SPECIFICATION
FOR
LCD Module
TS8036WV001-T

MODULE:	**TS8036WV001-T**
CUSTOMER:	

TZD	**INITIAL**	**DATE**
PREPARED BY	杨荣武	**2024.1.3**
CHECKED BY	陈志文	**2024.1.3**
APPROVED BY	罗教平	**2024.1.3**

CUSTOMER	**INITIAL**	**DATE**
APPROVED BY		

REVISION STATUS

Version	Revise Date	Page	Content	Modified by
V1.0	2024.1.3	-	First Issued.	YANG

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1.General Description

* DESCRIPTION

TS8036WV001-T is a color active matrix TFT (Thin Film Transistor) LCD (liquid crystal display) that uses amorphous silicon TFT as a switching device. This model is composed of a Transmissive type TFT-LCD Panel, driver circuit, back-light unit. The resolution of a 3.6" TFT-LCD contains 480*480 pixels, and can display up to 16.7M colors.

* Features

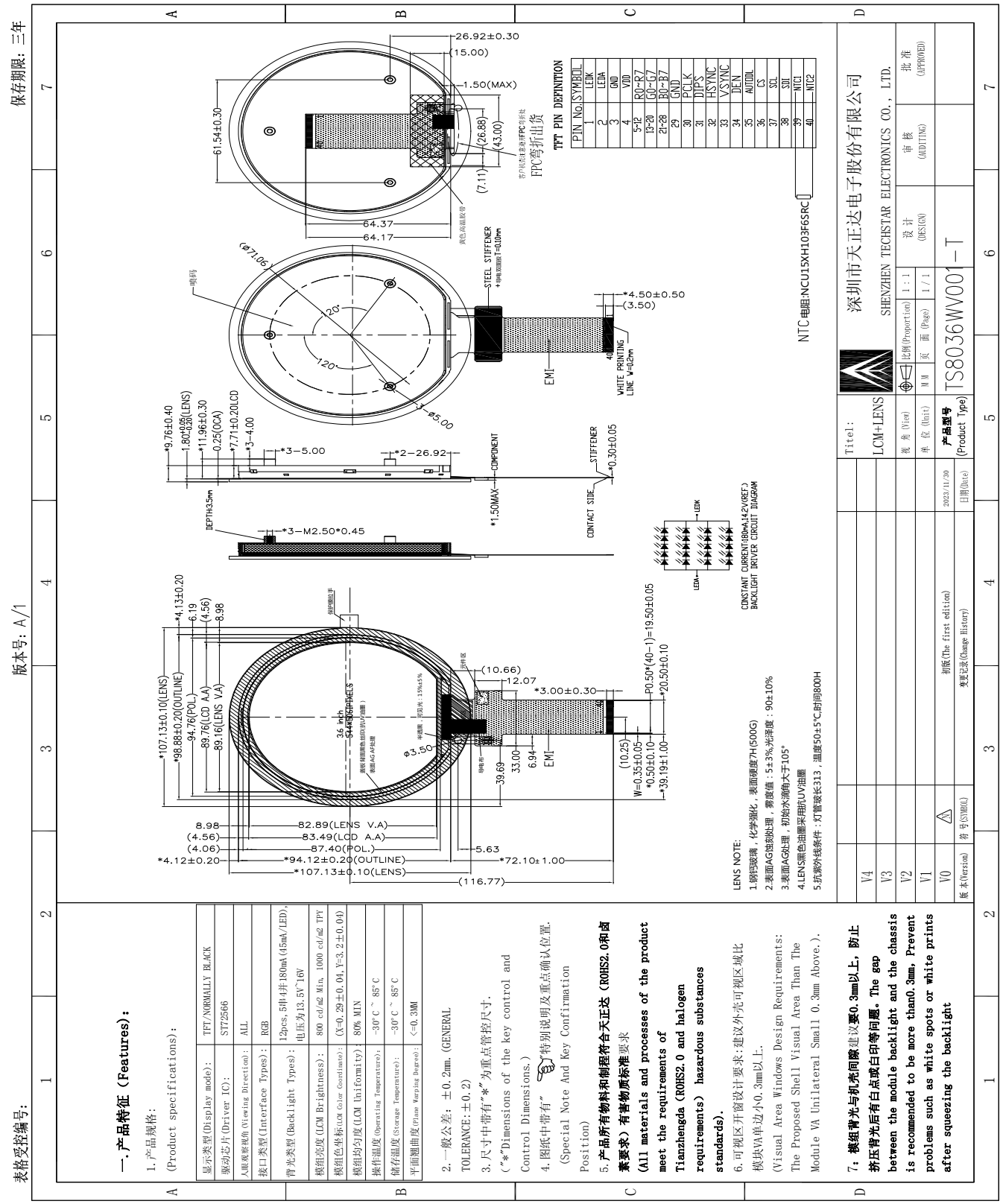
-Low Input Voltage: VDD: 2.7~3.6V;
-Display Colors of TFT LCD: 16.7M colors
-CPU Interface: -RGB 24BIT
-Internal Power Supply Circuit.

General Information Items	Specification	Unit	Note
	Main Panel		
Display area(AA)	89.76(H) *83.49(V) (3.6inch)	mm	-
Driver element	a-Si TFT active matrix	-	-
Display colors	16.7M	colors	-
Number of pixels	544(RGB) *506	dots	-
Pixel arrangement	RGB vertical stripe	-	-
Pixel pitch	0.165(H) *0.165(V)	mm	-
Viewing angle	ALL	o'clock	-
Drive IC	ST72566	-	-
Color Pixel Arrangement	RGB vertical stripe		
Display mode	Transmissive/ Normally Black	-	-
Operating temperature	-30～+85	℃	-
Storage temperature	-30～+85	℃	-

Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)	-	107.13	-	mm	-0.1
	Vertical(V)	-	107.13	-	mm	-0.1
	Depth(D)	-	9.76	-	mm	±0.4
Weight		-	TBD	-	g	-

2. Mechanical Specification



3. PIN DESCRIPTION

PIN No.	SYMBOL	LEVEL	DESCRIPTION
1	LEDK	L	Back light-
2	LEDA	H	Back light+
3	GND	H	power ground
4	VCC	H	power supply(2.7-3.6V)
5-12	R0-R7	H/L	Red data bus
13-20	G0-G7	H/L	Green data bus
21-28	B0-B7	H/L	Blue data bus
29	GND	L	power ground
30	DCLK	H/L	Pixel clock signal pin
31	DISP	H/L	connected to VDD in normal operation mode. connected to GND, the IC is in standby mode.
32	HSYNC	H/L	Horizontal sync.
33	VSYNC	H/L	Vertical sync.
34	DE	H/L	Data enable signal
35	AUTODL	H/L	OTP trim function control pin. When normal display, AUTODL should be set to "H" and the value in the OTP will be downloaded automatically. AUTODL: L — Disable auto-refresh function; H — Enable auto-refresh function(Default)
36	CS	H/L	Chip select input pin
37	SCL	H/L	Serial clock input.
38	SDA	H/L	Serial data input pin
39	NTC1	/	Connect thermistor
40	NTC2	/	Connect thermistor

4. ELECTRICAL CHARACTERISTICS

4.1 ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Values		Unit	Remark
		Min	Max.		
Supply Voltage for Logic circuit	IOVCC	-	-	V	
Supply Voltage for analog circuit	VCI	-0.3	4.6	V	

4.2 DC ELECTRICAL CHARACTERISTICS

4.2.1 OPERATING CONDITIONS

Typical Operating Conditions (Ta=25℃)

Item	Symbol	Values			Unit	Remark
		Min	Typ	Max.		
Power Supply	VCC	2.7	2.8	3.3	V	
Normal mode Current consumption	Icc	-	-	55	mA	Vcc=3.3V
TFT Gate ON Voltage	V_{GH}	11.5	12	16	V	
TFT Gate OFF Voltage	V_{GL}	-8	-12	-12	V	

4.2.2 BACKLIGHT UNIT (GND=0V)

Item	Symbol	Values			Unit	Remark
		Min	Typ	Max.		
Forward supply Voltage	V_f	13.5	-	16	V	
Forward supply Current	I_f	-	180	-	mA	
LCM Luminance	LV	800	1000	-	cd/m2	IB=180mA
Uniformity	/	80			%	-

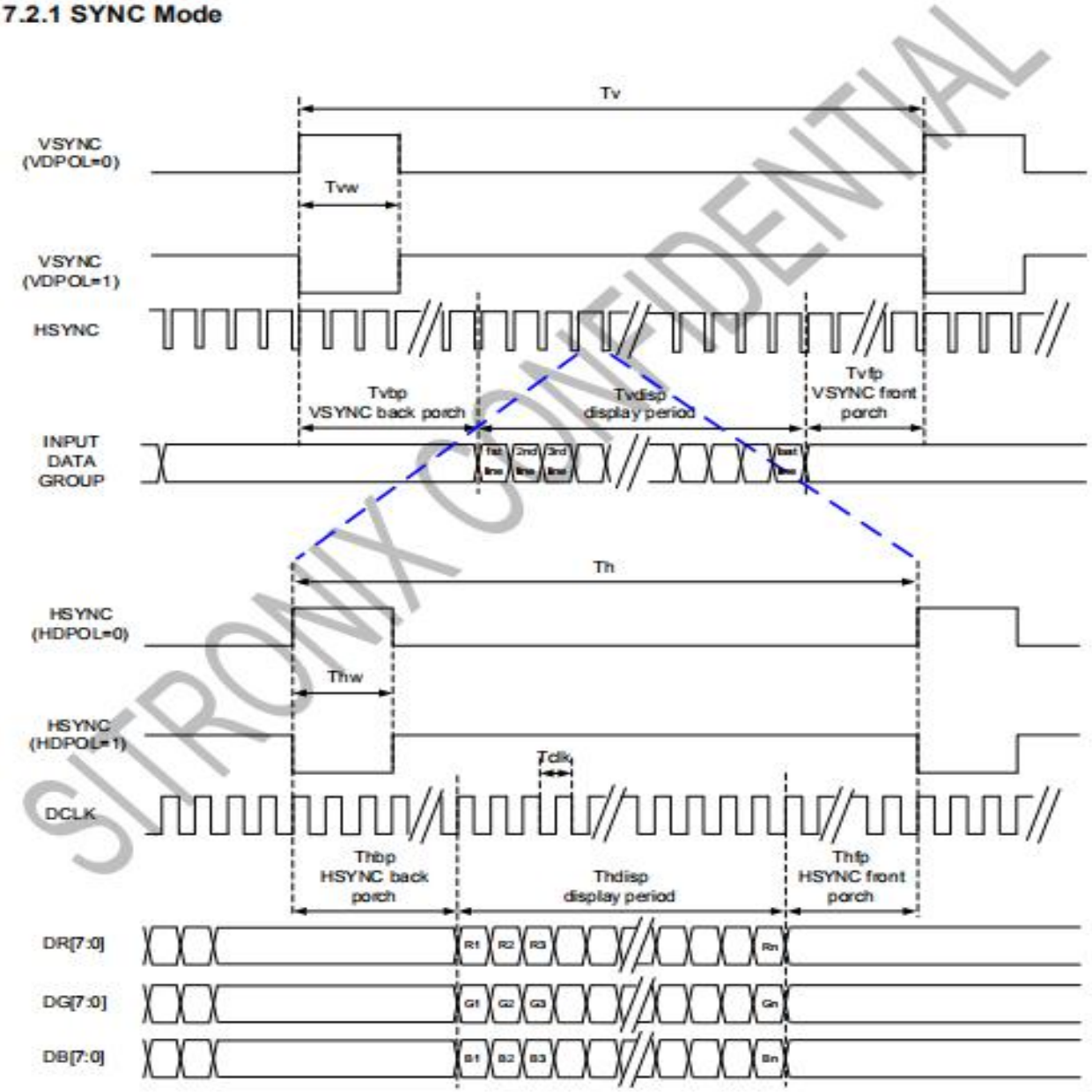
4.3 MIPI TIMING CHARACTERISTICS

7.2 RGB Interface

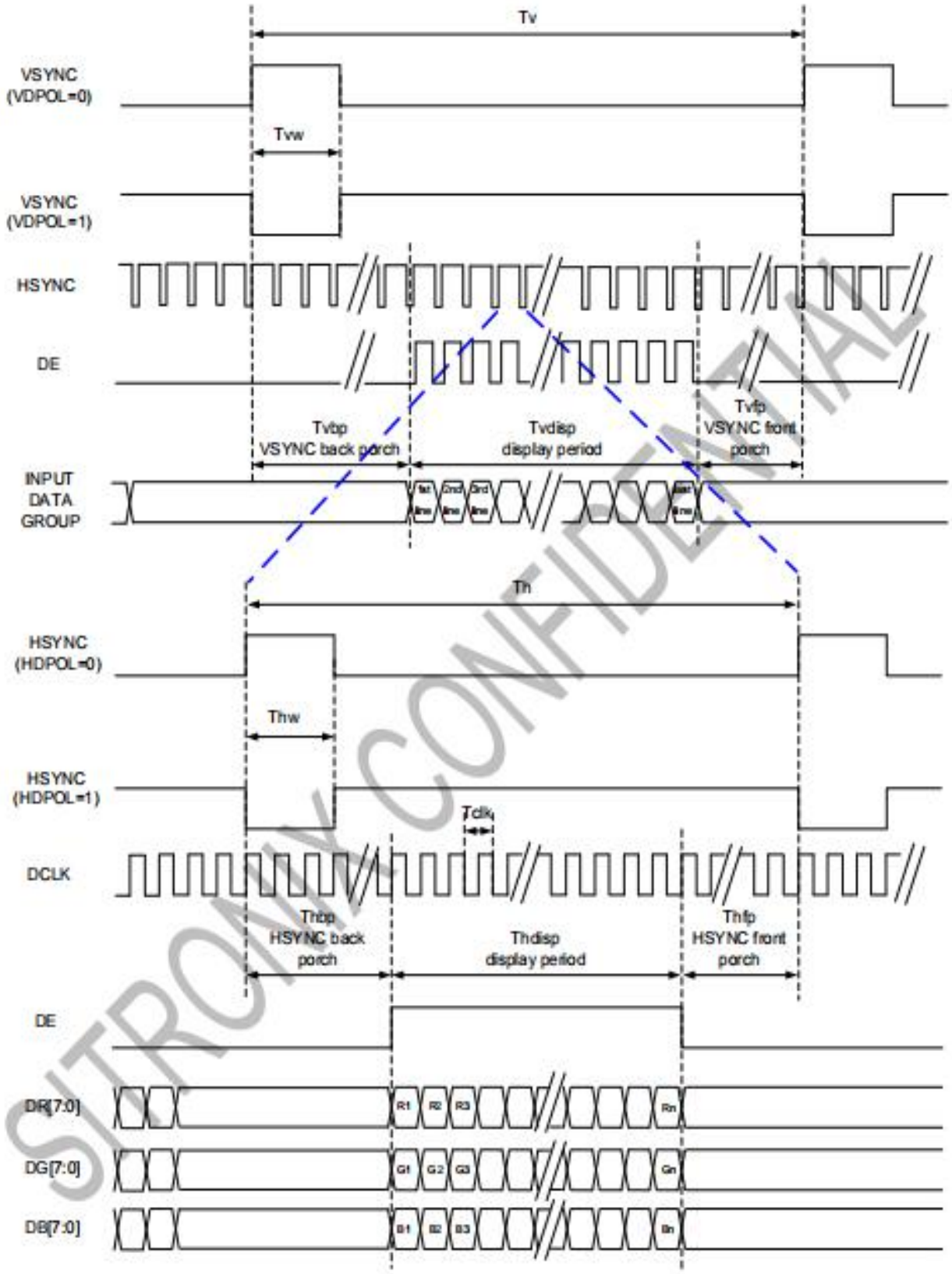
RGB Mode Selection Table	DCLK	HSYNC	VSYNC	DE
SYNC - DE Mode	Input	Input	Input	Input
SYNC Mode	Input	Input	Input	GND
DE Mode	Input	GND	GND	Input

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

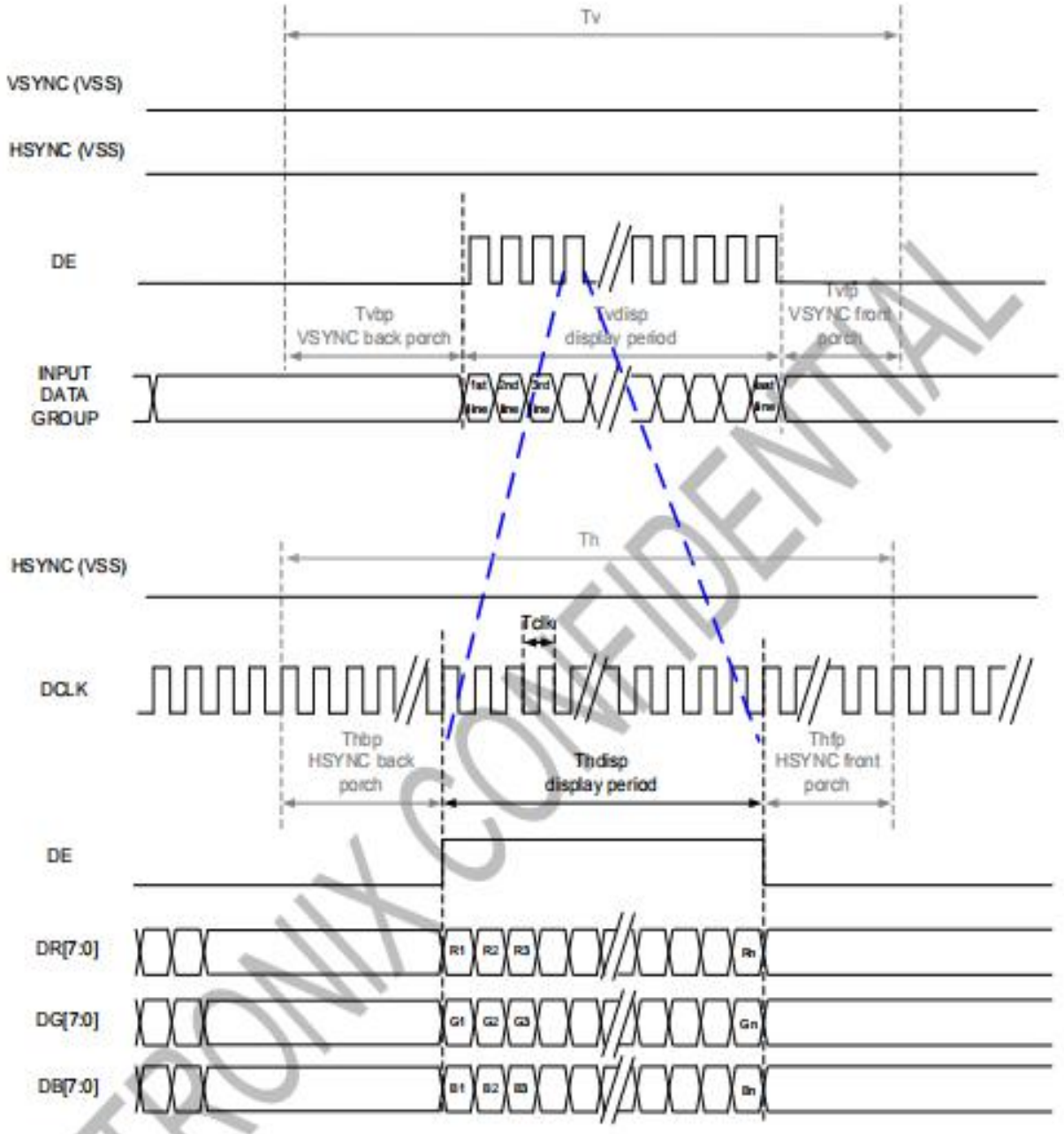
7.2.1 SYNC Mode



7.2.2 SYNC-DE Mode



7.2.3 DE Mode



5. OPTICAL CHARACTERISTICS

（LCD optical characteristics）

4.0 OPTICAL SPECIFICATION

4.1 Overview

The test of Optical specifications shall be measured in a dark room (ambient luminance ≤ 1lux and temperature = 25±2°C) with the equipment of Luminance meter system (Goniometer system and TOPCON BM-5) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0°. The center of the measuring spot on the Display surface shall stay fixed.

The backlight should be operating for 30 minutes prior to measurement.

<Table 4. Optical Specifications >

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle range	Horizontal	Θ_3	CR > 10	80	85	-	Deg.	Note 1
		Θ_9		80	85	-	Deg.	
	Vertical	Θ_{12}		80	85	-	Deg.	
		Θ_6		80	85	-	Deg.	
Luminance Contrast ratio		CR	Θ = 0° (Center) Normal Viewing Angle	1000	1200	-		Note 2
Transmittance (pol)		T(%)		5.5	6.5	-	%	@Silicate BLU POL:HC+APF Note 3
White luminance uniformity		ΔY					%	
White Chromaticity		x_w		0.263	0.293	0.323		CF @C Light Note 4
		y_w		0.306	0.336	0.366		
Reproduction of color	Red	x_R		0.623	0.653	0.683		
		y_R		0.293	0.323	0.353		
	Green	x_G		0.251	0.281	0.311		
		y_G		0.533	0.563	0.593		
	Blue	x_B		0.106	0.136	0.166		
		y_B		0.113	0.143	0.173		
Response Time (Rising + Falling)		T_{RT}	Ta= 25° C Θ = 0°	-	30	40	ms	Note 5

Note :

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface.
2. Contrast measurements shall be made at viewing angle of $\theta = 0°$ and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. (See FIGURE 1 shown in Appendix) Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. Transmittance is the Value with Polarizer(HC+APF) & silicate BLU (Film structure is on Table 4.1)
4. The color chromaticity coordinates specified in the above Table shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.

5. The electro-optical response time measurements shall be made as **FIGURE 1** shown in Appendix. The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Tf.

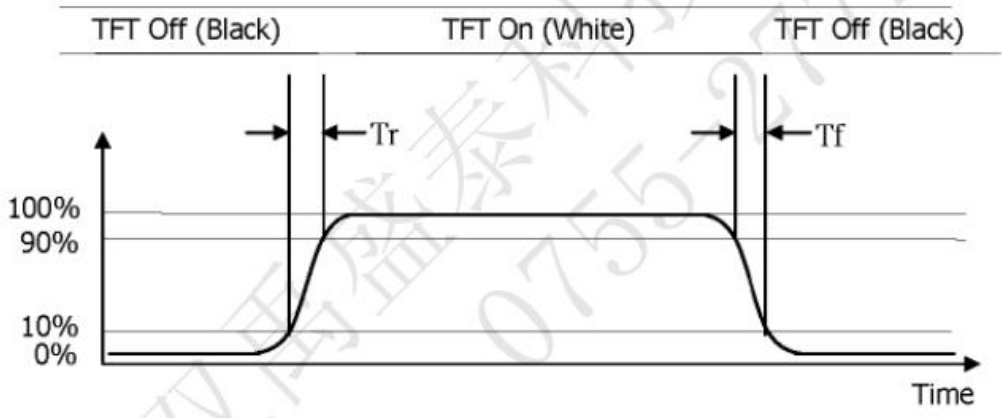


Figure1 Response Time Testing

6. QUALITY SPECIFICATIONS

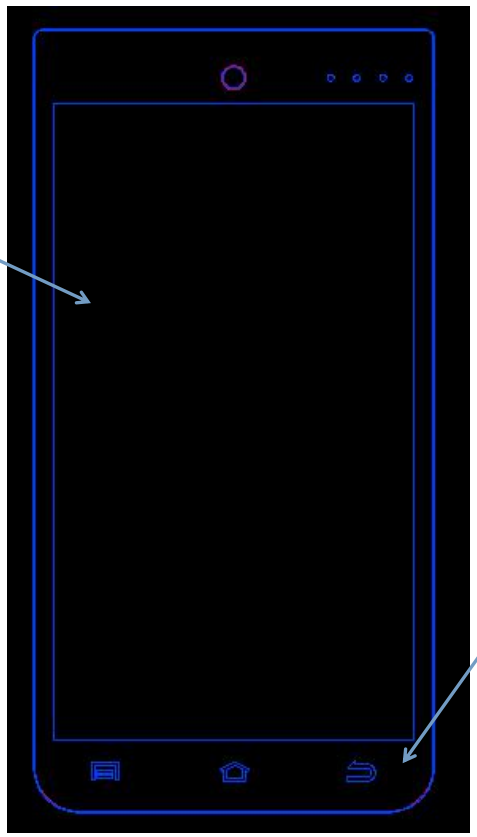
1. Inspection condition

1.1:Cosmetic inspection: viewing distance is about 30cm with bare eyes, and under an environment of 20~40W light intensity（600~1200LUX）, all directions for inspecting the sample should be within 45° against perpendicular line.

6.1.2:Function inspection: viewing distance is about 30cm with bare eyes, and under an environment of 300LUX light intensity, all directions for inspecting the sample should be within 45° against perpendicular line.

2. Definition of Inspection Item.

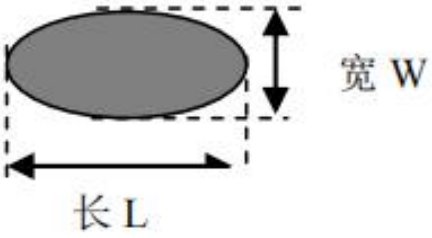
2.1 Definition of Inspection zone in I-touch module.



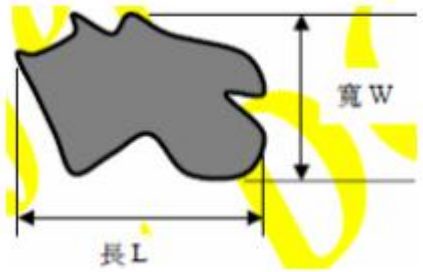
AA zone：Character/Display area
BM zone：Printing area
VA zone：Viewing area（AA area + BM area = viewing area ）

3. Defect definition

3.1 Circular defect

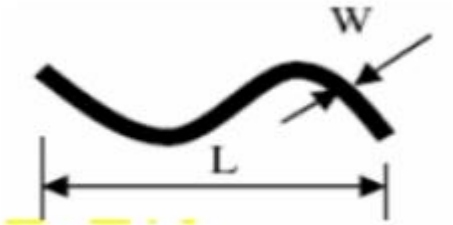


Diameter Φ=1/2(L+W)

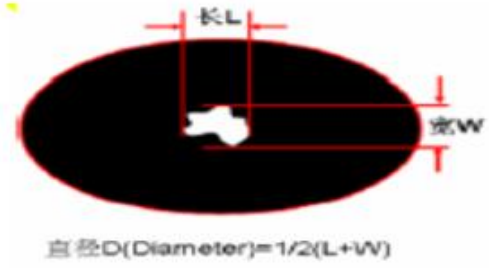


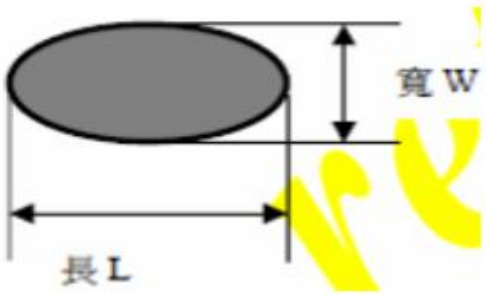
Diameter Φ=1/2(L+W)

3.2 Linear defect



3.3 Pin hole





3.4 Zigzag

4. Inspection standards

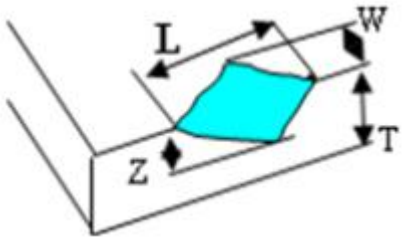
4.1 Major defect

-Item -No	Items to be inspected	Inspection Standard	Classification of defects
4.1.1	All functional defects	1) No display 2) Display abnormally 3) Missing vertical，horizontal segment 4) Short circuit 5) Back-light no lighting, flickering and abnormal lighting. 6) Touch panel abnormal.	Major
4.1.2	Missing	Missing component	
4.1.3	Outline dimension	Overall outline dimension beyond the drawing is not allowed.	
4.1.4	LCD Mura	LCD Mura according to ND 5% keep out to determine, if keep out distance at 30cm be seen by eyes is NG, otherwise will be ok if invisible.	
4.1.5	Sub Pixel classification	● Sub Pixel: Number of sub pixel doesn't exceed two dot.  Sub Pixel (Dot) a> Dark dot ----two Allowed b> Bright dot ---- two Allowed ● Pixel : Three dots link together doesn't exceed twos  Pixel	N≦2

4.2 Cosmetic defect

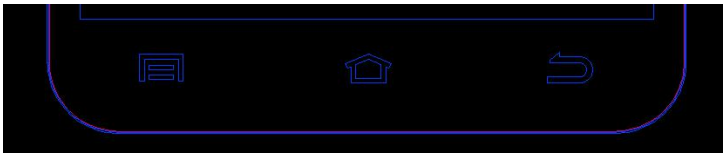
<table>
<tr><td>Item No</td><td>Items to be inspected</td><td>Inspection Standard</td><td>Classification of defects</td></tr>
<tr><td>4.2.1</td><td>Dot defect</td><td>
<table>
<tr><td>Zone
Size(mm)</td><td>VA area
Acceptable Qty</td></tr>
<tr><td>Φ≤0.1</td><td>Ignore</td></tr>
<tr><td>0.10＜Φ≤0.25</td><td>2</td></tr>
<tr><td>0.25＜Φ≤0.30</td><td>1</td></tr>
<tr><td>0.30＜Φ</td><td>0</td></tr>
</table>
</td><td>Minor</td></tr>
<tr><td>4.2.2</td><td>Dim Spots:
Circle
shaped
and dim
edged
defects</td><td>
<table>
<tr><td>Zone
Size(mm)</td><td>VA area
Acceptable Qty</td></tr>
<tr><td>Φ≤0.20</td><td>Ignore</td></tr>
<tr><td>0.20＜Φ≤0.40</td><td>2</td></tr>
<tr><td>0.40＜Φ≤0.60</td><td>1</td></tr>
<tr><td>0.60＜Φ</td><td>0</td></tr>
</table>
</td><td>Minor</td></tr>
<tr><td>Item No</td><td>Items to be inspected</td><td>Inspection Standard</td><td>Classification of defects</td></tr>
</table>

<table>
<tr>
<td>4.2.3</td>
<td>Dent Spot
Fish eye</td>
<td>
<table>
<tr><td>Zone
Size(mm)</td><td>VA area
Acceptable Qty</td></tr>
<tr><td>Φ≤0.10</td><td>Ignore</td></tr>
<tr><td>0.10＜Φ≤0.20</td><td>2</td></tr>
<tr><td>0.20＜Φ≤0.30</td><td>1</td></tr>
<tr><td>0.30＜Φ</td><td>0</td></tr>
</table>
</td>
<td>Minor</td>
</tr>
<tr>
<td>4.2.4</td>
<td>Line defect</td>
<td>
<table>
<tr><td colspan="2">Zone
Size(mm)</td><td>VA area</td></tr>
<tr><td>L
(Length)</td><td>W
(Width)</td><td>Acceptable Qty</td></tr>
<tr><td>Ignore</td><td>W≤0.03</td><td>Ignore</td></tr>
<tr><td>L≤5.0</td><td>0.03＜W≤0.05</td><td>2</td></tr>
<tr><td>L≤3.0</td><td>0.05＜W≤0.07</td><td>1</td></tr>
<tr><td>/</td><td>0.07＜W</td><td>Define as spot defect</td></tr>
</table>
</td>
<td>Minor</td>
</tr>
<tr>
<td>4.2.5</td>
<td>Scratch</td>
<td>
If the scratch can be seen after mobile phone cover assembling or in the operating condition, judged as the line defect of 4.2.4.
If the scratch can be seen only in non-operating condition or some special angle, judged as the following table.
<table>
<tr><td colspan="2">Size (mm)</td><td>VA area</td></tr>
<tr><td>L
(Length)</td><td>Acceptable Qty</td><td>Acceptable Qty</td></tr>
<tr><td>Ignore</td><td>W≤0.03</td><td>Ignore</td></tr>
<tr><td>5.0＜L≤10.0</td><td>0.03＜W≤0.05</td><td>2</td></tr>
<tr><td>L≤5.0</td><td>0.05＜W≤0.08</td><td>1</td></tr>
<tr><td>/</td><td>W＞0.08</td><td>0</td></tr>
</table>
</td>
<td>Minor</td>
</tr>
</table>

<table>
<tr><th>Item No</th><th>Items to be inspected</th><th>Inspection Standard</th><th>Classification of defect</th></tr>
<tr><td>4.2.6</td><td>Bubble</td><td>
<table>
<tr><td rowspan="2">Zone
Size(mm)</td><td>VA area</td></tr>
<tr><td>Acceptable Qty</td></tr>
<tr><td>Φ≤0.15</td><td>Ignore</td></tr>
<tr><td>0.15＜Φ≤0.25</td><td>2</td></tr>
<tr><td>0.25＜Φ</td><td>0</td></tr>
</table>
</td><td rowspan="3">Minor</td></tr>
<tr><td>4.2.7</td><td>Glass defect</td><td>4.2.7a Chip on corner or surface
 

<table>
<tr><td>L(length)</td><td>W(width)</td><td>Z(thickness）</td></tr>
<tr><td>L≤0.30</td><td>W≤0.20</td><td>T/2</td></tr>
</table>
Notes: T=Lens thickness， Φ≤0.10 ignore
Acceptable Qty：Single edge N≤2，Total N≤4

4.2.7b Cracks
Cracks tend to break are not allowed.
 
</td></tr>
</table>

Item No	Items to be inspected	Inspection Standard	Classification of defect
4.2.8	Parts alignment	1) Not allow IC and FPC/heat-seal lead width is more than 50% beyond lead pattern. 2) Not allow chip or solder component is off center more than 50% of the pad outline.	Minor
4.2.9 view area/ printing area of front surface and view area of rear surface	LOGO Pattern	 **Dot: according to Dot spec.** **Thickness odds:** $\frac{\lvert \text{Spec pattern width} - \text{Print pattern width} \rvert \times 100\%}{\text{Spec pattern width}} \leqslant 30\%$ **Drawing slant:** Print pattern length≤10mm, slant angle ≤3°； 10mm＜Print pattern length≤20mm, slant angle≤1.5°  **Pattern serration:** H≤0.05 mm **Pattern leak print/ error/overprint:** not allowed **Pattern break line:** width ≤0.10 mm **Logo pattern color windage / color thin:** Follow the limit samples.	Minor

Item No	Items to be inspected	Inspection Standard	Classification of defects
4.2.10 view area/printing area of front surface and view area of rear surface	IR hole(A)/ Light sensor hole(B)/ LED hole(C)	 1. A.B.C hole must be according the transmittancy 2. Light leakage on A.B.C hole or follow the limited sample. 3. A.B.C hole (LED) hole only judge by black background，no need to check in the lamb condition.	Minor
	Surface dirty	1. Dirty can not be cleaned follow the dot spec. 2. Accept while the dirty can be cleaned. 3. The quality guarantee period of protective film is 3months, during the period, the spot or contamination is not allowed.	
	Printing area Light leakage	Follow the dot defect spec， MAX，Severity －see light leakage limit sample	
	Ink overflow	Visual inspection 30cm not allowed	
	Color discordant	Obvious color difference in the BM area is not allowed	
	Icon scratch of printing logo area	Icon printing logo area is not allow penetrability scratch	

7.RELIABILITY

Test Item	Test Condition	Inspection after test
High Temperature Operation	85℃ for 96 hours	Inspection after 2~4hours storage at room temperature, the sample shall be free from defects: 试验结束后，已测试的 LCD 样品必须在室内正常温湿度 环境下放置 2~4 个小时以上才能进行功能和外观检查，样品不允许有以下缺陷： 1.无功能不良，例：缺划,，显异，严重爆灯等 2.外观无偏光片气泡，OCA 气泡等不良： 2. The test samples should be applied to only one test item.每个被测试的模块只能用于其中的一个测试项目。
Low Temperature Operation	-30℃ for 96 hours	
High Temperature Storage	85℃ for 96 hours	
Low Temperature Storage	-30℃ for 96 hours	
High Temperature Storage Humidity Storage	60℃, 90%RH for 72 hours	
Thermal Shock (No Operation)	-10℃(30min) ~+25℃(5min)~ +60℃(30min) for 10 cycles	
Vibration Test	Frequency: 10~55Hz Amplitude:1.0mm Sweep Time: 11min Test Period: 6 Cycles for each direction of X, Y, Z	
Static electricity test	Touch ±4KV,air touch ±8KV	

8. HANDLING PRECAUTION

8.1 SAFETY

(1) Do not swallow any liquid crystal, even if there is no proof that liquid stal 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±5℃ and thehumidity is below 50±20%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 ketonics solvent & Aromatic solvent, use with a soft cloth soaked with acleaning naphtha solvent.
(7) Do not operate it above the absolute maximum rating.
(8) Do not remove the panel or frame from the module.

8.4 WARRANTY

1) From the Techstar shipping date, customers need to be up and running within 6 months.从Techstar发货之日起，客户需要6个月内上线并且使用。
2) According to Techstar TFT LCD quality standrad,Techstar will rework or exchange for functional defect goods sine within one year。依据Techstar TFT LCD质量标准，Techstar将在一年内保修或置换功能缺陷产品。
3) strictly prohibit the display in the whole machine for a long time point a fixed screen (display by the LCD residual shadow determination criteria); suggest that the entire machine more than 2 minutes without the use of LCM automatically into hibernation, more than 30 minutes without the use of the system to force LCM into hibernation. 严禁显示屏在整机长期点一个固定画面（显示屏依LCD残影判定标准）;建

议整机超过2分钟不使用LCM自动进入休眠，超过30分钟不使用系统强制LCM进入休眠状态。

4) Display is strictly prohibited to work continuously for more than 8 hours on the whole machine. 严禁显示屏在整机连续工作8小时以上。

5) Please take the module under static protection.请在有静电防护情况下，拿取模组。

6) LCM in special scenarios (such as high concentration of chemicals, strong magnetic field, extreme cold, and other use scenarios) use in advance to contact us to confirm.LCM在特殊场景（比如高浓度化学品，强磁场，极寒等使用场景）使用时提前联系我们确认。