

Doc. Number:

- ☒ Tentative Specification
☐ Preliminary Specification
☐ Approval Specification

MODEL NO.: DJ090IA
SUFFIX: 01A

APPROVED BY	SIGNATURE
<u>Name / Title</u>	
Please return 1 copy for your confirmation with	

Approved By	Checked By	Prepared By
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REVISION HISTORY

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Contents

1. General Specifications	1
2. Pin Assignment	2
3. Operation Specifications	5
3.1. Absolute Maximum Ratings	5
3.1.1. Typical Operation Conditions	5
3.1.2. Backlight Driving Conditions	6
3.2. Power Sequence	7
3.3. Timing Characteristics	8
3.3.1. AC Electrical Characteristics	8
3.3.2. Input Clock and Data Timing Diagram	9
3.3.3. DC Electrical Characteristics	10
3.3.4. Timing	11
3.3.5. Data Input Format	11
3.3.6. Reset timing	12
4. Optical Specifications	13
5. Reliability Test Items	16
6. General Precautions	18
6.1. Safety	18
6.2. Handling	18
6.3. Static Electricity	18
6.4. Storage	18
6.5. Cleaning	19
7. Mechanical Drawing	19
8. Package Drawing	22
8.1. Packaging Material Table	22
8.2. Packaging Quantity	22
8.3. Packaging Drawing	23
8.4. Shipping Drawing	24

1. General Specifications

No.	Item	Specification	Remark
1	LCD size	9.0 inch (Diagonal)	
2	Driver element	a-Si TFT active matrix	
3	Resolution	1280 × 3(RGB) × 720	
4	Display mode	Normally Black, Transmissive	
5	Dot pitch	0.1554(H) × 0.0518(H) mm	
6	Active area	198.912(W) × 111.888(H) mm	
7	Module size	211.2(W) × 125.3(H) × 5.9(D) mm	Note 1
8	Surface treatment	Anti-Glare	
9	Color arrangement	RGB-stripe	
10	Interface	1-port LVDS (DE mode only)	
11	Backlight power consumption	(6.76) (Max.)	
12	Panel power consumption	TBD (Typ.)	
13	Weight	240 g (Max.)	

Note 1: Refer to Mechanical Drawing.

2. Pin Assignment

PCBa connector is used for the module electronics interface. The recommended model is 20647-040E-01 manufactured by I-PEX.

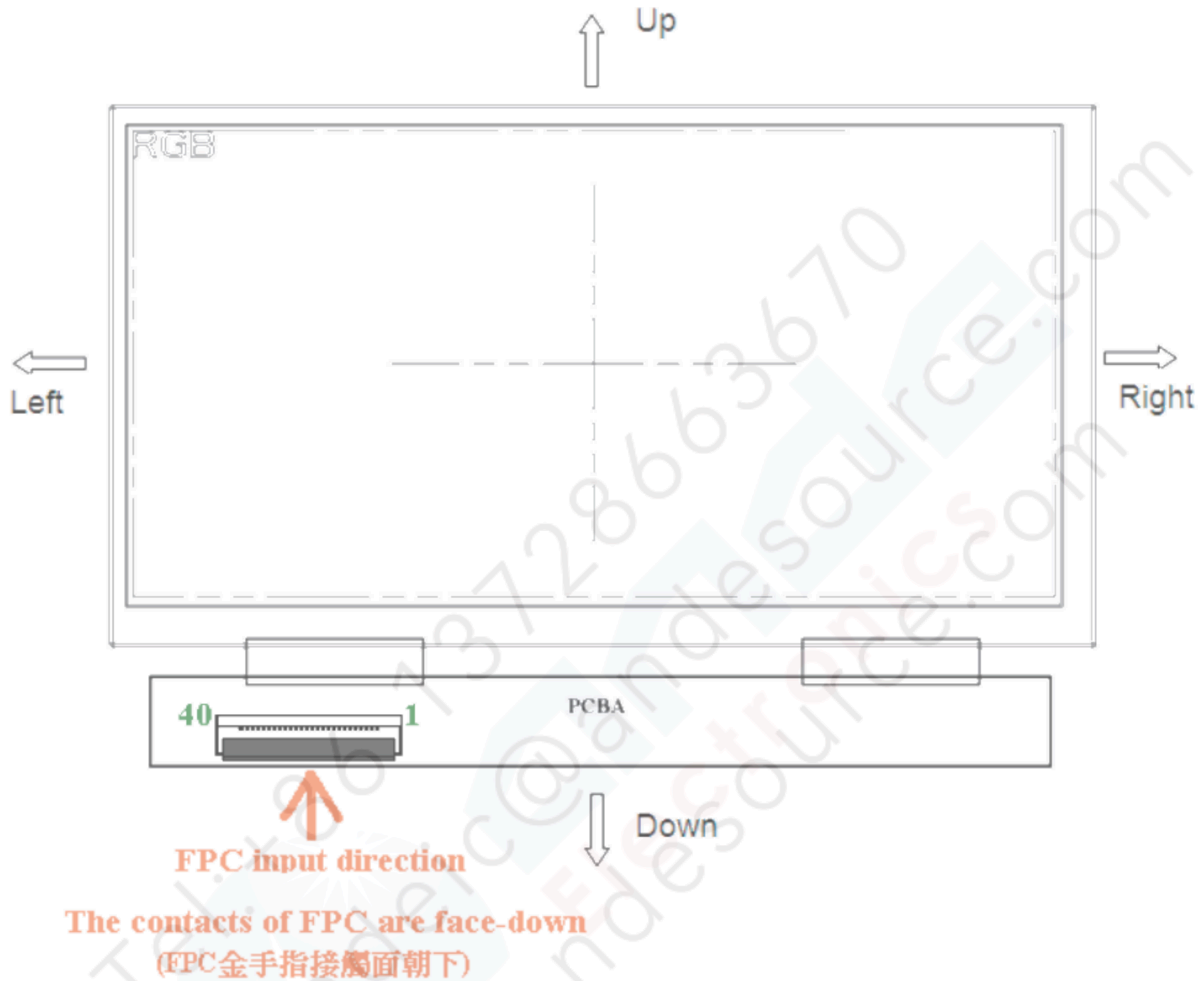
Pin No.	Symbol	I/O	Pulled Internally (Note3)	Function	Remark
1	NC	-		Keep floating	
2	VDD	Power		External main and I/O power supply ; Power3V3	Note 2
3	VDD	Power		External main and I/O power supply : Power3V3	Note 2
4	NC	-		Keep floating	
5	RESET	Input	H	Global reset pin	Note 2
6	STBYB	Input	H	Standby mode setting pin	Note 2
7	GND	Power			
8	RXIN0-	Input		LVDS data 0-	
9	RXIN0+	Input		LVDS data 0+	
10	GND	Power		Ground	
11	RXIN01-	Input		LVDS data 1-	
12	RXIN01+	Input		LVDS data 1+	
13	GND	Power		Ground	
14	RXCLKIN-	Input		LVDS clk -	
15	RXCLKIN+	Input		LVDS clk +	
16	GND	Power		Ground	
17	RXIN02-	Input		LVDS data 2-	
18	RXIN02+	Input		LVDS data 2+	
19	GND	Power		Ground	
20	RXIN03-	Input		LVDS data 3-	
21	RXIN03+	Input		LVDS data 3+	
22	GND	Power		Ground	
23	NC	-		Keep floating	
24	NC	-		Keep floating	

25	GND	Power		Ground	
26	NC	-		Keep floating	
27	NC	-		Keep floating	
28	SELB(DINT)	Input	H	Input Input data format selection DINT = 1 : 8-bit (Default) DINT = 0 : 6-bit	
29	NC	-		Keep floating	
30	GND	Power		Ground	
31	LED-	Power		Negative backlight voltage	
32	LED-	Power		Negative backlight voltage	
33	L/R	Input	H	Horizontal shift direction (source output) selection. RL = 1: Left -> Right (Default) RL = 0: Right -> Left	
34	U/D	Input	H	Vertical shift direction (gate output) selection. TB = 1: Top ->Bottom (Default) TB = 0: Bottom ->Top	
35	NC	-		Keep floating	
36	NC	-		Keep floating	
37	NC	-		Keep floating	
38	NC	-		Keep floating	
39	LED+	Power		Positive backlight voltage	
40	LED+	Power		Positive backlight voltage	

Note 2: Please follow "3.2 power sequence"

Note 3: Typical internal pull low / high resistor is 350 kΩ

Note 4: Definition of scanning direction.
Refer to the figure as below:



3. Operation Specifications

3.1. Absolute Maximum Ratings

(GND=0V, Note 5)

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power voltage	V_{DD}	-0.3	3.96	V	
Operation Temperature	T_{OP}	-30	85	°C	
Storage Temperature	T_{ST}	-40	90	°C	
LED Reverse Voltage	VR	(TBD)	(TBD)	V	Each LED
LED Forward Current	IF	(TBD)	(TBD)	mA	Each LED

Note 5: 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.

3.1.1. Typical Operation Conditions

(GND =0V)

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	V_{DD}	3.0	3.3	3.6	V	Note 6
Input logic high voltage	V_{IH}	0.7 V_{DD}	-	V_{DD}	V	Note 7
Input logic low voltage	V_{IL}	GND	-	0.3 V_{DD}	V	
Internal Pull low / high resistor	RI	200	350	850	kΩ	Note 7

Note 6: V_{DD} setting should match the signals output voltage of customer's system board .

Note 7: RESET, STBYB, SELB(DINT), L/R, U/D

3.1.2. Backlight Driving Conditions

Item	Symbol				Unit	Remark
			Typ.	Max.		
Voltage for LED backlight	V_L	19.6	-	23.8	V	Note 8
Current for LED backlight	I_L		(284)		mA	
LED life time	-	20,000			Hr	Note 9

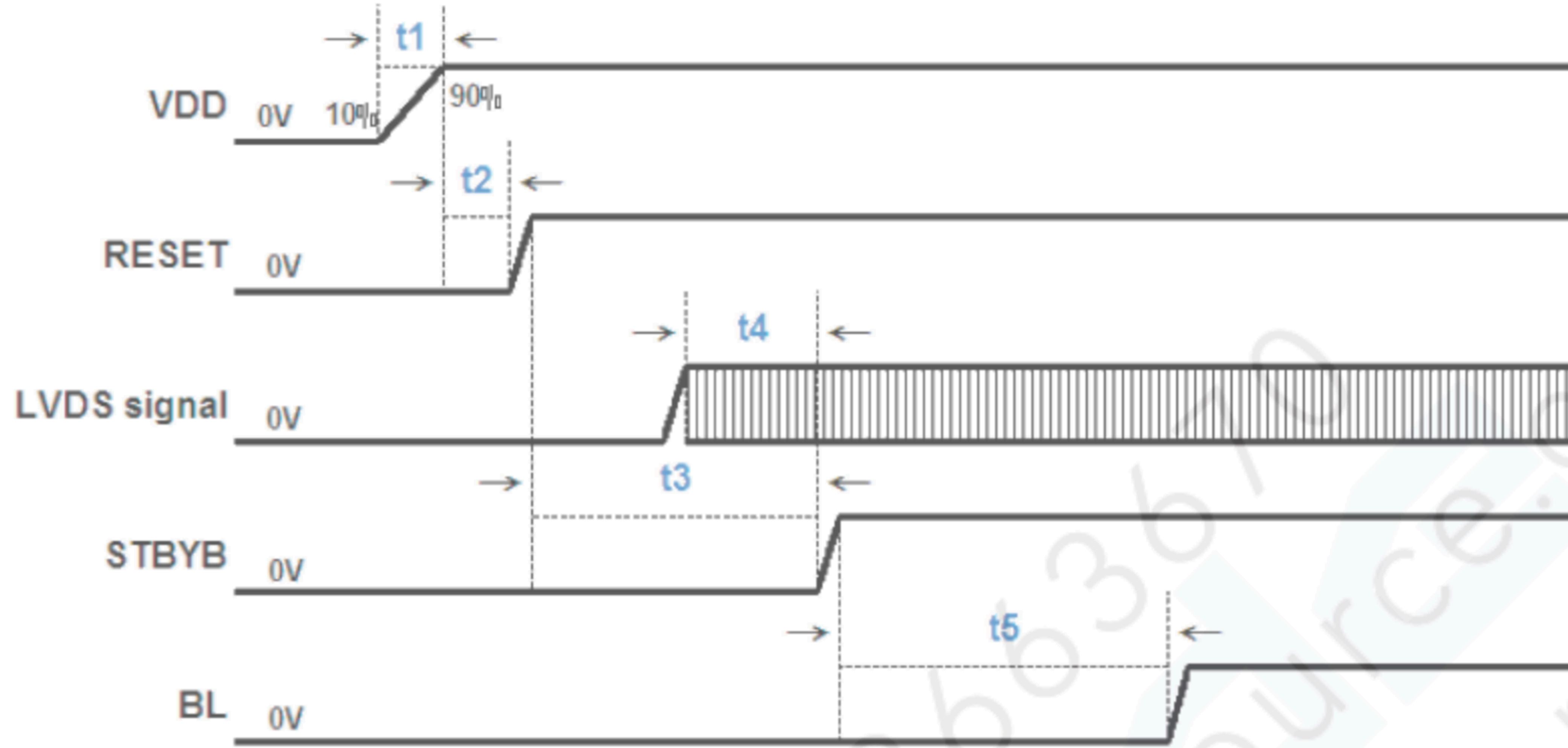
Note 8: The LED Supply Voltage is defined by the number of LED at $T_a=25^{\circ}\text{C}$ and $I_L = 320\text{mA}$

Note 9: The “LED life time” is defined as the module brightness decrease to 50% original brightness at $T_a=25^{\circ}\text{C}$ and $I_L = 320\text{mA}$. The LED lifetime could be decreased if operating I_L is larger than 320mA.

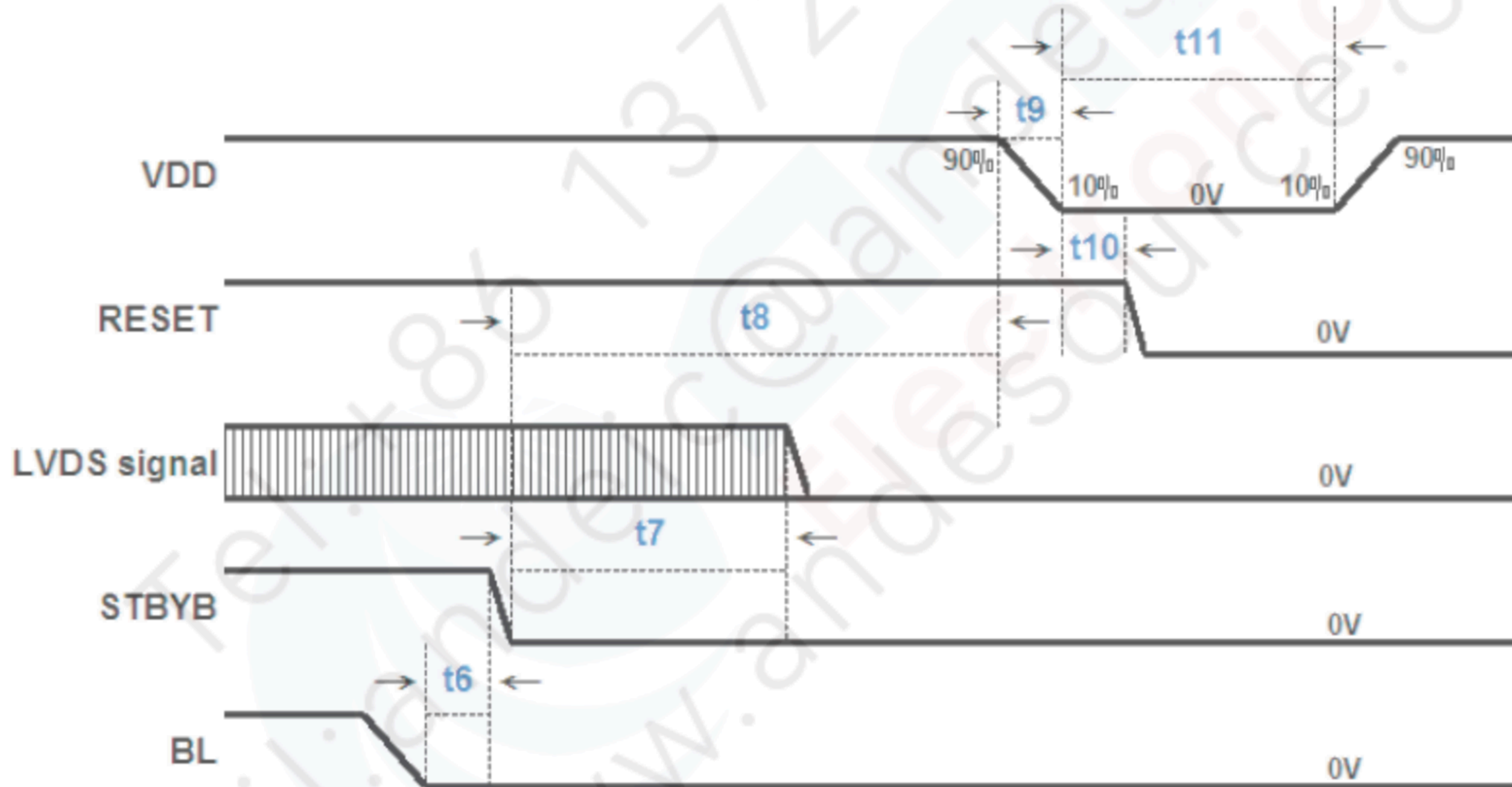
3.2. Power Sequence

VDD = 3.0~3.6V

a. Power on:



b. Power off:



Symbol	SPEC.			Unit
	Min.	Typ.	Max.	
t1	0.5	---	10	ms
t2	20	---	---	us
t3	10	---	---	ms
t4	1	---	t3	ms
t5	30	---	---	ms
t6	0	---	---	ms
t7	20	---	t8	ms
t8	100	---	---	ms
t9	0.5	---	10	ms
t10	10	---	20	ms
t11	500	---	---	ms

3.3. Timing Characteristics

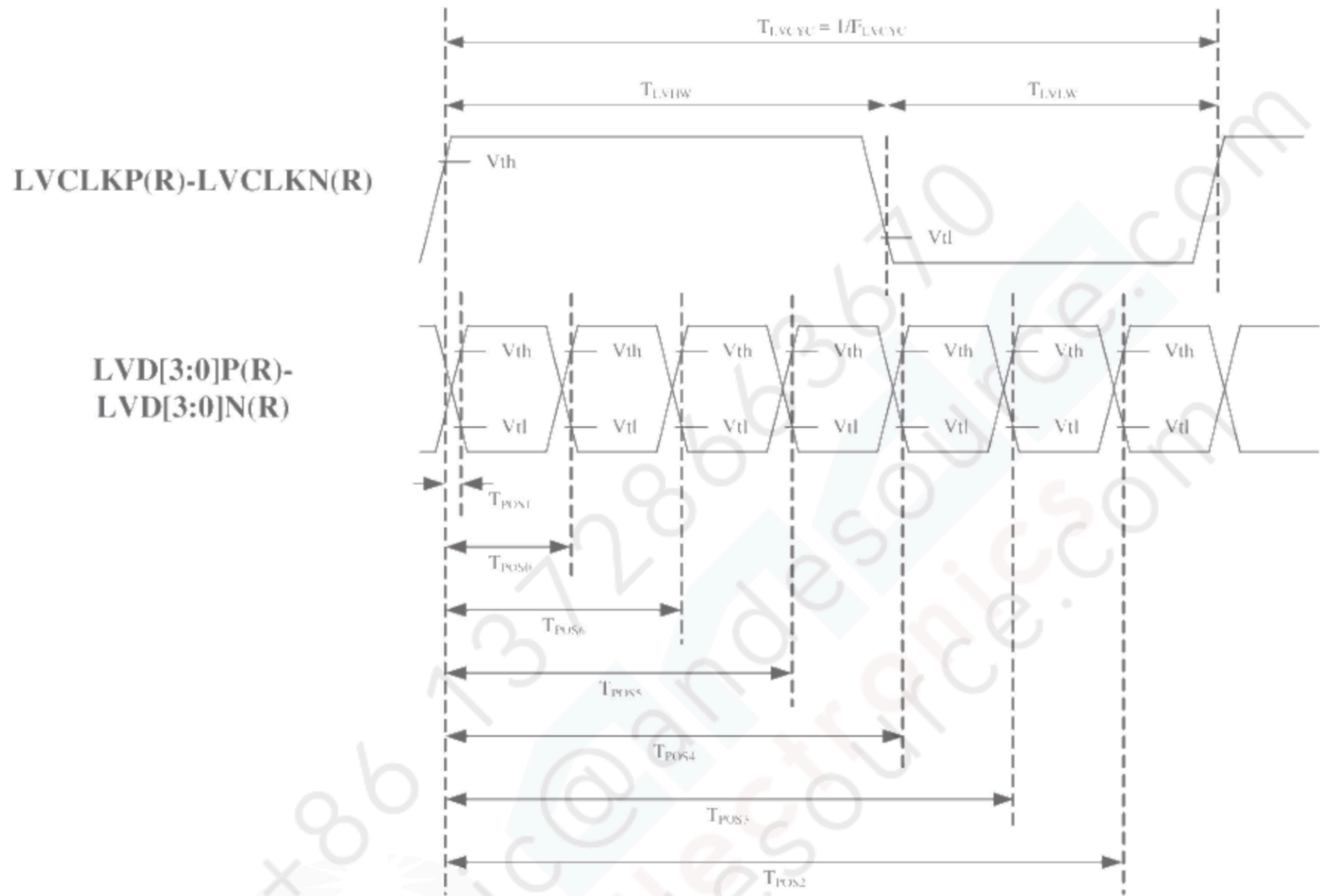
3.3.1. AC Electrical Characteristics

Parameter	Symbol				Unit	Remark
		Min.				
Clock frequency	FLVCYC	10	-	85	MHz	Frame rate=60Hz
Clock Period	TLVCYC	11.76	-	100	Nsec	Frame rate=60Hz
1 data bit time	UI	-	1/7	-	TLVCYC	
Position 1	TPOS1	-0.2	0	0.2	UI	Note 10
Position 0	TPOS0	0.8	1	1.2	UI	
Position 6	TPOS6	1.8	2	2.2	UI	
Position 5	TPOS5	2.8	3	3.2	UI	
Position 4	TPOS4	3.8	4	4.2	UI	
Position 3	TPOS3	4.8	5	5.2	UI	
Position 2	TPOS2	5.8	6	6.2	UI	
Input eye width	TEYEW	0.6	-	-	UI	
Input eye border	TEX	-	-	0.2	UI	
LVDS wake up time	TENLVDS	-	-	150	ns	

Note 10: Please refer to “3.3.2 Input Clock and Data Timing Diagram”

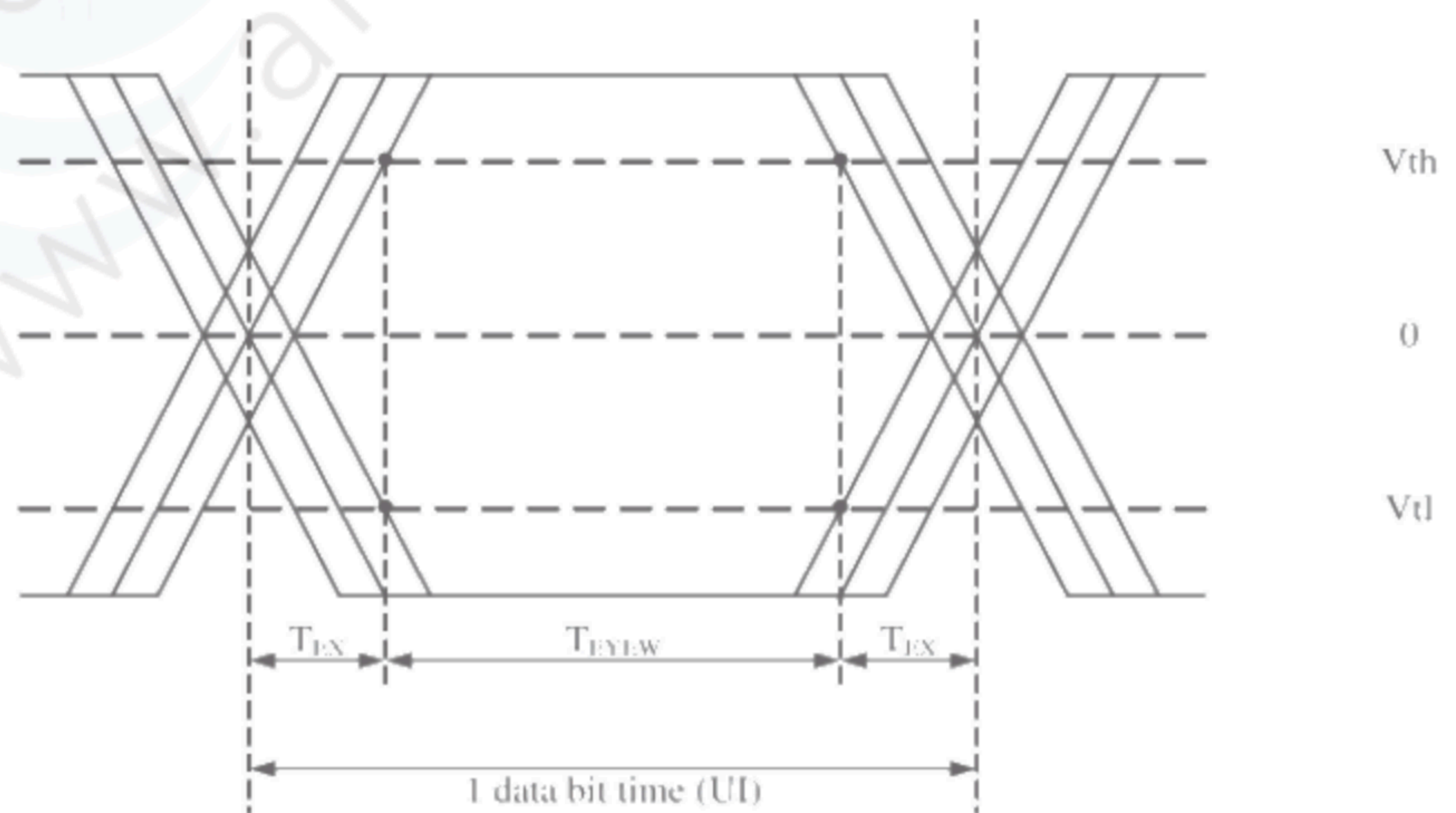
3.3.2. Input Clock and Data Timing Diagram

LVDS input timing:



Differential:

LVD[3:0]P-LVD[3:0]N

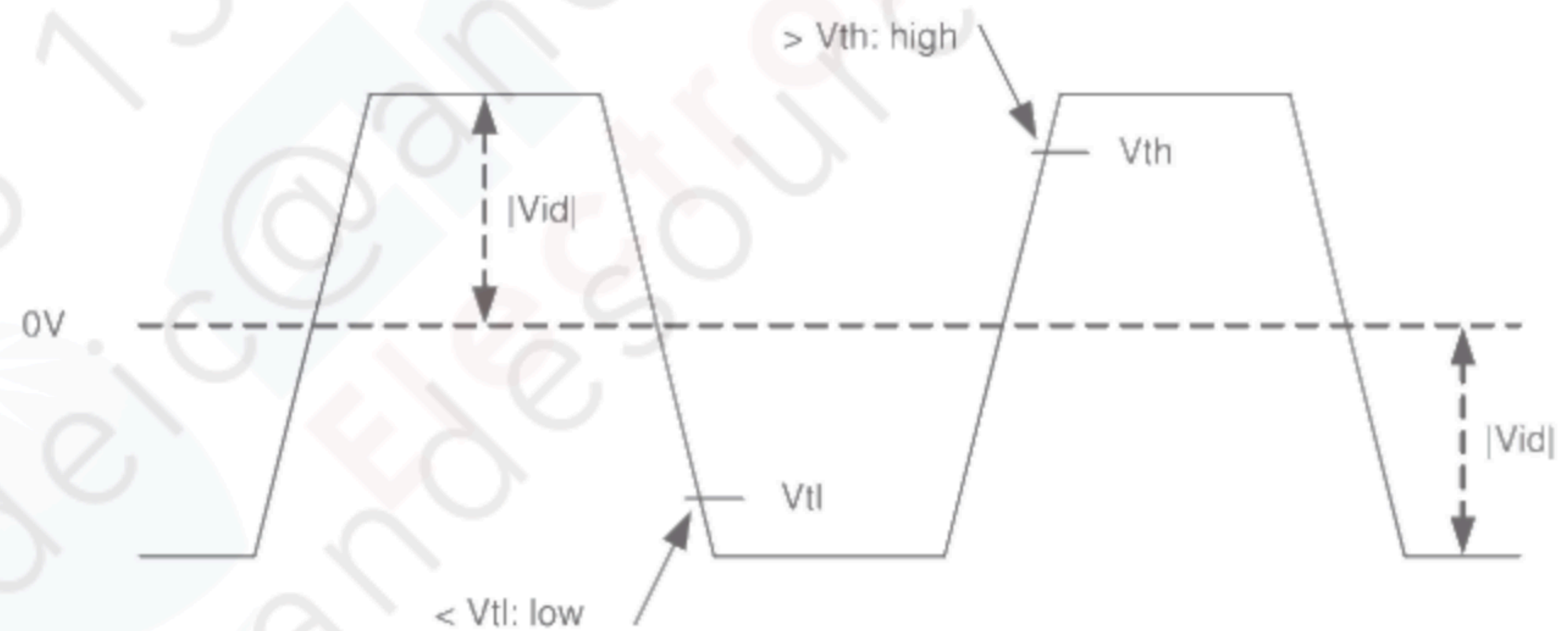


LVDS input eye diagram

3.3.3. DC Electrical Characteristics

Parameter	Symbol	Spec.			Unit	Remark
		Min.	Typ.	Max.		
Differential input high Threshold voltage	Vth	-	-	+0.1	V	Vcm=1.2V
Differential input low Threshold voltage	Vtl	-0.1	-	-	V	
Differential input common Mode voltage	Vcm	1	1.2	$1.8 - V_{id} /2$	V	-
LVDS input voltage	V _{INLV}	0.7		1.8	V	-
Differential input voltage	V _{id}	0.2	-	0.6	V	-
Differential input leakage Current	Vleak	-10	-	+10	μA	-
Termination Resistor	Z _{id}	80	100	120	Ω	-

Differential:
LVCLKP(R)-LVCLKN(R),
LVD[3:0]P(R)-
LVD[3:0]N(R)



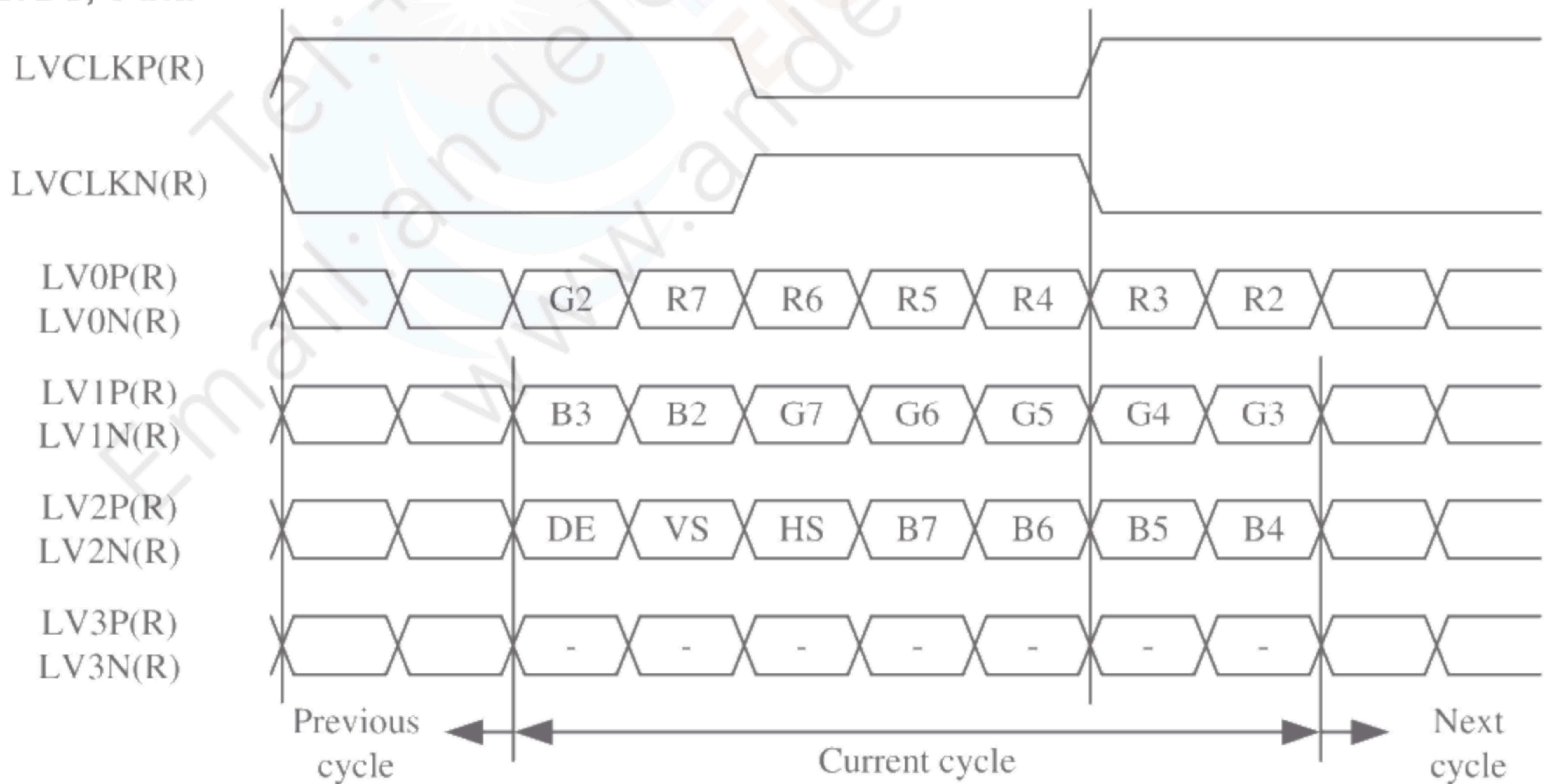
3.3.4. Timing

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
DCLK Frequency	F DCLK	58.5	63.7	76.3	MHz	Frame rate=60Hz
Horizontal valid data	t _{hd}	1280			DCLK	
H-blanking	t _{hb}	56	60	192	DCLK	
1 Horizontal Line	t _h	1336	1340	1472	DCLK	
Vertical valid data	t _{vd}	720			H	
V-blanking	t _{vb}	10	72	144	H	
1 Vertical field	t _v	730	792	864	H	

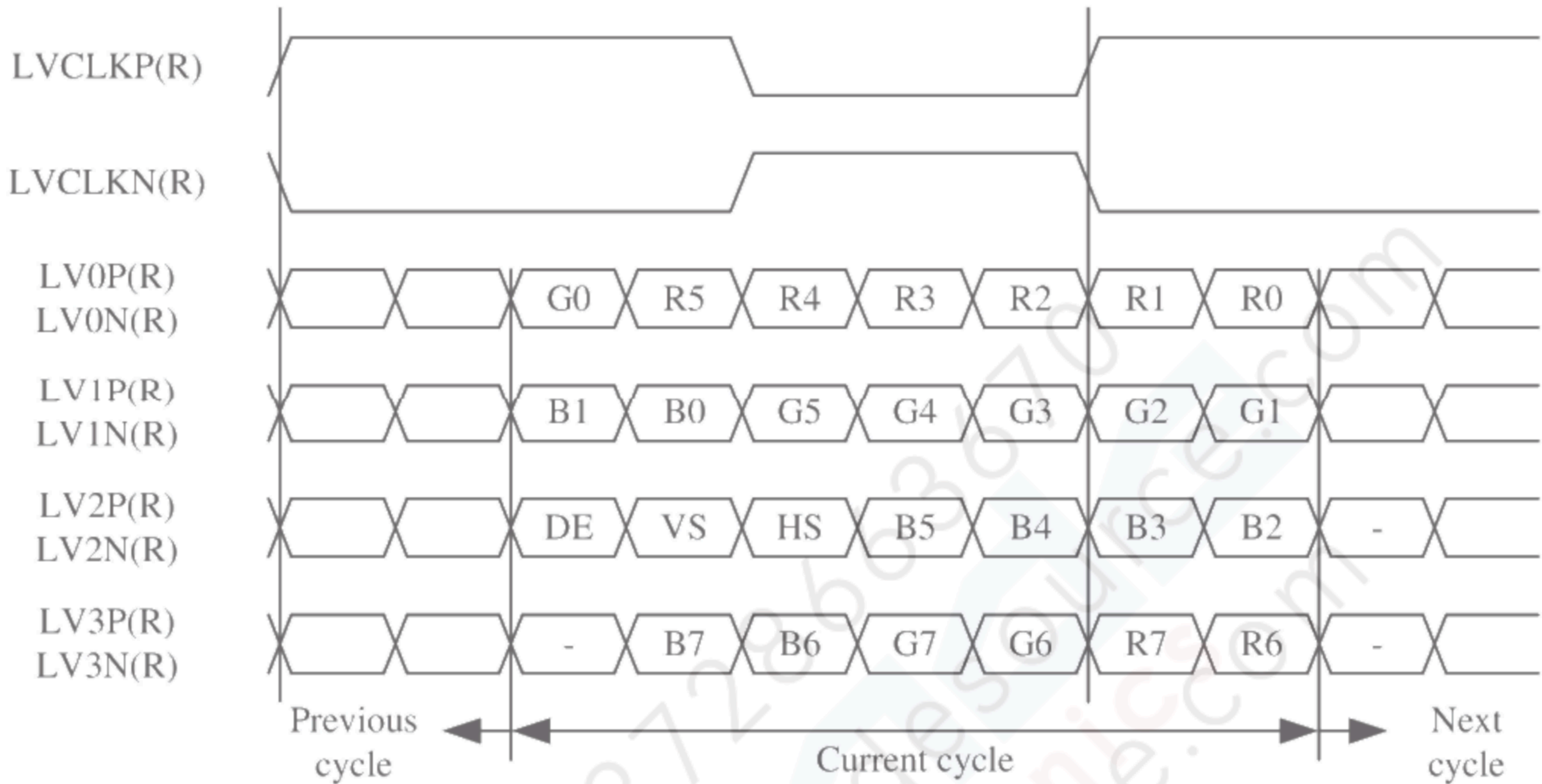
Note 11: DE mode only.

3.3.5. Data Input Format

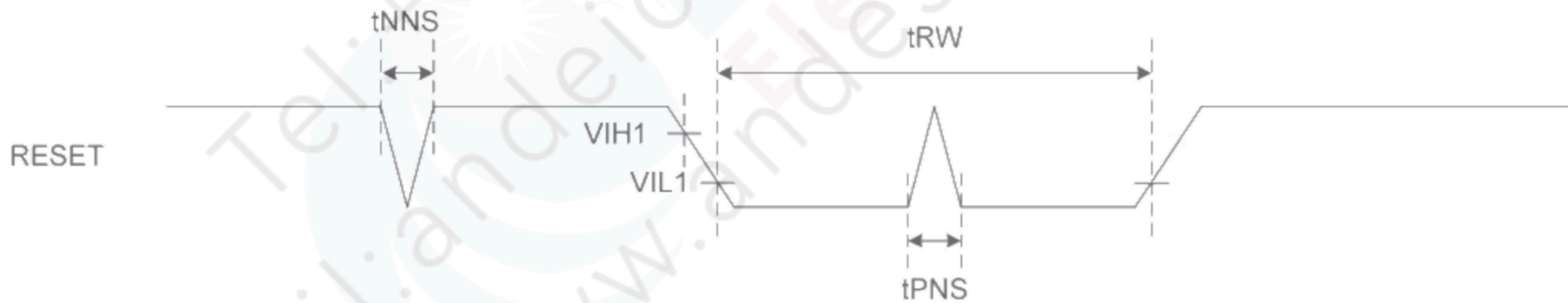
LVDS, 6-bit:



LVDS, 8-bit, VESA format:



3.3.6. Reset timing



Signal	Parameter	Symbol	Spec.			Unit	Remark
			Min.	Typ.	Max.		
RESET	Reset pulse width	tRW	10	-	-	μs	-
	Positive spike noise width	tPNS	-	-	100	ns	-
	Negative spike noise width	tNNS	-	-	100	ns	-

4. Optical Specifications

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR≥ 10)	θ_L	$\Phi=180^\circ$ (9 o'clock)		85	-	degree	Note 1
	θ_R	$\Phi=0^\circ$ (3 o'clock)		85	-		
	θ_T	$\Phi=90^\circ$ (12 o'clock)		85	-		
	θ_B	$\Phi=270^\circ$ (6 o'clock)		85	-		
Response time	T_{ON}	Normal $\theta=\Phi=0^\circ$	-	10	20	msec	Note 3
	T_{OFF}		-	15	30	msec	Note 3
Contrast ratio	CR		(TBD)	1000	-	-	Note 2 Note 4
Color chromaticity (CIE 1931)	W_X		(0.26)	(0.31)	(0.36)	-	Note 2 Note 5
	W_Y		(0.28)	(0.33)	(0.38)	-	
Luminance	L		600	(750)	-	cd/m ²	Note 5
Luminance uniformity	Y_U		75	80	-	%	Note 6

Test Conditions:

1. $DV_{DD}=3.3V$, $I_L=284mA$ (Backlight current), the ambient temperature is 25°C.
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range.

The view angel for $\Theta=85^\circ$ is measured by BM-5A.

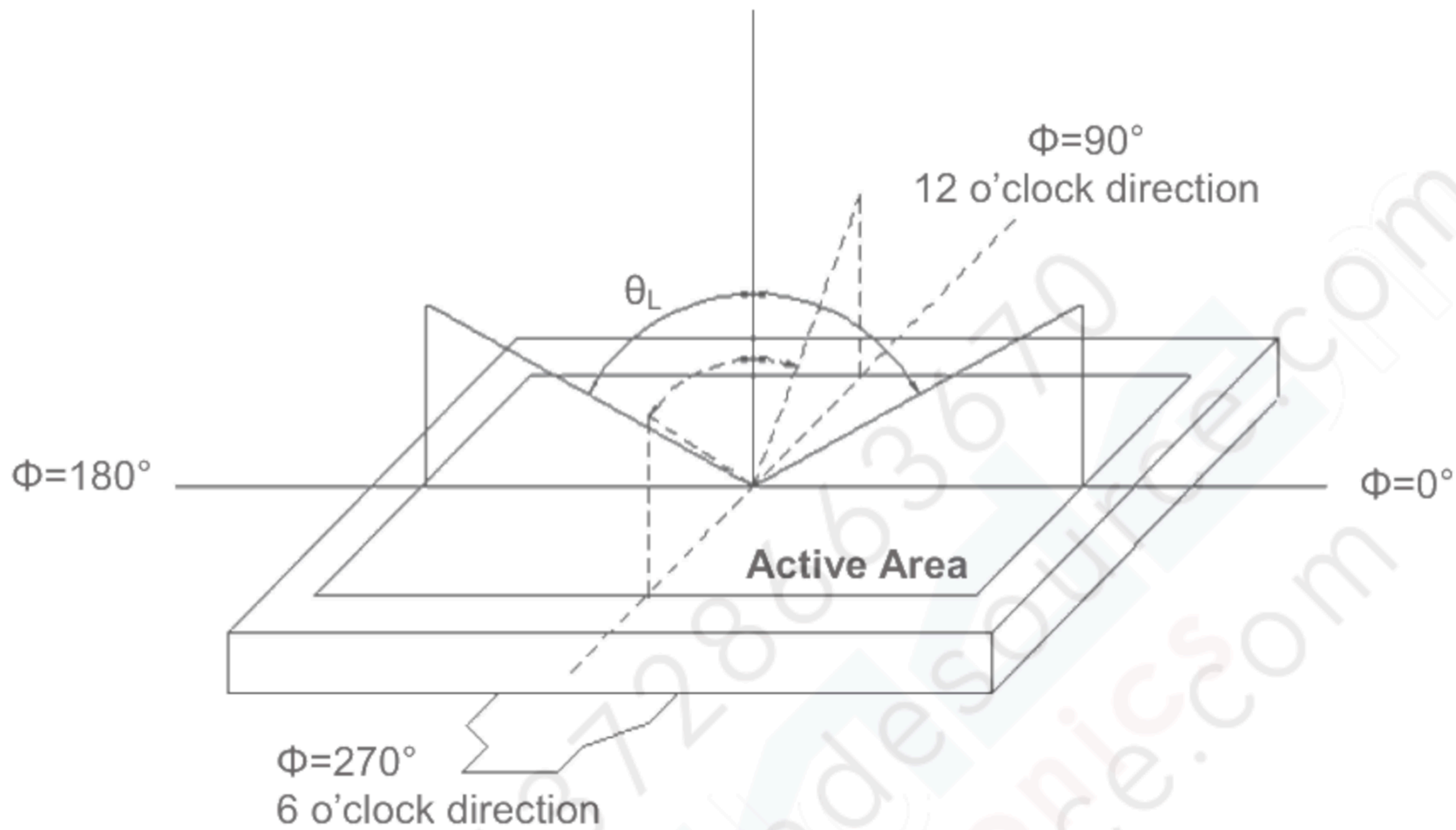


Fig. 4-1 Definition of viewing angle

Note 2: Definition of optical measurement system.

The backlight has been light on for 30 minutes then measured the optical properties at the center point of the LCD screen in dark room. The color chromaticity、contrast ratio are measured by DMS 803.

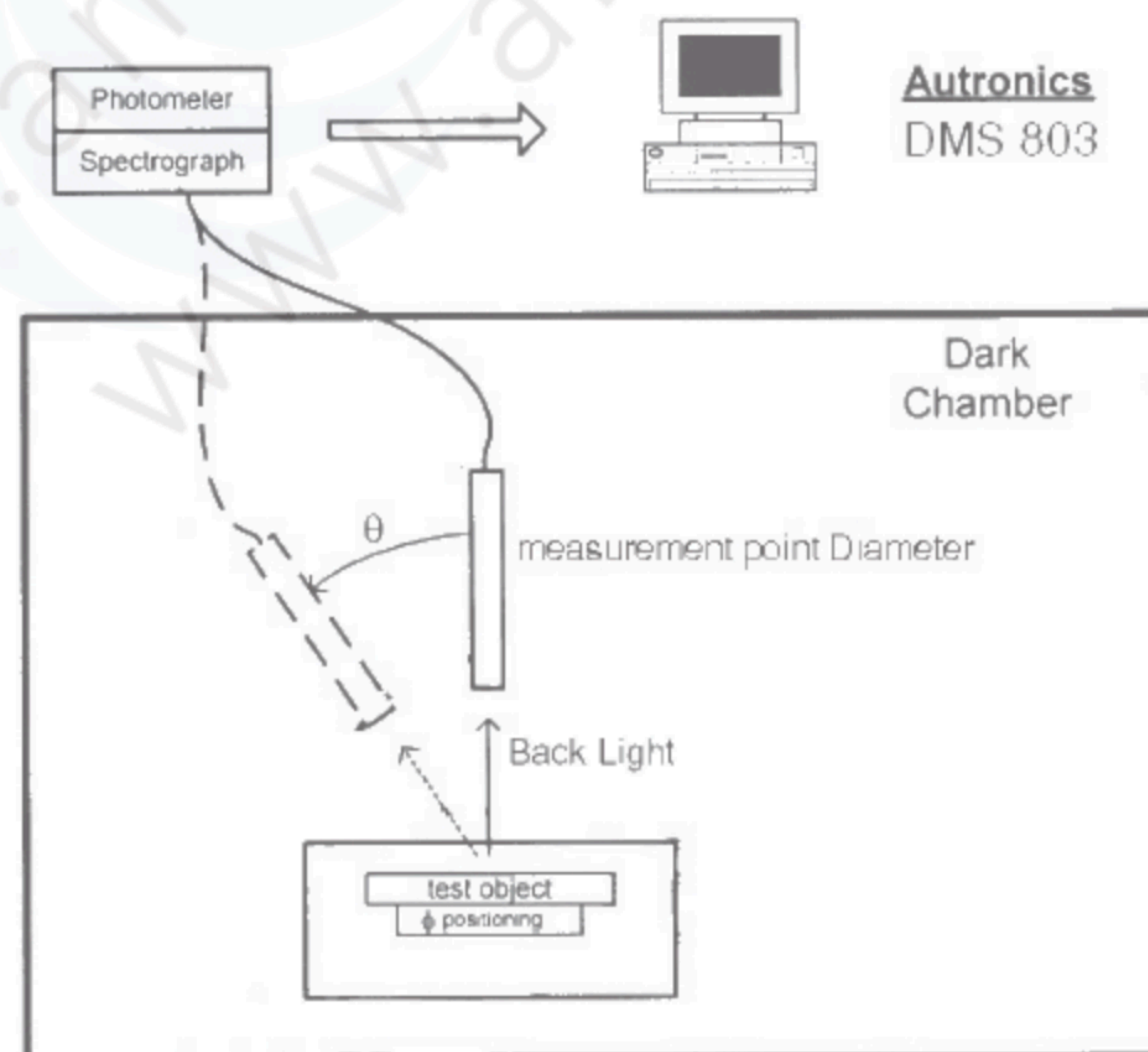


Fig. 4-2 Optical measurement system setup

Note 3: Definition of response time

The response time is measured by photo detector of oscilloscope.

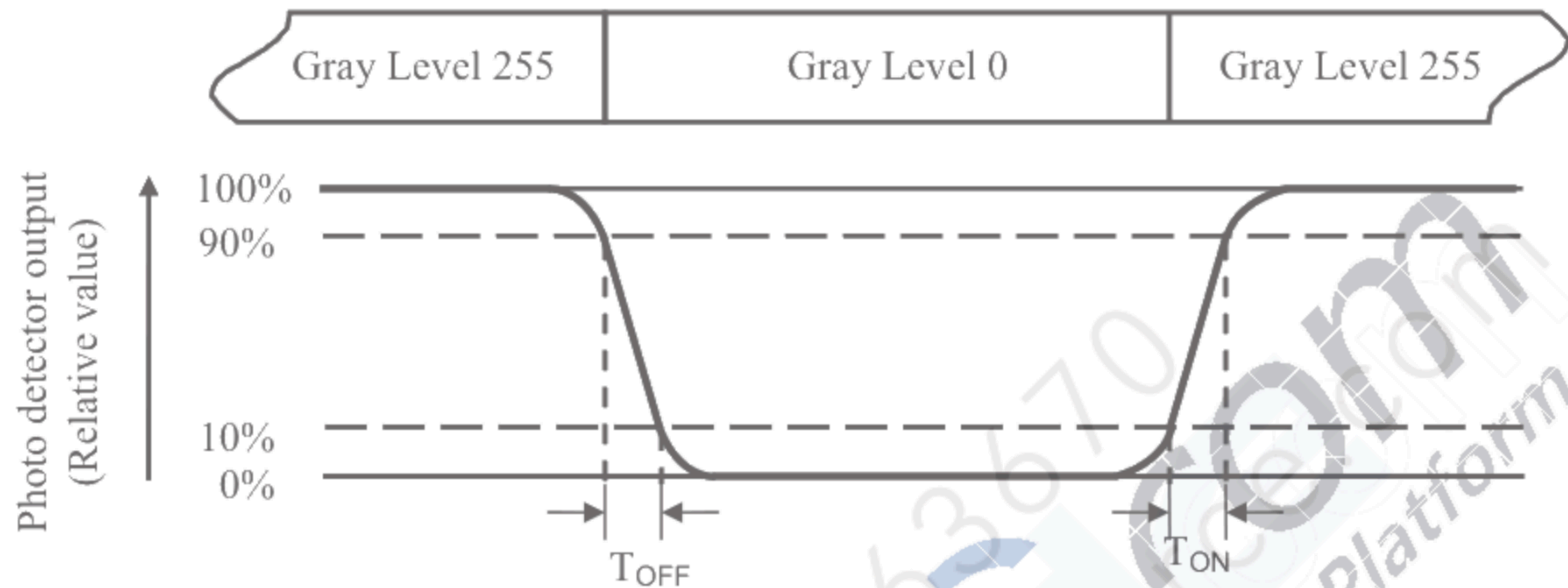


Fig. 4-3 Definition of response time

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 $I_L = (268\text{mA})$.

5. Reliability Test Items

	Test Conditions	Remark
High Temperature Storage Test	90°C, 500 hours	Note 1 Note 2 Note 4
Low Temperature Storage Test	-40°C, 500 hours	
High Temperature Operation Test	85°C, 500 hours	
Low Temperature Operation Test	-30°C, 500 hours	
High Temperature & High Humidity Operation Test	60°C, RH 90%, 500hours	
Thermal Shock	[(-30°C 30min)→(85°C 30min)]/cycle , (Ramp rate ≥ 20°C/min) , 100cycles	
ESD Test (Non-Operation)	Condition 1 : C = 150pF, R = 330Ω Contact Discharge, ± 8KV Condition 2 : C = 150pF, R = 330Ω, Air Discharge, ± 15KV	Note 1
ESD Test (Operation)	Condition 1 : C = 150pF, R = 330Ω Contact Discharge, ± 8KV Condition 2 : C = 150pF, R = 330Ω, Air Discharge, ± 15KV	Note 5
Mechanical Shock	100G, 6ms, half sine wave, 3 times for each direction of ±X, ±Y, ±Z	Note 1 Note 3
Mechanical Vibration	Frequency: 10 ~55~10Hz;Sweep Mode: Log Sweep Sweep time: 1Oct/min; Acceleration: 1.5G;Test time:2 hr for each direction of X, Y, Z.	Note 1 Note 3
Packaging Vibration Test	1.47Grms X, Y, Z three axes (30min /axis) [Frequency : 5Hz(0.015G ² /Hz) , 100Hz(0.015G ² /Hz) , 200Hz(0.0037G ² /Hz)]	
Packaging Drop Test	1corner, 3edges, 6faces (1 time/direction) <follow ISTA(1A) Height> 0kg ≤ W < 10kg : 76cm, 10kg ≤ W < 19kg : 61cm, 19kg ≤ W < 28kg : 46cm, 28kg ≤ W < 45kg : 31cm, 45kg ≤ W ≤ 68kg : 20cm	

Note 1: Criteria: Normal display image with no obvious non-uniformity and no line defect.

Note 2: Evaluation should be tested after storage at room temperature for more than two hour

Note 3: At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.

Note 4: A certain level of Mura (non-uniformity) of dark / black image will happen several days after high temperature testing (H.T.T.). There is a slowly part recovery over a long time (several months). Such a long exposure time like in H.T.T. will normally not happen in a real application. Therefore the test H.T.T. was introduced to simulate cycles with normal conditions in-between but with the same total exposure time what show a significant reduced Mura.

The root cause is related to tension generated due to different amount of shrinking in the stack of layers in the polarizer sheet. The effect is more significant on larger displays like this size. An investigation into alternative polarizer material showed that there is no better alternative currently available.

Note 5: Criteria Class B: Some performance degradation allowed. No data loss. Self - recoverable No hardware failures

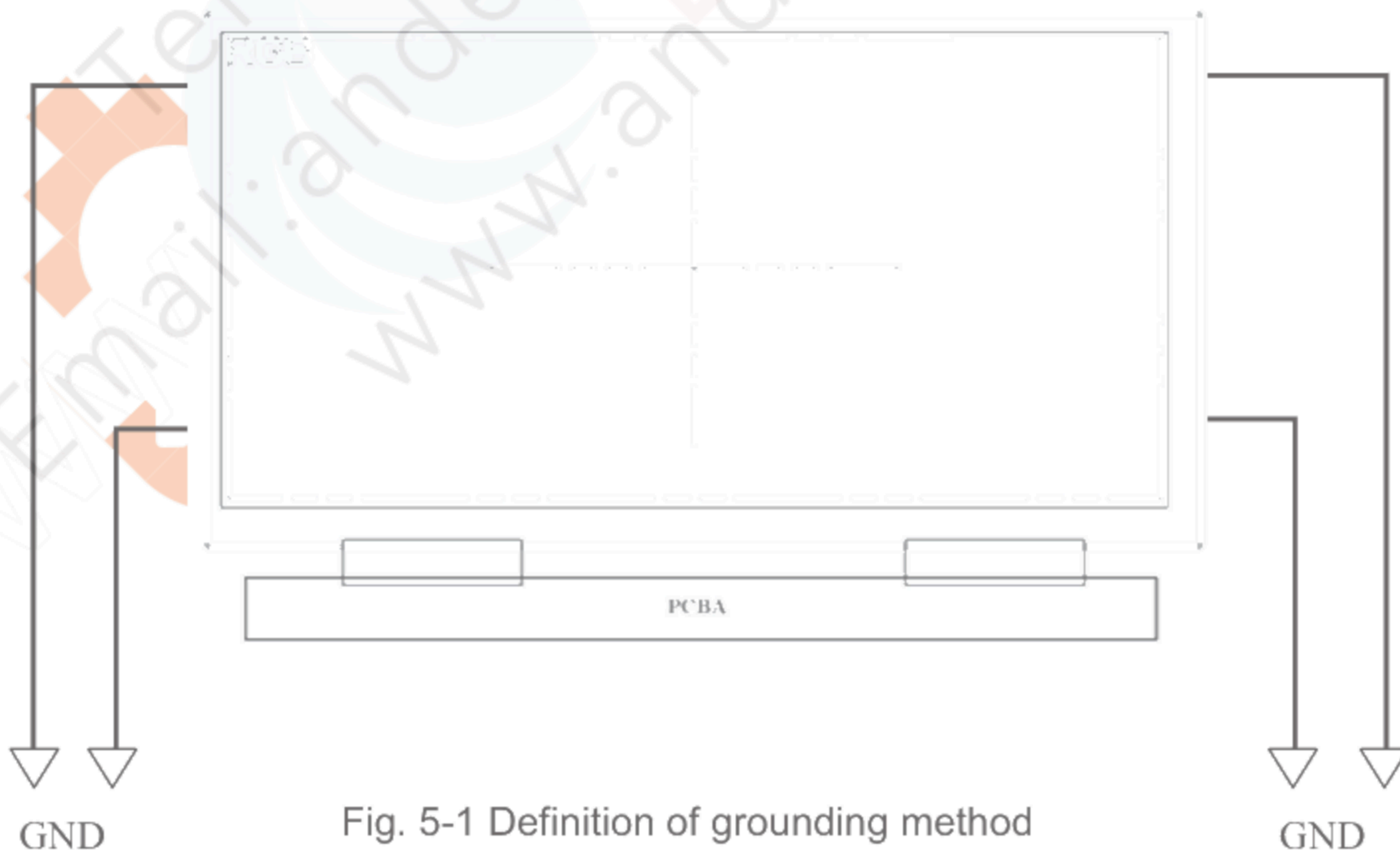


Fig. 5-1 Definition of grounding method

6. General Precautions

6.1. Safety

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

6.2. 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.

6.3. 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.

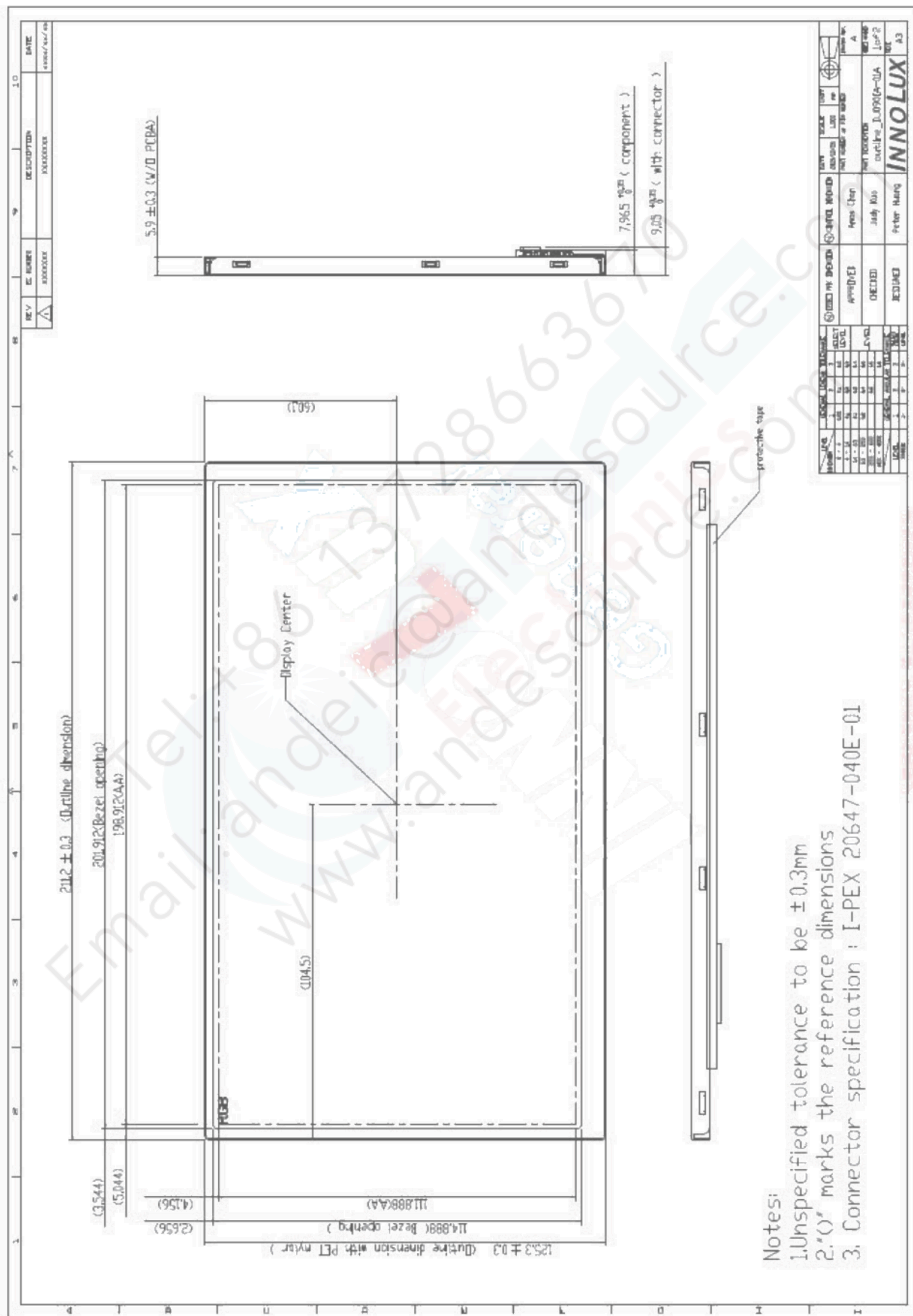
6.4. Storage

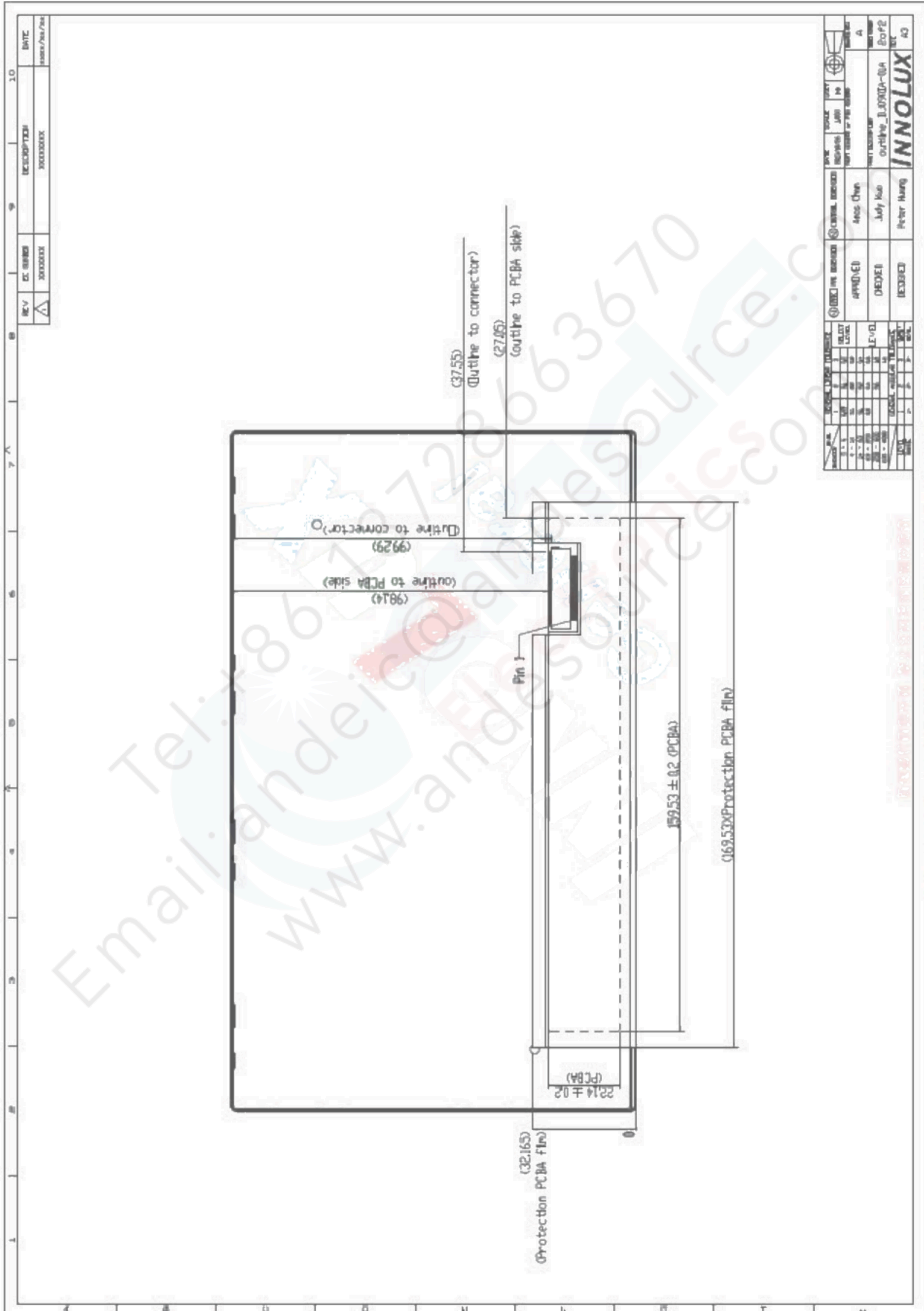
1. Store the module in a dark room where must keep at $25\pm 10^{\circ}\text{C}$ and 65%RH or less.
2. Do not store the module in surroundings containing organic solvent or corrosive gas.
3. Store the module in an anti-electrostatic container or bag.

6.5. Cleaning

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

7. Mechanical Drawing





8. Package Drawing

8.1. Packaging Material Table

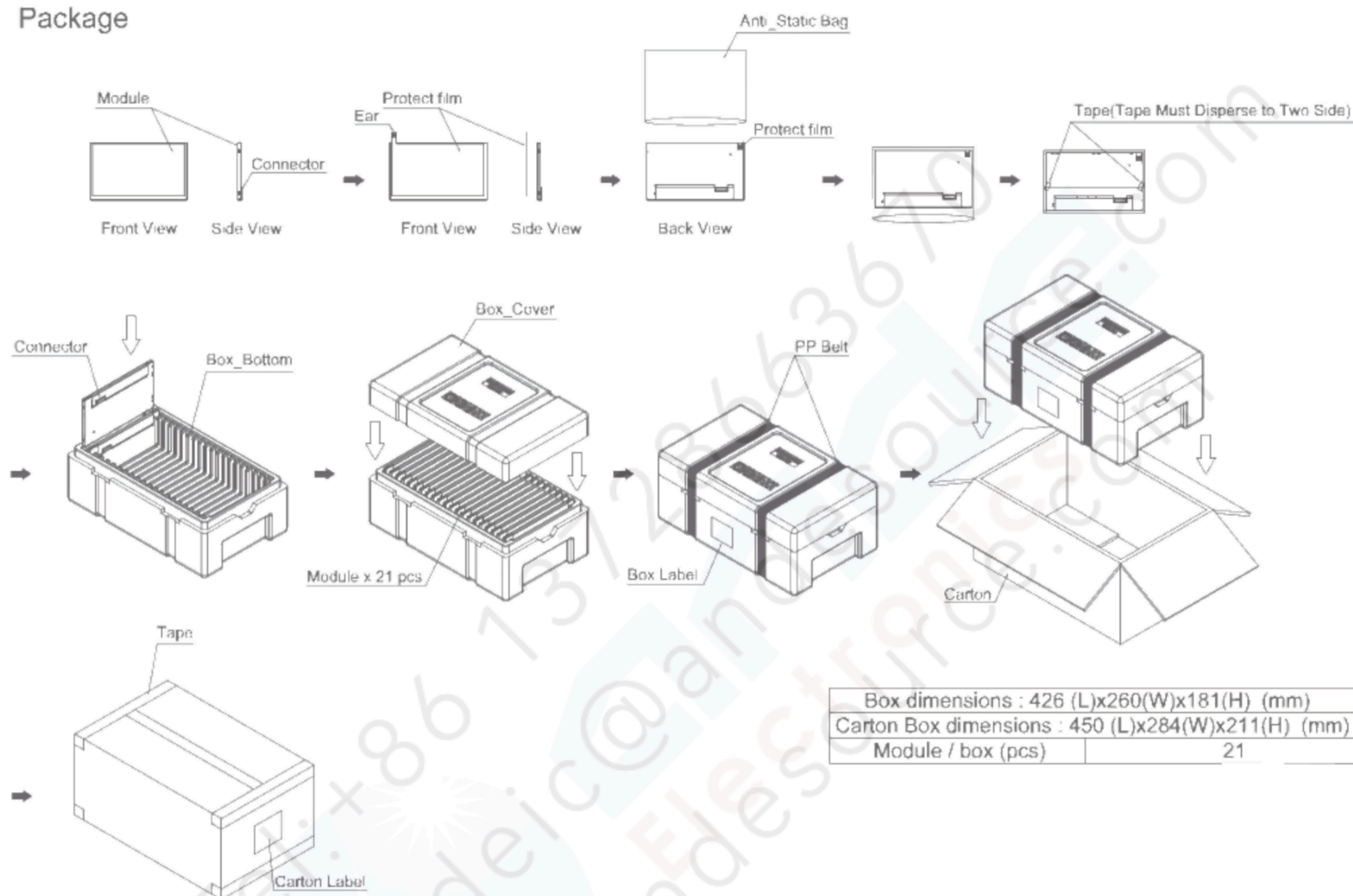
No.	Item	Model (Material)	Dimensions(mm)	Unit Weight (kg)	Quantity	Remark
1	LCM Module	Model Name	211.2×125.3×5.9		21	
2	EPO Box	EPO	426x260x181	0.284	1	
3	protect film	PET	200.9x113.9	0.002	21	
3	A/S Bag	PE	230x168x0.04	0.005	21	
4	Carton	Corrugated paper	450x284x211	0.71	1	
5	Total weight					

8.2. Packaging Quantity

Total LCM quantity in Carton : 21 pcs.

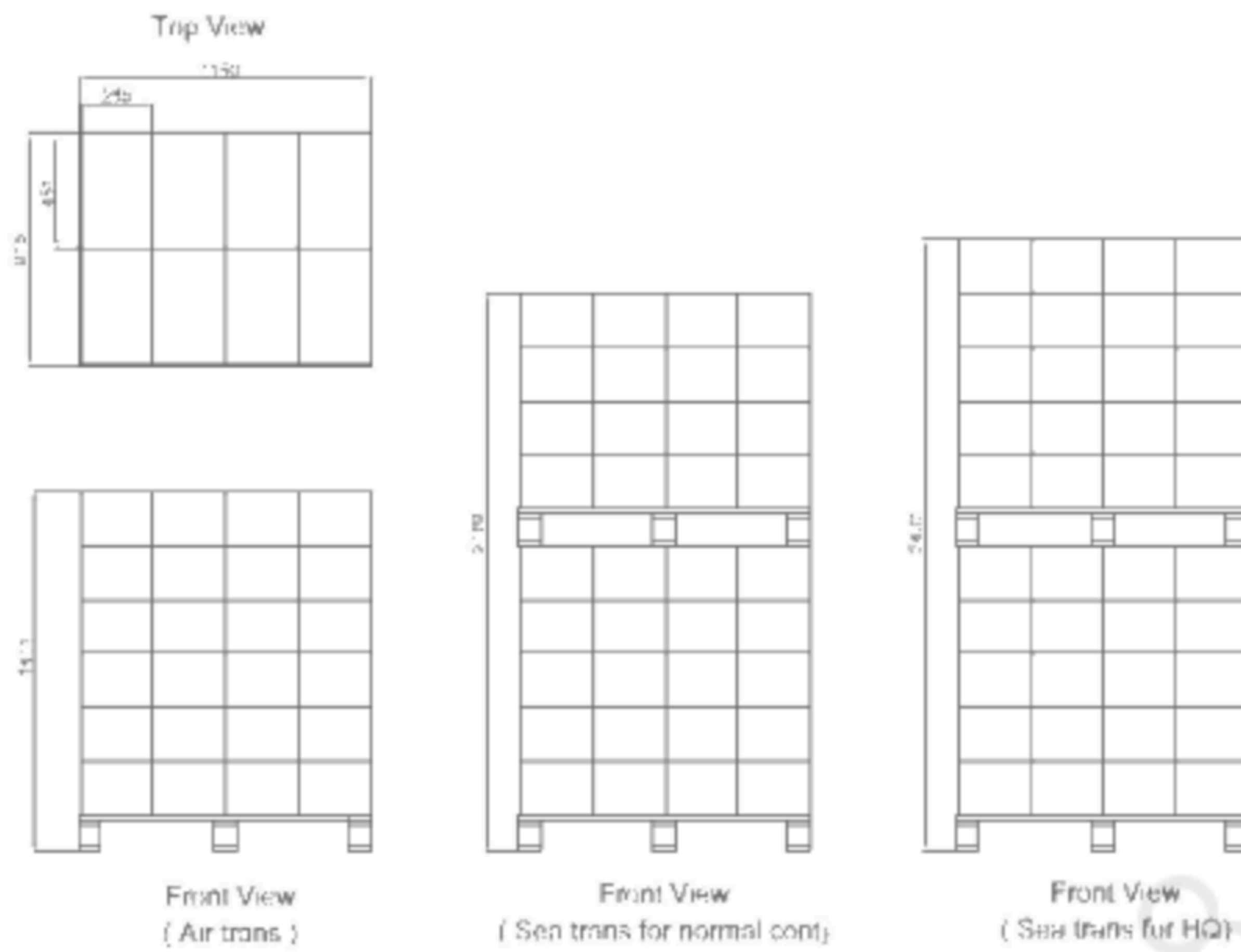
8.3. Packaging Drawing

Package



8.4. Shipping Drawing

Shipping



Pallet Type

Destination	Material	Pallet size(mm)
For customer	Wood	L1150xW915xH142
-	-	-

Trans type	Box / Top Pallet	Box / Bottom Pallet
Air	0	48
Sea	32	40
Sea for HQ	40	40

Storage Condition

Destination	Value	Unit
Temperature	0~35	°C
Humidity	40~80	%RH

Storage temperature and humidity conditions, reference the EDCC document : I130S-0045

