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TFT Display Module

Part Number

E50RG38048LW2M320-R

Overview

800x480(120.7x75.8), 16/18/24 bit RGB
interface, WHITE LED backlight, Top view,
Wide temp, Transmissive, 4-wire Resistive
Touch Screen, 320 NITS,
Controller: ILI5960/ILI6122, RoHS Compliant

Contents

General Description	4
1.Block Diagram	5
2. Outline dimension	6
3. Input Terminal Pin Assignment	7
4. LCD Optical Characteristics	9
5. Electrical Characteristics	13
6. AC Characteristic	14
7. LCD Module Out-Going Quality Level.....	16
8. Reliability Test Result	24
9.Cautions and Handling Precautions	25
10.Packing.....	26

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 5.0TFT-LCD contains 800x480 pixels, and can display up to 65K/262K/16.7M colors.

* Features

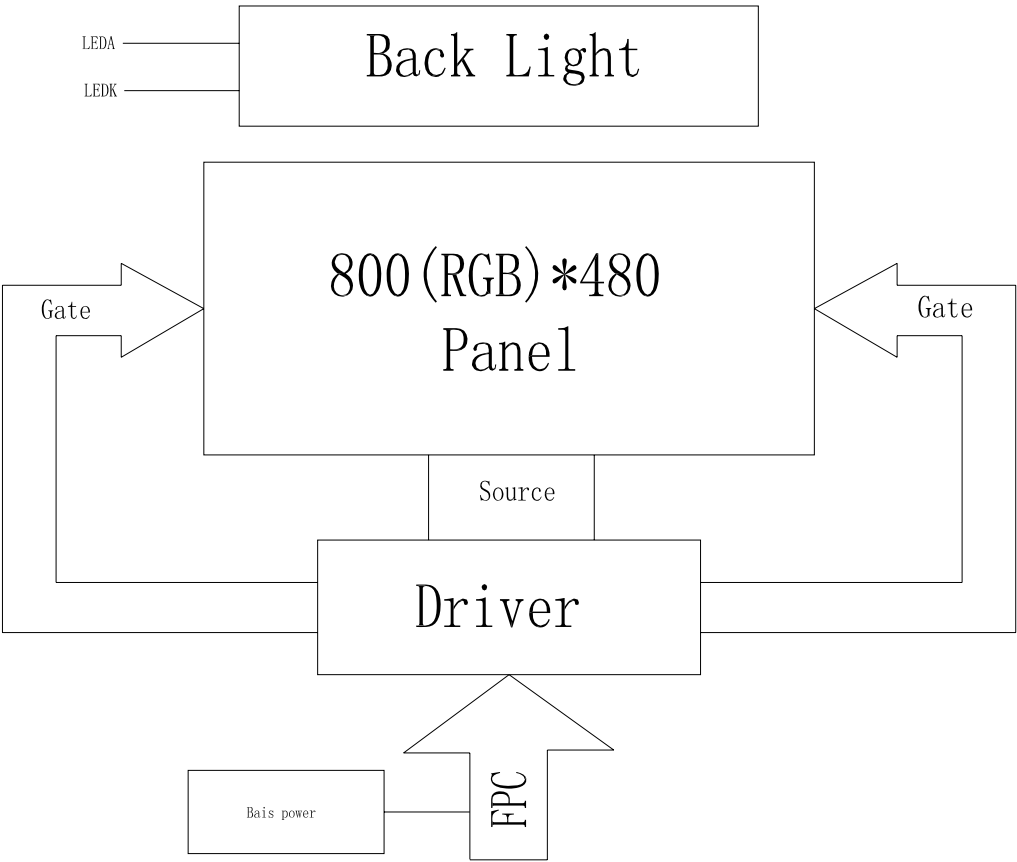
- Low Input Voltage: 3.3V(TYP)
- Display Colors of TFT LCD: 65K/262K/16.7M colors
- Interface: 16/18/24 bit RGB

General Information Items	Specification	Unit	Note
	Main Panel		
Display area(AA)	108.00(H)*64.80(V) (5.0inch)	mm	-
Driver element	TFT active matrix	-	-
Display colors	65K/262K/16.7M	colors	-
Number of pixels	800(RGB)*480	dots	-
Pixel arrangement	RGB vertical stripe	-	-
Pixel pitch	0.108(H)*0.108(V)	mm	-
Viewing angle	12:00	o'clock	-
Controller IC	ILI5960/ILI6122	-	-
Display mode	Transmissive/ Normally White	-	-
Operating temperature	-20~+70	℃	-
Storage temperature	-30~+80	℃	-

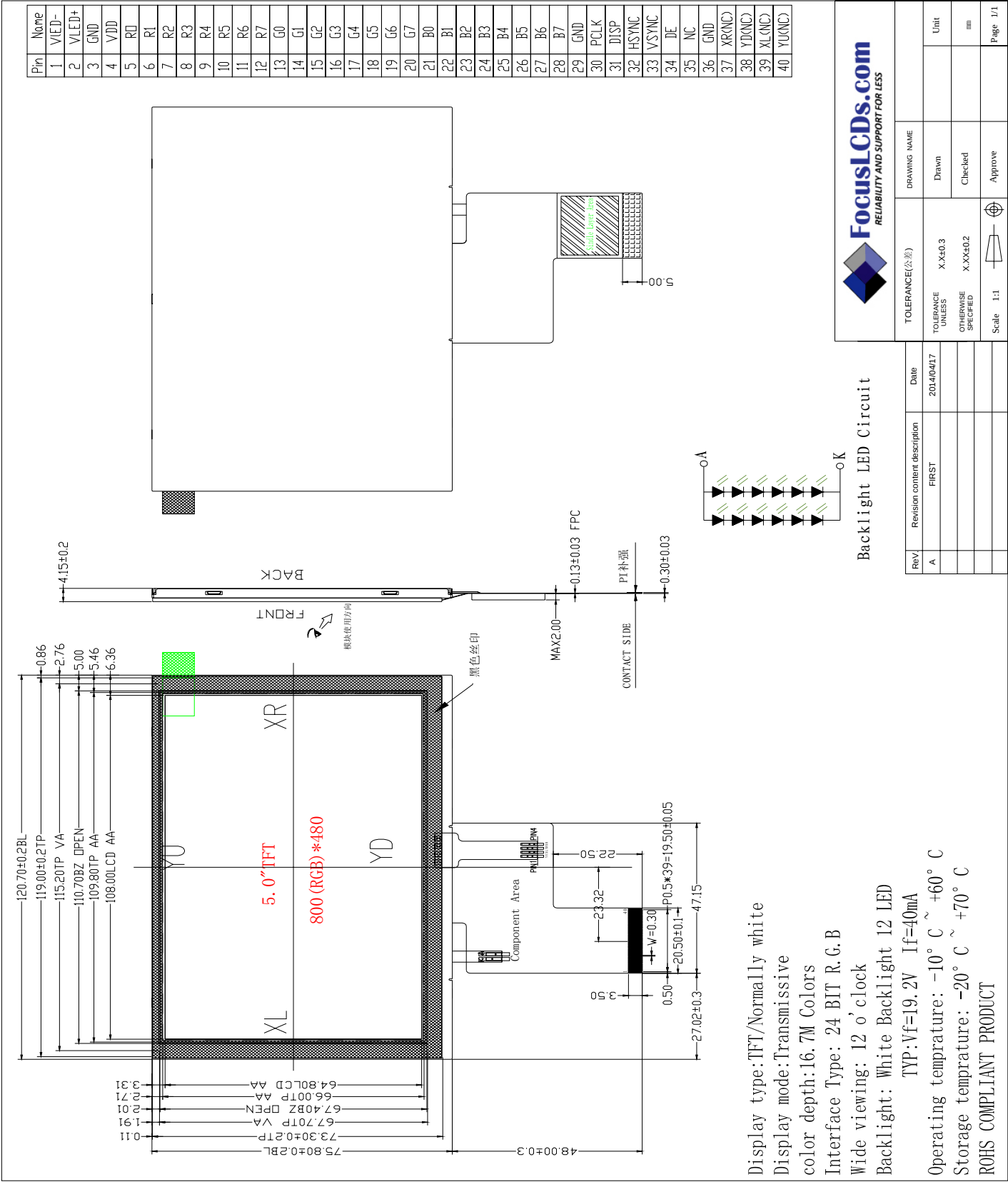
* Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)		120.70		mm	-
	Vertical(V)		75.80		mm	-
	Depth(D)		4.15		mm	-
Weight			TBD		g	-

1. Block Diagram



2. Outline dimension



3. Input terminal Pin Assignment

NO.	SYMBOL	DISCRIPTION	I/O
1	VLED-	Cathode pin OF backlight	P
2	VLED+	Anode pin of backlight	P
3	GND	Ground.	P
4	VDD	Supply voltage(3.3V).	P
5	R0	Red data input.	I/O
6	R1	Red data input.	I/O
7	R2	Red data input.	I/O
8	R3	Red data input.	I/O
9	R4	Red data input.	I/O
10	R5	Red data input.	I/O
11	R6	Red data input.	I/O
12	R8	Red data input.	I/O
13	G0	Green data input.	I/O
14	G1	Green data input.	I/O
15	G2	Green data input.	I/O
16	G3	Green data input.	I/O
17	G4	Green data input.	I/O
18	G5	Green data input.	I/O
19	G6	Green data input.	I/O
20	G7	Green data input.	I/O
21	B0	Blue data input.	I/O
22	B1	Blue data input.	I/O
23	B2	Blue data input.	I/O
24	B3	Blue data input.	I/O
25	B4	Blue data input.	I/O
26	B5	Blue data input.	I/O

27	B6	Blue data input.	I/O
28	B7	Blue data input.	I/O
29	GND	Ground.	P
30	PCLK	Dot clock signal for RGB interface operation Fix this pin at VCI or GND when not in use.	I
31	DISP	Standby setting for testing, it should be connected to VDDIO in normal operation mode. If connected to GND, the IC is in standby mode.	I
32	HSYNC	Line synchronizing signal for RGB interface operation. fix this pin at VCI or GND when not in use	I
33	VSYNC	Frame synchronizing signal for RGB interface operation. fix this pin at VCI or GND when not in use.	I
34	DE	Data enable signal for RGB interface operation. fix this pin at VCI or GND when not in use.	I
35	NC	NC	
36	GND	Ground.	P
37	XR(NC)	Touch panel Right Glass Terminal	A/D
38	YD(NC)	Touch panel Bottom Film Terminal	A/D
39	XL(NC)	Touch panel LIFT Glass Terminal	A/D
40	YU(NC)	Touch panel Top Film Terminal	A/D

4. LCD Optical Characteristics

4.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Transmittance (with Polarizer)		T (%)	Θ=0 Normal viewing angle	—	4.29	—	—	
Transmittance (without Polarizer)		T(%)		—	12.16	—	—	
Contrast		CR		560	700	—		(1)(2)
Response time	Rising	T _R		—	4	8	msec	(1)(3)
	Falling	T _F		—	12	24		
Color gamut	S(%)			—	62	—	%	
Color chromaticity (CIE1931)	White	W _x		0.283	0.303	0.323		(1)(4) CF glass
		W _y		0.305	0.325	0.345		
	Red	R _x		0.606	0.626	0.646		
		R _y		0.314	0.334	0.354		
	Green	G _x		0.257	0.277	0.297		
		G _y		0.529	0.549	0.569		
	Blue	B _x		0.122	0.142	0.162		
		B _y		0.102	0.122	0.142		
Viewing angle	Hor.	Θ _L	CR>10	60	70	—		(1)(4) Viewing Angle base on using EWV Polarizer , Reference Only
		Θ _R		60	70	—		
	Ver.	Θ _U		60	70	—		
		Θ _D		40	60	—		
Optima View Direction		12 O'clock						(5)

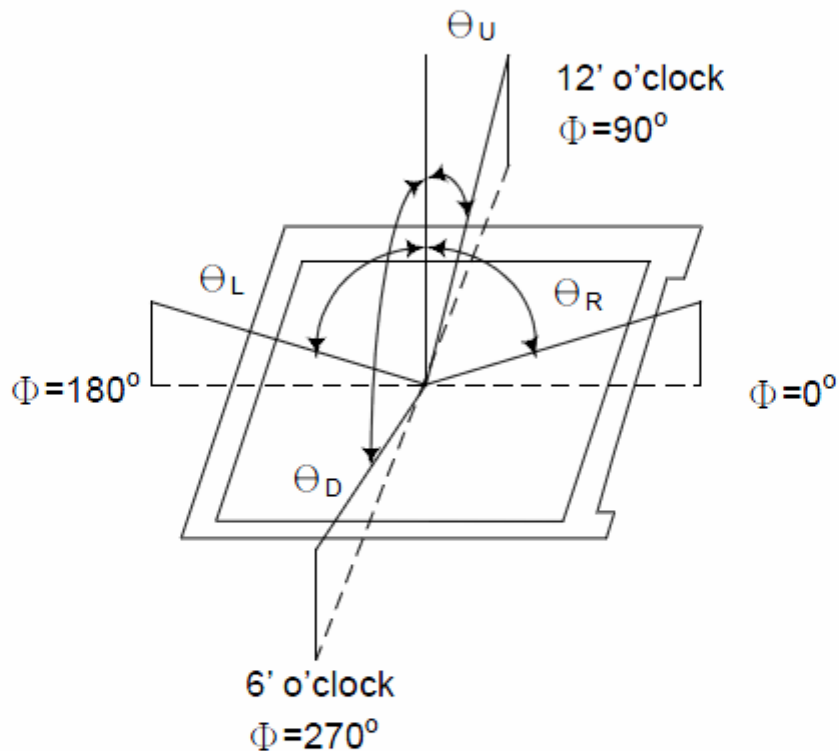
4.2 Measuring Condition

- Measuring surrounding : dark room
- Ambient temperature : $25 \pm 2^\circ\text{C}$
- 15min. warm-up time.

4.3 Measuring Equipment

- FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.

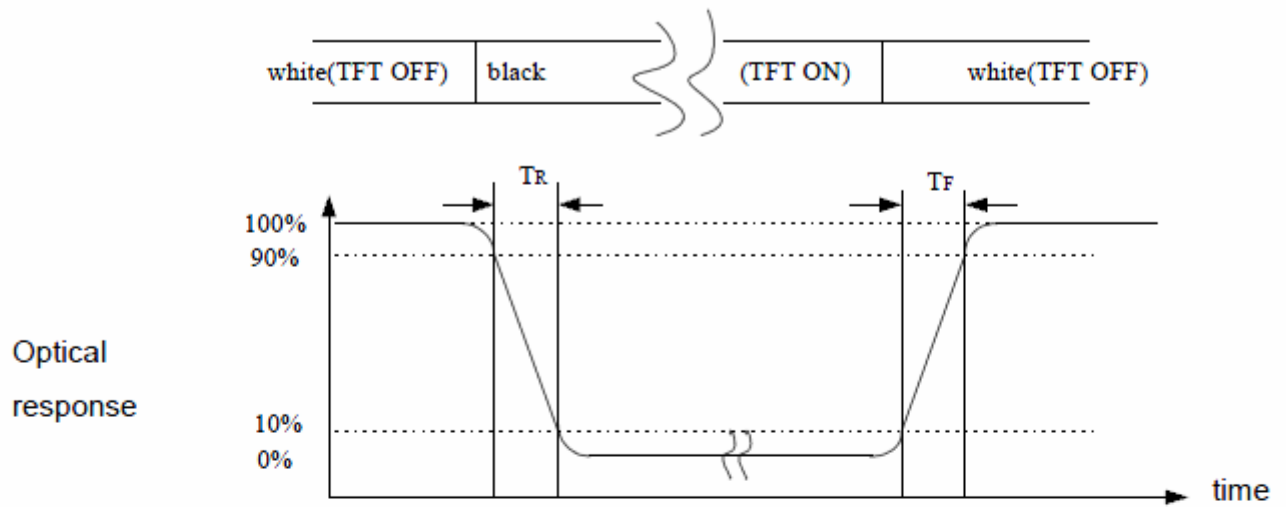
Note (1) Definition of Viewing Angle:



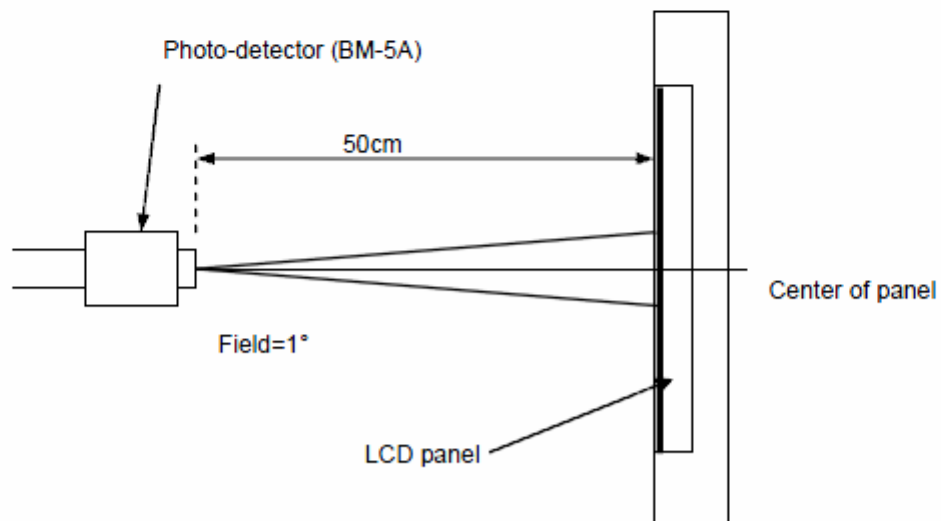
Note (2) Definition of Contrast Ratio (CR) :
measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

Note (3) Definition of Response Time : Sum of T_R and T_F



Note (4) Definition of optical measurement setup



5. Electrical Characteristics

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

Characteristics	Symbol	Min.	Max.	Unit
Digital Supply Voltage	VDD	-0.5	5.0	V
Digital interface supple Voltage	VDDIO	-0.5	VDD+0.3	V
Operating temperature	T _{OP}	-20	+70	°C
Storage temperature	T _{ST}	-30	+80	°C

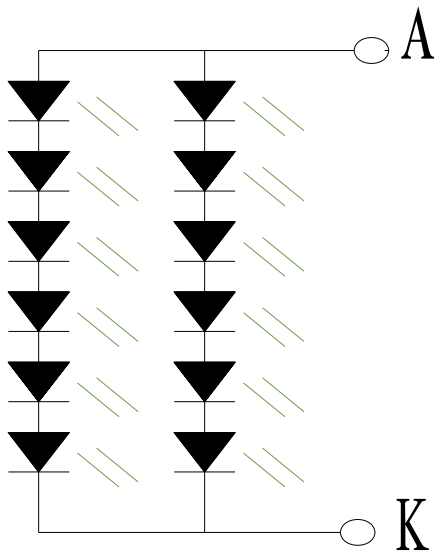
5.2 DC Electrical Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Digital Supply Voltage	VDD	3.0	3.3	4.2	V	
Digital interface supple Voltage	VDDIO	3.0	3.3	4.2	V	
Normal mode Current consumption	IDD	--	200	--	mA	
Level input voltage	VIH	0.7VDDIO		VDDIO	V	
	VIL	GND		0.3VDDIO	V	
Level output voltage	VOH	0.8VDDIO		VDDIO	V	
	VOL	GND		0.2VDDIO	V	

5.3 LED Backlight Characteristics

The back-light system is edge-lighting type with 12chips White LED

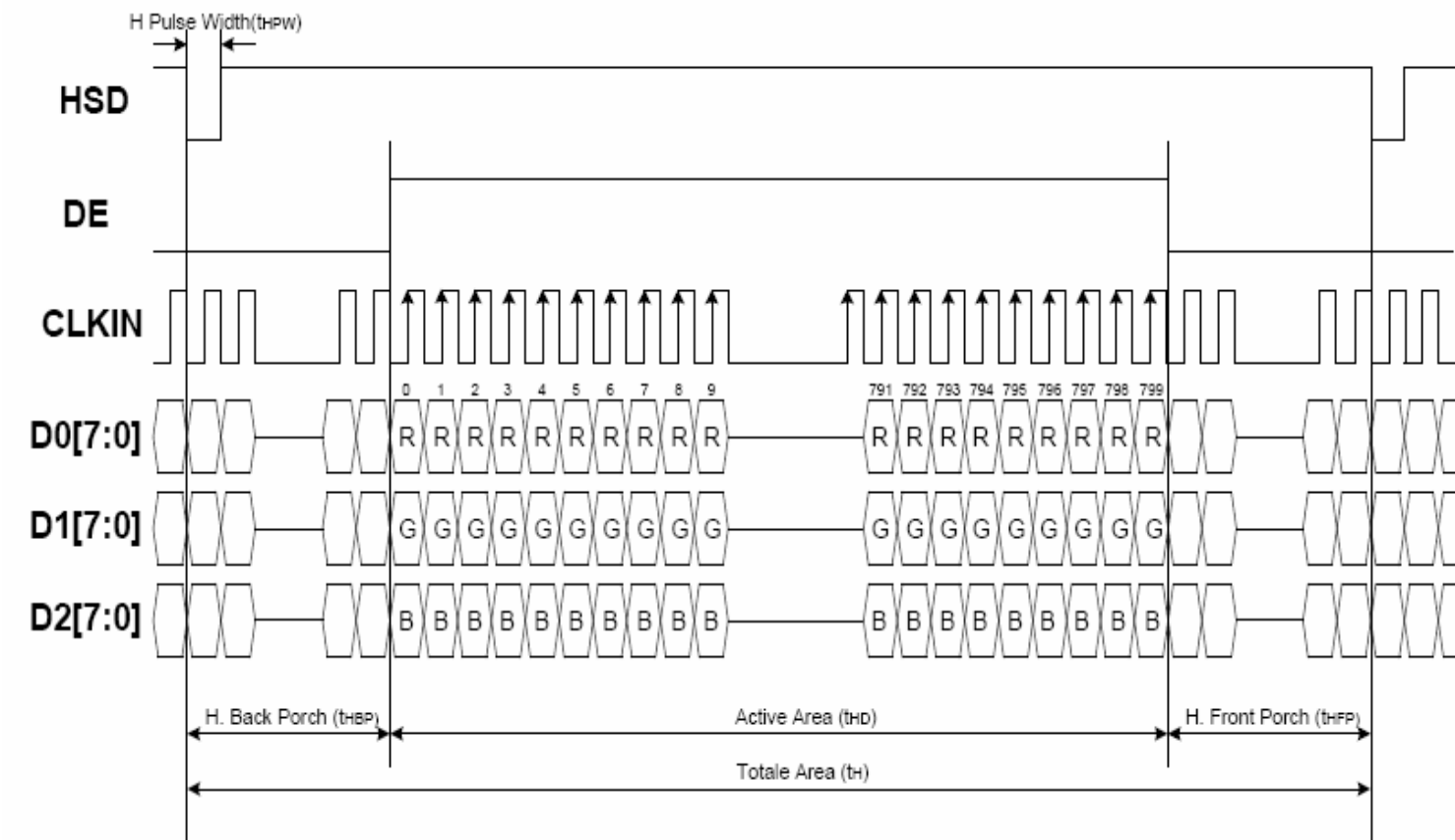
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Current	I_F	30	40	--	mA	
Forward Voltage	V_F	--	19.2	--	V	
LCM Luminance	L_V	320	--	--	cd/m2	$I_F=40\text{mA}$
Uniformity	AV_g	80	--	--	%	



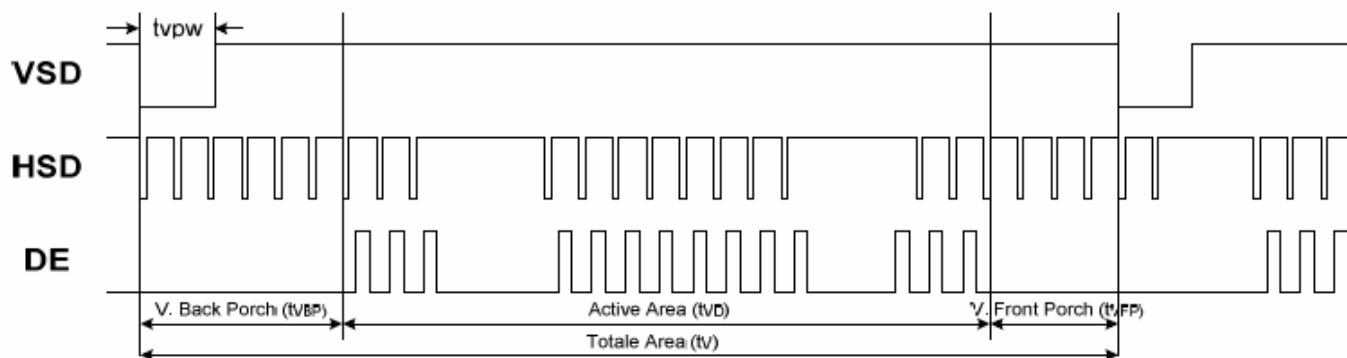
Backlight LED Circuit

6. AC Characteristic

6.1. Display Timing characteristics



Horizontal Input Timing						
Parameter		Symbol	Value			Unit
			Min.	Typ.	Max.	
Horizontal display area		t _{HD}	--	800	--	CLKIN
CLKIN frequency		f _{CLK}	--	33.3	50	MHz
1 Horizontal line period		t _H	862	1056	1200	CLKIN
HSD pulse width	Min.	t _{HPW}	--	1	--	CLKIN
	Typ.		--	--	--	CLKIN
	Max.		--	40	--	CLKIN
HSD back porch	SYNC	t _{HBP}	46	46	46	CLKIN
HSD front porch	SYNC	t _{HFP}	16	210	354	CLKIN



Vertical Input Timing					
Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Vertical display area	t_{vD}	--	480	--	HSD
VSD period time	t_v	510	525	650	HSD
VSD pulse width	t_{vpw}	1	--	20	HSD
VSD back porch	t_{vBP}	23	23	23	HSD
VSD front porch	t_{vFP}	7	22	147	HSD

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.

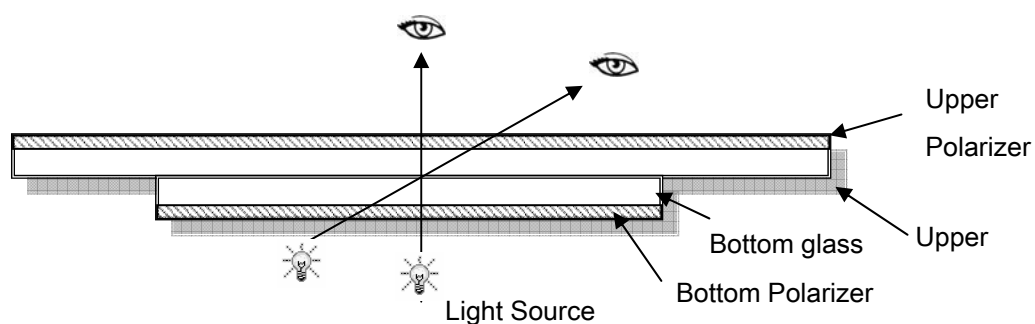
Temperature : $25 \pm 5^{\circ}\text{C}$

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

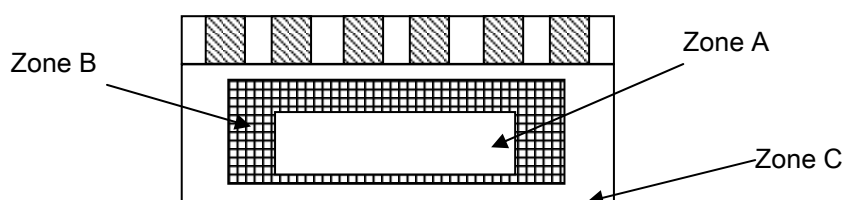
Viewing Angle : Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance: 30–50cm



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

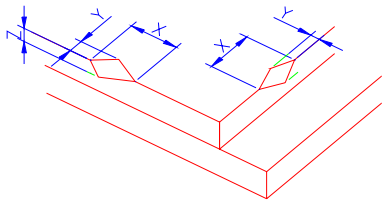
AQL:

Major defect	Minor defect
0.65	1.5

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

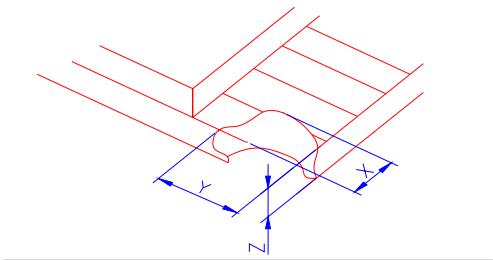
No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. 4) TP no function	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing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

7.1.4 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								

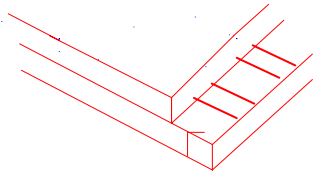
Z: Height
L: Length of
ITO,
T: Height of
LCD

(2)LCD corner broken

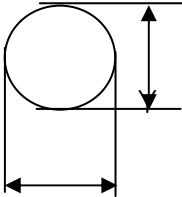


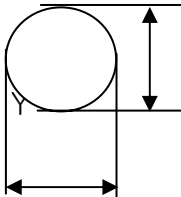
X	Y	Z
≤3.0mm	≤L	≤T

(3) LCD crack



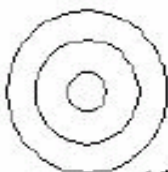
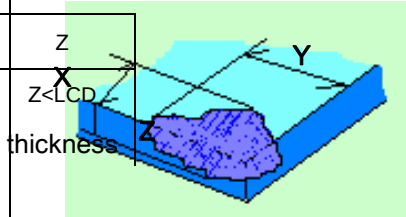
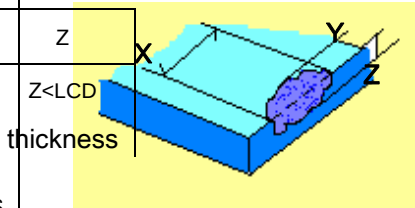
Crack
Not allowed

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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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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$\Phi>0.5$	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>$\Phi \leq 0.03$</td><td>Ignore</td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr><tr><td>$0.03 < W \leq 0.05$</td><td>$L \leq 3.0$</td><td colspan="2">$N \leq 2$</td></tr><tr><td>$0.05 < W \leq 0.08$</td><td>$L \leq 2.0$</td><td colspan="2">$N \leq 2$</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	$\Phi \leq 0.03$	Ignore	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			
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	Polarizer Bubble	<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>$\Phi \leq 0.2$</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr><tr><td>$0.2 < \Phi \leq 0.4$</td><td colspan="2">$2(\text{distance} \geq 10\text{mm})$</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 Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.2$	Ignore		Ignore	$0.2 < \Phi \leq 0.4$	$2(\text{distance} \geq 10\text{mm})$		$0.4 < \Phi \leq 0.6$	1		$0.6 < \Phi$	0							
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$0.6 < \Phi$	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="2">Ignore</td><td rowspan="4">Ignore</td></tr><tr><td>$0.1 < \Phi \leq 0.2$</td><td colspan="2">2</td></tr><tr><td>$0.2 < \Phi \leq 0.3$</td><td colspan="2">1</td></tr><tr><td>$0.3 < \Phi$</td><td colspan="2">0</td></tr></table>			Size Φ (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.1$	Ignore		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 NG	TP	Ring area	 1 规律性			
		Newton area≤1/3 OK	TP	Ring area	 2 非规律性				
					 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			
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X	Y								
X≤6.0mm	Y≤2.0mm								

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.