



A Professional Manufacturer of Display

Manufacturer Certificated



CERT. No.: 282Q19070712006



CERT. No.: 282E19070712007

Product Specification

Model: TTH019BVS-05

1.9" TFT Display Module(170*320)

This module uses RoHS material

Tailor Pixels Technology Co., Ltd.

www.tailorpixels.com

tailor@tailorpixels.com

Ph: 86-755-8821 2653

Records of Revision 修改记录

Rev 版本号	Date 修改日期	Description 内容	Page 页	Remarks 注释
V0	2023/05/08	首 次	19	

Table of Contents 目录

1	General Description 规格简介	4
2	Module Parameter 模组参数	4
3	Mechanical Drawings 结构图	错误！未定义书签。
4	Module Interface 模组接口定义	6
5	Application Circuit 应用电路	6
6	Absolute Maximum Ratings 绝对最大额定值	7
7	Electrical Specification 电性规格	7
8	Initialization Code 初始化代码	8
9	Optical Specifications 光学规格	10
9.1	Optical Specifications 光学规格	10
9.2	The power on/off sequence is illustrated below 电源启动/关闭顺序如下所示	11
9.3	Definition of Contrast Ratio 对比度的定义	11
9.4	Definition of Viewing Angles 视角的定义	11
9.5	Definition of Color Appearance 色域的定义	11
9.6	Definition of Surface Luminance, Uniformity and Transmittance	12
	表面亮度、均匀性和透光率的定义	12
10	Quality Assurance 质量标准	12
10.1	Purpose 目的	12
10.2	Agreement Items 协议项目	12
10.3	Standard of the Product Visual Inspection 产品外观检验标准	12
10.4	Inspection Specification 检验标准	13
10.5	Classification of Defects 缺陷的分类	18
10.6	Identification/marketing criteria 识别/评分标准	18
10.7	Packing 包装	18
11	Reliability Specification 可靠性规范	18
12	Precautions and Warranty 注意事项和保证	19
12.1	Safety 安全	19
12.2	Handling 处理	19
12.3	Operation 操作	19
12.4	Static Electricity 静电	19
12.5	Limited Warranty 有限质量保证	19
13	Packaging 包装	20
14	Prior Consult Matter 免责声明	20

1 General Description 规格简介

This display module is a transmissive type color active matrix TFT(Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This module is composed of a TFT LCD module, a driver circuit, and a back-light unit. The resolution of a 1.9" contains 170RGB x 320 dots and can display up to 262K colors.

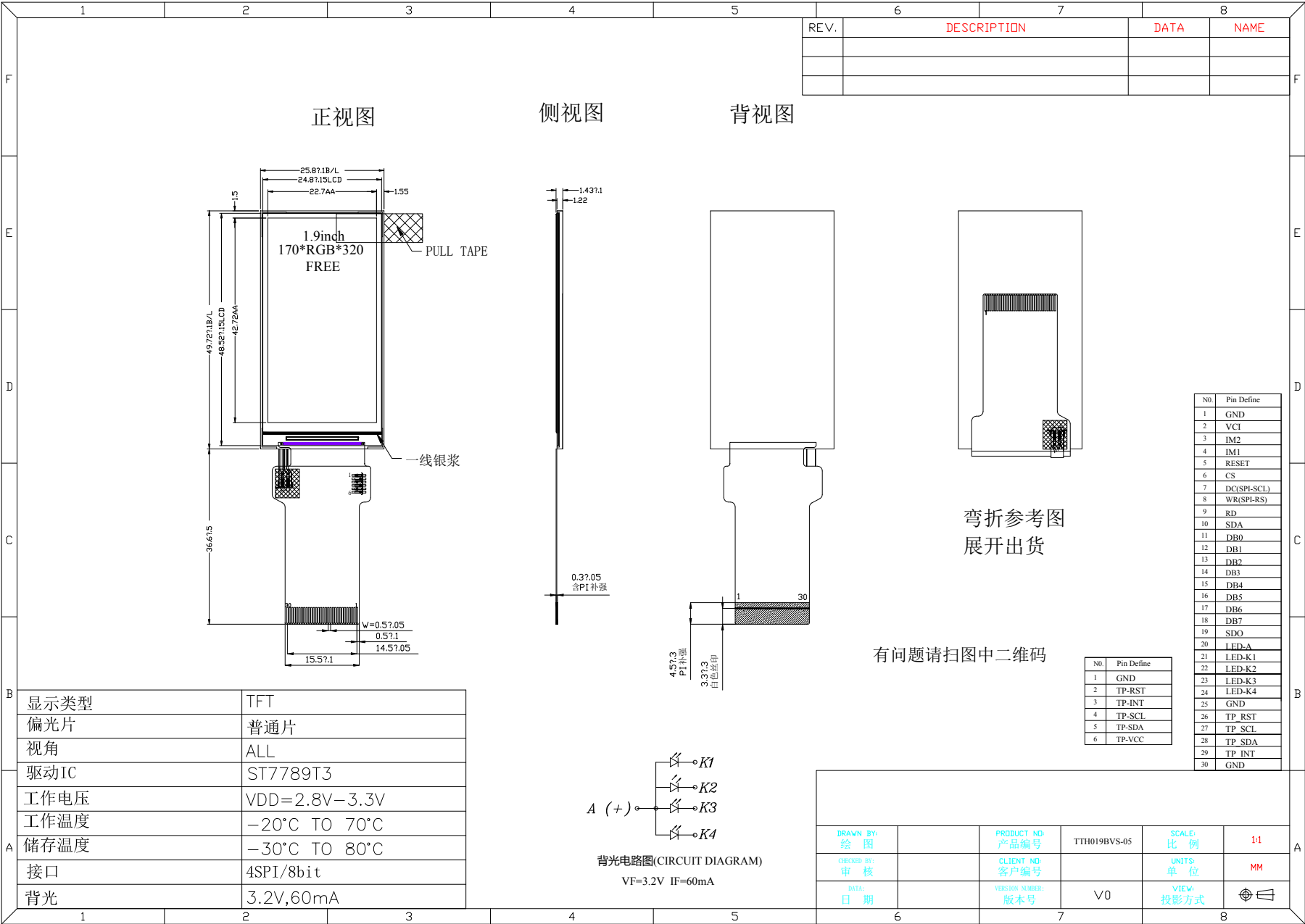
该显示模块是一种采用非晶硅 TFT 作为开关器件的透射型彩色有源矩阵 TFT(薄膜晶体管)液晶显示器。该模块由 TFT 液晶显示模块、驱动电路和背光单元组成。1.9 英寸的分辨率包含 170RGB x 320 点，可显示高达 262K 的颜色。

2 Module Parameter 模组参数

Features	Details	Unit
Display Size(Diagonal) 显示尺寸(对角线)	1.9	inch
LCD type 液晶显示屏类型	α -Si TFT(ON CELL)	-
Display Mode 显示模式	IPS / Transmissive / Normally Black	-
Resolution 分辨率	170RGB x 320	-
Active Area 显示区	22.70(H)×42.72(V)	mm
Module Outline 模组外形	25.8(H) ×49.72(V)×1.43(T)	mm
Display Colors 显示颜色	262K	-
Interface 接口	8Bit/4SPI	-
Driver IC 驱动 IC	ST7789T3	-
TP Viewing Area TP 视窗	-	mm
TP Outline(assembly) TP 外形	-	mm
Luminance on surface 亮度	500	cd/m ²
View Direction 视角方向	All	Best image
Contrast ratio 对比度	1200:1	
Color gamut 色域	65%	
PPI 图像点密集度	190	
Window effect 视窗效果	-	-
Cover plate surface effect 盖板表面效果	-	-
Operating Temperature 工作温度	-20~70	°C
Storage Temperature 储存温度	-30~80	°C
Weight 重量	TBD	g

Note 1: Excluding hooks, posts , FPC/FPC tail etc.

3 Mechanical Drawings 结构图



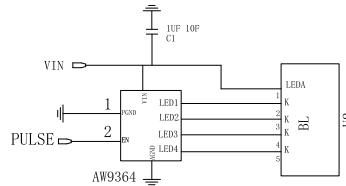
4 Module Interface 模组接口定义

NO	SYMBOL	FUNCTION															
1	GND	Power Ground															
2	VCI	Power Supply for Analog, VCC=2.4V~3.3V.															
3	IM2	<table><tr><td>IM2</td><td>IM1</td><td>interface mode</td><td>data pin</td></tr><tr><td>0</td><td>0</td><td>8bit parallel</td><td>DB07:DB00</td></tr><tr><td>1</td><td>1</td><td>4 line 8bit serial</td><td>SDA:in/out</td></tr></table>				IM2	IM1	interface mode	data pin	0	0	8bit parallel	DB07:DB00	1	1	4 line 8bit serial	SDA:in/out
IM2	IM1					interface mode	data pin										
0	0					8bit parallel	DB07:DB00										
1	1	4 line 8bit serial	SDA:in/out														
4	IM1																
5	RESET	This signal will reset the device and it must be applied to properly initialize the chip. Signal is active low															
6	CS	CS Chip selection pin; Low enable, High disable															
7	DC(SPI SCL)	Display data/command selection (RS) pin in MCU interface															
8	WR(SPI RS)	Write enable in MCU parallel interface.															
9	RD	Read enable in 8080 MCU parallel interface															
10	SDA	When IM3: Low, SPI interface input/output pin															
11-18	DB0-DB7	MCU parallel interface data bus															
19	SDO	SPI interface output pin.															
20	LEDA	LED Anode															
21	LEDK	LED Cathode															
22	LEDK	LED Cathode															
23	LEDK	LED Cathode															
24	LEDK	LED Cathode															
25	GND	Power Ground.															
26	TP RST	Touch panel reset.If not used, please open it.															
27	TP SCL	Touch panel I2C clock.If not used, please open it.															
28	TP SDA	Touch panel I2C data.If not used, please open it.															
29	TP INT	Touch panel interrupt output.If not used, please open it.															
30	GND	Power Ground.															

5 Application Circuit 应用电路

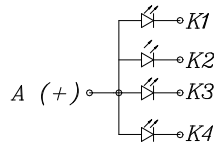
5.1 Backlight recommended circuit 背光电路参考

Motherboard driver backlight is need constant current circuit, if the rated 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 (AW9364). The reference circuit is as follows:



5.2 Backlight recommended circuit 背光电路参数推荐

Motherboard driver backlight is need constant current circuit:



背光电路图(CIRCUIT DIAGRAM)

VF=3.2V IF=60mA

4 灯并联

Note: constant current circuit for every LED, and though LED lamp current is less than 20mA. Recommend between 15mA and 20 mA for every LED.

5.3 Application Circuit 应用电路 ()

6 Absolute Maximum Ratings 绝对最大额定值

VSS=0V, Ta=25°C

Item 项目	Symbol	Min.最小	Max.最大	Unit 单位
Supply Voltage 电源电压	Power supply 电力供应 VDD	-0.3	+4.6	V
	Analog 模拟	-	-	V
	IO IOVDD	-0.3	+4.6	V
Input Voltage 输入电压	Vi	-0.3	IOVDD+0.3	V
Storage temperature 储存温度	T _{stg}	-30	+70	°C
Operating temperature 工作温度	T _{op}	-20	+60	°C
Storage humidity 存储湿度	H _{stg}	10	Note 1	%RH
Operating humidity 操作湿度	H _{op}	10	Note 1	%RH

Note 1: 90%RH max, If Ta is below 50°C; 60%RH max, If Ta is over 60°C.

7 Electrical Specification 电性规格

DC Characteristics 直流特性

Item 项目		Symbol	Min.最小	Typ.中间	Max.最大	Unit 单位
Supply Voltage 电源电压	Powersupply 电力供应	VDD	2.4	2.8	3.3	V
	Analog	VCI	2.4	2.8	3.3	V
	IO	IOVDD	1.65	1.8/2.8	3.3	V
Logic Low input voltage 输入电压低		V _{IL}	-0.3IOVDD	-	0.3IOVDD	V
Logic High input voltage 输入电压高		V _{IH}	0.7IOVDD	-	IOVDD	V
Logic Low output voltage 输出电压低		V _{OL}	-	-	0.2IOVDD	V
Logic High output voltage 输出电压高		V _{OH}	0.8IOVDD	-	-	V
Current Consumption 电流消耗	Normal display 正常的显示	Ivdd	-	12	-	mA
	Standby mode 待机模式	Ivdd	-	60	-	uA
Frame Frequency 帧频		f _{FR}	-	60	-	Hz
不打开 BL 功耗		-	0.019	-	-	W
打开 BL 功耗		-	0.096	-	-	W

8 Initialization Code 初始化代码

```

HW_Reset();                                Write(Parameter , 0x35);

Delay(120);                                //Delay 120ms    Write(Command , 0xBB);
                                                Write(Parameter , 0x1A);

Write(Command , 0x11);

                                                Write(Command , 0xC0);
Delay(120);                                //Delay 120ms    Write(Parameter , 0x2C);

Write(Command , 0x36);                      Write(Command , 0xC2);
Write(Parameter , 0x00);                    Write(Parameter , 0x01);

Write(Command , 0x3A);                      Write(Command , 0xC3);
Write(Parameter , 0x05);    //06           Write(Parameter , 0x0B);

Write(Command , 0xB2);                      Write(Command , 0xC4);
Write(Parameter , 0x0C);                    Write(Parameter , 0x20);
Write(Parameter , 0x0C);
Write(Parameter , 0x00);                    Write(Command , 0xC6);
Write(Parameter , 0x33);                    Write(Parameter , 0x0F);
Write(Parameter , 0x33);

                                                Write(Command , 0xD0);
Write(Command , 0xB7);                      Write(Parameter , 0xA4);

```


Write(Parameter , 0xA1);	Write(Parameter , 0x23);
	Write(Parameter , 0x2A);
Write(Command , 0x21);	Write(Parameter , 0x43);
	Write(Parameter , 0x42);
Write(Command , 0xE0);	Write(Parameter , 0x09);
Write(Parameter , 0x00);	Write(Parameter , 0x18);
Write(Parameter , 0x03);	Write(Parameter , 0x17);
Write(Parameter , 0x07);	Write(Parameter , 0x25);
Write(Parameter , 0x08);	Write(Parameter , 0x27);
Write(Parameter , 0x07);	
Write(Parameter , 0x15);	Write(Command , 0x29);
Write(Parameter , 0x2A);	
Write(Parameter , 0x44);	Write(Command , 0x2A);
Write(Parameter , 0x42);	Write(Parameter , 0x00);
Write(Parameter , 0x0A);	Write(Parameter , 0x23);
Write(Parameter , 0x17);	Write(Parameter , 0x00);
Write(Parameter , 0x18);	Write(Parameter , 0xCC);
Write(Parameter , 0x25);	
Write(Parameter , 0x27);	Write(Command , 0x2B);
	Write(Parameter , 0x00);
Write(Command , 0xE1);	Write(Parameter , 0x00);
Write(Parameter , 0x00);	Write(Parameter , 0x01);
Write(Parameter , 0x03);	Write(Parameter , 0x3F);
Write(Parameter , 0x08);	
Write(Parameter , 0x07);	Write(Command , 0x2C);
Write(Parameter , 0x07);	

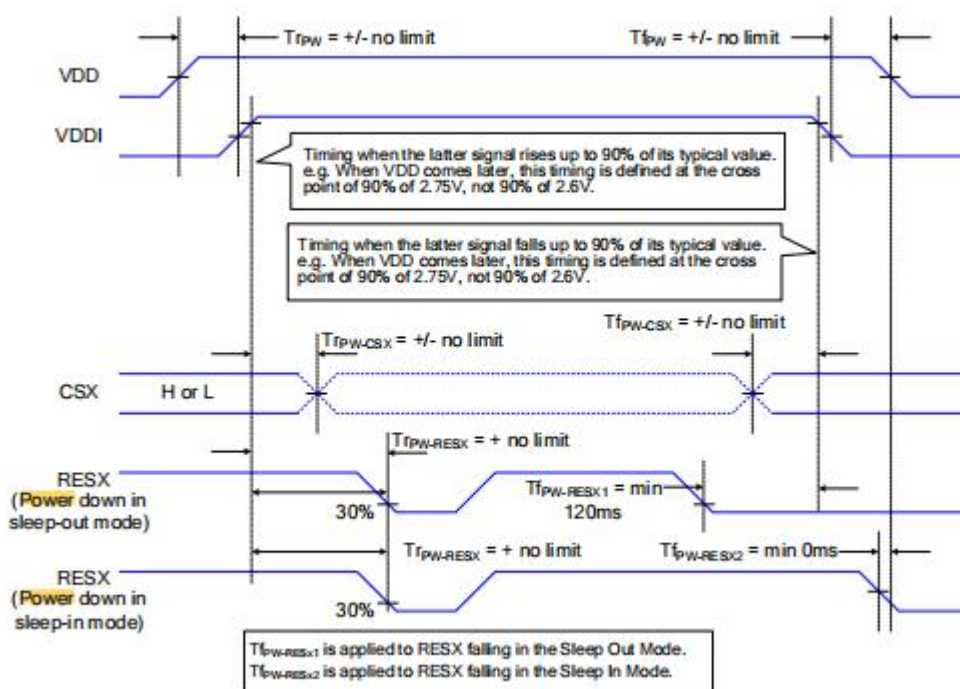
9 Optical Specifications 光学规格

9.1 Optical Specifications 光学规格

Ta=25°C, VDD=2.8V, TN LC+ Polarizer

Backlight On (Transmissive Mode)	Item 项目		Symbol 标志	Condition 条件	Specification 规范			Unit 单位	
					Min. 最小	Typ. 中间	Max. 最大		
	Luminance on surface(I_f =20mA) 表面亮度		L_v	Normally viewing angle $\theta_x=\theta_y=0^\circ$		500	-	cd/m²	
	Contrast ratio 对比度		CR		1000	1200	-	-	
	Response time 响应时间		TR		-	10	15	ms	
			TF	-	20	20			
	Chromaticity Transmissive 色度		Red	XR	-	0.630	0.660	0.690	-
			红	YR		0.293	0.323	0.353	-
			Green	XG		0.249	0.279	0.309	-
			绿	YG		0.544	0.574	0.604	-
			Blue	XB		0.104	0.134	0.164	-
			蓝	YB		0.101	0.131	0.161	-
			White	XW		0.263	0.293	0.323	-
			白	YW		0.305	0.335	0.365	-
	Viewing Angle 视角		Horizo	$\theta X+$	Center $CR\geq 10$	75	85	-	Deg.
			ntal	$\theta X-$		75	85	-	
Vertical			$\theta Y+$	75		85	-		
			$\theta Y-$	75		85	-		
NTSC Ratio(Gamut)		-	-	60	65	-	%		

9.2 The power on/off sequence is illustrated below 电源启动/关闭顺序



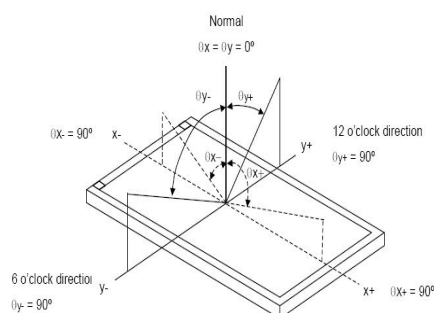
9.3 Definition of Contrast Ratio 对比度的定义

Contrast is measured perpendicular to display surface in reflective and transmissive mode. The measurement condition is:

Measuring Equipment 测量设备	BM-7 or EQUI
Measuring Point Diameter 测点直径	3mm//1mm
Measuring Point Location 测点位置	Active Area centre point
Test pattern 测试模式	A: All Pixels white
	B: All Pixel black
Contrast setting	Maximum

Definitions: CR (Contrast) = Luminance of White Pixel / Luminance of Black Pixel

9.4 Definition of Viewing Angles 视角的定义



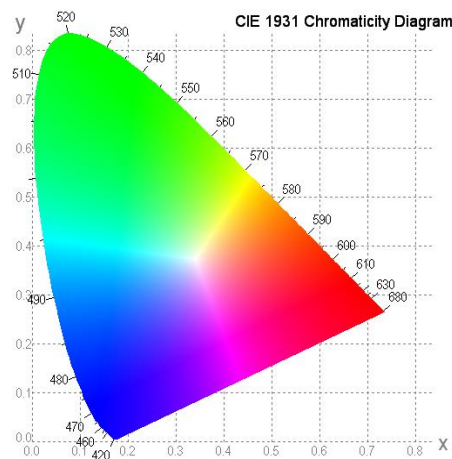
Measuring machine: LCD-5100 or EQUI

9.5 Definition of Color Appearance 色域的定义

R,G,B and W are defined by (x, y) on the IE chromaticity diagram

NTSC=area of RGB triangle/area of NTSC triangleX100%

Measuring picture: Red, Green, Blue and White (Measuring machine: BM-7)



9.6 Definition of Surface Luminance, Uniformity and Transmittance

表面亮度、均匀性和透光率的定义

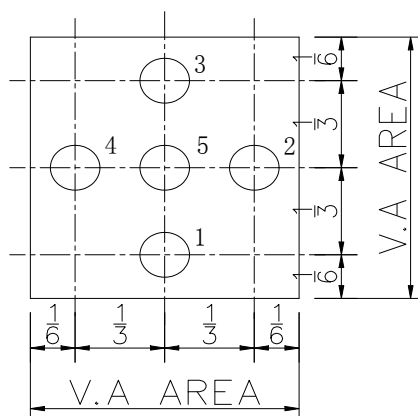
Using the transmissive mode measurement approach, measure the white screen luminance of the display panel and backlight.

9.6.1 Surface Luminance: $LV = \text{average (LP1:LP5)}$

9.6.2 Uniformity = $\text{Minimal (LP1:LP5)} / \text{Maximal (LP1:LP5)} * 100\%$

9.6.3 Transmittance = $LV \text{ on LCD} / LV \text{ on Backlight} * 100\%$

Note :Measuring machine:BM-7



10 Quality Assurance 质量标准

10.1 Purpose 目的

This standard for Quality Assurance assures the quality of LCD module products supplied to customer by Tailorpixels .

10.2 Agreement Items 协议项目

Tailorpixels and customer shall negotiate if the following situation occurs:

10.2.1 Discrepancies between Tailorpixels 's QA standards and customer's QA standards.

10.2.2 Additional requirement to be added in product specification.

10.2.3 Any other special problem.

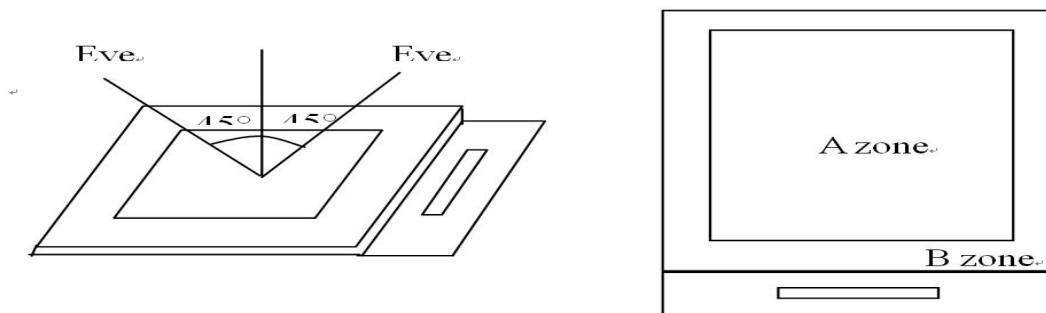
10.3 Standard of the Product Visual Inspection 产品外观检验标准

10.3.1 Appearance inspection:

10.3.1.1 The inspection must be under illumination about 1000 – 1500 lx, and the distance of view must be at 30cm ± 2cm.

10.3.1.2 The viewing angle should be 45° from the vertical line without reflection light or follows customer's viewing angle specifications.

10.3.1.3 Definition of area: A Zone: Active Area, B Zone: Viewing Area.



10.3.2 Basic principle: A set of sample to indicate the limit of acceptable quality level must be discussed by both Tailorpixels and customer when there is any dispute happened.

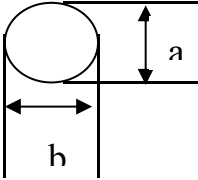
10.4 Inspection Specification 检验标准

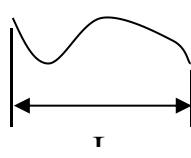
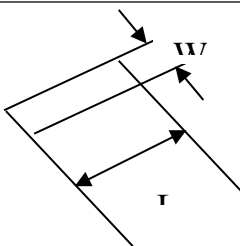
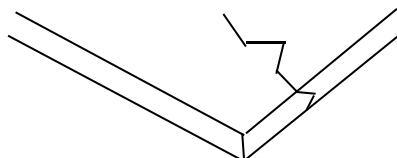
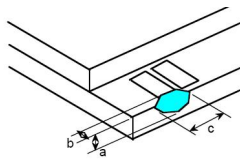
Sampling plan according to GB/T2828.1-2012/ISO 2859-1: 1999 and ANSI/ASQC

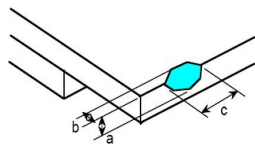
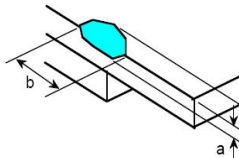
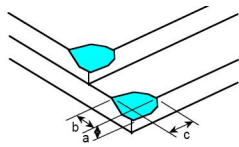
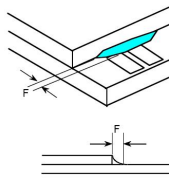
Z1.4-1993, normal level 2 and based on:

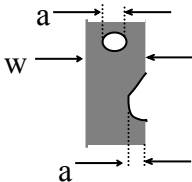
Major defect: AQL 0.4

Minor defect: AQL 1.0

No.	Item 项目	Criteria (Unit: mm) 标准											
01	Black / White spot		<table><tr><th>Size \ Area</th><th>Acc. Qty</th></tr><tr><td>φ≤0.10</td><td>Ignore</td></tr><tr><td>0.10<φ≤0.2</td><td>2</td></tr><tr><td>0.2<φ</td><td>0</td></tr><tr><td>Total</td><td>N≦3 NO include φ≤ 0.10</td></tr></table>	Size \ Area	Acc. Qty	φ≤0.10	Ignore	0.10<φ≤0.2	2	0.2<φ	0	Total	N≦3 NO include φ≤ 0.10
	Size \ Area			Acc. Qty									
	φ≤0.10			Ignore									
	0.10<φ≤0.2			2									
	0.2<φ			0									
Total	N≦3 NO include φ≤ 0.10												
Foreign material													
(Round type)													
Pinholes Stain													
Particles inside cell.													
(Minor defect) 黑/白斑/异物	$\varphi= (a + b) / 2$												
(圆类型)细胞内的针孔染色颗粒。(小瑕疵)	Distance between 2 defects should more than10mm apart.												

No.	Item 项目	Criteria (Unit: mm) 标准															
02	Black and White line Scratch Foreign material (Line type) (Minor defect) 黑白 线刮伤异物(类型)行 (小瑕疵)	 <table><tr><th>Length</th><th>Width</th><th>Acc. Qty</th></tr><tr><td>/</td><td>$W \leq 0.03$</td><td>Ignore</td></tr><tr><td>$L \leq 3$</td><td>$0.05 < W \leq 0.08$</td><td>2</td></tr><tr><td>/</td><td>$0.08 < W$</td><td>0</td></tr><tr><td colspan="2">Total</td><td>$N \leq 2$</td></tr></table> Distance between 2 defects should more than 10mm apart. Scratches not viewable through the back of the display are acceptable.	Length	Width	Acc. Qty	/	$W \leq 0.03$	Ignore	$L \leq 3$	$0.05 < W \leq 0.08$	2	/	$0.08 < W$	0	Total		$N \leq 2$
Length	Width	Acc. Qty															
/	$W \leq 0.03$	Ignore															
$L \leq 3$	$0.05 < W \leq 0.08$	2															
/	$0.08 < W$	0															
Total		$N \leq 2$															
03	Glass Crack (Minor defect) 玻璃裂 纹(小瑕疵)	 LCD with extensible crack line is unacceptable(When press the cracked LCD area, the line will expand, we define it is extensible crack line)															
04	Glass Chipping Pad Area: (Minor defect) 玻璃碎片面积:(轻微 缺陷)	<table><tr><th>Length and Width</th><th>Acc. Qty</th></tr><tr><td>$c < 5.0, b < 0.4$</td><td>Ignore</td></tr></table> 	Length and Width	Acc. Qty	$c < 5.0, b < 0.4$	Ignore											
Length and Width	Acc. Qty																
$c < 5.0, b < 0.4$	Ignore																

No.	Item 项目	Criteria (Unit: mm) 标准										
05	Glass Chipping Rear of PadArea:(Minor defect) 玻璃切屑垫区后方:(小瑕疵) 	<table><tr><th>Length and Width</th><th>Acc. Qty</th></tr><tr><td>$c > 3.0, b < 1.0$</td><td>1</td></tr><tr><td>$c < 3.0, b < 1.0$</td><td>2</td></tr><tr><td>$c < 3.0, b < 0.5$</td><td>4</td></tr><tr><td colspan="2">$a < \text{Glass Thickness}$</td></tr></table>	Length and Width	Acc. Qty	$c > 3.0, b < 1.0$	1	$c < 3.0, b < 1.0$	2	$c < 3.0, b < 0.5$	4	$a < \text{Glass Thickness}$	
Length and Width	Acc. Qty											
$c > 3.0, b < 1.0$	1											
$c < 3.0, b < 1.0$	2											
$c < 3.0, b < 0.5$	4											
$a < \text{Glass Thickness}$												
06	Glass Chipping Except Pad Area: (Minor defect) 除垫区外的玻璃切屑:(小瑕疵) 	<table><tr><th>Length and Width</th><th>Acc. Qty</th></tr><tr><td>$c \leq 0.6, b < 5.0$</td><td>Ignore</td></tr><tr><td colspan="2">$a < \text{Glass Thickness}$</td></tr></table>	Length and Width	Acc. Qty	$c \leq 0.6, b < 5.0$	Ignore	$a < \text{Glass Thickness}$					
Length and Width	Acc. Qty											
$c \leq 0.6, b < 5.0$	Ignore											
$a < \text{Glass Thickness}$												
07	Glass Corner Chipping: (Minor defect) 玻璃切角:(小瑕疵) 	<table><tr><th>Length and Width</th><th>Acc. Qty</th></tr><tr><td>$c < 2.0, b < 1.5$</td><td>Ignore</td></tr><tr><td>$c < 1.5, b < 2$</td><td>Ignore</td></tr><tr><td colspan="2">$a < \text{Glass Thickness}$</td></tr></table>	Length and Width	Acc. Qty	$c < 2.0, b < 1.5$	Ignore	$c < 1.5, b < 2$	Ignore	$a < \text{Glass Thickness}$			
Length and Width	Acc. Qty											
$c < 2.0, b < 1.5$	Ignore											
$c < 1.5, b < 2$	Ignore											
$a < \text{Glass Thickness}$												
08	Glass Burr: (Minor defect) 玻璃磨:(小瑕疵) 	Glass burr don't affect assemble and module dimension. <table><tr><th>Length</th><th>Acc. Qty</th></tr><tr><td>$F < 0.5$</td><td>Ignore</td></tr></table>	Length	Acc. Qty	$F < 0.5$	Ignore						
Length	Acc. Qty											
$F < 0.5$	Ignore											

No.	Item 项目	Criteria (Unit: mm) 标准										
09	FPC Defect: (Minor defect) FPC 缺陷:(小瑕疵) 	9.1 Dent, pinhole width $a<w/3$. (w: circuitry width.) 9.2 Open circuit is unacceptable. 9.3 No oxidation, contamination and distortion.										
10	Screen deformation 屏幕上的变形 	Test for insertion of plug gauge at highest warping point: (3.1-6.0inches) $H\leq 0.3\text{MM}$ The client has special requirements,according to drawing										
11	Bubble on Polarizer (Minor defect) 偏光片上的气泡(小瑕疵)	<table><tr><th>Diameter</th><th>Acc. Qty</th></tr><tr><td>$\varphi\leq 0.15$</td><td>Ignore</td></tr><tr><td>$0.15 < \varphi\leq 0.25$</td><td>2</td></tr><tr><td>$0.25 < \varphi\leq 0.3$</td><td>1</td></tr><tr><td>$0.3 < \varphi$</td><td>0</td></tr></table>	Diameter	Acc. Qty	$\varphi\leq 0.15$	Ignore	$0.15 < \varphi\leq 0.25$	2	$0.25 < \varphi\leq 0.3$	1	$0.3 < \varphi$	0
Diameter	Acc. Qty											
$\varphi\leq 0.15$	Ignore											
$0.15 < \varphi\leq 0.25$	2											
$0.25 < \varphi\leq 0.3$	1											
$0.3 < \varphi$	0											
12	Dent on Polarizer (Minor defect) 偏光片上的凹痕(小瑕疵)	<table><tr><th>Diameter</th><th>Acc. Qty</th></tr><tr><td>$\varphi\leq 0.15$</td><td>Ignore</td></tr><tr><td>$0.15 < \varphi\leq 0.25$</td><td>2</td></tr><tr><td>$0.25 < \varphi\leq 0.30$</td><td>1</td></tr><tr><td>$0.3 < \varphi$</td><td>0</td></tr></table>	Diameter	Acc. Qty	$\varphi\leq 0.15$	Ignore	$0.15 < \varphi\leq 0.25$	2	$0.25 < \varphi\leq 0.30$	1	$0.3 < \varphi$	0
Diameter	Acc. Qty											
$\varphi\leq 0.15$	Ignore											
$0.15 < \varphi\leq 0.25$	2											
$0.25 < \varphi\leq 0.30$	1											
$0.3 < \varphi$	0											
13	Bezel 边框	13.1 No rust, distortion on the Bezel.										

No.	Item 项目	Criteria (Unit: mm) 标准
14	Touch Panel 触控面板	D: Diameter W: width L: length 14.1 Spot: $D \leq 0.20$ is acceptable $0.20 < D \leq 0.3$, acceptable QTY, 3 $D > 0.3$ is unacceptable 14.2 Dent (dot): $D \leq 0.20$ is acceptable $0.20 < D \leq 0.3$, acceptable QTY, 3 $D > 0.30$ is unacceptable 2dots are acceptable and the distance between defects should more than 10 mm. Dent (line) According to the limit sample 14.3 Scratch: $W \leq 0.03$, $L \leq 10$ is acceptable, $0.03 < W \leq 0.10$, $L \leq 10$, acceptable QTY, 3 $W > 0.10$ is unacceptable. Distance between 2 defects should more than 10 mm.
15	PCB	15.1 No distortion or contamination on PCB terminals. 15.2 All components on PCB must same as documented on the BOM/component layout. 15.3 Follow IPC-A-600F.
16	Soldering 焊接	Follow IPC-A-610C standard
17	Electrical Defect (Major defect) 电气缺陷(主要缺陷)	The below defects must be rejected. 17.1 Missing vertical / horizontal segment, 17.2 Abnormal Display. 17.3 No function or no display. 17.4 Current exceeds product specifications. 17.5 LCD viewing angle defect. 17.6 No Backlight. 17.7 Dark Backlight. 17.8 Touch Panel no function. 17.9 Dark Dot –one Allowed. 17.10 Bright Dot – one Allowed. Remark: 1. A pixel defect is acceptable if one color is none functional and causes a bright dot. The display may have one case where one color is out and cause a dark dot. 2. Bright dot caused by scratch and foreign object accords to item1.

No.	Item 项目	Criteria (Unit: mm) 标准
18	Light leak 漏光	Yellow light OK; White light, According to the limit sample

Remark: Visual and cosmetic defects are rejectable only if these fall within the LCD viewing area.

10.5 Classification of Defects 缺陷的分类

Visual defects (Except no / wrong label) are treated as minor defect and electrical defect is major.

10.6 Identification/marketing criteria 识别/评分标准

Any unit with illegible / wrong /double or no marking/ label shall be rejected.

10.7 Packing 包装

10.7.1 There should be no damage of the outside carton box, each packaging box should has label in the correct location per packing drawing requirement.

10.7.2 All direct package materials shall offer ESD protection.

11 Reliability Specification 可靠性规范

Item 项目	Condition 条件	Cycle Time 周期时间	Quantity 数量	Remark 备注
Constant Temp. and Constant Humidity Operation Test 恒温恒湿运行试验	$+40 \pm 3^{\circ}\text{C}$, $90 \pm 3\%\text{RH}$	96hrs	--	*1
High Temp. Operation Test 高温操作试验	$+70 \pm 3^{\circ}\text{C}$	96hrs	--	
Low Temp. Operation Test 低温操作试验	$-20 \pm 3^{\circ}\text{C}$	96hrs	--	
Thermal Shock Test 热冲击试验	$-20 \pm 3^{\circ}\text{C}$ (30min) $+70 \pm 3^{\circ}\text{C}$ (30min)	10cycles	--	
ESD Test(end product) ESD 测试(最终产品)	150pF, 330Ω, $\pm 2\text{KV}$, Contact	10times	--	*2, *3
	150pF, 330Ω, $\pm 6\text{KV}$, Air			
Vibration Test(for packaging) 振动测试(包装)	Frequency: 10Hz to 55Hz to 10Hz, Swing: 1.5mm, time: X, Y, Z each 2H.	6hrs	One inner carton	*4

Note 1. For humidity test, DI water should be used.

Inspection Standard: Inspect after 1-2hrs storage at room temperature, the sample shall be free from the following defects:

- Air bubble in the LCD
- Seal Leakage
- Non-display
- Missing Segment
- Glass Crack
- IDD is greater than twice initial value.
- Others as per QA Inspection Criteria

Note 2. No defect is allowed after testing

The End Product ESD value is only indicative and depends on customer ESD protection design for the whole system.

Note 3. ESD should be applied to LCD glass panel, not other areas (such as on IC and so on) IDD should be within twice initial value.

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.

Note 4. Only upon request.

12 Precautions and Warranty 注意事项和保证

12.1 Safety 安全

12.1.1 The liquid crystal in the LCD is poisonous. Do not put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.

12.1.2 Since the liquid crystal cells are made of glass, do not apply strong impact on them. Handle with care.

12.2 Handling 处理

12.2.1 Reverse and use within ratings in order to keep performance and prevent damage.

12.2.2 Do not wipe the polarizer with dry cloth, as it might cause scratch. If the surface of the LCD needs to be cleaned, wipe it swiftly with cotton or other soft cloth soaked with petroleum IPA, do not use other chemicals.

12.3 Operation 操作

12.3.1 Do not drive LCD with DC voltage

12.3.2 Response time will increase below lower temperature

12.3.3 Display may change color with different temperature

12.3.4 Mechanical disturbance during operation, such as pressing on the display area, may cause the segments to appear “fractured”.

12.4 Static Electricity 静电

12.4.1 CMOS LSIs are equipped in this unit, so care must be taken to avoid the electro-static charge, by ground human body, etc.

12.4.2 The normal static prevention measures should be observed for work clothes and benches.

12.4.3 The module should be kept into anti-static bags or other containers resistant to static for storage.

12.5 Limited Warranty 有限质量保证

12.5.1 Unless otherwise agreed between Tailorpixels and customer, Tailorpixels will replace or repair any of its LCD and LCM which Tailorpixels found to be defective electrically and visually when inspected in accordance with Tailorpixels Quality Standards, for a period of one year from date of shipment.

12.5.2 The warranty liability of Tailorpixels is limited to repair and/or replacement. Tailorpixels will not be responsible for any consequential loss.

12.5.3 If possible, we suggest you use up all modules in six months. If the module storage time over twelve months, we suggest that recheck it before the module be used.

13 Packaging 包装

TBD

14 Prior Consult Matter 免责声明

1. For Tailorpixels standard products, we keep the right to change material, process for improving the product property without prior notice to our customer.

2. For OEM products, if any changes are needed which may affect the product property, we will consult with our customer in advance.

3. If you have special requirement about reliability condition, please let us know before you start the test on our samples.

Reference 参考

Item 项目	Description 描述	Revision 修订
ST7789T3	IC Data sheet	V1.0
Panel 1.9 寸 170X320	LCM assembly drawing	V0