

# SPECIFICATION FOR LCD MODULE

**MODULE NO: YB-TG128160S12B-N-B0**

**Doc.Version:01**

Customer Approval:

<input type="checkbox"/> Accept	<input type="checkbox"/> Reject
---------------------------------	---------------------------------

YEEBO	NAME	SIGNATURE	DATE
Prepare	Electronic Engineer	傅國長	2017.5.3
Check	Mechanical Engineer	林碩昂	2017.5.3
Verify		曾志凱	2017.5.7
Approval		陳齊倫	2017.5.3

APPROVAL FOR SPECIFICATIONS ONLY

APPROVAL FOR SPECIFICATIONS AND SAMPLE

WIMRD005-02-D



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

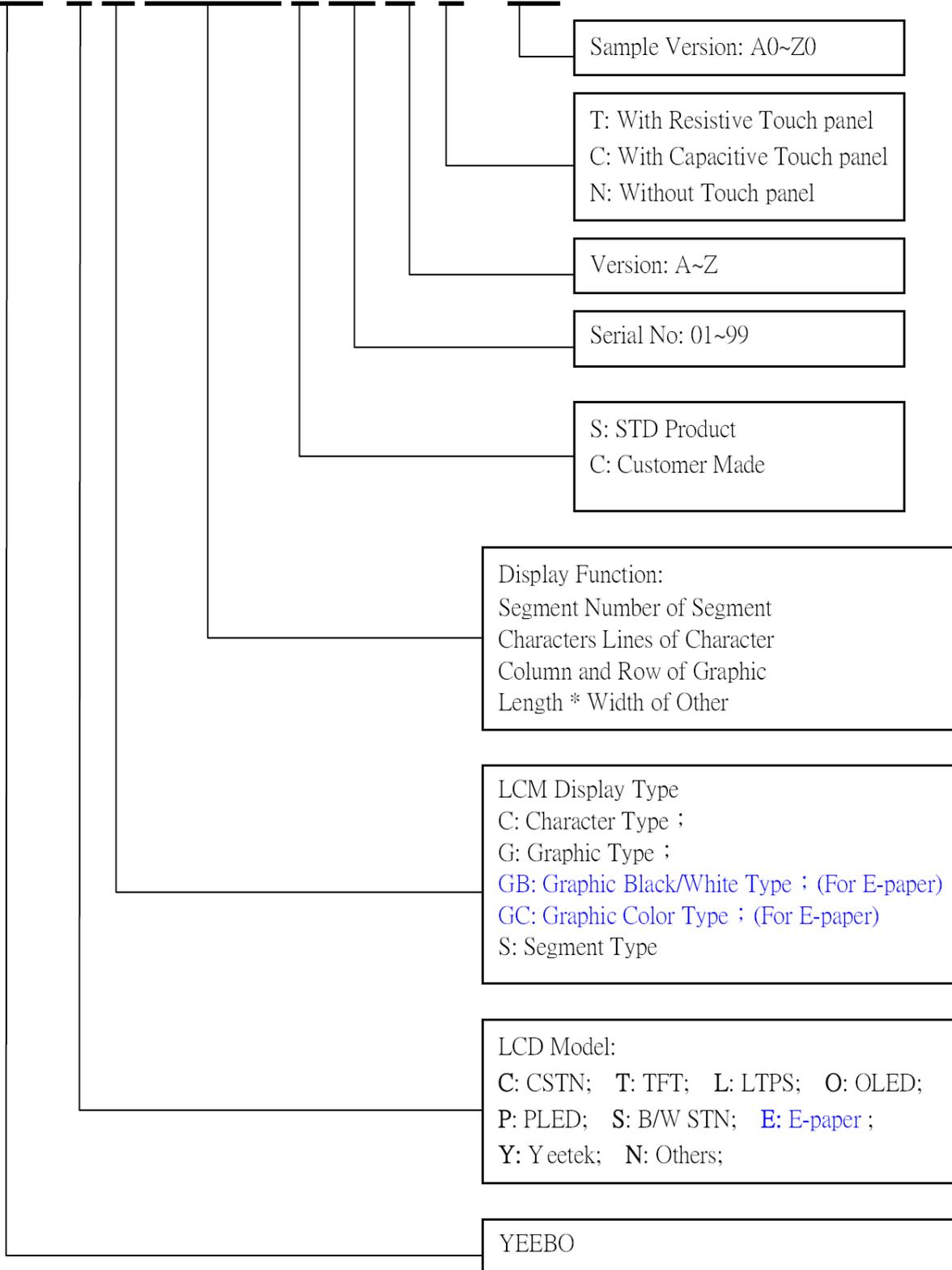
<b>NO</b>	<b>CONTENTS</b>	<b>PAGE</b>
1	Revision History	1
2	Table of Contents	2
3	Module Numbering System	3
4	General Specification	4
5	LCM drawing	5
6	Electrical Characteristics	6
7	Optical Characteristics	12
8	Interface Pin Assignment	14
9	Block Diagram	15
10	Backlight	16
11	Standard Specification for Reliability	17
12	Specification of Quality Assurance	19
13	Handling Precaution	28
14	Guarantee	28



### 3. Module Numbering System:

(Example)

**YB- T G 240320 S 01 D -T - A0**



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

ITEM	CONTENTS
Module Size	34.0 (W) *43.78(H) * 2.3(T) mm
Module Size(With FPC)	34.0 (W) * 56.88(H) * 2.3(T) mm
Display Size(Diagonal)	1.77 inch
Display Format	128(RGB)* 160 Pixels
Active Area	28.032(W) * 35.04 (H) mm
Pixel Pitch	0.219 * 0.219 mm
LCD Type	TFT (262K)/ Transmissive / NW
View Angle (Gray inversion)	12 O'clock
The Best View Angle	6 O'clock
Controller IC	ST7735S
Weight	5.55g



## 6. Electrical Characteristics

### 6-1 Absolute Maximum Ratings

(Ta=25°C VSS=0V)

Item	Symbol	Min.	Type	Max.	Unit	Remark
Supply Voltage	V <sub>DD</sub>	-0.3	-	+4.8	Volt	Note1
Operating Temperature	T <sub>opr</sub>	-20	-	+70	°C	-
Storage Temperature	T <sub>stg</sub>	-30	-	+80	°C	-

Note1: Absolute maximum rating is the limit value beyond which the IC maybe broken.  
They do not assure operations.

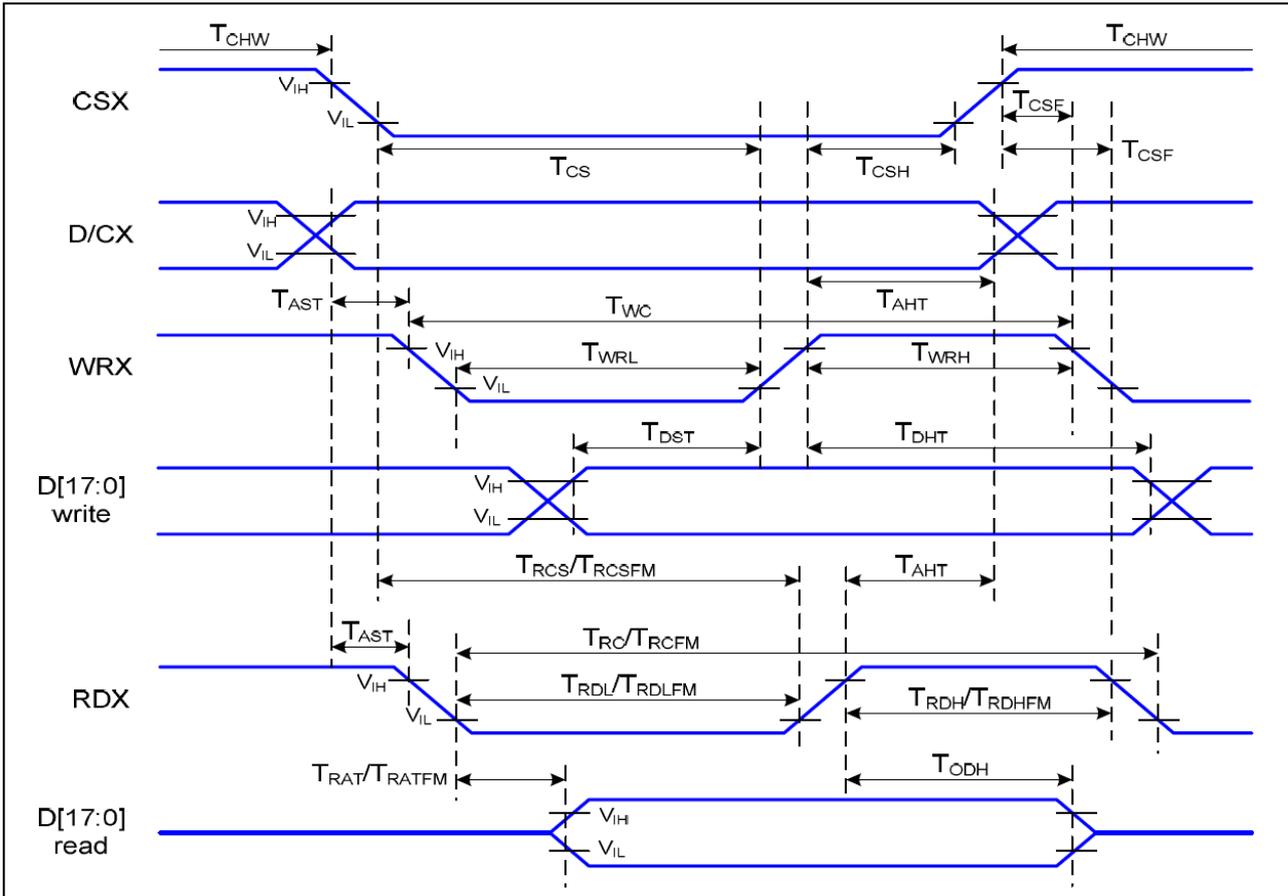
### 6-2 Operating Conditions

(Ta=25°C )

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Power Supply voltage	V <sub>DD</sub>	-	2.6	2.8	3.3	Volt
TFT Gate ON Voltage	V <sub>GH</sub>		-	11.5	-	Volt
TFT Gate OFF Voltage	V <sub>GL</sub>		-	-7.5	-	Volt
TFT Common Voltage	V <sub>COM</sub>		-1.5	-	3.5	Volt
Input 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
Power Supply Current for LCM	I <sub>DD</sub>	V <sub>DD</sub> =2.8V	-	1.9	2.85	mA

### 6-3 Timing Characteristics

Parallel Interface: 18, 16, 9 or 8-bit Bus (8080 Series MCU Interface)

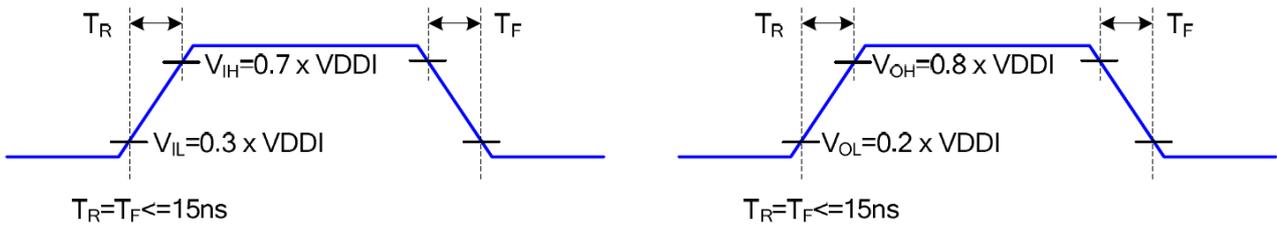


Timing Characteristics (8080 Series MCU Interface)

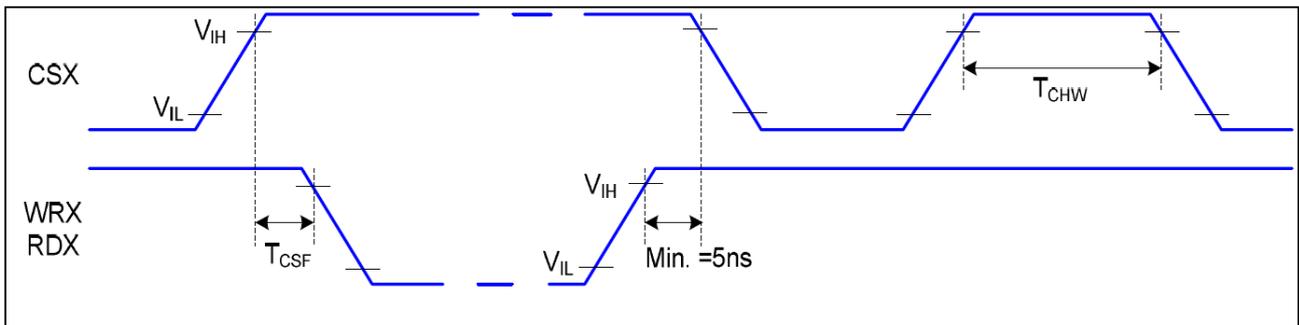
Ta=25 °C, VDDI=1.65~3.7V, VDD=2.5~4.8V

Signal	Symbol	Parameter	Min	Max	Unit	Description
D/CX	TAST	Address Setup Ttime	0		ns	-
	TAHT	Address Hold Time (Write/Read)	10		ns	
CSX	TCHW	Chip Select "H" Pulse Width	0		ns	-
	TCS	Chip Select Setup Time (Write)	15		ns	
	TRCS	Chip Select Setup Time (Read ID)	45		ns	
	TRCSFM	Chip Select Setup time (Read FM)	355		ns	
	TCSF	Chip Select Wait Time (Write/Read)	10		ns	
	TCSH	Chip Select Hold Time	10		ns	
WRX	TWC	Write Cycle	66		ns	-
	TWRH	Control Pulse "H" Duration	15		ns	
	TWRL	Control Pulse "L" Duration	15		ns	
RDX (ID)	TRC	Read Cycle (ID)	160		ns	When Read ID Data
	TRDH	Control Pulse "H" Duration (ID)	90		ns	
	TRDL	Control Pulse "L" Duration (ID)	45		ns	

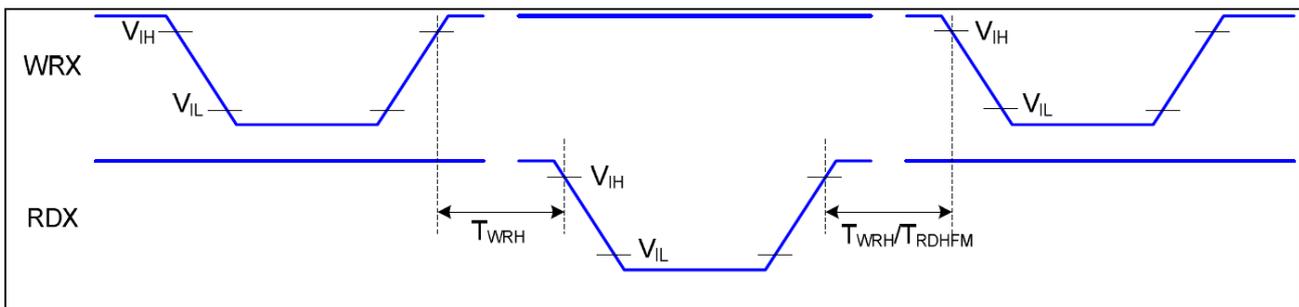
RDX (FM)	TRCFM	Read Cycle (FM)	450		ns	When Read from Frame Memory
	TRDHFH	Control Pulse "H" Duration (FM)	90		ns	
	TRDLFM	Control Pulse "L" Duration (FM)	355		ns	
D[17:0]	TDST	Data Setup Time	10		ns	For CL=30pF
	TDHT	Data Hold Time	10		ns	
	TRAT	Read Access Time (ID)		40	ns	
	TRATFM	Read Access Time (FM)		340	ns	
	TODH	Output Disable Time	20	80	ns	



**Rising And Falling Timing for Input And Output Signal**

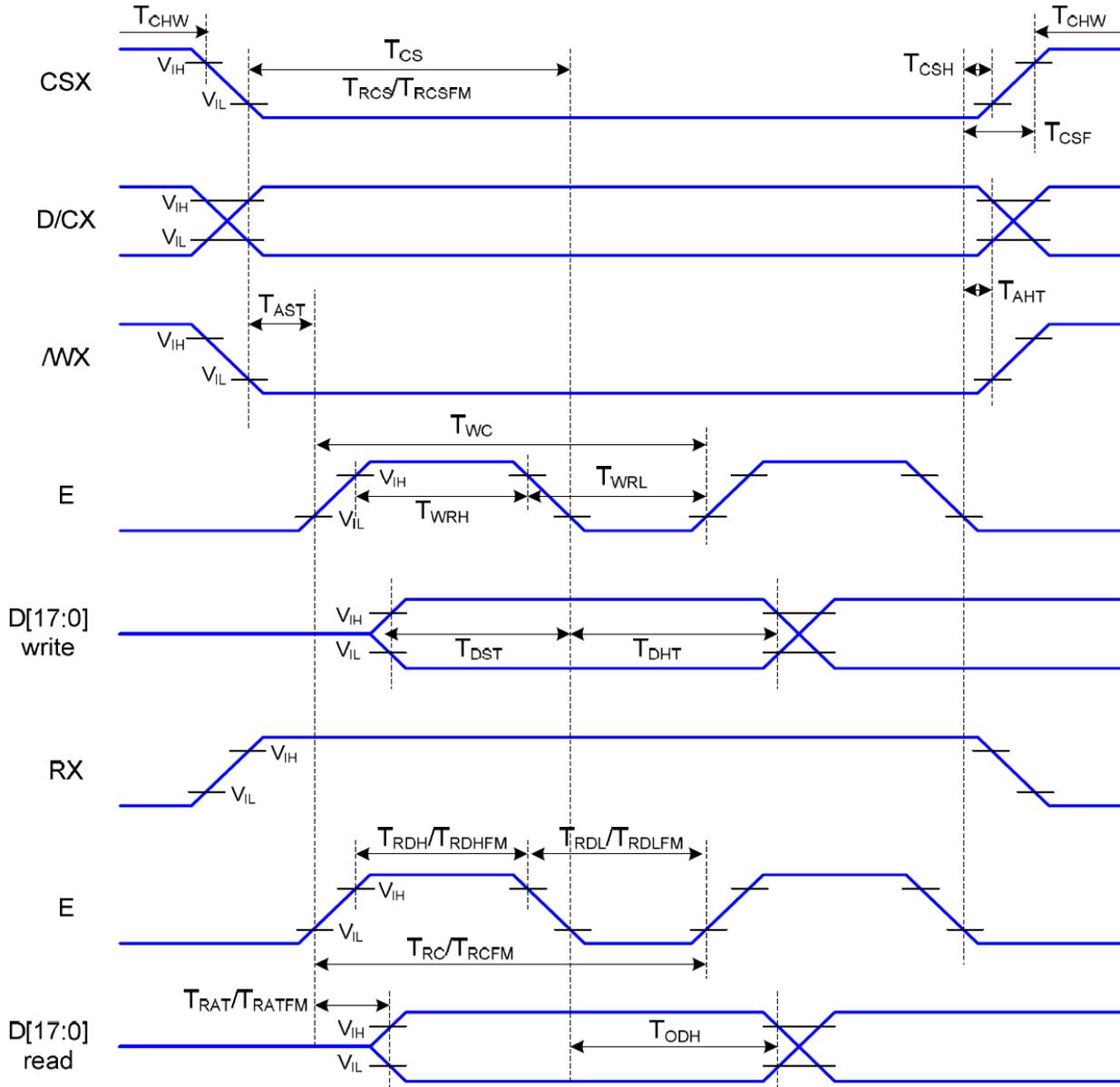


**Chip Selection (CSX) Timing**



**Write-to-Read And Read-to-Write Timing**

Parallel Interface : 18, 16, 9 or 8-bit Bus (6800 Series MCU Interface)



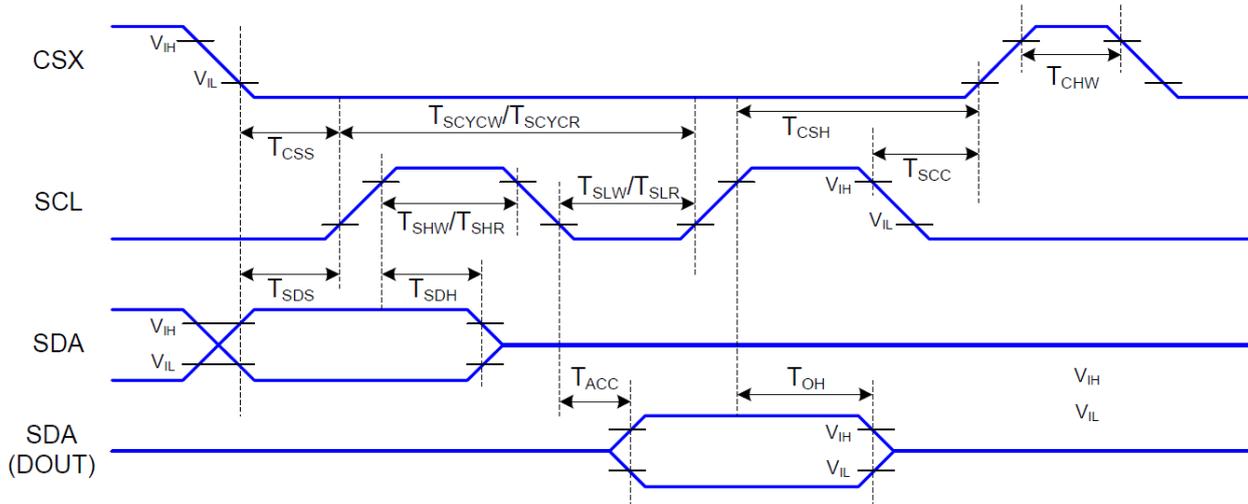
Timing Characteristics (6800-Series MCU Interface)

$T_a=25\text{ }^\circ\text{C}$ ,  $V_{DDI}=1.65\sim 3.7\text{V}$ ,  $V_{DD}=2.5\sim 4.8\text{V}$

Signal	Symbol	Parameter	Min	Max	Unit	Description
D/CX	$T_{AST}$	Address Setup Time	0		ns	-
	$T_{AHT}$	Address Hold Time (Write/Read)	10		ns	-
CSX	$T_{CHW}$	Chip Select "H" Pulse Width	0		ns	-
	$T_{CS}$	Chip Select Setup Time (Write)	15		ns	
	$T_{RCS}$	Chip Select Setup Time (Read ID)	45		ns	
	$T_{RCSFM}$	Chip Select Setup Time (Read FM)	355		ns	
	$T_{CSF}$	Chip Select wait Time (Write/Read)	10		ns	
	$T_{CSH}$	Chip Select Hold Time	10		ns	
WRX	$T_{WC}$	Write Cycle	66		ns	-
	$T_{WRH}$	Control Pulse "H" Duration	15		ns	
	$T_{WRL}$	Control Pulse "L" Duration	15		ns	

RDX (ID)	$T_{RC}$	Read Cycle (ID)	160		ns	When Read ID Data
	$T_{RDH}$	Control Pulse "H" Duration (ID)	90		ns	
	$T_{RDL}$	Control Pulse "L" Duration (ID)	45		ns	
RDX (FM)	$T_{RCFM}$	Read Cycle (FM)	450		ns	When Read From Frame Memory
	$T_{RDHFM}$	Control Pulse "H" Duration (FM)	90		ns	
	$T_{RDLFM}$	Control Pulse "L" Duration (FM)	355		ns	
D[17:0]	$T_{DST}$	Data Setup Time	10		ns	For Maximum CL=30pF
	$T_{DHT}$	Data Hold Time	10		ns	
		$T_{ODH}$	Output Disable Time	20	80	ns

### Serial Interface (3-line Serial)

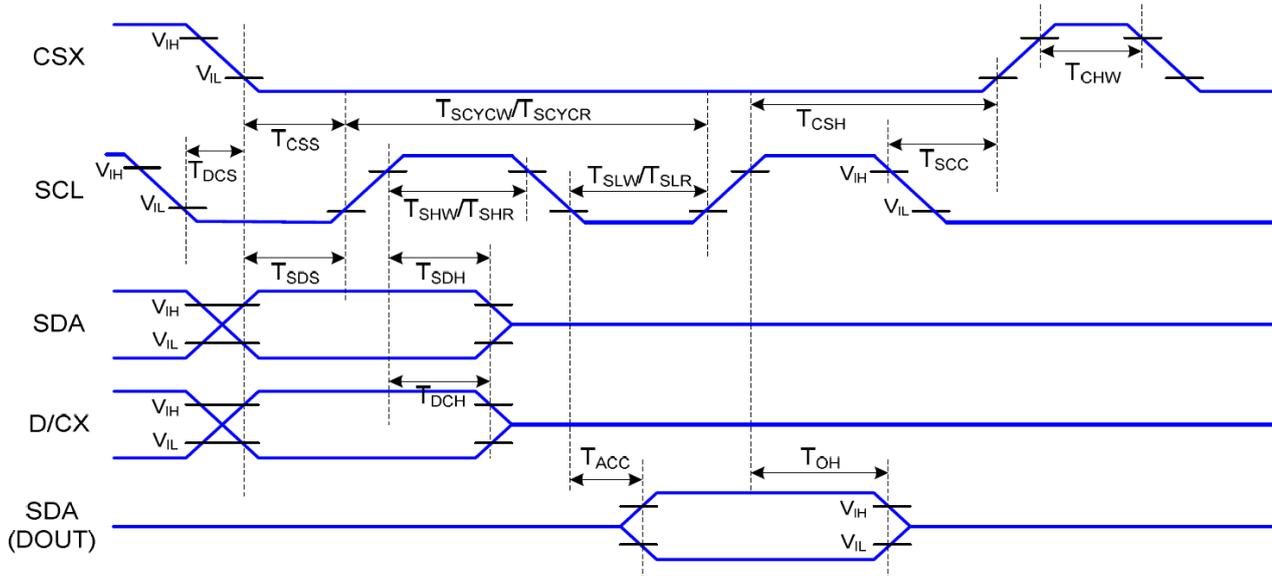


### 3-line Serial Interface Timing

$T_a=25\text{ }^\circ\text{C}$ ,  $V_{DDI}=1.65\sim 3.7\text{V}$ ,  $V_{DD}=2.5\sim 4.8\text{V}$

Signal	Symbol	Parameter	Min	Max	Unit	Description
CSX	TCSS	Chip Select Setup Time (Write)	15		ns	
	TCSH	Chip Select Hold Time (Write)	15		ns	
	TCSS	Chip Select Setup Time (Read)	60		ns	
	TSCC	Chip Select Hold Time (Read)	65		ns	
	TCHW	Chip Select "H" pulse width	40		ns	
SCL	TSCYCW	Serial Clock Cycle (Write)	66		ns	
	TSHW	SCL "H" Pulse Width (Write)	15		ns	
	TSLW	SCL "L" Pulse Width (Write)	15		ns	
	TSCYCR	Serial Clock Cycle (Read)	150		ns	
	TSHR	SCL "H" Pulse Width (Read)	60		ns	
	TSLR	SCL "L" Pulse Width (Read)	60		ns	
SDA (DIN) (DOUT)	TSDS	Data Setup Time	10		ns	For Maximum CL=30pF For Minimum CL=8pF
	TSDH	Data Hold Time	10		ns	
	TACC	Access Time	10	50	ns	
	TOH	Output Disable Time	15	50	ns	

### Serial Interface (4-line Serial)



### 4-line Serial Interface Timing

$T_a=25\text{ }^\circ\text{C}$ ,  $V_{DDI}=1.65\sim 3.7\text{V}$ ,  $V_{DD}=2.5\sim 4.8\text{V}$

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
CSX	TCSS	Chip Select Setup Time (Write)	45		ns	
	TCSH	Chip Select Hold Time (Write)	45		ns	
	TCSS	Chip Select Setup Time (Read)	60		ns	
	TSCC	Chip Select Hold Time (Read)	65		ns	
	TCHW	Chip Select "H" Pulse Width	40		ns	
SCL	TSCYCW	Serial Clock Cycle (Write)	66		ns	-Write Command & Data Ram
	TSHW	SCL "H" Pulse Width (Write)	15		ns	
	TSLW	SCL "L" Pulse Width (Write)	15		ns	
	TSCYCR	Serial Clock Cycle (Read)	150		ns	-Read Command & Data Ram
	TSHR	SCL "H" Pulse Width (Read)	60		ns	
	TSLR	SCL "L" Pulse Width (Read)	60		ns	
D/CX	TDCS	D/CX Setup Time	10		ns	
	TDCH	D/CX Hold Time	10		ns	
SDA (DIN) (DOUT)	TSDS	Data Setup Time	10		ns	For Maximum $CL=30\text{pF}$ For Minimum $CL=8\text{pF}$
	TSDH	Data Hold Time	10		ns	
	TACC	Access Time	10	50	ns	
	TOH	Output Disable Time	15	50	ns	

## 7. Optical Characteristics:

Item	Symbol	Conditions	Specifications			Unit	Note	
			Min	Typ	Max			
Transmittance (Without PL)	T(%)	-	-	6.9	-	-	-	
Contrast Ratio	CR	$\Theta = 0$ Normal Viewing angle	-	500	-		(1) (2)	
Response time	TR+TF	-	-	16	-	ms	(1) (3)	
Viewing angle	Hor.	$\Theta_{x+}$	CR $\geq$ 10	-	70	-	deg.	-
		$\Theta_{x-}$		-	70	-		
	Ver.	$\Theta_{y+}$		-	70	-		
		$\Theta_{y-}$		-	60	-		

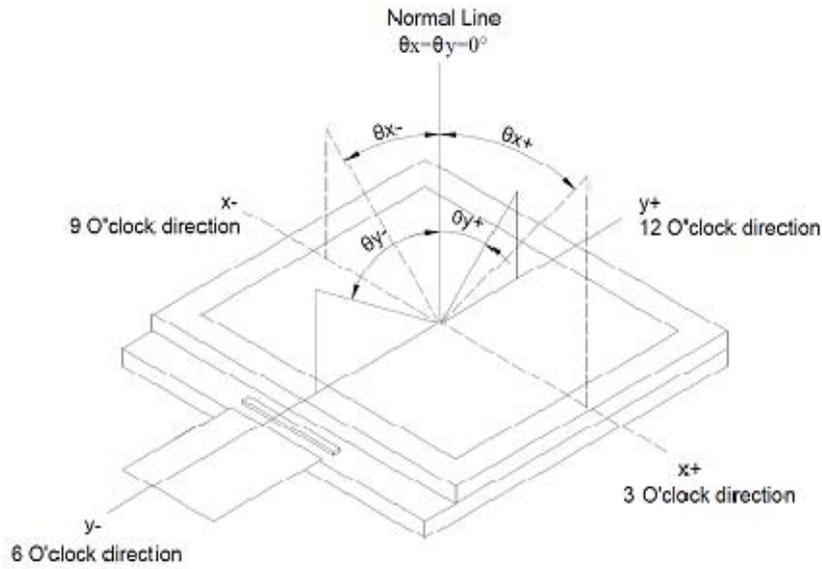
### Measuring Condition

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

### Color of CIE Coordinate:

Item		Symbol	Condition	Min.	Typ.	Max.
Chromaticity Coordinates (Transmissive)	Red	x	$\theta = \phi = 0^{\circ}$ LED Backlight Color Degree	0.548	0.598	0.648
		y		0.316	0.366	0.416
	Green	x		0.265	0.315	0.365
		y		0.526	0.576	0.626
	Blue	x		0.095	0.145	0.195
		y		0.050	0.100	0.15
	White	x		0.23	0.280	0.33
		y		0.244	0.294	0.344

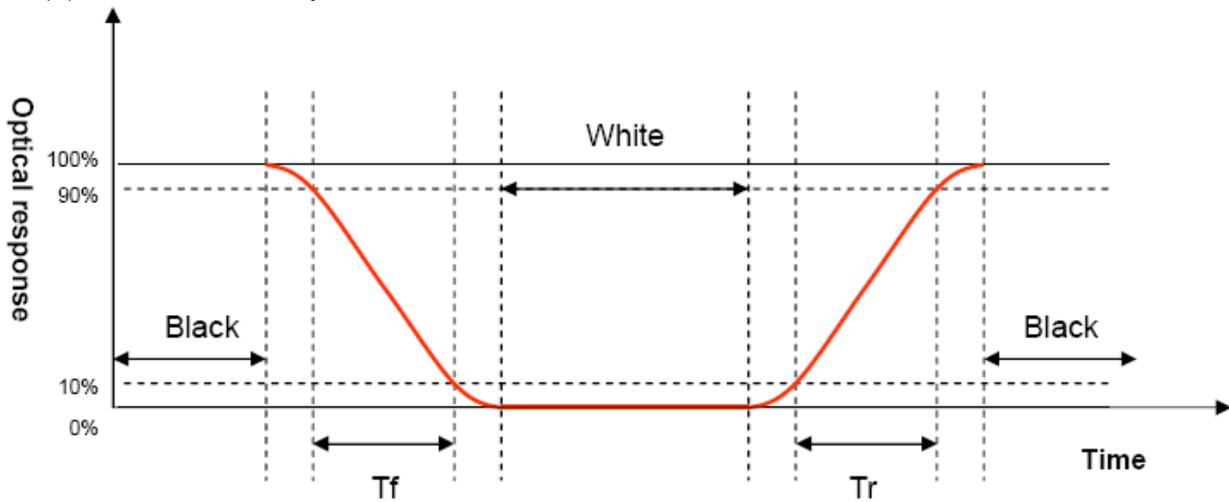
Note (1) Definition of Viewing Angle :



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

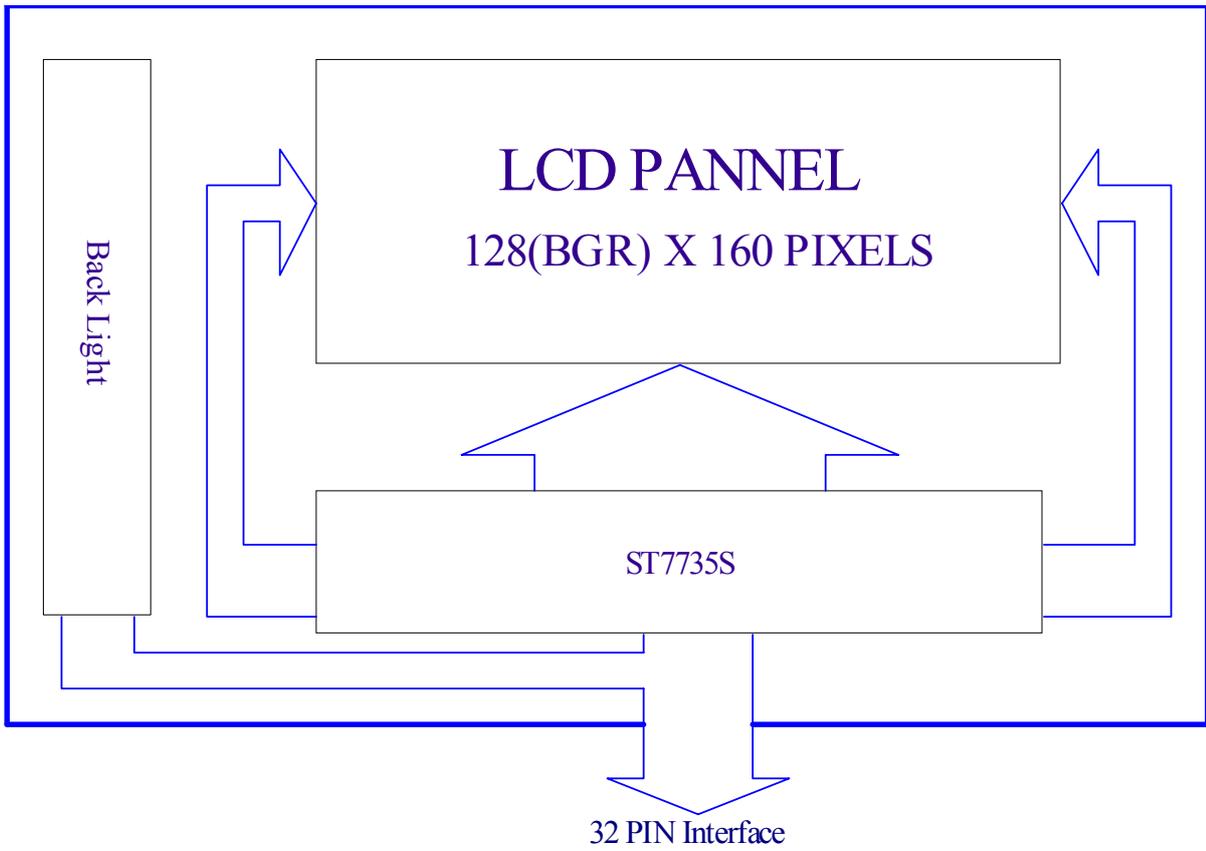


## 8. Interface Pin Assignment:

### 8-1 LCM FPC Interface

No.	Symbol	Function															
1	LEDK	Backlight light power supply-															
2	LEDA	Backlight light power supply+															
3	VDD	Power Supply															
4	VSS	Ground.															
5	/CS	Chip Selection															
6	D/C(SCL)	D/CX='1': Display Data or Parameter. D/CX='0': Command Data. Serial Interface, this is used as SCL. not used, VDD or VSS															
7	RD	Read Enable in 8080 MCU Parallel Interface. not used, VDD or VSS															
8	W/R(DC)	Write Enable in MCU Parallel Interface. In 4-line SPI, this pin is used as D/CX (data/ command selection). not used, VDD or VSS															
9	RESET	This signal will reset the device Signal is active low.															
10~27	D0~D17	D[17:0] are used as MCU parallel interface data bus. D0 is the serial input/output signal in serial interface mode. In serial interface, VDD or VSS															
28	SPI4W	SPI4W='0', 3-line SPI Enable. SPI4W='1', 4-line SPI Enable.															
29	P68	P68='1', Select 6800 MCU Parallel Interface. P68='0', Select 8080 MCU Parallel Interface.															
30	IM2	IM2='1', Parallel Interface IM2='0', Serial Interface															
31~32	IM1~IM0	MCU Parallel Interface Type Selection <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>IM1</th> <th>IM0</th> <th>Parallel Interface</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>MCU 8-bit Parallel</td> </tr> <tr> <td>0</td> <td>1</td> <td>MCU 16-bit Parallel</td> </tr> <tr> <td>1</td> <td>0</td> <td>MCU 9-bit Parallel</td> </tr> <tr> <td>1</td> <td>1</td> <td>MCU 18-bit Parallel</td> </tr> </tbody> </table>	IM1	IM0	Parallel Interface	0	0	MCU 8-bit Parallel	0	1	MCU 16-bit Parallel	1	0	MCU 9-bit Parallel	1	1	MCU 18-bit Parallel
IM1	IM0	Parallel Interface															
0	0	MCU 8-bit Parallel															
0	1	MCU 16-bit Parallel															
1	0	MCU 9-bit Parallel															
1	1	MCU 18-bit Parallel															

**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:

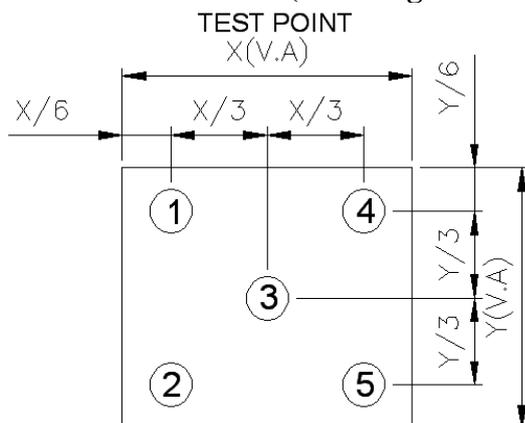
(Ta=25°C )

PARAMETER	Sym.	Min.	Typ.	Max.	Unit	Test Condition	Note
Supply Current	I	30			mA	V=3.2V	
Supply Voltage	V	2.7	3.0	3.2	V	If=30mA	
Luminous Intensity for LCM	IV	150	250	-	Cd/m <sup>2</sup>	If=30mA	2
Uniformity for LCM	-	70	-	-	%		3
Life Time	-	20000	-	-	Hr.		4
Color	White						

NOTE:

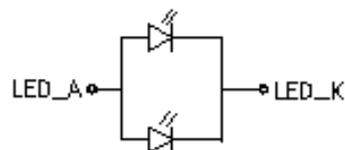
1. Backlight Only
2. Average Luminous Intensity of P1-P9
3. Uniformity = Min/Max \* 100%
4. LED life time defined as follows: The final brightness is at 50% of original brightness

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



#### Internal Circuit Diagram

B/L CIRCUIT DIAGRAM  
30mA(Reference Vf=3.2V)



#### (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°C 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°C 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°C 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°C 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°C,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 : -30°C for 30 minutes → normal temperature for 5 minutes → +80°C 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

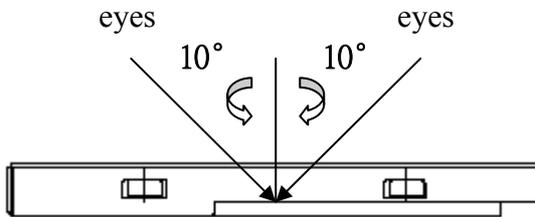
a. Manner of appearance test:

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

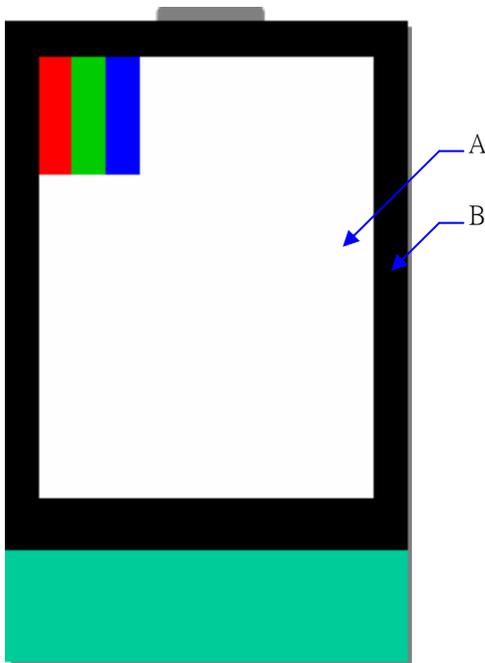
(ii) When test the model of transmissive product must add the reflective plate.

(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.

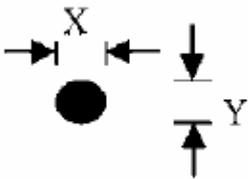
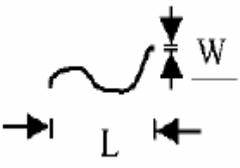
(ii) The sample of the lowest acceptable quality level must be discussed by both supplier and customer when any dispute happened.

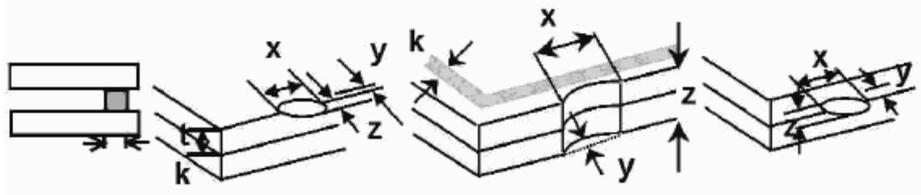
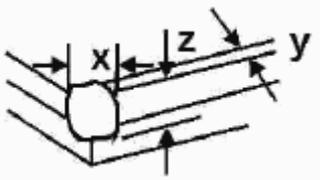
(iii) Must add new item on time when it is necessary.

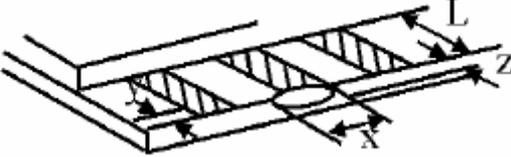
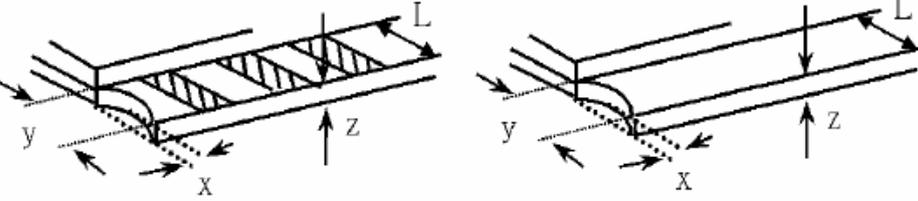
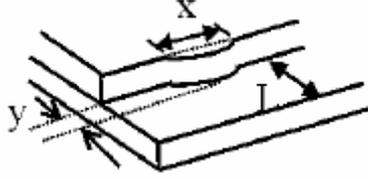
c. Standard of inspection: (Unit: mm)

12-6. Inspection specification

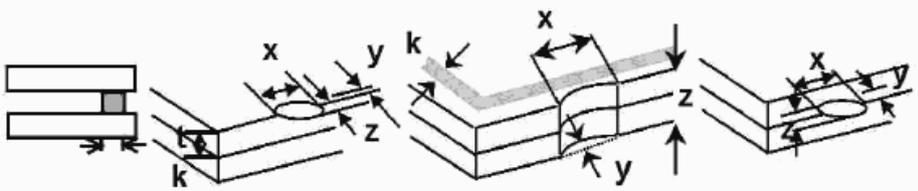
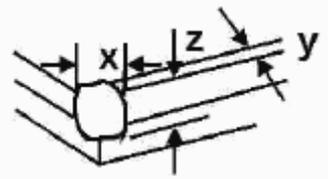
Defect out of viewing area can be neglected.

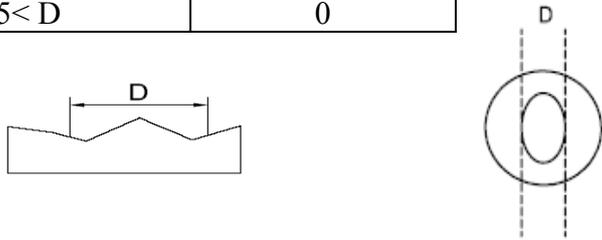
NO	Item	Criterion	AQL												
01	Electrical Testing	1.1 Missing vertical, horizontal segment, segment contrast defect. 1.2 Missing character, dot or icon. 1.3 Display malfunction. 1.4 No function or no display. 1.5 Current consumption exceeds product specifications. 1.6 LCD viewing angle defect. 1.7 Mixed product types. 1.8 Flicker	<b>0.65</b>												
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.	<b>2.5</b>												
03	LCD and Touch Panel black spots, white spots, contamination (non – display)	3.1 Round type: As following drawing $\Phi = (X+Y) / 2$  <table border="1" data-bbox="829 1008 1364 1265"> <thead> <tr> <th>Size(mm)</th> <th>Acceptable Q'ty</th> </tr> </thead> <tbody> <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> </tbody> </table> <p style="text-align: center;">* Densely spaced: No more than two spots within 3mm.</p>	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	<b>2.5</b>
		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														
3.2 Line type: (As following drawing)  <table border="1" data-bbox="694 1411 1364 1646"> <thead> <tr> <th>Length(mm)</th> <th>Width(mm)</th> <th>Acceptable Q'ty</th> </tr> </thead> <tbody> <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> </tbody> </table> <p style="text-align: center;">* Densely spaced: No more than two lines within 3mm.</p>	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	<b>2.5</b>
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	<p>If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction</p> <table border="1"> <thead> <tr> <th>Size <math>\Phi</math>(mm)</th> <th>Acceptable Q'ty</th> </tr> </thead> <tbody> <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> </tbody> </table>	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	<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>6.1 General glass chip:  6.1.1 Chip on panel surface and crack between panels:</p>  <table border="1"> <thead> <tr> <th>z: Chip thickness</th> <th>y: Chip width</th> <th>x: Chip length</th> </tr> </thead> <tbody> <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> </tbody> </table> <p>⊙ Unit: mm  ⊙ If there are 2 or more chips, x is the total length of each chip</p> <p>6.1.2 Corner crack:</p>  <table border="1"> <thead> <tr> <th>z: Chip thickness</th> <th>y: Chip width</th> <th>x: Chip length</th> </tr> </thead> <tbody> <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> </tbody> </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	$Z \leq 1/2t$	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 border="1" data-bbox="550 683 1225 824"> <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 border="1" data-bbox="550 1198 1225 1339"> <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 border="1" data-bbox="869 1668 1305 1809"> <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 border="1" data-bbox="414 795 1236 1019"> <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 border="1" data-bbox="414 1388 1236 1612"> <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 border="1"> <thead> <tr> <th>SIZE(mm)</th> <th>Acceptable Q'ty</th> </tr> </thead> <tbody> <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> </tbody> </table>	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.	0.65											
		19.2 LCD pin loose or missing pins.	0.65											
		19.3 Product packaging must the same as specified on packaging specification sheet.	0.65											
		19.4 Product dimension and structure must conform to product specification sheet.	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 PCB 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.