

**PRODUCT :** TFT TOUCH MODULE**MODULE NO. :** WKS43WQV001-WCT**SUPPLIER:** WKS Technology Co.,LTD**DATE:** Sep 11, 2016

# SPECIFICATION

Revision: 0.0

**WKS43WQV001-WCT**

This module uses ROHS material

This specification may change without prior notice in order to improve performance or quality. Please contact WKS R&D department for updated specification and product status before design for this product or release of this order.

<b>WRITTEN BY</b>	<b>CHECKED BY</b>	<b>APPROVED BY</b>
Jason	Liwen	Henry

### REVISION RECORD

REV NO.	REV DATE	CONTENTS	REMARKS
0.0	2016-09-11	First release	Preliminary

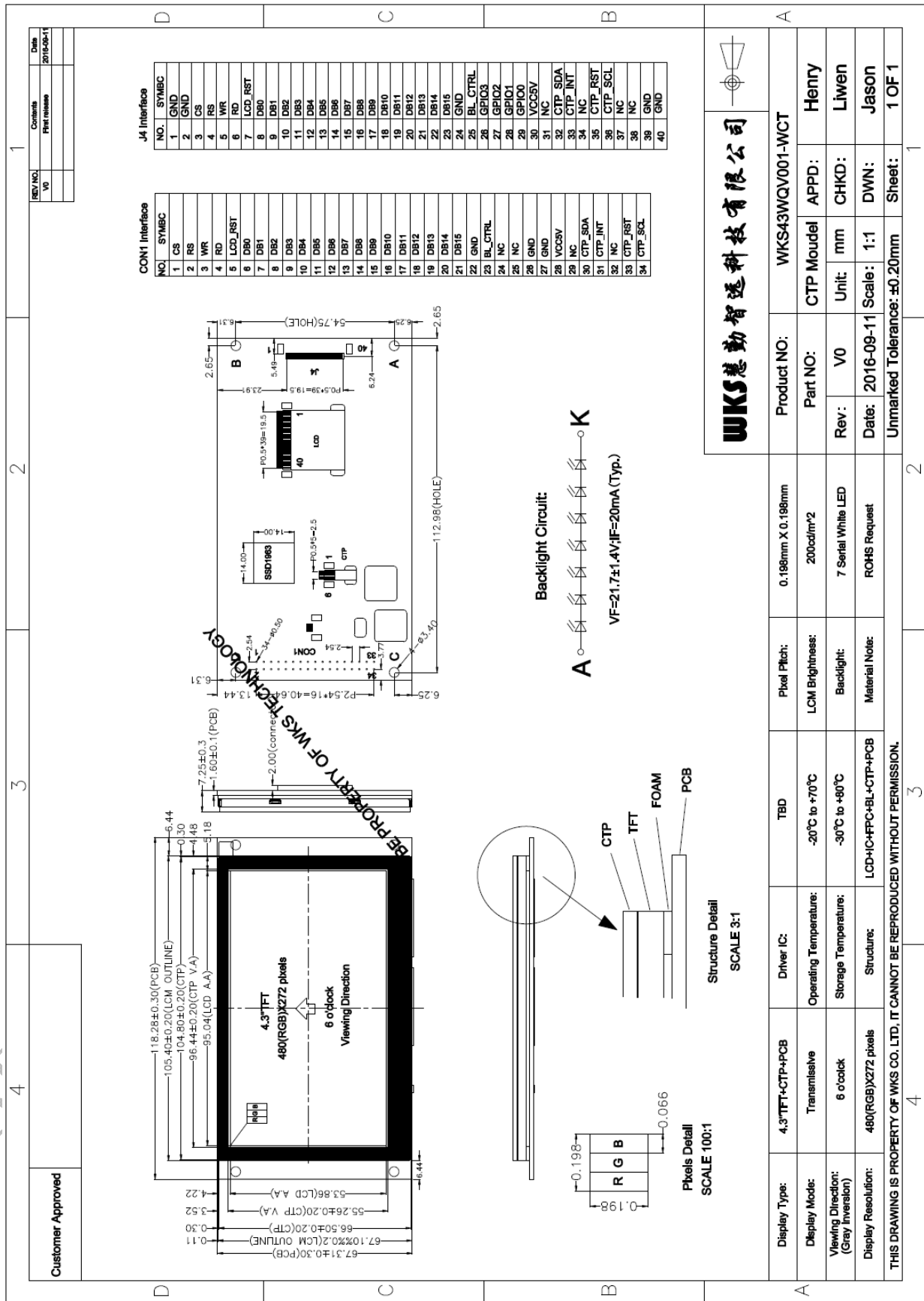
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## 1、GENERAL INFORMATION

Item of general information	Contents		Unit
LCD Display Size(Diagonal)	4.3		inch
Module Structure	LCD Display + CTP Touch + PCB		-
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)	118.28×67.31×7.25		mm
Active area (W×H)	95.04×53.86		mm
Number of pixels(Resolution)	480RGB×272		pixel
Pixel pitch (W×H)	0.198×0.198		mm
Color Pixel Arrangement	RGB Stripe		-
LCD Driver IC	-		-
Module Interface Type	LCD	16-bit 8080 interface	-
	CTP	I2C interface	-
Module Input voltage	5.0V		V
Module Power Consumption	-		mW
Color Numbers	65K		-
Backlight Type	White LED		-

## 2、EXTERNAL DIMENSIONS



WKS 慧勤智远科技有限公司

Product NO:	WKS43WQV001-WCT
Part NO:	CTP Moudel
APPD:	Henry
Rev:	V0
Unit:	mm
CHKD:	Liwen
Date:	2016-09-11
Scale:	1:1
DWN:	Jason
Unmarked Tolerance:	±0.20mm
Sheet:	1 OF 1

### 3、ABSOLUTE MAXIMUM RATINGS

Parameter of absolute maximum ratings	Symbol	Min	Max	Unit
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)

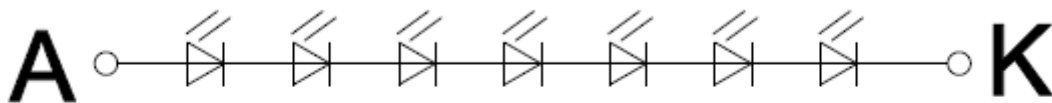
Parameter of DC characteristics	Symbol	Min.	Typ.	Max.	Unit
PCB operating voltage	VCC5V	-	5.0	-	V
LCD I/O operating voltage	VDD	2.7	3.3	3.6	V
Input voltage 'H' level	VIH	0.7*VDD	-	VDD	V
Input voltage 'L' level	VIL	VSS	-	0.3*VDD	V
Output voltage 'H' level	VOH	VDD-0.4	-	VDD	V
Output voltage 'L' level	VOL	VSS	-	VSS+0.4	V

## 5、BACKLIGHT CHARACTERISTICS

Item of backlight characteristics	Symbol	Min.	Typ.	Max.	Unit	Condition
Forward Voltage	Vf	20.3	21.7	23.1	V	Note1
Forward Current	If	-	20	-	mA	-
Number of LED	-	-	7	-	Piece	-
LED Connection mode	P/S	-	Serial	-	-	-
Lifetime of LED	-	-	10000	-	hour	Note2

Note:

- Note1: The LED Supply Voltage is defined by the number of LED at Ta=25°C and If=20mA.
- Note2: The LED lifetime define as the estimated time to 50% degradation of initial luminous. The LED lifetime could be decreased if operating If is lager than 20mA.
- Backlight control via the BL\_CTR pin or PWM signal.
- Backlight circuit:



$$VF=21.7\pm 1.4V; IF=20mA (Typ.)$$

## 6、CTP CHARACTERISTICS

Item of CTP characteristics	Specification	Unit	Remark
Panel Type	Glass Cover + Glass Sensor	-	-
Resolution	480 × 272	pixel	-
Surface Hardness	6H	-	-
Transparency	≥82%	-	-
Driver IC	-	-	-
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	$\theta=0$ $\phi=0$ Ta=25°C	-	10	20	ms	FIG 1.	4
Contrast Ratio		CR		-	400	-	-	FIG 2.	1
Luminance uniformity		$\delta$ WHITE		-	80	-	%	FIG 2.	3
Surface Luminance		Lv		-	200	-	cd/m <sup>2</sup>	FIG 2.	2
CIE (x, y) chromaticity	White	White x	$\theta=0$ $\phi=0$ Ta=25°C	-	0.307	-	-	FIG 2.	5
		White y		-	0.348	-			
	Red	Red x		-	0.631	-			
		Red y		-	0.342	-			
	Green	Green x		-	0.321	-			
		Green y		-	0.553	-			
	Blue	Blue x		-	0.149	-			
		Blue y		-	0.183	-			
Viewing angle range	$\phi=90$ (12 o'clock)		CR $\geq$ 10	-	60	-	deg	FIG 3.	6
	$\phi=270$ (6 o'clock)			-	70	-	deg		
	$\phi=0$ (3 o'clock)			-	75	-	deg		
	$\phi=180$ (9 o'clock)			-	75	-	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,P 3,P4, P5,P6,P7,P8,P9)

**Note 3.** The uniformity in surface luminance ( $\delta$ WHITE) 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, Tr) and from black to white(Decay Time, Tf). For additional information see FIG 1.

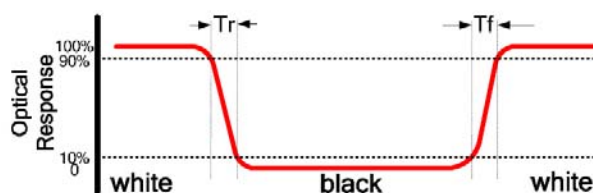
**Note 5.** CIE (x, y) chromaticity ,The x,y value is determined by screen active area position 5. For more information see FIG 2.

**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 base on Autronic-Melchers's ConoScope. Series Instruments. For contrast ratio, Surface Luminance, Luminance uniformity and CIE, the testing data is base 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**

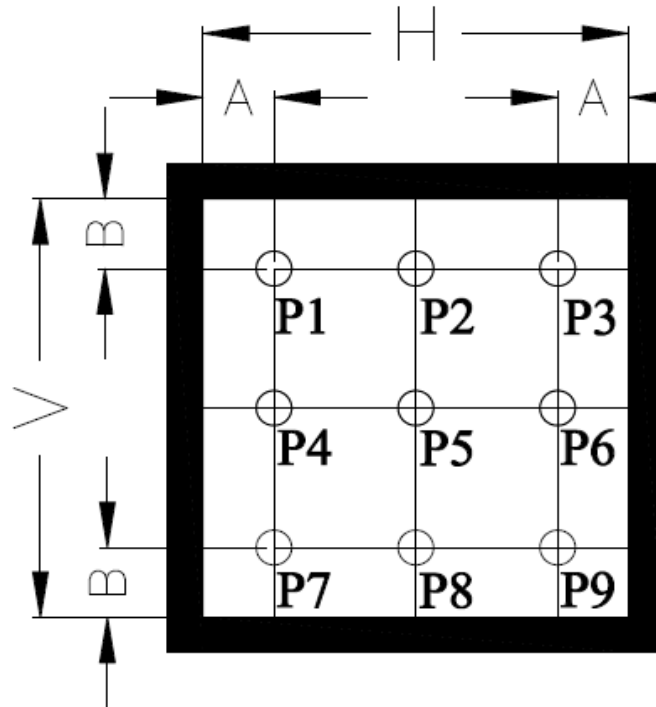
**uniformity, CIE (x , y) chromaticity**

A :  $H/6$  ;

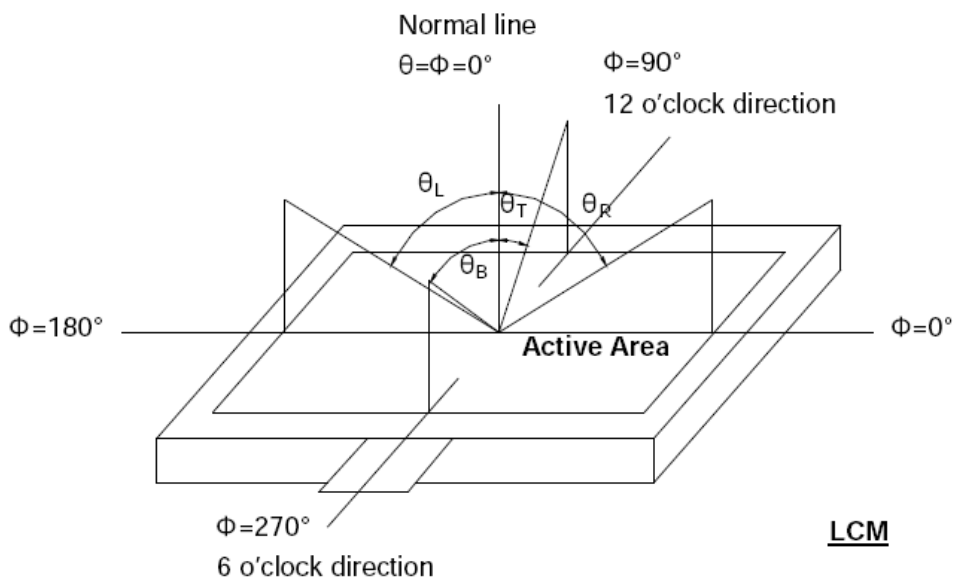
B :  $V/6$  ;

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、CON1 Interface Description(34 pin 2.54mm pitch header)

NO.	Symbol	I/O	DESCRIPTION
1	CS	I	Chip select
2	RS	I	Data/Command select
3	WR	I	Write strobe signal
4	RD	I	Read strobe signal
5	RESET	I	LCD RESET signal, Low is active
6~21	D0~D15	I/O	Data bus(D0:LSB; D15:MSB)
22	GND	Power supply	Power ground
23	BL_CTRL	I	Backlight control pin
24~25	NC	-	No connection
26~27	GND	Power supply	Power ground
28	VCC5V	Power supply	Module Power input(5V Typ.)
29	NC	-	No connection
30	CTP_SDA	I/O	CTP I2C data input and output
31	CTP_INT	O	CTP External interrupt to the host
32	NC	-	No connection
33	CTP_RST	I	CTP external reset signal, Low is active
34	CTP_SCL	I	CTP I2C clock input

**B、 J4 Interface Description(40 pin 0.5mm pitch connector)**

NO.	Symbol	I/O	DESCRIPTION
1~2	GND	Power supply	Power ground
3	CS	I	Chip select
4	RS	I	Data/Command select
5	WR	I	Write strobe signal
6	RD	I	Read strobe signal
7	RESET	I	LCD RESET signal, Low is active
8~23	D0~D15	I/O	Data bus(D0:LSB; D15:MSB)
24	GND	Power supply	Power ground
25	BL_CTRL	I	Backlight control pin
26~29	NC	-	No connection
30	VCC5V	Power supply	Module Power input(5V Typ.)
31	NC	-	No connection
32	CTP_SDA	I/O	CTP I2C data input and output
33	CTP_INT	I	CTP External interrupt to the host
34	NC	-	No connection
35	CTP_RST	I	CTP external reset signal, Low is active
36	CTP_SCL	I	CTP I2C clock input
37	NC	-	No connection
38	NC	-	No connection
39~40	GND	Power supply	Power ground

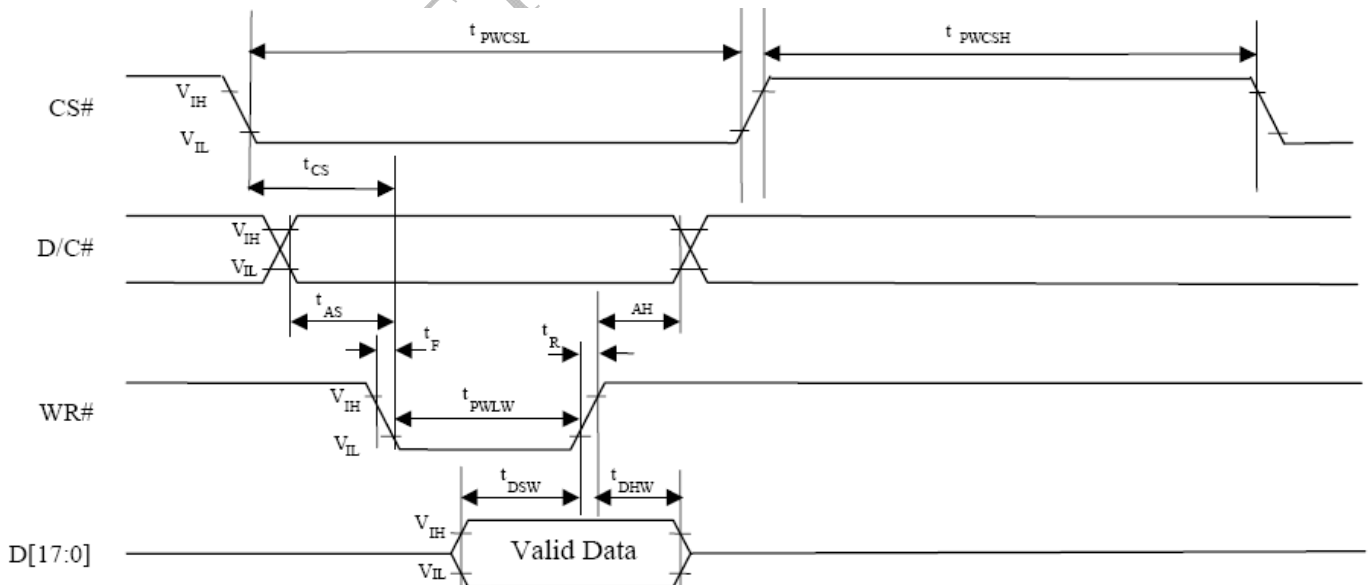
## 9、INPUT TIMING

### Parallel 8080 Interface Timing Characteristics

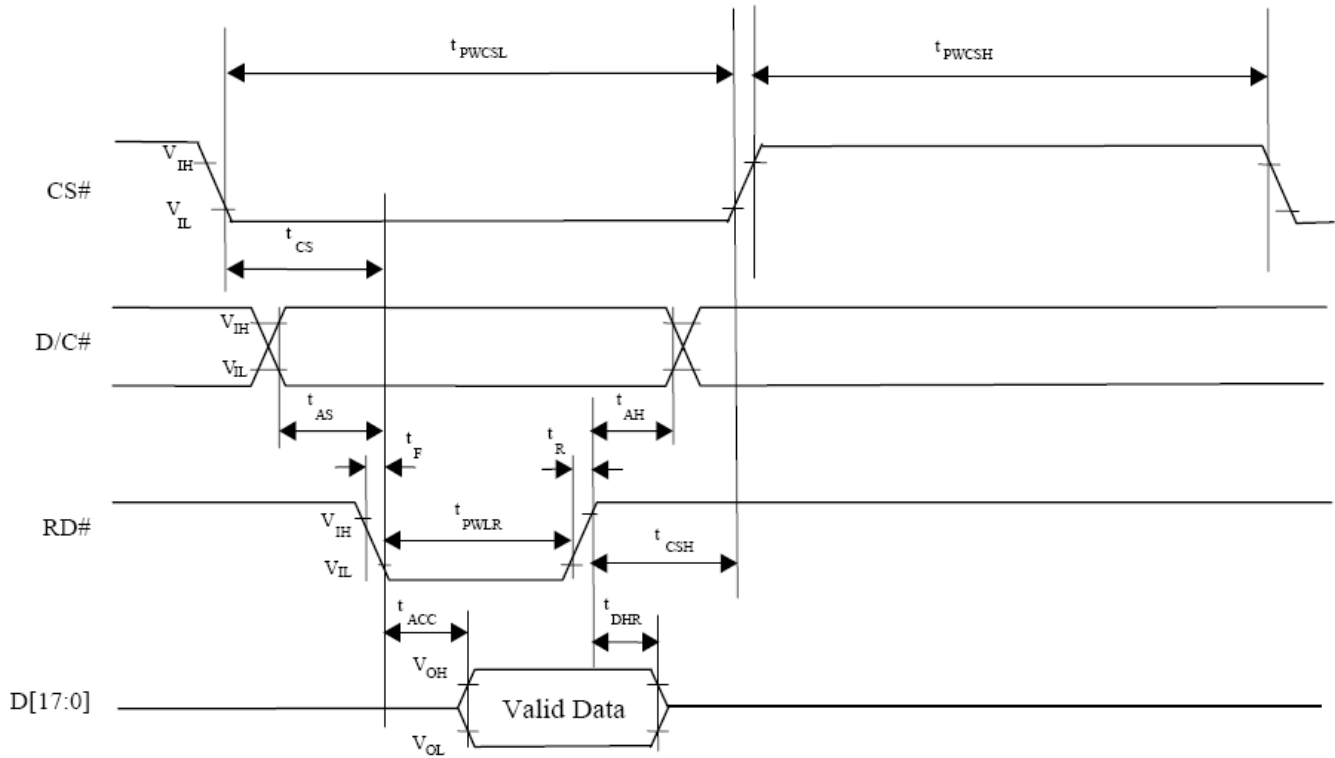
Symbol	Parameter	Min	Typ	Max	Unit
$f_{MCLK}$	System Clock Frequency*	1	-	110	MHz
$t_{MCLK}$	System Clock Period*	$1/f_{MCLK}$	-	-	ns
$t_{PWCSL}$	Control Pulse High Width Write Read	13 30	$1.5 * t_{MCLK}$ $3.5 * t_{MCLK}$	-	ns
$t_{PWCSH}$	Control Pulse Low Width Write (next write cycle) Write (next read cycle) Read	13 80 80	$1.5 * t_{MCLK}$ $9 * t_{MCLK}$ $9 * t_{MCLK}$	-	ns
$t_{AS}$	Address Setup Time	1	-	-	ns
$t_{AH}$	Address Hold Time	2	-	-	ns
$t_{DSW}$	Write Data Setup Time	4	-	-	ns
$t_{DHW}$	Write Data Hold Time	1	-	-	ns
$t_{PWLW}$	Write Low Time	12	-	-	ns
$t_{DHR}$	Read Data Hold Time	1	-	-	ns
$t_{ACC}$	Access Time	32	-	-	ns
$t_{PWLR}$	Read Low Time	36	-	-	ns
$t_R$	Rise Time	-	-	0.5	ns
$t_F$	Fall Time	-	-	0.5	ns
$t_{CS}$	Chip select setup time	2	-	-	ns
$t_{CSH}$	Chip select hold time to read signal	3	-	-	ns

\* System Clock denotes external input clock (PLL-bypass) or internal generated clock (PLL-enabled)

### Parallel 8080 Interface Timing Diagram(Write Cycle)



**Parallel 8080 Interface Timing Diagram(Read Cycle)**



**LCD Parallel RGB input Timing table**

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency@ Frame rate=60Hz	DCLK	5	9	12	MHz
Horizontal display area	thd	480			DCLK
Horizontal period time	th	520	525	800	DCLK
HSYNC Back Porch	thbp	36	40	255	DCLK
HSYNC Front Porch	thfp	4	5	65	DCLK
Vertical display area	tvd	272			H
VSYNC period time	tv	277	288	396	H
VSYNC Back Porch	tvbp	3	8	31	H
VSYNC Front Porch	tvfp	2	8	93	H

## 10、RELIABILITY TEST CONDITIONS

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

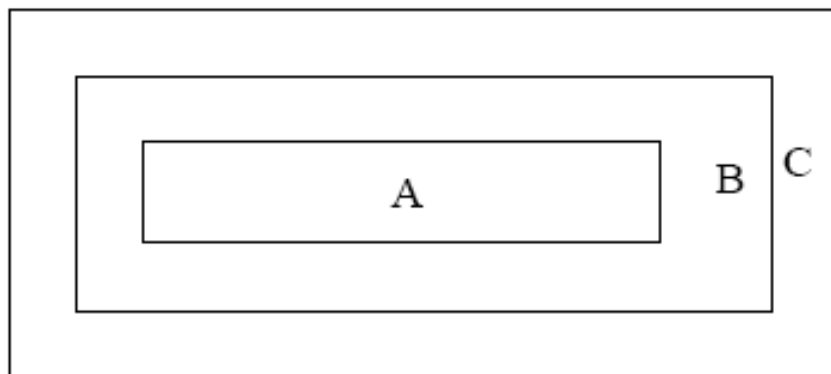
Minor defect: AQL 1.5

### 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.

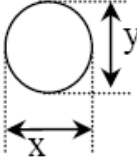
### B、 Definition of some visual defect

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.

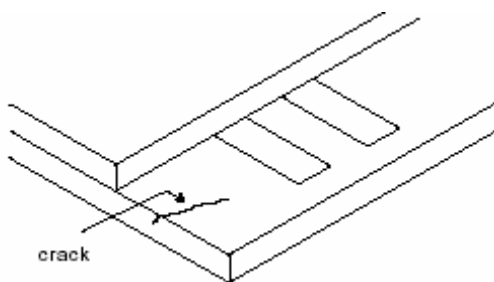
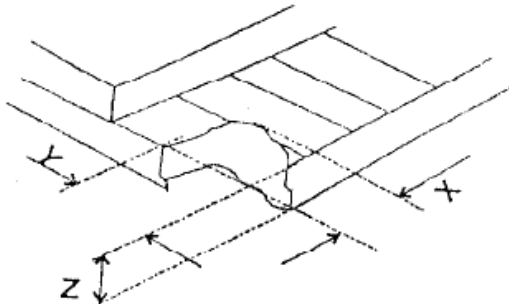
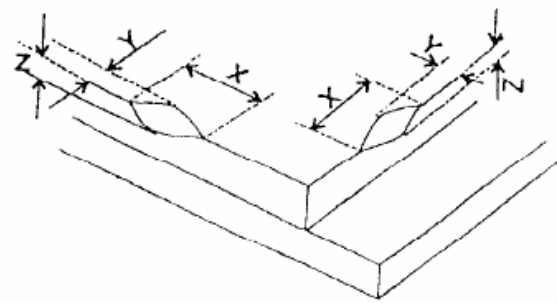
### 11.4 Major Defect

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="3">Zone</th> <th colspan="3" data-bbox="783 439 1238 472">Acceptable Qty</th> <th data-bbox="1158 472 1238 562" rowspan="3">C</th> </tr> <tr> <th colspan="3" data-bbox="783 472 1158 517">A+B</th> </tr> <tr> <th data-bbox="783 517 903 562">3.5"~7"</th> <th data-bbox="903 517 1023 562">7~10.1"</th> <th data-bbox="1023 517 1158 562">&gt;10.1"</th> </tr> </thead> <tbody> <tr> <td data-bbox="464 562 783 607">Bright pixel dot</td> <td data-bbox="783 562 903 607">1</td> <td data-bbox="903 562 1023 607">2</td> <td data-bbox="1023 562 1158 607">3</td> <td data-bbox="1158 562 1238 819" rowspan="6">Acceptable</td> </tr> <tr> <td data-bbox="464 607 783 651">Dark pixel dot</td> <td data-bbox="783 607 903 651">4</td> <td data-bbox="903 607 1023 651">4</td> <td data-bbox="1023 607 1158 651">4</td> </tr> <tr> <td data-bbox="464 651 783 696">2bright dots adjacent</td> <td data-bbox="783 651 903 696">0</td> <td data-bbox="903 651 1023 696">0</td> <td data-bbox="1023 651 1158 696">0</td> </tr> <tr> <td data-bbox="464 696 783 741">2dark dots adjacent</td> <td data-bbox="783 696 903 741">0</td> <td data-bbox="903 696 1023 741">0</td> <td data-bbox="1023 696 1158 741">0</td> </tr> <tr> <td data-bbox="464 741 783 819">Total bright and dark dots</td> <td data-bbox="783 741 903 819">5</td> <td data-bbox="903 741 1023 819">6</td> <td data-bbox="1023 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"	Bright pixel dot	1	2	3	Acceptable	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
Zone		Acceptable Qty			C																																			
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2	<p data-bbox="256 1070 424 1104">Dot defect</p>  <p data-bbox="264 1294 424 1328"><math>\Phi = (x+y) / 2</math></p>	<table border="1"> <thead> <tr> <th colspan="2" data-bbox="464 954 695 1066" rowspan="3">Zone</th> <th colspan="3" data-bbox="695 954 1238 987">Acceptable Qty</th> <th data-bbox="1158 987 1238 1066" rowspan="3">C</th> </tr> <tr> <th colspan="3" data-bbox="695 987 1158 1032">A+B</th> </tr> <tr> <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">&gt;10.1"</th> </tr> </thead> <tbody> <tr> <td data-bbox="464 1077 695 1144">Size(mm)</td> <td data-bbox="695 1077 847 1144"><math>\Phi \leq 0.2</math></td> <td data-bbox="847 1077 999 1144">Acceptable</td> <td data-bbox="999 1077 1158 1144">Acceptable</td> <td data-bbox="1158 1077 1238 1267" rowspan="3">Acceptable</td> </tr> <tr> <td></td> <td data-bbox="464 1144 695 1200"><math>0.2 &lt; \Phi \leq 0.5</math></td> <td data-bbox="695 1144 847 1200">4</td> <td data-bbox="847 1144 999 1200">5</td> <td data-bbox="999 1144 1158 1200">6</td> </tr> <tr> <td></td> <td data-bbox="464 1200 695 1267"><math>\Phi &gt; 0.5</math></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			3.5"~7"	7~10.1"	>10.1"	Size(mm)	$\Phi \leq 0.2$	Acceptable	Acceptable	Acceptable		$0.2 < \Phi \leq 0.5$	4	5	6		$\Phi > 0.5$	0	0	0	Minor						
Zone		Acceptable Qty			C																																			
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	$0.2 < \Phi \leq 0.5$	4	5		6																																			
	$\Phi > 0.5$	0	0		0																																			
3	Linear defect	<table border="1"> <thead> <tr> <th colspan="2" data-bbox="464 1451 695 1585" rowspan="3">Zone</th> <th colspan="3" data-bbox="695 1451 1238 1507">Acceptable Qty</th> <th data-bbox="1158 1507 1238 1585" rowspan="3">C</th> </tr> <tr> <th colspan="3" data-bbox="695 1507 1158 1585">A+B</th> </tr> <tr> <th data-bbox="695 1585 847 1641">3.5"~7"</th> <th data-bbox="847 1585 999 1641">7~10.1"</th> <th data-bbox="999 1585 1158 1641">&gt;10.1"</th> </tr> </thead> <tbody> <tr> <td data-bbox="464 1641 576 1686">Length</td> <td data-bbox="576 1641 695 1686">Width</td> <td data-bbox="695 1641 847 1686">3.5"~7"</td> <td data-bbox="847 1641 999 1686">7~10.1"</td> <td data-bbox="999 1641 1158 1686">&gt;10.1"</td> <td data-bbox="1158 1641 1238 1877" rowspan="4">Acceptable</td> </tr> <tr> <td data-bbox="464 1686 576 1731">Ignore</td> <td data-bbox="576 1686 695 1731"><math>W \leq 0.05</math></td> <td data-bbox="695 1686 847 1731">Acceptable</td> <td data-bbox="847 1686 999 1731">Acceptable</td> <td data-bbox="999 1686 1158 1731">Acceptable</td> </tr> <tr> <td data-bbox="464 1731 576 1809"><math>L \leq 5.0</math></td> <td data-bbox="576 1731 695 1809"><math>0.05 &lt; W \leq 0.1</math></td> <td data-bbox="695 1731 847 1809">4</td> <td data-bbox="847 1731 999 1809">5</td> <td data-bbox="999 1731 1158 1809">6</td> </tr> <tr> <td data-bbox="464 1809 576 1877"><math>L &gt; 5.0</math></td> <td data-bbox="576 1809 695 1877"><math>W &gt; 0.1</math></td> <td data-bbox="695 1809 847 1877">0</td> <td data-bbox="847 1809 999 1877">0</td> <td data-bbox="999 1809 1158 1877">0</td> </tr> </tbody> </table>					Zone		Acceptable Qty			C	A+B			3.5"~7"	7~10.1"	>10.1"	Length	Width	3.5"~7"	7~10.1"	>10.1"	Acceptable	Ignore	$W \leq 0.05$	Acceptable	Acceptable	Acceptable	$L \leq 5.0$	$0.05 < W \leq 0.1$	4	5	6	$L > 5.0$	$W > 0.1$	0	0	0	Minor
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<p>4</p>	<p>Polarizer defect</p>	<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 &amp; Air bubble</p> <table border="1" data-bbox="464 517 1235 837"> <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 colspan="2">Size(mm)</th> <th>3.5"~7"</th> <th>7~10.1"</th> <th>&gt;10.1"</th> <th rowspan="4">Acceptable</th> </tr> </thead> <tbody> <tr> <td colspan="2"><math>\Phi \leq 0.2</math></td> <td>Acceptable</td> <td>Acceptable</td> <td>Acceptable</td> </tr> <tr> <td colspan="2"><math>0.2 &lt; \Phi \leq 0.5</math></td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td colspan="2"><math>\Phi &gt; 0.5</math></td> <td>0</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" data-bbox="464 1043 1235 1444"> <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>Length</th> <th>Width</th> <th>3.5"~7"</th> <th>7~10.1"</th> <th>&gt;10.1"</th> <th rowspan="4">Acceptable</th> </tr> </thead> <tbody> <tr> <td>Ignore</td> <td><math>W \leq 0.05</math></td> <td>Acceptable</td> <td>Acceptable</td> <td>Acceptable</td> </tr> <tr> <td><math>1.0 &lt; L \leq 5.0</math></td> <td><math>0.05 &lt; W \leq 0.20</math></td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td><math>L &gt; 5.0</math></td> <td><math>W &gt; 0.2</math></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	<p>Minor</p>
Zone		Acceptable Qty			C																																																										
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<p>5</p>	<p>MURA</p> <p>White/Black dot (MURA)</p>	<p>Using 3% ND filter, it's NG if it can be seen in R,G,B picture.</p> <p>Visible under: ND3%; <math>D \leq 0.15\text{mm}</math>, Acceptable;  <math>0.15\text{mm} &lt; D \leq 0.5\text{mm}</math>, <math>N \leq 4</math>; <math>D &gt; 0.5\text{mm}</math>, Not allowable.</p>	<p>Minor</p>																																																												

6	Glass defect	<p>(i) Crack Cracks are not allowed.</p> 	Minor								
		<p>(ii) TFT chips on corner</p>  <table border="1" data-bbox="462 929 1236 1064"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> <th>Acceptable</th> </tr> </thead> <tbody> <tr> <td><math>\leq 3.0</math></td> <td><math>\leq 3.0</math></td> <td>Not more than the thickness of glass</td> <td><math>N \leq 3</math></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	$\leq 3.0$	$\leq 3.0$	Not more than the thickness of glass	$N \leq 3$	Minor
		X	Y	Z	Acceptable						
$\leq 3.0$	$\leq 3.0$	Not more than the thickness of glass	$N \leq 3$								
<p>(iii) Usual surface crack</p>  <table border="1" data-bbox="462 1512 1236 1646"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> <th>Acceptable</th> </tr> </thead> <tbody> <tr> <td><math>\leq 1.5</math></td> <td><math>\leq 1.5</math></td> <td>Not more than the thickness of glass</td> <td><math>N \leq 4</math></td> </tr> </tbody> </table> <p>It is only applicable to the upper glass of LCD.</p>	X	Y	Z	Acceptable	$\leq 1.5$	$\leq 1.5$	Not more than the thickness of glass	$N \leq 4$	Minor		
X	Y	Z	Acceptable								
$\leq 1.5$	$\leq 1.5$	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 <sup>2</sup> .		Minor	
c. Solder balls/Solder splashes do not violate minimum electrical clearance.		Major	

