PRODUCT SPECIFICATION

KADI Model: **KD150BXNA-AG**

CUSTOMER Model:

Description: **15” TFT-LCD Module**

Version: **1.0**

KADI	PREPARED BY	CHECKED BY	APPROVED BY
SIGNATURE			
DATE	2024.11.27	2024.11.27	2024.11.27

	SIGNATURE	DATE
CUSTOMER APPROVAL		

Record of Revisions

Version	Revise Date	Description	Page
1.0	2024-11-27	First Release	-

Contents

1. General Specifications

1.1 LCM General Information

Item	Specification	Unit
LCD Size	15	inch
Number of Pixels	1024 (H) RGB x 768 (V)	pixels
Display Mode	Normally Black, Transmissive	-
Viewing Direction	Free	o' clock
Interface	LVDS	-
Display Colors	16.7M	colors
Outline Dimension	326.5 (H) x 253.5 (V) x 9.7 (D)	mm
Active Area	304.13 (H) x 228.10 (V)	mm
Pixel Pitch	0.297 (H) x 0.0.297 (V)	mm
Driver IC	-	-
Operation Temperature	-20~70	℃
Storage Temperature	-20~70	℃

Note1:
Requirements on Environmental Protection: RoHS Compliant

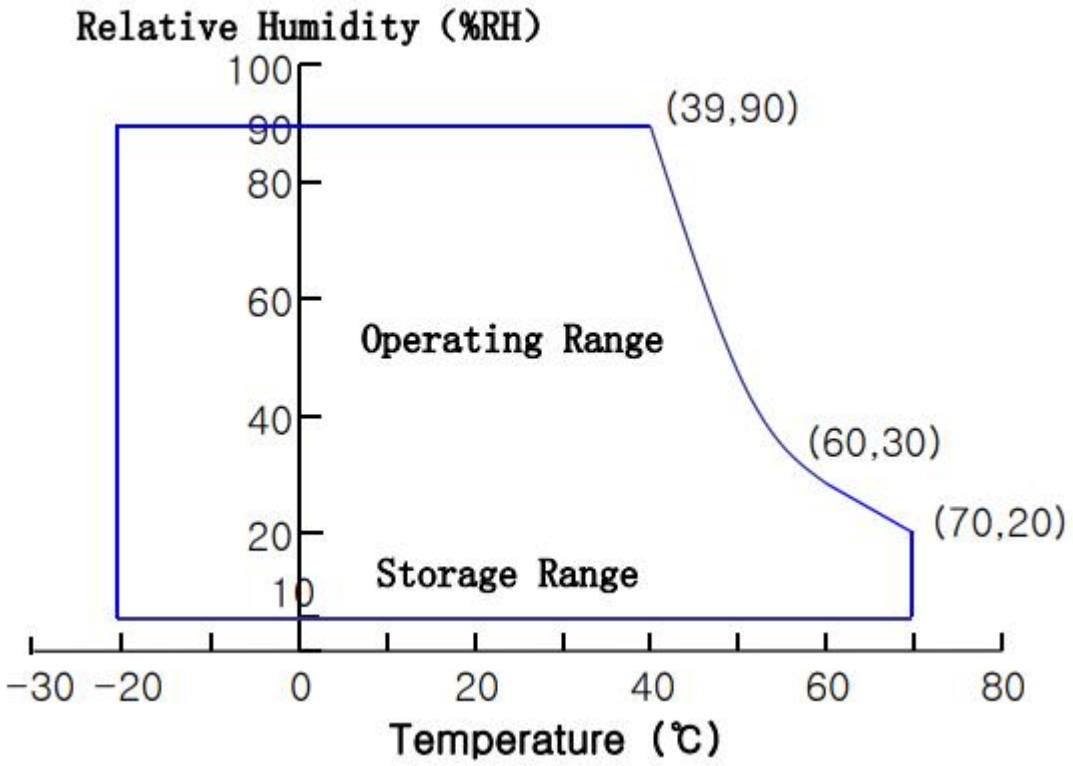
2. Absolute Maximum Ratings

Item	Symbol	MIN.	MAX.	Unit	Note
Analog Supply voltage	VDD	-0.3	4	V	Ta=25℃
Operating Temperature	Top	-20	+70	℃	Note 2 Note 3
Storage Temperature	Tst	-20	+70	℃	
Operating Ambient Humidity	Hop	10	90	%RH	
Storage Humidity	Hst	10	90	%RH	

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.

Note 2:
Temperature and relative humidity range are shown in the figure below. Wet bulb temperature should be 39 ℃ max. and no condensation of water.

Note 3：
When used near the limit conditions of temperature and humidity, the life will be reduced.



3. Elecrical Characteristics

3.1 Recommended Operating Condition for TFT LCD

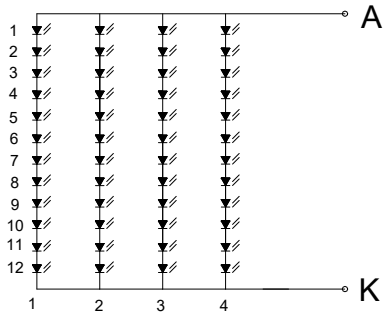
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Power Supply Input Voltage	VDD	3	3.3	3.6	V	
Power Supply Current	I_{VDD}	-	455	900	mA	
Logic input voltage	VIH	0.7*IOVCC	-	IOVCC	V	
	VIL	GND	-	0.3*IOVCC	V	

3.2 Recommended Driving Condition for Backlight

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Driving Current	I_F	-	220	-	mA	
Driving Voltage	V_F	32.4	36	39.6	V	
Power consumption	W_{BL}	-	7.92	-	W	
LED Life-Time	N/A	50,000	-	-	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 :



48 CHIP WHITE LED, 12S4P
VF =32.4~39.6V;IF = 220mA

4. Interface Pin Assignment

4.1 LCM Pin Assignment

LVDS connector：MSB240420HEA or Compatible.

No.	Symbol	Description
1-2	VDD	Power Supply
3	GND	Ground
4	NC	No connection
5	RIN0-	- LVDS differential data input
6	RIN0+	+ LVDS differential data input
7	GND	Ground
8	RIN1-	- LVDS differential data input
9	RIN1+	+ LVDS differential data input
10	GND	Ground
11	RIN2-	- LVDS differential data input
12	RIN2+	+ LVDS differential data input
13	GND	Ground
14	CLKIN-	- LVDS differential clock input
15	CLKIN+	+ LVDS differential clock input
16	GND	Ground
17	RIN3-	- LVDS differential data input
18	RIN3+	+ LVDS differential data input
19	GND	Ground
20	NC	No connection

4.2 Backlight LED Connector Pin Assignment

LED connector： CI4205M1HR0-NH（瀚荃）or Compatible.

No.	Symbol	Description
1	NC	No Connection
2	PWM	PWM Dimming
3	Enable	3.3V-On / 0V-Off
4	GND	Ground
5	VCC	12V

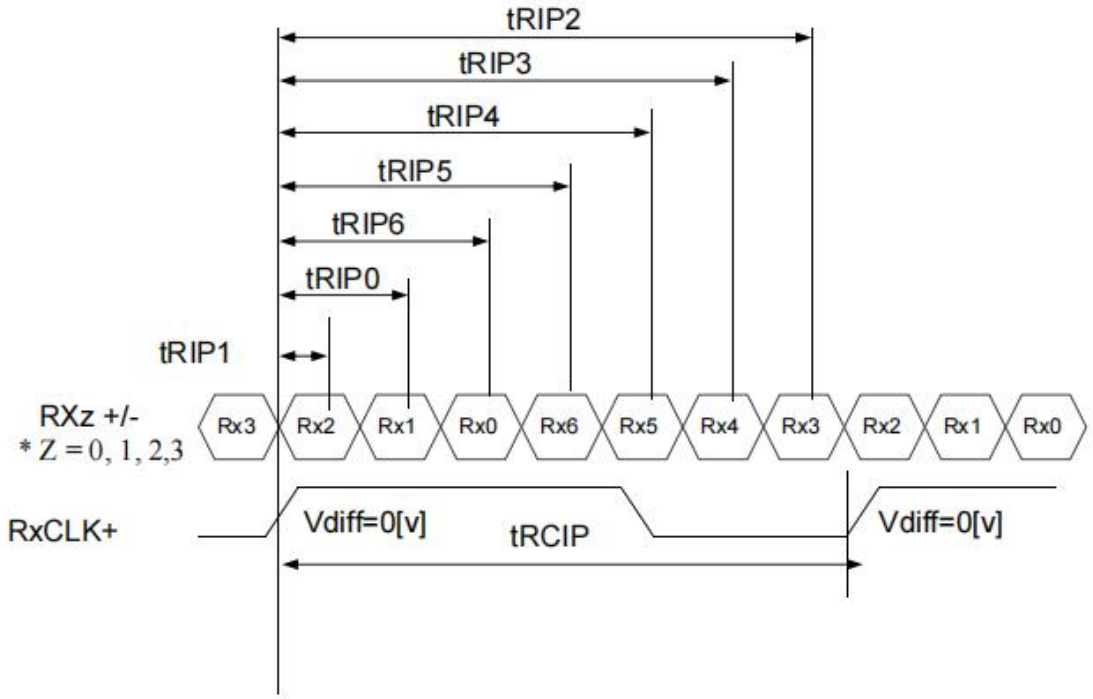
5. Interface Characteristics

5.1 LVDS Receiver : Timing Controller (LVDS Rx merged) / LVDS Data : Pixel Data

	Input Signal	Transmitter		Interface		HT236F01-100 (CN 11)	Remark
		Pin No.	Pin No.	System (Tx)	TFT-LCD (Rx)	Pin No.	
LVDS	OR0	51	48 47	OUT0- OUT0+	RXO0- RXO0+	1 2	
	OR1	52					
	OR2	54					
	OR3	55					
	OR4	56					
	OR5	3					
	OG0	4					
	OG1	6	46 45	OUT1- OUT1+	RXO1- RXO1+	3 4	
	OG2	7					
	OG3	11					
	OG4	12					
	OG5	14					
	OB0	15					
	OB1	19					
	OB2	20	42 41	OUT2- OUT2+	RXO2- RXO2+	5 6	
	OB3	22					
	OB4	23					
	OB5	24					
	Hsync	27					
	Vsync	28					
	DE	30					
	MCLK	31	40 39	CLK OUT- CLK OUT+	RXO CLK- RXO CLK+	8 9	
	OR6	50	38 37	OUT3- OUT3+	RXO3- RXO3+	10 11	
	OR7	2					
	OG6	8					
	OG7	10					
	OB6	16					
	OB7	18					
	RSVD	25					

5.2 LVDS Rx Interface Timing Parameter

Item	Symbol	Min	Typ	Max	Unit	Remark
CLKIN Period	tRCIP	10.31	13.47	15.87	nsec	
Input Data 0	tRIP1	0.5 ×tRCIP/7-0.4	0.5 ×tRCIP/7	0.5 ×tRCIP/7 +0.4	nsec	
Input Data 1	tRIP0	1.5 ×tRCIP/7 -0.4	1.5 ×tRCIP/7	1.5 ×tRCIP/7 +0.4	nsec	
Input Data 2	tRIP6	2.5 ×tRCIP/7-0.4	2.5 ×tRCIP/7	2.5 ×tRCIP/7+0.4	nsec	
Input Data 3	tRIP5	3.5 ×tRCIP/7-0.4	3.5 ×tRCIP/7	3.5 ×tRCIP/7+0.4	nsec	
Input Data 4	tRIP4	4.5 ×tRCIP/7-0.4	4.5 ×tRCIP/7	4.5 ×tRCIP/7+0.4	nsec	
Input Data 5	tRIP3	5.5 ×tRCIP/7-0.4	5.5 ×tRCIP/7	5.5 ×tRCIP/7+0.4	nsec	
Input Data 6	tRIP2	6.5 ×tRCIP/7-0.4	6.5 ×tRCIP/7	6.5 ×tRCIP/7+0.4	nsec	



* Vdiff = (RXz+)-(RXz-),.... ,(RXCLK+)-(RXCLK-)

5.3 Timing Parameters (DE only mode)

Item		Symbols		Min	Typ	Max	Unit
Clock	Frequency	1/Tc		52	65	71	MHz
	High Time	Tch		-	4/7Tc	-	
	Low Time	Tcl		-	3/7Tc	-	
Frame Period		Tv		48	60	63	Hz
Horizontal Active Display Term		Valid	t_{HV}	-	1024	-	t_{CLK}
		Total	t_{HP}	1200	1344	1400	t_{CLK}
Vertical Active Display Term		Valid	t_{VV}	-	768	-	t_{HP}
		Total	t_{VP}	788	806	845	t_{HP}

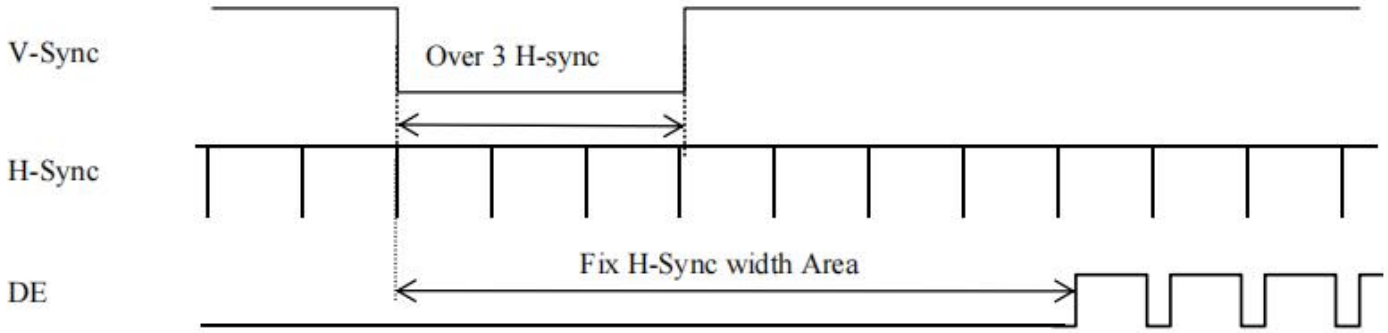
Note 1:

This product is DE only mode. The input of Hsync & Vsync signal does not have an effect on normal operation.

Symbol	Parameter	Condition	Min	Typ	Max	Unit
F	LVDS Input frequency	-	25	-	100	MHz
T_{LVSK}	LVDS channel to channel skew	F=65MHz V_{IC}=1.2V V_{ID}=±200mV	-600	-	+600	ps
F_{LVMOD}	Modulating frequency of input clock during SSC	F=65MHz V_{IC}=1.2V V_{ID}=±200mV	10	-	300	KHz
F_{LVDEV}	Maximum deviation of input clock frequency during SSC		-3	-	+3	%
T_{CY-CY}	Cycle to Cycle jitter		-	-	200	ps

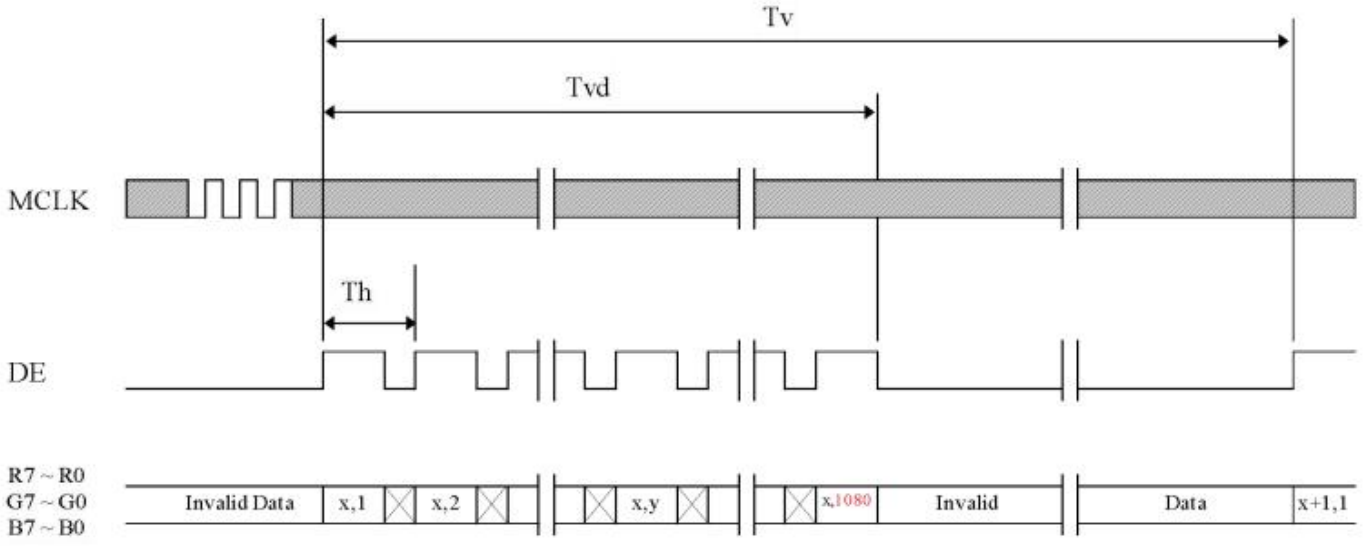
5.4 Signal Timing Waveform

5.4.1 Sync Timing Waveform

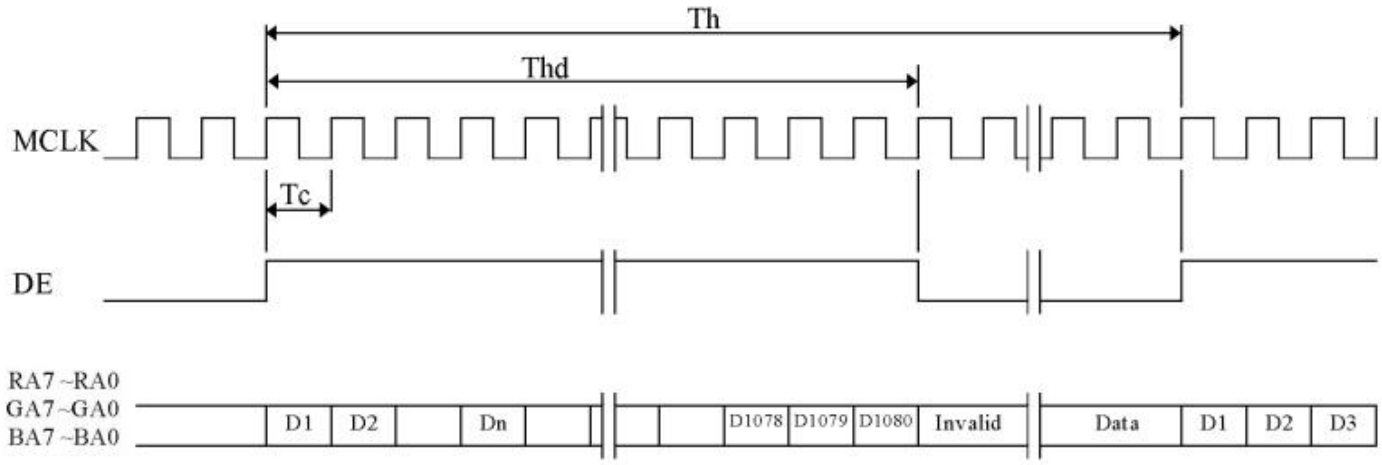


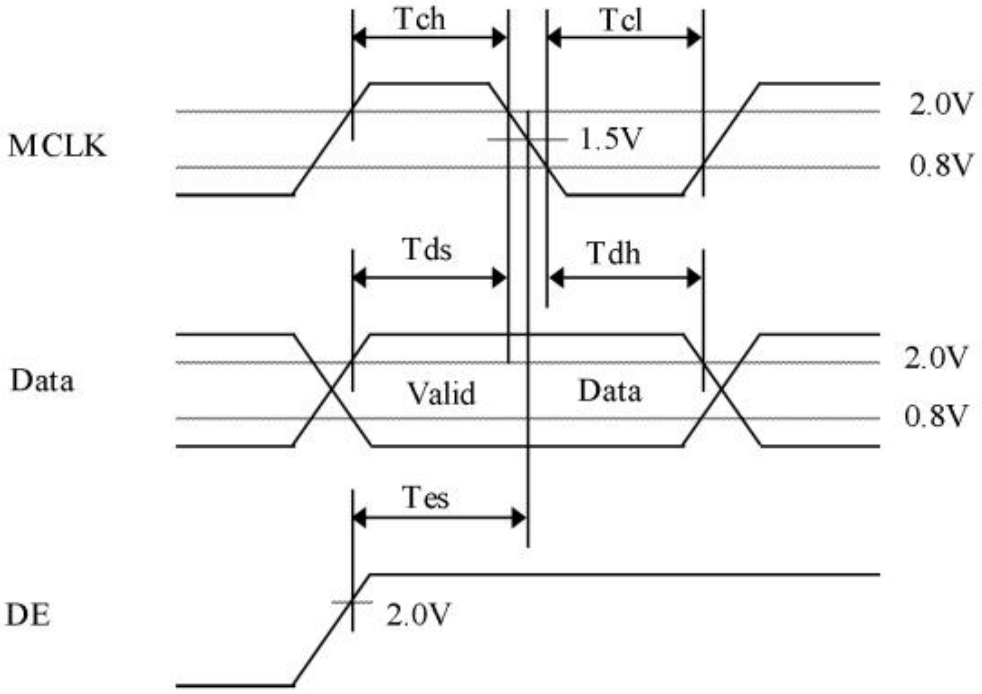
1) Need over 3 H-sync during V-Sync Low
2) Fix H-Sync width from V-Sync falling edge to first rising edge

5.4.2 Vertical Timing Waveform



5.4.3 Horizontal Timing Waveform



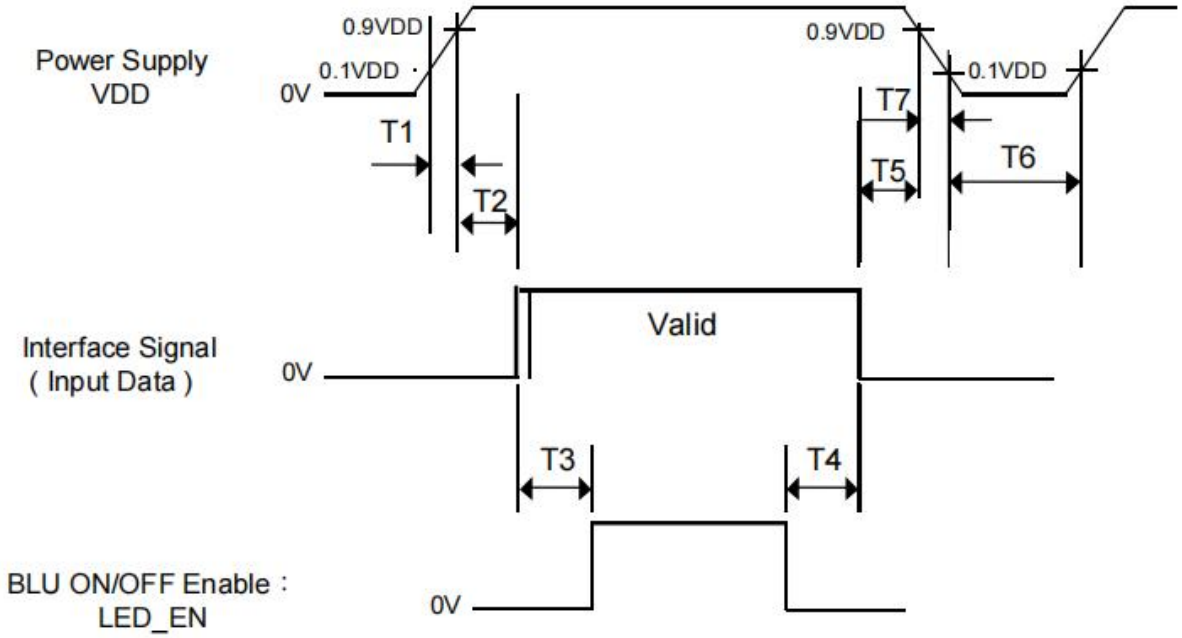


5.5 Input Signals, Basic Display Colors and Gray Scale of Colors

Color & Gray Scale		Input Data Signal																							
		Red Data								Green Data								Blue Data							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	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	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	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	1	1	1	1	1	1
Gray Scale of Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	▽	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	▽	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale of Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	▽	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Gray Scale of White	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	Darker	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1
	▽	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

5.6 Power Sequence

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence shall be as shown in below.



< Table 11. Sequence Table >

Parameter	Values			Units
	Min	Typ	Max	
T1	0.5	-	10	ms
T2	0	-	50	ms
T3	500	-	-	ms
T4	500	-	-	ms
T5	0	-	30	ms
T6	1	-	-	s

Note 1:

Back Light must be turn on after power for logic and interface signal are valid.

Note 2：

Even though T1 is out of SPEC, it is still ok if the inrush current of VDD is below the limit.

Note 3：

When VDD<0.9VDD(Typ.),Power off.

Note 4：

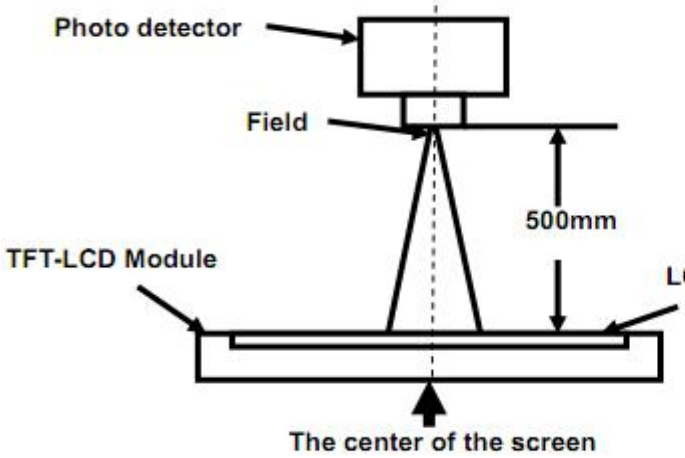
T7 decreases smoothly, if there were rebounding voltage, it must smaller than 0.5 volts.

6. Optical Specifications

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR≥10) B/L ON	θ_T	Φ=90°(12 o'clock)	85	89	-	deg	Note2
	θ_B	Φ=270°(6 o'clock)	85	89	-	deg	Note2
	θ_L	Φ=180°(9 o'clock)	85	89	-	deg	Note2
	θ_R	Φ=0°(3 o'clock)	85	89	-	deg	Note2
Response Time	$T_{ON+}T_{OFF}$	Normal θ=Φ=0°	-	30	35	msec	Note4
Contrast Ratio	CR		700	1000	-	-	Note1 Note3
Color Chromaticity	W_X		0.273	0.313	0.353	-	Note1 Note5
	W_Y		0.289	0.329	0.369	-	Note1 Note5
Luminance	L		315	350	-	cd/m²	Note1 Note7
Luminance Uniformity	Y_U		75	80	-	%	Note1 Note6
NTSC	-		67	72	-	%	-

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.



Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

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).

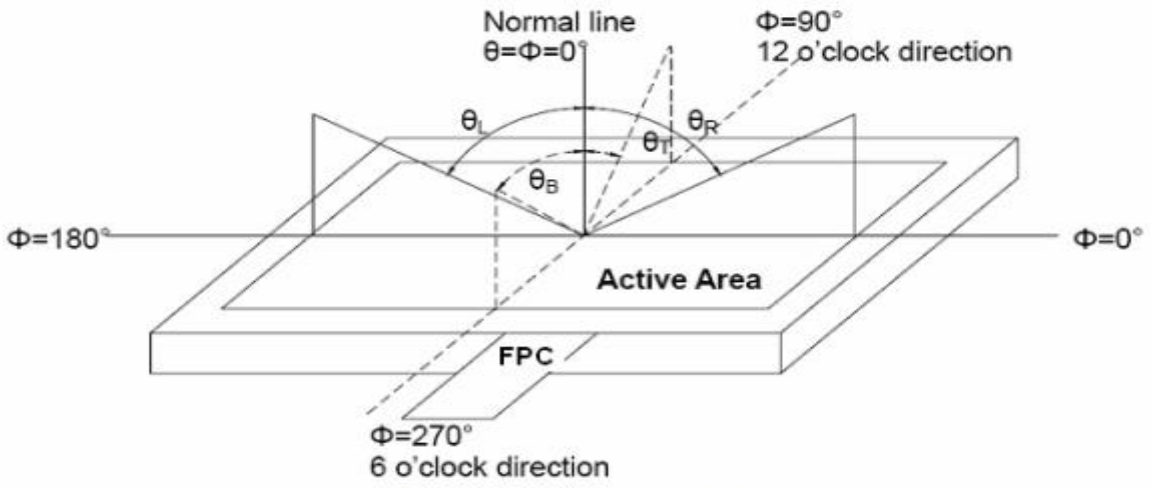


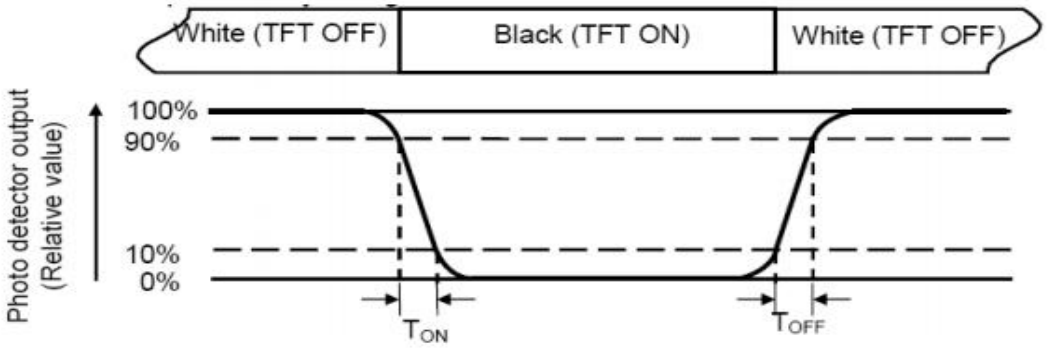
Fig. 1 Definition of viewing angle

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.2

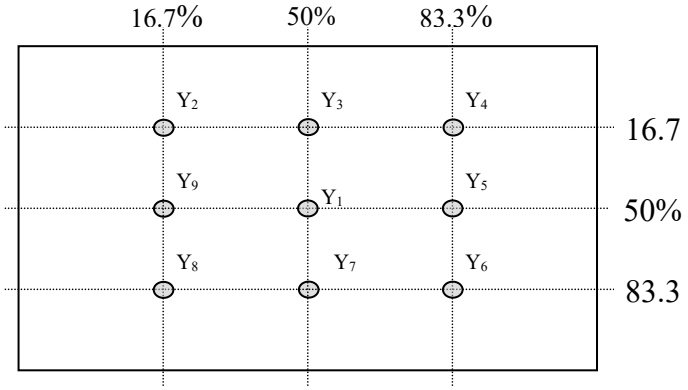


Fig. 2 Definition of points

Note 7: Definition of Luminance (Refer Fig. 2):

Surface luminance is the luminance with all pixels displaying white.

Lv = Average Surface Luminance with all white pixels(P1,P2,P3, ...,Pn)

7. Reliability Test Items

Test Item	Test Conditions	
High Temperature Storage	Ta= +70℃	96hrs
Low Temperature Storage	Ta= -20℃	96hrs
High Temperature Operation	Ta= +70℃	96hrs
Low Temperature Operation	Ta= -20℃	96hrs
High Temperature and Humidity Operation	Ta= +50℃, 80% RH	96hrs
Thermal Shock (Non-operation)	-20℃/30 min ~ +60℃/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:

1. 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:

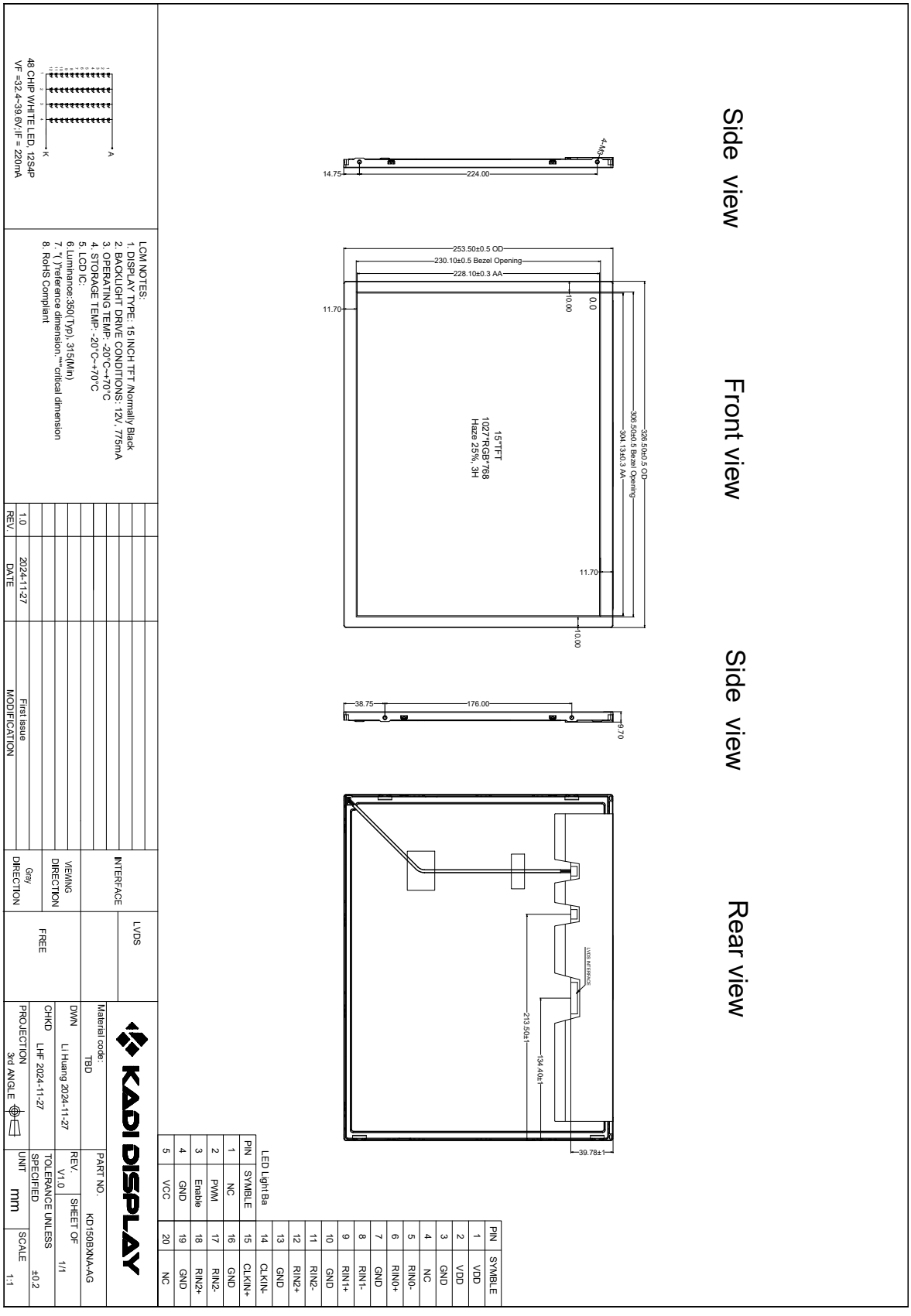
1). Air bubble in the LCD

2). Seal leak or Glass crack

3). Non display or abnormal display

4). Brightness reduction >50%

8. Mechanical Drawing



9. Packing

TBD

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.