



SmarterGlass

state-of-the-art display solutions

www.smarterglass.com
978 997 4104
sales@smarterglass.com

TECHNICAL SPECIFICATION

MODEL NO. : PW056XS2

Customer's Confirmation

Customer _____

Date _____

By _____

Revision History

Rev.	Issued Date	Eng.	Revised Contents
0.1	Sept. 26, 2007	鄒益智	Preliminary

TECHNICAL SPECIFICATION

CONTENTS

<i>NO.</i>	<i>ITEM</i>	<i>PAGE</i>
-	Cover	1
-	Revision History	2
-	Contents	3
1	Application	4
2	Features	4
3	Mechanical Specifications	4
4	Mechanical Drawing of TFT-LCD module	5
5	Input / Output Terminals	6
6	Pixel Arrangement	7
7	Absolute Maximum Ratings	8
8	Electrical Characteristics	8
9	Power on Sequence	18
10	Optical Characteristics	18
11	Handling Cautions	22
12	Reliability Test	23
13	Block Diagram	24
14	Packing	25

1. Application

This technical specification applies to 5.6" color TFT-LCD module, PW056XS2.

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

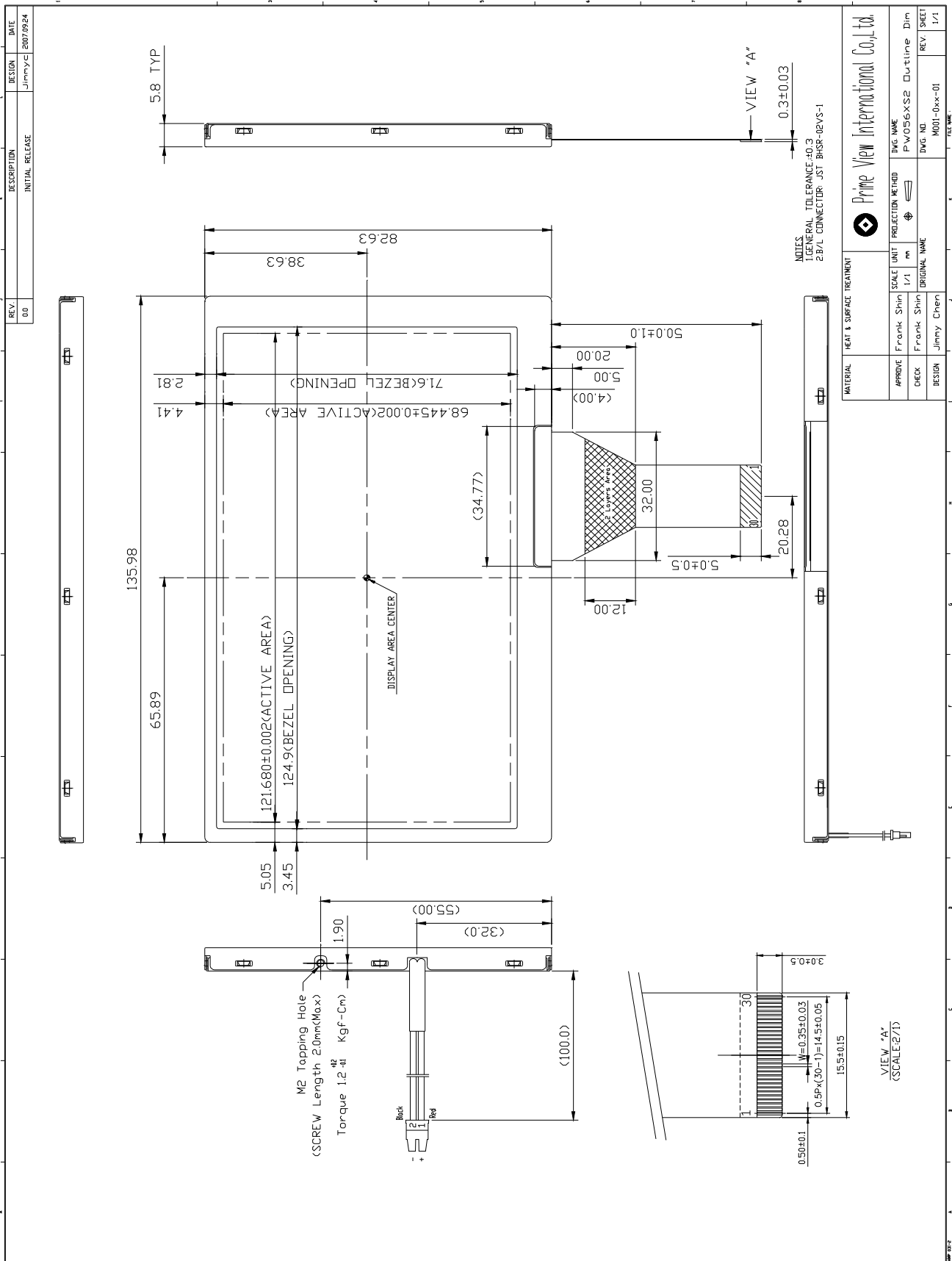
2. Features

- . Pixel in stripe configuration
- . Compatible with NTSC and PAL system
- . Slim and compact
- . High Brightness
- . Up / Down and Left / Right Image Reversion
- . Support full , center , wide mode with PVI-1004D
(If customer use PVI-1004D , this panel doesn't support zoom mode)

3. Mechanical Specifications

Parameter	Specifications	Unit
Screen Size	5.6 (16 : 9 diagonal)	Inch
Display Format	480×(R,G,B)×234	Dot
Active Area	121.68 (H)×68.445 (V)	mm
Pixel Pitch	0.2535 (H)×0.2925 (V)	mm
Pixel Configuration	Stripe	
Outline Dimension	135.98 (W)×82.63(H)×5.8 (D) (typ.)	mm
Weight	TBD	g
Back-light	LED	
Surface Treatment	Anti-Glare	
Display mode	Normally white	
Gray scale inversion direction	6 o'clock [Reference to page. 20]	

4. Mechanical Drawing of TFT-LCD Module :



5. Input / Output Terminals

LCD Module Connector

FPC Down 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

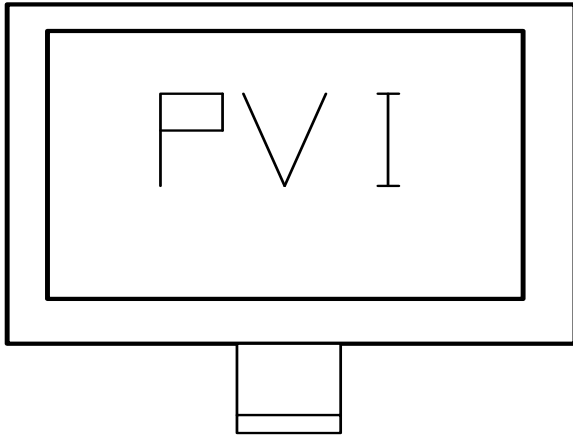
U/D	STVD	STVU	scanning direction
V _{CC}	Input	output	down to up
GND	output	input	up to down

Note 5-2

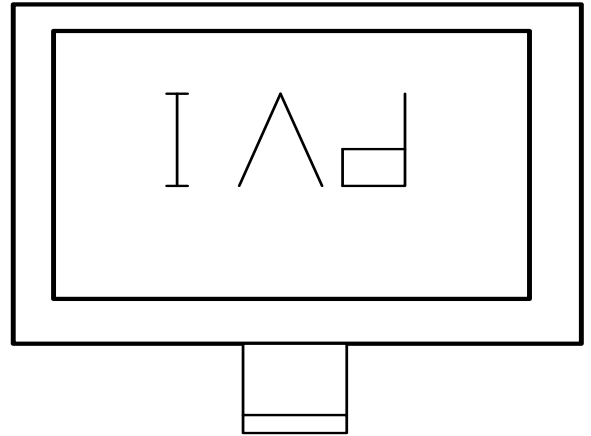
R/L	STHL	STHR	scanning direction
V _{DD1}	output	input	left to right
GND	input	output	right to left

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

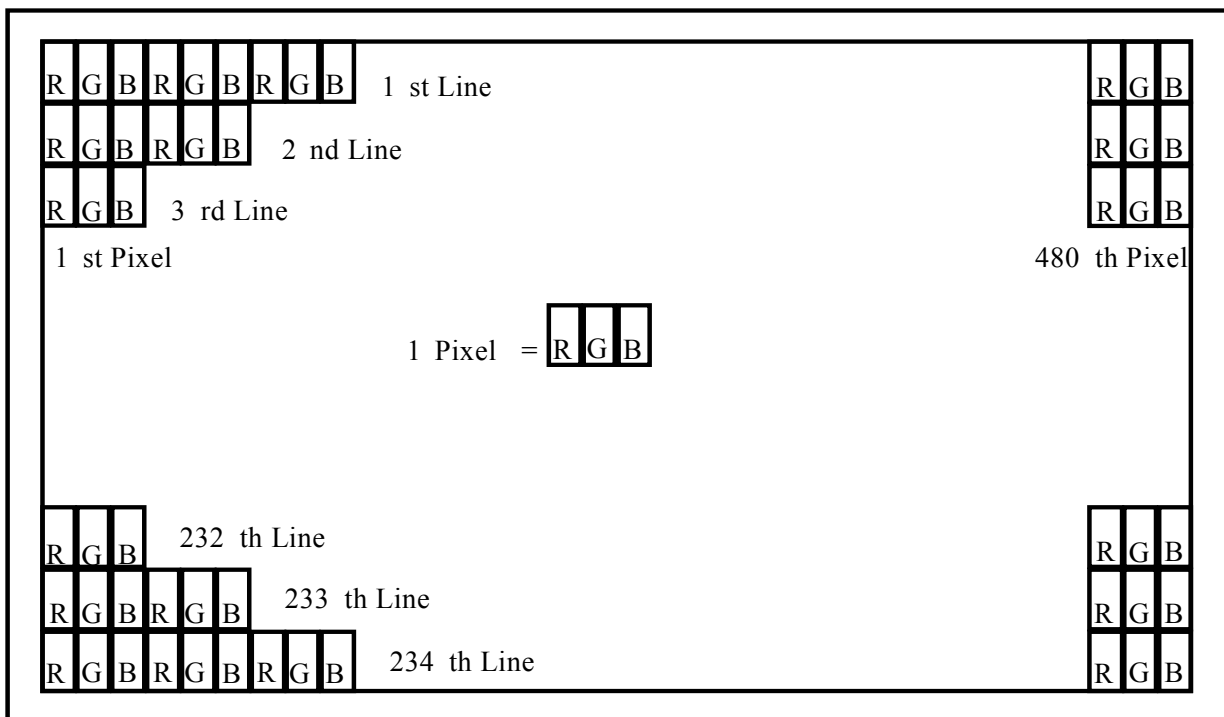
Note 5-4 : V_{EE} TYP. = -12V

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



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	+7.0	V	
	$V_{GH}-V_{EE}$	-0.3	+45.0	V	
	H Level V_{GH}	-0.3	+30.0	V	
	L Level V_{EE}	-17	+0.3	V	

8. Electrical Characteristics
8-1) Recommended Driving condition for TFT-LCD panel

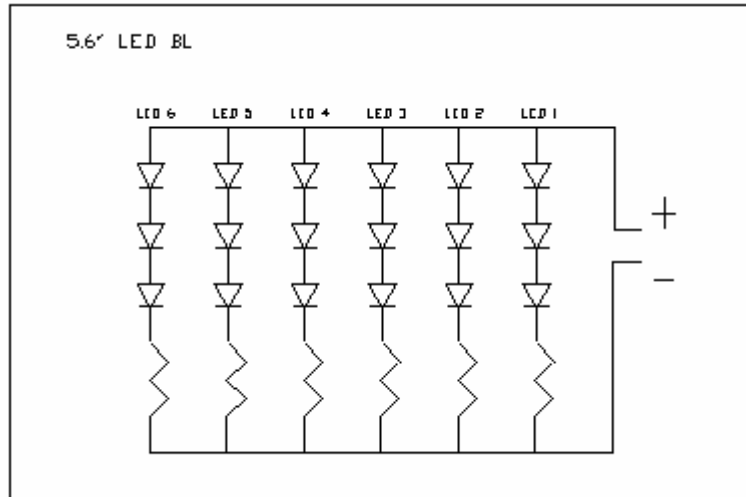
Parameter	Symbol	MIN.	Typ.	MAX.	Unit	Remark
Supply Voltage for Source Driver	Analog V_{DD2}	+4.5	+5.0	+5.5	V	
	Logic V_{DD1}	+3.0	+3.3	+3.6	V	Depend on T/C signal voltage
+4.5		+5.0	+5.5	V		
Supply Voltage for Gate Driver	V_{GH}	+15	+17	+19	V	
	$V_{EE DC}$	-13.0	-12	-10.5	V	DC Component of V_{EE}
	$V_{EE AC}$	-	+5.0	-	V_{P-P}	AC Component of V_{EE}
	Logic V_{CC}	+3.0	+3.3	+3.6	V	Depend on T/C signal voltage
+4.5		+5.0	+5.5	V		
Analog Signal input Level (V_R, V_G, V_B)	V_{iAC}	-	+3.6	+4.0	V	
	V_{iDC}	-	2.5	-	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}	$V_{COM AC}$	-	+5.0	-	V_{P-P}	AC Component of V_{COM}
	$V_{COM DC}$	-	+1.9	-	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 $1.9V \pm 1V$, every module's $V_{COM DC}$ level shall be carefully adjusted to show a best image performance.

8-2) Recommended driving condition for LED back light

Ta= 25 °C

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED voltage	V _{LED}	-	11.0	12.0	V _{rms}	I _L =20mA
LED current	I _{LED}	-	20	-	mA	Note 8-2
Back Light Power Consumption	P _{LED}	-	1320	1440	mW	Note 8-3



Note 8-2 : The LED driving condition is defined for each LED module. (3 LED Serial)

Note 8-3 : $P_{LED} = V_{LED-1} * I_{LED-1} + V_{LED-2} * I_{LED-2} \dots + V_{LED-6} * I_{LED-6}$

Back Light Connector : JST BHSR-02VS-1, Pin No. : 2 , Pitch : 3.5 mm

Pin No	Symbol	Description	Remark
1	VL1	Input terminal (Hi voltage side)	
2	VL2	Input terminal (Low voltage side)	

8-3) LCD Power Consumption :

Ta= 25 °C

Parameter	Symbol	Conditions	TYP.	MAX	Unit	Remark
Supply current for Gate Driver (Hi level)	I _{GH}	V _{GH} = +17V	0.226	0.678	mA	
Supply current for Gate Driver (Low level)	I _{EE}	V _{EE} = -12V	0.098	0.3	mA	V _{EE} center voltage
Supply current for Source Driver(Digital)	I _{DD1}	V _{DD1} = +3.3V	0.84	1.68	mA	
Supply current for Source Driver(Analog)	I _{DD2}	V _{DD2} = +5V	5.594	11.19	mA	
Supply current for Gate Driver (Digital)	I _{CC}	V _{CC} = +3.3V	0.003	0.009	mA	
LCD Panel Power Consumption	-	-	35.77	76.57	mW	Note 8-5

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

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}	9.2	9.6	10.0	MHZ	CPH1~CPH3
CPH pulse duty	t_{CWH}	30	50	70	%	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	μ S	STHR,STHL
OEH pulse width	t_{OEH}	-	1.40	-	μ S	OEH
Sample and hold disable time	t_{DIS1}	-	7.43	-	μ S	
OEV pulse width	t_{OEV}	-	18	-	μ S	OE1,2,3
CKV pulse width	t_{CKV}	-	31.75	-	μ S	CKV
Clean enable time	t_{DIS2}	-	9.0	-	μ S	
Horizontal display timing range	t_{DH}	-	480	-	$t_{CPH}/3$	
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	μ S	
VCOM falling time	t_{fCOM}	-	-	5	μ S	
VCOM delay time	t_{DCOM}	-	-	3	μ S	
RGB delay time	t_{DRGB}	-	-	1	μ S	

8-5) Signal Timing Waveforms

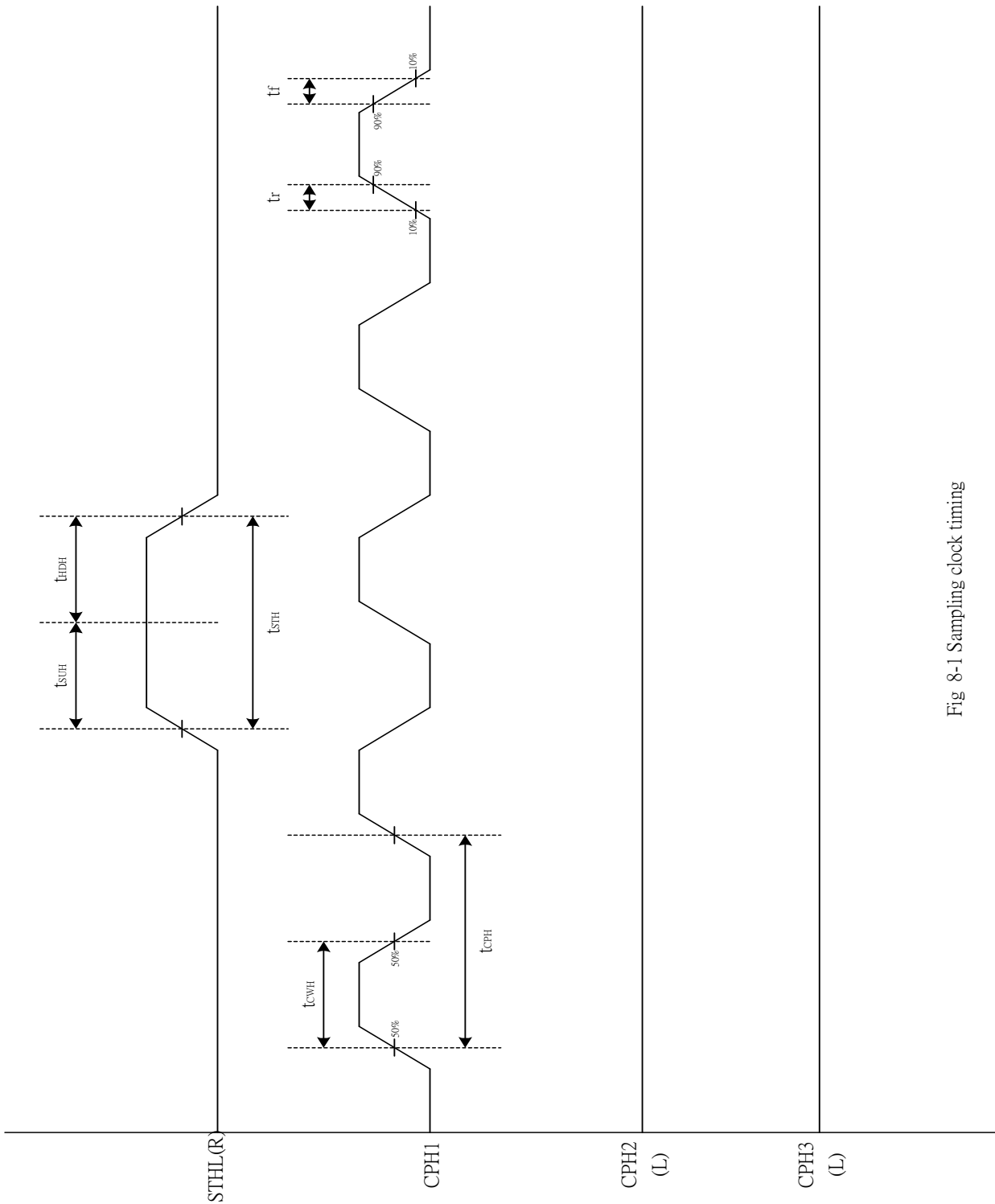


Fig 8-1 Sampling clock timing

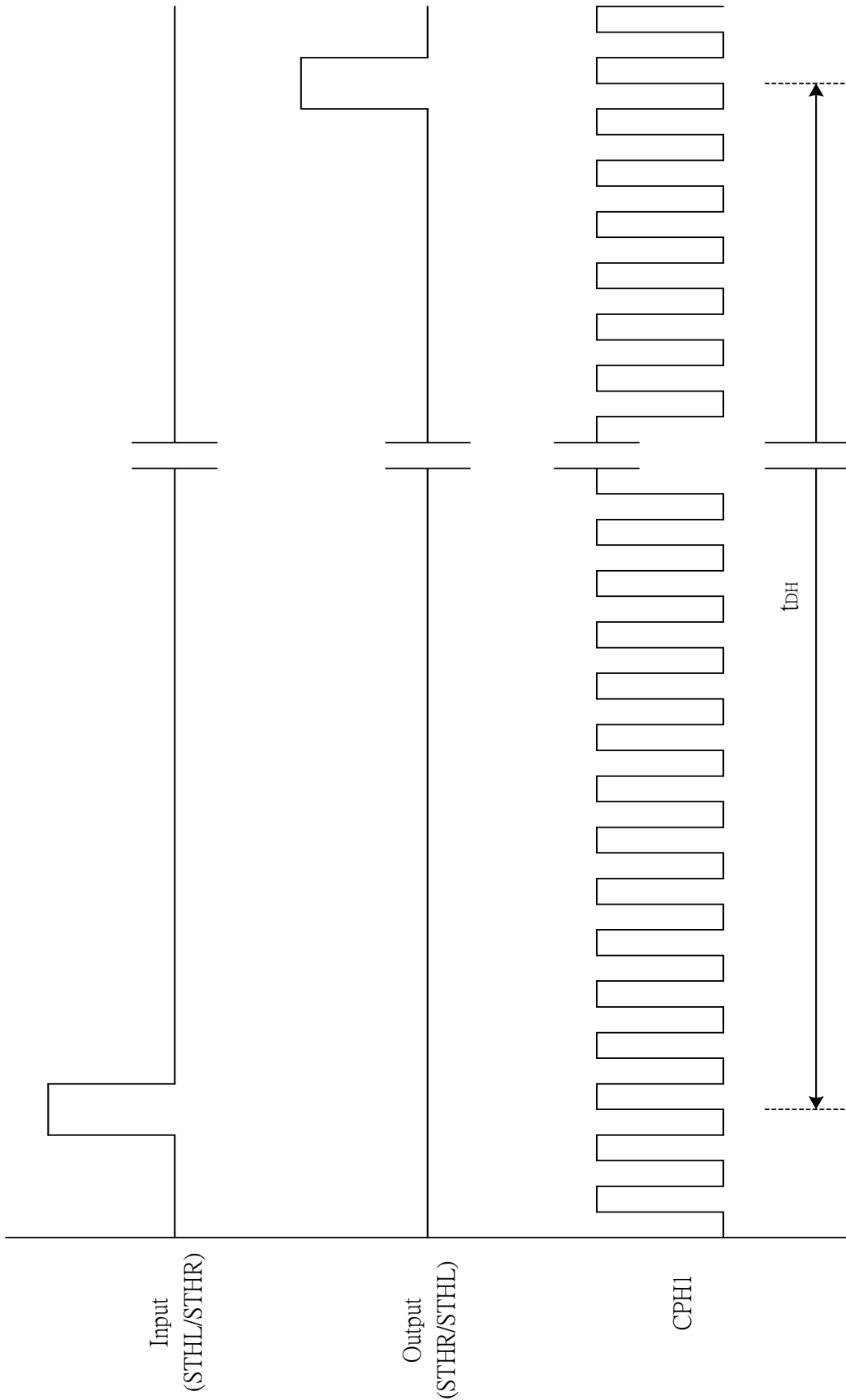


Fig. 8-2 Horizontal display timing range

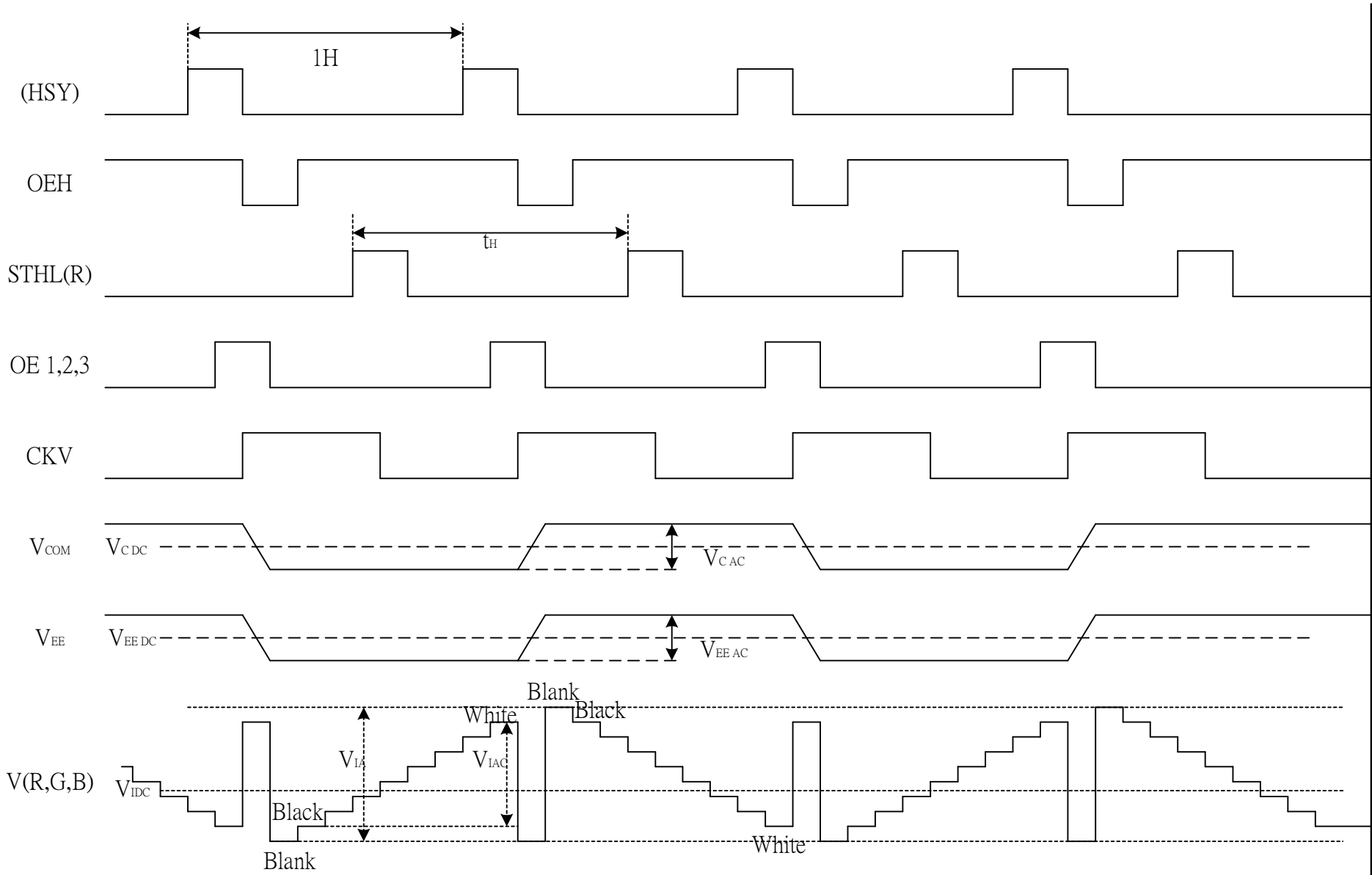
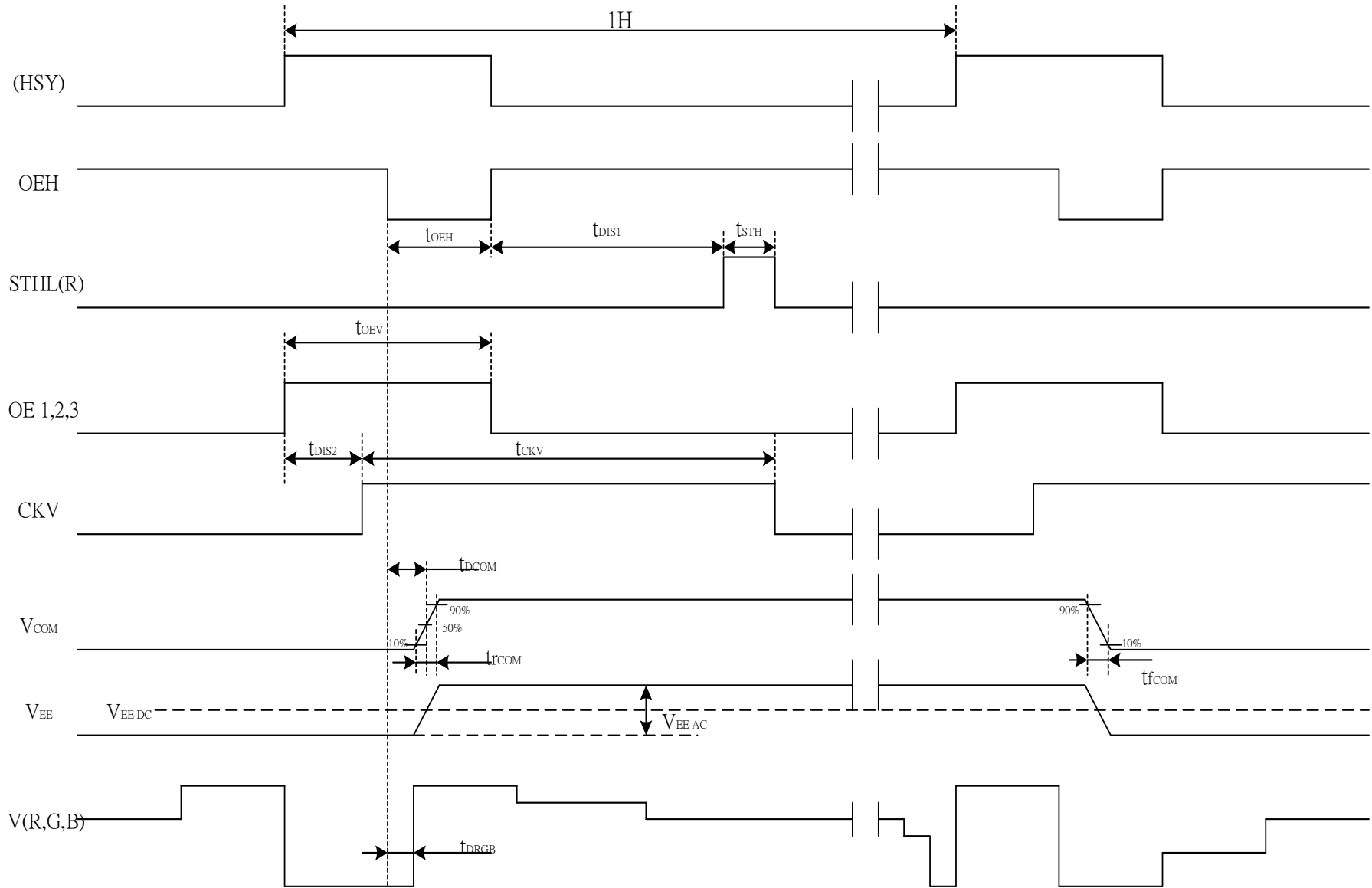


Fig. 8-3 (a) Horizontal timing



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

Fig. 8-3 (b) Detail horizontal timing

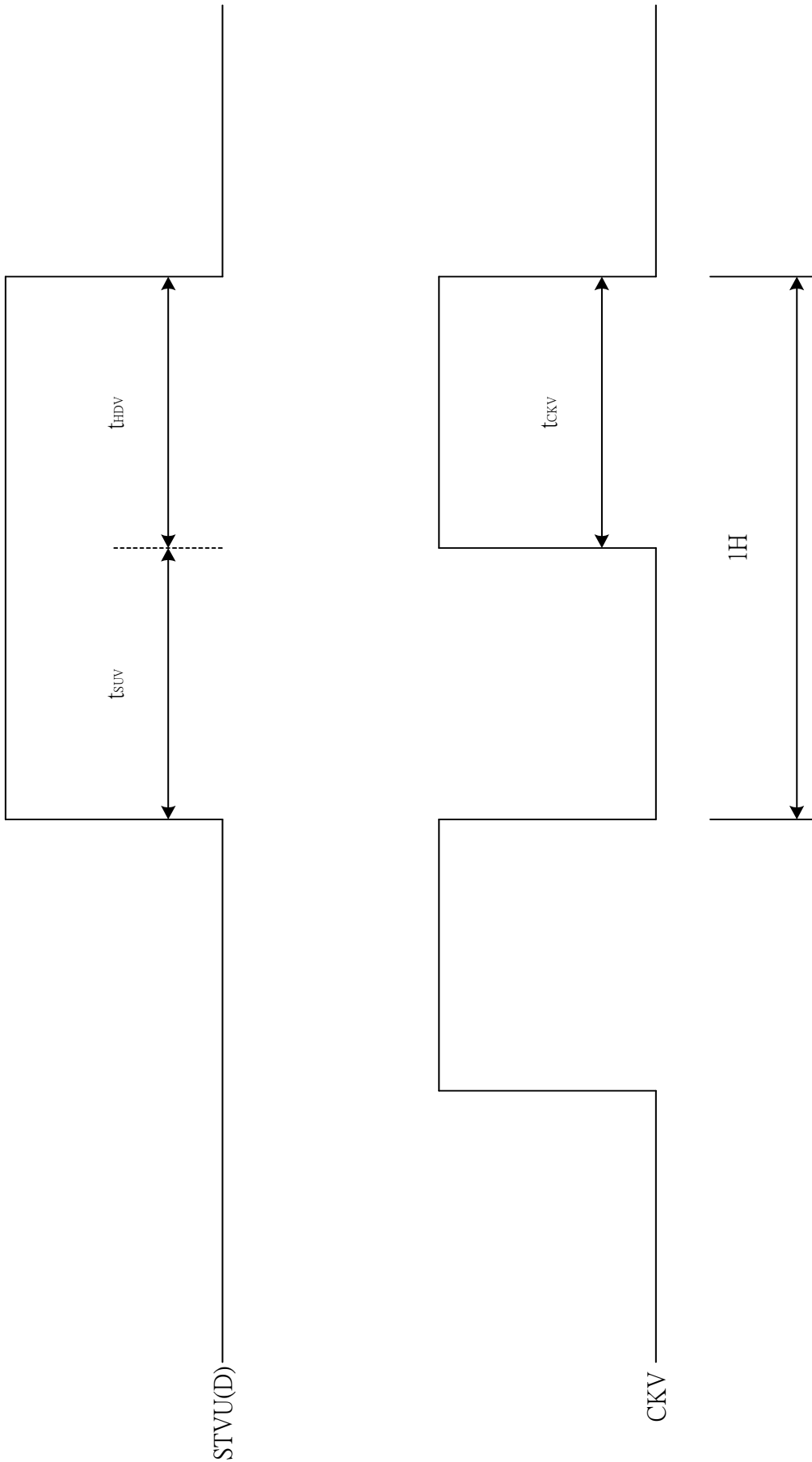


Fig. 8-4 Vertical shift clock timing

Vertical timing (From up to down)

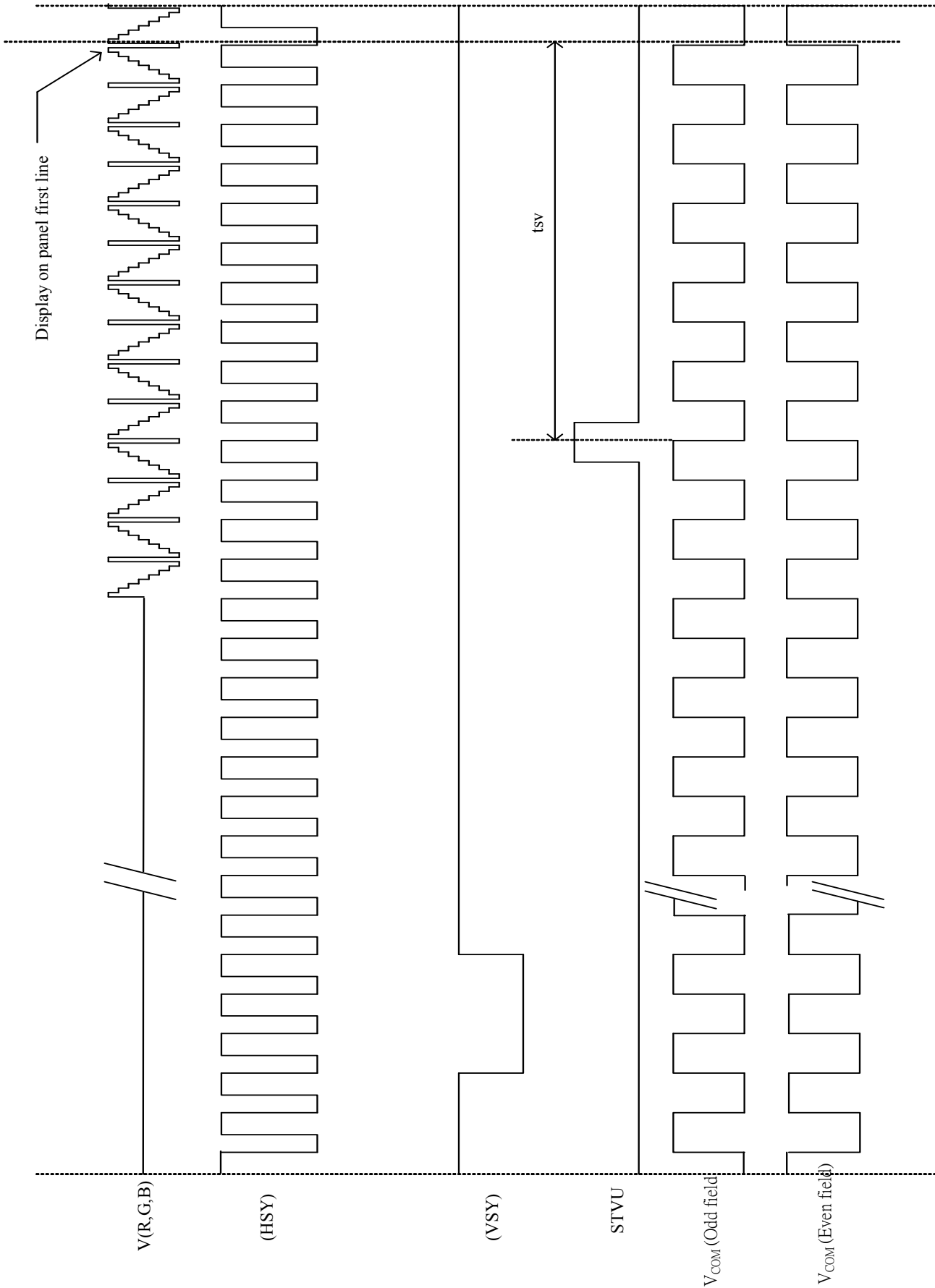


Fig. 8-5 (a) Vertical timing (From Up to Down)

Vertical timing (From down to up)

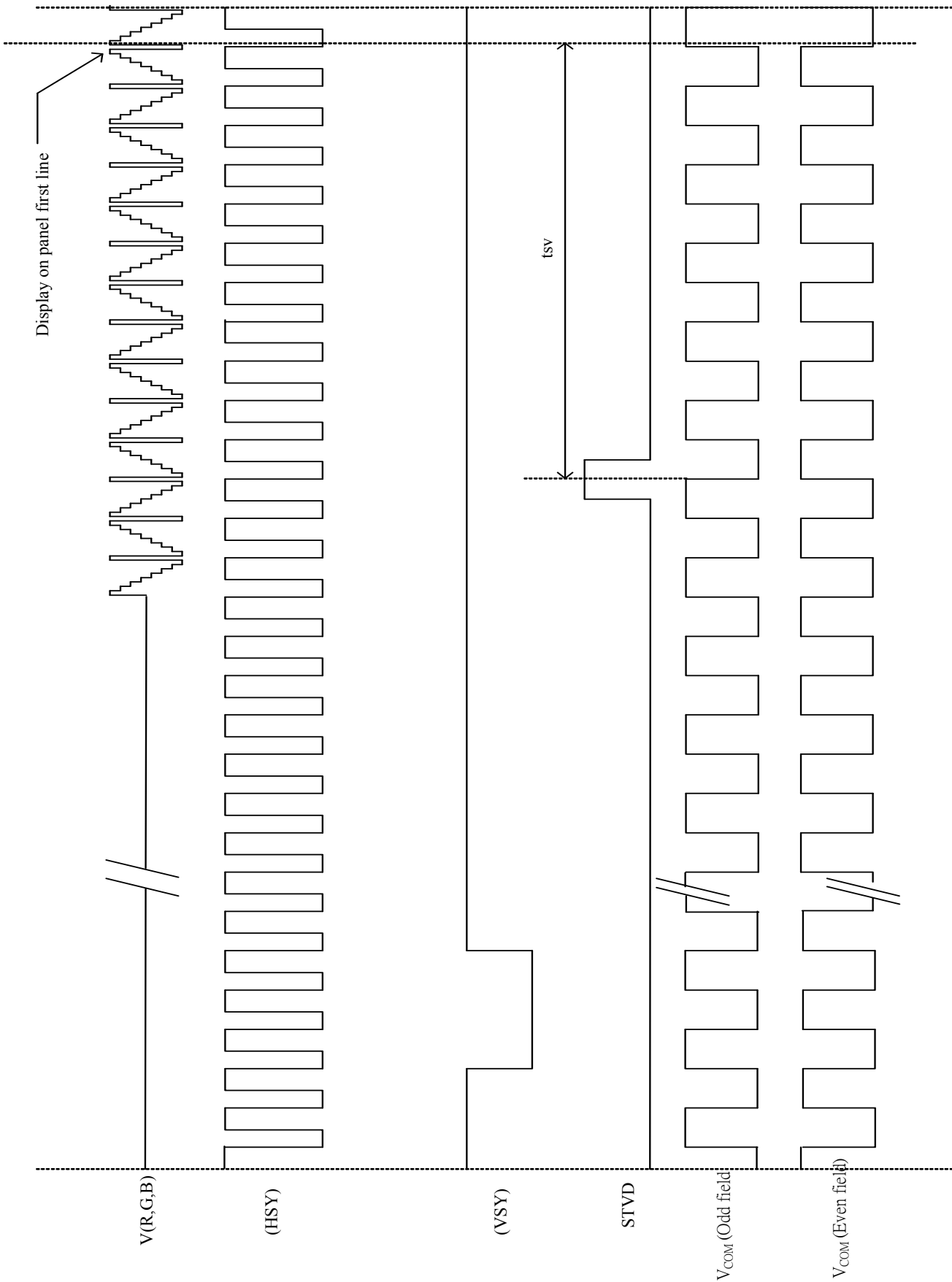
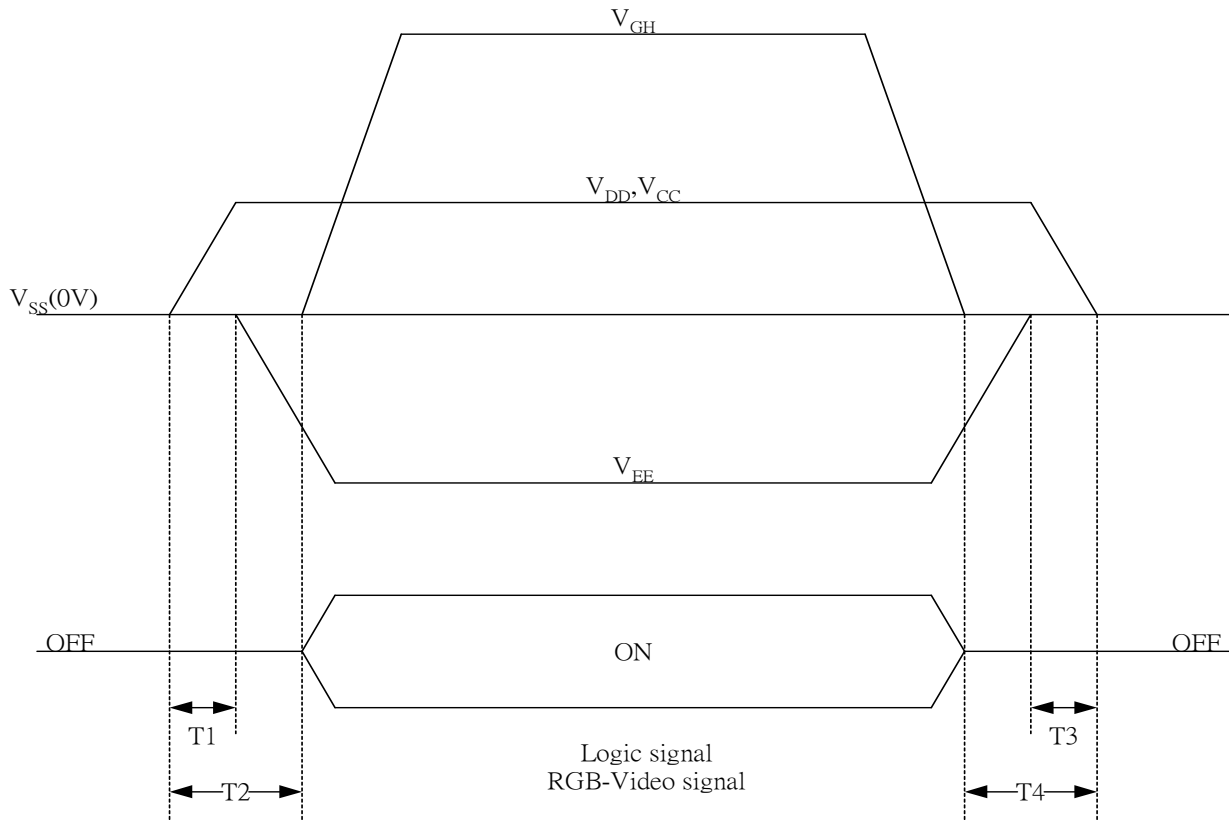


Fig. 8-5 (b) Vertical timing (From Down to Up)

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.



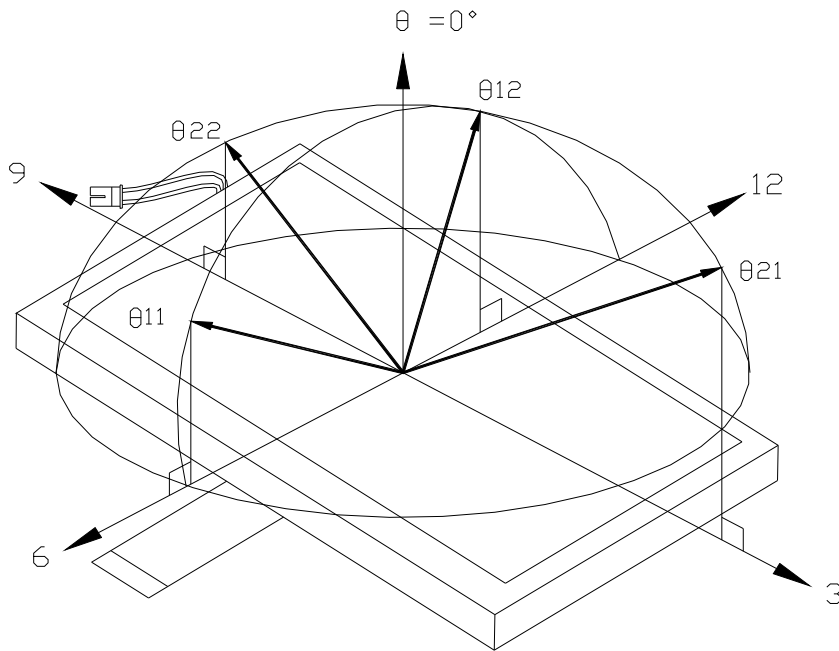
- 1) $10\text{ms} \leq T1 < T2$
- 2) $0\text{ms} < T3 \leq T4 \leq 10\text{ms}$

10. Optical Characteristics
10-1) Specification

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

Parameter		Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remarks
Viewing Angle	Horizontal	$\theta 21, \theta 22$	$CR \geq 10$	45	50	-	deg	Note 10-1
	Vertical	$\theta 12$		10	15	-	deg	
		$\theta 11$		30	35	-	deg	
Contrast Ratio		CR	At optimized view angle	200	400	-	-	Note 10-2
Response time	Rise	T_r	$\theta = 0^\circ$	-	15	30	ms	Note 10-4
	Fall	T_f		-	25	50	ms	
Brightness		L	Center point	350	400	-	cd/m^2	Note 10-3
Uniformity		U%		80	85	-	%	Note 10-5
White Chromaticity	x	$\theta = 0^\circ$		0.265	0.295	0.325	-	Note 10-3
	y			0.300	0.330	0.360	-	
LED Life Time			$+25^\circ\text{C}$	20K	30K	-	hr	

Note 10-1 : The definitions of viewing angles



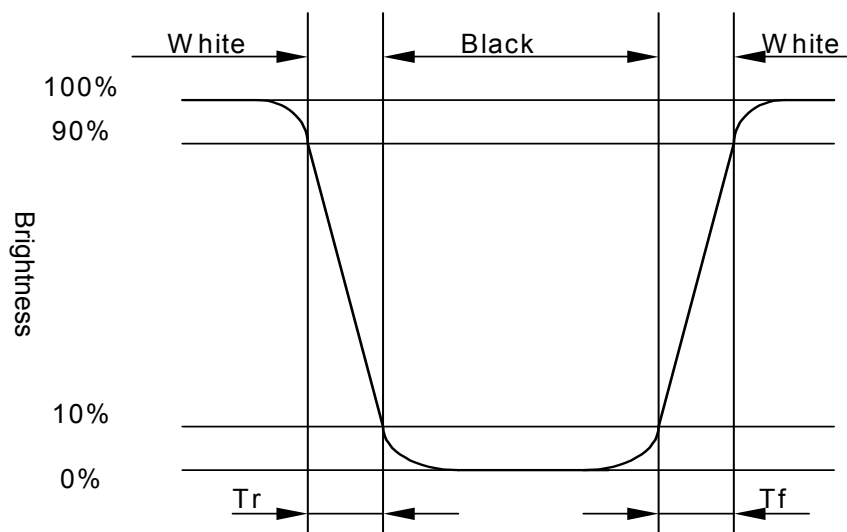
Note 10-2 : $CR = \frac{\text{Luminance when Testing point is White}}{\text{Luminance when Testing point is Black}}$

(Testing configuration see 10-2)

Contrast Ratio is measured in optimum common electrode voltage.

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

Note 10-4 : The definition of response time:



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

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

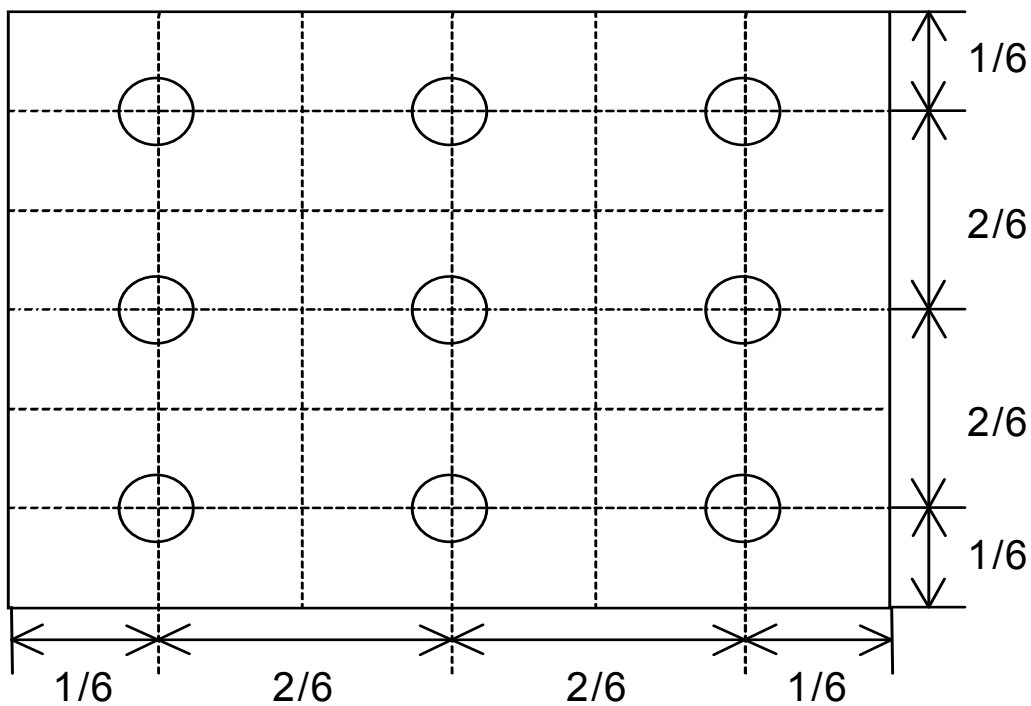
Luminance meter : BM-5A or BM-7 fast (TOPCON)

Measurement distance : 500 mm +/- 50 mm

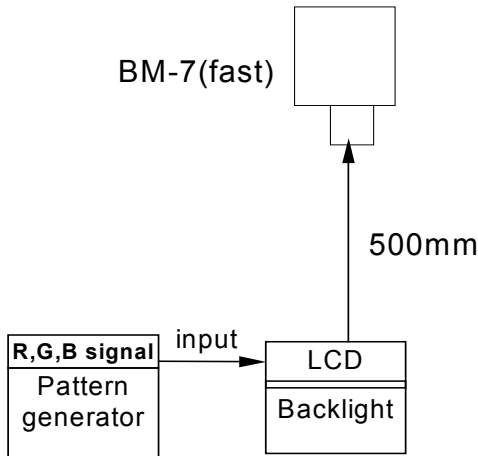
Ambient illumination : < 1 Lux

Measuring direction : Perpendicular to the surface of module

The test pattern is white (Gray Level 63).

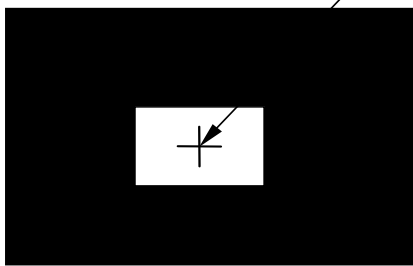


10-2) Testing configuration

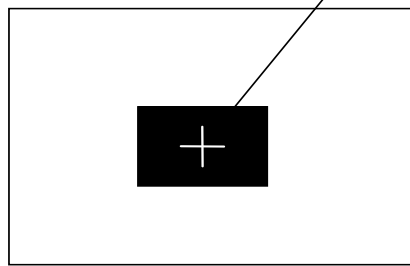


Caution: 1. Environmental illumination ≤ 1 lux
 2. Before test CR, Vcom voltage must be adjusted carefully to get the best CR.

- LCD Display Testing Point Testing Point

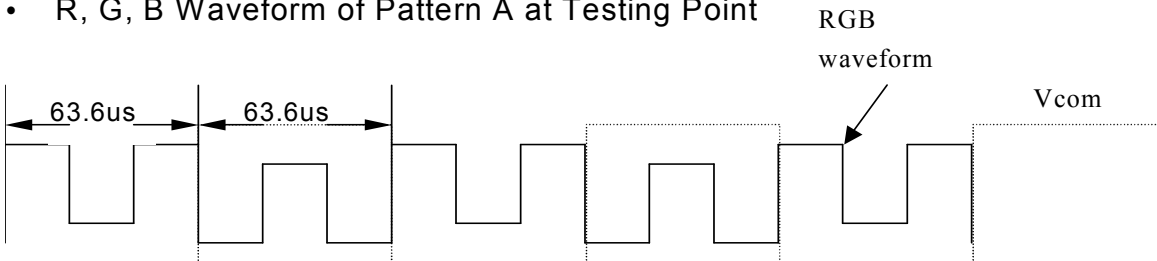


Pattern A

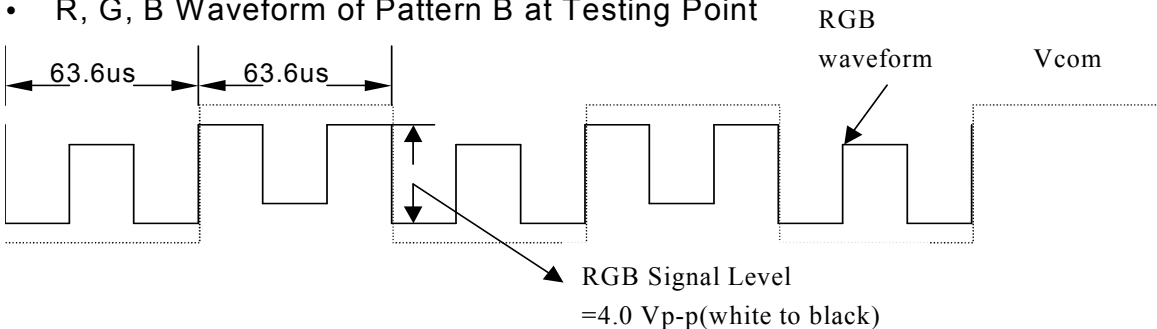


Pattern B

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

11-4) Polarizer mark

The polarizer mark is to describe the direction of 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 = +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 = +50°C, 80%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 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)	200pF, 0Ω ±200V 1 time / each terminal

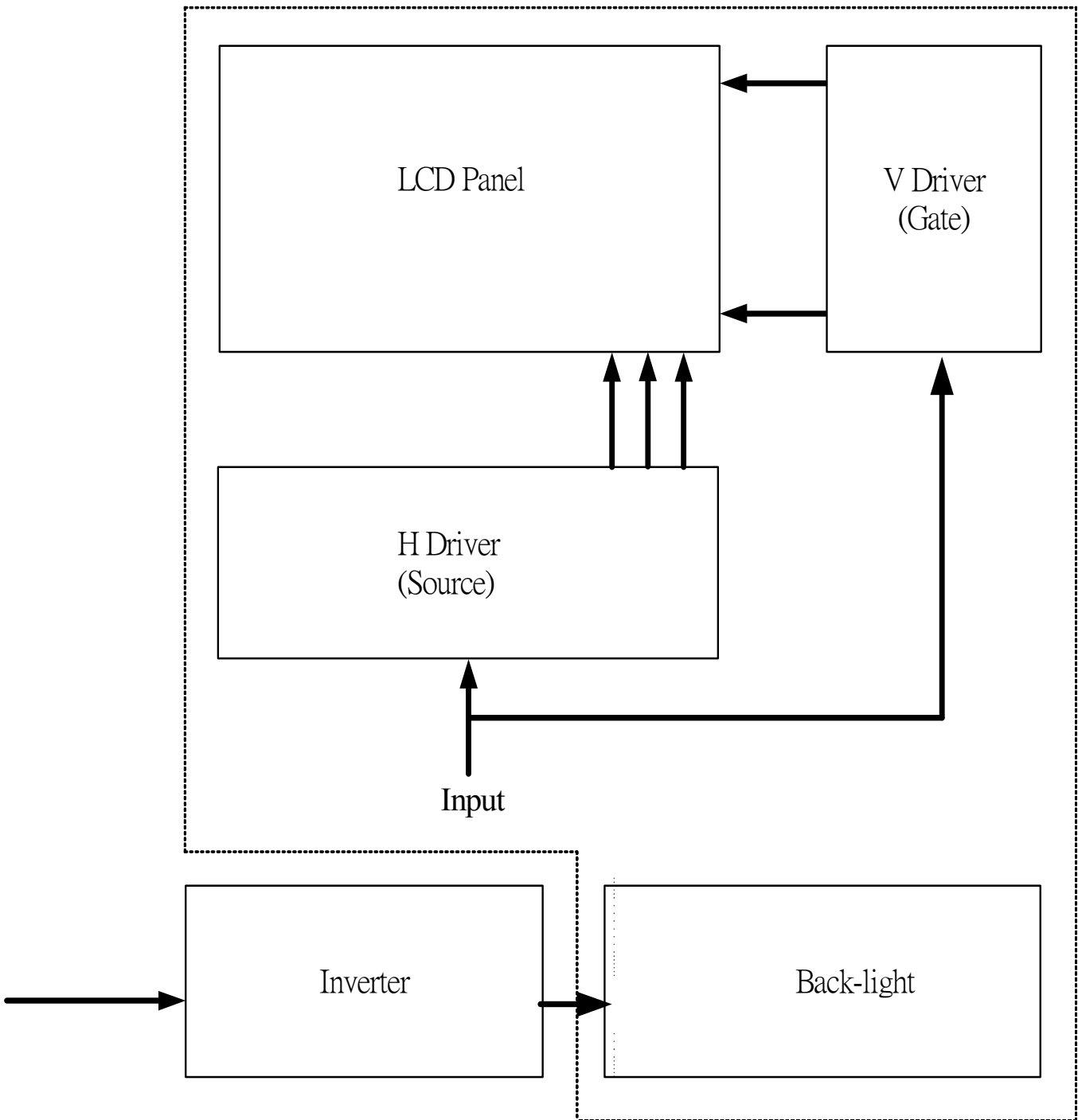
Ta : ambient temperature

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

[Criteria]

In the standard conditions, there is not display function NG issue occurred. (Including : line defect, no image) All the cosmetic specification is judged before the reliability stress.

13. Block Diagram



14. Packing

ZONE	REV.	DOCUMENT NO.	DESCRIPTION	DATE	REV. BY																									
<p>NOTE: 1.Q'TY: 40 pcs panel/carton. 2.Dimension: 530*295*230mm 3.Weight: 7.5 Kg</p>																														
		<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>ITEM</th> <th>PART NO.</th> <th>DESCRIPTION</th> <th>QTY</th> <th>REMARK</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>50-0100111</td> <td>CARTON</td> <td>1</td> <td></td> </tr> <tr> <td>3</td> <td>50-0500091</td> <td>PINK Bag 195*105mm</td> <td>40</td> <td>抗靜電</td> </tr> <tr> <td>2</td> <td></td> <td>5.6" Panel</td> <td>40</td> <td></td> </tr> <tr> <td>1</td> <td>50-0301151</td> <td>瓦楞隔板緩衝材</td> <td>1</td> <td>上蓋+底座</td> </tr> </tbody> </table>		ITEM	PART NO.	DESCRIPTION	QTY	REMARK	4	50-0100111	CARTON	1		3	50-0500091	PINK Bag 195*105mm	40	抗靜電	2		5.6" Panel	40		1	50-0301151	瓦楞隔板緩衝材	1	上蓋+底座		
ITEM	PART NO.	DESCRIPTION	QTY	REMARK																										
4	50-0100111	CARTON	1																											
3	50-0500091	PINK Bag 195*105mm	40	抗靜電																										
2		5.6" Panel	40																											
1	50-0301151	瓦楞隔板緩衝材	1	上蓋+底座																										
MTL.SPEC.		UNSPECIFIED TOL'S		REMARK																										
		ANGLE																												
		ROUGHNESS																												
APPROVE	Franks	'07.09.27	SCALE	UNIT	SHEET																									
CHECK	Franks	'07.09.27			1 OF 1																									
DRAWN	Jimmyc	'07.09.27	MTL.NO.		DWG.TITLE																									
					PW056XS Model Packing Draw																									
				DWG FILE:	REV. 01																									
					A4 SIZE																									

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