# CDTech(H.K.)Electronics Limited

## Product Specification

| | |
|---|---|
| **customer model** | OSD039T4379-75 |
| **Model Name** | S039QWQ09HS-O05 |
| **Description** | 3.9" WQVGA<br>480(RGB)x128 Dots |
| **Date** | 2022/02/16 |
| **Version** | 2.0 |

| **Approved by/Date** | **Check by/Date** | **Prepared by/Date** |
|---|---|---|
| ZHP 2022/02/16 | ZHP 2022/02/16 | ZWF 2022/02/16 |

| **Customer Approval** | |
|---|---|
| | |
| **Date** | |

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## 1. Record of Revision

| Rev | Issued Date | Description | Editor |
|---|---|---|---|
| 1.0 | 2019/11/23 | First Release. | ZHP |
| 2.0 | 2022/02/16 | Update Yellow insulating adhesive 3M7413d | ZWF |
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## 2. General Specifications

| Feature | | Spec |
|---|---|---|
| Characteristics | Size | 3.9 inch |
| | Resolution | 480(horizontal)*128(Vertical) |
| | Interface | RGB-24bit(HV mode) |
| | Connect type | Connector |
| | Display Colors | 16.7M |
| | Technology type | a-Si |
| | Pixel pitch (mm) | 0.198*0.198 |
| | Pixel Configuration | R.G.B.-Stripe |
| | Display Mode | Normally White |
| | Driver IC | ILI6480 |
| | Viewing Direction | 12 O'clock |
| | Gray Inversion Direction | 6 O'clock |
| Mechanical | LCM (W x H x D) (mm) | 105.50*40.64*2.95 |
| | Active Area(mm) | 95.04*25.34 |
| | With /Without TSP | Without TSP |
| | Weight (g) | TBD |
| | LED Numbers | 10 LEDs |

Note 1: Requirements on Environmental Protection: RoHs
Note 2: LCM weight tolerance: +/- 5%

## 3. Input/OutputTerminals

| No. | Symbol | Description |
|---|---|---|
| 1 | VBL- | Backlight LED Cathode |
| 2 | VBL+ | Backlight LED Anode. |
| 3 | GND | System Ground |
| 4 | VDD | Power supply for logic operation |
| 5~12 | R0~R7 | Data bus |
| 13~20 | G0~G7 | Data bus |
| 21~28 | B0~B7 | Data bus |
| 29 | GND | System Ground |
| 30 | CLK | Pixel clock signal |
| 31 | DISP | Display on/off control |
| 32 | HSYNC | Horizontal Sync signal |
| 33 | VSYNC | Vertical Sync signal |
| 34 | DEN | Data Enable<br>Remark: internal pulled weak low |
| 35 | NC | No connection |
| 36 | GND | System Ground |
| 37 | XR(NC) | The right side signal of TP |
| 38 | YD(NC) | The down side signal of TP |
| 39 | XL(NC) | The left side signal of TP |
| 40 | YU(NC) | The up side signal of TP |

## 4. Absolute Maximum Rating

| Item | Symbol | MIN | Typ | MAX | Unit | Remark |
|---|---|---|---|---|---|---|
| Supply Voltage | VDD | -0.5 | - | 5.0 | V | - |
| Operating Temperature | TOPR | -20 | - | 70 | ℃ | - |
| Storage Temperature | TSTG | -30 | - | 80 | ℃ | |

# 5. Electrical Characteristics

## 5.1 Driving TFT LCD Panel

| Item | | Symbol | MIN | TYP | MAX | Unit | Remark |
|---|---|---|---|---|---|---|---|
| Supply Voltage | | VDD | 3.0 | 3.3 | 3.6 | V | |
| Input Signal Voltage | Low Leve | VIL | GND | - | 0.3x VDD | V | |
| | High Level | VIH | 0.7x VDD | - | VDD | V | |
| Output Signal Voltage | Low Leve | VOL | GND | - | VDD+0.4 | V | |
| | High Level | VOH | VDD-0.4 | - | - | V | |

## 5.2 LED Driving Conditions

| Item | Symbol | MIN | TYP | MAX | Unit | Remark |
|---|---|---|---|---|---|---|
| Forward Current | $I_F$ | - | 40 | 50 | mA | |
| Forward Voltage | $V_F$ | 15 | 16 | 16.5 | V | |
| Backlight Power consumption | $W_{BL}$ | - | 0.64 | - | W | |
| LED Lifetime | | - | 50000 | - | Hrs | |

Note 1: Each LED: IF =20 mA, VF =3.2+/0.2V.

Note 2: Optical performance should be evaluated at Ta=25℃ only.

Note 3: If LED is driven by high current, high ambient temperature & humidity condition. The life Time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

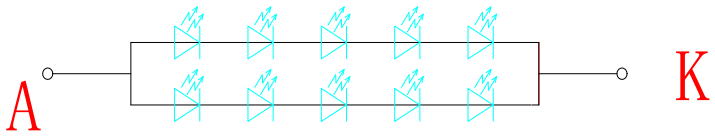
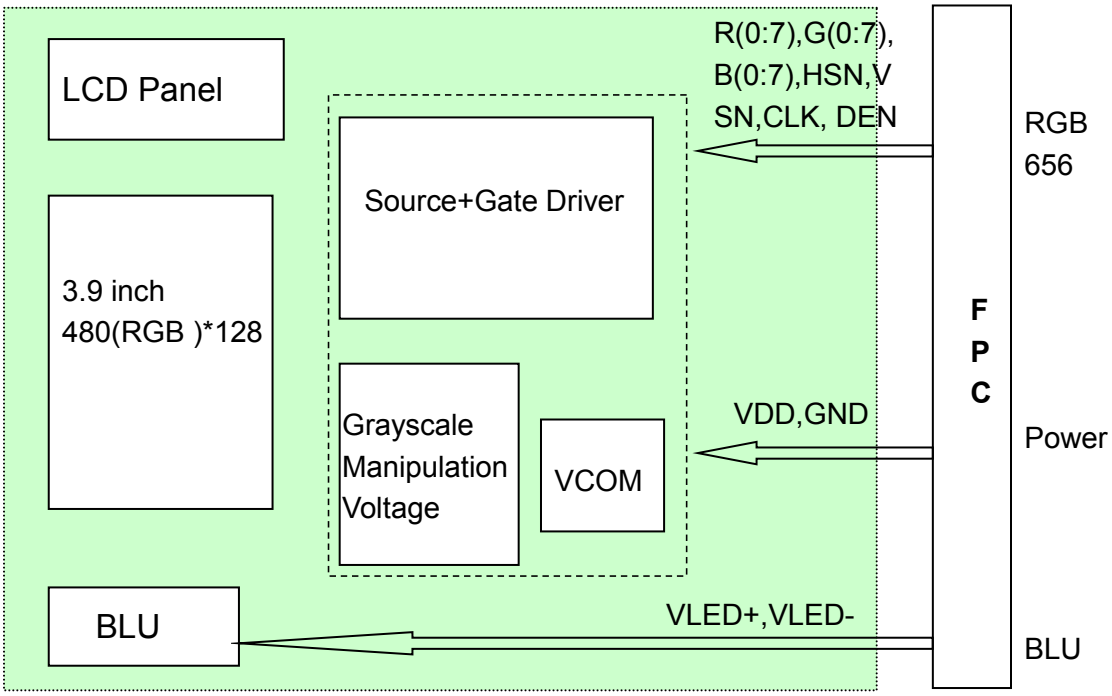


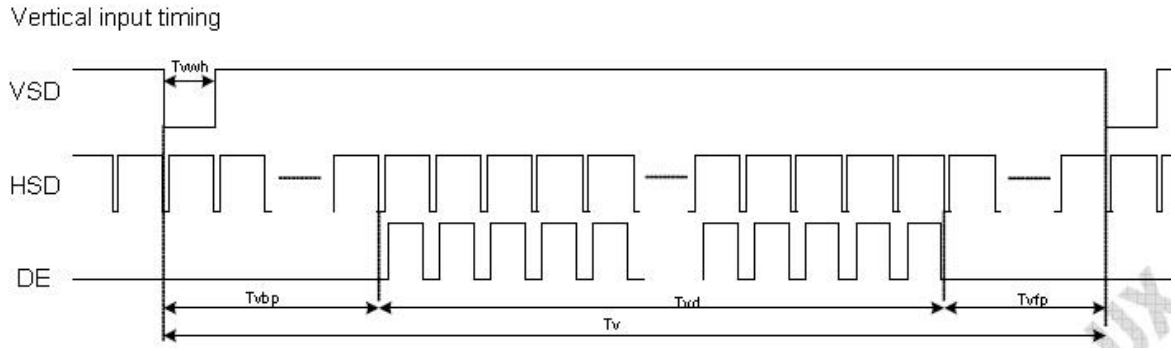

Figure: LED connection of backlight(Constant Current)

**5.3 Block Diagram**

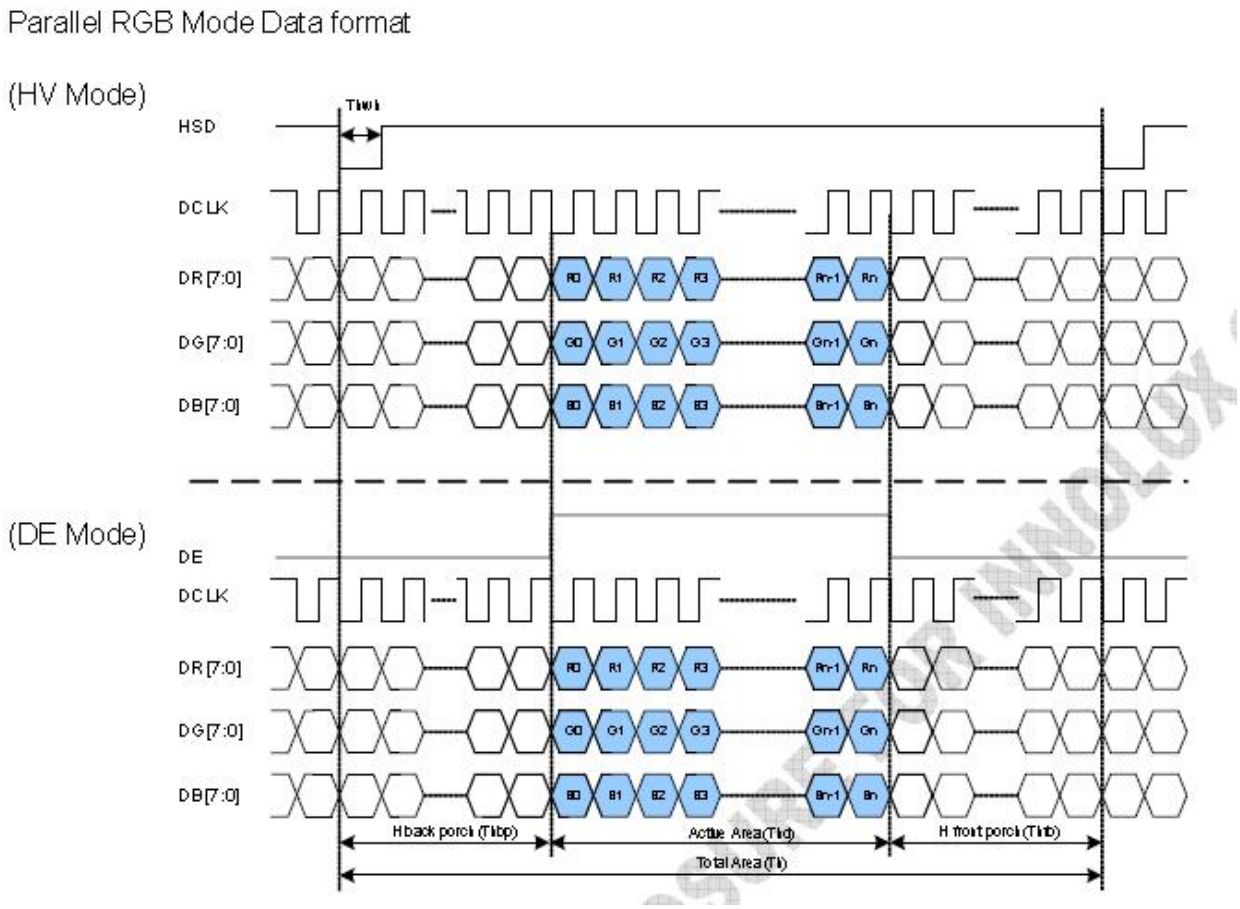


# 6. Interface Timing

## 6.1 Timing relationship among DE, Source Output, Gate Output, Vcom

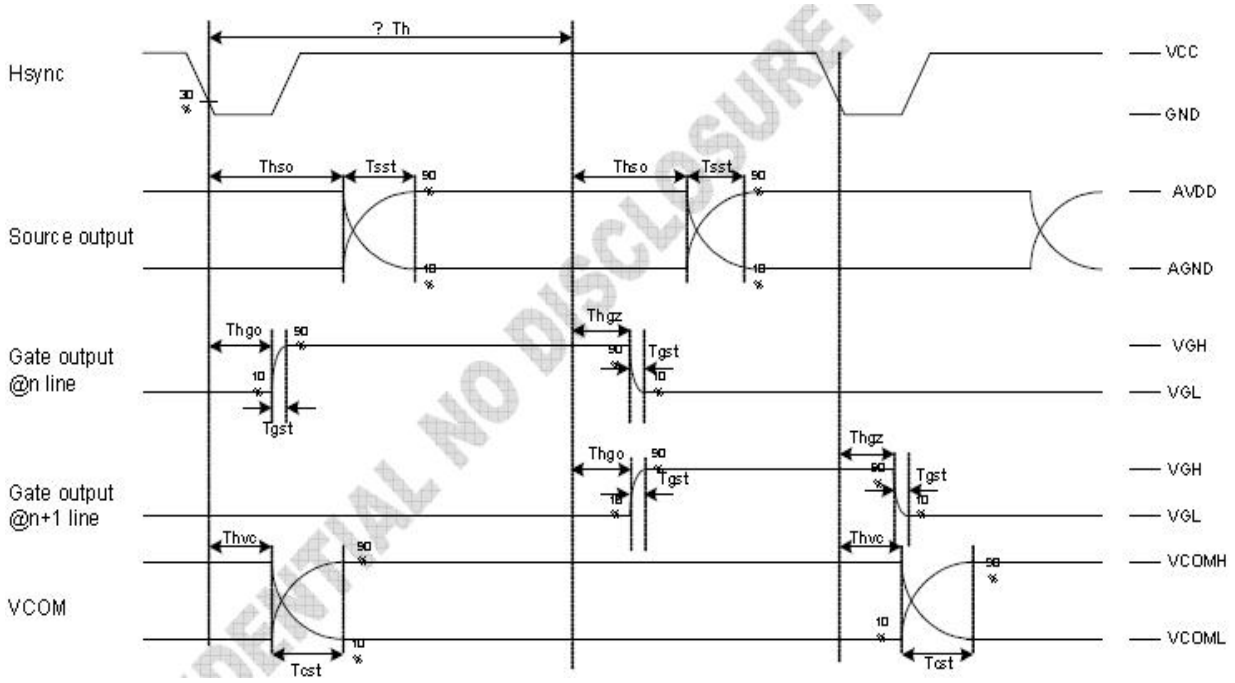



## 6.2 Parallel RGB Data Format

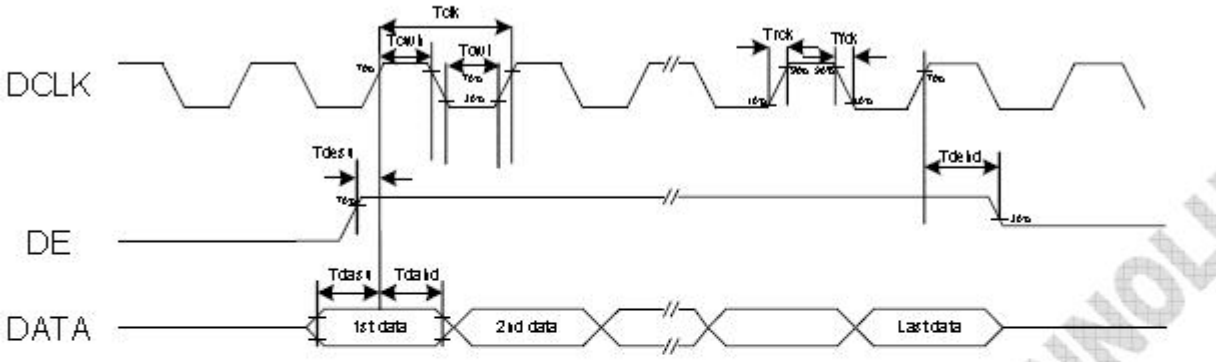


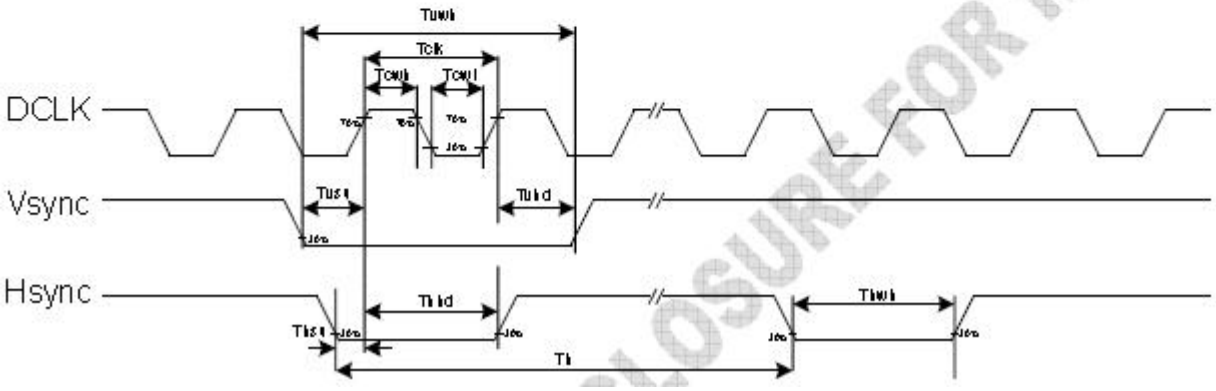
| Parameter | Symbol | Value | | | Unit |
|---|---|---|---|---|---|
| | | Min | Typ | Max | |
| DCLK frequency | FCLK | 5 | 9 | 12 | MHZ |
| VSD period time | TV | 133 | 144 | 256 | H |
| VSD display area | TVD | 128 | 128 | 128 | H |
| VSD back porch | TVB | 3 | 8 | 31 | H |
| VSD front porch | TVFP | 2 | 8 | 97 | H |
| HSD period time | TH | 520 | 525 | 800 | DCLK |
| HSD display area | THD | 480 | 480 | 480 | DCLK |
| HSD back porch | THBP | 36 | 40 | 255 | DCLK |
| HSD front porch | THFP | 4 | 5 | 65 | DCLK |

## 6.3 Output Timing Diagram



## Clock and Data Input Waveforms




DISCLOSURE FOR INNOLUX

## 7. Optical Characteristics

| Items | | Symbol | Condition | Min. | Typ. | Max. | Unit | Remark | Note |
|---|---|---|---|---|---|---|---|---|---|
| Response time | | Tr+Tf | - | - | 25 | 50 | ms | FIG.1 | Note4 |
| Contrast Ratio | | CR | | - | 500 | - | - | FIG.2 | Note1 |
| Surface luminance | | LV | θ =0° | 450 | 500 | - | cd/m2 | FIG.2 | Note2 |
| Luminance uniformity | | Yu | θ =0° | 75 | 80 | - | % | FIG.2 | Note3 |
| NTSC | | - | θ =0° | - | 50 | - | % | FIG.2 | Note5 |
| Viewing angle | | $\theta_T$ | Center CR≥10 | - | 55 | - | deg | FIG.3 | Note6 |
| | | $\theta_B$ | | - | 65 | - | deg | FIG.3 | |
| | | $\theta_L$ | | - | 65 | - | deg | FIG.3 | |
| | | $\theta_R$ | | - | 65 | - | deg | FIG.3 | |
| Chromaticity | Red | $R_X$ | θ =0° ∅=0° Ta=25° | TBD | TBD | TBD | - | FIG.2 CIE1931 | Note5 |
| | | $R_Y$ | | TBD | TBD | TBD | - | | |
| | Green | $G_X$ | | TBD | TBD | TBD | - | | |
| | | $G_Y$ | | TBD | TBD | TBD | - | | |
| | Blue | $B_X$ | | TBD | TBD | TBD | - | | |
| | | $B_Y$ | | TBD | TBD | TBD | - | | |
| | White | $W_X$ | | TBD | TBD | TBD | - | | |
| | | $W_Y$ | | TBD | TBD | TBD | - | | |

**Note1. Definition of contrast ratio**
Contrast ratio(Cr) is defined mathematically by the following formula.
For more information see FIG.2.

$$\text{Contrast ratio} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

For contrast ratio, Surface Luminance, Luminance uniformity and CIE,the testing data is base on TOPCON's BM-5 or BM-7 photo detector or compatible.

**Note2. Definition of surface luminance**
Surface luminance is the luminance with all pixels displaying white. For more information see FIG.2.
Lv = Average Surface Luminance with all white pixels(P1,P2,P3, .....,Pn)

**Note3. Definition of luminance uniformity**
The luminance uniformity in surface luminance is determined by measuring luminance at each test position 1 through n, and then dividing the maximum luminance of n points luminance by minimum luminance of n points luminance.For more information see FIG.2.

$$Yu = \frac{\text{Minimum surface luminance with all white pixels (P1,P2,P3,.....,Pn)}}{\text{Maximum surface luminance with all white pixels (P1,P2,P3,.....,Pn)}}$$

**Note4. Definition of response time**
The response time is defined as the LCD optical switching time interval between "White" state and "Black"state.Rise time (Tr) is the time between photo detector output intensity changed from 90% to 10%. And fall time (Tf) is the time between photo detector output intensity changed from 10% to 90%.
For additional information see FIG1.

**Note5. Definition of color chromaticity (CIE1931)**
CIE (x,y) chromaticity,The x,y value is determined by screen active area center position P5.For more information see FIG.2.

**Note6. Definition of viewing angle**
Viewing angle is the angle at which the contrast ratio is greater than 10. Angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface.
For more information see FIG.3.
For viewing angle and response time testing, the testing data is base on Autronic-Melchers's ConoScope or DMS series Instruments or compatible.

**FIG.1. The definition of response Time**

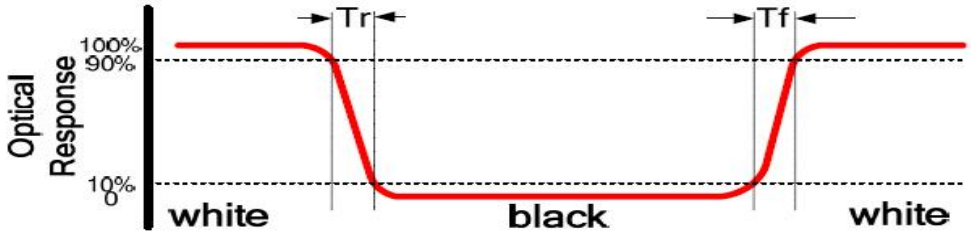



**FIG.2. Measuring method for contrast ratio, surface luminance, luminance uniformity, CIE (x,y) chromaticity**

Size : S≤5"(see Figure a)
A : 5 mm B : 5 mm
H,V : Active area
Light spot size ∅=5mm(BM-5) or ∅=7.7mm (BM-7)50cm distance or compatible distance from the LCD surface to detector lens.
test spot position : see Figure a.
measurement instrument : TOPCON's luminance meter BM-5 or BM-7 or compatible (see Figure c).

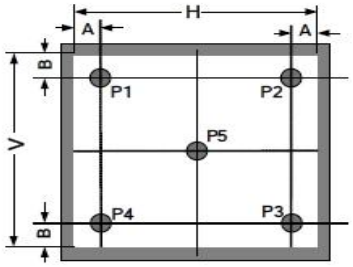



Figure a

Size : 5"＜S≤12.3"(see Figure b)
H,V : Active area
Light spot size ∅=5mm(BM-5) or ∅=7.7mm (BM-7)50cm distance or compatible distance from the LCD surface to detector lens.
test spot position : see Figure b.
measurement instrument : TOPCON's luminance meter BM-5 or BM-7 or compatible (see Figure c).

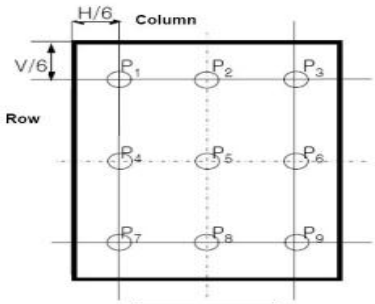



Figure b

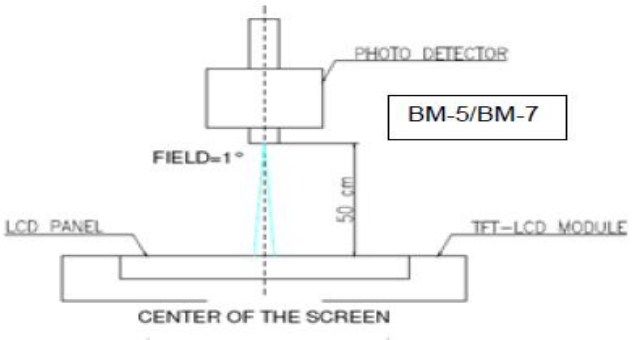
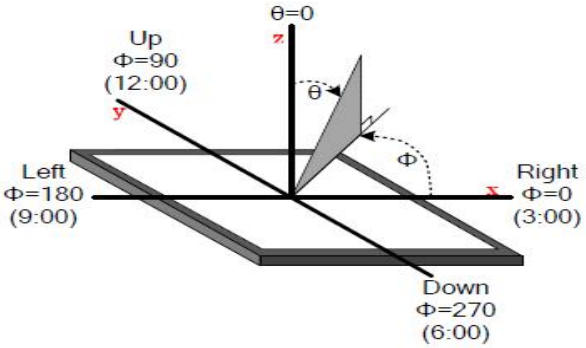



Figure c

**FIG.3. The definition of viewing angle**

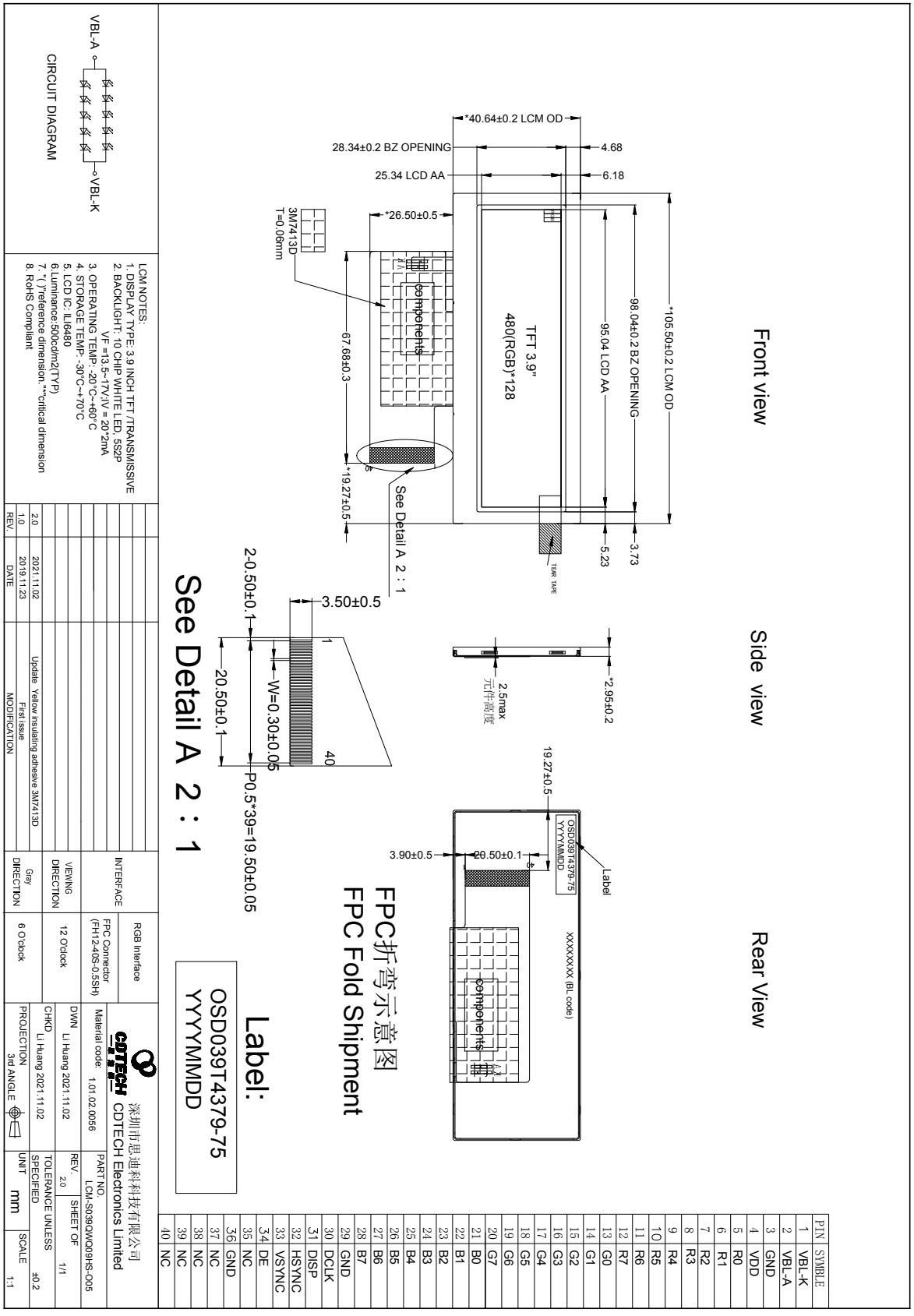


## 8. Environmental / Reliability Tests

| No | Test Item | Condition | Remarks |
|---|---|---|---|
| 1 | High Temperature Operation | Ts= +70℃, 96hrs | Note 1 IEC60068-2-2, GB2423. 2-89 |
| 2 | Low Temperature Operation | Ta= -20℃, 96hrs | Note 2 IEC60068-2-1 GB2423.1-89 |
| 3 | High Temperature Storage | Ta= +80℃, 96hrs | IEC60068-2-2 GB2423. 2-89 |
| 4 | Low Temperature Storage | Ta= -30℃, 96hrs | IEC60068-2-1 GB/T2423.1-89 |
| 5 | High Temperature & Humidity Storage | Ta= +60℃, 90% RH max,96 hours | IEC60068-2-3 GB/T2423.3-2006 |
| 6 | Thermal Shock (Non-operation) | -20℃ 30 min ~ +60℃ 30 min Change time: 5min, 30 Cycle | Start with cold temperature, end with high temperature IEC60068-2-14, GB2423.22-87 |
| 7 | Electro Static Discharge (Operation) | C=150pF, R=330 Ω, 5 points/panel Air:±8KV, 5 times; Contact: ±4KV, 5 times; (Environment: 15℃ ~ 35℃, 30% ~ 60%, 86Kpa ~ 106Kpa) | IEC61000-4-2 GB/T17626.2-1998 |
| 8 | Vibration (Non-operation) | Frequency range: 10~55Hz, Stroke: 1.mm Sweep: 10Hz~55Hz~10Hz 2 hours for each direction of X .Y. Z. (package condition) | IEC60068-2-6 GB/T2423.5-1995 |
| 9 | Shock (Non-operation) | 60G 6ms, ± X, ±Y , ± Z 3 times for each direction | IEC60068-2-27 GB/T2423.5-1995 |
| 10 | Package Drop Test | Height: 80 cm, 1 corner, 3 edges, 6 surfaces | IEC60068-2-32 GB/T2423.8-1995 |

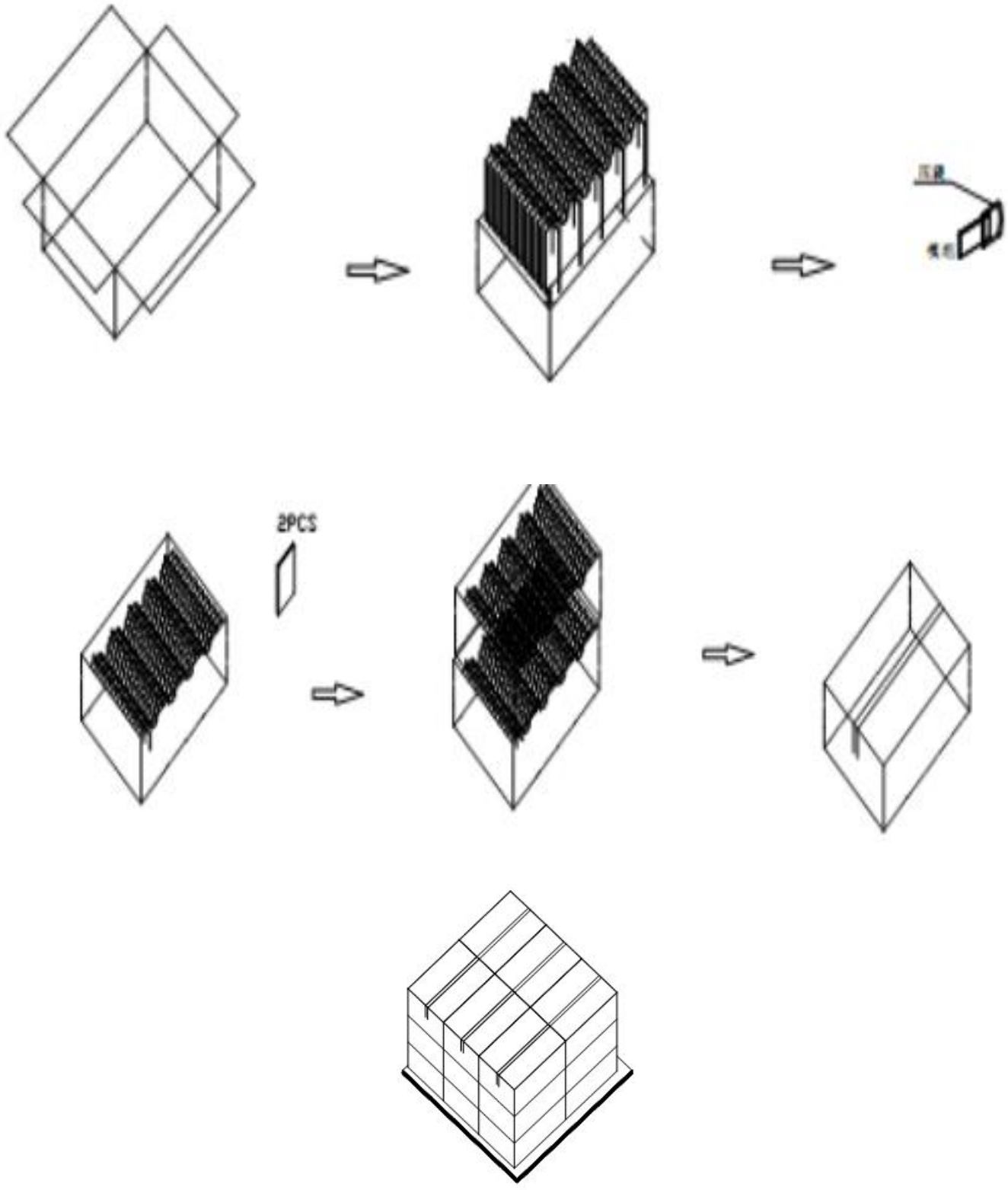
Note: 1. $T_S$ is the temperature of panel's surface.
2. Ta is the ambient temperature of sample.
3. The size of sample is 5pcs.

## 9. Mechanical Drawing



## 10. Packing

**Packing Method**



# 11. Precautions for Use of LCD modules

## 11.1 Handling Precautions

11.1.1. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

11.1.2. If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

11.1.3. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

11.1.4. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

11.1.5. If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketene
- Aromatic solvents

11.1.6. Do not attempt to disassemble the LCD Module.

11.1.7. If the logic circuit power is off, do not apply the input signals.

11.1.8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

11.1.8.1. Be sure to ground the body when handling the LCD Modules.

11.1.8.2. Tools required for assembly, such as soldering irons, must be properly ground.

11.1.8.3. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

11.1.8.4. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

## 11.2 Storage Precautions

11.2.1. When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

11.2.2. The LCD modules should be stored under the storage temperature range If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0℃ ～ 40℃ Relatively humidity: ≤80%

11.2.3. The LCD modules should be stored in the room without acid, alkali and harmful gas.

## 11.3 Transportation Precautions

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.