# SPECIFICATION

## OF

## LIQUID CRYSTAL DISPLAY MODULE


**CUSTOMER :** URT-STD

**Model No. :** UMSH-9392MD-1T

**Model version :** 0

**Document Revision :** 1

| CUSTOMER APPROVED SIGNATURE | | | |
|---|---|---|---|
| | | | |

This specification need to be signed by purchaser or customer as a specification of products production and delivery from URT. Without signature of this specification , any purchase order for this model no. will be treated and considered that this specification is automatically acknowledged and accepted by purchaser or customer.

U.R.T. UNITED RADIANT TECHNOLOGY CORPORATION

| Joe Wu | Ashin Chiu | Jenny Wang | Mar-14-2019 |
|---|---|---|---|
| APPROVED | CHECKED | PREPARED | Date |

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# Revision record

| Document Revision | Model No. Version No. | Description | Revision by |
|---|---|---|---|
| 0 | UMSH-9392MD-T Version No. 0 | 7”TFT | H.F. Kuo<br>Titan Lo<br>14-Mar-2019 |
| 1 | UMSH-9392MD-1T Version No. 0 | 1. Change the backlight<br>2. Modify the module number from UMSH-9392MD-T to UMSH-9392MD-1T. | H.F. Kuo<br>Titan Lo<br>14-Mar-2019 |
| | | | |

**CONTENTS:**

## 1. BASIC SPECIFICATION

### 1.1 Mechanical specifications

| Items | Nominal Dimension | Unit |
|---|---|---|
| Active screen size | 7.0” diagonal | - |
| Dot Matrix | 800 x RGB x 480 | Pixel |
| Module Size (W x H x T) | 164.9 x 100.0 x 7.0 | mm. |
| Active Area (W x H) | 154.08 x 85.92 | mm. |
| Pixel Size ( W×H ) | 0.1926 x 0.179 | mm. |
| Color depth | 16.7M | color |
| Interface | Parallel 24-bit RGB | - |
| Driving IC Package | COG | - |
| Module weight | TBD±10% | g |

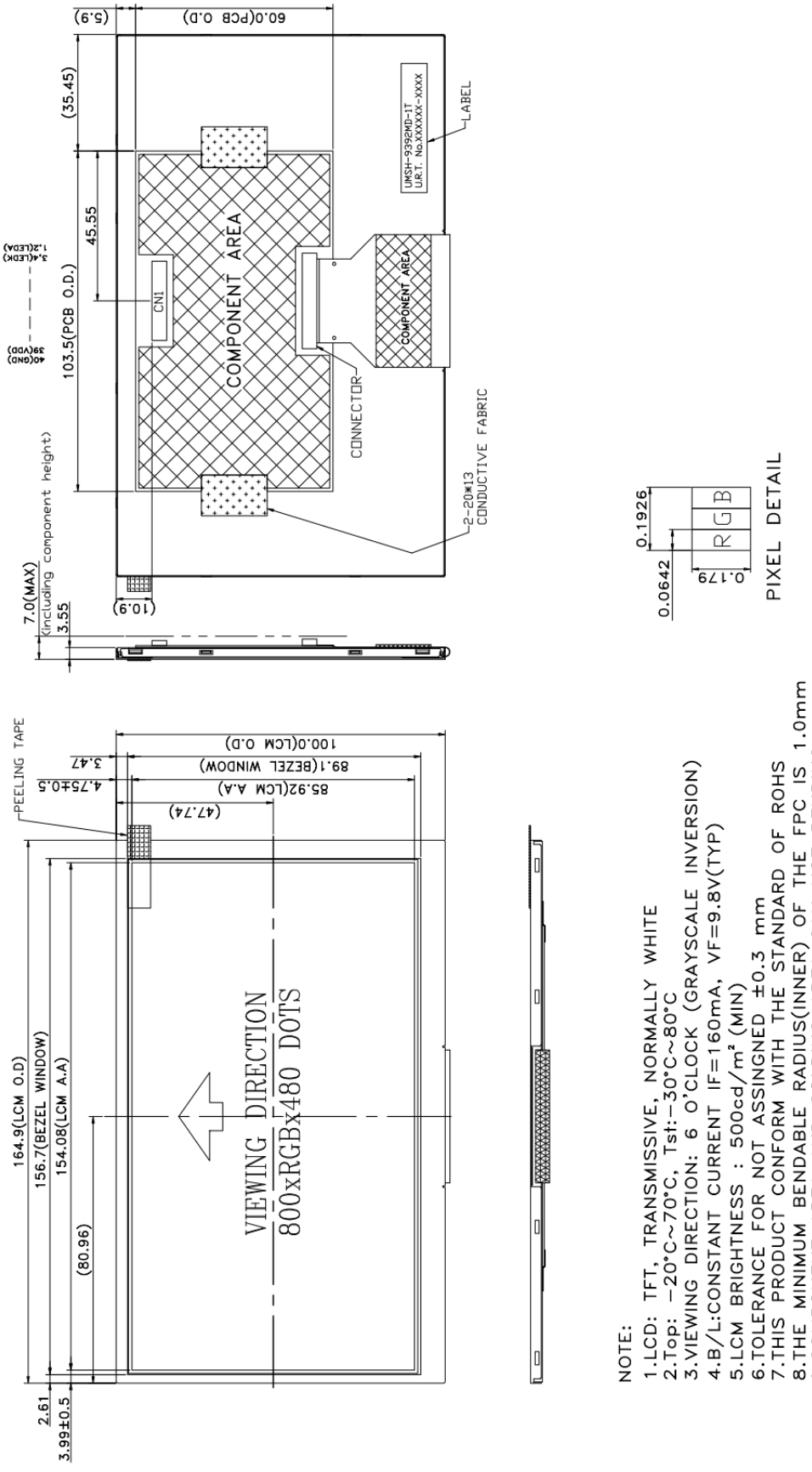
### 1.2 Display specification

| Display | Descriptions | Note |
|---|---|---|
| LCD Type | a-Si TFT | - |
| LCD Mode | TN / Normal white | - |
| Polarizer Mode | Transmissive | - |
| Polarizer Surface | Anti-Glare | - |
| Pixel arrangement | RGB-stripe | - |
| Backlight Type | LED | - |
| Viewing Direction(Gray inversion) | 6 O'clock Direction | 1 |

*Color tone is slightly changed by temperature and driving voltage.

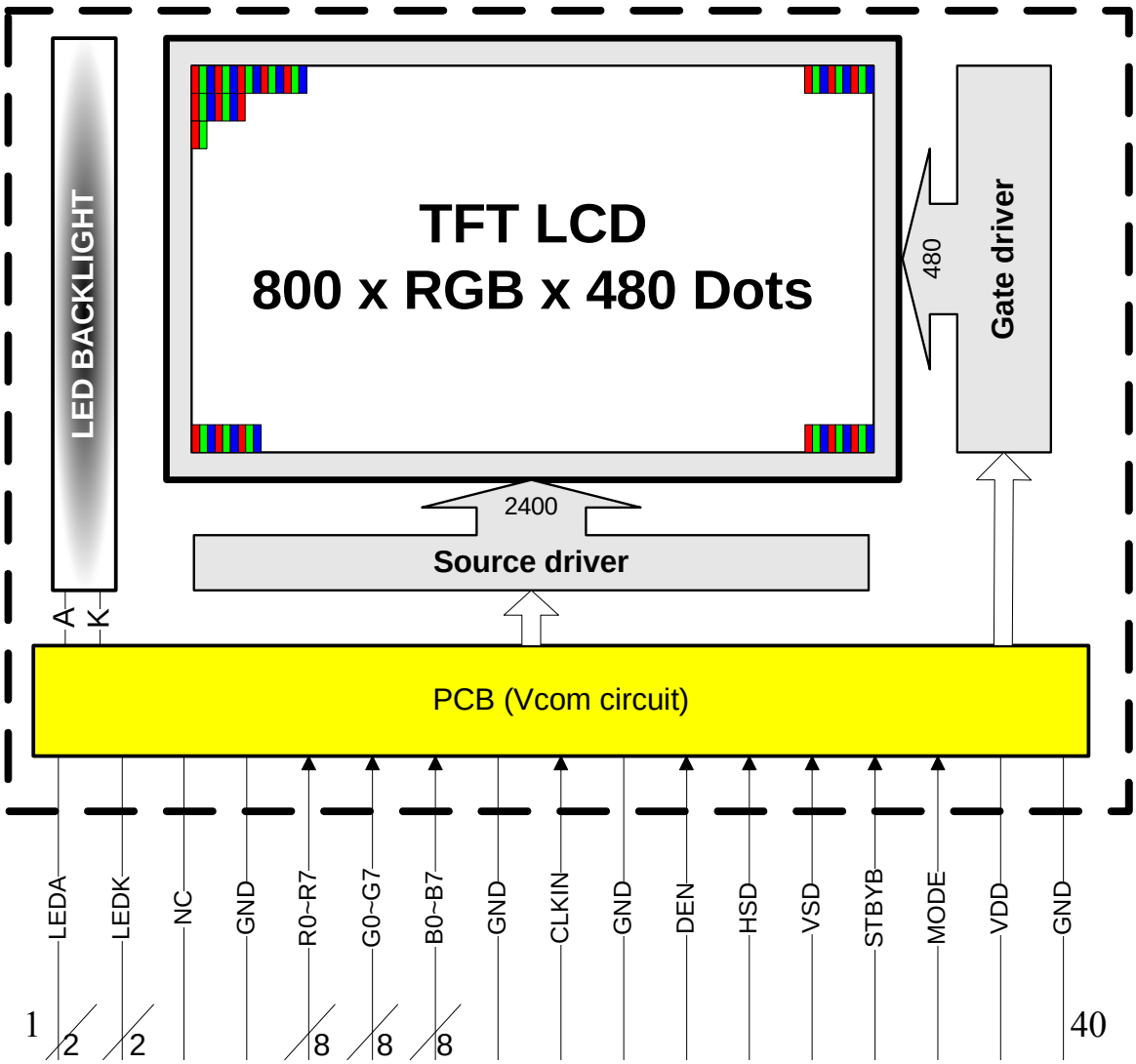
Note 1：The viewing direction defined in this specification is according to the rubbing direction of its TFT surface treatment by the TFT glass manufacturer. The grayscale inversion is at this direction as well. However, the optimal viewing direction for human view is normally where the color does NOT change to grayscale inversion, and this would be the opposite site of the specified viewing direction in this specification. In any case we advise customers to judge by themselves, and be aware of this phenomenon.

## 1.3 Outline dimension




NOTE:
1.LCD: TFT, TRANSMISSIVE, NORMALLY WHITE
2.Top: −20°C~70°C, Tst:−30°C~80°C
3.VIEWING DIRECTION: 6 O'CLOCK (GRAYSCALE INVERSION)
4.B/L:CONSTANT CURRENT IF=160mA, VF=9.8V(TYP)
5.LCM BRIGHTNESS : 500cd/m² (MIN)
6.TOLERANCE FOR NOT ASSINGNED ±0.3 mm
7.THIS PRODUCT CONFORM WITH THE STANDARD OF ROHS
8.THE MINIMUM BENDABLE RADIUS(INNER) OF THE FPC IS 1.0mm
9.COMPONENT AREA AND SOLDING AREA CAN NOT BENDING
10.CN1 : 6705K−E40N−00L(E&T) OR EQUIVALENT

## 1.4 Block diagram:



## 1.5 Interface Pin Connection:

| Pin No. | Pin Symbol | I/O | Description |
|---|---|---|---|
| 1~2 | LEDA | P | Power voltage for LED backlight. (Anode). |
| 3~4 | LEDK | P | Power voltage for LED backlight. (Cathode). |
| 5 | NC | - | Not connect. |
| 6 | GND | P | Power ground. |
| 7~14 | R0~R7 | I | Red data input. |
| 15~22 | G0~G7 | I | Green data input. |
| 23~30 | B0~B7 | I | Blue data input. |
| 31 | GND | P | Power ground. |
| 32 | CLKIN | I | Clock signal. |
| 33 | GND | P | Power ground. |
| 34 | DEN | I | Data Enable signal. |
| 35 | HSD | I | Horizontal sync input. Negative polarity. |
| 36 | VSD | I | Vertical sync input. Negative polarity. |
| 37 | STBYB | I | Standby mode, normally pull high.<br>STBYB="1", normal operation.<br>STBYB="0",timing control, source driver will turn off all output are high-Z. |
| 38 | MODE | I | DE/SYNC mode select. Normally pull high.<br>H: DE mode. L: HSD/VSD mode. |
| 39 | VDD | P | Digital power supply (+3.3V) |
| 40 | GND | P | Power ground. |

## 2. ELECTRICAL CHARACTERISTICS

### 2.1 Absolute Maximum Ratings

| Items | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|
| Power supply voltage | VDD | -0.5 | +5.0 | V |
| Input voltage | VIN | 0 | VDD+0.3 | V |
| Operate temperature range | TOP | -20 | 70 | ℃ |
| Storage temperature range | TST | -30 | 80 | ℃ |

## 2.2 DC Characteristics

$T_a$= 25℃

| Items | Symbol | Min. | Typ. | Max. | Unit | Condition |
|---|---|---|---|---|---|---|
| Supply voltage | VDD | 3.0 | 3.3 | 3.6 | V | - |
| Input Voltage | IL | GND | - | 0.3VDD | V | L level |
| | VIH | 0.7VDD | - | VDD | V | H level |
| Current consumption | IDD | - | - | 182 | mA | Note1 |

*Note1 :

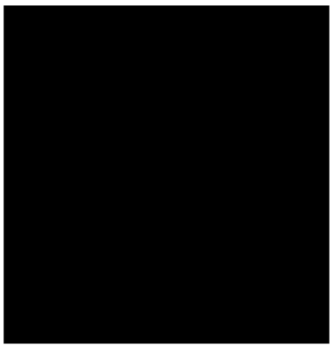
Measuring Condition:

Standard Value MAX.

Ta = 25℃

DVDD -GND =3.3V

Display Pattern = Check pattern

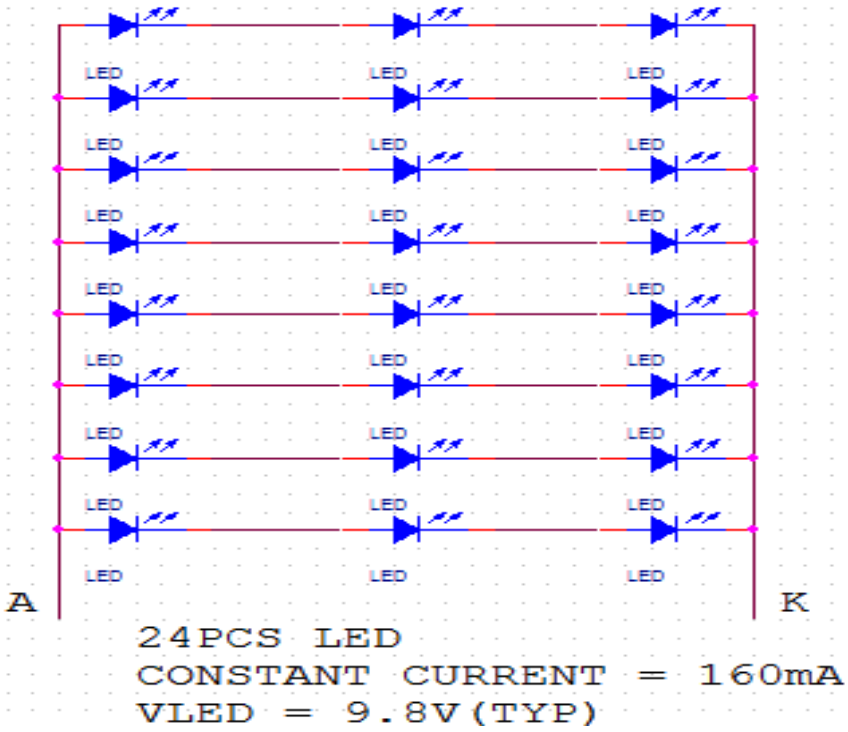


0 gray black pattern

## 2.3 Back-light only Specification

| PAR METER | SYMBOL | MIN | TYP | MAX | Unit | Test Condition | NOTE |
|---|---|---|---|---|---|---|---|
| Supply Current | If | - | 160 | | mA | Ta=25℃ | Constant current |
| Supply Voltage | Vf | 8.7 | 9.8 | 10.6 | V | Ta=25℃ | Constant current |
| Half-Life Time | Lf | - | 30000 | - | hrs | Ta=25℃ | 1 |

Note 1：The " Half-Life Time "is defined as the module brightness decrease to 50% original brightness.



## 2.4 AC Characteristics

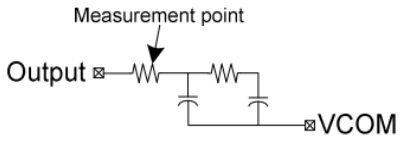
### 2.4.1 AC Timing characteristics

| Parameter | Symbol | Spec | | | Unit | Conditions |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| VDD Power ON slew rate | $t_{POR}$ | -- | -- | 20 | ms | 0V ~ 0.9VDD |
| RSTB pulse width | $t_{RST}$ | 10 | -- | -- | us | CLKIN=50MHz |
| CLKIN cycle time | $t_{CPH}$ | 20 | -- | -- | ns | |
| CLKIN pulse duty | $t_{CWH}$ | 40 | 50 | 60 | % | |
| VSD setup time | $t_{VST}$ | 8 | -- | -- | ns | |
| VSD hold time | $t_{VHD}$ | 8 | -- | -- | ns | |
| HSD setup time | $t_{HST}$ | 8 | -- | -- | ns | |
| HSD hold time | $t_{HHD}$ | 8 | -- | -- | ns | |
| Data setup time | $t_{DST}$ | 8 | -- | -- | ns | D0[7:0], D1[7:0], D2[7:0] to CLKIN |
| Data hold time | $t_{DHD}$ | 8 | -- | -- | ns | D0[7:0], D1[7:0], D2[7:0] to CLKIN |
| DE setup time | $t_{EST}$ | 8 | -- | -- | ns | |
| DE hold time | $t_{EHD}$ | 8 | -- | -- | ns | |
| Output stable time | $t_{SST}$ | -- | -- | 6 | us | 10% to 90% target voltage. CL=120pF, R=10KΩ |
| CLKIN frequency | $f_{CLK}$ | -- | 40 | 50 | MHz | VDD=3.0 ~ 3.6V |
| CLKIN cycle time | $t_{CLK}$ | 20 | 25 | -- | ns | |
| CLKIN pulse duty | $t_{CWH}$ | 40 | 50 | 60 | % | $T_{CLK}$ |
| Time from HSD to Source output | $t_{HSO}$ | -- | 20 | -- | CLKIN | |
| Time from HSD to LD | $t_{HLD}$ | -- | 20 | -- | CLKIN | Note (2) |
| Time from HSD to STV | $t_{HSTV}$ | -- | 2 | -- | CLKIN | |
| Time from HSD to CKV | $t_{HCKV}$ | -- | 20 | -- | CLKIN | |
| Time from HSD to OEV | $t_{HOEV}$ | -- | 4 | -- | CLKIN | |
| LD pulse width | $t_{WLD}$ | -- | 10 | -- | CLKIN | Note (2) |
| CKV pulse width | $t_{WCKV}$ | -- | 66 | -- | CLKIN | |
| OEV pulse width | $t_{WOEV}$ | -- | 74 | -- | CLKIN | |

*Note: (1) VDD=3.0 ~ 3.6V, VDDA=6.5~13.5V, DGND=AGND=0V, Ta=-20~+85*

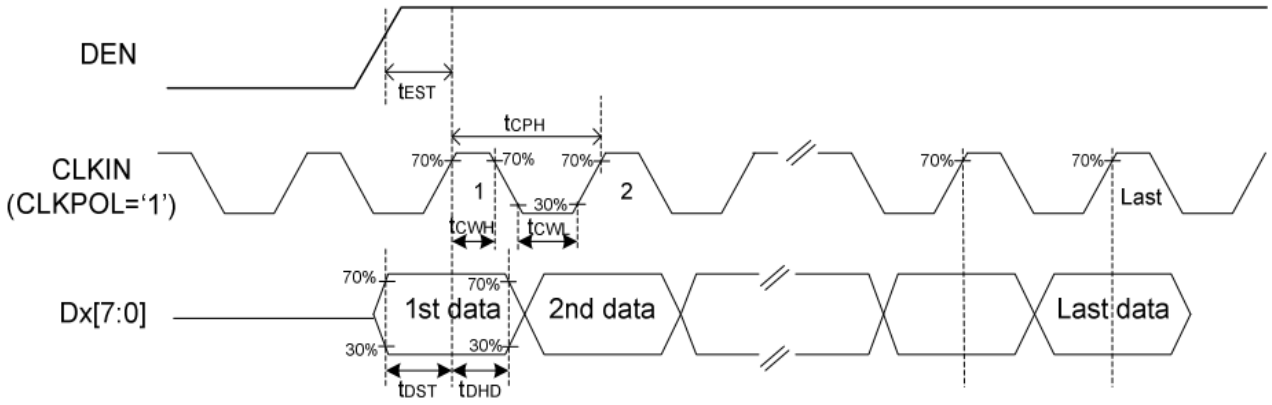
*(2) The contents of the data register are transferred to the latch circuit at the rising edge of LD. Then the gray scale voltage is output from the device at the falling edge of LD.*

*(3) Output loading condition :*

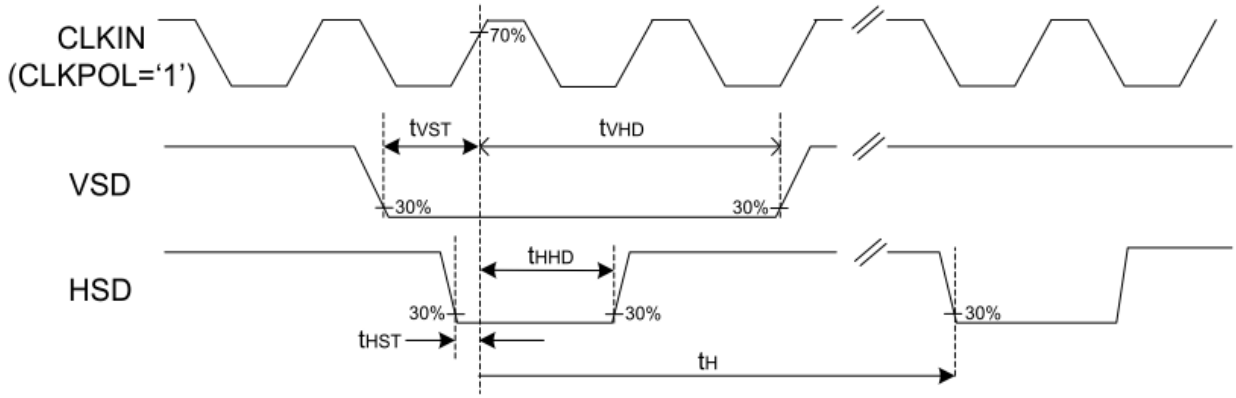


### 2.4.2 Timing Controller Timing Chart

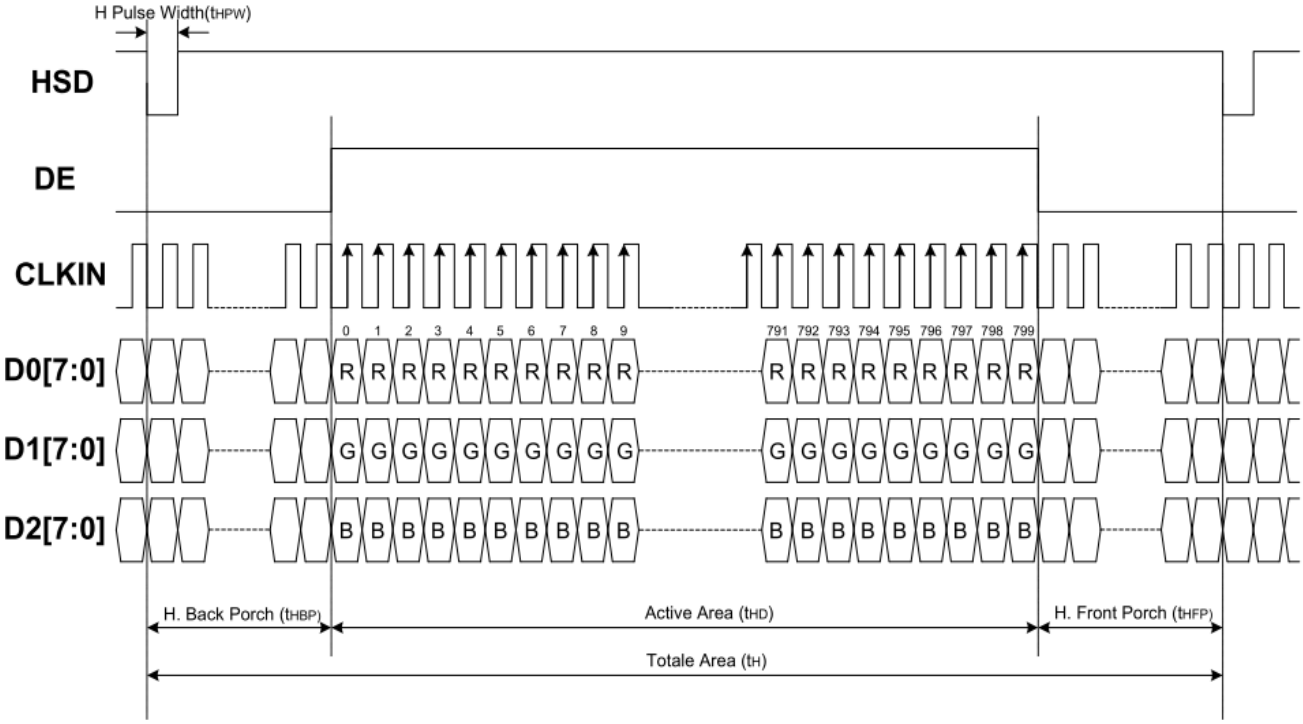
**DE Mode (MODE='1')**



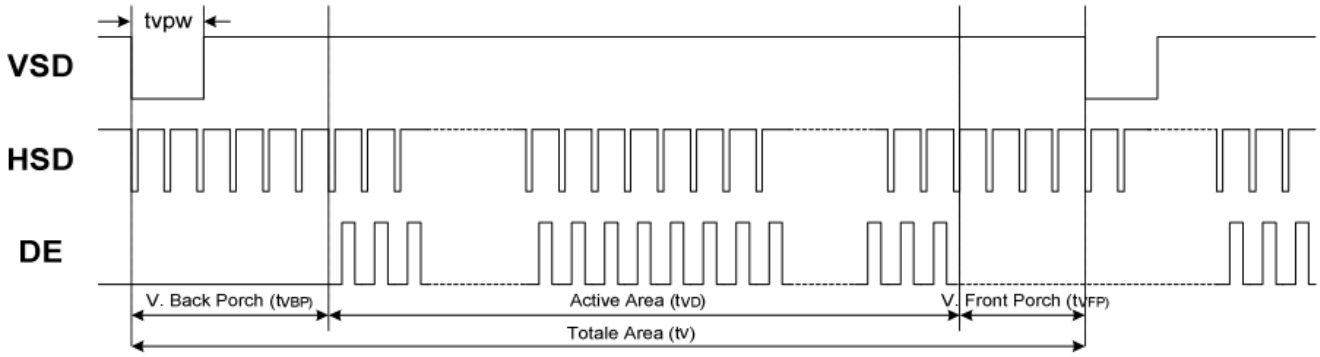

**SYNC Mode (MODE='0')**



### 2.4.3 Display Timing characteristics




| Horizontal Input Timing | | | | | | |
|---|---|---|---|---|---|---|
| Parameter | | Symbol | Value | | | Unit |
| | | | Min. | Typ. | Max. | |
| Horizontal display area | | $t_{HD}$ | -- | 800 | -- | CLKIN |
| CLKIN frequency | | $f_{CLK}$ | -- | 33.3 | 50 | MHz |
| 1 Horizontal line period | | $t_H$ | 862 | 1056 | 1200 | CLKIN |
| HSD pulse width | Min. | $t_{HPW}$ | -- | 1 | -- | CLKIN |
| | Typ. | | -- | -- | -- | CLKIN |
| | Max. | | -- | 40 | -- | CLKIN |
| HSD back porch | SYNC | $t_{HBP}$ | 46 | 46 | 46 | CLKIN |
| HSD front porch | SYNC | $t_{HFP}$ | 16 | 210 | 354 | CLKIN |




| Vertical Input Timing | | | | | |
|---|---|---|---|---|---|
| Parameter | Symbol | Value | | | Unit |
| | | Min. | Typ. | Max. | |
| Vertical display area | $t_{VD}$ | -- | 480 | -- | HSD |
| VSD period time | $t_{V}$ | 510 | 525 | 650 | HSD |
| VSD pulse width | $t_{VPW}$ | 1 | -- | 20 | HSD |
| VSD back porch | $t_{VBP}$ | 23 | 23 | 23 | HSD |
| VSD front porch | $t_{VFP}$ | 7 | 22 | 147 | HSD |

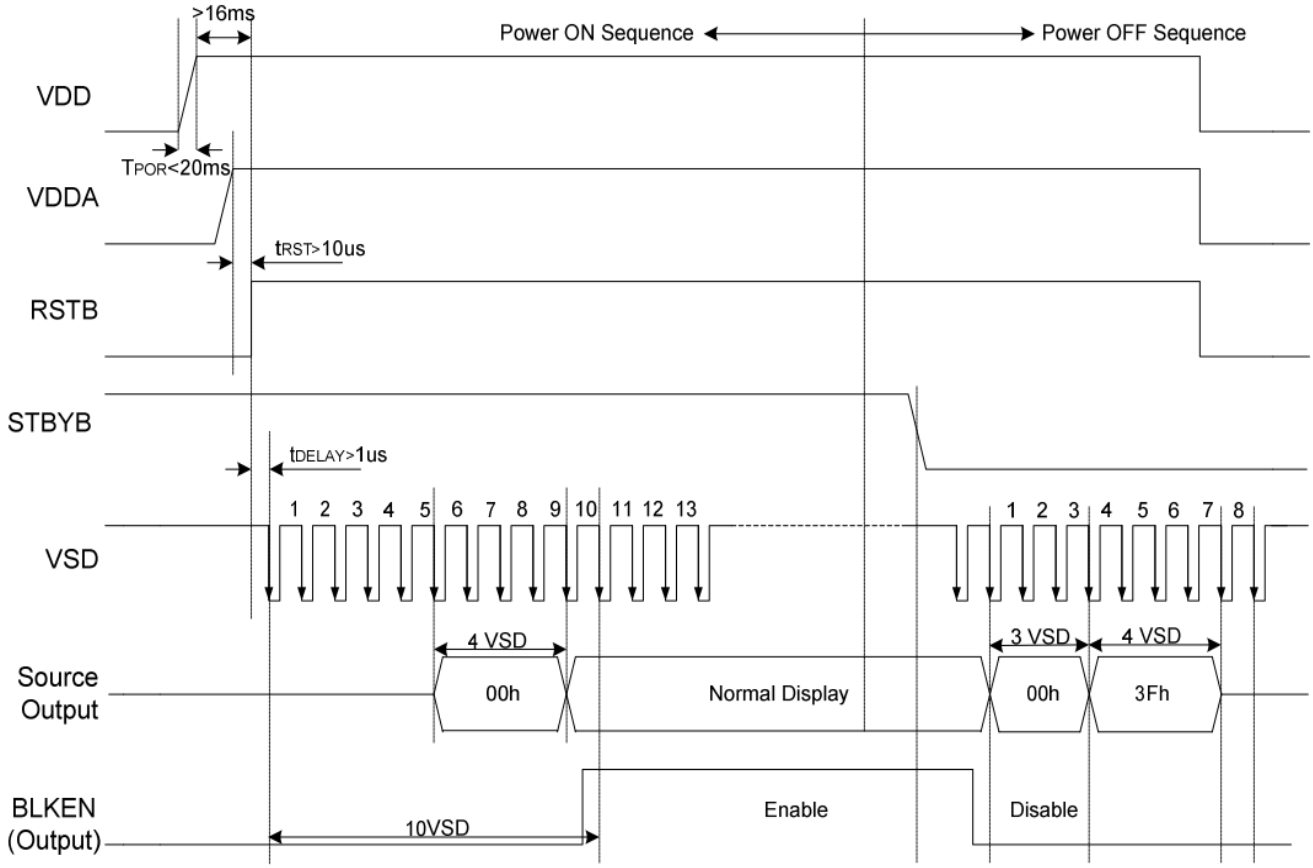
## 2.5 Power-On/Off Sequence

To prevent the device damage from latch up, the power ON/OFF sequence shown below must be followed.

Power ON: VDD, DGND→ VDDA, AGND → V1 to V14

Power OFF: V1 to V14 → VDDA, AGND→ VDD, DGND

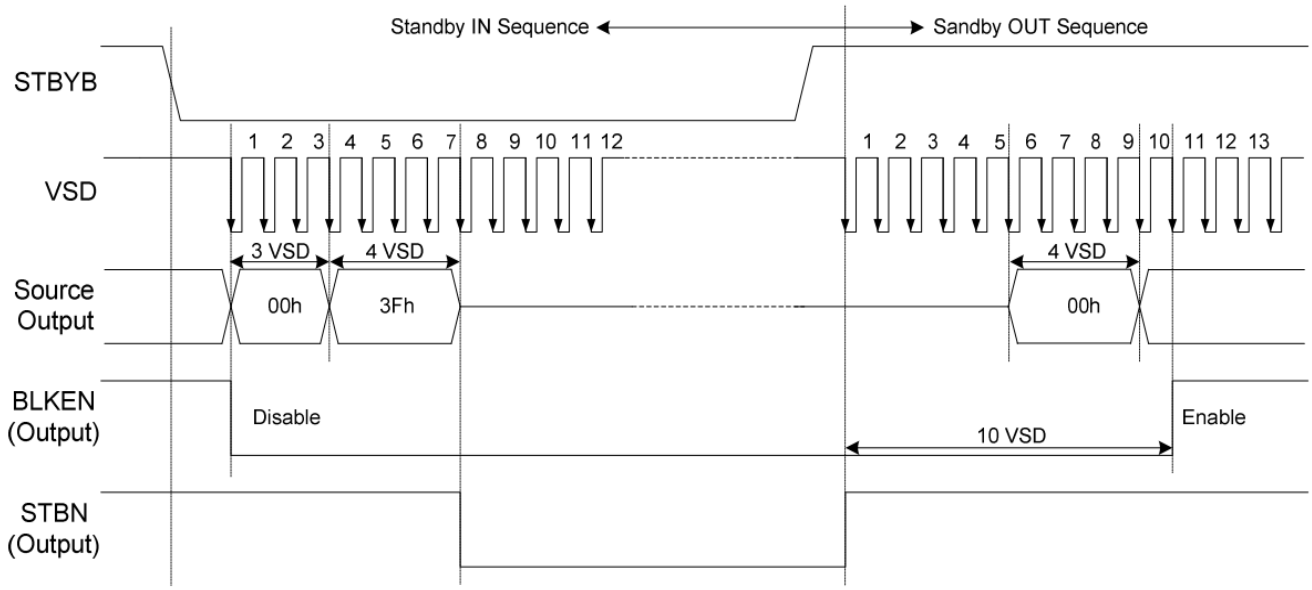
In order to prevent ILI6122 from power ON reset fail, the rising time ($t_{POR}$) of the digital power supply VDD should be maintained within given specifications. The power ON/OFF timing sequence is illustrated as below:




*Note: For prevent anormal operation, $t_{RST}$ must be longer than 10us during Power ON sequence.*

## 2.6 Standby-ON/OFF Control

ILI6122 supports Standby mode for saving power consumption, the source driver will turn off and all source output channel will be Hi-Z state when chip in Standby mode. The Standby mode can be controlled via STBYB pin and the Standby ON/FF timing sequence is illustrated as below:



## 3. OPTICAL CHARACTERISTICS

### 3.1 Characteristics

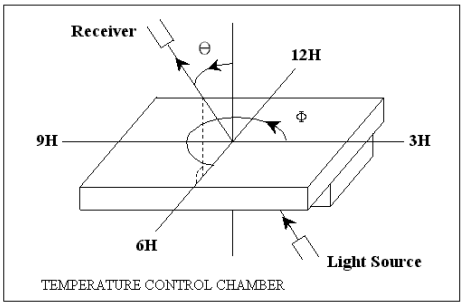
Electrical and Optical Characteristics

| No. | Item | | | symbol / temp. | | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Response Time | | | Tr+Tf | θ=Φ=0° | - | 25 | 50 | ms | 2 |
| 2 | Viewing Angle | Hor. | Cr＞10 | $\theta_{2+}$ | Φ= 0° | 60 | 70 | - | degree | 3 |
| | | | | $\theta_{2-}$ | Φ= 180° | 60 | 70 | - | | |
| | | Ver. | | $\theta_{1+}$ | Φ= 270° | 60 | 70 | - | | |
| | | | | $\theta_{1-}$ | Φ= 90° | 50 | 60 | - | | |
| 3 | Contrast Ratio | | | Cr | 25 ℃ | 500 | 700 | - | - | 4 |
| 4 | Red x-code | | | Rx | 25 ℃ | 0.55 | 0.60 | 0.65 | - | 5 |
| | Red y-code | | | Ry | | 0.29 | 0.34 | 0.39 | | |
| | Green x-code | | | Gx | | 0.31 | 0.36 | 0.41 | | |
| | Green y-code | | | Gy | | 0.55 | 0.60 | 0.65 | | |
| | Blue x-code | | | Bx | | 0.10 | 0.15 | 0.20 | | |
| | Blue y-code | | | By | | 0.06 | 0.11 | 0.16 | | |
| | White x-code | | | Wx | | 0.25 | 0.30 | 0.35 | | |
| | White y-code | | | Wy | | 0.28 | 0.33 | 0.38 | | |
| | Brightness | | | Y | | 500 | 650 | - | $cd/m^2$ | |
| 5 | Brightness Uniformity | | | | 25 ℃ | - | 80 | - | % | 6 |

## 3.2 Definition of optical characteristics

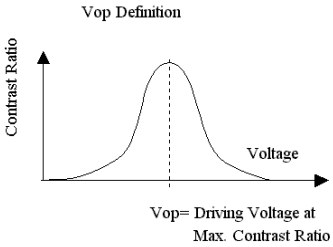
**Measurement condition :**

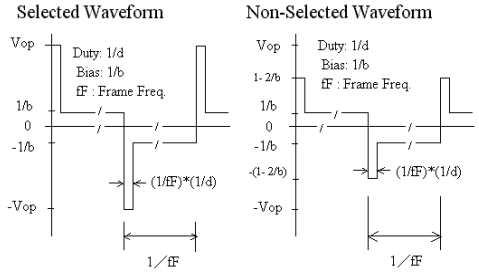
Transmissive and Transflective type




PHOTAL LCD-5000

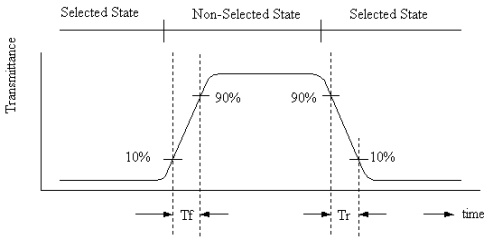
**[Note 1] Definition of LCD Driving Vop and Waveform :**



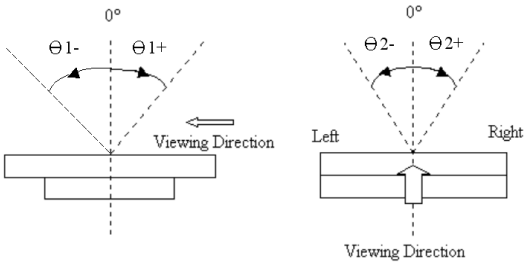




**[Note 2] Definition of Response Time**

for Positive type :

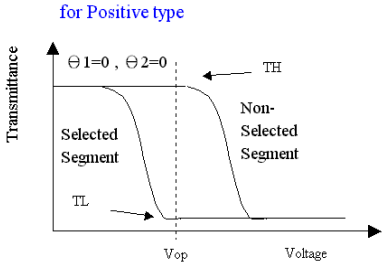



**[Note 3] Definition of Viewing Angle :**



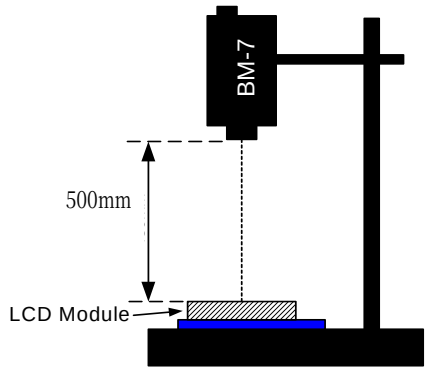

**[Note 4] Definition of Contrast Ratio :**

for Positive type

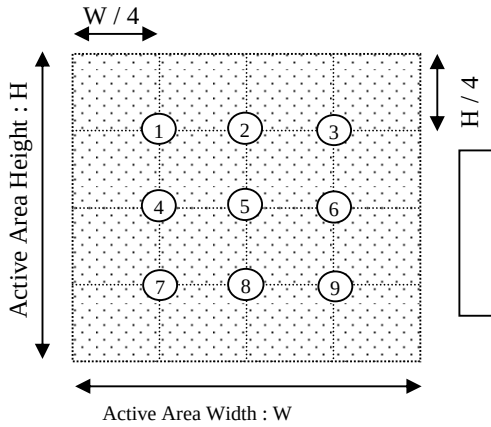



$$\text{Contrast Ratio} = \frac{TH}{TL}$$

**[Note 5] Definition of measurement of Color Chromaticity and Brightness**

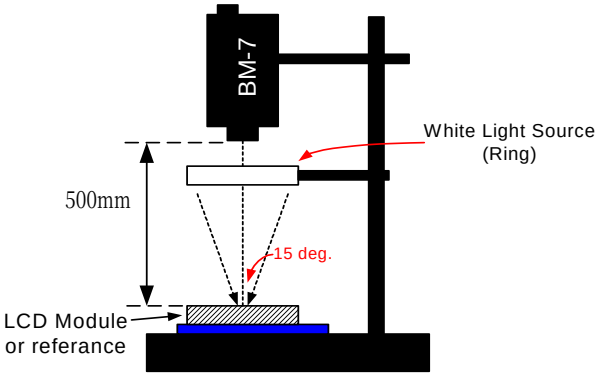



**[Note 6] Definition of Brightness Uniformity**




$$\text{Brightness Uniformity} = \frac{\text{Minimum Brightness of Point 1~9}}{\text{Maximum Brightness of Point 1~9}}$$

**[Note 7] Definition of Measurement of Reflectance**



## 4. RELIABILITY :

| Item No | Items | Condition | Note |
|---|---|---|---|
| **1** | High temperature operating | 70 ℃ , 200 hours | 1 |
| **2** | Low temperature operating | -20 ℃ , 200 hours | 1 |
| **3** | High temperature storage | 80 ℃ , 200 hours | 1 |
| **4** | Low temperature storage | -30 ℃ , 200 hours | 1 |
| **5** | High temperature & humidity storage | 60℃, 90%RH, 120 hours | 2 |
| **6** | Thermal Shock storage | -30℃, 30min.<=> 80℃, 30min.<br>10 Cycles | 1 |
| **7** | Vibration test | 10 => 55 =>10 => 55 => 10 Hz ,<br>within 1 minute<br>Amplitude : 1.5mm.<br>15 minutes for each Direction ( X,Y,Z ) | |
| **8** | Drop test | Packed, 100CM free fall,<br>6 sides, 1 corner, 3edges | |

Note 1：The product move into the room temperature for at least 2 hours with no condensation.

Note 2：The product move into the room temperature for at least 24 hours with no condensation.

Note 3 : Please change the display picture (autorun) during operating mode. Avoid displaying static images to avoid image sticking , and the image sticking is accelerated by temperature.

* One single product test for only one item.

* Judgment after test : keep in room temperature for more than 2 hours.

- Current consumption < 2 times of initial value
- Contrast > 1/2 initial value
- Function : work normally

## 5. PRODUCT HANDLING AND APPLICATION

### ☐ PRECAUTION FOR HANDLING LCM

- The LCD module contains a C-MOS LSI. People who operate the LCM should wear ESD protection eguipement to prevent ESD hurt on products.
- Do not input any signal before power is turned on.
- Do not take LCM from its packaging bag until it is assembled.
- Peel off the LCM protective film slowly since static electricity may be generated.
- Pay attention to the humidity of the work shop, 50~60%RH is satisfactory.
- Use a non-leak iron for soldering LCM.
- Do not touch the display surface or connection terminals area with bare hands.Smudges on the display surface reduce the insulation between terminals.
- Cautions for soldering to LCM:

  Condition for soldering I/O terminals:
  Temperature at iron tip :350℃±15℃.
  Soldering time : 3~4sec./ terminals.
  Type of solder : Eutectic solder(rosin flux filled).

### ☐ PRECAUTION IN USE OF LCD

- Do not contact or scratch the front surface and the contact pads of a LCD panel with hard materials such as metal or glass or with one's nail.
- To clean the surface , wipe it gently with soft cloth dampened by alcohol.
- Do not attempt to wiped off the contact pads.
- Keep LCD panels away from direct sunlight , also avoid them in high-temperature & high humidity environment for a long period.
- Do not drive LCD panels by DC voltage.
- Do not expose LCD panels to organic solvent.
- Liquid in LCD is hazardous substance. In case a contact with liquid crystal material is occured, be sure to immediately wash such material away by soap and water.
- The polarizer is easily damaged and should be handle with special care. Don't press or rub it with hard objects.

### ☐ PRECAUTION FOR STORING AND USE OF LCM

- To avoid degradation of the device , do not store the module under the conditions of direct sunlight , high temperature or high humidity . Keep the module in bags designed to prevent static electricity charging under low temperature / normal humidity conditions(avoid high temperature / high humidity and low temperature below 0℃)
- Never use the LCD , LCM under 45 Hz , the liquid crystal will decomposition and cause permently damage on display !!

### ☐ USING ON MEDICAL CARE , SAFETY OR HAZARDOUS APPLICATION OR SYSTEM

- For the application in medical care, safety and hazardous prodcuts or systems, an authorization from URT is required. URT will not responsible for any damage or loss which caused by the products without any authorization given by URT.
- This product is not allowed to be designed and used for military application and/or purpose.
- The delivery of this product to the countries and/or regions where the embargoes are imposed by U.N. is prohibited.
- The application and delivery of this product must comply with Startegic High-Tech Commodities (SHTC) export control and the sales to the embargoed and/or sanctioned countries or regions are strictly prohibited.

## 6. DATE CODE OF PRODUCTS

- Date code will be shown on each product :

- **YY MM DD - XXXX**

  Year Month Day - Production lots No.

- Example: 121108 - 0003 ==> Year 2012, November,8th , Production lots. No. 0003

Note ： The lot no. attached on the packing box will be used for tracking once the part is too small to print the date code.

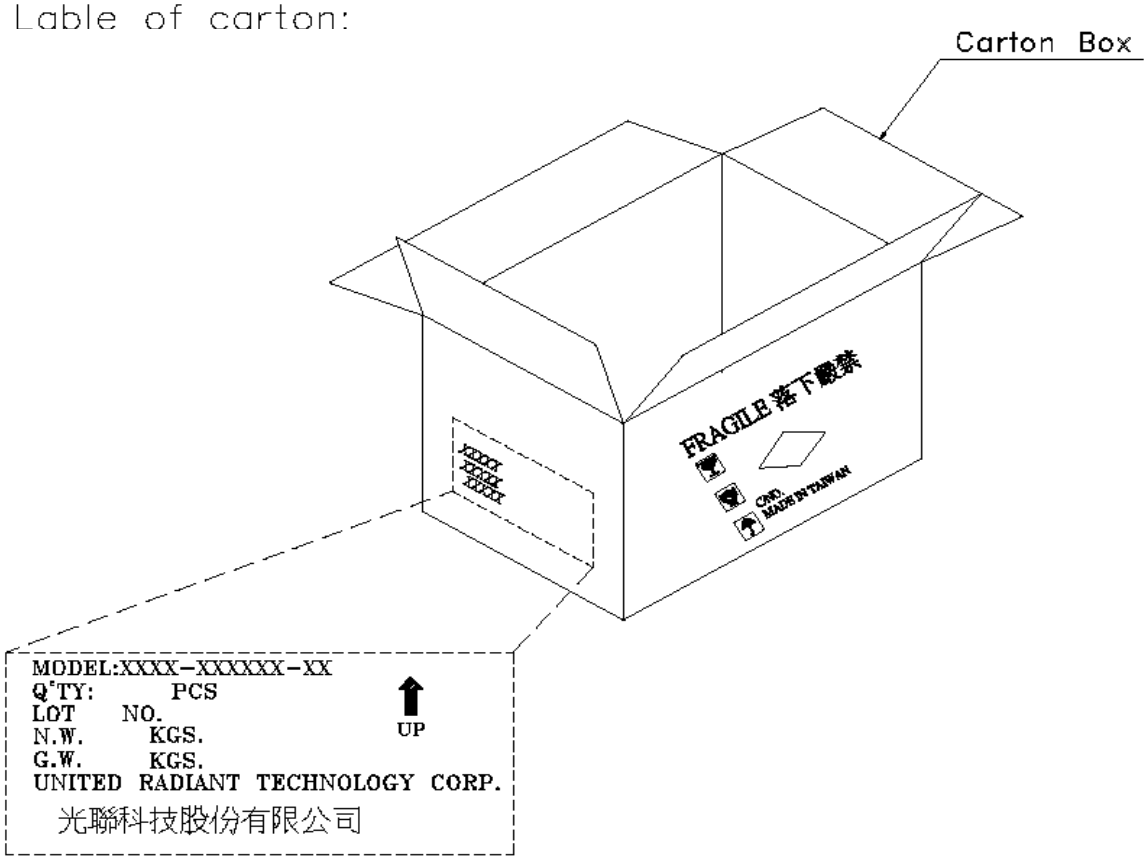
## 7. LOT NO

Instruction of lot number:

LOT NO. : 0 0 0 8 3 5 2 5 (EX)

| | | |
|---|---|---|
| Date | 01–1 st<br>02–2 nd<br>31–31 th |
| Week | 1 ——— 7 |
| Week of Month | 1 ——— 5 |
| Month | 01–January<br>02–February<br>12–December |
| Year | 00–2000<br>01–2001 |

Lable of carton:



# 8. INSPECTION STANDARD

## 8.1. QUALITY :

THE QUALITY OF GOODS SUPPLIED TO PURCHASER SHALL COME UP TO THE FOLLOWING STANDARD.

### 8.1.1. THE METHOD OF PRESERVING GOODS

AFTER DELIVERY OF GOODS FROM U.R.T. TO PURCHASER. PURCHASER SHALL CONTROL THE LCM AT -10 ℃ 40 ℃ ,AND IT MIGHT BE DESIRABLE TO KEEP AT THE NORMAL ROOM TEMPERATURE AND HUMIDITY UNTIL INCOMING INSPECTION OR THROWING INTO PROCESS LINE.

### 8.1.2. INCOMING INSPECTION

(A) THE METHOD OF INSPECTION

IF PURCHASER MAKE AN INCOMING INSPECTION , A SAMPLING PLAN SHALL BE APPLIED ON THE CONDITION THAT QUALITY OF ONE DELIVERY SHALL BE REGARDED AS ONE LOT.

(B) THE STANDARD OF QUALITY

ISO-2859-1 ( SAME AS MIL-STD-105E ) , LEVEL Ⅱ SINGLE PLAN.

| CLASS | AQL(%) |
|---|---|
| MAJOR | 0.65 % |
| MINOR | 1.5 % |

EVERY ITEM SHALL BE INSPECTED ACCORDING TO THE CLASS.

(C) MEASURE

IF AS THE RESULT OF ABOVE RECEIVING INSPECTION , A LOT OUT IS DISCOVERED. PURCHASER SHALL BE INFORM SELLER OF IT WITHIN SEVEN DAYS. BUT FIRST SHIPMENT WITHIN FOURTEEN DAYS.

### 8.1.3. WARRANTY POLICY

U.R.T. WILL PROVIDE ONE-YEAR WARRANTY FOR THE PRODUCTS ONLY IF UNDER SPECIFICATION OPERATING CONDITIONS. U.R.T. WILL REPLACE GOOD PRODUCTS FOR THESE DEFECT PRODUC′ WHICH UNDER WARRANTY PERIOD AND BELONG TO THE RESPONSIBILITY OF U.R.T.

## 8.2. CHECKING CONDITION

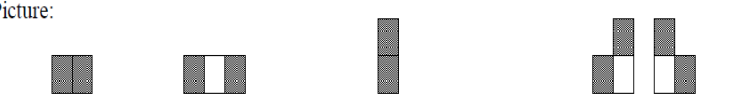
**8.2.1.** CHECKING DIRECTION SHALL BE IN THE 45 DEGREE AREA FROM VIEWING DIRECTION.

**8.2.2.** CHECKER SHALL SEE OVER 300~400 mm. WITH BARE EYES FAR FROM SAMPLE AND USING 2 PCS. OF 20W FLUORESCENT LAMP.

**8.3. INSPECTION PLAN :**

| CLASS | ITEM | JUDGEMENT | CLASS |
|---|---|---|---|
| PACKING & INDICATE | 1. OUTSIDE AND INSIDE PACKAGE | "MODEL NO." , "LOT NO." AND "QUANTITY" SHOULD INDICATE ON THE PACKAGE. | Minor |
| | 2. MODEL MIXED AND QUANTITY | OTHER MODEL MIXED.....REJECTED<br>QUANTITY SHORT OR OVER.....REJECTED | Critical |
| | 3. PRODUCT INDICATION | "MODEL NO." SHOULD INDICATE ON THE PRODUCT | Major |
| ASSEMBLY | 4. DIMENSION,<br>LCD GLASS SCRATCH<br>AND SCRIBE DEFECT. | ACCORDING TO SPECIFICATION OR DRAWING. | Major |
| APPEARANCE | 5. VIEWING AREA | POLARIZER EDGE OR LCD'S SEALING LINE IS VISABLE IN THE VIEWING AREA<br>……..REJECTED | Minor |
| | 6. BLEMISH、BLACK SPOT、<br>WHITE SPOT IN THE LCD<br>AND LCD GLASS CRACKS | ACCORDING TO STANDARD OF VISUAL INSPECTION ( INSIDE VIEWING AREA ) | Minor |
| | 7. BLEMISH、BLACK SPOT<br>WHITE SPOT AND SCRATCH<br>ON THE POLARIZER | ACCORDING TO STANDARD OF VISUAL INSPECTION ( INSIDE VIEWING AREA ) | Minor |
| | 8. BUBBLE IN POLARIZER | ACCORDING TO STANDARD OF VISUAL INSPECTION ( INSIDE VIEWING AREA ) | Minor |
| | 9. LCD'S RAINBOW COLOR | STRONG DEVIATION COLOR ( OR NEWTON RING) OF LCD.....REJECTED.<br>OR ACCORDING TO LIMITED SAMPLE<br>( IF NEEDED, AND INSIDE VIEWING AREA ) | Minor |
| ELECTRICAL | 10. ELECTRICAL AND OPTICAL CHARACTERISTICS<br>( CONTRAST、VOP、<br>CHROMATICITY … ETC ) | ACCORDING TO SPECIFICATION OR DRAWING . ( INSIDE VIEWING AREA ) | Critical |
| | 11.MISSING LINE | MISSING DOT、LINE、CHARACTER<br>....REJECTED | Critical |
| | 12.SHORT CIRCUIT、<br>WRONG PATTERN DISPLAY | NON DISPLAY、WRONG PATTERN DISPLAY、CURRENT CONSUMPTION OUT OF SPECIFICATION..... REJECTED | Critical |
| | 13. PIN HOLE、PATTERN DEFORMITY | ACCORDING TO STANDARD OF VISUAL INSPECTION | Minor |

## 8.4. STANDARD OF VISUAL INSPECTION

<table>
<tr><th>NO.</th><th>CLASS</th><th>ITEM</th><th>JUDGEMENT</th></tr>
<tr><td rowspan="4">8.4.1</td><td rowspan="4">MINOR</td><td>Foreign Black/White/Bright Spot<br>(Display & Appearance)</td><td>NOTE: Φ=(LENGTH+WIDTH)/2 unit : mm.<br><table><tr><th>DIAMETER (mm.)</th><th>ACCEPTABLE Q'TY</th></tr><tr><td>Φ ≦ 0.25</td><td>DISREGARD</td></tr><tr><td>0.25 < Φ ≦ 0.5</td><td>3 (Distance>5mm)</td></tr><tr><td>0.5 < Φ</td><td>0</td></tr></table></td></tr>
<tr><td>Foreign Black/White/Bright Line<br>(Display & Appearance)</td><td>unit : mm.<br><table><tr><th>LENGTH</th><th>WIDTH</th><th>ACCEPTABLE Q'TY</th></tr><tr><td>---</td><td>W ≦0.05</td><td>DISREGARD</td></tr><tr><td>L ≦ 3.0</td><td>0.05 < W ≦0.1</td><td>3 (Distance>5mm)</td></tr><tr><td>L > 3.0</td><td>0.1 < W</td><td>0</td></tr></table></td></tr>
<tr><td>Polarizer Dent/Air Bubble</td><td>NOTE: Φ=(LENGTH+WIDTH)/2 unit : mm.<br><table><tr><th>DIAMETER (mm.)</th><th>ACCEPTABLE Q'TY</th></tr><tr><td>Φ ≦ 0.25</td><td>DISREGARD</td></tr><tr><td>0.25 < Φ ≦ 0.5</td><td>3 (Distance>5mm)</td></tr><tr><td>0.5 < Φ</td><td>0</td></tr></table></td></tr>
<tr><td>Polarizer Scratches</td><td>unit : mm.<br><table><tr><th>LENGTH</th><th>WIDTH</th><th>ACCEPTABLE Q'TY</th></tr><tr><td>---</td><td>W ≦0.05</td><td>DISREGARD</td></tr><tr><td>L ≦ 3.0</td><td>0.05 < W ≦0.1</td><td>3 (Distance>5mm)</td></tr><tr><td>L > 3.0</td><td>0.1 < W</td><td>0</td></tr></table></td></tr>
<tr><td>8.4.2</td><td>MINOR</td><td>Dot Defect</td><td><table><tr><th colspan="2">Items</th><th>Acceptable count</th></tr><tr><td rowspan="2">Full Bright dot</td><td>Random</td><td>N ≦ 2</td></tr><tr><td>2 dots adjacent</td><td>N = 0</td></tr><tr><td rowspan="2">Full Dark dot</td><td>Random</td><td>N ≦ 3</td></tr><tr><td>2 dots adjacent</td><td>N = 0</td></tr><tr><td colspan="2">Total full bright and full dark dot</td><td>N ≦ 4</td></tr><tr><td>Distance</td><td>Minimum Distance Between full dark dots</td><td>≧5mm</td></tr></table><br>a) Full bright dot：Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.<br>b) Full dark dot：Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue picture.<br>c) 2 dot adjacent = 1 pair = 2 dots<br>Picture:<br>  <br>2 dot adjacent 2 dot adjacent 2 dot adjacent (vertical) 2 dot adjacent (slant)</td></tr>
<tr><td>8.4.3</td><td>MINOR</td><td>Mura/Waving/Hot spot</td><td>Not visible through 5% ND filter in 50% gray or judge by limit sample if necessary.</td></tr>
<tr><td>8.4.4</td><td>MINOR</td><td>Panel Crack</td><td>Not allowable</td></tr>
</table>