# SPECIFICATION OF LCD MODULE

| | |
|---|---|
| **CUSTOMER**<br>客户名称 | |
| **PART NO.**<br>产品型号 | **JHD756B FP/W V3.0** |
| **PRODUCTS TYPE**<br>产品内容 | |
| **REMARKS**<br>备注 | |

**SIGNATURE BY CUSTOMER**
客户签署：

| APPROVED BY<br>李伟浩<br>JHD | CHECKED BY<br>王国选<br>JHD | ORGANIZED BY<br>郝黎明<br>JHD |
|---|---|---|

深圳市晶汉达电子有限公司

08年08月18日

## LCM System

**1** **LCD Type**

☐ STN     ■ FSTN     ☐ DFSTN

**2** **Viewing Angle**

■ Lower 6:00     ☐ Upper 12:00     ☐ Others

**3** **Display Mode**

☐ Yellow Green positive     ☐ Blue Negative     ☐ Grey positive

■ FSTN positive     ☐ FSTN negative

**4** **Polarizer Mode**

☐ Reflective     ■ Transflective     ☐ Transmissive

**5** **Connector**

☐ Pin     ☐ Heat sealed     ■ FPC

**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

## •REVISION RECORD

| REV. NO. | REV. DATE | DESCRIPTION OF REVISION | PAGE | REMARK |
|---|---|---|---|---|
| 1.0 | 12/10/07 | INITIAL RELEASE | ALL | |
| 2.0 | 18/08/08 | 1、Modify：OUTLINE DRAWING | 5、15 | |
| 3.0 | 06/11/09 | 1、Modify：OUTLINE DRAWING | 5、15 | |
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# CONTENTS

# 1. FEATURES

•Display construction……………     128*64 DOTS
•Display mode………………………     FSTN
•Display type………………………     Positive Transflective
•Backlight……………………………     LED/3.1V(White)
•Viewing direction…………………     6 o'clock
•Operating temperature……………     0 to 50 ℃
•Storage temperature  ……………     -10 to 60℃
•Driving voltage……………………     Single power
•Driving method……………………     1/65 duty, 1/9 bias
•Type…………………………………     COG (Chip On GLASS)
•Drive IC……………………………     ST7565R
•Number of data line………………     Serial/Parallel 6800/8080
                                   Series MPU interface
•Connector……………………………     FPC

# 2. MECHANICAL DATA

| ITEM | | WIDTH | HEIGHT | THICKNESS | UNIT |
|---|---|---|---|---|---|
| Module Size ( include component of FPC) | | 71.2 | 52.0+19.35 | 5.5(MAX) | mm |
| Resolution | | 128×64 | | | dots |
| Active area | | 60.78 | 32.94 | – | mm |
| Viewing area | | 67.0 | 40.0 | – | mm |
| Dot | Size | 0.45 | 0.49 | – | mm |
| | Pitch | 0.48 | 0.52 | – | mm |
| Diameter of mounting hole | | – | | | mm |

# 3. ABSOLUTE MAXIMUM RATINGS

| Cperation Votage | Symbol | Ratings |
|---|---|---|
| Operation Voltage | VDD | -0.3V~7.0V |
| Drive Supply Voltage | VLCD | -0.3V~17V |
| Input Voltage Range | VIN | -0.3V~VDD+0.3V |
| Operation Temperature | TOPR | 0℃~50 ℃ |
| Storage Temperature | TSTR | -10 ℃~60 ℃ |
| Humidity | --- | 90%RH |

# 4. ELECTRICAL CHARACTERISTICS

| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| Supply Voltage | Logic | $V_{DD}$ | --- | --- | 3.0 | --- | V |
| Input Voltage | H level | $V_{IH}$ | --- | $0.8V_{DD}$ | --- | $V_{DD}$ | V |
| | L level | $V_{IL}$ | | $V_{SS}$ | --- | $0.2V_{DD}$ | |
| Current Consumption | | $I_{DD}$ | With internal $V_{LCD}$ generation; $V_{DD}$=3.0V;Ta=25℃; 4x charge pump | --- | --- | 250 | uA |
| LCD Driving Voltage | | $V_{LCD}$ | Bias=1/9 VLCD=V0-Vss | 8.8 | 9.0 | 9.2 | V |

## 4.1 LED ELECTRICAL/OPTLCAL CHARACTERISTICS

| 项目Item | 符号<br>Symbol | 最小值<br>min | 典型值<br>typ | 最大值<br>max | 单位<br>Unit | 测定条件<br>Condition |
|---|---|---|---|---|---|---|
| 正向电压<br>Forward Voltage | Vf | — | 3.1 | — | V | If= 45mA |
| 反向电流<br>Reverse Current | Ir | — | 50 | — | uA | Vr= 5 V |
| 主波长<br>Dominant wave length | λp | — | X=0.29<br>Y=0.30 | — | nm | If=45mA |
| 频谱半宽度<br>Spectral Line Half width | Δλ | — | — | — | — | If=mA |
| *亮度<br>Luminance | Lv | 80 | 100 | — | cd/㎡ | If= 45mA |

## 4.2 LED ABSOLUTE MAXIMUM RATINGS

| Item | Symbol | Condition | Rating | Unit |
|---|---|---|---|---|
| Reverse  Voltage | Vr | Ta=25℃ | 5 | V |
| Absolute maximum forward current | Ifm | Ta=25℃ | 75 | mA |
| Power  description | pd | Ta=25℃ | 375 | mW |

## 4.2 .1 LED ARRAY BLOCK DIAGRAM

R1：0欧姆

R2：0 欧姆

A 〇 ────────────── 〇 K

R3：0 欧姆
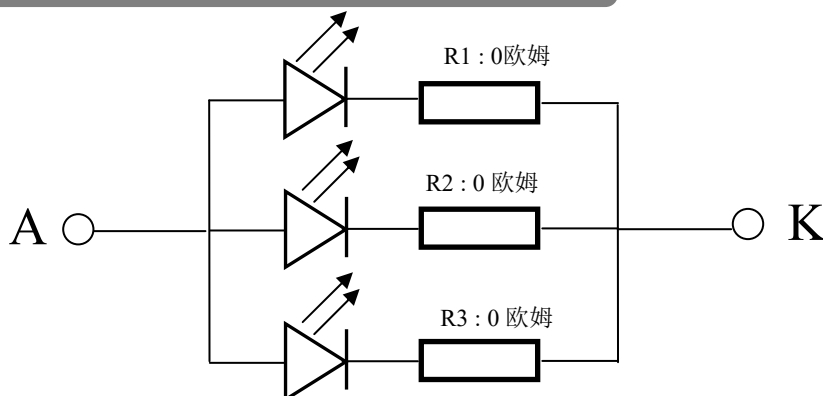
# 5. ELECTRO-OPTICAL CHARACTERISTICS

| ITEM | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT | NOTE |
|------|--------|-----------|------|------|------|------|------|
| Contrast ratio | K | φ=0 | 1.4 | 4 | - | - | 1 |
| Response time (rise) | Tr | φ=0 | - | 250 | 300 | ms | 2 |
| Response time (fall) | Tf | φ=0 | - | 250 | 350 | ms | 2 |
| Viewing angle | φ | K ≥2.0 | -40 -- +40 | | | deg. | 3 |
| | θ | | -40 -- +10 | | | | |

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

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

Brightness Curve of selected area

Brightness Curve of non-selected area

90%

Brightness

10%

A

B

Vop

Driving Voltage
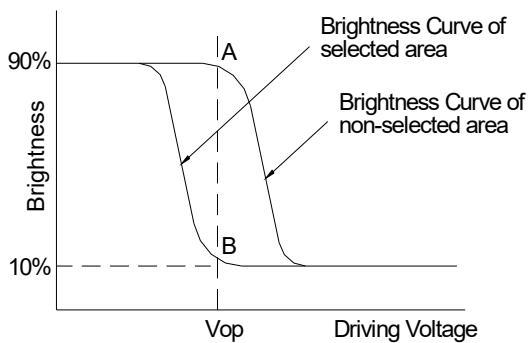
## Note 2: Definition of Optical Response Time

Non-selected    Selected    Non-selected

100%

Brightness

90%

10%

0%

Tr

Tf

Rise Time        Fall Time
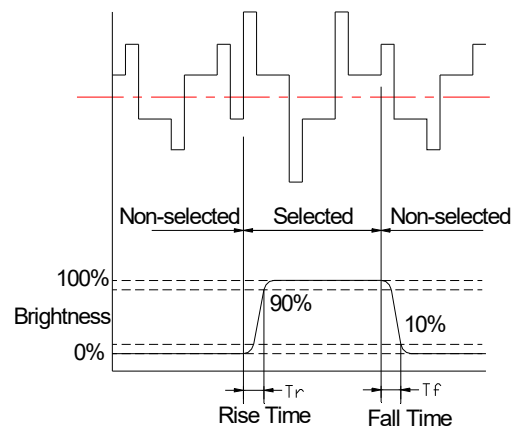
## Note 3: Definition of Viewing Angle

Left                          Right

∅    ∅

Viewing Surface

Top
Top Viewing Angle
θ

Top

Bottom

θ

Bottom
Bottom Viewing Angle
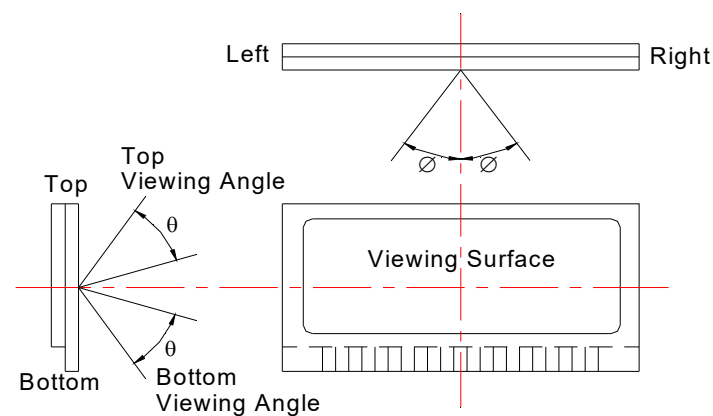
Please select either top or bottom viewing angle

# 6. BLOCK DIAGRAM

/CS1 → 
/RES → 
AO → 
/WR(R/W) → 
/RD(E) → 
D0~D7 ↔ 

**MPU Interface Serial**

V0 → 
V1 → 
V2 → 
V3 → 
V4 → 

**LCD Controller Interface ST7565R**

COM1~64 / → **LCD PANEL 128✕64 DOTS**

SEG1~128 /

VDD → 
VSS → 
VOUT → 

**LCD Driving Power Circuit**

C1+
C1-      C1 : 1uF/16V
C3+      C2 : 1uF/16V
C2+      C3 : 1uF/16V
C2-

C4 : 1uF/16V
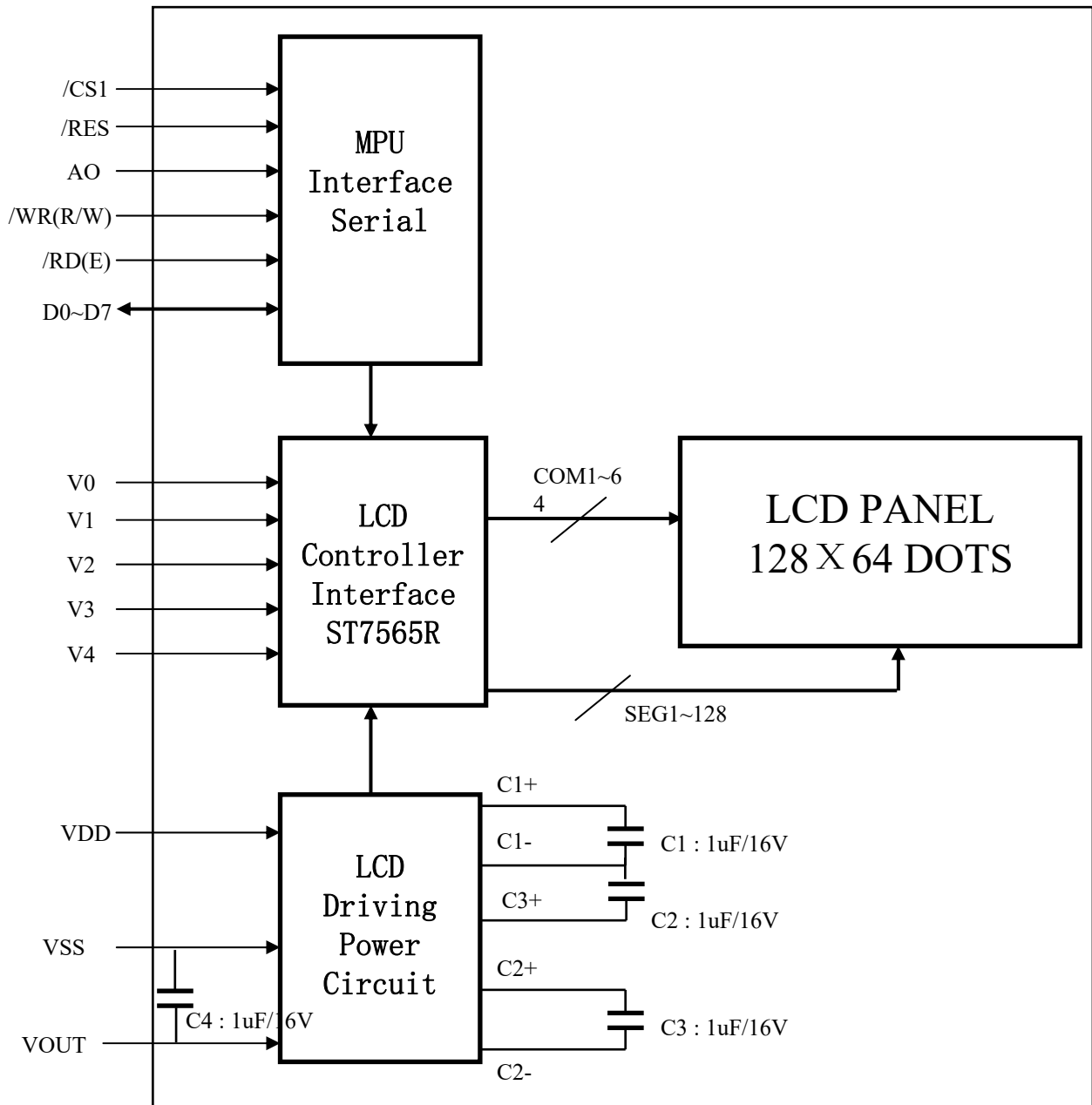
# 7. TIMING DIAGRAM

**System Bus Read/Write Characteristics 1 (For the 8080 Series MPU)**
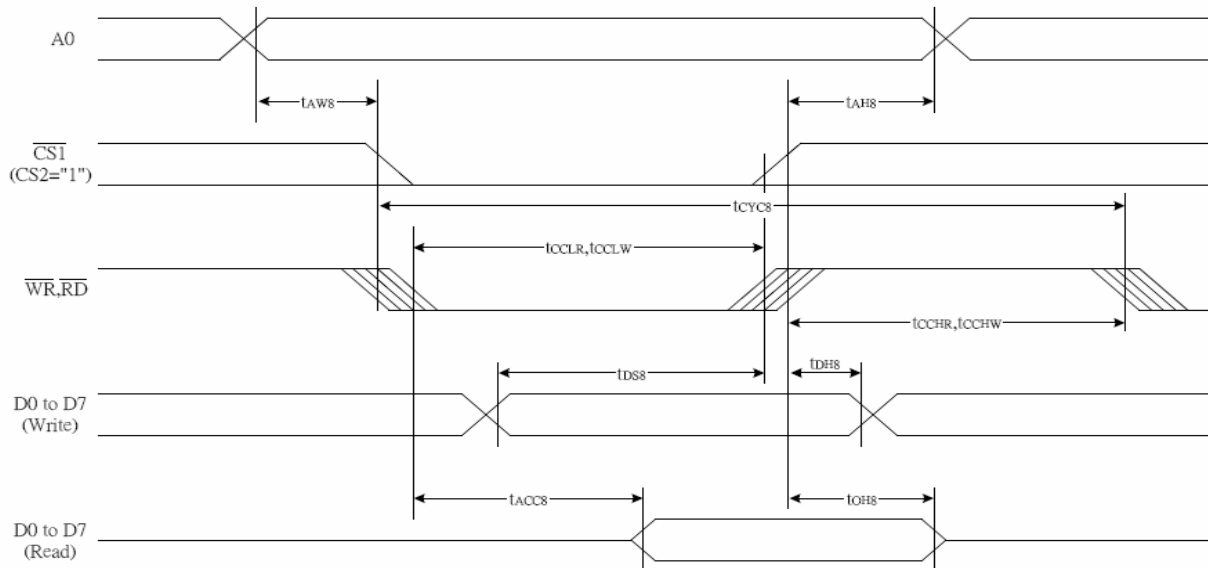


(V$_{DD}$ = 3.3V, Ta = –30 to 85°C)

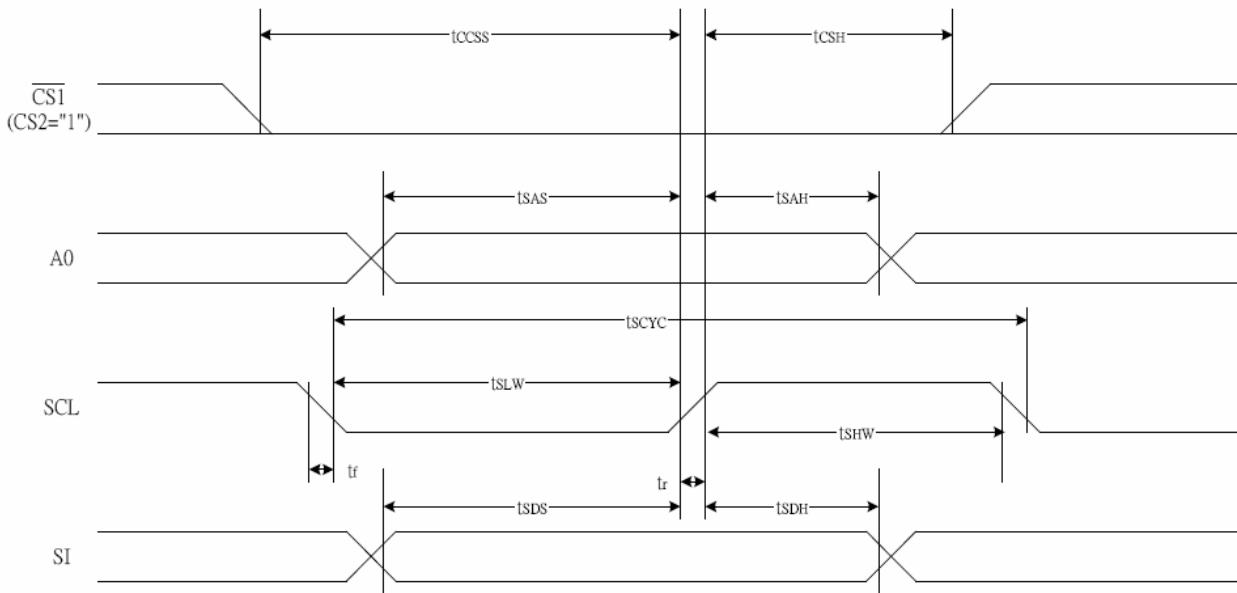| Item | Signal | Symbol | Condition | Rating Min. | Rating Max. | Units |
|---|---|---|---|---|---|---|
| Address hold time | A0 | t$_{AH8}$ | | 0 | — | Ns |
| Address setup time | | t$_{AW8}$ | | 0 | — | |
| System cycle time | | t$_{CYC8}$ | | 240 | — | |
| Enable L pulse width (WRITE) | WR | t$_{CCLW}$ | | 80 | — | |
| Enable H pulse width (WRITE) | | t$_{CCHW}$ | | 80 | — | |
| Enable L pulse width (READ) | RD | t$_{CCLR}$ | | 140 | — | |
| Enable H pulse width (READ) | | t$_{CCHR}$ | | 80 | — | |
| WRITE Data setup time | D0 to D7 | t$_{DS8}$ | | 40 | — | |
| WRITE Address hold time | | t$_{DH8}$ | | 0 | — | |
| READ access time | | t$_{ACC8}$ | C$_L$ = 100 pF | — | 70 | |
| READ Output disable time | | t$_{OH8}$ | C$_L$ = 100 pF | 5 | 50 | |
| Address hold time | A0 | t$_{AH8}$ | | 0 | — | ns |
| Address setup time | | t$_{AW8}$ | | 0 | — | |
| System cycle time | | t$_{CYC8}$ | | 400 | — | |
| Enable L pulse width (WRITE) | WR | t$_{CCLW}$ | | 220 | — | |
| Enable H pulse width (WRITE) | | t$_{CCHW}$ | | 180 | — | |
| Enable L pulse width (READ) | RD | t$_{CCLR}$ | | 220 | — | |
| Enable H pulse width (READ) | | t$_{CCHR}$ | | 180 | — | |
| WRITE Data setup time | D0 to D7 | t$_{DS8}$ | | 40 | — | |
| WRITE Address hold time | | t$_{DH8}$ | | 0 | — | |
| READ access time | | t$_{ACC8}$ | C$_L$ = 100 pF | — | 140 | |
| READ Output disable time | | t$_{OH8}$ | C$_L$ = 100 pF | 10 | 100 | |

**System Bus Read/Write Characteristics 2 (For the 6800 Series MPU)**
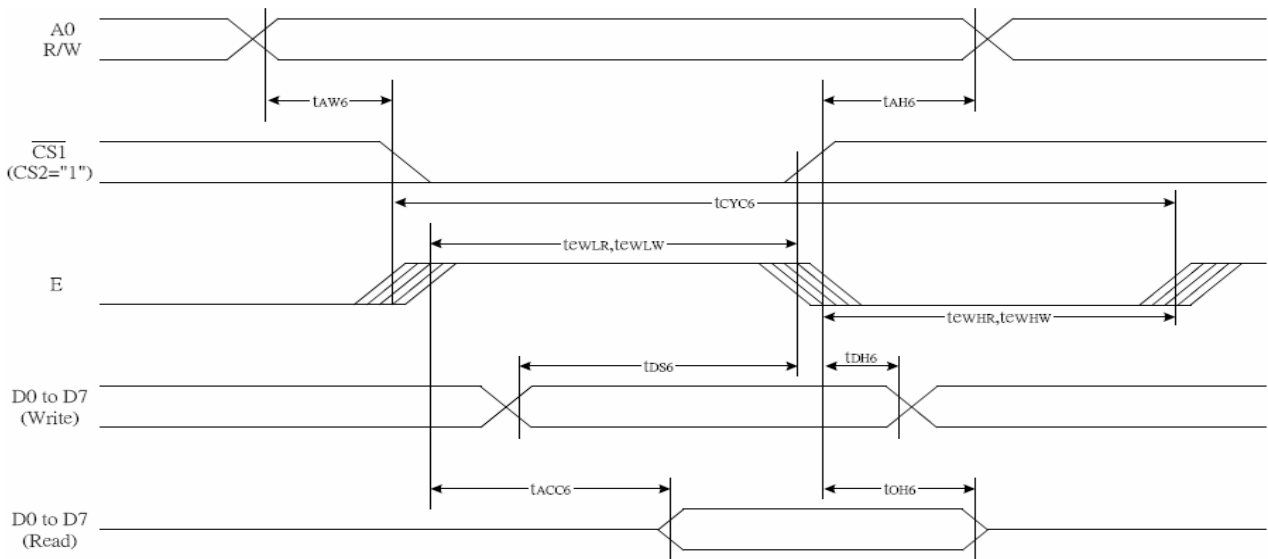


(V$_{DD}$ = 3.3V, Ta = –30 to 85°C)

| Item | Signal | Symbol | Condition | Min. | Max. | Units |
|---|---|---|---|---|---|---|
| Address hold time | A0 | t$_{AH6}$ | | 0 | — | |
| Address setup time | | t$_{AW6}$ | | 0 | — | |
| System cycle time | | t$_{CYC6}$ | | 240 | — | |
| Enable L pulse width (WRITE) | WR | t$_{EWLW}$ | | 80 | — | |
| Enable H pulse width (WRITE) | | t$_{EWHW}$ | | 80 | — | |
| Enable L pulse width (READ) | RD | t$_{EWLR}$ | | 80 | — | ns |
| Enable H pulse width (READ) | | t$_{EWHR}$ | | 140 | | |
| WRITE Data setup time | D0 to D7 | t$_{DS6}$ | | 40 | — | |
| WRITE Address hold time | | t$_{DH6}$ | | 0 | — | |
| READ access time | | t$_{ACC6}$ | C$_L$ = 100 pF | — | 70 | |
| READ Output disable time | | t$_{OH6}$ | C$_L$ = 100 pF | 5 | 50 | |
| Address hold time | A0 | t$_{AH6}$ | | 0 | — | |
| Address setup time | | t$_{AW6}$ | | 0 | — | |
| System cycle time | | t$_{CYC6}$ | | 400 | — | |
| Enable L pulse width (WRITE) | WR | t$_{EWLW}$ | | 220 | — | |
| Enable H pulse width (WRITE) | | t$_{EWHW}$ | | 180 | — | |
| Enable L pulse width (READ) | RD | t$_{EWLR}$ | | 220 | — | ns |
| Enable H pulse width (READ) | | t$_{EWHR}$ | | 180 | — | |
| WRITE Data setup time | D0 to D7 | t$_{DS6}$ | | 40 | — | |
| WRITE Address hold time | | t$_{DH6}$ | | 0 | — | |
| READ access time | | t$_{ACC6}$ | C$_L$ = 100 pF | — | 140 | |
| READ Output disable time | | t$_{OH6}$ | C$_L$ = 100 pF | 10 | 100 | |

**The Serial Interface**



(V$_{DD}$ = 3.3V, Ta = −30 to 85°C)

| Item | Signal | Symbol | Condition | Rating Min. | Rating Max. | Units |
|---|---|---|---|---|---|---|
| Serial Clock Period | SCL | T$_{scyc}$ | | 50 | — | ns |
| SCL "H" pulse width | | T$_{shw}$ | | 25 | — | |
| SCL "L" pulse width | | T$_{SLW}$ | | 25 | — | |
| Address setup time | A0 | T$_{SAS}$ | | 20 | — | |
| Address hold time | | T$_{sah}$ | | 10 | — | |
| Data setup time | SI | T$_{sds}$ | | 20 | — | |
| Data hold time | | T$_{SDH}$ | | 10 | — | |
| CS-SCL time | CS | T$_{css}$ | | 20 | — | |
| CS-SCL time | | T$_{csh}$ | | 40 | — | |

# 8. INSTRUCTION SET

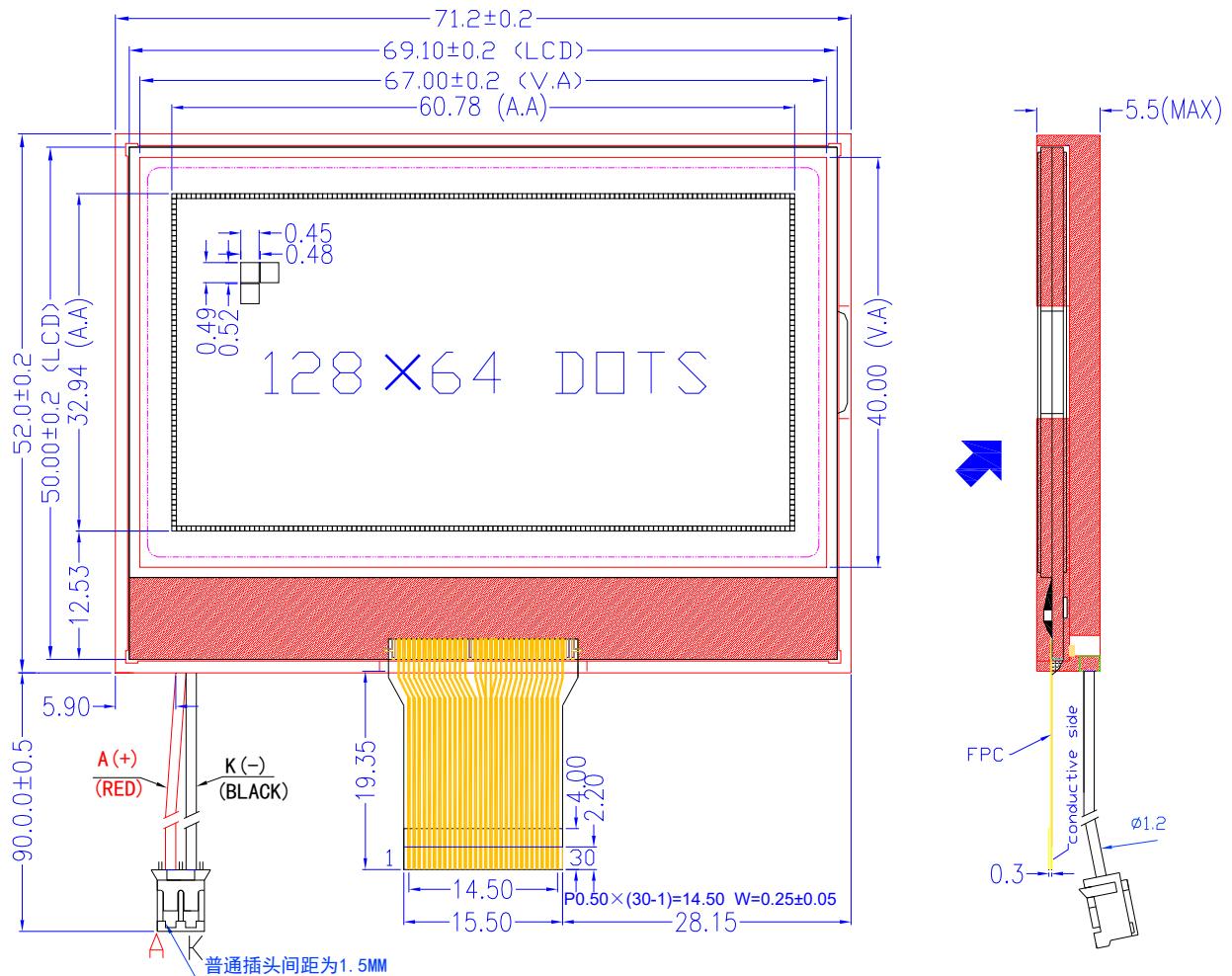| Command | A0 | /RD | /WR | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Function |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) Display ON/OFF | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 / 1 | LCD display ON/OFF 0: OFF, 1: ON |
| (2) Display start line set | 0 | 1 | 0 | 0 | 1 | Display start address |||||| Sets the display RAM display start line address |
| (3) Page address set | 0 | 1 | 0 | 1 | 0 | 1 | 1 | Page address ||||  Sets the display RAM page address |
| (4) Column address set upper bit | 0 | 1 | 0 | 0 | 0 | 0 | 1 | Most significant column address |||| Sets the most significant 4 bits of the display RAM column address. |
| Column address set lower bit | 0 | 1 | 0 | 0 | 0 | 0 | 0 | Least significant column address |||| Sets the least significant 4 bits of the display RAM column address. |
| (5) Status read | 0 | 0 | 1 | Status |||| 0 | 0 | 0 | 0 | Reads the status data |
| (6) Display data write | 1 | 1 | 0 | Write data |||||||| Writes to the display RAM |
| (7) Display data read | 1 | 0 | 1 | Read data |||||||| Reads from the display RAM |
| (8) ADC select | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 / 1 | Sets the display RAM address SEG output correspondence 0: normal, 1: reverse |
| (9) Display normal/ reverse | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 / 1 | Sets the LCD display normal/ reverse 0: normal, 1: reverse |
| (10) Display all points ON/OFF | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 / 1 | Display all points 0: normal display 1: all points ON |
| (11) LCD bias set | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 / 1 | Sets the LCD drive voltage bias ratio 0: 1/9 bias, 1: 1/7 bias (ST7565P) |
| (12) Read/modify/write | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | Column address increment At write: +1 At read: 0 |
| (13) End | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | Clear read/modify/write |
| (14) Reset | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | Internal reset |
| (15) Common output mode select | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 / 1 | * | * | * | Select COM output scan direction 0: normal direction 1: reverse direction |
| (16) Power control set | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | Operating mode ||| Select internal power supply operating mode |
| (17) V0 voltage regulator internal resistor ratio set | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | Resistor ratio ||| Select internal resistor ratio(Rb/Ra) mode |
| (18) Electronic volume mode set | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | Set the V0 output voltage electronic volume register |
| Electronic volume register set | | | | 0 | 0 | Electronic volume value |||||| |
| (19) Static indicator ON/OFF | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 / 1 | 0: OFF, 1: ON |
| Static indicator register set | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 Mode || Set the flashing mode |
| (20) Booster ratio set | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | select booster ratio 00: 2x,3x,4x 01: 5x 11: 6x |
| | | | | 0 | 0 | 0 | 0 | 0 | 0 | step-up value || |
| (21) Power saver | | | | | | | | | | | | Display OFF and display all points ON compound command |
| (22) NOP | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | Command for non-operation |
| (23) Test | 0 | 1 | 0 | 1 | 1 | 1 | 1 | * | * | * | * | Command for IC test. Do not use this command |

# 9. INSTRUCTION SEQUENCE

I NIT:

```
LCALL DEL_20MS
CLR RESET
LCALL DEL_20MS
SETB RESET
LCALL DEL_20MS
MOV A,#81H
LCALL WC1
MOV A,BIAS
LCALL WC1

;MOV A,#84H
;LCALL WC1
;MOV A,#07H
;LCALL WC1
;MOV A,#82H
;LCALL WC1
;MOV A,#05H
;LCALL WC1

MOV A,#0A0H      ;ADC
LCALL WC1
MOV A,#0C8H      ;SHL
LCALL WC1
MOV A,#0A3H
LCALL WC1
MOV A,#2FH
LCALL WC1
MOV A,#25H
LCALL WC1
MOV A,#040H      ;COM0
LCALL WC1
MOV A,#0AFH
LCALL WC1
        RET
```
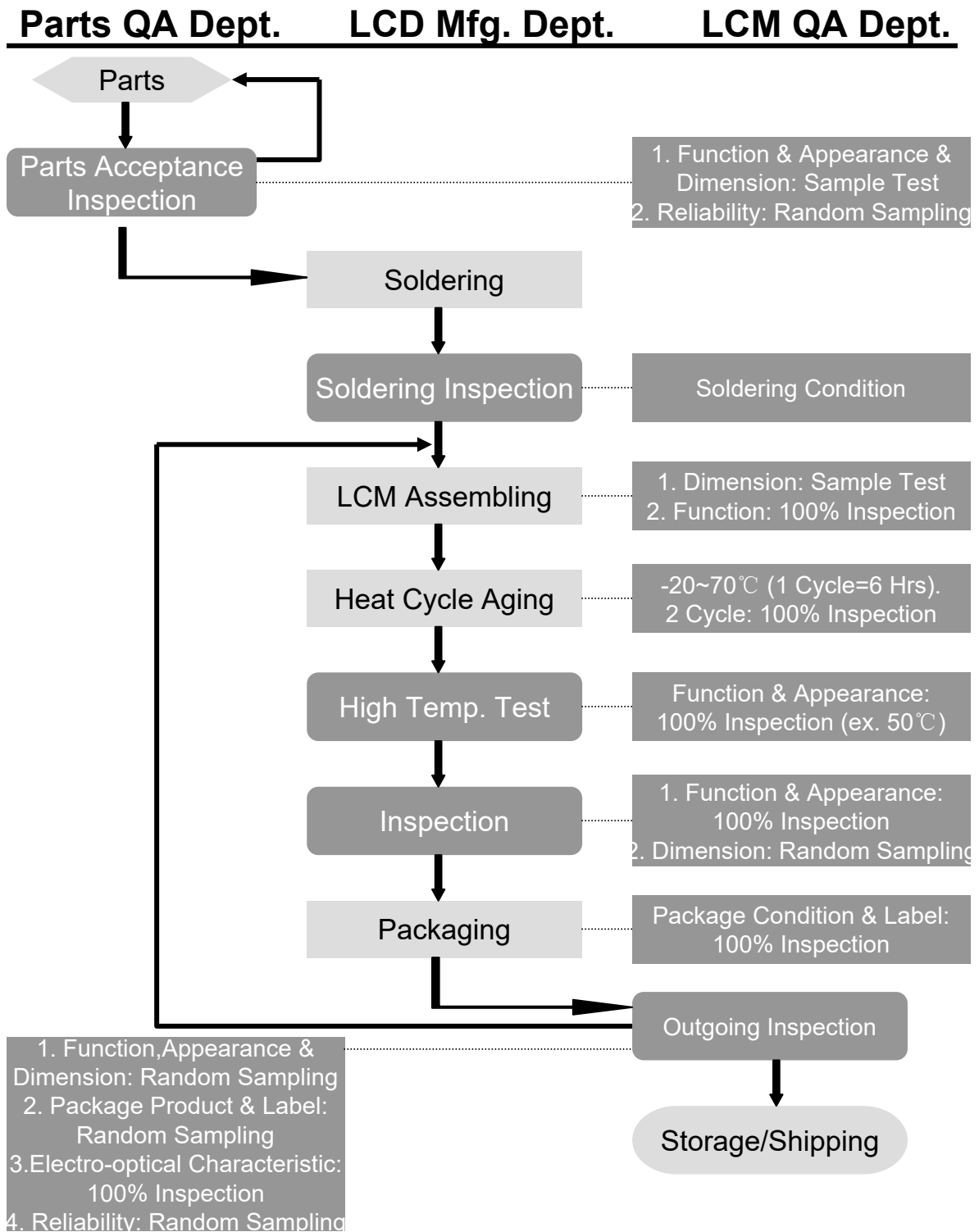
# 10. EXTERNAL DIMENSION

# 11.INTERFACE

| PIN | SYMBOL | I/O | LEVEL | INSTRUCTION |
|-----|--------|-----|-------|-------------|
| 1 | INTRS | I | H/L | This terminal selects the resistors for the V0 voltage level adjustment.<br>IRS = "H": Use the internal resistors<br>IRS = "L": Do not use the internal resistors. |
| 2 | PS | I | H/L | This pin configures the interface to be parallel mode or serial mode.<br>P/S = "H": Parallel data input/output.<br>P/S = "L": Serial data input. |
| 3 | C86 | I | H/L | This is the MPU interface selection pin.<br>C86 = "H": 6800 Series MPU interface.<br>C86 = "L": 8080 Series MPU interface. |
| 4 | VR | I | - | Output voltage regulator terminal. Provides the voltage between VSS and V0 through a resistive voltage divider.<br>IRS = "L" : the V0 voltage regulator internal resistors are not used.<br>IRS = "H" : the V0 voltage regulator internal resistors are used. |
| 5~9 | V0~V4 | I/O | - | LCD drive supplay voltage.<br>The voltage determined by LCD pixel is impedance converted by an operational amplifier for application.<br>Voltage should have the following relationship:<br>V0≥V1 ≥V2 ≥V3≥V4 ≥VSS. |
| 10 | C2- | O | - | Capacitor 2 negative Connection pin for voltage converter. |
| 11 | C2+ | O | - | Capacitor 2 positive Connection pin for voltage converter. |
| 12 | C1+ | O | - | Capacitor 1 positive Connection pin for voltage converter. |
| 13 | C1- | O | - | Capacitor 1 negative Connection pin for voltage converter. |
| 14 | C3+ | O | - | Capacitor 3 positive Connection pin for voltage converter. |
| 15 | VOUT | I/O | - | Voltage converter input/output pin. |
| 16 | VSS | SUPPLY | L | Ground |
| 17 | VDD | SUPPLY | H | Power Supply Voltage |
| 18~25 | D7(SI)<br>D6(SCL)<br>D5~D0 | I/O | H/L | This is an 8-bit bi-directional data bus that connects to an 8-bit  or 16bit standard MPU data bus. |
| 26 | /RD<br>(E) | I | H/L | 8080:Read execution control pin.<br>6800:enable clock input control pin. |
| 27 | /WR<br>(R/W) | I | H/L | 8080:Write execution control pin.<br>6800:When R/W = "H": Read.<br>        When R/W = "L": Write. |
| 28 | A0 | I | H/L | Register  select input pin. |
| 29 | /RES | I | L | Reset select input pin,low effective. |
| 30 | /CS1 | I | L | Chip select input pin,low effective. |

# 12. QC/QA PROCEDURE

| Parts QA Dept. | LCD Mfg. Dept. | LCM QA Dept. |
|---|---|---|

Parts

Parts Acceptance Inspection

1. Function & Appearance & Dimension: Sample Test
2. Reliability: Random Sampling

Soldering

Soldering Inspection ········· Soldering Condition

LCM Assembling
1. Dimension: Sample Test
2. Function: 100% Inspection

Heat Cycle Aging
-20~70℃ (1 Cycle=6 Hrs).
2 Cycle: 100% Inspection

High Temp. Test
Function & Appearance: 100% Inspection (ex. 50℃)

Inspection
1. Function & Appearance: 100% Inspection
2. Dimension: Random Sampling

Packaging
Package Condition & Label: 100% Inspection

Outgoing Inspection

1. Function,Appearance & Dimension: Random Sampling
2. Package Product & Label: Random Sampling
3.Electro-optical Characteristic: 100% Inspection
4. Reliability: Random Sampling

Storage/Shipping

## 13. RELIABILITY

### •Operating life time:

Longer than 50000 hours (at room temperature without direct irradiation of sunlight)

### •Reliability Characteristics:

| Item | Test | Criterion |
|---|---|---|
| High temp | 50℃ / 200 Hrs | ■Total current consumption should be below double of initial value<br>■Contrast ratio should be within initial value±50%<br>■No defect in cosmetic and operational function is allowable |
| Low temp. | 0℃ / 200 Hrs | |
| High humidity | 40℃ * 90%RH / 200 Hrs | |
| Thermal shock | 0℃→25℃→50℃→25℃ /5 Cycles (30min) (5min) (30min) (5min) | |
| Vibration | 1.Operating time: Thirty minutes exposure in each direction (x, y, z)<br>2.Sweep Frequency (1min):10Hz→55Hz →10Hz<br>3.Amplitude: 0.75mm double amplitude | |

# 14. 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!
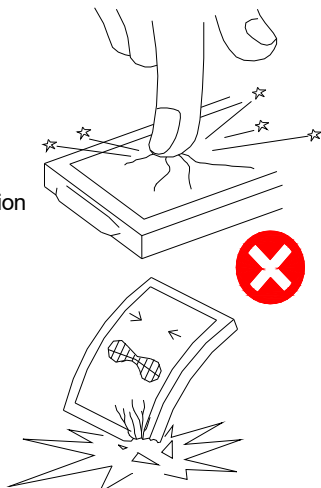


## Don't Swallow or Touch Liquid Crystal!

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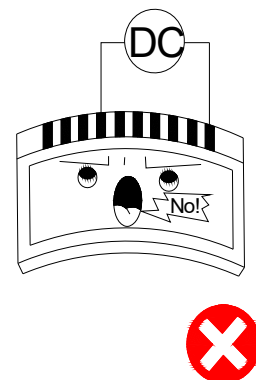If it accidentally gets your hands,
  wash then with water!
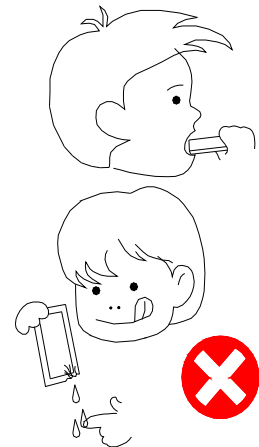


## Don't not Scratch!

Polarizer is a soft material
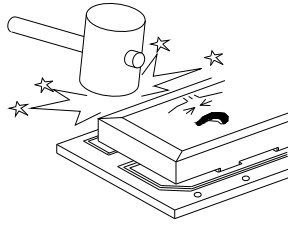  and can easily be scratched.
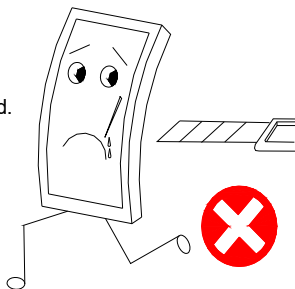


## No DC Voltage to LCD!

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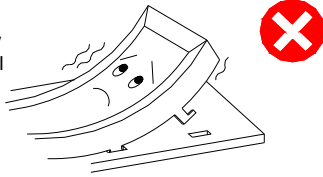  will reduce the lifetime of
  the LCD.

## Don't Press the Metallic Frame and Disassemble the 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.
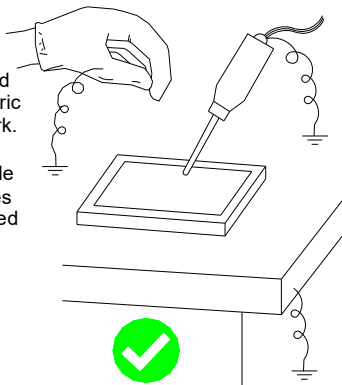
## Wear Gloves While Handing!

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

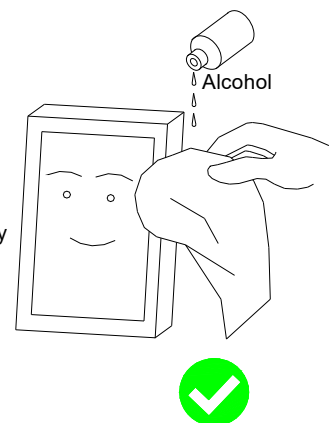Please do not touch electrodes with bare hands or make them dirty.

GLOVE
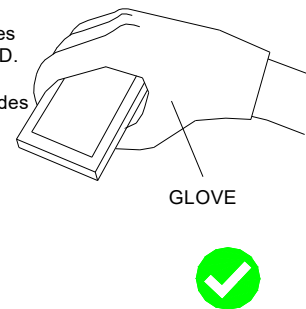
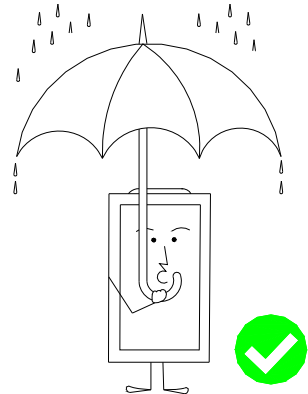## Keep Away From Extreme Heat and Humidity!

LCD deteriorates.
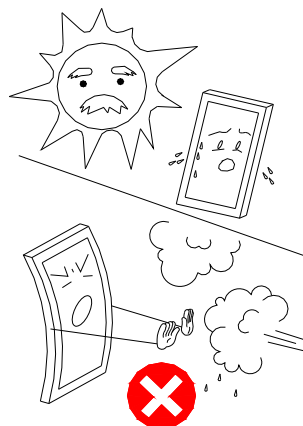
## Use Alcohol to Clean Terminals!

Alcohol

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℃
　　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℃ 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.