# SPECIFICATION
# FOR
# LCD Module
# PV05040D0140M

## Table of Contents

| KINGTECH | INITIAL | DATE |
|---|---|---|
| PREPARED BY | 林锦雄 | 2023-10-7 |
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| APPROVED BY | 罗教平 | 2021-10-7 |

| CUSTOMER | INITIAL | DATE |
|---|---|---|
| APPROVED BY |  |  |

## 2. Revision Record

| Date | Rev.No. | Page | Revision Items | Prepared |
|---|---|---|---|---|
| **2023-05-10** | **V0** | | **The first release** | **LC** |
| **2023-05-12** | **V1** | | **Revised Operating temperature in Item#3 and#5** | **LC** |
| **2023.8.17** | **V2** | | **Added ESD in Item#8.0 and Updated the drawing in Item#4.0** | **CJ** |
| **2023.8.22** | **V3** | | **Updated ESD in Item#8.0 and Added IDD in Item#6.1** | **CJ** |
| **2023.9.12** | **V4** | | **Updated AC Characteristics in Item#6.4 and Added Item#6.5 POWER ON/OFF SEQUENCE** | **CJ** |
| **2023.9.16** | **V5** | | **Added Item#6.6 Input Color Format Application Circuit** | **CJ** |
| **2023.9.25** | **V6** | | **Added Item#4.2 package drawing and Item#10 Quality Assurance** | **CJ** |
| **2023.10.07** | **V7** | | **Revised the area for A,B and C in Item#10.5.2,Note 3 in Item#5.2; and Note 1 in Item#6.1; Added LED P/N in Item#6.2** | **CJ** |
| | | | | |

## 3. General Specifications

PV05040D0140M is a TFT-LCD module. It is composed of a TFT-LCD panel, driver IC, FPC, a back light unit . The 5.0′′ display area contains 800 x (RGB)x 480 pixels and can display up to 16.7M colors. This product accords with ROHS environmental Criterion.
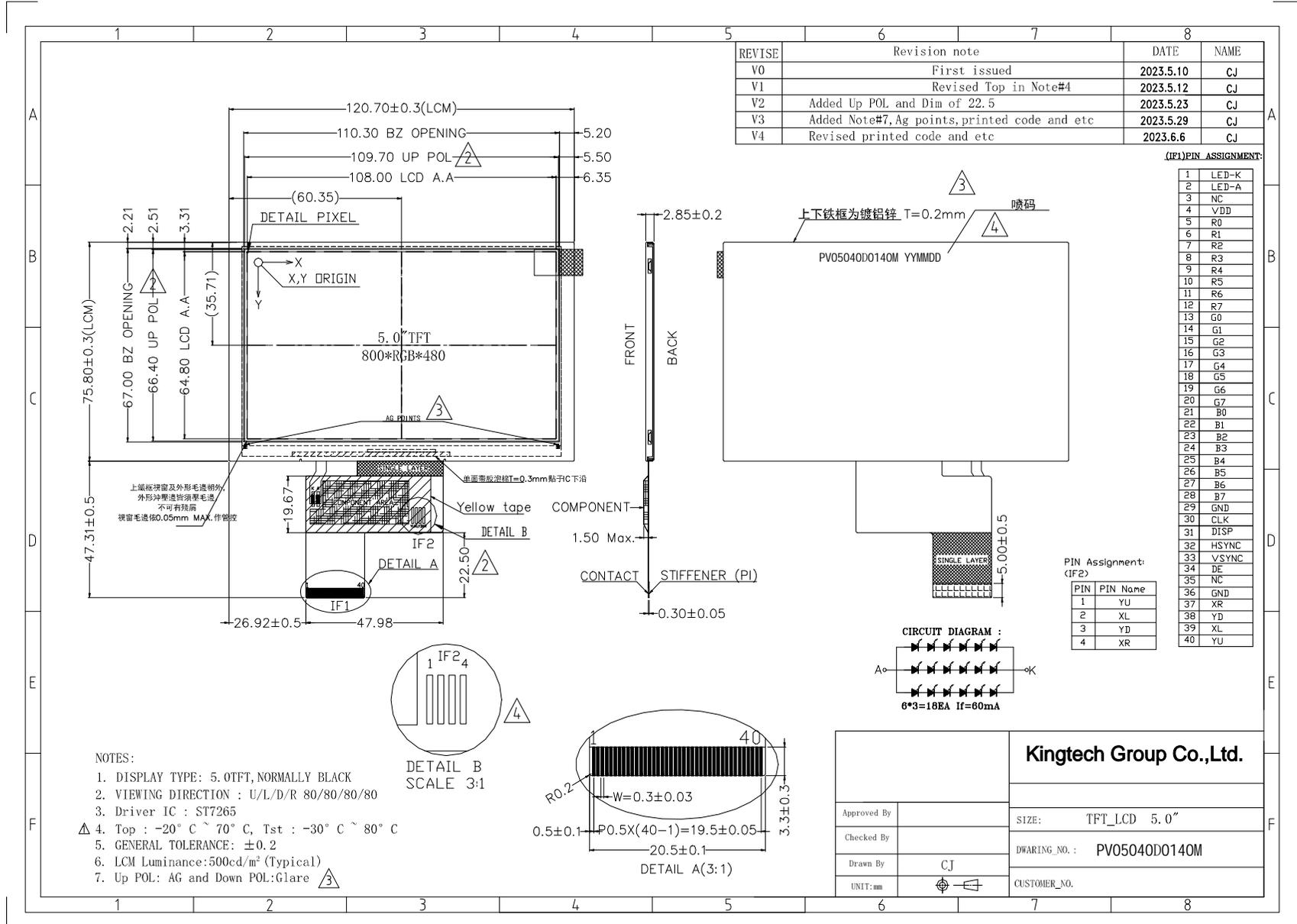
| Item | Contents | Unit | Note |
|---|---|---|---|
| LCD Type | TFT | - | |
| Display color | 16.7M | | 1 |
| Viewing Direction | ALL | O'Clock | |
| Operating temperature | -20~+70 | ℃ | |
| Storage temperature | -30~+80 | ℃ | |
| Module size | 120.70X75.80X2.85 | mm | 2 |
| Active Area(W×H) | 108.00X64.80 | mm | |
| Number of Dots | 800×480 | dots | |
| Controller | ST7265 | - | |
| Power Supply Voltage | 3.3 | V | |
| Backlight | 6S3P-LEDs (white) | pcs | |
| Weight | --- | g | |
| Interface | RGB888 | - | |

Note 1:   Color tune is slightly changed by temperature and driving voltage.
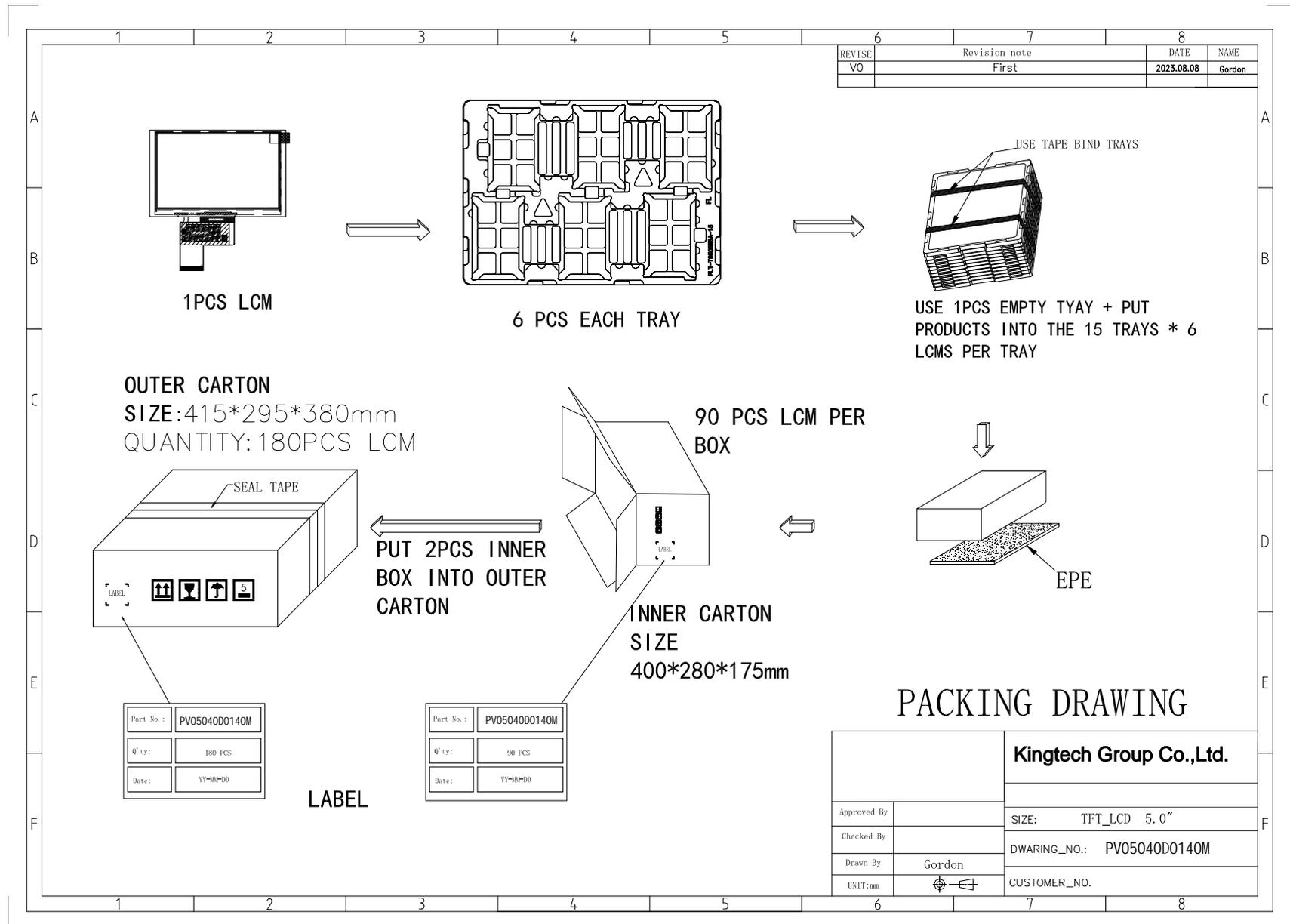
Note 2:   Without FPC and Solder .

**4.1 Outline Drawing**

| REVISE | Revision note | DATE | NAME |
|---|---|---|---|
| V0 | First issued | 2023.5.10 | CJ |
| V1 | Revised Top in Note#4 | 2023.5.12 | CJ |
| V2 | Added Up POL and Dim of 22.5 | 2023.5.23 | CJ |
| V3 | Added Note#7, Ag points,printed code and etc | 2023.5.29 | CJ |
| V4 | Revised printed code and etc | 2023.6.6 | CJ |

120.70±0.3(LCM)
110.30 BZ OPENING
109.70 UP POL
108.00 LCD A.A
(60.35)
DETAIL PIXEL
5.20
5.50
6.35

2.21
2.51
3.31
75.80±0.3(LCM)
67.00 BZ OPENING
66.40 UP POL
64.80 LCD A.A
(35.71)
47.31±0.5

X,Y ORIGIN
5.0″TFT
800*RGB*480
AG POINTS

2.85±0.2
FRONT
BACK
COMPONENT
1.50 Max.
CONTACT  STIFFENER (PI)
0.30±0.05

上下铁框为镀铝锌 T=0.2mm
喷码
PV05040D0140M YYMMDD

单面带胶泡棉T=0.3mm贴于C下沿

SINGLE LAYER
19.67
IF2
Yellow tape
DETAIL B
DETAIL A
IF1
22.50
26.92±0.5
47.98

上端框视窗及外形毛边朝外
外形冲压毛边朝须朝毛边
不可有残屑
视窗毛边依0.05mm MAX.作管控

5.00±0.5
SINGLE LAYER

**DETAIL B**
SCALE 3:1
1 IF2 4

**CIRCUIT DIAGRAM :**
A○————————○K
6*3=18EA  If=60mA

PIN Assignment (IF2)

| PIN | PIN Name |
|---|---|
| 1 | YU |
| 2 | XL |
| 3 | YD |
| 4 | XR |

(IF1)PIN ASSIGNMENT:

| 1 | LED-K |
|---|---|
| 2 | LED-A |
| 3 | NC |
| 4 | VDD |
| 5 | R0 |
| 6 | R1 |
| 7 | R2 |
| 8 | R3 |
| 9 | R4 |
| 10 | R5 |
| 11 | R6 |
| 12 | R7 |
| 13 | G0 |
| 14 | G1 |
| 15 | G2 |
| 16 | G3 |
| 17 | G4 |
| 18 | G5 |
| 19 | G6 |
| 20 | G7 |
| 21 | B0 |
| 22 | B1 |
| 23 | B2 |
| 24 | B3 |
| 25 | B4 |
| 26 | B5 |
| 27 | B6 |
| 28 | B7 |
| 29 | GND |
| 30 | CLK |
| 31 | DISP |
| 32 | HSYNC |
| 33 | VSYNC |
| 34 | DE |
| 35 | NC |
| 36 | GND |
| 37 | XR |
| 38 | YD |
| 39 | XL |
| 40 | YU |

**DETAIL A(3:1)**
1                    40
R0.2
W=0.3±0.03
3.3±0.3
0.5±0.1
P0.5X(40−1)=19.5±0.05
20.5±0.1

**NOTES :**
1. DISPLAY TYPE: 5.0TFT, NORMALLY BLACK
2. VIEWING DIRECTION : U/L/D/R 80/80/80/80
3. Driver IC : ST7265
⚠ 4. Top : −20°C ~ 70°C, Tst : −30°C ~ 80°C
5. GENERAL TOLERANCE: ±0.2
6. LCM Luminance:500cd/m² (Typical)
7. Up POL: AG and Down POL:Glare

**Kingtech Group Co.,Ltd.**

| Approved By | | SIZE: | TFT_LCD 5.0″ |
|---|---|---|---|
| Checked By | | | |
| Drawn By | CJ | DWARING_NO. : | PV05040D0140M |
| UNIT:mm | | CUSTOMER_NO. | |

**4.2 Package Drawing**

Professional LCD Module Manufacturer since 2003
Tel: 86-755-23037763  Mobile:86-139-2528-0716  Web : www.kingtechlcd.com

KINGTECH

| REVISE | Revision note | DATE | NAME |
|--------|---------------|------|------|
| V0 | First | 2023.08.08 | Gordon |

1PCS LCM

6 PCS EACH TRAY

USE TAPE BIND TRAYS

USE 1PCS EMPTY TYAY + PUT PRODUCTS INTO THE 15 TRAYS * 6 LCMS PER TRAY

OUTER CARTON
SIZE:415*295*380mm
QUANTITY:180PCS LCM

90 PCS LCM PER BOX

EPE

SEAL TAPE

PUT 2PCS INNER BOX INTO OUTER CARTON

INNER CARTON
SIZE
400*280*175mm

| Part No.: | PV05040D0140M |
|-----------|---------------|
| Q'ty: | 180 PCS |
| Date: | YY-MM-DD |

LABEL

| Part No.: | PV05040D0140M |
|-----------|---------------|
| Q'ty: | 90 PCS |
| Date: | YY-MM-DD |

# PACKING DRAWING

**Kingtech Group Co.,Ltd.**

| Approved By | | SIZE: | TFT_LCD 5.0" |
|-------------|---|-------|--------------|
| Checked By | | | |
| Drawn By | Gordon | DWARING_NO.: | PV05040D0140M |
| UNIT:mm | | CUSTOMER_NO. | |

## 5. Absolute Maximum Ratings(Ta=25℃)

### 5.1 Electrical Absolute Maximum Ratings.(Vss=0V ,Ta=25℃)

| Item | Symbol | Min. | Max. | Unit | Note |
|------|--------|------|------|------|------|
| Power Supply Voltage | VDD | -0.3 | 4.0 | V | 1，2 |

*Notes:*

*1. If the module is above these absolute maximum ratings. It may become permanently damaged.*
*Using the module within the following electrical characteristic conditions are also exceeded, the module will malfunction and cause poor reliability.*

*2. $V_{DD} > V_{SS}$ must be maintained.*

*3. Please be sure users are grounded when handing LCD Module.*

### 5.2 Environmental Absolute Maximum Ratings.

| Item | Storage | | Operating | | Note |
|------|---------|---------|-----------|-----------|------|
| | MIN. | MAX. | MIN. | MAX. | |
| Ambient Temperature | -30℃ | 80℃ | -20℃ | 70℃ | 1,2 |
| Humidity | - | - | - | - | 3 |

*Notes:*

*1. The response time will become lower when operated at low temperature.*

*2. Background color changes slightly depending on ambient temperature.*
*   The phenomenon is reversible.*

*3. Ta<=60℃:90%RH MAX.*
*   Ta>=60℃:Absolute humidity must be lower than the humidity of 90%RH at 60℃.*

# 6. Electrical Specifications

## 6.1 Electrical characteristics(Vss=0V ,Ta=25℃)

| Parameter | | Symbol | Condition | Min | Typ | Max | Unit | Note |
|---|---|---|---|---|---|---|---|---|
| Power supply for TFT | | VDD | Ta=25℃ | 3.1 | 3.3 | 3.6 | V | |
| Input voltage | 'H' | $V_{IH}$ | Ta=25℃ | 0.7*VDD | - | VDD | V | |
| | 'L' | $V_{IL}$ | Ta=25℃ | 0 | - | 0.3*VDD | V | |
| Current supply for TFT | | IDD | Ta=25℃ | - | 60 | 85 | mA | 1 |

Note 1:    White display pattern

## 6.2 LED backlight specification(VSS=0V ,Ta=25℃)

| Item | Symbol | Condition | Min | Typ | Max | Unit | Note |
|---|---|---|---|---|---|---|---|
| Supply voltage | Vf | If=60mA | 16.2 | 18.0 | 19.8 | V | |
| Uniformity | △Bp | If=60mA | 75 | 80 | - | % | |
| Life Time | time | If=60mA | 30K | - | - | hours | 1 |
| LED Manufacture | JUFEI OPTOELECTRONICS CO.,LTD P/N:01. JB.CAS206W65T03 | | | | | | |

Note 1:    Brightness to be decreased to 50% of the initial value at ambient temperature TA=25℃

## 6.3 Interface signals

| Pin No. | Symbol | I/O | Function |
|---------|--------|-----|----------|
| 1 | LED-K | P | LED back light(Cathode) |
| 2 | LED-A | P | LED back light(Anode) |
| 3 | NC | - | No connection. |
| 4 | VDD | P | Power supply |
| 5-12 | R0~R7 | I | Red data bus |
| 13-20 | G0~G7 | I | Green data bus |
| 21-28 | B0~B7 | I | Blue data bus |
| 29 | GND | P | Ground. |
| 30 | CLK | I | Data clock |
| 31 | DISP | I | Standby mode select pin |
| 32 | HSYNC | I | Line sync signal |
| 33 | VSYNC | I | Frame sync signal |
| 34 | DE | I | Data enable pin |
| 35 | NC | - | No connection. |
| 36 | GND | P | Ground. |
| 37 | XR | O | |
| 38 | YD | O | |
| 39 | XL | O | RTP control pin,no use please NC. |
| 40 | YU | O | |

## 6.4 AC Characteristics

### 6.4.1 System Operation AC Characteristics

DC Electrical Characteristics (PVDD=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C, Bare Chip).

| Item | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| VDD Power Source Slew Time | TPOR | - | - | 20 | ms | From 0V to 99% VDD |
| GRB Pulse Width | tRSTW | 10 | 50 | - | us | R=10Kohm, C=1uF |
| SD Output Stable Time | Tst | - | - | 12 | us | Output settled within +20mV Loading = 6.8k+28.2pF. |
| GD Output Rise and Fall Time | Tgst | - | - | 6 | us | Output settled (5%~95%), Loading = 4.7k+29.8pF |

### 6.4.2 System Bus Timing for RGB Interface（DCLKPOL=H, VDPOL=H,HDPOL=H）

**DCLK Neagtive Polarity (DCLPOL="H")**
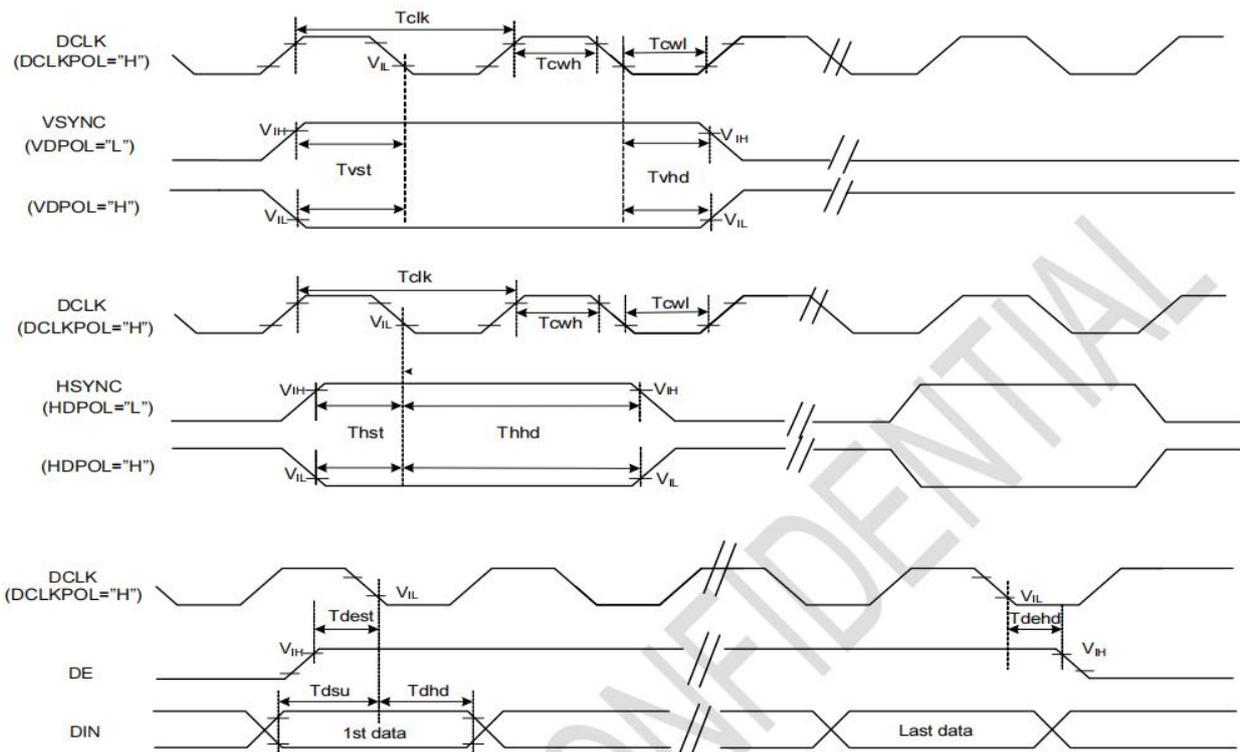
DC Electrical Characteristics (PVDD=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C, Bare Chip).

| Item | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| CLK Pulse Duty | Tcw | 40 | 50 | 60 | % | |
| 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 | |

### 6.4.3 Parallel RGB Timing Table

Parallel 24-bit RGB Input Timing (PVDD=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 | 848 | DCLK | |
| | Display Period | Thdisp | | 800 | | DCLK | |
| | Back Porch | Thbp | 4 | 8 | 24 | DCLK | |
| | Front Porch | Thfp | 4 | 8 | 24 | DCLK | |
| | Pulse Width | Thw | 2 | 4 | 8 | DCLK | |
| VSYNC | Period Time | Tv | 496 | 512 | 528 | HSYNC | |
| | Display Period | Tvdisp | | 480 | | HSYNC | |
| | Back Porch | Tvbp | 8 | 16 | 24 | HSYNC | |
| | Front Porch | Tvfp | 8 | 16 | 24 | HSYNC | |
| | Pulse Width | Tvw | 2 | 4 | 8 | HSYNC | |

Note: 1. The minimum blanking time depends on the GIP timing of the panel specification.

2. To ensure the compatibility of different panels, it is recommended to use the typical setting.

3. It is necessary to keep Tvbp =16 and Thbp =8 in sync mode. DE mode is unnecessary to keep it.

4. The maximum DCLK Frequency is 27MHz. If the case needs faster DCLK, please contact Sitronix.

| RGB Mode Selection Table | DCLK | HSYNC | VSYNC | DE |
|---|---|---|---|---|
| SYNC - DE Mode | Input | Input | Input | Input |
| SYNC Mode | Input | Input | Input | GND |
| DE Mode | Input | GND | GND | Input |

Note: "Input" means these signals are driven by host side.

**SYNC-DE Mode Timing Diagram（DCLKPOL=H, VDPOL=H,HDPOL=H）**
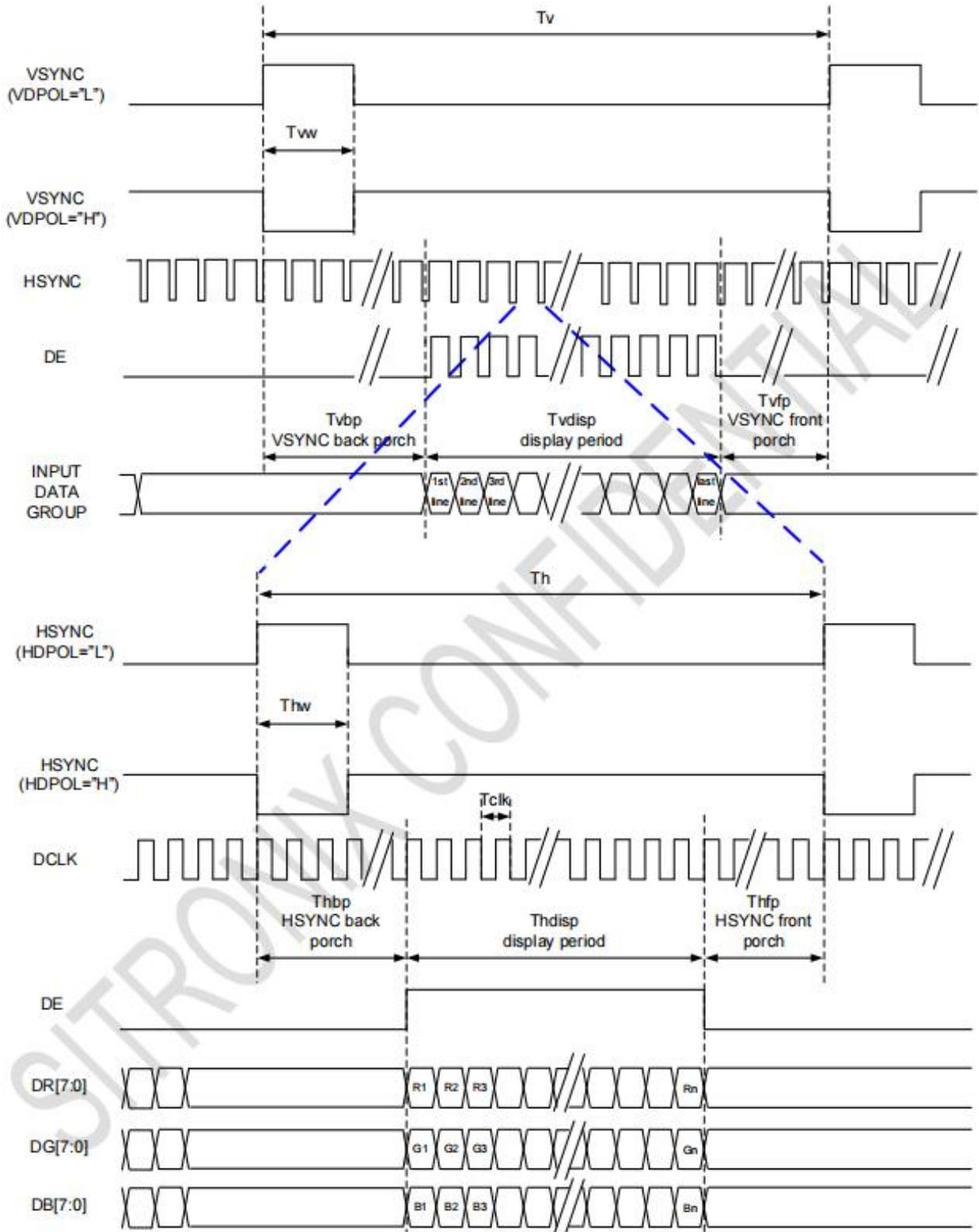
**SYNC Mode Timing Diagram（DCLKPOL=H, VDPOL=H,HDPOL=H）**
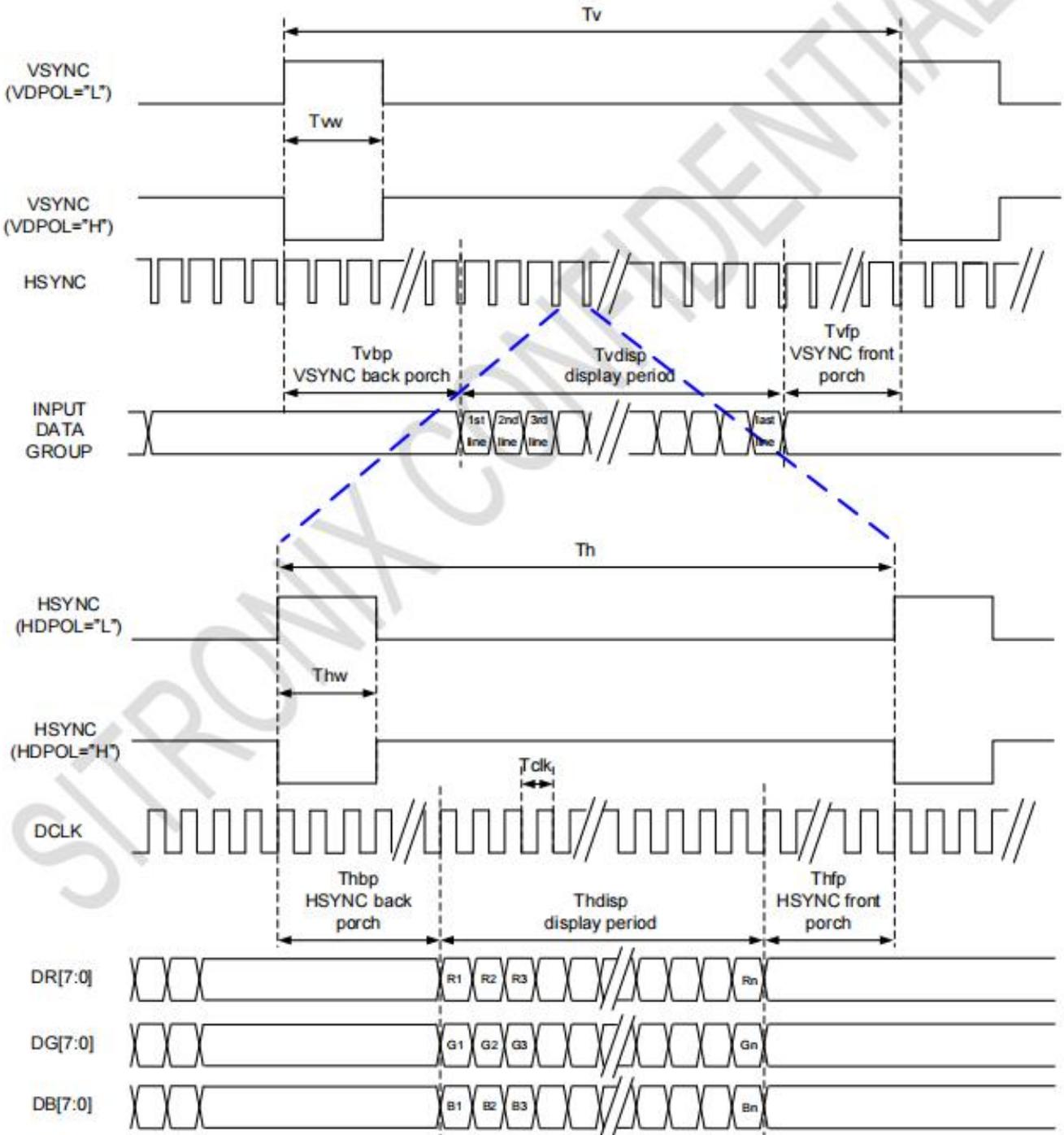
**DE Mode Timing Diagram（DCLKPOL=H）**
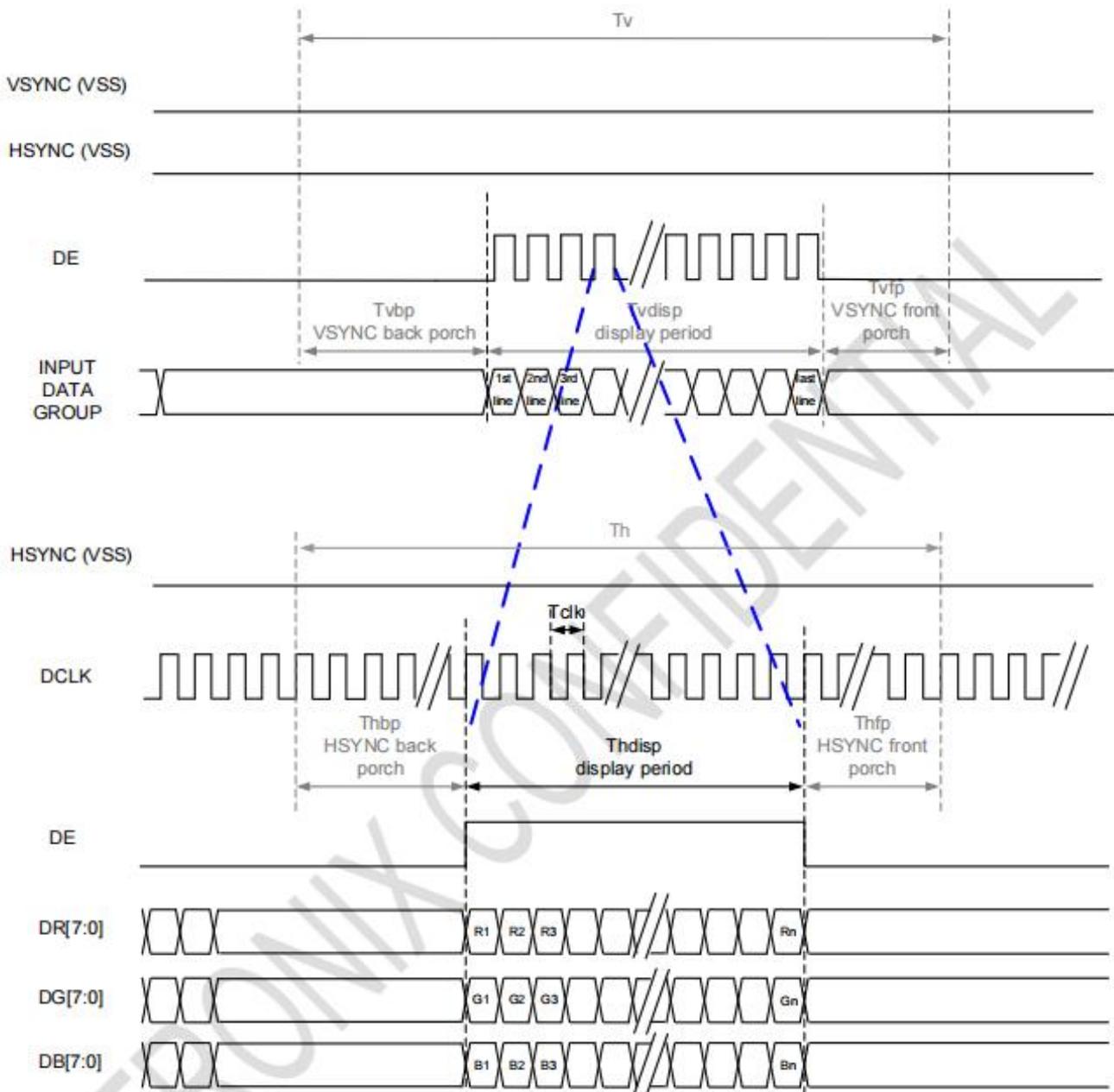


### 6.4.4 Reset timing

Setting GRB pin to "L" (hardware reset) can initialize internal function. Initialized by GRB pin is essential before operating. The GRB pin with external RC circuit built on FPC ( R=10K and C=1uF).
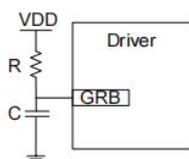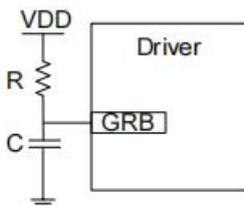
## 6.5 POWER ON/OFF SEQUENCE

## 6.5.1Power On Sequence
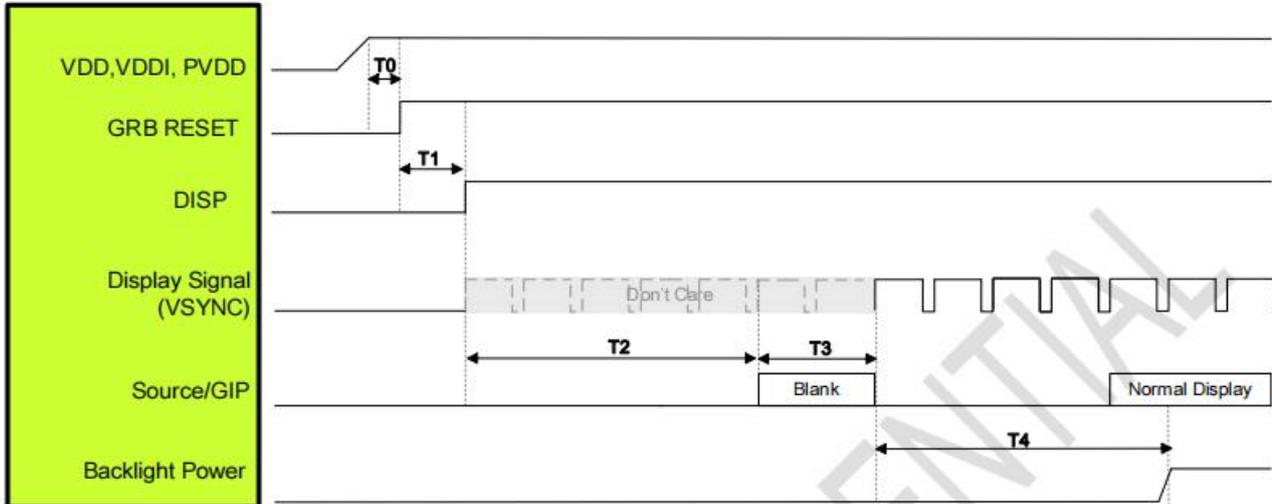


| Symbol | Description | Time | Unit |
|--------|-------------|------|------|
| T0 | System power stability to GRB RESET signal | ≥1 | ms |
| T1 | GRB RESET= "High" to DISP="High" | ≥10 | ms |
| T2 | DISP="High" to Source/GIP scan blank | 85 | ms |
| T3 | IC scan blanking signal | ≥33 | ms |
| T4 | Display signal input to Backlight power on (base on Display Signal Frame Rate 60Hz) | ≥100 | ms |

Note:

1. When DISP pull "H" or "L", IC will execute the internal power on or power off procedures .Please be careful about the timing of DISP and do not interrupt it during power on or power off procedure, otherwise unexpected errors will occur.

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

3. Setting GRB pin to "L" (hardware reset) can initialize internal function. Initialized by GRB pin is essential before operating. Now RC circuit is built in FPC, T0=10ms.

## 6.5. 2 Power Off Sequence
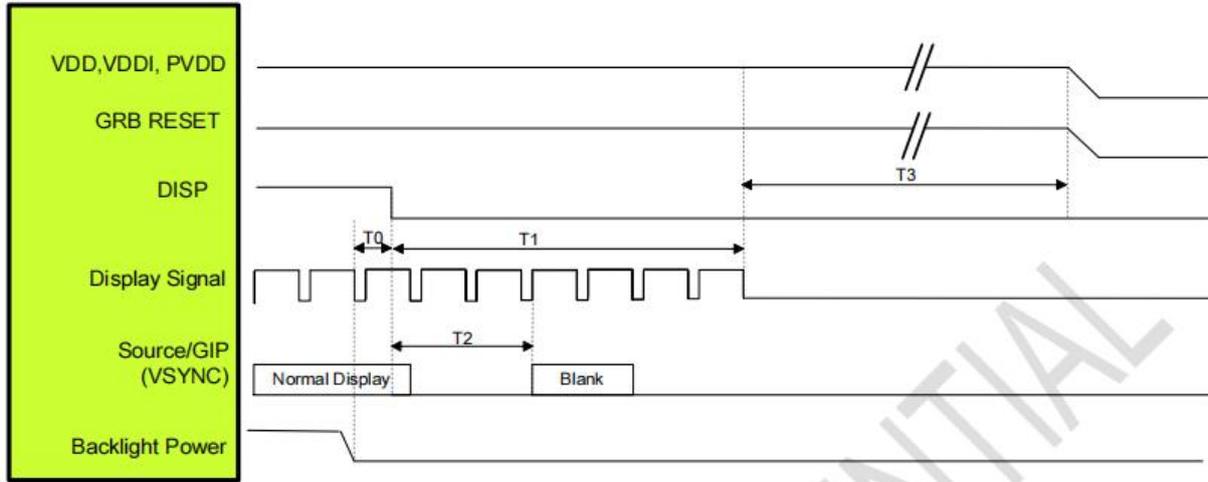


| Symbol | Description | Time | Unit |
|---|---|---|---|
| T0 | Backlight Power off to DISP="Low" | ≥1 | ms |
| T1 | DISP="Low" to IC internal voltage discharge complete | ≥100 | ms |
| T2 | DISP="Low" to Source/GIP scan blank (base on Display Signal Frame Rate 60Hz) | ≤50 | ms |
| T3 | IC internal voltage discharge is completed to VDD/VDDI/PVDD off | ≥0 | ms |

Note: 1. When DISP pull "H" or "L", IC will execute the internal power on or power off procedures .Please be careful about the timing of DISP and do not interrupt it during power on or power off procedure, otherwise unexpected errors will occur.

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

## 6.6 Input Color Format Application Circuit
## 6.6.1 Pin Assignment for RGB Interface

| Pin | | Parallel RGB | | |
|---|---|---|---|---|
| | | 888 | 666 | 565 |
| VSYNC | SYNC Mode | VSYNC | VSYNC | VSYNC |
| | DE Mode | x | x | x |
| | SYNC DE Mode | VSYNC | VSYNC | VSYNC |
| HSYNC | SYNC Mode | HSYNC | HSYNC | HSYNC |
| | DE Mode | x | x | x |
| | SYNC DE Mode | HSYNC | HSYNC | HSYNC |
| DE | SYNC Mode | x | x | x |
| | DE Mode | DE | DE | DE |
| | SYNC DE Mode | DE | DE | DE |
| DCLK | | DCLK | DCLK | DCLK |
| DR0 | | R0 | x | x |
| DR1 | | R1 | x | x |
| DR2 | | R2 | R2 | x |
| DR3 | | R3 | R3 | R3 |
| DR4 | | R4 | R4 | R4 |
| DR5 | | R5 | R5 | R5 |
| DR6 | | R6 | R6 | R6 |
| DR7 | | R7 | R7 | R7 |
| DG0 | | G0 | x | x |
| DG1 | | G1 | x | x |
| DG2 | | G2 | G2 | G2 |
| DG3 | | G3 | G3 | G3 |
| DG4 | | G4 | G4 | G4 |
| DG5 | | G5 | G5 | G5 |
| DG6 | | G6 | G6 | G6 |
| DG7 | | G7 | G7 | G7 |
| DB0 | | B0 | x | x |
| DB1 | | B1 | x | x |
| DB2 | | B2 | B2 | x |
| DB3 | | B3 | B3 | B3 |
| DB4 | | B4 | B4 | B4 |
| DB5 | | B5 | B5 | B5 |
| DB6 | | B6 | B6 | B6 |
| DB7 | | B7 | B7 | B7 |

## 6.6.2 Data Format

| Parallel RGB888 | | | | |
|---|---|---|---|---|
| Pin | 1st Data | 2nd Data | 3rd Data | ··· | Nth Data |
| DR0 | 1'R0 | 2'R0 | 3'R0 | ···· | N'R0 |
| DR1 | 1'R1 | 2'R1 | 3'R1 | ···· | N'R1 |
| DR2 | 1'R2 | 2'R2 | 3'R2 | ···· | N'R2 |
| DR3 | 1'R3 | 2'R3 | 3'R3 | ···· | N'R3 |
| DR4 | 1'R4 | 2'R4 | 3 R4 | ···· | N'R4 |
| DR5 | 1'R5 | 2'R5 | 3 R5 | ···· | N'R5 |
| DR6 | 1'R6 | 2'R6 | 3 R6 | ···· | N'R6 |
| DR7 | 1'R7 | 2'R7 | 3 R7 | ···· | N'R7 |
| DG0 | 1'G0 | 2'G0 | 3'G0 | ··· | N'G0 |
| DG1 | 1'G1 | 2'G1 | 3'G1 | ··· | N'G1 |
| DG2 | 1'G2 | 2'G2 | 3'G2 | ··· | N'G2 |
| DG3 | 1'G3 | 2'G3 | 3'G3 | ··· | N'G3 |
| DG4 | 1'G4 | 2'G4 | 3'G4 | ··· | N'G4 |
| DG5 | 1'G5 | 2'G5 | 3'G5 | ··· | N'G5 |
| DG6 | 1'G6 | 2'G6 | 3'G6 | ··· | N'G6 |
| DG7 | 1'G7 | 2'G7 | 3'G7 | ··· | N'G7 |
| DB0 | 1'B0 | 2'B0 | 3'B0 | ··· | N'B0 |
| DB1 | 1'B1 | 2'B1 | 3'B1 | ··· | N'B1 |
| DB2 | 1'B2 | 2'B2 | 3'B2 | ··· | N'B2 |
| DB3 | 1'B3 | 2'B3 | 3'B3 | ··· | N'B3 |
| DB4 | 1'B4 | 2'B4 | 3'B4 | ··· | N'B4 |
| DB5 | 1'B5 | 2'B5 | 3'B5 | ··· | N'B5 |
| DB6 | 1'B6 | 2'B6 | 3'B6 | ··· | N'B6 |
| DB7 | 1'B7 | 2'B7 | 3'B7 | ··· | N'B7 |

| Parallel RGB666 | | | | | |
|---|---|---|---|---|---|
| Pin | 1st Data | 2nd Data | 3rd Data | ... | Nth Data |
| DR0 | x | x | x | ... | x |
| DR1 | x | x | x | ... | x |
| DR2 | 1'R0 | 2'R0 | 3'R0 | ... | N'R0 |
| DR3 | 1'R1 | 2'R1 | 3'R1 | ... | N'R1 |
| DR4 | 1'R2 | 2'R2 | 3'R2 | ... | N'R2 |
| DR5 | 1'R3 | 2'R3 | 3'R3 | ... | N'R3 |
| DR6 | 1'R4 | 2'R4 | 3'R4 | ... | N'R4 |
| DR7 | 1'R5 | 2'R5 | 3'R5 | ... | N'R5 |
| DG0 | x | x | x | ... | x |
| DG1 | x | x | x | ... | x |
| DG2 | 1'G0 | 2'G0 | 3'G0 | ... | N'G0 |
| DG3 | 1'G1 | 2'G1 | 3'G1 | ... | N'G1 |
| DG4 | 1'G2 | 2'G2 | 3'G2 | ... | N'G2 |
| DG5 | 1'G3 | 2'G3 | 3'G3 | ... | N'G3 |
| DG6 | 1'G4 | 2'G4 | 3'G4 | ... | N'G4 |
| DG7 | 1'G5 | 2'G5 | 3'G5 | ... | N'G5 |
| DB0 | x | x | x | ... | x |
| DB1 | x | x | x | ... | x |
| DB2 | 1'B0 | 2'B0 | 3'B0 | ... | N'B0 |
| DB3 | 1'B1 | 2'B1 | 3'B1 | ... | N'B1 |
| DB4 | 1'B2 | 2'B2 | 3'B2 | ... | N'B2 |
| DB5 | 1'B3 | 2'B3 | 3'B3 | ... | N'B3 |
| DB6 | 1'B4 | 2'B4 | 3'B4 | ... | N'B4 |
| DB7 | 1'B5 | 2'B5 | 3'B5 | ... | N'B5 |

| Parallel RGB565 | | | | | |
|---|---|---|---|---|---|
| Pin | 1st Data | 2nd Data | 3rd Data | ... | Nth Data |
| DR0 | x | x | x | ... | x |
| DR1 | x | x | x | ... | x |
| DR2 | x | x | x | ... | x |
| DR3 | 1'R0 | 2'R0 | 3'R0 | ... | N'R0 |
| DR4 | 1'R1 | 2'R1 | 3'R1 | ... | N'R1 |
| DR5 | 1'R2 | 2'R2 | 3'R2 | ... | N'R2 |
| DR6 | 1'R3 | 2'R3 | 3'R3 | ... | N'R3 |
| DR7 | 1'R4 | 2'R4 | 3'R4 | ... | N'R4 |
| DG0 | x | x | x | ... | x |
| DG1 | x | x | x | ... | x |
| DG2 | 1'G0 | 2'G0 | 3'G0 | ... | N'G0 |
| DG3 | 1'G1 | 2'G1 | 3'G1 | ... | N'G1 |
| DG4 | 1'G2 | 2'G2 | 3'G2 | ... | N'G2 |
| DG5 | 1'G3 | 2'G3 | 3'G3 | ... | N'G3 |
| DG6 | 1'G4 | 2'G4 | 3'G4 | ... | N'G4 |
| DG7 | 1'G5 | 2'G5 | 3'G5 | ... | N'G5 |
| DB0 | x | x | x | ... | x |
| DB1 | x | x | x | ... | x |
| DB2 | x | x | x | ... | x |
| DB3 | 1'B0 | 2'B0 | 3'B0 | ... | N'B0 |
| DB4 | 1'B1 | 2'B1 | 3'B1 | ... | N'B1 |
| DB5 | 1'B2 | 2'B2 | 3'B2 | ... | N'B2 |
| DB6 | 1'B3 | 2'B3 | 3'B3 | ... | N'B3 |
| DB7 | 1'B4 | 2'B4 | 3'B4 | ... | N'B4 |

## 7. Optical Characteristics

| Item | Symbol | | Condition | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|---|
| Brightness | Bp | | $\theta$=0°  $\Phi$=0° | 400 | 500 | - | Cd/m$^2$ | 1 |
| Uniformity | ⊿Bp | | | 75 | 80 | - | % | 1,2 |
| Viewing Angle | 3:00 | | Cr≥10 | 70 | 80 | - | Deg | 3 |
| | 6:00 | | | 70 | 80 | - | | |
| | 9:00 | | | 70 | 80 | - | | |
| | 12:00 | | | 70 | 80 | - | | |
| Contrast Ratio | Cr | | $\theta$=0°  $\Phi$=0° | 1000 | 1200 | - | - | 4 |
| Response Time | $T_r+T_f$ | | | - | 30 | 40 | ms | 5 |
| Color of CIE Coordinate | W | x | $\theta$=0°  $\Phi$=0° | Typ -0.05 | 0.318 | Typ +0.05 | - | 1,6 |
| | | y | | | 0.349 | | - | |
| | R | x | | | 0.605 | | - | |
| | | y | | | 0.343 | | - | |
| | G | x | | | 0.352 | | - | |
| | | y | | | 0.584 | | - | |
| | B | x | | | 0.141 | | - | |
| | | y | | | 0.103 | | - | |
| NTSC Ratio | S | | | 50 | 55 | - | % | |

Note：The parameter is slightly changed by temperature, driving voltage and materiel

Note 1: The data are measured after LEDs are turned on for 5 minutes. LCM displays full white.

The brightness is the average value of 9 measured spots. Measurement equipment BM-7

(Φ5mm)

Measuring condition:

- Measuring surroundings: Dark room.
- Measuring temperature: Ta=25℃.
- Adjust operating voltage to get optimum contrast at the center of the display.

Measured value at the center point of LCD panel after more than 5 minutes while

backlight turning on.
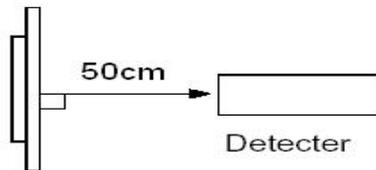


Note 2: The luminance uniformity is calculated by using following formula.

$\triangle Bp = Bp\ (Min.) / Bp\ (Max.) \times 100\ (\%)$

Bp (Max.) = Maximum brightness in 9 measured spots

Bp (Min.) = Minimum brightness in 9 measured spots.
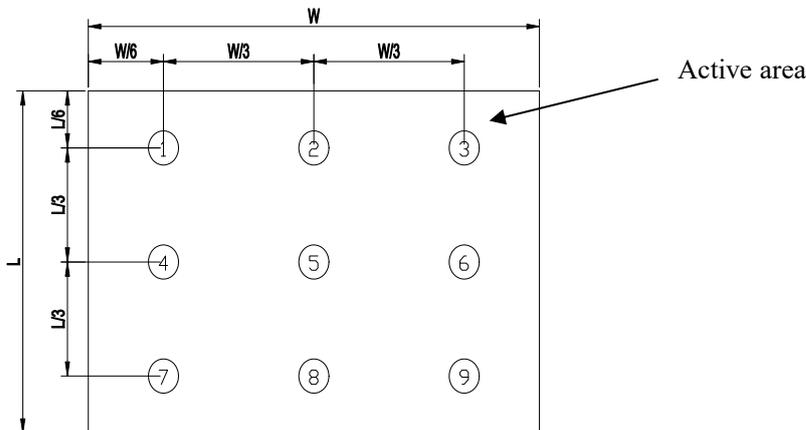
Note 3: The definition of viewing angle:
Refer to the graph below marked by θ and Φ

Up (12:00)
∅=90°
$\Theta$=0° ∅=0°
θ
Y
AB
Left (9:00)
∅=180°
∅
X
Right (3:00)
∅=0°
Down (6:00)
∅=270°
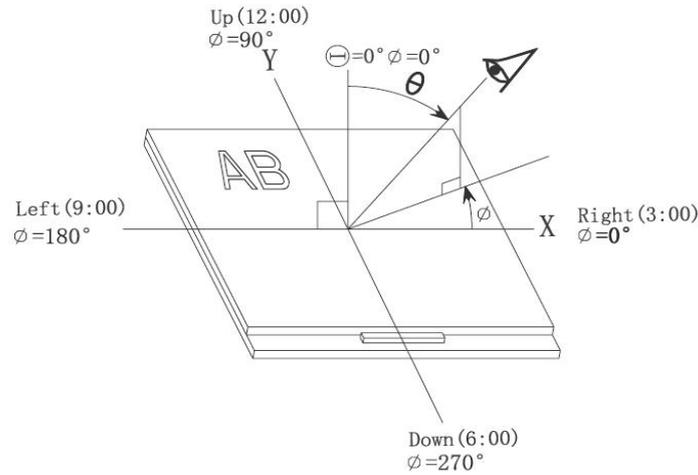
Note 4: Definition of contrast ratio.( Test LCD using DMS501)

Selected Wave
100%
Non-selected Wave
Cr max
*Conditions
Operating Voltage  :  Vop
Frame Frequency  :  70Hz
Appling Waveform :  1/N duty 1/a bias
View angle (θ, Φ) :  (0°, 0°)
Vop
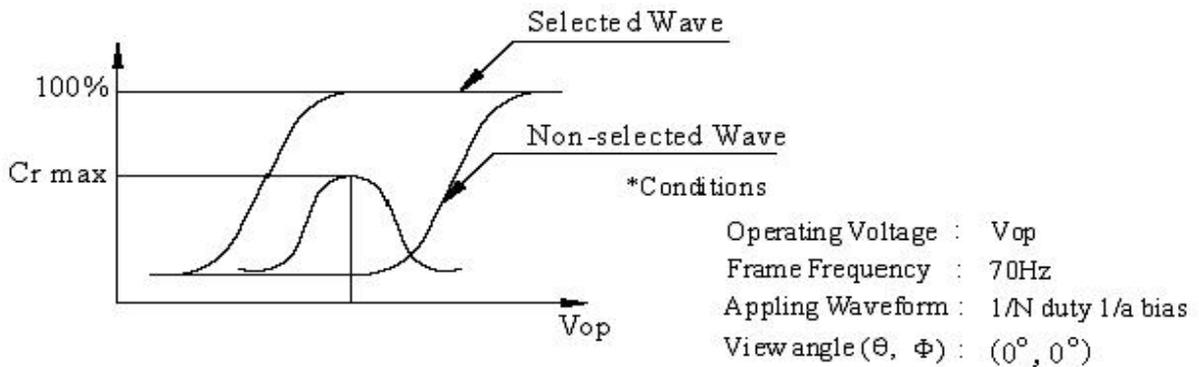
$$Contrast\ ratio(Cr) = \frac{Brightness\ of\ selected\ dots}{Brightness\ of\ non-selected\ dots}$$

Note 5: Definition of Response time. (Test LCD using DMS501):
TThe output signals of photo detector are measured when the input signals are changed from"black"to"white"(falling time)   and   from" white"to "black"(rising time), respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes.Refer to figure as below.

100%
90%
10%
$T_r$
$T_f$
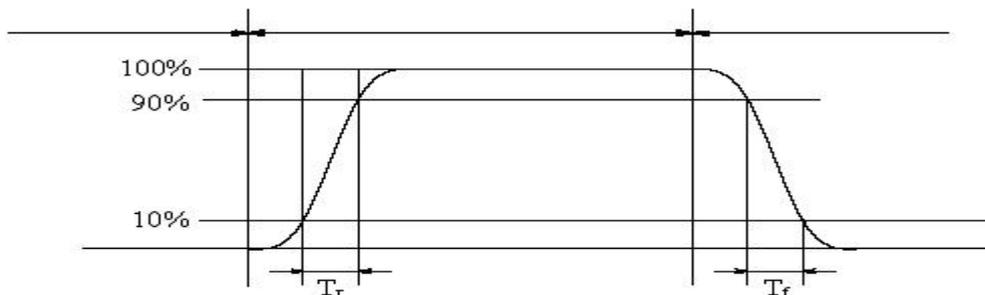
*The definition of response time*

*Note 6: Definition of Color of CIE Coordinate and NTSC Ratio.*



1931 CIE Chromaticity Diagram
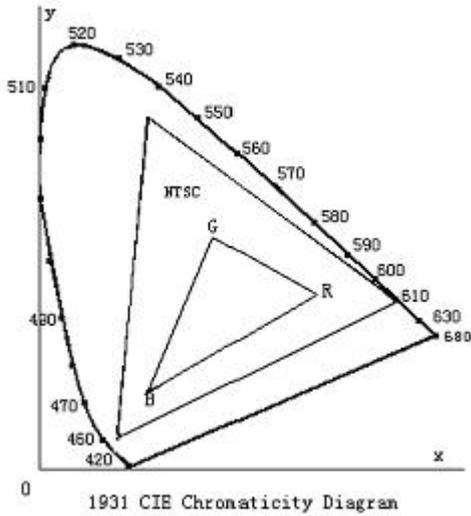
**Color gamut:**

$$S = \frac{\text{area of RGB triangle}}{\text{area of NTSC triangle}} \times 100\%$$

*Note 7: Definition of cross talk.*
*Cross talk ratio(%)=|pattern A Brightness-pattern B Brightness|/pattern A Brightness*100*
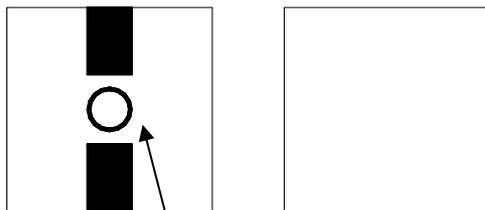


Pattern A          Pattern B

*Measurement point(center)*

*Electric volume value=3F+/-3Hex*

## 8. Reliability Test Items and Criteria

| Test Item | Test condition | Remark |
|---|---|---|
| High    Temperature Storage | Ta = 80℃    240hrs | Note1,Note3，4 |
| Low    Temperature Storage | Ta = -30℃    240hrs | Note1,Note3，4 |
| High    Temperature Operation | Ta = 70℃    240hrs | Note2,Note3，4 |
| Low Temperature Operation | Ta = -20℃    240hrs | Note1,Note3，4 |
| Operation at High Temperature/Humidity | +60℃, 90%RH 240hrs | Note3，4 |
| Thermal Shock | -30℃/30 min ~ +80℃/30 min for a total 50 cycles, Start with cold temperature and end with high temperature. | Note3，4 |
| Package Drop Test | Height:60cm 1 corner, 3 edges, 6 surfaces | |
| ESD | C=150pF,R=330Ω ,5point/panel Air:±12Kv,5times; Contact:±8Kv,5times (Environment:15℃~35℃, 30%~60%.86Kpa~106Kpa) | (IEC-61000-4-2) |

Note 1: Ta is the ambient temperature of samples.

Note 2: Ts is the temperature of panel's surface.

Note 3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

Note 4: Before cosmetic and function test, the product must have enough recovery time,at least 2 hours at room temperature

# 9. *Precautions for Use of LCD Modules*

## *9.1 Handling Precautions*

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

*9.1.2 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.*

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

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

*9.1.5 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                — Ketone                — Aromatic solvents*

*9.1.6 Do not attempt to disassemble the LCD Module.*

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

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

   *a. Be sure to ground the body when handling the LCD Modules.*

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

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

   *d. 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.*

### *9.2 Storage precautions*

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

*9.2.2 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%*

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

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

## *10 . Quality Assurance*

### 10.1.Objective

The TFT criteria is set to formalize the TFT quality standards with reference to customer for inspection.

### 10.2.Scope

The criteria is applicable to all TFT products manufactured by Kingtech.

### 10.3.Tools for Inspection

Tester, calipers, multi-meter, anti-static wrist straps, finger cots, desk Lamps, etc.

### 10.4.Sampling Plan and Reference Standards

10.4.1.1 Sampling plan:

Refer to ANSI/ASQZ1.4 NORMAL INSPECTION LEVEL II

AQL:

1) MA=0.65

2) MI=1.0

10.4.1.2   IPC-A-610 Acceptability of Electronic Assemblies.

### 10.5.Inspection Conditions and Inspection Reference

**10.5.1** Cosmetic inspection with naked eyes:

1) Temperature: 25±5℃; relative humidity: 65±20%RH

2) Illumination: Appearance Inspection Condition:600 ~ 800lux;
Operation Inspection Condition: 300lux~500lux

**3)** Distance: 35cm±5 from the inspector's naked eyes to the LCD panel and inspection time is more than 15s. The ND filter needs to be 20mm away from the LCD surface,and judged at 90° vertical angles.

4) View angle: within 45°from perpendicular to LCM surface (view direction and special parameters refer to production specification).
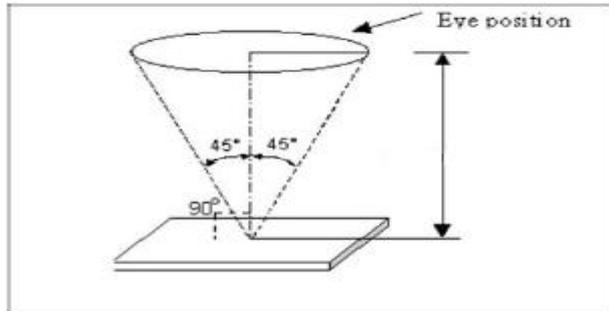


**10.5.2** Definition

10.5.2.1 Area definition

A area：Active area（AA area）

B area: Viewing area（VA area）

C area: non-view area (out of B area)

10.5.2.2 Any cosmetic defect which do not affect product quality and customer assembling in C area, it's Acceptable. (The dimension is defined on the drawing below)
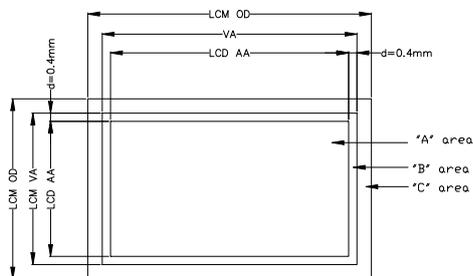


10.5.2.3 Test condition: refer to product specification

**10.5.3** Defect type：

10.5.3.1 A and B area defect type：

Line defect（scratch, soft flocks, fibre）、dot defect（white dot, black dot, same color dot, different color dot, bubble）, stain, pin-hole, light leak, scratch.

10.5.3.2 C area defect type：

Broken, crack/chipping

10.5.4 Undefined items or other special items, refer to mutual agreement and limited sample by customer.

10.5.5 Test condition: refer to product specification.
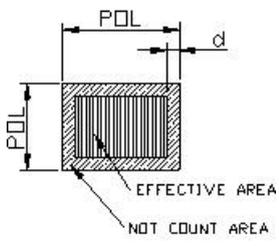
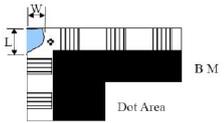**10.6.Defects and Acceptance Standards**
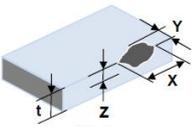
**10.6.1** Appearance inspection

10.6.1.1 Dot/line defect

| Defect | Criterion | Accepted standard | MAJ | MIN |
|---|---|---|---|---|
| **Line defect(foreign objects etc)** **W:width** **L:length**  | W≤0.03mm | Accept | | √ |
| | 0.03mm＜W≤0.05mm, L≤3mm quantity≤1 | Accept | | √ |
| | W＞0.05mm L＞3mm | Reject | | √ |
| **Dot defect** **( foreign objects** **etc )** **D:Diameter**  | D≤0.1mm | Accept | | √ |
| | 0.1mm<D≤0.25mm quantity≤2 distance＞5mm | Accept | | √ |
| | D＞0.25mm | Reject | | √ |
| **Polarizer with air bubble，convex-concave dots or dent defect in EFECTIVE AREA**  D=(w+l)/2  | D≤0.1mm(d=0.4) | Accept | | √ |
| | 0.1mm<D≤0.25mm (d=0.4) quantity≤2 distance＞5mm | Accept | | √ |
| | D＞0.25mm (d=0.4) | Reject | | √ |

| Polarizer Line defect in EFECTIVE AREA | W≤0.03mm(d=0.4) | Accept | | √ |
|---|---|---|---|---|
|  | 0.03mm＜W≤0.05mm, L≤3mm(d=0.4) quantity≤1 | Accept | | |
|  | W＞0.05mm(d=0.4) L＞3mm(d=0.4) | Reject | | |
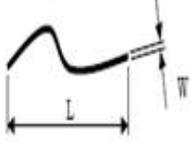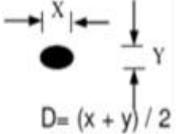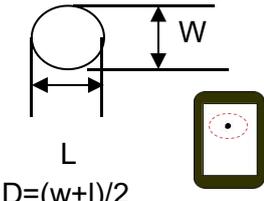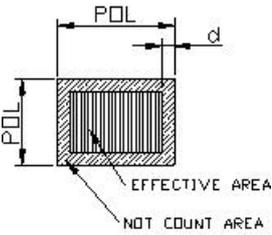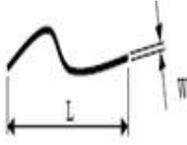
10.6.1.2 Chip and Crack

| Defect | Criterion | Accepted standard | MAJ | MIN |
|---|---|---|---|---|
| **Broken corners of glass**  | ITO Align Mark in LCD is OK. W≤1.5mm,L≤5mm | Accept | | |
| **Broken edges of glass**  | Y≤2.0mm,X≤5.0mm.Z≤t | | | |
| **Glass scratch** | Not affect ITO line, Judge by dot, line standard 10.6.1.1 | Accept | | √ |
| | Affect ITO line and be visual. | Reject | | √ |

| **Glass crack** | | | |
|---|---|---|---|
|  | Glass crack. | Reject | √ |
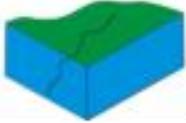
**1**0.6.1.3 Attaching defect（kapton tape/protective film）

| Defect | Description | Accepted standard | MAJ | MIN |
|---|---|---|---|---|
| **Protective film** | scratch、attaching flat、no shifting | Accept | | √ |
| **PCBA** | Appearance defect | Accept | | √ |
| **COF** | Appearance defect | Accept | | √ |
| **Silicone spread** | Appearance defect | Accept | | √ |
| **Label for Kapton** | Damaged and the text invisible | Reject | | √ |

**10.6.2** TFT defects and Inspection Criterion

10.6.2.1 Function items

| Defects | Inspection Criterion | Pictures | Inspection method/tools | Defect category |
|---|---|---|---|---|
| No display /function | shows no picture/display in normal connected situation. ->Rejected | | Naked eyes/ testers | MA |
| Missing segment | Shows missing lines in normal display.->Rejected | | Naked eyes/ testers | MA |
| Display abnormal | Not accepted | | Naked eyes/ testers | MA |
| Display dim/bright | Refer to bright value definition | / | Naked eyes/ BM-7 | MA |
| Contrast | Refer to SPEC | / | Naked eyes/ BM-7 | MA |
| Flicker | <15% | | CA310 | MA |

10.6.2.2 LCD pixel defect(defect category：MI)

| Item | Acceptable count |
|---|---|
| Area | AA |
| Bright dots | N≤1 |
| Bright dot-2 adjacent | N≤0 |
| Bright dot-3 adjacent | N≤0 |
| Dark dots | N≤2 |
| Dark dots-2 adjacent | N≤1 |
| Dark dots-3 adjacent | N≤0 |
| Dark or bright dots-3 and more adjacent | N≤0 |
| Total bright and dark dots | N≤3 |
| Minimum distance between bright or dark dots | 5mm |
| Micro bright dots( invisible through 5% ND filter) | D≤0.1mm Accept<br>0.1mm<D≤0.25mm, N≤2<br>distance＞5mm |
| Display Mura or Cross-talk | There should not be invisible through 5%ND filter under 50% gray pattern. |

Remark：

1) The definition of dot:

The size of a defective dot over 1/2 of whole sub-pixel is regarded as one defective dot.
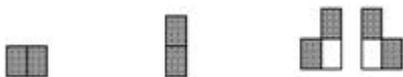
2) Bright dot：

Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern. The bright dot defect must be visible through 5% ND filter.

3) Dark dot:

Dots appear dark and unchanged in size in which LCD panel is displaying under pure Red,Green,Blue pattern.

4)dots-adjacent



**END**