BATRON

# Specification

## BTHQ 128064AVO-FETF-06-LEDWHITE02-COG (NT7538)

**Version June 2008**

Supplied by:
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# RECORDS OF REVISION

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Total：29 Pages

## Contents

# 1. SPECIFICATIONS

## 1.1 Features

| Item | Standard Value |
|---|---|
| Display Type | 128 * 64 Dots |
| LCD Type | FSTN , Positive , Transflective type |
| Driver Condition | LCD Module : 1/65 Duty , 1/9 Bias |
| Viewing Direction | 6 O'clock |
| Backlight | White LED B/L |
| Weight | 32g |
| Interface | 8- bit parallel data input / Serial data input |
| Other(controller / driver IC) | NOVATEK --- NT7538 |
| ROHS | THIS PRODUCT CONFORMS THE ROHS OF PTC |

## 1.2 Mechanical Specifications

| Item | Standard Value | Unit |
|---|---|---|
| Outline Dimension | 89.7 (L) * 49.8 (w) * 6.3 (H)(Max) | mm |
| Viewing Area | 69.0 (L) *36.5 (w) | mm |
| Active Area | 63.857 (L) * 31.921 (w) | mm |
| Dot Size | 0.484(L) * 0.484 (w) | mm |
| Dot Pitch | 0.499 (L) * 0.499 (w) | mm |

Note：For detailed information please refer to LCM drawing

## 1.3 Absolute Maximum Ratings

| Item | Symbol | Condition | Min. | Max. | Unit |
|---|---|---|---|---|---|
| Power Supply Voltage | $V_{dd}$ | — | -0.3 | 4.0 | V |
| LCD Driver Supply Voltage | $V_{LCD}$ | — | 0.3 | 15.0 | V |
| Input Voltage | $V_{IN}$ | — | -0.3 | VDD+0.3 | V |
| Operating Temperature | $T_{OP}$ | — | -20 | 70 | ℃ |
| Storage Temperature | $T_{ST}$ | — | -30 | 80 | ℃ |
| Storage Humidity | $H_D$ | Ta＜60 ℃ | - | 90 | %RH |

## 1.4 DC Electrical Characteristics

Ta = 25℃

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Logic Supply Voltage | $V_{dd}$ | - | 2.7 | 3.0 | 3.3 | V |
| "H" Input Voltage | $V_{IH}$ | - | 0.8VDD | - | VDD | V |
| "L" Input Voltage | $V_{IL}$ | - | VSS | - | 0.2VDD | V |
| "H" Output Voltage | $V_{OH}$ | IOH=-0.5 mA | 0.8VDD | - | VDD | V |
| "L" Output Voltage | $V_{OL}$ | IOL=0.5 mA | VSS | - | 0.2VDD | V |
| Supply Current | $I_{dd}$ | $V_{DD}$= 3.0V;$V_{OP}$=9.0V; Pattern= Full display | - | 0.6 | - | mA |
| | | $V_{DD}$= 3.0V;$V_{OP}$=9.0V; Pattern= Horizontal line*1 | - | 2.0 | 3.0 | |
| LCM Driver Voltage | $V_{OP}$ *2 | -20℃ | | | | V |
| | | 25℃ | 13.0 | 13.2 | 13.4 | |
| | | 70℃ | | | | |

NOTE: *1 The Maximum current display

*2 The VOP test point is V1-VSS.

## 1.5 Optical Characteristics

LCD Panel:1/65Duty,1/9Bias,$V_{LCD}$ =13.2V,Ta =25℃

| Item | | Symbol | Conditions | Min. | Typ. | Max. | Unit | Reference |
|---|---|---|---|---|---|---|---|---|
| Response Time | Rise | tr | C≥2.0, ∅ = 270° | - | 70 | 105 | ms | Note2 |
| | Fall | tf | | - | 210 | 315 | | |
| Viewing angle range | Top | ΘY+ | | - | - | 40 | Deg. | Notes 1 |
| | Bottom | ΘY- | | - | - | 40 | | |
| | Left | ΘX- | | - | - | 45 | | |
| | Right | ΘX+ | | - | - | 45 | | |
| Contrast Ratio | | C | θ = 0°, ∅ =270° | 11 | - | - | | Note 3 |
| Average Brightness (with LCD) *1 | | IV | IF=60mA VF=3.5V | 80 | 100 | - | $cd/m^2$ | |
| CIE Color Coordinate (With LCD) *1 | | X | | 0.27 | 0.30 | 0.33 | | Note 4 |
| | | Y | | 0.29 | 0.32 | 0.35 | | |
| Uniformity *2 | | △B | | 70 | - | - | % | |

Note 4 :

1：△B=B(min) / B(max) * 100%

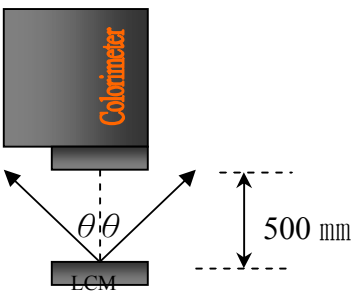
2：Measurement Condition for Optical Characteristics:

a：Environment: 25℃±5℃ / 60±20%R.H，no wind，dark room below 10 Lux at typical lamp current and typical operating frequency.

b：Measurement Distance: 500 ± 50 ㎜ ，(θ= 0°)

c：Equipment: TOPCON BM-7 fast，(field 1°)，after 10 minutes operation.

d：The uncertainty of the C.I.E coordinate measurement ±0.01，Average Brightness ± 4%

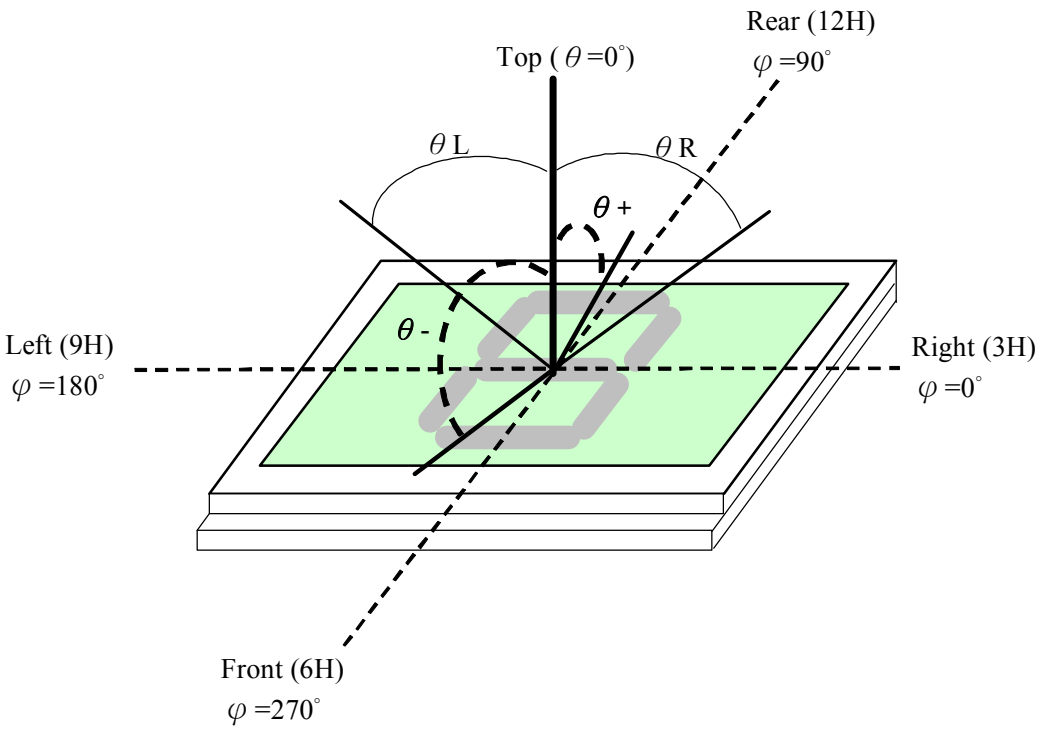




Colorimeter=BM-7 fast

Note 1.

Optical characteristics-2

Viewing angle

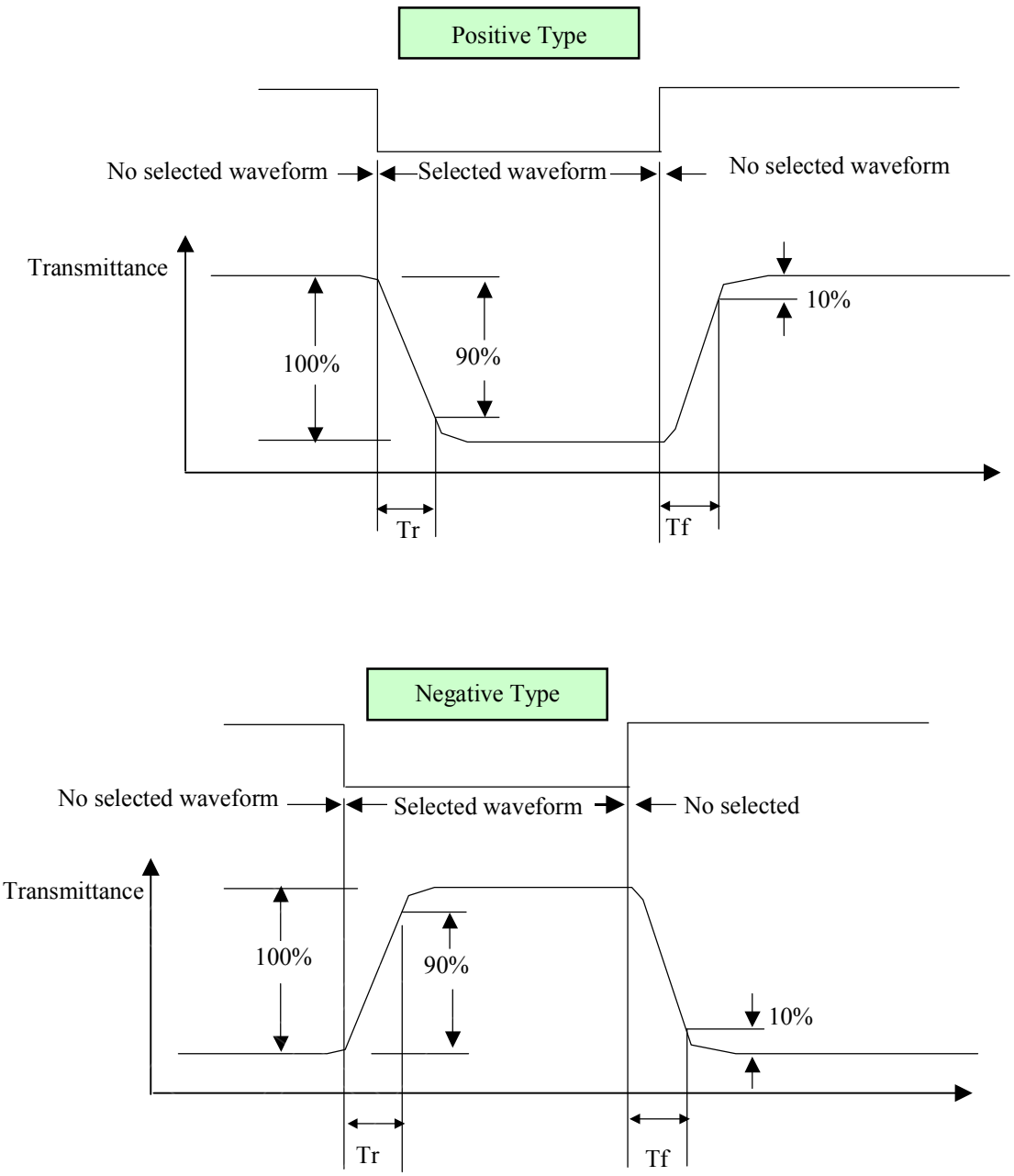



**Viewing angle**

Note 2.

Optical characteristics-3

Fig.2 Definition of response time



Electrical characteristics-2

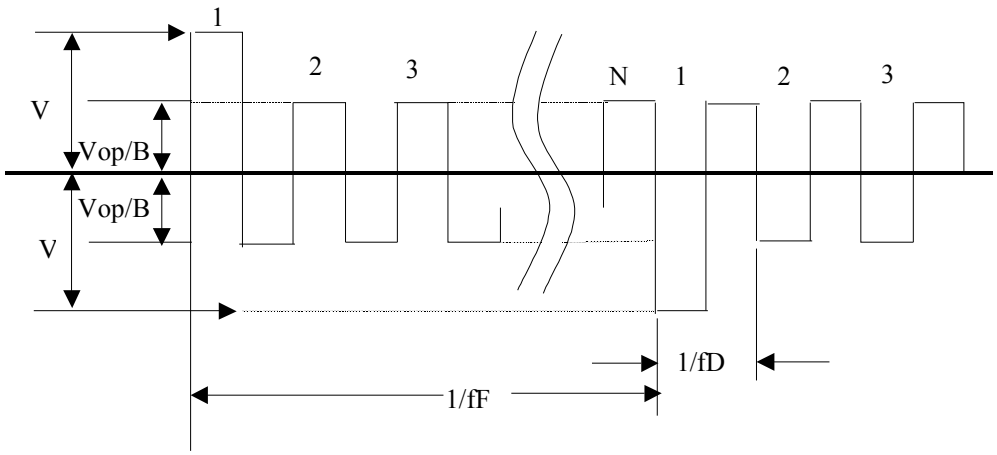
※2 Drive waveform

Vop: Drive voltage fF: Frame frequency

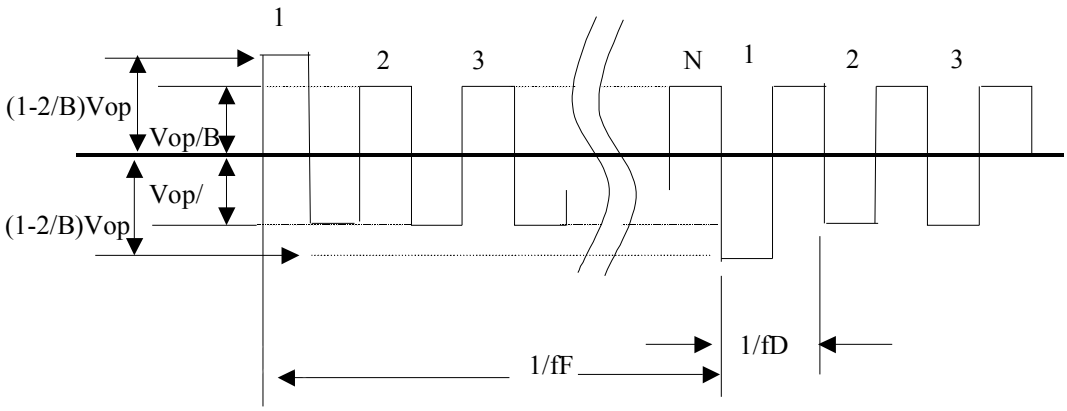
1/B: Bias fD: Drive frequency

N: Duty

(1) Selected waveform



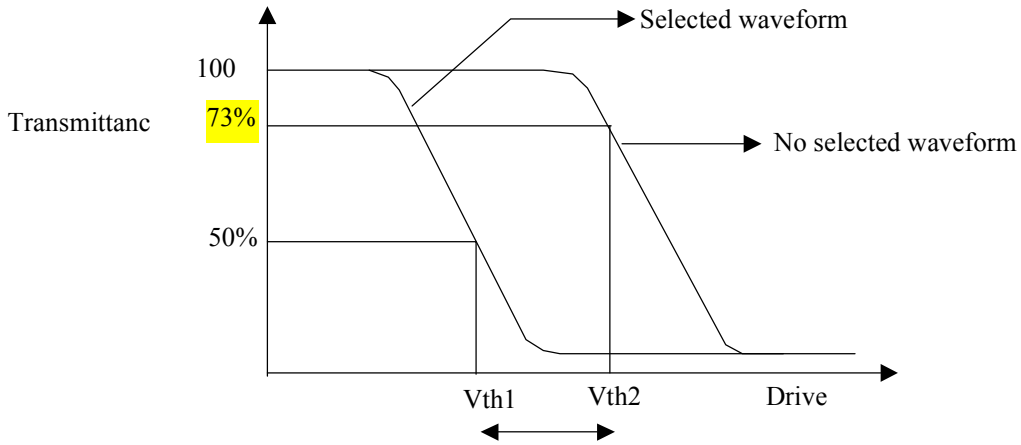

(2) Non- Selected wave form




Note:

Frame frequency is defined as follows: Common side supply voltage peak - to - peak /2 = 1 period

Note 3. : Definition of Vth

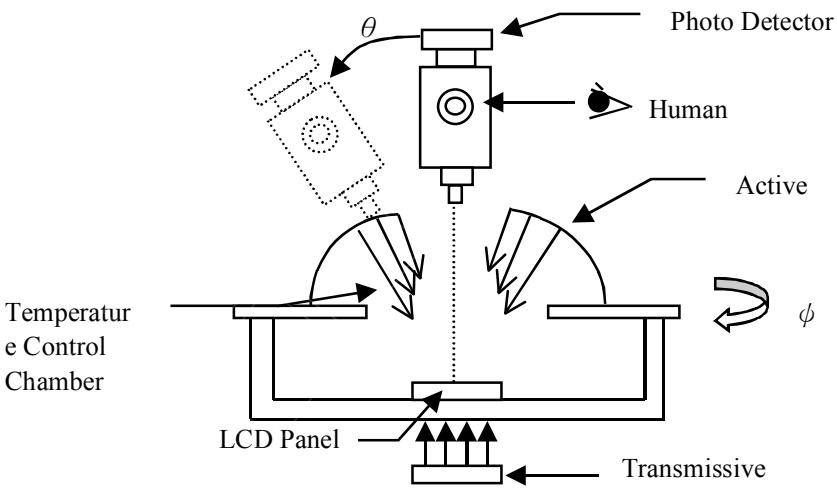



Active voltage range

| | Vth1 | Vth2 |
|---|---|---|
| View direction | 10° | 40° |
| Drive waveform | (Selected waveform) | (No selected waveform) |
| Transmittance | 50% | 73% |

※1 Contrast ratio
= (Brightness in OFF state) / (Brightness in ON state)

Outline of Electro-Optical Characteristics Measuring System




Measuring System: Autronic DMS-803

## 1.6 Backlight Characteristics

LCD Module with LED Backlight

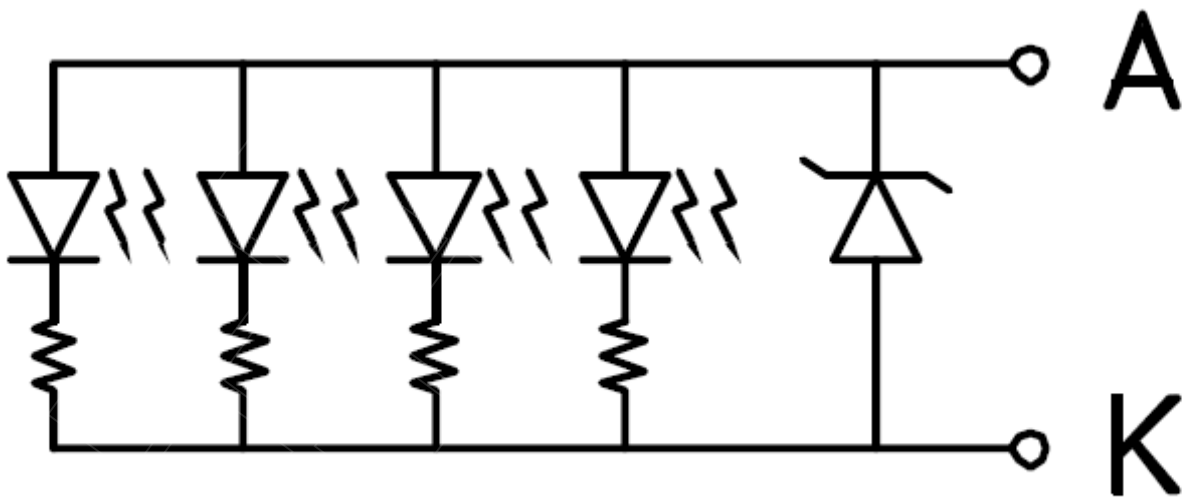
Maximum Ratings

| Item | Symbol | Conditions | Min. | Max. | Unit |
|---|---|---|---|---|---|
| Forward Current | IF | Ta =25℃ | - | 100 | mA |
| Reverse Voltage | VR | Ta =25℃ | - | 1.0 | V |
| Power Dissipation | PD | Ta =25℃ | - | 300 | W |

Electrical / Optical Characteristics

| Item | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Forward Voltage | VF | IF=60mA | - | 3.5 | 3.8 | V |
| Average Brightness (without LCD) | IV | | 220 | 250 | - | $cd/m^2$ |
| CIE Color Coordinate (Without LCD) | X | | 0.25 | 0.28 | 0.31 | - |
| | Y | | 0.25 | 0.28 | 0.31 | |
| Color | White | | | | | |

Internal Circuit Diagram:



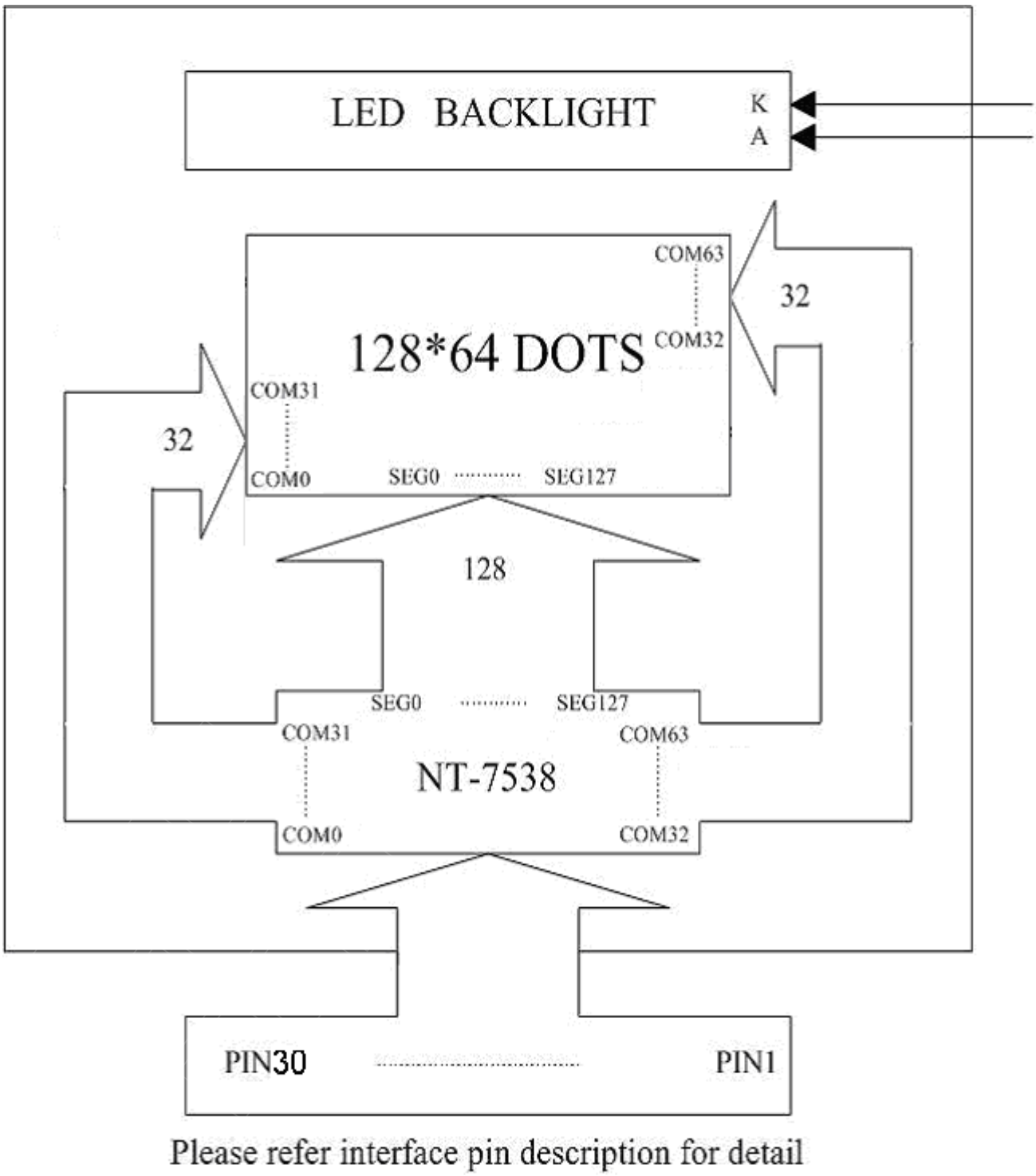
# 2. MODULE STRUCTURE

## 2.1 Counter Drawing

### 2.1.1 LCM Mechanical Diagram

* See Appendix

### 2.1.2 Block Diagram




Please refer interface pin description for detail

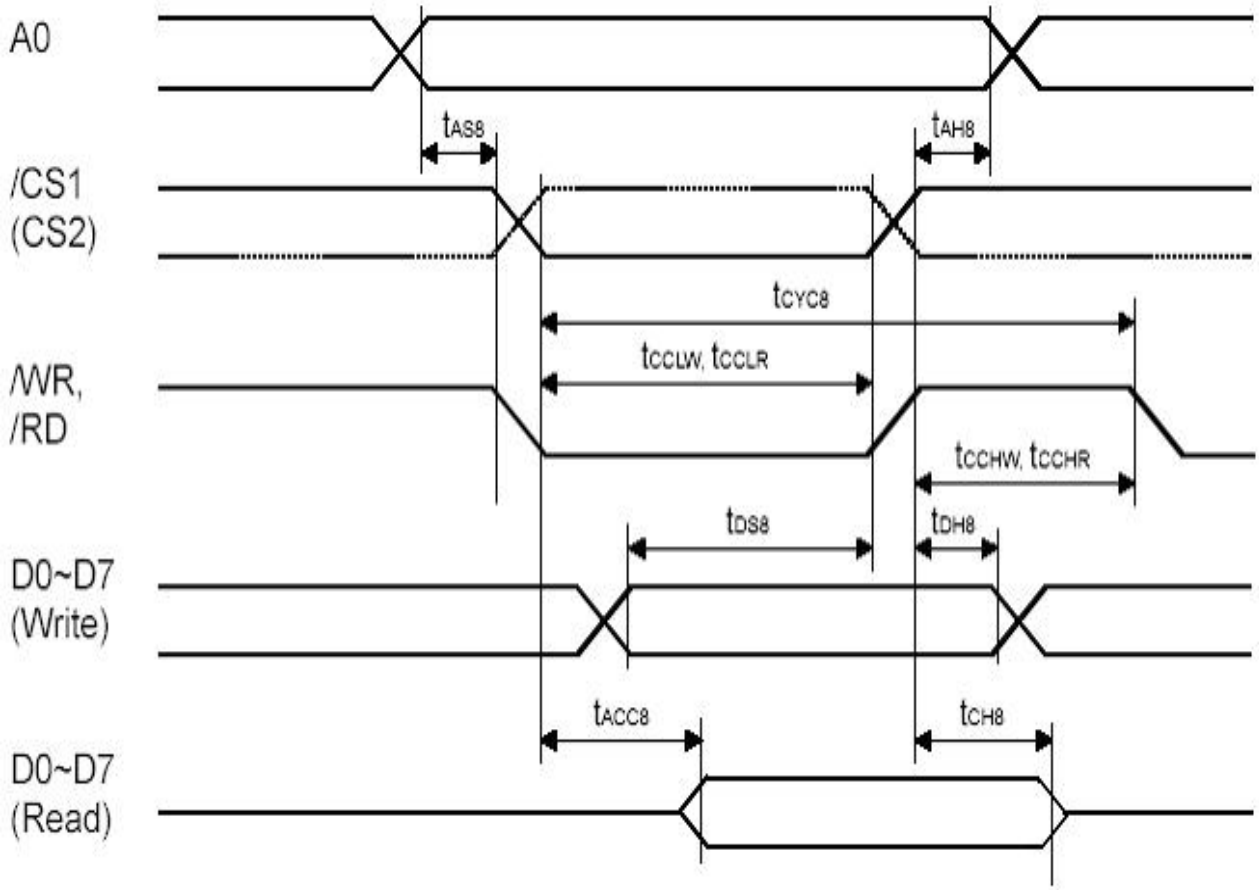
## 2.2 Interface Pin Description

| | | |
|---|---|---|
| 1 | CS1 | This is the chip select signal. When /CS1="L" and CS2="H", then the chip select becomes active, and data/command I/O is enabled. |
| 2 | RES | When /RES is set to "L", the settings are initialized. The reset operation is performed by the /RES signal level |
| 3 | A0 | This is connected to the least significant bit of the normal MPU address bus, and it determines whether the data bits are data or a command.<br>A0 = "H": Indicate that D0 to D7 are display data<br>A0 = "L": Indicates that D0 to D7 are control data |
| 4 | WR | When connected to an 8080 MPU, this is active LOW. This terminal connects to the 8080 MPU /WR signal. The signals on the data bus are latched at the rising edge of the /WR signal.<br>When connected to a 6800 Series MPU, this is the read/write control signal input terminal.<br>When R/W = "H": Read<br>When R/W = "L": Write |
| 5 | RD | When connected to an 8080 MPU, it is active LOW. This pad is connected to the /RD signal of the 8080MPU, and the NT7538 data bus is in an output status when this signal is "L".<br>When connected to a 6800 Series MPU, this is active HIGH.<br>This is used as an enable clock input of the 6800 series MPU |
| 6 | D0 | This is an 8-bit bi-directional data bus that connects to an 8-bit or 16-bit standard MPU data bus.<br>When the serial interface is selected (P/S="L"), then D7 serves as the serial data input terminal (SI) and D6 serves as the serial clock input terminal (SCL). When the serial interface is selected, fix D0~D5 pads to VDD or VSS level.<br>When the chip select is inactive, D0 to D7 are set to high impedance. |
| 7 | D1 | |
| 8 | D2 | |
| 9 | D3 | |
| 10 | D4 | |
| 11 | D5 | |
| 12 | D6 | |
| 13 | D7 | |
| 14 | VDD | Power Supply (VDD=3.3) |
| 15 | VSS | Power Supply (VSS=0) |
| 16 | VOUT | DC/DC voltage converter output |
| 17 | C3+ | Capacitor 3+ pad for internal DC/DC voltage converter. |
| 18 | C1+ | Capacitor 1+ pad for internal DC/DC voltage converter. |
| 19 | C1- | Capacitor 1- pad for internal DC/DC voltage converter. |

<table>
<tr><td>20</td><td>C2-</td><td>Capacitor 2- pad for internal DC/DC voltage converter.</td></tr>
<tr><td>21</td><td>C2+</td><td>Capacitor 2+ pad for internal DC/DC voltage converter.</td></tr>
<tr><td>22</td><td>V1</td><td rowspan="5">LCD driver supplies voltages. The voltage determined by the LCD cell is impedance-converted by a resistive driver or an operation amplifier for application. Voltages should be according to the following relationship:<br>V1 ≥ V2 ≥ V3 ≥ V4 ≥V5 ≥ VSS2<br>When the on-chip operating power circuit is on, the following voltages are supplied to V1 to V4 by the on-chip power circuit. Voltage selection is performed by the LCD Bias Set command.</td></tr>
<tr><td>23</td><td>V2</td></tr>
<tr><td>24</td><td>V3</td></tr>
<tr><td>25</td><td>V4</td></tr>
<tr><td>26</td><td>V5</td></tr>
<tr><td>27</td><td>VR</td><td>Voltage adjustment pad. Applies voltage between V0 and VSS using a resistive divider.</td></tr>
<tr><td>28</td><td>C86</td><td>This is the MPU interface switch terminal<br>C86 = “H”: 6800 Series MPU interface<br>C86 = “L”: 8080 Series MPU interface</td></tr>
<tr><td>29</td><td>P/S</td><td>This is the parallel data input/serial data input switch terminal<br>P/S = “H”: Parallel data input<br>P/S = “L”: Serial data input<br>The following applies depending on the P/S status:
<table>
<tr><td>P/S</td><td>Data/Command</td><td>Data</td><td>Read/Write</td><td>Serial Clock</td></tr>
<tr><td>“H”</td><td>A0</td><td>D0 to D7</td><td>/RD, /WR</td><td>-</td></tr>
<tr><td>“L”</td><td>A0</td><td>SI (D7)</td><td>Write only</td><td>SCL (D6)</td></tr>
</table></td></tr>
<tr><td>30</td><td>C4+</td><td>Capacitor 4+ pad for internal DC/DC voltage converter.</td></tr>
</table>

## 2.3 Timing Characteristics

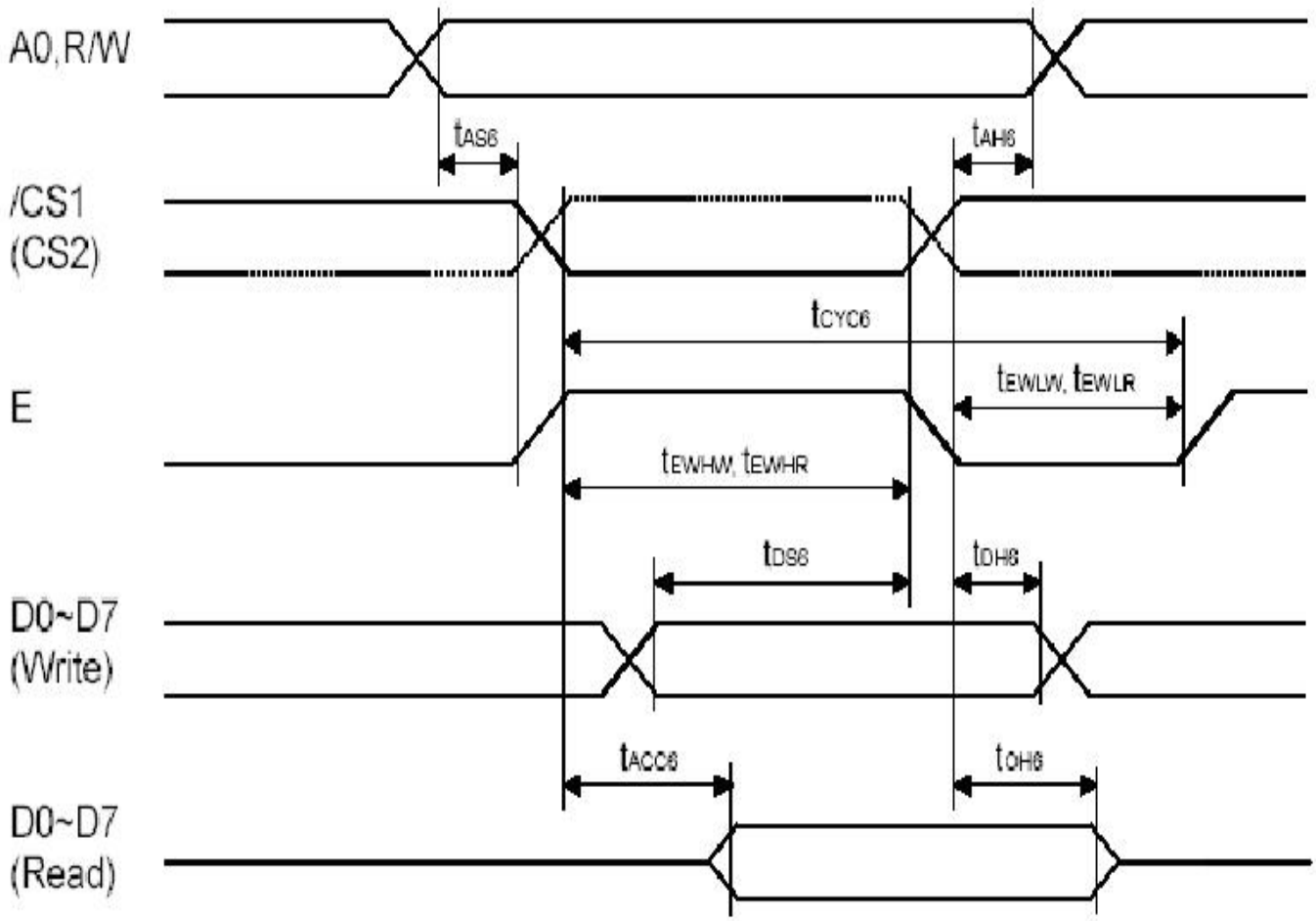
System Bus Read/Write Timing (8080 Family MPU)




(VDD = 3.0 ~ 3.6V, Ta = -20 ~ 70 □ C)

| Item | Signal | Symbol | Condition | Rating | | Units |
|---|---|---|---|---|---|---|
| | | | | Min. | Max. | |
| Address hold time | A0 | $t_{AH8}$ | | 0 | - | ns |
| Address setup time | | $t_{AS8}$ | | 0 | - | |
| System cycle time | | $t_{CYC8}$ | | 240 | - | |
| Enable L pulse width (WRITE) | WR | $t_{CCLW}$ | | 90 | - | |
| Enable H pulse width (WRITE) | | $t_{CCHW}$ | | 100 | - | |
| Enable L pulse width (READ) | RD | $t_{CCLR}$ | | 120 | - | |
| Enable H pulse width (READ) | | $t_{CCHR}$ | | 60 | | |
| Data setup time | D0 to D7 | $t_{DS8}$ | | 40 | - | |
| Data hold time | | $t_{DH8}$ | | 0 | - | |
| /RD access time | | $t_{ACC8}$ | $C_L$=100pF | - | 140 | |
| Output disable time | | $t_{OH8}$ | $C_L$=100pF | 5 | 50 | |

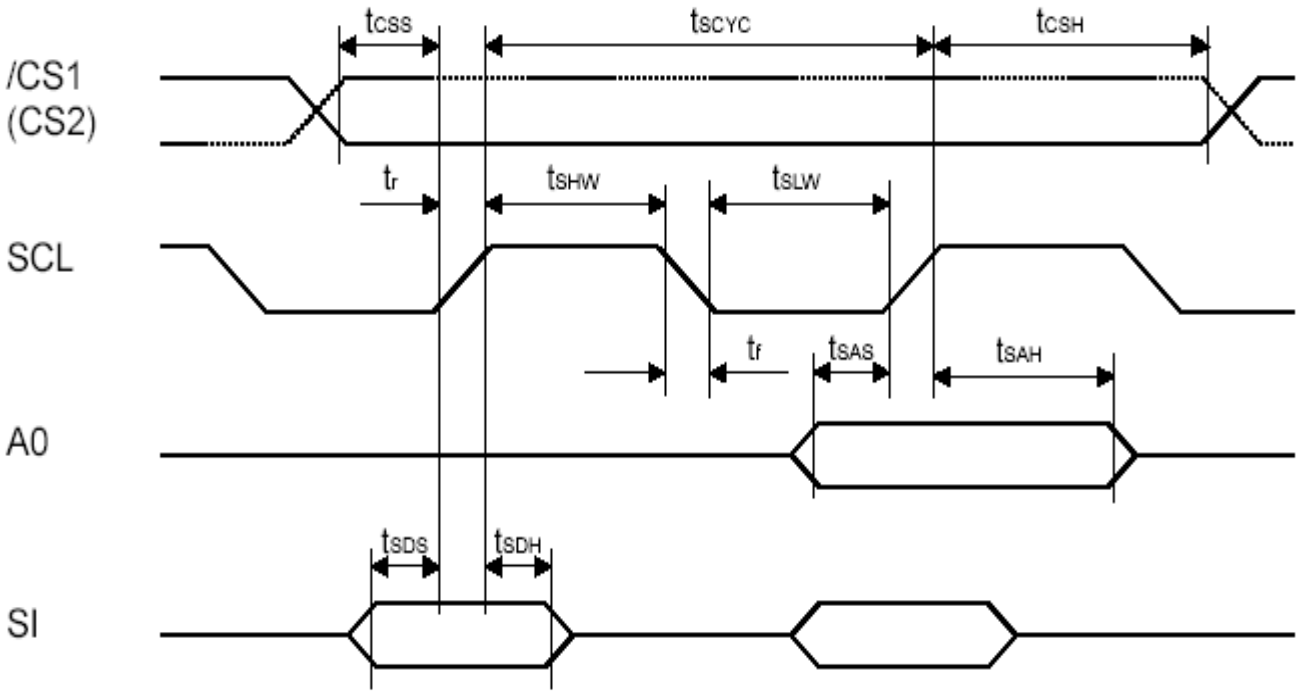
System Bus Read/Write Timing (6800 Family MPU)




(VDD = 3.0 ~ 3.6V, Ta = -20 ~ 70° C)

| Item | Signal | Symbol | Condition | Rating | | Units |
|---|---|---|---|---|---|---|
| | | | | Min. | Max. | |
| Address hold time | A0,RW | $t_{AH6}$ | | 0 | - | ns |
| Address setup time | | $t_{AS6}$ | | 0 | - | |
| System cycle time | | $t_{CYC6}$ | | 240 | - | |
| Enable L pulse width (WRITE) | E | $T_{EWHW}$ | | 90 | - | |
| Enable H pulse width (WRITE) | | $T_{EWHW}$ | | 100 | - | |
| Enable L pulse width (READ) | E | $T_{EWHR}$ | | 120 | - | |
| Enable H pulse width (READ) | | $T_{EWHR}$ | | 60 | | |
| Data setup time | D0 to D7 | $t_{DS6}$ | | 40 | - | |
| Data hold time | | $t_{DH6}$ | | 0 | - | |
| /RD access time | | $t_{ACC6}$ | $C_L$=100pF | - | 140 | |
| Output disable time | | $t_{OH6}$ | $C_L$=100pF | 5 | 50 | |

Serial Interface Timing




(VDD = 3.0 ~ 3.6V, Ta = -20 ~ 70° C)

| Symbol | Parameter | Min | Typ | Max | Unit | Condition |
|---|---|---|---|---|---|---|
| $t_{SCYC}$ | Serial clock cycle | 120 | - | - | ns | SCL |
| $t_{SHW}$ | Serial clock H pulse width | 60 | - | - | ns | SCL |
| $t_{SLW}$ | Serial clock L pulse width | 60 | - | - | ns | SCL |
| $t_{SAS}$ | Address setup time | 30 | - | - | ns | A0 |
| $t_{SAF}$ | Address hold time | 20 | - | - | ns | A0 |
| $t_{SDS}$ | Data setup time | 30 | - | - | ns | SI |
| $t_{SDH}$ | Data hold time | 20 | - | - | ns | SI |
| $t_{CSS}$ | Chip Serial setup time | 20 | - | - | ns | /CS1,CS2 |
| $t_{CSH}$ | Chip Serial hold time | 40 | - | - | ns | /CS1,CS2 |

## **2.4** Display command

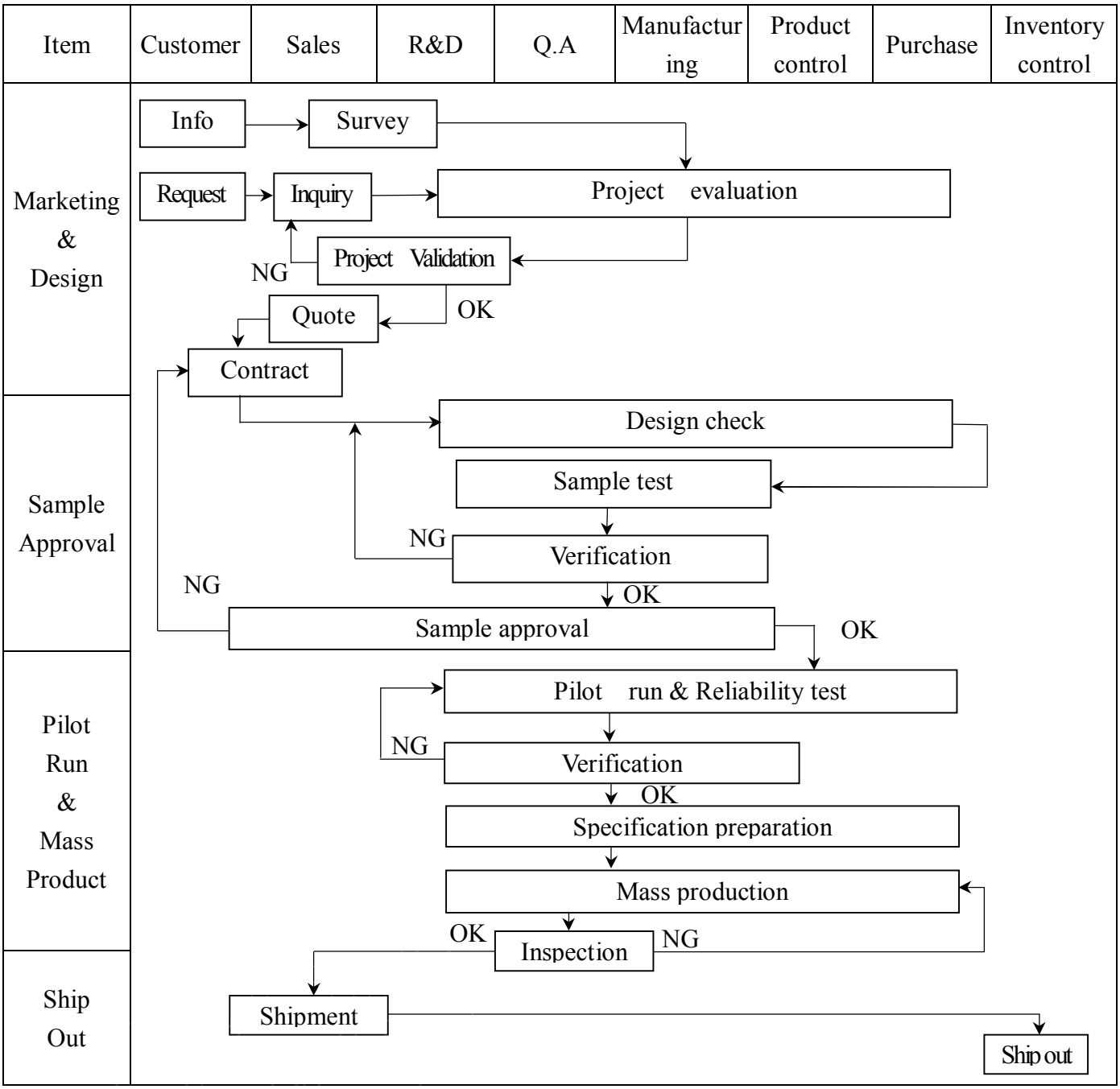
| Command | A0 | /RD | /WR | Code D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Hex | Function |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) Display OFF | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0<br>1 | AEh<br>AFh | Turn on LCD panel when high, and turn off when low |
| (2) Display Start Line Set | 0 | 1 | 0 | 0 | 1 | Display Start Address | | | | | | 40h to 7Fh | Specifies RAM display line for COM0 |
| (3) Page Address Set | 0 | 1 | 0 | 1 | 0 | 1 | 1 | Page Address | | | | B0h to B8h | Set the display data RAM page in Page Address register |
| (4) Column Address Set | 0 | 1 | 0 | 0 | 0 | 0 | 1 | Higher Column Address | | | | 00h to 18h | Set 4 higher bits and 4 lower bits of column address of display data RAM in register |
| | 0 | 1 | 0 | 0 | 0 | 0 | 0 | Lower Column Address | | | | | |
| (5) Read Status | 0 | 0 | 1 | Status | | | | 0 | 0 | 0 | 0 | XX | Reads the status information |
| (6) Write Display Data | 1 | 1 | 0 | Write Data | | | | | | | | XX | Write data in display data RAM |
| (7) Read Display Data | 1 | 0 | 1 | Read Data | | | | | | | | XX | Read data from display data RAM |
| (8) ADC Select | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0<br>1 | A0h<br>A1h | Set the display data RAM address SEG output correspondence |
| (9) Normal/Reverse Display | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0<br>1 | A6h<br>A7h | Normal indication when low, but full indication when high |
| (10)Entire Display ON/OFF | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0<br>1 | A4h<br>A5h | Select normal display (0) or entire display on |
| (11)LCD Bias Set | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0<br>1 | A2h<br>A3h | Sets LCD driving voltage bias ratio |
| (12)Read-Modify-Write | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | E0h | Increments column address counter during each write |
| (13)End | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | EEh | Releases the Read-Modify-Write |
| (14)Reset | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | E2h | Resets internal functions |
| (15)Common Output Mode Select | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0<br>1 | * | * | * | C0h to CFh | Select COM output scan direction<br>*: invalid data |
| (16)Power Control Set | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | Operation Status | | | 28h to 2Fh | Select the power circuit operation mode |
| (17)V0 Voltage Regulator Internal Resistor ratio Set | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | Resistor Ratio | | | 20h to 27h | Select internal resistor ratio Rb/Ra mode |
| (18)Electronic Volume mode Set | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 81h | |
| Electronic Volume Register Set | 0 | 1 | 0 | * | * | Electronic Control Value | | | | | | XX | Sets the V0 output voltage electronic volume register |
| (19)Set Static indicator ON/OFF | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0<br>1 | ACh<br>ADh | Sets static indicator ON/OFF<br>0: OFF, 1: ON |
| Set Static Indicator Register | 0 | 1 | 0 | * | * | * | * | * | * | Mode | | XX | Sets the flash mode |
| (20)Power Save | 0 | 1 | 0 | - | - | - | - | - | - | - | - | - | Compound command of Display OFF and Entire Display ON |
| (21)NOP | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | E3h | Command for non-operation |

| Command | A0 | /RD | /WR | Code | | | | | | | | | Function |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Hex | |
| (22)Oscillation Frequency Select | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0<br>1 | E4h<br>E5h | Select the oscillation frequency |
| (23)Partial Display mode Set | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0<br>1 | 82h<br>83h | Enter/Release the partial display mode |
| (24)Partial Display Duty Set | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | Duty Ratio | | | 30h<br>37h | Sets the LCD duty ratio for partial display mode |
| (25)Partial Display Bias Set | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | Bias Ratio | | | 38h<br>3Fh | Sets the LCD bias ratio for partial display mode |
| (26)Partial Start Line Set | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | D3h | Enter Partial Start Line Set |
| Partial Start Line Set | 0 | 1 | 0 | 1 | 1 | Partial Start Line | | | | | | XX | Sets the LCD Number of partial display start line |
| (27)N-Line Inversion Set | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 85h | Enter N-Line inversion |
| Number of Line Set | 0 | 1 | 0 | * | * | * | Number of Line | | | | | XX | Sets the number of line used for N-Line inversion |
| (28)N-Line Inversion Release | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 84h | Exit N-Line Inversion |
| (29)DC/DC Clock Set | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | E6h | Set DC/DC Clock Frequency |
| DC/DC Clock Division Set | 0 | 1 | 0 | 1 | 1 | 0 | 0 | Clock Division | | | | XX | Set the Division of DC/DC Clock Frequency |
| (30)Test Command | 0 | 1 | 0 | 1 | 1 | 1 | 1 | * | * | * | * | F1h<br>to<br>FFh | IC test command. Do not use! |
| (31)Test Mode Reset | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | F0h | Command of test mode reset |

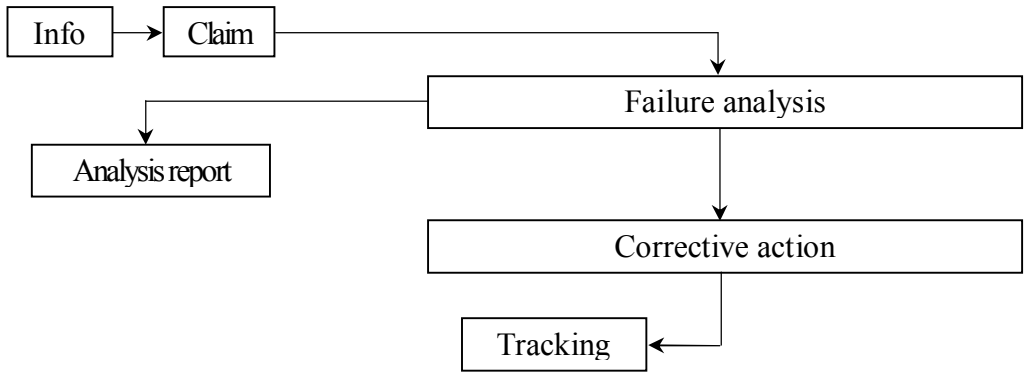
Note: Do not use any other command, or system malfunction may result.

# 3. QUALITY ASSURANCE SYSTEM

## 3.1 Quality Assurance Flow Chart

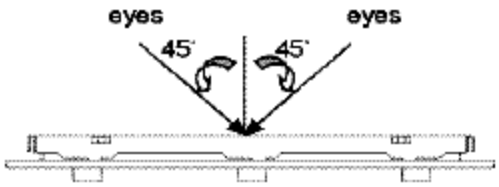


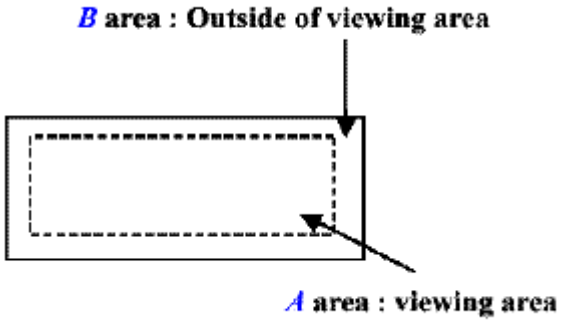

| Item | Customer | Sales | R&D | Q.A | Manufacturing | Product control | Purchase | Inventory control |
|---|---|---|---|---|---|---|---|---|

| | |
|---|---|
| Sales Service |  |
| Q.A Activity | 1. ISO 9001 Maintenance Activities<br>2. Process improvement proposal<br>3. Equipment calibration<br>4. Education And Training Activities<br>5. Standardization Management |

## 3.2 Inspection Specification

◆Inspection Standard : MIL-STD-105E Table Normal Inspection Single Sampling Level Ⅱ .
◆Equipment : Gauge、MIL-STD、Powertip Tester、Sample
◆Defect Level : Major Defect AQL 0.4; Minor Defect AQL 1.5 .
◆OUT Going Defect Level : Sampling .
◆Manner of appearance test :
(1). The test be under 40W×2 fluorescent light ' and distance of view must be at 30 cm.
(2). The test direction is base on about around 45° of vertical line. (Fig. 1)
(3). Definition of area . (Fig. 2)

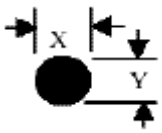
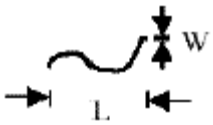


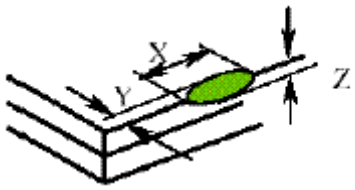
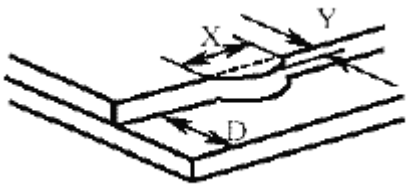

◆ Specification:

| NO | Item | Criterion | level |
|---|---|---|---|
| 01 | Product condition | 1.1 The part number is inconsistent with work order of Production. | Major |
| | | 1.2 Mixed production types. | Major |
| | | 1.3 Assembled in inverse direction. | Major |
| 02 | Quantity | 2.1 The quantity is inconsistent with work order of production. | Major |
| 03 | Outline dimension | 3.1 Product dimension and structure must conform to Structure diagram. | Major |
| 04 | Electrical Testing | 4.1 Missing line character、dot and icon. | Major |
| | | 4.2 No function or no display. | Major |
| | | 4.3 Output data is error. | Major |
| | | 4.4 LCD viewing angle defect. | Major |
| | | 4.5 Current consumption exceeds product specifications. | Major |
| 05 | Black or white dot、scratch、contamination Round type | 5.1 Round type:<br>5.1.1 display only :<br>• White and black spots on display ≦ 0.30mm, no more than Four white or black spots present.<br>• Densely spaced : NO more than two spots or lines within 3mm | Minor |

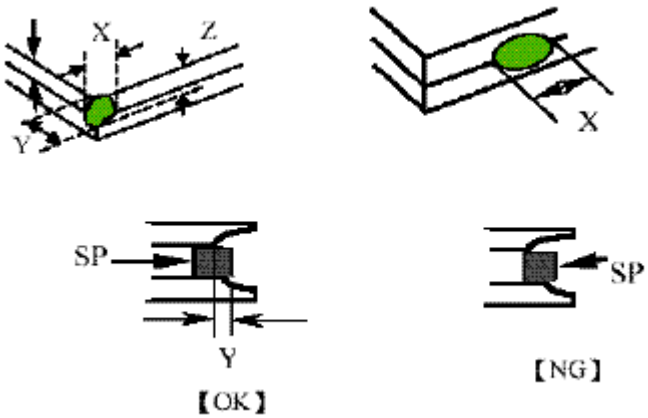
◆Specification :

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>level</th></tr>
<tr><td>05</td><td>Black or white dot、scratch、contamination<br>Round type<br>  <br><br>Φ=(x+y)/2<br>  <br></td><td>5.1.2 Nom-display :<br><table><tr><td>Dimension (diameter : Φ)</td><td>Acceptance(Q'ty)</td></tr><tr><td>Φ ≦0.10mm</td><td>Accept no dense</td></tr><tr><td>0.10mm＜ Φ ≦0.20mm</td><td>3</td></tr><tr><td>0.20mm＜ Φ ≦0.30mm</td><td>2</td></tr><tr><td>Total</td><td>4</td></tr></table>5.1.3 Line type:<br><table><tr><td colspan="2">Dimension (diameter : Φ)</td><td colspan="2">Acceptance (Q'ty)</td></tr><tr><td>Length</td><td>width</td><td>A area</td><td>B area</td></tr><tr><td>---</td><td>w≦0.03mm</td><td>Accept no dense</td><td>Don't count</td></tr><tr><td>L≦3.0mm</td><td>0.03mm＜ Φ ≦0.05mm</td><td rowspan="2">4</td><td>Don't count</td></tr><tr><td>L≦2.5mm</td><td>0.05mm＜ Φ ≦0.075mm</td><td>Don't count</td></tr><tr><td>---</td><td>w＞0.075mm</td><td colspan="2">As round type</td></tr></table></td><td>Minor</td></tr>
<tr><td>06</td><td>Polarizer<br>Bubble</td><td><table><tr><td rowspan="2">Dimension (diameter : Φ)</td><td colspan="2">Acceptance(Q'ty)</td></tr><tr><td>A area</td><td>B area</td></tr><tr><td>Φ ≦0.20mm</td><td>Accept no dense</td><td>Don't count</td></tr><tr><td>0.20mm＜ Φ ≦0.50mm</td><td>3</td><td>Don't count</td></tr><tr><td>0.50mm＜ Φ ≦1.00mm</td><td>2</td><td>Don't count</td></tr><tr><td>Φ ＞1.00mm</td><td>0</td><td>Don't count</td></tr><tr><td>Total quantity</td><td>4</td><td>Don't count</td></tr></table></td><td>Minor</td></tr>
<tr><td>07</td><td>The crack of glass</td><td>● Glass Crack:<br>7.1 Crack on the circuit of electrode terminal :<br>  <br><br><table><tr><td></td><td>X</td><td>Y</td><td>Z</td></tr><tr><td>Front</td><td>X≦1/5 a</td><td>Y≦ 1/2 D</td><td>Z≦ t</td></tr><tr><td>Back</td><td colspan="3">Neglect</td></tr></table></td><td>Minor</td></tr>
</table>

◆Specification :

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>Level</th></tr>
<tr><td rowspan="2">07</td><td>The crack of glass<br><br>X: The length of Crack<br><br>Y: The width of crack<br><br>Z: The thickness of crack<br><br>D: terminal length<br><br>T: The thickness of glass<br><br>A : The length of glass</td><td>● Glass Crack:<br><br>7.2 General glass crack and corner edge:<br><br>7.2.1<br>  <br><br><table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>Neglect</td><td>Out A area</td><td>Neglect</td></tr></table><br>7.2.2<br>  <br><br><table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>Neglect</td><td>Out A area</td><td>Neglect</td></tr></table></td><td>Minor</td></tr>
<tr><td>7.3 Glass remain:<br>  <br><br><table><tr><td>X</td><td>Y</td></tr><tr><td>Neglect</td><td>≦ 1/3 d</td></tr></table></td><td>Minor</td></tr>
</table>

◆Specification :

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>Level</th></tr>
<tr><td>07</td><td>The crack of glass<br>X: The length of Crack<br>Y: The width of crack<br>Z: The thickness of crack<br>D: terminal length<br>T: The thickness of glass<br>A : The length of glass</td><td>7.4 Corner crack and medial crack:<br> 

<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≦1/5a</td><td>Crack can’t enter viewing area</td><td>≦1/2t</td></tr>
<tr><td>≦1/5a</td><td>Crack can’t exceed the half of width of SP width of SP</td><td>1/2t<Z≦2t</td></tr>
</table></td><td>Minor</td></tr>
<tr><td>08</td><td>Backlight elements</td><td>8.1 Backlight can’t work normally.</td><td>Major</td></tr>
<tr><td></td><td></td><td>8.2 Backlight doesn’t light or color is wrong.</td><td>Major</td></tr>
<tr><td></td><td></td><td>8.3 Illumination source flickers when lit.</td><td>Major</td></tr>
<tr><td>09</td><td>General appearance</td><td>9.1 pin type must match type in specification sheet</td><td>Major</td></tr>
<tr><td></td><td></td><td>9.2 No short circuits in components on PCB or FPC</td><td>Major</td></tr>
<tr><td></td><td></td><td>9.3Product packaging must the same as specified on packaging specification sheet.</td><td>Major</td></tr>
<tr><td></td><td></td><td>9.4 The folding and peeled off in polarizer are not acceptable</td><td>Major</td></tr>
<tr><td></td><td></td><td>9.5 The PCB or FPC between B/L assembled distance (PCB or FPC) is ≦1.5mm</td><td>Major</td></tr>
</table>

# 4. RELIABILITY TEST

## 4.1 Reliability Test Condition

| NO. | TEST ITEM | TEST CONDITION |
|---|---|---|
| 1 | High Temperature Storage Test | Keep in 80 ±2℃ 96 hrs<br>Surrounding temperature, then storage at normal condition 4hrs |
| 2 | Low Temperature Storage Test | Keep in -30 ±2℃ 96 hrs<br>Surrounding temperature, then storage at normal condition 4hrs |
| 3 | High Humidity Storage | Keep in +60℃/90%RH duration for 96 hrs<br>Surrounding temperature, then storage at normal condition 4hrs<br>(Excluding the polarizer) |
| 4 | ESD Test | Air Discharge:<br>Apply 2 KV with 5 times<br>Discharge for each polarity +/-<br>Contact Discharge:<br>Apply 250V with 5 times<br>discharge for each polarity +/-<br>1. Temperature Ambient:15℃～35℃<br>2. Humidity relative:30%～60%<br>3. Energy Storage Capacitance(Cs+Cd):150pF±10%<br>4. Discharge Resistance(Rd):330Ω±10%<br>5. Discharge, mode of operation:<br>Single Discharge (time between successive discharges at least 1 s)<br>(Tolerance lf the output voltage indication: ±5%) |
| 5 | Temperature Cycling Test | -20℃ → 25℃ → 70℃ → 25℃<br>(30mins) (5mins) (30mins) (5mins)<br>10 Cycle<br>Surrounding temperature, then storage at normal condition 4hrs |
| 6 | Vibration Test (Packaged) | 1. Sine wave 10～55HZ frequency (1 min)<br>2. The amplitude of vibration :1.5 mm<br>3. Each direction (XYZ) duration for 2 Hrs |
| 7 | Drop Test (Packaged) | Packing Weight (Kg) / Drop Height (cm):<br>0 ~ 45.4 — 122<br>45.4 ~ 90.8 — 76<br>90.8 ~ 454 — 61<br>Over 454 — 46<br>Drop direction :※3 comer /1 edges /6 sides etch 1times |

# 5. PRECAUTION RELATING PRODUCT HANDLING

## 5.1 SAFETY

5.1.1 If the LCD panel breaks , be careful not to get the liquid crystal to touch your skin.

5.1.2 If the liquid crystal touches your skin or clothes , please wash it off immediately by using soap and water.

## 5.2 HANDLING

5.2.1 Avoid any strong mechanical shock which can break the glass.

5.2.2 Avoid static electricity which can damage the CMOS LSI—When working with the module , be sure to ground your body and any electrical equipment you may be using.

5.2.3 Do not remove the panel or frame from the module.

5.2.4 The polarizing plate of the display is very fragile. So , please handle it very carefully ,do not touch , push or rub the exposed polarizing with anything harder than an HB pencil lead (glass , tweezers , etc.)

5.2.5 Do not wipe the polarizing plate with a dry cloth , as it may easily scratch the surface of plate.

5.2.6 Do not touch the display area with bare hands , this will stain the display area.

5.2.7 Do not use ketonics solvent & aromatic solvent. Use with a soft cloth soaked with a cleaning naphtha solvent.

5.2.8 To control temperature and time of soldering is 320±10℃and 3-5 sec.

5.2.9 To avoid liquid (include organic solvent) stained on LCM .

## 5.3 STORAGE

5.3.1 Store the panel or module in a dark place where the temperature is 25℃ ±5℃ and the humidity is below 65% RH.

5.3.2 Do not place the module near organics solvents or corrosive gases.

5.3.3 Do not crush , shake , or jolt the module.

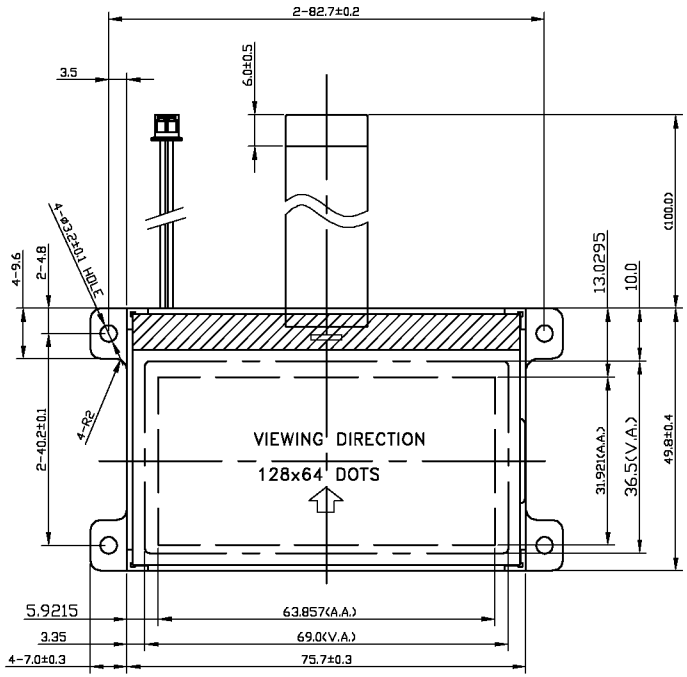
## 5.4 TERMS OF WARRANTY

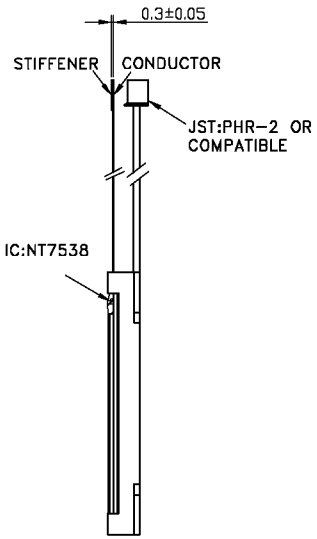
5.4.1 Applicable warrant period

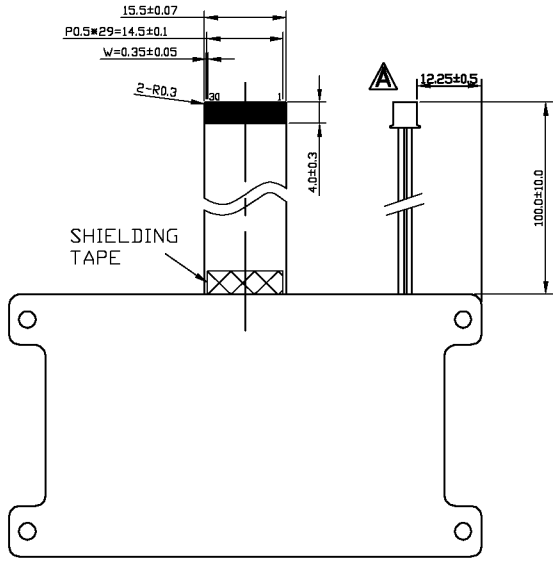
The period is within thirteen months since the date of shipping out under normal using and storage conditions.

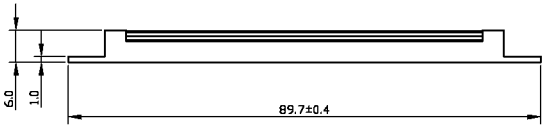
5.4.2 Unaccepted responsibility

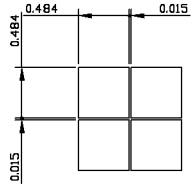
This product has been manufactured to your company's specification as a part for use in your company's general electronic products. It is guaranteed to perform according to delivery specifications. For any other use apart from general electronic equipment , we cannot take responsibility if the product is used in nuclear power control equipment , aerospace equipment , fire and security systems or any other applications in which there is a direct risk to human life and where extremely high levels of reliability are required.




DETAIL DOTS
SCALE 20/1

NOTE:
1.THE TOLERANCE UNLESS CLASSIFIED ±0.3mm
2.LCD TYPE : FSTN
3.VIEWING DIRECTION : 6 O'CLOCK
4.DISPLAY MODE : POSITIVE / TRANSFLECTIVE
5.DRIVER IC:NT7538
6.THIS PRODUCT CONFORMS ROHS

| NO. | SYMBOL | NO. | SYMBOL | NO. | SYMBOL |
|---|---|---|---|---|---|
| 1 | CS1 | 11 | D5 | 21 | C2+ |
| 2 | RES | 12 | D6 | 22 | V1 |
| 3 | A0 | 13 | D7 | 23 | V2 |
| 4 | WR | 14 | VDD | 24 | V3 |
| 5 | RD | 15 | VSS | 25 | V4 |
| 6 | D0 | 16 | VOUT | 26 | V5 |
| 7 | D1 | 17 | C3+ | 27 | VR |
| 8 | D2 | 18 | C1+ | 28 | C86 |
| 9 | D3 | 19 | C1− | 29 | P/S |
| 10 | D4 | 20 | C2− | 30 | C4+ |

BATRON

| REV | DESCRIPTION | DATE |
|---|---|---|
| A | MODIFY THE BL | 2008/4/28 |

SCALE: NOTE UNIT: MM PAGE: 1/1

圖面名稱

圖面編號 DTE-08081 EDI A

| APPROVED | CHECKER | DRAWN |
|---|---|---|
| 周自立 | / | 彭 武輪 |

PT-R-312-1

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