

Version :1.0

TECHNICAL SPECIFICATION

MODEL NO. : PD035VX3

Customer's Confirmation

Customer \_\_\_\_\_

By \_\_\_\_\_

PVI's Confirmation

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

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**TECHNICAL SPECIFICATION****CONTENTS**

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## 1. Application

This data sheet applies to a color TFT LCD module, PD035VX3.

The application of panel are projector and other media application which require high quality flat panel display.

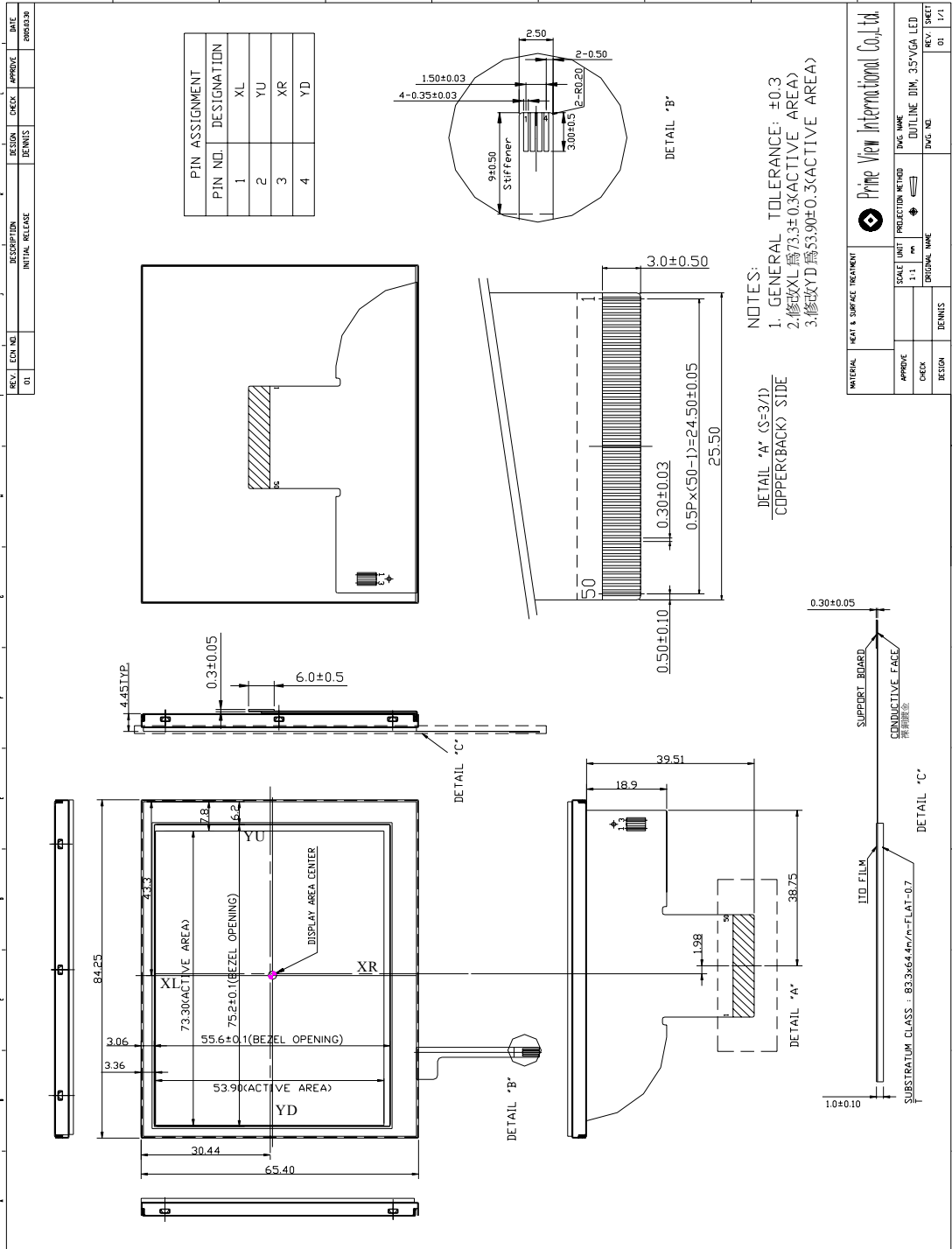
## 2. Features

- . Amorphous silicon TFT LCD panel with LED B/L.
- . Module with resistive type touch panel .
- . Pixel in stripe configuration
- . Display Colors : 262,144 colors
- . Optimum Viewing Direction : 6 o'clock
- . TTL transmission interface

## 3. Mechanical Specifications

<b>Parameter</b>	<b>Specifications</b>	<b>Unit</b>
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	84.25 (W)×65.40 (H)×4.45 (D) (Typ.)	mm
Weight	52±5	g
Surface treatment	AG	
Surface treatment of Touch Panel	3H	

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



**5. Input / Output Terminals**

Pin No.	Symbol	I/O	Function	Remark
1	DIO1	I/O	Horizontal Start Pulse Signal Input or Output 1	Note5 - 1
2	VSS2	I	Ground	
3	VDD1	I	Power Supply	
4	CLK	I	Horizontal Shift Clock	
5	R/L	I	Left/Right Selection	Note 5 - 1
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 - 2
26	REV	I	Data invert control	Note5 - 3
27	POL	I	Polarity selection	Note5 - 4
28	DIO2	I/O	Horizontal Start Pulse Signal Input or Output	Note5 - 1
29	VSS2	I	Ground	
30	V3	I	Gamma Voltage 3	Note5 - 5
31	V5	I	Gamma Voltage 5	Note5 - 5
32	V7	I	Gamma Voltage 7	Note5 - 5
33	V8	I	Gamma Voltage 8	Note5 - 5
34	V10	I	Gamma Voltage 10	Note5 - 5
35	V12	I	Gamma Voltage 12	Note5 - 5
36	VSS2	I	Ground	
37	VDD2	I	Voltage for analog circuit	Note5 - 5
38	VCOM	I	Common Voltage	
39	OE	I	Output Enable	Note5 - 6
40	U/D	I	Up/Down Selection	Note 5 - 7
41	CKV	I	Vertical Shift Clock	Note5 - 8
42	STVU	I/O	Vertical Shift Pulse Signal Input or Output	Note5 - 7
43	STVD	I/O	Vertical Shift Pulse Signal Input or Output	Note5 - 7
44	VGG	I	Gate On Voltage	Note5 - 9
45	VSS1	I	Ground	
46	VCC	I	Voltage for logic circuit	
47	VEE	I	Gate Off Voltage	Note5 - 10
48	VLED	-	Supply voltage for LED backlight	Note5 - 11
49	GLED2	-	Ground for LED backlight	
50	GLED1	-	Ground for LED backlight	

Note 5-1: Select left or right shift

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

Note 5-2: 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 5-3: 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”

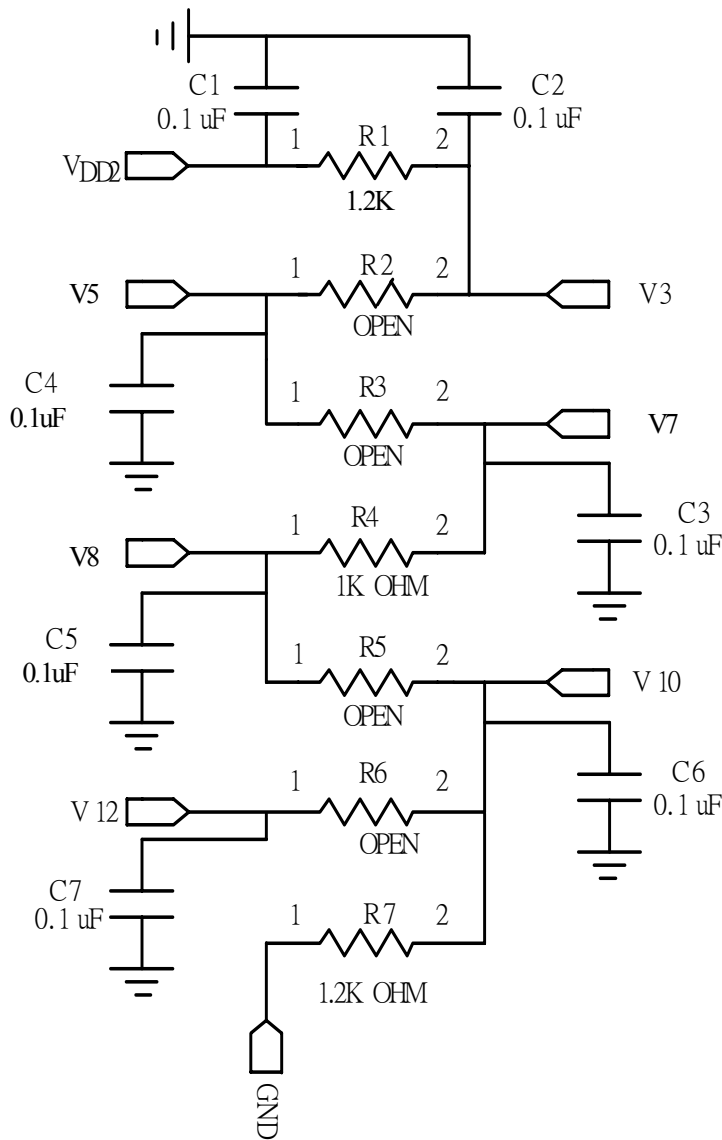
Note 5-4: Polarity selector for dot-inversion control. Available at the rising edge of LD.

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 5-5:

Typical Application Circuit



Note 5-6: 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 5-7: 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 5-8: Gate driver shift clock

Note 5-9: Gate on voltage,  $V_{GG} = +17V$ .

Note 5-10: Gate off voltage,  $V_{EE} = -10V$ .

Note 5-11:  $I_{LED}$  TYP.=20mA.

6.Touch Panel Characteristics

6.1) Pin assignment:

Pin	Symbol	Function	Remark
1	XL	Upper electrode X( left side)	
2	YU	Lower electrode(Upper side)	
3	XR	Upper electrode X( right side)	
4	YD	Lower electrode(Down side)	

6.2) Electrical Performance:

Parameters	Symbol	MIN.	Typ.	MAX.	Unit	Remark
Terminal Resistance	X	100	-	900	$\Omega$	
	Y	100	-	900	$\Omega$	
Input Voltage	$V_T$		5.0	7.0	V	
Linearity(X ,Y direction)				$\pm 1.5$	%	
Insulation Impedance		20			M $\Omega$	DC 25V
Response Time				5	ms	
Operation Force				35	g	Note 6-1

Note 6-1 Input through 0.8R stylus or finger.

6.3) Durability Performance

1. Hitting Durability:

At least 1,000,000 times with R8.0mm silicon rubber, 200g , 3times/sec .

2. Sliding Durability:

At least 1,00,000 times with R0.8mm polyacetal stylus , 200g , 60mm/sec.

7.Absolute Maximum Ratings:

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

Parameters	Symbol	MIN.	MAX.	Unit	Remark
Supply Voltage	$V_{DD1}$	-0.3	2	V	
	$V_{CC}$	-0.3	5	V	
	$V_{DD2}$	-0.5	12.0	V	
	$V_{GG}$	-0.3	40.0	V	
	$V_{GG}-V_{EE}$	-	40.0	V	



	V <sub>EE</sub>	-20	0.3	V	
Storage Temperature	T <sub>ST</sub>	-20	70		
Operating Temperature	T <sub>OP</sub>	0	60		Notes 7-1

Note7-1 : Operating Temperature define that contrast, response time, other display optical character are Ta=+25.

### 8.Electrical Characteristics

#### 8-1) Recommended Operating Conditions:

V<sub>SS1</sub>=V<sub>SS2</sub>=GND = 0V , Ta = 25°C

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Supply Voltage for Source Driver	V <sub>DD1</sub>	3.0	3.3	3.6	V	
	V <sub>DD2</sub>	9.5	10	10.5		
Supply Voltage for Gate Driver	V <sub>GG</sub>	-	+17	-	V	
	V <sub>EE</sub>	-	-10	-	V	
	V <sub>CC</sub>	3.0	3.3	3.6	V	
Supply Voltage for Vcom	Vcom		(2.7)		V	
Digital Input Voltage	V <sub>IH</sub>	0.8V <sub>DD1</sub>	-	V <sub>DD1</sub>	V	
	V <sub>IL</sub>	0	-	0.2V <sub>DD1</sub>	V	

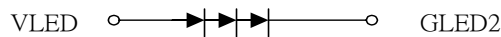
#### 8-2) Recommended driving condition for LED backlight

GND = 0 V , Ta = 25°C

Parameter	Symbol	Min	TYP	MAX	Unit	Remark
Supply voltage of LED backlight	VLED	9	9.6	11.4	V	I <sub>L</sub> = 20 mA
Supply current of LED backlight	ILED1		20		mA	Note 8-1
	ILED2					
Backlight Power Consumption	PLED	360	384	456	mW	Note 8-2

Note 8-1 : LED B/L applied information , please refer to the appendix at the end .

Note 8-2 : PLED = VLED \* ILED1 + VLED \* ILED2 .



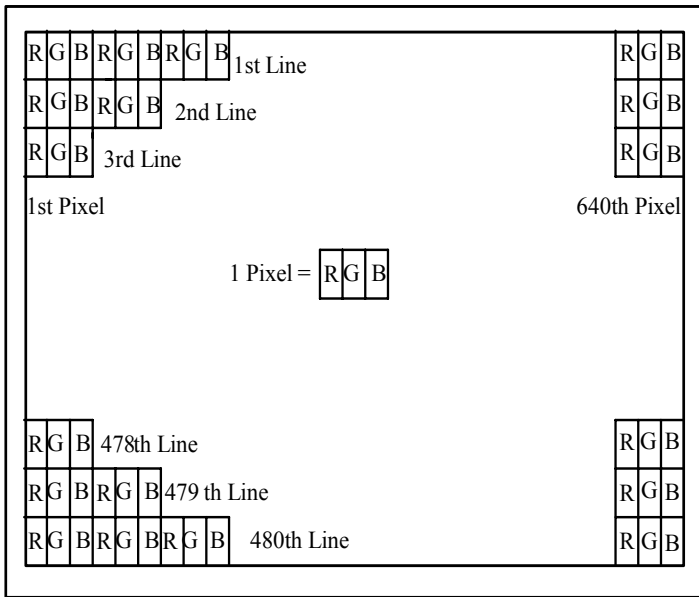
#### 8-3) Power Consumption

Parameter	Symbol	Condition	Typ.	Max.	Unit	Remark
Supply Current for Gate Driver (Hi level)	I <sub>GG</sub>	V <sub>GG</sub> =+17V	0.12	0.15	mA	
Supply Current for Gate Driver (Low level)	I <sub>EE</sub>	V <sub>EE</sub> =-10V	0.15	0.19	mA	
Supply Current for Source Driver (Digital)	I <sub>DD1</sub>	V <sub>DD1</sub> =+3.3V	4.8	8.0	mA	

Supply Current for Source Driver (Analog)	I <sub>DD2</sub>	V <sub>DD2</sub> =+10V	16.0	30.0	mA	
Supply Current for Gate Driver (Digital)	I <sub>CC</sub>	V <sub>CC</sub> =+3.3V	0.17	0.21	mA	
LCD Panel Power Consumption			180	332	mW	
Backlight Power Consumption	P <sub>LED</sub>		384	456	mW	
Total Power Consumption			564	788	mW	

9. Pixel Arrangement

The LCD module pixel arrangement is the stripe.

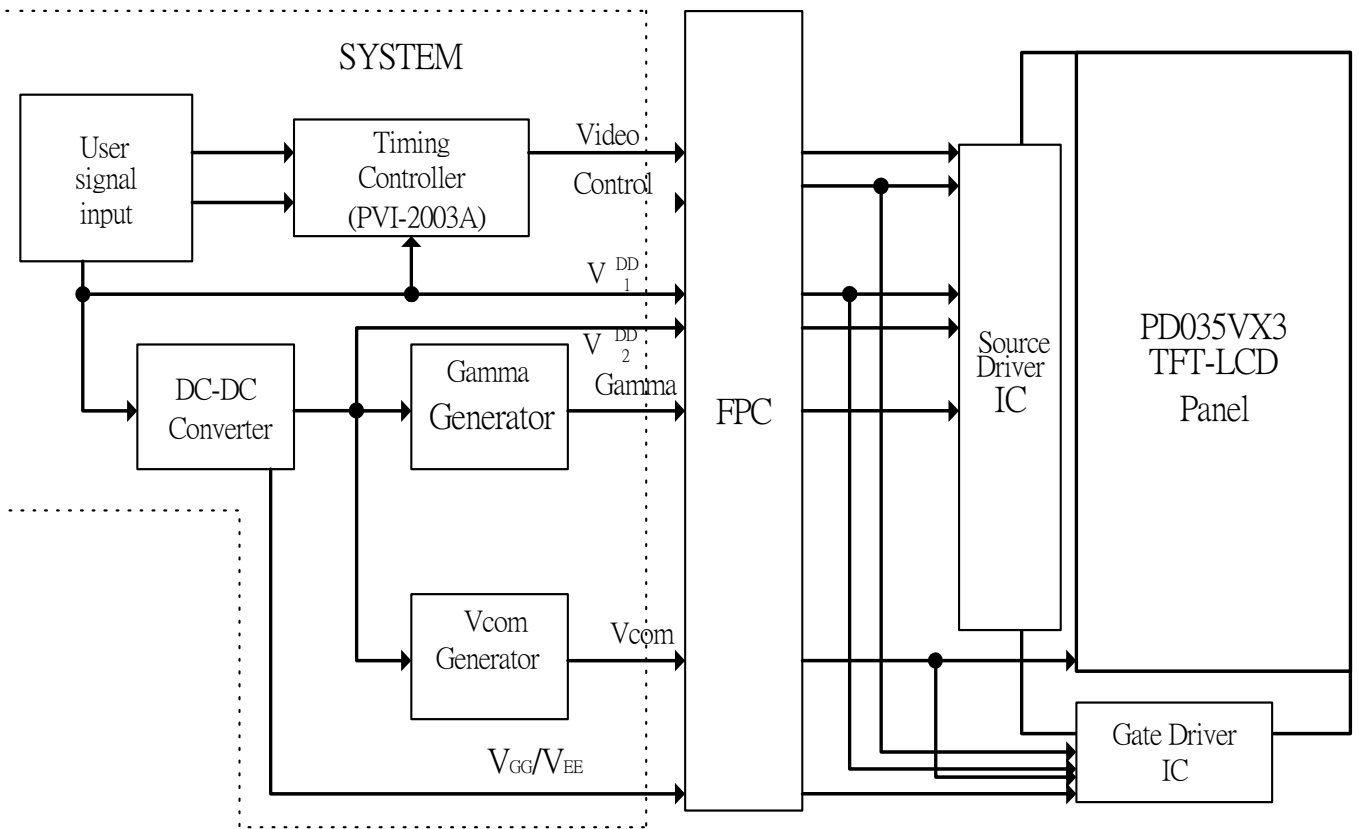


10. Display Color and Gray Scale Reference

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
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

Basic Colors	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	
	Red (01)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Red (02)	0	0	0	0	0	1	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	
	Red (62)	1	1	1	1	1	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	
Green	Green (00)	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	1	0	0	0	0	0	0	
	Green (02)	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	
	Green (62)	0	0	0	0	0	0	1	1	1	1	1	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	
Blue	Blue (00)	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	1	
	Blue (02)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	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

11. Block Diagram



## 12. Interface Timing

### 12.1) Timing Parameters

AC Electrical Characteristics ( $V_{CC}=V_{DD1}=3.3V$ ,  $V_{DD2}=10V$ ,  $GND=V_{SS1}=V_{SS2}=0V$ ,  $T_a=25^{\circ}C$ )

Parameter	Symbol	Min.	Typ.	Max.	Unit
CLK Frequency	Fclk	-	25	40	MHz
CLK Pulse Width	T <sub>CPH</sub>	25	-	-	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>OEV</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>

### 12.2) Timing Diagram

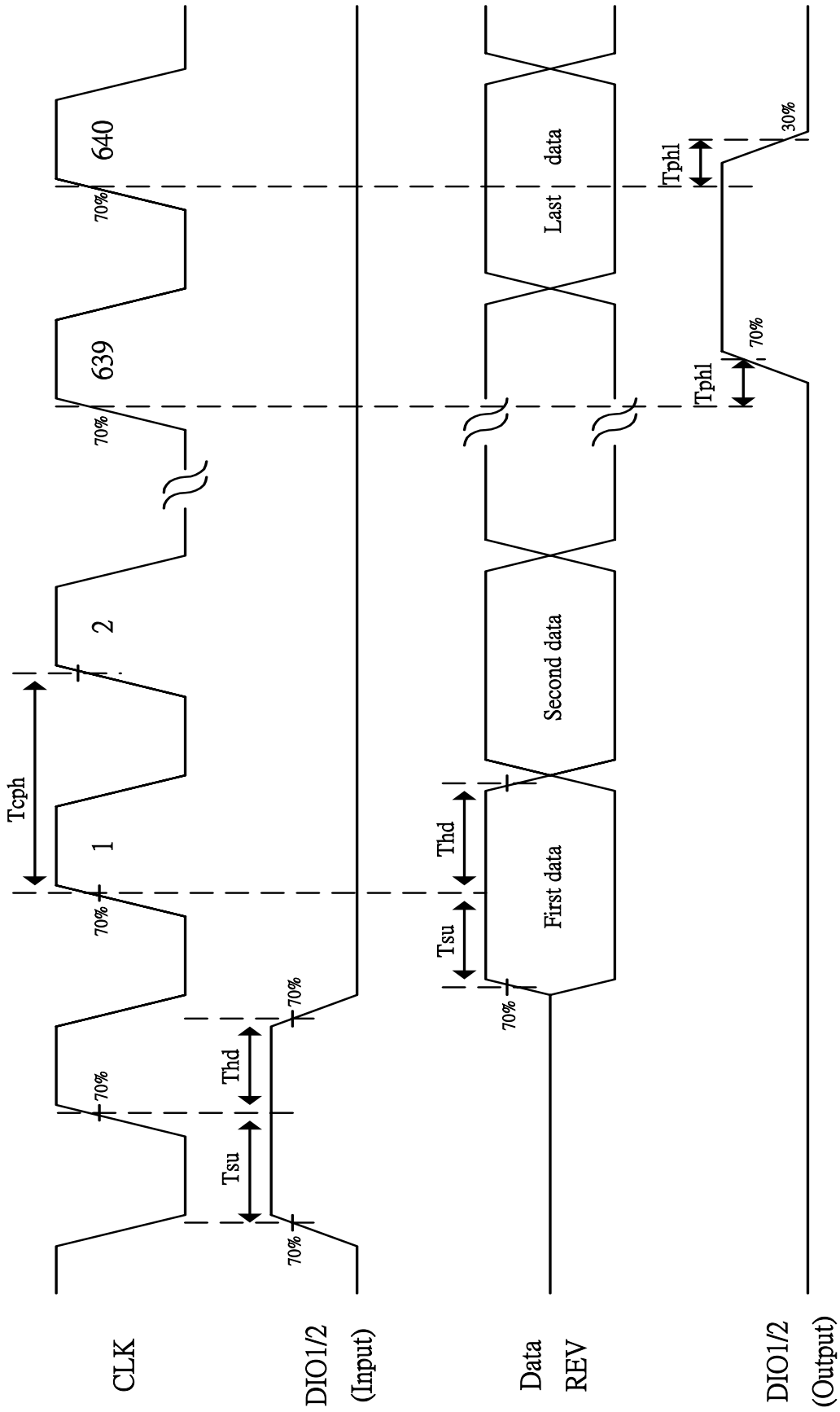


Fig. 1 1-1 Horizontal timing(1)

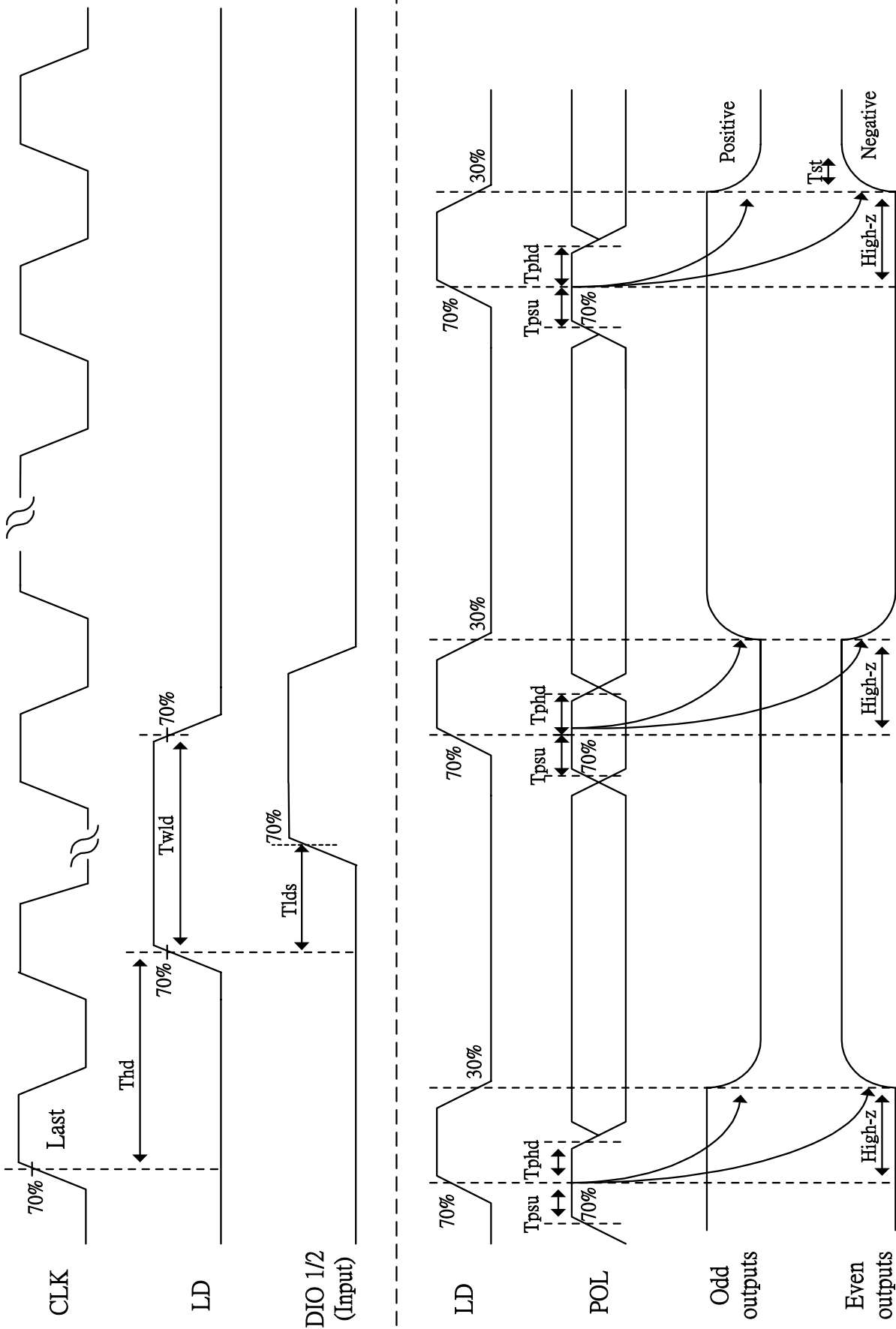


Fig. 11-2 Horizontal timing(2)

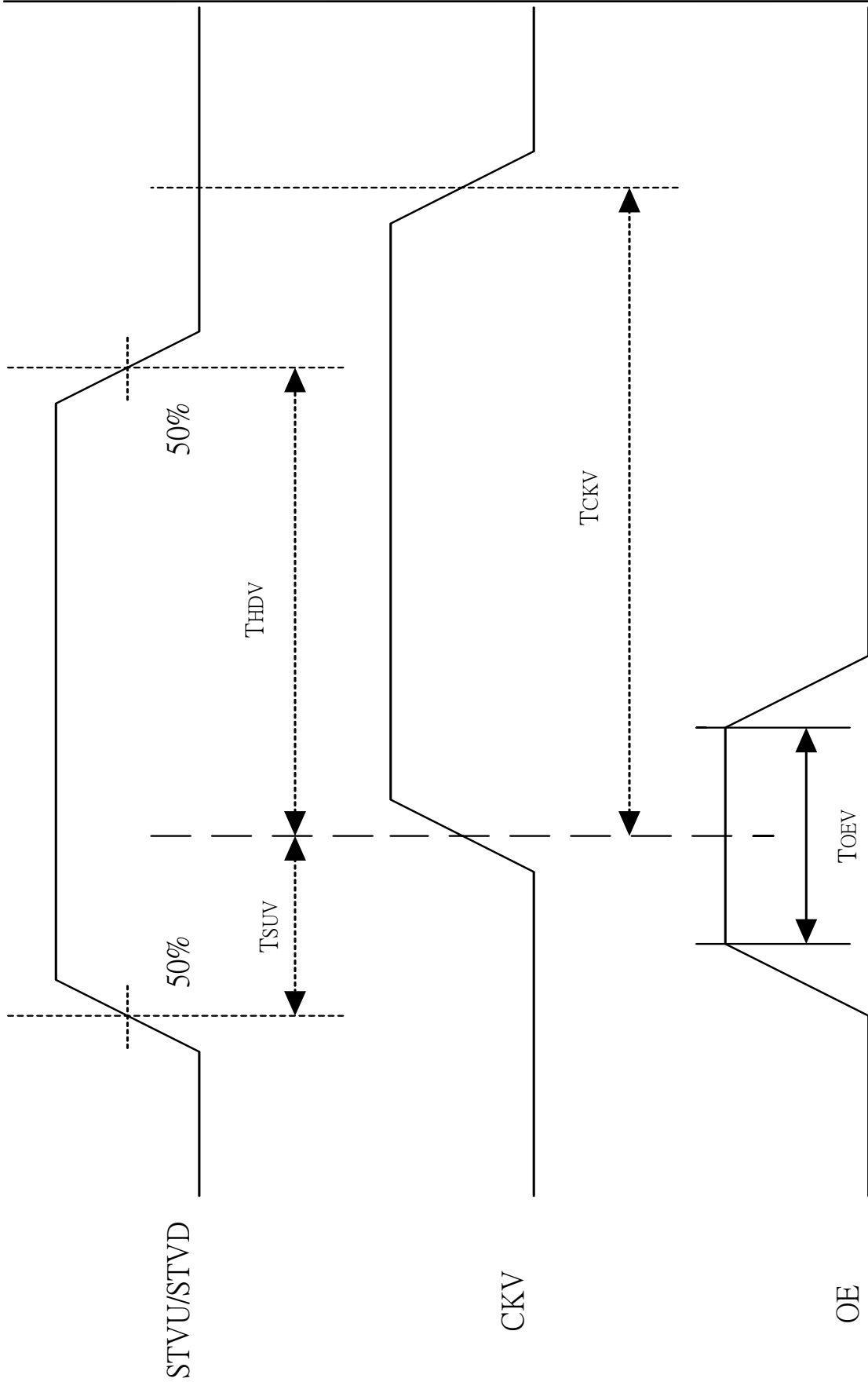


Fig. 11-3 Vertical shift clock timing



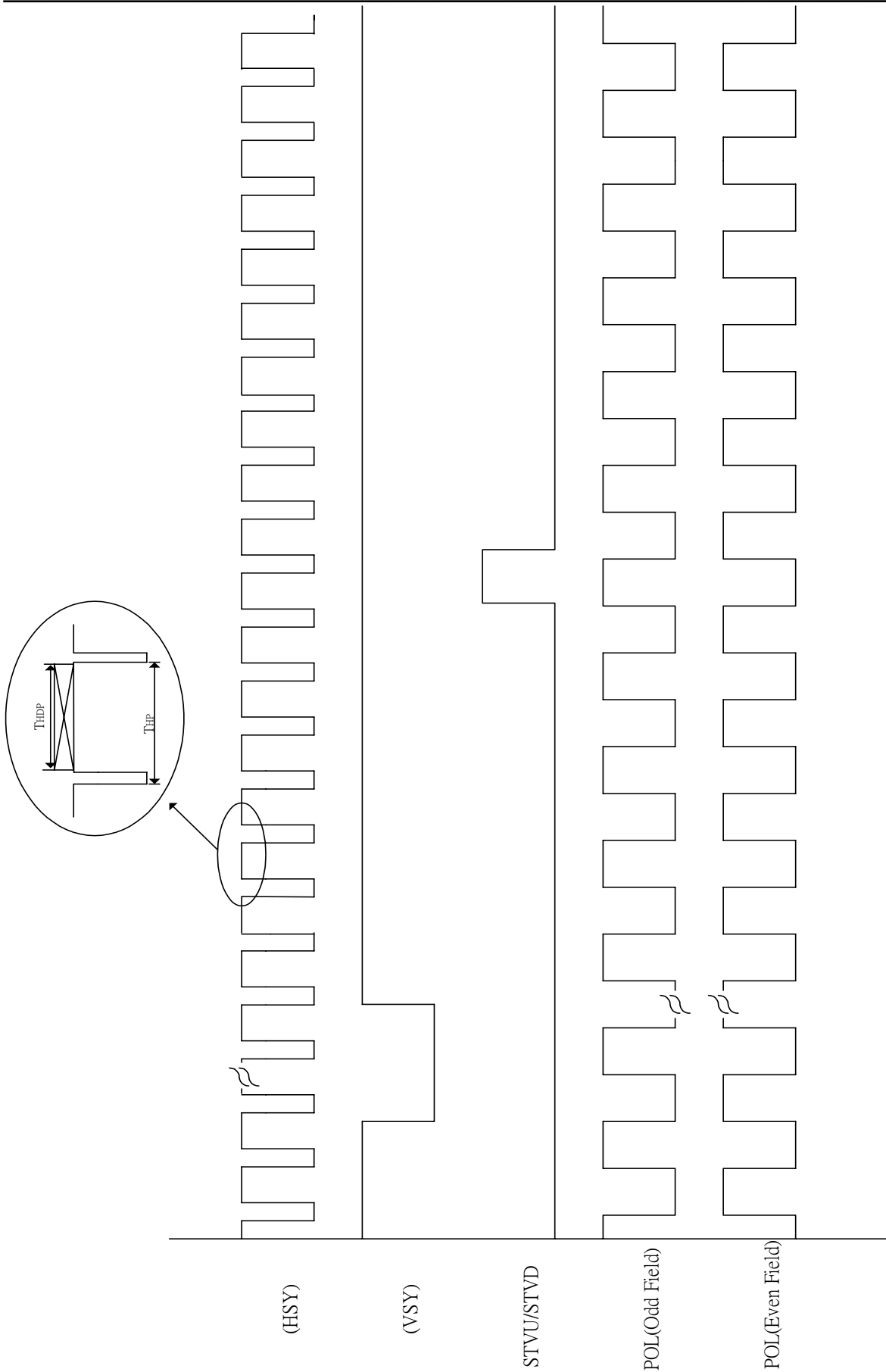
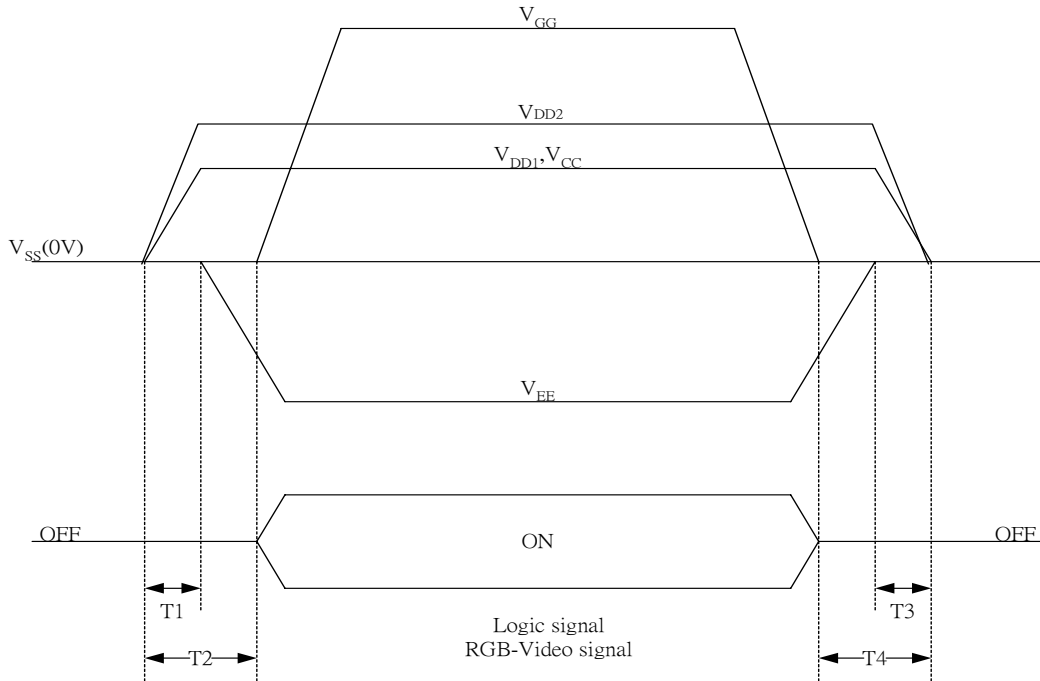


Fig. 11-4 Vertical timing

### 13. Power On Sequence

1)  $10\text{ms} \leq T1 < T2$



2)  $0\text{ms} < T3 \leq T4 \leq 10\text{ms}$

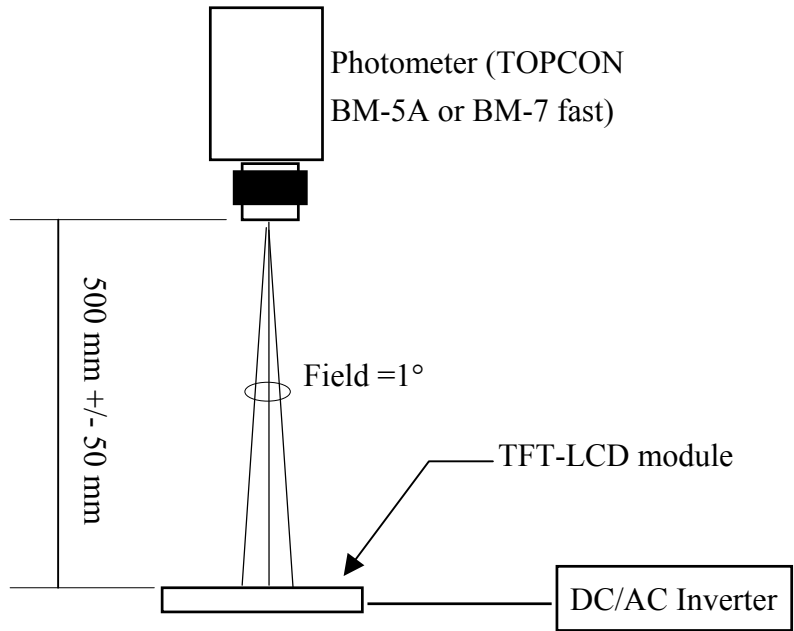
14. Optical Characteristics

14-1) Specification:

$T_a=25^\circ\text{C}$

Parameter		Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remarks
Viewing Angle	Horizontal	$\theta$	$CR > 10$	$\pm 45$	$\pm 50$		deg	Note 14-2
	Vertical	$\theta$ 12(to 12 o'clock)		10	15	-	deg	
		$\theta$ 11(to 6 o'clock)		30	35	-	deg	
Contrast Ratio		CR		200	400	-	-	Note 14-4
Response time	Rise	$T_r$	$\theta = 0^\circ$	-	15	30	ms	Note 14-3
	Fall	$T_f$		-	25	50	ms	
Brightness			$\theta = 0^\circ$	180	210		$\text{cd}/\text{m}^2$	Note 14-1
Uniformity		U	$\theta = 0^\circ$	70	75		%	Note 14-5
Cross Talk			$\theta = 0^\circ$	-	-	3	%	Note 14-6
White Chromaticity		x		0.28	0.31	0.34	-	Note 14-1
		y		0.30	0.33	0.36	-	
LED Life Time	$T_a=25^\circ\text{C}$			-	10000	-	hrs	

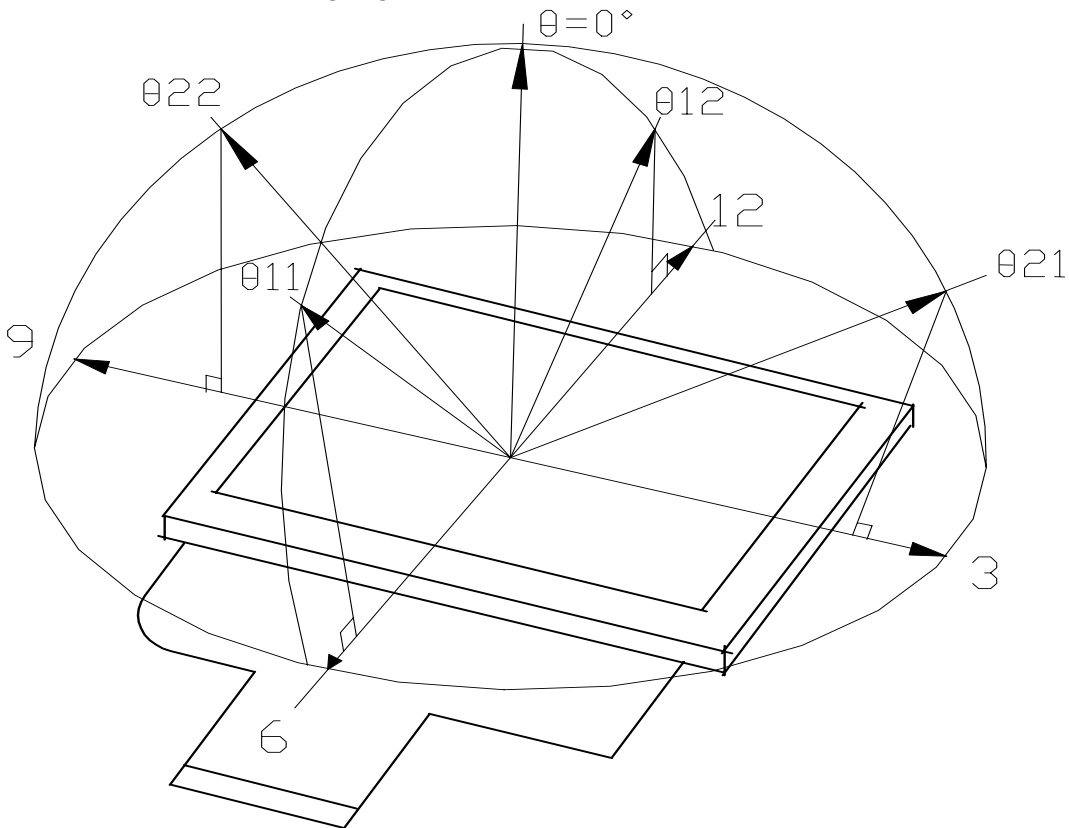
All the optical measurement shall be executed 1 minute after backlight being turn-on. The optical characteristics shall be measured in dark room (ambient illumination on panel surface less than 1 Lux). The measuring configuration shows as following figure.



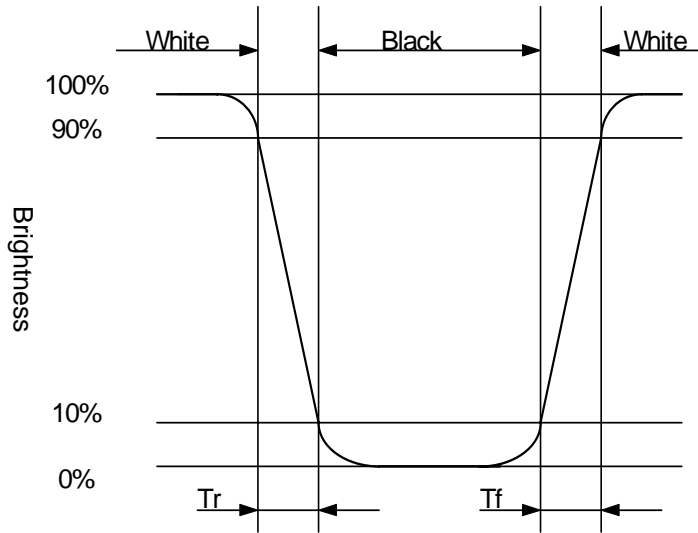
Optical characteristics measuring configuration

Note 14-1: 1. Topcon BM-5A or BM-7 fast luminance meter 1° field of view is used in the testing (after 1 minute operation).

Note 14-2: The definitions of viewing angles are as follow



Note 14-3: Definition of Response Time  $T_r$  and  $T_f$ :



Note 14-4: The definition of contrast ratio  $CR = \frac{\text{Luminance at gray level 63}}{\text{Luminance at gray level 0}}$

Note 14-5 : The uniformity of LCD is defined as

$$U = \frac{\text{The Minimum Brightness of the 9 testing Points}}{\text{The Maximum Brightness of the 9 testing Points}}$$

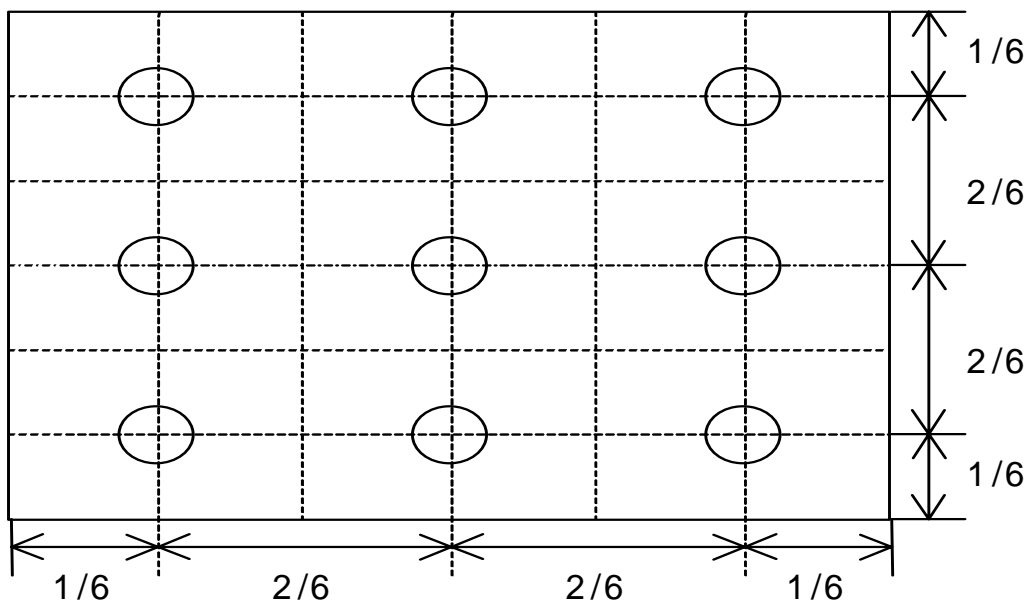
Luminance meter : BM-5A or BM-7 fast (TOPCON)

Measurement distance : 500 mm +/- 50 mm

Ambient illumination : < 1 Lux

Measuring direction : Perpendicular to the surface of module

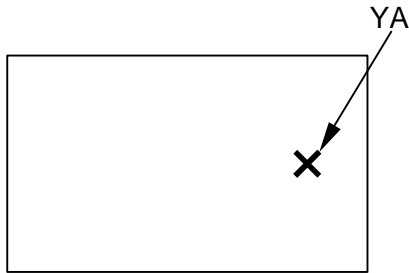
The test pattern is white (Gray Level 63).



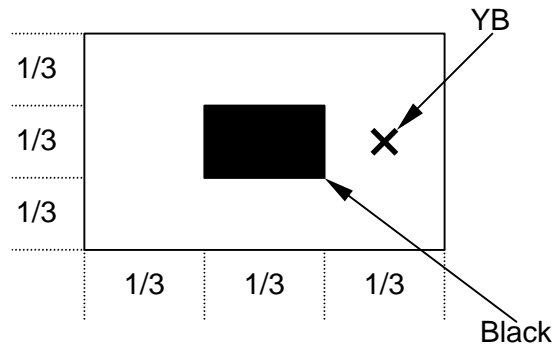
Note 14-6 : Cross Talk (CTK) =  $\frac{|YA-YB|}{YA} \times 100\%$

YA : Brightness of Pattern A  
 YB : Brightness of Pattern B  
 Pattern A

(Gray Level 31)



Pattern B  
 (Gray Level 31, central  
 black box exclusive)



**X**: Testing Point (A and B are at the same point.)

Black  
 (Gray Level 0)

**15. Handling Cautions**

## 15-1) Mounting of module

- a) Please power off the module when you connect the input/output connector.
- b) Polarizer which is made of soft material and susceptible to flaw must be handled carefully.
- c) 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.

## 15-2) Precautions in mounting

- a) Wipe off water drops or finger grease immediately. Long contact with water may cause discoloration or spots.
- b) TFT-LCD module uses glass which breaks or cracks easily if dropped or bumped on hard surface. Please handle with care.
- c) Since CMOS LSI is used in the module. So take care of static electricity and earth yourself when handling.

## 15-3) Precautions about touch panel

- a) Input must be performed through a special designed stylus only. Do not pile up the products or put any heavy things on it.

## 15-4) 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.

**16. Reliability Test**

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No	Test Item	Test Condition
1	High Temperature Storage Test	Ta = +70°C, 240 hrs
2	Low Temperature Storage Test	Ta = -20°C, 240 hrs
3	Low Temperature Operation Test	Ta = 0°C, 240 hrs
4	High Temperature & High Humidity Operation Test	Ta = +60°C, 90%RH, 240 hrs (No Condensation)
5	Thermal Cycling Test (non-operating)	-20°C → +70°C, 100 Cycles 30min 30min
6	Vibration Test (non-operating)	Frequency : 10 ~ 55 Hz 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)	200pF, 0Ω ±200V 1 time / each terminal
9	Hitting Durability Test ( Touch panel)	1,000,000 times, with R 8.0 mm silicon rubber, 200g, 3times/sec
10	Sliding Durability Test ( Touch panel)	1,00,000 times, with R 0.8 mm polyacetal stylus, 200g, 60mm/sec

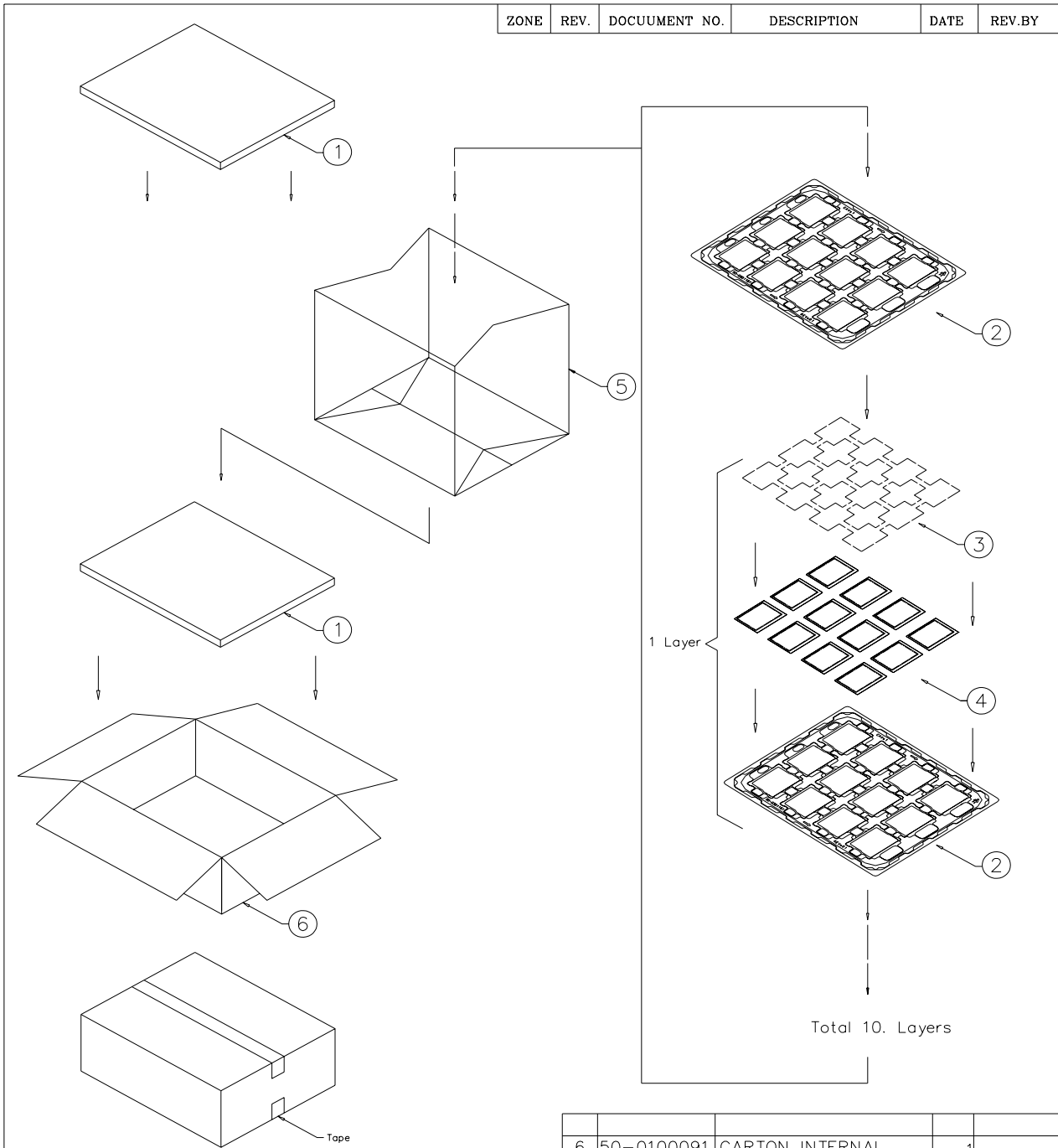
Ta: ambient temperature

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

[Judgement Criteria]

Under the display quality test conditions with normal operation state , there should be no change which may affect practical display function.

17. Packing



**NOTE:**

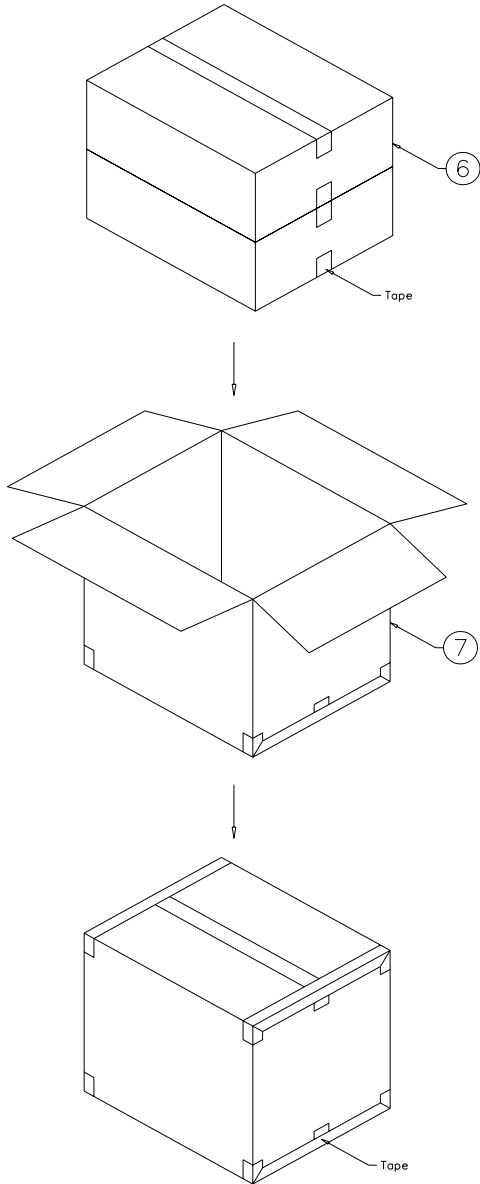
1. One layer include: 1 piece of cushion sheet, 12pcs panel & 1 piece of tray.
2. Q'TY: 120 pcs panel/carton.
3. Dimension: 455\*375\*190mm
4. Weight: 7.7 KG

ITEM	PART NO.	DESCRIPTION	QTY	REMARK
6	50-0100091	CARTON INTERNAL	1	
5	50-0500041	摺口袋450*380*700mm	1	抗靜電
4		PD035VX2	120	
3	50-0200059	EPE CUSHION SHEET	10	抗靜電
2	50-0301181	TRAY	11	抗靜電
1	50-0300491	EPE FOAM	2	

MTL.SPEC.	UNSPECIFIED TOL'S	REMARK		 元太科技股份有限公司 Prime View International Co.,ltd.	
APPROVE	ANGLE	SCALE	UNIT		
CHECK	ROUGHNESS	SHEET	1 OF 2		
DESIGN	Dennis	'05.01.21	MTL.NO.	DWG.NO.	
				REV. 01	A4 SIZE



ZONE	REV.	DOCUMENT NO.	DESCRIPTION	DATE	REV. BY
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NOTE:

1. Q'TY: 240 pcs panel/carton.
2. Dimension: 480\*396\*405mm
3. Weight: 16.3 KG

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

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

APPROVE		SCALE	UNIT	SHEET	DWG.TITLE
CHECK				2 OF 2	PA035VX2 PACKING Dim
DESIGN	Dennis	'05.01.21	MTL.NO.	DWG.NO.	REV. 01
					A4 SIZE

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### Revision History

<b>Rev.</b>	<b>Issued Date</b>	<b>Revised Contents</b>
0.1	Apr. 12 , 2005	Preliminary
1.0	July.15 , 2005	Release version

## Appendix

