

**Version :1.1**
**TECHNICAL SPECIFICATION**
**MODEL NO : PA040XS3**
☐ Customer's Confirmation

Customer \_\_\_\_\_

Date \_\_\_\_\_

By \_\_\_\_\_

☐ PVI's Confirmation

Dep	FAE	Panel Design	Electronic Design	Mechanical Design	Product Verification	Prepared by
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## 1. Application

This technical specification applies to 4" color TFT-LCD module , PA040XS3.

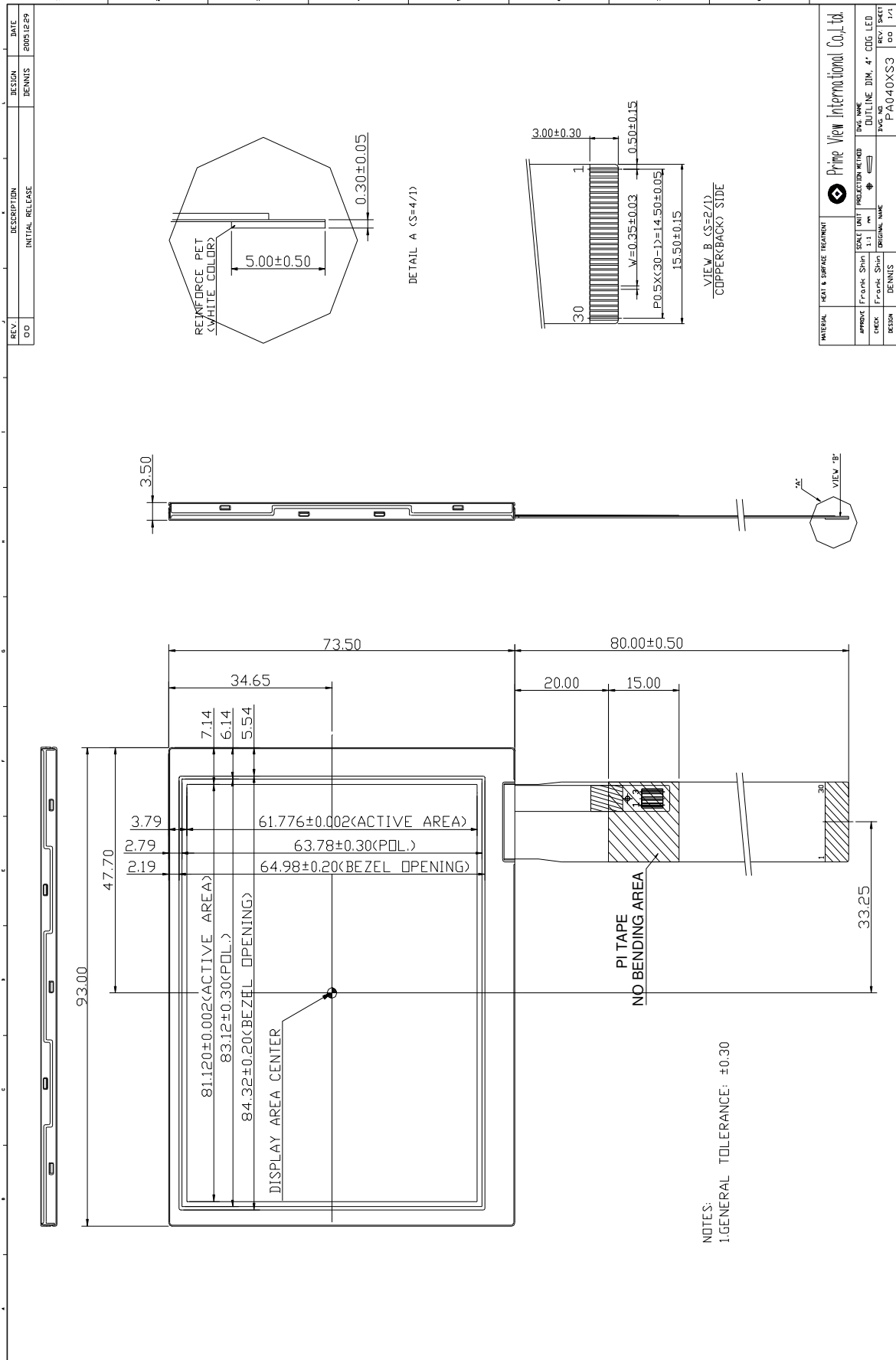
The applications of the panel are car TV, portable DVD, GPS, door phone, multimedia applications and others AV system.

## 2. Features

- . Amorphous silicon TFT-LCD panel with LED B/L unit.
- . Compatible with NTSC & PAL system
- . Pixel in stripe configuration
- . Slim and compact
- . Image Reversion : Up/Down and Left/Right (With PVI timing controller : PVI-1004D)

## 3. Mechanical Specifications

Parameter	Specifications	Unit
Screen Size	4 (diagonal)	inch
Display Format	320×R,G,B×234	dot
Active Area	81.120(H) × 61.776(V)	mm
Dot Pitch	0.0845(H) × 0.2640 (V)	mm
Pixel Configuration	Stripe	
Outline Dimension	93.00(W)×73.50(H)×3.50(D)(typ.)	mm
Surface Treatment	Anti – Glare	
Back Light	LED	
Weight	74±5	g

**4. Mechanical Drawing of TFT-LCD Module**


**5. Input / Output Terminals**

FPC Down Connect , 30pins , Pitch : 0.5mm

Pin No	Symbol	I/O	Description	Remark
1	STH1	I/O	Start pulse for source driver	Note 5-1
2	AV <sub>SS</sub>	I	Analog GND for source driver	
3	AV <sub>DD</sub>	I	Analog power input for source driver	Note 5-3
4	V <sub>B</sub>	I	Video Input B	Note 5-6
5	V <sub>G</sub>	I	Video Input G	
6	V <sub>R</sub>	I	Video Input R	
7	V <sub>SS</sub>	I	Digital GND	
8	V <sub>DD</sub>	I	Digital power input	Note 5-4
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	N/C	-	Not connector	
14	OE	I	Output enable for source driver	
15	R/L	I	Left/Right Control for source driver	Note 5-1
16	V <sub>COM</sub>	I	Common electrode voltage	Note 5-6
17	V <sub>COM</sub>	I	Common electrode voltage	
18	XOE	I	Output enable for gate driver	
19	CPV	I	Clock input for gate driver	
20	U/D	I	Up/Down Control for gate driver	Note 5-2
21	STVU	I/O	Vertical start pulse	
22	STVD	I/O	Vertical start pulse	
23	V <sub>GL</sub>	I	Gate off voltage (alternative every 1-H)	Note 5-6
24	N/C	-	Not connector	
25	V <sub>SS</sub>	I	GND	
26	V <sub>CC</sub>	I	Logic power for gate driver	Note 5-4
27	V <sub>GH</sub>	I	Gate on voltage	Note 5-5
28	GLED1	-	Ground for LED backlight	
29	GLED2	-	Ground for LED backlight	
30	VLED	-	Supply voltage for LED B/L	Note 5-7

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

R/L	STH1	STH2	Remark
High ( $V_{DD}$ )	Input	Output	Left to Right
Low (0 Volt.)	Output	Input	Right to Left

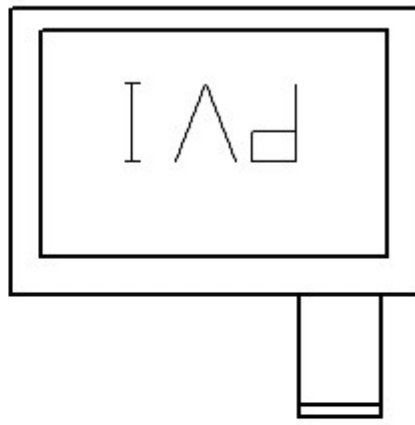
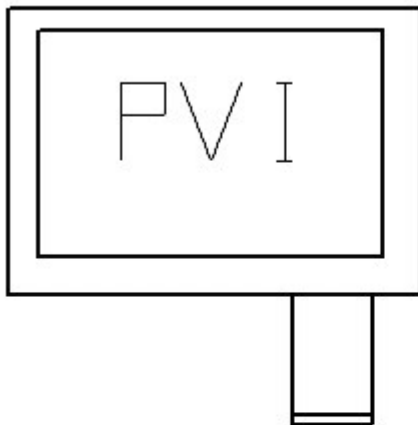
Note 5-2 : STVU, STVD and U/D mode

U/D	STVD	STVU	Remark
High ( $V_{CC}$ )	Input	Output	Down to Up
Low (0 Volt.)	Output	Input	Up to Down

The definitions of Note 5-1,5-2

U/D(PIN20)=Low R/L(PIN15)=High

U/D(PIN20)=High R/L(PIN15)=Low



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

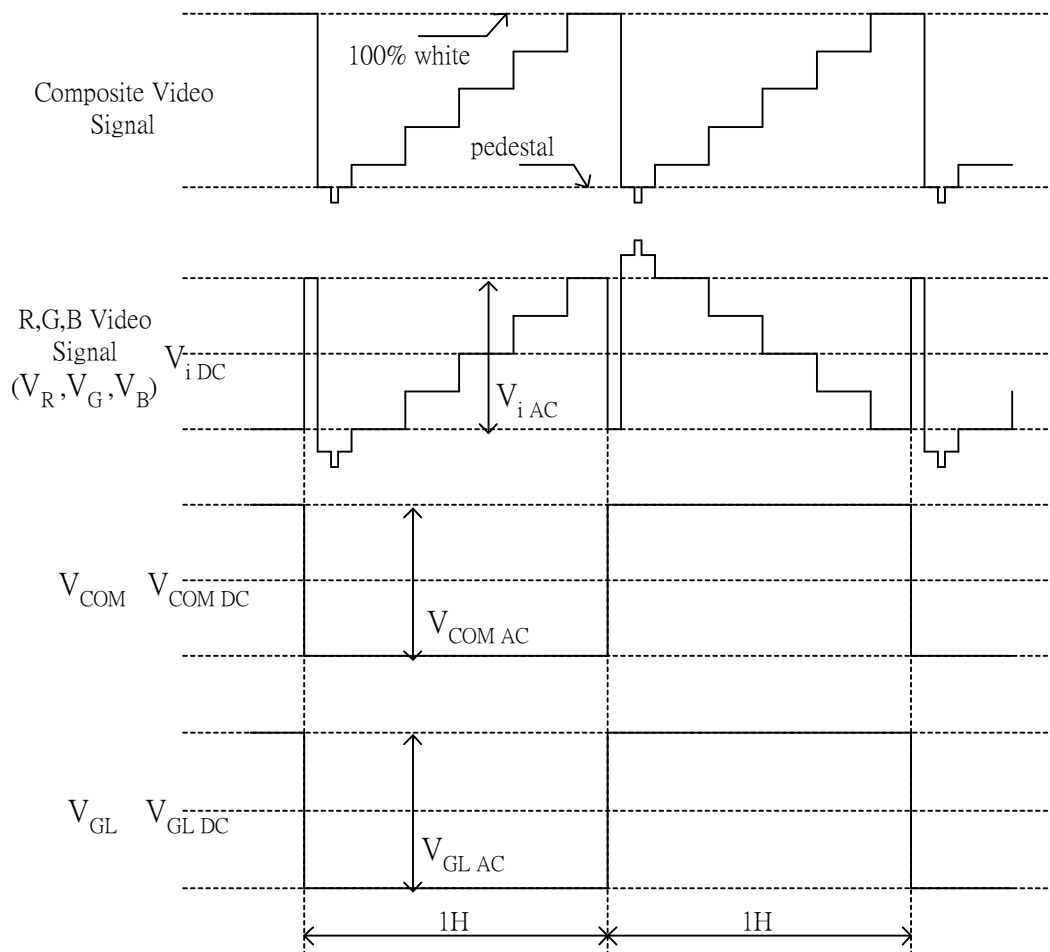
Note 5-4 :  $V_{DD}, V_{CC} = +3.3V$  (Typ.)

Note 5-5 :  $V_{GH} = +17V$  (Typ.)

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

Phase of the video signal input and  $V_{COM}$

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



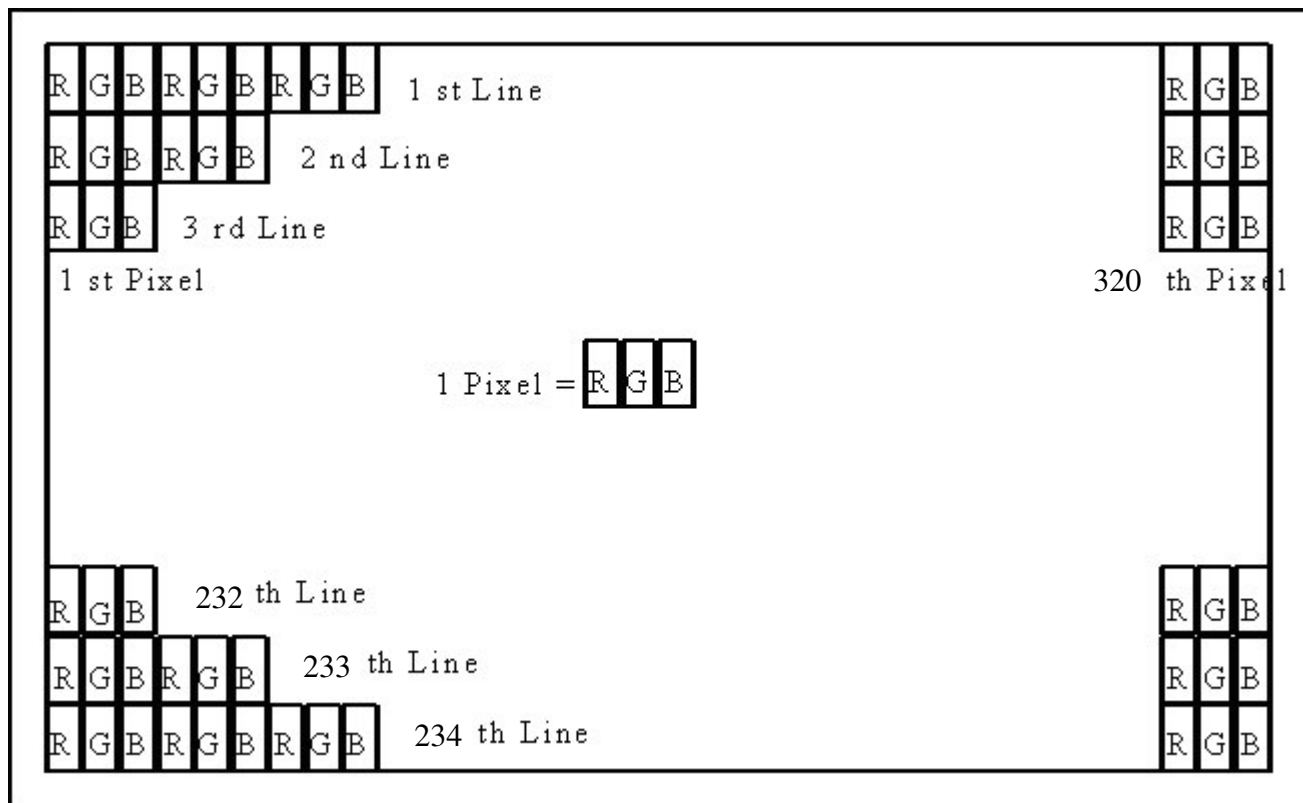
Liquid crystal transmission of the video signal input and  $V_{COM}$

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

White : maximum transmission / Black : minimum transmission

Note 5-7 :  $I_{LED} = 20mA$  (Typ.)

## 6. Pixel Arrangement



## 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	$AV_{DD}$	-0.3	+5.8	V	
	$V_{DD}$	-0.3	+7.0	V	
Supply Voltage For Gate Driver	$V_{CC}$	-0.3	+7.0	V	
	$V_{GH}-V_{GL}$	-0.3	+45.0	V	
	H Level $V_{GH}$	-0.3	+32.0	V	
	L Level $V_{GL}$	-22	+0.3	V	
Analog Signal Input Level	$V_R, V_G, V_B$	-0.2	$AV_{DD}+0.2$	V	

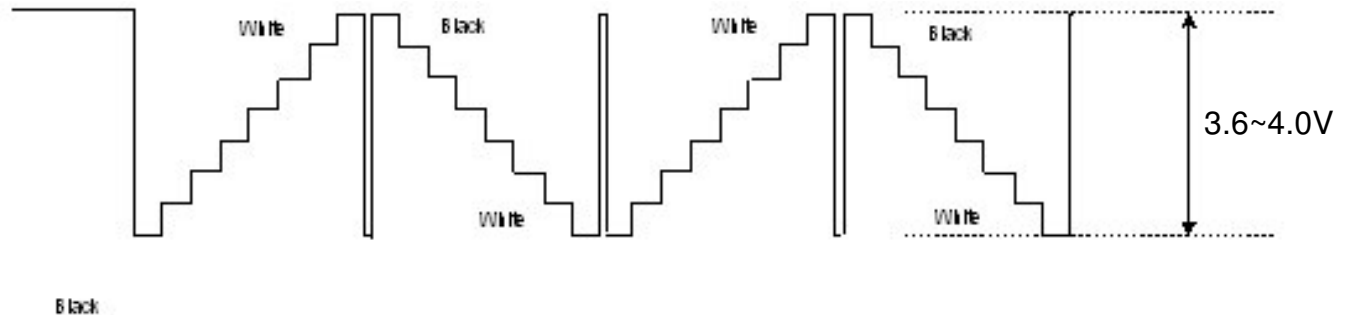


## 8. Electrical Characteristics

### 8-1) Operating Condition

Parameter		Symbol	MIN.	Typ.	MAX.	Unit	Remark
Supply Voltage For Source Driver	Analog	$AV_{DD}$	+4.5	+5.0	+5.5	V	
	Logic	$V_{DD}$	+3.0	+3.3	+3.6	V	
Supply Voltage For Gate Driver	H level	$V_{GH}$	+15	+17	+19	V	
	L level	$V_{GL\ DC}$	-13	-12	-10.5	V	DC Component of $V_{GL}$
		$V_{GL\ AC}$	-	+6.0	-	$V_{P-P}$	AC Component of $V_{GL}$
	Logic	$V_{CC}$	+3.0	+3.3	+3.6	V	
Analog Signal Input Level ( $V_R$ , $V_G$ , $V_B$ )		$V_{i\ AC}$	-	+3.6	+4.0	$V_{P-P}$	Note 8-1
		$V_{i\ DC}$	-	+2.5	-	V	
Digital input voltage	H level	$V_{IH}$	0.7 VDD	-	VDD	V	
	L level	$V_{IL}$	0	-	0.3 VDD	V	
Digital output voltage	H level	$V_{OH}$	$V_{DD}-0.4$	-	VDD	V	
	L level	$V_{OL}$	0	-	0.4	V	
$V_{COM}$		$V_{COM\ AC}$	-	+6.0	-	$V_{P-P}$	AC Component of $V_{COM}$
		$V_{COM\ DC}$		1.5		V	DC Component of $V_{COM}$ Note 8-2

Note 8-1 : Both NTSC and PAL system Video Signal input waveform is based on 8 steps gray scale.



Note 8-2 : PVI strongly suggests that the  $V_{COM\ DC}$  level shall be adjustable , and the adjustable level range is  $1.5V \pm 1V$  , every module's  $V_{COM\ DC}$  level shall be carefully adjusted to show a best image performance.

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

$T_a = 25^\circ C$

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Current for Driver	$I_{GH}$	$V_{GH}=+17V$	-	0.055	0.083	mA	
	$I_{GL}$	$V_{GL}=-12V$	-	0.067	0.087	mA	$V_{GL}$ center voltage
	$I_{CC}$	$V_{CC}=+3.3V$	-	0.441	0.563	mA	
	$AI_{DD}$	$AV_{DD}=+5V$	-	7	10	mA	
	$I_{DD}$	$V_{DD}=+3.3V$	-	1.2	3	mA	

### 8-3) Backlight driving & Power Consumption

Pin No	Symbol	Description	Remark
28	GLED1	Ground for LED backlight	
29	GLED2	Ground for LED backlight	
30	VLED	Supply voltage for LED	Note 8-3

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

GND = 0 V    Ta = 25°C

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED voltage	VLED	-	12.8	14.0	V	I <sub>L</sub> =20mA
LED current	ILED1	-	20	-	mA	
	ILED2					
Backlight Power Consumption	PLED	-	512	560	mW	Note 8-4

Note 8-4 :  $PLED = VLED \times ILED1 + VLED \times ILED2$



### 8-4) Power Consumption

Ta = 25°C

Parameter	Symbol	Conditions	TYP.	MAX	Unit	Remark
LCD Panel Power Consumption			48.7	72.4	mW	
Backlight Power Consumption	PLED		512	560	mW	
Total Power Consumption			560.7	632.4	mW	

**8-5) 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	$t_{CPH}$	147	156	166	ns	CPH1
CPH pulse duty	$t_{CWH}$	30	50	70	%	CPH1
STH setup time	$t_{SUH}$	20	-	-	ns	STH1,STH2
STH hold time	$t_{HDH}$	20	-	-	ns	STH1,STH2
STH pulse width	$t_{STH}$	-	1	-	$t_{CPH}$	STH1,STH2
STH period	$t_H$	61.5	63.5	65.5	$\mu s$	STH1,STH2
OE pulse width	$t_{OE}$	-	1.6	-	$\mu s$	OE
Sample and hold disable time	$t_{DIS1}$	-	4.4	-	$\mu s$	
XOE pulse width	$t_{XOE}$	-	12	-	$\mu s$	XOE
CKV pulse width	$t_{CKV}$	-	32	-	$\mu s$	CPV
Clean enable time	$t_{DIS2}$	-	6	-	$\mu s$	
Horizontal display timing range	$t_{DH}$	-	320	-	$t_{CPH}$	
STV setup time	$t_{SUV}$	400	-	-	ns	STVU,STVD
STV hold time	$t_{HDV}$	400	-	-	ns	STVU,STVD
STV pulse width	$t_{STV}$	-	-	1	$t_H$	
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	$\mu s$	

8-6) Signal Timing Waveforms

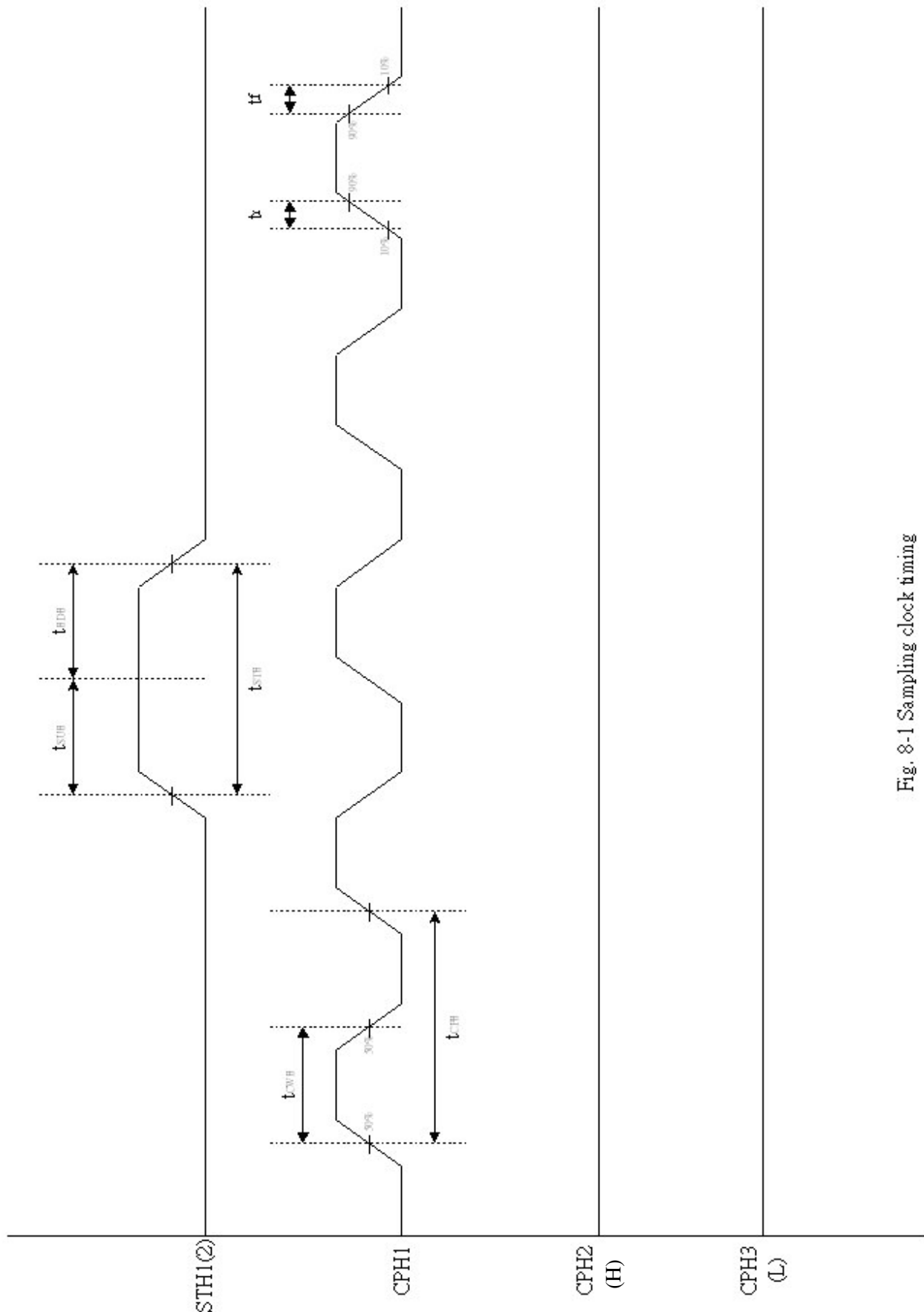


Fig. 8-1 Sampling clock timing

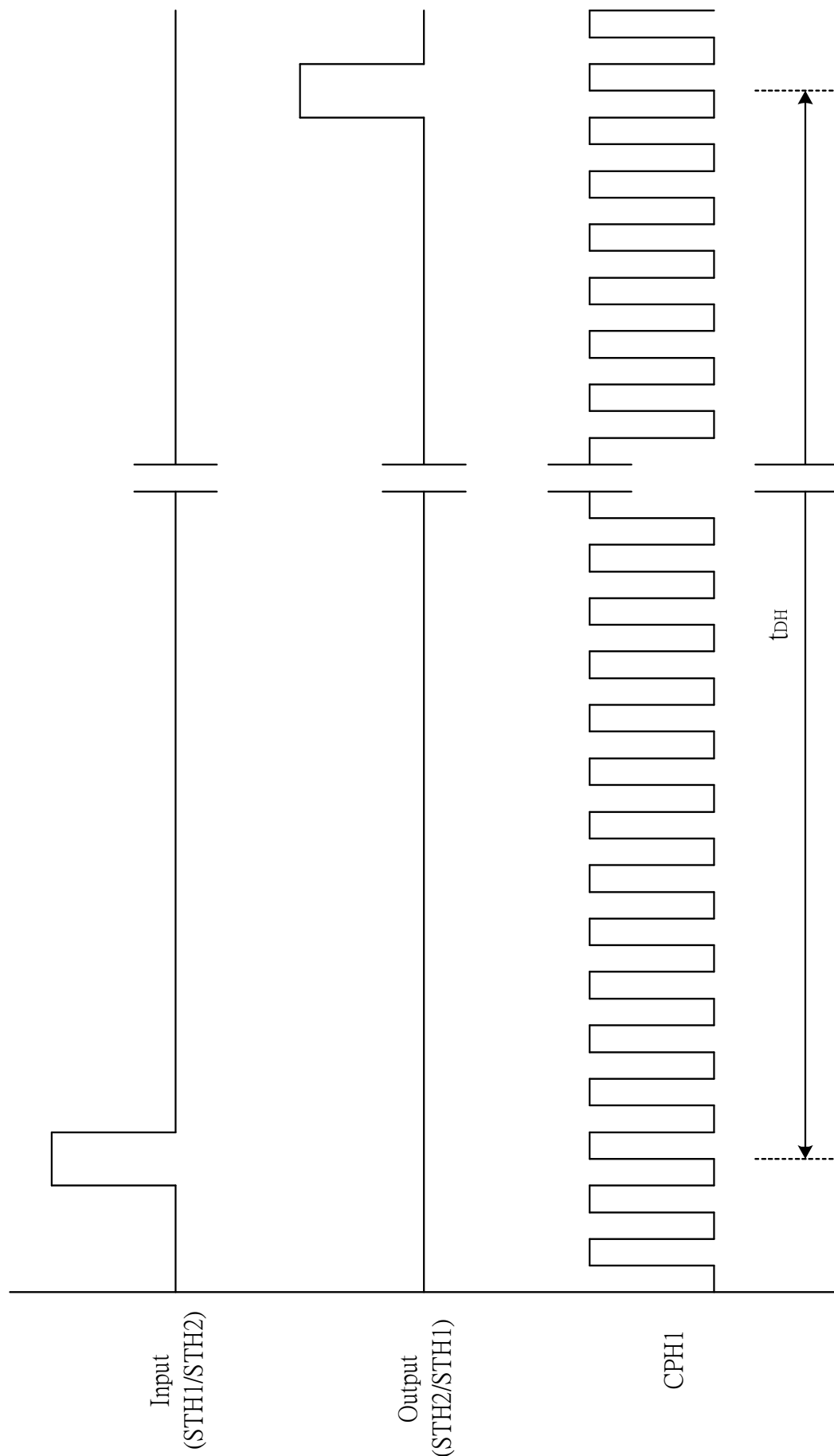


Fig. 8-2 Horizontal display timing range

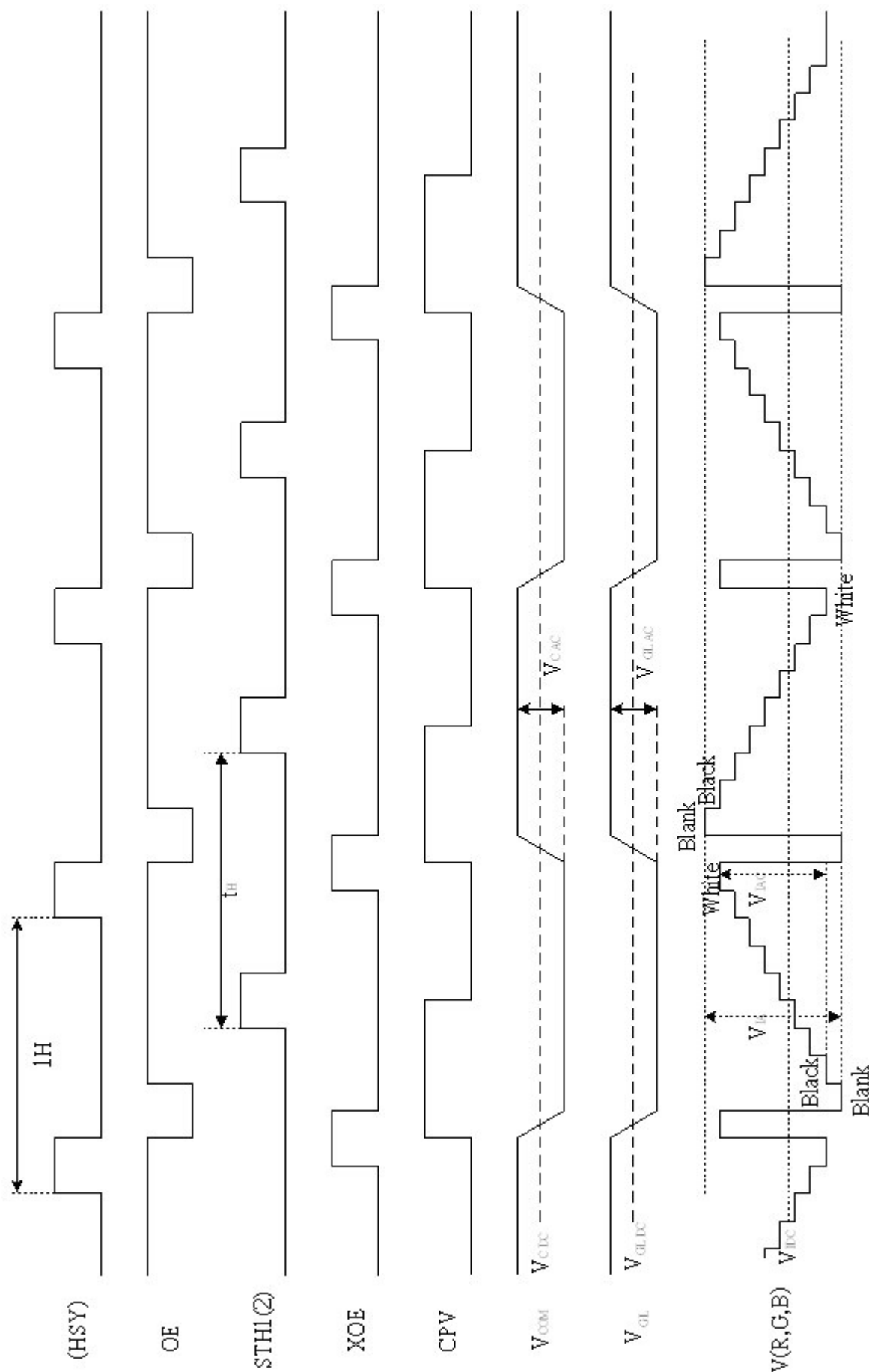
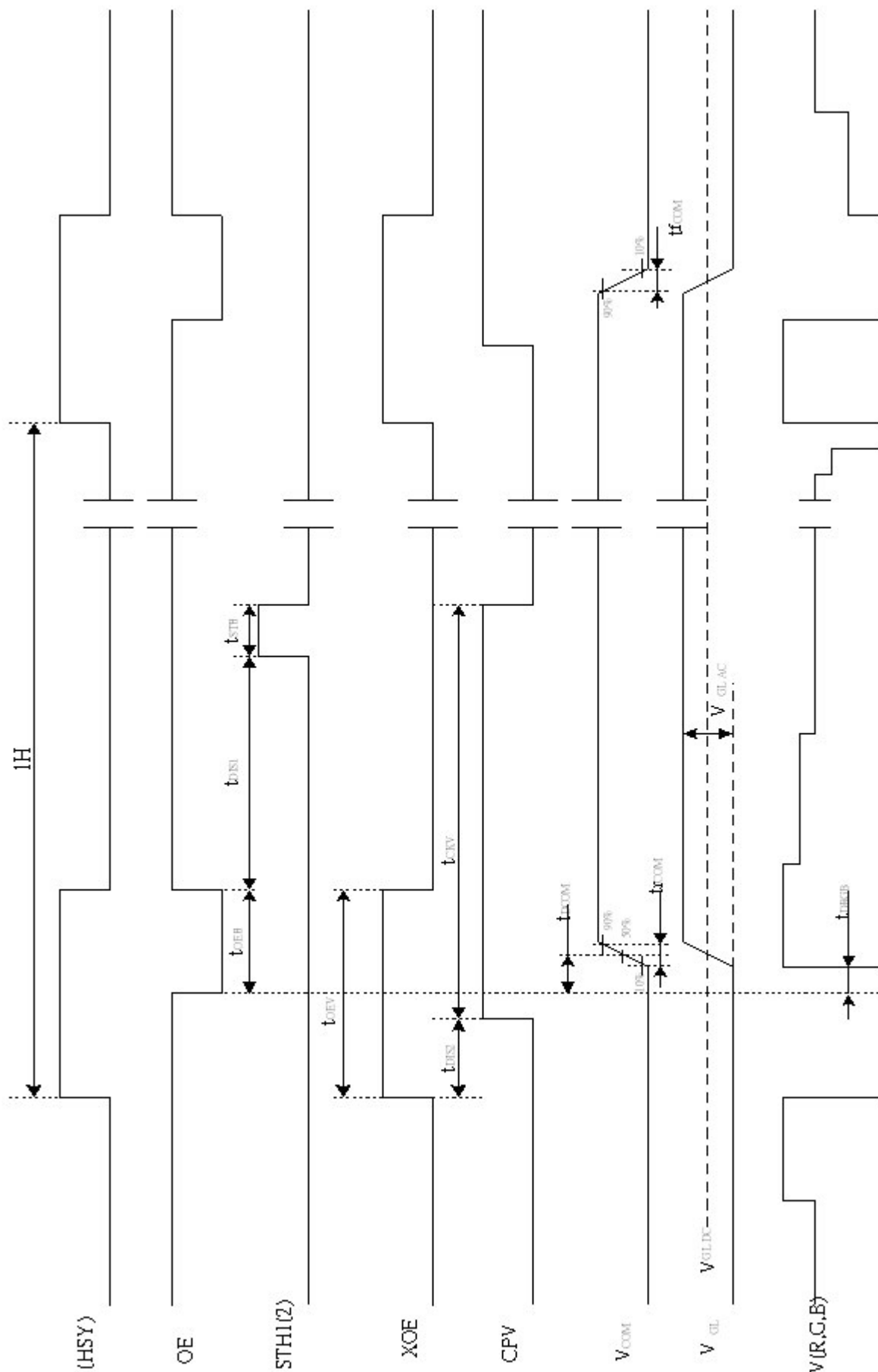


Fig. 8-3 (a) Horizontal timing



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

Fig. 8-3 (b) Detail horizontal timing

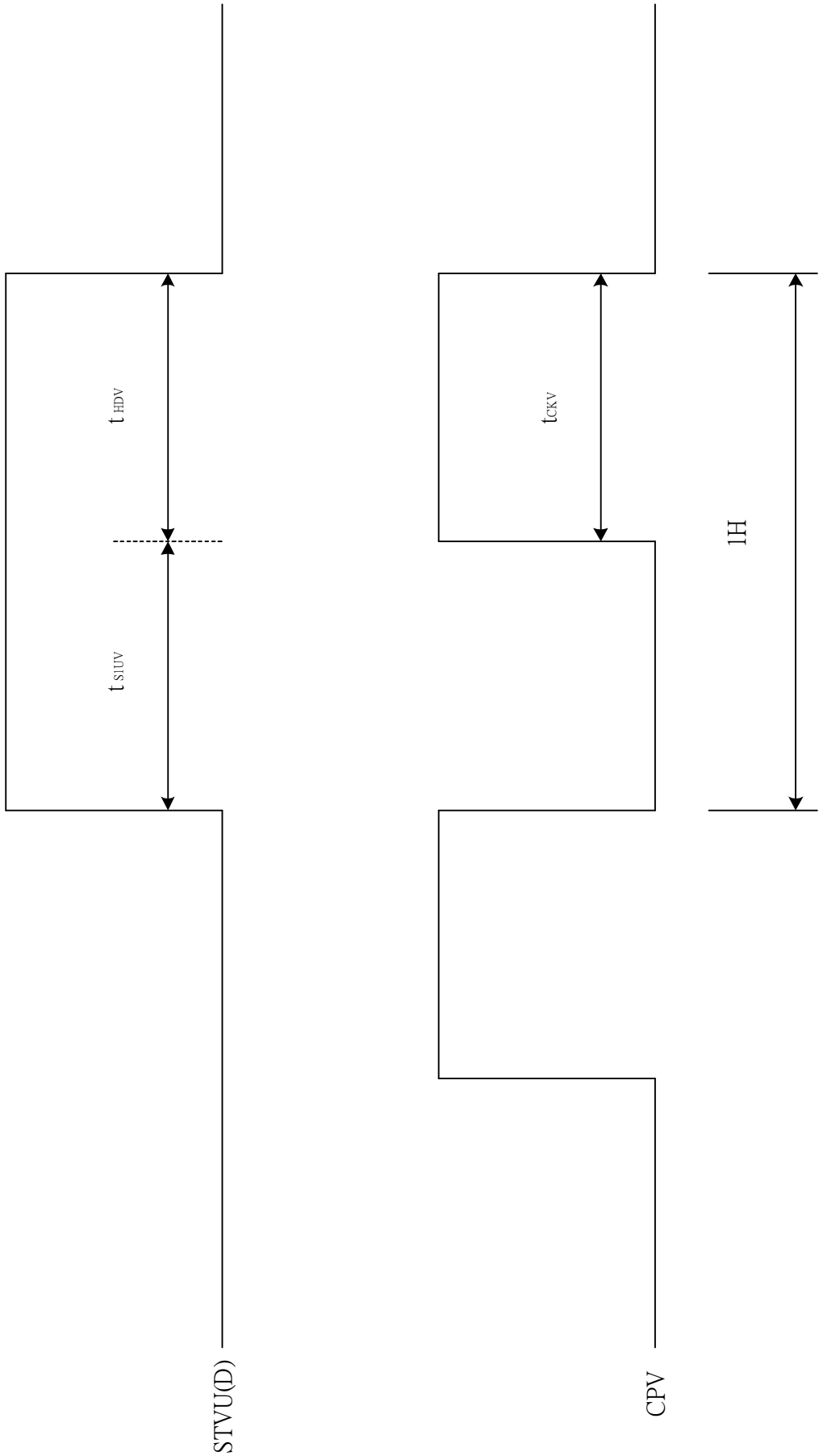


Fig. 8-4 Vertical shift clock timing



Vertical timing (From up to down)

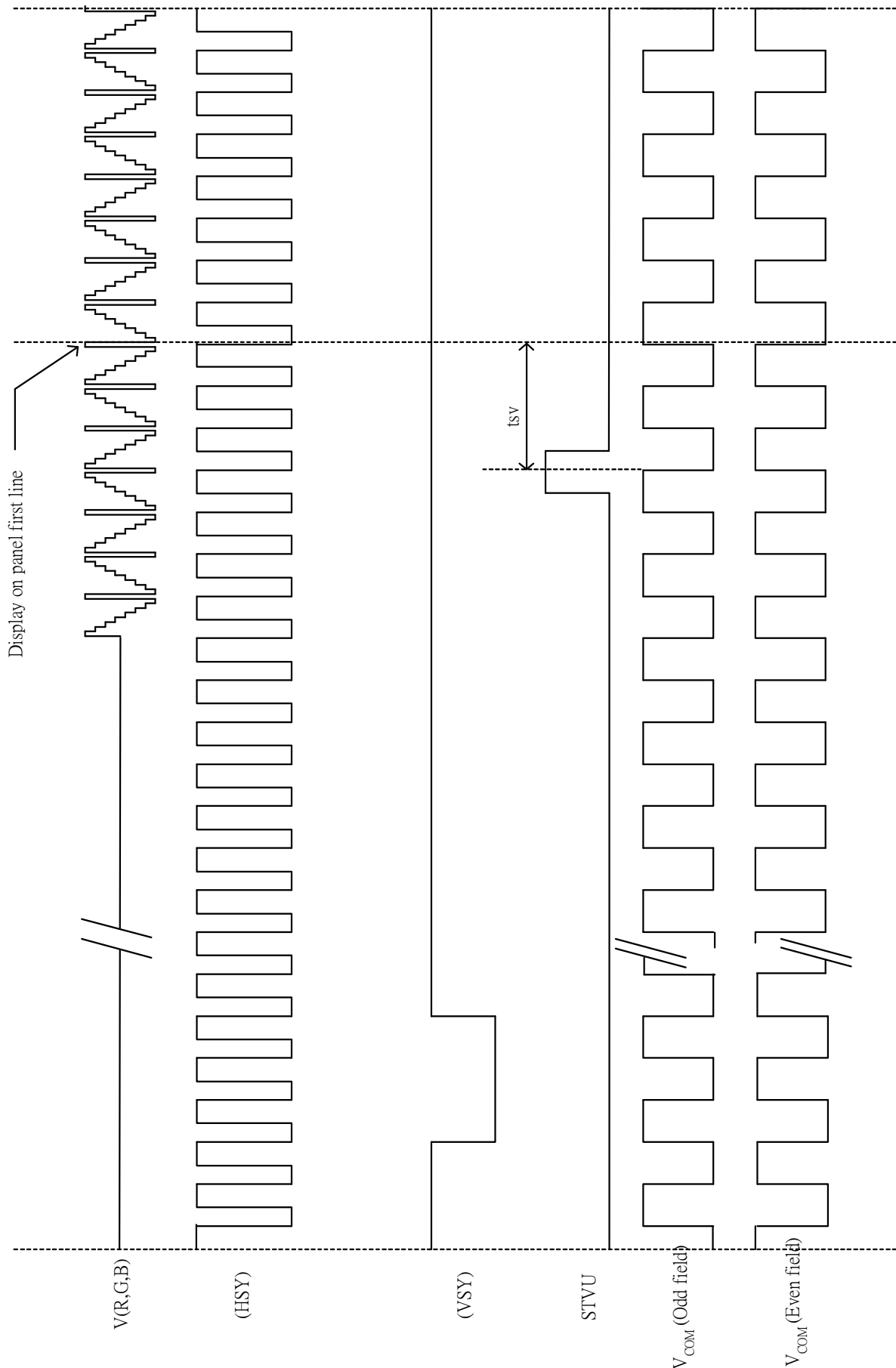


Fig. 8-5 (a) Vertical timing (From Up to Down)

Vertical timing (From down to up)

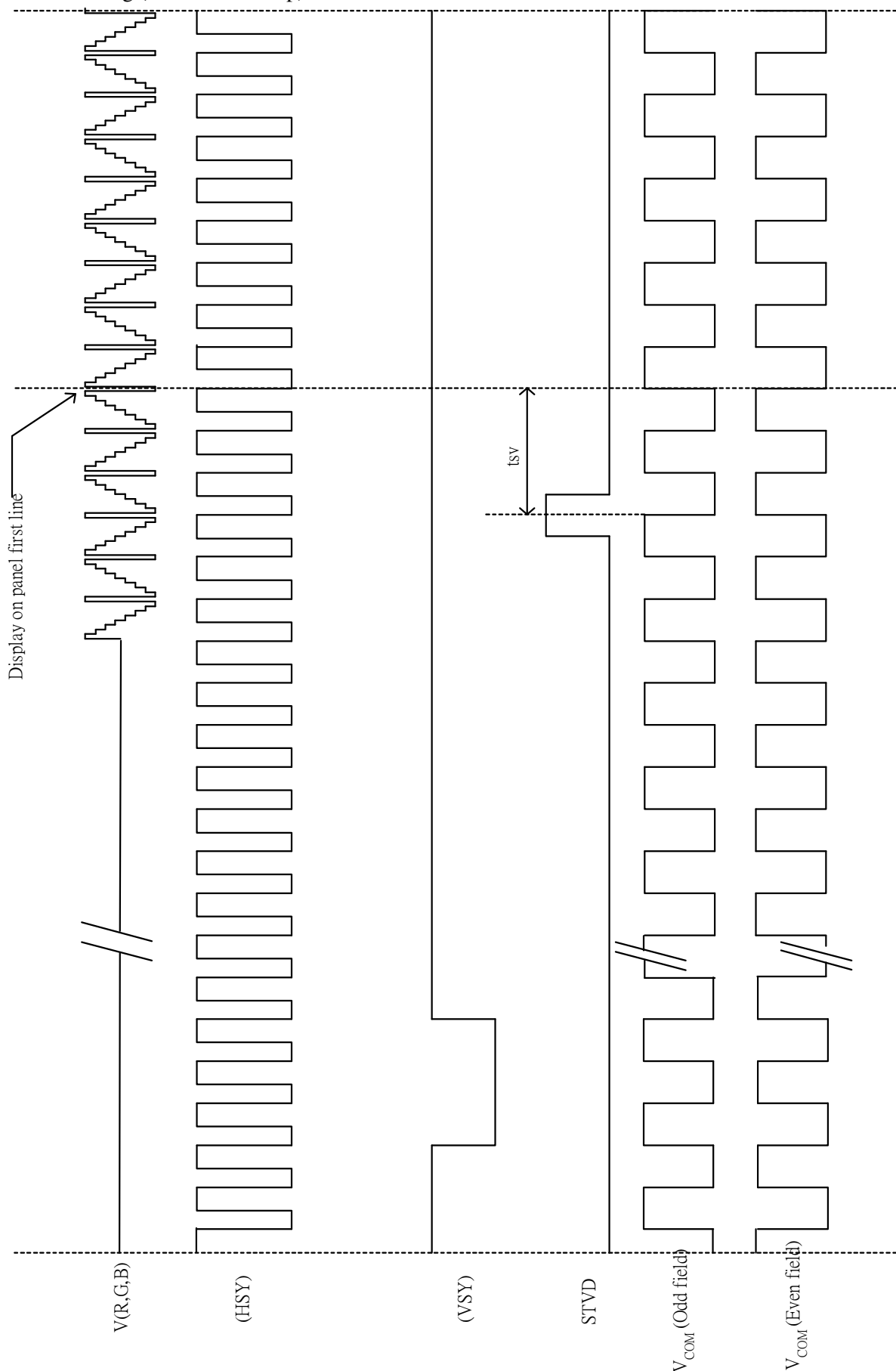
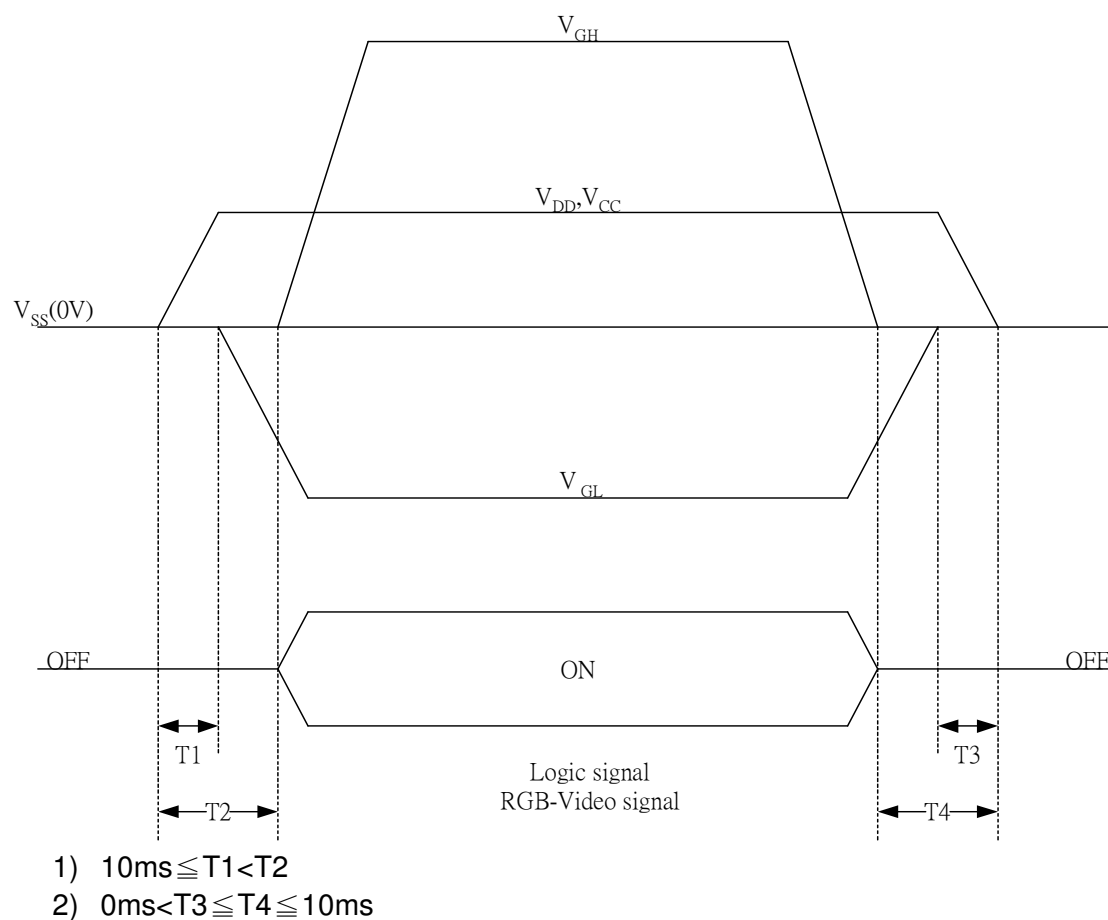


Fig. 8-5 (b) Vertical timing (From Down to Up)

## 9. Power On Sequence

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



## 10. Optical Characteristics

### 10-1) Specification:

$T_a = 25^\circ\text{C}$

Parameter		Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remarks
Viewing Angle	Horizontal	$\theta_{21}$ , $\theta_{22}$	$CR \geq 10$	$\pm 45$	$\pm 50$	---	deg	Note 10-1
	Vertical	$\theta_{11}$		30	35	---	deg	
		$\theta_{12}$		10	15	---	deg	
Contrast Ratio		CR	At optimized viewing angle	200	350	---		Note 10-2
Response time	Rise	Tr	$\theta = 0^{\circ}$	---	15	30	ms	Note 10-4
	Fall	Tf		---	25	50	ms	
Uniformity		U		75	80	---	%	Note 10-5
Brightness				300	350	---	cd/m <sup>2</sup>	Note 10-3
White Chromaticity		x	$\theta = 0^{\circ}$	0.28	0.31	0.34		
		y		0.30	0.33	0.36		
LED Life Time			25 <sup>o</sup> C		10000		hr	Note 10-3



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

$$U = \frac{\text{The Minimum Brightness of the 9 testing Points}}{\text{The Maximum Brightness of the 9 testing Points}} \times 100\%$$

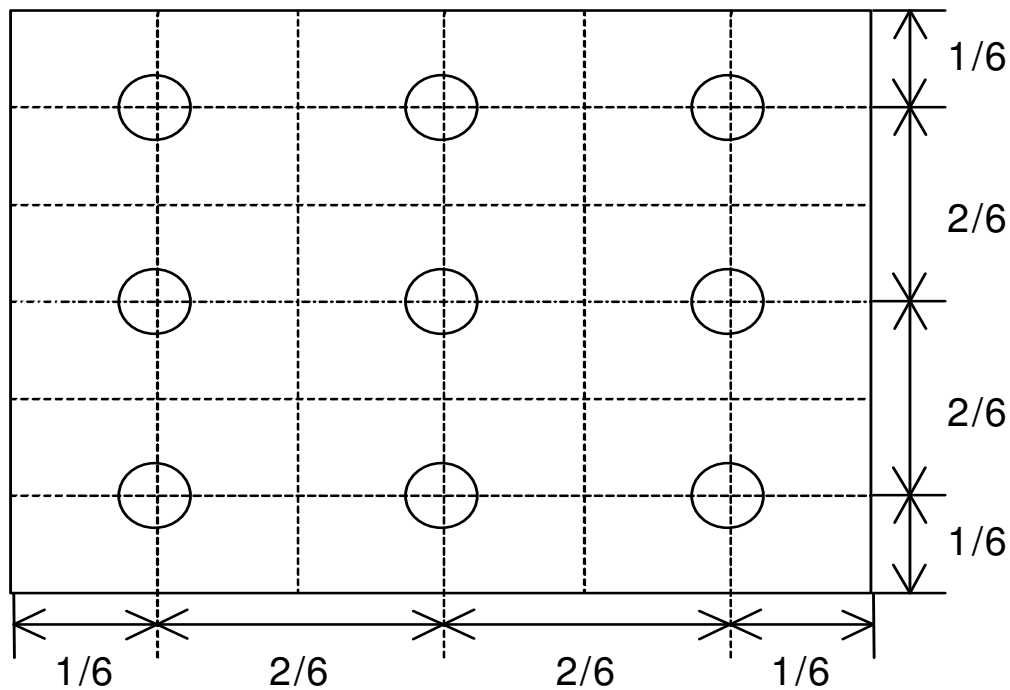
Luminance meter : BM-5A or BM-7 fast (TOPCON)

Measurement distance :  $500 \pm 50$  mm

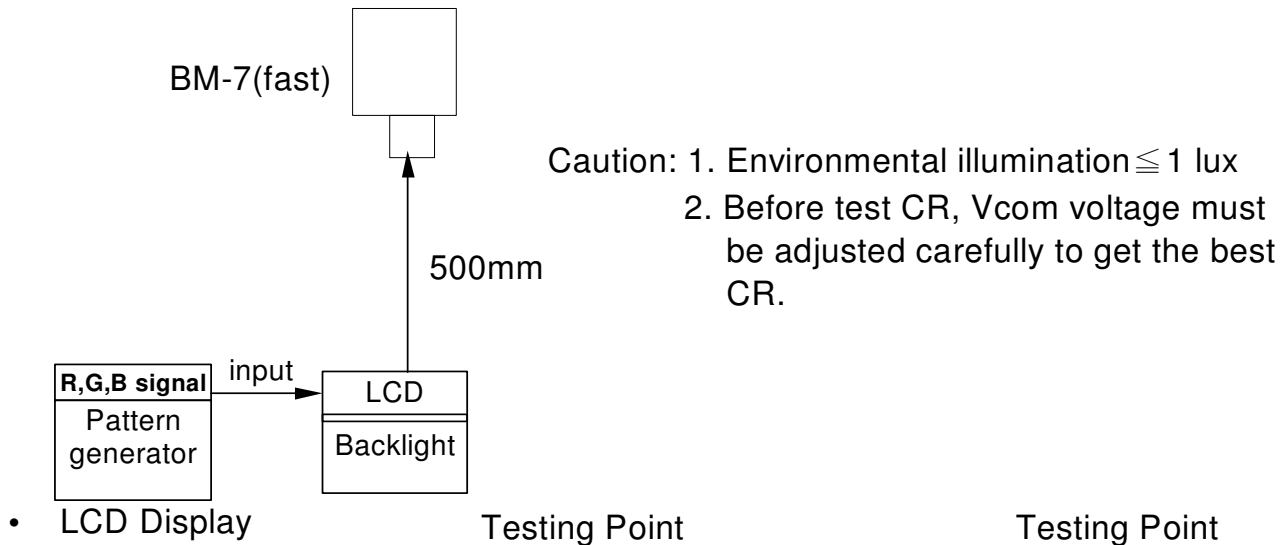
Ambient illumination : < 1 Lux

Measuring direction : Perpendicular to the surface of module

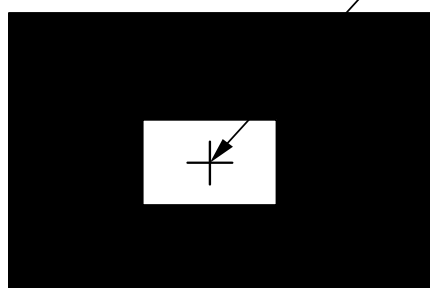
The test pattern is white (Gray Level 63).



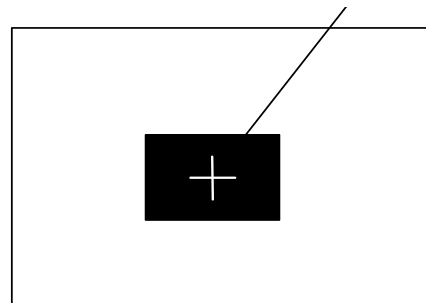
10-2) Testing configuration



- LCD Display

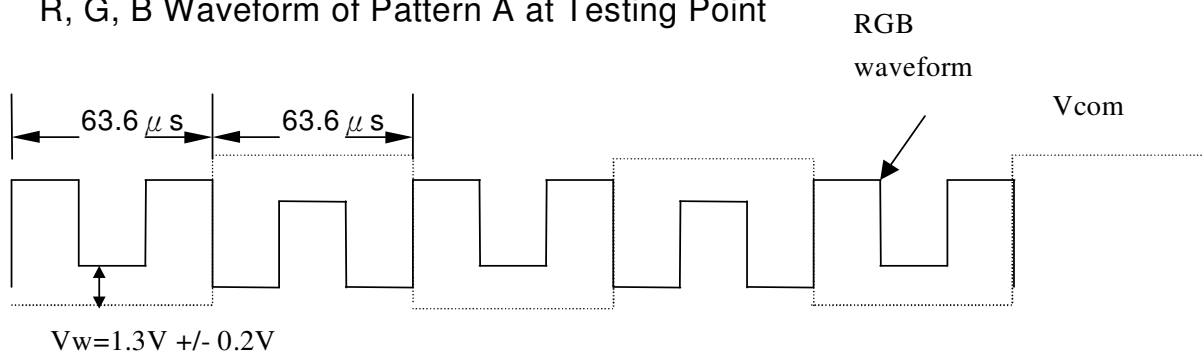


Pattern A

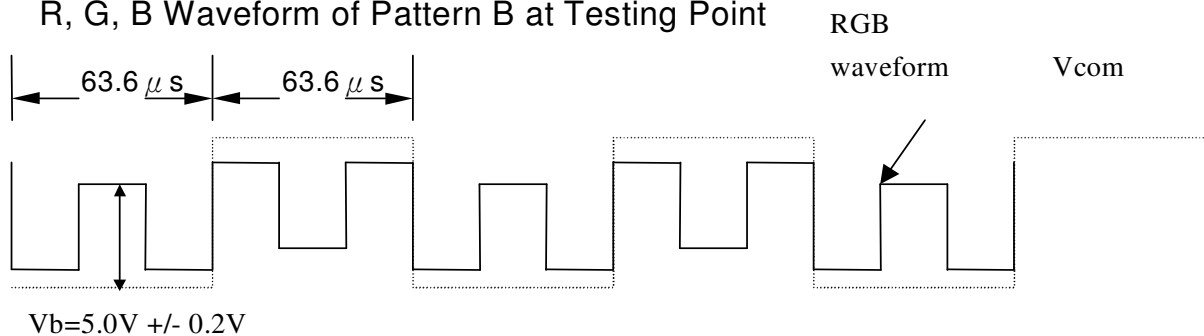


Pattern B

- 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.
  1. 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. Wipe off water drops or finger grease immediately. Long contact with water may cause discoloration or spots.
- b) TFT-LCD module uses glass which breaks or cracks easily if dropped or bumped on hard surface. Please handle with care.
- c) 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.

## 12. Reliability Test

No	Test Item	Test Condition
1	High Temperature Storage Test	Ta = +80°C , 240 hrs
2	Low Temperature Storage Test	Ta = -30°C , 240 hrs
3	High Temperature Operation Test	Ta = +70°C , 240 hrs
4	Low Temperature Operation Test	Ta = -20°C , 240 hrs
5	High Temperature & High Humidity Operation Test	Ta = +60°C , 90%RH, 240 hrs
6	Thermal Cycling Test (non-operating)	-20°C → +70°C , 200 Cycles 30 min 30 min
7	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
8	Shock Test (non-operating)	100G, 6ms Direction : ±X, ±Y, ±Z Cycle : 3 times
9	Electrostatic Discharge Test (non-operating)	Machine Mode = ±200V C = 200pF , R = 0Ω 1 times discharge for each pad

Ta : ambient temperature

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

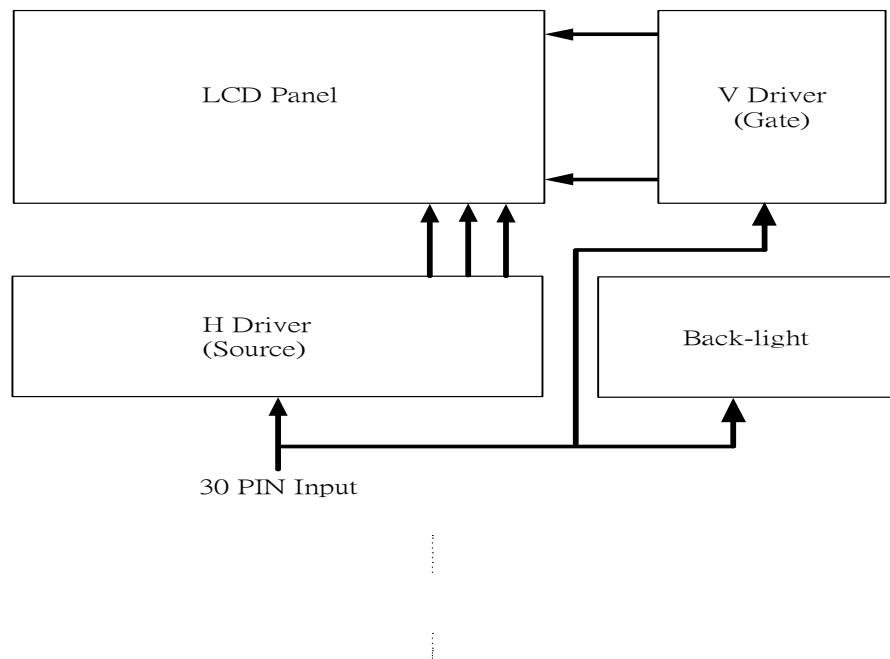
### [Criteria]

1. Main LCD should normally work under the normally condition no defect of function, screen quality and appearance.(including : mura ,line defect ,no image)
2. After the temperature and humidity test, the luminance and CR (Contrast ratio) , should not be lower than minimum of specification.
1. After the vibration and shock test , can't be found chip broken.

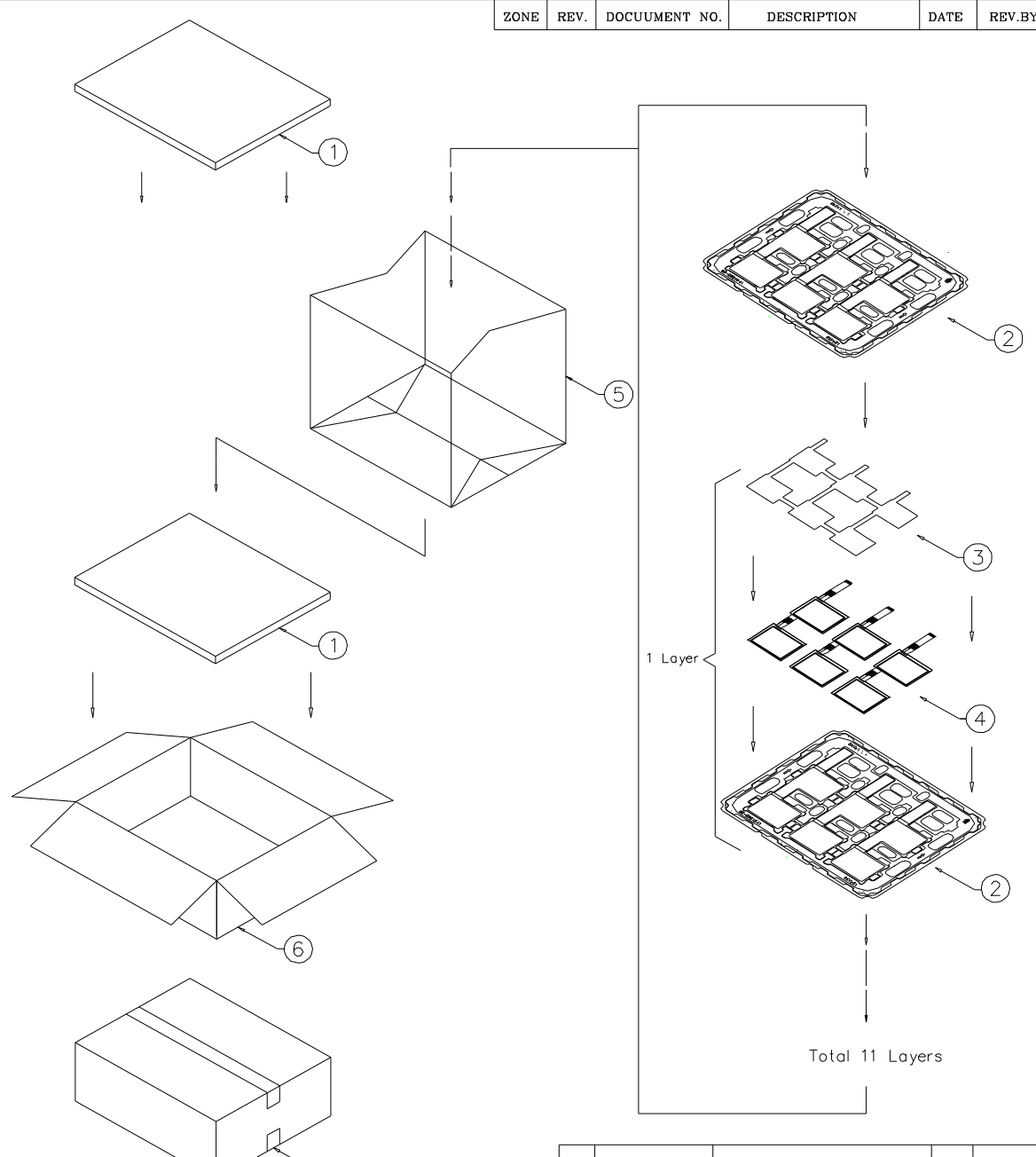


### 13. Block Diagram

#### 13-1) LCD Module Diagram




**14. Packing**

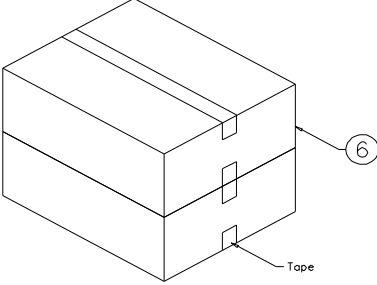
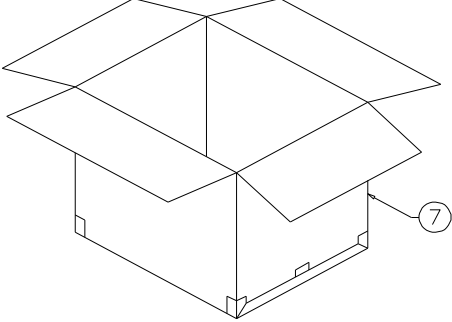
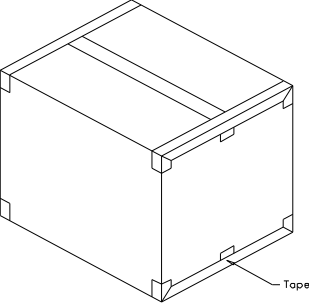
ZONE	REV.	DOCUMENT NO.	DESCRIPTION	DATE	REV.BY
					
<p><b>NOTE:</b></p> <p>1. One layer include: 1 piece of cushion sheet, 6 pcs panel &amp; 1 piece of tray.</p> <p>2. Q'TY: 66 pcs panel/carton.</p> <p>3. Dimension: 455*375*190mm</p> <p>4. Weight: 6.2 KG</p>					
MTL.SPEC.		UNSPECIFIED TOL'S		REMARK	
		ANGLE			
		ROUGHNESS			
APPROVE	Frank Shin	'06.03.02	SCALE	UNIT	SHEET
CHECK	Frank Shin	'06.03.02	1:1	mm	1 OF 2
DESIGN	Dennis	'06.03.02	MTL.NO.		DWG.NO.
					REV. 01
					A4 SIZE

ITEM	PART NO.	DESCRIPTION	QTY	REMARK
6	50-0100091	CARTON INTERNAL	1	
5	50-0500041	擴口袋450*380*700mm	1	抗靜電
4		PA040XS3	66	
3	50-0200080	EPE CUSHION SHEET	11	抗靜電
2	50-0301541	TRAY	12	抗靜電
1	50-0300491	EPE FOAM	2	


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**DWG.TITLE**  
**PA040XS3 PACKING Dim**

ZONE	REV.	DOCUMENT NO.	DESCRIPTION	DATE	REV.BY																														
<div style="text-align: center;">  <p>↓</p>  <p>↓</p>  </div> <div style="margin-top: 20px;"> <p><b>NOTE:</b></p> <p>1.Q'TY: 132 pcs panel/carton.</p> <p>2.Dimension: 480*396*405mm</p> <p>3.Weight: 12.5 KG</p> </div> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr> <td>7</td> <td>50-0100101</td> <td>CARTON EXTERNAL</td> <td>1</td> <td> </td> </tr> <tr> <td>ITEM</td> <td>PART NO.</td> <td>DESCRIPTION</td> <td>QTY</td> <td>REMARK</td> </tr> </table>																										7	50-0100101	CARTON EXTERNAL	1		ITEM	PART NO.	DESCRIPTION	QTY	REMARK
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**元太科技股份有限公司**  
**Prime View International Co.,Ltd.**

**Revision History**

<b>Rev.</b>	<b>Issued      Date</b>	<b>Revised      Contents</b>
1.0	Mar. 14, 2006	New
1.1	Ape. 14, 2006	Page. 19 10. Optical Characteristics 10-1) Specification: Brightness 變更前： Typ.=370cd/m <sup>2</sup> , Min.= 330cd/m <sup>2</sup> 變更後： Typ.=350cd/m <sup>2</sup> , Min.= 300cd/m <sup>2</sup>