

SV104SAZ

SolarView 10.4" TFT LCD

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Revision History

Revision	Date	Page(s)	Description
0.0	12 Jun 07	all	First preliminary version
0.1	01 Aug 07	all	Updated optical figures; Changed document template

1 General Description

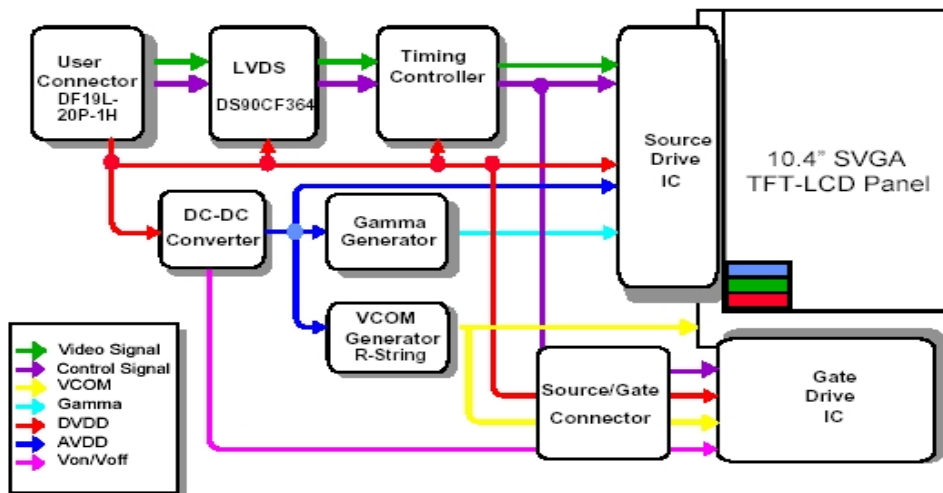
The SV104SAZ is a Color Active Matrix Liquid Crystal Display with an integral Cold Cathode Fluorescent Tube (CCFT) backlight system. The matrix employs a-Si Thin Film Transistor as the active element. It is a SolarView type (1) display operating in the normally white mode. This TFT-LCD has 10.4 inches diagonally measured active display area with SVGA resolution (600 vertical by 800 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 brightness of the sub-pixel color is determined with a 6-bit gray scale signal for each dot, thus, presenting a palette of up to 262144 colors.

The SV104SAZ has been designed to apply the interface method that enables low power. Flat Link must be used as a LVDS (Low Voltage Differential Signaling) chip.

The SV104SAZ is intended to support applications where thin thickness, low power are critical factors and graphic display are important. In combination with the vertical arrangement of the sub-pixels, the SV104SAZ characteristics provide an excellent flat display for office automation products such as Public information, public transportation, car navigation use and outdoor application where sunlight readability is critical.

(1) SolarView type means that has a function of transmissive and reflective mode in a body and it is able to use at indoor or outdoor under dark and sunlight at all.



1.1 General Features

Active screen size	10.4 inches(26.4cm) diagonal
Outline Dimension	246.0(W) x 177.8(H) x 10.5 Max. (D) mm (Typ.)
Pixel format	800 horiz. By 600 vert. Pixels (RGB stripes arrangement)
Color depth	6-bit, 262144 colors
Luminance (white)	530 cd/m2 (Typ.)
Reflectance	2.5 % (Max.)
Power consumption	6.91Watt at B/L ON, (0.91 Watt at B/L OFF)
Weight	535 g (Max.)
Display operating mode	Sunlight readable mode, Normally White
Surface treatments	UV coating and low reflection treatment of the front polarizer

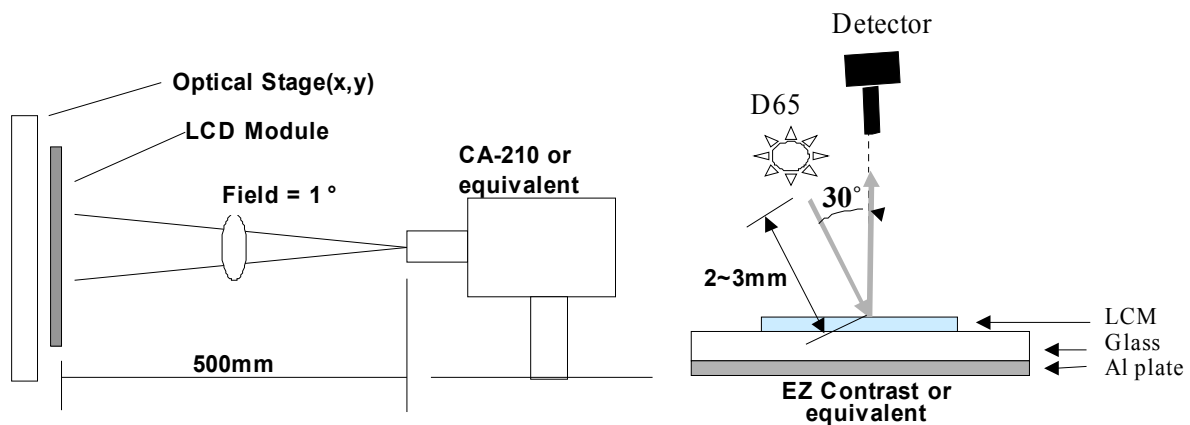
2 OPTICAL SPECIFICATION

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 15 minutes in a dark environment at 25 °C.

The values specified are at an approximate distance of 500mm from the LCD surface at a viewing angle equal to 0 °.

		Values			units	Note	
		Min.	Typ.	Max.			
At Indoor	Brightness	480	530	-	cd/m ²		
	Contrast Ratio	-	300		-		
	Viewing angle (CR > 10)	Left	-	65	-	degree	
		Right	-	65	-	degree	
		Top	-	55	-	degree	
		Bottom	-	60	-	degree	
Color coordinates	White X-axis	Typ	0.314	Typ. +0.05	-		
	White Y-axis	-0.05	0.331		-		
At 80Klux	Reflectance	-	-	2.5	%		
	Brightness	-	900	-	cd/m ²		
Response time	Rise time	-	10	20	msec		
	Fall time	-	30	50	msec		

Conditions: Ta=25±2 °C, Vdd=3.3V, fV=60Hz, fDclk=40.0MHz, IL=6.0mA



3 ELECTRICAL SPECIFICATION

3.1 Electrical Characteristics

The SV104SAZ requires two power inputs. One is employed to power the LCD electronics and to drive the TFT array and liquid crystal. The second input which powers the CCFT, is typically generated by an inverter. The inverter is an external unit to the LCD.

ITEM		SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
Power Supply Voltage		V_{DD}	3.0	3.3	3.6	V	
Differential Input Threshold Voltage	High	V_{IH}	-	-	+100	mV	(1)
	Low	V_{IL}	-100	-	-	mV	
Power Consumption	White	I_{DD}	-	230	-	mA	(2),(4)
	Mosaic		-	250	-	mA	
	Vertical		-	275	-	mA	
Vsync Frequency		f_v	-	60	-	Hz	-
Hsync Frequency		f_H	-	37.879	-	KHz	
Main Frequency		f_{DCLK}	-	40.0	-	MHz	
Rush Current		I_{RUSH}	-	-	1.5	A	

Note:

1. Condition : $V_{CM} = +1.2V$ (Common mode voltage)
2. $f_v = 60Hz$, $f_{DCLK} = 65MHz$, $V_{DD} = 3.3V$, DC current
3. 1 pixel / clock
4. Power dissipation check pattern
 - (a) White pattern
 - (b) Mosaic pattern
 - (c) Vertical pattern

3.2 Back light unit

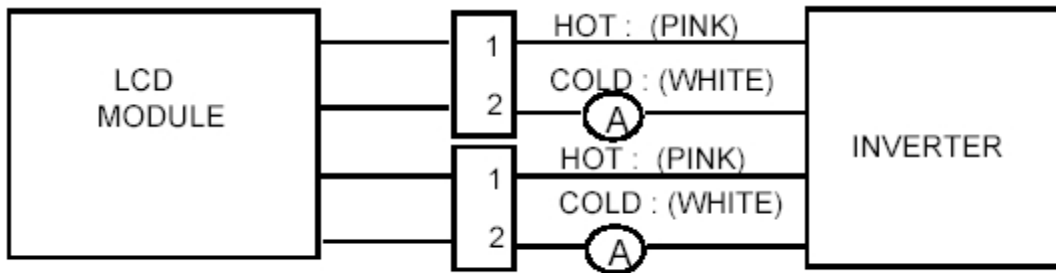
The back light unit is an edge-lighting type with dual CCFTs (Cold Cathode Fluorescent Tube). The characteristics of two dual lamps are shown in the following tables.

Item	Symbol	Min.	Typ.	Max.	unit	Note
Lamp current	I_L	3.5	6.0	7.0	mArms	
Lamp Voltage	V_L	-	500	-	Vrms	
Lamp Frequency	f_L	40	55	70	KHz	
Power consumption	P_L	-	60	-	Watt	$I_L=6mA$
Operating Life time	Hr	30.000	-	-	Hr	
Startup Voltage	V_s	-	-	25°C	Vrms	
				0°C		

Important: The waveform of the inverter output voltage must be area symmetric and the design of the inverter must have specifications for modularized lamp. The performance of the back-light, for example life time or brightness, is much influenced by the characteristics of the DC-AC inverter for the lamp. So all the parameters of an inverter should be carefully designed so as not to produce too much leakage current from high-voltage output of the inverter.

When you design or order the inverter, please make sure that a poor lighting caused by the mismatch of the back-light and the inverter (miss lighting, flicker, etc.) never occur. When you confirm it, the module should be operated in the same condition as it is installed in your instrument.

Notes



No 2 Pin is VLow.

1. Lamp current is measured with current meter for high frequency as shown above
2. Lamp frequency may produce interference with horizontal synchronous frequency which may cause line flow on the display. Therefore lamp frequency should be detached from the horizontal synchronous frequency and its harmonics as far as possible in order to avoid interference.
3. Refer to $IL \times VL \times 2CCFT$ to calculate.
4. Life time (Hr) of a lamp can be defined as the time in which it continues to operate under the condition $T_a = 25 \pm 2^\circ\text{C}$ and $IL = 6\text{mArms}$ until one of the following event occurs.
 - a. When the brightness becomes 50% or lowers than its original.
 - b. When the effective ignition length becomes 80% or lowers than its original value. (Effective ignition length is defined as an area that has less than 70% brightness compared to the brightness in the center point.)
5. The voltage above this value should be applied to the lamp for more than 1 second to startup. Otherwise, the lamp may not be turned on.

4 CONNECTORS

4.1 Interface connector

Input Signal & Power (LVDS connector : DF19L-20P-1H [Hirose])

Pin No.	Symbol	Function	Polarity	Remark
1	VDD	Power Supply +3.3V		
2	VDD	Power Supply +3.3V		
3	GND	Ground		
4	GND	Ground		
5	RxIN0-	LVDS Differential Data input	Negative	R0~R5 ,G0
6	RxIN0+	LVDS Differential Data input	Positive	
7	GND	Ground		
8	RxIN1-	LVDS Differential Data input	Negative	G1~G5 ,B0,B1
9	RxIN1+	LVDS Differential Data input	Positive	
10	GND	Ground		
11	RxIN2-	LVDS Differential Data input	Negative	B2~B5 ,Vs,Hs,DE
12	RxIN2+	LVDS Differential Data input	Positive	
13	GND	Ground		
14	RxCLK-	LVDS Differential Data input	Negative	Clock
15	RxCLK+	LVDS Differential Data input	Positive	
16	GND	Ground		
17	GND	Ground		
18	GND	Ground		
19	GND	Ground		
20	GND	Ground		

4.2 Back-light connector

Connector: JST BHSR-03VS-01

Mating connector: JST SM02(8.0)B-BHS

Pin No.	Symbol	Color	Function
1	Hot	Pink	High Voltage
2	Cold	White	Low Voltage

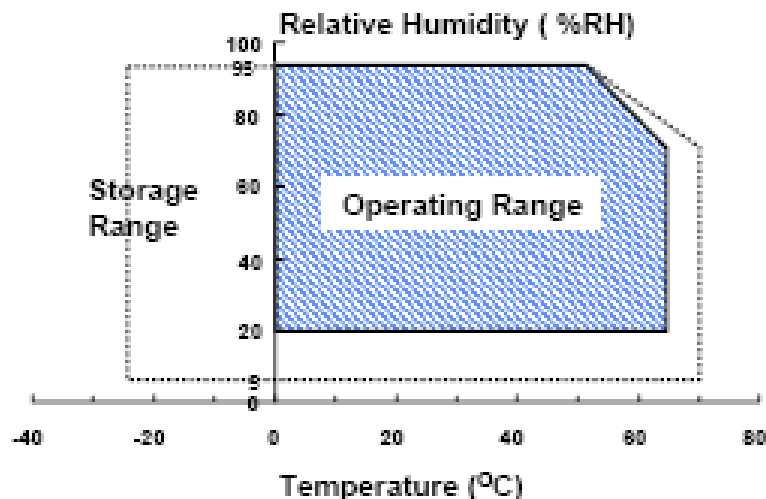
5 OPERATING CONDITIONS

The following are maximum values which, if exceeded, may cause operation or damage to the unit.

PARAMETER	Symbol	VALUES		UNITS	NOTES
		MIN	MAX		
Power input voltage	V_{cc}	$V_{ss} - 0.3$	4.0	V	At $25 \pm 2^\circ\text{C}$
Logic input voltage	V_{in}	$V_{ss} - 0.3$	$V_{cc} + 0.3$	V	At $25 \pm 2^\circ\text{C}$
Lamp current	I_L	3.0	7.0	mA rms	1
Lamp frequency	F_L	40	80	KHz	1
Operating temperature	T_{OPR}	0	65	$^\circ\text{C}$	2
Storage temperature	T_{STG}	-25	70	$^\circ\text{C}$	2
Operating ambient humidity	H_{OPR}	10	90	% RH	2
Storage humidity	H_{STG}	10	90	% RH	2

Notes

1. Permanent damage to device may occur if maximum values are exceeded. Functional operation should be restricted to the conditions described under normal operating conditions.
2. Temperature and relative humidity range are shown in the figure below.
 $95\% \text{ RH Max}$ ($50^\circ\text{C} > T_a$)
 Maximum wet – bulb temperature at 39°C or less ($T_a > 50^\circ\text{C}$). No condensation.



6 MECHANICAL DIAGRAMS

The contents provide general mechanical characteristics for the model SV104SAZ. In addition the figures in the next page are detailed mechanical drawing of the LCD.

MechANICAL Spec.		Values	units
Outline Dimension	(H)	226.5 ± 0.5	mm
	(V)	177.8 ± 0.5	mm
	(D)	10.5 Max.	mm
Bezel Area	(H)	215.6 ± 0.3	mm
	(V)	162.8 ± 0.3	mm
Active Area	(H)	211.2	mm
	(V)	158.4	mm
Weight		535 Max.	gram
Surface Treatment		UV coating and low reflection treatment of the front polarizer	

7 WARNINGS AND PRECAUTIONS

7.1 Handling

- When the module is assembled, it should be attached to the system firmly using all mounting holes. Be careful not to twist or bend the modules.
- Because the inverter uses high voltage, it should be disconnected from power before it is assembled or disassembled.
- Refrain from strong mechanical shock and /or any force to the module. In addition to damage, this may cause improper operation or damage to the module and CCFT backlight.
- Note that polarizers are very fragile and could be easily damaged. Do not press or scratch the surface using the harder than a HB pencil lead.
- Wipe off water droplets or oil immediately. If you leave the droplets for a long time, straining and discoloration may occur.
- If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.
- The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane. Do not use Ketone type material (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride, they might permanent damage the polarizer due to chemical reaction.
- 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.
- Protect the module from static which may cause damage to CMOS Gate Array IC.
- Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
- Do not disassemble the module.
- Do not pull or fold the lamp wire.
- Do not adjust the variable resistor located on the module.
- Protection film for polarizer on the module should be slowly peeled off just before use so that electrostatic charge can be minimized.
- Pins of I/F connector should not be touched directly with bare hands.

7.2 Storage

- Do not leave the module in high temperature, 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 %.
- Do not store the TFT-LCD module in direct sunlight. The module should be stored in a dark place. It is prohibited to apply sunlight or fluorescent light in storage.

7.3 Operation

- Do not connect or disconnect the module in the “Power On” condition.
- Power supply should always be turned on/off by “Power on/off sequence”.
- Module has high frequency circuits. Sufficient suppression to the electromagnetic interference should be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

- The cable between the backlight connector and its inverter power supply should be connected directly with a minimized length. A longer cable between the backlight and the inverter may cause lower luminance of lamp (CCFT) and may require higher startup voltage (Vs).

7.4 Others

- Avoid condensation of water which may result in improper operation or disconnection of electrode.
- Do not exceed the absolute maximum rating value. (Supply voltage variation, and so on) Otherwise the module may be damaged.
- If the module keeps displaying the same pattern for a long period of time, the image may be “sticked” to screen. To avoid image sticking, it is recommended to use a screen saver.
- This module has its circuitry PCB’s on the rear side and should be handled carefully in order not to be stressed.
- Please contact Pacer in advance when you display the same pattern for a long time.