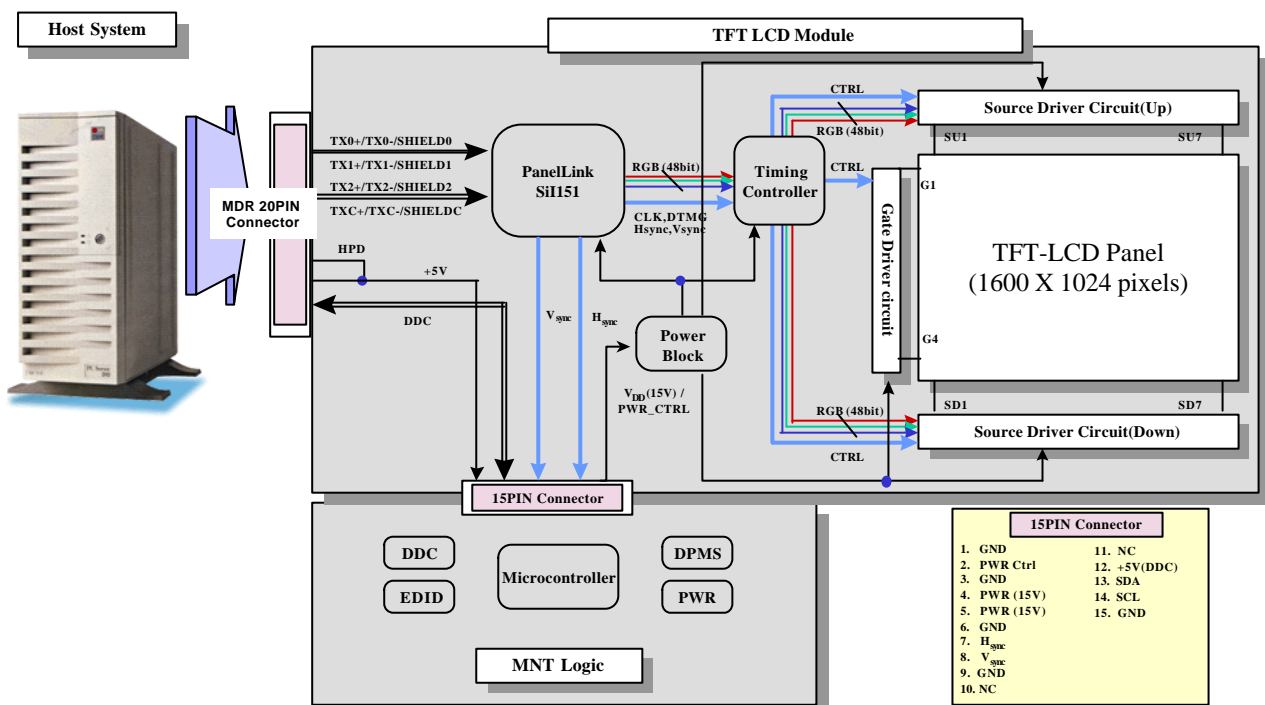


1. General Descriptions

The LM220W1 LCD is a Color Active Matrix Liquid Crystal Display with an integral Cold Cathode Fluorescent Lamp(CCFL) back light system. The matrix employs aSi Thin Film Transistor as the active element. It is a transmissive type display operating in the normally black mode. This TFT-LCD has a 22.0 inch diagonally measured active display area with wide-SXGA resolution(1024 vertical by 1600 horizontal pixel array). Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes. Gray scale or the luminance of the sub-pixel color is determined with a 8bit gray scale signal for each dot, thus, presenting a palette of more than 16,777,216 colors.

The LM220W1 has been designed to apply the TMDS™(Transition Minimized differential Signaling) as the interface method to enables a simple and low-cost implementation in both the host and monitor.

The LM220W1 LCD is intended to support applications where high brightness, wide viewing angle, high color gamut, and high color depth are very important. In combination with the vertical arrangement of the sub-pixels, the LM220W1 characteristics provide an excellent flat panel display for office automation products such as monitors.



General Display Characteristics

Followings are general features of the model LM220W1 LCD;

- Active display area 22.0 inches(56cm) diagonal
- Outsize dimensions 542.0w * 375.0h * 35.3t(typ)mm(Without Inverter)
- Pixel pitch 0.294 mm × 0.294 mm
- Pixel format 1600 horiz. By 1024 vert. pixels
- RGB vertical stripe arrangement
- Color depth 8-bit, 16,777,216 colors
- Display operating mode transmissive mode, normally black
- Surface treatments hard coating(3H), anti-glare treatment of the front polarizer
- Interface method TMDS™ interface using Si1151 chips and DFP connector
- Lamps Four CCFL(Cold Cathode Fluorescent Lamp)

2. Electrical Specifications

2-1. Electrical Characteristics

The LM220W1 requires two power inputs. One input is employed to power the LCD electronics and to drive the voltages to drive the TFT array and liquid crystal. And the second input which powers the CCFL, is typically generated by an inverter. The inverter is an external unit to the LCD.

Table 1 Electrical Characteristics:

Parameter	Symbol	Values			Units	Notes
		Min.	Typ.	Max.		
MODULE:						
Power Supply Input Voltage	V_{DD}	14.25	15.0	16.5	V_{DC}	1
Power Supply Input Current	I_{DD}	-	0.8	1.0	A	
Control Logic Input High	V_{IH}	2.6	-	-	V_{DC}	
Control Logic Input Low	V_{IL}	-	-	0.8	V_{DC}	
Control Logic Output High	V_{OH}	2.5	-	-		
Control Logic Output Low	V_{OL}	-	-	0.5		
LAMP (each CCFL)						2
Operating voltage	V_{BL}	1070	860	830	V_{RMS}	3
Operating Current	I_{BL}	3.0	8.0	9.0	mA	4
Established Starting Voltage						3
at 25		1400	-	-	V_{RMS}	
at 0		2100	-	-	V_{RMS}	
Operating Frequency	F_{BL}	40	50	60	KHZ	5
Discharge Stabilization time	T_S	-	-	3	minutes	6
Life time		15000	20000	-	hours	7

Notes: 1. The input current shall be measured at V_{DD} of 15.0Vdc at 25 , refresh rate of 60Hz, and pixel clock frequency of 112.2MHz under full white pattern(255gray).

2. The inverter should have symmetrical output voltage and current waveform because the performance of lamp is extremely influenced by the characteristics of it.
3. The values shall be measured at both end of lamp and are for reference for inverter design.
4. The value shall be measured at the ground cable and does not include loss of external inverter.
5. The lamp frequency shall be designed carefully to evade interference with Hsync frequency.
6. T_s is the time required for the brightness of the center of the lamp to be 95%. Assume the brightness is 100% after operating 5minutes.
7. The life time is defined as the time at which brightness of lamp is 50% compare to that of initial value at the typical lamp current on condition of continuous operating at $25 \pm 2^\circ\text{C}$.

2-2. Interface Connections

Interface chip in host side, must be used TMDSTM, part No. Sil150, designed by Silicon Image Inc., or its equivalent.

This LCD employs three kinds of interface connections. A 20 pin connector called by DFP connector, is used for TMDS signals from the host computer. This connector is fully compatible with DFP standard. Please, refer to Digital Flat Panel(DFP) standard for the detailed descriptions. A 15-pin connector is used for LCD module power and LCM controls signal from external monitor control circuits. And four connectors, a two pin connector, are used for the integral backlight system.

The pin configuration for the 20 pin DFP connector is shown in the table below.

Table 2 DFP CONNECTOR PIN CONFIGURATION (DFP Standard)

Pin	Symbol	Description	Pin	Symbol	Description
1	TX1+	TMDS positive differential output (channel1)	11	TX2+	TMDS positive differential output (channel2)
2	TX1-	TMDS negative differential output (channel1)	12	TX2-	TMDS negative differential output (channel2)
3	SHLD1	Shield for TMDS channel 1	13	SHLD2	Shield for TMDS channel 2
4	SHLDC	Shield for TMDS clock	14	SHLD0	Shield for TMDS channel 0
5	TXC+	TMDS positive differential output (reference clock)	15	TX0+	TMDS positive differential output (channel 0)
6	TXC-	TMDS negative differential output (reference clock)	16	TX0-	TMDS negative differential output (channel 0)
7	GND	Logic Ground	17	NC	Logic Ground
8	+5V	Logic +5V Supply (See note 2)	18	HPD	Hot Plug Detection (See note 3)
9	NC	No Connection	19	DDC_DAT	DDC2B Data (See note 4)
10	NC	No Connection	20	DDC_CLK	DDC2B Clock (See note 5)

- Notes:
- All shield pins and GND(ground) pin should be connected together and should also be connected to the LCD' s metal frame.
 - This +5V is only for external monitor control circuits and directly connected to 15 pin connector. The specifications for this source are the same as those defined in the VESA DDC Standard V3.0(+5V \pm 5%, 50mA minimum, 1.0A maximum).
 - This pin is internally connected to pin 8 (+5V) in LCM circuits.
 - 4, 5. These pins are only for external monitor control circuits and directly connected to 15 pin connector.
 6. Refer to appendix 1 regarding TMDS signal mapping.

The following is a preliminary list of DFP compatible connectors.

- 3M - Mini Delta Ribbon(MDR) Connector .050" series
 - Receptacle : P/N 10220-55G3 VC
 - Plug : P/N 10120-6000 EC
- AMP
 - Receptacle : P/N 917738-2
 - Plug : P/N 2-175677-2
- Molex
 - Receptacle : P/N 52515-2011
 - Plug : P/N 52316-2011

Please, contact connector manufacturer for detail description of this connector.

Product General Specification

A 15 pin connector for external monitor control circuits, is a model 53261 manufactured by Molex. The mating connector part number is 51021 or its equivalent. The pin configuration for this connector is shown in the table below.

Table 3 15 PIN CONNECTOR PIN CONFIGURATION

Pin	Symbol	Description	Notes
1	GND	Ground	1
2	PWR_CTRL	LCM power control input signal Low : LCM power down except Sil151 receiver High : Normal operation mode	2
3	GND	Ground	
4	V _{DD}	LCM power supply, +15V ± 5%	
5	V _{DD}	LCM power supply, +15V ± 5%	
6	GND	Ground	
7	H _{SYNC}	H _{SYNC} out from Sil151 receiver	
8	V _{SYNC}	V _{SYNC} out from Sil151 receiver	
9	GND	Ground	
10	NC	No connection (Reserved)	
11	NC	No connection (Reserved)	
12	+5V_DDC	+5V out for DDC	3
13	SDA	DDC data line out	
14	SCL	DDC clock line out	
15	GND	Ground	

- Notes:
1. All GND(ground) pins should be connected together and should also be connected to the LCD's metal frame.
 2. LCM power control input signal for power saving mode. If this pin is held low state, LCM goes to power saving mode except Sil151 receiver.
 3. Pin 12, 13, 14 are for DDC2B communication between host computer and external monitor control circuits. These pins are directly connected to 20 pin DFP connector.

The backlight interface connector is a model BHSR-02VS-1, manufactured by JST. The mating connector part number is SM02B-BHS-1 or equivalent. The pin configuration for the connector is shown in the table below.

Table 4 BACKLIGHT CONNECTOR PIN CONFIGURATION

Pin	Symbol	Description	Notes
1	HV	Lamp power input	1
2	LV	Ground	2

- Notes:
1. The input power terminal is colored pink. Ground pin color is white.
 2. The backlight ground should be common with LCD metal frame.

4.PRECAUTIONS

The LCD Products listed on this documents are not suitable for use of Military,Industry,Medical etc. system.

If customers intend to use these LCD products for above application, Please contact ours sales people in advance.