SPECIFICATION OF LCD MODULE

CUSTOMER 客户名称	
PART NO. 产品型号	**JHD162a-YG** **659Y-YG**
PRODUCTS TYPE 产品内容	
REMARKS 备注	
SIGNATURE BY CUSTOMER 客户签署：	

APPROVED BY LI.W.H. TRUESTONE	CHECKED BY IM.H.J. TRUESTONE	ORGANIZED BY KIM.W.J. TRUESTONED

深圳市晶汉达电子有限公司

08 年 11 月 17 日

LCM System

1 **LCD Type**

■ S - STN ☐ F - FSTN ☐ D - DFSTN

2 **Viewing Angle**

■ D - Lower 6:00 ☐ U - Upper 12:00 ☐ O - Others

3 **Display Mode**

■ Yellow Green positive ☐ Blue negative ☐ Gray positive

☐ FSTN positive ☐ W - FSTN negative

4 **Polarizer Mode**

☐ Reflective ☐ Transflective ■ Transmissive

5 **Connector**

☐ Pin ☐ Heat sealed ■ Zebra

6 **Thickness of Glass**

■ 1.1mm ☐ 0.4mm

☐ 0.55mm ☐ 0.7mm

7 **Backlight Mode**:

■ LED ☐ CCFL

8 **Backlight Color**

☐ Blue ☐ Amber ■ Yellow Green

☐ Red ☐ White ☐ Without backlight

9 **Temperature Grade**

■ Normal temperature ☐ Wide temperature ☐ Super wide temperature

10 **CG-ROM**

■ 01 for English + Japanese Language

•REVISION RECORD

REV. NO.	REV. DATE	DESCRIPTION OF REVISION	PAGE	REMARK
1.0	3004/08	INITIAL RELEASE	ALL	

CONTENTS

1. FEATURES

Display construction	16 Characters * 2 Lines
Display mode	STN(Y/G)
Display type	Positive Transmissive
Backlight	LED(Y/G)/5.0V
Viewing direction	6 o'clock
Operating temperature	0 to 50℃
Storage temperature	-10 to 60℃
Controller	SPLC780D or
Driving voltage	Eequivalence
Driving method	Single power
Type	1/16 duty, 1/5 bias
Number of data line	COB (Chip On Board)
Connector	4/8-bit parallel
	PIN

2. MECHANICAL DATA

ITEM		WIDTH	HEIGHT	THICKNESS	UNIT
Module size		80.0	36.0	13.5(MAX)	mm
Viewing area		64.5	14.5	-	mm
character	Construction	5*7			dots
	Size	2.95	4.35	-	mm
	Pitch	3.65	5.05	-	mm
Dot	Size	0.55	0.5	-	mm
	Pitch	0.6	0.55	-	mm
Diameter of mounting hole		Φ2.9			mm
Weight		About 50			g

3. ABSOLUTE MAXIMUM RATINGS

3.1 Electrical Absolute Maximum Rating

(TA = 25 , Vss=0V)

Item	Symbol	MIN.	Max.	Unit
Supply Voltage (Logic)	VDD-VSS	0	7.0	V
Supply Voltage (LCD Driveer)	V_{LCD}	VDD-12	VDD+0.3	V
Input Voltage	V_{IN}	-0.3	VDD+0.3	V
Operating temperature	Top	-20	70	℃
Storage temperature	Tsto	-30	80	℃

3.2 Environmental Absolute Maximum Rating

Item	Operating		Storage		Comment
	Min.	Max.	Min.	Max.	
Ambient temp	-20	+70	-30	+80	Note(1)
Humidity	Note(2)		Note(2)		Without condensation
Vibration	--	4.9M/S²	--	19.6M/S2	XYZ direction
Shock	--	29.4M/S²	--	490M/S2	XYX direction

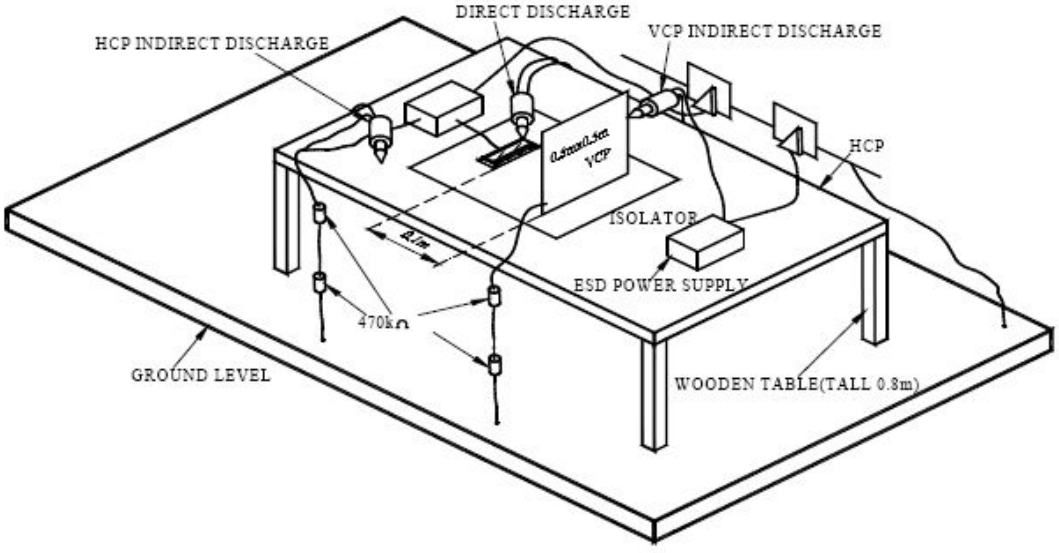
Note(1) Ta=0℃: 50 Hr Max.
Note(2) Ta≦40℃: 90%RH Max.
Ta≧40℃: Absolue humidity must be lower than the humidity of 90%RH@40℃

3.3 Electronic Static Discharge Maximum Rating

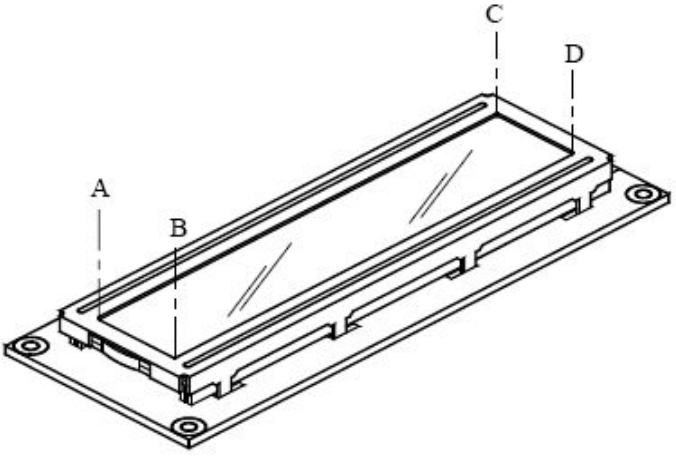
ESD Test Method : IEC-1000-4-2

Item	Description	
Testing environment	Ambient temperature : 15℃ to 35℃ Humidity : 30% to 60% LCM(E.U.T) : Power up	
Testing equipment	Manufacture : Noiseken, Model No. ESD	
Testing condition	See drawing 1	
Direct discharge	0 to ± 4KV	Discharge point, see drawing2
Indirect discharge	0 to ± 8KV	Discharge point, see drawing1
Pass condition	No malfunction of unit. Temporary malfunction of unit which can be recovered by system reset.	
Fail condition	Non Recoverable malfunction of LCM or system.	

FIG1 ESD Testing Equipment



Direct Contact Discharge / Contact Point : A,B,C,D



4. ELECTRICAL CHARACTERISTICS

(VDD = 4.5 to 5.5V , TA = 25)

Characteristic	Symbol	Condition	Min	Typ	Max	Unit
Operating Voltage	V_{DD}	-	4.5	-	5.5	V
Operating Current	I_{DD}	Internal oscillation or external clock (V_{DD} = 5.0V, fosc = 270kHz)	-	0.35	0.6	mA
Input Voltage (1) (except OSC1)	V_{IH1}	-	2.2	-	V_{DD}	V
	V_{IL1}	-	-0.3	-	0.6	
Input Voltage (2) (OSC1)	V_{IH2}	-	V_{DD}-1.0	-	V_{DD}	V
	V_{IL2}	-	-0.2	-	1.0	
Output Voltage (1) (DB0 to DB7)	V_{OH1}	I_{OH} = -0.205mA	2.4	-	-	V
	V_{OL1}	I_{OL} = 1.2mA	-	-	0.4	
Output Voltage (2) (except DB0 to DB7)	V_{OH2}	I_O = -40μA	$0.9V_{DD}$	-	-	V
	V_{OL2}	I_O = 40μA	-	-	$0.1V_{DD}$	
Voltage Drop	Vd_{COM}	I_O = ±0.1mA	-	-	1	V
	Vd_{SEG}		-	-	1	
Input Leakage Current	I_{LKG}	V_{IN} = 0V to V_{DD}	-1	-	1	μA
Input Low Current	I_{IL}	V_{IN} = 0V, V_{DD} = 5V (pull up)	-50	-125	-250	
Internal Clock (external Rf)	f_{OSC1}	Rf = 91kΩ ±2% (V_{DD} = 5V)	190	270	350	kHz
External Clock	f_{OSC}	-	125	270	350	kHz
	duty		45	50	55	%
	t_R, t_F		-	-	0.2	μA
LCD Driving Voltage	V_{LCD}	V_{DD}-V5 (1/5, 1/4 bias)	3.0	-	13.0	V

4.1 LED ELECTRICAL/OPTLCAL CHARACTERISTICS

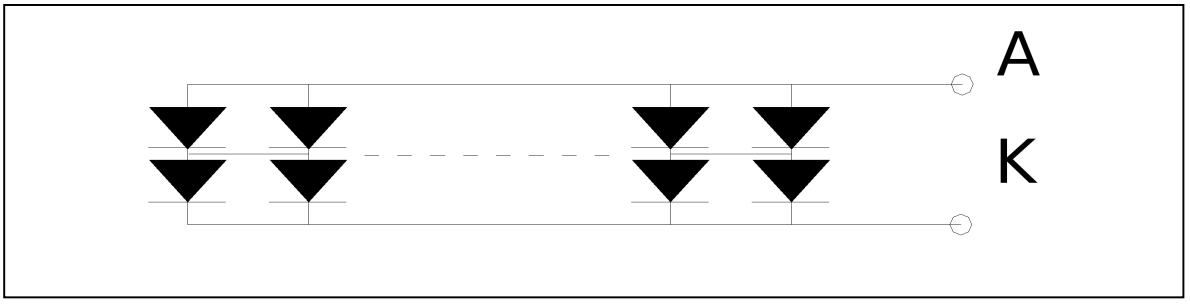
Item	Symbol	min	typ	max	Unit	Condition
Forward Voltage	Vf	-	5.0	5.2	V	If= 100 mA
Reverse Current	Ir	-	100	-	uA	Vr=10V
Dominant wave length	λ d	565	570	575	nm	If= 100 mA
Spectral Line Half width	Δ λ	-	30	-	mm	If= 100 mA
Luminance	Lv	-	80	-	cd/m^2	If= 100 mA

4.2LED ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Condition	Rating	Unit
Reverse Voltage	Vr	Ta=25℃	10	V
Absolute maximum forward current	Ifm	Ta=25℃	150	mA
Power description	pd	Ta=25℃	750	mW

4.2.1 LED ARRAY BLOCK DIAGRAM

(LED DICE 2×5= 10 dices)



4.2.2 LED POWER SOURCE

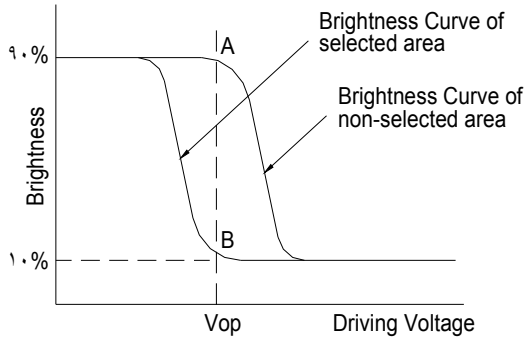
	Option	Power source	Jumper setting
LED	A	15A/16K	R7=2.2Ω

5. ELECTRO-OPTICAL CHARACTERISTICS

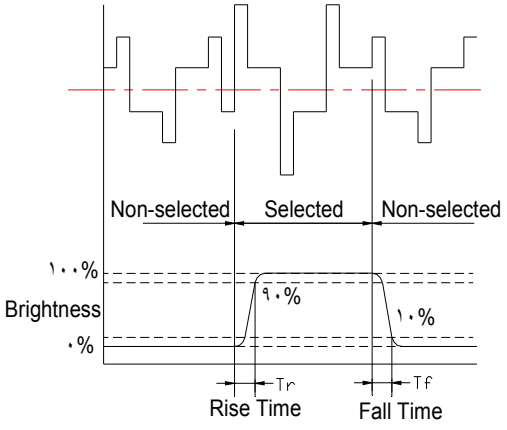
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Contrast ratio	K	φ=0	1.4	4	-	-	1
Response time (rise)	Tr	φ=1	-	130	-	ms	2
Response time (fall)	Tf	φ=2		130	-	ms	2
Viewing angle	φ	K ≥1.4	-40 -- +10			deg.	3
	θ		-30 -- +30				

Note 1: Definition of Contrast Ratio "K"

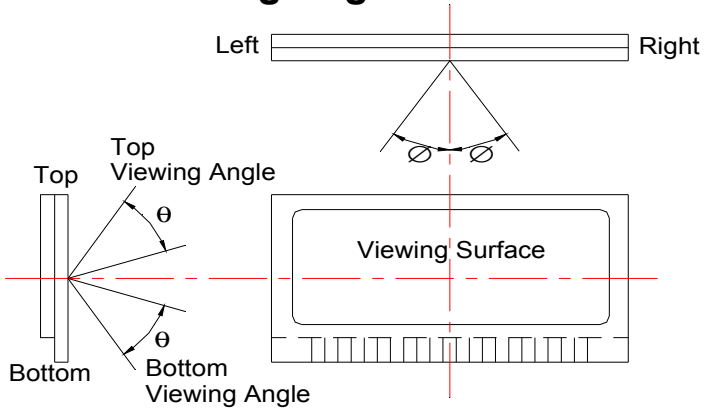
$$K = \frac{\text{Brightness of non-selected segment(A)}}{\text{Brightness of selected segment(B)}}$$



Note 2: Definition of Optical Response Time

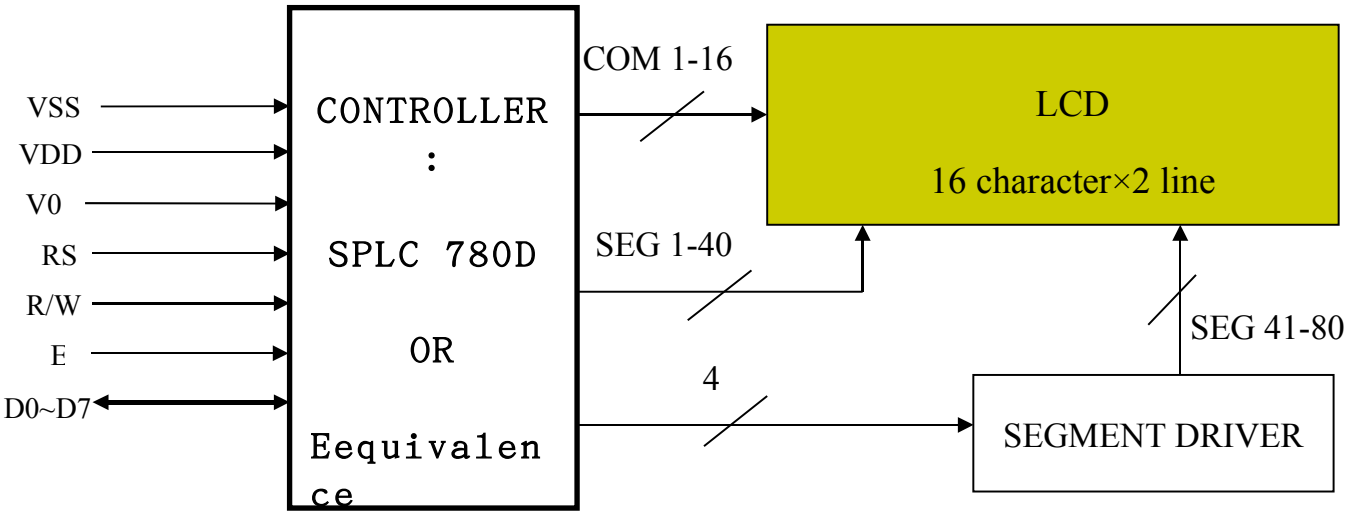


Note 3: Definition of Viewing Angle

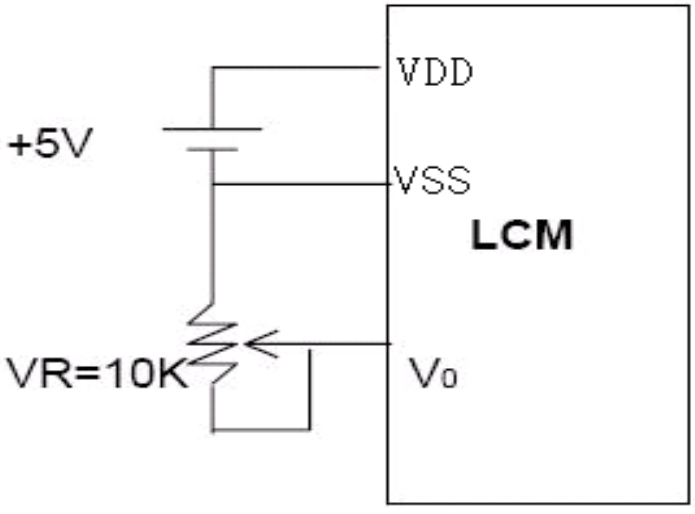


Please select either top or bottom viewing angle

6. BLOCK DIAGRAM

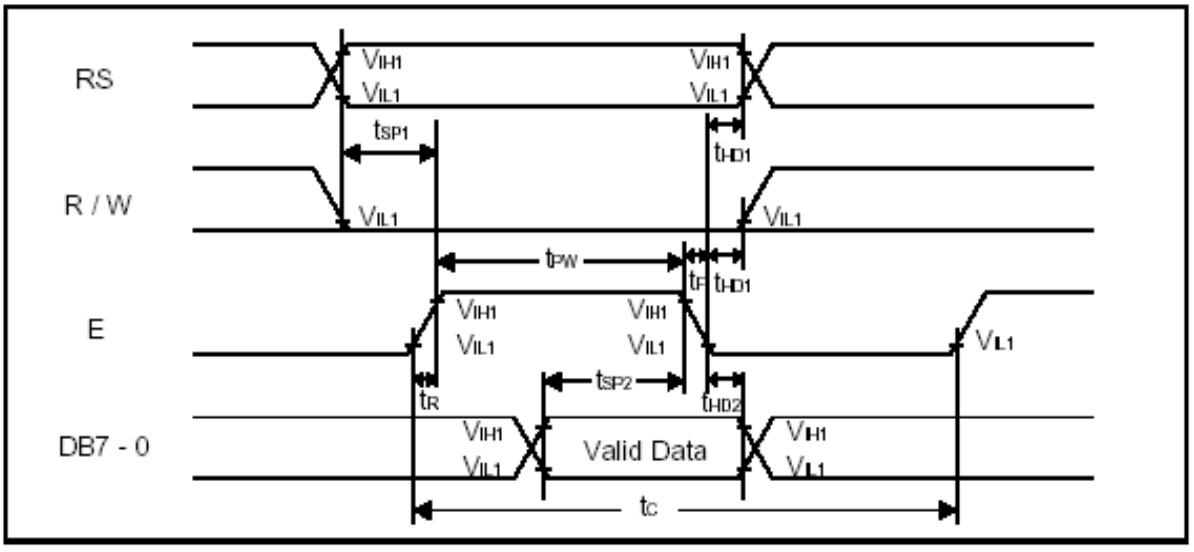


7. POWER SUPPLY

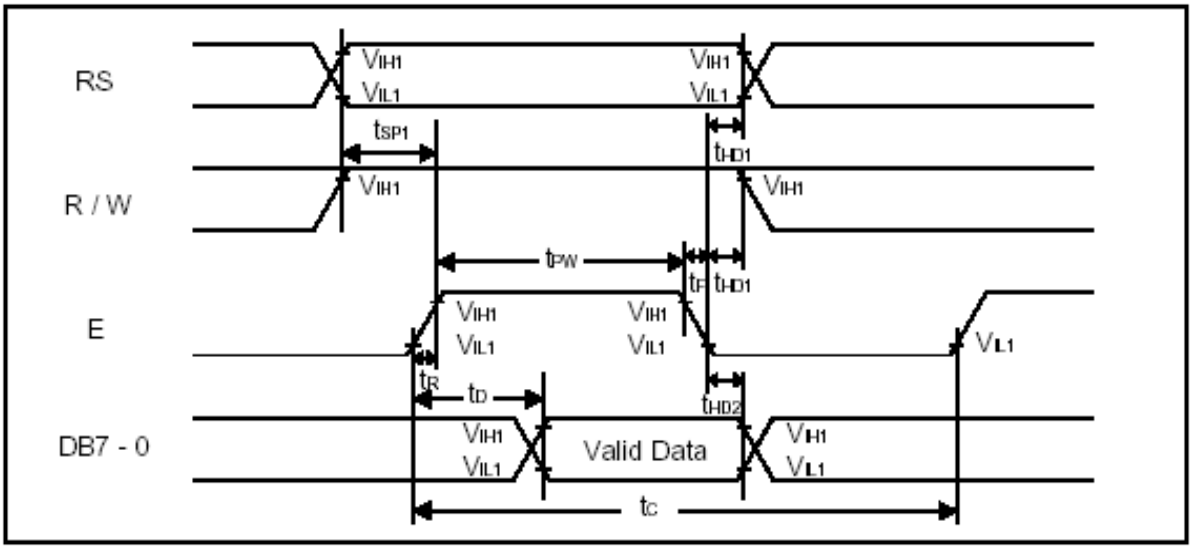


8. TIMING DIAGRAM

• WRITE OPERATION



• READ OPERATION



9. AC CHARACTERISTICS

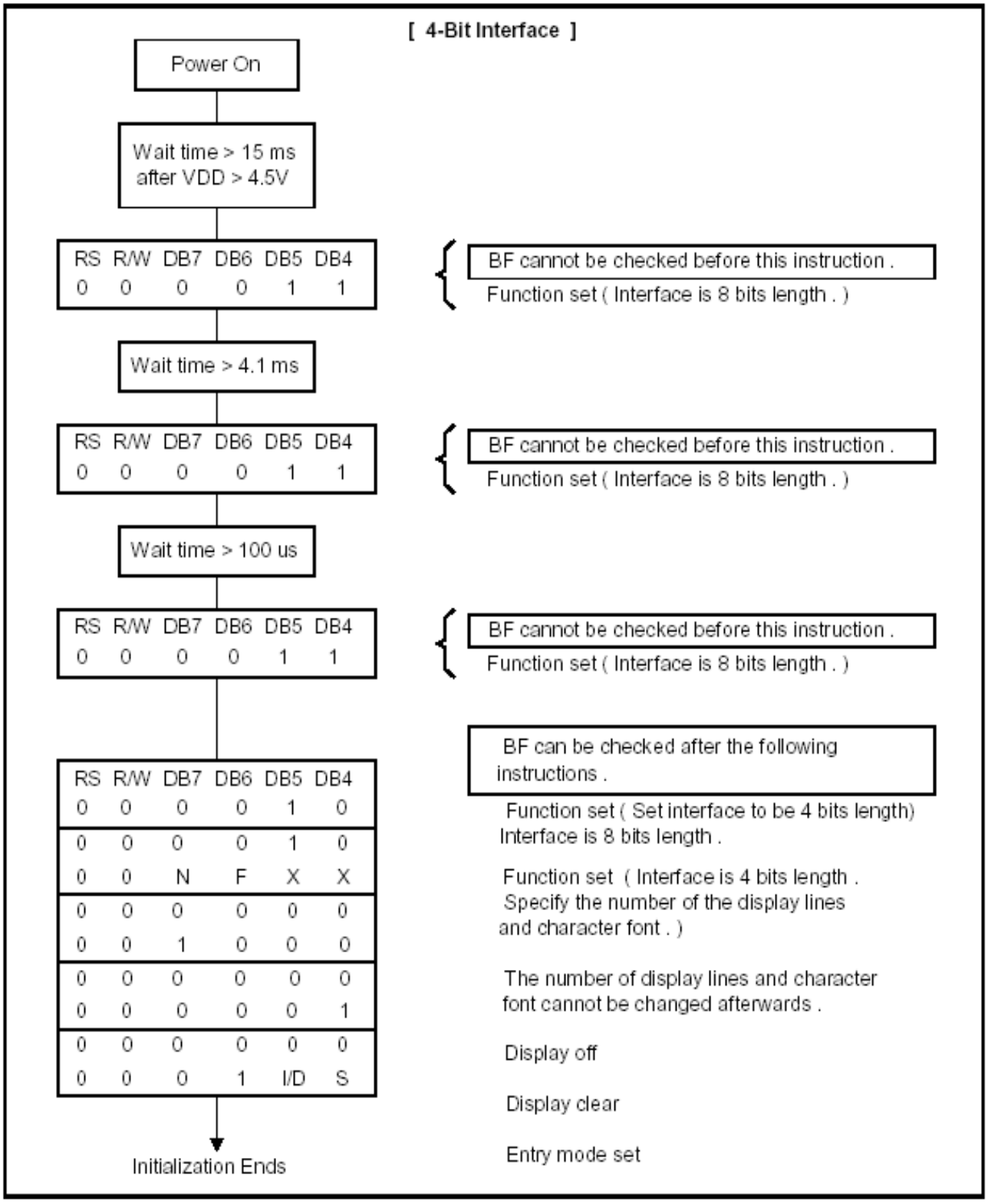
• WRITE MODE

Characteristics	Symbol	Limit			Unit	Test Condition
		Min.	Typ.	Max.		
E Cycle Time	t_C	1000	-	-	ns	Pin E
E Pulse Width	t_{PW}	450	-	-	ns	Pin E
E Rise/Fall Time	t_R, t_F	-	-	25	ns	Pin E
Address Setup Time	t_{SP1}	60	-	-	ns	Pins: RS, R/W, E
Address Hold Time	t_{HD1}	20	-	-	ns	Pins: RS, R/W, E
Data Setup Time	t_{SP2}	195	-	-	ns	Pins: DB7 - 0
Data Hold Time	t_{HD2}	10	-	-	ns	Pins: DB7 - 0

• READ MODE

Characteristics	Symbol	Limit			Unit	Test Condition
		Min.	Typ.	Max.		
E Cycle Time	t_C	1000	-	-	ns	Pin E
E Pulse Width	t_W	450	-	-	ns	Pin E
E Rise/Fall Time	t_R, t_F	-	-	25	ns	Pin E
Address Setup Time	t_{SP1}	60	-	-	ns	Pins: RS, R/W,E
Address Hold Time	t_{HD1}	20	-	-	ns	Pins: RS, R/W,E
Data Output Delay Time	t_D	-	-	360	ns	Pins: DB7 - 0
Data hold time	t_{HD2}	5.0	-	-	ns	Pin DB7 - 0

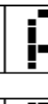
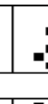
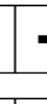
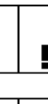
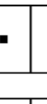
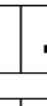
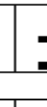
10. INITIALIZATION SEQUENCE



11. INSTRUCTION SET

COMMAND	COMMAND CODE										COMMAND CODE	E-CYCLE f_{osc}=250KHz
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
SCREEN CLEAR	0	0	0	0	0	0	0	0	0	1	Screen Clear, Set AC to 0 Cursor Reposition	1.64ms
CURSOR RETURN	0	0	0	0	0	0	0	0	1	*	DDRAM AD=0, Return, Content Changeless	1.64ms
INPUT SET	0	0	0	0	0	0	0	1	I/D	S	Set moving direction of cursor, Appoint if move	40us
DISPLAY SWITCH	0	0	0	0	0	0	1	D	C	B	Set display on/off,cursor on/off, blink on/off	40us
SHIFT	0	0	0	0	0	1	S/C	R/L	*	*	Remove cursor and whole display,DDRAM changeless	40us
FUNCTION SET	0	0	0	0	1	DL	N	F	*	*	Set DL,display line,font	40us
CGRAM AD SET	0	0	0	1	ACG						Set CGRAM AD, send receive data	40us
DDRAM AD SET	0	0	1	ADD							Set DDRAM AD, send receive data	40us
BUSY/AD READ CT	0	1	BF	AC							Executing internal function, reading AD of CT	40us
CGRAM/ DDRAM DATA WRITE	1	0	DATA WRITE								Write data from CGRAM or DDRAM	40us
CGRAM/ DDRAM DATA READ	1	1	DATA READ								Read data from CGRAM or DDRAM	40us
	I/D=1: Increment Mode; I/D=0: Decrement Mode S=1: Shift S/C=1: Display Shift; S/C=0: Cursor Shift R/L=1: Right Shift; R/L=0: Left Shift DL=1: 8D DL=0: 4D N=1: 2R N=0: 1R F=1: 5x10 Style; F=0: 5x7 Style BF=1: Execute Internal Function; BF=0: Command Received										DDRAM: Display data RAM CGRAM: Character Generator RAM ACG: CGRAM AD ADD: DDRAM AD & Cursor AD AC: Address counter for DDRAM & CGRAM	E-cycle changing with main frequency. Example: If fcp or f_{osc}=270KHz 40us x 250/270 =37us

12. FONT TABLE

b7-b4 / b3-b0	0000	0010	0011	0100	0101	0110	0111	1010	1011	1100	1101	1110	1111
0000	CG RAM (1)												
0001	(2)												
0010	(3)												
0011	(4)												
0100	(5)												
0101	(6)												
0110	(7)												
0111	CG RAM (8)												
1000	CG RAM (1)												
1001	(2)												
1010	(3)												
1011	(4)												
1100	(5)												
1101	(6)												
1110	(7)												
1111	CG RAM (8)												

13. QUALITY ASSURANCE

13.1.1 Temperature and Humidity(Ambient Temperature)

Temperature : 20 ± 5°C

Humidity : 65 ± 5%

131.1.2 Operation

Unless specified otherwise, test will be conducted under function state.

13.1.3 Container

Unless specified otherwise, vibration test will be conducted to the product itself without putting it in a container.

13.1.4 Test Frequency

In case of related to deterioration such as shock test, It will be conducted only once.

13.1.5 Test Method

No.	Parameter	Conditions	Regulations
1	High Temperature Operating	50±2°C	Note 3
2	Low Temperature Operating	0 ±2°C	Note 3
3	High Temperature Storage	60±2°C	Note 3
4	Low Temperature Storage	-10±2°C	Note 3
5	Vibration Test (Non-operation state)	Total fixed amplitude : 1.5mm Vibration Frequency : 10 ~ 55Hz One cycle 60 seconds to 3 directions of X.Y.Z. for each 15 minutes	Note 3
6	Damp Proof Test (Non-operation state)	40°C±2°C, 90~95%RH, 96h	Note 1,2
7	Shock Test (Non-operation state)	To be measured after dropping from 60cm high once concrete surface in packing state	Note 3

Note 1: Returned under normal temperature and humidity for 4 hrs.

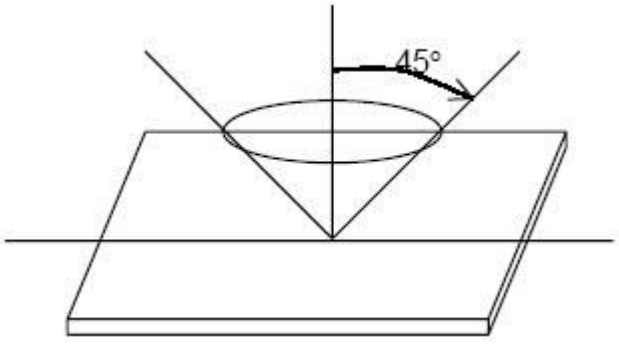
Note 2: No dew condensation to be observed.

Note 3: No change on display and in operation under the test condition

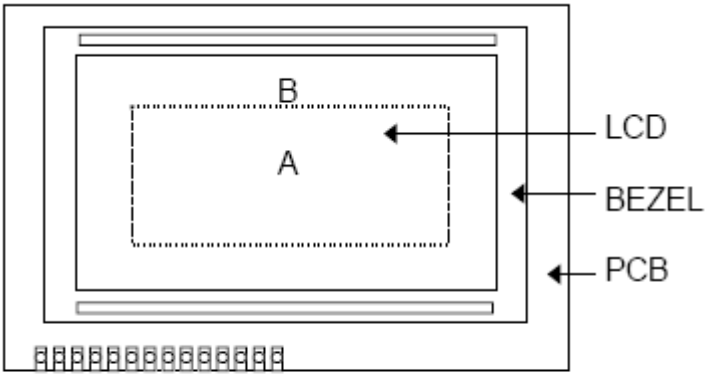
13.2Inspection condition

13.2.1 Inspection conditions

The LCD shall be inspected under 40W white fluorescent light.

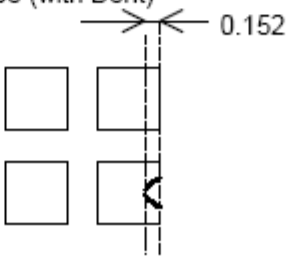


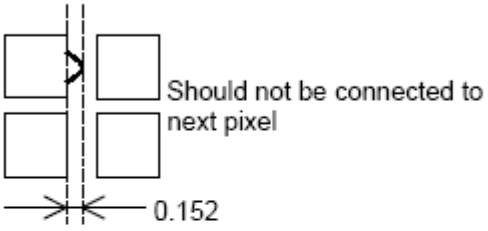
13.2.2 Definition of applicable Zones

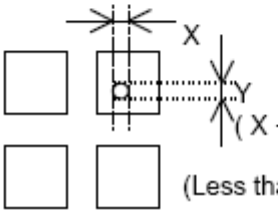


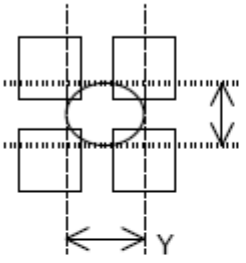
A : Display Area
B : Non-Display Area

13.2.3 Inspection Parameters

<table>
<tr><th>No.</th><th>Parameter</th><th>Criteria</th></tr>
<tr><td>1</td><td>Black or White spots</td><td>
<table>
<tr><th rowspan="2">Zone / Dimension</th><th colspan="2">Acceptable number</th><th rowspan="2">Class Of Defects</th><th rowspan="2">AQL Level</th></tr>
<tr><th>A</th><th>B</th></tr>
<tr><td>D < 0.15</td><td>*</td><td>*</td><td rowspan="4">Minor</td><td rowspan="4">2.5</td></tr>
<tr><td>0.15≤ D< 0.2</td><td>4</td><td>4</td></tr>
<tr><td>0.2 ≤ D ≤ 0.25</td><td>2</td><td>2</td></tr>
<tr><td>D ≤ 0.3</td><td>0</td><td>1</td></tr>
</table>
D = (Long + Short) / 2 * : Disregard
</td></tr>
<tr><td>2</td><td>Scratch, Substances</td><td>
<table>
<tr><th rowspan="2">Zone
X (mm) / Y(mm)</th><th colspan="2">Acceptable number</th><th rowspan="2">Class Of Defects</th><th rowspan="2">AQL Level</th></tr>
<tr><th>A</th><th>B</th></tr>
<tr><td>*</td><td>0.04 ≥ W</td><td>*</td><td>*</td><td rowspan="4">Minor</td><td rowspan="4">2.5</td></tr>
<tr><td>3.0 ≥ L</td><td>0.06 ≥ W</td><td>4</td><td>4</td></tr>
<tr><td>2.0 ≥ L</td><td>0.08 ≥ W</td><td>2</td><td>3</td></tr>
<tr><td>—</td><td>0.1 < W</td><td>0</td><td>1</td></tr>
</table>
X : Length Y : Width * : Disregard
Total defects should not exceed 4/module
</td></tr>
<tr><td>3</td><td>Air Bubbles
(between glass & polarizer)</td><td>
<table>
<tr><th rowspan="2">Zone / Dimension</th><th colspan="2">Acceptable number</th><th rowspan="2">Class of Defects</th><th rowspan="2">AQL Level</th></tr>
<tr><th>A</th><th>B</th></tr>
<tr><td>D ≤ 0.15</td><td>*</td><td>*</td><td rowspan="3">Minor</td><td rowspan="3">2.5</td></tr>
<tr><td>0.15 < D ≤ 0.25</td><td>2</td><td>*</td></tr>
<tr><td>0.25 < D</td><td>0</td><td>1</td></tr>
</table>
* : Disregard
Total defects shall not excess 3/module.
</td></tr>
<tr><td>4</td><td>Uniformity of Pixel</td><td>(1) Pixel shape (with Dent)
 
</td></tr>
</table>

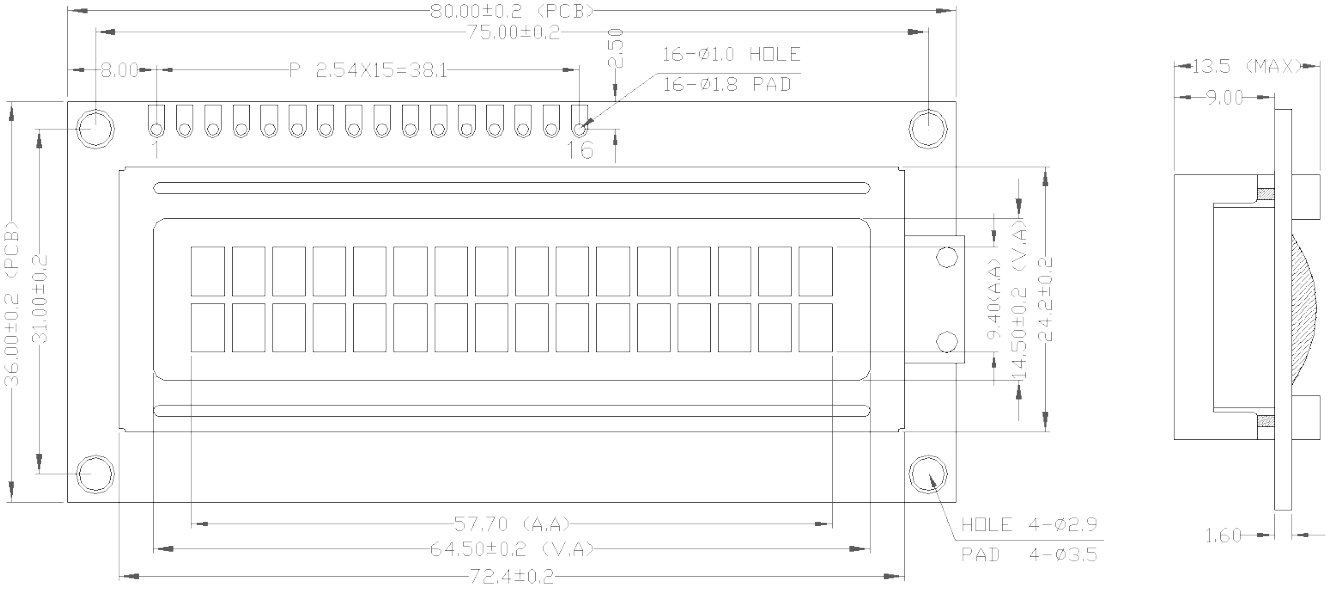
<table>
<tr><td>4</td><td>Uniformity of Pixel</td><td colspan="2">(2) Pixel shape (with Projection)
 

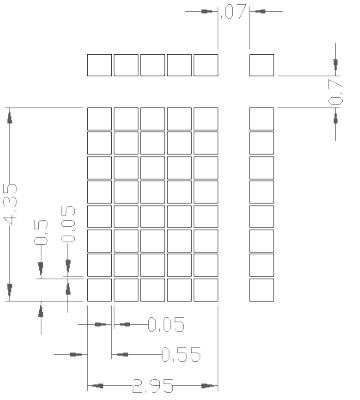
(3) Pin hole
 

(X + Y)/2 ≤ 0.02mm
(Less than 0.1 mm is no counted)
(4) Deformation
 

(X + Y) / 2 ≤ 0.3mm
Total acceptable number : 1/pixel, 5/cell</td></tr>
<tr><td rowspan="3">Class of defects</td><td rowspan="2">Major</td><td>AQL 0.65%</td><td>Definition
It is a defect that is likely to result in failure or to reduce materially the usability of the product for the intended function.</td></tr>
<tr><td>AQL 1.00%</td><td>It is a defect that is likely to assembly size and not result in functioning problem.</td></tr>
<tr><td>Minor</td><td>AQL 2.5%</td><td>It is a defect that will not result in functioning problem with deviation classified.</td></tr>
</table>

14. OUTLINE DRAWING





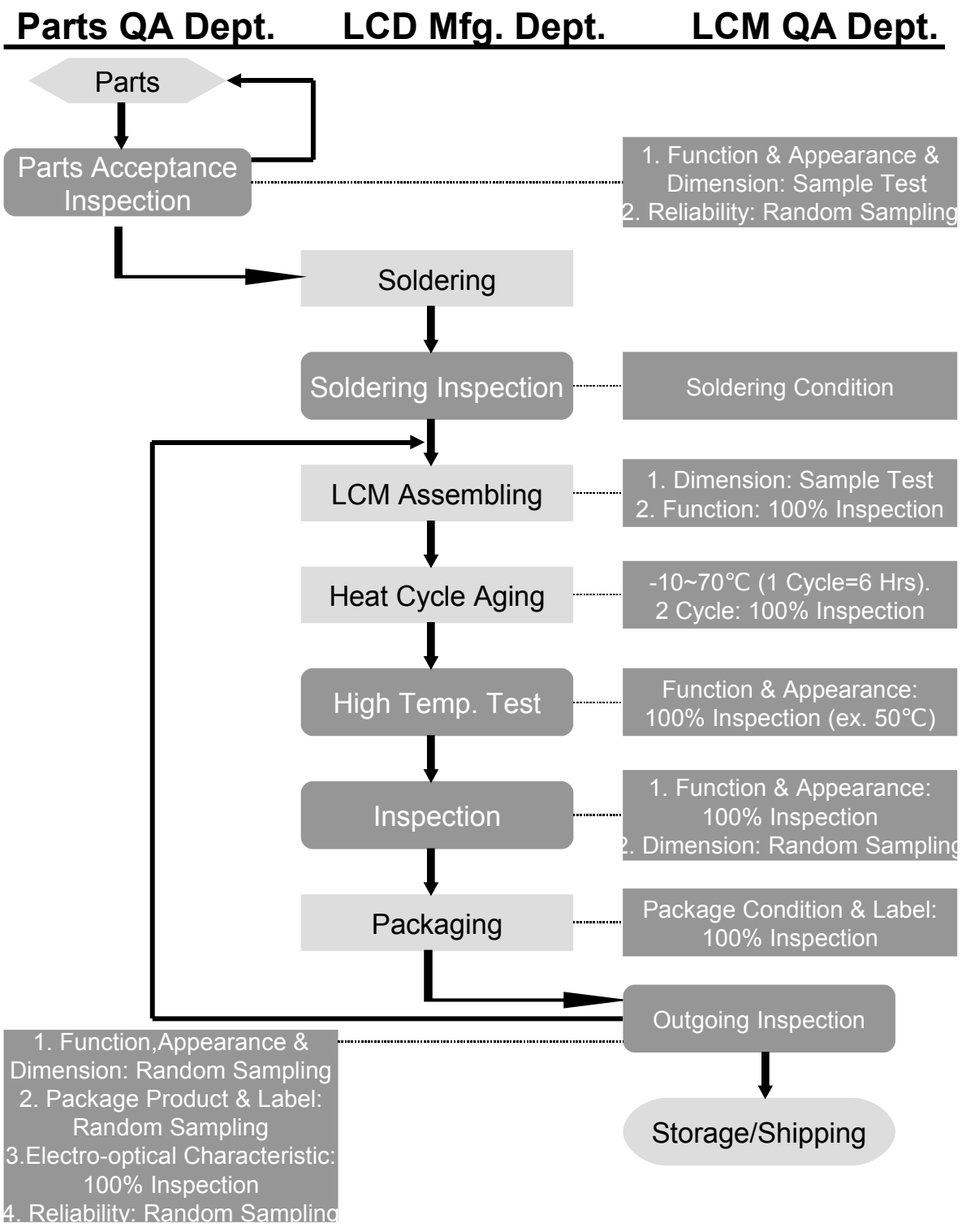
Note:tolerance is ±0.2 unless otherwise noted.

1	2	3	4	5	6	7	8
VSS	VDD	V0	RS	R/W	E	DB0	DB1
9	10	11	12	13	14	15	16
DB2	DB3	DB4	DB5	DB6	DB7	LEDA	LEDK

15. INTERFACE

1	VSS	GROUND	0V (GND)
2	VDD	POWER SUPPLY FOR LOGIC CIRCUIT	+5.0V
3	V0	LCD CONTRAST ADJUSTMENT	
4	RS	INSTRUCTION/DATA REGISTER SELECTION	RS = 0 : INSTRUCTION REGISTER RS = 1 : DATA REGISTER
5	R/W	READ/WRITE SELECTION	R/W = 0 : REGISTER WRITE R/W = 1 : REGISTER READ
6	E	ENABLE SIGNAL	
7	DB0	DATA BUS	8 BIT: DB0-DB7
8	DB1		
9	DB2		
10	DB3		
11	DB4		
12	DB5		
13	DB6		
14	DB7		
15	LEDA	SUPPLY VOLTAGE FOR LED+	+5.0V
16	LEDK	SUPPLY VOLTAGE FOR LED-	0V

16. QC/QA PROCEDURE

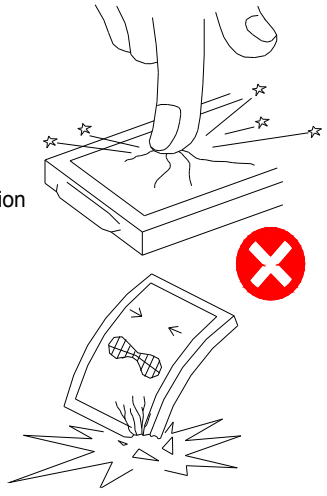


17. Handling Precautions

tation of Application:
products are designed for use in ordinary electronic devices such as business machines, telecommunications
nent,measurement devices and etc. Please handle the products with care. (see below)
products are not designed,intended ,or authorized for use in any application which the failure of the product cou
in a situation where personal injury or death may occur . these applications include, but are not limited to . life-su
nent,nuclear control devices , aerospace equipment , devices related to hazardous or flammable materials , etc.[
s to purchase or use the Optrex Products for such unintended or unauthorized applications , Buyer must secure p
consent to such use by a responsible officer of Optrex Corporation.]Should Buyer purchase or use Optrex Produc
ch unintended or unauthorized application [without such consent].Buyer shall indemnify and hold Optrex and its
yees. subsidiaries, affiliates and distributors harmless against all claims, costs, damages and expenses , and reas
ey's fees,arising out of , directly or indirectly, any claim of personal injury or death associated with such unintend
norized use, even if such claim alleges that Optrex was negligent regarding the design or manufacture of the part
strial Rights and Patents
shall not be responsible for any infringement of industrial property rights of third parties in any country arising o
ation or use of Optrex products, except which directly concern the structure or production of such products.

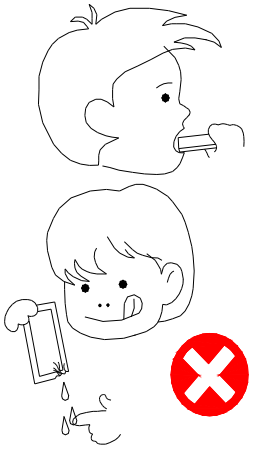
No Press and Shock!

If pressure to LCD, orientation may be disturbed.
LCD will broken by shock!



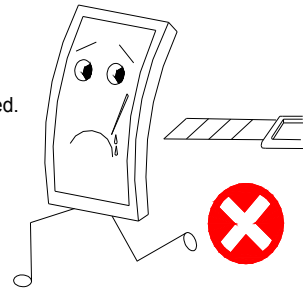
Don't Swallow or Touch Liquid Crystal!

Liquid Crystal may be leaked when display is broked.
If it accidentally gets your hands, wash then with water!



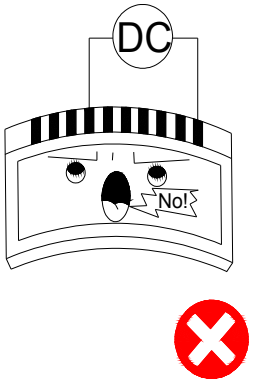
Don't not Scratch!

Polarizer is a soft material and can easily be scratched.



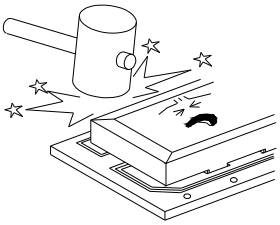
No DC Voltage to LCD!

DC volrage or driveing higher than the specified voltage will reduce the lifetime of the LCD.

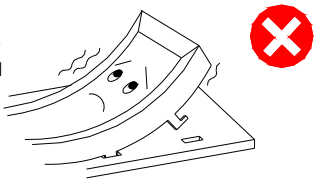


n't Press the Metallic Frame and Disass e LCM

Pressure on the metallic frame and PCB may deform the conductive rubber or break the liquid crystal cell and back light, which will cause defects.

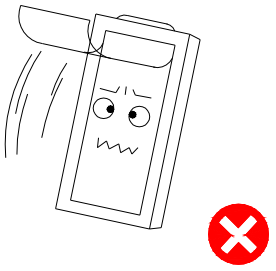


LCD may be shifted or conductive rubber may be reshaped, which will cause defects.



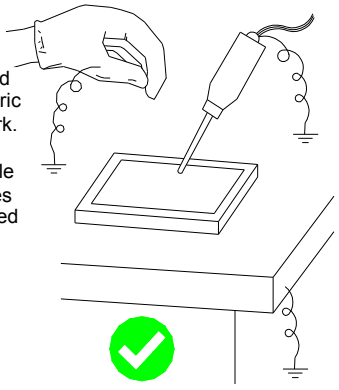
Slowly Peel Off Protective Film!

Avoid static electricity.



Avoid Static Electricity!

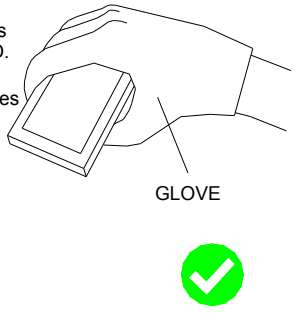
Please be sure to ground human body and electric apploances during work.
It is preferable to use conductive mat on table and wear cotton clothes or conduction processed fiber. Synthetic fiber is not recommended.



Wear Gloves While Handing!

It is preferable to wear gloves to avoid damaging the LCD.

Please do not touch electrodes with bare hands or make them dirty.

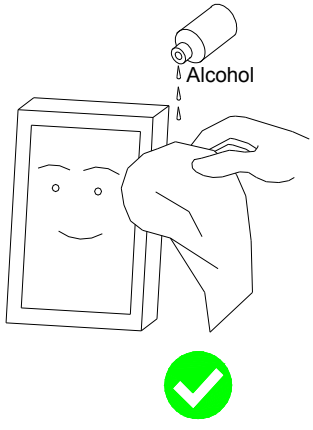


Keep Away From Extreme Heat and Hum

LCD deteriorates.

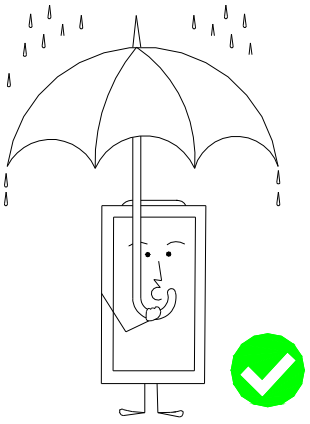
Use Alcohol to Clean Terminals!

When attaching with the heat seal or anisontropically conductive film, wipe off with alcohol before use.



Don't Drop Water on LCD!

Note that the presence of waterdrops or dew in the LCD panel may deteriorate the polarizer or corrade electrode.



Precaution in Soldering LCD Module

Basic instructions: Solder I/O terminals only.
Use soldering iron without leakage.
(1)Soldering condition to I/O terminals
Temperature at tip of the iron: 280±10°C
Soldering time: 3~4 sec.
Type of solder: Eutectic solder (containing colophony-flux)
*Please do not use flux because it may soak into LCD Module or contaminate it.
*It is preferable to peel off protective film on display surface after soldering I/O terminals is finished.
(2)Remove connector or cable
*When you remove connector or cable soldered to I/O terminals, please confirm that solder is fully melted. If you remove by force, electrodes at I/O terminals may be damaged(or stripped off).
*It is recommended to use solder suction machine.

Long-term Storage

If it is necessary to store LCD modules for a long time, please comply with the following procedures.
If storage condition is not satisfactory, display(especially polarizer) may be deteriorated or soldering I/O terminals may become difficult(some oxide is generated at I/O terminals plating).
1.Store as delivered by Optrex
2.If you store as unpacked,put in anti-static bag,seal its opening and store where it is not subjected to direct sunshine nor fluorescent lamp.
3.Store at temperature 0 to +35°C and at low humidity.Please refer to our specification sheets for storage temperature range and humidity condition.

Long-term Storage

Please use power supply with built-in surge protection circuit.