深圳市晶惠迪电子有限公司
JHDLCM Electronics Co.,Ltd

zhiqian

LCD Module
Product Specification

Ordering No: JHD240128-G02PFWD-B1

Model No: JHD240128-G02PFWD-B1
(For JHD internal use only)

(RoHS Compliant Product)

Customer Approval:

Customer P/N:

☐ **Approved for sample making.**

☐ **Approved for pilot production. Please specify minimum quantity (if any) _____ pcs**

☐ **Approved for mass production.**

Customer Signature and Date:

Written By (Electrical)	Written By (Mechanical)	Checked By (R&D)	Approved By	
			R&D	QA

REVISION HISTORY:

Revision	Date	Description	Written By	Approved By
1.0	2020-09-01			

CONTENTS

1.0 GENERAL SPECIFICATION

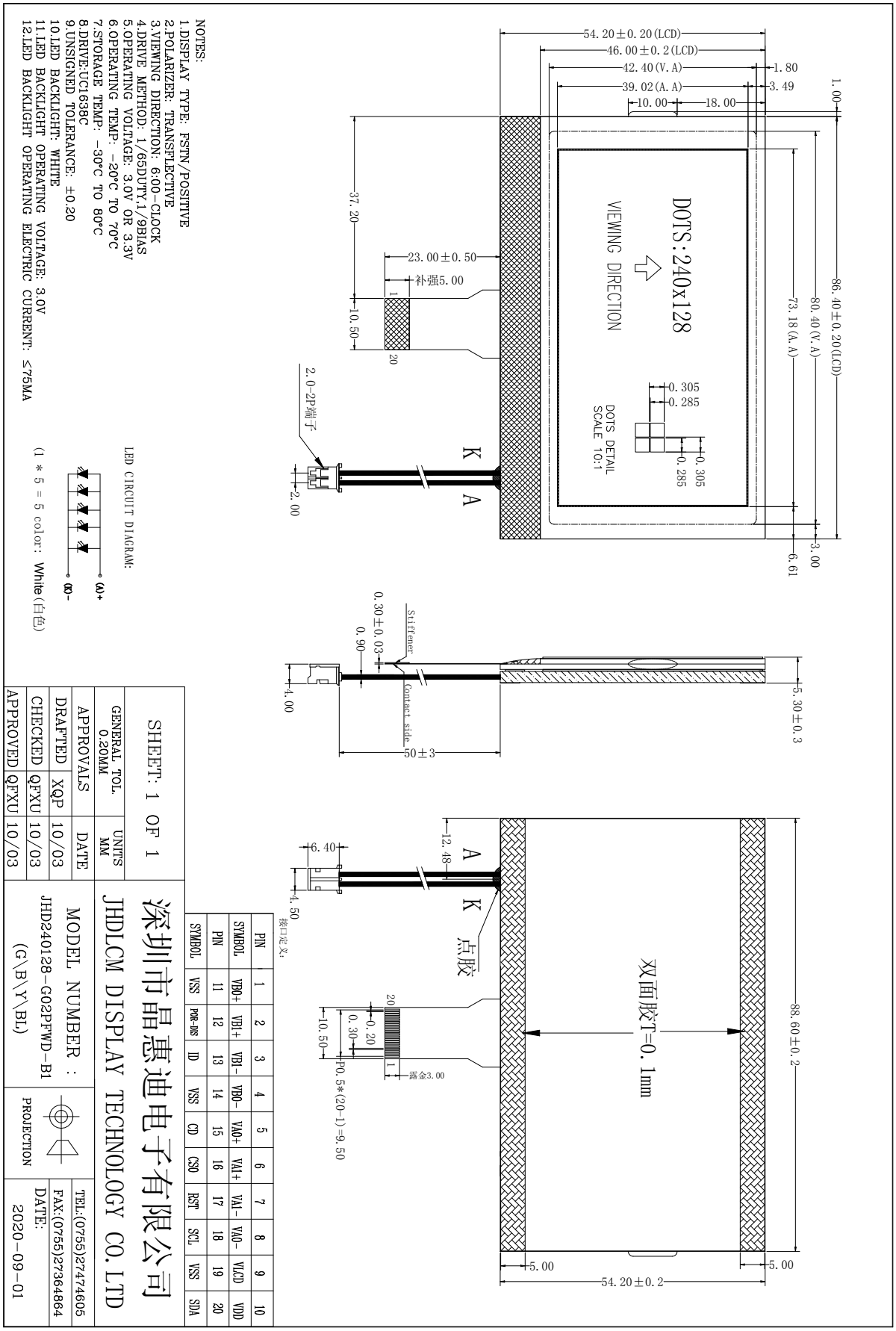
Item	Contents	Unit
LCD type	FSTN POSITIVE/NEGATIVE	-
Viewing direction	6:00	O'Clock
Module size (W×H×T)	86.40×54.20×5.30 (excluded FPC length)	mm
Viewing area (W×H)	80.40×42.40	mm
Driver IC	UC1638C	-
Number of dots	240X128	-
Backlight type	5 LEDS White 3.0V 75mA	
Interface type	Serial interface	-
Operating temperature	-20 ~ 70	ºC
Storage temperature	-30 ~ 80	ºC

2.0 LCM NUMBERING SYSTEM

JHD 240128 G02PFWD-B1
(1) (2) (3)

(1) ShenZhen JHDLCM Electronic Co Ltd
(2) Number of dots
(3) Serial number

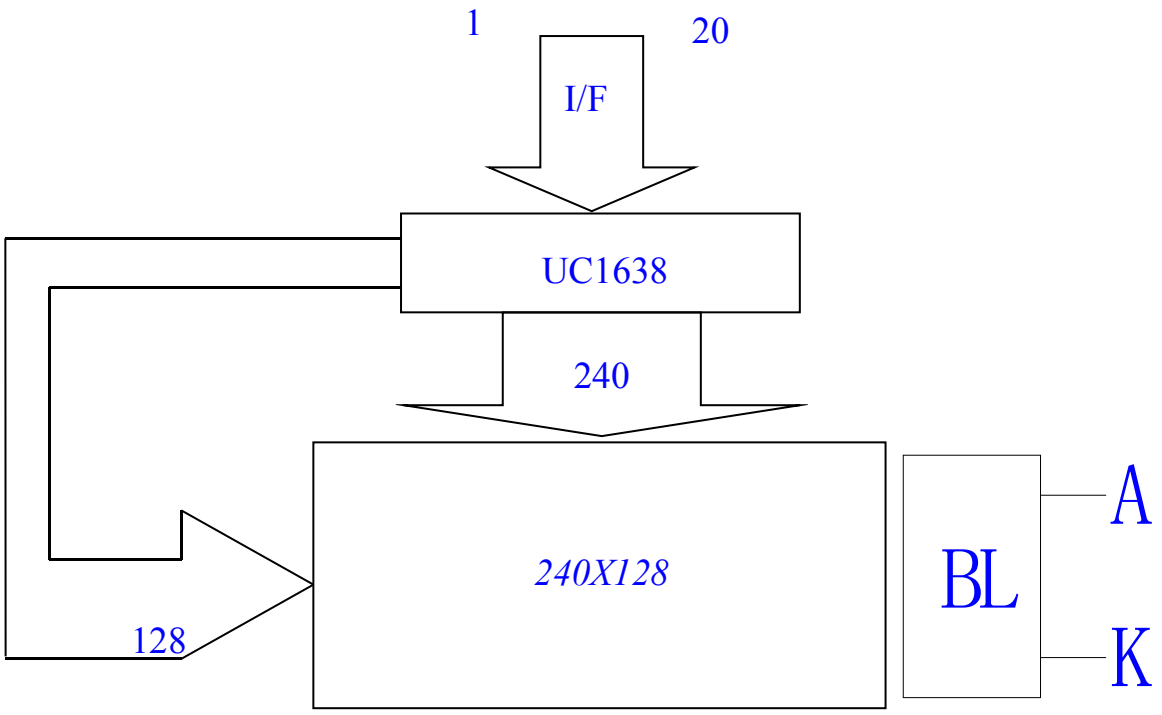
3.0 OUTLINE DRAWING

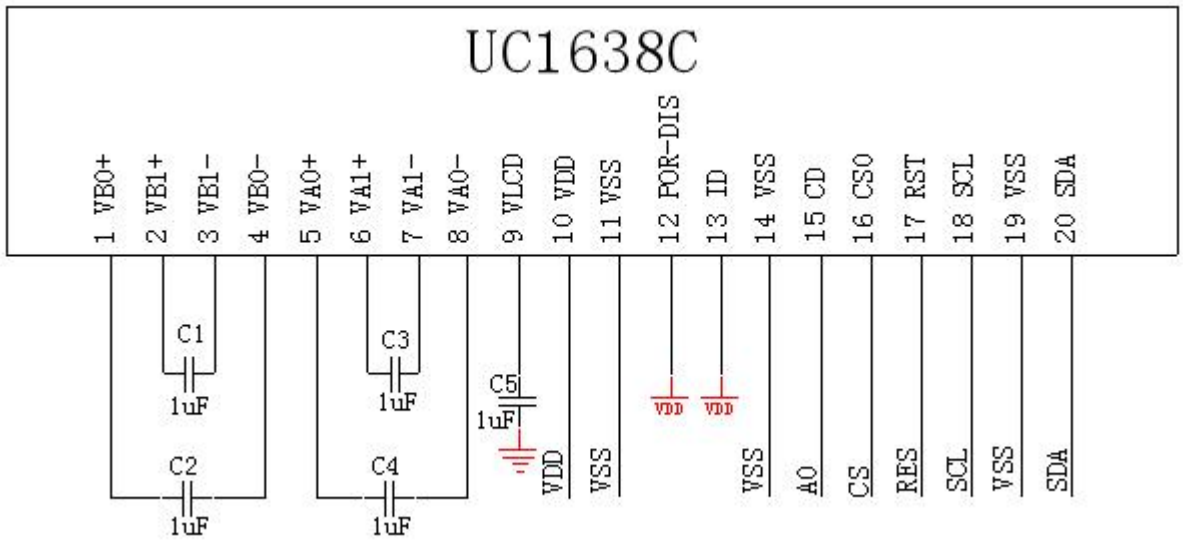


4.0 INTERFACE PIN DESCRIPTION

Pin No.	Symbol	Pin Description
1	VB0+	LCD Bias Voltages
2	VB1+	LCD Bias Voltages
3	VB1-	LCD Bias Voltages
4	VB0-	LCD Bias Voltages
5	VA0+	LCD Bias Voltages
6	VA1+	LCD Bias Voltages
7	VA1-	LCD Bias Voltages
8	VA0-	LCD Bias Voltages
9	VLCD	High voltage LCD Power Supply
10	VDD	Power supply（+3.0）
11	VSS	Ground
12	POR-DIS	Power-ON reset control
13	ID	ID pin is for production control
14	VSS	Ground
15	CD/A0	Data or command select signal input
16	CS0	Chip select signal input(low active)
17	RST	A reset pin.
18	SCK	Serial clock input
19	VSS	Ground
20	SDA	Serial data input

5.0 BLOCK DIAGRAM





6.0 OPERATING PRINCIPLE & DRIVING METHOD

The following is a list of host commands supported by UC1638c:

C/D: 0: Control, 1: Data W/R: 0: Write Cycle, 1: Read Cycle D7-D0: # : Useful Data bits –: Don't Care

No	Command	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0	Action	Default
1.	Write Data Byte (multiple-byte command)	0	0	0	0	0	0	0	0	0	1	Write byte by byte	N/A
		1	0	#	#	#	#	#	#	#	#		
		:	:	:	:	:	:	:	:	:	:		
2.	Read Data Byte (multiple-byte command)	0	0	0	0	0	0	0	0	1	0	Read byte by byte	N/A
		1	1	#	#	#	#	#	#	#	#		
		:	:	:	:	:	:	:	:	:	:		
3.	Get Status (triple-byte command)	0	0	0	0	0	0	0	0	1	1	Get Status	N/A
		1	1	POR	MX	MY	PID	DE	WS	MD	MS		
		1	1	Ver[1:0]		PMO[5:0]							
4.	Set Column Address (double-byte command)	0	0	0	0	0	0	0	1	0	0	Set CA[7:0]	00H
		1	0	#	#	#	#	#	#	#	#		
5.	Set Temp. Compensation	0	0	0	0	1	0	0	#	#	#	Set TC[2:0]	100b
6.	Set Pump Control	0	0	0	0	1	0	1	1	0	#	Set PC	1b
7.	Set Adv. Program Control (double-byte command)	0	0	0	0	1	1	0	R	R	R	R = 0~5, Set APC[R][7:0]	N/A
		1	0	#	#	#	#	#	#	#	#		
8.	Set Scroll Line LSB	0	0	0	1	0	0	#	#	#	#	Set SL[3:0]	0H
	Set Scroll Line MSB	0	0	0	1	0	1	#	#	#	#	Set SL[7:4]	0H
9.	Set Page Address LSB	0	0	0	1	1	0	#	#	#	#	Set PA[3:0]	0H
	Set Page Address MSB	0	0	0	1	1	1	0	0	#	#	Set PA[5:4]	0H
10.	Set V_{BIAS} Potentiometer (double-byte command)	0	0	1	0	0	0	0	0	0	1	Set PM[7:0]	54H
		1	0	#	#	#	#	#	#	#	#		
11.	Set Partial Display Control	0	0	1	0	0	0	0	1	0	#	Set LC[8]	0: Disable
12.	Set COM Scan Function	0	0	1	0	0	0	0	1	1	#	Set CSF	0b
13.	Set RAM Address Control	0	0	1	0	0	0	1	#	#	#	Set AC[2:0]	001b
14.	Set Display mode	0	0	1	0	0	1	0	1	#	#	Set DC[5:4]	00b
15.	Set Line Rate	0	0	1	0	1	0	0	0	#	#	Set LC[3:2]	10b
16.	Set All-Pixel-ON	0	0	1	0	1	0	0	1	0	#	Set DC[1]	0b
17.	Set Inverse Display	0	0	1	0	1	0	0	1	1	#	Set DC[0]	0b
18.	Set LCD Mapping Control	0	0	1	1	0	0	0	#	#	0	Set LC[1:0]	00b
19.	Set N-Line Inversion (double-byte command)	0	0	1	1	0	0	1	0	0	0	Set NIV[6:0]	00H
		1	0	0	#	#	#	#	#	#	#		
20.	Set Display Enable (double-byte command)	0	0	1	1	0	0	1	0	0	1	Set DC[3:2]	10b
		1	0	1	0	1	0	1	1	#	#		
21.	Set LCD Gray Shade 1	0	0	1	1	0	1	0	0	#	#	Set LC[5:4]	01b
22.	Set LCD Gray Shade 2	0	0	1	1	0	1	0	1	#	#	Set LC[7:6]	10b
23.	System Reset (double-byte command)	0	0	1	1	1	0	0	0	0	1	System Reset	N/A
		1	0	1	1	1	0	0	0	1	0		
24.	NOP	0	0	1	1	1	0	0	0	1	1	No operation	N/A
25.	Set Test Control (double-byte command)	0	0	1	1	1	0	0	1	TT		For testing only. Do not use.	N/A
		1	0	#	#	#	#	#	#	#	#		
26.	Set LCD Bias Ratio	0	0	1	1	1	0	1	0	#	#	Set BR[1:0]	11b: 12
27.	Reset Cursor Update Mode	0	0	1	1	1	0	1	1	1	0	AC[4]=0, CA=CR	N/A
28.	Set Cursor Update Mode	0	0	1	1	1	0	1	1	1	1	AC[4]=1, CR=CA	N/A
29.	Set COM End (double-byte command)	0	0	1	1	1	1	0	0	0	1	Set CEN[7:0]	159
		1	0	#	#	#	#	#	#	#	#		
30.	Set Partial Display Start (double-byte command)	0	0	1	1	1	1	0	0	1	0	Set DST[7:0]	0
		1	0	#	#	#	#	#	#	#	#		
31.	Set Partial Display End (double-byte command)	0	0	1	1	1	1	0	0	1	1	Set DEN[7:0]	159
		1	0	#	#	#	#	#	#	#	#		

No	Command	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0	Action	Default
32.	Set Window Programming Starting Column Address	0	0	1	1	1	1	0	1	0	0	Set WPC0[7:0]	0
		1	0	#	#	#	#	#	#	#	#		
33.	Set Window Programming Starting Page Address	0	0	1	1	1	1	0	1	0	1	Set WPP0[5:0]	0
		1	0	0	0	#	#	#	#	#	#		
34.	Set Window Programming Ending Column Address	0	0	1	1	1	1	0	1	1	0	Set WPC1[7:0]	239
		1	0	#	#	#	#	#	#	#	#		
35.	Set Window Programming Ending Page Address	0	0	1	1	1	1	0	1	1	1	Set WPP1[5:0]	39
		1	0	0	0	#	#	#	#	#	#		
36.	Enable Window Program	0	0	1	1	1	1	1	0	0	#	Set AC[3]	0: Disable
37.	Set MTP Operation control (double-byte command)	0	0	1	0	1	1	1	0	0	0	Set MTPC[4:0]	10H
		1	0	0	0	0	#	#	#	#	#		
38.	Set MTP Write Mask (double-byte command)	0	0	1	0	1	1	1	0	0	1	Set MTPM[5:0]	00H
		1	0	0	0	#	#	#	#	#	#		
39.	Set MTP Read Potentiometer	0	0	1	1	1	1	1	0	1	0	Set RV[7:0] (BR=00b)	00H
		1	0	#	#	#	#	#	#	#	#		
40.	Set MTP Program/Erase Potentiometer	0	0	1	1	1	1	1	0	1	1	Set WV[7:0] (BR=10b)	46H
		1	0	#	#	#	#	#	#	#	#		
41.	Set MTP Write Timer (double-byte command)	0	0	1	1	1	1	1	1	0	0	Set WT[7:0]	40H
		1	0	#	#	#	#	#	#	#	#		
42.	Set MTP Read Timer (double-byte command)	0	0	1	1	1	1	1	1	0	1	Set RT[7:0]	03H
		1	0	#	#	#	#	#	#	#	#		

Warning: Any bit patterns other than the commands listed above may result in undefined behavior.

Notes:

(1) Any bit patterns other than the commands listed above may result in undefined behavior.

(2) The interpretation of commands (37)~(42) depends on register MTPC[3].

(3) After MTP-ERASE or MTP-PROGRAM operation, before resuming normal operation, please always
a) Remove TST4 power source,
b) Do a full VDD ON-OFF-ON cycle.

7.0 ABSOLUTE MAXIMUM RATINGS (Ta = 25°C, V_{SS} = 0 V)

Symbol	Parameter	Min.	Max.	Unit
V_{DD}	Logic Supply voltage	-0.3	+4.0	V
V_{DD2}	LCD Generator Supply voltage	-0.3	+4.0	V
V_{DD3}	Analog Circuit Supply voltage	-0.3	+4.0	V
$V_{DD2/3}$-V_{DD}	Voltage difference between V_{DD} and $V_{DD2/3}$	--	1.6	V
V_{LCD}	LCD Generated voltage (-40°C ~ +85°C)	-0.3	+19.8	V
V_{IN}	Digital input signal	-0.4	V_{DD} + 0.5	V
T_{OPR}	Operating temperature range	-40	+85	°C
T_{STR}	Storage temperature	-55	+125	°C

Note:

1. V_{DD} is based on V_{SS} = 0V
2. Stress beyond ranges listed above may cause permanent damages to the device.

8.0 ELECTRICAL CHARACTERISTICS

DC CHARACTERISTICS

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{DD}	Supply for digital circuit		1.7	1.8~3.3	3.6	V
$V_{DD2/3}$	Supply for bias & pump		2.7	2.8~3.3	3.6	V
V_{LCD}	Charge pump output	$V_{DD2/3} \geqslant 2.7V$, 25°C		14.5	17.49	V
V_D	LCD data voltage	$V_{DD2/3} \geqslant 2.7V$, 25°C	0.99		1.59	V
V_{IL}	Input logic LOW				$0.2V_{DD}$	V
V_{IH}	Input logic HIGH		$0.8V_{DD}$			V
V_{OL}	Output logic LOW				$0.2V_{DD}$	V
V_{OH}	Output logic HIGH		$0.8V_{DD}$			V
I_{IL}	Input leakage current	$V_{IN} = V_{DD}$ or Vss			1.5	µA
I_{SB}	Standby current	$V_{DD} = V_{DD2/3} = 3.3V$, Temp = 85°C			50	µA
C_{IN}	Input capacitance			5	10	pF
C_{OUT}	Output capacitance			5	10	pF
$R_{ON(SEG)}$	SEG output impedance	V_{LCD} = 17.49V		1.20	1.70	kΩ
$R_{ON(COM)}$	Upward COM output impedance	V_{LCD} = 17.49V		1.20	1.70	kΩ
f_{LINE}	Average Line rate	LC[4:3] = 10b	-10%	26.0	+10%	klps

POWER CONSUMPTION

V_{DD} = 2.7 V, Bias Ratio = 11b , PM = 84,
V_{LCD} = 14.51 V, Line Rate = 26 Klps, Mux Rate = 160
Bus mode = 6800, C_L =330 nF, C_B = 2.2 µF,
Temperature = 25°C, All HV outputs are open circuit.

Display Pattern	Conditions	Typical	Maximum	Unit
All-OFF	Bus = idle	1173	1467	µA
All-ON	Bus = idle	1205	1507	µA
2-pixel checker	Bus = idle	1445	1807	µA
-	Reset (standby current)	< 3	5	µA

9.0 ELECTRO-OPTICAL CHARACTERISTICS

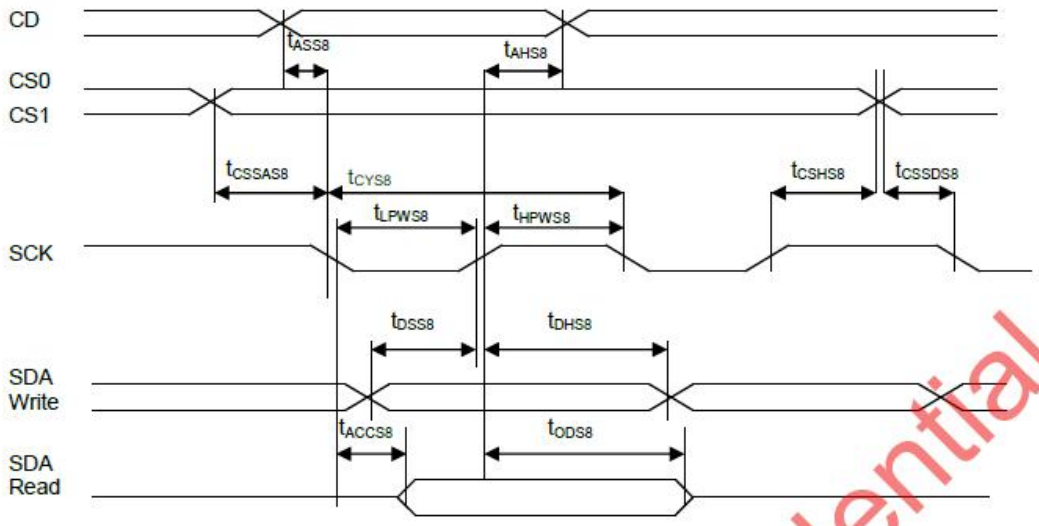


FIGURE 18: Serial Bus Timing Characteristics (for S8)

Symbol	Signal	Description	Condition	Min.	Max.	Unit
(2.7V ≤ V_{DD} ≤ 3.6V, Ta= –30 to +85°C)				(read / write)		
t_{ASS8}	CD	Address setup time		0	–	nS
t_{AHS8}		Address hold time		15		
t_{CSSAS8}	CS1/CS0	Chip select setup time		5	–	nS
t_{CSHS8}		Chip select hold time		15		
t_{CYS8}	SCK	System cycle time		430 / 220	–	nS
t_{LPWS8}		Low pulse width		200 / 95		
t_{HPWS8}		High pulse width		200 / 95		
t_{DSS8}	SDA (Write)	Data setup time		-- / 25	–	nS
t_{DHS8}		Data hold time		-- / 15		
t_{ACCS8}	SDA (Read)	Read access time	C_L = 100pF	– / --	200	nS
t_{ODS8}		Output disable time		30 / --	–	

Note: tr (rising time), tf (falling time) : ≤ 15nS

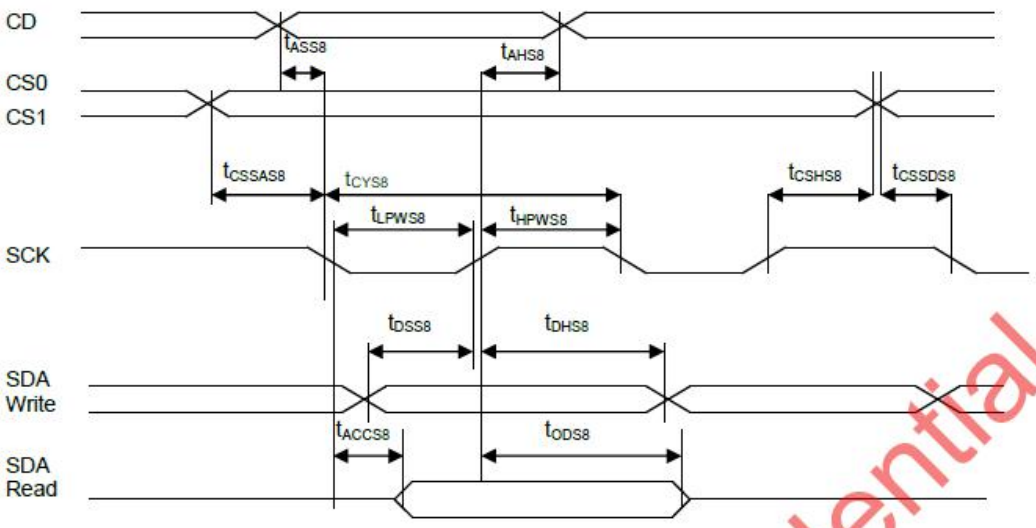


FIGURE 18: Serial Bus Timing Characteristics (for S8)

Symbol	Signal	Description	Condition	Min.	Max.	Unit
(2.7V ≤ V_{DD} ≤ 3.6V, Ta= –30 to +85°C)				(read / write)		
t_{ASS8}	CD	Address setup time		0	–	nS
t_{AHS8}		Address hold time		15		
t_{CSSAS8}	CS1/CS0	Chip select setup time		5	–	nS
t_{CSHS8}		Chip select hold time		15		
t_{CYS8}	SCK	System cycle time		430 / 220	–	nS
t_{LPWS8}		Low pulse width		200 / 95		
t_{HPWS8}		High pulse width		200 / 95		
t_{DSS8}	SDA (Write)	Data setup time		-- / 25	–	nS
t_{DHS8}		Data hold time		-- / 15		
t_{ACCS8}	SDA (Read)	Read access time	C_L = 100pF	– / --	200	nS
t_{ODS8}		Output disable time		30 / --	–	

Note: tr (rising time), tf (falling time) : ≤ 15nS

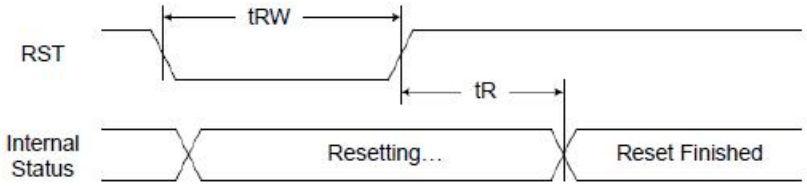


FIGURE 21: Reset Characteristics

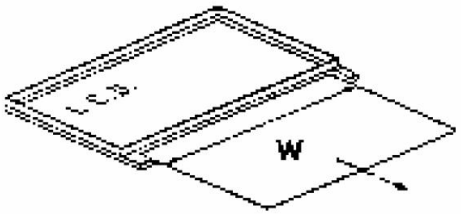
Symbol	Signal	Description	Condition	Min.	Max.	Unit
(2.7V ≤ V_{DD} ≤ 3.6V, Ta= –30 to +85°C)						
t_{RW}	RST	Reset low pulse width		5	–	mS
t_R	RST, Internal Status	Reset to Internal Status pulse delay		10	–	uS
		Wait before Power Down		1	–	mS

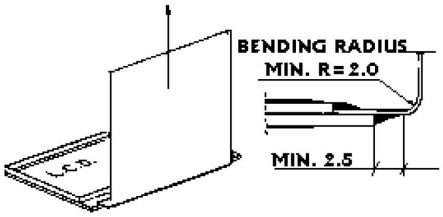
Note:

For each mode, the signal's rising and falling times (tr, tf) are stipulated to be equal to or less than 15nS each.

10.0 STANDARD SPECIFICATION FOR RELIABILITY

10.1 Standard specification of Reliability Test

No.	Test Item	Content of Test	Test Condition
1	High temperature operation	Endurance test applying the high storage temperature for a long time.	+70ºC for 500Hrs
2	Low temperature operation	Endurance test applying the low storage temperature for a long time.	-20ºC for 500Hrs
3	Low temperature storage	Endurance test applying the low storage temperature for a long time.	-30 °C for 500hrs
4	High temperature storage	Endurance test applying the low storage temperature for a long time.	+80 °C for 500hrs
5	Damp heat Operation	Endurance test applying the electric stress and temperature / humidity stress to the element for a long time.	+60 ºC, 95%RH for 500Hrs
6	Thermal cycles operation	Endurance test applying the thermal shock operation for a long time.	Display on , 2h at -30°C ; shift from - 30°C to + 80°C with gradient of 3°C/min; 2 h at 80°C; shift from +80°C to - 30°C with gradient of 2°C/min , repeated 100 times.
7	Thermal shocks	Endurance test applying the thermal shock operation for a long time.	Display off, 1h at -30°C ; shift from - 30°C to + 80°C in 10 s max. 1 h at 80°C; shift from + 80°C to - 30°C in 10 s max. , repeated 100 times
8	Random vibrations	Endurance test applying the vibrations. for a long time when transportation	Test 3 axes during 8 hour/axe - from 5 to 200 Hz: Acc = 10G - from 200 to 500 Hz : Amplitude =5mm – from 5 to 12HZ. Scanning speed= 1 octave / min
9	ESD test	To check the immunity of display to ESD incurred during storage, handling, maintenance and assembly operation.	Discharge resistance = 2kΩ Discharge capacitance = 150pF Number of discharges = 3times Discharge interval = 3 sec Discharge voltage = ± 2 kV on COG connection interface.
10	FPC pull test	To verify the FPC/ glass connection resistance to pull forces applied to the FPC.	 Keeping the LCD fixed, pull the FPC/FFC with a force F= 40 N for cm width of FPC at glass connection.

11	FPC peel test	To verify the FPC/ glass connection resistance to peel forces applied to the FPC.	 Keeping the LCD fixed, pull the FPC/FFC according to the figure above with a force F= 10 N for cm width of FPC at glass connection. The minimum bending radius has to be 2 mm

Remarks:
1) For operation test, above specification is applicable when test pattern is changing during entire operation test.
2) Inspections after reliability tests are performed when the display temperature resumes back to room temperature.
3) It is a normal characteristic that some display abnormality can be seen during reliability test. If the display abnormality can resume back to normal condition at room temperature within 24hours, there is no permanent destruction over the display. The display still possesses its functionality after reliability tests.

10.2 Failure Judgment Criteria

After the reliability tests above, test sample shall be let return to room temperature and humidity for at least 4 hours before final tests are carried out.

Criterion Item	Failure Judgment Criteria
Electrical characteristic	Electrical short and open.
Mechanical characteristic	Out of mechanical specification
Optical characteristic	Out of the Appearance Standard

11.0 QUALITY ASSURANCE

11.1 Inspection Standard

Item	Contents
Objective	This product inspection standard is intended to provide an inspection guideline for the LCD or LCM products manufactured by the Company for automotive customer MM.
Scope	Applicable to the inspection criteria of dimension, appearance, functionality etc.for the LCD or LCM products supplied to the customer MM. Criteria not included in this Inspection Standard will be justified in accordance with any documents agreed upon otherwise.
Inspection Unit	An inspection unit is a unit of display under inspection. The unit for the dimension addressed in this inspection standard is referring to mm, unless otherwise specified.
Inspection System	1： Inspection system includes inspection during production inspection and outgoing product inspection. 2： Process inspection is the inspection for appearance and functionality of the products during the production process. 3： Outgoing inspection is the inspection for the finished products prior to the delivery, based on defined sampling plan.

Inspection Condition

1： Inspection equipments: Equipment and tools used for inspection, measuring and testing during the inspection process.

2：Inspection conditions are described as the following.

Distance：40cm between the observer's eyes and the LCD.

Viewing angle：according to main viewing direction（MVD）.

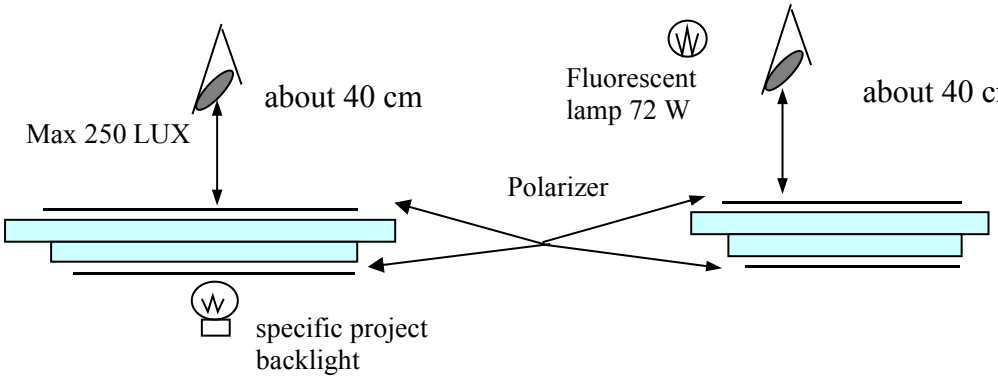


Fig 1
Trasflective or Transmissive LCD/LCM

Fig 2
Reflective LCD/LCM

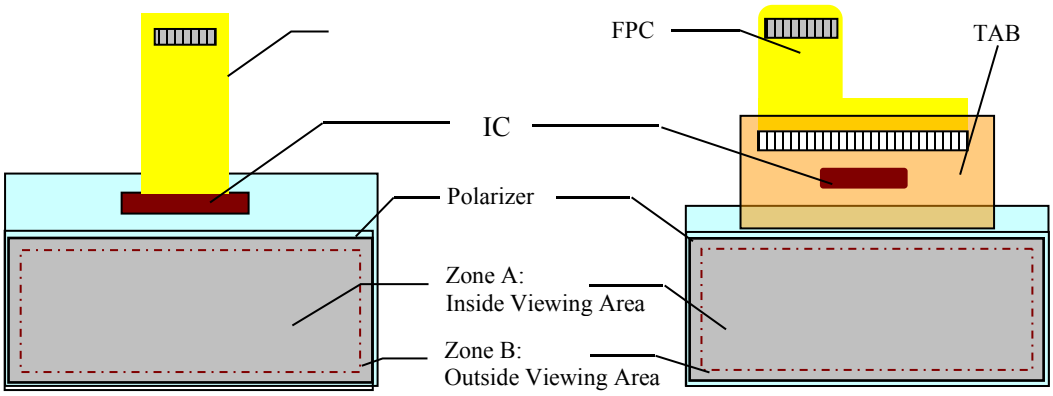
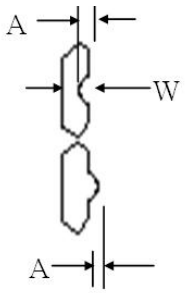
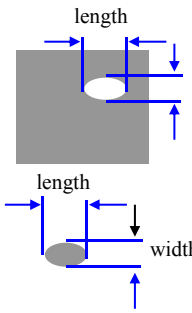


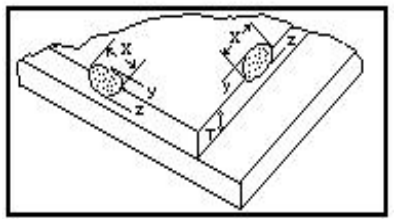
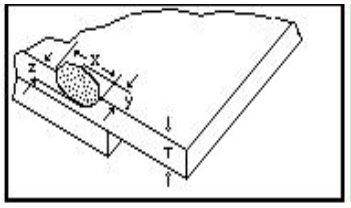
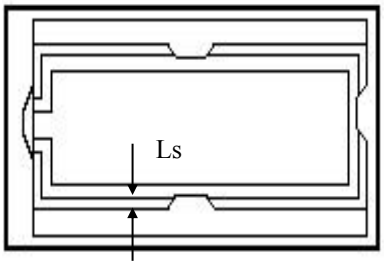
Fig 3
Product Configuration

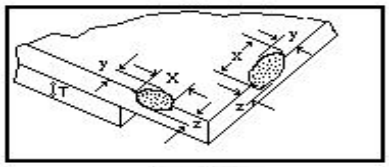
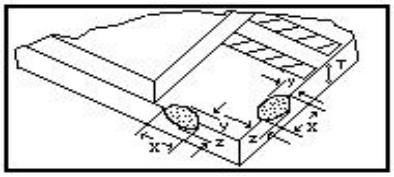
11.2 Acceptance Criteria (Zastron internal standard: JU-MM)

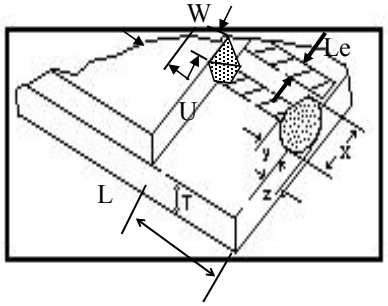
<table>
<tr><th>Inspection Item</th><th>Acceptance/Rejection Criteria</th><th>Defect Classification</th><th>Method</th><th>Applicable Zone</th></tr>
<tr><td>Functional</td><td>1. No display defect is not acceptable.
2. Abnormal display defect is not acceptable.
3. Missing segment and extra segment is not acceptable.
4. Dim contrast or dark contrast is not acceptable.
5. Current consumption (Idd MAX) shall not exceed the limit specified on the MI.
6. Wrong/reversed viewing angle is not acceptable.
7. Uneven contrast or stripe defect shall be in accordance with master sample. (Refer to specified limit sample if applicable)
8. Display character/ pattern shall be referred to the Test Instruction of the related models.</td><td>Major</td><td>Visual</td><td>A</td></tr>
<tr><td>Pattern Deformation</td><td> 

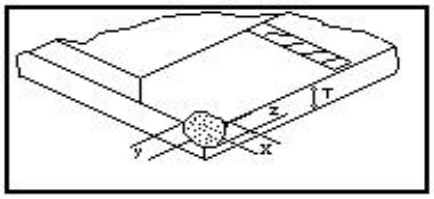
<table>
<tr><th>Size</th><th>Acceptable Number</th></tr>
<tr><td>A≤0.10 or A≤1/4W, whichever is less</td><td>1 per segment
3 per display</td></tr>
<tr><td>A>0.10 or A>1/4W, whichever is less</td><td>Unlimted</td></tr>
</table>
Note: Protrusion shall not cause bridging between adjacent segments</td><td>Major</td><td>Visual
Magnifier</td><td>A</td></tr>
<tr><td>Black or white spots (on pattern), pin hole</td><td> 

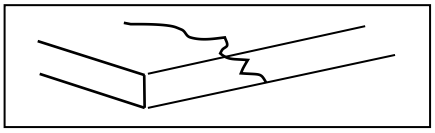
<table>
<tr><th>Size, d (mm)</th><th>Acceptable quantity</th></tr>
<tr><td>d ≤ 0.15</td><td>Unlimited</td></tr>
<tr><td>0.15 < d ≤ 0.25</td><td>1</td></tr>
<tr><td>d > 0.25</td><td>0</td></tr>
<tr><td colspan="2">d = (length + width) / 2</td></tr>
</table>
Note:
Number of spot shall not be more than 1 per each segment.
If 2 spots exist, the distance must be > 20mm between each other</td><td>Minor</td><td>Visual
Magnifier</td><td>A</td></tr>
</table>

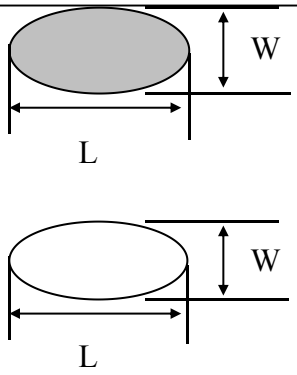
<table>
<tr>
<td>Chip-out</td>
<td>A. General chip-out (for glass edges and glass corner along perimeter seal)
 
 
 

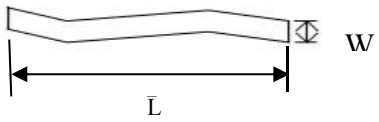
<table>
<tr><td>X</td><td>Y</td><td>Z</td></tr>
<tr><td>≤2.0</td><td>≤1.5 or ≤Ls, whichever is less</td><td>≤1/2t</td></tr>
<tr><td>≤2.0</td><td>≤1.0 or ≤Ls, whichever is less</td><td>≤t</td></tr>
<tr><td colspan="3">X = length parallel with glass edge.
Y = width perpendicular with glass edge
Z = height of glass
t = single glass thickness</td></tr>
</table>
Note:
Chip out shall not reach the perimeter seal.</td>
<td>Minor</td>
<td>Visual Magnifier</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>B： Chip-out at terminal ledge or back of terminal ledge, but no exactly on terminal
 
 
<table>
<tr><td>X</td><td>Y</td><td>Z</td></tr>
<tr><td>≤2.0</td><td>≤1.5</td><td>≤1/2t</td></tr>
<tr><td>≤2.0</td><td>≤1.0</td><td>≤t</td></tr>
</table>
Note:
In the event that the distance between the chip-out location and the terminal is less than the width of ITO pad Le, the acceptance criteria of chip-out on terminal shall apply.</td>
<td>Minor</td>
<td>Visual Magnifier</td>
<td>B</td>
</tr>
</table>

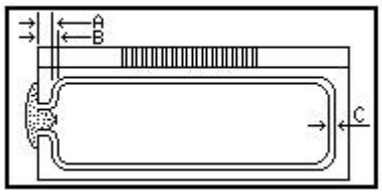
<table>
<tr><td></td><td>C：Chip-out and protuberance at terminals
 

<table>
<tr><th>W</th><th>U</th></tr>
<tr><td colspan="2">Meet the dimension tolerance of the drawing</td></tr>
</table>
<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≤0.5 Le
& not bridge two adjacent ITO pads.</td><td>≤0.2L or ≤2.0mm whichever is less</td><td>≤1/2t</td></tr>
</table>
Note:
Chip out and protuberance shall not co-exist on the same ITO pad.
Protuberance is not allowed if affect assembly.</td><td>Minor</td><td>Visual Magnifier</td><td>B</td></tr>
<tr><td></td><td>D：Chip-out at corner (ITO ledge)
 

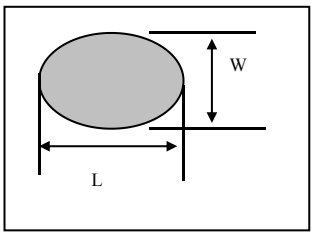
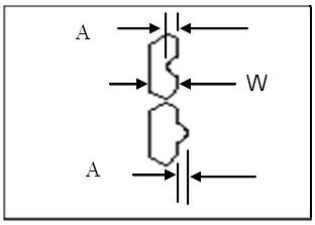
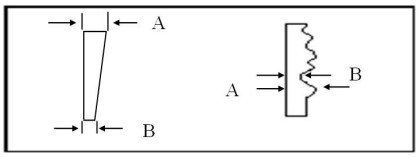
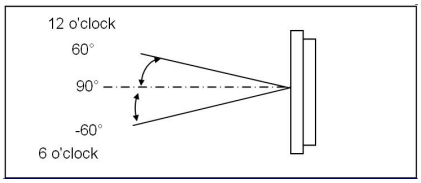
<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≤2.0</td><td>≤2.0</td><td>≤t</td></tr>
</table></td><td>Minor</td><td>Visual Magnifier</td><td>B</td></tr>
<tr><td>Crack line</td><td> 
Crack line is not acceptable.</td><td>Minor</td><td>Visual Magnifier</td><td>A & B</td></tr>
<tr><td>Number of Chip-out</td><td>Maximum acceptable number of chip-out: 2 defects per LCD; 1 defect on ITO ledge.
Distance between chip-out: > 5mm.</td><td>Minor</td><td>Visual</td><td>B</td></tr>
</table>

<table>
<tr>
<td>Black spot
White spot
Bubble
Foreign material
Dent</td>
<td> 

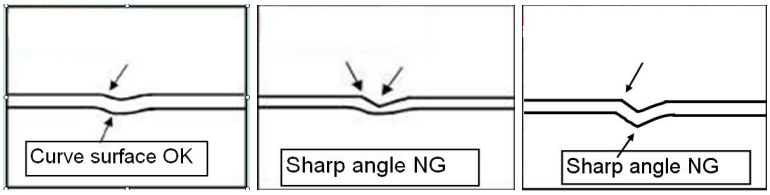
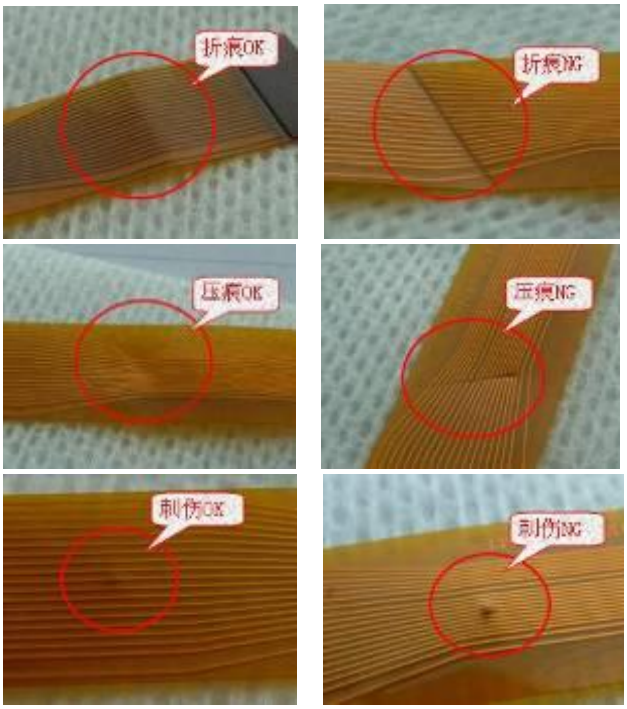
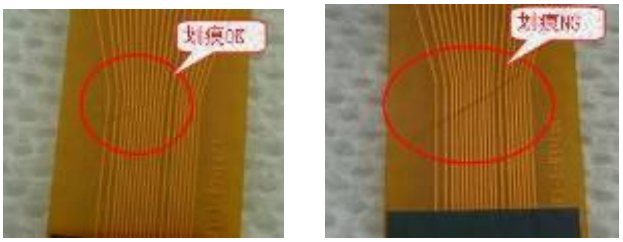
<table>
<tr><th>D</th><th>Acceptable Number</th></tr>
<tr><td>D≤0.15</td><td>Unlimited</td></tr>
<tr><td>0.15＜D≤0.25</td><td>1</td></tr>
<tr><td>D＞0.25</td><td>0</td></tr>
<tr><td colspan="2">Note: If 2 spots exist, the distance must be > 20mm between each other</td></tr>
</table>
D=（L+W）/2</td>
<td>Minor</td><td>Visual
Magni
fier</td><td>A</td>
</tr>
<tr>
<td>Scratch line
Dark line
Lint</td>
<td> 

<table>
<tr><th>Length</th><th>Width</th><th>Acceptable Number</th></tr>
<tr><td>L≤3.0</td><td>W≤0.015</td><td>2</td></tr>
<tr><td>L≤1.5</td><td>W≤0.03</td><td>1</td></tr>
<tr><td></td><td>W＞0.03</td><td>0</td></tr>
</table>
Note: If 2 line defects co-exist, the distance must be > 20mm between each other</td>
<td>Minor</td><td>Visual
Magni
fier</td><td>A</td>
</tr>
<tr>
<td>Endseal</td>
<td> 

<table>
<tr><td>A：Length of end-sealant</td></tr>
<tr><td>B：Length of seal mouth</td></tr>
<tr><td>C：Perimeter seal wi dth</td></tr>
</table>
1.Minimum amount of end-sealant filled, A> 1/3 B
2.Maximum amount of end-sealant shall not spread over to Zone A, Viewing Area (VA).
3.Dimension of end seal shall meet the dimension specified on the drawing.
4.Deformation of perimeter seal which result in perimeter seal becoming less than 1/3 C is not acceptable.</td>
<td>Minor</td><td>Visual
Magni
fier</td><td>A,B</td>
</tr>
<tr>
<td>Polarizer</td>
<td>Polarizer position shall meet the dimension tolerance indicated on the drawing</td>
<td>Minor</td><td>Visual</td><td>A,B</td>
</tr>
<tr>
<td>Background color</td>
<td>Background color shall not exceed the range of the limit sample. Obvious uneven coloration (rainbow) shall not be seen.</td>
<td>Minor</td><td>Visual</td><td>A</td>
</tr>
<tr>
<td rowspan="6">Ink printing</td>
<td>1. Pattern position on the display shall match the MI/drawing.</td>
<td>Major</td><td>Visual</td><td rowspan="6">A</td>
</tr>
<tr>
<td>2. Pattern appearance shall match the MI/drawing.</td>
<td>Major</td><td>Visual</td>
</tr>
<tr>
<td>3. Reverse printing is not acceptable.</td>
<td>Major</td><td>Visual</td>
</tr>
<tr>
<td>4. Printing color shall match the master sample.</td>
<td>Major</td><td>Visual</td>
</tr>
<tr>
<td>5. Insufficient ink, blur, missing pattern, broken pattern are not acceptable.</td>
<td>Major</td><td>Visual</td>
</tr>
<tr>
<td>6. Angle of the printed pattern, the dimension between the pattern and the glass edge shall meet the dimension on the drawing.</td>
<td>Major</td><td>Visual</td>
</tr>
</table>

	7. The printed patterns shall be free of stain, fingeprint and scratch.	Major	Visual Magnifier	
	8. Spot/pinhole on the pattern.  D=（L+W）/2	Major	Visual	
	9. Ink pattern deformation  Protrusion ≤0.10 or ≤1/4W, whichever is less, Indentation ≤0.10 or ≤1/4W, whichever is less	Minor	Visual Magnifier	A
	10. Ink line deformation  A-B≤0.15	Minor	Visual Magnifier	A
	11. Pattern misalignment  Dimension must meet the requirement on the drawing For 12 o'clock viewing angle product, light leakage between 90°to 60° shall not be seen. For 6 o'clock viewing angle product, light leakage between 90°to -60° shall not be seen.	Minor	Visual	A
HSC FPC FFC	1. The outer dimension shall meet the MI/drawing.	Minor	Visual	B

D	Acceptable Number
D≤0.15	Unlimited
0.15＜D≤0.25	1
D＞0.25	0
Note: If 2 spots exist, the distance must be > 20mm between each other	

	2. FPC、HSC、FFC、shall not have folding/stress/dented mark with sharp angle on the surface.  			
	4.Scratch on FPC、HSC、FFC、TAB shall not damage the PI layer and the conductive traces. 			
	5.Goldfinger of FPC、TAB、FFC shall be free of solder。			
	6.Goldfinger of FPC、TAB、FFC shall be max 5% of area of oxidization and corrosion. 	Major	Visual	B

Stiffening tape Identity Label Identity marking	1. The tape sticking position shall meet the requirement on the MI/drawing. 2. Missing label/tape/marking is not acceptable. 3. The format of identification (including date code and product code) shall meet the requirement (eg. label,color marking, inkjet printing) on the MI/drawing.	Minor	Visual	B
Metal bezel	1. Dimension and specification shall meet the requirment on the MI/drawing.	Major	Visual	B
	2.The lock tab of bezel shall not have wrong bending orientation, missing tab, or crack.	Minor		B
	3.Bezel shall be free of rust, twist, deformation,finger print,oil stain and unknown contamination.	Minor		B

12.0 PRECAUTIONS FOR USING LCD MODULE

12.1 Handing Precautions

12.1.1 The display panel is made of glass and polarizer. Do not subject it to mechanical shock by dropping or impact which may cause chipping especially on the edges.

12.1.2 Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

12.1.3 If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with Isopropyl alcohol or ethyl alcohol. Avoid using solvents like acetone (ketene), water, toluene, ethanol to clean the polarizer surface.

12.1.4 Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.

12.1.5 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

12.1.6 Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion.

12.1.7 Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.

12.1.8 NC terminal should be open. Do not connect anything.

12.1.9 If the logic circuit power is off, do not apply the input signals.

12.1.10 Avoid contacting oil and fats.

12.1.11 Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizers. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.

12.1.12 Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading.

12.2 Electro-Static Discharge Control

12.2.1 Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC.

12.2.2 Be sure to ground the body when handling the LCD modules. Tools required for assembling, such as soldering irons, must be properly grounded.

12.2.3 To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions. To reduce the generation of static electricity, be careful that the air in the work is not too dried. A relative humidity of 50%-60% is recommended.

12.2.4 The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

12.2.5 When soldering the terminal of LCM, make certain the AC power source for the soldering iron does not leak.

12.3 Precaution for soldering to the LCM

12.3.1 Observe the following when soldering lead wire, connector cable and etc. to the LCD module.

- Soldering iron temperature: 300 ~ 350°C.
- Soldering time: ≤ 3 sec.
- Solder: eutectic solder.

Above is a recommended approach based on a 5mm distance between soldering point and pin contact point. Due to different solder composition, actual distance between soldering and contact point, and processing method, it is recommended that customer to study and fine tuning their soldering process parameters accordingly so that the temperature at pin-LCD contact point does not exceed 85°C during soldering..

12.3.2 If soldering flux is used, be sure to remove any remaining flux after finishing to soldering operation. (This does not apply in the case of a non-halogen type of flux.) It is recommended that you protect the LCD surface with a cover during soldering to prevent any damage due to flux spatters.

12.4 Precautions for Operation

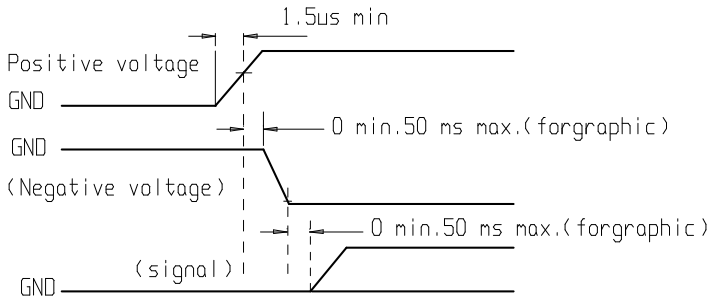
12.4.1 Viewing angle varies with the change of liquid crystal driving voltage (V_O). Adjust V_O to show the best contrast.

12.4.2 Driving the LCD in the voltage above the limit shortens its lifetime.

12.4.3 Response time is greatly delayed at temperature below the operating temperature range. However, it will recover when it returns to the specified temperature range.

12.4.4 If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.

12.4.5 When turning the power on, input each signal after the positive/negative voltage becomes stable (below figure is a general illustration where typical value depends on individual product design).



12.5 Storage

12.5.1 When storing LCDs as spares for some years, the following precautions are necessary.

- Store them in a sealed polyethylene bag. If properly sealed, there is no need for desiccant.
- Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C.

12.5.2 Environmental conditions:

- Do not leave them for more than 168hrs. at 60°C.
- Should not be left for more than 48hrs. at -20°C.

12.6 Safety

12.6.1 It is recommended to crush damaged or unnecessary LCD into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.

12.6.2 If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

13.0 MANUFACTURER CONTACT:

Address:JHDLCM Electronics Co.,Ltd
BLDGD,4/F,Li Cheng Technology Industrial Area,Xinhe Street, Shajing sub-district, Shenzhen 518104,China
Tel: +86-755-27474605/27474625
FAX: +86-755-27364864
mail: jhdlcm@163.com
skype:jhdlcm