SPECIFICATIONS FOR LCD MODULE

CUSTOMER	
MODEL	**SCT050005-V01**
CUSTOMER APPROVED	

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RECORDS OF REVISIONS

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1. General Description

This Module SCT050005-V01 is TFT Liquid Crystal Display Module. This specification covers the delivery requirements for the liquid crystal display module delivered by quality to Customer.

1.1. Mechanical & Display Specifications

Item	Standard value	Unit
LCD Size	5	inch
Dot Matrix	800(RGB) ×480	pixel
Module Size	120.70 ×75.80 ×2.80	mm
Active Area	108.00 ×64.80	mm
Dot Pitch	0.135 ×0.135	mm
Pixel Configuration	R.G.B. Stripe	-
Color depth	16.7M	-
Display Mode	Normally Black, Transmissive	-
Technology Type	a-Si	-
Viewing Direction	All	-
Gray Scale Inversion Direction	All	-
Driver IC	ST7262 or Compatible	-
Interface	RGB	-
LED Numbers	12 LEDs	-
Weight	TBD	g

1.2. Interface Pin

Pin No.	Symbol	Type	Description
1	LEDK	P	LED driving cathode
2	LEDA	P	LED driving anode
3	GND	P	Ground
4	VDD	P	Power supply for system
5 – 12	R0 – R7	I	Data bus for red
13 – 20	G0 – G7	I	Data bus for green
21 – 28	B0 – B7	I	Data bus for blue
29	GND	P	Ground
30	PCLK	I	Pixel clock input
31	DISP	I	Display ON/OFF control
32	HSYNC	I	Horizontal sync input
33	VSYNC	I	Vertical sync input
34	DE	I	Data enable input
35	NC	-	No connection
36	GND	P	Ground
37	NC	-	No connection
38	NC	-	No connection
39	NC	-	No connection
40	NC	-	No connection

Note1: TYPE definition: I-----Input O---Output P----Power/Ground

2. Electrical Characteristics

2.1. Absolute Maximum Rating

Item	Symbol	Min.	Max.	Unit	Remark
Power Supply Voltage	VDD	-0.3	4	V	
Input Signal Voltage	V_{IN}	-0.3	VDD+0.3	V	Note 1
Operating Temperature	T_{OPR}	-20	+70	℃	Ambient
Storage Temperature	T_{STG}	-30	+80	℃	Ambient

Note1: VIN represent IO

2.2. DC Electrical Characteristics

2.2.1. Driving TFT LCD Panel

GND=0V, Ta=25℃

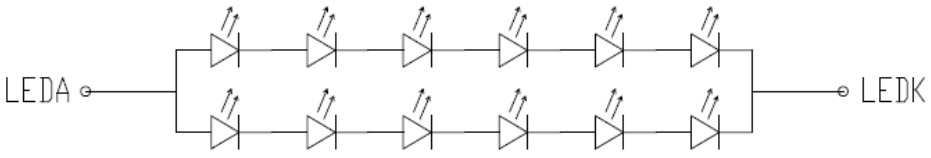
Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Operating Voltage	VDD	3.1	3.3	3.6	V	
Logic High level input voltage	V_{IH}	0.7VDD	-	VDD	V	
Logic Low level input voltage	V_{IL}	0	-	0.3VDD	V	
Logic High level output voltage	V_{OH}	VDD-0.4	-	VDD	V	I_{OH}=-0.4mA
Logic Low level output voltage	V_{OL}	0	-	0.4	V	I_{OL}=0.4mA
Power Consumption	I_{CC}	-	TBD	-	mA	

2.2.2. Driving Backlight

Ta=25℃

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Forward Current	I_F	-	40	40	mA	Note1
Forward Current Voltage	V_F	16.5	-	21	V	
Operating Life Time	-	10000			hrs	

Note 1: The figure below shows the connection of backlight LED.



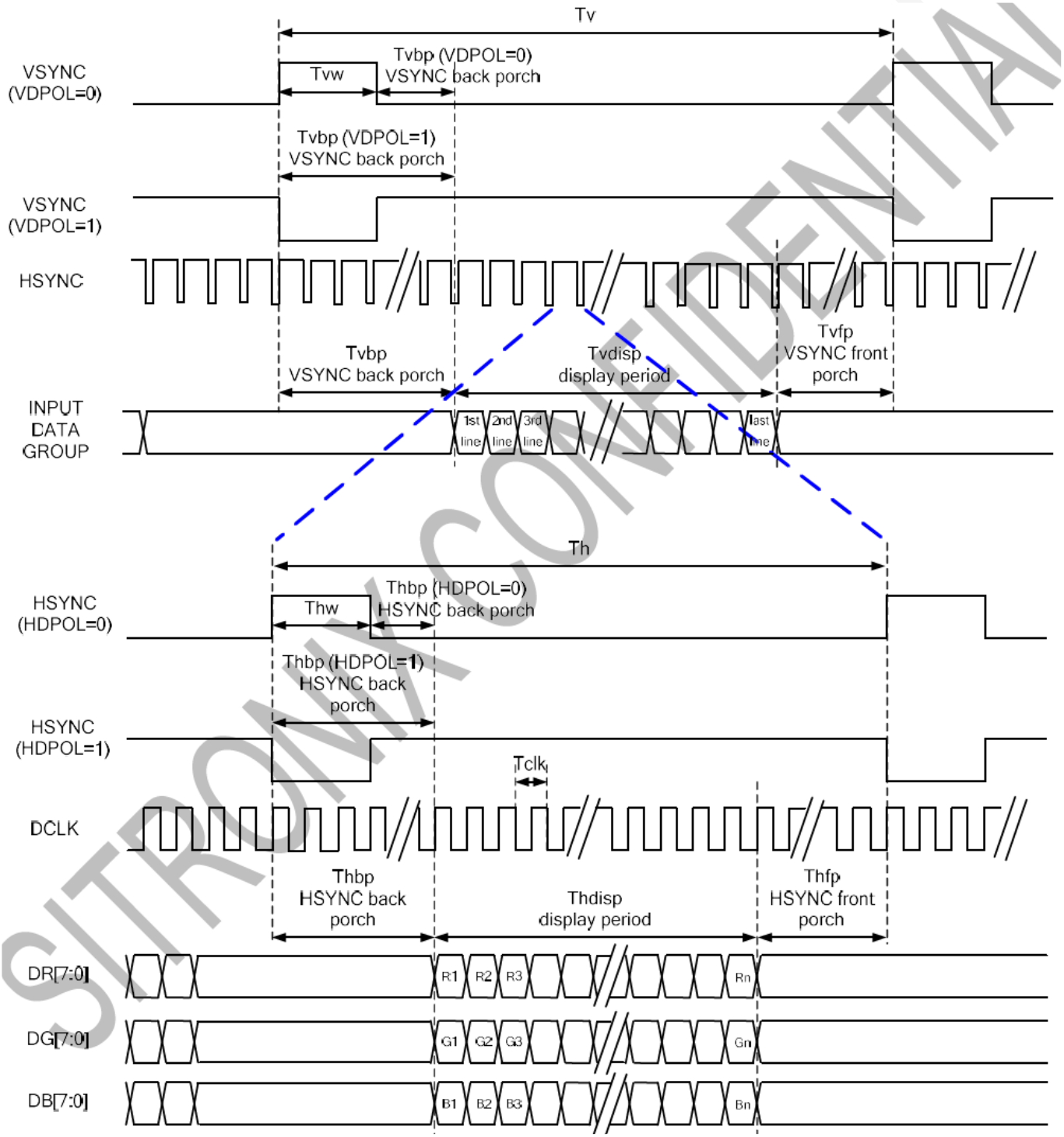
Note 2: One LED: I_F =20mA.

2.3. AC Electrical Characteristics

RGB Mode Selection Table	DCLK	HSYNC	VSYNC	DE
SYNC - DE Mode	Input	Input	Input	Input
SYNC Mode	Input	Input	Input	GND
DE Mode	Input	GND	GND	Input

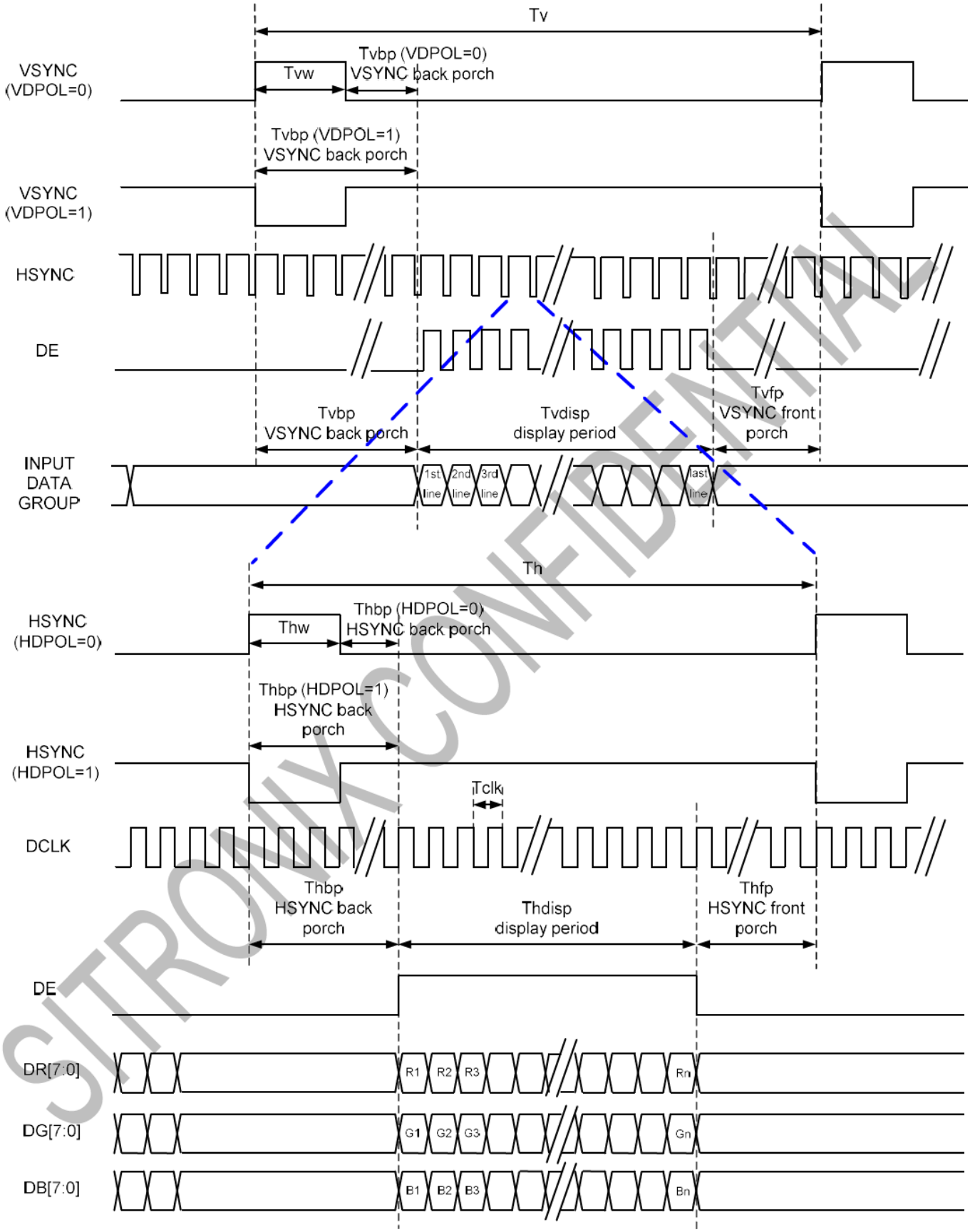
Note: "Input" means these signals are driven by host side

2.3.1. SYNC Mode



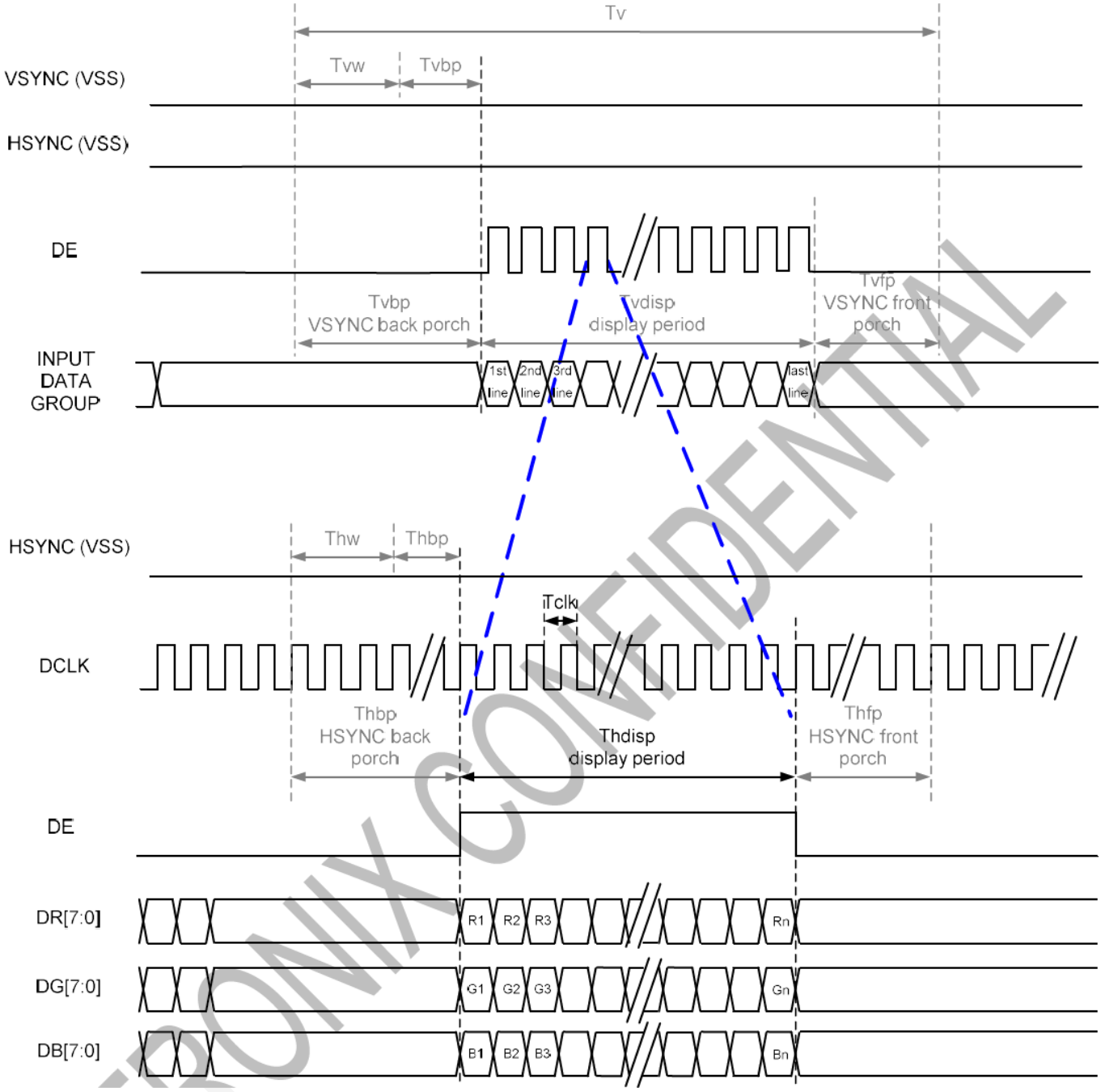
Note1: VDPOL =1. HDPOL =1.

2.3.2. SYNC-DE Mode



Note1: VDPOL =1. HDPOL =1.

2.3.3. DE Mode



Note1: VDPOL =1. HDPOL =1.

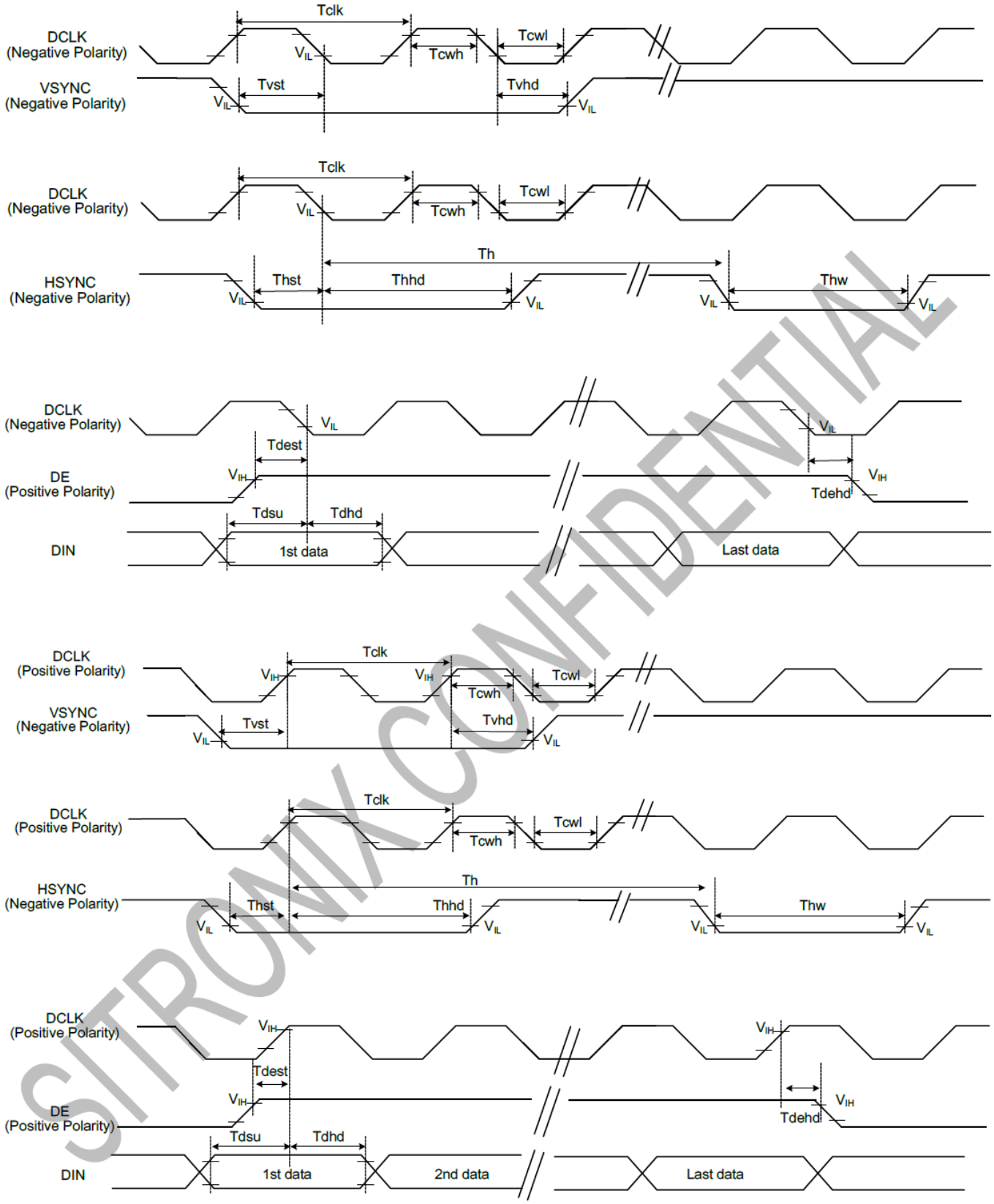
2.3.4. Parallel 24-bit RGB Input Timing Table

(VDD=3.3V, GND= 0V, TA=25°C)

Parallel 24-bit RGB Interface Timing Table							
Item		Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency		Fclk	23	25	27	MHz	
HSYNC	Period Time	Th	-	816	896	DCLK	
	Display Period	Thdisp		800		DCLK	
	Back Porch	Thbp	-	8	48	DCLK	
	Front Porch	Thfp	-	8	48	DCLK	
	Pulse Width	Thw	-	4	8	DCLK	
VSYNC	Period Time	Tv	-	496	504	HSYNC	
	Display Period	Tvdisp		480		HSYNC	
	Back Porch	Tvbp	-	8	12	HSYNC	
	Front Porch	Tvfp	-	8	12	HSYNC	
	Pulse Width	Tvw	-	4	8	HSYNC	

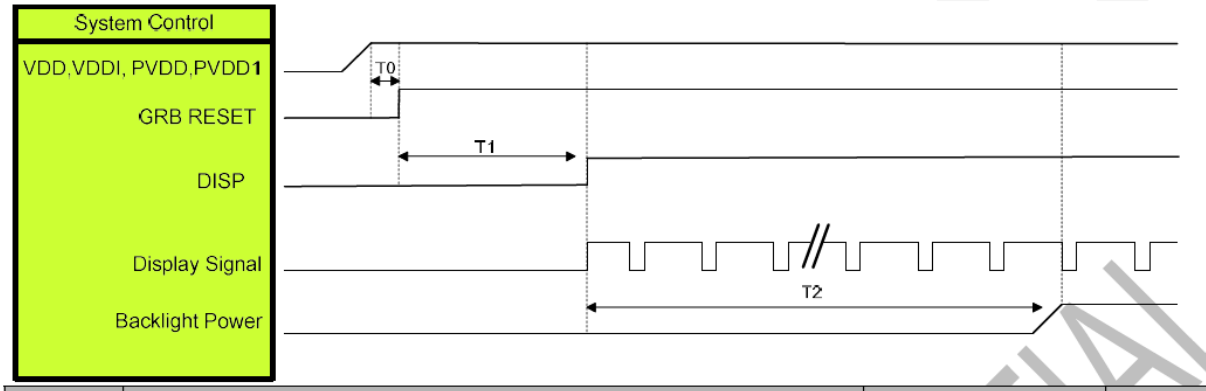
Note: The minimum blanking time depends on the GIP timing of the panel specification.

2.3.5. System Bus Timing for RGB Interface



Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLK Pulse Duty	Tcw	40	50	60	%	
VSYNC Setup Time	Tvst	-	-	10	ns	
VSYNC Hold Time	Tvhd	-	-	10	ns	
HSYNC Setup Time	Thst	-	-	10	ns	
HSYNC Hold Time	Thhd	-	-	10	ns	
Data Setup Time	Tdsu	-	-	10	ns	
Data Hold Time	Tdhd	-	-	10	ns	
DE Setup Time	Tdest	-	-	10	ns	
DE Hold Time	Tdehd	-	-	10	ns	

2.3.6. 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: RGB interface 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	100	ms

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

3. Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle		θL	CR≥10		80	-	degree	Note5
		θR			80	-		
		θT			80	-		
		θB			80	-		
Contrast Ratio		CR	θ=0° optimal	-	1500	-	-	Note3
Response Time		T_R	Ta=25℃	-	10	20	ms	Note2
		T_F		-	15	30		
Color Chromaticity	White	x	θ=0°	-0.05	0.318	+0.05	-	Note6
		y			0.341			
	Red	x			0.638			
		y			0.338			
	Green	x			0.296			
		y			0.575			
	Blue	x			0.137			
		y			0.124			
Uniformity		U	θ=0°	70	80	-	%	Note7
Luminance		L	I_F=Typ.	-	TBD	-	cd/m^2	Note8

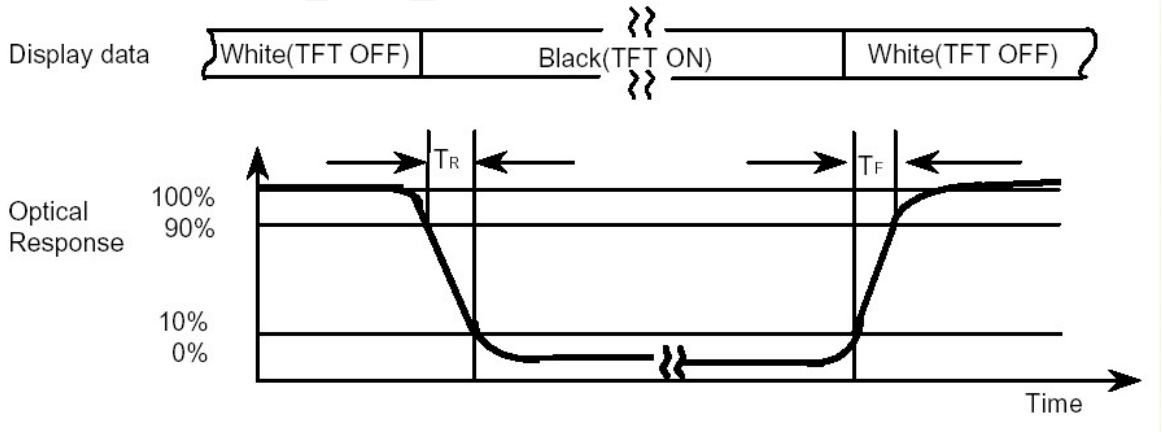
Note:

1. Test equipment setup

After stabilizing and leaving the panel alone at a given temperature for 30 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-5A with a viewing angle of 1 °at a distance of 50cm and normal direction.

2. Definition of response time: TR and TF

The figure below is the output signal of the photo detector.

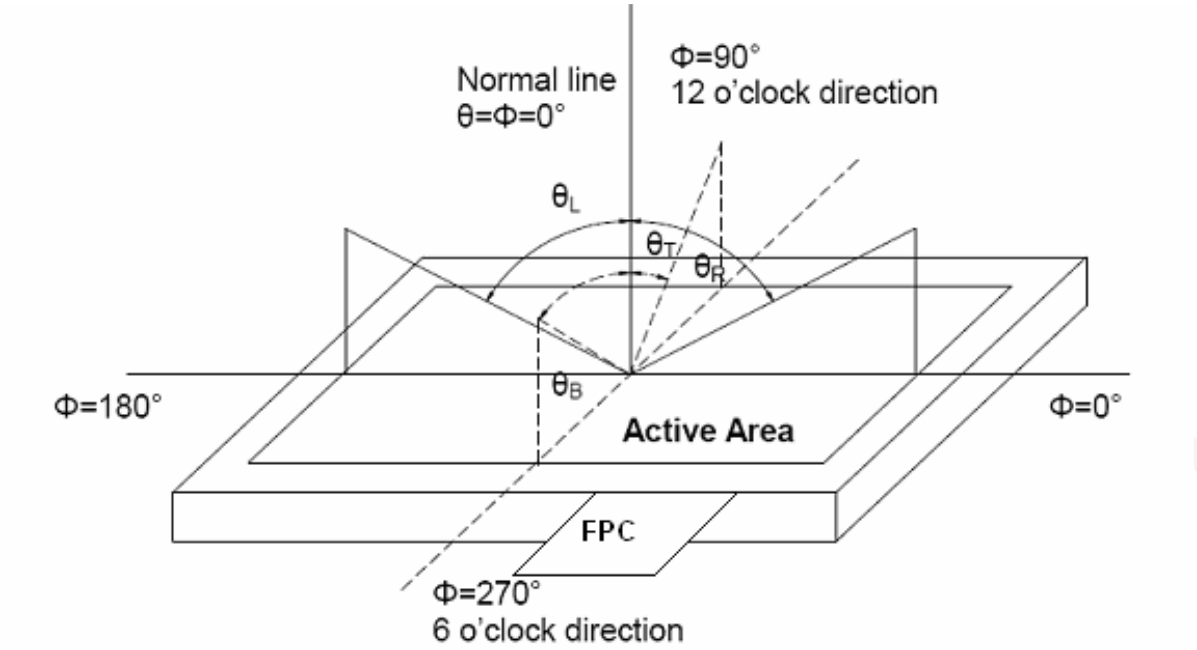


3.Definition of contrast ratio

$$CR = \frac{\text{Luminance with all pixel white}}{\text{Luminance with all pixel black}}$$

4.The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

5. Definition of viewing angle:



6. Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

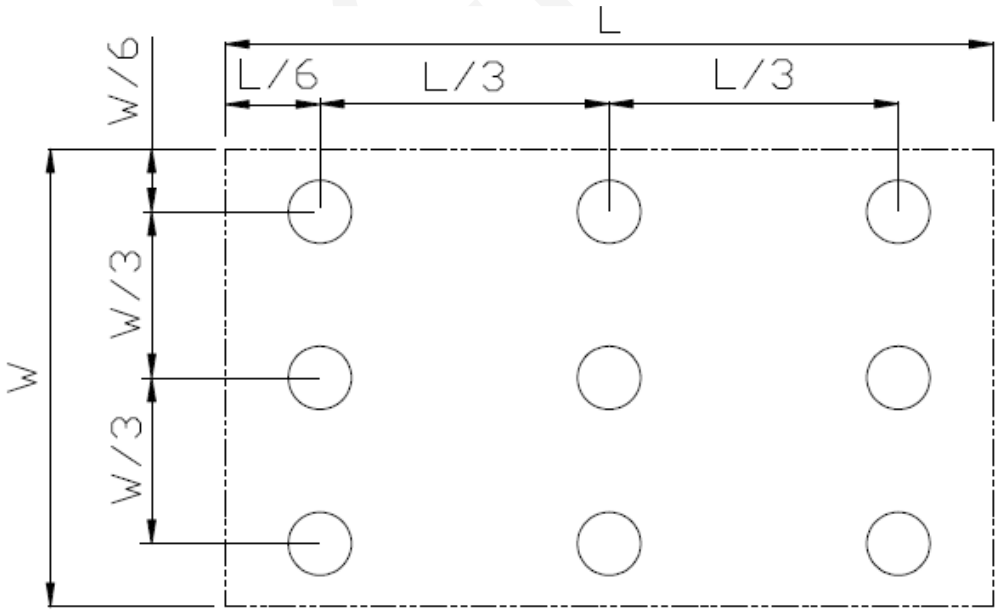
7. Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig.). 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



Lmax: The measured maximum luminance of all measurement position.

Lmin: The measured minimum luminance of all measurement position.

8. Definition of Luminance:

Measure the luminance of white state at center point.

4. Reliability

4.1. Reliability Condition

No.	Item	Condition	Remark
1	High temperature Operating	70℃, 240hrs	Finish product (With polarizer)
2	Low temperature Operating	-20℃, 240hrs	Finish product (With polarizer)
3	High temperature Storage	80℃, 240hrs	Finish product (With polarizer)
4	Low temperature Storage	-30℃, 240hrs	Finish product (With polarizer)
5	High temperature & Humidity Storage	80℃, 90%RH, 240hrs	Finish product (With polarizer)
6	Thermal Shock Storage (No operation)	-30℃, 30min. <=> 80℃,30min. 100 Cycles	Finish product (With polarizer)
7	ESD Test	Voltage: +8KV R:330Ω, C:150pF Air discharge, 10 times	Finish product (With polarizer)
8	Vibration Test	0.015G*G/Hz from 5-200HZ, -6dB/Octave from 200-500HZ 2 hours for each direction of X. Y. Z. (6 hours for total)	Finish product (With polarizer)
9	Drop Test	Packed, 60cm free fall 1 corner, 3 edges, 6 surfaces	Finish product (With polarizer)

*One single product test for only one item.

* Judgment after test: keep in room temperature for more than 2 hours.

- Current consumption < 2 times of initial value
- Contrast > 1/2 initial value
- Function: work normally

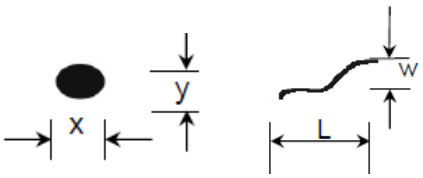
4.2. Inspection plan

Class	Item	Judgment	Class
Packing & Indicate	1.Outside and inside package	"Model no.", "lot no." and" quantity" should indicate on the package.	Minor
	2.Model mixed and quantity	Other model mixed ..... rejected. Quantity short or over ..... rejected.	Critical
	3.Product indication	"Model no." should indicate on the product	Major
Assembly	4.Dimension,LCD glass scratch and scribe defect	According to specification or drawing	Major
Appearance	5.Viewing area	Polarizer edge or LCD's sealing line is visible in the viewing area ..... rejected	Minor
	6.Blemish,black spot, white spot in the LCD and LCD glass cracks	According to standard of visual inspection (inside viewing area)	Minor
	7.Blemish,black spot White spot and scratch on the polarizer	According to standard of visual inspection (inside viewing area)	Minor
	8.Bubble in polarizer	According to standard of visual inspection (inside viewing area)	Minor
	9.LCD's rainbow color	Strong deviation color (or Newton ring) of LCD ..... rejected. Or according to limited sample (if needed, and inside viewing area)	Minor
	10.FPC	Burned area or wrong part number is on FPC. The symbol, character, and mark of FPC are unidentifiable. The stripped solder mask, A>1.0mm. 0.3mm < stripped solder mask or visible circuit, A<1.0mm,and the number is ≧4 pieces. Particle between circuits in solder mask. Circuit is peeled off or cracked. Any circuit risen or exposed. 0.2mm< Area of solder ball, A is ≦0.4mm,the number of solder ball is ≧3 pieces. The magnitude of solder ball, A is > 0.4mm.	Minor
Electrical	11.Electrical and optical characteristics (contrast, VOP, chromaticity etc.)	According to standard of visual inspection (inside viewing area)	Critical
	12.Missing pattern	Missing dot, line, character ..... rejected	Critical
	13.Short circuit, wrong pattern display	Non display, wrong pattern display, current consumption out of specification ..... rejected	Critical
	14.Pin hole, pattern deformity	According to standard of visual inspection	Minor
	15.Black spot, white spot, black line, white line, slant line, background uneven, color uneven	Strong deviation color ..... rejected Or according to limited sample full off screen (all black) ..... disregards	Minor
	16.Stick image (retention image)	Fixed test picture within two hours ..... rejected	Minor

4.3. Standard of visual inspection

<table>
<tr><th>Class</th><th>Item</th><th>Judgment</th></tr>
<tr><td>Minor</td><td>Blemish, black spot, white spot in the LCD.

Blemish, black spot, white spot and scratch on the polarizer.

Round type Line type</td><td>(A) Round type Unit: mm
<table>
<tr><th>Diameter (mm)</th><th>Acceptable Quantity</th></tr>
<tr><td>0.25 < A</td><td>0</td></tr>
</table>
Note: A = (x + y)/2 (mm)

(B) Line type Unit: mm
<table>
<tr><th>Length</th><th>Width</th><th>Acceptable Quantity</th></tr>
<tr><td>-</td><td>W≦0.03</td><td>Acceptable</td></tr>
<tr><td>L<5</td><td>0.03<W≦0.07</td><td>3</td></tr>
<tr><td>L<5</td><td>0.03<W≦0.07</td><td>1</td></tr>
<tr><td>-</td><td>0.07<W</td><td>Follow round type</td></tr>
</table></td></tr>
<tr><td>Minor</td><td>Bubble in polarizer</td><td>Unit: mm
<table>
<tr><th>Diameter (mm)</th><th>Acceptable Quantity</th></tr>
<tr><td>A < 0.3</td><td>Acceptable</td></tr>
<tr><td>0.3 < A < 0.5</td><td>1</td></tr>
<tr><td>0.5 < A</td><td>0</td></tr>
</table></td></tr>
<tr><td>Minor</td><td>Pin hole, Pattern deformity</td><td>Unit: mm
<table>
<tr><th>Diameter (mm)</th><th>Acceptable Quantity</th></tr>
<tr><td>0.4 < A</td><td>0</td></tr>
</table></td></tr>
</table>

5. Precautions

5.1. Handling Precautions

(1) Protect the panel from static, it may cause damage to the CMOS Gate Array IC.

(2) Use fingerstalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

(3) 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.

(4) The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane. Don't use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(5) Pins of I/F connector shall not be touched directly with bare hands.

(6) Refrain from strong mechanical shock and / or any force to the panel. In addition to damage, this may cause improper operation or damage to the panel.

(7) Note that polarizers are very fragile and could be easily damaged. Do not press or scratch the surface harder than a B pencil lead.

(8) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, staining and discoloration may occur.

(9) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.

5.2. Storage Precautions

(1) Do not leave the panel in high temperature, and high humidity for a long time. It is highly recommended to store the panel with temperature from 0 to 35℃ and relative humidity of less than 70%.

(2) The panel shall be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during the store.

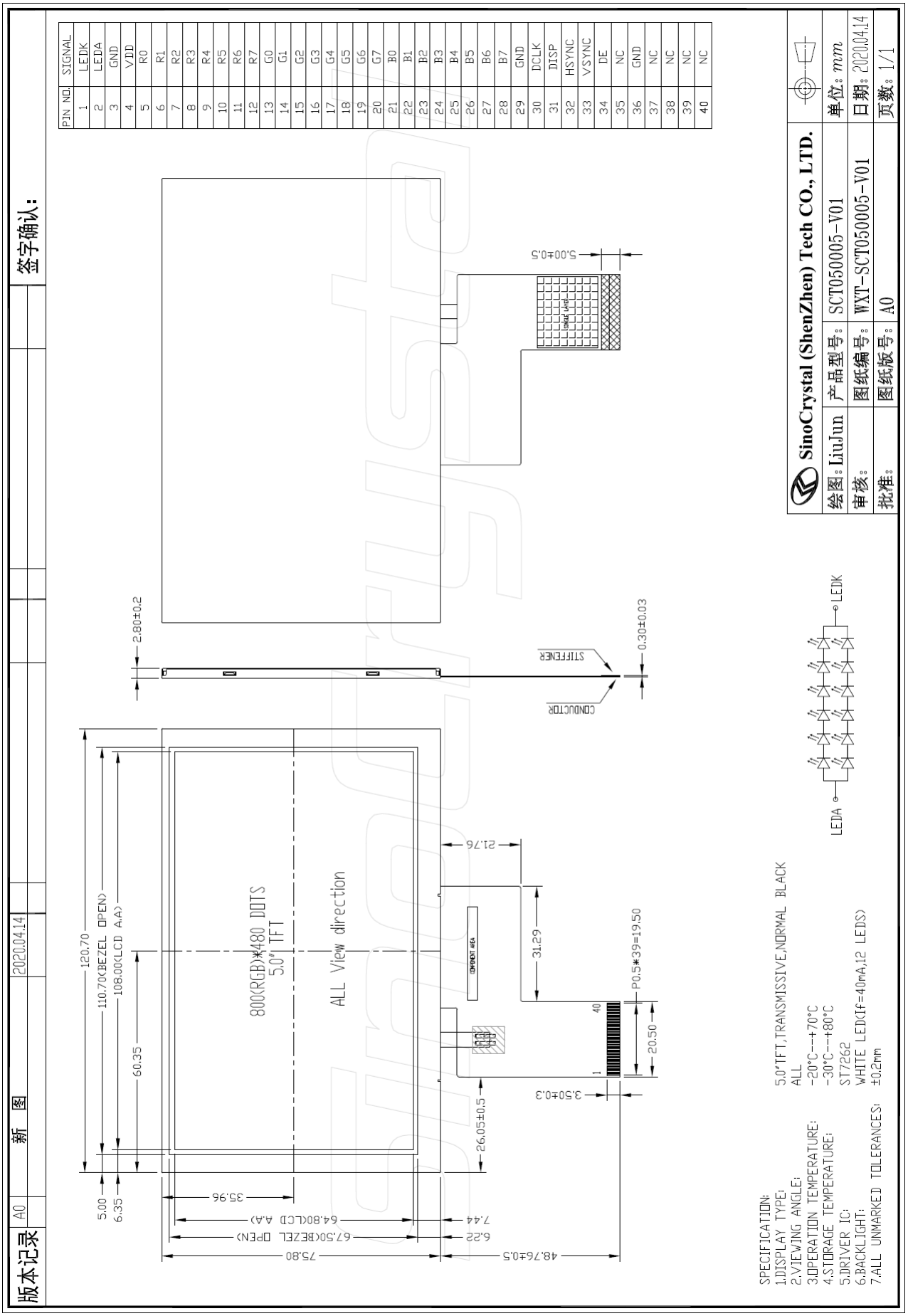
5.3. Operation Precautions

(1) The LCD shall be operated within the limits specified. Operation at values outside of these limits may shorten life, and/or harm display images.

(2) Do not exceed the absolute maximum rating value. (the supply voltage variation, Input voltage variation in part contents and environmental temperature and so on). Otherwise the panel may be damaged.

(3) If the panel displays the same pattern continuously for a long period of time, it can be the situation when the image" Sticks" to the screen.

6. Outline Dimension



7. Packing method

7.1. Packing Quantity

TBD.

7.2. Flowing chart

TBD.