Version	0.9
Total pages	23
Date	17 Dec, 2007

Product Specification

7″ color TFT-LCD module

MODEL NAME: C070FW01 V0

( ) Preliminary Specification
(◆) Final Specification

Note: The content of this specification is subject to change.

Record of Revision

Version	Revise Date	Page	Content
Draft 0	06.Mar, 2006	0	First draft.
Draft 0.1	20.Nov, 2006	6	Update lamp current maximum value to 6.5mArms
Draft 0.2	03.May, 2007	0	Rohs Compliance
		3	Display Resolution – 480RGBx234; Gray scale inversion
		5	CCFL – VL (3000vrms); Storage/Operation temp. range
		5	Note 2 : add MOD
		6	V-COM → AC Component ; Note 2; Note 3;
		6	Discharge stablization time → 3 min.
		8	Note 3→ For Partial Mode(4:3)
		9	Power Sequence→ T5h≦ 25ms; T8 ≧ 1.5ms
		10	Add NTSC ratio
		12	Add testing regulation; Add cycle time for vibration
		14,15	Update drawing
Draft 0.3	18.May,2007	5	Update Maximum operation temp.
		6	Add MOD into Note 2 --- Electrical Charisterics
		12	Reliability test items (Note 2) → 改爲 Note 3
Draft 0.4	29.Jun,2007	13	Packing Form Updates
Draft 0.5	5. Sep,2007	14	Update TFT-LCD module → CCFL H/Low voltage connector
Draft 0.6	2. Oct,2007	15	Update TFT LCD module drawing
Draft 0.7	15. Oct,2007	6	Typical operating conditions (GND=AVss=0V, Note 3)
		6	Backlight driving conditions (Self-heating type) – Note 1, Note 3
		8	Timing Condition
		9	Power Sequence Format
		12	Reliability Test – Add Note 1&2

		19	Delete tDRGB
		23	Fig 7 the setup and hold time definition
Draft 0.8	16. Nov,2007	7	AC Timing. Updates of Timing Conditions.
0.9	17 Dec,2007	6	Vcc Voltage updates

Contents:

Appendix:

A. Physical specifications

NO.	Item	Specification	Remark
1	Display resolution(dot)	480RGB(W)×234(H)	
2	Active area(mm)	154.08(W)×86.58(H)	
3	Screen size(inch)	7.0(Diagonal)	
4	Dot pitch(mm)	0.107(W)×0.370(H)	
5	Color configuration	R. G. B. stripe	
6	Overall dimension(mm)	164.9(W)×100.0(H)×6.0(D)	Note 1
7	Weight(g)	160 ±10	
8	Surface treatment	AG (25%) with SWV film	
9	Backlight unit	CCFL	
10	Gray Scale Inversion	6 o'clock	

Note 1: Refer to Fig. 1

B. Electrical specifications

1.Pin assignment

a. TFT-LCD panel driving section

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	STVR	I/O	Vertical start pulse	Note 1
6	STVL	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	MOD	I	Sequential sampling and simultaneous sampling setting	Note 3
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	

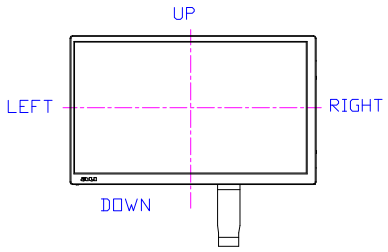
Note 1: Selection of scanning mode (please refer to the following table)

Setting of scan control input		IN/OUT state for start pulse				Scanning direction
U/D	L/R	STVR	STVL	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.

IN: Input; OUT: Output.

Note 2: Definition of scanning direction.
Refer to figure as below:



Note 3: MOD = H: Simultaneous sampling.
MOD = L: Sequential sampling.
Please set CPH2 and CPH3 to GND when MOD = H.

b. Backlight driving section (Refer to Figure 1)

No.	Symbol	I/O	Description	Remark
1	HI	I	Power supply for backlight unit (High voltage)	--
2	GND	-	Ground for backlight unit	--

2. Absolute maximum ratings

Item	Symbol	Condition	Min.	Max.	Unit	Remark
Power voltage	V_{CC}	GND=0	-0.3	7	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	
CCFL	V_L			3,000	Vrms	
	I_L			10	mA	
Temp. range		Operation	-30	+85	˚C	Note 3
		Storage	-40	+95	˚C	

Note 1: VR, VG, VB.
Note 2: STHL, STHR, OEH, L/R, CPH1~CPH3, STVR, STVL, OEV, CKV, U/D,MOD
Note 3: Operation temp. range means Ambient Temp.

3. Electrical characteristics

a. Typical operating conditions (GND=AVss=0V, Note 3)

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply		V_{CC}	3	3.3	5.2	V	Note 4
		AV_{DD}	4.5	5	5.5	V	
		V_{GH}	14.3	15	15.7	V	
		V_{GL}	-10.5	-10	-9.5	V	
Video signal amplitude (VR,VG,VB)		V_{iA}	0.4	-	AV_{DD}-0.4	V	Note 1
		V_{iAC}	-	3	-	V	AC component
		V_{iDC}	-	AV_{DD}/2	-	V	DC component
VCOM		V_{CAC}	3.5	5.6	6.5	Vp-p	AC component
		V_{CDC}	1.4	1.7	2.0	V	DC component
Input signal voltage	H Level	V_{IH}	0.8 V_{CC}	-	V_{CC}	V	Note 2
	L Level	V_{IL}	0	-	0.2 V_{CC}	V	

Note 1: Refer to Fig.4- (a).
Note 2: STHL, STHR, OEH, L/R, CPH1~CPH3, STVR, STVL, OEV, CKV, U/D,MOD
Note 3: Be sure to apply GND, V_{CC} and V_{GL} to the LCD first, and then apply V_{GH}.
Note 4: If input signal amplitude is 3.3V, recommend value for Vcc is 3.3V; If input signal amplitude is 5V, recommend value for Vcc is 5V

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

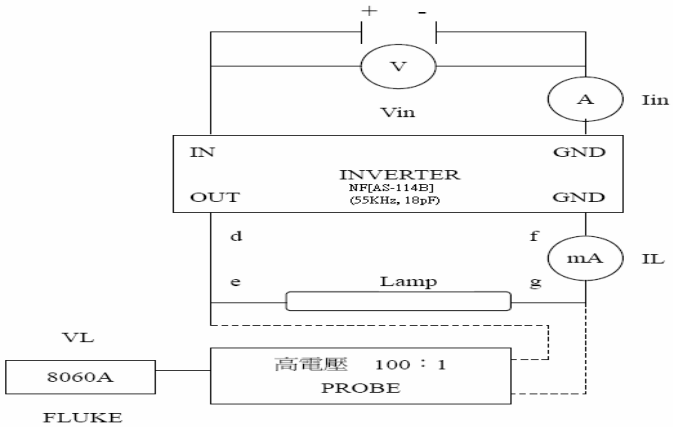
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Current for driver	I_{GH}	V_{GH}=15V	-	0.20	0.5	mA	
	I_{GL}	V_{GL}=-10V	-	0.80	1.5	mA	
	I_{CC}	V_{CC}=5V	-	3.0	6.0	mA	
	I_{DD}	AV_{DD}=5V	-	17.0	30	mA	

c. Backlight driving conditions (Self-heating type) – Note 1, Note 3

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Lamp voltage	V_L	513	570	627	Vrms	
Lamp current	I_L	-	6	6.5	mArms	
Frequency	F_L	50	-	80	kHz	Note 2
Lamp starting voltage	V_S	-	890	1,110	Vrms	Ta = 25℃,Note 4
		-	1,160	1,440	Vrms	Ta = 0℃,Note 4
		-	1,500	1,870	Vrms	Ta = -30℃,Note 4
Discharge Stabilization Time	Ts			3	min	
Discharge Time lag	Td			1	sec	Note 5
Lamp life time		10,000	-	-	Hr	Note 6

Note 1: Panel surface temperature should be kept less than content of “2. Absolute maximum ratings"
Note 2: The lamp frequency should be selected as different as possible from display horizontal synchronous signal to avoid interference. (Reference value)

Note 3: Values of “Lamp Voltage”, “Lamp power consumption” and “Starting voltage” are defined on condition of the LCD module derived by NF[AS-114B] circuit which measured from connectors of product(as below figure). However this isn’t the values that we can assure stability of starting lamp on condition that the module is installed in your set.



Note 4: The “MAX” of “Starting voltage” means the minimum voltage to light normally in the LCD module.

Note 5: The time needed to start discharge when the over 1500Vrms voltage is continuously applied to both end of the lamp. Before testing, the lamp is left in the dark room(ambient temperature: 25+/- 2°C, ambient luminance: less than 0.1lux) for 24Hrs after lighted for 1minute at lated lamp current.

Note 6:The” Lamp life time” is defined as the module brightness decrease to 50% original brightness at Ta=25℃, I_L=6mA.

4. AC Timing

a. Timing conditions

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}	95	103	107	ns	CPH1~CPH3
		83.3			ns	Note 3
CPH pulse duty	t_{CWH}	40	50	60	%	CPH1~CPH3
CPH pulse delay	t_{C12} t_{C23} t_{C31}	30	t_{CPH}/3	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	61.5	63.5	65.5	μs	STHR,STHL
OEH pulse width	t_{OEH}	0.475	3.48	6.48	μs	OEH(Note 5)
Sample and hold disable time	t_{DIS1}	5.5	8.78	8.88	μs	Note 6
OEV pulse width	t_{OEV}	2.0	3.4	6.5	μs	OEV
CKV pulse width	t_{CKV}	1.0	3.1	4.68	μs	CKV
Clean enable time	t_{DIS2}	1.0	2.2	4.1	μs	Note 7

Horizontal display start	t_{SH}	-	1	-	$T_{CPH}/3$	Note 8
Horizontal display timing range	t_{DH}	-	480	-	$T_{CPH}/3$	Note 8
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 Note 4
Horizontal lines per field	t_V	256	262	268	t_H	Note 2
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}	0	-		μ s	
Setup time of analog	t_{asu}	60			ns	
RGB delay time	t_{DRGB}	40	-	1	ns	

Note 1: For all of the logic signals.

Note 2: Please don't use odd horizontal lines to drive LCD panel for both odd and even field simultaneously.

Note 3: For Partial mode (4:3, side-black)

Note 4: Maximum time is one line period.

Note 5: The maximum pulse width of OEH should refer to the minimum of tDis1 and the hsync Back porch.

Note 6: t_{dis1} is time difference between OEH and STHL

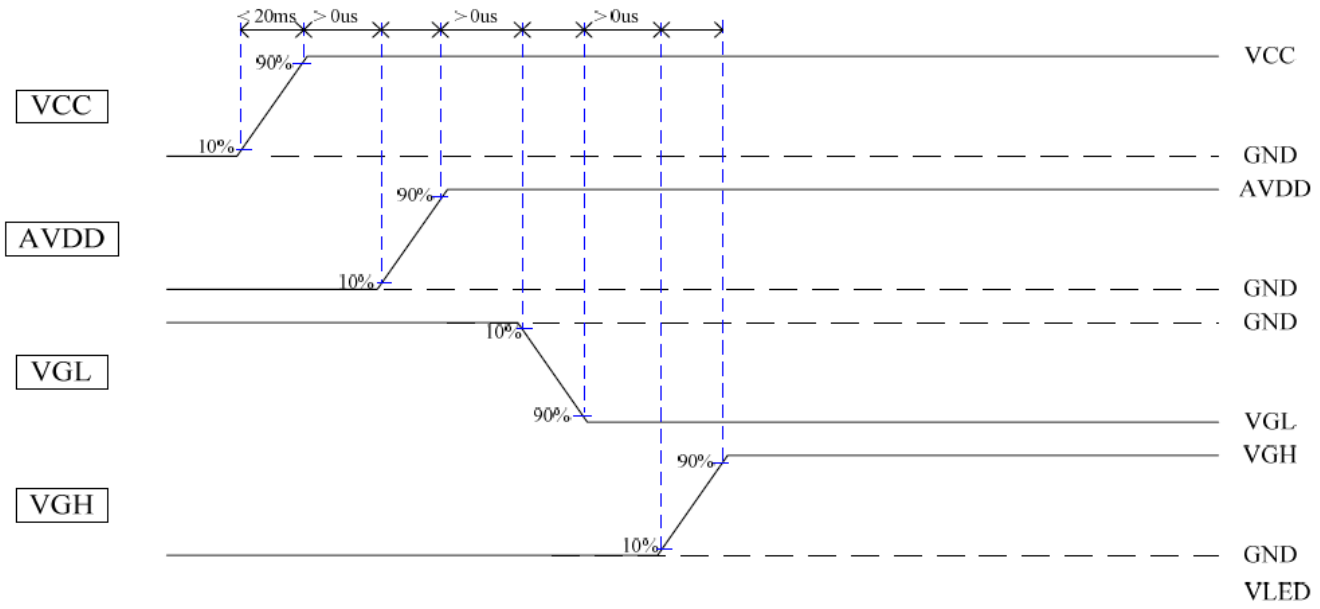
Note 7: t_{dis2} is time difference between OEV and CKV.

Note 8: The unit is t_{CPH}

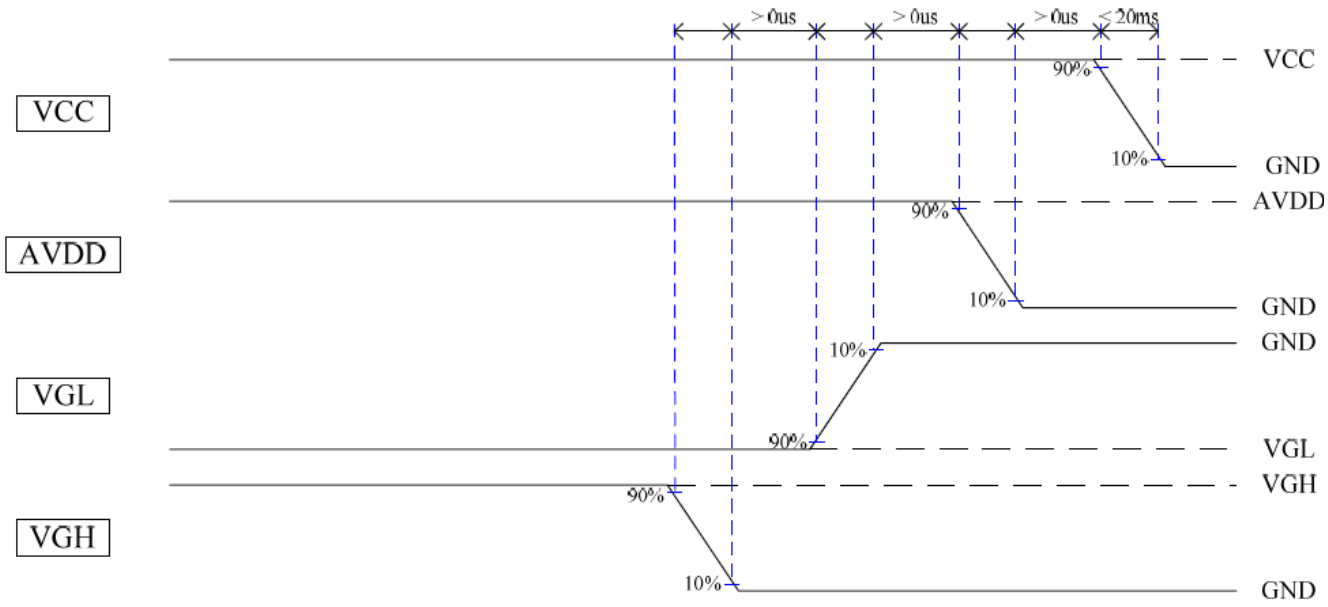
b. Timing diagram

Please refer to the attached drawing, from Fig.2 to Fig.6.

5. Power Sequence (Only for reference)



Power On :



Power Off :

C. Optical specification (Note 1, Note 2)

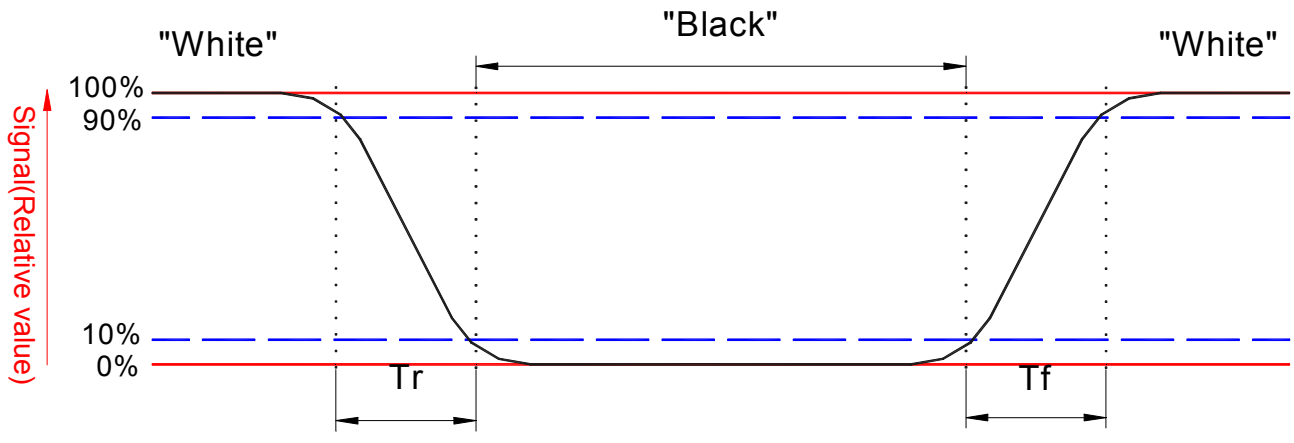
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response time	Rise Fall	Tr Tf	θ =0°	- -	12 18	24 36	ms ms	Note 3,5
Contrast ratio		CR	At optimized Viewing angle	200	300	-		Note 4, 5
Viewing angle	Top Bottom Left Right		CR≧10	30 50 50 50	40 60 60 60	- - - -	deg.	Note 5, 6
Viewing angle	Top Bottom Left Right		CR≧5	40 60 60 60	50 70 70 70	- - - -	deg.	Note 5, 6
Brightness		Y_L	I_L=6mA, 25℃	400	500	-	cd/m^2	Note 7
White chromaticity		X	θ =0°	0.26	0.31	0.36		Note 7
		Y	θ =0°	0.28	0.33	0.38		
NTSC Ratio			θ =0°		48		%	

Note 1 : Ambient temperature =25℃, and lamp current I_L = 6 mArms. To be measured in the dark room. DC/AC inverter driving frequency: 70 kHz.

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.

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 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 $Vi=V_{i50} + 1.5V$

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

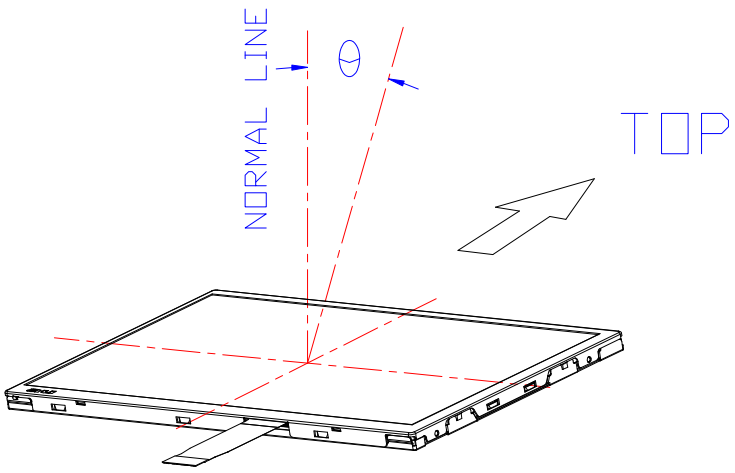
“±” means that the analog input signal swings in phase with V_{COM} signal.

“∓” 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 as below.



Note 7. Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

D. Reliability test items(Note 3):

No.	Test items	Conditions	Remark
1	High temperature storage	Ta= 95℃ 240Hrs	Note 1
2	Low temperature storage	Ta= -40℃ 240Hrs	
3	High temperature operation	Tp= 85℃ 240Hrs	Note 2
4	Low temperature operation	Ta= -30℃ 240Hrs	
5	High temperature and high humidity	Tp= 60℃, 90% RH 240Hrs	Operation
6	Heat shock	-30℃~85℃/200 cycles 1Hrs/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 D1601, A-10 condition A Note 4
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: 60cm 1 corner, 3 edges, 6 surfaces	JIS Z0202

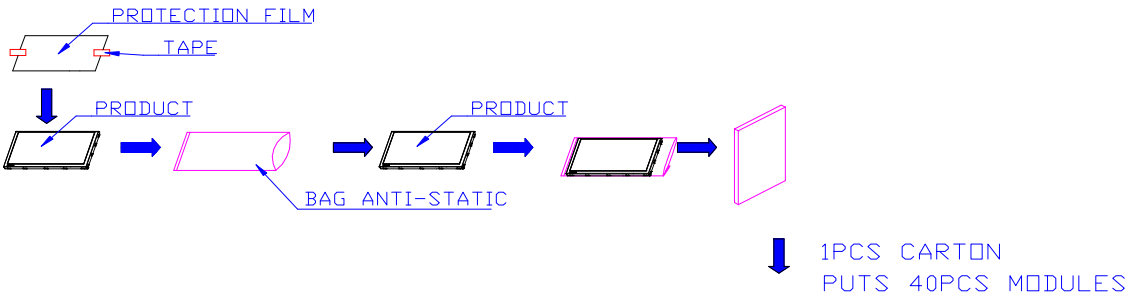
Note1: Ta: Ambient temperature.

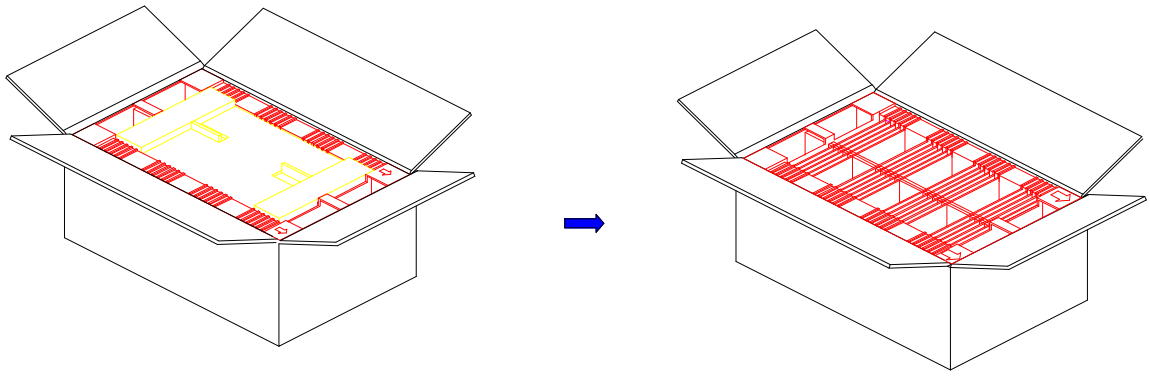
Note2: Tp: Panel Surface Temperature

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

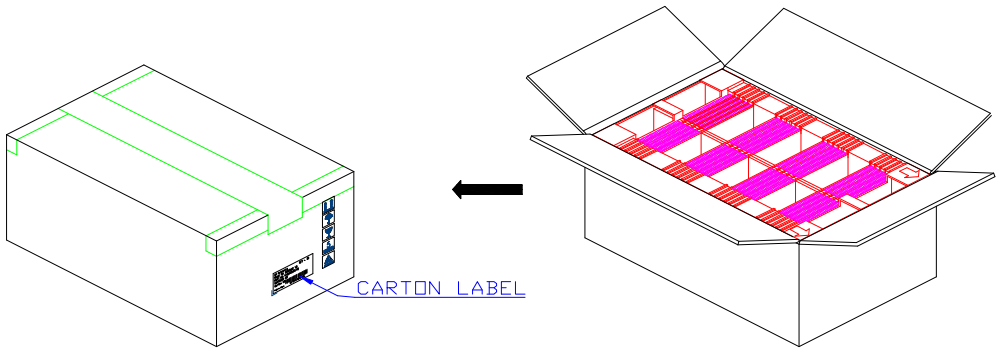
Note 4: Cycle time for vibration is 15 minutes.

E. Packing form





MAX. CAPACITY: 40 MODULES
MAX. WEIGHT: 8.5 kg
CARTON MEAS.520mm*340mm*250mm



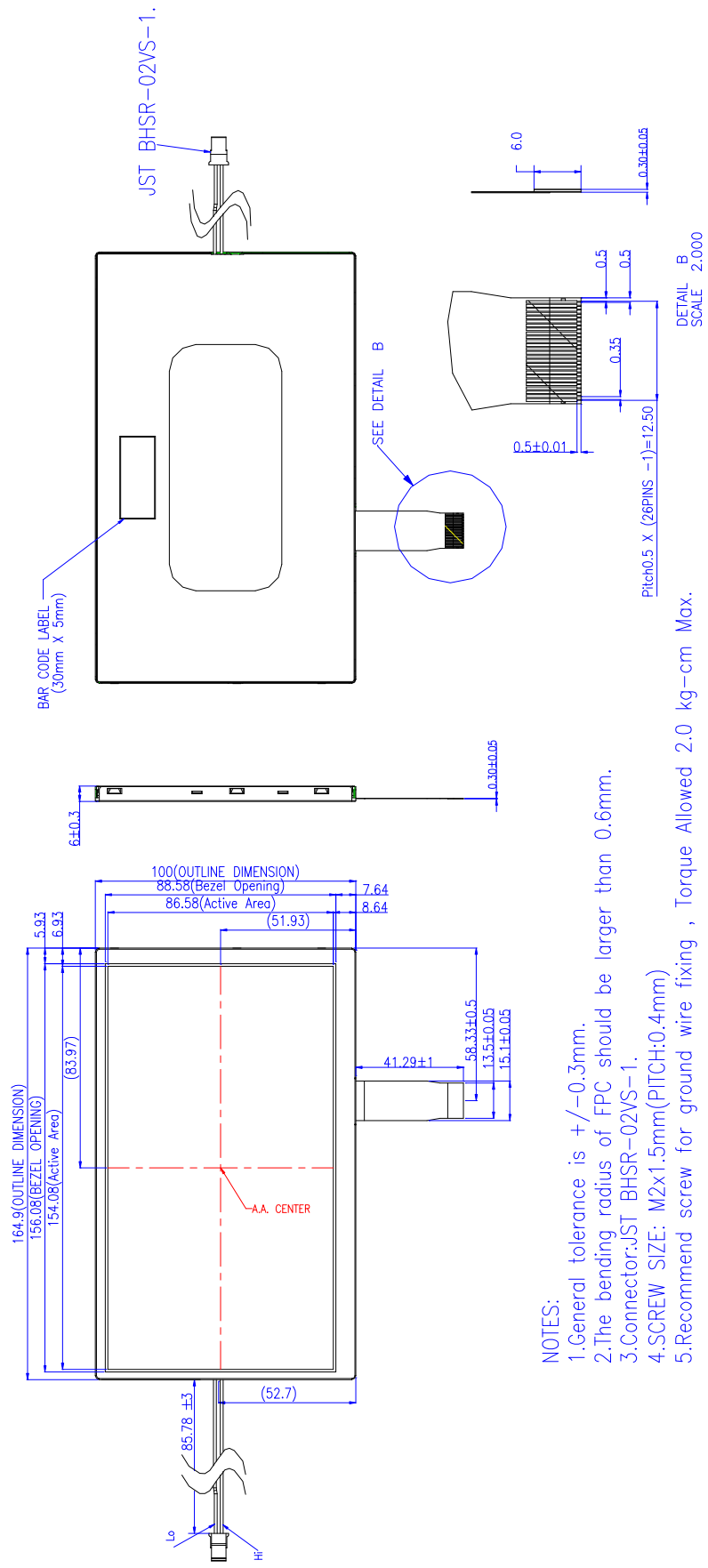


Fig.1- Outline dimension of TFT-LCD module

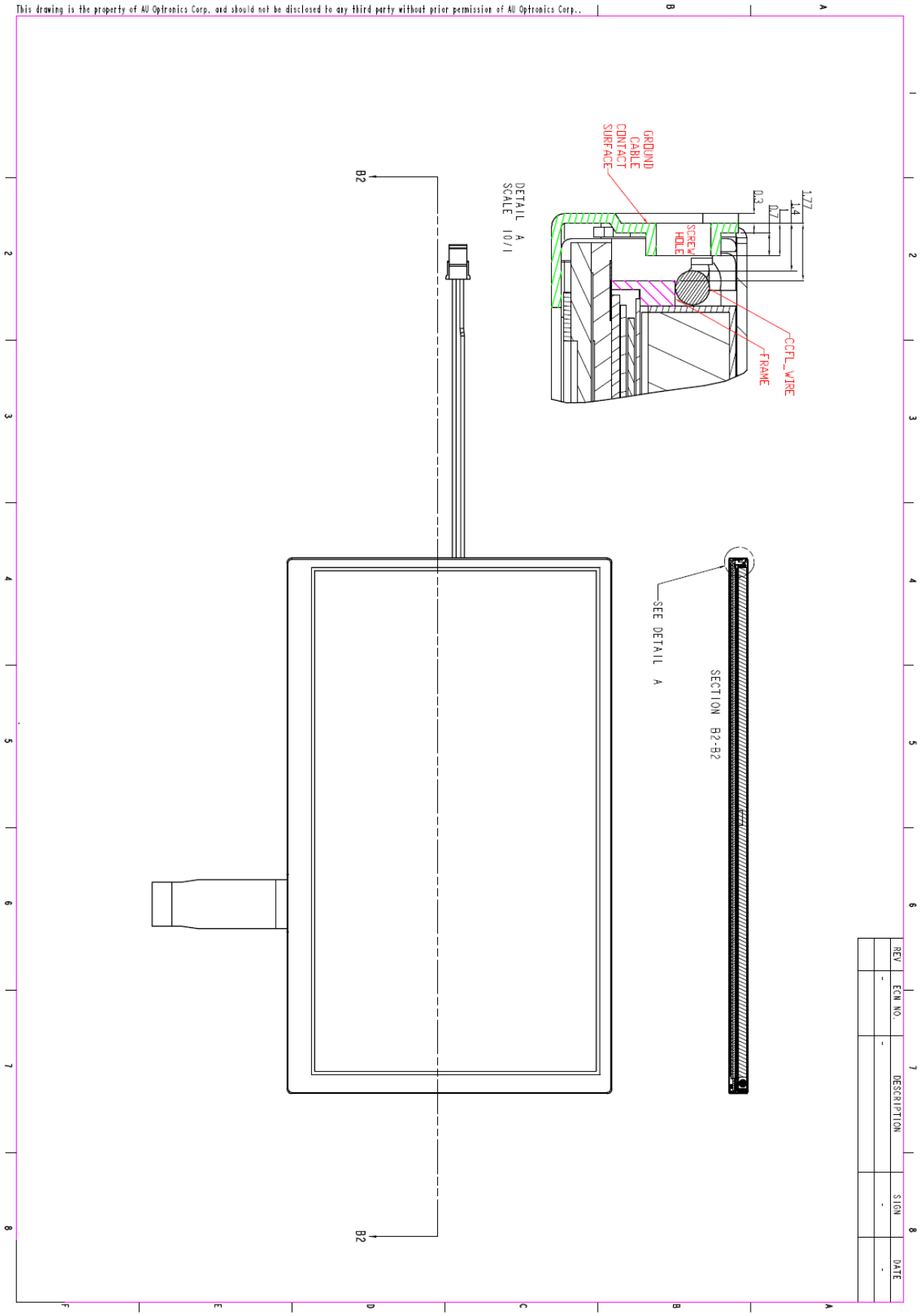


Fig.- 2 Outline Dimension of TFT LCD Module

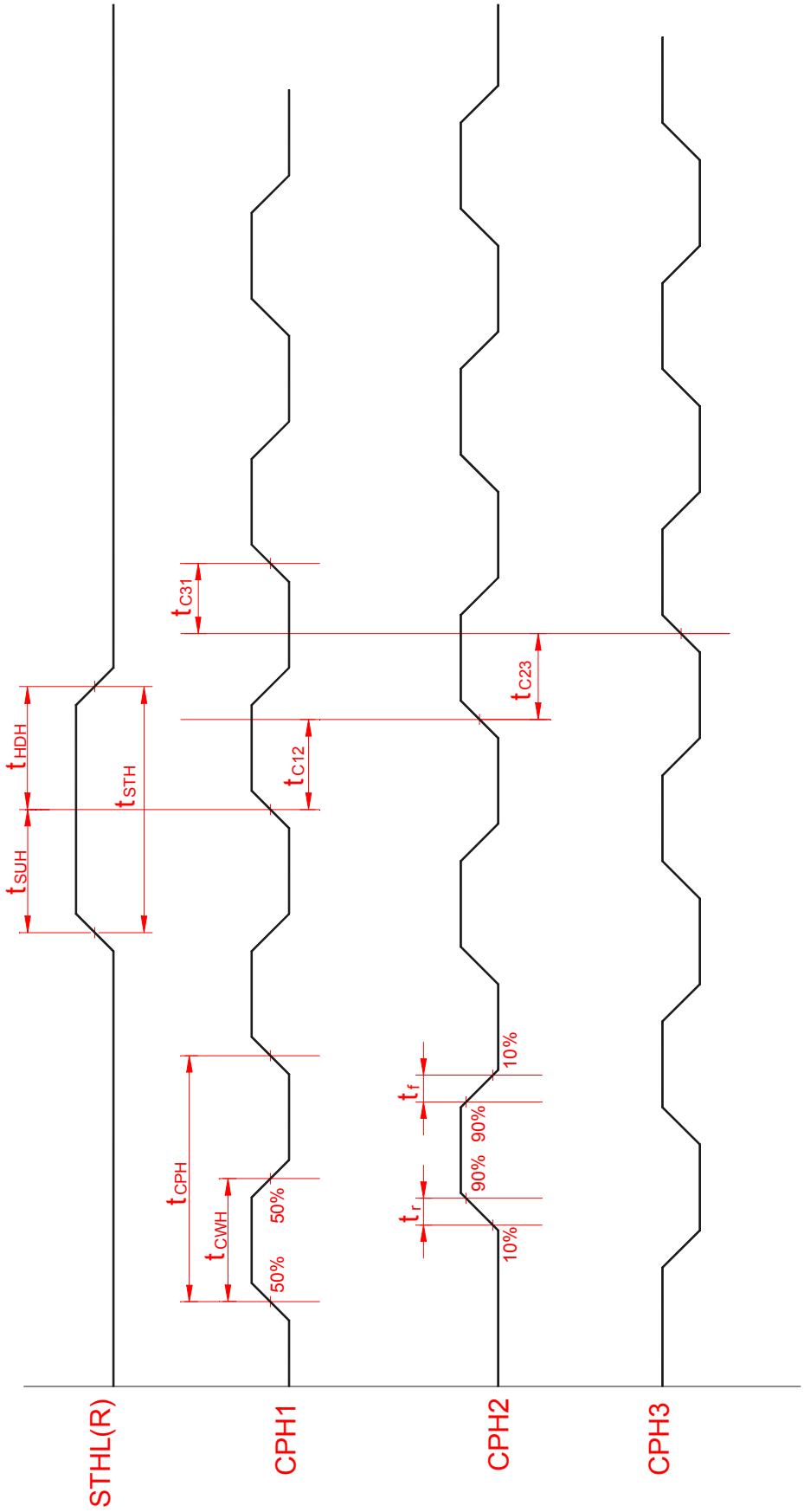


Fig.3 Sampling clock timing

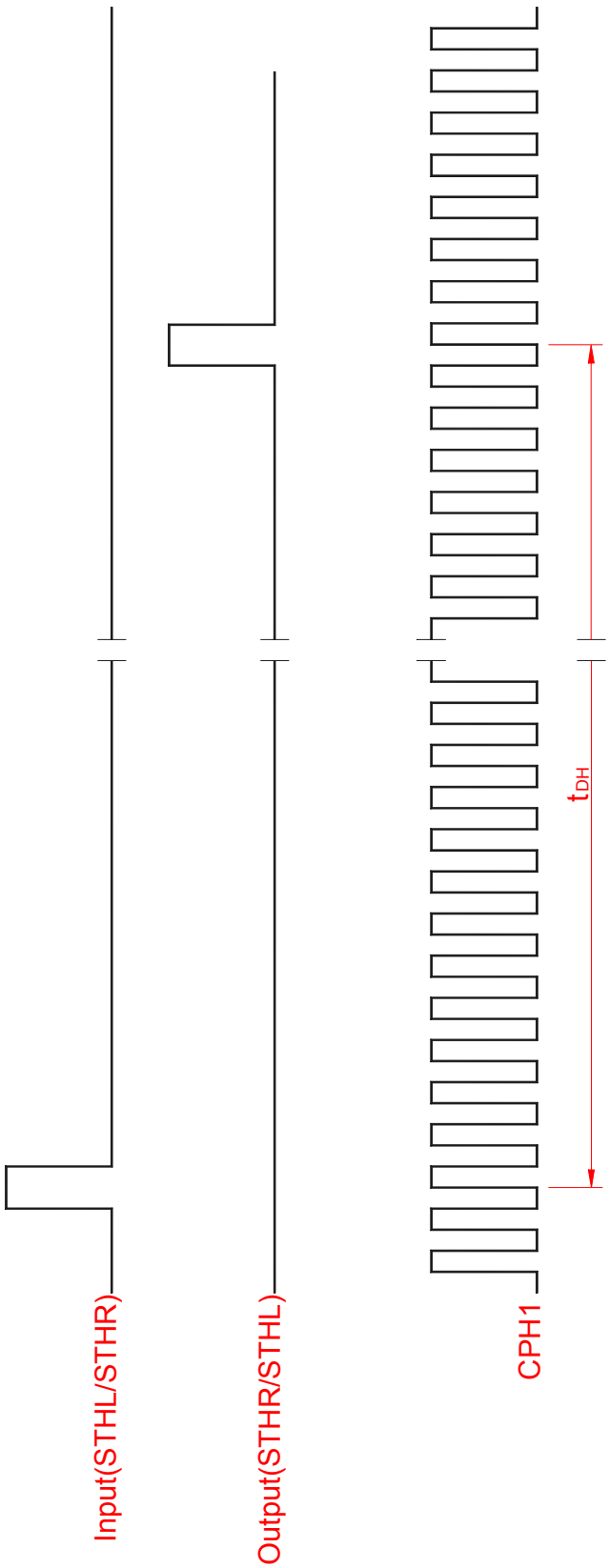


Fig. 4 Horizontal display timing range

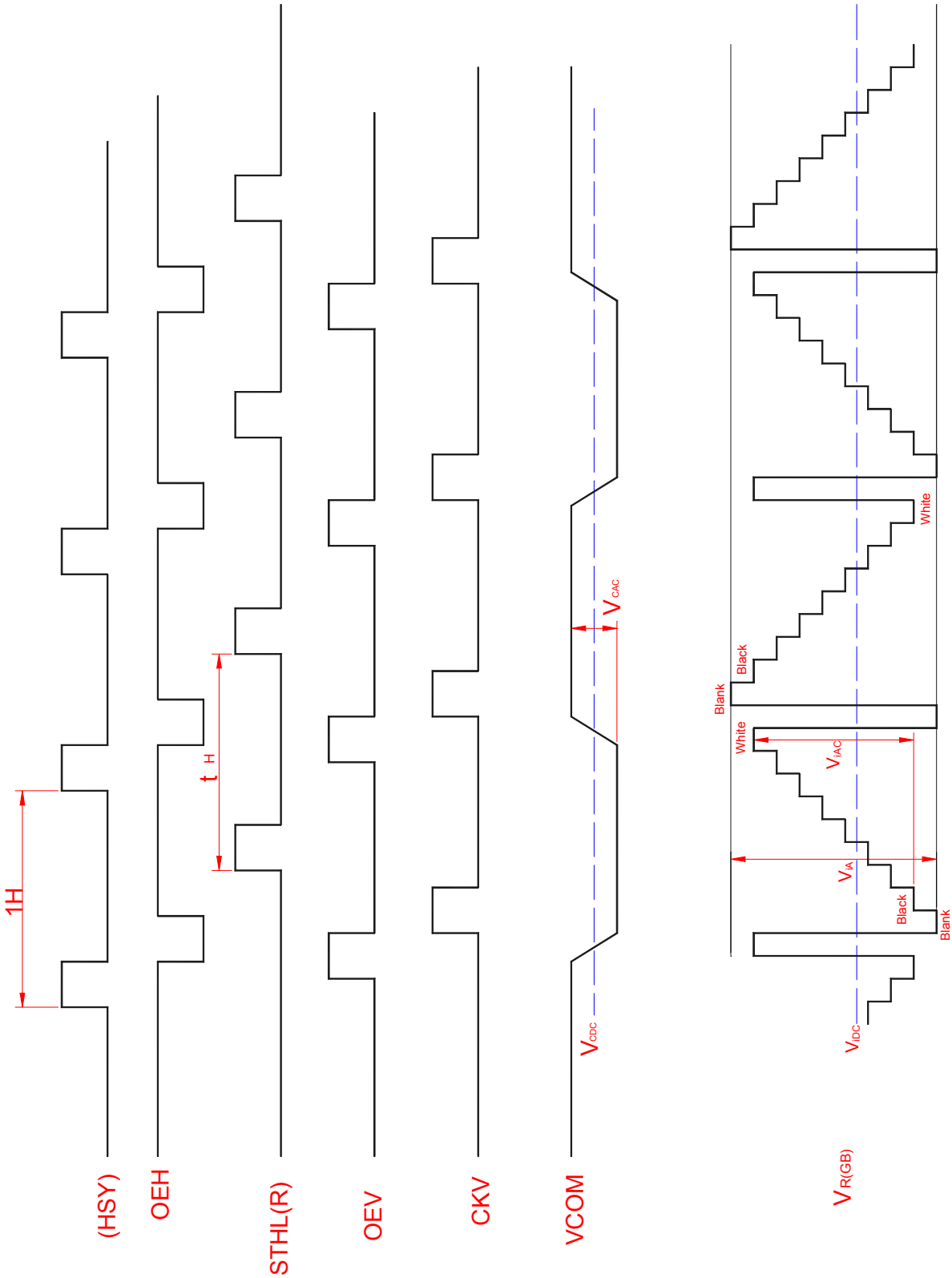
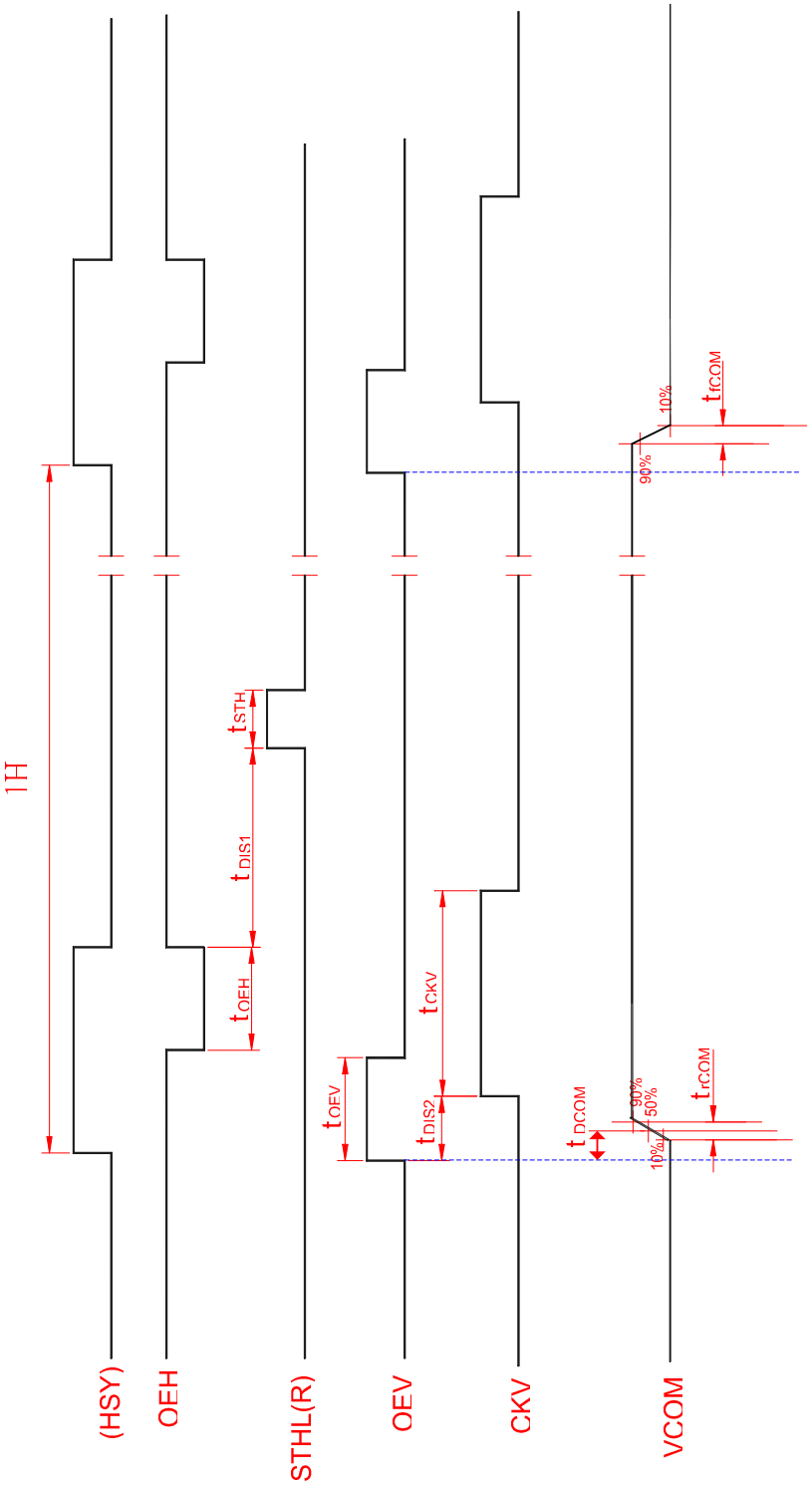


Fig.5-(a) Horizontal timing



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

Fig.5-(b) Detail horizontal timing

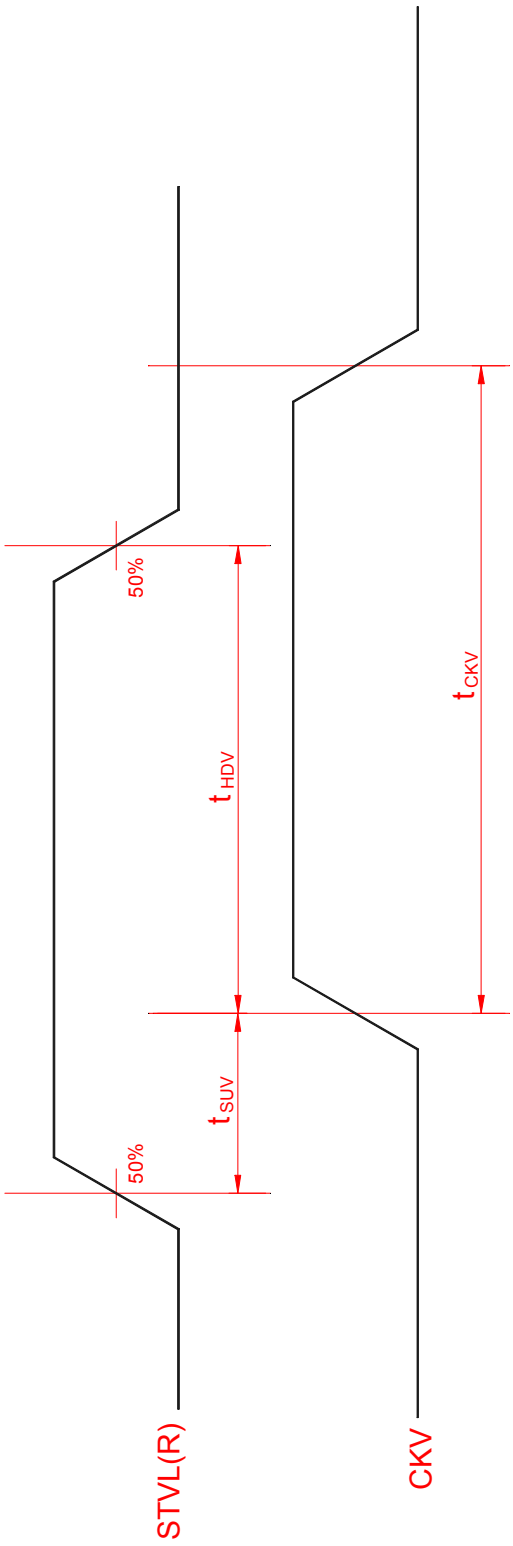


Fig.6 Vertical shift clock timing

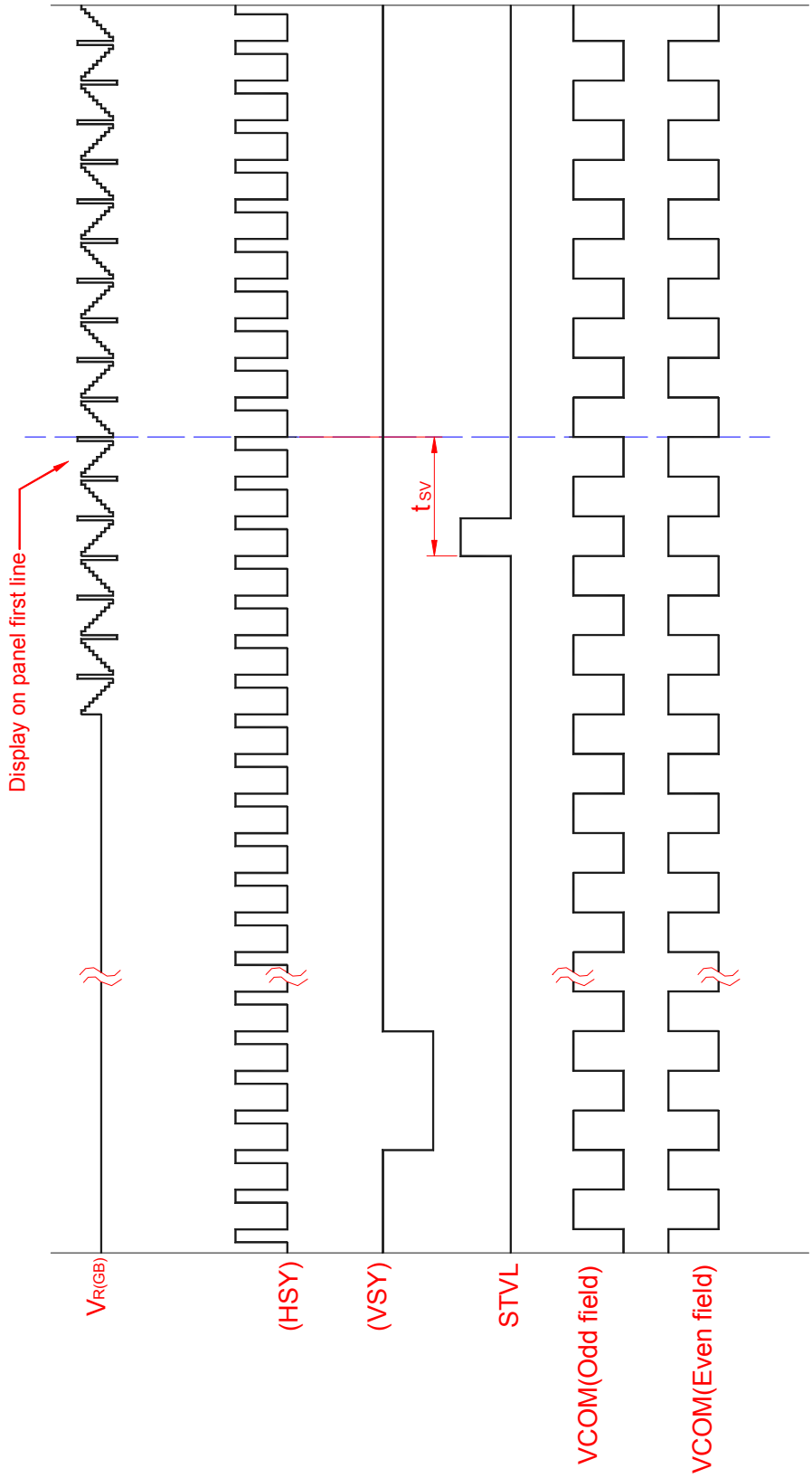


Fig.6-(a) Vertical timing (From up to down)

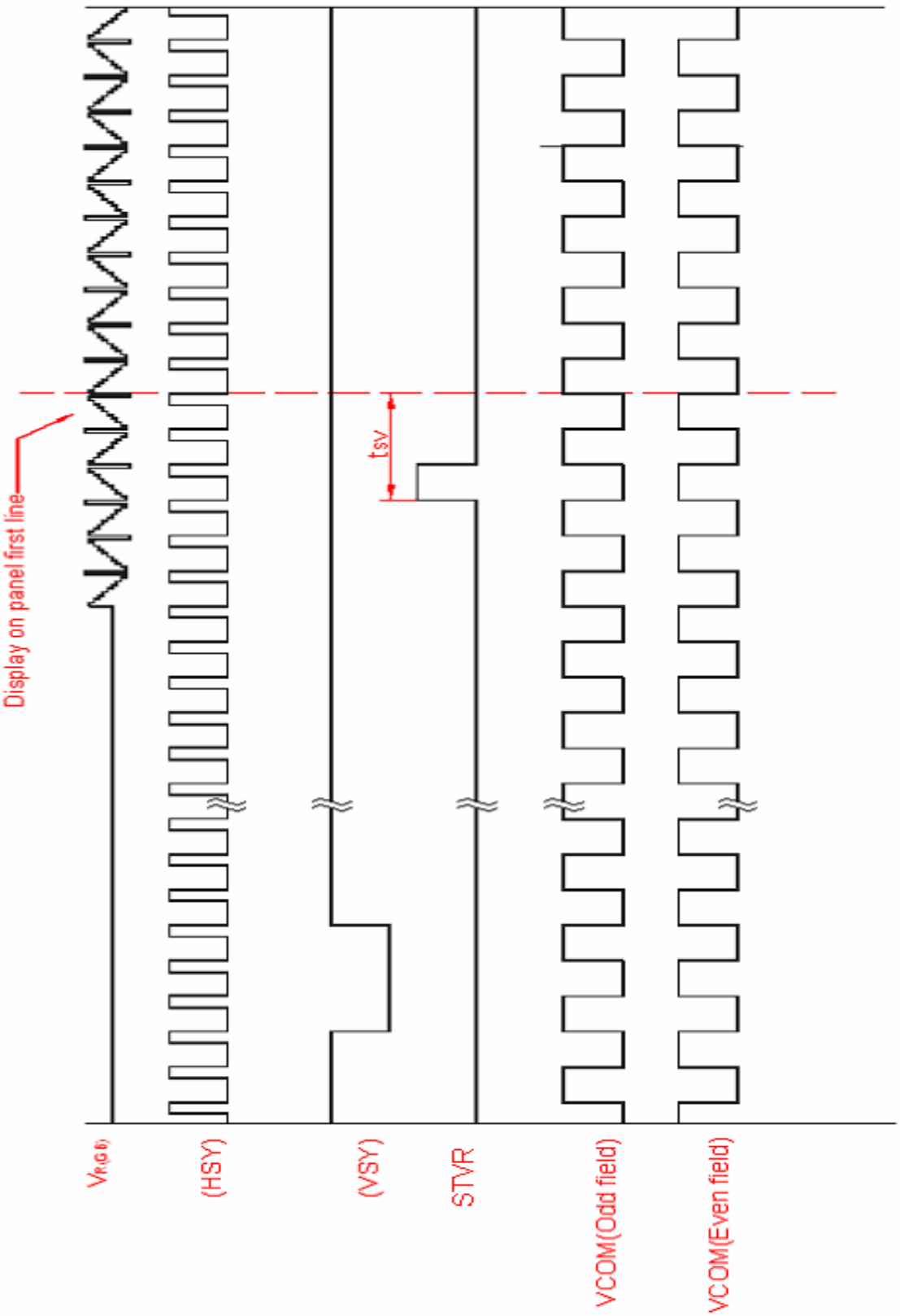


Fig.6-(b) Vertical timing (From down to up)

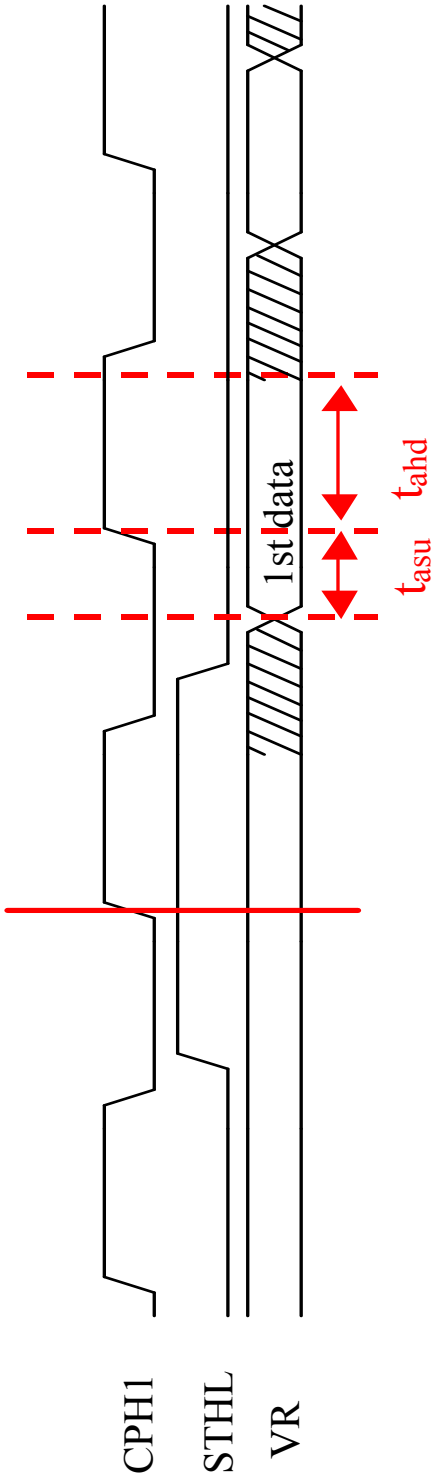


Figure-7 the setup and hold time definition betwwen CPH1 and analog signal VR