TFT Display Module

Part Number

E104RB-FW450-N

Overview:

- 10.4-inch TFT (288.92x41.5mm)
- 24-bit RGB Interface
- 1024x100 pixels
- Top View
- Wide Temp

- Transmissive/ Normally White
- No Touch Screen
- 450 NITS
- Controller: HX8282-A/HX8678-C
- 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 the 10.4" TFT-LCD contains 1024x100 pixels and can display up to 16.7M colors.

Features

Low Input Voltage: 3.3V (TYP)
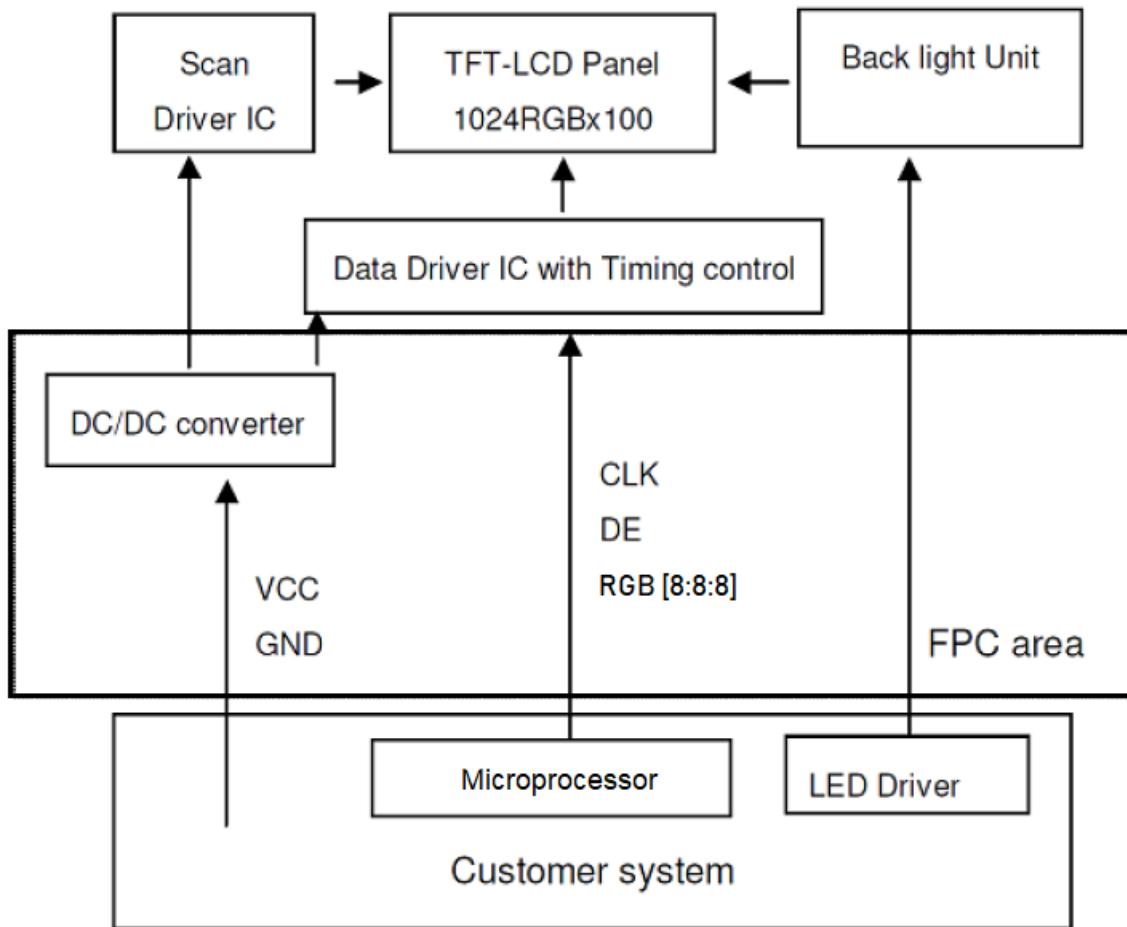Display Colors: 16.7M colors
TFT Interface: 24-bit RGB

General Information Items	Specification	Unit	Note
	Main Panel		
TFT Display Area (AA)	264.192(W) x 35.8(H) (10.4 inch)	mm	-
Driver Element	TFT active matrix	-	-
Display Colors	16.7M	colors	-
Number of Pixels	1024(RGB)x100	dots	-
TFT Pixel Arrangement	RGB vertical stripe	-	-
Pixel Pitch	0.258 (W) x 0.258 (H)	mm	-
Viewing Angle	12 (Gray inversion: 6)	o'clock	-
TFT Controller IC	HX8282-A*1, HX8678-C*1	-	-
Display Mode	Transmissive/Normally White	-	-
Polarizer	Anti-Glare (Haze:25%)	-	-
Hardness	3H	-	-
Operating Temperature	-20～+70	℃	-
Storage Temperature	-30～+80	℃	-

Mechanical Information

Item		Typ.	Unit	Note
Module Size	Width (W)	288.92	mm	-
	Height (H)	41.5	mm	-
	Depth (D)	4.2	mm	-
Weight		TBD	g	-

Note: Without FPC

1.   Block Diagram

2. Outline Dimensions

0.3±0.05

Conductive (AU) Stiffener (PI)

Viewing Direction (Customer's Application)

FR4(t=0.5)

4.2
(7.12)

BEZEL OPENING 29±0.5
(30)
A.A. 25.8

(132.46) 4.5 MIN. 24±0.05 22±0.05

41 1

1024xRGBx100 DOTS

41.5±0.5

(9.6) (12.363) A.A. 264.192
(11.2) BEZEL OPENING 267.392±0.5
(10.764) 288.92±0.5

Peeling tape

0.258
0.086

| R | G | B |
| R | G | B |

0.258

Display
Scale 50/1

BEZEL

Bar Code

41 1

2±0.08 P0.5X40=20±0.05

"A"

1.5±0.05
2.95±0.05
3.5 MIN.

W=0.35±0.05
S=0.15±0.05

R0.2

DETAIL "A"
SCALE 5/1

Single Side Area
Mylar Tape (Amber)
COMPONENT AREA (H=2.2 MAX.)

FPC PIN FUNCTION:

NO.	SYMBOL	NO.	SYMBOL	NO.	SYMBOL	NO.	SYMBOL
1	VDD	13	G0	25	R3	37	DE
2	VDD	14	G1	26	R4	38	LED_K
3	VSS	15	G2	27	R5	39	LED_K
4	B0	16	G3	28	R6	40	LED_A
5	B1	17	G4	29	R7	41	LED_A
6	B2	18	G5	30	VSS		
7	B3	19	G6	31	DCLK		
8	B4	20	G7	32	VSS		
9	B5	21	VSS	33	HSYNC		
10	B6	22	R0	34	VSS		
11	B7	23	R1	35	VSYNC		
12	VSS	24	R2	36	VSS		

NOTE: Silicone applied to cover trace ,but NOT IC

REVISED RECORD		SCALE		TOLERANCE	±0.3
A		UNIT	mm	ORG DATE	01.08.18
B		MATERIAL		DRAWN BY	wen
C				CHECKED BY	
D		FINISH		CONCURRED BY	
E				APPROVED BY	

DWG NO.

DCN A4 VERSION
P 1 OF 1 A

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3. Input Terminal Pin Assignment

Recommended Connector: XF3M-4115-1B

NO.	Symbol	Description	I/O
1	VDD	Power Supply	P
2	VDD		P
3	VSS	Power Ground	P
4	B0	Blue 8-bit data bus	I
5	B1		I
6	B2		I
7	B3		I
8	B4		I
9	B5		I
10	B6		I
11	B7		I
12	VSS	Power Ground	P
13	G0	Green 8-bit data bus	I
14	G1		I
15	G2		I
16	G3		I
17	G4		I
18	G5		I
19	G6		I
20	G7		I
21	VSS	Power Ground	P
22	R0	Red 8-bit data bus	I
23	R1		I
24	R2		I
25	R3		I
26	R4		I
27	R5		I
28	R6		I
29	R7		I
30	VSS	Power Ground	P
31	DCLK	Clock signal for RGB interface operation	I
32	VSS	Power Ground	P
33	HSYNC	Horizontal sync input	I
34	VSS	Power Ground	P
35	VSYNC	Vertical sync input	I
36	VSS	Power Ground	P
37	DE	Data enable input	I
38	LED_K	Cathode pin of backlight	P
39	LED_K		P
40	LED_A	Anode pin of backlight	P
41	LED_A		P

I: Input, O: Output, P: Power

4.   LCD Optical Characteristics

4.1   Optical Specifications

Item		Symbol	Condition	Min	Typ.	Max	Unit	Note
Contrast Ratio		C_R		200	300	--	--	(2)
Response Time		T_R+T_F		--	25	50	ms	(4)
NTSC		S(%)		39	--	--	%	(5)
Color Filter Chromaticity	White	W_X	Normal Viewing Angle θ=0	0.287	0.337	0.387	--	(5)(6)
		W_Y		0.298	0.348	0.398		
	Red	R_X		0.528	0.578	0.628		
		R_Y		0.283	0.333	0.383		
	Green	G_X		0.343	0.393	0.443		
		G_Y		0.493	0.543	0.593		
	Blue	B_X		0.108	0.158	0.208		
		B_Y		0.092	0.142	0.192		
Viewing Angle	Hor.	Θ_L	9 o'clock	--	60	--	degree	(1)(6)
		Θ_R	3 o'clock	--	60	--		
	Ver.	Θ_T	12 o'clock	--	50	--		
		Θ_B	6 o'clock	--	60	--		
Option View Direction			FREE					(1)

4.2   Measuring Conditions

Measuring surrounding: dark room

Ambient temperature: 25±2˚C

15 min. 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.

Normal
$\Theta = 0°$

$\Theta 21$ $\Theta 22$

3 o-clock

$\Theta 12$ $\Theta 11$

12 o-clock

6 o-clock

9 o-clock

Normal

$\Theta x - \Theta y - 0°$

$\Theta y-$ $\Theta y+$

12 o'clock direction

$\Theta x - 90°$ x-

$\Theta y+= 90°$

Θx

y+

Θx

y-

x+ $\Theta x+ - 90°$

6 o'clock

$\Theta y = 90°$

IC Bonding Pad

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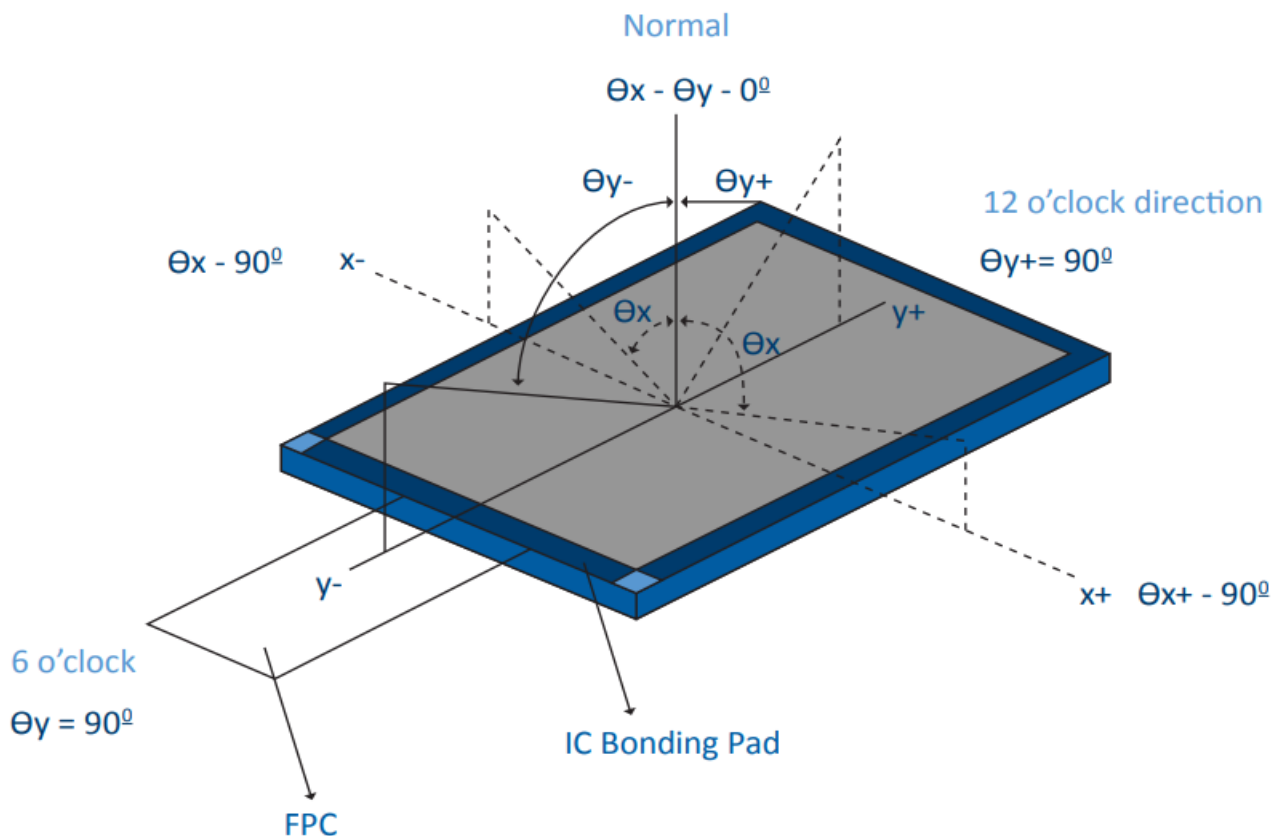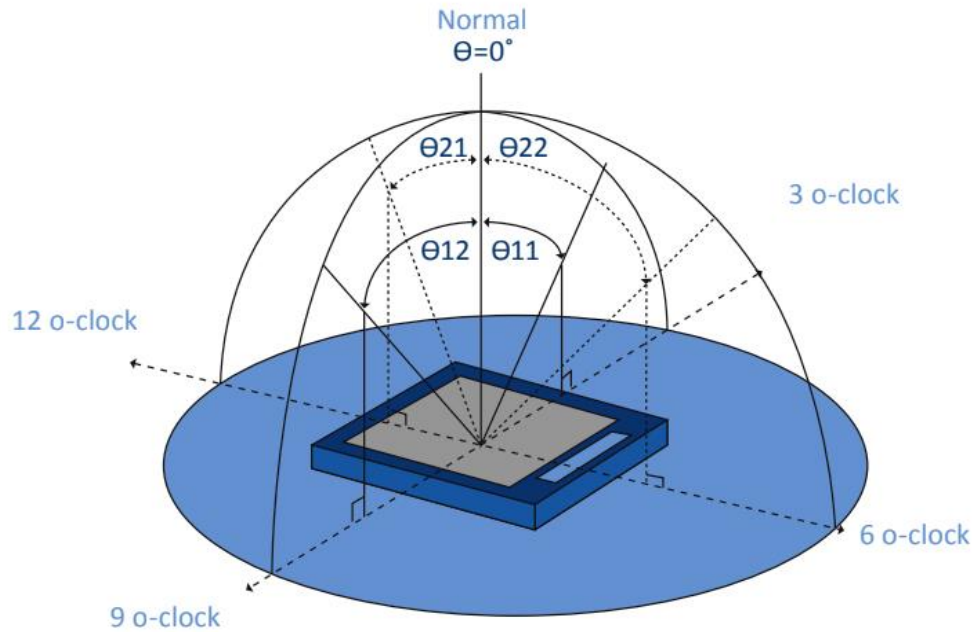
(2) Definition of Contrast Ratio (Cr): measured at the center point of panel. The contrast ratio (Cr) measured on a module, is the ratio between the luminance (Lw) in a full white area (R=G=B=1) and the luminance (Ld) in a dark area (R=G=B=0).

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

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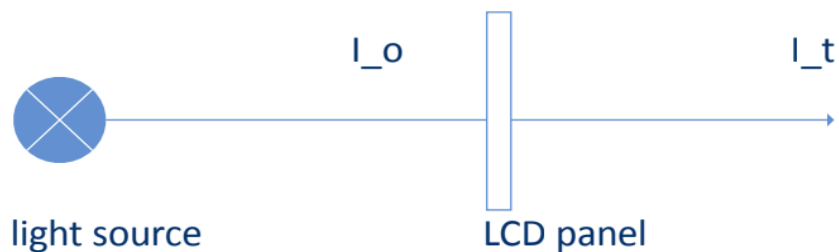
The transmittance is defined as:

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

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.
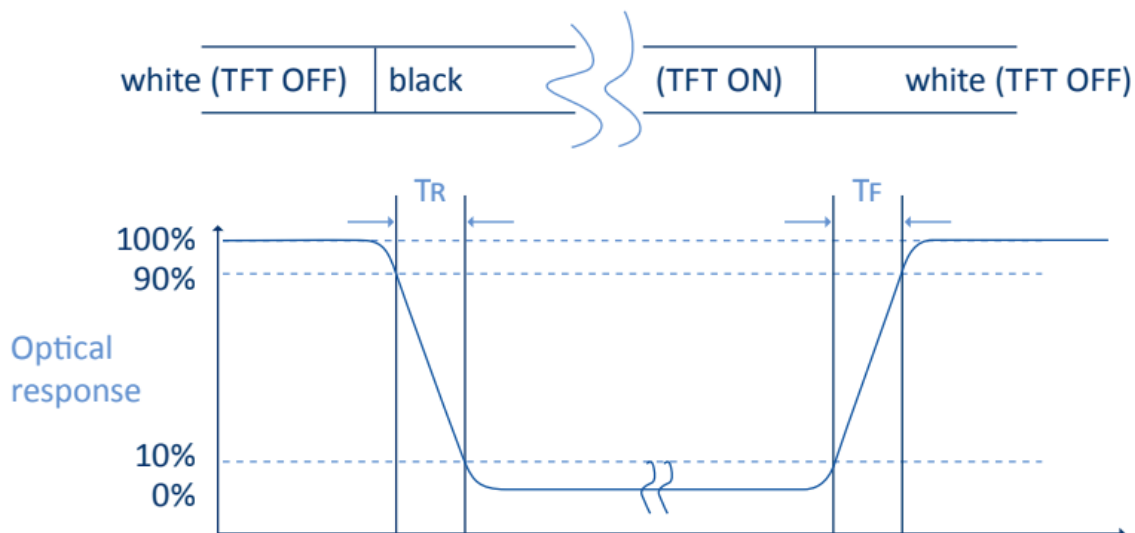
(5) Definition of Color Gamut: Measuring machine CFT-01. NTSC's Primaries: R(x,y,Y),G(x,y,Y), B(x,y,Y). FPM520 of Westar Display Technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics. The color chromaticity shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.
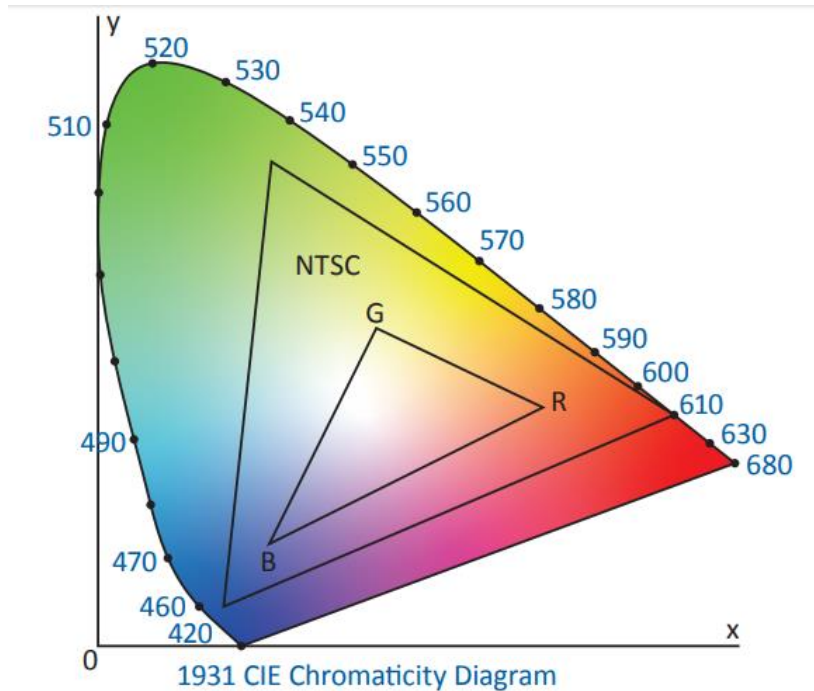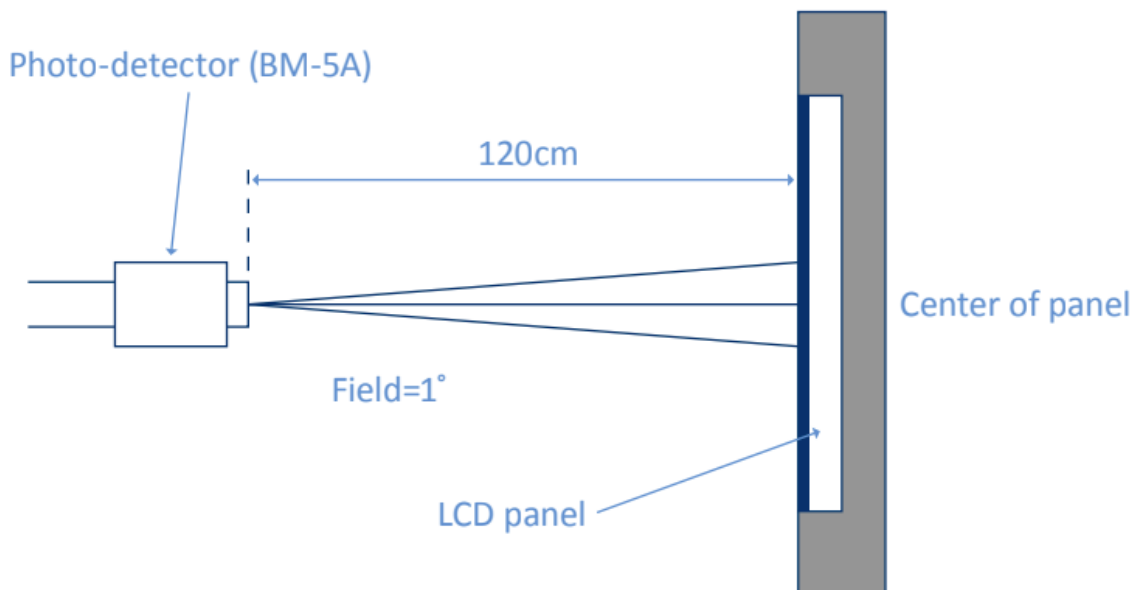
Fig. 1931 CIE chromacity diagram

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.

X = test point

X = 1 to 5
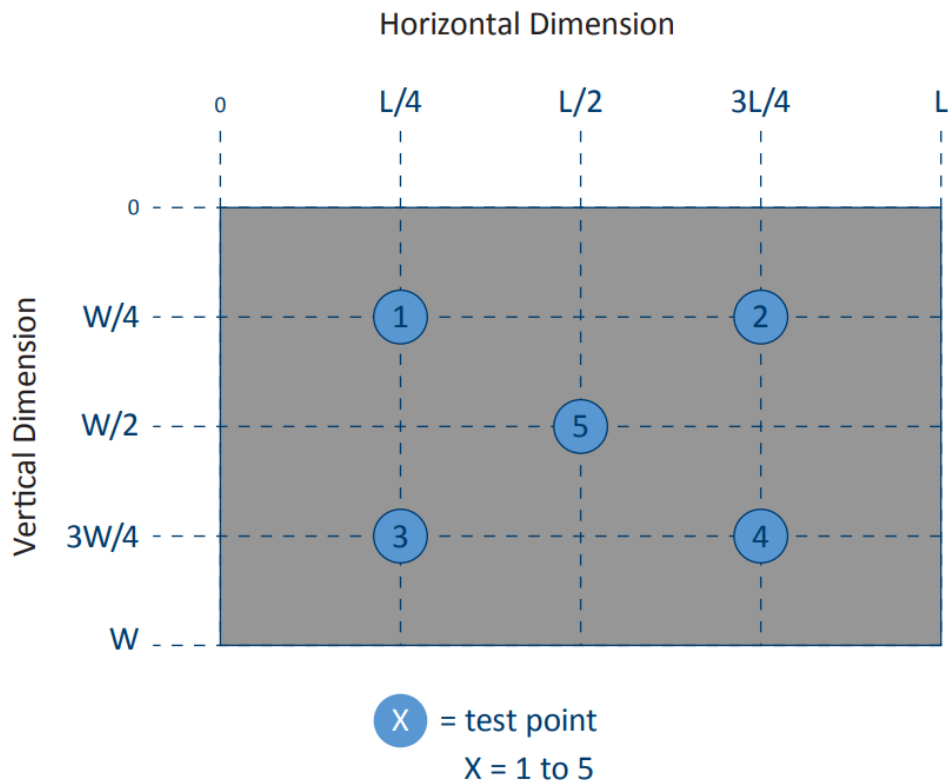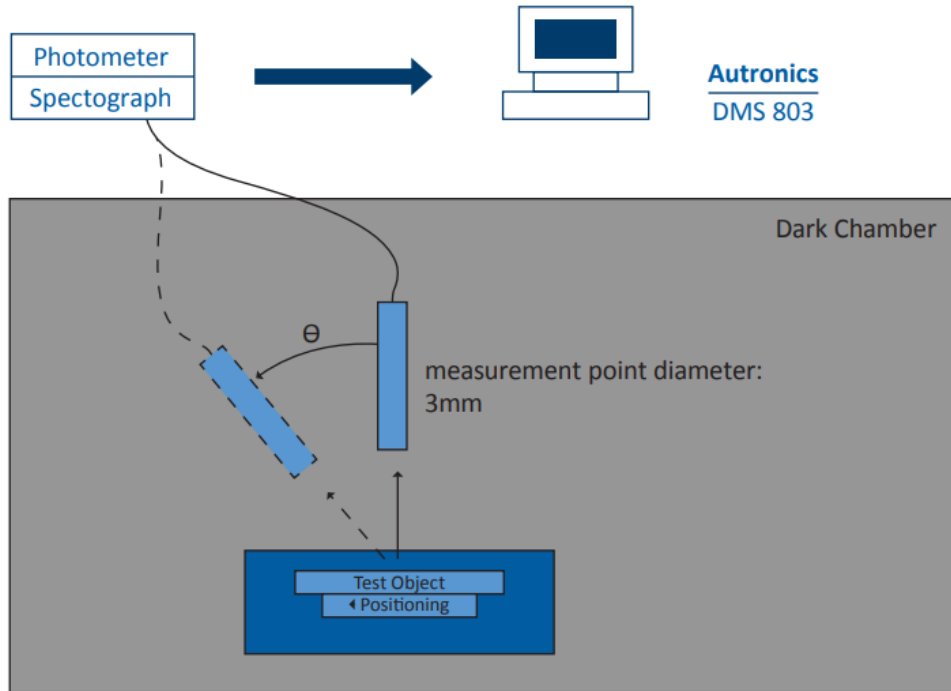
5. TFT Electrical Characteristics

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

Characteristics	Symbol	Min	Max	Unit
Digital Supply Voltage	V_{DD}	-0.3	3.96	V
Operating Temperature	T_{OP}	0	+50	℃
Storage Temperature	T_{ST}	-10	+60	℃
Humidity	Hstg	-	90	%RH

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
LCD Power Supply Voltage	V_{DD}	3.2	3.3	3.4	V	
LCD Power Supply Current	Idd	--	--	TBD	mA	
Driver Input Signal Voltage	V_{IH}	$0.7V_{DD}$	--	V_{DD}	V	
	V_{IL}	GND	--	$0.3V_{DD}$	V	

5.3 LED Backlight Characteristics

Characteristics	Symbol	Min	Typ.	Max	Unit	Note
Power Consumption	PLED	--	--	1728	mW	
LED Supply Voltage	VLED	15.6	--	21.6	V	
LED Supply Current	ILED	--	80	80	mA	
LED Rush Current		--	--	120	mA	
Luminous Color	White					
LED Lifetime	25℃ / L50: 200000				Hrs	

The back-light system is edge-lighting type with 12 chips White LED
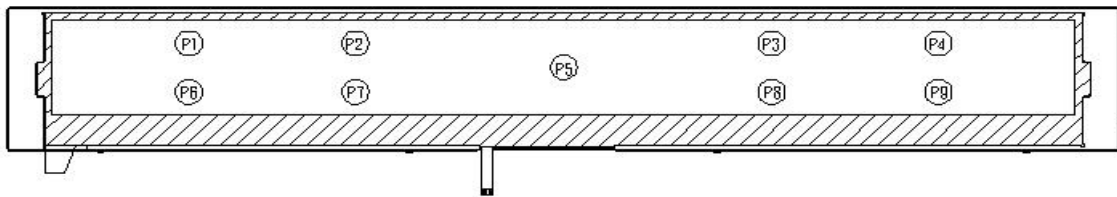

Note 1: LED lifetime (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25 ±3 ℃, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note 2: The "LED lifetime" is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and IL = 80mA. The LED lifetime could be decreased if operating IL is larger than 80mA. The constant current driving method is suggested.
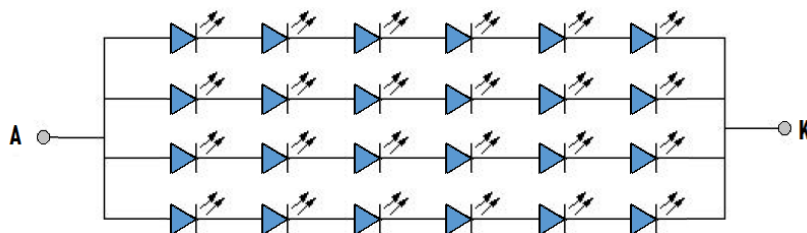
LED Backlight Circuit

Note 3: Luminance Uniformity of these 9 points is defined as below:
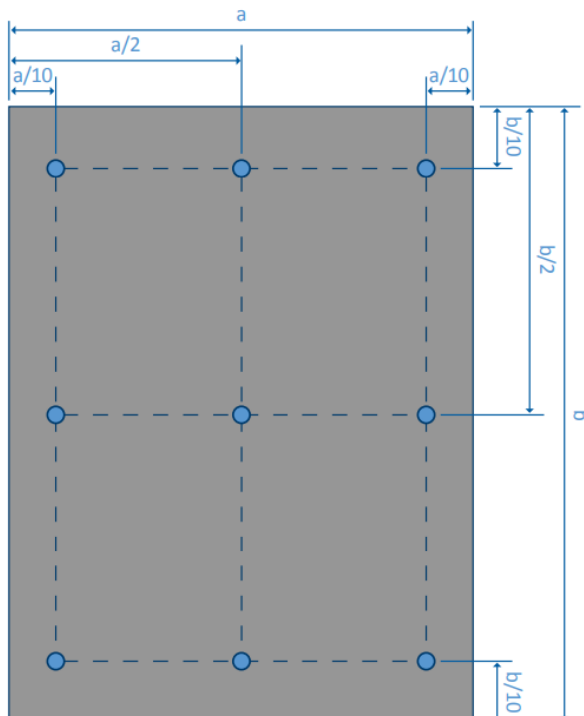
$$\text{Luminance} = \frac{\text{(Total Luminance of 9 points)}}{9}$$

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

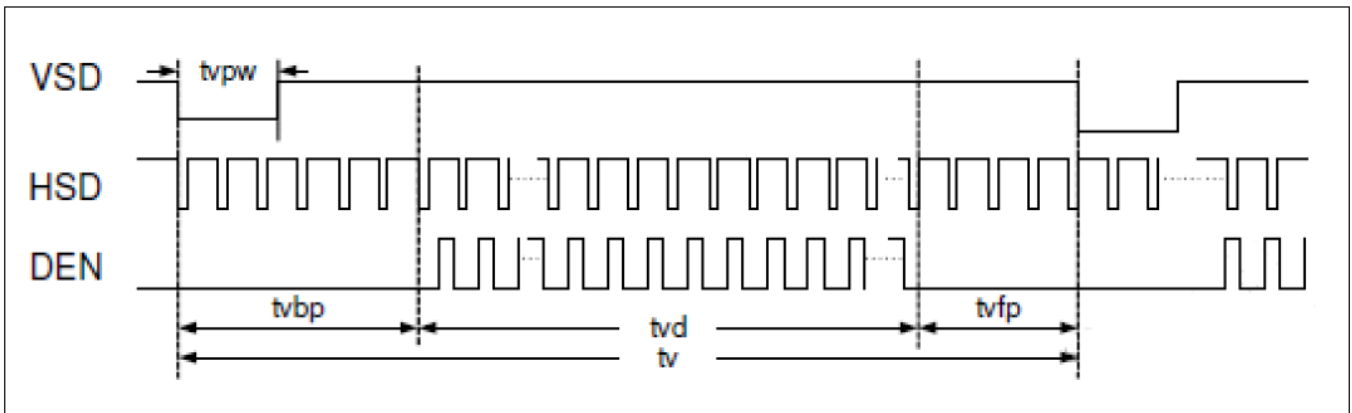# 6. AC Timing Characteristics

6.1 SYNC Mode

Vertical Timing

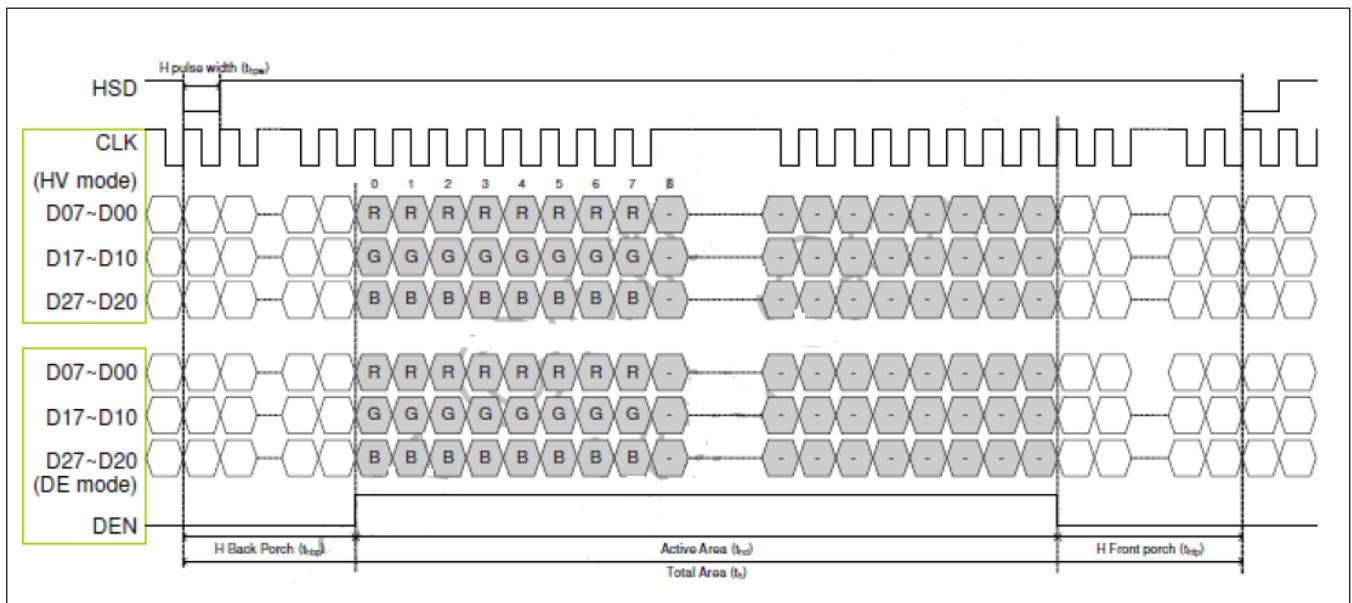*Figure 6.1: Sync-Mode Vertical Timing Diagram*

Horizontal Timing

Figure 6.2: Sync-Mode Horizontal Timing Diagram

Parameter		Symbol	Min	Typ.	Max	Unit
Frame Rate		FR	--	60.2	--	Hz
DCLK Frequency		FDCLK	--	21	--	MHz
Horizontal	Total line	tH	--	1344	--	DCLK
	Active pixels	tHact		1024		DCLK
	Back porch	tHBP	--	158	--	DCLK
	Pulse width	tHPW	--	1	--	DCLK
	Front porch	tHFP	--	161	--	DCLK
Vertical	Total time	tV	--	258	--	H
	Active lines	tVact		130		H
	Back porch	tVBP	--	21	--	H
	Pulse width	tVPW	--	2	--	H
	Front porch	tVFP	--	105	--	H

Table 6.1: HX8282A SYNC Mode Timing Table

Parameter		Symbol	Min	Typ.	Max	Unit
Frame Rate		FR	--	60.2	--	Hz
DCLK Frequency		FDCLK	--	21	--	MHz
Horizontal	Total line	tH	--	1344	--	DCLK
	Active pixels	tHact		1024		DCLK
	Back porch	tHBP	--	158	--	DCLK
	Pulse width	tHPW	--	1	--	DCLK
	Front porch	tHFP	--	161	--	DCLK
Vertical	Total time	tV	--	259	--	H
	Active lines	tVact		130		H
	Back porch	tVBP	--	57	--	H
	Pulse width	tVPW	--	2	--	H
	Front porch	tVFP	--	70	--	H

Table 6.2: HX8282A SYNC Mode Timing Table

Note: Back porch is not included in pulse width

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.