Rocktech Displays Limited

LCD Module Specification

Module P/N: RK104IX01E

Version: 1.0

Description : 10.4 inch TFT 1024*768 Pixels with LED backlight, All viewing angle, 1000 nits brightness

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Revision History

Date	Rev.	Page	Description
2024-03-25	1.0	All	First issue

CONTENTS

1. General Features

Item	Spec	Remark
Display Mode	Normally Black transmissive	
Viewing Direction	Free	IPS
Input Signals	LVDS Signal	
Outside Dimensions	227.00(W) x175.80(H) x6.60(D)	Exclude Mounting Hole
Active Area	210.43mm(W)×157.82mm(H)	
Number of Pixels	1024(RGB)×768	
Dot Pitch	0.2055mm(W) ×0.2055mm(H)	
Pixel Arrangement	RGB Vertical stripes	

2. Absolute Maximum Ratings

The following are maximum values which, if exceeded may cause operation or damage to the unit.

ITEM	Sym.	Min.	Typ.	Max.	Unit	Remark
Power for Circuit Driving	VDD	-0.3	-	5	V	
	LED_VCCS	-0.3	-	25	V	
Backlight Forward Current	I_{LED}	-	-	25	mA	For each LED
Storage Temperature	T_{ST}	-30	-	80	℃	
Operating Ambient Humidity	H_{OP}	10	-		%RH	
Operating Ambient temperature	T_{OP}	-20	-	70	℃	

3. Electrical Specification

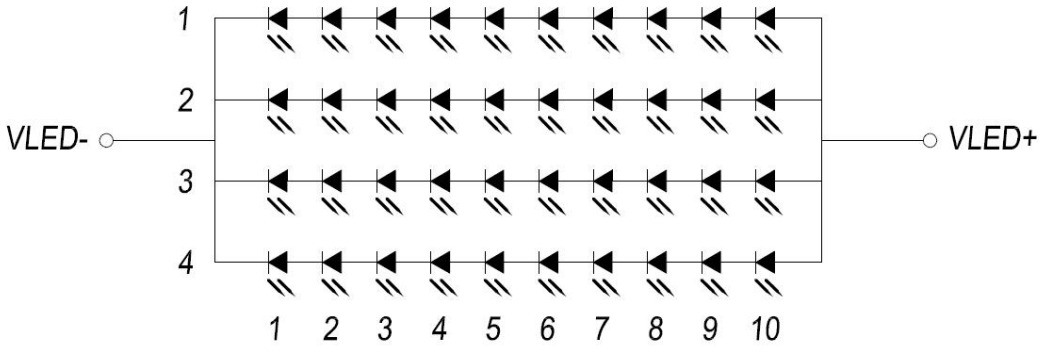
3.1 Driving TFT LCD Panel

Item		Sym.	Min	Typ.	Max	Unit	Note
Power for Circuit Driving		VDD	3.0	3.3	3.6	V	
		LED_VCCS	11	12	13	V	
Logic Input Voltage	Low Voltage	VIL	0	-	0.3VDD	V	
	High Voltage	VIH	0.7VDD	-	VDD	V	

3.2 Backlight Driving Conditions

Item	Sym.	Min	Typ.	Max	Unit	Note
Backlight driving voltage	VF	-	30.0	-	V	
Backlight driving current	IF	140	160	180	mA	
Backlight Power Consumption	WBL	-	4800	-	mW	
Life Time	-	-	50,000	-		

Note 1: Each LED, If=40mA,Vf=3.0+/-0.2V.
Note 2: Optical performance should be evaluated at Ta=25℃ only.
Note 3: If LED is driven by high current,high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.



LED Diagram Circuit

4.Optical Specifications

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25 ℃. The values specified are at an approximate distance 500mm from the LCD surface at a viewing angle of Φ and θ equal to 0°.

Item	Sym.	Values			Unit	Note
		Min.	Typ.	Max.		
1)Contrast Ratio	C/R	800	1000	-		FIG.1
2)Module Luminance	L	900	1000	-	cd/m^2	FIG.1
3)Response time	Tr+Tf	-	25	35	ms	FIG.2
4)Viewing Angle	θ_T	80	85	-	Degree	FIG.3
	θ_B	80	85	-		
	θ_L	80	85	-		
	θ_R	80	85	-		
5)Chromaticity	Wx	0.279	0.319	0.359		
	Wy	0.329	0.369	0.409		
	Rx	-	-	-		
	Ry	-	-	-		
	Gx	-	-	-		
	Gy	-	-	-		
	Bx	-	-	-		
	By	-	-	-		

◆ Measurement System

Notes:

1. Contrast Ratio(CR) is defined mathematically as :

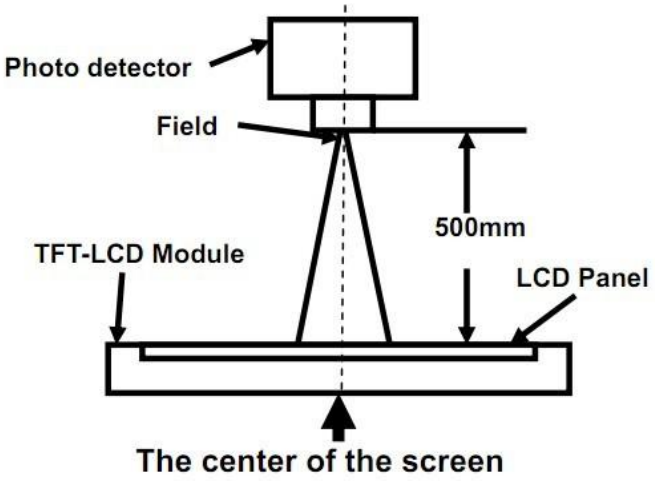
$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

2. Surface luminance is the center point across the LCD surface 500mm from the surface with all pixels displaying white. For more information see FIG 1.

3. Response time is the time required for the display to transition from white to black (Rising Time, Tr) and from black to white (Falling Time, Tf). For additional information see FIG 2.

4. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG 3.

FIG. 1 Optical Characteristic Measurement Equipment and Method



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

FIG. 2 The definition of Response Time

The response time is defined as the following figure and shall be measured by switching the input signal for “black” and “white”.

Response Time = Rising Time(Tr) + Falling Time(Tf)

- Rising Time(Tr) : Full White 90% → Full White 10% Transmittance.
- Falling Time(Tf) : Full White 10% → Full White 90% Transmittance.

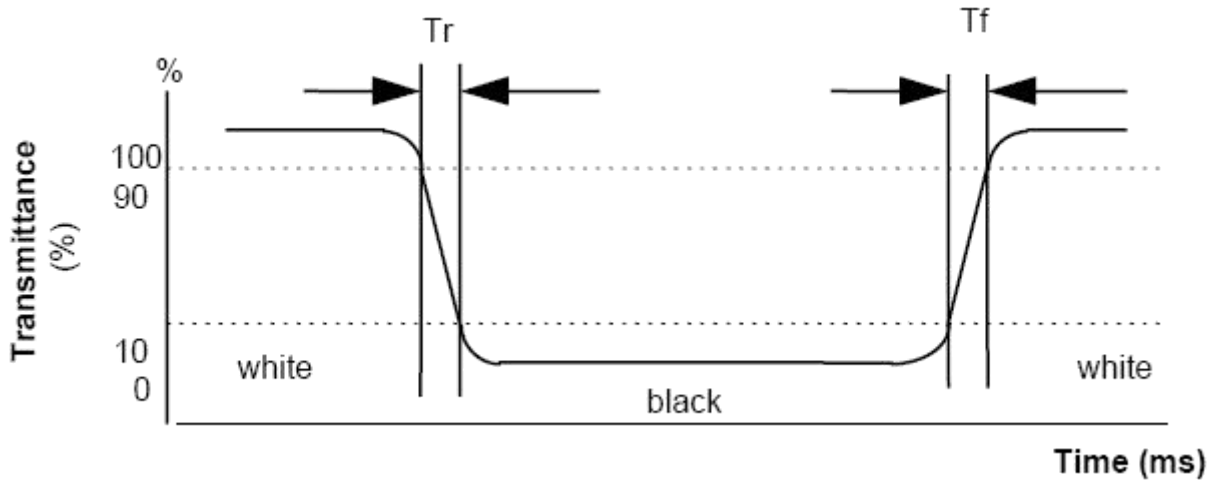
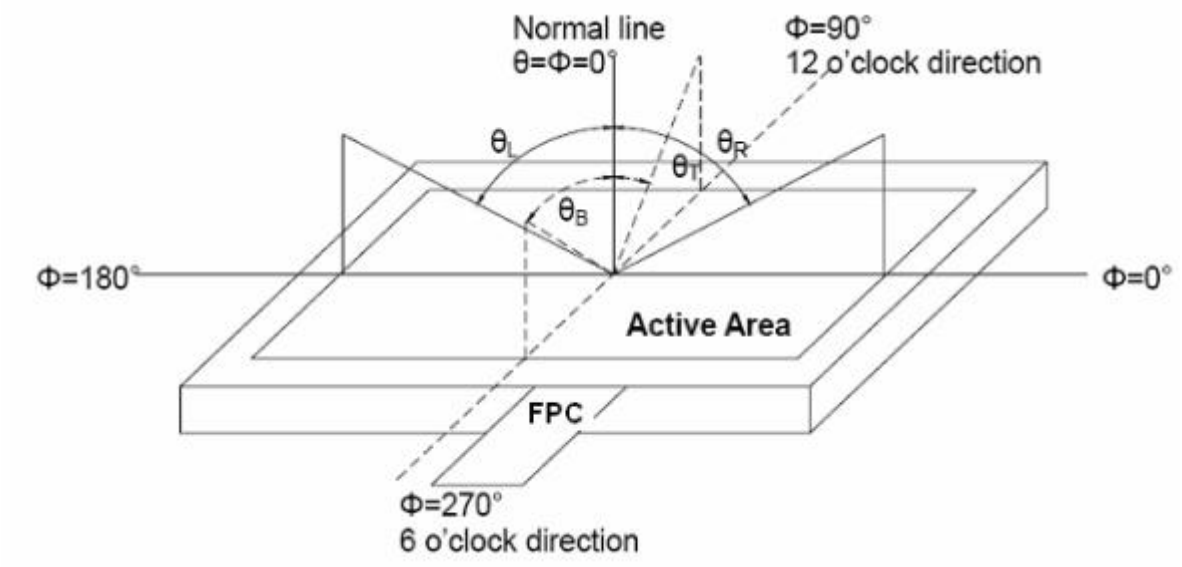
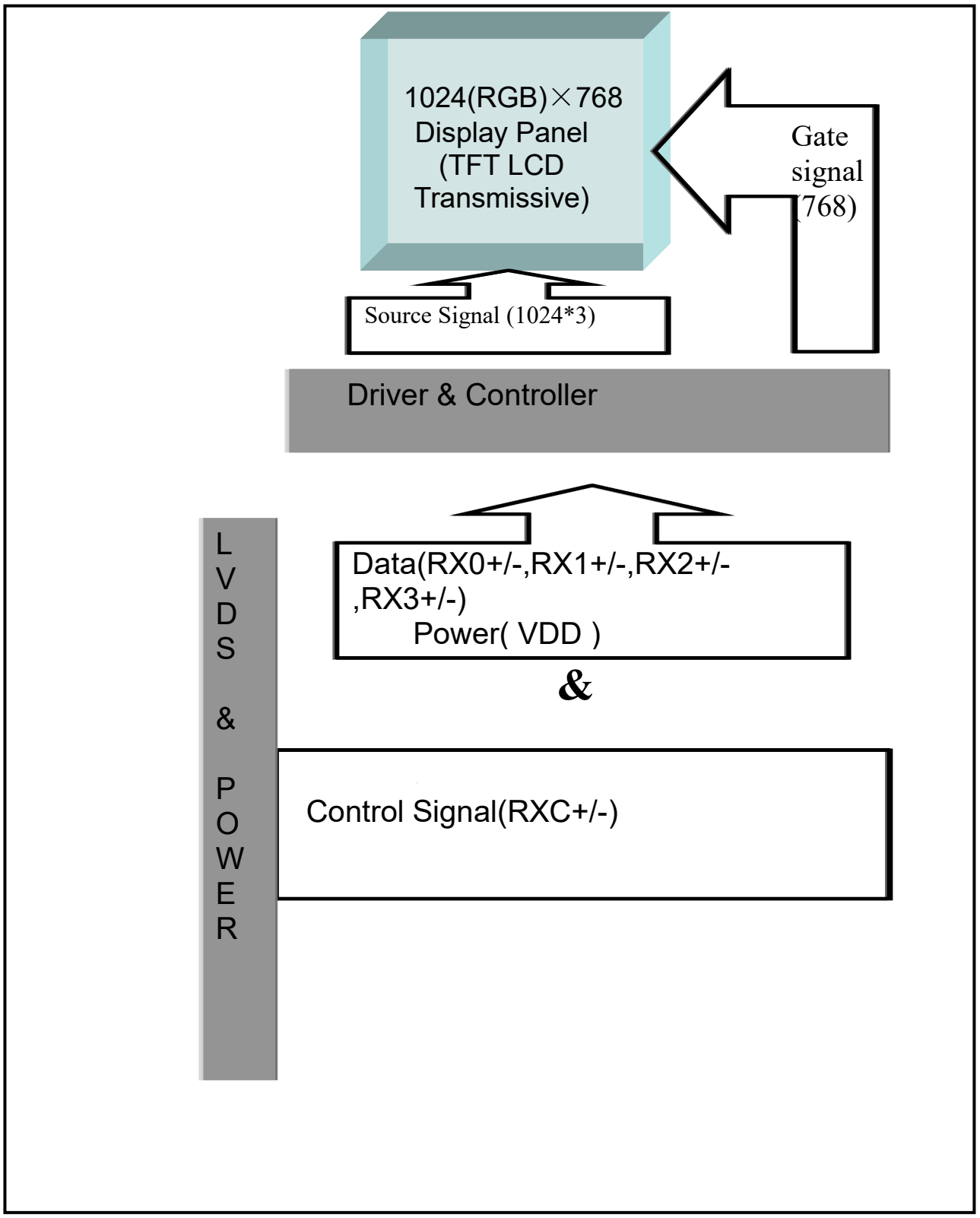


FIG. 3 The definition of Viewing Angle

Use Fig. 1(Test Procedure) under Measurement System to measure the contrast from the measuring direction specified by the conditions as the following figure.



5.Block Diagram



6.Pin Description

6.1 LCD Pin Interface(CN1 Connector P/N: 187098-30091)

Item	Terminal	Functions	
1	NC	Reserved as BIST Function for manufacture test	1
2	GND	Ground	
3	RX3+	Differential Data Input, CH3(Positive)	
4	RX3-	Differential Data Input, CH3(Negative)	
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	GND	Ground	
18	NC	No Connection	
19	GND	Ground	
20	SEL 6/8	LVDS 6/8 Bit Select Function Control, SEL 6/8=1: LVDS Input Data is 6 bit SEL 6/8=0 or NC: LVDS Input Data is 8 bit	2
21	NC	Reversed as EE_WP for OTP Function	3
22	NC	Reversed as EE_SDA for OTP Function	3
23	NC	Reversed as EE_SCL for OTP Function	3
24	Reverse	Reverse Panel Function(Display Rotation)	4
25	GND	Ground	
26	GND	Ground	
27	GND	Ground	
28	VDD	Power Supply 3.3V	
29	VDD	Power Supply 3.3V	
30	VDD	Power Supply 3.3V	

Note:

1. Pin1 is reversed as BIST function for test, don't connect signal to this pin, keep floating.
2. SEL6/8 is used for selecting 6bit/8bit LVDS data input, L or NC: 8bit; High:6bit.
3. Pin21,22,23 are used as SPI interface for OTP function, don't connect any signal to these pin, and don't short them, keep floating.
4. Reverse pin is used for selecting scanning direction.

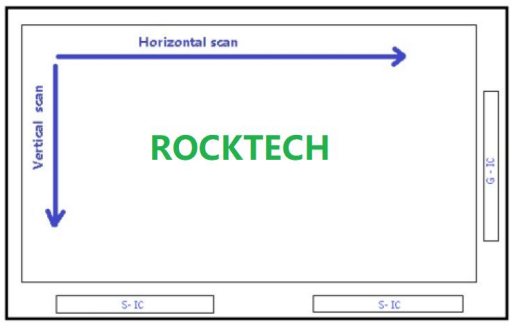


Fig. 1 Normal scan (Pin24, Reverse = Low or NC)

Fig. 2 Reverse scan (Pin24, Reverse = High)

6.2 Backlight Input Pin Interface(CN2 Connector P/N: C14205M2HRD-NH)

No	Symbol	I/O	Function	Remark
1	LED_VCCS	P	12V input	
2	LED_VCCS	P	12V input	
3	GND	P	Ground	
4	LED_PWM	I	PWM	
5	LED_EN	I	Converter power IC Enable (Active High)	

6.3 Backlight Output Pin Interface(CN3 Connector P/N: C14203M2HRD-NH)

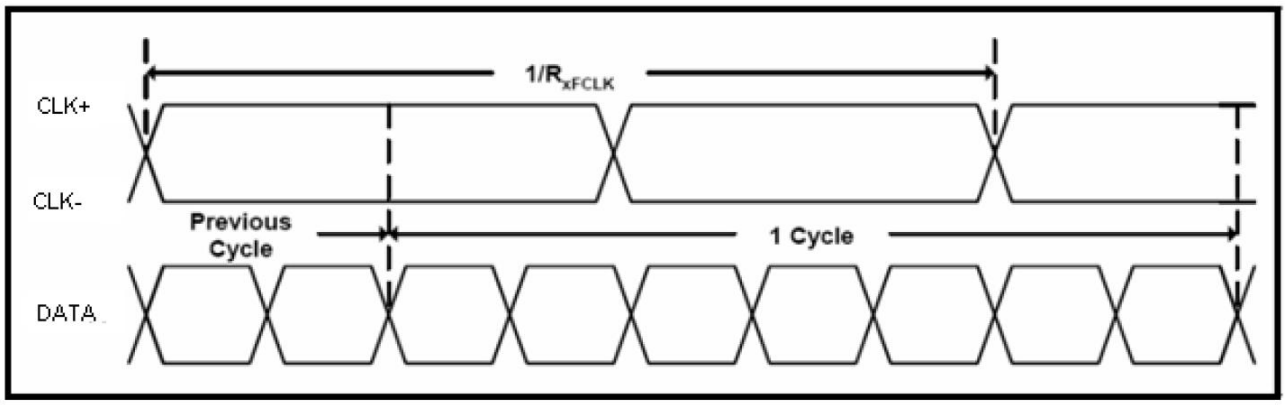
No	Symbol	I/O	Function	Remark
1	LED+	P	Red wire	BL output power
2	LED1-	P	White wire	BL feedback channel1
3	LED2-	P	White wire	BL feedback channel2

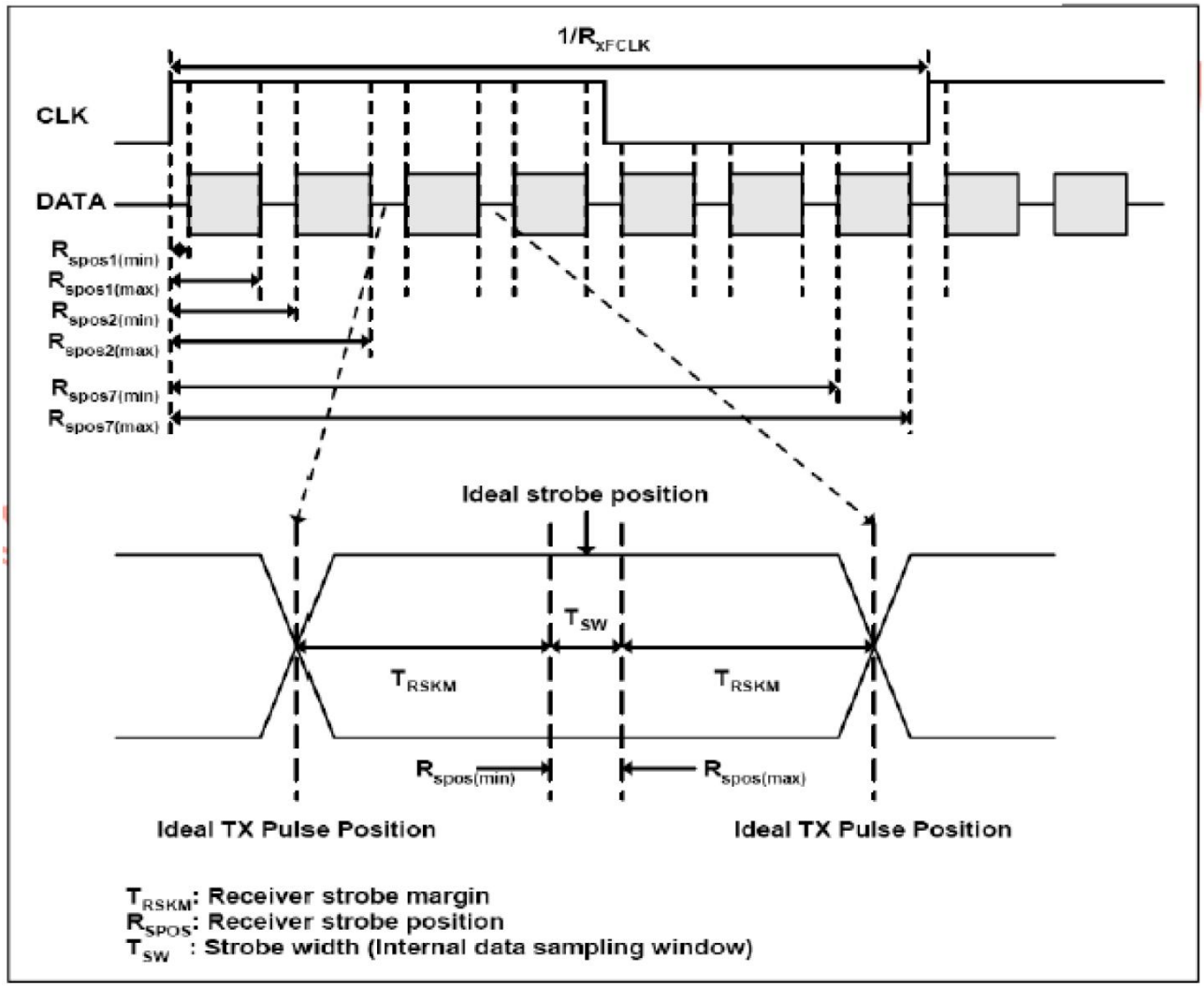
7.Timing Characteristics

7.1 AC Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Units	Condition
Clock frequency	RxFCLK	26.2	51.2	71	MHz	
Input data skew margin	TRSKM	500	500	1/(2*RxFCLK)	ps	Typical value for 1024*600 resolution
Clock high time	TLVCH		4/(7xRxFCLK)		ns	|VID|=400mv RxVCM=1.2V RxFCLK=71MHz VDD_LVDS=3.3V
Clock low time	TLVCL		3/(7xRxFCLK)		ns	
VSD setup time	TenPLL	0	TenPLL	150	us	

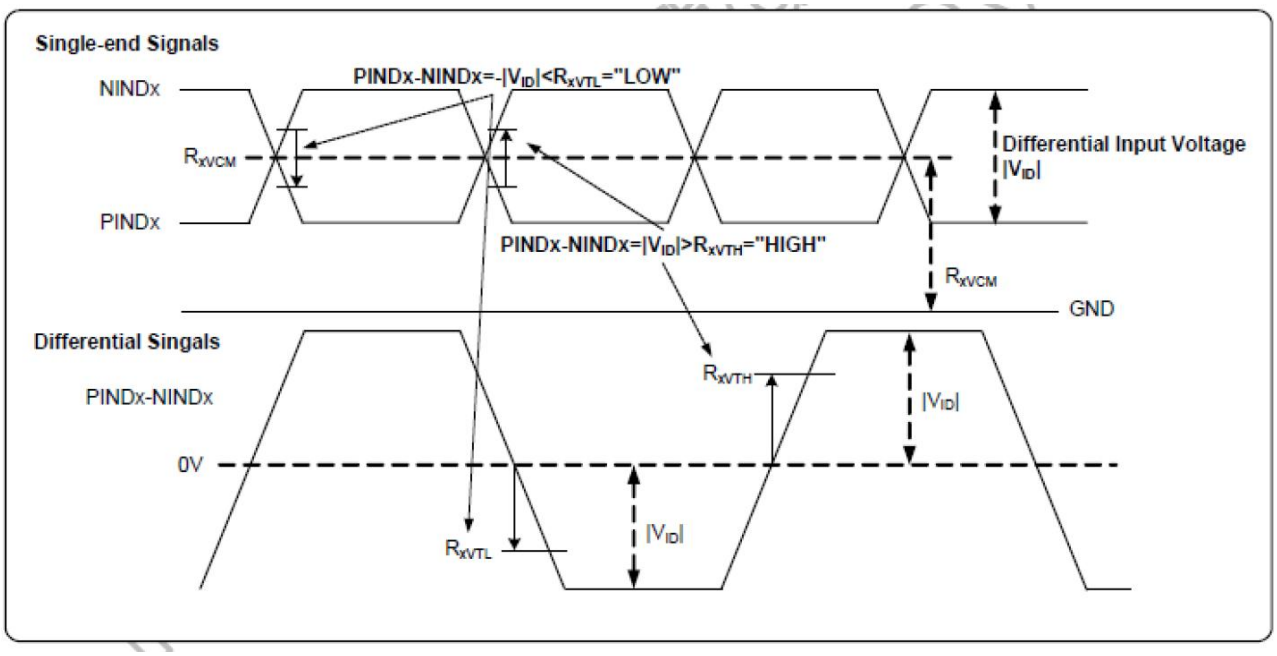
7.2 Input Clock and Data Timing Diagram





7.3 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	-	VDD-1.2+ $\|V_{ID}\|/2$	V	
LVDS Differential input common mode voltage	R_{xVCM}	$\|V_{ID}\|/2$	-	VDD-1.2	V	
LVDS Differential voltage	$\|V_{ID}\|$	0.2	-	0.6	V	

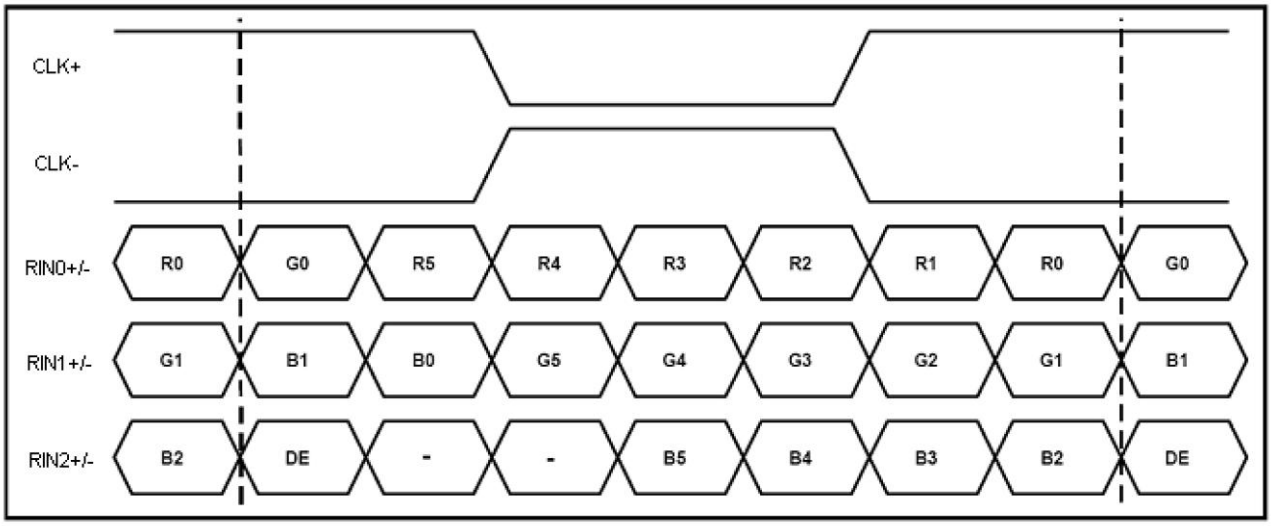


7.4 Data Timing

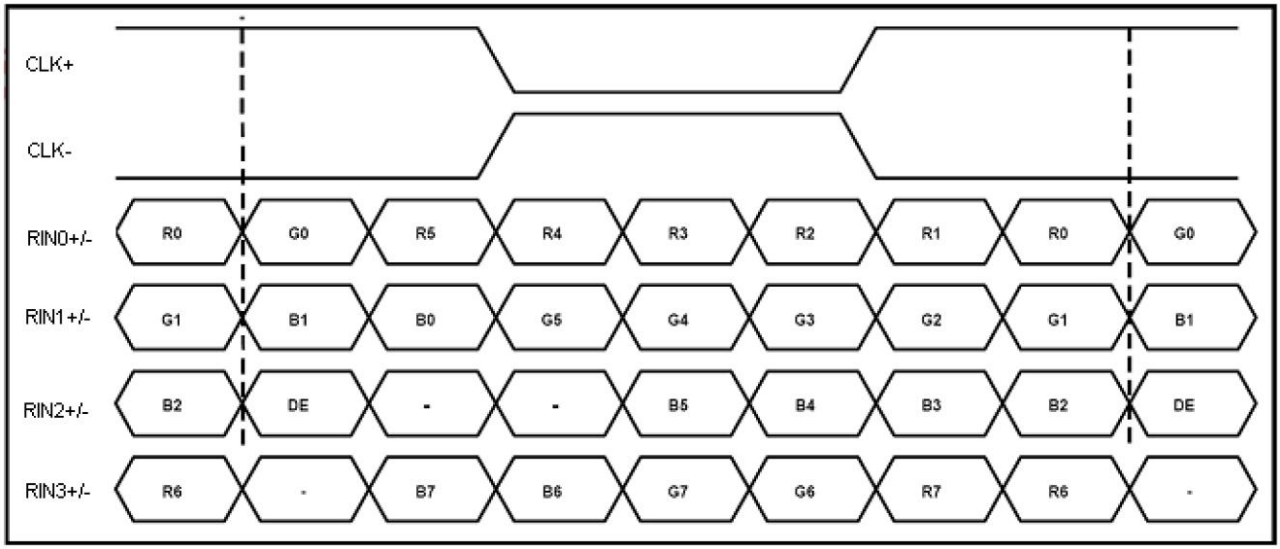
Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK frequency	fclk	52	65	71	MHz
Horizontal display area	thd		1024		DCLK
HSD period	th	1114	1344	1400	DCLK
HSD blanking	thb+thfp	90	320	376	DCLK
Vertical display area	tvd		768		T_H
VSD period	tv	778	806	845	T_H
VSD blanking	tvbp+tvfp	10	38	77	T_H

7.5 LVDS Data Input Format

SEL6/8 = "High" for 6 bits LVDS Input



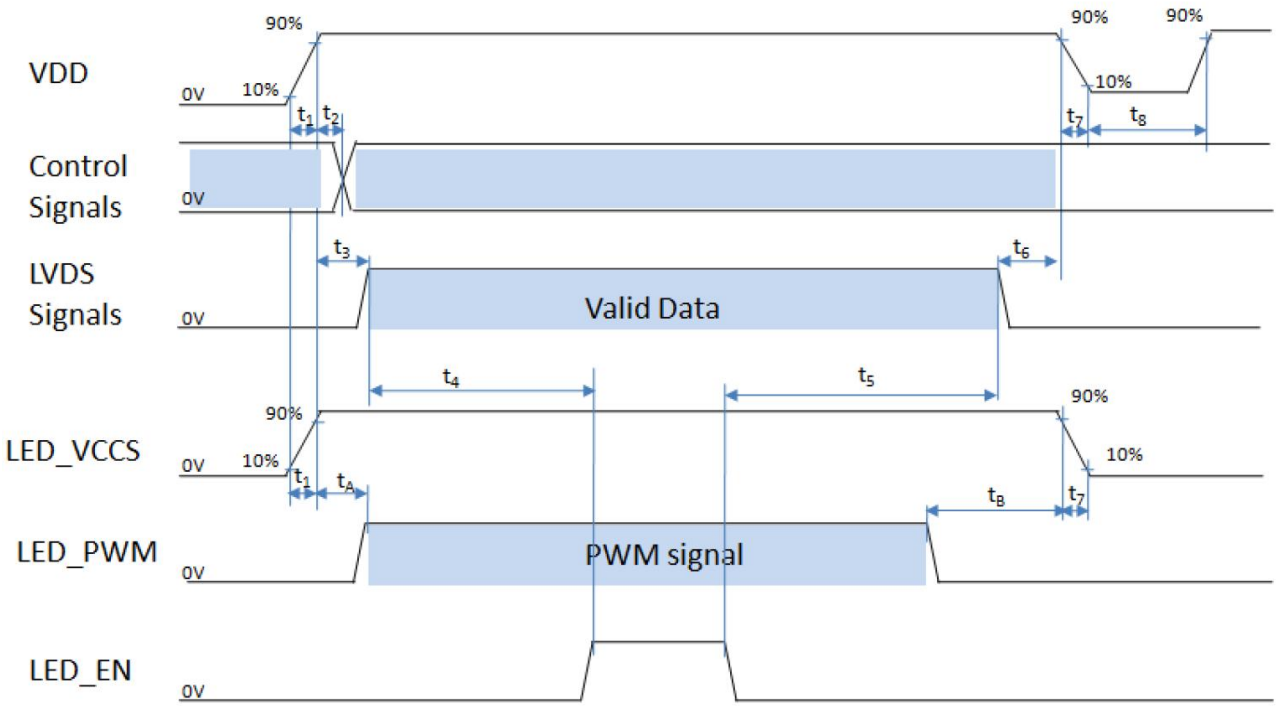
SEL6/8 = "Low" or "NC" for 8 bits LVDS Input



7.6 Power Sequence

The power sequence specifications 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.

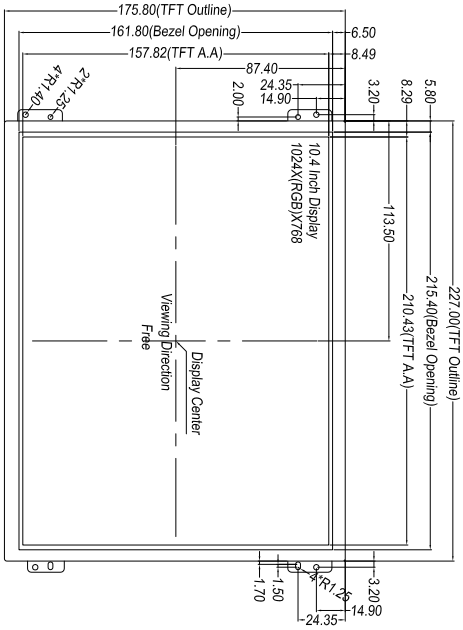
Note 2: Please avoid floating state of the interface signal during signal invalid period.

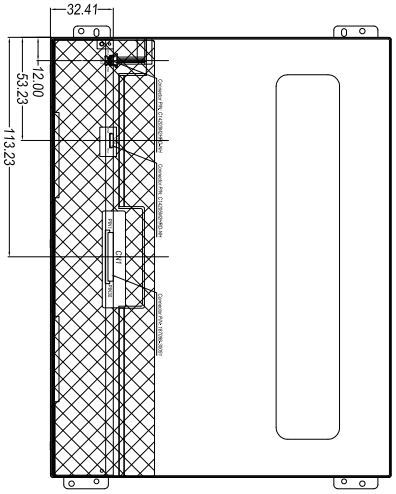
Note 3: It is recommended that the backlight power must be turned on after the power supply for LCD and the interface signal is valid.

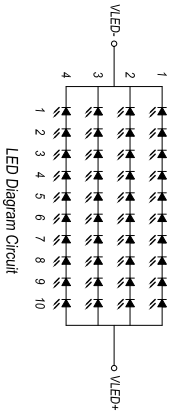
Note 4: Control signals include SEL6/8 & Reverse.

8.Outline Dimension

Display Type	Transmissive,Normally Black
Display Resolution	1024(RGB)X768
Viewing Angle	Free
Controller/Driver	/
Driving Voltage	3.3V(TFT)
Operation Temperature	-20°C TO 70°C
Storage Temperature	-30°C TO 80°C
Backlight Speciality	40PCS LEDS,Vf=30.0V(typ.),If=160mA
Remark	Luminance: 1000cd/m² All materials in the drawing comply with the ROHS







LED Diagram Circuit

TFT(CN1) ASSIGNMENT:																													
PIN	SYMBLE	PIN	SYMBLE	PIN	SYMBLE	PIN	SYMBLE	PIN	SYMBLE	PIN	SYMBLE	PIN	SYMBLE	PIN	SYMBLE	PIN	SYMBLE	PIN	SYMBLE	PIN	SYMBLE	PIN	SYMBLE	PIN	SYMBLE	PIN	SYMBLE	PIN	SYMBLE
1	NC	3	RX3-	5	GND	7	RXC-	9	RX2-	11	GND	13	RX1-	15	RX0-	17	GND	19	GND	21	NC	23	NC	25	GND	27	GND	29	VDD
2	GND	4	RX3+	6	GND	8	RXC+	10	RX2+	12	RX1+	14	GND	16	RX0+	18	NC	20	SEL68	22	NC	24	Reverse	26	GND	28	VDD	30	VDD

BL Input(CN3) ASSIGNMENT:					
PIN	SYMBLE	PIN	SYMBLE	PIN	SYMBLE
1	LED_VCCS_12V	3	GND	5	LED_EN
2	LED_VCCS_12V	4	LED_PWM		

BL Output(CN2) ASSIGNMENT:			
PIN	SYMBLE	PIN	SYMBLE
1	LED+	3	LED2-
2	LED1-		

ISSUE	MODIFY DESCRIPTION	DATE
1.0	First Issue	2024.03.20

TITLE:	LCM Outline		
PROJECT NO:	RK104IX01E		
DESCRIPTION:	10.1 Inch TFT with high brightness		
GENERAL TOLERANCE: ±0.3			
Rocktech Displays Limited			
	THIRD ANGLE PROJECTION		
	NAME	SIGN	DATE
DRAWN	Marvin Zhou		2024.03.20
CHECKED	Marvin Zhou		2024.03.20
REV: 1.0	UNIT: MM	SCALE: 1/1	SHEET: 1 OF 1

9. Reliability and Inspection Standard

No.	Test Item		Test Conditions	Remark
1	High Temperature	Storage	80℃, 120Hr	Note
		Operation	70℃, 120Hr	Note
2	Low Temperature	Storage	-30℃, 120Hr	Note
		Operation	-20℃, 120Hr	
3	High Temperature and High Humidity		40℃, 90%RH, 120Hr	Note
4	Thermal Cycling Test(No operation)		-20℃ for 30min, 70℃ for 30 min. 100 cycles. Then test at room temperature after 1 hour	Note
5	Vibration Test(No operation)		Frequency :10~55 HZ; Stroke :1.5 mm;Sweep:10HZ~55HZ~10HZ; 2hours for each direction of X, Y, Z(6 hours for total)	
6	Package Drop Test		Height:60 cm,1 corner, 3 edges, 6 surfaces	
7	Electro Static Discharge		±2KV,Human Body Mode, 100pF/1500Ω	

Note:

1) Sample quantity for each test item is 5~10pcs.
2) Note 4: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

10.PRECAUTIONS FOR USING LCD MODULES

Handing Precautions

(1) The display panel is made of glass and polarizer. As glass is fragile, it tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact.
(2) If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.
(3) Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary. Do not touch the display with bare hands. This will stain the display area and degraded insulation between terminals (some cosmetics are determined to the polarizer).
(4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.
(5) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents
- Isopropyl alcohol
- Ethyl alcohol
Do not scrub hard to avoid damaging the display surface.
(6) Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.
- Water
- Ketone
- Aromatic solvents
Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contacting oil and fats.
(7) Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.
(8) Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.
(9) Do not attempt to disassemble or process the LCD module.
(10) NC terminal should be open. Do not connect anything.
(11) If the logic circuit power is off, do not apply the input signals.
(12) Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.
- Do not alter, modify or change the shape of the tab on the metal frame.
- Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
- Do not damage or modify the pattern writing on the printed circuit board.
- Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.

- Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
- Do not drop, bend or twist LCM.

Storage Precautions

When storing the LCD modules, the following precaution is necessary.

(1) Store them in a sealed polyethylene bag. If properly sealed, there is no need for the dessicant.

(2) Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C.

(3) The polarizer surface should not come in contact with any other objects. (We advise you to store them in the container in which they were shipped).

Others

Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.

If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.

To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules.

- Exposed area of the printed circuit board.
-Terminal electrode sections.