UNIPAC OPTOELECTRONICS CORPORATION

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UP040D01 COLOR TFT-LCD
PRELIMINARY SPECIFICATION

MODEL NAME: UP040D01

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Approved by	Checked by	Prepared by
J. C. Sue	T. P. Chiang	C. T. Chen

Contents:

Appendix:

A.Physical specifications

NO.	Item	Specification	Remark
1	Display resolution(dot)	480(W) × 234(H)	
2	Active area(mm)	82.1(W) × 61.8(H)	
3	Screen size(inch)	4.05(Diagonal)	
4	Dot pitch(mm)	0.171(W) × 0.264(H)	
5	Color configuration	R.G.B delta	
6	Overall dimension(mm)	96.0(W) × 76.0(H) × 6.5(D)	Note 1
7	Weight(g)	(65±20)	

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 for 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	Q1H	i	Analog signal rotate input	
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	

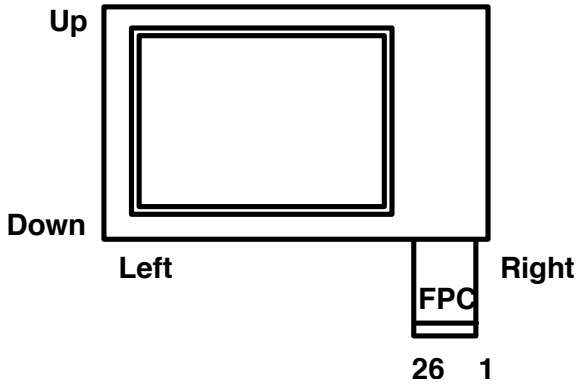
Note 1 : Selection of scanning mode

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:



b. Backlight driving section(Refer to Fig.1)

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

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	
	$V_{GH} - V_{GL}$		-	31	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	
Operating temperature	Topa		0	60	°C	Ambient temperature
Storage temperature	Tstg		-25	80	°C	Ambient temperature

Note 1: VR,VG,VB

Note 2: STHL,STHR,Q1H,OEH,L/R,CPH1 ~ CPH3,STVR,STVL,OEV,CKV,U/D

3.Electrical characteristics

a.Typical operating conditions (GND=AV_{SS}=0V , Note 5)

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply		V_{CC}	4.8	5	5.2	V	
		AV_{DD}	4.8	5	5.2	V	
		V_{GH}	14.3	15	15.7	V	
		V_{GLAC}	3.5	5	7.5	Vp-p	AC component of V_{GL}, Note 1
		V_{GLDC}	-10.5	-10	-9.5	V	DC component of V_{GL}
Video signal amplitude (VR,VG,VB)		V_{iA}	AV_{SS}+0.4	-	AV_{DD}-0.8	V	Note 2
		V_{iAC}	-	3	-	V	AC component
		V_{iDC}	-	AV_{DD}/2	-	V	DC component
VCOM		V_{CAC}	3.5	5	7.5	Vp-p	AC component, Note 3
		V_{CDC}	-	1.3	-	V	DC component
Input signal voltage	H Level	V_{IH}	4	-	V_{CC}	V	Note 4
	L Level	V_{IL}	0	-	1	V	

Note 1: The same phase and amplitude with common electrode driving signal(VCOM).
Note 2: Refer to Fig.4-(a)
Note 3: The brightness of LCD panel could be changed by adjusting the AC component of VCOM.
Note 4: STHL,STHR,Q1H,OEH,L/R,CPH1 ~ CPH3,STVR,STVL,OEV,U/D,CKV .
Note 5: Be sure to apply GND , Vcc , V_{GL} to the LCD first , and then apply V_{GH} .

b.Current consumption (GND=AV_{SS}=0V)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Current for driver	I_{GH}	V_{GH}=15V	-	80	150	μA	
	I_{GL}	V_{GL}= -10V	-	-0.2	-0.4	mA	
	I_{CC}	V_{CC}=5V	-	2.0	4.0	mA	
	I_{DD}	AV_{DD}=5V	-	5	10	mA	

c.Backlight driving conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Lamp voltage	V_L	260	290	320	Vrms	
Lamp current	I_L	2.5	2.9	3.3	mArms	
Frequency	F_L	55	60	65	KHz	
Lamp Starting voltage	V_S	-	-	580	Vrms	Note 1
		-	-	870	Vrms	Note 2

Note 1: Ta = 25 °C
Note 2: Ta = 0 °C

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}	299	308	319	ns	CPH1~CPH3
CPH pulse duty	t_{CWH}	40	50	60	%	CPH1~CPH3
CPH pulse delay	t_{C12} t_{C23} t_{C31}	70	$t_{CPH}/3$	$t_{CPH}/2$	ns	CPH1¡ ¢CPH3
STH setup time	t_{SUH}	35	-	-	ns	STHR,STHL
STH hold time	t_{HDH}	35	-	-	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}	-	3	-	t_{CPH}	OEH
Sample and hold disable time	t_{DIS1}	-	28	-	t_{CPH}	
OEV pulse width	t_{OEV}	-	12	-	t_{CPH}	OEV
CKV pulse width	t_{CKV}	16	28	40	t_{CPH}	CKV
Clean enable time	t_{DIS2}	-	10	-	t_{CPH}	
Horizontal display start	t_{SH}	-	0	-	$t_{CPH}/3$	
Horizontal display timing range	t_{DH}	-	480	-	$t_{CPH}/3$	
STV setup time	t_{SUV}	400	-	-	ns	STVL,STVR
STV hold time	t_{HDV}	400	-	-	ns	STVL,STVR
STV pulse width	t_{STV}	-	-	1	t_H	STVL,STVR
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}	-	-	3	μs	
VCOM falling time	t_{fCOM}	-	-	3	μs	
VCOM delay time	t_{DCOM}	-	-	3	μs	
RGB delay time	t_{DRGB}	-	-	1	μs	

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.

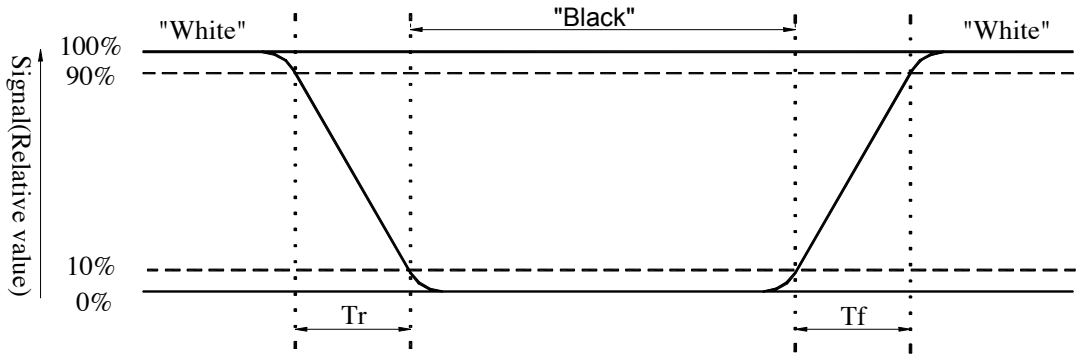
b.Timing diagram

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

C.Optical specifications (Note 1,Note 2, Note 3)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response time	Rise	Tr	θ = 0°	-	25	50	ms	Note 4,6
	Fall	Tf		-	30	60	ms	
Contrast ratio		CR	At optimized viewing angle	60	150			Note 5,6
Viewing angle	Top		CR ≧ 10	10	-	-	deg.	Note 6,7
	Bottom			30	-	-		
	Left			45	-	-		
	Right			45	-	-		
Brightness		Y_L	θ = 0°	210	250	-	nit	Note 8
White chromaticity		x	θ = 0°	0.25	0.30	0.35		Note 8
		y		0.30	0.35	0.40		

Note 1. Ambient temperature = 25 °C, and lamp current I_L=2.9mArms.
Note 2. To be measured in the dark room.
Note 3. To be measured on the center area of panel with a viewing cone of 1° by Topcon luminance meter BM-7, after 10 minutes operation.
Note 4. Definition of response time:
The output signals of photodetector 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.

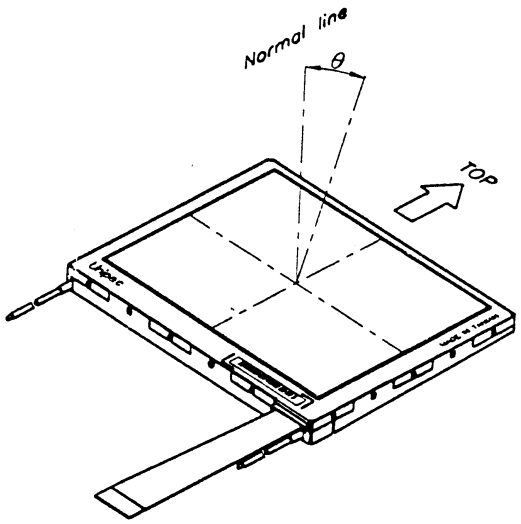


Note 5. Definition of contrast ratio:
Contrast ratio is calculated with the following formula.

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

Note 6. White Vi=V_{i50} ∓ 1.5V
Black Vi=V_{i50} ± 2.0V
' ± ' means that analog input signal swings in phase with COM signal.
' ∓ ' means that analog input signal swings out of phase with 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 7. Definition of viewing angle:
Refer to figure as below.



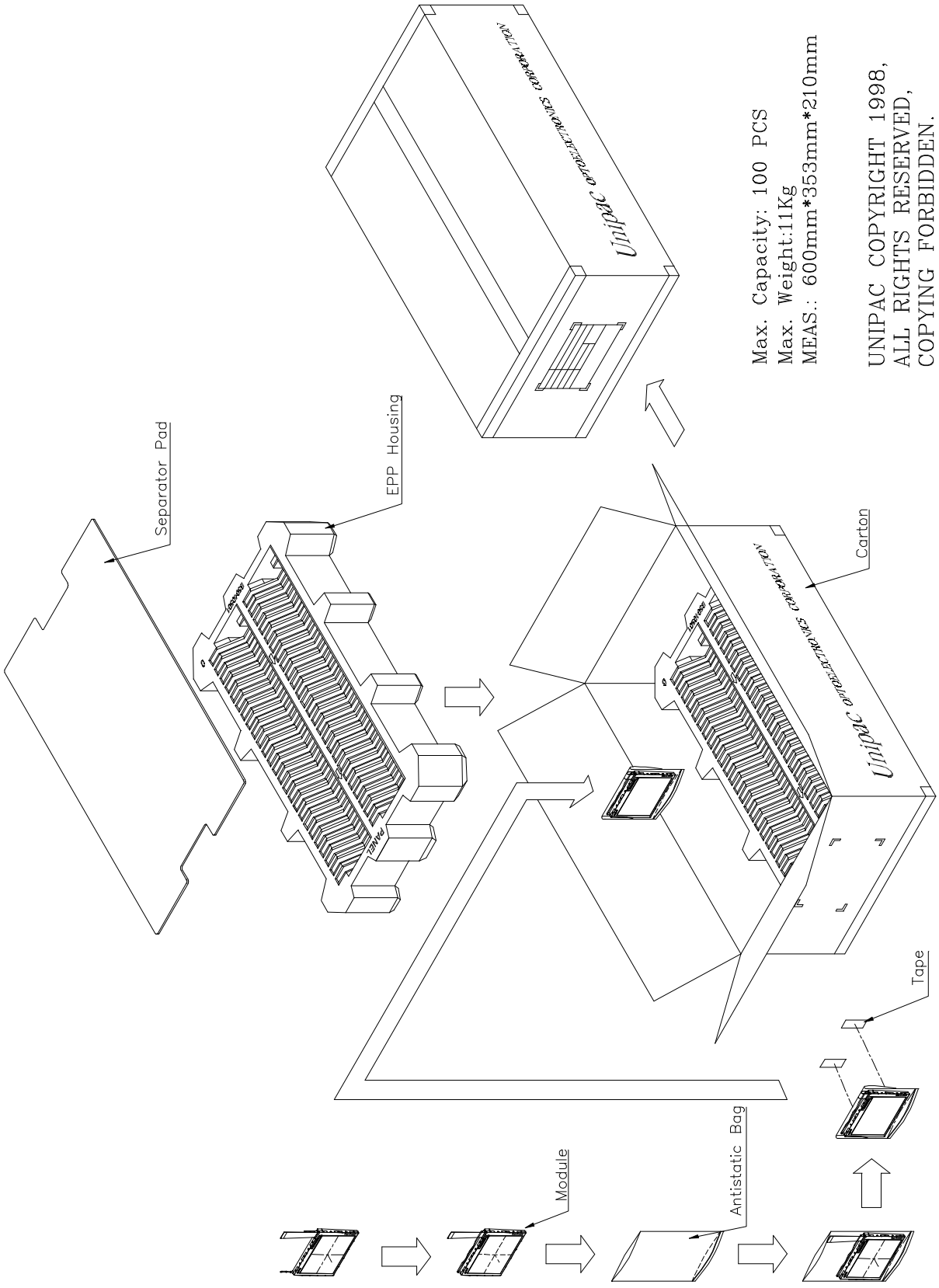
Note 8. Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

D.Reliability test items:

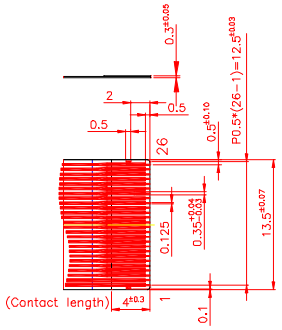
No.	Test items	Conditions	Remark
1	High temperature storage	Ta = 80°C 240H	
2	Low temperature storage	Ta = -25°C 240H	
3	High temperature operation	Ta = 60°C 240H	
4	Low temperature operation	Ta = 0°C 240H	
5	High temperature and high humidity	Ta = 60°C・95%RH 240H	Operation
6	Heat shock	-25°C ~ +80°C/50 cycles 2H/cycle	Non-operation
7	Electrostatic discharge	± 200V, 200pF(0Ω),once for each terminal	Non-operation
8	Vibration	Frequency range:10 ~ 55Hz Stroke :1.5mm Sweep :10¡ 55Hz ~ 10Hz 2 hours for each direction of X,Y,Z (6 hours for total)	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: 80cm 1 corner,3 edges,6 surfaces	

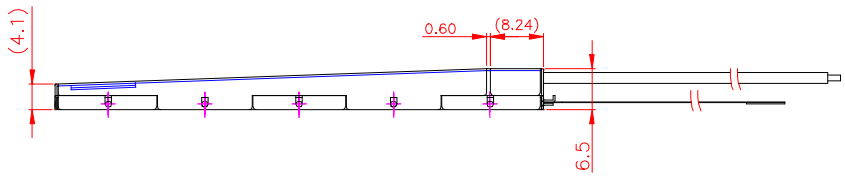
Note: Ta: Ambient temperature.

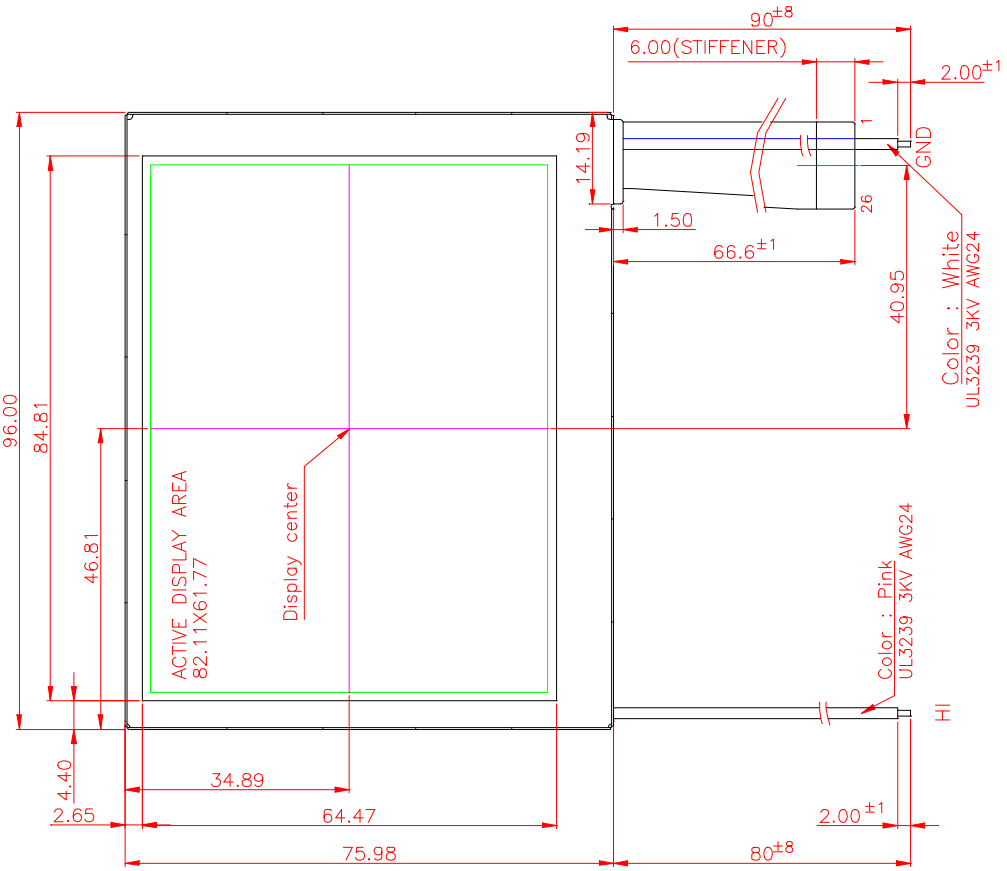
E. Packing form



NOTES :
1. General tolerance ±0.3.
2. The bending radius of FPC should be larger than 0.6.
3. Unit : mm







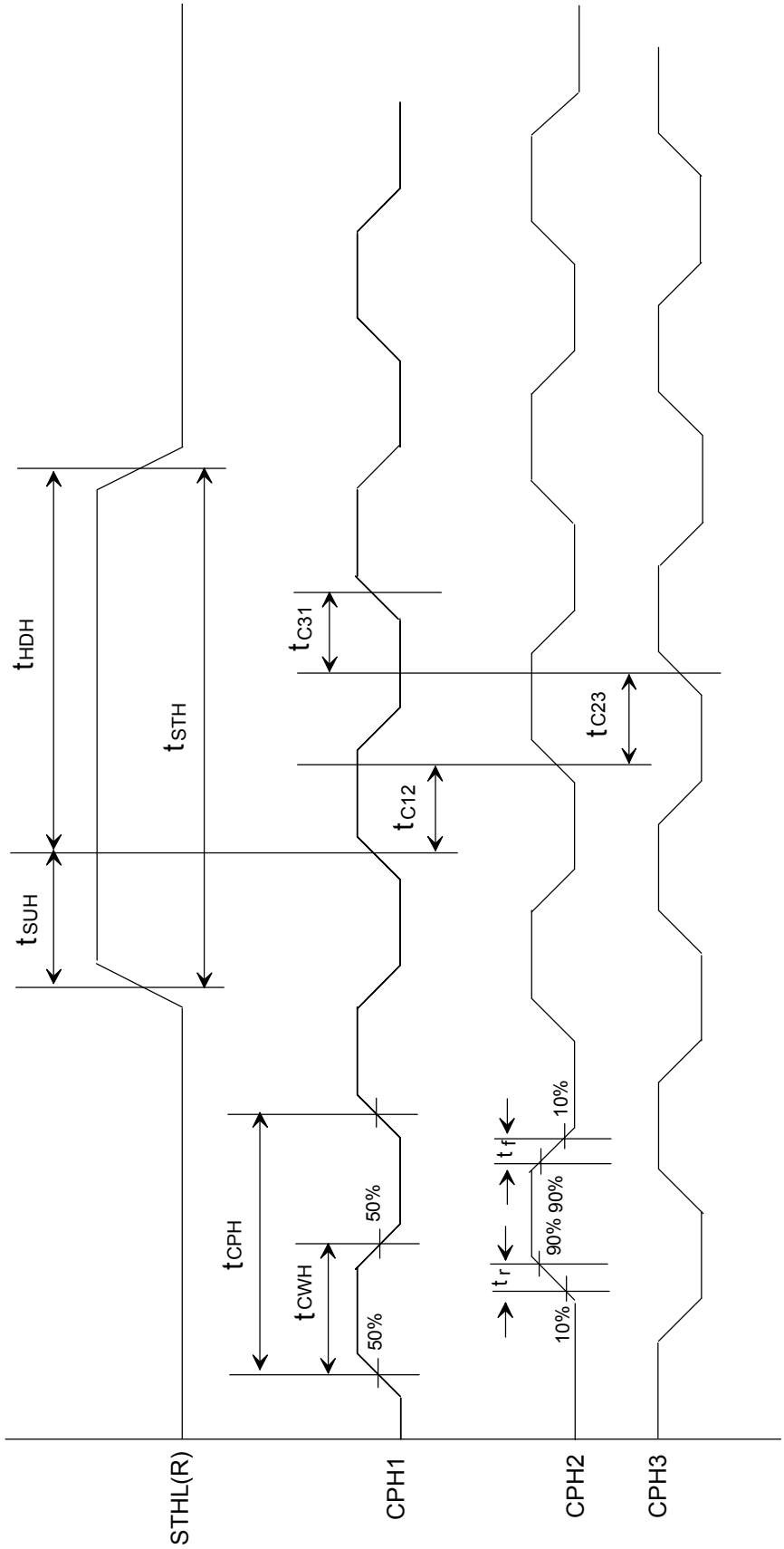


Fig.2 Sampling clock timing

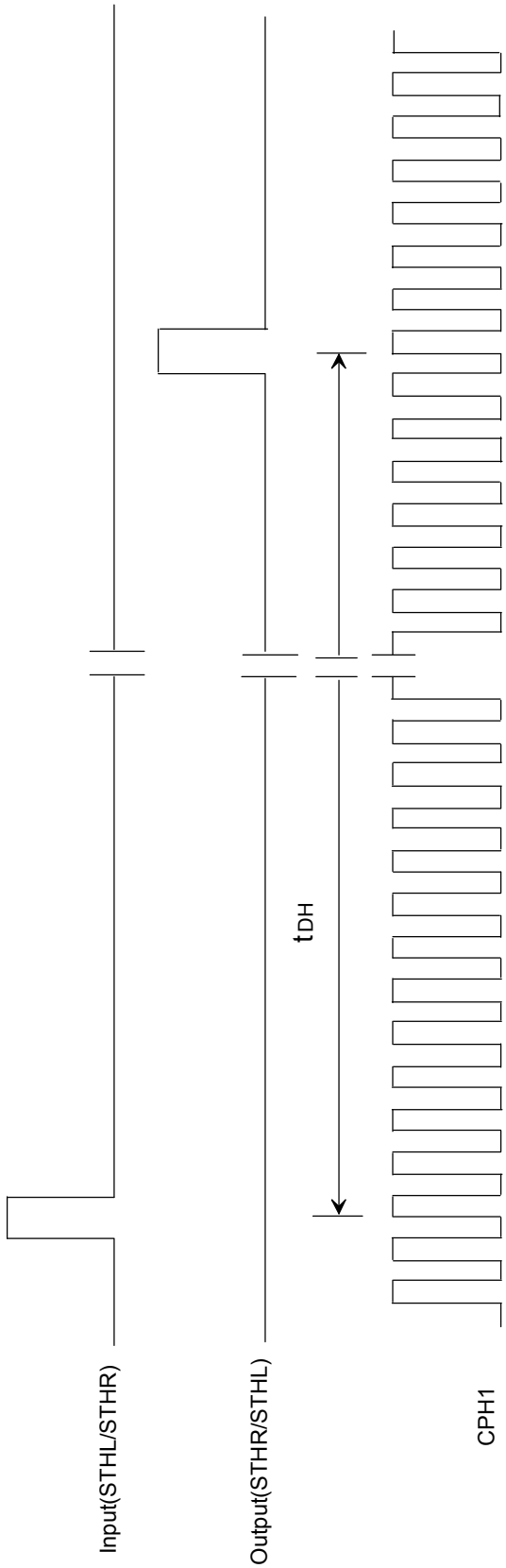


Fig.3 Horizontal display timing range

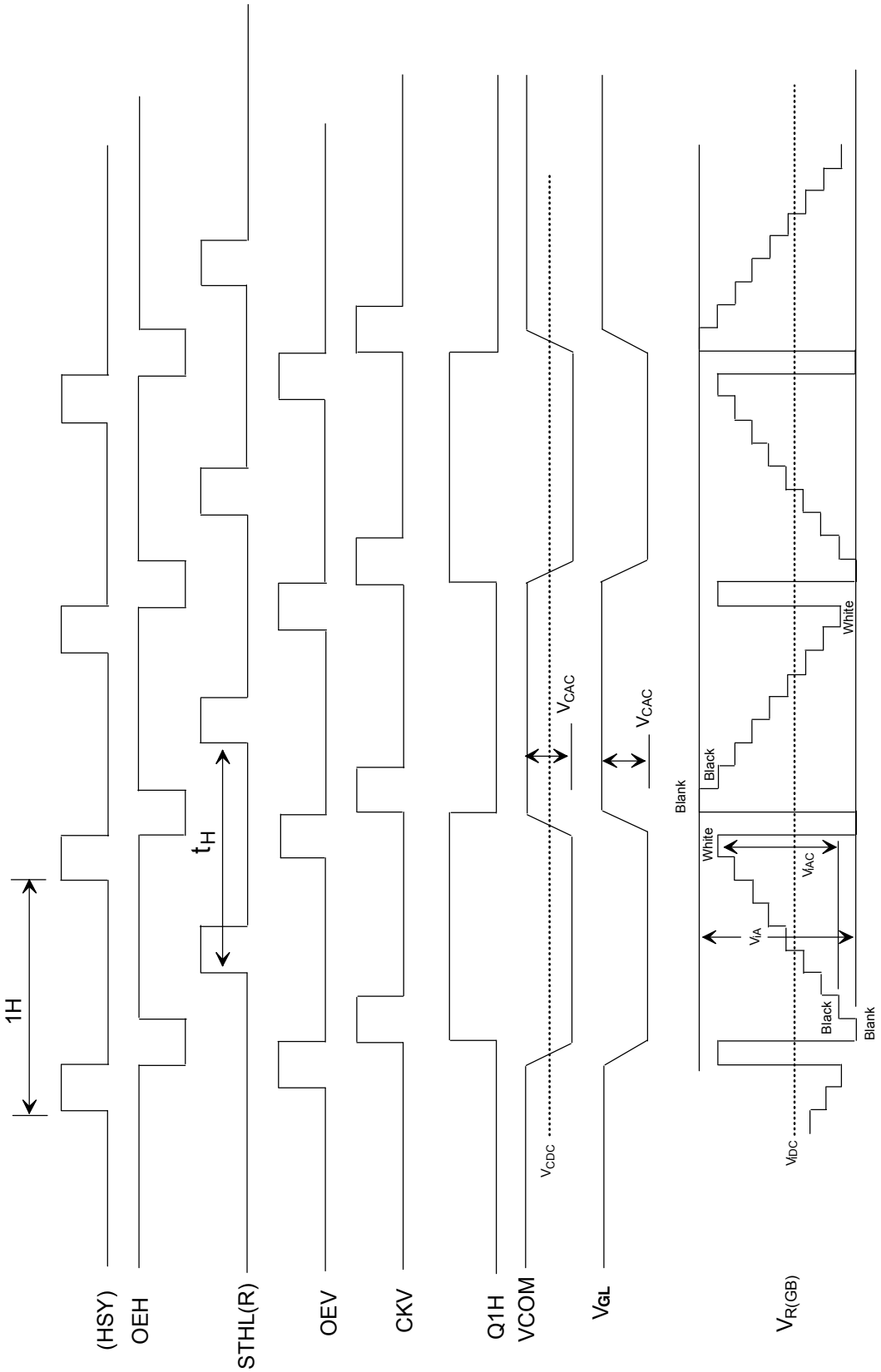
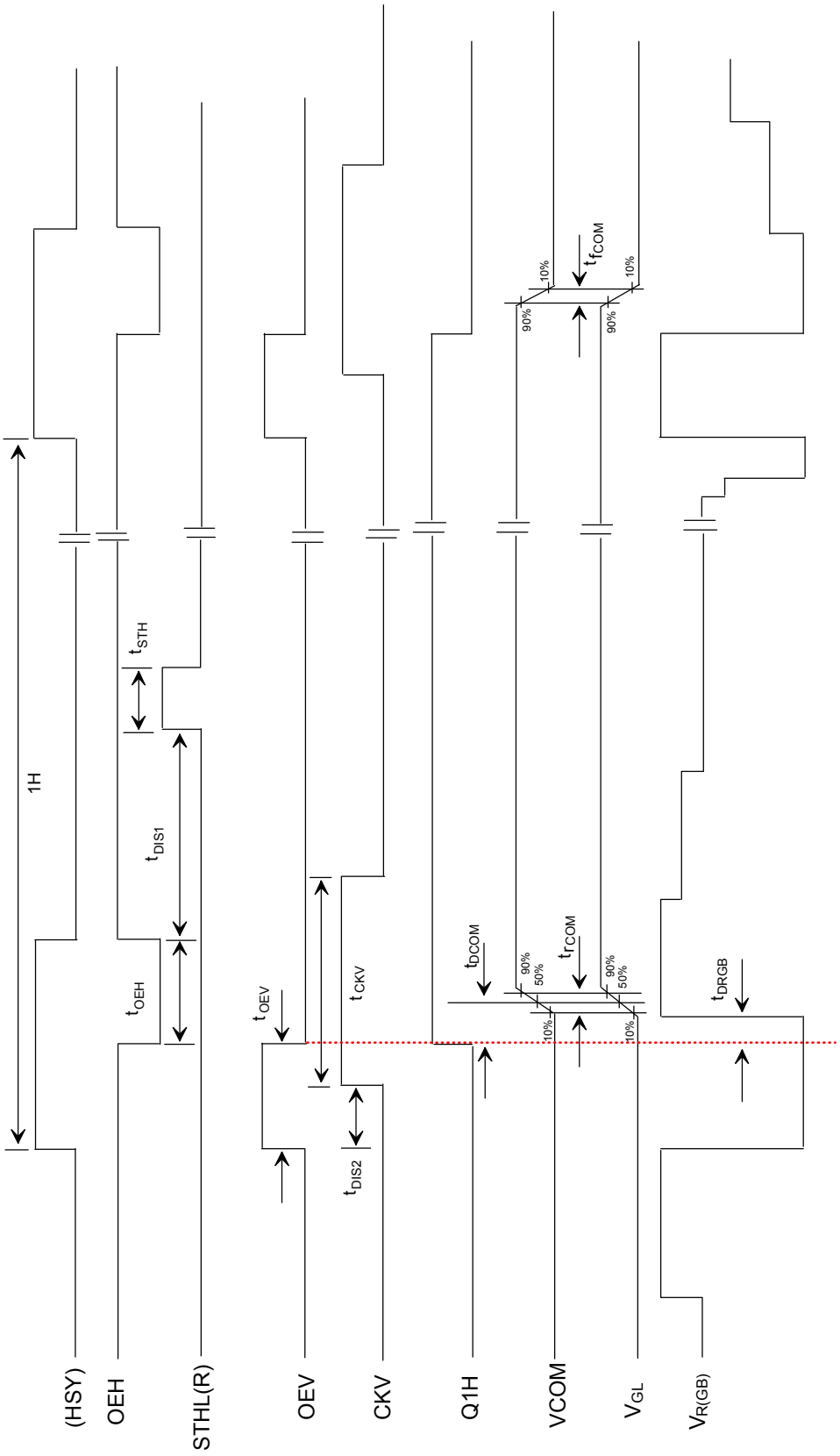


Fig.4-(a) Horizontal timing



Note: The rising edge of Q1H and the falling edge of OEV should be synchronized with the falling edge of OEH

Fig.4-(b) Detail horizontal timing

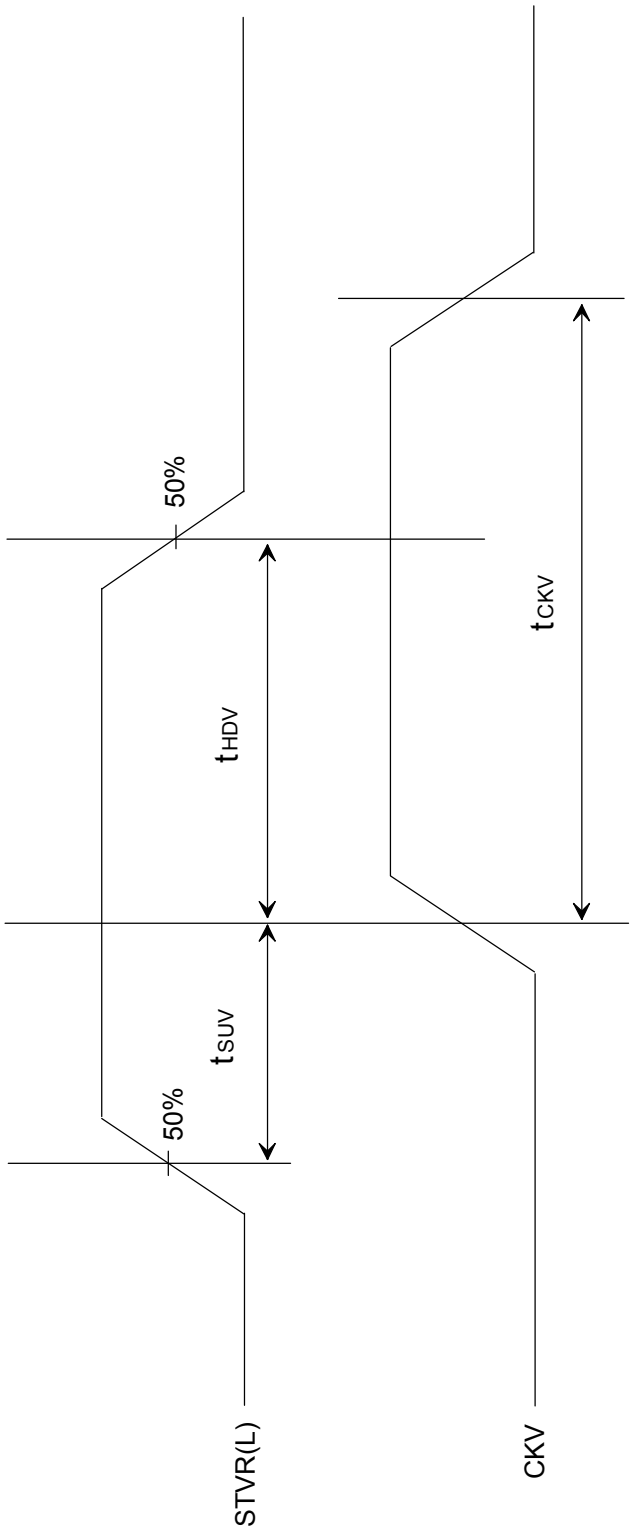


Fig.5 Vertical shift clock timing

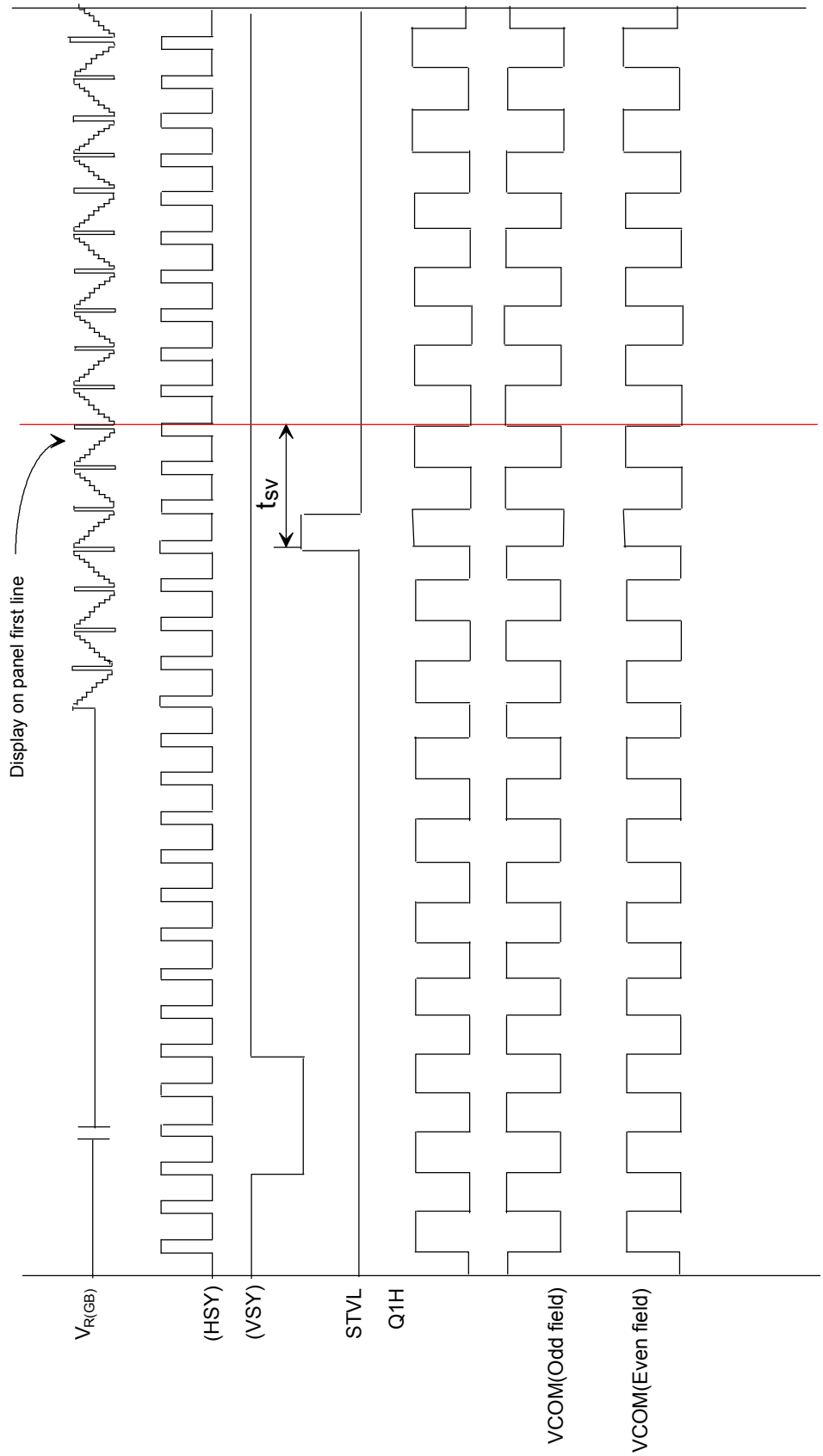


Fig.6-(a) Vertical timing (From up to down)

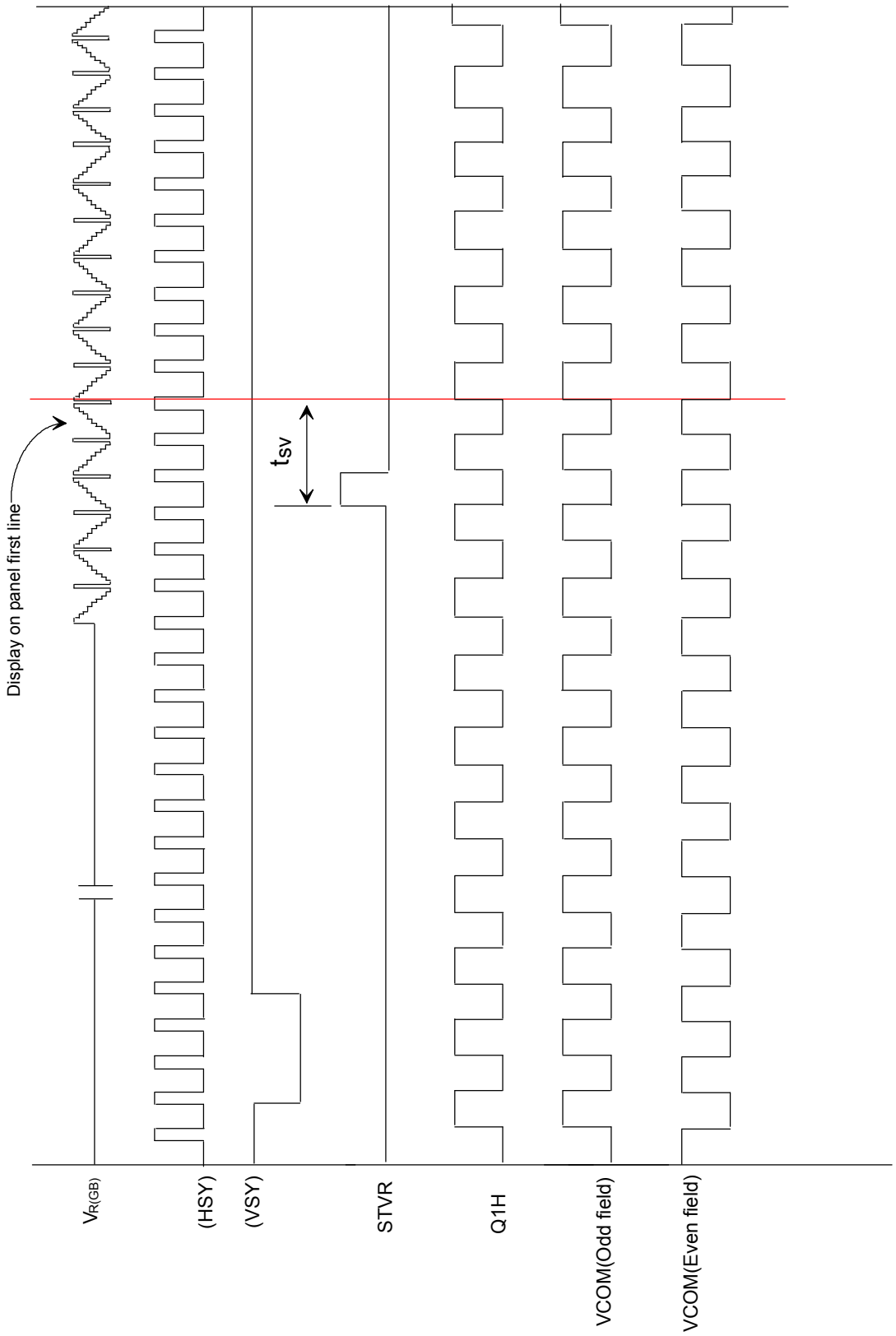


Fig.6-(b) Vertical timing (From down to up)

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(Revision: January 1996)

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b. Title to the goods and the entire risk will pass to Buyer upon delivery to carrier.

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c. Buyer will not return any goods without first obtaining a customer return order number.

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Unipac may at any time make substitutions for product ordered which do not materially and adversely affect overall performance with the then current specifications in the typical and intended use. Unipac reserves the right to halt deliveries and shipments and alter specifications and prices without notice. Buyer shall verify that the literature and information is current before purchasing.

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b. In no event will Buyer have rights in partially completed goods.

8. INDEMNIFICATION

Unipac will, at its own expense, assist Buyer with technical support and information in connection with any claim that any parts as shipped by Unipac under this purchase order infringe any valid, enforceable, unexpired R.O.C. patent, copyright, or trademark, provided however, that Buyer (i) gives immediate written notice to Unipac, (ii) permits Unipac to participate and to defend if Unipac requests to do so, and (iii) gives Unipac all needed information, assistance and authority. However, Unipac will not be responsible for infringements resulting from anything not entirely manufactured by Unipac, or from any combination with products, equipment, or materials not furnished by Unipac. Unipac will have no liability with respect to intellectual property matters arising out of products made to Buyer's specifications, code, or designs.

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a. These terms and conditions are the entire agreement between Unipac and Buyer, and no addition, deletion or modification shall be binding on Unipac unless expressly agreed to in a writing signed by an officer of Unipac.

b. Buyer is not relying upon any warranty or representation except for those specifically stated here.

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This contract and all performance and disputes arising out of or relating to goods involved will be governed by the laws of Taiwan, Republic of China, without reference to conflict of laws principles and excluding the U.N. Convention on Contracts for the International Sale of Goods. Buyer agrees at its sole expense to comply with all applicable laws in connection with the purchase, use or sale of the goods provided hereunder.

12. JURISDICTION AND VENUE

The courts located in Taiwan, Republic of China, will have the sole and exclusive jurisdiction and venue over any dispute arising out of or relating to this contract or any sale of goods hereunder, and Buyer hereby consents to the jurisdiction of such courts.

13. ATTORNEYS' FEES

Reasonable attorneys' fees and costs will be awarded to the prevailing party in the event of litigation involving the enforcement or interpretation of this contract.

Unipac optoelectronics corp.

No.3 Industry E. Rd III,
Science-Based Industrial Park,
Hsin-Chu City, Taiwan, R.O.C.

Fax:886-3-5772545
Tel :886-3-5772700