


SPECIFICATIONS FOR LCD MODULE

CUSTOMER	
MODEL	SCT070013-V01
CUSTOMER APPROVED	

APPROVED BY	CHECKED BY	ORGANIZED BY
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0158

RECORDS OF REVISIONS

Revision No	Revision Date	Description
Ver: A0	2019-11-06	First release

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1. General Description

This LCM **SCT070013-V01** is a TFT LCD module, **1024 (RGB) x 600** dots graphic, and power supply circuit. Display mode is **Normal Black**, The 16.7M color can be display.

This TFT-LCD has **7.0** inch diagonally measured active display area with **WSVGA** resolution.

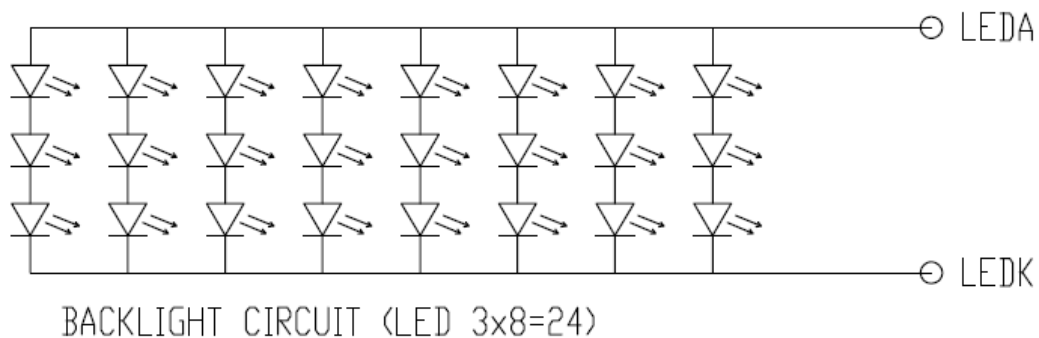
1.1 Mechanical Specifications

Item	Nominal Dimension	Unit
Dot Matrix	1024 x RGB x 600	Dots
Module Size (W×H×T)	163.8 x 97.0 x 2.71	mm.
Active Area (W×H)	154.21 x 85.92	mm.
Pixel arrangement	RGB Stripe	mm.
Dot Pitch (W×H)	0.1506 x 0.1432	mm.
Color depth	16.7M (MAX)	colors
Interface	MIPI	-
Driving IC	EK79007 or Compatible	-

1.2 Display Specifications

Item	Nominal Dimension	Unit
Operating temperature	-20 ~70	□
Storage temperature	-30~80	□
LCD Type	a-Si TFT	-
LCD Mode	Normal Black	-
Backlight Type	LED x 24	PCS

1.3 Back-light Unit

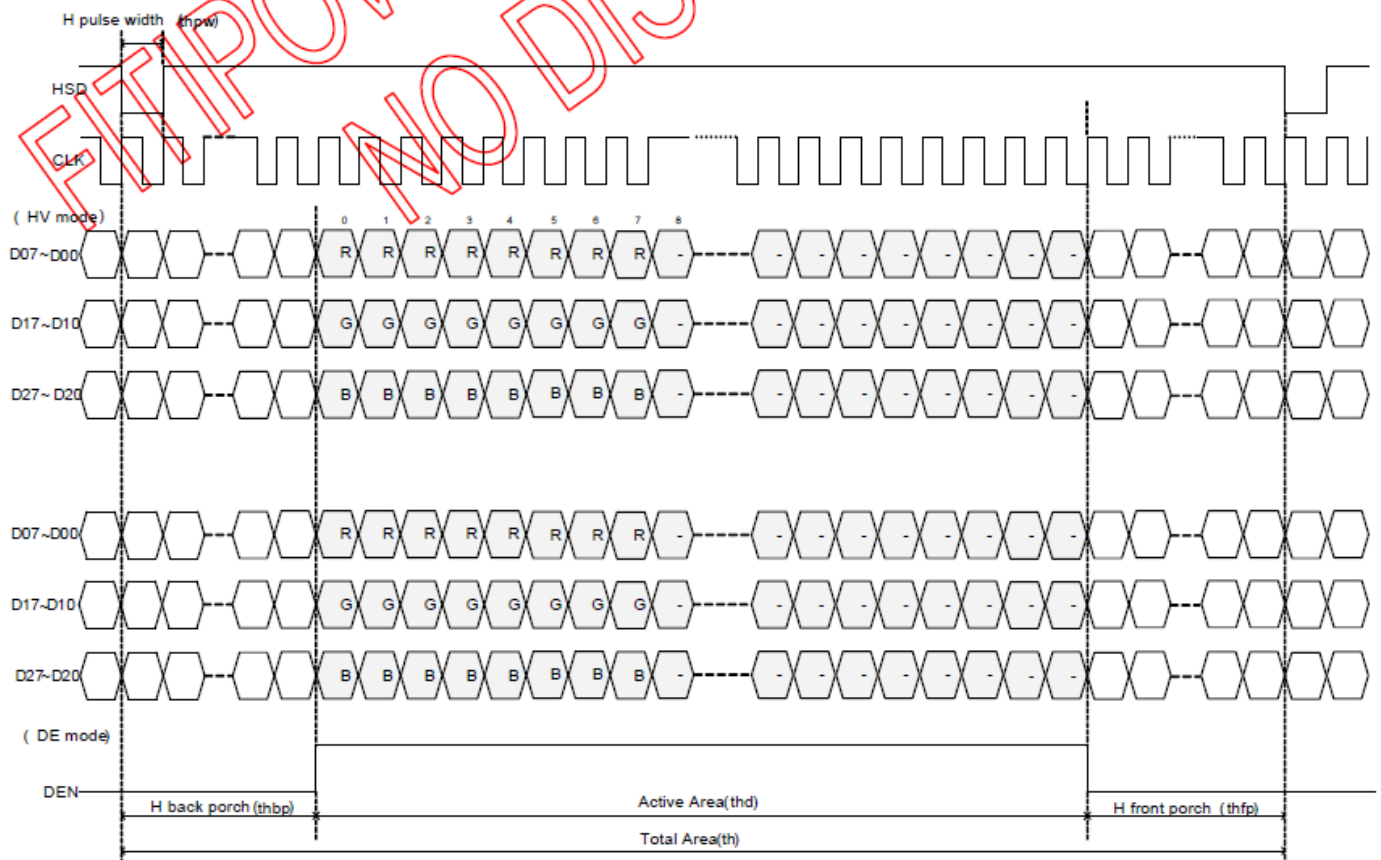
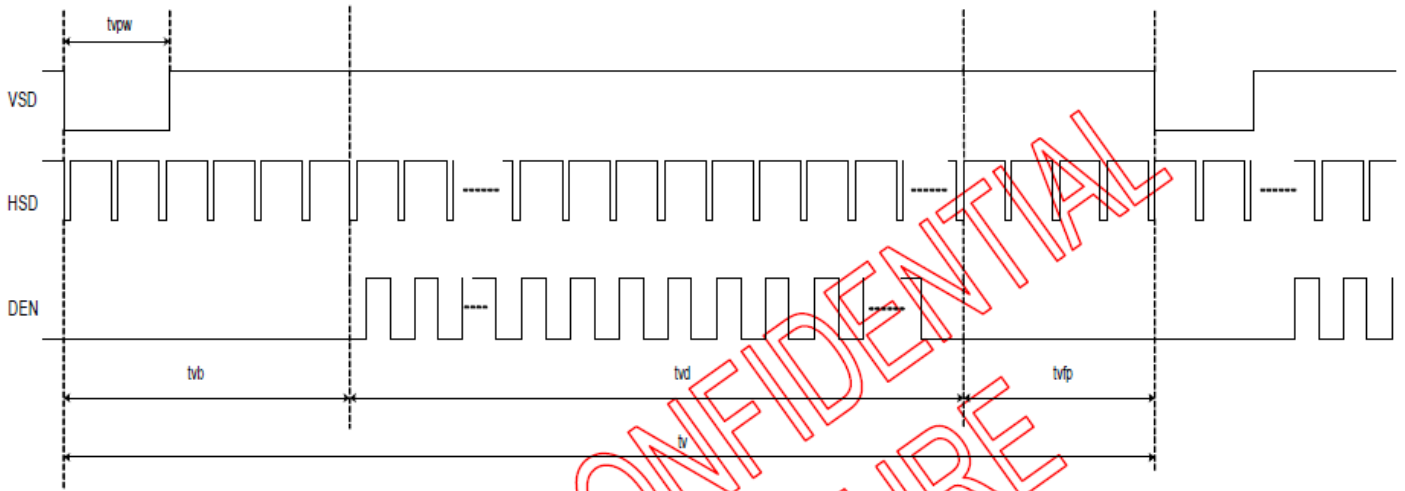


1.4 Interface Pin

Pin No	Pin Symbol	Type	Description
1	LEDA	P	Backlight Power, anode.
2	LEDA	P	Backlight Power, anode.
3	VGH	P	Power supply for Gate ON Voltage
4	VGL	P	Power supply for Gate OFF Voltage
5	UPDN	I	Horizontal direction, up or down.
6	SHLR	I	Horizontal direction, left or right.
7	LEDK	P	Backlight Power, cathode.
8	LEDK	P	Backlight Power, cathode.
9	AVDD	P	Power supply analog circuit
10	GND	P	Power ground
11	D3P	I	MIPI data input
12	D3N	I	MIPI data input
13	GND	P	Power ground
14	D2P	I	MIPI data input
15	D2N	I	MIPI data input
16	GND	P	Power ground
17	CLKP	I	MIPI clock input
18	CLKN	I	MIPI clock input
19	GND	P	Power ground
20	D1P	I	MIPI data input
21	D1N	I	MIPI data input
22	GND	P	Power ground
23	D0P	I	MIPI data input
24	D0N	I	MIPI data input
25	GND	P	Power ground
26	STBYB	I	Standby mode. H: Normal operation L: Driver turn off, No output.
27	RESET	I	Reset signal
28	VDD	P	Power supply for MIPI circuit and digital circuit (1.8V)
29	VDD	P	Power supply for MIPI circuit and digital circuit (1.8V)
30	VCOM	P	Common Voltage

2. Interface Timing

MIPI 4LANE



DE mode

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency @Frame rate=60hz	fclk	40.8	51.2	67.2	Mhz
Horizontal display area	thd	1024			DCLK
HSYNC period time	th	1114	1344	1400	DCLK
HSYNC blanking	thb+thfp	90	320	376	DCLK
Vertical display area	Tvd	600			H
VSYNC period time	Tv	610	635	800	H
VSYNC blanking	Tvb+Tvfp	10	35	200	H

HV mode

Horizontal input timing

Parameter	Symbol	Value			Unit
Horizontal display area	thd	1024			DCLK
DCLK frequency@ Frame rate=60hz	fclk	Min. 44.9	Typ. 51.2	Max. 63	Mhz
1 Horizontal Line	th	1200	1344	1400	DCLK
HSYNC pulse width	Min.	1			
	Typ.	70			
	Max.	140			
HSYNC blanking	thb	160	160	160	DCLK
HSYNC front porch	thfp	16	160	216	

HV mode

Vertical input timing

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Vertical display area	tvd	600			H
VSYNC period time	tv	624	635	750	H
VSYNC pulse width	tvpw	1	10	20	H
VSYNC back porch	tvb	23	23	23	H
VSYNC front porch	tvfp	1	12	127	H

MIPI 2LANE

DE mode

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency @Frame rate=60hz	fclk	40.8	51.2		Mhz
Horizontal display area	thd	1024			DCLK
HSYNC period time	th	1114	1344		DCLK
HSYNC blanking	thb+thfp	90	320		DCLK
Vertical display area	Tvd	600			H
VSYNC period time	Tv	610	635		H
VSYNC blanking	Tvb+Tvfp	10	35		H

HV mode

Horizontal input timing

Parameter	Symbol	Value			Unit
Horizontal display area	thd	1024			DCLK
DCLK frequency@ Frame rate=60hz	fclk	Min. 44.9	Typ. 51.2	Max.	Mhz
1 Horizontal Line	th	1200	1344		DCLK
HSYNC pulse width	thpw	Min.	1		
		Typ.	70		
		Max.	140		
HSYNC blanking	thb	160	160		
HSYNC front porch	thfp	16	160		

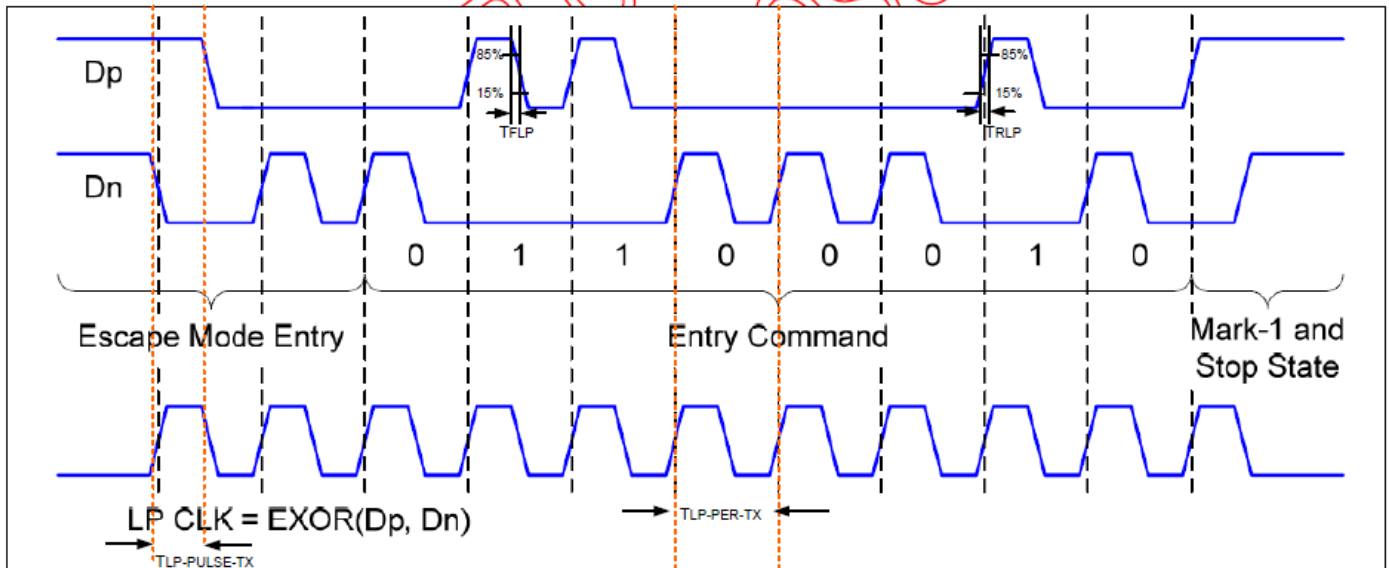
HV mode

Vertical input timing

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Vertical display area	tvd	600			H
VSYNC period time	tv	624	635		H
VSYNC pulse width	tpw	1	20		H
VSYNC back porch	tvb	23	23		H
VSYNC front porch	tvfp	1	12		H

LP Transmitter AC Specification

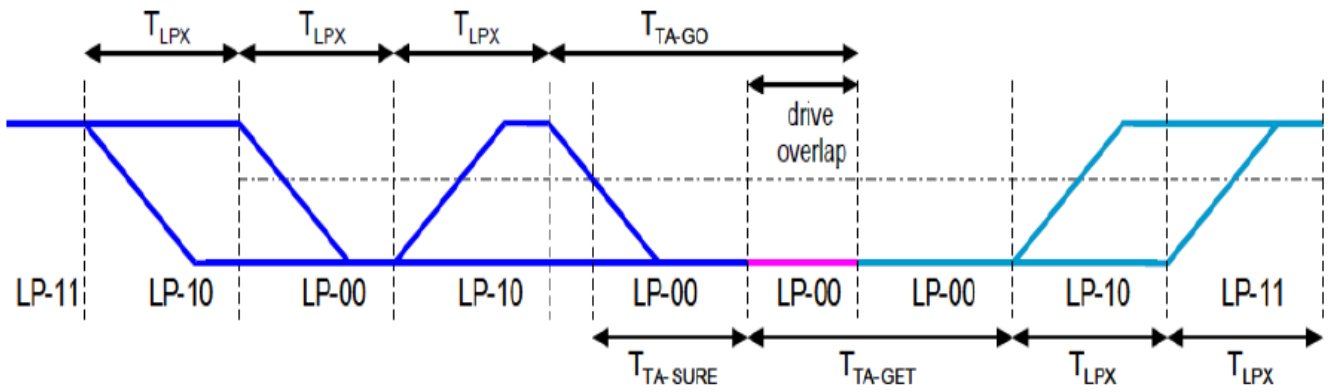
Parameter	Symbol	Min	Typ	Max	Units	Notes
15%~85% rising time and falling time	T_{RLP} / T_{FLP}	-	-	25	ns	-
30%~85% rising time and falling time	T_{REOT}	-	-	35	ns	-
Pulse width of LP exclusive-OR clock	First LP EXOR clock pulse after STOP state or Last pulse before stop state	40	-	-	ns	-
	All other pulses					
Period of the LP EXOR clock	$T_{LP-PER-TX}$	90	-	-	mV/ns	-
Slew Rate @CLOAD =0pF	$\delta V / \delta t_{SR}$	30	-	500	mV/ns	-
Slew Rate @CLOAD =5pF		30	-	200	mV/ns	-
Slew Rate @CLOAD =20pF		30	-	150	mV/ns	-
Slew Rate @CLOAD =70pF		30	-	100	mV/ns	-
Load Capacitance	T_{RLP}	-	-	70	pF	-



Turnaround Procedure

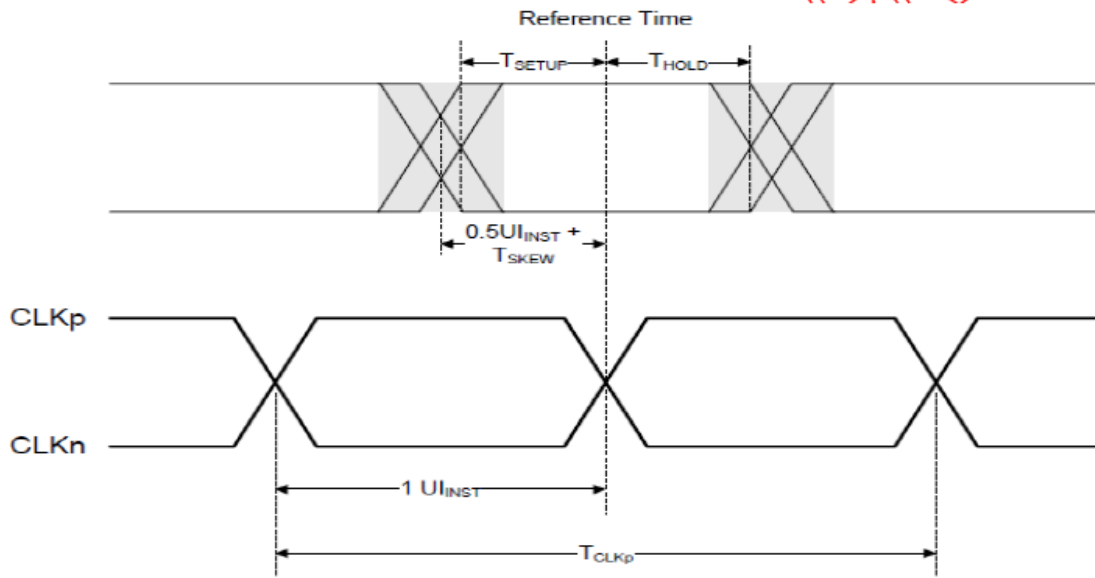
Turnaround Procedure Operation Timing Parameters

Parameter	Symbol	Min	Typ	Max	Units
Length of any Low-Power state period: Master side	T_{LPX}	50	-	75	ns
Length of any Low-Power state period: Slave side	T_{LPX}	50	55.56	58.34	ns
Ratio of T_{LPX} (Master)/ T_{LPX} (Slave) between Master and Slave side	Ratio T_{LPX}	2/3	-	3/2	
Time-out before new TX side start driving	$T_{TA-Sure}$	T_{LPX}	-	$2T_{LPX}$	ns
Time to drive LP-00 by new TX	T_{TA-GET}	-	$5T_{LPX}$	-	ns
Time to drive LP-00 after Turnaround Request	T_{TA-GO}	-	$4T_{LPX}$	-	ns



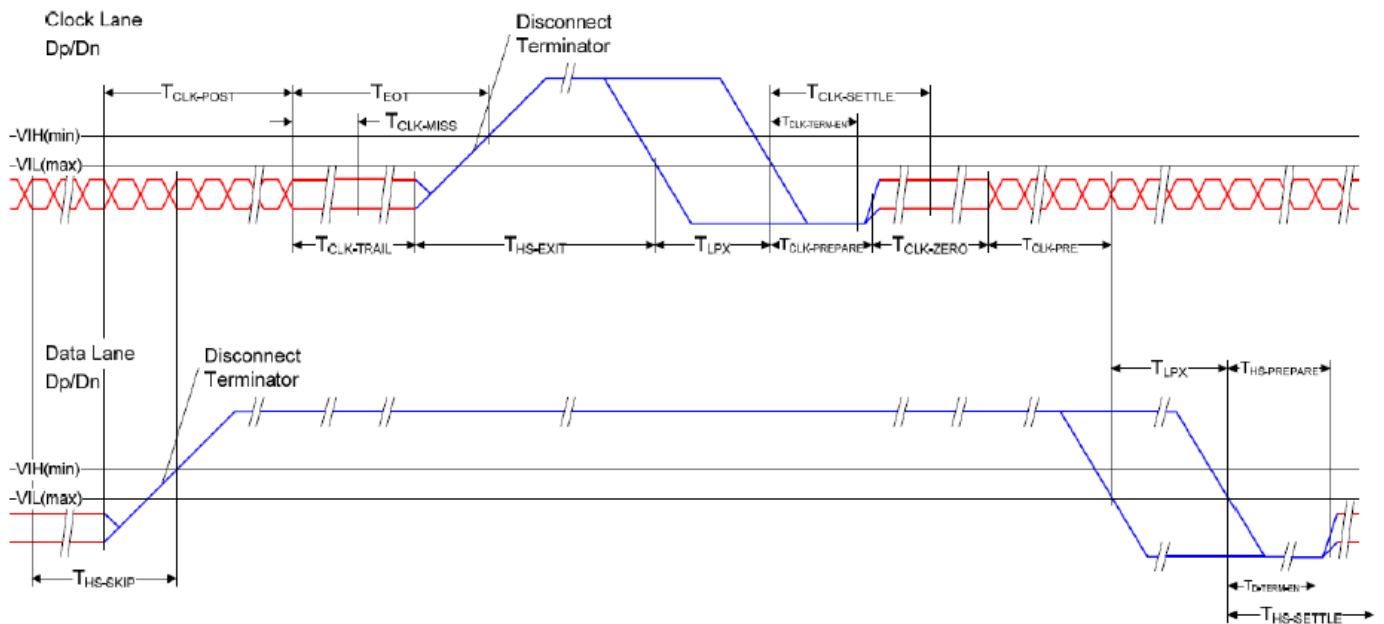
High speed transmission

Parameter	Symbol	Min	Typ	Max	Units
UI instantaneous	U_{INST}	2	-	12.5	ns
Data to Clock Skew(measured at transmitter)	$T_{SKEW(TX)}$	-0.15	-	0.15	U_{INST}
Data to Clock Setup time(measured at receiver)	$T_{SETUP(RX)}$	0.15	-	-	U_{INST}
Data to Clock Hold time(measured at receiver)	$T_{HOLD(RX)}$	0.15	-	-	U_{INST}
20%~80% rise time and fall time	T_R, T_F	150	-	-	ps
		-	-	0.3	U_{INST}

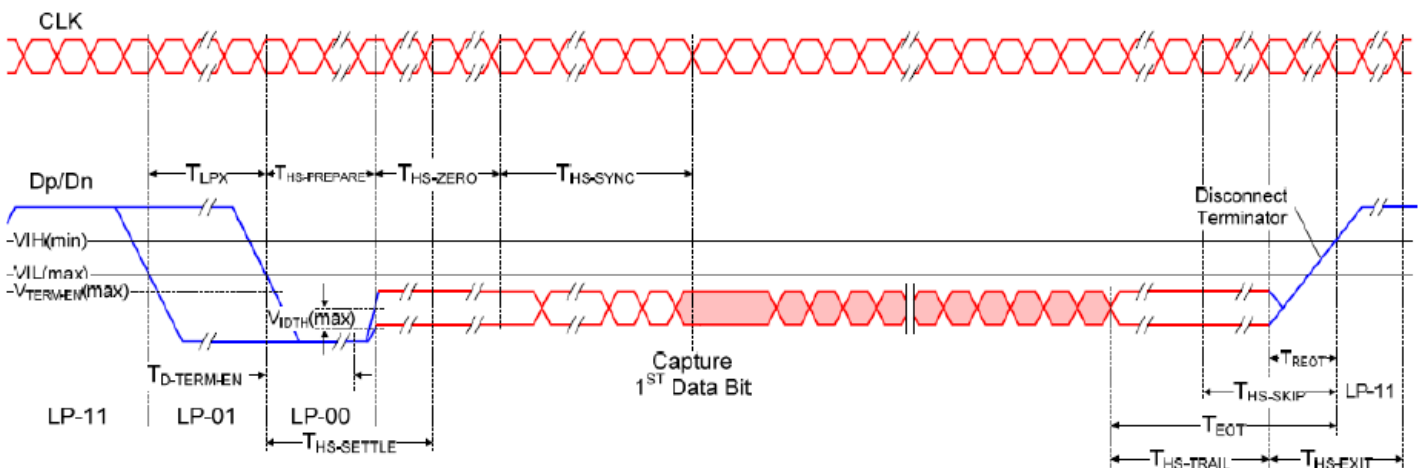


High Speed Clock Transmission

Parameter	Symbol	Min	Typ	Max	Units
Time that the transmitter shall continue sending HS clock after the last associated Data Lane has transitioned to LP mode	T _{CLK-POST}	60+52UI	-	-	ns
Detection time that the clock has stopped toggling	T _{CLK-MISS}	-	-	60	ns
Time to drive LP-00 to prepare for HS clock transmission	T _{CLK-PREPARE}	38	-	95	ns
Minimum lead HS-0 drive period before starting clock	T _{CLK-PREPARE} + T _{CLK-ZERO}	300	-	-	ns
Time to enable Clock Lane receiver line termination measured from when Dn cross V _{IL,MAX}	T _{HS-TERM-EN}	-	-	38	ns
Minimum time that the HS clock must be prior to any associated data lane beginning the transmission from LP to HS mode	T _{CLK-PRE}	8	-	-	UI
Time to drive HS differential state after last payload clock bit of a HS transmission burst	T _{CLK-TRAIL}	60	-	-	ns



High Speed Data Transmission in Bursts



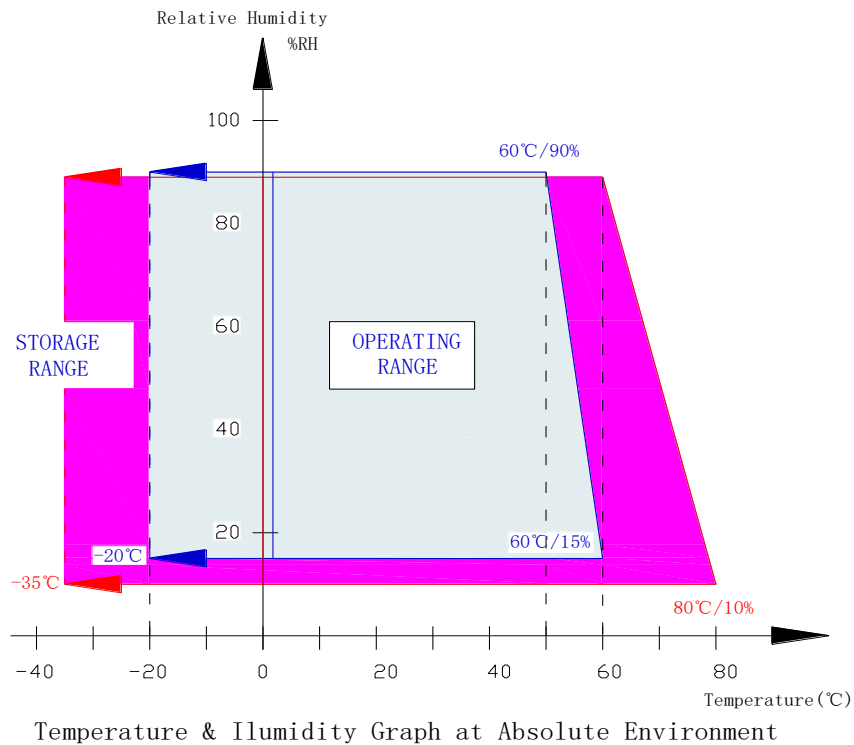
3. Electrical Characteristics

3.1 Absolute Maximum Ratings

Item	Symbol	Min	Max	Unit
Supply voltage for Digital	VDD	-0.3	+2.0	V
Supply voltage for Analog	AVDD	-0.3	+15.0	V
Supply voltage for Backlight	LEDA - LEDK	0	11	V
Operate temperature range	TOP	-20	70	□
Storage temperature range	TST	-30	80	□

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

$T_a = 25^\circ\text{C}$

Item	Symbol	Min	Typ	Max	Unit	Condition
Supply voltage for Digital	VDD	1.71	1.8	1.89	V	
Supply voltage for Analog	AVDD	8	9.6	13.5	V	
Supply voltage for Gate ON	VGH	14	18	22	V	
Supply voltage for Gate OFF	VGL	-2	-6	-10	V	
Supply voltage for Common	VCOM	1	3.2	AVDD	V	
Input high level voltage	V_{IH}	0.7VDD	-	VDD	V	
Input low level voltage	V_{IL}	0	-	0.3VCC	V	
Power supply current	I_{DD}	-	-	-	mA	
Backlight forward voltage	V_F	8.25	-	10.5	V	
Backlight forward current	I_F	-	160	160	mA	

4. Optical characteristics

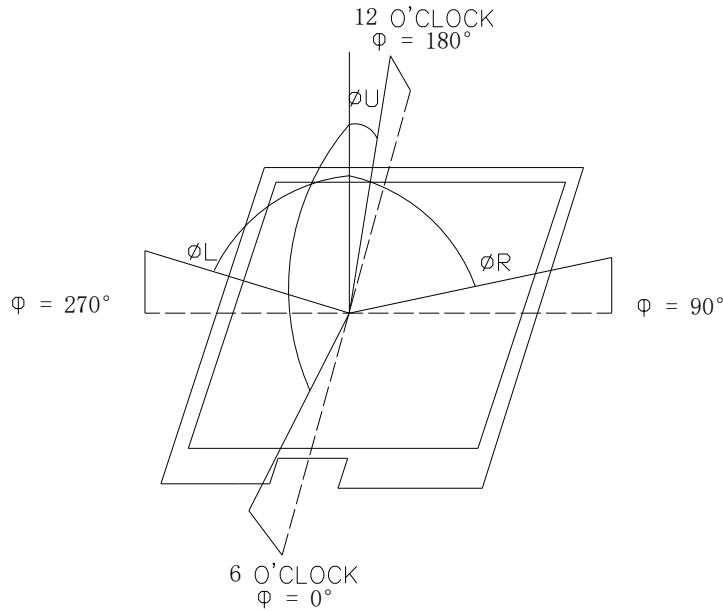
Parameter		Symbol	Condition	Min	Typ	Max	Unit	Note
Viewing angle		Left	$CR \geq 10$		85		Degree	(2)
		Right			85		Degree	
		Up			85		Degree	
		Down			85		Degree	
Color Chromaticity	Red	Rx	$\theta = 0$ Normal viewing angle	-0.05	0.599	+0.05	-	Color Chromaticity
		Ry			0.338		-	
	Green	Gx			0.299		-	
		Gy			0.550		-	
	Blue	Bx			0.139		-	
		By			0.131		-	
	White	Wx			0.308		-	
		Wy			0.336		-	
Contrast ratio		CR	optimal		800		-	(1)
Response time		$T_r + T_f$			30		ms	(3)
Luminance on surface $I_f = 160\text{mA}$		L_v	Normally $\theta_x = \theta_y = 0$	330	370	-	cd/m ²	

Note (1) Definition of contrast ratio

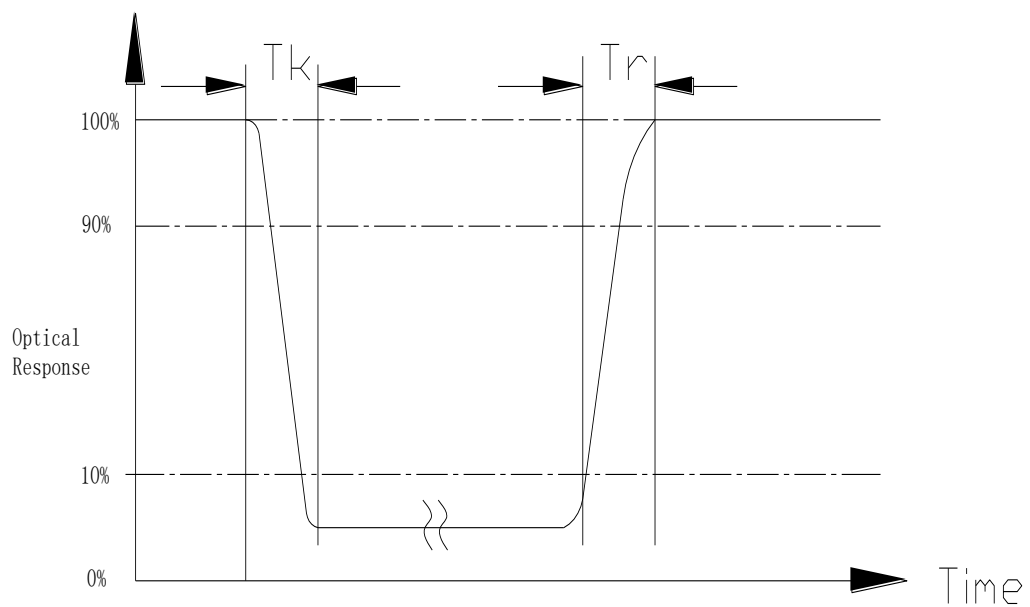
Measured at the center point of panel

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

Note (2) Definition of viewing angle



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



5. Reliability

5.1 Reliability Condition

Item No	Item	Condition	Remark
1	High temperature Operating	70°C, 240Hours	Finish product (With polarizer)
2	Low temperature Operating	-20°C, 240 Hours	Finish product (With polarizer)
3	High temperature Storage	80°C, 240 Hours	Finish product (With polarizer)
4	Low temperature Storage	-30°C, 240 Hours	Finish product (With polarizer)
5	High temperature & humidity Storage	60°C, 90%RH, 240 Hours	Finish product (With polarizer)
6	Thermal Shock Storage (No operation)	-30°C , 30min.<=> 80°C , 30min. 100 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	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

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	<ul style="list-style-type: none"> · Blemish 、 black spot 、 white spot in the LCD. · Blemish 、 black spot 、 white spot and scratch on th polarizer 	<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: $A = (\text{Length} + \text{Width}) / 2$</p> <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>$L \square 5$</td> <td>$0.03 < W \square 0.05$</td> <td>3</td> </tr> <tr> <td>$L \square 5$</td> <td>$0.05 < W \square 0.07$</td> <td>1</td> </tr> <tr> <td>---</td> <td>$0.07 < W$</td> <td>Follow round type</td> </tr> </tbody> </table>	Diameter (mm.)	Acceptable Q'ty	$0.2 < A$	0	Length	Width	Acceptable Q'ty	---	$W \leq 0.03$	Disregard	$L \square 5$	$0.03 < W \square 0.05$	3	$L \square 5$	$0.05 < W \square 0.07$	1	---	$0.07 < W$	Follow round type
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$L \square 5$	$0.05 < W \square 0.07$	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>$A \square 0.3$</td> <td>Disregard</td> </tr> <tr> <td>$0.3 < A \square 0.5$</td> <td>1</td> </tr> <tr> <td>$0.5 < A$</td> <td>0</td> </tr> </tbody> </table>	Diameter	Acceptable Q'ty	$A \square 0.3$	Disregard	$0.3 < A \square 0.5$	1	$0.5 < A$	0											
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$0.3 < A \square 0.5$	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

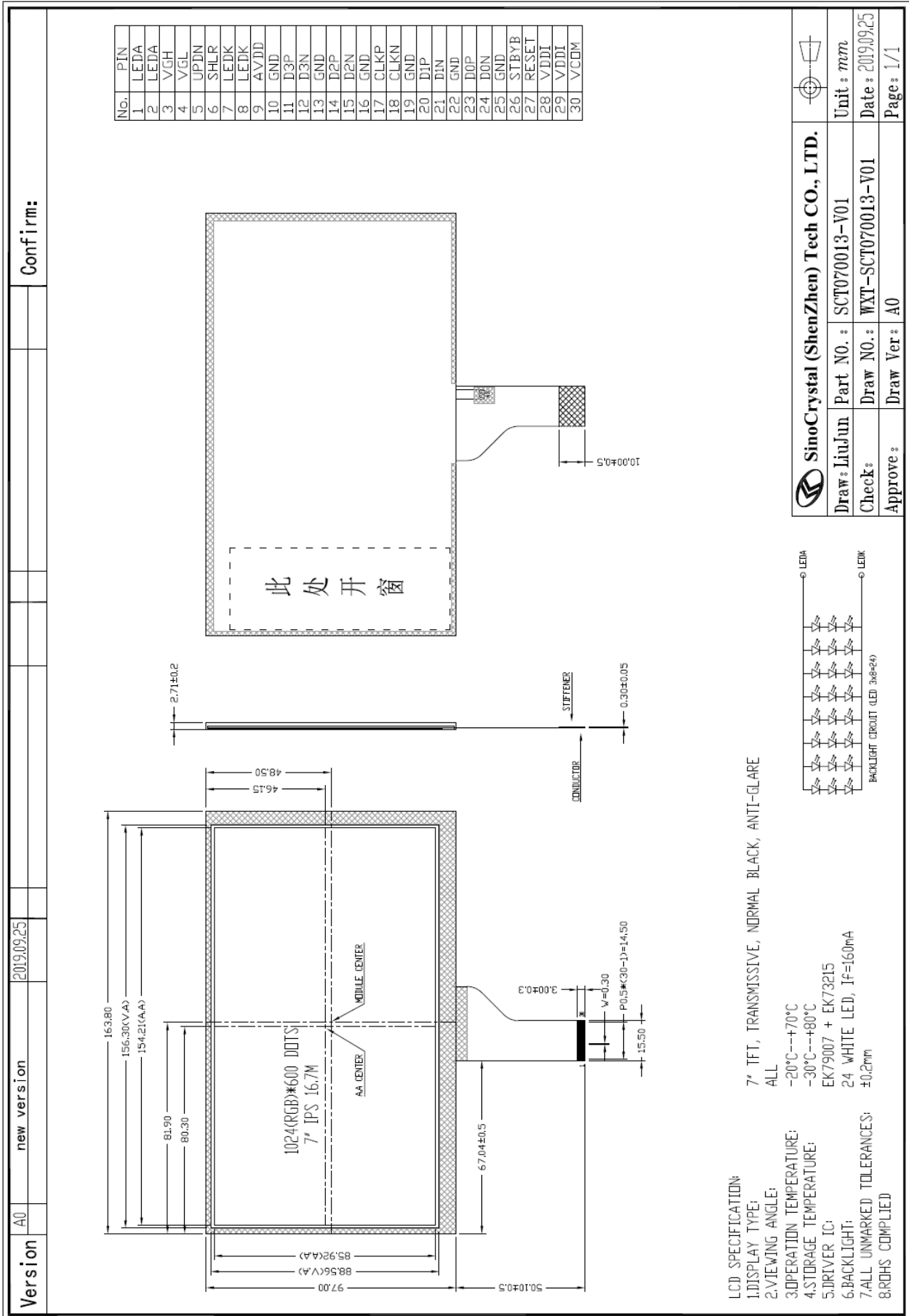
- (1) Do not leave the panel in high temperature, and high humidity for a long time. It is highly recommended to store the panel with temperature from 0 to 35°C and relative humidity of less than 70%.
- (2) The panel shall be stored in a dark place. It is prohibited to apply sunlight or fluorescent light 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 SCT070013-V01 drawing.



8. Packing method

8.1 Packing Quantity (TBD)

8.2 Flowing chart (TBD)