

# **INNOLUX DISPLAY CORPORATION**

## **LCD MODULE**

# **SPECIFICATION**

**Customer:** \_\_\_\_\_  
**Model Name:** AT080TN03 V.4  
**SPEC NO.:** A080-03-TT-42  
**Date:** 2009/03/12  
**Version:** 02

- Preliminary Specification  
 Final Specification

<b>Remark</b>
<input checked="" type="checkbox"/> Touch Screen Panel

### For Customer's Acceptance

Approved by	Comment

Approved by	Reviewed by	Prepared by
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### Record of Revision

Version	Revise Date	Page	Content
Final Spec. 01	2008/10/22	1	Modify LCM weight
		31	Modify LED lightbar wire length to 125mm
02	2009/03/12	32	Modify the weight of Package Material and total weight

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# 1. General Specifications

No.	Item	Specification	Remark
1	LCD size	8.0 inch(Diagonal)	
2	Driver element	a-Si TFT active matrix	
3	Resolution	800 × 3(RGB) × 480	
4	Display mode	Normally White, Transmissive	
5	Dot pitch	0.0736(W) × 0.2070(H) mm	
6	Active area	176.64(W) × 99.36(H) mm	TFT Panel Active area
7	Module size	192.8(W) × 116.9(H) × 8.25(D) mm	Note 1
8	Surface treatment	Anti-Glare	
9	Color arrangement	RGB-stripe	
10	Interface	Digital	
11	Backlight Power consumption	2.376W (Typ.)	
12	Panel Power consumption	268mW (Typ.)	
13	Weight	305g (Typ.)	

Note 1: Refer to Mechanical Drawing.

## 2. Pin Assignment

### 2.1. TFT LCD Panel Driving Section

FPC connector is used for the module electronics interface. The recommended model is P-TWO “AF 730L-A2G1T” manufactured by P-TWO.

Pin No.	Symbol	I/O	Function	Remark
1	POL	I	Polarity selection	
2	STVD	I/O	Vertical start pulse input when U/D= H	Note 1
3	OEV	I	Output enable	
4	CKV	I	Vertical clock	
5	STVU	I/O	Vertical start pulse input when U/D= L	Note 1
6	GND	P	Power ground	
7	EDGSL	I	Select edge	
8	V <sub>CC</sub>	P	Power supply for digital circuit	
9	V <sub>9</sub>	I	Gamma voltage level 9	
10	V <sub>GL</sub>	P	Gate OFF voltage	
11	V <sub>2</sub>	I	Gamma voltage level 2	
12	V <sub>GH</sub>	P	Gate ON voltage	
13	V <sub>6</sub>	I	Gamma voltage level 6	
14	U/D	I	Up/down selection	Note 1,2
15	V <sub>COM</sub>	I	Common voltage	
16	GND	P	Power ground	
17	AV <sub>DD</sub>	P	Power supply for analog circuit	
18	V <sub>14</sub>	I	Gamma voltage level 14	
19	V <sub>11</sub>	I	Gamma voltage level 11	

20	V8	I	Gamma voltage level 8	
21	V5	I	Gamma voltage level 5	
22	V3	I	Gamma voltage level 3	
23	GND	P	Power ground	
24	R5	I	Red data(MSB)	
25	R4	I	Red data	
26	R3	I	Red data	
27	R2	I	Red data	
28	R1	I	Red data	
29	R0	I	Red data(LSB)	
30	GND	P	Power ground	
31	GND	P	Power ground	
32	G5	I	Green data(MSB)	
33	G4	I	Green data	
34	G3	I	Green data	
35	G2	I	Green data	
36	G1	I	Green data	
37	G0	I	Green data(LSB)	
38	STHL	I/O	Horizontal start pulse input when R/L = L	Note 1
39	REV	I	Control signal are inverted or not	Note3
40	GND	I	Power ground	
41	DCLK	I	Sample clock	
42	V <sub>CC</sub>	P	Power supply for digital circuit	
43	STHR	I/O	Horizontal start pulse input when R/L = H	Note 1
44	LD	I	Latches the polarity of outputs and switches the new data to outputs	

45	B5	I	Blue data (MSB)	
46	B4	I	Blue data	
47	B3	I	Blue data	
48	B2	I	Blue data	
49	B1	I	Blue data	
50	B0	I	Blue data (LSB)	
51	R/L	I	Right/ left selection	Note 1,2
52	V1	I	Gamma voltage level 1	
53	V4	I	Gamma voltage level 4	
54	V7	I	Gamma voltage level 7	
55	V10	I	Gamma voltage level 10	
56	V12	I	Gamma voltage level 12	
57	V13	I	Gamma voltage level 13	
58	AV <sub>DD</sub>	P	Power supply for analog circuit	
59	GND	P	Power ground	
60	V <sub>COM</sub>	I	Common voltage	

I: input, O: output, P: Power

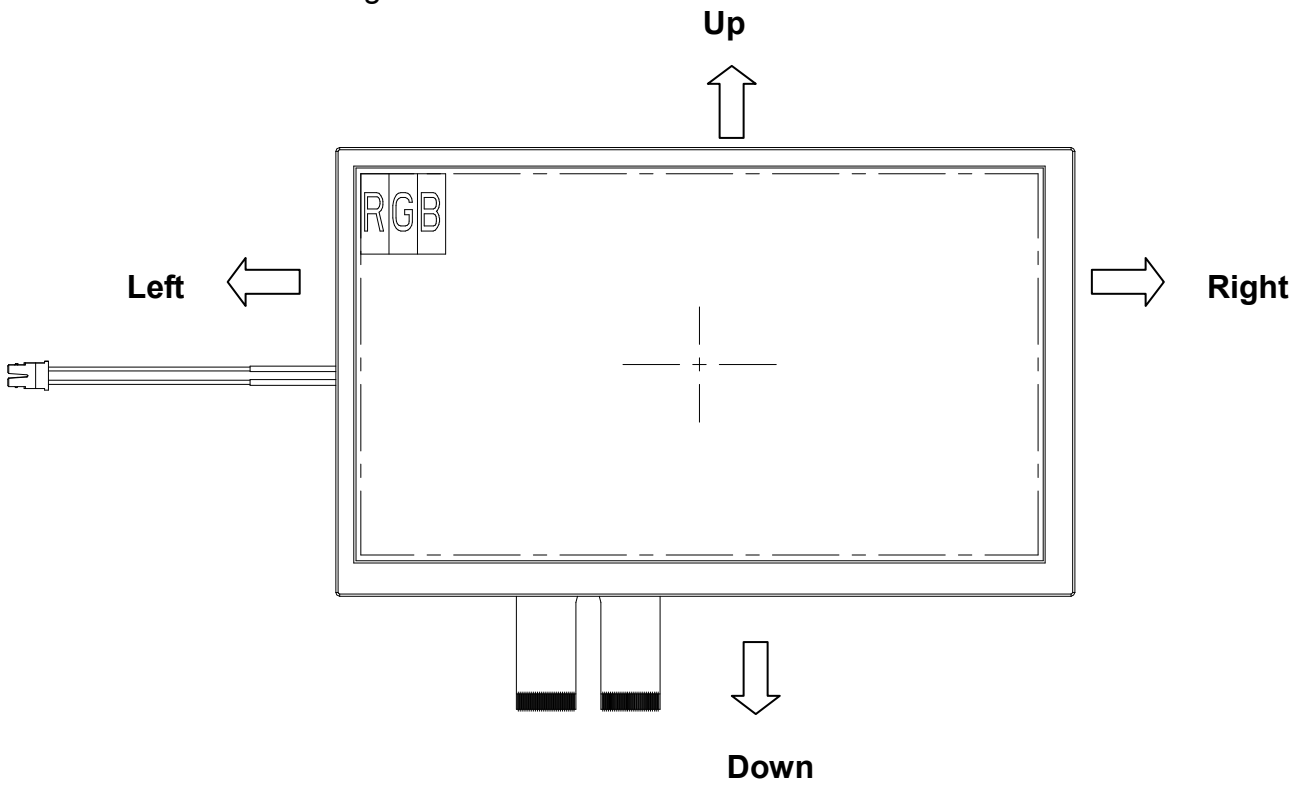
Note 1: Selection of scanning mode

Setting of scan control input		IN/OUT state for start pulse				Scanning direction
U/D	R/L	STVD	STVU	STHR	STHL	
GND	V <sub>CC</sub>	O	I	I	O	Up to down, left to right
V <sub>CC</sub>	GND	I	O	O	I	Down to up, right to left
GND	GND	O	I	O	I	Up to down, right to left
V <sub>CC</sub>	V <sub>CC</sub>	I	O	I	O	Down to up, left to right

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



Note 3: When REV="L" , normally  
REV="H", these data will be inverted.



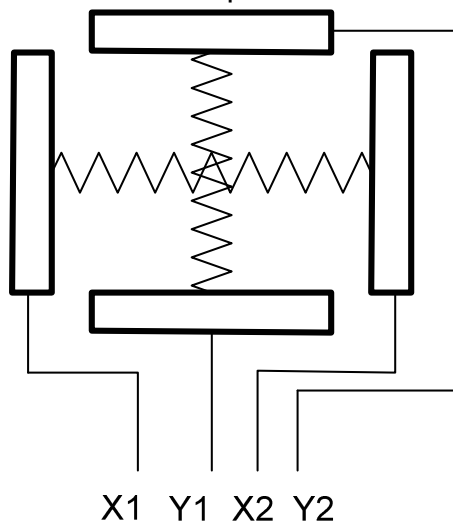
## 2.2. Backlight Unit Section

Pin No.	Symbol	I/O	Function	Remark
1	V <sub>LED+</sub>	P	Power for LED backlight anode	Pink
2	V <sub>LED-</sub>	P	Power for LED backlight cathode	White

## 2.3. Touch Screen Panel Section

Pin No.	Symbol	I/O	Function	Remark
1	Y2	Top	Top electrode – differential analog	
2	X2	Right	Right electrode – differential analog	
3	Y1	Bottom	Bottom electrode – differential analog	
4	X1	Left	Left electrode – differential analog	

Note: Touch screen panel block



Top View

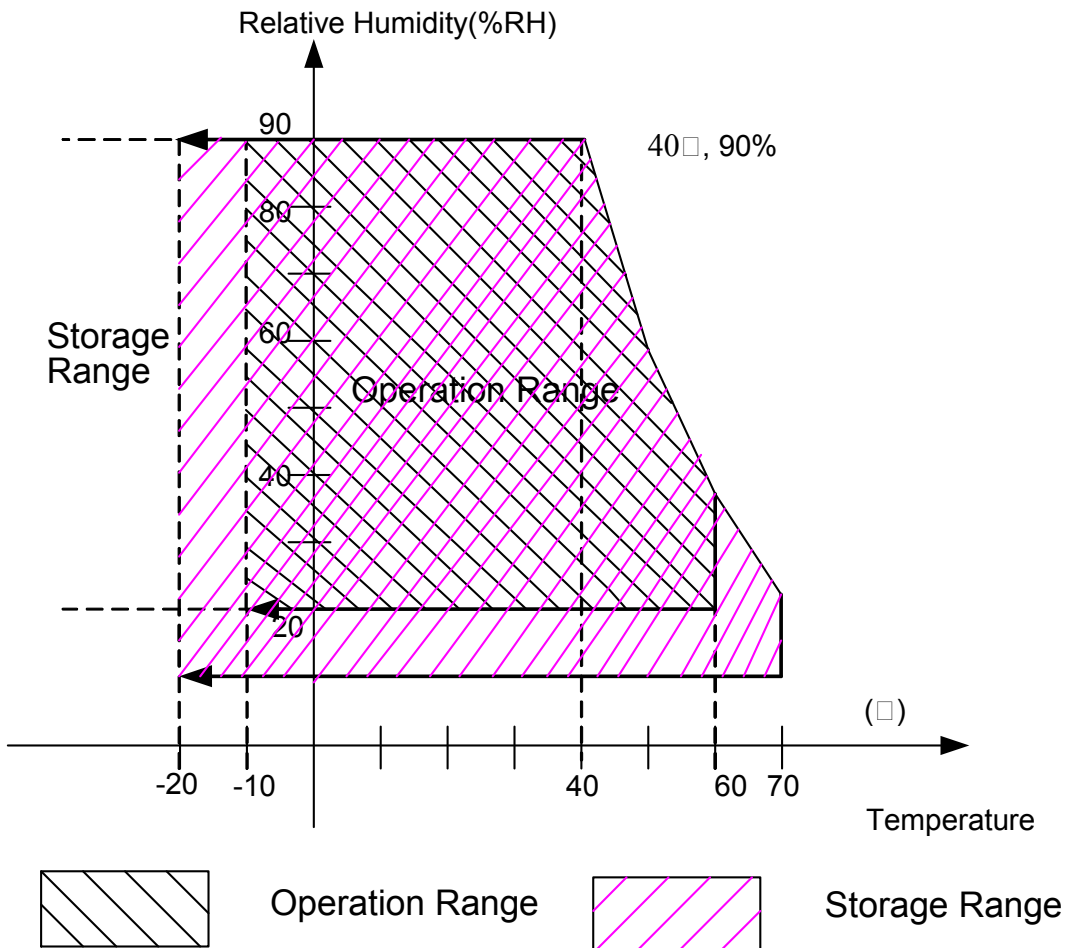
### 3. Operation Specifications

#### 3.1. Absolute Ratings of Environment

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Operation temperature	T <sub>OP</sub>	-10	60	°C	Note 1, 2
Storage temperature	T <sub>ST</sub>	-20	70	°C	Note 1, 2

Note 1 : 90% RH Max.(Max wet temp. is 40°C )

Maximum wet-bulb temperature is at 38°C or less. And No condensation (no drops of dew)



Note2: In case of temperature below 0°C, the response time of liquid crystal (LC) becomes slower and the color of panel darker than normal one.

### 3.2. Electrical Absolute Maximum Rating

(GND=AV<sub>SS</sub>=0V, Note 2)

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power voltage	V <sub>CC</sub>	-0.3	5.0	V	
	AV <sub>DD</sub>	-0.5	13.5	V	
	V <sub>GH</sub>	13.0	19.0	V	
	V <sub>GL</sub>	-12.0	-2.0	V	
	V <sub>GH</sub> -V <sub>GL</sub>	-	31.0	V	
Input signal voltage	V1~V7	0.4 AV <sub>DD</sub>	AV <sub>DD</sub> +0.3	V	Note 1
	V8~V14	-0.3	0.6AV <sub>DD</sub>	V	Note 1
LED Reverse Voltage	V <sub>R</sub>	-	1.2	V	Each LED Note 3
LED Forward Current	I <sub>F</sub>	-	25	mA	Each LED

Note 1: AV<sub>DD</sub>-0.1 ≥ V1 ≥ V2 ≥ V3 ≥ V4 ≥ V5 ≥ V6 ≥ V7 ≥ V8 ≥ V9 ≥ V10 ≥ V11 ≥ V12 ≥ V13 ≥ V14 ≥ V<sub>SS</sub>+0.1

Note 2: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

Note 3: V<sub>R</sub> Conditions: Zener Diode 20mA

**3.2.1. Typical Operation Conditions**

(GND=AV<sub>SS</sub>=0V, Note 1)

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	V <sub>CC</sub>	3.0	3.3	3.6	V	Note 2
	AV <sub>DD</sub>	9.8	10	10.2	V	
	V <sub>GH</sub>	14.3	15	15.7	V	
	V <sub>GL</sub>	-10.5	-10	-9.5	V	
Input signal voltage	V <sub>COM</sub>	-	4.1	-	V	
	V1~V7	0.4 A <sub>VDD</sub>	-	A <sub>VDD</sub> -0.1	V	
	V8~V14	0.1	-	0.6 A <sub>VDD</sub>	V	
Input logic high voltage	V <sub>IH</sub>	0.7V <sub>CC</sub>	-	V <sub>CC</sub>	V	Note 3
Input logic low voltage	V <sub>IL</sub>	0	-	0.3V <sub>CC</sub>	V	

Note 1: Be sure to apply V<sub>CC</sub> and V<sub>GL</sub> to the LCD first, and then apply V<sub>GH</sub>.

Note 2: V<sub>CC</sub> setting should match the signals output voltage (refer to Note 3) of customer's system board.

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

**3.2.2. Current Consumption**

(GND=AV<sub>SS</sub>=0V)

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Current for Driver	I <sub>GH</sub>	-	0.2	0.5	mA	V <sub>GH</sub> =15.0V
	I <sub>GL</sub>	-	0.2	1.0	mA	V <sub>GL</sub> = -10.0V
	I <sub>CC</sub>	-	4.0	10.0	mA	V <sub>CC</sub> =3.3V
	I <sub>AV<sub>DD</sub></sub>	-	25.0	50.0	mA	AV <sub>DD</sub> =10.0V

**3.2.3. Backlight Driving Conditions**

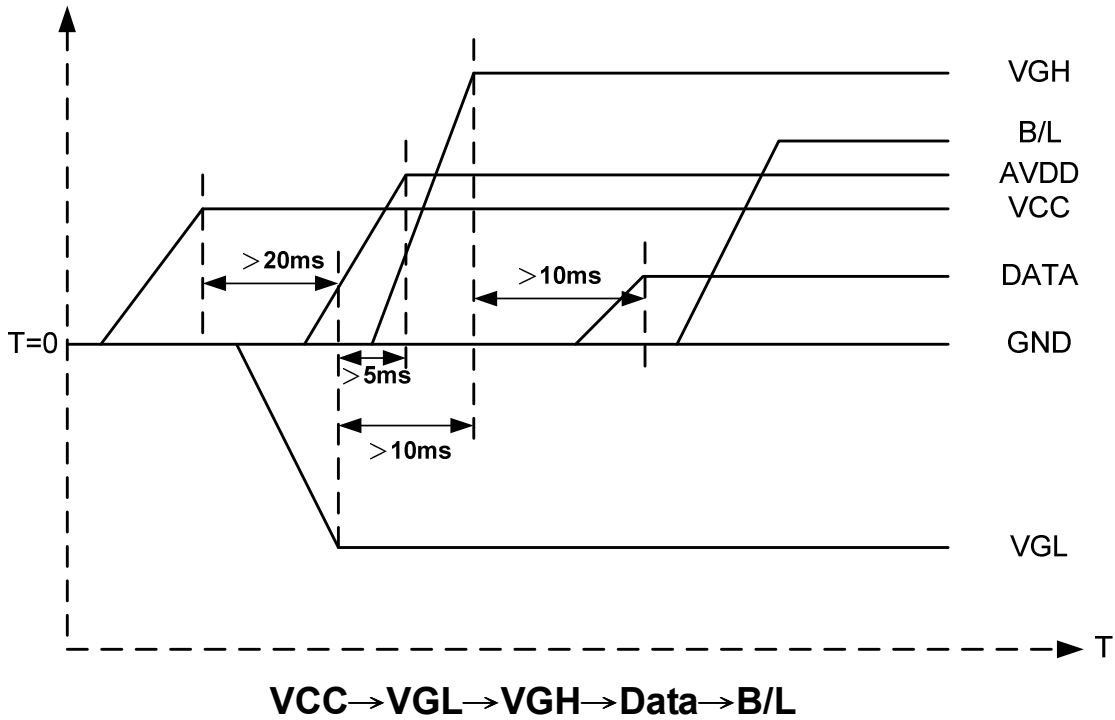
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED Backlight	V <sub>L</sub>	9.3	9.9	10.5	V	Note 1
Current for LED Backlight	I <sub>L</sub>	216	240	264	mA	
LED life time	-	20,000	-	-	Hr	Note 2

Note 1: The Voltage for LED Backlight is defined at Ta=25°C and I<sub>L</sub> =240mA.

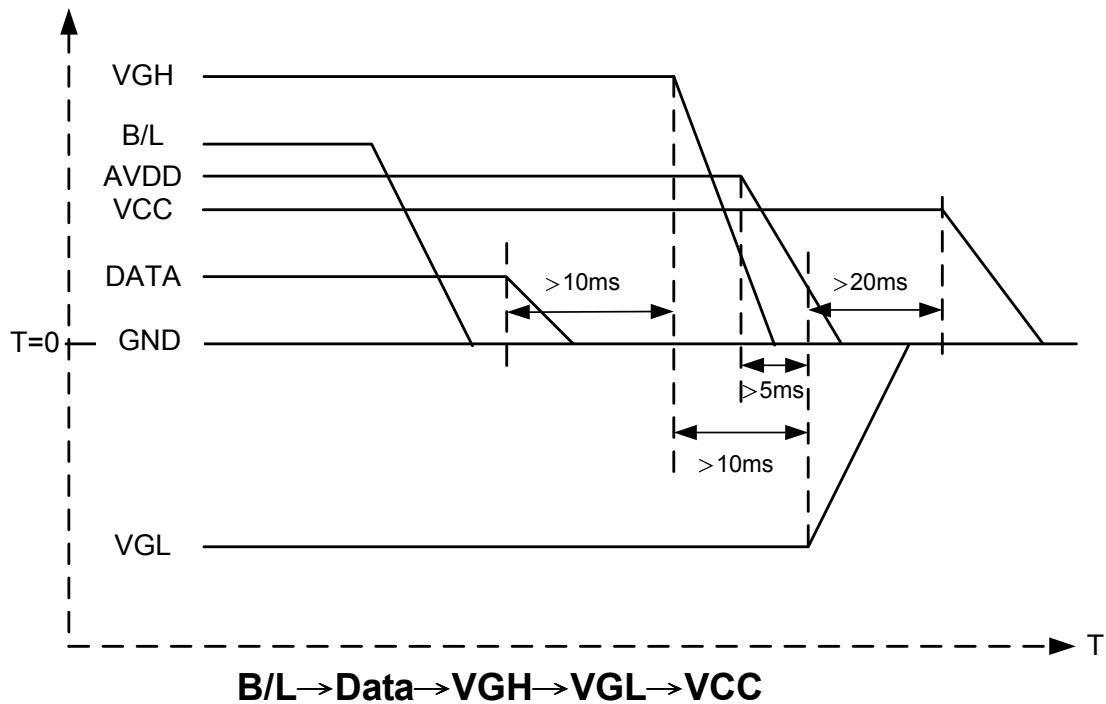
Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25°C and I<sub>L</sub> =240mA. The LED lifetime could be decreased if operating I<sub>L</sub> is lager than 240 mA.

### 3.3. Power Sequence

#### 1. Power on:



#### 2. Power off:



Note: Data include POL, STVU, STVD, STHL, STHR, OEV, CKV, R0~R5, G0~G5, B0~B5, DCLK, LD.

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### 3.4. Timing Characteristics

#### 3.4.1. Timing Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
DCLK frequency	Fdclk	-	33.3	45	MHz	
DCLK cycle	Tcph	22	30	-	ns	
DCLK pulse width	Tcw	8	-	-	ns	
Data set-up time	Tsu	4	-	-	ns	
Data hold time	Thd	2	-	-	ns	
Time that the last data to LD	Tld	1	-	-	Tcph	
Pulse width of LD	Twld	2	-	-	Tcph	
Time that LD to STHL/R	Tlds	5	-	-	Tcph	
POL set-up time	Tpsu	6	-	-	ns	
POL hold time	Tphd	6	-	-	ns	
CKV frequency	Fvclk	-	-	200	KHz	
CKV rise time	Trck	-	-	100	ns	
CKV falling time	Tfck	-	-	100	ns	
CKV pulse width	PWCLK	500	-	-	ns	
Horizontal display timing range	Tdh	-	800	-	Tcph	
Horizontal timing range	Th	-	1056	-	Tcph	
STVU/D setup time	Tsuv	200	-	-	ns	
STVU/D hold time	Thdv	300	-	-	ns	
STVU/D delay time	Tdt	-	-	500	ns	
Driver output delay time	Tdo	-	-	900	ns	

Output rise time	Ttlh	-	500	1000	ns	
Output falling time	Tthl	-	400	800	ns	
OEV pulse width	Twcl	1	-	-	us	
OEV to Driver output delay time	Toe	-	-	900	ns	
Horizontal lines per field	Tv	512	525	610	Line	
Vertical display timing range	Tvd	-	480	-	Line	



3.4.2. Timing Diagram

Timing Diagram1 (CHNSL="1", Default)

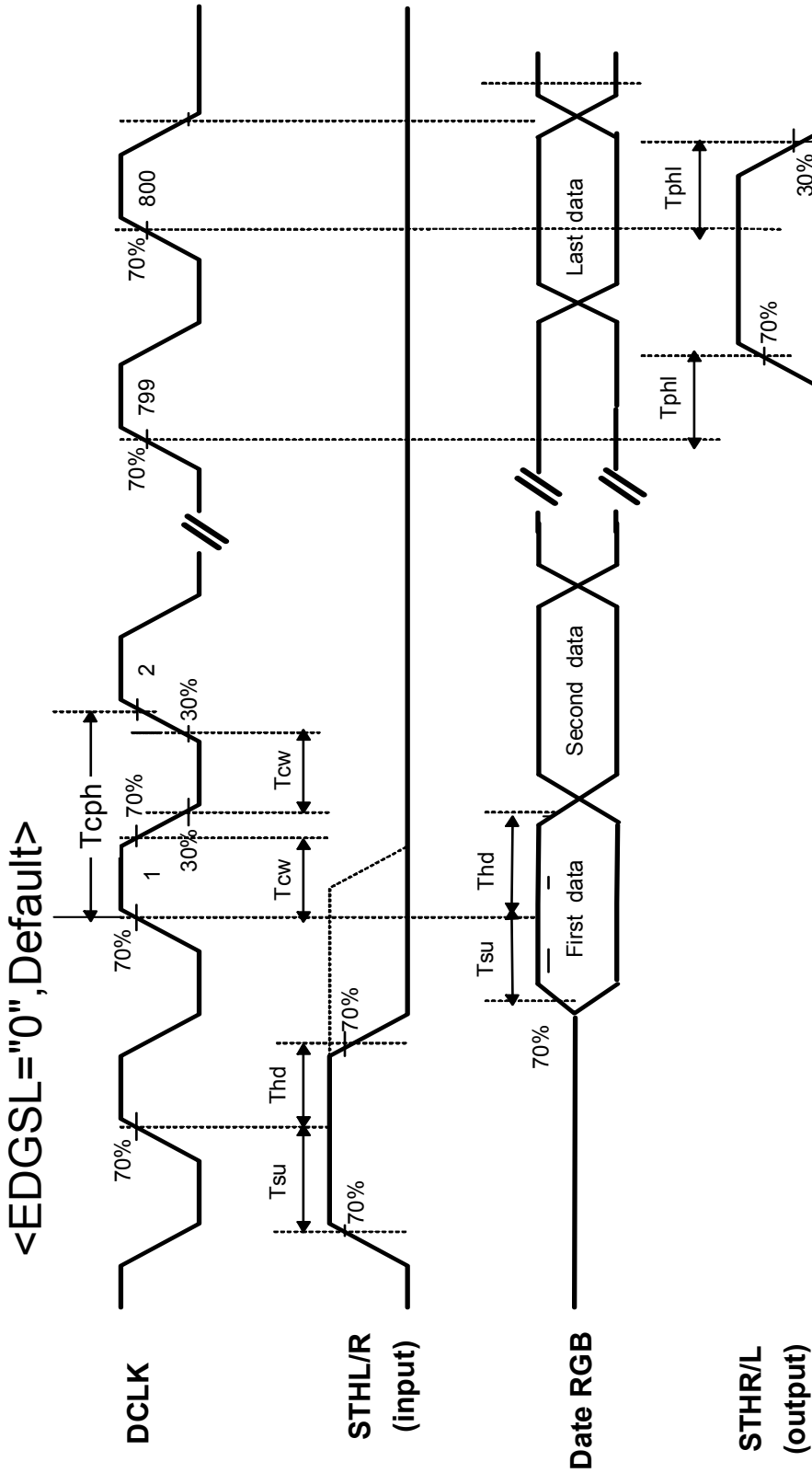


Fig.3-1 operation model 1

< EDGSL = "1" >

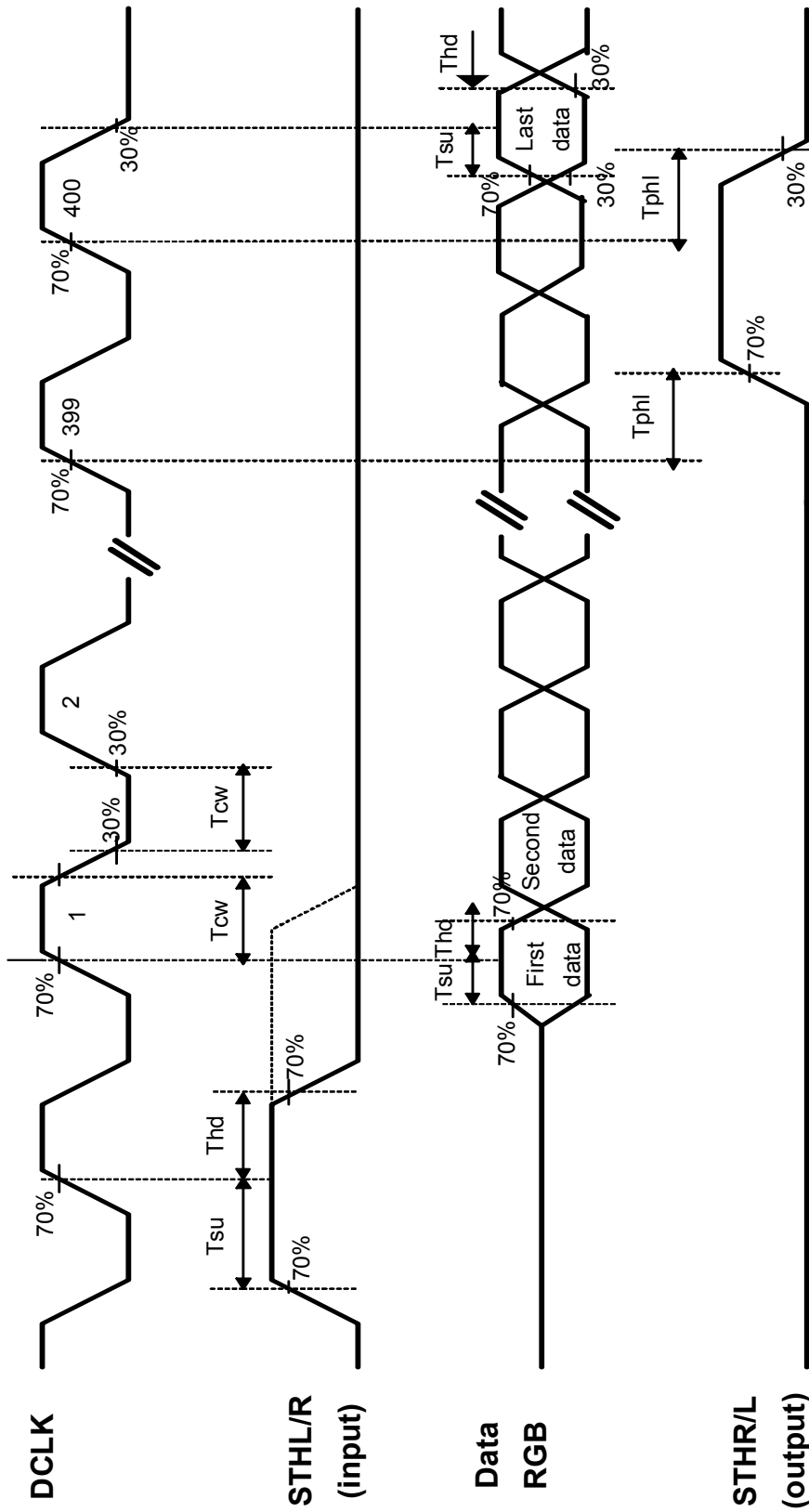


Fig.3-2 operation model 2

Timing Diagram 2

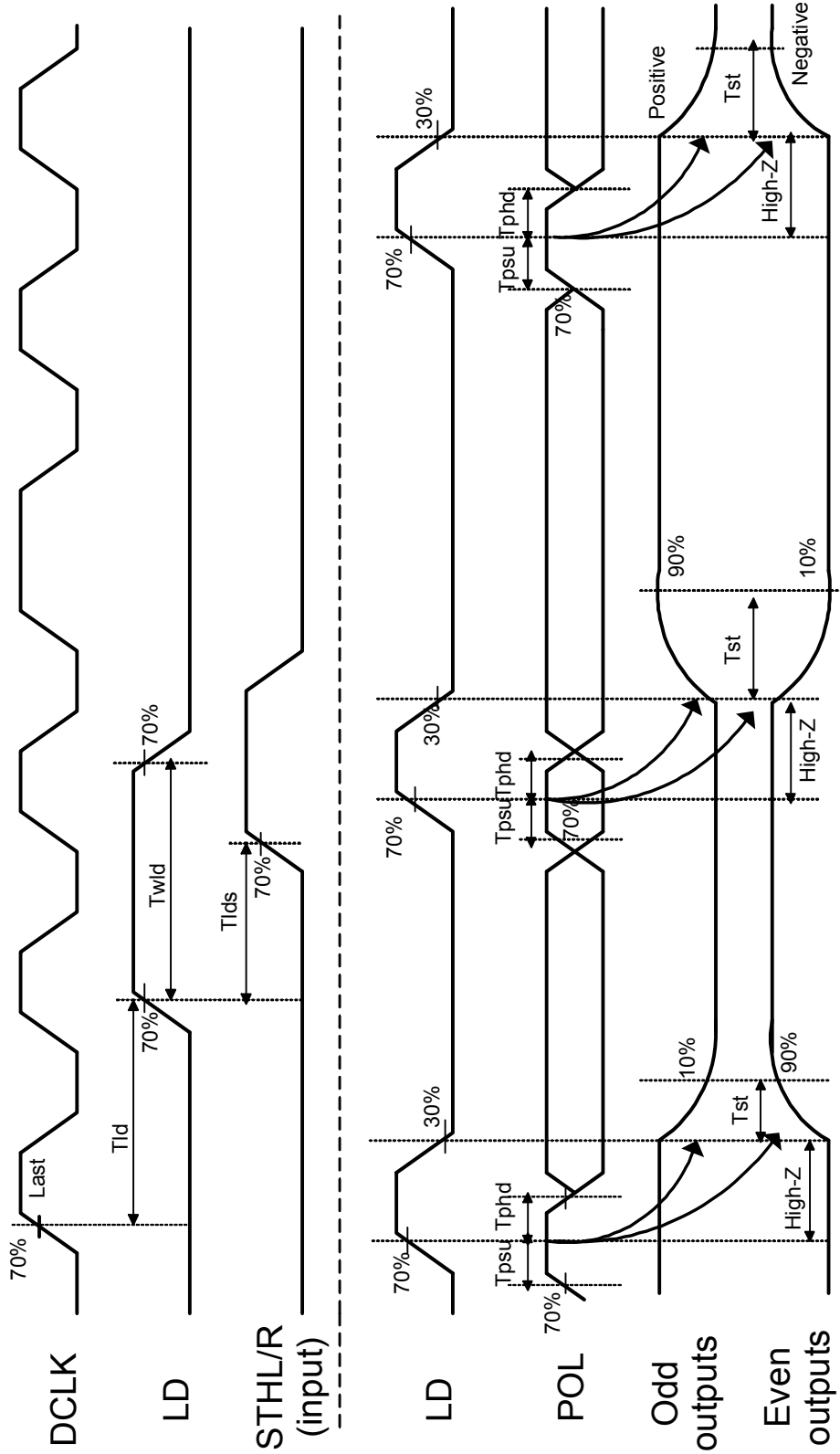


Fig.3-3 Horizontal timing 1

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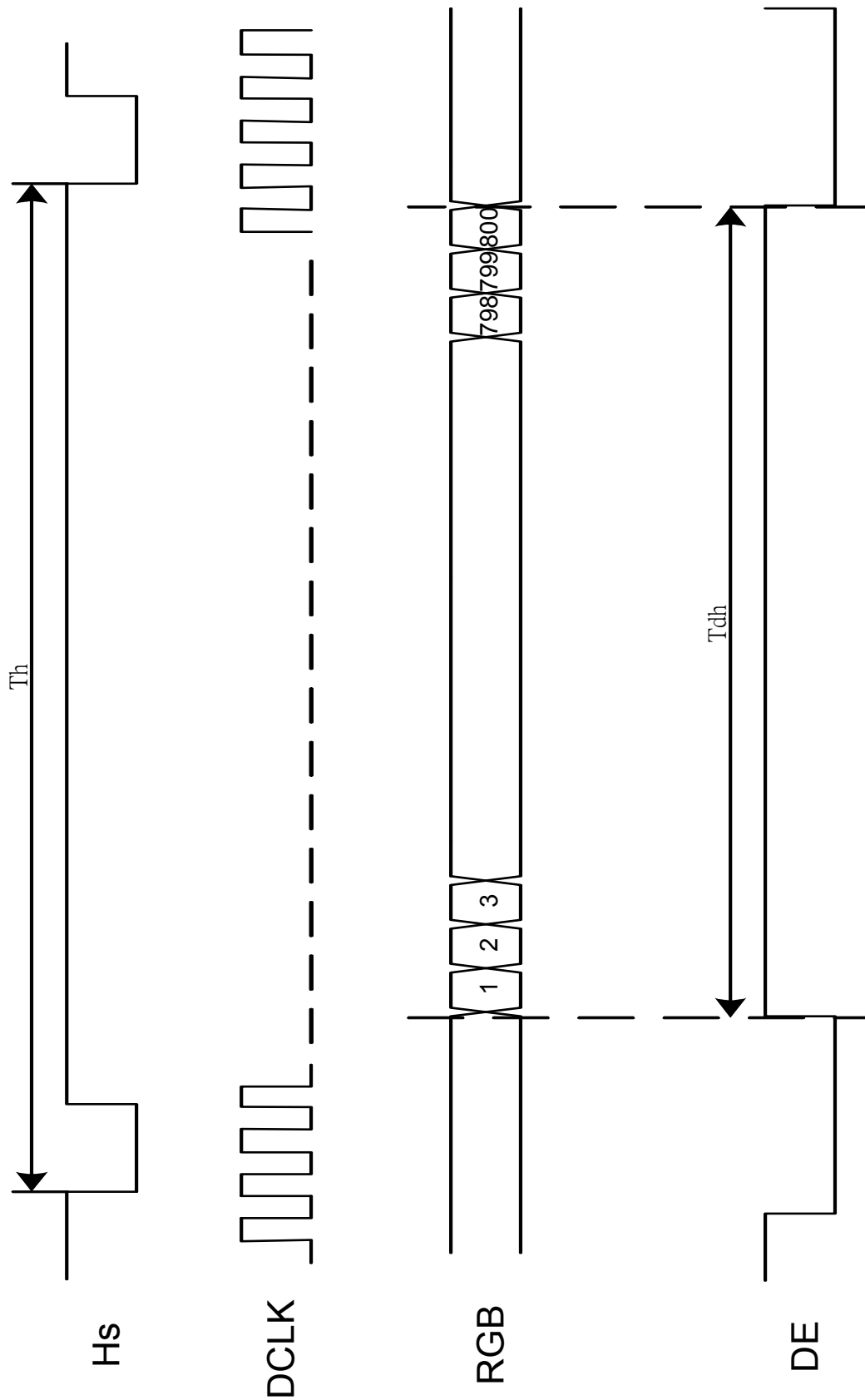


Fig.3-4 Horizontal timing 2

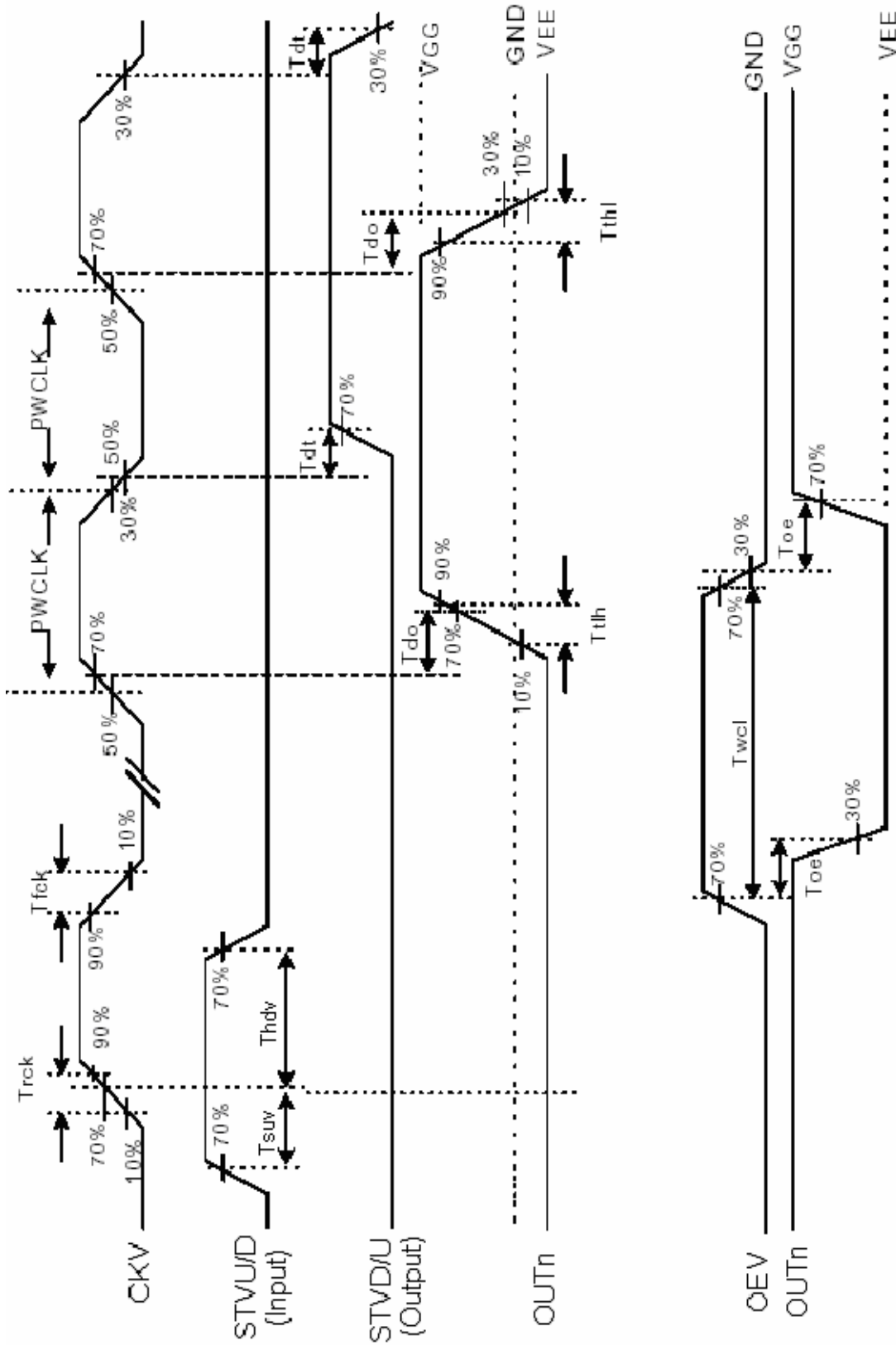


Fig.3-5 Vertical shift clock timing

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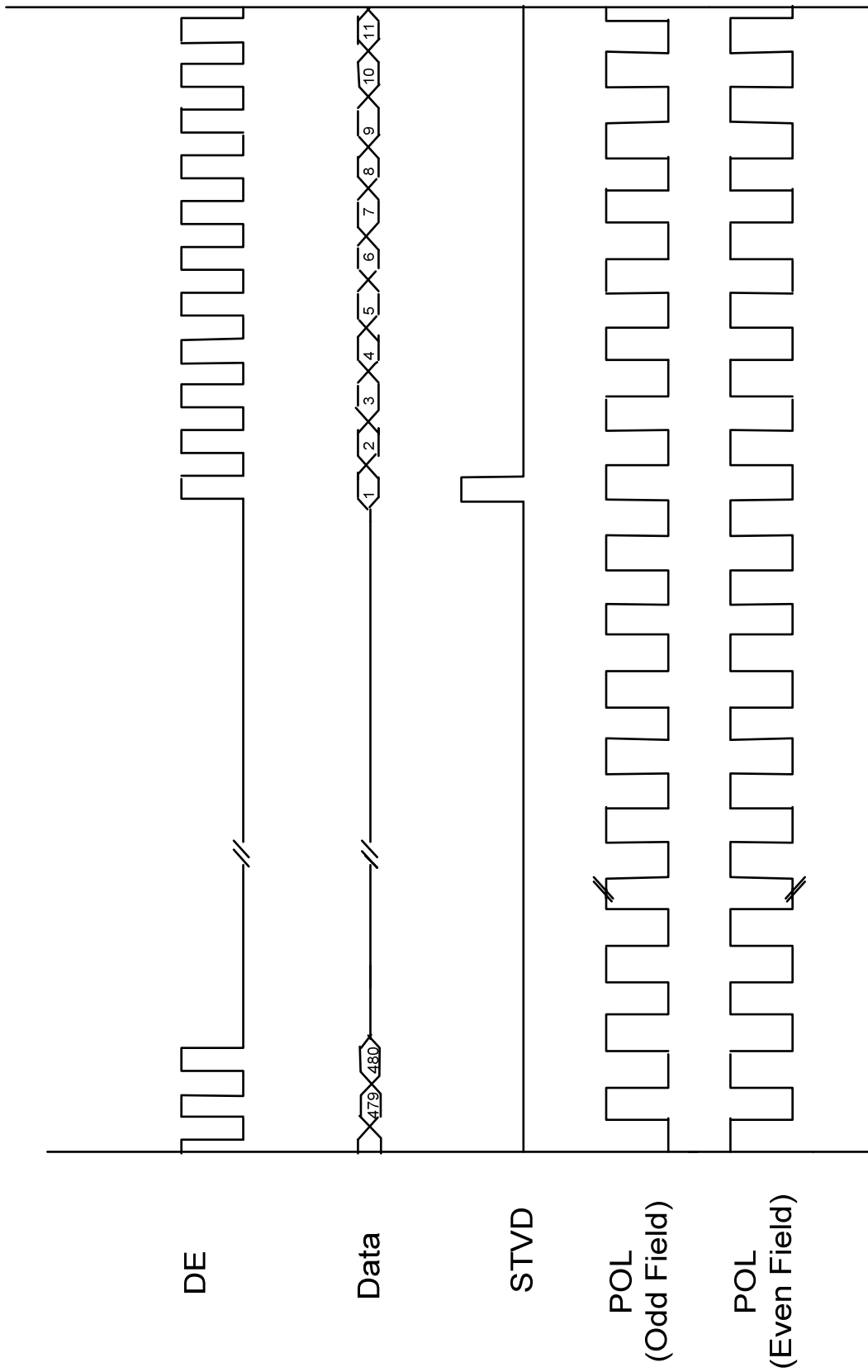


Fig.3-6 Vertical timing (from up to down)

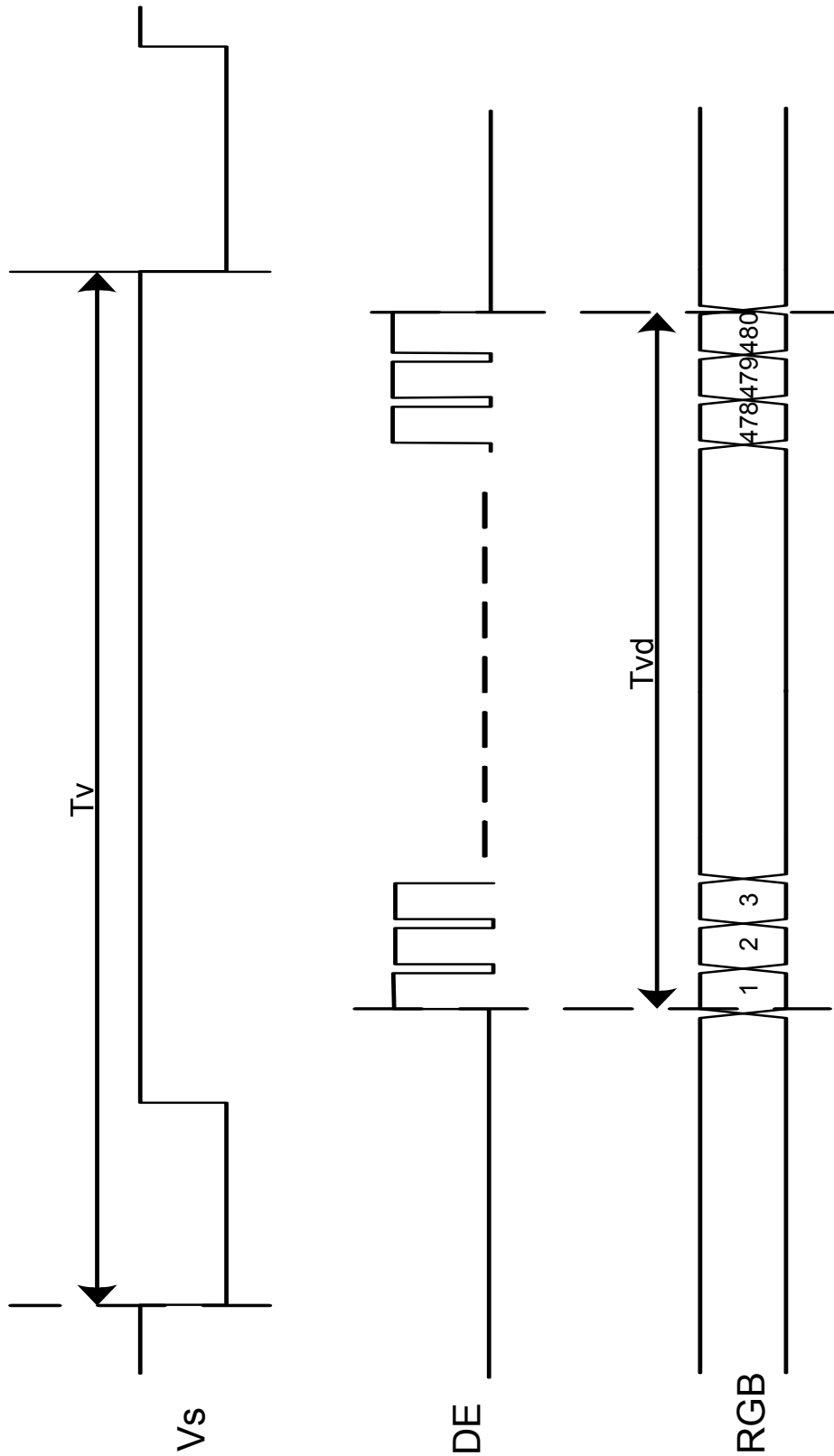


Fig.3-7 Vertical timing

## 4. Touch Screen Panel Specifications

### 4.1. Electrical Characteristics

Item	Value			Unit	Remark
	Min.	Typ.	Max.		
Linearity	-1.5	-	1.5	%	Analog X and Y directions
Terminal Resistance	200	-	1230	Ω	X(Film side)
	150	-	640	Ω	Y(Glass side)
Insulation resistance	25	-	-	MΩ	DC 25V
Voltage	-	5	7	V	DC
Chattering	-	-	10	ms	100kΩ pull-up
Transparency	80	-	-	%	

Note: Avoid operating with hard or sharp material such as a ball point pen or a mechanical pencil except a polyacetal pen (tip R0.8mm or less) or a finger.

### 4.2. Mechanical & Reliability Characteristics

Item	Value			Unit	Remark
	Min.	Typ.	Max.		
Activation force	80	-		g	Note 1
Durability-surface scratching	Write 100,000	-	-	characters	Note 2
Durability-surface pitting	1,000,000	-	-	touches	Note 3
Surface hardness	3	-	-	H	

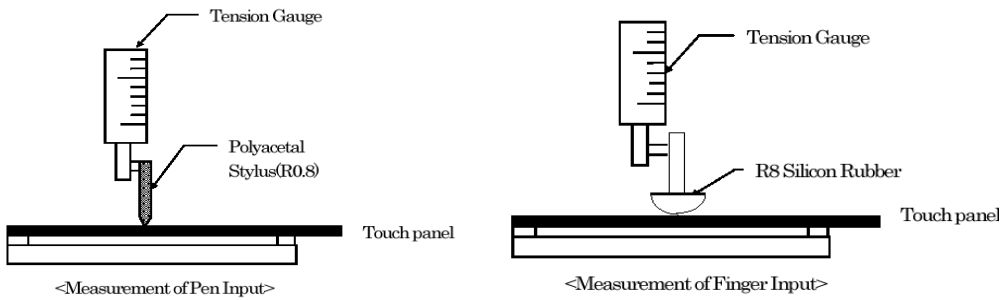
Note 1: Activation force test condition

- (1) Input DC 5V on X direction, Drop off Polyacetal Stylus (R0.8), until output voltage stabilize ,then get the activation force .
- (2) R8.0mm Silicon rubber for finger Activation force test
- (3) Test point: 9 points

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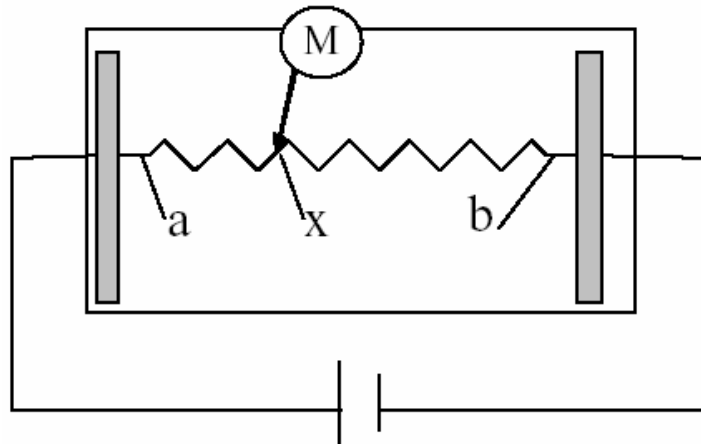
**Note 2: Measurement for surface area.**

- Material of Pen: Polyacetal resin.
- End shape of Pen: R 0.8 mm (Stylus).
- Sliding 100,000 times straight line on the film with a stylus change every 20,000 times.
- Load force: 250gf.
- Sliding speed: 60mm/sec.

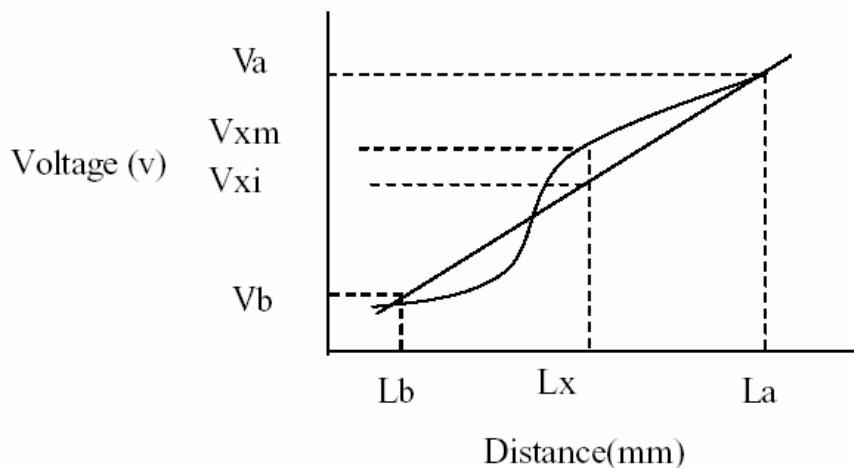
**Note 3: Measurement for surface area.**

- Material of Pen: Polyacetal resin
- End shape of Pen: 0.8mm (stylus).
- Force: 250gf.
- Speed: 2times/sec.

### 4.3. Linearity Definition

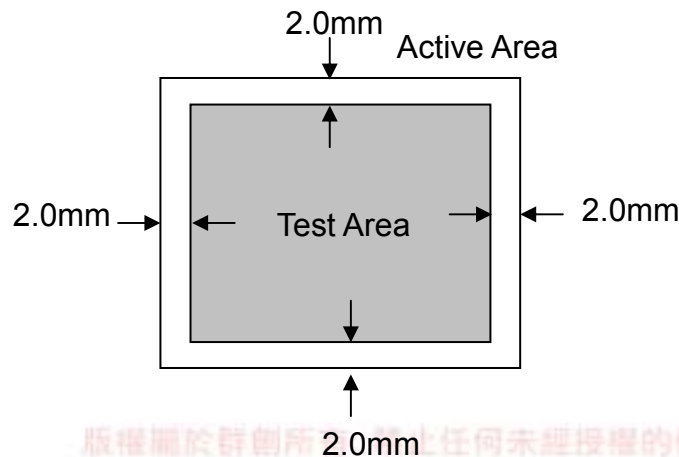


- Va: maximum voltage in the active area of touch panel
- Vb: minimum voltage in the active area of touch panel
- X: random measuring point
- Vxm: actual voltage of Lx point
- Vxi: theoretical voltage of Lx point



$$\text{Linearity} = \frac{|Vxi - Vxm|}{(Va - Vb)} \times 100\%$$

Note: Test area is as follows and operation force is 150gf.

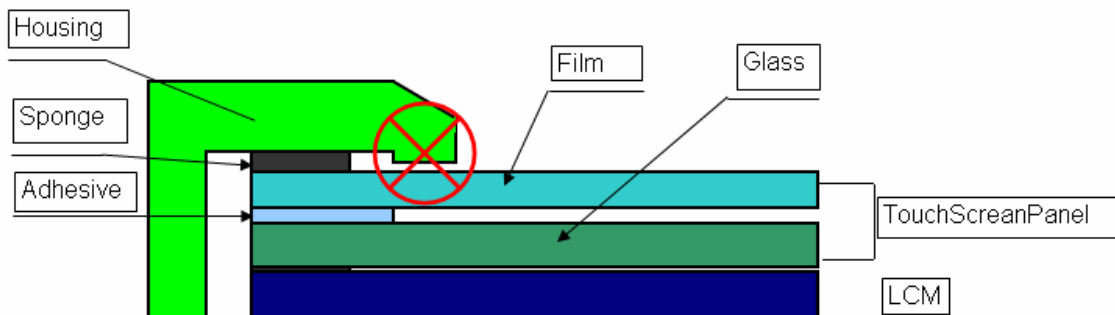


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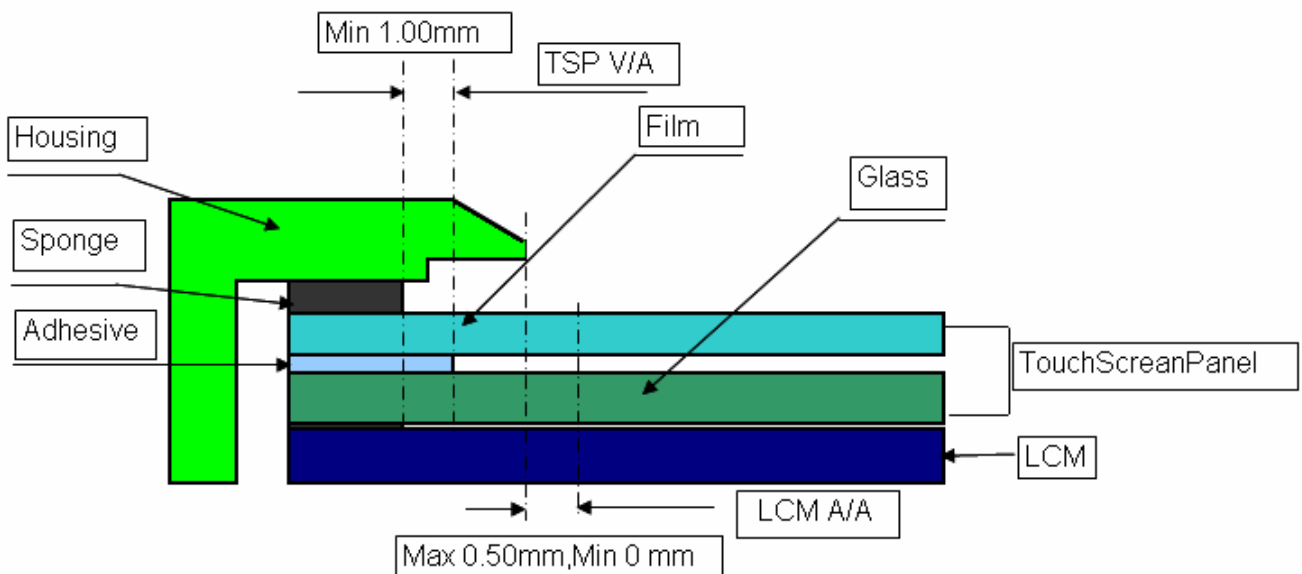
### 4.4. Housing design guide

Housing design follow as below

- 1) Avoid the design that housing overlap and press on the active area of the LCM
- 2) Give enough gap(over 0.5mm at compressed) between the housing and TSP to protect wrong operating.



- 3) Use a buffer material(Gasket) between the TSP and housing to protect damage and wrong operating.
- 4) Avoid the design that buffer material overlap and press on the inside of TSP view area.



## 5. Optical Specifications

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR≥10)	$\theta_L$	$\Phi=180^\circ$ (9 o'clock)	55	65	-	degree	Note 1
	$\theta_R$	$\Phi=0^\circ$ (3 o'clock)	55	65	-		
	$\theta_T$	$\Phi=90^\circ$ (12 o'clock)	35	45	-		
	$\theta_B$	$\Phi=270^\circ$ (6 o'clock)	55	65	-		
Response time	$T_{ON}$	Normal $\theta=\Phi=0^\circ$	-	15	30	msec	Note 3
	$T_{OFF}$		-	20	40	msec	Note 3
Contrast ratio	CR		250	300	-	-	Note 4
Color chromaticity	$W_X$		0.26	0.31	0.36	-	Note 2 Note 5 Note 6
	$W_Y$		0.28	0.33	0.38	-	
Luminance	$L_1$		300	350	-	cd/m <sup>2</sup>	Note 6
Luminance uniformity	$Y_U$		70	75	-	%	Note 7

**Test Conditions:**

1.  $V_{CC}=3.3V$ ,  $AV_{DD}=10V$ ,  $I_L=240mA$  (Backlight current), the ambient temperature is  $25^\circ C$ .
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range

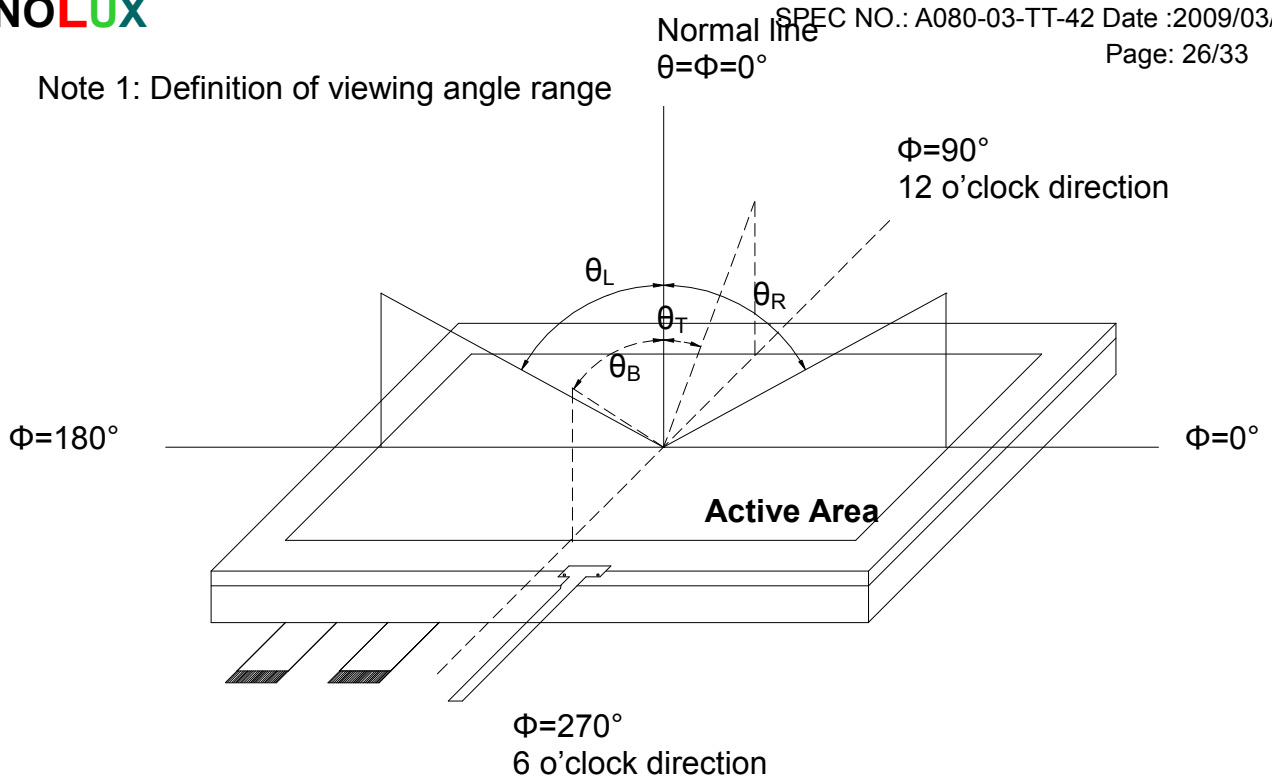


Fig. 4-1 Definition of viewing angle

Note 2: Definition of optical measurement system.

The optical characteristics should be measured in dark room. The optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/Field of view: 1° /Height: 500mm.)

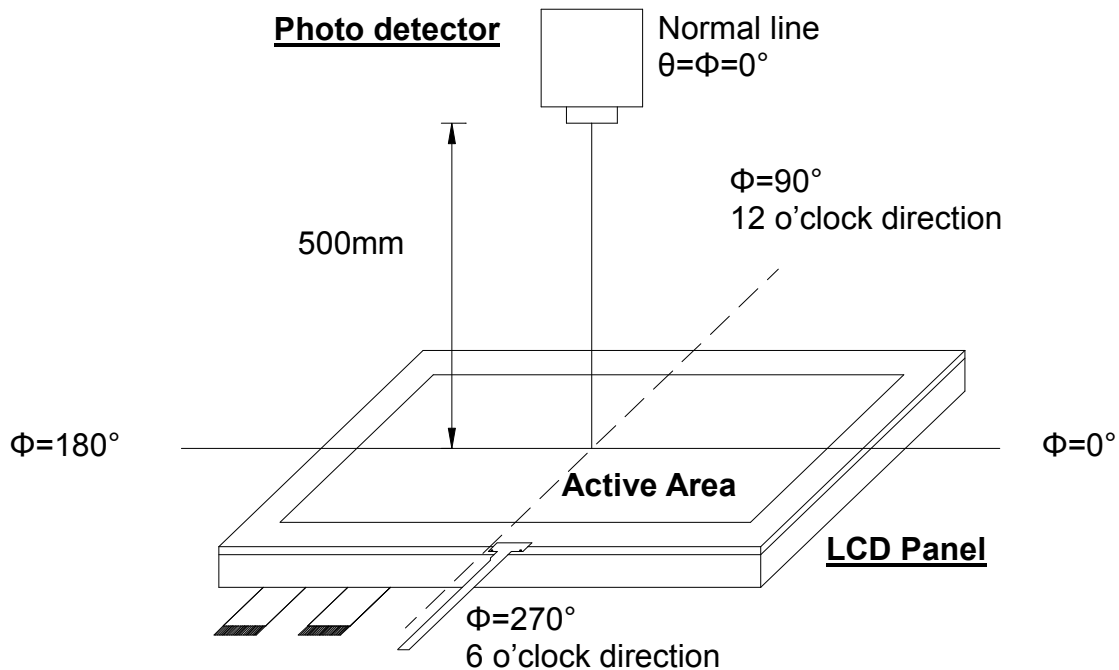


Fig. 4-2 Optical measurement system setup

Note 3: Definition of Response time

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time ( $T_{ON}$ ) is the time between photo detector output intensity changed from 90% to 10%. And fall time ( $T_{OFF}$ ) is the time between photo detector output intensity changed from 10% to 90%.

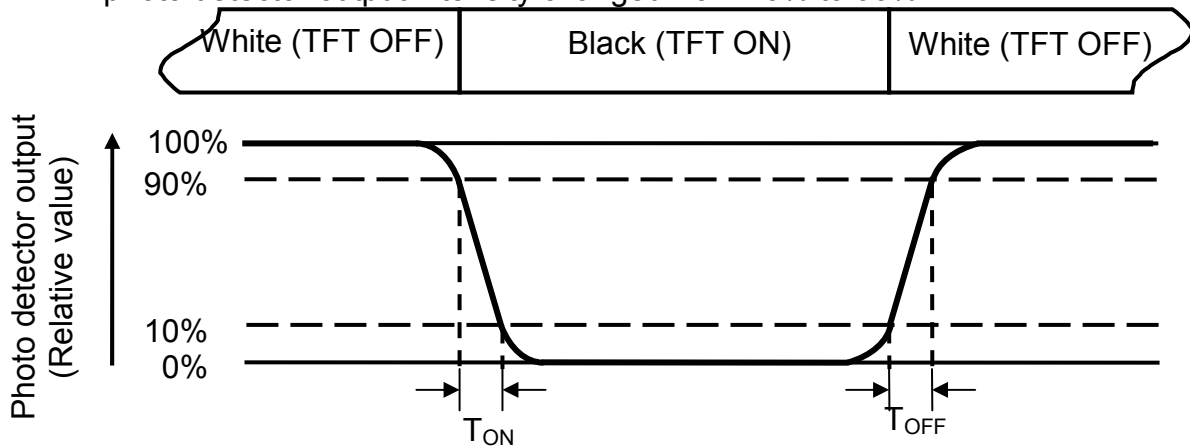


Fig. 4-3 Definition of response time

Note 4: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is  $I_L=240\text{mA}$ .

Note 7: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer to Fig. 4-4 ).Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (Yu)} = \frac{B_{min}}{B_{max}}$$

L-----Active area length      W----- Active area width

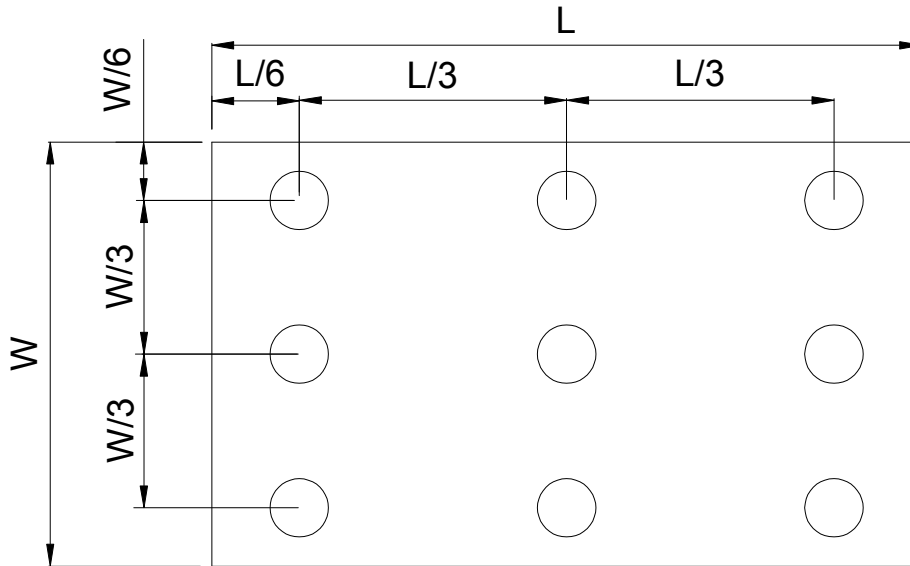


Fig. 4-4 Definition of measuring points

**B<sub>max</sub>**: The measured maximum luminance of all measurement position.

**B<sub>min</sub>**: The measured minimum luminance of all measurement position.





## 7. General Precautions

### 7.1. Safety

Liquid crystal is poisonous. Do not put it in your mouth. If liquid crystal touches your skin or clothes, wash it off immediately by using soap and water.

### 7.2. Handling

1. The LCD panel is plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
2. The polarizer attached to the display is easily damaged. Please handle it carefully to avoid scratch or other damages.
3. To avoid contamination on the display surface, do not touch the module surface with bare hands.
4. Keep a space so that the LCD panels do not touch other components.
5. Put cover board such as acrylic board on the surface of LCD panel to protect panel from damages.
6. Transparent electrodes may be disconnected if you use the LCD panel under environmental conditions where the condensation of dew occurs.
7. Do not leave module in direct sunlight to avoid malfunction of the ICs.

### 7.3. Static Electricity

1. Be sure to ground module before turning on power or operating module.
2. Do not apply voltage which exceeds the absolute maximum rating value.

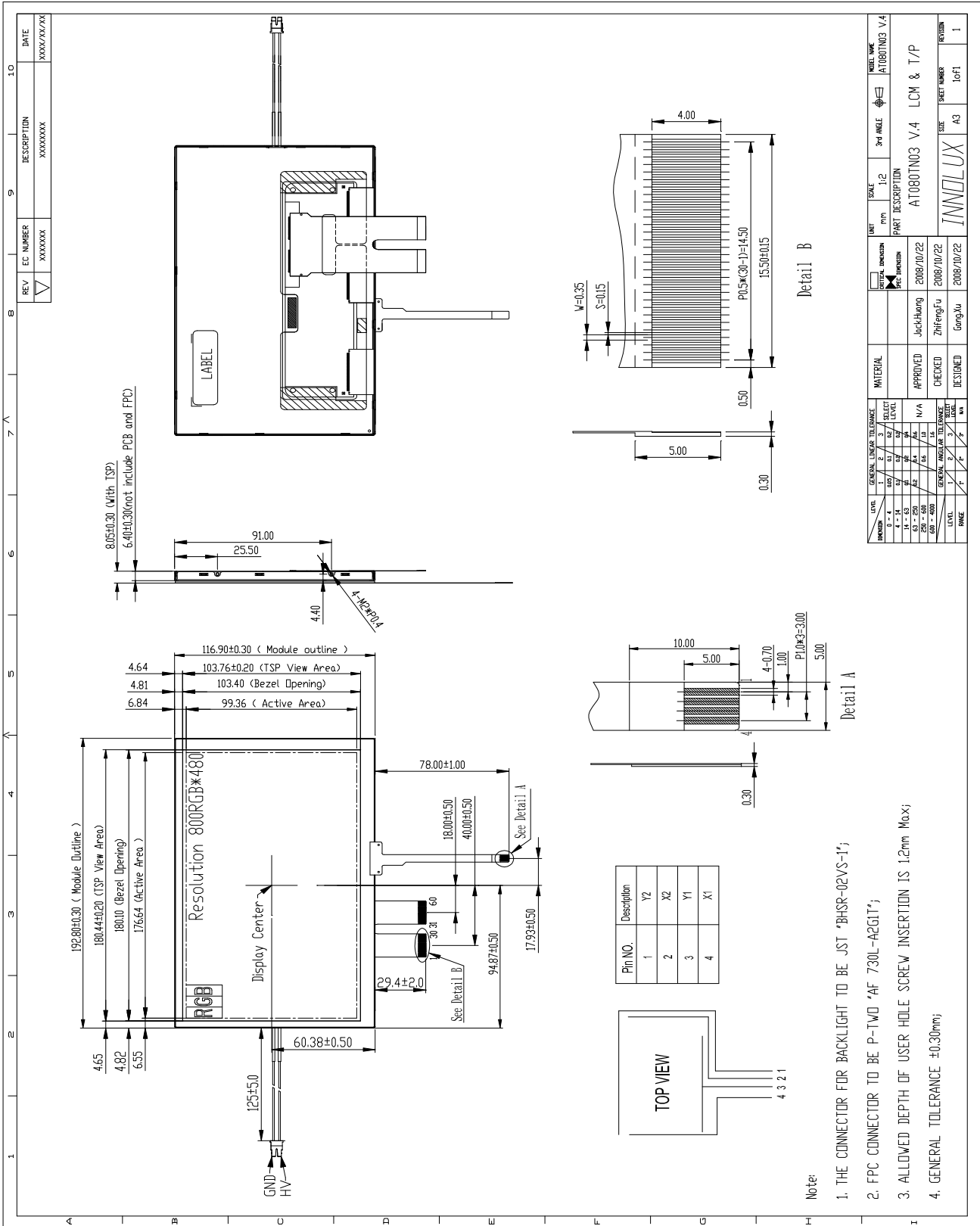
### 7.4. Storage

1. Store the module in a dark room where must keep at  $25\pm 10^{\circ}\text{C}$  and 65%RH or less.
2. Do not store the module in surroundings containing organic solvent or corrosive gas.
3. Store the module in an anti-electrostatic container or bag.

### 7.5. Cleaning

1. Do not wipe the polarizer with dry cloth. It might cause scratch.
2. Only use a soft sloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.

# 8. Mechanical Drawing



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## 9. Package Drawing

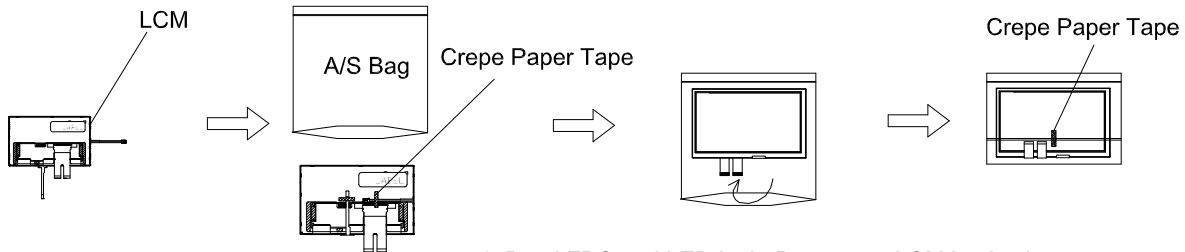
### 9.1. Packaging Material Table

No.	Item	Model (Material)	Dimensions(mm)	Unit Weight (kg)	Quantity	Remark
1	LCM Module	AT080TN03 V.4	192.8 × 116.9 × 8.25	0.305	30pcs	
2	Partition	BC Corrugated paper	512 × 349 × 226	0.850	1set	
3	Corrugated Bar	B Corrugated paper	349 × 199 × 52	0.127	4pcs	
4	Dust-Proof Bag	PE	700 × 530	0.041	1pcs	
5	A/S Bag	PE	205 × 195 × 0.2	0.003	30pcs	
6	Carton	Corrugated paper	530 × 355 × 255	0.830	1pcs	
7	Total weight	11.469Kg±5%				

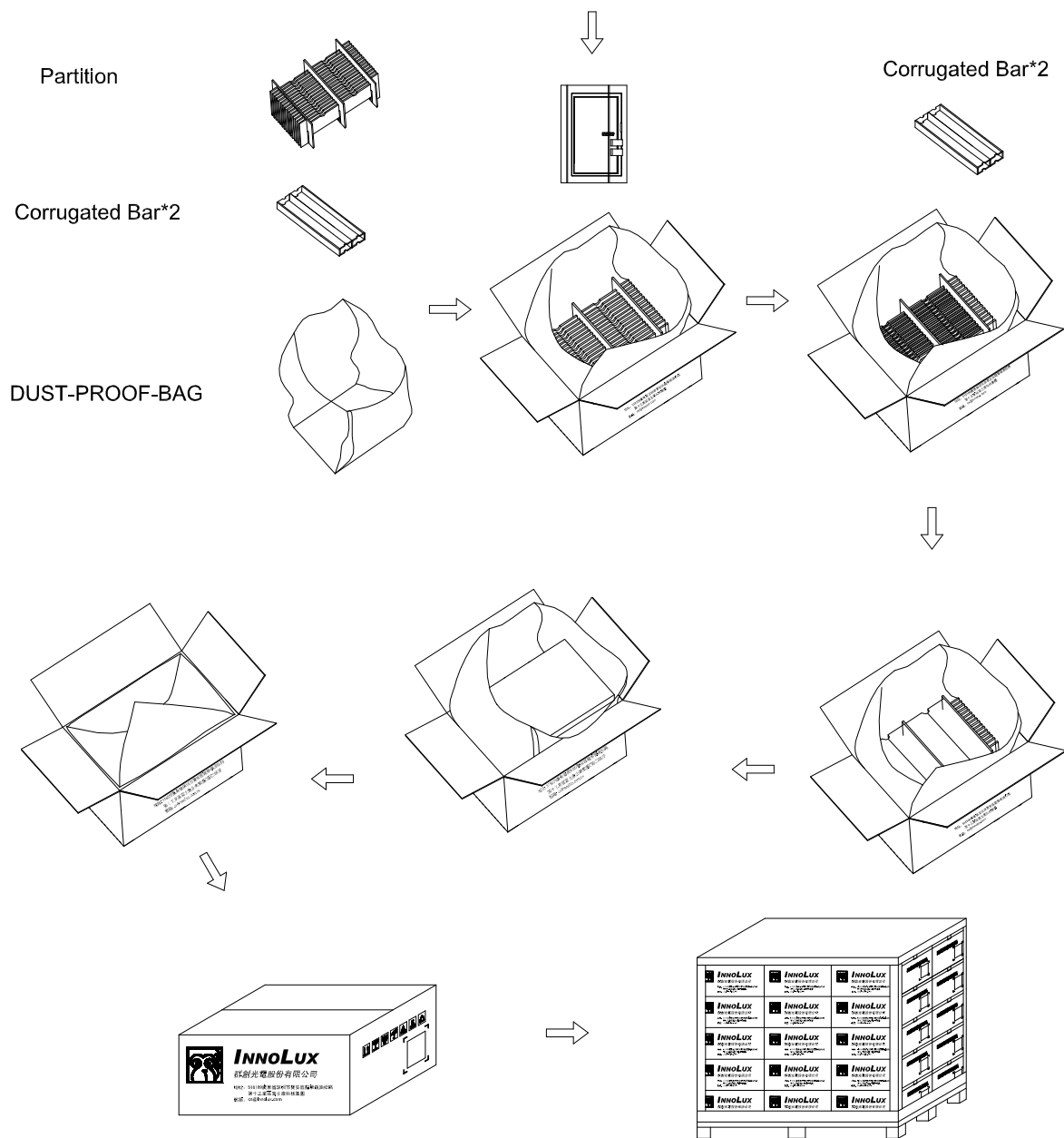
### 9.2. Packaging Quantity

Total LCM quantity in Carton: no. of Partition	2 Rows	x	quantity per Row	15	= 30
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### 9.3. Packaging Drawing



1. Bend FPC and LED Light Bar wire to LCM backside.
2. Fix with crepe paper tape .
3. Put LCM into A/S BAG .



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