

深圳市高信技术有限公司

Shenzhen Gaoxin Technology Co., Ltd

SPECIFICATION

FOR

LCD MODULE

Customer : _____

CustomerP/N _____

Model No. : GX109-40MB-A1

Version : V00

Date : 2023-12-25

Final Approval by Customer

LCM Machinery OK ☐	Checked By	
LCM Display OK ☐	Checked By	
LCM NG ☐ LCM OK ☐	Approved By	

ShenZhen GX Confirmed :

DESIGN	CHECK	APPROVAL

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Record of Revision

Version	Revise Date	Page	Content
Pre-spec.A	2024/10/20		Initial Release

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1. GENERAL DESCRIPTION

1.1 DESCRIPTION

GX109-40MB-A1 is a color active matrix TFT LCD Q-panel using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This Q-panel has a10.88inch diagonally measured active area with Z9 resolutions (480 horizontal by 1920 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this Q-panel can display 16.7M colors.

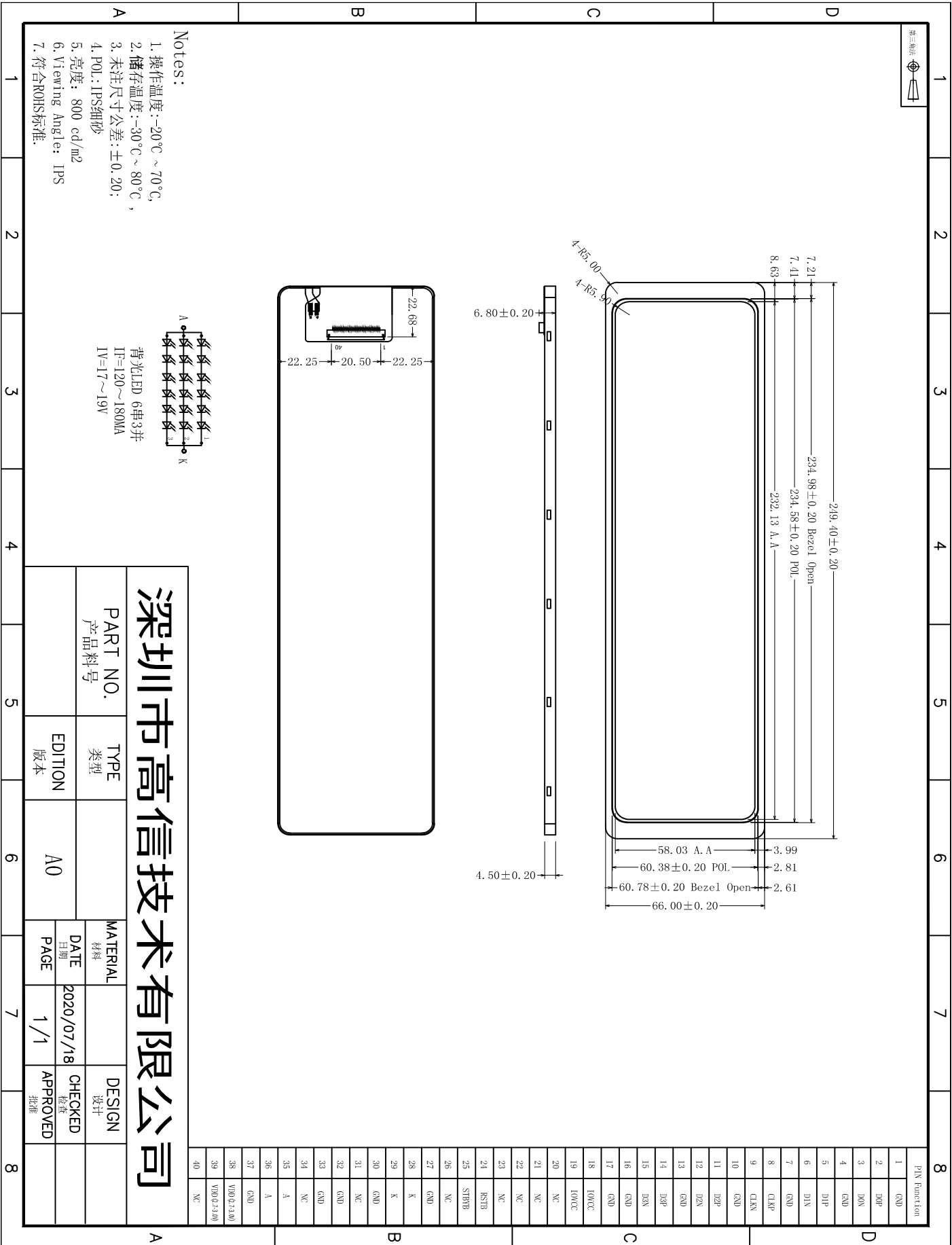
1.2 FEATURES:

No.	Item	Specification	Unit
1	Panel Size	10.88	inch
2	Number of Pixels	480(H) ×1920(V)	pixels
3	Active Area	58.032 (H) x232.128(V)	mm
4	Pixel Pitch	0.0403(H) × 0.1209 (V)	mm
5	Outline Dimension	66.00(H)×249.40(V)×4.50 (D)	mm
6	Number of Colors	16.7M	-
7	Display Mode	Transmission mode, normally black	-
8	Viewing Direction	Full viewing	-
9	Display Format	RGB vertical stripe	-
10	Surface Treatment	Glare	-
11	Interface	MIPI	-
12	Backlight	White LED	-
13	Operation Temperature	-20~70	℃
14	Storage Temperature	-30~80	℃
15	Weight	100	g

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2. MECHANICAL SPECIFICATION



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3. PIN DESCRIPTION

FPC Connector is used for the module electronics interface.

No.	Symbol	Function	Remark
1	GND	Ground	
2	D0P	Positive MIPI differential data input	
3	D0N	Negative MIPI differential data input	
4	GND	Ground	
5	D1P	Positive MIPI differential data input	
6	D1N	Negative MIPI differential data input	
7	GND	Ground	
8	CLKP	Positive MIPI differential clock input	
9	CLKN	Negative MIPI differential clock input	
10	GND	Ground	
11	D2P	Positive MIPI differential data input	
12	D2N	Negative MIPI differential data input	
13	GND	Ground	
14	D3P	Positive MIPI differential data input	
15	D3N	Negative MIPI differential data input	
16	GND	Ground	
17	GND		
18	IOVCC1.8V	A power supply for the analog power.	
19	IOVCC1.8V		
20	NC	No connection	
21	NC	No connection	
22	NC	No connection	
23	NC	No connection	
24	RSTB	Reset pin.	
25	STBYB	Standby mode control.	
26	NC	No connection	
27	GND	Ground	
28	K	LED Cathode	
29	K		
30	GND	Ground	
31	NC	No connection	
32	GND	Ground	
33	GND	Ground	
34	NC	No connection	
35	A	LED Anode	
36	A		
37	GND	Ground	
38	VDD(3.3V)	A power supply for the analog power.	
39	VDD(3.3 V)		
40	NC	No connection	

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4. ELECTRICAL CHARACTERISTICS

4.1 TFT LCD MODULE

Parameter	Symbol	Values			Unit	Notes
		Min	Typ	Max		
TFT Gate ON Voltage	VGH	10	12	14	V	
TFT Gate OFF Voltage	VGL	-10	-12	-14	V	
TFT Common Electrode Voltage	VCOM	-3.5	-	0	V	
Max Voltage of Source	VOP	-	TBD	-	V	
Analog power supply	VSP	4.5	-	6.0	V	
	VSN	-6.0	-	-4.5	V	
Analog Operation Voltage	VCI	1.8V	--	2.8V	V	
Logic Operation Voltage	IOVCC	-	1.8V	-	V	

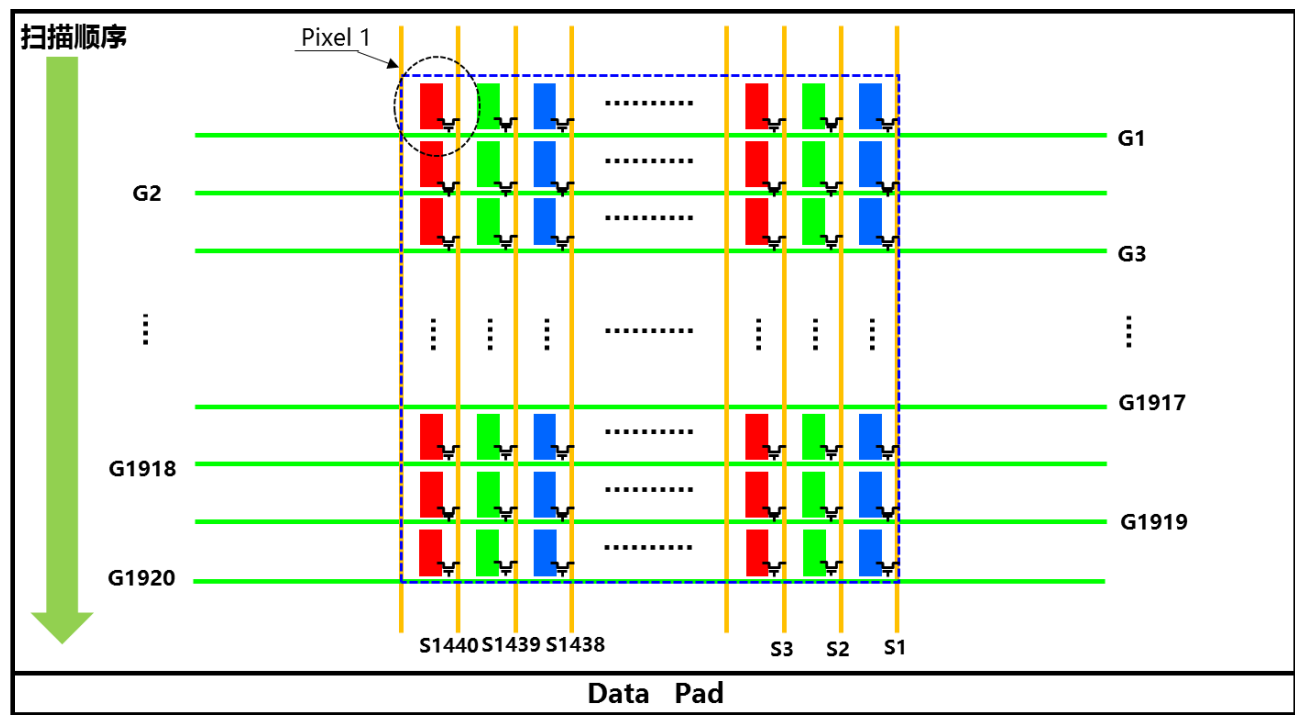
Notes :

1. VGH is TFT Gate operating voltage.
2. VGL is TFT Gate operating voltage. The low voltage level of VGL signal must be fluctuates with same phase as Vcom.
3. Vcom must be adjusted to optimize display quality, as Crosstalk and Contrast Ratio etc..

different D-IC

4.2 Data Input Format

Figure 5. Pixel Format



Display Position of Input Data (V-H)

Figure 6. Scan direction

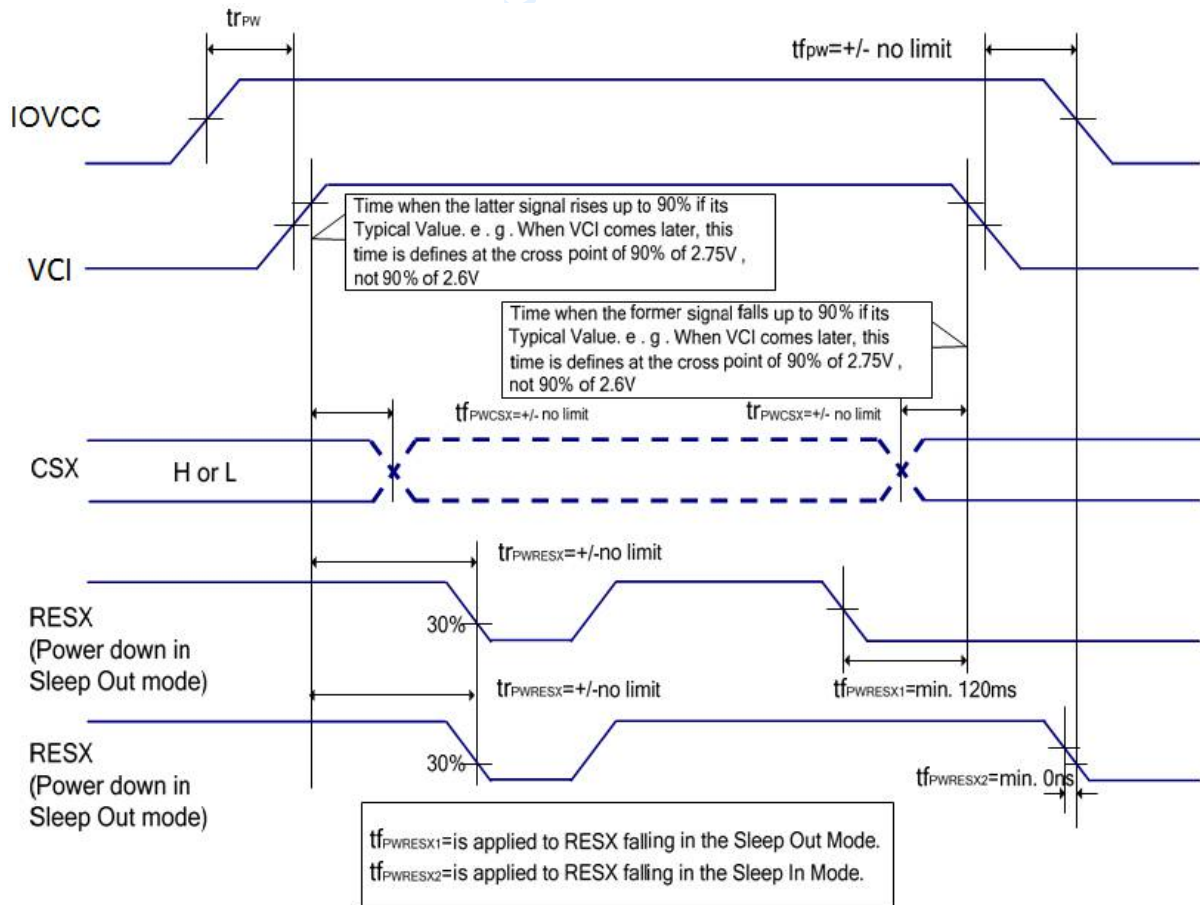


4.4 POWER ON/OFF SEQUENCE

POWER ON SEQUENCE

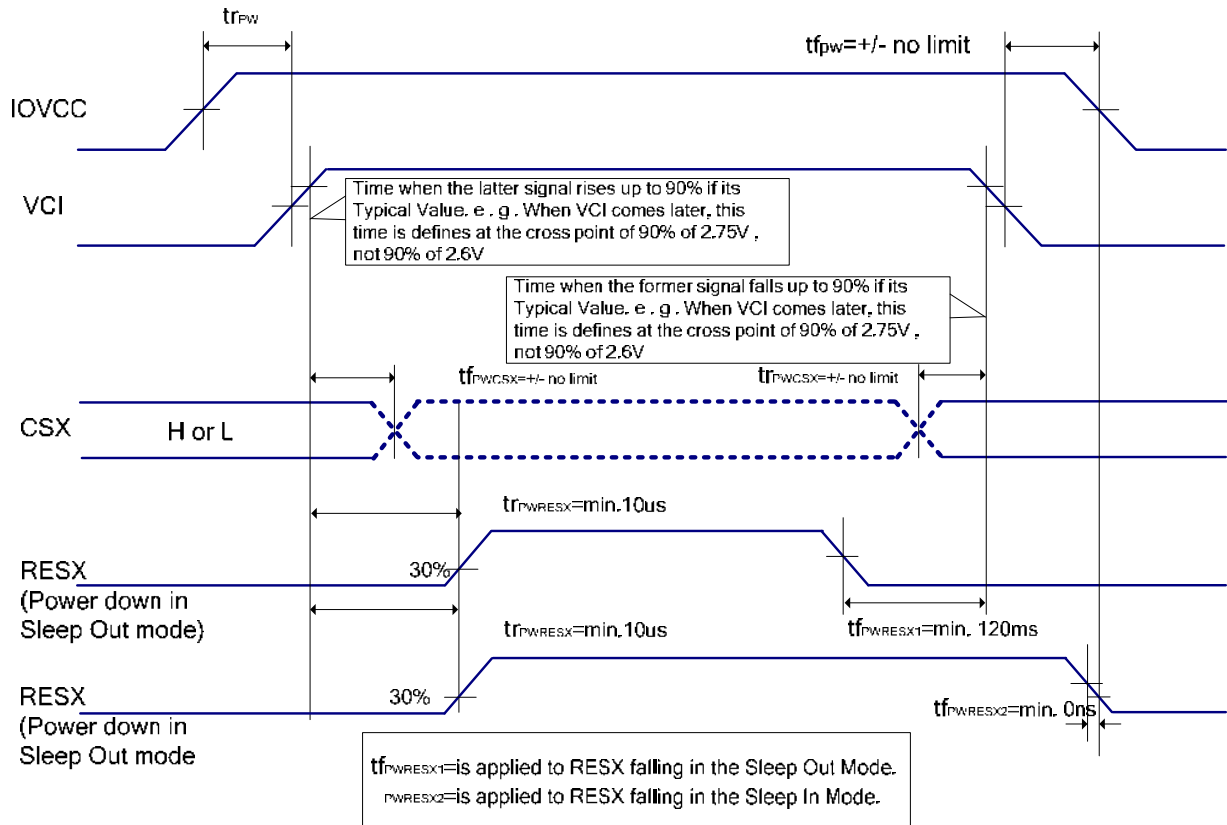
4.4.1. Case 1 – RESX line is held high or unstable by host at power on

If RESX line is held High or unstable by the host during Power On, then a Hardware Reset must be applied after both VCI and IOVCC have been applied – otherwise correct functionality is not guaranteed. There is no timing restriction upon this hardware reset.



4.4.2. Case 2 – RESX line is held low or unstable by host at power on

If RESX line is held Low (and stable) by the host during Power On, then the RESX must be held low for minimum 10sec after both VCI and IOVCC have been applied.



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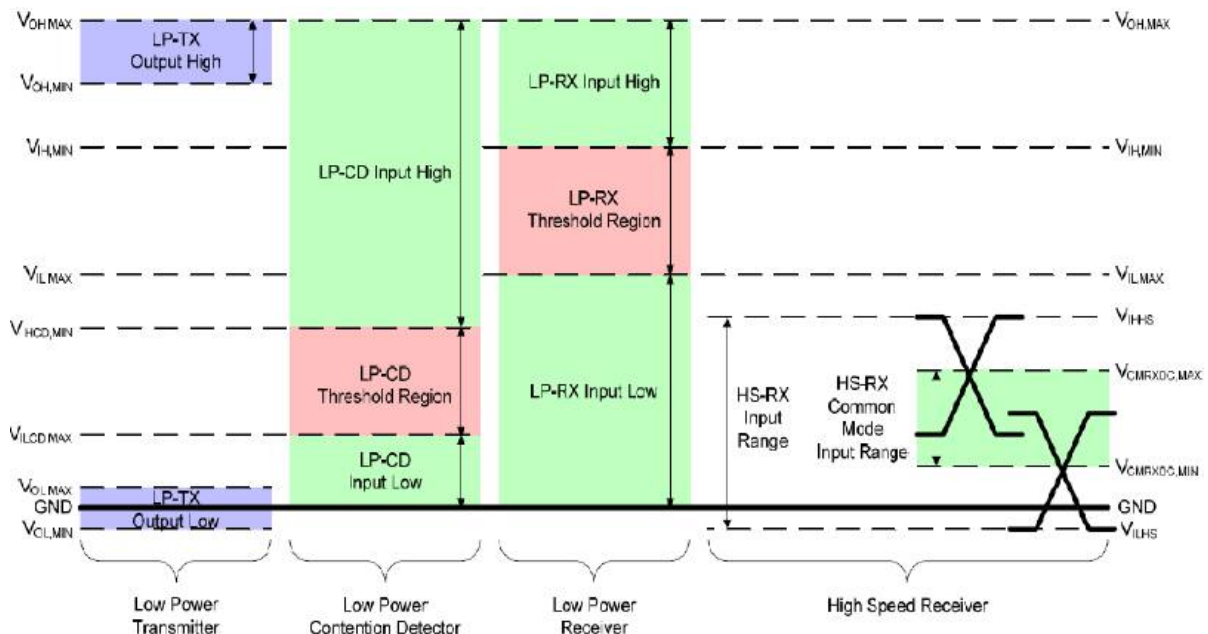
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5. INPUT SIGNAL TIMING

5.1 MODE DC ELECTRICAL CHARACTERISTICS

(VCI=2.5V~6.0V, IOVCC = 1.65V~3.6V, Ta = -30℃ ~ 70℃)

Parameter	Symbol	Conditions	Specification			Unit	Notes
			MIN	TYP	MAX		
Power & Operation Voltage							
Analog Operating voltage	VCI	Operating Voltage	2.5	--	2.8	V	
Logic Operating voltage	IOVCC	I/O supply voltage	1.65	1.8	2.8	V	
MIPI interface operating voltage	VDDAM	MIPI supply voltage	1.75	-	6.0	V	Note1
Input/Output							
Logic High level input voltage	VIH	-	0.7*IOVCC	-	IOVCC	V	
Logic Low level input voltage	VIL	-	VSS	-	0.3*IOVCC	V	
Logic High level output voltage	VOH	IOH = -0.1Ma	0.8*IOVCC	-	IOVCC	V	
Logic Low level output voltage	VOL	IOL = +0.1Ma	VSS	-	0.2*IOVCC	V	
Logic Input leakage current	IIL	Vin=IOVCC or VSSI	-0.1	-	+0.1	Ua	
VCOM Operation							
VCOM voltage	VCOM	-	-3.375	-1.0	0	V	
Source Driver							
Source output range	Vsout	-	VGMN+0.1	-	VGMP-0.1	V	
Gamma positive reference voltage	VGMP	-	2.62	-	5.68	V	
Gamma negative reference voltage	VGMN	-	-5.68	-	-2.62	V	
Source output settling time	Tr	Below with 99% precision	-	TBD	-	us	
Output deviation voltage (Source positive output channel)	V,dev	Sout >=+4.2V, Sout<=+0.8V	-	-	TBD	Mv	
		+4.2V>Sout>+0.8V	-	-	TBD	Mv	
Output deviation voltage (Source negative output channel)	V,dev	Sout <=-4.2V, Sout>=-0.8V	-	-	TBD	Mv	
		-4.2V<Sout<-0.8V	-	-	TBD	Mv	



5.2.1. MIPI video parameter

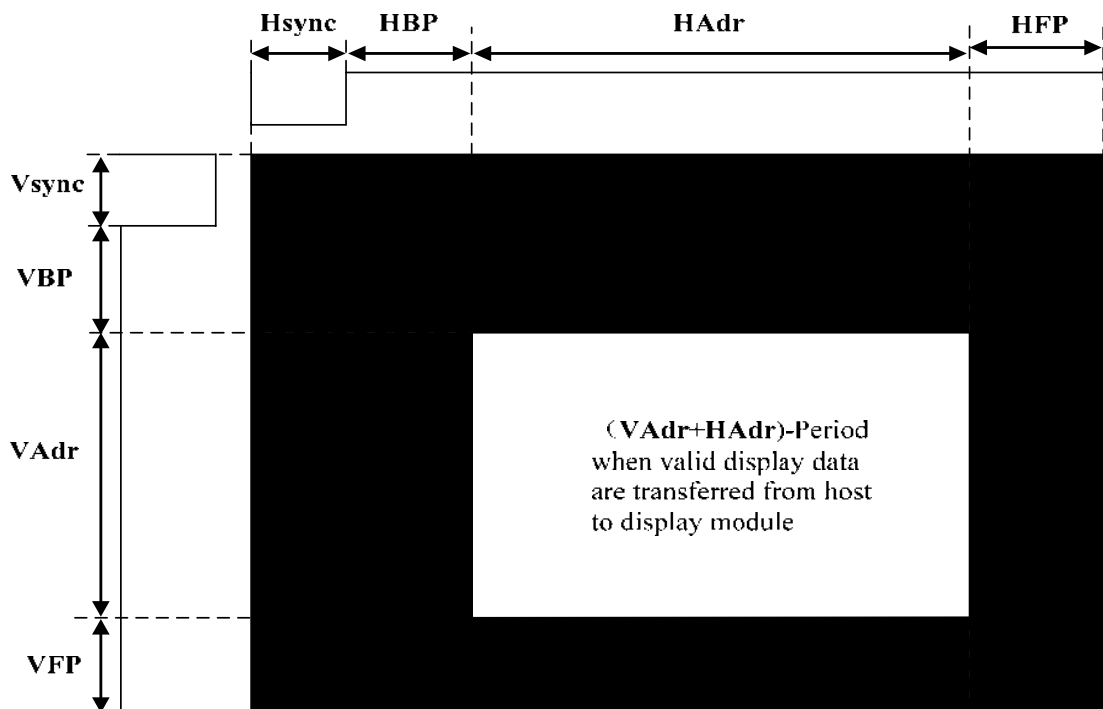
In the MIPI video mode, the frame is transmitted from the host processor to a display module as a sequence of pixels, with each horizontal line of the image data sent as a group of consecutive pixels.

Vsync (VS) indicates the beginning of each frame of the displayed image.

Hsync (HS) signals the beginning of each horizontal line of pixels.

Each pixel value (16-, 18-, or 24-bit data) is transferred from the host processor to the display module during one pixel period. The rising edge of PCLK is used by the display module to capture pixel data.

Since PCLK runs continuously, control signal DE is required to indicate when valid pixel data is being transmitted on the pixel data signals.



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5.3 PARALLEL RGB INPUT TIMING TABLE

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Horizontal Display Area	thd	600			DCLK
One Horizontal Line	th	-	824	-	DCLK
HS pulse width(HSYNC)	thpw	-	2	-	DCLK
Hs Back Porch(Blanking)	thbp	30			DCLK
Hs Front Porch	thfp	24			DCLK
Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Vertical Display Area	tvd	1920			TH
VS Period	tv	-		-	TH
VS Pulse Width(VSYNC)	tvpw	-	2	-	TH
VS Back Porch(Blanking)	tvbp	8			TH
VS Front Porch	tvfp	-	8	-	TH
Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
MIPI(4 Lane)@Frame rate=60Hz			382		Mbps
MIPI(3 Lane)@Frame rate=60Hz			515		Mbps
DCLK frequency@Frame rate=60Hz	F _{DCLK}		70		MHz

6.OPTICAL CHARACTERISTICS

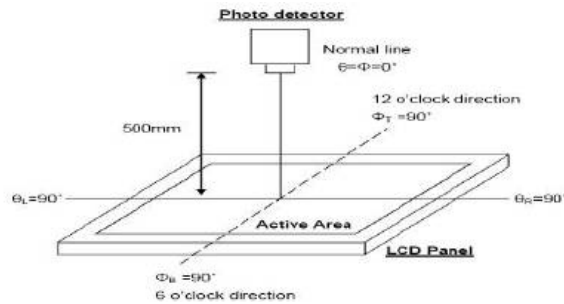
Ta=25±2℃

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	-	1000	1200		Note1 Note3
Luminance(center)		L	-	800	-	cd/m2	Note1 Note5 Note7
Luminous tolerance		LU	80	85		%	Note7
Response Time		Rising + Falling	-	30	35	ms	Note1 Note4
Viewing Angle K=Contrast Ratio>10	Horizontal	θx ⁺	80	85	-	degree	Note2
		θx ⁻	80	85	-		
	Vertical	θy ⁺	80	85	-		
		θy ⁻	80	85	-		
Color Chromaticity (CIE1931)	Red	x	Typ- 0.05	0.592	Typ+ 0.05		Note1 Note5 Note7
		y		0.321			
	Green	x		0.289			
		y		0.609			
	Blue	x		0.139			
		y		0.076			
	White	x		0.270			
		y		0.298			
Color gamut (NTSC ratio)			-	65		%	

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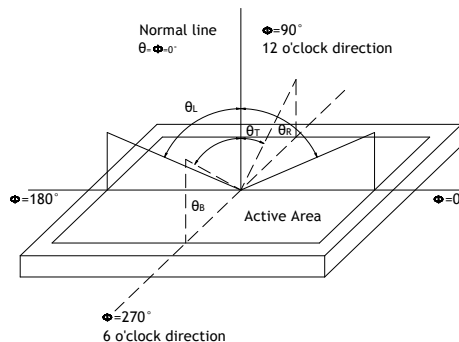
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Note1: Definition of optical measurement system (BM-7)



Note2: Definition of viewing angle range and measurement system

Viewing angle is measured at the center point of the LCD by CONOSCOPE (ergo-80).



Note3: Definition of Response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.

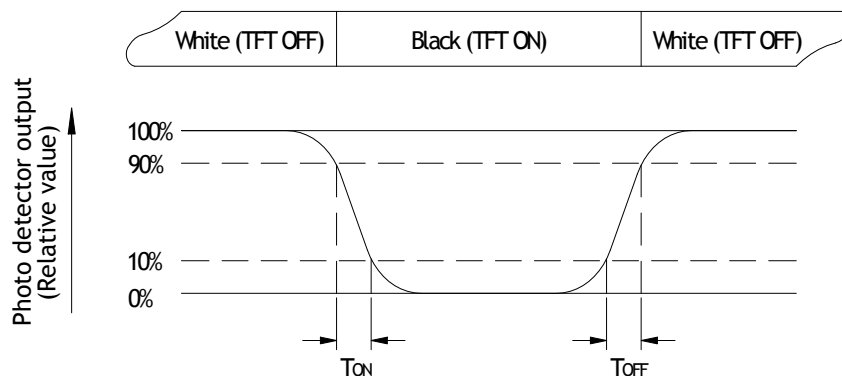


Fig. 6-3 Definition of response time

Note4: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the Whitestate}}{\text{Luminance measured when LCD on the Blackstate}}$$

“White state “: The state is that the LCD should drive by Vwhite.

“Black state”: The state is that the LCD should drive by Vblack.

Vwhite: To be determined Vblack: To be determined.

Note5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note6: All input terminals LCD panel must be ground while measuring the center area of the

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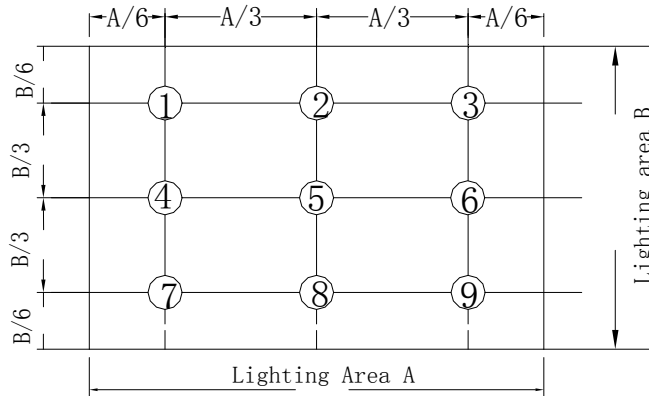
panel. The LED driving condition is $I_L=120\text{mA}$

Note7: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas. Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = $L_{\min} / L_{\max}$

L ----Active area length, W ---- Active area width



$B_{\max}$: The measured maximum luminance of all measurement position.

$B_{\min}$: The measured minimum luminance of all measurement position.

7. RELIABILITY TEST ITEMS

7.1 TEMPERATURE AND HUMIDITY

Test Item	Test Condition	Remark
High Temperature Storage	$T_a=80^{\circ}\text{C}$; 96hrs	IEC60068-2-1 : 2007 GB2423.2-2008
Low Temperature Storage	$T_a=-30^{\circ}\text{C}$; 96hrs	IEC60068-2-1 : 2007 GB2423.1-2008
High Temperature Operation	$T_a=70^{\circ}\text{C}$; 96Hrs	IEC60068-2-1 : 2007 GB2423.2-2008
Low Temperature Operation	$T_a=-20^{\circ}\text{C}$; 96hrs	IEC60068-2-1 : 2007 GB2423.1-2008
High Temperature High Humidity Operation	$T_a=60^{\circ}\text{C}$, 90%RH , 96Hrs(no condensation)	IEC60068-2-78 : 2001 GB/T2423.3-2006
Thermal Shock	-30°C (0.5h) ~ 80°C (0.5h) / 72 cycles	Start with cold temperature , End with high temperature , IEC60068-2-14:1984,GB2423.22-2002
Image Sticking	25°C ; 1hrs	Note1

Note1:Condition of image sticking test : $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$

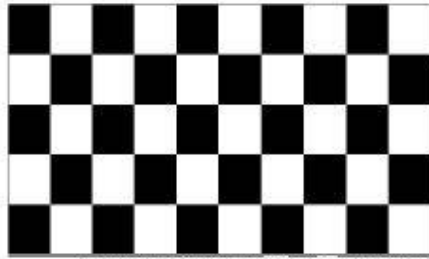
Operation with test pattern sustained for 1 hrs,then change to gray pattern immediately.after 5 mins,the mura must be disappeared completely

7.2 ESD

Test item	Conditions	Remark	
Electro Static Discharge Test (non-operation)	150pF , 330Ω , Contact:±2KV,Air:±8KV	1	Class C
	200pF , 0Ω , ±200V contact test	2	

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(a) Test Pattern (chess board Pattern)



(b) Gray Pattern

7.2 VIBRATION&SHOCK

Test item	Conditions	Remark
Packing Shock (non-operation)	980m/s ² , 6ms, $\pm x, y, z$ 3times for direction	IEC60068-2-27 : 1987 GB/T2423.5-1995
Packing Vibration (non-operation)	Frequency range: 10 Hz~50HZ Stroke: 1.0mm, sweep: 10 Hz ~50HZ x, y, z 2 hours for each direction	IEC60068-2-32 : 1990 GB/T2423.8-1995

7.3 ESD

Test item	Conditions	Remark	
Electro Static Discharge Test (non-operation)	150pF , 330 Ω , Contact: ± 2 KV, Air: ± 8 KV	1	Class C
	200pF , 0 Ω , ± 200 V contact test	2	

Note: Measure point :

1. LCD glass and metal bezel
2. IF connector pins
3. ESD class B: some performance degradation allowed. Self-recoverable.
No data lost, no hardware failures.

8. GENERAL PRECAUTION

8.1 SAFETY

1. Do not swallow any liquid crystal, even if there is no proof that liquid crystal is poisonous.
2. If the LCD panel breaks, be careful not to get liquid crystal to touch your skin.
3. If skin is exposed to liquid crystal, wash the area thoroughly with alcohol or soap.

8.2 STORAGE CONDITIONS

1. Store the panel or module in a dark place where the temperature is $23 \pm 5^{\circ}\text{C}$ and The humidity is below $50 \pm 20\%\text{RH}$.
2. Store in anti-static electricity container.
3. Store in clean environment, free from dust, active gas, and solvent.
4. Do not place the module near organics solvents or corrosive gases.
5. Do not crush, shake, or jolt the module.

8.3 HANDLING PRECAUTIONS

1. Avoid static electricity which can damage the CMOS LSI.
2. The polarizing plate of the display is very fragile. So, please handle it very carefully.
3. Do not give external shock.
4. Do not apply excessive force on the surface.
5. Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the Surface of plate.
6. Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with a

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cleaning naphtha solvent.

7. Do not operate it above the absolute maximum rating.
8. Do not remove the panel or frame from the module.
9. When the module is assembled, it should be attached to the system firmly, Be careful not to twist and bend the module.
10. Wipe off water droplets or oil immediately. If you leave the droplets for a long time, staining and discoloration may occur.
11. If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth in case of contact with hands, legs or clothes, it must be washed away thoroughly with soap.

8.4 WARRANTY

1. The period is within twelve months since the date of shipping out under normal using and storage conditions.
2. Do not repaired or modified the LCM. It may cause function to lose efficacy, Starry does not warrant the LCM.
3. All process and material comply ROHS.

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1. Incoming inspection right

- (1) The Incoming Inspection Standard will be agreed and signed by both sides(Customer and starry)

2. Inspection condition is as follows

- (1) Viewing distance is approximately 35~40 cm
- (2) Viewing angle is normal to the LCD panel as Fig-1(30°)
- (3) Ambient temperature is approximately $25\pm 5^{\circ}\text{C}$
- (4) Ambient humidity is $60\pm 5\%\text{RH}$
- (5) Ambient illuminance is from 300~500 Lux
- (6) Input signal timing should be typical value
- (7) Mura & Light leakage inspection with ND-Filter 5%

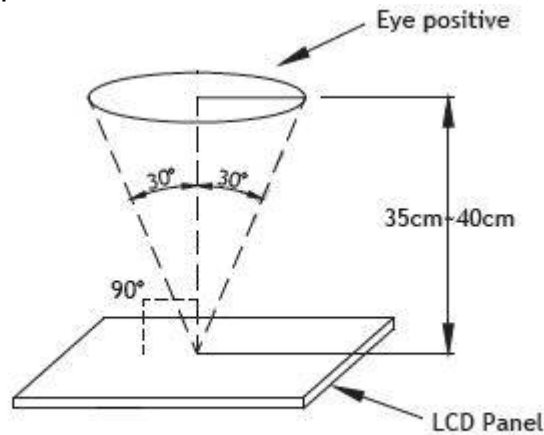


Fig-1

3. Special condition

- (1) Viewing distance is close for inspection of adjacent dots and distance between defect Dots
- (2) Viewing condition of “ Shot block non-uniformity from oblique angle” is as Fig-2
- (3) Exceptional case: Viewing angle $\pm 40^{\circ}$ while inspected image-sticking

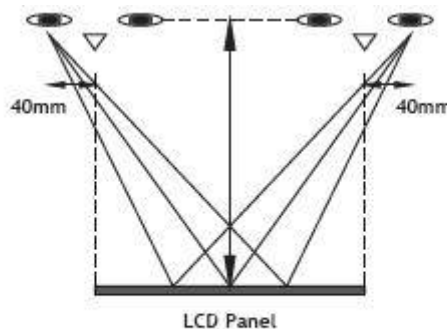
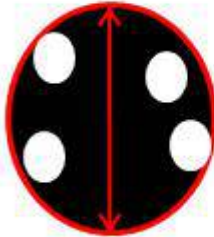
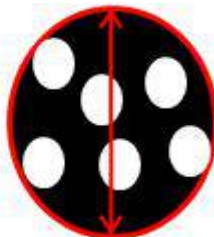


Fig-2

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4. INSPECTION CRITERIA

Defecttype			Limit		Note	
Visual defect	Scratch		W ≤ 0.05mm		Ignore	Note1
			0.05mm ≤ w ≤ 0.1m		N ≤ 3	
			L ≤ 10mm			
			20mm < l, 0.1mm < w		N=0	
	Internal	Spot	Φ < 0.3mm		Ignore	Note 1
			0.3mm ≤ φ ≤ 0.4mm		N ≤ 3	
			0.4 ≤ φ		N=0	
		Fiber	0.1mm ≤ w ≤ 0.2m		N ≤ 4	Note 1
			L ≤ 2.5mm			
			0.2mm < w, 2.5mm < l		N=0	
		Polarizer bubble	Φ < 0.3mm		Ignore	Note 1
			0.25mm ≤ φ ≤ 0.5mm		N ≤ 2	
			0.5 ≤ φ		N=0	
		Dent	Φ < 0.25mm		Ignore	Note 1
			0.25mm ≤ φ ≤ 0.5mm		N ≤ 4	
0.5 ≤ φ			N=0			
Electrical Defect	Bright dot		C area	O area	Total	Note 2 Note 3 use of ND5 % invisible OK
			N ≤ 1	N ≤ 2	N ≤ 3	
	Dark dot		N ≤ 2	N ≤ 4	N ≤ 4	
	Total dot		N ≤ 3	N ≤ 4	N ≤ 4	
	Dense point		Using ND5 % visible by intensive foreign standard judgement, ND5 % invisible OK			Note 4
	 D=2mm, 点4 判定OK  D=2mm, 点6 个为密集点NG					

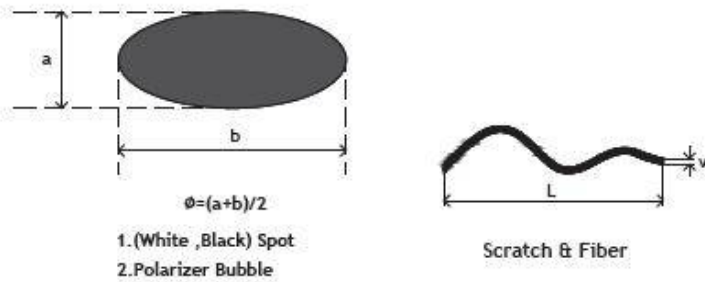
(1) One pixel consists of 3 sub-pixel,including r,g,ang b dot.(sub-pixel=dot)

(2) Panel is acceptable if distance between 2 dot defects are greater or equal to 5mm.

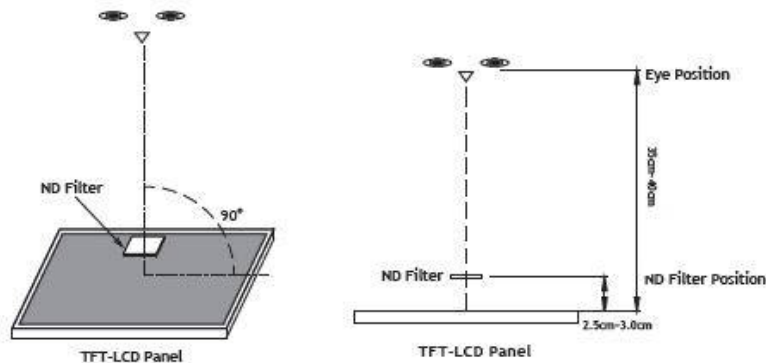
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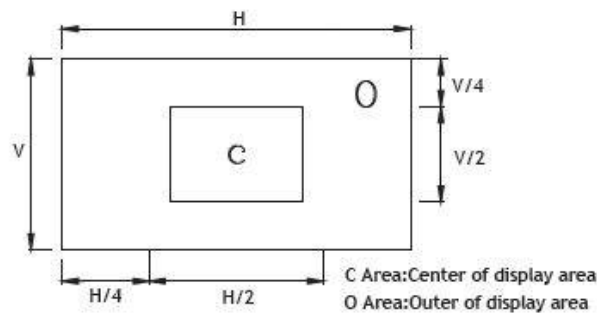
Note1 : W : Width[mm], L : Length[mm], N : Number, ϕ : Average Diameter



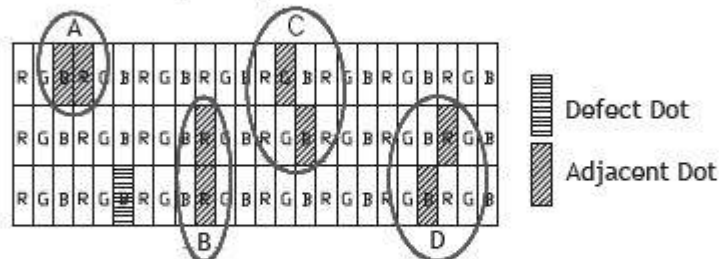
Note2 : Bright dot is defined as the defective area of the dot is larger than 50% of one sub-pixel area.



Note3 :



Note4 : Judge defect dot and adjacent dot as following. Allow below (as A, B, C and D status) adjacent defect dots, including bright and dart adjacent dot. And they will be counted 2 defect dots in total quantity.



Note5 : Other condition

(1) The defects that are not defined above and considered to be problem shall be reviewed and discussed by both parties.

(2) Defects on the Black Matrix, out of Display area, are not considered as a defect or counted.

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5. HANDLING PRECAUTION

- (1) Don't disassemble and reassemble the module by self.
(禁止自行拆解)
- (2) Acid, alkali, alcohol or touched directly by hand will damage the display.
(酸性、碱性、酒精或手的直接接触将会损伤显示面)
- (3) Static electricity will damage the module. Please configure grounding device.
(静电会损伤模组，请装配接地设备)
- (4) The strong vibration, shock, twist or bend will cause material damage, even module broken.
(强烈的撞击、震动、扭转或弯曲将会造成原材损伤，甚至面板破裂)
- (5) It is easy to cause image sticking while displaying the same pattern for very long time.
(长期显示同一画面会造成影像残留)
- (6) The response time, brightness and performance will vary from different temperature.
(响应时间、亮度与均匀性会因温度而有所改变)
- (7) The Period is within 12 months since the date of shipping out under normal using and Storage conditions.
(从出货之日开始,在正常使用和存储条件下，产品保质期为 12 个月)