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PRODUCT SPECIFICATION

TFT-LCD MODULE

Model No: AML101WXBI4002-D

For Customer's Acceptance	
Approved by	Comment

	Signature	Date
Prepared by		
Checked by		
Approved by		

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1. General Description

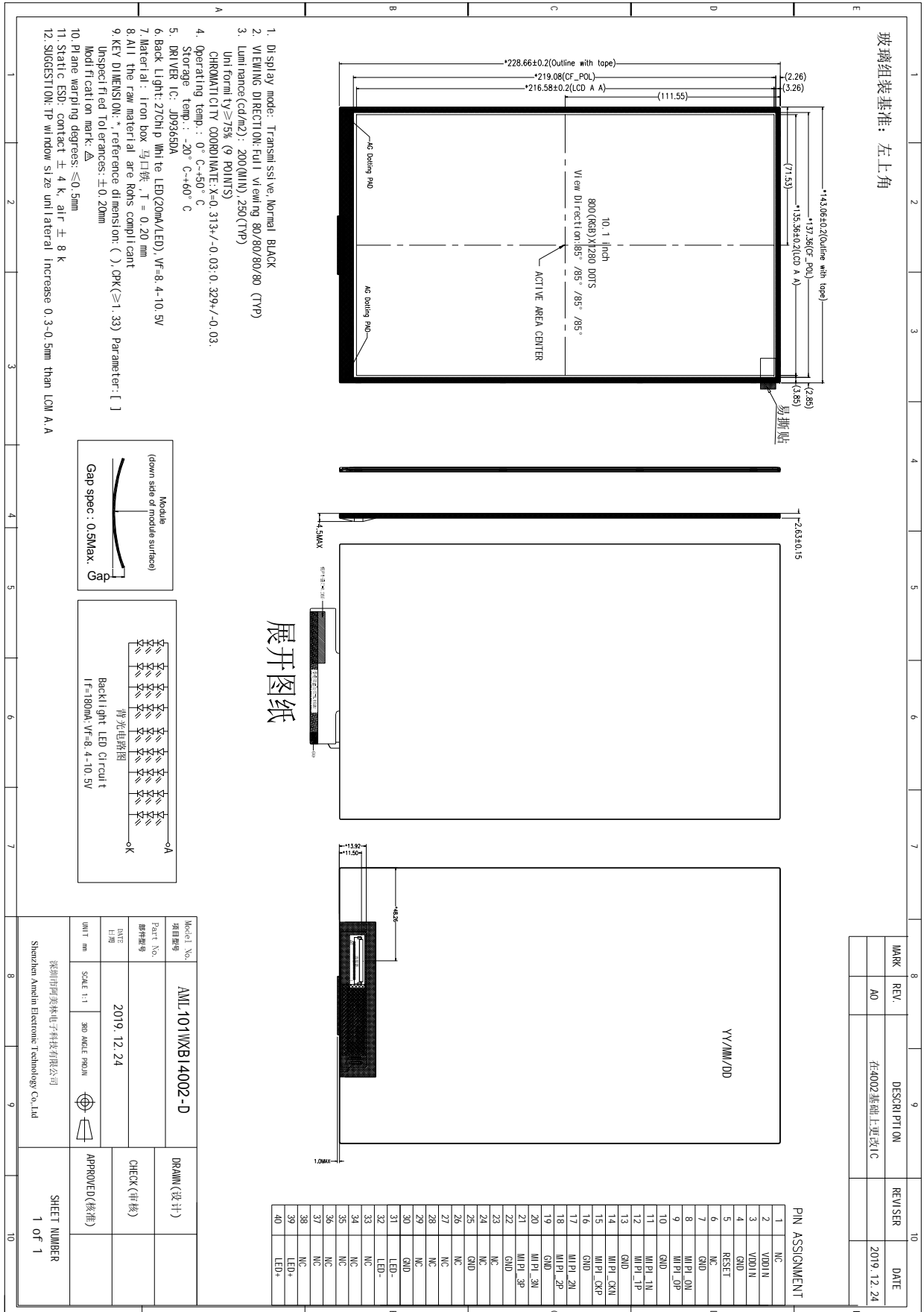
1.1 Description

AML101WXBI4002-D is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. It is composed of a TFT LCD panel, Driver IC ,FPC and Backlight.

1.2 LCM General Specification:

Parameter	Specification	Unit	Remarks
LCD Size	10.1	inch	-
Active area	135.36(H)x 216.576 (V)	mm	-
Number of pixels	800*1280	pixels	-
Pixel pitch	0.1692 (H)x0.1692(V)	um	-
Pixel arrangement	RGB	-	-
Display colors	16.7M	colors	-
Display mode	IPS,Normally Black	-	-
Surface Treatment	An-Glare	-	-
LCM Outline Dimension	143.00(W)x228.60(H)x2.63(D)	mm	Warpage≤0.5mm
TLCM Outline Dimension	-		
NTSC	60% Typ./50% Min.	-	-
LCD Inversion Type	Column	-	
Response Time	TYP. 30	ms	
Panel Power Consumption	0.35W max @W L255	mW	@White pattern
BLU Power Consumption	1.836W max	mW	W/O LED Driver
CR	Typ. 1000 Min:800		
Brightness	Typ:250 Min:200	nits	Lcm @Center
Brightness Uniformity	80%Typ., 75% Min.	-	@9P
Viewing angle (CR ≥ 10)	Typ:80/80/80/80		
LCM Weight	TBD	gram	
Interface	MIPI 4lane	-	-
LCD Driver IC	JD9365DA	-	1ea

2. Mechanical Drawing



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3.Pin Description

3.1Display Interface

FPC Signal interface :

Pin No.	Symbol	Type	Function
1	NC	-	No connection
2	VDD	P	Power supply 3.3V
3	VDD	P	Power supply 3.3V
4	GND	P	Ground
5	Reset	I	Global reset pin(3.3V)
6	NC	-	No connection
7	GND	P	Ground
8	MIPI-0N	I/O	MIPI Date negative signal
9	MIPI-0P	I/O	MIPI Date Positive signal
10	GND	P	Ground
11	MIPI-1N	I	MIPI Date negative signal
12	MIPI-1P	I	MIPI Date Positive signal
13	GND	P	Ground
14	MIPI-CLKN	I	MIPI CLK negative signal
15	MIPI-CLKP	I	MIPI CLK Positive signal
16	GND	P	Ground
17	MIPI-2N	I	MIPI Date negative signal
18	MIPI-2P	I	MIPI Date Positive signal
19	GND	P	Ground
20	MIPI-3N	I	MIPI Date negative signal
21	MIPI-3P	I	MIPI Date Positive signal
22	GND	P	Ground
23	NC	-	No connection
24	NC	-	No connection
25	GND	P	Ground
26	NC	-	No connection
27	NC	-	No connection
28	NC	-	No connection
29	NC	-	No connection
30	GND	P	Ground
31	LED-	P	Power for LED backlight (Cathode)
32	LED-	P	Power for LED backlight (Cathode)
33	NC	-	No connection
34	NC	-	No connection
35	NC	-	No connection
36	NC	-	No connection
37	NC	-	No connection
38	NC	-	No connection
39	LED+	P	Power for LED backlight (Anode)
40	LED+	P	Power for LED backlight (Anode)

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4. Electrical Characteristics

4.1 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

Parameter	Symbol	Min.	Max.	Unit
Power Supply Voltage (LCD Module)	IOVCC	-0.3	3.6	V
Power Supply Voltage (LCD Module)	AVDD	-0.3	6.6	V
Power Supply Voltage (LCD Module)	AVEE	-6.6	0	V
Power Supply Voltage (LCD Module)	VGH	0	30	V
Power Supply Voltage (LCD Module)	VGL	-20	0	V
Operating Temperature	TOP	0	50	°C
Operating Humidity	HOP	10	90	%(RH)

Notes : 1. Permanent damage to the device may occur if maximum values are exceeded functional operation should be restricted to the condition described under normal operating conditions..

4.2 Power Consumption of TFT Panel

Frame =60HZ @ 25degC,

Item	Symbol	Value			Unit	Remark
		Min	Typ	Max		
Power Supply	IOVCC	3.0	3.3	3.6	V	
Power Supply	AVDD	5.2	5.5	5.8	V	
Power Supply	AVEE	-5.8	-5.5	-5.2	V	
Power Supply	VGH	14.5	15	15.5	V	
Power Supply	VGL	-12.5	-11	-11.5	V	
Power Supply	VCOM	-1.2	-0.7	-0.2	V	

4.3 Power Consumption of Backlight

Test Condition : ILED=20mA

Warning: LCM Brightness must match Optical Spec requirement when ILED=20mA

Backlight Unit Schematic:

Ta=25°C

Item	Symbol	Value			Unit	Remark
		Min	Typ	Max		
Forward Voltage VLED	VF	8.4	-	10.2	V	IF=20mA
Forward Current Per LED	IF	-	20	-	mA	
Forward Current ILED	ILED	-	180	-	mA	
Power Consumption	PLED	-	1.62	1.836	W	Note 1
LED Quantity		27			pcs	

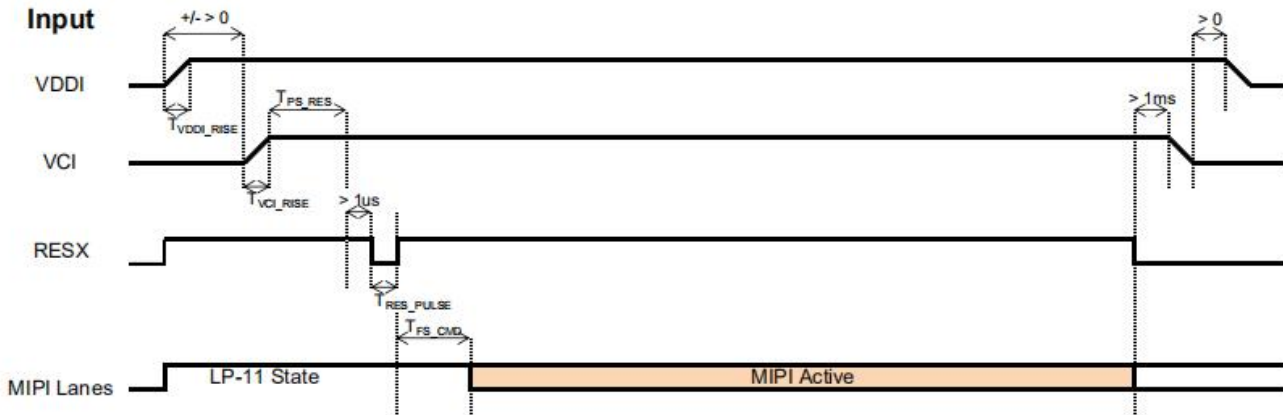
Note 1 : When ILED=20mA, the VBL must be in the range of above table specified.

The FPC wire resistance between LED+ and LED- must be less than 0.15ohm

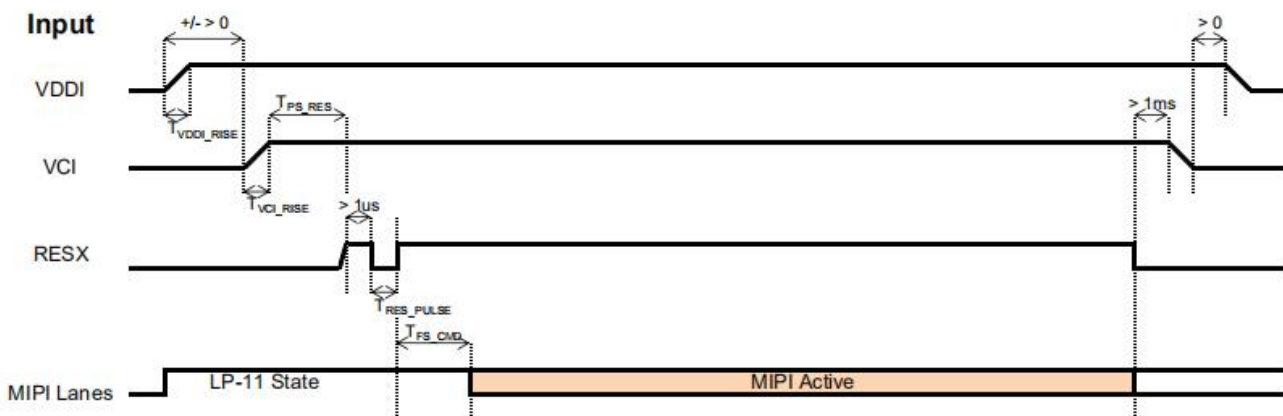
PBL= ILEDX VBL

4.5 Power ON/OFF Sequence

In order to prevent IC from power on reset fail, the rising time (TPOR) of the digital power supply VDD should be maintained within the given specifications. Refer to “ AC Characteristics” for more detail on timing.



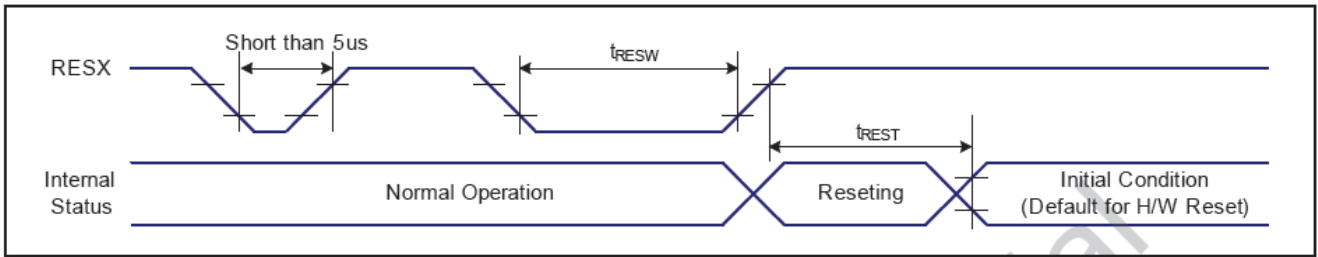
Case B:



Symbol	Characteristics	Min.	Typ.	Max.	Units
T_{VDDI_RISE}	VDDI Rise time	10	-	-	us
T_{VCI_RISE}	Case A: VCI Rise time	130	-	-	us
	Case B: VCI Rise time	40	-	-	us
T_{PS_RES}	VDDI/VCI on to Reset high	5	-	-	ms
T_{RES_PULSE}	Reset low pulse time	10	-	-	us
T_{FS_CMD}	Reset to first command	10	-	-	ms

5. SEQUENTIAL CHART

5.1 RESET TIMING CHARACTERISTICS



VSS=0V, VDDI=1.65V to 3.6V, VCI=2.5V to 5.7V, Ta = -30°C to 70°C

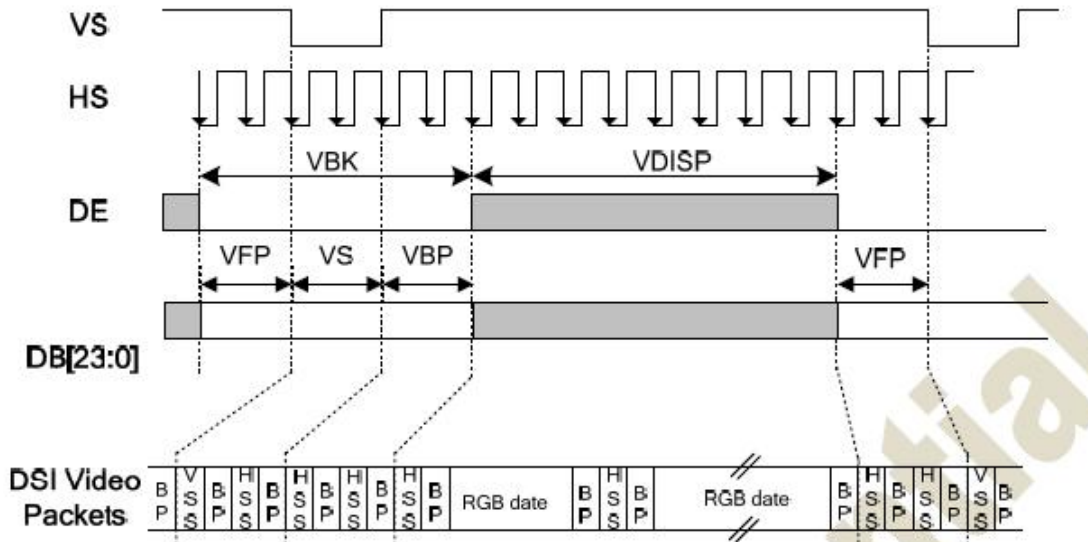
Symbol	Parameter	Related Pins	MIN	TYP	MAX	Note	Unit
t _{RESW}	*1) Reset low pulse width	RESX	10	-	-	-	us
t _{REST}	*2) Reset complete time	-	-	-	5	When reset applied during Sleep in mode	ms
		-	-	-	120	When reset applied during Sleep out mode	ms

Table:Reset input timing

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

5.2 TIMINGS FOR DSI VIDEO MODE

Vertical Timings

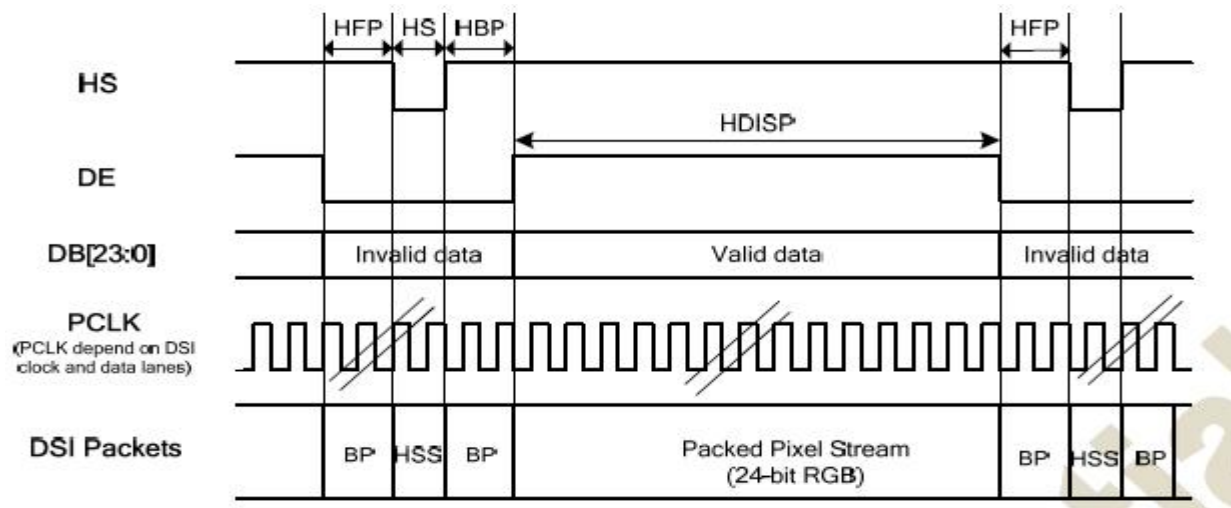


Horizontal Timings

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Item		SYMBOL	min	Typ.	Max.	UNIT	
LCD	Frame Rate	-	-	60	-	Hz	
	Pixels Rate	-		67.8		MHz	
Timing	DCLK	Frequency	fCLK	67.8		MHz	
		Period	Tclk	14.75		ns	
	Horizontal	Horizontal total time	tHP		854		tCLK
		Horizontal Active time	tHadr	800			tCLK
		Horizontal Pulse Width	tHsync		18		tCLK
		Horizontal Back Porch	tHBP		18		tCLK
		Horizontal Front Porch	tHFP		18		tCLK
	Vertical	Vertical total time	tvp		1316		tH
		Vertical Active time	tVadr	1280			tH
		Vertical Pulse Width	tVsync		4		tH
		Vertical Back Porch	tVBP		8		tH
Vertical Front Porch		tVFP		24		tH	

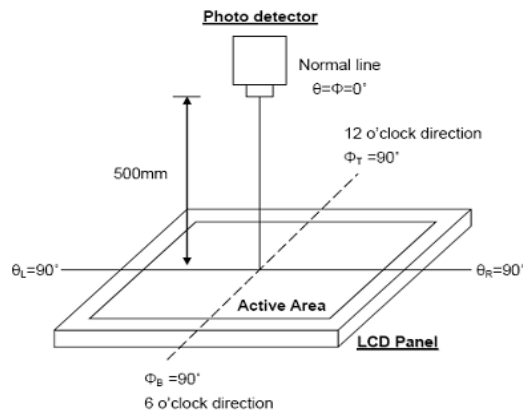
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6. Optical Characteristics

Ta=25°C±2

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio	CR	$\Theta = 0^\circ$	800	1000	-		Note1 Note4
Luminance	YL		200	250	-	cd/m2	Note1 Note6 Note7
Luminance Uniformity	IV-M		75	80	-	%	
Crosstalk			-	2	4	%	
Response Time (Rising + Falling)	TRT	Ta= 25°C $\Theta = 0^\circ$	-	30	40	ms	Note1 Note3
Viewing Angle range	Horizontal	Θ_L	CR = 10	75	80	-	Note2
		Θ_R		75	80	-	
	Vertical	Θ_U		75	80	-	
		Θ_D		75	80	-	
Color Chromaticity	White	x	CIE 1931	0.283	0.313	0.343	Note1 Note5 Note7
		y		0.299	0.329	0.359	
	Red	x		TBD	TBD	TBD	
		y		TBD	TBD	TBD	
	Green	x		TBD	TBD	TBD	
		y		TBD	TBD	TBD	
	Blue	x		TBD	TBD	TBD	
		y		TBD	TBD	TBD	
NTSC			50	55	-	%	

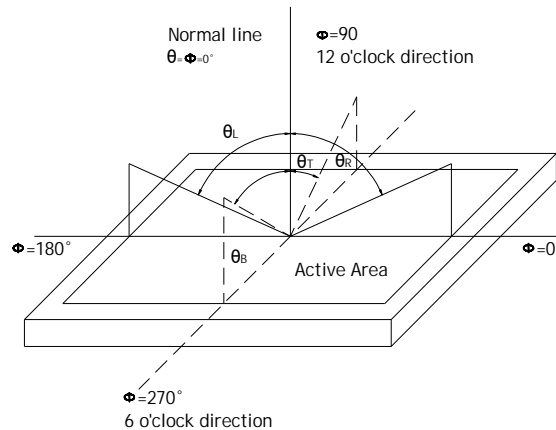
Note1: Definition of optical measurement system



Note2: Definition of viewing angle range and measurement system

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

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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%.

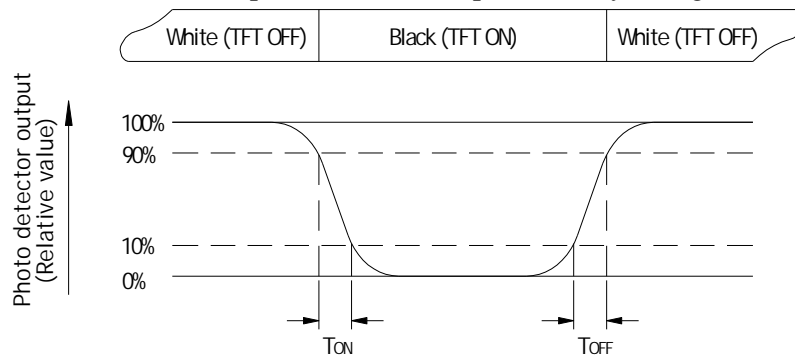


Fig. 6-3 Definition of response time

Note4: Definition of contrast ratio

Contrast ratio(CR)=

“White state “: The state is that the LCD should drive by V_{white} .

“Black state”: The state is that the LCD should drive by V_{black} .

V_{white} : To be determined V_{black} : 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 panel. The LED driving condition is $I_L=184mA$

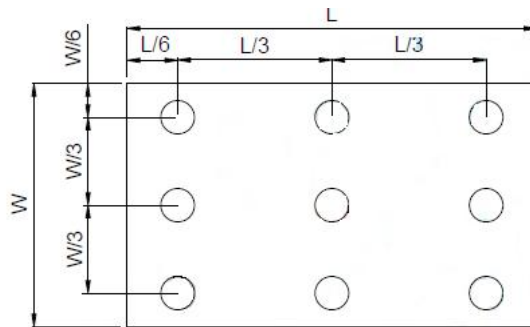
Note7: Definition of Luminance Uniformity

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

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Bmax: The measured maximum luminance of all measurement position.

Bmin: The measured minimum luminance of all measurement position.

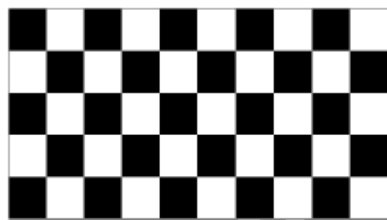
7. Quality Assurance System

7.1 Temperature and Humidity

Test Item	Test Condition	Remark
High Temperature Storage	Ta=60°C; 72hrs	IEC60068-2-1: 2007 GB2423.2-2008
Low Temperature Storage	Ta=-20°C; 72hrs	IEC60068-2-1: 2007 GB2423.1-2008
High Temperature Operation	Ta=50°C; 72hrs	IEC60068-2-1: 2007 GB2423.2-2008
Low Temperature Operation	Ta=0°C; 72hrs	IEC60068-2-1: 2007 GB2423.1-2008
High Temperature High Humidity Operation	Ta=50 °C , 90%RH , 72Hrs(no condensation)	IEC60068-2-78: 2001 GB/T2423.3-2006
Thermal Shock	-20 °C (0.5h) ~ 60 °C (0.5h) / 10cycles	Start with cold temperature , End with high temperature, IEC60068-2-14:1984,GB2423.22- 2002
Image Sticking	25°C ; 2hrs	Note 1

Note1:Condition of image sticking test :25°C±2°C

Operation with test pattern sustained for 2hrs,then change to gray pattern immediately.after 5 mins,the mura must be disappeared completely



(a) Test Pattern (chess board Pattern)



(b) Gray Pattern

7.2ESD

Test item	Conditions	Remark	
Electro Static Discharge Test (non-operation)	150pF, 330Ω, Contact:±4KV,Air:±8KV	1	IEC61000-4-2: 2001 GB/T17626.2-2006
	200pF, 0Ω, ±200V contact test	2	

Note: Measure point :

1. LCD glass and metal bezel
2. IF connector pins

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8. Precaution Relating Product Handling

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 ketonic solvent & Aromatic solvent, use with a soft cloth soaked with a 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 ,PINGBO does not warrant the LCM.
- All process and material comply ROHS.

9. Package Drawing

TBD

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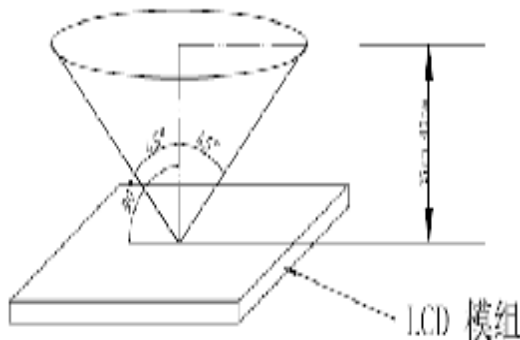
10. Quality Inspection Standard

10.1 Inspection methods

10.1.1 Ambient temperature is approximately $25 \pm 5^{\circ}\text{C}$ 10.1.2 Ambient humidity is $55 \pm 15\% \text{RH}$ 10.1.3 Inspect when the angle is 45° , up and down, left and right sides for visual inspection distance: 350 ~ 400 mm.

10.1.4 Lighting conditions: 800-1200 LUX

10.1.5 Input signal timing should be typical value(3s-5s)



10.2 Sampling method

AQL: GB/T2828.1-2003 CR=0,MA=0.65, MI=1.0

10.3 Inspection specification

Defect Type		Inspection specification				Note
LCD Size(inch)		6.0≤Size<8.0	8.0≤Size<10.1	10.1≤Size<12	12≤Size<15.6	
Electrical Defect	Bright dot	N≤1	N≤2	N≤2	N≤3	Note4 Note5 Note6
	Dark dot	N≤2	N≤3	N≤4	N≤5	
	Two adjacent dot	N≤1	N≤1	N≤2	N≤2	
	Three or more adjacent dot	Not allowed	Not allowed	Not allowed	Not allowed	
	Mura	5% ND filter				Note7 Note8
Appearance Defect	Scratch / Lines /Fiber	W≤0.05 Ignore	W≤0.05 Ignore	W≤0.05 Ignore	W≤0.05 Ignore	Note1 Note5
		0.05 <W≤0.1 and L≤5 N≤3	0.05 <W≤0.1 and L≤5 N≤3	0.05 <W≤0.1 and L≤5 N≤4	0.05 <W≤0.1 and L≤5 N≤5	
		W>0.1mm or L>5mm Not Allowed	W>0.1mm or L>5mm Not Allowed	W>0.1mm or L>5mm Not Allowed	W>0.1mm or L>5mm Not Allowed	
	Spot	D≤0.2 Ignore	D≤0.25 Ignore	D≤0.25 Ignore	D≤0.3 Ignore	
		0.2<D≤0.4mm N≤4	0.25<D≤0.4mm N≤4	0.25<D≤0.5mm N≤4	0.3<D≤0.5mm N≤5	
		D>0.4mm Not Allowed	D>0.4mm Not Allowed	D>0.5mm Not Allowed	D>0.5mm Not Allowed	
	Bubble / Dent	D≤0.2 Ignore	D≤0.25 Ignore	D≤0.25 Ignore	D≤0.3 Ignore	
		0.2<D≤0.4mm N≤3	0.25<D≤0.4mm N≤4	0.25<D≤0.5mm N≤4	0.3<D≤0.5mm N≤5	
		D>0.4mm Not Allowed	D>0.4mm Not Allowed	D>0.5mm Not Allowed	D>0.5mm Not Allowed	

Note 1: W=Width, L=Lenght, D=Diameter, Unit: mm

Note 2: Extraneous substances that can be wiped out, like Finger point, Particles are not considered as a defect.

Note 3: Defects on the Black Matrix (outside of Active Area) are not considered as a defect.

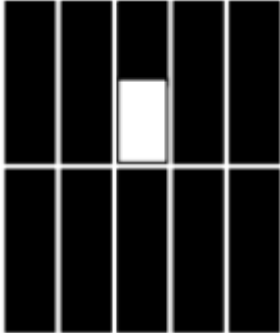
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Note 4: Dot is smaller than 1/2 sub-pixel as SBP which is visible through ND filter 8% and the count is less than 4 dots.(IF the SBP is invisible through ND filter 8% which is disregard.)

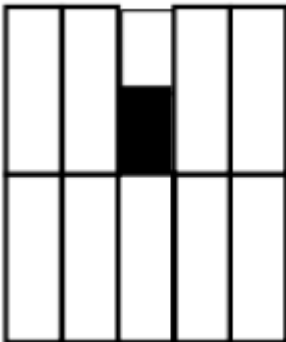
Note 5: Minimum distance between dot defects and spot is 5mm.

Note 6: The definition of bright dot and dark dot

--Bright area is more than 50% of one dot



--Dark area is more than 50% of one dot



Note 7: Mura criteria: judged by ND filter 5%, and can't be seen under the ND filter 5%

Note 8: ND filter use method The inspection method of ND Filter - holding ND filter in front of the panel around 3cm and examine the panel from 35±5 cm in the front view for 1 seconds

