TFT Display Module

Part Number

E70RA-HW480-R

Overview:

- 7.0-inch TFT (165x100mm)
- 6/8-bit LVDS Interface
- 1024(RGB)x600 pixels
- 3.3V
- White LED back-light

- Transmissive/ Normally Black
- 4-wire Resistive Touch Screen
- 480 NITS
- Controller: EK73215/EK79001
- 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, 4-wire resistive touch screen, and backlight unit. The resolution of the 7.0" TFT-LCD contains 1024x600 pixels and can display up to 16.7M colors.

Features

Low Input Voltage: 3.3V (TYP)
Display Colors of TFT LCD: 262K/16.7M colors
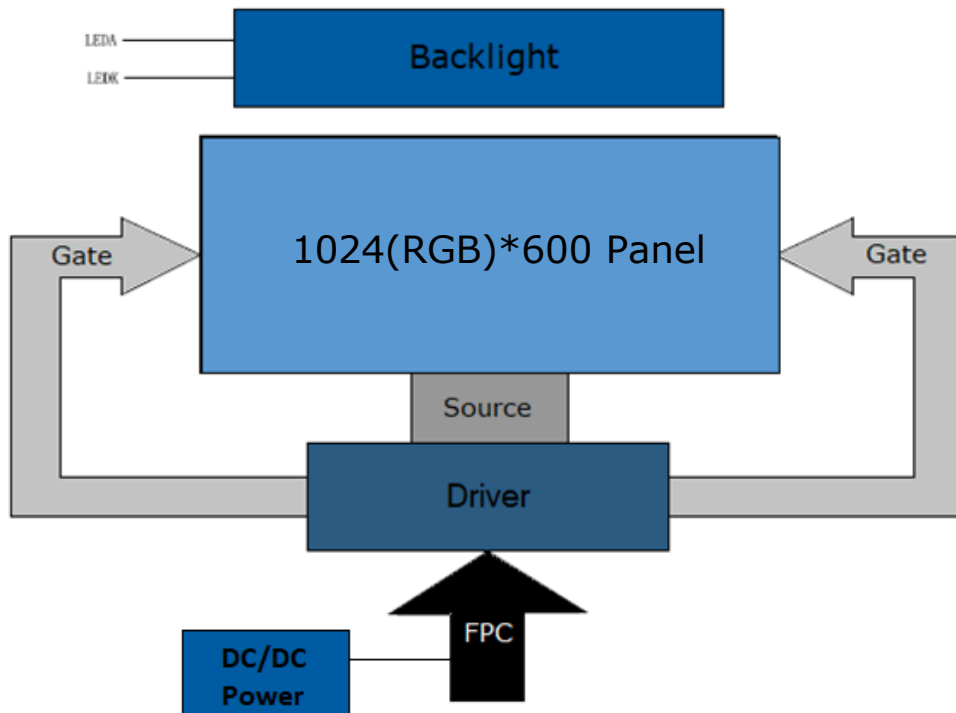TFT Interface: 6/8-bit LVDS
TFT Controller IC: EK73215/EK79001

General Information Items	Specification Main Panel	Unit	Note
TFT Display area (AA)	154.21(H) * 85.92(V) (7.0 inch)	mm	-
Driver element	TFT active matrix	-	-
Display colors	262K/16.7M	colors	-
Number of pixels	1024(RGB)*600	dots	-
TFT Pixel arrangement	RGB vertical stripe	-	-
Pixel pitch	0.1506 (H) x 0.1432 (V)	mm	-
Viewing angle	ALL	o'clock	-
TFT Controller IC	EK73215/EK79001	-	-
LCM Interface	6/8-bit LVDS		
Display mode	Transmissive/ Normally Black	-	-
Operating temperature	-20～+70	℃	-
Storage temperature	-30～+80	℃	-

Mechanical Information

Item		Min	Typ.	Max	Unit	Note
Module size	Horizontal(H)		165		mm	-
	Vertical(V)		100		mm	-
	Depth(D)		7.3		mm	-
Weight			192		g	-

1. Block Diagram

2. Outline Dimensions

Dimensions (left view):
- 165±0.35 (BL O.D)
- 164.4±0.2 (TP O.D)
- 155.11 (TP V.A)
- 154.21 (LCD A.A)
- (84.38)
- (0.34)
- (6.77)
- (7.27)
- (0.3)
- (4.18)
- (4.68)
- 100±0.3 (BL O.D)
- 97.81±0.2 (TP O.D)
- 86.92 (TP V.A)
- 85.92 (LCD A.A)
- (47.68)
- 80.05±0.5
- 44.25±0.5
- (80.4)
- 3.5±0.3
- 5±0.30
- *77.58±1.0
- 0.5±0.1 P:0.5
- P0.5*40-1=19.5
- 0.75 W 0.5 PITCH
- P 1.0*3=3±0.05
- 5±0.10
- *40.09±1.0

YU, XL, XR, YD

7.0"
1024*RGB*600
IPS
Black

Remove Tape

Component (Yellow tape on surface)
Components (Yellow tape on surface)

Side view dimensions:
- 7.3±0.2 (Include Up Bezel)
- 5.8±0.2 (Include Up Bezel)
- 2Max(Components)
- 0.2(Stainless steel stiffener)
- 0.4Max(Soliding)
- 0.13±0.03(FPC)
- 0.13±0.03(FPC)
- 0.3±0.03 (FPC+PI Stiffener)
- Contact Side / PI Stiffener
- 0.3±0.05
- 10±0.30
- 5±0.10
- (10.25)
- 20.5±0.1
- 5±0.3 (PI Stiffener)
- 3.5(White silk printing)

BL0702703
HC X

Stainless steel stiffener(T=0.2mm?Ground)
Yellow tape(T=0.05mm)
0.4MAX(Soliding)
PI Stiffener

NOTES:
1. DISPLAY TYPE: 7", TFT-LCD, 16.7M COLORS
2. DISPLAY MODE: NORMALLY BLACK/IPS
3. VIEWING DIRECTION: ALL
4. LCM DRIVER IC: EK73215& EK79001
   LCM Interface: LVDS Interface
5. Touch Mode: RTP
   Touch Driver IC: NA
   Touch Interface: 4 Wire
   Touch and LCM Bonding technology: Tape bonding
6. VDD:3.3V
7. OPERATING TEMP: -20°C TO 70°C
   STORAGE TEMP: -30°C TO 80°C
8. BACK LIGHT: LED WHITE, 27 LED, 270mA, 9.6±0.3V
9. RoHS COMPLIANT.

Pin Assignment (touch):

Pin NO.	Assignment
1	YU
2	XR
3	YD
4	XL

YU, XL, XR, YD
1 2 3 4

K(-)
A(+)
B/L Circuit

Revision table:

ReV.	Revision content description	Date
V0	FIRST	2018. 03. 13
V1		2018. 04. 16
V2		2018. 08. 14

Pin Name table:

NO.	Pin Name
1	NC
2	VDD
3	VDD
4	NC
5	RESTET
6	STBYB
7	GND
8	RXIN0-
9	RXIN0+
10	GND
11	RXIN1-
12	RXIN1+
13	GND
14	RXIN2-
15	RXIN2+
16	GND
17	RXCLKIN-
18	RXCLKIN+
19	GND
20	RXIN3-
21	RXIN3+
22	GND
23	NC
24	NC
25	GND
26	NC
27	DIMO
28	SELB
29	NC
30	GND
31	LED-
32	LED-
33	L/R
34	U/D
35	NC
36	NC
37	NC
38	NC
39	LED+
40	LED+

Title block:

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TOLERANCE()	DRAWING NAME	E70RA-HW480-R
	PARTS NO.	

| 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 TFT Connector: FH12S-40S-0.5SH(55) | Recommended RTP Connector: FH33-4S-1SH(10)

NO.	Symbol	Description	I/O
1	NC	--	--
2	VDD	Power supply for digital circuits	P
3	VDD	Power supply for digital circuit	P
4	NC	--	--
5	RESET	Global reset pin. Active low to enter reset state	I
6	STBYB	Standby mode normally pulled high. STBYB='1', normal operation, STBYB='0', timing controller, source driver will turn off, all outputs are High-Z	I
7	GND	Ground	P
8	RXIN0-	- LVDS differential data input	I
9	RXIN0+	+LVDS differential data input	I
10	GND	Ground	P
11	RXIN1-	- LVDS differential data input	I
12	RXIN1+	+ LVDS differential data input	I
13	GND	Ground	P
14	RXIN2-	- LVDS differential data input	I
15	RXIN2+	+ LVDS differential data input	I
16	GND	Ground	P
17	RXCLKN-	- LVDS differential clock input	I
18	RXCLKN+	+ LVDS differential data input	I
19	GND	Ground	P
20	RXIN3-	- LVDS differential data input	I
21	RXIN3+	+ LVDS differential data input	I
22	GND	Ground	P
23	NC	--	--
24	NC	--	--
25	GND	Ground	P
26	NC	--	--
27	DIMO	Backlight dimmer signal for external controller. DIMO='0', Turn off external backlight. DIMI='1', Logical control signal to turn on external backlight. If CABC off, DIMO=DIMI, else DIMO is controlled by CABC. If not used leave open.	O
28	SELB	Input data format selection. SLEB=0, 8-bit LVDS. SLEB=1, 6-bit LVDS	I
29	NC	--	--
30	GND	Ground	P
31-32	LED-	LED Cathode	P
33	L/R	Horizontal shift direction (source output) selection (see note 1)	I
34	U/D	Vertical shift direction (gate output) selection (see note 1)	I
35-38	NC	--	--
39-40	LED+	LED Anode	P

Note 1: When L/R='0', set right to left scan direction.
   When L/R='1', set left to right scan direction.
   When U/D='0', set top to bottom scan direction.
   When U/D='1', set bottom to top scan direction.
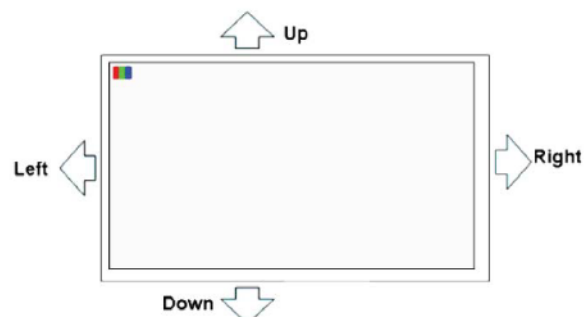
4. LCD Optical Characteristics

4.1 Optical Specifications

Item		Symbol	Condition	Min	Typ.	Max	Unit	Note
Contrast Ratio		CR		600	800	--		(2)
Response time	Rising	T_R+T_F		--	25	40	msec	(4)
	Falling							
Color Gamut		S (%)		--	50	--	%	(5)
Color Filter Chromaticity	White	W_X	Θ = φ = 0 Normal viewing angle	0.2668	0.3068	0.3468		(5)(6)
		W_Y		0.2984	0.3384	0.3784		
	Red	R_X		0.5758	0.6158	0.6558		
		R_Y		0.2915	0.3315	0.3715		
	Green	G_X		0.2907	0.3307	0.3707		
		G_Y		0.5345	0.5745	0.6145		
	Blue	B_X		0.1066	0.1466	0.1866		
		B_Y		0.0738	0.1138	0.1538		
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℃

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.

Normal
$\Theta=0°$

$\Theta21$ $\Theta22$

3 o-clock

$\Theta12$ $\Theta11$

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

Θx

y+

x+ $\Theta x+ - 90°$

y-

6 o'clock

$\Theta y = 90°$

IC Bonding Pad

FPC

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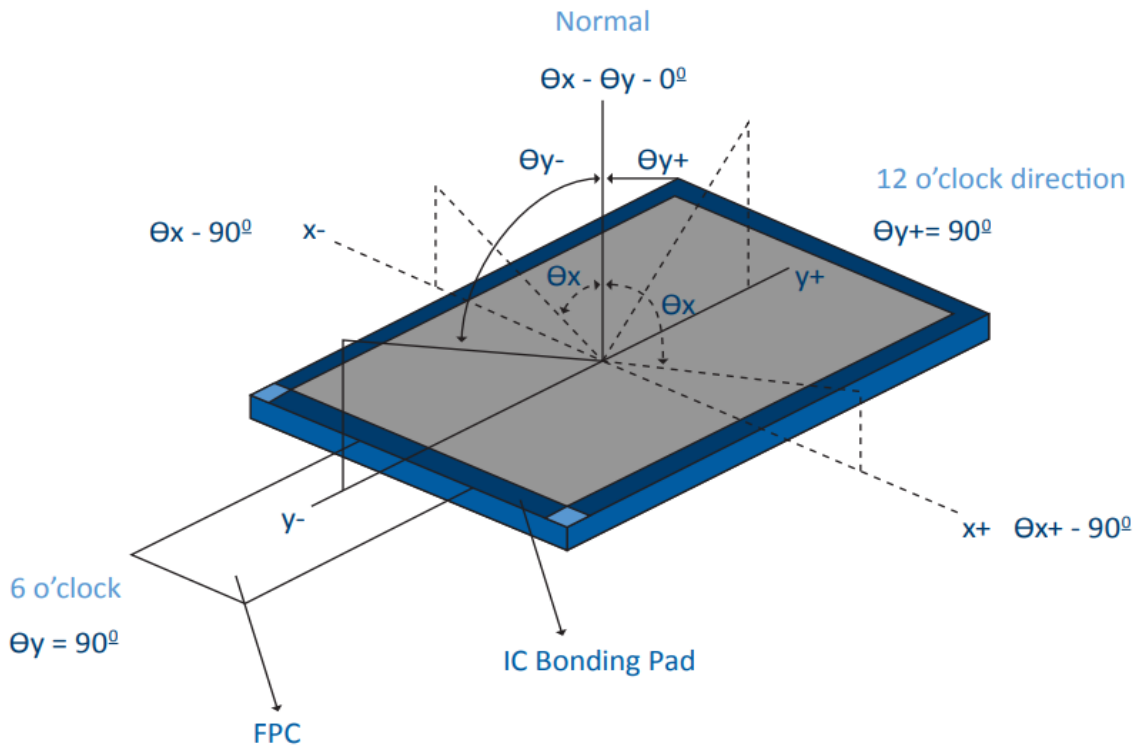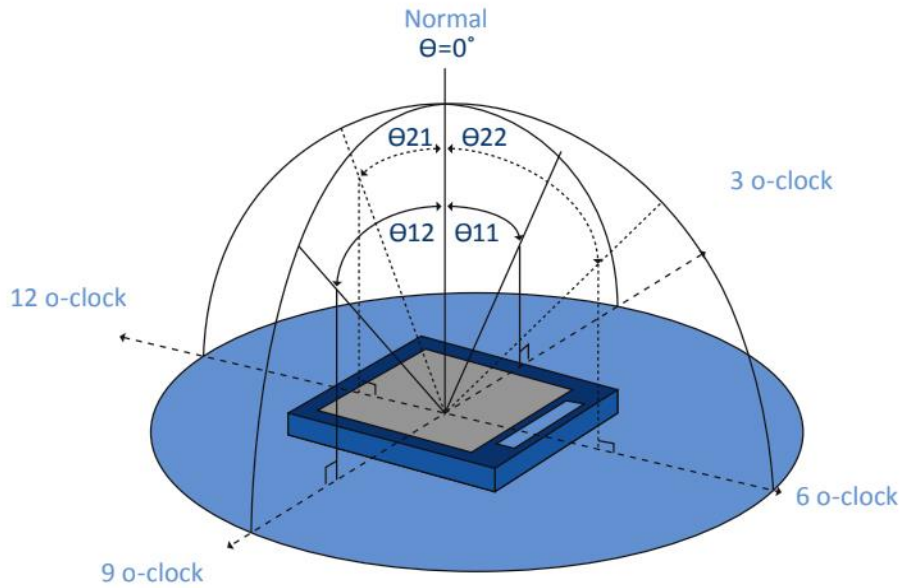
(2) Definition of Contrast Ratio (Cr): measured at the center point of panel. The contrast ratio (Cr) measured on a module, is the ratio between the luminance (Lw) in a full white area (R=G=B=1) and the luminance (Ld) in a dark area (R=G=B=0).

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

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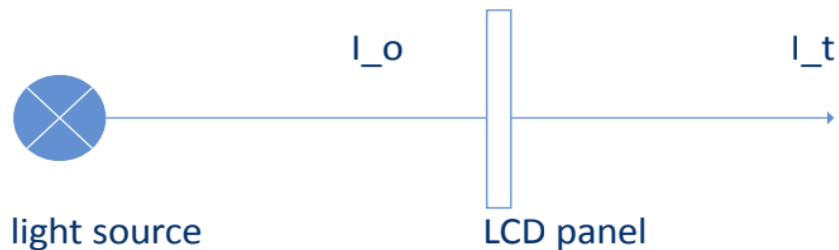
The transmittance is defined as:

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

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.
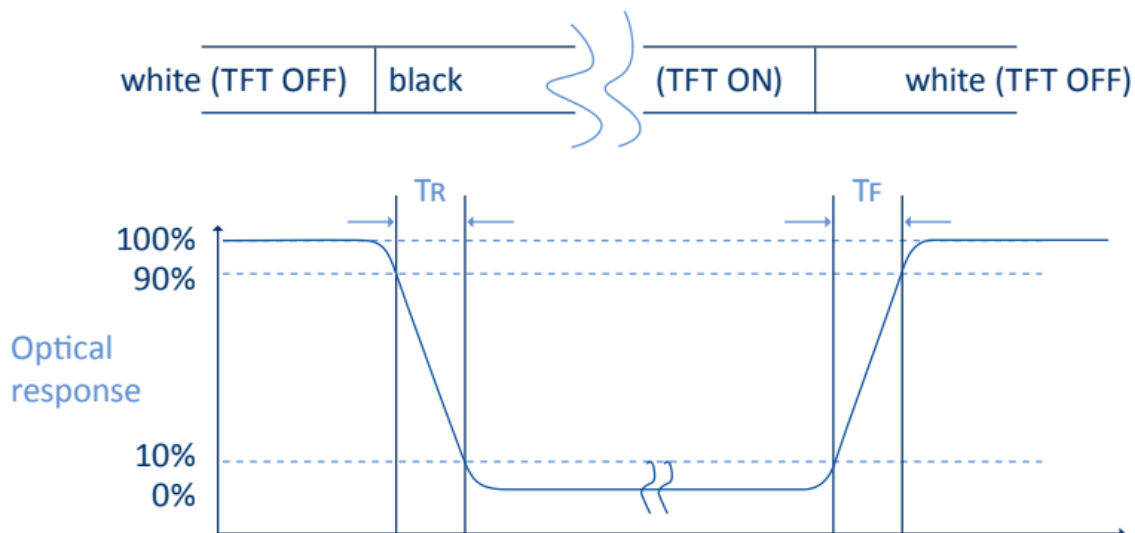
(5) Definition of Color Gamut: Measuring machine CFT-01. NTSC's Primaries: R(x,y,Y),G(x,y,Y), B(x,y,Y). FPM520 of Westar Display Technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.
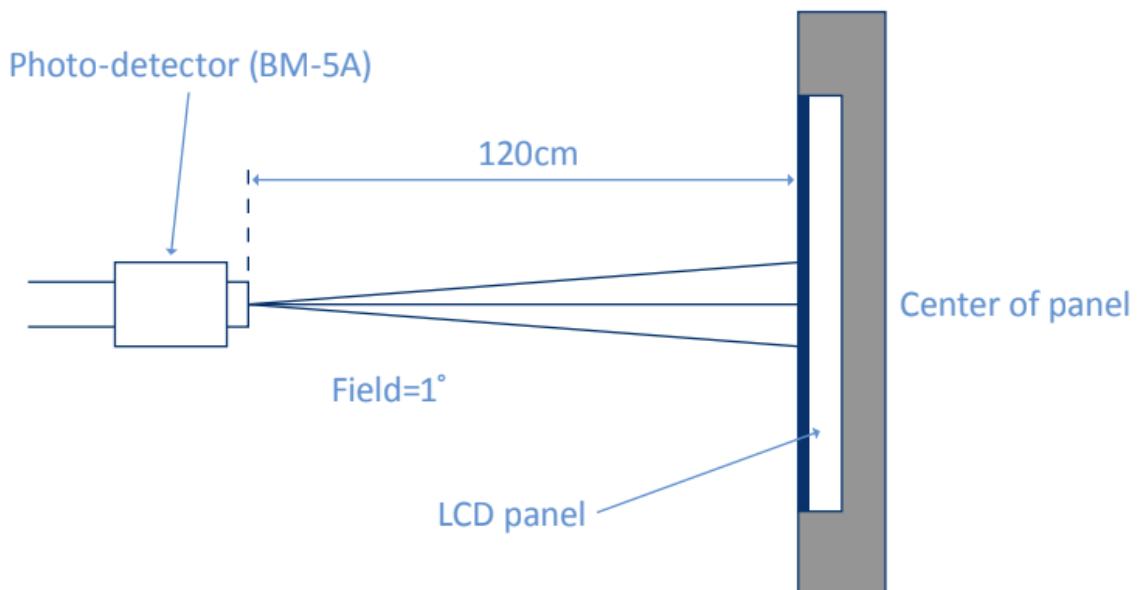

1931 CIE Chromaticity Diagram
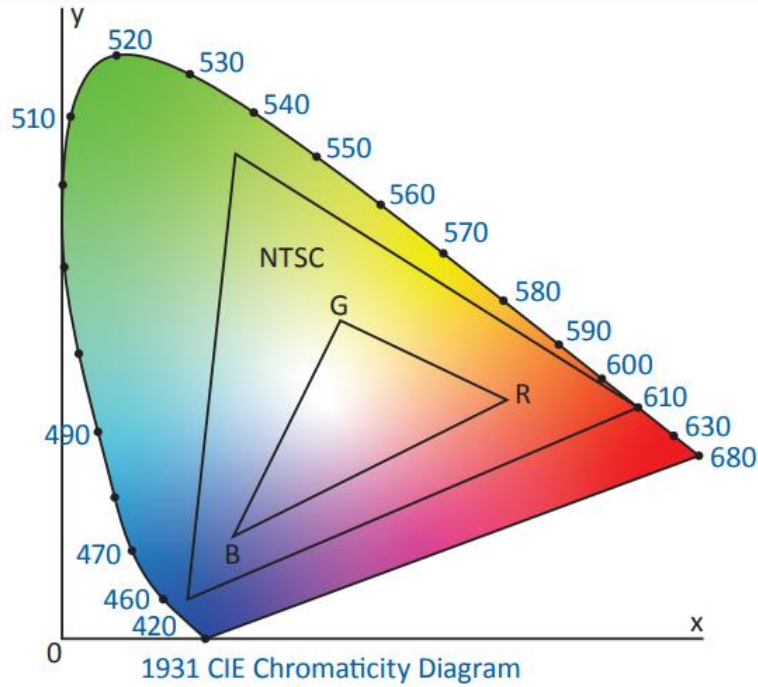
Fig. 1931 CIE chromacity diagram

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.
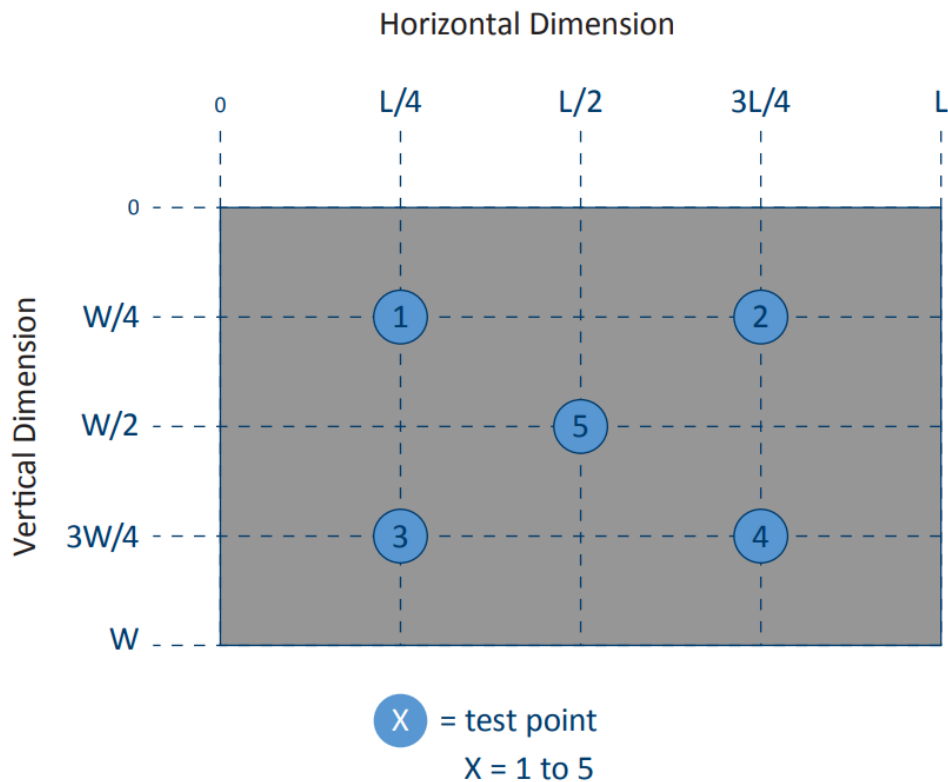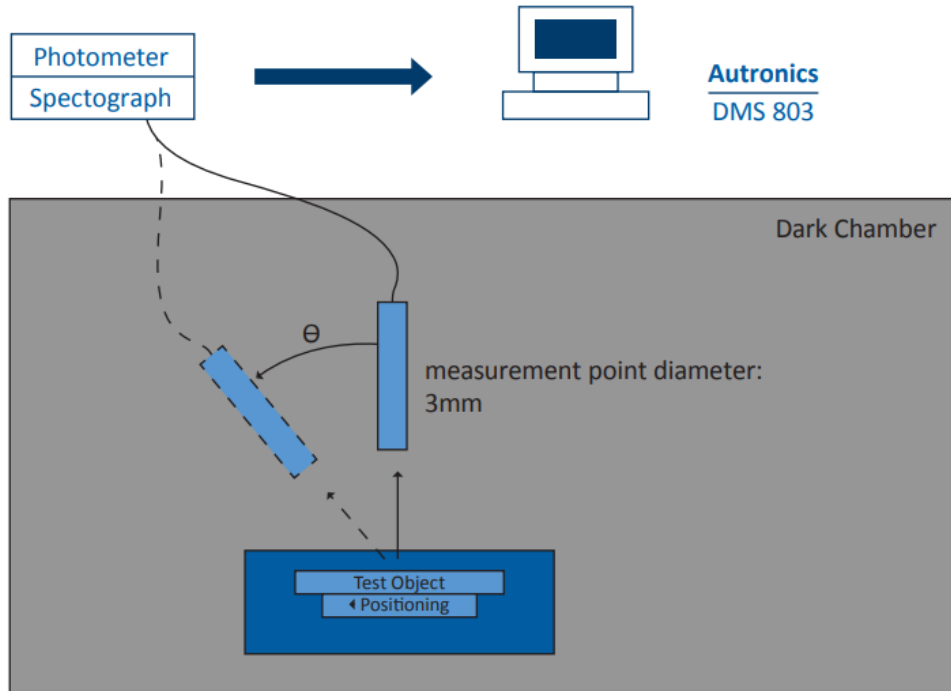
5. Electrical Characteristics

5.1 Absolute Maximum Rating

Characteristics	Symbol	Min	Max	Unit
Digital Supply Voltage	VDD	-0.3	4.6	V
Operating temperature	TOP	-20	+70	℃
Storage temperature	TST	-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	--	120	--	mA	
Level input voltage	VIH	0.7V_{DD}	--	V_{DD}	V	
	VIL	0	--	0.3V_{DD}	V	
Level output voltage	VOH	V_{DD}-0.4	--	--	V	
	VOL	0	--	0.4	V	

5.3   LED Backlight Characteristics

The backlight system is edge lighting type with 27 chips LED.

Item	Symbol	Min	Typ.	Max	Unit	Note
Forward Current	I_F	180	270	--	mA	
Forward Voltage	V_F	--	9.6	--	V	
LCM Luminance (I_F=180mA)	LV	310	360	--	cd/m2	(3)
LCM Luminance (I_F=270mA)	LV	430	480	--	cd/m2	(3)
LED lifetime	Hr	--	50000	--	Hour	(1)(2)
Uniformity	Avg	80	--	--	%	(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 = 270mA. The LED lifetime could be decreased if operating IL is larger than 270mA. The constant current driving method is suggested.

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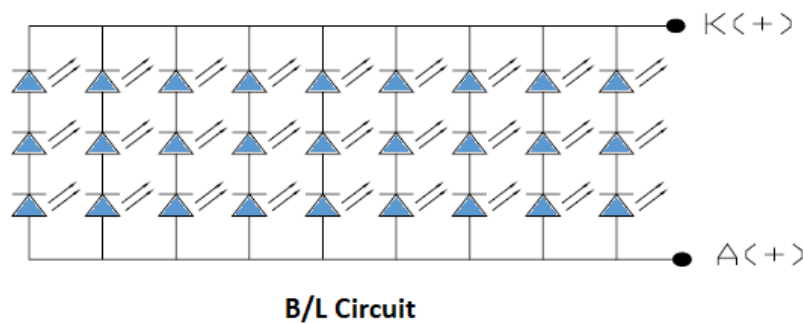
Note 3: Luminance Uniformity of these 9 points is defined as below:
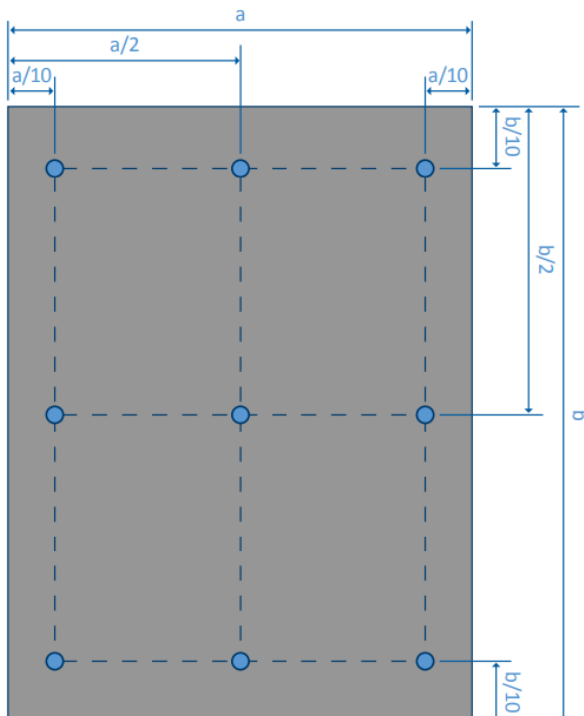
$$Luminance = \frac{(Total\ Luminance\ of\ 9\ points)}{9}$$

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

6. Timing Characteristics

6.1 AC Electrical Characteristics

Parameter	Symbol	Min	Typ.	Max	Unit	Note
Clock Frequency	R_{xFCLK}	40.8	51.2	67.2	MHz	--
Input data skew margin	T_{RSKM}	500	--	--	ps	--
Clock high time	T_{LVCH}	--	$4/(7*R_{xFCLK})$	--	ns	--
Clock low time	T_{LVCL}	--	$3/(7*R_{xFCLK})$	--	ns	--

6.2 Input Clock and Data Timing Diagram
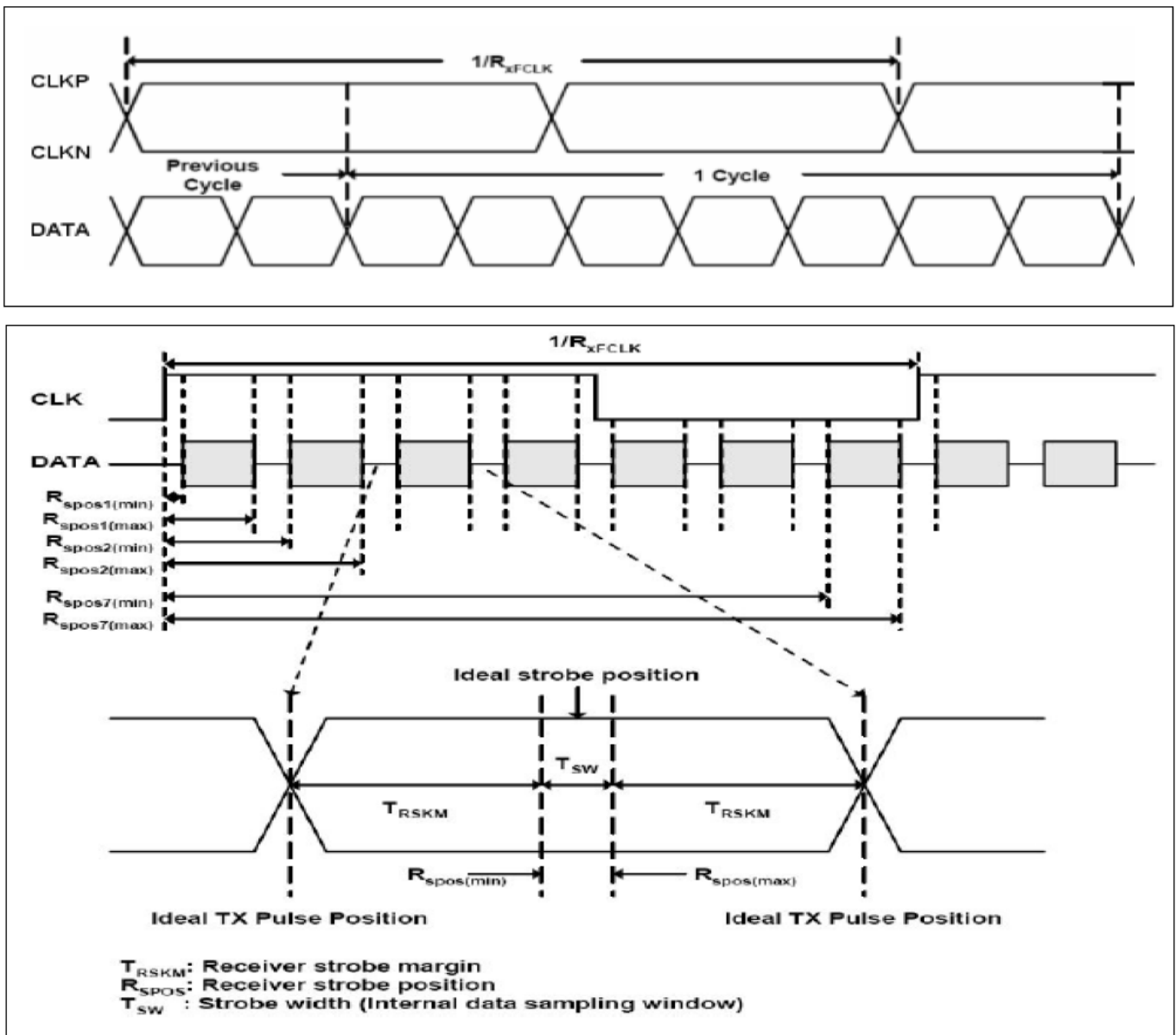
Figure 6.1: Clock and Data Input Diagram

6.3 DC Electrical Characteristics

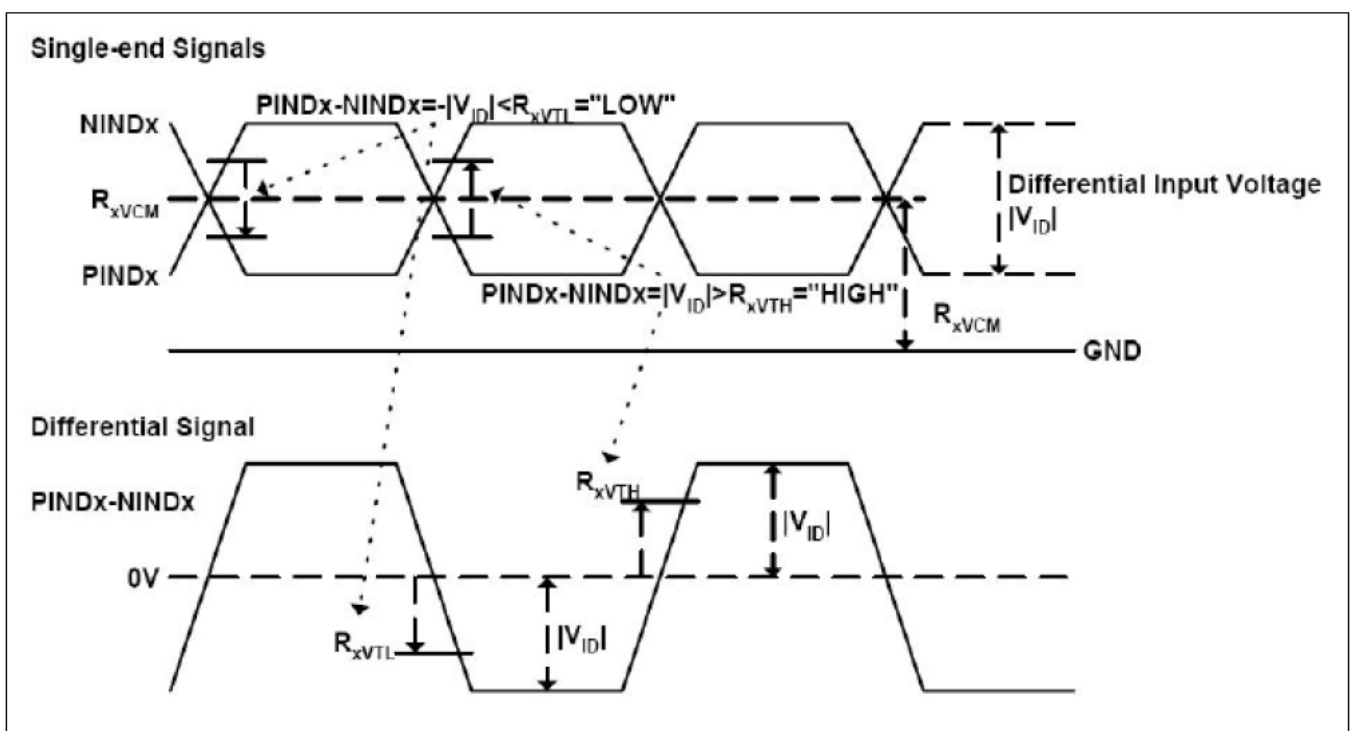| Parameter	Symbol	Min	Typ.	Max	Unit	Note
Differential Input High Threshold Voltage	RxVTH	--	--	+0.1	V	RxVCM=1.2V
Differential Input Low Threshold Voltage	RxVTL	-0.1	--	--	V	
Input Voltage Range (single ended)	RxVIN	0	--	2.4	V	--
Differential Input Common Mode Voltage	RxVCM	$|V_{ID}|/2$	--	$2.4-|V_{ID}|/2$	V	--
Differential Voltage	$|V_{ID}|$	0.2	--	0.6	V	--
Differential Input Leakage Current	RVxliz	-10	--	+10	uA	--

Figure 6.2: Single-End and Differential Signals Diagram

6.4 Horizontal and Vertical Timing Characteristics

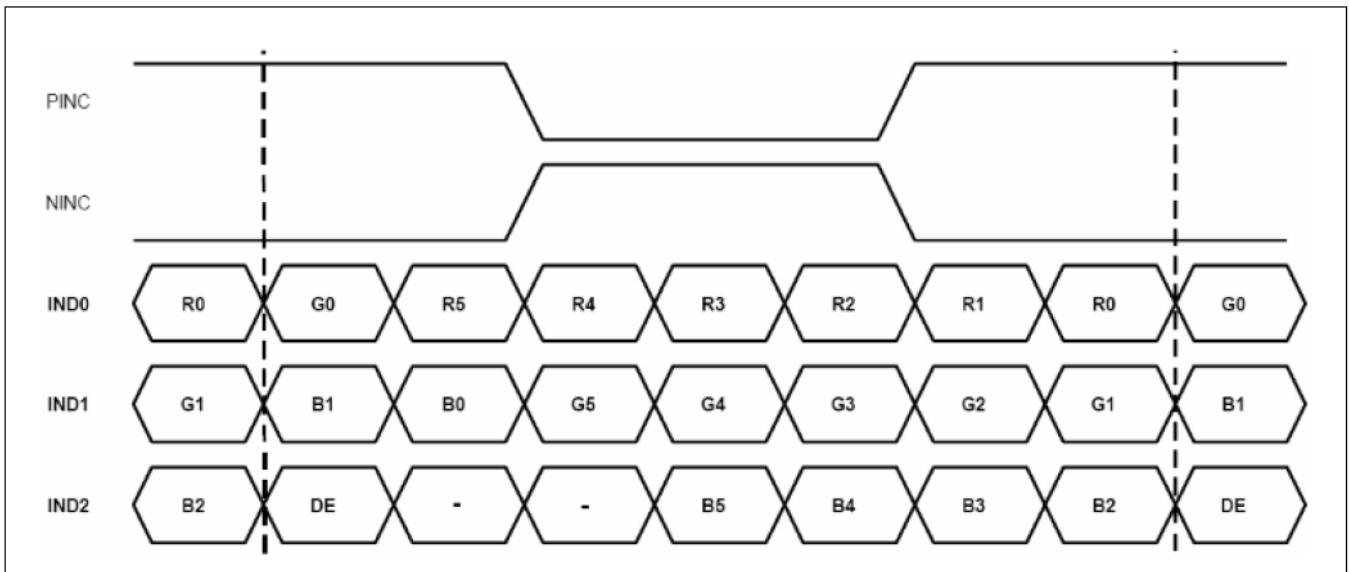| Parameter	Symbol	Min	Typ.	Max	Unit	Note
Clock Frequency	fclk	40.8	51.2	67.2	MHz	Frame rate = 60Hz
Horizontal Display Area	thd	1024	1024	1024	DCLK	--
HS Period Time	th	1114	1344	1400	DCLK	--
HS Blanking	thb	90	320	376	DCLK	--
Vertical Display Area	tvd	600	600	699	H	--
VS Period Time	tv	610	635	800	H	--
VS Blanking	thb	10	35	200	H	

6.5 Data Input Format

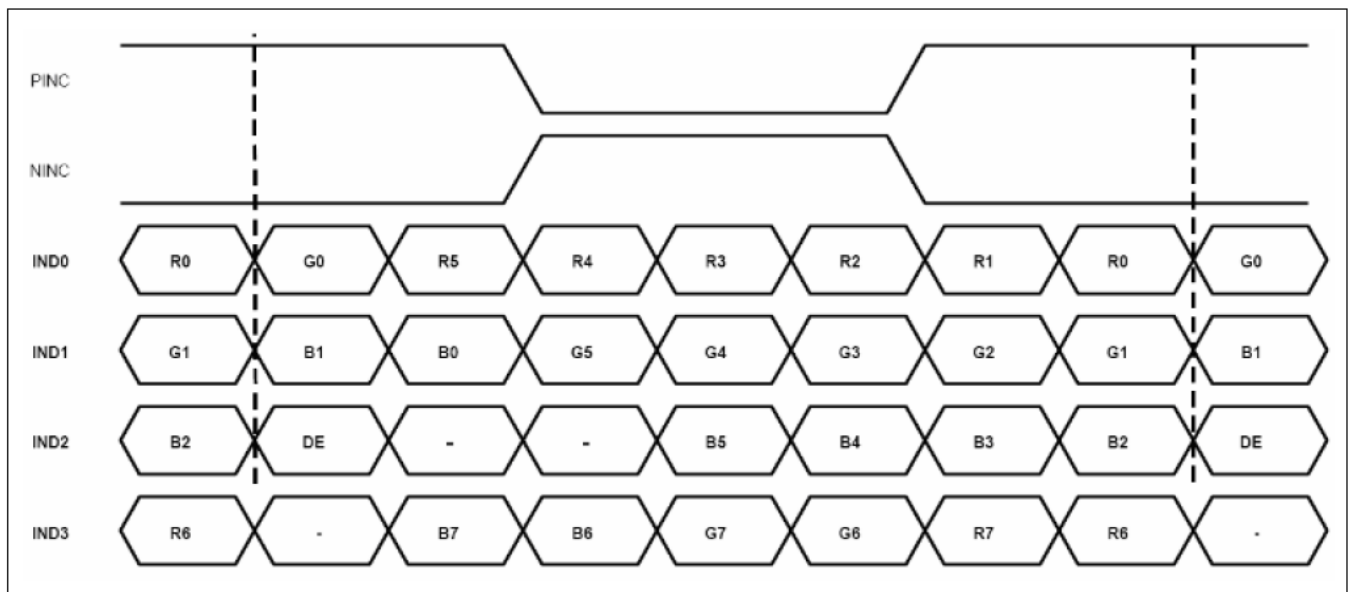*Figure 6:3 6-bit LVDS Input Format Diagram*

Figure 6.4: 8-bit LVDS Input Format Diagram

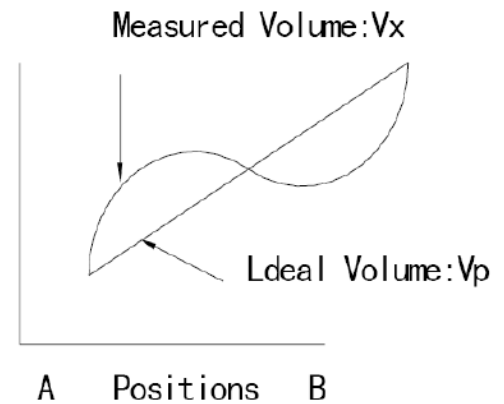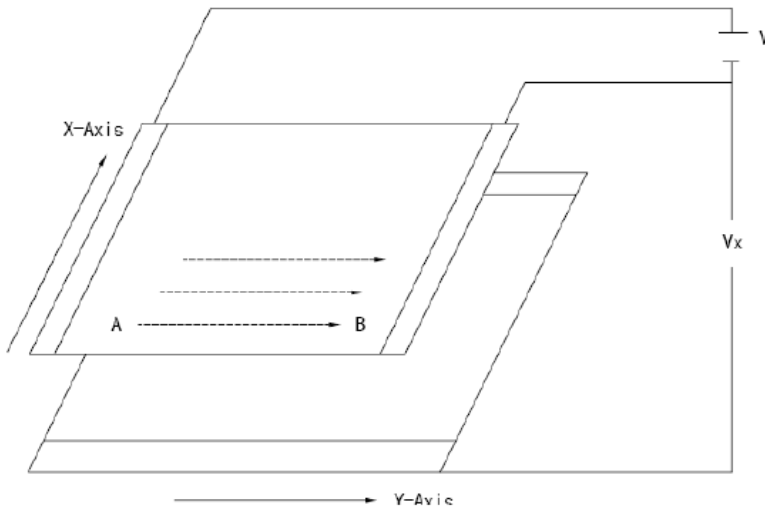*Note: Support DE timing mode only. Sync mode is not supported.*

7.   TP Feature

7.1   Conditions of Use and Storage

Item	Condition	Note
Temperature range upon operation	Humidity: 20%-90% non-dew, condensation -20℃~70℃	In a simple substance
Temperature range upon storage	Humidity: 20%-90% non-dew, condensation -30℃~80℃	In a simple substance

7.2   Electrical Property

Item	Value	Note
Maximum voltage	DC 5V	
Resistance between terminal	X direction (film side): 200-600 Ω	
	Y direction (glass side): 300-900 Ω	
Insulation resistance	DC 25V, 20MΩ or above	Connect X + ~X and Y+ ~Y, apply 25V DC
Chattering	10ms or below	Between X and Y for perform measurements
Rating	Voltage is 5V DC	

7.3 Mechanical Property

Item	Value		Note
Input method	Used of an exclusive pen or finger		
Load upon operation	Exclusive pen	60-100g or below	Operation and measurement with a pen must be carried out under the following tip conditions: Stylus pen material: POM (ployacetal) Tip: Diameter 3.0mm, SR 0.8 mm
	Finger	60-100g or below	Operation and measurement with a pen must be carried out under the following tip conditions: Stylus pen material: Silicon rubber (Hardness: 30°Hs) Tip: Diameter 12.0mm, SR 12.5 mm
Surface hardness	Pencil hardness: 3H or above		It complies with the way of test method JIS K5400

7.4 Optical Property

Item	Performance	Note
Total light transmittance	80% or above	JIS K7105
Haze	5% or below	JIS K7136
Film specification	Polished type with hard coated surface	

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.