TFT Display Module

Part Number

E43RG63248LW2M220-N

Overview:

- 4.3-inch TFT: 480x272 (105.4x67.2)
- 16/18/24- bit RGB Interface
- 3.3V
- 65K/262K/16.7M colors
- White LED back-light
- Transmissive/ Normally White
- 220 NITS
- Controller: OTA5180A
- RoHS Compliant

Description

This is a color active matrix TFT (Thin Film Transistor) LCD (Liquid Crystal Display) that uses amorphous silicon TFT as a switching device. This model is composed of a Transmissive type TFT-LCD Panel, driver circuit and backlight unit. The resolution of a 4.3" TFT-LCD contains 480x272 pixels and can display up to 65K/262K/16.7M colors.

Features

Low Input Voltage: 3.3V (TYP)
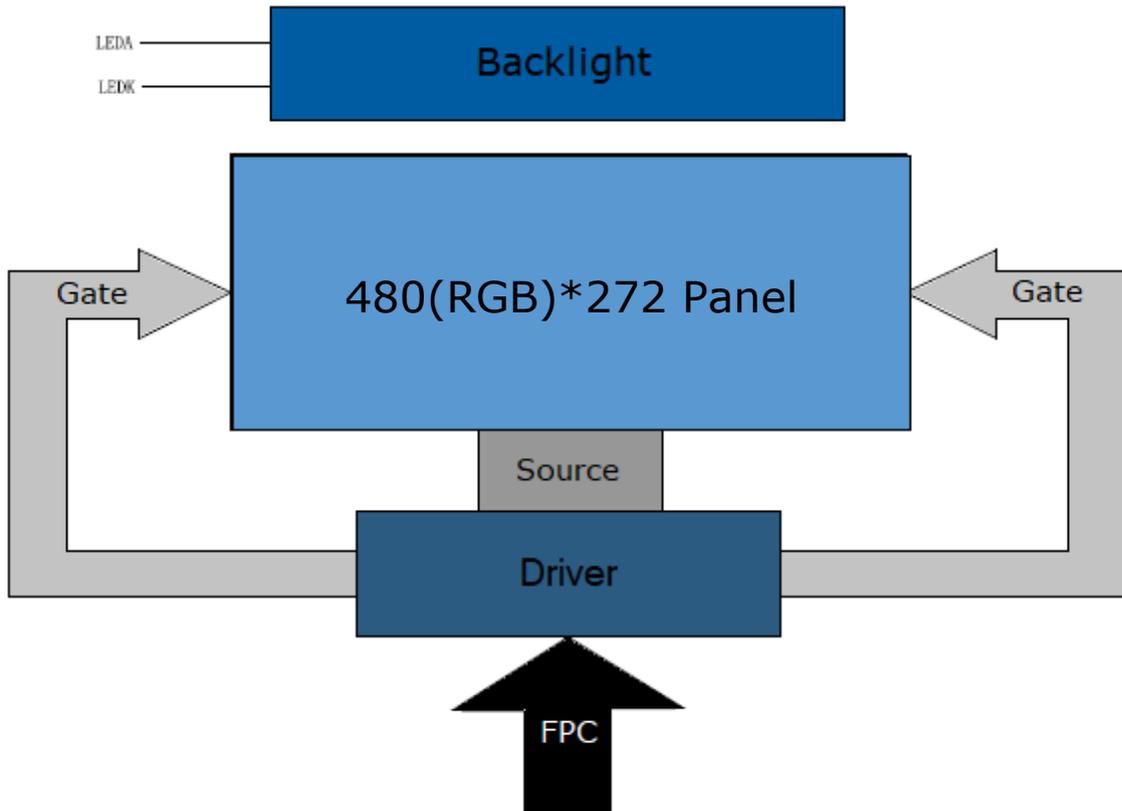Display Colors of TFT LCD: 65K/262K/16.7M colors
TFT Interface: 16/18/24-bit RGB

General Information Items	Specification Main Panel	Unit	Note
Display area (AA)	95.04(H) *53.86(V) (4.3 inch)	mm	-
Driver element	TFT active matrix	-	-
Display colors	65K/262K/16.7M	colors	-
Number of pixels	480(RGB)*272	dots	-
TFT Pixel arrangement	RGB vertical stripe	-	-
Pixel pitch	0.198 (H) x 0.198 (V)	mm	-
Viewing angle	12:00	-	-
TFT Controller IC	OTA5180A	-	-
Display mode	Transmissive/ Normally White	-	-
Operating temperature	-20～+70	℃	-
Storage temperature	-30～+80	℃	-

Mechanical Information

Item		Min	Typ.	Max	Unit	Note
Module size	Horizontal(H)		105.4		mm	-
	Vertical(V)		67.15		mm	-
	Depth(D)		2.86		mm	-
Weight			TBD		g	-

1. Block Diagram

2. Outline Dimension

REV	DESCRIPTION	DATE
1.0	First	

4.3"TFT
480*RGB*272

105.40±0.2BL
98.80±0.1 UP BEZEL OPEN
98.00 UP POL
95.04 LCD AA
3.30
3.70
5.18

2.35
2.75
4.12

67.15±0.2BL
57.70±0.1 UP BEZEL OPEN
56.90 UP POL
53.86 LCD AA

2.86±0.2

FRONT
BACK

46.10±0.3
41.67
18.50±0.5
25.96
YELLOW TAPE

3.50
0.50±0.1
U=0.30
R0.30
20.50±0.1
P0.5*39=19.5±0.05
23.95
46.77

18.50
12.94
3.00
5.00 PI
Single Layer Area
40

0.30±0.03 LCM FPC
Tenor Stiffener

Pin	Name
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	GND
30	PCLK
31	DISP
32	HSYNC
33	VSYNC
34	DE
35	NC
36	GND
37	XR(NC)
38	YD(NC)
39	XL(NC)
40	YU(NC)

Interface set in FPC

VCC
R10
PSEL
R11
GND

R10	R11	Interface type
VDD	NC	24bit RGB interface
NC	GND	8080 MCU interface ,RS=GT

K ⊶|◁|◁|◁|◁|◁|◁|◁⊷ A

B/L Circuit

NOTES:

1. DISPLAY TYPE: 4.3", TFT-LCD, 65K/262K/16.7M COLORS
2. DISPLAY MODE: T/N NORMALLY WHITE
3. VIEWING DIRECTION: 12:00
4. DRIVER IC: OTM5180A (COG)
5. INTERFACE: 24BIT-RGB
6. VDD: 3.3V(TYP)
7. OPERATING TEMP: -20°C TO 70°C
   STORAGE TEMP: -30°C TO 80°C
8. BACK LIGHT: LED WHITE, 7 LED, 20mA, 22.4±0.3V
9. RoHS COMPLIANT.

Model Name: E43RG63248LW2M220-N

GENERAL TOL: ±0.2

APPROVALS	DATE
DWN:	
CHK:	
APP:	

DRAWING NO.:

FOCUS LCDs
LCDs MADE SIMPLE®

SIZE:

Scale:

Unit: **mm**

Page: 1/1

3. Input Terminal Pin Assignment

NO.	Symbol	Description	I/O
1	LEDK	Cathode pin of backlight	P
2	LEDA	Anode pin of backlight	P
3	GND	Ground	P
4	VDD	Supply voltage (3.3V)	P
5	R0	Red data input	I
6	R1	Red data input	I
7	R2	Red data input	I
8	R3	Red data input	I
9	R4	Red data input	I
10	R5	Red data input	I
11	R6	Red data input	I
12	R7	Red data input	I
13	G0	Green data input	I
14	G1	Green data input	I
15	G2	Green data input	I
16	G3	Green data input	I
17	G4	Green data input	I
18	G5	Green data input	I
19	G6	Green data input	I
20	G7	Green data input	I
21	B0	Blue data input	I
22	B1	Blue data input	I
23	B2	Blue data input	I
24	B3	Blue data input	I
25	B4	Blue data input	I
26	B5	Blue data input	I
27	B6	Blue data input	I
28	B7	Blue data input	I
29	GND	Ground	P
30	PCLK	Clock signal. Latching data at falling edge.	I
31	DISP	Standby setting for testing. Connect to VDDIO in normal operation mode. If connected to GND, the IC is in standby mode.	I
32	HYSYNC	Horizontal sync input. Negative polarity.	I
33	VSYNC	Vertical sync input. Negative polarity.	I
34	DE	Data input enable. Active high to enable the data input. Active high to enable the data input bus under "DE mode"	I
35	NC		
36	GND	Ground	P
37	XR(NC)	Touch panel right glass terminal	A/D
38	YD(NC)	Touch panel bottom film terminal	A/D
39	XL(NC)	Touch panel left glass terminal	A/D
40	YU(NC)	Touch panel top film terminal	A/D

4. LCD Optical Characteristics

4.1 Optical Specifications

Item		Symbol	Condition	Min	Typ.	Max	Unit	Note
Contrast Ratio		CR	$\Theta = \phi = 0$ Normal viewing angle		250	--		(2)
Response time	Rising	TR+TF		--	30	45	msec	(4)
	Falling			--				
Color gamut		S(%)		--	40	--	%	(5)
Color Filter Chromaticity	White	W_X		0.230	0.270	0.310		(5)(6)
		W_Y		0.232	0.272	0.312		
	Red	R_X		0.453	0.493	0.533		
		R_Y		0.258	0.298	0.338		
	Green	G_X		0.287	0.327	0.367		
		G_Y		0.506	0.546	0.586		
	Blue	B_X		0.118	0.158	0.198		
		B_Y		0.043	0.083	0.123		
Viewing angle	Hor.	ΘL		--	40	--		(1)(6)
		ΘR		--	40	--		
	Ver.	ΘU		--	30	--		
		ΘD		--	40	--		
Option View Direction		12:00 o'clock						(1)

4.2 Measuring Condition

VDD = 3.3V, IL = 20mA (Backlight current)

Ambient temperature: 25 ± 2℃

15min. warm-up time

Optical Specification Reference Notes:

(1) Definition of Viewing Angle: The viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3,9 o'clock direction and the vertical or 6,12 o'clock direction with respect to the optical axis which is normal to the LCD surface.
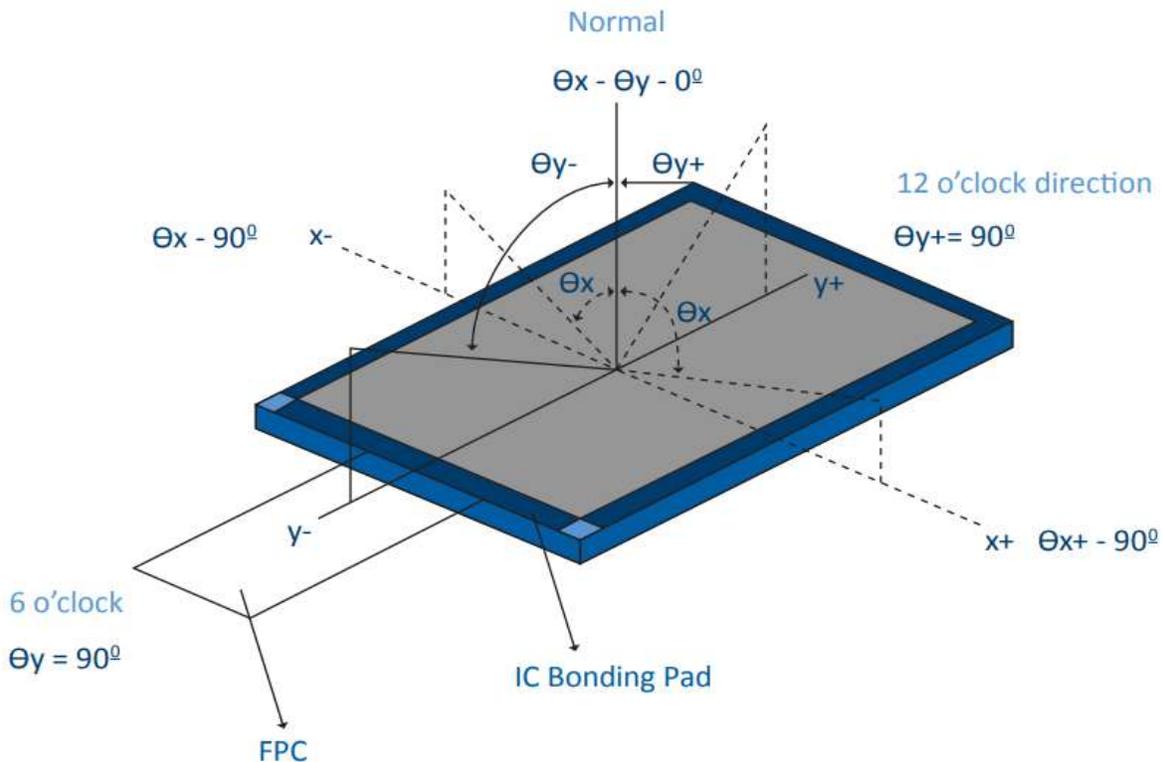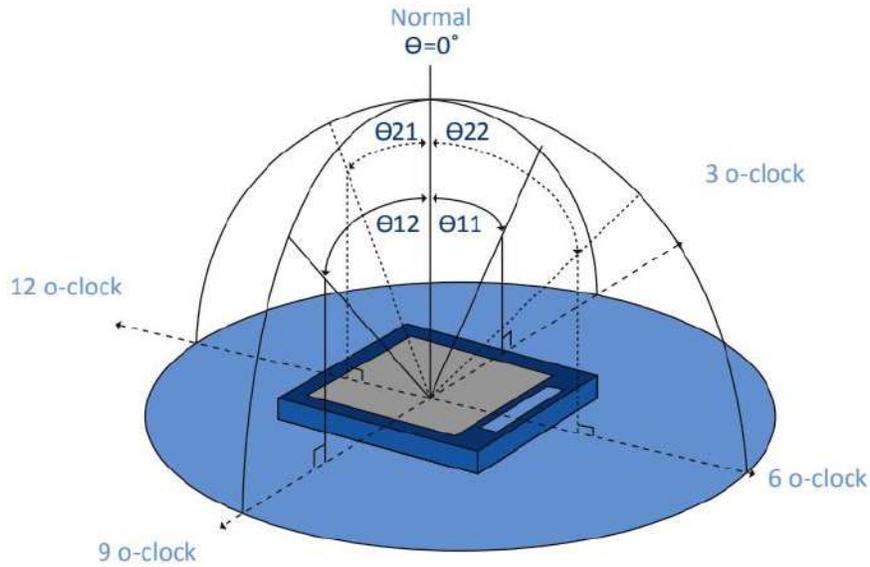
(2) Definition of Contrast Ratio (Cr): measured at the center point of panel. The contrast ratio (Cr) measured on a module, is the ratio between the luminance (Lw) in a full white area (R=G=B=1) and the luminance (Ld) in a dark area (R=G=B=0).

$$Cr = \frac{Lw}{Ld}$$

(3) Definition of transmittance (T%): The transmittance of the panel including the polarizers is measured with electrical driving.

I_o   I_t

light source   LCD panel
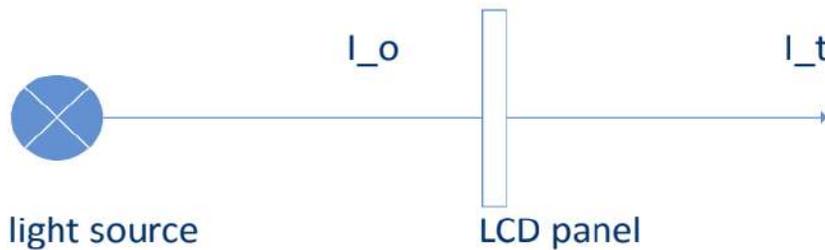
The transmittance is defined as:

$$Tr = \frac{It}{Io} \; x \; 100\%$$

Io = the brightness of the light source.
It = the brightness after panel transmission

(4) Definition of Response Time (Tr, Tf): The rise time 'Tr' is defined as the time for luminance to change from 90% to 10% as a result of a change of the electrical condition. The fall time 'Tf' is defined as the time for luminance to change from 10% to 90% as a result of a change of the electrical condition.
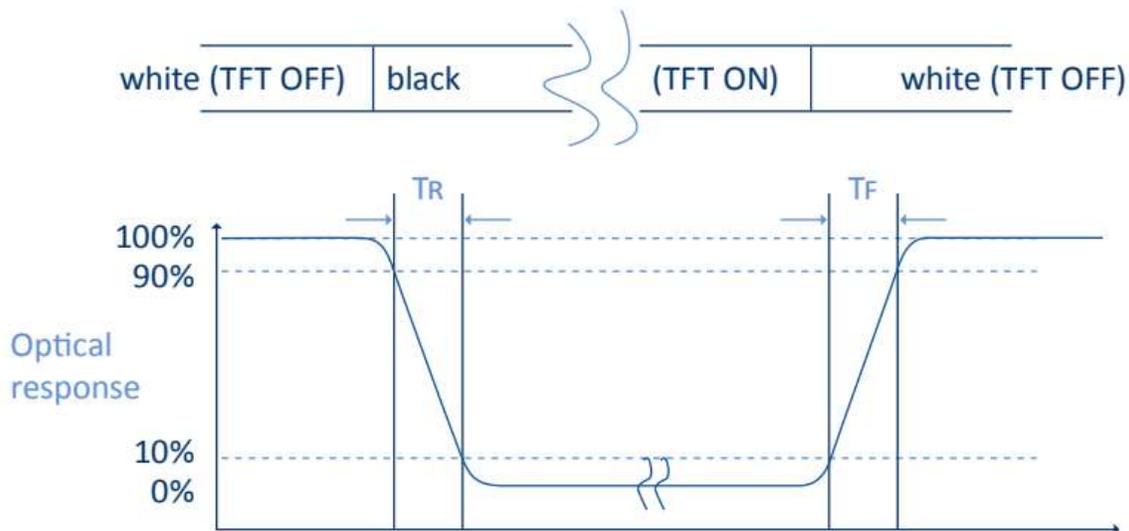
(5) Definition of Color Gamut: Measuring machine CFT-01. NTSC's Primaries: R(x,y,Y),G(x,y,Y), B(x,y,Y). FPM520 of Westar Display Technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.
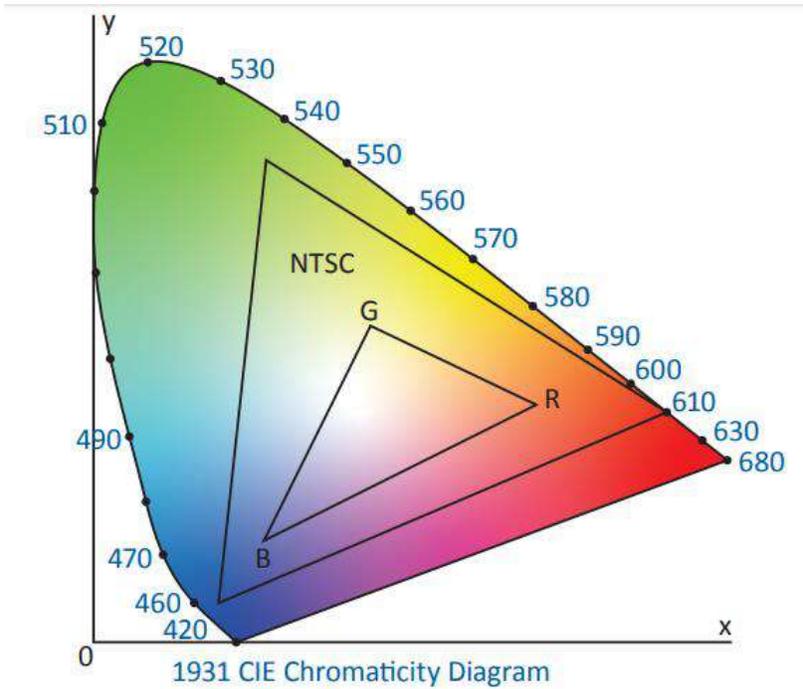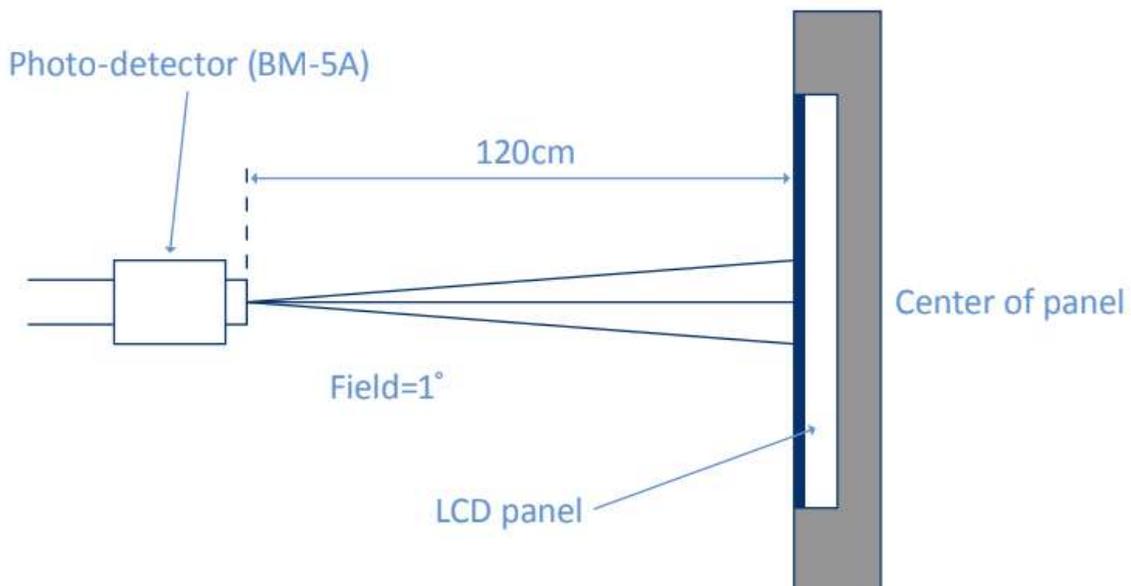
Fig. 1931 CIE chromacity diagram

Color gamut: $S = \dfrac{\text{Area of RGB triangle}}{\text{Area of NTSC triangle}} \times 100\%$

(6) Definition of Optical Measurement Setup:

(6) Optical Measurement Setup Continued:

The LCD module should be stabilized at a given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 20 minutes.

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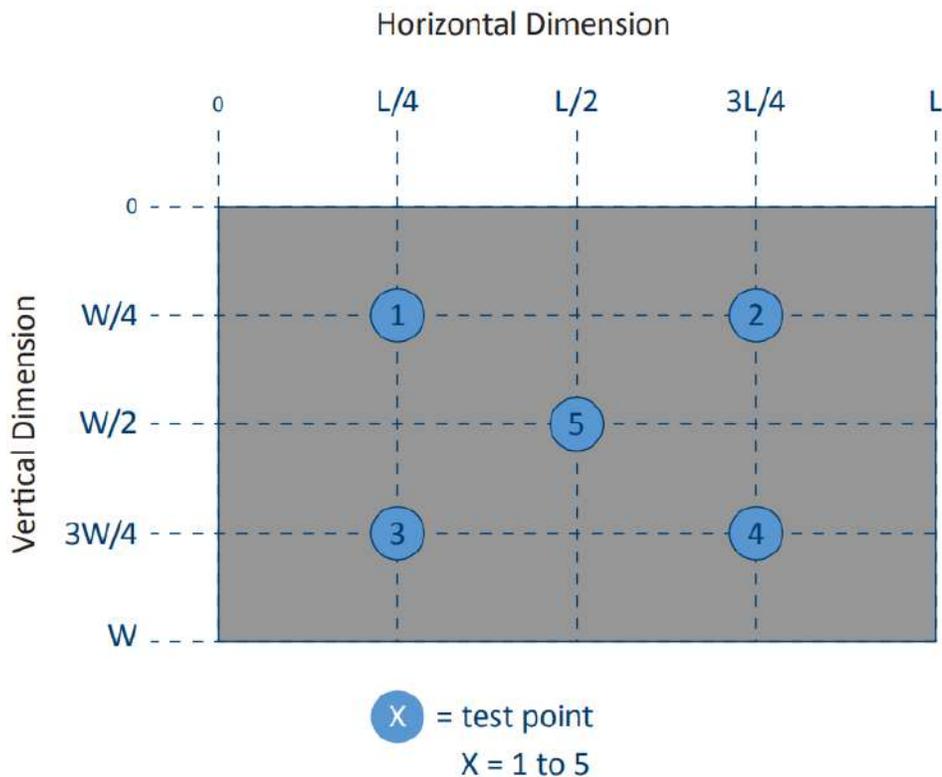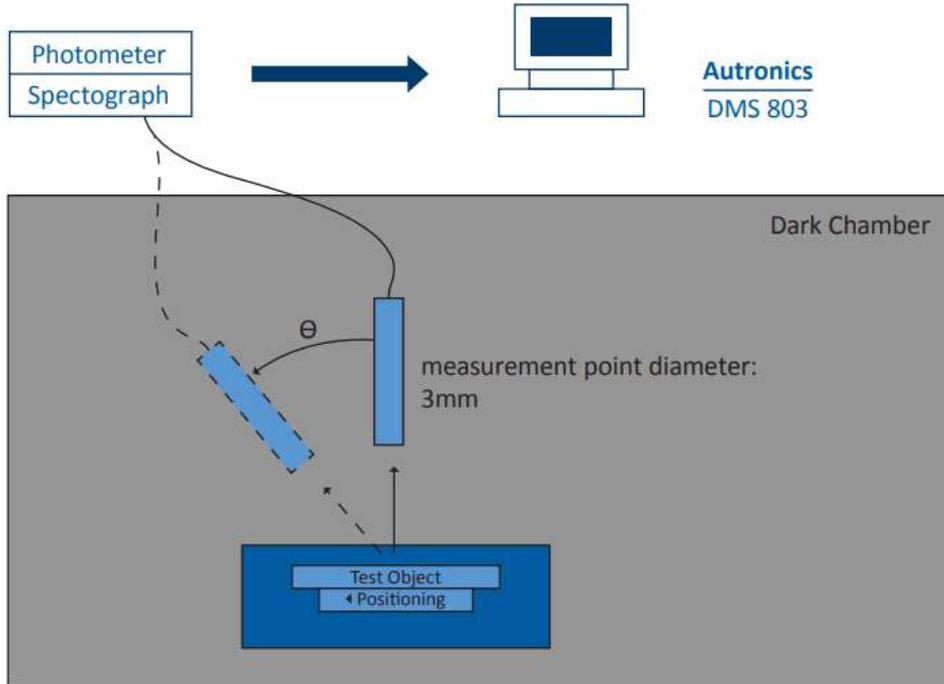
5. Electrical Characteristics

5.1   Absolute Maximum Rating (Ta=25 VSS=0V)

Characteristics	Symbol	Min	Max	Unit
Digital Supply Voltage	VDD	-0.3	7.0	V
Operating temperature	T_{OP}	-20	+70	℃
Storage temperature	T_{ST}	-30	+80	℃

NOTE: If the absolute maximum rating of even is one of the above parameters is exceeded even momentarily, the quality of the product may be degraded. Absolute maximum ratings, therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the range of the absolute maximum ratings.

5.2   DC Electrical Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Digital Supply Voltage	VDD	3.0	3.3	3.6	V	
Normal Mode Current Consumption	IDD	--	25	--	mA	
Level input voltage	VIH	0.7 VDDIO		VDD	V	
	VIL	GND		0.3 VDD	V	
Level output voltage	VOH	0.8 VDDIO		VDD	V	
	VOL	GND		0.2 VDDIO	V	

5.3   LED Backlight Characteristics

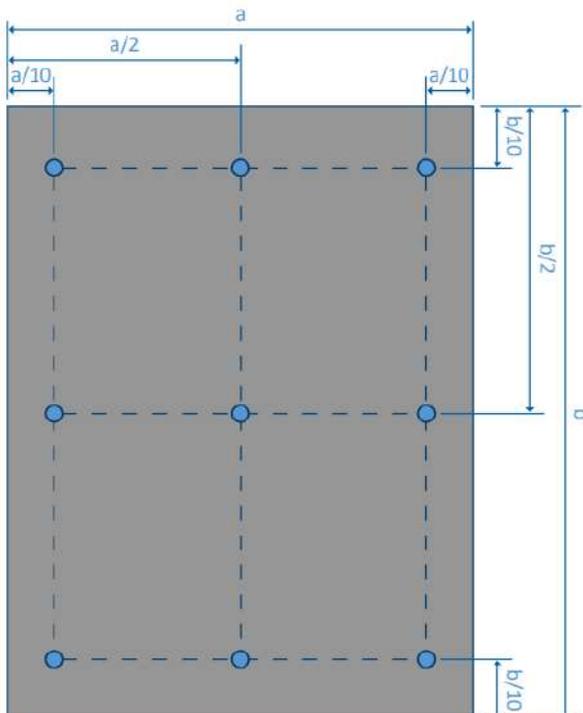| Item	Symbol	Min	Typ.	Max	Unit	Note
Forward Current	IF	15	20	--	mA	
Forward Voltage	VF	--	22.4	--	V	
LCM Luminance	LV	170	220	--	cd/m2	Note 3
LED lifetime	Hr	50000	--	--	hour	Note1 & 2
Uniformity	AVg	80	--	--	%	Note 3

The back-light system is edge-lighting type with 7 chips White LED

Note 1: LED lifetime (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3 ℃, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note 2: The "LED lifetime" is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and IL= 20mA. The LED lifetime could be decreased if operating IL is larger than 20mA. The constant current driving method is suggested.
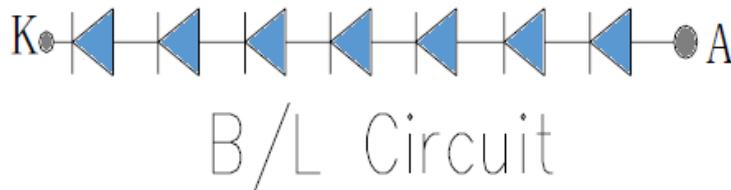
Note 3: Luminance Uniformity of these 9 points is defined as below:

$$\text{Luminance} = \frac{\text{(Total Luminance of 9 points)}}{9}$$

$$\text{Uniformity} = \frac{\text{minimum luminance in 9 points(1-9)}}{\text{maximum luminance in 9 points(1-9)}}$$

6. AC Characteristics

6.1 Input Signal Characteristics

Parameters	Symbol	Min	Typ.	Max	Unit	Condition
CLK pulse duty	Tcw	40	50	60	%	
Hsync width	Thw	1	--	--	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 setup time	Tdsu	12	--	--	ns	
Data hold time	Tdhd	12	--	--	ns	
SD output stable time	Tst	--	10	12	us	
GD output rise and fall time	Tgst	--	500	1000	us	
3-wire 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	

Table 7.1: AC Input Signal Timing Characteristics

6.2 RGB Interface Timing Characteristics
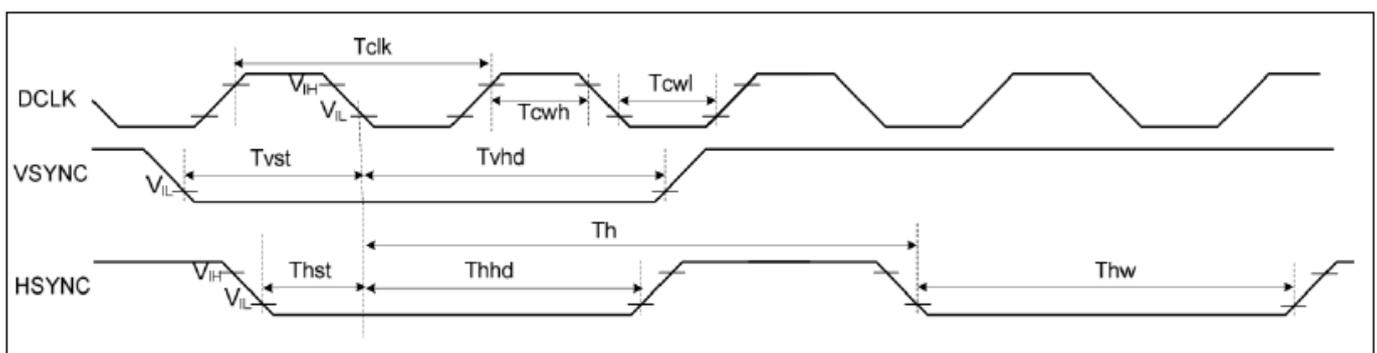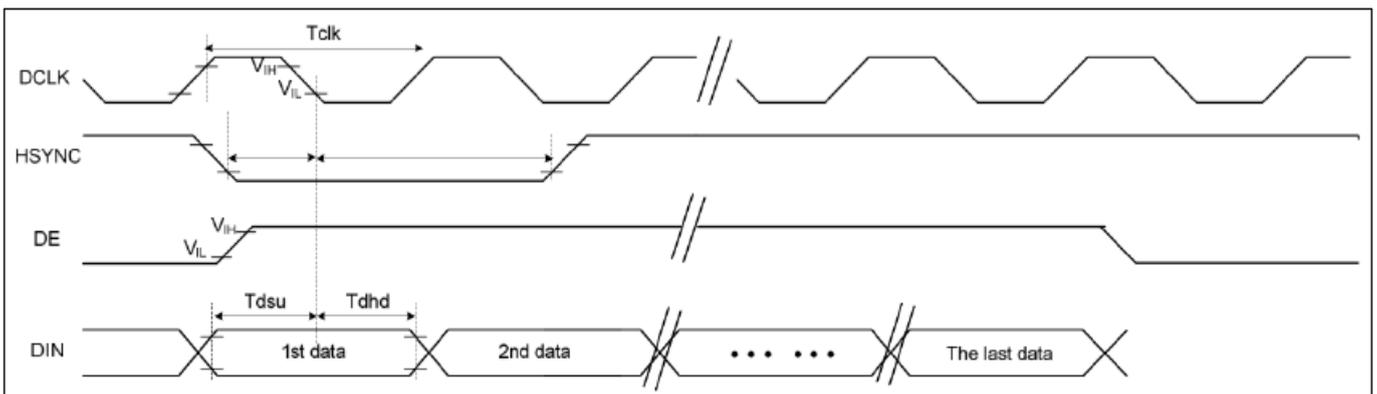
Figure 7.1: RGB Interface Timing Diagram

6.3   RGB Input Timing Tables

Parameters		Symbol	Min	Typ.	Max	Unit	Condition
DCLK frequency		Fclk	5	9	12	MHz	
DCLK cycle time		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	Tvlp	1	4		H	
	Pulse width	Tvw	1	10		H	

Table 7.2: Parallel 24-bit RGB Timing Characteristics

Parameters		Symbol	Min	Typ.	Max	Unit	Condition
DCLK frequency		Fclk	24	27	30	MHz	
DCLK cycle time		Tclk	42	37	33	ns	
Hsync	Period time	Th	1560	1716	1900	DCLK	
	Display period	Thdisp		1440		DCLK	
	Back porch	Thbp	108	129	255	DCLK	By H_blanking setting
	Front porch	Thfp	12	168	205	DCLK	
	Pulse width	Thw	1			DCLK	
Vsync	Period time	Tv	274	288	335	H	
	Display period	Tvdisp		272		H	
	Back porch	Tvbp		12		H	By V_blanking setting
	Front porch	Tvlp		3		H	
	Pulse width	Tvw	1	10		H	

Table 7.3: Series 8-bit RGB Timing Characteristics

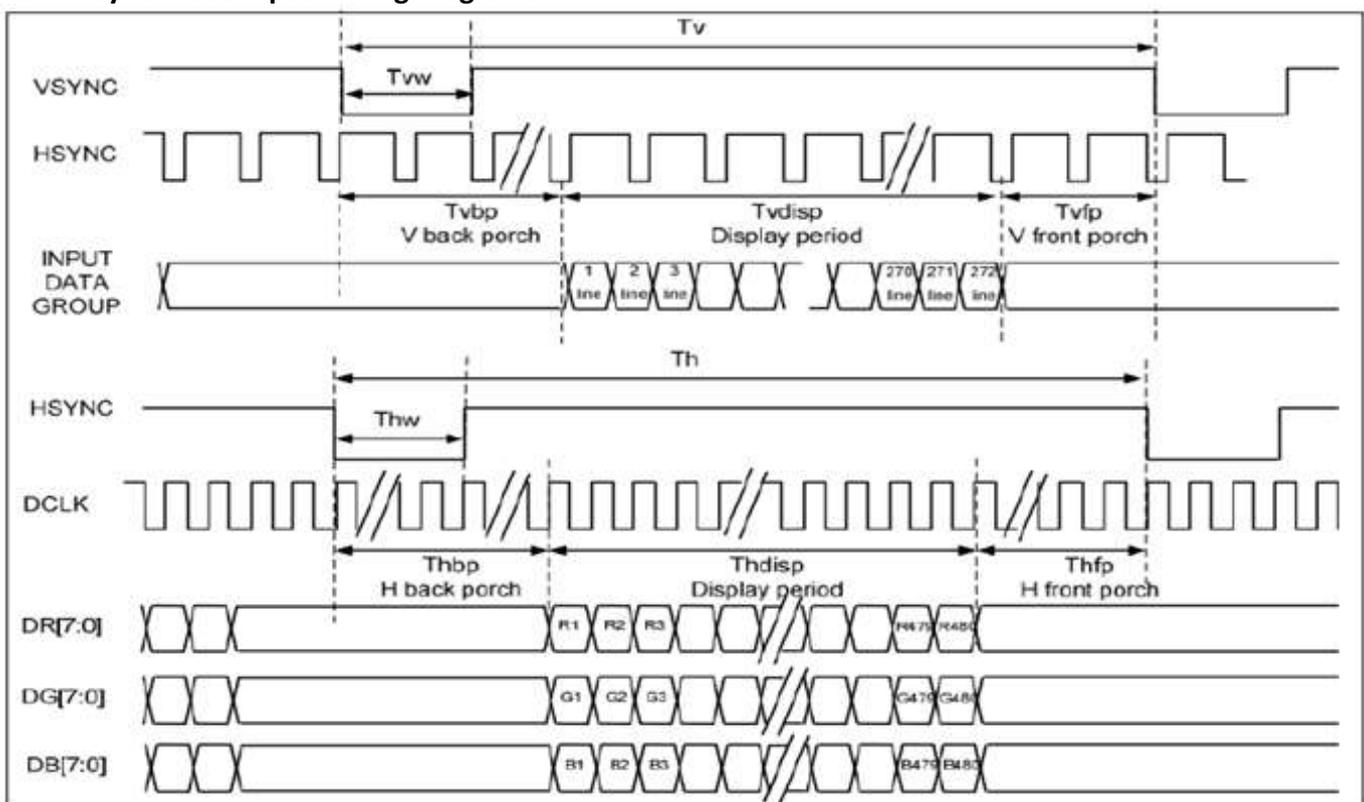## 6.4   Sync Mode Input Timing Diagrams

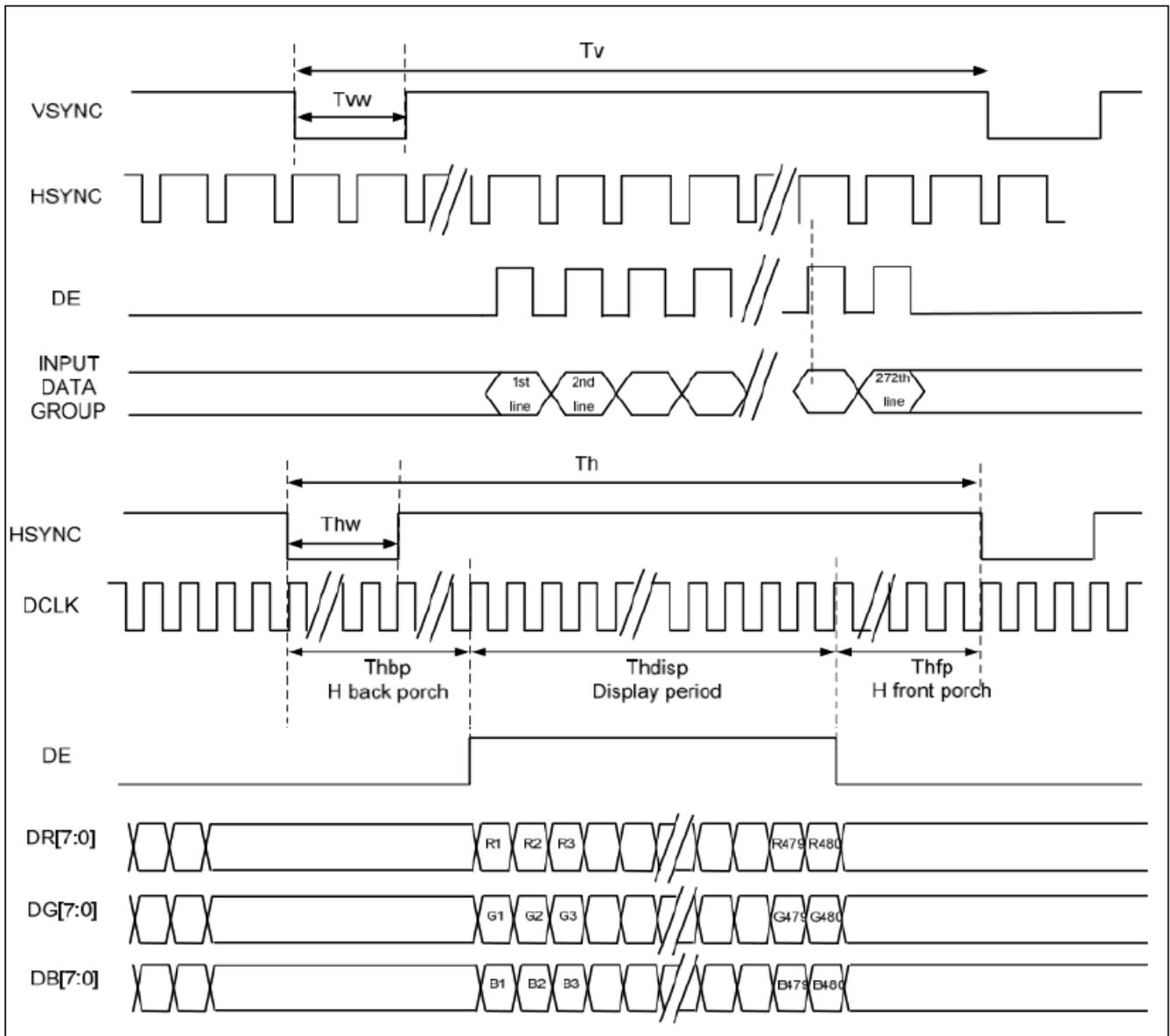*Figure 7.2: Sync Mode Timing Diagram*

Figure 7.3: Sync-DE Mode Timing Diagram

7. Cautions and Handling Precautions

7.1 Handling and Operating the Module

1. When the module is assembled, it should be attached to the system firmly. Do not warp or twist the module during assembly work.
2. Protect the module from physical shock or any force. In addition to damage, this may cause improper operation or damage to the module and back-light unit.
3. Note that polarizer is very fragile and could be easily damaged. Do not press or scratch the surface.
4. Do not allow drops of water or chemicals to remain on the display surface. If you have the droplets for a long time, staining and discoloration may occur.
5. If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.
6. The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane. Do not use ketene type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
7. If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs, or clothes, it must be washed away thoroughly with soap.
8. Protect the module from static; it may cause damage to the CMOS ICs.
9. Use fingerstalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
10. Do not disassemble the module.
11. Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.
12. Pins of I/F connector shall not be touched directly with bare hands.
13. Do not connect, disconnect the module in the "Power ON" condition.
14. Power supply should always be turned on/off by the item Power On Sequence & Power Off Sequence

7.2 Storage and Transportation

1. Do not leave the panel in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35 ℃ and relative humidity of less than 70%
2. Do not store the TFT-LCD module in direct sunlight.
3. The module shall be stored in a dark place. When storing the modules for a long time, be sure to adopt effective measures for protecting the modules from strong ultraviolet radiation, sunlight, or fluorescent light.
4. It is recommended that the modules should be stored under a condition where no condensation is allowed. Formation of dewdrops may cause an abnormal operation or a failure of the module. In particular, the greatest possible care should be taken to prevent any module from being operated where condensation has occurred inside.
5. This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.