Version No.:	01

SPECIFICATIONS

MODEL NO.	YL050MY01
TYPE	LCD MODULE, 800(RGB) * 480 PIXELS,WITH CTP

CUSTOMER			YUNLEA		
APPROVED	CHECKED	CHECKED	APPROVED	CHECKED	PREPARED
			Pan 2014-3-17		LiXY 2014-3-17

☐ APPROVAL FOR SPECIFICATIONS ONLY

■ APPROVAL FOR SPECIFICATIONS AND SAMPLE

YUNLEA ELECTRONICS CO.,LTD.

RECORDS OF REVISION

DATE	REVISED NO.	REVISED DESCRIPTIONS	PREPARED	CHECKED	APPROVED
2014-3-17	01	FIRST ISSUE	LiXY		Pan

CONTENTS

1. GENERAL SPECIFICATIONS

1-1 SCOPE:

This specification covers the delivery requirements for the liquid crystal display delivered by YUNLEA ELECTRONIC to Customer。

1-2 PRODUCTS:

Liquid Crystal Display Module (LCM)

1-3 MODULE NAME:

YL050MY01

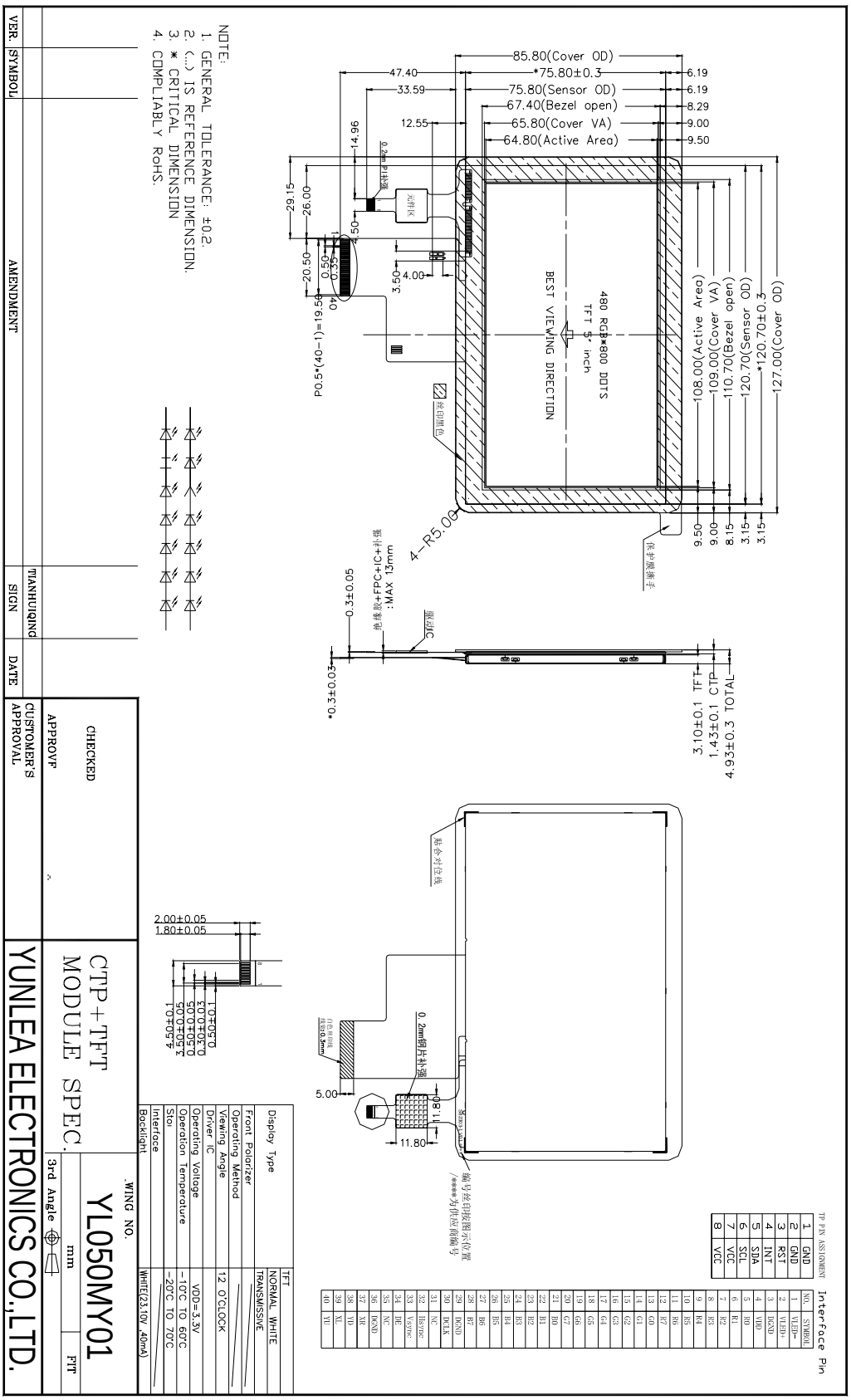
2. FEATURES

(1) Display Type: 5.0" a-Si TFT; 800RGB*480dots; 12 O'clock; transmissive; normally white; ,
(2) Driving Method: TFT
(3) Built-in controller:FT5316(CTP)
(4) With WHITE LED Backlight

3. MECHANICAL SPECIFICATIONS

ITEM	SPECIFICATIONS	UNIT
OUTLINE DIMEMSIONS	127.0(W) x85.8(H) x4.93 (T)	mm
ACTIVE AREA	108.00 (W) x64.80(H)	mm
DISP.CONSTRUCTION	800(RGB) x480 Dots	---
ASSY.TYPE	COG+FPC+BL+FRAME+CTP	---
BACKLIGHT	WHITE LED	—
WEIGHT	TBD	g

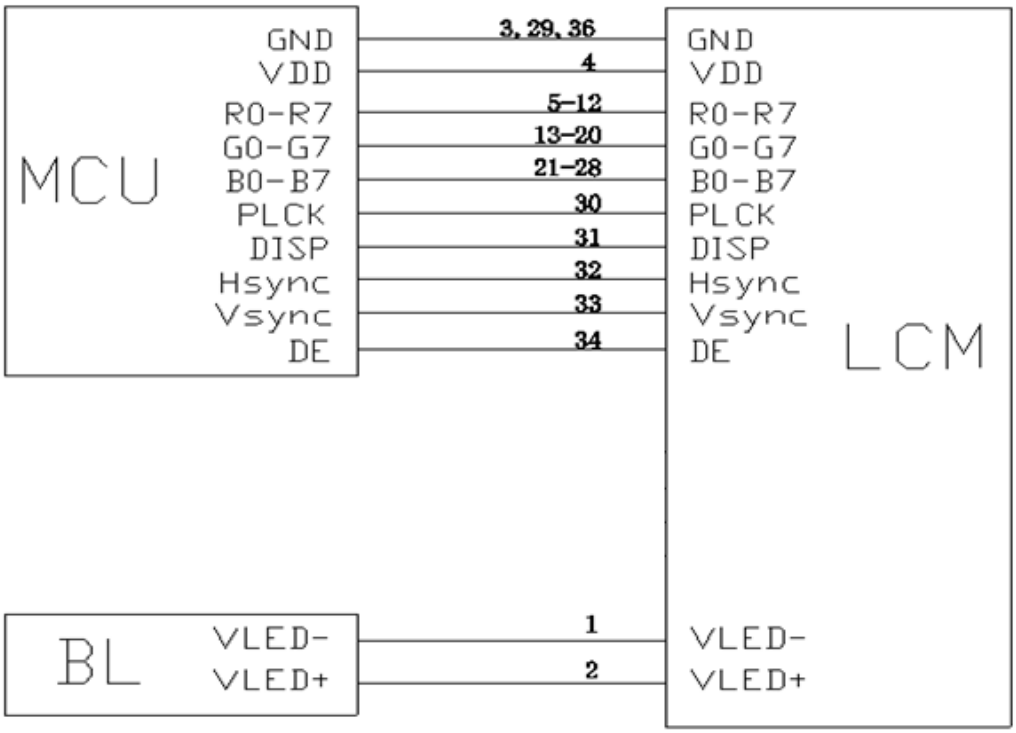
4.OUTLINEDIMENSIONS



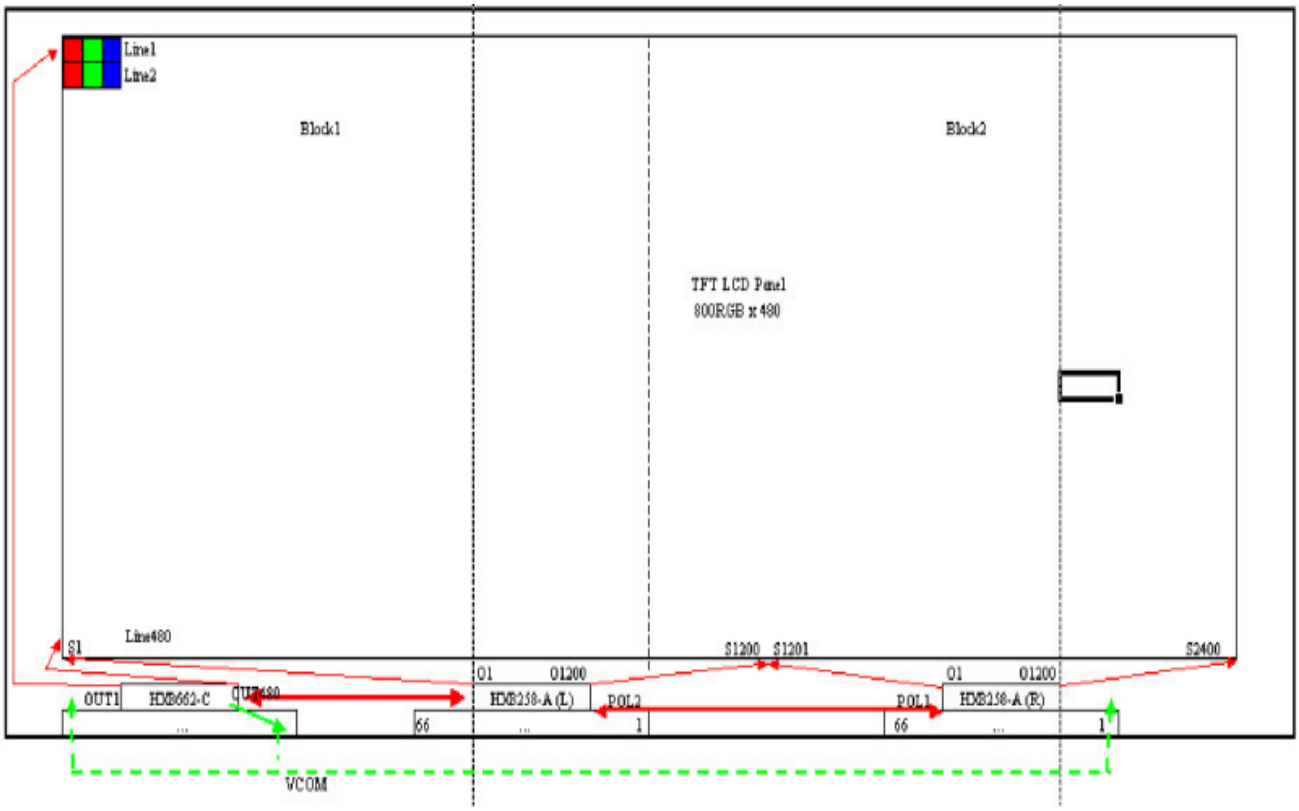
5. INTERFACE ASSIGNMENT

PIN NO.	FUNCTION DESCRIPTIONS	SYMBOL
1	Backlight Cathode	VLED-
2	Backlight Anode	VLED+
3	GND	GND
4	power source	VDD
5	Red data signal(LSB)	R0
6	Red data signal	R1
7	Red data signal	R2
8	Red data signal	R3
9	Red data signal	R4
10	Red data signal	R5
11	Red data signal	R6
12	Red data signal(MSB)	R7
13	Green data signal(LSB)	G0
14	Green data signal	G1
15	Green data signal	G2
16	Green data signal	G3
17	Green data signal	G4
18	Green data signal	G5
19	Green data signal	G6
20	Green data signal(MSB)	G7
21	Blue data signal(LSB)	B0
22	Blue data signal	B1
23	Blue data signal	B2
24	Blue data signal	B3
25	Blue data signal	B4
26	Blue data signal	B5
27	Blue data signal	B6
28	Blue data signal(MSB)	B7
29	GND	GND
30	Clock signal to sample each data	PCLK
31	Display ON/OFF control. Internally pulled high	DISP
32	Horizontal synchronizing signal	HSYNC
33	Vertical synchronizing signal	VSYNC
34	Input data enable control.	DE
35	NO CONNECT.	NC
36	GND	GND
37	TP Interfacefor XR or no connection	XR（NC）
38	TP Interfacefor YD or no connection	YD（NC）
39	TP Interfacefor XL or no connection	XL（NC）
40	TP Interfacefor YU or no connection	YU（NC）

6.APPLICATION CIRCUIT

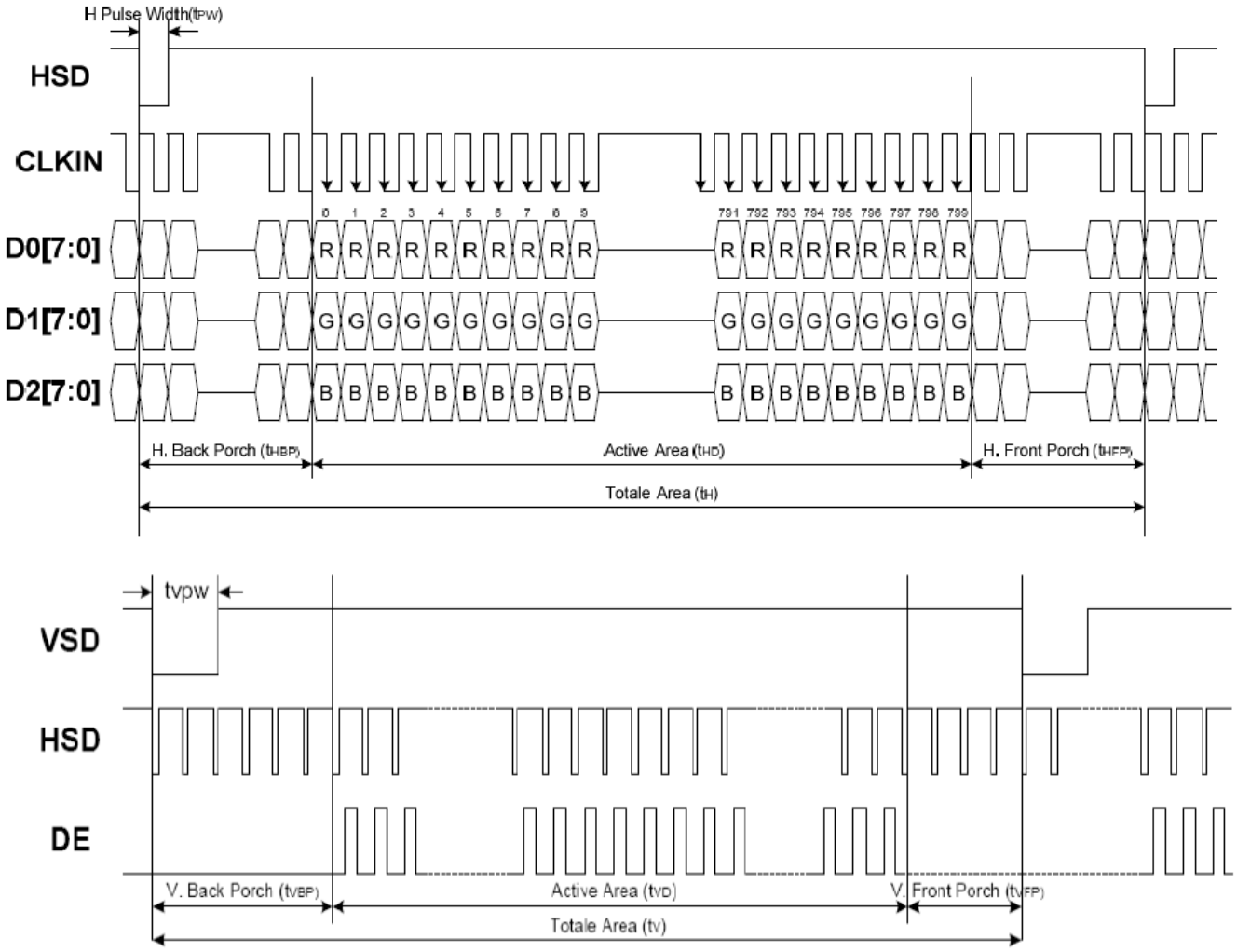


7. BLOCK DIAGRAM



8.TIMING CHARACTERISTICS

8.1 Parallel RGB input t requirement



Timing Table

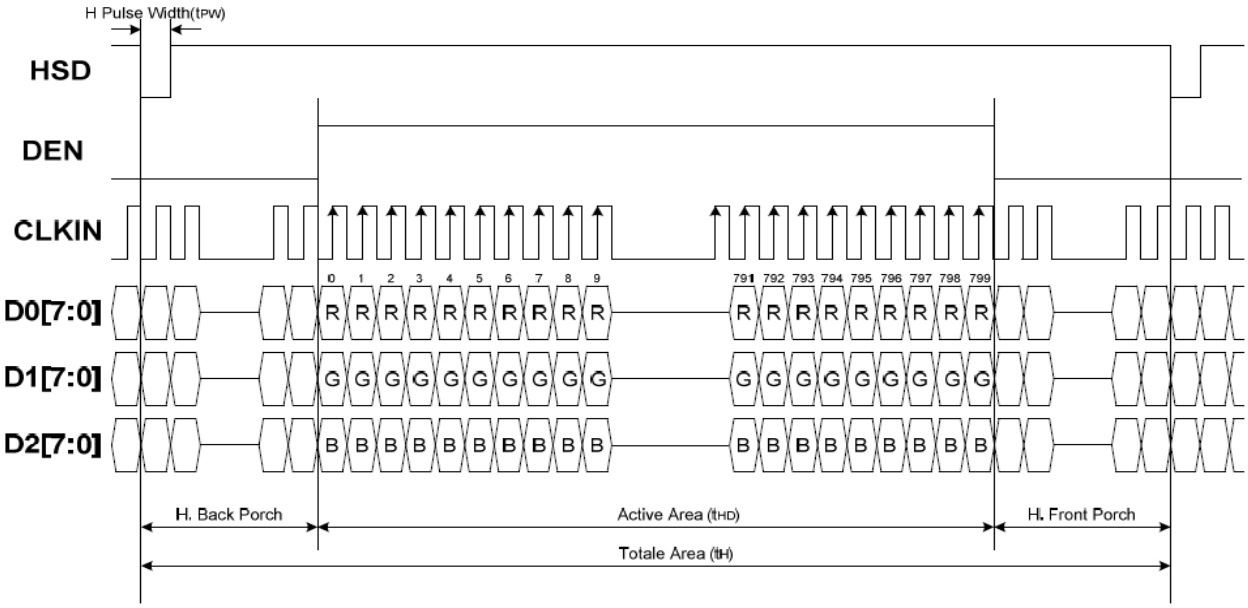
Parameter	Symbol	Spec			Unit	Conditions
		Min.	Typ.	Max.		
VDD Power ON slew rate	t_{POR}	--	--	20	ms	0V ~ 0.9VDD
RSTB pulse width	t_{RST}	10	--	--	us	CLKIN=50MHz
CLKIN cycle time	t_{CPH}	20	--	--	ns	
CLKIN pulse duty	t_{CWH}	40	50	60	%	
VSD setup time	t_{VST}	8	--	--	ns	
VSD hold time	t_{VHD}	8	--	--	ns	
HSD setup time	t_{HST}	8	--	--	ns	
HSD hold time	t_{HHD}	8	--	--	ns	
Data setup time	t_{DST}	8	--	--	ns	D0[7:0], D1[7:0], D2[7:0] to CLKIN
Data hold time	t_{DHD}	8	--	--	ns	D0[7:0], D1[7:0], D2[7:0] to CLKIN
DE setup time	t_{EST}	8	--	--	ns	
DE hold time	t_{EHD}	8	--	--	ns	
Output stable time	t_{SST}	--	--	6	us	10% to 90% target voltage. CL=120pF, R=10KΩ
CLKIN frequency	f_{CLK}	--	40	50	MHz	VDD=3.0 ~ 3.6V
CLKIN cycle time	t_{CLK}	20	25	--	ns	
CLKIN pulse duty	t_{CWH}	40	50	60	%	T_{CLK}
Time from HSD to Source output	t_{HSO}	--	20	--	CLKIN	
Time from HSD to LD	t_{HLD}	--	20	--	CLKIN	Note (2)
Time from HSD to STV	t_{HSTV}	--	2	--	CLKIN	
Time from HSD to CKV	t_{HCKV}	--	20	--	CLKIN	
Time from HSD to OEV	t_{HOEV}	--	4	--	CLKIN	
LD pulse width	t_{WLD}	--	10	--	CLKIN	Note (2)
CKV pulse width	t_{WCKV}	--	66	--	CLKIN	
OEV pulse width	t_{WOEV}	--	74	--	CLKIN	

Note: (1) VDD=3.0 ~ 3.6V, VDDA=6.5~13.5V, DGND=AGND=0V, Ta=-20~+85℃

(2) The contents of the data register are transferred to the latch circuit at the rising edge of LD. Then the gray scale voltage is output from the device at the falling edge of LD.

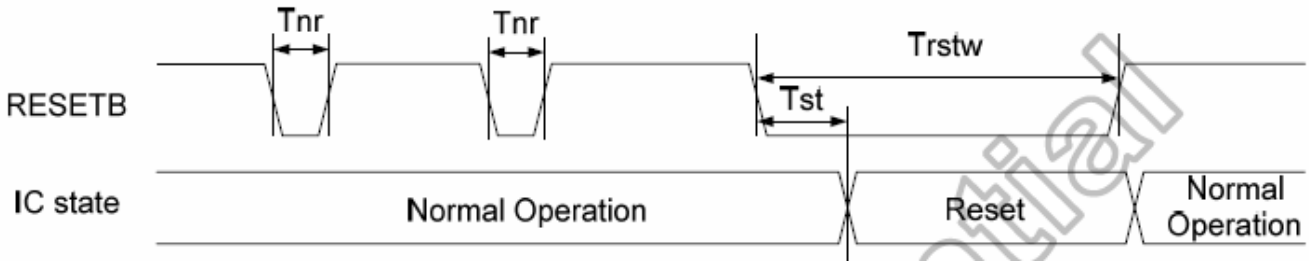
(3) Output loading condition :

8.2 DE Mode



9.RESET TIMING CHARACTERISTICS

PARAMETER	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
RESETB low pulse width	T_{rstw}	10	-	-	μs
Negative noise pulse width	T_{nr}		-	2	μs
Reset start time	T_{st}	2	-		μs



10. POWER ON/OFF SEQUENCE

To prevent the device damage from latch up, the power ON/OFF sequence shown below must be followed.

Power ON: VCC, GND → VDDA, VSS → V1 to V10
Power OFF: V1 to V10 → VDDA, VSS → VCC, GND

11. ABSOLUTE MAXIMUM RATING

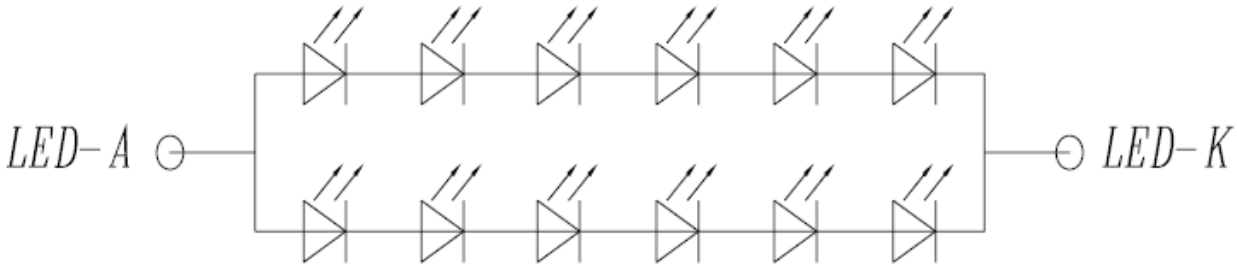
ITEM	SYMBOL	CONDITION	STANDARD VALUE			UNIT
			MIN	TYP	MAX	
POWER SUPPLY FOR LOGIC	IOVCC	Ta=25℃	-0.3	---	+3.6	V
INPUT VOLTAGE	VIN	Ta=25℃	-0.3	---	VCI+0.3	V
OPERATION TEMPERATURE	TOPR	---	-10	---	+60	℃
STORAGE TEMPERATURE	TSTG	---	-20	---	+70	℃

12. ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITIONS	STANDARD VALUE			UNIT
			MIN	TYP	MAX	
POWER SUPPLY VOLTAGE	VDD－VSS	Ta= +25℃	-	3.3	-	V
INPUT VOLTAGE “H” LEVEL	VIH	—	0.8VDD	—	VDD	V
INPUT VOLTAGE “L” LEVEL	VIL	—	VSS	—	0.2VDD	V
OUTPUT VOLTAGE “H” LEVEL	VOH	IOH=200uA	VDD-0.3	—	VDD	V
OUTPUT VOLTAGE “L” LEVEL	VOL	IOL=200uA	VSS	—	VSS+0.3	V

13. LED BACKLIGHT

13-1 POWER SUPPLY FOR LED BACKLIGHT



13-2 ABSOLUTE MAXIMUN RATING

PARAMETER	SYMBOL	SPECIFICATIONS	UNIT
POWER DISSIPATION	PD	792	mW
FORWARD CURRENT	IFm	40	mA
REVERSE VOLTAGE	VF	5.0 / LED	V
OPERATION TEMPERATURE	TOPR	-20℃ ～+70℃	℃
STORAGE TEMPERATURE	TSTG	-30℃ ～+80℃	℃

13-3 ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	LIGHT SOURCE	CONDITIONS	STANDARD VALUE			UNIT
				MIN	TYP	MAX	
PARAMETER	VF	WHITE	IF =40mA	18.6	19.8	21.0	V
LUMINOUS INTENSITY	Iv	WHITE	IF =40mA	200	250	375	cd/m2
Color of CIE(1931) coordinate	X	WHITE		0.25	—	0.29	nm
	Y	WHITE		0.25	—	0.29	nm

14. TOUCH PANEL SPECIFICATION

14.1. General Specification

No.	Item		Specification	Unit	Remark
1	CTP Size		5	inch	-
2	Panel Type		Glass Cover+Glass Sensor	-	-
3	Resolution		800 x 480	pixel	-
4	Module Size		127.00(W) x 85.80(H) x 1.43(D)	mm	Note1
5	Active Area		109.80(H) x 66.60(V)	mm	Note1
6	Surface Hardness		6H	-	-
7	Transparency		85%min	-	Note2
8	Driver IC		FT5316	-	-
9	Interface		I2C	-	-
10	Support Points		5	-	-
11	Rate		20-100	Hz	-
12	Power supply		2.8-3.3	V	-
13	Operating current	Normal mode	7.2(Typ.)	mA	-
		Green mode	3(Typ.)	mA	-
		Sleep mode	0.07-0.12	mA	-
14	Operating Temperature		-20~70	℃	-
15	Storage Temperature		-30~80	℃	-
16	ESD	Air	±8	KV	Note3
		Contact	±4	KV	Note3

Note1: Please refer to the mechanical drawing.

Note2: Wave Length 550nm.

Note3: Touch Panel Surface.

14.2. FPC PIN Assignment

PIN NO.	SYMBOL	FUNCTION DESCRIPTIONS
1	GND	Ground
2	GND	Ground
3	WAKE	Wake signal
4	INT	Interrupt signal（1.8V）
5	SDA	I2C data（1.8V）
6	SCL	I2C clock（1.8V）
7	VCC	Analog power supply（2.8-3.3V）
8	VCC	Analog power supply（2.8-3.3V）

14.3. Serial Interface

FT5316 supports the I2C interfaces, which can be used by a host processor or other devices.The I2C is always configured in the Slave mode. The data transfer format is shown in Figure 2-4.

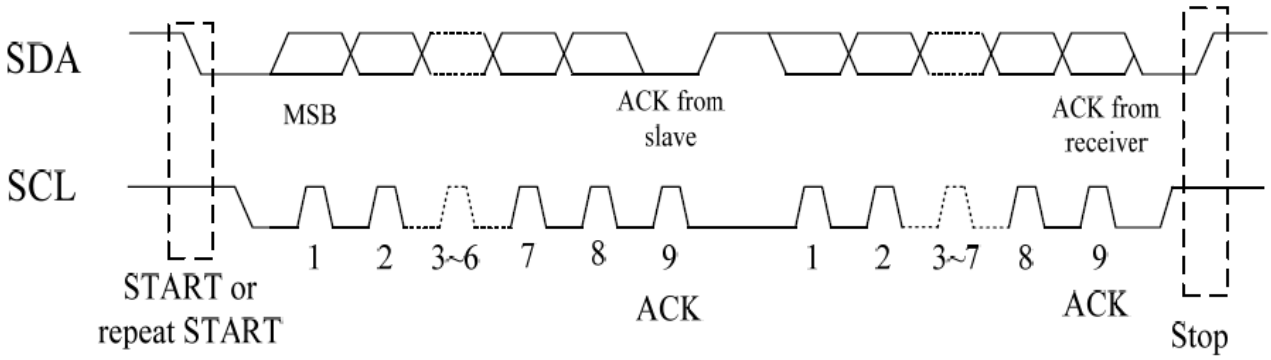


Figure 2-4 I2C Serial Data Transfer Format

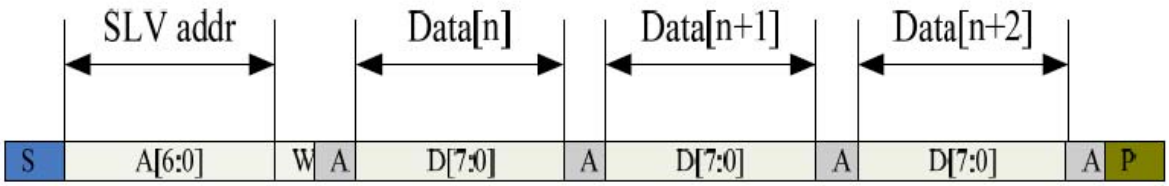


Figure 2-5 I2C master write, slave read

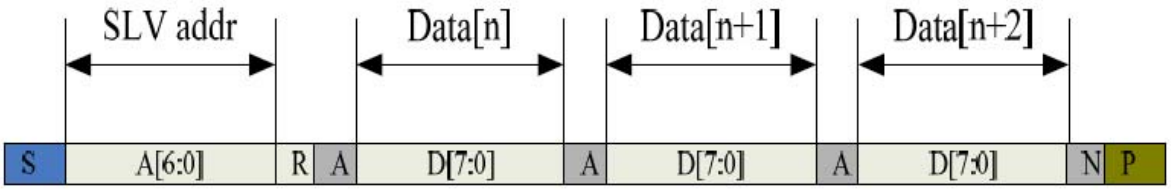


Figure 2-6 I2C master read, slave write

Table 2-1 lists the meanings of the mnemonics used in the above figures.

Table 2-1 Mnemonics Description

Mnemonics	Description
S	I2C Start or I2C Restart
A[6:0]	Slave address A[6:0]: address bits are identical to those of I2CADDR [7:1] register.
R/ W	'1' for read, '0'for write
A(N)	ACK(NACK)
P	STOP: the indication of the end of a packet (if this bit is missing, S will indicate the end of the current packet and the beginning of the next packet)

I2C Interface Timing Characteristics is shown in Table 2-2.

Table 2-2 I2C Timing Characteristics

Parameter	Unit	Min	Max
SCL frequency	KHz	0	400
Bus free time between a STOP and START condition	us	4.7	\
Hold time (repeated) START condition	us	4.0	\
Data setup time	ns	250	\
Setup time for a repeated START condition	us	4.7	\
Setup Time for STOP condition	us	4.0	\

14.4. Electrical Specifications

Absolute Maximum Ratings

Item	Symbol	Unit	Value	Note
Power Supply Voltage 1	VDDA - VSSA	V	-0.3 ~ +3.6	1, 2
Power Supply Voltage 2	VDD3 – VSS	V	-0.3 ~ +3.6	1, 3
I/O Digital Voltage	IOVCC	V	1.8~3.6	1
Operating Temperature	Topr	℃	-20 ~ +85	1
Storage Temperature	Tstg	℃	-55 ~ +150	1

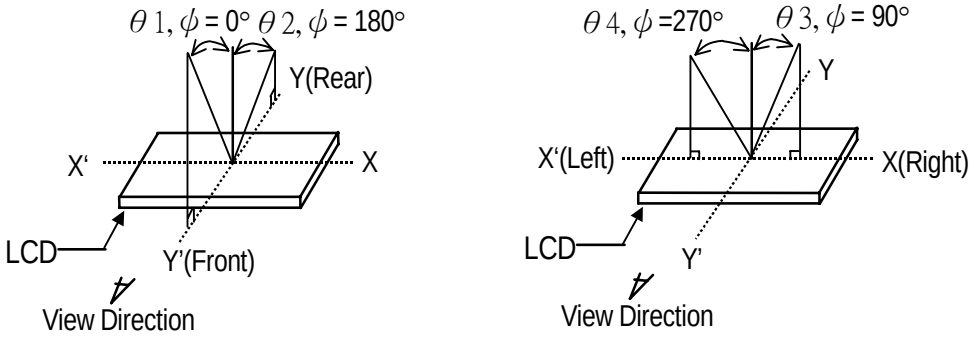
15.OPTICAL CHARACTERISTICS

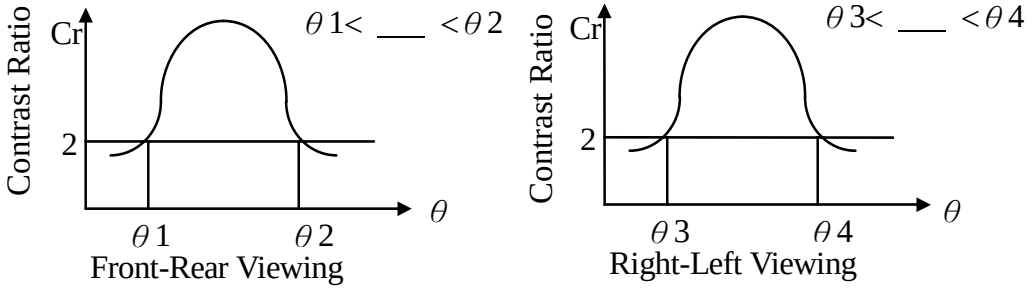
Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR≥ 10)	θ_L	Φ=180°(9 o'clock)	-	70	-	degree	Note 1
	θ_R	Φ=0°(3 o'clock)	-	70	-		
	θ_T	Φ=90°(12 o'clock)	-	50	-		
	θ_B	Φ=270°(6 o'clock)	-	70	-		
Response time	T_{ON}	Normal θ=Φ=0°	-	10	20	msec	Note 3
	T_{OFF}		-	10	20	msec	Note 3
Contrast ratio	CR		500	700	-	-	Note 4
Color chromaticity	W_X		0.26	0.31	0.36	-	Note 2 Note 5 Note 6
	W_Y		0.28	0.33	0.38	-	
Luminance	L		200	250	-	cd/m²	Note 6
Luminance uniformity	Y_U		70	75	-	%	Note 7

Test Conditions:

1. V_{DD}=3.3V, I_L=40mA (Backlight current), the ambient temperature is 25℃.
2. The test systems refer to Note 2.

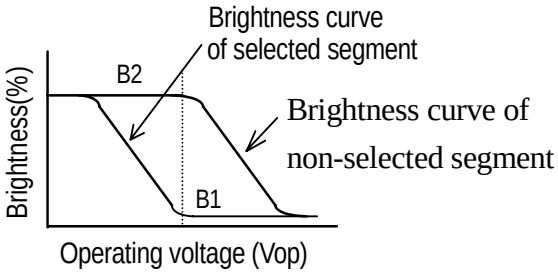
(1) DEFINITION OF VIEWING ANGLE



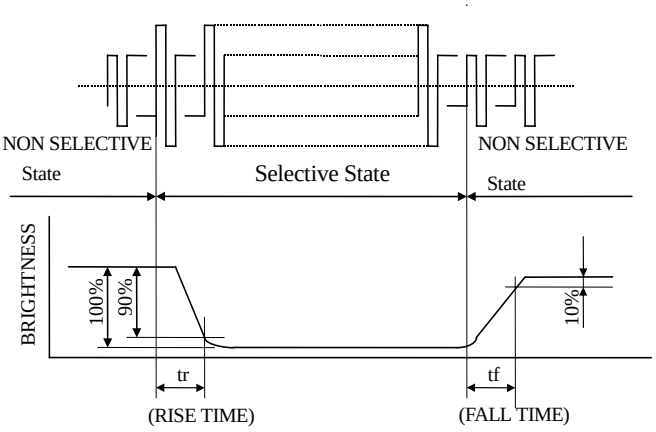


(2) DEFINITION OF CONTRAST

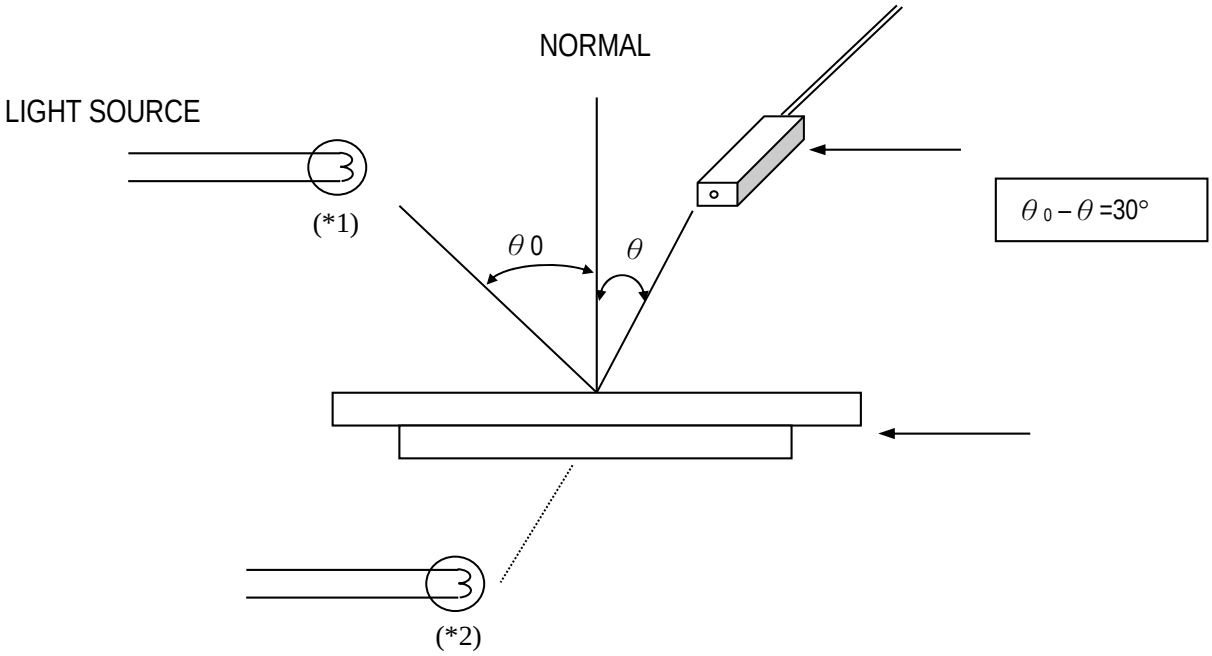
$$C.R = \frac{\text{Brightness of non-selected segment (B2)}}{\text{Brightness of selected segment (B1)}}$$



(3) DEFINITION OF RESPONSE



(4) MEASURING INSTRUMENTS FOR ELECTRO-OPTICAL CHARACTERISTICS



*1.Light source position for measuring the reflective type of LCD panel

*2.Light source position for measuring the transflective / transmissive types of LCD panel

16. ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	CONDITIONS	CRITERION
OPERATING TEMPERATURE	TOPR	-20℃～+70℃	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
STORAGE TEMPERATURE	TSTG	-30℃～+80℃	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
HUMIDITY	—	See Note	WITHOUT CONDENSATION

*NOTE: TEST CONDITION

(1)TEMPERATURE AND HUMIDITY: IF NO SPECIFICATION, TEMP. SET AT 25±2℃, HUMIDITY SET AT 60±5%RH

(2) OPERATING STATE: SAMPLES SUBJECT TO THE TESTS SHALL BE IN " OPERATING" CONDITION

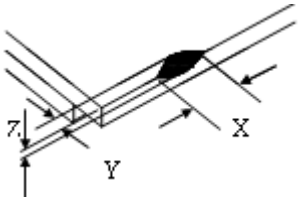
17.RELIABILITY TEST

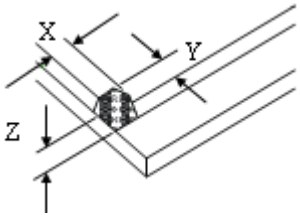
ITEM	CONDITIONS	CRITERION
OPERATING TEMPERATURE	HIGH TEMPERTURE +70℃ 48HRS	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
	LOW TEMPERTURE - 20℃ 48HRS	
STORAGE TEMPERATURE	HIGH TEMPERTURE +80℃ 48HRS	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
	LOW TEMPERTURE - 30℃ 48HRS	
HUMIDITY	40℃ 90%RH 48HRS	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
VIBRATION	• Operating Time: thirty minutes exposure for each direction (X,Y,Z) • Sweep Frequency: 10～55Hz (1 min) • Amplitude: 1.5mm	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
THERMAL SHOCK	-20℃(30mins) ←→+70℃(30mins) 10 cycles	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION

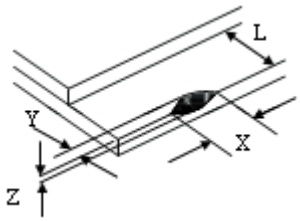
NOTE: The samples must be free from defect before test, must be restore at room condition at least for 2 hour after reliability test before any inspection.

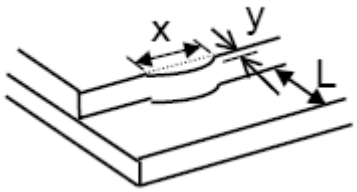
18.**THE STANDARD OF INSPECTION**

18-1 Inspection items and specification for appearance（power off）

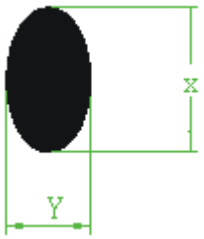
<table>
<tr><th>No.</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>1</td><td>Dimension</td><td>Dimension out of the specification</td><td>1.0</td></tr>
<tr><td>2</td><td>Glass crack</td><td>1、General crack
 

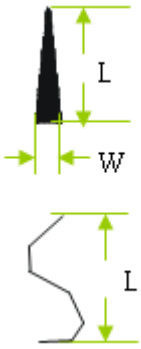
<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≥ K/8</td><td>Not over A area</td><td>≤T</td></tr>
</table>
2、corner
 

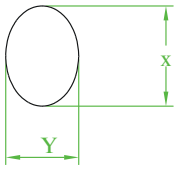
<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≥ K/8</td><td>Not over A area</td><td>No check</td></tr>
</table>
3、contact pad crack
 

<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≥ K/8</td><td>≥ L/3</td><td>No check</td></tr>
</table>
4、Substrate protuberance and internal crack
 

<table>
<tr><th>X</th><th>Y</th></tr>
<tr><td>≥ K/8</td><td>≥ L/3</td></tr>
</table>
Transfer position crack: ≤L/5</td><td>2.50</td></tr>
</table>

<table>
<tr><td>3</td><td>Black dot \ White dot</td><td>


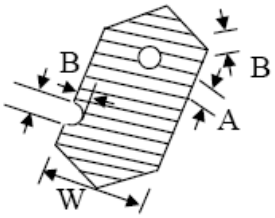
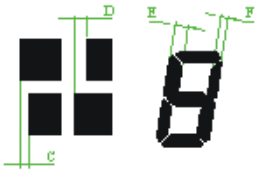
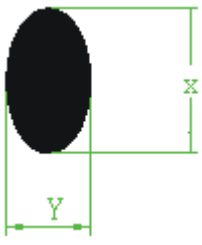
<table>
<tr><td rowspan="2">D</td><td colspan="2">Acceptable of defect</td></tr>
<tr><td>A/B Area</td><td>C Area</td></tr>
<tr><td>D＜0.2</td><td>No check</td><td rowspan="4">No check</td></tr>
<tr><td>0.2≤D＜0.3</td><td>2</td></tr>
<tr><td>0.3≤D≤0.5</td><td>1</td></tr>
<tr><td>D>0.5</td><td>0</td></tr>
</table>
X: long diameter
Y: shot diameter
D: average of diameter D=(X+Y)/2
</td><td>2.50</td></tr>
<tr><td>4</td><td>Line defect</td><td>


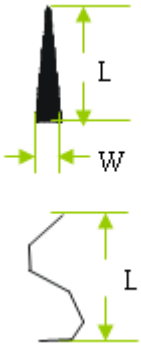
<table>
<tr><td rowspan="2">Length</td><td rowspan="2">Whidth</td><td colspan="2">Acceptable of defect</td></tr>
<tr><td>A/B Area</td><td>C Area</td></tr>
<tr><td>accept</td><td>W≤0.02</td><td>No check</td><td rowspan="3">No check</td></tr>
<tr><td>L≤3</td><td>W≤0.05</td><td>2</td></tr>
<tr><td rowspan="2">L≤2.5</td><td>W≤0.05</td><td>2</td></tr>
<tr><td>W＞0.05</td><td colspan="2">As round type</td></tr>
</table>
L: Length W: Width
Defect of polarizer (Scratches、Spot) : According to the limit specimen
</td><td>2.50</td></tr>
<tr><td>5</td><td>Polarizer Bubble</td><td>


<table>
<tr><td rowspan="2">D</td><td colspan="2">Acceptable of defect</td></tr>
<tr><td>A/B Area</td><td>C Area</td></tr>
<tr><td>D≤0.2</td><td>No check</td><td rowspan="4">No check</td></tr>
<tr><td>0.2≤D≤0.5</td><td>3</td></tr>
<tr><td>0.5≤D≤1.0</td><td>2</td></tr>
<tr><td>D＞1.0</td><td>0</td></tr>
</table>
</td><td>2.50</td></tr>
<tr><td>6</td><td>External print of panel</td><td>1、 Transfigure、pin hole：same as segment transfinguer
2、 Print width: print width ≥1/2 standard width is acceptable</td><td>2.50</td></tr>
<tr><td>7</td><td>Silicon glue</td><td>The area of painting silicon glue must cover the ITO circuit.</td><td>2.50</td></tr>
<tr><td>8</td><td>Defect of PCB</td><td>1、 The char 、wrong edition、bresking off circuit、crack and air-logged orifice are unreceivable for PCB.
2、 gold finger of PCB can not be oxidative、smudgy and broken..</td><td>2.50</td></tr>
</table>

9	SMT organ	1、 deflexion of component≤1/3width of component 2、 Trying to keep dot of soldering tin orbicular 3、 Damage 、break、 wrong assembly and unseal are unreceivable for component.	2.50
10	Steel Frame	1、 Break and distortion are unreceivable for frame. 2、 If there is one nick which can not lead to cast or hole of painting, we allow that following: Length≤5mm;Width≤0.3mm	2.50

18-2 Inspection items and specification for display defect（power on）

1	Electrical Defect	Segment missing: Not allow Segment short: Not allow Non-display: Not allow	1.0
2	Pin hole	1、Pin hole  width: Acceptable of defect W＜0.4: D≤0.2 & D≤1/2W W≥0.4: D≤0.25 & D≤1/3W * D=(A+B)/2 D≤0.1 acceptable	2.50
3	Display pattern	 Width: Acceptable of defect W＜0.4: C、D、G≤1/2W W≥0.4: C、D、G≤0.2 W: Design dimension C、D: discrepant dimension G=|E-F|	1.0
4	Black/white dot	 X: long diameter Y: shot diameter D: Acceptable QTY (A/B Area / C Area) D＜0.1: No check / No check 0.1≤D＜0.2: 2 / No check 0.2≤D≤0.25: 1 / No check D>0.25: 0 / No check	2.50

<table>
<tr><td></td><td></td><td colspan="3">D: average diameter D=(X+Y)/2</td><td></td></tr>
<tr><td>5</td><td>Line defect</td><td> 

L: length W: width</td><td colspan="2"><table>
<tr><td rowspan="2">Length</td><td rowspan="2">Width</td><td colspan="2">Acceptable QTY</td></tr>
<tr><td>A/B Area</td><td>C Area</td></tr>
<tr><td>不计</td><td>W≤0.02</td><td>No check</td><td rowspan="3">No check</td></tr>
<tr><td>L≤3</td><td>W≤0.03</td><td>2</td></tr>
<tr><td rowspan="2">L≤2.5</td><td>0.03<W≤0.05</td><td>2</td></tr>
<tr><td>W>0.05</td><td colspan="2">Sa round type</td></tr>
</table></td><td>2.50</td></tr>
</table>

19.USING LCD MODULES

19-1 LIQUID CRYSTAL DISPLAY MODULES

LCD is composed of glass and polarizer. Pay attention to the following items when handling.

(1) Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.

(2) Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.).

(3) N-hexane is recommended for cleaning the adhesives used to attach front/rear polarizers and reflectors made of organic substances which will be damaged by chemicals such as acetone, toluene, ethanol and isopropylalcohol.

(4) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, wipe gently with absorbent cotton or other soft material like chamois soaked in Isopropyl alcohol or Ethyl alcohol. Do not scrub hard to avoid damaging the display surface.

(5) Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading.

(6) Avoid contacting oil and fats.

(7) Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizers. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.

(8) Do not put or attach anything on the display area to avoid leaving marks on.

(9) Do not touch the display with bare hands. This will stain the display area and degradate insulation between terminals (some cosmetics are determinated to the polarizers).

(10) Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.

(11) As glass is fragile. It tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring.

19-2 PRECAUTION FOR HANDING LCD MODULES

Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the

module or making any alterations or modifications to it.

(1) Do not alter, modify or change the the shape of the tab on the metal frame.

(2) Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.

(3) Do not damage or modify the pattern writing on the printed circuit board.

(4) Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.

(5) Except for soldering the interface, do not make any alterations or modifications with a soldering iron.

(6) Do not drop, bend or twist LCM. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.

(7) In order to avoid the cracking of the FPC,you should to pay attention to the area of FPC where the FPC was bent .the edge of coverlay;the area of surface of Ni-Au plating,the area of soldering land,the area of through hole.

19-3 ELECTRO-STATIC DISCHARGE CONTROL

Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC.

(1) Make certain that you are grounded when handing LCM. To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules. - Exposed area of the printed circuit board. - Terminal electrode sections.

(2) Before remove LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential.

(3) When soldering the terminal of LCM, make certain the AC power source for the soldering iron does not leak.

(4) When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.

(5) As far as possible make the electric potential of your work clothes and that of the work bench the ground potential.

(6) To reduce the generation of static electricity be careful that the air in the work is not too dried. A relative humidity of 50%-60% is recommended.

19-4 PRECAUTIONS FOR OPERATION

(1) Viewing angle varies with the change of liquid crystal driving voltage (VO). Adjust VO to show the best contrast.

(2) Driving the LCD in the voltage above the limit shortens its life.

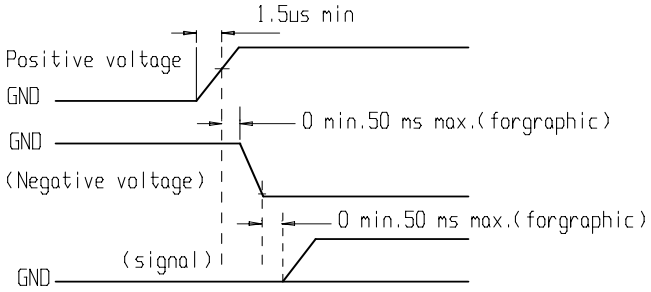
(3) If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.

(4) Response time is greatly delayed at temperature below the 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.

(5) If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.

(6) Condensation on terminals can cause an electrochemical reaction disrupting the terminal circuit. Therefore, it must be used under the relative condition of 40°C , 50% RH.

(7) When turning the power on, input each signal after the positive/negative voltage becomes stable.



19-5 STORAGE

When storing LCDs as spares for some years, the following precaution are necessary.

(1) Store them in a sealed polyethylene bag. If properly sealed, there is no need for dessicant.

(2) Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C.

3) The polarizer surface should not come in contact with any other objects. (We advise you to store them in the container in which they were shipped.)

(4) Environmental conditions :

- Do not leave them for more than 160hrs. at 70°C.
- Should not be left for more than 48hrs. at -20°C.

19-6 SAFETY

(1) It is recommended to crush damaged or unnecessary LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.

(2) If any liquid leakes out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

19-7 LIMITED WARRANTY

Unless agreed between YUNLEA and customer, YUNLEA will replace or repair any of its LCD modules which are foundtobefunctionallydefectivewheninspectedinaccordancewith YUNLEA LCDacceptancestandards(copies available upon request) for a period of one year from date of shipments. Cosmetic/visual defects must be returned to YUNLEA within90daysofshipment.Confirmationofsuchdateshallbebasedonfreightdocuments.Thewarrantyliability of YUNLEA limited to repairand/orreplacement on the terms setforth above.YUNLEA will not be responsible for any subsequent or consequential events.

19-8 RETURN LCM UNDER WARRANTY

No warranty can be granted if the precautions stated above have been disregarded. The typical examples of violations are :

- Broken LCD glass.
- Circuit modified in any way, including addition of components.

Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB's eyelet, conductors and terminals.