# SPECIFICATION
# FOR
# LCD MODULE

## MODULE NO: AFK480234A0-2.36N6NTN
## REVISION NO: V01

Customer's Approval:

|  | SIGNATURE | DATE |
|---|---|---|
| PREPARED BY (RD ENGINEER) |  |  |
| CHECKED BY |  |  |
| APPROVED BY |  |  |

# Records of Revision

| DATE | REF.PAGE PARAGRAPH DRAWING No. | REVISED No. | SUMMARY | REMARK |
|---|---|---|---|---|
| 2015-11-21 | | V01 | First Issue | |
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# Contents

# 1. General Specification

| Item | Contents | Unit |
|---|---|---|
| LCD TYPE | TFT/TRANSMISSIVE | |
| MODULE SIZE (W*H*T) | 55.20*47.55*2.90 | MM |
| ACTIVE SIZE (W*H) | 48.00*35.69 | MM |
| PIXEL PITCH (W*H) | 0.1*0.1525 | MM |
| NUMBER OF DOTS | 480*234 | |
| DIVER IC | OTA5182A | |
| INTERFACE TYPE | 8 BIT RGB | |
| TOP POLARIZER TYPE | ANTI-GLARE | |
| RECOMMEND VIEWING DIRECTION | 6 | O'CLOCK |
| GRAY SCALE INVERSION DIRECTION | 12 | O'CLOCK |
| COLORS | 65K | |
| BACKLIGHT TYPE | 2-DIES WHITE LED | |
| TOUCH PANEL TYPE | WITHOUT | |

# 2. Mechanical Drawing



| PIN | SYMBOL |
|---|---|
| 1 | VCOM |
| 2 | NC |
| 3 | VGL |
| 4 | C4P |
| 5 | C4N |
| 6 | VGH |
| 7 | FRP |
| 8 | VCAC |
| 9 | VDD_25 |
| 10 | C3P |
| 11 | C3N |
| 12 | VDD3 |
| 13 | C2P |
| 14 | C2N |
| 15 | VDDA |
| 16 | C1P |
| 17 | C1N |
| 18 | GND |
| 19 | VDD |
| 20 | DRV |
| 21 | VLED |
| 22 | NC |
| 23 | FB |
| 24 | NC |
| 25 | AGND |
| 26 | VDDIO |
| 27 | CSB |
| 28 | SDA |
| 29 | SCL |
| 30 | HSYNC |
| 31 | VSYNC |
| 32 | DCLK |
| 33 | D7 |
| 34 | D6 |
| 35 | D5 |
| 36 | D4 |
| 37 | D3 |
| 38 | D2 |
| 39 | D1 |
| 40 | D0 |

| Display Type | TFT |
|---|---|
| Optimum Viewing Direction | 6 O'CLOCK |
| Upper Ploarizer Type | ANTI-GLARE |
| LCD Driver IC | OTA5182A |
| Operating Voltage | VDD=3.3V |
| Operation Temperature | -20°C TO 70°C |
| Storage Temperature | -30°C TO 80°C |
| Interface | 8 BIT RGB |
| Backlight | 2-CHIP WHITE LED |
| Surface luminance | 260 cd/m2 |
| White X/Y | |

MODULE SPEC.

| TITLE | |
|---|---|
| DRAWING NO. | AFK480234A0-2.36N6NTN |
| UNIT | mm |
| 3rd Angle | SCALE FIT |
| | SHEET OF 1 |

ORIENT DISPLAY

LED CIRCUIT DIAGRAM
3.2V@40mA

Pixtel Detail

NOTES:
1. General Tolerance: ±0.2
2. ( )reference dimension.
3. Recommended Case Open Area Should Be Less Than Module V.A
4. recommended cushion adherent area:TP V.A+1.6mm
5. ROHS MUST BE COMPLIANT

480*234 dots
2.36" TFT

| VER. | SYMBOL | AMENDMENT | SIGN | DATE |
|---|---|---|---|---|
| V00 | | First issue | | 2015.9.22 |

| DRAWN | |
|---|---|
| ME.CHECKED | |
| EE.CHECKED | |
| APPROVED | |
| CUSTOMER'S APPROVAL | |

# 3. Block Diagram

VDD

VDDIO

CSB

SDA

SCL

HSYNC

VSYNC

DCLK

AGND

DB[0:7]

8 BIT

"ORISE"
OTA5182A
(COG)
LCD
Controller/
Driver or
Equivalent

Gate:234

2.36″
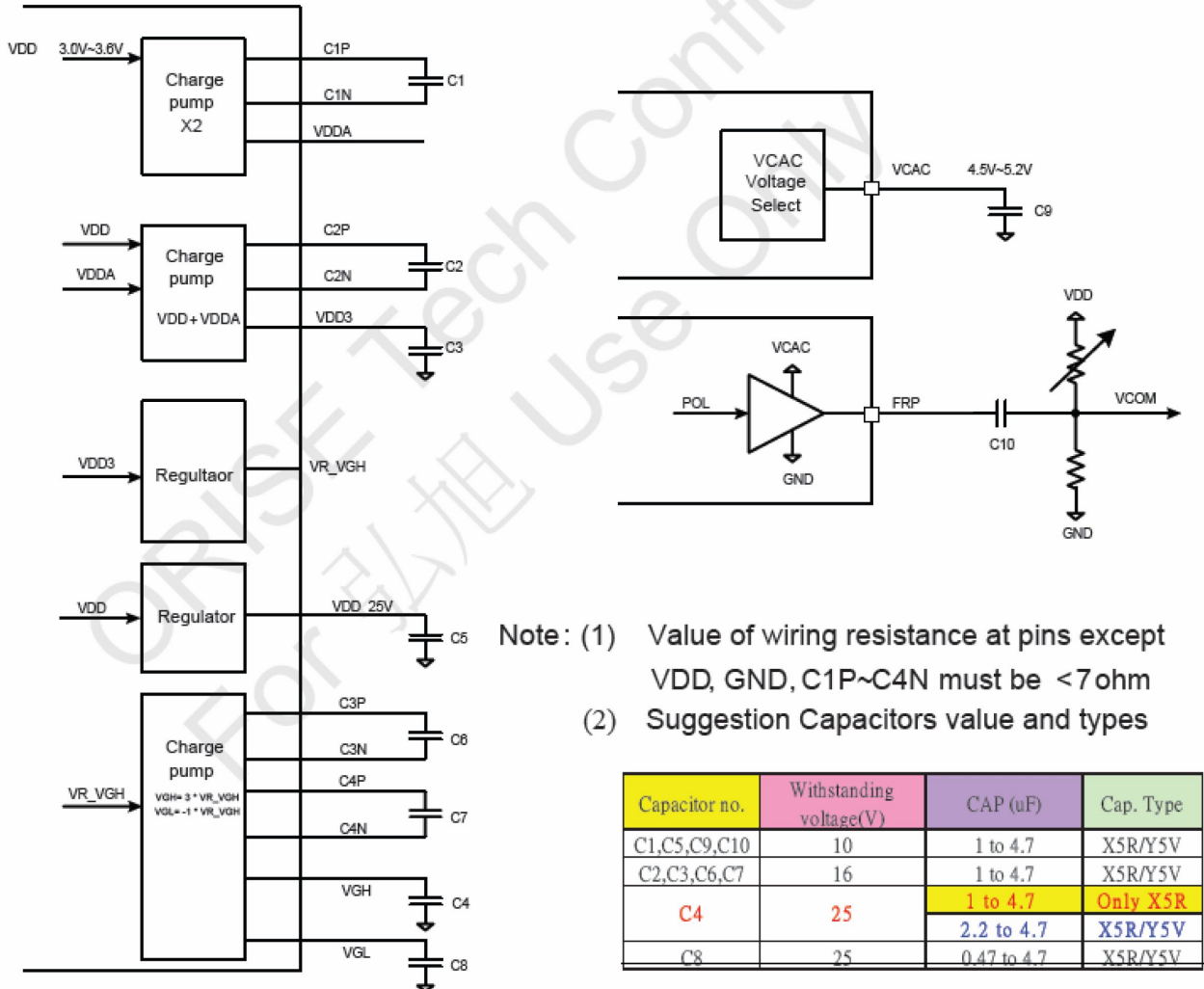TFT LCD Panel
480*234

Source:480

VLED

FB

BL Circuit(4-Dies LED)

# 4. Interface Pin Function

| Pin No. | Symbol | Description |
|---|---|---|
| 1 | VCOM | Common |
| 2 | NC | No Connect |
| 3 | VGL | Power supply for gate off voltage. |
| 4 | C4P | Pins to connect capacitance for power circuitry. |
| 5 | C4N | Pins to connect capacitance for power circuitry. |
| 6 | VGH | Power supply for gate on voltage. |
| 7 | FRP | Frame polarity output for VCOM. |
| 8 | VCAC | Define the amplitude of the VCOM wing. |
| 9 | VDD_25V | Intermediate voltage for charge Pump. Please connect the capacitor between VDD_25V and GND. |
| 10 | C3P | Pins to connect capacitance for power circuitry. |
| 11 | C3N | Pins to connect capacitance for power circuitry. |
| 12 | VDD3 | Charge-pump circuit reference voltage. Please connect the capacitor between VDD3 and GND. |
| 13 | C2P | Pins to connect capacitance for power circuitry. |
| 14 | C2N | Pins to connect capacitance for power circuitry. |
| 15 | VDDA | Power supply voltage of source driver liquid crystal drives circuit. Please connect the capacitor between VDDA and GND. |
| 16 | C1P | Pins to connect capacitance for power circuitry. |
| 17 | C1N | Pins to connect capacitance for power circuitry. |
| 18 | GND | Power ground |
| 19 | VDD | Power supply for analog circuit blocks (3.0~ 3.6 V). |
| 20 | DRV | Gate signal for the power transistor of the boost converter. |
| 21 | VLED | Supply voltage for LED backlight. |
| 22 | NC | No Connect |
| 23 | FB | Main boost regulator feedback input. |
| 24 | NC | No Connect |
| 25 | AGND | Power ground |
| 26 | VDDIO | Power supply for interface logic circuits (1.8 ~ 3.6V). |
| 27 | CSB | Serial communication chip select ("Low" enable). |
| 28 | SDA | Serial communication data input. |
| 29 | SCL | Serial communication clock input. |
| 30 | HSYNC | Line synchronizing signal for RGB interface operation. |
| 31 | VSYNC | Frame synchronizing signal for RGB interface operation. |
| 32 | DCLK | Dot clock signal for RGB interface operation. |
| 33~40 | D7~D0 | Data Input |

NOTE: THE CIRCUIT ARE FOR REFERENCE

Note1:VCOM=+5.0 Vp-p.(Typ.)
Note2: The external capacitor is required on those pins as following.



Note: (1) Value of wiring resistance at pins except VDD, GND, C1P~C4N must be <7ohm
(2) Suggestion Capacitors value and types

| Capacitor no. | Withstanding voltage(V) | CAP (uF) | Cap. Type |
|---|---|---|---|
| C1,C5,C9,C10 | 10 | 1 to 4.7 | X5R/Y5V |
| C2,C3,C6,C7 | 16 | 1 to 4.7 | X5R/Y5V |
| C4 | 25 | 1 to 4.7 | Only X5R |
| | | 2.2 to 4.7 | X5R/Y5V |
| C8 | 25 | 0.47 to 4.7 | X5R/Y5V |

Note3: VDD, VDDIO=+3.3V (Typ.)
Note4: Outputs the control signal of switching regulator for LED. Duty cycle varies according to FB input voltage
Note5: Feedback signal of switching signal for LED. It controls DRV output duty cycle with 0.6V input level sense.
Note6: Horizontal sync signal, it is a "L "active signal.
Note7: Vertival sync signal, it is a "Low "active signal.
Note8: Dot clock signal for RGB interface, timing for data loading defined at rising edge.

# 5. Absolute Maximum Ratings

| Parameter | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| Supply voltage for analog | VDD | -0.3 | 4.6 | V |
| Supply voltage for logic | VDDIO | -0.3 | 4.6 | V |
| Supply current (One LED) | $I_{LED}$ | | 30 | mA |
| Operating temperature | $T_{OP}$ | -20 | +70 | °C |
| Storage temperature | $T_{ST}$ | -30 | +80 | °C |

Note: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

# 6. Electrical Characteristics

## 6.1 Input Power

| Item | Symbol | Min | Typ. | Max | Unit | Applicable terminal |
|---|---|---|---|---|---|---|
| Supply Voltage for Analog | VDD | 2.5 | 2.8 | 3.3 | V | |
| Supply Voltage for Logic | VDDIO | 1.65 | 1.8/2.8 | 3.3 | V | |
| Input Voltage | $V_{IL}$ | GND | - | 0.3VDDIO | V | |
| | $V_{IH}$ | 0.8 VDDIO | - | VDDIO | | |
| Input leakage Current | $I_{LKG}$ | -1 | | 1 | μA | |

## 6.2 Backlight Driving Conditions

| Item | Symbol | Value | | | Unit | Remark |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Voltage for LED Backlight | $V_F$ | - | 3.2 | - | V | $I_L$ =40mA |
| Current for LED Backlight | $I_L$ | | 40 | - | mA | |
| Power Consumption | P | | 0.128 | | W | |
| LED Life Time | | 30,000 | | | Hr | Note |

**Note**: Brightness to be decreased to 50% of the initial value at ambient temperature TA=25℃

# 7. Optical Characteristics

| ITEM | | SYMBOL | CONDITIONS | SPECIFICATIONS | | | UNIT | NOTE |
|---|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP. | MAX | | |
| Luminance | | L | $I_L$ =30mA | | 260 | | Cd/m$^2$ | |
| Contrast Ratio | | CR | θ=0° | 250 | 250 | | | |
| Response Time | $T_{ON}$ | | 25℃ | | 50 | 70 | ms | |
| | $T_{OFF}$ | | | | | | | |
| CIE Color Coordinate | Red | $X_R$ | Viewing normal angle | | | | | |
| | | $Y_R$ | | | | | | |
| | Green | $X_G$ | | | | | | |
| | | $Y_G$ | | | | | | |
| | Blue | $X_B$ | | | | | | |
| | | $Y_B$ | | | | | | |
| | White | $X_W$ | | | 0.294 | | | |
| | | $Y_W$ | | | 0.334 | | | |
| Viewing Angle | Hor. | $\theta_{X+}$ | CR≥10 | 45 | 45 | | Degree | |
| | | $\theta_{X-}$ | | 45 | 45 | | | |
| | Ver. | $\theta_{Y+}$ | | 45 | 45 | | | |
| | | $\theta_{Y-}$ | | 10 | 15 | | | |
| Uniformity | | Un | | 80 | | | % | |

**Note 1: Definition of Viewing Angle θx and θy:**
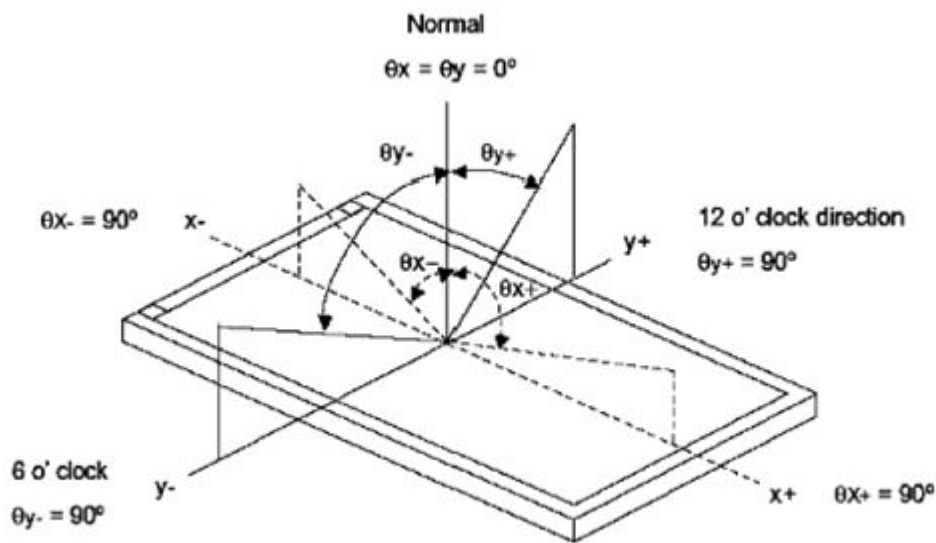


**Note 2: Definition of contrast ratio CR:**

$$CR = \frac{\text{Luminance of white state}}{\text{Luminance of black state}}$$

**Note 3: Definition of Response Time(Tr,Tf)**
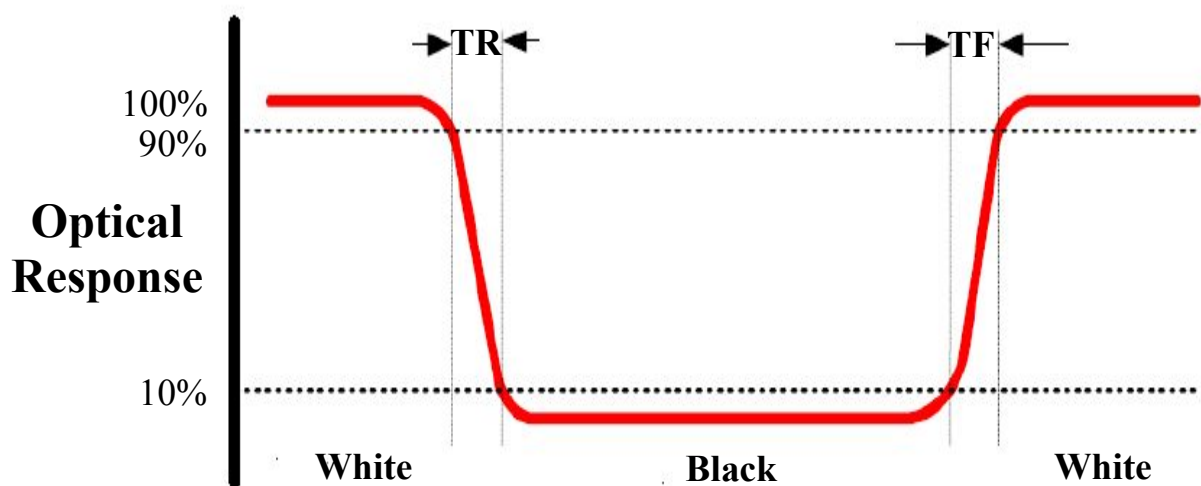
## Note 4: Definition of Luminance
### ①The Brightness Test Equipment Setup
Field=2° (As measuring "black" image, field=2° is the best testing condition)



BM-7

Field=2°

50cm

TFT-LCD Panel

The center of the screen
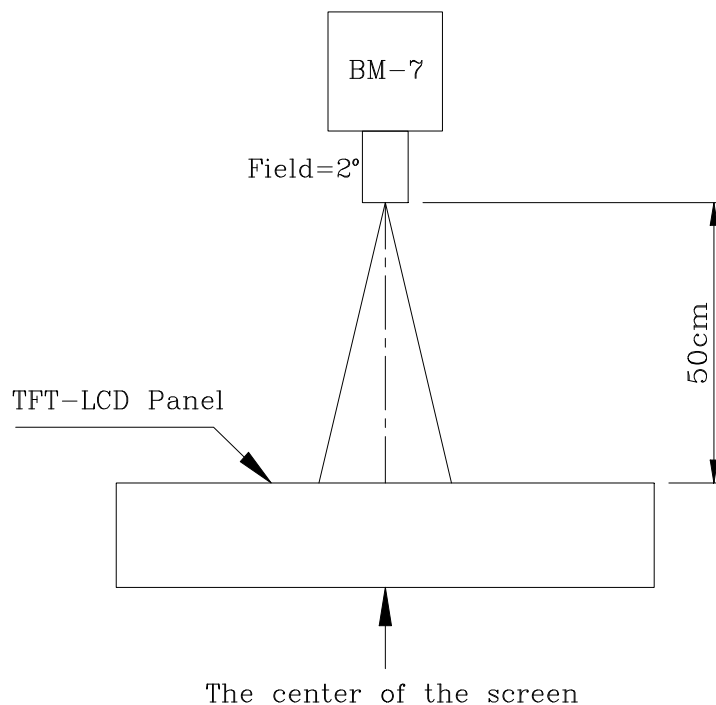
### ②The Brightness Test Point Setup



H/6

H/3

H/3

H/6

Active area
H

L/6  L/6  L/6  L/6

L

Active area

Unit: mm
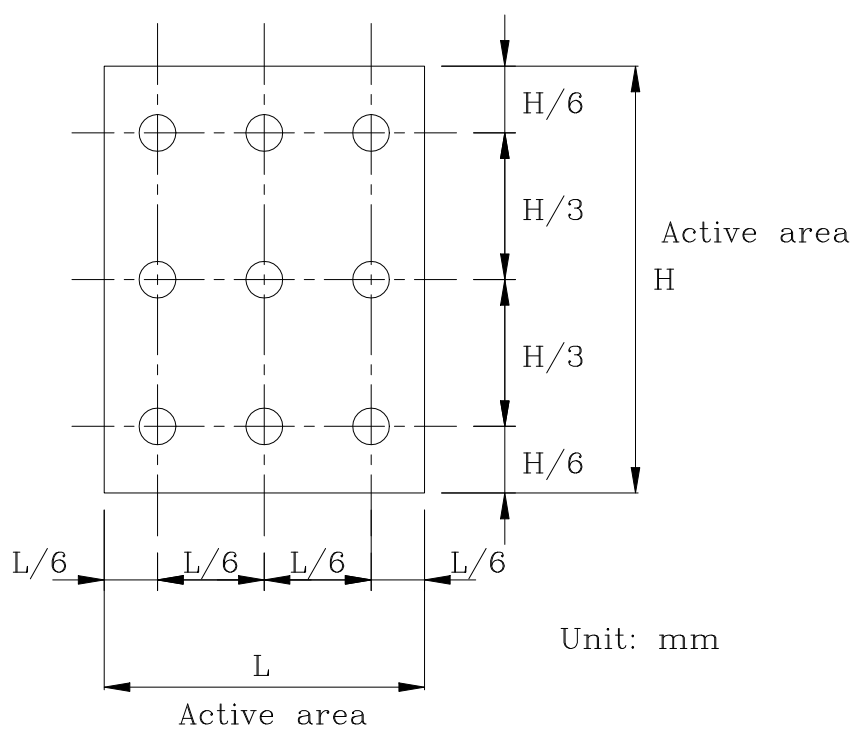
# 8. Timing Characteristics

## 8.1 Horizon input timing
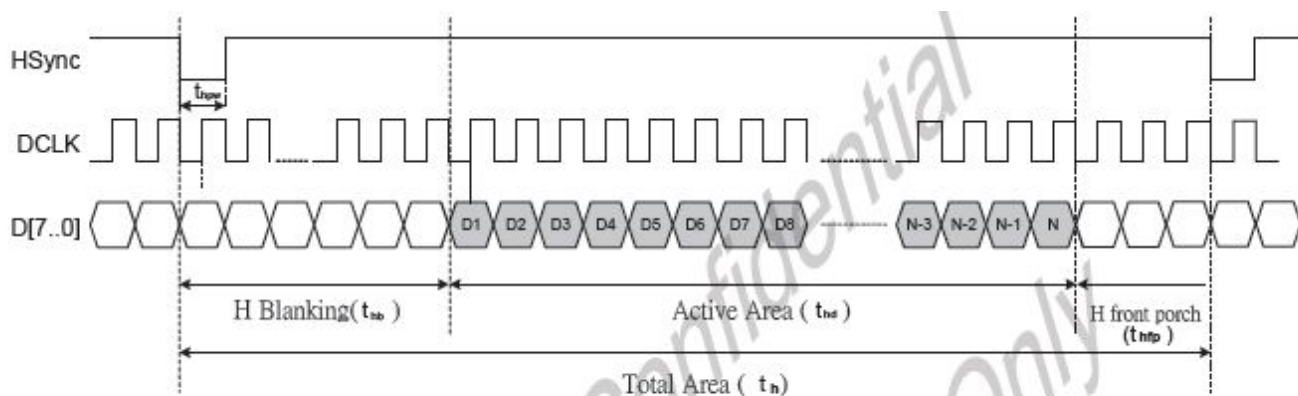


### 6.14.1. Raw Data

| Parameter | | Symbol | Value | | | Unit |
|---|---|---|---|---|---|---|
| Horizontal display area | | $t_{hd}$ | 480 | | | DCLK |
| DCLK frequency | | $f_{clk}$ | Min. | Typ. | Max | |
| | | | 8.1 | 9.7 | 11.3 | Mhz |
| 1   Horizontal Line | | $t_h$ | 617 | | | |
| HSYNC pulse width | Min. | $t_{hpw}$ | 1 | | | DCLK |
| | Typ. | | 1 | | | |
| | Max. | | 96 | | | |
| HSYNC blanking | | $t_{hb}$ | 84 | 100 | 115 | |
| HSYNC front porch | | $t_{hfp}$ | 53 | 37 | 22 | |

## 8.2 Serial RGB mode

**NTSC**

| Parameter | | Symbol | Value | | | Value | | | Value | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Horizontal display area | | $t_{hd}$ | 1280 | | | 1408 | | | 1440 | | | DCLK |
| DCLK frequency | | $f_{clk}$ | Min. | Typ. | Max | Min. | Typ. | Max | Min. | Typ. | Max | |
| | | | 20.47 | 24.54 | 28.66 | 22.5 | 27 | 31.5 | 22.5 | 27 | 31.5 | MHz |
| 1 Horizontal Line | | $t_h$ | 1560 | | | 1716 | | | 1716 | | | DCLK |
| HSYNC pulse width | Min. | $t_{hpw}$ | 1 | | | 1 | | | 1 | | | |
| | Typ. | | 1 | | | 1 | | | 1 | | | |
| | Max. | | 96 | | | 96 | | | 96 | | | |
| HSYNC blanking | | $t_{hb}$ | 237 | 252 | 268 | 237 | 252 | 268 | 237 | 252 | 268 | |
| HSYNC front porch | | $t_{hfp}$ | 43 | 28 | 12 | 71 | 56 | 40 | 39 | 24 | 8 | |

**PAL**

| Parameter | | Symbol | Value | | | Value | | | Unit |
|---|---|---|---|---|---|---|---|---|---|
| Horizontal display area | | $t_{hd}$ | 1408 | | | 1440 | | | DCLK |
| DCLK frequency | | $f_{clk}$ | Min. | Typ. | Max | Min. | Typ. | Max | |
| | | | 22.5 | 27 | 31.5 | 22.5 | 27 | 31.5 | MHz |
| 1 Horizontal Line | | $t_h$ | 1728 | | | 1728 | | | DCLK |
| HSYNC pulse width | Min. | $t_{hpw}$ | 1 | | | 1 | | | |
| | Typ. | | 1 | | | 1 | | | |
| | Max. | | 96 | | | 96 | | | |
| HSYNC blanking | | $t_{hb}$ | 237 | 252 | 268 | 237 | 252 | 268 | |
| HSYNC front porch | | $t_{hfp}$ | 83 | 68 | 52 | 51 | 36 | 20 | |

### 6.14.3. 3. CCIR

| Parameter | | Symbol | Mode(NTSC/PAL) | Unit |
|---|---|---|---|---|
| Horizontal display area | | $t_{hd}$ | 1440 | DCLK |
| DCLK frequency | | $f_{clk}$ | 27 | MHz |
| 1 Horizontal Line | | $t_h$ | 1716 | DCLK |
| Internal HSYNC pulse width | Min. | $t_{hpw}$ | 1 | DCLK |
| | Typ. | | 1 | |
| | Max. | | - | |
| HSYNC blanking | | $t_{hb}$ | 268 | |

# 9. Standard Specification for Reliability

## 9.1 Standard Specification for Reliability of LCD Module

| No. | Item | Description |
|-----|------|-------------|
| 01 | High temperature operation | The sample should be allowed to stand at 70℃ for 120 hours under driving condition and then returning it to normal temperature condition, and allowing it stand for 2 hours. |
| 02 | Low temperature operation | The sample should be allowed to stand at -20℃ for 120 hours under driving condition and then returning it to normal temperature condition, and allowing it stand for 2 hours. |
| 03 | High temperature storage | The sample should be allowed to stand at 80℃ for 240 hours under no-load condition, and then returning it to normal temperature condition, and allowing it stand for 2 hours. |
| 04 | Low temperature storage | The sample should be allowed to stand at -30℃ for 240 hours under no-load condition, then returning it to normal temperature condition, and allowing it stand for 2 hours. |
| 05 | Moisture storage | The sample should be allowed to stand at 60℃,90%RH MAX for 240 hours under no-load condition, then taking it out and drying it at normal temperature for 2 hours. |
| 06 | Thermal shock storage | The sample should be allowed to stand the following 10 cycles : <br> -30℃ for 30 minutes → normal temperature for 5 minutes → +80℃ for 30 minutes → normal temperature for 5 minutes, as one cycle. |
| 07 | Packing vibration | Frequency range : 10Hz ~ 55Hz <br> Amplitude of vibration : 1.5mm    Sweep time: 12 min <br> X, Y, Z 2 hours for each direction. |
| 08 | Packing drop test | According to ASTM-D-5327. |
| 09 | Electrical Static Discharge | Air: ±4KV 150pF/330Ω 5 times |
| | | Contact: ±2KV 150pF/330Ω 5 time |

*Sample size for each test item is 3~5pcs

## 9.2 Testing Conditions and Inspection Criteria

For the final test, the testing sample must be stored at room temperature for 24 hours. After the tests listed in Table 9.2, standard specifications for reliability will be executed in order to ensure stability.

| No. | Item | Test Model | In section Criteria |
|---|---|---|---|
| 01 | Current Consumption | Refer To Specification | The current consumption should conform to the product specification. |
| 02 | Contrast | Refer To Specification | After the tests have been executed, the contrast must be larger than half of its initial value prior to the tests. |
| 03 | Appearance | Visual inspection | Defect free. |

## 9.3 MTBF

| | |
|---|---|
| MTBF | Functions, performance, appearance, etc. shall be free from remarkable deterioration within 50,000 hours under ordinary operating and storage conditions room temperature (25±5℃), normal humidity (50±10% RH), and in area not exposed to direct sun light. |

# 10. Specification of Quality Assurance

This standard of Quality Assurance confirms to the quality of LCD module products supplied by Orient Display.

## 10.1 Quality Test

Before delivering, the supplier should conduct the following tests to confirm the quality of products.

- Electrical-Optical Characteristics: According to the individual specification to test the product.
- Appearance Characteristics: According to the individual specification to test the product.
- Reliability Characteristics: According to the definition of reliability on the specification for testing products.

## 10.2 Delivery Test

Before delivering, the supplier should conduct the delivery test.

- Test method: According to MIL-STD105E.General Inspection Level Ⅱ take a single time.
- The defects classify of AQL as following:
  Major defect: AQL = 0.65
  Minor defect: AQL = 2.5
  Total defects: AQL = 2.5

## 10.3 Non-conforming Analysis & Deal With Manners

### 10.3.1 Non-conforming Analysis

- Purchaser should provide the data  detail of non-conforming sample and the non-conforming.
- After receiving the data  detail from purchaser, the analysis of non-conforming should be finished within two weeks.
- If the analysis can't be finished  on time, supplier must notice purchaser 3 days in advance.

### 10.3.2 Disposition of non-conforming

- If any product defect be found during assembling, supplier must change the good for every defect after confirmation.
- Both supplier and customer should analyze the reason and discuss the disposition of non-conforming when the reason of nonconforming is not sure.

## 10.4 Agreement items

Both parties should negotiate together when the following problems happen.
- There is any problem of standard of quality assurance, and both sides should agree that it must be modified.
- There is any argument item which does not record in the standard of quality assurance.
- Any other special problem.

## 10.5 Standard of the Product Appearance Test

### 10.5.1 Manner of appearance test

- The test must be under 20W × 2 or 40W fluorescent light, and the distance of view must be at 30±5cm.
- When test the model of transmissive product must add the reflective plate.
- The test direction is base on around 10° of vertical line.
- Temperature: 25±5℃　Humidity: 60±10%RH
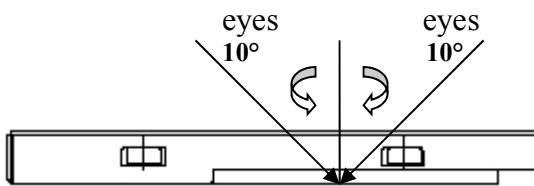


- Definition of area:
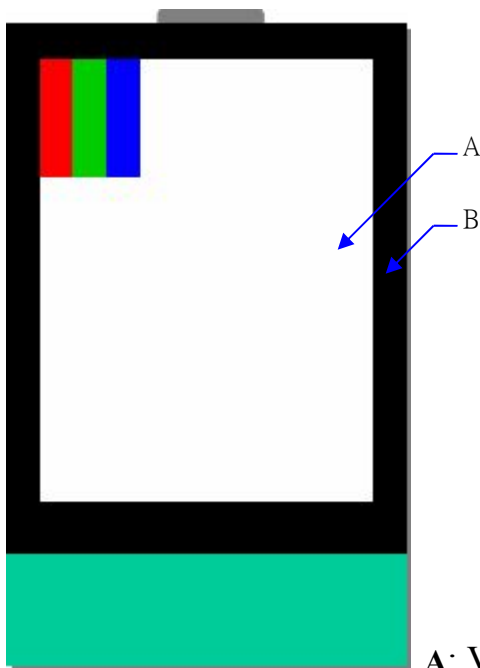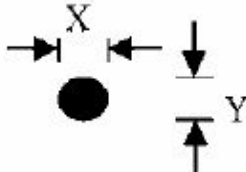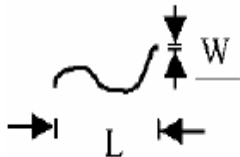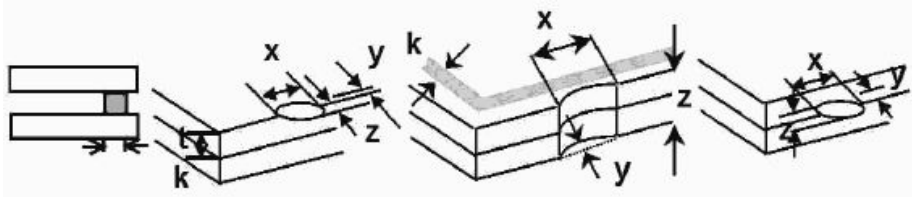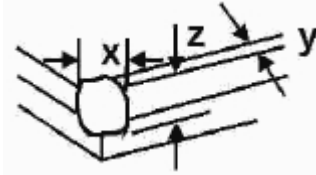


**A**: Viewing area B: Outside viewing area

### 10.5.2 Basic principle
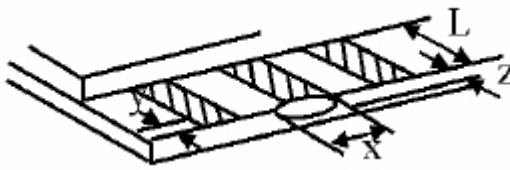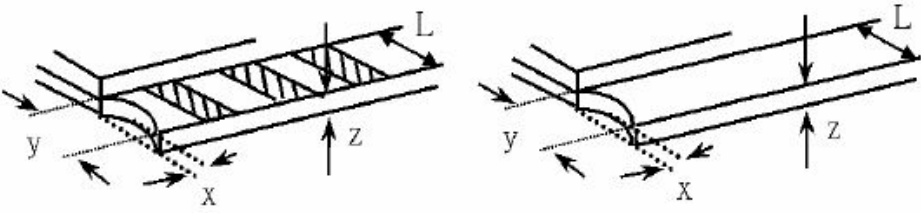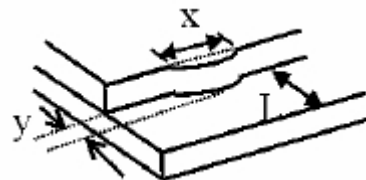
- When the standard cannot be described, AQL will be applied.
- The sample of the lowest acceptable quality level must be negotiated by both supplier and customer when any dispute happened.
- New item must be added on time when it is necessary.
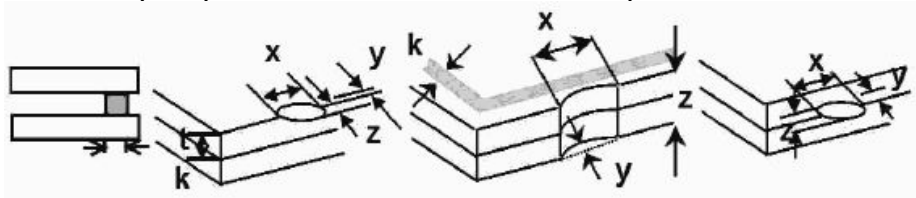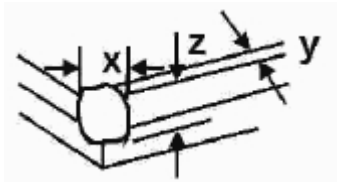
# 10.6 Inspection Specification
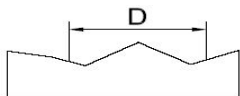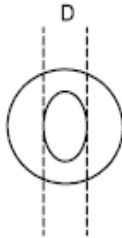
| NO. | Item | Criterion | AQL |
|---|---|---|---|
| 01 | Electrical Testing | 1.1 Missing vertical, horizontal segment, segment contrast defect.<br>1.2 Missing character, dot or icon.<br>1.3 Display malfunction.<br>1.4 No function or no display.<br>1.5 Current consumption exceeds product specifications.<br>1.6 LCD viewing angle defect.<br>1.7 Mixed product types.<br>1.8 Flicker | **0.65** |
| 02 | Black or White spots or Bright spots or Color spots on LCD (Display only) | 2.1 White and black or color spots on display $\leqq$ 0.25mm, no more than Five spots.<br>2.2 Densely spaced: No more than three spots within 3mm. | **2.5** |
| 03 | LCD and Touch Panel black spots, white spots, contamination (non – display) | 3.1 Round type: As following drawing<br>$\Phi = (X+Y)/2$<br><br><br><br>| Size(mm) | Acceptable Q'ty |<br>|---|---|<br>| $\Phi \leqq 0.10$ | Accept no dense |<br>| $0.10 < \Phi \leqq 0.20$ | 2 |<br>| $0.20 < \Phi \leqq 0.25$ | 2 |<br>| $0.25 < \Phi \leqq 0.30$ | 1 |<br>| $0.30 < \Phi$ | 0 |<br><br>* Densely spaced: No more than two spots within 3mm. | **2.5** |
| | | 3.2 Line type: (As following drawing)<br><br><br><br>| Length(mm) | Width(mm) | Acceptable Q'ty |<br>|---|---|---|<br>| --- | $W \leqq 0.02$ | Accept no dense |<br>| $L \leqq 3.0$ | $0.02 < W \leqq 0.05$ | 2 |<br>| $L \leqq 2.5$ | $0.03 < W \leqq 0.08$ | |<br>| --- | $0.08 < W$ | Rejection |<br><br>* Densely spaced: No more than two lines within 3mm. | **2.5** |

| NO. | Item | Criterion | | | AQL |
|---|---|---|---|---|---|
| 04 | Polarizer bubbles | If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction | Size Φ(mm) | Acceptable Q'ty | 2.5 |
| | | | Φ≦0.20 | Accept no dense | |
| | | | 0.20< Φ≦0.50 | 3 | |
| | | | 0.50< Φ≦1.00 | 2 | |
| | | | 1.00< Φ | 0 | |
| | | | Total Q'ty | 3 | |
| 05 | Scratches | Follow NO.3 -2 Line Type. | | | |
| 06 | Chipped glass | Symbols:<br>x: Chip length    y: Chip width    z: Chip thickness<br>k: Seal width    t: Glass thickness  a: LCD side length<br>L: Electrode pad length<br>6.1 General glass chip:<br>6.1.1 Chip on panel surface and crack between panels: | | | 2.5 |

6.1.1 image and table:



| z: Chip thickness | y: Chip width | x: Chip length |
|---|---|---|
| Z≦1/2t | Not over viewing area | x≦1/8a |
| 1/2t< z≦2t | Not exceed 1/3k | x≦1/8a |

⊙ Unit:    mm
⊙ If there are 2 or more chips, x is the total length of each chip
6.1.2 Corner crack:



| z: Chip thickness | y: Chip width | x: Chip length |
|---|---|---|
| Z≦1/2t | Not over viewing area | x≦1/8a |
| 1/2t< z≦2t | Not exceed 1/3k | x≦1/8a |

⊙ Unit:    mm
⊙ If there are 2 or more chips, x is the total length of each chip

| NO. | Item | Criterion | AQL |
|-----|------|-----------|-----|
| 08 | Cracked glass | The LCD with extensive crack is not acceptable. | 2.5 |
| 09 | Backlight elements | 9.1 Illumination source flickers when lit.<br>9.2 Spots or scratches that appear when lit must be judged. Using LCD spot, lines and contamination standards.<br>9.3 Backlight doesn't light or color is wrong. | 2.5<br>2.5<br><br>0.65 |
| 10 | Bezel | Bezel must comply with product specifications. | 2.5 |
| 11 | PCB、COB | 11.1 COB seal may not have pinholes larger than 0.2mm or contamination.<br>11.2 COB seal surface may not have pinholes through to the IC.<br>11.3 The height of the COB should not exceed the height indicated in the assembly diagram.<br>11.4 There may not be more than 2mm of sealant outside the seal area on PCB. And there should be no more than three places.<br>11.5 Parts on PCB must be the same as on the production characteristic  chart, There should be no wrong parts, missing parts or excess parts.<br>11.6 The jumper on the PCB should conform to the product characteristic chart. | 2.5<br>2.5<br>2.5<br><br>2.5<br><br>0.65<br><br>0.65 |
| 12 | FPC | 12.1 FPC terminal damage $\leqq$ 1/2 FPC terminal width and can not affect the function, we judge accept.<br>12.2 FPC alignment hole damage $\leqq$ 1/2 alignment area and can not affect the function, we judge accept. | 2.5<br><br>2.5 |
| 13 | Soldering | 13.1 No cold solder joints, missing solder connections, oxidation or icicle.<br>13.2 No short circuits in components on PCB or FPC. | 2.5<br>0.65 |

| NO. | Item | Criterion | AQL |
|-----|------|-----------|-----|
| 07 | Glass crack | Symbols:<br>x: Chip length    y: Chip width    z: Chip thickness<br>k: Seal width    t: Glass thickness  a: LCD side length<br>L: Electrode pad length<br>7.2 Protrusion over terminal:<br>7.2.1 Chip on electrode pad:<br><br><br><br>| 2.5 |

Symbols:
x: Chip length    y: Chip width    z: Chip thickness
k: Seal width    t: Glass thickness  a: LCD side length
L: Electrode pad length
7.2 Protrusion over terminal:
7.2.1 Chip on electrode pad:



| y: Chip width | x: Chip length | z: Chip thickness |
|---------------|----------------|-------------------|
| $y \leqq 0.5mm$ | $x \leqq 1/8a$ | $0 < z \leqq t$ |

7.2.2
Non-conductive portion:



| y: Chip width | x: Chip length | z: Chip thickness |
|---------------|----------------|-------------------|
| $y \leqq L$ | $x \leqq 1/8a$ | $0 < z \leqq t$ |

⊙ If there chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications.
⊙ If the product will be heat sealed by the customer, the alignment mark must not be damaged.
7.2.3 Substrate protuberance and internal crack



| y: width | x: length |
|----------|-----------|
| $y \leqq 1/3L$ | $X \leqq a$ |

| NO. | Item | Criterion | AQL |
|:---:|:---:|:---|:---:|
| 14 | Touch Panel Chipped glass | Symbols:<br>x: Chip length    y: Chip width    z: Chip thickness<br>k: Seal width    t: Touch Panel Total thickness   a: LCD side length<br>L: Electrode pad length<br>14.1 General glass chip:<br>14.1.1 Chip on panel surface and crack between panels:<br><br><br>| z: Chip thickness | y: Chip width | x: Chip length |<br>|---|---|---|<br>| $Z \leqq t$ | $\leqq 1/2$ k and not over viewing area | $x \leqq 1/8a$ |<br><br>⊙ Unit: mm<br>⊙ If there are 2 or more chips, x is the total length of each chip<br>14.1.2 Corner crack:<br><br><br>| z: Chip thickness | y: Chip width | x: Chip length |<br>|---|---|---|<br>| $z \leqq t$ | $\leqq 1/2$ k and not over viewing area | $x \leqq 1/8a$ |<br><br>⊙ Unit: mm<br>⊙ If there are 2 or more chips, x is the total length of each chip | 2.5 |

| NO. | Item | Criterion | AQL |
|---|---|---|---|
| 15 | Touch Panel(Fish eye、dent and bubble on film) | <table><tr><td>SIZE(mm)</td><td>Acceptable Q'ty</td></tr><tr><td>Φ≦0.2</td><td>Accept no dense</td></tr><tr><td>0.2< D ≦0.4</td><td>5</td></tr><tr><td>0.4< D ≦0.5</td><td>2</td></tr><tr><td>0.5< D</td><td>0</td></tr></table>  | 2.5 |
| 16 | Touch Panel Newton ring | Newton ring dimension ≦ 1/2 touch panel area and not affect font and line distortion (≦2.5%) , it is acceptable. | 2.5 |
| 17 | Touch Panel Linearity | Less than 2.5% is acceptable. | 2.5 |
| 18 | LCD Ripple | Touch the touch panel, cannot see the LCD ripple. <br>Pen: R 1.0mm silicon rubber. <br>Operation Force: 80g | 2.5 |
| 19 | General appearance | 19.1 Pin type must match type in specification sheet. <br>19.2 LCD pin loose or missing pins. <br>19.3 Product packaging must the same as specified on packaging specification sheet. <br>19.4 Product dimension and structure must conform to product specification sheet. | 0.65<br>0.65<br>0.65<br><br>0.65 |

# 11. Handling Precaution

## 11.1 Handling of LCM

- Avoid external shock.
- Don't apply excessive force on the surface.
- Liquid in LCD is hazardous substance, do not lick or swallow. When the liquid is attaching to your hand, skin, cloth, etc., wash it thoroughly and immediately.
- Don't operate it above the absolute maximum rating.
- Don't disassemble the LCM.
- The operators should wear protections whenever he/she comes into contact with the module. Never touch any of the conductive parts such as the LSI pads, the copper leads on the PCB and the interface terminals with any parts of the human body.
- The modules should be kept in antistatic bags or other containers resistant to static for storage.
- The module is coated with a film to protect the display surface, be careful when peeling off this protective film since static electricity may be generated.

## 11.2 Storage

- Store it in an ambient temperature of 25±10℃, and in a relative humidity of 50±10%RH. Don't expose to sunlight or fluorescent light.
- Store it in a clean environment, free from dust, active gas, and solvent.
- Store it in anti-static electricity container.
- Store it without any physical load.

## 11.3 Soldering

- Use only soldering irons with proper grounding and no leakage.
- Iron: no higher than 280±10℃ and less than 3 sec during hand soldering.
- Rewiring: no more than 2 times.

# 12. Packing Method

----TBD