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

TFT Display Module

Part Number

E70RA1-FW1700-N

Overview:

- 7.0-inch TFT (165x100 I I)
- 1024x600 iXr18
- 6/8-bit LVDS LIT↑LIT
- ° 0T πT Iix
- All View
- Transmissive
- No Touch Panel
- 1700 NITS
- TFT IC: 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 and a backlight unit. The resolution of the 7.0" TFT-LCD contains 1024(RGB)x600 pixels and can display up to 16.7M colors.

TFT Features

Display Colors: 16.7M

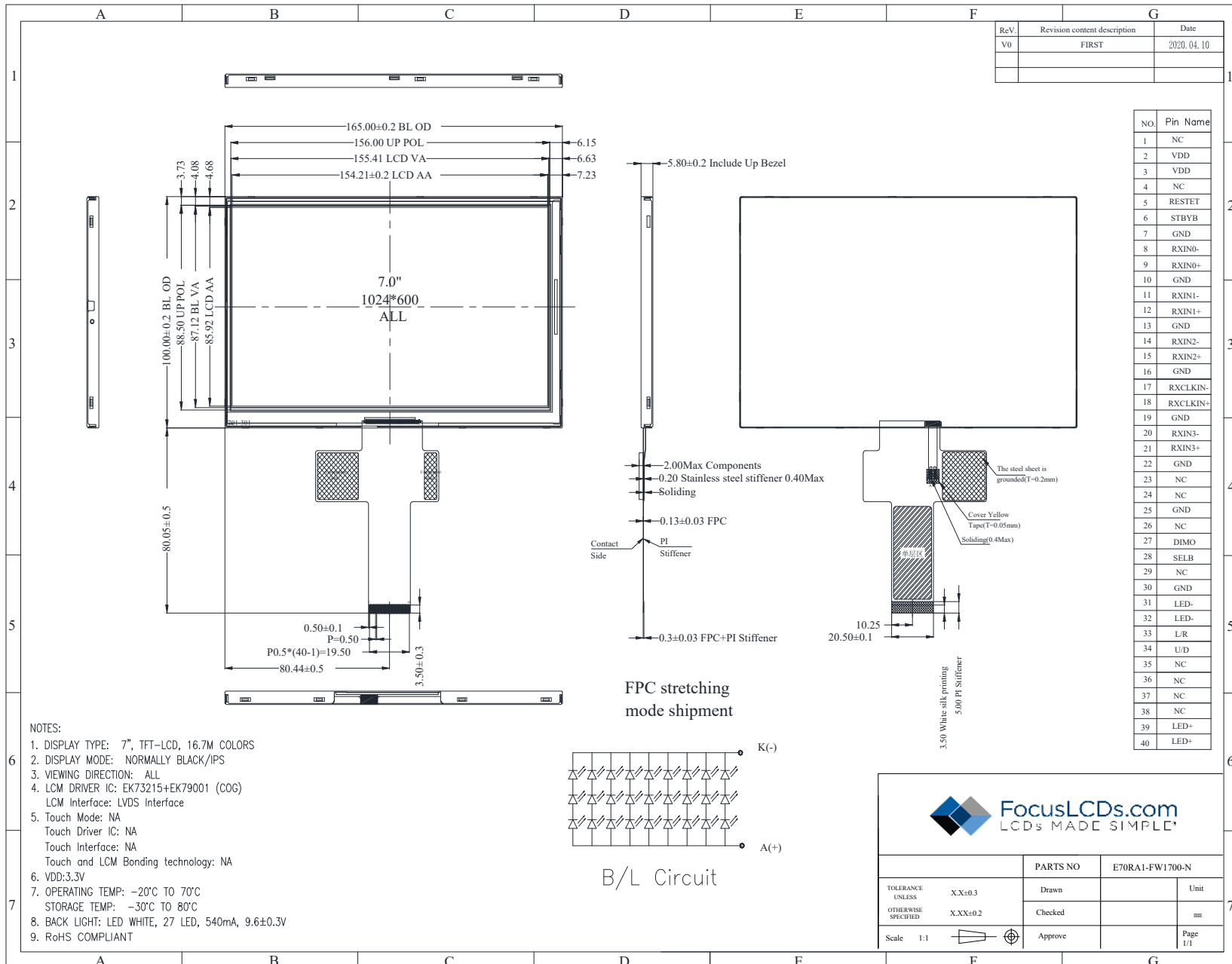
Interface: 6/8-bit LVDS

General Information Items	Specification	Unit	Note
	Main Panel		
TFT Display area (AA)	154.21(H) x 85.92 (7.0 inch)	mm	-
Driver Element	TFT active matrix	-	-
Display Colors	16.7M	colors	-
Number of pixels	1024(RGB)x600	dots	-
TFT Pixel arrangement	RGB vertical stripe	-	-
Pixel Pitch	0.1506 (H)x0.1432(V)	mm	-
Viewing angle	ALL	o'clock	-
TFT Controller IC	EK73215/EK79001	-	-
TFT Interface	6/8-bit LVDS	-	-
Display mode	Transmissive/ Normally Black	-	-
Operating temperature	-20~+70	°C	-
Storage temperature	-30~+80	°C	-

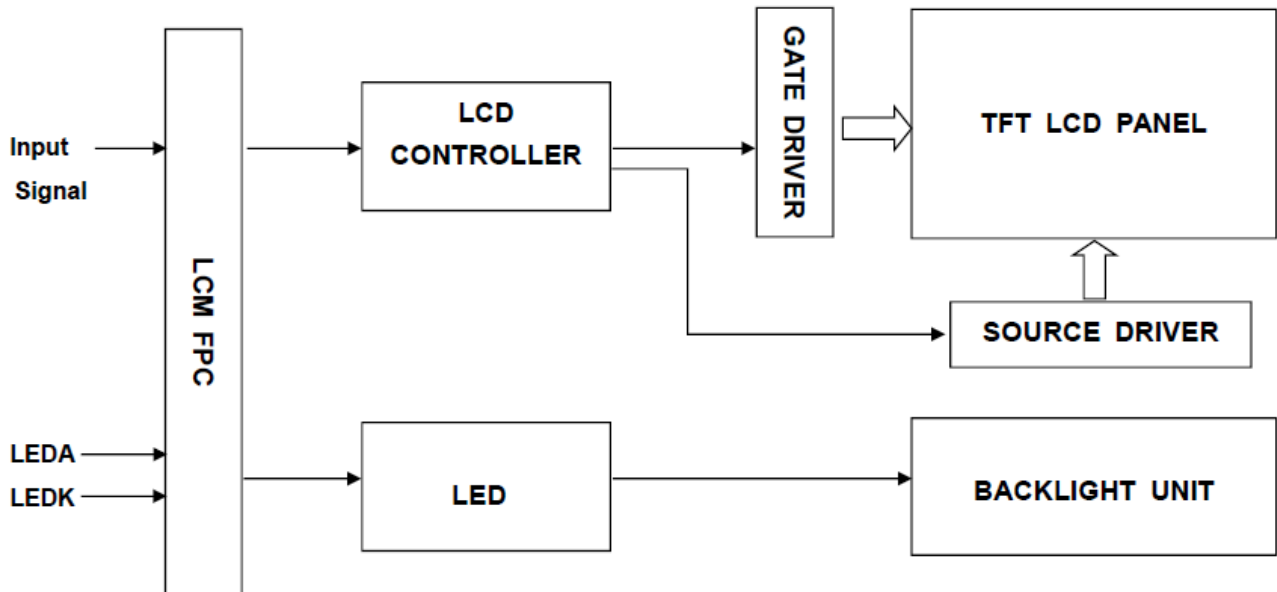
Mechanical Information

Item		Min	Typ.	Max	Unit	Note
Module Size	Horizontal (H)		165		mm	-
	Vertical (V)		100		mm	-
	Depth (D)		5.88		mm	-
	Weight		140		g	

2. Outline Dimensions



1. Block Diagram



3. Input Terminal Pin Assignment

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

NO.	Symbol	Description	I/O
1	NC	Not connected	--
2	VDD	Digital power supply	P
3	VDD		
4	NC	Not connected	--
5	RESET	Reset signal of the device. Active low.	I
6	STBYB	Standby mode. Pulled high. STBYB=1, normal operation mode. STBYB=0, timing controller with source driver off. The output is 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 clock 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	Not connected	--
24	NC	Not connected	--
25	GND	Ground	P
26	NC	Not connected	--
27	NC	Not connected	--
28	SELB	Input data format selection. SELB=0, 8-bit LVDS, SELB=1, 6-bit LVDS	I
29	NC	Not connected	--
30	GND	Ground	P
31	LED-	LED cathode pin of the backlight	P
32	LED-	LED cathode pin of the backlight	P
33	L/R	Horizontal shift direction (source output) selection	I
34	U/D	Vertical shift direction (gate output) selection	I
35-38	NC	Not connected	--
39	LED+	LED anode pin of the backlight	P
40	LED+	LED anode pin of the backlight	P

I: Input, O: Output, P: Power

NOTE:

When L/R = 0, right to left scan direction.
 When L/R=1, left to right scan direction
 When U/D=0, top to bottom scan direction
 When U/D=1, bottom to top scan direction

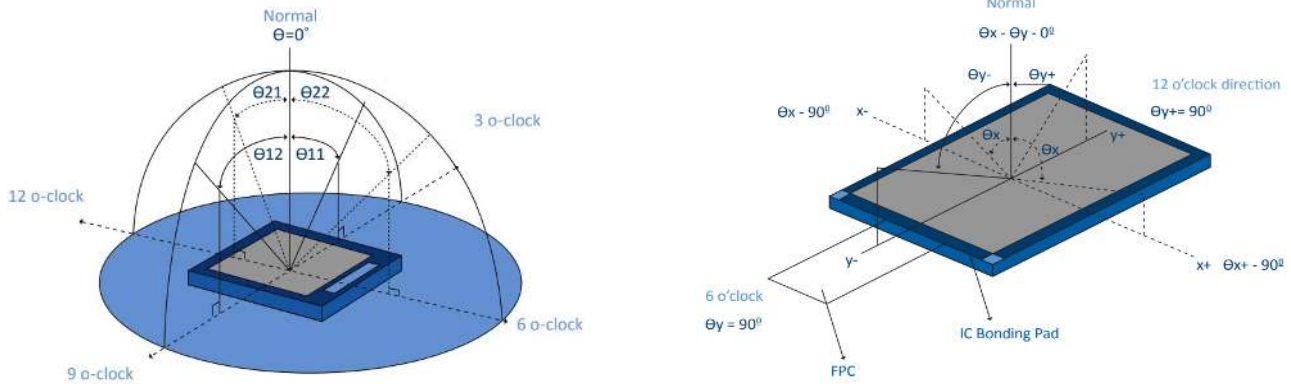
4. LCD Optical Characteristics

4.1 Optical Specifications

Item	Symbol	Condition	Min	Typ.	Max	Unit	Note	
Color Gamut	S%	θ=0 Normal viewing angle	45	50	--	%	(3)	
Contrast Ratio	CR		600	800	--	%	(2)	
Response Time	Rising		TR+TF	--	25	40	ms	(4)
	Falling							
Color Filter Chromaticity	White		W _X	0.2926	0.2953	0.2971		(5)(6)
			W _Y	0.3230	0.3253	0.3288		
	Red		R _X	0.5907	0.5910	0.5912		
			R _Y	0.3517	0.3524	0.3526		
	Green		G _X	0.3090	0.3095	0.3098		
			G _Y	0.5488	0.5490	0.5501		
	Blue	B _X	0.1512	0.1518	0.1520			
		B _Y	0.1037	0.1042	0.1048			
Viewing Angle	Hor.	ΘL	--	85	--	degrees	(1)(6)	
		ΘR	--	85	--			
	Ver.	ΘT	--	85	--			
		ΘB	--	85	--			
Option View Direction	ALL						(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.

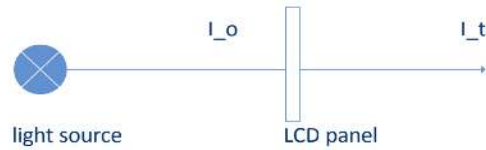


(2) Definition of Contrast Ratio (Cr): measured at the center point of panel. The contrast ratio (Cr) measured on a module, is the ratio between the luminance (Lw) in a full white area (R=G=B=1) and the luminance (Ld) in a dark area (R=G=B=0).

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

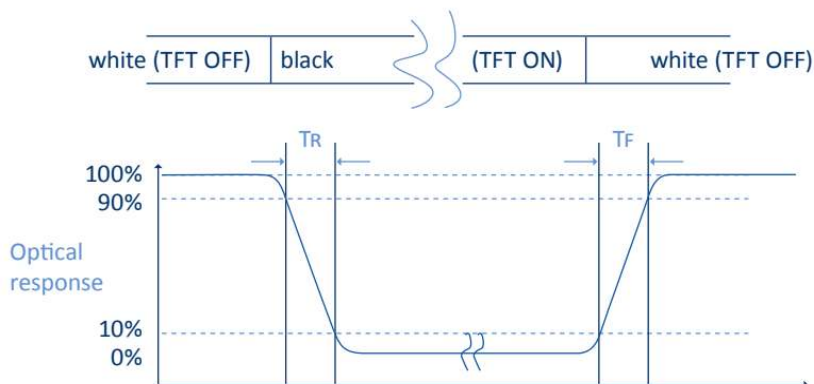
(3) Definition of transmittance (T%): The transmittance of the panel including the polarizers is measured with electrical driving. The equation for transmittance Tr is:

$$Tr = \frac{I_t}{I_o} \times 100\%$$



I_o = the brightness of the light source.
 I_t = the brightness after panel transmission

(4) Definition of Response Time (T_r , T_f): The rise time ' T_r ' 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 ' T_f ' 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.

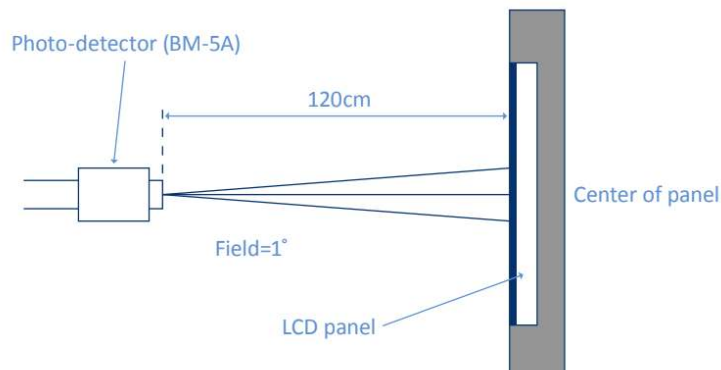
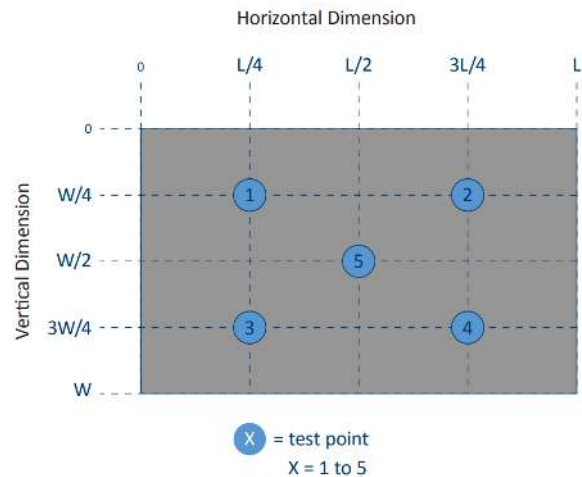
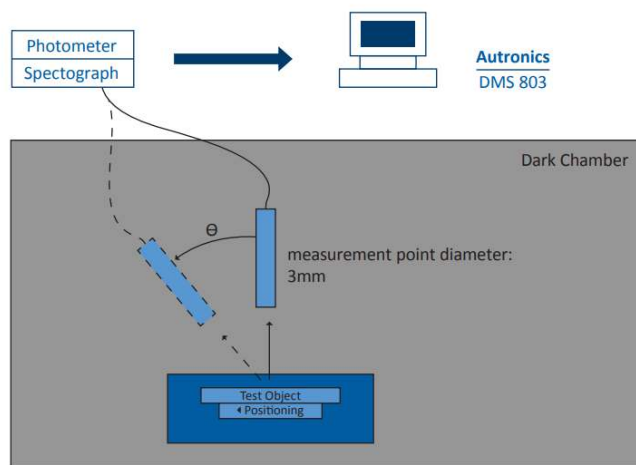


Fig. 1931 CIE chromacity diagram

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

(6) Definition of Optical Measurement Setup:

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	VDD	-0.3	6	V
Operating Temperature	TOP	-20	+70	°C
Storage Temperature	TST	-30	+80	°C

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	
Normal Mode Current	IDD	--	120	240	mA	
Level Input Voltage	VIH	0.7VDD	--	VDD	V	
	VIL	0	--	0.3VDD	V	
Level Output Voltage	VOH	VDD-0.4	--	--	V	
	VOL	0	--	0.4	V	

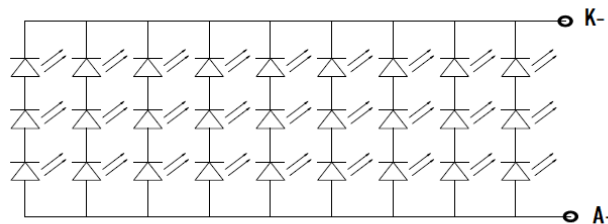
5.3 LED Backlight Characteristics

Item	Symbol	Min	Typ.	Max	Unit	Note
Forward Current	IF	180	540	--	mA	
Forward Voltage	VF	--	9.6	--	V	
LCM Luminance	LV	1650	1700	--	cd/m ²	Note 3
LED lifetime	Hr	--	50000	--	hour	Note1 & 2
Uniformity	AVg	80	--	--	%	Note 3

The back-light system is edge-lighting type with 27 white LEDs.

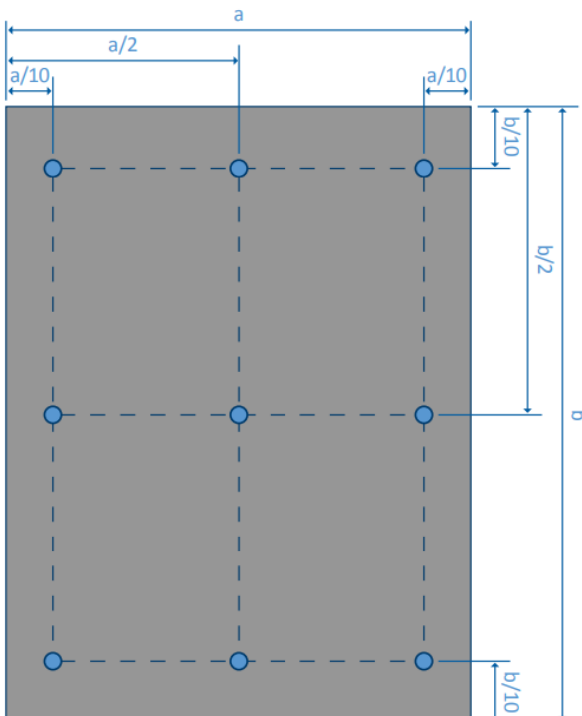
Note 1: LED lifetime (Hr) can be defined as the time in which it continues to operate under the condition: $T_a=25\pm 3^\circ\text{C}$, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note 2: The “LED lifetime” is defined as the module brightness decrease to 50% original brightness at $T_a=25^\circ\text{C}$ and $I_L=540\text{mA}$. The LED lifetime could be decreased if operating I_L is larger than 540mA. The constant current driving method is suggested.



Backlight LED 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. Timing Characteristics

6.1 AC Electrical Characteristics

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

6.2 Input Clock and Data Timing Diagram

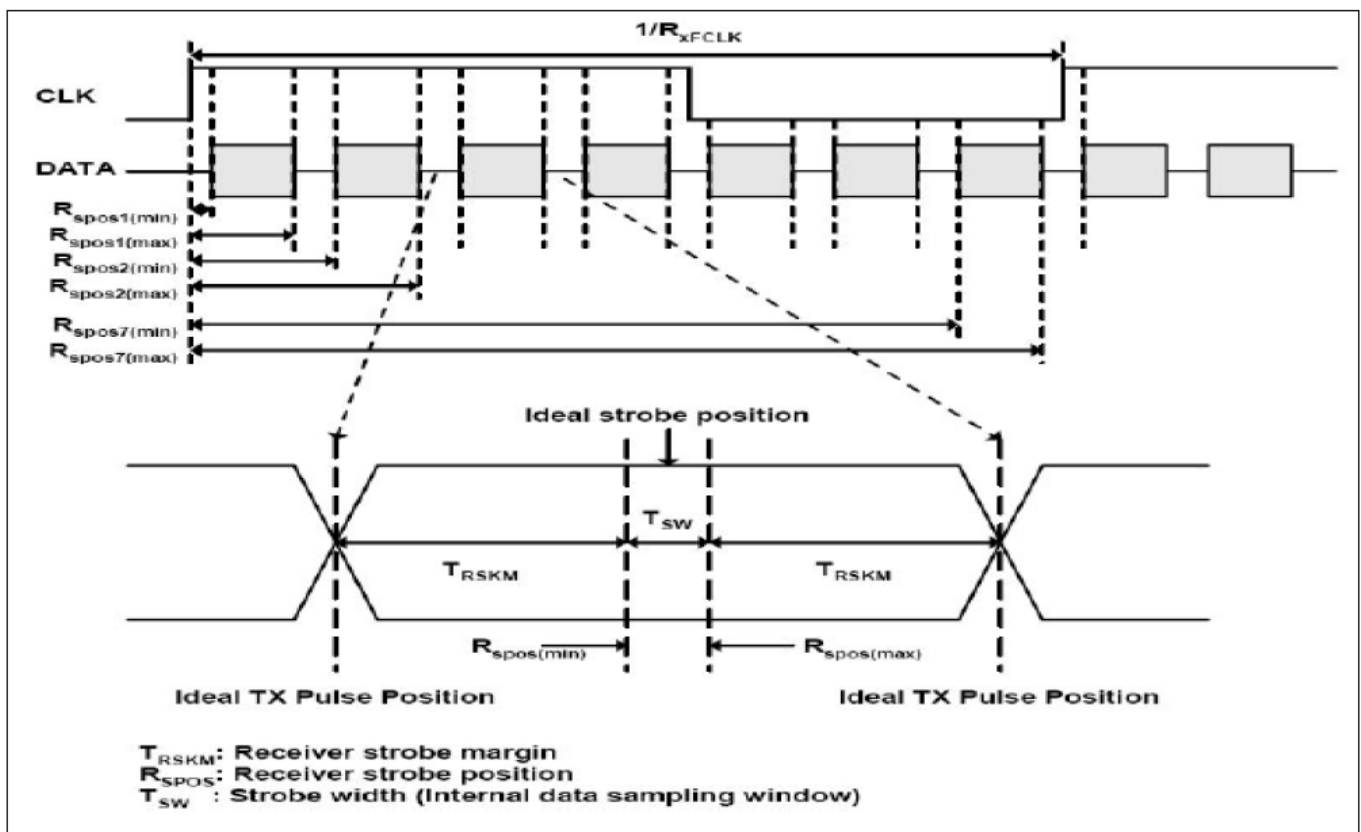
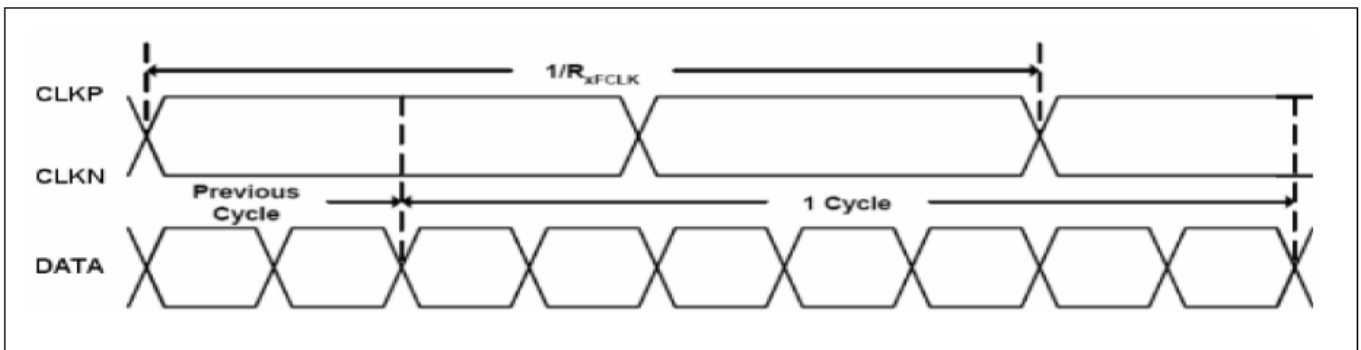


Figure 6.1: Clock and Data Input Diagram

6.3 DC Electrical Characteristics

Parameter	Symbol	Min	Typ.	Max	Unit	Note
Differential Input High Threshold Voltage	R _{xVTH}	--	--	+0.1	V	R _{xVCM} =1.2V
Differential Input Low Threshold Voltage	R _{xVTL}	-0.1	--	--	V	
Input Voltage Range (single ended)	R _{xVIN}	0	--	2.4	V	--
Differential Input Common Mode Voltage	R _{xVCM}	V _{ID} /2	--	2.4- V _{ID} /2	V	--
Differential Voltage	V _{ID}	0.2	--	0.6	V	--
Differential Input Leakage Current	R _{Vxliz}	-10	--	+10	uA	--

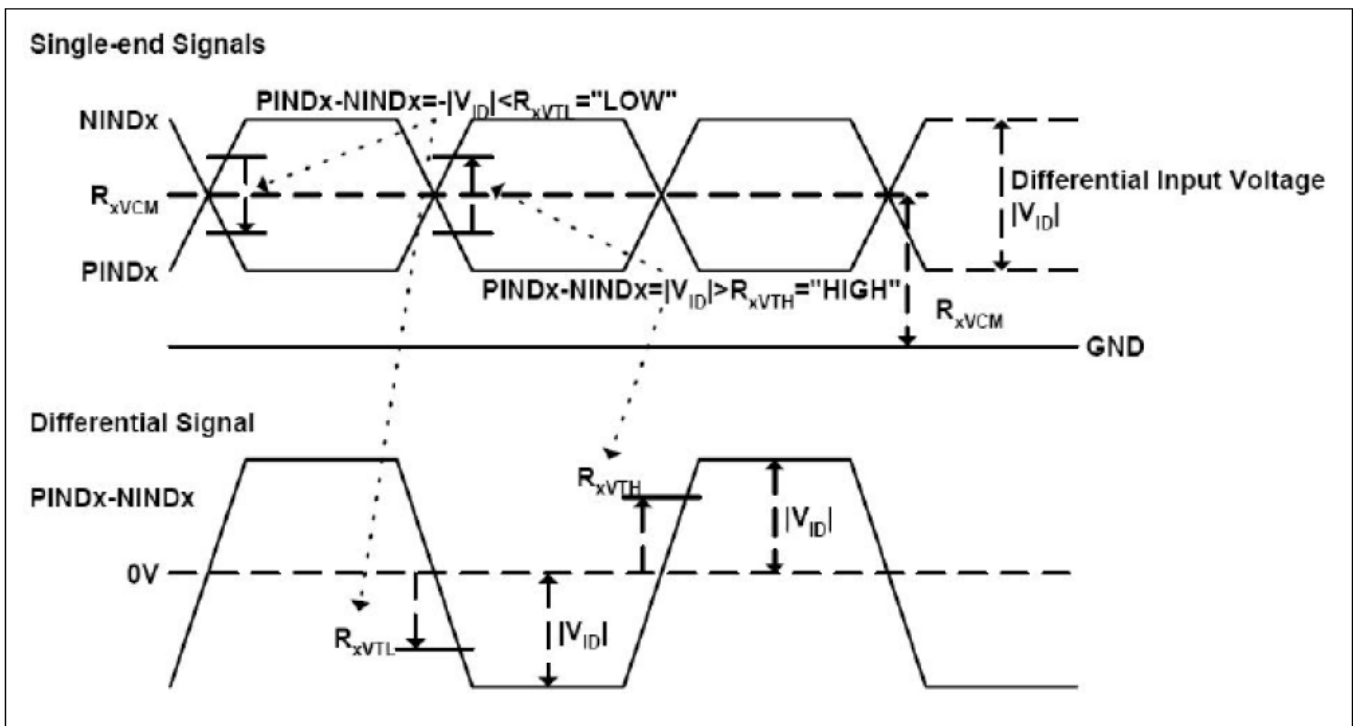


Figure 6.2: Single-End and Differential Signals Diagram

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

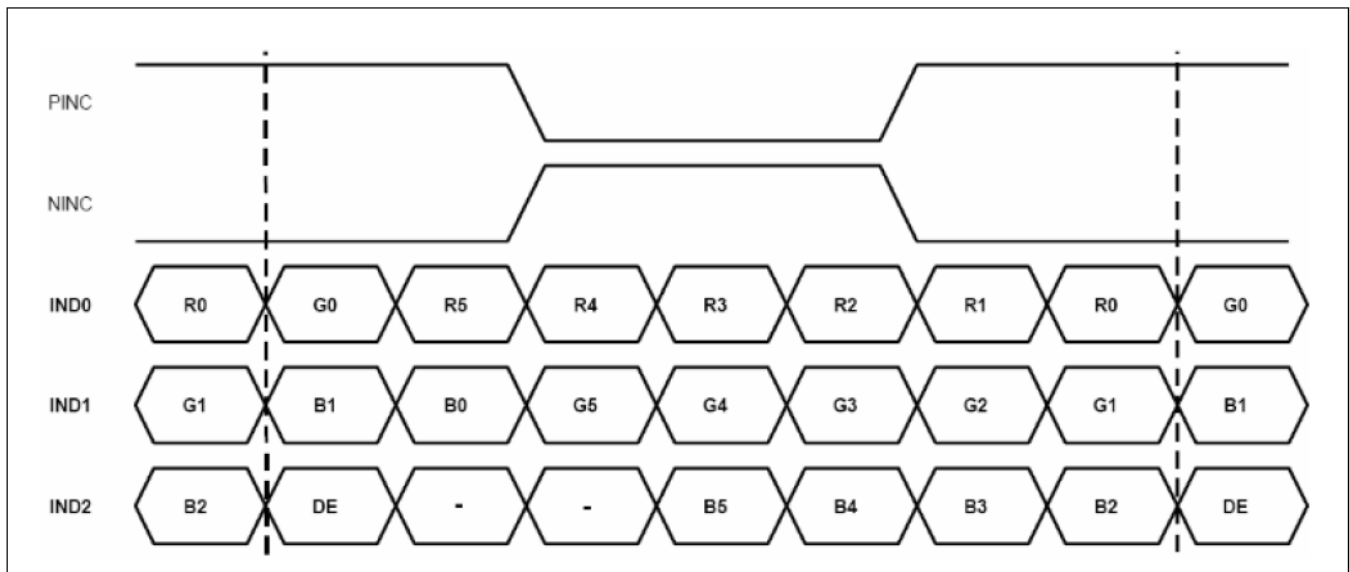


Figure 6.3: 6-bit LVDS Input Format Diagram

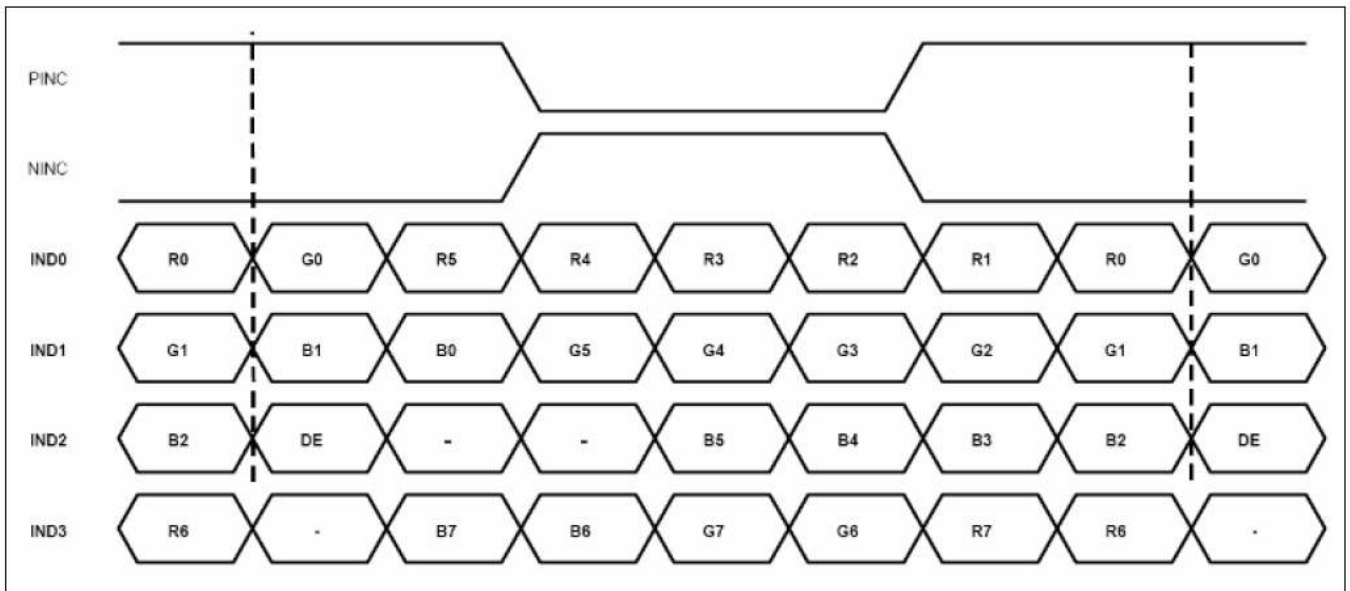


Figure 6.4: 8-bit LVDS Input Format Diagram

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

7. 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 °C 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.