

Approval sheet

Customer: _____

Model name: JT270MZQIV04

Spec NO: _____

Date: 2014.11.11

Version: 01

- Preliminary Specification**
- Final Specification**

For Customer's Acceptance

Approved by	Content

Approved by	Reviewed by	Prepared by

Contents

1	Introduction-----	4
2	General specification-----	5
3	Mechanical drawing-----	6
4	Absolute maximum ratings-----	7
5	Electrical characteristics-----	7
6	Optical characteristics -----	8
7	Pin Assignment -----	11
8	Timing characteristics-----	13
9	Block diagram -----	14
10	LCM quality criteria-----	15
11	Packing method-----	23

1. Introduction

1.1 Scope of application

This specification applies to the positive type TFT transmissive dot matrix LCD module that is supplied by Tecenstar. This LCD module should be designed for mobile phone use.

LCD specification: Dots 240xRGBx320.

As to basic specification of the driver IC, refer to the IC(ILI8961) specification and datasheet.

1.2 Structure:

Double display structure:

TFT Module + FPC + BL;

FULL 256-Color 2.7 inch TFT LCD size for main LCD;

One bare chip with gold bump (COG) TECH;

SPI+8 BIT RGB interface;

1.3 TFT features:

Structure: TFT PANNEL+IC+FPC+BL;

Transmissive Type LCD;

240 dot-source and 320 dot-gate outputs;

256-Color can be selected by software;

White LED back light;

SPI+8 BIT RGB interface;

1.4 Applications:

Mobile phone

PSP

PDA

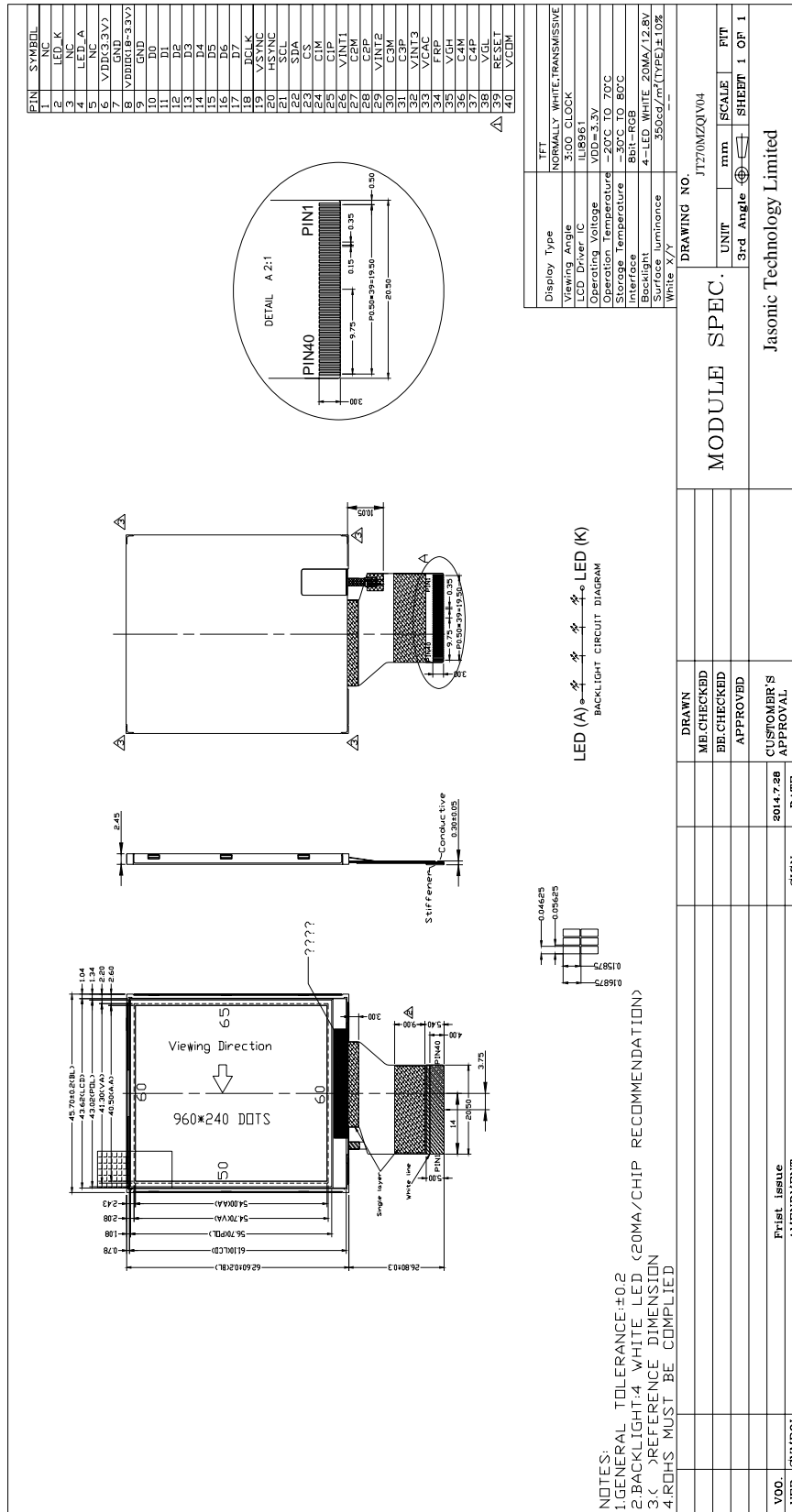
GPS

Etc...

2. General specification

ITEM	Standard value	UNIT
LCD Type	TFT Transmissive	---
Driver element	a-Si TFT Active matrix	
Number of Dots	240*(RGB)*320	Dots
Pixel Arrangement	Delta RGB Stripe	
Active Area	40.50 *54.00	mm
Viewing Direction	3 0' clock	
Driver IC	ILI8961	
Module Size(W*H*T)	45.70x62.60x2.45	mm
Approx. Weight	TBD	g
Back Light	White LED	
System interface	SPI+8 bit RGB interface	

3. Mechanical drawing



4. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Supply voltage for logic	VDD	-0.3	5	V
Input voltage for analog	VDDIO	-0.3	5	V
Supply current (One LED)	I_{LED}		30	mA
Operating temperature	T_{OP}	-20	+70	°C
Storage temperature	T_{ST}	-30	+80	°C

Note: If the absolute maximum rating of even is one of the above parameters is exceeded even momentarily, the quality of the product may be degraded. Absolute maximum ratings, therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the range of the absolute maximum ratings.

5. ELECTRICAL CHARACTERISTICS

Item	Symbol	Min	Typ	Max	Unit	Applicable terminal
Supply voltage	VDD	2.5	2.8	3.3	V	V_{DD}
Input voltage for analog	VDDIO	1.8	2.8	3.3	v	
Input voltage	V_{IL}	-0.3	-	$0.3 V_{CC}$	V	
	V_{IH}	$0.7 V_{CC}$	-	V_{CC}	V	
Input leakage current	I_{LKG}				μA	
LED Forward voltage	V_f	3.0	3.2	3.4	V	With One LED
Input backlight current	I_{LED}	-	20	25	mA	With One LED

BACKLIGHT DRIVING CONDITIONS

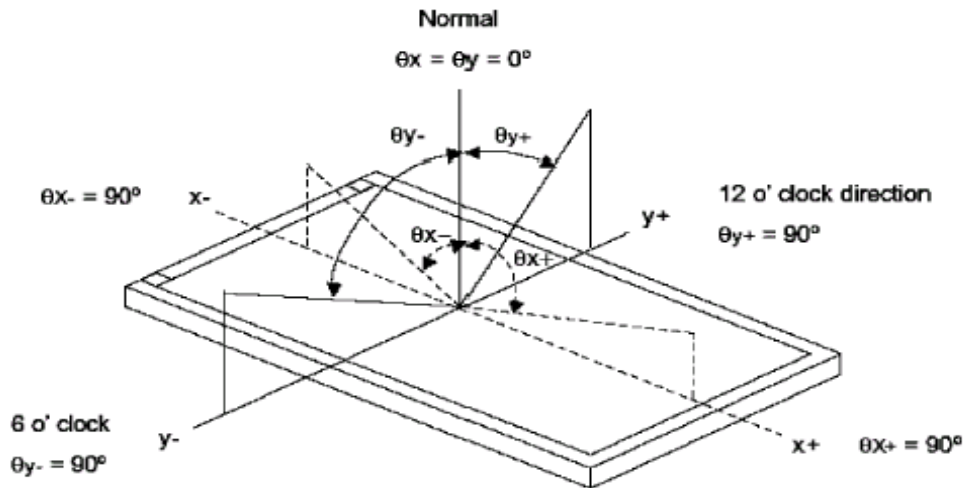
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED backlight	V_L	12	12.8	13.6	V	
Current for LED backlight	I_L	--	20	25	mA	
LED life time	-	20,000	-	-	Hr	Note

Note : The "LED life time" is defined as the module brightness decrease to 50% original brightness at $T_a=25^{\circ}C$ and $I_L=40mA$. The LED lifetime could be decreased if operating I_L is larger than 40 mA.

6. OPTICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITIONS	SPECIFICATIONS			UNIT	NOTE	
			MIN.	TYP.	MAX			
Brightness	B	Viewing normal angle	--	350	--	Cd/m ²	All left side data are based on CPT' s product reference only	
Contrast Ratio	CR		--	400	--	--		
Response Time	Tr+Tf		--	30	70	ms		
CIE Color coordinate	Red		X _R	--	0.633			
			Y _R		0.329			
	Green		X _G	--	0.297			
			Y _G		0.577			
	Blue		X _B	--	0.133			
			Y _B		0.129			
White	X _w		--	-				
	Y _w	-	-					
Viewing Angle	Hor.	⊖ x+	-	20	--	Deg.		
		⊖ x-	-	50	--			
	Ver.	⊖ y+	-	45	--			
		⊖ y-	-	45	--			
Uniformity	Un		80	85		%		

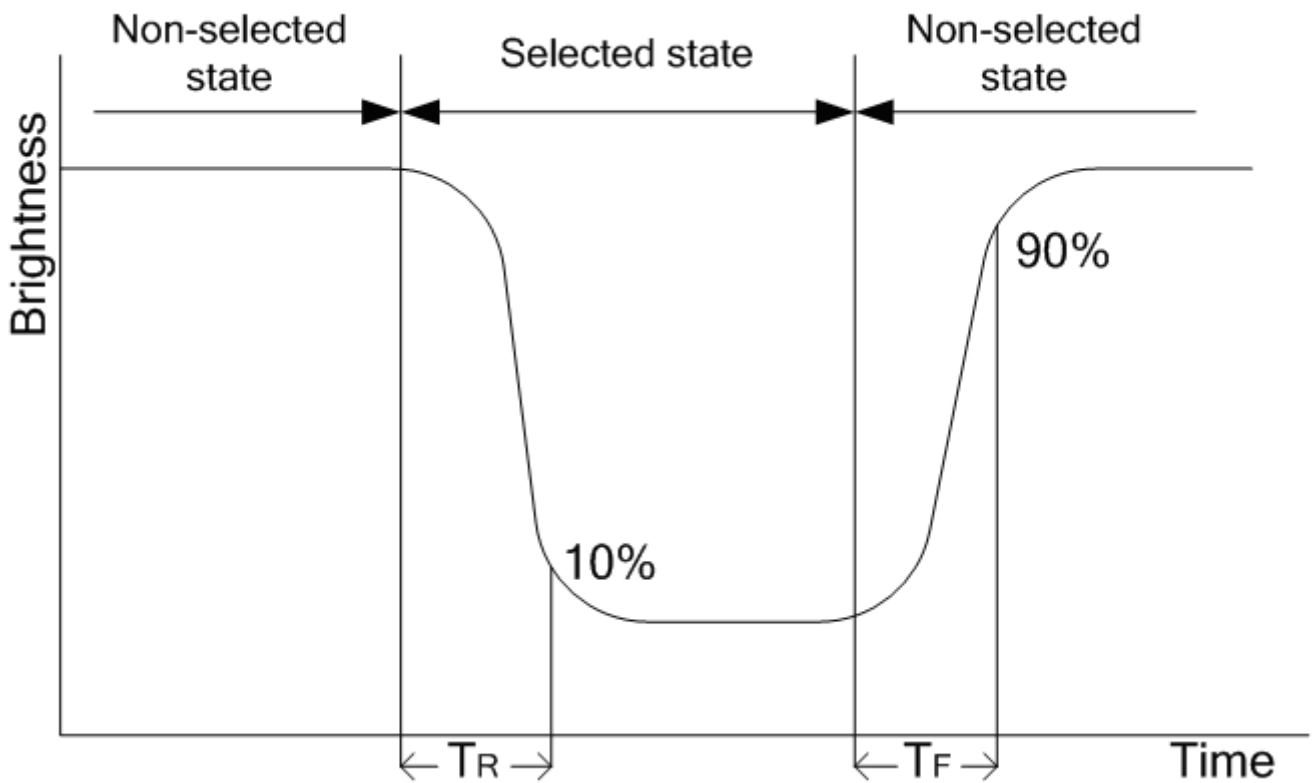
Note 1 : Definition of Viewing Angle θ_x and θ_y :



Note 2: Definition of contrast ratio CR:

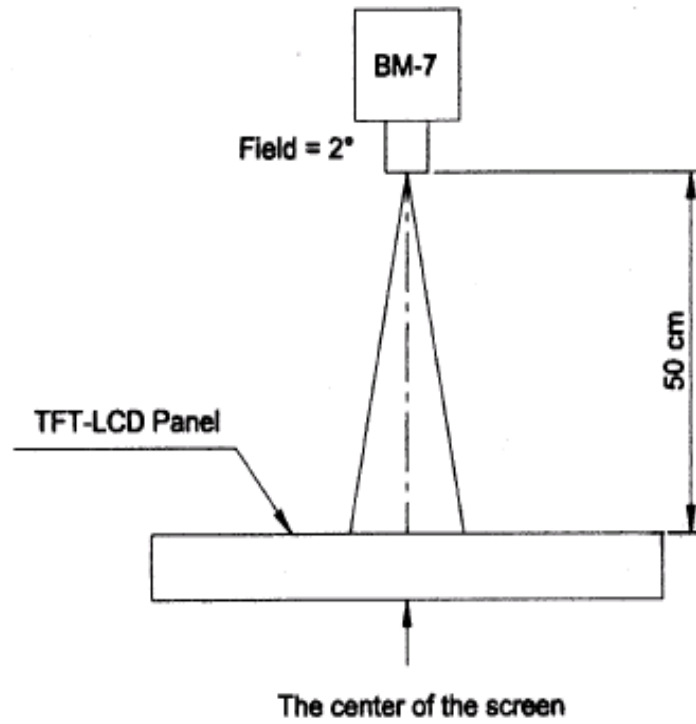
$$CR = \frac{\text{Brightness of non-selected dots (white)}}{\text{Brightness of selected dots (black)}}$$

Note 3: Definition of response time (T_R , T_F)

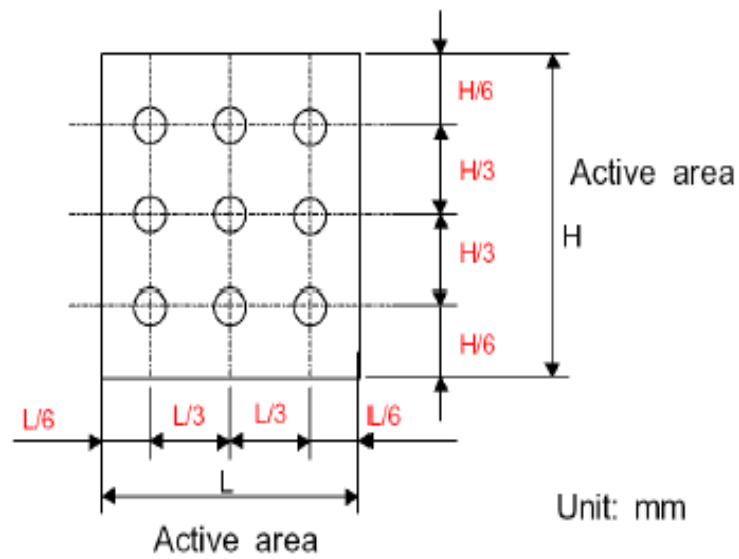


The brightness test equipment setup

20mA Field=2° (As measuring "black" image, field=2° is the best testing condition)



Note 4 :

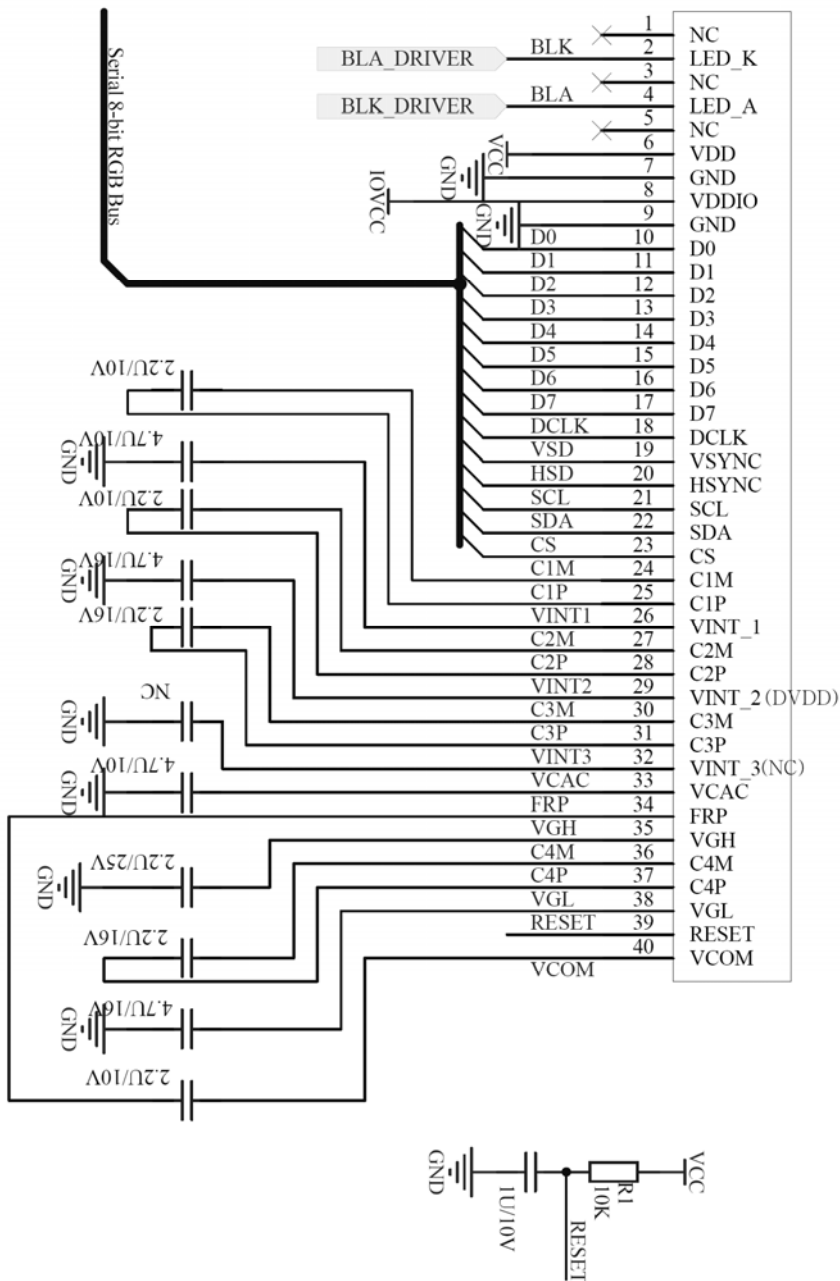


7. MCU Interface Pin Function

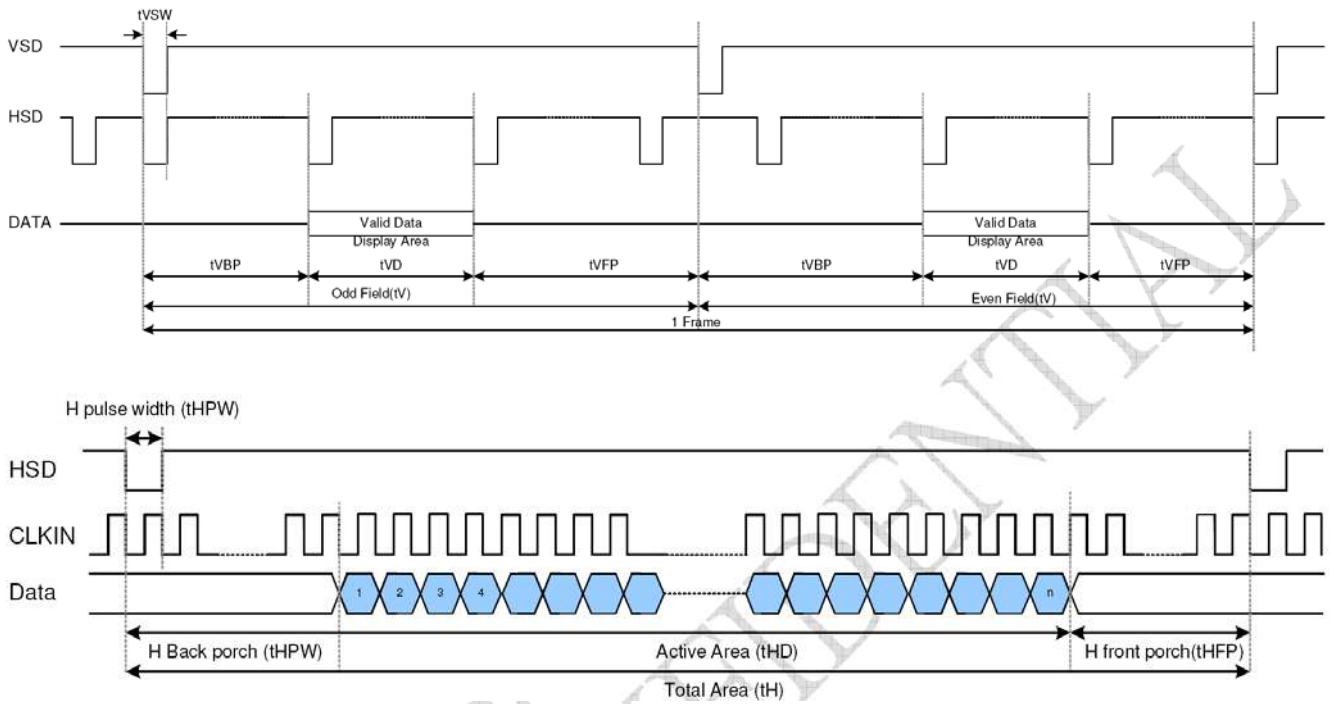
PIN NO.	SYMBOL	DESCRIPTION
1	NC	No connect
2	LED_K	Cathode of backlight
3	NC	No connect
4	LED_A	Anode of backlight
5	NC	Serial clock signal
6	VDD(3.3V)	Power supply
7	GND	Ground
8	VDDIO(1.8-3.3V)	Power supply for digital
9	GND	Ground
10	D0	Ground
11	D1	Data bus
12	D2	Data bus
13	D3	Data bus
14	D4	Data bus
15	D5	Data bus
16	D6	Data bus
17	D7	Data bus
18	DCLK	Pixel clock signal in RGB interface
19	VSYNC	Vertical signal in RGB interface
20	HSYNC	Horizon signal in RGB interface
21	SCL	Serial clock input signal
22	SDA	Serial data input signal
23	CS	Chip select signal
24	C1M	Pins to connect capacitors for power circuit
25	C1P	
26	VINT1	
27	C2M	
28	C2P	
29	VINT2	
30	C3M	
31	C3P	
32	VINT3	
33	VCAC	
34	FRP	Frame polarity output (Capacitor connect to VCOM)
35	VGH	Positive power supply for gate driver(+18v)

36	C4M	Pins to connect capacitors for power circuit
37	C4P	
38	VGL	Negative power supply for gate driver(-16v)
39	RESET	Reset signal
40	VCOM	VCOM pin

Application circuit

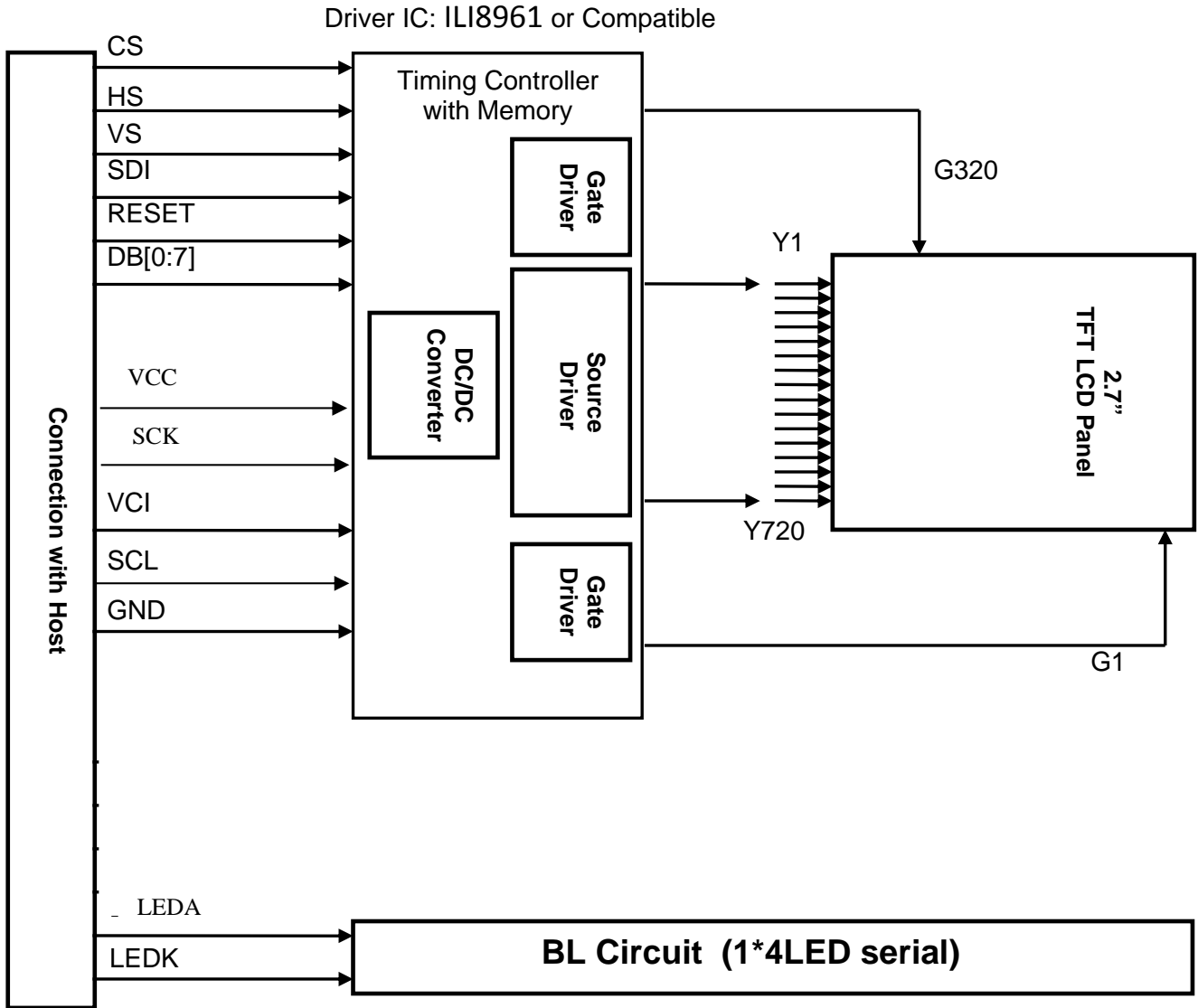


8. 8 RGB interface timing characteristics



Parameter	Symbol	Interface			Unit	
		Min.	Typ.	Max.		
CLKIN frequency	fCLKIN	13.5	27	27.19	MHz	
HSD period	tH	1024	1716	1728	CLKIN	
HSD display period	tHD		960		CLKIN	
HSD back porch	tHBP	50	70	255	CLKIN	
HSD front porch	tHFP	14	686	718	CLKIN	
HSD pulse width	tHSW	1	1	tHBP-1	CLKIN	
VSD period time	tV	242.5	262.5	450.5	H	
Vertical display area	tVD		240		H	
VSD back porch	tVBP	Odd field	1	21	31	H
		Even field	1.5	21.5	31.5	
VSD front porch	tVFP	Odd field	1.5	1.5	179.5	H
		Even field	1	1	179	
VSD pulse width	tVSW	1CLKIN	1CLKIN	6H		
1 Frame		485	525	901	H	

9. BLOCK DIAGRAM



10. LCM Quality Criteria

10.1 VISUAL & FUNCTION INSPECTION STANDARD

10.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

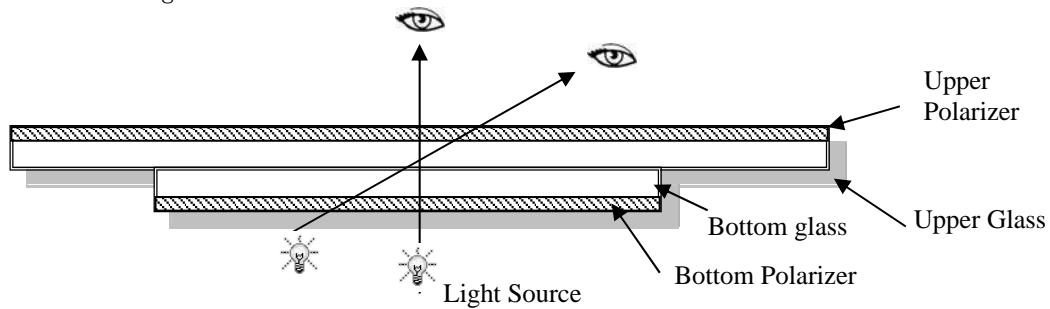
Temperature : $25 \pm 5^{\circ}\text{C}$

Humidity : $65\% \pm 10\% \text{RH}$

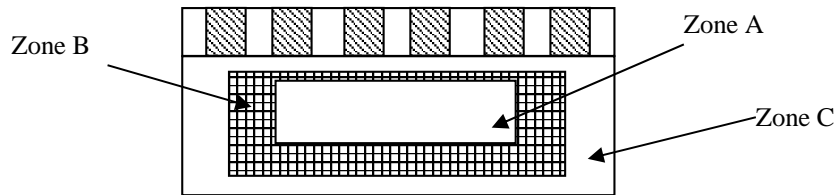
Viewing Angle : Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance:30-50cm



10.1.2 Definition



Zone A : Effective Viewing Area(Character or Digit can be seen)

Zone B : Viewing Area except Zone A

Zone C : Outside (Zone A+Zone B) which can not be seen after assembly by customer .)

Note:

As a general rule ,visual defects in Zone C can be ignored when it doesn' t effect product function or appearance after assembly by customer.

10.1.3 Sampling Plan

According to GB/T 2828-2003 ; , normal inspection, Class II

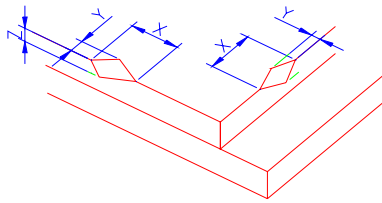
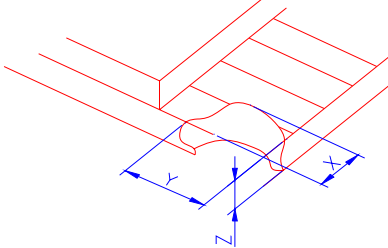
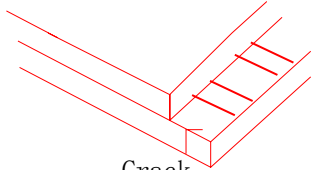
AQL:

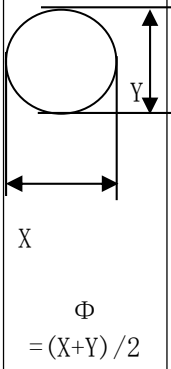
Major defect	Minor defect
0.65	1.5




LCD: Liquid Crystal Display , TP: Touch Panel , LCM: Liquid Crystal Module

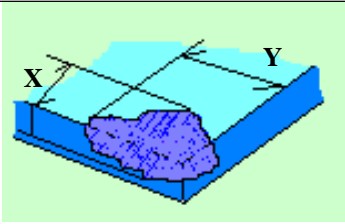
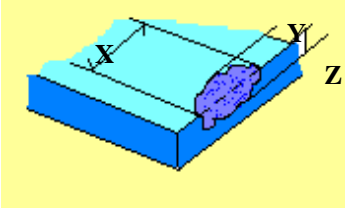
No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. 4) TP no function	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed	
4	Color tone	Color unevenness, refer to limited sample	Minor
5	Soldering appearance	Good soldering , Peeling off is not allowed.	
6	LCD/Polarizer/TP	Black/White spot/line, scratch, crack, etc.	

10.1.4 Criteria (Visual)

Number	Items	Criteria(mm)						
1.0 LCD Crack/Broken NOTE: X: Length Y: Width Z: Height L: Length of ITO, T: Height of LCD	(1) The edge of LCD broken	 <table border="1" data-bbox="847 600 1391 757"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>$\leq 3.0\text{mm}$</td> <td><Inner border line of the seal</td> <td>$\leq T$</td> </tr> </tbody> </table>	X	Y	Z	$\leq 3.0\text{mm}$	<Inner border line of the seal	$\leq T$
X	Y	Z						
$\leq 3.0\text{mm}$	<Inner border line of the seal	$\leq T$						
	(2) LCD corner broken	 <table border="1" data-bbox="908 1048 1331 1124"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>$\leq 3.0\text{mm}$</td> <td>$\leq L$</td> <td>$\leq T$</td> </tr> </tbody> </table>	X	Y	Z	$\leq 3.0\text{mm}$	$\leq L$	$\leq T$
X	Y	Z						
$\leq 3.0\text{mm}$	$\leq L$	$\leq T$						
	(3) LCD crack	 <p style="text-align: center;">Crack Not allowed</p>						

Number	Items	Criteria (mm)																																																																	
2.0	Spot defect  <p style="text-align: center;">$\Phi = (X+Y)/2$</p>	<p>① light dot (LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain)</p> <table border="1" data-bbox="432 383 1227 750"> <thead> <tr> <th rowspan="2">Zone Size (mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.10$</td> <td colspan="3">Ignore</td> </tr> <tr> <td>$0.10 < \Phi \leq 0.15$</td> <td colspan="3">3 (distance $\geq 10\text{mm}$)</td> </tr> <tr> <td>$0.15 < \Phi \leq 0.2$</td> <td colspan="3">1</td> </tr> <tr> <td>$0.2 < \Phi$</td> <td colspan="3">0</td> </tr> </tbody> </table> <p>②Dim spot (LCD/TP/Polarizer dim dot, light leakage, dark spot)</p> <table border="1" data-bbox="432 819 1227 1184"> <thead> <tr> <th rowspan="2">Zone Size (mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.1$</td> <td colspan="3">Ignore</td> </tr> <tr> <td>$0.1 < \Phi \leq 0.2$</td> <td colspan="3">2 (distance $\geq 10\text{mm}$)</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.3$</td> <td colspan="3">1</td> </tr> <tr> <td>$\Phi > 0.3$</td> <td colspan="3">0</td> </tr> </tbody> </table> <p>③ Polarizer accidented spot</p> <table border="1" data-bbox="432 1254 1227 1559"> <thead> <tr> <th rowspan="2">Zone Size (mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.2$</td> <td colspan="3">Ignore</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.5$</td> <td colspan="3">2 (distance $\geq 10\text{mm}$)</td> </tr> <tr> <td>$\Phi > 0.5$</td> <td colspan="3">0</td> </tr> </tbody> </table>	Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.10$	Ignore			$0.10 < \Phi \leq 0.15$	3 (distance $\geq 10\text{mm}$)			$0.15 < \Phi \leq 0.2$	1			$0.2 < \Phi$	0			Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.1$	Ignore			$0.1 < \Phi \leq 0.2$	2 (distance $\geq 10\text{mm}$)			$0.2 < \Phi \leq 0.3$	1			$\Phi > 0.3$	0			Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.2$	Ignore			$0.2 < \Phi \leq 0.5$	2 (distance $\geq 10\text{mm}$)			$\Phi > 0.5$	0		
Zone Size (mm)	Acceptable Qty																																																																		
	A	B	C																																																																
$\Phi \leq 0.10$	Ignore																																																																		
$0.10 < \Phi \leq 0.15$	3 (distance $\geq 10\text{mm}$)																																																																		
$0.15 < \Phi \leq 0.2$	1																																																																		
$0.2 < \Phi$	0																																																																		
Zone Size (mm)	Acceptable Qty																																																																		
	A	B	C																																																																
$\Phi \leq 0.1$	Ignore																																																																		
$0.1 < \Phi \leq 0.2$	2 (distance $\geq 10\text{mm}$)																																																																		
$0.2 < \Phi \leq 0.3$	1																																																																		
$\Phi > 0.3$	0																																																																		
Zone Size (mm)	Acceptable Qty																																																																		
	A	B	C																																																																
$\Phi \leq 0.2$	Ignore																																																																		
$0.2 < \Phi \leq 0.5$	2 (distance $\geq 10\text{mm}$)																																																																		
$\Phi > 0.5$	0																																																																		
	Line defect (LCD/TP /Polarizer black/white line, scratch, stain)	<table border="1" data-bbox="432 1597 1227 1962"> <thead> <tr> <th rowspan="2">Width (mm)</th> <th rowspan="2">Length (mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.03$</td> <td>Ignore</td> <td colspan="3">Ignore</td> </tr> <tr> <td>$0.03 < W \leq 0.05$</td> <td>$L \leq 3.0$</td> <td colspan="3">$N \leq 2$</td> </tr> <tr> <td>$0.05 < W \leq 0.08$</td> <td>$L \leq 2.0$</td> <td colspan="3">$N \leq 2$</td> </tr> <tr> <td>$0.08 < W$</td> <td colspan="4">Define as spot defect</td> </tr> </tbody> </table>	Width (mm)	Length (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.03$	Ignore	Ignore			$0.03 < W \leq 0.05$	$L \leq 3.0$	$N \leq 2$			$0.05 < W \leq 0.08$	$L \leq 2.0$	$N \leq 2$			$0.08 < W$	Define as spot defect																																								
Width (mm)	Length (mm)	Acceptable Qty																																																																	
		A	B	C																																																															
$\Phi \leq 0.03$	Ignore	Ignore																																																																	
$0.03 < W \leq 0.05$	$L \leq 3.0$	$N \leq 2$																																																																	
$0.05 < W \leq 0.08$	$L \leq 2.0$	$N \leq 2$																																																																	
$0.08 < W$	Define as spot defect																																																																		

3.0	Polarizer Bubble	<table border="1"> <thead> <tr> <th rowspan="2">Zone Size (mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.2$</td> <td colspan="3">Ignore</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.4$</td> <td colspan="3">2 (distance $\geq 10\text{mm}$)</td> </tr> <tr> <td>$0.4 < \Phi \leq 0.6$</td> <td colspan="3">1</td> </tr> <tr> <td>$0.6 < \Phi$</td> <td colspan="3">0</td> </tr> </tbody> </table>	Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.2$	Ignore			$0.2 < \Phi \leq 0.4$	2 (distance $\geq 10\text{mm}$)			$0.4 < \Phi \leq 0.6$	1			$0.6 < \Phi$	0											
Zone Size (mm)	Acceptable Qty																																	
	A	B	C																															
$\Phi \leq 0.2$	Ignore																																	
$0.2 < \Phi \leq 0.4$	2 (distance $\geq 10\text{mm}$)																																	
$0.4 < \Phi \leq 0.6$	1																																	
$0.6 < \Phi$	0																																	
4.0	SMT	According to IPC-A-610C class II standard . Function defect and missing part are major defect , the others are minor defect.																																
5.0	TP Related	<table border="1"> <tr> <td data-bbox="435 766 619 1059">TP bubble/ accidented spot</td> <td data-bbox="619 766 1318 1059"> <table border="1"> <thead> <tr> <th rowspan="2">Size Φ (mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.1$</td> <td colspan="3">Ignore</td> </tr> <tr> <td>$0.1 < \Phi \leq 0.2$</td> <td colspan="3">2 (distance \geq</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.3$</td> <td colspan="3">1</td> </tr> <tr> <td>$0.3 < \Phi$</td> <td colspan="3">0</td> </tr> </tbody> </table> </td> </tr> <tr> <td data-bbox="435 1059 619 1167">Assembly deflection</td> <td colspan="3" data-bbox="619 1059 1465 1167">beyond the edge of backlight $\leq 0.15\text{mm}$</td> </tr> <tr> <td data-bbox="435 1167 619 1957">Newton Ring</td> <td data-bbox="619 1167 1075 1957"> <p>Newton Ring area $> 1/3$ TP area NG</p> <p>Newton Ring area $\leq 1/3$ TP area OK</p> </td> <td data-bbox="1075 1167 1465 1957">  </td> </tr> </table>	TP bubble/ accidented spot	<table border="1"> <thead> <tr> <th rowspan="2">Size Φ (mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.1$</td> <td colspan="3">Ignore</td> </tr> <tr> <td>$0.1 < \Phi \leq 0.2$</td> <td colspan="3">2 (distance \geq</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.3$</td> <td colspan="3">1</td> </tr> <tr> <td>$0.3 < \Phi$</td> <td colspan="3">0</td> </tr> </tbody> </table>	Size Φ (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.1$	Ignore			$0.1 < \Phi \leq 0.2$	2 (distance \geq			$0.2 < \Phi \leq 0.3$	1			$0.3 < \Phi$	0			Assembly deflection	beyond the edge of backlight $\leq 0.15\text{mm}$			Newton Ring	<p>Newton Ring area $> 1/3$ TP area NG</p> <p>Newton Ring area $\leq 1/3$ TP area OK</p>	
TP bubble/ accidented spot	<table border="1"> <thead> <tr> <th rowspan="2">Size Φ (mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.1$</td> <td colspan="3">Ignore</td> </tr> <tr> <td>$0.1 < \Phi \leq 0.2$</td> <td colspan="3">2 (distance \geq</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.3$</td> <td colspan="3">1</td> </tr> <tr> <td>$0.3 < \Phi$</td> <td colspan="3">0</td> </tr> </tbody> </table>	Size Φ (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.1$	Ignore			$0.1 < \Phi \leq 0.2$	2 (distance \geq			$0.2 < \Phi \leq 0.3$	1			$0.3 < \Phi$	0												
Size Φ (mm)	Acceptable Qty																																	
	A	B	C																															
$\Phi \leq 0.1$	Ignore																																	
$0.1 < \Phi \leq 0.2$	2 (distance \geq																																	
$0.2 < \Phi \leq 0.3$	1																																	
$0.3 < \Phi$	0																																	
Assembly deflection	beyond the edge of backlight $\leq 0.15\text{mm}$																																	
Newton Ring	<p>Newton Ring area $> 1/3$ TP area NG</p> <p>Newton Ring area $\leq 1/3$ TP area OK</p>																																	

	TP corner broken X: length Y: width Z: height	<table border="1"> <tr> <td>X</td> <td>Y</td> <td>Z</td> </tr> <tr> <td>$X \leq 3.0\text{mm}$</td> <td>$Y \leq 3.0\text{mm}$</td> <td>$Z < \text{LCD thickness}$</td> </tr> </table>	X	Y	Z	$X \leq 3.0\text{mm}$	$Y \leq 3.0\text{mm}$	$Z < \text{LCD thickness}$	
		X	Y	Z					
$X \leq 3.0\text{mm}$	$Y \leq 3.0\text{mm}$	$Z < \text{LCD thickness}$							
* Circuitry broken is not allowed.									
	TP edge broken X: length Y: width Z: height	<table border="1"> <tr> <td>X</td> <td>Y</td> <td>Z</td> </tr> <tr> <td>$X \leq 6.0\text{mm}$</td> <td>$Y \leq 2.0\text{mm}$</td> <td>$Z < \text{LCD thickness}$</td> </tr> </table>	X	Y	Z	$X \leq 6.0\text{mm}$	$Y \leq 2.0\text{mm}$	$Z < \text{LCD thickness}$	
		X	Y	Z					
$X \leq 6.0\text{mm}$	$Y \leq 2.0\text{mm}$	$Z < \text{LCD thickness}$							
* Circuitry broken is not allowed.									

Criteria (functional items)

Number	Items	Criteria (mm)
1	No display	Not allowed
2	Missing segment	Not allowed
3	Short	Not allowed
4	Backlight no lighting	Not allowed
5	TP no function	Not allowed

10.2 RELIABILITY TEST

NO	ITEM	CONDITION	STANDARD
1	High Temp. Storage	80°C, 240 hours	1. Functional test is OK. Missing Segment, short, unclear segment, non-display, display abnormally and liquid crystal leak are un-allowed. 2. No low temperature bubbles, end seal loose and fall, frame rainbow.
2	Low Temp. Storage	-30°C, 240 hours	
3	High Temp. Operation	70°C, 240 hours	
4	Low Temp. Operation	-20°C, 240 hours	
5	High temperature and high Humidity storage	40°C, 90%RH , 120 hours	
6	Thermal and cold shock	Static state, -20°C (30 Min) ~ 70°C (30 Min) ~ -20°C (30Min) , packaging, 10 cycles	

7	Vibration test	Packaging, Frequency : 10-55Hz Amplitude : 1.0mm, Each direction on X,Y axe 0.5 houre, circle 2 hours	1. Function test is OK. 2. No glass crack, chipped glass, end seal loose and fall, epoxy frame crack and so on. 3. No structure loose and fall.
8	Dropping test	Pack products into the carton box. Drop it from 80cm height to ground. Once for each side of the carton	

NOTE:

10.2.1 The reliability items will be fully performed in new sample qualification,

10.2.2 The reliability status will be tested as monitor during mass production. Individual reliability test shall be

performed by lot , Moreover, the individual reliability item shall be decided according to reliability plan.

10.2.3 All samples are inspected after keeping in the room with normal temperature and humidity for 2 hours or above.

10.2.4 Vibration test: It is not necessary to test for those products without assembly frame , back light ,PCB and so on.

10.2.5 Dropping test : It is necessary for affirming new package.

10.2.6 For the high temperature and high humidity test, pure water of over 10 M Ω .cm should be used.

10.2.7 Each test item applies for test LCM only once .Then tested LCM cannot be used again in any other test item.

10.2.8 The quantity of LCM examination for each test item is 5pcs to 10pcs.

10.3 Safetv instructions

10.3.1 If the LCD panel breaks, be careful not to get any liquid crystal substance in your mouth.

10.3.2 If the liquid crystal substance touches your skin or clothes, please wash it off immediately by using soap and water.

10.4 Handling Precautions

10.4.1 Avoid static electricity damaging the LSI.

10.4.2 Do not remove the panel or frame from the module .

10.4.3 The polarizing plate of the display is very fragile . So, please handle it very carefully.

10.4.4 Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of the plate.

10.4.5 The color tone of display and background of LCM has the possibility to be changed in the storage temperature range.

10.4.6 Pay attention to the working environment, as the element may be destroyed by static electricity.

--Be sure to ground human body and electric appliance during work.

--Avoid working in a dry environment to minimize the generations of static electricity.

--Static electricity may be generated when the protective film is fast peeled off.

10.4.7 When soldering the terminal of LCM, make certain the AC power source of soldering iron does not leak.

10.4.8 If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft-dry-clean cloth. If it is heavily contaminated, moisten cloth with the following solvent (ex: Ethyl alcohol). Solvents other than those above-mentioned may damage the polarizer (Especially, do not use them. ex: Water / Ketone)

10.5 Operation instructions

- 10.5.1 It is recommended to drive the LCD within the specified voltage limits, try to adjust the operating voltage for the optimal contrast, the color and contrast of LCD panel will vary at different temperature.
- 10.5.2 Response time is greatly delayed at low operating temperature range. However, this does not mean the LCD will be out of the order, It will recover when it returns to the specified temperature range.
- 10.5.3 If the display area is pushed hard during operation, the display will become abnormal.
- 10.5.4 Do not operate the LCD at the environments over the specified conditions, this may cause damage on the LCD and shorten the lifetime.

10.6 Storage instructions:

- 10.6.1 Store LCDs in a sealed polyethylene bag.
- 10.6.2 Store LCDs in a dark place, Do not expose to sunlight or fluorescent light. Keep the temperature between 0°C and 35°C.
- 10.6.3 Avoid the polarizer touch any other object, (It is recommended to store them in the container in which they were shipped.)

10.7 Limited Warranty

- 10.7.1 will replace or repair any of its LCD modules, which are found to be defective, when inspected in accordance with LCM acceptance standards (copies available upon request) for a period of 12 months from ink-print date on product
- 10.7.2 Any defects must be returned to within 60 days since ship-out. Confirmation of such date shall be based on freight documents. The warranty liability of wasam limited to repair and/or replacement on defects above (7.1, 7.2)
- 10.7.3 No warranty can be granted if the precautions stated above have been disregarded. The typical samples are as below:
 - LCD glass crack/break
 - PCB outlet is damaged or modified.
 - PCB conductors damaged.
 - Circuit modified with by grinding, engraving or painting varnish.
 - FPC crack

10.7.4 Modules must be returned with sufficient description of the failures of defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB outlet, conductors and terminals. Modules must be packed with the container in which they were shipped.

11. Packing method

-----TBD