Part Name 部件名称	TFT Display Module TFT 显示模块
SWI Part ID SWI 产品料号	LH397K-IC01
Customer Part ID 客户产品料号	
Manufactured By 供应商	Shineworld Innovations Limited 东莞市华瑞电子创新科技有限公司

PRODUCT SPECIFICATION

产品规格书

Version: 1.0

核 准 Approved By	制 定 Prepared By	客 户 审 批 Customer Approval
Yang D 	Luis Liu	

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本文档中的信息如有更改，恕不另行通知。
Please ask sales personnel from Shineworld Innovations Limited for updated specifications before product design and release of the orders.
在进行产品设计及下达订单前，请与东莞市华瑞电子创新科技有限公司业务人员索取最新规格资料。

CONTENTS 目录

REVISION RECORD 修订记录

DATE 修订日期	CONTENTS 修订内容	REVISION 版本	PREPARED BY 制定
2020-07-23	First Release	V1.0	Luis Liu

1) GENERAL DATA 概要参数

NO. 编号	ITEM 项目	SPECIFICATIONS 规格	UNIT 单位
1	Display Mode 显示模式	TFT	-
2	Diagonal Size 尺寸	3.97	Inch
3	Resolution 分辨率	480(RGB) x 800	Dots
4	Active Area 有效显示区域	51.84(H) x 86.40(V)	mm
5	Outline Dimension 外围尺寸	55.94(H) x 95.05(V)	mm
6	Thickness 厚度	1.95 Max	mm
7	Pixel Pitch 像素间距	0.108(W) x 0.108(H)	mm
8	Pixel Size 像素尺寸	0.108(W) x 0.108(H)	mm
9	Display Driver IC 显示驱动 IC	ST7701S	-
10	Touch Driver IC 触控驱动 IC	No Touch	-
11	Display Color 显示色彩	262K	-
12	Gray Scale 灰阶	8	Bit
13	Brightness 亮度	330 (Typ.)	cd /m2
14	Contrast Ratio 对比度	900:1 (Typ.)	-
15	Interface 接口	MIPI 2 Lane	-
16	IC Package Type IC 封装类型	COG	-
17	Module Connecting Type 模块连接方式	B2B Connector (OK-03M024-04)	-
18	Weight 重量	22.8±10%	g
19	Pins 引脚数	24	Pins
20	Operating Temperature 操作温度	-20~70	℃
21	Storage Temperature 存储温度	-30~80	℃

2) ABSOLUTE MAXIMUM RATINGS 极限参数

Unless otherwise specified, VSS = 0V (Ta=25℃)
除另行规定外，VSS=0V

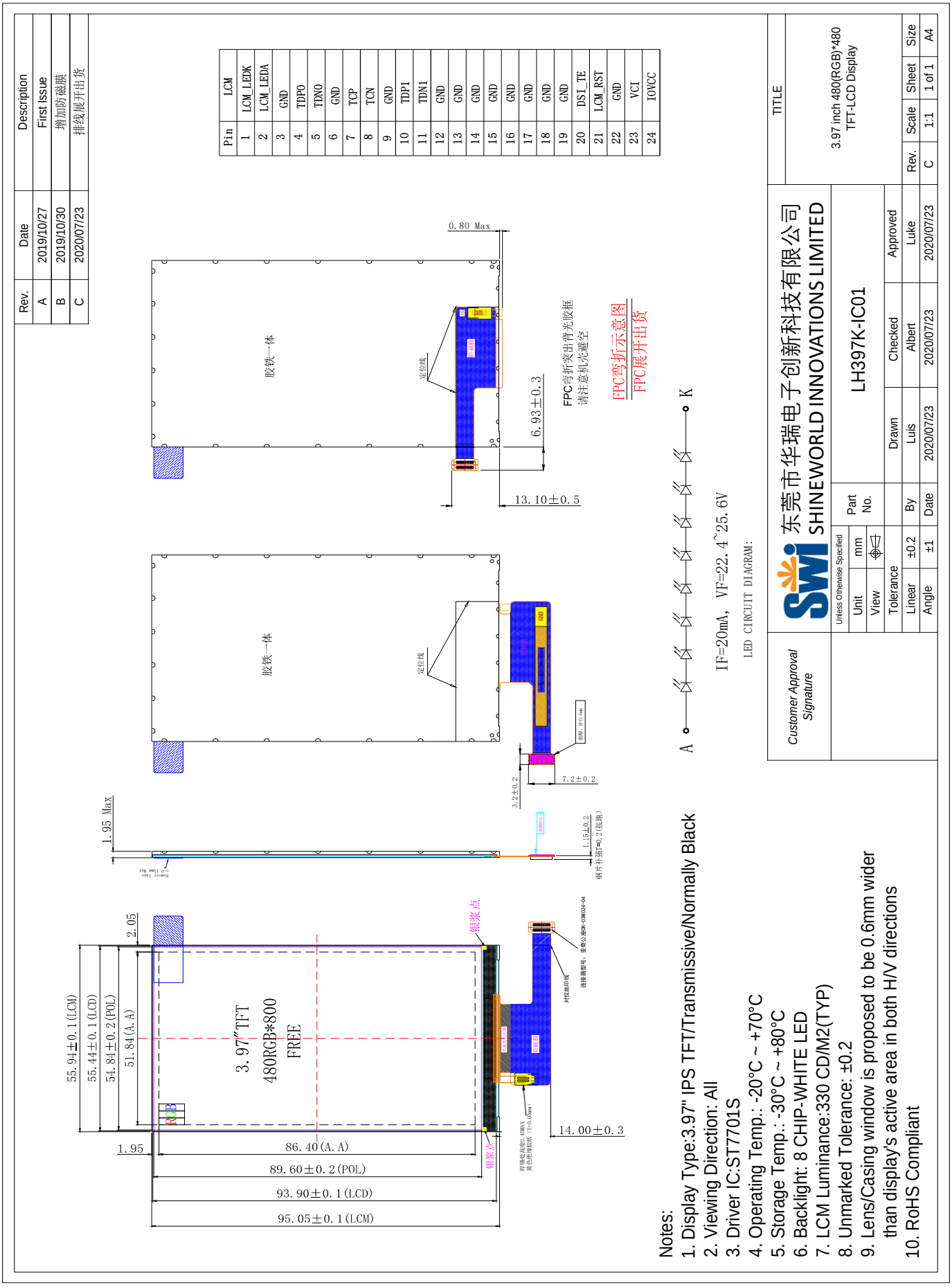
Items 项目	Min. 最小值	Max. 最大值	Unit 单位	Remark 备注
I/O Supply Voltage (VDD) I/O电压 (VDD)	-0.3	+4.0	V	
Analog Supply Voltage (VDDIO) 模拟电源电压 (VDDIO)	-0.3	+4.0	V	
Logic Input Voltage (VIN) 逻辑输入电压 (VIN)	-0.3	VDDIO+0.3	V	
Operating Temperature (T_{OP}) 操作温度 (T_{OP})	-20	70	℃	
Storage Temperature (T_{ST}) 存储温度 (T_{ST})	-30	80	℃	

NOTE:

Absolute Maximum Ratings means the product can withstand short-term, NOT more than 120 hours. If the product is a long time to withstand these conditions, the life time would be shorter.

极限条件仅指产品能短暂承受的范围,不可超过 120 小时。如果产品长时间在极限条件,将有损产品的使用寿命。

3) EXTERNAL DIMENSIONS 外形尺寸



Notes:
1. Display Type:3.97" IPS TFT/Transmissive/Normally Black
2. Viewing Direction: All
3. Driver IC:ST7701S
4. Operating Temp.: -20°C ~ +70°C
5. Storage Temp.: -30°C ~ +80°C
6. Backlight: 8 CHIP-WHITE LED
7. LCM Luminance:330 CD/M2(TYP)
8. Unmarked Tolerance: ±0.2
9. Lens/Casing window is proposed to be 0.6mm wider than display's active area in both H/V directions
10. RoHS Compliant

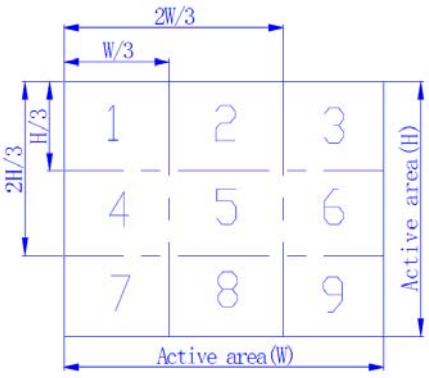
4) ELECTRICAL CHARACTERISTICS 电气特性

4.1. Backlight Characteristics 背光特性

Item 项目	Symbol 符号	Min. 最小值	Typ. 典型值	Max. 最大值	Unit 单位	Note 备注
Voltage for LED backlight LED背光电压	VLED	22.4	24	25.6	V	-
Current for LED backlight LED背光电流	ILED	-	20	30	mA	-
Power Consumption 耗电量	Pbl	-	480	768	mW	1
Brightness 亮度	Lbr	280	330	-	cd /m2	2
LED Life time LED寿命	-	20000	-	-	hr	3
Number of LED LED数量	-	8			Pic	-
Connection mode 连接模式	S/P	S			-	-

Note 备注:

1. Where ILED =20mA , VLED=24V , Pbl= ILED x VLED
2. Uniform measure condition 测量条件:
   a. Measure 9 point , Measure location is show below 测量 9 个点，位置如下图:
   b. Uniform=(Min brightness/Max brightness)x100%
   c. Best Contrast.

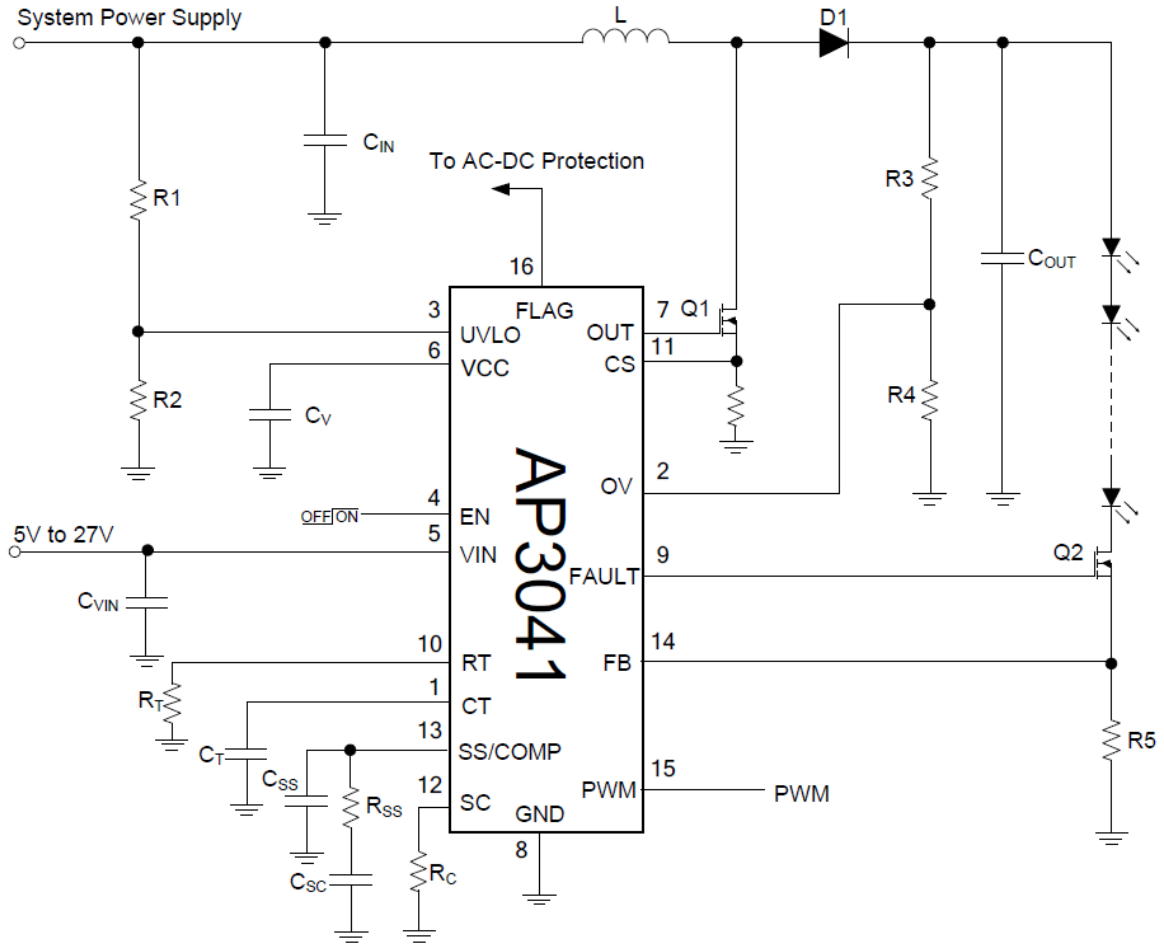


3. The environmental conducted under ambient air flow ,at Ta=25±2℃,60%RH±5%
   在 Ta=25±2℃,60%RH±5%的环境条件下进行

4.2. Backlight Recommended Circuit 背光推荐电路

Motherboard driver backlight is need constant current circuit, if threated voltage screen after light brightness difference. Current and power consumption of the machine are inconsistent, so recommend a backlight driving circuit is best rated current. It is recommended to use IC (AP3041). The reference circuit is as follows:

主板驱动背光需要使用恒流电路，如果使用电压驱动，屏幕亮度会有差异，使模块的电流和功耗不一致。因此建议背光驱动为定电流方式，建议使用 IC (AP3041)。参考电路如下：

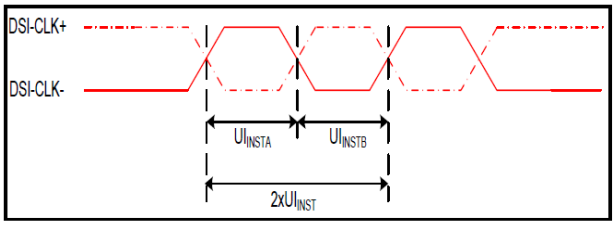


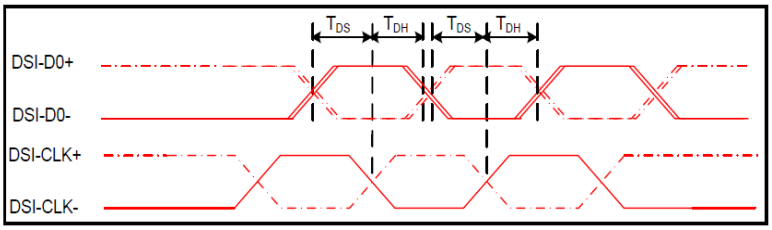
4.3. DC Characteristics 直流特性

Item 项目	Symbol 符号	Min. 最小值	Typ. 典型值	Max. 最大值	Unit 单位	Note 备注
Supply Voltage 电源电压	VDD	2.5	2.8	3.3	V	
Interface Operation Voltage 接口工作电压	VDDIO	1.65	1.8	3.3	V	
Gate Driver High Voltage 栅极高电压	VGH	11.5	-	17	V	
Gate Driver Low Voltage 栅极低电压	VGL	-7.6	-	-12	V	
Operating Current for VDD VDD工作电流	I_{DD}	-	TBD	-	mA	
Sleep_In Mode VDD VDD睡眠模式电流	I_{DD}	-	70	100	uA	
Sleep_In Mode VDDIO VDDIO睡眠模式电流	I_{DDIO}	-	5	10	uA	

4.4. AC Characteristics 交流特性

4.4.1. MIPI Interface Characteristics: MIPI接口时序

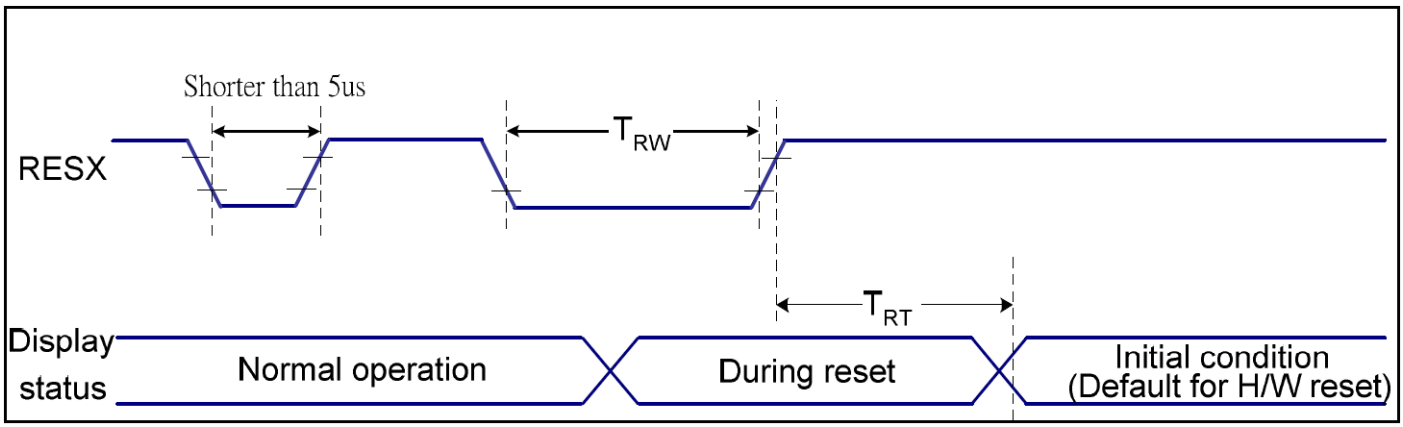




VDDI=1.8,VDD=2.8, AGND=DGND=0V, Ta=25 ℃

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
DSI-CLK+/-	$2xUI_{INSTA}$	Double UI instantaneous	4	25	ns	
DSI-CLK+/-	UI_{INSTA} UI_{INSTB}	UI instantaneous halfs	2	12.5	ns	UI = UI_{INSTA}= UI_{INSTB}
DSI-Dn+/-	tDS	Data to clock setup time	0.15	-	UI	
DSI-Dn+/-	tDH	Data to clock hold time	0.15	-	UI	

4.4.2. Reset Timing: 复位时序



VDDI=1.65 to 3.3V, VDD=2.4 to 3.3V, AGND=DGND=0V, Ta=-30 ~ 70 ℃

Related Pins	Symbol	Parameter	MIN	MAX	Unit
RESX	TRW	Reset pulse duration	10	-	us
	TRT	Reset cancel	-	5 (Note 1, 5)	ms
				120 (Note 1, 6, 7)	ms

Notes:

1. The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from NVM (or similar device) to registers. This loading is done every time when there is HW reset cancel time (tRT) within 5 ms after a rising edge of RESX.

1. 重置取消还包括将 ID 字节、VCOM 设置和其他设置从 NVM（或类似设备）加载到寄存器所需的时间。当 RESX 上升沿后 5 毫秒内出现 HW 重置取消时间（tRT）时，每次都会进行此加载。

2. Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below ：

2. 根据下表，RESX 线上的静电放电引起的尖峰不会导致系统不规则复位:

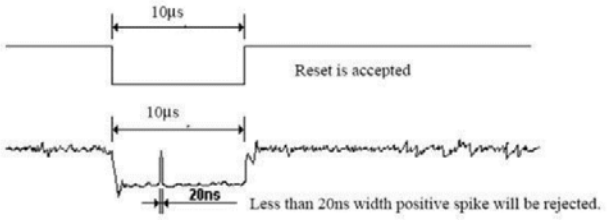
RESX Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 9us	Reset
Between 5us and 9us	Reset starts

3. During the Resetting period, the display will be blanked (The display is entering blanking sequence，which maximum time is 120 ms, when Reset Starts at Sleep-Out status. The display remains the blank state in Sleep-In mode). Then return to Default condition for Hardware Reset

3. 在复位期间，显示屏将被消隐（显示屏进入消隐序列，最长时间为 120 毫秒，此时 Reset 在 Sleep-Out 状态下开始。在 Sleep-In 模式下显示屏保持空白状态）。 然后返回到硬件重置的默认条件

4. Spike Rejection also applies during a valid reset pulse as shown below ：

4.尖峰抑制也适用于有效复位脉冲期间，如下所示:



5. When Reset applied during Sleep-In Mode. 当进入睡眠模式时应用复位。

6. When Reset applied during Sleep-Out Mode. 当退出睡眠模式时应用复位。

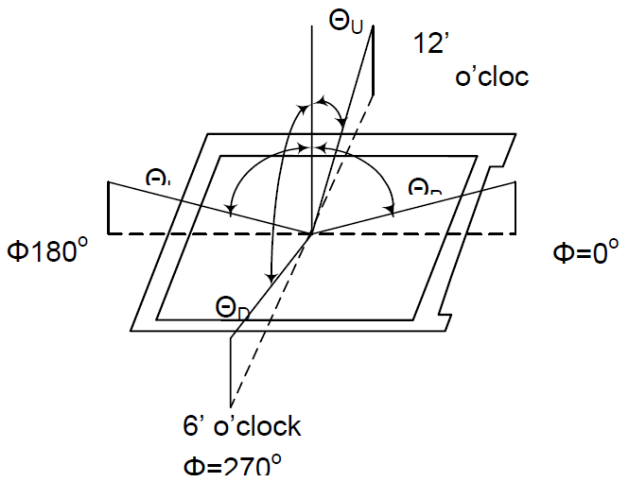
7. It is necessary to wait 10ms after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120 ms.

7. 在发送命令之前，有必要在释放 RESX 之后等待 10 毫秒。此外，在 120 毫秒内不能发送“Sleep Out”命令。

5) ELECTRO-OPTICAL CHARACTERISTICS 光电参数

Items 项目	Symbol 符号	Condition 条件		Min. 最小值	Typ. 典型值	Max. 最大值	Unit 单位	Note 备注
Viewing angle 视角	θ	Φ=0°	25℃	70	80	-	Deg	Note1
		Φ=180°	25℃	70	80	-		
	θ	Φ=90°	25℃	70	80	-		
		Φ=270°	25℃	70	80	-		
Brightness 亮度	Lbr	-	-	280	330	-	Cd/m2	
Luminance Uniformity 发光均匀性	ΔL	-	-	70	75	-	-	
Contrast Ratio 对比度	CR	-	25℃	720	900	-	-	Note2
Response Time 响应时间	Tr+Tf	θ=0° Φ=0°	25℃	-	35	45	ms	Note3
CIE(x,y) chromaticity CIE 色度坐标	White	X	25℃	-	0.273	-	-	BM-7A
		Y	25℃	-	0.298	-		
	Red	X	25℃	-	0.625	-		
		Y	25℃	-	0.322	-		
	Green	X	25℃	-	0.307	-		
		Y	25℃	-	0.610	-		
	Blue	X	25℃	-	0.152	-		
		Y	25℃	-	0.050	-		
Transmittance (with polarizer) 透过率	-	-		-	4.14	-	%	

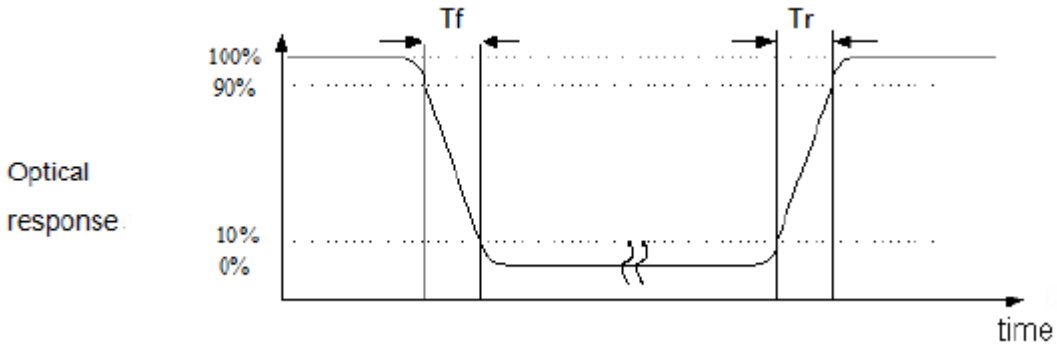
Note1. Definition of Viewing Angle 视角的定义:



Note 2. Definition of Contrast Ratio:
对比度定义:

$$\text{Contrast Ratio 对比度} = \frac{\text{Luminance with all pixels white 显示白色画面时的亮度}}{\text{Luminance with all pixels black 显示黑色画面的亮度}}$$

Note3. Definition of Response Time : Sum of Tr and Tf :
响应时间的定义: Tr和Tf的总和:



6) INTERFACE PIN CONNECTIONS 引脚接口

No. 编号	Symbol 符号	Description 描述
1	LCM_LEDK	LED Cathode LED负极
2	LCM_LEDA	LED Anode LED正极
3	GND	Ground 接地
4	TDP0	MIPI DSI differential data pair MIPI数据通道0
5	TDN0	MIPI DSI differential data pair MIPI数据通道0
6	GND	Ground 接地
7	TCP	MIPI DSI differential clock pair MIPI时钟通道
8	TCN	MIPI DSI differential clock pair MIPI时钟通道
9	GND	Ground 接地
10	TDP1	MIPI DSI differential data pair MIPI数据通道1
11	TDN1	MIPI DSI differential data pair MIPI数据通道1
12~19	GND	Ground 接地
20	DSI_TE	Tearing effect signal is used to synchronize MCU to frame memory writing 防撕裂
21	LCM_RST	This signal will reset the device, Signal is active low. 复位信号
22	GND	Ground 接地
23	VCI	Power Supply for Analog 模拟电源
24	IOVCC	Power Supply for I/O system I/O口电源

7) RELIABILITY TEST 可靠性测试

No. 序号	Item 试验项目	Conditions 试验条件	Inspection after Test 判断标准
1	High Temperature Storage 高温存储	80℃, 120 hours	Inspection after 2~4 hours 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. Air Bubble in the LCD; 模组中有气泡 2. Non-display; 不显示 4. Missing Segments; 漏笔 5. Glass Crack; 玻璃破裂 6. Current Idd is Twice Higher than Initial Value 电流Idd大于初始值的2倍
2	Low Temperature Storage 低温存储	-30℃, 120 hours	
3	High Temperature Operating 高温操作	70℃, 120 hours	
4	Low Temperature Operating 低温操作	-20℃, 120 hours	
5	High Temperature & High Humidity Storage 高温高湿存储	+60℃,90% RH, 120 hours	
6	Thermal Shock 热冲击	-10℃ ~ 60℃ (30min) (30min) Change time:5min 24CYC	
7	ESD Test 静电试验	C=150pF, R=330,5points/panel Air:±4KV, 5times; Contact:±2KV, 5 times; (Environment: 15℃~35℃,30%~60%).	
8	Vibration (Non-operation) 震动试验（非操作）	Frequency: 10 ~ 55Hz Amplitude: 1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total) (Package condition).	
9	Box Drop Test 跌落试验	1 Corner 3 Edges 6 faces,76cm (MEDIUM BOX)	

Remark: 备注:

1. 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。
2. Sample size for each test item is 5~10pcs.
   每个测试项目的样品数量为 5 ~ 10 片.
3. For Damp Proof Test, Pure water(Resistance > 10MΩ) should be used.
   对于防潮试验，试验箱的用水必须是电阻大于 10M 欧姆的纯水。
4. In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.
   如果由静电引起产品故障,当放置一段时间后能够恢复正常，则不视为产品缺陷。
5. Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic
   故障判断标准：基本规格、电气特性、机械特性、光学特性
6. The color fading mura of polarizing filter should not care.
   Mura 和偏光片褪色不包括在内

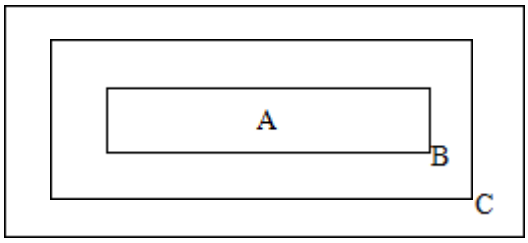
8) OUTGOING QUALITY CONTROL SPECIFICATIONS 出厂质量控制规范

8.1. Standard 标准

According to GB/T2828.1-2003/ISO 2859-1:1999 and ANSI/ASQC Z1.4-1993, General Inspection Level II.

8.2. Definition 定义

1) Major Defect: The defect that greatly affect the usability of product.
主要缺陷：严重影响产品可用性的缺陷。
2) Minor Defect: The other defects, such as cosmetic defects, etc.
轻微缺陷：其他缺陷，如外观缺陷等。
3) Definition of Inspection Zone 检验区的定义:

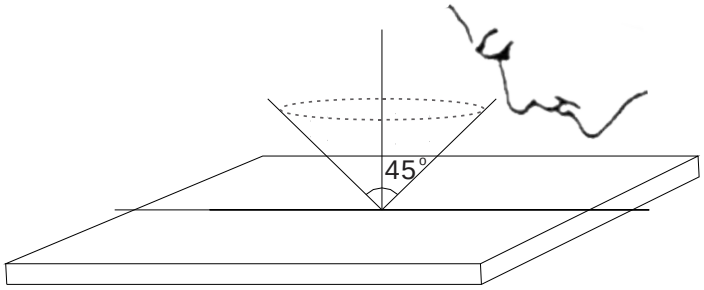


Zone A: Active Area
Zone B: Viewing Area except Zone A Zone
C: Outside Viewing Area

Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble of quality and assembly to customer`s product.
A区为显示区，B区为可视区内A区以外的区域，C区为可视区以外的区域。一般情况下，在客户产品没有质量和装配问题的情况下，C 区的视觉缺陷是允许的。

8.3. Inspection Methods 检查方法

1) General Inspection: under 20W x 2 or 40W fluorescent light, about 30cm viewing distance, within 45º viewing angle, under 25±5℃.
一般检查：20W x 2或40W荧光灯下，约30cm观看距离，45°视角内，25±5℃以下。

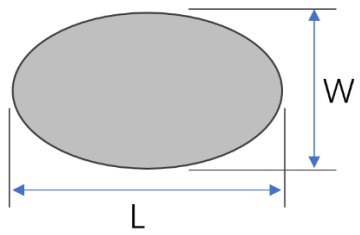


2) The Brightness and Color Coordinate Inspection: By CS2000/09A-LCD-117 or the equal equipment, in the dark room, under 25±5℃.
亮度及色坐标检测：CS2000/09A-LCD-117或同等设备，暗室，25±5℃以下。

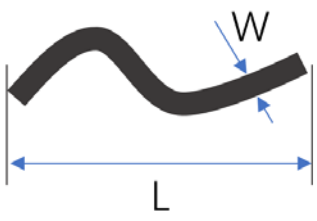
8.1. Inspection Criteria 检查标准

1) Definition of the Defect Size 不良点尺寸定义:

Spot Shape 斑状:



Line Shape 线状:

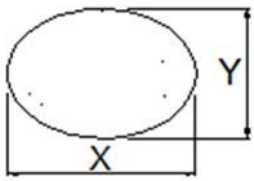
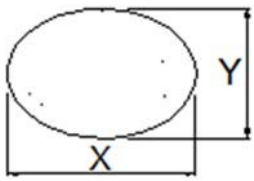


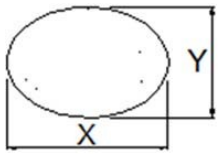
Φ= (L+W)/2
L: Length 长度 W: Width 宽度 N: Number 数量

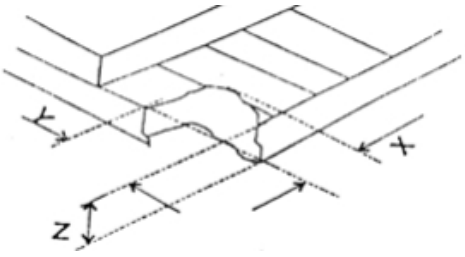
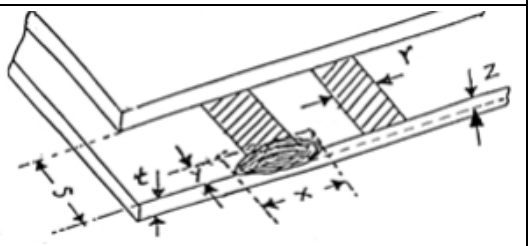
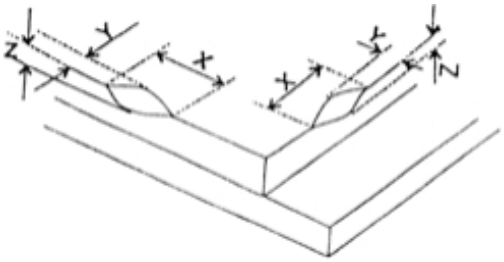
2) Major Defect: AQL= 0.65

Item 项目	Criterion 标准
Function Defect 功能不良	1. No display or abnormal display is not accepted 无显示或异常显示不可接受.
	2. Open or short is not accepted. 开路或短路不可接受.
	3. Bright/Dark line or other line shapes are not accepted 亮/暗线或其它线不良不可接受.
	4. Missing vertical or horizontal segment are not accepted 横向或竖向断笔缺失.
	5. Back Light has no lighting, flickering or abnormal lighting are not accepted 背光不亮、闪烁或异常.
Component Defect 元件不良	Missing/Broken component is not accepted. 缺件/元件破损不可接受.
Outline Dimension 外形尺寸	Outline dimension exceeding the spec is not accepted. 外形尺寸超出规格不可接受.
Glass Crack 玻璃裂纹	Glass crack tends to enlarge is not accepted. 趋于扩大的玻璃裂纹不可接受.
FPC Defect 排线不良	Split/Broken FPC is not accepted. FPC破裂不可接受.

3) Minor Defect: AQL= 1.5

Item 项目	Criterion 标准			
Clear Spot Defect (Black & White Spot, Foreign Particle, Pinhole, Stain under Polarizer) 亮斑缺陷 (黑白斑,异物,Pin孔,脏污)	Size (mm)		Accepted Qty. 可接受数量	
			Area A + Area B	Area C
		Φ≦0.1	Ignored 忽略	
		0.10 < Φ≦0.15	N≦2	Ignored 忽略
		0.15 < Φ≦0.20	N≦1	
		0.20 < Φ	N=0	
	Note: Φ= (x + y) / 2			
Dim Spot Defect (Circle Shaped and Dim Edged Defects) 暗斑缺陷 (圆形和暗边不良)	Size (mm)		Accepted Qty. 可接受数量	
			Area A + Area B	Area C
		Φ≦0.2	Ignored 忽略	
		0.20 < Φ≦0.40	N≦2	Ignored 忽略
		0.40 < Φ≦0.60	N≦1	
		0.60 < Φ	N=0	
	Note: Φ= (x + y) / 2			
Dot (Pixel) Defect 像素点不良	Item		Area A + Area B	Area C
	Bright Dot 亮点		N=0	Ignored 忽略
	Dark Dot 暗点		N≦4	

<table>
<tr><th>Item 项目</th><th colspan="4">Criterion 标准</th></tr>
<tr><td rowspan="5">Line Defect
(Dimming and Lighting Line)
线缺陷
(暗线和亮线)</td><td>L (Length): mm</td><td>W (Width): mm</td><td>Area A + Area B</td><td>Area C</td></tr>
<tr><td>/</td><td>W≦0.02</td><td colspan="2">Ignored 忽略</td></tr>
<tr><td>L≦3.0</td><td>0.02 < W≦0.03</td><td>N≦2</td><td rowspan="3">Ignored
忽略</td></tr>
<tr><td>L≦2.0</td><td>0.03 < W≦0.05</td><td>N≦1</td></tr>
<tr><td>/</td><td>0.05 < W</td><td>As spot defect
依据斑缺陷判断</td></tr>
<tr><td colspan="5">Note: The total of spot defects and line defects shall not exceed 4 PCS. The distance between two lines defects must exceed 1 mm
备注：斑缺陷和线缺陷的总和不得超过4个。两条线缺陷之间的距离必须超过1毫米。</td></tr>
<tr><td>Mura</td><td colspan="4">Judged OK if unviewable by using 3% ND Filter on 128 gray scale pattern.
如果在128灰度模式上使用 3%ND滤光片看不到，则判断为OK。</td></tr>
<tr><td>FPC Defect
排线缺陷</td><td colspan="4">Crack, deep fold and deep pressure mark on the FPC are not accepted
软膜排线上的破裂、深折痕和深压痕不可接受。</td></tr>
<tr><td>Polarizer Stain
偏光片污渍</td><td colspan="4">Stain which can be wiped off lightly with a soft cloth or similar cleaning is accepted, otherwise, according to the Spot Defect and the Line Defect.
可以用软布或类似清洁剂轻轻擦掉的污渍可以接受，否则，依据斑缺陷和线缺陷判断。</td></tr>
<tr><td rowspan="7">Polarizer Scratch
偏光片刮伤</td><td colspan="4">1. If scratch can be seen during operation, according to the criterions of the Spot Defect and the Line Defect.
如果在操作过程中可以看到划痕，则依据斑缺陷和线缺陷的标准判断。</td></tr>
<tr><td colspan="4">2. If scratch can be seen only under non-operation or some special angle, the criterion is as below:
如果只有在非操作或特殊角度下才能看到划痕，则标准如下:</td></tr>
<tr><td>L (Length): mm</td><td>W (Width) : mm</td><td>Area A + Area B</td><td>Area C</td></tr>
<tr><td>/</td><td>W≦0.03</td><td colspan="2">Ignore 忽略</td></tr>
<tr><td>L≦10.0</td><td>0.03 < W≦0.05</td><td>N≦2</td><td rowspan="3">Ignore
忽略</td></tr>
<tr><td>L≦5.0</td><td>0.05 < W≦0.08</td><td>N≦1</td></tr>
<tr><td>/</td><td>0.08 < W</td><td>N=0</td></tr>
<tr><td rowspan="6">Polarizer Air Bubble
偏光片气泡</td><td colspan="2">Size (mm)</td><td>Area A + Area B</td><td>Area C</td></tr>
<tr><td rowspan="4">  </td><td>Φ≦0.20</td><td colspan="2">Ignored 忽略</td></tr>
<tr><td>0.20 < Φ≦0.30</td><td>N≦2</td><td rowspan="3">Ignored
忽略</td></tr>
<tr><td>0.30 < Φ≦0.50</td><td>N≦1</td></tr>
<tr><td>0.50 < Φ</td><td>N=0</td></tr>
<tr><td colspan="4">Note: Φ= (x + y) / 2</td></tr>
</table>

<table>
<tr><th>Item 项目</th><th>Criterion 标准</th></tr>
<tr><td rowspan="4">Glass Defect
(Glass Chipped)
玻璃缺陷
(玻璃崩边)</td><td>1. On the corner (mm)
在角部(mm)
<table><tr><td>x</td><td>y</td><td>z</td></tr><tr><td>≦2.0</td><td>≦s</td><td>Disregard</td></tr></table>  </td></tr>
<tr><td>2. On the Bonding Edge (mm)
在邦定边缘(mm)
<table><tr><td>x</td><td>y</td><td>z</td></tr><tr><td>≦a/4</td><td>≦s/3 & ≦0.7</td><td>Disregard</td></tr></table>  </td></tr>
<tr><td>3. On the Other Edges (mm)
在其它边缘(mm)
<table><tr><td>x</td><td>y</td><td>z</td></tr><tr><td>≦3.0</td><td>≦0.5</td><td>Disregard</td></tr></table>  </td></tr>
<tr><td>Note: t: Glass Thickness; s: Pad Width; a: Edge Length, x: Chip Length, y: Chip Width, z: Chip Thickness
t: 玻璃厚度; s: Pad 宽度; a: 边的长; x: 崩边长; y: 崩边宽; z: 崩边厚</td></tr>
</table>

4) Parts Defect 元器件不良

Item 项目	Criterion 标准
Parts Alignment 元器件对位	**Minor Defect:** IC and FPC/heat-seal lead width is more than 50% beyond lead pattern. Chip or solder component shifted from center more than 50% of the pad outline. IC/FPC焊接偏离引线图案宽度超过50%. 焊接的元器件偏离焊盘中心超过50%焊盘长/宽尺寸.
SMT	According to the <Acceptability of Electronic Assemblies> IPC-A-610E Class 2 Standard, component missing or function defect is Major defect, the others are Minor defect. 按照IPC-A-610E <电子组件的可接受性> 2级产品标准，缺少元器件或功能缺陷为重缺陷，其它缺陷为轻缺陷。

9) CAUTIONS FOR USING LCD MODULES 模块使用注意事项

9.1. Precautions for Handling LCD Modules 处理LCD模块的注意事项

1) The display panel is made of glass and polarizer. As glass is fragile. It tends to become chipped during handling especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact.
显示屏由玻璃和偏光片组成。由于玻璃是脆弱的，使用过程中要特别防止边缘区损伤。请避免显示屏因跌落或振动而受到机械冲击。
2) Do not apply excessive force to the display surface or the adjoining areas since this may cause abnormal. Do not touch the display with bare hands. This will stain the display area (some cosmetics are determined to the polarizer).
请勿施加过大的压力于显示屏或连接部位，否则可能会引起显示异常。不要用手接触显示屏，这将弄脏显示区（一些外观是由偏光片决定的）。
3) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on it. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming in to contact with room temperature air.
覆盖 LCD 显示模块显示平面的偏光片是软性的且易被擦伤，请小心轻拿。请勿用任何硬度大于HB铅笔芯的物品（玻璃，镊子等）接触、撞压或摩擦裸露偏光片。不要放置或粘附物体在显示区域上以免留下痕迹。冷凝在表面和端子将会损坏或弄脏偏光片。产品在低温下测试之后，与室温空气接触之前必须在容器内升温。
4) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents.
   - Isopropyl alcohol
   - Ethyl alcohol

   Do not scrub hard to avoid damaging the display surface.
   如果显示平面受污，可对平面吹热气且轻轻地用软性干布擦除。如果受污严重，用含下列一种溶剂的湿布擦除:
   - 甘油
   - 酒精

   请勿用力擦拭以免损坏显示平面。
5) Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.
   - Water
   - Ketone
   - Aromatic solvents

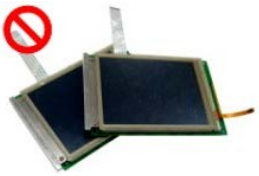
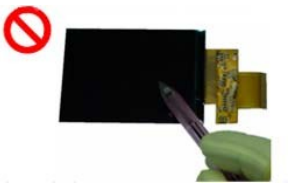
   Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contact with oil and fats.
   除以上提到的溶剂外，其他溶剂可能会损坏偏光片，特别要避免使用以下溶剂:
   - 水
   - 酮
   - 芳烃溶剂

   立即擦掉唾液或水滴，长时间与水接触会引起变形或褪色。避免接触油和油脂。

6) Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.
特别注意最小限度地减少电极腐蚀，电极腐蚀会因水滴、湿度冷凝或在高湿环境下通电而加速。
7) When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable.
组装LCD模块时一定不要弯曲、扭曲和变形。要特别注意不要用力拔，弯曲排线。
8) Do not attempt to disassemble or process the LCD module.
请勿拆卸LCD模块。
9) NC terminal should be open. Do not connect anything.
悬空端应断开，不要连接任何器件。
10) If the logic circuit power is off, do not apply the input signals.
如果逻辑电路电源是断开的，不要施加输入信号。
11) Electro-Static Discharge Control: Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
ESD管控: 由于LCD显示模块使用CMOS集成，要特别注意静电放电问题。对CMOS器件，要特别注意静电。为防止静电造成的损坏，注意保持合宜的工作环境。
- Before removing LCD from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential. Be sure to ground the body when handling the LCD modules.
LCD模块移出包装盒和安装之前，要保证模块和人体具有相同的电位。处理模块时可靠接地。
- Tools required for assembling, such as soldering irons, must be properly grounded. Make certain the AC power source for the soldering iron does not leak. When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.
使用工具如电烙铁时，必须正确接地，并确保烙铁使用的交流电不会漏电。用电动螺丝刀固定模块时，电动螺丝刀应接地，尽可能降低电动换向器火花产生的电磁波。
- To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions. To reduce the generation of static electricity be careful that the air in the work is not too dry. A relative humidity of 50%-60% is recommended. As far as possible make the electric potential of your work clothes and that of the work bench the ground potential.
为减少静电产生，不要在干燥的条件下进行组装等工作。为降低静电，工作环境一定不要太干燥。建议相对湿度为 50%-60%。尽可能使你的工作服和工作台接地。
- The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.
LCD 模块表面有保护膜。需要小心操作因为撕保护膜时可能产生静电。
12) LCD module is easy to be damaged. Please note below and be careful for handling.
LCD 显示模块很容易被损坏. 请注意以下并小心操作。
i. Correct Handling 正确操作:

As showed above, please handle with anti-static gloves around LCD module edges.
如上面的图片所示,请戴抗静电手套,并拿模块边缘.

ii. Incorrect Handling 错误操作:

 Don't touch IC directly 不要直接触摸 IC	 Don't hold the surface of panel 不要拿着面板的表面	 Don't stack LCD modules 不要堆叠 LCD 模块
 Don't hold the surface of IC 不要拿着 IC 的表面	 Don't operate with sharp stick such as pens 不要用尖锐的物体来操作，如笔尖	 Don't stretch interface of input, such as FPC 不要拉扯输入接口，如软排线

9.2. Precautions for Storing LCD Module LCD 模块存储注意事项

When storing the LCD modules, the following precautions are necessary:
LCD 模块的存储依照以下几点:

1) Store them in a sealed polyethylene bag with the desiccant.
使用干燥剂和聚乙烯袋密封包装。
2) Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0℃and 35℃, and keep the relative humidity between 40%RH and 60%RH.
避光保存，避免直接暴露在太阳光或黄光灯下，保持温度在 0~35 摄氏度之间，保持相对湿度在 40%RH和60%RH 之间。
3) The polarizer surface should not come in contact with any other objects (We advise you to store them in the anti-static electricity container in which they were shipped).
偏光片表面避免接触其他物质 建议存放在货运防静电包装中。
4) To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules.
为最小限度地降低由静电等导致 LCD 模块性能降低，使用模块时慎重使用下列区域:
   - Exposed area of the printed circuit board.
   印制电路板裸露区域。
   - Terminal electrode sections.
   印制电路板引出端子区域。

9.3. Precautions for Transportation 运输注意事项

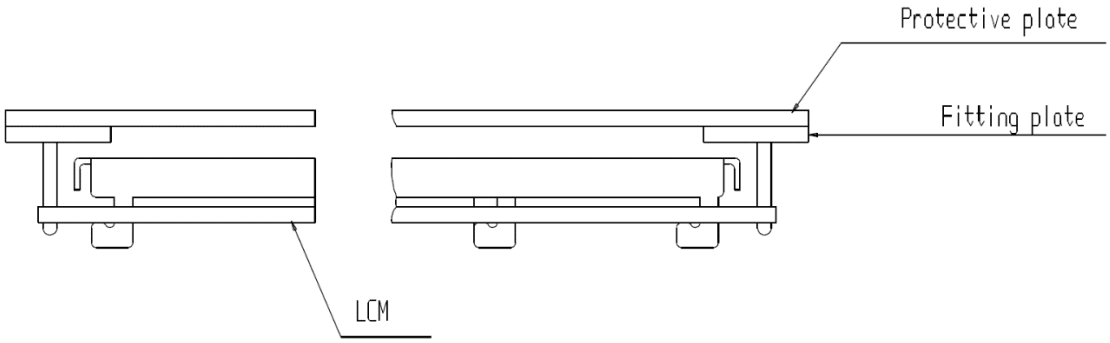
1) During shipment, please handle with care. The packaging bag can not be broken, step on trap. Packaging Carton layer height can not be over two meters.
装运过程要轻拿轻放。不能出现包装袋破损，踢陷。纸箱叠层高度不能超过2米.
2) The transportation process should pay attention to the waterproof and moisture-proof measures. Product can not be watering. Ethylene sealed bags can not be unsealed.
运输过程要注意有防水和防潮措施。产品不能淋水。产品乙烯密封袋不可开封。

9.4. Using LCD Modules LCD 模块使用注意事项

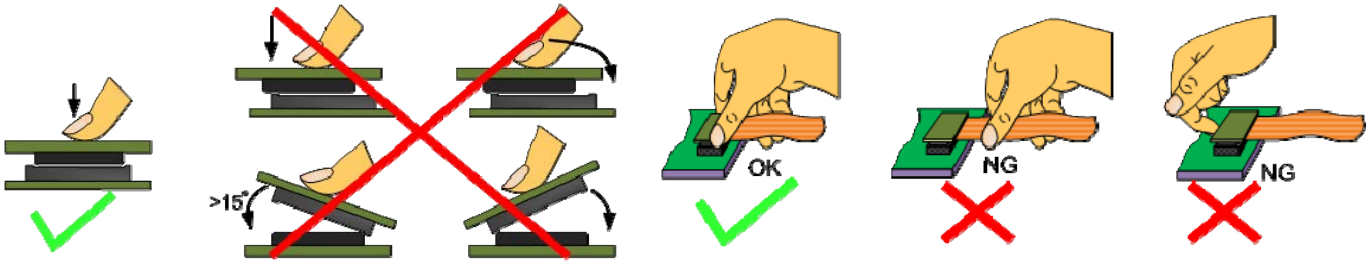
Installing LCD Modules 安装LCD模块

1) When assembling the LCD module into other equipment, the spacer to the bit between the LCD module and the fitting plate should have enough height to avoid causing stress to the module surface, refer to the individual specifications for measurements. The measurement tolerance should be ±0.1mm.
将 LCD 模块安装进入其它设备时，模块和安装板之间间隔应有足够的高度以避免模块表面受压。参照专业度量技术标准。量度公差应是±0.1 毫米。

2) Cover the surface with a transparent protective plate to protect the polarizer and LC cell.
贴一层透明保护膜来保护偏光片和液晶盒。



3) Precaution for assembling the module with BTB connector:
用板对板连接器安装 LCD 显示模块注意事项:
Please mind the connecting position of the male and female connectors, don't assemble the LCD in improper ways shown below.
请注意连接器的公母及连接位置，请勿出现下图所示的不正确的连接方式。



9.5. Precautions for Soldering LCD Module LCD 模块焊接注意事项

	Manual Soldering 手工焊接	Machine Drag Soldering 机器拖焊	Machine Press Soldering 机器压焊
Non-RoHS Product 非环保产品	290℃ ~350℃ Time: 3-5s	330℃ ~350℃ Speed: 15-17mm/s	300℃ ~330℃ Time: 3-6S. Press: 0.8~1.2Mpa
RoHS Product 环保产品	340℃ ~370℃ Time: 3-5s	350℃ ~370℃. Speed: 15-17mm/s	330℃ ~360℃ Time: 3-6s Press: 0.8~1.2Mpa

1) If soldering flux is used, be sure to remove any remaining flux after finishing to soldering operation (This does not apply in the case of a non-halogen type of flux). It is recommended that you protect the LCD surface with a cover during soldering to prevent any damage due to flux spatters.

如果使用助焊剂，完成焊接后一定要清除剩余的助焊剂 (除非卤化物助焊剂)，建议焊接时用盖子保护显示屏面以避免因助焊剂溅出造成的任何损坏。

2) When soldering the LCD module and PC board, the panel and board should not be detached more than three times. This maximum number is determined by the temperature and time conditions mentioned above, though there may be some variance depending on the temperature of the soldering iron.
焊接 LCD 模块和线路板时，不应装卸多于三次。尽管焊接温度会有变化，但不应超过上面提到的焊接温度和时间最大值。

3) When remove the LCD module from the PC board, be sure the solder has completely melted, the soldered pad on the PC board could be damaged.
从线路板上移除LCD模块时，要保证焊锡已完全熔化，不要损坏线路板上的焊接位。

9.6. Precautions for Operation 工作运行注意事项

1) Viewing angle varies with the change of liquid crystal driving voltage (VLCD). Adjust VLCD to show the best contrast.
视角应随液晶驱动电压(VLCD)变化而变化.调整VLCD 可显示最好的对比度。

2) It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage than the limit will damage the driver IC. An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.
在LCD驱动电压内来操作模块是必要的。超过限定电压会损坏集成电路。直流电会引起液晶的电化学反应，导致液晶老化，因此要避免直流电驱动液晶。

3) Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operating temperature.
液晶响应时间在低温时比常温要慢，高温时，液晶底色会深。然而，这并不是指液晶显示屏工作异常，显示屏在温度恢复时，效果会恢复正常。

4) If the display area is pushed hard, the display will cause pixel short, it will become the display defect.
如果在运行过程中显示区受到挤压，将可能引起像素短路，引起显示缺陷。

5) A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit. Usage under the maximum operating temperature, 50%RH or less is required.
接线端冷凝会引起电化学反应而断路。因此必须在最大的操作温度之内，湿度小于50%的条件下使用LCD模块。

6) Input logic voltage before apply analog high voltage such as LCD driving voltage when power on. Remove analog high voltage before logic voltage when power off the module. Input each signal after the positive/negative voltage becomes stable.
开机时，先接通逻辑电压，再接通模拟高压，比如LCD驱动电压。关机时，先断开模拟高压，再关逻辑电压。正负电源都稳定后再送控制信号。

7) Please keep the temperature within the specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.
模块在操作和存储规格范围内使用。高温高湿可能会引起偏振退化，起泡，偏光片脱落等问题。

8) Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.
液晶在低温会凝固（低于储存温度范围以下），会导致缺陷或产生气泡（黑或白）。如果模块处于低温下，也会产生气泡。

9) If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.
如果液晶显示模块长时间工作于同一个显示图案，换屏时会出现鬼影，也会出现轻微的对比度不均。停止使用一段时间后可恢复到正常状态。此现象不会严重影响性能可靠性。

9.7. Safety 安全

1) It is recommended to crush damaged or unnecessary LCD into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.
建议将损坏的 LCD 显示屏压成碎片，，用溶剂诸如丙酮,乙醇冲洗掉，迟后烧掉。
2) If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.
如果任何固体或粉末从玻璃种泄漏出且与手接触,要用肥皂和水彻底清洗。

9.8. Limited Warranty 有限质保

Unless agreed between SWI and the customer, SWI will replace or repair any of its LCD modules which are found to be functionally defective when inspected in accordance with SWI LCD acceptance standards for a period of one year from date of production. Cosmetic/visual defects must be returned to SWI within 90 days of shipment. Confirmation of such date shall be based on data code on product. The warranty liability of SWI limited to repair and/or replace on the terms set forth above. SWI will not be responsible for any subsequent or consequential events.
除华瑞和客户之间另有协议外，自生产之日起一年内，根据华瑞的LCD显示屏品质标准，华瑞将对有功能缺陷的LCD显示模块换货或返工。外观/视觉缺陷产品，必须在出货后90天内归还华瑞。以产品上标识日期为准。华瑞保修责任仅限于对符合上述规定的货品进行返工和/或换货。对此后发生的任何情况，华瑞均不承担任何责任。

9.9. Return LCD Module under Warranty LCD 模块返修质保

1) No warranty can be granted if the precautions stated above have been disregarded. The typical examples of violations are :
保修是以上述注意事项未被忽视为先决条件的。典型的违反例子如下:
- Broken LCD glass.
断裂的 LCD 显示屏玻璃。
- PCB eyelet is damaged or modified.
印制线路板孔修改或损坏。
- PCB conductors damaged.
线路板导体损坏。
- Circuit modified in any way, including addition of components.
线路随意变更，包括元件变化。
- PCB tampered with by grinding, engraving or painting varnish.
印制电路板已修改，如研磨，雕刻，绘涂等。
- Soldering to or modifying the bezel in any manner.
焊接或变动模块

2) Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB eyelet, conductors and terminals.
模块维修清单将按双方协议送呈客户。模块详细缺陷描述须模块一并退回。顾客安装的连接器或电缆必须在不破坏线路板孔，线路和引线端条件下全部移去。

10) PRIOR CONSULTING MATTERS 提前商议事项

1) For SWI standard products, we keep the right to change the materials and processes without prior notification to our customers.
对于华瑞的标准产品，我们保留在不通知客户的情况下，改变原材料及加工方法等的权利。
2) For OEM products, if any changes are needed which may affect the product property, we will consult with our customer in advance.
对于OEM 产品，如果需要做任何会影响到产品性能的改变，我们会提前和客户商议。
3) If you have special requirement about reliability condition, please let us know before you start the test on our samples.
如对可靠性条件有特殊要求，请在产品测试前通知我们。