Version : 1.8

TECHNICAL SPECIFICATION

MODEL NO : PW070XS1

☐Customer's Confirmation

Customer _____

Date _____

By _____

☐PVI's Confirmation

Dep	FAE	Panel Design	Electronic Design	Mechanical Design	Product Verification	Prepared by
SIGN						

TECHNICAL SPECIFICATION

CONTENTS

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

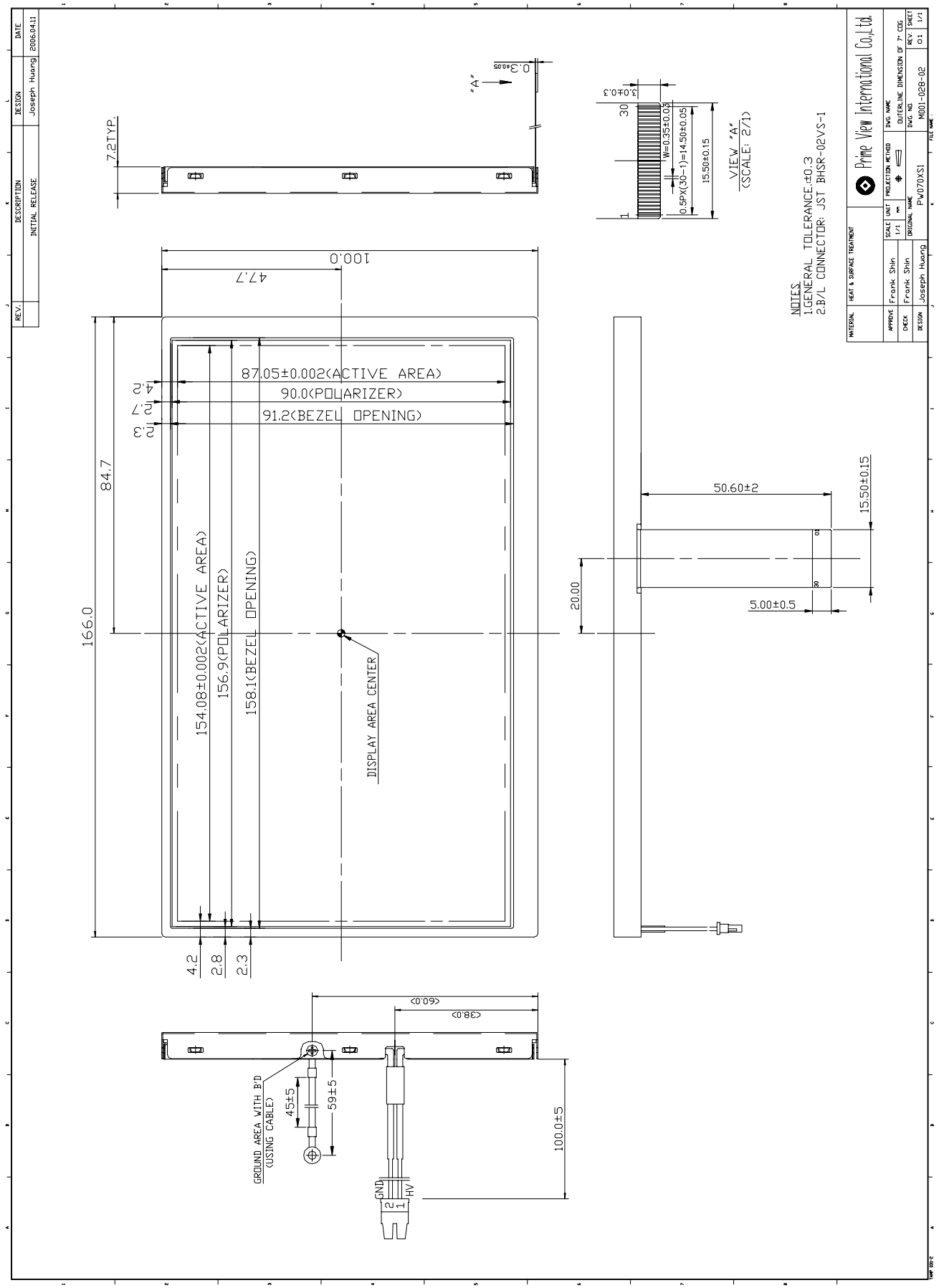
. Wide Viewing Angle

. Support multi display mode
(If you use this mode, you must use PVI-1004D’s timing controller (mode by PVI))

3. Mechanical Specifications

Parameter	Specifications	Unit
Screen Size	7.0 (16:9 diagonal)	Inch
Display Format	480 (H) ×RGB ×234(V)	dot
Active Area	154.08 (H)×87.05 (V)	mm
Pixel Pitch	0.321(H)×0.372 (V)	mm
Pixel Configuration	Stripe	
Outline Dimension	166.0 (W)×100.0 (H)×7.2 (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_{CC}	I	Supply voltage of logic control circuit for gate driver	Note 5-1
3	NC	-	No connection	
4	V_{EE}	I	Negative power gate driver	Note 5-2
5	NC	-	No connection	
6	V_{GH}	I	Positive power for gate driver	Note 5-3
7	NC	-	No connection	
8	STVD	I/O	Vertical start pulse	Note 5-4
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 5-4
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	Note 5-5
16	STHL	I/O	Start pulse for source driver	Note 5-4
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 5-1
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 5-1
27	R/L	I	Left / Right Control for source driver	Note 5-4
28	NC	I	No Connection	
29	OEH	I	Output enable for source driver	
30	STHR	I/O	Start pulse for source driver	Note 5-4

Note 5 – 1 : V_{DD1}, $V_{CC(TYP.)}$ = +3.3V , $V_{DD2\ (TYP.)}$= +5V

Note 5 – 2 : $V_{EE\ (TYP.)}$ = -12V

Note 5 – 3 : $V_{GH(TYP.)}$ = +17V

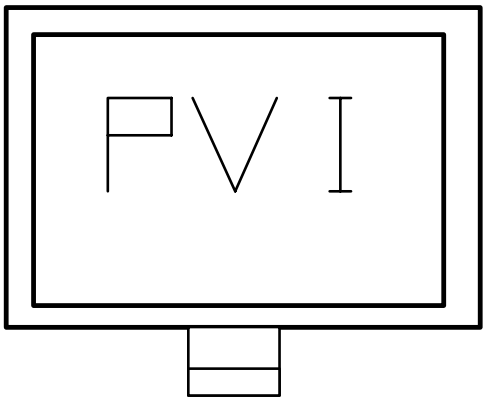
Note 5 – 4 : STHL ,STHR and R/L mode

R/L	STHL	STHR	Remark
High(V_{DD1})	Output	Input	Left to Right
Low(0 Volt.)	Input	Output	Right to Left

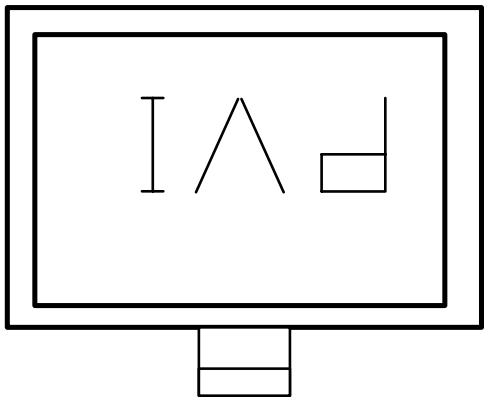
STVU,STVD,and U/D mode

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

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



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



Note 5 – 5 : $V_{COM\ (TYP.)} = 6.0\ V_{PP}$.

bPhase of the video signal input and V_{COM}
The relation between these values could refer to 8-1 Operating condition.

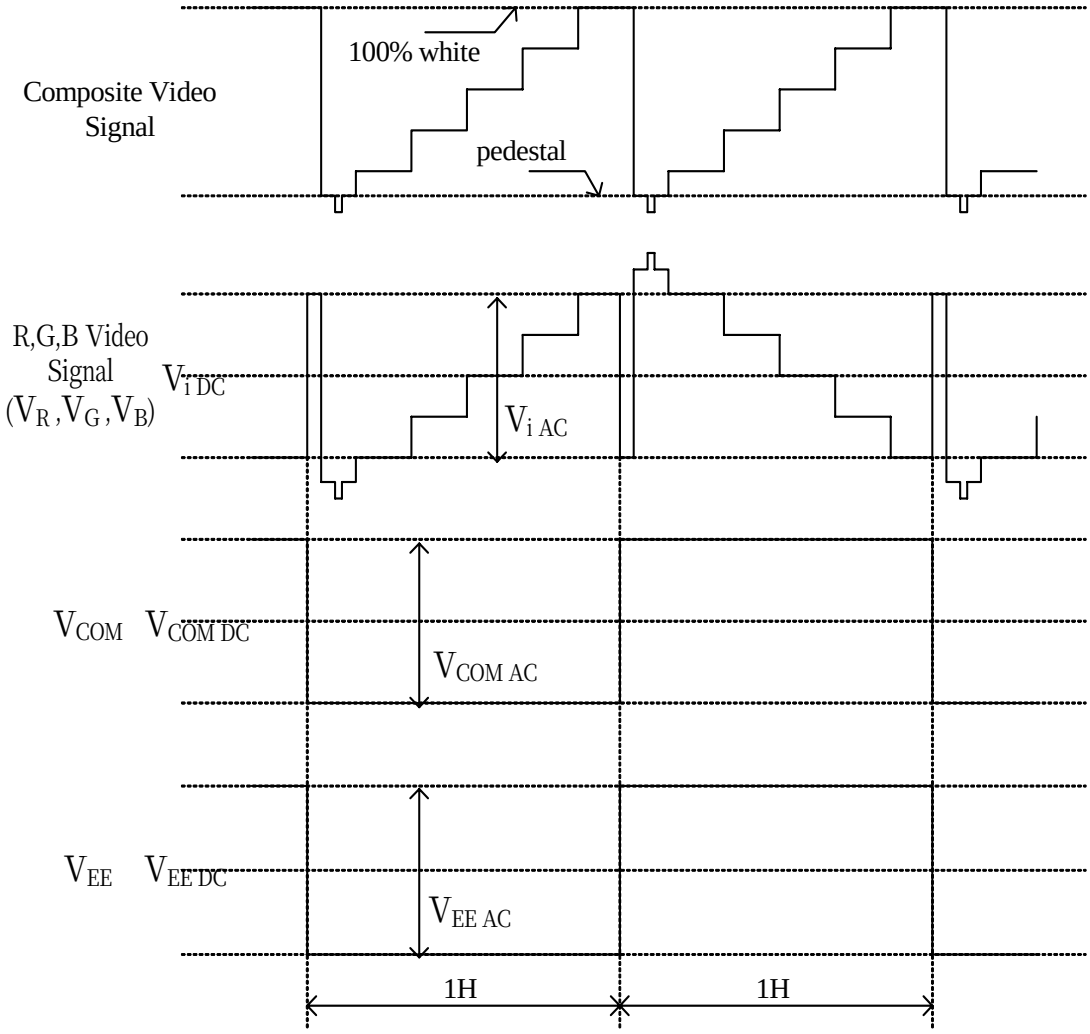


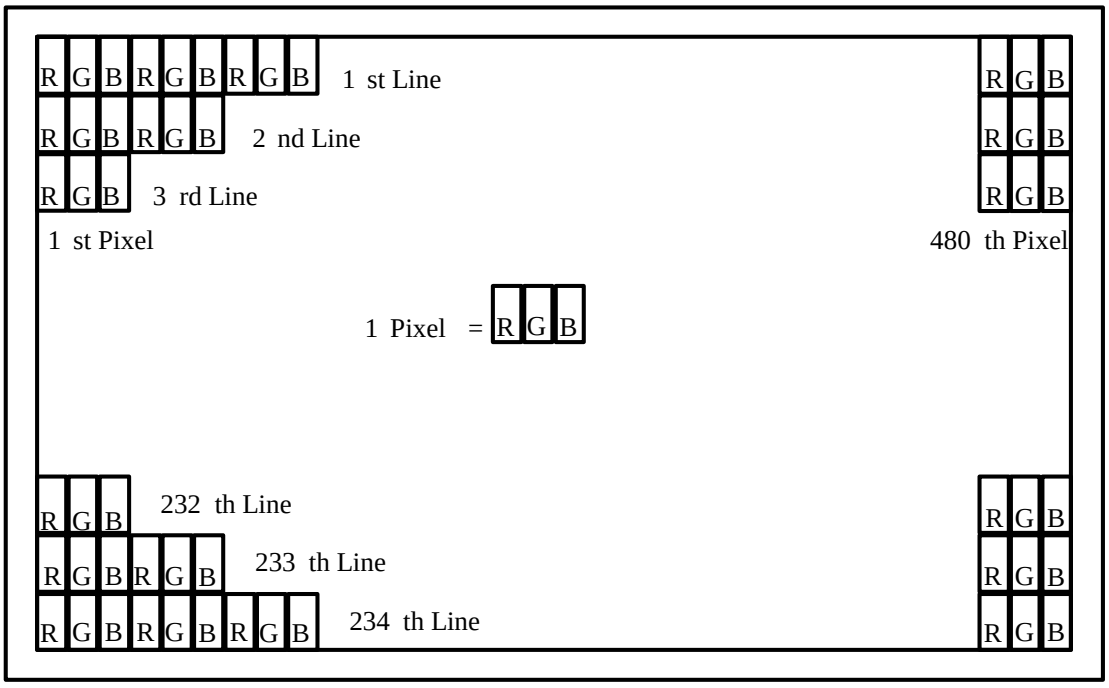
Fig.1

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

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 = 0V, Ta = 25°C

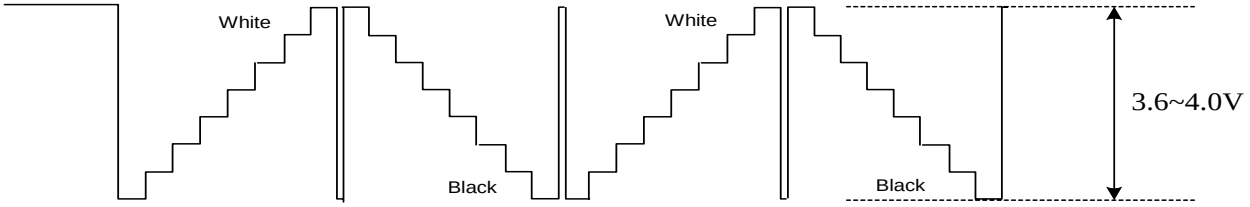
Parameter		Symbol	MIN.	MAX.	Unit	Remark
Supply Voltage For Source Driver		V_{DD2}	-0.3	+5.8	V	
		V_{DD1}	-0.3	+7.0	V	
Supply Voltage For Gate Driver		V_{CC}	-0.3	+6.0	V	
		V_{GH}-V_{EE}	-0.3	+40.0	V	
	H Level	V_{GH}	-0.3	+25.0	V	
	L Level	V_{EE}	-16	+0.3	V	

8. Electrical Characteristics

8-1) Operating Condition

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}
	$V_{EE\ AC}$		-	+6.0	-	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	Note 8-1
	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}		$V_{COM\ AC}$	-	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 8-2

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±1V,every module's $V_{COM\ DC}$ level shall be carefully adjusted to show a best image performance.

8-2) Current Consumption (GND=0V)

Ta= 25 °C

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Current for Driver	I_{GH}	V_{GH}=+17V	-	0.08	0.1	mA	
	I_{EE}	V_{EE}=-12V	-	0.11	0.13	mA	V_{EE} center voltage
	I_{CC}	V_{CC}=+3.3V	-	0.004	0.005	mA	
	I_{DD}	V_{DD1}=+3.3V	-	1.2	3.6	mA	
	AI_{DD}	V_{DD2}=+5V	-	5	8	mA	

8-3) Backlight driving & Power Consumption

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

Note 8-3 : Low voltage side of backlight inverter connects with Ground of inverter circuits.

Ta= 25 °C

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 8-4
Lamp frequency	P_L	40	55	80	KHz	Note 8-5
Starting voltage(25°C) (Reference Value)	Vs	-	-	1070	Vrms	Note 8-6
Starting voltage(0°C) (Reference Value)	Vs	-	-	1380	Vrms	Note 8-6

Note 8-4 : 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 8-5 : The waveform of lamp driving voltage should be as closed to a perfect SIN wave as possible.

Note 8-6 : The" Max of starting voltage " means the minimum voltage of inverter to turn on the CCFL. and it should be applied to the lamp for more than 1 second to start up. Otherwise the lamp may not be turned on.
PVI strongly recommend that the minimum voltage of inverter could be designed for 0°C condition.

Power Consumption

Ta= 25 ℃

Parameter	Symbol	Conditions	TYP.	Unit	Remark
LCD Panel Power Consumption	-	-	32	mW	
Backlight Lamp Power Consumption	-	-	3.15	W	Note 8-7
Total Power Consumption	-	-	3.2	W	

Note 8-7：Backlight lamp power consumption is calculated by I_L X V_L.

8-4) Input / Output Connector

A) Backlight Connector
JST BHSR-02VS-1,
Pin No. : 2 ,
Pitch : 4 mm

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}	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	μs	STHR,STHL
OEH pulse width	t_{OEH}	-	1.40	-	μs	OEH
Sample and hold disable time	t_{DIS1}	-	7.43	-	μs	
OEV pulse width	t_{OEV}	-	18	-	μs	OE1,2,3
CKV pulse width	t_{CKV}	-	31.75	-	μs	CKV
Clean enable time	t_{DIS2}	-	9.0	-	μs	
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	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	Ms	
VCOM falling time	t_{fCOM}	-	-	5	Ms	
VCOM delay time	t_{DCOM}	-	-	3	Ms	
RGB delay time	t_{DRGB}	-	-	1	Ms	

8 – 6) Signal Timing Waveforms

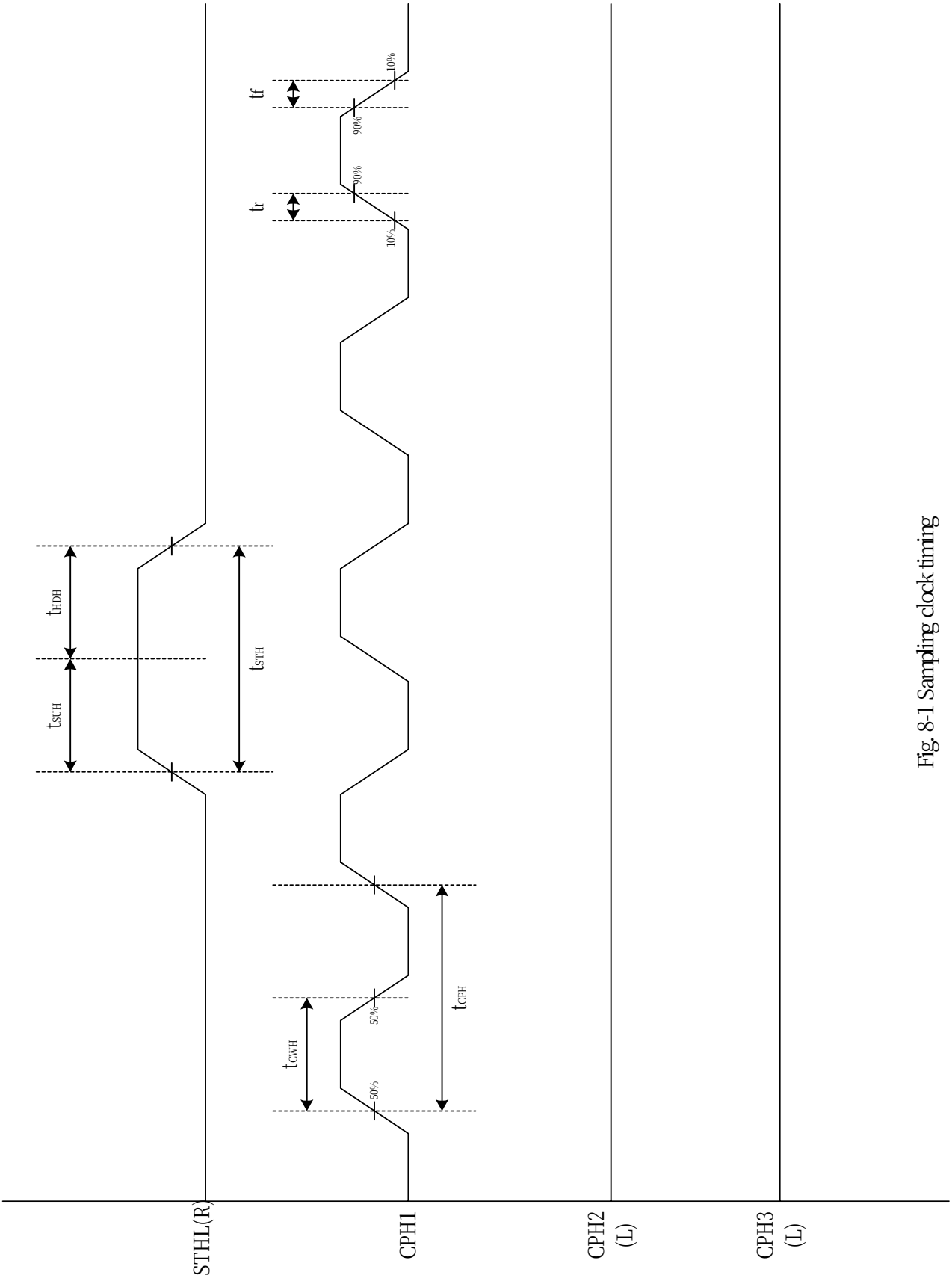


Fig. 8-1 Sampling clock timing

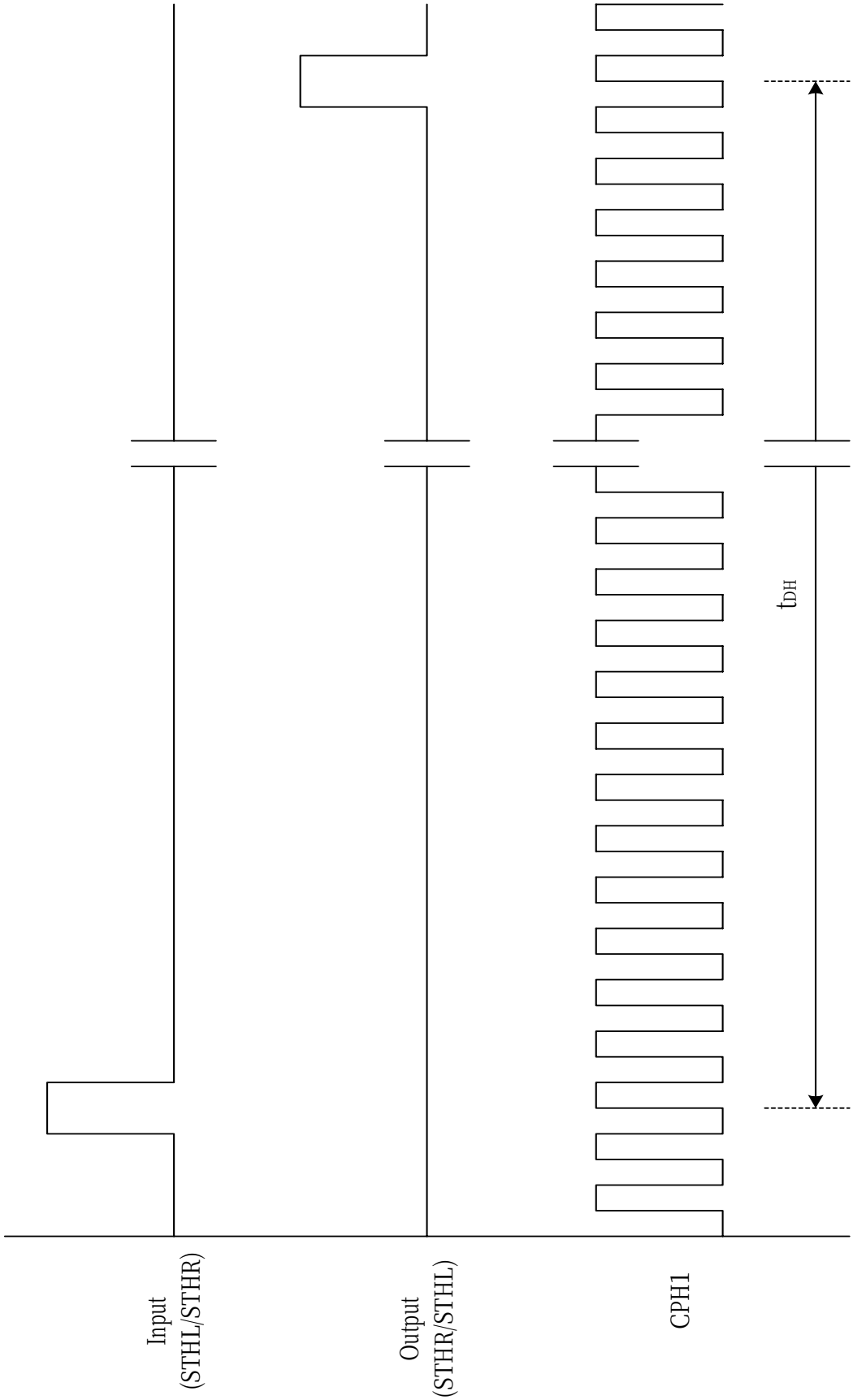


Fig. 8-2 Horizontal display timing range

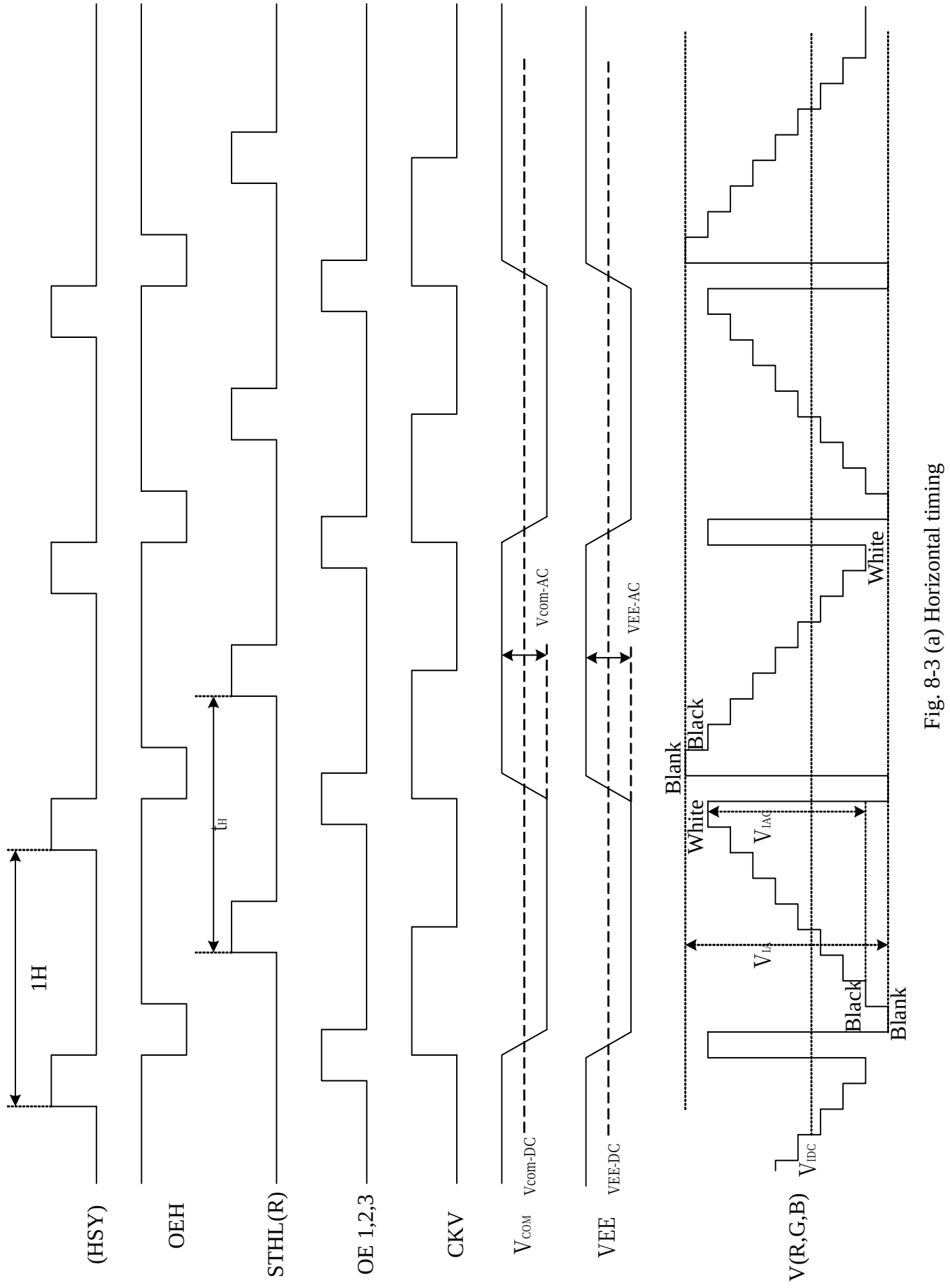
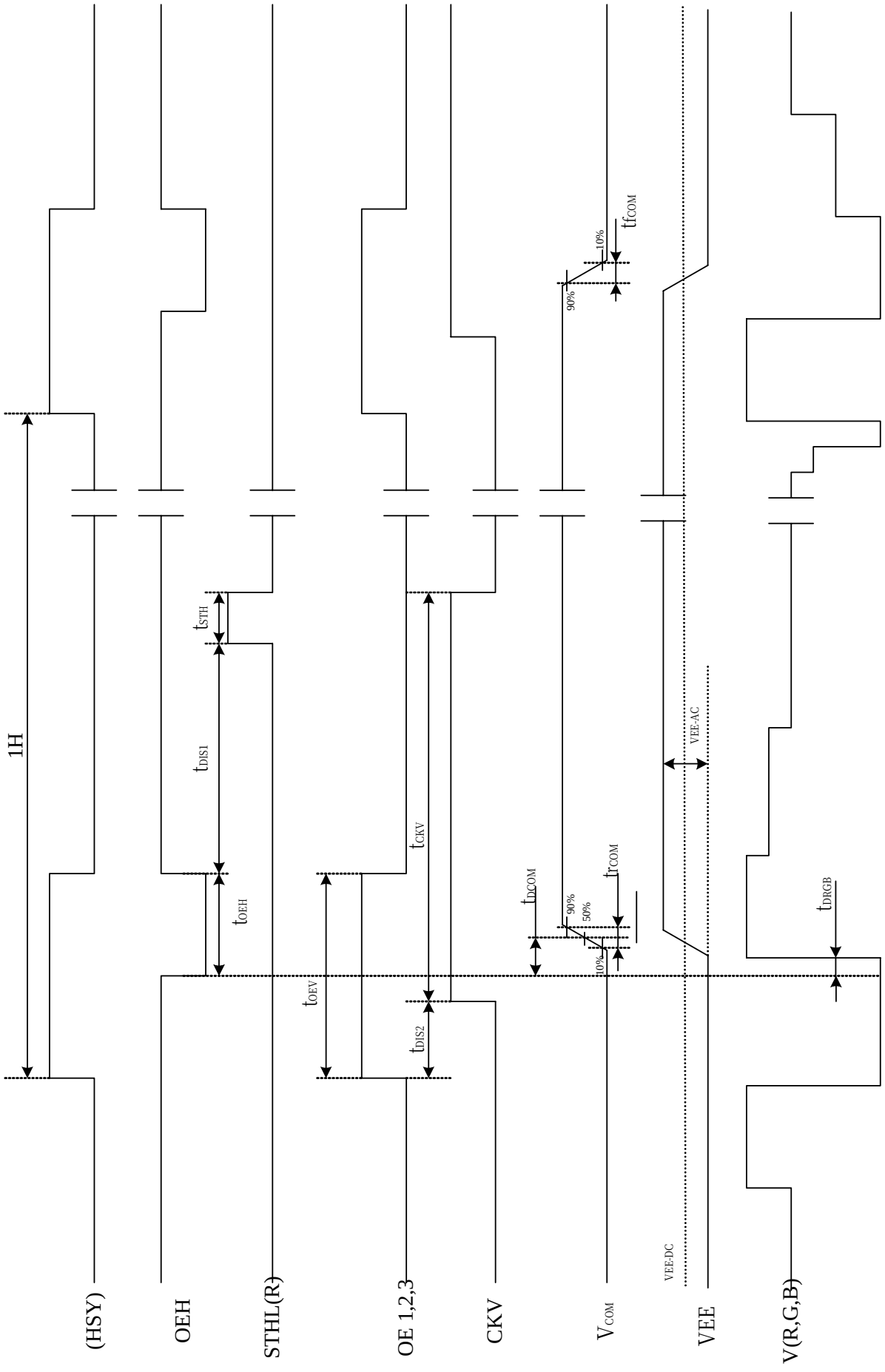


Fig. 8-3 (a) Horizontal timing



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

Fig. 8-3 (b) Detail horizontal timing

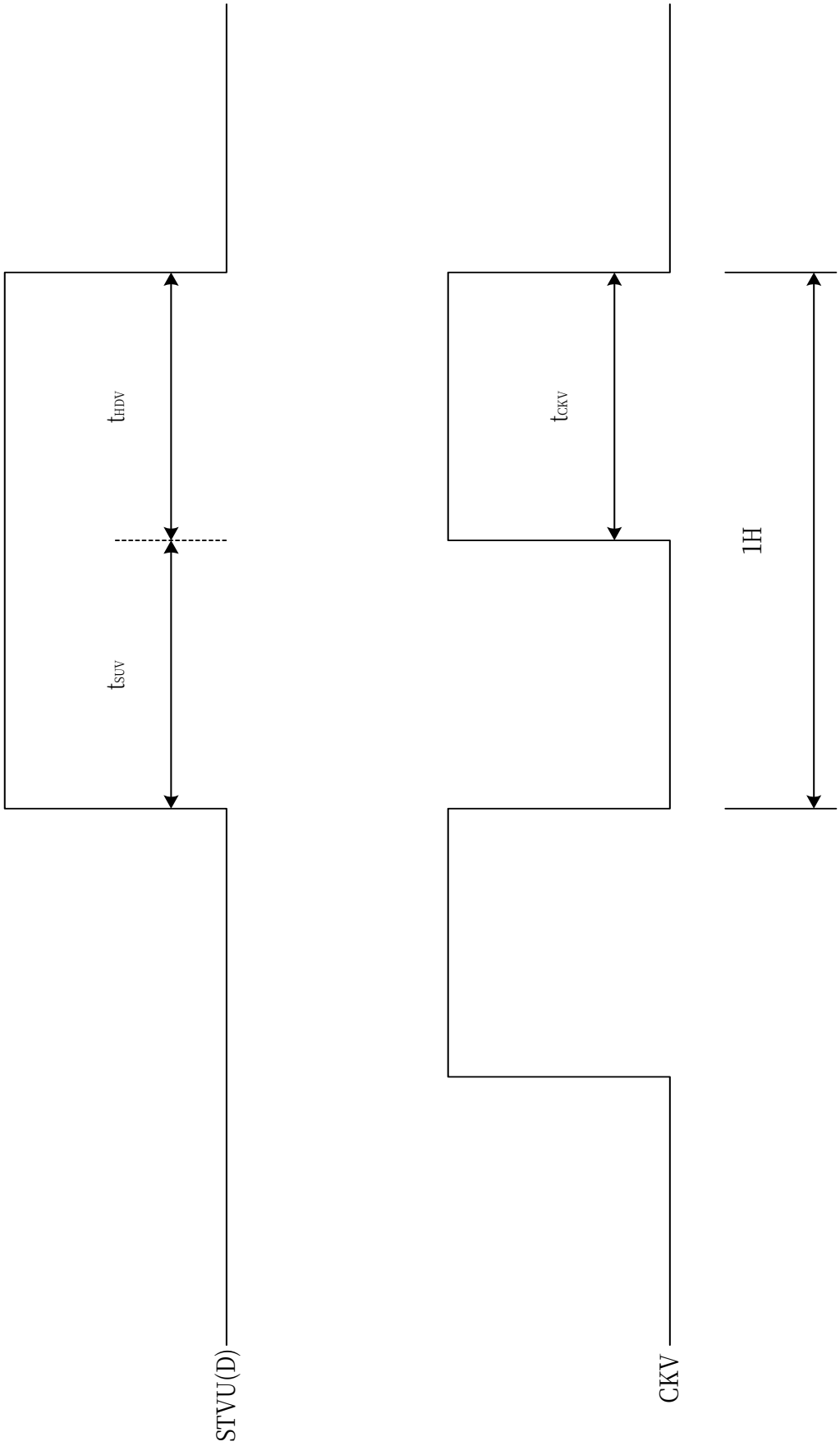


Fig. 8-4 Vertical shift clock timing

Vertical timing (From up to down)

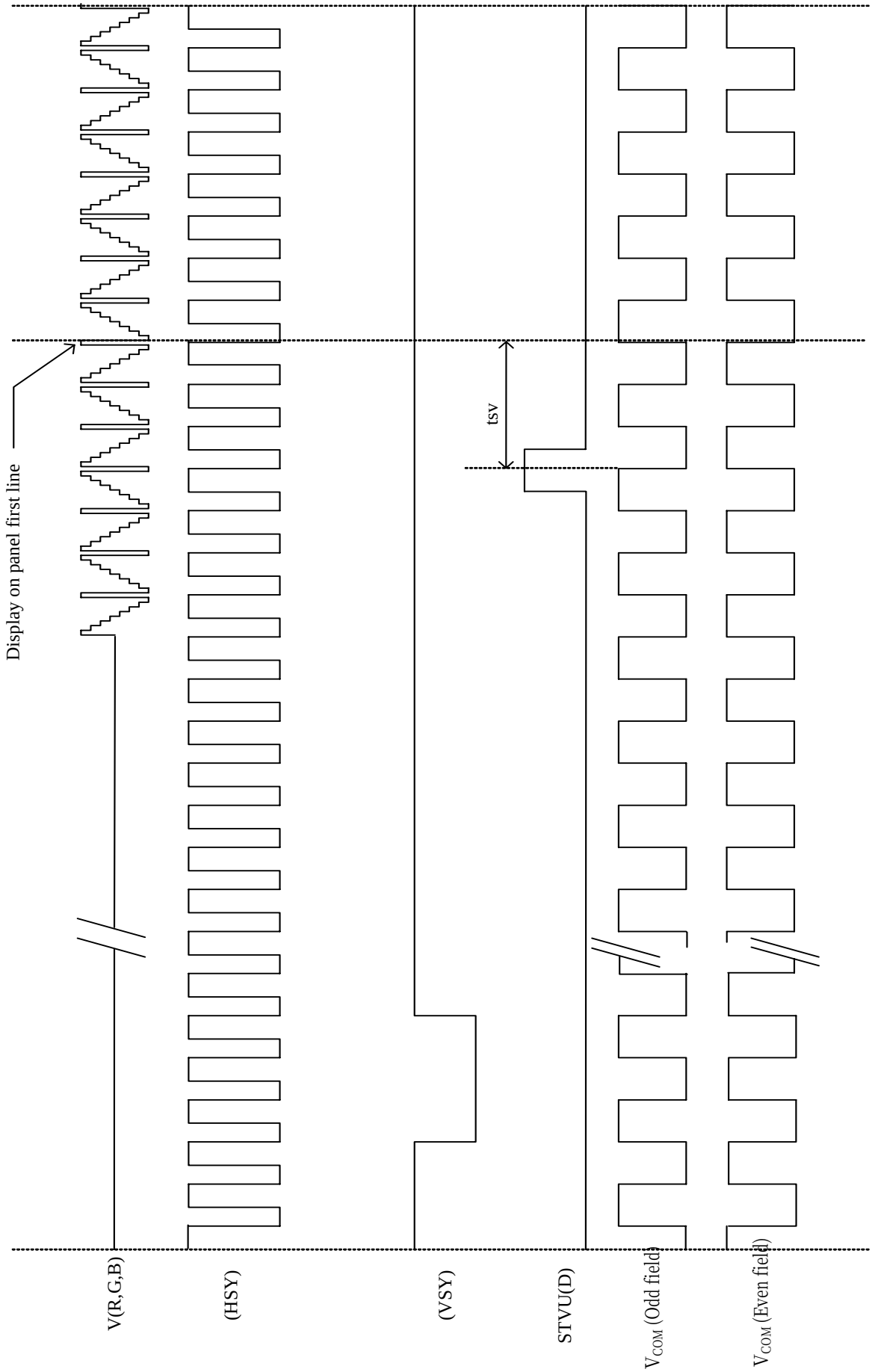


Fig. 8-5 (a) Vertical timing (From Up to Down)

Vertical timing (From down to up)

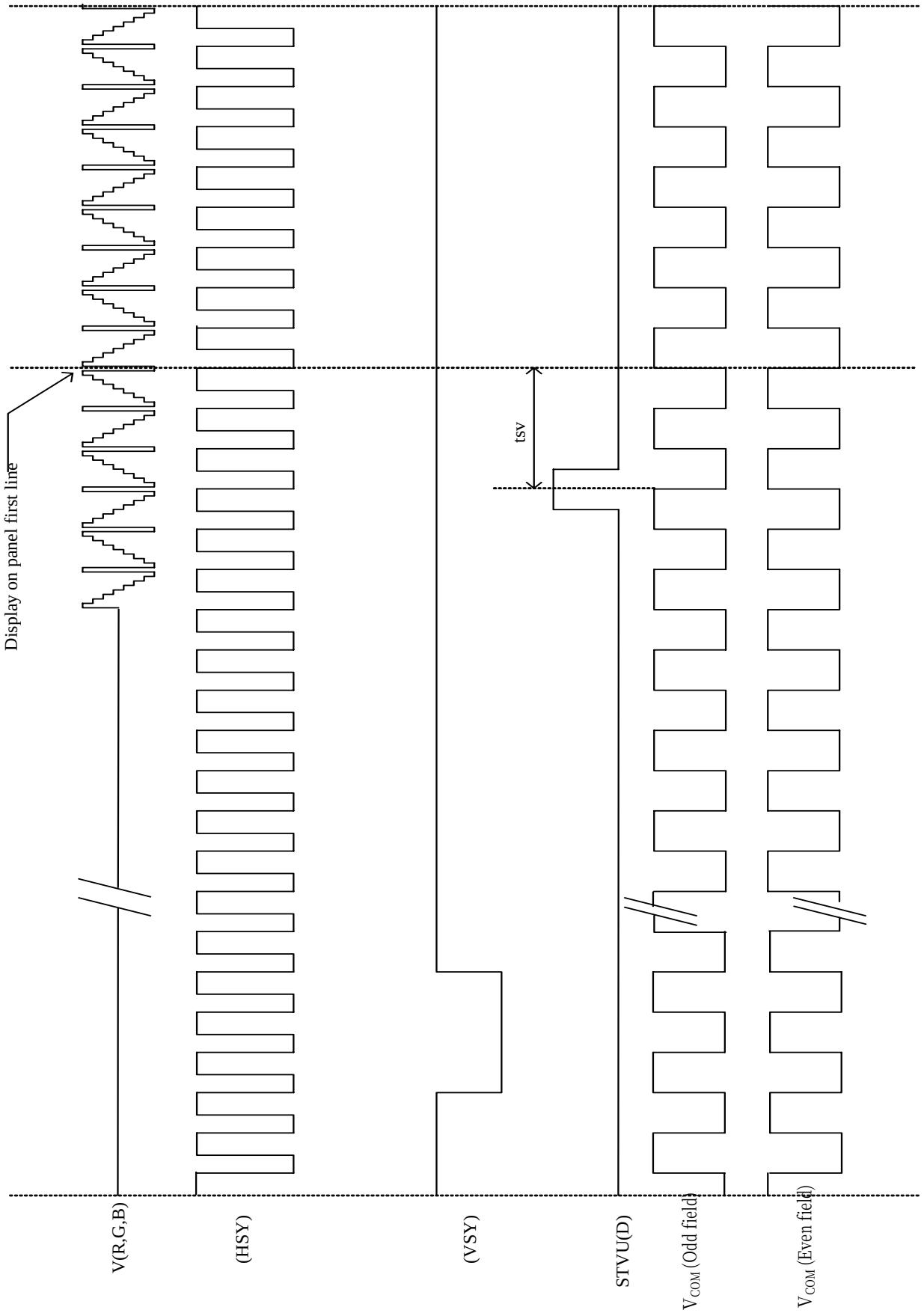
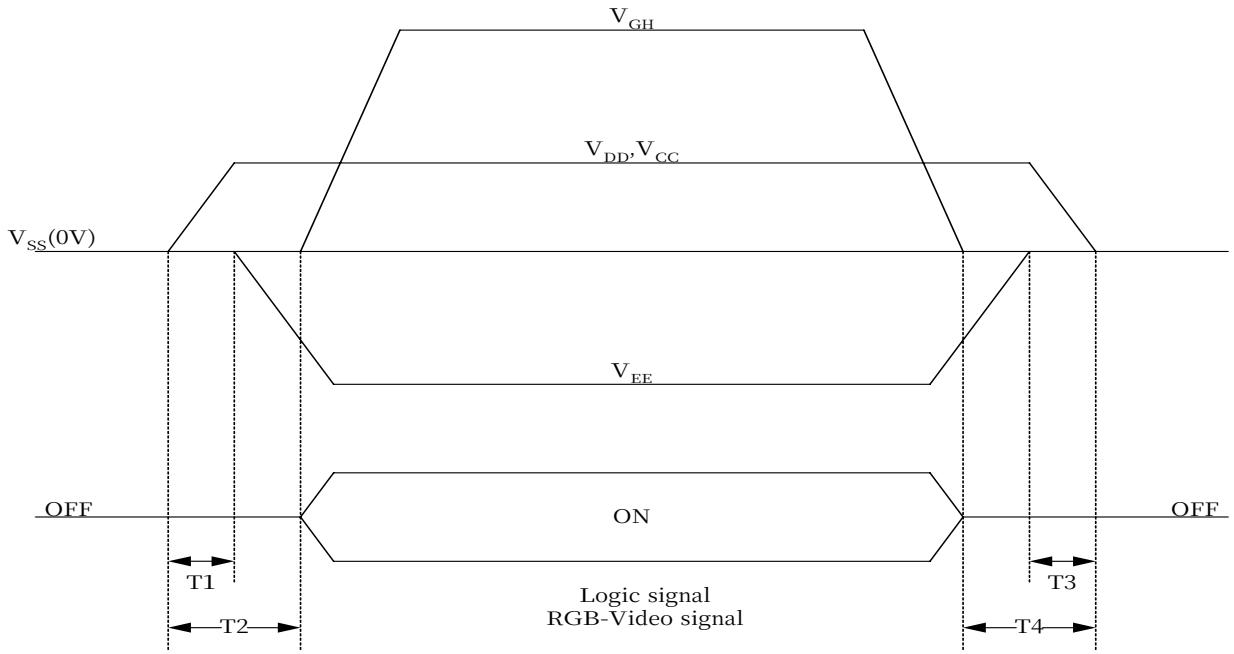


Fig. 8-5 (b) Vertical timing (From Down to Up)

9. Power On Sequence



1) 10ms≦T1<T2
2) 0ms<T3≦T4≦10ms

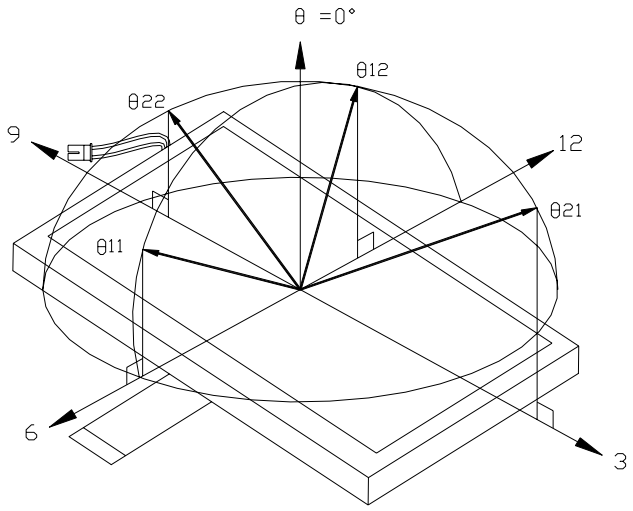
10. Optical Characteristics

10-1) Specification:

Ta = 25℃

Parameter		Symbol	Condition	MIN.	TYP.	MAX.	Unit	*Remarks*
Viewing Angle	Horizontal	θ21, θ22	CR≧10	55	60	-	deg	Note 10-1
	Vertical	θ12		35	40	-	deg	
		θ11		45	50	-	deg	
Contrast Ratio		CR	At optimized Viewing angle	200	350	-		Note 10-2
Response time	Rise	Tr	θ=0°	-	15	30	ms	Note 10-4
	Fall	Tf		-	25	50	ms	
Brightness			θ=0°	350	400	-	cd/㎡	Note 10-3
Transmission Ratio		T	θ=0°	7.8	8.3	-	%	
Uniformity		U	9 point	70	75	-	%	Note 10-5
White Chromaticity		x	θ=0°	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 $=$ $\frac{\text{Luminance when Testing point is White}}{\text{Luminance when Testing point is Black}}$

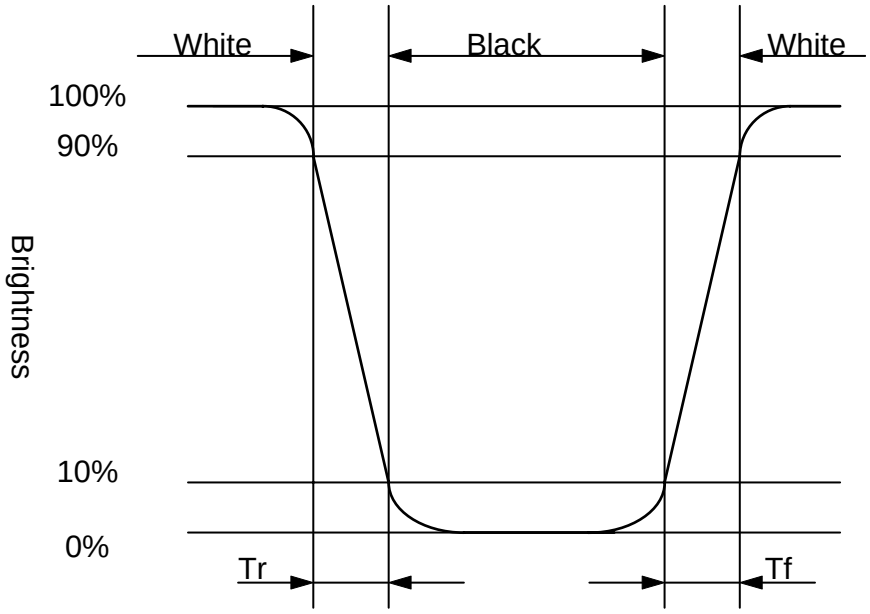
(Testing configuration see 10-2)

Contrast Ratio is measured in optimum common electrode voltage.

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

Lamp Current 6mA

Note 10-4 : The definition of response time:

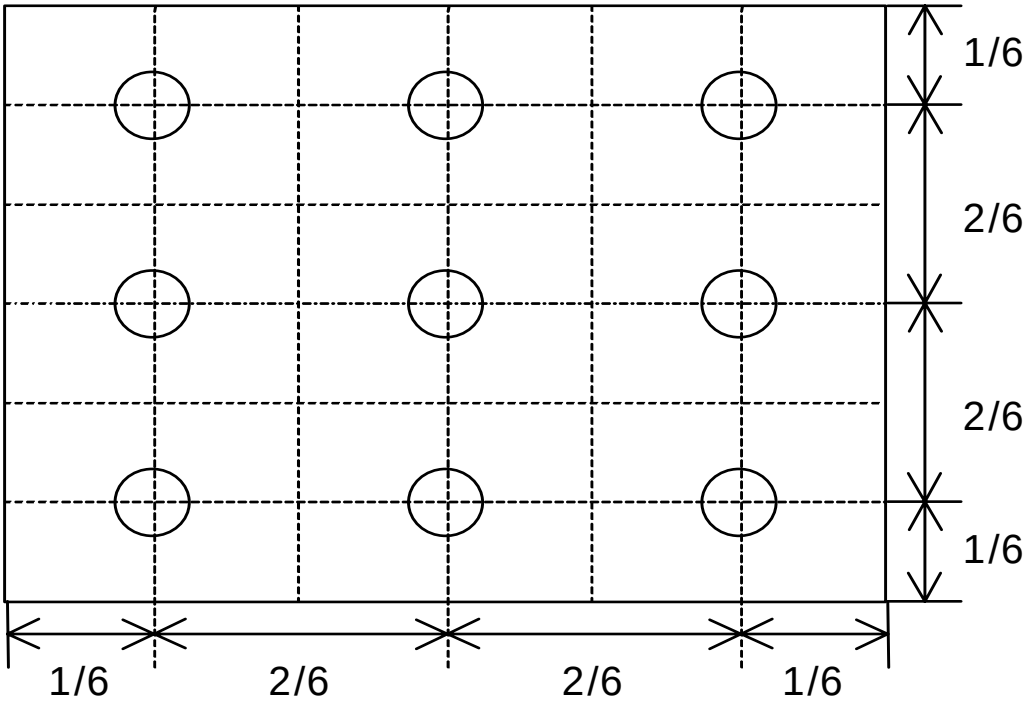


Note 10-5 : The uniformity of LCD is defined as

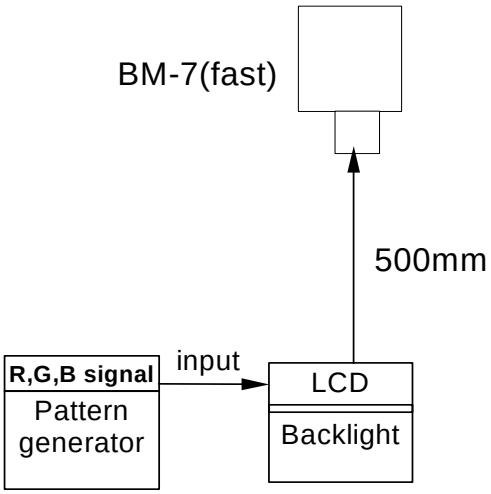
$$U = \frac{\text{The Minimum Brightness of the 9 testing Points}}{\text{The Maximum Brightness of the 9 testing Points}}$$

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).

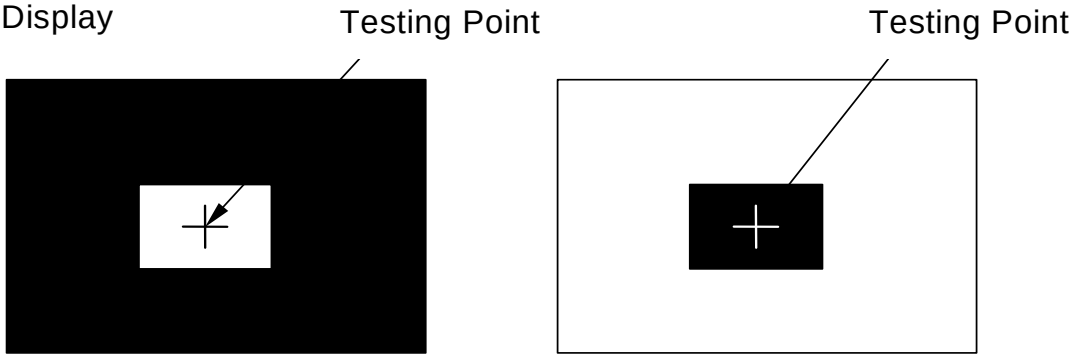


10-2) Testing configuration



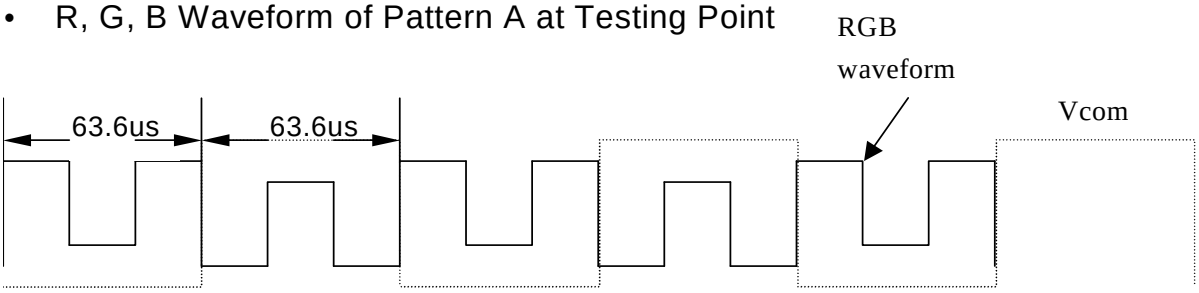
Caution: 1. Environmental illumination≦1 lux
2. Before test CR, Vcom voltage must be adjusted carefully to get the best CR.

- LCD Display

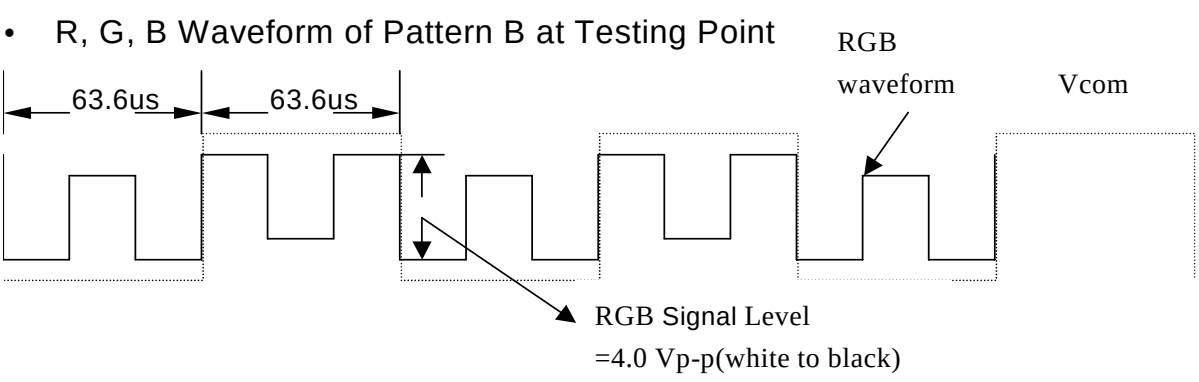


Pattern A Pattern B

- 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 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 H_Z 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

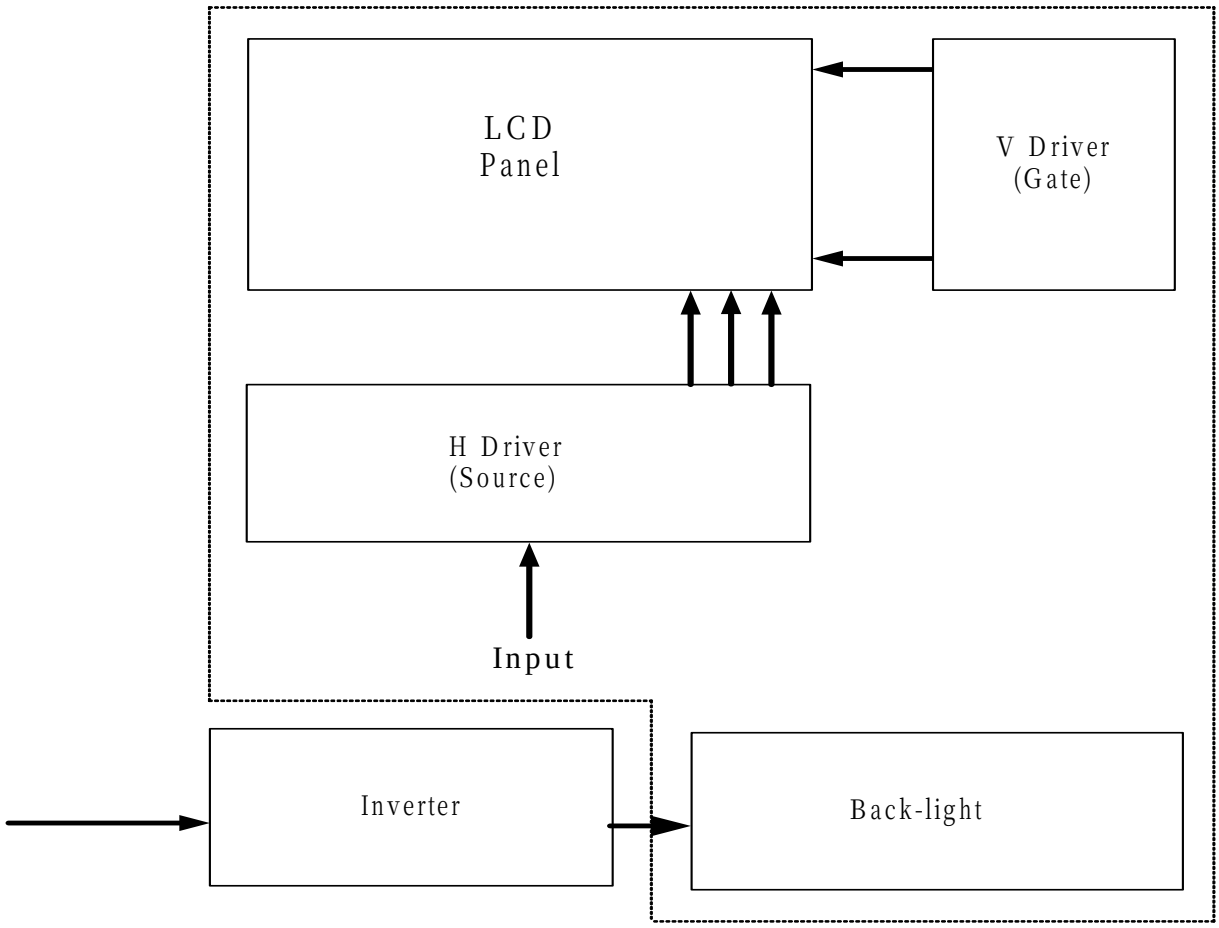
[Criteria]

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 .

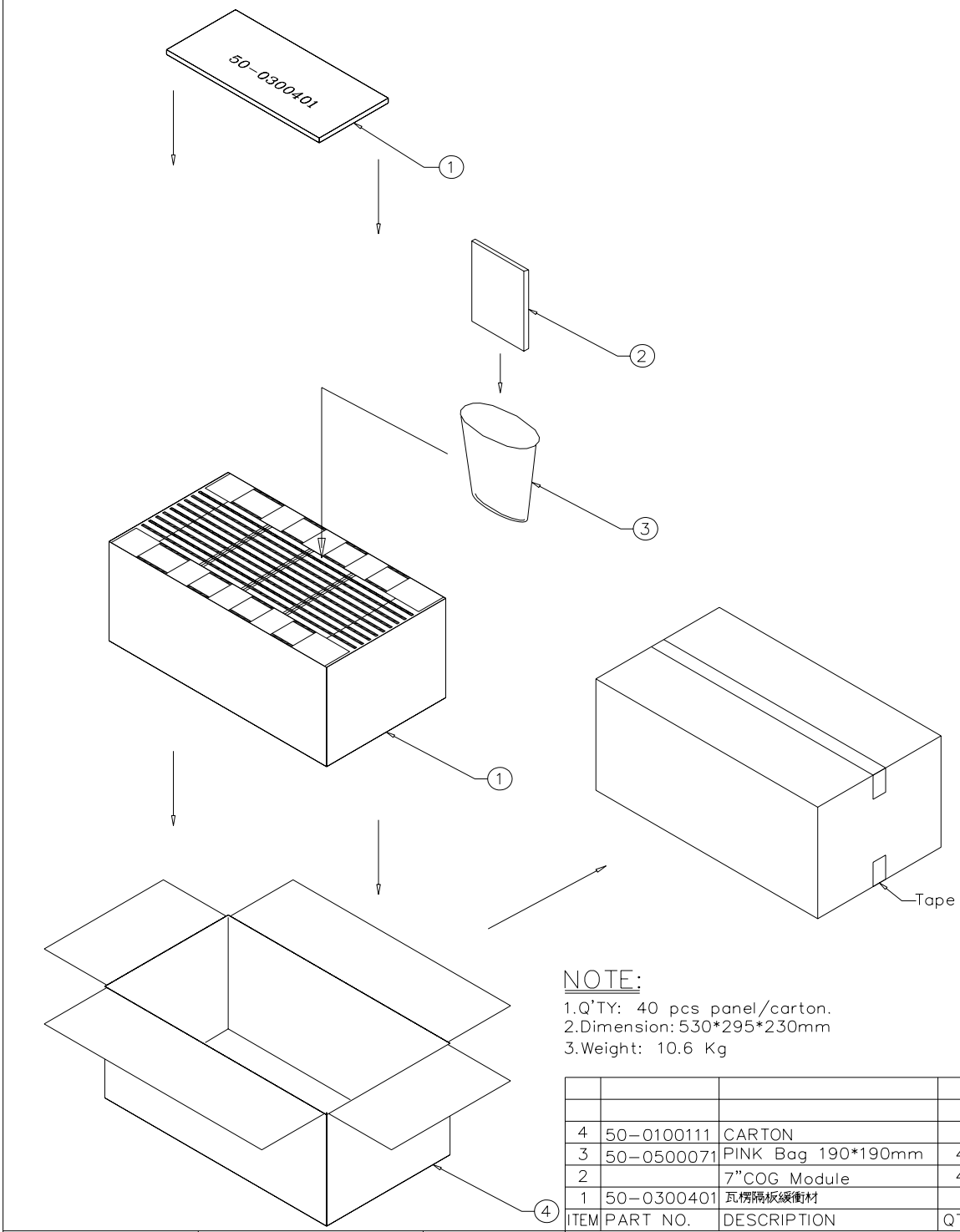
3. After the vibration and shock test , can't be found, chip ,broken.

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: 10.6 Kg

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 Module	40	
1	50-0300401	瓦楞隔板緩衝材	1	上蓋+ 底座

MTL.SPEC.	UNSPECIFIED TOL'S ANGLE ROUGHNESS	REMARK	Prime View International Co., Ltd.

APPROVE	Frank Shin	'05.08.18	SCALE	UNIT: mm	SHEET: 1OF 1
CHECK	Frank Shin	'05.08.18			DWG.TITLE: 7"COG Model Packing Draw
DRAWN	Tzung Yu	'05.08.17	MTL.NO.	DWG FILE:	REV. 01 / 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 C 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	July. 13,2004	Modify Page 4 Mechanical Drawing of TFT-LCD Module(Change new FPC)
1.6	Sep.15,2005	Page 22. Modify Reliability Test to Car application.
1.7	Mar. 13,2006	Page 8. 7. Absolute Maximum Ratings : Delete storage and operation temperature

Rev.	Issued Date	Revised Contents
1.8	Apr.28,2006	Modify: Page: 8 8-2) Current Consumption (GND=0V) From: Ta= 25 ℃ Parameter / Symbol / Condition / Min. / Typ. / Max. / Unit / Remark Current for Driver: I_{GH} V_{GH}=+17V - 0.11 0.17 mA; I_{EE} V_{EE}=-12V - 1.12 1.68 mA V_{EE} center voltage; I_{CC} V_{CC}=+3.3V - 0.02 0.05 mA; I_{DD} V_{DD1}=+3.3V - 1.80 4.50 mA; AI_{DD} V_{DD2}=+5V - 10.5 15.0 mA modify to : Ta= 25 ℃ Parameter / Symbol / Condition / Min. / Typ. / Max. / Unit / Remark Current for Driver: I_{GH} V_{GH}=+17V - 0.08 0.1 mA; I_{EE} V_{EE}=-12V - 0.11 0.13 mA V_{EE} center voltage; I_{CC} V_{CC}=+3.3V - 0.004 0.005 mA; I_{DD} V_{DD1}=+3.3V - 1.2 3.6 mA; AI_{DD} V_{DD2}=+5V - 5 8 mA Page11 power consumption From: Ta= 25 ℃ Parameter / Symbol / Conditions / TYP. / Unit / Remark LCD Panel Power Consumption - - 76.9 mW Backlight Lamp Power Consumption - - 3.15 W Note 8-7 Total Power Consumption - - 3.3 W modify to: Ta= 25 ℃ Parameter / Symbol / Conditions / TYP. / Unit / Remark LCD Panel Power Consumption - - 32 mW Backlight Lamp Power Consumption - - 3.15 W Note 8-7 Total Power Consumption - - 3.2 W