***Version : 1.6***

# TECHNICAL SPECIFICATION

# MODEL NO. : PW065XS1

☐Customer's Confirmation

Customer

Date

By

☐PVI's Confirmation

Confirmed By 王天良

黃曲格

Date : Apr. 12 , 2005

This technical specification is subject to change without notice.
Please return 1 copy with your signature on this page for approval.

# *TECHNICAL SPECIFICATION*

## *CONTENTS*

## 1. Application

This technical specification applies to 6.5” color TFT-LCD module, PW065XS1.
The applications of the panel are car TV, portable DVD, GPS, multimedia applications and others AV system.

## 2. Features

. Pixel in stripe configuration

. Compatible with NTSC and PAL system

. Slim and compact

. High Brightness

. Up / Down and Left / Right Image Reversion

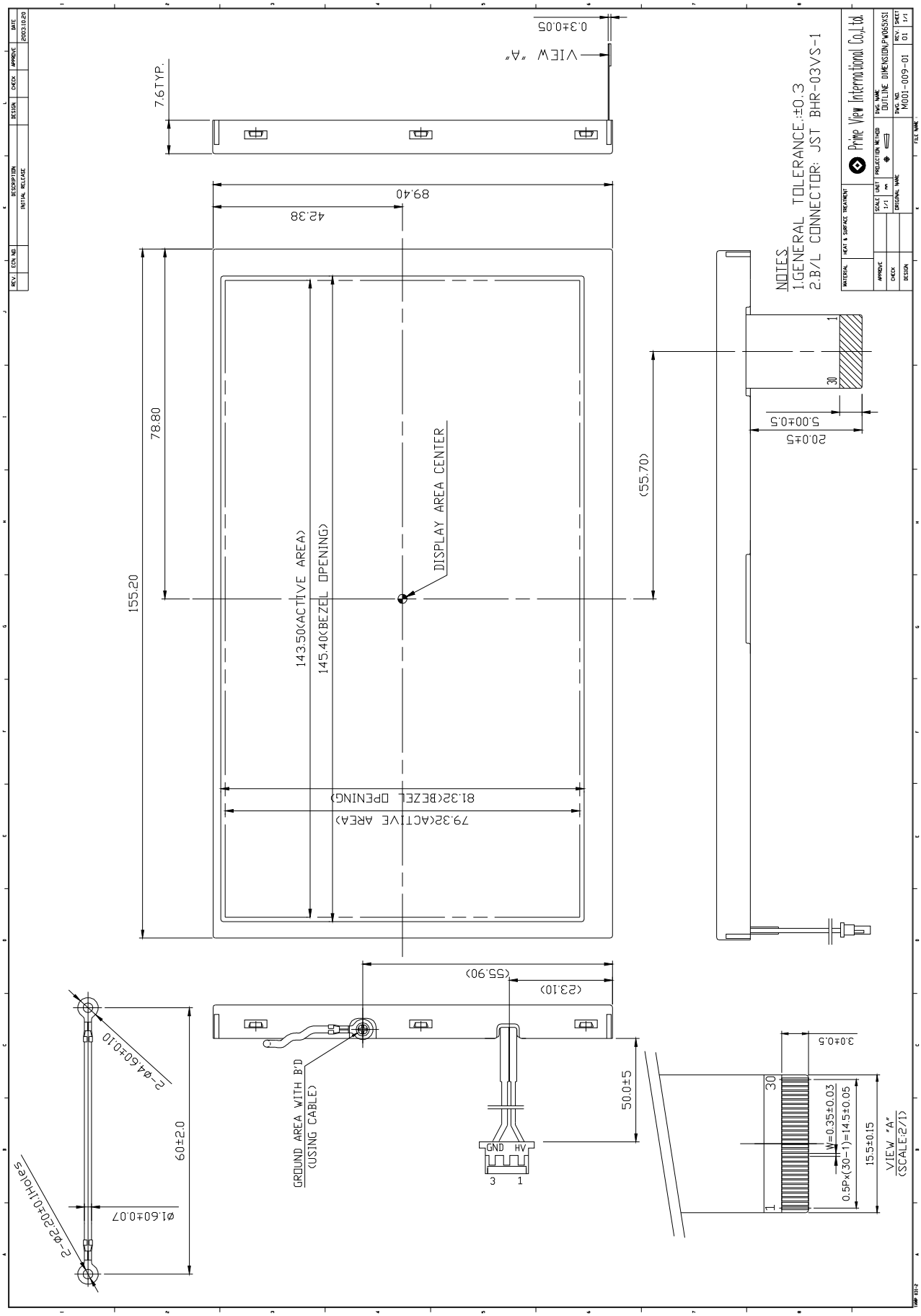
. Wide Viewing Angle

. Support Multi Video Display Mode
(With PVI timing controller : PVI-1004D)

## 3. Mechanical Specifications

| Parameter | Specifications | Unit |
|---|---|---|
| Screen Size | 6.5 (16:9 diagonal) | Inch |
| Display Format | 1200 (H) ×234(V) | Dot |
| Active Area | 143.40 (H)×79.32 (V) | Mm |
| Dot Pitch | 0.119 (H)×0.345 (V) | Mm |
| Pixel Configuration | Stripe | |
| Outline Dimension | 155.0 (W)×89.2 (H)×7.6 (D) (typ.) | mm |
| Surface Treatment | Anti-Glare+WV film | |
| Weight | 164±3 | g |

## 4. Mechanical Drawing of TFT-LCD Module



## 5. Input / Output Terminals

LCD Module Connector
FPCDown Connect , 30 Pins , Pitch : 0.5 mm

| Pin No | Symbol | I/O | Description | Remark |
|---|---|---|---|---|
| 1 | GND | - | Ground for logic circuit | |
| 2 | $V_{CC}$ | I | Supply voltage of logic control circuit for gate driver | Note 5-3 |
| 3 | NC | - | No connection | |
| 4 | $V_{EE}$ | I | Negative power for gate driver | Note 5-4 |
| 5 | NC | - | No connection | |
| 6 | $V_{GH}$ | I | Positive power for gate driver | Note 5-5 |
| 7 | NC | - | No connection | |
| 8 | STVD | I/O | Vertical start pulse | Note 5-1 |
| 9 | STVU | I/O | Vertical start pulse | |
| 10 | CKV | I | Shift clock for gate driver | |
| 11 | U/D | I | Up / Down Control for gate driver | Note 5-1 |
| 12 | OE3 | I | Output enable for gate driver | |
| 13 | OE2 | I | Output enable for gate driver | |
| 14 | OE1 | I | Output enable for gate driver | |
| 15 | $V_{COM}$ | I | Common electrode voltage | |
| 16 | STHL | I/O | Start pulse for source driver | Note 5-2 |
| 17 | $V_{SS2}$ | - | Ground for analog circuit | |
| 18 | $V_R$ | I | Video Input R | |
| 19 | $V_G$ | I | Video Input G | |
| 20 | $V_B$ | I | Video Input B | |
| 21 | $V_{SS1}$ | - | Ground for digital circuit | |
| 22 | $V_{DD2}$ | I | Supply power for analog circuit | Note 5-6 |
| 23 | CPH1 | I | Sampling and shift clock for source driver | |
| 24 | CPH2 | I | Sampling and shift clock for source driver | |
| 25 | CPH3 | I | Sampling and shift clock for source driver | |
| 26 | $V_{DD1}$ | I | Supply power for digital circuit | Note 5-7 |
| 27 | R/L | I | Left / Right Control for source driver | Note 5-2 |
| 28 | NC | I | No Connection | |
| 29 | OEH | I | Output enable for source driver | |
| 30 | STHR | I/O | Start pulse for source driver | Note 5-2 |

Note 5-1

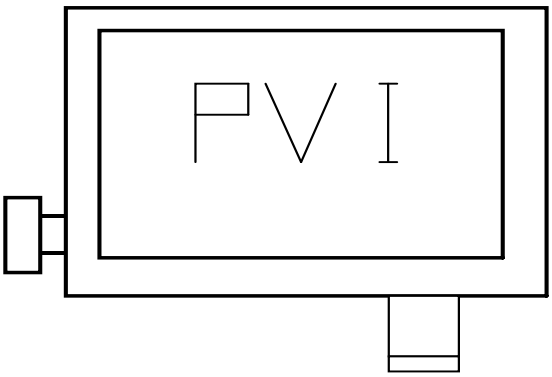
| U/D | STVD | STVU | scanning direction |
|---|---|---|---|
| Vcc | Input | output | down to up |
| GND | Output | input | up to down |

Note 5-2

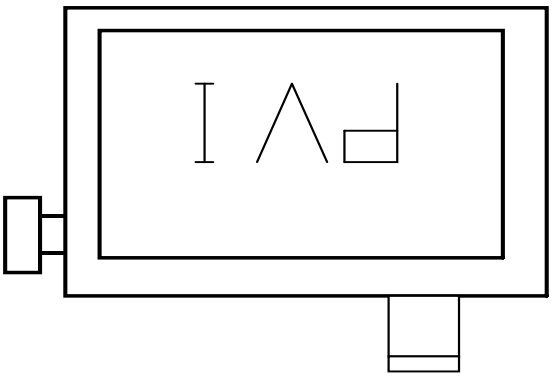
| R/L | STHL | STHR | scanning direction |
|---|---|---|---|
| Vcc | output | input | left to right |
| GND | input | output | right to left |

The definitions of Note 5-1,5-2

U/D(PIN 11)=Low R/L(PIN 27)=High



U/D(PIN 11)=High R/L(PIN 27)=Low



Note 5-3 : $V_{CC}$ TYP.＝+3.3V

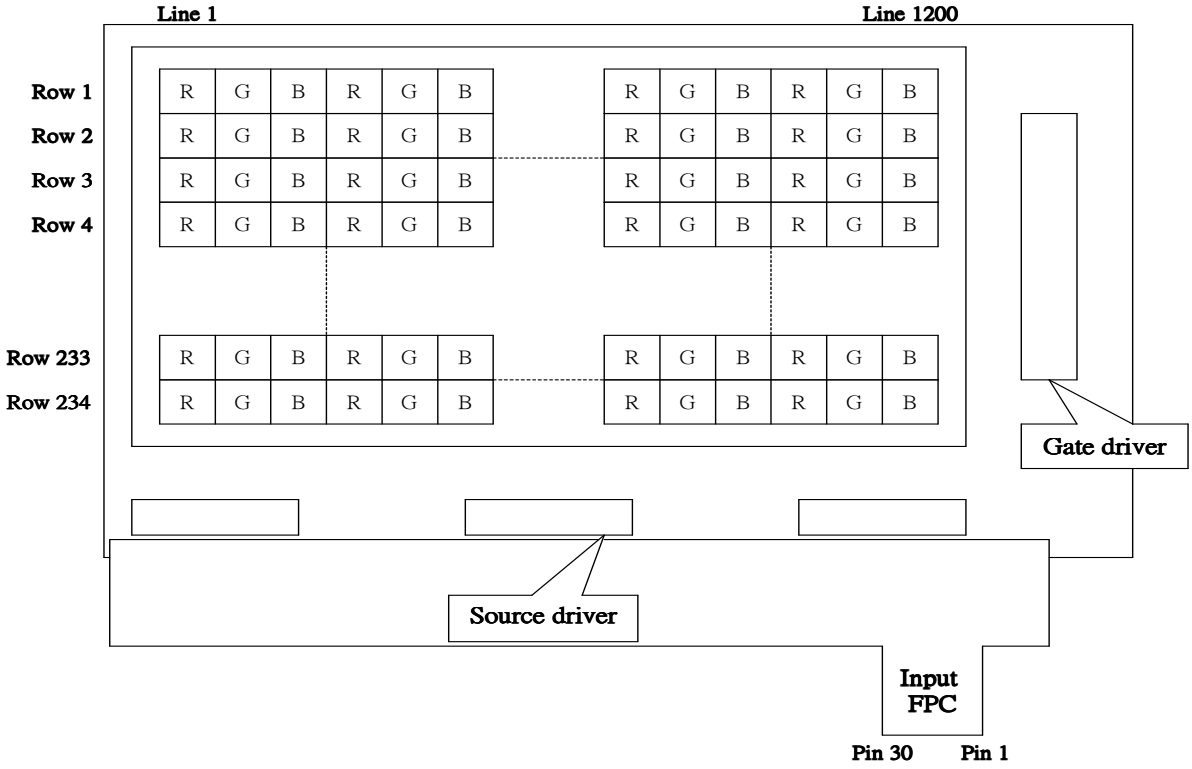
Note 5-4 : $V_{EE}$ TYP.＝-12V

Note 5-5 : $V_{GH}$ TYP.＝+17V

Note 5-6 : $V_{DD2}$ TYP.＝+5V

Note 5-7 : $V_{DD1}$ TYP.＝+3.3V

6. Pixel Arrangement and input connector pin NO.



## 7. Absolute Maximum Ratings

The followings are maximum values , which if exceeded, may cause faulty operation or damage to the unit.

| Parameter | | Symbol | MIN. | MAX. | Unit | Remark |
|---|---|---|---|---|---|---|
| Supply Voltage For Source Driver | | $V_{DD2}$ | -0.3 | +5.8 | V | |
| | | $V_{DD1}$ | -0.3 | +7.0 | V | |
| Supply Voltage For Gate Driver | | $V_{CC}$ | -0.3 | +6.0 | V | |
| | | $V_{GH}$-$V_{EE}$ | -0.3 | +40.0 | V | |
| | H Level | $V_{GH}$ | -0.3 | +25.0 | V | |
| | L Level | $V_{EE}$ | -16 | +0.3 | V | |
| Analog Signal Input Level | | $V_R$,$V_G$,$V_B$ | -0.2 | $V_{DD1}$+0.2 | V | Note 7-1 |
| Storage Temperature | | | -40 | +95 | ℃ | |
| Operation Temperature | | | -30 | +85 | ℃ | Note 7-2 |

Notes 7-1 : Analog Input Voltage means $V_R$,$V_G$,$V_B$.

Notes 7-2 : Optical characteristics shown in Table 10-1 are measured under Ta=+25℃.

## 8. Electrical Characteristics

8-1) Recommended Driving condition for TFT-LCD panel

| Parameter | | Symbol | MIN. | Typ. | MAX. | Unit | Remark |
|---|---|---|---|---|---|---|---|
| Supply Voltage For Source Driver | Analog | $V_{DD2}$ | +4.5 | +5.0 | +5.5 | V | |
| | Logic | $V_{DD1}$ | +3.0 | +3.3 | +3.6 | V | |
| Supply Voltage For Gate Driver | H level | $V_{GH}$ | +15 | +17 | +19 | V | |
| | L level | $V_{EE\ DC}$ | -13.0 | -12 | -10.5 | V | DC Component of $V_{EE}$ |
| | | $V_{EE\ AC}$ | | +6.0 | | $V_{P-P}$ | AC Component of $V_{EE}$ |
| | Logic | $V_{CC}$ | +3.0 | +3.3 | +3.6 | V | |
| Analog Signal input Level | Amplitud | | +0.3 | | $V_{CC}$-0.3 | V | |
| Digital input voltage | H level | $V_{IH}$ | 0.7 $V_{DD1}$ | - | $V_{DD1}$ | V | |
| | L level | $V_{IL}$ | -0.3 | - | 0.3 $V_{DD1}$ | V | |
| Digital output voltage | H level | $V_{OH}$ | 0.7 $V_{DD1}$ | - | $V_{DD1}$ | V | |
| | L level | $V_{OL}$ | -0.3 | - | 0.3 $V_{DD1}$ | V | |
| $V_{COM}$ | | $V_{COM\ AC}$ | - | +6.0 | - | $V_{P-P}$ | AC Component of $V_{COM}$ |
| | | $V_{COM\ DC}$ | 1.3 | 1.5 | 1.7 | V | DC Component of $V_{COM}$ Note 8-1 |

Note 8-1 : PVI strongly suggests that the $V_{COM\ DC}$ level shall be adjustable , and the adjustable level range is 1.5V±1V , every module's $V_{COM\ DC}$ level shall be carefully adjusted to show a best image performance.

8-2) Recommended driving condition for back light

Ta= 25 ℃

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|
| Lamp voltage | $V_L$ | 500 | 550 | 600 | Vrms | $I_L$=6mA |
| Lamp current | $I_L$ | 3 | 6 | 8 | mA | Note 8-2 |
| Lamp frequency | $P_L$ | 30 | 43 | 80 | KHz | Note 8-3 |
| Kick-off voltage(25℃) (Reference Value) | Vs | - | 720 | 830 | Vrms | Note 8-4 |
| Kick-off voltage(0℃) (Reference Value) | | - | 910 | 1100 | Vrms | |

Note 8-2 : In order to satisfy the quality of B/L , no matter use what kind of inverter , the output lamp current must between Min. and Max. to avoid the abnormal display image caused by B/L.

Note 8-3 : The waveform of lamp driving voltage should be as closed to a perfect sine wave as possible.

Note 8-4 : The Kick-off times≧1sec.

Back Light driving

Back Light Connector : JST BHR-03VS-1, Pin No. : 3 , Pitch : 4 mm

| Pin No | Symbol | Description | Remark |
|---|---|---|---|
| 1 | VL1 | Input terminal (Hi voltage side) | |
| 2 | NC | No Connection | |
| 3 | VL2 | Input terminal (Low voltage side) | Note 8-5 |

Note 8-5 : Low voltage side of back light inverter connects with Ground of inverter circuits.

8-3) Power Consumption

Ta= 25 ℃

| Parameter | Symbol | Conditions | TYP. | MAX | Unit | Remark |
|---|---|---|---|---|---|---|
| Supply current for Gate Driver (Hi level) | $I_{GH}$ | $V_{GH}$ =+17V | 0.76 | 1.35 | mA | |
| Supply current for Gate Driver (Low level) | $I_{EE}$ | $V_{EE}$ =-12V | 1.02 | 1.53 | mA | $V_{EE}$ center voltage |
| Supply current for Source Driver(Digital) | $I_{DD1}$ | $V_{DD1}$ =+3.3V | 1.5 | 5.0 | mA | |
| Supply current for Source Driver(Analog) | $I_{DD2}$ | $V_{DD2}$ =+5V | 19.9 | 22.5 | mA | |
| Supply current for Gate Driver (Digital) | $I_{CC}$ | $V_{CC}$ =+3.3V | 0.036 | 0.075 | mA | |
| LCD Panel Power Consumption | | | 129.73 | 170.56 | mW | Note 8-6 |
| Back Light Lamp Power Consumption | | | 3.30 | | W | Note 8-7 |

Note 8-6 : The power consumption for back light is not included.

Note 8-7 : Back light lamp power consumption is calculated by $I_L \times V_L$.

8-4) Timing Characteristics Of Input Signals

| Characteristics | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|
| Rising time | $t_r$ | - | - | 10 | ns | |
| Falling time | $t_f$ | - | - | 10 | ns | |
| High and low level pulse width | $t_{CPH}$ | 120 | 125 | 130 | ns | CPH1~CPH3 |
| CPH pulse duty | $t_{CWH}$ | 40 | 50 | 60 | % | CPH1~CPH3 |
| STH setup time | $t_{SUH}$ | 20 | - | - | ns | STHR,STHL |
| STH hold time | $t_{HDH}$ | 20 | - | - | ns | STHR,STHL |
| STH pulse width | $t_{STH}$ | - | 1 | - | $t_{CPH}$ | STHR,STHL |
| STH period | $t_H$ | 61.5 | 63.5 | 65.5 | $\mu$ s | STHR,STHL |
| OEH pulse width | $t_{OEH}$ | - | 1.22 | - | $\mu$ s | OEH |
| Sample and hold disable time | $t_{DIS1}$ | - | 8.28 | - | $\mu$ s | |
| OEV pulse width | $t_{OEV}$ | - | 10.8 | - | $\mu$ s | OEV |
| CKV pulse width | $t_{CKV}$ | - | 32 | - | $\mu$ s | CKV |
| Clean enable time | $t_{DIS2}$ | - | 5.4 | - | $\mu$ s | |
| Horizontal display start | $t_{SH}$ | - | 0 | - | $t_{CPH}/3$ | |
| Horizontal display timing range | $t_{DH}$ | - | 1200 | - | $t_{CPH}/3$ | |
| STV setup time | $t_{SUV}$ | 400 | - | - | ns | STVU,STVD |
| STV hold time | $t_{HDV}$ | 400 | - | - | ns | STVU,STVD |
| STV pulse width | $t_{STV}$ | - | - | 1 | $t_H$ | STVU,STVD |
| Horizontal lines per field | $t_V$ | 256 | 262 | 268 | $t_H$ | |
| Vertical display start | $t_{SV}$ | | 3 | - | $t_H$ | |
| Vertical display timing range | $t_{DV}$ | | 234 | - | $t_H$ | |
| VCOM rising time | $t_{rCOM}$ | | - | 5 | $\mu$ s | |
| VCOM falling time | $t_{fCOM}$ | | - | 5 | $\mu$ s | |
| VCOM delay time | $t_{DCOM}$ | | - | 3 | $\mu$ s | |
| RGB delay time | $t_{DRGB}$ | | - | 1 | $\mu$ s | |

8-5) Signal Timing Waveforms

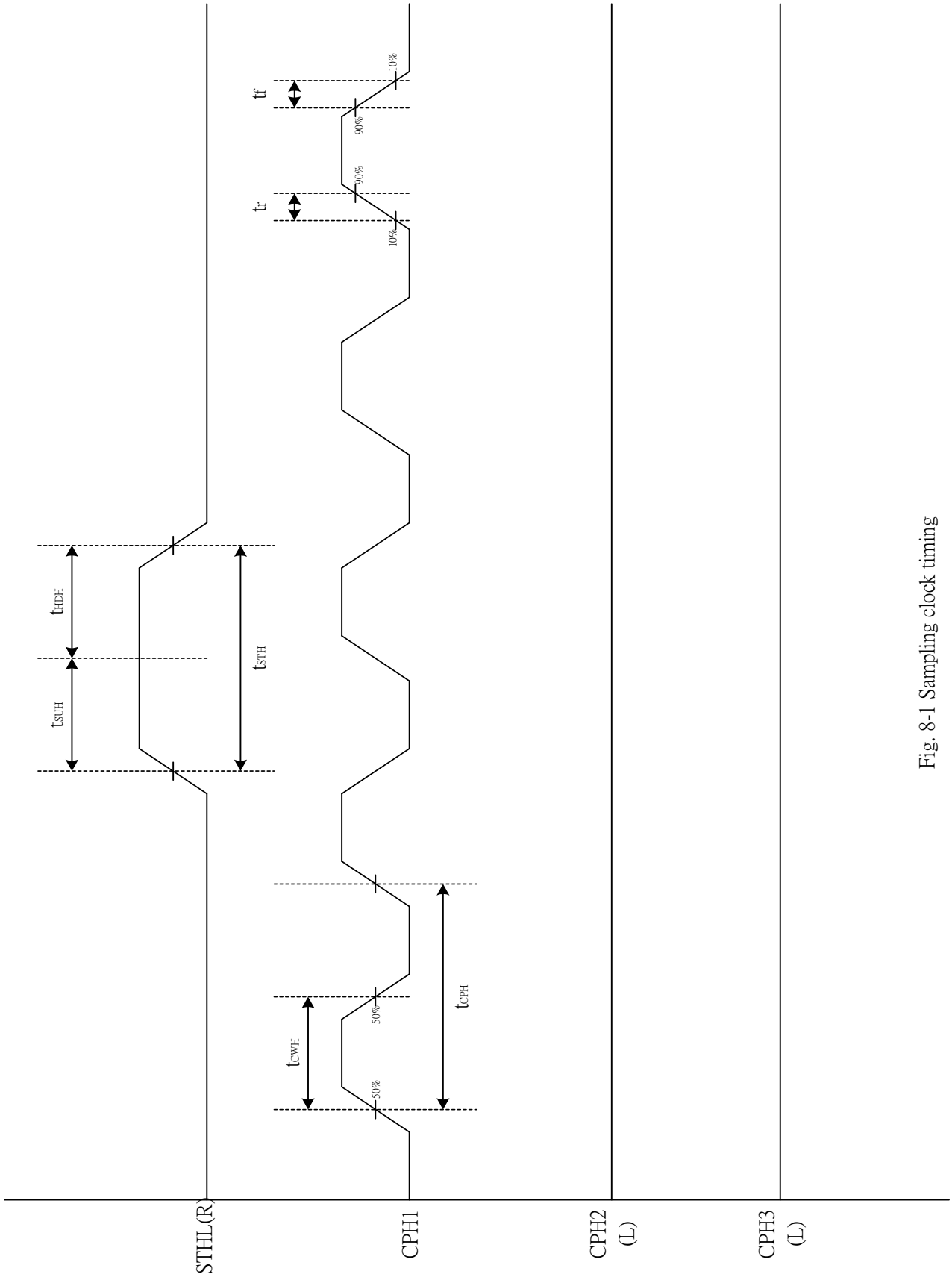



Fig. 8-1 Sampling clock timing

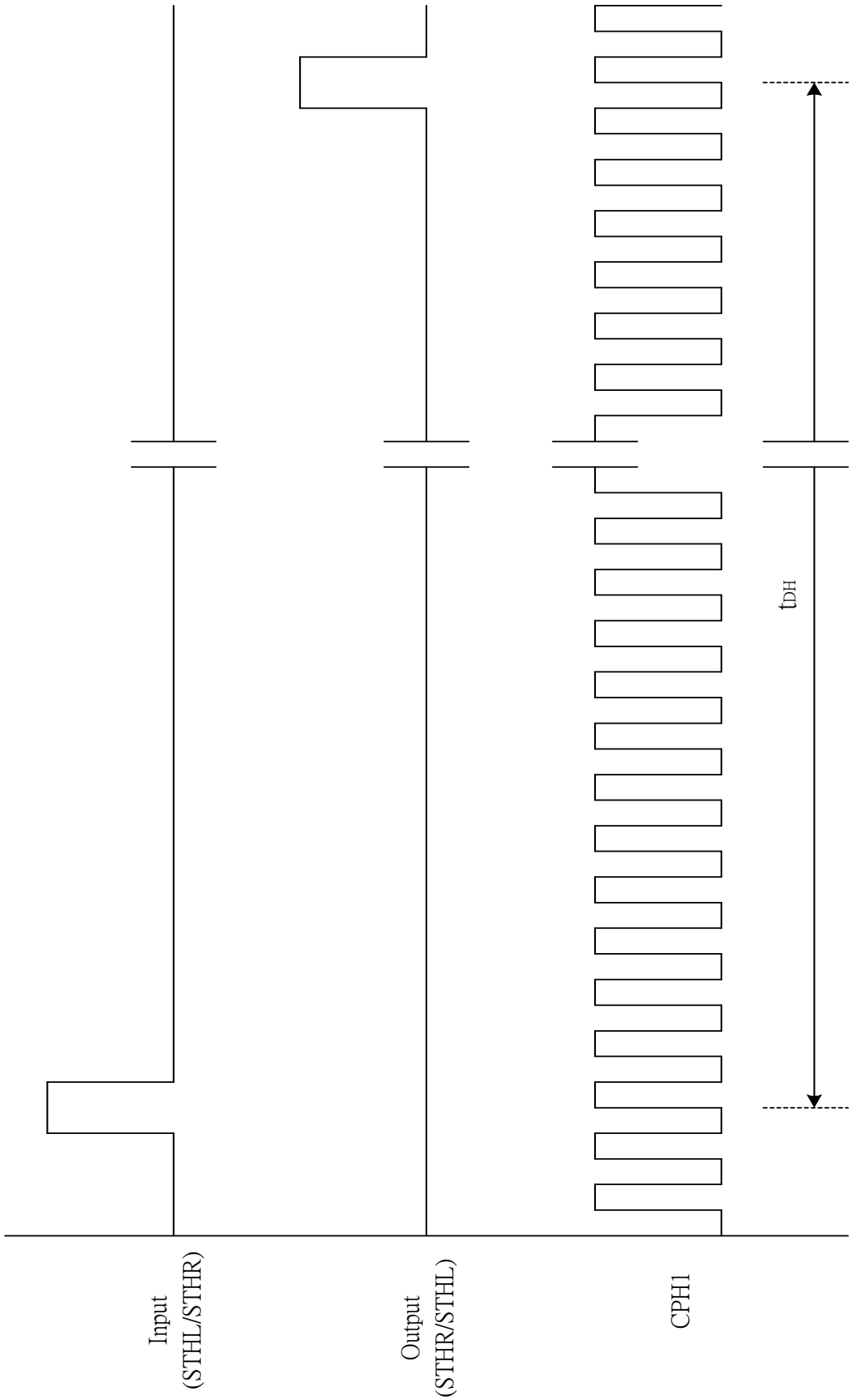



Fig. 8-2 Horizontal display timing range

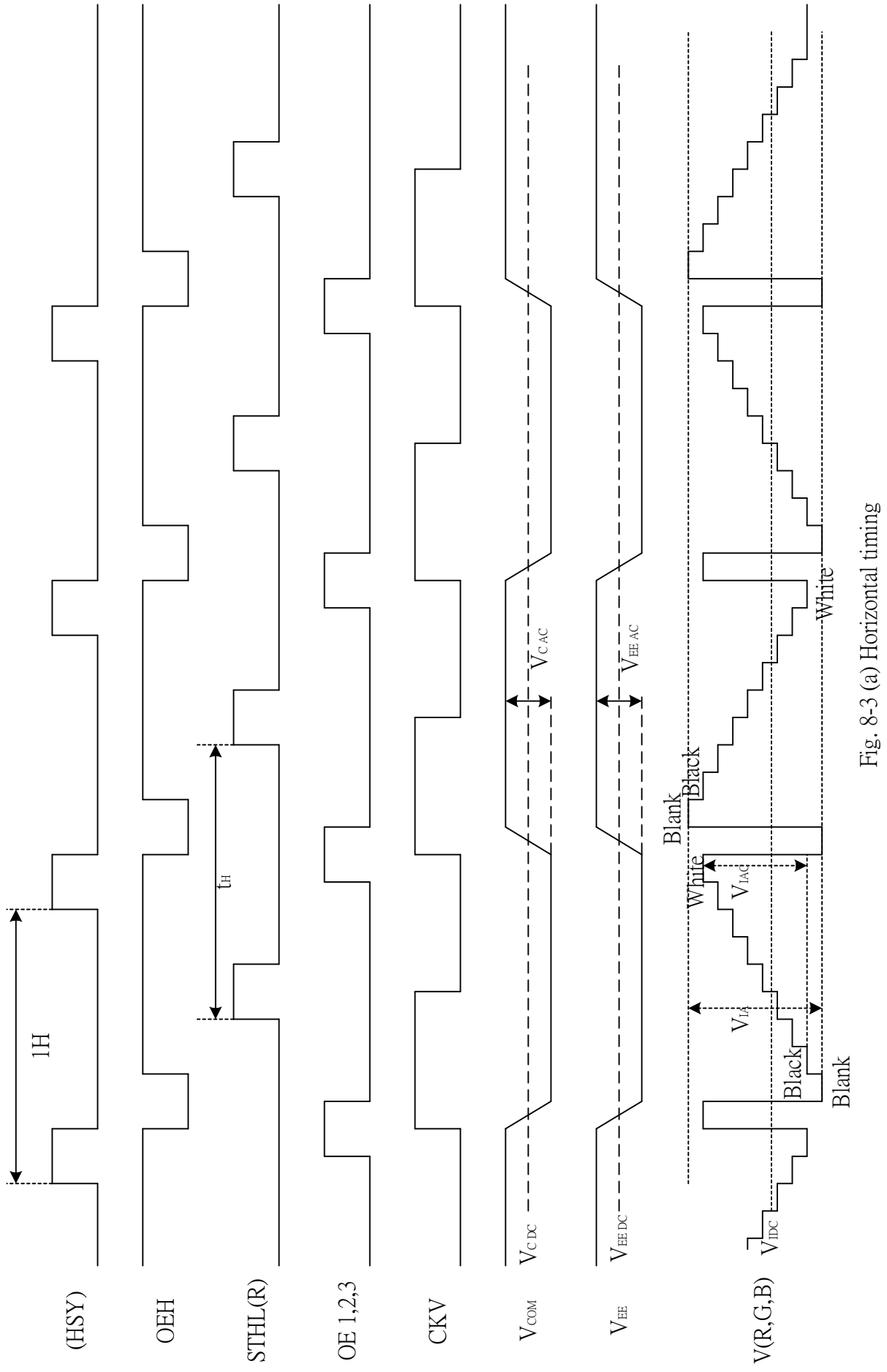
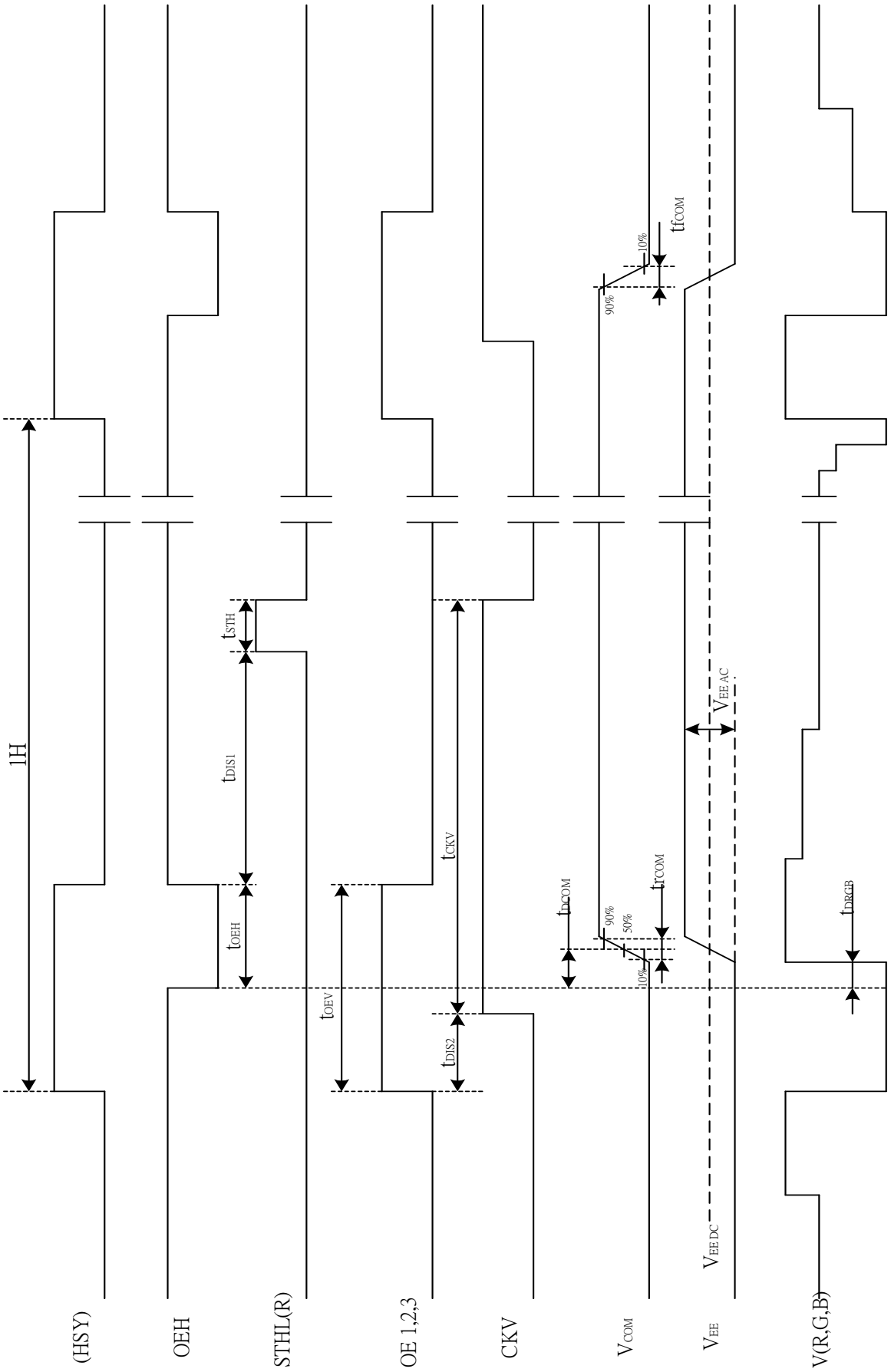



Fig. 8-3 (a) Horizontal timing




Note : The falling edge of OEV should be synchronized with the falling edge of OEH

Fig. 8-3 (b) Detail horizontal timing

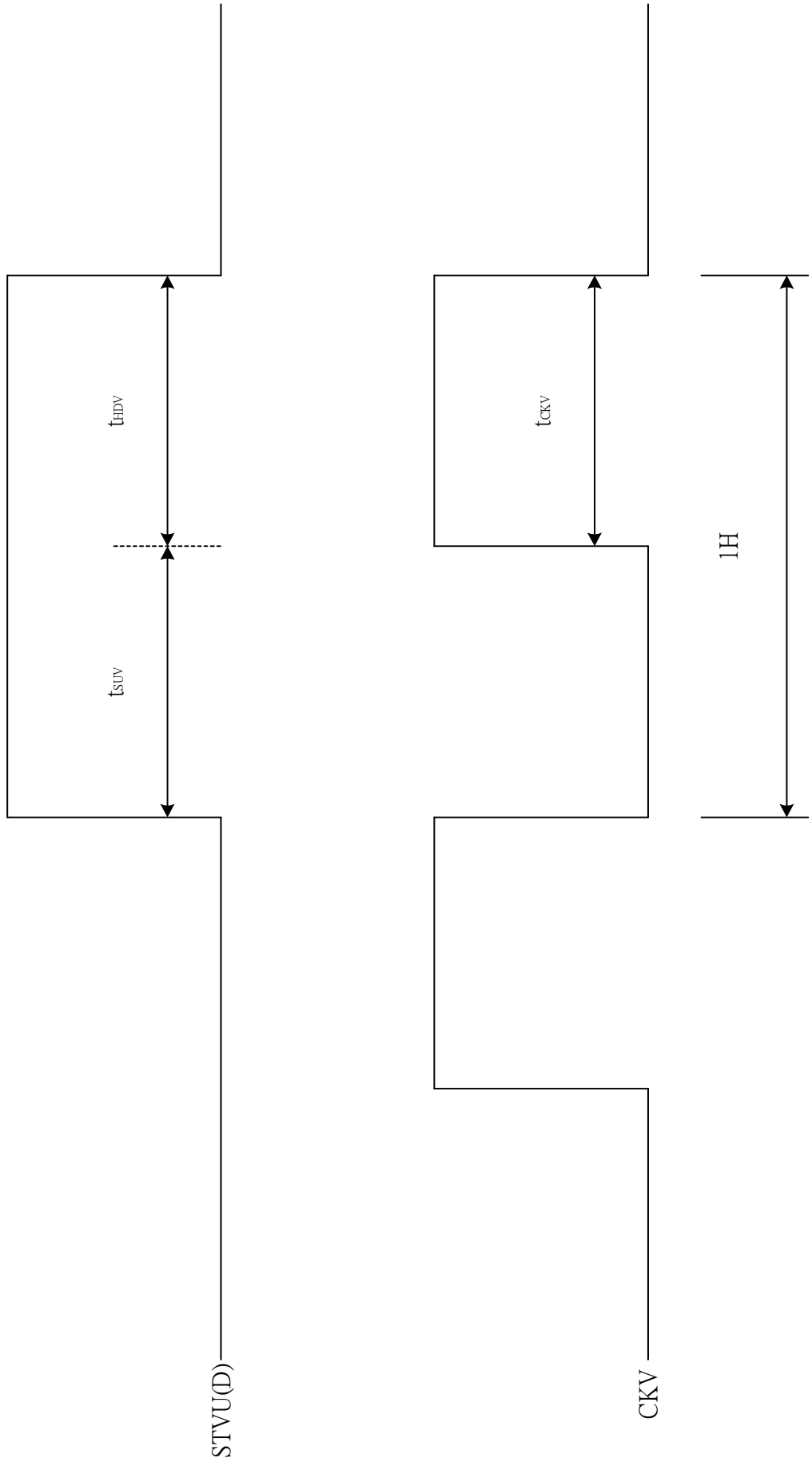



Fig. 8-4 Vertical shift clock timing

Vertical timing (From up to down)

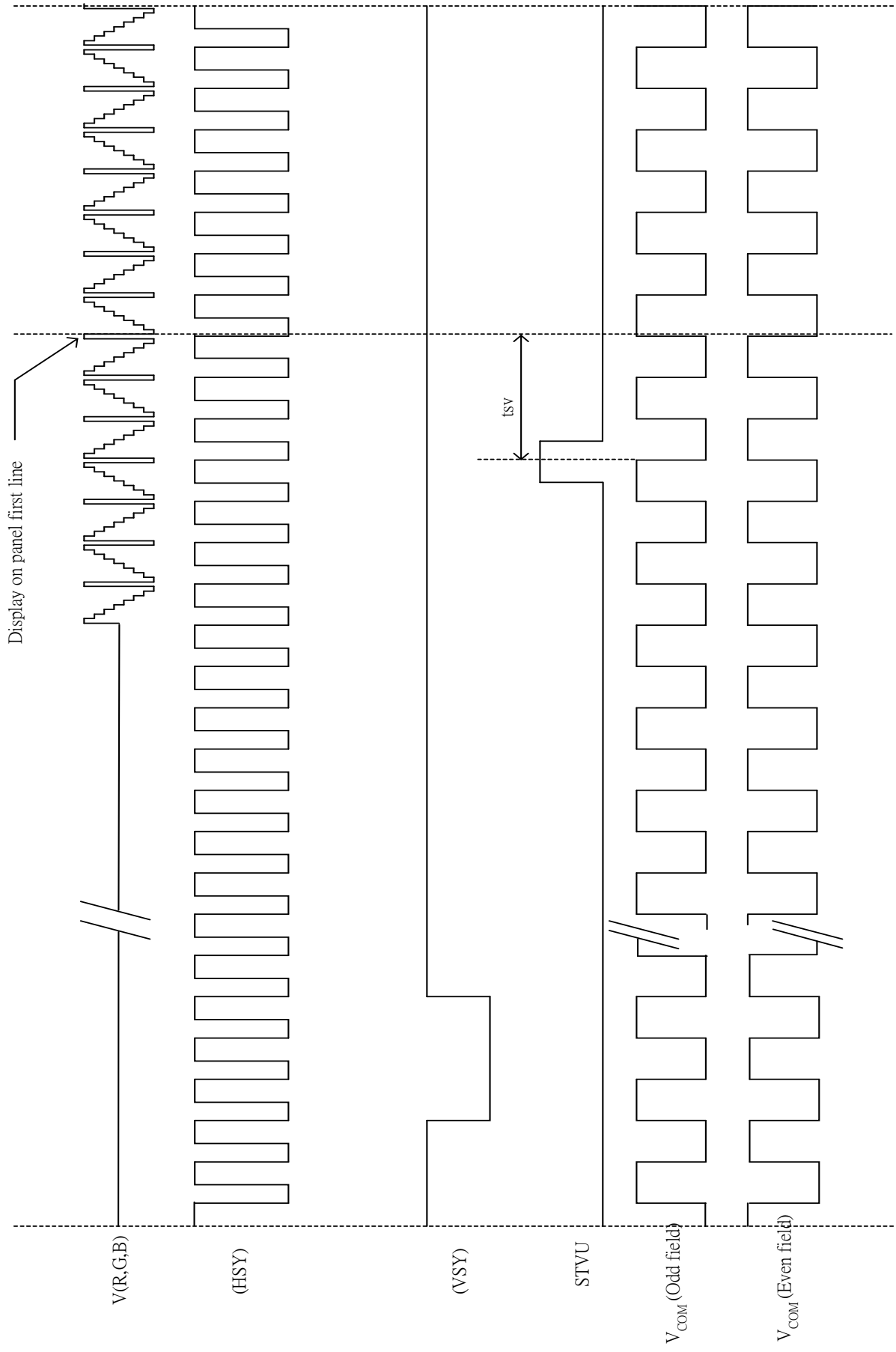



Fig. 8-5 (a) Vertical timing (From Up to Down)

Vertical timing (From down to up)

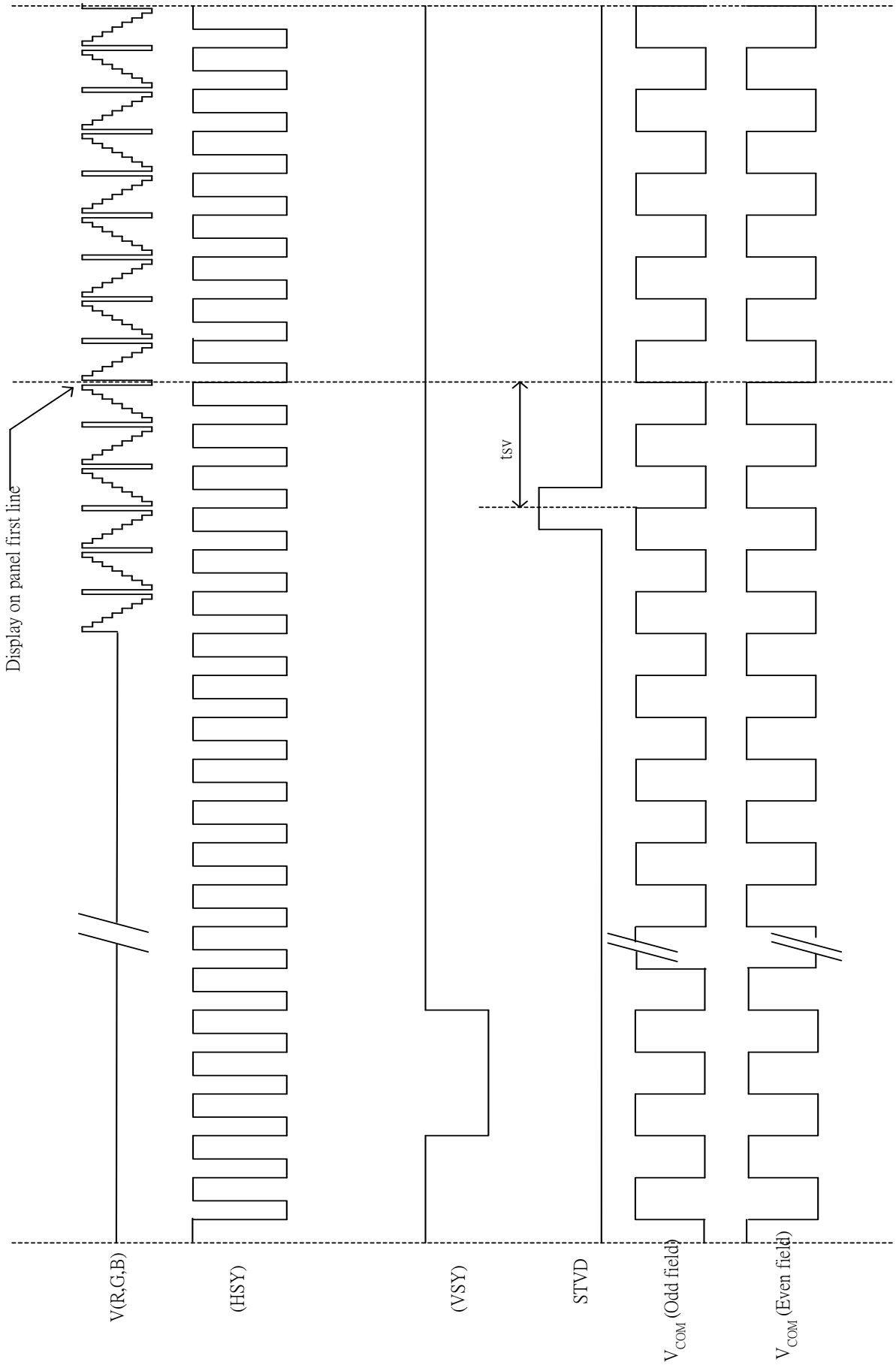
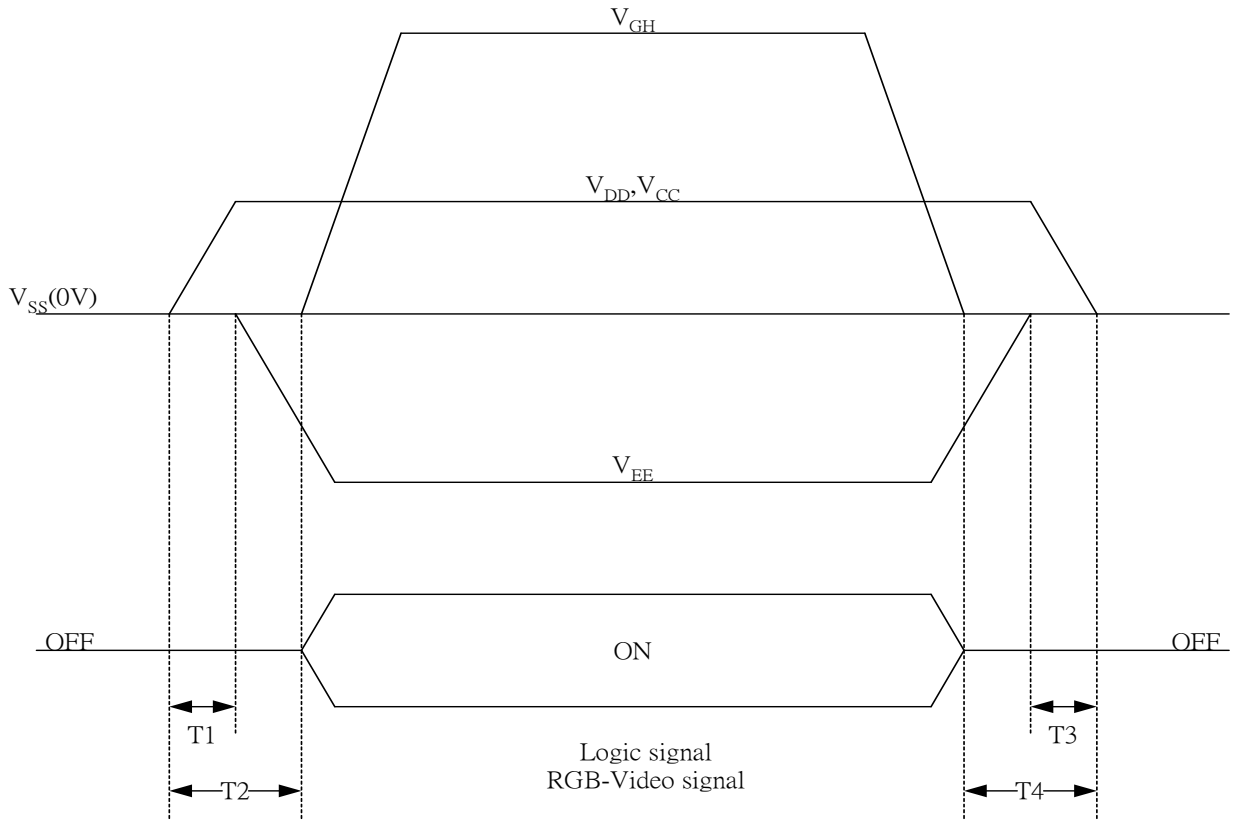



Fig. 8-5 (b) Vertical timing (From Down to Up)

9. Power on Sequence

The Power on Sequence only effect by $V_{CC}$,$V_{SS}$,$V_{DD}$,$V_{EE}$ and $V_{GH,}$ the others do not care.




1) 10ms≦T1<T2
2) 0ms<T3≦T4≦10ms

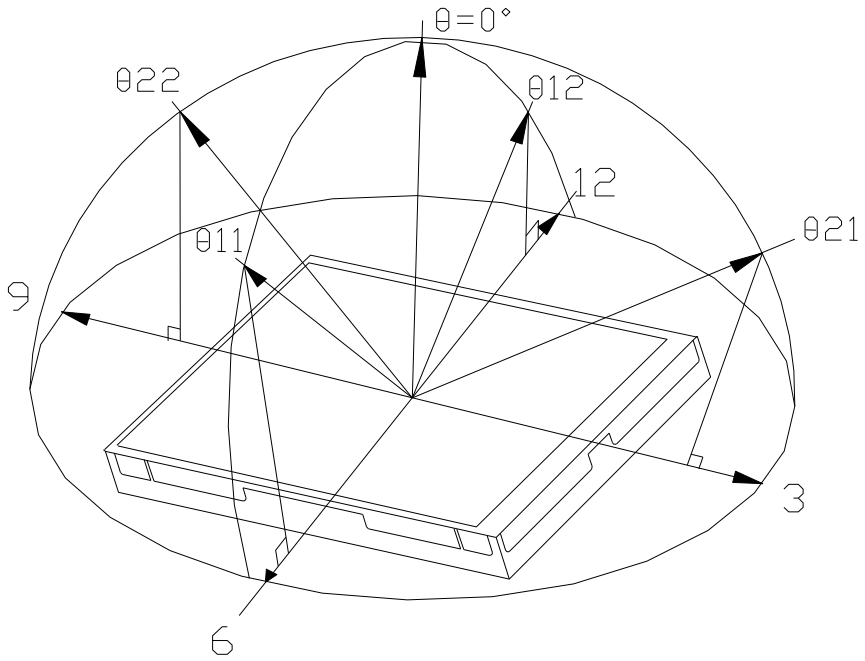
10. Optical Characteristics

10-1) Specification

Ta = 25℃

| Parameter | | Symbol | Condition | MIN. | TYP. | MAX. | Unit | Remarks |
|---|---|---|---|---|---|---|---|---|
| Viewing Angle | Horizontal | $\theta$ 21, $\theta$ 22 | CR≧10 | 55 | 60 | | deg | Note 10-1 |
| | Vertical | $\theta$ 12 | | 35 | 40 | | deg | |
| | | $\theta$ 11 | | 50 | 55 | | deg | |
| Contrast Ratio | | CR | At optimized Viewing angle | 200 | 350 | | | Note 10-2 |
| Response time | Rise | Tr | $\theta$ =0° | | 15 | 30 | ms | Note 10-4 |
| | Fall | Tf | | | 25 | 50 | ms | |
| Brightness | | | | 350 | 400 | | cd/㎡ | Note 10-3 |
| Uniformity | | U | | 70 | 75 | | % | Note 10-5 |
| White Chromaticity | | x | $\theta$ =0° | 0.283 | 0.313 | 0.343 | | Note 10-3 |
| | | y | | 0.299 | 0.329 | 0.359 | | |
| Lamp Life Time +25℃ | | | | 20000 | 30000 | | hr | |

Note 10-1 : The definitions of viewing angles




Note 10-2 : CR = $\frac{\text{Luminance when Testing point is White}}{\text{Luminance when Testing point is Black}}$

(Testing configuration see 10-2 )

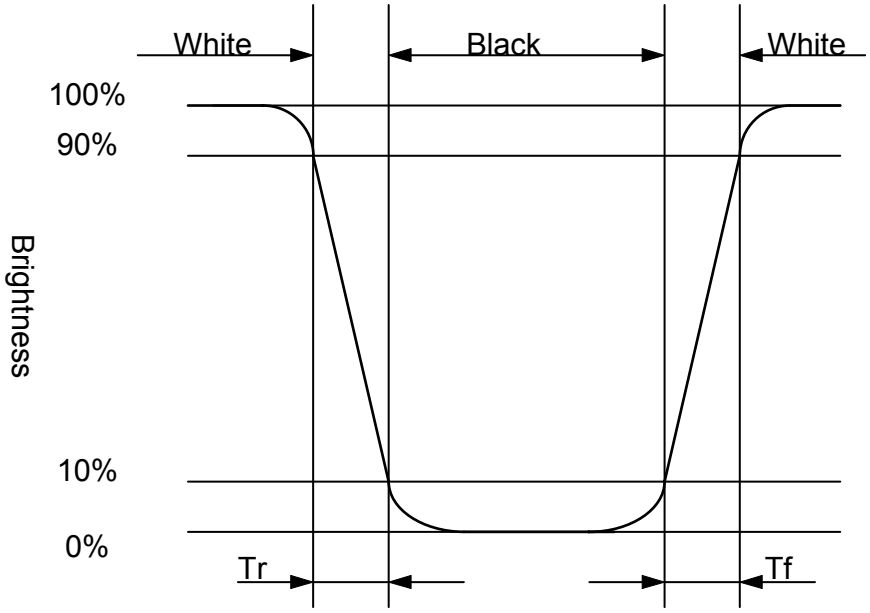
Contrast Ratio is measured in optimum common electrode voltage.

Note 10-3 : 1.Topcon BM-7(fast) luminance meter 1° field of view is used in the testing (after 20~30 minutes operation).

2.Lamp current : 6 mA

3.Inverter model : TDK-347.

Note 10-4 : The definition of response time:

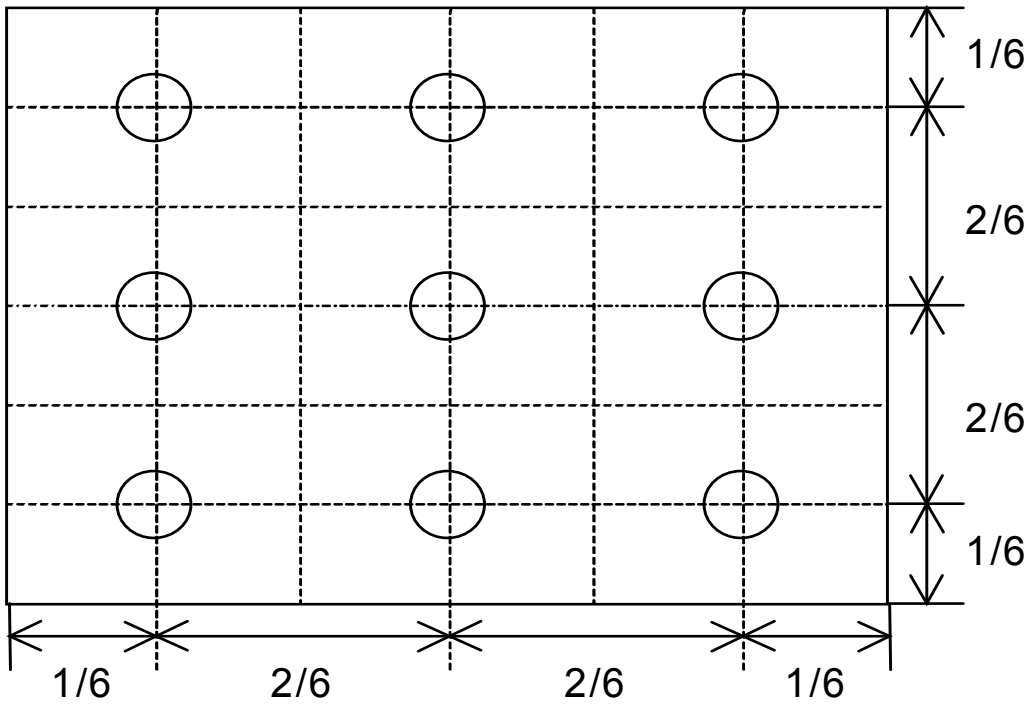


Note 10-5 : The uniformity of LCD is defined as

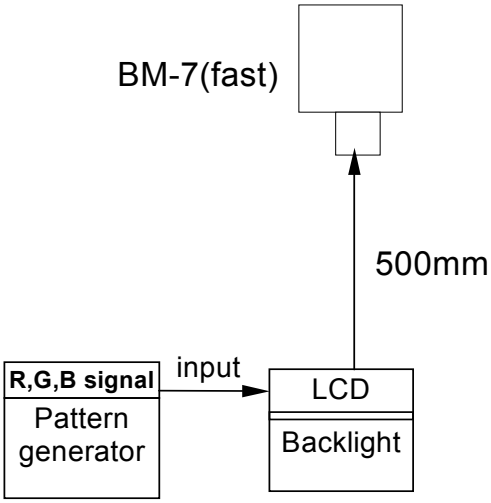
$$U = \frac{\text{The Minimum Brightness of the 9 testing Points}}{\text{The Maximum Brightness of the 9 testing Points}}$$

Luminance meter : BM-5A or BM-7 fast (TOPCON)
Measurement distance : 500 mm +/- 50 mm
Ambient illumination : < 1 Lux
Measuring direction : Perpendicular to the surface of module

The test pattern is white (Gray Level 63).

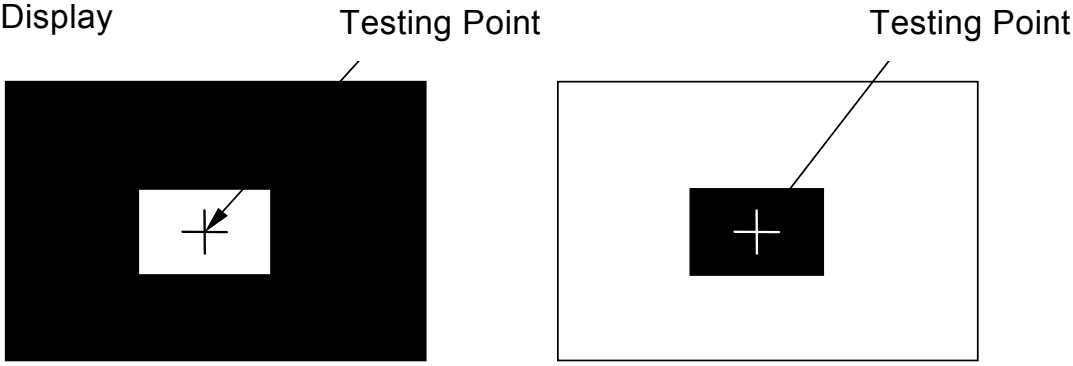


10-2) Testing configuration



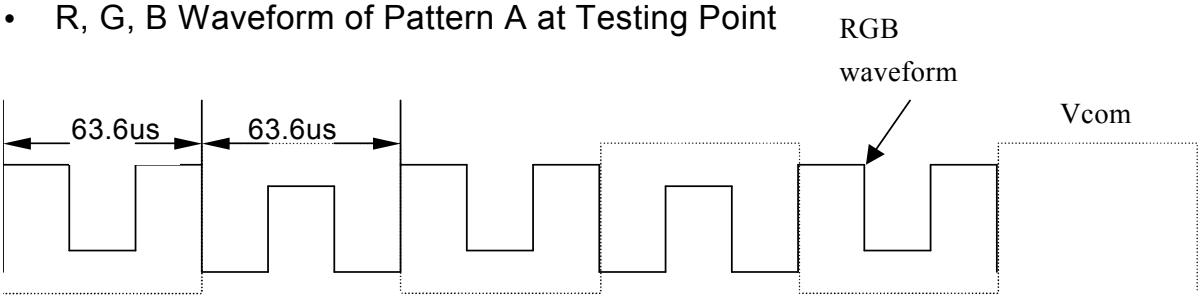

Caution: 1. Environmental illumination ≦ 1 lux
2. Before test CR, Vcom voltage must be adjusted carefully to get the best CR.

- LCD Display

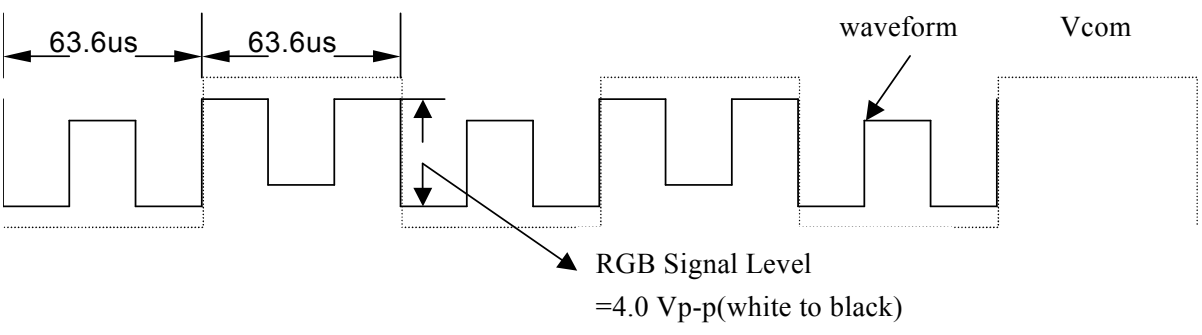



Pattern A Pattern B

- R, G, B Waveform of Pattern A at Testing Point




- R, G, B Waveform of Pattern B at Testing Point



## 11. Handling Cautions

### 11-1) Mounting of module

1. Please power off the module when you connect the input/output connector.

b) Please connect the ground pattern of the inverter circuit surely. If the connection is not perfect, some following problems may happen possibly.

1. The noise from the backlight unit will increase.
2. The output from inverter circuit will be unstable.
1. In some cases a part of module will heat.

c) Polarizer which is made of soft material and susceptible to flaw must be handled carefully.

d) Protective film (Laminator) is applied on surface to protect it against scratches and dirt. It is recommended to peel off the laminator before use and taking care of static electricity.

### 11-2) Precautions in mounting

1. When metal part of the TFT-LCD module (shielding lid and rear case) is soiled, wipe it with soft dry cloth.

b) Wipe off water drops or finger grease immediately. Long contact with water may cause discoloration or spots.

c) TFT-LCD module uses glass which breaks or cracks easily if dropped or bumped on hard surface. Please handle with care.

d) Since CMOS LSI is used in the module. So take care of static electricity and earth yourself when handling.

### 11-3) Others

1. Do not expose the module to direct sunlight or intensive ultraviolet rays for many hours.

b) Store the module at a room temperature place.

c) The voltage of beginning electric discharge may over the normal voltage because of leakage current from approach conductor by to draw lump read lead line around.

d) If LCD panel breaks, it is possibly that the liquid crystal escapes from the panel. Avoid putting it into eyes or mouth. When liquid crystal sticks on hands, clothes or feet. Wash it out immediately with soap.

e) Observe all other precautionary requirements in handling general electronic components.

### 11-4) Polarizer mark

The polarizer mark is to describe the direction of wide view angle film how to mach up with the rubbing direction.

12. Reliability Test

| No. | Test Item | Test Condition |
|---|---|---|
| 1 | High Temperature Storage Test | Ta = +95℃, 240 hrs |
| 2 | Low Temperature Storage Test | Ta = -40℃, 240 hrs |
| 3 | High Temperature Operation Test | Ta = +85℃, 240 hrs |
| 4 | Low Temperature Operation Test | Ta = -30℃, 240 hrs (Note 12-1) |
| 5 | High Temperature & High Humidity Operation Test | Ta = +60℃, 90%RH , 240 hrs |
| 6 | Thermal Cycling Test (non-operating) | -30℃ → +80℃ , 200 Cycles<br>30 min 30 min |
| 7 | Vibration Test (non-operating) | Frequency : 10 ~ 55 $H_Z$<br>Amplitude : 1 mm<br>Sweep time : 11 mins<br>Test Period : 6 Cycles for each direction of X, Y, Z |
| 8 | Shock Test (non-operating) | 100G , 6ms<br>Direction : ±X , ±Y , ±Z<br>Cycle : 3 times |
| 9 | Electrostatic Discharge Test (non-operating) | 200pF , 0Ω<br>±200V<br>1 time / each terminal |

Ta: ambient temperature

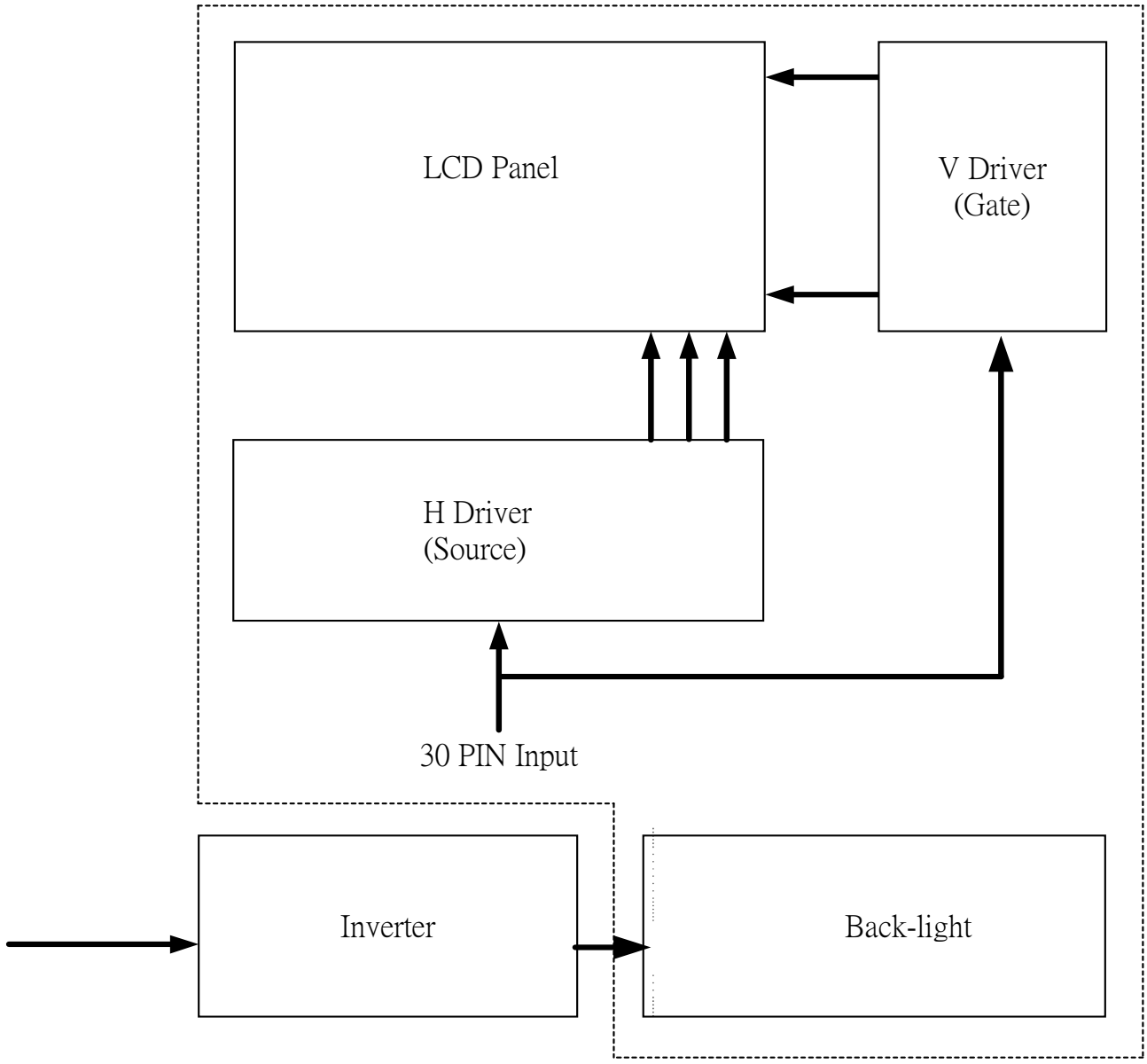
Note : PVI guarantee the module can power on under –30℃

Note : The protective film must be removed before temperature test.

[Criteria]

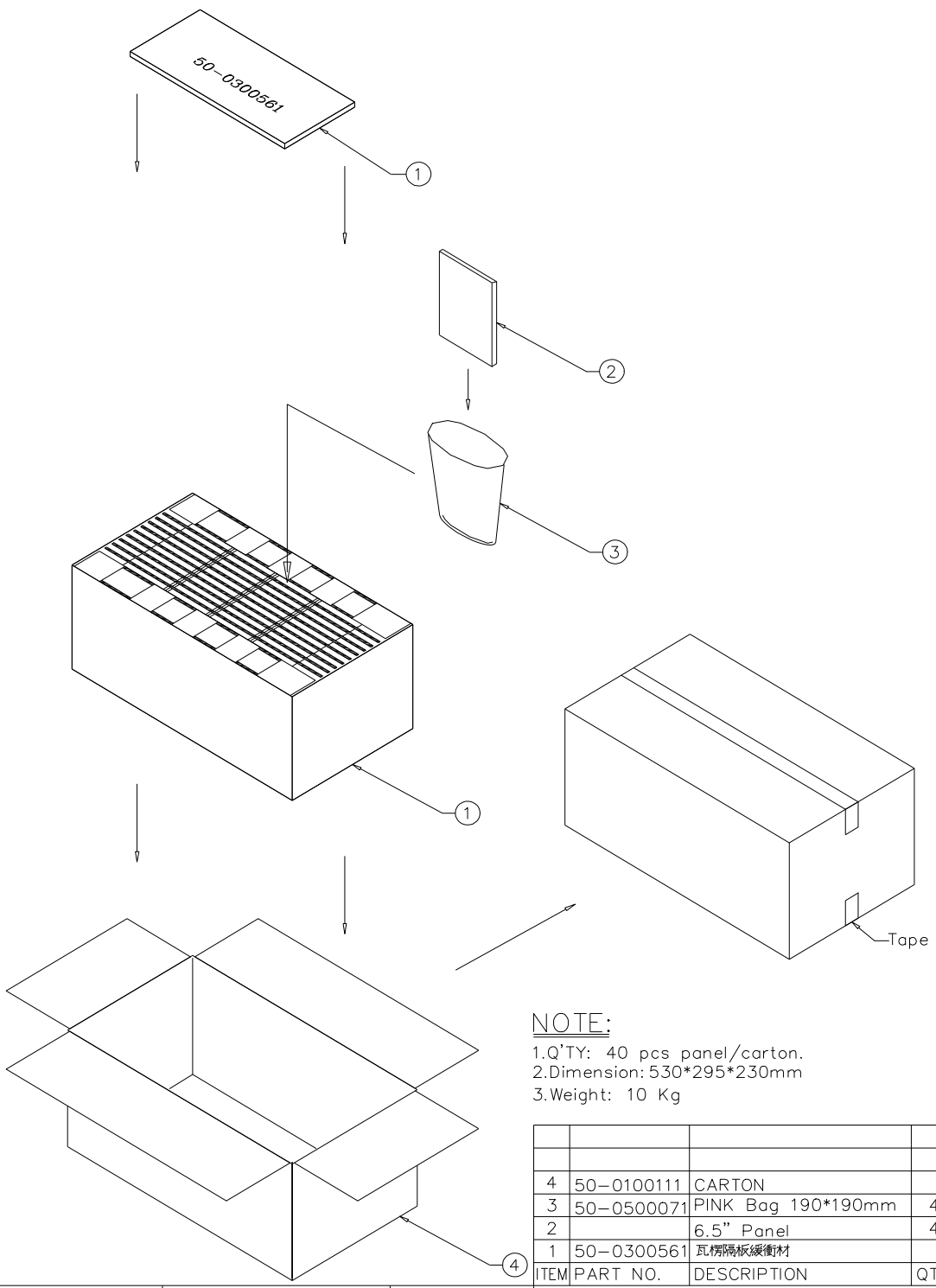
Under the display quality test conditions with normal operation state, there should be no change which may affect practical display function.

13. Block Diagram



## 14. Packing

| ZONE | REV. | DOCUUMENT NO. | DESCRIPTION | DATE | REV.BY |
|---|---|---|---|---|---|




NOTE:

1.Q'TY: 40 pcs panel/carton.
2.Dimension: 530*295*230mm
3.Weight: 10 Kg

| ITEM | PART NO. | DESCRIPTION | QTY | REMARK |
|---|---|---|---|---|
| | | | | |
| | | | | |
| 4 | 50-0100111 | CARTON | 1 | |
| 3 | 50-0500071 | PINK Bag 190*190mm | 40 | 抗靜電 |
| 2 | | 6.5" Panel | 40 | |
| 1 | 50-0300561 | 瓦楞隔板緩衝材 | 1 | 上蓋+ 底座 |

| MTL.SPEC. | UNSPECIFIED TOL'S<br>ANGLE<br>ROUGHNESS | REMARK |
|---|---|---|

元太科技工業股份有限公司
Prime View International Co., Ltd.

| | | | SCALE | UNIT | SHEET | DWG.TITLE |
|---|---|---|---|---|---|---|
| APPROVE | | . . | | | 1 OF 1 | 6.5" Model Packing Draw |
| CHECK | | . . | | | | |
| DRAWN | Jimmy | '02.09.23 | MTL.NO. | DWG FILE: | REV. 01 | A4 SIZE |

# Revision History

| Rev. | Issued Date | Revised Contents |
|---|---|---|
| 0.1 | Oct. 30 , 2001 | NEW |
| 0.2 | Mar. 05 , 2002 | Modify<br>Page 17 : Power on sequence<br>Page 19 : Note 10-5: The uniformity of LCD testing points defined<br>Page 22 : Reliability test condition |
| 0.3 | Mar. 14 , 2002 | Modify<br>Page 8 : Power Consumption |
| 0.4 | Apr. 12 , 2002 | Modify<br>Page 4 : Mechanical Drawing of TFT-LCD Module |
| 0.5 | Jul. 12 , 2002 | Modify<br>Page 6 : Pixel Arrangement and input connector pin NO.<br>Page 8 : Power Consumption<br>Page 10 : Signal Timing Waveforms<br>Page 17 : Optical Characteristics |
| 0.6 | Aug. 21 , 2002 | Modify<br>Page 22 : Reliability Test (About High Temperature test) |
| 0.7 | Sep. 16 , 2002 | Modify<br>Page 5 : Note description<br>Page 7 : Recommended Driving condition for TFT-LCD panel |
| 0.8 | Sep. 26 , 2002 | Modify<br>Page 23 : Packing |
| 1.0 | Nov. 04 , 2002 | Modify<br>Page 3 : Mechanical Specifications<br>Page 4 : Mechanical Drawing of TFT-LCD Module (FPC length)<br>Page 8 : Power Consumption |
| 1.1 | Mar. 27 , 2003 | Modify<br>Page 8 : Power Consumption (From 79.83mW to 109.76mW Typ.)<br>(From 98.54mW to 134.14mW Max.) |
| 1.2 | Aug. 29 , 2003 | Modify<br>Page 4 : Mechanical Drawing of TFT-LCD Module |
| 1.3 | Sep. 19 , 2003 | Modify<br>Page 8 : Power Consumption (From 109.76mW to 132.34mW Typ.)<br>(From 134.14mW to 179.19mW Max.) |
| 1.4 | Nov. 25 , 2003 | Modify<br>Page 17 : Optical Characteristics (contrast ratio from 110 to 200 Min.)<br>(contrast ratio from 150 to 350 Typ.) |
| 1.5 | Jan. 11 , 2005 | Removed<br>Page 22 : Indication of Lot Number Label<br>Add<br>Page 22 : Reliability<br>(Note : The protective film must be removed before temperature test.) |
| 1.6 | Apr. 12 , 2005 | Modify :<br>Page 04: Mechanical Drawing of TFT-LCD Module( GND line).<br>Page 06: Note 5-3 : $V_{CC}$ TYP.＝+3.3V<br>Note 5-7 : $V_{DD1}$ TYP.＝+3.3V<br>Page 07: 8-1) Recommended Driving condition for TFT-LCD panel<br>1 VDD1 , VCC Typ. 5V to 3.3V ; Max. 5.5V to 3.6V ; Min 4.5V to 3.0V. |

| | | |
|---|---|---|
| | | 2 Power Consumption Typ. 132.34mW to 129.73mW; Max 179.19mW to 170.56mW<br>Page 22: Reliability Test condition change to Car application SPEC. |