

Version :5.0

TECHNICAL SPECIFICATION  
MODEL NO. : PD035VX1

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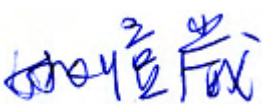
Customer's Confirmation

Customer \_\_\_\_\_

By \_\_\_\_\_

PVI's Confirmation

  
Confirmed By \_\_\_\_\_

  
Prepared By \_\_\_\_\_

## Revision History

Rev.	Issued Date	Revised Contents
1.0	Aug. 25, 2005	NEW
2.0	Nov.28,2005	Page 8 6.Absolute Maximum Ratings: before modify: VDD1 =2V,min.=-0.3V After modify: VDD1 =5V,min.=-0.5V  Page 24 : Reliability Test Condition 1. Add High Temperature Operation Test +70°C.  Change Low Temperature Operation Test Condition from 0°C to -20°C
3.0	Mar.22, 2007	2. Version NO. modify to 3.0 2. Page3. <b>3.Mechanical Specifications</b> 2.1 Surface treatment from “AG” modify to “Normal” 2.2 Add “Gray scale inversion direction”
4.0	Nov.14,2007	Modify Page 22: 16. Delete carton and change packing
5.0	March.24.2008	Add Page 21 14.Handling Cautions 14-1 item e)

# TECHNICAL SPECIFICATION

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**1.Application**

This data sheet applies to a color TFT LCD module, PD035VX1 The module applies to OA product, GPS, which require high quality flat panel display. If you must use in high reliability environment can't over reliability test condition. If you use PD035VX1 Prime View advises your system sides must use PVI-2002A(2005/8 new product change to PVI-2003A) which one generates signal to control PD035VX1

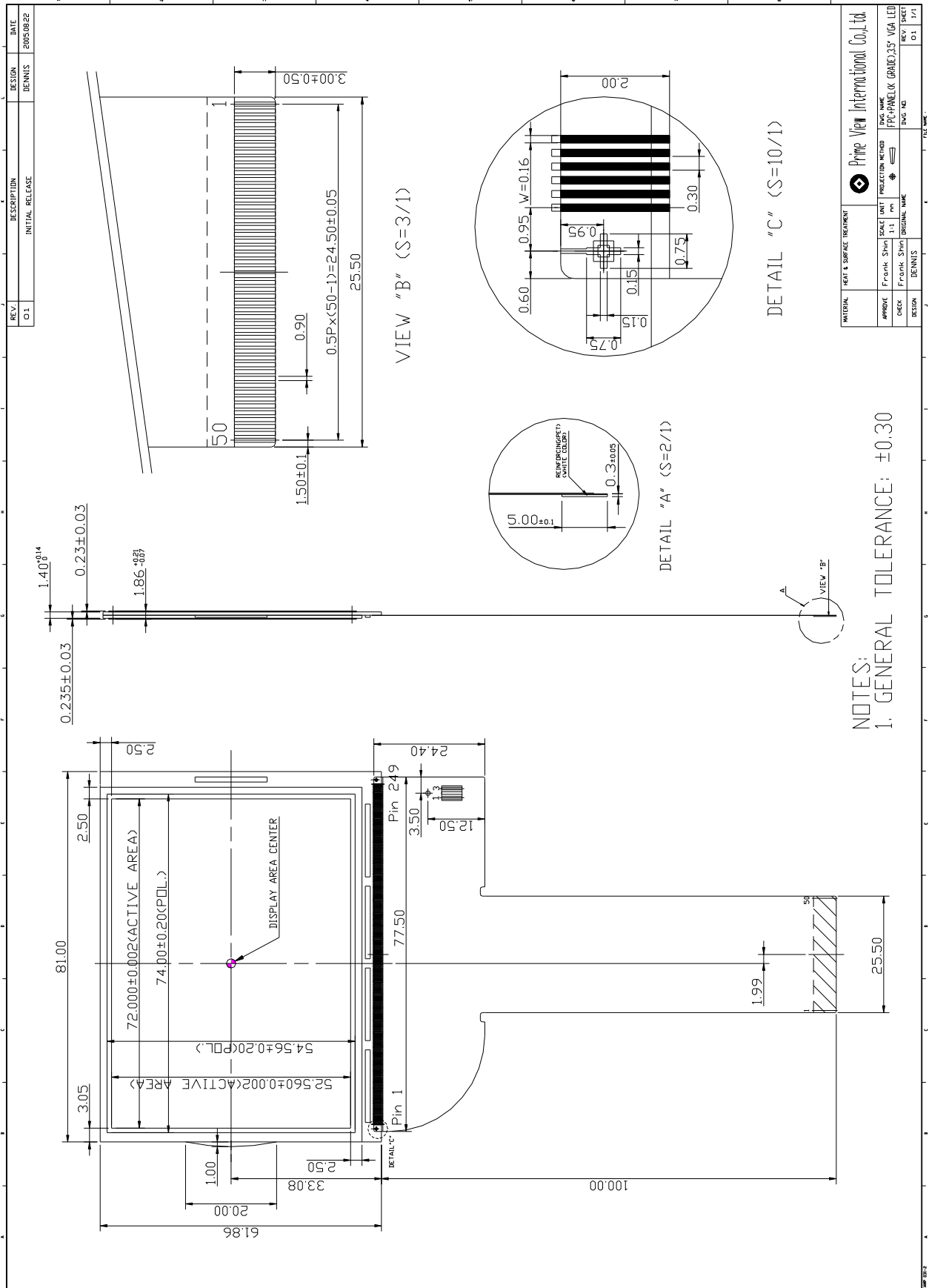
**2. Features**

- . Amorphous silicon TFT LCD panel
- . Pixel in stripe configuration
- . Display Colors : 262,144 colors
- . TTL transmission interface
- . Optimum Viewing Direction : 6 o'clock

**3.Mechanical Specifications**

Parameter	Specifications	Unit
Screen Size	3.5(diagonal)	inch
Display Format	640×(R, G, B)×480	dot
Display Colors	262,144	
Active Area	72(H)×52.56(V)	mm
Pixel Pitch	0.1125(H)×0.1095(V)	mm
Pixel Configuration	Stripe	
Outline Dimension	81.0(W)×61.68 (H)×1.4 (typ.) (D)	mm
Weight	20±5	g
Surface treatment	Normal	
Display mode	Normally white	
Gray scale inversion direction	6 o'clock [ref to Note10]	

### 4. Mechanical Drawing of TFT-LCD Module



**5.Input / Output Terminals**

TFT-LCD Panel Driving

Pin No.	Symbol	I/O	Function	Remark
1	DIO1	I/O	Horizontal Start Pulse Signal Input or Output 1	Note5-3
2	VSS2	I	Ground	
3	VDD1	I	Power Supply	
4	CLK	I	Horizontal Shift Clock	
5	R/L	I	Left/Right Selection	Note 5-3
6	R0	I	Red Data (LSB)	
7	R1	I	Red Data	
8	R2	I	Red Data	
9	R3	I	Red Data	
10	R4	I	Red Data	
11	R5	I	Red Data (MSB)	
12	VSS2	I	Ground	
13	G0	I	Green Data (LSB)	
14	G1	I	Green Data	
15	G2	I	Green Data	
16	G3	I	Green Data	
17	G4	I	Green Data	
18	G5	I	Green Data (MSB)	
19	B0	I	Blue Data (LSB)	
20	B1	I	Blue Data	
21	B2	I	Blue Data	
22	B3	I	Blue Data	
23	B4	I	Blue Data	
24	B5	I	Blue Data (MSB)	
25	LD	I	Load output signal	Note5-7
26	REV	I	Data invert control	Note5-8
27	POL	I	Polarity selection	Note5-9
28	DIO2	I/O	Horizontal Start Pulse Signal Input or Output	Note5-3
29	VSS2	I	Ground	
30	V3	I	Gamma Voltage 3	Note5-10
31	V5	I	Gamma Voltage 5	Note5-10
32	V7	I	Gamma Voltage 7	Note5-10
33	V8	I	Gamma Voltage 8	Note5-10
34	V10	I	Gamma Voltage 10	Note5-10
35	V12	I	Gamma Voltage 12	Note5-10
36	VSS2	I	Ground	
37	VDD2	I	Voltage for analog circuit	Note5-10
38	VCOM	I	Common Voltage	
39	OE	I	Output Enable	Note5-5
40	U/D	I	Up/Down Selection	Note5-6
41	CKV	I	Vertical Shift Clock	Note5-4
42	STVU	I/O	Vertical Shift Pulse Signal Input or Output	Note5-6
43	STVD	I/O	Vertical Shift Pulse Signal Input or Output	Note5-6
44	VGG	I	Gate On Voltage	Note5-1
45	VSS1	I	Ground	
46	VCC	I	Voltage for logic circuit	
47	VEE	I	Gate Off Voltage	Note5-2
48	VLED	-	Supply voltage for LED backlight	
49	GLED2	-	Ground for LED backlight	
50	GLED1	-	Ground for LED backlight	

Note 5-1  $V_{GG} = +17V$ .

Note 5-2  $V_{EE} = -10V$ .

Note 5-3: Select left or right shift

R/L	DIO1	DIO2	Shift
1	Input	Hi-Z	Left to right
0	Hi-Z	Input	Right to left

Note 5-4: Gate driver shift clock

Note 5-5: When OE is connected to high “1”, the driver outputs are disabled (Gate output =  $V_{EE}$ ).  
Under this condition, the operation of registers will not be affected.

Note 5-6: Select up or down shift

U/D	STVU	STVD	Shift
1	Hi-Z	Input	Down to Up
0	Input	Hi-Z	Up to Down

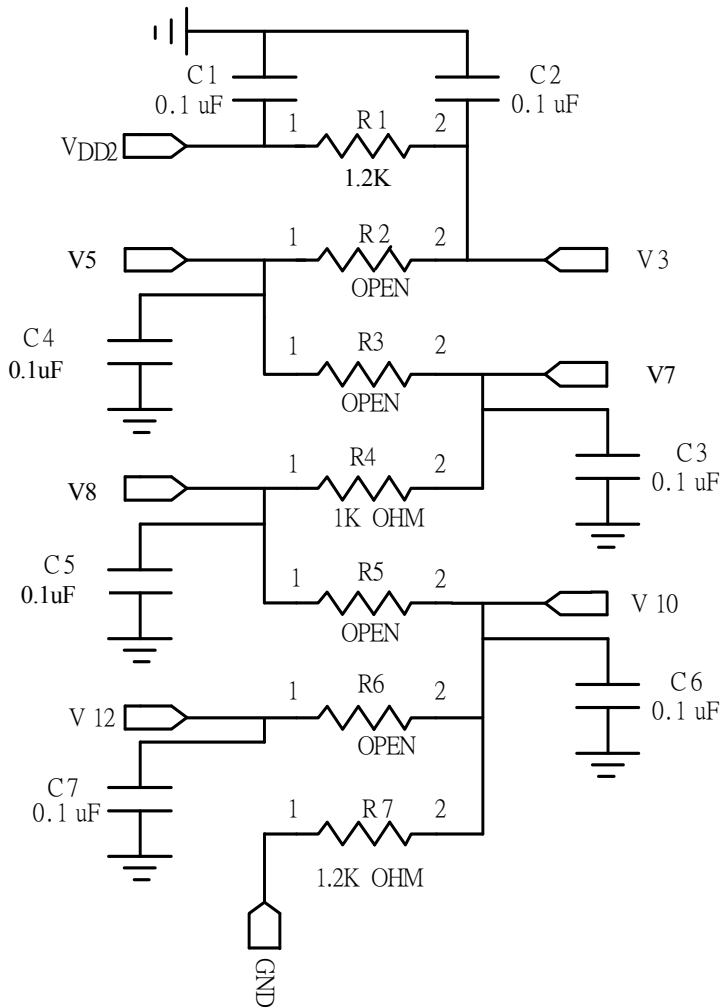
Note 5-7 Latch the polarity of outputs and switch the new data to outputs  
At the rising edge (LD), latch the “POL” signal to control the polarity of the outputs.

Note 5-8 Control whether the Data R0~G5 are inverted or not. (PVI suggests connecting to GND)  
When “REV=1”, these data will be inverted.  
EX: “00”→”3F”, “07”→”38”, “15”→”2A”

Note 5-9: Polarity selector for dot-inversion control. Available at the rising edge of LD.  
When POL=1: Even outputs range from V1~V7, and Odd outputs range from V8~V14;  
When POL=0: Even outputs range from V8~V14, and Odd outputs range from V1~V7.

Note 5-10

Typical Application Circuit





**6. Absolute Maximum Ratings:**

$V_{ss1}=V_{ss2}=GND=0V, T_a=25^{\circ}C$

Parameters	Symbol	MIN.	MAX.	Unit	Remark
Supply Voltage	$V_{DD1}$	-0.5	5.0	V	
	$V_{CC}$	-0.3	5.0	V	
	$V_{DD2}$	-0.5	12.0	V	
	$V_{GG}$	-0.3	40.0	V	
	$V_{GG}-V_{EE}$	-	40.0	V	
	$V_{EE}$	-20	0.3	V	

**7. Electrical Characteristics**

**7-1) Recommended Operating Conditions:**

$V_{ss1}=V_{ss2}=GND = 0V, T_a = 25^{\circ}C$

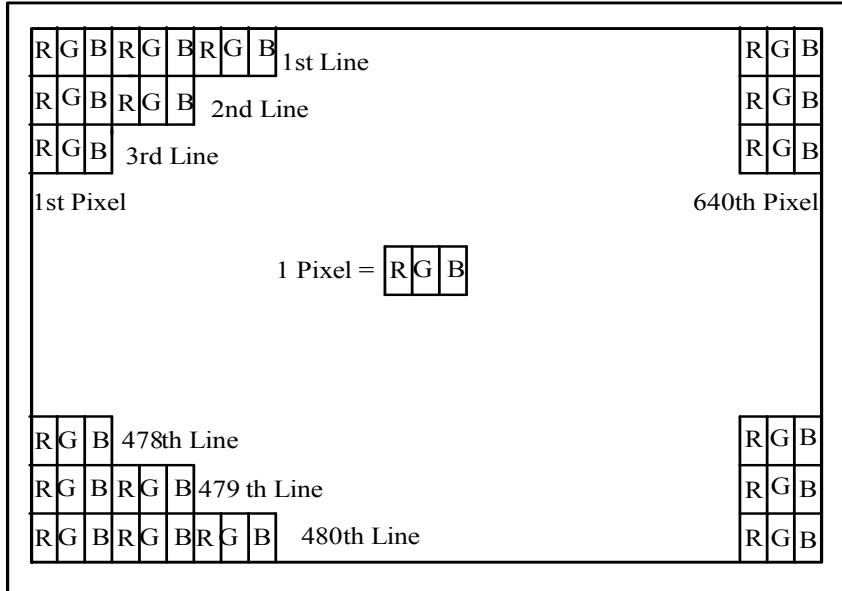
Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Supply Voltage for Source Driver	$V_{DD1}$	3.0	3.3	3.6	V	
	$V_{DD2}$	9.5	10	10.5		
Supply Voltage for Gate Driver	$V_{GG}$	-	+17	-	V	
	$V_{EE}$	-	-10	-	V	
	$V_{CC}$	3.0	3.3	3.6	V	
Supply Voltage for Vcom	$V_{com}$	-	2.7	-	V	
Digital Input Voltage	$V_{IH}$	$0.8V_{DD1}$	-	$V_{DD1}$	V	
	$V_{IL}$	0	-	$0.2V_{DD1}$	V	

**7-2) Power Consumption**

Parameter	Symbol	Condition	Typ.	Max.	Unit	Remark
Supply Current for Gate Driver (Hi level)	$I_{GG}$	$V_{GG}=+17V$	0.12	0.15	mA	
Supply Current for Gate Driver (Low level)	$I_{EE}$	$V_{EE}=-10V$	0.15	0.19	mA	
Supply Current for Source Driver (Digital)	$I_{DD1}$	$V_{DD1}=+3.3V$	4.8	8.0	mA	
Supply Current for Source Driver (Analog)	$I_{DD2}$	$V_{DD2}=+10V$	16.0	30.0	mA	
Supply Current for Gate Driver (Digital)	$I_{CC}$	$V_{CC}=+3.3V$	0.17	0.21	mA	
LCD Panel Power Consumption	-	-	180	332	mW	

**8. Pixel Arrangement**

The LCD module pixel arrangement is the stripe.

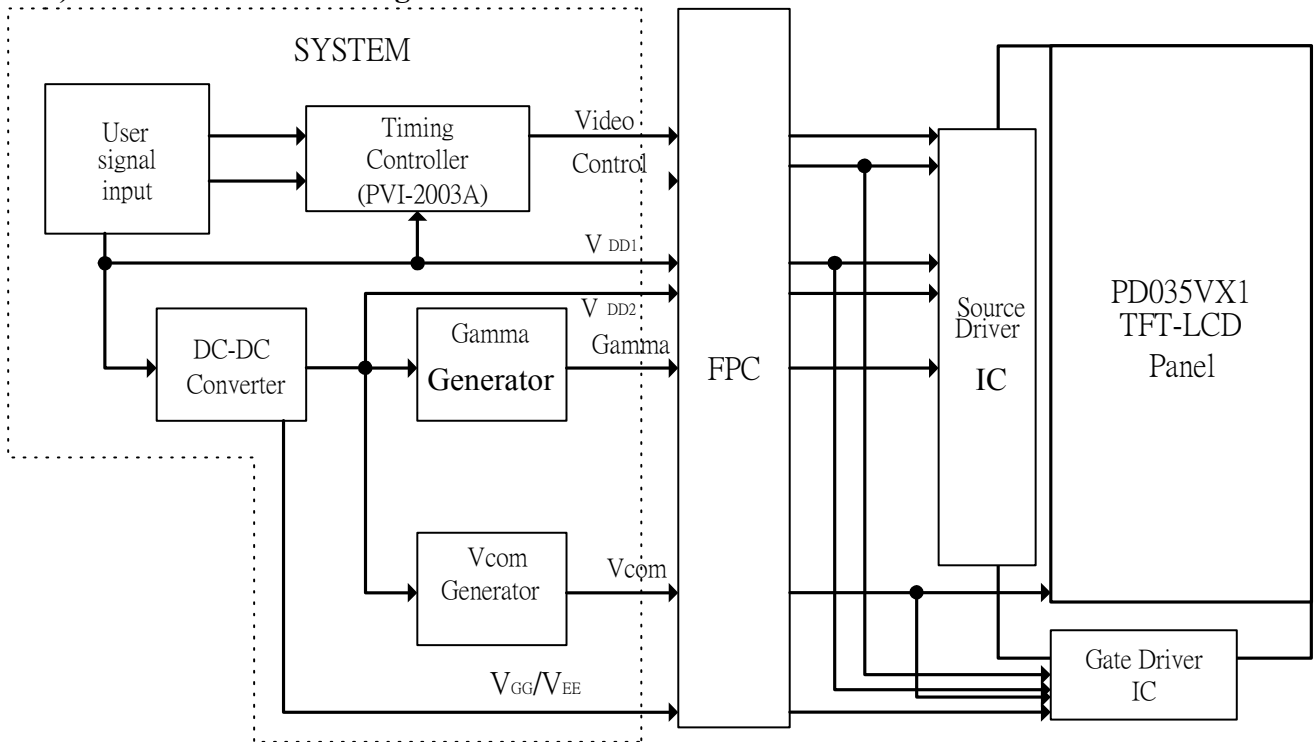


9. Display Color and Gray Scale Reference

Color		Input Color Data																	
		Red						Green						Blue					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green (63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue (63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red	Red (00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (01)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red (02)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker																		
	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	Brighter																		
	Red (61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red (62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Green	Green (00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green (01)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green (02)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Darker																		
	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	Brighter																		
	Green (61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green (62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green (63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Blue	Blue (00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue (01)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue (02)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	Darker																		
	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	Brighter																		
	Blue (61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue (62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue (63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

**10. Block Diagram**

**10-1) TFT-module Block Diagram**



If you use PD035VX1, you must apply PVI-2003A(Timing controller) which Will generate signal to support PD035VX1.

**11. Interface Timing**
**11.1) Timing Parameters**

Parameter	Symbol	Min.	Typ.	Max.	Unit
CLK Frequency	Fclk	-	25	40	MHz
CLK Pulse Width	T <sub>CPH</sub>	25	40	-	ns
Data Set-up Time	T <sub>su</sub>	4	-	-	ns
Data Hold Time	T <sub>hd</sub>	2	-	-	ns
Propagation Delay of DIO2/1	T <sub>phl</sub>	6	10	15	ns
Time That The Last Data to LD	T <sub>ld</sub>	1	-	-	T <sub>CPH</sub>
Pulse width of LD	T <sub>wld</sub>	2	-	-	T <sub>CPH</sub>
Time That LD to DIO1/2	T <sub>lds</sub>	5	-	-	T <sub>CPH</sub>
POL Set-up Time	T <sub>psu</sub>	6	-	-	ns
POL Hold Time	T <sub>phd</sub>	6	-	-	ns
OE Pulse Width	T <sub>OE<sub>V</sub></sub>	1	-	-	μs
CKV Pulse Width	T <sub>CKV</sub>	500	-	-	ns
STV Set-up Time	T <sub>SUV</sub>	400	-	-	ns
STV Hold Time	T <sub>HDV</sub>	400	-	-	ns
Horizontal Display Period	T <sub>HDP</sub>	-	640	-	T <sub>CPH</sub>
Horizontal Period Timing Range	T <sub>HP</sub>	-	800	-	T <sub>CPH</sub>
Horizontal Lines Per Field	T <sub>V</sub>	520	525	640	T <sub>HP</sub>
Vertical Display Timing Range	T <sub>DV</sub>	-	480	-	T <sub>HP</sub>

11.2) Timing Diagram

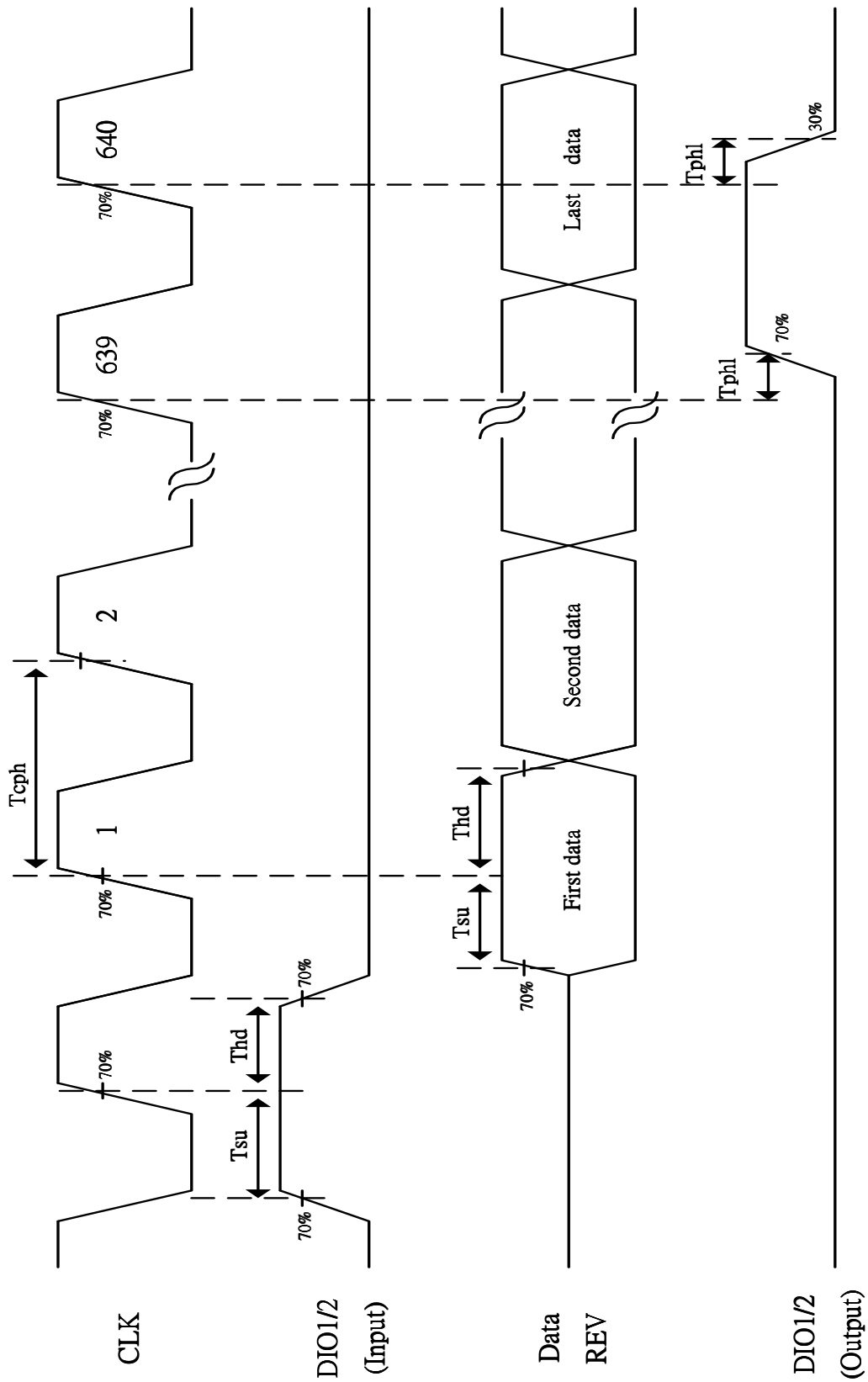


Fig. 11-1 Horizontal timing(1)

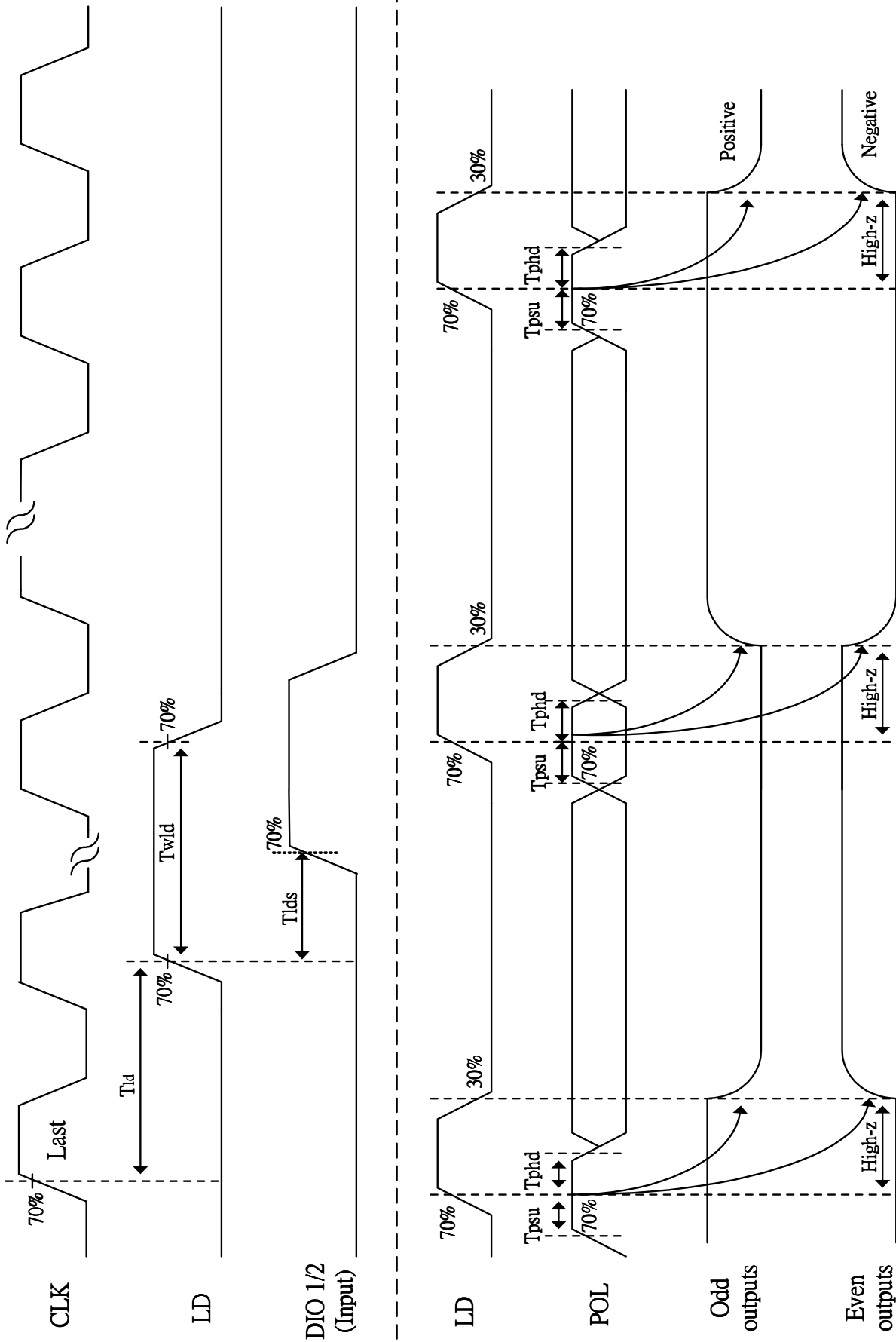


Fig. 11-2 Horizontal timing(2)

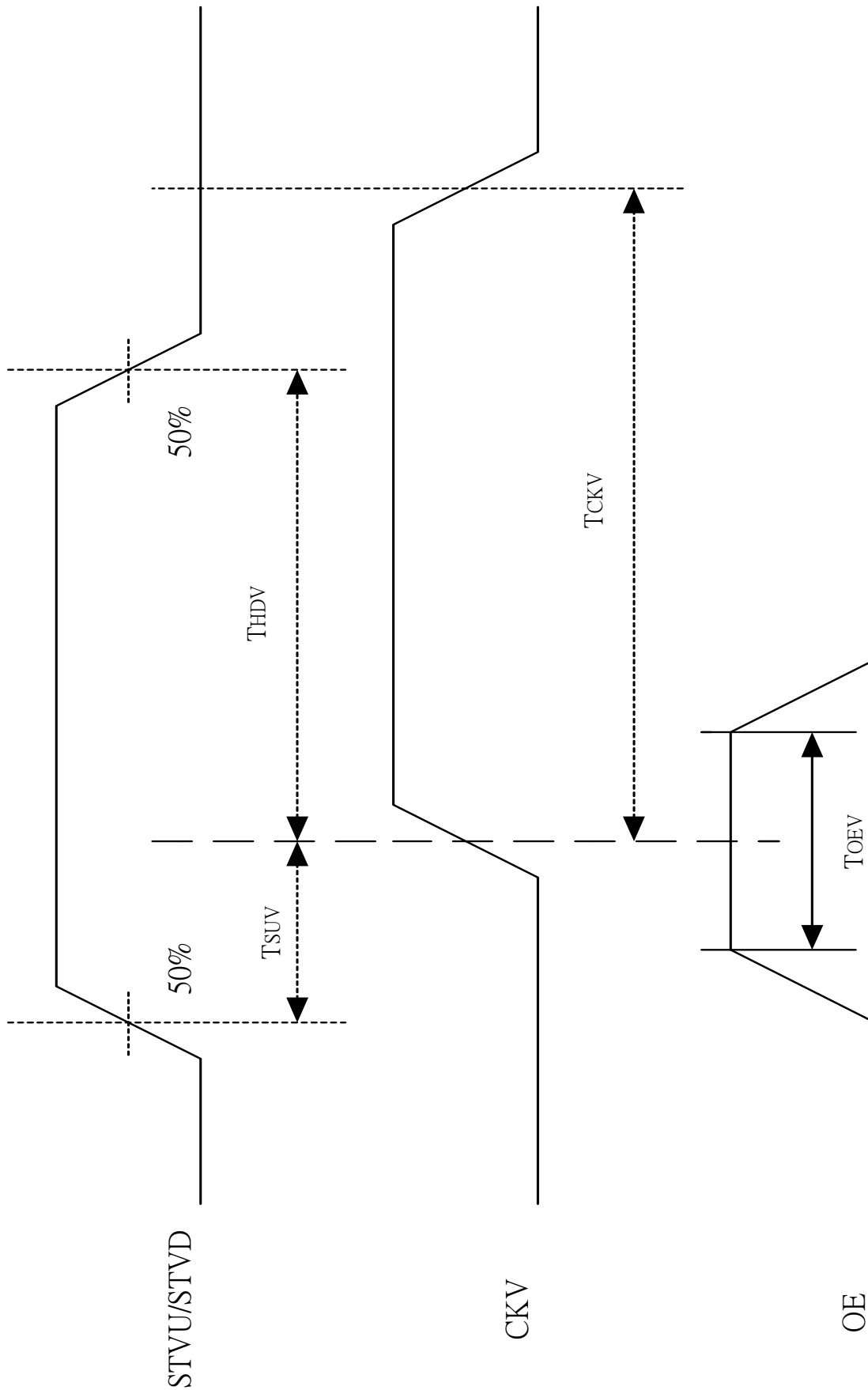


Fig. 11-3 Vertical shift clock timing



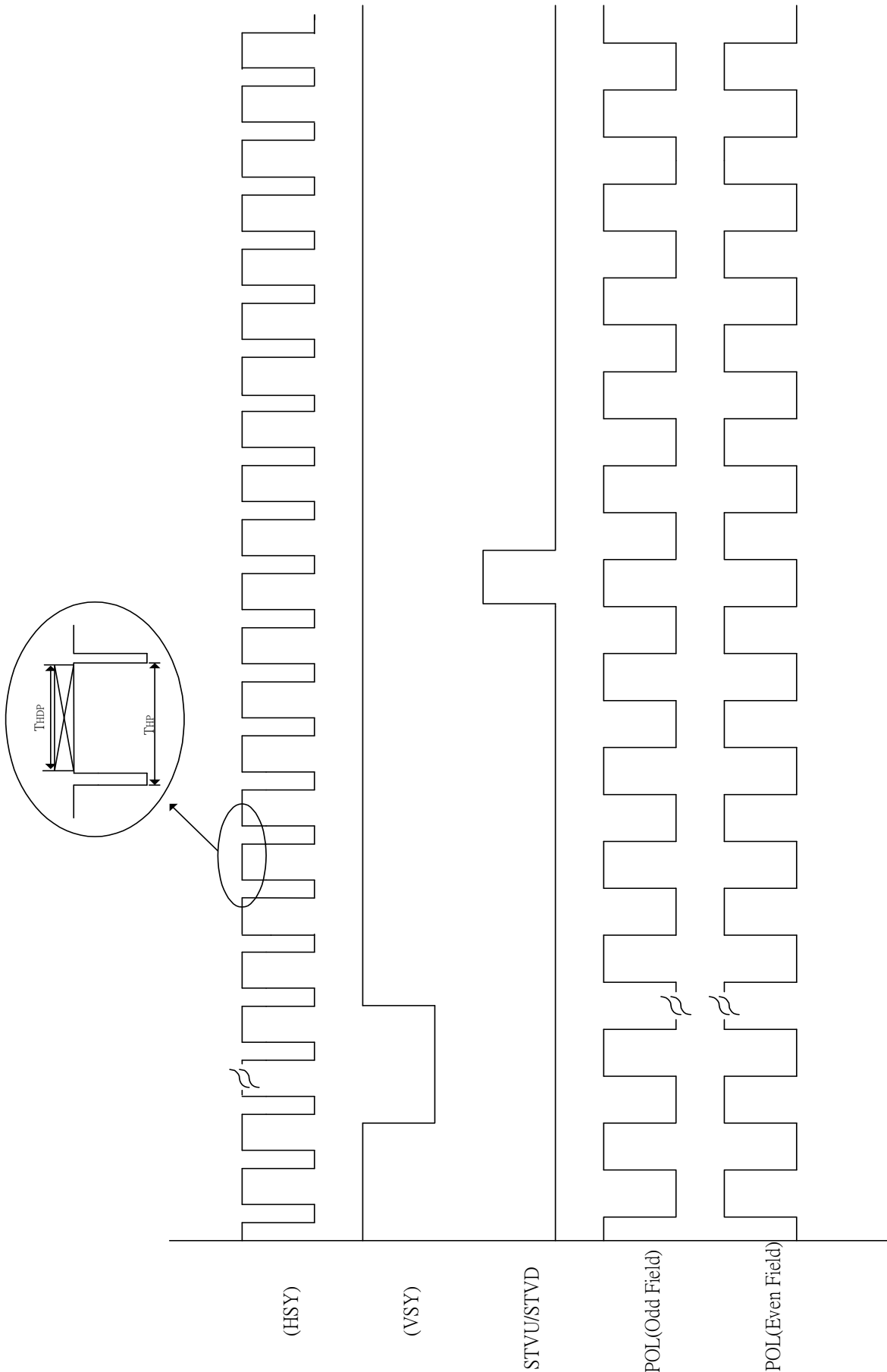
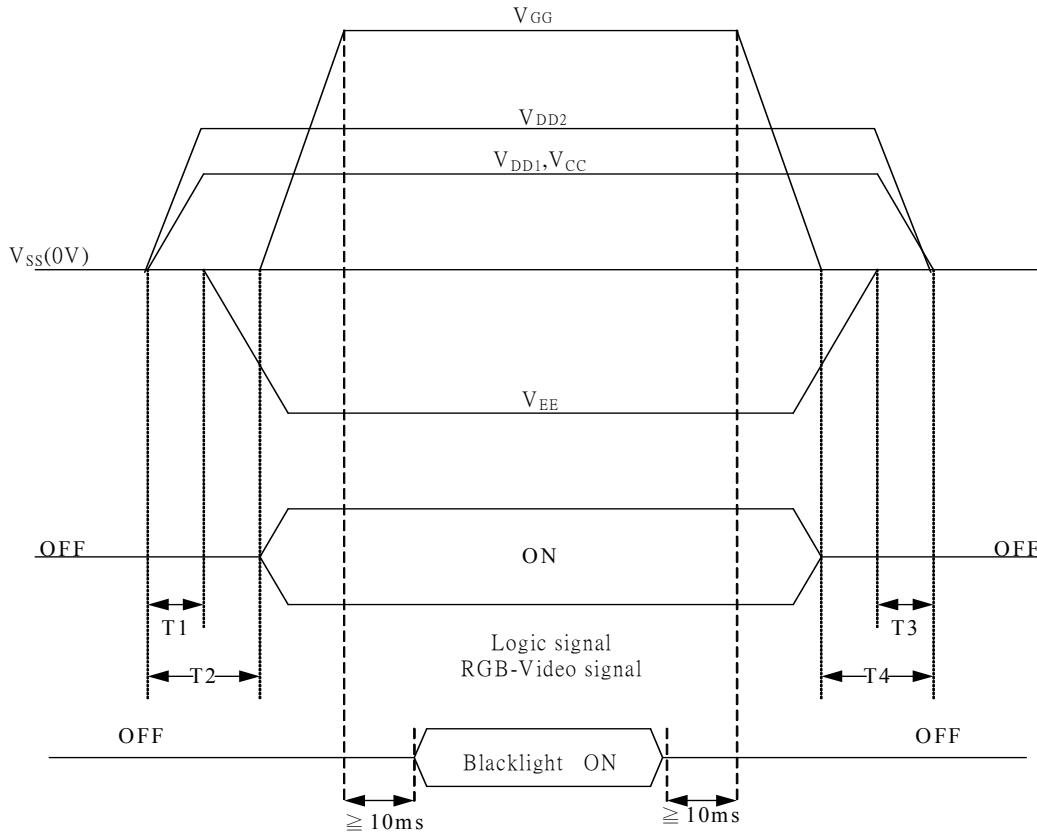


Fig. 11-4 Vertical timing

**12. Power On Sequence**



- 2.  $10\text{ms} \leq T_1 < T_2$
- 2)  $0\text{ms} < T_3 \leq T_4 \leq 10\text{ms}$

**13. Optical Characteristics**

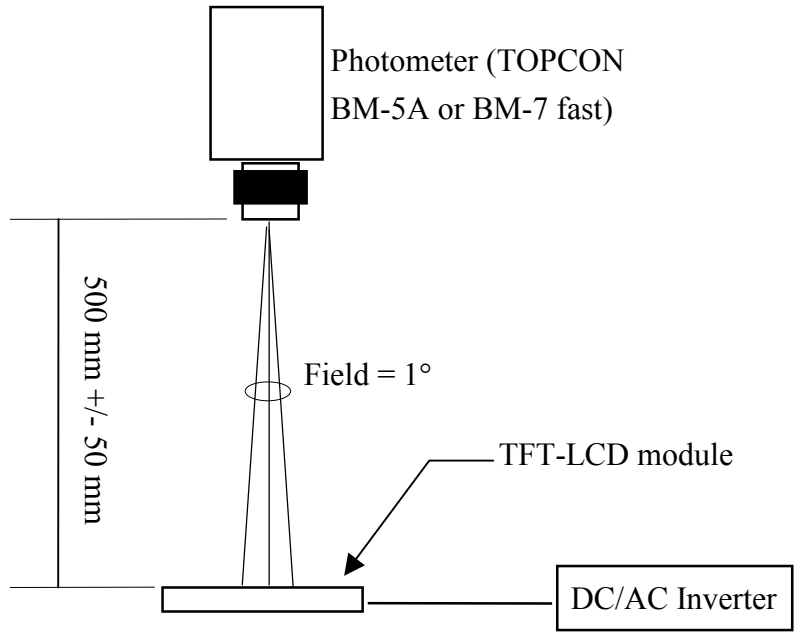
**13-1) Specification:**

The back-light which PVI used is 3.5 “ inch for optical measuring and the specification of average brightness is 3500 (cd/m<sup>2</sup>).

Ta=25°C

Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remarks
Viewing Angle	Horizontal	$\theta 21, \theta 22$	$\pm 45$	$\pm 50$	-	deg	Note 13-2
	Vertical	$\theta 12$ (to 12 o'clock)	10	15	-	deg	
		$\theta 11$ (to 6 o'clock)	30	35	-	deg	
Contrast Ratio	CR	At optimized Viewing angle	200	400	-	-	Note 13-4
Response time	Rise	Tr	-	15	30	ms	Note 13-3
	Fall	Tf	-	25	50	ms	
Transmission ratio	T	$\theta = 0^\circ$	6.7	7.2	-	-	-
White Chromaticity	x	$\theta = 0^\circ$	0.28	0.310	0.34	-	Note 13-1
	y	$\theta = 0^\circ$	0.30	0.330	0.36	-	

All the optical measurement shall be executed 30 minute after backlight being turn-on. The optical characteristics shall be measured in dark room (ambient illumination on panel surface less than 1 Lux). The measuring configuration shows as following figure.

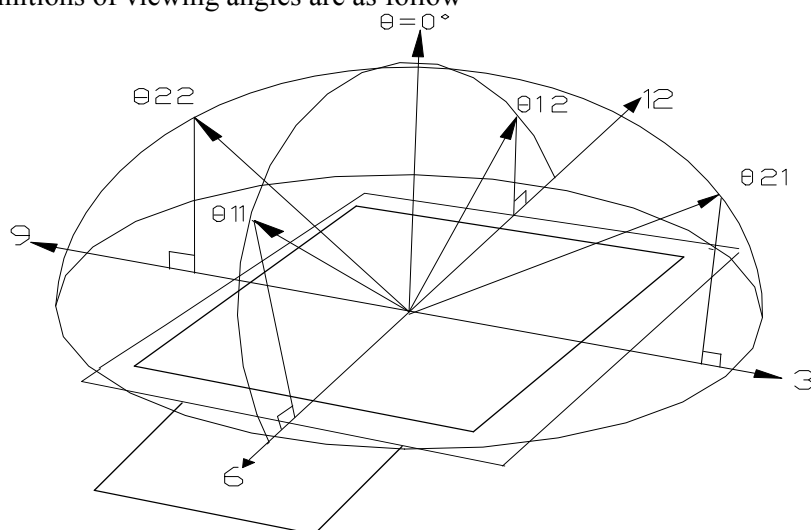


Optical characteristics measuring configuration

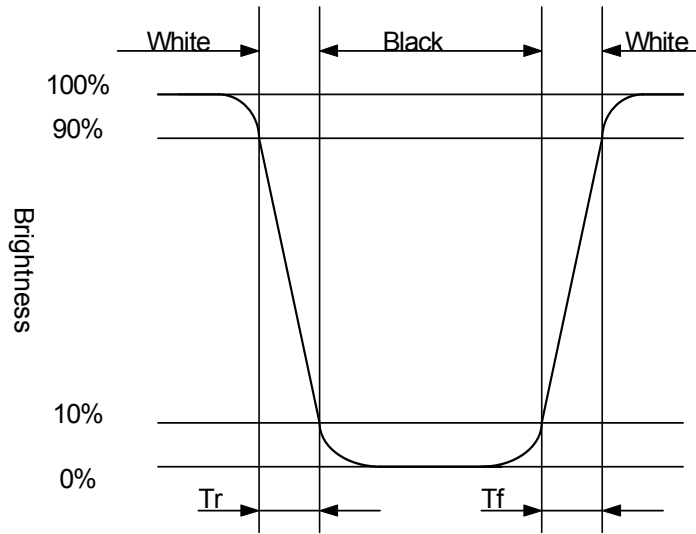
Note 13-1: 1.Topcon BM-5A or BM-7 fast luminance meter 1° field of view is used in the testing (after 30 minute operation).

2.LED current : 20 mA

Note 13-2: The definitions of viewing angles are as follow



Note 13-3: Definition of Response Time  $T_r$  and  $T_f$ :



Note 13-4: The definition of contrast ratio  $CR = \frac{\text{Luminance at gray level 63}}{\text{Luminance at gray level 0}}$

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## 14. Handling Cautions

### 14-1) 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.
- e) Please following the tear off direction as figure14-1 to remove the protective film as slowly as possible, so that electrostatic charge can be minimized.

### 14-2) 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.

### 14-3) 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.

### 14-4) 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.

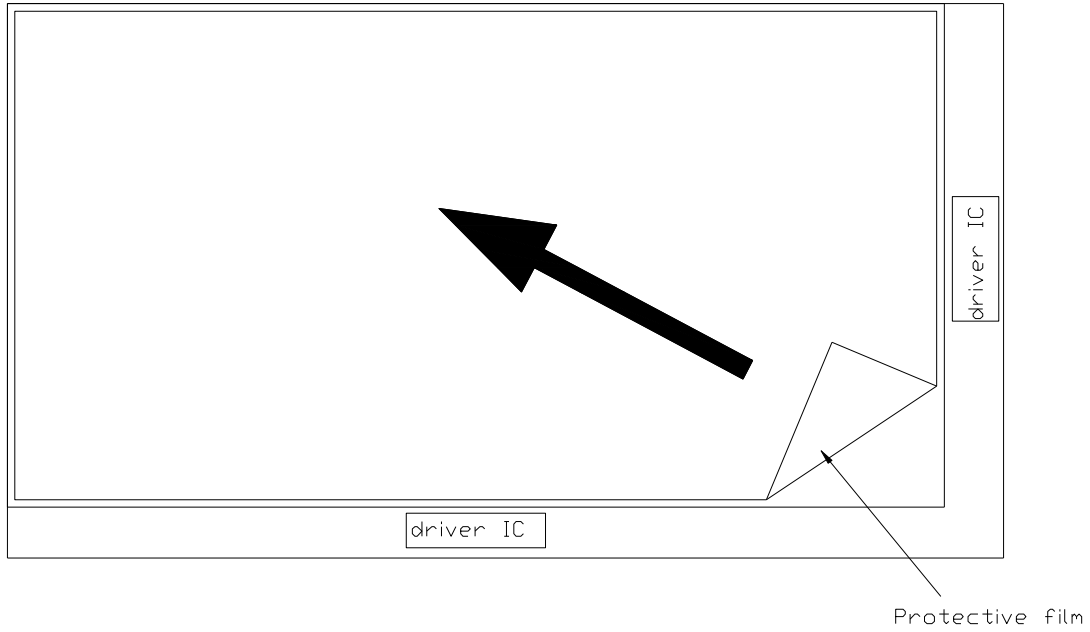


Figure 14-1 the way to peel off protective film

**15. Reliability Test**

No	Test Item	Test Condition	Remark
1	High Temperature Storage Test	Ta = +70°C, 240 hrs	
2	Low Temperature Storage Test	Ta = -20°C, 240 hrs	
3	High Temperature Operation Test	Ta = +70°C, 240 hrs	
4	Low Temperature Operation Test	Ta = -20°C, 240 hrs	
5	High Temperature & High Humidity Operation Test	Ta = +60°C, 90%RH, 240 hrs (No Condensation)	
6	Thermal Cycling Test (non-operating)	-20°C → +70°C, 200 Cycles (30min – 30min)	
7	Electrostatic Discharge Test (non-operating)	200pF, 0Ω ±200V 1 time / each terminal	

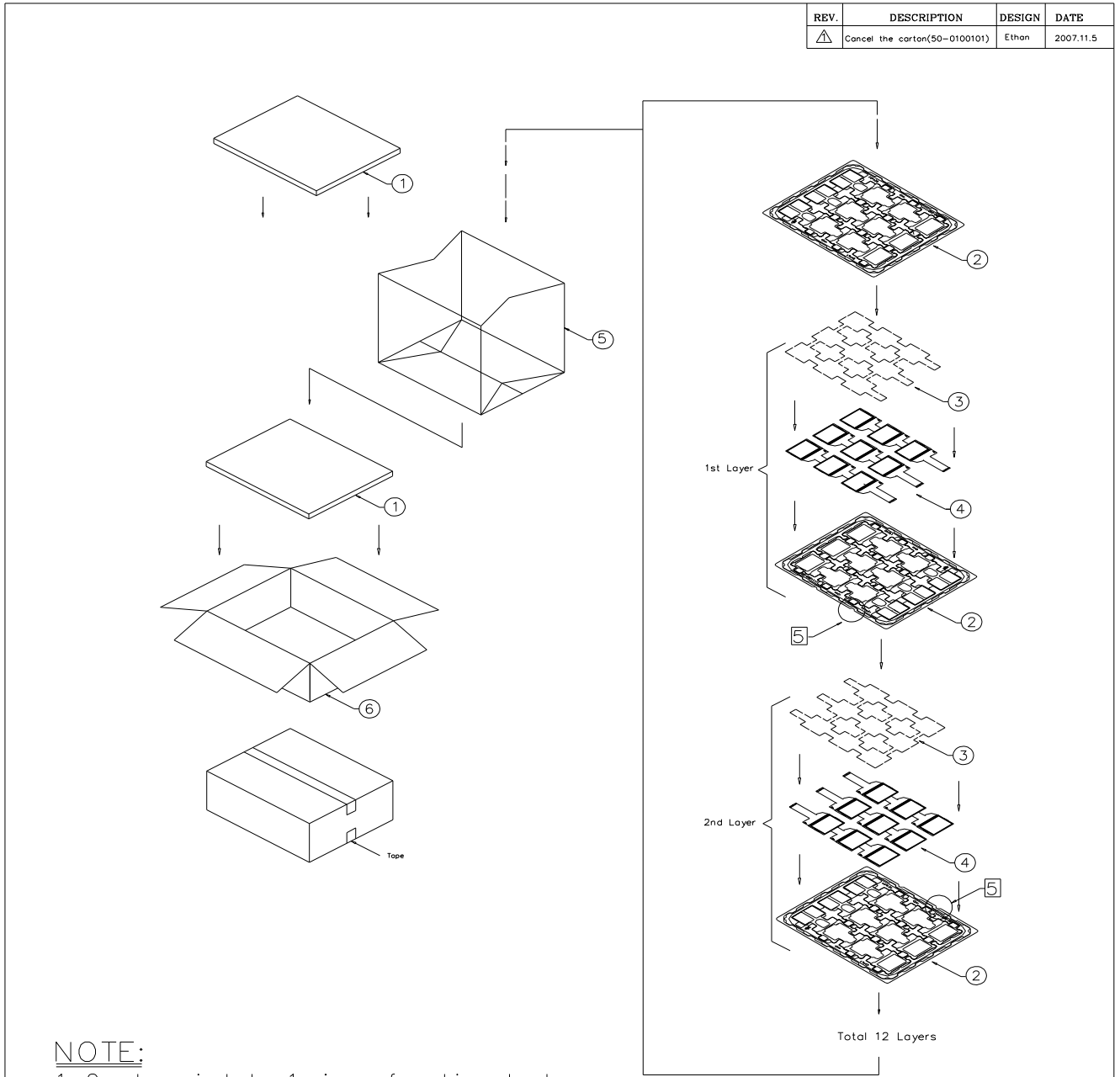
Ta: ambient temperature

Note : The protective film must be removed before temperature test.

[Criteria]

In the standard conditions, there is not display function NG issue occurred. (including : line defect ,no image).All the cosmetic specification is judged before the reliability stress.

**16. Packing Diagram**



**NOTE:**

- 1. One layer include: 1 piece of cushion sheet, 9 pcs panel & 1 piece of tray.
- 2. Q'TY: 108 pcs panel/carton.
- 3. Dimension: 455\*375\*190mm
- 4. Weight: 5.3 KG
- 5. tray需180°交叉堆疊,堆疊後可從側邊檢視圓弧防呆方向是否正確

6	50-0100091	CARTON INTERNAL	1	
5	50-0500041	摺口袋450*380*700mm	1	抗靜電
4		PD035VX1	108	
3	50-0200054	EPE CUSHION SHEET	12	抗靜電
2	50-0301111	TRAY	13	抗靜電
1	50-0300491	EPE FOAM	2	
ITEM	PART NO.	DESCRIPTION	QTY	REMARK

MTL.SPEC.	UNSPECIFIED TOL'S ±5.0mm	REMARK
	ANGLE	
	ROUGHNESS	



元太科技股份有限公司  
Prime View International Co.,Ltd.

APPROVE	Frank Shin	'05.01.21	SCALE	UNIT	SHEET
CHECK	Frank Shin	'05.01.21	1:1	mm	1 OF 1
DESIGN	Dennis	'05.01.21	MTL.NO.		

DWG.TITLE		DWG.NO.	REV.	SIZE
PD035VX1 PACKING Dim			01	A4