


SPECIFICATIONS FOR LCD MODULE

CUSTOMER	
MODEL	SCT035019-V01
CUSTOMER APPROVED	

APPROVED BY	CHECKED BY	ORGANIZED BY
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0158

RECORDS OF REVISIONS

Revision No	Revision Date	Description
Ver: A0	2018-12-16	First release

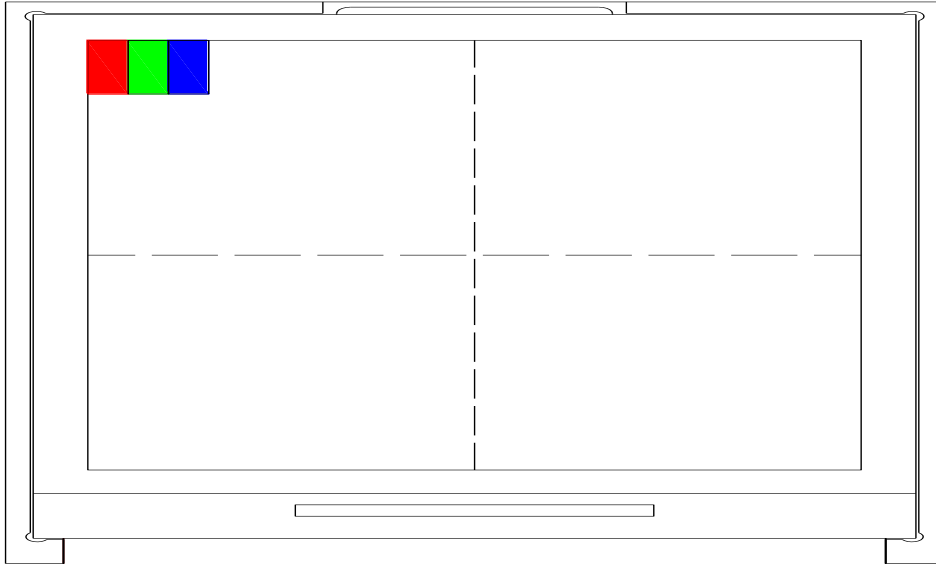
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1. General Description

This LCM **SCT035019-V01** is a TFT LCD module, **480 (RGB) x 272** dots graphic, and power supply circuit. Display mode is **Normal Black**, The 16.7M color can be display.

This TFT-LCD has **3.5** inch diagonally measured active display area with **QVGA** resolution.



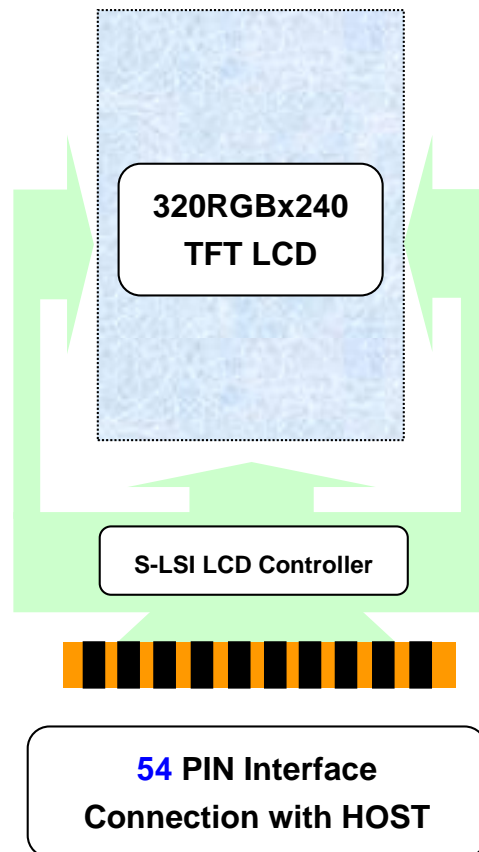
1.1 Mechanical Specifications

Item	Nominal Dimension	Unit
Dot Matrix	320 x RGB x 240	Dots
Module Size (W×H×T)	76.9 x 63.9 x 3.27	mm.
Active Area (W×H)	70.08 x 52.56	mm.
Pixel arrangement	RGB Stripe	mm.
Dot Pitch (W×H)	0.219 x 0.219	mm.
Color depth	262K (MAX)	colors
Interface	Parallel 24-bit RGB	-
Driving IC	ST7272A	-

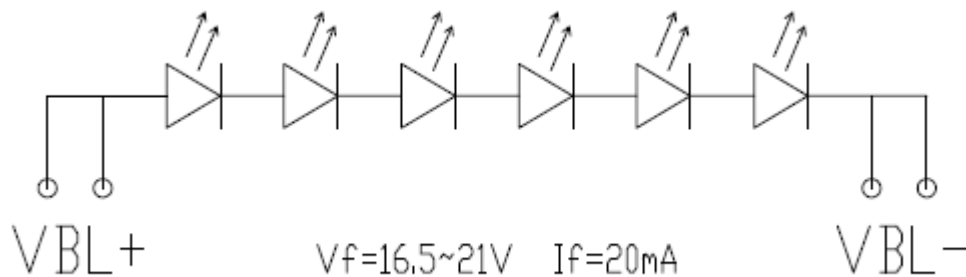
1.2 Display Specifications

Item	Nominal Dimension	Unit
Operating temperature	-20 ~70	°C
Storage temperature	-30~80	°C
LCD Type	a-Si TFT	-
LCD Mode	Normal BLACK	-
Backlight Type	LED x 6	PCS

1.3 Block Diagram



1.4 Back-light Unit

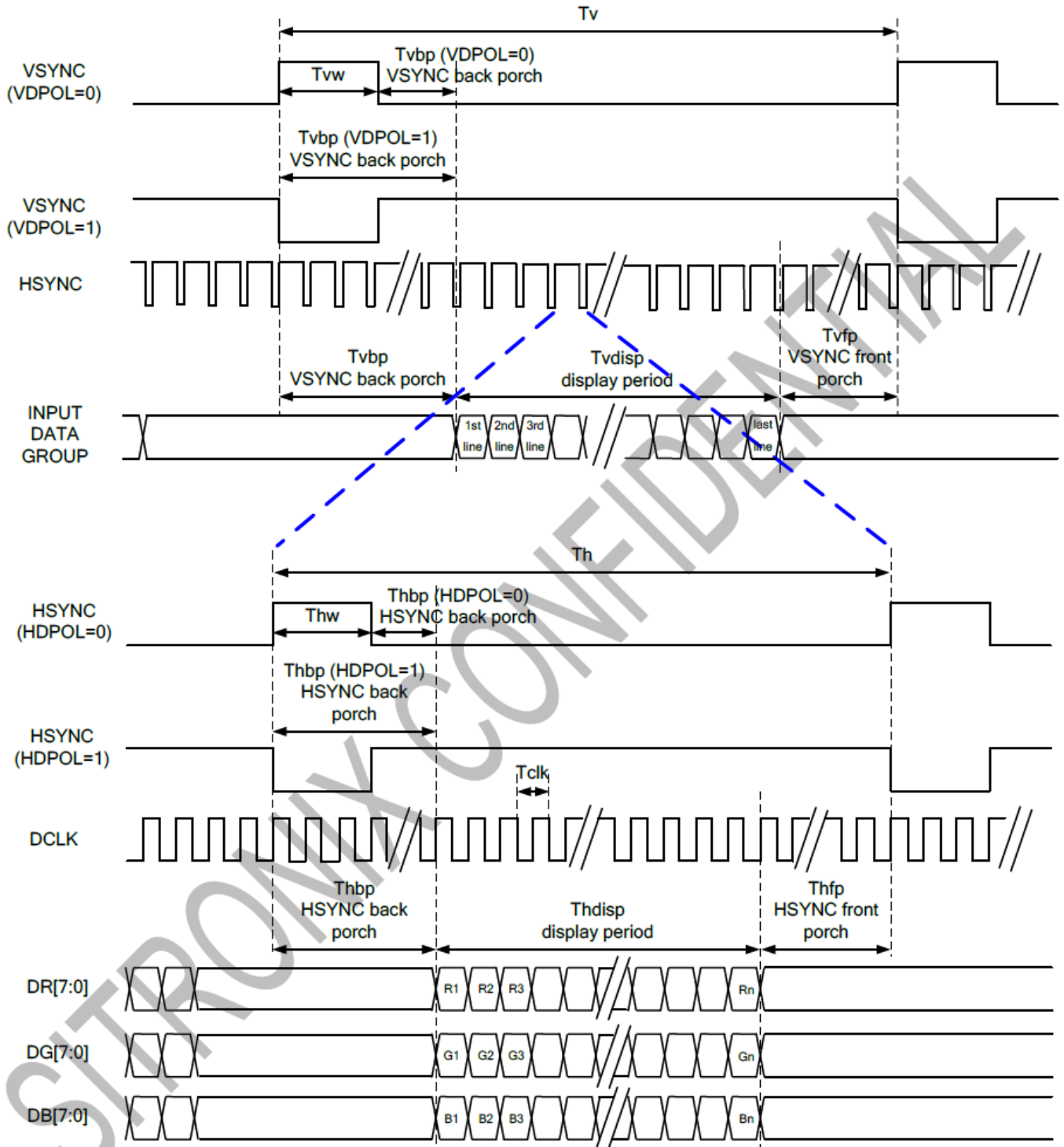


1.5 Interface Pin

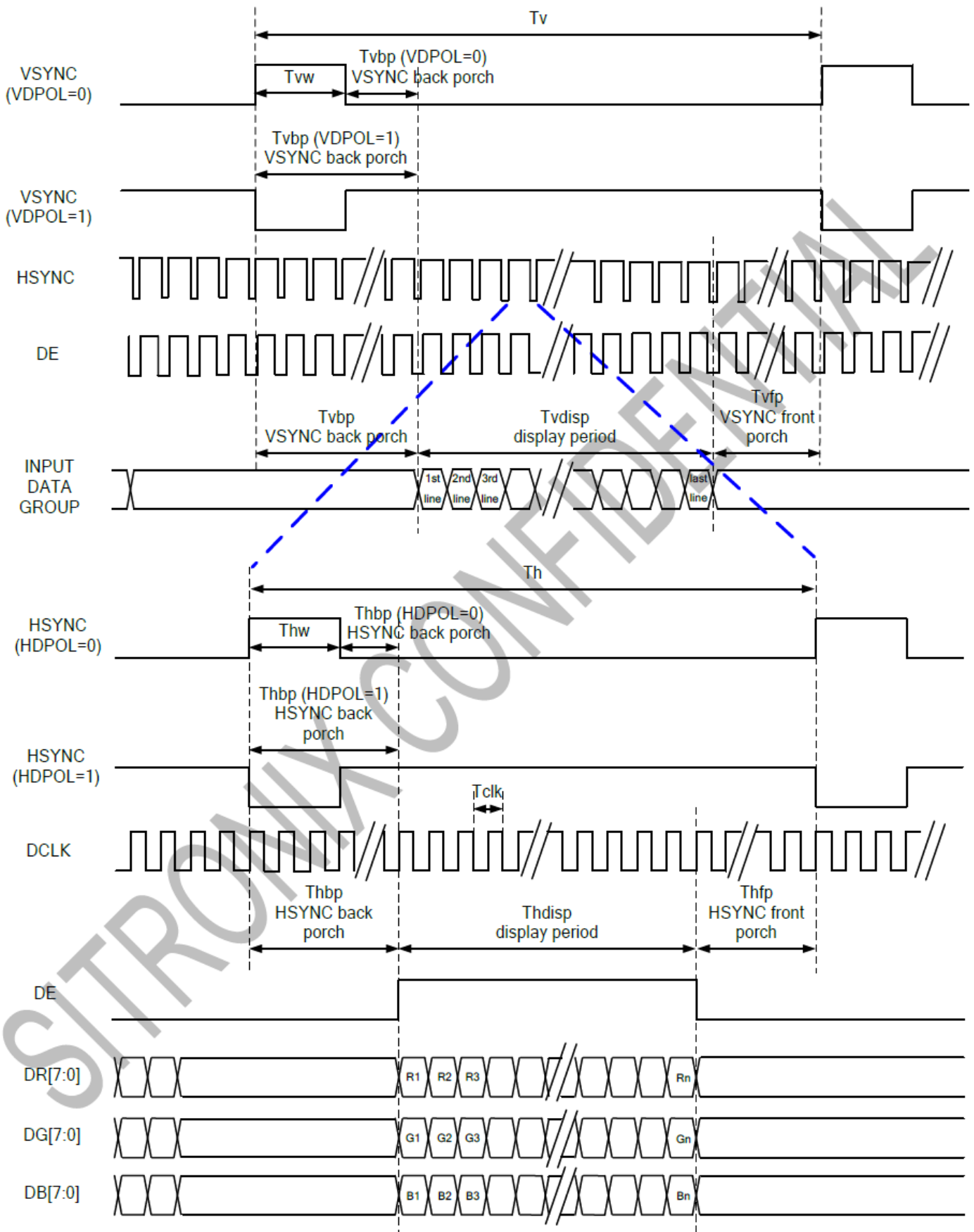
Pin No	Pin Symbol	Type	Description
1	VBL-	P	Backlight Power, cathode.
2	VBL-	P	Backlight Power, cathode.
3	VBL+	P	Backlight Power, anode.
4	VBL+	P	Backlight Power, anode.
5	NC	-	No connection
6	NC	-	No connection
7	NC	-	No connection
8	RESET	I	Hardware reset
9	CS	I	SPI Interface Chip Select
10	SCL	I	SPI Interface Data Clock
11	SDA	IO	SPI Interface Data
12-19	B0-B7	I	8 bit data bus display blue data
20-27	G0-G7	I	8 bit data bus display green data
28-35	R0-R7	I	8 bit data bus display red data
36	HSYNC	I	Horizontal sync input
37	VSYNC	I	Vertical sync input
38	DCLK	I	Pixel clock input
39	NC	-	No connection
40	NC	-	No connection
41	VCC	P	Power supply
42	VCC	P	Power supply
43	NC	-	No connection
44	NC	-	No connection
45	NC	-	No connection
46	NC	-	No connection
47	NC	-	No connection
48	NC	-	No connection
49	NC	-	No connection
50	NC	-	No connection
51	NC	-	No connection
52	DEN	I	Data enable input
53	GND	P	Ground
54	GND	P	Ground

2. Interface Timing

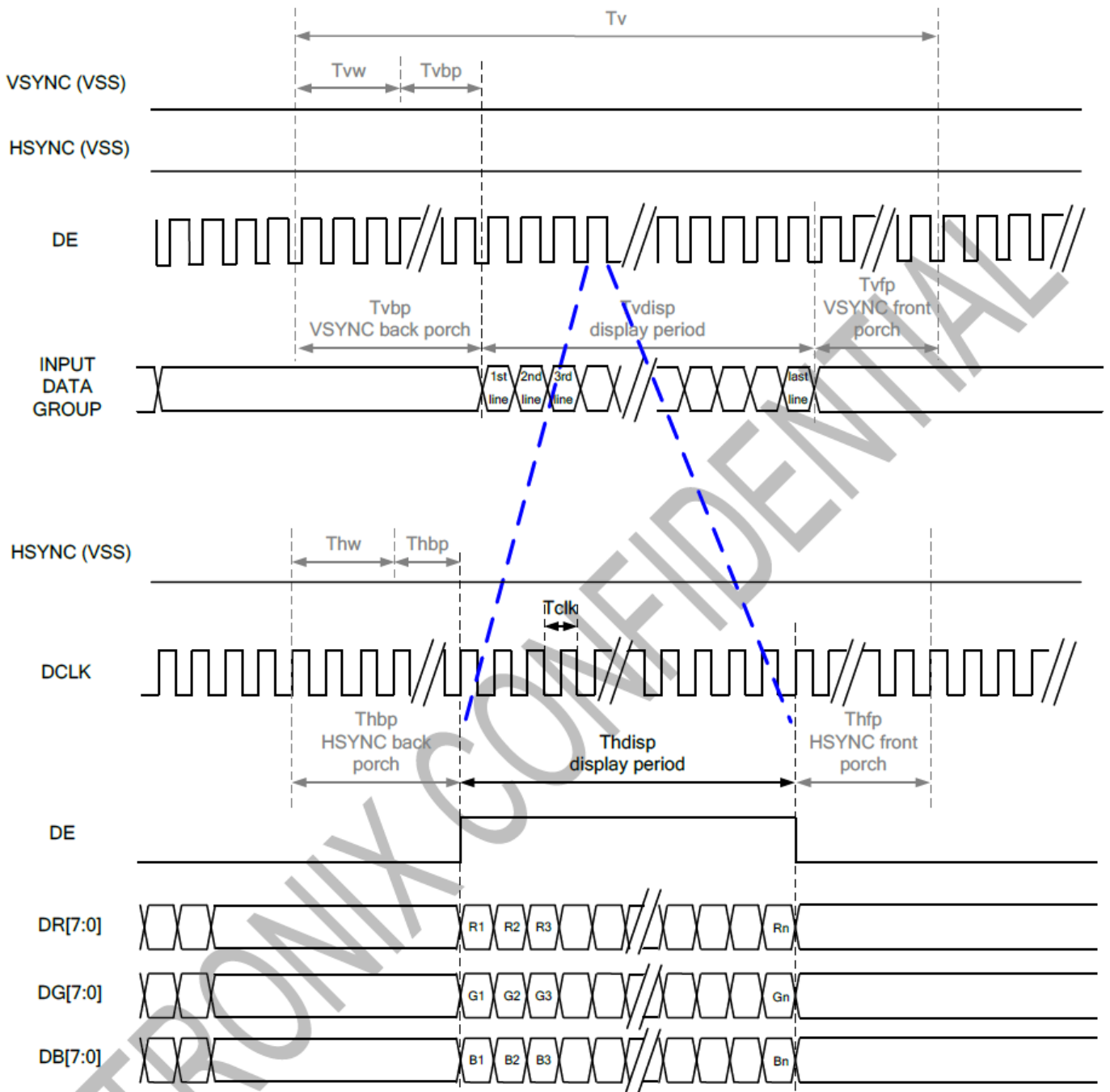
SYNC Mode



SYNC-DE Mode



DE Mode



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

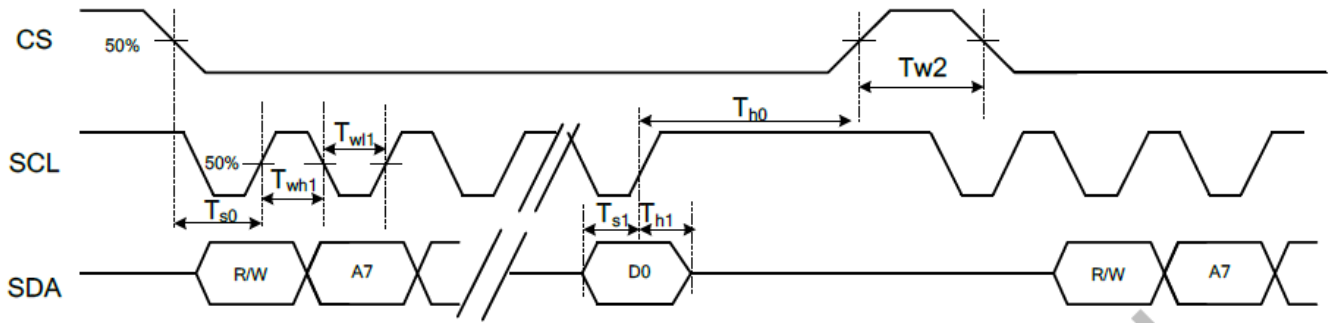
Note: "Input" means these signals are driven by host side.

Parallel 24-bit RGB Input Timing (PVDD=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C)

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	

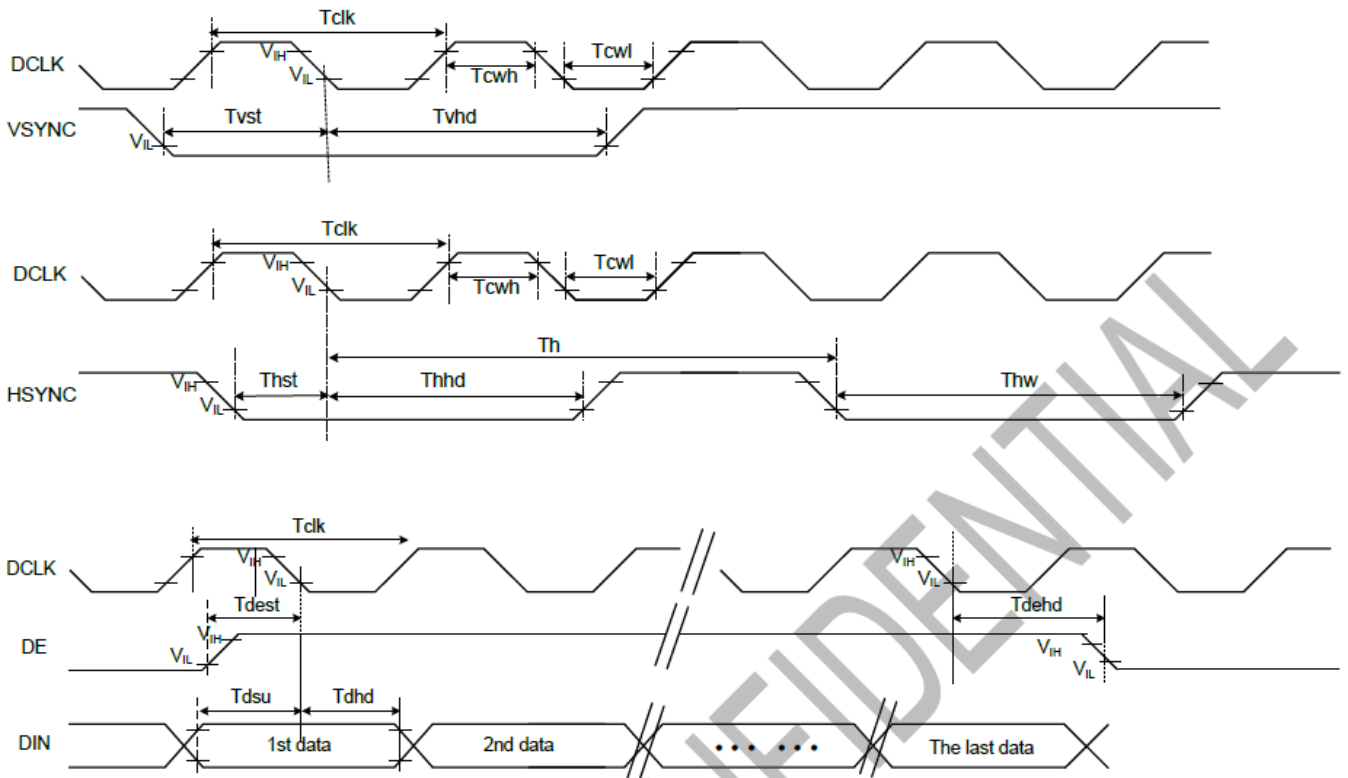
Note: It is necessary to keep Tvbp =12 and Thbp =43 in sync mode. DE mode is unnecessary to keep it.

Timing for 3-Wire SPI Interface



Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
CS Input Setup Time	Ts0	50	-	-	ns	
Serial Data Input Setup Time	Ts1	50	-	-	ns	
CS Input Hold Time	Th0	50	-	-	ns	
Serial Data Input Hold Time	Th1	50	-	-	ns	
SCL Write Pulse High Width	Twh1	50	-	-	ns	
SCL Write Pulse Low Width	Twl1	50	-	-	ns	
SCL Read Pulse High Width	Trh1	300			ns	
SCL Read Pulse Low Width	Trl1	300			ns	
CS Pulse High Width	Tw2	400	-	-	ns	

System Bus Timing for RGB Interface



Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLK Pulse Duty	T_{clk}	40	50	60	%	
HSYNC Width	T_{hw}	2	-	-	DCLK	
HSYNC Period	T_h	55	60	65	us	
VSYNC Setup Time	T_{vst}	12	-	-	ns	
VSYNC Hold Time	T_{vhhd}	12	-	-	ns	
HSYNC Setup Time	T_{hst}	12	-	-	ns	
HSYNC Hold Time	T_{hhhd}	12	-	-	ns	
Data Setup Time	T_{dsu}	12	-	-	ns	
Data Hold Time	T_{dhhd}	12	-	-	ns	
DE Setup Time	T_{dest}	12	-	-	ns	
DE Hold Time	T_{dehd}	12	-	-	ns	

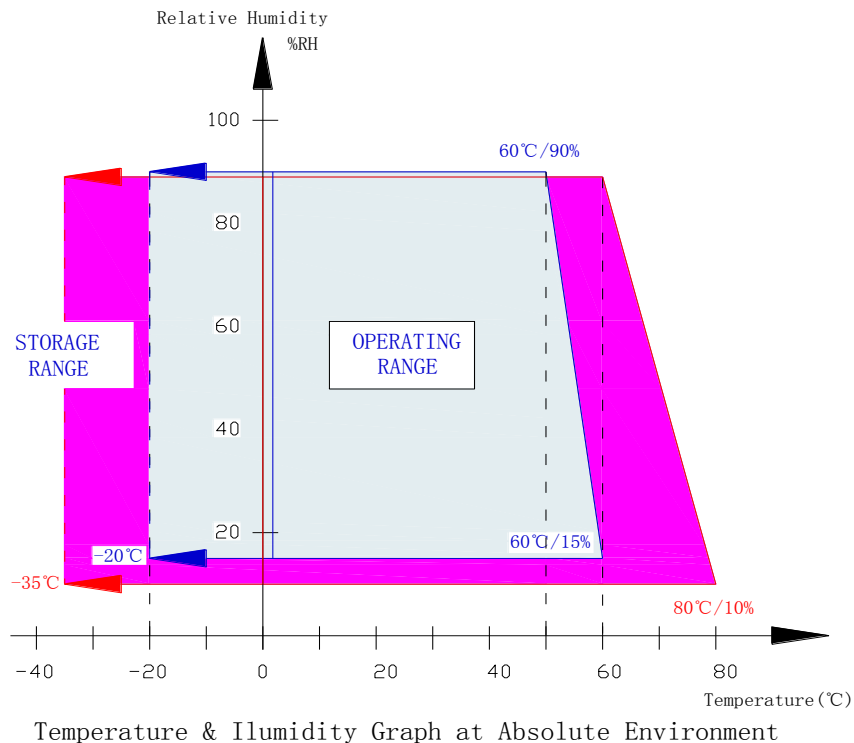
3. Electrical Characteristics

3.1 Absolute Maximum Ratings

Item	Symbol	Min	Max	Unit
Supply voltage for System	VCC	0	4.0	V
Supply voltage for backlight	VBL+	0	21.0	V
Operate temperature range	TOP	-20	70	°C
Storage temperature range	TST	-30	80	°C

Note:

- (1) 90%RH maximum humidity, 60°C maximum wet-bulb temperature When operated at a temperature lower than 0°C, the LCD worked slowly and the screen appeared low-contrast images due to the characteristics of LC(Liquid Crystal).
- (2) If any fixed pattern is displayed on LCD for minutes, image-sticking phenomenon may occur.
- (3) Degradation could occur to pixels' TFT when DC BIOS is input into its gate-signal under POWER OFF WAITING STAND-BY & SLEEP MODE. Therefore, LCD should be turn off then.
- (4) Please operate a LCD module on the basis of the recommended S/W(Register)



DATA). If you want to change any part of the S/W, you must take driver's confirmation.

3.2 DC Characteristics

T_a= 25°C

Item	Symbol	Min	Typ	Max	Unit	Condition
Supply voltage for System	VCC	3.0	3.3	3.6	V	
Input high level voltage	V _{IH}	0.8VCC	--	VCC	V	
Input low level voltage	V _{IL}	0	--	0.2VCC	V	
Power supply current	I _{DD}	--	--	-	mA	
Backlight forward voltage	V _F	16.5	--	21	V	
Backlight forward current	I _F	--	15	20	mA	

4. Optical characteristics

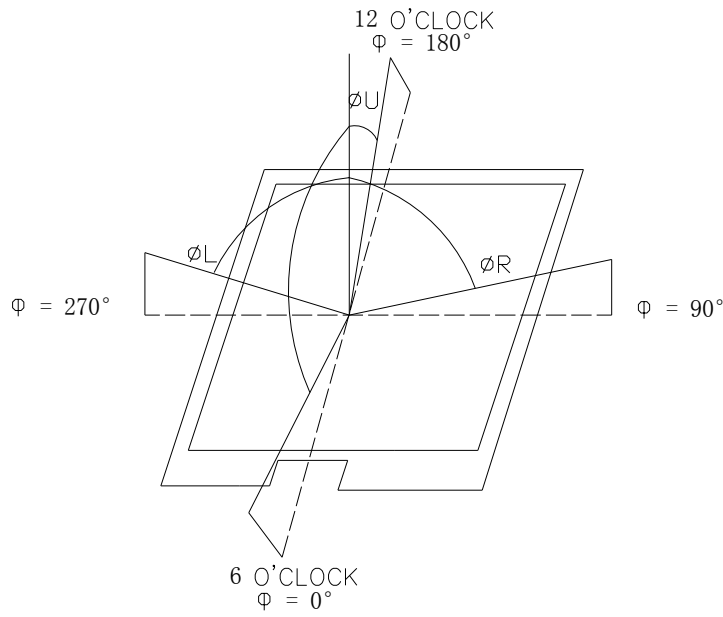
Parameter		Symbol	Condition	Min	Typ	Max	Unit	Note
Viewing angle		Left	CR _≥ 10		80		Degree	(2)
		Right			80		Degree	
		Up			80		Degree	
		Down			80		Degree	
Color Chromaticity	Red	R _x	θ=0 Normal viewing angle	-0.05	0.646	+0.05	-	Color Chromaticity
		R _y			0.332		-	
	Green	G _x			0.323		-	
		G _y			0.567		-	
	Blue	B _x			0.134		-	
		B _y			0.121		-	
	White	W _x			0.317		-	
		W _y			0.339		-	
Contrast ratio		CR	optimal	640	800		-	(1)
Response time		Tr+Tf			30	40	ms	(3)
Luminance on surface		L _v	Normally θ _x = θ _y = 0	300	400	-	cd/m ²	

Note (1) Definition of contrast ratio

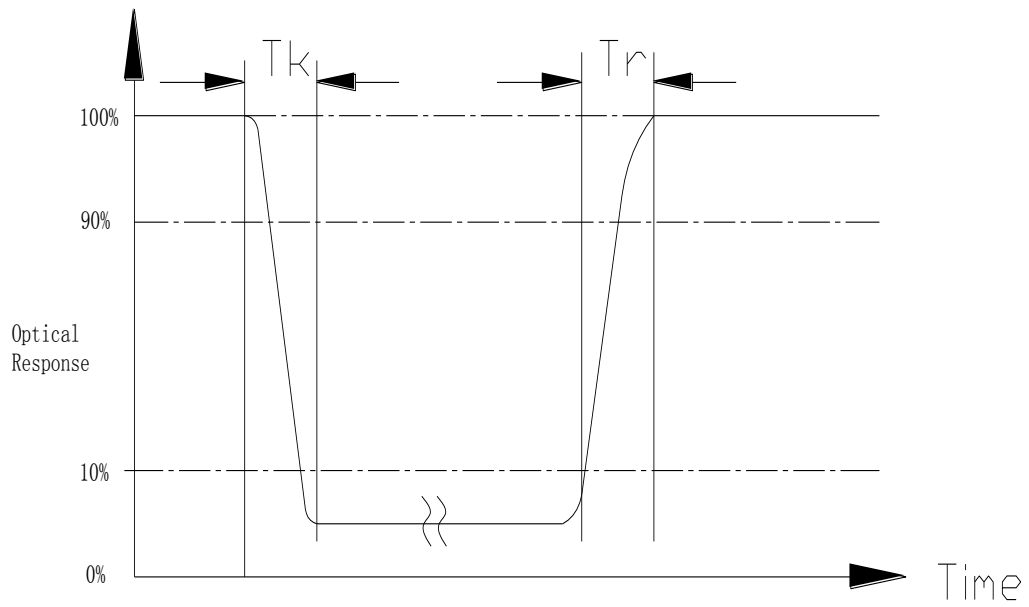
Measured at the center point of panel

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

Note (2) Definition of viewing angle



Note (3) Definition of response time: Tr+Tf



5. Reliability

5.1 Reliability Condition

*One single product test for only one item.

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

Item No	Item	Condition	Remark
1	High temperature Operating	60°C, 120Hours	Finish product (With polarizer)
2	Low temperature Operating	-10°C, 120 Hours	Finish product (With polarizer)
3	High temperature Storage	70°C, 200 Hours	Finish product (With polarizer)
4	Low temperature Storage	-20°C, 200 Hours	Finish product (With polarizer)
5	High temperature & humidity Storage	50°C, 90%RH, 120 Hours	Finish product (With polarizer)
6	Thermal Shock Storage (No operation)	-10°C , 30min.<=> 60°C , 30min. 10 Cycles	Finish product (With polarizer)
7	ESD test	Voltage:±8KV R:330 ohm,C:150pF Air discharge,10 times	Finish product (With polarizer)
8	Vibration test	10 => 55 =>10 => 55 => 10 Hz, within 1 minute;Amplitude:1.5mm. 15 minutes for each Direction (X,Y,Z)	Finish product (With polarizer)
9	Drop test	Packed, 100CM free fall 6 sides, 1 corner, 3edges	Finish product (With polarizer)

Current consumption < 2 times of initial value

- Contrast > 1/2 initial value

- Function: work normally

5.2 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 arearejected	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 LCDrejected. 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

5.3 Standard of visual inspection

Class	Item	Judgment	Class
Electrical	11.Electrical and optical characteristics (contrast、VOP、chromaticity...etc)	According to specification or drawing. (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

Class	Item	Judgment														
Minor	. Blemish、 black spot、 white spot in the LCD.	<p>(A) Round type: unit: mm</p> <table border="1"> <thead> <tr> <th>Diameter (mm.)</th> <th>Acceptable Q'ty</th> </tr> </thead> <tbody> <tr> <td>0.2<A</td> <td>0</td> </tr> </tbody> </table> <p>Note: A= (Length +Width) / 2</p>	Diameter (mm.)	Acceptable Q'ty	0.2<A	0										
	Diameter (mm.)	Acceptable Q'ty														
0.2<A	0															
. Blemish、 black spot、 white spot and scratch on th polarizer	<p>(B) Liner type: unit: mm</p> <table border="1"> <thead> <tr> <th>Length</th> <th>Width</th> <th>Acceptable Q'ty</th> </tr> </thead> <tbody> <tr> <td>---</td> <td>$W \leq 0.03$</td> <td>Disregard</td> </tr> <tr> <td>$L \leq 5$</td> <td>$0.03 < W \leq 0.05$</td> <td>3</td> </tr> <tr> <td>$L \leq 5$</td> <td>$0.05 < W \leq 0.07$</td> <td>1</td> </tr> <tr> <td>---</td> <td>$0.07 < W$</td> <td>Follow round type</td> </tr> </tbody> </table>	Length	Width	Acceptable Q'ty	---	$W \leq 0.03$	Disregard	$L \leq 5$	$0.03 < W \leq 0.05$	3	$L \leq 5$	$0.05 < W \leq 0.07$	1	---	$0.07 < W$	Follow round type
Length	Width	Acceptable Q'ty														
---	$W \leq 0.03$	Disregard														
$L \leq 5$	$0.03 < W \leq 0.05$	3														
$L \leq 5$	$0.05 < W \leq 0.07$	1														
---	$0.07 < W$	Follow round type														
Minor	Bubble in polarizer	<p>unit: mm</p> <table border="1"> <thead> <tr> <th>Diameter</th> <th>Acceptable Q'ty</th> </tr> </thead> <tbody> <tr> <td>$A \leq 0.3$</td> <td>Disregard</td> </tr> <tr> <td>$0.3 < A \leq 0.5$</td> <td>1</td> </tr> <tr> <td>$0.5 < A$</td> <td>0</td> </tr> </tbody> </table>	Diameter	Acceptable Q'ty	$A \leq 0.3$	Disregard	$0.3 < A \leq 0.5$	1	$0.5 < A$	0						
Diameter	Acceptable Q'ty															
$A \leq 0.3$	Disregard															
$0.3 < A \leq 0.5$	1															
$0.5 < A$	0															
Minor	Pin hole、 Pattern deformity	<p>unit: dot size</p> <table border="1"> <thead> <tr> <th>Diameter</th> <th>Acc. Q'ty</th> </tr> </thead> <tbody> <tr> <td>$0.4 < \Phi$</td> <td>0</td> </tr> </tbody> </table>	Diameter	Acc. Q'ty	$0.4 < \Phi$	0										
Diameter	Acc. Q'ty															
$0.4 < \Phi$	0															

6. Precaution

6.1 Handling

- (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.

6.2 Storage

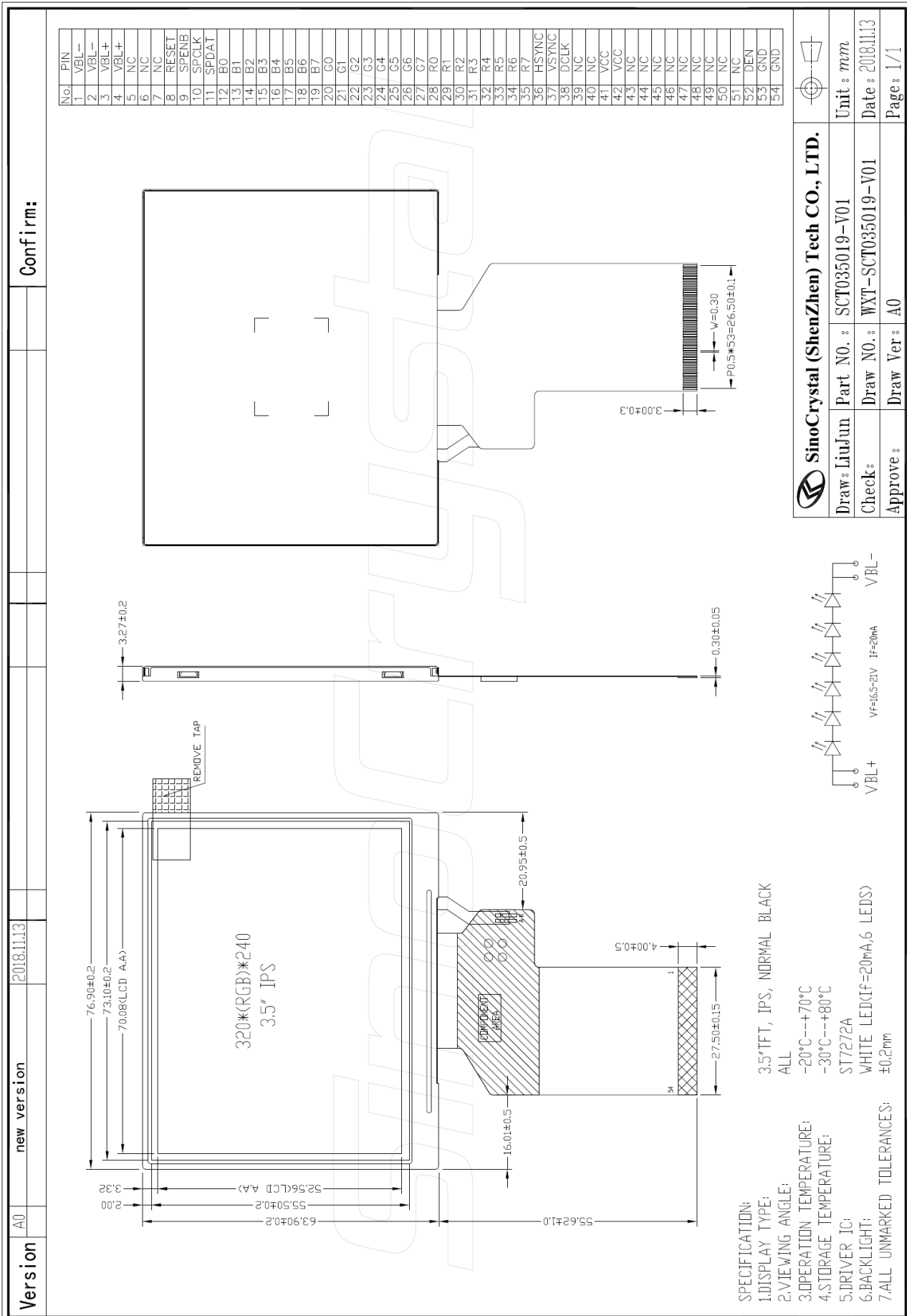
- (1) Do not leave the panel in high temperature, and high humidity for a long time. It is highly recommended to store the panel with temperature from 0 to 35°C and relative humidity of less than 70%.
- (2) The panel shall be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during the store.

6.3 Operation

- (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.

7. Outline Dimension

Refer to SCT035019-V01 drawing.



8. Packing method

8.1 Packing Quantity (TBD)

8.2 Flowing chart (TBD)