



# SPECIFICATION FOR LCD MODULE

MODULE NO: YB-TG480800S13A-N-B0

Doc.Version:03

Customer Approval:

☐ Accept

☐ Reject

YEEBO	NAME	SIGNATURE	DATE
Prepare	Electronic Engineer	傅國展	2018/1/3
Check	Mechanical Engineer	林西芳	2018/1/3
Verify		黎志凱	2018/1/3
Approval		何景益	2018/1/3

☐ APPROVAL FOR SPECIFICATIONS ONLY

☒ APPROVAL FOR SPECIFICATIONS AND SAMPLE

WIMRD005-02-D

## 1. Revision History

[illegible]

## **2. Table of Contents:**

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**3. Module Numbering System:**

(Example)

**YB-TG240320S01D-T-A0**

Sample Version: A0~Z0

T: With Resistive Touch panel  
C: With Capacitive Touch panel  
N: Without Touch panel

Version: A~Z

Serial No: 01~99

S: STD Product  
C: Customer MadeDisplay Function:  
Segment Number of Segment  
Characters Lines of Character  
Column and Row of Graphic  
Length \* Width of OtherLCM Display Type  
C: Character Type ;  
G: Graphic Type ;  
GB: Graphic Black/White Type ; (For E-paper)  
GC: Graphic Color Type ; (For E-paper)  
S: Segment TypeLCD Model:  
C: CSTN; T: TFT; L: LTPS; O: OLED;  
P: PLED; S: B/W STN; E: E-paper ;  
Y: Yeetek; N: Others;

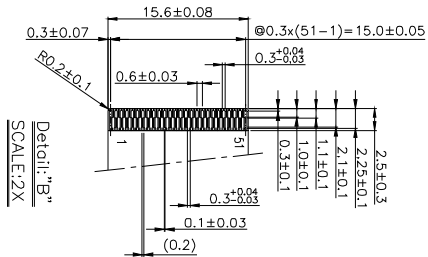
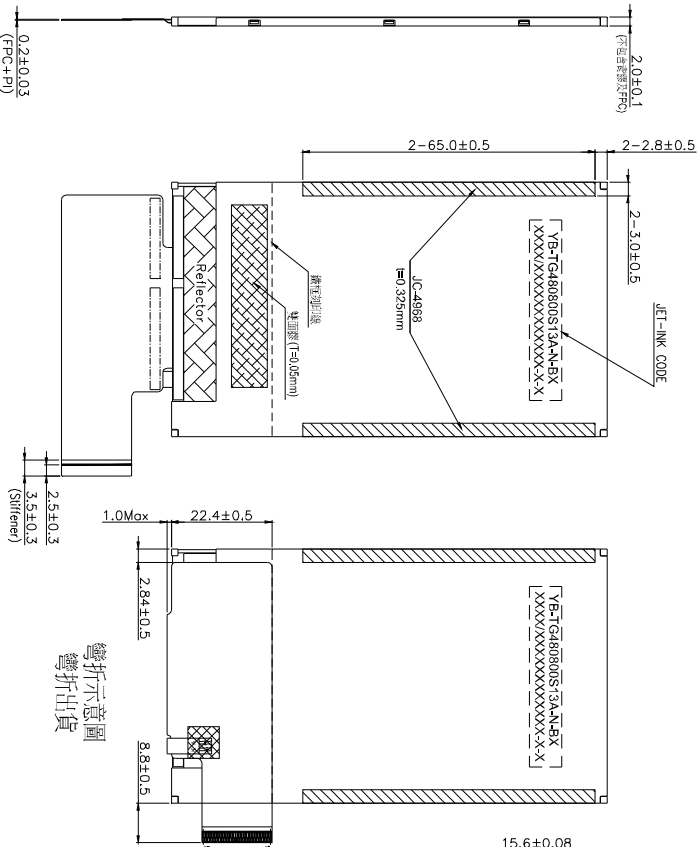
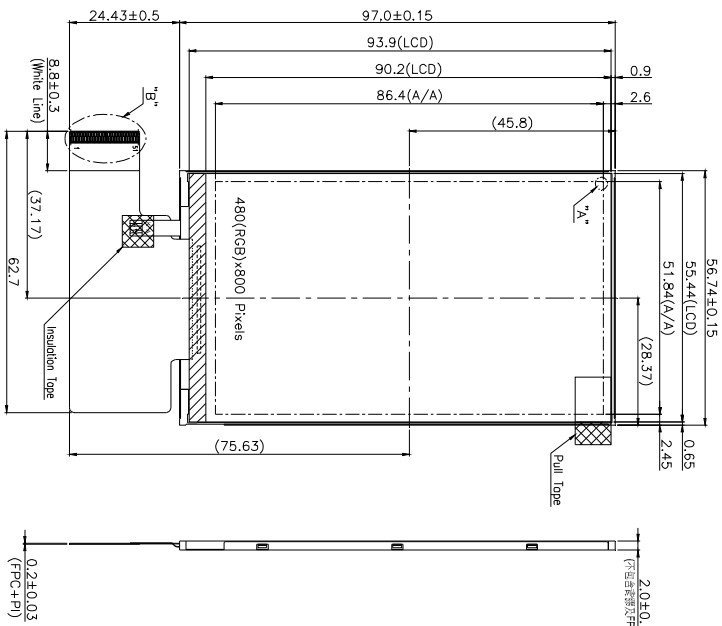
YEEBO

#### **4. General Specification:**

ITEM	CONTENTS
Module Size	56.74 (W) * 97.00 (H) * 2.0 (T) mm
Module Size(With FPC)	65.54 (W) * 121.43 (H) * 2.0 (T) mm
Display Size(Diagonal)	3.97 inch
Display Format	480(RGB) * 800 Pixels
Active Area	51.84 (W) * 86.4 (H) mm
Pixel Pitch	0.108*0.108 mm
LCD Type	16.7M Color / Transmissive / Normal Black
View Direction	Free
Controller IC	ST7701S
Weight	23.52g

### **5. LCM drawing:**

Count drawing & Spec,revision record during discussion with customer		
Rec.	Revision content description	Date
#1	FIRST ISSUE	2017-06-12



51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0																																																																																																																																																																																																																																																																																																																																																																																								
TE	LED_PWM	VS	HS	GND	PCLK	GND	DE	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7	DB8	DB9	DB10	DB11	DB12	DB13	DB14	DB15	DB16	DB17	DB18	DB19	DB20	DB21	DB22	DB23	DB24	DB25	DB26	DB27	DB28	DB29	DB30	DB31	DB32	DB33	DB34	DB35	DB36	DB37	DB38	DB39	DB40	DB41	DB42	DB43	DB44	DB45	DB46	DB47	DB48	DB49	DB50	DB51	DB52	DB53	DB54	DB55	DB56	DB57	DB58	DB59	DB60	DB61	DB62	DB63	DB64	DB65	DB66	DB67	DB68	DB69	DB70	DB71	DB72	DB73	DB74	DB75	DB76	DB77	DB78	DB79	DB80	DB81	DB82	DB83	DB84	DB85	DB86	DB87	DB88	DB89	DB90	DB91	DB92	DB93	DB94	DB95	DB96	DB97	DB98	DB99	DB100	DB101	DB102	DB103	DB104	DB105	DB106	DB107	DB108	DB109	DB110	DB111	DB112	DB113	DB114	DB115	DB116	DB117	DB118	DB119	DB120	DB121	DB122	DB123	DB124	DB125	DB126	DB127	DB128	DB129	DB130	DB131	DB132	DB133	DB134	DB135	DB136	DB137	DB138	DB139	DB140	DB141	DB142	DB143	DB144	DB145	DB146	DB147	DB148	DB149	DB150	DB151	DB152	DB153	DB154	DB155	DB156	DB157	DB158	DB159	DB160	DB161	DB162	DB163	DB164	DB165	DB166	DB167	DB168	DB169	DB170	DB171	DB172	DB173	DB174	DB175	DB176	DB177	DB178	DB179	DB180	DB181	DB182	DB183	DB184	DB185	DB186	DB187	DB188	DB189	DB190	DB191	DB192	DB193	DB194	DB195	DB196	DB197	DB198	DB199	DB200	DB201	DB202	DB203	DB204	DB205	DB206	DB207	DB208	DB209	DB210	DB211	DB212	DB213	DB214	DB215	DB216	DB217	DB218	DB219	DB220	DB221	DB222	DB223	DB224	DB225	DB226	DB227	DB228	DB229	DB230	DB231	DB232	DB233	DB234	DB235	DB236	DB237	DB238	DB239	DB240	DB241	DB242	DB243	DB244	DB245	DB246	DB247	DB248	DB249	DB250	DB251	DB252	DB253	DB254	DB255	DB256	DB257	DB258	DB259	DB260	DB261	DB262	DB263	DB264	DB265	DB266	DB267	DB268	DB269	DB270	DB271	DB272	DB273	DB274	DB275	DB276	DB277	DB278	DB279	DB280	DB281	DB282	DB283	DB284	DB285	DB286	DB287	DB288	DB289	DB290	DB291	DB292	DB293	DB294	DB295	DB296	DB297	DB298	DB299	DB300	DB301	DB302	DB303	DB304	DB305	DB306	DB307	DB308	DB309	DB310	DB311	DB312	DB313	DB314	DB315	DB316	DB317	DB318	DB319	DB320	DB321	DB322	DB323	DB324	DB325	DB326	DB327	DB328	DB329	DB330	DB331	DB332	DB333	DB334	DB335	DB336	DB337	DB338	DB339	DB340	DB341	DB342	DB343	DB344	DB345	DB346	DB347	DB348	DB349	DB350	DB351	DB352	DB353	DB354	DB355	DB356	DB357	DB358	DB359	DB360	DB361	DB362	DB363	DB364	DB365	DB366	DB367	DB368	DB369	DB370	DB371	DB372	DB373	DB374	DB375	DB376	DB377	DB378	DB379	DB380	DB381	DB382	DB383	DB384	DB385	DB386	DB387	DB388	DB389	DB390	DB391	DB392	DB393	DB394	DB395	DB396	DB397	DB398	DB399	DB400	DB401	DB402	DB403	DB404	DB405	DB406	DB407	DB408	DB409	DB410	DB411	DB412	DB413	DB414	DB415	DB416	DB417	DB418	DB419

**Specification:**



1. Display mode: 3.97" TFT / Normal Black/ Transmissive
  2. Display Color: 16.7M
  3. Viewing Direction: Full View
  4. Controller IC: ST7701S or Compatible
  5. Operating temperature: -20°C to +70°C
  6. Storage temperature: -30°C to +80°C
  7. Backlight: 8 chips White LED(LED MUST HAVE JAPAN PATENT RIGHT)
  8. Unspecified tolerance:  $\pm 0.30\text{mm}$ .
  9. ROHS compliant

**CIRCUIT DIAGRAM**  
**B/L Electrical Circuit**

**JET-INK CODE NOTES:**

YB-TG480800S13A-N-BX — Yeebo P/N.  
XXXX/XXXXXXXXXXXXX-X-X

- LOT NO.  
- Production Year and weekPixel Detail  
Scale:50X

 	UNIT	SIZE	SCALE	MOD. Name YB-TG480800S13A-N-B	DESIGNED 林麗芬 2017-06-12	CHECKED	VERIFIED	APPROVED	Sheet	1
	mm	A4	N-T-S						Of	1
Count Dwg.										

## 6. Electrical Characteristics

### 6-1 Absolute Maximum Ratings

(Ta=25°C)

Item	Symbol	Min.	Type	Max.	Unit	Remark
Power Supply Voltage	V <sub>DD</sub>	-0.3	-	4.8	V	
Supply Voltage(Logic)	V <sub>DDI</sub>	-0.3	-	4.6	V	
Logic Input Voltage Range	V <sub>IH</sub>	-0.3	-	V <sub>DDI</sub> +0.5	V	
Logic Output Voltage Range	V <sub>OH</sub>	-0.3	-	V <sub>DDI</sub> +0.5	V	
Operating Temperature	T <sub>opr</sub>	-20	-	+70	°C	
Storage Temperature	T <sub>stg</sub>	-30	-	+80	°C	

Note : Even if the absolute maximum rating of one of the above parameters is exceeded only for a short while, the quality of the product may be degraded. Therefore, be sure to use the product within the range of the absolute maximum ratings.

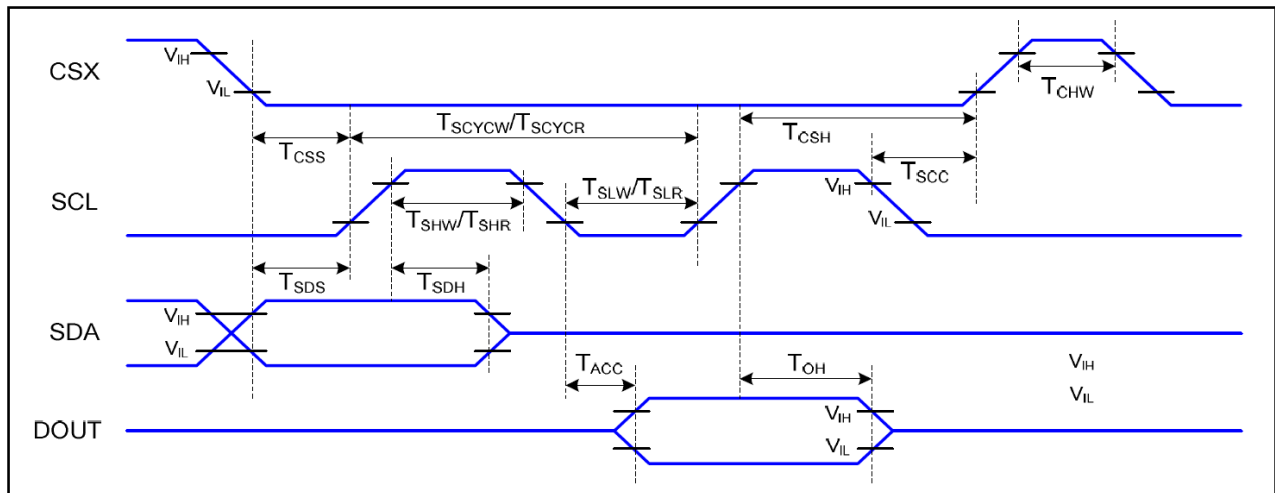
### 6-2 Operating Conditions

(Ta=25°C )

Item	Symbol	Condition	Min.	Type	Max.	Unit	Remark
Power Supply Voltage	V <sub>DD</sub>	-	2.5	2.8	3.6	V	
Supply Voltage(Logic)	V <sub>DDI</sub>	-	1.68	2.8	3.3	V	
IO Supply Voltage	V <sub>IH</sub>	-	0.7 V <sub>DDI</sub>	-	V <sub>DDI</sub>	V	
	V <sub>IL</sub>	-	V <sub>SS</sub>	-	0.3 V <sub>DDI</sub>	V	
	V <sub>OH</sub>	-	0.8 V <sub>DDI</sub>	-	V <sub>DDI</sub>	mA	
	V <sub>OL</sub>	-	V <sub>SS</sub>	-	0.2 V <sub>DDI</sub>	V	
Power Supply Current	I <sub>DD</sub>	V <sub>DD</sub> =2.8V	-	47	70.5	mA	

## 6-3 AC Characteristics

### Serial Interface Characteristics (3-line serial):



### 3-line serial interface timing characteristics

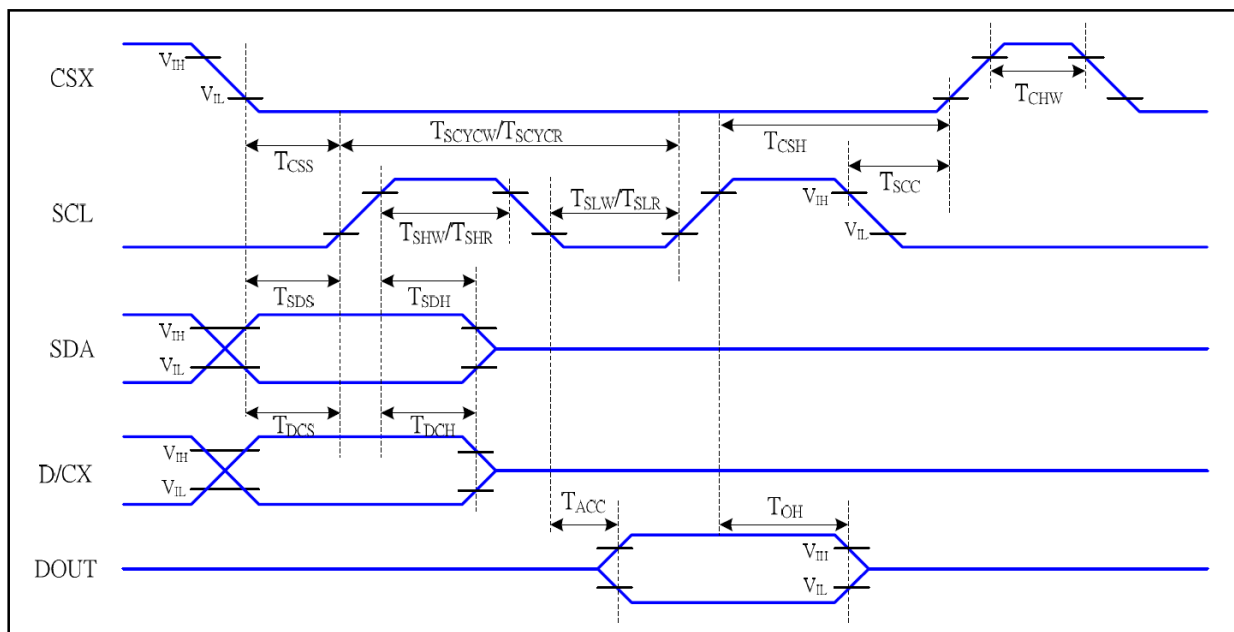
$V_{DDI}=1.8, V_{DD}=2.8, AGND=DGND=0V, T_a=25^{\circ}C$

Signal	Symbol	Parameter	Min	Max	Unit	Description
CSX	$T_{CSS}$	Chip select setup time (write)	15		ns	
	$T_{CSH}$	Chip select hold time (write)	15		ns	
	$T_{CSS}$	Chip select setup time (read)	60		ns	
	$T_{SCC}$	Chip select hold time (read)	60		ns	
	$T_{CHW}$	Chip select "H" pulse width	40		ns	
SCL	$T_{SCYCW}$	Serial clock cycle (Write)	66		ns	
	$T_{SHW}$	SCL "H" pulse width (Write)	15		ns	
	$T_{SLW}$	SCL "L" pulse width (Write)	15		ns	
	$T_{SCYCR}$	Serial clock cycle (Read)	150		ns	
	$T_{SHR}$	SCL "H" pulse width (Read)	60		ns	
	$T_{SLR}$	SCL "L" pulse width (Read)	60		ns	
SDA (DIN)	$T_{SDS}$	Data setup time	10		ns	
	$T_{SDH}$	Data hold time	10		ns	

### 3-line serial interface timing characteristics



## Serial Interface Characteristics (4-line serial):



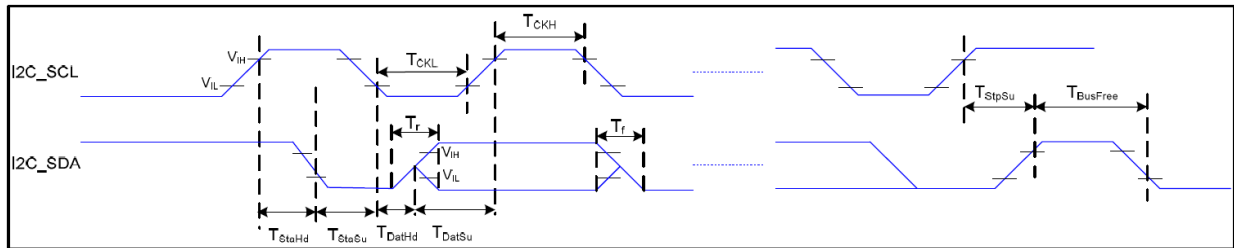
4-line serial interface timing characteristics

$V_{DDI}=1.8, V_{DD}=2.8, AGND=DGND=0V, T_a=25\text{ }^{\circ}\text{C}$

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
CSX	$T_{CSS}$	Chip select setup time (write)	15		ns	
	$T_{CSH}$	Chip select hold time (write)	15		ns	
	$T_{CSS}$	Chip select setup time (read)	60		ns	
	$T_{SCC}$	Chip select hold time (read)	65		ns	
	$T_{CHW}$	Chip select "H" pulse width	40		ns	
SCL	$T_{SCYCW}$	Serial clock cycle (Write)	66		ns	-write command & data ram
	$T_{SHW}$	SCL "H" pulse width (Write)	15		ns	
	$T_{SLW}$	SCL "L" pulse width (Write)	15		ns	
	$T_{SCYCR}$	Serial clock cycle (Read)	150		ns	-read command & data ram
	$T_{SHR}$	SCL "H" pulse width (Read)	60		ns	
	$T_{SLR}$	SCL "L" pulse width (Read)	60		ns	
D/CX	$T_{DCS}$	D/CX setup time	10		ns	
	$T_{DCH}$	D/CX hold time	10		ns	
SDA (DIN)	$T_{SDS}$	Data setup time	10		ns	
	$T_{SDH}$	Data hold time	10		ns	

4-line serial interface timing characteristics

## Serial Interface Characteristics (I2C):



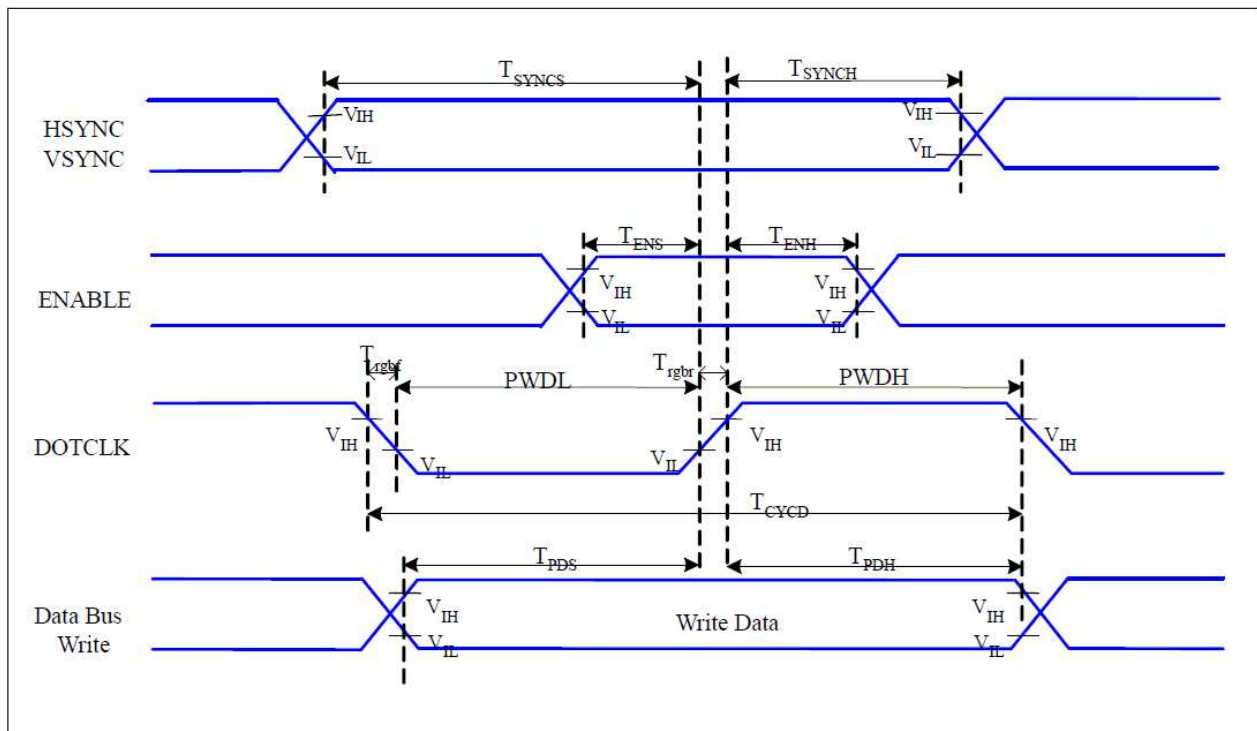
I2C interface timing characteristics

VDDI=1.8, VDD=2.8, AGND=DGND=0V, Ta=25 °C

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
I2C SCL	$T_{CKL} + T_{CKH}$	Working frequency	-	400	KHz	
	$T_{CKL}$	SCL "H" pulse width	1.3	-	us	
	$T_{CKH}$	SCL "L" pulse width	0.6	-	us	
I2C SDA	$T_r$	Data rising time	20	300	ns	
	$T_f$	Data falling time	20	300	ns	
	$T_{SDS}$	Data setup time	100	-	ns	
	$T_{SDH}$	Data hold time	0	0.9	us	
	$T_{StaSU}$	Start condition setup time	0.6	-	us	
	$T_{StaHD}$	Start condition hold time	0.6	-	us	
	$T_{StpSU}$	Stop condition setup time	0.6	-	us	
	$T_{BusFREE}$	Bus free time	1.3	-	us	

I2C interface timing characteristics

## RGB Interface Characteristics:



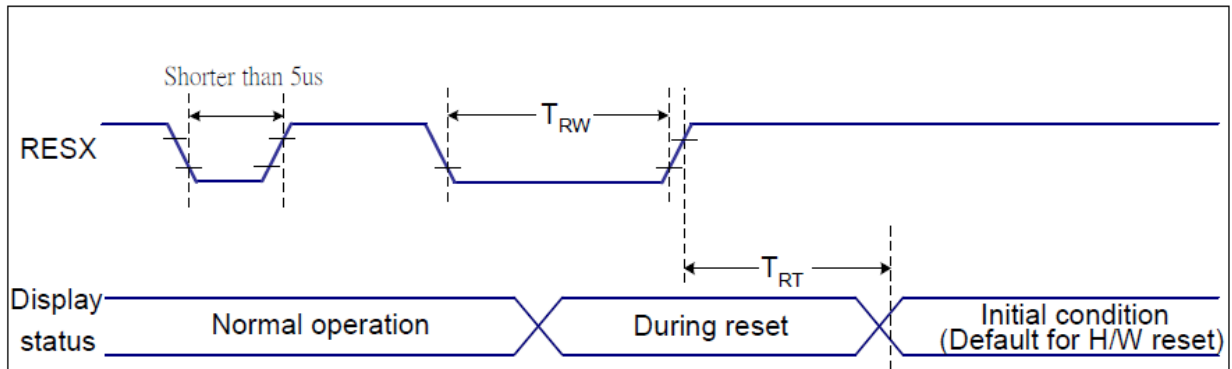
RGB interface timing characteristics

$V_{DDI}=1.8, V_{DD}=2.8, A_{GND}=D_{GND}=0V, T_a=25\text{ }^{\circ}\text{C}$

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
HSYNC, VSYNC	$T_{SYNCS}$	VSYNC, HSYNC Setup Time	5	-	ns	
ENABLE	$T_{ENS}$	Enable Setup Time	5	-	ns	
	$T_{ENH}$	Enable Hold Time	5	-	ns	
DOTCLK	PWDH	DOTCLK High-level Pulse Width	13	-	ns	
	PWDL	DOTCLK Low-level Pulse Width	13	-	ns	
	$T_{CYCD}$	DOTCLK Cycle Time	28	-	ns	
	$T_{rgbr}, T_{rgbf}$	DOTCLK Rise/Fall time	-	15	ns	
DB	$T_{PDS}$	PD Data Setup Time	5	-	ns	
	$T_{PDH}$	PD Data Hold Time	5	-	ns	

RGB interface timing characteristics

## Reset Timing



$V_{DDI}=1.8, V_{DD}=2.8, AGND=DGND=0V, T_a=25\text{ }^{\circ}\text{C}$

Related Pins	Symbol	Parameter	MIN	MAX	Unit
RESX	TRW	Reset pulse duration	10	-	us
	TRT	Reset cancel	-	5 (Note 1, 5)	ms
				120 (Note 1, 6, 7)	ms

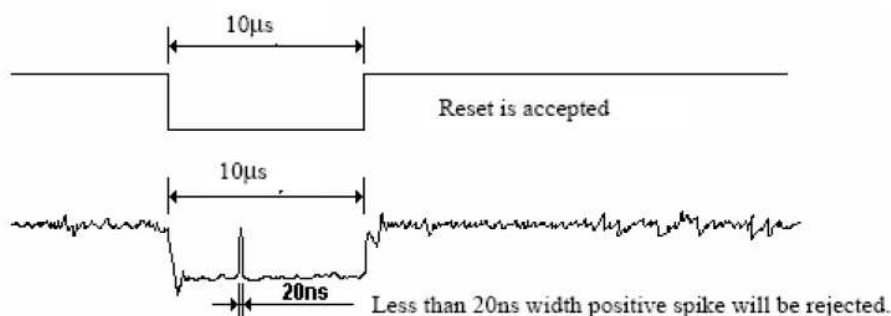
**Notes:**

1. The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from NVM (or similar device) to registers. This loading is done every time when there is HW reset cancel time ( $t_{RT}$ ) within 5 ms after a rising edge of RESX.
2. Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below:

RESX Pulse	Action
Shorter than 5 $\mu$ s	Reset Rejected
Longer than 9 $\mu$ s	Reset
Between 5 $\mu$ s and 9 $\mu$ s	Reset starts

3. During the Resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In –mode.) and then return to Default condition for Hardware Reset.

4. Spike Rejection also applies during a valid reset pulse as shown below:



5. When Reset applied during Sleep In Mode.
6. When Reset applied during Sleep Out Mode.
7. It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

## Power ON/OFF Sequence

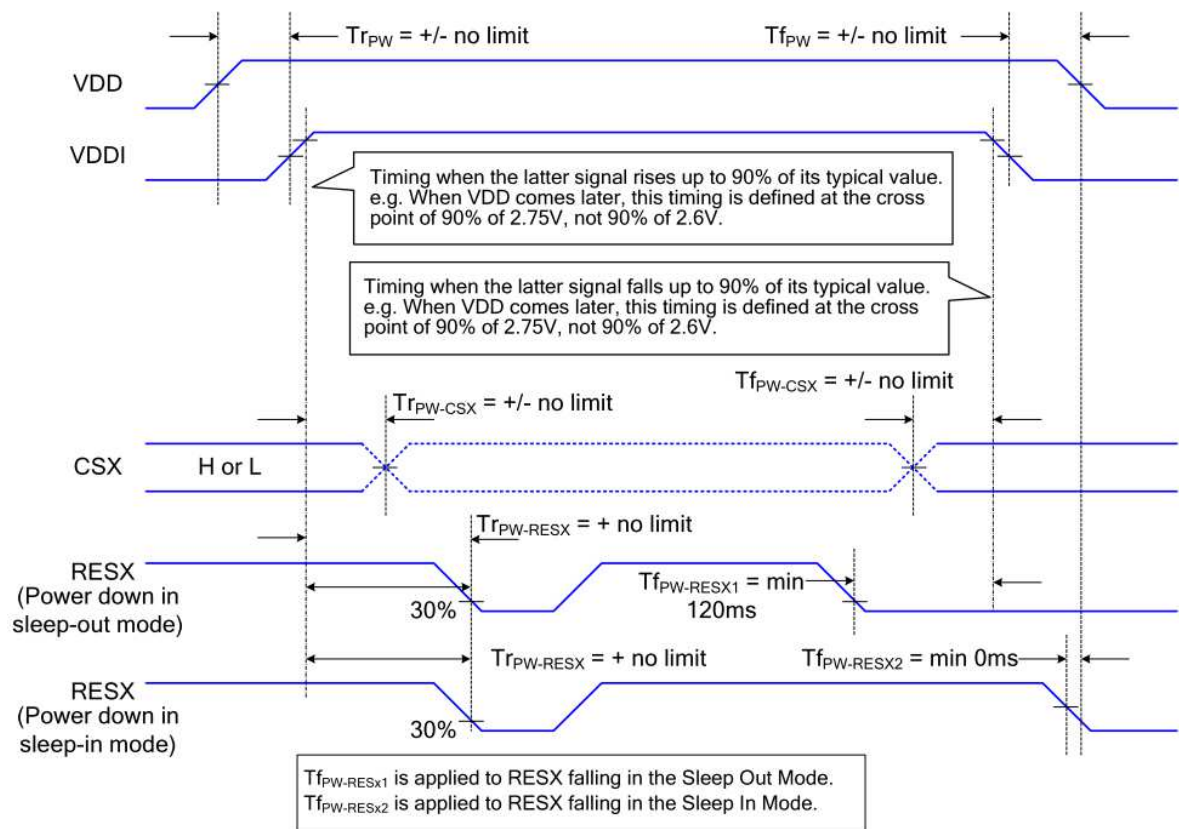
VDDI and VDDA can be applied or powered down in any order. During the Power Off sequence, if the LCD is in the Sleep Out mode, VDDA and VDDI must be powered down with minimum 120msec. If the LCD is in the Sleep In mode, VDDA and VDDI can be powered down with minimum 0msec after the RESX is released.

CSX can be applied at any timing or can be permanently grounded. RESX has high priority over CSX.

**Notes:**

1. There will be no damage to the ST7701 if the power sequences are not met.
2. There will be no abnormal visible effects on the display panel during the Power On/Off Sequences.
3. There will be no abnormal visible effects on the display between the end of Power On Sequence and before receiving the Sleep Out command, and also between receiving the Sleep In command and the Power Off Sequence.
4. If the RESX line is not steadily held by the host during the Power On Sequence as defined in Sections 9.1 and 9.2, then it will be necessary to apply the Hardware Reset (RESX) after the completion of the Host Power On Sequence to ensure correct operations. Otherwise, all the functions are not guaranteed.

The power on/off sequence is illustrated below



## 7. Optical Characteristics:

Item		Symbol	Conditions	Specifications			Unit	Note
				Min	Typ	Max		
Transmittance		T(%)	-	-	4.14	-	-	-
Contrast Ratio		CR	$\theta=0^\circ$ Normal Viewing Angle	720	900	-		(1) (2)
Response time		TR+TF		-	35	45	ms	(1) (3)
NTSC		-	-	-	70	-	%	Note 1
Viewing Angle	Hor.	$\theta_{x+}$	$CR \geq 10$	-	80	-	deg.	(1)
		$\theta_{x-}$		-	80	-		
	Ver.	$\theta_{y+}$		-	80	-		
		$\theta_{y-}$		-	80	-		

### Measuring Condition

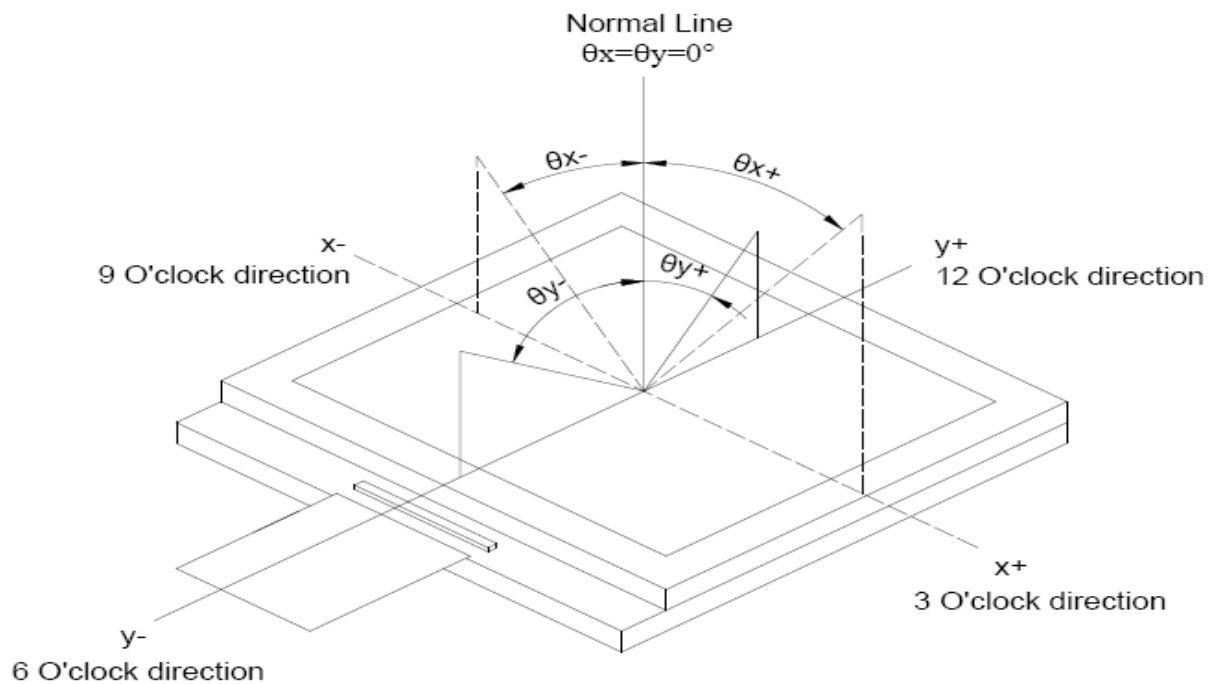
1. Measuring surrounding: dark room
2. Ambient temperature:  $25 \pm 2^\circ\text{C}$
3. 30 min. Warm-up time.

### Color of CIE Coordinate:

( $T_a=25^\circ\text{C}$ )

Item		Symbol	Condition	Min.	Typ.	Max.
Chromaticity Coordinates (Transmissive)	Red	x	$\theta = \varphi = 0^\circ$ LED Backlight	0.585	0.635	0.685
		y		0.294	0.344	0.394
	Green	x		0.282	0.332	0.382
		y		0.550	0.600	0.650
	Blue	x		0.092	0.142	0.192
		y		0.050	0.100	0.150
	White	x		0.259	0.309	0.359
		y		0.288	0.338	0.388

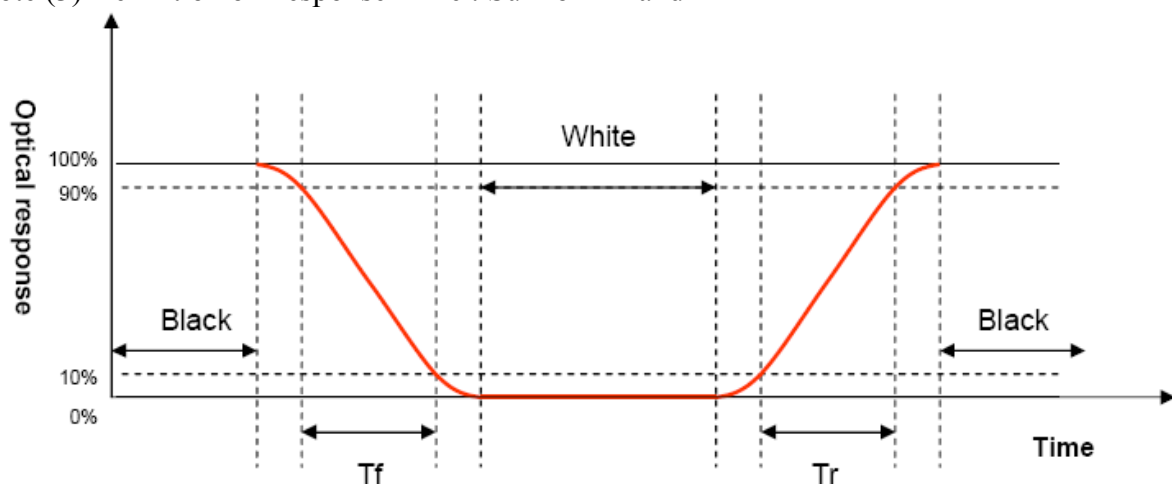
Note (1) Definition of Viewing Angle :



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

$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector output when LCD is at "Black" state}}$$

Note (3) Definition of Response Time : Sum of TR and TF



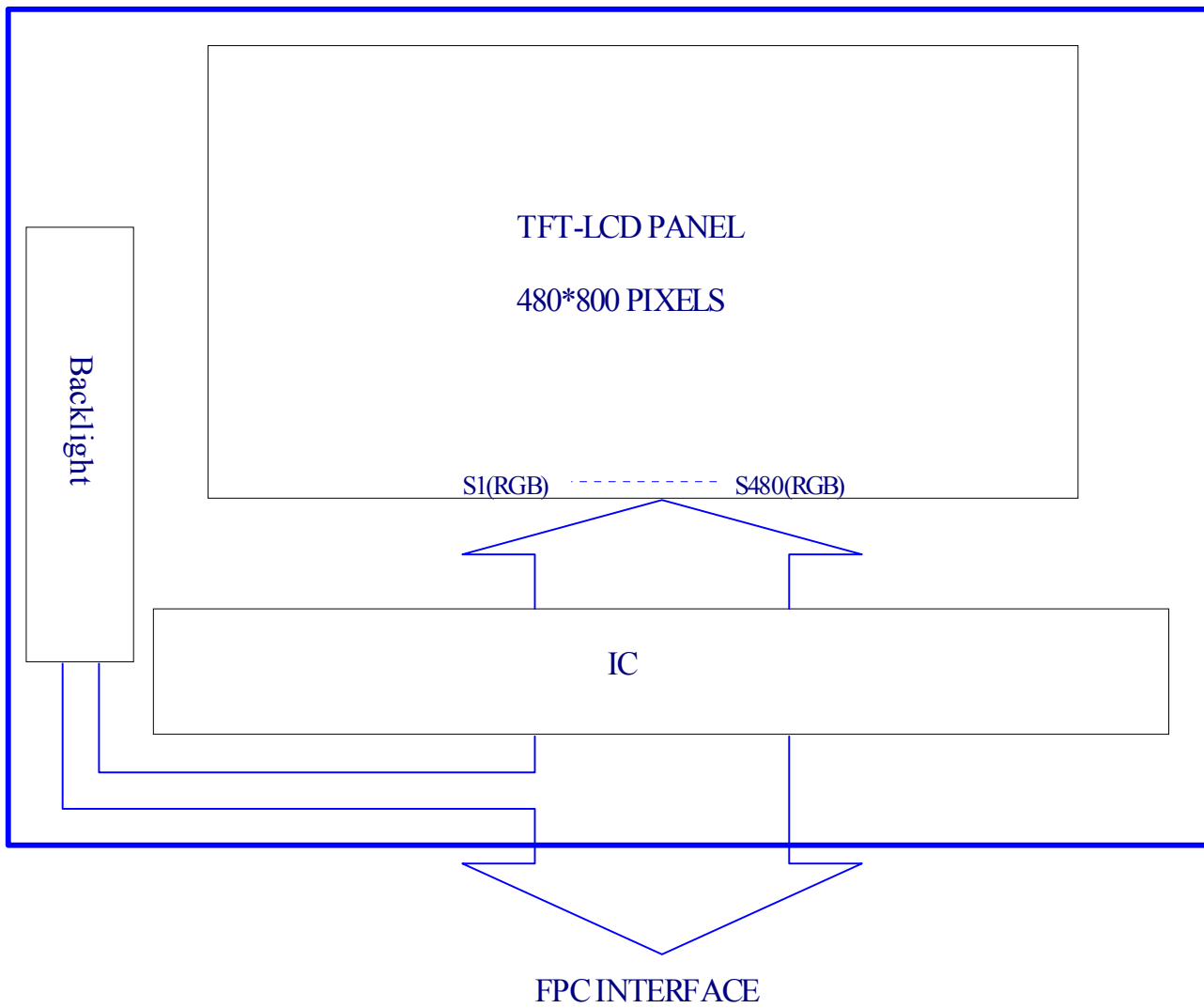


## 8. Interface Pin Assignment:

No.	Symbol	Function					Remark																																			
1	LED_K	LED cathode																																								
2	LED_A	LED anode																																								
3	NC	Not connect.																																								
4	NC	Not connect.																																								
5	NC	Not connect.																																								
6	NC	Not connect.																																								
7	VDD	Power Supply for analog Voltage																																								
8	VDDI	Power Supply for logic Voltage																																								
9	IM3	<table><tr><th>IM3</th><th>IM2</th><th>IM1</th><th>IM0</th><th>MPU Interface Mode</th></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td><td>RGB+8b SPI (fall)</td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td><td>RGB+9b SPI (fall)</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td><td>RGB+16b SPI (rise)</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td><td>RGB+8b SPI (rise)</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td><td>RGB+9b SPI (rise)</td></tr><tr><td>1</td><td>0</td><td>1</td><td>1</td><td>RGB+16b SPI (fall)</td></tr></table>					IM3	IM2	IM1	IM0	MPU Interface Mode	0	0	0	1	RGB+8b SPI (fall)	0	0	1	0	RGB+9b SPI (fall)	0	0	1	1	RGB+16b SPI (rise)	1	0	0	1	RGB+8b SPI (rise)	1	0	1	0	RGB+9b SPI (rise)	1	0	1	1	RGB+16b SPI (fall)	
IM3	IM2						IM1	IM0	MPU Interface Mode																																	
0	0	0	1	RGB+8b SPI (fall)																																						
0	0	1	0	RGB+9b SPI (fall)																																						
0	0	1	1	RGB+16b SPI (rise)																																						
1	0	0	1	RGB+8b SPI (rise)																																						
1	0	1	0	RGB+9b SPI (rise)																																						
1	0	1	1	RGB+16b SPI (fall)																																						
10	IM2																																									
11	IM1																																									
12	IM0																																									
13	SDO	Serial data output pin used the for SPI interface																																								
14	SDA	Serial data input/output bidirectional pin for SPI interface Serial input data for I2C interface.																																								
15	DCX	Data /command select pin.The SPI interface (DCX): The signal for command or parameter select. Low: Command High: Parameter																																								
16	SCL	Write enable clock input pin Serial clock input for SPI interface. Serial input clock for I2C interface.																																								
17	NC	Not connect																																								
18	CSX	Chip select input pin Low: the chip is selected and accessible High: the chip is not selected and not accessible.																																								
19	RESX	Reset pin																																								
20	DB23	Data bus																																								
21	DB22	Data bus																																								
22	DB21	Data bus																																								
23	DB20	Data bus																																								
24	DB19	Data bus																																								
25	DB18	Data bus																																								
26	DB17	Data bus																																								
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29	DB14	Data bus																																								
30	DB13	Data bus																																								
31	DB12	Data bus																																								

No.	Symbol	Function	Remark
32	DB11	Data bus	
33	DB10	Data bus	
34	DB9	Data bus	
35	DB8	Data bus	
36	DB7	Data bus	
37	DB6	Data bus	
38	DB5	Data bus	
39	DB4	Data bus	
40	DB3	Data bus	
41	DB2	Data bus	
42	DB1	Data bus	
43	DB0	Data bus	
44	DE	Data enable signal in RGB interface.	
45	GND	Ground	
46	PCLK	RGB clock	
47	GND	Ground	
48	HS	Horizontal synchronizing signal in RGB interface.	
49	VS	Vertical synchronizing signal in RGB interface.	
50	TE	Tearing effect pin	
51	LED_PWM	Backlight control	

**9. Block Diagram:**



## 10. Backlight:

### 1. Standard Lamp Styles (Edge Lighting Type):

The LED chips are distributed over the edge light area of the illumination unit, which gives the less power consumption:

### 2. The Main Advantages of the LED Backlight are as following:

2.1 The brightness of the backlight can simply be adjusted.

By a resistor or a potentiometer.

### 3. Data About LED Backlight:

(Ta=25°C)

PARAMETER	Sym.	Min.	Typ.	Max.	Unit	Test Condition	Note
Supply Current	I	-	20	-	mA	V=24.0V	
Supply Voltage	V	22.0	24.0	27.2	V	If=20mA	
Luminous Intensity for LCM	IV	220	280	-	cd/m <sup>2</sup>		2
Uniformity for LCM	-	80	-	-	%		3
Life Time	-	20000	-	-	Hr.		4
Color	White						

NOTE:

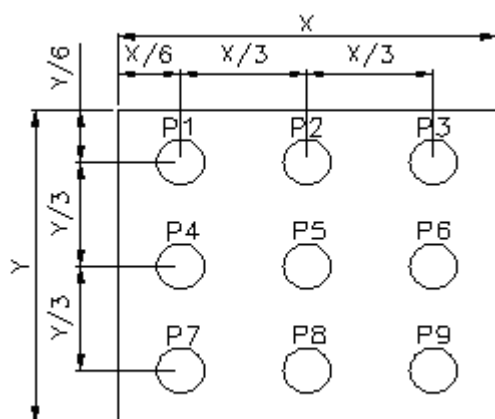
1. Backlight Only

2. Average Luminous Intensity of P1-P9

3. Uniformity = Min/Max \* 100%

4. LED life time defined as follows: The final brightness is at 50% of original brightness

**Measured Method: (X\*Y: Light Area)**



**Internal Circuit Diagram**



LED CIRCUIT DIAGRAM

**(Effective spatial Distribution)**

Using aperture of 1°, distance 50cm

## **11. Standard Specification for Reliability:**

### 11-1. Standard Specifications for Reliability of LCD Module

No	Item	Description
01	High temperature operation	The sample should be allowed to stand at 70℃ for 120 hours under driving condition and then returning it to normal temperature condition, and allowing it stand for 2 hours.
02	Low temperature operation	The sample should be allowed to stand at -20℃ for 120 hours under driving condition and then returning it to normal temperature condition, and allowing it stand for 2 hours.
03	High temperature storage	The sample should be allowed to stand at 80℃ for 240 hours under no-load condition, and then returning it to normal temperature condition, and allowing it stand for 2 hours.
04	Low temperature storage	The sample should be allowed to stand at -30℃ for 240 hours under no-load condition, then returning it to normal temperature condition, and allowing it stand for 2 hours.
05	Moisture storage	The sample should be allowed to stand at 60℃,90%RH MAX for 240 hours under no-load condition, then taking it out and drying it at normal temperature for 2 hours.
06	Thermal shock storage	The sample should be allowed to stand the following 10 cycles : -20℃ for 30 minutes → normal temperature for 5 minutes → +60℃ for 30 minutes → normal temperature for 5 minutes, as one cycle.
07	Packing vibration	Frequency range : 10Hz ~ 55Hz Amplitude of vibration : 1.5mm      Sweep time: 12 min X,Y,Z 2 hours for each direction.
08	Packing drop test	According to ISTA 1A 2001.
09	Electrical Static Discharge	Air: ±4KV 150pF/330Ω 5 times
		Contact: ±2KV 150pF/330Ω 5 time

\*Sample size for each test item is 3~5pcs

## 11 - 2. Testing Conditions and Inspection Criteria

For the final test the testing sample must be stored at room temperature for 24 hours, after the tests listed in Table 11.2, Standard specifications for Reliability have been executed in order to ensure stability.

No	Item	Test Model	In section Criteria
01	Current Consumption	Refer To Specification	The current consumption should conform to the product specification.
02	Contrast	Refer To Specification	After the tests have been executed, the contrast must be larger than half of its initial value prior to the tests.
03	Appearance	Visual inspection	Defect free.

## 11- 3. MTBF

MTBF	Functions, performance, appearance, etc. shall be free from remarkable deterioration within 50,000 hours under ordinary operating and storage conditions room temperature ( $25\pm 5^{\circ}\text{C}$ ), normal humidity ( $50\pm 10\%$ RH), and in area not exposed to direct sun light.
------	---

## **12. Specification of Quality Assurance:**

### 12-1. Purpose

This standard for Quality Assurance should affirm the quality of LCD module products to supply to purchaser by YEEBO CORPORATION (Supplier).

### 12-2. Standard for Quality Test

#### a. Inspection:

Before delivering, the supplier should take the following tests, and affirm the quality of product.

#### b. Electro-Optical Characteristics:

According to the individual specification to test the product.

#### c. Test of Appearance Characteristics:

According to the individual specification to test the product.

#### d. Test of Reliability Characteristics:

According to the definition of reliability on the specification for testing products.

#### e. Delivery Test:

Before delivering, the supplier should take the delivery test.

(i) Test method: According to ISO2859-1. General Inspection Level II take a single time.

(ii) The defects classify of AQL as following:

Major defect: AQL = 0.65%

Minor defect: AQL = 2.5%

Total defects: AQL = 2.5%

### 12-3. Non- conforming Analysis & Deal With Manners

#### a. Non- conforming Analysis:

(i) Purchaser should supply the detail data of non- conforming sample and the non- conforming.

(ii) After accepting the detail data from purchaser, the analysis of non- conforming should be finished in two weeks.

(iii) If supplier can not finish analysis on time, must announce purchaser before 3 days.

#### b. Disposition of non- conforming:

(i) If find any product defect of supplier during assembly time, supplier must change the good product for every defect after recognition.

(ii) Both supplier and customer should analyze the reason and discuss the disposition of non- conforming when the reason of nonconforming is not sure.

### 12-4. Agreement items

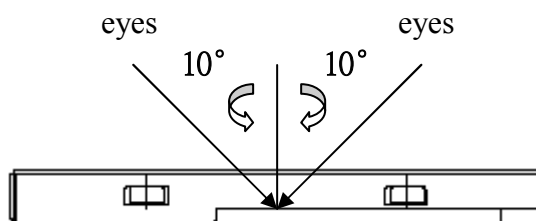
Both sides should discuss together when the following problems happen.

- a. There is any problem of standard of quality assurance, and both sides should think that must be modified.
- b. There is any argument item which does not record in the standard of quality assurance.
- c. Any other special problem.

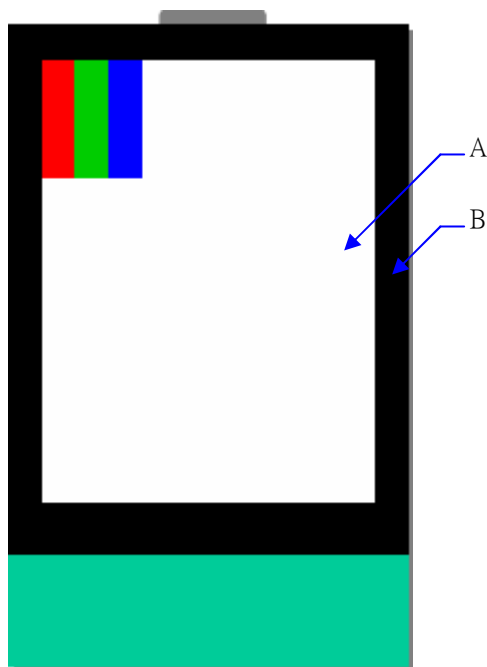
## 12-5. Standard of The Product Appearance Test

### a. Manner of appearance test:

- (i) The test must be under 20W × 2 or 40W fluorescent light, and the distance of view must be at 30±5cm.
- (ii) When test the model of transmissive product must add the reflective plate.
- (iii) The test direction is base on around 10° of vertical line.
- (iii) Temperature: 25±5°C      Humidity: 60±10%RH



### (iv) Definition of area:



A. Area: Viewing area.

B. Area: Out of viewing area.  
(Outside viewing area)

### b. Basic principle:

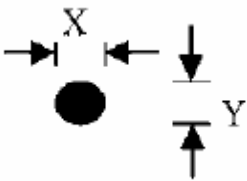
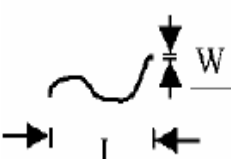
- (i) It will accord to the AQL when the standard can not be described.
- (ii) The sample of the lowest acceptable quality level must be discussed by both supplier and customer when any dispute happened.
- (iii) Must add new item on time when it is necessary.

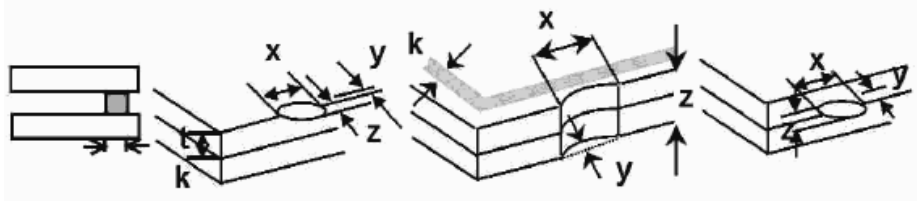
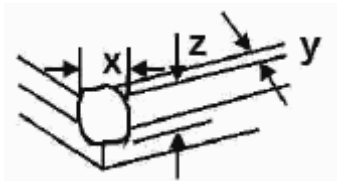
### c. Standard of inspection: (Unit: mm)

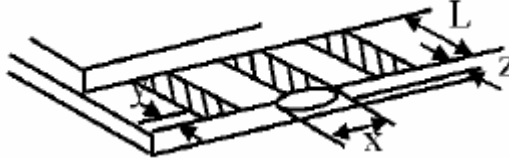
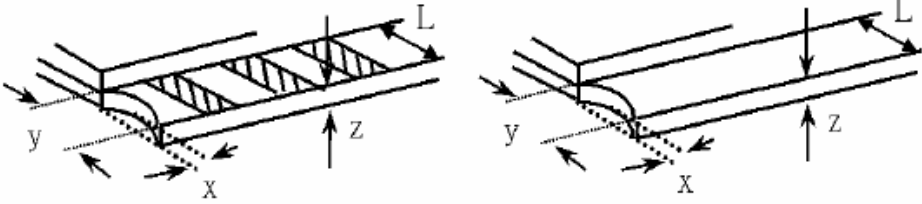
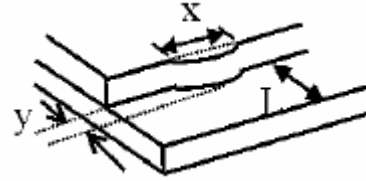


12-6. Inspection specification

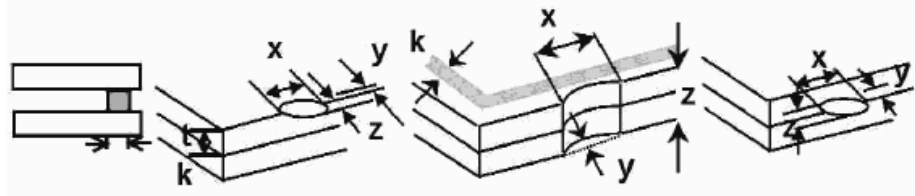
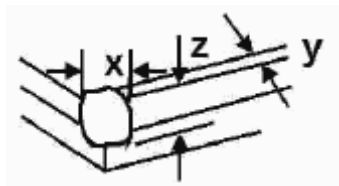
Defect out of viewing area can be neglected.

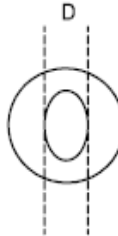
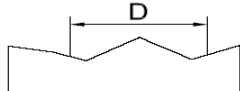
NO	Item	Criterion	AQL																										
01	Electrical Testing	1.1 Missing vertical, horizontal segment, segment contrast defect. 1.2 Missing character, dot or icon. 1.3 Display malfunction. 1.4 No function or no display. 1.5 Current consumption exceeds product specifications. 1.6 LCD viewing angle defect. 1.7 Mixed product types. 1.8 Flicker	0.65																										
02	Black or White spots or Bright spots or Color spots on LCD (Display only)	2.1 White and black or color spots on display $\leq 0.25\text{mm}$ , no more than Five spots. 2.2 Densely spaced: No more than three spots within 3mm.	2.5																										
03	LCD and Touch Panel black spots, white spots, contamination (non – display)	<div>3.1 Round type: As following drawing <math>\Phi = (X+Y) / 2</math> <table><tr><th>Size(mm)</th><th>Acceptable Q'ty</th></tr><tr><td><math>\Phi \leq 0.10</math></td><td>Accept no dense</td></tr><tr><td><math>0.10 &lt; \Phi \leq 0.20</math></td><td>2</td></tr><tr><td><math>0.20 &lt; \Phi \leq 0.25</math></td><td>2</td></tr><tr><td><math>0.25 &lt; \Phi \leq 0.30</math></td><td>1</td></tr><tr><td><math>0.30 &lt; \Phi</math></td><td>0</td></tr></table><p>* Densely spaced: No more than two spots within 3mm.</p></div> <div>3.2 Line type: (As following drawing) <table><tr><th>Length(mm)</th><th>Width(mm)</th><th>Acceptable Q'ty</th></tr><tr><td>---</td><td><math>W \leq 0.02</math></td><td>Accept no dense</td></tr><tr><td><math>L \leq 3.0</math></td><td><math>0.02 &lt; W \leq 0.05</math></td><td rowspan="2">2</td></tr><tr><td><math>L \leq 2.5</math></td><td><math>0.03 &lt; W \leq 0.15</math></td></tr><tr><td>---</td><td><math>0.15 &lt; W</math></td><td>Rejection</td></tr></table><p>* Densely spaced: No more than two lines within 3mm.</p></div>	Size(mm)	Acceptable Q'ty	$\Phi \leq 0.10$	Accept no dense	$0.10 < \Phi \leq 0.20$	2	$0.20 < \Phi \leq 0.25$	2	$0.25 < \Phi \leq 0.30$	1	$0.30 < \Phi$	0	Length(mm)	Width(mm)	Acceptable Q'ty	---	$W \leq 0.02$	Accept no dense	$L \leq 3.0$	$0.02 < W \leq 0.05$	2	$L \leq 2.5$	$0.03 < W \leq 0.15$	---	$0.15 < W$	Rejection	2.5
Size(mm)	Acceptable Q'ty																												
$\Phi \leq 0.10$	Accept no dense																												
$0.10 < \Phi \leq 0.20$	2																												
$0.20 < \Phi \leq 0.25$	2																												
$0.25 < \Phi \leq 0.30$	1																												
$0.30 < \Phi$	0																												
Length(mm)	Width(mm)	Acceptable Q'ty																											
---	$W \leq 0.02$	Accept no dense																											
$L \leq 3.0$	$0.02 < W \leq 0.05$	2																											
$L \leq 2.5$	$0.03 < W \leq 0.15$																												
---	$0.15 < W$	Rejection																											

NO	Item	Criterion	AQL																		
04	Polarizer bubbles	<div><div>If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction</div><table><tr><th>Size <math>\Phi</math>(mm)</th><th>Acceptable Q'ty</th></tr><tr><td><math>\Phi \leq 0.20</math></td><td>Accept no dense</td></tr><tr><td><math>0.20 &lt; \Phi \leq 0.50</math></td><td>3</td></tr><tr><td><math>0.50 &lt; \Phi \leq 1.00</math></td><td>2</td></tr><tr><td><math>1.00 &lt; \Phi</math></td><td>0</td></tr><tr><td>Total Q'ty</td><td>3</td></tr></table></div>	Size $\Phi$ (mm)	Acceptable Q'ty	$\Phi \leq 0.20$	Accept no dense	$0.20 < \Phi \leq 0.50$	3	$0.50 < \Phi \leq 1.00$	2	$1.00 < \Phi$	0	Total Q'ty	3	2.5						
Size $\Phi$ (mm)	Acceptable Q'ty																				
$\Phi \leq 0.20$	Accept no dense																				
$0.20 < \Phi \leq 0.50$	3																				
$0.50 < \Phi \leq 1.00$	2																				
$1.00 < \Phi$	0																				
Total Q'ty	3																				
05	Scratches	Follow NO.3 -2 Line Type.																			
06	Chipped glass	<div><div>Symbols: x: Chip length      y: Chip width      z: Chip thickness k: Seal width      t: Glass thickness      a: LCD side length L: Electrode pad length</div><div>6.1 General glass chip: 6.1.1 Chip on panel surface and crack between panels:</div><div></div><table><tr><th>z: Chip thickness</th><th>y: Chip width</th><th>x: Chip length</th></tr><tr><td><math>Z \leq 1/2t</math></td><td>Not over viewing area</td><td><math>x \leq 1/8a</math></td></tr><tr><td><math>1/2t &lt; z \leq 2t</math></td><td>Not exceed 1/3k</td><td><math>x \leq 1/8a</math></td></tr></table><div><div>⊙ Unit: mm</div><div>⊙ If there are 2 or more chips, x is the total length of each chip</div></div><div>6.1.2 Corner crack:</div><div></div><table><tr><th>z: Chip thickness</th><th>y: Chip width</th><th>x: Chip length</th></tr><tr><td><math>Z \leq 1/2t</math></td><td>Not over viewing area</td><td><math>x \leq 1/8a</math></td></tr><tr><td><math>1/2t &lt; z \leq 2t</math></td><td>Not exceed 1/3k</td><td><math>x \leq 1/8a</math></td></tr></table><div><div>⊙ Unit: mm</div><div>⊙ If there are 2 or more chips, x is the total length of each chip</div></div></div>	z: Chip thickness	y: Chip width	x: Chip length	$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$	$1/2t < z \leq 2t$	Not exceed 1/3k	$x \leq 1/8a$	z: Chip thickness	y: Chip width	x: Chip length	$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$	$1/2t < z \leq 2t$	Not exceed 1/3k	$x \leq 1/8a$	2.5
z: Chip thickness	y: Chip width	x: Chip length																			
$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$																			
$1/2t < z \leq 2t$	Not exceed 1/3k	$x \leq 1/8a$																			
z: Chip thickness	y: Chip width	x: Chip length																			
$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$																			
$1/2t < z \leq 2t$	Not exceed 1/3k	$x \leq 1/8a$																			

NO	Item	Criterion	AQL																
07	Glass crack	<p>Symbols: x: Chip length            y: Chip width            z: Chip thickness k: Seal width            t: Glass thickness    a: LCD side length L: Electrode pad length</p> <p>7.2 Protrusion over terminal: 7.2.1 Chip on electrode pad:</p>  <table><tr><td>y: Chip width</td><td>x: Chip length</td><td>z: Chip thickness</td></tr><tr><td><math>y \leq 0.5\text{mm}</math></td><td><math>x \leq 1/8a</math></td><td><math>0 &lt; z \leq t</math></td></tr></table> <p>7.2.2 Non-conductive portion:</p>  <table><tr><td>y: Chip width</td><td>x: Chip length</td><td>z: Chip thickness</td></tr><tr><td><math>y \leq L</math></td><td><math>x \leq 1/8a</math></td><td><math>0 &lt; z \leq t</math></td></tr></table> <p>⊙ If there chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications. ⊙ If the product will be heat sealed by the customer, the alignment mark must not be damaged.</p> <p>7.2.3 Substrate protuberance and internal crack</p>  <table><tr><td>y: width</td><td>x: length</td></tr><tr><td><math>y \leq 1/3L</math></td><td><math>X \leq a</math></td></tr></table>	y: Chip width	x: Chip length	z: Chip thickness	$y \leq 0.5\text{mm}$	$x \leq 1/8a$	$0 < z \leq t$	y: Chip width	x: Chip length	z: Chip thickness	$y \leq L$	$x \leq 1/8a$	$0 < z \leq t$	y: width	x: length	$y \leq 1/3L$	$X \leq a$	2.5
		y: Chip width	x: Chip length	z: Chip thickness															
		$y \leq 0.5\text{mm}$	$x \leq 1/8a$	$0 < z \leq t$															
		y: Chip width	x: Chip length	z: Chip thickness															
$y \leq L$	$x \leq 1/8a$	$0 < z \leq t$																	
y: width	x: length																		
$y \leq 1/3L$	$X \leq a$																		

NO	Item	Criterion	AQL
08	Cracked glass	The LCD with extensive crack is not acceptable.	2.5
09	Backlight elements	9.1 Illumination source flickers when lit. 9.2 Spots or scratches that appear when lit must be judged. Using LCD spot, lines and contamination standards. 9.3 Backlight doesn't light or color is wrong.	2.5 2.5 0.65
10	Bezel	Bezel must comply with product specifications.	2.5
11	PCB、COB	11.1 COB seal may not have pinholes larger than 0.2mm or contamination. 11.2 COB seal surface may not have pinholes through to the IC. 11.3 The height of the COB should not exceed the height indicated in the assembly diagram. 11.4 There may not be more than 2mm of sealant outside the seal area on PCB. And there should be no more than three places. 11.5 Parts on PCB must be the same as on the production characteristic chart, There should be no wrong parts, missing parts or excess parts. 11.6 The jumper on the PCB should conform to the product characteristic chart.	2.5 2.5 2.5 2.5 0.65 0.65
12	FPC	12.1 FPC terminal damage $\leq 1/2$ FPC terminal width and can not affect the function , we judge accept. 12.2 FPC alignment hole damage $\leq 1/2$ alignment area and can not affect the function , we judge accept.	2.5 2.5
13	Soldering	13.1 No cold solder joints, missing solder connections, oxidation or icicle. 13.2 No short circuits in components on PCB or FPC.	2.5 0.65

NO	Item	Criterion	AQL												
14	Touch Panel Chipped glass	<p>Symbols: x: Chip length                      y: Chip width                      z: Chip thickness k: Seal width                      t: Touch Panel Total thickness    a: LCD side length L: Electrode pad length</p> <p>14.1 General glass chip: 14.1.1 Chip on panel surface and crack between panels:</p>  <table><tr><td>z: Chip thickness</td><td>y: Chip width</td><td>x: Chip length</td></tr><tr><td><math>Z \leq t</math></td><td><math>\leq 1/2 k</math> and not over viewing area</td><td><math>x \leq 1/8a</math></td></tr></table> <p>⊙ Unit: mm ⊙ If there are 2 or more chips, x is the total length of each chip</p> <p>14.1.2 Corner crack:</p>  <table><tr><td>z: Chip thickness</td><td>y: Chip width</td><td>x: Chip length</td></tr><tr><td><math>z \leq t</math></td><td><math>\leq 1/2 k</math> and not over viewing area</td><td><math>x \leq 1/8a</math></td></tr></table> <p>⊙ Unit: mm ⊙ If there are 2 or more chips, x is the total length of each chip</p>	z: Chip thickness	y: Chip width	x: Chip length	$Z \leq t$	$\leq 1/2 k$ and not over viewing area	$x \leq 1/8a$	z: Chip thickness	y: Chip width	x: Chip length	$z \leq t$	$\leq 1/2 k$ and not over viewing area	$x \leq 1/8a$	2.5
z: Chip thickness	y: Chip width	x: Chip length													
$Z \leq t$	$\leq 1/2 k$ and not over viewing area	$x \leq 1/8a$													
z: Chip thickness	y: Chip width	x: Chip length													
$z \leq t$	$\leq 1/2 k$ and not over viewing area	$x \leq 1/8a$													

NO	Item	Criterion	AQL										
15	Touch Panel(Fish eye、dent and bubble on film)	<table><tr><th>SIZE(mm)</th><th>Acceptable Q'ty</th></tr><tr><td><math>\Phi \leq 0.2</math></td><td>Accept no dense</td></tr><tr><td><math>0.2 &lt; D \leq 0.4</math></td><td>5</td></tr><tr><td><math>0.4 &lt; D \leq 0.5</math></td><td>2</td></tr><tr><td><math>0.5 &lt; D</math></td><td>0</td></tr></table> <div></div>	SIZE(mm)	Acceptable Q'ty	$\Phi \leq 0.2$	Accept no dense	$0.2 < D \leq 0.4$	5	$0.4 < D \leq 0.5$	2	$0.5 < D$	0	2.5
SIZE(mm)	Acceptable Q'ty												
$\Phi \leq 0.2$	Accept no dense												
$0.2 < D \leq 0.4$	5												
$0.4 < D \leq 0.5$	2												
$0.5 < D$	0												
16	Touch Panel Newton ring	Newton ring dimension $\leq 1/2$ touch panel area and not affect font and line distortion( $\leq 2.5\%$ ) , it is acceptable.	2.5										
17	Touch Panel Linearity	Less than 2.5% is acceptable.	2.5										
18	LCD Ripple	Touch the touch panel , can not see the LCD ripple. Pen: R 1.0mm silicon rubber. Operation Force: 80g	2.5										
19	General appearance	19.1 Pin type must match type in specification sheet. 19.2 LCD pin loose or missing pins. 19.3 Product packaging must the same as specified on packaging specification sheet. 19.4 Product dimension and structure must conform to product specification sheet.	0.65 0.65 0.65 0.65										

## **13. Handling Precaution:**

### 13-1 Handling of LCM

- Don't give external shock.
- Don't apply excessive force on the surface.
- Liquid in LCD is hazardous substance. Must not lick and swallow. when the liquid is attach to your hand, skin, cloth etc. Wash it out thoroughly and immediately.
- Don't operate it above the absolute maximum rating.
- Don't disassemble the LCM.
- The operators should be grounded whenever he/she comes into contact with the module. Never touch any of the conductive parts such as the LSI pads, the copper leads on the FPC and the interface terminals with any parts of the human body.
- The modules should be kept in antistatic bags or other containers resistant to static for storage.
- The module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

### 13-2 Storage

- Store in an ambient temperature of  $25\pm 10^{\circ}\text{C}$ , and in a relative humidity of  $50\pm 10\%\text{RH}$ . Don't expose to sunlight or fluorescent light.
- Storage in a clean environment, free from dust, active gas, and solvent.
- Store in anti-static electricity container.
- Store without any physical load.

### 13-3 Soldering

- Use only soldering irons with proper grounding and no leakage.
- Iron: No higher than  $280\pm 10^{\circ}\text{C}$  and less than 3 sec during Hand soldering.
- Rewiring: no more than 2 times.

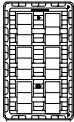


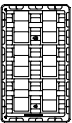

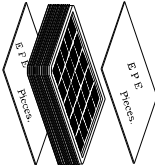
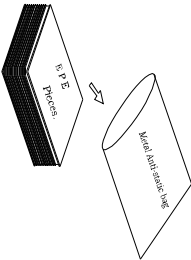

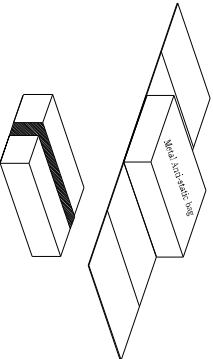
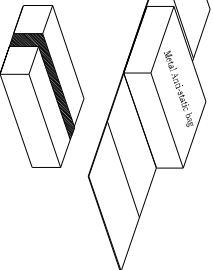
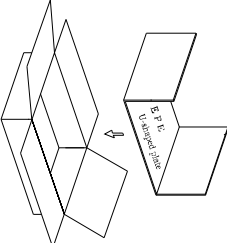
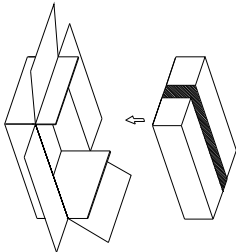
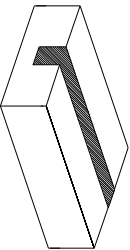
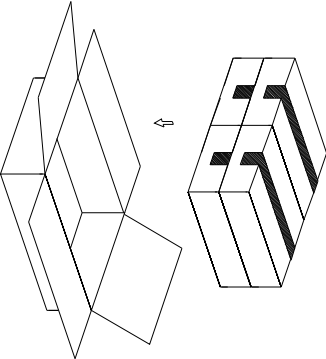
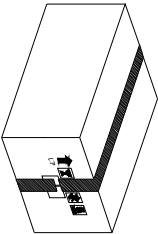
## **14. Guarantee:**

Our products meet requirements of the environment.

YEEBO ROHS requirement is based on European Union Directive 2011/65/EU (ROHS) Requirements and Update.

## 15. Package:

Part drawing & Spec./revision record during discussion with customer			
Rev.	Revision content description	Date	
#1	First Issue	2017-06-12	

<p>(1)Packaging materials description</p> <p>① Tray front</p>  <p>② LCM(Glass face-up)</p>  <p>③ Anti-static EPE</p>  <p>④ Tray Related 180 degrees.</p> 		<p>(2)Stacking order.</p> <p>① ③ ② ④ ③ ② ①</p> <p>PS:Module face up EPE placed on module Tray plate placed staggered</p> 	<p>(3)A small label affixed to packaging to packaging</p> 	<p>(4)</p> 		
<p>(5)</p>  <p>⑤ A small label affixed to packaging</p> 	<p>(6)A small label affixed to packaging</p> 	<p>(7)</p> 	<p>(8)</p> 	<p>(9) Completion of small boxes.</p> <p>Packing: Products 72 pcs / 1 small box.</p> <p>1 Tray pans Product 6 pcs.</p> <p>12 products tray mounting plate, 1 empty tray.</p> <p>A small label affixed to packaging.</p> 	<p>(10) 4 small boxes into a big carton.</p> 	<p>(11) Complete package</p> <p>48 products tray mounting plate,</p> <p>4 empty tray.</p> <p>Packing: Product 288 PCS / 1 big carton.</p> <p>A big label affixed to packaging.</p> 

<p>Tray packaging schematic.</p> <p>Packing order:(1)~(11)</p> <p>Tray Size: 372.0 × 222.0 × 10.4mm</p> <p>Carton Size: 520.0 × 420.0 × 300.0 mm</p> <p>Gross Weight: 14.1(±10%)kg</p>			
<p>YEEBO</p>		<p>PART No. YB-TG480800S13A-N-B</p>	
<p>DESIGNED</p>	<p>CHECKED</p>	<p>VERIFIED</p>	<p>APPROVED</p>
<p>林麗芬</p>			
<p>2017-06-12</p>			
<p>Sheet 1</p>		<p>FILE NAME Package</p>	
<p>Of 1</p>			