POWERTIP TECH. CORP.

# SPECIFICATIONS

| | | |
|---|---|---|
| CUSTOMER | : | PTC |
| SAMPLE CODE | : | NSC1602WRP-JWA-I |
| MASS PRODUCTION CODE | : | NPC1602WRP-JWA-I |
| SAMPLE VERSION | : | 01 |
| SPECIFICATIONS EDITION | : | 001 |
| DRAWING NO. (Ver.) | : | JLMD-NPC1602WRP-JWA-I_001 |
| PACKAGING NO. (Ver.) | : | |

## Customer Approved

Date:

POWERTIP
2014.05.20
JS RD APPROVED

| Approved | Checked | Designer |
|---|---|---|
| 閆偉 | 劉進 | 周志仙 |

■ Preliminary specification for design input

□ Specification for sample approval


**POWERTIP TECH. CORP.**

***Headquarters:*** No.8, 6th Road, Taichung Industrial Park, Taichung, Taiwan
台中市 407 工業區六路 8 號

TEL: 886-4-2355-8168
FAX: 886-4-2355-8166

E-mail: sales@powertip.com.tw
Http://www.powertip.com.tw

## History of Version

| Date (mm / dd / yyyy) | Ver. | Edi. | Description | Page | Design by |
|---|---|---|---|---|---|
| 05/15/2014 | 01 | 001 | New Drawing | - | 周志仙 |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Total：29 Pages

## Contents

1. SPECIFICATIONS
- 1.1 Features
- 1.2 Mechanical Specifications
- 1.3 Absolute Maximum Ratings
- 1.4 DC Electrical Characteristics
- 1.5 Optical Characteristics
- 1.6 Backlight Characteristics

2. MODULE STRUCTURE
- 2.1 Counter Drawing
- 2.2 Interface Pin Description
- 2.3 Timing Characteristics
- 2.4 Display Command
- 2.5 Character Pattern
- 2.6 Jumper

3. QUALITY ASSURANCE SYSTEM
- 3.1 Quality Assurance Flow Chart
- 3.2 Inspection Specification

4. RELIABILITY TEST
- 4.1 Reliability Test Condition

5. PRECAUTION RELATING PRODUCT HANDLING
- 5.1 Safety
- 5.2 Handling
- 5.3 Storage
- 5.4 Terms of Warranty

Appendix :
- 1. LCM drawing

**Note : For detailed information please refer to IC data sheet : SITRONIX---ST7066U-0A**

# 1. SPECIFICATIONS

## 1.1 Features

| Item | Standard Value |
|---|---|
| Display Type | 16*2 Characters |
| LCD Type | PBT，Negative，Transmissive |
| Driver Condition | LCD Module : 1/16 Duty，1/5 Bias |
| Viewing Direction | 6 O'clock |
| Weight | TBD |
| Interface | 6800-series 8-bit parallel |
| Driver IC | ST7066U |
| ROHS | THIS PRODUCT CONFORMS THE ROHS OF PTC<br>Detail information please refer website :<br>http://www.powertip.com.tw/news.php?area_id_view=1085560481/ |

## 1.2 Mechanical Specifications

| Item | Standard Value | Unit |
|---|---|---|
| Outline Dimension | 85.0 (L) * 30.0 (W) *12.7(H) | mm |
| Viewing Area | 66.0 (L) * 16.0 (W) | mm |
| Active Area | 56.2 (L) * 11.5 (W) | mm |
| Character Size | 2.95mm * 5.55mm | mm |
| Character Pitch | 3.55mm * 5.95mm | 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 | 7.0 | V |
| LCD Driver Supply Voltage | $V_{LCD}$ | - | $V_{DD}$ -10.0 | $V_{DD}$ +0.3 | V |
| Input Voltage | $V_{IN}$ | - | -0.3 | $V_{DD}$+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 | $V_{DD}$ | - | 4.5 | 5.0 | 5.5 | V |
| “H” Input Voltage | $V_{IH}$ | - | 0.7 $V_{DD}$ | - | $V_{DD}$ | V |
| “L” Input Voltage | $V_{IL}$ | - | -0.3 | - | 0.6 | V |
| “H” Output Voltage | $V_{OH}$ | $I_{OH}$=-0.1mA | 3.9 | - | $V_{DD}$ | V |
| “L” Output Voltage | $V_{OL}$ | $I_{OL}$=0.1mA | - | - | 0.4 | V |
| Supply Current | $I_{DD}$ | $V_{DD}$= 5.0 V ,Vo=TBD V Pattern=check Patten *1 | - | TBD | TBD | mA |
| LCM Driver Voltage | $V_O$ | -20℃ （$V_{DD}$= 5.0 V） | TBD | TBD | TBD | V |
| | | 25℃ （$V_{DD}$= 5.0 V） | TBD | TBD | TBD | |
| | | 70℃ （$V_{DD}$= 5.0 V） | TBD | TBD | TBD | |

NOTE: *1 The Maximum current display

## 1.5 Optical Characteristics

LCD Panel：1/16 Duty，1/5 Bias，$V_{LCD}$ = TBDV，Ta =25℃

| Item | | Symbol | Conditions | Min. | Typ. | Max. | Unit | Reference |
|---|---|---|---|---|---|---|---|---|
| Response Time | Rise | tr | - | - | TBD | TBD | ms | Note 2 |
| | Fall | tf | | - | TBD | TBD | | |
| Viewing angle range | Top | θ+ | C≥2.0 | - | TBD | - | Deg | Note 1 |
| | Bottom | θ- | | - | TBD | - | | |
| | Left | θL | | - | TBD | - | | |
| | Right | θR | | - | TBD | - | | |
| Contrast Ratio | | C | - | - | TBD | - | - | Note 3 |
| Average Brightness (with LCD) *2 | | IV | IF= TBD mA | TBD | TBD | - | $cd/m^2$ | Note 4 |
| Wavelength (with LCD) | | λp | | TBD | TBD | TBD | nm | |
| Uniformity *1 | | △B | | 70 | - | - | % | |

Note 4 ：

1：△B=B(min) / B(max) * 100%

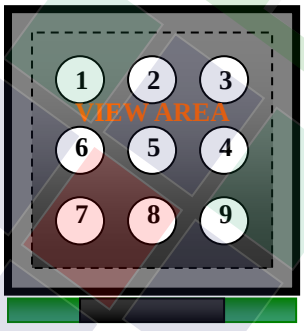
2：Measurement Condition for Optical Characteristics:

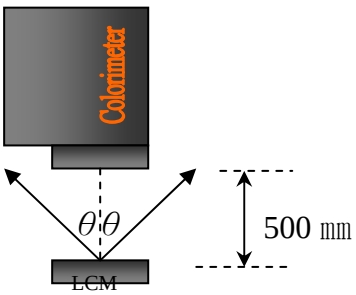
a：Environment: 25℃±5℃ / 60±20%R.H，no wind，dark room below 10 Lux at typical lamp current and typical operating frequency.

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%



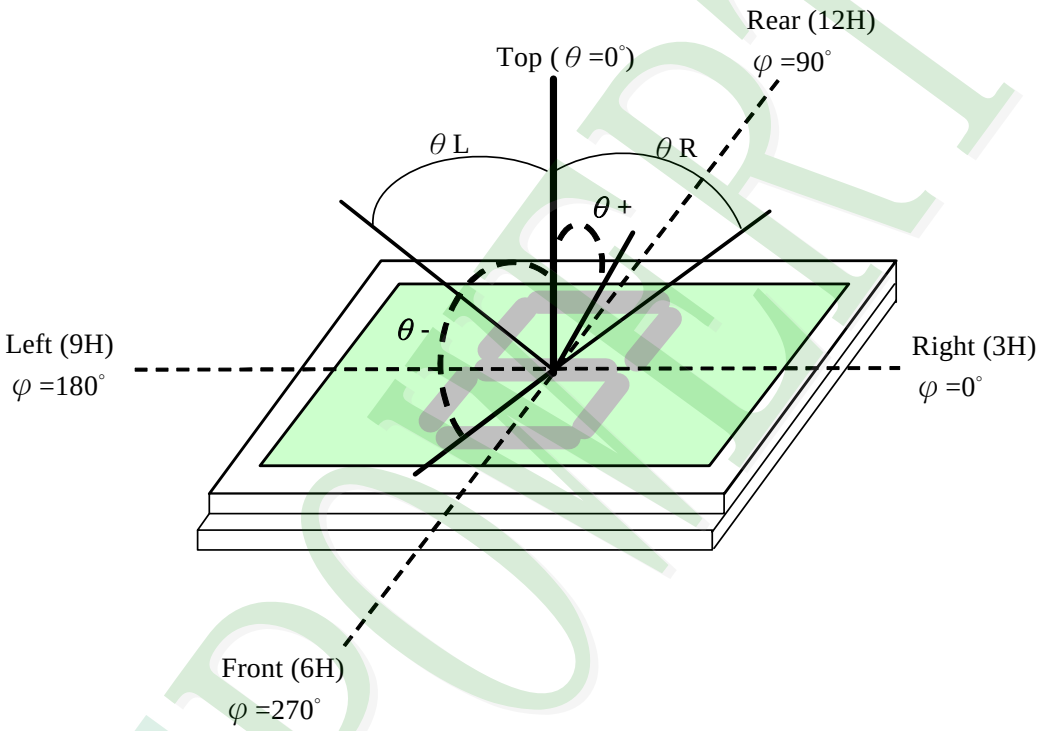




Colorimeter=BM-7 fast

Note 1.

Optical characteristics-2

Viewing angle

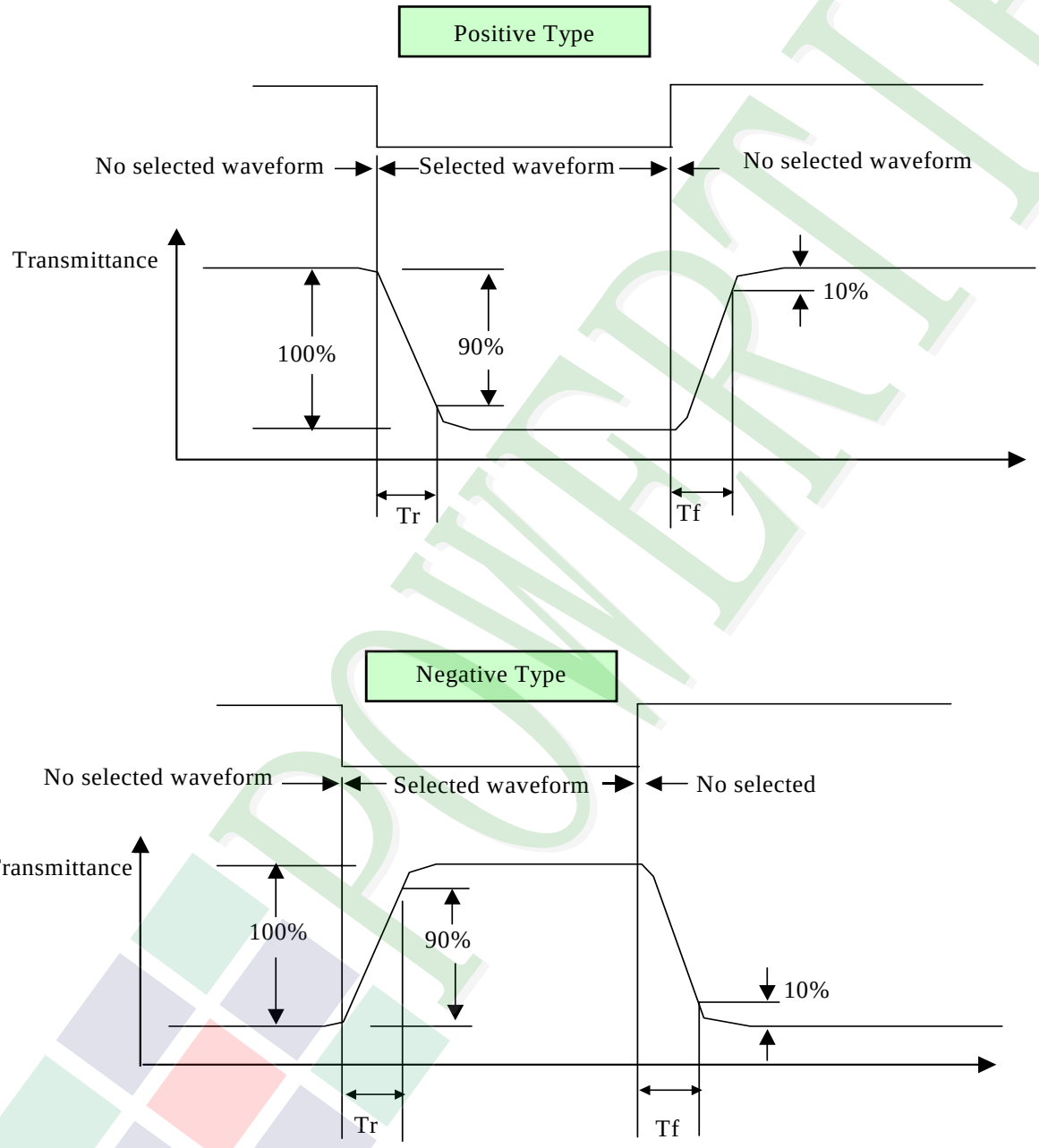



**Viewing angle**

Note 2.

Optical characteristics-3

Fig.2 Definition of response time



Electrical characteristics-2

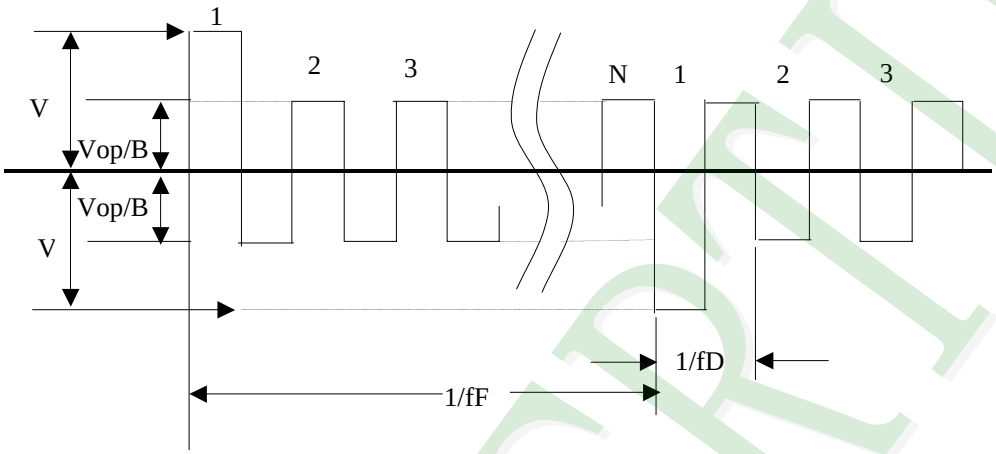
※2 Drive waveform

Vop: Drive voltage fF: Frame frequency

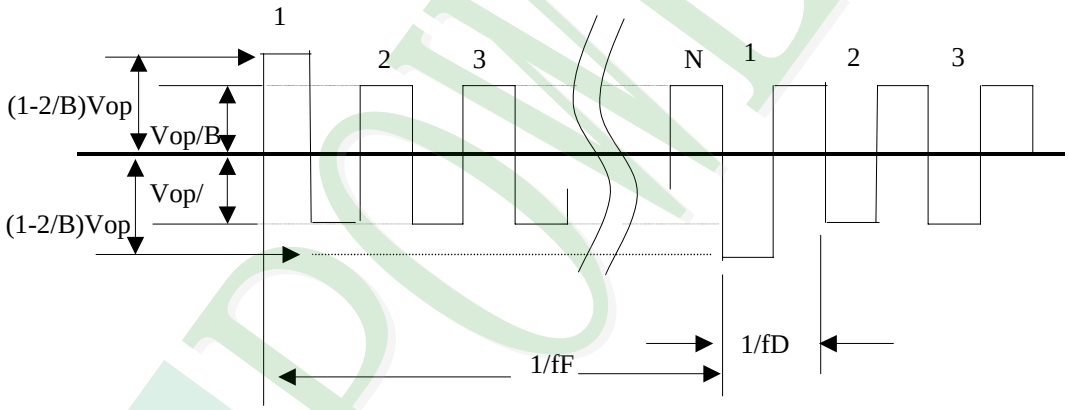
1/B: Bias fD: Drive frequency

N: Duty

(1) Selected waveform



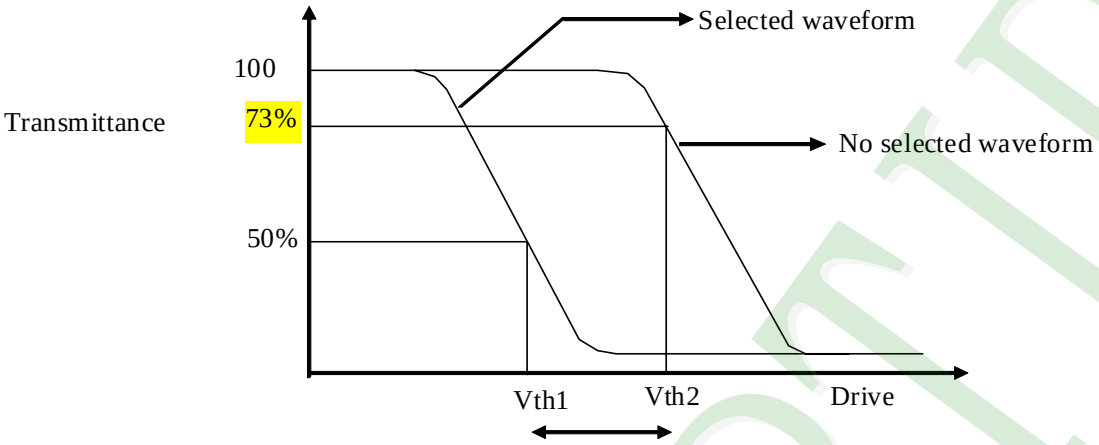

(2) Non- Selected wave form




Note:

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

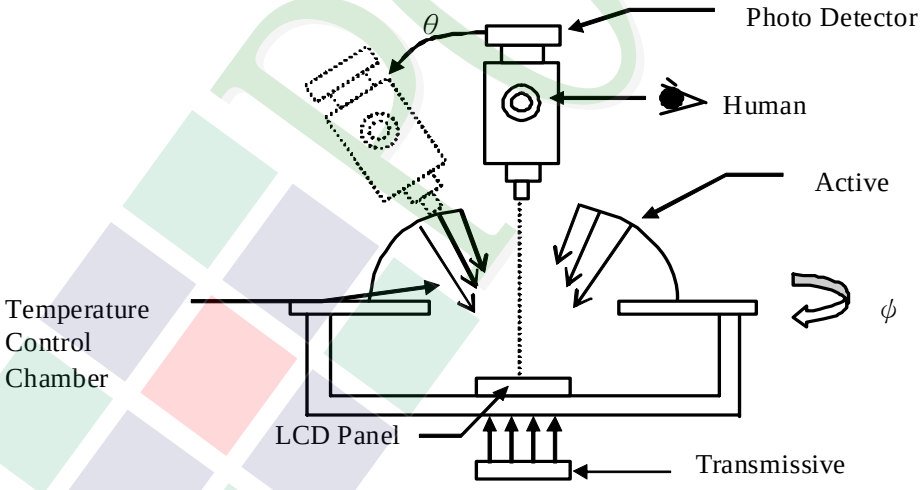
Note 3. : Definition of Vth




| | 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

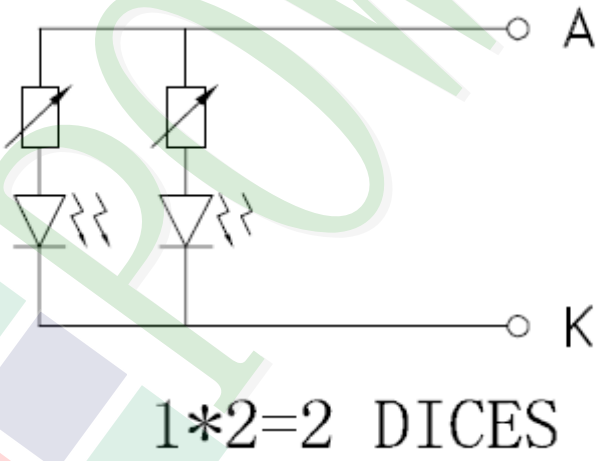
Maximum Ratings

| Item | Symbol | Conditions | Min. | Max. | Unit |
|---|---|---|---|---|---|
| Forward Current | IF | Ta =25℃ | - | 40 | mA |
| Reverse Voltage | VR | Ta =25℃ | - | 5 | V |
| Power Dissipation | PD | Ta =25℃ | - | 132 | W |

Electrical / Optical Characteristics

| Item | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Forward Voltage | VF | IF= 40 mA | 3.0 | 3.3 | 3.6 | V |
| Average Brightness (without LCD) | IV | | 1200 | 1500 | - | $cd/m^2$ |
| CIE Color Coordinate (Without LCD) | X | | 0.26 | 0.29 | 0.31 | - |
| | Y | | 0.26 | 0.29 | 0.31 | |
| Color | White | | | | | |

Internal Circuit Diagram:




1*2=2 DICES

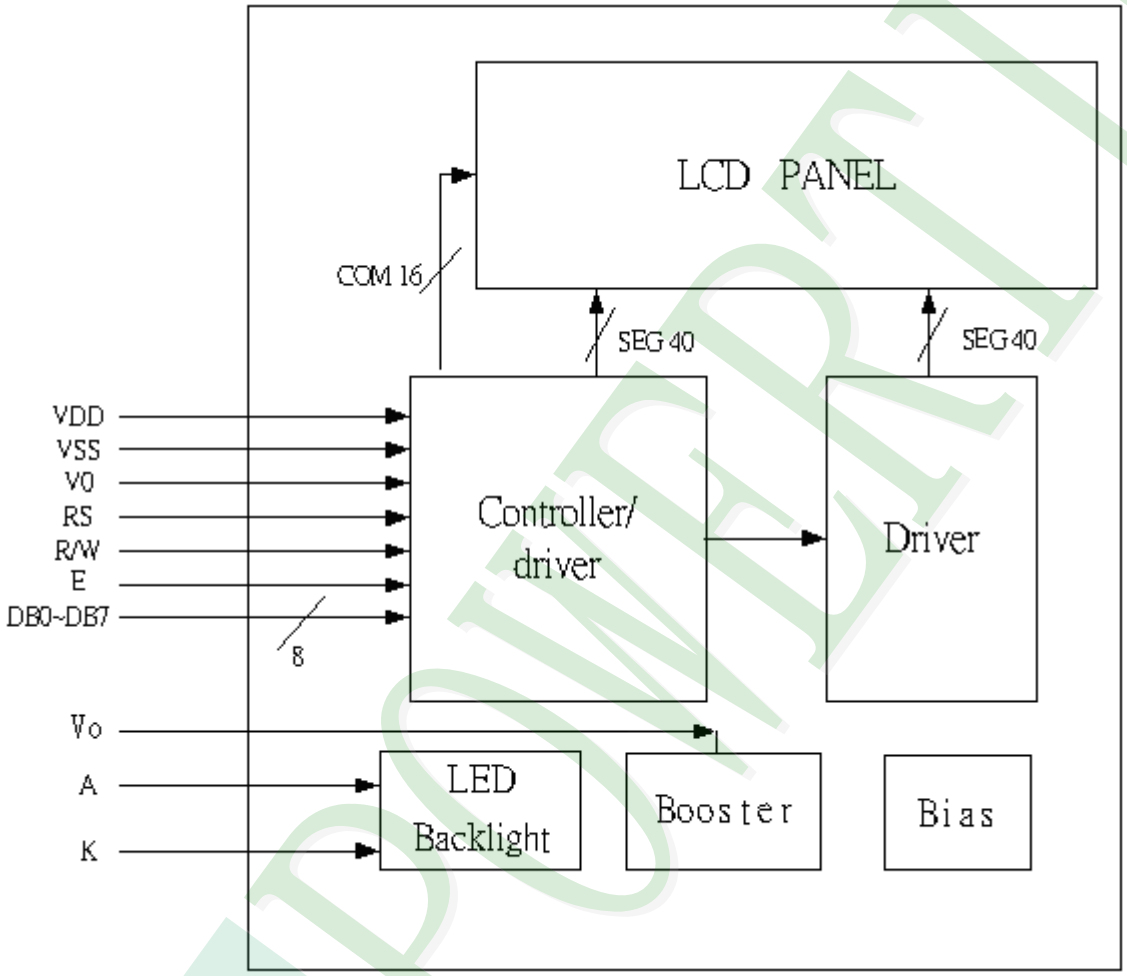
# 2. MODULE STRUCTURE

## 2.1 Counter Drawing

### 2.1.1 LCM Mechanical Diagram

* See Appendix

### 2.1.2 Block Diagram

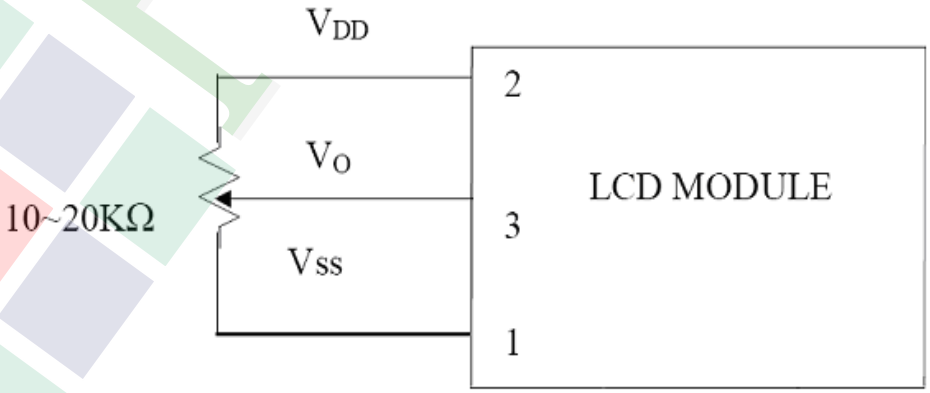


## 2.2 Interface Pin Description

| Pin No. | Symbol | Signal Description |
|---|---|---|
| 1 | $V_{SS}$ | Power Supply (Vss=0) |
| 2 | $V_{DD}$ | Power Supply (5V) |
| 3 | $V_O$ | Operating voltage for LCD |
| 4 | RS | Register Selection input<br>High = Data register<br>Low = Instruction register (for write)<br>Busy flag address counter (for read) |
| 5 | R/W | Read/Write signal input is used to select the read/write mode<br>High = Read mode, Low = Write mode |
| 6 | E | Start enable signal to read or write the data |
| 7 | DB0 | Four low order bi-directional three-state data bus lines. Use for data transfer between the MPU and the LCD module.<br>These four are not used during 4-bit operation. |
| 8 | DB1 | |
| 9 | DB2 | |
| 10 | DB3 | |
| 11 | DB4 | Four high order bi-directional three-state data bus lines. Used for data transfer between the MPU and the LCD module.<br>DB7 can be used as a busy flag. |
| 12 | DB5 | |
| 13 | DB6 | |
| 14 | DB7 | |

### 2.2.1 Application Notes

Contrast Adjust

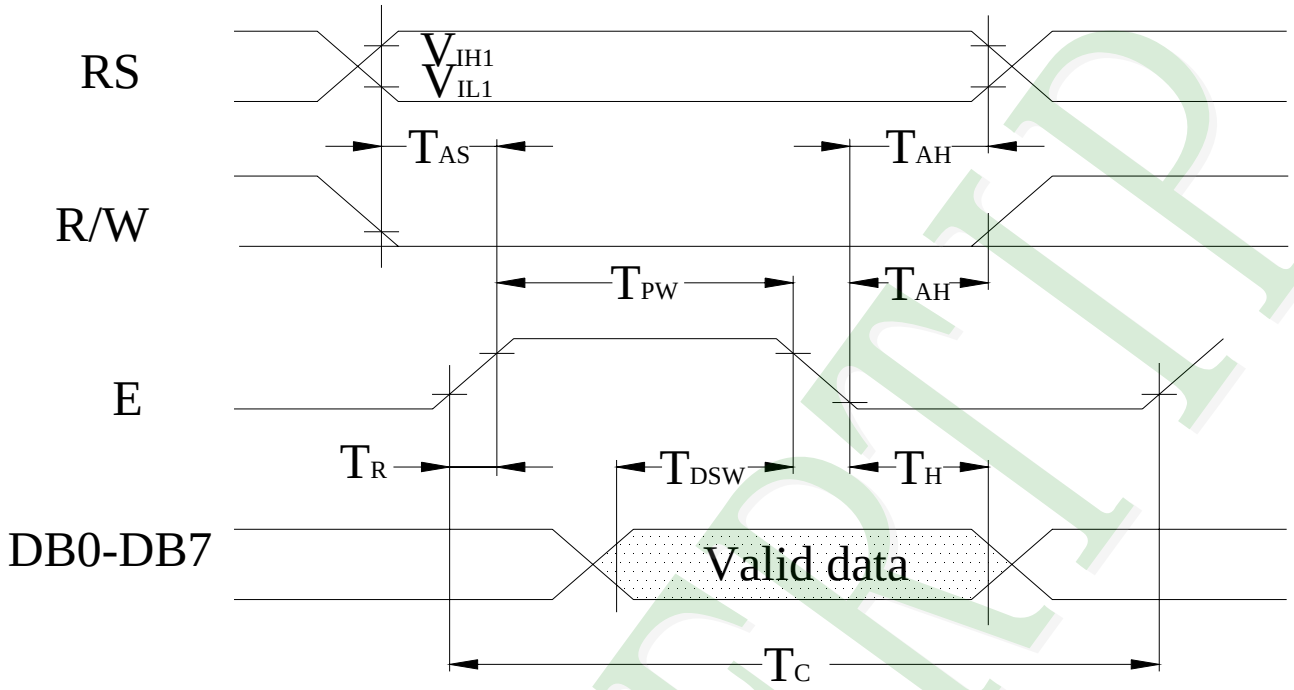



### 2.2.2 Refer Initial code

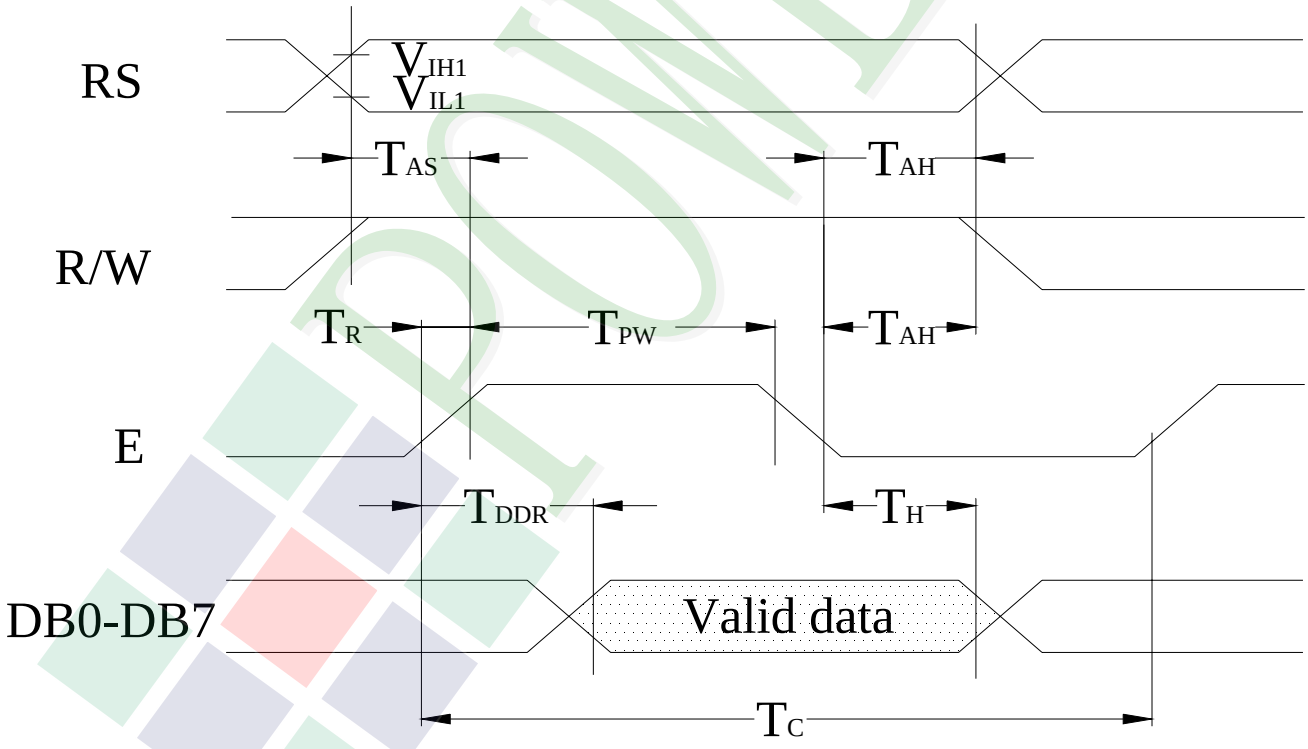
TBD

## 2.3 Timing Characteristics

- Writing data from MPU to ST7066U




- Reading data from ST7066U to MPU



- Write Mode (Writing data from MPU to ST7066U)

(VDD = 5V,Ta=25°C)

| Symbol | Characteristics | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $T_C$ | Enable Cycle Time | Pin E | 1200 | - | - | ns |
| $T_{PW}$ | Enable Pulse Width | Pin E | 140 | - | - | ns |
| $T_R$ , $T_F$ | Enable Rise / Fall Time | Pin E | - | - | 25 | ns |
| $T_{AS}$ | Address Setup Time | Pins: RS , RW,E | 0 | - | - | ns |
| $T_{AH}$ | Address Hold Time | Pins :RS,RW,E | 10 | - | - | ns |
| $T_{DSW}$ | Data Setup Time | Pins:DB0~DB7 | 40 | - | - | ns |
| $T_H$ | Data Hold Time | Pins:DB0~DB7 | 10 | - | - | ns |

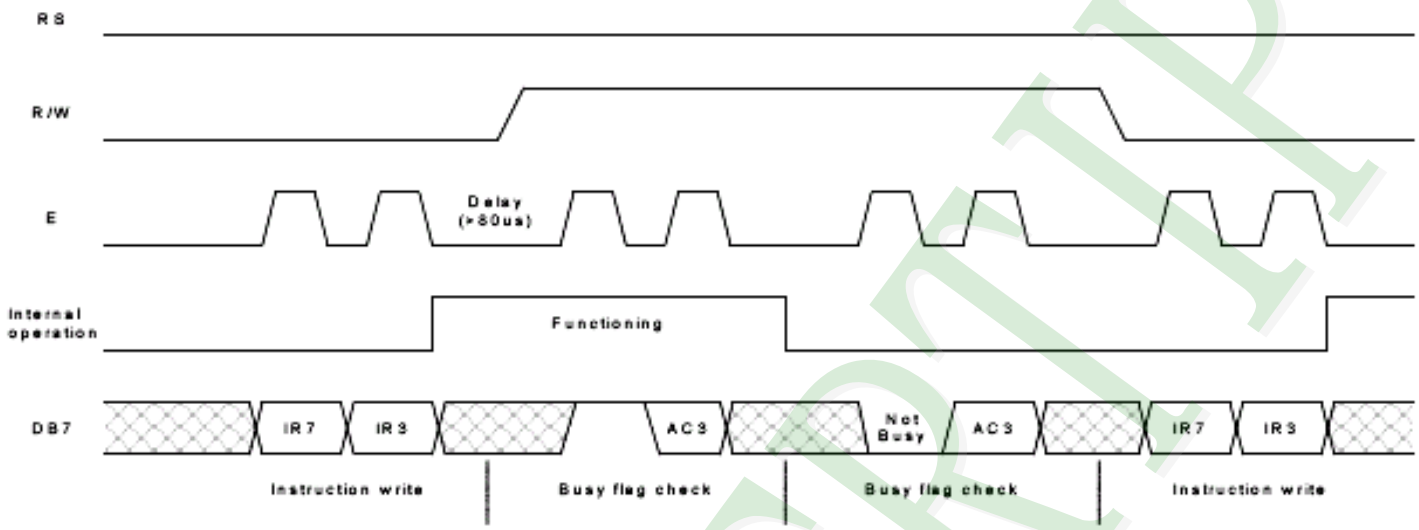
- Read Mode (Reading data from ST7066U to MPU)

(VDD = 5V,Ta=25°C)

| Symbol | Characteristics | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $T_C$ | Enable Cycle Time | Pin E | 1200 | - | - | ns |
| $T_{PW}$ | Enable Pulse Width | Pin E | 140 | - | - | ns |
| $T_R$ , $T_F$ | Enable Rise / Fall Time | Pin E | - | - | 25 | ns |
| $T_{AS}$ | Address Setup Time | Pins: RS , RW,E | 0 | - | - | ns |
| $T_{AH}$ | Address Hold Time | Pins :RS,RW,E | 10 | - | - | ns |
| $T_{DDR}$ | Data Setup Time | Pins:DB0~DB7 | - | - | 100 | ns |
| $T_H$ | Data Hold Time | Pins:DB0~DB7 | 10 | - | - | ns |

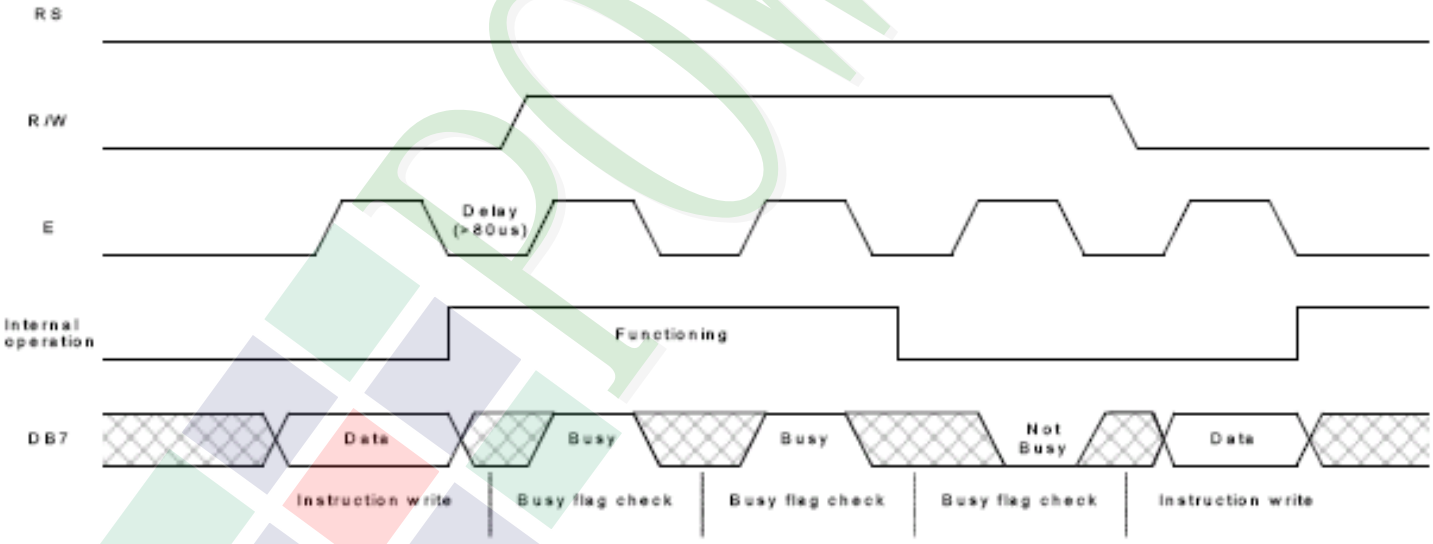
For 4-bit interface date, only four bus lines (DB4 to DB7) are used for transfer

Example of busy flag check timing sequence




For 8-bit interface date, all eight bus lines (DB0 to DB7) are used

Example of busy flag check timing sequence



## 2.4 Display Command

| Instructions | Instruction Code | | | | | | | | | | Description | Description Time (270KHz) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | RS | R/W | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 | | |
| Clear Display | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | Write "20H" to DDRAM. and set DDRAM address to "00H" from AC. | 1.52ms |
| Return Home | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | × | Set DDRAM address to "00H" from AC and return cursor to it's original position if shifted. The contents of DDRAM are not changed. | 1.52ms |
| Entry Mode Set | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | I/D | S | Sets cursor move direction and specifies display shift. These operations are performed during data write and read . | 37μs |
| Display ON/OFF | 0 | 0 | 0 | 0 | 0 | 0 | 1 | D | C | B | D=1 : entire display on<br>C=1 : cursor on<br>B=1 : cursor position on | 37μs |
| Cursor or Display Shift | 0 | 0 | 0 | 0 | 0 | 1 | S/C | R/L | × | × | Set cursor moving and display shift control bit, and the the direction, without changing of DDRAM data. | 37μs |
| Function Set | 0 | 0 | 0 | 0 | 1 | DL | N | F | × | × | DL: interface data is 8/4 bits<br>NL: number of line is 2/1<br>F: font size is 5×11/5×8 | 37μs |
| Set CGRAM Address | 0 | 0 | 0 | 1 | AC5 | AC4 | AC3 | AC2 | AC1 | AC0 | Set CGRAM address in address counter. | 37μs |
| Set DDRAM Address | 0 | 0 | 1 | AC6 | AC5 | AC4 | AC3 | AC2 | AC1 | AC0 | Set DDRAM address in address counter. | 37μs |
| Read Busy Flag and Address | 0 | 1 | BF | AC6 | AC5 | AC4 | AC3 | AC2 | AC1 | AC0 | Whether during internal operation or not can be known by reading BF. The contents of address counter can also be read. | 0μs |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Write Data to RAM | 1 | 0 | D 7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Write data into internal RAM (DDRAM/CGRAM). | 37μs |
| Read Data from RAM | 1 | 1 | D 7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Read data from internal RAM (DDRAM/CGRAM). | 37μs |

Note:

Be sure the ST7066U is not in the busy state (BF=0) before sending an instruction from the MPU to the ST7066.

If an instruction is sent without checking the busy flag , the time between the first instruction and next instruction will take much longer than the instruction time itself.

Before checking BF, be sure to wait at least 80us.. Do not keep “E” always “High” for checking BF

Refer to Instruction Table for the list of each instruction execution time .

## 2.5 Character Pattern

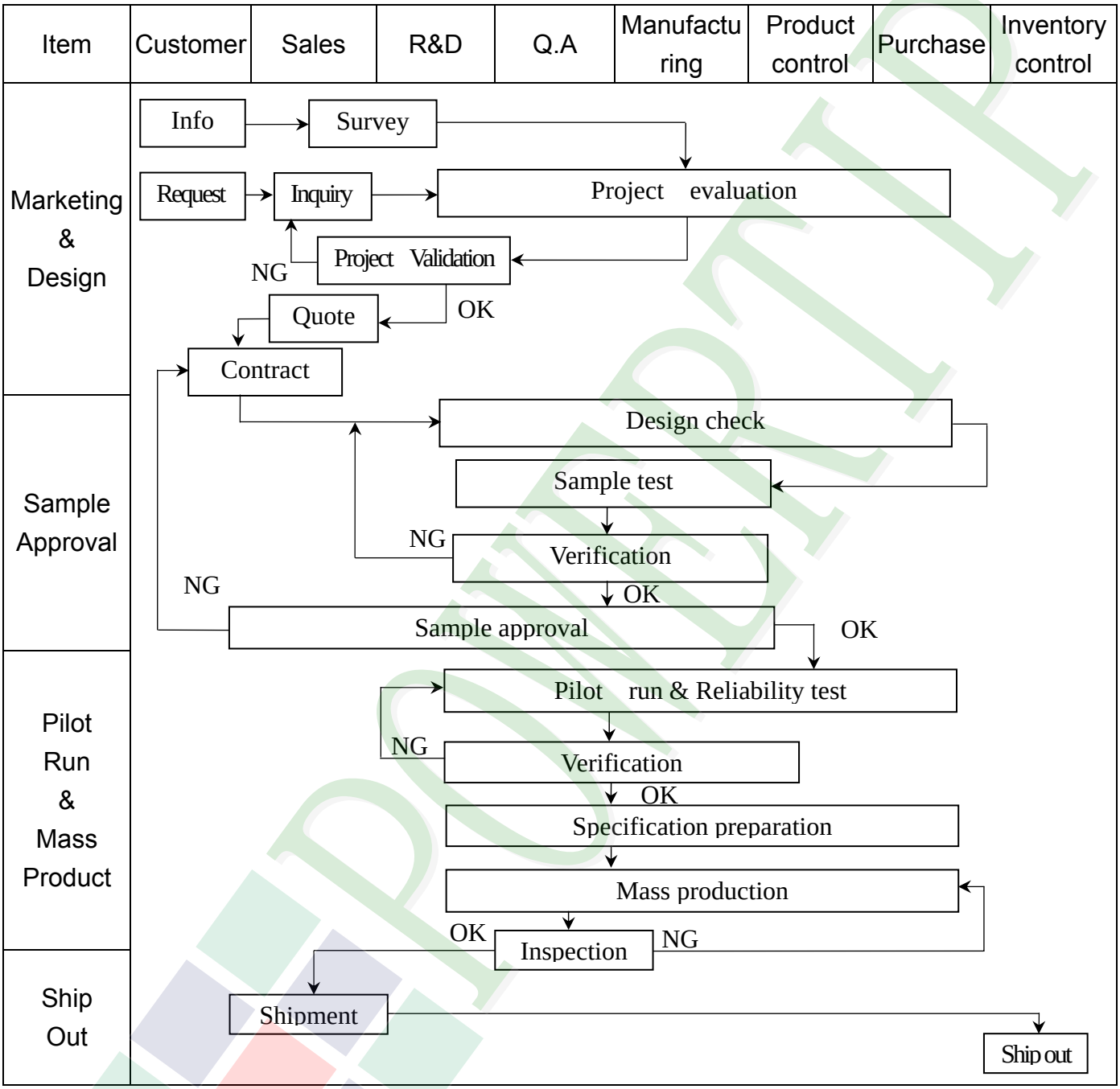
NO.7066-0A

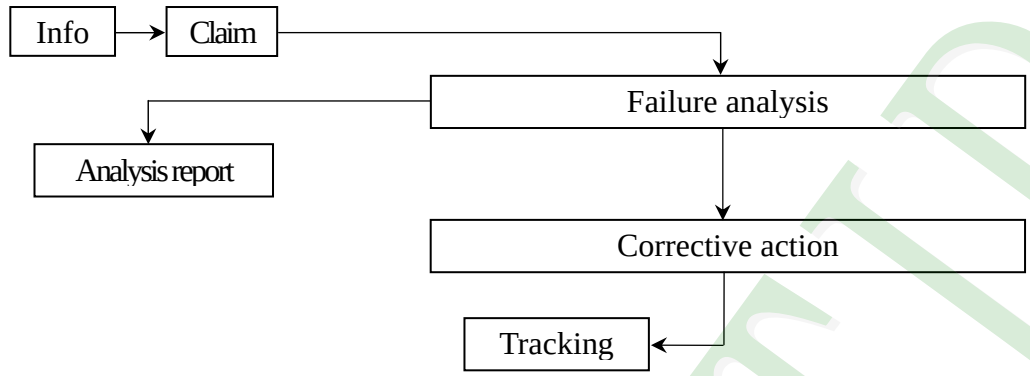

## 2.6 JUMPER

TBD

# 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

◆Scope : The document shall be applied to LCD Module for Monotype and Color STN(Ver. B01).

◆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 20W×2 fluorescent light ' and distance of view must be at 30 cm.

(2). Standard of inspection： (Unit：mm)

(3). The test direction is base on about around 45°of vertical line. (Fig. 1)

(4). Definition of area . (Fig. 2)

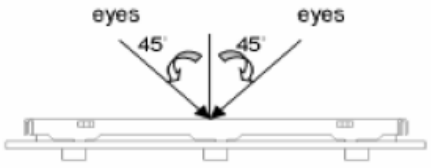



Fig.1

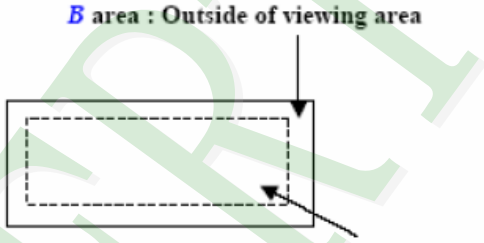
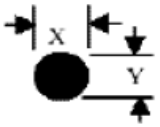
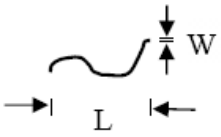



Fig. 2

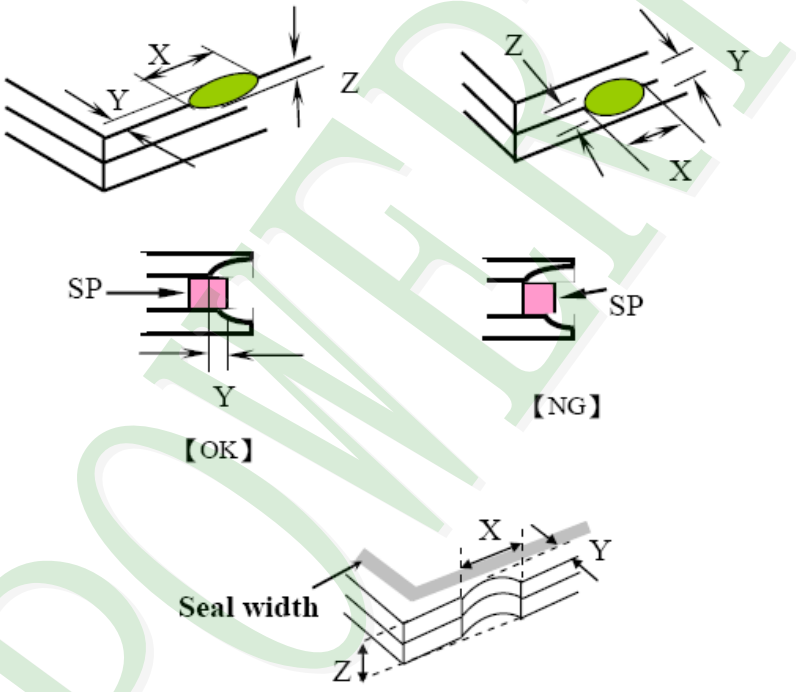
◆ Specification:

| 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 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 |

◆Specification For Monotype and Color STN：　(Ver.B01)

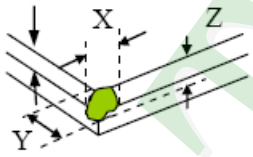
<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>Level</th></tr>
<tr><td>05</td><td>Black or white dot、scratch、contamination<br><br>Round type<br>  <br><br>Φ=(x+y)/2<br><br>Line type<br>  <br></td><td>5.1 Round type:<br>5.1.1 display only :<br>• White and black spots on display ≦ 0.30 mm , no more than 4 white or black spots present.<br>• Densely spaced : NO more than two spots or lines within 3 mm.<br><br>5.1.2 Non-display :
<table>
<tr><th rowspan="2">Dimension (diameter : Φ)</th><th colspan="2">Acceptance (Q'ty)</th></tr>
<tr><th>A area</th><th>B area</th></tr>
<tr><td>Φ≦ 0.10</td><td>Accept no dense</td><td rowspan="4">Ignore</td></tr>
<tr><td>0.10 ＜ Φ ≦ 0.20</td><td>3</td></tr>
<tr><td>0.20 ＜ Φ ≦ 0.30</td><td>2</td></tr>
<tr><td>Total quantity</td><td>4</td></tr>
</table>
5.1.3 Line type:
<table>
<tr><th colspan="2">Dimension</th><th colspan="2">Acceptance (Q'ty)</th></tr>
<tr><th>Length (L)</th><th>Width (W)</th><th>A area</th><th>B area</th></tr>
<tr><td>---</td><td>W ≦ 0.03</td><td>Accept no dense</td><td rowspan="3">Ignore</td></tr>
<tr><td>L ≦ 3.0</td><td>0.03 ＜ W ≦ 0.05</td><td rowspan="2">4</td></tr>
<tr><td>L ≦ 2.5</td><td>0.05 ＜W ≦ 0.075</td></tr>
<tr><td>---</td><td>W ＞0.075</td><td colspan="2">As round type</td></tr>
</table></td><td>Minor</td></tr>
<tr><td>06</td><td>Polarizer Bubble</td><td>
<table>
<tr><th rowspan="2">Dimension (diameter : Φ)</th><th colspan="2">Acceptance (Q'ty)</th></tr>
<tr><th>A area</th><th>B area</th></tr>
<tr><td>Φ ≦ 0.20</td><td>Accept no dense</td><td rowspan="4">Ignore</td></tr>
<tr><td>0.20 ＜Φ ≦ 0.50</td><td>3</td></tr>
<tr><td>0.50 ＜Φ ≦ 1.00</td><td>2</td></tr>
<tr><td>Φ ＞ 1.00</td><td>0</td></tr>
<tr><td>Total quantity</td><td>4</td></tr>
</table></td><td>Minor</td></tr>
</table>

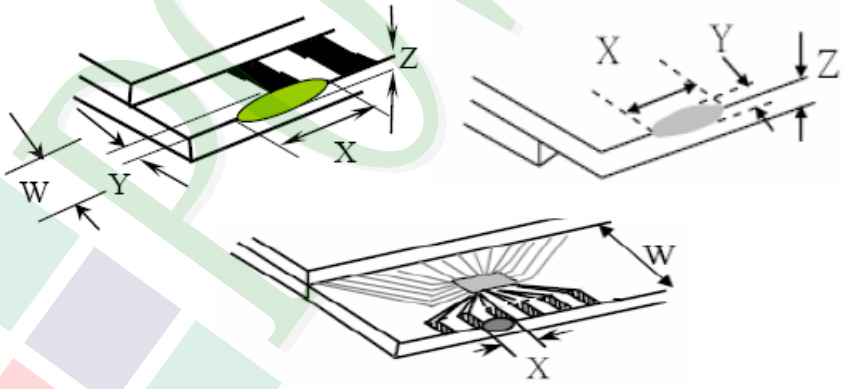
◆Specification For Monotype and Color STN：　(Ver. B01)

| NO | Item | Criterion | Level |
|---|---|---|---|
| 07 | The crack of glass | Symbols：<br>X : The length of crack　Y : The width of crack.<br>Z : The thickness of crack　W : terminal length<br>t : The thickness of glass　a : LCD side length<br>7.1 General glass chip：<br>7.1.1 Chip on panel surface and crack between panels:<br>  | Minor |

| X | Y | Z |
|---|---|---|
| ≦ a | Crack can't enter viewing area | ≦1/2 t |
| ≦ a | Crack can't exceed the half of SP width. | 1/2 t < Z ≦2 t |

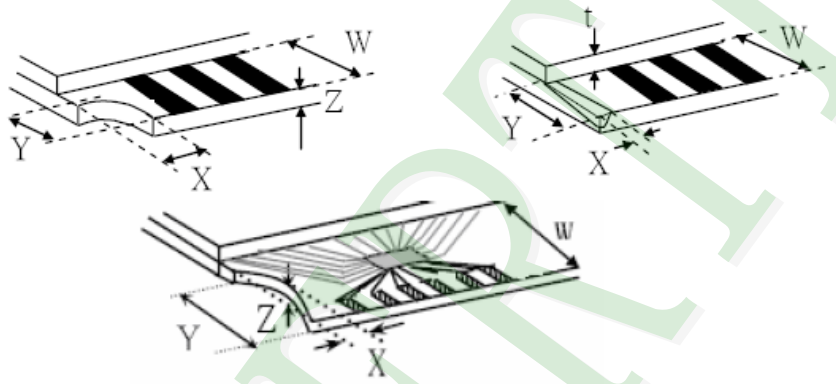
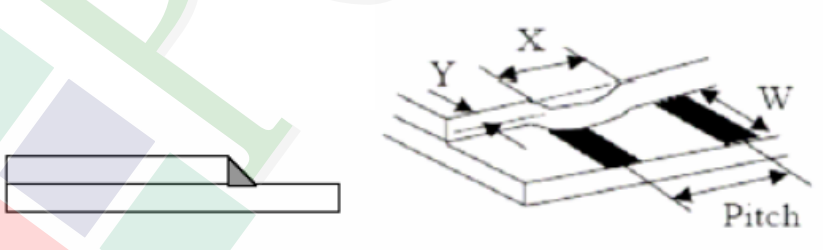
◆Specification For Monotype and Color STN：　(Ver. B01)

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>Level</th></tr>
<tr><td>07</td><td>The crack of glass</td><td>
Symbols：<br><br>
X : The length of crack　　Y : The width of crack.<br>
Z : The thickness of crack　　W : terminal length<br>
t : The thickness of glass　　a : LCD side length<br><br>
7.1.2 Corner crack：<br>


<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≦1/5 a</td><td>Crack can’t enter viewing area</td><td>Z ≦ 1/2 t</td></tr>
<tr><td>≦1/5 a</td><td>Crack can’t exceed the half of SP width.</td><td>1/2 t < Z ≦ 2 t</td></tr>
</table>
7.2 Protrusion over terminal：<br>
7.2.1 Chip on electrode pad：<br>


<table>
<tr><th></th><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>Front</td><td>≦ a</td><td>≦ 1/2 W</td><td>≦ t</td></tr>
<tr><td>Back</td><td colspan="3">Neglect</td></tr>
</table>
</td><td>Minor</td></tr>
</table>

◆Specification For Monotype and Color STN：　(Ver. B01)

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>Level</th></tr>
<tr><td rowspan="2">07</td><td rowspan="2">The crack of glass</td><td>Symbols：<br><br>X : The length of crack　　Y : The width of crack.<br>Z : The thickness of crack　　W : terminal length<br>t : The thickness of glass　　a : LCD side length</td><td rowspan="2">Minor</td></tr>
<tr><td>7.2.2 Non-conductive portion：<br>  <br><br><table><tr><th>X</th><th>Y</th><th>Z</th></tr><tr><td>≦1/3 a</td><td>≦W</td><td>≦t</td></tr></table><br>⊙ If the chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications.<br><br>7.2.3 Glass remain：<br>  <br><br><table><tr><th>X</th><th>Y</th><th>Z</th></tr><tr><td>≦ a</td><td>≦ 1/3 W</td><td>≦ t</td></tr></table></td></tr>
</table>

◆Specification For Monotype and Color STN：　(Ver. B01)

| NO | Item | Criterion | Level |
|---|---|---|---|
| 08 | Backlight elements | 8. 1 Backlight can't work normally. | Major |
| | | 8. 2 Backlight doesn't light or color is wrong. | Major |
| | | 8. 3 Illumination source flickers when lit. | Major |
| 09 | General appearance | 9. 1 Pin type must match type in specification sheet. | Major |
| | | 9. 2 No short circuits in components on PCB or FPC. | Major |
| | | 9. 3 Product packaging must the same as specified on packaging specification sheet. | Minor |
| | | 9. 4 The folding and peeled off in polarizer are not acceptable. | Minor |
| | | 9. 5 The PCB or FPC between B/L assembled distance (PCB or FPC) is ≦1. 5 mm. | Minor |

# 4. RELIABILITY TEST

## 4.1 Reliability Test Condition (Ver.B01)

<table>
<tr><th>NO.</th><th>TEST ITEM</th><th>TEST CONDITION</th></tr>
<tr><td>1</td><td>High Temperature Storage Test</td><td>Keep in +80 ±2℃ 96 hrs<br>Surrounding temperature, then storage at normal condition 4hrs.</td></tr>
<tr><td>2</td><td>Low Temperature Storage Test</td><td>Keep in -30 ±2℃ 96 hrs<br>Surrounding temperature, then storage at normal condition 4hrs.</td></tr>
<tr><td>3</td><td>High Temperature / High Humidity Storage Test</td><td>Keep in +60 ℃ / 90% R.H duration for 96 hrs<br>Surrounding temperature, then storage at normal condition 4hrs.<br>(Excluding the polarizer)</td></tr>
<tr><td>4</td><td>Temperature Cycling Storage Test</td><td>-30℃ → +25℃ → +80℃ → +25℃<br>(30mins) (5mins) (30mins) (5mins)<br>10 Cycle<br>Surrounding temperature, then storage at normal condition 4hrs.</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">ESD Test</td><td>Air Discharge:<br>Apply 2 KV with 5 times<br>Discharge for each polarity +/-<br>Contact Discharge:<br>Apply 250 V with 5 times<br>discharge for each polarity +/-</td></tr>
<tr><td>1. Temperature ambiance : 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 sec)<br>(Tolerance if the output voltage indication : ±5%)</td></tr>
<tr><td>6</td><td>Vibration Test (Packaged)</td><td>1. Sine wave 10～55 Hz frequency (1 min/sweep)<br>2. The amplitude of vibration :1.5 mm<br>3. Each direction (X、Y、Z) duration for 2 Hrs</td></tr>
<tr><td>7</td><td>Drop Test (Packaged)</td><td><table><tr><th>Packing Weight (Kg)</th><th>Drop Height (cm)</th></tr><tr><td>0 ~ 45.4</td><td>122</td></tr><tr><td>45.4 ~ 90.8</td><td>76</td></tr><tr><td>90.8 ~ 454</td><td>61</td></tr><tr><td>Over 454</td><td>46</td></tr></table>Drop Direction :※1 corner / 3 edges / 6 sides each 1time</td></tr>
</table>

# 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.

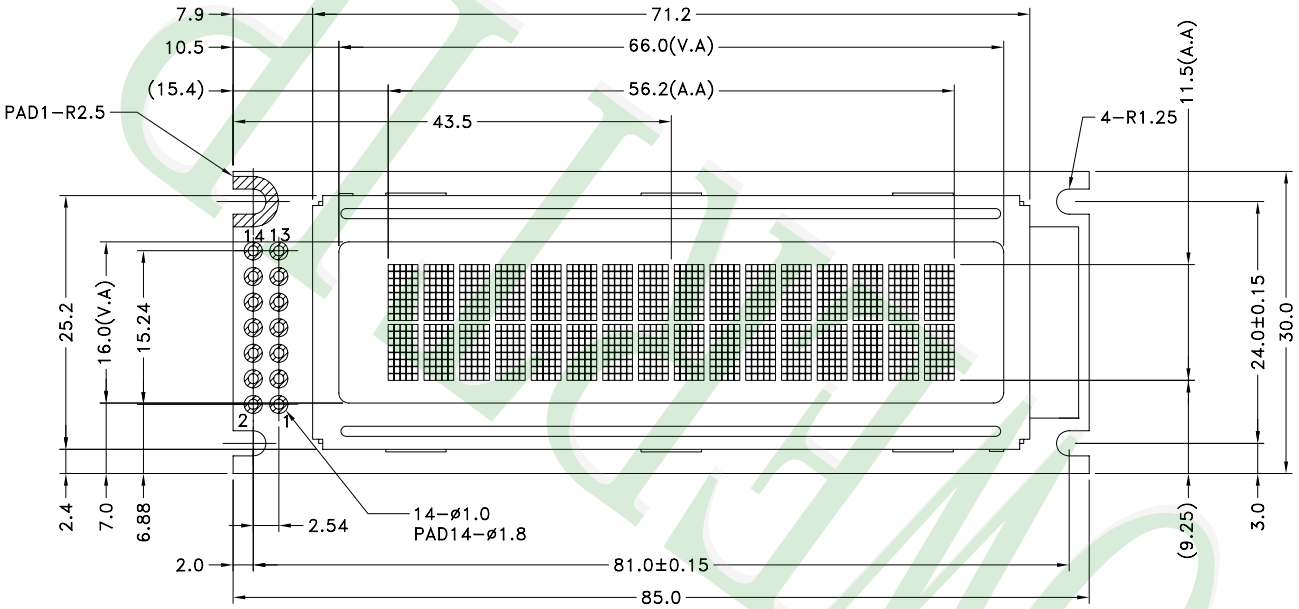
## 5.4 TERMS OF WARRANTY

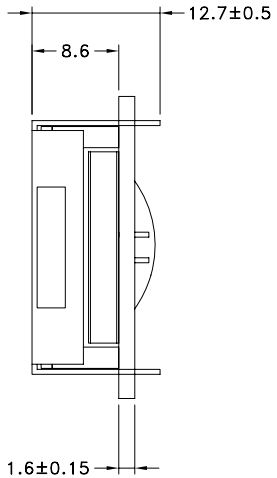
5.4.1 Applicable warrant period

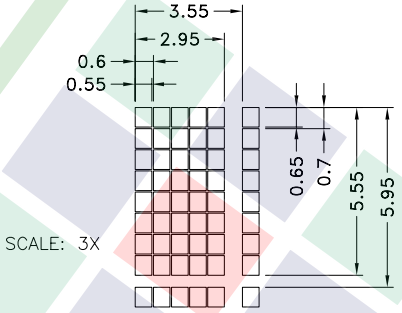
The period is within thirteen months since the date of shipping out under normal using and storage conditions.

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.




NOTES:

1.LCD TYPE: PBT NEGATIVE/ TRANSMISSIVE
2.VIEW DIRECTION: 6 O'CLOCK
3.Top: −20~70°C Tst:−30~80°C
4.This product conforms ROHS
5.The tolerance unless classified ±0.3mm

| REV | REV BY | REVISER | DATE |
|---|---|---|---|
| 007 | | | |
| 006 | | | |
| 005 | | | |
| 004 | | | |
| 003 | | | |
| 002 | | | |
| 001 | NEW DRAWING | Terry | 2014/05/06 |

PART NO: NPC1602WRP-JWA-I

DRAWING NAME : JLMD-NPC1602WRP-JWA-I

TITLE: LCD Module Drawing

久正光電股份有限公司
POWERTIP TECHNOLOGY CORPORATION

| | | | | | |
|---|---|---|---|---|---|
| Design | Terry | (3) | Surface | | |
| Check | Eddy | Unit | MM | Material | |
| Approve | Ryan | Scale | 1:1 | Thickness | |
| | | Page | 1/1 | Quantity | |

| 公差精度等級 / 最小長度 (mm) | 精級 |
|---|---|
| 1 ~ 4 | - |
| 4 ~ 16 | - |
| 16 ~ 63 | - |
| 63 ~ 250 | - |
| 250 ~ 1000 | - |