



FS-8815P02092 REV. A
(FFPL2WHES-06-RA-HDC)

MAR/2015

PAGE 1 OF 28

DOCUMENT NUMBER AND REVISION

FS-8815P02092 REV. A
(FFPL2WHES-06-RA-HDC)

DOCUMENT TITLE:
SPECIFICATION
OF
LCD MODULE TYPE

CUSTOMER	
MODEL NUMBER	8815P02092
CUSTOMER APPROVAL	
DATE	

DEPARTMENT	NAME	SIGNATURE	DATE
PREPARED BY	YANG YANYAN	<i>Yang Yanyan</i>	2015.03.13
CHECKED BY	XIAO HUIHONG	<i>肖辉红</i>	2015.03.13
APPROVED BY	YU HAO	<i>俞浩</i>	15.3.13

SHENZHEN JINGHUA DISPLAYS CO., LTD.

4th floor, 2nd building, Pengji Industrial Park, No.3 Liuhe Road, Liuyue Community, Henggang Street,
Longgang District, Shenzhen China

Tel: 86-755-82442519, 82487795

Fax: 86-755-82262610

86-755-82441596, 82448287

URL: www.china-lcd.com



DOCUMENT REVISION HISTORY 1:

DOCUMENT REVISION FROM TO	DATE	DESCRIPTION	CHANGED BY	CHECKED BY
A	2015.03.13	First Release.	YANG YANYAN	XIAO HUIHONG



CONTENTS

	<u>Page No.</u>
1. GENERAL DESCRIPTION	4
2. MECHANICAL SPECIFICATIONS	4
3. INTERFACE SIGNALS	6
4. ABSOLUTE MAXIMUM RATINGS	7
4.1 ELECTRICAL MAXIMUM RATINGS (Ta=25°C)	7
4.2 ENVIRONMENTAL CONDITION	7
5. ELECTRICAL SPECIFICATIONS	8
5.1 TYPICAL ELECTRICAL CHARACTERISTICS	8
5.2 BACKLIGHT CHARACTERISTICS	8
5.3 TIMING SPECIFICATIONS	9
5.4 CHARACTER FONT MAP	13
5.5 INSTRUCTION TABLE	14
6. QUALITY UNITS	16



Specification of LCD Module Type Item No.: 8815P02092

1 General Description

- 240*128 dots FSTN positive transfective dot matrix LCD Module.
- Viewing direction: 6 O'clock direction.
- Driving duty: 1/128Duty, 1/12bias.
- RA6963 LCD Controller &Driver or equivalent.
- SDN8080G LCD Controller &Driver or equivalent.
- Power Supply: +5.0V.
- White backlight(LED side).

2 Mechanical Specifications

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

Table 1

Parameter	Specifications	Unit
Outline dimensions	144.0(L) × 104.0(W) × 14.3 MAX(H)	mm
Viewing area	114.0(L) × 64.0 (W)	mm
Active area	107.98(L) × 57.58(W)	mm
Display format	240*128	dots
Dot size	0.43(L) × 0.43 (W)	mm
Dot spacing	0.02(L) × 0.02(W)	mm
Dot pitch	0.45(L) × 0.45(W)	mm
Weight	169.0 ± 10%	g
Panel size	<input type="checkbox"/> LARGE <input checked="" type="checkbox"/> MIDDLE <input type="checkbox"/> SMALL	

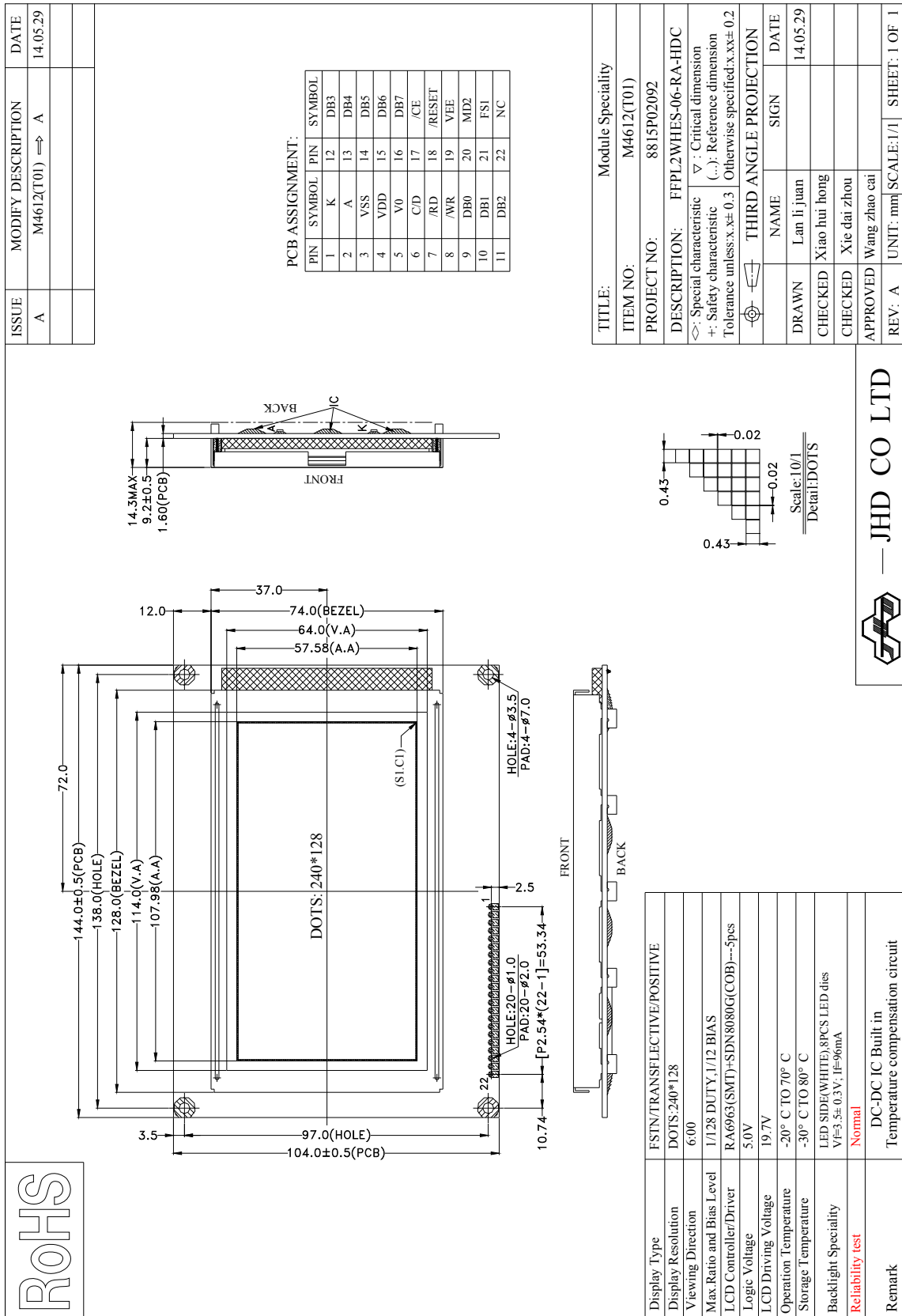


Figure 1: Module Specification



3 Interface signals

Table 2

Pin No.	Symbol	Description									
1	K	Cathode of the backlight.									
2	A	Anode of the backlight.									
3	VSS	Ground(0V)									
4	VDD	Power supply voltage for logic									
5	V0	VLCD driving voltage.									
6	C/D	Command/Data Select or Register Select This is a Data or Command select signal.									
		<table border="1"> <thead> <tr> <th>C/\bar{D}</th> <th>$\overline{WR} = \text{Low}$</th> <th>$\overline{RD} = \text{Low}$</th> </tr> </thead> <tbody> <tr> <td>High</td> <td>Command Write</td> <td>Status Read</td> </tr> <tr> <td>Low</td> <td>Data Write</td> <td>Data Read</td> </tr> </tbody> </table>	C/ \bar{D}	$\overline{WR} = \text{Low}$	$\overline{RD} = \text{Low}$	High	Command Write	Status Read	Low	Data Write	Data Read
		C/ \bar{D}	$\overline{WR} = \text{Low}$	$\overline{RD} = \text{Low}$							
		High	Command Write	Status Read							
Low	Data Write	Data Read									
7	/RD	Read Control /RD is a data read signal. When Low, MPU read data from RA6963.									
8	/WR	Write Control /WR is a data write signal. When Low, MPU write data into RA6963.									
9	DB0	Data Bus for External Memory									
10	DB1										
11	DB2										
12	DB3										
13	DB4										
14	DB5										
15	DB6										
16	DB7										
17	/CE	Chip Enable This s chip enable of RA6963. When MPU communicate with RA6963, this pin must be Low.									
18	/RESET	Reset Signal /RESET= Low RA6963 will be reset. /RESET= High, Normal mode. RA6963 built-in a Pull-Hi resistor.									
19	VEE	Negative voltage.									
20	MD2	Columns Selection									
		<table border="1"> <thead> <tr> <th>MD2</th> <th>H</th> <th>L</th> </tr> </thead> <tbody> <tr> <th>MD3</th> <td>H</td> <td>H</td> </tr> <tr> <th>Columns</th> <td>32</td> <td>40</td> </tr> </tbody> </table>	MD2	H	L	MD3	H	H	Columns	32	40
		MD2	H	L							
		MD3	H	H							
Columns	32	40									
		In the module, MD[1:0]=00,MD3=1.									



21	FS1	Font Selection				
		FS0	H	L	H	L
		FS1	H	H	L	L
		Font	5 X 8	6 X 8	7 X 8	8 X 8
In the module, FS0=0.						
22	NC	No connection				

4 Absolute Maximum Ratings

4.1 Electrical Maximum Ratings (Ta = 25 °C)

Table 3

Symbol	Parameter	Min.	Max.	Unit
VDD(Note1)	Logic Supply voltage	-0.3	+7.0	V
Vin(Note1)	Any input/output	-0.3	VDD + 0.3	V

Note 1: GND = 0V.

4.2 Environmental Condition

Table 4

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



5 Electrical Specifications

5.1 Typical Electrical Characteristics

At $T_a = 25\text{ }^\circ\text{C}$, $V_{DD} = 5.0 \pm 0.2\text{V}$, $V_{SS} = 0\text{V}$.

Table 5

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage (Logic)	VDD-VSS	Note 1	4.8	5.0	5.2	V
Supply voltage (LCD)	VLCD	VDD =+5.0V, Note 2	19.4	19.7	20.0	V
Input signal voltage	V _{IH}	“H” level	0.8VDD	-	VDD	V
	V _{IL}	“L” level	0	-	0.2VDD	V
Input signal voltage	V _{OH}	“H” level	VDD-0.3	-	VDD	V
	V _{OL}	“L” level	0	-	0.3	V
Supply Current (Logic)	IDD	Note 1	-	30.0	45.0	mA

Note 1: The voltage is IC can support. But the display effect isn't best.

Note 2: There is tolerance in optimum LCD driving voltage during production and it will be within the specified range. The module will be display best within $5.0 \pm 0.05\text{V}$ for VCC.

5.2 Backlight characteristics

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

Item of backlight characteristics	Symbol	Min.	Typ.	Max.	Unit	Condition
Forward voltage	V _f	3.2	3.5	3.8	V	I _f = 96mA
Number of LED	-	-	8	-	Piece	white
Connection mode		-	parallel	-	-	-
Luminance	L _v	300	-	-	cd/m ²	I _f = 96mA
Luminance uniformity		70			%	
Chromaticity coordinates	x	0.26		0.30		
	y	0.26		0.30		
Color	White					

Note 1: Using condition: constant current driving method I_f = 96mA.

Note 2: For operation above 25°C, The I_f & P must be derated, the current derating is -0.26 mA/°C for DC drive. (Per LED)

Note 3: The luminance is the average value of 9 points, and The L_{vmax} /L_{vmin} is less than 1.5 Typical. The measurement instrument is BM-7 luminance Colorimeter. The caperture is Φ10 mm.

Note 4: The values in the above table are nominal.



5.3 Timing Specifications

At $T_a = -20\text{ }^{\circ}\text{C}$ To $+70\text{ }^{\circ}\text{C}$, $V_{DD} = 5.0\pm 0.2\text{V}$, $V_{SS} = 0\text{V}$.

Refer to Fig. 2, the bus-timing diagram for MPU interface timing.

Table 6

Item	Symbol	Test Conditions	Min.	Max.	Unit
C/\overline{D} Set Up Time	t_{CDS}	--	100	--	ns
C/\overline{D} Hold Time	t_{CDH}	--	10	--	ns
\overline{CE} , \overline{RD} , \overline{WR} Pulse Width	t_{CE} , t_{RD} , t_{WR}	--	80	--	ns
Data Set Up Time	t_{DS}	--	80	--	ns
Data Hold Time	t_{DH}	--	40	--	ns
Access Time	t_{ACC}	--	--	150	ns
Output Hold Time	t_{OH}	--	10	50	ns

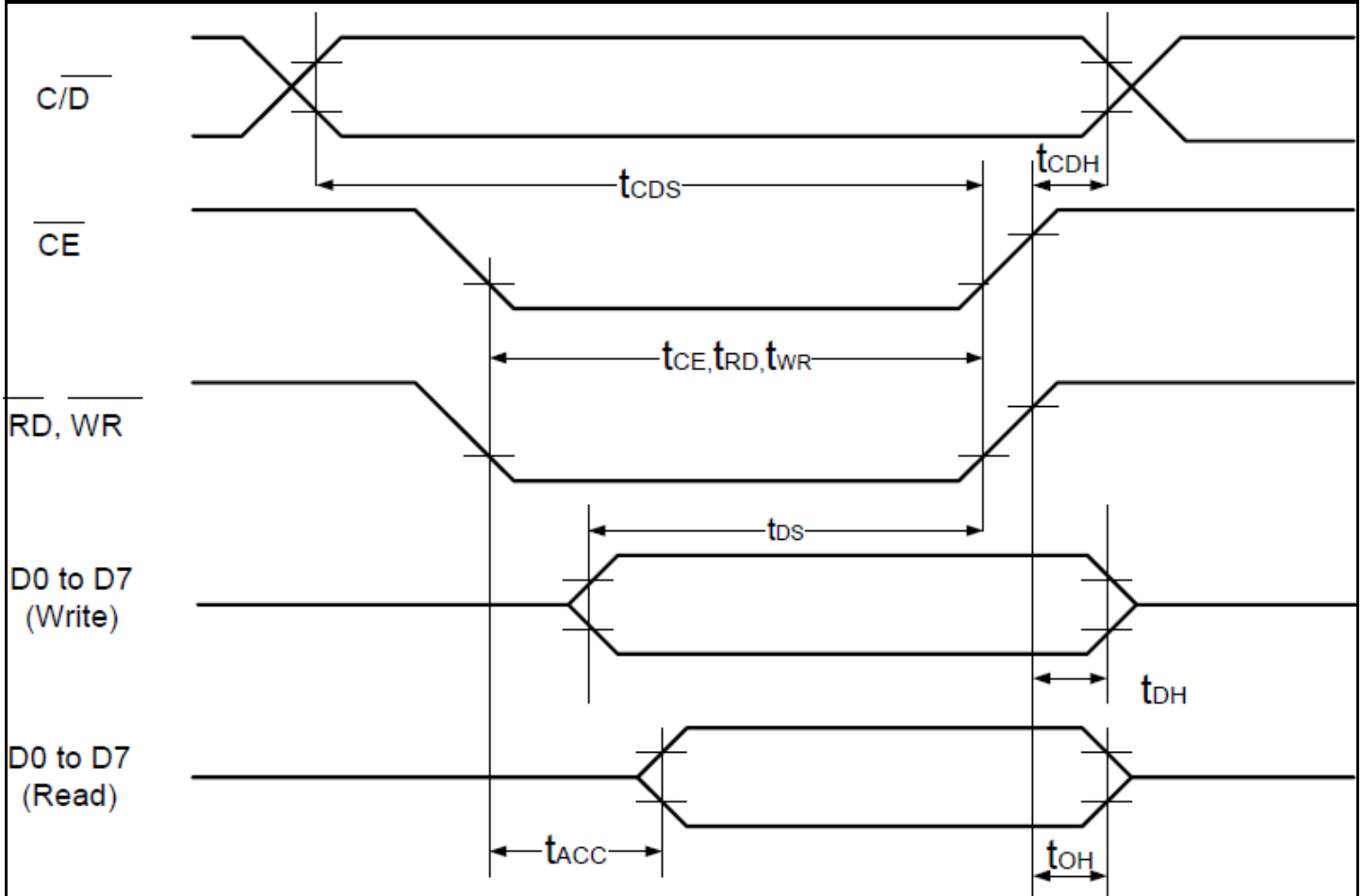


Figure 2: Parallel Bus Timing Characteristics (for 8080 MCU).



At $T_a = -20\text{ }^{\circ}\text{C}$ To $+70\text{ }^{\circ}\text{C}$, $V_{DD} = 5.0\text{V} \pm 0.2\text{V}$, $V_{SS} = 0\text{V}$.

Refer to Fig. 4, the bus-timing diagram for driver interface timing.

Table 7

Item	Symbol	Test Conditions	Min.	Max.	Unit
Operating Frequency	f_{SCP}	$T_a = -20\sim 70\text{ }^{\circ}\text{C}$	--	9	MHz
SCP Pulse Width	t_{CWH}, t_{CWL}	--	150	--	ns
SCP Rise/Fall Time	t_r, t_f	--	--	30	ns
LP Setup Time	t_{LSU}	--	150	290	ns
LP Hold Time	t_{LHD}	--	5	40	ns
Data Setup Time	t_{DSU}	--	170	--	ns
Data Hold Time	t_{DHD}	--	80	--	ns
FR Delay Time	t_d	--	0	90	ns
CDATA Setup Time	t_{CSU}	--	450	850	ns
CDATA Hold Time	t_{CHD}	--	450	950	ns

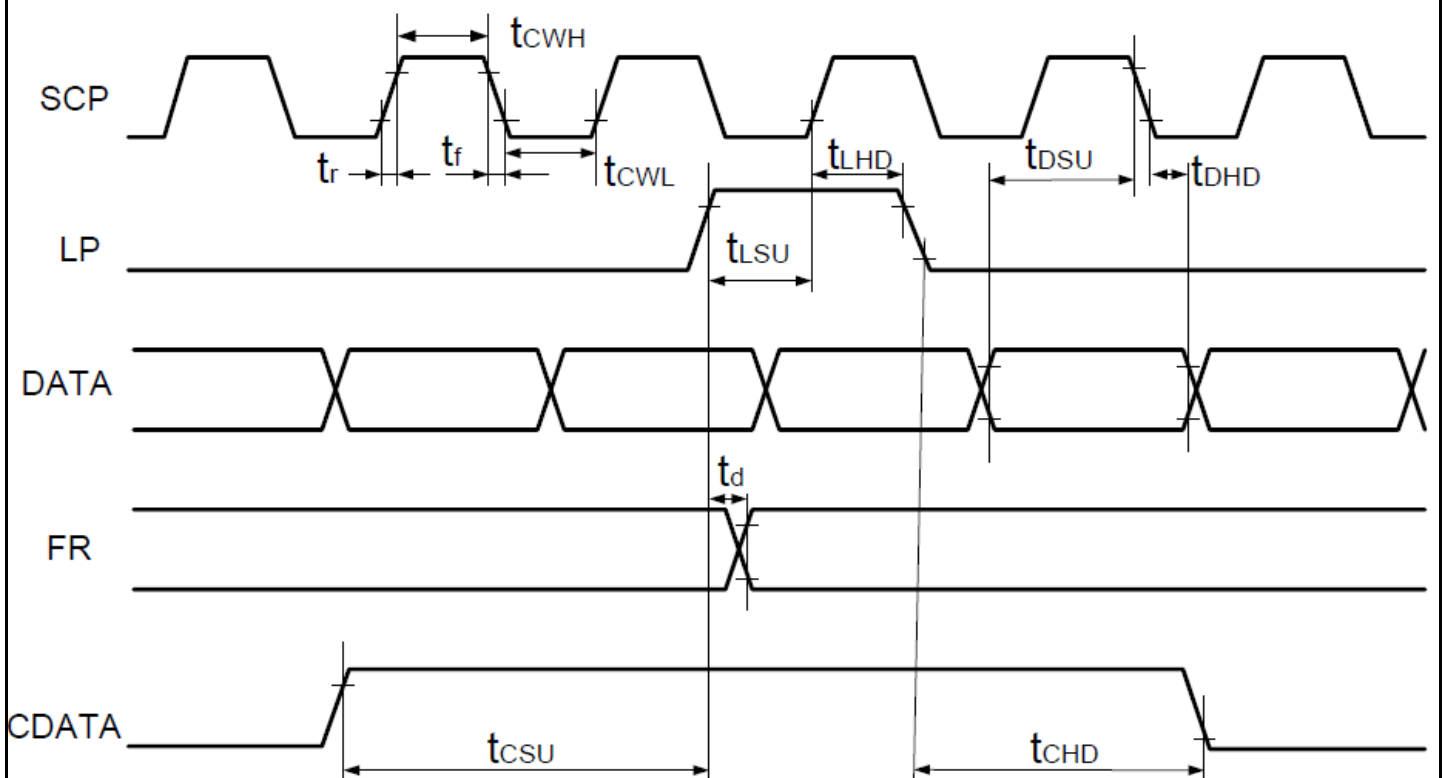


Figure 4: Driver interface timing



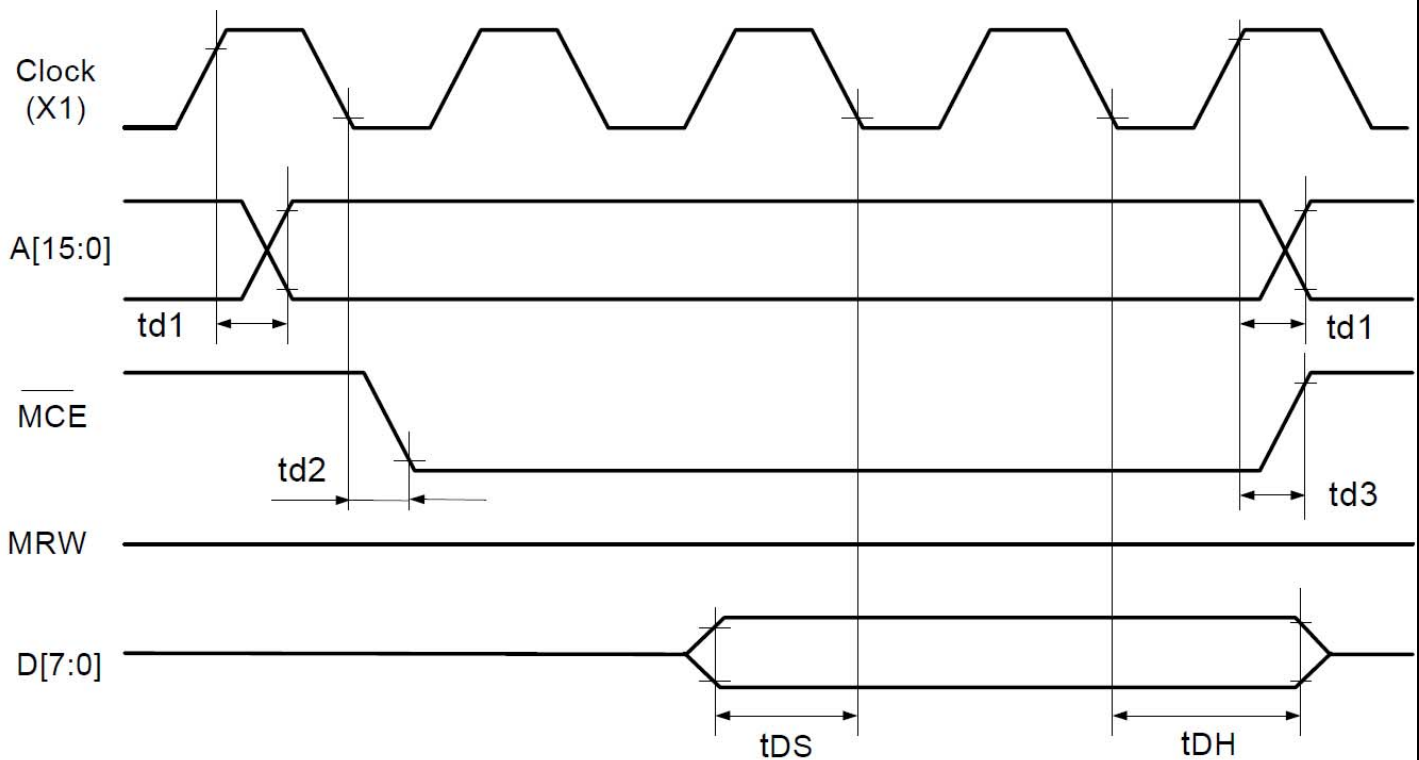
At $T_a = -20\text{ }^\circ\text{C}$ To $+70\text{ }^\circ\text{C}$, $V_{DD} = 5.0\text{V} \pm 0.2\text{V}$, $V_{SS} = 0\text{V}$.

Refer to Fig. 5, the bus-timing diagram for external memory interface

Table 8

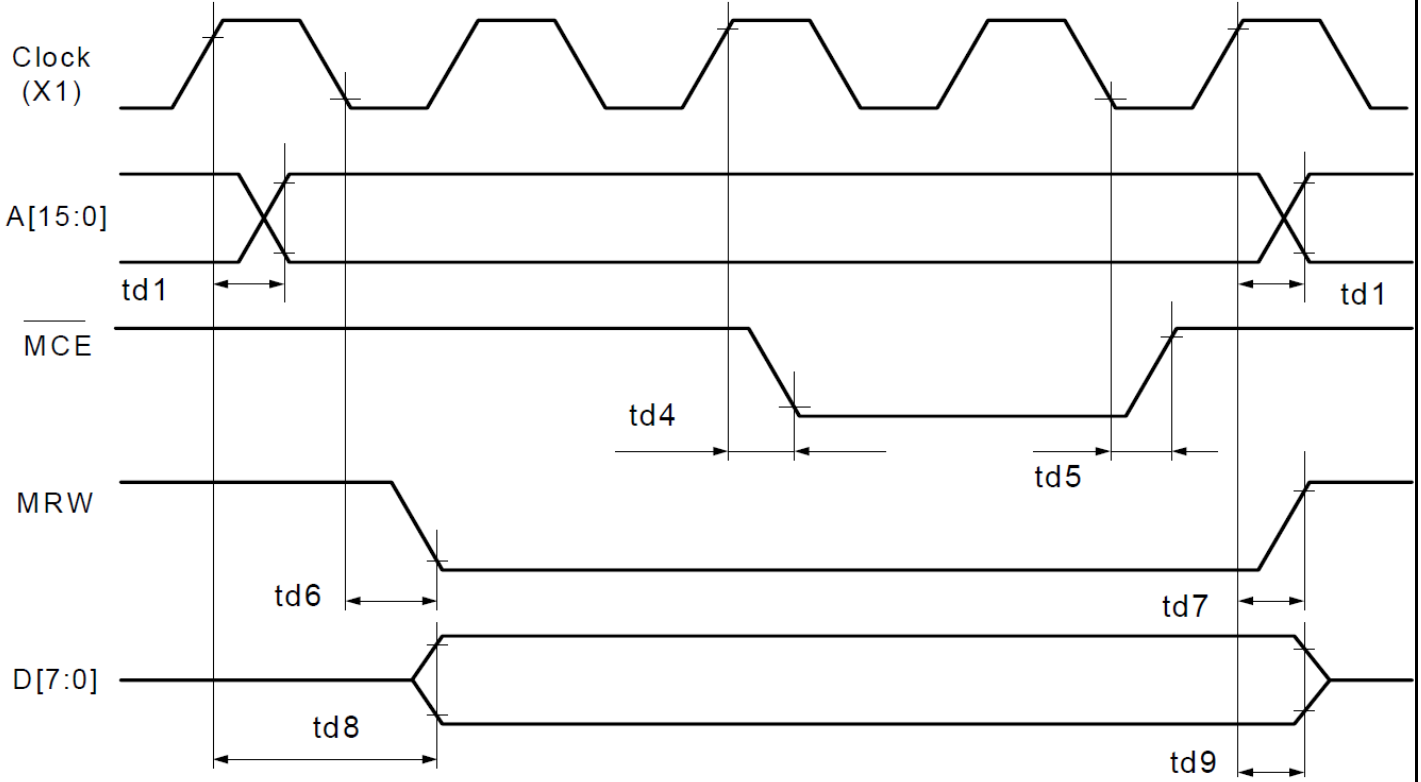
Item	Symbol	Test Conditions	Min.	Max.	Unit
Address Delay Time	t_{d1}	--	--	250	ns
$\overline{\text{MCE}}$ Fall Delay Time(Read)	t_{d2}	--	--	180	ns
$\overline{\text{MCE}}$ Rise Delay Time(Read)	t_{d3}	--	--	180	ns
Data Setup Time	t_{DS}	--	--	--	ns
Data Hold Time	t_{DH}	--	--	--	ns
$\overline{\text{MCE}}$ Fall Delay Time(Write)	t_{d4}	--	--	200	ns
$\overline{\text{MCE}}$ Rise Delay Time(Write)	t_{d5}	--	--	200	ns
MRW Fall Delay Time	t_{d6}	--	--	180	ns
MRW Rise Delay Time	t_{d7}	--	--	180	ns
Data Stable Time	t_{d8}	--	--	450	ns
Data Hold Time	t_{d9}	--	--	200	ns

External RAM read.





External RAM write





5.4 Character Font Map

CGROM Font - 01

LSB MSB	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		!	"	#	\$	%	&	'	()	*	+	,	-	.	/
1	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
2	a	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
3	P	Q	R	S	T	U	U	W	X	Y	Z	[\]	^	_
4	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
5	p	q	r	s	t	u	v	w	x	y	z	{		}	~	
6	ç	ü	é	á	ä	à	â	ó	ê	ë	è	ï	î	í	ä	â
7	é	æ	re	ô	ö	ó	ô	ü	ö	o	ø	ø	æ	re	f	f



5.5 Instruction table

Command	Code	D1	D2	Function
Registers Setting	00100001	X address	Y address	Set cursor pointer
	00100010	Data	00h	Set Offset Register
	00100100	Low address	High address	Set Address pointer
Set Control Word	01000000	Low address	High address	Set Text Home Address
	01000001	Columns	00h	Set Text Area
	01000010	Low address	High address	Set Graphic Home Address
	01000011	Columns	00h	Set Graphic Area
Mode Set	1000X000	--	--	OR mode
	1000X001	--	--	EXOR mode
	1000X011	--	--	AND mode
	1000X100	--	--	Text Attribute mode
	10000XXX	--	--	Internal CG ROM mode
	10001XXX	--	--	External CG RAM mode
Display Mode	10010000	--	--	Display off
	1001XX10	--	--	Cursor on, blink off
	1001XX11	--	--	Cursor on, blink on
	100101XX	--	--	Text on, graphic off
	100110XX	--	--	Text off, graphic on
	100111XX	--	--	Text on, graphic on
Cursor Pattern Select	10100000	--	--	1-line cursor
	10100001	--	--	2-line cursor
	10100010	--	--	3-line cursor
	10100011	--	--	4-line cursor
	10100100	--	--	5-line cursor
	10100101	--	--	6-line cursor
	10100110	--	--	7-line cursor
	10100111	--	--	8-line cursor
Data Read/Write	11000000	Data	--	Data Write and Increment ADP
	11000001	--	--	Data Read and Increment ADP
	11000010	Data	--	Data Write and Decrement ADP
	11000011	--	--	Data Read and Decrement ADP
	11000100	Data	--	Data Write and Non-variable ADP
	11000101	--	--	Data Read and Non-variable ADP
Data auto Read/Write	10110000	--	--	Set Data Auto Write
	10110001	--	--	Set Data Auto Read
	10110010	--	--	Auto Reset
Screen Peek	11100000	--	--	Screen Peek
Screen Copy	11101000			Screen Copy
Bit Set/Reset	11110XXX	--	--	Bit Reset
	11111XXX	--	--	Bit Set
	1111X000	--	--	Bit 0 (LSB)
	1111X001	--	--	Bit 1
	1111X010	--	--	Bit 2
	1111X011	--	--	Bit 3
	1111X100	--	--	Bit 4
	1111X101	--	--	Bit 5
	1111X110	--	--	Bit 6
	1111X111	--	--	Bit 7 (MSB)



Screen Reverse	11010000	Data	Data (Don't care) (Note)	Whole screen reverse Data Bit 0 0 : Normal 1 : Reverse
Blink Time	01010000	Data	Data (Don't care) (Note)	If Frame = 60Hz Data Bit 2:0 000 : 0.066s 001 : 0.25s 010 : 0.5s (Default) 011 : 0.75s 100 : 1s 101 : 1.25s 110 : 1.5s 111 : 2s
Cursor Auto Moving	01100000	Data	Data (Don't care) (Note)	Data Bit 0 0 : Disable.(Default) 1 : Enable.
CGROM Font Select	01110000	Data	Data (Don't care) (Note)	Data Bit 1:0 00 : Do not care.(Default) 01 : Do not care. 10 : CGROM Font-01. 11 : CGROM Font-02.

Note : In these functions, it must be sent two data before sending the command, but the contents of the second datum (D2) can be any values.



6 Quality Units

6.1 Purpose

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

6.2 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 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): 1~6 pcs LCD screens are cut out of from each 14" ×16" motherglass.

Middle size(M): 7~99 pcs LCD screens are cut out of from each 14" ×16" unit motherglass.

Small size(S): > 99 pcs LCD screens are cut out of from each 14" ×16" unit motherglass.

6.4 Quality Specification



6.4.1 Conditions of Inspection

6.4.1.1 Tests should be conducted under the following conditions:

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

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

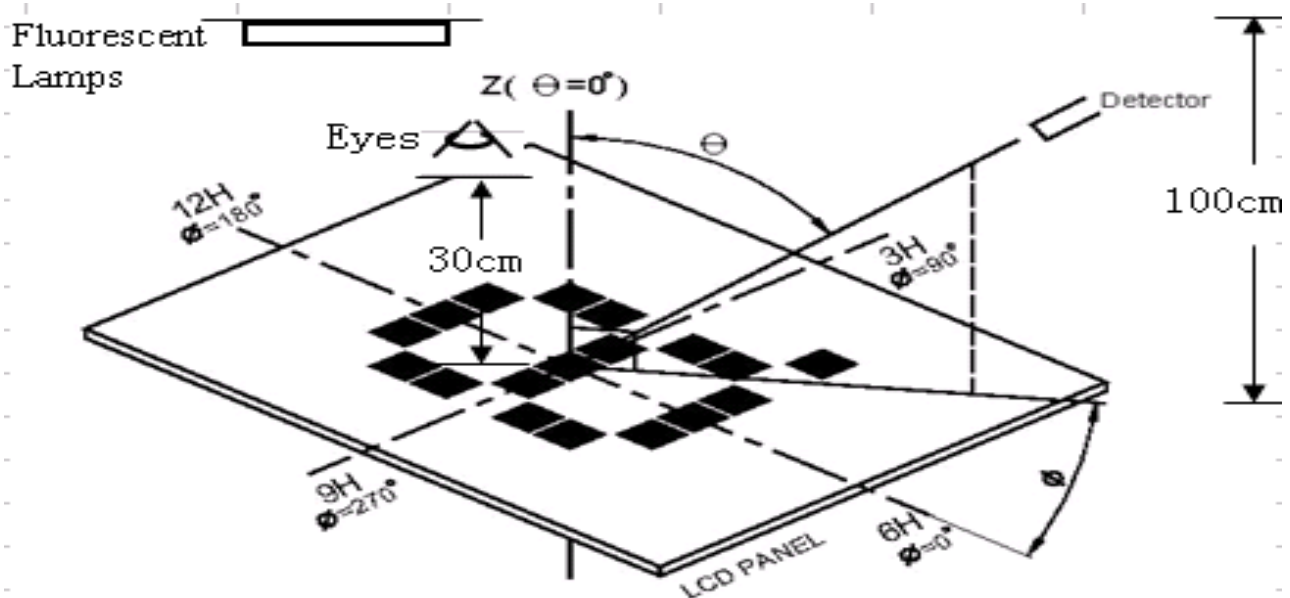
6.4.1.2 Function test:

With fluorescent lamps, the light should be 200Lux or upwards of 200 Lux, the product should be inspected with 30cm to LCD surface;

6.4.1.3 Cosmetic Inspection:

With fluorescent lamps, the light should be 600~800Lux, the product should be inspected with 30cm to LCD surface;

6.4.1.4 Diagram of inspection as following:



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 belows:

📖 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 following:

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.

📖 Multi-meter.

📖 Caliper.

📖 Defect size filming standard.

6.4.5 Inspection quality criterion



6.4.5.1 Function Inspection :

Content	Item	Inspection list and Standard	Defect		
Display	1	LCD cross short;	Maj.		
	2	Segment missing, line missing, short, much dot;	Maj.		
	3	Display uniformity not good;	Maj.		
	4	No display or display error;	Maj.		
	5	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 	Min.		
	6	Pinholes: black spot (negative)/ white spot (positive) at activated state.		Min.	
		Product Type	Defect Size Accept Qt'y		
		Large Size	Within 1m inspection, the defect is unobvious and not get bigger when display;		
		Middle Size	$D \leq 0.15$		Ignorance
			$0.15 < D \leq 0.25$		3
			$0.25 < D \leq 0.35$		1
			$0.35 < D$		0
Small Size		$D \leq 0.15$	Ignorance		
	$0.15 < D \leq 0.25$	2			
	$0.25 < D \leq 0.3$	1			
	$0.3 < D$	0			
1. For the dot pattern: accept if the area of defect is less than or equal to half of one lattice's. 2. Only allow one defect in one segment. 3. The nearest distance allowed between two pinholes is above 20mm. 					
7	When character displays, the background is deeper or lighter than simple.	Min.			
8	The color of character is lighter than sample;	Min.			
Backlight	9	The backlight is not light;	Maj.		
	10	When working, the light is flashing;	Maj.		
	11	The backlight does not work or the color is wrong;	Maj.		
	12	When working, the obvious gridding is visual;	Min		



Backlight	13	<p>The uniformity inspection: As following picture, we use the 5-points test method to confirm the uniformity, the standard is: $\text{Min/Max} \geq 70\%$; Average both length and width to 6 parts, and test points as following(green points):</p>	Min
Others	14	The product model does not match the specification;	Maj.
	15	LCD view angle does not match the specification;	Maj.
	16	The color is obviously different(pls reference for sample);	Min

6.4.5.2 Final Assembly cosmetic inspection

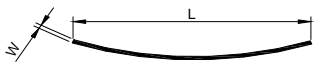
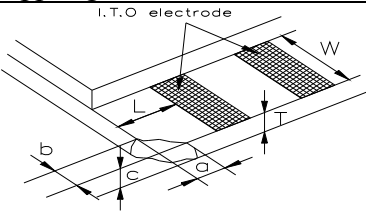
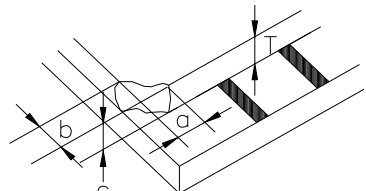
Content	Item	Inspection list and Standard	Defect
Final Assembly cosmetic inspection	1	The product structure should match the specification. It can not be tilted or loosed;	Maj.
	2	The silica gel of LCD can not be over the upper polarizer;	Maj.
	3	When heating, the touch area of PAD/ ITO between two parts should be $\geq 1/2w$ (eg: FFC to PCB; FFC to FFC)	Maj.
	4	The product holder is tilted(can not be assembled) or cracked;	Maj.
	5	Polarizer scalded: the protect film can not be torn off or can be seen in view area;	Maj.
	6	The size of LCM does not match the drawing;	Maj.
	7	The height of silica gel can not be over the upper polarizer;	Min
	8	The tape should not be missing;	Min
	9	The label should follow the specification, and should be stucked in right position and can not be missing;	Min
	10	The label can be scanned, and the ink can not be off easily;	Min

6.4.5.3 LCD cosmetic inspection:

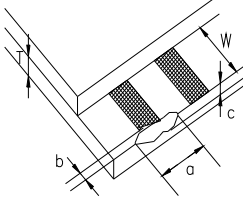
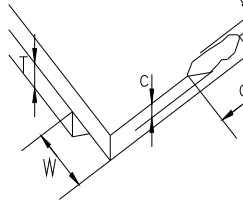
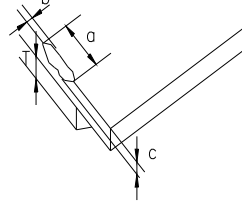
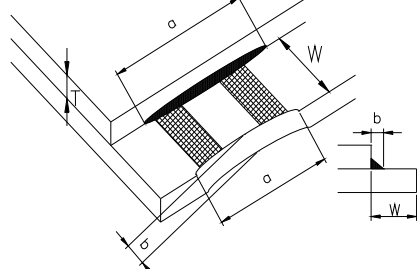


Content	Item	Inspection list and Standard			Defect	
LCD	1	Crack on LCD: not accept;			Maj.	
	2	LCD rainbow;(compare with the sample)			Min	
	3	The spot in LCD:				Min
		①Zone A:				
		Product Type	Defect Size	Accept Qt'y		
		Positive Large Size	Within 1m inspection, the defect is unobvious and not get bigger when display;			
		Positive Middle Size	$D \leq 0.15$	Ignorance		
			$0.15 < D \leq 0.25$	3		
			$0.25 < D \leq 0.35$	1		
		Positive Small Size	$D \leq 0.15$	Ignorance		
			$0.15 < D \leq 0.25$	2		
			$0.25 < D \leq 0.3$	1		
			$D > 0.3$	0		
		Negative Large Size	$D \leq 0.15$	Ignorance		
			$0.15 < D \leq 0.3$	4		
			$0.3 < D \leq 0.5$	1		
			$D > 0.5$	0		
		Negative Middle Size	$D \leq 0.15$	Ignorance		
			$0.15 < D \leq 0.3$	3		
			$D > 0.3$	0		
	Negative Small Size	$D \leq 0.15$	Ignorance			
		$0.15 < D \leq 0.25$	3			
		$D > 0.25$	0			
	②Zone B: the defect size is 1.5 times than Zone A; ③Zone C: Ignore the spot defect; The distance between two defect should longer than 20mm;					
	$D = (X+Y)/2$					
	4	The scratch / line defect on LCD or polarizer				Min
		①Zone A:				
		Product Type	Defect Width	Defect Length	Accept Qt'y	
Positive Large Size		Within 1m inspection, the defect is unobvious and not get bigger when display;				
Positive Middle Size		$W \leq 0.02$	/	Ignorance		
		$0.02 < W \leq 0.03$	$L \leq 4$	2		
		$0.02 < W \leq 0.03$	$L > 4$	0		
	$0.03 < W \leq 0.05$	$L \leq 3$	2			
$0.03 < W \leq 0.05$	$L > 3$	0				



LCD	4	Positive Middle Size	$W > 0.05$	/	Same as the spot
		Positive Small Size	$W \leq 0.02$	/	Ignorance
			$0.02 < W \leq 0.03$	$L \leq 4$	2
			$0.02 < W \leq 0.03$	$L > 4$	0
			$0.03 < W \leq 0.05$	$L \leq 2$	2
			$0.03 < W \leq 0.05$	$L > 2$	0
			$W > 0.05$	/	Same as the spot
		Negative Large Size	$W \leq 0.02$	/	Ignorance
			$0.02 < W \leq 0.03$	$L \leq 5$	3
			$0.02 < W \leq 0.03$	$L > 5$	0
			$0.03 < W \leq 0.05$	$L \leq 4$	2
			$0.03 < W \leq 0.05$	$L > 4$	0
			$W > 0.05$	/	Same as the spot
		Negative Middle Size	$W \leq 0.02$	/	Ignorance
			$0.02 < W \leq 0.03$	$L \leq 4$	2
			$0.02 < W \leq 0.03$	$L > 4$	0
			$0.03 < W \leq 0.05$	$L \leq 2$	2
			$0.03 < W \leq 0.05$	$L > 2$	0
			$W > 0.05$	/	Same as the spot
		Negative Small Size	$W \leq 0.02$	/	Ignorance
	$0.02 < W \leq 0.03$		$L \leq 3$	2	
	$0.02 < W \leq 0.03$		$L > 3$	0	
	$0.03 < W \leq 0.05$		$L \leq 2$	1	
	$0.03 < W \leq 0.05$		$L > 2$	0	
$W > 0.05$	/		Same as the spot		
<p>②Zone B: the defect size is 1.5 times than Zone A; ③Zone C: Ignore the spot defect; The distance between two defect should longer than 20mm;</p> 					
5	Chipped glass on corner:				
	 <p>ITO side</p>		 <p>Others</p>		
Zone	a	b	c	Acc Qt'y	Min



LCD	5	ITO side	$a \leq 5\text{mm} (L \geq 5\text{mm})$	$b \leq W$	$c \leq T$	3		
			$a < L (L < 5\text{mm})$	$b \leq W$	$c \leq T$	3		
		Others	not exceed 1/2 width of seal		$c \leq T$	3		
	6	Glass chip on edge						Min
		 ITO touch side		 ITO back side		 Others		Min
		Zone	a	b	c	Acc Qt'y		
		ITO touch side (COG and TAB)	$a \leq 3\text{mm}$ (and not exceed 4 ITO terminal)	$b \leq W/5$	$c \leq 1/2T (T > 0.7\text{mm})$ $c \leq T (T \leq 0.7\text{mm})$	3		
		ITO touch side (except COG and TAB)	$a \leq 4\text{mm}$ (and not exceed 4 ITO terminal)	$b \leq W/4$	$c \leq T$	3		
		ITO back side (COG and TAB)	$a \leq 3\text{mm}$	$b \leq 1/4W$	$c \leq 3/4T (T > 0.7\text{mm})$ $c \leq T (T \leq 0.7\text{mm})$	3		
		ITO back side (except COG and TAB)	$a \leq 5\text{mm}$	$b \leq 1/3W$	$C \leq T$	3		
Others	$a \leq 5\text{mm}$	Not exceed 1/2 width of seal	$c \leq T$	3				
7	<p>Extended crack inspector shall attempt to remove the chip with tweezers, re-evaluate if the remaining defect is still a crack or a chip: $b \leq 1/4W$, accept Qt'y: 2 ;</p> 							
COG	8	The silica gel is missing;					Maj.	



	9	The FPC is open, short;	Maj.
	10	The protection for COG ITO: ITO should be fully cover with silica gel and the height of silica should not over the LCD upper side, and the width should not overrun the side of LCD;(If there is special command, follow it) No dust or foreign in this zone;	Min.
	11	The gobo tape should totally cover IC; The bubble under tape should less than 0.5mm;	Min.
	12	Missing the gobo tape/ silica gel/ protect tape etc.	Min.
Polarizer	13	Bubble under polarizer: Zone A: it is visual at 30cm inspection; Zone B: ignorance;	Min.
	14	The size or position of polarizer can not match the drawing; It should cover the view zone and can not exceed the edge of LCD or cover the ITO;	Min.
Silk	15	The silk is discontinuous;	Min.
	16	Burr: Reject if the thick or thin is more than 1/4W	Min.
	17	Spot/ pinhole: same as the spec of LCD pinhole;	Min.
	18	Reject if the thick or thin is more than 1/2W. (W: normal width)	Min.
	19	The width of silk is not uniformity: Reject when $W_{max} - W_{min} > 1/3W$.	Min.
Others	20	Wrong assembly direction of LCD;	Maj.
	21	LC leakage;	Maj.
	22	Finger prints/ dirty on LCD surface;	Min.

6.4.5.4 PCBA Cosmetic Inspection

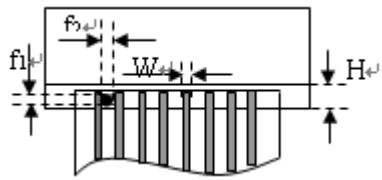
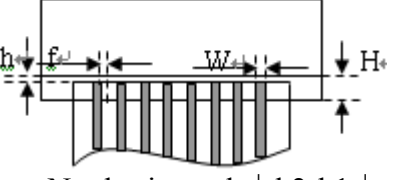
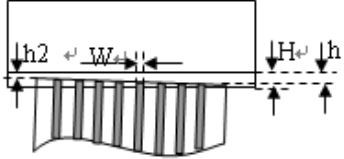
Content	Item	Inspection list and Standard	Defect
PCBA	1	The connecting finger of COB can not be leaked outside;	Maj
	2	The pinholes is deep to IC: not accept;	Maj.
	3	The surface of COB can not be scratched;	Min.
	4	The diameter of pinholes on Cob surface should be under 0.2mm; And there is no foreign;	Min.
	5	The height of COB should match the specification;	Min.
	6	The glue should be inside of PCB silk-circle;	Min.
	7	If there is some tin remained at the screw hole, it should be removed to make the hole surface smooth;	Min.
	8	The solder standard: IPC-610D;	/

6.4.5.5 Bezel Inspection



Content	Item	Inspection list and Standard	Defect
Bezel	1	The material, surface processing, color should match the specification;	Maj.
	2	The holder of bezel is cracked;	Maj.
	3	Wrong twist direction;	Maj.
	4	The bezel should not be oxydic, bended, deformed, finger prints, oil, dirty etc...	Maj.
	5	The bezel can not be scratched to the inner material;	Min.
	6	The burr can not exceed into view area;	Min.
	7	The angle of holder should be $30^{\circ} \sim 70^{\circ}$; If the copper is shaved, it should be cleaned;	Min.

6.4.5.6 Connector Inspection

Content	Item	Inspection list and Standard	Defect
TCP/FPC	1	The pin should not be oxydic, dirty, bended, cracked;	Maj.
	2	TCP IC broken or torn off from LCD;	Maj.
	3	FPC/TCP broken (The circuit is broken)	Maj.
	4	The holder board should be sticked closely and the size should match the specification;	Min.
	5	FPC/TCP broken (The circuit is OK)	Min.
Heat Seal Connector	6	Heat Seal Connector broken (The circuit is broken);	Maj.
	7	Silica gel is missing; (If there is no special request from customer, the connecting area should be project by silica gel)	Maj.
	8	Heat Seal: foreign or bubble: the connecting area should be under $\leq 1/2$ ITO (But if it make the surface not smooth, it is not accept)  Heat position not perfect matched: $f \leq 1/3W, h \leq 1/4H$: accept  Not horizontal: $ h2-h1 \leq 1/8H$: accept; 	Maj.



Heat Seal Connector	9	Pull test and remain inspection: 1. Test the force of pulling the heat seal connector instantly; It should be > 500g.f/cm × L (L: the length of connecting, CM); 2. After tearing, 70% of heat seal connector remains on every ITO of LCD;	Maj.
	10	Heat Seal Connector broken (The circuit is OK);	Min.
	11	Heat Seal Connector is dirty;	Min.
Connector (Pin)	12	Connector is loose;	Maj.
	13	The pin is tilted, and can not be assembled;	Maj.
	14	Connector is broken, and can not be assembled;	Maj.

6.4.5.7 Others

Content	Item	Inspection list and Standard	Defect
Back-light	1	The size should match the specification;	Maj.
	2	Back-light is broken or cracked, bended;	Maj.
	3	The standard of spots/ scratches is the same as LCD;	Min.
Glue	5	According the drawing and sample, check all the glue is OK or not;	Maj.
	6	The quantity of glue is not enough;	Min.
	7	The color of glue does not match the BOM or sample;	Maj.

6.4.5.8 Special Commands from Customer

If there is some standard need to be discussed or some special command, it should be confirmed by both customer and JHD.



6.5 Reliability

The LCD module should not fail the following reliability test.

ITEM	Condition		Criterion
High temperature operation	Temp: +70°C; 48H		1.Total current consumption should be below double of initial value. 2.Cosmetic defects should not be happened. 3. Products to be displayed normal after starting up again, cannot occur without display, the black screen, segment, display confusion.
Low temperature operation	Temp: -20°C 48H		
Humidity	Storage	40°C;93%RH; 24H	
	Operation	40°C;93%RH; 24H	
High temperature storage	Temp: +80°C 24H		
Low temperature storage	Temp: -30°C 24H		
Thermal shock storage	Temp: -30→+80°C 30min→30min 10cycle		
Vibration (Package state)	10~500Hz;5g; 30min in each direction (X, Y, Z).		
Falling test (Packaged state)	Weight≥15kg; Falling height: 80cm. Weight < 15kg; Falling height: 100cm.		
ESD test	1. Test frequency: 5 points/panel, 5 times/point (LCD around and middle a total of 5 points). 2. Test apparatus parameter: C=150pF, R=330Ω 3. Environment: 15°C~35°C, 30%~60%RH. 86Kpa~106Kpa. 4. Test item: A. Contact: ±2KV, ±4KV, ±6KV B. Air: ±2KV, ±4KV, ±8KV Arcing distance ≤ 1cm 5. Test method: According to the above voltage level at each test point in order to test 5 times discharge under each voltage level.		



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

6.7.1 Handling of LCM

6.7.1.1 Don't give external shock.

6.7.1.2 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.

6.7.1.3 Don't apply excessive force on the display surface.

6.7.1.4 Don't scratch and dirty polarizer of covering the display surface of the LCD module.

6.7.1.5 In order to prevent static electricity from destructing, be sure to wear gauntlet that is tested up to grade.

6.7.2. Storage

6.7.2.1 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.

6.7.2.2 Storage in a clean environment, free-dust and well ventilated.

6.7.2.3 Storage in anti-static electricity container.

6.7.3. Soldering

6.7.3.1 The soldering temperature is 260+5°C(with Pb)/ 330+5°C(No Pb) and soldering Time should be less than 3 sec, and soldering iron power should be less than 30w.

6.7.3.2 Re-soldering: no more than 3 times.

6.7.3.3 The soldering point should be further than 1.6 mm from body.

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