# APPROVAL SHEET

# 确 认 书

| | |
|---|---|
| 客户名称<br>Customer | SUNCORP |
| 客户编号<br>Cusmton Number | |
| 产品型号<br>Part No. | KMC12864-Z-02-DNH |
| 显示格式<br>Display Format | 128*64DOTS |
| 工作电压<br>Power Supply | 3.2V |
| 显示类型<br>Display Type | FFSTN , Negative, Transmissive |
| 视角<br>Viewing Direction | 6 O'Clock |
| LCD 驱动参数<br>LCD Driving Scheme | 1/65D, 1/9B, 9.0V(J1005 D) |
| 连接方式<br>Connector | COG+FPC |
| 控制芯片<br>LCD Driver IC | ST7588TI |
| 屏检验标准<br>INSPECTION STANDARD OF LCD | A |
| 是否符合ROHS标准<br>INSPECTION STANDARD OF ROHS | YES |
| 客户确认签字（签字并回传）<br>Signature by Customer: | |

| 批准 | 审核 | 品质 | 设计 |
|---|---|---|---|
| | | | 金冬维 |

# REVISION RECORD

| REV.NO. | DATE | DESCRIPTION OF REVISION | CHECK & APPROVAL |
|---|---|---|---|
| A | 2006-12-13 | First issue | |

# Specification of LCD Module

## PRODUCT No: KMC12864-Z-02-DNH

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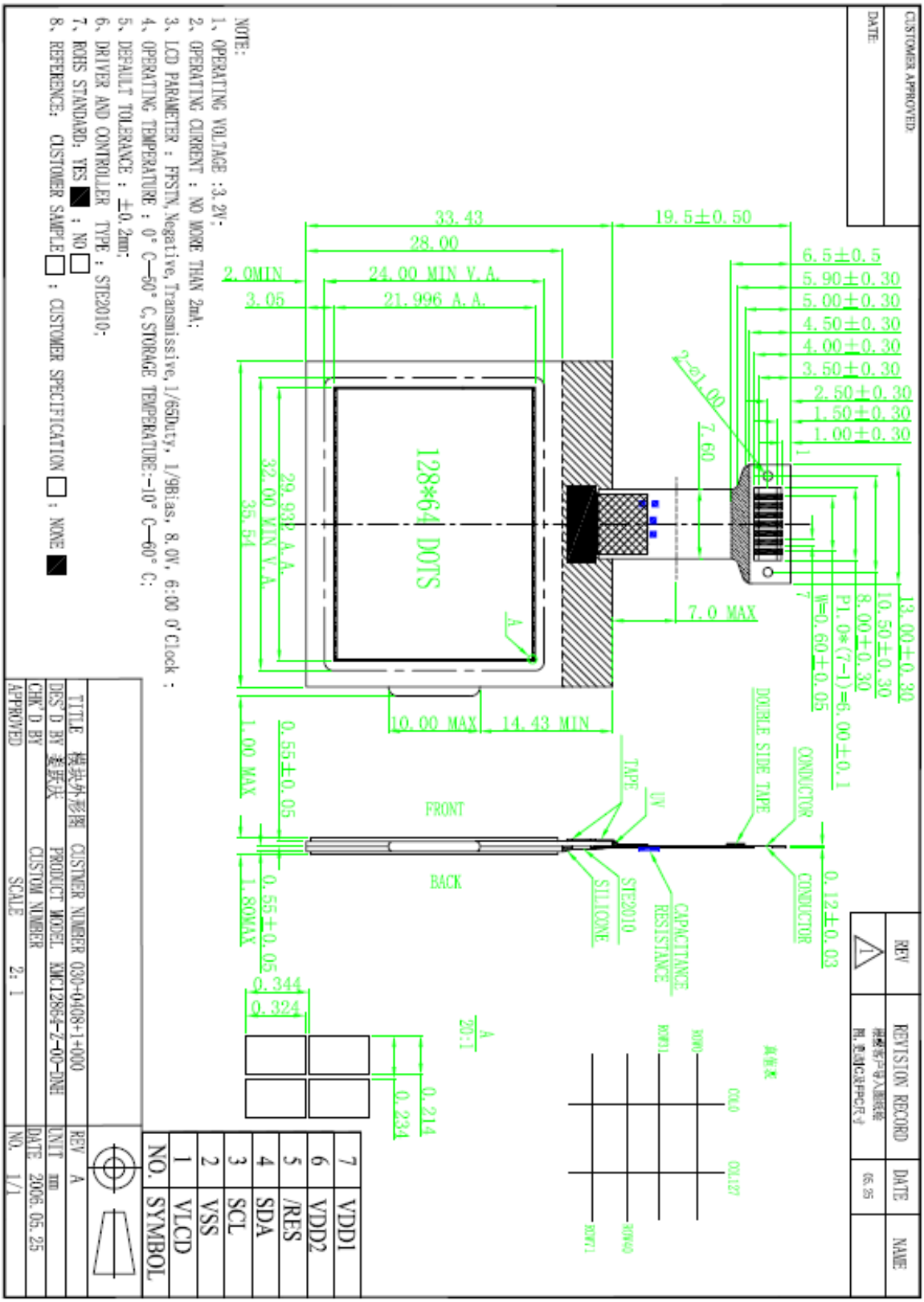
# TABLE OF CONTENTS

# 1. GENERAL DESCRIPTION

| | |
|---|---|
| LCD Type | FFSTN , Negative, Transmissive |
| Display Format | 128*64DOTS |
| Input Data | $I^2C$ |
| Driving Method | 1/65D, 1/9B,8.0V |
| Viewing Direction | 6 O'Clock |
| Driver IC | ST7588TI |
| Module Size(W*H*T) | 35.54*45.43*1.8 (MAX)mm |
| Viewing Area (W*H) | 32.00 *24.00mm |
| Dot Pitch (W*H) | 0.234*0.344mm |
| Dot Size (W*H) | 0.214*0.324mm |
| Active Area (W*H) | 29.932*21.966mm |
| Others | -- |

# 2. MECHANICAL DIMENSION




# 3. ABSOLUTE MAXIMUM RATINGS

| Item | Symbol | MIN | Max | Unit |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| Supply Voltage | VDD1 | -0.3 | 3.6 | V |
| | VDD2 | -0.3 | 3.6 | V |
| | VLCD | -0.5 | 13.5 | V |
| Input Voltage | Vin | -0.5 | VDD+0.5 | V |
| Operating temperature | Topr | 0 | 50 | ℃ |
| Storage temperature | Tstr | -10 | 60 | ℃ |

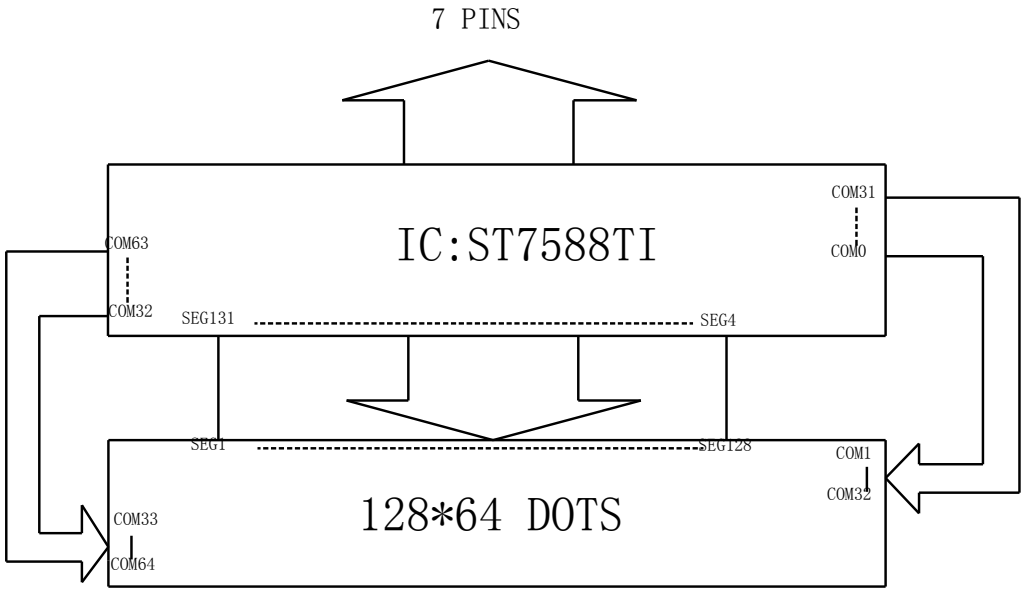
# 4. ELECTRICAL CHARACTERISTICS

| Item | | Symbl | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| Suppl Voltage | Logic | $V_{DD}$ | $V_{DD}$-GND | 2.4 | -- | 3.3 | V |
| | LCD | $V_{LCD}$ | - | 7.8 | 8.0 | 8.2 | V |
| Input Voltage | H level | $V_{IH}$ | - | 0.7VDD1 | | VDD | V |
| | L level | $V_{IL}$ | | VSS | | 0.3VDD1 | |
| Current Consumption (without backlight) | | $I_{DD}$ | - | | | 2 | mA |

# 5. INTERFACE PIN CONNECTIONS

| PIN NO | SYMBOL | FUNCTIONS |
|---|---|---|
| **1** | **VLCD** | **Power supply for LCD drive** |
| **2** | **VSS** | **Ground** |
| **3** | **SCL** | **CLOCK INPUT** |
| **4** | **SDA** | **DATA INPUT** |
| **5** | **RES** | **EXTERNAL RESET PIN** |
| **6** | **VDD2** | **Internal Generator supply Voltages** |
| **7** | **VDD1** | **Power supply** |

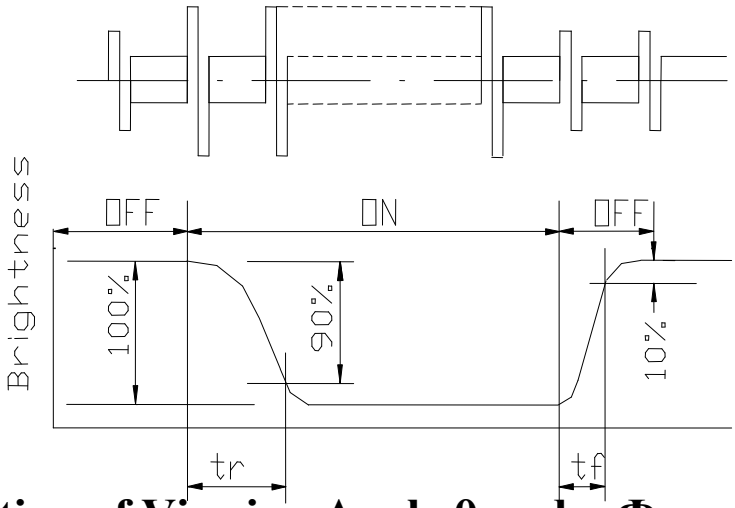
# 6. BLOCK DIAGRAM OF LCM



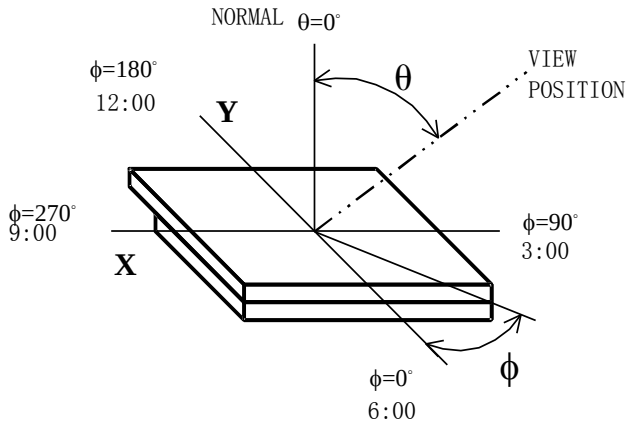

# ]7. lectro-Optical Characteristics

| Item | Symbol | Condition | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Contrast | K | θ=0° Φ=0° | 3.0 | — | — | deg. |
| Viewing Angle | θ | K=3.0 θx | -35 | — | 35 | deg. |
| | | K=3.0 θy | -25 | — | 45 | deg. |
| Response time | $T_{on}$ | 25℃ | — | — | 250 | ms |
| | $T_{off}$ | 25℃ | — | — | 250 | ms |

## (1). Definition of Optical Response Time



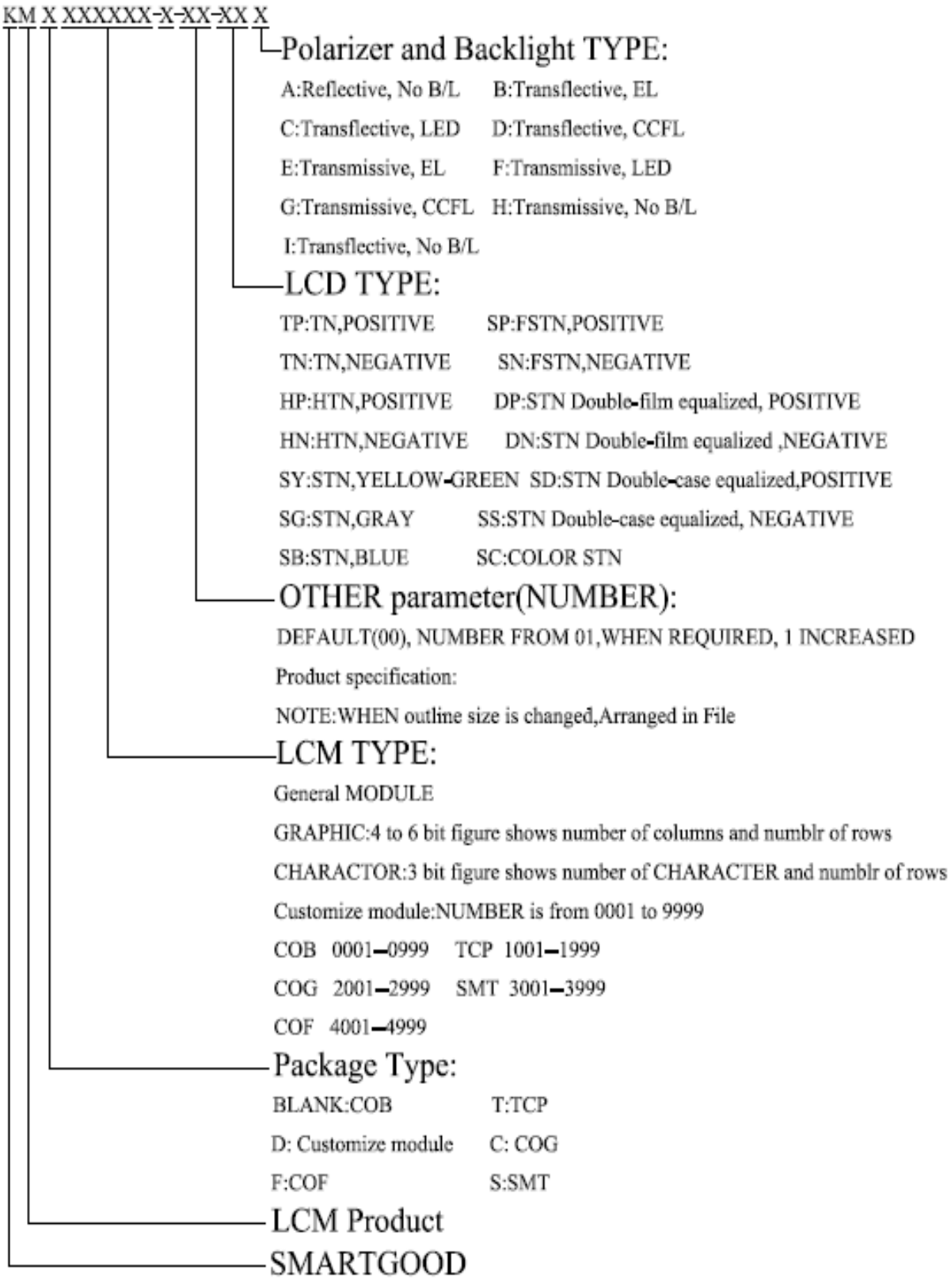

## (2). Definition of Viewing Angle θ and Φ




# 8. RELIABILITY

| ITEM | CONDITIONS | CRITERIA |
|---|---|---|
| High temperature operation | 50℃ for 96 hours | |
| Low temperature operation | 0℃ for 96 hours | |
| High humidity storage | 40℃,90%RH for 96 hours | |
| High temperature storage | 60℃ for 96 hours | |
| Low temperature storage | -10℃ for 96 hours | |
| Temperature cycling | 50℃ (30 min)<br>↓ ↑<br>25℃ ( 5 min)<br>↓ ↑<br>0℃ ( 30 min)<br>CYCLES: 5 | |

# 9. MODEL No. EXPRESSION




**9**

# 10. USING LCD MODULES

a. LIQUID CRYSTAL DISPLAY MODULES

LCD is composed of glass and polarizer. Pay attention to the following items when handling.

1. Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.
2. Do not touch, push or rub the exposed polarizer with anything harder than a HB pencil lead (glass, tweezers, etc).
3. N-hexane is recommended for cleaning the adhesives used to attach front/rear polarizer and reflectors made of organic substances, which will be damaged by chemicals such as acetone, toluene, toluene, ethanol and isopropyl alcohol.
4. When the display surface becomes dusty, wipe gently with absorbent cotton or other soft material like chamois soaked in petroleum ether. Do not scrub hard to avoid damaging the display surface.
5. Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading.
6. Avoid contacting oil and fats.
7. Condensation on the surface and contact with terminals due to cold will damage, stain or polarizer. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.
8. Do not put or attach anything on the display area to avoid leaving marks on.
9. Do not touch the display with bare hands. This will stain the display area and degrade insulation between terminals (some cosmetics are determinate to the polarizer).
10. As glass is fragile, it tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring.

b. INSTALLING LCD MODULE

Attend to the following items when installing the LCM.

1. Cover the surface with a transparent protective plate to protect the polarizer and LC cell.
2. When assembling the LCM into other equipment, the spacer to the bit between the LCM and the fitting plate should have enough height to avoid causing stress to the module surface, refer to the individual specifications for measurements. The measurement tolerance should be ±0.1mm.

c. ELECTRO-STATIC DISCHARGE CONTROL

Since this module uses a CMOS LSI, the same careful attention should be paid for electrostatic discharge as for ordinary CMOS IC.

1. Make certain that you are grounded when handing LCM.
2. Before removing LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential.
3. When soldering the terminal of LCM, make certain the AC power source for the soldering

iron does not leak.

4. When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutate of the motor.
5. As far as possible, make the electric potential of your work clothes and that of the workbenches to the ground potential.
6. To reduce the generation of electro-static discharge, be careful that the air in the work is not too dried. A relative humidity of 50%-60% is recommended.

d. PRECAUTIONS FOR OPERATION

1. Viewing angle varies with the change of liquid crystal driving voltage (Vo). Adjust Vo to show the best contrast.

2. Driving the LCD in the voltage above the limit will shorten its lifetime.

3. Response time is greatly delayed at temperature below the operating temperature range. However, this does not mean the LCD will be out of the order. It will recover when it returns to the specified temperature range.

4. If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then on.

# 11. INSPECTION STANDARD OF LCM.

AQL inspection standard

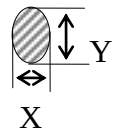
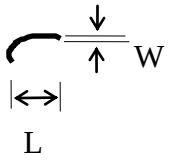
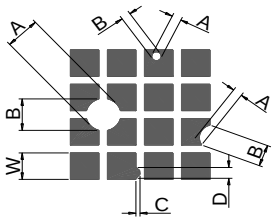
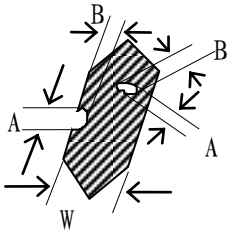
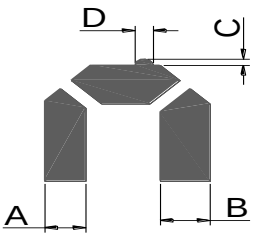
Sampling method:MIL-STD-105E,Level Ⅱ,single sampling

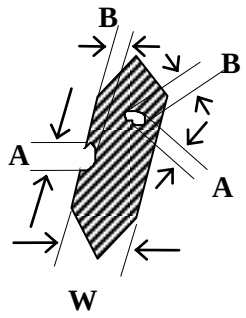
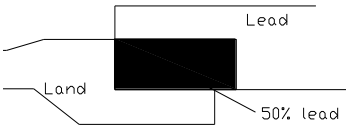
Defect classification ( Note:* is not including)

| Classify | Item | | Note | AQL |
|---|---|---|---|---|
| Major | Display state | Short or open circuit | 1 | 0.4 |
| | | Flickering | | |
| | | No display | | |
| | | Wrong viewing direction | | |
| | No-display | Flat cable or pin reverse | 10 | |
| | | Wrong or missing component | 11 | |
| | | LC leakage | 1 | |
| Minor | Display state | Background color deviation | 2 | 1.0 |
| | | Black spot and dust | 3 | 1.0 |
| | | Line defect | 4 | 1.0 |
| | | Rainbow | 5 | 1.0 |
| | | Pin hole | 6 | 1.0 |
| | | Segment defect | 7 | 1.0 |
| | | Back-light | 1,8 | 1.0 |
| | | Contrast defect（dim，ghost） | 2 | 1.0 |
| | Polarizer | Scratch | 4 | 1.0 |
| | | Bubble and foreign material | 3 | 1.0 |
| | Soldering | Poor connection | 9 | 1.0 |
| | Wire | Poor connection | 10 | 1.0 |
| TOTAL | | | | 1.5 |

Note on defect classification

| No | Item | Criterion |
|---|---|---|
| 1 | Short or open circuit | Not allow |
| | Lc Leakage | |
| | Flickering | |
| | No display | |
| | Wrong viewing direction | |
| | Wrong Back-light | |
| 2 | Contrast defect | refer to approval sample |
| | Background color deviation | |

<table>
<tr><td>3</td><td>Point defect<br>Back spot,dust<br>(including polarizer)<br>Φ=(X+Y)/2<br>  <br></td><td colspan="2">Point Size ( Unit: mm )</td><td>Acceptable Qty</td></tr>
<tr><td></td><td></td><td colspan="2">Φ≤0.10</td><td>Disregarded</td></tr>
<tr><td></td><td></td><td colspan="2">0.10<Φ≤0.20</td><td>3</td></tr>
<tr><td></td><td></td><td colspan="2">0.20<Φ≤0.25</td><td>2</td></tr>
<tr><td></td><td></td><td colspan="2">0.25<Φ≤0.30</td><td>1</td></tr>
<tr><td></td><td></td><td colspan="2">Φ>0.30</td><td>0</td></tr>
<tr><td>4</td><td>Line defect<br>scratch<br>(including polarizer)<br>  <br></td><td colspan="2">Line ( Unit: mm )</td><td>Acceptable Qty</td></tr>
<tr><td></td><td></td><td>L</td><td>W</td><td></td></tr>
<tr><td></td><td></td><td>---</td><td>0.015≥W></td><td>Disregard</td></tr>
<tr><td></td><td></td><td>≤2.5</td><td>0.03≥W>0.015</td><td>2</td></tr>
<tr><td></td><td></td><td>≤1.5</td><td>0.05≥W>0.03</td><td>2</td></tr>
<tr><td></td><td></td><td>≤1.5</td><td>0.1≥W>0.05</td><td>1</td></tr>
<tr><td></td><td></td><td></td><td>W >0.1</td><td>Applied as point defect</td></tr>
<tr><td>5</td><td>Rainbow</td><td colspan="3">According to the limit sample</td></tr>
<tr><td>6</td><td>Pin hole<br>  <br><br>Matrix type: pin hole<br>  <br><br>Segment type: pin hole</td><td colspan="3"><table><tr><td rowspan="2">Size</td><td>Area≤60cm $^2$</td><td>Area > 60cm $^2$</td></tr><tr><td colspan="2">Allowed number</td></tr><tr><td>ϕ≤0.1</td><td colspan="2">Disregarded</td></tr><tr><td>0.10 < ϕ≤0.15</td><td>2</td><td>3</td></tr><tr><td>0.15 < ϕ≤0.2</td><td>1</td><td>2</td></tr><tr><td>ϕ > 0.2</td><td>0</td><td>0</td></tr></table><br>Remark<br>W: width of dot or segment<br>A: in the horizontal direction<br>B: in the vertical direction<br>ϕ:(A+B)/2</td></tr>
<tr><td>7</td><td>Segment defect:<br>1) Segment width defect<br>  <br></td><td colspan="3"><table><tr><td>Size (mm)</td><td>Allowed number</td></tr><tr><td>(C+D)/2≤ 0.10</td><td>2</td></tr><tr><td>0.10 < (C+D)/2≤ 0.2</td><td>1</td></tr><tr><td>(C+D)/2 > 0.20</td><td>Not Allowed</td></tr></table><br>Remark<br>A: in the horizontal direction<br>B: in the vertical direction<br>Segment width defect allowed standard |A - B|</td></tr>
</table>

<table>
<tr><td></td><td>2) Segment pattern<br>  <br></td><td colspan="2"><0.2mm<br>Does not touch other segment or matrix spot<br>D≤W/3 ( W: width of dot or segment )</td></tr>
<tr><td rowspan="6"></td><td rowspan="6"></td><td>POINT SIZE （Unit: mm）</td><td>Acceptable Qty</td></tr>
<tr><td>Φ < 0.10mm</td><td>Disregarded</td></tr>
<tr><td>Φ≤1/4W</td><td>Disregarded</td></tr>
<tr><td>1/4W<Φ≤1/2W</td><td>1</td></tr>
<tr><td>Φ＞1/2W</td><td>0</td></tr>
<tr><td colspan="2">Remark：W=SEGMENT WIDTH；Φ=（A+B）/2</td></tr>
<tr><td>8</td><td>Back-light</td><td colspan="2">1) the color of backlight should correspond its specification</td></tr>
<tr><td></td><td></td><td colspan="2">2) not allow flickering</td></tr>
<tr><td rowspan="2">9</td><td rowspan="2">Soldering<br>  <br></td><td colspan="2">(1) not allow heavy dirty and solder ball on PCB(the size of dirty refer to point and dust defect)</td></tr>
<tr><td colspan="2">(2) over 50% of lead should be soldered on land</td></tr>
<tr><td rowspan="3">10</td><td rowspan="3">Wire</td><td colspan="2">(1) copper wire should not be rusted</td></tr>
<tr><td colspan="2">(2) not allow crack on copper wire connection</td></tr>
<tr><td colspan="2">(3) not allow reversing the position of the flat cable</td></tr>
<tr><td>11</td><td>PCB</td><td colspan="2">(1) not allow screw rusted or damaged<br>(2) not allow missing or wrong putting of component</td></tr>
</table>