



## SPECIFICATION OF LCD MODULE

<b>CUSTOMER</b> 客户名称	
<b>PART NO.</b> 产品型号	<b>OTM840 FP-B-30</b>
<b>PRODUCTS TYPE</b> 产品内容	
<b>REMARKS</b> 备注	
<b>SIGNATURE BY CUSTOMER</b> 客户签署:	

		
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## 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



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## 1. FEATURES

•Display construction.....	128*32 DOTS
•Display mode.....	FSTN
•Display type.....	Positive Transmissive
•Backlight.....	LED/3.3V(BLUE)
•Viewing direction.....	6 o'clock
•Operating temperature.....	-20 to 70 °C
•Storage temperature .....	-30 to 80°C
•Driving voltage.....	Single power
•Driving method.....	1/64 duty, 1/5 bias
•Type.....	COB (Chip On Board)
•Controller/Drive IC.....	KS0107/KS0108
•Number of data line.....	8-bit parallel
•Connector.....	Pin

## 2. MECHANICAL DATA

ITEM		WIDTH	HEIGHT	THICKNESS	UNIT
Module size		85.0	30.0	9.5(MAX)	mm
Viewing area		64.5	16.0	-	mm
Dot	Size	0.40	0.32	-	mm
	Pitch	0.44	0.36	-	mm
Diameter of mounting hole		R 1.25			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)	$V_{EE}$	$V_{DD}-19.0$	$V_{DD}+0.3$	v
	$V_{LCD}$	$V_{EE} -0.3$	$V_{DD} +0.3$	V
Input Voltage	$V_{IN}$	-0.3	VDD+0.3	V
Operating temperature	Top	-20	70	°C
Storage temperature	Tsto	-30	80	°C

### 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/S <sup>2</sup>	--	19.6M/S <sup>2</sup>	XYZ direction
Shock	--	29.4M/S <sup>2</sup>	--	490M/S <sup>2</sup>	XYX direction

Note(1) Ta=0°C : 50 Hr Max.

Note(2) Ta≤40°C : 90%RH Max.

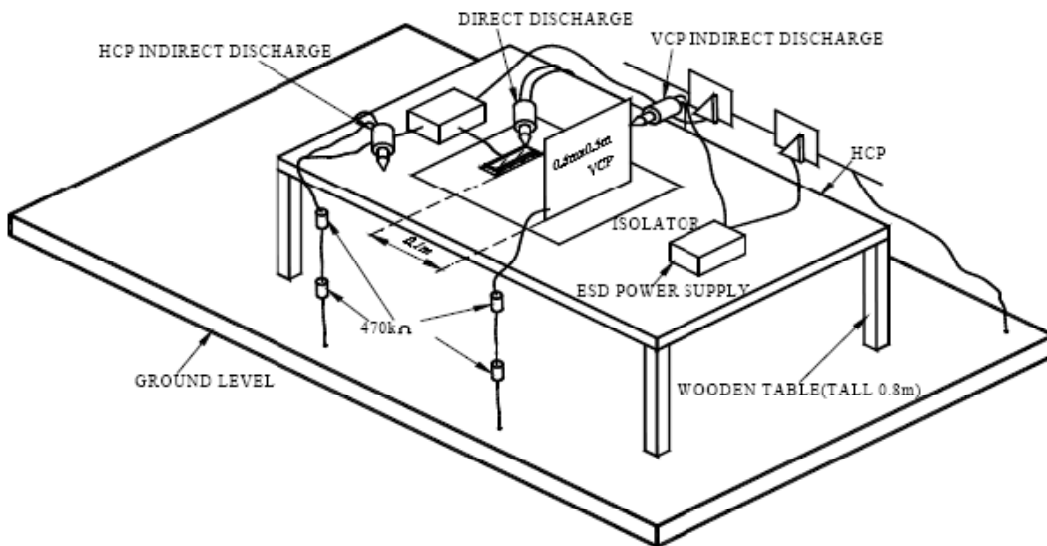
Ta≥40°C : Abslue humidity must be lower than the humidity of 90%RH@40°C

## 3.3 Electronic Static Discharge Maximum Rating

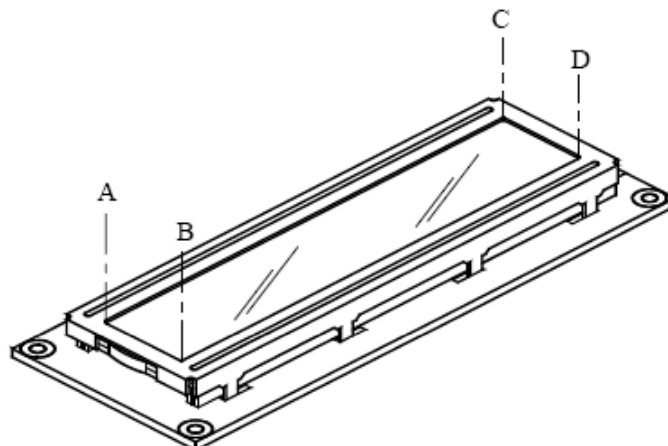
### ESD Test Method : IEC-1000-4-2

Item	Description	
Testing environment	Ambient temperature : 15°C to 35°C 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 $\pm$ 4KV	Discharge point, see drawing2
Indirect discharge	0 to $\pm$ 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

( $V_{DD} = +5V \pm 10\%$ ,  $V_{SS} = 0V$ ,  $V_{DD}-V_{EE} = 8$  to  $17V$ ,  $T_a = -20$  to  $70$  °C)

Characteristic	Symbol	Condition	Min	Typ	Max	Unit	Note
Input high voltage	$V_{IH1}$	–	$0.7V_{DD}$	–	$V_{DD}$	V	(1)
	$V_{IH2}$	–	2.0	–	$V_{DD}$	V	(2)
Input low voltage	$V_{IL1}$	–	0	–	$0.3V_{DD}$	V	(1)
	$V_{IL2}$	–	0	–	0.8	V	(2)
Output high voltage	$V_{OH}$	$I_{OH} = -200\mu A$	2.4	–	–	V	(3)
Output low voltage	$V_{OL}$	$I_{OL} = 1.6mA$	–	–	0.4	V	(3)
Input leakage current	$I_{LKG}$	$V_{IN} = V_{SS} - V_{DD}$	-1.0	–	1.0	$\mu A$	(4)
Three-state(off) input current	$I_{TSL}$	$V_{IN} = V_{SS} - V_{DD}$	-5.0	–	5.0	$\mu A$	(5)
Driver input leakage current	$I_{DIL}$	$V_{IN} = V_{EE} - V_{DD}$	-2.0	–	2.0	$\mu A$	(6)
Operating current	$I_{DD1}$	During display	–	–	100	$\mu A$	(7)
	$I_{DD2}$	During access Access cycle = 1MHz	–	–	500	$\mu A$	(7)
On resistance	$R_{ON}$	$V_{DD}-V_{EE} = 15V$ $I_{LOAD} = \pm 0.1mA$	–	–	7.5	$K\Omega$	(8)

### NOTES:

- CL, FRM, M, RSTB, CLK1, CLK2
- CS1B, CS2B, CS3, E, R/W, RS, DB0 - DB7
- DB0 - DB7
- Except DB0 - DB7
- DB0 - DB7 at high impedance
- $V_{OL}(R)$ ,  $V_{2L}(R)$ ,  $V_{3L}(R)$ ,  $V_{5L}(R)$
- 1/64 duty, FCLK = 250kHz, frame frequency = 70HZ, output: no load
- $V_{DD} - V_{EE} = 15.5V$   
 $V_{OL}(R) > V_{2L}(R) = V_{DD} - 2/7 (V_{DD}-V_{EE}) > V_{3L}(R) = V_{EE} + 2/7 (V_{DD}-V_{EE}) > V_{5L}(R)$



## 4.1 LED ELECTRICAL/OPTICAL CHARACTERISTICS

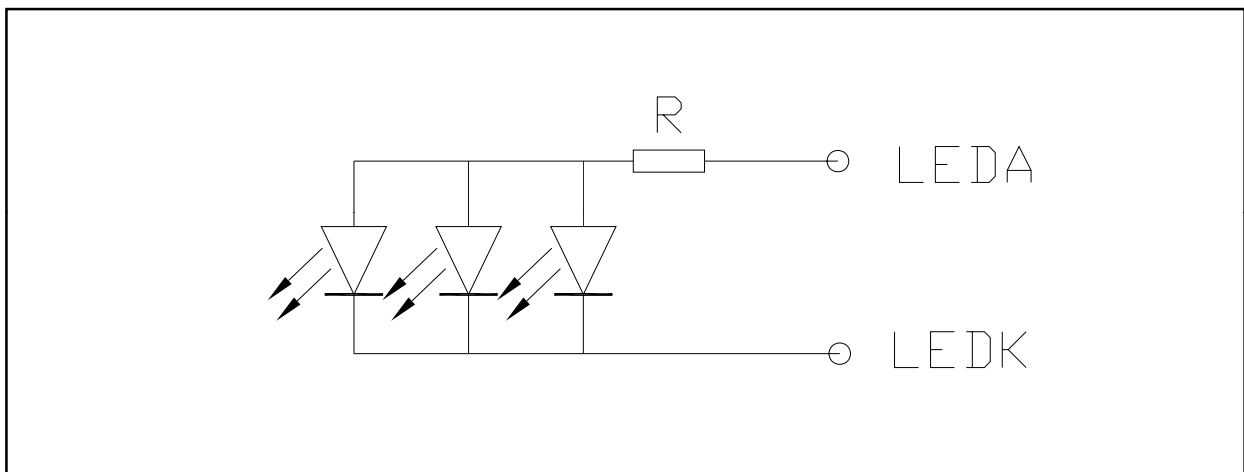
Item	Symbol	min	typ	max	Unit	Condition
Forward Voltage	V <sub>f</sub>	-	3.3	-	V	I <sub>f</sub> =60mA
Reverse Current	I <sub>r</sub>	-	30	-	uA	V <sub>r</sub> =5V
Dominant wave length	λ <sub>d</sub>	465	470	475	nm	I <sub>f</sub> =60mA
Spectral Line Half width	Δλ	-	30	-	-	I <sub>f</sub> =60mA
Luminance	L <sub>v</sub>	-	80	-	cd/m <sup>2</sup>	I <sub>f</sub> =60mA

## 4.2 LED ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Condition	Rating	Unit
Reverse Voltage	V <sub>r</sub>	T <sub>a</sub> =25℃	5	V
Absolute maximum forward current	I <sub>fm</sub>	T <sub>a</sub> =25℃	75	mA
Power description	pd	T <sub>a</sub> =25℃	375	mW

### 4.2.1 LED ARRAY BLOCK DIAGRAM

( LED DICE 1×3= 3 dices )



### 4.2.2 LED POWER SOURCE

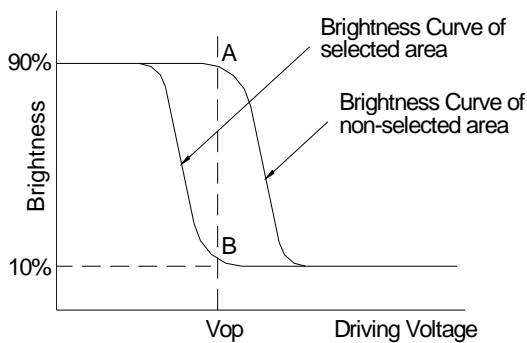
LED	Option	Power source	Jumper setting
	A	15A/16K	R8

## 5. ELECTRO-OPTICAL CHARACTERISTICS

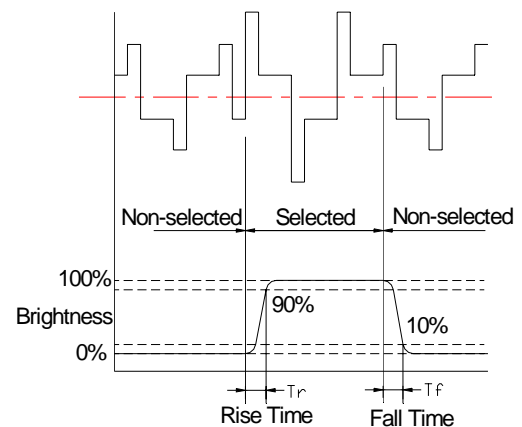
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Contrast ratio	K	$\varphi=0$	1.4	4	-	-	1
Response time (rise)	$T_r$	$\varphi=0$	-	250	300	ms	2
Response time (fall)	$T_f$	$\varphi=0$		250	350	ms	2
Viewing angle	$\varphi$	$K \geq 2.0$	-40 -- +10			deg.	3
	$\theta$		-30 -- +30				

### Note 1: Definition of Contrast Ratio "K"

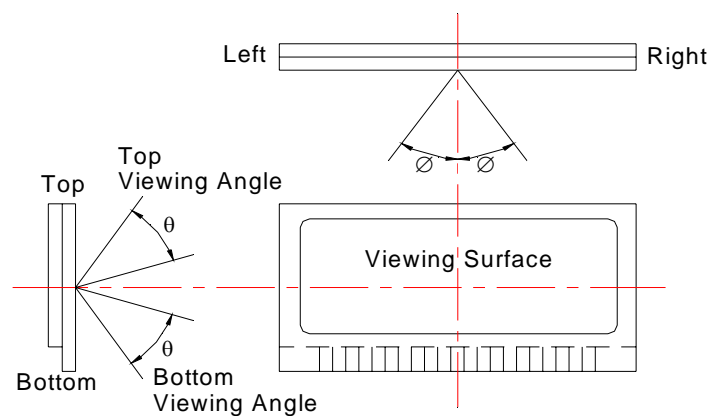
$$K = \frac{\text{Brightness of non-selected segment(A)}}{\text{Brightness of selected segment(B)}}$$



### Note 2: Definition of Optical Response Time

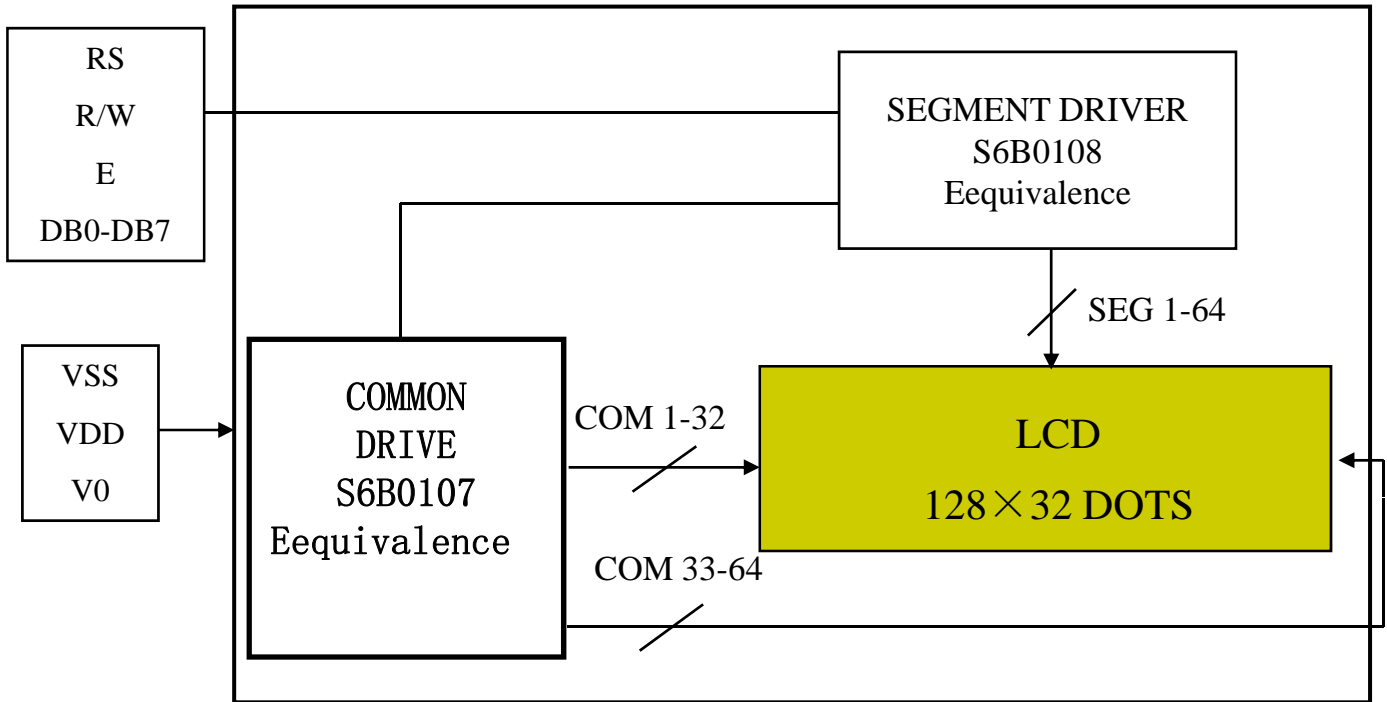


### Note 3: Definition of Viewing Angle

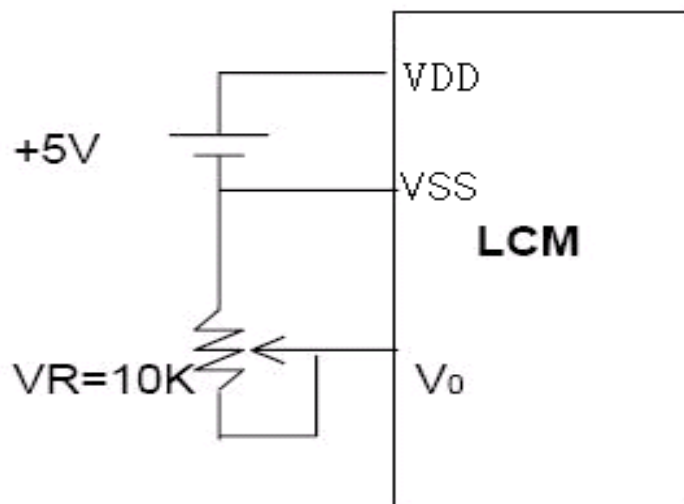


Please select either top or bottom viewing angle

## 6. BLOCK DIAGRAM



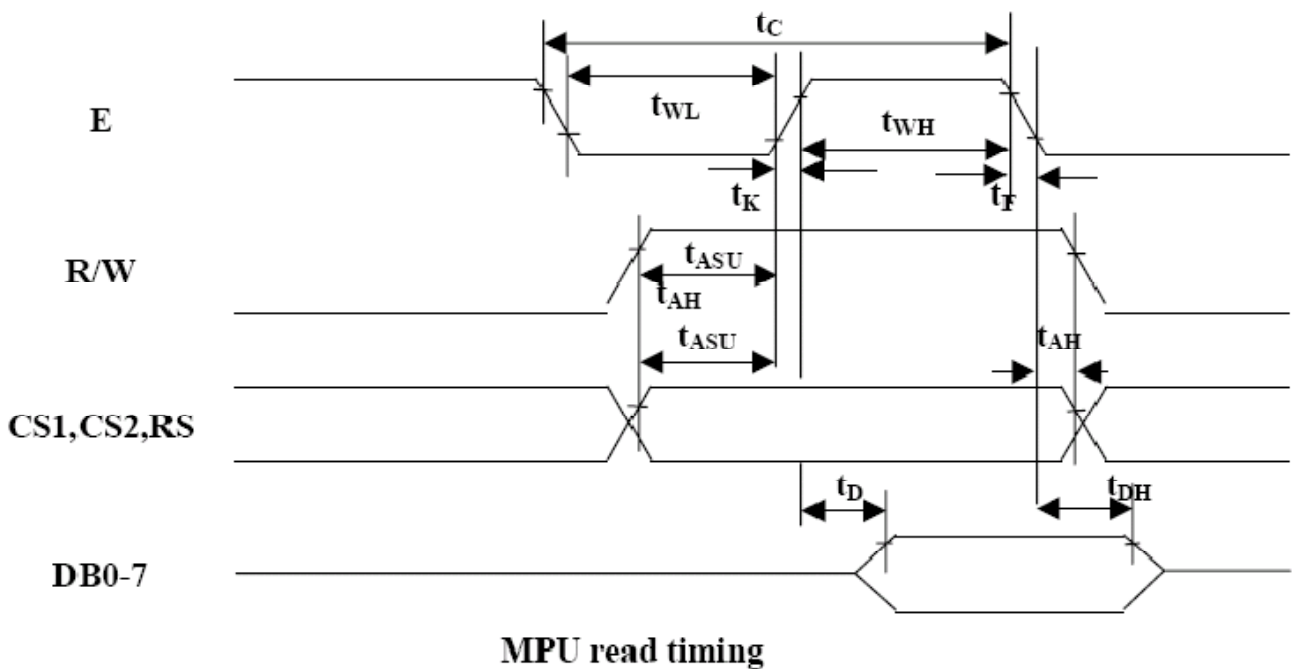
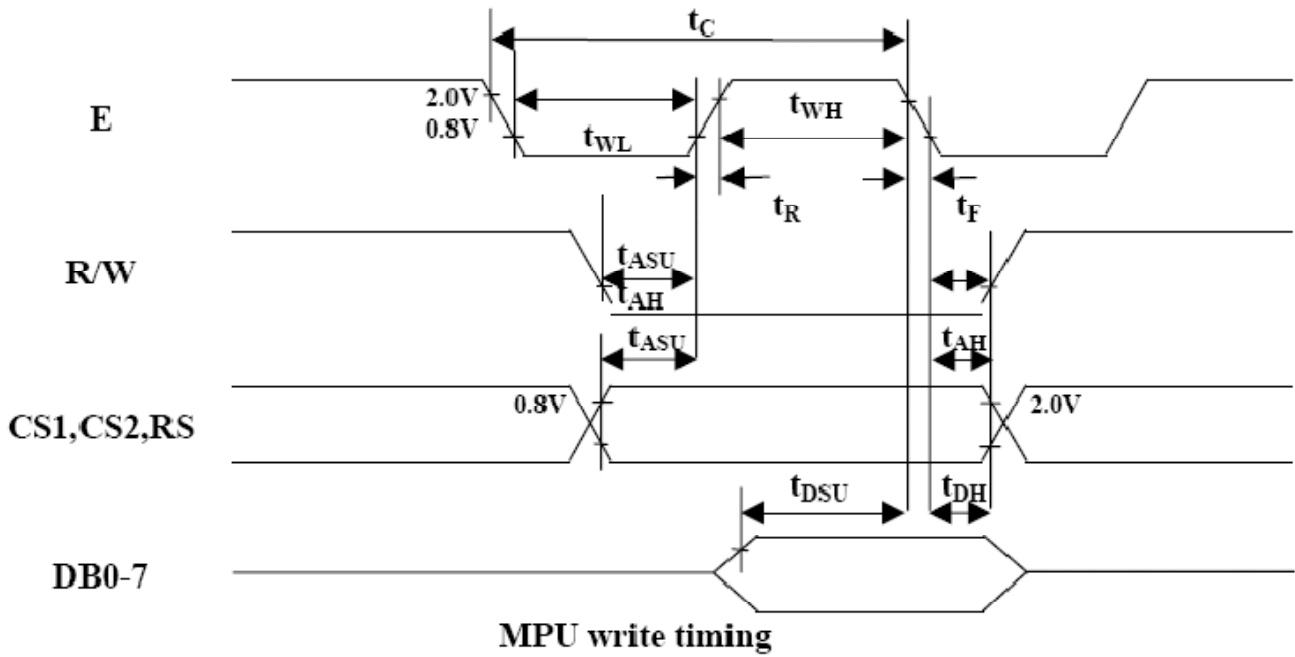
## 7. VOLTAGE REGULATOR CIRCUITS



## 8. TIMING DIAGRAM

### MPU Interface

Characteristic	Symbol	Min	Typ	Max	Unit
E Cycle	$t_C$	1000	--	--	ns
E High Level Width	$t_{WH}$	450	--	--	ns
E Low Level Width	$t_{WL}$	450	--	--	ns
E Rise Time	$t_R$	--	--	25	ns
E Fall Time	$t_F$	--	--	25	ns
Address Set-Up Time	$t_{ASU}$	140	--	--	ns
Address Hold Time	$t_{AH}$	10	--	--	ns
Data Set-Up Time	$t_{SU}$	200	--	--	ns
Data Delay Time	$t_D$	--	--	320	ns
Data Hold Time (Write)	$t_{DHW}$	10	--	--	ns
Data Hold Time (Read)	$t_{DHR}$	20	--	--	ns



## 9. INSTRUCTION SET

### DISPLAY CONTROL INSTRUCTION

The display control instructions control the internal state of the S6B0108. Instruction is received from MPU to S6B0108 for the display control. The following table shows various instructions.

Instruction	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function	
Display on/off	L	L	L	L	H	H	H	H	H	L/H	Controls the display on or off. Internal status and display RAM data is not affected. L: OFF, H: ON	
Set address (Y address)	L	L	L	H	Y address (0 - 63)						Sets the Y address in the Y address counter.	
Set page (X address)	L	L	H	L	H	H	H	Page (0 - 7)			Sets the X address at the X address register.	
Display start line (Z address)	L	L	H	H	Display start line (0 - 63)						Indicates the display data RAM displayed at the top of the screen.	
Status read	L	H	Busy	L	On/Off	Reset	L	L	L	L	Read status. BUSY L: Ready H: In operation ON/OFF L: Display ON H: Display OFF RESET L: Normal H: Reset	
Write display data	H	L	Write data									Writes data (DB0:7) into display data RAM. After writing instruction, Y address is increased by 1 automatically.
Read display data	H	H	Read data									Reads data (DB0:7) from display data RAM to the data bus.

## 10. INSTRUCTION SEQUENCE

INIT:

```
MOV A,#0C0H ;Display 0star line  
LCALL WC  
MOV A,#3FH ;Display on  
LCALL WC1
```

RET

## 11. QUALITY ASSURANCE

### 13.1.1 Temperature and Humidity(Ambient Temperature)

Temperature :  $20 \pm 5^{\circ} \text{C}$

Humidity :  $65 \pm 5\%$

### 13.1.2 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	$70 \pm 2^{\circ} \text{C}$	Note 3
2	Low Temperature Operating	$-20 \pm 2^{\circ} \text{C}$	Note 3
3	High Temperature Storage	$80 \pm 2^{\circ} \text{C}$	Note 3
4	Low Temperature Storage	$-30 \pm 2^{\circ} \text{C}$	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)	$40^{\circ} \text{C} \pm 2^{\circ} \text{C}$ , 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

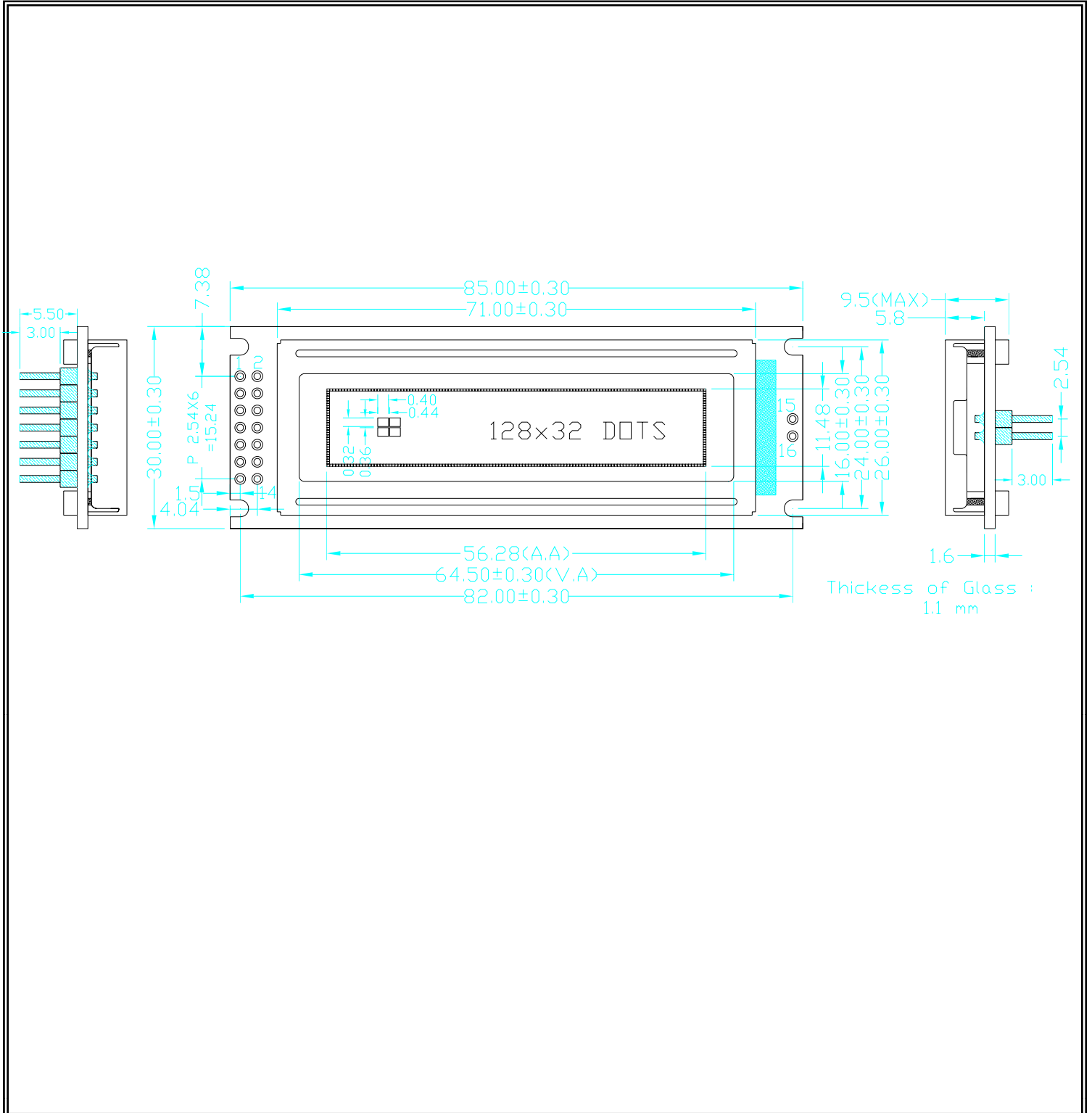
Note 1: Returned under normal temperature and humidity for 4 hrs.

Note 2: No dew condensation to be observed.

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



## 12. OUTLINE DRAWING

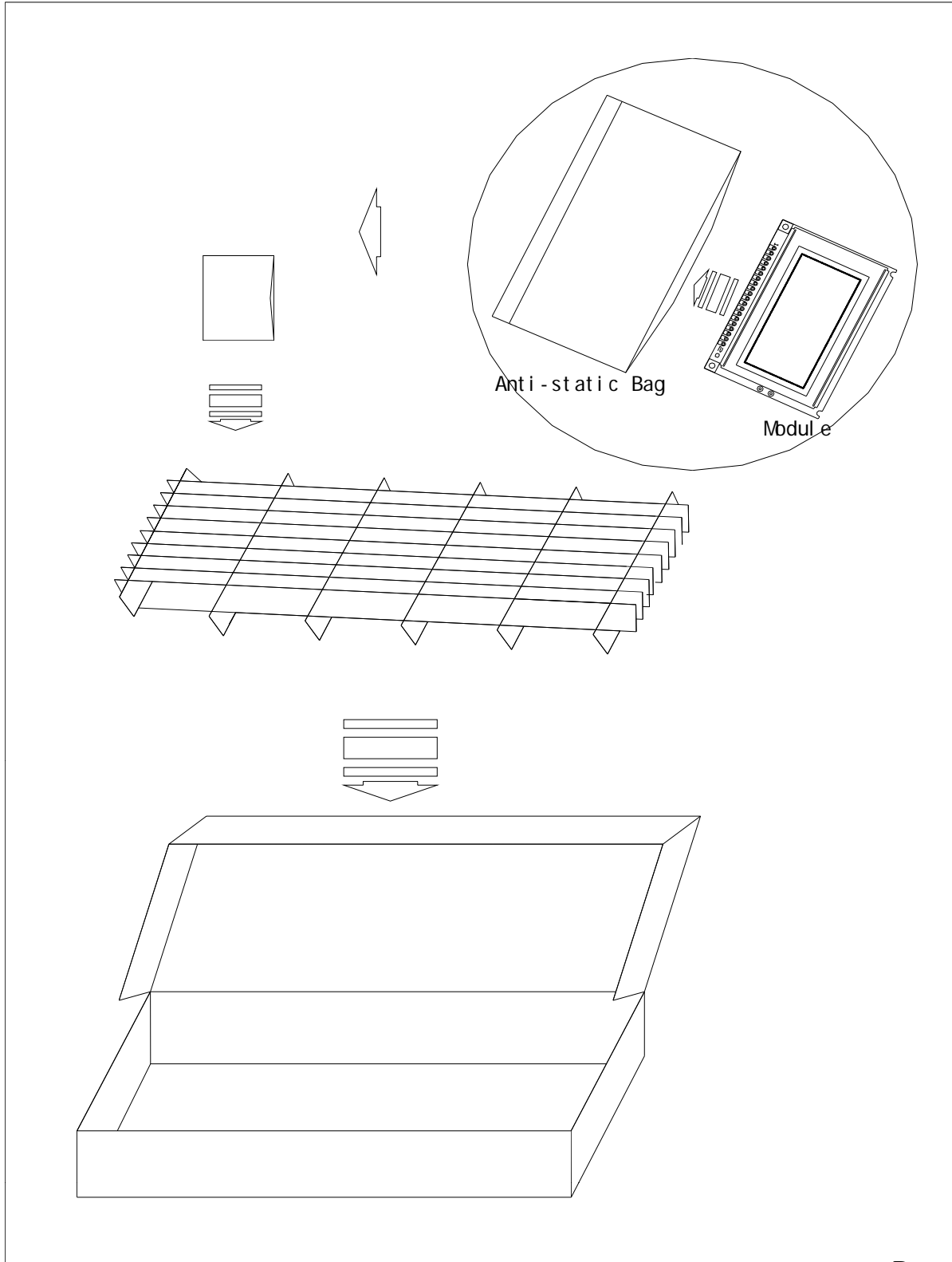


## 13.INTERFACE

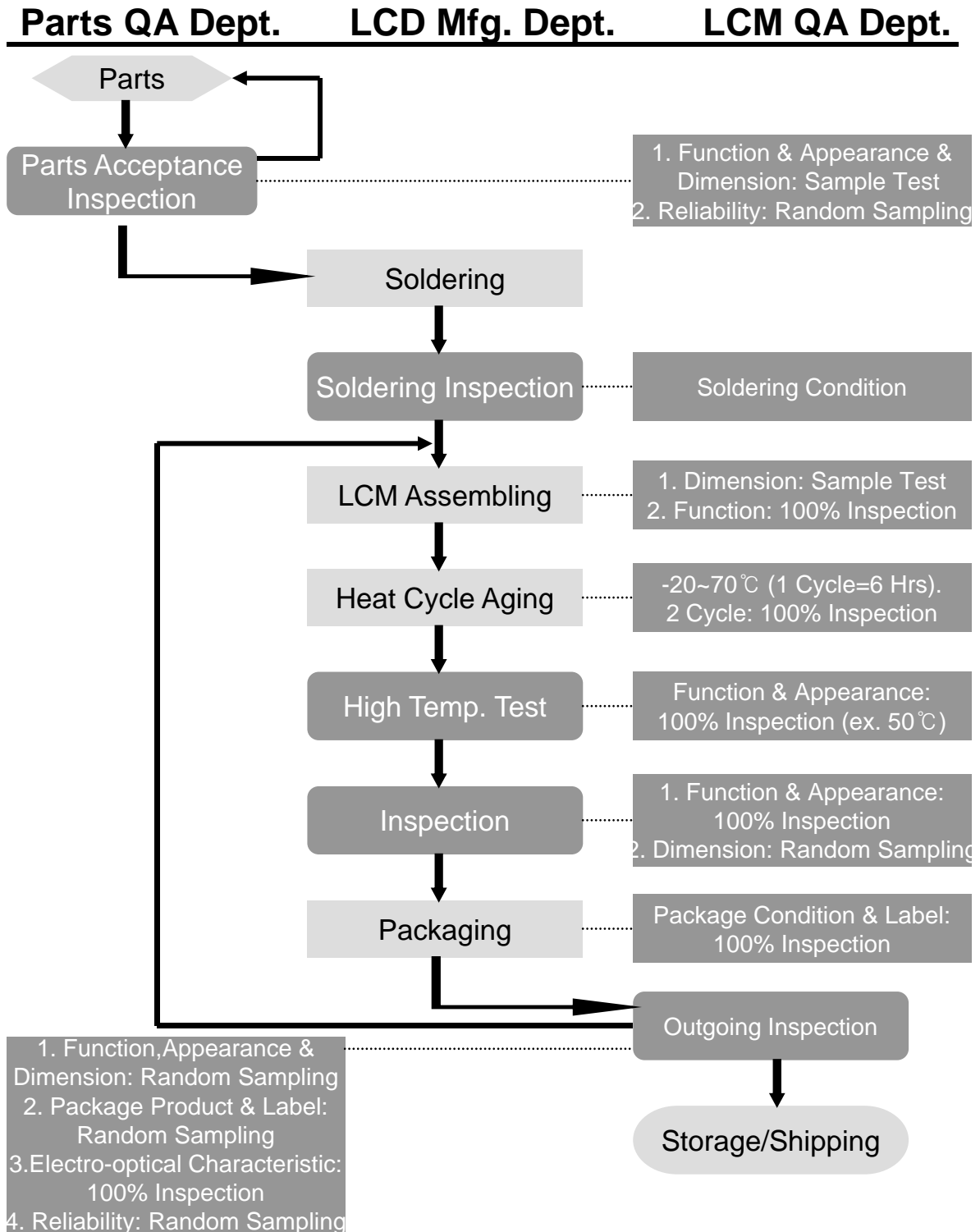
PIN NO.	SYMBOL	DESCRIPTION	FUNCTION
1	DB7	DATA BUS	8 BIT: DB0-DB7
2	DB6		
3	DB5		
4	DB4		
5	DB3		
6	DB2		
7	DB1		
8	DB0		
9	E	ENABLE SIGNAL	
10	R/W	READ/WRITE SELECTION	R/W = 0 : REGISTER WRITE R/W = 1 : REGISTER READ
11	RS	INSTRUCTION/DATA REGISTER SELECTION	RS = 0 : INSTRUCTION REGISTER RS = 1 : DATA REGISTER
12	V0	LCD CONTRAST ADJUSTMENT	
13	VSS	GROUND	0V (GND)
14	VDD	POWER SUPPLY FOR LOGIC CIRCUIT	+5V
15	LEDA	SUPPLY VOLTAGE FOR LED+	+3.3V
16	LEDK	SUPPLY VOLTAGE FOR LED-	0V

## 14. PACKAGE INFORMATION

A Box include 80pcs



# 15. QC/QA PROCEDURE



## 16. Handling Precaution

### 1. Limitation of Application:

Optrex products are designed for use in ordinary electronic devices such as business machines, telecommunications equipment, measurement devices and etc. Please handle the products with care. (see below)

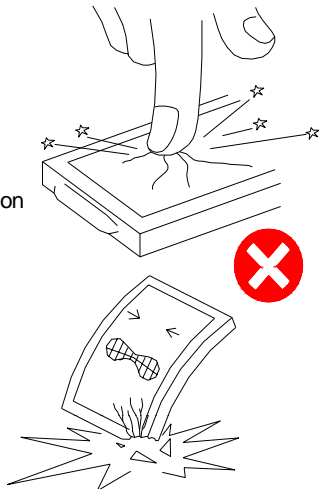
Optrex products are not designed, intended, or authorized for use in any application which the failure of the product could result in a situation where personal injury or death may occur. these applications include, but are not limited to. life-sustaining equipment, nuclear control devices, aerospace equipment, devices related to hazardous or flammable materials, etc. [If Buyer intends to purchase or use the Optrex Products for such unintended or unauthorized applications, Buyer must secure prior written consent to such use by a responsible officer of Optrex Corporation.] Should Buyer purchase or use Optrex Products for any such unintended or unauthorized application [without such consent]. Buyer shall indemnify and hold Optrex and its officers, employees, subsidiaries, affiliates and distributors harmless against all claims, costs, damages and expenses, and reasonable attorney's fees, arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Optrex was negligent regarding the design or manufacture of the part.

### 2. Industrial Rights and Patents

Optrex shall not be responsible for any infringement of industrial property rights of third parties in any country arising out of the application or use of Optrex products, except which directly concern the structure or production of such products.

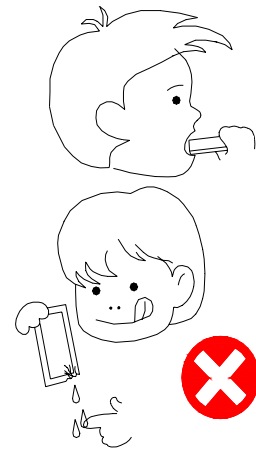
#### No Press and Shock!

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



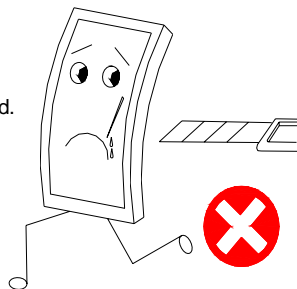
#### Don't Swallow or Touch Liquid Crystal!

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



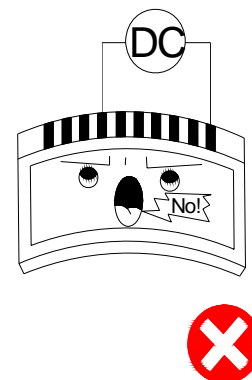
#### Don't not Scratch!

Polarizer is a soft material and can easily be scratched.



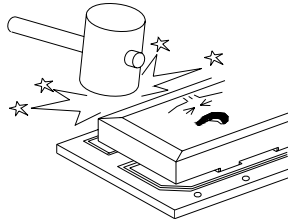
#### No DC Voltage to LCD!

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

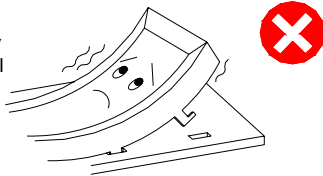


**Don't Press the Metallic Frame and Disassemble the LCM      Slowly Peel Off Protective Film!**

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.

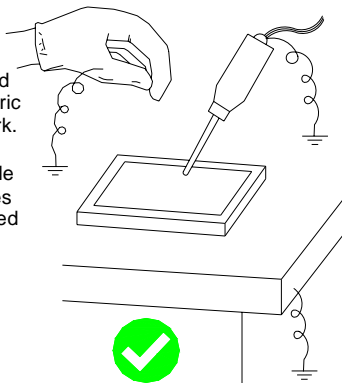


Avoid static electricity.



**Avoid Static Electricity!**

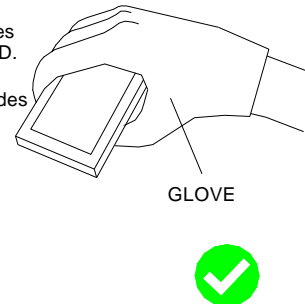
Please be sure to ground human body and electric appliances during work. It is preferable to use conductive mat on table and wear cotton clothes or conduction processed fiber. Synthetic fiber is not recommended.



**Wear Gloves While Handling!**

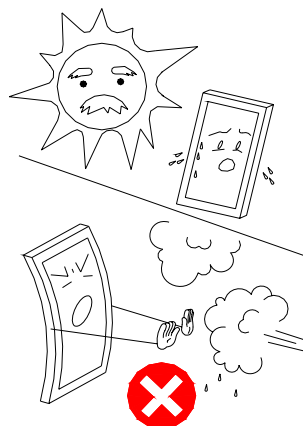
It is preferable to wear gloves to avoid damaging the LCD.

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



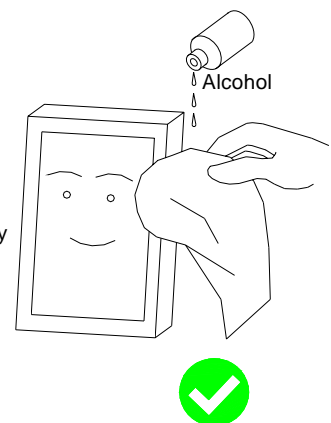
**Keep Away From Extreme Heat and Humidity!**

LCD deteriorates.



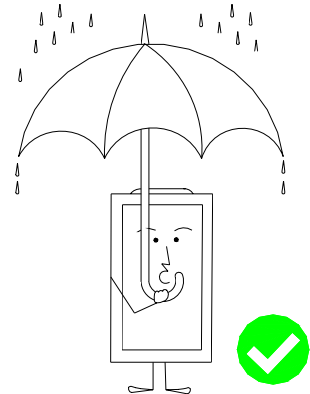
**Use Alcohol to Clean Terminals!**

When attaching with the heat seal or anisotropically 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 corrode 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:  $280 \pm 10^{\circ}\text{C}$

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  $+35^{\circ}\text{C}$  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.