PRODUCT SPECIFICATION

KADI Model: KD121QX01ED

CUSTOMER Model: -

Description: 12.1” TFT-LCD Module

Version: 1.0

KADI	PREPARED BY	CHECKED BY	APPROVED BY
SIGNATURE	LXM	LHP	ZGX
DATE	2023.4.26	2023.4.26	2023.4.26

	SIGNATURE	DATE
CUSTOMER APPROVAL		

Record of Revisions

Version	Revise Date	Description	Page
1.0	2023-04-26	First Release	-

Contents

1. General Specifications

1.1 LCM General Information

Item	Specification	Unit
LCD Size	12.1	inch
Number of Pixels	1024(H) RGB x 768(V)	pixels
Display Type	Normally Black, Transmissive	-
Viewing Direction	Free	-
Interface	LVDS	-
Display Colors	256K/16.7M	-
Color Arrangement	RGB Stripe	-
Outline Dimension	260.5(H) x 204V) x 8.51(D)	mm
Active Area	245.76 (H) x 184.32 (V)	mm
Pixel Pitch	0.08(H) x 0.08(V)	mm
Surface Treatment	AG	-
Contrast Ratio (Light On)	1000:1(Typ)	-
Operation Temperature	-30~85	℃
Storage Temperature	-30~85	℃
Panel power consumption	Max:(1.66W)@white pattern	W

Note1:Requirements on environmental protection RoHS compliant.

2. Absolute Maximum Ratings

Item	Symbol	MIN.	MAX.	Unit	Remark
Power Supply Voltage	VDD	-0.3	3.8	V	
	LED_VCCS	-0.3	25	V	
Storage Temperature	Tstg	-30	+85	℃	
Operating Temperature	Topr	-30	+85	℃	

Note :
(1) All of the voltages listed above are with respective to GND= 0V
(2) Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above.

3. Elecrical Characteristics

3.1 DC CHARCTERISTICS

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	VDD	3.0	3.3	3.6	V	
	LED_VCCS	11	12	13	V	
Input logic high voltage	V_{IH}	0.7VDD	-	VDD	V	1
Input logic low voltage	V_{IL}	0	-	0.3VDD	V	
Current for Power	I_{VDD}		-	(410)	mA	VDD =3.3V@frame 60 Hz, Whitepattern
	I_{LED_VCCS}	(400)	-	(425)	mA	LED_VCCS=12V, PWM Duty =100%, @ (8S4P)
		(600)		(635)	mA	LED_VCCS=12V, PWM Duty =100%, @ (11S4P)

LED_EN Control Level	BL On	3.0	-	5	V	
	BL Off	0	-	0.3	V	
LED_PWM Control Level	PWM High Level	3.0	-	5	V	
	PWM Low Level	0	-	0.3	V	
LED_PWM Control Frequency	f_{PWM}	1K	-	20K	Hz	2

Note 1 : Including signal: SEL68 & reLR & reUD
Note 2: LED_PWM duty >10%.

3.2 BL power output

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Output Power	LED+	35	36	37	V	LED+ =36V @12S4P
Output Power Current	ILED1-~LED4	44.55	45	45.45	V	Total 180mA(Typ.)(45mA x 4channel)

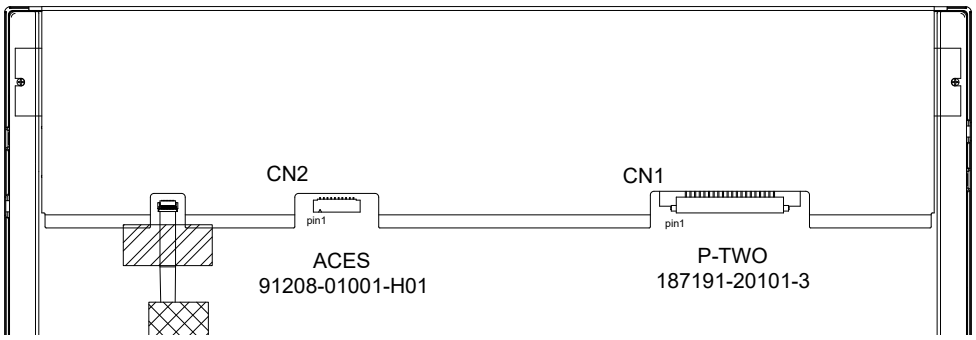
Note 1:output power LED+ OVP is 40V

4. Interface Pin Assignment

4.1 Connector

There are 3 connectors on PCBA, location & CN1,CN2 is showed on below figure.

BACK View



Connectors type:

1. CN1 : Input LVDS CONN,20pins, P-TWO 187191-20101-3
2. CN2: Input BL power CONN,10pins, ACES, 91208-01001-H01

4.2 PIN assignment

4.2.1 Connector 1: A 20pin connector of P-two 187191-20101-3 is used for the module electronics interface. And a special plug needed for connecting this connector, the recommended model is JAE FI-S20S.

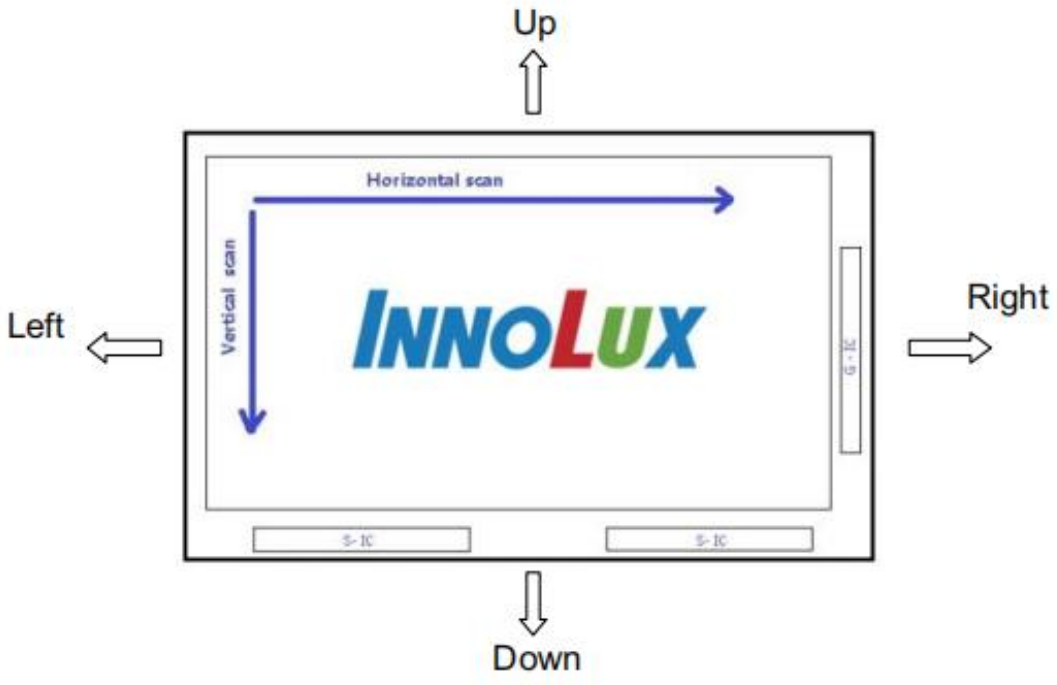
Pin assignment:

No.	Symbol	Description	Note
1	RX3+	Differential Data Input, CH3 (Positive)	
2	RX3-	Differential Data input, CH3 (Negative)	
3	BIST	Nommal operation/BiST pattern select BIST=0: Normal operation BIST=1: BIST mode	Note 1
4	SEL68	LVDS 6/8 bit select function control SEL68=1: LVDS input data is 8 bit SEL68=0: LVDS input data is 6 bit	Note 2
5	GND	Ground	
6	RXC+	Differential Clock input (Positive)	
7	RXC+	Differential Clock input (Negative)	
8	GND	Ground	
9	RX2+	Differential Data Input, CH2 (Positive)	
10	RX2-	Differential Data input, CH2 (Negative)	
11	GND	Ground	
12	RX1+	Differential Data Input, CH1 (Positive)	
13	RX1-	Differential Data input, CH1 (Negative)	

14	GND	Ground	
15	RX0+	Differential Data Input, CH0 (Positive)	
16	RX0-	Differential Data input, CH0 (Negative)	
17	reLR	Left or right display control LR=1: Left-->Right LR=0: Right--> Left	Note 3
18	reUD	Up or Down display control LR=1: Up-->Down LR=0: Down--> Up	Note 3
19	VDD	Power supply. 3.3V	
20	VDD	Power supply. 3.3V	

Note 1:Pin1 is reversed as BIST function for test, don′ t connect signal to this pin, keep floating.
Note 2:SEL68 is used for selecting 6bit/8bit LVDS data input, 1: connect to VDD -->8bit; 0: connect to GND-->6bit.
Note 3: reLR & reUD are used for selecting scanning direction.0: connect to GND; 1: connect to VDD.

Setting of scan control input		Scanning direction
reLR	reUD	
1	1	left to right ,up to down
1	0	left to right, down to up
0	1	right to left ,up to down
0	0	right to left ,down to up

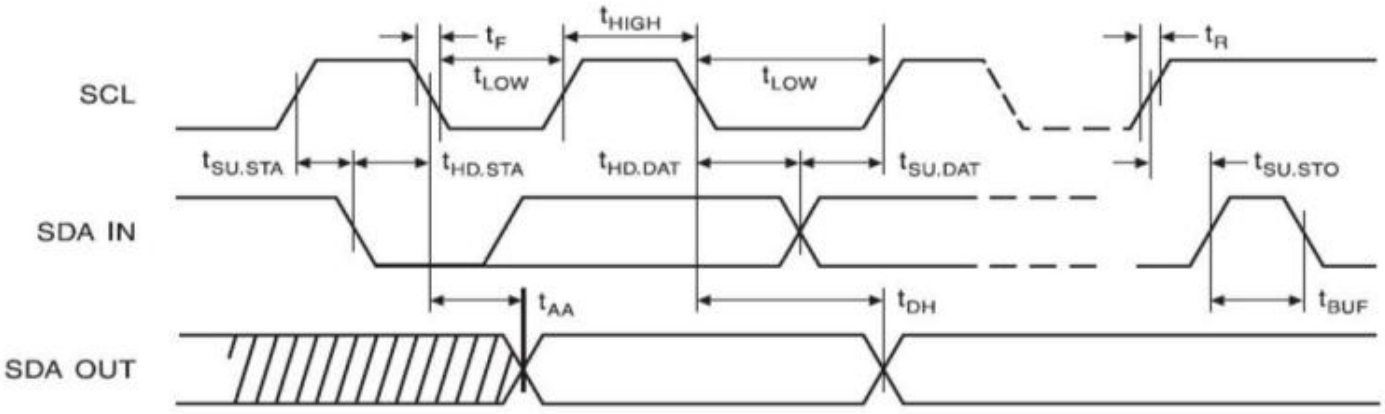


Note 1:I2C DC/AC CHARACTERISTICS as following.

I2C INTERFACE---SDA,SCL,A0,WPN						
Low Level Input Voltage	V_{IL}	VIN=2.5V to 5.5V	0		0.8	V
High Level Input Voltage	V_{IH}	VIN=2.5V to 5.5V	1.5		5.5	V
SDA, SCL Hysteresis			0.6	0.7	0.8	V
Internal Pull High Resistor	R_{PULL-1}	A0 internal pull high(VIN1) resistor	8	10	12	KΩ
EEPROM Write Protect		When WPN = High, can`t write EEPROM	1.5		5.5	V
EEPROM Write Time	T_{WRITE}		30		500	msec
Number of Guaranteed EEPROM Write Cycles	N_{WRITE}		1		1000	Cycles

Symbol	Description	Min.	Typ.	Max.	Unit
F_{SCL}	Clock Frequency, SCL	0	-	400	kHz
t_{LOW}	Clock Pulse Width Low	1.3	-		us
t_{HIGH}	Clock Pulse Width High	0.6	-		us
t_1	Noise Suppression Time(2)			10	ns
t_{BUF}	Time the bus must be free before a new transmission can start(2)	1.3			us
$t_{HD.STA}$	Start Hold Time	0.6			us
$t_{SU.STA}$	Start Setup Time	0.6			us
$t_{HD.DAT}$	Data In Hold Time	0		900	ns
$t_{SU.DAT}$	Data In Setup Time	100			ns
t_R	Inputs Rise Time(2)			1	us
t_F	Inputs Fall Time(2)			300	ns
$t_{SU.STO}$	Stop Setup Time	0.6			us
t_{AA}	Clock Low to Data Out Valid	0.1		0.9	us
t_{DH}	Data Out Hold Time	50			ns

I2C Bus Timing



4.2.2 Connector2 : Input BL power CONN

CONN type: ACES, 91208-01001-H01 the recommended male connector is ACES:50216-01011-001 or equivalent.

10-pin connector pin assignment:

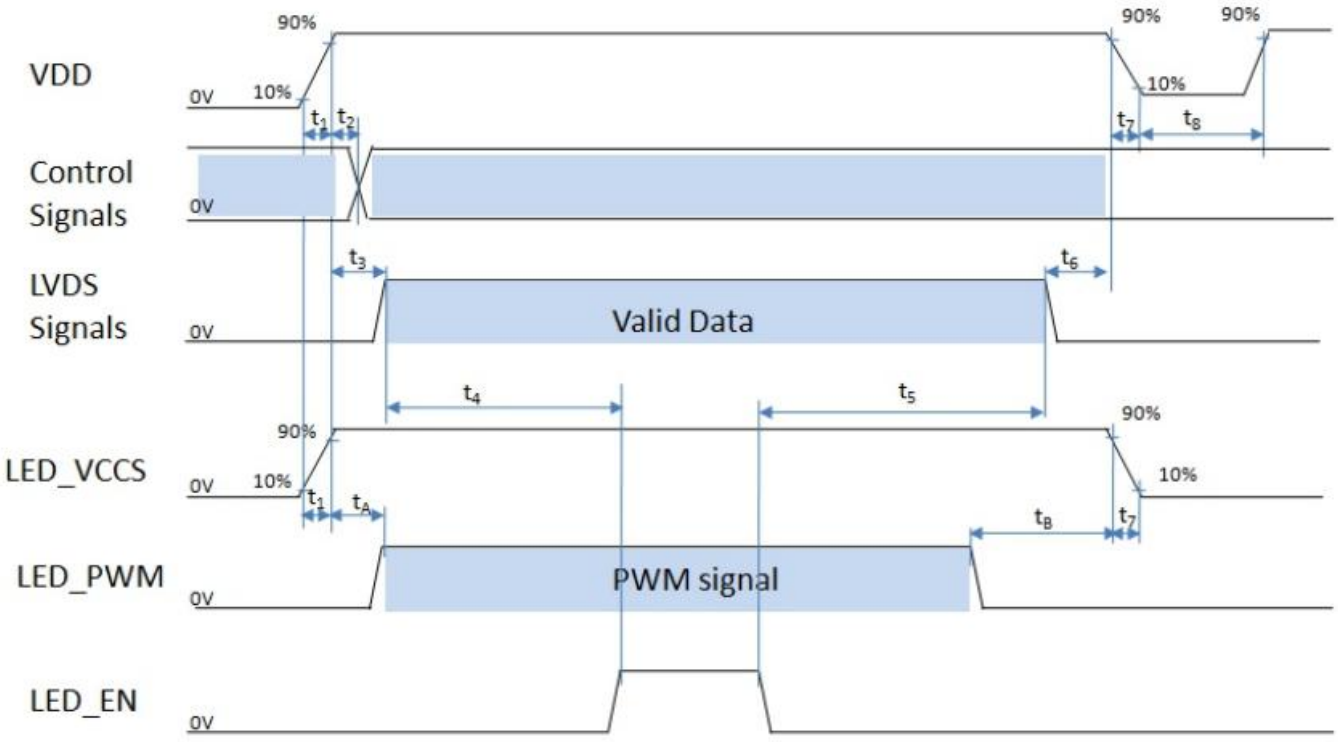
Pin NO.	Symbol	Description
1	LED_VCCS	LED convertor input power, 12V
2	LED_VCCS	LED convertor input power, 12V
3	LED_VCCS	LED convertor input power, 12V
4	LED_VCCS	LED convertor input power, 12V
5	GND	Ground
6	GND	Ground
7	GND	Ground
8	GND	Ground
9	LED_EN	Converter power IC output Enable (Active High)
10	LED_PWM	PWM control signal for LED convertor

5. Interface Characteristics

5.1 Power sequence

The power sequence specififfications are shown as the following table and diagram.

Symbol	Value		Unit
	Min.	Max.	
t_1	1	20	ms
t_2	1	5	ms
t_3	10	50	ms
t_4	200	500	ms
t_5	200	500	ms
t_6	50	200	ms
t_7	0	20	ms
t_8	500	–	ms
t_A	0	50	ms
t_B	0	50	ms



Note 1: Please don't plug the interface cable of on when system is turned on.
Note 2: Please avoid floating state of the interface signal during signal invalid period.
Note 3: It is recommended that the backlight power must be turned on after the power supply for LCD and the interface signal is valid.
Note 4: Control signals include BIST, SEL68 , reUD & reLR.

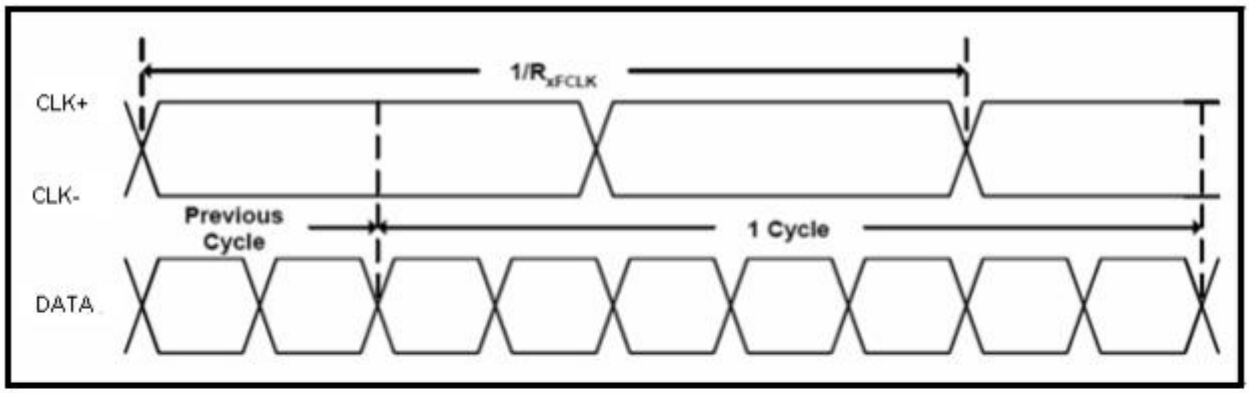
5.2 LVDS SIGNAL TIMING CHARACTERISTICS

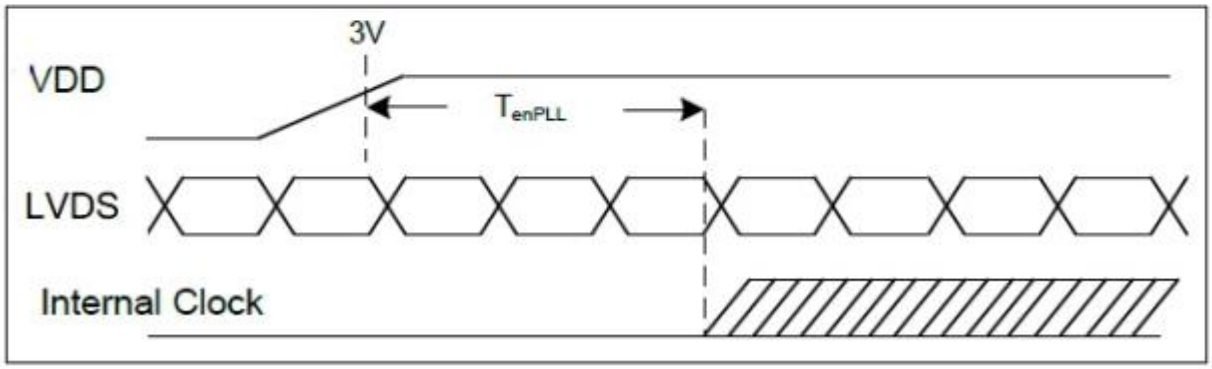
5.2.1 AC Electrical characteristics

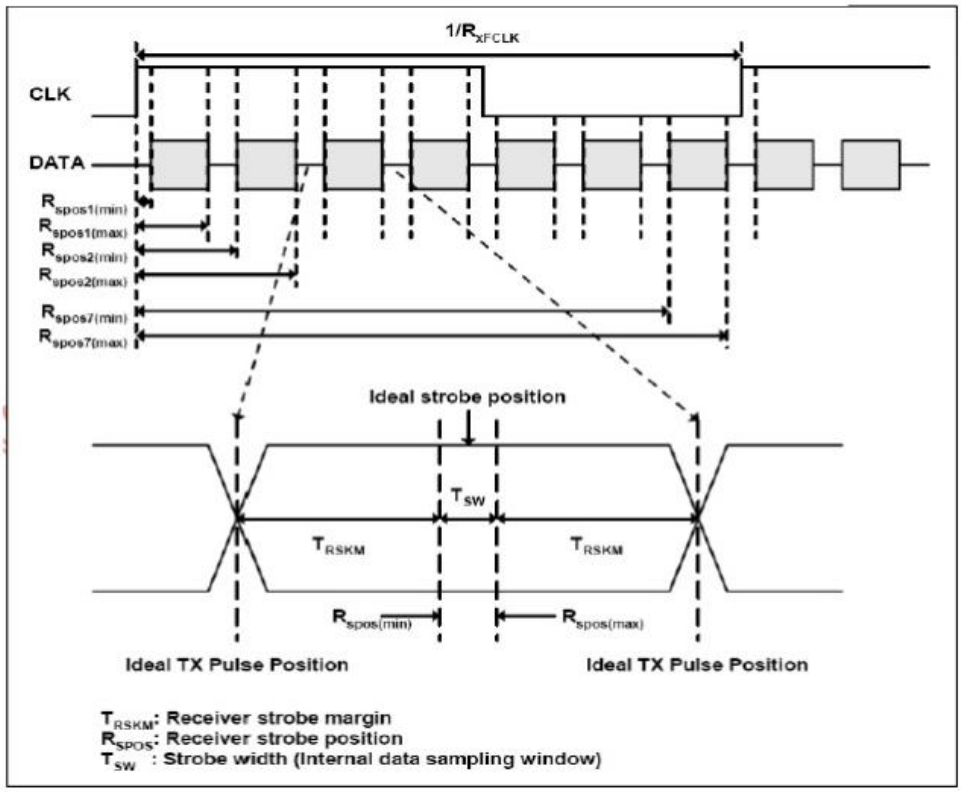
Parameter	Symbol	Min	Typ	Max	Units	Condition
Clock frequency	RxFCLK	26.2	-	71	MHz	
Input data skew margin	TRSKM	500	-	-	ps	| VID | = 400mV RxVCM=1.2V RxFCLK=71MHz
Clock high time	TLVCH	-	4/(7xRxFCLK)	-	ns	
Clock low time	TLVCL	-	3/(7xRxFCLK)	-	ns	
PLL wake-up time	TenPLL	-	-	150	us	

5.

2.2 Input clock and data timing diagram

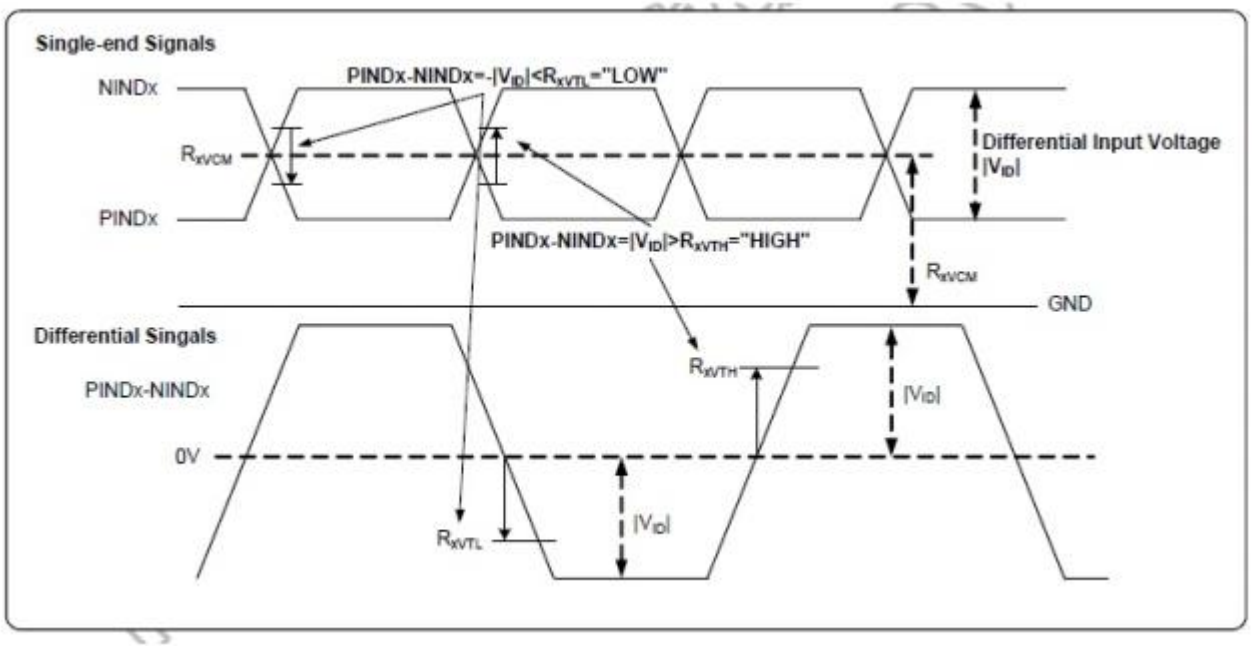






5.2.3 DC electrical characteristics

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
LVDS Differential input high Threshold voltage	R_{xVTH}	-	-	+100	mV	R_{XVCM}=1.2V
LVDS Differential input low Threshold voltage	R_{xVTL}	-100	-	-	mV	
Input Voltage range (Singled-end)	R_{xVIN}	0	-	2.4	V	
LVDS Differential input common mode voltage	R_{xVCM}	$\|V_D\|/2$	-	$2.4-\|V_D\|/2$	V	
LVDS Differential input voltage	$\|V_D\|$	0.2	-	0.6	V	

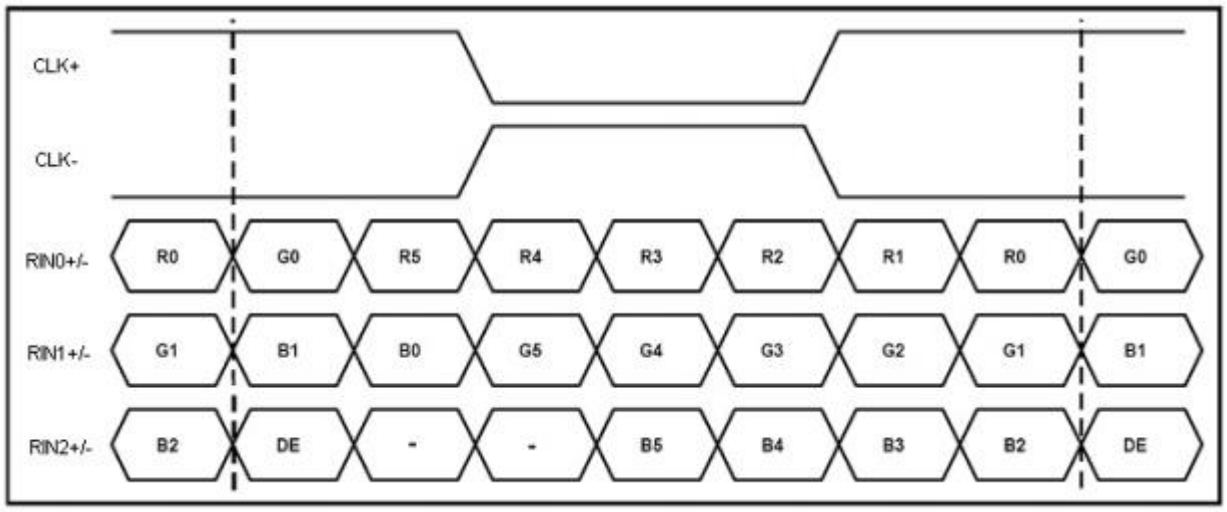


5.2.4 data timing

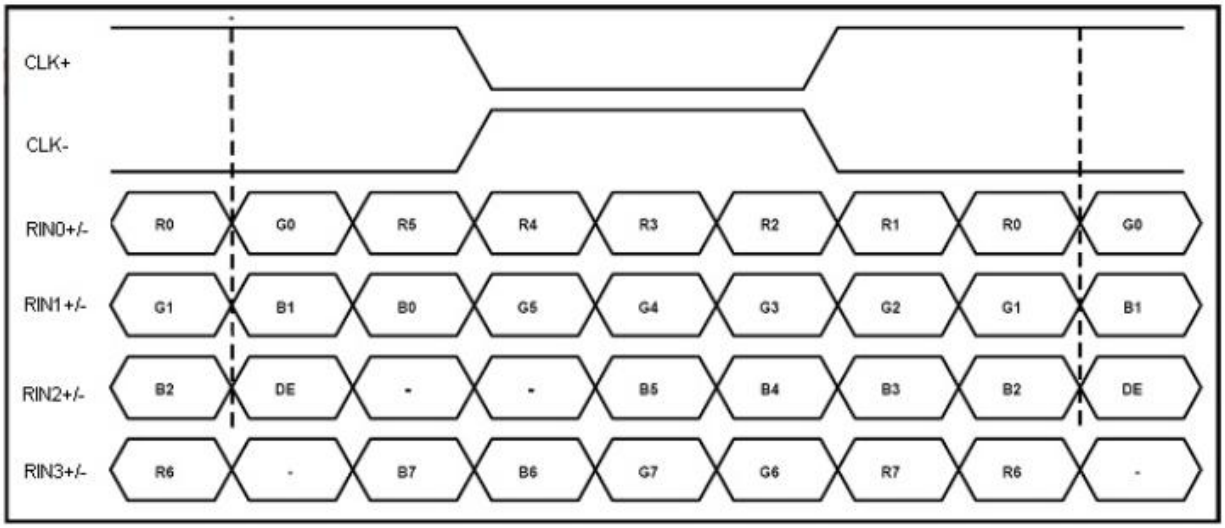
Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK frequency	fclk	52	65	71	MHz
Horizontal display area	thd		1024		DCLK
HSD period	th	1114	1344	1400	DCLK
HSD blanking	thb+thfp	90	320	376	DCLK
Vertical display area	tvd		768		T_H
VSD period	tv	778	806	845	T_H
VSD blanking	tvbp+tvfp	10	38	77	T_H

5.2.5 LVDS data input format

SEL68 = “Low” for 6 bits LVDS Input



SEL68 = “High” for 8 bits LVDS Input

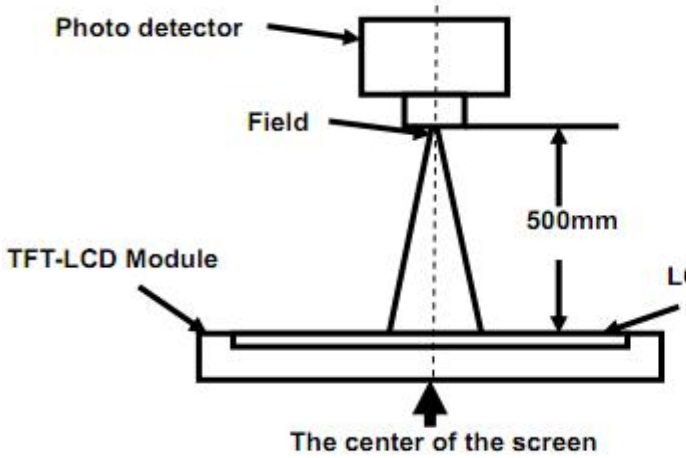


6. Optical Specifications

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Viewing Angle	Horizontal	X+	(CR≥10)	85	89	-	deg	Note2
		X-		85	89	-	deg	Note2
	Vertical	Y+		85	89	-	deg	Note2
		Y-		85	89	-	deg	Note2
Response Time		T_R+T_F	q_x=0° , q_Y =0°	-	25	35	msec	Note4
Contrast Ratio		CR	q_x=0° , q_Y =0° R=G=B=255 Gray scale	700	1000	-	-	Note1 Note3
Color Chromaticity	White	W_X		Typ – 0.03	0.305	Typ + 0.03	-	Note1 Note5
		W_Y			0.327		-	Note1 Note5
Luminance		L		-	800	-	cd/m²	Note1 Note7
Luminance Uniformity		Y_U		75	-	-	%	Note1 Note6
NTSC		-	(Under C light)	-	70	-	%	-
Life Time		-	defin defined as the module brightness decrease to 50% original brightness at Ta=25℃	50000	-	-	Hrs	-

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).

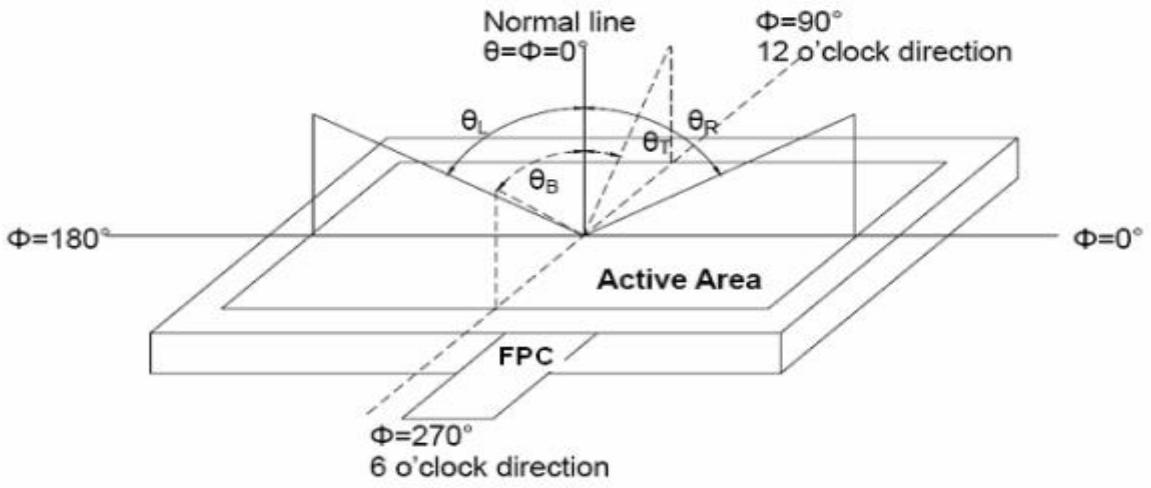


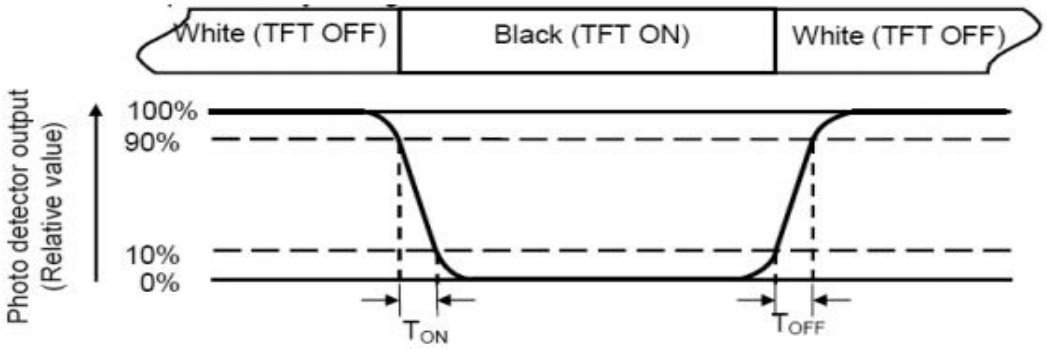
Fig. 1 Definition of viewing angle

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.

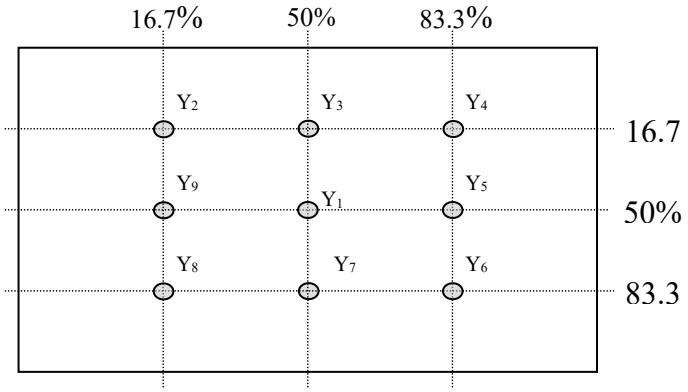


Fig. 2 Definition of points

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).

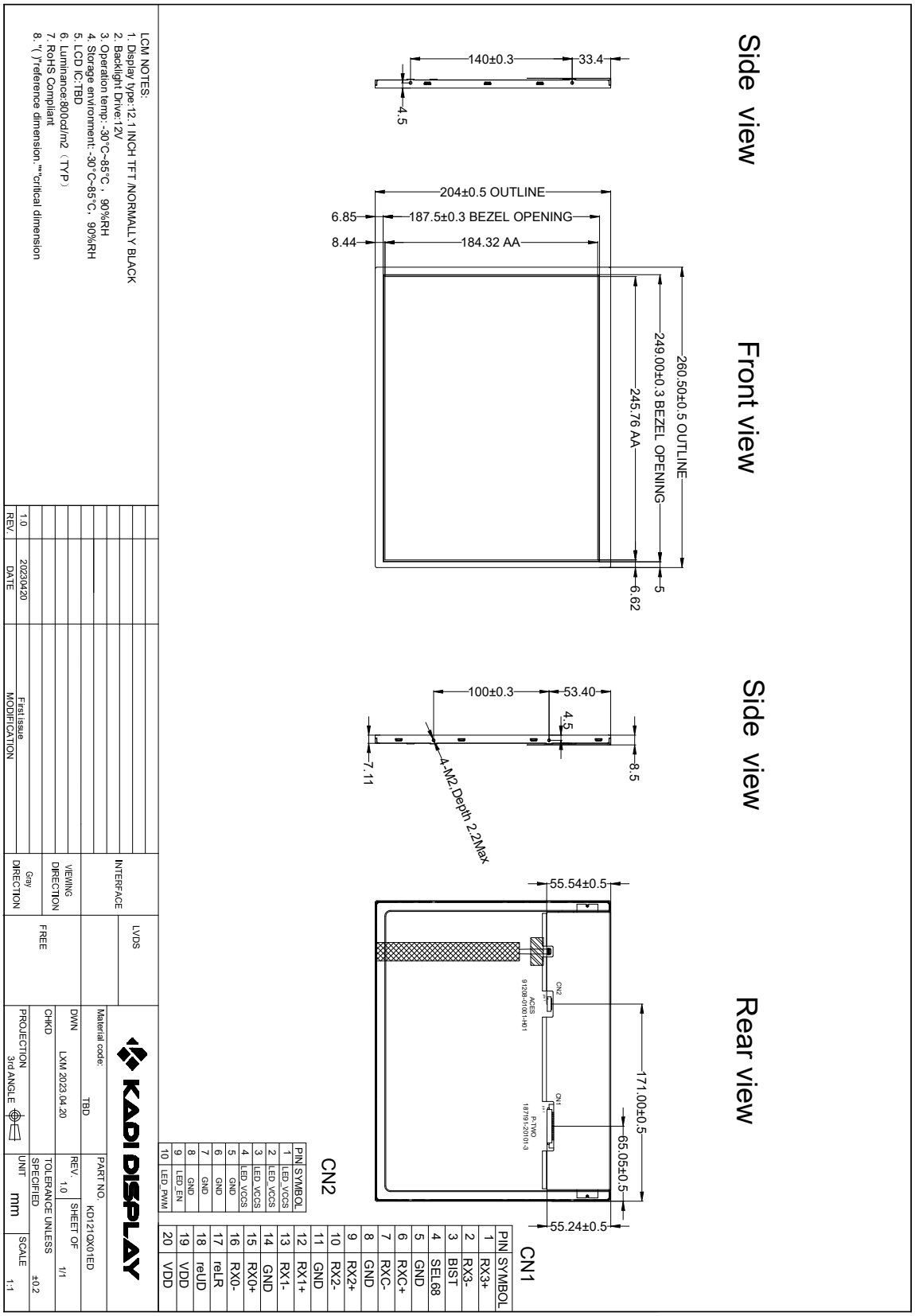
7. Reliability Test Items

Test Item	Test Conditions	
High Temperature Storage	Ta= +85℃	96hrs
Low Temperature Storage	Ta= -30℃	96hrs
High Temperature Operation	Ta= +85℃	96hrs
Low Temperature Operation	Ta= -30℃	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



PIN	SYMBOL
1	LED_VCCS
2	LED_VCCS
3	LED_VCCS
4	LED_VCCS
5	GND
6	GND
7	GND
8	GND
9	LED_EN
10	LED_PWM

PIN	SYMBOL
1	RX3+
2	RX3-
3	BIST
4	SEL68
5	GND
6	RXC+
7	RXC-
8	GND
9	RX2+
10	RX2-
11	GND
12	RX1+
13	RX1-
14	GND
15	RX0+
16	RX0-
17	reLR
18	reUD
19	VDD
20	VDD

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.