![AUO logo]

Version	0.0
Total pages	19
Date	2006.11.10

Product Specification

6″ color TFT-LCD module

MODEL NAME: A060FW02 V1

< ◆ > Preliminary Specification

< > Final Specification

Record of Revision

Version	Revise Date	Page	Content
0.0	2006/11/10		First draft.

Content Index

A. Physical specifications

NO.	Item	Specification	Remark
1	Display resolution(dot)	520(W)×RGBx288(H)	
2	Active area(mm)	133.38(W)×73.872(H)	
3	Screen size(inch)	6.0(Diagonal)	
4	Dot pitch(mm)	0.0855(W)×0.2565(H)	
5	Color configuration	R. G. B. stripe	
6	Overall dimension(mm)	141.68(W)×83.97(H)×1.72(D)	Note 1
7	Weight(g)	TBD	
8	Surface treatment	AG with SWV film	
9	Interface	Analog	Note 2

Note 1: Please refer P. 15 outline dimension of Module

Note 2: Interface with Tcon AUO-025 : parallel RGB 18bits

      Interface with Tcon AUO-011 : CCIR 656

      Interfacw with Tcon AUO-037: parallel RGB 18bits/CCIR 601/CCIT 656/Serial RGB
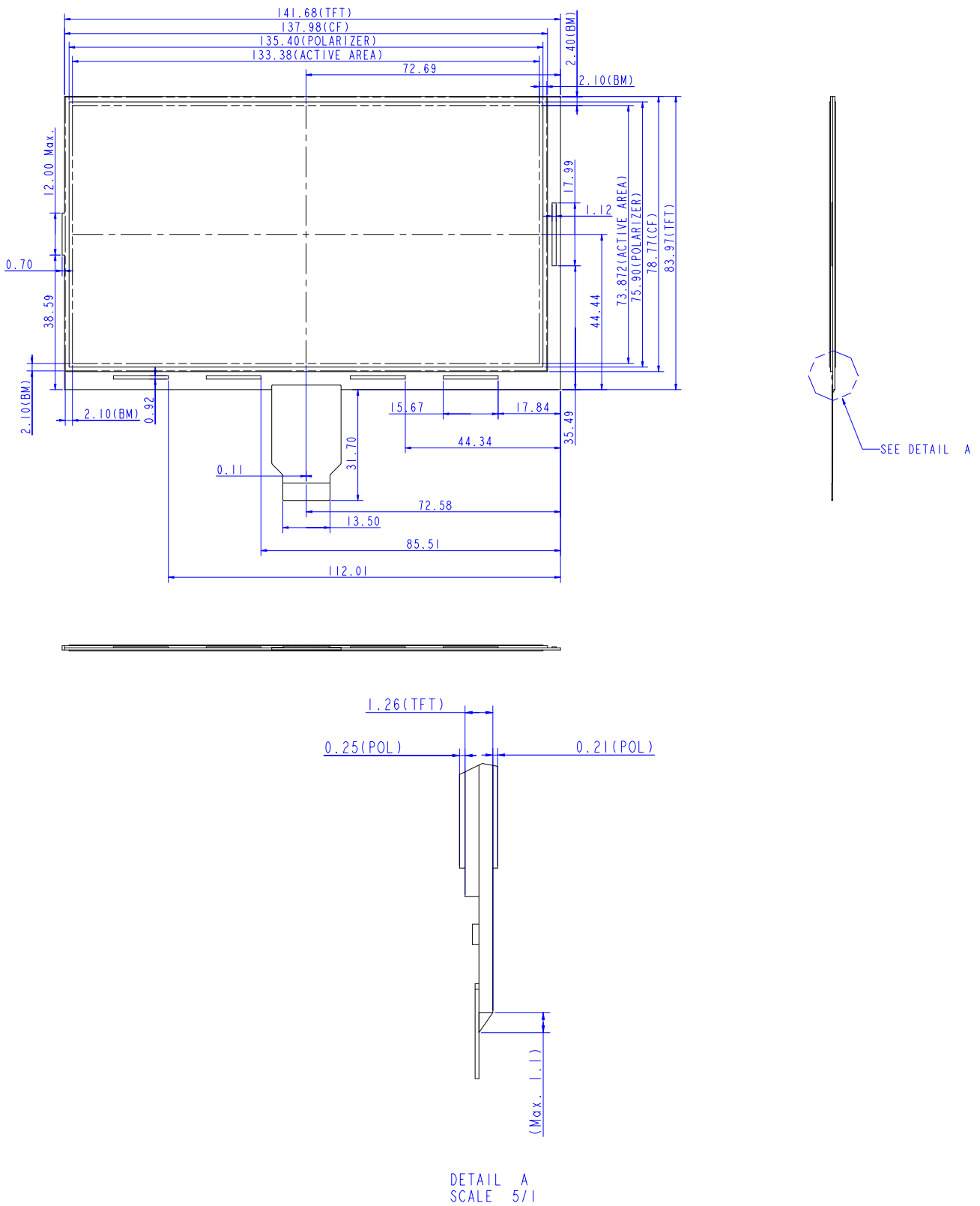
B. Outline dimension

Figure 1: outline dimension

C. Electrical Specifications

1. Pin assignment

Pin no	Symbol	I/O	Description	Remark
1	GND	-	Ground for logic circuit	
2	V_{CC}	I	Supply voltage of logic control circuit for scan driver	
3	V_{GL}	I	Negative power for scan driver	
4	V_{GH}	I	Positive power for scan driver	
5	STVD	I/O	Vertical start pulse	Note 1
6	STVU	I/O	Vertical start pulse	Note 1
7	CKV	I	Shift clock input for scan driver	
8	U/D	I	UP/DOWN scan control input	Note 1,2
9	OEV	I	Output enable input for scan driver	
10	VCOM	I	Common electrode driving signal	
11	VCOM	I	Common electrode driving signal	
12	L/R	I	LEFT/RIGHT scan control input	Note 1,2
13	NC	-	Not connect	
14	OEH	I	Output enable input for data driver	
15	STHL	I/O	Start pulse for horizontal scan line	Note 1
16	STHR	I/O	Start pulse for horizontal scan line	Note 1
17	CPH3	I	Sampling and shifting clock pulse for data driver	
18	CPH2	I	Sampling and shifting clock pulse for data driver	
19	CPH1	I	Sampling and shifting clock pulse for data driver	
20	V_{CC}	I	Supply voltage of logic control circuit for data driver	
21	GND	-	Ground for logic circuit	
22	VR	I	Alternated video signal input(Red)	
23	VG	I	Alternated video signal input(Green)	
24	VB	I	Alternated video signal input(Blue)	
25	AV_{DD}	I	Supply voltage for analog circuit	
26	AV_{SS}	-	Ground for analog circuit	

Note 1: Selection of scanning mode (please refer to the following table)

Setting of scan control input		IN/OUT state for start pulse				Scanning direction
U/D	L/R	STVD	STVU	STHR	STHL	
GND	V_{CC}	OUT	IN	OUT	IN	From up to down, and from left to right.
V_{CC}	GND	IN	OUT	IN	OUT	From down to up, and from right to left.
GND	GND	OUT	IN	IN	OUT	From up to down, and from right to left.
V_{CC}	V_{CC}	IN	OUT	OUT	IN	From down to up, and from left to right.

Note 2: Definition of scanning direction as **figure 2**.
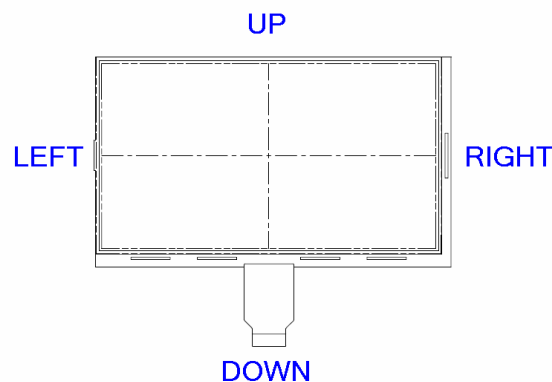
2. Absolute Maximum Ratings

Item	Symbol	Condition	Min.	Max.	Unit	Remark
Power voltage	V_{CC}	GND=0	-0.3	6	V	
	AV_{DD}	$AV_{SS}=0$	-0.3	7	V	
	V_{GH}	GND=0	-0.3	18	V	
	V_{GL}		-15	0.3	V	
	$V_{GH}-V_{GL}$		-	33	V	
Input signal voltage	V_i		-0.3	$AV_{DD}+0.3$	V	Note 1
	V_I		-0.3	$V_{CC}+0.3$	V	Note 2
	VCOM		-2.9	5.2	V	

Note 1: VR, VG, VB.

Note 2: STHL, STHR, OEH, L/R, CPH1~CPH3, STVD, STVU, OEV, CKV, U/D.

3. Electrical Characteristics

a. Typical Operating Conditions (GND=AVss=0V, Note 4)

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply	V_{CC}	3	3.3	5	V	
	AV_{DD}	4.5	5	5.5	V	
	V_{GH}	14.3	15	15.7	V	
	V_{GL-DC}	-10.5	-10	-9.5	V	
	V_{GL-AC}	-	5.5	-	V	

Video signal amplitude (VR,VG,VB)	V_{iA}	0.4	-	AV_{DD}-0.4	V	
	V_{iAC}	-	3	-	V	AC component
	V_{iDC}	-	AV_{DD}/2	-	V	DC component
VCOM	V_{CAC}	-	5.5	-	Vp-p	AC component, Note 1
	V_{CDC}	1	-	1.8	V	DC component, Note 2
Input signal voltage	H Level	V_{IH}	$0.8\ V_{CC}$	-	V_{CC}	V	Note 3
	L Level	V_{IL}	0	-	$0.2\ V_{CC}$	V	

Note 1: Vcom AC have to be a fixed value.

Note 2: V_{CDC} could be adjusted so as to minimize vertical straight line, flicker and maximum contrast on each module.

Note 3: STHL, STHR, OEH, L/R, CPH1~CPH3, STVD, STVU, OEV, CKV, U/D.

Note 4: Be sure to apply GND, V_{CC} and V_{GL} to the LCD first, and then apply V_{GH}.

b. Current Consumption (GND=AVss=0V)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Current for driver	IGH	VGH=15V	-	0.20	0.5	ma	
	IGL	VGL=-10V	-	0.80	1.5	ma	
	ICC	VCC=5V	-	1.5	3	ma	
	IDD	AVDD=5V	-	6	12	ma	

5. AC Timing

Parameter	Symbol	Min.	Typ.	Max.	Unit.	Remark
Rising time	t_r	-	-	10	ns	Note 1
Falling time	t_f	-	-	10	ns	Note 1
High and low level pulse width	t_{CPH}	83	87	91	ns	CPH1~CPH3
CPH pulse duty	t_{CWH}	40	50	60	%	CPH1~CPH3
CPH pulse delay	t_{C12} t_{C23} t_{C31}	20	-	t_{CPH}/2	ns	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	54	56.3	58.9	µs	STHR, STHL
OEH pulse width	t_{OEH}	-	1.2	-	µs	OEH
Sample and hold disable time	t_{DIS1}	-	7.8	-	µs	
OEV pulse width	t_{OEV}	-	3.2	-	µs	OEV
CKV pulse width	t_{CKV}	-	6	-	µs	CKV
Clean enable time	tDIS2		1.1		µs	

Horizontal display start	tSH		24		TCPH/3	
Horizontal display timing range	t_{DH}	-	1560	-	$T_{CPH}/3$	
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		307		t_H	
Vertical display start	t_{SV}		6		t_H	
Vertical display timing range	t_{DV}		288		t_H	
VCOM rising time	t_{rCOM}		-	5	µs	
VCOM falling time	t_{fCOM}		-	5	µs	
VCOM delay time	t_{DCOM}		-	3	µs	
RGB delay time	t_{DRGB}		-	1	µs	

Note 1: For all logic signals.

6. Power On/Off Sequence (figure 3)
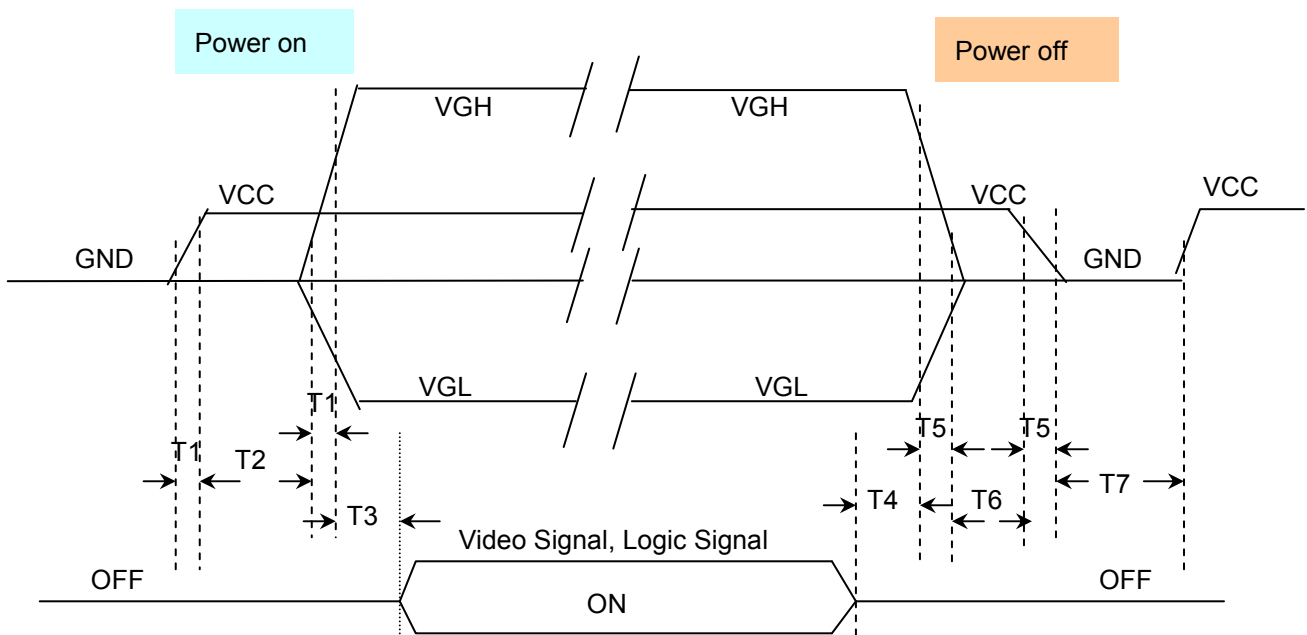
T1 ≦ 15ms (From 10%*VCC to 90%*VCC，when VCC is Low to High)；

T2 ≦ 10ms (From 90%*VCC to 10%*VGH，when VCC is Low to High)；

T3 ≦ 10ms (From 90%*VGH to Video signal，when VGH is Low to High)；

T4 ≦ 10ms (From Video signal to 90%*VGH，when VGH is High to Low)；

T5 ≦ 20ms (From 90%*VCC to 10%*VCC，when VCC is High to Low)；

T6 ≦ 10ms (From 10%*VGH to 90%*VCC，when VCC is Low to High)；

T7 ≧ 0.4s (From 10%*VCC is H→L to 10%*VCC is L→H)。

D. Optical specification (Note 1, Note 2)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response time	Rise	Tr	$\theta = 0°$	-	25	50	ms	Note 3,5
	Fall	Tf		-	30	60	ms	
Contrast ratio		CR	At optimized Viewing angle	200	300	-		Note 4, 5
Viewing angle	Top		CR$\geqq$10	30	40	-	deg.	Note 5, 6
	Bottom			50	60	-		
	Left			50	60	-		
	Right			50	60	-		
Transmission			$\theta = 0°$	6	7.6		%	Note 7
White chromaticity shift		X	$\theta = 0°$	-0.03		0.03		Note 8
		Y	$\theta = 0°$	-0.03		0.03		

Note 1 : Ambient temperature =25℃

Note 2 : To be measured on the center area of panel with a viewing cone of 1°by Topcon luminance meter BM-5, after 15 minutes operation and in the dark room.

Note 3. Definition of response time:

The output signals of photo detector are measured when the input signals are changed from "black" to "white"(falling time) and from "white" to "black"(rising time), respectively.

The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to **figure 4** as below.
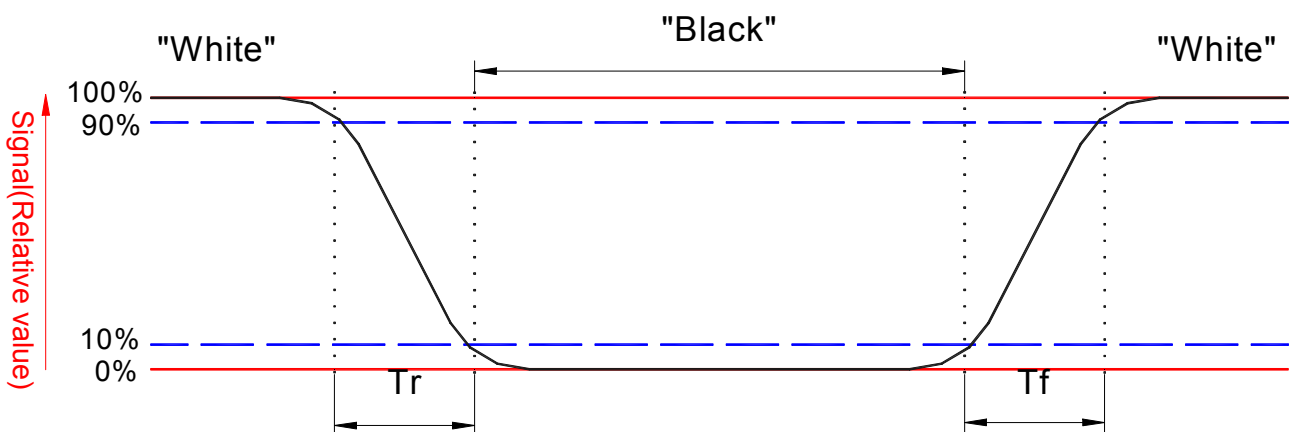
Note 4. Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector output when LCD is at "Black" state}}$$

Note 5. White Vi=V_{i50} $\overline{+}$ 1.5V

Black Vi=V_{i50} $\pm$ 2.0V

"$\pm$" means that the analog input signal swings in phase with V_{COM} signal.

"$\overline{+}$" means that the analog input signal swings out of phase with V_{COM} signal.

V_{i50} : The analog input voltage when transmission is 50%

The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

Note 6. Definition of viewing angle, refer to **figure 5** as below.
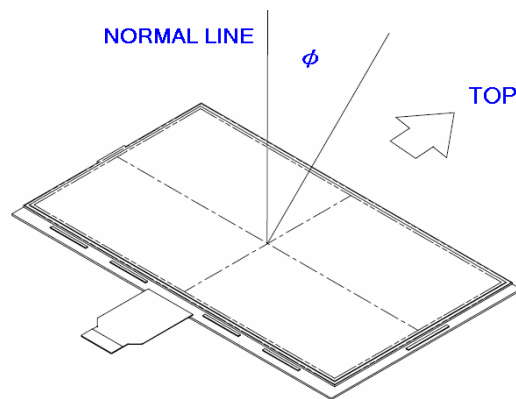
Note 7. Transmission is defined as follow: (θ =0°).

$$\text{Transmission} = \frac{\text{Photodetector output voltage when measuring the brightness of the LCD panel placed on the light source with no applied voltage}}{\text{Photodetector output voltage when measuring the light source brightness}}$$

Note 8. Chromaticity shift is the difference of those of the light source and the panel place on it. The light source chromaticity is supposed to be (x=0.30, y=0.32)

E. Reliability test items(Note 2)

No.	Test items	Conditions		Remark
1	High temperature storage	Ta= 70℃	240Hrs	Note1
2	Low temperature storage	Ta= -20℃	240Hrs	
3	High temperature operation	Tp= 60℃	240Hrs	Note2
4	Low temperature operation	Ta= 0℃	240Hrs	
5	High temperature and high humidity	Tp= 40℃, 90% RH	240Hrs	Operation
6	Heat shock	-20℃~70℃/50 cycles, 2Hrs/cycle		Non-operation
7	Electrostatic discharge	±200V,200pF(0Ω), once for each terminal		Non-operation
8	Vibration	Frequency range : 8~33.3Hz Stoke : 1.3mm Sweep : 2.9G, 33.3 ~ 400Hz Cycle : 15 minutes 2 hours for each direction of X,Z 4 hours for Y direction		JIS C7021, A-10 Condition A
9	Mechanical shock	100G, 6ms, ±X,±Y,±Z 3 times for each direction		JIS C7021, A-7 Condition C
10	Vibration (with carton)	Random vibration: 0.015G^2/Hz from 5~200Hz –6dB/octave from 200~500Hz		IEC 68-34
11	Drop (with carton)	Height: 76.2cm 1 corner, 3 edges, 6 surfaces		JIS Z0202

Note1: Ta: Ambient temperature.

Note2: Tp: Panel Surface Temperature

Note3: In the standard conditions, there is not display function NG issue occurred. All the cosmetic specification is judged before the reliability stress.

F. Packing Form
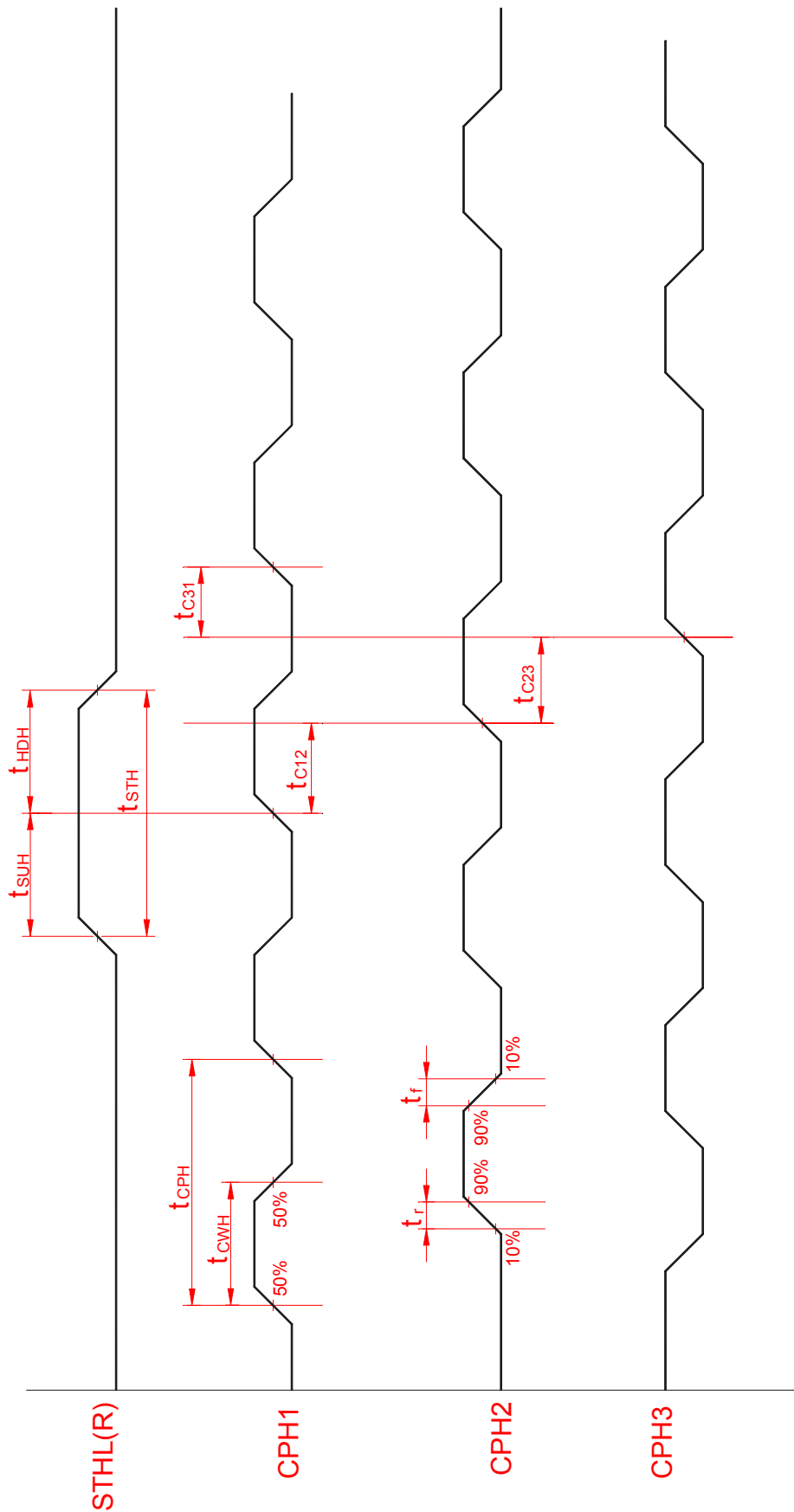**TBD**

Figure 6: Packing form
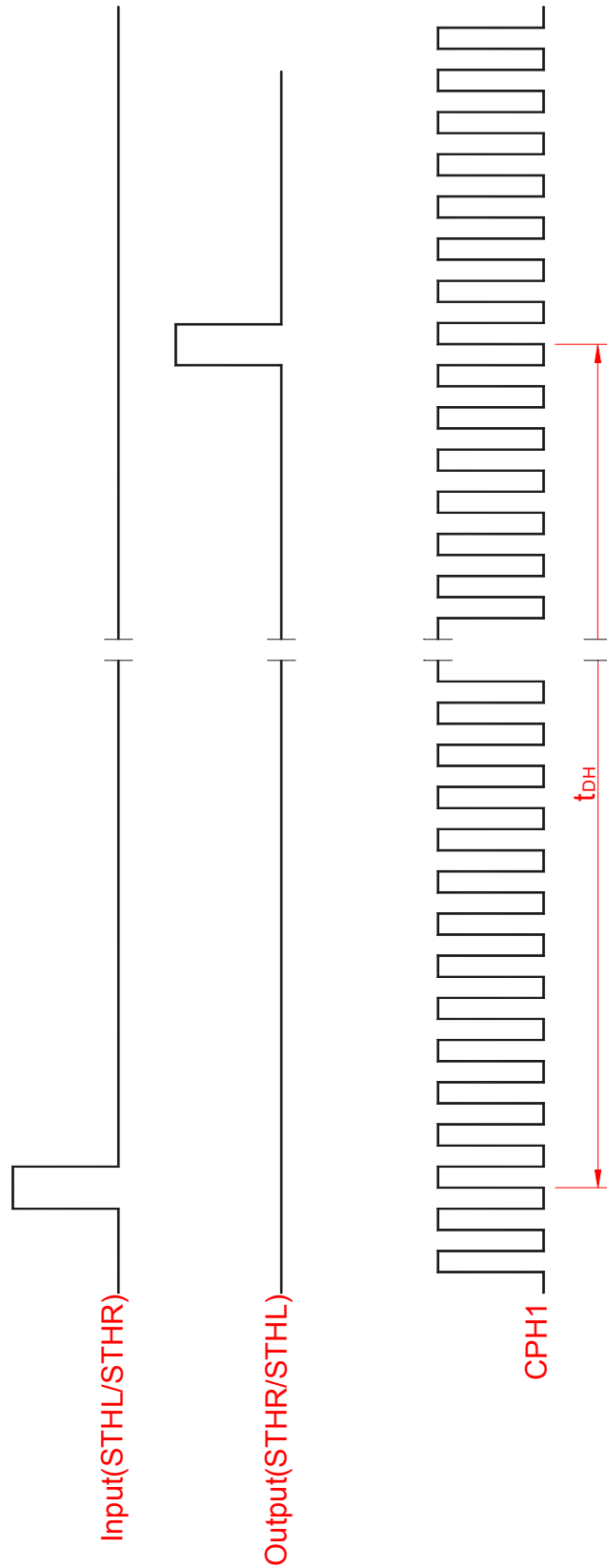
G. Appendix

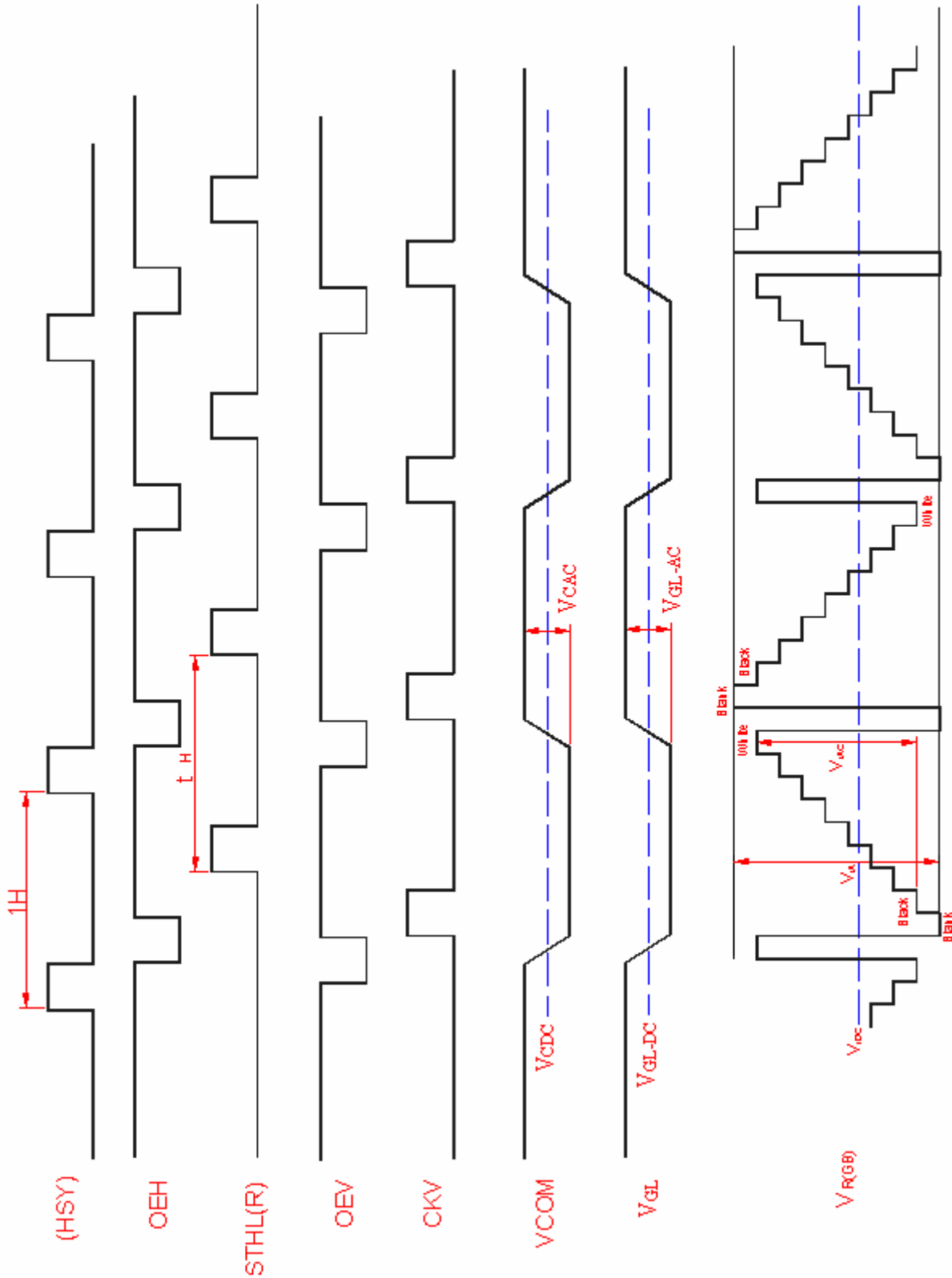**Fig.7 Sampling clock timing**
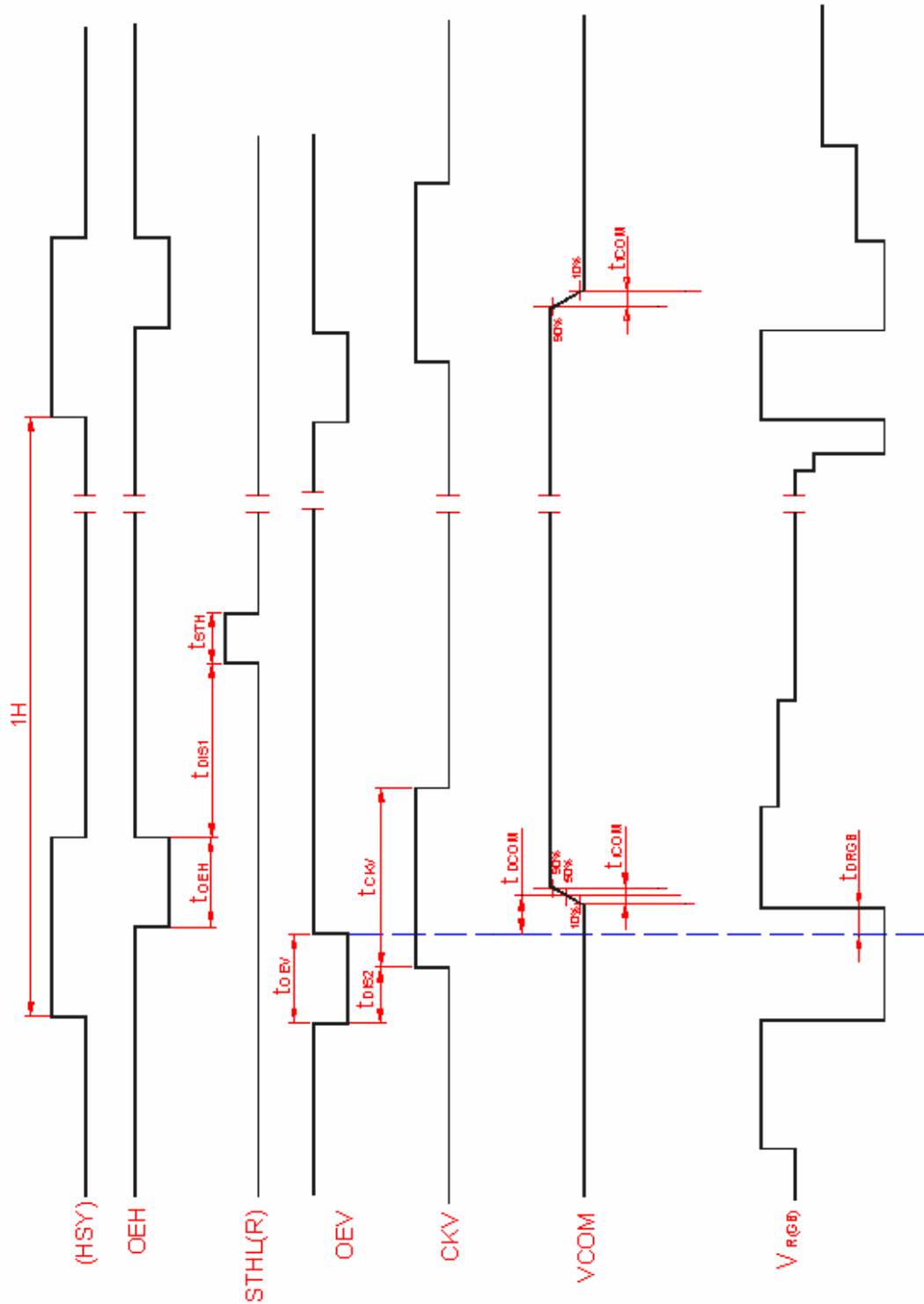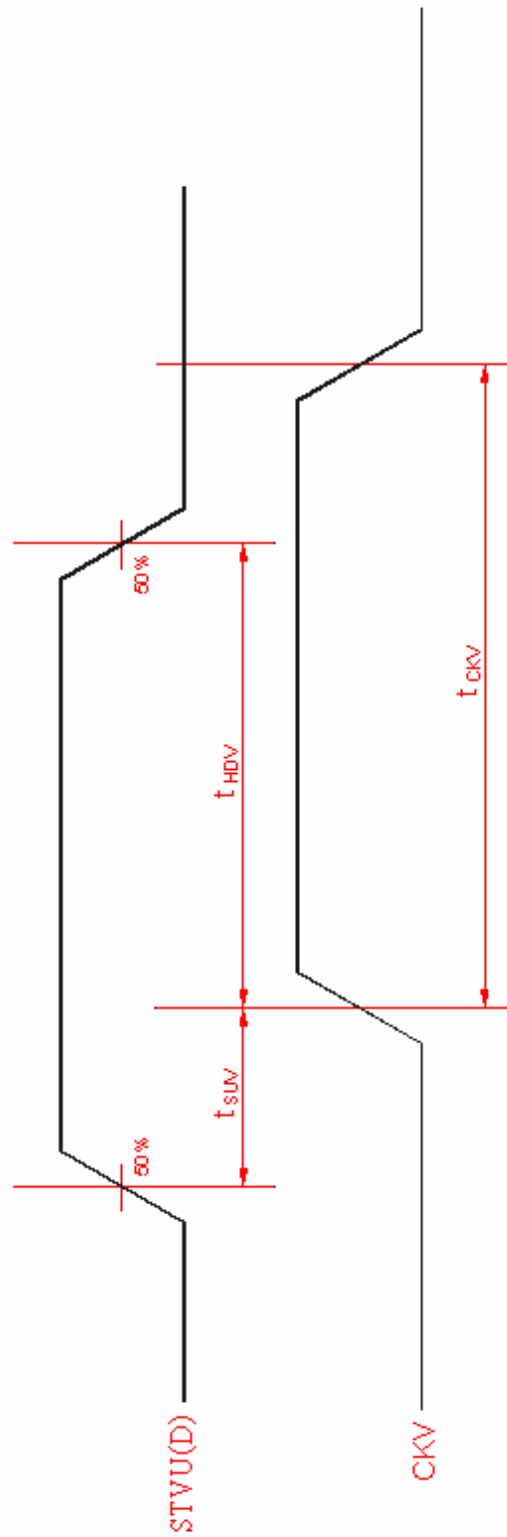
Fig.8 Horizontal display timing range

Input(STHL/STHR)

Output(STHR/STHL)

CPH1

t_{DH}

Fig.9-(a) Horizontal timing

Fig.9-(b) Detail horizontal timing

Fig.10 Vertical shift clock timing
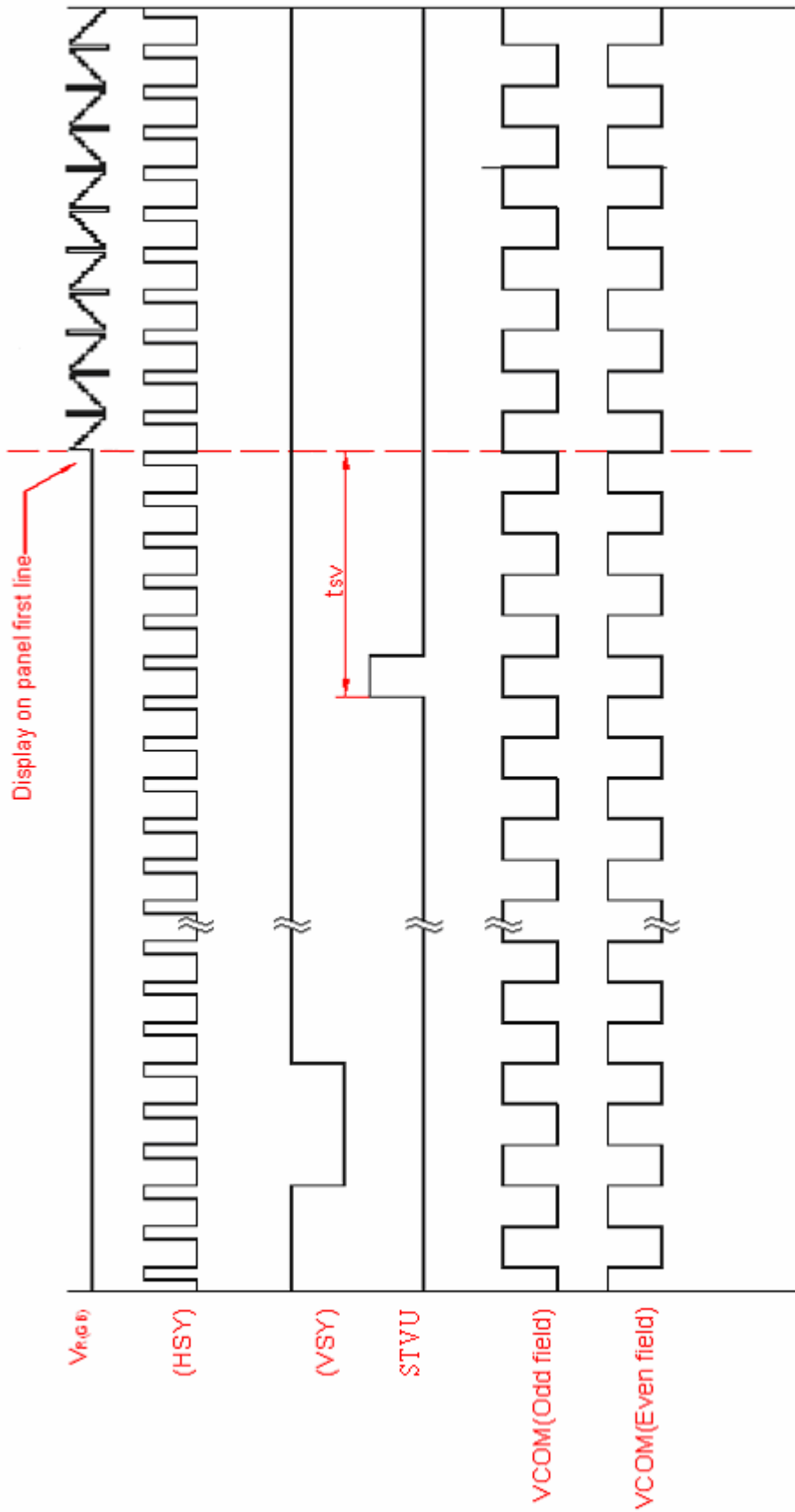
Fig.11-(a) Vertical timing (From up to down)

Display on panel first line
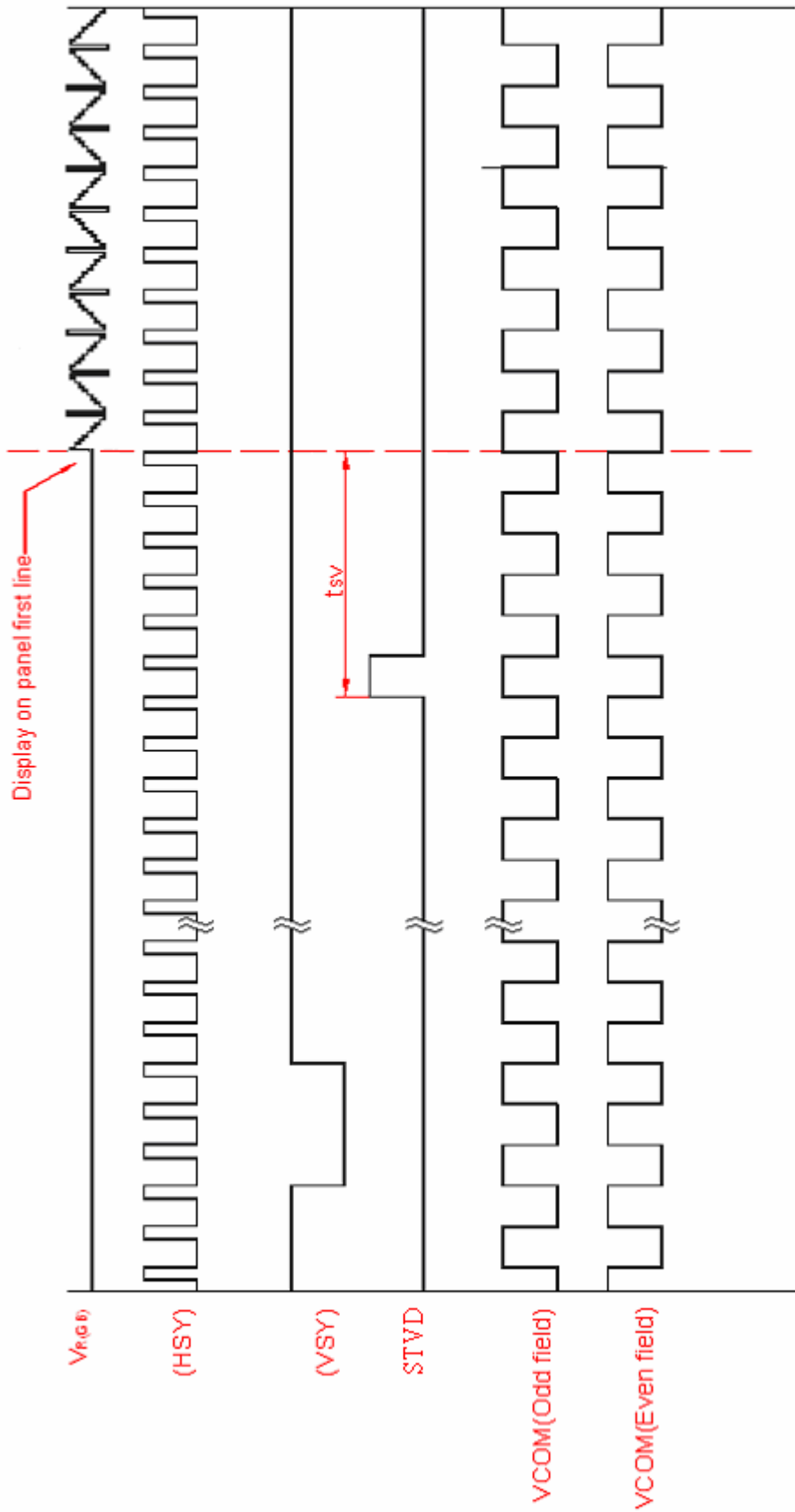
tsv

V(R,G,B)

(HSY)

(VSY)

STVU

VCOM(Odd field)

VCOM(Even field)

Fig.11-(b) Horizontal timing (From down to up)