


SPECIFICATIONS FOR LCD MODULE

| | |
|--------------------------|-----------------------|
| CUSTOMER | |
| MODEL | SC12232001-V01 |
| CUSTOMER APPROVED | |

| APPROVED BY | CHECKED BY | ORGANIZED BY |
|---|-------------------|---------------------|
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0158

Specification Revision History

| Version | Content | Date |
|----------------|--------------------|-----------------|
| A0 | First Issue | 2017-9-1 |
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1. SPECIFICATIONS

1.1 Features

| Item | Standard Value |
|-------------------|-----------------------------------|
| Display Type | 122 x 32 DOTS |
| LCD Type | STN(BLUE), NEGATIVE, TRANSMISSIVE |
| Driver Condition | LCD Module : 1/32 Duty , 1/5 Bias |
| Viewing Direction | 6 O'Clock |
| Backlight Type | SIDE WHITE |
| Interface | 8BIT bus MPU interface |
| Driver IC | SED1520 or eqv |

1.2 Mechanical Specifications

| Item | Standard Value | Unit |
|-------------------|-------------------------|------|
| Outline Dimension | 84(L) * 44(W) * 12.8(T) | mm |
| Viewing Area | 60(L) * 18(W) | mm |
| Dot Size (W*H) | 0.36*0.42mm | |
| Dot Pitch (W*H) | 0.40*0.46 mm | |

1.3 Absolute Maximum Ratings

| Item | Symbol | Condition | Min. | Max. | Unit |
|-----------------------------|--------------------|------------|------|-----------|------|
| System Power Supply Voltage | VDD | - | -0.3 | 6.0 | V |
| LCD Driver Supply Voltage | VOUT _{IN} | - | 4.5 | 5.5 | V |
| Input Voltage | V _{IN} | - | -0.3 | VDD + 0.2 | V |
| Operating Temperature | T _{OP} | - | -20 | 70 | °C |
| Storage Temperature | T _{ST} | - | -30 | 80 | °C |
| Storage Humidity | H _D | Ta < 40 °C | 20 | 90 | %RH |

1.4 Backlight Characteristics

LCD Module with LED Backlight

Electrical / Optical Characteristics

Ta =25°C

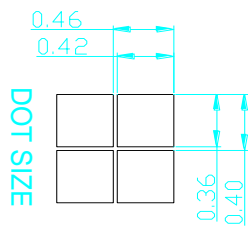
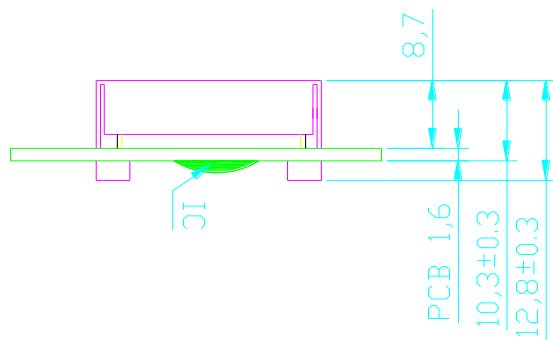
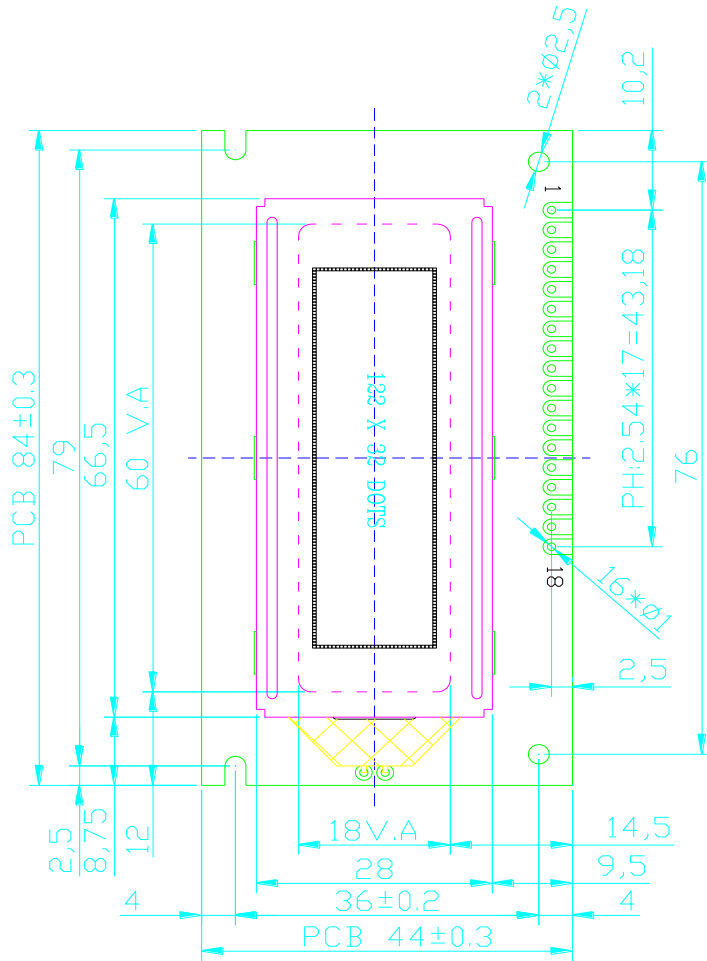
| Item | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|-------------------------------------|-------------|---------------------|------|------|------|-------------------|
| Forward Voltage | Vf | If=20mA | 3.0 | 3.1 | 3.2 | V |
| Reverse Current | Ir | If=5v | | | -- | uA |
| Average Brightness | IV | If=20mA | | | | cd/m ² |
| Wavelength (Without LCD) | λd | If=20mA | -- | -- | -- | nm |
| Luminous Intensity (without LCD) | Lv Sub | If=20mA | | | | cd/m ² |
| Uniformity | $\Delta\%$ | IvMin / IvMax *100% | -- | - | - | % |
| Color | WHITE | | | | | |

2. MODULE STRUCTURE

2.1 Counter Drawing

2.1.1 LCM Mechanical Diagram

| INTERFACE | |
|-----------|-----------|
| 1 | VDD(5V) |
| 2 | VSS |
| 3 | V0 |
| 4 | RST |
| 5 | E1 |
| 6 | E2 |
| 7 | R/W |
| 8 | RS |
| 9 | DB0 |
| 10 | DB1 |
| 11 | DB2 |
| 12 | DB3 |
| 13 | DB4 |
| 14 | DB5 |
| 15 | DB6 |
| 16 | DB7 |
| 17 | LED-A(5V) |
| 18 | LED-K |



DOT SIZE

- SPECIFICATION:
- 1). STN(BLUE) /NEGATIVE/TRANSMISSIVE
 - 2). DUTY:1/32. BIAS:1/5. VOP=5.0V
 - 3). VIEWING ANGLE: 6 0°CLOCK
 - 4). OPERATING TEMPERATURE: -20~70°C
STORAGE TEMPERATURE: -30~80°C
 - 5). BACKLIGHT: WHITE I=20MA
 - 6). DRIVE IC: SED1520
 - 7). DRIVE POWER: VDD=5.0V

| | | | | | | | | | | | |
|------------------|-----|-----------|--|----------------|--|--------------------------------|--|------------|--|---------------|--|
| Tolerance: ±0.20 | | UNITS: mm | | DATE: 2017-9-1 | | MODE NUMBER: SC12232001-V01-A0 | | PROJECTION | | SHEET: 1 OF 1 | |
| DESIGN BY: | WZQ | | | | | | | | | | |
| CHECKED BY: | | | | | | | | | | | |
| CUSTOM NO.: | | | | | | | | | | | |

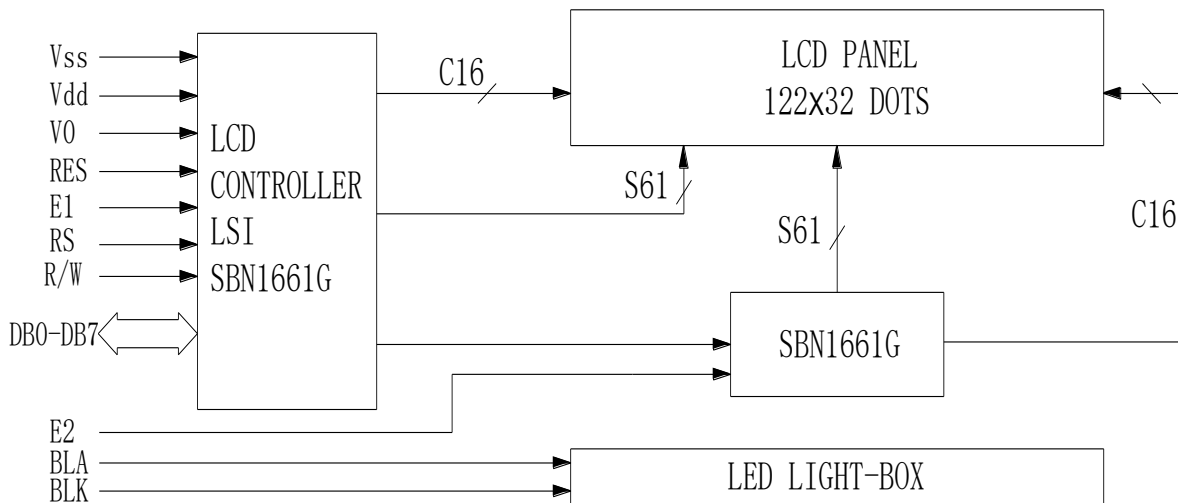
DO NOT SCALE THIS DRAWING.

深圳市华之晶科技有限公司

| VER | DETAIL DESCRIPTION | DATE |
|-----|--------------------|----------|
| 00 | FIRST ISSUE | 2017-9-1 |

2.2 Interface Pin Description

| Pin No. | Symbol | Function |
|---------|---------|---|
| 1 | VDD | Power supply input for driver IC (+5V) |
| 2 | VSS | Ground (0V) |
| 3 | VO | LCD driver supply voltages, Contrast Adjust |
| 4 | RST | Reset signal |
| 5 | E1 | Enable signal IC1(U1) |
| 6 | E2 | Enable signal IC2(U2) |
| 7 | RW | Read write control 0:write 1:read |
| 8 | RS | 0:DB0-DB7= Command 1: DB0-DB7= Data |
| 9-16 | DB0~DB7 | data bus for 8 bit interface |
| 17 | LED+ | BACKLIGHT+ (5V) |
| 18 | LED- | BACKLIGHT- (0V) |



2.3 Timing Characteristics

Table 42 AC timing for interface with a 80-type microcontroller at $V_{DD}=5$ volts

$V_{DD} = 5\text{ V} \pm 10\%$; $V_{SS} = 0\text{ V}$; $T_{amb} = -20\text{ }^{\circ}\text{C}$ to $+75\text{ }^{\circ}\text{C}$.

| symbol | parameter | min. | max. | test conditons | unit |
|------------|--------------------------------------|------|------|-------------------|------|
| t_{AS} | Address set-up time | 20 | | | ns |
| t_{AH} | Address hold time | 10 | | | ns |
| t_F, t_R | Read/Write pulse falling/rising time | | 15 | | ns |
| t_{RWPW} | Read/Write pulse width | 200 | | | ns |
| t_{CYC} | System cycle time | 1000 | | | ns |
| t_{DS} | Data setup time | 80 | | | ns |
| t_{DH} | Data hold time | 10 | | | ns |
| t_{ACC} | Data READ access time | | 90 | CL= 100 pF. | ns |
| t_{OH} | Data READ output hold time | 10 | 60 | Refer to Fig. 23. | ns |

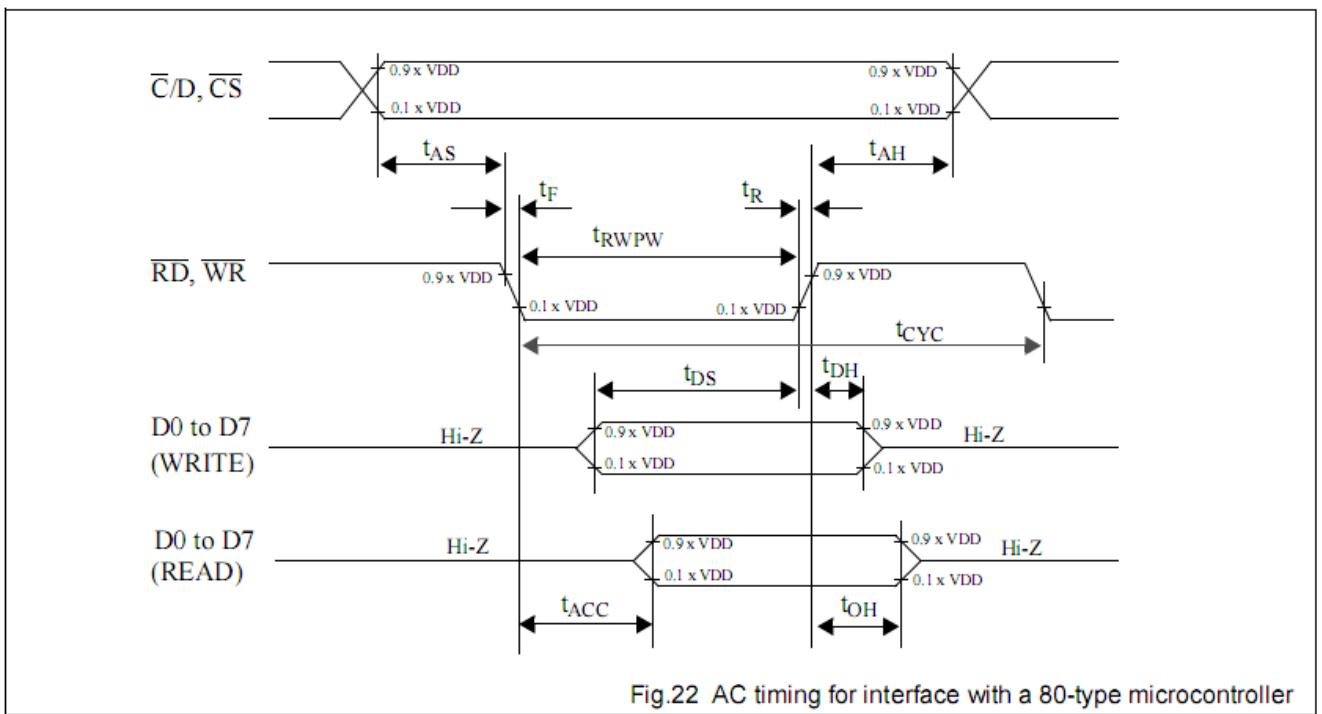


Fig.22 AC timing for interface with a 80-type microcontroller

Table 39 DC Characteristics

$V_{DD} = 5 V \pm 10\%$; $V_{SS} = 0 V$; all voltages with respect to V_{SS} , unless otherwise specified; $T_{amb} = -20$ to $+75$ °C.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|--|---|-----------------|----------------|------|----------|------------|
| V_{DD} | Supply voltage for logic | | 4.5 | 5.0 | 5.5 | V |
| V_{LCD} | LCD bias voltage $V_{LCD} = V_{DD} - V_5$ | | | | 13 | V |
| V_{IL} | LOW level input voltage | For all inputs | 0 | | 0.8 | V |
| V_{IH} | HIGH level input voltage | For all inputs | $V_{DD} - 1.2$ | | V_{DD} | V |
| V_{OL} | LOW level output voltage | For all outputs | 0.0 | | 0.3 | V |
| V_{OH} | HIGH level output voltage | For all outputs | $V_{DD} - 0.3$ | | V_{DD} | V |
| I_{STBY} | Standby current at $V_5 = -5$ volts | Note 1 | | | 3.0 | μA |
| $I_{DD(1)}$ | Operating current at $V_5 = -5$ volts and $f_{CL} = 2$ KHz, $V_{LCD} = 10$ volts | Note 2 & Note 3 | | 2.7 | 5.6 | μA |
| $I_{DD(2)}$ | Operating current at $V_5 = -5$ volts and $R_f = 1$ M Ω , $V_{LCD} = 10$ volts | | | 12.3 | 15.6 | μA |
| $I_{DD(3)}$ | Operating current at $V_5 = -5$ volts and $f_{CL} = 21.8$ KHz, $V_{LCD} = 10$ volts | | | 5.3 | 10.8 | μA |
| $I_{DD(4)}$ | Operating current at $V_5 = -5$ volts and $t_{CYC} = 100$ KHz, $V_{LCD} = 10$ volts | Note 4 | | 21.7 | 26.2 | μA |
| $f_{osc(VDD=5V)}$, $f_{osc(VDD=3V)}$ | Please refer to Table 37, On-chip RC oscillator characteristics. | | | | | |
| C_{in} | Input capacitance of all input pins | | | 5.0 | 8.0 | pF |
| R_{ON} | LCD driver ON resistance | Note 5 | | 5.0 | 7.5 | K Ω |
| t_R | Reset time | Note 6 | 1.0 | | | μS |

Display Data Memory Page and the Page Address Register

| | | | | | | | | | | | | | | |
|--------|------|-----------------|-----------------|-----------------|-----------------|-------|--|--|--|--|--|-------------------|-------------------|-------------------|
| Page 0 | Bit0 | Column 0(Byte0) | Column 1(Byte1) | Column 2(Byte2) | Column 3(Byte3) | Row0 | | | | | | Column 77(Byte77) | Column 78(Byte78) | Column 79(Byte79) |
| | Bit1 | | | | | Row1 | | | | | | | | |
| | Bit2 | | | | | Row2 | | | | | | | | |
| | Bit3 | | | | | Row3 | | | | | | | | |
| | Bit4 | | | | | Row4 | | | | | | | | |
| | Bit5 | | | | | Row5 | | | | | | | | |
| | Bit6 | | | | | Row6 | | | | | | | | |
| | Bit7 | | | | | Row7 | | | | | | | | |
| Page 1 | Bit0 | | | | | Row8 | | | | | | | | |
| | Bit1 | | | | | Row9 | | | | | | | | |
| | Bit2 | | | | | Row10 | | | | | | | | |
| | Bit3 | | | | | Row11 | | | | | | | | |
| | Bit4 | | | | | Row12 | | | | | | | | |
| | Bit5 | | | | | Row13 | | | | | | | | |
| | Bit6 | | | | | Row14 | | | | | | | | |
| | Bit7 | | | | | Row15 | | | | | | | | |
| Page 2 | Bit0 | | | | | Row16 | | | | | | | | |
| | Bit1 | | | | | Row17 | | | | | | | | |
| | Bit2 | | | | | Row18 | | | | | | | | |
| | Bit3 | | | | | Row19 | | | | | | | | |
| | Bit4 | | | | | Row20 | | | | | | | | |
| | Bit5 | | | | | Row21 | | | | | | | | |
| | Bit6 | | | | | Row22 | | | | | | | | |
| | Bit7 | | | | | Row23 | | | | | | | | |
| Page 3 | Bit0 | | | | | Row24 | | | | | | | | |
| | Bit1 | | | | | Row25 | | | | | | | | |
| | Bit2 | | | | | Row26 | | | | | | | | |
| | Bit3 | | | | | Row27 | | | | | | | | |
| | Bit4 | | | | | Row28 | | | | | | | | |
| | Bit5 | | | | | Row29 | | | | | | | | |
| | Bit6 | | | | | Row30 | | | | | | | | |
| | Bit7 | | | | | Row31 | | | | | | | | |

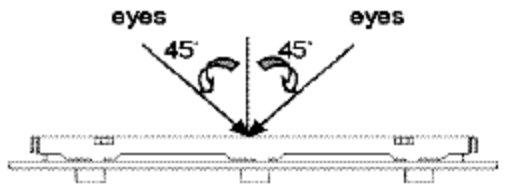
Fig.12 Page/Column allocation of the Display Data Memory

2.4 Instruction Table

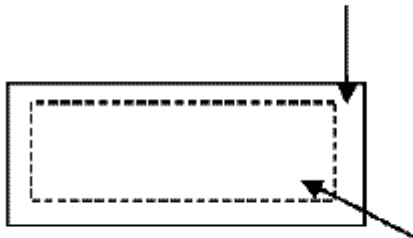
| | Command | Code | | | | | | | | | | | Function | |
|------|------------------------------|------|-----------------|-----------------|------------|-----------------------|--------|------------------------------|----|----|------------|---|---|---|
| | | A0 | \overline{RD} | \overline{WR} | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | | |
| (1) | Display ON/OFF | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0/1 | Turns all display on or off, independently of display RAM data or internal status. 1: ON 0: OFF (Power-saving mode with static drive on)* | |
| (2) | Display start line | 0 | 1 | 0 | 1 | 1 | 0 | Display Start Address (0-31) | | | | 0 | Specifies RAM line corresponding to uppermost line (COM0) of display. | |
| (3) | Set page address | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | Page (0-3) | | Sets display RAM page in page address register. | |
| (4) | Set column (segment) address | 0 | 1 | 0 | 0 | Column Address (0-79) | | | | | | 0 | Sets display RAM column address in column address register. | |
| (5) | Read status | 0 | 0 | 1 | Busy | ADC | ON/OFF | RESET | 0 | 0 | 0 | 0 | Reads the following status: BUSY 1: Internal operation, 0: Ready ADC 1: CW output (forward), 0: CCW output (reverse) ON/OFF 1: Display off, 0: Display on RESET 1: Being reset, 0: Normal | |
| (6) | Write display data | 1 | 1 | 0 | Write Data | | | | | | | Writes data from data bus into display RAM. | | Display RAM location whose address has been preset is accessed. After access, the column address is incremented by 1. |
| (7) | Read display data | 1 | 0 | 1 | Read Data | | | | | | | Reads data from display RAM onto data bus. | | |
| (8) | Select ADC | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0/1 | Used to invert relationship of assignment between display RAM column addresses and segment driver outputs. 0: CW output (forward) 1: CCW output (reverse) | |
| (9) | Static drive ON/OFF | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0/1 | Selects normal display or static driving operation. 1: Static drive (power-saving mode) 0: Normal driving | |
| (10) | Select duty | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0/1 | Selects LCD cell driving duty. 1: 1/32 0: 1/16 | |
| (11) | Read modify write | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | Increments column address counter by 1 when display data is written. (This is not done when data is read.) | |
| (12) | End | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | Clears read modify write mode. | |
| (13) | Reset | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | Sets display start line register on the first line. Also sets column address counter and page address counter to 0. | |

2.5 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)



B area : Outside of viewing area



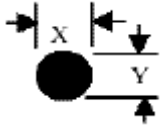
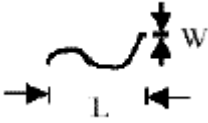
A area : viewing area

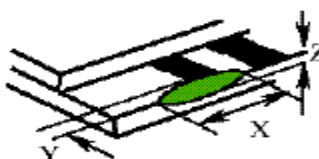
◆ Specification:

| 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: 5.1.1 display only : ·White and black spots on display $\leq 0.25\text{mm}$, no more than Four white or black spots present. ·Densely spaced : NO more than two spots or lines within 3mm | Minor |

◆ Specification :

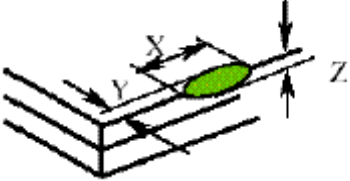

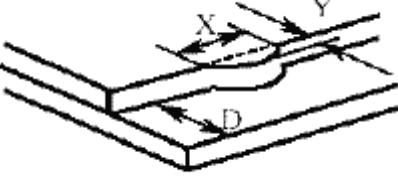
| NO | Item | Criterion | level |
|----|------|-----------|-------|
|----|------|-----------|-------|

| | | | |
|-----------|---|---|--------------|
| <p>05</p> | <p>Black or white dot、scratch、contamination Round type</p>  <p>$\Phi = (x+y)/2$</p>  | <p>5.1.2 Nom-display :</p> <p>Dimension (diameter : Φ) Acceptance(Q'ty)</p> <p>$\Phi \leq 0.10\text{mm}$ Accept no dense</p> <p>$0.10\text{mm} < \Phi \leq 0.20\text{mm}$ 3</p> <p>$0.20\text{mm} < \Phi \leq 0.25\text{mm}$ 2</p> <p>Total 4</p> <p>5.1.3 Line type: Dimension (diameter : Φ) Acceptance (Q'ty)</p> <p>Length width A area B area ---</p> <p>$w \leq 0.03\text{mm}$ Accept no dense Don't count</p> <p>$L \leq 3.0\text{mm}$ $0.03\text{mm} < \Phi \leq 0.05\text{mm}$</p> <p>4 Don't count</p> <p>$L \leq 2.5\text{mm}$ $0.05\text{mm} < \Phi \leq 0.075\text{mm}$</p> <p>Don't count ---</p> <p>$w > 0.075\text{mm}$ As round type</p> | <p>Minor</p> |
|-----------|---|---|--------------|

| | | | |
|----|--------------------|---|-------|
| 06 | Polarizer Bubble | <p>Dimension (diameter : Φ)</p> <p>A area</p> <p>Acceptance(Q'ty)</p> <p>B area</p> <p>$\Phi \leq 0.20\text{mm}$ Accept no dense Don't count</p> <p>$0.20\text{mm} < \Phi \leq 0.50\text{mm}$ 3 Don't count</p> <p>$0.50\text{mm} < \Phi \leq 1.00\text{mm}$ 2 Don't count</p> <p>$\Phi > 1.00\text{mm}$ 0 Don't count</p> <p>Total quantity 4 Don't count</p> | Minor |
| 07 | The crack of glass | <p>● Glass Crack:</p> <p>7.1 Crack on the circuit of electrode terminal :</p>  <p>X Y Z</p> <p>Front</p> <p>$X \leq 1/5 a$ $Y \leq 1/2 D$ $Z \leq t$</p> <p>Back</p> <p>Neglect</p> | Minor |

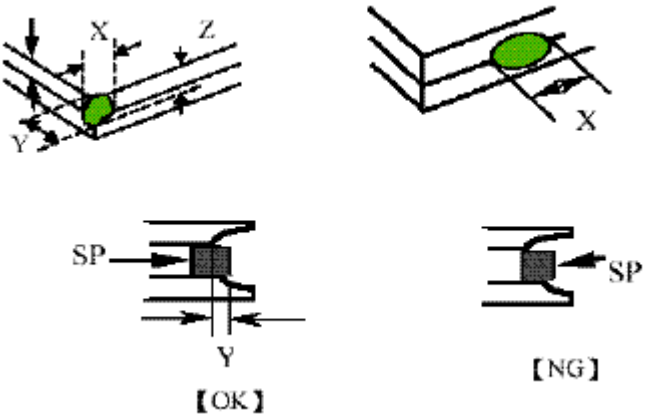
◆ Specification :

| NO | Item | Criterion | Level |
|----|------|-----------|-------|
|----|------|-----------|-------|

| | | | |
|----|---|---|-------|
| 07 | <p>The crack of glass</p> <p>X: The length of Crack</p> <p>Y: The width of crack</p> <p>Z: The thickness of crack</p> <p>D: terminal length</p> <p>T: The thickness of glass</p> <p>A : The length of glass</p> | <p>● Glass Crack:</p> <p>7.2 General glass crack and corner edge:</p> <p>7.2.1</p>  <p>X Y Z Neglect Out A area Neglect</p> <p>7.2.2</p>  <p>X Y Z Neglect Out A area Neglect</p> | Minor |
| | | <p>7.3 Glass remain:</p>  <p>X Y Neglect $\leq 1/3 d$</p> | Minor |

◆ Specification :

| NO | Item | Criterion | Level |
|----|------|-----------|-------|
|----|------|-----------|-------|

| | | | |
|----|---|--|-------|
| 07 | <p>The crack of glass</p> <p>X: The length of Crack</p> <p>Y: The width of crack</p> <p>Z: The thickness of crack</p> <p>D: terminal length</p> <p>T: The thickness of glass</p> <p>A : The length of glass</p> | <p>7.4 Corner crack and medial crack:</p>  <p style="text-align: center;"> X Y Z $\cong 1/5a$ Crack can't enter viewing area $\cong 1/2t$ $\cong 1/5a$ Crack can't exceed the half of width of SP width of SP $1/2t < Z \cong 2t$ </p> | Minor |
| 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. | Major |
| | | 9.4 The folding and peeled off in polarizer are not acceptable | Major |
| | | 9.5 The PCB or FPC between B/L assembled distance (PCB or FPC) is $\cong 1.5\text{mm}$ | Major |