TFT Display Module

Part Number

E70RG68048LWAM400-N

Overview:

- 7.0-inch TFT: (165.4x104.59mm)
- 800(RGB)x480 pixels
- 16/18/24-bit RGB Interface
- Super Wide Temp
- White LED back-light

- Transmissive/ Normally Black
- No Touch Panel
- 400 NITS
- Controller: SC5004/SC5005
- 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 a backlight unit. The resolution of the 7.0" TFT-LCD contains 800x480 pixels and can display up to 65K/262K/16.7M colors.

TFT Features

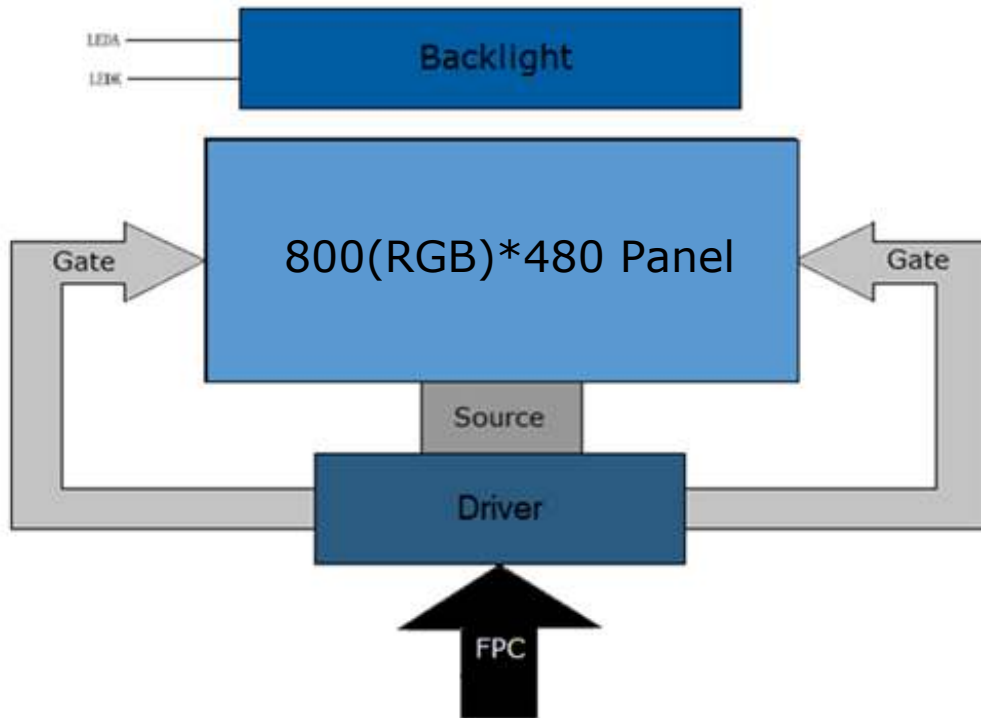Low Input Voltage: 3.3V (TYP)
Display Colors: 65K/262K/16.7M
TFT Interfaces: 16/18/24-bit RGB

General Information Items	Specification	Unit	Note
	Main Panel		
TFT Display area (AA)	152.40 (H) x 91.44 (V) (7.0 inch)	mm	-
Driver element	TFT active matrix	-	-
Display colors	65K/262K/16.7M	colors	-
Number of pixels	800(RGB)x480	dots	-
TFT Pixel arrangement	RGB vertical stripe	-	-
Pixel pitch	0.1905 (H) x 0.1905 (V)	mm	-
Viewing angle	ALL	o'clock	-
TFT Controller IC	SC5004/SC5005	-	-
Display mode	Transmissive/ Normally Black	-	-
Operating temperature	-30～+85	℃	-
Storage temperature	-40～+90	℃	-

Mechanical Information

Item		Min	Typ.	Max	Unit	Note
Module size	Height (H)		165.40		mm	-
	Vertical (V)		104.59		mm	-
	Depth (D)		5.8		mm	-
Weight			TBD		g	-

1. Block Diagram

2. Outline Dimensions

FRONT SIDE BACK

7.0"TFT
800(RGB)*480

165.40 BL OD
156.80 UP BEZEL
156.20 UP POL
152.40 LCD AA

6.00
6.30
8.80

5.80±0.2 LCM

1.50MAX

Conduct + Stiffener
0.30±0.03(Conduct+Stiffener)

Sheet Steel
Connected to GND

104.59 BL OD
96.24 UP BEZEL
94.64 UP POL
91.44 LCD AA

64.00±0.5
32.60±0.5
27.00
18.86

Component Area

93.50

R0.30
W=0.30
P0.5*39=19.50±0.05
74.13±0.3
20.50±0.1
109.63±0.5
3.50

27LED

Pin	Name
1	VIED-
2	VLED+
3	GND
4	VDD
5	RO
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)

Display type:TFT
Display Mode:Transmissive/Negative
Interface Type: 24 BIT R.G.B
Wide viewing: ALL SIDES
Driver IC:SC5004(Source),SC5005(Gate)
VDD:3.3V
Backlight: White Backlight 27 LED
TYP: Vf=9.9V If=180mA
Operating temprature: -30°C ~ +85°C
Storage temprature: -40°C ~ +90°C
ROHS COMPLIANT PRODUCT

ReV.	Revision content description	Date
A	FIRST	2018.05.10
A01	Change the window size of the upper iron frame.	20108.05.10

FocusLCDs.com LCDs MADE SIMPLE

PARTS NO.	E70RG68048LWAM400	
TOLERANCE UNLESS X.X±0.3	Drawn	Unit
OTHERWISE SPECIFIED X.XX±0.2	Checked	mm
Scale 1:1	Approve	Page 1/1

3. Input Terminal Pin Assignment

Recommended Connector: FH12S-40S-0.5SH(55)

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 the rising edge	I
31	DISP	Standby setting for testing, should be connected to VDDIO in normal operation mode. If connected to GND, the IC is in standby mode.	I
32	HSYNC	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 bus under DE mode.	I
35	NC	Open	
36	GND	Ground	P
37	XR(NC)	Touch panel right glass terminal	
38	YD(NC)	Touch panel bottom film terminal	
39	XL(NC)	Touch panel left glass terminal	
40	YU(NC)	Touch panel top film terminal	

I: Input, O: Output, P: Power

4. LCD Optical Characteristics

4.1 Optical Specifications

Item		Symbol	Condition	Min	Typ.	Max	Unit	Note
Contrast Ratio		CR		--	1000	--	%	(2)
Response Time	Rising	TR+TF		--	35	40	ms	(4)
	Falling							
Color Gamut		S		--	70	--	%	(5)
Color Filter Chromaticity	White	W_X	θ=0 Normal viewing angle	0.267	0.307	0.347		(5)(6)
		W_Y		0.306	0.346	0.386		
	Red	R_X		0.599	0.639	0.679		
		R_Y		0.298	0.338	0.378		
	Green	G_X		0.287	0.327	0.367		
		G_Y		0.548	0.578	0.618		
	Blue	B_X		0.103	0.143	0.183		
		B_Y		0.027	0.067	0.107		
Viewing Angle	Hor.	ΘL	CR≥10	--	85	--	degree	(1)(6)
		ΘR		--	85	--		
	Ver.	ΘT		--	85	--		
		ΘB		--	85	--		
Option View Direction			FREE					(1)

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.
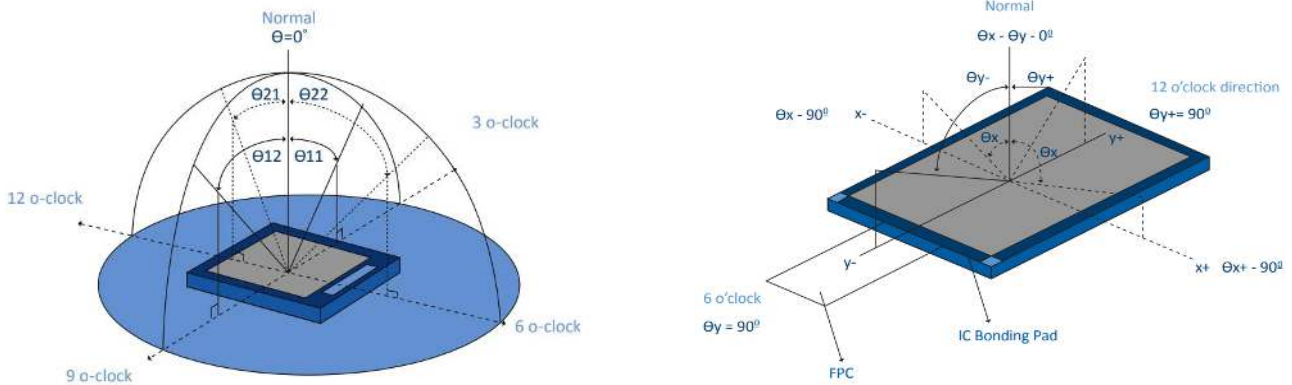

(2) Definition of Contrast Ratio (Cr): measured at the center point of panel. The contrast ratio (Cr) measured on a module, is the ratio between the luminance (Lw) in a full white area (R=G=B=1) and the luminance (Ld) in a dark area (R=G=B=0).

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

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

$$Tr = \frac{It}{Io} \; x \; 100\%$$
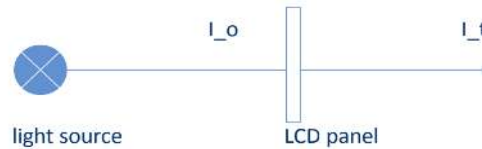
Io = the brightness of the light source.
It = the brightness after panel transmission

(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.

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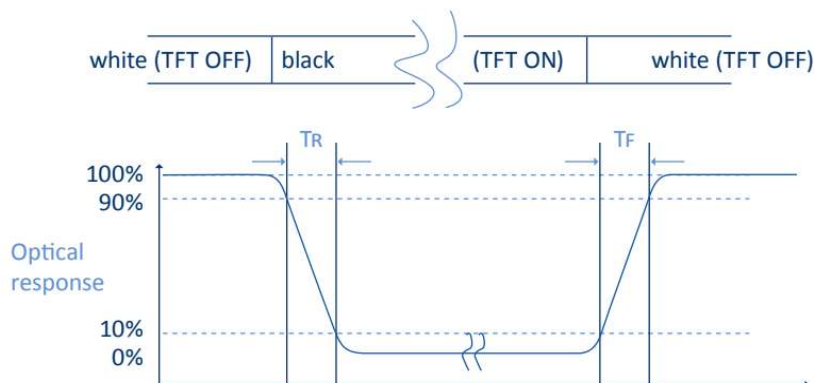
(5) Definition of Color Gamut:

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. The color chromaticity shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.
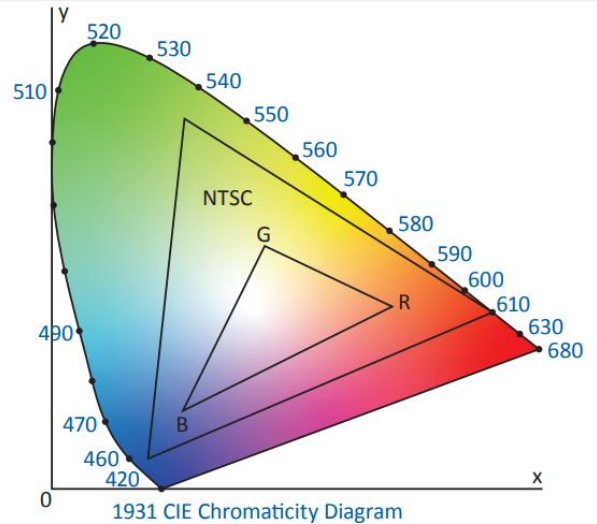

Fig. 1931 CIE chromacity diagram

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

(6) Definition of Optical Measurement Setup:

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.
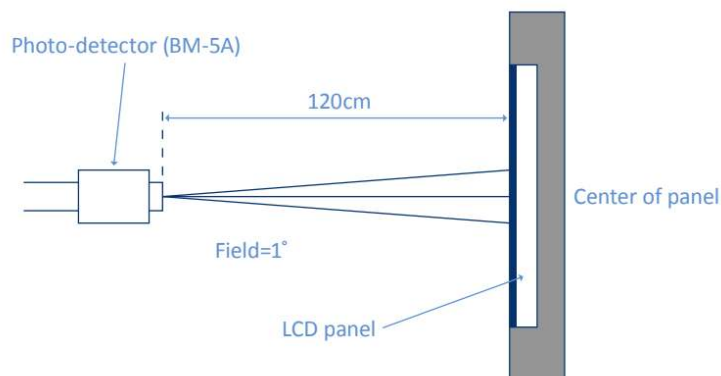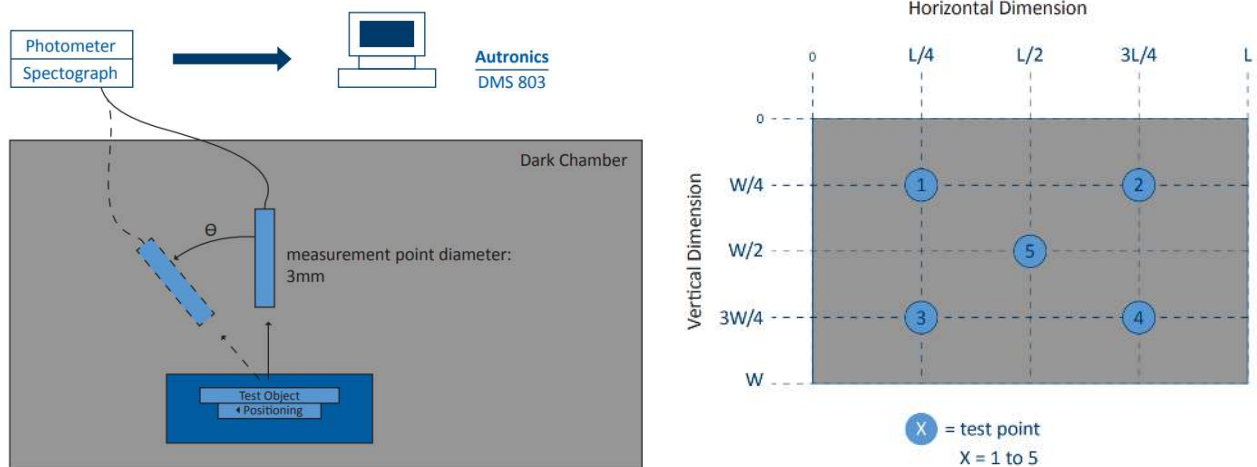
5. TFT Electrical Characteristics

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

Characteristics	Symbol	Min	Max	Unit
Digital Supply Voltage	VCI	-0.3	4.0	V
Operating Temperature	TOP	-10	+60	℃
Storage Temperature	TST	-30	+80	℃

NOTE: If the absolute maximum rating of the above parameters is exceeded, even momentarily, the quality of the product may be degraded. Absolute maximum ratings specify the values which the product may be physically damaged if exceeded. 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	
DC Booster Circuit Current	IDD	--	120	--	mA	
Level Input Voltage	VIH	0.7VDD	--	VDD	V	
	VIL	GND	--	0.3VDD	V	
Level Output Voltage	VOH	0.8VDD	--	VDD	V	
	VOL	GND	--	0.2VDD	V	

5.3   LED Backlight Characteristics

The backlight system is edge lighting type with 27 chips

| Item	Symbol	Min	Typ.	Max	Unit	Note
Forward Current	I_F	170	180	--	mA	
Forward Voltage	V_F	--	9.9	--	V	
LCM Luminance	LV	350	400	--	cd/m2	Note 3
LED lifetime	Hr	50000	--	--	hour	Note1 & 2
Uniformity	AVg	80	--	--	%	Note 3

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 = 180mA. The LED lifetime could be decreased if operating IL is larger than 180mA. The constant current driving method is suggested.
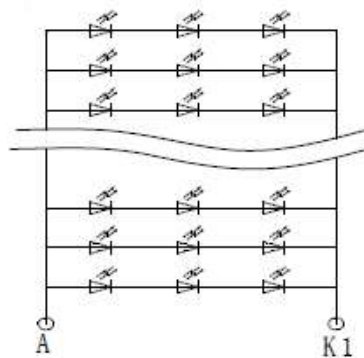
Backlight LED Circuit (27 LEDs)

Note 3: Luminance Uniformity of these 9 points is defined as below:
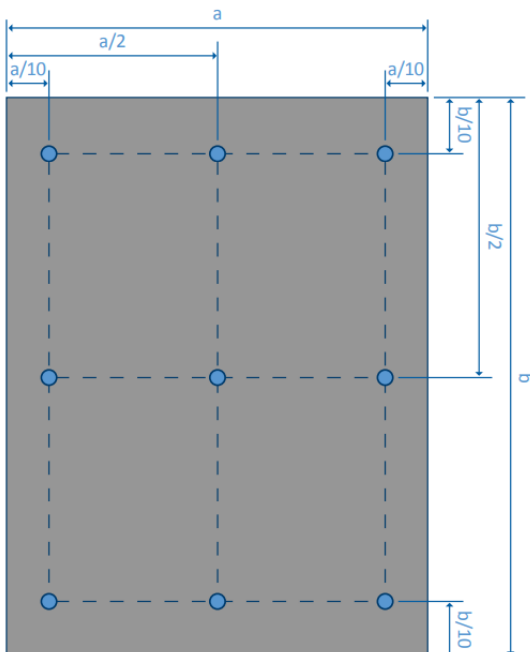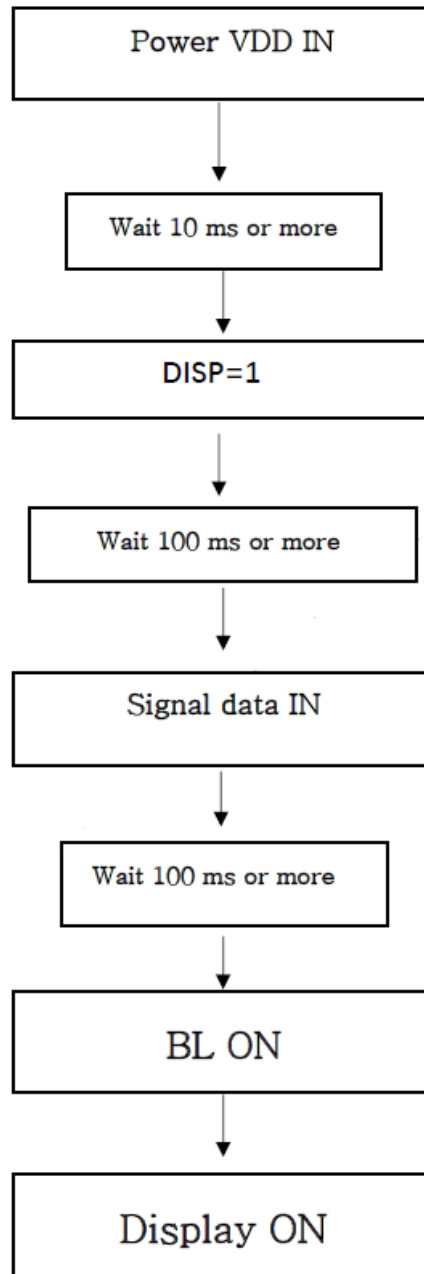

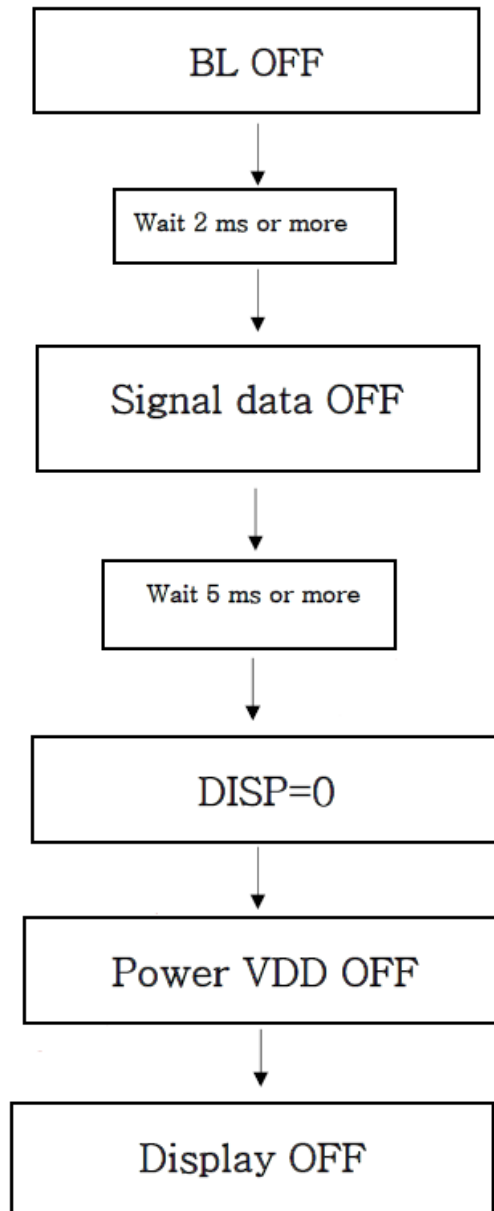$$\text{Luminance} = \frac{\text{(Total Luminance of 9 points)}}{9}$$

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

6. TFT AC Characteristics

6.1 Display ON Sequence

```
        ┌─────────────────────────┐
        │     Power VDD IN         │
        └─────────────────────────┘
                     │
                     ▼
        ┌─────────────────────────┐
        │   Wait 10 ms or more     │
        └─────────────────────────┘
                     │
                     ▼
        ┌─────────────────────────┐
        │         DISP=1           │
        └─────────────────────────┘
                     │
                     ▼
        ┌─────────────────────────┐
        │   Wait 100 ms or more    │
        └─────────────────────────┘
                     │
                     ▼
        ┌─────────────────────────┐
        │      Signal data IN      │
        └─────────────────────────┘
                     │
                     ▼
        ┌─────────────────────────┐
        │   Wait 100 ms or more    │
        └─────────────────────────┘
                     │
                     ▼
        ┌─────────────────────────┐
        │         BL ON            │
        └─────────────────────────┘
                     │
                     ▼
        ┌─────────────────────────┐
        │       Display ON         │
        └─────────────────────────┘
```

6.2   Display OFF Sequence

```
          ┌─────────────────────────┐
          │         BL OFF          │
          └─────────────────────────┘
                       │
                       ▼
             ┌───────────────────┐
             │  Wait 2 ms or more │
             └───────────────────┘
                       │
                       ▼
          ┌─────────────────────────┐
          │      Signal data OFF    │
          └─────────────────────────┘
                       │
                       ▼
             ┌───────────────────┐
             │  Wait 5 ms or more │
             └───────────────────┘
                       │
                       ▼
          ┌─────────────────────────┐
          │         DISP=0          │
          └─────────────────────────┘
                       │
                       ▼
          ┌─────────────────────────┐
          │      Power VDD OFF      │
          └─────────────────────────┘
                       │
                       ▼
          ┌─────────────────────────┐
          │       Display OFF       │
          └─────────────────────────┘
```
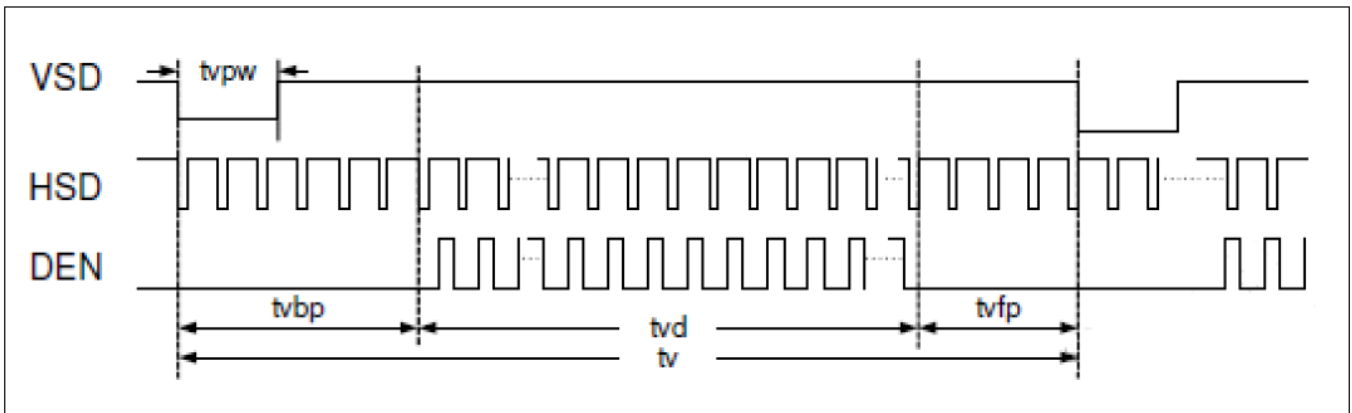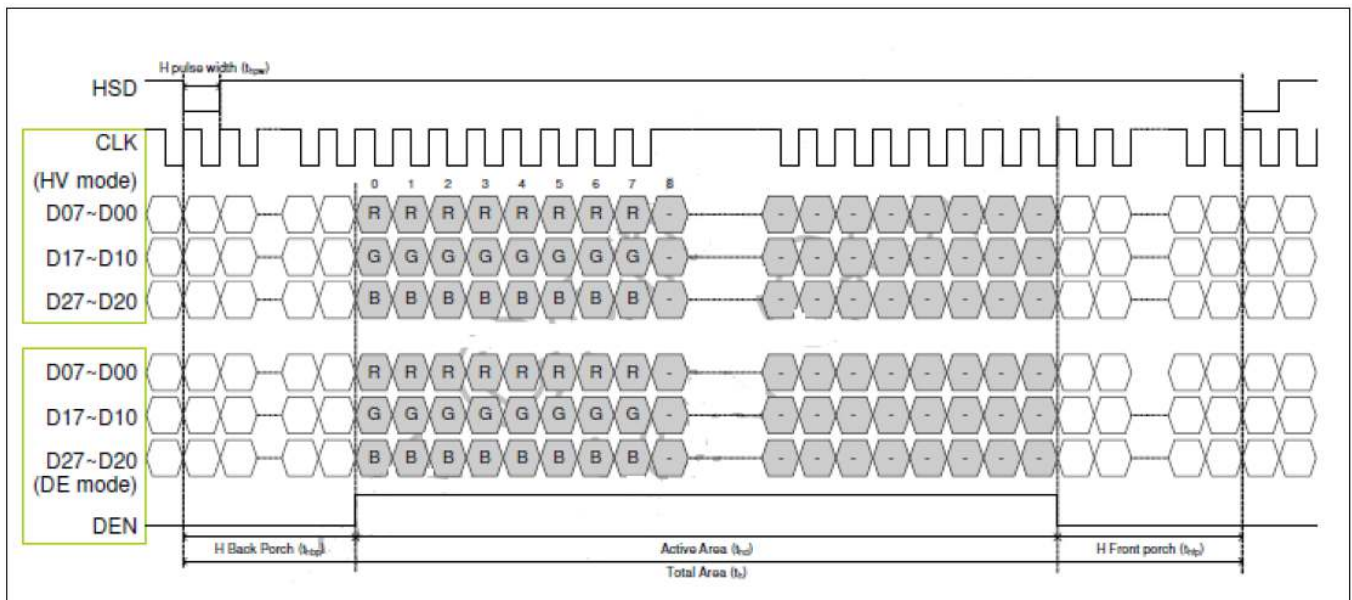
7.   AC Timing Characteristics

7.1   Input Signal Timing

Vertical Timing

**Horizontal Timing**

7.2 Parallel RGB Interface Timing Characteristics

(VDD=VDD_LVDS=3.0~3.6V, GND=GND_LVDS=0V, TA=-20-85°C)

Parameter	Symbols	Min	Typ.	Max	Units	Conditions
CLK cycle time	tCPH	16.7	-	-	ns	
CLK pulse high duty	tCWH	40	50	60	%	
CLK pulse low duty	tCWL	40	50	60	%	
VS setup time	tVST	4	-	-	ns	
VS hold time	tVHD	2	-	-	ns	
HS setup time	tHST	4	-	-	ns	
HS hold time	tHHD	2	-	-	ns	
Data setup time	tDSH	4	-	-	ns	D0[7:0], D1[7:0], D2[7:0] to CLK
Data hold time	tDHD	2	-	-	ns	D0[7:0], D1[7:0], D2[7:0] to CLK
DE setup time	tESU	4	-	-	ns	
DE hold time	tEHD	2	-	-	ns	
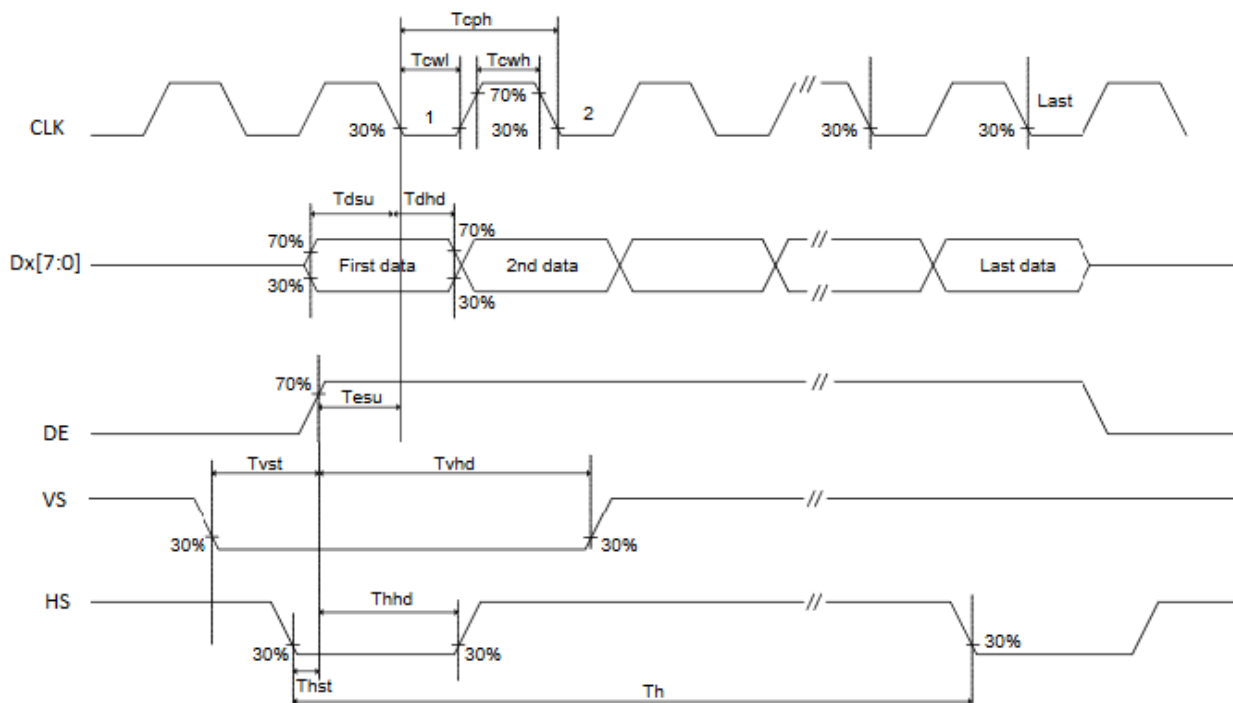
Parameter	Symbols	Min	Typ.	Max	Units	Notes
CLK frequency	tCLK	25.9	27.6	48.7	Mhz	
Horizontal blanking time	tHBT	90	110	304	tCLK	tHBP + tHFP
Horizontal back porch	tHBP	5	5	304- tHFP	tCLK	
Horizontal display area	tHD	800	800	800	tCLK	
Horizontal front porch	tHFP	85	105	299	tCLK	
Horizontal period	tH	890	910	1104	tCLK	
Horizontal pulse width	tHPW	1	1	256	tCLK	
Vertical blanking time	tVBT	5	26	255	tH	tVBP + tVFP
Vertical back porch	tVBP	2	2	255- tVFP	tH	
Vertical display area	tVD	480	480	480	tH	
Vertical front porch	tVFP	3	24	253	tH	
Vertical period	tV	485	506	735	tH	
Vertical pulse width	tVPW	1	1	128	tH	

8. Cautions and Handling Precautions

8.1 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

8.2 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.