深圳市一众显示科技有限公司

**SHEN ZHEN TEAM SOURCE DISPLAY TECH. CO, LTD.**

# TFT-LCD Module Specification

## Module NO.：TST043WVBS-79

### Version：V1.0

☐ **APPROVAL FOR SPECIFICATION**　　　☐ **APPROVAL FOR SAMPLE**

| For Customer's Acceptance： | |
|---|---|
| **Approved by** | **Comment** |
| | |

| Team Source Display： | | |
|---|---|---|
| **Presented by** | **Reviewed by** | **Organized by** |
| | | |

| Version No. | Date | Content | Remark |
|---|---|---|---|
| V1.0 | 2021-03-05 | Initial Release | |
| | | | |
| | | | |

## CONTENTS

# 1 General Characteristics

| ITEM | Specification | Unit |
|---|---|---|
| LCD Type | a-si TFT,Transmissive,Normally black,IPS | - |
| LCD Size | 4.3 | inch |
| Resolution (W x H) | 800 x (RGB) ×480 | pixel |
| LCM (W × H × D ) | 105.5(W) x 67.2(H) x 2.95(D) | mm |
| Active Area (W × H) | 95.04(W) x 53.86(H) | mm |
| Pixel Pitch | 0.1188(H)x0.1122(V) | mm |
| Viewing Direction | All o'clock | - |
| Color Depth | 16.7M | - |
| Pixel Arrangement | RGB-stripe | - |
| Backlight Type | 10 LEDs | - |
| Surface Luminance | 400 TYP | cd/m2 |
| Surface Treatment | - | - |
| Polarizer | - | - |
| Driver IC | ST7262E43 | - |
| Interface Type | RGB | - |
| Input Voltage | VDD=3.3 | V |
| With/Without TP | Without | - |
| Weight | TBD | g |

**Note 1: RoHS compliant**

**Note 2: LCM weight tolerance: ± 5%.**

# 2 Outline drawing

LCM PIN Definition

| Pin | Symbol | Description |
|-----|--------|-------------|
| 1 | LED- | Power for LED |
| 2 | LED+ | Power for LED |
| 3 | GND | Power ground |
| 4 | VDD | Power supply |
| 5 | R0 | Blue data(LSB) |
| 6 | R1 | Red data |
| 7 | R2 | Red data |
| 8 | R3 | Red data |
| 9 | R4 | Red data |
| 10 | R5 | Red data |
| 11 | R6 | Red data |
| 12 | R7 | Red data(MSB) |
| 13 | G0 | Green data(LSB) |
| 14 | G1 | Green data |
| 15 | G2 | Green data |
| 16 | G3 | Green data |
| 17 | G4 | Green data |
| 18 | G5 | Green data |
| 19 | G6 | Green data |
| 20 | G7 | Green data(MSB) |
| 21 | B0 | Blue data(LSB) |
| 22 | B1 | Blue data |
| 23 | B2 | Blue data |
| 24 | B3 | Blue data |
| 25 | B4 | Blue data |
| 26 | B5 | Blue data |
| 27 | B6 | Blue data |
| 28 | B7 | Blue data(MSB) |
| 29 | GND | Power Ground |
| 30 | PCLK | Pixel clock |
| 31 | DISP | Display on/of |
| 32 | HSYNC | Horizontal sync signal |
| 33 | VSYNC | Vertical sync signal |
| 34 | DE | Data enable |
| 35 | NC | NC |
| 36 | GND | |
| 37 | XR | NC |
| 38 | YD | NC |
| 39 | XL | NC |
| 40 | YU | NC |

丝印 3.50

PI 5.00

2.95±0.2 ③

105.50±0.2 ①

上偏开窗 97.64

LCD A.A 95.04

4.3"TFT
All O'Clock
800*RGB*480

3.93

5.23

4.19

2.94

LCD A.A 53.86

上铁开窗 56.66

67.20±0.2 ②

Remover tape

43.20±0.5

20.50±0.1

3.50

18.49±0.5

P 0.5*39=19.50±0.05

40

1

FPC+PI=0.30±0.03

BL: 10 LEDs，40mA，15.5V

A ———— K

| LCD Type | 4.3"TFT,Transmissive |
|----------|----------------------|
| | Normally black,IPS |
| Resolution | 800(RGB)*480 |
| View Direction | All O'CLOCK |
| LCD Driver IC | ST7262I43 |
| Color Depth | 16.7M |
| Interface Types | RGB |
| Operating voltage | 3.3V |
| TP/Lens | Without |
| Backlight LEDs | 10 LEDs，40mA，15.5V |
| Surface luminance | 400~440 cd/m2 |
| Operating temperature | -20 ℃~70 ℃ |
| Storage temperature | -30 ℃~80 ℃ |

NOTES：
1. GENERAL TOLERANCE: ±0.2
2. (  )REFERENCE DIMENSION
3. Important dimension：①~③

| 版本(Version) | 变更记录(Change History) |
|---------------|--------------------------|
| A0 | Initial release |

| 日期(Date) | 设计(DESIGN) | 审核(CHECKED) | 批准(APPROVED) | 客户承认(CUSTOMER APPROVAL) |
|------------|--------------|---------------|----------------|------------------------------|
| 2020.03.11 | Bill | Aron | Aron | |

TEAM SOURCE DISPLAY 一众显示

TITLE: MODULE SPEC

Drawing No. TST043WVBS-79

页面(Page) 1 / 1

单位(Unit) mm

比例(SCALE) 1 : 1

角度(Angle)

# 3  Interface description

| Pin No. | Symbol | Description |
|---------|--------|-------------|
| 1 | LED- | Cathode of LED backlight |
| 2 | LED+ | Anode of LED backlight |
| 3 | GND | Power ground |
| 4 | VDD | Power voltage |
| 5 | R0 | Red data (LSB) |
| 6 | R1 | Red data |
| 7 | R2 | Red data |
| 8 | R3 | Red data |
| 9 | R4 | Red data |
| 10 | R5 | Red data |
| 11 | R6 | Red data |
| 12 | R7 | Red data (MSB) |
| 13 | G0 | Green data (LSB) |
| 14 | G1 | Green data |
| 15 | G2 | Green data |
| 16 | G3 | Green data |
| 17 | G4 | Green data |
| 18 | G5 | Green data |
| 19 | G6 | Green data |
| 20 | G7 | Green data(MSB) |
| 21 | B0 | Blue data(LSB) |
| 22 | B1 | Blue data |
| 23 | B2 | Blue data |
| 24 | B3 | Blue data |
| 25 | B4 | Blue data |
| 26 | B5 | Blue data |
| 27 | B6 | Blue data |
| 28 | B7 | Blue data(MSB) |
| 29 | GND | Power ground |
| 30 | DCLK | Pixel clock |
| 31 | DISP | Display on/off |
| 32 | HSYN | Horizontal sync signal |
| 33 | VSYNC | Vertical sync signal |
| 34 | DE | Data enable |
| 35 | NC | NO connect |
| 36 | GND | Power ground |
| 37 | XR | The touch panel X Right pin |
| 38 | YD | The touch panel Y Down pin |

| 39 | XL | The touch panel X Left pin |
|----|----|----------------------------|
| 40 | YU | The touch panel Y Up pin   |

# 4 AC Characteristics and RGB Input Timing

## 4.1 System Bus Timing for RGB Interface
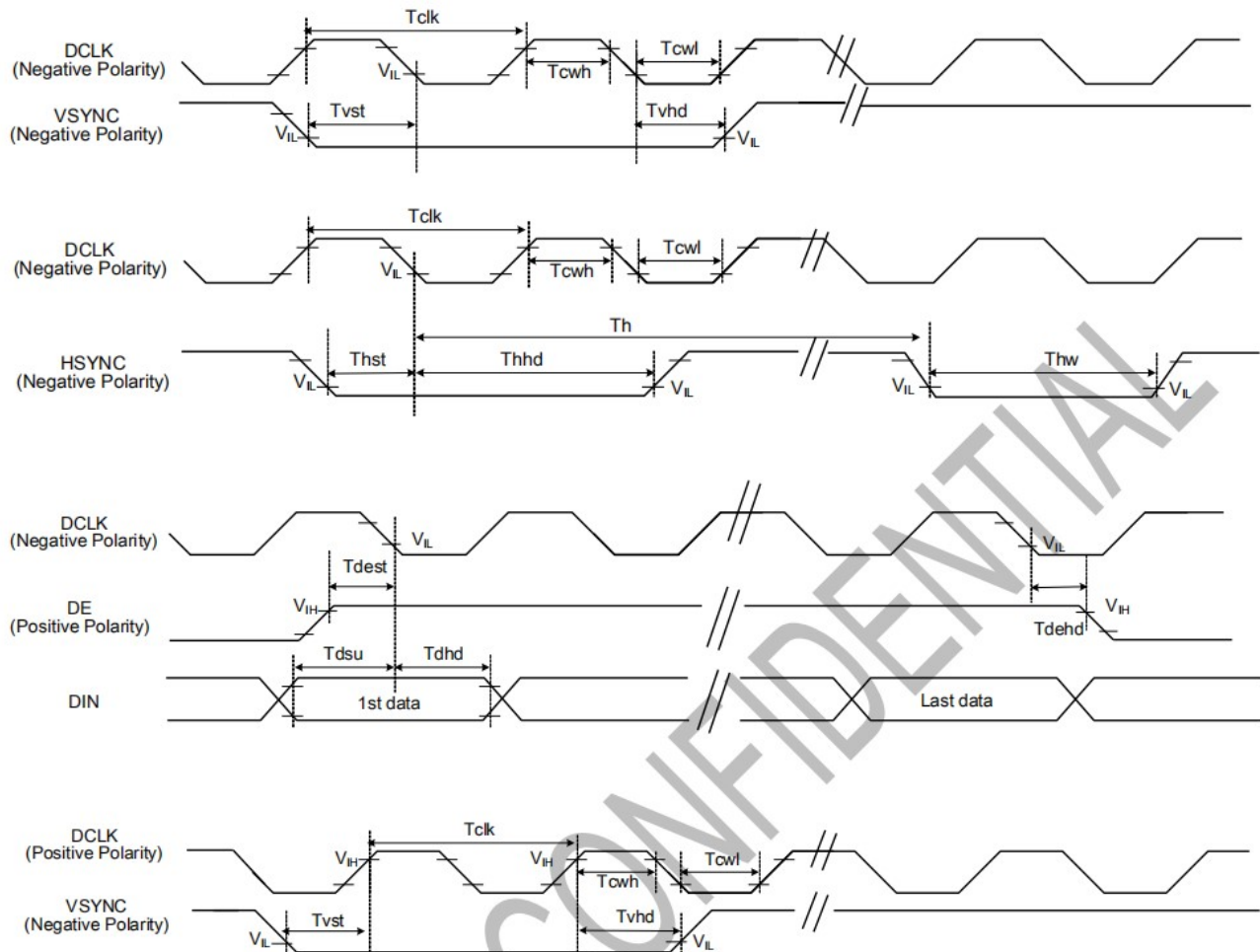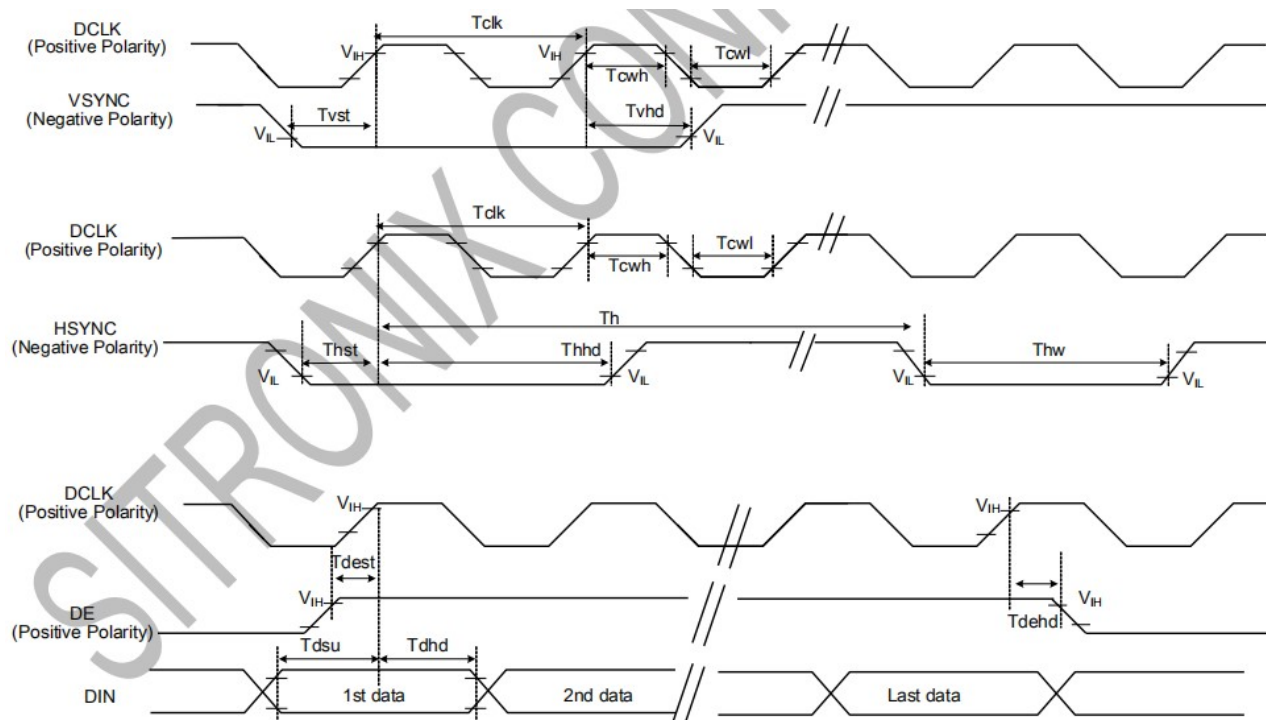
| Item | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|------|--------|------|------|------|------|------------|
| CLK Pulse Duty | Tcw | 40 | 50 | 60 | % | |
| HSYNC Width | Thw | 2 | - | - | DCLK | |
| HSYNC Period | Th | 55 | 60 | 65 | us | |
| VSYNC Setup Time | Tvst | 10 | - | - | ns | |
| VSYNC Hold Time | Tvhd | 10 | - | - | ns | |
| HSYNC Setup Time | Thst | 10 | - | - | ns | |
| HSYNC Hold Time | Thhd | 10 | - | - | ns | |
| Data Setup Time | Tdsu | 10 | - | - | ns | |
| Data Hold Time | Tdhd | 10 | - | - | ns | |
| DE Setup Time | Tdest | 10 | - | - | ns | |
| DE Hold Time | Tdehd | 10 | - | - | ns | |

## 4.2   RGB Input Timing

## Parallel 24-bit RGB Timing Table

Parallel 24-bit RGB Input Timing (PVDD=PVDD1=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C)

| Parallel 24-bit RGB Interface Timing Table | | | | | | | |
|---|---|---|---|---|---|---|---|
| Item | | Symbol | Min. | Typ. | Max. | Unit | Remark |
| DCLK Frequency | | Fclk | 23 | 25 | 27 | MHz | |
| HSYNC | Period Time | Th | 808 | 816 | 896 | DCLK | |
| | Display Period | Thdisp | | 800 | | DCLK | |
| | Back Porch | Thbp | 4 | 8 | 48 | DCLK | |
| | Front Porch | Thfp | 4 | 8 | 48 | DCLK | |
| | Pulse Width | Thw | 2 | 4 | 8 | DCLK | |
| VSYNC | Period Time | Tv | 488 | 496 | 504 | HSYNC | |
| | Display Period | Tvdisp | | 480 | | HSYNC | |
| | Back Porch | Tvbp | 4 | 8 | 12 | HSYNC | |
| | Front Porch | Tvfp | 4 | 8 | 12 | HSYNC | |
| | Pulse Width | Tvw | 2 | 4 | 8 | HSYNC | |

## SYNC Mode Timing Diagram
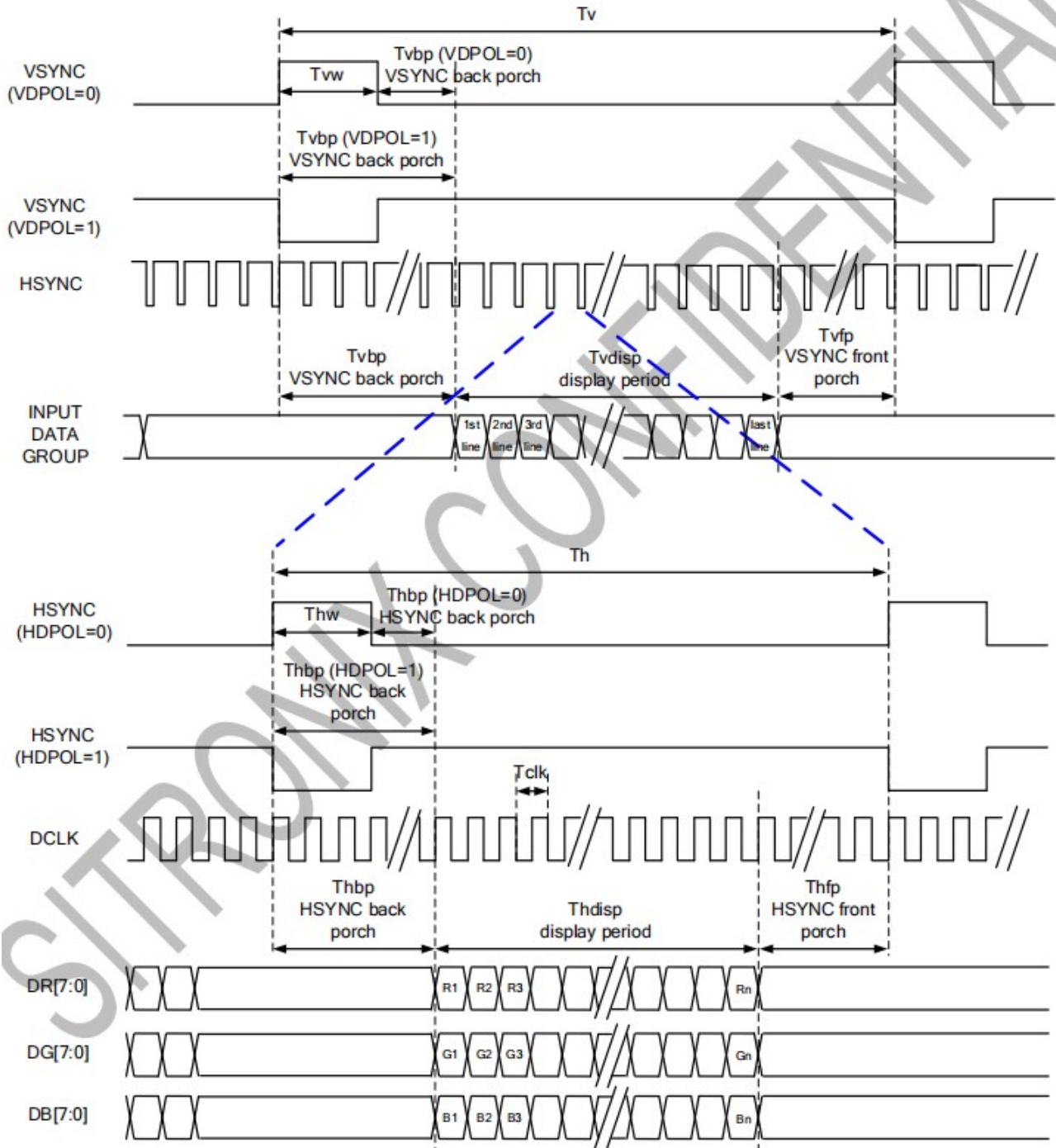
## SYNC-DE Mode Timing Diagram
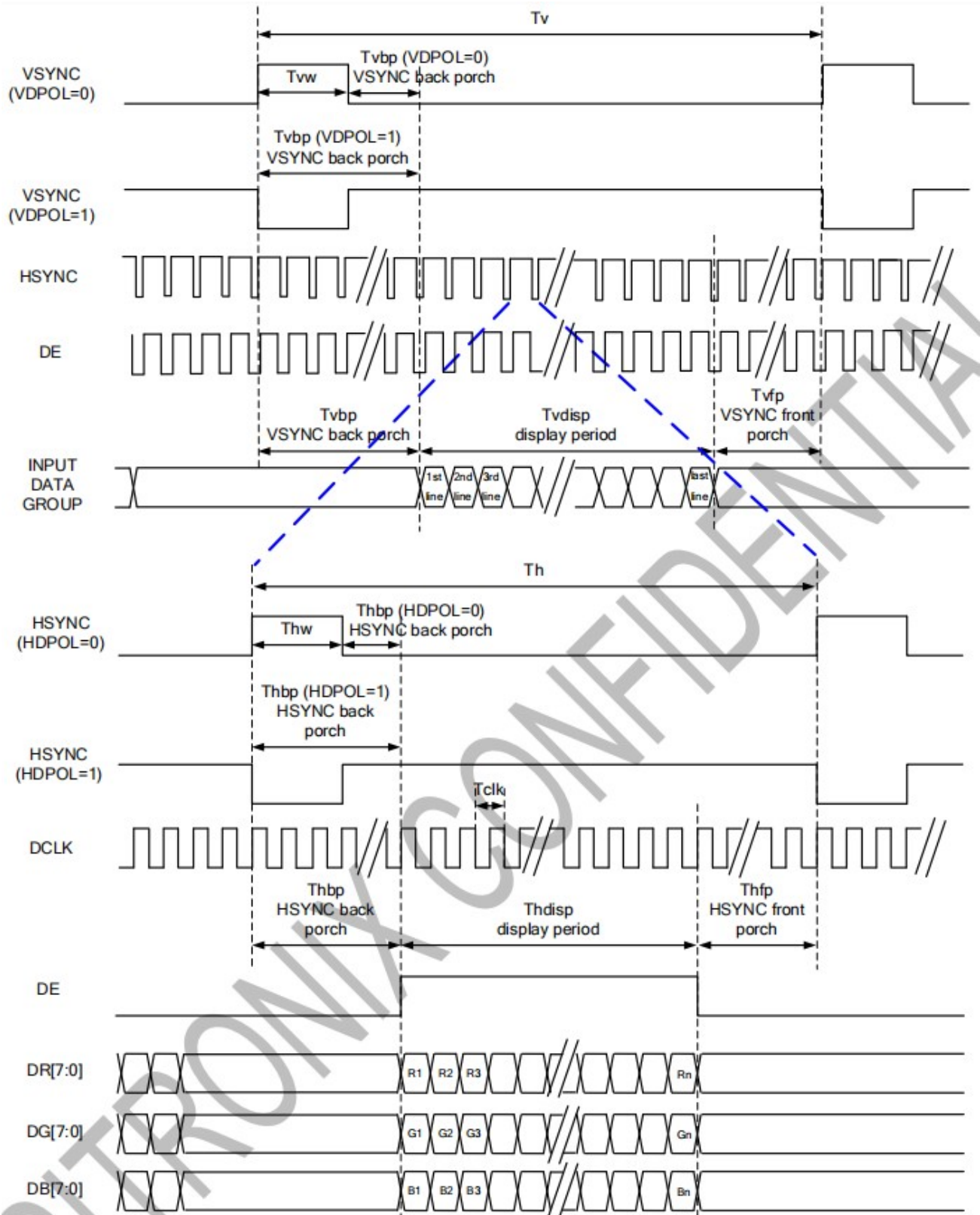
# DE Mode Timing Diagram
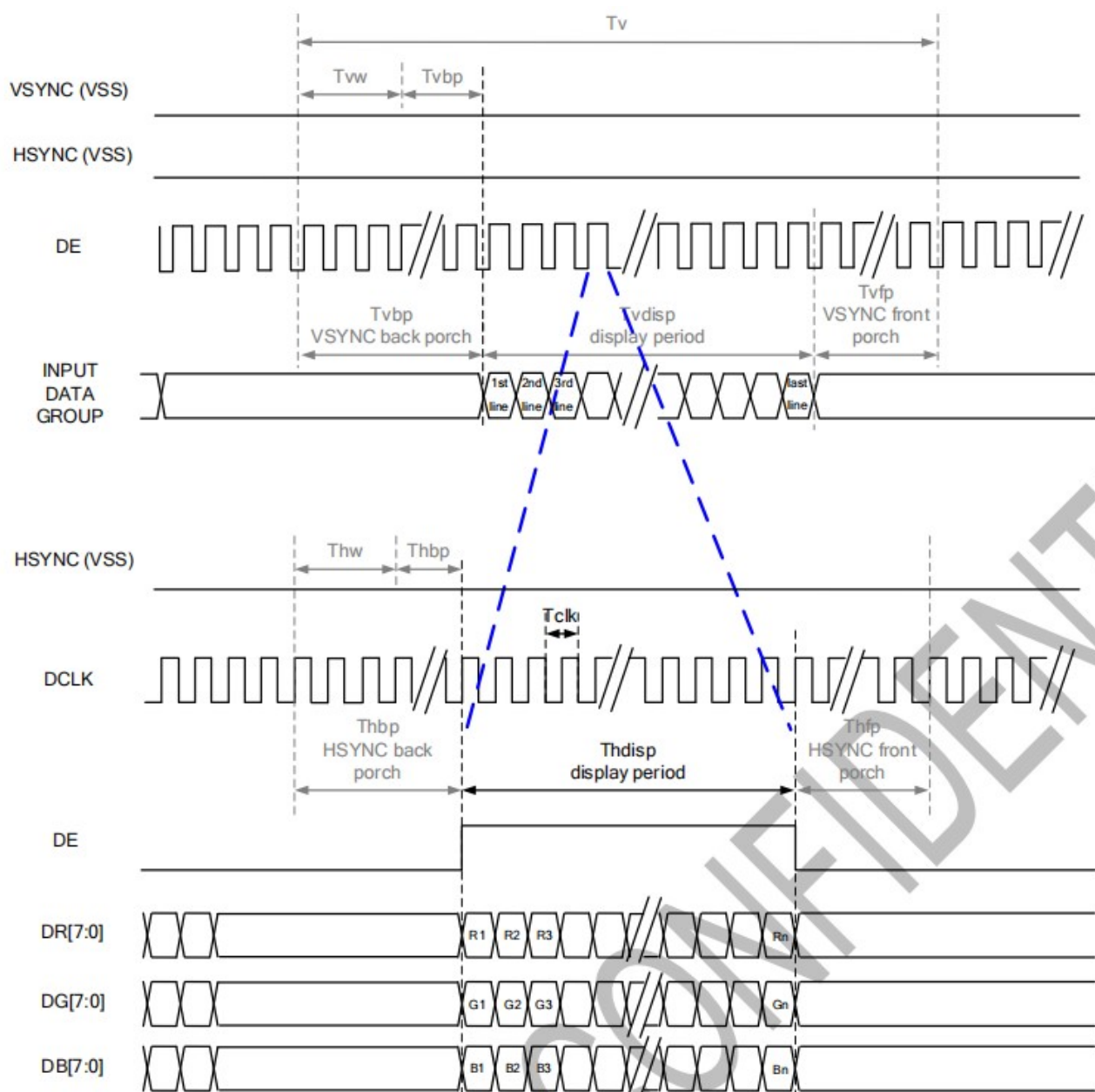
## 4.3 Power Off sequence
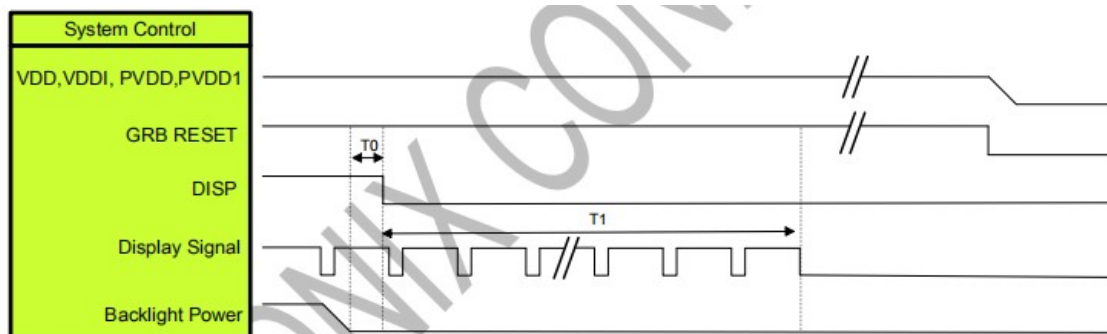


| Symbol | Description | Min. Time | Unit |
|--------|-------------|-----------|------|
| T0 | Backlight Power off to DISP="Low" | 5 | ms |
| T1 | DISP="Low" to IC internal voltage discharge complete | 100 | ms |

Note: RGB interface Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]

## 4.4 Power On Sequence
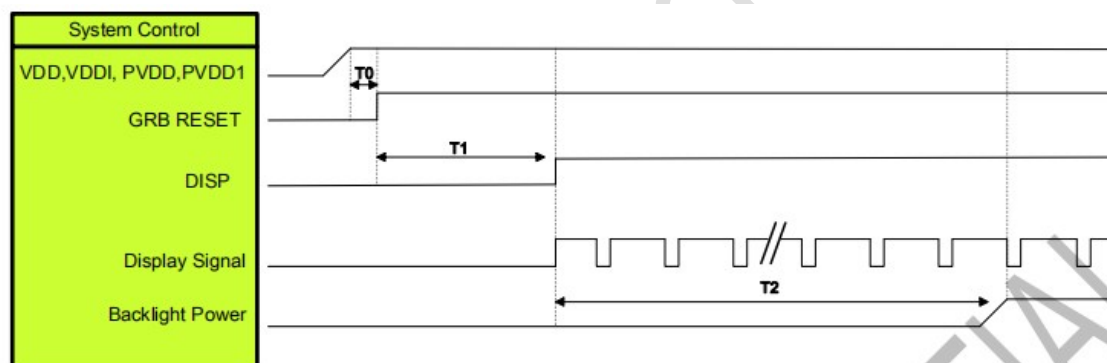


| Symbol | Description | Min. Time | Unit |
|--------|-------------|-----------|------|
| T0 | System power stability to GRB RESET signal | 0 | ms |
| T1 | GRB RESET= "High" to DISP="High" | 10 | ms |
| T2 | Display Signal output to Backlight Power on | 250 | ms |

Note: RGB interface Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]

## 5 Absolute Maximum Ratings

| PARAMETER | SYMBOL | MIN | MAX | UNIT |
|-----------|--------|-----|-----|------|
| Supply Voltage (Analog) | VDD~GND | -0.3 | 4.6 | V |
| Operating Temperature | TOP | -20 | 70 | °C |
| Storage Temperature | TST | -30 | 80 | °C |
| Humidity | RH | - | 90%(Max 60°C) | RH |
| | | | | |

## 6  Electrical    Characteristics

| PARAMETER | SYMBOL | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|
| Analog operating voltage | VDD | 3.0 | 3.3 | 3.6 | V |
| Input Current | IDD | - | TBD | - | mA |
| Input Voltage ' H ' level | VIH | 0.7*VDD | - | VDD | V |
| Input Voltage ' L ' level | VIL | 0 | - | 0.3*VDD | |
| Output Voltage ' H ' level | VOH | VDD-0.4 | - | VDD | |
| Output Voltage ' L ' level | VOL | 0 | - | 0.4 | |

## 7  Backlight    Characteristics

| ITEM | SYMBOL | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|
| Voltage for LED backlight | $V_f$ | - | 15.5 | - | V |
| Current for LED backlight | $I_f$ | - | 40 | - | mA |
| Power consumption | Wbl | - | 620 | - | mW |
| Uniformity | Avg | 80 | - | - | % |
| LED Life Time | - | 30000 | 40000 | - | Hrs |

Note:

1.The LED life time is defined as the module brightness decrease to 50% original brightness at Ta=25°C, 60%RH ±5 %.

2. The life time of LED will be reduced if LED is driven by high current, high ambient temperature and humidity conditions.

3. Typical operating life time is an estimated data.

4. Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is loaded .Functional operation should be restricted to the conditions described under normal operating conditions.

# 8  LCD   Optical   specifications

| Item | Symbol | Condition | Specification | | | Unit | Remark |
|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | | |
| Response time (By Quick) | Tr+Tf | θ = 0° | - | 30 | 30 | ms | Note 5 |
| Contrast ratio | CR | θ = 0° | - | 1200 | - | | Note 2,6 |
| Viewing angle | Top | CR≧10 | - | 80 | - | Deg. | Note 2,6,7 |
| | Bottom | CR≧10 | - | 80 | - | | |
| | Left | CR≧10 | - | 80 | - | | |
| | Right | CR≧10 | - | 80 | - | | |
| Color chromaticity ( CF only with ITO, light source is C light, CIE 1931) | Wx | θ = 0° | -0.03 | 0.325 | +0.03 | | Note 3 |
| | Wy | | | 0.342 | | | |
| | Rx | | | 0.618 | | | |
| | Ry | | | 0.350 | | | |
| | Gx | | | 0.342 | | | |
| | Gy | | | 0.576 | | | |
| | Bx | | | 0.151 | | | |
| | By | | | 0.057 | | | |
| NTSC | | | - | 50% | - | | Note 3 |
| Cross talk | Ct | | - | - | 2% | | Note 9 |
| Transmittance | Trans | | | 5.41% | - | | Note 4 |

Note 1: Ambient temperature = 25℃.

Note 2: To be measured with a viewing cone of 2°by Topcon luminance meter BM-5A.

Note 3: To be measured with Otsuta chromaticity meter LCF-2100M, CF only measure under C light simulation.

Note 4: CTC shipping status is cell without polarizer. Transmittance of Specification is cell with polarizer. The tolerance of Transmittance is ±10%.

Note 5: Definition of response time:

The output signals of TRD-100 are measured when the input signals are changed to "White" (falling time) and from "White" to "Black" (rising time), respectively. The interval is between the 10% and 90% of amplitudes. Refer to figure as below.
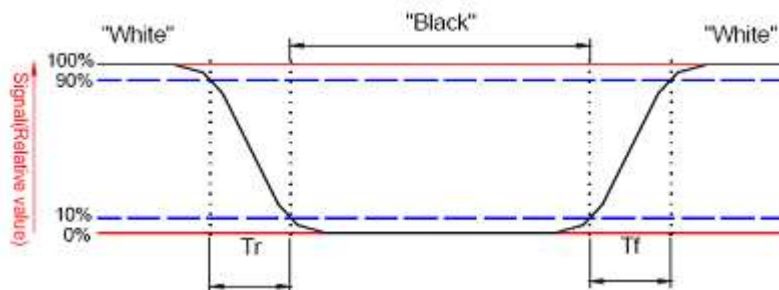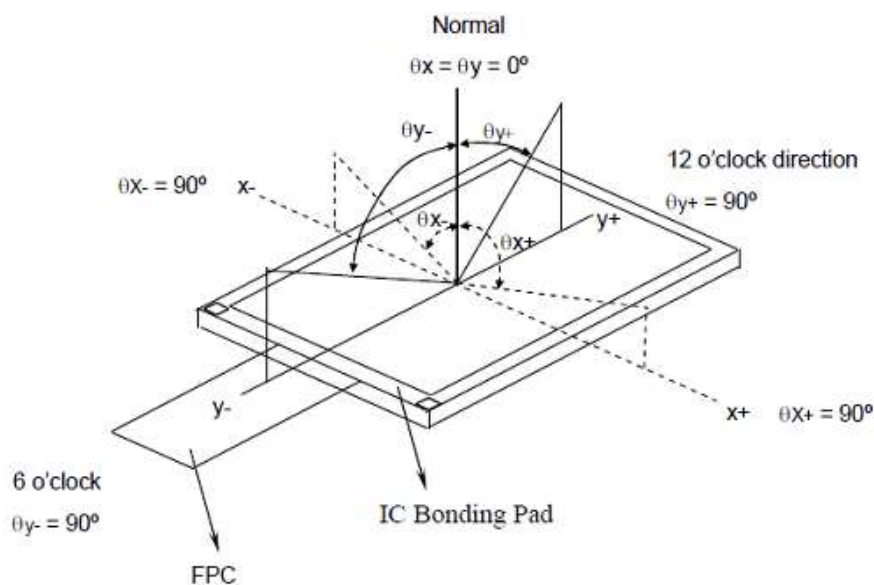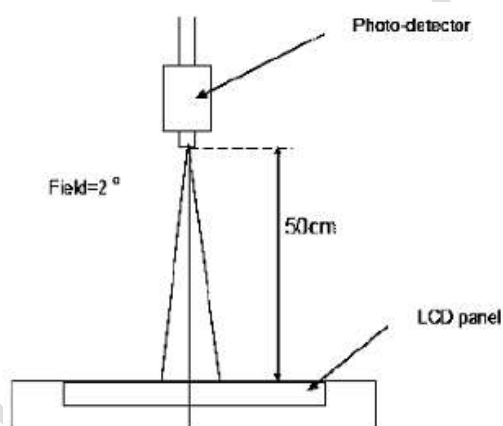


Note 6: Definition of contrast ratio:

Contrast ratio is calculated by the following formula.

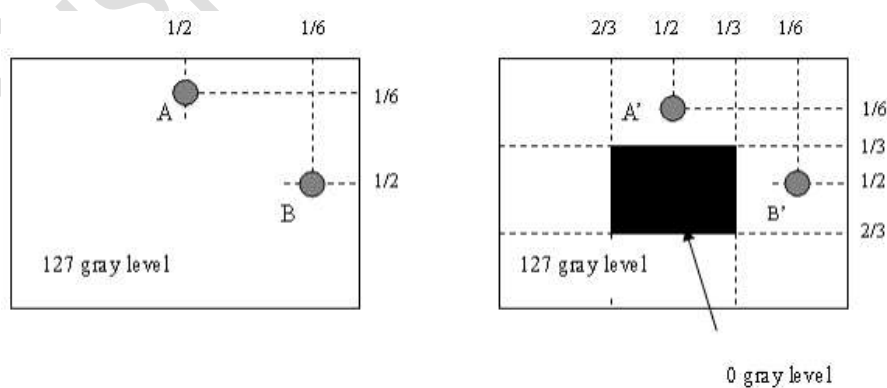Contrast ratio (CR)= $\dfrac{\text{Brightness on the "white" state}}{\text{Brightness on the "black" state}}$

Note 7: Definition of viewing angle



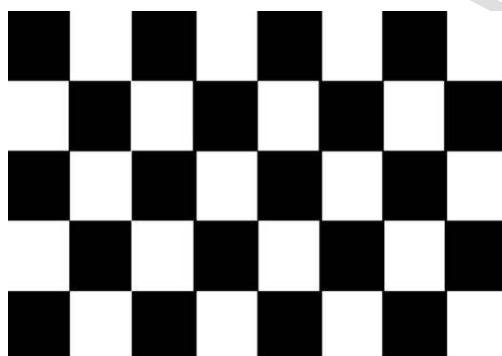Note 8: Optical characteristic measurement setup.



Note 9:



l LA-LA' l / LA x 100%= 2% max., LA and LA' are brightness at location A and A'.

l LB-LB' l / LB x 100%= 2% max., LB and LB' are brightness at location B and B'.

## 9　RELIABILITY TEST

| NO. | TEST ITEM | TEST CONDITION | INSPECTION AFTER TEST |
|---|---|---|---|
| 1 | High Temperature Storage | 70±2°C/96 hours | Inspection after 2~4 hours storage at room temperature and humidity. The condensation is not accepted. The sample shall be free from defects:<br><br>1.　Air bubble in the LCD<br>2.　Seal leak<br>3.　Non-display<br>4.　Missing segments<br>5.　Glass crack |
| 2 | Low Temperature Storage | -20±2°C/96 hours | |
| 3 | High Temperature Operating | 60±2°C/96 hours | |
| 4 | Low Temperature Operating | -10±2°C/96 hours | |
| 5 | Temperature Cycle | -30±2°C ~ 25~ 70± 2°C × 10 cycles<br>(30 min.)　(5min.)　　(30min.) | |
| 6 | Damp Proof Test | 60°C ±5°C × 90%RH/96 hours | |
| 7 | Vibration Test | Frequency 10Hz~55Hz<br>Stroke: 1.5mm<br>Sweep: 10Hz~150 Hz~10Hz 2 hours<br>For each direction of X, Y, Z | |
| 8 | Shock Test | Half-sine, wave, 300m/s | |
| 9 | Packing Drop Test | Height: 80 cm<br>1 corner, concrete floor | |
| 10 | Electrostatic Discharge Test | C=150pF, R=330 Ω<br>Air: ±8KV 150pF/330Ω 30 times<br>Contact: ±4KV,20 times | |
| 11 | Image Sticking | 25℃,60%RH (ref. to Remark(1)) | 30mins |

5*8 chess pattern　　　　　　　　　　　　　　　Gray127

## 10 Image Sticking

### 10.1 What is image sticking?

If you remain a fixed image on LCD Display for a long period of time, you may experience a phenomenon called Image Sticking. Image Sticking - sometimes also called "image retention" or "ghosting" - is a phenomenon where a faint outline of a previously displayed image remains visible on the screen when the image is changed. It can occur at variable levels of intensity depending on the specific image makeup, as well as the amount of time the core image elements are allowed to remain unchanged on the screen. In POS applications, for example, a

button menu which remains fixed, or in which the "frame" elements (core image) remain fixed and the buttons may change, may be susceptible to image sticking. It is important to note that if the screen is used exclusively for this application, the user may never notice this phenomenon since the screen never displays other content. `It is only when an image other than the "retained" image is shown on the screen that this issue becomes evident. Image sticking is different that the "burn-in" effect commonly associated with phosphor based devices.

## 10.2 What cause image sticking?

Image sticking is an intrinsic behavior of LCD displays due to the susceptibility to polarization of the interior materials (liquid crystals) when used under static, charged conditions (continuously displaying the same image). The individual liquid crystals in an LCD panel have unique electrical properties. Displaying a fixed pattern - such as the POS menu described above – over prolonged periods can cause a parasitic charge build-up (polarization) within the liquid crystals which affects the crystals' optical properties and ultimately prevents the liquid crystal from returning to its normal, relaxed state when the pattern is finally changed. This effect takes place at a cellular level within the LCD, and the effect can cause charged crystal alignment at the bottom or top of a crystal cell in the "z" axis, or even crystal migration to the edges of a cell, again based on their polarity. These conditions can cause image sticking over an entire area, or at boundaries of distinct color change respectively. In either case, when the liquid crystals in the pixels and sub-pixels utilized to display the static image are polarized such that they can not return fully to their "relaxed" state upon deactivation, the result is a faint, visible, retained image on the panel upon presentation of a new, different image. The actual rate of image retention depends on variation factors such as the specific image, how long it is displayed unchanged, the temperature within the panel and even the specific panel brand due to manufacturing differences amongst panel manufacturers.

## 10.3 How to avoid image sticking?

- Try not to operate the LCD with a "fixed" image on the screen for more than 1 hours.
- If you are operating the monitor in an elevated temperature environment and with a displayed image which is contrary to the recommendations in "For Software Developers" below, image stick can occur in as little as 30 minutes. Adjust your screen saver settings accordingly.
- Power down the unit during prolonged periods of inactivity such as the hours a store is closed or a shift during which the piece of equipment isn't used.
- Use a screensaver with a black or medium gray background that is automatically set to come on if the device is inactive for more than 5-10 minutes.
- Avoid placing the monitor in poorly ventilated areas or in areas that will create excess heat around the monitor for software developers.
- In defining the icons, buttons, or windows in the screen, try to utilize block patterns instead of distinct lines as borders for dividing the display into distinct areas.
- If it is necessary to display a static image, try to use colors that are symmetric to the middle grey level at the boundary of two different colors, and slightly shift the borders line once in a while.
- Try to utilize medium gray hues for those areas that will have prolonged display times or remain static as other menu elements change.

## 10.4 How to fix the image sticking?

Unlike the usually irreversible "burn-in" effects commonly associated with direct view phosphor display devices such as CRTs, an image retained on an LCD display can be reversed – often to a point of total invisibility. However, the severity of the underlying causes (as described above) of the image retained on a specific display, as well as

the variation factors    under which the retained image was created, will dictate the final level of retention reversal. One way to erase a retained image on a panel is to run the screen (monitor "on") in an "all black" pattern for 4-6 hours. It is also helpful to do this in an elevated temperature environment of approximately 35º to 50ºC. Again, utilizing a dynamic screen saver with an all black background during prolonged idle display periods is a good way to avoid image retention issues.

## 10.5 Is image sticking covered by TSD warranty?

Image sticking is a phenomenon inherent to LCD Display technology itself, and as such, the occurrence of this "ghosting" effect is considered normal operation by the manufacturers of the LCD display modules which are integrated into today's monitor solutions. TSD does not warrant any display against the occurrence of image sticking. We strongly advise that you follow the operating recommendations listed above to avoid the occurrence of this phenomenon.

# 11  Suggestions for using LCD modules

## 11.1  Handling of LCM

1. The LCD screen is made of glass. Don't give excessive external shock, or drop from a high place.

2. If the LCD screen is damaged and the liquid crystal leaks out, do not lick and swallow. When the liquid is attach to your hand, skin, cloth etc, wash it off by using soap and water thoroughly and immediately.

3. Don't apply excessive force on the surface of the LCM.

4. If the surface is contaminated, clean it with soft cloth. If the LCM is severely contaminated, use Isopropyl alcohol/Ethyl alcohol to clean. Other solvents may damage the polarizer. The    following solvents is especially prohibited: water , ketone Aromatic solvents etc.

5. Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.

6. Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping    and    distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.

7. Don't disassemble the LCM.

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

- Be sure to ground the body when handling the LCD modules.

- Tools required for assembling, such as soldering irons, must be properly grounded.

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

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

9. Do not alter, modify or change the the shape of the tab on the metal frame.

10. Do not make extra holes on the printed circuit board, modify its    shape    or    change the positions    of components to be attached.

11. Do not damage or modify the pattern writing on the printed circuit board.

12. Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector

13. Except for soldering the interface, do not make any alterations or modifications with a soldering iron.

14. Do not drop, bend or twist LCM.

## 11.2 Storage

1. Store in an ambient temperature of 5 to 45　C, and in a relative humidity of 40% to 60%. Don't expose to sunlight or fluorescent light.

2. Storage in a clean environment, free from dust, active gas, and solvent.

3. Store in antistatic container.

# 12 Limited Warranty

## 12.1

Our warranty liability is limited to repair and/or replacement. We will not be responsible for any consequential loss.

## 12.2

If possible, we suggest customer to use up all LCD modules as soon as possible. If the LCD module storage time over twelve months, we suggest to recheck it before being used.

## 12.3

Any product issues must be feedback to TSD within twelve months since delivery,　otherwise, we will not be responsible for the subsequent or consequential events.