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Optical Bonding

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Cover glass

System solutions

OEM Solutions

Custom Display

Production Custom designs Installation

Mechanical design



Project No. 项目编号	ET055WU01-TT V1
Customer 客户名称	
Module No. 客户型号	
Product type 产品内容	Standard LCD Module TFT: 1080*RGBx1920Dots 5.46" TFT LCD With touch panle

客户确认Customer Approval

项目负责人Project Manager	
品质主管Director of Quality	
采购工程师Purchasing Engineer	

PREPARED BY	CHECKED BY	APPROVED BY



1. Introduction

1.1 Scope of application

This specification applies to the LCD module that is supplied by YOURITECH Technology CO., LTD.

LCD specification: Dots 1080xRGBx1920.

As to basic specification of the driver IC, refer to the IC (Himax:HX8399C) specification and data book.

All material & processing of the LCD module should be Lead Free.

1.2 TFT features:

Structure: TFT PANNEL+IC +FPC+BL+CTP;

IPS Type LCD

1080 dot-segment and 1920 dot-common outputs;

16.7M Color can be selected by software;

White LED back light;

4Lane MIPI interface



2. LCM General specification

ITEM	Standard value	Unit
LCD Type	Normally black	--
Drive element	TFT active matrix	--
Number of pixels	1080*3RGB(H)X1920(V)	Dots
Pixel arrangement	RGB stripe	--
Pixel Pitch (H*V)	21*3 (H) x63 (V)	um
Active area(H*V)	68.04(H) x 120.96(V)	mm
Viewing direction	ALL O'CLOCK	
TFT Driver IC	HX8399-C	
TFT interface	4Lane MIPI Interface	-
Approx. Weight	TBD	g
LCM Size(W*H*T)	70.04(W) x 128.29(H) x1.78(T)	mm
LCM+CTP Size(W*H*T)	108.50(W) x 140.50(H) x4.19(T)	mm
Touch structure	G+F+F	
Touch Driver IC	GT911	-
Touch Interface	I2C	





3.Absolute Maximum Rating

Characteristics	Symbol	Min.	Max.	Unit
LCM Operating Temperature	T _{OPR}	-20	+60	°C
LCM Storage Temperature	T _{STG}	-30	+70	°C
TP Operating Temperature & Humidity(20% ~ 90%RH)	T _{OPR}	-20	+60	°C
TP SStorage Temperature & Humidity(20% ~ 90%RH)	T _{STG}	-30	+70	°C
Humidity	RH	-	90	%

4.Electrical Characteristics

4.1 TFT DC Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage for I/O	VDDIO	1.65	1.8	3.3	V	
External Input Voltage for(DC/DC)	VSP	4.8	--	6.0	V	
External Input Voltage for(DC/DC)	VSN	-6.0	--	-4.8	V	

4.2 Back-Light Unit Characeristics

The back-light system is an edge-lighting type with 15 white LEDs. The characteristics of the back-light are shown in the following tables.

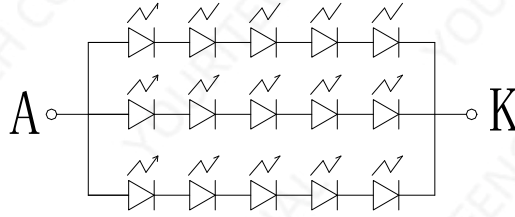
Characteristics	Symbol	Min.	Type	Max.	Unit	Notes
Forward Voltage	V _F	28	--	32	V	-
Forward current	I _F	--	60	-	mA	-
Luminance(With LCD+CTP)	L _v	--	1200	--	cd/m ²	-
LED life time	N/A	----	30,000	--	Hr	Note 1

Note:

- (1) The “LED life time” is defined as the module brightness decrease to 50% of original brightness at I_L=20mA/LED. The LED life time could be decreased if operating I_L is larger than 25mA/LED.

Backlight circuit diagram shown in below:





5. Module Function Description

Pin No	Symbol	Description
1	GND	Power Ground
2	GND	Power Ground
3	CTP_RST	Touch panel reset
4	RESET	Reset signal input terminal. Active at 'L'.
5	CTP_INT	Touch panel interrupt output
6	TE	Tearing effect signal is used to synchronize MCU to frame memory
7	CTP_SDA	Touch panel I2C data
8	LCD_ID	Not connected
9	CTP_SCL	Touch panel I2C clock
10	GND	Power Ground
11	CTP_VCC	Touch panel Power supply 2.8~3.3V
12	DON	High speed interface data differential signal input/output pins
13	GND	Power Ground
14	DOP	High speed interface data differential signal input/output pins
15	LEDA	Power supply for backlight anode input terminal.
16	GND	Power Ground
17	LEDA	Power supply for backlight anode input terminal.
18	D1N	High speed interface data differential signal input/output pins
19	GND	Power Ground
20	D1P	High speed interface data differential signal input/output pins
21	LEDK	Power supply for backlight cathode input terminal.
22	GND	Power Ground
23	LEDK	Power supply for backlight cathode input terminal.



24	CLKN	High speed interface clock differential signal input/output pins
25	LEDK	Power supply for backlight cathode input terminal.
26	CLKP	High speed interface clock differential signal input/output pins
27	GND	Power Ground
28	GND	Power Ground
29	PWM	This pin is connecting with the external LED driver.
30	D2N	High speed interface data differential signal input/output pins
31	IOVCC 1.8V	Power Supply For I/O.
32	D2P	High speed interface data differential signal input/output pins
33	GND	Power Ground
34	GND	Power Ground
35	VSP	External input voltage (4.8V~6V)
36	D3N	High speed interface data differential signal input/output pins
37	VSN	External input voltage (-4.8V~-6V)
38	D3P	High speed interface data differential signal input/output pins
39	GND	Power Ground
40	GND	Power Ground



6. Timing Characteristics

VSP/VSN/VDD1 input power (PCCS[2:0]=011)

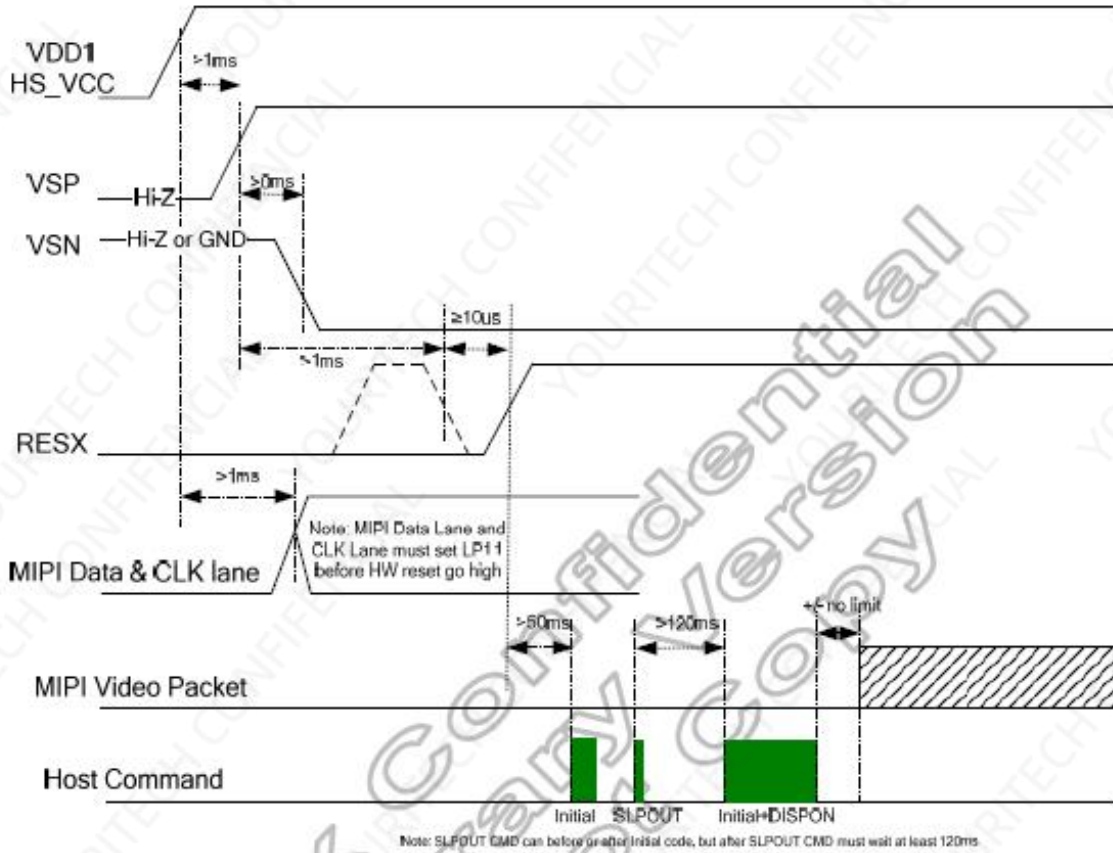


Figure 5.34: VSP/VSN/VDD1 input power on sequence (PCCS[2:0]=011)

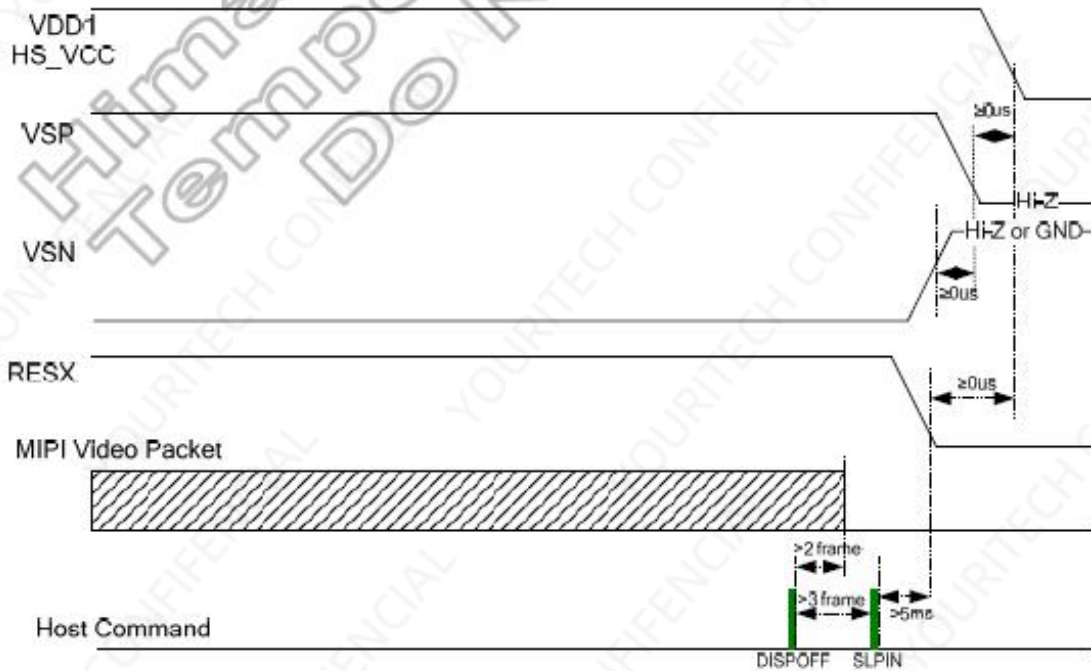


Figure 5.35: VSP/VSN/VDD1 input power off sequence (PCCS[2:0]=011)



Timings for DSI video mode

Vertical Timings

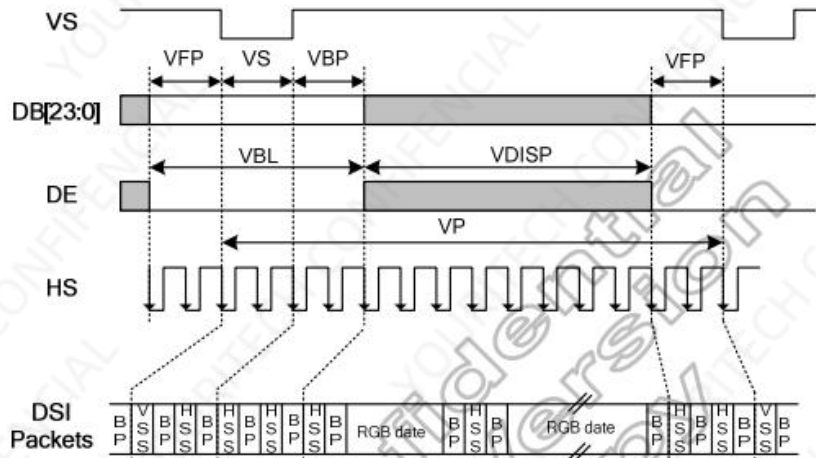


Figure 8.10: Vertical timings for DSI I/F

Vertical Resolution=528+8xNL (VSSA=0V, VDD1=1.8V, VDD3=2.8V, T_A=25°C)

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
Vertical cycle	VP	-	534+8xNL	-	-	Line
Vertical low pulse width	VS	-	2	-	Note ⁽¹⁾	Line
Vertical front porch	VFP	-	2	-	-	Line
Vertical back porch	VBP	-	2	-	Note ⁽¹⁾	Line
Vertical data start point	-	VS+VBP	4	-	Note ⁽¹⁾	Line
Vertical blanking period	VL	VS+VBP+VFP	6	-	-	Line
Vertical active area	-	VDISP	-	528+8xNL	-	Line
Vertical Refresh rate	VRR	-	-	60	-	Hz

Note: (1) The VS and VBP pulse width are related to GSP and GCK timing. The GSP and GCK must be set at corresponding position for LCD normal display.

Table 8.14: Vertical timings for DSI I/F

Horizontal Timings

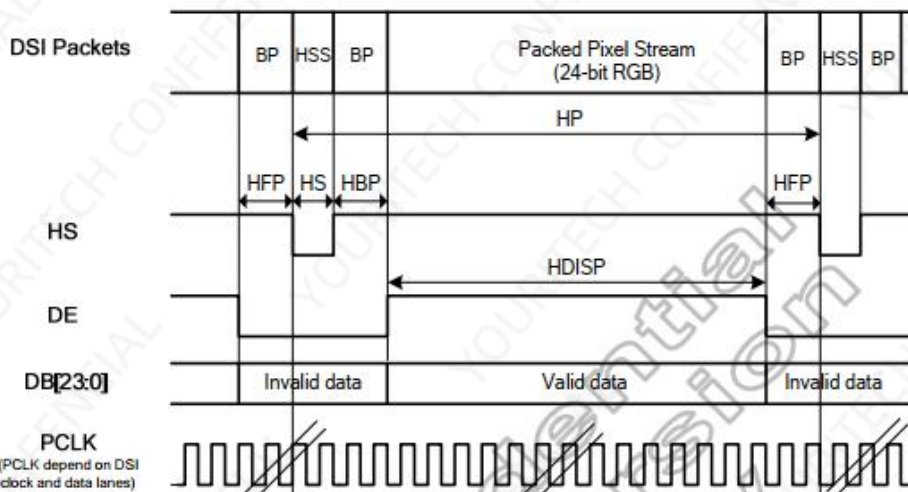


Figure 8.11: Horizontal timing for DSI video mode I/F



Horizontal Resolution=H_RES(1200/1080/1024/960/900/800/720) (VSSA=0V, VDD1=1.8V, VDD3 = HS_VCC =2.8V, T_A=25°C)

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
HS cycle	HP	-	H_RES+15	-	-	DCK
HS low pulse width	HS	-	5	-	-	DCK
Horizontal back porch	HBP	-	5	-	-	DCK
Horizontal front porch	HFP	-	5	-	-	DCK
Horizontal data start point	-	HS+HBP	10	-	-	DCK
Horizontal blanking period	HBLK	HS+HBP+HFP	15	-	-	DCK
Horizontal active area	HDISP	-	-	H_RES	-	DCK

Table 8.15: Horizontal timings for DSI video mode I/F

Reset input timing

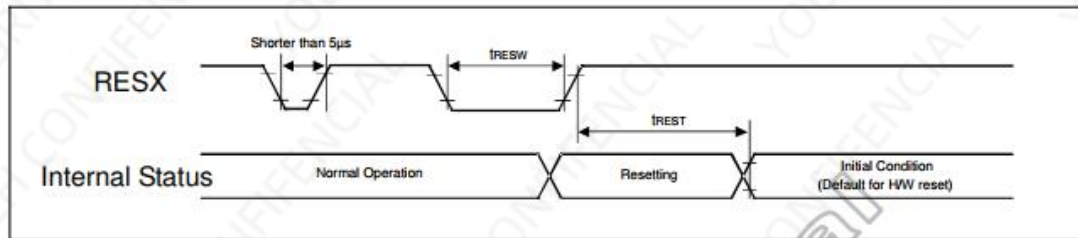


Figure 8.12: Reset input timing

Symbol	Parameter	Related pins	Spec.			Unit	Note
			Min.	Typ.	Max.		
t _{RESW}	Reset low pulse width ⁽¹⁾	RESX	10	-	-	µs	-
t _{REST}	Reset complete time ⁽²⁾	-	-	-	50	ms	-

Note: (1) Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below.

RESX Pulse	Action
Shorter than 5µs	Reset Rejected
Longer than 10µs	Reset
Between 5µs and 10µs	Reset Start

(2) During Reset Complete Time, OTP will be latched to internal register during this period. This loading is done every time when there is H/W reset complete time (t_{REST}) within 5ms after a rising edge of RESX.

(3) Spike Rejection also applies during a valid reset pulse as shown below:

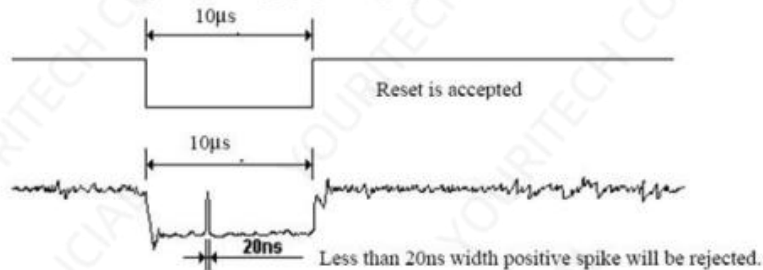


Table 8.16: Reset timing



7. Optical Characteristics

Item		Symbol	Conditions	Specifications			Unit	Note	
				Min.	Typ.	Max.			
Transmittance		T%	Viewing normal angle $\theta_x = \theta_y = 0^\circ$	3.11	3.63		%	All left side data are based on Innolux's following condition (1),(2),(3),(4),(5),(6) 1.LC : AAS 2.Light Source : INX BLU , Spectrum: YAG 3.Polarizer : w/o haze, w/o APCF Front:GRT1794XH1UHC3(90°) Rear:CVT1764KDUHC3(0°) 4.Measurement Machine : DMS 900 5.w/i Backside Film 6.VLC (just for reference) dark = +0.1V/-0.54V white = +4.75V/-4.75V 7.w/o WPA	
Contrast Ratio		CR		700	1000	--	--		
Response Time		T _{on} +T _{off}		--	35	45	ms		
Viewing Angle	Hor.	θ_{x+}	CR ≥ 10 at 25 °C		80	--	deg.		
		θ_{x-}			80	--			
	Ver.	θ_{y+}			80	--			
		θ_{y-}			80	--			
CF Only Color Chromaticity	Red	X _R	Viewing normal angle $\theta_x = \theta_y = 0^\circ$ at 25 °C			0.681	--		CF Only under C-light Chromaticity (w/i OC, w/o ITO)
		Y _R							
	Green	X _G							
		Y _G							
	Blue	X _B							
		Y _B							
	White	X _W		0.270	0.290	0.310			
		Y _W		0.283	0.303	0.323			
Color Gamut	CG			67	72	-	%		

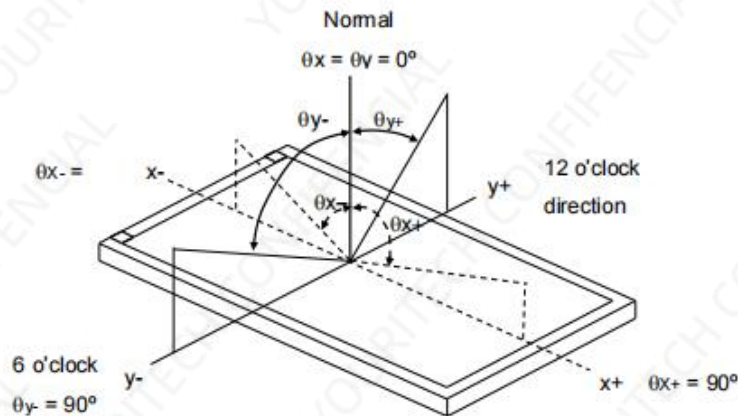
Note (0) Light source is the standard light source "C" which is defined by CIE and driving voltages are based on suitable gamma voltages. The calculating method is as following :

1. Measure Module's and BLU's spectrums. W, R, G, B are with signal input. BLU is supplied by INNOLUX.
2. Calculate cell's spectrum.
3. Calculate cell's chromaticity by using the spectrum of standard light source "C"

Note (1) Light source is the BLU which is supplied by INNOLUX and driving voltages are based on suitable gamma voltages. W, R, G, B are with signal input.



Note (2) Definition of Viewing Angle (θ_x , θ_y):



Note (3) Definition of Contrast Ratio (CR):

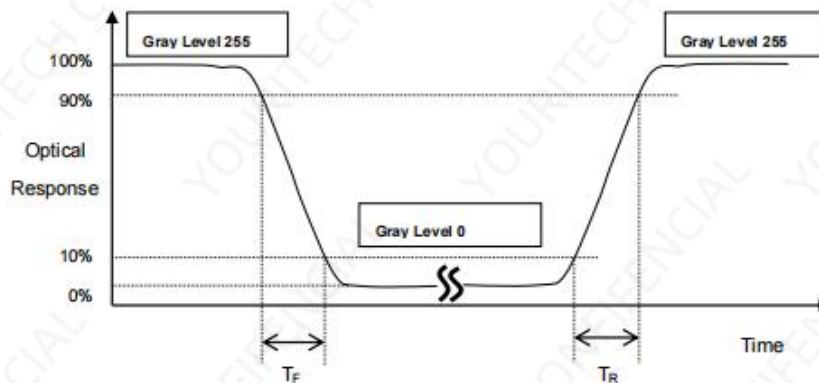
The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_w / L_d$$

L_w : Luminance of white pattern

L_d : Luminance of dark pattern

Note (4) Definition of Response Time (T_R , T_F):



Note (5) Measurement Setup:

The LCD module should be stabilized at ambient temperature $25 \pm 2^\circ\text{C}$ for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.

Note (6) Definition of Transmittance ($T\%$):

Module is without signal input.

BLU is supplied by INNOLUX.

$$\text{Transmittance} = \frac{\text{Luminance of LCD module}}{\text{Luminance of backlight}} * 100\%$$



8. Reliability Test Item

No.	Test Item	Test Condition	Notes
1	High Temp. Storage	+70°C / 96H	1. Functional test is OK. Missing Segment, short, unclear segment non-display, display abnormally and liquid crystal leakage un-allowed. 2. No low temperature bubbles, end seal loose and fall, frame rainbow.
2	Low Temp. Storage	-30°C / 96H	
3	High Temp. Operating	+60°C / 96H	
4	Low Temp. Operating	-20°C / 96H	
5	High Temperature / Humidity storage	50°C x 90%RH / 96H	
6	Thermal and cold shock	Static state, -20°C (30min) ~60°C (30min), 10 cycles	

9. Inspection standards

9.1 AQL (Acceptable Quality Level)

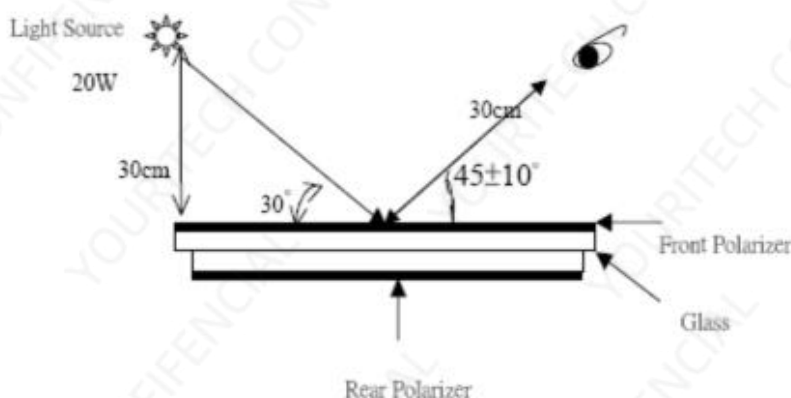
AQL of major and minor defect.

	MAJOR DEFECT	MINOR DEFECT
AQL	1.0	1.5

9.2 Basic conditions for inspection

The LCM face to us, in normal environment, the lux is 1000 ± 200 . (Darkroom's lux: 100 ± 50). About an angle of incidence 30°, a distance of 30 cm with an angle of 45 degree to check the products without uncovering the film!

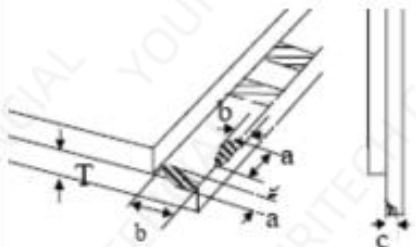
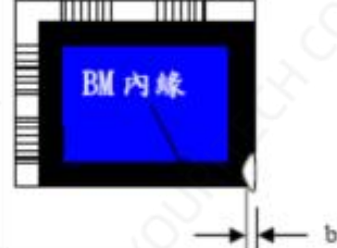
(As shown below)



9.3 Inspection item and criteria

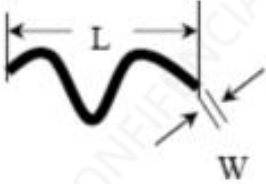
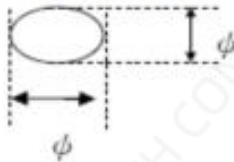
9.3.1 Visual inspection criterion in immobility

9.3.1.1 Glass defect

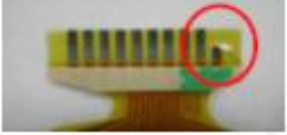
N O	Defect item	Criteria	Remark
1	Dimension Unconformity (Major defect)	By Engineering Drawing	
2	Cracks (Major defect)	1. Linear cracks panel 【Reject】 2. Nonlinear crack contrast by limited sample	
3	Glass extrude the conductive area (minor defect)	a: disregards and no influence assemblage. 1) $b \leq 1/3$ Pin width (non bonding area) 【Accept】 2) bonding area $\leq 0.5\text{mm}$ 【Accept】	A: Length, b: Width
4	Pin-side ,conductive area damaged (minor defect)	(a c: disregards) $b \leq 1/3$ of effective length for bonding electrode 【Accept】	a: length, b: Width, c: Thickness 
5	Pin-side, non-conductive area damaged (minor defect)	1) Damage area don't touch the ITO (Including contraposition mark, except scribing mark) 【Accept】 2) $C < T$ $b \leq BM1/3$ of width 【Accept】 3) $c = T$ b not touch the seal glue 【Accept】 4) a disregards	a: Length, b: Width c: Thickness 
6	Non-pin-side damage (minor defect)	$c < T$ 1) b exceeds $1/3 B_m$ 【Reject】 $c = T$ b not touch the seal glue 【Reject】	c: Thickness b: width of damage 



9.3.1.2 LCD appearance defect(View area)

NO	Defect item	Criteria		Remark
1	Fiber、glass cratch、polarizer scratch/folded (minor defect)	Specification	Allowable	note1:L: Length, W: Width note2: disregard if out of AA 
		$W \leq 0.03\text{mm}$	disregard	
		$0.03\text{mm} < W \leq 0.05\text{mm}$; $L \leq 4.0\text{mm}$	2	
		$0.05\text{mm} < W \leq 0.1\text{mm}$; $L \leq 4.0\text{mm}$	1	
		$W > 0.1\text{mm}; L > 4.0\text{mm}$	0	
2	Polarizer bubble、 concave and convex (minor defect)	$\Phi \leq 0.2\text{mm}$	disregard	note1: Φ $= (L+W) / 2$, L: Length, W :Width note2:disregard if out of AA
		$0.2\text{mm} < \Phi \leq 0.3\text{mm}$	2	
		$0.3\text{mm} < \Phi \leq 0.5\text{mm}$	1	
		$0.5\text{mm} < \Phi$	0	
3	Black dots、dirty dots、impurities、 eye winker (minor defect)	$\Phi \leq 0.15\text{mm}$	disregard	note2:disregard if out of AA 
		$0.15\text{mm} < \Phi \leq 0.25\text{mm}$	2	
		$0.25\text{mm} < \Phi \leq 0.3\text{mm}$	1	
		$0.3\text{mm} < \Phi$	0	
4	Polarizer prick (minor defect)	$\Phi \leq 0.1\text{mm}$	disregard	note1: Φ $= (L+W) / 2$, L=Length, W=Width note2:the distance between two dots>5mm
		$0.1\text{mm} < \Phi \leq 0.25\text{mm}$	3	
		$\Phi > 0.25\text{mm}$	0	

9.3.1.3 FPC

NO	Defect item	Criteria		Remark
1	Copper screen peel (minor defect)	Copper screen peel 【Reject】		
2	No release tape or peel	No release tape or peel 【Reject】		
3	Dirty dot and impurity of FPC for customer using side (minor defect)	Specification	Allowable	Note1: Cannot have stride ITO impurities
		$\Phi \leq 0.3\text{mm}$	2	
		$\Phi > 0.3$	0	



9.3.1.4 Black tape & Mara tape

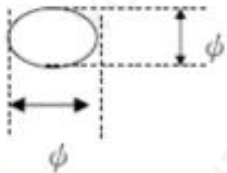
NO	Defect item	Criteria	Remark
1	FPC or H/S black tape (minor defect)	1. shift spec: 1) glue to the polarize 【Reject】 2) IC bare 【Reject】 2. left-and-right spec: 1) exceed of FPC edge or H-S edge 【Reject】 2) IC bare 【Reject】	
2	No black tape (major defect)	No black tape 【Reject】	
3	Tape position mistake (minor defect)	Not by engineering drawing	
4	Mara tape defect (minor defect)	Peel before pulling the protecting film 【Reject】	

9.3.1.5 Silicon and Taffy glue

NO	Defect item	Criteria	Remark
1	Quantity of silicon (major defect)	Uncover the ITO and circuit area 【Reject】	note: compared by engineering
2	Taffy glue (major defect)	1. Uncover the reveal copper area 【Reject】 2. Cover layer 0.3mm(Min)~3.0mm(Max) 【Reject】	note: if customer has special requirement, refer to the technical document
3	Depth of glue covering (major defect)	Depth of glue covering overtop front Polarizer 【Reject】	Except of the special requirement

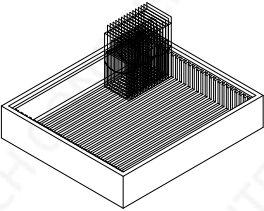
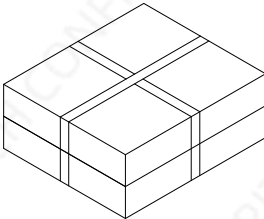
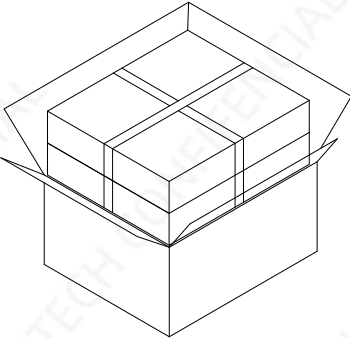
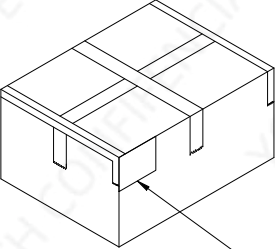


9.3.2Electrical criteria

NO	Defect item	Criteria	Remark	
1	No display (major defect)	No display 【Reject】		
2	Missing line (major defect)	Missing line 【Reject】		
3	Seg-com light and dark (major defect)	Seg-com light and dark 【Reject】	ND filter 2% test	
4	No display in immobility (major defect)	No display in immobility 【Reject】		
5	Flicker of Pattern (major defect)	Flicker of Pattern 【Reject】		
6	Mura (major defect)	ND filter 2%test		
7	Over current (major defect)	Over current 【Reject】		
8	Voltage out of specification (major defect)	Voltage out of specification 【Reject】		
9	Pattern blur, error code (major defect)	Pattern blur, error code 【Reject】		
10	Dark light, Flicker (major defect)	Dark light, Flicker 【Reject】		
11	Black/white dots、Dirty dots、eye winker (major defect)	Specification	Allowable	Note1:disregard if out of 
		$\phi \leq 0.15\text{mm}$	disregard	
		$0.15\text{mm} < \phi \leq 0.25\text{mm}$	2	
		$0.25\text{mm} < \phi \leq 0.3\text{mm}$	1	
		$0.3\text{mm} < \phi$	0	
12	Fiber、glass crutch、Polarizer scratch/folded (major defect)	$W \leq 0.03\text{mm}$	disregard	Note1:L: Length, W: Width Note2: disregard if out of AA
		$0.03\text{mm} < W \leq 0.05\text{mm}$	2	
		$L \leq 4.0\text{mm}$		
		$0.05\text{mm} < W \leq 0.1\text{mm}$	1	



10. Packing Method

 1, 气泡袋单片包装	 2, 5片为一扎
 3, 捆扎好的产品依序装入泡沫箱	 4, 泡沫箱加盖用透明胶带封箱
 5, 泡沫箱装入相应的纸箱并用透明胶带封箱	 外箱标签位置 6, 纸箱用透明胶带封箱并贴标签

11. Packing Method----TBD

- END -

