



SPECIFICATIONS

| | | |
|------------------------|---|----------------------------|
| CUSTOMER | : | PTC |
| SAMPLE CODE | : | NSC1602LRU-GWT-H |
| MASS PRODUCTION CODE | : | NPC1602LRU-GWT-H |
| SAMPLE VERSION | : | 01 |
| SPECIFICATIONS EDITION | : | 001 |
| DRAWING NO. (Ver.) | : | JLMD- NPC1602LRU-GWT-H_001 |
| PACKAGING NO. (Ver.) | : | JPKG- NPC1602LRU-GWT-H_001 |

Customer Approved

Date:

| Approved | Checked | Designer |
|----------|---------|----------|
| 閔偉 | 劉進 | 陳璐 |

- Preliminary specification for design input
- Specification for sample approval

POWERTIP TECH. CORP.

| | | |
|---|--|--|
| Headquarters: No.8, 6 th 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 |
|--------------------------|------|------|-------------|------|-----------|
| 08/06/2018 | 01 | 001 | New Sample | - | 陳璐 |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Total : 31 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 (Setting different use)

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 A : LCM drawing
PKG drawing

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

1. SPECIFICATIONS

1.1 Features

| Item | Standard Value |
|-------------------|--|
| Display Type | 16*2 Characters |
| LCD Type | STN Y/G , Positive , Transflective |
| Driver Condition | LCD Module : 1/16 Duty , 1/5 Bias |
| Viewing Direction | 6 O'clock |
| Weight | 32.8g |
| Interface | 6800-series 8-bit parallel |
| Driver IC | ST7066U |
| ROHS | THIS PRODUCT CONFORMS THE ROHS OF PTC Detail information please refer web site : http://www.powertip.com.tw/news.php?area_id_view=1085560481/ |

1.2 Mechanical Specifications

| Item | Standard Value | Unit |
|-------------------|-------------------------------|------|
| Outline Dimension | 80.0 (L) * 36.0 (W) *12.7 (H) | mm |
| Viewing Area | 66.0 (L) * 16.0 (W) | mm |
| Active Area | 56.2 (L) * 11.5 (W) | mm |
| Χηαρακτηρ Size | 2.95(L) * 5.55(W) | mm |
| Χηαρακτηρ Pitch | 3.55(L) * 5.95(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 | 7.0 | V |
| LCD Driver Supply Voltage | V_{LCD} | - | $V_{DD} - 10.0$ | $V_{DD} + 0.3$ | |
| Input Voltage | V_{IN} | - | -0.3 | $V_{DD} + 0.3$ | V |
| Operating Temperature | T_{OP} | - | -20 | 70 | °C |
| Storage Temperature | T_{ST} | - | -30 | 80 | °C |
| Storage Humidity | H_D | $T_a < 60\text{ °C}$ | - | 90 | %RH |

1.4 DC Electrical Characteristics

$T_a = 25\text{ °C}$

| 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} | $I_{OH} = -0.1\text{mA}$ | 3.9 | - | V_{DD} | V |
| “L” Output Voltage | V_{OL} | $I_{OL} = 0.1\text{mA}$ | - | - | 0.4 | V |
| Supply Current | I_{DD} | $V_{DD} = 5.0\text{ V}$, $V_{op} = 4.5\text{ V}$ Pattern = Horizontal *1 | - | 2.0 | 3.0 | mA |
| LCM Driver Voltage | V_{OP} *2 | -20°C | 4.4 | 4.6 | 4.8 | V |
| | | 25°C | 4.3 | 4.5 | 4.7 | |
| | | 70°C | 4.1 | 4.3 | 4.5 | |

NOTE: *1 The Maximum current display

*2 The V_{OP} test point is ($V_{DD} - V_o$)

1.5 Optical Characteristics

LCD Panel : 1/16 Duty , 1/5 Bias , $V_{LCD} = 4.5 V$, $T_a = 25^\circ C$

| Item | Symbol | Conditions | Min. | Typ. | Max. | Unit | Reference |
|-------------------------------|-------------|------------|------|------|------|-------------------|-----------|
| Response Time | Rise | tr | - | 80 | 125 | ms | Note 2 |
| | Fall | tf | - | 220 | 330 | | |
| Viewing angle range | Top | $\theta+$ | - | 40 | - | Deg. | Note 1 |
| | Bottom | $\theta-$ | - | 40 | - | | |
| | Left | θL | - | 45 | - | | |
| | Right | θR | - | 45 | - | | |
| Contrast Ratio | C | - | - | 10 | - | - | Note 3 |
| Average Brightness (with LCD) | IV | IF= 100 mA | 30 | 35 | - | cd/m ² | Note 4 |
| Wavelength (with LCD) | λp | | 568 | 571 | 574 | nm | |
| Uniformity | ΔB | | 70 | - | - | % | |

Note 4 :

1 : $\Delta B = B(\min) / B(\max) * 100\%$

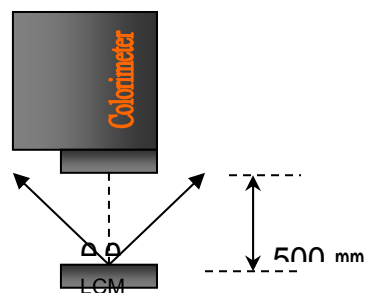
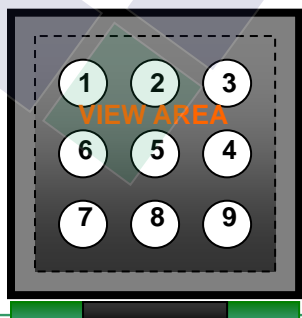
2 : Measurement Condition for Optical Characteristics:

a : Environment: $25^\circ C \pm 5^\circ C$ / $60 \pm 20\% R.H$, no wind , dark room below 10 Lux at typical lamp current and typical operating frequency.

b : Measurement Distance: 500 ± 50 mm , ($\theta = 0^\circ$)

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

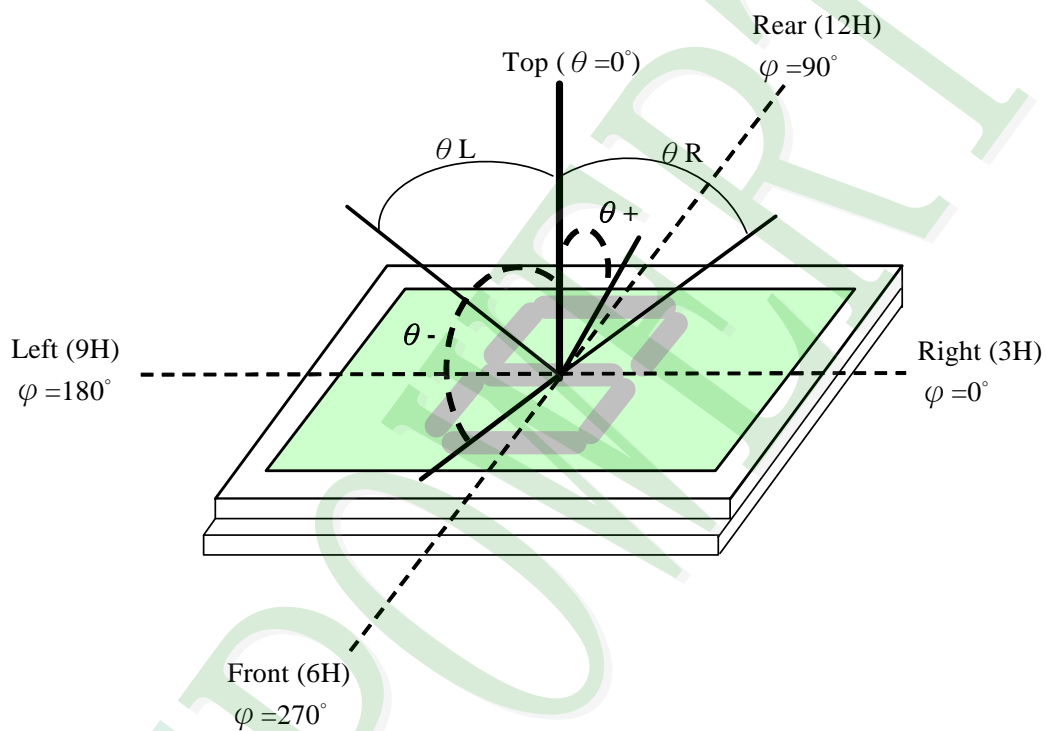
d : The uncertainty of the C.I.E coordinate measurement ± 0.01 , Average Brightness $\pm 4\%$



Note 1.

Optical characteristics-2

Viewing angle

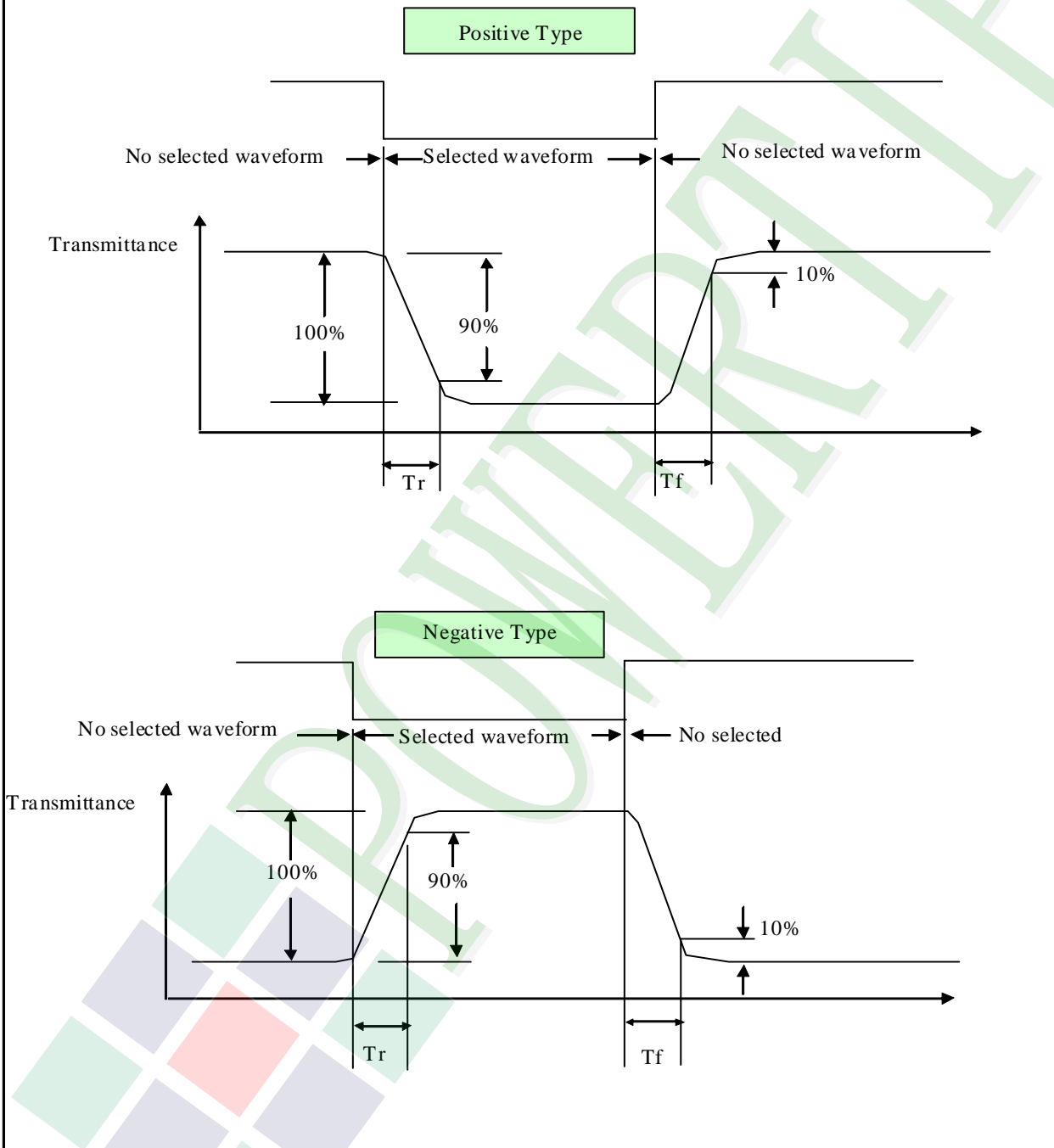


Viewing angle

Note 2.

Optical characteristics-3

Fig.2 Definition of response time



Electrical characteristics-2

※2 Drive waveform

V_{op} : Drive voltage

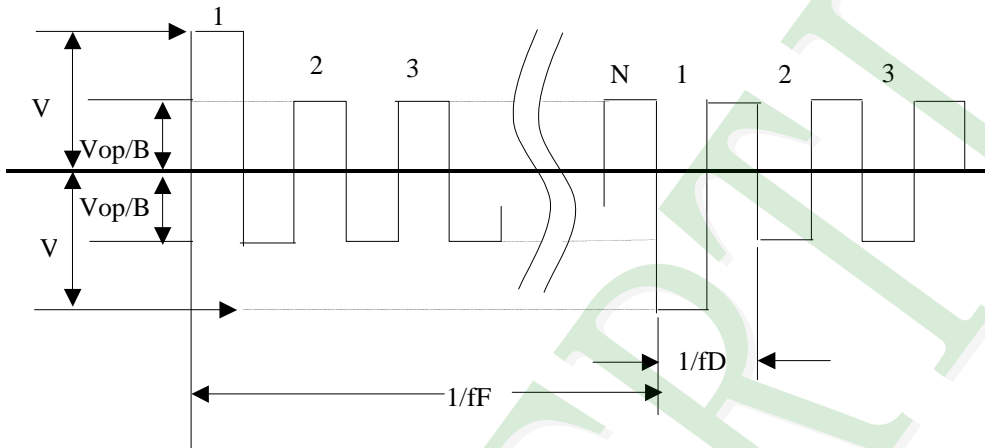
f_F : Frame frequency

$1/B$: Bias

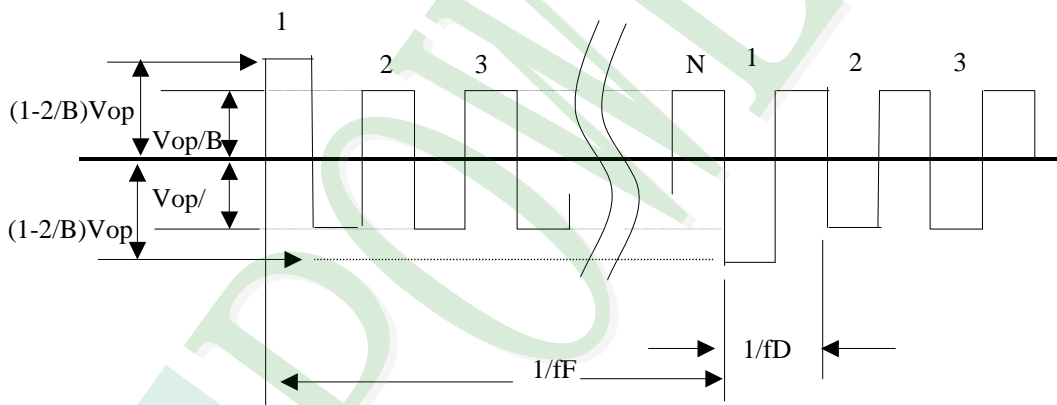
f_D : Drive frequency

N : Duty

(1) Selected waveform



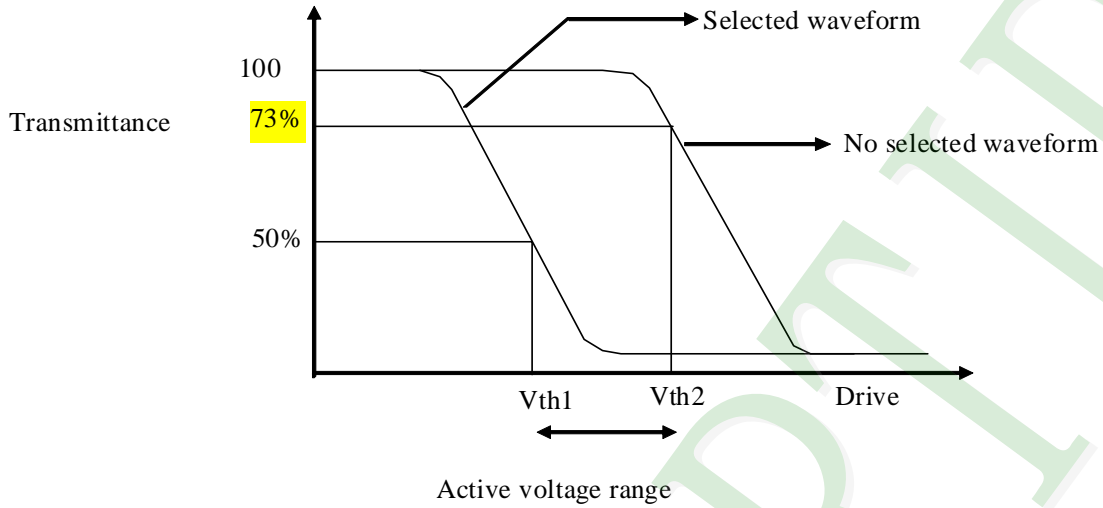
(2) Non- Selected wave form



Note:

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

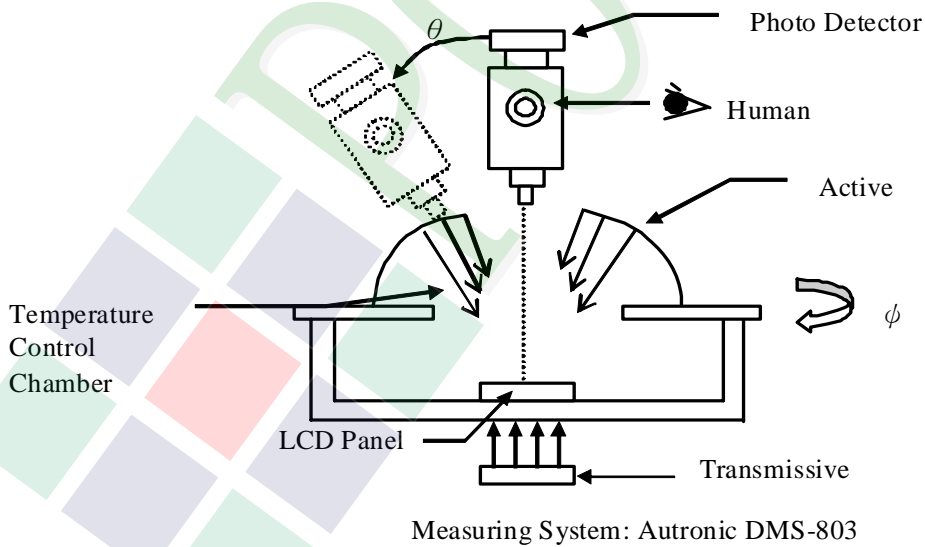
Note 3. : Definition of Vth



| | 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



1.6 Backlight Characteristics

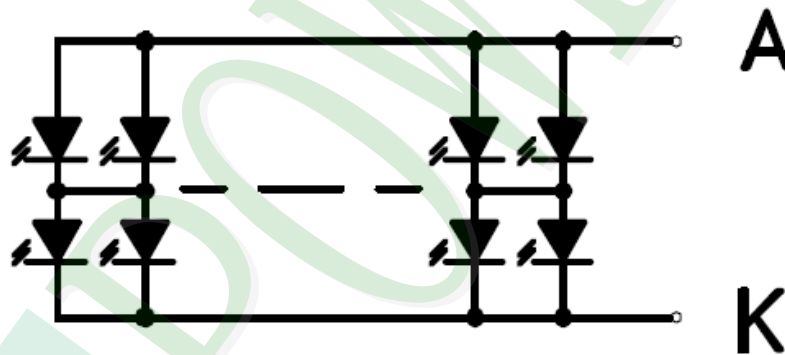
Maximum Ratings

| Item | Symbol | Conditions | Min. | Max. | Unit |
|-------------------|--------|------------|------|------|------|
| Forward Current | IF | Ta =25°C | - | 150 | mA |
| Reverse Voltage | VR | Ta =25°C | - | 8 | V |
| Power Dissipation | PD | Ta =25°C | - | 660 | mW |

Electrical / Optical Characteristics

| Item | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|-------------------------------------|--------------|------------|------|------|------|-------------------|
| Forward Voltage | VF | IF= 100 mA | 4.0 | 4.2 | 4.4 | V |
| Average Brightness (without LCD) | IV | | 160 | 190 | - | cd/m ² |
| Wavelength (Without LCD) | λ_p | | 569 | 572 | 575 | nm |
| Color | Yellow/Green | | | | | |

Internal Circuit Diagram:



2*10=20 Dices

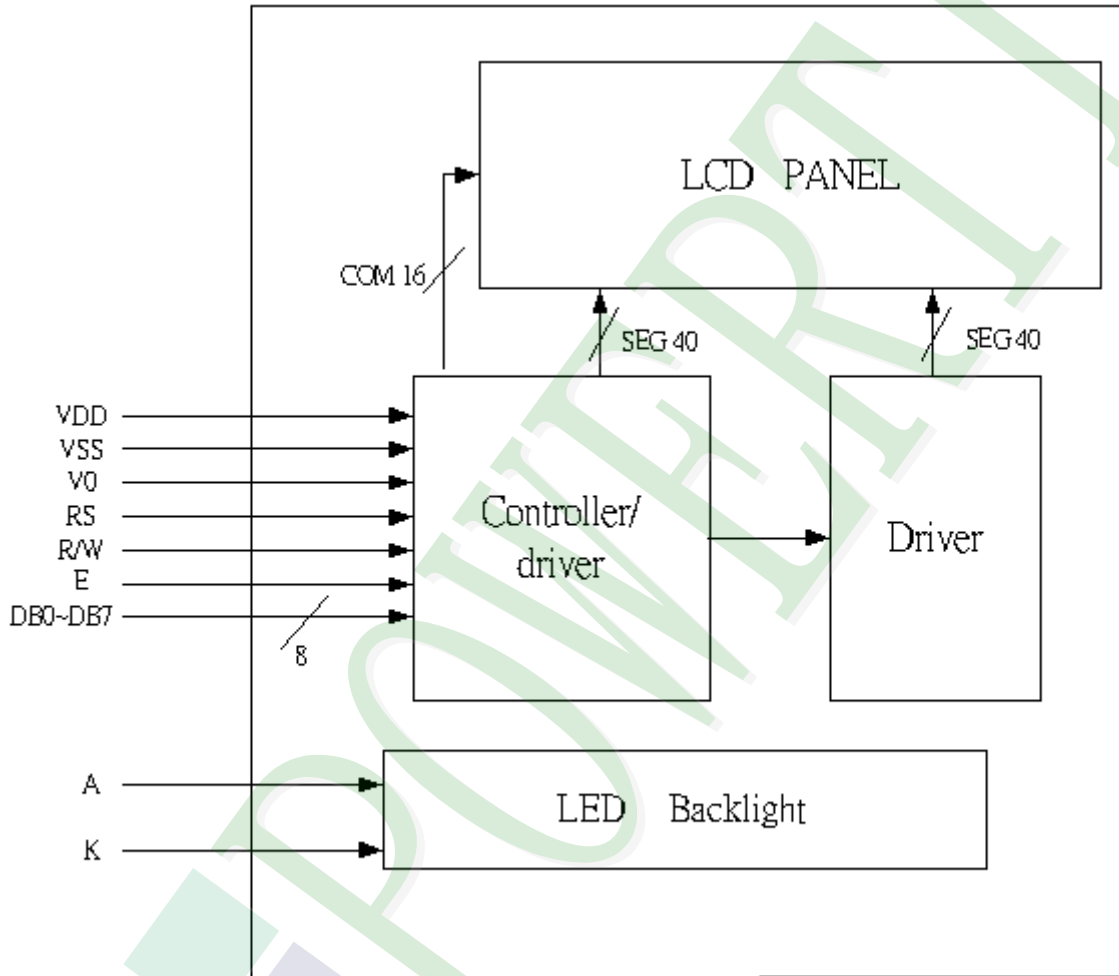
2. MODULE STRUCTURE

2.1 Counter Drawing

2.1.1 LCM Mechanical Diagram

* See Appendix

2.1.2 Block Diagram

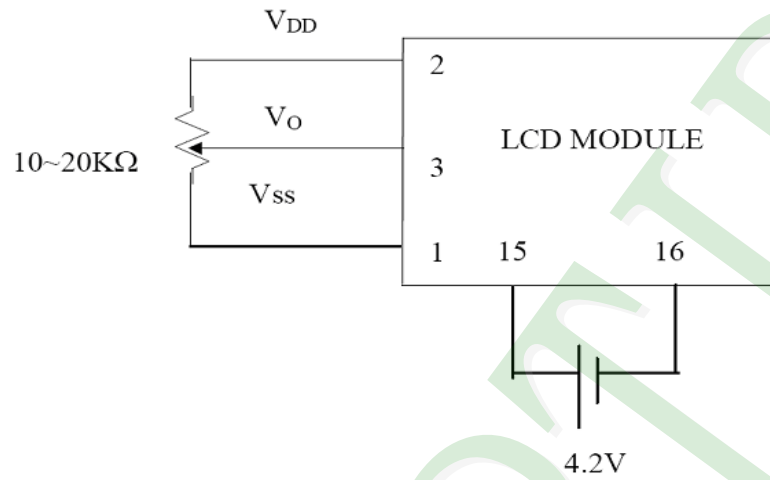


2.2 Interface Pin Description

| Pin No. | Symbol | Signal Description |
|---------|-----------------|--|
| 1 | V _{SS} | Power Supply (V _{SS} =0) |
| 2 | V _{DD} | Power Supply (5V) |
| 3 | V _O | Operating voltage for LCD |
| 4 | RS | Register Selection input High = Data register Low = Instruction register (for write) Busy flag address counter (for read) |
| 5 | R/W | Read/Write signal input is used to select the read/write mode 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. 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. DB7 can be used as a busy flag. |
| 12 | DB5 | |
| 13 | DB6 | |
| 14 | DB7 | |
| 15 | A | LED+ |
| 16 | K | LED- |

2.2.1 Application Notes

Contrast Adjust

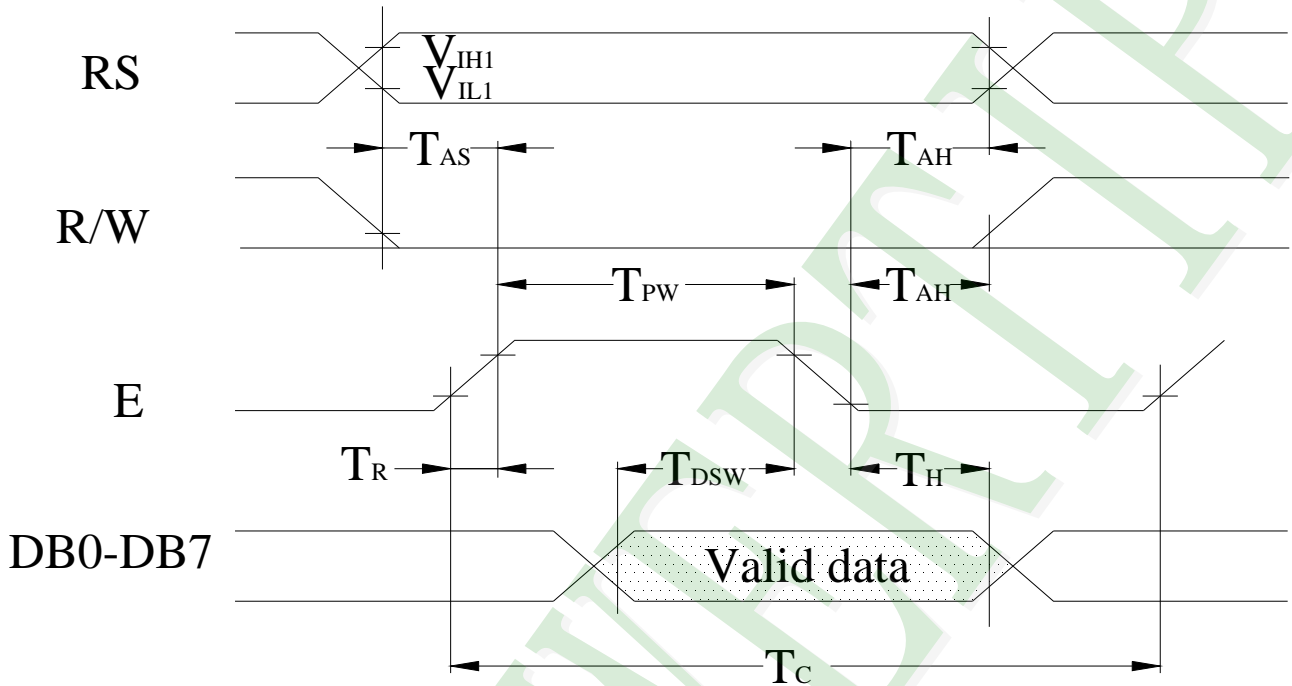


2.2.2 Refer Initial code

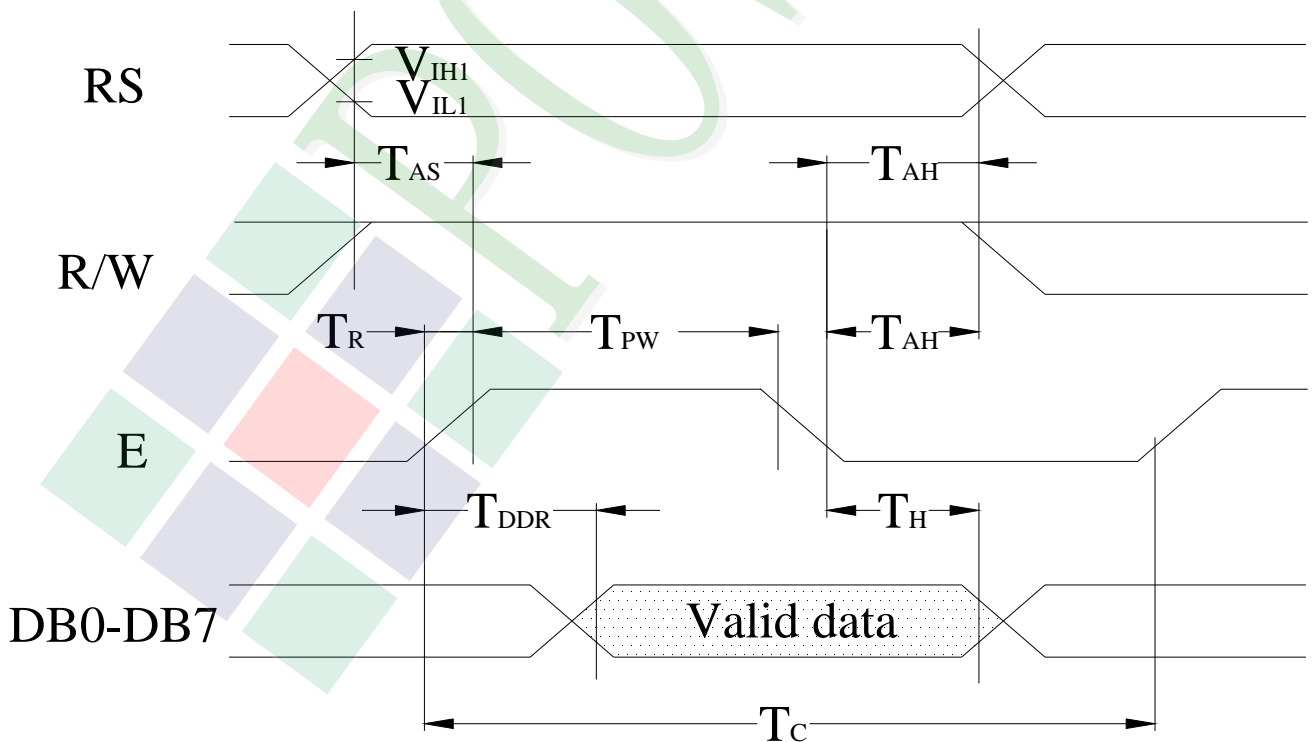
```
void initial()
{
    delay(40);
    write_com(0x01);
    delay(5);
    write_com(0x38);
    delay(5);
    write_com(0x0c);
    delay(5);
    write_com(0x06);
    delay(5);
}
```

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 |

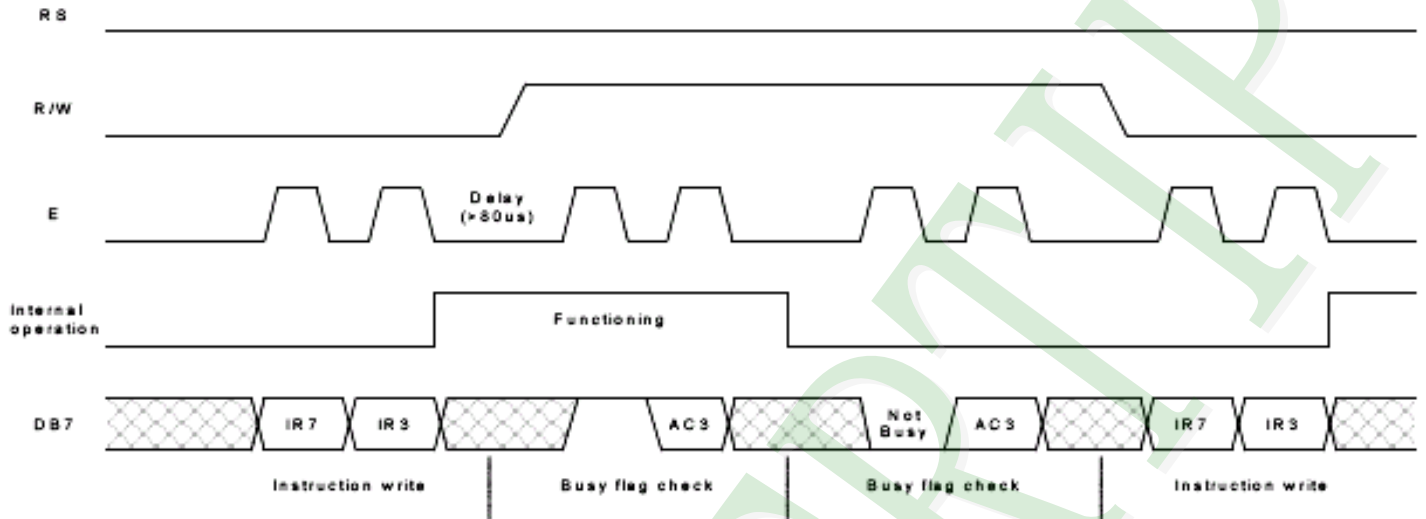
Read Mode (Reading data from ST7066U to MPU)

(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 |

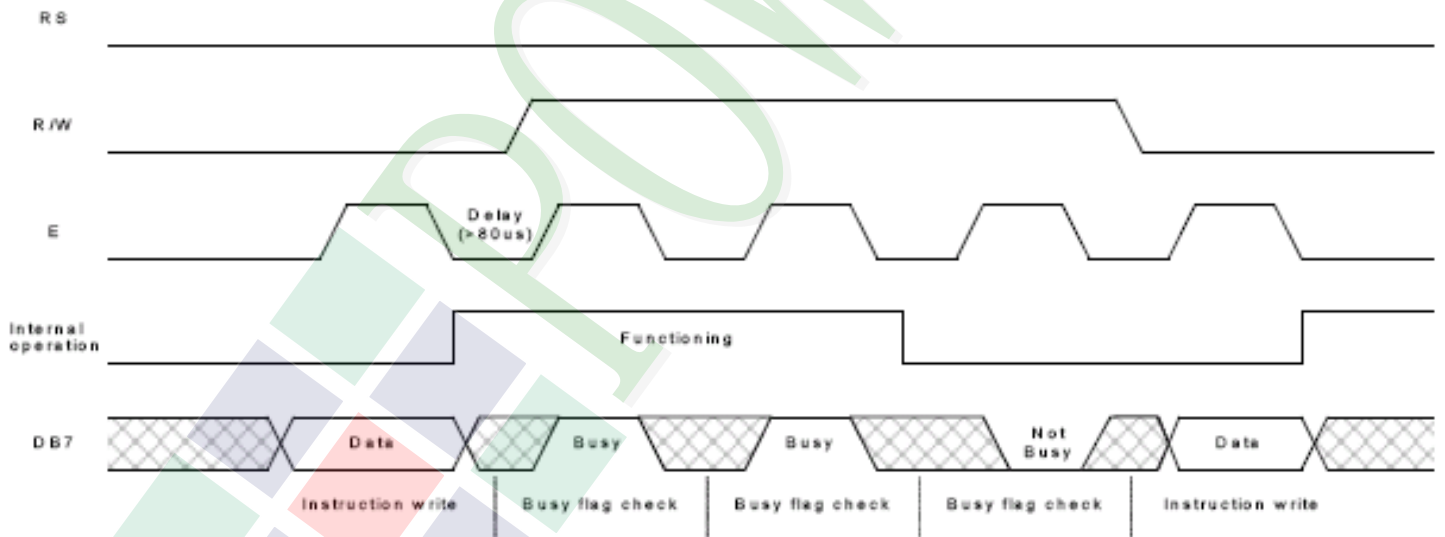
For 4-bit interface date, only four bus lines (DB4 to DB7) are used for transfer.

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 | DB 7 | DB 6 | DB 5 | DB 4 | DB 3 | DB 2 | DB 1 | DB 0 | | | |
| Clear Display | 0 | 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 | 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 | 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 | 0 | 1 | D | C | B | D=1 : entire display on C=1 : cursor on B=1 : cursor position on | 37μs |
| Cursor or Display Shift | 0 | 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 | 0 | 1 | DL | N | F | × | × | DL: interface data is 8/4 bits NL: number of line is 2/1 F: font size is 5×11/5×8 | 37μs |
| Set CGRAM Address | 0 | 0 | 0 | 1 | AC 5 | AC 4 | AC 3 | AC 2 | AC 1 | AC 0 | | Set CGRAM address in address counter. | 37μs |
| Set DDRAM Address | 0 | 0 | 1 | AC 6 | AC 5 | AC 4 | AC 3 | AC 2 | AC 1 | AC 0 | | Set DDRAM address in address counter. | 37μs |
| Read Busy Flag and Address | 0 | 1 | B F | AC 6 | AC 5 | AC 4 | AC 3 | AC 2 | AC 1 | AC 0 | | 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 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Write data into internal RAM (DDRAM/CGRAM). | 37μs |
| Read Data from RAM | 1 | 1 | D7 | 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

ST7066-0T

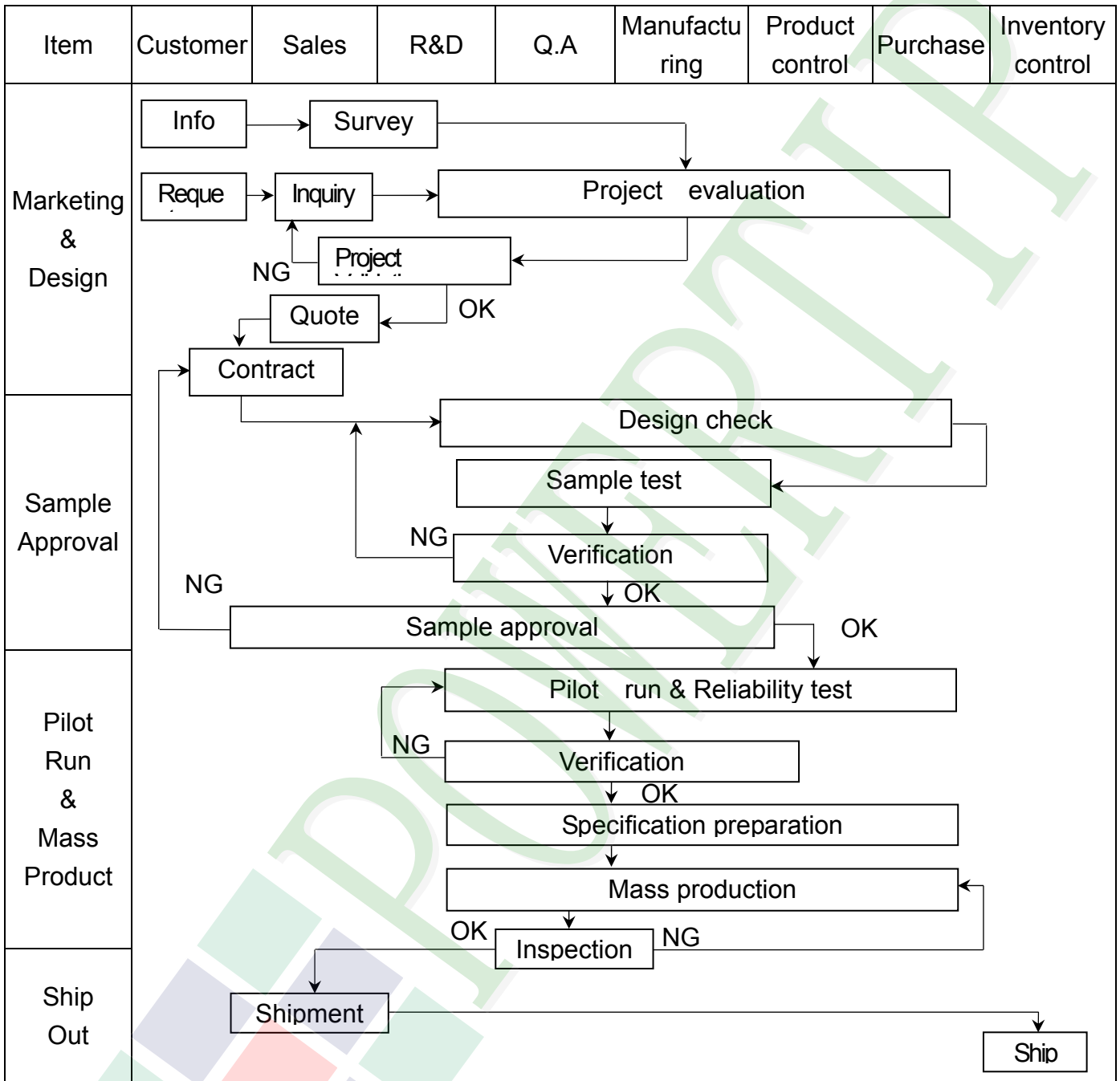
| b7-b4 b3-b0 | 0000 | 0001 | 0010 | 0011 | 0100 | 0101 | 0110 | 0111 | 1000 | 1001 | 1010 | 1011 | 1100 | 1101 | 1110 | 1111 |
|----------------|------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0000 | CG RAM (1) | | | 0 | 1 | 2 | 3 | 4 | | | 5 | 6 | 7 | 8 | 9 | A |
| 0001 | (2) | | ! | 1 | 2 | 3 | 4 | 5 | | | 6 | 7 | 8 | 9 | 0 | 1 |
| 0010 | (3) | | " | 1 | 2 | 3 | 4 | 5 | | | 6 | 7 | 8 | 9 | 0 | 1 |
| 0011 | (4) | | # | 1 | 2 | 3 | 4 | 5 | | | 6 | 7 | 8 | 9 | 0 | 1 |
| 0100 | (5) | | \$ | 1 | 2 | 3 | 4 | 5 | | | 6 | 7 | 8 | 9 | 0 | 1 |
| 0101 | (6) | | % | 1 | 2 | 3 | 4 | 5 | | | 6 | 7 | 8 | 9 | 0 | 1 |
| 0110 | (7) | | & | 1 | 2 | 3 | 4 | 5 | | | 6 | 7 | 8 | 9 | 0 | 1 |
| 0111 | (8) | | ' | 1 | 2 | 3 | 4 | 5 | | | 6 | 7 | 8 | 9 | 0 | 1 |
| 1000 | (1) | | < | 1 | 2 | 3 | 4 | 5 | | | 6 | 7 | 8 | 9 | 0 | 1 |
| 1001 | (2) | | > | 1 | 2 | 3 | 4 | 5 | | | 6 | 7 | 8 | 9 | 0 | 1 |
| 1010 | (3) | | * | 1 | 2 | 3 | 4 | 5 | | | 6 | 7 | 8 | 9 | 0 | 1 |
| 1011 | (4) | | + | 1 | 2 | 3 | 4 | 5 | | | 6 | 7 | 8 | 9 | 0 | 1 |
| 1100 | (5) | | , | 1 | 2 | 3 | 4 | 5 | | | 6 | 7 | 8 | 9 | 0 | 1 |
| 1101 | (6) | | - | 1 | 2 | 3 | 4 | 5 | | | 6 | 7 | 8 | 9 | 0 | 1 |
| 1110 | (7) | | . | 1 | 2 | 3 | 4 | 5 | | | 6 | 7 | 8 | 9 | 0 | 1 |
| 1111 | (8) | | / | 1 | 2 | 3 | 4 | 5 | | | 6 | 7 | 8 | 9 | 0 | 1 |

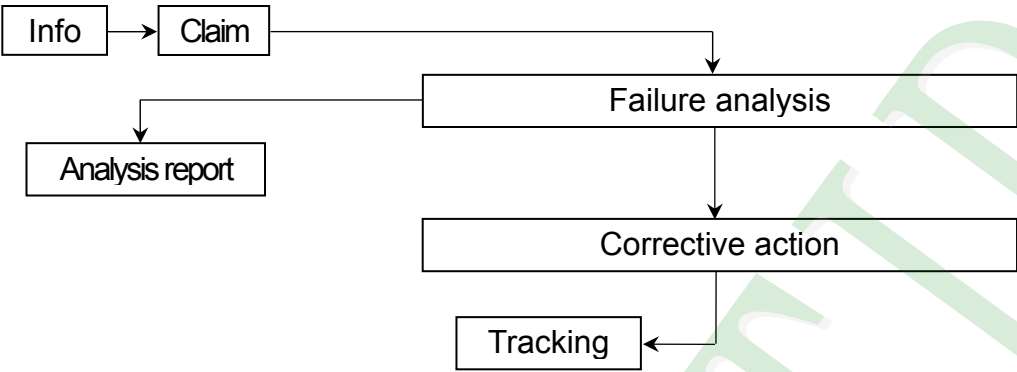
2.6 JUMPER (Setting different use)

J1、J4

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 |  <pre> graph TD Info[Info] --> Claim[Claim] Claim --> FA[Failure analysis] Claim --> AR[Analysis report] FA --> CA[Corrective action] CA --> Tracking[Tracking] </pre> | | | | | | | |
| Q.A Activity | 1. ISO 9001 Maintenance Activities 3. Equipment calibration 5. Standardization Management | | | | 2. Process improvement proposal 4. Education And Training Activities | | | |

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 .

(100% tested before shipment)

◆ 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)

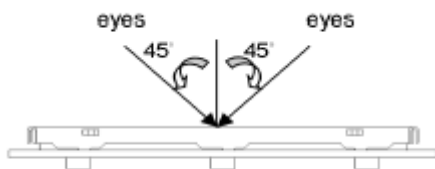


Fig.1

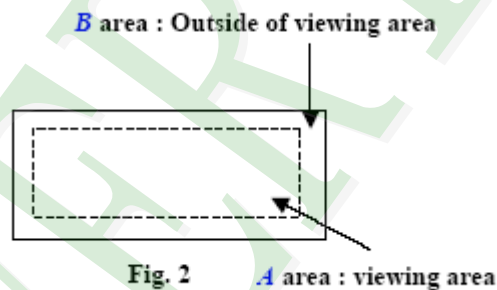


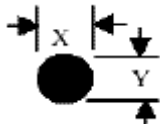
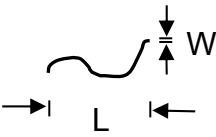
Fig. 2

◆ 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 :

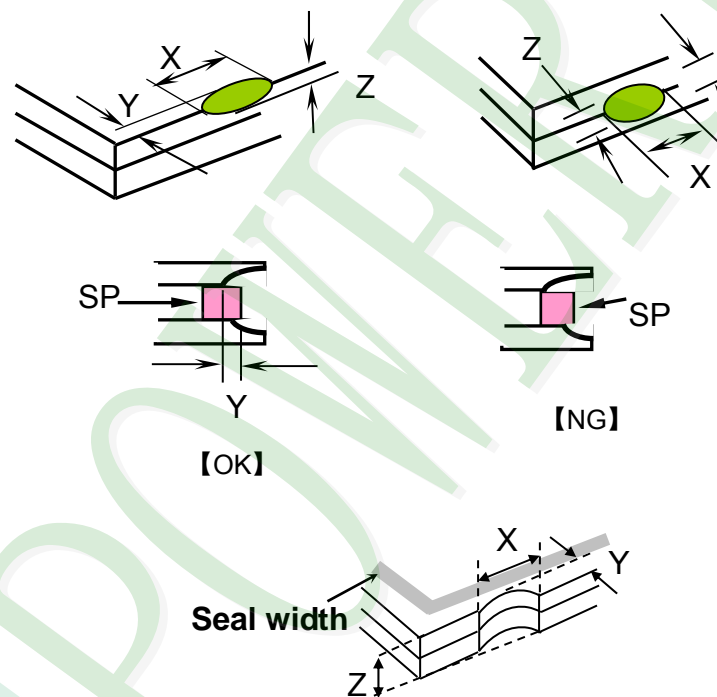
(Ver.B01)

| NO | Item | Criterion | Level | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------------------|---|---|--------------------------------|-------------------|--|--------|--------|------------------|-----------------|--|-------------------------|---|--------|-------------------------|---|----------------|---|-----------|--|-------------------|--|------------|-----------|--------|--------|-----|---------------|-----------------|--------|--------------|----------------------|---|--------------|-----------------------|-----|-------------|---------------|--|-------|
| 05 | <p>Black or white dot, scratch, contamination</p> <p>Round type</p>  <p>$\Phi = (x+y)/2$</p> <p>Line type</p>  | <p>5.1 Round type:</p> <p>5.1.1 display only :</p> <ul style="list-style-type: none"> • White and black spots on display ≤ 0.30 mm , no more than 4 white or black spots present. • Densely spaced : NO more than two spots or lines within 3 mm. <p>5.1.2 Non-display :</p> <table border="1" data-bbox="483 801 1342 1167"> <thead> <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> </thead> <tbody> <tr> <td>$\Phi \leq 0.10$</td> <td colspan="2">Accept no dense</td> </tr> <tr> <td>$0.10 < \Phi \leq 0.20$</td> <td>3</td> <td rowspan="3">Ignore</td> </tr> <tr> <td>$0.20 < \Phi \leq 0.30$</td> <td>2</td> </tr> <tr> <td>Total quantity</td> <td>4</td> </tr> </tbody> </table> <p>5.1.3 Line type:</p> <table border="1" data-bbox="434 1236 1390 1621"> <thead> <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> </thead> <tbody> <tr> <td>---</td> <td>$W \leq 0.03$</td> <td>Accept no dense</td> <td rowspan="3">Ignore</td> </tr> <tr> <td>$L \leq 3.0$</td> <td>$0.03 < W \leq 0.05$</td> <td rowspan="2">4</td> </tr> <tr> <td>$L \leq 2.5$</td> <td>$0.05 < W \leq 0.075$</td> </tr> <tr> <td>---</td> <td>$W > 0.075$</td> <td colspan="2">As round type</td> </tr> </tbody> </table> | Dimension (diameter : Φ) | Acceptance (Q'ty) | | A area | B area | $\Phi \leq 0.10$ | Accept no dense | | $0.10 < \Phi \leq 0.20$ | 3 | Ignore | $0.20 < \Phi \leq 0.30$ | 2 | Total quantity | 4 | Dimension | | Acceptance (Q'ty) | | Length (L) | Width (W) | A area | B area | --- | $W \leq 0.03$ | Accept no dense | Ignore | $L \leq 3.0$ | $0.03 < W \leq 0.05$ | 4 | $L \leq 2.5$ | $0.05 < W \leq 0.075$ | --- | $W > 0.075$ | As round type | | Minor |
| Dimension (diameter : Φ) | Acceptance (Q'ty) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | A area | B area | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $\Phi \leq 0.10$ | Accept no dense | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $0.10 < \Phi \leq 0.20$ | 3 | Ignore | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $0.20 < \Phi \leq 0.30$ | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total quantity | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dimension | | Acceptance (Q'ty) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Length (L) | Width (W) | A area | B area | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| --- | $W \leq 0.03$ | Accept no dense | Ignore | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $L \leq 3.0$ | $0.03 < W \leq 0.05$ | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $L \leq 2.5$ | $0.05 < W \leq 0.075$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| --- | $W > 0.075$ | As round type | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 06 | Polarizer Bubble | | Minor | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Dimension (diameter : Φ) | Acceptance (Q'ty) | |
|-----------------------------------|-------------------|--------|
| | A area | B area |
| $\Phi \leq 0.20$ | Accept no dense | |
| $0.20 < \Phi \leq 0.50$ | 3 | Ignore |
| $0.50 < \Phi \leq 1.00$ | 2 | |
| $\Phi > 1.00$ | 0 | |
| Total quantity | 4 | |

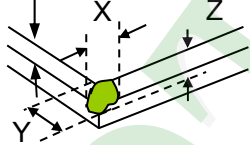
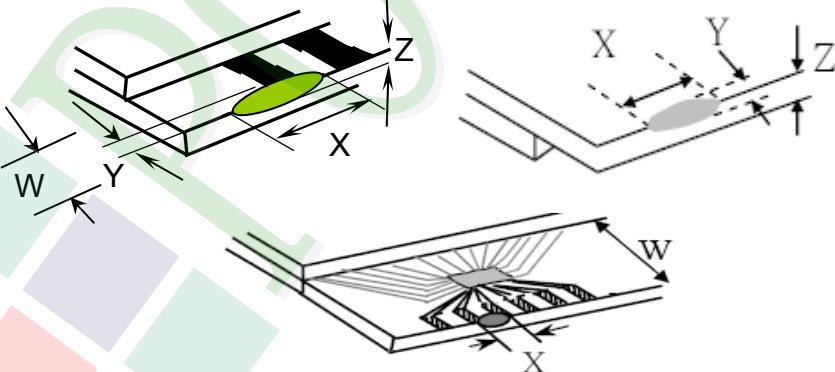
◆Specification For Monotype and Color STN :

(Ver.B01)

| NO | Item | Criterion | Level | | | | | | |
|----------|--|--|-------|---|---|---|----------|--------------------------------|--------------|
| 07 | The crack of glass | <p>Symbols :</p> <p>X : The length of crack Z : The thickness of crack t : The thickness of glass</p> <p>Y : The width of crack. W : terminal length a : LCD side length</p> <hr/> <p>7.1 General glass chip :</p> <p>7.1.1 Chip on panel surface and crack between panels:</p>  | Minor | | | | | | |
| | | <table border="1" data-bbox="494 1545 1308 1836"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>$\leq a$</td> <td>Crack can't enter viewing area</td> <td>$\leq 1/2 t$</td> </tr> <tr> <td>$\leq a$</td> <td>Crack can't exceed the half of SP width.</td> <td>$1/2 t < Z \leq 2 t$</td> </tr> </tbody> </table> | | X | Y | Z | $\leq a$ | Crack can't enter viewing area | $\leq 1/2 t$ |
| X | Y | Z | | | | | | | |
| $\leq a$ | Crack can't enter viewing area | $\leq 1/2 t$ | | | | | | | |
| $\leq a$ | Crack can't exceed the half of SP width. | $1/2 t < Z \leq 2 t$ | | | | | | | |

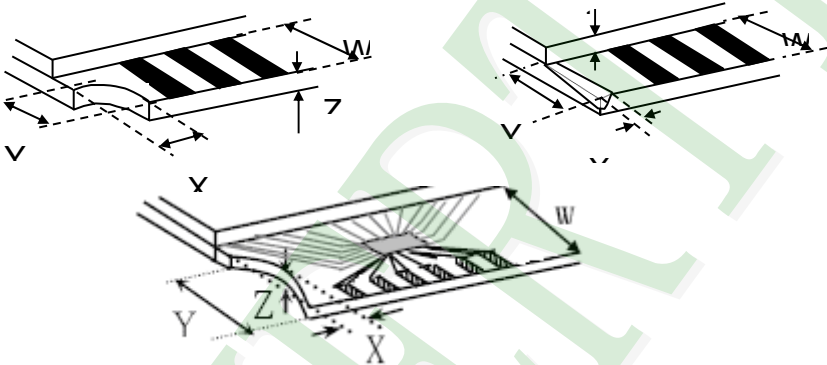
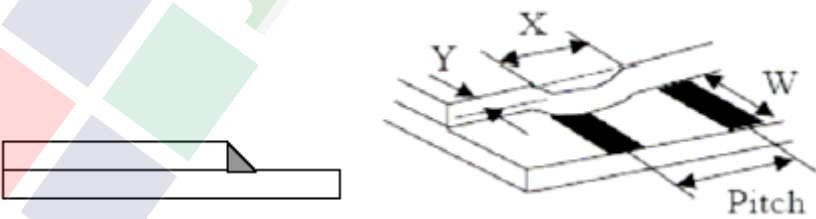
◆Specification For Monotype and Color STN :

(Ver.B01)

| NO | Item | Criterion | Level | | | | | | | | | |
|---|--|---|----------|---|-------|--------------|--------------------------------|----------------|--------------|--|----------------------|-------|
| 07 | The crack of glass | <p>Symbols :</p> <p>X : The length of crack Z : The thickness of crack t : The thickness of glass</p> <p>Y : The width of crack. W : terminal length a : LCD side length</p> <hr/> <p>7.1.2 Corner crack :</p>  <table border="1" data-bbox="501 846 1316 1137"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>$\leq 1/5 a$</td> <td>Crack can't enter viewing area</td> <td>$Z \leq 1/2 t$</td> </tr> <tr> <td>$\leq 1/5 a$</td> <td>Crack can't exceed the half of SP width.</td> <td>$1/2 t < Z \leq 2 t$</td> </tr> </tbody> </table> | X | Y | Z | $\leq 1/5 a$ | Crack can't enter viewing area | $Z \leq 1/2 t$ | $\leq 1/5 a$ | Crack can't exceed the half of SP width. | $1/2 t < Z \leq 2 t$ | Minor |
| | | X | Y | Z | | | | | | | | |
| $\leq 1/5 a$ | Crack can't enter viewing area | $Z \leq 1/2 t$ | | | | | | | | | | |
| $\leq 1/5 a$ | Crack can't exceed the half of SP width. | $1/2 t < Z \leq 2 t$ | | | | | | | | | | |
| <p>7.2 Protrusion over terminal :</p> <p>7.2.1 Chip on electrode pad :</p>  <table border="1" data-bbox="467 1727 1256 1899"> <thead> <tr> <th></th> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>Front</td> <td>$\leq a$</td> <td>$\leq 1/2 W$</td> <td>$\leq t$</td> </tr> <tr> <td>Back</td> <td colspan="3">Neglect</td> </tr> </tbody> </table> | | X | Y | Z | Front | $\leq a$ | $\leq 1/2 W$ | $\leq t$ | Back | Neglect | | |
| | X | Y | Z | | | | | | | | | |
| Front | $\leq a$ | $\leq 1/2 W$ | $\leq t$ | | | | | | | | | |
| Back | Neglect | | | | | | | | | | | |

◆Specification For Monotype and Color STN :

(Ver.B01)

| NO | Item | Criterion | Level | | | | | | | | | |
|--------------|--------------------|--|-------|---|---|---|--------------|----------|----------|---|---|---|
| 07 | The crack of glass | <p>Symbols :</p> <p>X : The length of crack Z : The thickness of crack t : The thickness of glass</p> <p>Y : The width of crack. W : terminal length a : LCD side length</p> | Minor | | | | | | | | | |
| | | <p>7.2.2 Non-conductive portion :</p>  <table border="1" data-bbox="579 1070 1211 1227"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>$\leq 1/3 a$</td> <td>$\leq W$</td> <td>$\leq t$</td> </tr> </tbody> </table> <p>⊙ If the chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications.</p> <p>7.2.3 Glass remain :</p>  <table border="1" data-bbox="499 1854 1193 1995"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>$\leq a$</td> <td>$\leq 1/3 W$</td> <td>$\leq t$</td> </tr> </tbody> </table> | | X | Y | Z | $\leq 1/3 a$ | $\leq W$ | $\leq t$ | X | Y | Z |
| X | Y | Z | | | | | | | | | | |
| $\leq 1/3 a$ | $\leq W$ | $\leq t$ | | | | | | | | | | |
| X | Y | Z | | | | | | | | | | |
| $\leq a$ | $\leq 1/3 W$ | $\leq t$ | | | | | | | | | | |

POWER TIP

◆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)

| NO. | TEST ITEM | TEST CONDITION | |
|-----|---|--|--|
| 1 | High Temperature Storage Test | Keep in +80 ±2°C 240hrs Surrounding temperature, then storage at normal condition 4hrs. | |
| 2 | Low Temperature Storage Test | Keep in -30 ±2°C 240hrs Surrounding temperature, then storage at normal condition 4hrs. | |
| 3 | High Temperature / High Humidity Storage Test | Keep in +60 °C / 90% R.H duration for 240hrs Surrounding temperature, then storage at normal condition 4hrs. (Excluding the polarizer) | |
| 4 | Temperature Cycling Storage Test | <div style="text-align: center;"> $-30^{\circ}\text{C} \xrightarrow{(30\text{mins})} +25^{\circ}\text{C} \xrightarrow{(5\text{mins})} +80^{\circ}\text{C} \xrightarrow{(30\text{mins})} +25^{\circ}\text{C} \xrightarrow{(5\text{mins})}$ 20 Cycle Surrounding temperature, then storage at normal condition 4hrs. </div> | |
| 5 | ESD Test | Air Discharge: Apply 2 KV with 5 times Discharge for each polarity +/- | Contact Discharge: Apply 250 V with 5 times discharge for each polarity +/- |
| | | 1. Temperature ambience : 15°C ~ 35°C 2. Humidity relative : 30% ~ 60% 3. Energy Storage Capacitance(Cs+Cd) : 150pF±10% 4. Discharge Resistance(Rd) : 330Ω±10% 5. Discharge, mode of operation : Single Discharge (time between successive discharges at least 1 sec) (Tolerance if the output voltage indication : ±5%) | |
| 6 | Vibration Test (Packaged) | 1. Sine wave 10~55 Hz frequency (1 min/sweep) 2. The amplitude of vibration : 1.5 mm 3. Each direction (X、 Y、 Z) duration for 2 Hrs | |

| | | | |
|--|-------------------------|--|-----|
| 7 | Drop Test (Packaged) | Packing Weight (Kg) Drop Height (cm) | |
| | | 0 ~ 45.4 | 122 |
| | | 45.4 ~ 90.8 | 76 |
| | | 90.8 ~ 454 | 61 |
| | | Over 454 | 46 |
| Drop Direction : ※1 corner / 3 edges / 6 sides each 1time | | | |



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 $320\pm 10^{\circ}\text{C}$ and 3-5 sec.
- 5.2.9 To avoid liquid (include organic solvent) stained on LCM .
- 5.2.10 Caution!(LCM products with Capacitive Touch Panel)
Strong EMI-sources such as switch-mode power supplies (SMPS) can lead to touch malfunction (e.g. ghost-touches).
Therefore, the touch needs to be thoroughly tested inside the target application.

5.3 STORAGE

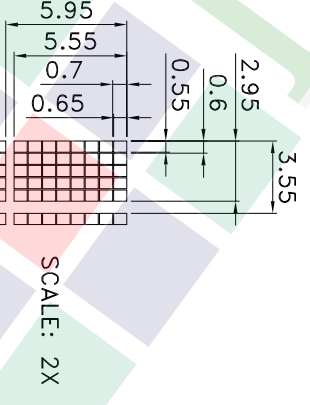
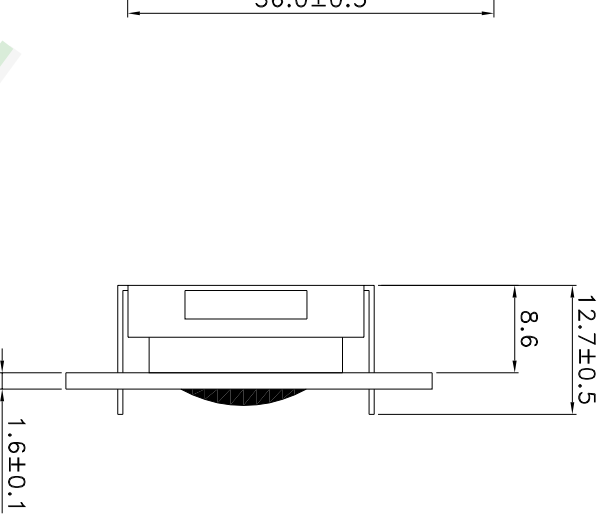
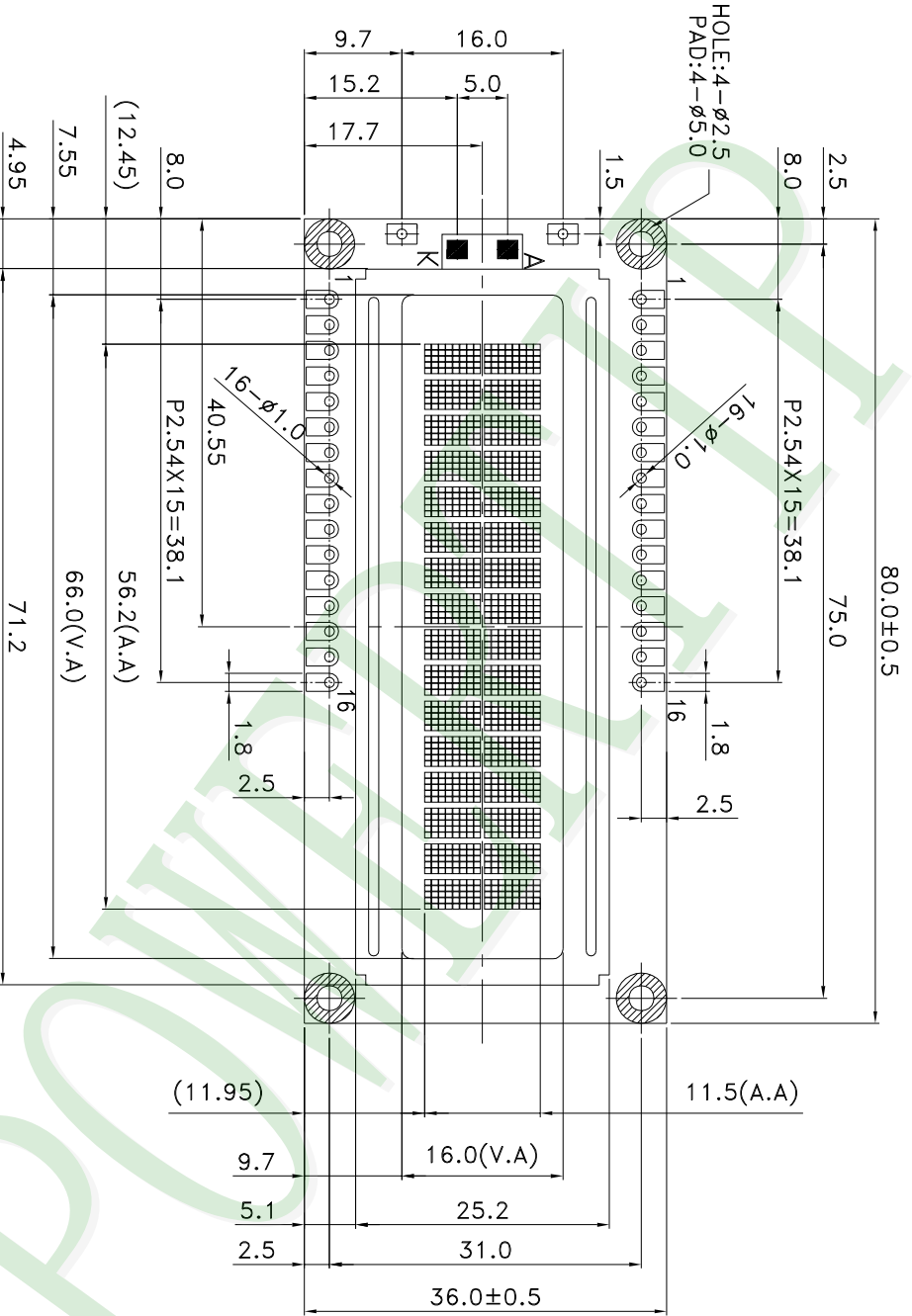
- 5.3.1 Store the panel or module in a dark place where the temperature is $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and the humidity is below 65% RH.
- 5.3.2 Do not place the module near organics solvents or corrosive gases.
- 5.3.3 Do not crush , shake , or jolt the module.

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.





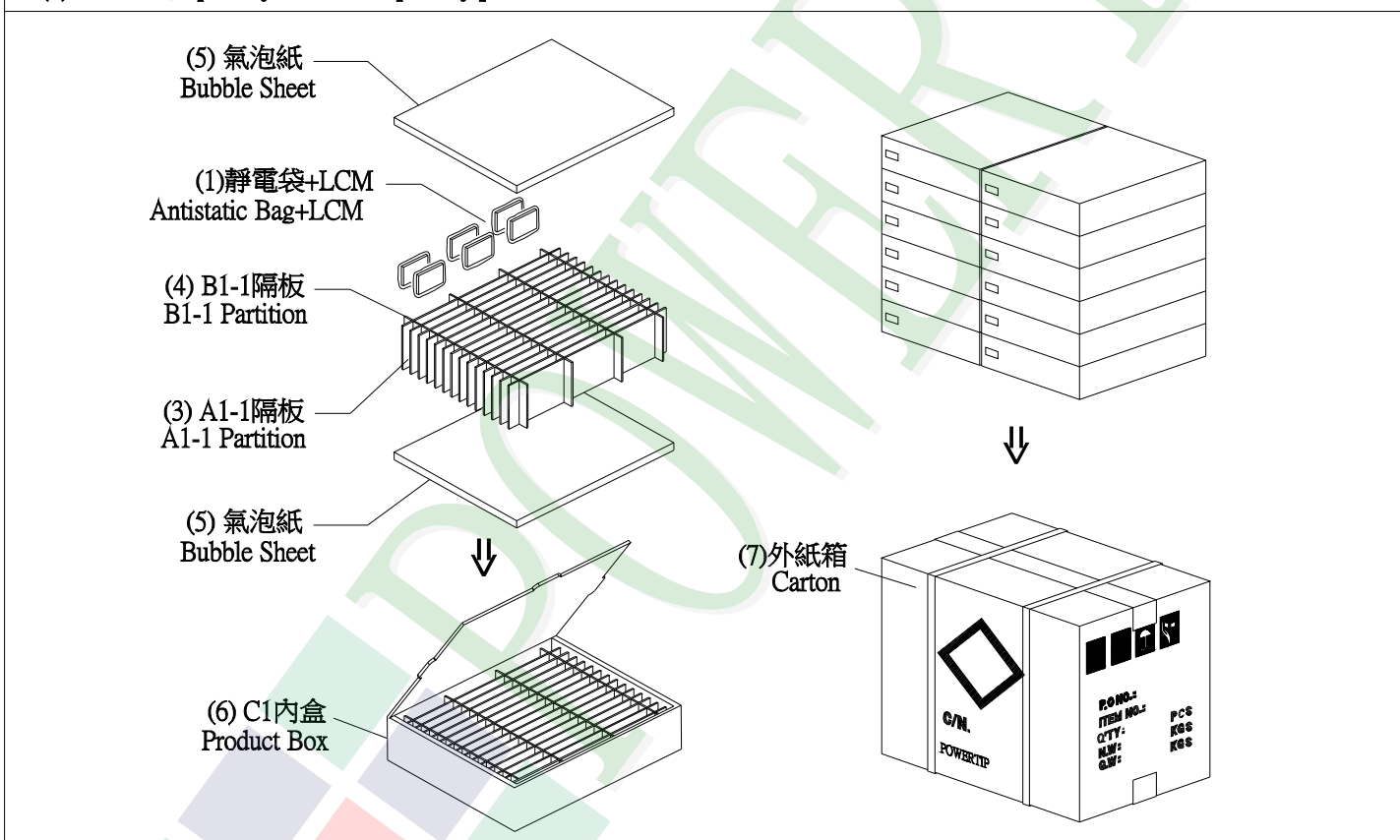
NOTES:
 1.LCD TYPE: STN (Y/G)
 2.LCD DISPLAY: POSITIVE/Transflective
 3.VIEW DIRECTION: 6 O'CLOCK
 4.Top: -20~70°C Tst:-30~80°C
 5.The tolerance unless classified ±0.3mm

| | | | | | | | | | | | |
|-----|-------------|--------|---------------|-----------------------|--------------------|--|---|--|---|--|----------------------------|
| 007 | | | | PART NO: | NPC1602LRU-GWT-H | | 久正光电股份有限公司 POWERTIP TECHNOLOGY CORPORATION | Design: Sally Check: Terry Approve: Ryan | Unit: MM (3) Scale: 1:1 Page: 1/1 | Surface: Material: Thickness: Quantity: | 公差等级 最大长度 最小长度 精度 |
| 006 | | | DRAWING NAME: | JLMD-NPC1602LRU-GWT-H | | | | | | | |
| 005 | | | | TITLE: | LCD Module Drawing | | | | | | |
| 004 | | | | | | | | | | | |
| 003 | | | | | | | | | | | |
| 002 | | | | | | | | | | | |
| 001 | NEW DRAWING | REV BY | Sally | DATE | 2018/08/06 | | | | | | |
| REV | | | | | | | | | | | |

1. 包裝材料規格表 (Packaging Material) : (per carton)

| No. | Item | Model | Dimensions (mm) | 1Pcs Weight | Quantity | Total Weight |
|-----|-------------------------|------------------|--------------------|-------------|----------|--------------|
| 1 | 成品 (LCM) | NPC1602LRU-GWT-H | 80.0 X 36.0 X 12.7 | 0.0328 | 468 | 15.444 |
| 2 | 靜電袋(1)Antistatic Bag | BAG100100ARABA | 100 X 100 | 0.0011 | 468 | 0.5148 |
| 3 | A1-1隔板(3)A1-1 Partition | BX29500047BZBA | 295 X 47 X 3 | 0.0078 | 168 | 1.3104 |
| 4 | B1-1隔板(4)B1-1 Partition | BX24500047BZBA | 245 X 47 X 3 | 0.0065 | 48 | 0.312 |
| 5 | 氣泡紙(5)Bubble Sheet | BAG280240BWABA | 280 X 240 | 0.006 | 24 | 0.144 |
| 6 | C1內盒(6)Product Box | BX31025555AABA | 310 X 255 X 55 | 0.13 | 12 | 1.56 |
| 7 | 外紙箱(7)Carton | BX52732536CCBA | 527 X 325 X 360 | 0.83 | 1 | 0.83 |
| 8 | | | | | | |
| 9 | | | | | | |

2. 一整箱總重量 (Total LCD Weight in carton) : 20.12 Kg±10%
 3. 單箱數量規格表 (Packaging Specifications and Quantity) :
 (1)Quantity Of Spacer : A1-1隔板 X 14 , B1-1隔板 X 4
 (2)Total LCM quantity in carton : quantity per box 39 x no of boxes 12 = 468



特 記 事 項 (REMARK)

1. LCM排放示意圖(前後間隔不放置):
 1. LCM placed as figure showing:
 (First and last slot should be empty)

▨ 模組(LCM) X 1pcs.

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for [TFT Displays & Accessories](#) category:

Click to view products by [Powertip](#) manufacturer:

Other Similar products are found below :

[OAI-80038AA-2013-A](#) [HDA430T-3G1H](#) [EA CARREDIPTFT02](#) [NL6448BC20-21D](#) [NB7W-KBA04](#) [NB-ATT01](#) [NB5Q-ATT01](#) [NB5Q-KBA04](#) [NB-CN001](#) [NL12880BC20-05](#) [NL8060BC26-35C](#) [NL8060BC26-35F](#) [TCG104SVLQAPNN-AN20](#) [OAI-80038AA-2008-A](#) [315-U004B15300](#) [UMSH-8596MD-34T \(REV D\)](#) [98-0003-3490-8](#) [1044278](#) [1029309](#) [1060549](#) [DE 127-TU-30/7,5](#) [DE 128-TU-20/7,5](#) [EP-LK007TFTPCAP](#) [FR7.0A00](#) [RC2002A-TIG-CSX](#) [NL6448BC2021C](#) [TX17D01VM2EAB](#) [TX14D23VM5BAA](#)
[TCG121WXLRXVNNANX35](#) [EIC-LCD-1080P](#) [T272480C07VR01](#) [1060632](#) [TCG070WVLPAAANN-AN50](#) [TCG035QVLPDANN-GN50](#)
[1060630](#) [RFE430V-AIW-DNG](#) [T-55619GD065J-LW-ABN](#) [NHD-1.8-128160EF-SSXN-FT](#) [TCG104SVLPEANN-AN30](#) [NL6448BC33-70](#)
[NL192108BC18-06F](#) [NLB150XG02L-01](#) [NL6448BC20-30D](#) [NL10276BC16-06](#) [NL192108AC10-01D](#) [NL6448AC18-08F](#) [NL6448BC20-30F](#)
[NL12880BC20-05BD](#) [NL12880BC20-05D](#) [NL8060BC26-35BA](#)