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TFT | CHARACTER | UWVD | FSC | SEGMENT | CUSTOM | REPLACEMENT

TFT Display Module

Part Number

E50RG68048LWAM700-N

Overview:

- 5.0-inch TFT (124.9x78.1mm)
- 16/18/24-bit RGB Interface
- 800(RGB)x480 pixels
- 3.3V
- White LED back-light
- Transmissive/ Normally Black
- No Touch Panel
- 700 NITS
- Controller: HX8678C/HX8249A
- 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 5.0" TFT-LCD contains 800x480 pixels and can display up to 65K/262K/16.7M colors.

Features

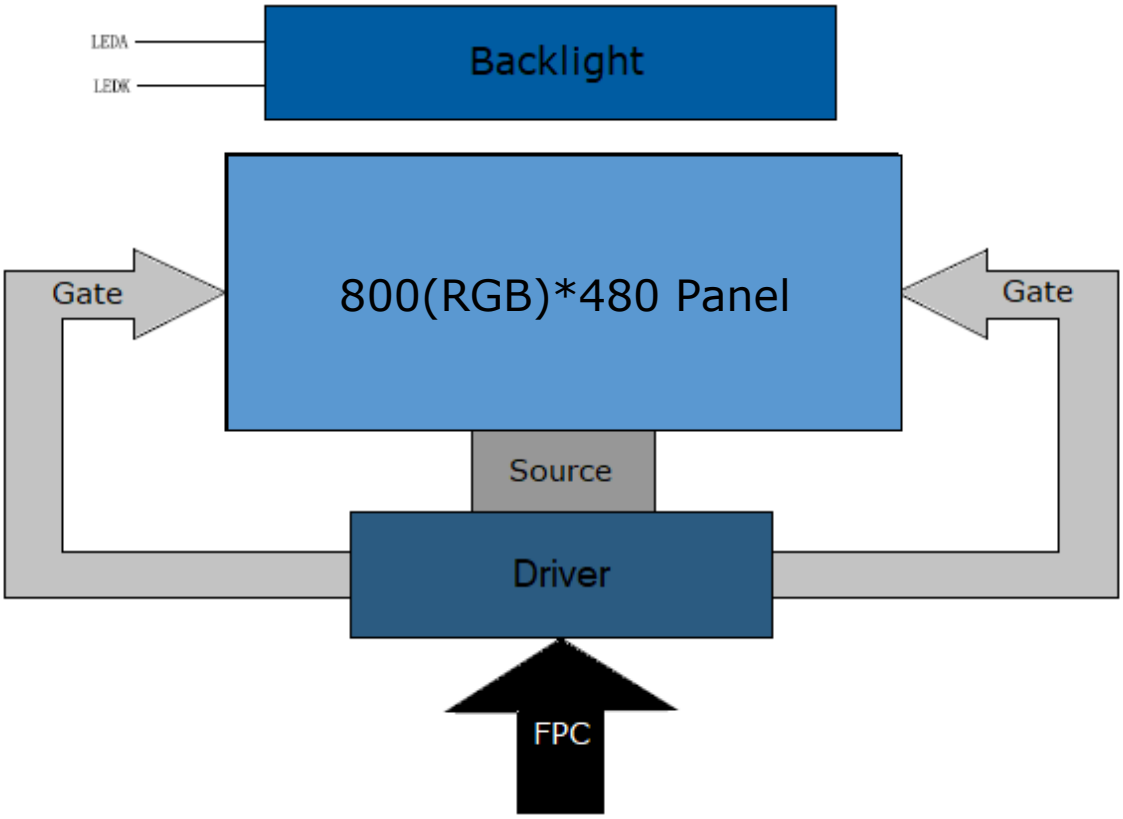
Low Input Voltage: 3.3V (TYP)
Display Colors of TFT LCD: 65K/262K/16.7M colors
TFT Interface: 16/18/24-bit RGB

General Information Items	Specification	Unit	Note
	Main Panel		
TFT Display area (AA)	108.00(H) * 64.80(V) (5.0 inch)	mm	-
Driver element	TFT active matrix	-	-
Display colors	65K/262K/16.7M	colors	-
Number of pixels	800(RGB)*480	dots	-
TFT Pixel arrangement	RGB vertical stripe	-	-
Pixel pitch	0.135 (H) x 0.135 (V)	mm	-
Viewing angle	ALL	o'clock	-
TFT Controller IC	HX8678C/HX8249A	-	-
Display mode	Transmissive/ Normally Black	-	-
Operating temperature	-30～+85	℃	-
Storage temperature	-40～+90	℃	-

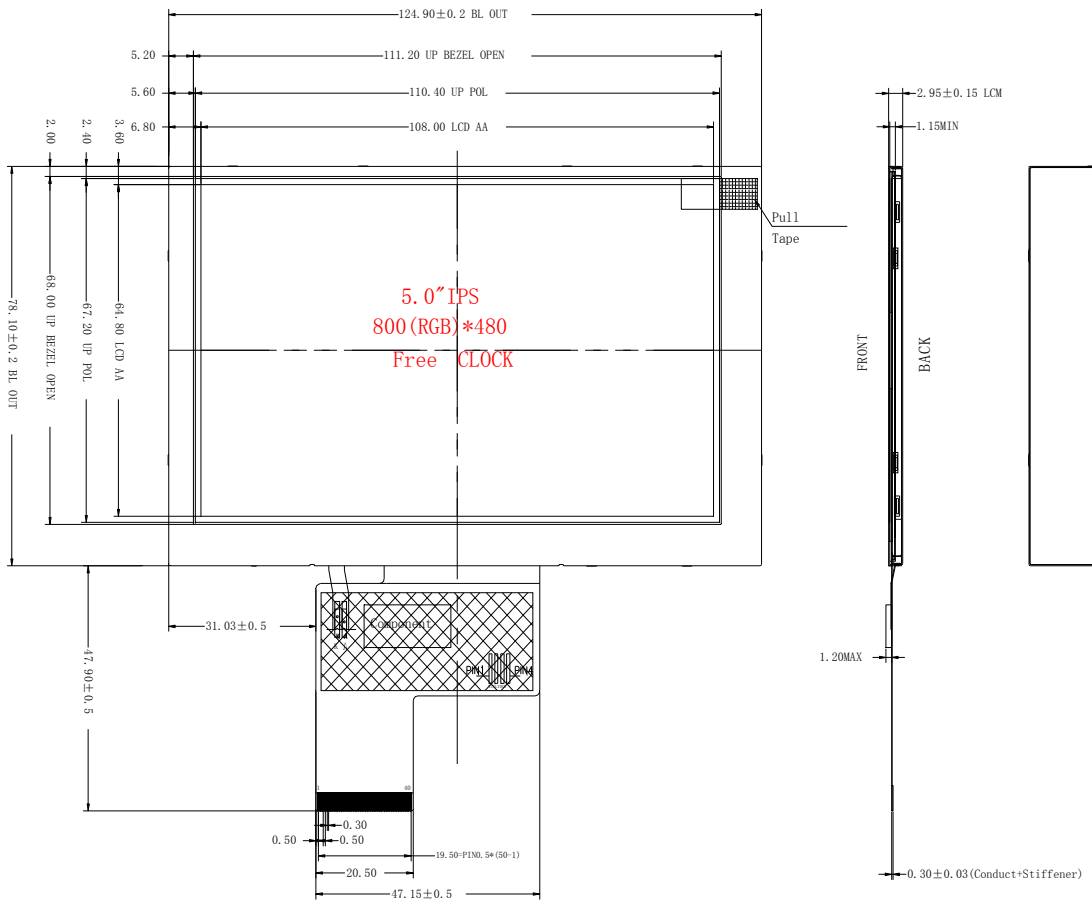
Mechanical Information

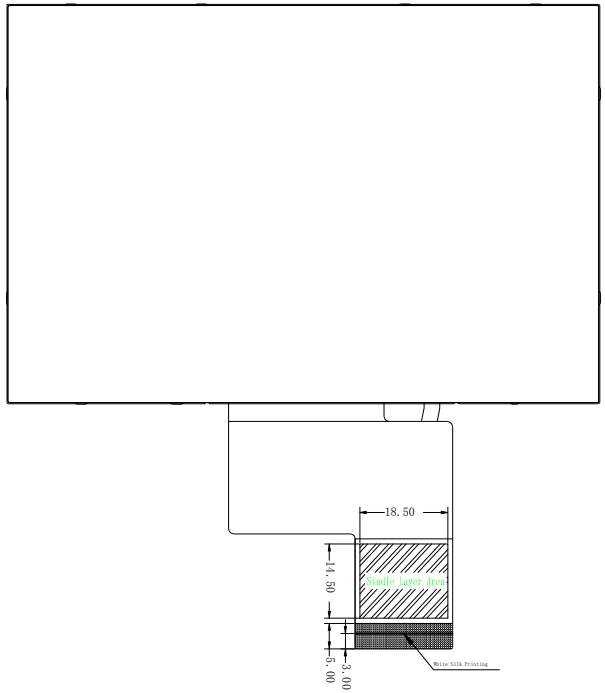
Item		Min	Typ.	Max	Unit	Note
Module size	Horizontal(H)		124.90		mm	-
	Vertical(V)		78.10		mm	-
	Depth(D)		2.95		mm	-
Weight			TBD		g	-

1. Block Diagram



2. Outline dimensions

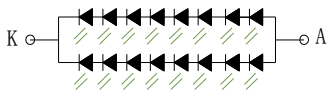




Pin	Name
1	VIED_K
2	VLED-A
3	GND
4	VDD
5	R0
6	R1
7	R2
8	R3
9	R4
10	R5
11	R6
12	R7
13	G0
14	G1
15	G2
16	G3
17	G4
18	G5
19	G6
20	G7
21	B0
22	B1
23	B2
24	B3
25	B4
26	B5
27	B6
28	B7
29	GND
30	PCLK
31	DISP
32	HSYNC
33	VSYNC
34	DE
35	NC
36	GND
37	XR(NC)
38	YD(NC)
39	XL(NC)
40	YU(NC)

NOTES:

1. DISPLAY TYPE: IPS GP5.0", 800W*RGB*480H
2. DISPLAY MODE: Normslly Black
3. VIEWING DIRECTION: ALL
4. TFT DRIVER IC: HX8678C-LT/HX8249A-LT (COG)
5. VDD: 3.3V
6. OPERATING TEMP: -30°C TO 85°C
   STORAGE TEMP: -40°C TO 90°C
7. BACK LIGHT: LED WHITE, 16 LED, 40mA, 25.6±0.3V
8. RoHS COMPLIANT.



Backlight LED Circuit

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 for RGB interface operation. 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	NC	
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	

4. LCD Optical Characteristics

4.1 Optical Specifications

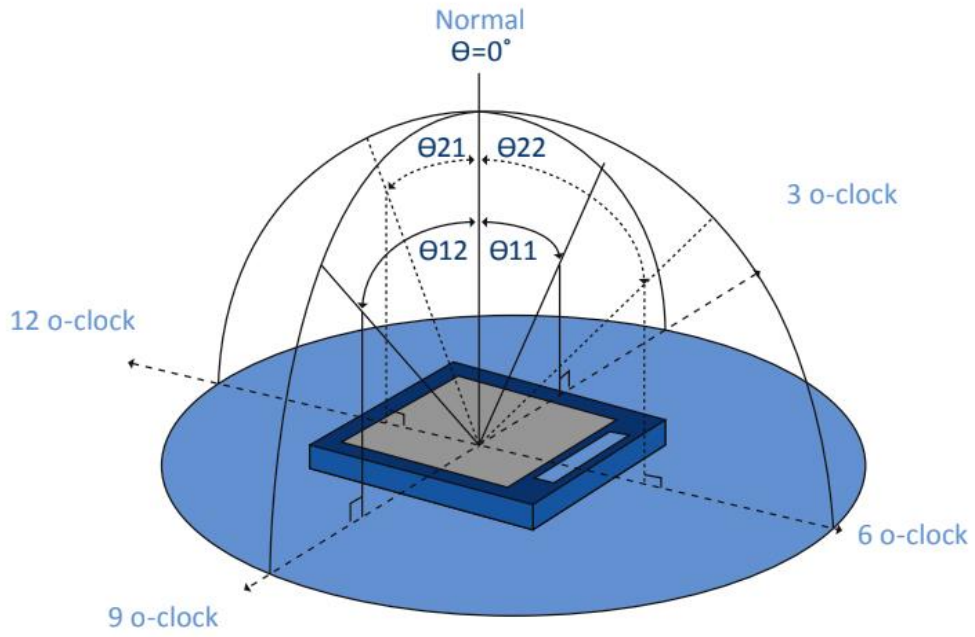
Item		Symbol	Condition	Min	Typ.	Max	Unit	Note
Contrast Ratio		CR	Θ = ϕ = 0 Normal viewing angle	--	1000	--		(2)
Response time	Rising	TR+TF		--	35	40	msec	(4)
	Falling			--				
Color Gamut		S(%)		--	65.84	--	%	(5)
Color Filter Chromaticity	White	W_X		0.275	0.325	0.365		(5)(6)
		W_Y		0.326	0.366	0.406		
	Red	R_X		0.579	0.619	0.659		
		R_Y		0.306	0.346	0.386		
	Green	G_X		0.286	0.326	0.366		
		G_Y		0.585	0.625	0.665		
	Blue	B_X		0.105	0.145	0.185		
		B_Y		0.045	0.085	0.125		
Viewing angle	Hor.	ΘL	CR>10	--	85	--		(1)(6)
		ΘR		--	85	--		
	Ver.	ΘU		--	85	--		
		ΘD		--	85	--		
Option View Direction		ALL						(1)

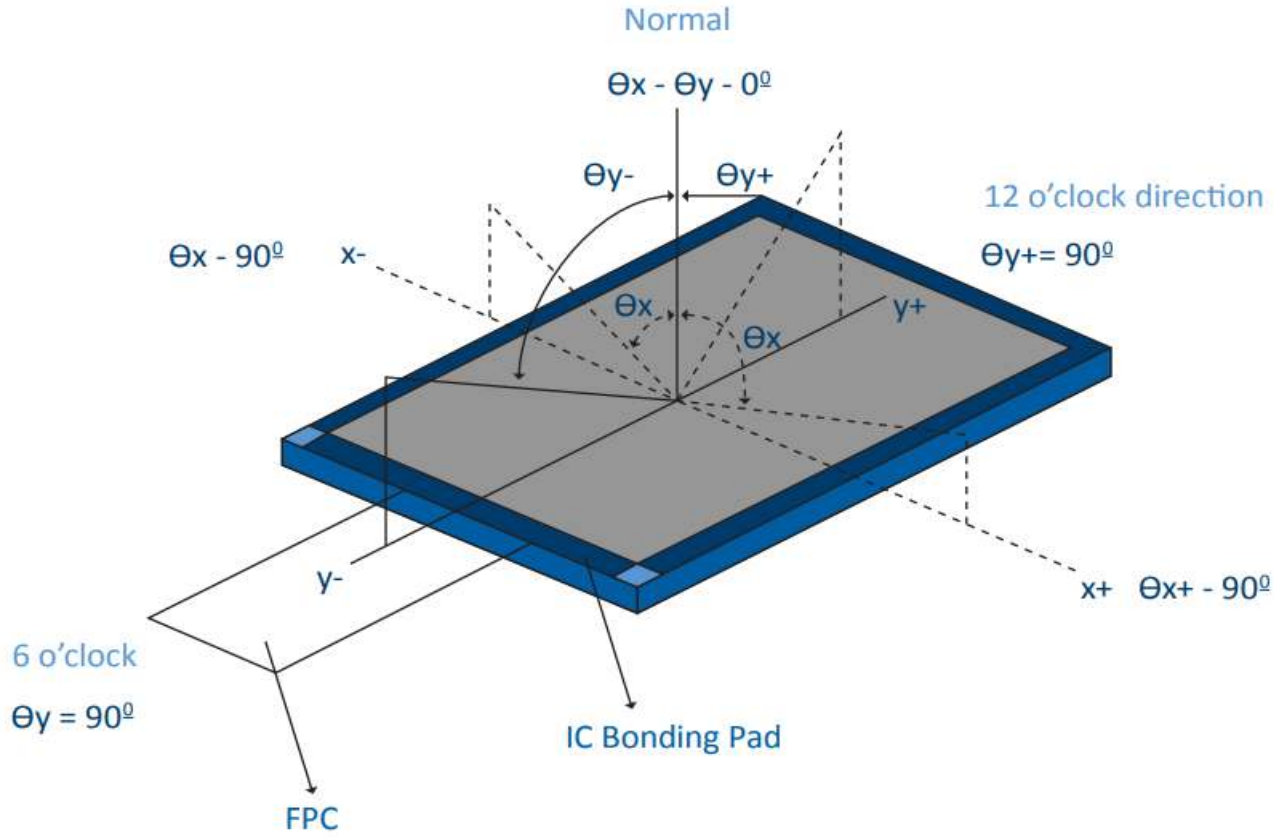
4.2 Measuring Condition

VDD = 3.3V, IL = 20mA (Backlight current)
Ambient temperature: 25 ± 2°C
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.

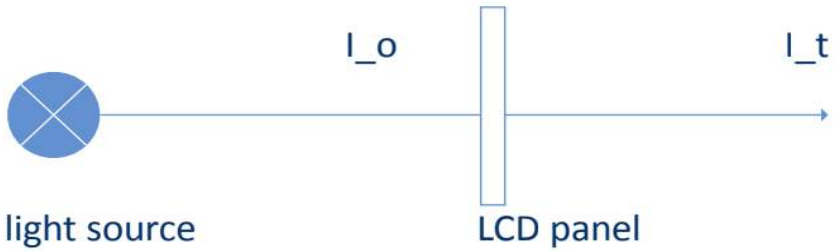




(2) Definition of Contrast Ratio (Cr): measured at the center point of panel. The contrast ratio (Cr) measured on a module, is the ratio between the luminance (Lw) in a full white area (R=G=B=1) and the luminance (Ld) in a dark area (R=G=B=0).

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

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

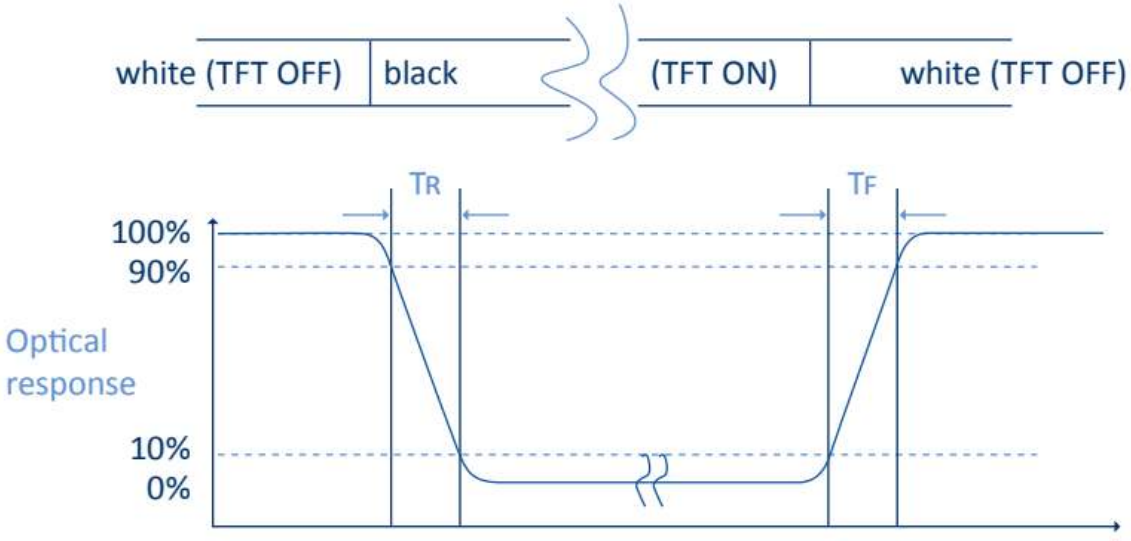


The transmittance is defined as:

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

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. 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.

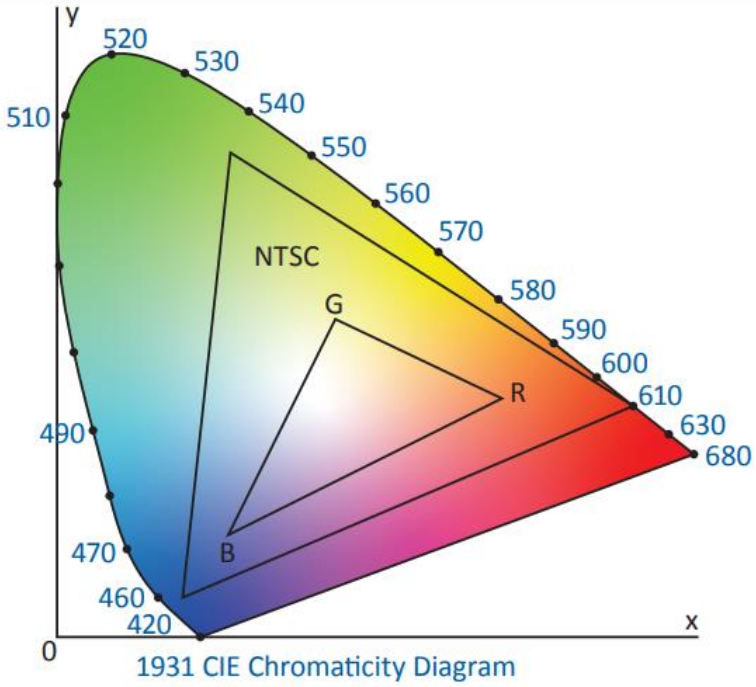
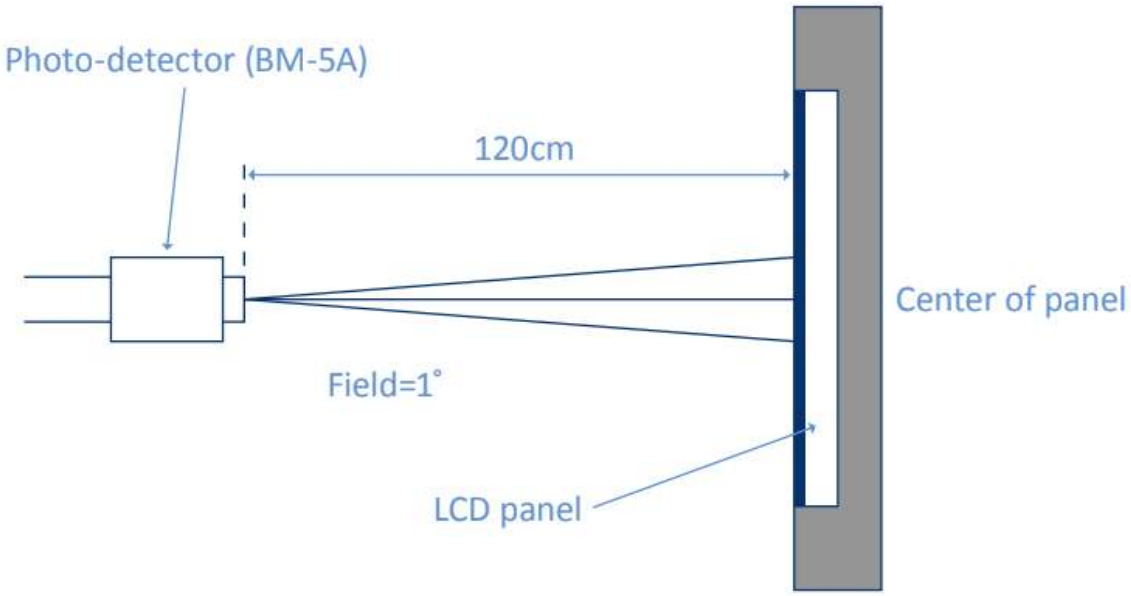


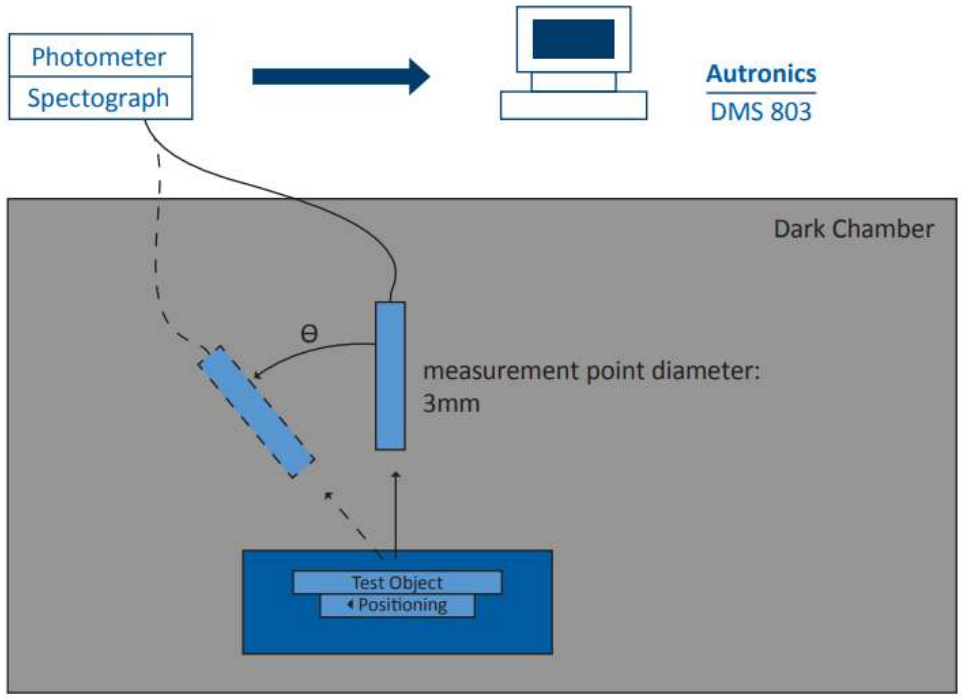
Fig. 1931 CIE chromacity diagram

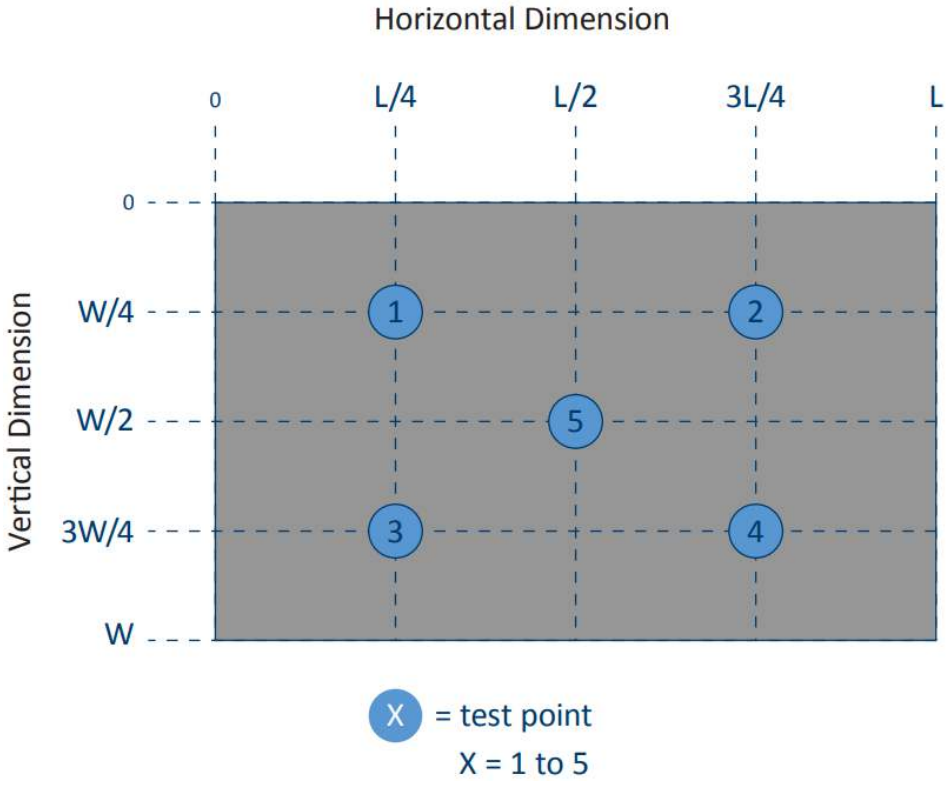
$$\text{Color gamut: } S = \frac{\text{Area of RGB triangle}}{\text{Area of NTSC triangle}} \times 100\%$$

(6) Definition of Optical Measurement Setup:



(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.





5. Electrical Characteristics

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

Characteristics	Symbol	Min	Max	Unit
Digital Supply Voltage	VDD	-0.3	4.0	V
Operating temperature	TOP	-30	+85	℃
Storage temperature	TST	-40	+90	℃

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	--	65	--	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	

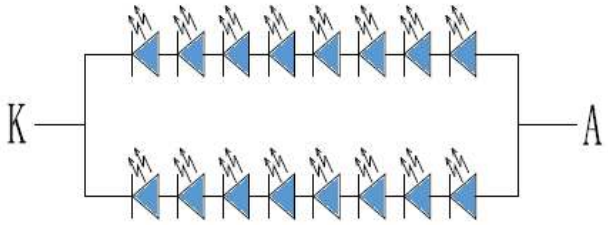
5.3 LED Backlight Characteristics

Item	Symbol	Min	Typ.	Max	Unit	Note
Forward Current	IF	30	40	--	mA	
Forward Voltage	VF	--	25.6	--	V	
LCM Luminance	LV	600	700	--	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 16 chips White LED

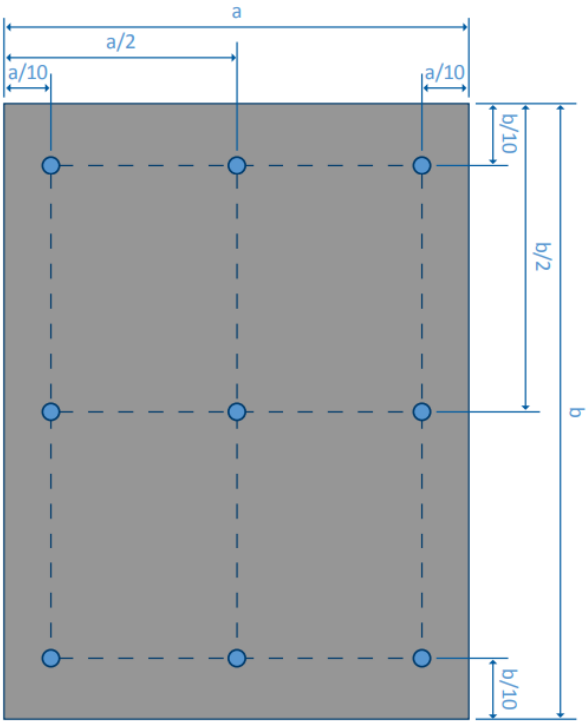
Note 1: LED lifetime (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3 ℃, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note 2: The "LED lifetime" is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and IL=40mA. The LED lifetime could be decreased if operating IL is larger than 40mA. The constant current driving method is suggested.



B/L Circuit

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 Timing Characteristics

Parameter	Symbol	Min	Typ.	Max	Unit	Conditions
DCLK period	t_{cph}	16.8	--	--	ns	
DCLK clock high width	t_{chw}	6	--	--	ns	
DCLK clock low width	t_{chw}	6	--	--	ns	
VS setup time	t_{ss}	5	--	--	ns	
VS hold time	t_{sh}	5	--	--	ns	
HS setup time	t_{ss}	5	--	--	ns	
HS hold time	t_{sh}	5	--	--	us	
DE setup time	t_{ss}	5	--	--	ns	
DE hold time	t_{sh}	5	--	--	ns	
Data setup time	t_{dsu}	5	--	--	ns	
Data hold time	t_{dhd}	5	--	--	ns	
Input signal rising time	t_r	--	--	10	ns	
Input signal falling time	t_f	--	--	10	ns	

Table 6.1: AC Timing Characteristics Table

6.2 RGB Interface Timing Characteristics

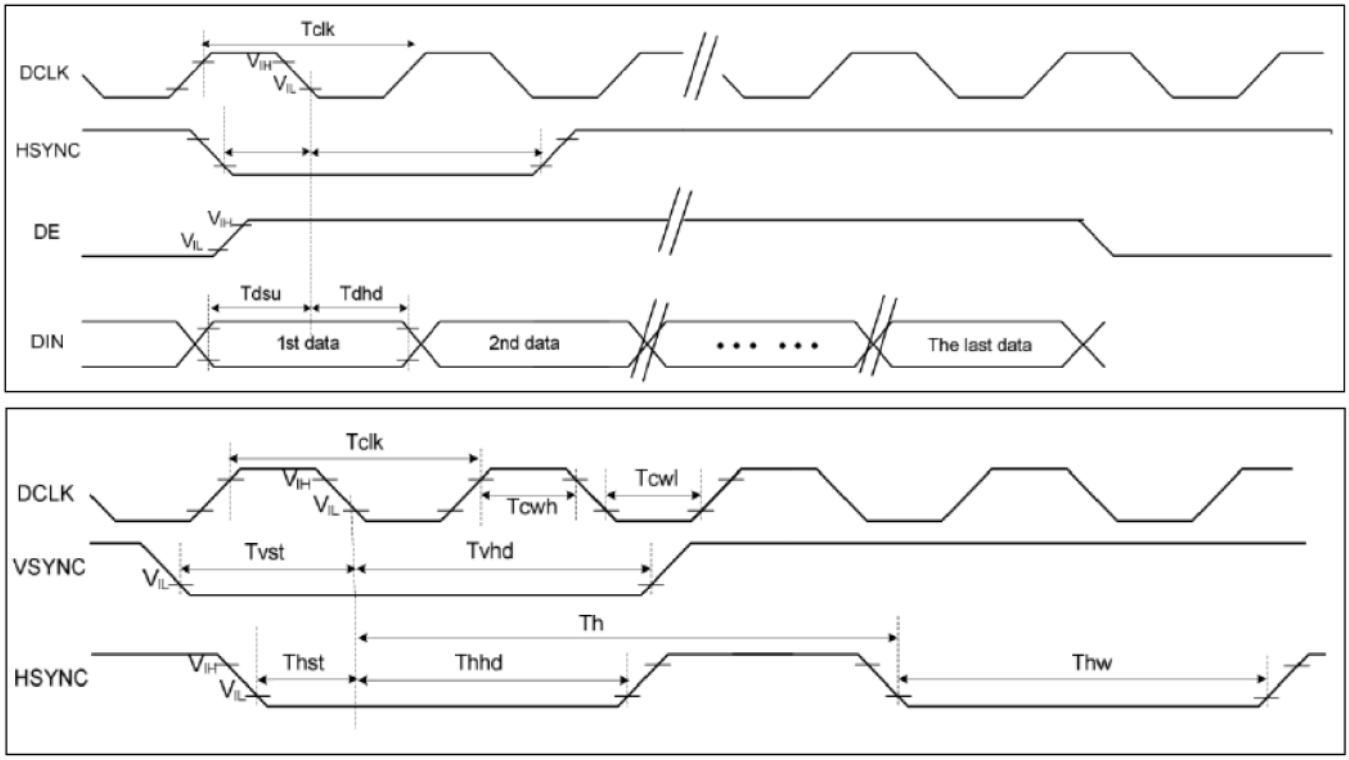


Figure 6.1: Input Signal Timing

6.3 Parallel RGB at Sync Mode (when R9=0Ω)

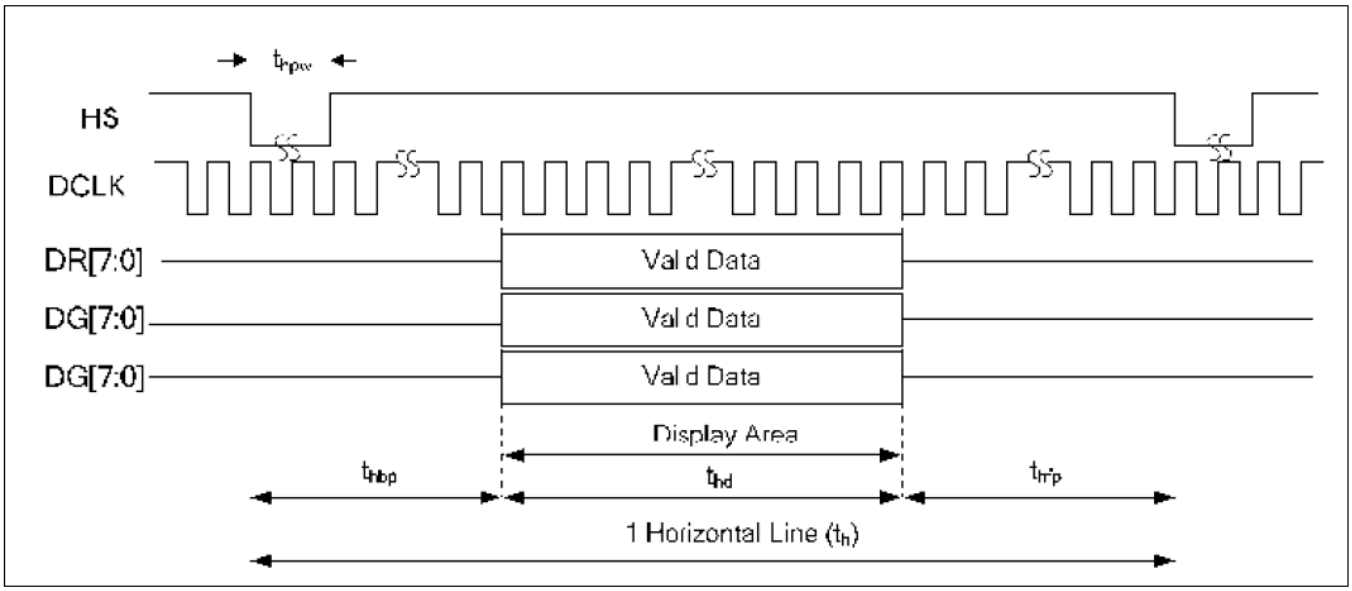


Figure 6.2 Horizontal Input Timing for Sync Mode

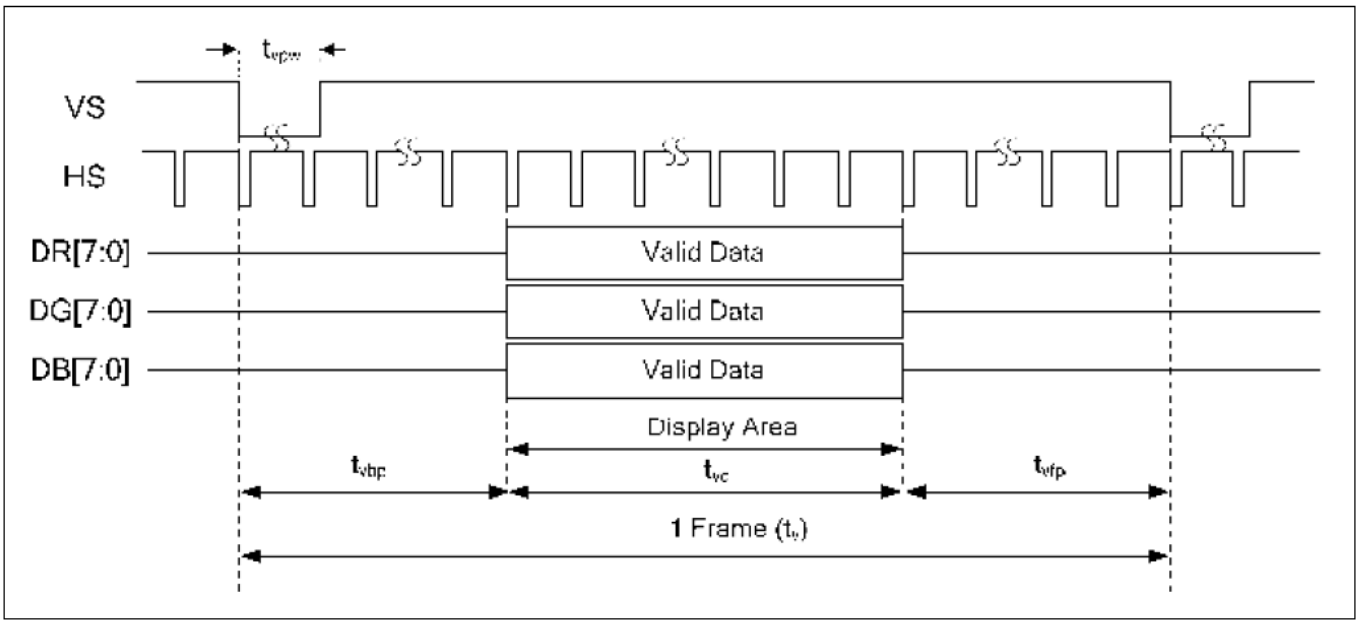


Figure 6.3 Vertical Input Timing for Sync Mode

Parameters	Symbol	Min	Typ.	Max	Unit	Condition
DCLK frequency	f_{DCLK}	25.2	27.2	30.5	MHZ	
Horizontal valid data	t_{hd}	800	800	800	DCLK	
Hsync pulse width	t_{hpw}	1	2	100	DCLK	
Hsync back porch	t_{hbp}	5	16	101	DCLK	
Hsync front porch	t_{hfp}	19	44	115	DCLK	
1 horizontal line	t_h	856	860	920	DCLK	
Vertical valid data	t_{vd}	480	480	480	H	
Vsync pulse width	t_{vpw}	1	2	66	H	
Vsync back porch	t_{vbp}	5	5	67	H	
Vsync front porch	t_{vfp}	5	43	67	H	
1 vertical field	t_v	490	528	552	H	

Table 6.2: Parallel RGB Sync Mode Input Timing Characteristics

6.4 Parallel RGB at DE mode (when R10=0Ω default)

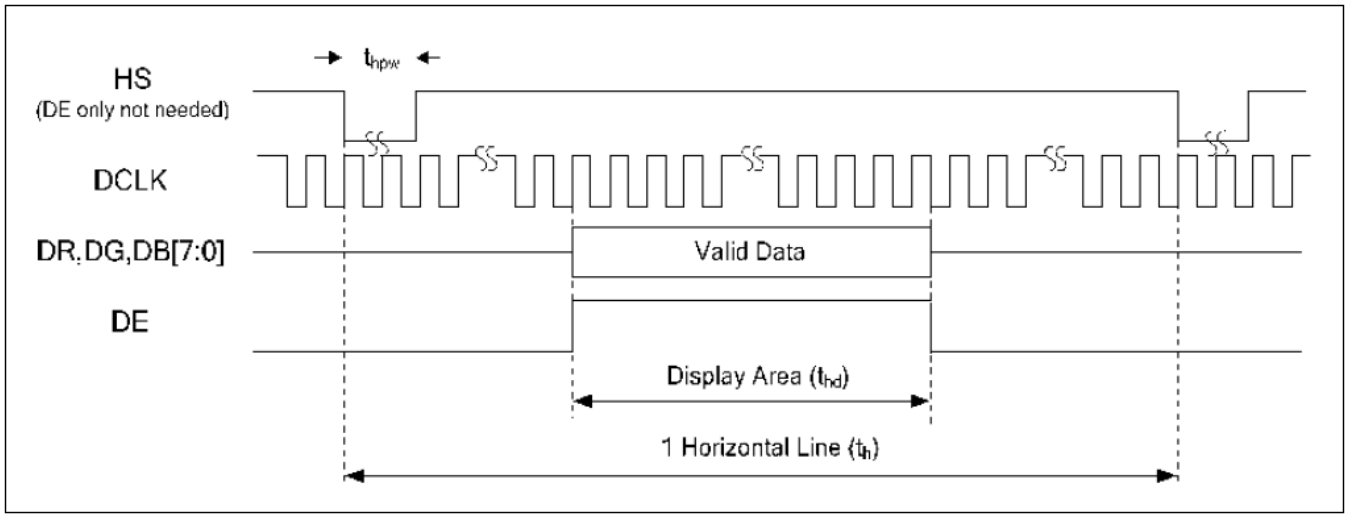


Figure 6.4: Horizontal Input Timing for DE only mode

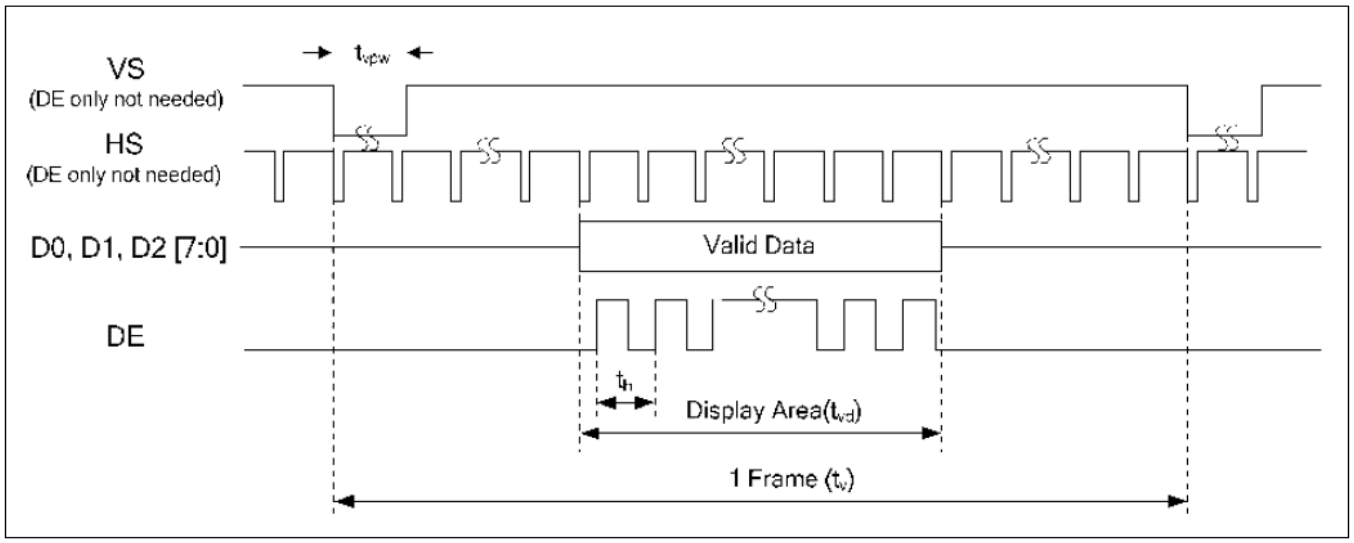


Figure 6.5: Vertical Input Timing for DE only mode

Parameters	Symbol	Min	Typ.	Max	Unit	Condition
DCLK frequency	f_{DCLK}	25.2	27.2	30.5	MHZ	
Horizontal valid data	t_{hd}	800	800	800	DCLK	
1 horizontal line	t_h	856	860	920	DCLK	
Vertical valid data	t_{vd}	480	480	480	DCLK	
1 vertical field	t_v	490	528	552	DCLK	

Table 6.3: Parallel RGB DE Mode Input Timing Characteristics

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.