



**SPECIFICATION
FOR
LCD Module
KD032C-1**

MODULE:	KD032C-1
CUSTOMER:	

REV	DESCRIPTION	DATE
1.0	FIRST ISSUE	2012.01.06

STARTEK	INITIAL	DATE
PREPARED BY		
CHECKED BY		
APPROVED BY		

CUSTOMER	INITIAL	DATE
APPROVED BY		



Revision History

[illegible]

Part. No	KD032C-1	REV	V1.0	Page 2 of 23
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General Description

* Description

This is a color active matrix TFT (Thin Film Transistor) LCD (liquid crystal display) that uses amorphous silicon TFT as a switching device. This model is composed of a Transmissive type TFT-LCD Panel, driver circuit, back-light unit. The resolution of a 3.2'TFT-LCD contains 240x320 pixels, and can display up to 65K/262K colors.

* Features

-Low Input Voltage: 3.3V(TYP)

-Display Colors of TFT LCD: 65K/262K colors

-RGB Interface: 16BIT MCU, 18BIT MCU

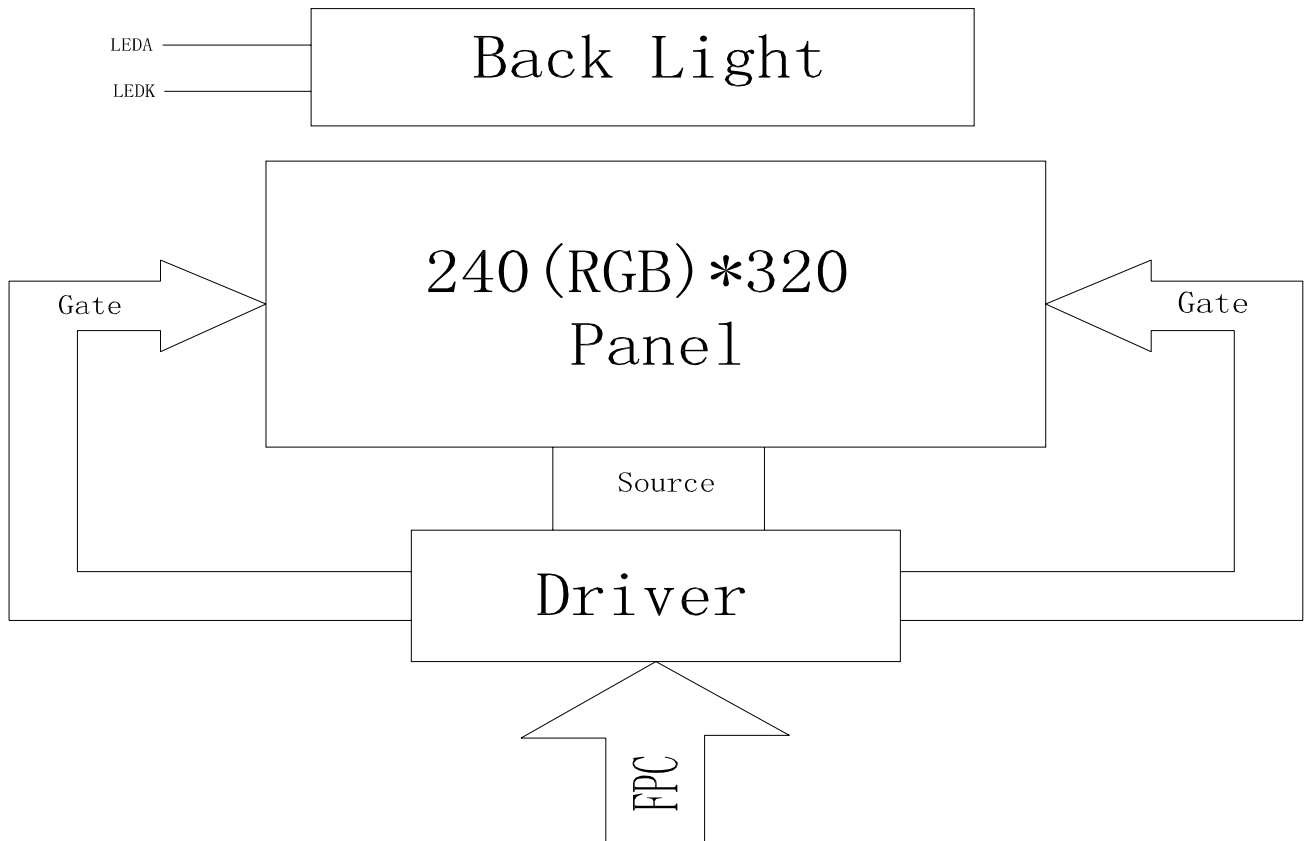
General Information Items	Specification	Unit	Note
	Main Panel		
Display area(AA)	48.60(H)*64.80(V) (3.2inch)	mm	-
Driver element	TFT active matrix	-	-
Display colors	65K/262K	colors	-
Number of pixels	240(RGB)*320	dots	-
Pixel arrangement	RGB vertical stripe	-	-
Pixel pitch	0.153(H)*0.153(V)	mm	-
Viewing angle	9:00	o'clock	-
Controller IC	ILI9325C	-	-
Display mode	Transmissive/ Normally White	-	-
Operating temperature	-20~+70	°C	-
Storage temperature	-30~+80	°C	-

* Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)		57.04		mm	-
	Vertical(V)		78.70		mm	-
	Depth(D)		3.1		mm	-
Weight			TBD		g	-

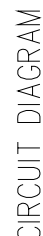
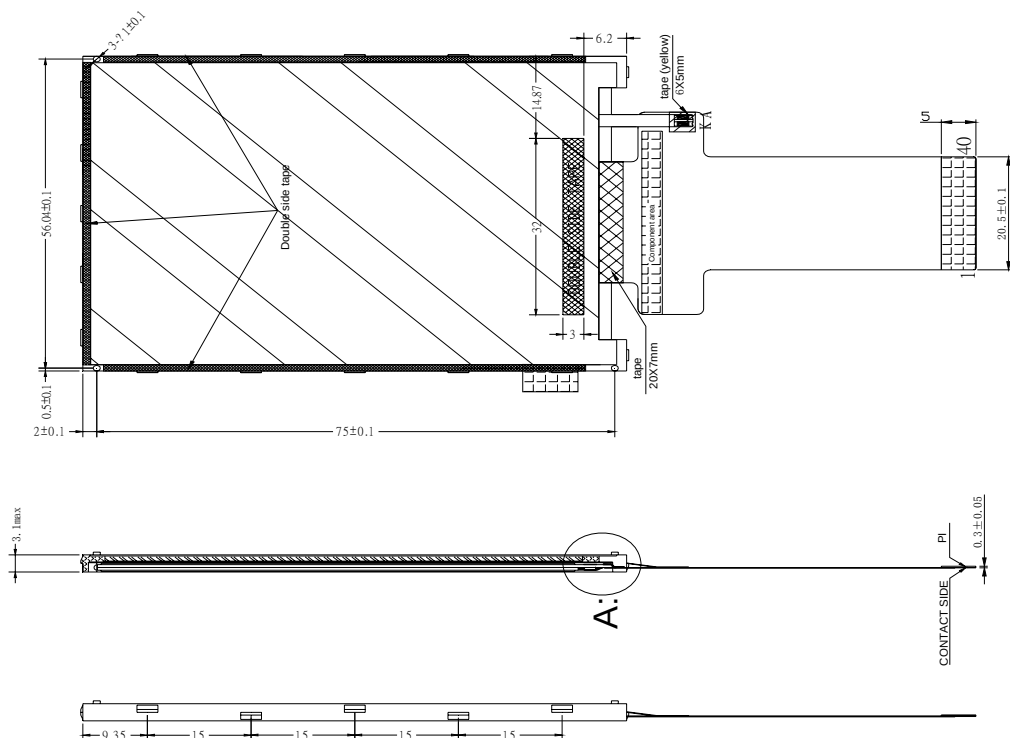


1. Block Diagram





2. Outline dimension



TOLERANCE UNLESS OTHERWISE SPECIFIED	X.X±0.3 X.X±0.2	Drawn	Unit
		Checked	mm
		Approved	Page 1/1
		TOLERANCE(公差) DRAWING NAME PARTS NO.	
SHENZHEN STARTEK ELECTRONICS CO.,LTD 深圳市柯达科电子科技有限公司		KD032C-1-LCM 99032001A	

Rev.	Revision content description	Date
A	FIRST	2014/06/24

Pin	Name	Pin	Name
1	NC	21	DB6
2	NC	22	DB5
3	IM3	23	DB4
4	NC	24	DB3
5	RESET	25	DB2
6	NC	26	DB1
7	NC	27	DB0
8	NC	28	RD
9	NC	29	WR CK
10	DB17	30	RS
11	DB16	31	NC
12	DB15	32	NC
13	DB14	33	NC
14	DB13	34	CS
15	DB12	35	VSS
16	DB11	36	VCC
17	DB10	37	LED-
18	DB9	38	LED+
19	DB8	39	VSS
20	DB7	40	NC

Display type: TFT/Normal white
Display mode: Transmissive
Interface: 8080-16/18 bit
Viewing direction: 9:00
Driver IC: **ILI9325C**
Logic voltage: $2.8 \pm 0.1V$
Backlight: White LED (4-LED serial)
 $V_{led} = 12.8 \pm 0.5V$ $I_{led} = 15mA$
Operating temperature: $-20^{\circ}C \sim +70^{\circ}C$
Storage temperature: $-30^{\circ}C \sim +80^{\circ}C$
Interface connector: FPC
Unspecified tolerance is $\pm 0.3mm$



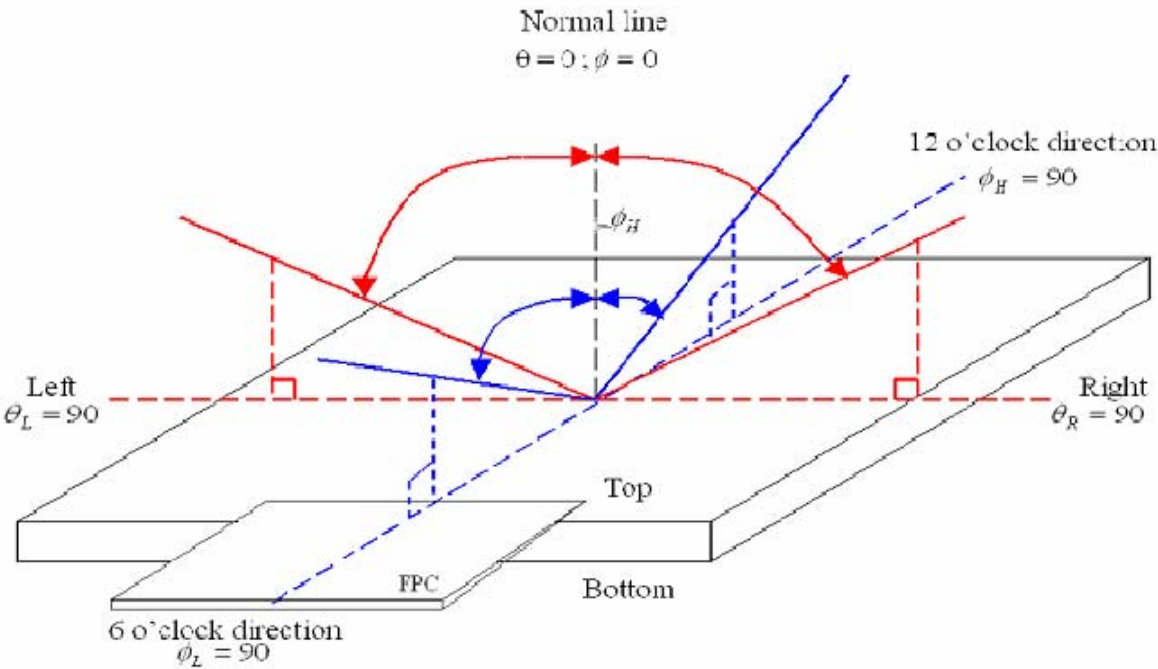
3. Input terminal Pin Assignment

NO.	SYMBOL	DISCRIPTION	I/O
1	NC	NC	
2	NC	NC	
3	IM3	MPU Parallel interface bus and serial interface. H:18 Bit ,DB17-DB0 used. L:16 Bit,DB17-DB10.DB8-DB1used.	I
4	NC	NC	
5	RESET	Reset pin. Setting either pin low initializes the LSI. Must be reset after power is supplied.	I
6	NC	NC	
7	NC	NC	
8	NC	NC	
9	NC	NC	
10-27	DB17-DB0	16/18-bit parallel bi-directional data bus for MCU interface mode. Fix to GND level when not in use.	I/O
28	RD	Serves as a read signal and MCU read data at the rising edge. fix this pin at VCI or GND when not in use	I
29	WR	Write strobe signal in DBI type B operation	I
30	RS	Display data/ command selection pin	I
31	NC	NC	
32	NC	NC	
33	NC	NC	
34	CS	Chip select input pin ("Low" enable). fix this pin at VCI or GND when not in use.	I
35	VSS	Ground.	P
36	VCC	Supply voltage(3.3V).	P
37	LED-	Cathode pin OF backlight	P
38	LED+	Anode pin of backlight	P
39	VSS	Ground.	P
40	NC	NC	

4. LCD Optical Characteristics

4.1 Optical specification

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.
Color Filter Chromaticity	White	x	$\theta = \phi = 0^\circ$	0.292	0.312	0.332
		y		0.321	0.341	0.361
	Red	x	$\theta = \phi = 0^\circ$	0.621	0.641	0.661
		y		0.327	0.347	0.367
	Green	x	$\theta = \phi = 0^\circ$	0.284	0.304	0.324
		y		0.553	0.573	0.593
	Blue	x	$\theta = \phi = 0^\circ$	0.115	0.135	0.155
		y		0.101	0.121	0.141
Gamut			60%			
Measured by C light						



5. Electrical Characteristics

5.1 Absolute Maximum Rating (Ta=25 VSS=0V)

Characteristics	Symbol	Min.	Max.	Unit
Digital Supply Voltage	VDD	-0.3	4.6	V
Digital interface supply Voltage	VDDIO	-0.3	4.6	V
Operating temperature	T _{OP}	-20	+70	°C
Storage temperature	T _{ST}	-30	+80	°C

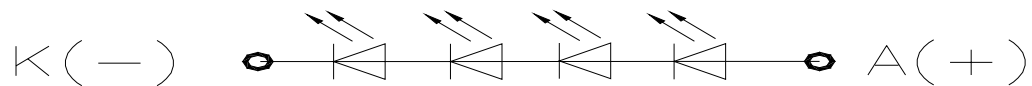
5.2 DC Electrical Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Digital Supply Voltage	VDD	2.4	3..3	4.2	V	
Digital interface supply Voltage	VDDIO	1.65	3.3	4.2	V	
Normal mode Current consumption	IDD	--	8	--	mA	
Level input voltage	V _{IH}	0.7V _{DDIO}		VDDIO	V	
	V _{IL}	GND		0.3V _{DDIO}	V	
Level output voltage	V _{OH}	0.8VDDIO		VDDIO	V	
	V _{OL}	GND		0.2VDDIO	V	

5.3 LED Backlight Characteristics

The back-light system is edge-lighting type with 4chips White LED

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Current	I_F	--	20	--	mA	
Forward Voltage	V_F	--	12.8	--	V	
LCM Luminance	L_v	250	--	--	cd/m ²	Current min 20mA
Uniformity	AV_g	80	--	--	%	



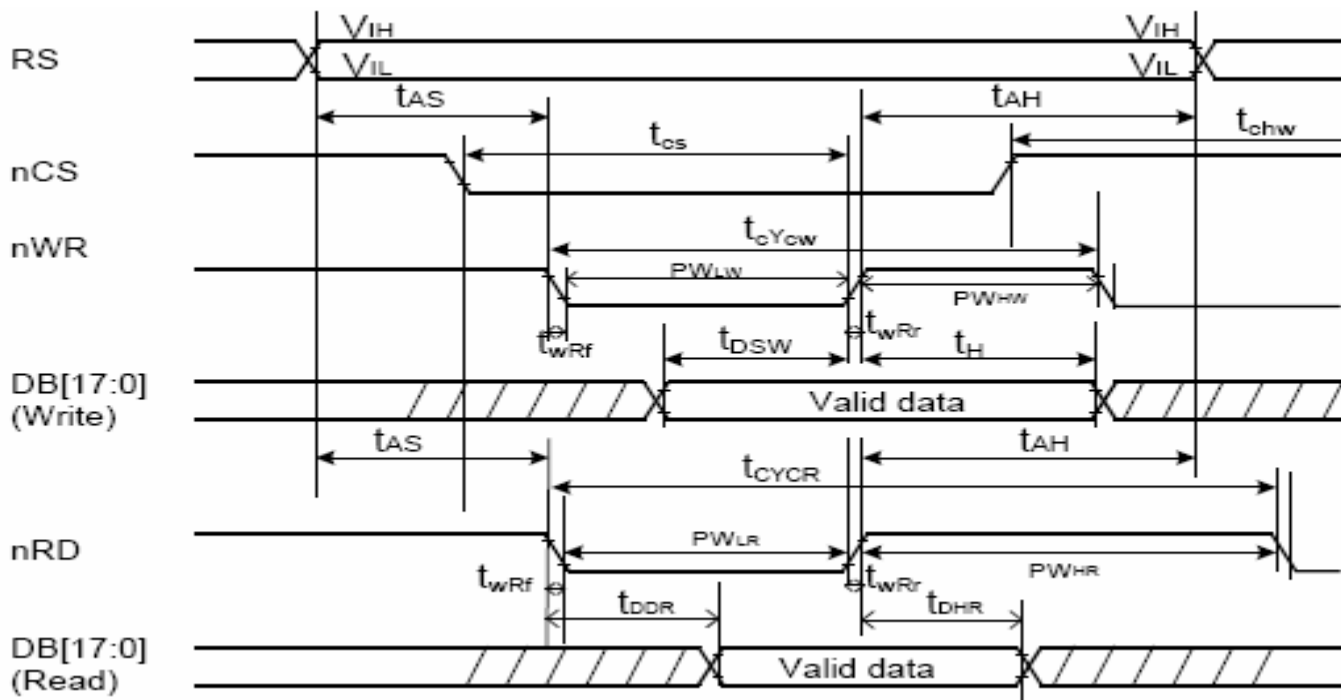
BLU CIRCUIT DIAGRAM

6. AC Characteristic

6.1. Display Parallel 18/16/9/8-bit Interface Timing Characteristics (8080 system)

Normal Write Mode (IOVCC = 1.65~3.3V)

Item	Symbol	Unit	Min.	Typ.	Max.	Test Condition
Bus cycle time	Write	t_{CYCW}	ns	80	-	-
	Read	t_{CYCR}	ns	300	-	-
Write low-level pulse width	PW_{LW}	ns	50	-	500	-
Write high-level pulse width	PW_{HW}	ns	15	-	-	-
Read low-level pulse width	PW_{LR}	ns	150	-	-	-
Read high-level pulse width	PW_{HR}	ns	150	-	-	-
Write / Read rise / fall time	t_{WRr}/t_{WRf}	ns	-	-	25	-
Setup time	Write (RS to nCS, E/nWR)	t_{AS}	ns	10	-	-
	Read (RS to nCS, RW/nRD)			5	-	-
Address hold time	t_{AH}	ns	5	-	-	-
Write data set up time	t_{DSW}	ns	10	-	-	-
Write data hold time	t_H	ns	15	-	-	-
Read data delay time	t_{DDR}	ns	-	-	100	-
Read data hold time	t_{DHR}	ns	5	-	-	-

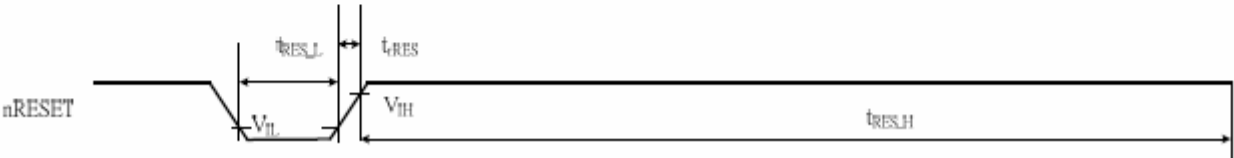




6.2 RESET Timing

Reset Timing Characteristics (IOVCC = 1.65 ~ 3.3 V)

Item	Symbol	Unit	Min.	Typ.	Max.
Reset low-level width	t_{RES_L}	ms	1	-	-
Reset rise time	t_{RES}	μ s	-	-	10
Reset high-level width	t_{RES_H}	ms	50	-	-



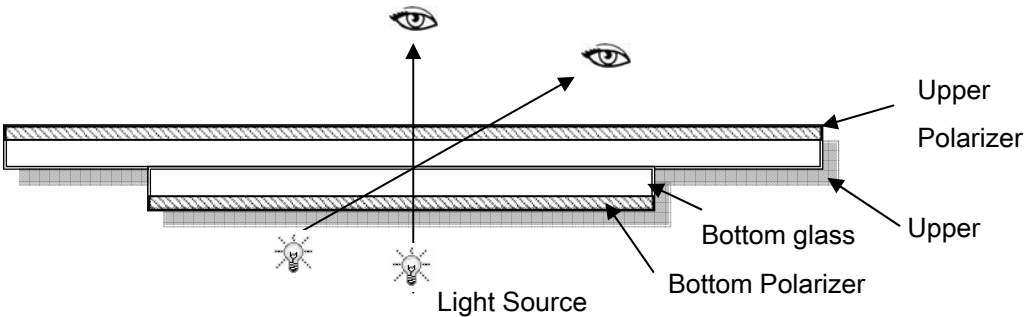
7. LCD Module Out-Going Quality Level

7.1 VISUAL & FUNCTION INSPECTION STANDARD

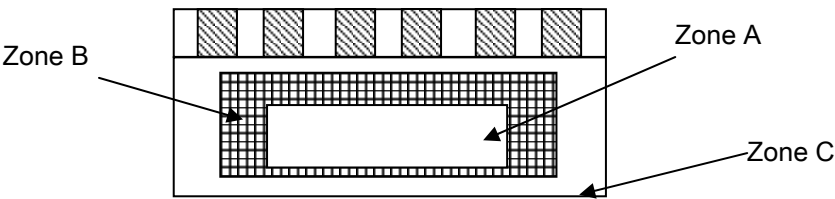
7.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

- Temperature : 25±5℃
- Humidity : 65%±10%RH
- Viewing Angle : Normal viewing Angle.
- Illumination: Single fluorescent lamp (300 to 700Lux)
- Viewing distance:30–50cm



7.1.2 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.

7.1.3 Sampling Plan

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

AQL:

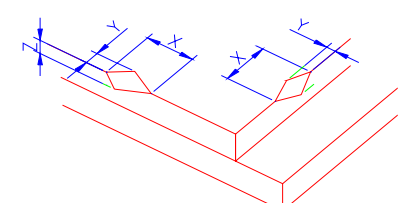
Major defect	Minor defect
0.65	1.5

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

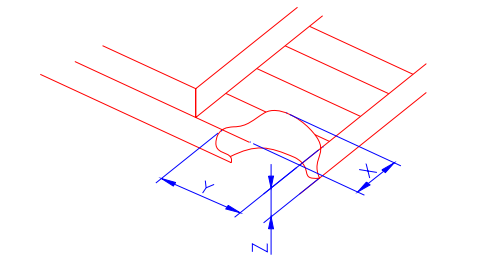
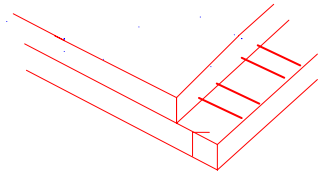
No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. 4) TP no function	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing 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.	

7

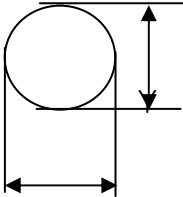
7.1.4 Criteria (Visual)

Number	Items	Criteria(mm)						
1.0 LCD Crack/Broken	(1) The edge of LCD broken	 <table> <tr> <th>X</th><th>Y</th><th>Z</th></tr> <tr> <td>≤3.0mm</td><td><Inner border line of the seal</td><td>≤T</td></tr> </table>	X	Y	Z	≤3.0mm	<Inner border line of the seal	≤T
X	Y	Z						
≤3.0mm	<Inner border line of the seal	≤T						
NOTE: X: Length Y: Width								

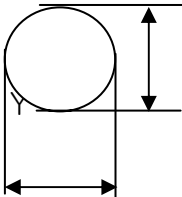


Z: Height L: Length of ITO, T: Height of LCD	(2)LCD corner broken	 <table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>≤3.0mm</td><td>≤L</td><td>≤T</td></tr></table>	X	Y	Z	≤3.0mm	≤L	≤T
	X	Y	Z					
≤3.0mm	≤L	≤T						
	(3) LCD crack	 Crack Not allowed						



Number	Items	Criteria (mm)																									
2.0	Spot defect  X Φ=(X+Y)/2	① light dot (LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain)																									
		<table><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><tr><td>Φ≤0.10</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr><tr><td>0.10<Φ≤0.15</td><td colspan="2">3(distance≥10mm)</td></tr><tr><td>0.15<Φ≤0.2</td><td colspan="2">1</td></tr><tr><td>0.2<Φ</td><td colspan="2">0</td></tr></table>	Zone Size (mm)	Acceptable Qty			A	B	C	Φ≤0.10	Ignore		Ignore	0.10<Φ≤0.15	3(distance≥10mm)		0.15<Φ≤0.2	1		0.2<Φ	0						
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Φ>0.5	0																										
Line defect (LCD/TP /Polarizer black/white line, scratch, stain)	<table><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><tr><td>Φ≤0.03</td><td>Ignore</td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr><tr><td>0.03<W≤0.05</td><td>L≤3.0</td><td colspan="2">N≤2</td></tr><tr><td>0.05<W≤0.08</td><td>L≤2.0</td><td colspan="2">N≤2</td></tr><tr><td>0.08<W</td><td colspan="4">Define as spot defect</td></tr></table>	Width(mm)	Length(mm)	Acceptable Qty			A	B	C	Φ≤0.03	Ignore	Ignore		Ignore	0.03<W≤0.05	L≤3.0	N≤2		0.05<W≤0.08	L≤2.0	N≤2		0.08<W	Define as spot defect			
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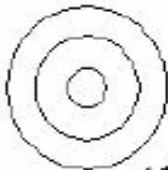
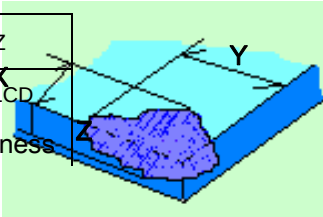
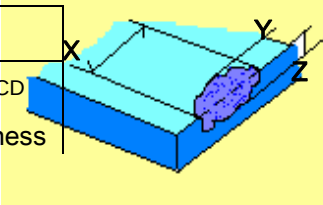


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Spot defect  X Y $\Phi=(X+Y)/2$	① light dot (LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain) <table><tr><th rowspan="2">Zone Size (mm)</th><th colspan="3">Acceptable Qty</th></tr><tr><th>A</th><th>B</th><th>C</th></tr><tr><td>$\Phi\leq0.10$</td><td colspan="3">Ignore</td></tr><tr><td>$0.10<\Phi\leq0.15$</td><td colspan="3">3(distance $\geq 10\text{mm}$)</td></tr><tr><td>$0.15<\Phi\leq0.2$</td><td colspan="3">1</td></tr><tr><td>$0.2<\Phi$</td><td colspan="3">0</td></tr></table> ②Dim spot (LCD/TP/Polarizer dim dot, light leakage、dark spot) <table><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><tr><td>$\Phi\leq0.1$</td><td colspan="3">Ignore</td></tr><tr><td>$0.1<\Phi\leq0.2$</td><td colspan="3">2(distance $\geq 10\text{mm}$)</td></tr><tr><td>$0.2<\Phi\leq0.3$</td><td colspan="3">1</td></tr><tr><td>$\Phi>0.3$</td><td colspan="3">0</td></tr></table> ③ Polarizer accidented spot <table><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><tr><td>$\Phi\leq0.2$</td><td colspan="3">Ignore</td></tr><tr><td>$0.2<\Phi\leq0.5$</td><td colspan="3">2(distance $\geq 10\text{mm}$)</td></tr><tr><td>$\Phi>0.5$</td><td colspan="3">0</td></tr></table>	Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi\leq0.10$	Ignore			$0.10<\Phi\leq0.15$	3(distance $\geq 10\text{mm}$)			$0.15<\Phi\leq0.2$	1			$0.2<\Phi$	0			Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi\leq0.1$	Ignore			$0.1<\Phi\leq0.2$	2(distance $\geq 10\text{mm}$)			$0.2<\Phi\leq0.3$	1			$\Phi>0.3$	0			Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi\leq0.2$	Ignore			$0.2<\Phi\leq0.5$	2(distance $\geq 10\text{mm}$)			$\Phi>0.5$	0		
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	$0.05 < W \leq 0.08$	$L \leq 2.0$	$N \leq 2$																							
	$0.08 < W$	Define as spot defect																								
Polarizer Bubble	<table><tr><td>Zone</td><td colspan="3">Acceptable Qty</td></tr><tr><td>Size (mm)</td><td>A</td><td>B</td><td>C</td></tr><tr><td>$\Phi \leq 0.2$</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr><tr><td>$0.2 < \Phi \leq 0.4$</td><td colspan="2">2(distance $\geq 10\text{mm}$)</td></tr><tr><td>$0.4 < \Phi \leq 0.6$</td><td colspan="2">1</td></tr><tr><td>$0.6 < \Phi$</td><td colspan="2">0</td></tr></table>					Zone	Acceptable Qty			Size (mm)	A	B	C	$\Phi \leq 0.2$	Ignore		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	Acceptable Qty																									
Size (mm)	A	B	C																							
$\Phi \leq 0.2$	Ignore		Ignore																							
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$0.4 < \Phi \leq 0.6$	1																									
$0.6 < \Phi$	0																									
SMT	According to IPC-A-610C class II standard . Function defect and missing part are major defect ,the others are minor defect.																									

		TP bubble/ accidented spot	<table><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><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</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></table>	Size Φ (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.1$	Ignore			$0.1 < \Phi \leq 0.2$	2			$0.2 < \Phi \leq 0.3$	1			$0.3 < \Phi$	0		
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$0.3 < \Phi$	0																									
		Assembly deflection	beyond the edge of backlight $\leq 0.15\text{mm}$																							



5.0	TP Related	Newton Ring	Newton area>1/3 TP		Ring area	 1 规律性		
			Newton area≤1/3 TP		Ring area	 2 非规律性		
			OK			 似牛顿环		
		TP corner broken X : length Y : width Z : height	<table><tr><td>X</td><td>Y</td></tr><tr><td>X≤3.0mm</td><td>Y≤3.0mm</td></tr></table> * Circuitry broken is not allowed.	X	Y	X≤3.0mm	Y≤3.0mm	<table><tr><td>Z</td></tr><tr><td>Z<LCD thickness</td></tr></table> 
X	Y							
X≤3.0mm	Y≤3.0mm							
Z								
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TP edge broken X : length Y : width Z : height	<table><tr><td>X</td><td>Y</td></tr><tr><td>X≤6.0mm</td><td>Y≤2.0mm</td></tr></table> * Circuitry broken is not allowed.	X	Y	X≤6.0mm	Y≤2.0mm	<table><tr><td>Z</td></tr><tr><td>Z<LCD thickness</td></tr></table> 	Z	Z<LCD thickness
X	Y							
X≤6.0mm	Y≤2.0mm							
Z								
Z<LCD thickness								



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

8. Reliability Test Result

8.1 Condition

Item	Condition	Sample Size	Test Result	Note
Low Temperature Operating Life test	-20℃, 96HR	3ea	pass	-
Thermal Humidity Operating Life test	70℃90%RH, 96HR	3ea	pass	-
Temperature Cycle ON/OFF test	-20℃ ↔ 70℃, ON/OFF, 20CYC	3ea	pass	(1)
High Temperature Storage test	80℃, 96HR	3ea	pass	-
Low Temperature Storage test	- 30℃, 96HR	3ea	pass	-
Thermal Shock Resistance	The sample should be allowed to stand the following 5 cycles of operation: TSTL for 30 minutes -> normal temperature for 5 minutes -> TSTH for 30 minutes -> normal temperature for 5 minutes, as one cycle, then taking it out and drying it at normal temperature, and allowing it stand for 24 hours	3ea	pass	
Box Drop Test	1 Corner 3 Edges 6 faces, 66cm(MEDIUM BOX)	1box	pass	-

Note (1) ON Time over 10 seconds, OFF Time under 10 seconds

9. Cautions and Handling Precautions

9.1 Handling and Operating the Module

(1) When the module is assembled, it should be attached to the system firmly.

Do not warp or twist the module during assembly work.

(2) Protect the module from physical shock or any force. In addition to damage, this may cause improper operation or damage to the module and back-light unit.

(3) Note that polarizer is very fragile and could be easily damaged. Do not press or scratch the surface.

(4) Do not allow drops of water or chemicals to remain on the display surface.

If you have the droplets for a long time, staining and discoloration may occur.

(5) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.

(6) The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane.

Do not use ketene type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs, or clothes, it must be washed away thoroughly with soap.

(8) Protect the module from static; it may cause damage to the CMOS ICs.

(9) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

(10) Do not disassemble the module.

(11) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.

(12) Pins of I/F connector shall not be touched directly with bare hands.

(13) Do not connect, disconnect the module in the "Power ON" condition.

(14) Power supply should always be turned on/off by the item 6.1 Power On Sequence & 6.2 Power Off Sequence

9.2 Storage and Transportation.

(1) Do not leave the panel in high temperature, and high humidity for a long time.

It is highly recommended to store the module with temperature from 0 to 35 °C and relative humidity of less than 70%

(2) Do not store the TFT-LCD module in direct sunlight.

(3) The module shall be stored in a dark place. When storing the modules for a long time, be sure to adopt effective measures for protecting the modules from strong ultraviolet radiation, sunlight, or fluorescent light.

(4) It is recommended that the modules should be stored under a condition where no condensation is allowed. Formation of dewdrops may cause an abnormal operation or a failure of the module.

In particular, the greatest possible care should be taken to prevent any module from being operated where condensation has occurred inside.

(5) This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.

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10.Packing

----TBD-----

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