PRIME VIEW

Version : *1.3*

液晶之友 电话:020-33819057
Http://www.lcdfriends.com

TECHNICAL SPECIFICATION

MODEL NO. : PA035XS1

☐Customer's Approved

Customer _____

Date _____

By _____

☐PVI's Confirmation

Approved By _____

Prepared By _____

PRIME VIEW INTERNATIONAL CO.,LTD.
3,LI SHIN RD. 1,SCIENCE-BASED INDUSTRIAL
PARK,HSINCHU,TAIWAN,R.O.C.
Http://www.pvi.com.tw

Date : Oct. 21, 2002

This technical specification is subject to change without notice.
Please return 1 copy with your signature on this page for approval.

TECHNICAL SPECIFICATION

CONTENTS

1. Application

This technical specification applies to 3.5" color TFT-LCD panel. The 3.5" color TFT LCD panel is designed for camcorder, digital camera application and other electronic products which require high quality flat panel displays.
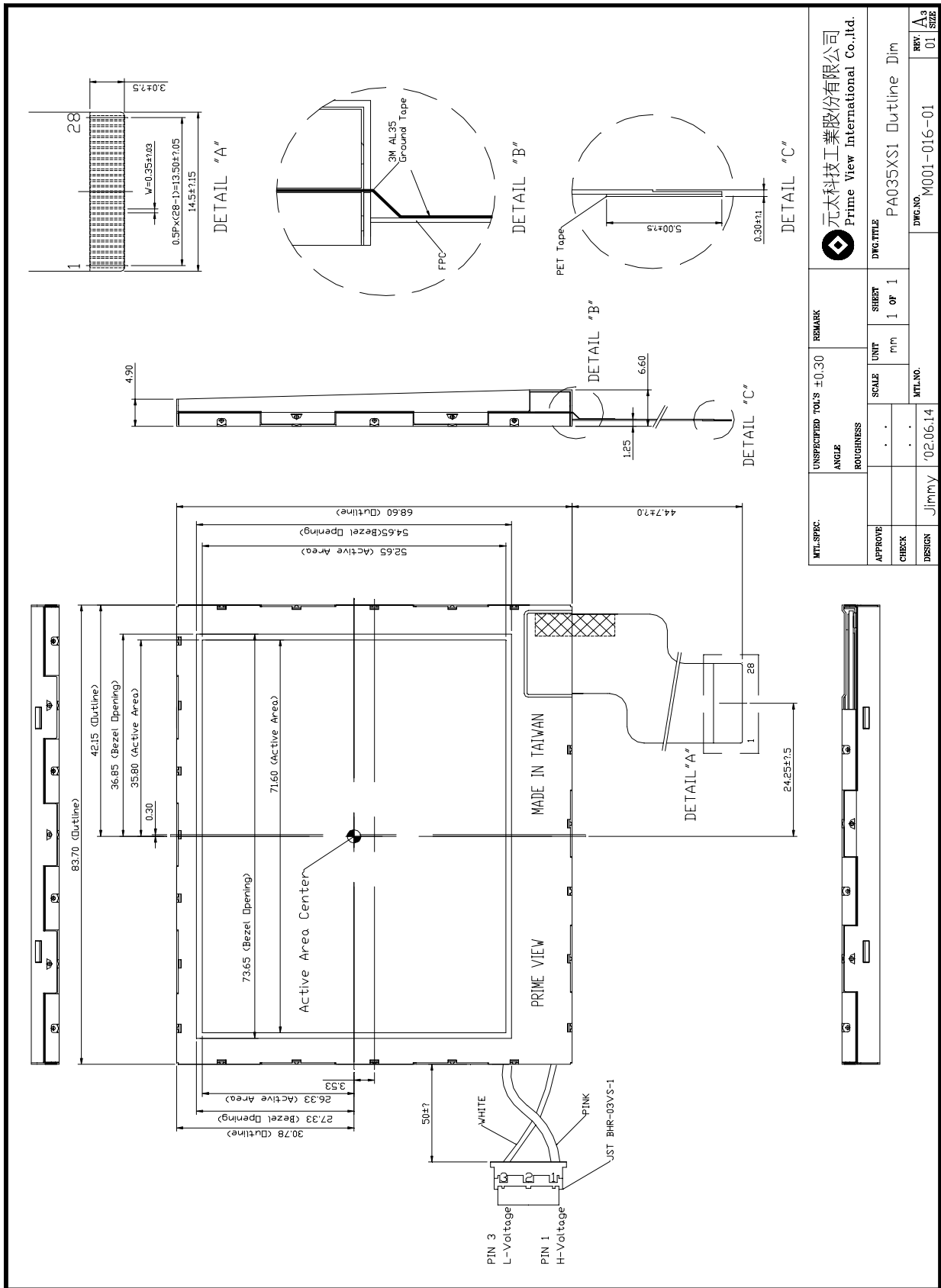
1. Features

. Compatible with NTSC or PAL system

. High Resolution：112,320 Dots

. Optimum Viewing Direction： 6 o'clock

. Up/Down and Left/Right Image Reversion

1. Mechanical Specifications

Parameter	Specifications	Unit
Screen Size	3.5 (diagonal)	inch
Surface Treatment	Anti-Glare	
Display Format	480× 234	dot
Active Area	71.6× 52.65	mm
Dot Pitch	0.149(W)× 0.225(H)	mm
Pixel Configuration	Delta	
Outline Dimension	83.7(W)× 68.6(H)× 6.6 (D)	mm
Weight	58±5	g

4. Mechanical Drawing of panel:

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	V_{COM}	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	
21	DIO2	I/O	Vertical start pulse	Note 5-5
22	DIO1	I/O	Vertical start pulse	
23	V_{GL}	I	Gate off voltage(alternative every 1-H)	Note 5-4
24	V_{EE}	I	Gate driver negative voltage	Note 5-6
25	V_{SS}	I	GND	
26	V_{CC}	I	Logic power for gate driver	Note 5-3
27	V_{GH}	I	Gate on voltage	Note 5-7
28	NC	-	No connection	-

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.
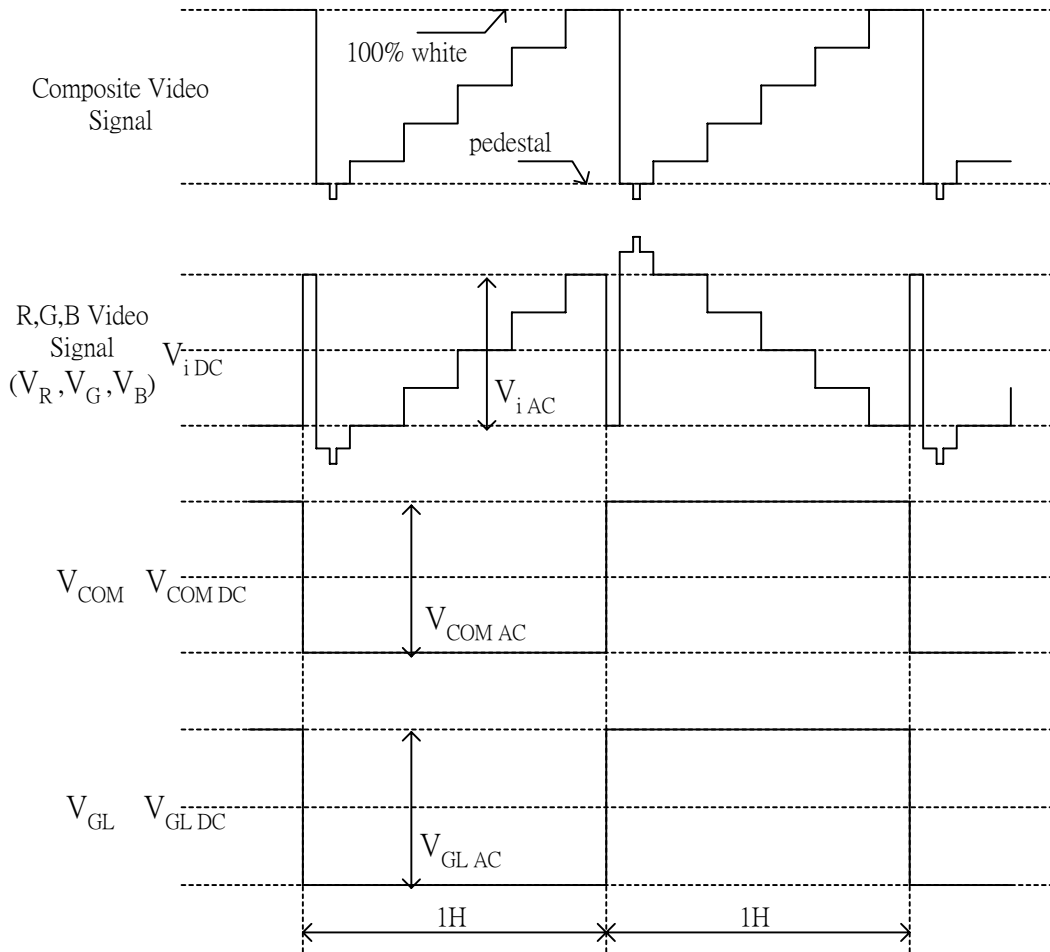
Fig.1

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

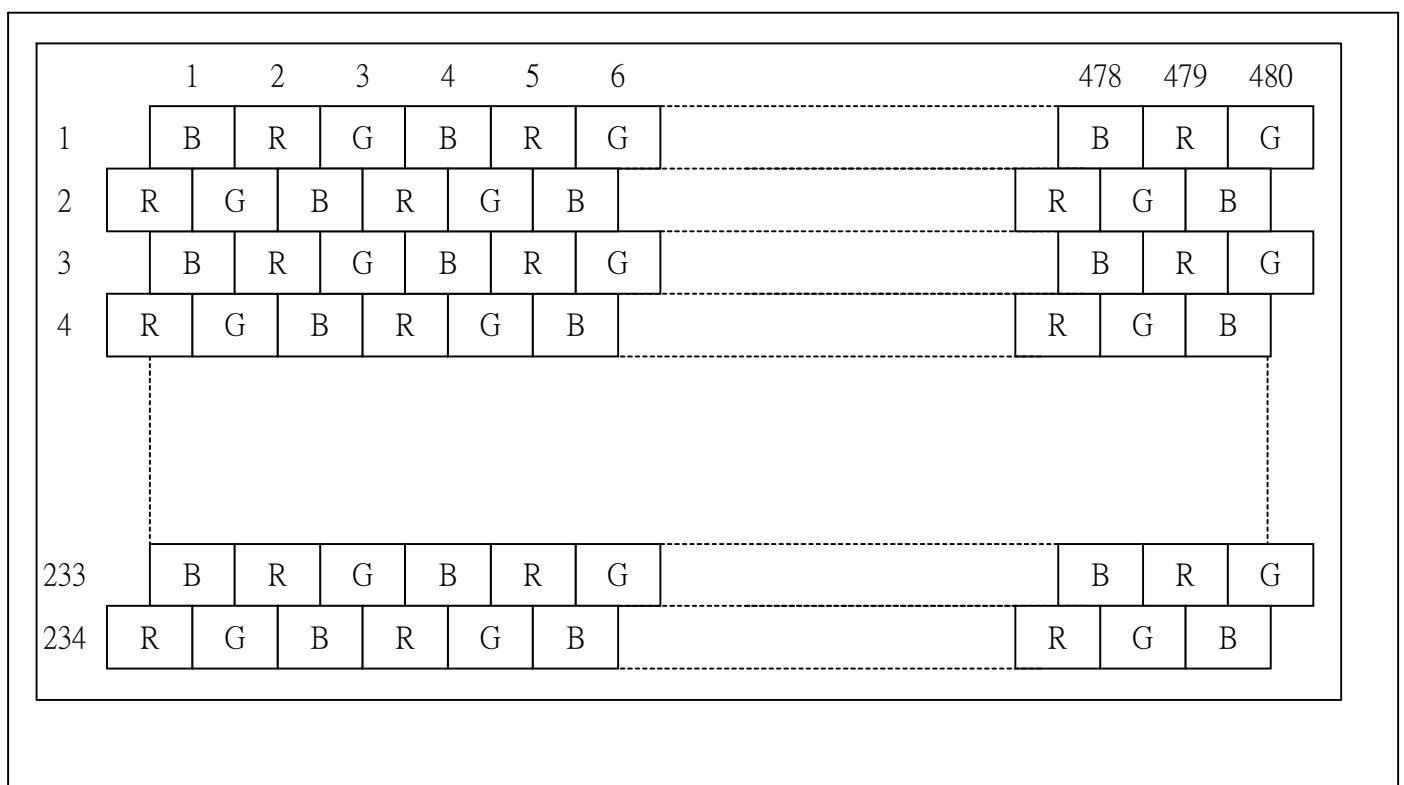White : maximum transmission / Black : minimum transmission

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.).

6. Pixel Arrangement and input connector pin NO.

	1	2	3	4	5	6		478	479	480
1	B	R	G	B	R	G		B	R	G
2	R	G	B	R	G	B		R	G	B
3	B	R	G	B	R	G		B	R	G
4	R	G	B	R	G	B		R	G	B
233	B	R	G	B	R	G		B	R	G
234	R	G	B	R	G	B		R	G	B

1   28

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 ℃

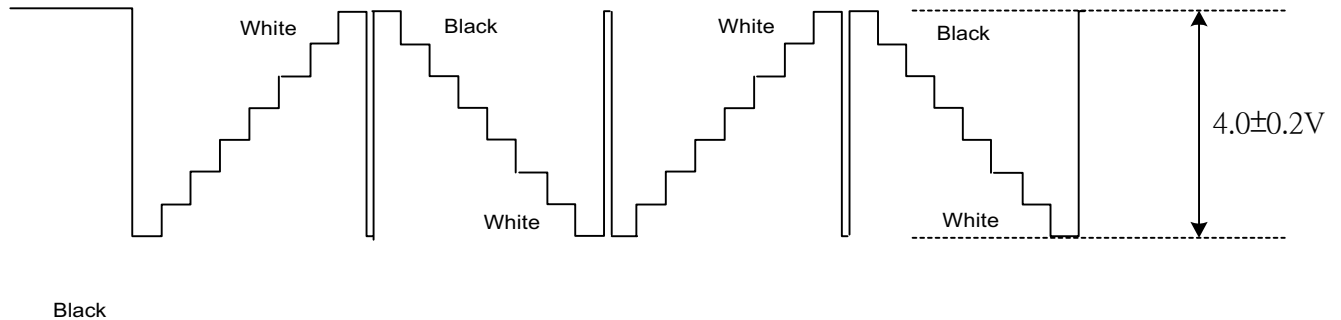| Parameter		Symbol	MIN.	MAX.	Unit	Remark
Supply Voltage for Source Driver	Analog	AV_{DD}	-0.3	+7.0		
	Digital	V_{DD}	-0.3	+7.0		
Supply Voltage for Gate Driver	Positive	V_{GH}	-0.3	+45	V	
	Negative	V_{GL}	-23	+0.3	V	
		V_{GH}-V_{GL}	+15	+40	V	
Analog input voltage		V_{Video}	-0.3	+7.3	V	Notes:7-1
Storage Temperature			-20	+70	℃	
Operation Temperature			0	+60	℃	Notes: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}
		$V_{COM\,DC}$	+1.7	+1.8	+1.9	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 ℃

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Current for Driver	I$_{GH}$	V$_{GH}$=+15V	-	0.069	0.09	mA	
	I$_{GL}$	V$_{GL}$=-12V	-	0.14	0.18	mA	V$_{GL}$ center voltage
	I$_{CC}$	V$_{CC}$=+5V	-	0.09	0.12	mA	
	AI$_{DD}$	AV$_{DD}$=+5V	-	4.51	5.86	mA	
	I$_{DD}$	V$_{DD}$=+5V	-	0.63	0.82	mA	
	I$_{EE}$	V$_{EE}$=-15V	-	0.30	0.39	mA	

8-3) Backlight driving & Power Consumption

Pin No	Symbol	Description	Remark
1	VL1	Input terminal (Hi voltage side)	
3	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 ℃

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Lamp voltage	V$_L$	-	265	-	Vrms	I$_L$=3mA
Lamp current	I$_L$		3		mA	
Lamp frequency	P$_L$	25	35	65	KHz	Note 8-4
Kick-off voltage(25℃)	Vs	-	-	400	Vrms	Note 8-5
Kick-off voltage(0℃)	Vs	-	-	520	Vrms	

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

Note 8-5 : This value is not output voltage of inverter.
The voltage of inverter must larger than the starting voltage.

8-4) Power Consumption

<div align="right">Ta= 25 ℃</div>

Parameter	Symbol	Conditions	TYP.	Unit	Remark
LCD Panel Power Consumption			33.5	mW	Note 8-5
Backlight Lamp Power Consumption			0.65	W	Note 8-6
Total Power Consumption			0.69	W	

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

Note 8-6：Backlight lamp power consumption is calculated by $I_L \times V_L$.

8-5) Input / Output Connector

1. LCD Module Connector
   FFC Down Connector,
      28 Pins
   Pitch：0.5 mm

B) Backlight Connector
   JST BHR-03VS-1
   Pin No.：3
   Pitch：4 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	

PRIME VIEW

8-6) Signal Timing Waveforms

HD

VD

1st display period

2nd display period

Xout

2 3 4 5 6 7 ... 19 20 21 22 23 ... 265 266 267 268 269 ... 282 283 284 285 286

(22H~256H)

(285H~519H)

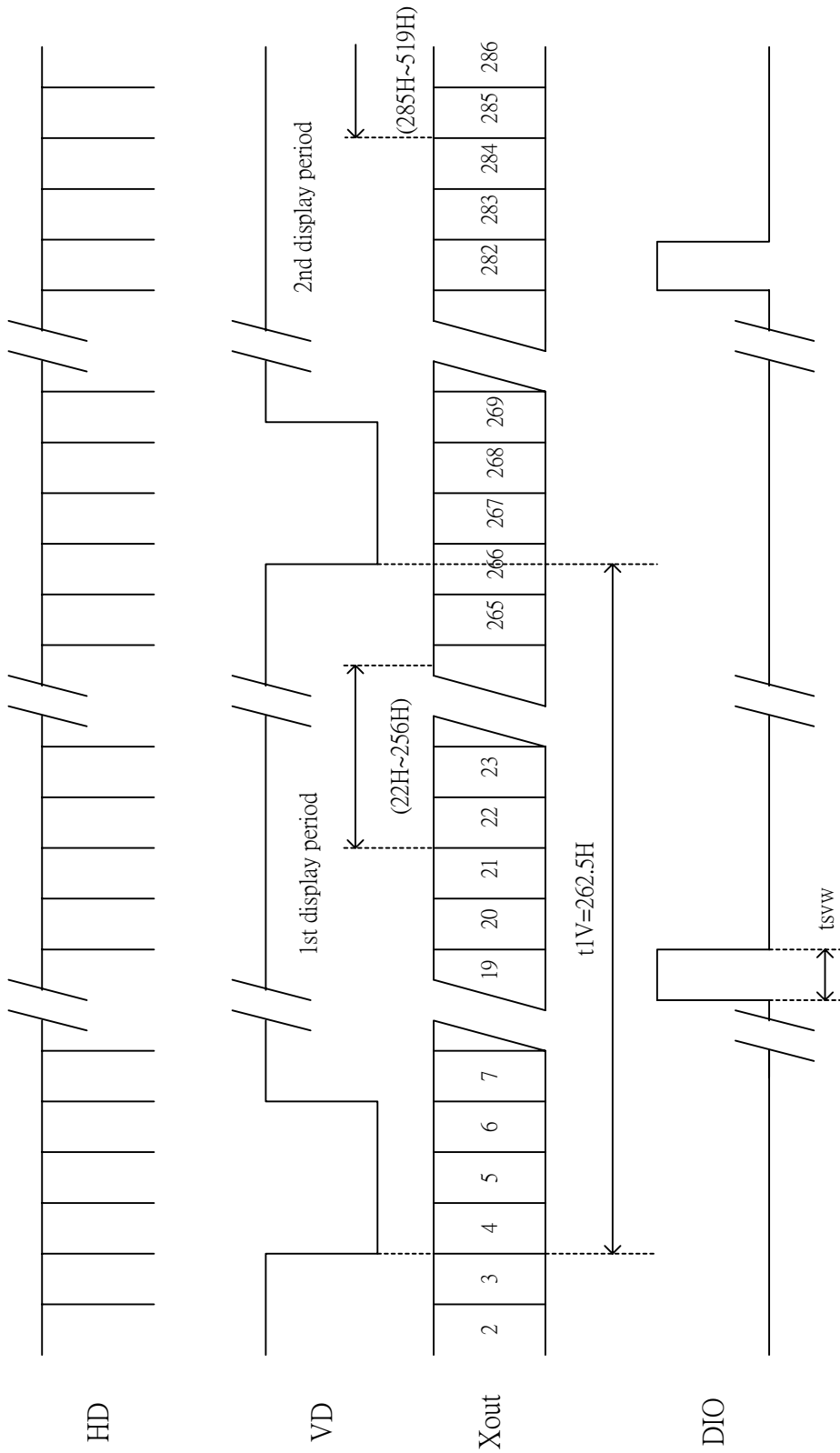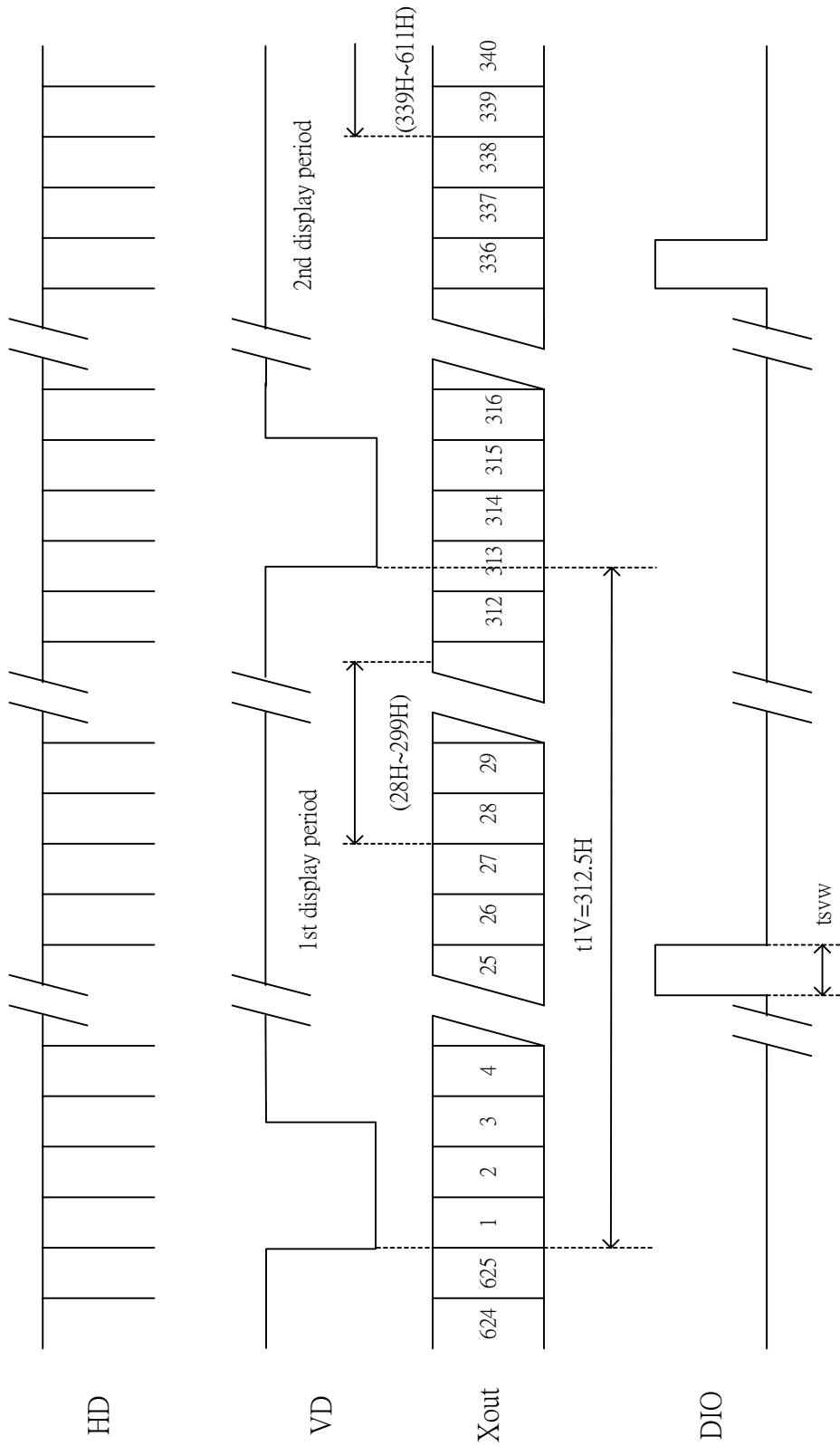t1V=262.5H

DIO

tsvw

Fig. 8-1 Vertical Start Line for NTSC

Fig. 8-1 Vertical Start Line for PAL

** odd field : Scan lines 14n+6 14n+12 (n = 2, 3, 4..) are not displayed.
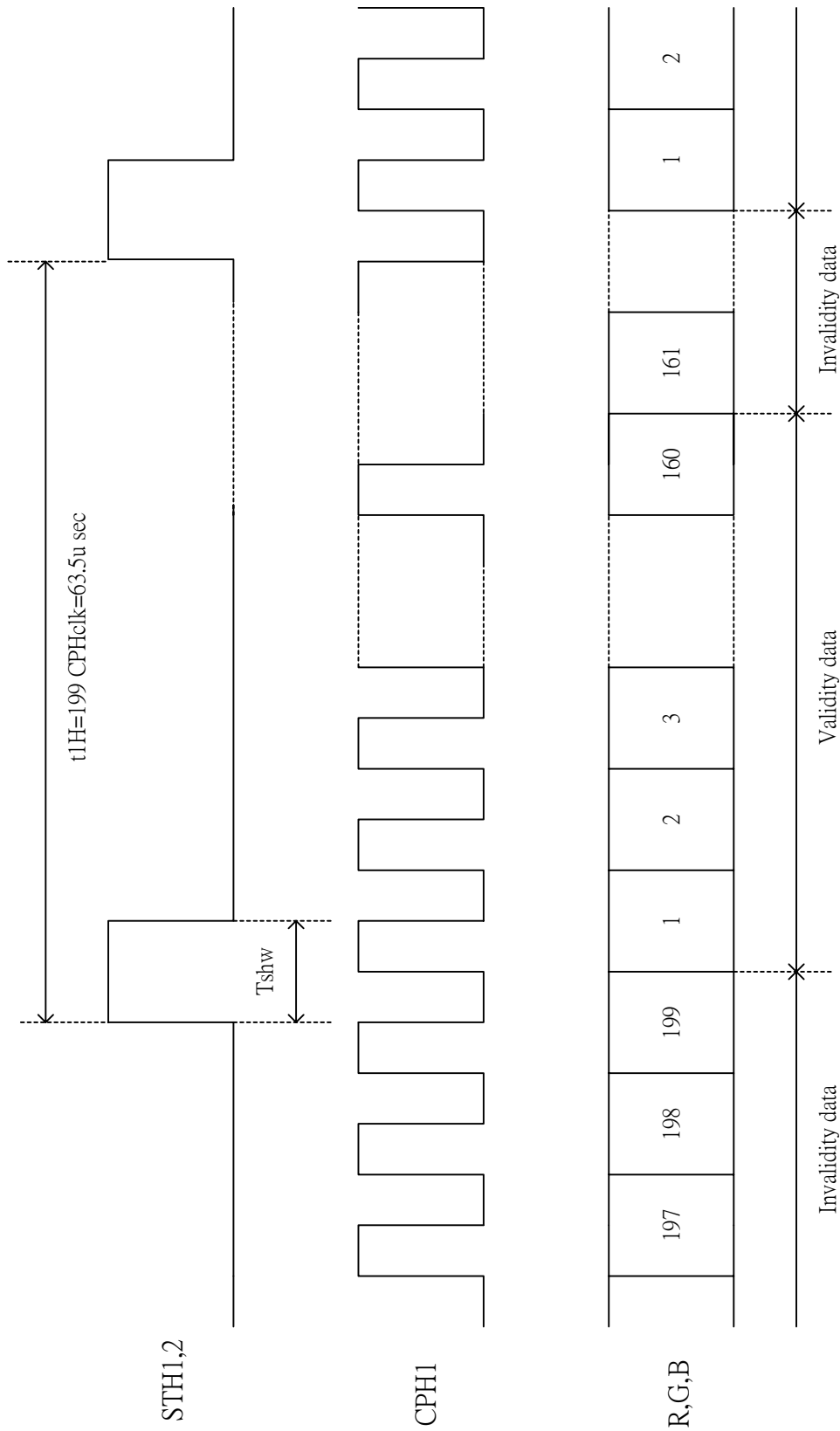even field : Scan lines 14n+12 14n+20 (n = 2, 3, 4..) are not displayed.
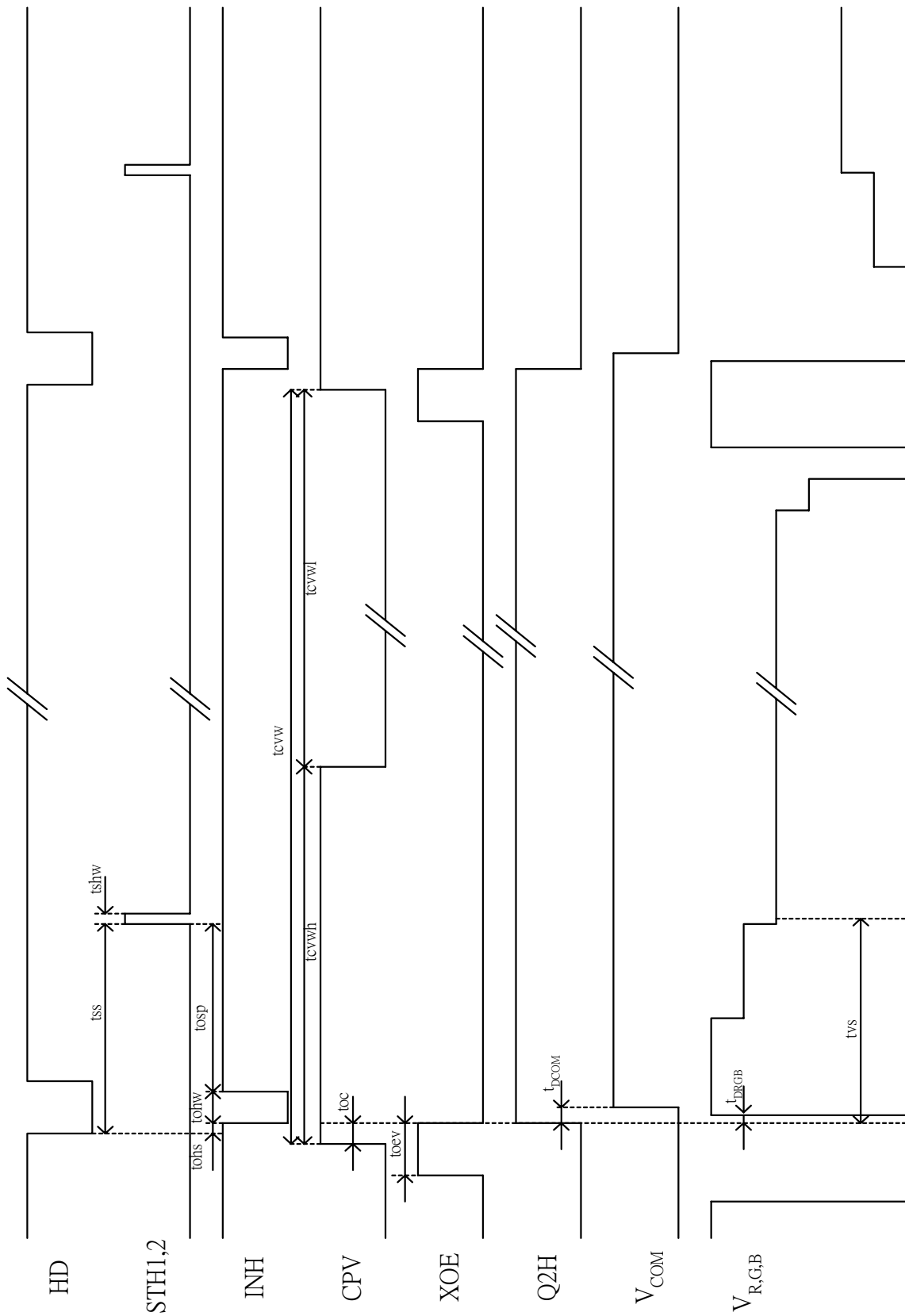
Fig. 8-2 Horizontal Start Pixel

t1H=199 CPHclk=63.5u sec

Tshw

STH1,2

CPH1

R,G,B

Invalidity data

Validity data

Invalidity data

Fig. 8-3 Detail Horizontal Timing

Signals: HD, STH1,2, INH, CPV, XOE, Q2H, V_{COM}, $V_{R,G,B}$

Timing parameters: tshw, tss, tosp, tohw, tohs, tcvwh, tcvw, tcvwl, toc, toev, t_{DCOM}, t_{DRGB}, tvs

PRIME VIEW
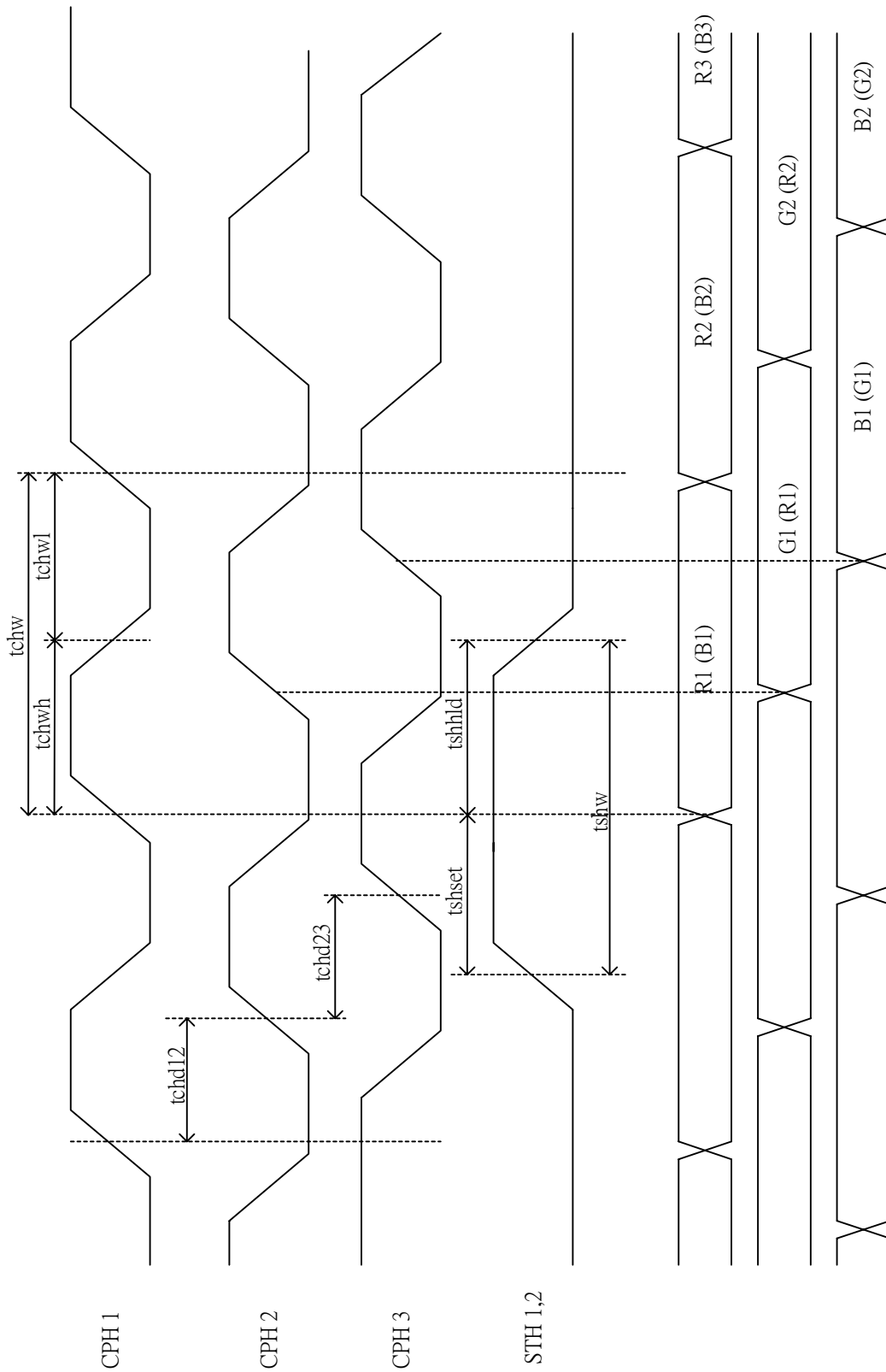
Fig. 8-4 Sampling Clock Timing

CPH 1
CPH 2
CPH 3
STH 1,2

tchw
tchwl
tchwh
tchd12
tchd23
tshset
tshhld
tshw

R3 (B3)
R2 (B2)
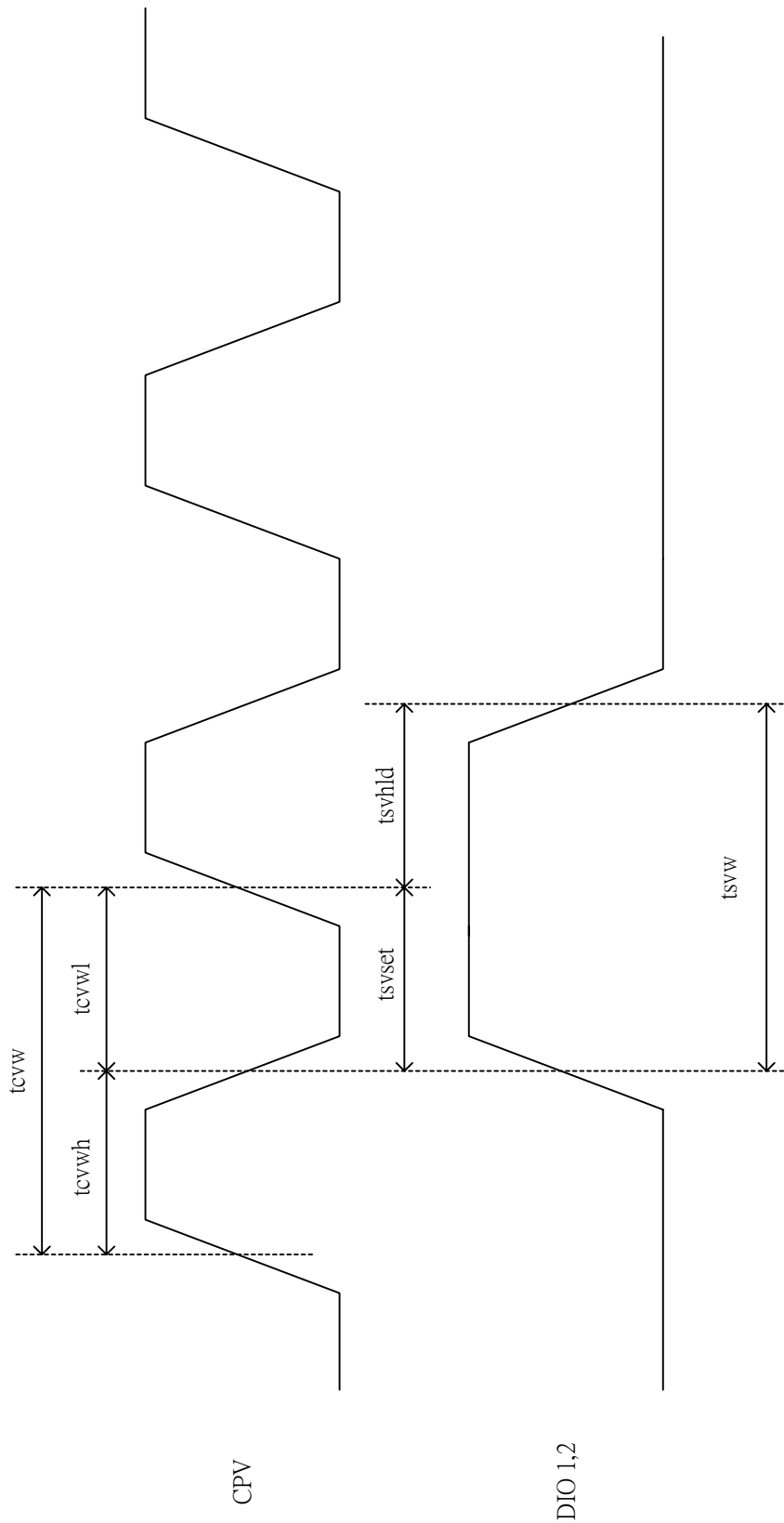R1 (B1)
G2 (R2)
G1 (R1)
B2 (G2)
B1 (G1)

Fig. 8-5 Vertical Shift Clock Timing

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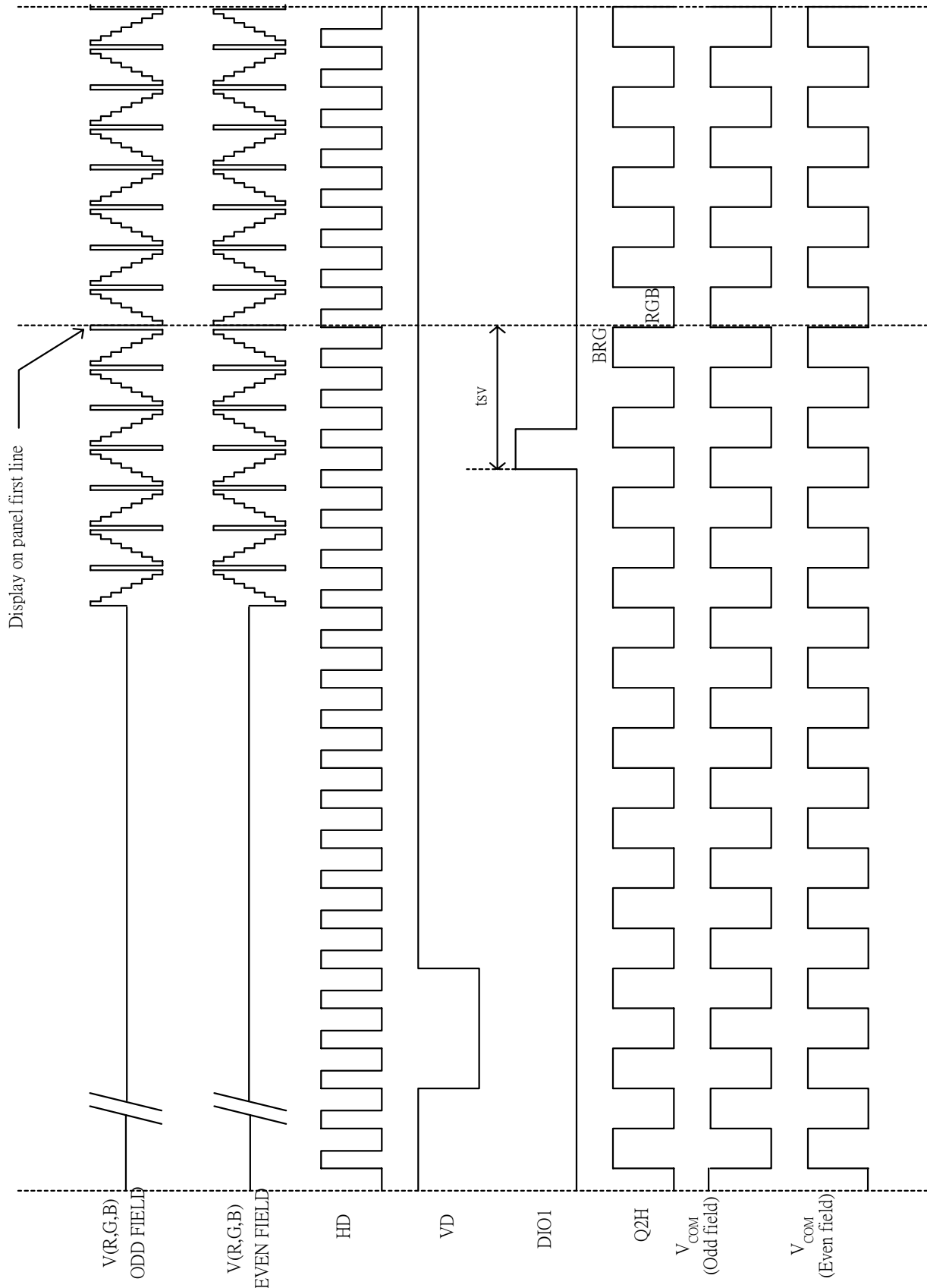
Fig. 8-6(b) Vertical Timing (From Up to Down)
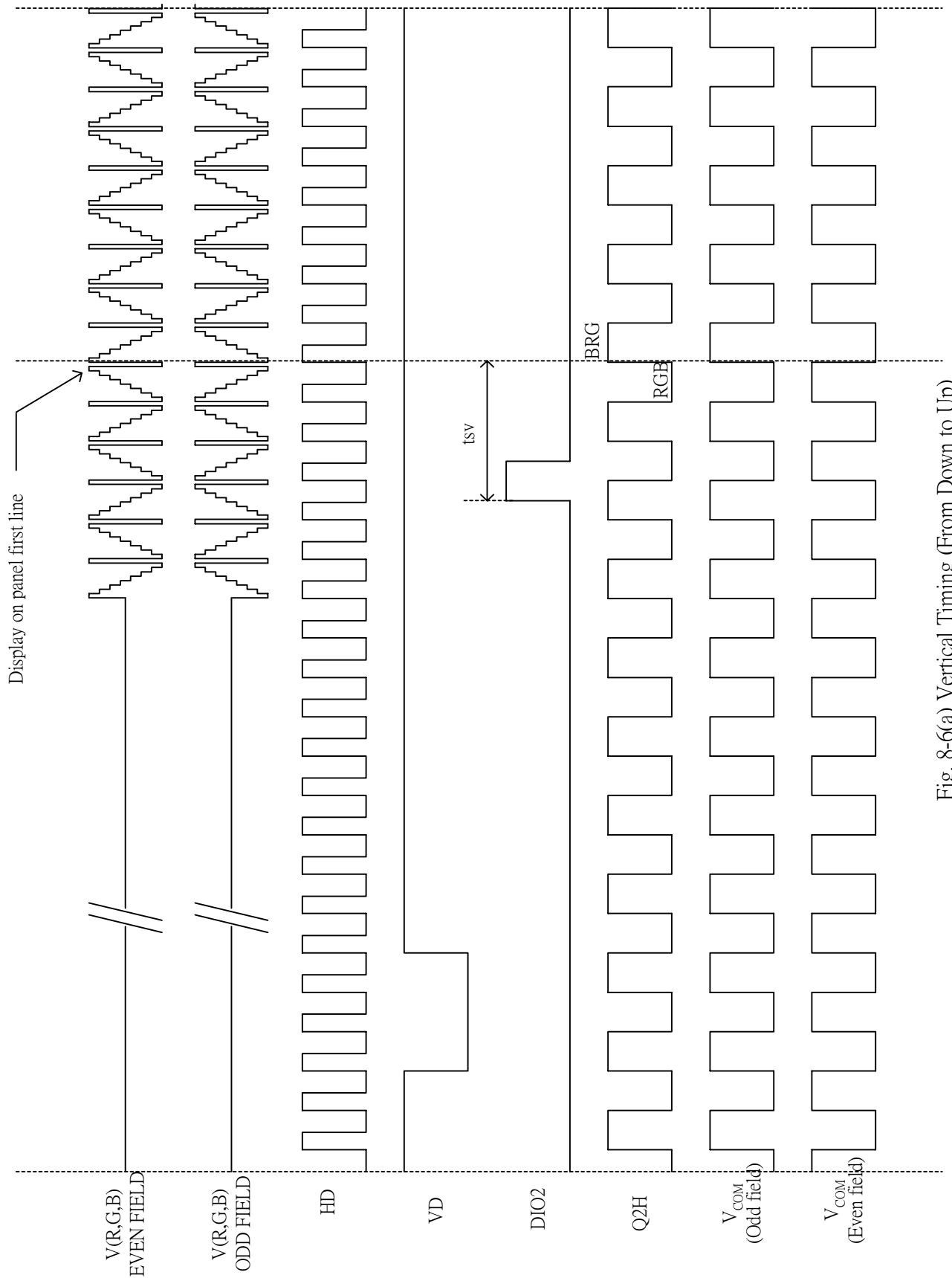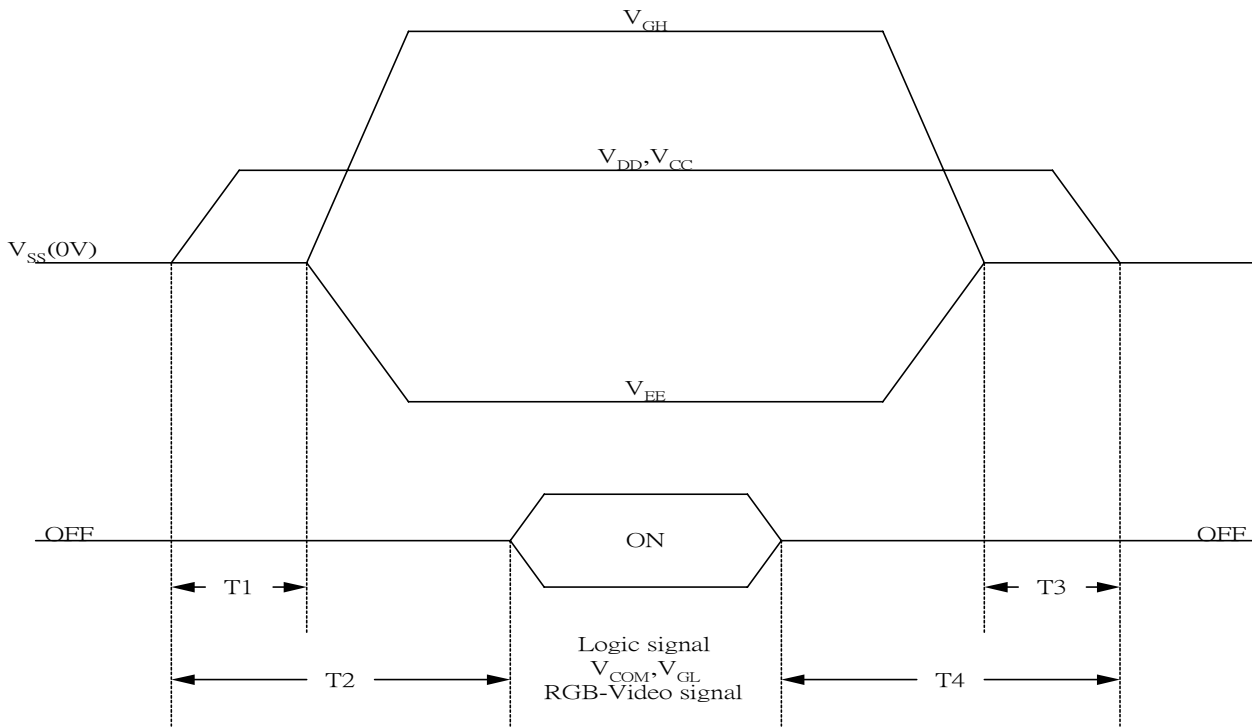
Vertical timing (From down to up)

Display on panel first line

V(R,G,B) EVEN FIELD

V(R,G,B) ODD FIELD

HD

VD

DIO2

Q2H

V_{COM} (Odd field)

V_{COM} (Even field)

tsv

BRG

RGB

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）$10ms \leqq T1 < T2$
2）$0ms < T3 \leqq T4 \leqq 10ms$

10. Optical Characteristics

10-1) Specification

Ta = 25℃

| Parameter		Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remarks
Viewing Angle	Horizontal	θ	CR≧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	110	150			Note 10-1
Response time	Rise	Tr	$\theta = 0°$		15	30	ms	Note 10-4
	Fall	Tf	$\varphi = 0°$		25	50	ms	
Transmission	Ratio	T		7.5	8.0	8.5	%	
Uniformity		U		65	70			
Brightness				200	250		cd/㎡	Note 10-2
White Chromaticity		X	$\theta = 0°$	0.280	0.310	0.340		Note 10-2
		Y		0.310	0.340	0.370		
		Tc		6650	6850	7050		
Lamp Life Time	+25℃			10,000			hr	

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

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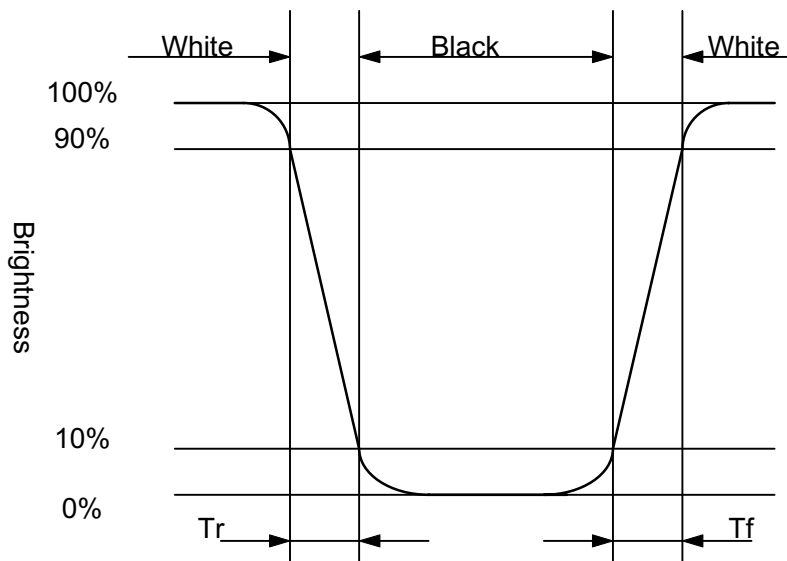The test configurations of contrast ratio see section 10-2.

Note 10-2：1.Topcon BM-7(fast) luminance meter 1.0° field of view is used in the testing (after 20~30 minutes operation).
1. Lamp current : 3 mA
1. Inverter model : TDK-347.

Note 10-3：The definition of viewing angle diagrams :
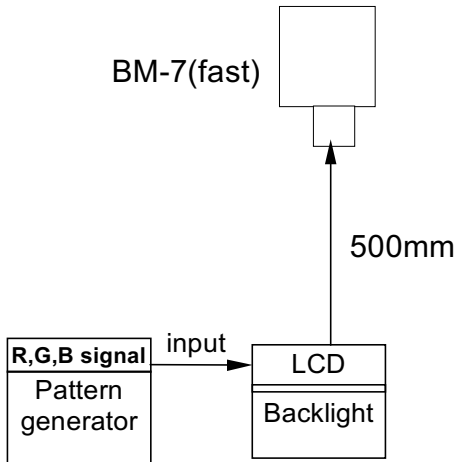
normal (θ＝0) observer
θ

3

12

ABC

LCD panel

6

φ

9

φ : Viewing direction
θ : Viewing angle
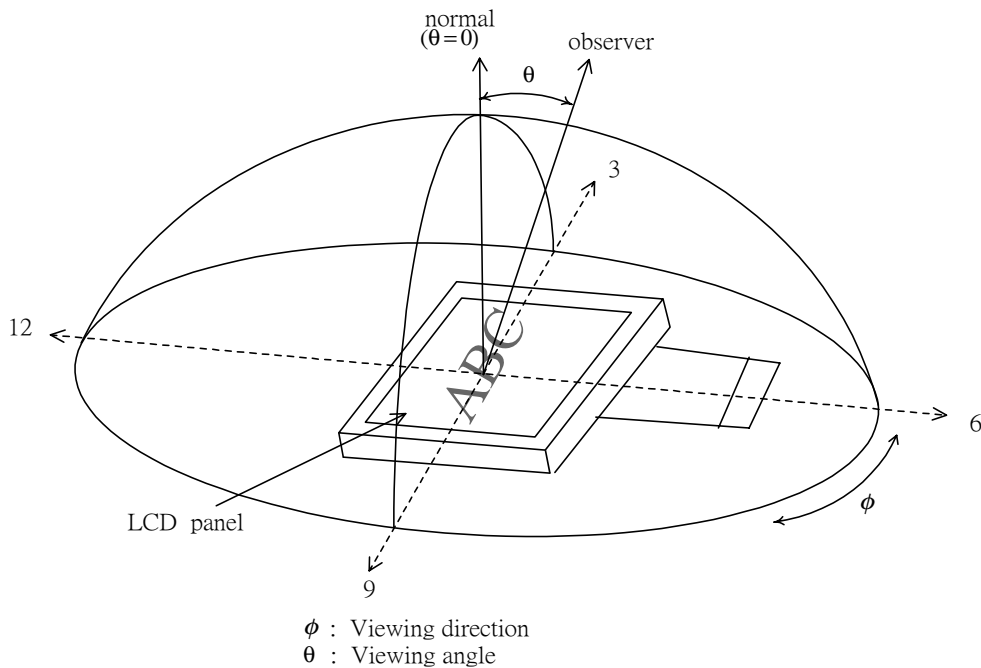
Note 10-4 : The definitions of response time:

White   Black   White

100%
90%
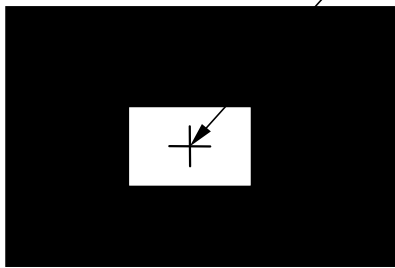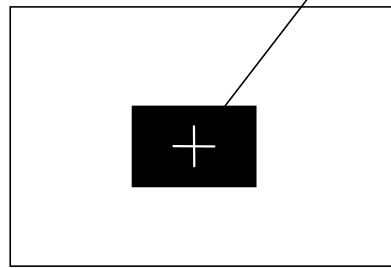
Brightness

10%

0%
Tr   Tf

10-2) Test Configuration

BM-7(fast)

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

500mm

R,G,B signal	input
Pattern generator	

LCD
Backlight

• LCD Display

Testing Point   Testing Point

Pattern A   Pattern B

• R, G, B Waveform of Pattern A at Testing Point   RGB waveform

Vcom

16ms   16ms

Vw=1.1V +/- 0.2V
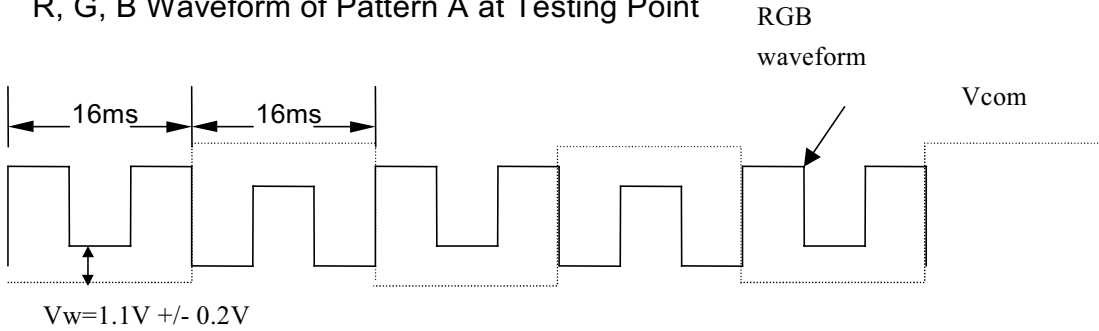
• R, G, B Waveform of Pattern B at Testing Point   RGB waveform   Vcom

16ms   16ms

Vb=5.2V +/- 0.2V
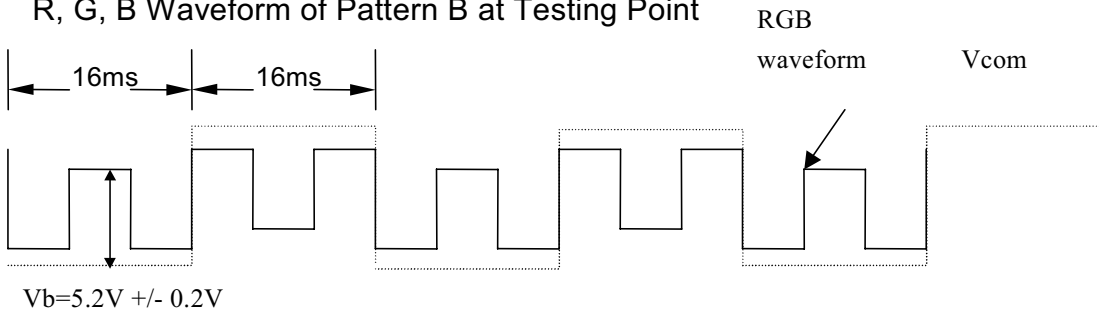
11. Handling Cautions
    11-1) Mounting of module
        1. Please power off the module when you connect the input/output connector.
        b) Please connect the ground pattern of the inverter circuit and case surely. If the connection is not perfect, some following problems may happen possibly.
            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
        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) Adjusting module
        a) Adjusting volumes on the rear face of the module have been set optimally before shipment.
        b) Therefore, do not change any adjusted values. If adjusted values are changed, the specifications described may not be satisfied.
    11-4) 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 ℃, 240 hrs
2	Low Temperature Storage Test	Ta = -20℃, 240 hrs
3	Low Temperature Operation Test	Ta = 0 ℃, 240 hrs
4	High Temperature & High Humidity Operation Test	Ta = +60℃, 95%RH, 240 hrs
5	Thermal Cycling Test (non-operating)	-25℃ →+25℃→ +70℃, 200 Cycles 30 min 5min 30 min
6	Vibration Test (non-operating)	Frequency：10 ~ 55 H$_Z$ 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)	150pF, 330Ω Air:± 15KV; Contact: ± 8KV 10 times/point, 4 points/panel face

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
1. Indicated contents of the label

Lot number

OOO-OOOOOO
PA035XS1XXS

Module number
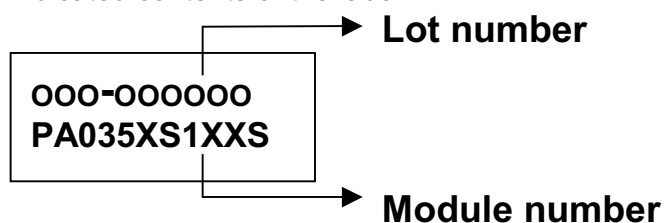
Contents of lot number : SB9—STC OEM product
5th—Production year : 1999⇒9, 2000⇒A, 2001⇒1……..
6th—Production month : 1, 2, 3,….9, A, B, C
7th~10th—Serial numbers : 0001~9999

14. Block Diagram


```
┌─────────────────────────┐        ┌──────────────┐
│                         │ ◄───── │              │
│       LCD Panel         │        │   V Driver   │
│                         │        │    (Gate)    │
│                         │ ◄───── │              │
└─────────────────────────┘        └──────────────┘
            ▲ ▲ ▲
┌─────────────────────────┐
│                         │
│       H Driver          │
│       (Source)          │
│                         │
└─────────────────────────┘
            ▲
        28 PIN Input

┌──────────────┐        ┌──────────────────┐
│              │        │                  │
──►│   Inverter   │ ──►   │    Back-light    │
│              │        │                  │
└──────────────┘        └──────────────────┘
```
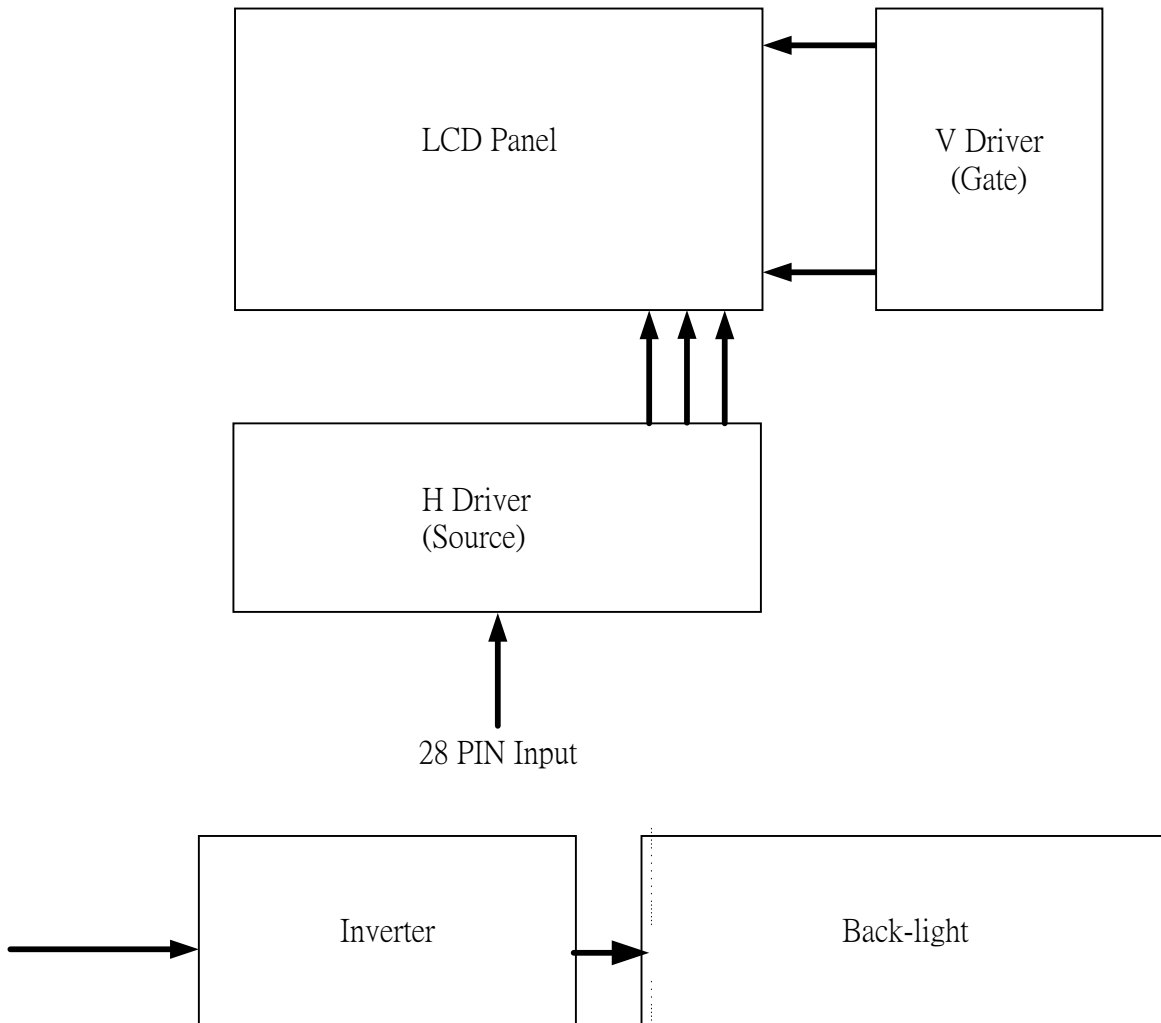
15. Packing

	ZONE	REV.	DOCUUMENT NO.	DESCRIPTION	DATE	REV.BY

1 Layer

Total 7 Layers

Tape

NOTE:
1.One layer include:1 piece of cushion sheet,
  12pcs panel & 1 piece of tray.
2.Q'TY: 84 pcs panel/carton.
3.Dimension: 455*375*190mm
4.Weight: 7.3 KG

6	50-0100091	CARTON INTERNAL	1	
5	50-0500041	摺口袋450*380*700mm	1	抗靜電
4		PA035XS1	84	
3	50-0200004	EPE CUSHION SHEET	7	抗靜電
2	50-0300282	TRAY	8	抗靜電
1	50-0300491	EPE FOAM	2	
ITEM	PART NO.	DESCRIPTION	QTY	REMARK

MTL.SPEC.	UNSPECIFIED TOL'S	REMARK	
	ANGLE		元太科技股份有限公司
	ROUGHNESS		Prime View Internation Co.,ltd.

APPROVE			SCALE	UNIT	SHEET	DWG.TITLE
		. .			1 OF 2	PA035XS1 PACKING Dim
CHECK		. .				
DESIGN	陳 萬 典	'02.06.05	MTL.NO.		DWG.NO.	REV. 01 / A4 SIZE

ZONE	REV.	DOCUUMENT NO.	DESCRIPTION	DATE	REV.BY

⑥ — Tape

⑦

Tape

NOTE:

1. Q'TY: 168 pcs panel/carton.
2. Dimension: 480*396*405mm
3. Weight: 15.6 KG

ITEM	PART NO.	DESCRIPTION	QTY	REMARK
7	50-0100101	CARTON EXTERNAL	1	

MTL.SPEC.	UNSPECIFIED TOL'S	REMARK	元太科技股份有限公司
	ANGLE		Prime View Internation Co.,ltd.
	ROUGHNESS		

APPROVE		SCALE	UNIT	SHEET	DWG.TITLE
CHECK				2 OF 2	PA035XS1 PACKING Dim
DESIGN	陳 萬 典 '02.06.05	MTL.NO.		DWG.NO.	REV. 01	A4 SIZE

Revision History

Rev.	Issued Date	Revised Contents
0.1	Mar. 07, 2002	NEW
0.2	Apr. 08 ,2002	Update Mechanical Drawing
1.0	Jun. 07 ,2002	Page 26:Update Packing
1.1	Jun. 19 ,2002	Page 4: FPC Add GND Tape
1.2	Jul. 19 ,2002	Page 9 : Update Current Consumption 　　　　Modify Lamp frequency 　　　　Modify Backlight Driving Page 10 : Update Power Consumption
1.3	Oct. 21,2002	Page 8 : Modify DC Component of V_{COM}