Rocktech Displays Limited

LCD Module Specification

Module P/N: RK043FN02H-CT

Version: 1.0

Description : 4.3 inch TFT 480*272 pixels with LED Backlight and capacitive touch panel

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Revision History

Date	Rev.	Page	Description
2014-3-20	1.0	All	First issue

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1. General Features

Item	Spec	Remark
Display Mode	Normally White transmissive	
Viewing Direction	12 O'CLOCK	
Input Signals	RGB 24 bit	
Outside Dimensions	105.5 (W) x67.2(H) x4.35(D) Max	With CTP
Active Area	95.04mm(W)×53.86mm(H)	
Number of Pixels	480(RGB)×272	
Dot Pitch	0.198mm(H)×0.198mm(W)	
Pixel Arrangement	RGB Vertical stripes	
Drive IC	OTA5180A	
CTP IC	FT5336GQQ	

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	-	4.6	V	
Power for Circuit Logic	Vt	-0.3	-	Vdd+0.3	V	
Storage Humidity	H_{ST}	10	-		%RH	At 25±5℃
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	
Logic Input Voltage	Low Voltage	V_{IL}	0	-	0.3Vdd	V	
	High Voltage	V_{IH}	0.7Vdd	-	Vdd	V	
Logic Output Voltage	Low Voltage	V_{OL}	0	-	0.2Vdd	V	
	High Voltage	V_{OH}	0.8Vdd	-	-	V	
Power Consumption	Black Mode	P_b	T.B.D	T.B.D	T.B.D	mW	
	Standby Mode	P_w	T.B.D	T.B.D	T.B.D	mW	

3.2 Driving Backlight

Item	Sym.	Min	Typ.	Max	Unit	Note
Backlight driving voltage	V_F	15	16	17	V	
Backlight driving current	I_F	-	40	-	mA	
Backlight Power Consumption	W_{BL}	-	640	-	mW	
Life Time	-	-	20,000	-		Note 3

Note 1: (Unless specified, the ambient temperature Ta=25℃)
Note 2: The recommended operating conditions refer to a range in which operation of this product is guaranteed. Should this range is exceeded, the operation cannot be guaranteed even if the values may be without the absolute maximum ratings.
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.

3.3 Driving CTP

Item	Value
Working Voltage	DC 2.8-3.3V
Insulation Resistance	>20M DC25V
Working Current	12.5mA
Response Time	<16ms

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	400	500	-		FIG.1
2)Module Luminance	L	-	350	-	cd/m^2	With CTP
3)Response time	Tr+Tf	-	20	-	ms	FIG.2
4)Viewing Angle	θ_T	60	70	-	Degree	FIG.3
	θ_B	40	50	-		
	θ_L	60	70	-		
	θ_R	60	70	-		
5)Chromaticity	Wx	0.278	0.298	0.318		
	Wy	0.311	0.331	0.351		
	Rx	-	-	-		
	Ry	-	-	-		
	Gx	-	-	-		
	Gy	-	-	-		
	Bx	-	-	-		
	By	-	-	-		

◆ Measurement System

Notes:

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

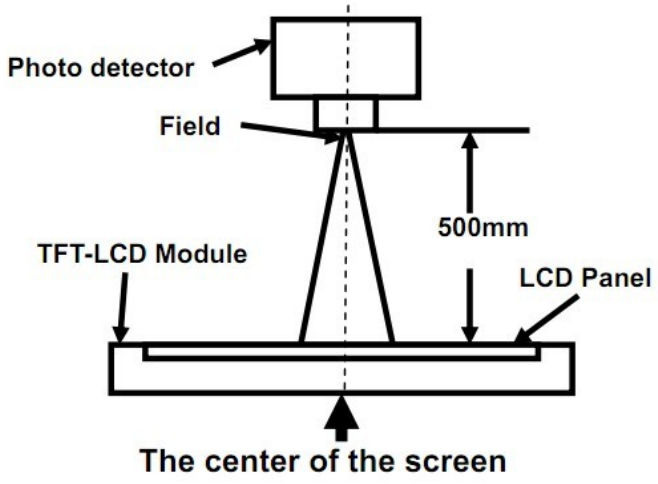
$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

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.

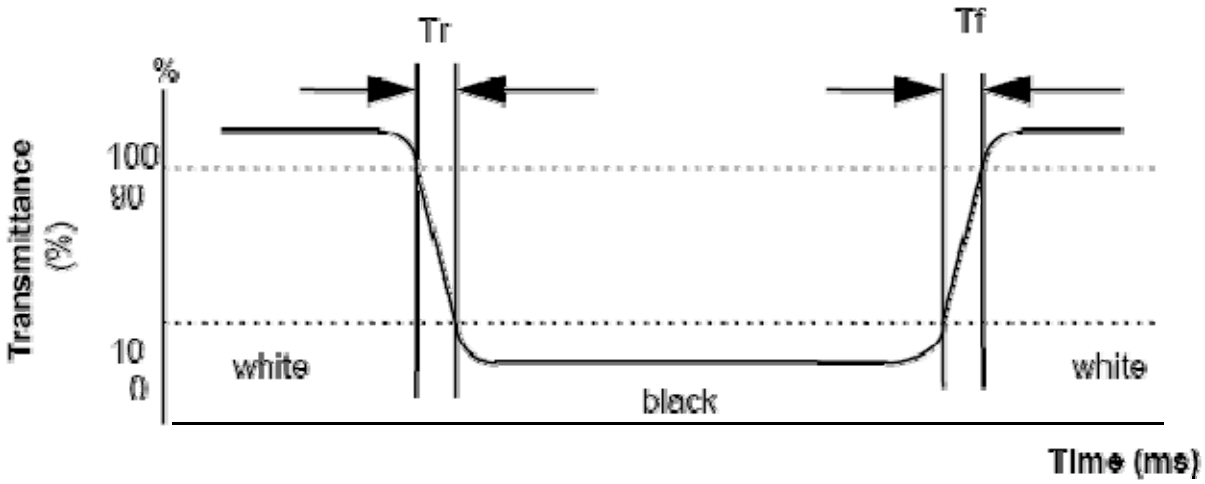
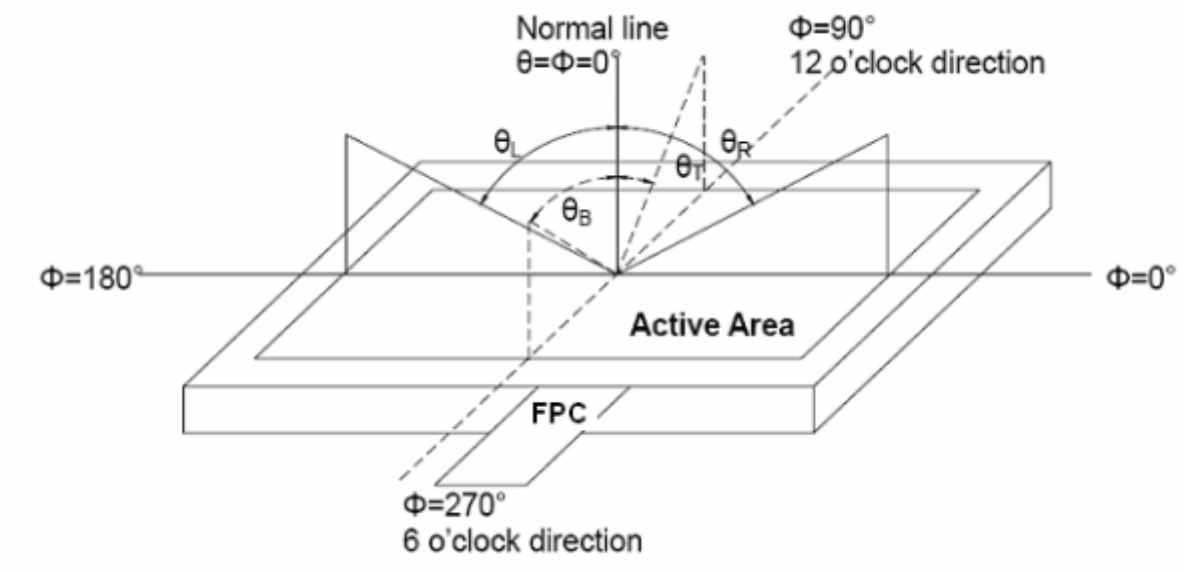
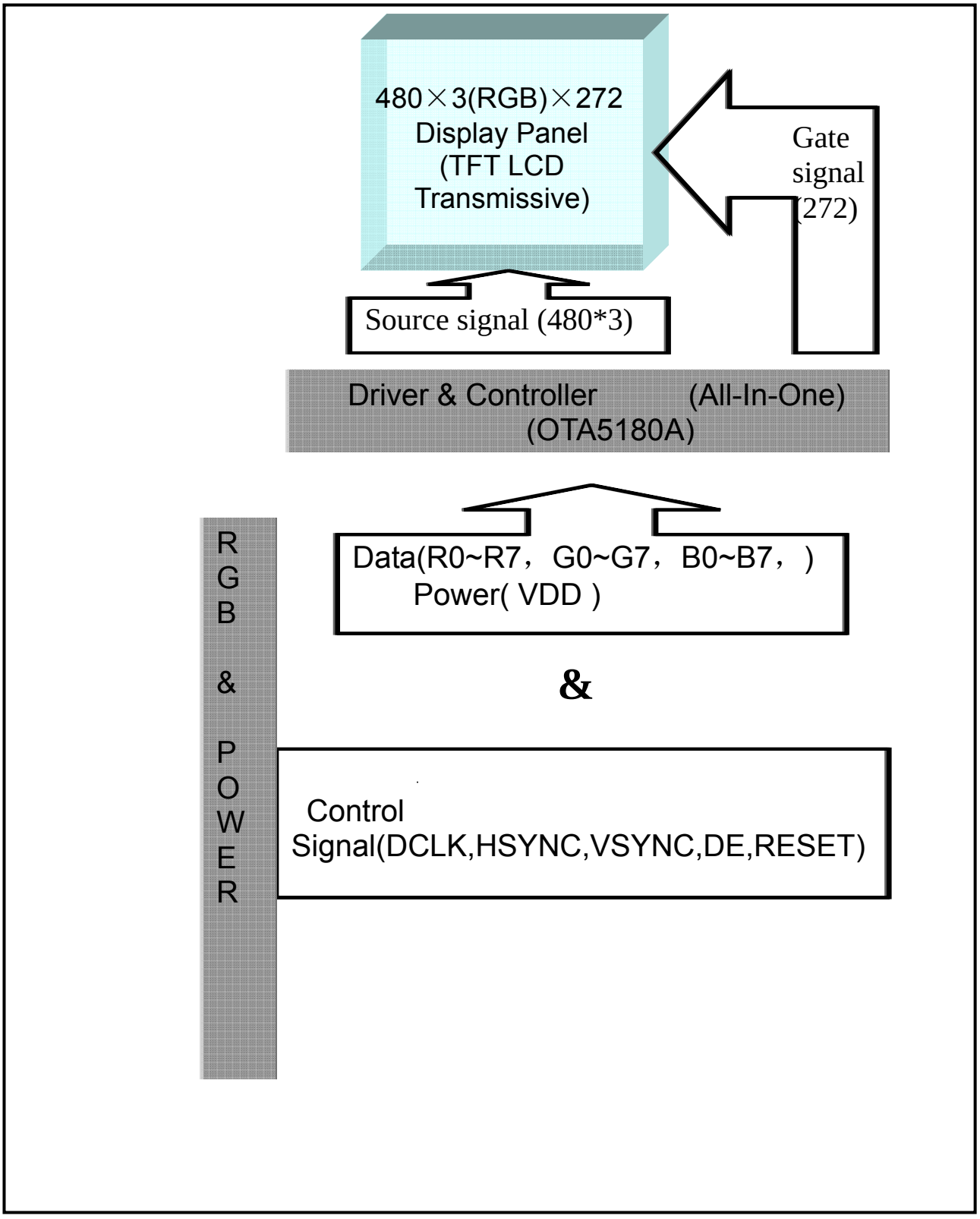


FIG. 3 The definition of Viewing Angle

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 interface

Item	Symbol	Description
1	K	B/L Power input PIN Cathode
2	A	B/L Power input PIN anode
3	GND	Ground
4	VDD	Power input
5--12	R0--R7	Red Data
13--20	G0--G7	Green Data
21--28	B0--B7	Blue Data
29	GND	Ground
30	CLK	Data clock signal
31	DISP	Standby Mode DISP=”1”, Normal operation DISP=”0”, Standby mode.
32	HSYNC	Horizontal synchronizing signal
33	VSYNC	Vertical synchronizing signal
34	DE	Data ENABLE signal
35	NC	NC
36	GND	Ground
37	NC	NC
38	NC	NC
39	NC	NC
40	NC	NC

6.2 CTP interface

Pin	Symbol	Description
1	VDD	Working voltage 2.8V~3.3V
2	Reset	Reset
3	INT	Interrupt
4	SCL	I2C clock
5	SDA	I2C data
6	GND	GND

CTP IC driver source code will be offered separately.

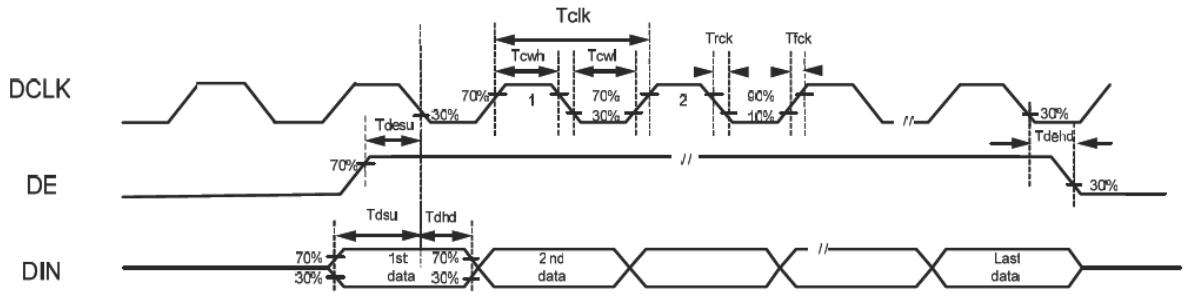
7.Timing Characteristics (details refer to spec of OTA5180A)

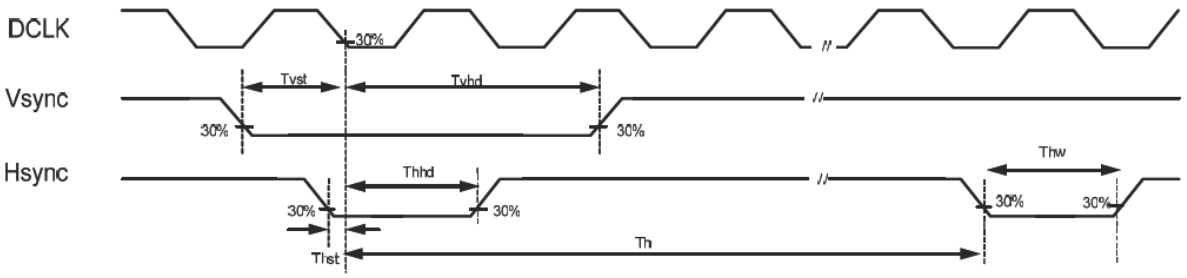
7.1 AC Characteristics

VDDIO=1.8V, VDD = 3.3V, AVDD = 6V, AGND = 0V, T_A = -20℃ to 80℃

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLK pulse duty	Tcw	40	50	60	%	
Hsync width	Thw	1.0	-	-	DCLK	
Hsync period	Th	55	60	65	us	
Vsync setup time	Tvst	12	-	-	ns	
Vsync hold time	Tvhd	12	-	-	ns	
Hsync setup time	Thst	12	-	-	ns	
Hsync hold time	Thhd	12	-	-	ns	
Data set-up time	Tdsu	12	-	-	ns	
Data hold time	Tdhd	12	-	-	ns	
DE set-up time	Tdesu	12	-	-	ns	
DE hold time	Tdehd	12	-	-	ns	
SD output stable time	Tst	-	10	12	us	
GD output rise and fall time	Tgst	-	500	1000	ns	
Serial communication						
Delay between CSB and Vsync	Tcv	1			us	
CS input setup time	Ts0	50			ns	
Serial data input setup time	Ts1	50			ns	
CS input hold time	Th0	50			ns	
Serial data input hold time	Th1	50			ns	
SCL pulse high width	Twh1	50			ns	
SCL pulse low width	Twl1	50			ns	
CS pulse high width	Tw2	400			ns	

7.2 AC Timing Diagram



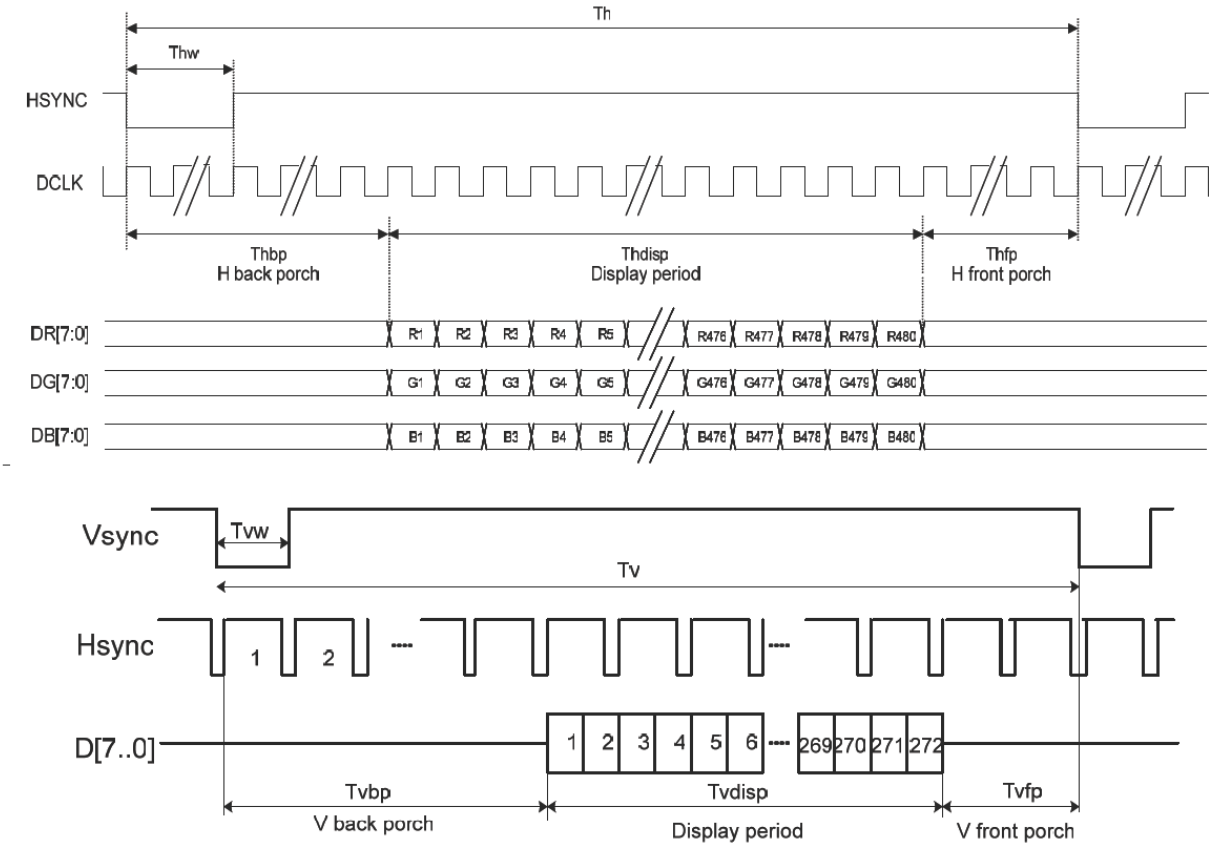


7.3 Parallel RGB Data Format

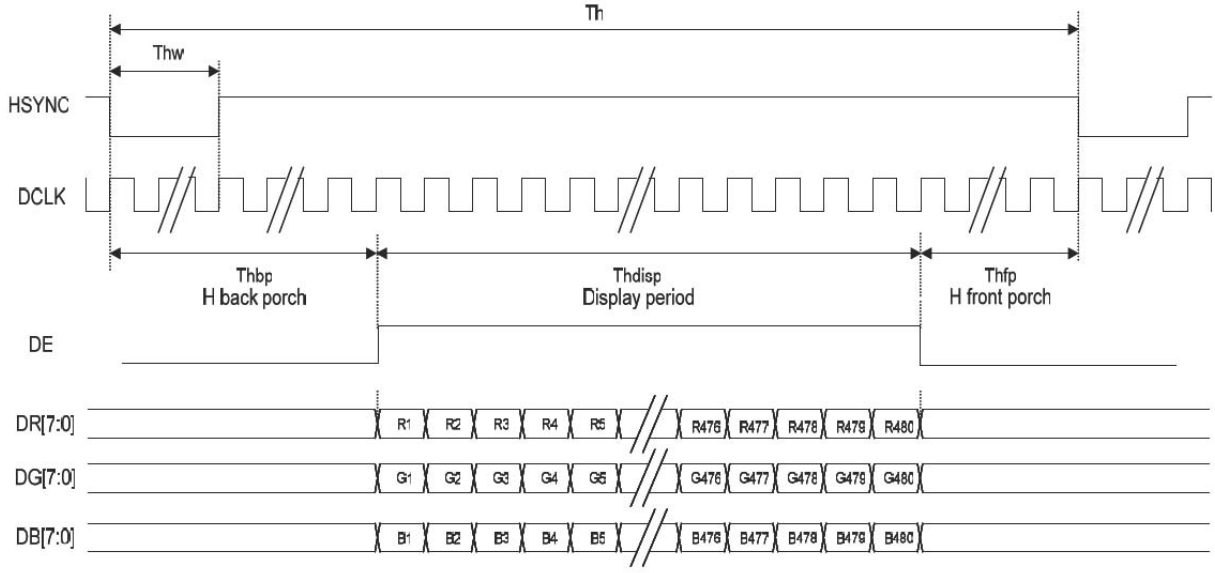
7.3.1 Parallel RGB Input Timing Table

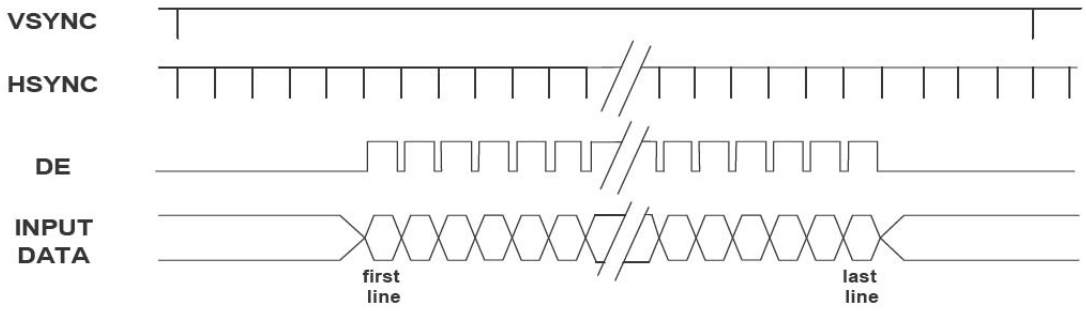
Item		Symbol	Min.	Typ.	Max.	Unit	
DCLK Frequency		Fclk	5	9	12	MHz	
DCLK Period		Tclk	83	110	200	ns	
Hsync	Period Time	Th	490	531	605	DCLK	
	Display Period	Thdisp		480		DCLK	
	Back Porch	Thbp	8	43		DCLK	By H_BLANKING setting
	Front Porch	Thfp	2	8		DCLK	
	Pulse Width	Thw	1			DCLK	
Vsync	Period Time	Tv	275	288	335	H	
	Display Period	Tvdisp		272		H	
	Back Porch	Tvbp	2	12		H	By V_BLANKING setting
	Front Porch	Tvfp	1	4		H	
	Pulse Width	Tvw	1	10		H	

7.3.2 SYNC Mode Timing Diagram



7.3.3 SYNC-DE Mode Timing Diagram

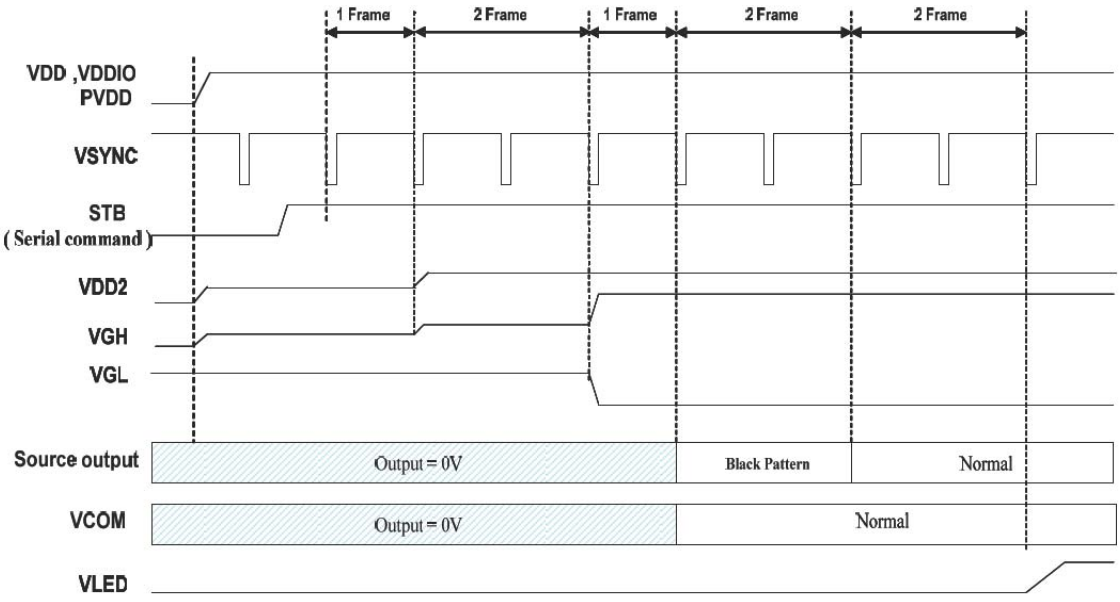




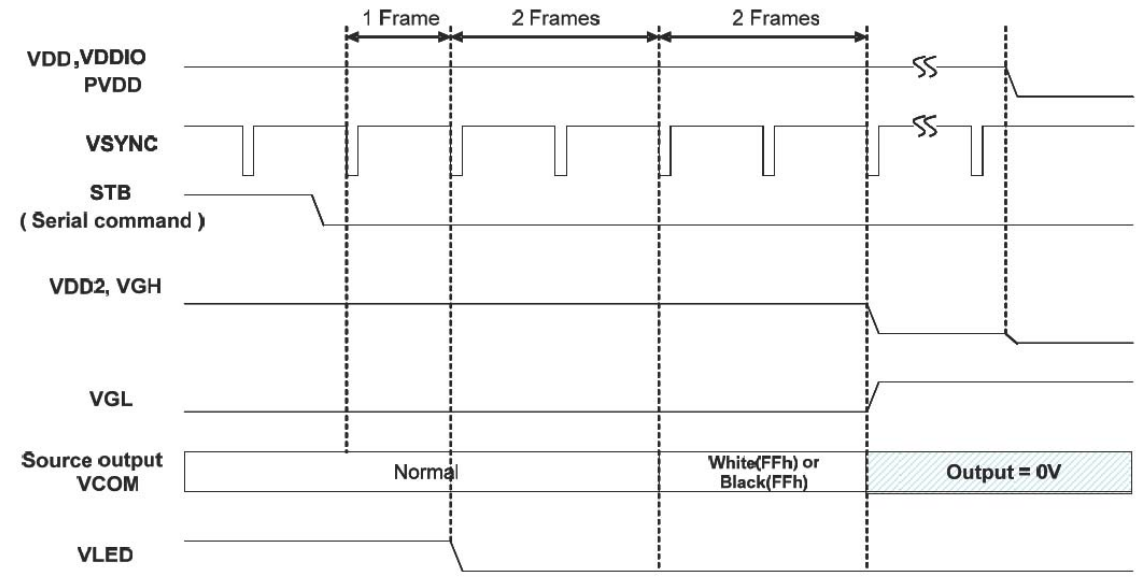
Note: In actual product, input data latched at rising edge of DCLK

7.4 Power on/off Sequence

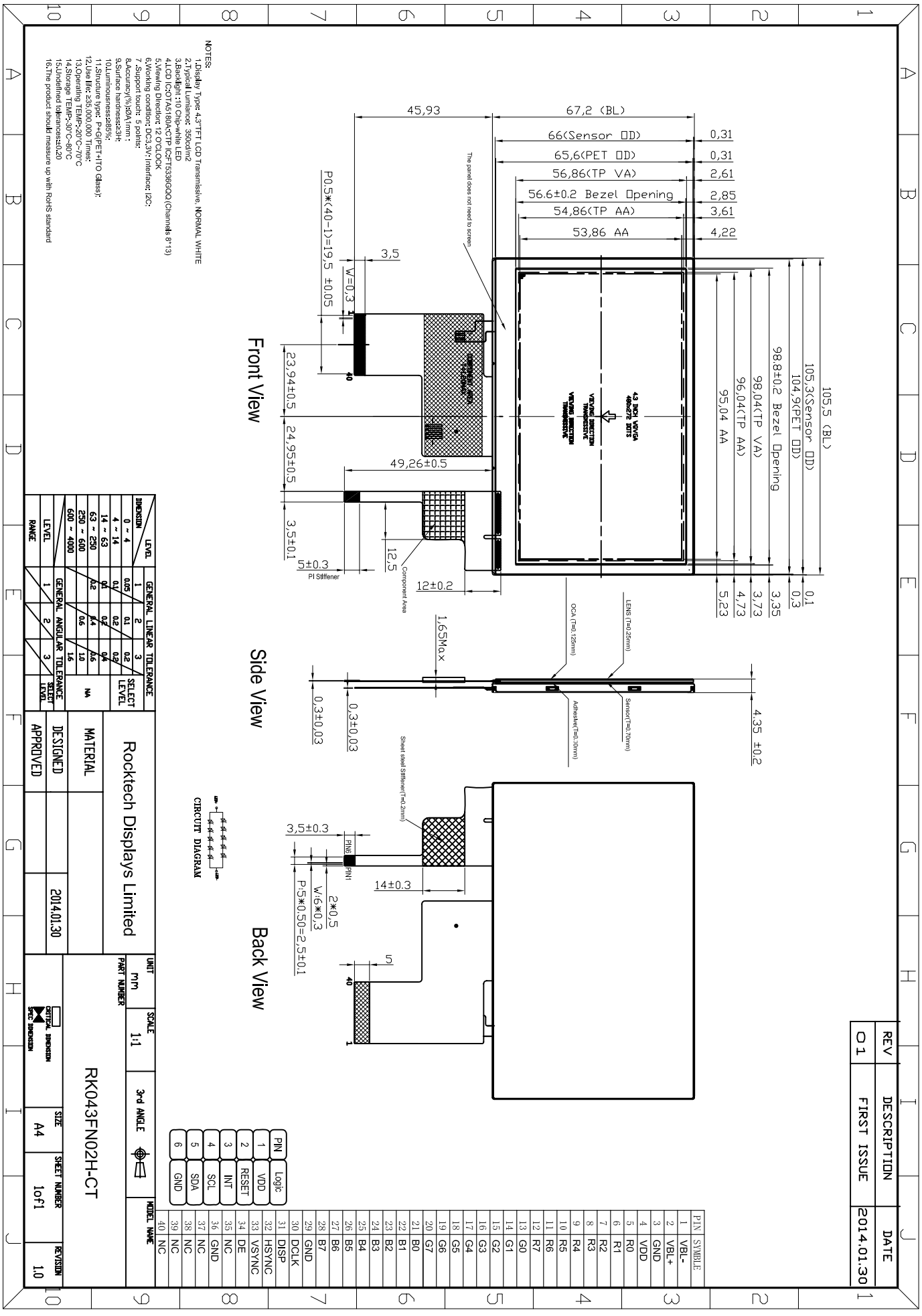
7.4.1 Power On Sequence



7.4.2 Power Off Sequence



8.Outline Dimension



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	Peeling Off (Storage)		≧500gf/cm	Note
5	FPC Bending Test		≧6,000 times, 2/sec	Note
6	Vibration Test(Storage)		50HZ, 30min, Amplitude: 2 cm, X/Y/Z directions	Note
7	Drop Test		60cm/ 3Corner/ 8Face, 1Cycle	Note

Note:

1) The test samples should be applied to only one test item.
2) Sample size for each test item is 5~10pcs.
3) For Damp Proof Test, pure water(Resistance>1MΩ) should be used.
4) In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.
5) EL evaluation should be excepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and fluorescence EL has.
6) After the reliability test, the test samples should be inspected after 2 hours at least.
7) Functional test is OK. Missing segment, shorts, unclear segment, non display, display abnormally, liquid crystal leak are not allowed.
8) After testing, the current Idd should be within initial value ±20%.
9) No low temperature bubbles ,end seal loose and fall, frame rainbow, ACF bubble growing are allowable in the appearance test.

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.