



FS-GP002-JCG12864A45-01 REV. A
(STBL2WHEG-12-NT-NSC)

OCT/2007

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DOCUMENT NUMBER AND REVISION

FS-GP002-JCG12864A45-01 REV. A
(STBL2WHEG-12-NT-NSC)

DOCUMENT TITLE:

SPECIFICATION
OF
LCD MODULE TYPE

CUSTOMER	
MODEL NUMBER	GP002-JCG12864A45-01
CUSTOMER APPROVAL	
DATE	

DEPARTMENT	NAME	SIGNATURE	DATE
PREPARED BY	LIANG YUN	梁云	2007.10.22
CHECKED BY	YI NA	伊娜	2007.10.22
APPROVED BY	WANG ZHAO CAI	王兆才	07.10.22

SHENZHEN JINGHUA DISPLAYS CO., LTD.

No.511 Bldg.6.7/F., Bagualing Ind.District,Shenzhen,Guangdong Province, China

Fax: 86-755-82262610

URL: www.china-lcd.com



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DOCUMENT REVISION HISTORY 1:

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Specification of LCD Module Type

Item No.: GP002-JCG12864A45-01

1. General Description

- 128 x 64 Dots STN Blue Negative Transmissive Dot Matrix LCD Module.
- Viewing Angle: 12 O'clock direction.
- Driving duty: 1/65 Duty, 1/9 bias.
- 'NOVATER' NT7538 LCD Controller & Driver or equivalent (COG type)
- Power Supply: +3.0V.
- Interface type: FPC
- White backlight. (Side LED)

2. Mechanical Specifications

The mechanical detail is shown in Fig. 1 and summarized in Table 1 below.

Table 1

Parameter	Specifications	Unit
Outline dimensions	56.0(L) x 37.0(W) x 6.9(H) (Exclude FPC)	mm
	56.0(L) x 69.0(W) x 6.9(H) (Include FPC)	
Viewing area	46.0MIN(L) x 26.0MIN(W)	mm
Display format	128 x 64	dots
Dot size	0.30(L) x 0.32(W)	mm
Dot spacing	0.03(L) x 0.03(W)	mm
Dot pitch	0.33(L) x 0.35(W)	mm

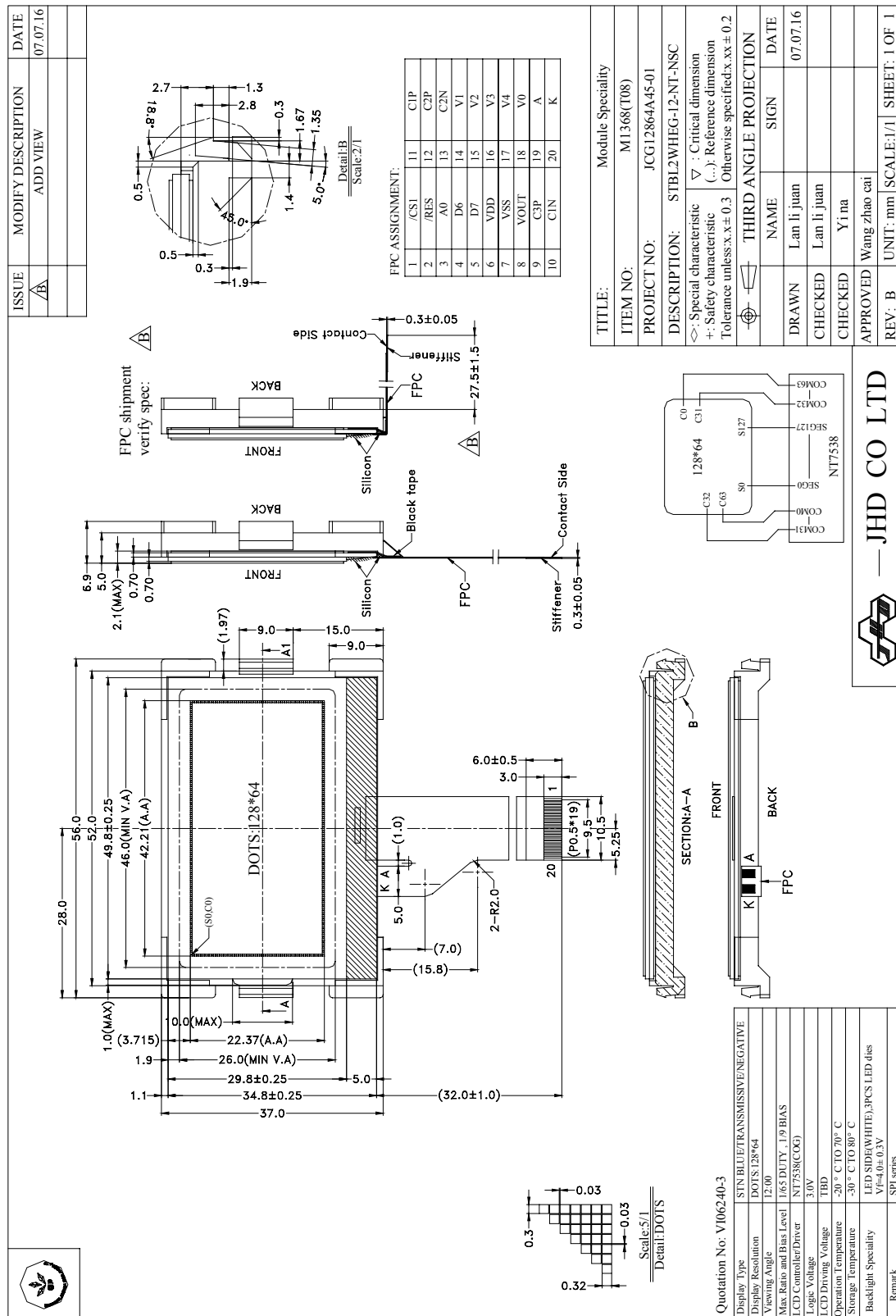


Figure 1: Module Specification



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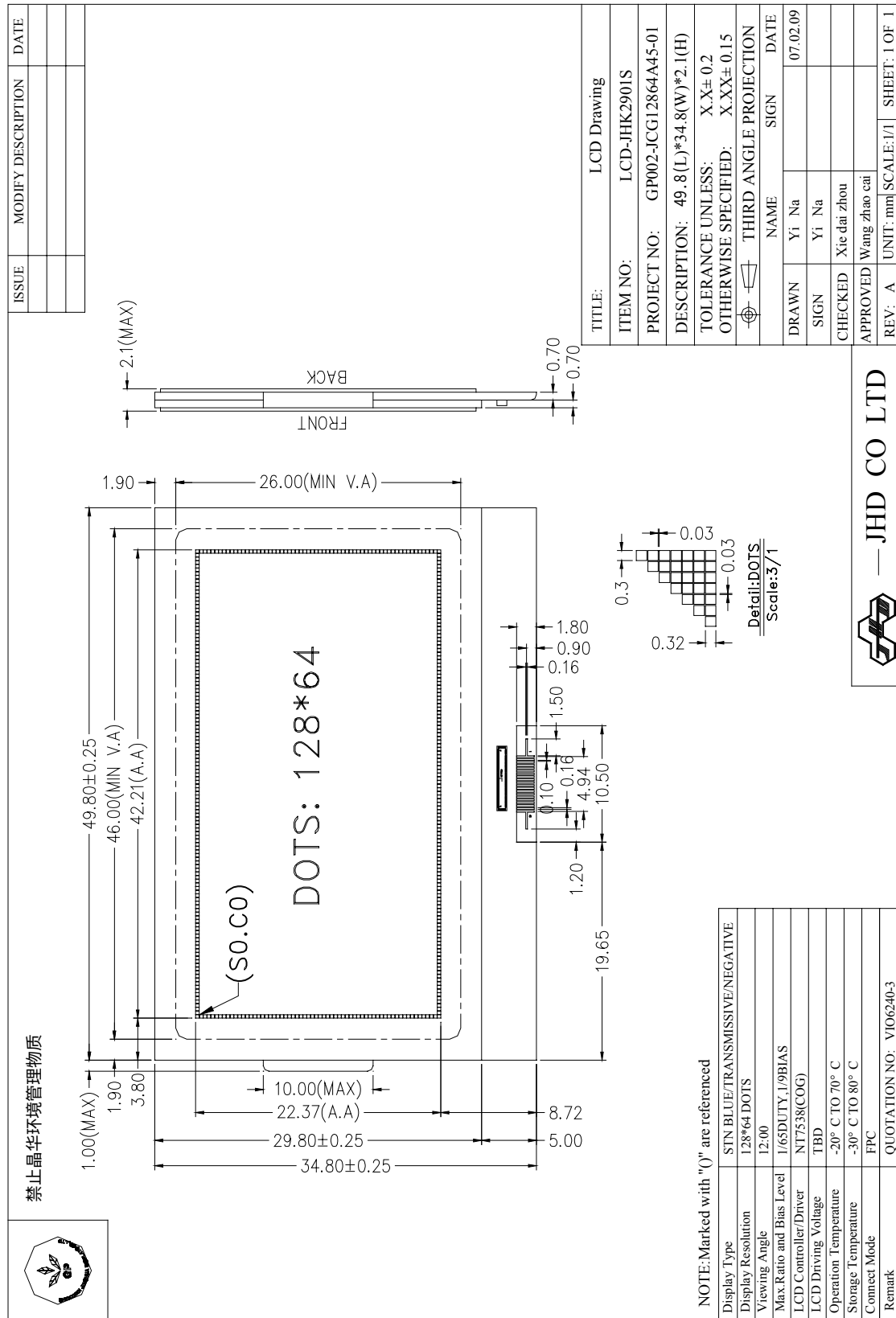


Figure 2: LCD Specification

Figure 3: Recommend the power supply for circuit



3. Interface signals

Table 2

Pin No.	Symbol	Description																																			
1	/CS	This is the chip select signal. When /CS1="L" and CS2="H", then the chip select becomes active, and data/command I/O is enabled.																																			
2	/RES	When /RES is set to "L", the settings are initialized. The reset operation is performed by the /RES signal level.																																			
3	A0	This is connected to the least significant bit of the normal MPU address bus, and it determines whether the data bits are data or a command. A0 = "H": Indicate that D0 to D7 are display data A0 = "L": Indicates that D0 to D7 are control data																																			
4	D6	This is an 8-bit bi-directional data bus that connects to an 8-bit or 16-bit standard MPU data bus.																																			
5	D7	When the serial interface is selected (P/S="L"), then D7 serves as the serial data input terminal (SI) and D6 serves as the serial clock input terminal (SCL). When the serial interface is selected, fix D0~D5 pads to VDD or VSS level. When the chip select is inactive, D0 to D7 are set to high impedance.																																			
6	VDD	Power supply.																																			
7	VSS	Ground.																																			
8	VOOUT	DC/DC voltage converter output.																																			
9	C3P	Capacitor 3+ pad for internal DC/DC voltage converter.																																			
10	C1N	Capacitor 1- pad for internal DC/DC voltage converter.																																			
11	C1P	Capacitor 1+ pad for internal DC/DC voltage converter.																																			
12	C2P	Capacitor 2+ pad for internal DC/DC voltage converter.																																			
13	C2N	Capacitor 2- pad for internal DC/DC voltage converter.																																			
14	V1	LCD driver supplies voltages. The voltage determined by the LCD cell is impedance-converted by a resistive driver or an operation amplifier for application. Voltages should be according to the following relationship: V0 V1 V2 V3 V4 VSS2																																			
15	V2																																				
16	V3																																				
17	V4																																				
18	V0	When the on-chip operating power circuit is on, the following voltages are supplied to V1 to V4 by the on-chip power circuit. Voltage selection is performed by the LCD Bias Set command. <table><tr><td>LCD bias</td><td>V1</td><td>V2</td><td>V3</td><td>V4</td></tr><tr><td>1/4 bias</td><td>3/4V0</td><td>2/4V0</td><td>2/4V0</td><td>1/4V0</td></tr><tr><td>1/5 bias</td><td>4/5V0</td><td>3/5V0</td><td>2/5V0</td><td>1/5V0</td></tr><tr><td>1/6 bias</td><td>5/6V0</td><td>4/6V0</td><td>2/6V0</td><td>1/6V0</td></tr><tr><td>1/7 bias</td><td>6/7V0</td><td>5/7V0</td><td>2/7V0</td><td>1/7V0</td></tr><tr><td>1/8 bias</td><td>7/8V0</td><td>6/8V0</td><td>2/8V0</td><td>1/8V0</td></tr><tr><td>1/9 bias</td><td>8/9V0</td><td>7/9V0</td><td>2/9V0</td><td>1/9V0</td></tr></table>	LCD bias	V1	V2	V3	V4	1/4 bias	3/4V0	2/4V0	2/4V0	1/4V0	1/5 bias	4/5V0	3/5V0	2/5V0	1/5V0	1/6 bias	5/6V0	4/6V0	2/6V0	1/6V0	1/7 bias	6/7V0	5/7V0	2/7V0	1/7V0	1/8 bias	7/8V0	6/8V0	2/8V0	1/8V0	1/9 bias	8/9V0	7/9V0	2/9V0	1/9V0
LCD bias	V1	V2	V3	V4																																	
1/4 bias	3/4V0	2/4V0	2/4V0	1/4V0																																	
1/5 bias	4/5V0	3/5V0	2/5V0	1/5V0																																	
1/6 bias	5/6V0	4/6V0	2/6V0	1/6V0																																	
1/7 bias	6/7V0	5/7V0	2/7V0	1/7V0																																	
1/8 bias	7/8V0	6/8V0	2/8V0	1/8V0																																	
1/9 bias	8/9V0	7/9V0	2/9V0	1/9V0																																	
19	A	Anode of the backlight.																																			
20	K	Cathode of the backlight.																																			



4. Absolute Maximum Ratings

4.1 Electrical Maximum Ratings (Ta = 25 °C)

Table 3

Parameter	Symbol	Min.	Max.	Unit
DC Supply voltage (Logic)	VDD	-0.3	+4.0	V
DC Supply voltage (Logic)	V0	-0.3	+15.0	V
DC Supply voltage	VOU	-0.3	+15.0	V
Input Voltage (all input pads)	VIN	-0.3	VDD+0.3	V

4.2 Environmental Condition

Table 4

Item	Operating Temperature (Topr)		Storage Temperature (Tstg)		Remark
	Min.	Max.	Min.	Max.	
Ambient Temperature	-20°C	+70°C	-30°C	+80°C	Dry



5. Electrical Specifications

5.1 Typical Electrical Characteristics

At $T_a = 25\text{ }^{\circ}\text{C}$, $V_{DD} = 3.0 \pm 0.1\text{V}$, $V_{SS} = 0\text{V}$.

Table 5

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage (Logic)	$V_{DD}-V_{SS}$		2.9	3.0	3.1	V
Supply voltage (LCD)	$V_{LCD}=V_{EE}-V_{SS}$	$V_{DD} = +3.0\text{V}$, Note 1	9.0	9.15	9.3	V
Input signal voltage	V_{IH}	“H” level	$0.8V_{DD}$	-	V_{DD}	V
	V_{IL}	“L” level	V_{SS}	-	$0.2V_{DD}$	V
Supply Current (Logic)	I_{DD}	Note 1	-	0.27	0.4	mA
Supply voltage for Backlight	V_{LED}	Forward current= 45 mA	3.7	4.0	4.3	V

Note 1: There is tolerance in optimum LCD driving voltage during production and it will be within the specified range.



5.2 Timing Specifications

At $T_a = -20\text{ }^{\circ}\text{C}$ To $+70\text{ }^{\circ}\text{C}$, $V_{DD} = 3.0 \pm 0.1\text{V}$, $V_{SS} = 0\text{V}$.

Refer to Fig. 4, the diagram for System Buses Read/Write Characteristics (for 8080 Series MPU).

Table 6

Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
T_{AH8}	Address hold time	0	-	-	ns	A0
T_{AS8}	Address setup time	0	-	-	ns	
t_{CYC8}	System cycle time	240	-	-	ns	
t_{CCLW}	Control low pulse width (write)	90	-	-	ns	/WR
t_{CCLR}	Control low pulse width (read)	120	-	-	ns	/RD
t_{CCHW}	Control high pulse width (write)	100	-	-	ns	/WR
t_{CCHR}	Control high pulse width (read)	60	-	-	ns	/RD
T_{DS8}	Data setup time	40	-	-	ns	D0~D7
T_{DH8}	Data hold time	0	-	-	ns	
t_{ACC8}	/RD access time	-	-	140	ns	D0~D7, $C_L = 100\text{pF}$
T_{CH8}	Output disable time	5	-	50	ns	

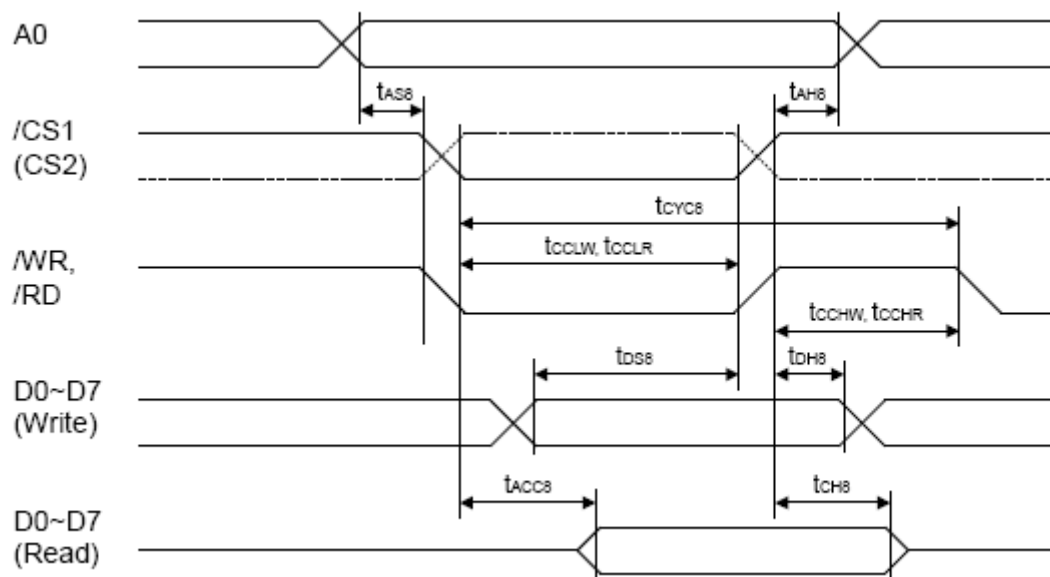


Figure 4: System Buses Read/Write Characteristics (for 8080 Series MPU)



At $T_a = -20\text{ }^{\circ}\text{C}$ To $+70\text{ }^{\circ}\text{C}$, $V_{DD} = 3.0 \pm 0.1\text{V}$, $V_{SS} = 0\text{V}$.

Refer to Fig. 5, the diagram for System Buses Read/Write Characteristics (for 6800 Series MPU)

Table 7

Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
t_{AH6}	Address hold time	0	-	-	ns	A0, R/W
t_{AS6}	Address setup time	0	-	-	ns	
t_{CYC6}	System cycle time	240	-	-	ns	
t_{EWHW}	Control high pulse width (write)	90	-	-	ns	E
t_{EWHR}	Control high pulse width (read)	120	-	-	ns	E
t_{EWLW}	Control low pulse width (write)	100	-	-	ns	E
t_{EWLR}	Control low pulse width (read)	60	-	-	ns	E
t_{DS6}	Data setup time	40	-	-	ns	D0~D7
t_{DH6}	Data hold time	0	-	-	ns	
t_{ACC6}	/RD access time	-	-	140	ns	D0~D7 CL = 100pF
t_{OH6}	Output disable time	5	-	50	ns	

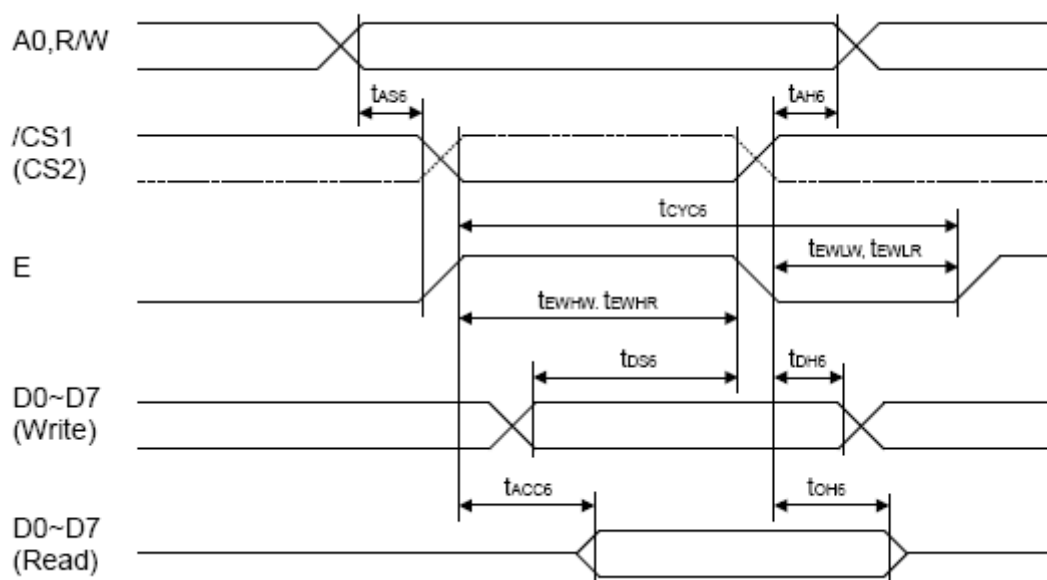


Figure 5: System Buses Read/Write Characteristics (for 6800 Series MPU)



At $T_a = -20\text{ }^{\circ}\text{C}$ To $+70\text{ }^{\circ}\text{C}$, $V_{DD} = 3.0 \pm 0.1\text{V}$, $V_{SS} = 0\text{V}$.

Refer to Fig. 6, the bus-timing diagram for Serial Interface Timing.

Table 8

Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
t_{scyc}	Serial clock cycle	120	-	-	ns	SCL
t_{shw}	Serial clock H pulse width	60	-	-	ns	SCL
t_{slw}	Serial clock L pulse width	60	-	-	ns	SCL
t_{sas}	Address setup time	30	-	-	ns	A0
t_{sah}	Address hold time	20	-	-	ns	A0
t_{sds}	Data setup time	30	-	-	ns	SI
t_{sdh}	Data hold time	20	-	-	ns	SI
t_{css}	Chip select setup time	20	-	-	ns	/CS1, CS2
t_{csh}	Chip select hold time	40	-	-	ns	/CS1, CS2

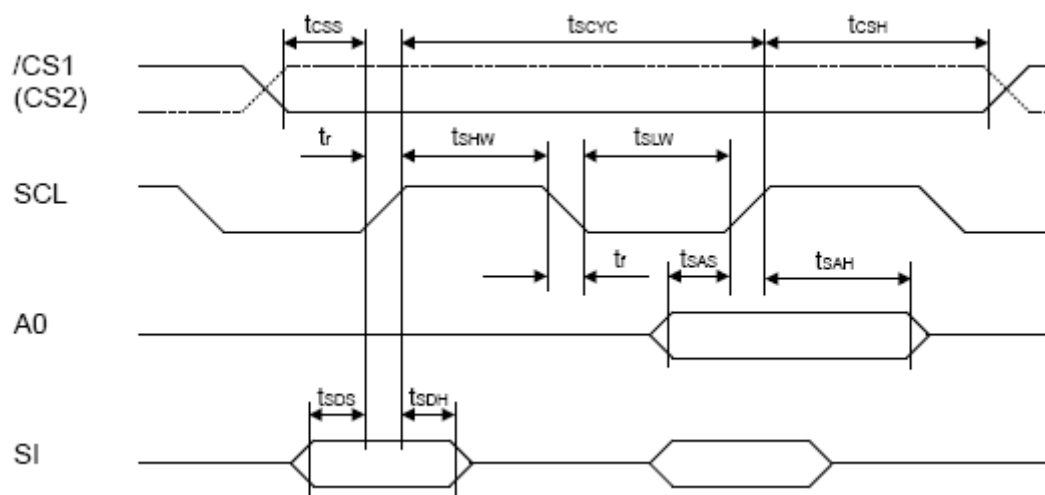


Figure 6: the bus-timing diagram for Serial Interface Timing



At $T_a = -20\text{ }^{\circ}\text{C}$ To $+70\text{ }^{\circ}\text{C}$, $V_{DD} = 3.0\text{V} \pm 0.1\text{V}$, $V_{SS} = 0\text{V}$.

Refer to Fig. 7, the bus-timing diagram for Display Control Timing.

Table9

Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
t_{DFR}	FR delay time	-	20	80	ns	$CL = 50\text{ pF}$

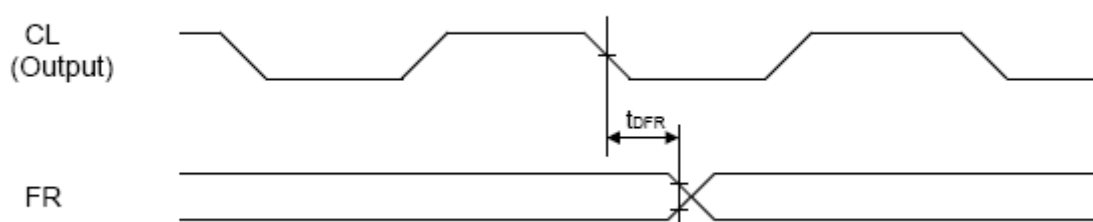


Figure 7: Display Control Timing

At $T_a = -20\text{ }^{\circ}\text{C}$ To $+70\text{ }^{\circ}\text{C}$, $V_{DD} = 3.0\text{V} \pm 0.1\text{V}$, $V_{SS} = 0\text{V}$.

Refer to Fig. 8, the bus-timing diagram for reset timing.

Table 10

Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
t_r	Reset Time	-	-	1.0	μs	
t_{rw}	Reset low pulse width	10	-	-	μs	/RES

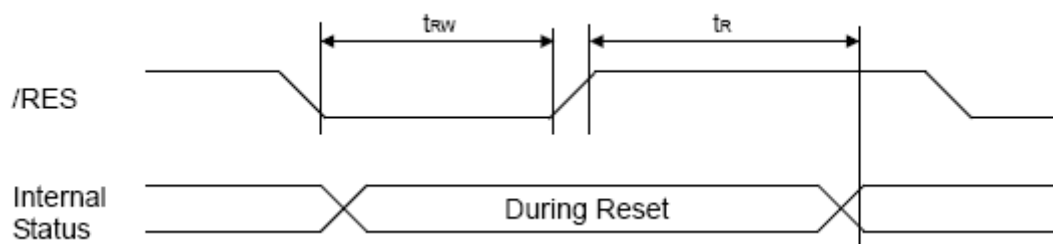


Figure 8: Reset Timing



6. Quality Units

6.1.0 Purpose

This standard for quality assurance should define the quality of LCD module products to customer by JINGHUA DISPLAYS LTD.

6.2.0 Scope

This document defines general provisions as well as inspection standards for LCD module supplied by JINGHUA DISPLAYS LTD, except of those with special requirements from customer.

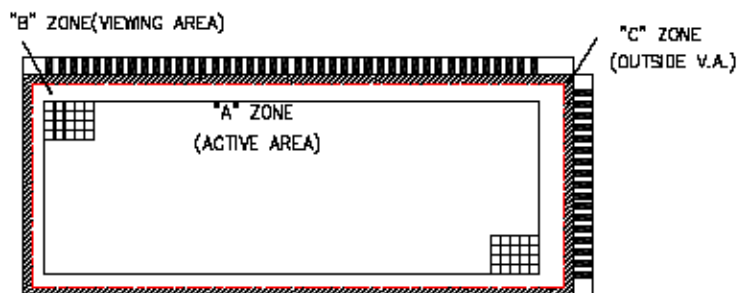
6.3.0 Definition

6.3.1 Definition of area

A Zone: Active area.

B Zone: Viewing area.

C Zone: Outside Viewing area.



6.3.2 Definition of size

Large size(L): Less than or equal to 1 Pcs / 7 " × 14 " unit glass.

Middle size(M): 2~6 Pcs / 7 " × 14 " unit glass.

Small size(S): more than 6 Pcs/7 " × 14 " unit glass.



6.4.0 Quality Specification

6.4.1 Conditions of Cosmetic Inspection

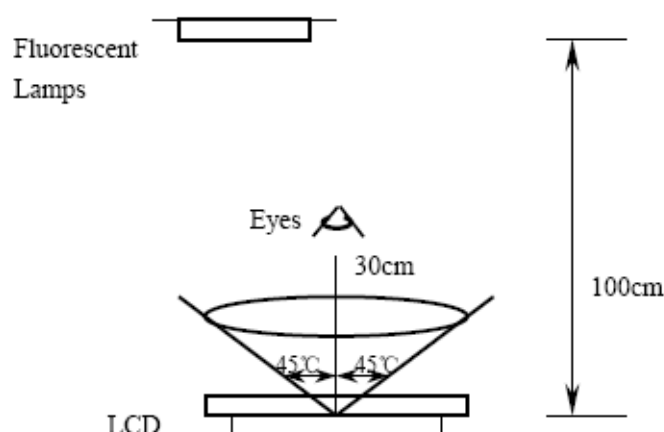
6.4.1.1 Tests should be conducted under the following conditions:

Ambient temperature: $22 \pm 5^{\circ}\text{C}$.

Ambient humidity: $65 \pm 20\%\text{RH}$.

Ambient Luminance: 40 watts fluorescent lamp.

An appearance test should be conducted by human sight at approximately 30 cm distance from the LCD module under fluorescent light. Distance between LCD and fluorescent lamps should be 100 cm or more. Viewing direction for inspection is 45° from vertical against LCD.



6.4.1.2 When test the model of transmissive product must add the reflective plate.

6.4.2 Sampling plan

Unless otherwise agreed in written, the sampling inspection shall be applied to the incoming inspection of customer.

-  Lot size: Quantity of shipment lot per model.
-  Sampling type: Normal inspection, single sampling.
-  Sampling Level: Level II.
-  Sampling table: GB/T2828.1. (GB-national standard of China.)



6.4.3 Classification of defects and Acceptable quality level

Defects and classified as either a major or minor defect defined as bellows:

- 📖 Major defect: It is a defect that is likely to result in failure or to reduce materially the usability of the product for the intended function.
- 📖 Minor defect: It is a defect that will not result in functioning problem with deviation classified.

The AQL for major and minor defects is defined as follows:

Partition	Definition	AQL
Major defect	Functional defective as product.	0.4
Minor defect	Satisfy all functions as product but not satisfy cosmetic standard.	1.0

6.4.4 Applicable instrument

- 📖 LCD module tester.
- 📖 Multimeter.
- 📖 Caliper.
- 📖 Defect size filming standard.



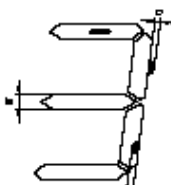
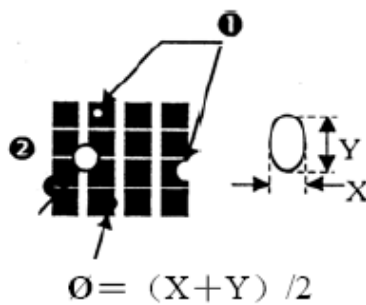
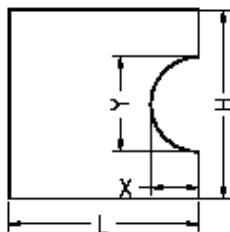
6.4.5 Inspection quality criterion

6.4.5.1 LCD panel part.

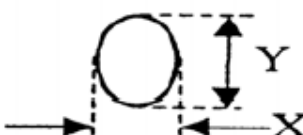
The inspection specification as following list:

Classify	Item	Description of defects	Inspection criterion	Drawing specification
Major defect	1. Non-display.	Product no function.	Not accept.	
	2. LCD with wrong view direction.	Difference in Spec.	Not accept.	
	3. Segment missing.	Part or all pattern do not light up.	Not accept.	
	4. Occur high current.	Current exceed designed value.	Not accept.	
	5. LC leakage.	LC does not fulfill the glass cell.	Not accept.	
	6. Deviation from drawing.	LCM Dimension difference from drawing and over tolerance	According to dimensions noted in the specification.	
	7. Wrong type applied.	Wrong polarizer attachment.	Not accept.	
		Pin attached wrong type applied.	Not accept.	
	8. Incorrect pins quantity	Pin attached wrong quantity applied.	Not accept.	



Minor defect	9. Pattern deformation	Segment fatter or smaller.	Accept if c or $d \leq 1/4 - 1/5W$, or refer to the defect specimen. W = Segment width Accept if $a-b \leq 1/4a$, or refer to the defect specimen. a = Segment width	 																				
Minor defect	10. Pinholes	black spot/ white spot at activated state.	1. Large size LCD Accept if can't be found at 1m distance and will not enlarge under electronic test. 2. Middle size LCD <table> <tr> <th>Diameter (mm)</th> <th>Accept QTY</th> </tr> <tr> <td>$\varnothing \leq 0.10$</td> <td>Not count</td> </tr> <tr> <td>$0.10 < \varnothing \leq 0.20$</td> <td>2</td> </tr> <tr> <td>$0.20 < \varnothing \leq 0.30$</td> <td>1</td> </tr> <tr> <td>$\varnothing > 0.30$</td> <td>0</td> </tr> </table> 3. Small size LCD <table> <tr> <th>Diameter (mm)</th> <th>Accept QTY</th> </tr> <tr> <td>$\varnothing \leq 0.1$</td> <td>Not count</td> </tr> <tr> <td>$0.10 < \varnothing \leq 0.15$</td> <td>2</td> </tr> <tr> <td>$0.15 < \varnothing \leq 0.20$</td> <td>1</td> </tr> <tr> <td>$\varnothing > 0.20$</td> <td>0</td> </tr> </table> 4. For the dot pattern: Accept $X, Y \leq 2/3L, H$ ($X, Y = (\text{Max } X, Y)$) 5. Only allow one defect in one segment. 6. The nearest distance allowed between two pinholes is 20mm.	Diameter (mm)	Accept QTY	$\varnothing \leq 0.10$	Not count	$0.10 < \varnothing \leq 0.20$	2	$0.20 < \varnothing \leq 0.30$	1	$\varnothing > 0.30$	0	Diameter (mm)	Accept QTY	$\varnothing \leq 0.1$	Not count	$0.10 < \varnothing \leq 0.15$	2	$0.15 < \varnothing \leq 0.20$	1	$\varnothing > 0.20$	0	  
Diameter (mm)	Accept QTY																							
$\varnothing \leq 0.10$	Not count																							
$0.10 < \varnothing \leq 0.20$	2																							
$0.20 < \varnothing \leq 0.30$	1																							
$\varnothing > 0.30$	0																							
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$\varnothing > 0.20$	0																							

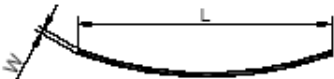


Minor defect	11.Blemishes and foreign matters.	Black spot/ dust on LCD. (non-display) Positive panel: 1. A zone. (1) Large size LCD Accept if can't be found at 1m distance and will not enlarge under electronic test. (2) Middle size LCD Diameter (mm) Accept QTY $\varnothing \leq 0.1$ Not count $0.10 < \varnothing \leq 0.20$ 2 $0.20 < \varnothing \leq 0.30$ 1 $\varnothing > 0.30$ 0 (3) Small size LCD Diameter (mm) Accept QTY $\varnothing \leq 0.1$ Not count $0.10 < \varnothing \leq 0.15$ 2 $0.15 < \varnothing \leq 0.20$ 1 $\varnothing > 0.20$ 0 2. B zone. 1.5 times of acceptable largest diameter size of Zone A. 3. C area Not count. Negative panel: 1. A zone. (1) Large size LCD Diameter (mm) Accept QTY $\varnothing \leq 0.15$ Not count $0.15 < \varnothing \leq 0.30$ 3 $0.30 < \varnothing \leq 0.50$ 1 $\varnothing > 0.50$ 0 (2) Middle size LCD Diameter (mm) Accept QTY $\varnothing \leq 0.1$ Not count $0.10 < \varnothing \leq 0.20$ 2 $\varnothing > 0.20$ 0 (3) Small size LCD Diameter (mm) Accept QTY $\varnothing \leq 0.1$ Not count $0.10 < \varnothing \leq 0.15$ 2 $\varnothing > 0.15$ 0  $\varnothing = (X + Y) / 2$
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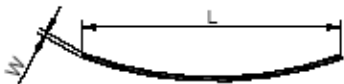


Minor defect	Blemishes and foreign matters.	Black spot/ dust on LCD . (non-display)	2. B area.	
			(1) Large size LCD	
			Diameter (mm)	Accept QTY
			$\varnothing \leq 0.15$	Not count
			$0.15 < \varnothing \leq 0.40$	3
			$0.40 < \varnothing \leq 0.50$	1
			$\varnothing > 0.50$	0
			(2) Middle size LCD	
			Diameter (mm)	Accept QTY
			$\varnothing \leq 0.1$	Not count
			$0.10 < \varnothing \leq 0.20$	2
			$0.20 < \varnothing \leq 0.25$	1
			$\varnothing > 0.25$	0
			(3) Small size LCD	
Diameter (mm)	Accept QTY			
$\varnothing \leq 0.1$	Not count			
$0.10 < \varnothing \leq 0.20$	2			
$\varnothing > 0.20$	0			
3. C zone				
Not count.				
4.The nearest distance allowed between two black spot is 20mm.				

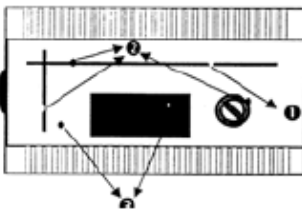
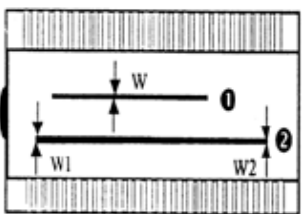
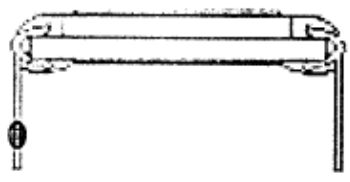


Minor defect	12.Black lines and scratches.	Scratch on glass or polarizer surface. And foreign linear matters in LCD.	Positive panel: 1. A 、 B zone. (1) Large size LCD Accept if can't be found at 1m distance and will not enlarge under electronic test. (2) Middle size LCD <table><tr><th>Diameter (mm)</th><th>Accept QTY</th></tr><tr><td>$W \leq 0.02$</td><td>Not count</td></tr><tr><td>$0.02 < W \leq 0.03, L \leq 3$</td><td>2</td></tr><tr><td>$0.03 < W \leq 0.05, L \leq 2$</td><td>2</td></tr><tr><td>$0.02 < W \leq 0.03, L > 3$</td><td>0</td></tr><tr><td>$0.03 < W \leq 0.05, L > 2$</td><td>0</td></tr><tr><td>$W > 0.05$</td><td>As the spot criteria.</td></tr></table> (3) Small size LCD <table><tr><th>Diameter (mm)</th><th>Accept QTY</th></tr><tr><td>$W \leq 0.02$</td><td>Not count</td></tr><tr><td>$0.02 < W \leq 0.03, L \leq 3$</td><td>2</td></tr><tr><td>$0.03 < W \leq 0.05, L \leq 1$</td><td>1</td></tr><tr><td>$0.02 < W \leq 0.03, L > 3$</td><td>0</td></tr><tr><td>$0.03 < W \leq 0.05, L > 1$</td><td>0</td></tr><tr><td>$W > 0.05$</td><td>As the spot criteria.</td></tr></table> 2. C zone Not count.	Diameter (mm)	Accept QTY	$W \leq 0.02$	Not count	$0.02 < W \leq 0.03, L \leq 3$	2	$0.03 < W \leq 0.05, L \leq 2$	2	$0.02 < W \leq 0.03, L > 3$	0	$0.03 < W \leq 0.05, L > 2$	0	$W > 0.05$	As the spot criteria.	Diameter (mm)	Accept QTY	$W \leq 0.02$	Not count	$0.02 < W \leq 0.03, L \leq 3$	2	$0.03 < W \leq 0.05, L \leq 1$	1	$0.02 < W \leq 0.03, L > 3$	0	$0.03 < W \leq 0.05, L > 1$	0	$W > 0.05$	As the spot criteria.	
Diameter (mm)	Accept QTY																															
$W \leq 0.02$	Not count																															
$0.02 < W \leq 0.03, L \leq 3$	2																															
$0.03 < W \leq 0.05, L \leq 2$	2																															
$0.02 < W \leq 0.03, L > 3$	0																															
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$W \leq 0.02$	Not count																															
$0.02 < W \leq 0.03, L \leq 3$	2																															
$0.03 < W \leq 0.05, L \leq 1$	1																															
$0.02 < W \leq 0.03, L > 3$	0																															
$0.03 < W \leq 0.05, L > 1$	0																															
$W > 0.05$	As the spot criteria.																															

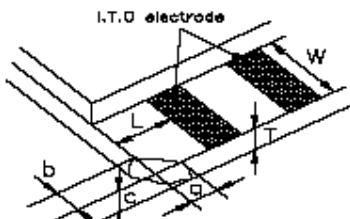
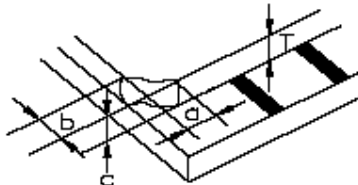
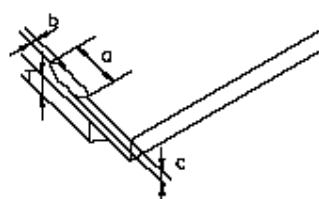
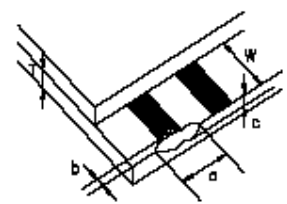


Minor defect	Black lines and scratches.	Scratch on glass or polarizer surface. And foreign linear matters in LCD.	Negative panel: 1. A 、 B zone. (1) Large size LCD <table><tr><th>Diameter (mm)</th><th>Accept QTY</th></tr><tr><td>$W \leq 0.02$</td><td>Not count</td></tr><tr><td>$0.02 < W \leq 0.03, L \leq 5$</td><td>3</td></tr><tr><td>$0.03 < W \leq 0.05, L \leq 3$</td><td>2</td></tr><tr><td>$0.02 < W \leq 0.03, L > 5$</td><td>0</td></tr><tr><td>$0.03 < W \leq 0.05, L > 3$</td><td>0</td></tr></table> $W > 0.05$ As the spot criteria. (2) Middle size LCD <table><tr><th>Diameter (mm)</th><th>Accept QTY</th></tr><tr><td>$W \leq 0.02$</td><td>Not count</td></tr><tr><td>$0.02 < W \leq 0.03, L \leq 3$</td><td>2</td></tr><tr><td>$0.03 < W \leq 0.05, L \leq 2$</td><td>1</td></tr><tr><td>$0.02 < W \leq 0.03, L > 3$</td><td>0</td></tr><tr><td>$0.03 < W \leq 0.05, L > 2$</td><td>0</td></tr></table> $W > 0.05$ As the spot criteria. (3) Small size LCD <table><tr><th>Diameter (mm)</th><th>Accept QTY</th></tr><tr><td>$W \leq 0.02$</td><td>Not count</td></tr><tr><td>$0.02 < W \leq 0.03, L \leq 3$</td><td>2</td></tr><tr><td>$0.02 < W \leq 0.03, L > 3$</td><td>0</td></tr></table> $W > 0.03$ As the spot criteria. 2. C zone Not count.	Diameter (mm)	Accept QTY	$W \leq 0.02$	Not count	$0.02 < W \leq 0.03, L \leq 5$	3	$0.03 < W \leq 0.05, L \leq 3$	2	$0.02 < W \leq 0.03, L > 5$	0	$0.03 < W \leq 0.05, L > 3$	0	Diameter (mm)	Accept QTY	$W \leq 0.02$	Not count	$0.02 < W \leq 0.03, L \leq 3$	2	$0.03 < W \leq 0.05, L \leq 2$	1	$0.02 < W \leq 0.03, L > 3$	0	$0.03 < W \leq 0.05, L > 2$	0	Diameter (mm)	Accept QTY	$W \leq 0.02$	Not count	$0.02 < W \leq 0.03, L \leq 3$	2	$0.02 < W \leq 0.03, L > 3$	0	
Diameter (mm)	Accept QTY																																			
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$0.02 < W \leq 0.03, L \leq 3$	2																																			
$0.02 < W \leq 0.03, L > 3$	0																																			
Minor defect	13.Scratch on PI coating.	PI coating scratched.	The visible scratch of A zone can not accepted at 30cm view distance.																																	
Minor defect	14.Rainbow	Arches, circular or parallel colorful spread.	According to the limit specimen.																																	
Minor defect	15.Bubbles or wrinkles in polarizer	Bubbles or wrinkles between polarizer and glass.	According to black spot/ foreign material specification.																																	

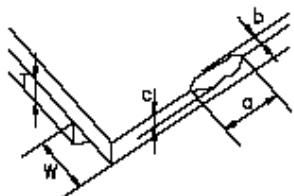
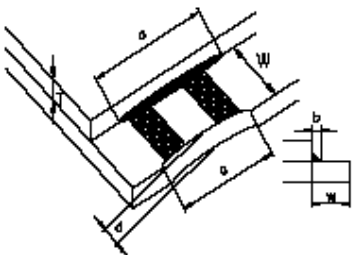


Minor defect	16.Position of polarizer attachment	16.1 Wrong polarizer attachment in position or dimension.	Polarizer protruding from edge of glass and exceeding/ within the maximum external dimension of LCD.	
Minor defect	17. Ink printing defect	17.1 Ink line/ pattern broken	Not accept.	
		17.2 Ink pattern/ line jagged.	Accept if the thick or thin part is less than or equal to 25% segment width or according to the limit specimen.	
		17.3 Light leakage	When activated with current white light appears in the position of pinhole or scratch due to ink printing misalignment. According to the pinhole specification.	
Minor defect		17.4 Ink printing pattern/ line uneven	Reject if the thick or thin is more than $1/2W$. Reject when $W1 - W2 \leq 1/3W$.	
Minor defect	18. Pin defect.	18.1 Corrosion or foreign material on terminal legs.	Pin incoming defect: oxidized, damage (including pins plating damaged), excess epoxy on bottom glass or terminal legs, which are not acceptable.	
Minor defect		18.2 Pin deviation over tolerance	According to the specification.	



Minor defect	19. Chipped glass on corner	19.1 Chip in lead contact area.	a	b	c	Accept QTY		
			$a \leq 3\text{mm}$ ($L \geq 5\text{mm}$)	$b \leq 1/2W$	$c \leq T$	2		
			$a < 1/2L$ ($L < 5\text{mm}$)	$b \leq 1/2W$	$c \leq T$	2		
		19.2 Others	a	b	c	Accept QTY		
not exceed 1/2 width of seal			$c \leq T$	2				
Minor defect	20. Glass chip on edge		a	b	c	Accept QTY		
			$a \leq 3\text{mm}$	not exceed 1/2 width of seal	$c \leq 3/4T$	2		
Minor defect	21. Chipped electrode pad	21.1 Glass chip on ITO edge	COG and TAB product.	a	b	c	Accept QTY	
$a \leq 2\text{mm}$ (and not exceed 3 ITO terminal)				$b \leq W/5$	$T > 0.7\text{mm}$ $c \leq 1/2T$ $T \leq 0.7\text{mm}$ $c \leq T$	2		
Minor defect			Others	a	b	c	Accept QTY	
				$a \leq 3\text{mm}$ (and not exceed 4 ITO terminal)	$b \leq W/4$	$c \leq T$	2	



Minor defect		21.2 Glass chip on ITO back	COG and TAB product.	a	b	c	Accept QTY	
				$a \leq 3\text{mm}$	$b \leq W/4$	$T > 0.7\text{mm}$ $c \leq 1/2T$ $T \leq 0.7\text{mm}$ $c \leq T$	2	
			Others	a	b	c	Accept QTY	
				$a \leq 5\text{mm}$	$b \leq W/4$	$c \leq T$	2	
Minor defect	22.Mechanical damage.	Extended crack inspector shall attempt to remove the chip with tweezers, re-evaluate if the remaining defect is still a crack or a chip.	B		Accept QTY			
			$b \leq 1/5W$		2			
Minor defect	23.Glass cracks		Not accept					

Remark:

The minimum space between any 2 defects (spot, dirt) should more than 20mm, and Max. allowed defect QTY in total:

Large size LCD : Zone A: $\leq 5/\text{unit}$, Zone B: $\leq 5/\text{unit}$;

Middle size LCD : Zone A: $\leq 3/\text{unit}$, Zone B: $\leq 3/\text{unit}$;

Small size LCD: Zone A: $\leq 2/\text{unit}$, Zone B: $\leq 2/\text{unit}$.



6.4.5.2 Other part

The inspection specification as following list:

NO	Items	Criterion of defects	AQL
1	Backlight	1.Lumination source flickers. 2.Using spot, lines and contamination standard of LCD to judge the spots or scratches defect on backlight. 3.Not allow unlighted on backlight. 4.Colour and luminance of backlight should correspond its specification.	Major Minor Major Major
2	PCB, COB	1.COB seal may not have pinholes larger than 0.2mm or contamination. 2.COB seal surface may not have pinholes through to the IC. 3.The height of the COB should not exceed the height indicated in the assembly diagram. 4.Beyond 2mm of the seal area, there may not have sealant on the PCB. 5.No oxidation or contamination on PCB connector. 6.Parts on PCB should correspond the characteristic, and not allow wrong parts, missing parts or additional parts. 7.The jumper on the PCB should correspond to the characteristic. 8.The solder which gets on bezel, LED pad, zebra pad or screw hole pad should be smoothed down.	Minor Minor Major Minor Minor Major Minor Major
3	Soldering	1.No unmelted solder pastes on the PCB. 2.No cold solder joints, solder connection missing, oxidation of solder. 3.No short circuits in components on PCB.	Minor Minor Minor
4	General Appearance	1.No oxidation, contamination, curves ,cracks or bends on interface Pin of TCP. 2.No solder residue or solder balls on product. 3.The IC on the TCP may not be damaged. 4.The residual rosin or tin oil of soldering (component or chip component) is not turned into brown or black color. 5.Packing method correspond the specification. 6.Dimension and structure correspond the specification sheet. 7.No dirt and break on the heat seal.	Minor Minor Major Minor Major Major Major



6.5.0 Reliability

The LCD module should not fail the following reliability test.

ITEM	Condition		Criterion
High temperature operation	+70℃ 8h		1.Total current consumption should be below double of initial value. 2.Cosmetic defects should not be happened.
Low temperature operation	-20℃ 8h		
Humidity	Storage	40℃ 93%RH 24h	
	Operation	40℃ 93%RH 8h	
High temperature storage	+80℃ 10h		
Low temperature storage	-30℃ 10h		
Thermal shock storage	-20℃→+70℃ 60min→60min 5 cycle		
Vibration (Package state)	50Hz 0.7mm 30min in each direction (X, Y, Z).		
Falling test (Packaged state)	Weight≥15kg; Falling height: 80cm. Weight<15kg; Falling height: 100cm.		



6.6. Quality Assurance

6.6.1 JINGHUA DISPLAYS will only replace or repair any of its LCD which is found defective electrically or visually when inspected in accordance with the LCM specification, for a period of one year from the date of shipment. Confirmation of such date shall be based on freight documents.

No warranty can be granted if any of the precautions stated in handling LCD and LCD Modules above have been disregarded.

6.6.2 In returning the LCD and LCD Modules, they must be properly packaged and there should be detailed description of the failures or defects. Broken glass, scratches on polarizers, mechanical damages as well as defects that are caused by accelerated environmental tests are excluded from warranty.

6.7. Precautions in Use of LCM

1. Handling of LCM

- 1.1 Don't give external shock.
- 1.2 Liquid crystal is chemical hazardous substance. Once the liquid crystal inside it leaks out, be sure not to get any in your mouth. If the liquid is adhered your skin or clothes etc, wash it off using soap and water thoroughly and immediately.
- 1.3 Don't apply excessive force on the display surface.
- 1.4 Don't scratch and dirty polarizer of covering the display surface of the LCD module.
- 1.5 In order to prevent static electricity from destructing, be sure to wear gauntlet that is tested up to grade.

2. Storage

- 2.1 Store in dark places and do not expose to sunlight or fluorescent light. Keep the temperature between 0°C and 40°C and the humidity lower than 60%RH. Please consult JINGHUA DISPLAYS LTD. for other storage requirements.
- 2.2 Storage in a clean environment, free-dust and well ventilated.
- 2.3 Storage in anti-static electricity container.

3. Soldering

- 3.1 The soldering temperature is 260±5°C and soldering Time should be less than 3 sec, and soldering iron power should be less than 30w.
- 3.2 Re-soldering: no more than 3 times.
- 3.3 The soldering point should be further than 1.6 mm from body.

“Shenzhen Jinghua Displays CO.,LTD. reserves the right to change this specification”

- END -