

PRODUCT SPECIFICATION

KADI Model: **KD090BWS09HB**

CUSTOMER Model: **-**

Description: **9.0 " TFT-LCD Module**

Version: **1.0**

KADI	PREPARED BY	CHECKED BY	APPROVED BY
SIGNATURE			
DATE	2025.6.9	2025.6.9	2025.6.9

CUSTOMER APPROVAL	SIGNATURE	DATE

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1. General Specifications

1.1 LCM General Information

Item	Specification	Unit
LCD Size	9.0	inch
Number of Pixels	1024 (H) RGB x 600 (V)	pixels
Display Mode	Normally Black	-
Viewing Direction	Free	-
Interface	LVDS	-
Display Colors	16.7M(8bits)	colors
Outline Dimension	210.7 (H) x 126.5 (V) x 5.2 (D)	mm
Active Area	196.61 (H) x 114.15 (V)	mm
Pixel Pitch	0.1920 (H) x 0.1902 (V)	mm
Driver IC	HX8282-A11+HX8696-A01	-
Operation Temperature	-20~70	°C
Storage Temperature	-30~80	°C

Note1:Requirements on environmental protection RoHS compliant.

2. Absolute Maximum Ratings

Item	Symbol	MIN.	MAX.	Unit	Note
Analog Supply voltage	VDD	-0.5	3.96	V	Note 1

Note 1:Permanent damage may occur to the LCD module if beyond this specification.

Functional operation should be restricted to the conditions described under normal operating conditions.

3. Electrical Characteristics

3.1 Recommended Operating Condition for TFT LCD

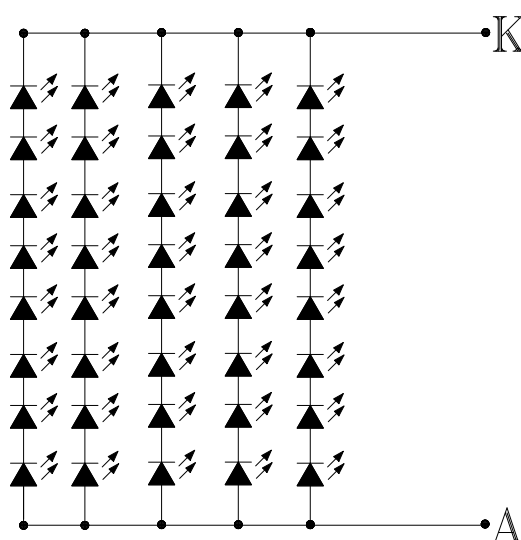
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Analog Supply voltage	VDD	2.3	3.3	3.6	V	
Analog supply current	I _{VDD}	-	TBD	-	mA	VDD=3.3V
Logic input voltage	V _{IH}	0.7*VDD	-	VDD	V	
	V _{IL}	GND	-	0.3*VDD	V	

3.2 Recommended Driving Condition for Backlight

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Driving Current	I _F	-	150	-	mA	
Driving Voltage	V _F	21.6	-	27.2	V	
Power consumption	W _{BL}	3.24	-	4.08	W	
LED Life-Time	N/A	-	30,000	-	Hours	Ta=25℃ Note 1

Note 1:LED lifetime is defined as the module brightness decay 50% of original brightness at Ta=25 degree, typical current.

Note 2:LED circuit :



4. Interface Pin Assignment

4.1 LCM Pin Assignment

No.	Symbol	Description
1	LEDK	Power for LED backlight (Anode)
2	LEDK	Power for LED backlight (Anode)
3	LEDA	Power for LED backlight (Cathode)
4	LEDA	Power for LED backlight (Cathode)
5	NC	No connection
6	DISP	Standby mode control. Normally pull High. When DISP=H: All the functions are on. (Default pulls high) When DISP=L: TCON and source driver are off and all output are GND.
7	GND	Ground
8	VDDI(NC)	No connection
9	VDDI(NC)	No connection
10	VDD 3.3V	Power supply (3.3V)
11	VDD 3.3V	Power supply (3.3V)
12	SCL	Input reference clock for serial interface.
13	SDA	Input for data of serial interface.
14	CS	Input the chip select signal for serial interface. Normally pull low.
15	GND	Ground
16	RXCLKN	-LVDS differential clock input
17	RXCLKP	+LVDS differential clock input
18	GND	Ground
19	RXIN0N	- LVDS differential data input
20	RXIN0P	+ LVDS differential data input
21	GND	Ground
22	RDIN1N	- LVDS differential data input
23	RXIN1P	+ LVDS differential data input
24	GND	Ground
25	RXIN2N	- LVDS differential data input
26	RXIN2P	+ LVDS differential data input
27	GND	Ground
28	NC	No connection
29	NC	No connection
30	GND	Ground
31	RESET	Global reset pin
32	ENPROG(NC)	No connection
33	VDIR	When VDIR=H:Down to Up. When VDIR=L:Up to Down.(Default)



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34	HDIR	When HDIR=H:Left to Right.(Default) When HDIR=L:Right to Left..
35	FMT(NC)	No connection
36	GND	Ground
37	NC	No connection
38	NC	No connection
39	NC	No connection
40	NC	No connection

5. Interface Characteristics

5.1 Power On/Off Sequence

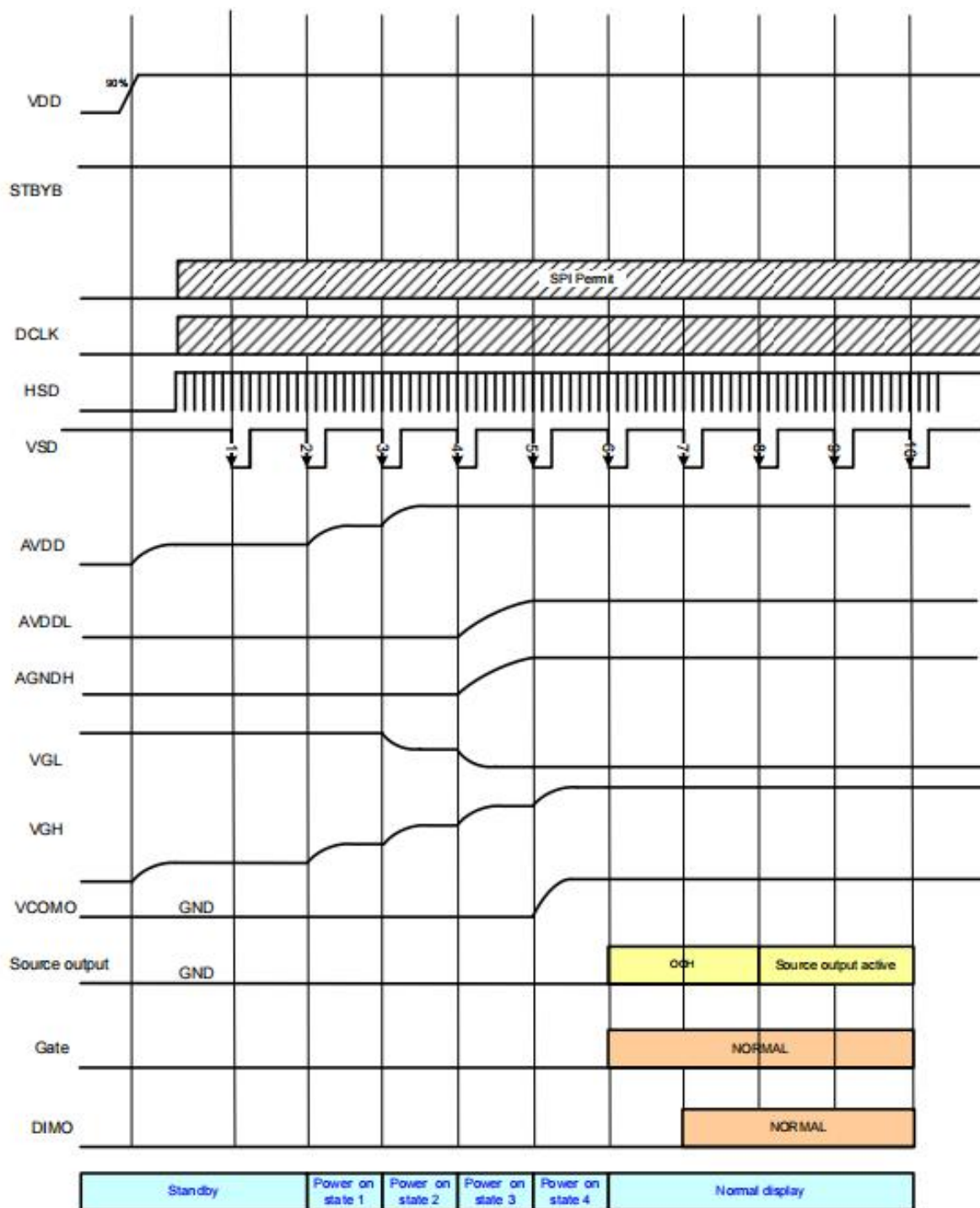
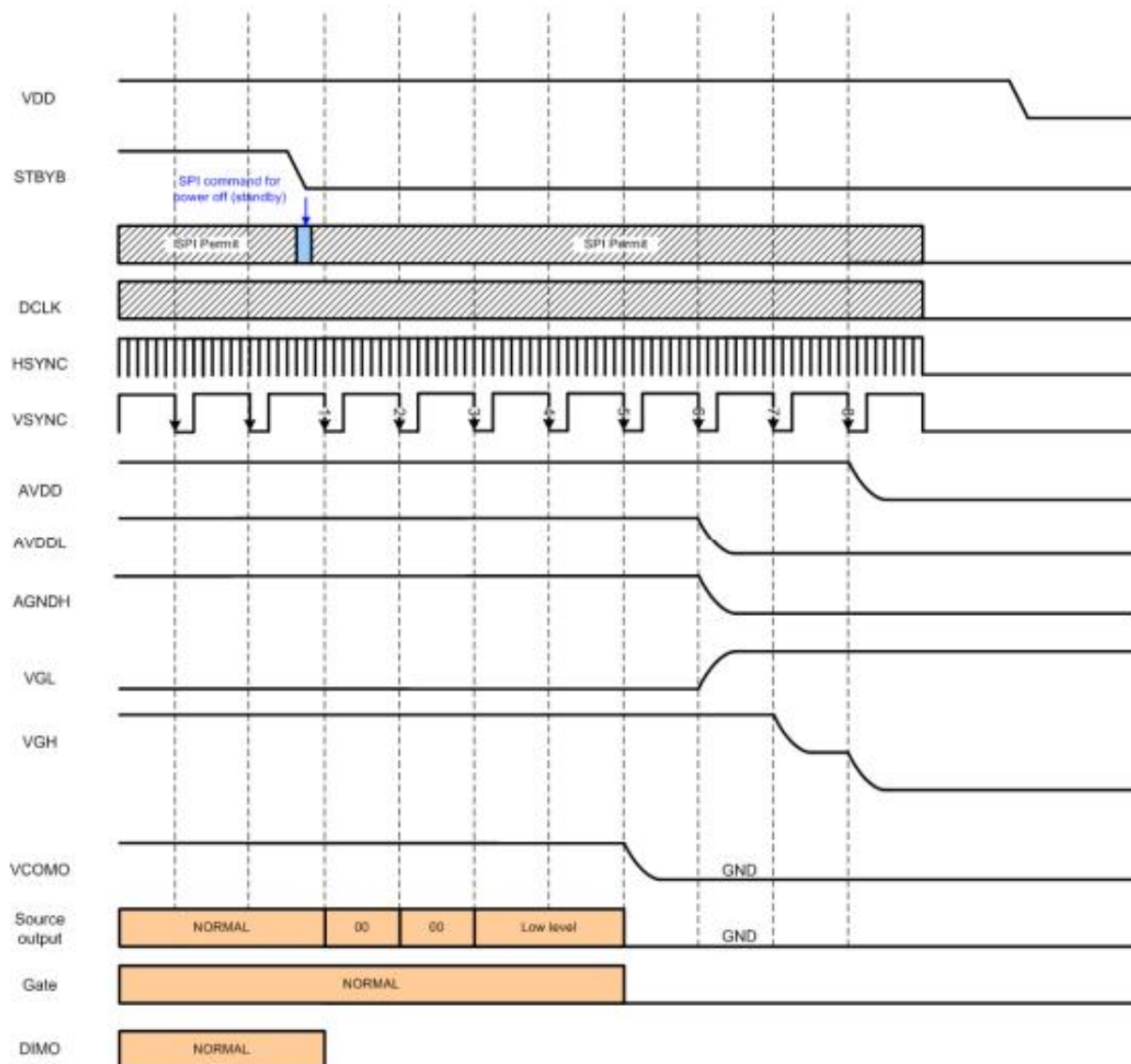


Figure 8.1: Power on timing sequence



Note: (1) Low level=3FH, when NBW=L. (Normally white)
 (2) Low level=00H, when NBW=H. (Normally black)

Figure 8.2: Power off timing sequence

5.2 DC Characteristics

5.2.1 LVDS mode Dc electrical characteristics

Parameter	Symbol	Condition	Min.	Spec. Typ.	Max.	Unit
Differential input high Threshold voltage	R_{XVTH}	$R_{XVCM}=1.2V$	-	-	+0.1	V
Differential input low threshold voltage	R_{XVTL}		-0.1	-	-	V
Input voltage range (Singed-end)	R_{XVIN}	-	0	-	$VDD-1.2+ V_{ID} /2$	V
Differential input common mode voltage	R_{XVCM}	-	$ V_{ID} /2$	-	$VDD-1.2$	V
Differential input voltage	$ V_{ID} $	-	0.2	-	0.6	V
Differential input leakage Current	RV_{XIZ}	-	-10	-	+10	μA
LVDS digital operating Current	I_{ddlvds}	Fclk=65MHz, VDD=3.3V	-	15	30	mA
LVDS digital stand-by Current	I_{stlvds}	Clock & all functions are stopped	-	10	50	μA

Table 9.3: LVDS mode DC electrical characteristics

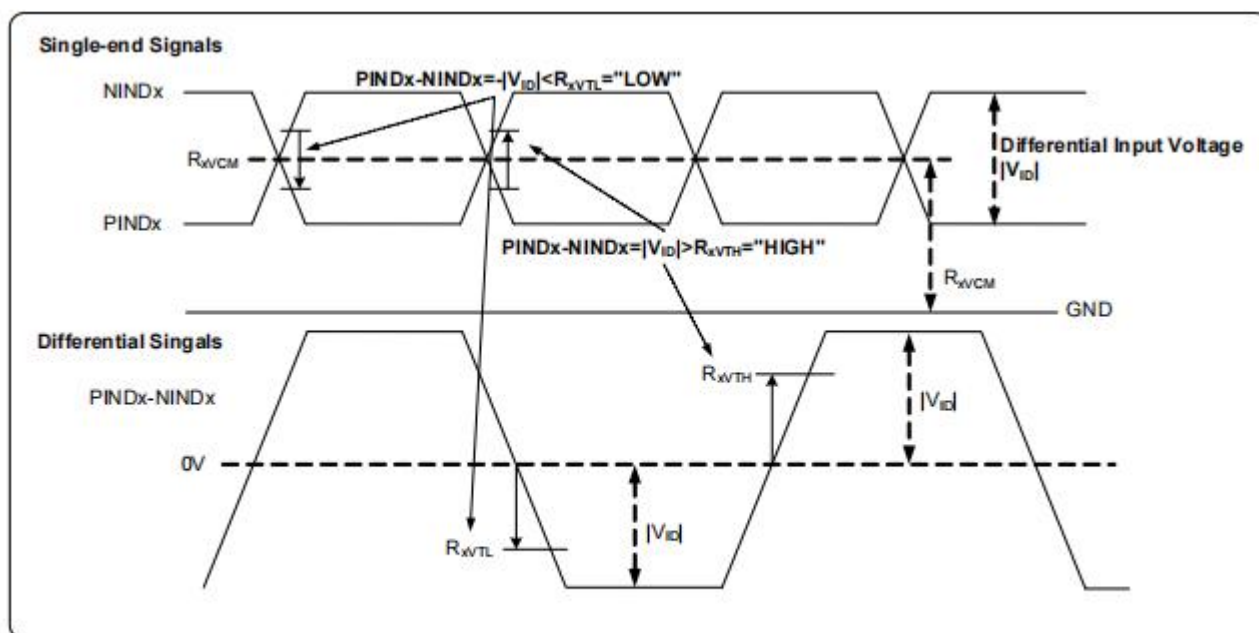


Figure 9.1: Single-end signals

5.3 AC Characteristics

5.3.1 LVDS mode AC electrical characteristics

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
Clock frequency	R_{XFCLK}	-	20	-	71	MHz
Input data skew margin	T_{RSKM}	$ V_{ID} =400mV$ $R_{XVCM}=1.2V$ $R_{XFCLK}=71MHz$	500	-	-	pS
Clock high time	T_{LVCH}	-	-	$4/(7 \times R_{XFCLK})$	-	ns
Clock low time	T_{LVCL}	-	-	$3/(7 \times R_{XFCLK})$	-	ns
PLL wake-up time	T_{enPLL}	-	-	-	150	μs

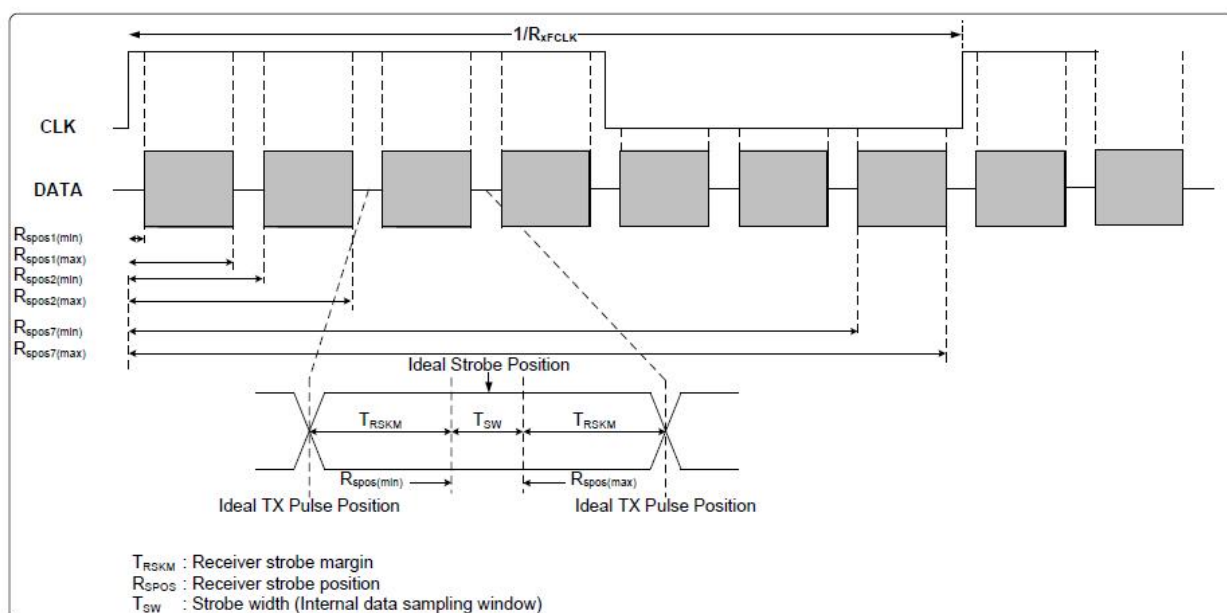
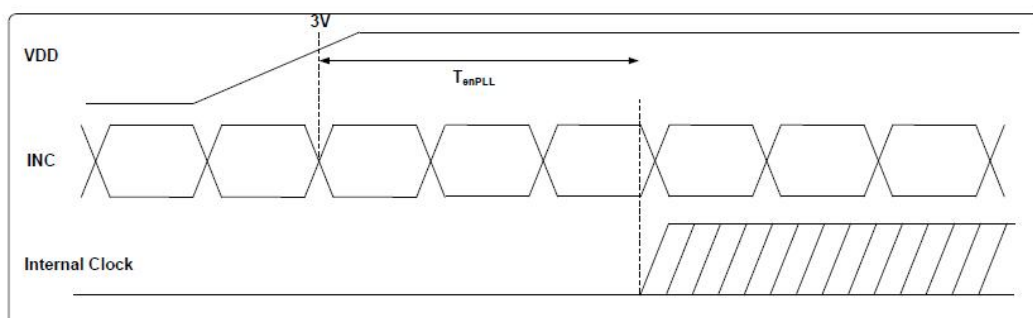
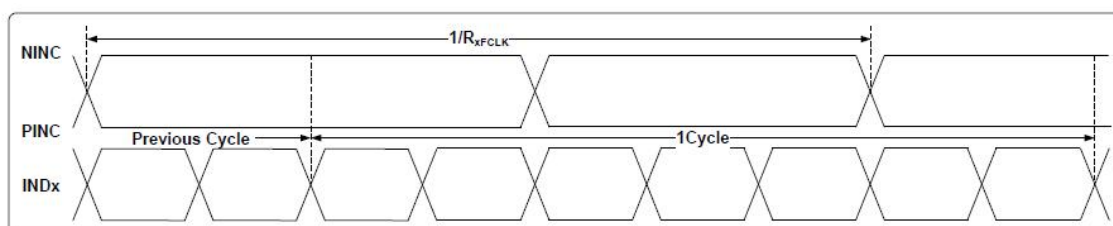


Figure 10.1: LVDS figure

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
Modulation frequency	SSC _{MF}	-	23	-	93	KHz
Modulation rate	SSC _{MR}	LVDS clock=71MHz center spread	-	-	±3	%

Table 10.3: SSC table

5.3.2 LVDS mode data input format

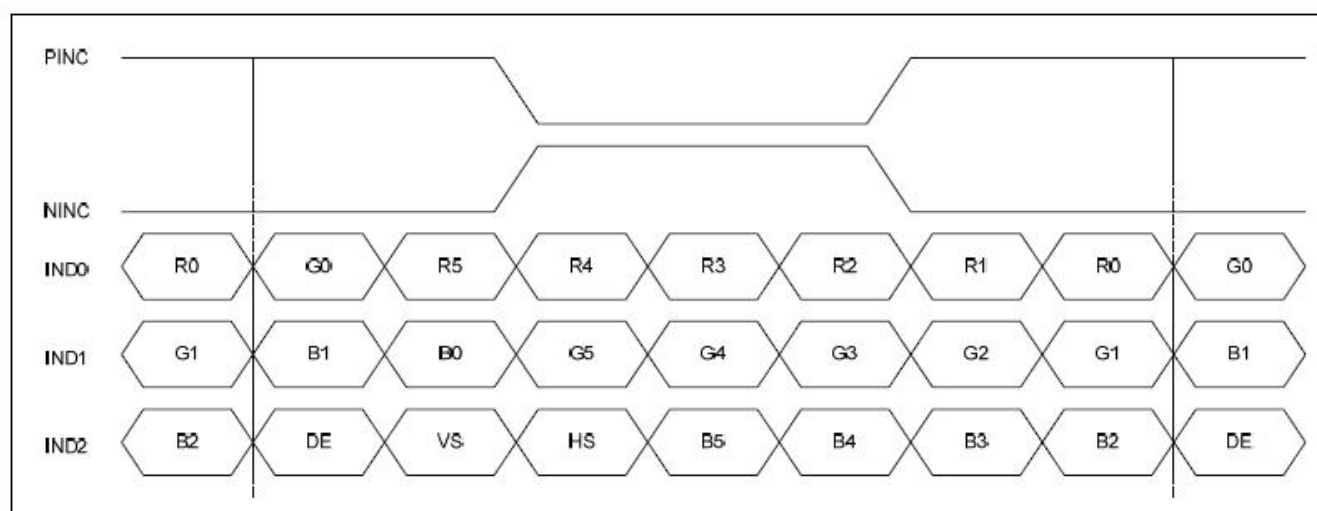
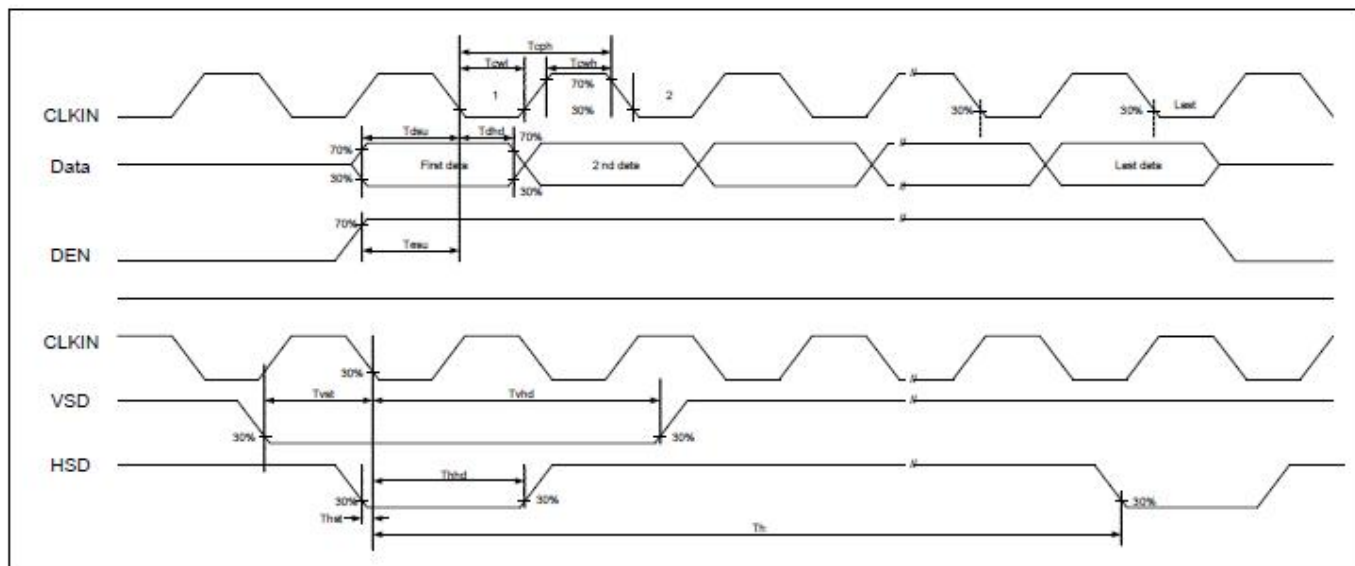


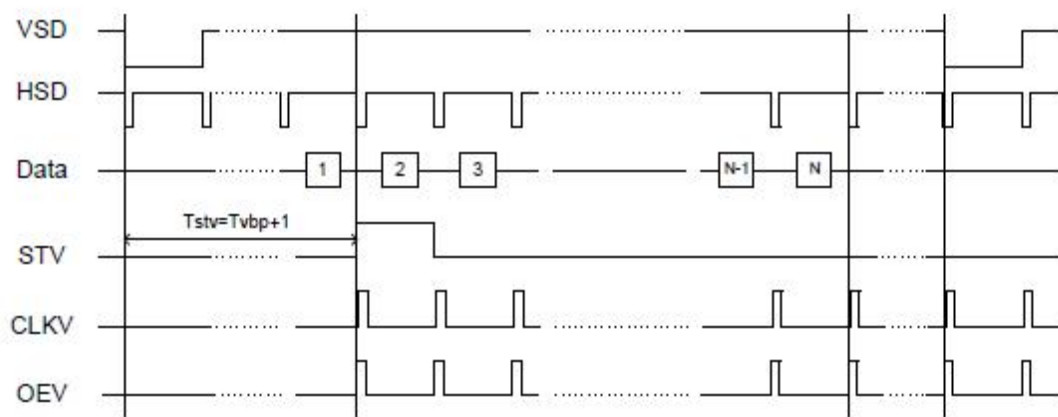
Figure 10.4: 6-bit LVDS input

5.4 Timing diagram

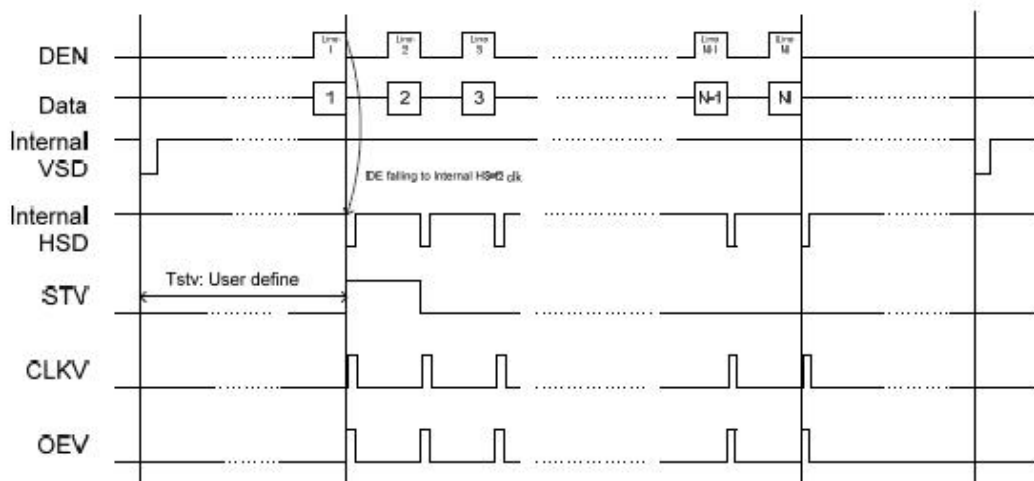
Input clock and data timing diagram



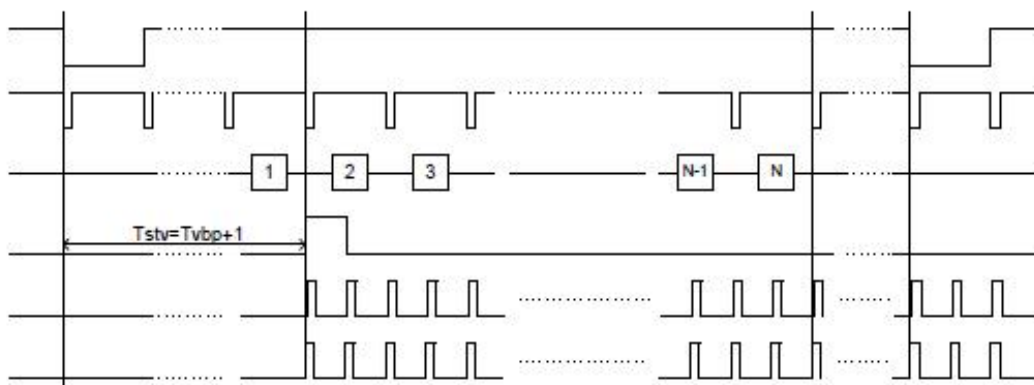
Vertical timing diagram HV (Cascade)



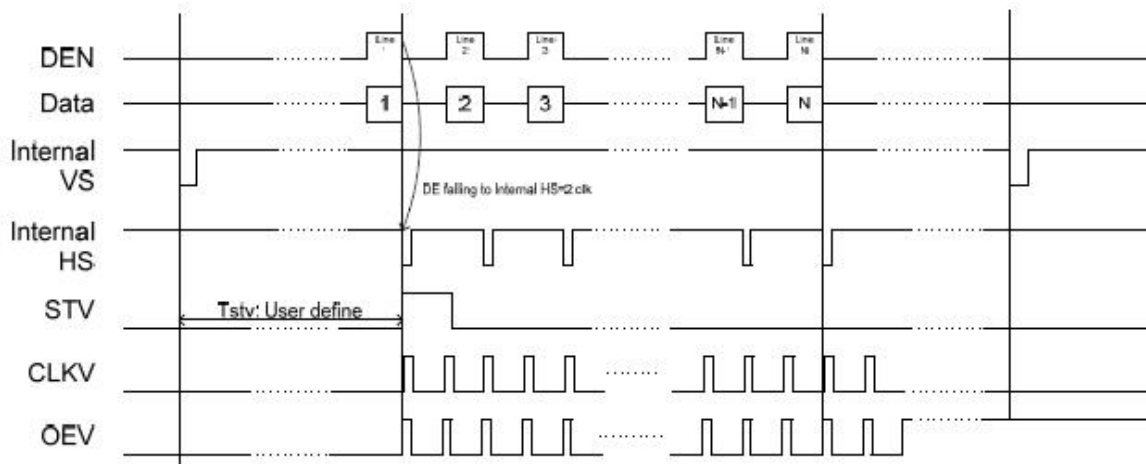
Vertical timing diagram DE (Cascade)



Vertical timing diagram HV (Dual gate)



Vertical timing diagram DE (Dual gate)



5.5 Parallel RGB input timing table

DE mode

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK frequency	fclk	40.8	51.2	67.2	MHz
Horizontal display area	thd	1024			DCLK
HSD period	th	1114	1344	1400	DCLK
HSD blanking	thb+thfp	90	320	376	DCLK
Vertical display area	tvd	600			T _H
VSD period	tv	610	635	800	T _H
VSD blanking	tvbp+tvfp	10	35	200	T _H

Table 10.4: DE mode (1024x600)

6. Optical Specifications

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR≥10) B/L ON	θ_T	$\Phi=90^\circ$ (12 o'clock)	-	85	-	deg	Note2
	θ_B	$\Phi=270^\circ$ (6 o'clock)	-	85	-	deg	Note2
	θ_L	$\Phi=180^\circ$ (9 o'clock)	-	85	-	deg	Note2
	θ_R	$\Phi=0^\circ$ (3 o'clock)	-	85	-	deg	Note2
Response Time	T_{ON}	Normal $\theta=\Phi=0^\circ$	-	15	20	msec	Note4
	T_{OFF}		-	15	20	msec	Note4
Contrast Ratio	CR		-	800	-	-	Note1 Note3
Color Chromaticity	W_X		TBD	TBD	TBD	-	Note1 Note5
	W_Y		TBD	TBD	TBD	-	Note1 Note5
Luminance	L		450	500	-	cd/m ²	Note1 Note7
Luminance Uniformity	Y_U		75	80	-	%	Note1 Note6
NTSC	-		-	50	-	%	-

Note 1:Definition of optical measurement system

The optical characteristics should be measured in dark room. After 5 minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.

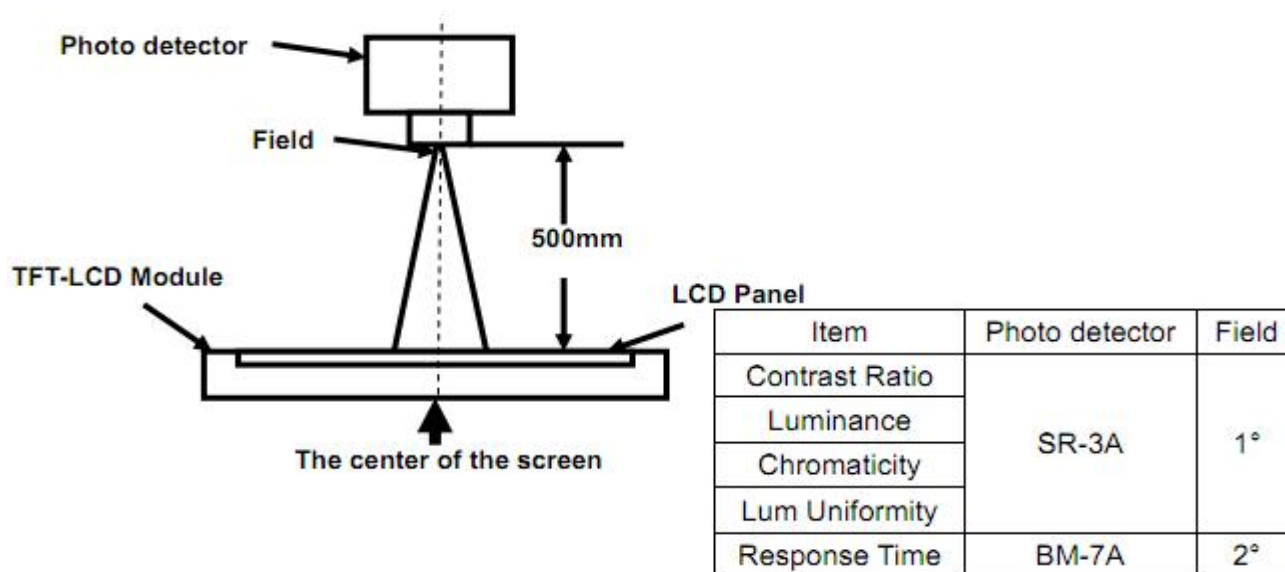


Fig 1

Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80).

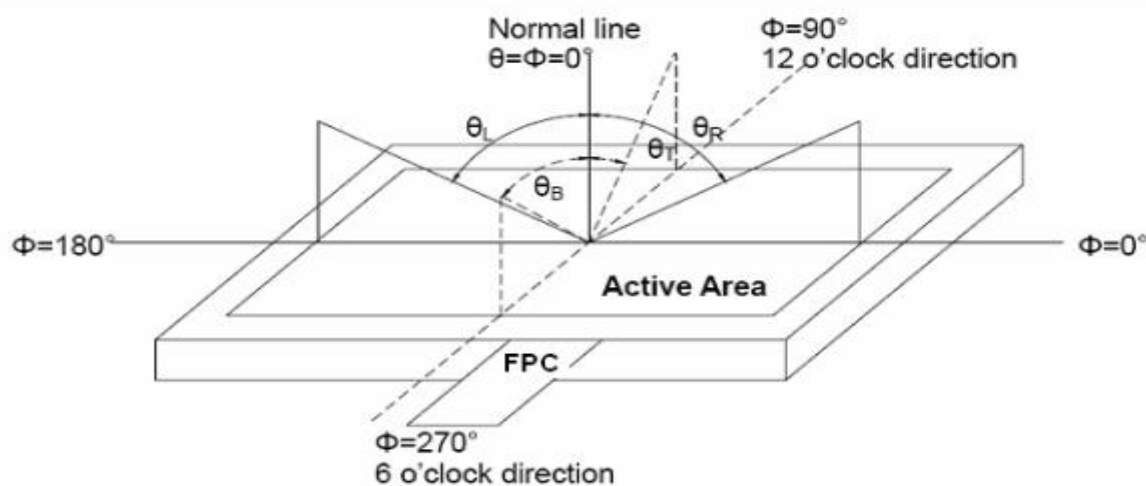


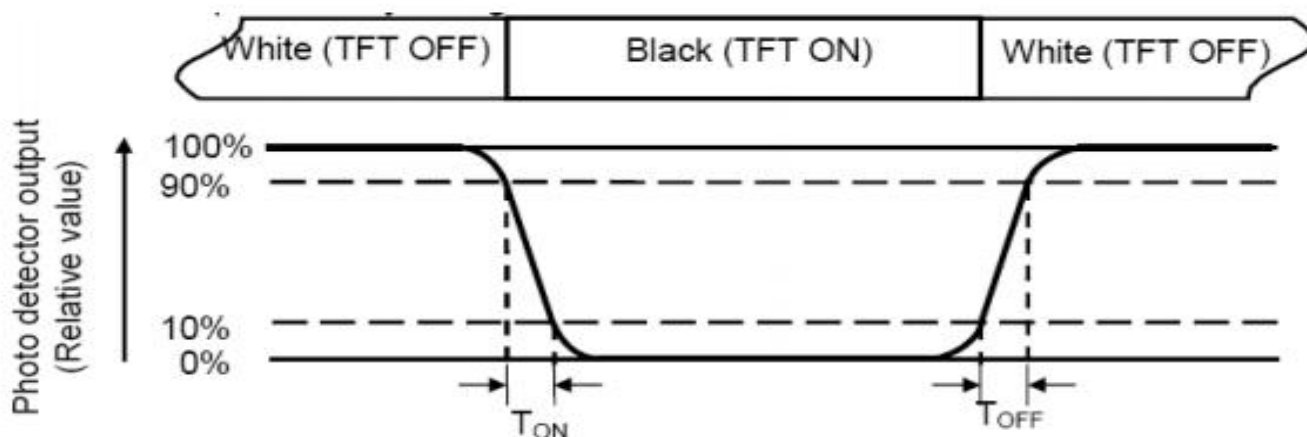
Fig 2 Definition of viewing angle

Note 3: Definition of contrast ratio

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.



Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity

The luminance uniformity in surface luminance is determined by measuring luminance at each test position 1 through n, and then dividing the maximum luminance of n points luminance by minimum luminance of n points luminance. For more information see FIG.3-a/b

Note 7: Surface luminance is the luminance with all pixels displaying white.

L_v = Average Surface Luminance with all white pixels ($P_1, P_2, P_3, \dots, P_n$)

For more information see FIG.3-a/b

Note 8:

H,V : Active area(see Figure b)

Light spot size $\varnothing = 5\text{mm}$ (BM-5) or $\varnothing = 7.7\text{mm}$ (BM-7) 50cm distance or compatible distance from the LCD surface to detector lens. test spot position : see Figure b.

measurement instrument : TOPCON's luminance meter SR-3A or BM-7 or compatible (see Figure 1).

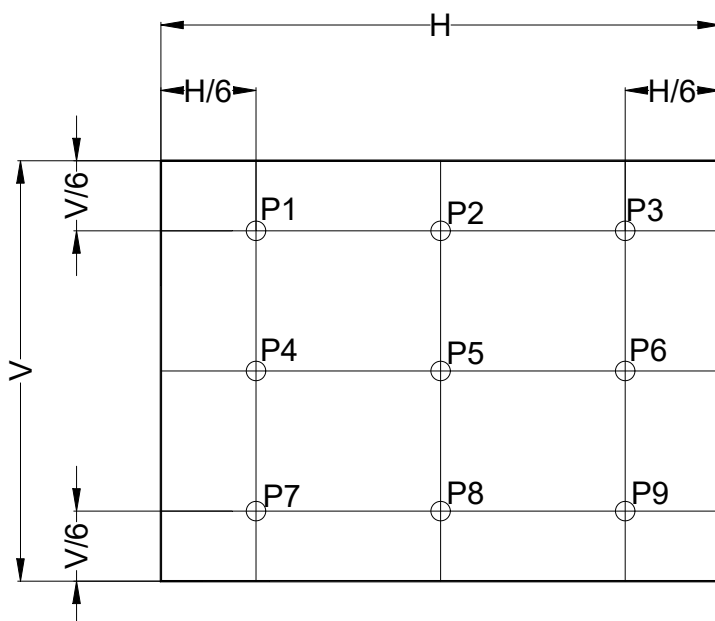


Fig. 3-b Definition of points

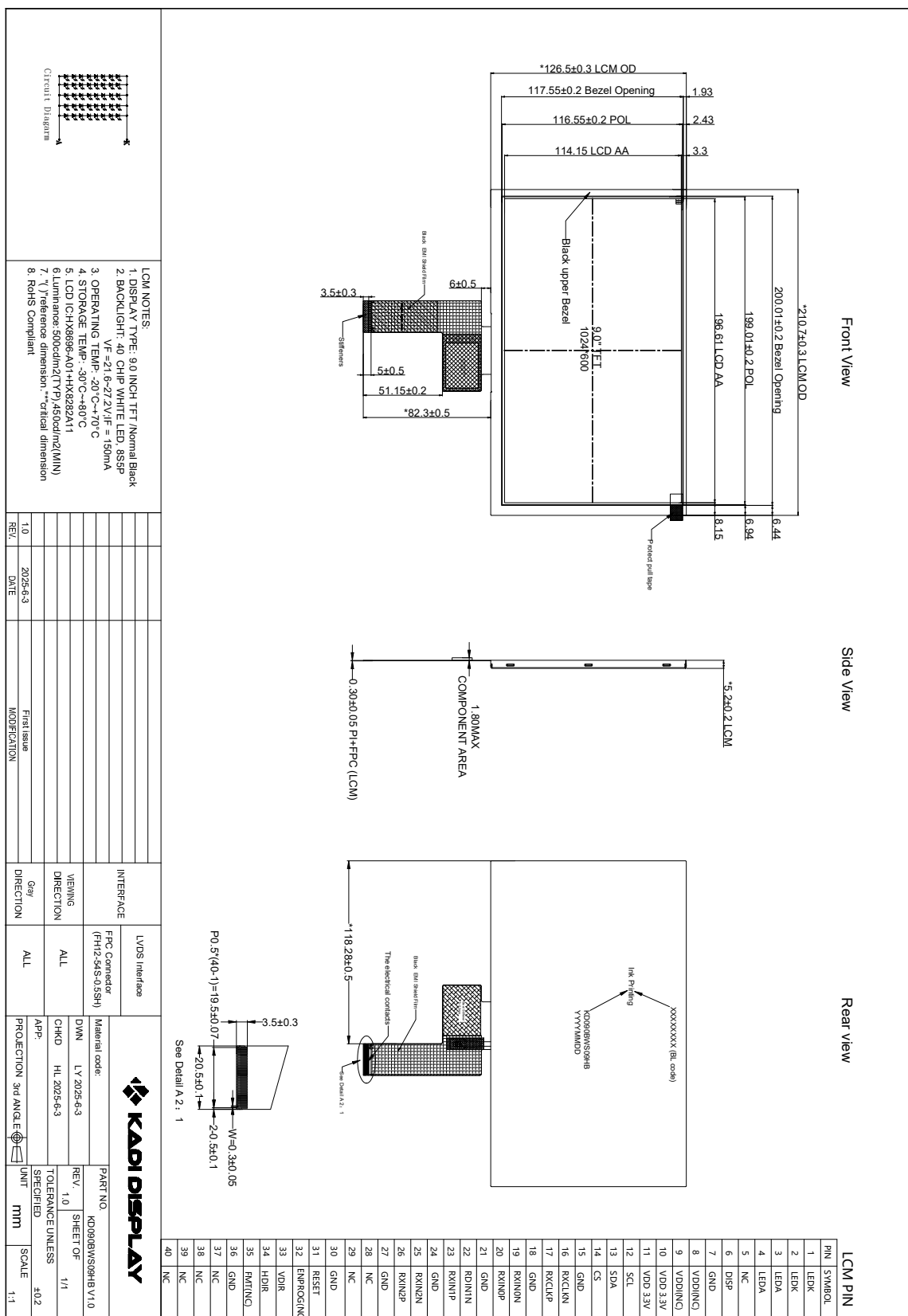
7. Reliability Test Items

Test Item	Test Conditions
High Temperature Storage	Ta= +80℃ 96hrs
Low Temperature Storage	Ta= -30℃ 96hrs
High Temperature Operation	Ta= +70℃ 96hrs
Low Temperature Operation	Ta= -20℃ 96hrs
High Temperature and Humidity Storage	Ta= +60℃, 90% RH 96hrs
Thermal Shock (Non-operation)	-30℃/30 min ~ +80℃/30 min for 20 cycles Start with cold temperature end with high temperature
Electro Static Discharge	Contact = ± 4 kV, class B Air = ± 8 kV, class B R=330Ω,C=150pF
Vibration	Sweep: 10Hz~55Hz~10Hz Stroke: 1.5mm 2 hrs for each direction of X .Y. Z.
Mechanical Shock	60G 6ms,±X,±Y,±Z 3 times for each direction
Package Drop Test	Height: 60 cm 1 corner, 3 edges, 6 surfaces

Notes: The test result shall be evaluated after the sample has been left at room temperature and humidity for 2 hours without load. No condensation shall be accepted. The sample will not be accepted if appear these defects:

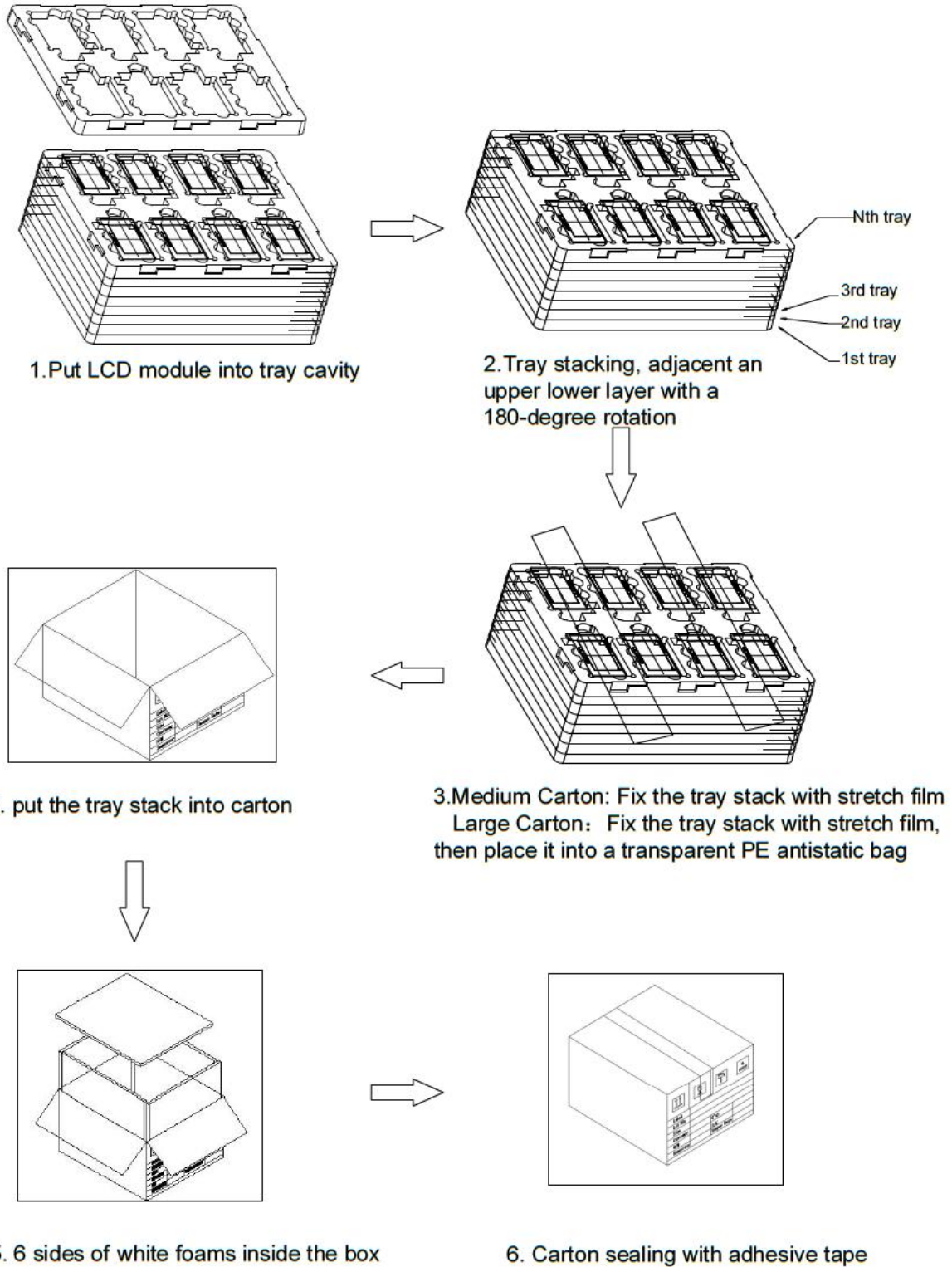
- 1). Air bubble in the LCD
- 2). Seal leak or Glass crack
- 3). Non display or abnormal display
- 4). Brightness reduction >50%

8. Mechanical Drawing



9. Packing

Packing Method



10. Precautions for Use of LCD modules

10.1 Handling Precautions

10.1.1. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

10.1.2. If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

10.1.3. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

10.1.4. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

10.1.5. If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketene
- Aromatic solvents

10.1.6. Do not attempt to disassemble the LCD Module.

10.1.7. If the logic circuit power is off, do not apply the input signals.

10.1.8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

10.1.8.1. Be sure to ground the body when handling the LCD Modules.

10.1.8.2. Tools required for assembly, such as soldering irons, must be properly ground.

10.1.8.3. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

10.1.8.4. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

10.2 Storage Precautions

10.2.1. When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

10.2.2. The LCD modules should be stored under the storage temperature range if the LCD modules will be stored for a long time, the recommend condition is :

Temperature : 0℃ ~40℃ Relatively humidity: ≤80%

10.2.3. The LCD modules should be stored in the room without acid, alkali and harmful gas.

10.3 Transportation Precautions

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.

10.4 Packaging instructions

When the customers using trays, they have to stack the adjacent trays in a 180° staggered to prevent pressure that could cause product damage.