億 都 集 團
YEEBO GROUP

SPECIFICATION
FOR
LCD MODULE

MODULE NO: YB-TG480800S13A-N-A0

Doc.Version:02

Customer Approval:

☐ Accept ☐ Reject

YEEBO	NAME	SIGNATURE	DATE
Prepare	Electronic Engineer		2017.7.13
Check	Mechanical Engineer		2017.7.13
Verify			2017.7.13
Approval			2017.7.13

☐ APPROVAL FOR SPECIFICATIONS ONLY

■ APPROVAL FOR SPECIFICATIONS AND SAMPLE

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1. Revision History

Sample Version	DOC. Version	DATE	DESCRIPTION		CHANGED BY
A0	00	2017-04-19	SPEC ONLY	First issue	Angus / Fen
A0	01	2017-06-30	FULL SPEC	First Sample	Gavin / Fen
A0	02	2017-07-13	FULL SPEC	Modify VDD Max P6	Gavin / Fen

2. Table of Contents:

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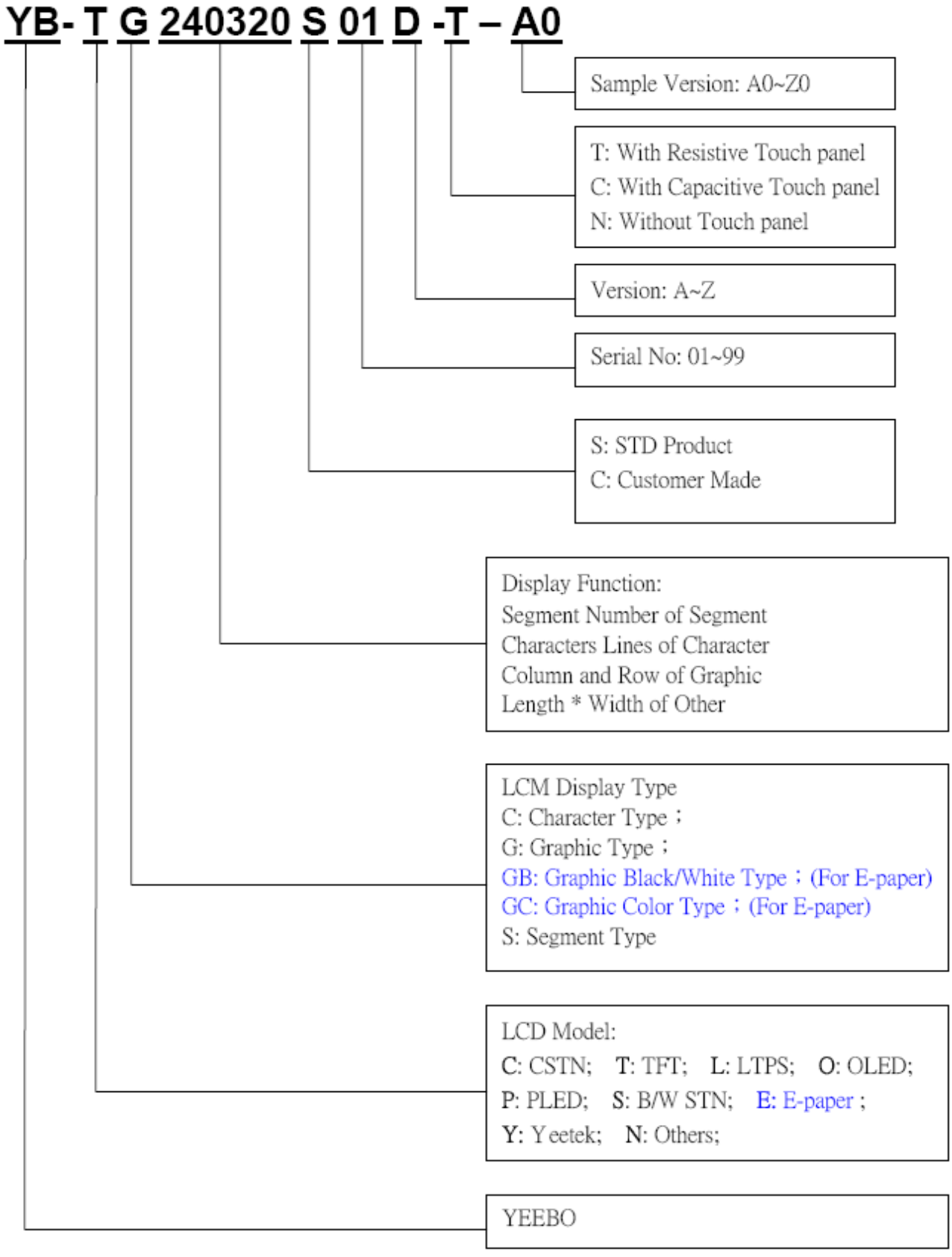
3. Module Numbering System:

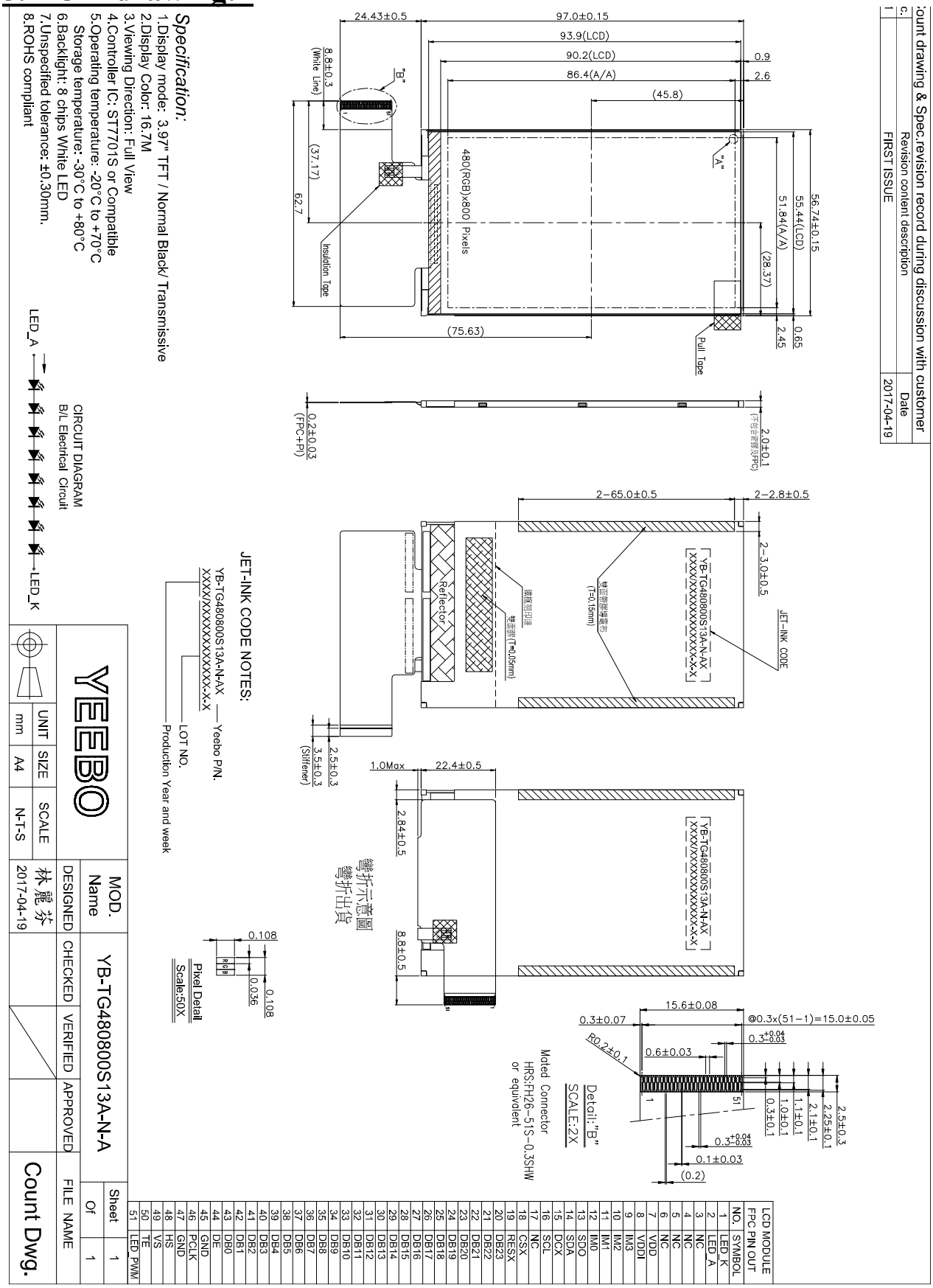
(Example)



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	23.60g

5. LCM drawing:



LCD MODULE FPC PIN OUT		
NO.	SYMBOL	
1	LED_K	
2	LED_A	
3	NC	
4	NC	
5	NC	
6	NC	
7	VDDI	
8	VDDI	
9	IM3	
10	IM2	
11	IM1	
12	IM0	
13	SDO	
14	SDA	
15	DCX	
16	SCL	
17	NC	
18	CSX	
19	RESX	
20	DB23	
21	DB22	
22	DB21	
23	DB20	
24	DB19	
25	DB18	
26	DB17	
27	DB16	
28	DB15	
29	DB14	
30	DB13	
31	DB12	
32	DB11	
33	DB10	
34	DB9	
35	DB8	
36	DB7	
37	DB6	
38	DB5	
39	DB4	
40	DB3	
41	DB2	
42	DB1	
43	DB0	
44	DE	
45	GND	
46	PCLK	
47	GND	
48	HS	
49	VS	
50	TE	
51	LED_PWM	

6. Electrical Characteristics

6-1 Absolute Maximum Ratings (Ta=25℃)

Item	Symbol	Min.	Type	Max.	Unit	Remark
Power Supply Voltage	V_{DD}	-0.3	-	4.8	V	
Supply Voltage(Logic)	V_{DDI}	-0.3	-	4.6	V	
Logic Input Voltage Range	V_{IH}	-0.3	-	V_{DDI} +0.5	V	
Logic Output Voltage Range	V_{OH}	-0.3	-	V_{DDI} +0.5	V	
Operating Temperature	Topr	-20	-	+70	℃	
Storage Temperature	Tstg	-30	-	+80	℃	

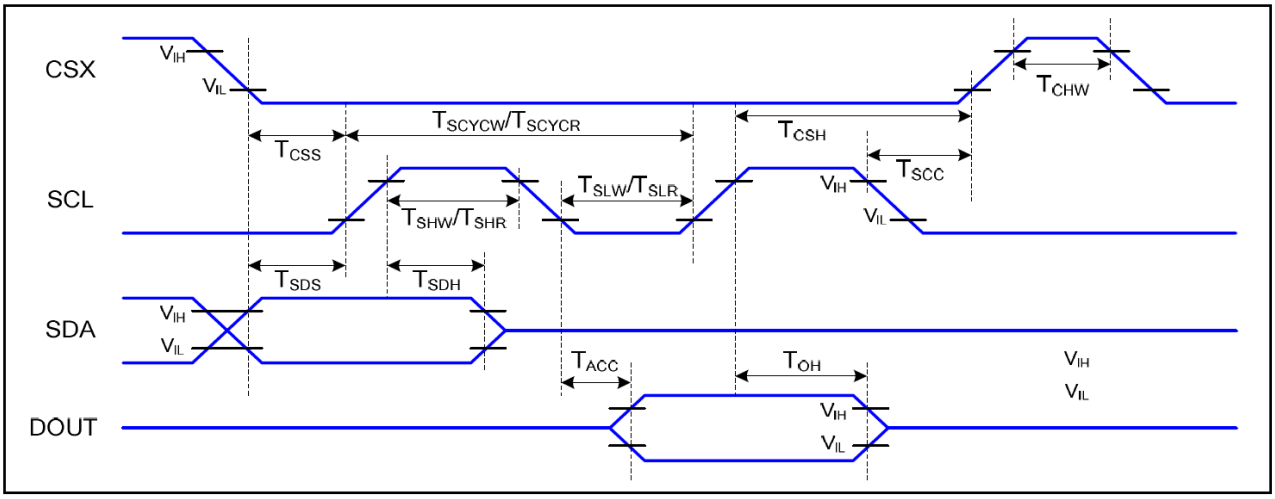
Note ：Even if the absolute maximum rating of one of the above parameters is exceeded only for a short while, the quality of the product may be degraded. Therefore, be sure to use the product within the range of the absolute maximum ratings.

6-2 Operating Conditions (Ta=25℃)

Item	Symbol	Condition	Min.	Type	Max.	Unit	Remark
Power Supply Voltage	V_{DD}	-	2.5	2.8	3.6	V	
Supply Voltage(Logic)	V_{DDI}	-	1.68	2.8	3.3	V	
IO Supply Voltage	V_{IH}	-	0.7 V_{DDI}	-	V_{DDI}	V	
	V_{IL}	-	V_{SS}	-	0.3 V_{DDI}	V	
	V_{OH}	-	0.8 V_{DDI}	-	V_{DDI}	mA	
	V_{OL}	-	V_{SS}	-	0.2 V_{DDI}	V	
Power Supply Current	I_{DD}	V_{DD}=2.8V	-	46.6	69.9	mA	

6-3 AC Characteristics

Serial Interface Characteristics (3-line serial):



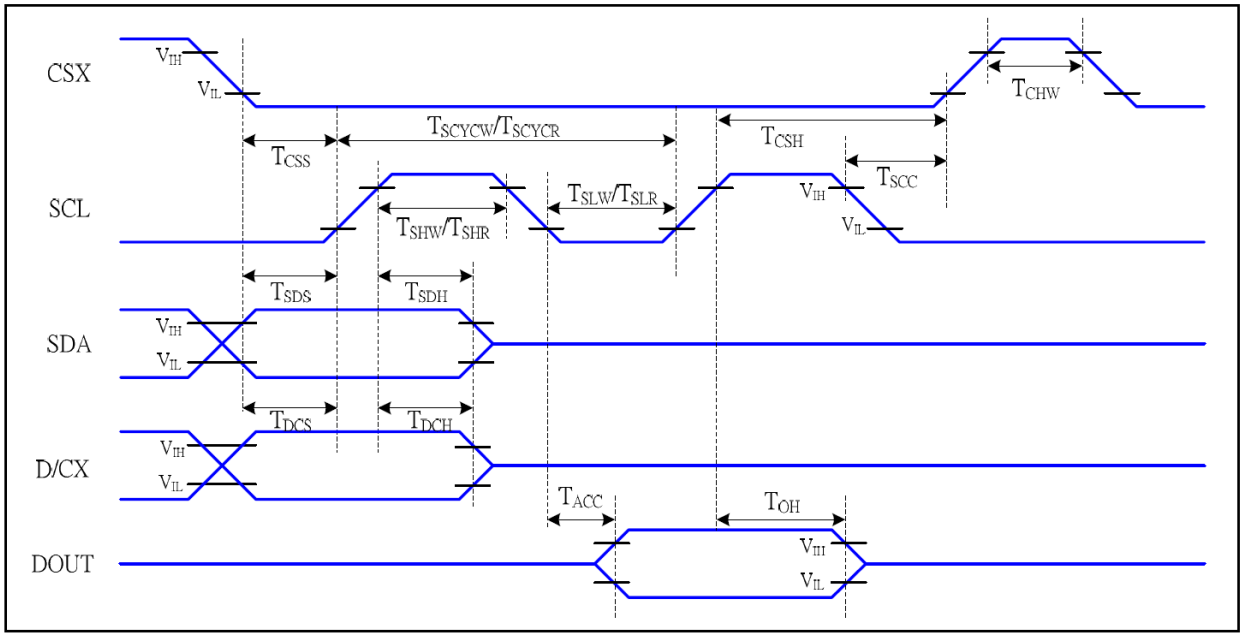
3-line serial interface timing characteristics

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

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):



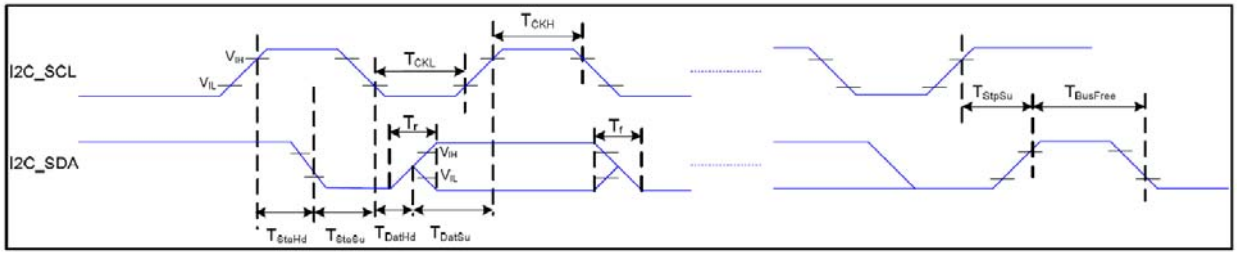
4-line serial interface timing characteristics

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

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):



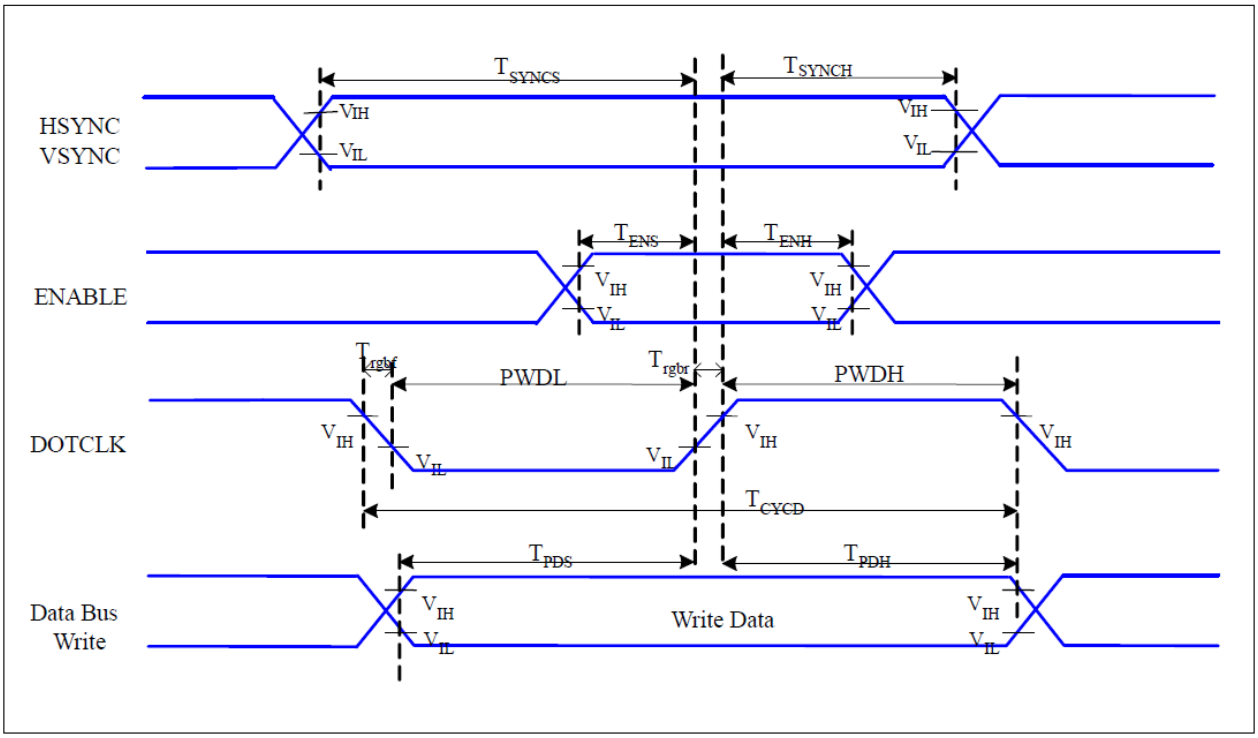
I2C interface timing characteristics

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

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 timg	20	300	ns	
	T_f	Data falling timg	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:



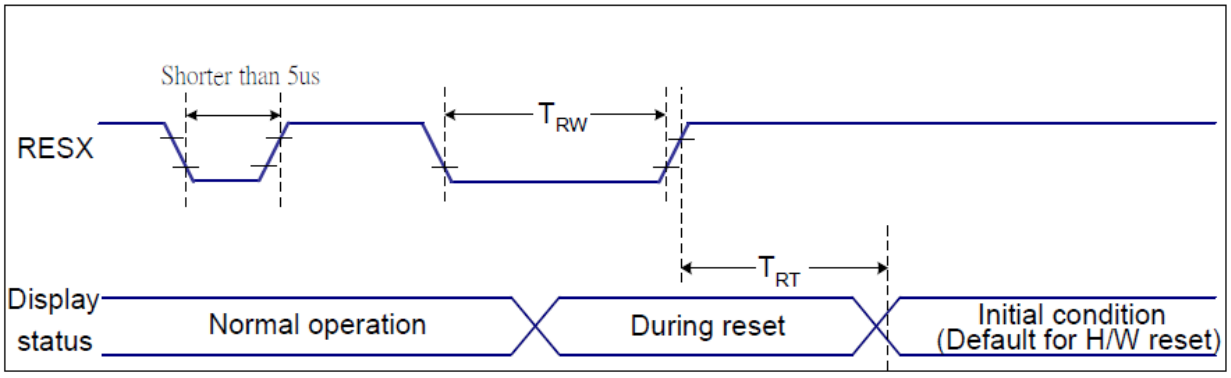
RGB interface timing characteristics

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

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	
	Trghr, Trghf	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



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

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:

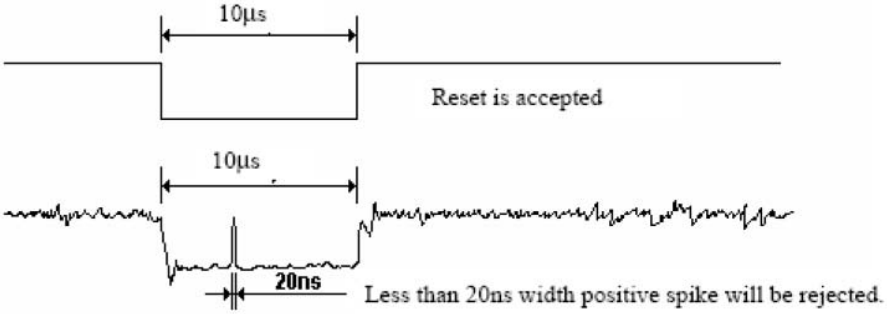
1. The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from NVM (or similar device) to registers. This loading is done every time when there is HW reset cancel time (tRT) within 5 ms after a rising edge of RESX.

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 5us	Reset Rejected
Longer than 9us	Reset
Between 5us and 9us	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

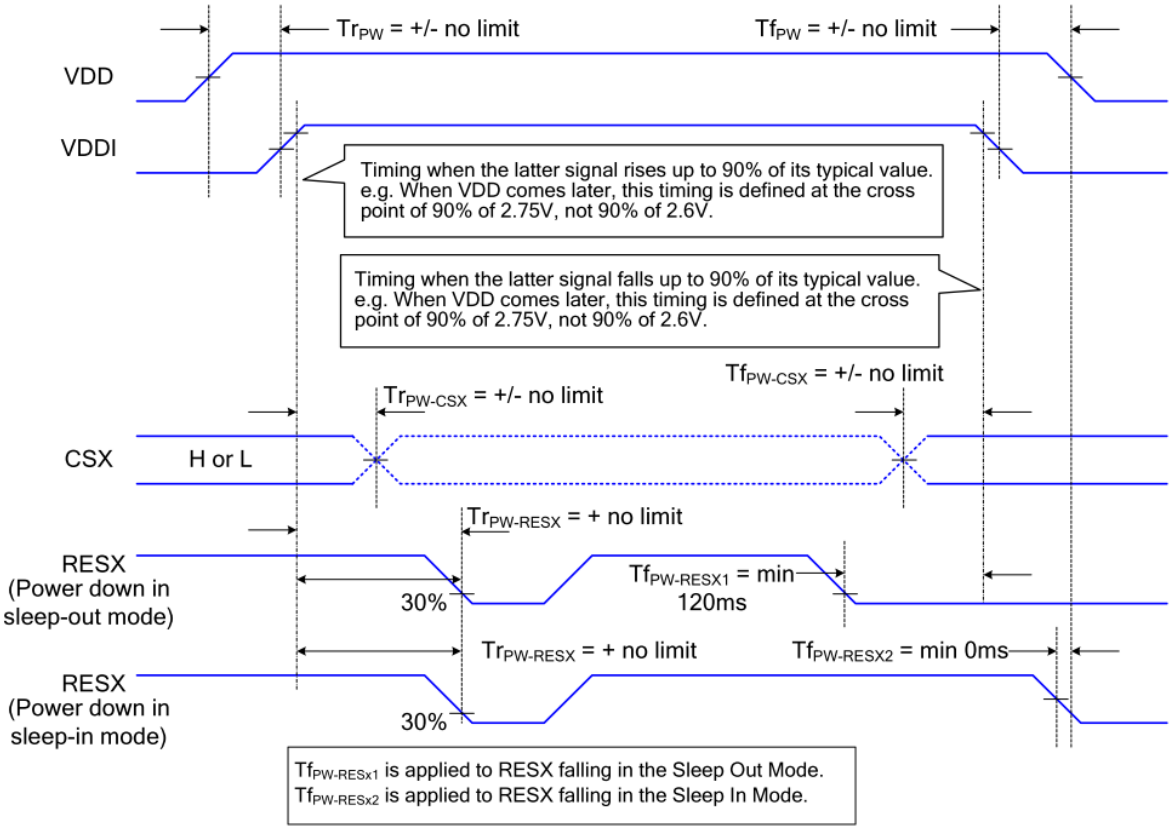
VDDI and VDDA can be applied or powered down in any order. During the Power Off sequence, if the LCD is in the Sleep Out mode, VDDA and VDDI must be powered down with minimum 120msec. If the LCD is in the Sleep In mode, VDDA and VDDI can be powered down with minimum 0msec after the RESX is released.

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


TrPW = +/- no limit
TfPW = +/- no limit
VDD
VDDI
Timing when the latter signal rises up to 90% of its typical value.
e.g. When VDD comes later, this timing is defined at the cross point of 90% of 2.75V, not 90% of 2.6V.
Timing when the latter signal falls up to 90% of its typical value.
e.g. When VDD comes later, this timing is defined at the cross point of 90% of 2.75V, not 90% of 2.6V.
TfPW-CSX = +/- no limit
TrPW-CSX = +/- no limit
CSX
H or L
TrPW-RESX = + no limit
RESX
(Power down in sleep-out mode)
TfPW-RESX1 = min
120ms
30%
TrPW-RESX = + no limit
TfPW-RESX2 = min 0ms
RESX
(Power down in sleep-in mode)
30%
TfPW-RESx1 is applied to RESX falling in the Sleep Out Mode.
TfPW-RESx2 is applied to RESX falling in the Sleep In Mode.

7. Optical Characteristics:

Item		Symbol	Conditions	Specifications			Unit	Note
				Min	Typ	Max		
Transmittance		T(%)	−	-	4.14	-	-	-
Contrast Ratio		CR	θ=0° Normal Viewing Angle	720	900	-		(1) (2)
Response time		TR+TF		-	35	45	ms	(1) (3)
NTSC		-	-	-	70	-	%	Note 1
Viewing Angle	Hor.	θx+	CR≧10	-	80	-	deg.	(1)
		θx-		-	80	-		
	Ver.	θy+		-	80	-		
		θy-		-	80	-		

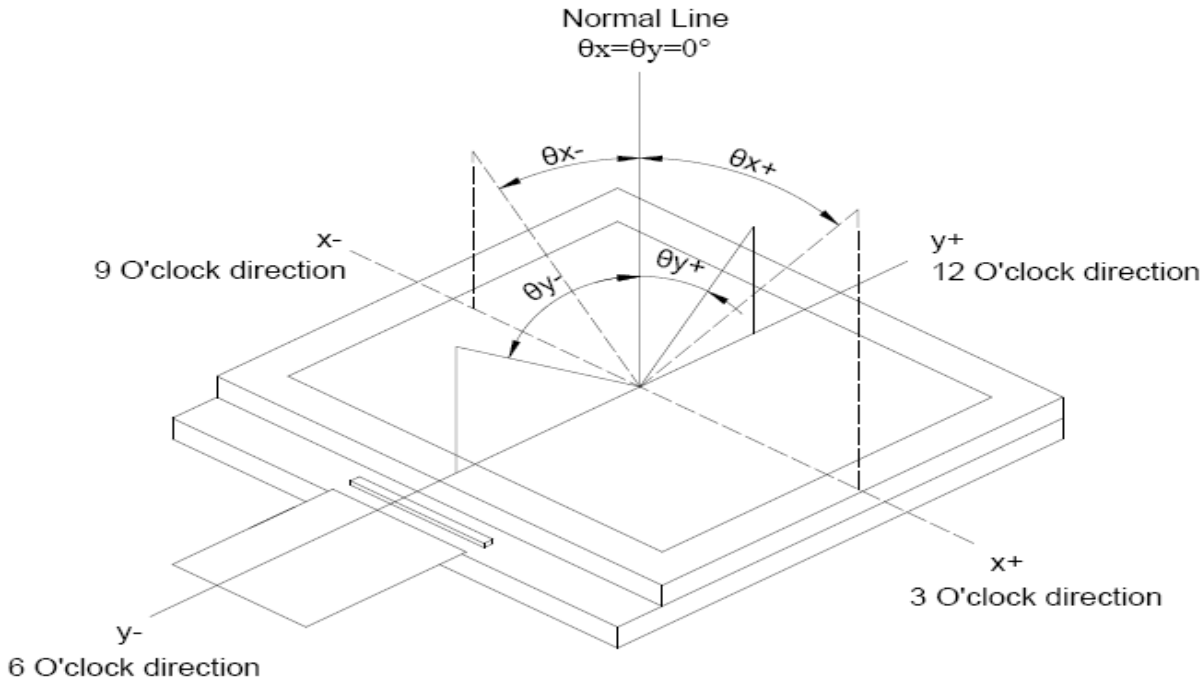
Measuring Condition
1. Measuring surrounding: dark room
2. Ambient temperature: 25±2℃
3. 30 min. Warm-up time.

Color of CIE Coordinate:

(Ta=25℃)

Item		Symbol	Condition	Min.	Typ.	Max.
Chromaticity Coordinates (Transmissive)	Red	x	θ = φ = 0° LED Backlight	0.580	0.630	0.680
		y		0.293	0.343	0.393
	Green	x		0.271	0.321	0.371
		y		0.559	0.609	0.659
	Blue	x		0.092	0.142	0.192
		y		0.050	0.100	0.150
	White	x		0.246	0.296	0.346
		y		0.193	0.243	0.293

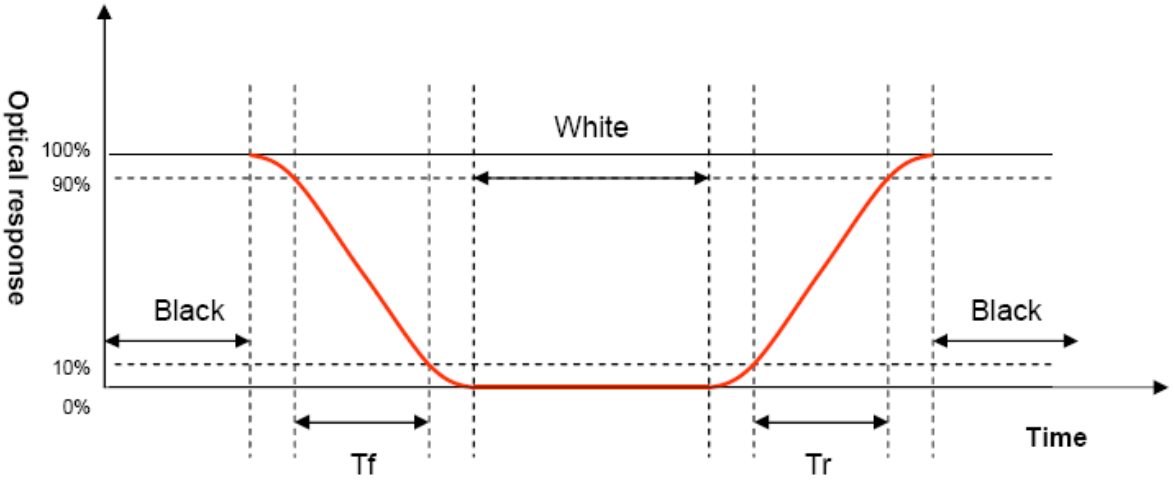
Note (1) Definition of Viewing Angle :



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

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

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

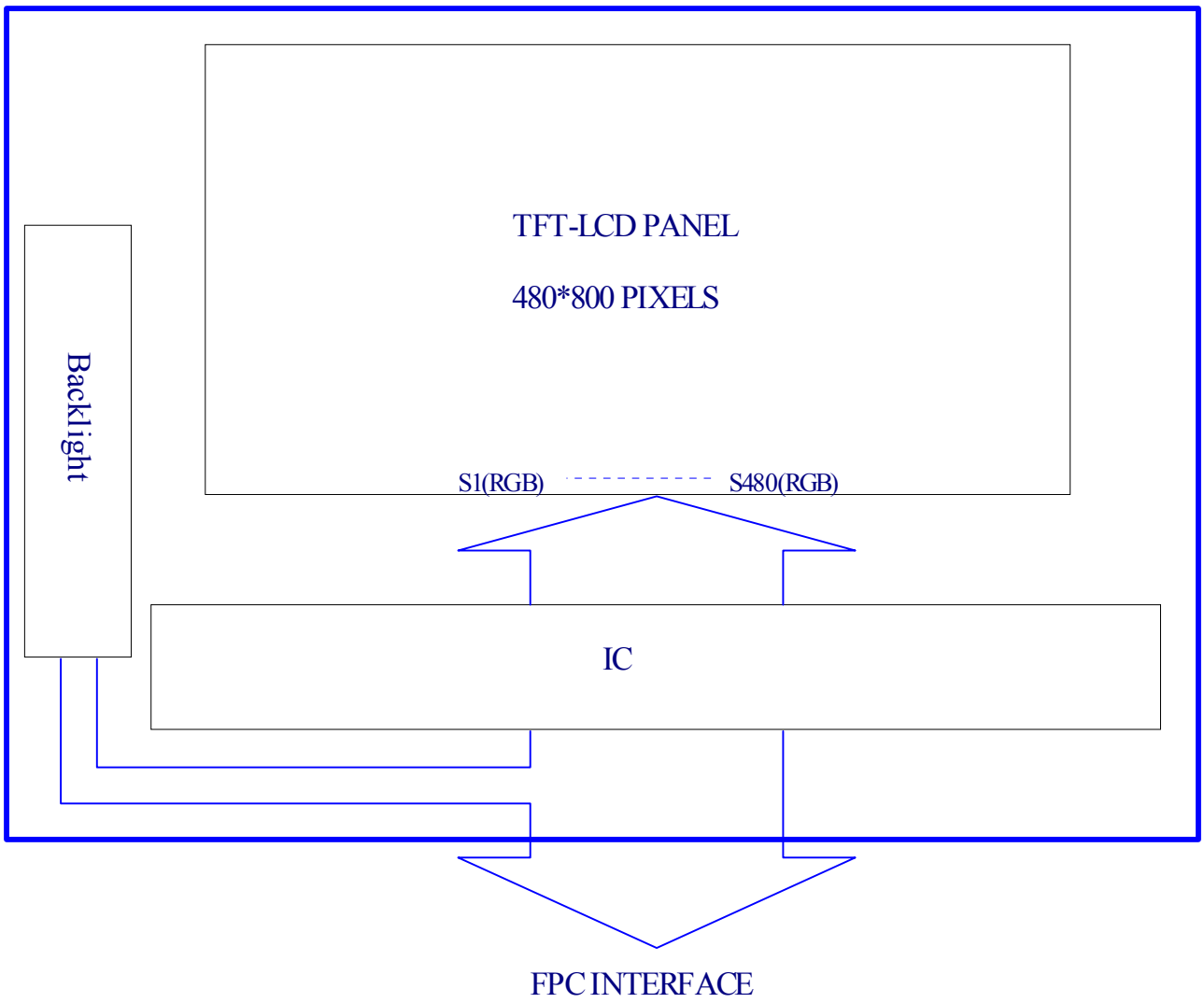


8. Interface Pin Assignment:

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	IM3 IM2 IM1 IM0 MPU Interface Mode	
10	IM2	0 0 1 1 RGB+16b SPI (rise)	
11	IM1	1 0 1 1 RGB+16b SPI (fall)	
12	IM0	0 1 0 0 RGB+I2C	
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	
27	DB16	Data bus	
28	DB15	Data bus	
29	DB14	Data bus	
30	DB13	Data bus	
31	DB12	Data bus	
32	DB11	Data bus	
33	DB10	Data bus	
34	DB9	Data bus	
35	DB8	Data bus	

No.	Symbol	Function	Remark
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:

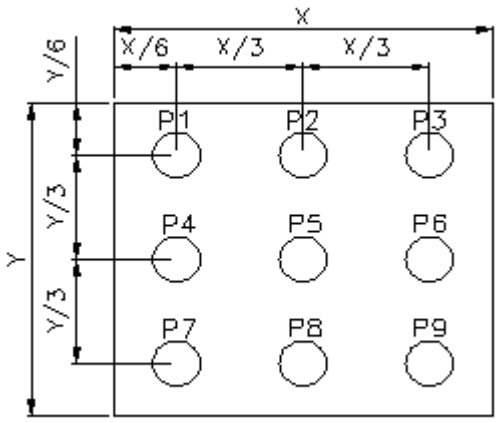
2. The Main Advantages of the LED Backlight are as following:
2.1 The brightness of the backlight can simply be adjusted.
By a resistor or a potentiometer.

3. Data About LED Backlight: (Ta=25℃)

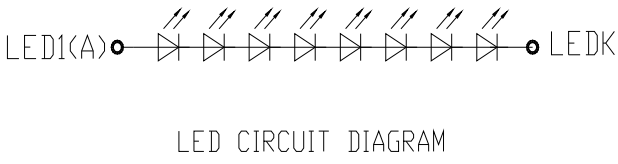
PARAMETER	Sym.	Min.	Typ.	Max.	Unit	Test Condition	Note
Supply Current	I	-	20	-	mA	V=26.4V	
Supply Voltage	V	22.4	26.4	27.2	V	If=20mA	
Luminous Intensity for LCM	IV	-	280	-	cd/m^2		2
Uniformity for LCM	-	80	-	-	%		3
Life Time	-	20000	-	-	Hr.		4
Color	White						

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



(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±5℃), normal humidity (50±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

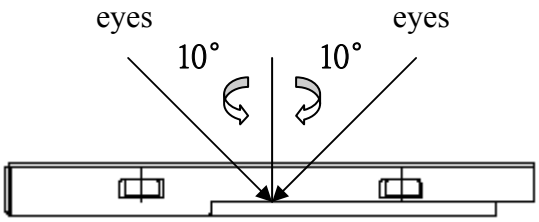
a. Manner of appearance test:

(i) The test must be under 20W × 2 or 40W fluorescent light, and the distance of view must be at 30±5cm.

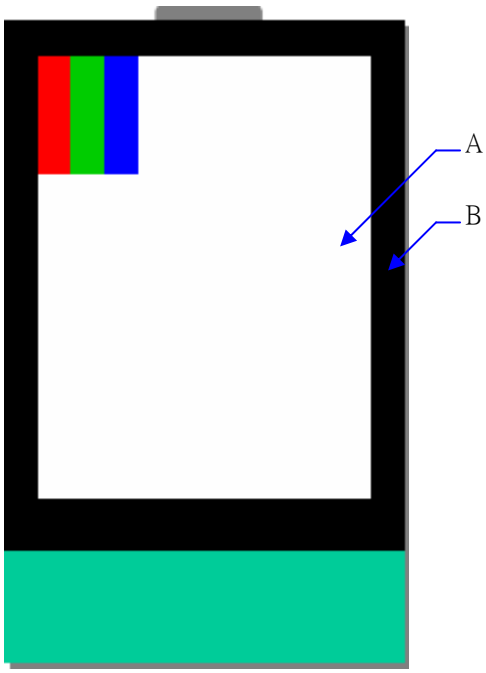
(ii) When test the model of transmissive product must add the reflective plate.

(iii)The test direction is base on around 10° of vertical line.

(iiii)Temperature: 25±5℃ 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.

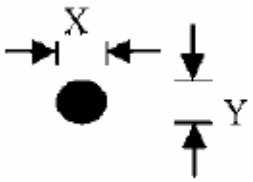
(ii) The sample of the lowest acceptable quality level must be discussed by both supplier and customer when any dispute happened.

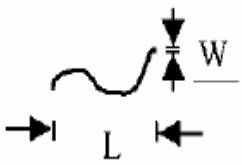
(iii) Must add new item on time when it is necessary.

c. Standard of inspection: (Unit: mm)

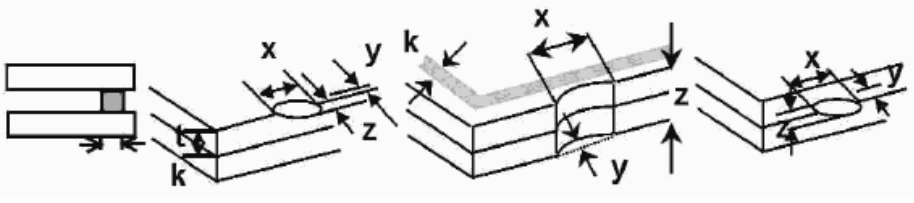
12-6. Inspection specification

Defect out of viewing area can be neglected.

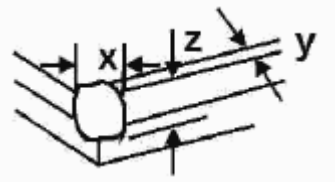
<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>01</td><td>Electrical Testing</td><td>1.1 Missing vertical, horizontal segment, segment contrast defect.
1.2 Missing character, dot or icon.
1.3 Display malfunction.
1.4 No function or no display.
1.5 Current consumption exceeds product specifications.
1.6 LCD viewing angle defect.
1.7 Mixed product types.
1.8 Flicker</td><td>0.65</td></tr>
<tr><td>02</td><td>Black or White spots or Bright spots or Color spots on LCD (Display only)</td><td>2.1 White and black or color spots on display ≦ 0.25mm, no more than Five spots.
2.2 Densely spaced: No more than three spots within 3mm.</td><td>2.5</td></tr>
<tr><td rowspan="2">03</td><td rowspan="2">LCD and Touch Panel black spots, white spots, contamination (non – display)</td><td>3.1 Round type: As following drawing
Φ = (X+Y) / 2
 

<table>
<tr><th>Size(mm)</th><th>Acceptable Q'ty</th></tr>
<tr><td>Φ≦0.10</td><td>Accept no dense</td></tr>
<tr><td>0.10< Φ≦0.20</td><td>2</td></tr>
<tr><td>0.20< Φ≦0.25</td><td>2</td></tr>
<tr><td>0.25< Φ≦0.30</td><td>1</td></tr>
<tr><td>0.30< Φ</td><td>0</td></tr>
</table>
* Densely spaced: No more than two spots within 3mm.</td><td>2.5</td></tr>
<tr><td>3.2 Line type: (As following drawing)
 

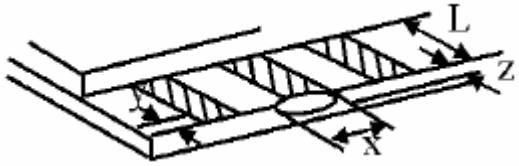
<table>
<tr><th>Length(mm)</th><th>Width(mm)</th><th>Acceptable Q'ty</th></tr>
<tr><td>---</td><td>W≦0.02</td><td>Accept no dense</td></tr>
<tr><td>L≦3.0</td><td>0.02<W≦0.05</td><td rowspan="2">2</td></tr>
<tr><td>L≦2.5</td><td>0.03<W≦0.15</td></tr>
<tr><td>---</td><td>0.15<W</td><td>Rejection</td></tr>
</table>
* Densely spaced: No more than two lines within 3mm.</td><td>2.5</td></tr>
</table>

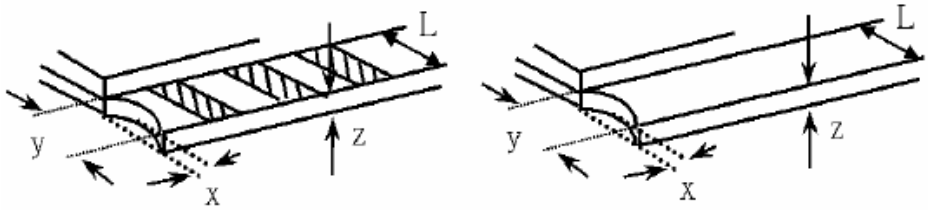
<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>04</td><td>Polarizer bubbles</td><td>If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction
<table>
<tr><th>Size Φ(mm)</th><th>Acceptable Q'ty</th></tr>
<tr><td>Φ≦0.20</td><td>Accept no dense</td></tr>
<tr><td>0.20< Φ≦0.50</td><td>3</td></tr>
<tr><td>0.50< Φ≦1.00</td><td>2</td></tr>
<tr><td>1.00< Φ</td><td>0</td></tr>
<tr><td>Total Q’ty</td><td>3</td></tr>
</table></td><td>2.5</td></tr>
<tr><td>05</td><td>Scratches</td><td>Follow NO.3 -2 Line Type.</td><td></td></tr>
<tr><td>06</td><td>Chipped glass</td><td>Symbols:
x: Chip length y: Chip width z: Chip thickness
k: Seal width t: Glass thickness a: LCD side length
L: Electrode pad length
6.1 General glass chip:
6.1.1 Chip on panel surface and crack between panels:
 

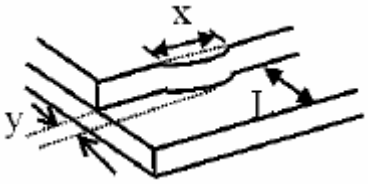
<table>
<tr><th>z: Chip thickness</th><th>y: Chip width</th><th>x: Chip length</th></tr>
<tr><td>Z≦1/2t</td><td>Not over viewing area</td><td>x≦1/8a</td></tr>
<tr><td>1/2t< z≦2t</td><td>Not exceed 1/3k</td><td>x≦1/8a</td></tr>
</table>
⊙ Unit: mm
⊙ If there are 2 or more chips, x is the total length of each chip

6.1.2 Corner crack:
 

<table>
<tr><th>z: Chip thickness</th><th>y: Chip width</th><th>x: Chip length</th></tr>
<tr><td>Z≦1/2t</td><td>Not over viewing area</td><td>x≦1/8a</td></tr>
<tr><td>1/2t< z≦2t</td><td>Not exceed 1/3k</td><td>x≦1/8a</td></tr>
</table>
⊙ Unit: mm
⊙ If there are 2 or more chips, x is the total length of each chip</td><td>2.5</td></tr>
</table>

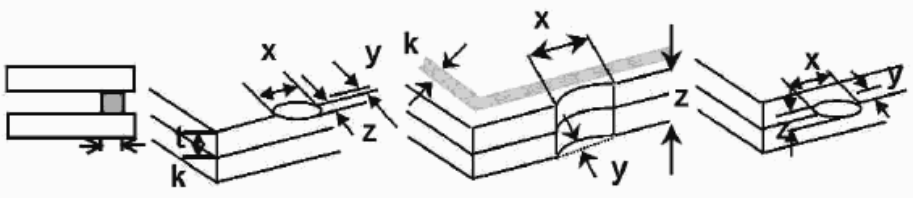
<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>07</td><td>Glass crack</td><td>
Symbols:
x: Chip length y: Chip width z: Chip thickness
k: Seal width t: Glass thickness a: LCD side length
L: Electrode pad length
7.2 Protrusion over terminal:
7.2.1 Chip on electrode pad:


<table>
<tr><td>y: Chip width</td><td>x: Chip length</td><td>z: Chip thickness</td></tr>
<tr><td>y≦0.5mm</td><td>x≦1/8a</td><td>0< z≦t</td></tr>
</table>
7.2.2
Non-conductive portion:


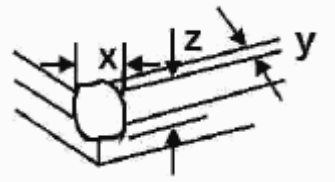
<table>
<tr><td>y: Chip width</td><td>x: Chip length</td><td>z: Chip thickness</td></tr>
<tr><td>y≦L</td><td>x≦1/8a</td><td>0< z≦t</td></tr>
</table>
⊙ If there chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications.
⊙ If the product will be heat sealed by the customer, the alignment mark must mot be damaged.
7.2.3 Substrate protuberance and internal crack


<table>
<tr><td>y: width</td><td>x: length</td></tr>
<tr><td>y≦1/3L</td><td>X≦a</td></tr>
</table>
</td><td>2.5</td></tr>
</table>

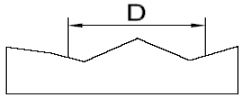
NO	Item	Criterion	AQL
08	Cracked glass	The LCD with extensive crack is not acceptable.	2.5
09	Backlight elements	9.1 Illumination source flickers when lit. 9.2 Spots or scratches that appear when lit must be judged. Using LCD spot, lines and contamination standards. 9.3 Backlight doesn't light or color 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 ≦ 1/2 FPC terminal width and can not affect the function , we judge accept. 12.2 FPC alignment hole damage ≦ 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

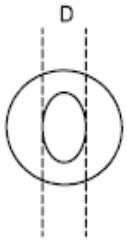
<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>14</td><td>Touch Panel Chipped glass</td><td>
Symbols:
x: Chip length y: Chip width z: Chip thickness
k: Seal width t: Touch Panel Total thickness a: LCD side length
L: Electrode pad length
14.1 General glass chip:
14.1.1 Chip on panel surface and crack between panels:


<table>
<tr><th>z: Chip thickness</th><th>y: Chip width</th><th>x: Chip length</th></tr>
<tr><td>Z≦t</td><td>≦1/2 k and not over viewing area</td><td>x≦1/8a</td></tr>
</table>
⊙ Unit: mm
⊙ If there are 2 or more chips, x is the total length of each chip

14.1.2 Corner crack:


<table>
<tr><th>z: Chip thickness</th><th>y: Chip width</th><th>x: Chip length</th></tr>
<tr><td>z≦t</td><td>≦1/2 k and not over viewing area</td><td>x≦1/8a</td></tr>
</table>
⊙ Unit: mm
⊙ If there are 2 or more chips, x is the total length of each chip
</td><td>2.5</td></tr>
</table>

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>15</td><td>Touch Panel(Fish eye、dent and bubble on film)</td><td>
<table>
<tr><th>SIZE(mm)</th><th>Acceptable Q’ty</th></tr>
<tr><td>Φ≦0.2</td><td>Accept no dense</td></tr>
<tr><td>0.2< D ≦0.4</td><td>5</td></tr>
<tr><td>0.4< D ≦0.5</td><td>2</td></tr>
<tr><td>0.5< D</td><td>0</td></tr>
</table>




</td><td>2.5</td></tr>
<tr><td>16</td><td>Touch Panel Newton ring</td><td>Newton ring dimension ≦ 1/2 touch panel area and not affect font and line distortion(≦2.5%) , it is acceptable.</td><td>2.5</td></tr>
<tr><td>17</td><td>Touch Panel Linearity</td><td>Less than 2.5% is acceptable.</td><td>2.5</td></tr>
<tr><td>18</td><td>LCD Ripple</td><td>Touch the touch panel , can not see the LCD ripple.
Pen: R 1.0mm silicon rubber.
Operation Force: 80g</td><td>2.5</td></tr>
<tr><td>19</td><td>General appearance</td><td>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.</td><td>0.65
0.65
0.65
0.65</td></tr>
</table>

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±10℃, and in a relative humidity of 50±10%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±10℃ 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.