YEEBO LCD Limited

LCM Specialist

SPECIFICATION
FOR
LCD MODULE

MODULE NO:BG-12864A-FBWB-J-G-B01

Doc.Version:04

Customer Approval:

☐ Accept ☐ Reject

YEEBO	NAME	SIGNATURE	DATE
Prepare	Electronic Engineer		2010-12-29
Check	Mechanical Engineer		2010-12-29
Verify			2010-12-29
Approval			

☐ APPROVAL FOR SPECIFICATIONS ONLY

■ APPROVAL FOR SPECIFICATIONS AND SAMPLE

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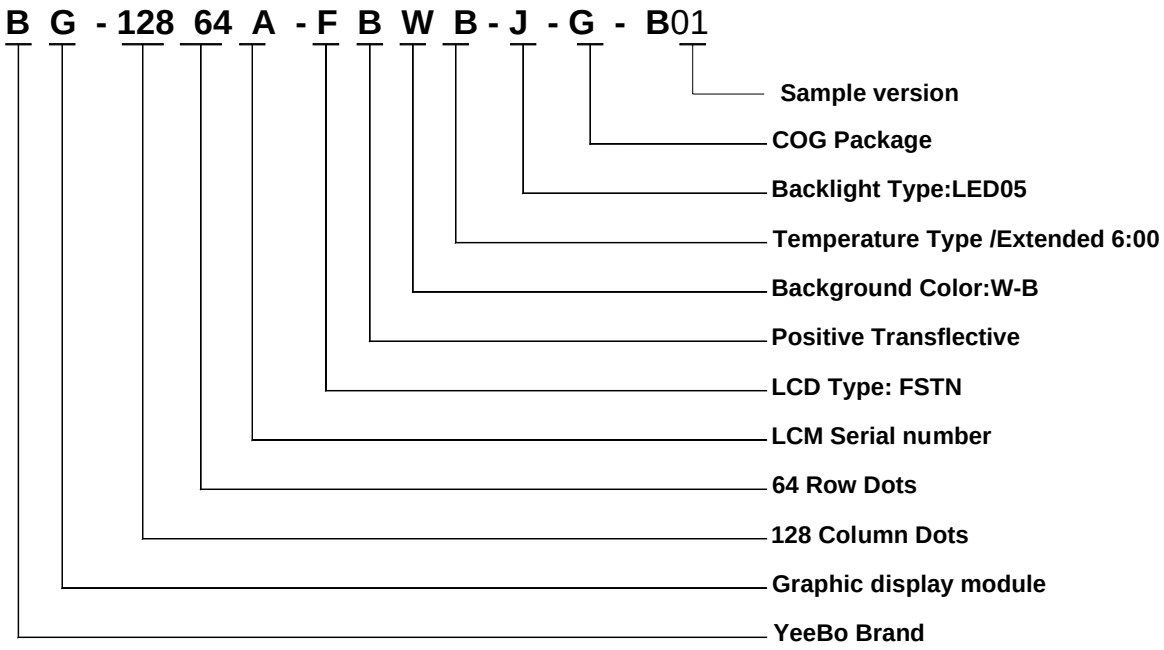
DOCUMENT REVISION HISTORY

Sample Version	DOC. Version	DATE DESCRIPTION	CHANGED BY
B00 00		2005-05-13 First issue	CAI SH
B00	01	2006-12-27 Changed the BL Size	Han hui li
B00	02	2006-06-04 Changed the Count Dwg	Luo yx
B00	03	2007-07-25 Revised A&K position	Luo yx
B01 04		2010-12-29 Change the LCD	CJW

CONTENTS

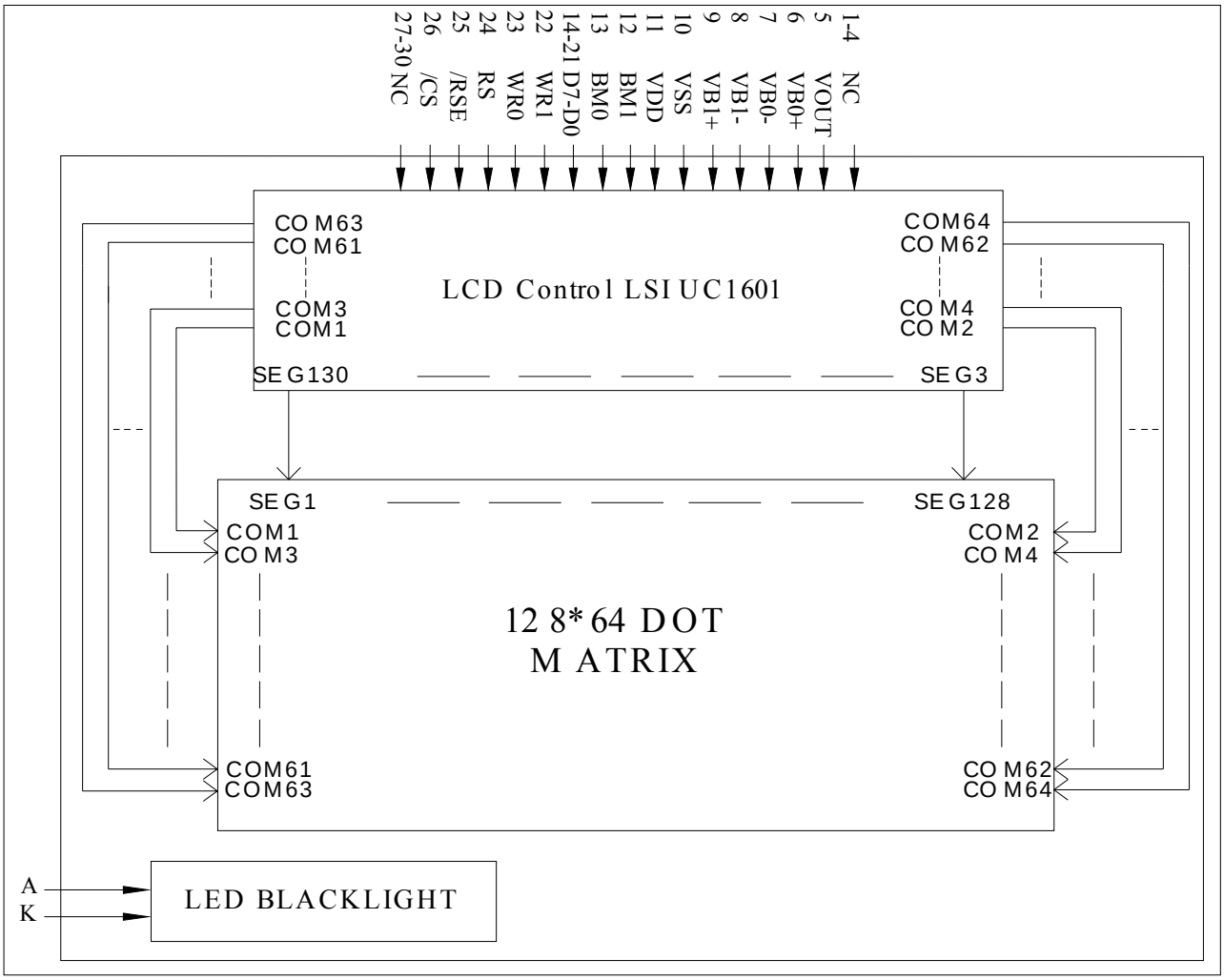
1.DESCRIBE TO THE PART NO:



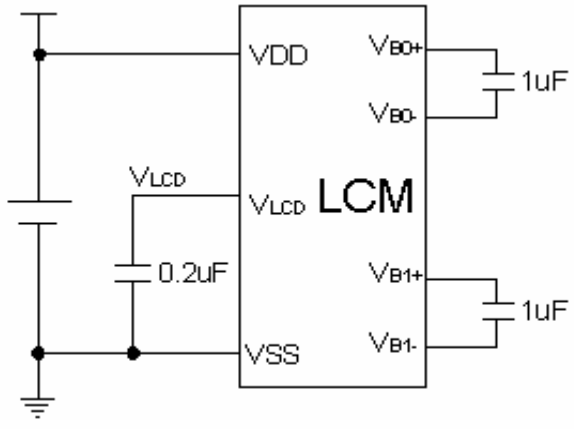
2.MECHANICAL SPECIFICATIONS

ITEM Nor	minal dimensions
Lcd mode	128*64 Dots Graphic
Module dimension	56.6(W)*44.2(H:not include the FPC)*7.65MAX (T)
Viewing area	50.6 (W) * 31.0(H)
Active area	46.562 (W)*27.682 (H)
Dot pitch	0.364(W) * 0.433(H)
Dot size	0.334(W) * 0.403(H)
Duty/bias	1/65duty, 1/9 bias
LCD FSTN/W	hite-Black /Positive/Transflective
Viewing direction	6 o'clock

3.BLOCKDIAGRAM



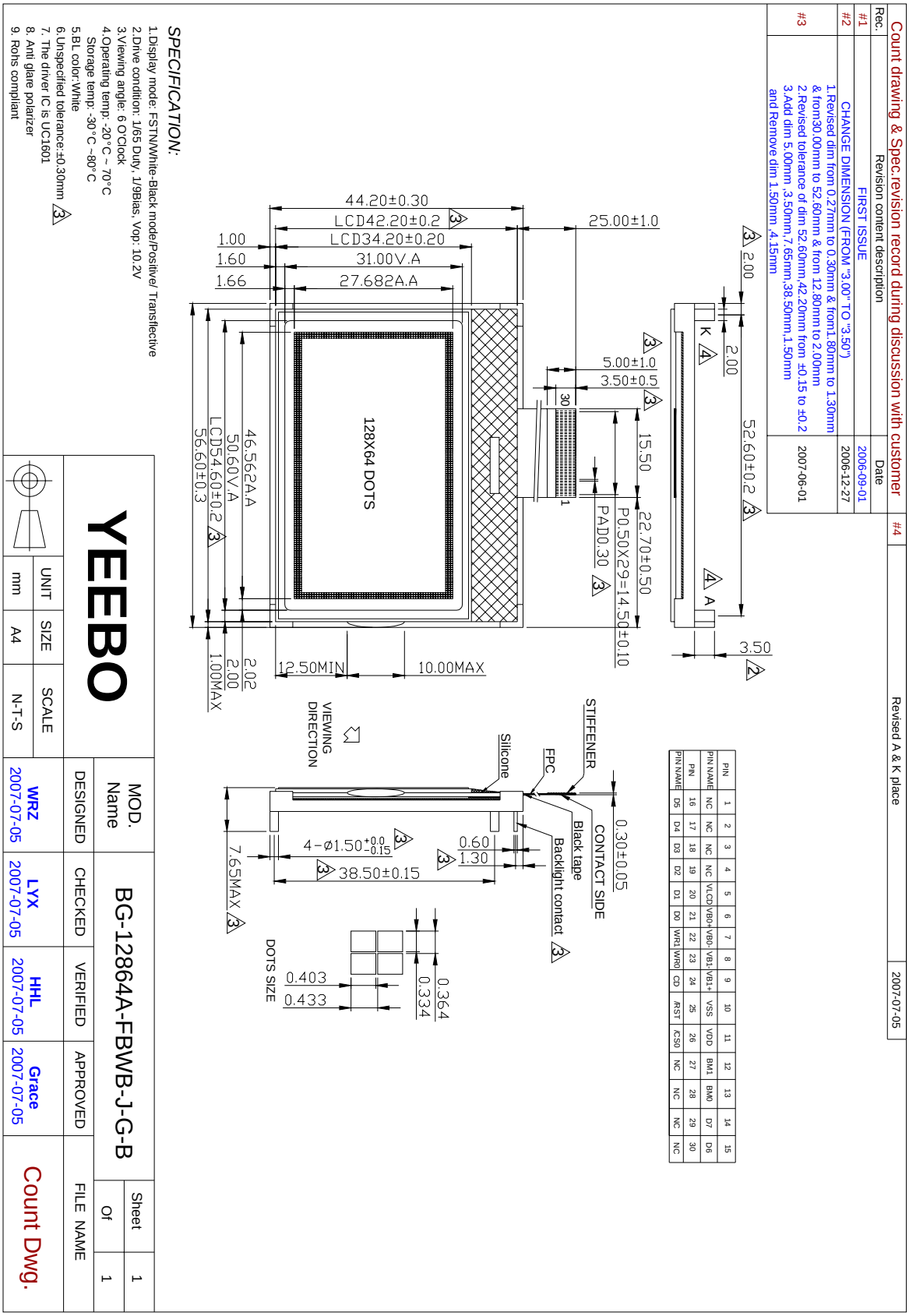
4.POWER SUPPLY



V_{DD}-V_0=Operating voltage for LCD

NOTE: C1=1.0~ 4.7 uF(X5R/X7R)
C2=0.1~4.7 uF (X5R/X7R)

5. Dimensional Outline



6. PIN DESCRIPTION

Pin no.	Symbol	Function
1 NC		NO Connection
2 NC		NO Connection
3 NC		NO Connection
4 NC		NO Connection
5	Vlcd	Power supply for LCD drive circuit
6	VB0+	LCD bias Voltages.
7	VB0-	LCD bias Voltages.
8	VB1-	LCD bias Voltages.
9	VB1+	LCD bias Voltages.
10 VSS		Ground
11	VDD	Power supply for Logic circuit and LCD
12	BM1	Host Interface set function
13	BM0	Host Interface set function
14	D7	Display data signal
15	D6	
16	D5	
17	D4	
18 D3/	SDA	
19	D2	
20	D1	
21 D0/	SCK	
22	WR1	Read/write enable signal
23	WR0	Read/write select signal
24	CD	Signal to select registers
25 R	ST	Reset signal
26	/CS	Chip select signal
27 NC		NO Connection
28 NC		NO Connection
29 NC		NO Connection
30 NC		NO Connection

7.MAXIMUM ABSOLUTE LIMIT (T=25°C)

Item Sym	bol	Standard value	Unit
Power supply voltage for logic	V_{DD} -0	.3~+4.0	V
LCD driving voltage	V_{LCD} -0	3~+ 12.0	
Input voltage	V_I	V_{SS} -0.4~V_{DD}+0.3 V	
Operating temperature	Topr	-20~+70	°C
Storage temperature	Tstg	-30~+80	°C

Note: Voltage greater than above may damage the module
All voltages are specified relative to V_{SS}=0V

8.ELECTRICAL CHARACTERISTICS.

8-1-1 DC Characteristics (V_{DD}=+3V, V_{SS}=0V, Ta=25°C)

Item Sym	bol	Min	Type	Max	Unit	Test condition
Operating voltage	V_{DD}	2.7	3.0	3.3	V	-
Supply current	I_{DD}	-	-	1	mA	During display
Input voltage	V_{IL} VSS		-	0.2VDD	V	-
	V_{IH} 0.	8VDD	-	V_{DD}	V	
Output voltage	V_{OL}	VSS	-	0.2VDD	V	-
	V_{OH} 0.	8VDD	-	VDD	V	-
Input leakage current	I_{LKG} -		-	1.5	uA	V_{IN}=0 or V_{DD}
LCD driving voltage	V_{LCD} 10		10.2	10.4	V	-

8-1-2 .Backlight Specifications Absolute maximum rating(Ta=25°C)

Item	Symbol	Min	Typ	Max	Unit	Condition
Forward voltage	Vf	2.9	3.1	3.3	V	If=30mA
Reverse Current	Ir	-	-	100	uA	Vr=5V
Power Dissipation	Pd	-	-	100	mw	If=30mA
Chromaticity Coordinates	X 0.	27	0.29	0.31	---	If=30mA
	Y	0.28	0.30	0.32	---	
Luminance	Lv	50	-	-	Cd/m*m	If=30mA
Luminance with the LCD	Lv	5 -		-	Cd/m*m	If=30mA

8-2 AC Characteristics

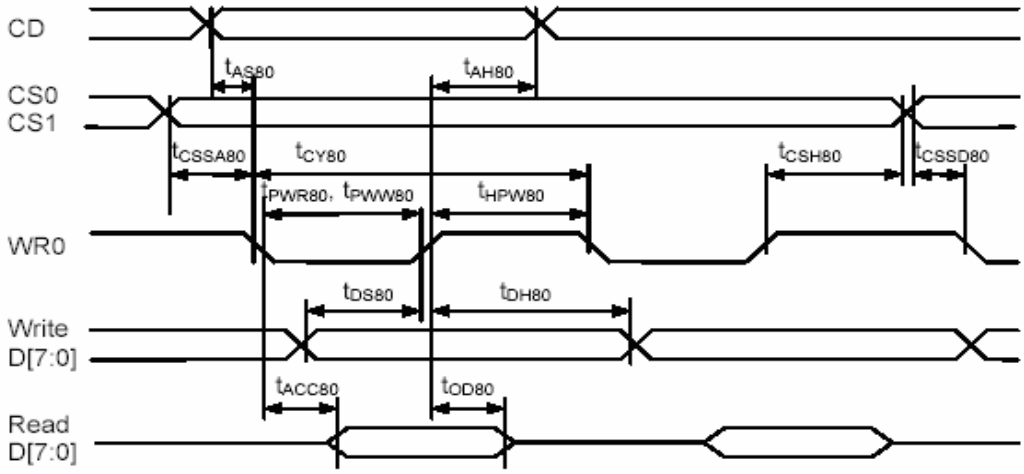


FIGURE 13: Parallel Bus Timing Characteristics (for 8080 MCU)

($2.5V \leqslant V_{DD} < 3.3V$, Ta= 25 °C)

Symbol	Signal	Description	Condition	Min.	Max.	Units
t_{AS80} t_{AH80}	CD	Address setup time Address hold time		0 40	–	nS
t_{CY80}		System cycle time		135	–	nS
t_{PWR80}	WR1	Pulse width (read)		65	–	nS
t_{PWW80}	WR0	Pulse width (write)		65	–	nS
t_{HPW80}	WR0, WR1	High pulse width		65	–	nS
t_{DS80} t_{DH80}	D0~D7	Data setup time Data hold time		30 20	–	nS
t_{ACC80} t_{OD80}		Read access time Output disable time	C_L = 100pF	– 10	50 50	nS
t_{CSSA80} t_{CSSD80} t_{CSH80}	CS1/CS0	Chip select setup time		10 10 20		nS

($2.4V \leqslant V_{DD} < 2.5V$, Ta= 25 °C)

Symbol	Signal	Description	Condition	Min.	Max.	Units
t_{AS80} t_{AH80}	CD	Address setup time Address hold time		0 60	–	nS
t_{CY80}		System cycle time		280	–	nS
t_{PWR80}	WR1	Pulse width (read)		95	–	nS
t_{PWW80}	WR0	Pulse width (write)		95	–	nS
t_{HPW80}	WR0, WR1	High pulse width		95	–	nS
t_{DS80} t_{DH80}	D0~D7	Data setup time Data hold time		30 30	–	nS
t_{ACC80} t_{OD80}		Read access time Output disable time	C_L = 100pF	– 10	50 50	nS
t_{CSSA80} t_{CSSD80} t_{CSH80}	CS1/CS0	Chip select setup time		10 10 20		nS

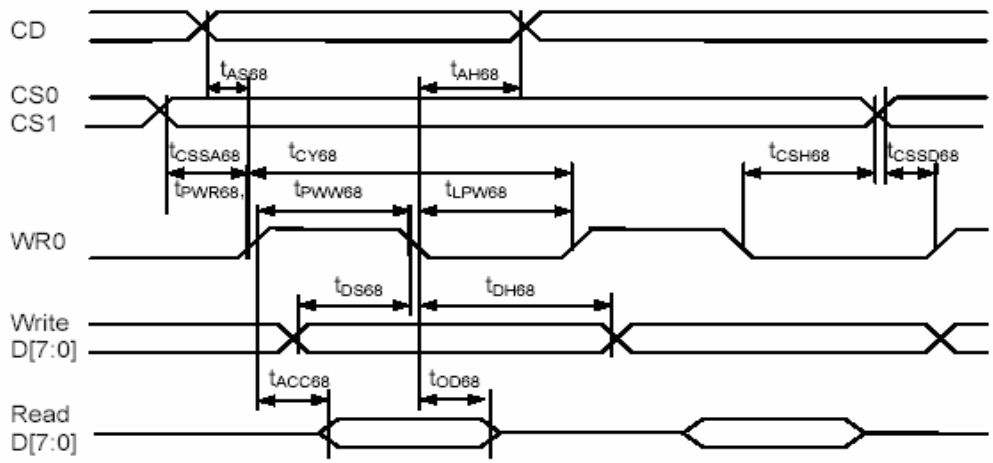


FIGURE 14: Parallel Bus Timing Characteristics (for 6800 MCU)

($2.5V \leqslant V_{DD} < 3.3V$, Ta= 25°C)

Symbol	Signal	Description	Condition	Min.	Max.	Units
t_{AS68} t_{AH68}	CD	Address setup time Address hold time		0 40	–	nS
t_{CY68}		System cycle time		135	–	nS
t_{PWR68}	WR1	Pulse width (read)		65	–	nS
t_{PWW68}		Pulse width (write)		65	–	nS
t_{LPW68}		Low pulse width		65	–	nS
t_{DS68} t_{DH68}	D0~D7	Data setup time Data hold time		30 15	–	nS
t_{ACC68} t_{OD68}		Read access time Output disable time	C_L = 100pF	– 10	50 50	nS
T_{CSSA68} T_{CSSD68} T_{CSH68}	CS1/CS0	Chip select setup time		10 10 20		nS

($2.4V \leqslant V_{DD} < 2.5V$, Ta= 25°C)

Symbol	Signal	Description	Condition	Min.	Max.	Units
t_{AS68} t_{AH68}	CD	Address setup time Address hold time		0 60	–	nS
t_{CY68}		System cycle time		200	–	nS
t_{PWR68}	WR1	Pulse width (read)		95	–	nS
t_{PWW68}		Pulse width (write)		95	–	nS
t_{LPW68}		Low pulse width		95	–	nS
t_{DS68} t_{DH68}	D0~D7	Data setup time Data hold time		30 30	–	nS
t_{ACC68} t_{OD68}		Read access time Output disable time	C_L = 100pF	– 10	50 50	nS
t_{CSSA68} t_{CSSD68} t_{CSH68}	CS1/CS0	Chip select setup time		10 10 20		nS

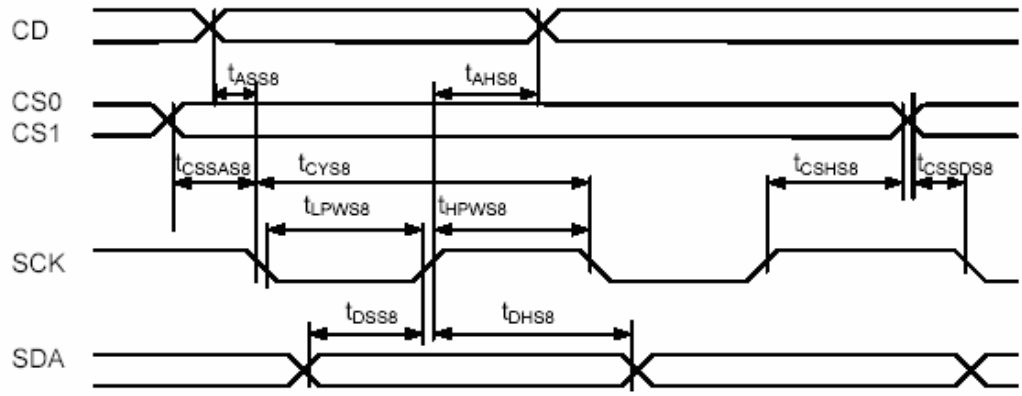


FIGURE 15: Serial Bus Timing Characteristics (for S8)

(2.5V ≤ V_{DD} < 3.3V, Ta= 25 °C)

Symbol	Signal	Description	Condition	Min.	Max.	Units
t_{ASS8}	CD	Address setup time		0	–	nS
t_{AHS8}		Address hold time		40	–	nS
t_{CYS8}	SCK	System cycle time		135	–	nS
t_{LPWS8}		Low pulse width		65	–	nS
t_{HPWS8}		High pulse width		65	–	nS
t_{DSS8} t_{DHS8}	SDA	Data setup time Data hold time		30 15	–	nS
t_{CSSAS8} t_{CSSDS8} t_{CSHS8}	CS1/CS0	Chip select setup time		10 10 20		nS

(2.4V ≤ V_{DD} < 2.5V, Ta= 25 °C)

Symbol	Signal	Description	Condition	Min.	Max.	Units
t_{ASS8}	CD	Address setup time		0	–	nS
t_{AHS8}		Address hold time		60	–	nS
t_{CYS8}	SCK	System cycle time		200	–	nS
t_{LPWS8}		Low pulse width		95	–	nS
t_{HPWS8}		High pulse width		95	–	nS
t_{DSS8} t_{DHS8}	SDA	Data setup time Data hold time		30 25	–	nS
t_{CSSAS8} t_{CSSDS8} t_{CSHS8}	CS1/CS0	Chip select setup time		10 10 20		nS

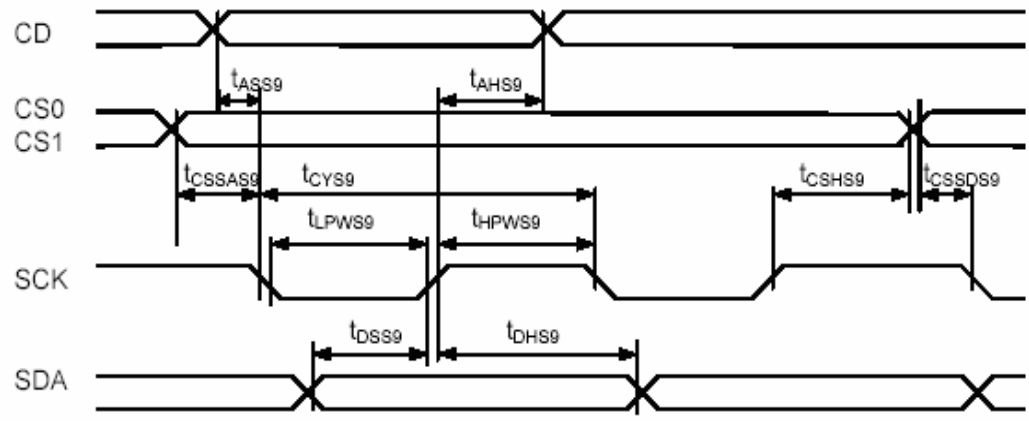


FIGURE 16: Serial Bus Timing Characteristics (for S9)

($2.5V \leqslant V_{DD} < 3.3V$, Ta= 25 °C)

Symbol	Signal	Description	Condition	Min.	Max.	Units
t_{ASS9}	CD	Address setup time		0	–	nS
t_{AHS9}		Address hold time		40	–	nS
t_{CYS9}	SCK	System cycle time		135	–	nS
t_{LPWS9}		Low pulse width		65	–	nS
t_{HPWS9}		High pulse width		65	–	nS
t_{DSS9} t_{DHS9}	SDA	Data setup time Data hold time		30 15	–	nS
t_{CSSAS9} t_{CSSDS9} t_{CSHS9}	CS1/CS0	Chip select setup time		10 10 20		nS

($2.4V \leqslant V_{DD} < 2.5V$, Ta= 25 °C)

Symbol	Signal	Description	Condition	Min.	Max.	Units
t_{ASS9}	CD	Address setup time		0	–	nS
t_{AHS9}		Address hold time		60	–	nS
t_{CYS9}	SCK	System cycle time		200	–	nS
t_{LPWS9}		Low pulse width		95	–	nS
t_{HPWS9}		High pulse width		95	–	nS
t_{DSS9} t_{DHS9}	SDA	Data setup time Data hold time		30 20	–	nS
t_{CSSAS9} t_{CSSDS9} t_{CSHS9}	CS1/CS0	Chip select setup time		10 10 20		nS

9.Instruction Description

The following is a list of host commands supported by UC1601

C/D: 0: Control, 1: Data
W/R: 0: Write Cycle, 1: Read Cycle

\# Useful Data bits
– Don't Care

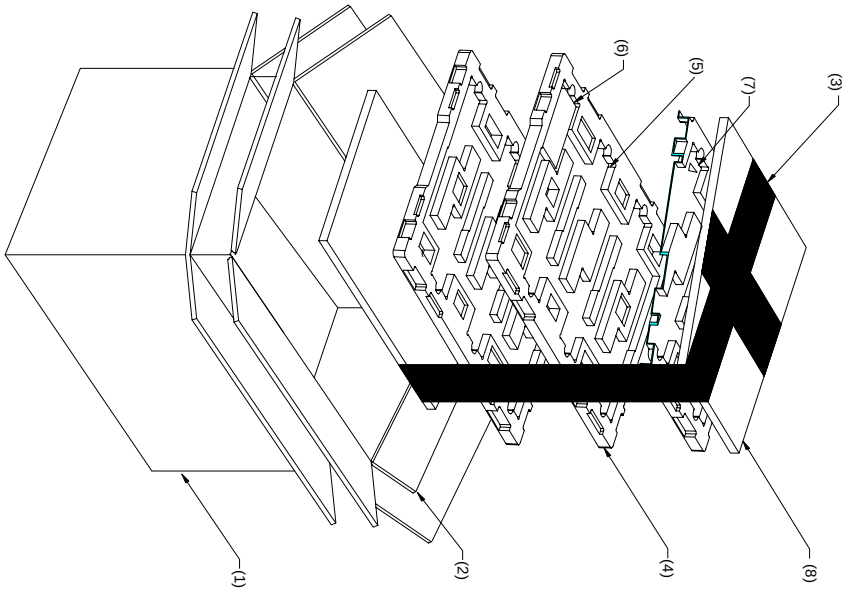
	Command	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0	Action	Default
1	Write Data Byte	1	0	#	#	#	#	#	#	#	#	Write 1 byte	N/A
2	Read Data Byte	1	1	#	#	#	#	#	#	#	#	Read 1 byte	N/A
3	Get Status	0	1	-	MX	MY	RS	WA	DE	–		N/A	
4	Set Column Address LSB	0	0	0	0	0	0	#	#	#	#	Set CA [3:0]	0
	Set Column Address MSB	0	0	0	0	0	1	#	#	#	#	Set CA [7:4]	0
5	Set Multiplexing Rate	0	0	0	0	1	0	0	0	#	#	Set MR [1:0]	11b: 65
6	Set Temp. Compensation	0	0	0	0	1	0	0	1	#	#	Set TC[1:0]	00b: -0.05%/°C
7	Set Panel Loading	0	0	0	0	1	0	1	0	0	#	Set PC[0]	0b: < 15nF
8	Set Pump Control	0	0	0	0	1	0	1	1	#	#	Set PC[2:1]	11b
9	Set Adv. Program Control	0	0	0	0	1	1	0	0	0	R	Set APC[R][7:0],	N/A
	(double byte command)	0	0	#	#	#	#	#	#	#	#	R = 0, or 1	
10	Set Scroll Line	0	0	0	1	#	#	#	#	#	#	Set SL[5:0]	0
11	Set Page Address	0	0	1	0	1	1	#	#	#	#	Set PA[3:0]	0
12	Set V_{BIAS} Potentiometer	0	0	1	0	0	0	0	0	0	1	Set PM[7:0]	C0H
	(double-byte command)	0	0	#	#	#	#	#	#	#	#		
13	Set RAM Address Control	0	0	1	0	0	0	1	#	#	#	Set AC[2:0]	001b
14	Set Frame Rate	0	0	1	0	1	0	0	0	0	#	Set LC[3]	0b
15	Set All-Pixel-ON	0	0	1	0	1	0	0	1	0	#	Set DC[1]	0
16	Set Inverse Display	0	0	1	0	1	0	0	1	1	#	Set DC[0]	0
17	Set Display Enable	0	0	1	0	1	0	1	1	1	#	Set DC[2]	0
18	Set LCD Mapping Control	0	0	1	1	0	0	0	#	#	0	Set LC[2:1]	0
19	System Reset	0	0	1	1	1	0	0	0	1	0	System Reset	N/A
20	NOP	0	0	1	1	1	0	0	0	1	1	No operation	N/A
21	Set Test Control	0	0	1	1	1	0	0	1	TT		For testing only.	N/A
	(double byte command)	0	0	#	#	#	#	#	#	#	#	Do not use.	
22	Set LCD Bias Ratio	0	0	1	1	1	0	1	0	#	#	Set BR[1:0]	11b: 9
23	Reset Cursor Update Mode	0	0	1	1	1	0	1	1	1	0	AC[3]=0, CA=CR	N/A
24	Set Cursor Update Mode	0	0	1	1	1	0	1	1	1	1	AC[3]=1, CR=CA	N/A

* Other than commands listed above, all other bit patterns result in NOP (No Operation).

10.Package Specifications

PRELIMINARY

NO.	ITEM	PART NO.	SPEC	UNIT	QTY PER	REMARK
1	CARTON	PK-CARTON-A	400*300*285	PCS	1	
2	SUB-CARTON	PK-SUB CARTON-A	375*270*260	PCS	1	
3	ADHESIVE TAP		1	m	1	## SHAPE
4	PSPK TRAY	BG-12864A-PSPK-B	360*255*17	PCS	19	ESD 10^{6}---10^{11}
5	PEARL PAD	BG-12864A-PP-B	306.5*233.7*2.0	PCS	18	ESD 10^{6}---10^{11}
6	MODULE	BG-12864A-FBEB-J-G-B	56.6*69.2*7.65	PCS	360	BE CAREFUL IN PUT
7	DRYER		1g	PCS	8	
8	PAPER BOARD	PK-PB-A	360*255*6	PCS	2	



Specification:

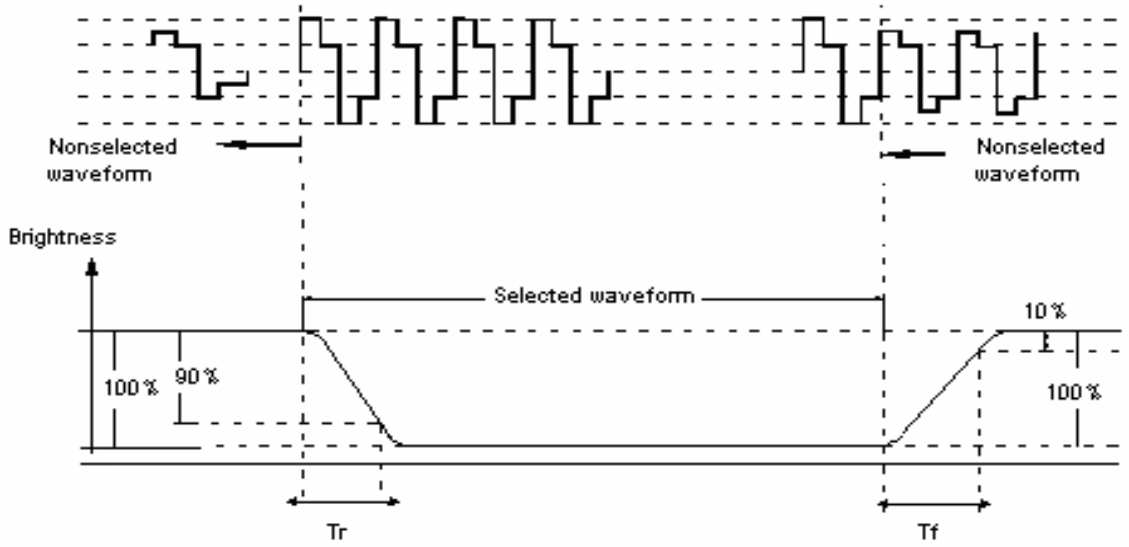
One sub-carton contains 19 layers packings. 20modules in each PSPK tray of 18 layers.8 packet of drayers is put on the upper top of 19 th PSPK tray. A stiff board is put on bottom and top side to stiffen the packings and it is adhered together with adhesive tape. The sub-carton are placed into the outside carton.

One carton can contain 18*20=360 modules.

11.ELETRO-OPTICAL CHARACTERISTICS

NO	ITEM		Symbol	Temp℃	Rating			Unit
					Min	Typ	Max	
1	Response time	Rise time	Tr					Ms
				25	N/A	65	300	
		Fall time	Tf					
				25	N/A	125	300	
2	Operating Frequency		Ff	25		64		Hz
3	Contrast Rate		Cr	25	2	5.5	-	-
4	Viewing Direction		6 O'CLOCK					
5	Viewing Angle Cr • 2	12Hψ=90°	θ1	25		30		Deg
		6Hψ=270°	θ2			35		
		3Hψ=0°	θ3			35		
		9Hψ=180°	θ4			35		
6	Current Consumption		Is	25		9	12	μA
7	Capacitance		C	25	4.1			nF

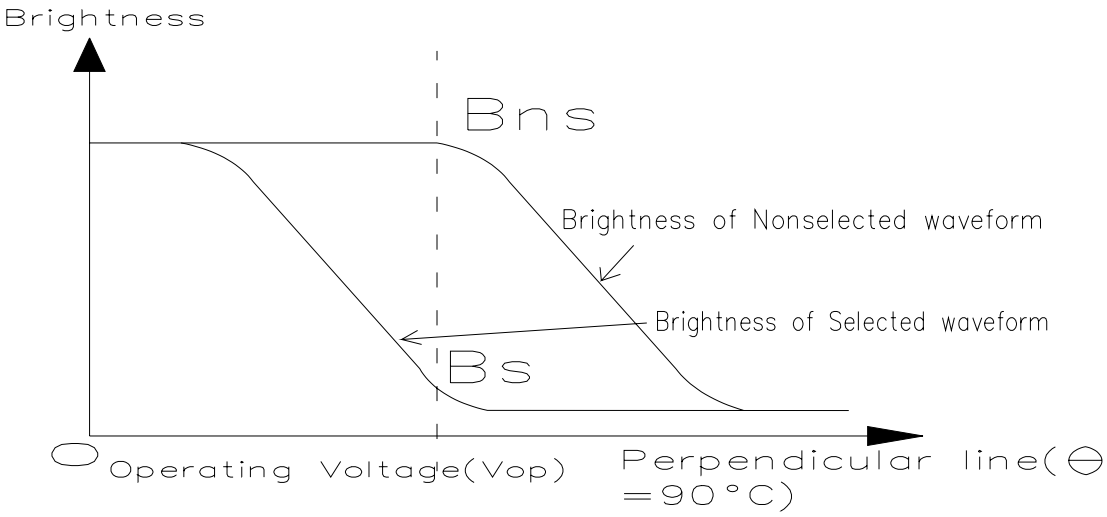
Response Time



Measuring Condition:

1. Driving waveform: 1/N Duty,1/a Bias selected waveform.
2. Driving Frequency: Typical value in Individual specification.
3. Operating Voltage: LCD driving voltage getting maximum contrast rate.
4. Measuring Angle: See Individual Specification.
5. Measuring Temperature: See Individual Specification.

Contrast Ratio Definition



$$\text{Contrast Ratio(Cr)} = \frac{\text{Brightness of non-selected waveform(Bns)}}{\text{B rightness of selected waveform(Bs)}}$$

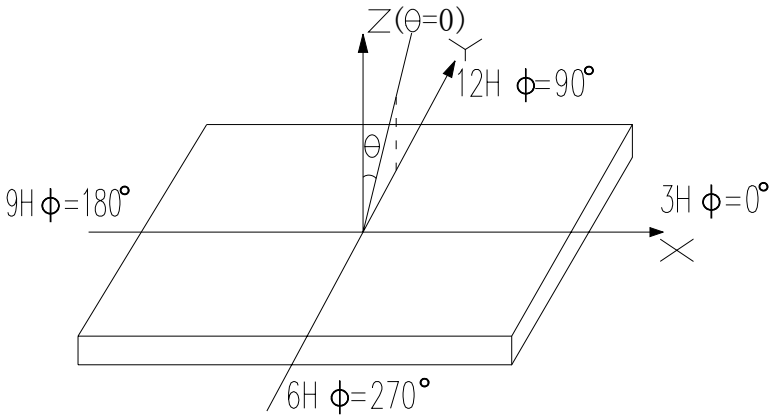
Viewing Angle

θ: Angle between Viewer Direction and Normal.

(-90°≤ θ ≤90°)

ϕ : Angle between Projection of Viewer Direction to X-Y plane and Y axis.

(0°≤ϕ≤360°)



Measuring Condition

1. Driving Voltage: Same as Vlcd.
2. Driving Frequency: Same as Frame Frequency

12 QUALITY SPECIFICATION

12-1. Specification of quality assurance

12-1-1. Purpose

Standardize the Quality Assurance of LCD module products supply to purchaser by YEEBO CORPORATION (Supplier).

12-1-2. Type of Quality Test

a. Inspection:

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

b. Electro-Optical Characteristics:

Test the product according to the individual specification.

c. Test of Appearance Characteristics:

Check the product according to the individual specification.

d. Test of Reliability Characteristics:

e. Delivery Test:

Before delivering, the supplier should take the delivery test.

(Ⅰ) Test method: According to ISO 2859-1.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 = 0.65%

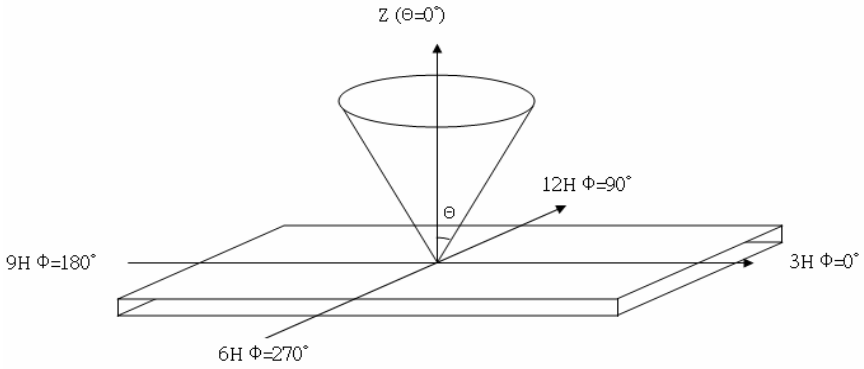
12-1-3. Standard of Product Appearance Inspection

a. Conditions of appearance inspection :

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

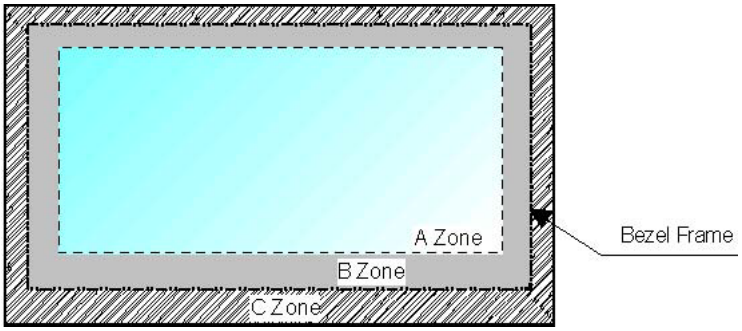
(Ⅱ) When inspecting the model of transmissive product must add the reflective plate.

(Ⅲ) The inspection direction is 30° off vertical line(Θ≦30°).



(Ⅳ) Temperature: 25±5℃ Hum idity: 60±10%RH

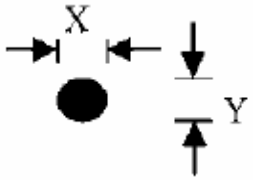
(Ⅴ) Definition of Applicable Zones:

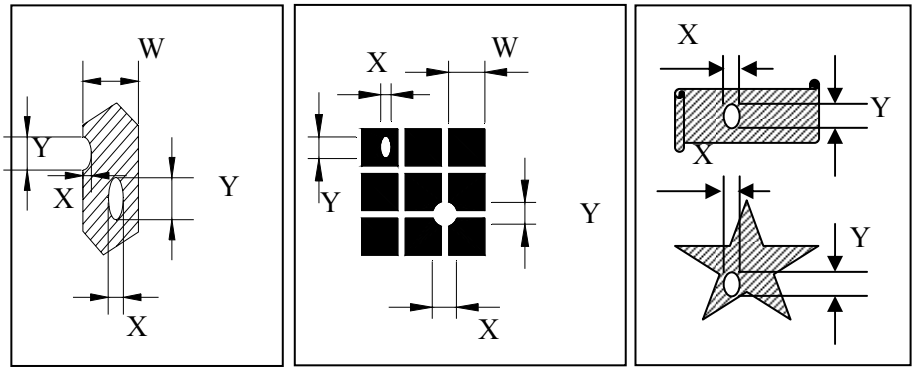


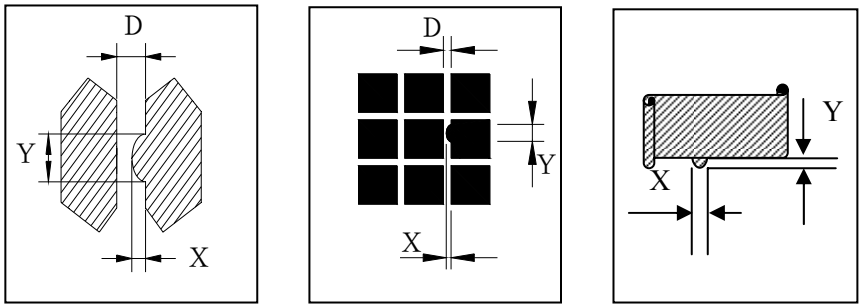
A Zone : Active display area
B Zone : Area from outside of "A Zone" to validity viewing area
C Zone : Rest parts
A Zone + B Zone = Validity viewing area

b. Unit of inspection : mm

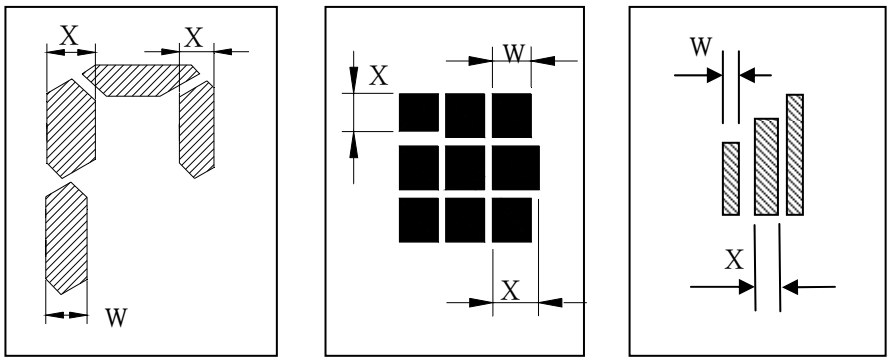
12-1-4. Defect Inspection Specification

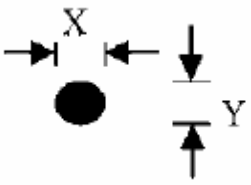
<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>01</td><td>Electrical Testing</td><td>1.1 Missing line.
1.2 Missing character, dot or icon.
1.3 Display malfunction.
1.4 No function or no display.
1.5 Current consumption exceeds product specifications.
1.6 LCD viewing angle defect.</td><td>0.65</td></tr>
<tr><td>02</td><td>Black or White spots or Bright spots or Color spots on LCD (Display “ON”)</td><td>Φ = (X+Y) / 2
 
<table>
<tr><th>Size(mm)</th><th>Acceptable Q'ty</th></tr>
<tr><td>Φ≦0.15</td><td>Accept no dense</td></tr>
<tr><td>0.15< Φ≦0.3</td><td>5</td></tr>
<tr><td>0.3< Φ</td><td>0</td></tr>
</table>
* For “Accept no Dense”, no more than five spots within 5mm.
* The distance between two defects should more than 5mm.
* Spot during display switching is considered as acceptable.</td><td>2.5</td></tr>
</table>

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td rowspan="2">03</td><td rowspan="2">Pin Hole or Distortion</td><td>3.1 Pin Hole：
Segment Dot Matrix Pattern
 

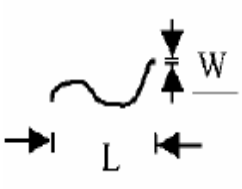
Ø＝(X+Y)/2
<table>
<tr><th>Wide (W)</th><th>Dimension (Ø)</th><th>Acceptable Number</th></tr>
<tr><td>-----</td><td>Ø<0.10</td><td>Accept no dense</td></tr>
<tr><td>W≦0.4 Ø</td><td>≦0.15 and X≦1/2W</td><td>2</td></tr>
<tr><td>W>0.4 Ø</td><td>≦0.20 and X≦1/3W</td><td>2</td></tr>
</table>
* For “Accept no Dense”, no more than 3 spots within 5mm.
* Shall not more than 2 defects and the distance between two defects should more than 10mm.</td><td>2.5</td></tr>
<tr><td>3.2 Distortion (Dot Shape)
Segment Dot Matrix Pattern
 

D：Space Ø=(X+Y)/2
<table>
<tr><th>Size (Ø)</th><th>Acceptable Qty</th></tr>
<tr><td>Ø<0.10</td><td>Disregard</td></tr>
<tr><td>Ø≦0.20 and X≦1/2D</td><td>2</td></tr>
<tr><td>Ø>0.20 or X>1/2D</td><td>0</td></tr>
<tr><td colspan="2">IF Y>0.5 , follow Item 3.3-</td></tr>
</table></td><td>2.5</td></tr>
</table>

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>03</td><td>Pin Hole or Distortion</td><td>3.3 Distortion (Thick or Thin)：
Segment Dot Matrix Pattern
 

<table>
<tr><th>Wide(W)</th><th>Distortion Wide (X)</th><th>Acceptable Qty</th></tr>
<tr><td>----- |</td><td>X -W| ≦ 0.10</td><td>Disregard</td></tr>
<tr><td>W ≦ 4mm</td><td>| X -W| ≦ 0.20 and X ≧ 1/2W</td><td>2</td></tr>
<tr><td>W>4mm |</td><td>X -W| ≦ 0.30</td><td>2</td></tr>
</table>
* Total defects shall not exceed 3.
* Distortion thickness cannot over 1/2 width of dot gap.</td><td>2.5</td></tr>
<tr><td>04</td><td>LCD and Touch Panel black spots, white spots, contamination (Display “OFF”)</td><td>4.1 Round type: As following drawing
Φ = (X+Y) / 2
 

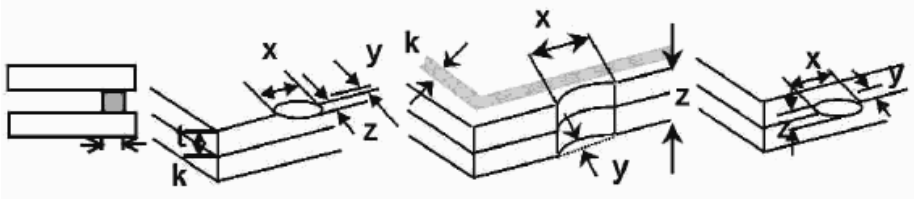
<table>
<tr><th>Size(mm)</th><th>Acceptable Q'ty</th></tr>
<tr><td>Φ ≦ 0.1</td><td>Accept no dense</td></tr>
<tr><td>0.1< Φ ≦ 0.2</td><td>3</td></tr>
<tr><td>0.2< Φ ≦ 0.25</td><td>2</td></tr>
<tr><td>0.25< Φ ≦ 0.35</td><td>1</td></tr>
<tr><td>0.35< Φ</td><td>0</td></tr>
</table>
* For “Accept no Dense”, no more than five spots within 5mm.
* The distance between two def ects should more than 5mm .
* Outside o f the V.A. is dis regard.</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>LCD and Touch Panel black spots, white spots, contamination (Display “OFF”)</td><td>4.2 Line type: (As following drawing)
 

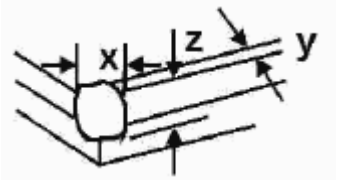
<table>
<tr><th>Length(mm)</th><th>Width(mm) Acceptable Q'ty</th></tr>
<tr><td>---</td><td>W≦0.02</td><td>Accept no dense</td></tr>
<tr><td>L≦3</td><td>0.02< W≦0.05</td><td>2</td></tr>
<tr><td>L≦2</td><td>0.05< W≦0.08</td><td>1</td></tr>
<tr><td>---</td><td>0.08<W</td><td>Rejection</td></tr>
</table>
* For “Accept no Dense”, no more than 2 lines within 5mm.
* The distance between two defects should more than 5mm.
* Outside of the V.A. is disregard.</td><td>2.5</td></tr>
<tr><td>05</td><td>Polarizer bubbles</td><td><table>
<tr><th>Size Φ(mm) 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>
* For “Accept no Dense”, no more than 2 bubbles within 5mm.
* The distance between two defects should more than 5mm.
* Outside of the V.A. is disregard.</td><td>2.5</td></tr>
<tr><td>06</td><td>Polarizer Scratches/ Puncture</td><td>Follow Item 4.</td><td>2.5</td></tr>
<tr><td>07</td><td>Polarizer dirt</td><td>Dirt on polarizer which can be clean or blow away is acceptable.</td><td>2.5</td></tr>
</table>

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>08</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

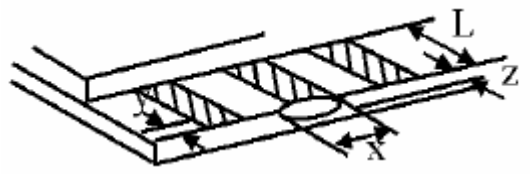
8.1 General glass chip:

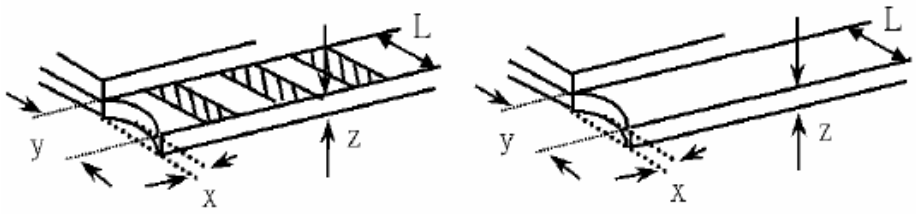
8.1.1 Chip on panel surface and crack between panels:


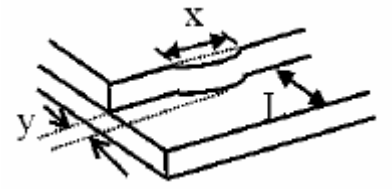
<table>
<tr><td>z: Chip thickness</td><td>y: Chip width</td><td>x: Chip length</td></tr>
<tr><td>Z≦1/2t</td><td>Not over viewing area</td><td>x≦1/8a</td></tr>
<tr><td>1/2t< z≦2t</td><td>Not exceed 1/3k</td><td>x≦1/8a</td></tr>
</table>
⊙ Unit: mm
⊙ If there are 2 or more chips, x is the total length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

8.1.2 Corner crack:


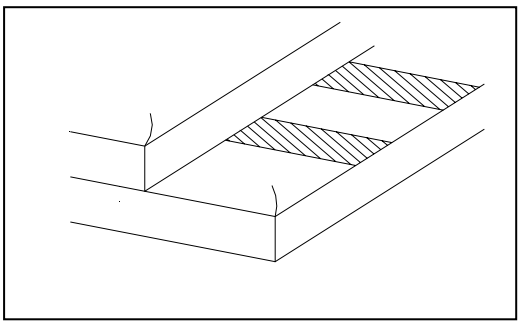
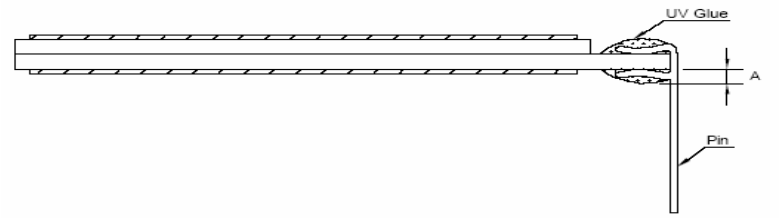
<table>
<tr><td>z: Chip thickness</td><td>y: Chip width</td><td>x: Chip length</td></tr>
<tr><td>Z≦1/2t</td><td>Not over viewing area</td><td>x≦1/8a</td></tr>
<tr><td>1/2t< z≦2t</td><td>Not exceed 1/3k</td><td>x≦1/8a</td></tr>
</table>
⊙ Unit: mm
⊙ If there are 2 or more chips, x is the total length 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>09</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
9.1 Protrusion over terminal:
9.1.1 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 x</td><td>≦1/8a 0<</td><td>z≦t</td></tr>
</table>
9.1.2
Non-conductive portion:


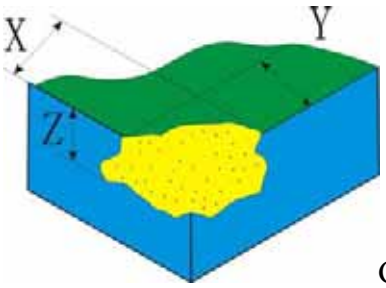
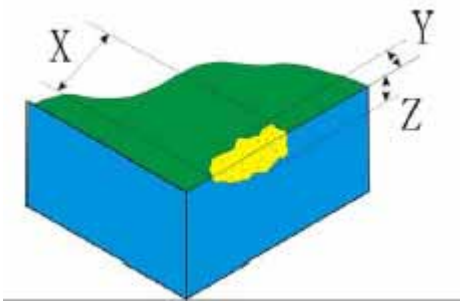
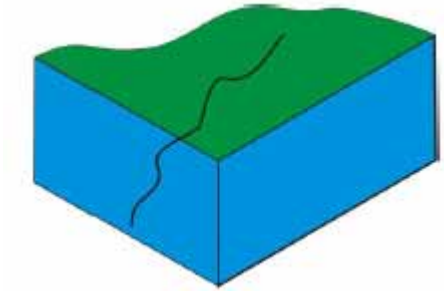
<table>
<tr><td>y: Chip width</td><td>x: Chip length</td><td>z: Chip thickness</td></tr>
<tr><td>y≦L x</td><td>≦1/8a</td><td>0< z≦t</td></tr>
</table>
⊙ If there chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications.
⊙ Heatseal alignment mark must not be damaged.
9.1.3 Substrate protuberance and internal crack


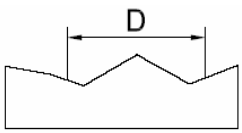
<table>
<tr><td>y: width</td><td>x: length</td></tr>
<tr><td>y≦1/3L</td><td>X≦a</td></tr>
</table>
</td><td>2.5</td></tr>
</table>

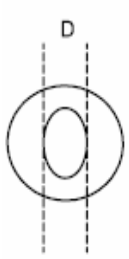
NO	Item	Criterion	AQL
10	Progressive crack line	 10.1 Crack is crack line extend to inner edge . 10.2 Crack round epoxy frame will be rejected. 10.3 Crack on the terminal will be rejected: Z=T length >1mm or Z<T length >2mm 10.4 Crack at ITO will be rejected.	2.5
11 PIN		11.1 PIN slant not per specificat ion. If the specif ication does not describe this item , the slant of PIN to ITO pad must ≦0.25mm. 11.2 The UV glue of PIN cannot higher than upper polarizer. 11.3 The UV glue height of A shall be ≦2mm  11.4 The terminal of PIN cannot have UV glue. 11.5 Damage of PIN such as scratch affect customer soldering. 11.6 The inclination tolerance of PIN ≦ ±5° unless otherwise stated. 11.7 Pin type not according to specification sheet. 11.8 LCD pin loose or missing pins.	2.5

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>12</td><td>Marking
(Printing &
Silkscreen)</td><td>12.1 The marking pattern different from specification.
12.2 Marking colour wrong or different from colour limit sample
12.3 Marking line not consistence in thickness or broken line
12.4 Marking position deviated. Base on toler ance specif ied and unspecified tolerance base on ±0.20mm. Marking line should not overlap with display unless otherwise specified.
12.5 Marking Line Width Criteria：
<table>
<tr><th>W： Designed Width</th><th>P： Actual Width</th></tr>
<tr><td>W≦0.40 |W</td><td>-P|≦1/2W</td></tr>
<tr><td>W>0.40</td><td>|W-P|≦0.2</td></tr>
</table>
Note: Unless otherwise specified.
12.6 Marking Pinhole or Distortion：
<table>
<tr><th>Size Accepted</th><th>Qty</th></tr>
<tr><td>Ø<0.10</td><td>Disregard</td></tr>
<tr><td>0.10<Ø≦0.20</td><td>2</td></tr>
<tr><td>0.20<Ø</td><td>0</td></tr>
</table>
Note: The distance between two defects should be greater than 5mm
12.7 Marking Black spot or Scratche s contro lled b ase on insp ection specification Item 4.
12.8 Smear allowed: ≦0.20mm</td><td>2.5</td></tr>
<tr><td>13</td><td>Bezel</td><td>Bezel not complies with product specifications.
Note: Scratch or prick which does not affect custom er assem bly is considered as acceptable.</td><td>2.5</td></tr>
<tr><td>14</td><td>FPC</td><td>14.1 FPC terminal damage ≦ 1/2 FPC ter minal width and does not affect functional is considered acceptable.
14.2 FPC alignm ent hole dam age ≦ 1/2 alignm ent area and does not affect the functional and assembly of customer are considered acceptable.
14.3 Foreign m aterial or dirt on co nductor pads which can be clean and does not affect functional is consider acceptable.</td><td>2.5</td></tr>
</table>

NO	Item	Criterion	AQL
15	SMT、COB	15.1 COB epoxy with pinholes larger than 0.5mm. 15.2 COB epoxy with exposed IC. 15.3 The height of the C OB should not exceed the height indicated in the assembly diagram. 15.4 Epoxy encap exceed more than 3mm of the silkscreen printing 15.5 Wrong parts, missing parts or excess parts. 15.6 Jumper on the PCBA not confor med to the product characteristic chart. 15.7 PCBA cosm etic control base on latest IPC standard, IPC-A-610, acceptable limit of grade 2. 15.8 Cold solder joints, missing solder connections. 15.9 Short circuits in components on PCB or FPC. 15.10 Bezel loose assembly Note: Ben d angle for bezel assembly should be within th e range of 15° ~60°	2.5 0.65 2.5 2.5 0.65 0.65 2.5 0.65 0.65 0.65 2.5
16	Backlight	16.1 Spots or scratches that appear when backlight on to be reviewed using Item .4 standards. 16.2 Backlight unable to light-up.	2.5
17	TAB	Oxidation on pin surface that result solderbility issue Note: a) Solde rbility cond ition: 310℃±10℃, 3sec (hand solder) or 280℃±10℃, 3sec (DIP) b) Wrinkles on TAB pin but not broken is consider as acceptable.	2.5

NO	Item	Criterion	AQL
18	Touch Panel Chipped glass	18.1 Chip And Crack Corner crack: X<3.0mm and Y<3.0mm and Z<GT ignored 18.1.1 Corner crack in the golden finger that seriously affects the product function. 18.1.2 Corner crack in the circuit that seriously affects product function .  GT : Glass Thickness 18.2 Side crack: X<4.0mm and Y<2.0mm and Z<GT ignored 18.2.1 Side crack in the golden finger that seriously affects the product function. 18.2.2 Side crack in the circuit that seriously affects product function  18.3 Progressive crack line. 	2.5

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>19</td><td>Touch Panel(Fish eye、dent and bubble on film)</td><td>
<table>
<tr><td>SIZE(mm)</td><td>Acceptable Qty</td></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>


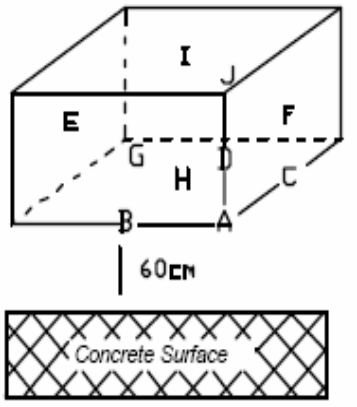


</td><td>2.5</td></tr>
<tr><td>20</td><td>Touch Panel Newton ring</td><td>Newton ring dimension < 1/2 touch panel area and affect font and line distortion(<1.5%).</td><td>2.5</td></tr>
<tr><td>21</td><td>Touch Panel Linearity</td><td>Linearity <2.0% .</td><td>2.5</td></tr>
<tr><td>22</td><td>General appearance</td><td>22.1 Product packaging not the same as the Specification
22.2 Product dimension and structure not conform to product specification sheet.

Note:
a) Wrinkles on protective ta pe or corner lifted ≦5mm is considered acceptable.
b) Dirt or scratches on protective film which does not transfer to polarizer is consider as acceptable
c) Datecode position unless otherwise specified by custom er, Yeebo will decide for it.
d) Datecode on module which is slight blur but still can be differentiated is considered as acceptable.</td><td>2.5</td></tr>
</table>

12-2 Standard Specification for Reliability

12-2 – 1. Standard Specifications for Reliability of LCD Module

Item	Description	
	Condition Ti	me (hrs)
High temp. (Storage)	80°C	240
High temp. (Operating)	70°C	240
Low temp. (Storage)	-30°C	240
Low temp. (Operating)	-200°C	240
High temp and high humidity .(Storage)	40°C/ 90%RH	240
Thermal shock (Storage)	-30°C → 20°C→ 80°C → 20°C (30 min → 5 min → 30 min →5 min)	10 cycles
Packing vibration	Frequency range : 10Hz ~ 55Hz Amplitude of vibration : 1.5mm Sweep time: 12 min X,Y,Z direction each 2 hours .	
Packing drop test	To be measured after dropping from 60cm high on the concrete surface in packing state.  Dropping method: Corner dropping : A Corner : once Edge dropping : B,C,D edge : once Face dropping: E, F, G, H, I, J face : once	
Electrical Static Discharge	Air: ±6KV 150pF/330Ω 5 times Contact: ±4KV 150pF/330Ω 5 times	

***Sample size for each test is 5pcs except Packing vibration & Packing drop test.**

12-2 - 2. Testing Conditions and Inspection Criteria

For the final test the testing sample must be stored at room temperature for 4 hours, after the tests listed in Table 12.2-1, 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 ratio must be larger than 2.
03	Appearance	Visual inspection	Defect free.
04	ESD	Function test	After reset, no abnormalities in functions.

12-2 - 3. MTBF

MTBF	Functions, perform ance, appearan ce, etc. shall be free from remarkable deterioration within 100,000 hours under ordinary operating and storage conditions room tem perature (25±5 ℃), normal humidity (50±10% RH), and in area not exposed to direct sun light.

***The half life of EL backlight is 1200hours Min.**

12-3.Warranty

This product has been manufactured to specifications as a part for use in your company's general electronic products. It is guaranteed to perform according to delivery specifications. For any other use apart from general electronic equipment, we will not take responsibility if the product is used in medical devices, nuclear power control equipment, aerospace equipment, fire and security systems, or any other applications in which there is a direct risk to human life and where extremely high levels of reliability are required. If the product is to be used in any of the above applications, we will need to enter into a separate product liability agreement.

1. We cannot accept responsibility for any defect arise after additional process of the product (including disassembly and reassembly), after product delivery.
2. We cannot accept responsibility for any defect, which may arise after the application of strong external force to the product.
3. We cannot accept responsibility for any defect, which may arise due to the application of static electricity after the product has passed your company's acceptance inspection procedures.
4. We cannot accept responsibility for industrial property, which may arise through the use of your product, with exception to those issues relating directly to the structure or method of manufacturing of our product one year from YEEBO production.
5. For Heatseal Product which required to heatseal by customer side, parts must be used within three

months after delivery from factory.

6. For TAB Product which required to solder by customer side, parts must be used within three months after delivery from factory.
7. The liability of YB is limited to repair or replacement on the terms set forth below. YB will not be responsible for any subsequent or consequential events or injury or damage to any personnel or user including third party personnel and/or user. Unless otherwise agreed in writing between YB and the customer, YB will only replace or repair any of its LCD which is found defective electrically or visually when inspected in accordance with YB GENERAL LCD INSPECTION STANDARD.

12-4 Precautions in Use of LCM

12-4-1 Handling of LCM

- Do not give external shock.
- Do not apply excessive force on the surface.
- Liquid Crystal in LCD is hazardous substance. Do not swallow it and when contact to hand, skin, cloth etc. Wash it out thoroughly and immediately.
- Do not operate it above the absolute maximum rating.
- Do not 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 careful when peeling off this protective film as static electricity may be generated.

12-4-2 Storage

- Store in ambient temperature of 25±5℃, and relative humidity of 50±10%RH. Do not 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.
- Heat-seal must be stored at 25 °C or less and 50% R.H. or less in a sealed condition, and must be used within three months after delivery from our factory.

12-4-3 Soldering

- Use only soldering irons with proper grounding and no leakage.
- Soldering: Not higher than 310±10℃ and less than 3 sec during for hand soldering.
- Resoldering: no more than 2 times.

12-5 Guarantee

Our products meet requirements of the environment.
YEEBO ROHS requirement is based on European Union Directive 200295EC (ROHS) Requirements and Update.