



PHOENIX DISPLAY INTERNATIONAL, INC.

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SPECIFICATION FOR LCD MODULE

CUSTOMER	
PART NUMBER	PDI022QVXH-03
DESCRIPTION	2.2" 240xRGBx320
VERSION	V1
ISSUE DATE	05-Nov-18

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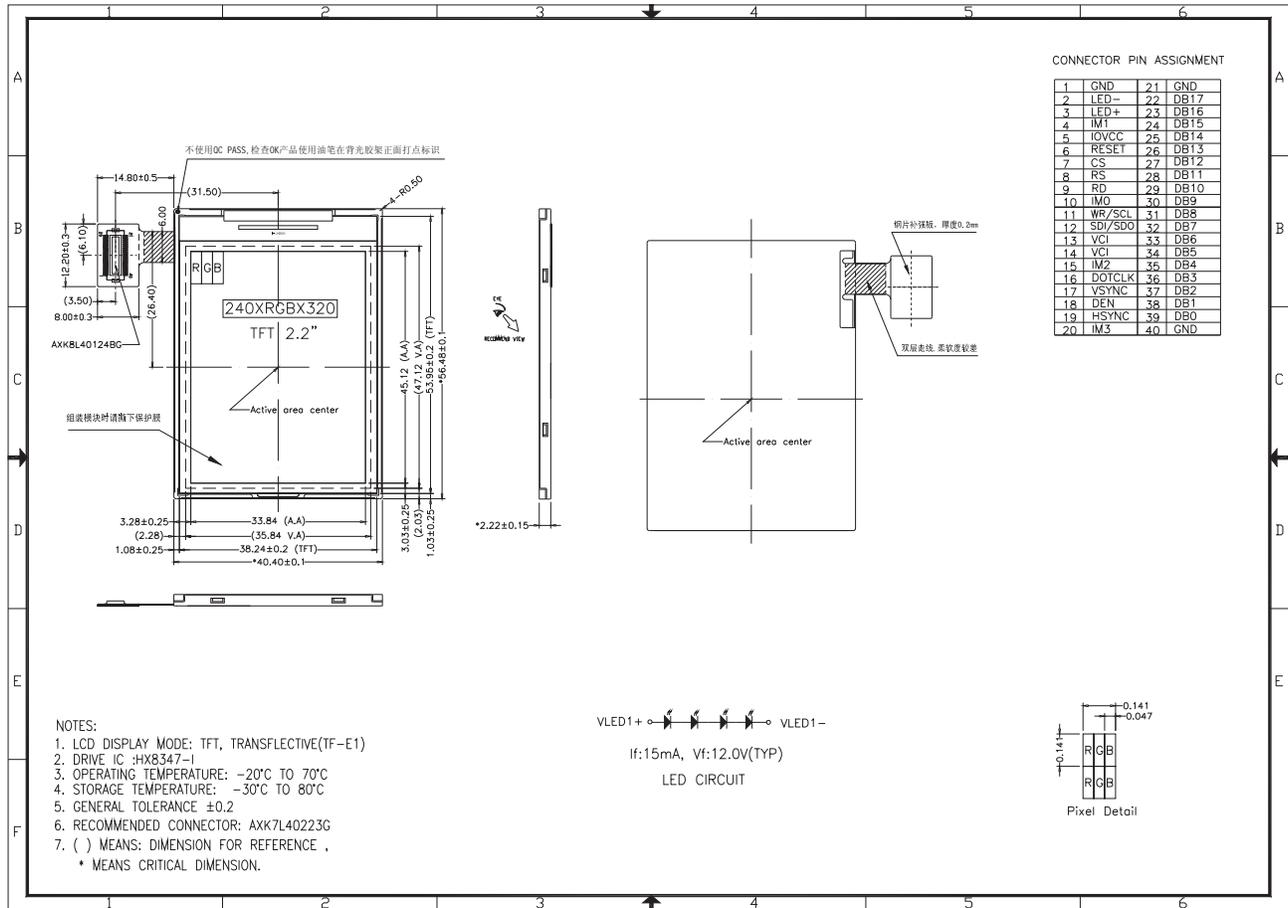
CONTENTS

- GENERAL INFORMATION
- EXTERNAL DIMENSIONS
- ABSOLUTE MAXIMUM RATINGS
- ELECTRICAL CHARACTERISTICS
- BACKLIGHT CHARACTERISTICS
- ELECTRO-OPTICAL CHARACTERISTICS
- INTERFACE DESCRIPTION
- REFERENCE APPLICATION CIRCUIT
- RELIABILITY TEST CONDITIONS
- INSPECTION CRITERION
- PRECAUTIONS FOR USING LCD MODULES
- PACKING SPECIFICATION
- PRIOR CONSULT MATTER
- FACTORY CONTACT INFORMATION

■ GENERAL INFORMATION

Item of general information	Contents	Unit
LCD Type	TFT, TRANSFLECTIVE	/
Recommended Viewing Direction	12:00	O' Clock
Module area (W × H×T)	40.40×56.48×2.22	mm ³
Viewing area (W×H)	35.84×47.12	mm ²
Active area (W×H)	33.84×45.12	mm ²
Number of Dots	240RGB×320	/
Pixel pitch (W × H)	0.141×0.141	mm ²
Driver IC	HX8347-I	/
Interface Type	MPU/RGB	/
Input voltage	2.8	V
Module Power consumption	198	mw
Backlight Type	LED	/

EXTERNAL DIMENSIONS



■ ABSOLUTE MAXIMUM RATINGS

Parameter of absolute maximum ratings	Symbol	Min	Max	Unit
Supply voltage for logic	VCI/IOVCC	-0.3	4.6	V
Input voltage	VIN	-0.3	IOVCC+0.5	V
Operating temperature	Top	-20	70	°C
Storage temperature	TST	-30	80	°C
Humidity	RH	-	90%(Max60 °C)	RH

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.

■ ELECTRICAL CHARACTERISTICS

DC CHARACTERISTICS

Parameter of DC characteristics	Symbol	Min	Typ	Max	Unit
Supply voltage for logic	VCI	2.3	2.8	3.3	V
I/O power supply	IOVCC	1.65	2.8	3.3	V
Input Current	I _{dd}	-	5	8	mA
Input voltage 'H' level	V _{IH}	0.7IOVCC	-	IOVCC	V
Input voltage 'L' level	V _{IL}	GND	-	0.3IOVCC	V
Output voltage 'H' level	V _{OH}	0.8IOVCC	-	IOVCC	V
Output voltage 'L' level	V _{OL}	GND	-	0.2IOVCC	V

■ BACKLIGHT CHARACTERISTICS

Item of backlight characteristics	Symbol	Min.	Typ.	Max.	Unit	Condition
Forward voltage	Vf	10.8	12.2	13.6	V	If=15mA;Ta=25°C
Number of LED	-	-	4	-	Piece	-
Connection mode 连	S	-	Serial	-	-	-

Using condition: constant current driving method If=15mA(+/-10%).

■ ELECTRO-OPTICAL CHARACTERISTICS

Item of electro-optical characteristics	Symbol	Condition	Min	Typ	Max	Unit	Remark	Note
Response time	Tr+ Tf	θ=0° ∅=0° Ta=25°C	-	25	40	ms	FIG 1.	4
Contrast ratio	Cr		35	69	-	---	FIG 2.	1
Luminance uniformity	δ WHITE		70	-	-	%	FIG 2.	3
Surface Luminance	Lv		130	170	-	cd/m ²	FIG 2.	2
Viewing angle range	θ	∅ = 90°	70	80	-	deg	FIG 3.	6
		∅ = 270°	20	30	-	deg	FIG 3	
		∅ = 0°	10	20	-	deg	FIG 3	
		∅ = 180°	50	60	-	deg	FIG 3	
NTSC ratio	-	-	-	42	-	%	-	-
CIE (x, y) chromaticity CIE	Red x	θ=0° ∅=0° Ta=25°C	0.5001	0.5501	0.6001	-	FIG 2.	5
	Red y		0.3019	0.3519	0.4019	-		
	Green x		0.2893	0.3393	0.3893	-		
	Green y		0.5149	0.5649	0.6149	-		
	Blue x		0.1125	0.1625	0.2125	-		
	Blue y		0.0579	0.1079	0.1579	-		
	White x		0.2196	0.2796	0.3396	-		
	White y		0.2293	0.2893	0.3493	-		

Note1. Contrast Ratio(CR) is defined mathematically by the following formula. For more information see FIG 2.:

$$\text{Contrast Ratio(CR)} = \frac{\text{Average Surface Luminance with all white pixels (P1, P2, \dots)}}{\text{Average Surface Luminance with all black pixels (P1, P2, \dots)}}$$

Note2. Surface luminance is the LCD surface luminance with all white pixels. For more information see FIG 2.

$L_v = \text{Average Surface Luminance with all white pixels (P1, P2, \dots)}$

备注2. 表面亮度是在显示白色画面时, 测试的亮度值, 详见FIG 2.。

$L_v = \text{平均的表面亮度(P1, P2, \dots)}$

Note3. The uniformity in surface luminance (δ WHITE) is determined by measuring luminance at each test position, and then dividing the maximum luminance of all white pixels by minimum luminance of all white pixels. For more information see FIG 2.

$$\delta \text{ WHITE} = \frac{\text{Minimum Surface Luminance with all white pixels (P1, P2, \dots)}}{\text{Maximum Surface Luminance with all white pixels (P1, P2, \dots)}}$$

备注3. 均匀度是在显示白色画面时, 测试P1到P9的亮度, 然后再用9个点亮度的最小值除以最大值。详见FIG 2.。

均匀度 = 白色画面下表面亮度最小值 (P1, P2, \dots) / 白色画面下表面亮度最大值 (P1, P2, \dots)

Note4. Response time is the time required for the display to transition from White to black(Rise Time, T_r) and from black to white(Decay Time, T_f). For additional information see FIG 1..

备注4. 响应时间是 T_r (上升时间) 与 T_f (下降时间) 的和; T_r 指显示黑色画面转为显示白色画面需要时间, T_f 指显示白色画面转为显示黑色画面需要时间。详见FIG 1.。

Note5. CIE(x, y) chromaticity is the Center point value. For more information see FIG 2.

备注5. 选择中心点 分别测试x, y值。详见FIG 2.。

Note6. Viewing angle is the angle at which the contrast ratio is greater than a specific value. For TFT module, the specific value of contrast ratio is 10; For monochrome and color stn module, the specific value of contrast ratio is 2. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG 3.

备注6. 视角 指对比度大于等于一个特定值时的可视范围, 对TFT屏, 对比度特定值为10, 对黑白屏, CSTN屏, 对比度特定值为2。视角由横轴 (x轴), 竖轴 (y轴) 同Z轴 (垂直于LCD表面) 之间的夹角来定义。详见FIG 3.。

Note7. For Viewing angle and response time testing, the testing data is base on Autronic-Melchers's ConoScope. Series Instruments. For contrast ratio, Surface Luminance, Luminance uniformity and CIE, the testing data is base on CS-2000 photo detector.

备注7. 视角和响应时间, 测试数据基于Autronic-Melchers's ConoScope. 系列。而对比度, 表面亮度, 均匀度, CIE坐标, 测试数据基于CS-2000 photo detector。

Note8. For TN type TFT transmissive module, Gray scale reverse occurs in the direction of panel viewing angle

备注8. TN型TFT全透产品, 在视角方向会发生灰度反转。

FIG.1. The definition of Response Time
响应时间定义

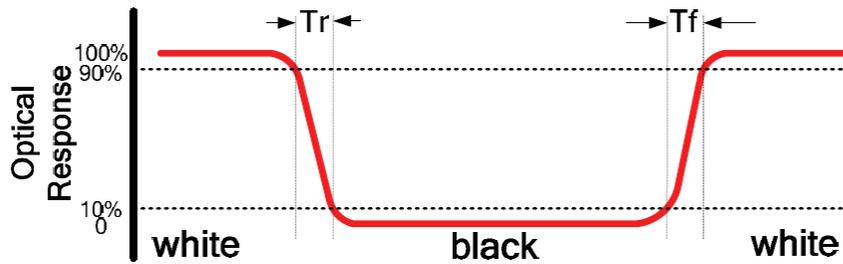


FIG.2. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity

对比度，表面亮度，均匀度，CIE坐标测试方法

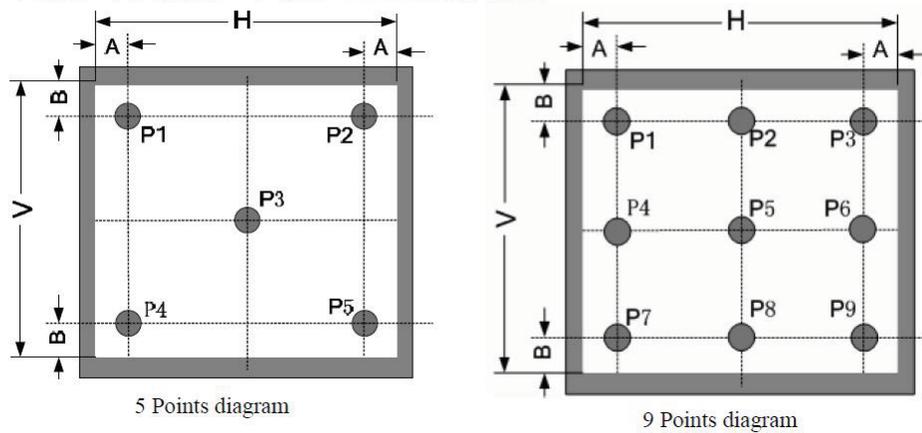


Fig2 Note1 For TFT Module Test point:9 points(as 9 Points diagram)

A : $H/6$ (if AA size < 4.0 inch); $H/10$ (if AA size ≥ 4.0 inch)

B : $V/6$ (if AA size < 4.0 inch); $V/10$ (if AA size ≥ 4.0 inch)

H, V : Active Area(AA) size

Measurement instrument: CS-2000; Light spot size $\varnothing=5$ mm, 350mm distance from the LCD surface to detector lens.

Fig2 Note2 For non-TFT Module and Dot-Matrix type Module

2.1 If the minimum side size is bigger than 20 mm, the testing method is the same as TFT module.

2.2 If the minimum side size is less than 20 mm, then testing 5 point datas (as 5 Points diagram), Both A and B are 5 mm.

2.3 Measurement instrument: CS-2000 is priority selected to measure.

Light spot size $\varnothing=5$ mm, 350mm distance from the LCD surface to detector lens.

2.4 Measurement instrument : ConoScope will be selected to measure If CS-2000 cannot meet the measurement requirement.

Light spot size $\varnothing=0.2-2.0$ mm. About 2-3mm distance from the LCD surface to detector lens, but suggest to confirm the best distance on focusing the picture to be clearest when actually measuring.

Fig2 Note3 For non-TFT Module and non-Dot-Matrix type Module

The test point is defined by the fact size and shape of module, but the center point and four edges should be selected.

3.1 Measurement instrument: CS-2000 is priority selected to measure..

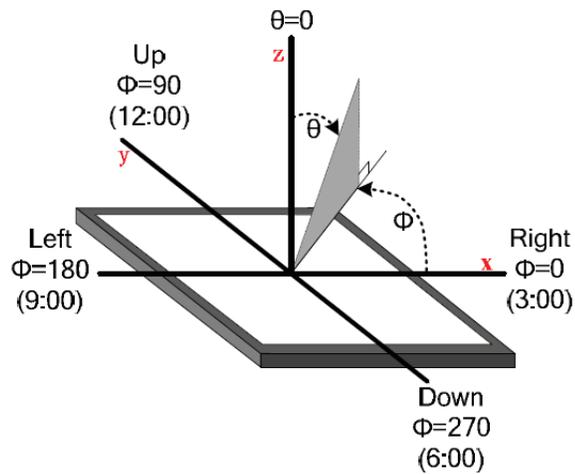
Light spot size $\varnothing=5\text{mm}$, 350mm distance from the LCD surface to detector lens.

3.2 Measurement instrument : ConoScope will be selected to measure If CS-2000 cannot meet the measurement requirement.

Light spot size $\varnothing=0.2\text{-}2.0\text{mm}$. About 2-3mm distance from the LCD surface to detector lens, but suggest to confirm the best distance on focusing the picture to be clearest when actually measuring.

FIG.3. The definition of viewing angle

视角定义



■ INTERFACE DESCRIPTION

接口定义描述

Interface NO. 接口序号	Symbol 符号	I/O or connect to 输入/出 或 连接到	Description 描述	When not in use 不用时
1	GND	Power Supply	Power Ground	-
2	LED-	LED DRIVER	LED CATHODE	-
3	LED+	LED DRIVER	LEDA ANODE	-
4	IM1	I Host processor	System interface select. For the detail,please refer to NOTE1	IOVCC or GND
5	IOVCC	Power Supply	Digital IO Pad power supply	-
6	RESET	LED DRIVER	Reset pin. Setting either pin low initializes theLSI. Must be reset after power is supplied.	-
7	CS	I Host processor	Chip select signal. Low: chip can be accessed; High: chip cannot be accessed.	-
8	RS	I Host processor	(RS) Command / parameter or display data selection pin.	IOVCC or GND
9	RD	I Host processor	(RD) Read enable pin I80 parallel bus system interface.	IOVCC or GND
10	IM0	I Host processor	System interface select. For the detail,please refer to NOTE1	IOVCC or GND
11	WR/SCL	I Host processor	Write enable pin I80 parallel bus system interface. (SCL) server as serial data clock in serial bus system interface.	IOVCC or GND
12	SDI/SDO	I /O Host processor	Serial data input pin and output pin(SDO) in serial bus system interface I.Serial data input pin (SDI) in serial bus system interface II.The data is inputted on the rising edge of the SCL signal.	GND
13	VCI	Power Supply	Analog power supply	-
14	VCI	Power Supply	Analog power supply	-
15	IM2	I Host processor	System interface select. For the detail,please refer to NOTE1	IOVCC or GND
16	DOTCLK	I Host processor	Data clock signal in RGB interface.	GND
17	VSYNC	I Host processor	Vertical synchronizing signal in RGB interface.	GND
18	DEN	I Host processor	A data ENABLE signal in RGB I/F mode.	GND
19	HSYNC	I Host processor	Horizontal synchronizing signal in RGB interface.	GND
20	IM3	I Host processor	System interface select. For the detail,please refer to NOTE1	IOVCC or GND
21	GND	Power Supply	Power Ground	-
22	DB17	I/O Host processor	18-bit bi-directional data bus.	OPEN/GND
23	DB16	I/O Host processor	18-bit bi-directional data bus.	OPEN/GND

24	DB15	I/O Host processor	18-bit bi-directional data bus.	OPEN/GND
25	DB14	I/O Host processor	18-bit bi-directional data bus.	OPEN/GND
26	DB13	I/O Host processor	18-bit bi-directional data bus.	OPEN/GND
27	DB12	I/O Host processor	18-bit bi-directional data bus.	OPEN/GND
28	DB11	I/O Host processor	18-bit bi-directional data bus.	OPEN/GND
29	DB10	I/O Host processor	18-bit bi-directional data bus.	OPEN/GND
30	DB9	I/O Host processor	18-bit bi-directional data bus.	OPEN/GND
31	DB8	I/O Host processor	18-bit bi-directional data bus.	OPEN/GND
32	DB7	I/O Host processor	18-bit bi-directional data bus.	OPEN/GND
33	DB6	I/O Host processor	18-bit bi-directional data bus.	OPEN/GND
34	DB5	I/O Host processor	18-bit bi-directional data bus.	OPEN/GND
35	DB4	I/O Host processor	18-bit bi-directional data bus.	OPEN/GND
36	DB3	I/O Host processor	18-bit bi-directional data bus.	OPEN/GND
37	DB2	I/O Host processor	18-bit bi-directional data bus.	OPEN/GND
38	DB1	I/O Host processor	18-bit bi-directional data bus.	OPEN/GND
39	DB0	I/O Host processor	18-bit bi-directional data bus.	OPEN/GND
40	GND	Power Supply	Power Ground	-

■ REFERENCE APPLICATION CIRCUIT

参考应用电路

Please consult our technical department for detail information.
 详细信息请联系我们的技术部

■ RELIABILITY TEST CONDITIONS

可靠性试验条件

No. 序号	Test Item 试验项目	Test Condition 试验条件	Inspection after test 判断标准
1	High Temperature Storage 高温存放	80±2℃/200 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.Air bubble in the LCD; 模块中有气泡; 2.Sealleak; 封口松脱; 3.Non-display; 不显示; 4.missing segments; 漏笔 5.Glass crack; 玻璃破碎; 6.Current Idd is twice higher than initial value. 电流 Idd 大于初时值的 2 倍
2	Low Temperature Storage 低温存放	-30±2℃/200 hours	
3	High Temperature Operating 高温操作	70±2℃/120 hours	
4	Low Temperature Operating 低温操作	-20±2℃/120 hours	
5	Temperature Cycle storage 冷热循环存放	-20±2℃~25~70±2℃×10cycles (30min.) (5min.) (30min.)	
6	Damp proof Test operating 防潮试验操作	50℃±5℃×90%RH/120 hours	
7	Vibration Test 振荡试验	Frequency: 10Hz~55Hz~10Hz Amplitude: 1.5mm, X, Y, Z direction for total 3hours (Packing condition)	
8	Dropping test 跌落试验	Drop to the ground from 1m height, one time, every side of carton. (Packing condition)	
9	ESD test 静电试验	Voltage:±8KV R: 330Ω C: 150pF Air discharge, 10time	
Remark: 注意: 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.EL evaluation should be excepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and Fluorescence EL has. 带EL片的可靠性测试在高温高湿条件下,荧光粉会发生自然化学反应而产生黑点或瑕疵,因此不在高温高湿条件测试范围内。 6.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,光电特性			

■ INSPECTION CRITERION

检查标准

This specification is made to be used as the standard of acceptance/rejection criteria for industrial type TFT-LCD module product

1. Sample plan

Sampling plan according to GB/T2828.1-2003/ISO 2859-1: 1999 and ANSI/ASQC Z1.4-1993, normal level 2 and based on:

Major defect: AQL 0.65

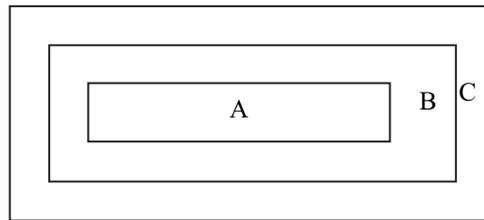
Minor defect: AQL 1.5

2. Inspection condition

Viewing distance for cosmetic inspection is about 30cm with bare eyes, and under an environment of 20~40W light intensity, all directions for inspecting the sample should be within 45° against perpendicular line. ((Normal temperature 20~25℃ and normal humidity 60±15%RH)

3. Definition of Inspection Item.

3.1 Definition of inspection zone in LCD.



Zone A: character/Digit area

Zone B: viewing area except Zone A (Zone A+Zone B=minimum Viewing area)

Zone C: Outside viewing area (invisible area after assembly in customer s product)

Fig.1 Inspection zones in an LCD

Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble for quality and assembly of customer s product.

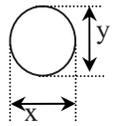
3.2 Definition of some visual defect

Bright dot	<p>Because of losing all or part function, bad pixel dots appear bright and the size is more than 50% of one dot in which LCD panel is displaying under black pattern.</p> 
Dark dot	<p>Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue picture, or pure whiter picture.</p>

4. Major Defect

Item No.	Items to be inspected	Inspection Standard	Classification of defects
4.1	Functional defects	1) No display 2) Display abnormally 3) Missing vertical, horizontal segment 4) Short circuit 5) Excess power consumption 6) Back-light no lighting, flickering and abnormal lighting	major
4.2	Missing	Missing component	
4.3	Outline dimension	Overall outline dimension beyond the drawing is not allowed	

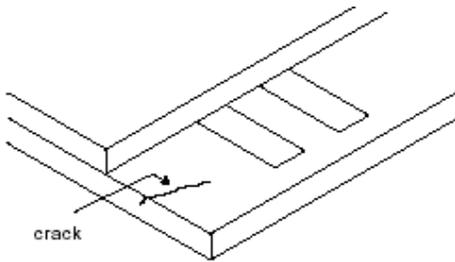
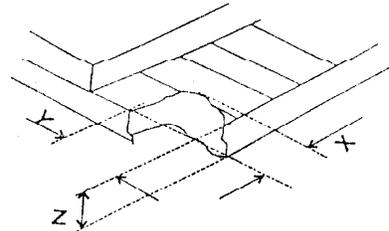
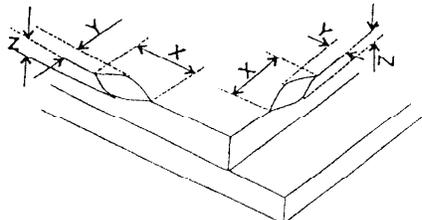
5. Minor Defect

Item No.	Items to be inspected	Inspection Standard			Classification of defects	
5.1	Bright dot /dark dot defect	Zone Size	Acceptable Qty		Minor	
			A+B			C
			<4.3"	≥4.3"		
		Bright pixel dot	1	2		Acceptable
		Dark pixel dot	4	4		
		2 bright dots adjacent	0	0		
		2 dark dots adjacent	0	0		
		Total bright and dark dots	5	6		
Note: Minimum distance between defective dots is more than 5 mm; Pixel dots' function is normal, but bright dots caused by foreign material and other reasons are judged by the dot defect of 5.2.						
5.2	Dot defect  $\Phi = (x+y) / 2$	Zone Size (mm)	Acceptable Qty		Minor	
			A+B			C
			<4.3"	≥4.3"		
		$\Phi \leq 0.1$	Acceptable	Acceptable		Acceptable
		$0.1 < \Phi \leq 0.2$	3			
		$0.2 < \Phi \leq 0.3$	1	5		
		$0.3 < \Phi \leq 0.5$	0			
		$\Phi > 0.5$	0	0		
Note: 1. Minimum distance between defective dots is more than 5 mm; 2. The quantity of defect (adjacent dots) is zero in operating condition.						

5. Minor Defect

Item No.	Items to be inspected	Inspection Standard				Classification of defects																																																								
5.3	Linear defect	<table border="1"> <thead> <tr> <th colspan="2">Zone</th> <th colspan="2">Acceptable Qty</th> <th rowspan="2">C</th> </tr> <tr> <th colspan="2">Size (mm)</th> <th colspan="2">A+B</th> </tr> <tr> <th>Length</th> <th>Width</th> <th><4.3"</th> <th>≥4.3"</th> </tr> </thead> <tbody> <tr> <td>Ignore</td> <td>$W \leq 0.03$</td> <td>Acceptable</td> <td>Acceptable</td> <td rowspan="3">Acceptable</td> </tr> <tr> <td>$L \leq 5.0$</td> <td>$0.03 < W \leq 0.10$</td> <td>4</td> <td>5</td> </tr> <tr> <td>$L > 5.0$</td> <td>$W > 0.10$</td> <td>0</td> <td>0</td> </tr> </tbody> </table>				Zone		Acceptable Qty		C	Size (mm)		A+B		Length	Width	<4.3"	≥4.3"	Ignore	$W \leq 0.03$	Acceptable	Acceptable	Acceptable	$L \leq 5.0$	$0.03 < W \leq 0.10$	4	5	$L > 5.0$	$W > 0.10$	0	0	Minor																														
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$L > 5.0$	$W > 0.10$	0	0																																																											
5.4	Polarizer defect	<p>5.4.1 Polarizer Position (i) Shifting in position should not exceed the glass outline dimension. (ii) Incomplete covering of the viewing area due to shifting is not allowed.</p> <p>5.4.2 Dirt on polarizer Dirt which can be wiped easily should be acceptable.</p> <p>5.4.3 Polarizer Dent & Air bubble</p> <table border="1"> <thead> <tr> <th colspan="2">Zone</th> <th colspan="2">Acceptable Qty</th> <th rowspan="2">C</th> </tr> <tr> <th colspan="2">Size (mm)</th> <th colspan="2">A+B</th> </tr> <tr> <th colspan="2"></th> <th><4.3"</th> <th>≥4.3"</th> </tr> </thead> <tbody> <tr> <td colspan="2">$\Phi \leq 0.3$</td> <td>Acceptable</td> <td>Acceptable</td> <td rowspan="4">Acceptable</td> </tr> <tr> <td colspan="2">$0.3 < \Phi \leq 1.0$</td> <td>3</td> <td>3</td> </tr> <tr> <td colspan="2">$1.0 < \Phi \leq 1.5$</td> <td>1</td> <td>1</td> </tr> <tr> <td colspan="2">$\Phi > 1.5$</td> <td>0</td> <td>0</td> </tr> </tbody> </table> <p>5.4.4 Polarizer scratch (i) If the polarizer scratch can be seen after cover assembling or in the operating condition, judge by the linear defect of 5.3. (ii) If the polarizer scratch can be seen only in non-operating condition or some special angle, judge by the following:</p> <table border="1"> <thead> <tr> <th colspan="2">Zone</th> <th colspan="2">Acceptable Qty</th> <th rowspan="2">C</th> </tr> <tr> <th colspan="2">Size (mm)</th> <th colspan="2">A+B</th> </tr> <tr> <th>Length</th> <th>Width</th> <th><4.3"</th> <th>≥4.3"</th> </tr> </thead> <tbody> <tr> <td>Ignore</td> <td>$W \leq 0.05$</td> <td>Acceptable</td> <td>Acceptable</td> <td rowspan="3">Acceptable</td> </tr> <tr> <td>$1.0 < L \leq 5.0$</td> <td>$0.05 < W \leq 0.20$</td> <td>4</td> <td>5</td> </tr> <tr> <td>$L > 5.0$</td> <td>$W > 0.20$</td> <td>0</td> <td>0</td> </tr> </tbody> </table>				Zone		Acceptable Qty		C	Size (mm)		A+B				<4.3"	≥4.3"	$\Phi \leq 0.3$		Acceptable	Acceptable	Acceptable	$0.3 < \Phi \leq 1.0$		3	3	$1.0 < \Phi \leq 1.5$		1	1	$\Phi > 1.5$		0	0	Zone		Acceptable Qty		C	Size (mm)		A+B		Length	Width	<4.3"	≥4.3"	Ignore	$W \leq 0.05$	Acceptable	Acceptable	Acceptable	$1.0 < L \leq 5.0$	$0.05 < W \leq 0.20$	4	5	$L > 5.0$	$W > 0.20$	0	0	Minor
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5. Minor Defect

Item No.	Items to be inspected	Inspection Standard	Classification of defects								
5.5	MURA	Using 5% ND filter, it's NG if it can be seen in R,G,B picture.	Minor								
	White/Black dot (MURA)	Visible under: ND5%; $D \leq 0.15\text{mm}$, Acceptable; $0.15\text{mm} < D \leq 0.5\text{mm}$, $N \leq 4$; $D > 0.5\text{mm}$, Not allowable.									
5.6	Glass defect	<p>(i) Crack Cracks are not allowed.</p> 	Minor								
		<p>(ii) TFT chips on corner</p>  <table border="1" data-bbox="511 1197 1153 1312"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> <th>Acceptable</th> </tr> </thead> <tbody> <tr> <td>≤ 3.0</td> <td>≤ 3.0</td> <td>Not more than the thickness of glass</td> <td>$N \leq 3$</td> </tr> </tbody> </table> <p>Chips on the corner of terminal shall not be allowed to extend into the ITO pad or expose perimeter seal.</p>	X	Y	Z	Acceptable	≤ 3.0	≤ 3.0	Not more than the thickness of glass	$N \leq 3$	Minor
		X	Y	Z	Acceptable						
≤ 3.0	≤ 3.0	Not more than the thickness of glass	$N \leq 3$								
<p>(iii) Usual surface crack</p>  <table border="1" data-bbox="511 1690 1153 1806"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> <th>Acceptable</th> </tr> </thead> <tbody> <tr> <td>≤ 1.5</td> <td>≤ 1.5</td> <td>Not more than the thickness of glass</td> <td>$N \leq 4$</td> </tr> </tbody> </table> <p>It is only applicable to the upper glass of LCD.</p>	X	Y	Z	Acceptable	≤ 1.5	≤ 1.5	Not more than the thickness of glass	$N \leq 4$	Minor		
X	Y	Z	Acceptable								
≤ 1.5	≤ 1.5	Not more than the thickness of glass	$N \leq 4$								

6. Module Cosmetic Criteria

Item No.	Items to be inspected	Inspection Standard	Classification of defects
1	Difference in Spec.	Not allowable	Major
2	Pattern peeling	No substrate pattern peeling and floating	Major
3	Soldering defects	No soldering missing No soldering bridge No cold soldering	Major Major Minor
4	Resist flaw on PCB	Visible copper foil ($\varnothing 0.5$ mm or more) on substrate pattern is not allowed	Minor
5	FPC gold finger	No dirt, breaking, oxidation lead to black	Major
6	Backlight plastic frame	No deformation, crack, breaking, backlight positioning column breaking, obvious nick.	Minor
7	Marking printing effect	No dark marking, incomplete, deformation lead to unable to judge	Minor
8	Accretion of metallic Foreign matter	No accretion of metallic foreign matter (Not exceed $\varnothing 0.2$ mm)	Minor
9	Stain	No stain to spoil cosmetic badly	Minor
10	Plate discoloring	No plate fading, rusting and discoloring	Minor
11	Solder amount	a. Soldering side of PCB Solder to form a 'Filet' all around the lead. Solder should not hide the lead form perfectly. (too much)	Minor
	1. Lead parts	b. Components side (In case of 'Through Hole PCB') Solder to reach the Components side of PCB.	Minor
	2. Flat packages	Either 'Toe' (A) or 'Seal' (B) of the lead to be covered by 'Filet'. Lead form to be assume over Solder.	Minor
	3. Chips	$(3/2) H \geq h \geq (1/2) H$	Minor
11	4. Solder ball/Solder splash	a. The spacing between solder ball and the conductor or solder pad $h \geq 0.13$ mm. The diameter of solder ball $d \leq 0.15$ mm. b. The quantity of solder balls or solder splashes isn't beyond 5 in 600 mm^2 . c. Solder balls/Solder splashes do not violate minimum electrical clearance. d. Solder balls/Solder splashes must be entrapped / encapsulated or attached to the metal surface . Note: Entrapped/encapsulated/attached is intended to mean that normal service environment of the product will not cause a solder ball to become dislodged.	Minor Minor Major Minor

■ PRECAUTIONS FOR USING LCD MODULES

1 Handling Precautions

- 1.1 The display panel is made of glass and polarizer. As glass is fragile. It tends to become or 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.
- 1.2 If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.
- 1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary. Do not touch the display with bare hands. This will stain the display area and degraded insulation between terminals (some cosmetics are determined to the polarizer).
- 1.4 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.
- 1.5 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 alcoholDo not scrub hard to avoid damaging the display surface.
- 1.6 Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.
 - Water
 - Ketone
 - Aromatic solventsWipe 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.

-
- 1.7 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
 - 1.8 Install the LCD Module by using the mounting holes. 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 or the backlight cable.
 - 1.9 Do not attempt to disassemble or process the LCD module.
 - 1.10 NC terminal should be open. Do not connect anything.
 - 1.11 If the logic circuit power is off, do not apply the input signals.
 - 1.12 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.

- Before removing LCM 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.

- 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.

- 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.

- 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.

- 1.13 Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.

-
- Do not alter, modify or change the shape of the tab on the metal frame.
 - Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
 - Do not damage or modify the pattern writing on the printed circuit board.
 - Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.
 - Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
 - Do not drop, bend or twist the LCM.

3 Storage Precautions

3.1 When storing the LCD modules, the following precaution are necessary.

液晶显示模块的存储依照以下几点:

3.1.1 Store them in a sealed polyethylene bag. If properly sealed, there is no need for the desiccant.

使用聚乙烯袋密封, 如果密封得当, 不需要干燥剂。

3.1.2 Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C, 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。

3.1.3 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)。

3.2 Transportation Precautions 运输注意事项

3.2.1 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, 塌陷. 卡通箱叠层高度不能超过2米.

3.2.2 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.

3.3 Others 其它

3.3.1 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。

3.3.2 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。

3.3.3 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.

工作为最小限度地降低由静电等导致液晶显示模块性能降低, 使用模块时慎重使用下列区域:

3.3.3.1 - Exposed area of the printed circuit board.

- 印制电路板裸露区域。

3.3.3.2 - Terminal electrode sections.

印制电路板引出端子区域

4 USING LCD MODULES

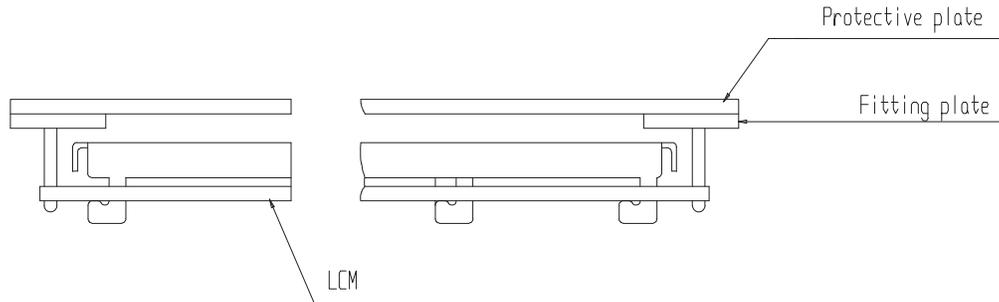
4.1 Installing LCD Modules

The hole in the printed circuit board is used to fix LCM as shown in the picture below. Attend to the following items when installing the LCM.

印制线路板上的孔用来固定液晶显示屏，如下图所示。安装液晶显示模块时，注意以下事项：

4.1.1 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。



4.1.2 When assembling the LCM into other equipment, the spacer to the bit between the LCM 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 $\pm 0.1\text{mm}$.

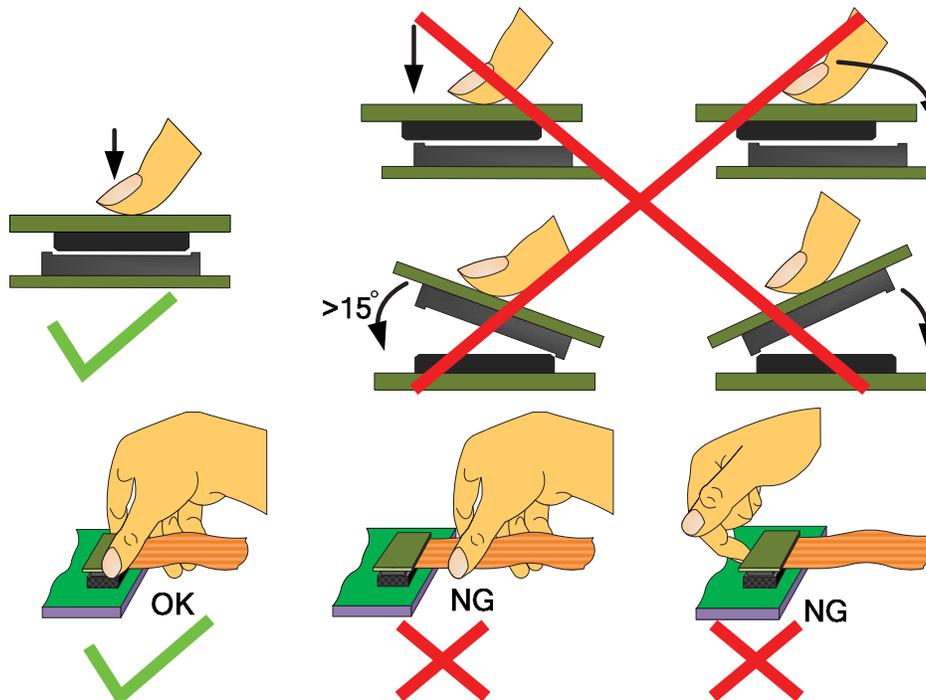
将模块安装进入其它设备时，模块和安装板之间间隔应有足够的高度以避免模块表面受压。参照专业度量技术标准。量度公差应是 ± 0.1 毫米。

4.2 Precaution for assemble the module with BTB connector:

用板对板连接器安装液晶显示模块注意事项：

Please note the position of the male and female connector position, don't assemble or assemble like the method which the following picture shows

请注意连接器的公母及连接位置，请勿出现下图所示的连接方式。



4.3 Precaution for soldering the LCM 焊接模块注意事项

	Manual soldering 手工焊接	Machine drag soldering 机器拖焊	Machine press soldering 机器压焊
No RoHS Product 非环保产品	290°C ~350°C. Time : 3-5S.	330°C ~350°C. Speed : 4-8 mm/s.	300°C ~330°C. Time : 3-6S. Press: 0.8~1.2Mpa
RoHS Product 环保产品	340°C ~370°C. Time : 3-5S.	350°C ~370°C. Time : 4-8 mm/s.	330°C ~360°C. Time : 3-6S. Press: 0.8~1.2Mpa

4.3.1 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焊剂油溅出造成的任何损坏。

4.3.2 When soldering the electroluminescent panel 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.

焊接背光源和线路板时，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。

4.3.3 When remove the electroluminescent panel from the PC board, be sure the solder has completely melted, the soldered pad on the PC board could be damaged.

从线路板上移除背光源时，要保证焊锡已完全熔化，不要损坏线路板上的焊接位。

4.4 Precautions for Operation 工作运行注意事项:

4.4.1 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。

4.4.2 It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life. An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.

在液晶驱动电压内来操作模块是必要的。超过限定电压会缩短液晶寿命。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。

4.4.3 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。

4.4.4 If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.

如果在运行过程中显示区受到挤压，显示将会异常。然而挤压中断，将恢复正常。

4.4.5 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.

4.4.6 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，先让逻辑电压，再接通模拟高压，如显示屏驱动电压。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。

4.4.7 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。

4.5 Safety 安全

4.5.1 It is recommended to crush damaged or unnecessary LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.

建议将损坏的液晶显示屏压成碎片，用溶剂诸如丙酮，乙醇冲洗掉，迟后烧掉。

4.5.2 If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

如果任何液体从液晶盒泄漏出且与手接触，要用肥皂和水彻底清洗。

4.7.2 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。顾客安装的连接器和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。

■ PACKING SPECIFICATION

TBD