

Version : 0.1

TECHNICAL SPECIFICATION

MODEL NO. : PA025XSC

Customer's Approved

Customer _____

Date _____

By _____

PVI's Confirmation

Approved By _____

Prepared By _____

FOR MORE INFORMATION:

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Date : Mar. 30 , 2004

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TECHNICAL SPECIFICATION**CONTENTS**

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1. Application

This technical specification applies to 2.5" color TFT-LCD panel. The 2.5" color TFT LCD panel is designed for camcorder, digital camera application and other electronic products which require high quality flat panel displays.

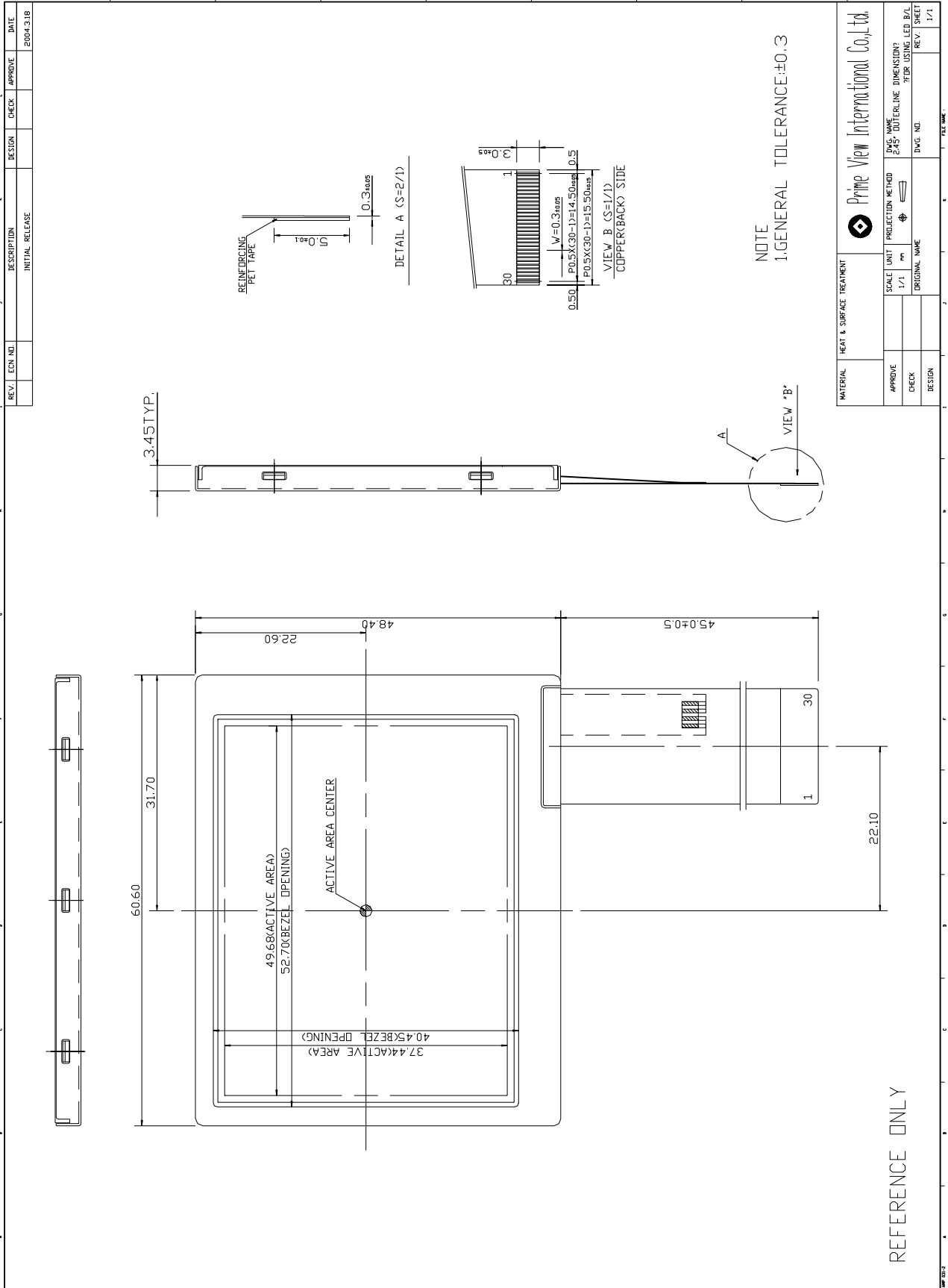
2. Features

- . Compatible with NTSC or PAL system
- . High Resolution : 112,320 Dots
- . Optimum Viewing Direction : 6 o'clock
- . Up/Down and Left/Right Image Reversion

3. Mechanical Specifications

| Parameter | Specifications | Unit |
|---------------------|----------------------------|-------------|
| Screen Size | 2.45 (diagonal) | inch |
| Surface Treatment | Anti-Glare | |
| Display Format | 480×234 | dot |
| Active Area | 49.68 (H)×37.44 (V) | Mm |
| Dot Pitch | 0.1035 (W)×0.160 (H) | mm |
| Pixel Configuration | Delta | |
| Outline Dimension | 60.6 (W)×48.4 (H)×3.45 (D) | mm |
| Weight | 20±3 | g |

4. Mechanical Drawing of panel



| | | | | | | |
|------|---------|-----------------|--------|-------|---------|-----------|
| REV. | ECN NO. | DESCRIPTION | DESIGN | CHECK | APPROVE | DATE |
| | | INITIAL RELEASE | | | | 2004.3.18 |

| | | | | | |
|----------|-------|--------------------------|-------------------|------------------------------------|--------------|
| MATERIAL | | HEAT & SURFACE TREATMENT | | PRIME VIEW INTERNATIONAL CO., LTD. | |
| APPROVE | SCALE | UNIT | PRODUCTION METHOD | DWG. NAME | DIMENSIONS |
| CHECK | 1/1 | mm | 245° DUTERLINE | PA025XSC | LED B/L |
| DESIGN | | | | DWG. NO. | REV. / SHEET |
| | | | | | 1 / 1 |

5. Input / Output Terminals

| Pin No | Symbol | I/O | Description | Remark |
|--------|------------------|-----|--|----------|
| 1 | STH1 | I/O | Start pulse for source driver | Note 5-1 |
| 2 | AV _{SS} | I | Analog GND for source driver | |
| 3 | AV _{DD} | I | Analog power input for source driver | Note 5-2 |
| 4 | V _B | I | Video Input B | Note 5-4 |
| 5 | V _G | I | Video Input G | |
| 6 | V _R | I | Video Input R | |
| 7 | V _{SS} | I | Digital GND | |
| 8 | V _{DD} | I | Digital power input | Note 5-3 |
| 9 | CPH1 | I | Sampling and shift clock for source driver | |
| 10 | CPH2 | I | Sampling and shift clock for source driver | |
| 11 | CPH3 | I | Sampling and shift clock for source driver | |
| 12 | STH2 | I/O | Start pulse for source driver | Note 5-1 |
| 13 | Q2H | I | Video input rotation control | |
| 14 | INH | I | Output enable for source driver | |
| 15 | R/L | I | Left/Right Control for source driver | Note 5-1 |
| 16 | V _{COM} | I | Common electrode voltage | Note 5-4 |
| 17 | XOE | I | Output enable for gate driver | |
| 18 | CPV | I | Clock input for gate driver | |
| 19 | U/D | I | Up/Down Control for gate driver | |
| 20 | DIO2 | I/O | Vertical start pulse | Note 5-5 |
| 21 | DIO1 | I/O | Vertical start pulse | |
| 22 | V _{GL} | I | Gate off voltage(alternative every 1-H) | Note 5-4 |
| 23 | V _{EE} | I | Gate driver negative voltage | Note 5-6 |
| 24 | V _{SS} | I | GND | |
| 25 | V _{CC} | I | Logic power for gate driver | Note 5-3 |
| 26 | V _{GH} | I | Gate on voltage | Note 5-7 |
| 27 | NC | - | No connection | - |
| 28 | NC | - | No connection | - |
| 29 | GLD | | Supply current for LED | Note 5-8 |
| 30 | VLED | | Supply voltage for LED | Note 5-9 |

Note 5-1 : STH1, STH2 and R/L mode

| R/L | STH1 | STH2 | Remark |
|--------------|--------|--------|---------------|
| High(VDD) | Input | Output | Left to Right |
| Low(0 Volt.) | Output | Input | Right to Left |

Note 5-2 : $AV_{DD} = +5V$ (Typ.)

Note 5-3 : $V_{DD}, V_{CC} = +5V$ (Typ.)

Note 5-4 : $V_{COM} = 6V_{PP}$.

Phase of the video signal input and V_{COM}

The relation between these values could refer to 8-1 Operating condition.

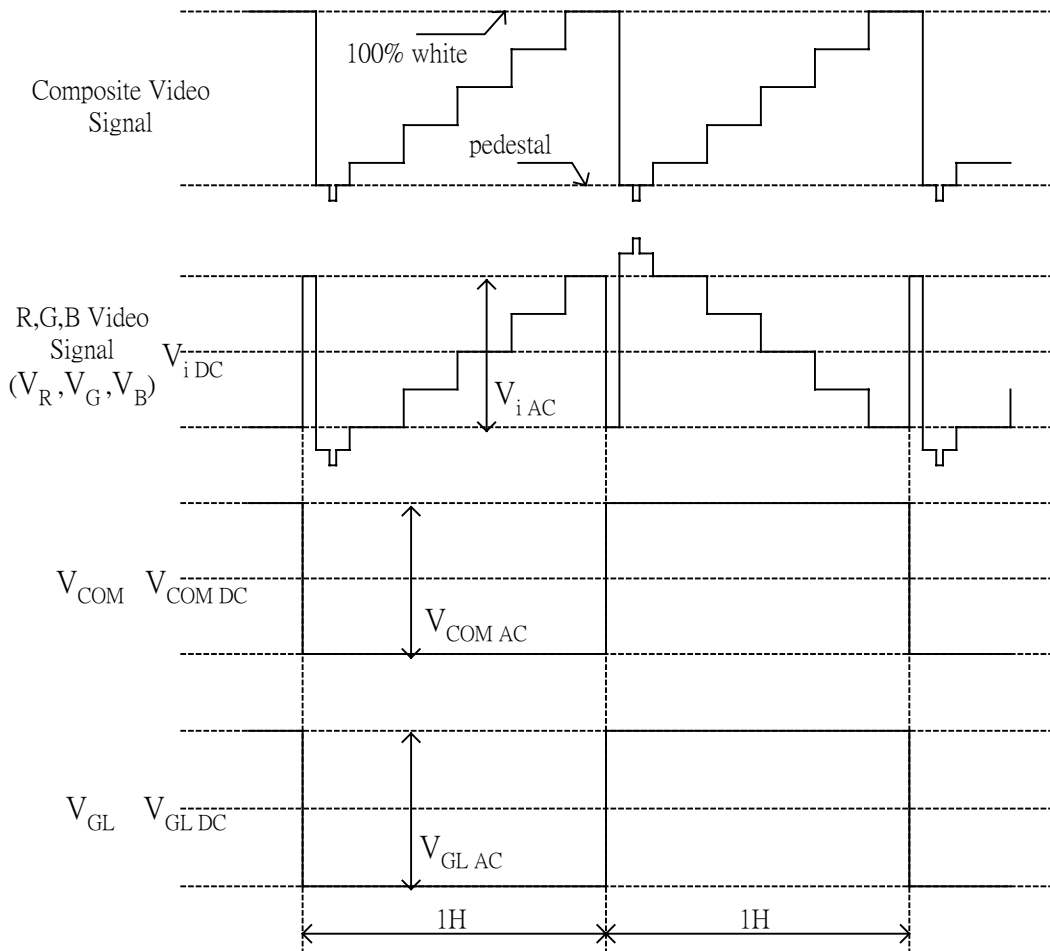


Fig.1

Liquid crystal transmission of the video signal input, V_{COM} and timing

| | V_{COM} | |
|----------------------------|-----------|---------|
| | H Level | L Level |
| Video Signal Input Maximum | Black | White |
| Video Signal Input Minimum | White | Black |

White : maximum transmission / Black : minimum transmission

Note 5-5 : DIO1, DIO2 and U/D mode

| U/D | DIO1 | DIO2 | Remark |
|---------------|--------|--------|------------|
| High (VDD) | Input | Output | Down to Up |
| Low (0 Volt.) | Output | Input | Up to Down |

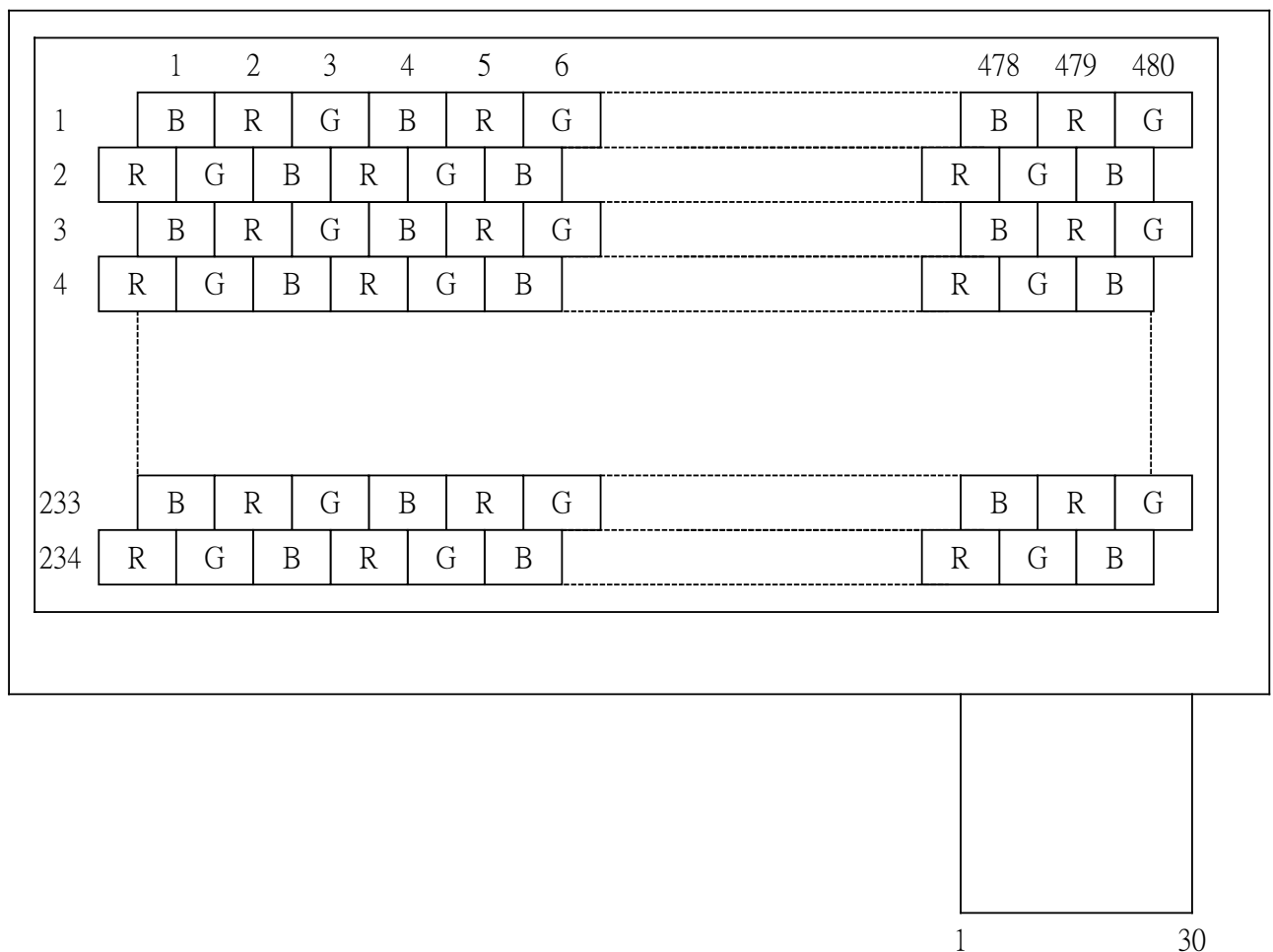
Note 5-6 : $V_{EE} = -15V$ (Typ.).

Note 5-7 : $V_{GH} = +15V$ (Typ.).

Note 5-8 : $GLED = 20mA$ (Typ.).

Note 5-9 : $VLED = +17V$ (Typ.).

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.

GND = 0 V , Ta = 25 °C

| Parameter | | Symbol | MIN. | MAX. | Unit | Remark |
|-------------------------------------|----------|-----------------|------|------|------|----------|
| Supply Voltage For Source Driver | Analog | AV_{DD} | -0.3 | +7.0 | V | |
| | Digital | V_{DD} | -0.3 | +7.0 | | |
| Supply Voltage For Gate Driver | Positive | V_{GH} | -0.3 | +45 | V | |
| | Negative | V_{GL} | -23 | +0.3 | V | |
| | | $V_{GH}-V_{GL}$ | +15 | +40 | V | |
| Analog input voltage | | V_{Video} | -0.3 | +7.3 | V | Note 7-1 |
| Storage Temperature | | | -20 | +70 | °C | |
| Operation Temperature | | | 0 | +60 | °C | Note 7-2 |

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

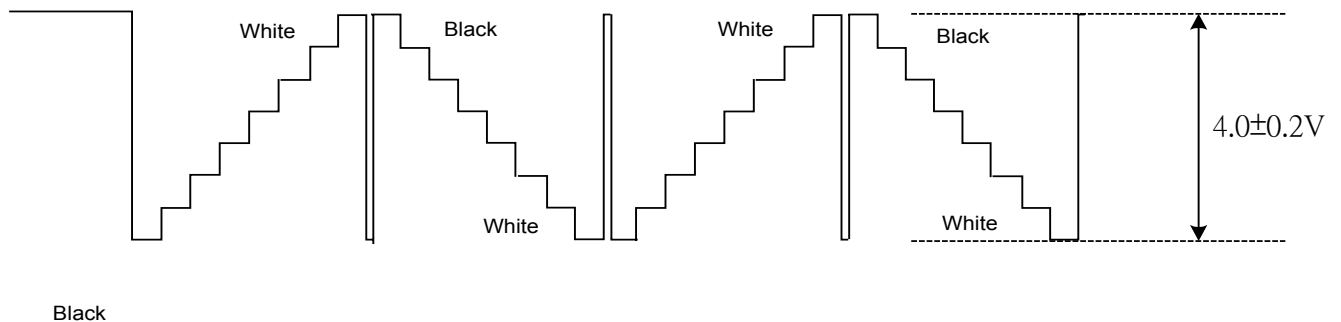
Notes 7-2 : Operating Temperature define that contrast, response time, other display optical character are Ta=+25.

8. Electrical Characteristics
8-1) Operating Condition

| Item | Symbol | Min. | Typ. | Max. | Unit | Remark | |
|-------------------------------------|--------------|----------|---------------|-------|---------------|---------------------------|----------|
| Power Supply | V_{CC} | +4.5 | +5.0 | +5.5 | V | | |
| | V_{DD} | +3.0 | +3.3 | +3.6 | | | |
| | AV_{DD} | +4.5 | +5.0 | +5.5 | V | | |
| | V_{GH} | +14.5 | +15.0 | +15.5 | V | | |
| | V_{EE} | -15.5 | -15.0 | -14.5 | V | | |
| | $V_{GL AC}$ | - | +6.0 | - | V_{P-P} | AC Component of V_{GL} | |
| | $V_{GL DC}$ | -12.5 | -11.0 | -9.5 | V | DC Component of V_{GL} | |
| Video Signal (V_R, V_G, V_B) | $V_{i AC}$ | - | +4.0 | +4.2 | V_{P-P} | AC Component Note 8-2 | |
| | $V_{i DC}$ | - | +2.5 | - | V | DC Component | |
| V_{COM} | $V_{COM AC}$ | - | +6.0 | - | V_{P-P} | AC Component of V_{COM} | |
| | $V_{COM DC}$ | +0.9 | +1.0 | +1.1 | V | DC Component of V_{COM} | |
| | H Level | V_{IH} | +0.7 V_{DD} | - | - | V | Note 8-1 |
| | L Level | V_{IL} | - | - | +0.3 V_{DD} | V | |

Note 8-1 : STH1,STH2,CPH1,CPH2,CPH3,Q2H,INH,CPV,XOE,DIO1,DIO2

Note 8-2 : Both NTSC and PAL system Video Signal input waveform is based on 8 steps gray scale.



8-2) Current Consumption (GND=AV_{SS}=0V)

Ta= 25 °C

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit | Remark |
|--------------------|------------------|-----------------------|------|------|------|------|--------------------------------|
| Current for Driver | I _{GH} | V _{GH} =+15V | - | 0.1 | 0.2 | mA | |
| | I _{GL} | V _{GL} =-12V | - | 0.36 | 0.9 | mA | V _{GL} center voltage |
| | I _{CC} | V _{CC} =+5V | - | 0.2 | 0.4 | mA | |
| | AI _{DD} | AV _{DD} =+5V | - | 3.5 | 5.0 | mA | |
| | I _{DD} | V _{DD} =+5V | - | 0.6 | 1.5 | mA | |
| | I _{EE} | V _{EE} =-15V | - | 0.3 | 0.6 | mA | |

8-3) Backlight driving & Power Consumption

| Pin No | Symbol | Description | Remark |
|--------|--------|------------------------|----------------------------|
| 29 | GLED | Supply current for LED | I _L |
| 30 | VLED | Supply voltage for LED | V _L Note 8-3 |

Note 8-3 : Supply voltage for LED would depend on supply current.

Ta= 25 °C

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Remark |
|----------------|----------------|------|------|------|------|----------------------|
| Supply voltage | V _L | - | 17 | - | V | I _L =20mA |
| Supply current | I _L | - | 20 | - | mA | |

Power Consumption

Ta= 25 °C

| Parameter | Symbol | Conditions | TYP. | Unit | Remark |
|----------------------------------|--------|------------|-------|------|----------|
| LCD Panel Power Consumption | | | 31.82 | mW | Note 8-5 |
| Backlight Lamp Power Consumption | | | 0.34 | W | Note 8-6 |
| Total Power Consumption | | | 0.372 | W | |

Note 8-5 : The power consumption for backlight is not included.

Note 8-6 : Backlight power consumption is calculated by I_L×V_L.

8-4) Input / Output Connector

LCD Module Connector
 FFC Down Connector,
 30 Pins
 Pitch : 0.5 mm

8-5) Timing Characteristics Of Input Signals

| Characteristics | Symbol | Min. | Typ. | Max. | Unit | Remark |
|-----------------------------------|-------------------|-------|-------|-------|------|-----------------|
| 1Field Scanning Period | t1V | - | 262.5 | - | H | |
| 1Line Scanning Period | t1H | - | 63.5 | - | μs | |
| Source Driver Operating Frequency | fhc | 1.0 | 3.14 | 5.0 | MHz | |
| Signal Sampling Pulse Width | tchw | 200 | 317.7 | 1000 | ns | |
| Signal Sampling Pulse Delay | tchd | 95.3 | 105.9 | 116.5 | ns | tchd 12,23 |
| Signal Sampling Pulse Width(H) | tchwh | 142.9 | 158.8 | 174.7 | ns | |
| Signal Sampling Pulse Delay(L) | tchwl | 142.9 | 158.8 | 174.7 | ns | |
| Source Start Signal Pulse Width | tshw | 90 | 317.7 | 630* | ns | *tshset=tshhld |
| Source Start Signal Setup Time | tshset | 20 | 158.8 | - | ns | |
| Source Start Signal Hold Time | tshhld | 20 | 158.8 | - | ns | |
| Source Output Enable Pulse Width | tohw | 1.0 | 2.0 | - | μs | |
| Source Start Signal Rising Time | tss | - | 9.8 | - | μs | |
| Video Input Signal Start Point | tvS | - | 10.0 | - | μs | |
| Phase Difference Between OEH&CPV | toc | 1.5 | 2.3 | - | μs | |
| Gate Clock Period | tcvw | 10 | 63.5 | - | μs | |
| Gate Clock Pulse Width(H) | tcvwh | 10 | 31.7 | 48 | μs | |
| Gate Clock Pulse Width(L) | tcvwl | 10 | 31.7 | 48 | μs | |
| Gate Start Signal Pulse Width | tsvw | 5 | 63.5 | 126** | μs | **tsvset=tsvhld |
| Gate Start Signal Setup Time | tsvset | 5 | 53.2 | - | μs | |
| Gate Start Signal Hold Time | tsvhld | 5 | 10.3 | - | μs | |
| Phase Difference Between OEH&STH | tosp | - | 4 | - | μs | |
| Phase Difference Between SYNC&OEH | tohs | - | 1.4 | - | μs | |
| Gate Output Enable Pulse Width | toev | - | 2.5 | - | μs | |
| V _{COM} Delay Time | t _{DCOM} | - | - | 3 | μs | |
| RGB Delay Time | t _{DRGB} | - | - | 2 | μs | |
| Vertical Display Start | tsv | - | 3 | - | tH | |

8-6) Signal Timing Waveforms

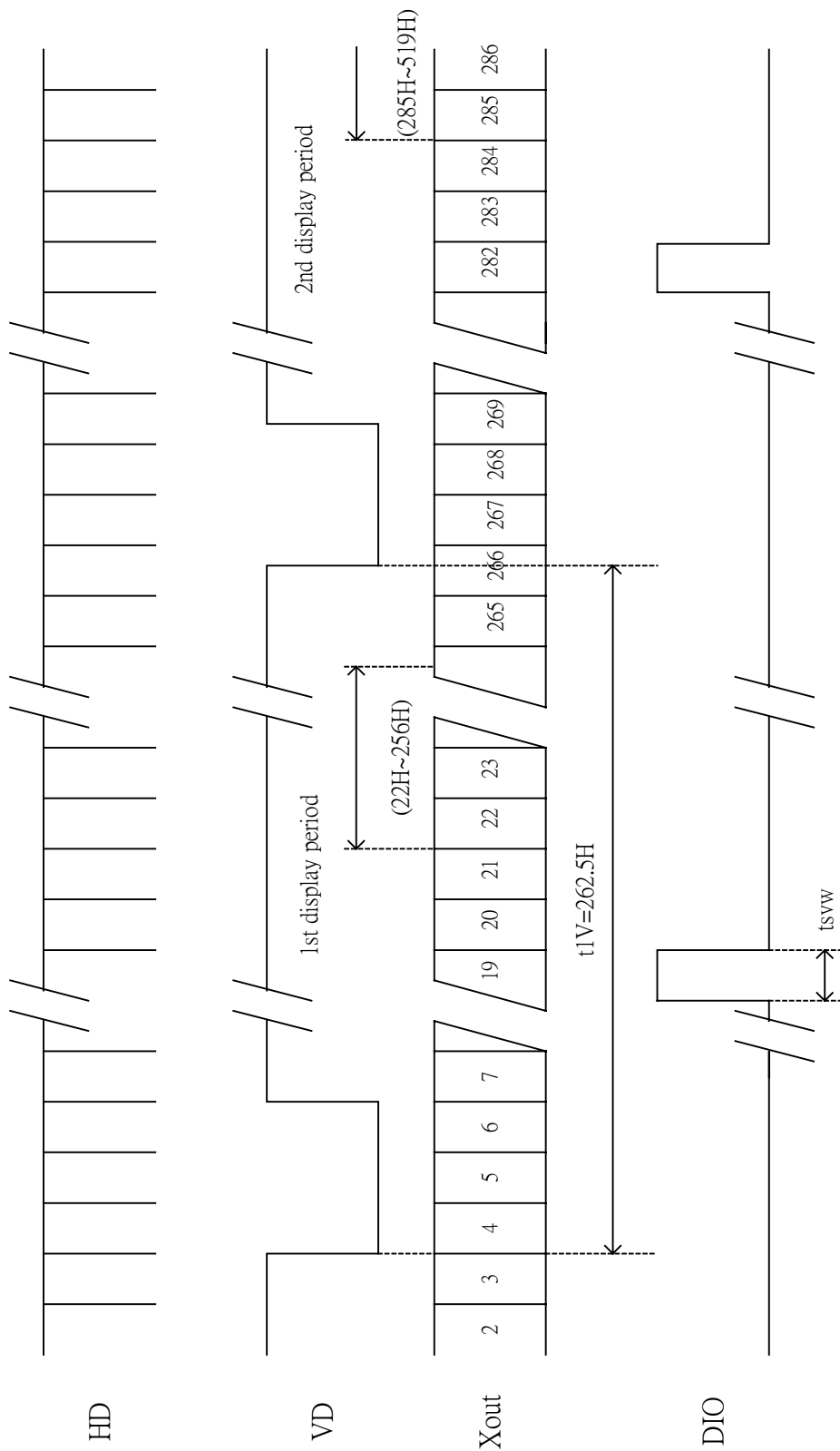
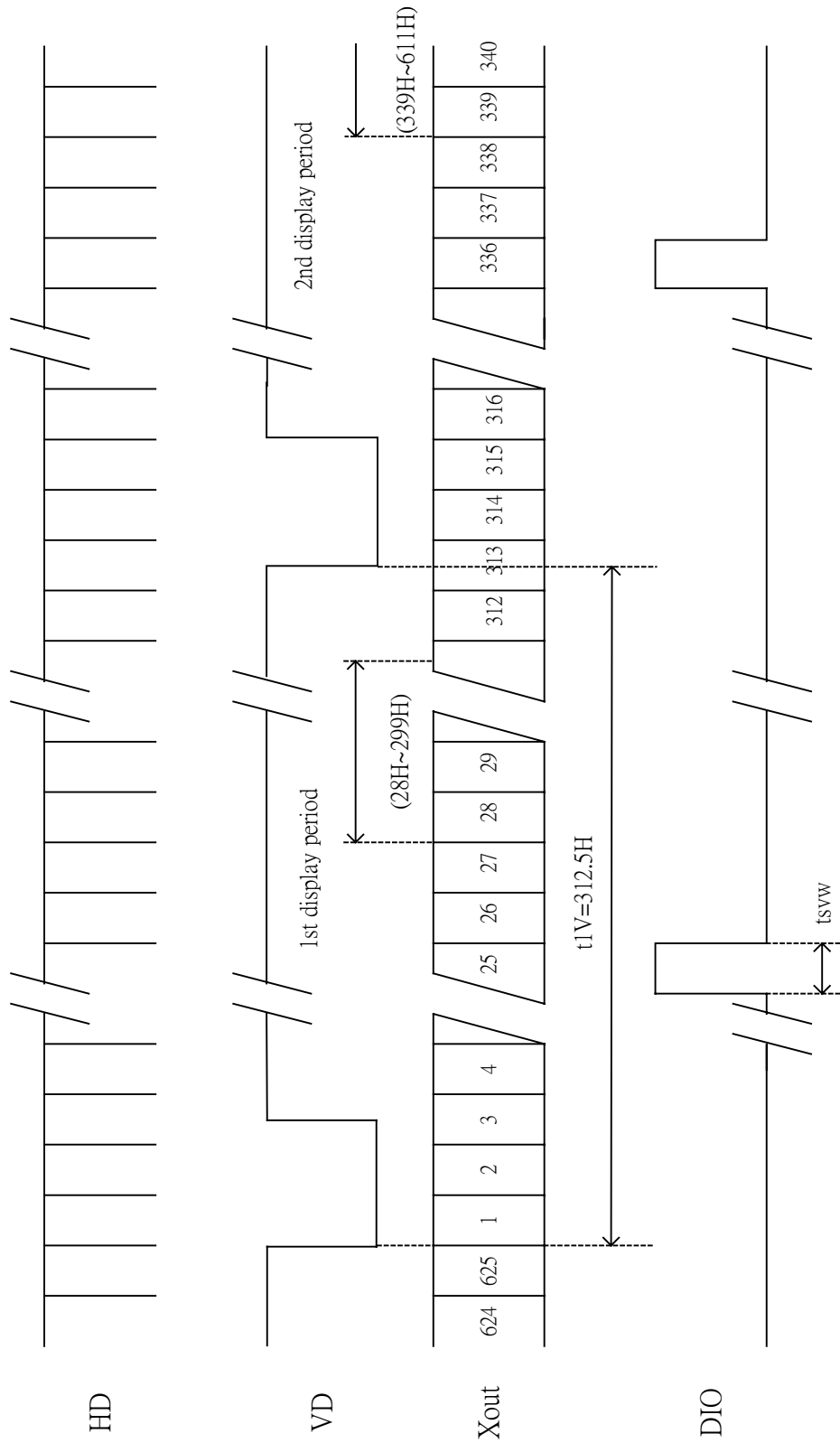


Fig. 8-1 Vertical Start Line for NTSC



** odd field : Scan lines 14n+6 14n+12 (n = 2, 3, 4..) are not displayed.
 even field : Scan lines 14n+12 14n+20 (n = 2, 3, 4..) are not displayed.

Fig. 8-1 Vertical Start Line for PAL

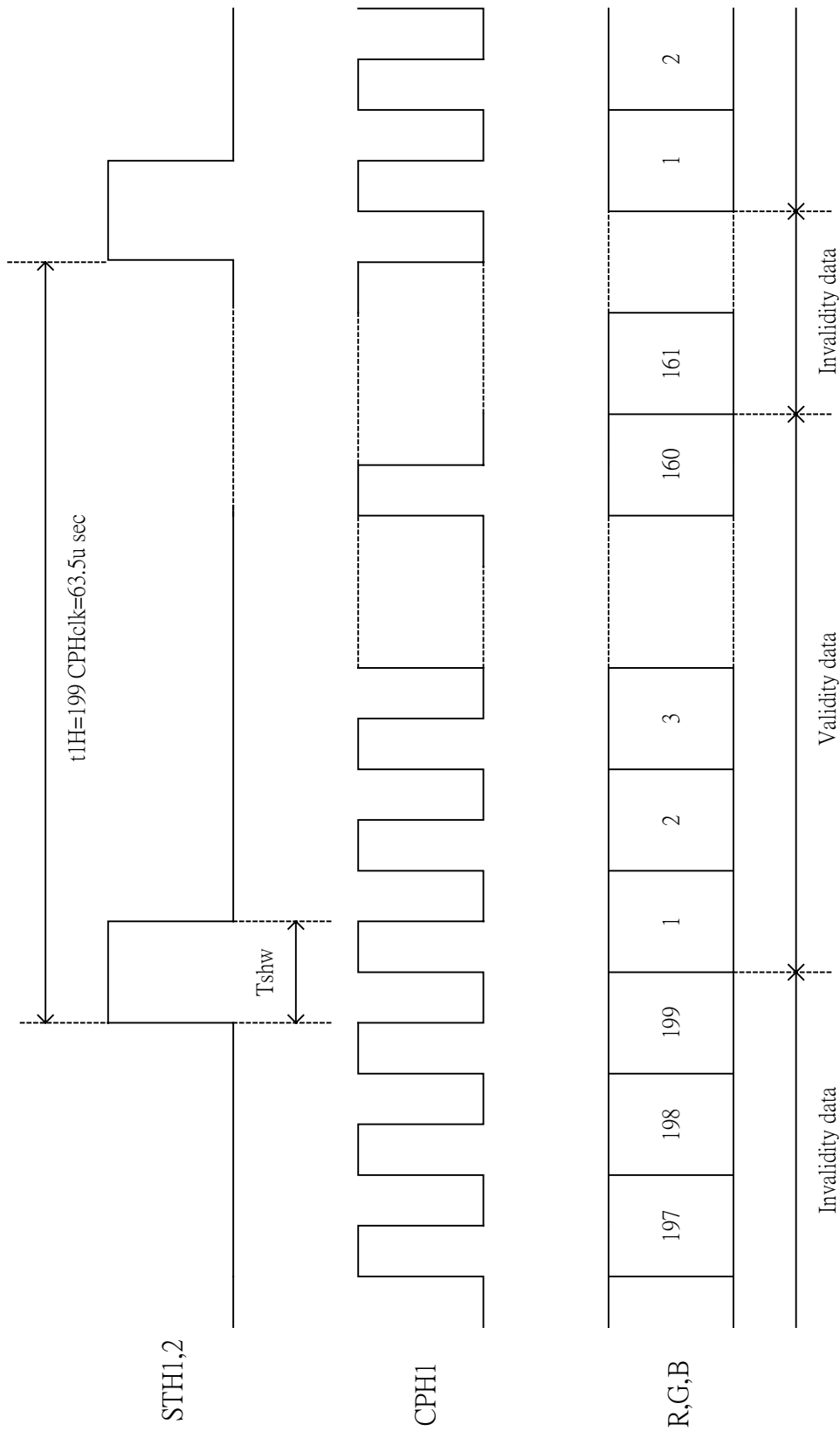


Fig. 8-2 Horizontal Start Pixel

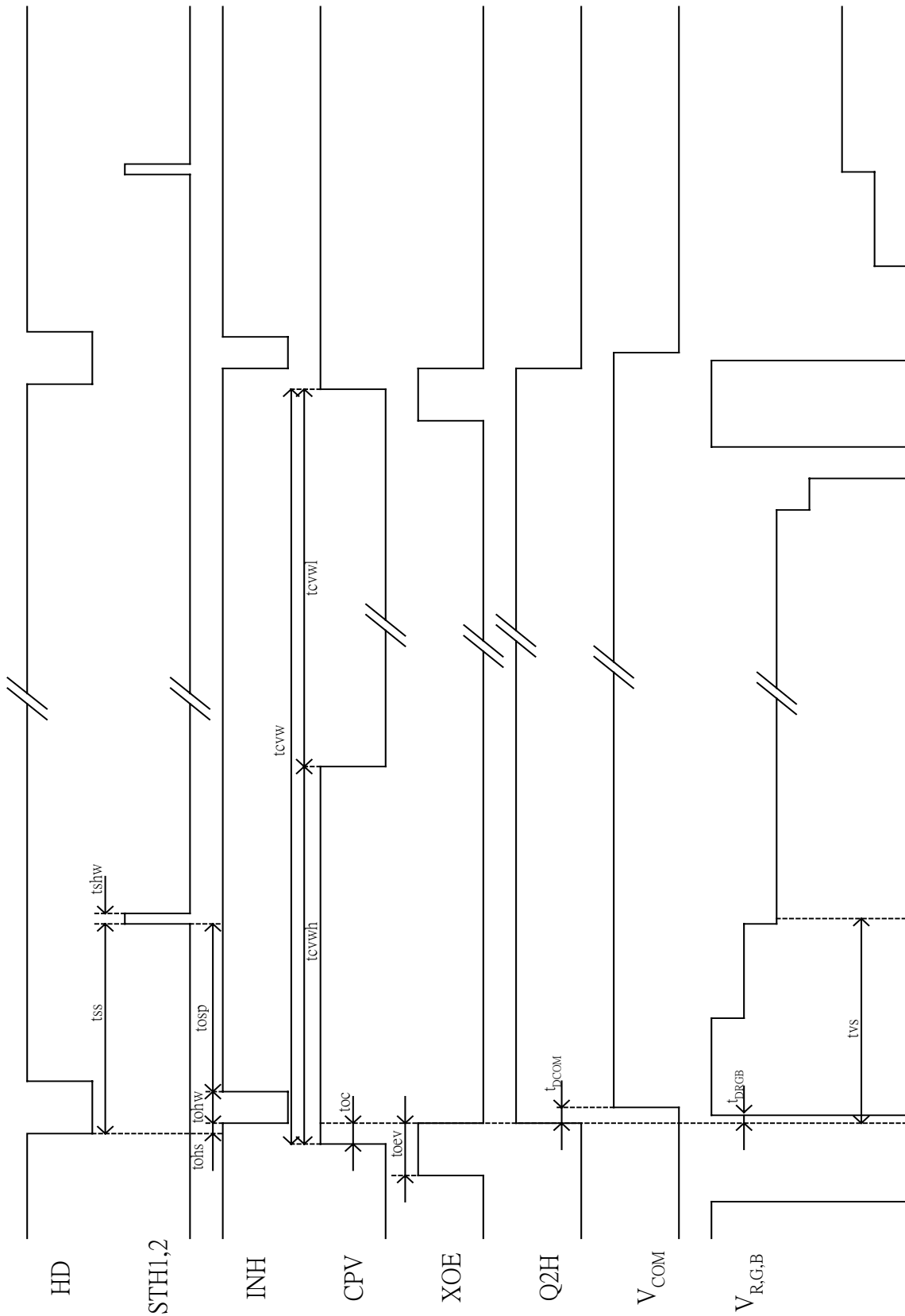


Fig. 8-3 Detail Horizontal Timing

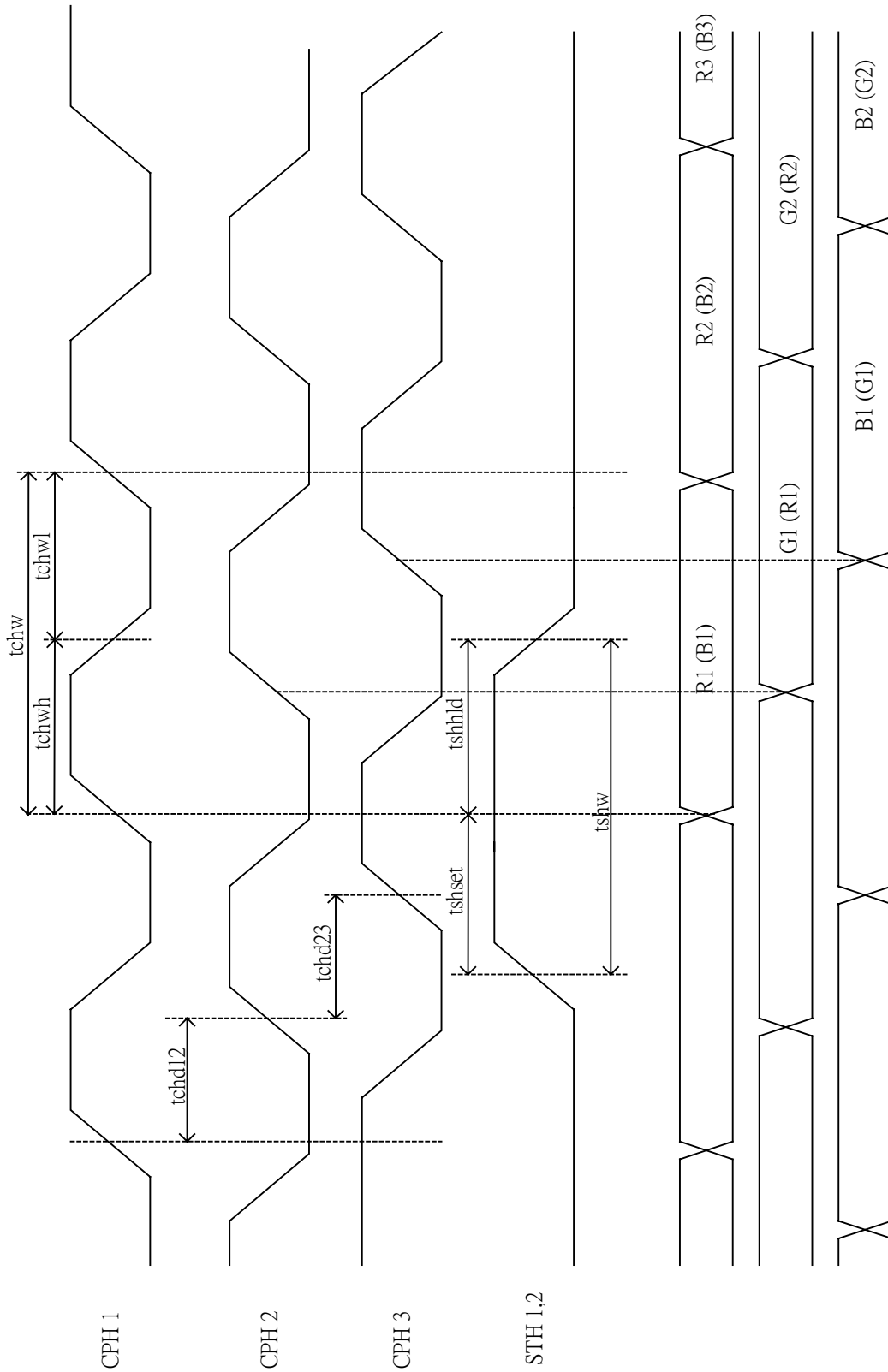


Fig. 8-4 Sampling Clock Timing

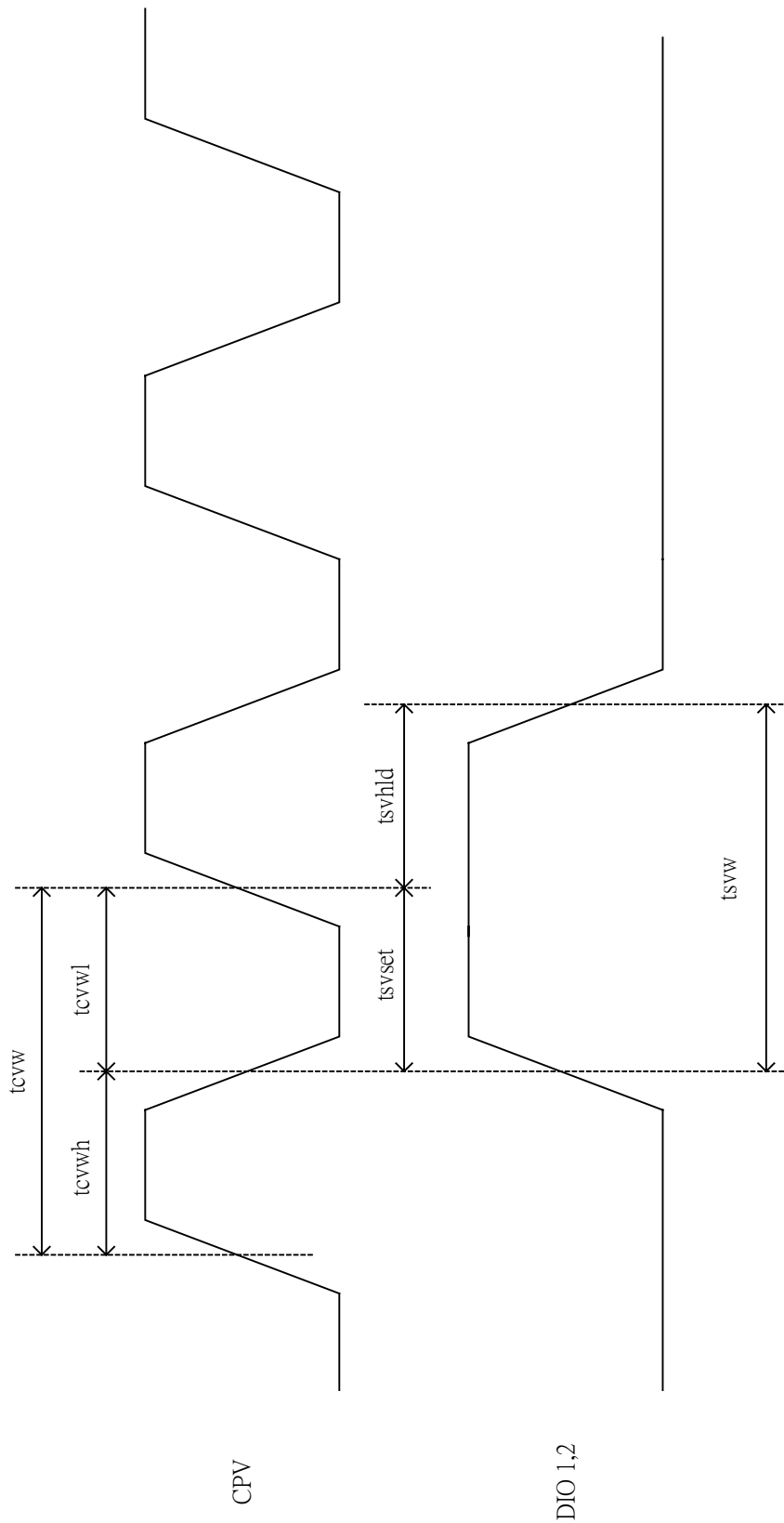


Fig. 8-5 Vertical Shift Clock Timing

Vertical timing (From up to down)

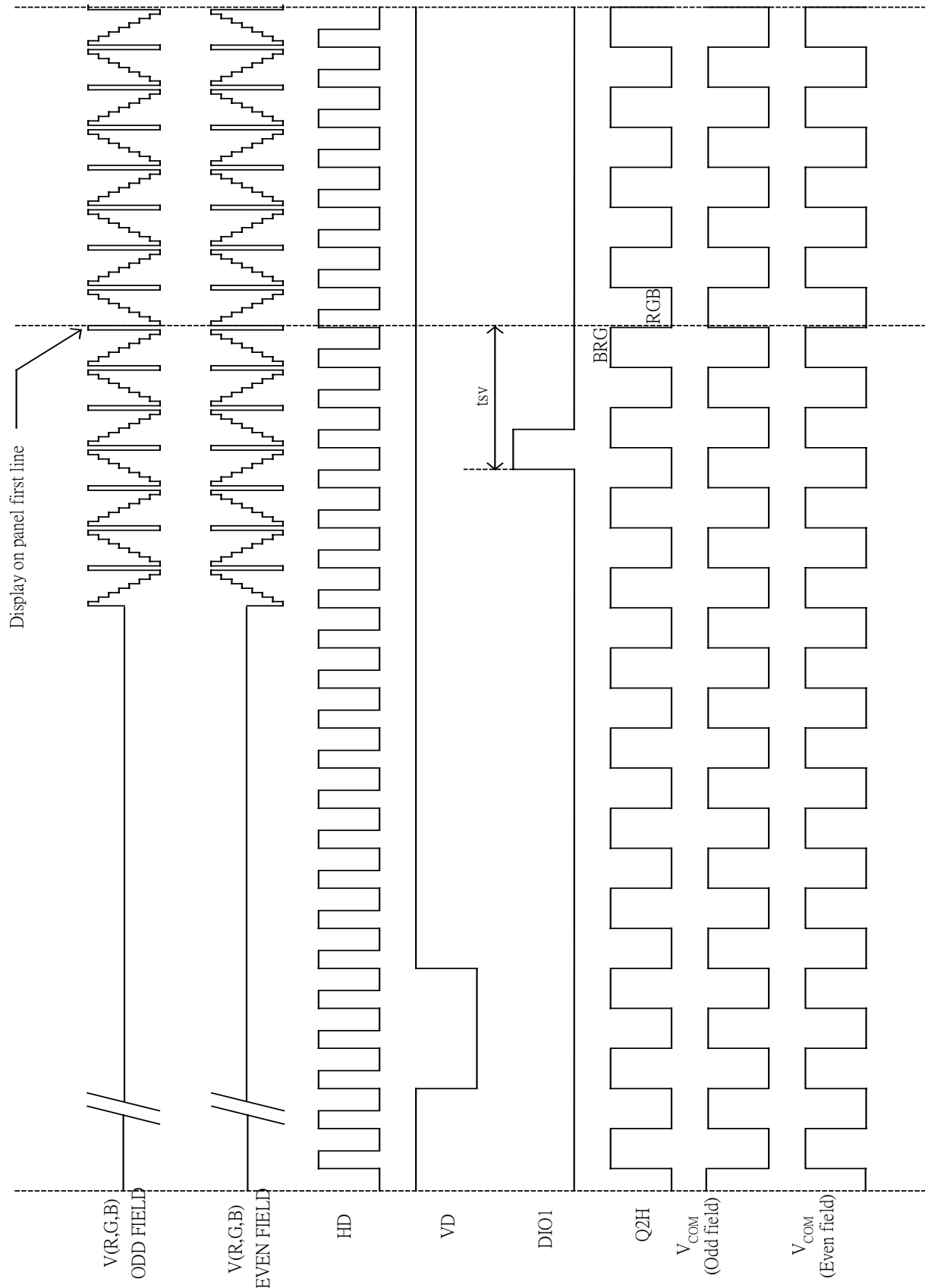


Fig. 8-6(b) Vertical Timing (From Up to Down)

Vertical timing (From down to up)

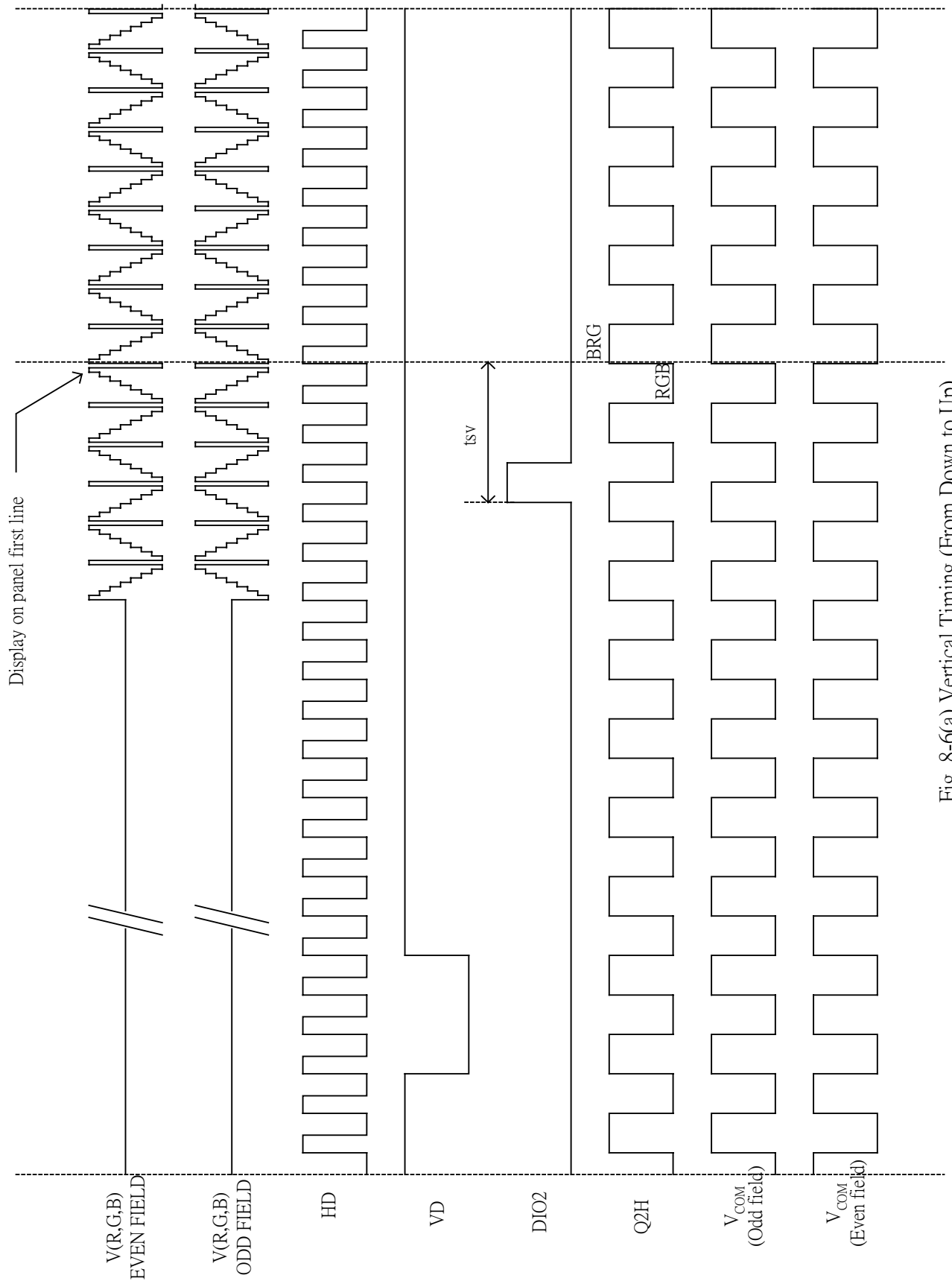
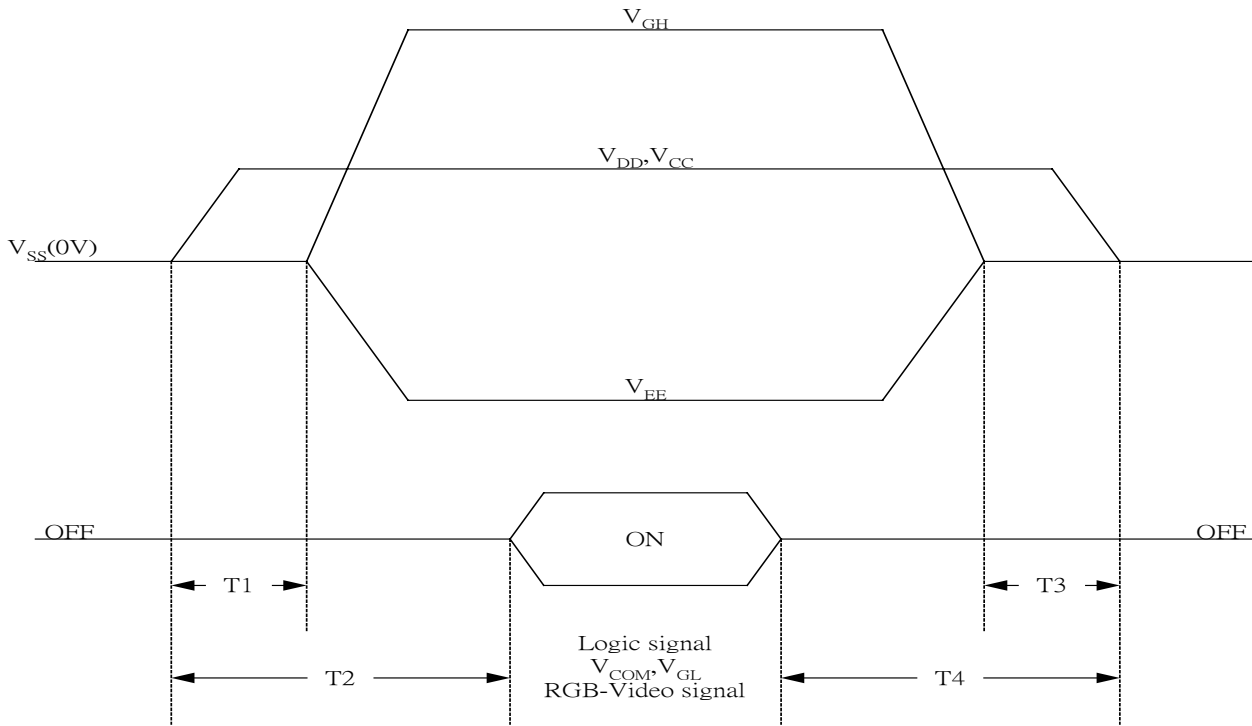


Fig. 8-6(a) Vertical Timing (From Down to Up)

9. Power on Sequence(Voltage source)

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



- 1) $10ms \leq T1 < T2$
- 2) $0ms < T3 \leq T4 \leq 10ms$

10. Optical Characteristics

10-1) Specification

$T_a = 25^\circ C$

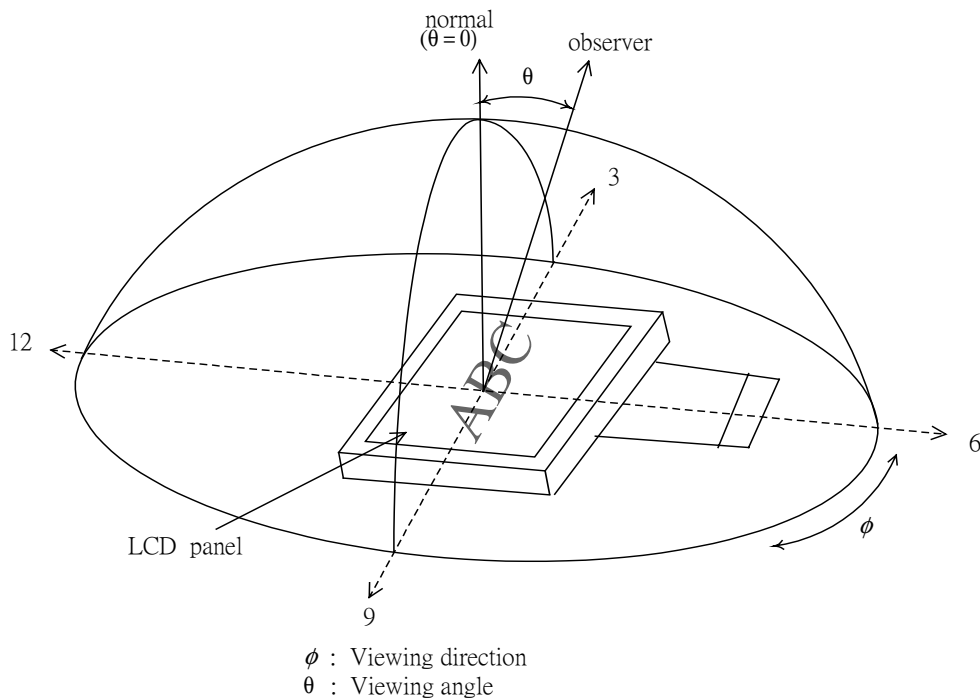
| Parameter | | Symbol | Condition | MIN. | TYP. | MAX. | Unit | Remarks |
|--------------------|---------------|--------------------------|----------------------------|----------|----------|-------|----------|-----------|
| Viewing Angle | Horizontal | θ | $CR \geq 10$ | ± 45 | ± 50 | | deg | Note 10-3 |
| | Vertical | θ (to 12 o'clock) | | 10 | 15 | | deg | |
| | | θ (to 6 o'clock) | | 30 | 35 | | deg | |
| Contrast Ratio | | CR | At optimized Viewing angle | 200 | 350 | | | Note 10-1 |
| Response time | Rise | T_r | $\theta = 0^\circ$ | | 15 | 30 | ms | Note 10-4 |
| | Fall | T_f | | | 25 | 50 | ms | |
| Transmission Ratio | | T | | 7.3 | 7.8 | 8.3 | % | |
| Uniformity | | U | | 65 | 70 | | | |
| Brightness | | | | 200 | 250 | | cd/m^2 | Note 10-2 |
| White Chromaticity | | X | $\theta = 0^\circ$ | 0.280 | 0.310 | 0.340 | | Note 10-2 |
| | | Y | | 0.300 | 0.330 | 0.360 | | |
| Lamp Life Time | $+25^\circ C$ | | | 1000 | 5000 | | hrs | |

Note 10-1 : $CR = \frac{\text{Luminance when LCD is White}}{\text{Luminance when LCD is Black}}$

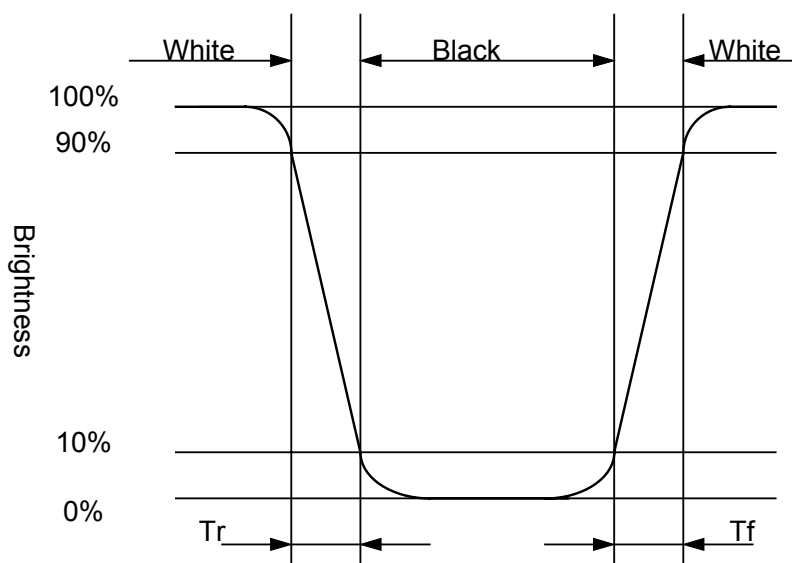
Contrast Ratio is measured in optimum common electrode voltage.
 (The test configurations of contrast ratio see section 10-2)

Note 10-2 : 1.Topcon BM-7(fast) luminance meter 1.0° field of view is used in the testing (after 10 minutes operation).

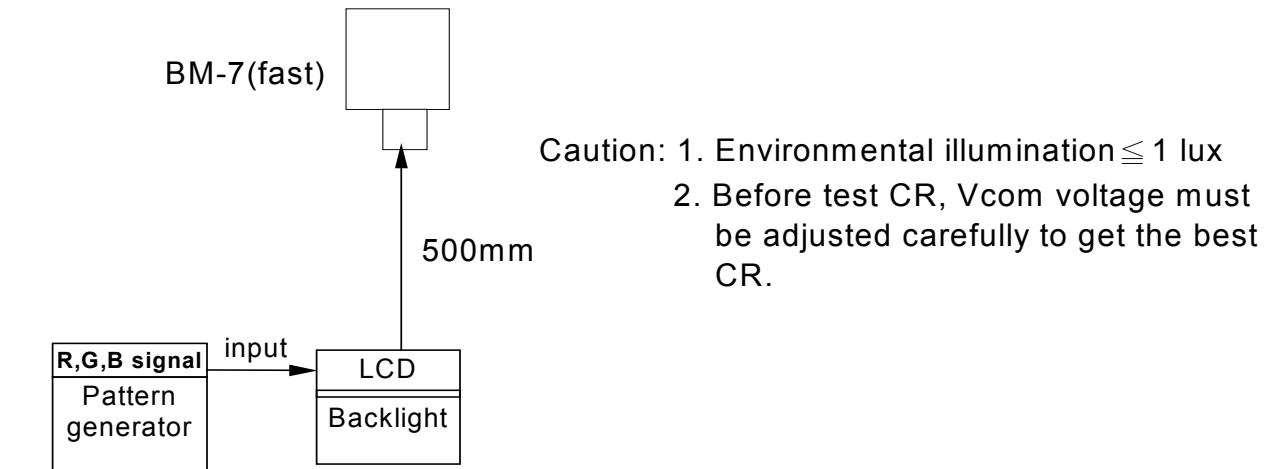
Note 10-3 : The definition of viewing angle diagram



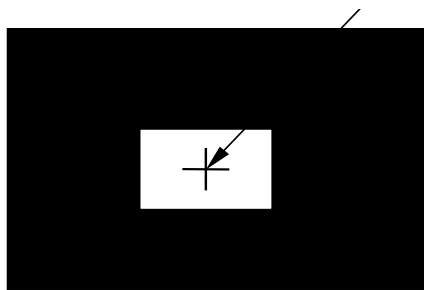
Note 10-4 : The definitions of response time



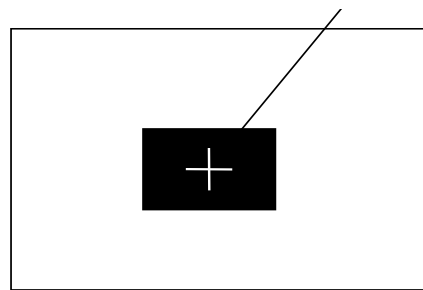
10-2) Test Configuration



- LCD Display Testing Point Testing Point

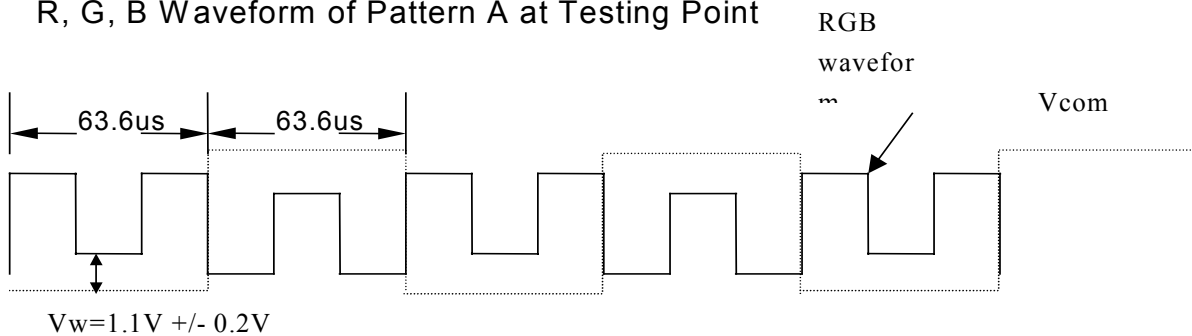


Pattern A

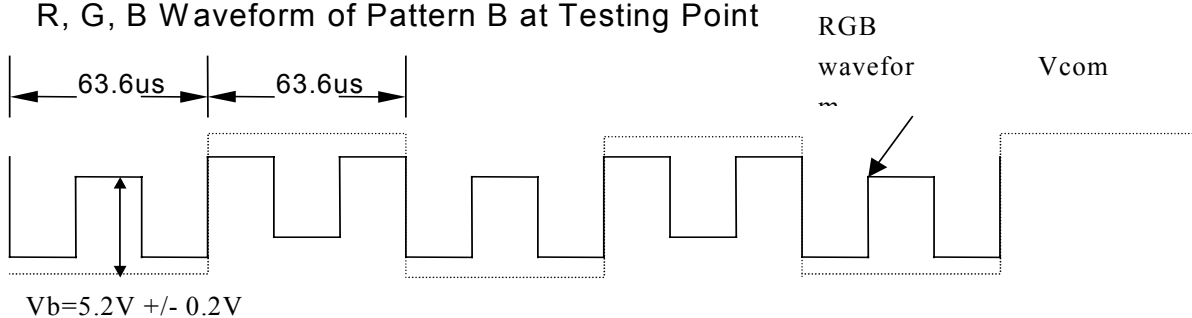


Pattern B

- 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

- a) Please power off the module when you connect the input/output connector.
- b) Please connect the ground pattern of the backlight power 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 power circuit will be unstable.
 - 3. 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

- a) 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

- a) 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.
- f) Please adjust the voltage of common electrode as material of attachment by 1 module.

12. Reliability

| No. | Test Item | Test Condition |
|-----|---|--|
| 1 | High Temperature Storage Test | Ta = +70°C , 240 hrs |
| 2 | Low Temperature Storage Test | Ta = -20°C , 240 hrs |
| 3 | Low Temperature Operation Test | Ta = 0°C , 240 hrs |
| 4 | High Temperature & High Humidity Operation Test | Ta = +60°C , 90%RH , 240 hrs |
| 5 | Thermal Cycling Test (non-operating) | -25°C → +70°C , 200 Cycles 30 min 30 min |
| 6 | Vibration Test (non-operating) | Frequency : 10 ~ 55 Hz Amplitude : 1.0 mm Sweep time : 11 mins Test Period : 6 Cycles for each direction of X, Y, Z |
| 7 | Shock Test (non-operating) | 100G , 6ms Direction : ±X , ±Y , ±Z Cycle : 3 times |
| 8 | Electrostatic Discharge Test (non-operating) | 200pF , 0Ω ±200V 1 time / each terminal |

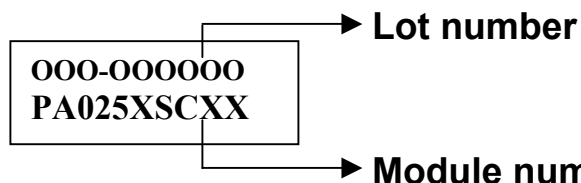
Ta: ambient temperature

[Criteria]

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

13. Indication of Lot Number Label

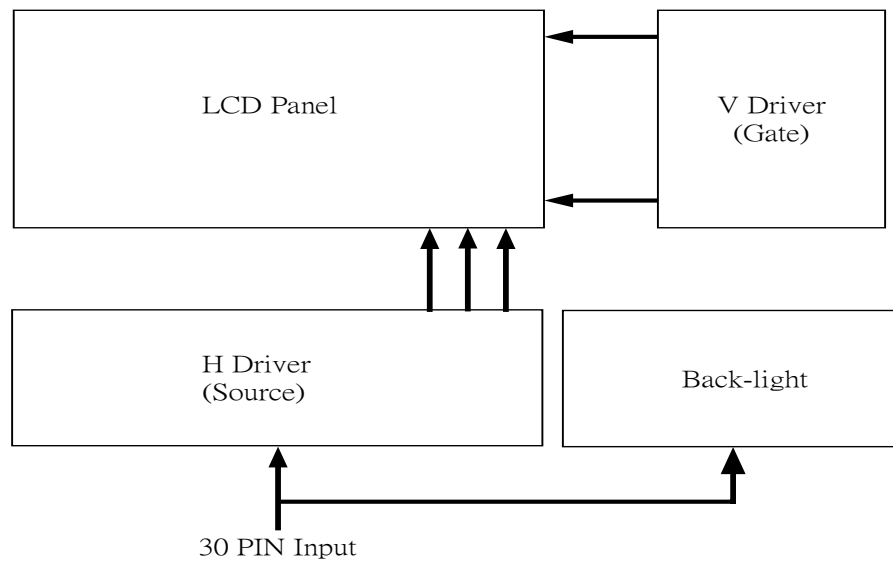
a) Indicated contents of the label



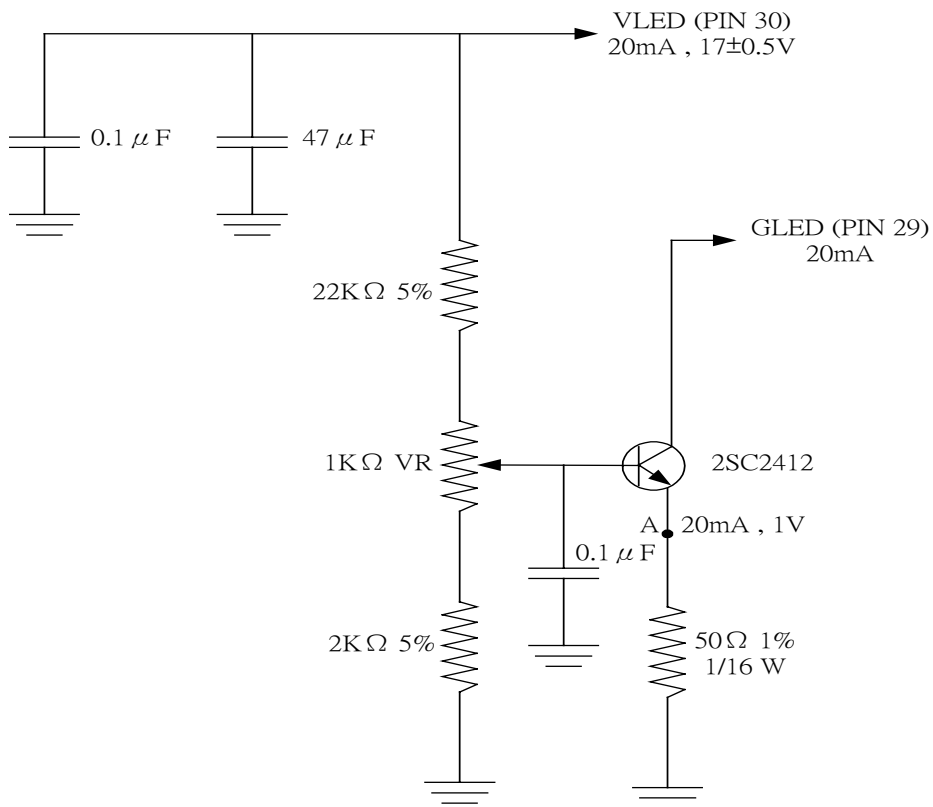
Contents of lot number : 1st~3rd—The OEM product
 5th—Production year : 1999⇒9, 2000⇒A, 2001⇒B.....
 6th—Production month : 1, 2, 3,...9, A, B, C
 7th~8th—Production size : 2.5"⇒25
 9th~10th—Serial numbers : 01~99

14. Block Diagram

14.1 LCD Module Diagram



14.2 Backlight Driving Diagram



15. Packing

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

NOTE:

- One layer include: 1 piece of cushion sheet, 12pcs panel & 1 piece of tray.
- QTY: 108 pcs panel/carton.
- Dimension: 455*375*190mm
- Weight: 6.1KG

| 6 | 50-0100091 | CARTON INTERNAL | 1 | |
|------|------------|-----------------------|-----|--------|
| 5 | 50-0500041 | 摺口袋450*380*700mm | 1 | 抗靜電 |
| 4 | PA025XXX | | 108 | |
| 3 | 50-0200006 | EPE Cushion Sheet 2.5 | 9 | 抗靜電 |
| 2 | 50-0300441 | TRAY 2.5" | 10 | 抗靜電 |
| 1 | 50-0300491 | EPE PLATE 4.30*350*15 | 2 | |
| ITEM | PART NO. | DESCRIPTION | QTY | REMARK |

| | | | | | |
|-----------|-----------|-------------------|------------|---------|-------------------------|
| MTL.SPEC. | | UNSPECIFIED TOL'S | | REMARK | |
| | | ANGLE | | | |
| | | ROUGHNESS | | | |
| APPROVE | | SCALE | UNIT | SHEET | DWG.TITLE |
| CHECK | | | | 1 OF 2 | PA025XXXXX PACKING DWG. |
| DESIGN | Jimmy | MTL.NO. | PA025XXXXX | DWG.NO. | REV. 01 |
| | '01.06.01 | | | | A4 SIZE |

元太科技股份有限公司
Prime View International Co.,Ltd.

Revision History

| Rev. | Issued Date | Revised Contents |
|-------------|--------------------|-------------------------|
| 0.1 | Mar. 30 , 2004 | Preliminary |