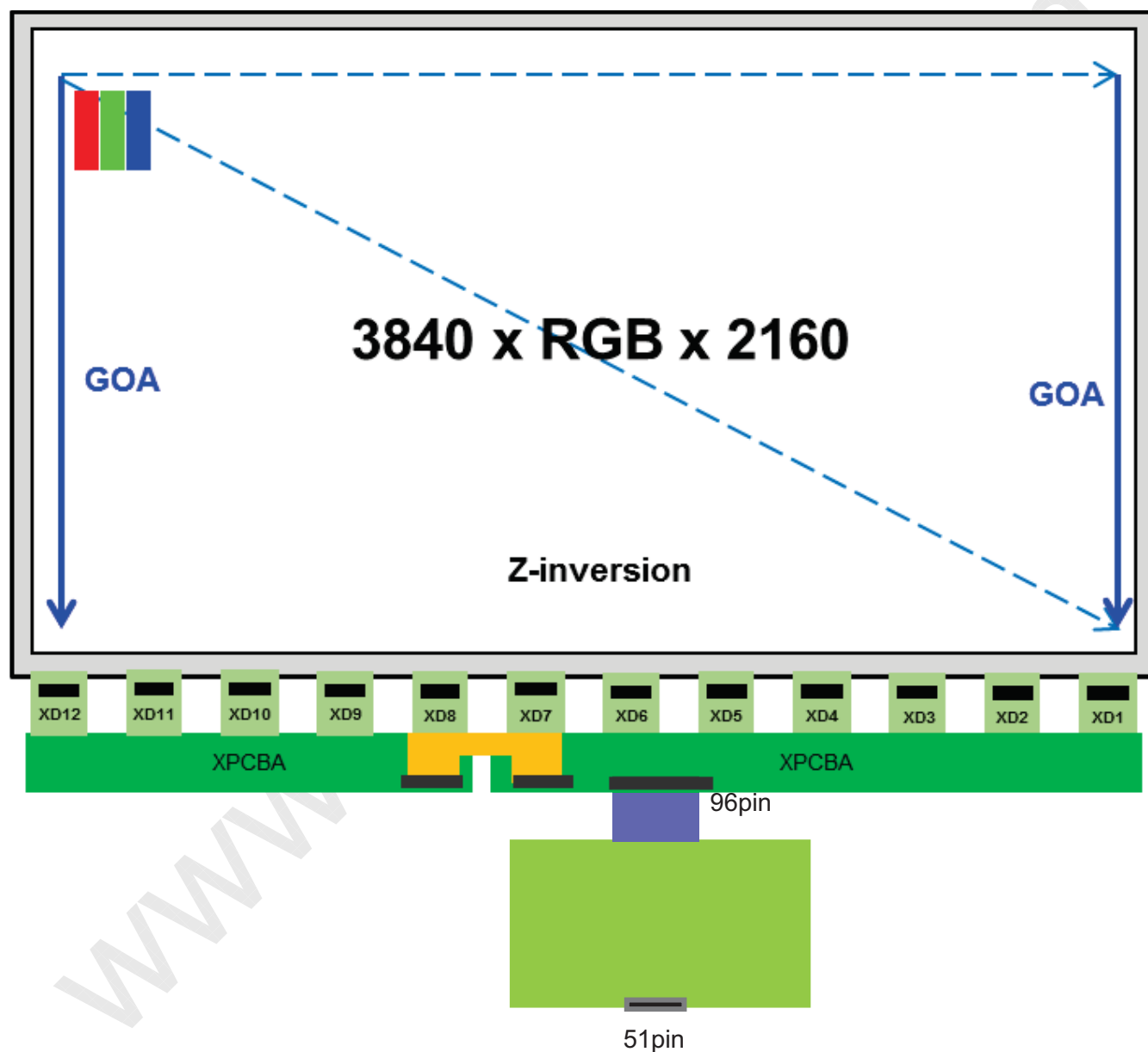
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13.0 APPENDIX 4

< Figure 5. Display Mode >



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