

SPECIFICATION

Revision: 0.0

This module uses ROHS material

WRITTEN BY	CHECKED BY	APPROVED BY

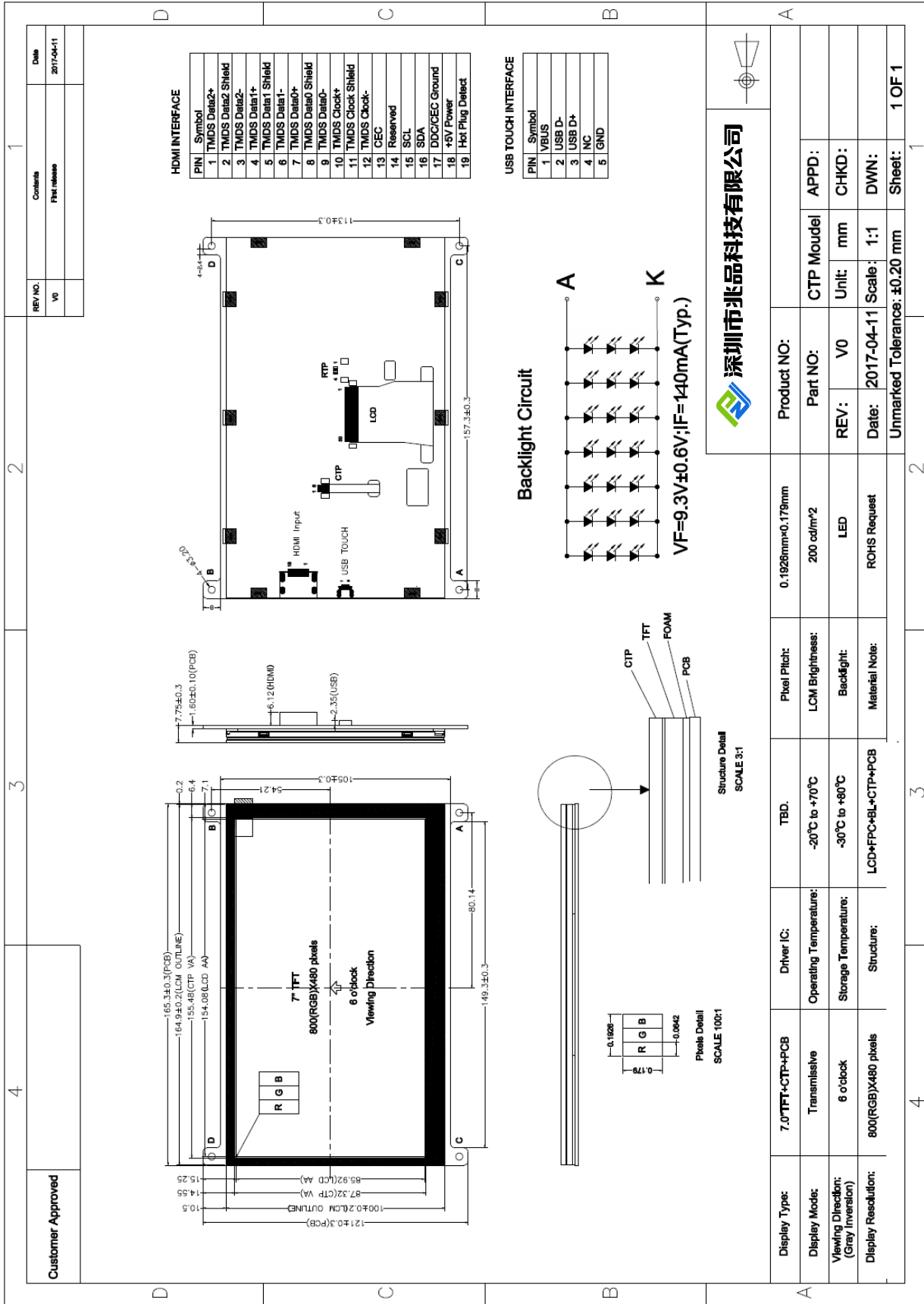
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1、GENERAL INFORMATION

Item of general information	Contents	Unit
LCD Display Size(Diagonal)	7	inch
LCD Display Type	TFT/TRANSMISSIVE	-
LCD Display Mode	Normally White	-
Recommended Viewing Direction	12	o'clock
Gray inversion Direction	6	o'clock
Module size (W×H×T)	165.30×121.00×7.75	mm
Active area (W×H)	154.08×85.92	mm
Number of pixels(Resolution)	800RGB×480	pixel
Pixel pitch (W×H)	0.1926×0.179	mm
Color Pixel Arrangement	RGB Stripe	-
LCD Driver IC	TBD	-
Module Interface Type	HDMI(Display)&USB(touch)	-
System Support	Android/Win7/Win8	
Module Input voltage	5.0V	V
Module Power consumption	TBD	mW
Color Numbers	16.7M	-
Backlight Type	White LED	-

2、EXTERNAL DIMENSIONS



3、ABSOLUTE MAXIMUM RATINGS

Parameter of absolute maximum ratings	Symbol	Min	Max	Unit
LCD supply voltage	VDD	-0.5	5.0	V
Operating temperature	Top	-20	70	°C
Storage temperature	Tst	-30	80	°C
Humidity	RH	-	90%(Max 60°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.

4、ELECTRICAL CHARACTERISTICS(DC CHARACTERISTICS)

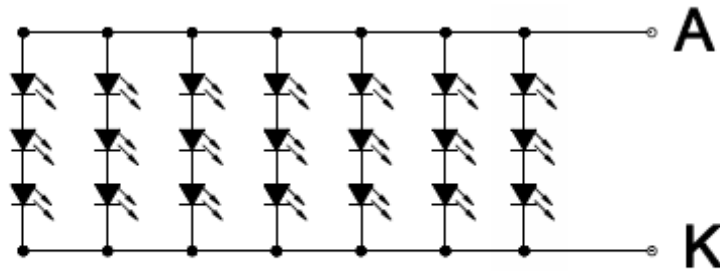
Parameter of DC characteristics	Symbol	Min.	Typ.	Max.	Unit
PCB operating voltage	VUSB	-	5.0	-	V
PCB Board Input Current	I _{dd}	-	TBD	-	mA
LCD I/O operating voltage	VDD	3.0	3.3	3.6	V
Input voltage 'H' level	V _{IH}	0.7*VDD	-	VDD	V
Input voltage 'L' level	V _{IL}	VSS	-	0.3*VDD	V
Output voltage 'H' level	V _{OH}	VDD-0.4	-	VDD	V
Output voltage 'L' level	V _{OL}	VSS	-	VSS+0.4	V

5、BACKLIGHT CHARACTERISTICS

Item of backlight characteristics	Symbol	Min.	Typ.	Max.	Unit	Condition
Forward Voltage	Vf	8.7	9.3	9.9	V	If=140mA Ta=25°C
Forward Current	If	-	120	-	mA	
Luminance	Lv	-	200	-	cd/m2	
Number of LED	-	-	3*7	-	Piece	-
LED Connection mode	P/S	-	Serial/Parallel	-	-	-
Lifetime of LED	-	-	TBD	-	hour	-

Note:

- Using condition: constant current driving method If=140mA(+/-10%).
- Backlight circuit:



$V_F=9.3V\pm 0.6V; I_F=140mA(Typ.)$

6、CTP CHARACTERISTICS

Item of CTP characteristics	Specification	Unit	Remark
Panel Type	Glass Cover + Glass Sensor	-	-
Resolution	800 × 480	pixel	-
Surface Hardness	≥6H	-	-
Transparency	>82%	-	-
Driver IC	TBD	-	-
Interface Type	I2C	-	-
Support Points	5	-	-
Sampling Rate	20~100	Hz	-
Supply voltage	3.3	V	-

7、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℃	-	25	40	ms	FIG 1.	4
Contrast Ratio		CR		-	320	-	-	FIG 2.	1
Luminance uniformity		δWHITE		-	80	-	%	FIG 2.	3
Surface Luminance		Lv		-	200	-	cd/m2	FIG 2.	2
CIE (x, y) chromaticity	White	White x	θ=0 ∅=0 Ta=25℃	-	0.302	-	-	FIG 2.	5
		White y		-	0.338	-			
	Red	Red x		-	0.606	-			
		Red y		-	0.325	-			
	Green	Green x		-	0.303	-			
		Green y		-	0.567	-			
	Blue	Blue x		-	0.147	-			
		Blue y		-	0.161	-			
Viewing angle range	∅=90(12 o'clock)		CR ≥ 10	-	60	-	deg	FIG 3.	6
	∅=270(6 o'clock)			-	70	-	deg		
	∅=0(3 o'clock)			-	60	-	deg		
	∅=180(9 o'clock)			-	60	-	deg		
NTSC ratio		-	-	-	50	-	%	-	-

Note 1. Contrast Ratio(CR) is defined mathematically by the following formula. For more information see FIG 2.:

$$\text{Contrast Ratio(CR)} = \frac{\text{Average Surface Luminance with all white pixels(P1,P2,P3,P4,P5,P6,P7,P8,P9)}}{\text{Average Surface Luminance with all black pixels(P1,P2,P3,P4,P5,P6,P7,P8,P9)}}$$

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

Lv=Average Surface Luminance with all white pixels (P1,P2,P3,P4,P5,P6,P7,P8,P9)

Note 3. The uniformity in surface luminance (δWHITE) is determined by measuring

luminance at each test position 1 through 9, and then dividing the maximum luminance of 9 points luminance by minimum luminance of 9 points luminance. For more information see FIG 2.

$$\delta_{\text{WHITE}} = \frac{\text{Minimum Surface Luminance with all white pixels (P1, P2, P3, P4, P5, P6, P7, P8, P9)}}{\text{Maximum Surface Luminance with all white pixels (P1, P2, P3, P4, P5, P6, P7, P8, P9)}}$$

Note 4. 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.

Note 5. CIE (x, y) chromaticity, The x, y value is determined by screen active area position 5. For more information see FIG 2.

Note 6. 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. 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.

Note 7. For Viewing angle and response time testing, the testing data is based on Autronic-Melchers's ConoScope. Series Instruments. For contrast ratio, Surface Luminance, Luminance uniformity and CIE, the testing data is based on BM-7 photo detector.

Note 8. For TN type TFT transmissive module, Gray scale reverse occurs in the direction of panel viewing angle.

FIG.1. The definition of Response Time

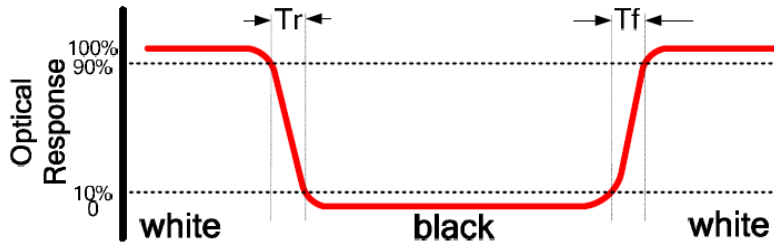


FIG.2. Measuring method for Contrast ratio, surface luminance, Luminance

uniformity, CIE (x , y) chromaticity

A : $H/6$;

B : $V/6$;

H,V : Active Area(AA) size

Measurement instrument: BM-7; Light spot size=5mm, 350mm distance from the LCD surface to detector lens.

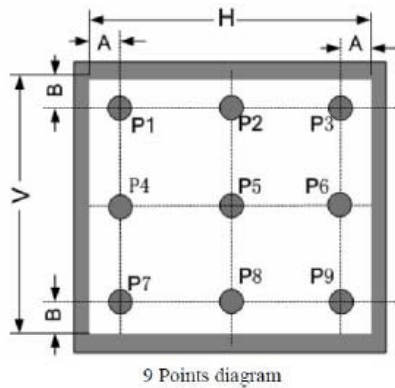
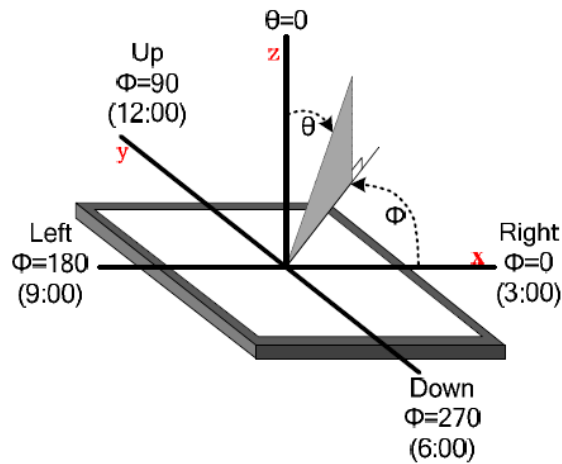


FIG.3. The definition of viewing angle



8、INTERFACE DESCRIPTION

A、HDMI Interface Description

NO.	Symbol	DESCRIPTION
1	TMDS Data2+	Positive side of channel 2 TMDS low-voltage signal differential input pair
2	TMDS Data2 Shield	Ground
3	TMDS Data2-	Negative side of channel 2 TMDS low-voltage signal differential input pair
4	TMDS Data1+	Positive side of channel 1 TMDS low-voltage signal differential input pair
5	TMDS Data1 Shield	Ground
6	TMDS Data1-	Negative side of channel 1 TMDS low-voltage signal differential input pair
7	TMDS Data0+	Positive side of channel 0 TMDS low-voltage signal differential input pair
8	TMDS Data0 Shield	Ground
9	TMDS Data0-	Negative side of channel 0 TMDS low-voltage signal differential input pair
10	TMDS Clock+	Positive side of reference clock. TMDS low-voltage signal differential input pair
11	TMDS Clock Shield	Ground
12	TMDS Clock-	Negative side of reference clock. TMDS low-voltage signal differential input pair
13	CEC	No Connection
14	Reserved(N.C.)	No Connection
15	SCL	DDC SCL
16	SDA	DDC SDA
17	DDC/CEC Ground	Ground
18	+5V Power	+5V Power
19	Hot Plug Detect	Hot Plug Detect

B、USB Interface Description

NO.	Symbol	DESCRIPTION
1	VUSB	USB Power
2	D-	USB Data-
3	D+	USB Data+
4	NC	No connection
5	GND	Power Ground

Application Note: Please connect the USB first, and then connect the HDMI interface.

9、LCD TIMING

Horizontal input Timing table

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency	DCLK	-	33.3	50	MHz
Horizontal display area	thd	800			DCLK
1 Horizontal Line	th	862	1056	1200	DCLK
HSD pulse width	thpw	1	-	40	DCLK
HSD Blanking	thb	46	46	46	DCLK
HSD Front Porch	thfp	16	210	354	DCLK

Vertical input Timing table

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Vertical display area	tvd	480			H
VSD period time	tv	510	525	650	H
VSD pulse width	tvpw	1	-	20	H
VSD Blanking	tvb	23	23	23	H
VSD Front Porch	tvfp	7	22	147	H

10、RELIABILITY TEST CONDITIONS

No.	Test Item	Test Condition
1	High Temperature Storage	80℃/120 hours
2	Low Temperature Storage	-30℃/120 hours
3	High Temperature Operating	70℃/120 hours
4	Low Temperature Operating	-20℃/120 hours
5	Temperature Cycle Storage	-20℃(30min.)~25(5min.)~70℃(30min.)×10cycles

A、Inspection after test:

Inspection after 2~4 hours storage at room temperature, the sample shall be free from defects:

- Air bubble in the LCD;
- Sealleak;
- Non-display;
- Missing segments;
- Glass crack;
- Current is twice higher than initial value.

B、Remark:

- The test samples should be applied to only one test item.
- Sample size for each test item is 5~10pcs.
- Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

11、INSPECTION CRITERION

This specification is made to be used as the standard of acceptance/rejection criteria for TFT-LCD/IPS TFT-LCD module product, and this specification is applicable only in the case that the size of module equal to or exceed than 3.5 inch.

11.1 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

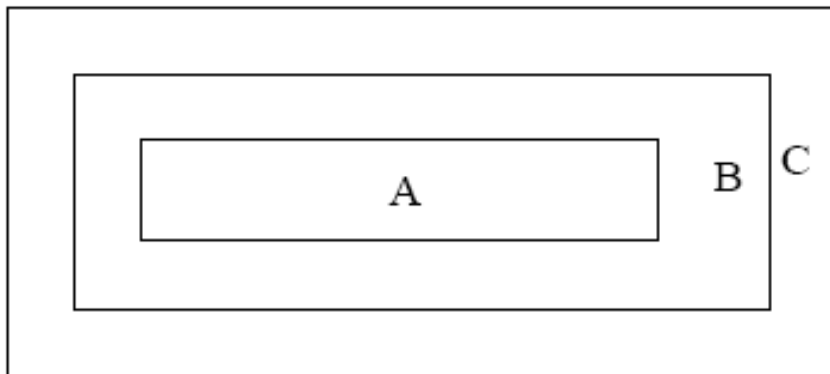
Minor defect: AQL 1.5

11.2 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°C and normal humidity 60 ±15%RH)

11.3 Definition of Inspection Item.

A、 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.

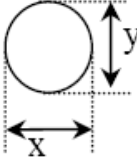
B、 Definition of some visual defect

Bright dot	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.
Dark dot	Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue picture, or pure whiter picture.

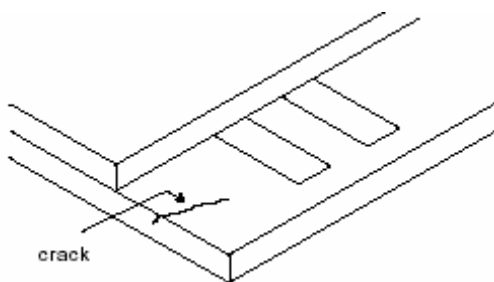
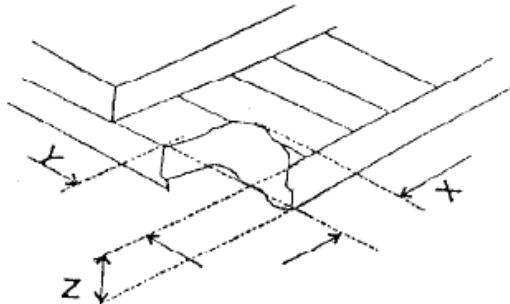
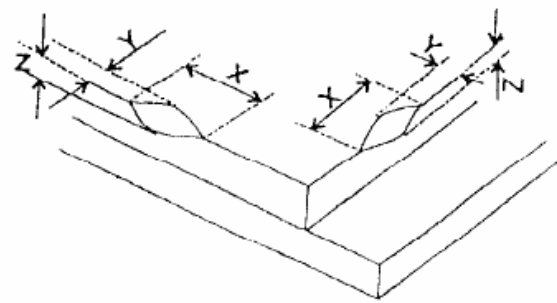
11.4 Major Defect

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

11.5 Minor Defect

Item No.	Items to be inspected	Inspection standard					Classification of defects																																								
1	Bright dot /dark dot defect	<table border="1"> <thead> <tr> <th colspan="2" data-bbox="464 439 783 562" rowspan="2">Zone</th> <th colspan="3" data-bbox="783 439 1238 472">Acceptable Qty</th> <th data-bbox="1158 439 1238 472" rowspan="2">C</th> </tr> <tr> <th colspan="3" data-bbox="783 472 1158 517">A+B</th> </tr> <tr> <th colspan="2" data-bbox="464 517 783 562"></th> <th data-bbox="783 517 903 562">3.5"~7"</th> <th data-bbox="903 517 1035 562">7~10.1"</th> <th data-bbox="1035 517 1158 562">>10.1"</th> <th data-bbox="1158 517 1238 562" rowspan="6">Acceptable</th> </tr> </thead> <tbody> <tr> <td data-bbox="464 562 584 607">Bright pixel dot</td> <td data-bbox="584 562 783 607"></td> <td data-bbox="783 562 903 607">1</td> <td data-bbox="903 562 1035 607">2</td> <td data-bbox="1035 562 1158 607">3</td> </tr> <tr> <td data-bbox="464 607 584 651">Dark pixel dot</td> <td data-bbox="584 607 783 651"></td> <td data-bbox="783 607 903 651">4</td> <td data-bbox="903 607 1035 651">4</td> <td data-bbox="1035 607 1158 651">4</td> </tr> <tr> <td data-bbox="464 651 584 696">2bright dots adjacent</td> <td data-bbox="584 651 783 696"></td> <td data-bbox="783 651 903 696">0</td> <td data-bbox="903 651 1035 696">0</td> <td data-bbox="1035 651 1158 696">0</td> </tr> <tr> <td data-bbox="464 696 584 741">2dark dots adjacent</td> <td data-bbox="584 696 783 741"></td> <td data-bbox="783 696 903 741">0</td> <td data-bbox="903 696 1035 741">0</td> <td data-bbox="1035 696 1158 741">0</td> </tr> <tr> <td data-bbox="464 741 584 819">Total bright and dark dots</td> <td data-bbox="584 741 783 819"></td> <td data-bbox="783 741 903 819">5</td> <td data-bbox="903 741 1035 819">6</td> <td data-bbox="1035 741 1158 819">7</td> </tr> </tbody> </table> <p data-bbox="464 819 1238 943">Note: Minimum distance between defective dots is more than 5mm; Pixel dots' function is normal, but bright dots caused by foreign material and other reasons are judged by the dot defect of 5.2.</p>					Zone		Acceptable Qty			C	A+B					3.5"~7"	7~10.1"	>10.1"	Acceptable	Bright pixel dot		1	2	3	Dark pixel dot		4	4	4	2bright dots adjacent		0	0	0	2dark dots adjacent		0	0	0	Total bright and dark dots		5	6	7	Minor
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2	<p data-bbox="256 1070 424 1104">Dot defect</p>  <p data-bbox="264 1294 424 1328">$\Phi = (x+y) / 2$</p>	<table border="1"> <thead> <tr> <th colspan="2" data-bbox="464 954 695 1066" rowspan="2">Zone</th> <th colspan="3" data-bbox="695 954 1238 987">Acceptable Qty</th> <th data-bbox="1158 954 1238 987" rowspan="2">C</th> </tr> <tr> <th colspan="3" data-bbox="695 987 1158 1032">A+B</th> </tr> <tr> <th colspan="2" data-bbox="464 1032 695 1077">Size(mm)</th> <th data-bbox="695 1032 847 1077">3.5"~7"</th> <th data-bbox="847 1032 999 1077">7~10.1"</th> <th data-bbox="999 1032 1158 1077">>10.1"</th> <th data-bbox="1158 1032 1238 1077" rowspan="4">Acceptable</th> </tr> </thead> <tbody> <tr> <td data-bbox="464 1077 584 1122">$\Phi \leq 0.2$</td> <td data-bbox="584 1077 695 1122"></td> <td data-bbox="695 1077 847 1122">Acceptable</td> <td data-bbox="847 1077 999 1122">Acceptable</td> <td data-bbox="999 1077 1158 1122">Acceptable</td> </tr> <tr> <td data-bbox="464 1122 584 1200">$0.2 < \Phi \leq 0.5$</td> <td data-bbox="584 1122 695 1200"></td> <td data-bbox="695 1122 847 1200">4</td> <td data-bbox="847 1122 999 1200">5</td> <td data-bbox="999 1122 1158 1200">6</td> </tr> <tr> <td data-bbox="464 1200 584 1267">$\Phi > 0.5$</td> <td data-bbox="584 1200 695 1267"></td> <td data-bbox="695 1200 847 1267">0</td> <td data-bbox="847 1200 999 1267">0</td> <td data-bbox="999 1200 1158 1267">0</td> </tr> </tbody> </table> <p data-bbox="464 1267 1238 1429">Note: 1. Minimum distance between defective dots is more than 5 mm; 2. The quantity of defect is zero in operating condition.</p>					Zone		Acceptable Qty			C	A+B			Size(mm)		3.5"~7"	7~10.1"	>10.1"	Acceptable	$\Phi \leq 0.2$		Acceptable	Acceptable	Acceptable	$0.2 < \Phi \leq 0.5$		4	5	6	$\Phi > 0.5$		0	0	0	Minor										
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$L > 5.0$	$W > 0.1$	0	0	0																																											

4	Polarizer defect	<p>5.4.1 Polarizer Position</p> <p>(i) Shifting in position should not exceed the glass outline dimension.</p> <p>(ii) Incomplete covering of the viewing area due to shifting is not allowed.</p> <p>5.4.2 Dirt on polarizer</p> <p>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" rowspan="2">Zone</th> <th colspan="3">Acceptable Qty</th> <th rowspan="2">C</th> </tr> <tr> <th colspan="3">A+B</th> </tr> <tr> <th rowspan="2">Size(mm)</th> <th rowspan="2"></th> <th>3.5"~7"</th> <th>7~10.1"</th> <th>>10.1"</th> <th rowspan="2">Acceptable</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.2$</td> <td></td> <td>Acceptable</td> <td>Acceptable</td> <td>Acceptable</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.5$</td> <td></td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td>$\Phi > 0.5$</td> <td></td> <td>0</td> <td>0</td> <td>0</td> </tr> </tbody> </table> <p>5.4.4 Polarizer scratch</p> <p>(i) If the polarizer scratch can be seen after cover assembling or in the operating condition, judge by the linear defect of 5.3.</p> <p>(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" rowspan="2">Zone</th> <th colspan="3">Acceptable Qty</th> <th rowspan="2">C</th> </tr> <tr> <th colspan="3">A+B</th> </tr> <tr> <th rowspan="2">Length</th> <th rowspan="2">Width</th> <th>3.5"~7"</th> <th>7~10.1"</th> <th>>10.1"</th> <th rowspan="2">Acceptable</th> </tr> </thead> <tbody> <tr> <td>Ignore</td> <td>$W \leq 0.05$</td> <td>Acceptable</td> <td>Acceptable</td> <td>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> <td>6</td> </tr> <tr> <td>$L > 5.0$</td> <td>$W > 0.2$</td> <td>0</td> <td>0</td> <td>0</td> </tr> </tbody> </table>	Zone		Acceptable Qty			C	A+B			Size(mm)		3.5"~7"	7~10.1"	>10.1"	Acceptable	$\Phi \leq 0.2$		Acceptable	Acceptable	Acceptable	$0.2 < \Phi \leq 0.5$		4	5	6	$\Phi > 0.5$		0	0	0	Zone		Acceptable Qty			C	A+B			Length	Width	3.5"~7"	7~10.1"	>10.1"	Acceptable	Ignore	$W \leq 0.05$	Acceptable	Acceptable	Acceptable	$1.0 < L \leq 5.0$	$0.05 < W \leq 0.20$	4	5	6	$L > 5.0$	$W > 0.2$	0	0	0	Minor
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5	MURA	Using 3% ND filter, it's NG if it can be seen in R,G,B picture.	Minor																																																												
	White/Black dot (MURA)	Visible under: ND3%; $D \leq 0.15\text{mm}$, Acceptable; $0.15\text{mm} < D \leq 0.5\text{mm}$, $N \leq 4$; $D > 0.5\text{mm}$, Not allowable.																																																													

6	Glass defect	<p>(i) Crack Cracks are not allowed.</p> 	Minor								
		<p>(ii) TFT chips on corner</p>  <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <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" style="width: 100%; border-collapse: collapse; text-align: center;"> <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	$N \leq 4$								

11.6 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	Major
		No soldering bridge	Major
		No cold soldering	Minor
4	Resist flaw on PCB	Visible copper foil ($\Phi 0.5$ 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 $\Phi 0.2$ mm)	Minor
9	Stain	No stain to spoil cosmetic badly	Minor
10	Plate discoloring	No plate fading, rusting and discoloring	Minor
11	1. Lead parts	a. Soldering side of PCB Solder to form a 'Filet' all around the lead. Solder should not hide the lead form perfectly.	Minor
		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
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.	Minor	
	b. The quantity of solder balls or solder splashes isn't beyond 5 in 600 mm ² .	Minor	
	c. Solder balls/Solder splashes do not violate minimum electrical clearance.	Major	