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Custom Display

Production Custom designs Installation

Mechanical design



Manufacturer Certificated



CERT. No.: 282Q19070712006



CERT. No.: 282E19070712007

Product Specification

Model: E T 0 1 9 A M 0 1 - T T

1.98"AMOLED Display Module(410*502)

This module uses RoHS material

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	2024/8/30	首 次	18	

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1 General Description 规格简介

1.958 inch 410x502 is a color active matrix AMOLED module This module has a 1.952 inch diagonally measured active area with 410x502 resolutions (410 horizontal by 502 vertical pixel arrays). Each pixel is divided into RED, GREEN, BLUE dots and this module can display 16.7M colors.

1.952 英寸 410x502 是一个彩色有源矩阵 AMOLED 模块。该模块有一个 1.952 英寸的对角线测量的活动区域，分辨率为 410x502（410 水平和 502 垂直像素数组）。每个像素被分为红色、绿色、蓝点，该模块可以显示 16.7M 的颜色。

2 Module Parameter 模组参数

Features	Details	Unit
Display Size(Diagonal) 显示尺寸(对角线)	1.98	inch
LCD type 液晶显示屏类型	AMOLED	-
Display Mode 显示模式	LTPS	-
Resolution 分辨率	410RGB x 502	-
Active Area 显示区	31.37(H) ×38.4(V)	mm
Module Outline 模组外形	33.07(H) ×41.05(V)×0.8(T)	mm
Display Colors 显示颜色	16.7M	-
Interface 接口	MIPI/QSPI	-
Driver IC 驱动 IC	CO5300	-
TP Viewing Area TP 视窗	31.77(H) ×38.8(V)	mm
TP Outline(assembly) TP 外形	38.27(H) ×45.25(V)×2.23(T)	mm
TP IC	CTS820	
Luminance on surface 亮度	800	cd/m ²
View Direction 视角方向	All	Best image
Contrast ratio 对比度	100000:1	
Color gamut 色域	100%	
PPI 图像点密集度	298	-
Window effect 视窗效果	-	-
Cover plate surface effect 盖板表面效果	AF	-
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

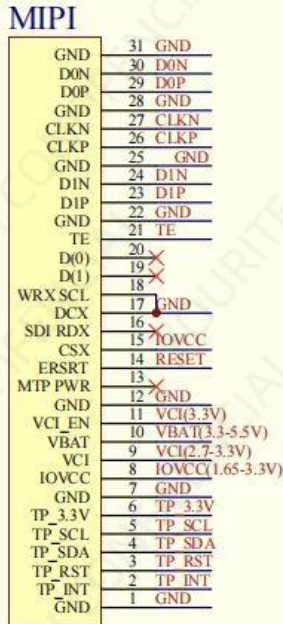
4 Module Interface 模组接口定义

NO	SYMBOL	FUNCTION
1	GND	Power Ground
2	TP_INT	Touch panel interrupt output
3	TP_RST	Touch panel reset
4	TP_SDA	Touch panel I2C data
5	TP_SCL	Touch panel I2C clock
6	TP_3.3V	Connect to voltage source between 2.8V to 3.3V
7	GND	Power Ground
8	IOVCC	Power Supply for logic, VDDIO=1.8V~3.3V.
9	VCI	Power Supply for logic, VDD=3.3V
10	VBAT	Power Input for SIBO VBAT=3.7~4.5V
11	VCI_EN	Enable for VBAT
12	GND	Power Ground
13	MTP PWR	MTP programming power supply pin. (8V typical) - Must be left open or connected to VSSD in normal condition.
14	RESET	- This signal will reset the device and must be applied to properly initialize the chip. Signal is active low.
15	CSX	chip select
16	SDI RDX	serial data input 0 / serial data output
17	DCX	serial data input 1
18	WRX SCL	- SCL: A synchronous clock signal in SPI I/F. - If not used, please connect to VSSI
19	D(1)	serial data input 3
20	D(0)	serial data input 2
21	TE	Tearing effect output pin to synchronize MCU to frame writing, activated by S/W command
22	GND	Power Ground
23	D1P	MIPI-DSI Data differential signal input pins.
24	D1N	MIPI-DSI Data differential signal input pins.
25	GND	Power Ground
26	CLKP	CLKP
27	CLKN	CLKN
28	GND	Power Ground
29	D0P	MIPI-DSI Data differential signal input pins.
30	D0N	MIPI-DSI Data differential signal input pins.
31	GND	Power Ground

5 Application Circuit 应用电路

5.3 Application Circuit 应用电路 ()

mipi接口参考接线图



6 Absolute Maximum Ratings 绝对最大额定值

VSS=0V, Ta=25°C

Note 1: 90%RH max, If Ta is below 50°C; 60%RH max, If Ta is over 60°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	+5.5	V
Input Voltage 输入电压		Vi	-0.3	IOVDD+0.3	V
Storage temperature 储存温度		T_{stg}	-30	+80	°C
Operating temperature 工作温度		T_{op}	-20	+70	°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

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	-	-	-	V
	Analog	VCI	2.7	3.3	3.6	V
	IO	IOVDD	1.65	1.8	3.3	V
Logic Low input voltage 输入电压低		V _{IL}	VSS	-	0.2IOVDD	V
Logic High input voltage 输入电压高		V _{IH}	0.8IOVDD	-	IOVDD	V
Logic Low output voltage 输出电压低		V _{OL}	VSS	-	0.2IOVDD	V
Logic High output voltage 输出电压高		V _{OH}	0.8IOVDD	-	IOVDD	V
Current Consumption 电 流消耗	Normal display 正常的显示	Ivdd	-	-	-	mA
	Standby mode 待机模式	Ivdd	-	50	-	uA
Frame Frequency 帧频		f _{FR}	-	60	-	Hz

8 Initialization Code 初始化代码

9 Optical Specifications 光学规格

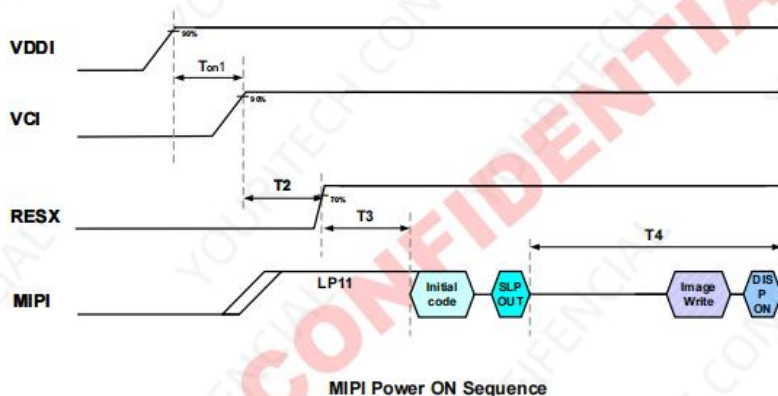
9.1 Optical Specifications 光学规格

Ta=25°C, VDD=2.8V, TN LC+ Polarizer

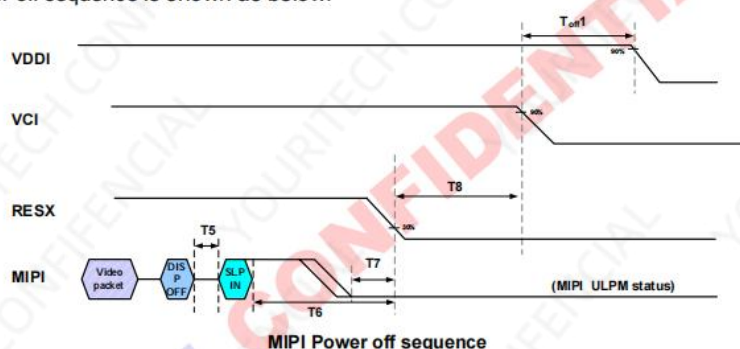
Item 项目	Symbol 标志	Condition 条件	Specification 规范			Unit 单位	
			Min. 最小	Typ. 中间	Max. 最大		
Luminance on surface(I_f =20mA) 表面亮度		L_v	Normally viewing angle $\theta_x=\theta_y=0^\circ$ -	750	800	-	cd/m ²
Contrast ratio 对比度		CR		-	10000 0	-	-
Response time 响应时间		TR/TF		-	-	3	ms
Chromaticity Transmissive 色度	Red 红	XR		0.6656	0.685 6	0.705 6	-
		YR		0.294	0.314	0.334	-
	Green 绿	XG		0.2088	0.258 8	0.308 8	-
		YG		0.6553	0.705 3	0.755 3	-
	Blue 蓝	XB		0.116	0.136	0.156	-
		YB		0.027	0.047	0.067	-
	White 白	XW		0.280	0.300	0.320	-
		YW		0.290	0.310	0.330	-
Viewing Angle 视角	Horizo ntal	$\theta X+$	Center $CR\geq 10$	-	80	-	Deg.
		$\theta X-$		-	80	-	
	Vertical	$\theta Y+$		-	80	-	
		$\theta Y-$		-	80	-	
NTSC Ratio(Gamut)		-	-	97	100	-	%

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

The Power on sequence is shown as below.



The power off sequence is shown as below:



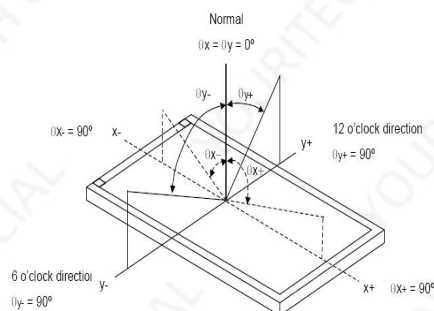
9.3 Definition of Contrast Ratio 对比度的定义

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



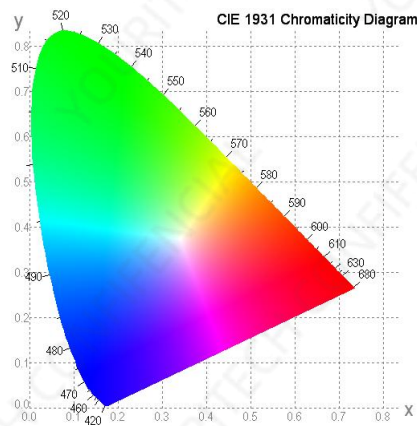
Measuring machine: LCD-5100 or EQUI

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

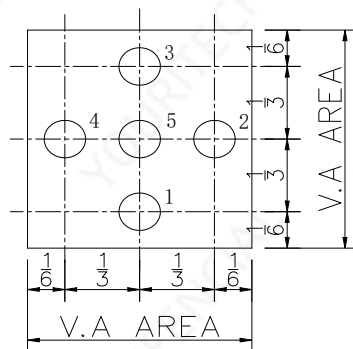
Using the transmissive mode measurement approach, measure the white screen luminance of the display panel and backlight.

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

HuaXia RGB Display 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.

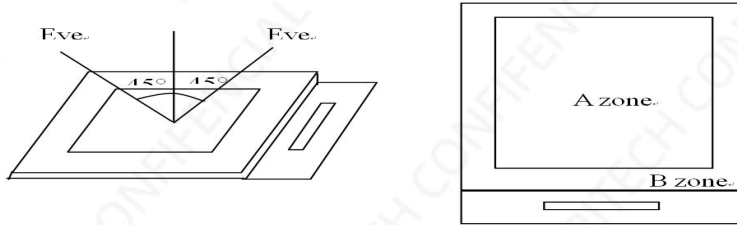
10.3 Standard of the Product Visual Inspection 产品外观检验标准

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 Tailor pixels and customer when there is any dispute happened.

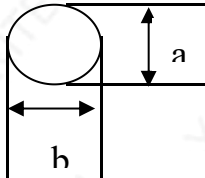
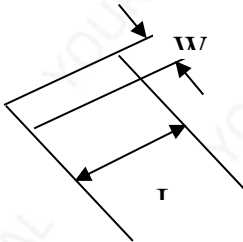
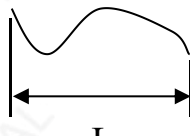
10.4 Inspection Specification 检验标准

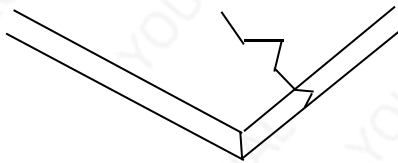
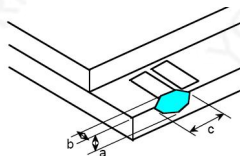
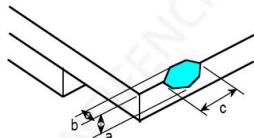
Sampling plan according to GB/T2828.1-2012/ISO 2859-1: 1999 and ANSI/ASQC

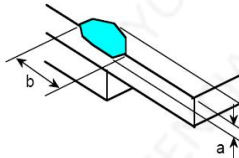
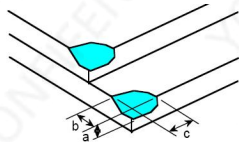
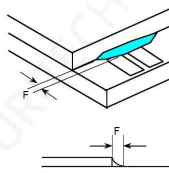
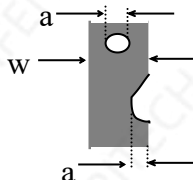
Z1.4-1993, normal level 2 and based on:

Major defect: AQL 0.4

Minor defect: AQL 1.0

No.	Item 项目	Criteria (Unit: mm) 标准										
01	Black / White spot Foreign material (Round type) Pinholes Stain Particles inside cell. (Minor defect) 黑/白斑/异物 (圆类型)细胞内的针孔染色颗粒。(小瑕疵)	 $\varphi = (a + b) / 2$ Distance between 2 defects should more than 10mm apart. <table><tr><th>Size \ Area</th><th>Acc. Qty</th></tr><tr><td>$\varphi \leq 0.10$</td><td>Ignore</td></tr><tr><td>$0.10 < \varphi \leq 0.2$</td><td>2</td></tr><tr><td>$0.2 < \varphi$</td><td>0</td></tr><tr><td>Total</td><td>$N \leq 3$ NO include $\varphi \leq 0.10$</td></tr></table>	Size \ Area	Acc. Qty	$\varphi \leq 0.10$	Ignore	$0.10 < \varphi \leq 0.2$	2	$0.2 < \varphi$	0	Total	$N \leq 3$ NO include $\varphi \leq 0.10$
Size \ Area	Acc. Qty											
$\varphi \leq 0.10$	Ignore											
$0.10 < \varphi \leq 0.2$	2											
$0.2 < \varphi$	0											
Total	$N \leq 3$ NO include $\varphi \leq 0.10$											
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)	 										

No.	Item 项目	Criteria (Unit: mm) 标准															
		<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																
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																
$a < \text{Glass Thickness}$																	

No.	Item 项目	Criteria (Unit: mm) 标准								
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<Glass Thickness</td></tr></table>	Length and Width	Acc. Qty	$c \leq 0.6, b < 5.0$	Ignore	a<Glass Thickness			
Length and Width	Acc. Qty									
$c \leq 0.6, b < 5.0$	Ignore									
a<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<Glass Thickness</td></tr></table>	Length and Width	Acc. Qty	$c < 2.0, b < 1.5$	Ignore	$c < 1.5, b < 2$	Ignore	a<Glass Thickness	
Length and Width	Acc. Qty									
$c < 2.0, b < 1.5$	Ignore									
$c < 1.5, b < 2$	Ignore									
a<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									
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								

No.	Item 项目	Criteria (Unit: mm) 标准	
11	Bubble on Polarizer (Minor defect) 偏光片上的气泡(小瑕疵)	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)	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.	
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 2 dots 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	

No.	Item 项目	Criteria (Unit: mm) 标准
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.
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 ± 3°C, 90 ± 3%RH	96hrs	--	*1
High Temp. Operation Test 高温操作试验	+70 ± 3°C	96hrs	--	
Low Temp. Operation Test 低温操作试验	-20 ± 3°C	96hrs	--	
Thermal Shock Test 热冲击试验	-20 ± 3°C (30min)	10cycles	--	

	+70 ± 3°C (30min)			
ESD Test(end product) ESD 测试 (最终产品)	150pF, 330Ω, ±2KV,Contact	10times	--	*2, *3
	150pF, 330Ω, ±6KV, Air			
Vibration Test(for packaging) 振动 测试(包装)	Frequency: 10Hz to 55Hz to10Hz,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.