PHOENIX DISPLAY
INTERNATIONAL, INC.

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SPECIFICATION FOR LCD MODULE

CUSTOMER	
PART NUMBER	PDIS029HQ05NS
DESCRIPTION	2.9" 320(RGB)x(120 Dots
VERSION	1.0
ISSUE DATE	19-Nov-20

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1 Record of Revision

Rev	Issued Date	Description	Editor
1.0	2020/11/19	First Release.	ZWF

2 General Specifications

Feature		Spec
Characteristics	Size	2.9inch
	Resolution	320(horizontal)*120(Vertical)
	Interface	RGB 18bit
	Connect type	Connector
	Color Depth	262k
	Technology type	a-Si
	Display Spec. Pixel pitch (mm)	0.219 x 0.219
	Pixel Configuration	R.G.B. Vertical Stripe
	Display Mode	Normally Black
	Driver IC	ST7272A
	Viewing Direction	IPS
Mechanical	LCM (W x H x D) (mm)	76.90*38.22*3.26
	Active Area(mm)	70.08 x 26.28
	With /Without TSP	Without TSP
	Weight (g)	TBD
	LED Numbers	6 LEDs

Note 1: RoHS
Note 2: LCM weight tolerance: +/- 5%

3 Input/Output Terminals

No.	Symbol	Description
1,2	VBL-	Backlight LED Cathode
3,4	VBL+	Backlight LED Anode.
5	Y1(YU)(NC)	No connection
6	X1(XR)(NC)	No connection
7	NC	NC
8	RESET	Reset Signal pin
9	CS(NC)	No connection
10	SCL(NC)	No connection
11	SDA(NC)	No connection
12	SDO(NC)	No connection
13	NC	NC
14~19	B0~B5	Data bus
20,21	NC	NC
22~27	G0~G5	Data bus
28,29	NC	NC
30~35	R0~R5	Data bus
36	HSYNC	Line Synchronous Signal
37	VSYNC	Frame Synchronous Signal
38	DOTCLK	Dot-clock signal and oscillator source
39	GND	Ground
40	IOVCC	Voltage input pin for logic
41	VDD	Booster input voltage pin
42	VDD	Booster input voltage pin
43	Y2(YD)(NC)	No connection
44	X2(XL)(NC)	No connection
45-51	NC	NC
52	DEN	Display enable pin for controller
53	GND	Ground
54	GND	Ground

4 Absolute Maximum Ratings

Item	Symbol	Rating	Unit
Power Supply Voltage	VDD	- 0.3 ~ +4.0	V
IO Supply Voltage	VDDI	- 0.3 ~ +4.0	V
Charge Pump Supply Voltage	PVDD	- 0.3 ~ +4.0	V
Logic Input Voltage Range	VIN	-0.3 ~ VDDI + 0.3	V
Logic Output Voltage Range	VOUT	-0.3 ~ VDDI + 0.3	V
Operating Temperature Range	TOPR	-30 ~ +85	℃
Storage Temperature Range	TSTG	-40 ~ +125	℃

Note:

1. *That the stress exceeds the Limiting Value listed above it may cause the driver IC permanent damage. These values are for stress only. IC should be operated under the DC/AC Characteristic conditions for normal operation. If these conditions are not met, IC operation may be error and the reliability may be deteriorated.*
2. *Parameters are valid over operating temperature range unless otherwise specified. All voltages are with respect to VSS unless otherwise noted.*
3. *Insure the voltage levels of VDDI, VDD, PVDD always matches the correct relation:*
   3.0V ≦ VDDI ≦ VDD = PVDD ≦ 3.6V
4. *VIN should be less than or equal to 3.6V. (VIN ≤ 3.6V)*

5 Electrical Characteristics

5.1 Driving TFT LCD Panel

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Supply Voltage		V_{cc}	3.0	3.3	3.6	V	
Input Signal Voltage	Low Leve	V_{IL}	GND	-	0.1x VDD	V	
	High Level	V_{IH}	0.8x VDD	-	VDD	V	
Output Signal Voltage	Low Leve	V_{OL}	0	-	0.2*VDD	V	
	High Level	V_{OH}	0.8*VDD	-	VDD	V	

5.2 Driving Backlight

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I_F	-	20	-	mA	Constant current
Forward Voltage	V_F	17.6	19.2	20.8	V	
Backlight Power consumption	W_{BL}	-	0.384	-	W	
LED Lifetime	W_{BL}	-	30000	-	W	

Note 1: Each LED : IF =20 mA, VF =3.2V.

Note 2: Optical performance should be evaluated at Ta=25℃ only.

Note 3: If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced.Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

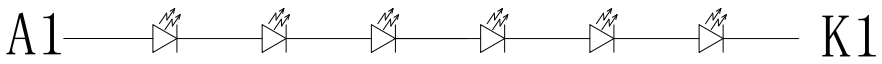
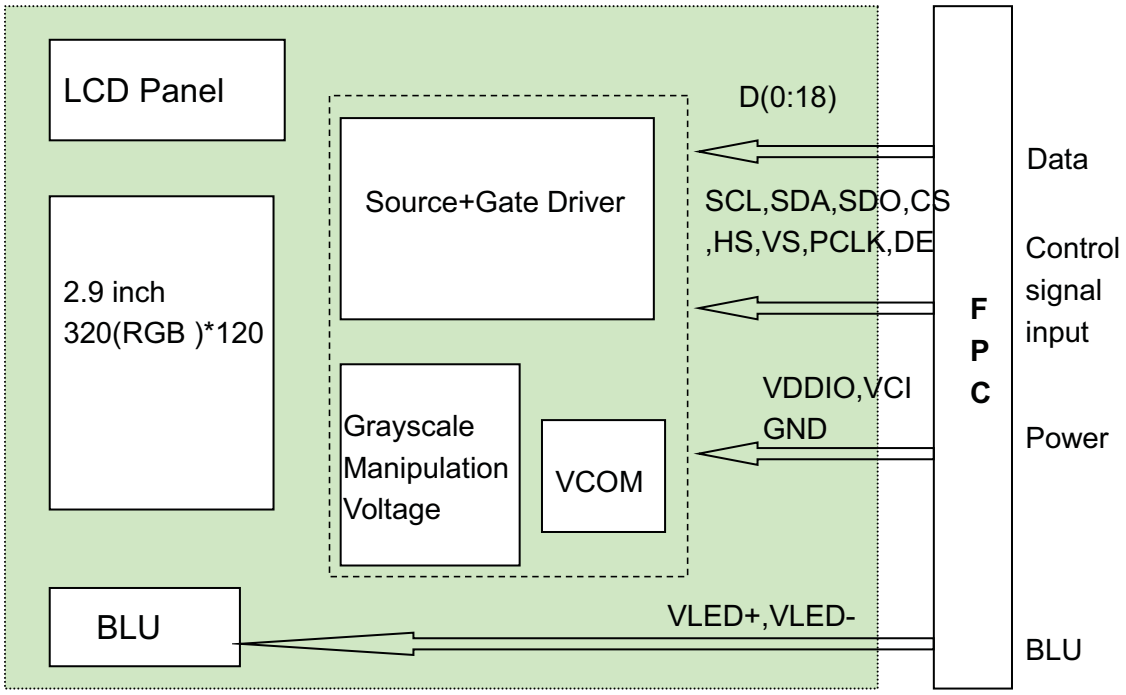


Figure : LED connection of backlight

5.3 Block Diagram

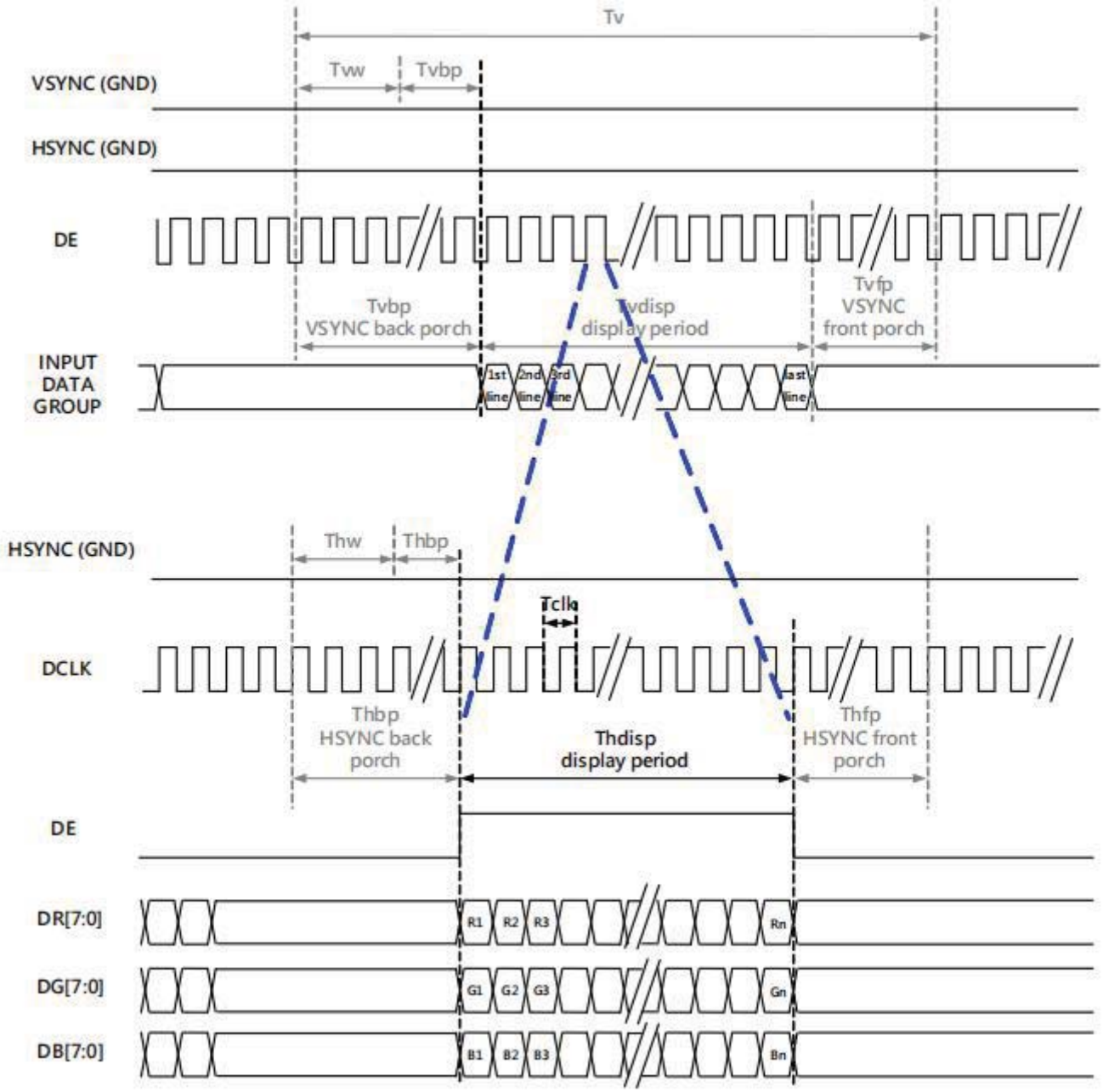


6 Interface Timing

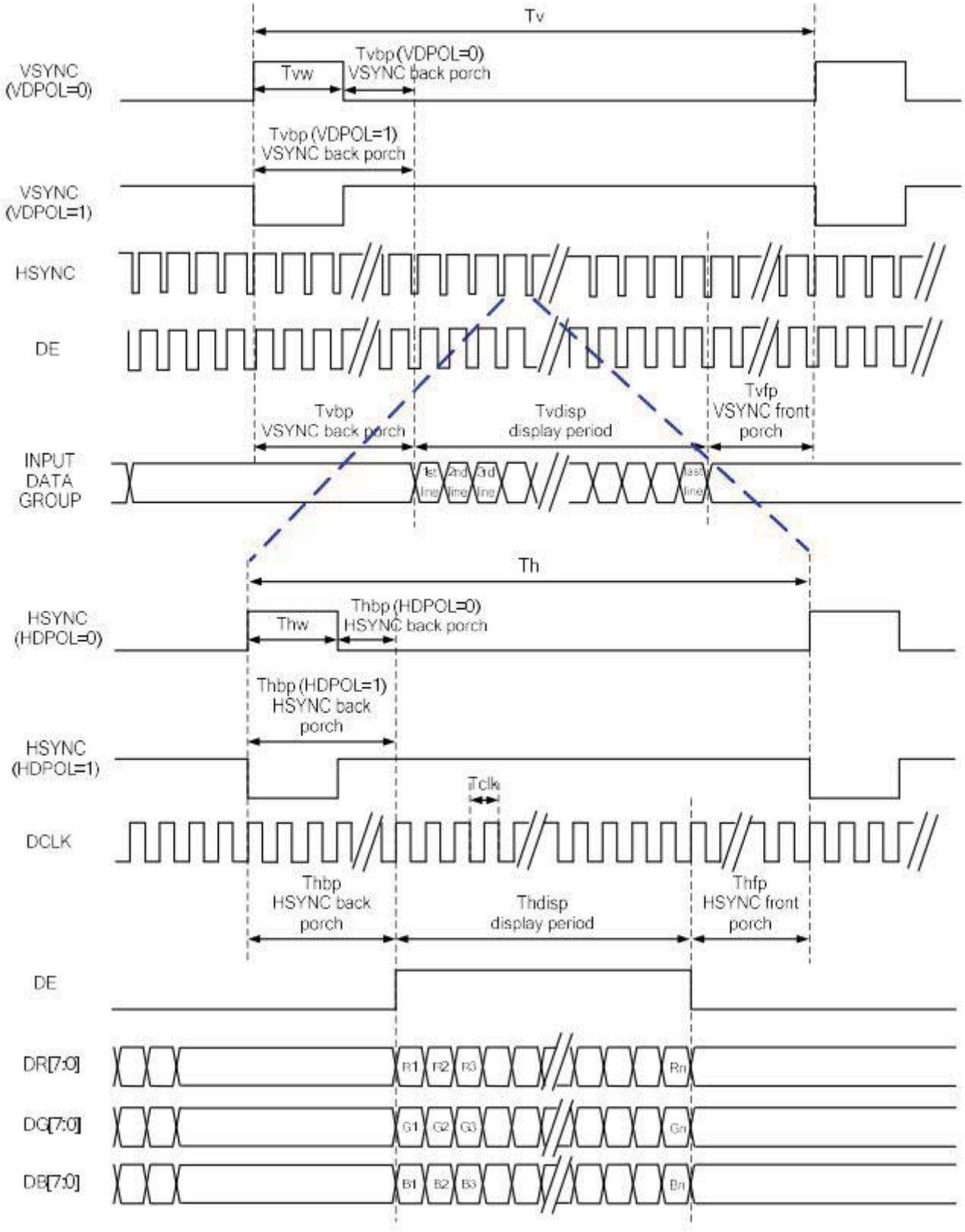
6.1 AC Characteristics

Test Condition: (VDD=VDDP=3.3V, VDDA=5.0V, GND=GNDA=GNDP=0V, TA= 25℃)

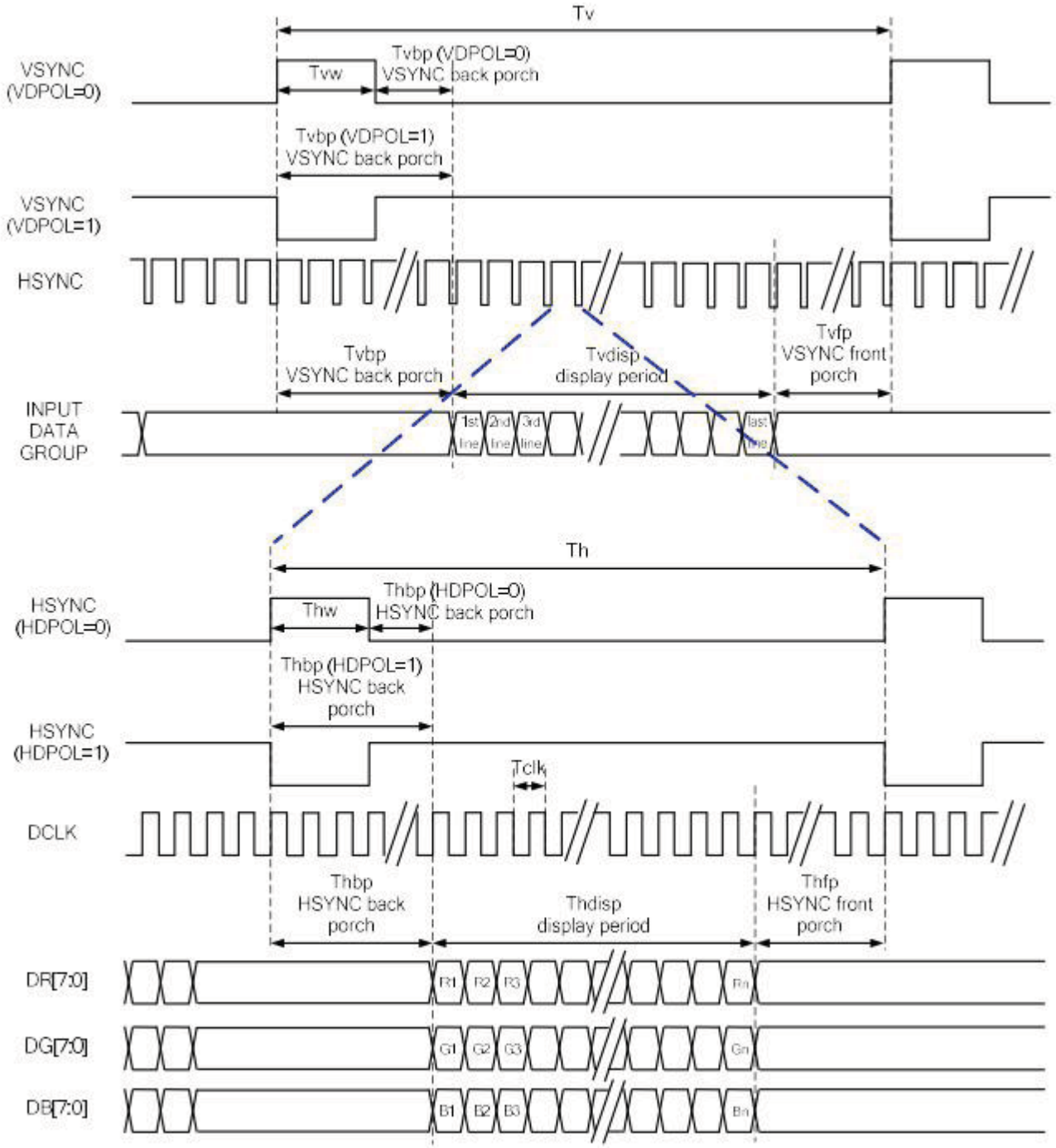
Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
System Operation Timing						
VDD power source slew time	T_{POR}			1000	us	From 0V to 90% VDD
RSTB active pulse width	T_{RSTB}	40			us	VDD = 3.3V
Input Output Timing						
CLKIN clock time	Tclk	33.3/125	-	-	ns	Please refer to timing table(p.32)
HSD to CLKIN	Thc	-	-	1	CLKIN	
HSD width	Thwh	1	-	-	CLKIN	
VSD width	Tvwh	1	-	-	Th	
HSD period time	Th	60	63.56	67	us	
VSD setup time	Tvst	8	-	-	ns	
VSD hold time	Tvhd	10	-	-	ns	
HSD setup time	Thst	8	-	-	ns	
HSD hold time	Thhd	10	-	-	ns	
Data set-up time	Tdsu	8	-	-	ns	DIN[23:0] to CLKIN
Data hold time	Tdhd	10	-	-	ns	DIN[23:0] to CLKIN
DEN setup time	Tesd	12	-		ns	DEN to CLKIN
Time that VSD to 1st line data input	Tvs	2	13	127	Th	@CCIR601 / 8bit RGB HV mode Control by HDLY[6:0] setting Tvs = HDLY[6:0]
Time that CCIR_V to 1st line data input	Tvs	12	20	28	Th	@CCIR656 NTSC mode Control by HDLY[6:0] setting Tvs = HDLY[6:0]
Time that CCIR_V to 1st line data input	Tvs 17 25 33 Th					@CCIR656 PAL mode Control by HDLY[6:0] setting Tvs = HDLY[6:0]
Time that VSD to 1st line data input	Tvs	2	13	127	Th	@24bit RGB HV mode Control by HDLY[6:0] setting Tvs = HDLY[6:0]
Source output stable time 1	Tst	-	25	30	us	96% final, CL=30pF, RL=2K
Gate output stable time	Tgst	-	500	1000	ns	96% final, CL=40pF
VCOMOUT output stable time	Tcst	-	4	8	us	96% final, CL=33nF, RL=100ohm
3-wire serial communication AC timing						
Serial clock	Tspck	320	-	-	ns	
SPCK pulse duty		40	50	60	%	Tckh / Tspck
Serial data setup time	Tisu	120	-	-	ns	
Serial data hold time	Tihd	120	-	-	ns	
Serial clock high/low	Tckh/l	120	-	-	ns	
Chip select distinguish	Tcd	1	-	-	us	
SPENB to VSD	Tcv	1	-	-	us	
SPENB input setup time	Teck	150	-	-	ns	
SPENB input hold time	Tcke	150	-	-	ns	



Parallel RGB DE Mode



Parallel RGB SYNC-DE Mode



Parallel RGB SYNC Mode

Parallel 24-bit RGB Input Timing Table							
Item		Symbol	Min.	Typ.	Max.	Unit	Note
DCLK Frequency		Fclk	5	6	8	MHz	
DCLK Period		Tclk	125	167	200	ns	
HSYNC	Period Time	Th	325	371	438	DCLK	
	Display Period	Thdisp		320		DCLK	
	Back Porch	Thbp	3	43	43	DCLK	SYNC mode back porch control by H_BLANKING[7:0] setting Thbp= H_BLANKING[7:0]
	Front Porch	Thfp	2	8	75	DCLK	
	Pulse Width	Thw	2	4	43	DCLK	
VSYNC	Period Time	Tv	244	260	289	HSYNC	
	Display Period	Tvdisp		240		HSYNC	
	Back Porch	Tvbp	2	12	12	HSYNC	SYNC mode back porch control by V_BLANKING[7:0] setting Tvbp= V_BLANKING[7:0]
	Front Porch	Tvfp	2	8	37	HSYNC	
	Pulse Width	Tvw	2	4	12	HSYNC	

Note: It is necessary to keep Tvbp = 12 and Thbp = 43 in sync mode. DE mode is unnecessary to keep it.

Parallel RGB Input Timing Table

6.2 DC Characteristics

Recommended Operating Range

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Supply Voltage	VDD	3.0	3.3	3.6	V	
IO Supply Voltage	VDDI	3.0	-	3.6	V	
Charge Pump Supply Voltage	PVDD	3.0	3.3	3.6	V	

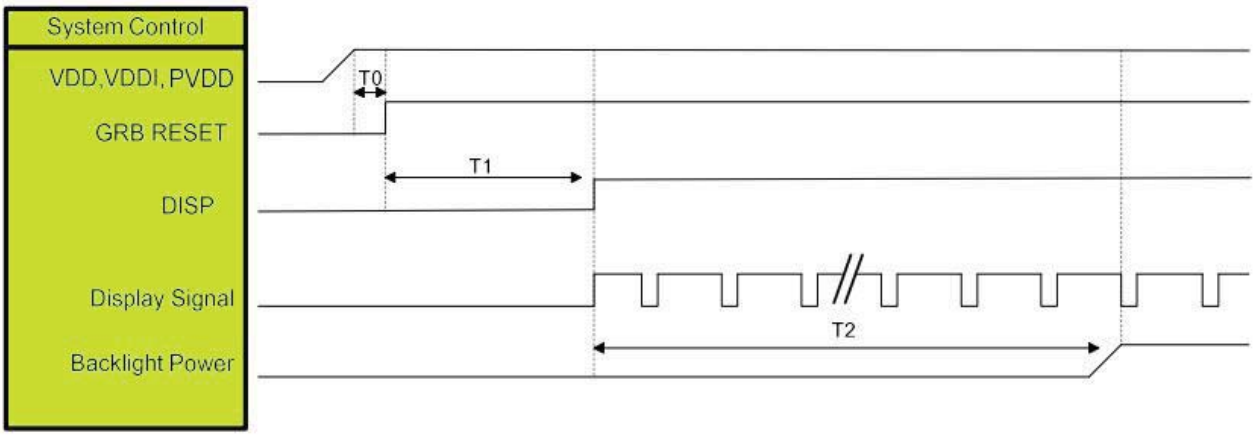
DC Characteristics for Digital Circuit

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Logic-High Input Voltage	Vih	0.7VDDI	-	VDDI	V	
Logic-Low Input Voltage	Vil	DGND	-	0.3VDDI	V	
Logic-High Output Voltage	Voh	VDDI-0.4	-	VDDI	V	
Logic-Low Output Voltage	Vol	DGND	-	DGND+0.4	V	

DC Characteristics for Analog Circuit

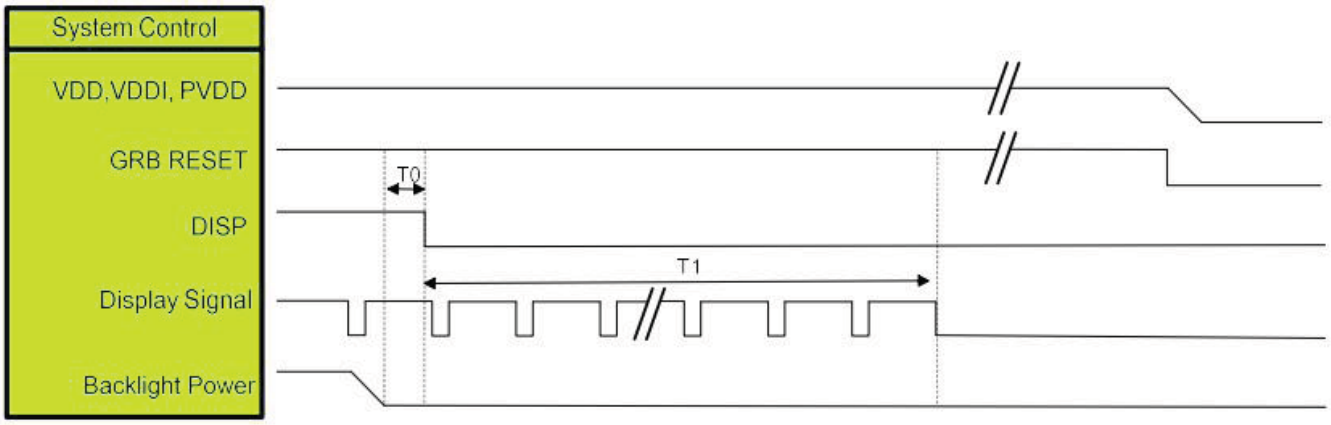
Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Positive High-Voltage Power	VGH	13	15	16.5	V	No Load@ FR=60Hz
Negative High-Voltage Power	VGL	-7	-10	-11	V	
Output Voltage Deviation	Vod	-	±35	±45	mV	
Standby Current	Isc	-		50	uA	
Operation Current	Ioc	-	20		mA	

6.2 **Power On/Off Sequence**



Symbol	Description	Min. Time	Unit
T0	System power stability to GRB RESET signal	0	ms
T1	GRB RESET= “High” to DISP=”High”	10	ms
T2	Display Signal output to Backlight Power on	250	ms

Note: Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]



Symbol	Description	Min. Time	Unit
T0	Backlight Power off to DISP=”Low”	5	ms
T1	DISP=”Low” to IC internal voltage discharge complete	80	ms

Note: Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]

7 Optical Characteristics

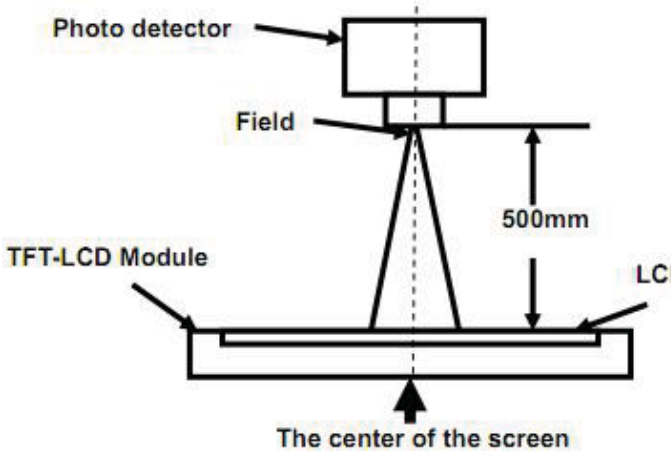
Items		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angles		θ_T	Center	-	80	-	Degree.	Note2
		θ_B		-	80	-		
		θ_L		-	80	-		
		θ_R		-	80	-		
Contrast Ratio		CR	Θ =0	640	800	-	-	Note1, Note3
Response Time		$T_{ON}+T_{off}$	25° C	-	30	40	ms	Note1, Note4
Chromaticity	White	X_W	Backlight is on	0.267	0.317	0.367	-	Note1, Note5
		Y_W		0.289	0.339	0.389	-	
	Red	X_R		0.596	0.646	0.696	-	
		Y_R		0.282	0.332	0.382	-	
	Green	X_G		0.273	0.323	0.373	-	
		Y_G		0.517	0.567	0.617	-	
	Blue	X_B		0.084	0.134	0.184	-	
		Y_B		0.071	0.121	0.171	-	
Uniformity		U		75	80	-	%	Note1, Note6
NTSC					60		%	Note5
Luminance		LV		250	300	-	cd/m2	Note1, Note7
Luminance uniformity		Yu	θ =0°	80	85	-	%	FIG.2

Test Conditions:

1. IF= 20mA(one channel),the ambient temperature is 25
2. The test systems refer to Note 1 and Note 2.

Note 1:Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

Note 2: Definition of viewing angle range and measurement system.
viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80).

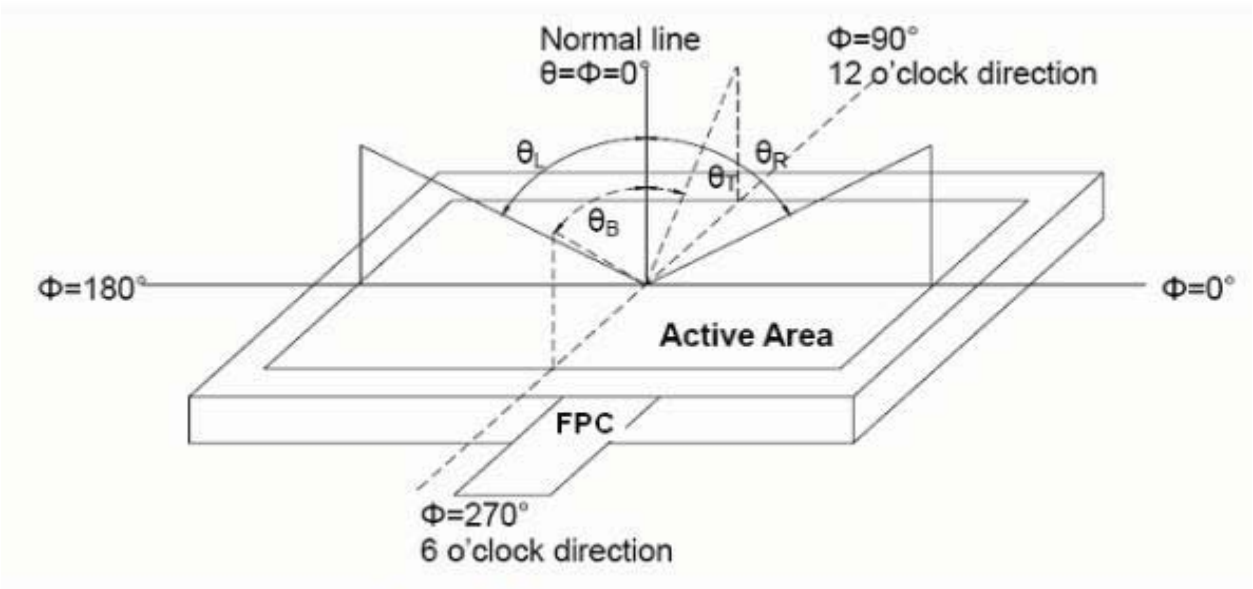


Fig. 1 Definition of viewing angle

Note 3: Definition of contrast ratio

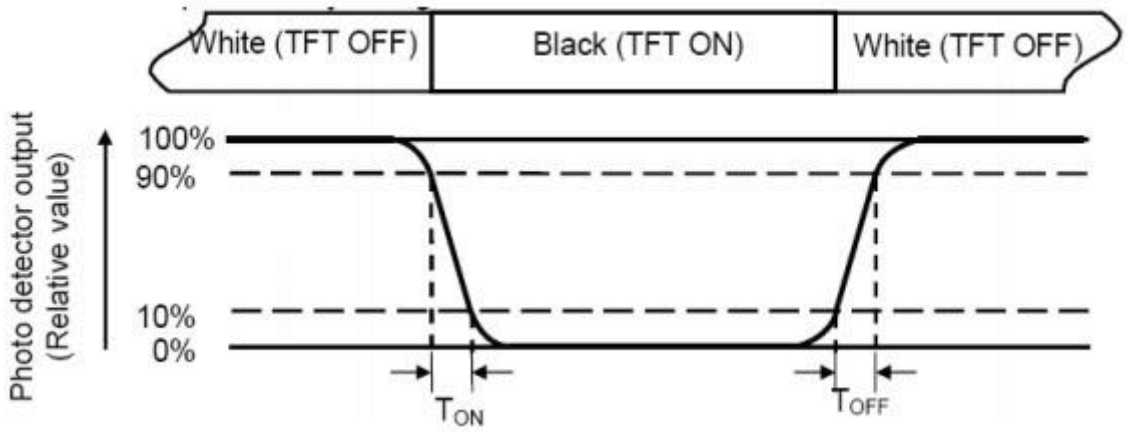
$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

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

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

Vwhite: To be determined Vblack: To be determined.

Note 4: 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%.



Note 5: Definition of color chromaticity (CIE1931)
Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity
Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity(U) = Lmin/ Lmax

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

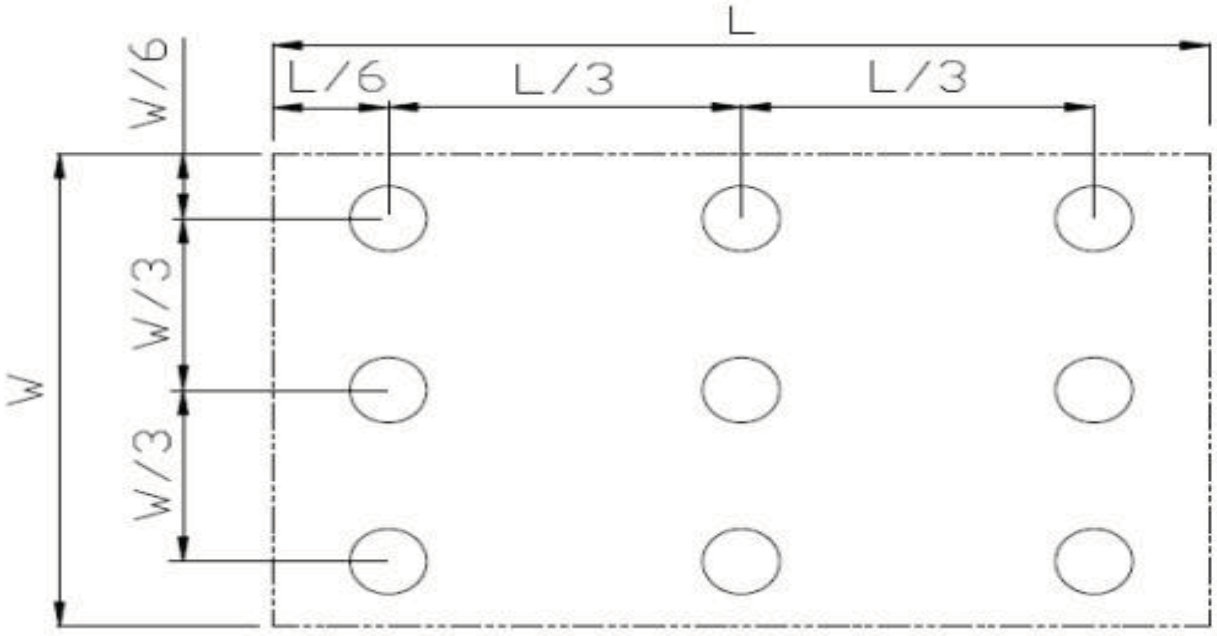


Fig. 2 Definition of uniformity
Lmax: The measured maximum luminance of all measurement position.
Lmin: The measured minimum luminance of all measurement position.

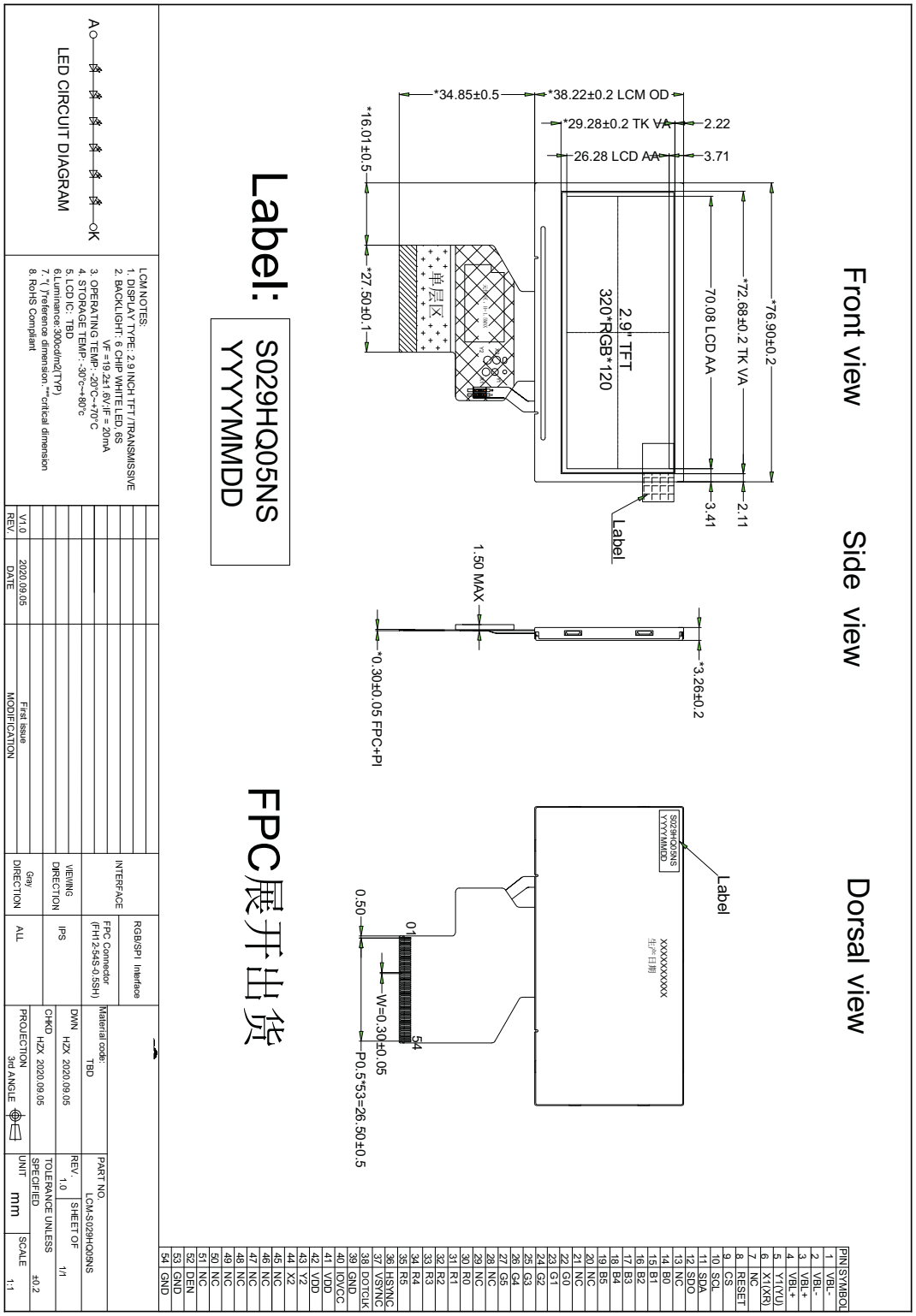
Note 7: Definition of Luminance :
Measure the luminance of state at point.

8 Environmental / Reliability Tests

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts= +70℃, 96hrs	IEC60068-2-1:2007 GB2423. 2-2008
2	Low Temperature Operation	Ta= -20℃, 96hrs	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	Ta= +80℃,96hrs	IEC60068-2-1:2007 GB2423. 2-2008
4	Low Temperature Storage	Ta= -30℃, 96hrs	IEC60068-2-1:2007 GB2423.1-2008
5	High Temperature & Humidity Operation	Ta= +60℃, 90% RH max,96 hours	IIEC60068-2-78:2001 GB/T2423.3-2006
6	Thermal Shock (Non-operation)	-30℃ 30 min ~ +80℃ 30 min Change time: 5min, 20 Cycle	Start with cold temperature, end with high temperature IEC60068-2-14:1984,GB2423.22-2002
7	ESD	C=150pF, R=330 Ω, 5 points/panel , Air:±8KV, 5 times Contact: ±4KV, 5 times (Environment: 15℃ ~ 35℃, 30% ~ 60%, 86Kpa ~ 106Kpa)	IEC61000-4-2:2001 GB/T17626.2-2006
8	Vibration (Non-operation)	Frequency range: 10~55Hz, Stroke: 1.5mm , Sweep: 10Hz~55Hz~10Hz 2 hours for each direction of X .Y. Z. (6 hours for total)	IEC60068-2-6:1982 GB/T2423.10-1995
9	Mechanical Shock (Non-operation)	Half Sine Wave 60G ,6ms,±X,±Y,±Z 3times for each direction	IEC60068-2-27:1987 GB/T2423.5—1995
10	Package Drop Test	Height: 60 cm, 1 corner, 3 edges, 6 surfaces	IEC60068-2-32:1990 GB/T2423.8-1995

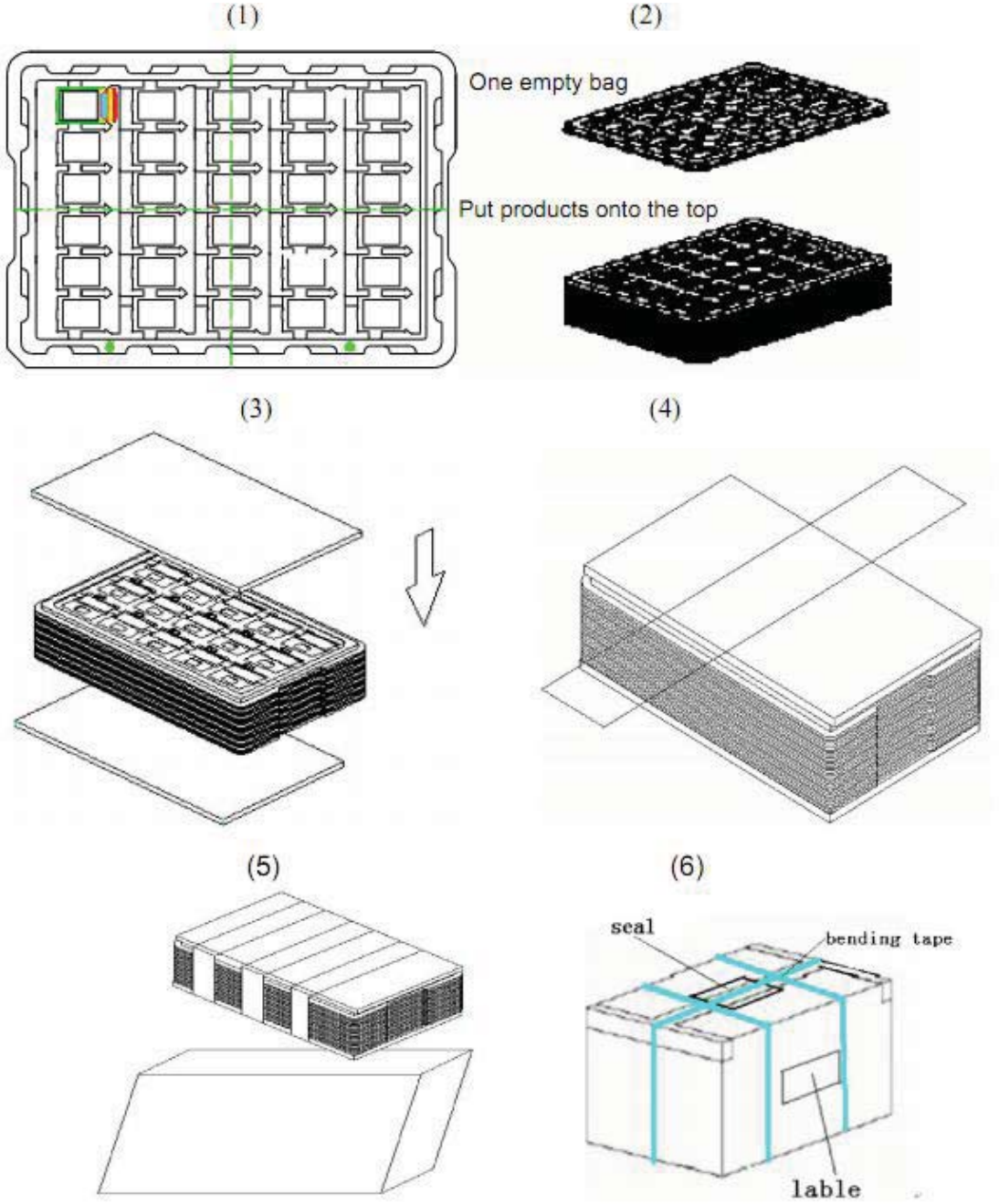
Notes:
1. The test result shall be evaluated after the sample has been left at room temperature and humidity for 2 hours without load. No condensation shall be accepted. The sample will not be accepted if appear these defects:
1).Air bubble in the LCD;
2).Seal leak
3).Non-display
4).missing segments
5).Glass crack
6).CR reduction >40%
7).IDD increase >100%
8).Brightness reduction >50%
9).Color coordinate tolerance >0.05
2.≤7.0 inch：The size of sample is 5pcs；
　＞7.0 inch：The size of sample is 2pcs；
3. One test sample must complete each test item;
4.In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judge as a good part.
5.In the test of High Temperature Operation and High Temperature & Humidity Operation ,the operation temperature is the surface temperature of module.

9 Mechanical Drawing



1 0.Packing

Packing Method



1. Put module into tray cavity:
2. Tray stacking
3. Put 1 cardboard under the tray stack and 1 cardboard above:
4. Fix the cardboard to the tray stack with adhesive tape:
5. Put the tray stack into carton.
6. Carton sealing with adhesive tape.

11 Precautions For Use of LCD modules

11.1 Handling Precautions

11.1.1. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

11.1.2. If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

11.1.3. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

11.1.4. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

11.1.5. If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketone
- Aromatic solvents

11.1.6. Do not attempt to disassemble the LCD Module.

11.1.7. If the logic circuit power is off, do not apply the input signals.

11.1.8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

11.1.8.1. Be sure to ground the body when handling the LCD Modules.

11.1.8.2. Tools required for assembly, such as soldering irons, must be properly ground.

11.1.8.3. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

11.1.8.4. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

11.2 Storage Precautions

12.2.1. When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

11.2.2. The LCD modules should be stored under the storage temperature range If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0℃ ～ 40℃ Relatively humidity: ≤80%

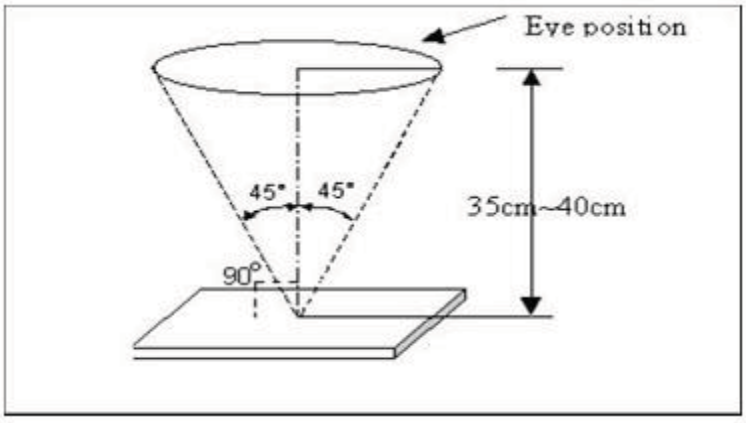
11.2.3. The LCD modules should be stored in the room without acid, alkali and harmful gas.

11.3 Inspection Sampling

3.1. Lot size : Quantity per shipment lot per model
3.2. Sampling type: Normal inspection, Single sampling
3.3. Inspection level: II
3.4. Sampling table : MIL-STD-105D
3.5. Acceptable quality level （AQL ）
Major defect : AQL=0.65
Minor defect: AQL=1.00

11.4 Inspection Conditions

4.1 Ambient conditions:
a. Temperature: Room temperature 25±5℃
b. Humidity: (60±10) ％RH
c. Illumination: Single fluorescent lamp non-directive (300 to 700 Lux)
4.2 Viewing distance
The distance between the LCD and the inspector’ s eyes shall be at least 35±5 ㎝.
4.3 Viewing Angle
U/D: 45o/45o, L/R: 45o/45o



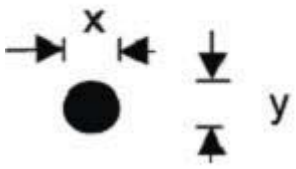
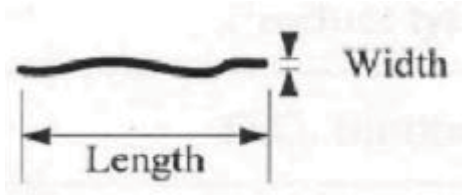
11.5. Inspection Criteria

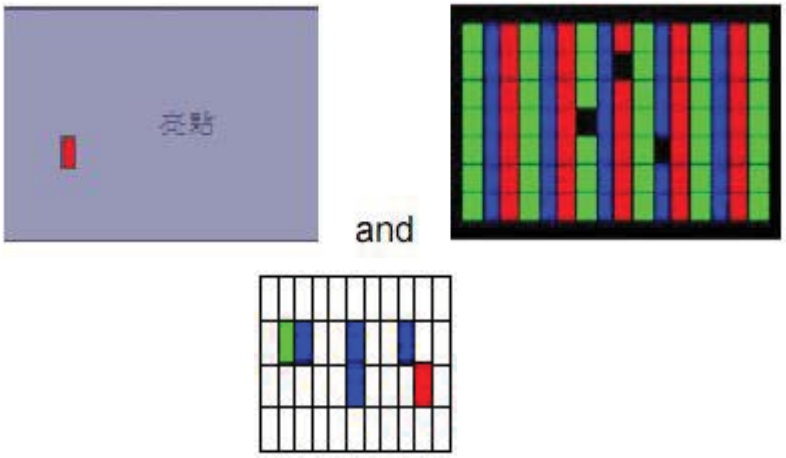
Defects are classified as major defects and minor defects according to the degree of Defectiveness defined herein.

11.5.1 Major defect

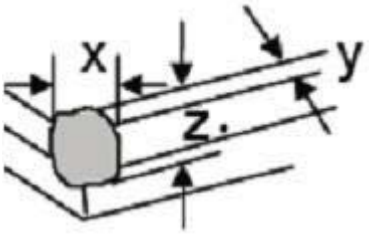
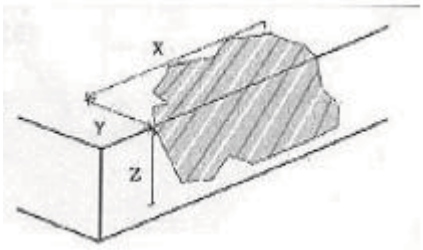
Item No	Items to be inspected	Inspection Standard
5.1.1	All functional defects	1) No display 2) Display abnormally 3) Short circuit 4) line defect
`5.1.2	Missing	Missing function component
5.1.3	Crack	Glass Crack

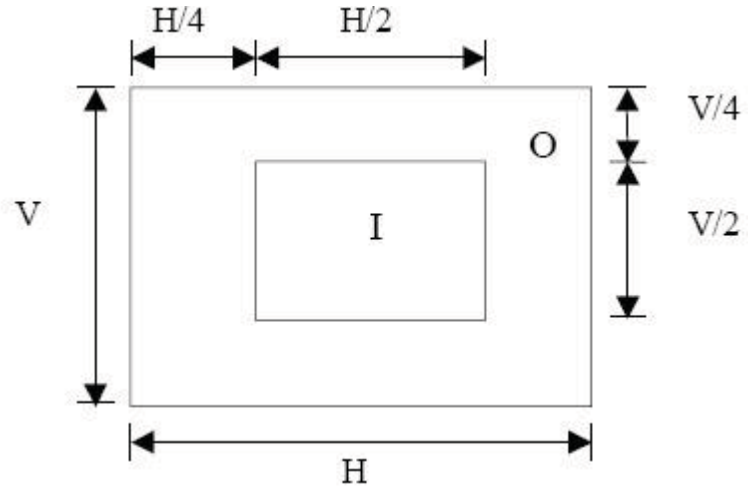
11.5.2 Minor defect

<table>
<tr><th>Item No</th><th>Items to be inspected</th><th colspan="2">Inspection standard</th></tr>
<tr><td rowspan="5">5.2.1</td><td rowspan="5">Spot Defect
Including
Black spot
White spot
Pinhole
Foreign particle
Polarizer dirt</td><td colspan="2">For dark/white spot is defined
φ = (x+y) ／2

</td></tr>
<tr><td>Size φ(mm)</td><td>Acceptable Quantity</td></tr>
<tr><td>φ≤0.2</td><td>Ignore</td></tr>
<tr><td>0.2 ＜ ϕ≤0.5</td><td>3</td></tr>
<tr><td>0.5 ＜ϕ</td><td>Not allowed</td></tr>
<tr><td>5.2.2</td><td>Line Defect
Including Black line
White line Scratch</td><td colspan="2">Define:

</td></tr>
</table>

<table>
<tr><td></td><td></td><td>Width(mm)
Length(mm)</td><td>Acceptable Quantity</td></tr>
<tr><td></td><td></td><td>W≤0.05</td><td>Ignore</td></tr>
<tr><td></td><td></td><td>0.05 ＜W≤0.1
L≤2.5</td><td>3</td></tr>
<tr><td></td><td></td><td>0.1＜W，or L>2.5</td><td>Not allowed</td></tr>
<tr><td rowspan="6">5.2.3</td><td rowspan="6">Polarizer
Dent/Bubble</td><td>Sizeφ(mm)</td><td>Acceptable Quantity</td></tr>
<tr><td>ϕ≤0.2</td><td>Ignore</td></tr>
<tr><td>0.2 ＜ ϕ≤0.3</td><td>2</td></tr>
<tr><td>0.3 ＜ ϕ≤0.5</td><td>1</td></tr>
<tr><td>0.5＜ϕ</td><td>Not allowed</td></tr>
<tr><td>Total QTY</td><td>3</td></tr>
<tr><td rowspan="11">5.2.4</td><td rowspan="11">Electrical Dot
Defect</td><td colspan="2">Bright and Black dot define:


Two Adjacent Dot</td></tr>
<tr><td colspan="2">Inspection pattern: Full white、Full black、Red、green and blue screens</td></tr>
<tr><td rowspan="2">Item</td><td colspan="3">Acceptable Quantity</td></tr>
<tr><td>I</td><td>O</td><td>Note</td></tr>
<tr><td>Black dot defect</td><td colspan="2">2</td><td rowspan="2">(5mm≤Distance)</td></tr>
<tr><td>Bright dot defect</td><td colspan="2">1</td></tr>
<tr><td>Two Adjacent Dot</td><td colspan="2">1</td><td></td></tr>
<tr><td>There or more Adjacent Dot</td><td colspan="3">Not allowed</td></tr>
<tr><td>Total Dot</td><td colspan="2">2</td><td></td></tr>
</table>

<table>
<tr><td rowspan="5">5.2.5</td><td rowspan="5">Glass defect</td><td colspan="2">1.Corner Fragment:
</td></tr>
<tr><td>Size(mm)</td><td>Acceptable Quantity</td></tr>
<tr><td>X≤3mm
Y≤1mm
Z≤T</td><td>Ignore
T：Glass thickness
X: Length
Y: Width
Z: thickness</td></tr>
<tr><td colspan="2">2. Side Fragment:
</td></tr>
<tr><td>Size(mm)</td><td>Acceptable Quantity</td></tr>
<tr><td>X≤5.0mm
Y ≤1mm
Z≤T</td><td>T：Glass thickness
X: Length
Y: Width
Z: thickness</td></tr>
</table>



I area & O area

Note: 1). Dot defect is defined as the defective area of the dot area is larger than 50% of the dot area.
2). The distance between two bright dot defects (red, green, blue, and white) should be larger than 15mm.
3). The distance between black dot defects or black and bright dot defects should be more than 5mm apart.
4). Polarizer bubble is defined as the bubble appears on active display area. The defect of polarizer bubble shall be ignored if the polarizer bubble appears on the outside of active display area.

11.6 Mechanics specification

As for the outside dimension of the modules, please refer to product specification for more details

Note: 1). Dot defect is defined as the defective area of the dot area is larger than 50% of the dot area.
2). The distance between two bright dot defects (red, green, blue, and white)

12 Precautions for Use of LCD modules

12.1 Handling Precautions

12.1.1. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

12.1.2. If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

12.1.3. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

12.1.4. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

12.1.5. If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketene

12.1.6. Do not attempt to disassemble the LCD Module.

12.1.7. If the logic circuit power is off, do not apply the input signals.

12.1.8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

12.1.8.1. Be sure to ground the body when handling the LCD Modules.

12.1.8.2. Tools required for assembly, such as soldering irons, must be properly ground.

12.1.8.3. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

12.1.8.4. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

12.2 Storage Precautions

12.2.1. When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

12.2.2. The LCD modules should be stored under the storage temperature range If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0℃ ～ 40℃ Relatively humidity: ≤80%

12.2.3. The LCD modules should be stored in the room without acid, alkali and harmful gas.

12.3 Transportation Precautions

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.