

Version : 1.6

TECHNICAL SPECIFICATION

MODEL NO. : PW070XS1

Customer's Confirmation

Customer \_\_\_\_\_

Date \_\_\_\_\_

By \_\_\_\_\_

PVI's Confirmation

Confirmed By \_\_\_\_\_

Prepared By \_\_\_\_\_

**FOR MORE INFORMATION:**

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Date : Apr.29,2004

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# TECHNICAL SPECIFICATION

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## 1. Application

This technical specification applies to 7.0" color TFT-LCD module, PW070XS1. The applications of the panel are car TV, portable DVD, GPS, multimedia applications and others AV system.

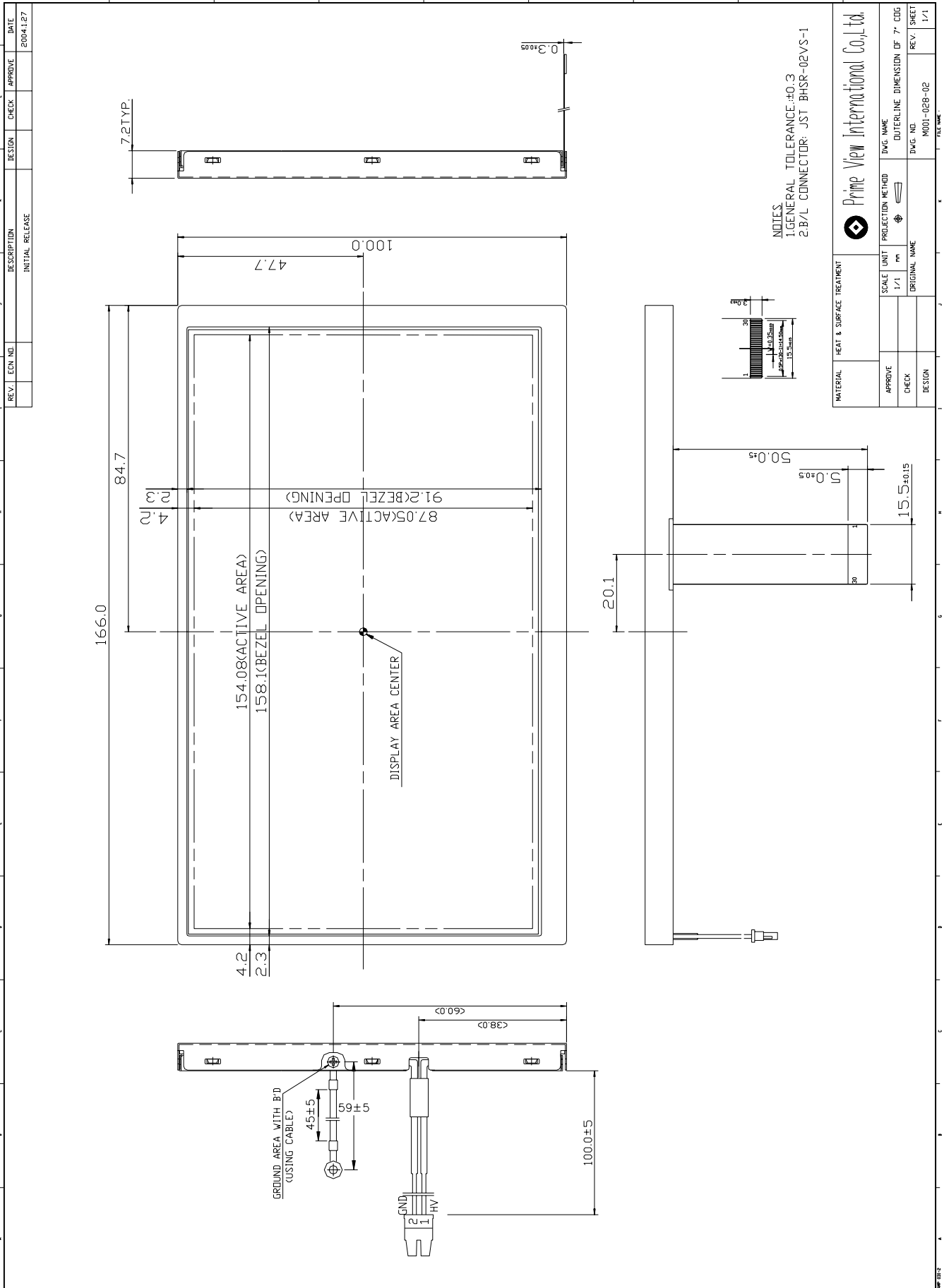
## 2. Features

- . Pixel in stripe configuration
- . Slim and compact
- . High Brightness
- . Image Reversion : Up/Down and Left/Right
- . Wide Viewing Angle
- . Support multi display mode  
(If you use this mode, you must use PVI-1004B's timing controller (mode by PVI))

## 3. Mechanical Specifications

<b>Parameter</b>	<b>Specifications</b>	<b>Unit</b>
Screen Size	7.0 (16:9 diagonal)	Inch
Display Format	1440 (H) x234(V)	dot
Active Area	154.08 (H)x87.05 (V)	mm
Dot Pitch	0.107(H)x0.372 (V)	mm
Pixel Configuration	Stripe	
Outline Dimension	166.0 (W)x100.0 (H)x7.2 (D) (typ.)	mm
Surface Treatment	Anti-Glare and Hard Coating	
Weight	180±10	g

**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 <sub>CC</sub>	I	Supply voltage of logic control circuit for gate driver	Note 5-3
3	NC	-	No connection	
4	V <sub>EE</sub>	I	Negative power gate driver	Note 5-4
5	NC	-	No connection	
6	V <sub>GH</sub>	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 <sub>COM</sub>	I	Common electrode voltage	
16	STHL	I/O	Start pulse for source driver	Note 5-2
17	V <sub>SS2</sub>	-	Ground for analog circuit	
18	V <sub>R</sub>	I	Video Input R	
19	V <sub>G</sub>	I	Video Input G	
20	V <sub>B</sub>	I	Video Input B	
21	V <sub>SS1</sub>	-	Ground for digital circuit	
22	V <sub>DD2</sub>	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 <sub>DD1</sub>	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 <sub>cc</sub>	Input	output	down to up
GND	Output	input	up to down

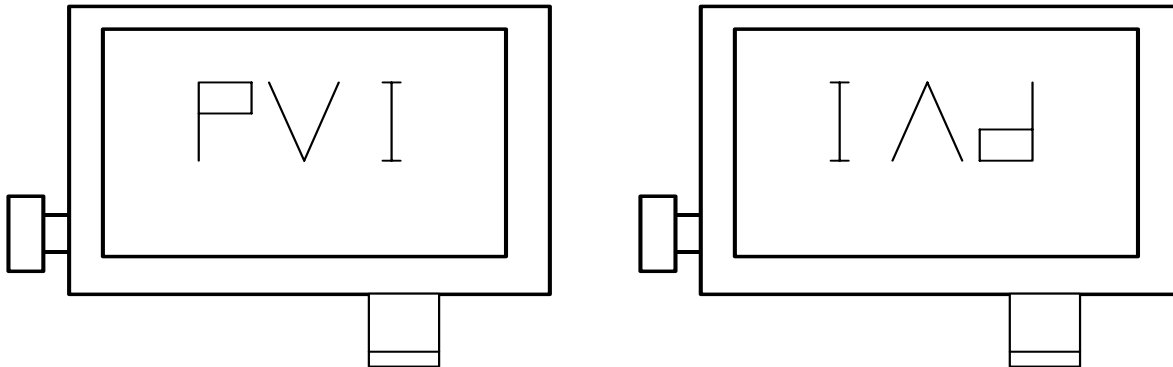
Note 5-2

R/L	STHL	STHR	scanning direction
V <sub>cc</sub>	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. = +5V

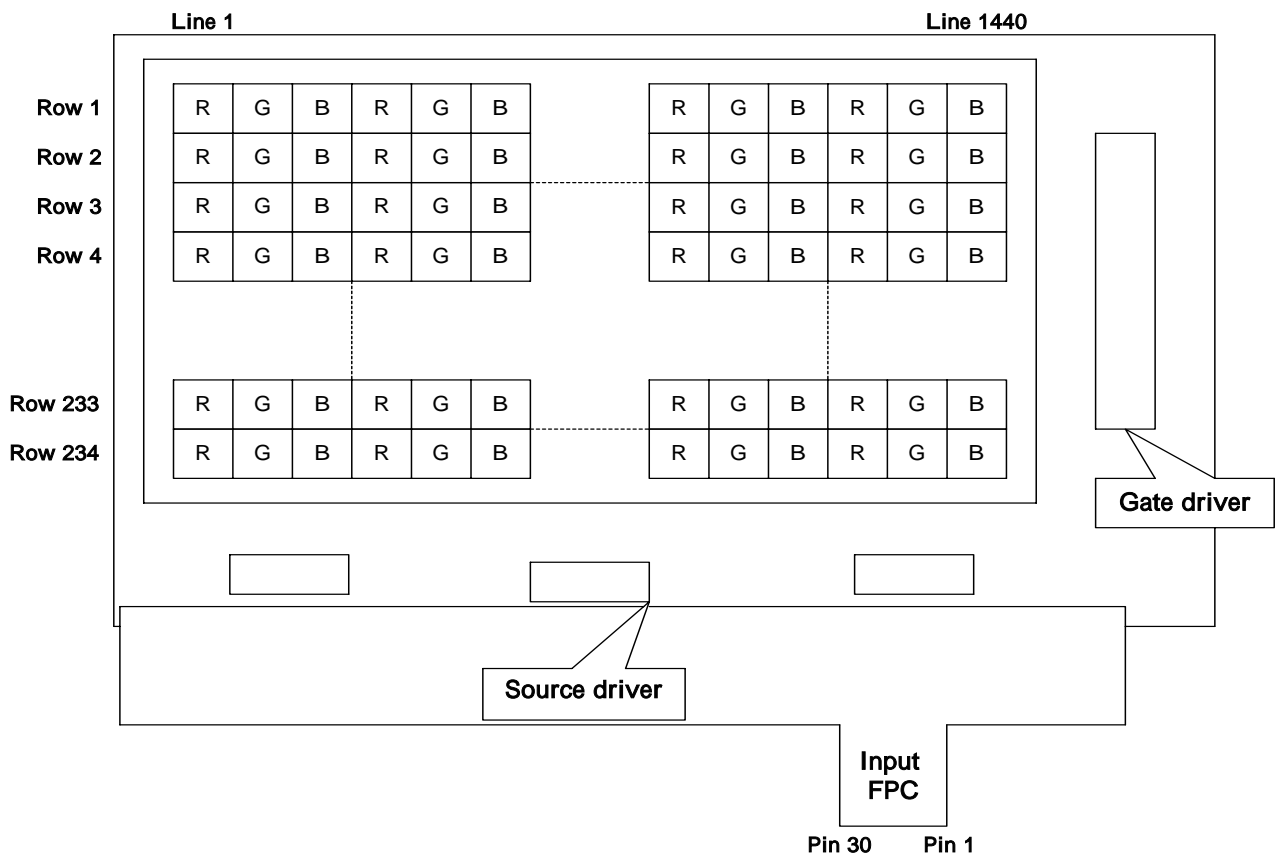
Note 5-4 :  $V_{EE}$  TYP. = -12V

Note 5-5 :  $V_{GH}$  TYP. = +17V

Note 5-6 :  $V_{DD2}$  TYP. = +5V

Note 5-7 :  $V_{DD1}$  TYP. = +5V

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		-30	+80		
Operation Temperature		-20	+80		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  $T_a=+25$  .

## 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 $V_{DD1}$	+4.5	+5.0	+5.5	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 $V_{CC}$	+4.5	+5.0	+5.5	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  $1.5V \pm 1V$  , every module's  $V_{COM DC}$  level shall be carefully adjusted to show a best image performance.

**8-2) Back Light driving (JST BHSR-02VS-1 ,Pin No. : 2)**

Pin No	Symbol	Description	Remark
1	VL1	Input terminal (Hi voltage side)	Wire color: pink
2	VL2	Input terminal (Low voltage side)	Wire color: white Note 8-1

Note 8-1 : Low voltage side of back light inverter connects with Ground of inverter circuits.

Recommended driving condition for back light

Ta= 25

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Lamp voltage	$V_L$	474	527	580	Vrms	$I_L=6mA$
Lamp current	$I_L$	3	6	8	mA	Note 8-2
Lamp frequency	$P_L$	40	55	80	KHz	Note 8-3
Starting voltage(25 ) (Reference Value)	$V_s$			630	Vrms	Note 8-4
Starting voltage(0 ) (Reference Value)	$V_s$			890	Vrms	Note 8-4

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 : This value is not output voltage of inverter.  
The voltage of inverter must larger than the starting voltage.  
The kick-off time must larger than 1 second.

**8-3) Power Consumption**

Ta= 25

Parameter	Symbol	Conditions	TYP.	MAX	Unit	Remark
Supply current for Gate Driver (Hi level)	$I_{GH}$	$V_{GH} = +17V$	0.11	0.17	mA	
Supply current for Gate Driver (Low level)	$I_{EE}$	$V_{EE} = -12V$	1.12	1.68	mA	
Supply current for Source Driver(Digital)	$I_{DD1}$	$V_{DD1} = +5V$	1.80	4.50	mA	
Supply current for Source Driver(Analog)	$I_{DD2}$	$V_{DD2} = +5V$	10.5	15.0	mA	
Supply current for Gate Driver (Digital)	$I_{CC}$	$V_{CC} = +5V$	0.02	0.05	mA	
LCD Panel Power Consumption			76.9	120.8	mW	Note 8-5
Back Light Lamp Power Consumption			3.15		W	Note 8-6

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

Note 8-6: 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	$t_{CPH}$	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	$\mu s$	STHR,STHL
OEH pulse width	$t_{OEH}$	-	1.40	-	$\mu s$	OEH
Sample and hold disable time	$t_{DIS1}$	-	7.43	-	$\mu s$	
OEV pulse width	$t_{OEV}$	-	18	-	$\mu s$	OEV
CKV pulse width	$t_{CKV}$	-	31.75	-	$\mu s$	CKV
Clean enable time	$t_{DIS2}$	-	9.0	-	$\mu s$	
Horizontal display start	$t_{SH}$	-	0	-	$t_{CPH}/3$	
Horizontal display timing range	$t_{DH}$	-	480	-	$t_{CPH}$	
STV setup time	$t_{SUV}$	400	-	-	Ns	STVR,STVL
STV hold time	$t_{HDV}$	400	-	-	Ns	STVR,STVL
STV pulse width	$t_{STV}$	-	-	1	$t_H$	STVR,STVL
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	s	
VCOM falling time	$t_{FCOM}$		-	5	s	
VCOM delay time	$t_{DCOM}$		-	3	s	
RGB delay time	$t_{DRGB}$		-	1	s	

8-5) Signal Timing Waveforms

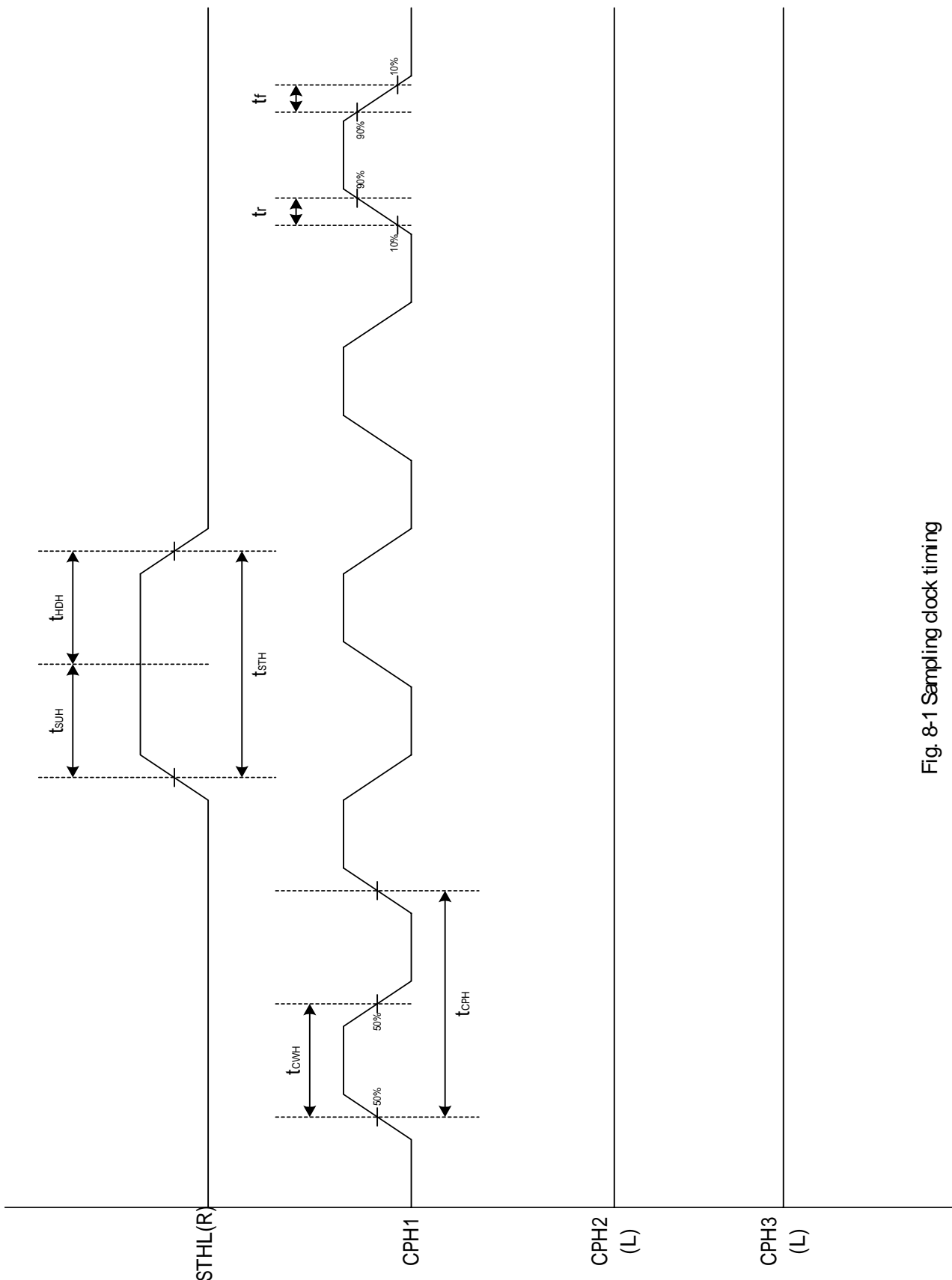


Fig. 8-1 Sampling clock timing

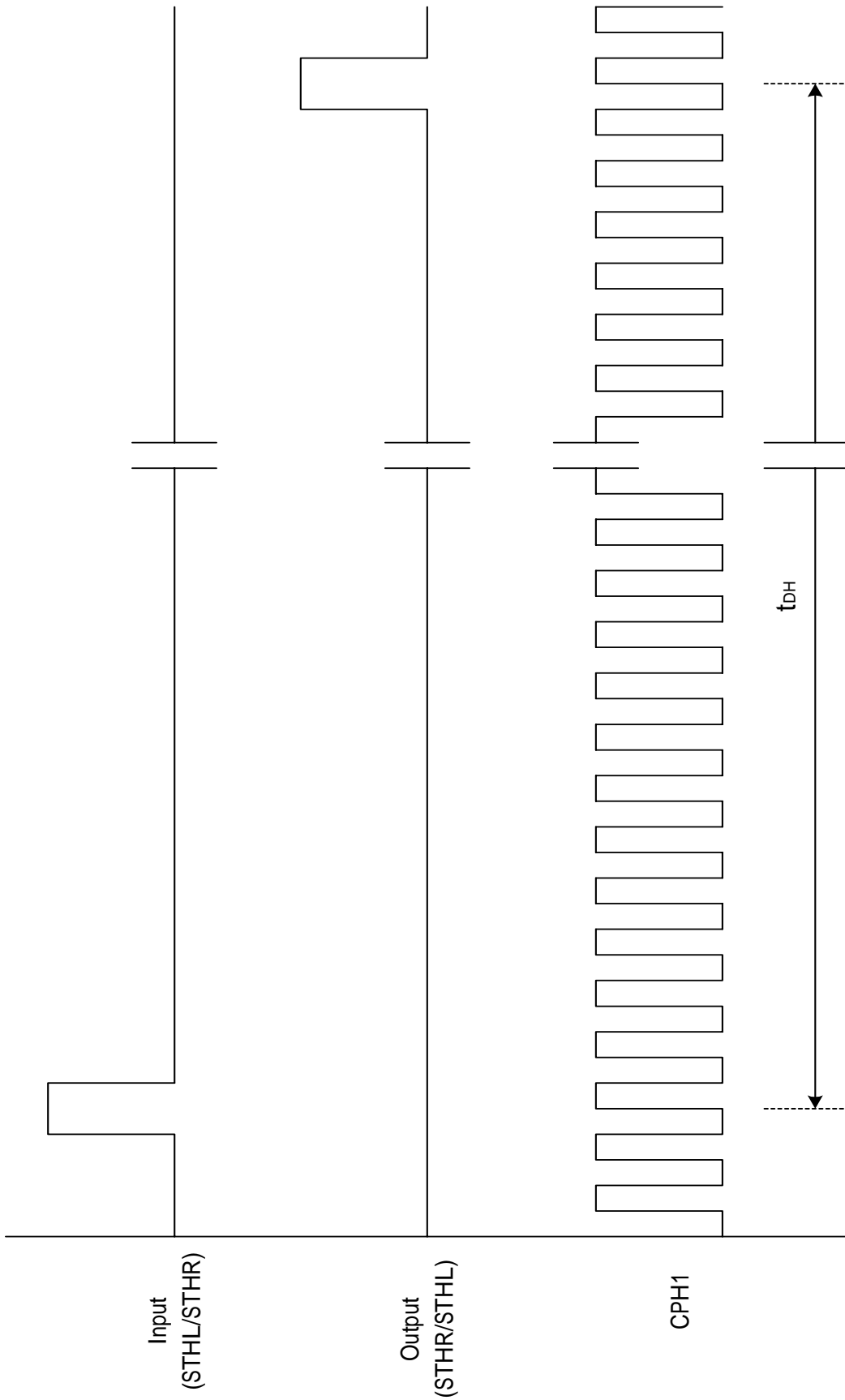


Fig. 8-2 Horizontal display timing range

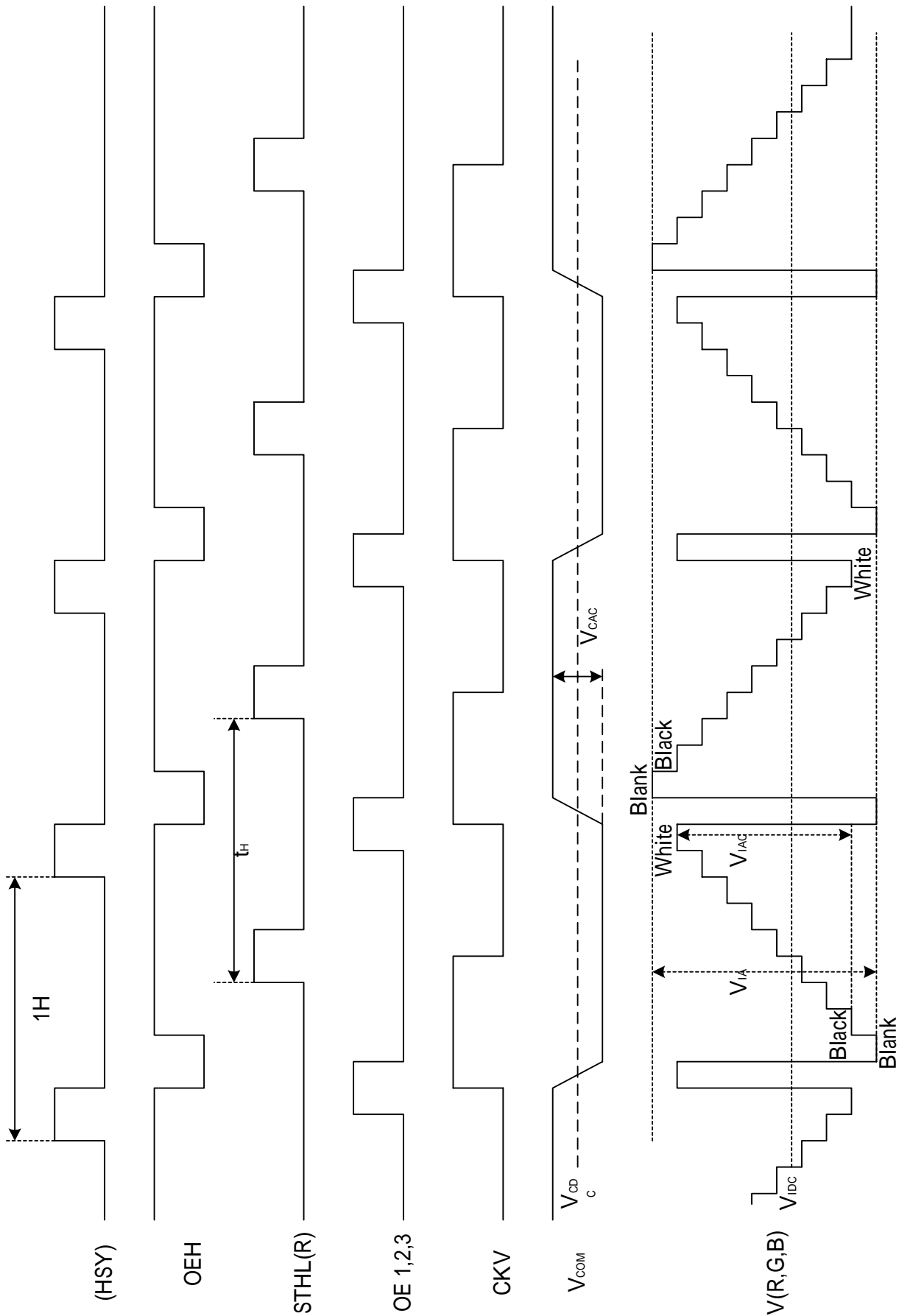
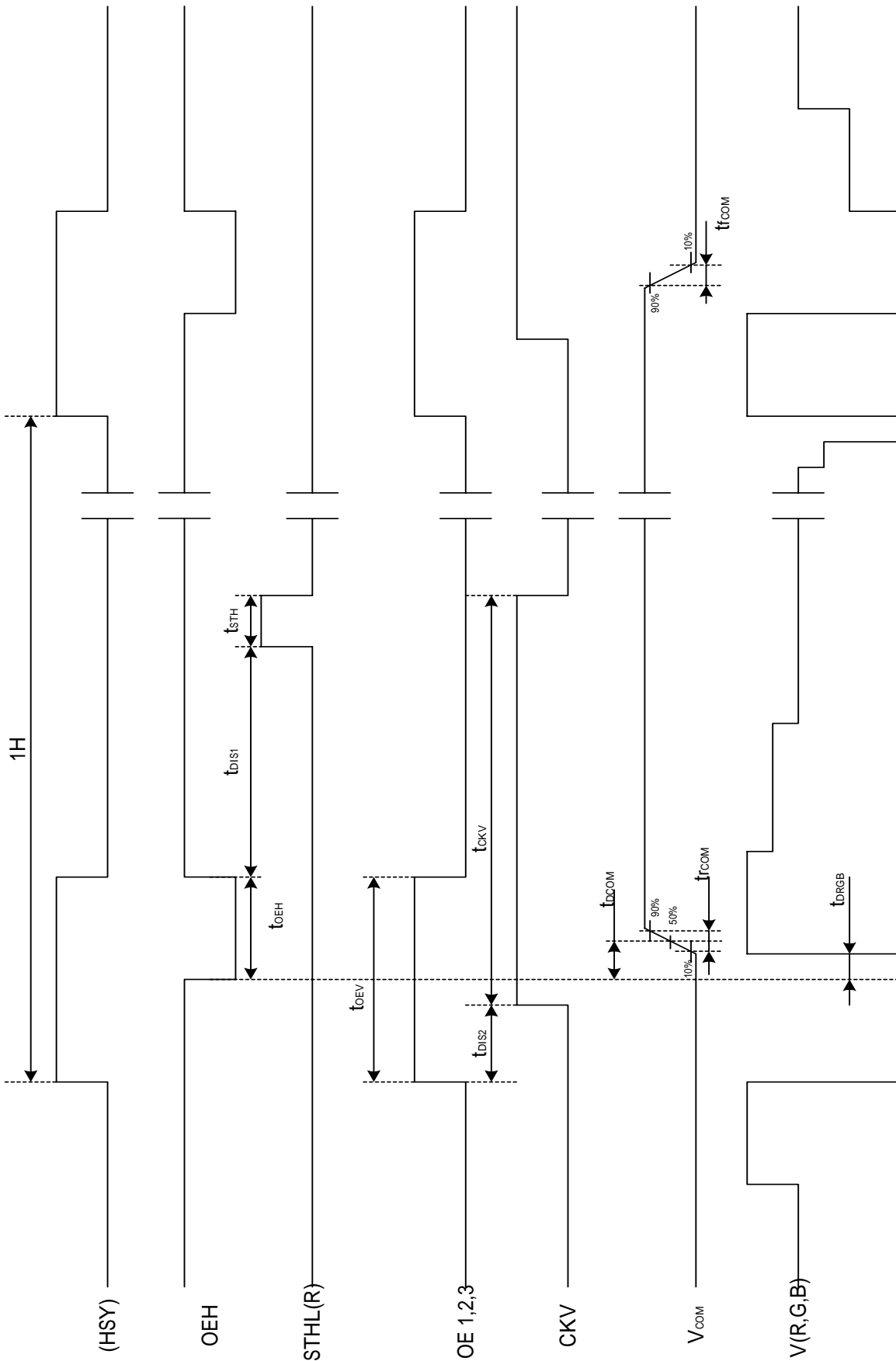


Fig. 8-3 (a) Horizontal timing



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

Fig. 8-3 (b) Detail horizontal timing

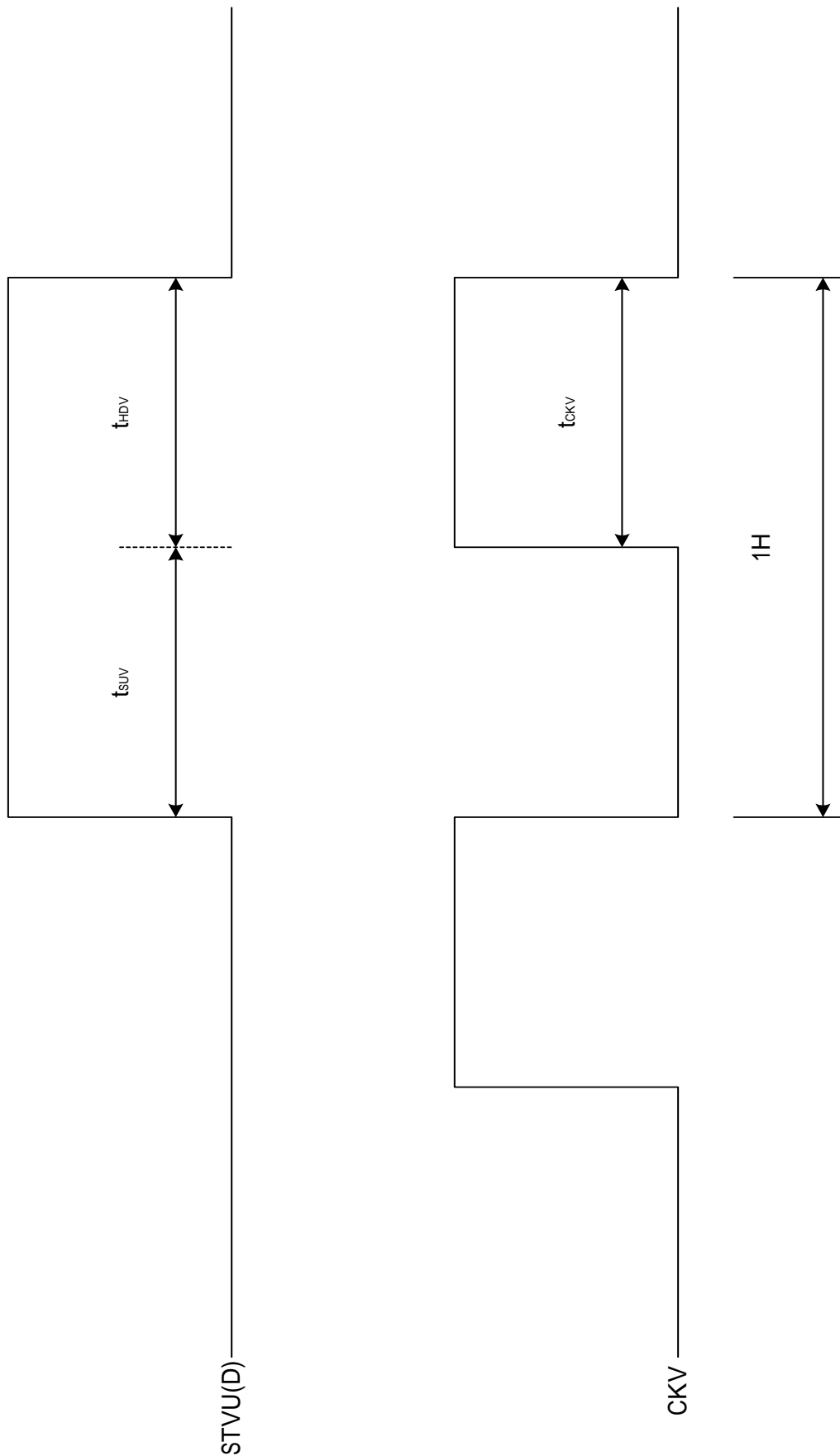


Fig. 8-4 Vertical shift clock timing

Vertical timing (From up to down)

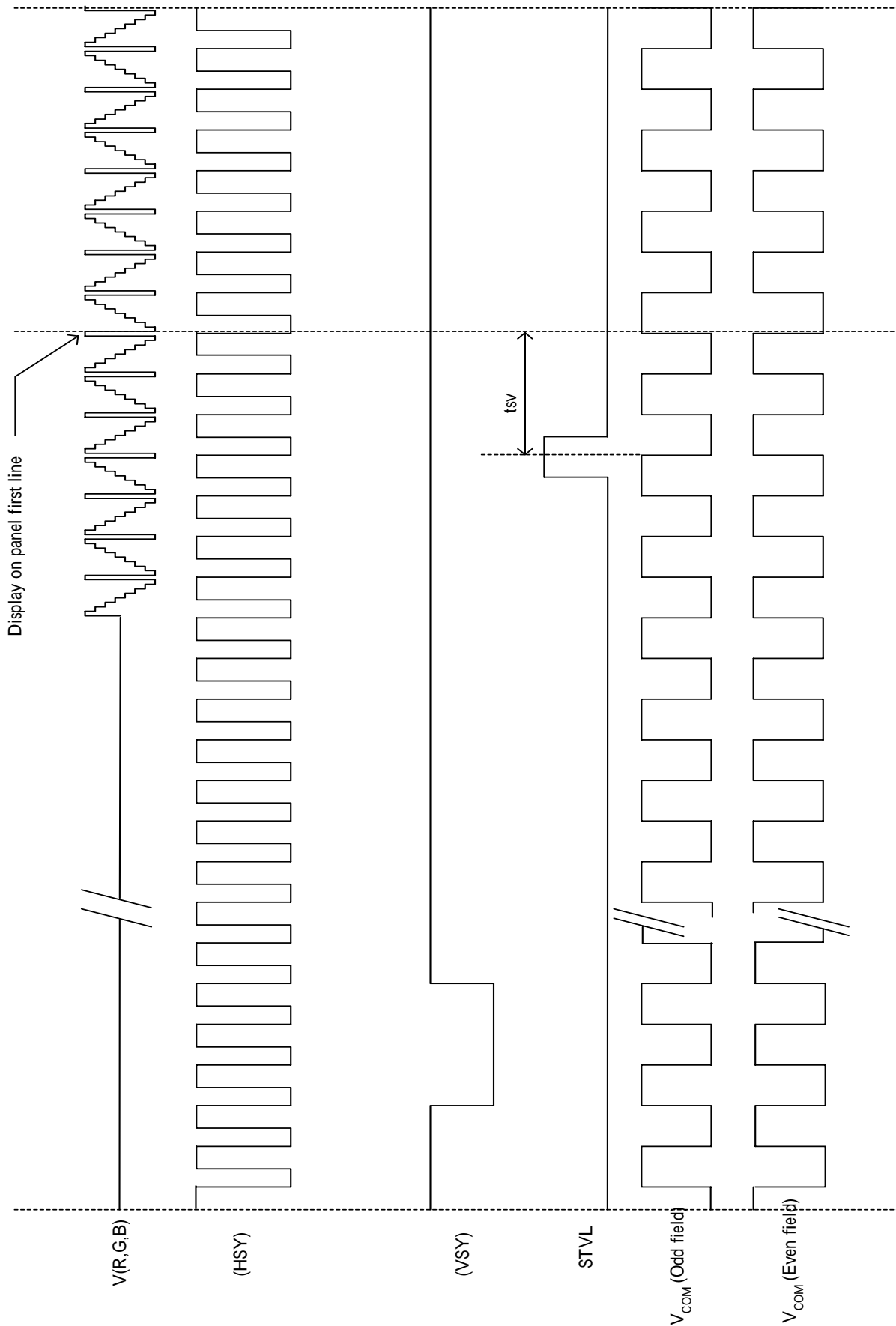


Fig. 8-5 (a) Vertical timing (From Up to Down)

Vertical timing (From down to up)

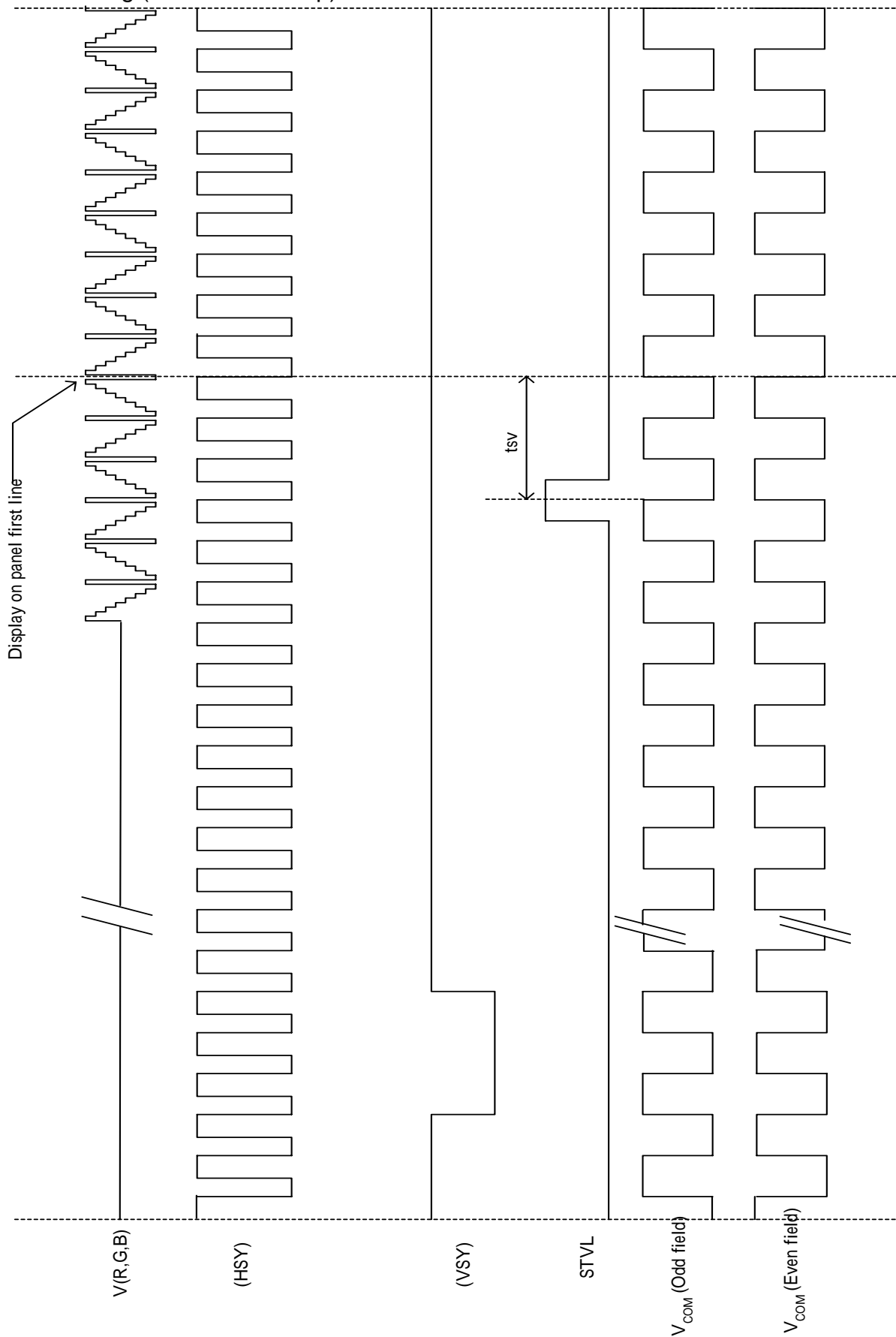
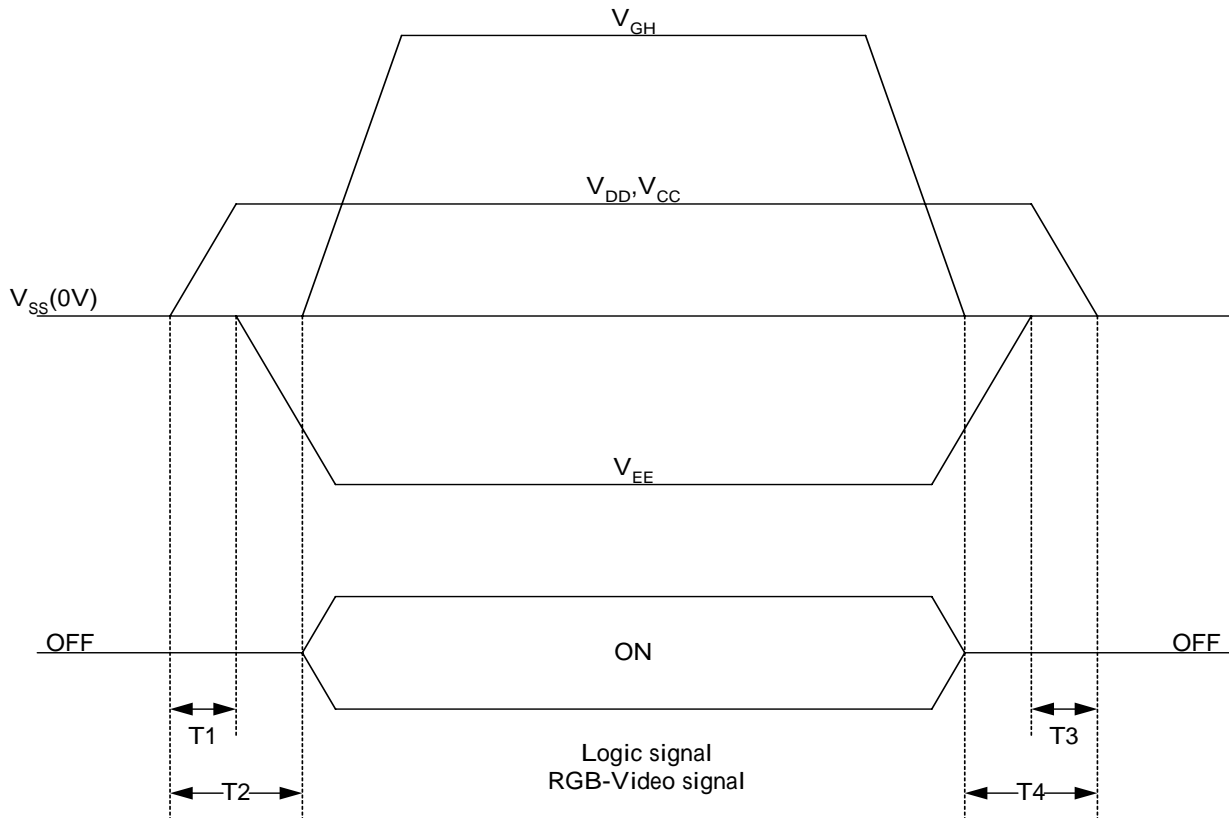


Fig. 8-5 (b) Vertical timing (From Down to Up)



9. Power on Sequence



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

- 1) 10ms  $T_1 < T_2$
- 2) 0ms  $< T_3$   $T_4$  10ms

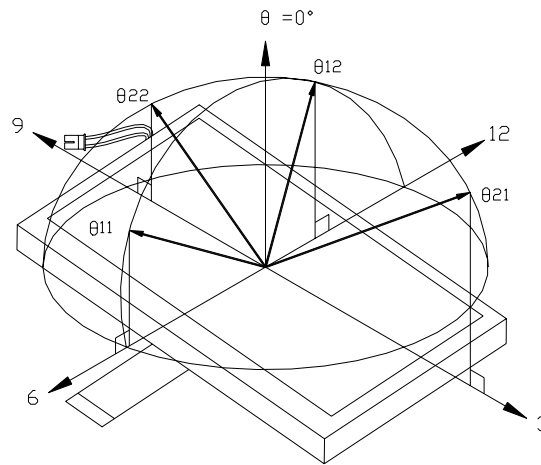
10. Optical Characteristics

10-1) Specification

$T_a = 25$

Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remarks
Viewing Angle	Horizontal	CR 10	55	60		deg	Note 10-1
	Vertical		35	40		deg	
			11	45	50		
Contrast Ratio	CR	At optimized Viewing angle	200	350			Note 10-2
Response time	Rise	$=0^\circ$		15	30	ms	Note 10-4
	Fall			25	50	ms	
Brightness			350	400		cd/m <sup>2</sup>	Note 10-3
Transmission Ratio	T		7.8	8.3		%	
Uniformity	U		70	75		%	Note 10-5
White Chromaticity	x	$=0^\circ$	0.260	0.290	0.320		Note 10-3
	y		0.280	0.310	0.340		
Lamp Life Time +25				40000		hr	

Note 10-1 : The definitions of viewing angles



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

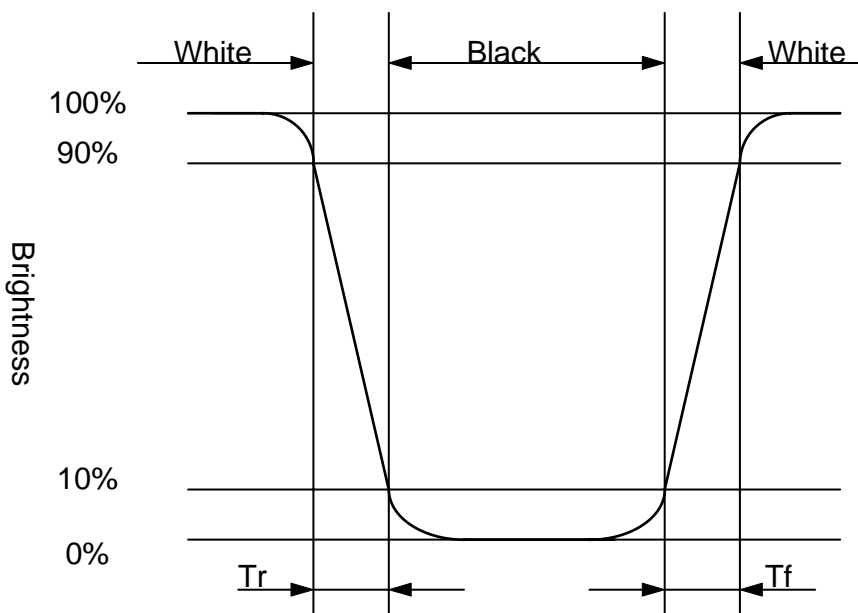
(Testing configuration see 10-2 )

Contrast Ratio is measured in optimum common electrode voltage.

Note 10-3 : Topcon BM-7(fast) luminance meter 2°field of view is used in the testing (after 20~30 minutes operation).

Lamp Current 6mA

Note 10-4 : The definition of response time:



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

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

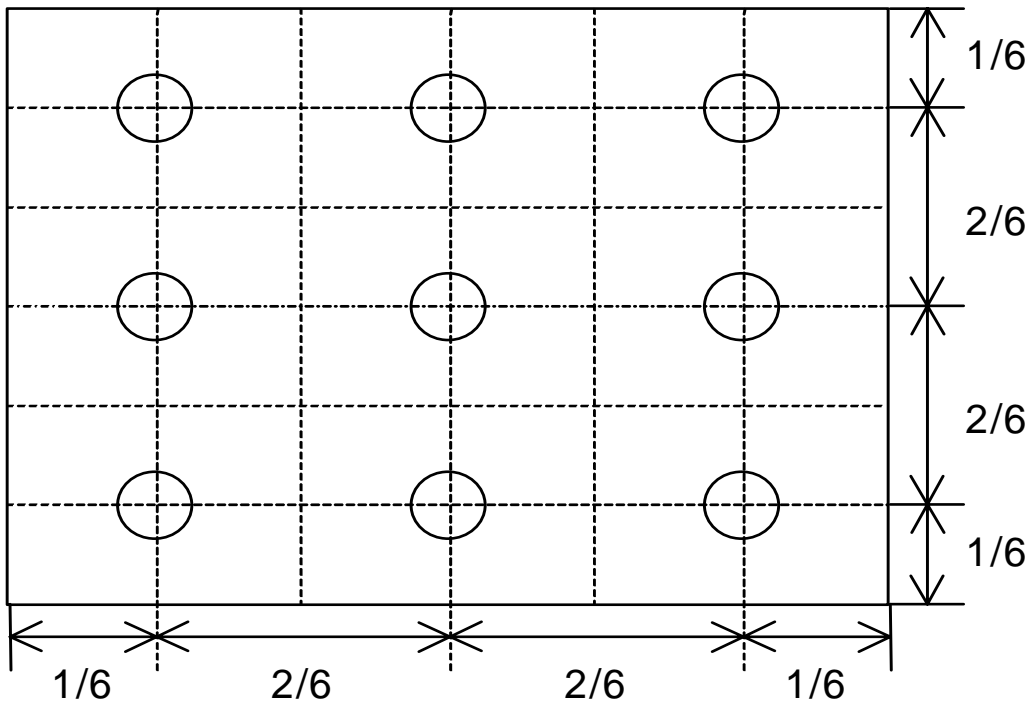
Luminance meter : BM-5A or BM-7 fast (TOPCON)

Measurement distance : 500 mm +/- 50 mm

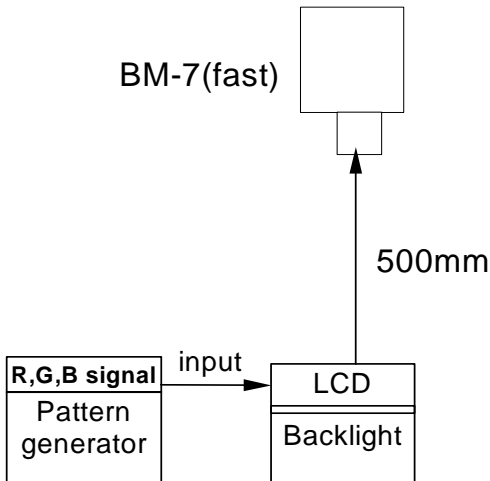
Ambient illumination : < 1 Lux

Measuring direction : Perpendicular to the surface of module

The test pattern is white (Gray Level 63).

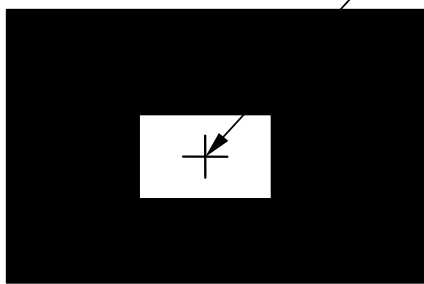


10-2) Testing configuration

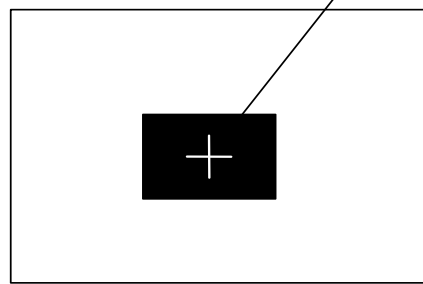


Caution: 1. Environmental illumination 1 lux  
 2. Before test CR, Vcom voltage must be adjusted carefully to get the best CR.

- LCD Display Testing Point Testing Point

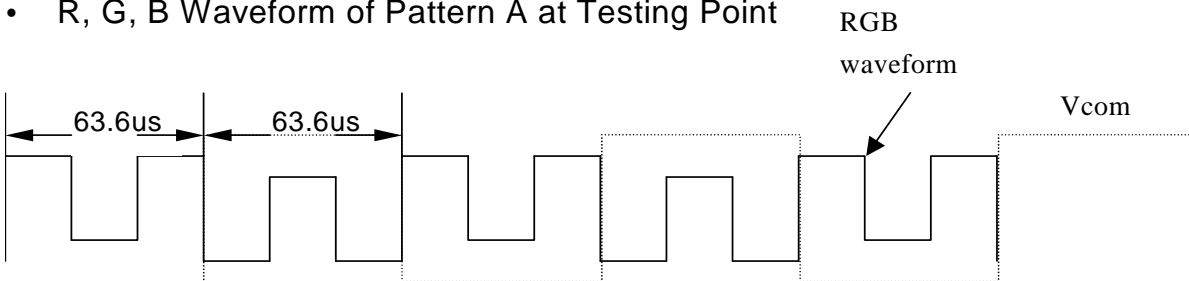


Pattern A

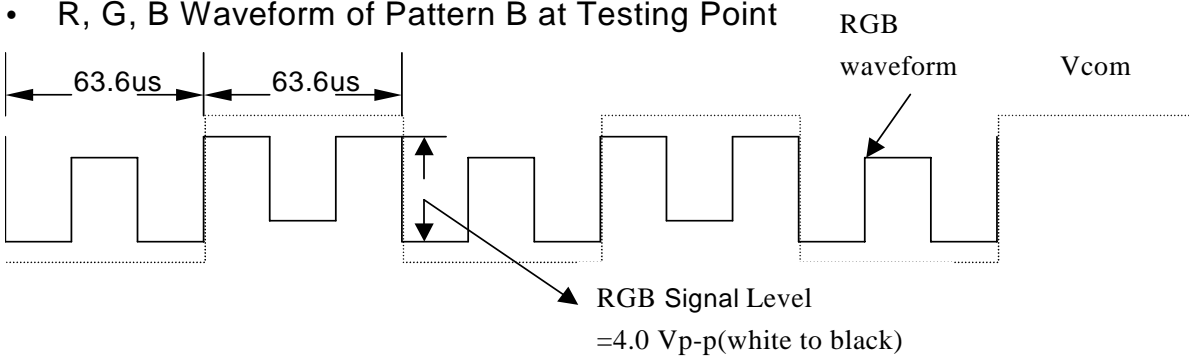


Pattern B

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



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



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## 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 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.
  - 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.

### 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
5	High Temperature & High Humidity Operation Test	Ta = +60 , 90%RH, 240 hrs
6	Thermal Cycling Test (non-operating)	-30 +80 , 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 , 0 ±200V 1 time / each terminal

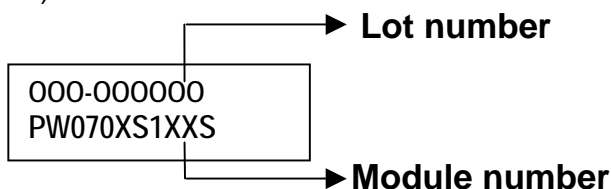
Ta: ambient temperature

**[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

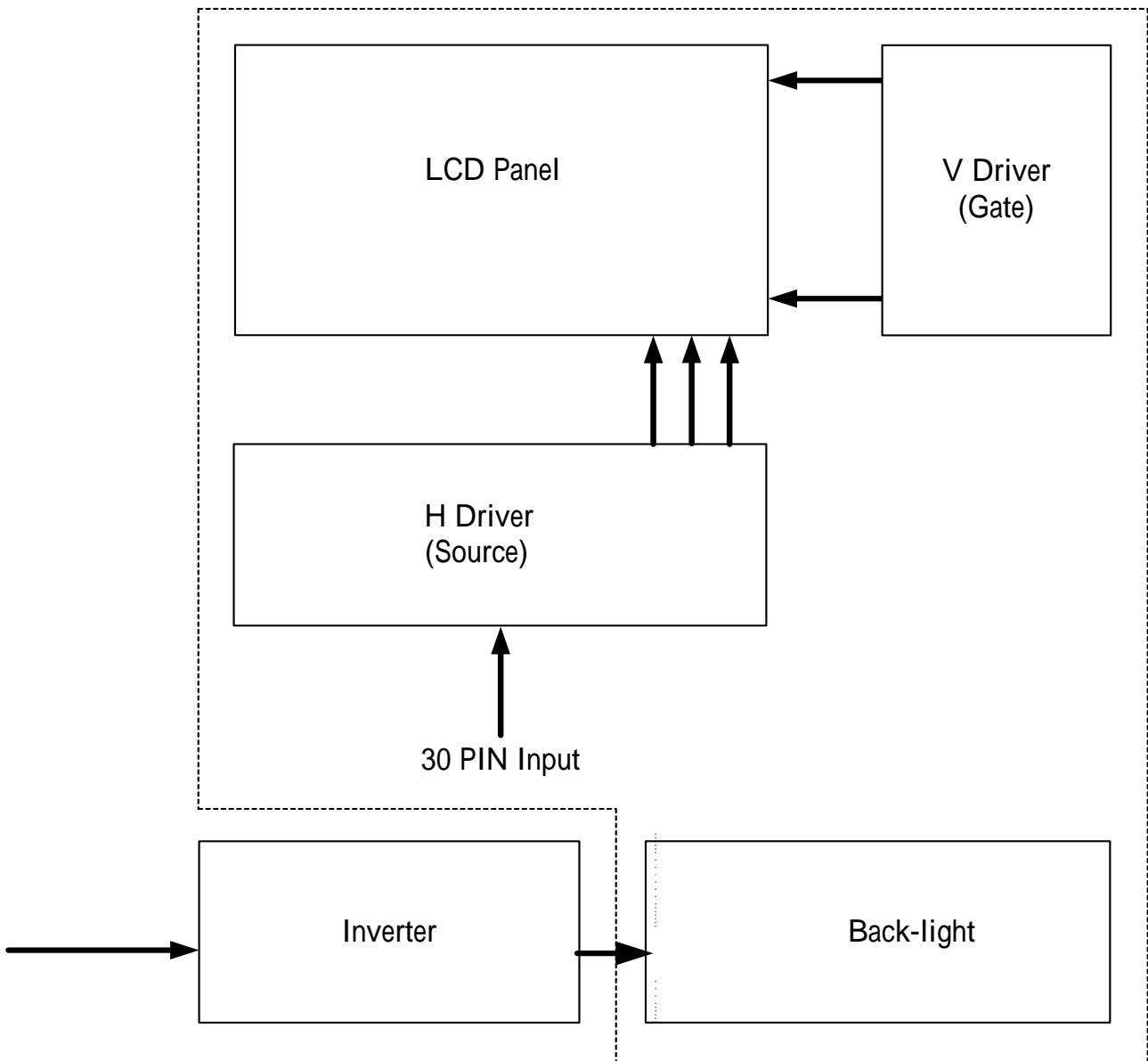
5th—Production year : 1999⇒9, 2000⇒A, 2001⇒B.....

6th—Production month : 1, 2, 3,...9, A, B, C

7th~8th—Production size : 7.0"⇒70

9th~10th—Serial numbers : 01~99

14. Block Diagram



15. Packing

ZONE	REV.	DOCUMENT NO.	DESCRIPTION	DATE	REV.BY																									
<p><b>NOTE:</b>                      1.Q'TY: 40 pcs panel/carton.                      2.Dimension: 530*295*230mm                      3.Weight: 10.6 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>50-0500071</td> <td>PINK Bag 190*190mm</td> <td>40</td> <td>抗靜電</td> </tr> <tr> <td>2</td> <td></td> <td>7"COG Panel</td> <td>40</td> <td></td> </tr> <tr> <td>1</td> <td>50-0300401</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	50-0500071	PINK Bag 190*190mm	40	抗靜電	2		7"COG Panel	40		1	50-0300401	瓦楞隔板緩衝材	1	上蓋+底座		
ITEM	PART NO.	DESCRIPTION	QTY	REMARK																										
4	50-0100111	CARTON	1																											
3	50-0500071	PINK Bag 190*190mm	40	抗靜電																										
2		7"COG Panel	40																											
1	50-0300401	瓦楞隔板緩衝材	1	上蓋+底座																										
MTL.SPEC.		UNSPECIFIED TOL'S		REMARK																										
		ANGLE																												
		ROUGHNESS																												
APPROVE		SCALE	UNIT	SHEET	DWG.TITLE																									
CHECK				1 OF 1	7"COG Model Packing Draw																									
DRAWN	Jimmy	MTL.NO.		DWG FILE:	REV. 01																									
	'03.02.12				A4 SIZE																									



### Revision History

Rev.	Issued Date	Revised Contents
0.1	Sep. 02, 2002	NEW
0.2	Nov. 26,2002	Modify Page 4 mechanical Drawing (change thickness from 6.8mm to 7.2mm and back light connector from BHR-03VS-1 to BHSR-02VS-1 )
0.3	Dec. 11,2002	Modify Page 4 mechanical Drawing (change back light wire from 50mm to 100 mm)
1.0	Feb. 11,2003	Confirm Page 3 Mechanical Specifications (Weight) Confirm Page 8 back light specification and Power Consumption Modify Page 17 optics specification Modify Page 22 Reliability Test (Low Temperature Operation Test from -30 to -20 ) Modify Page 24 packing drawing Modify Page 22 reliability test(Electrostatic Discharge Test method)
1.1	Sep. 01,2003	Modify Page 4 mechanical Drawing
1.2	Sep. 18,2003	Modify Page 8 Power Consumption Modify Page 8 Lamp voltage Modify Page 22 Reliability Test (High Temperature & High Humidity, Ta = +60 , 90%RH, 240 hrs)
1.3	Nov. 25,2003	Modify Page17 Contrast Ratio (CR from Typ.150,Min.110 to Typ.350,Min.200)
1.4	Jun. 28,2004	Modify Page 4 Mechanical Drawing of TFT-LCD Module Page 17 Optical Characteristics (White Chromaticity)
1.5	Oct. 12,2004	Modify Page 8 Note 8-4 Add Lamp kick –off time
1.6	Apr.29.2005	Modify Page22 12 Reliability test ( Modify Test condition) HTST+80 →+95 HTOT+80 →+85 LTST –30 →-40 LTOT –20 →-30