Rocktech Displays Limited

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LCD Module Specification

Module P/N: <u>RK043HN10HS</u>

Version: <u>1.0</u>

Description : 4.3 inch TFT 480*272 pixels with <u>LED backlight,All viewing angle</u> <u>500 nits brightness</u>

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Revision History

Date	Rev.	Page	Description
2022-05-20	1.0	All	First issue

CONTENTS

1. General Features

Item	Spec	Remark
Display Mode	Normally Black Transmissive	
Viewing Direction	FREE	IPS
Input Signals	RGB 24 bit	
Outside Dimensions	105.50(W) x67.20(H) x2.95(D)	
Active Area	95.04mm(W)×53.86mm(H)	
Number of Pixels	480(RGB)×272	
Dot Pitch	0.198mm(W) ×0.198mm(H)	
Pixel Arrangement	RGB Vertical stripes	
Driver IC	ST7282A	

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	V_{dd}	-0.3	-	4.6	V	
Power for Circuit Logic	V_t	-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}	GND	-	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	

3.2 Driving Backlight

Item	Sym.	Min	Typ.	Max	Unit	Note
Backlight driving voltage	V_F	-	16.0	-	V	
Backlight driving current	I_F	30	40	50	mA	
Backlight Power Consumption	W_{BL}	-	640	-	mW	
Life Time	-	-	50,000	-		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.

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	640	800	-		FIG.1
2)Module Luminance	L	400	500	-	cd/m^2	FIG.1
3)Response time	Tr+Tf	-	30	40	ms	FIG.2
4)Viewing Angle	θ_T	70	80	-	Degree	FIG.3
	θ_B	70	80	-		
	θ_L	70	80	-		
	θ_R	70	80	-		
5)Chromaticity	Wx	0.280	0.320	0.360		
	Wy	0.305	0.345	0.385		
	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
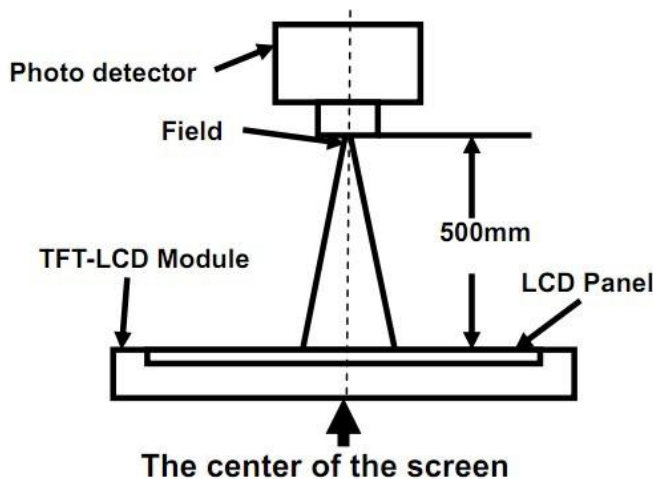
| Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

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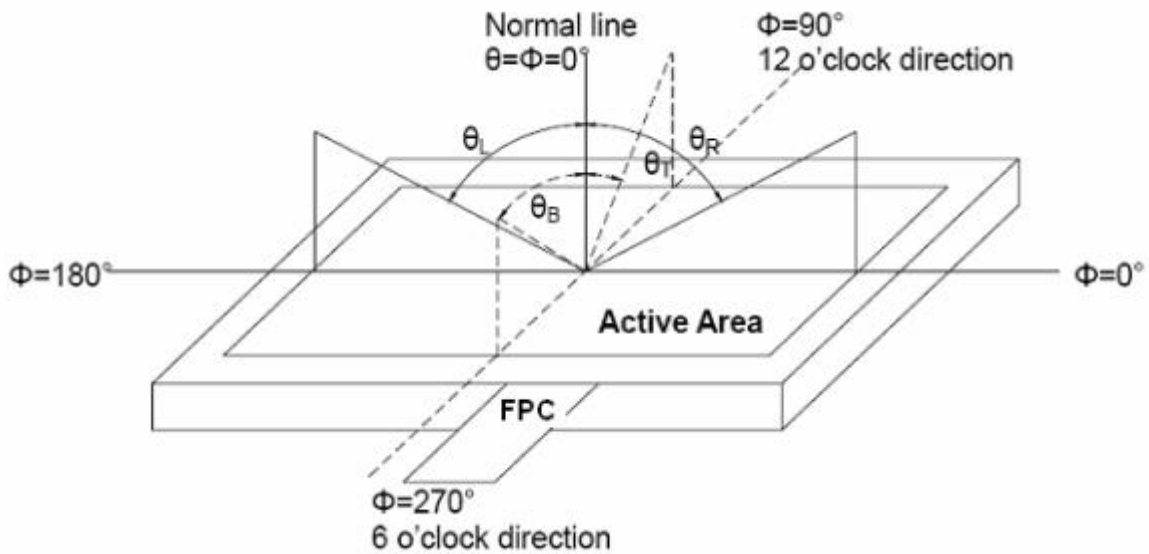
Response Time = Rising Time(Tr) + Falling Time(Tf)

- Rising Time(Tr) : Full White 90% → Full White 10% Transmittance.
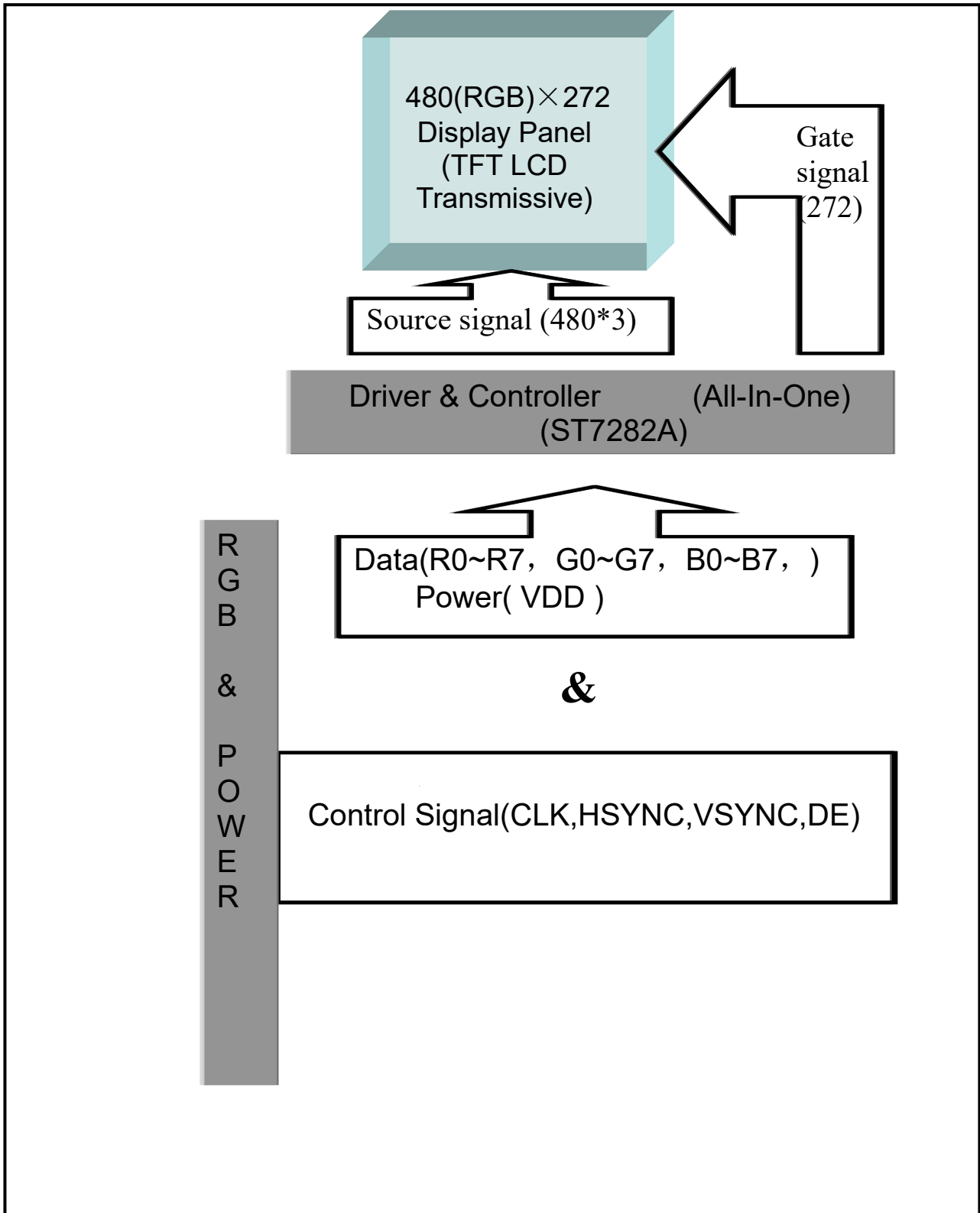- Falling Time(Tf) : Full White 10% → Full White 90% Transmittance.
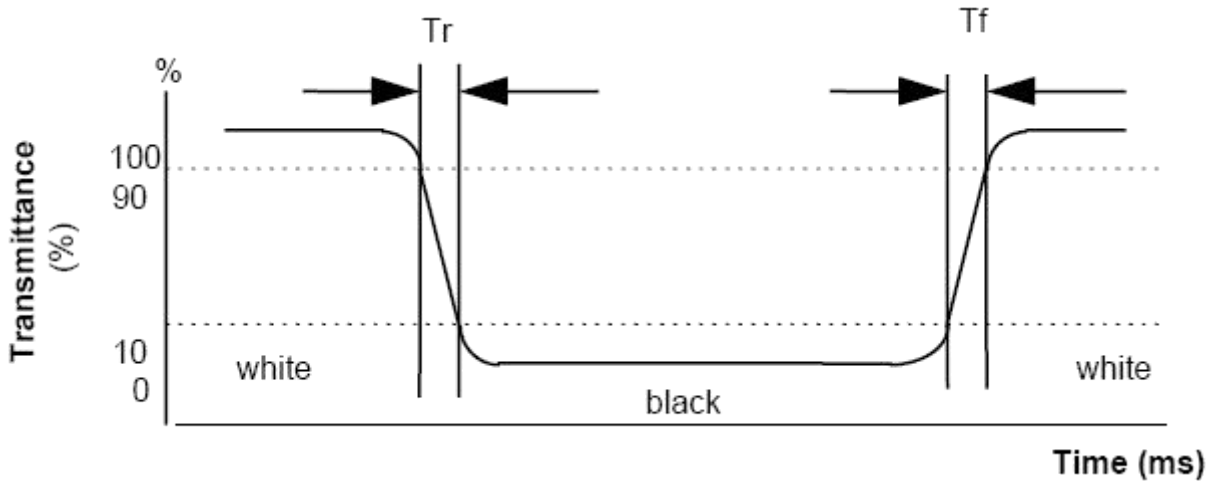
FIG. 3 The definition of Viewing Angle

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

480(RGB)×272
Display Panel
(TFT LCD
Transmissive)

Gate
signal
(272)

Source signal (480*3)

Driver & Controller   (All-In-One)
(ST7282A)

R
G
B

&

P
O
W
E
R

Data(R0~R7，G0~G7，B0~B7，)
Power(VDD)

&

Control Signal(CLK,HSYNC,VSYNC,DE)

6.Pin Description

| Item	Symbol	Description
1	VLED-	B/L Power input PIN Cathode
2	VLED+	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	XR	No connection if without TP
38	YD	No connection if without TP
39	XL	No connection if without TP
40	YU	No connection if without TP

7.Timing Characteristics

7.1 Timing Diagram and Input Setup Timing setting
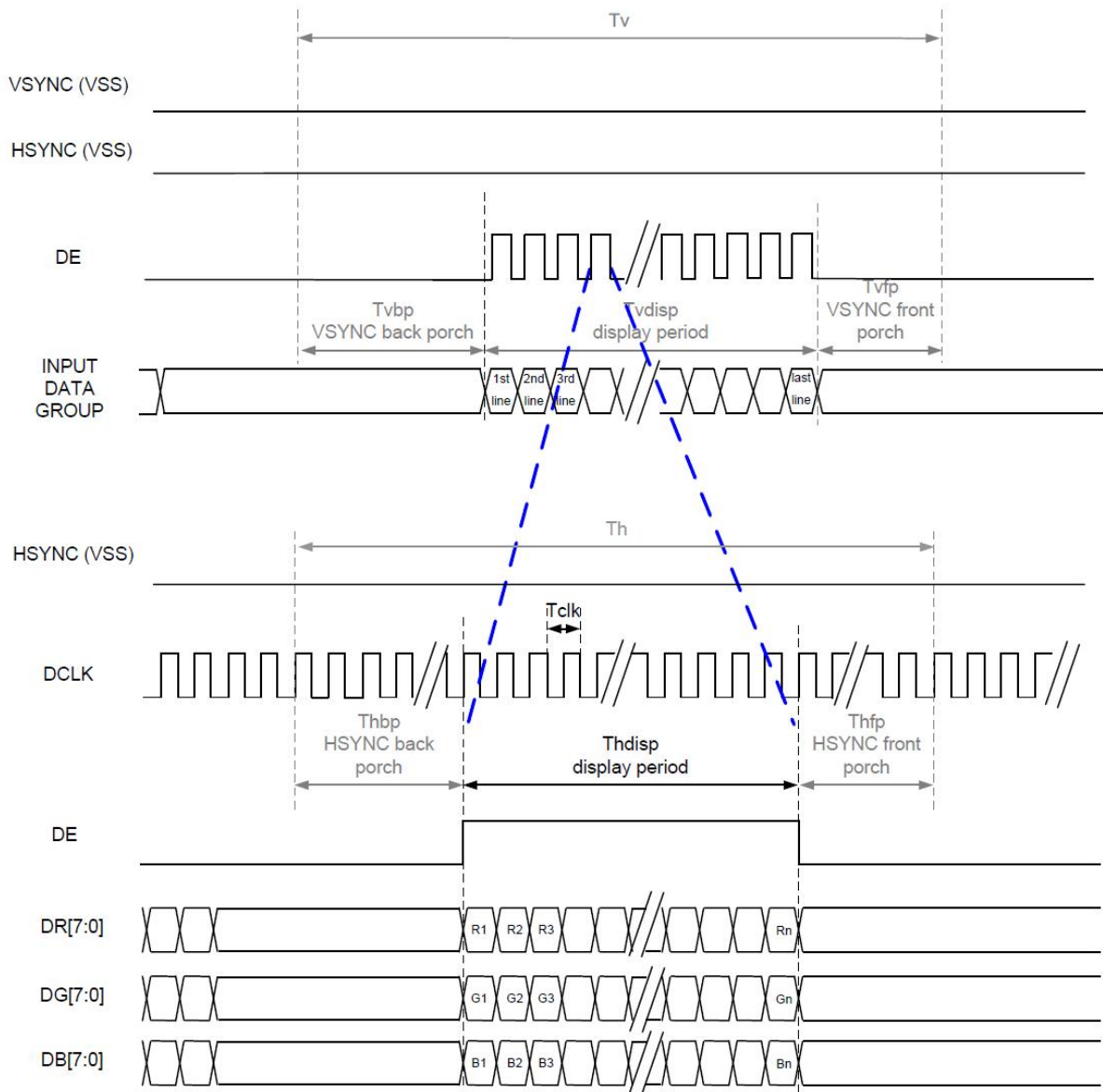
7.1.1 SYNC Mode Timing Diagram
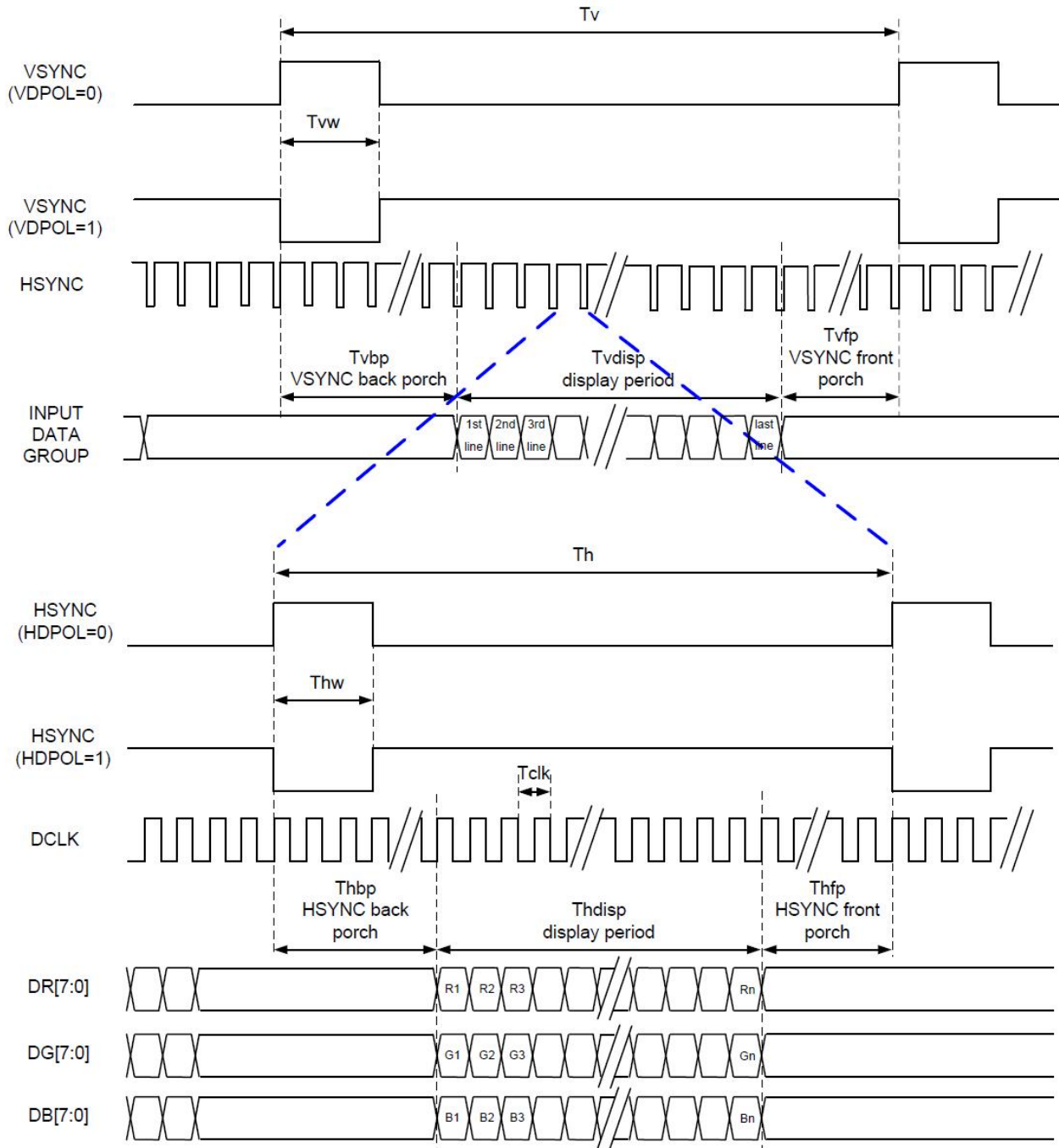
7.1.2 SYN-DE Mode Timing Diagram
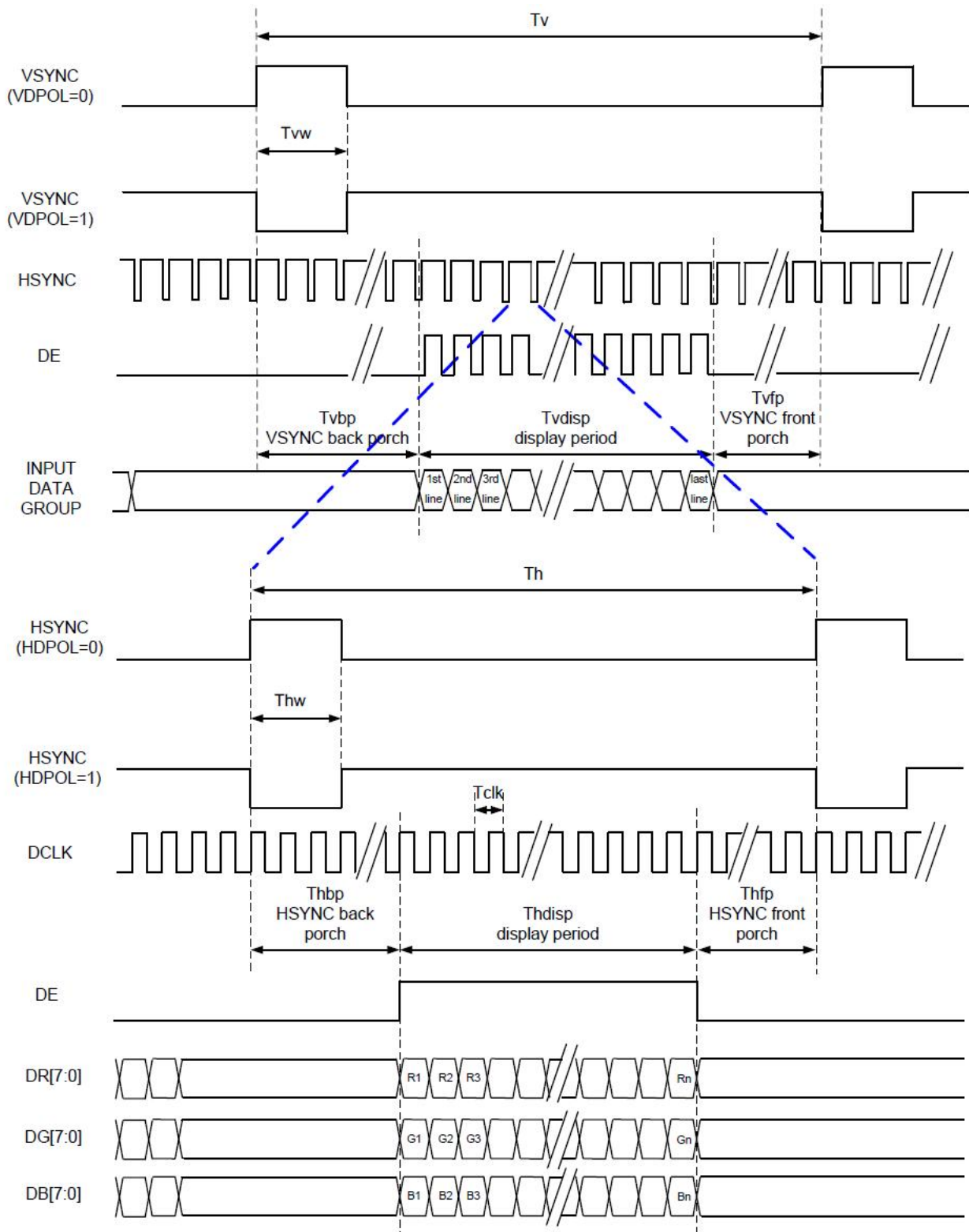
7.1.3 DE Mode Timing Diagram

RGB Mode Selection Table	DCLK	HSYNC	VSYNC	DE
SYNC - DE Mode	Input	Input	Input	Input
SYNC Mode	Input	Input	Input	GND
DE Mode	Input	GND	GND	Input

Note: "Input" means these signals are driven by host side.

7.2 Parallel 24 bit RGB Input Timing Table

Parallel 24-bit RGB Input Timing (PVDD=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C)

480RGB X 272 Resolution Timing Table							
Item		Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency		Fclk	8	9	12	MHz	
DCLK Period		Tclk	83	111	125	ns	
HSYNC	Period Time	Th	485	531	598	DCLK	
	Display Period	Thdisp	-	480	-	DCLK	
	Back Porch	Thbp	3	43	43	DCLK	By H_BLANKING setting
	Front Porch	Thfp	2	8	75	DCLK	
	Pulse Width	Thw	2	4	43	DCLK	
VSYNC	Period Time	Tv	276	292	321	HSYNC	
	Display Period	Tvdisp	-	272	-	HSYNC	
	Back Porch	Tvbp	2	12	12	HSYNC	By V_BLANKING setting
	Front Porch	Tvfp	2	8	37	HSYNC	
	Pulse Width	Tvw	2	4	12	HSYNC	

Note: It is necessary to keep Tvbp =12 and Thbp =43 in sync mode. DE mode is unnecessary to keep it.

7.3 Power ON/OFF Sequence
7.3.1 Power On Sequence
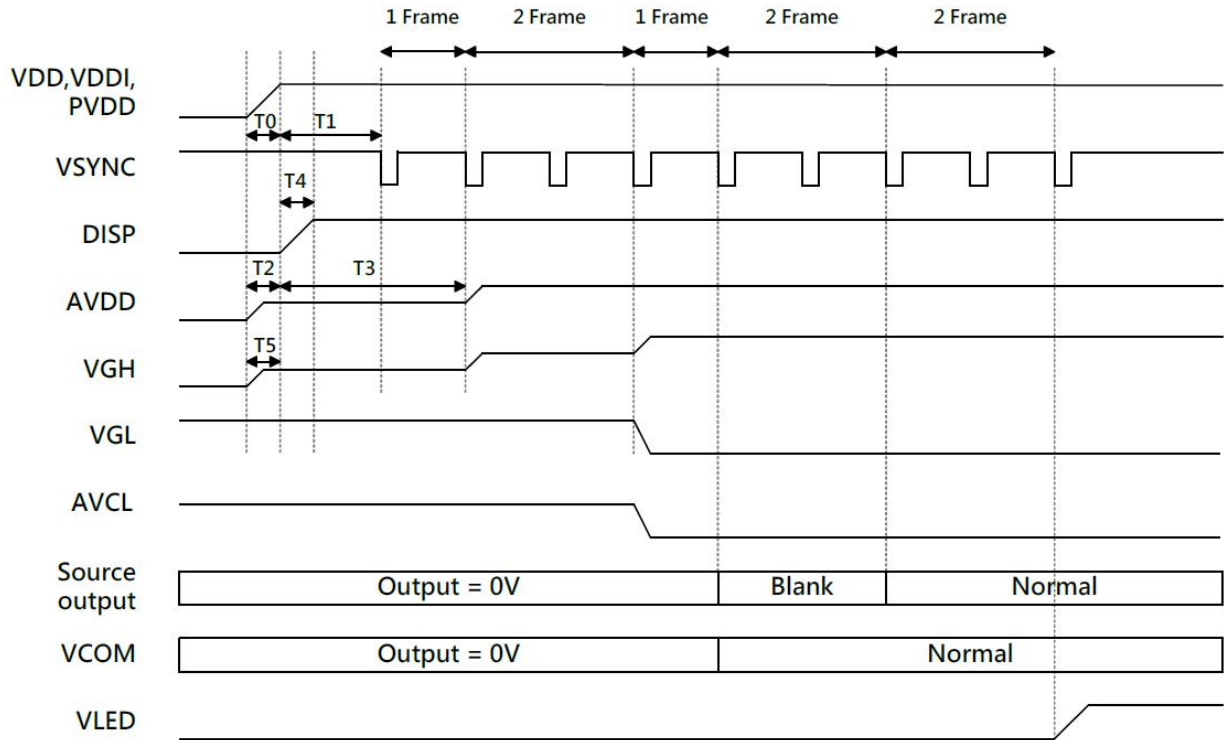
	Description	Min. Time
T0	Determined by the external power	
T1	Time from stable VDD, VDDI, PVDD set-up to the first VSYNC	T1=0
T2	Time from AVDD=0V to AVDD=3.3V	T2=T0
T3	Time from AVDD=3.3V to AVDD=6.0V	T3=T1+ (1*Frame)
T4	Time from stable VDD, VDDI, PVDD set-up to DISP asserted	T4=0
T5	Time from VGH=0V to VGH=3.3V	T5=T0

7.3.2 Power Off Sequence
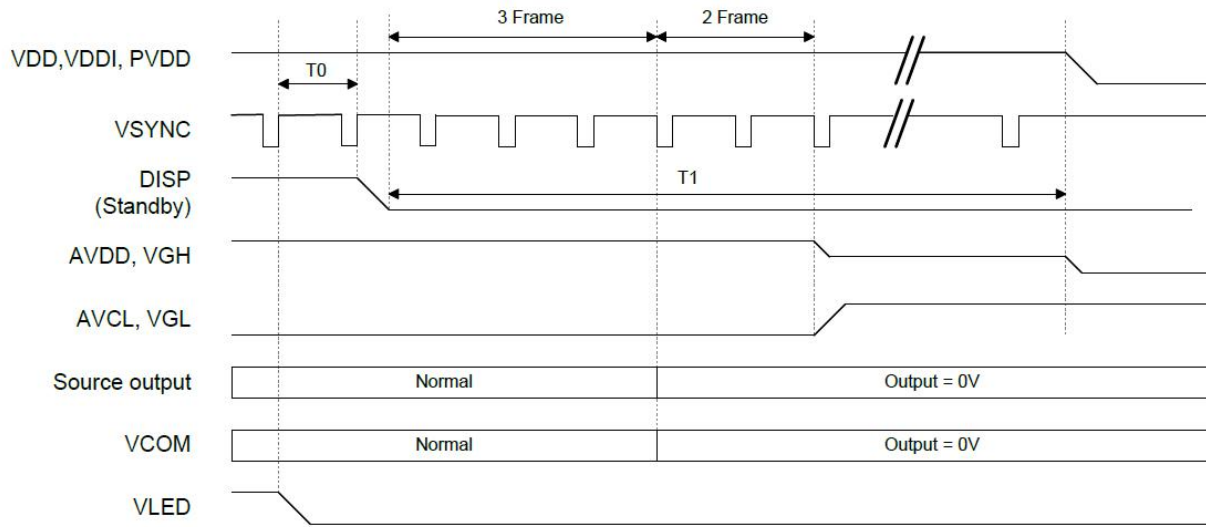
Item	Description	Min. Time
T0	Time from backlight power off to DISP="L"	1*Frame
T1	Time from DISP="L" to LCM Power off	5*Frame

8.Outline Dimension

Display Type	Transmissive.Normally Black
Display Resolution	480(RGB)X272
Viewing Angle	FREE
Controller/Driver	ST7282A
Driving Voltage	3.3V
Operation Temperature	-20°C TO 70°C
Storage Temperature	-30°C TO 80°C
Backlight Speciality	10PCS LEDS,Vf=16V,If=40mA
Remark	Luminance: 500cd/m²
	All materials in the drawing comply with the ROHS

46.06
67.20(TFT Outline)
56.32(TFT Window)
53.86(TFT A.A)
30.93
2.77
4.00
4.13
5.23
17.43
52.75
4.3' TFT
480*RGB*272 DOTS
IPS
105.50(TFT Outline)
97.24(TFT Window)
95.04(TFT A.A)
PIN1
wide=0.30
pitch=0.50
19.50
PIN40
3.50
28.63
Black tape
t=0.05mm
38.94
23.61
0.30
2.95
20.50
5.00

LED Diagram Circuit
LEDA
LEDK

Rocktech Displays Limited

THIRD ANGLE PROJECTION

TITLE:	LCM Outline
PROJECT NO:	RK043HN10HS
DESCRIPTION:	4.3 Inch TFT
GENERAL TOLERANCE:	±0.3

	NAME	SIGN	DATE
DRAWN	Marvin Zhou		2022.05.20
CHECKED	Marvin Zhou		2022.05.20
REV: 1.0	UNIT: MM	SCALE: 1/1	SHEET: 1 OF 1

ISSUE	MODIFY DESCRIPTION	DATE
1.0	First Issue	2022.05.20

TFT ASSIGNMENT:

PIN	SYMBLE
1	VLED-
2	VLED+
3	GND
4	VDD
5	R0
6	R1
7	R2
8	R3
9	R4
10	R5
11	R6
12	R7
13	G0
14	G1
15	G2
16	G3
17	G4
18	G5
19	G6
20	G7
21	B0
22	B1
23	B2
24	B3
25	B4
26	B5
27	B6
28	B7
29	DE
30	DCLK
31	DISP
32	HSYNC
33	VSYNC
34	DE
35	NC
36	GND
37	NC
38	NC
39	NC
40	NC

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.