

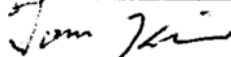


PRELIMINARY PRODUCT INFORMATION

(All information in this technical data sheet is
subject to change without notice.)

Updated: 07/15/2009

22.0" Wide SXGA Very High Bright TFT-LCD

LVM220WSXSB-L03 **(PRELIMINARY)**

PRODUCT ENGINEERING DEPT. Vertex LCD Inc.			
	Name	Signature	Date
CREATED BY	Tom Kim		7/15/2009
REVIEWED BY	Eric Kim		7/17/2009
APPROVED BY	Ed Kang		7/17/2009

CONTENTS

NO.	ITEM	Page
-	COVER	1
-	CONTENTS	2
-	REVISION HISTORY	3
1	GENERAL DESCRIPTION	4
2	ABSOLUTE MAXIMUM RATING	4
3	ELECTRICAL CHARACTERISTICS	5,6
3.1	Vcc Power Dip Conditions	6
4	INTERFACE CONNECTIONS	7,8
5.1	Outline of input signal Timings	8
5.2	Timing Characteristics	9
6	COLOR INPUT DATA REFERENCE	10
7	Power Sequence	11
8	OPTICAL SPECIFICATIONS	12
9	MECHANICAL CHARACTERISTICS	13
10	MECHANICAL SPECIFICATIONS	14,15
11	RELIABILITY	16
12	PACKING FORM	16
13	PRECAUTIONS	16
14.1	MOUNTING PRECAUTION	16,17
14.2	OPERATING PRECAUTION	17
14.3	ELECTROSTATIC DISCHARGE CONTROL	17
14.4	STORAGE	17
14.5	HANDLING PRECAUTION FOR PROTECTION FILM	17,18
A	OPTICAL CHARACTERISTIC MEASUREMENT EQUIPMENT AND METHOD	18
B	LUMINANCE	18
C	RESPONSE TIME	19
D	VIEWING ANGLE	19

1. General Description

LVM220WSXSB-L03 is 22.0" Color Active Matrix Liquid Crystal Display with an integral LED backlight system. The matrix employs Thin Film Transistor as the active element. It is a transmissive type display operating in the normally white mode. This TFT-LCD has 22.0 inch diagonally measured active display area with Wide SXGA resolution (1680 horizontal by 1050 vertical 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 8-bit gray scale signal for each dot, thus presenting a palette of more than 16.7M colors.

The LVM220WSXSB-L03 is intended to support applications where high brightness, broad viewing angle are critical factors. In combination with the vertical arrangement of the sub-pixels, the LVM220WSXSB-L03 characteristics provide an excellent flat panel display for office or industrial automation products or daylight applications.

General Specification

General specifications are summarized in the following table:

ITEM	SPECIFICATION
Active screen size	22.0 inches(55.868cm) diagonal 473.76(H) X 296.1(V) mm
Outline dimensions	493.70(H) × 320.10(V) × 16.50(D) mm Typ.
Pixel pitch	0.282(H) mm × 0.282(V) mm
Pixel format	1680(H) X 1050(V) pixels (16:10 wide screen)
Color Pixel Arrangement	RGB stripe arrangement
Color depth	8-bit, 16.7M colors
Brightness	1,000 cd/m ²
Power Consumption	Total 34.7 Watt, typ (5.85 Watt @Vcc, Black Pattern, 28.8 Watt @LED)
Weight	2700g (typ.)
Display operating mode	transmissive mode, normally White
Surface treatments	hard coating(3H), Anti-glare
Backlight Unit	White LED

2. Absolute Maximum Rating

Parameter	Symbol	Values		Units	Notes
		Min.	Max.		
Power Supply Voltage	V _{CC}	-0.3	+5.5	V	at 25°C
Logic Input Voltage	V _{IN}	-0.3	+4.3	V	
Operating Temperature	T _{OP}	0	+50	°C	Note 1,2
Storage Temperature	T _{ST}	-20	+60	°C	Note 1

Notes: 1. Humidity Less than 90% RH at Ta ≤ 40°C. No condensation.

2. The temperature of panel surface should be 0 °C Min. and 60 °C Max.

3. Electrical Characteristics

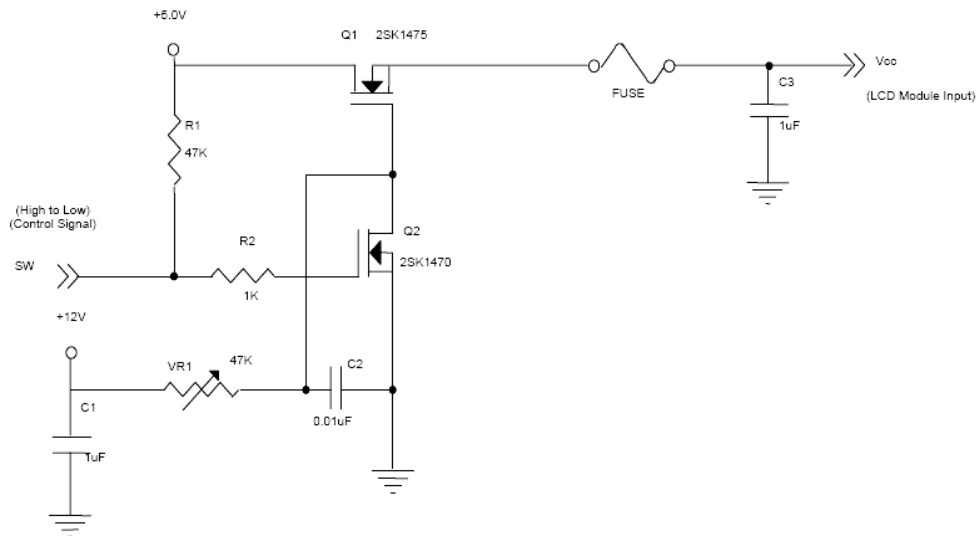
The LVM220WSXSB-L03 requires two power inputs. One is employed to power the LCD electronics and to drive the TFT array and liquid crystal. The second input, which powers the LED, is typically generated by a LED driver. The LED Driver is an external unit to the LCD.

Parameter	Condition	Symbol	Values			Units	Notes
			Min.	Typ.	Max.		
MODULE: Power Supply Voltage Ripple Voltage Rush Current		V_{CC} V_{RP} I_{RUSH}	+4.5 - -	+5.0 - -	+5.5 250 3	Vdc mV A	2
Power Supply Current	White Black $f_v = 75\text{Hz}$ $V_{CC} = 4.5\text{V}$	I_{CC}	-	630 1170 1330 1330	819 1521 1729 1729	mA	3 a 3 b 4 4
LED BACKLIGHT: Operating Voltage Power Consumption Life Time	$(I_{BL} = 1.6\text{A})$	V_{BL} P_{BL}	- 17.0 -	- 18.0 28.8	- 19.0 -	Vdc Watts	5,6
			20,000	30,000		Hrs	

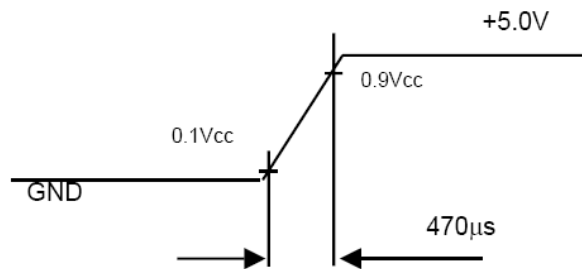
Above all conditions are VDD=5.0V, all black pattern at 75HZ.

Notes 1. The module is recommended to operate within specification ranges listed above for normal function.

2. Measurement Conditions:

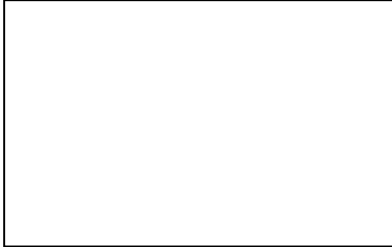


Vcc rising time is 470µs



3. The specified power supply current is under the conditions at $V_{cc} = 5.0\text{ V}$, $T_a = 25 \pm 2\text{ }^\circ\text{C}$, $f_v = 60\text{ Hz}$, whereas a power dissipation check pattern below is displayed.

a. White Pattern



Active Area

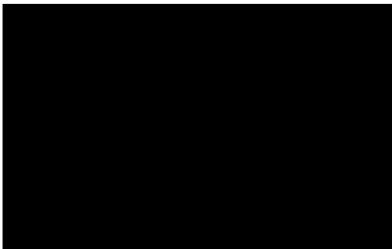
b. Black Pattern



Active Area

4. The specified power supply current is under the conditions at $V_{cc} = 4.5\text{ V}$, $T_a = 25 \pm 2\text{ }^\circ\text{C}$, $f_v = 75\text{ Hz}$, whereas a power dissipation check pattern (Black Pattern) below is displayed.

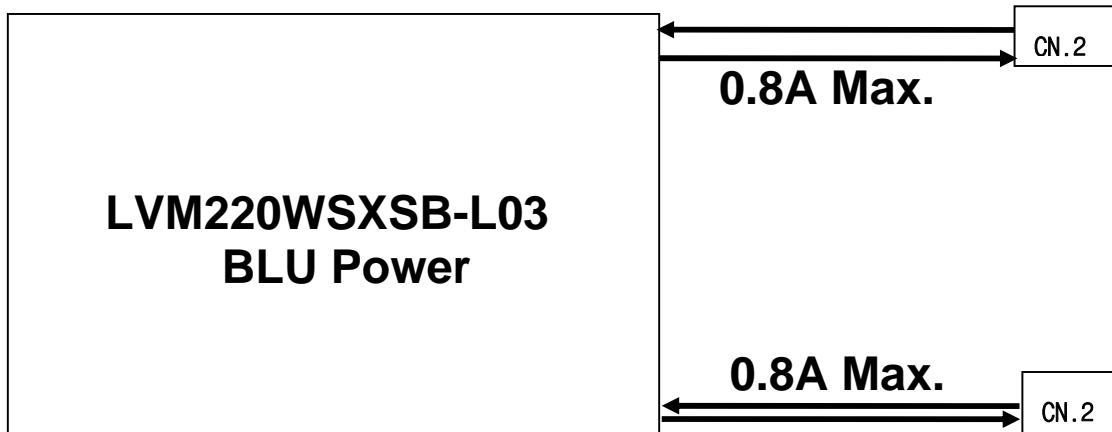
Black Pattern



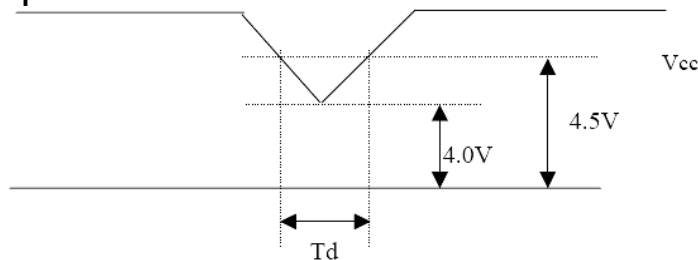
Active Area

5. The life time is determined as the time at which brightness of lamp is 50% compare to that of initial value at the typical LED current & at ambient temperature of 25°C .

6. LVM220WSXSB-L03 load voltage should be about 18.0V at 1.6A max current.



3.1 Vcc Power Dip Condition:



Dip condition: : $4.0\text{ V} \leq V_{cc} \leq 4.5\text{ V}, T_d \leq 20\text{ ms}$

4. Interface Connections

CN 1(interface signal): LVM220WSXSB-L03 uses 30-pin connector for module electronics.

Used connector: 093G30-B0001A(STARCONN) or FI-X30SSL-HF(JAE) or equivalent connectors

Matching side: No.: FI-X30H ; FI-X30C* ; FI-X30M* ; FI-X30HL(-T),FI-X30C*L(-T) [JAE]

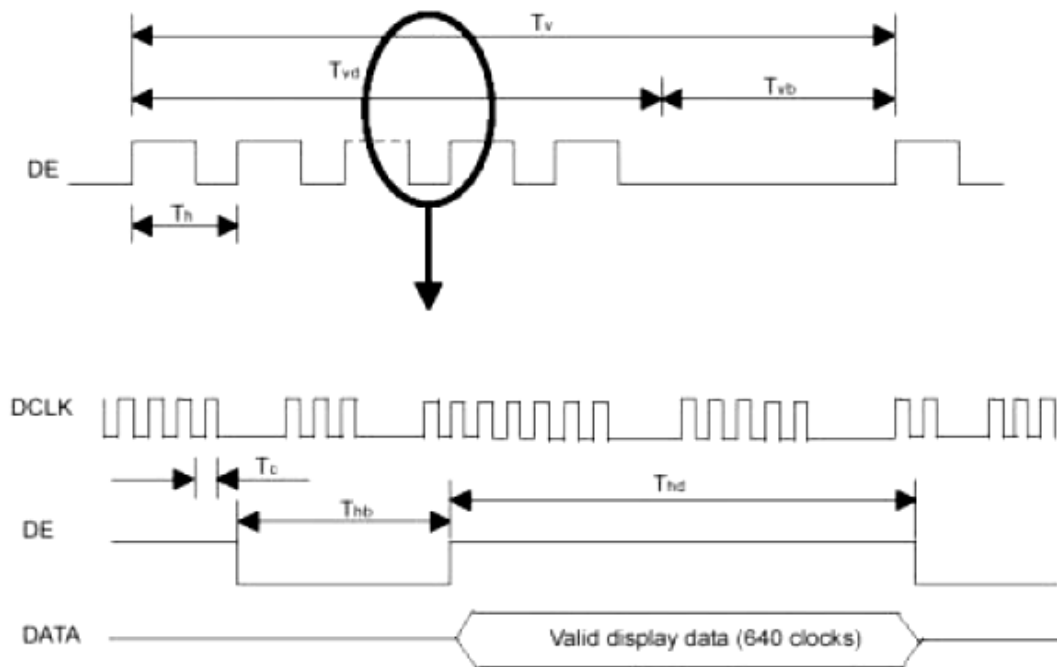
Pin	Symbol	Function	Remark
1	RXO0-	Negative LVDS differential data input. Channel O0 (odd)	
2	RXO0+	Positive LVDS differential data input. Channel O0 (odd)	
3	RXO1-	Negative LVDS differential data input. Channel O1 (odd)	
4	RXO1+	Positive LVDS differential data input. Channel O1 (odd)	
5	RXO2-	Negative LVDS differential data input. Channel O2 (odd)	
6	RXO2+	Positive LVDS differential data input. Channel O2 (odd)	
7	GND	Ground	
8	RXOC-	Negative LVDS differential clock input. (odd)	
9	RXOC+	Positive LVDS differential clock input. (odd)	
10	RXO3-	Negative LVDS differential data input. Channel O3(odd)	
11	RXO3+	Positive LVDS differential data input. Channel O3 (odd)	
12	RXE0-	Negative LVDS differential data input. Channel E0 (even)	
13	RXE0+	Positive LVDS differential data input. Channel E0 (even)	
14	GND	Ground	
15	RXE1-	Negative LVDS differential data input. Channel E1 (even)	
16	RXE1+	Positive LVDS differential data input. Channel E1 (even)	
17	GND	Ground	
18	RXE2-	Negative LVDS differential data input. Channel E2 (even)	
19	RXE2+	Positive LVDS differential data input. Channel E2 (even)	
20	RXEC-	Negative LVDS differential clock input. (even)	
21	RXEC+	Positive LVDS differential clock input. (even)	
22	RXE3-	Negative LVDS differential data input. Channel E3 (even)	
23	RXE3+	Positive LVDS differential data input. Channel E3 (even)	
24	GND	Ground	
25	NC	Not connection, should open.	
26	VCOM	VCOM Control, should open.	
27	AGMODE	AGMODE should be tied to ground or open.	
28	Vcc	+5.0V Power supply	
29	Vcc	+5.0V Power supply	
30	Vcc	+5.0V Power supply	

CN 2(backlight): LVM220WSXSB-L03 employs Molex 51004-0200 or equivalent connectors for the LED backlight.

Pin	Symbol	Description	Notes
1	V	Lamp power input	PINK (or Red)
2	Ground	Ground	WHITE (or Black)

SELLVDS = Low or Open								
LVDS Channel E0	LVDS output †	D7	D6	D4	D3	D2	D1	D0
	Data order	EG0	ER5	ER4	ER3	ER2	ER1	ER0
LVDS Channel E1	LVDS output †	D18	D15	D14	D13	D12	D9	D8
	Data order	EB1	EB0	EG5	EG4	EG3	EG2	EG1
LVDS Channel E2	LVDS output †	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	EB5	EB4	EB3	EB2
LVDS Channel E3	LVDS output †	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	EB7	EB6	EG7	EG6	ER7	ER6
LVDS Channel O0	LVDS output †	D7	D6	D4	D3	D2	D1	D0
	Data order	OG0	OR5	OR4	OR3	OR2	OR1	OR0
LVDS Channel O1	LVDS output †	D18	D15	D14	D13	D12	D9	D8
	Data order	OB1	OB0	OG5	OG4	OG3	OG2	OG1
LVDS Channel O2	LVDS output †	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	OB5	OB4	OB3	OB2
LVDS Channel O3	LVDS output †	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	OB7	OB6	OG7	OG6	OR7	OR6

5.1 Outline of input signal Timings



5.2 Timing Characteristics

ITEM	Symbol		Min.	Typ.	Max.	Unit	Note
LVDS Clock	Frequency	F _c	50	59.5	82	MHz	-
	Period	T _c	13.4	16.8	-	Ns	-
	High Time	T _{ch}	-	4/7	-	Tc	
	Low Time	T _{cl}	-	3/7	-	Tc	
LVDS Data	Setup Time	T _{lvs}	600	-	-	Ps	
	Hold Time	T _{lvh}	600	-	-	Ps	
Vertical Active Display Term	Frame Rate	Fr	50	60	76	Hz	T _v =T _{vd} +T _{vb}
	Total	T _v	1060	1080	1195	Th	
	Display	T _{vd}	1050	1050	1050	Th	
	Blank	T _{vb}	T _v -T _{vd}	30	T _v -T _{vd}	Th	
Horizontal Active Display Term	Total	T _h	890	920	1000	Tc	T _h =T _{hd} +T _{hb}
	Display	T _{hd}	840	840	840	Tc	
	Blank	T _{hb}	T _h -T _{hd}	80	T _h -T _{hd}	Tc	

Note : Because this module is operated by DE only mode, Hsync and Vsync input signals should be set to low logic level or ground. Otherwise, this module would operate abnormally.

6. Color Input Data Reference

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color; the higher the binary input, the brighter the color. The table below provides a reference for color versus data input.

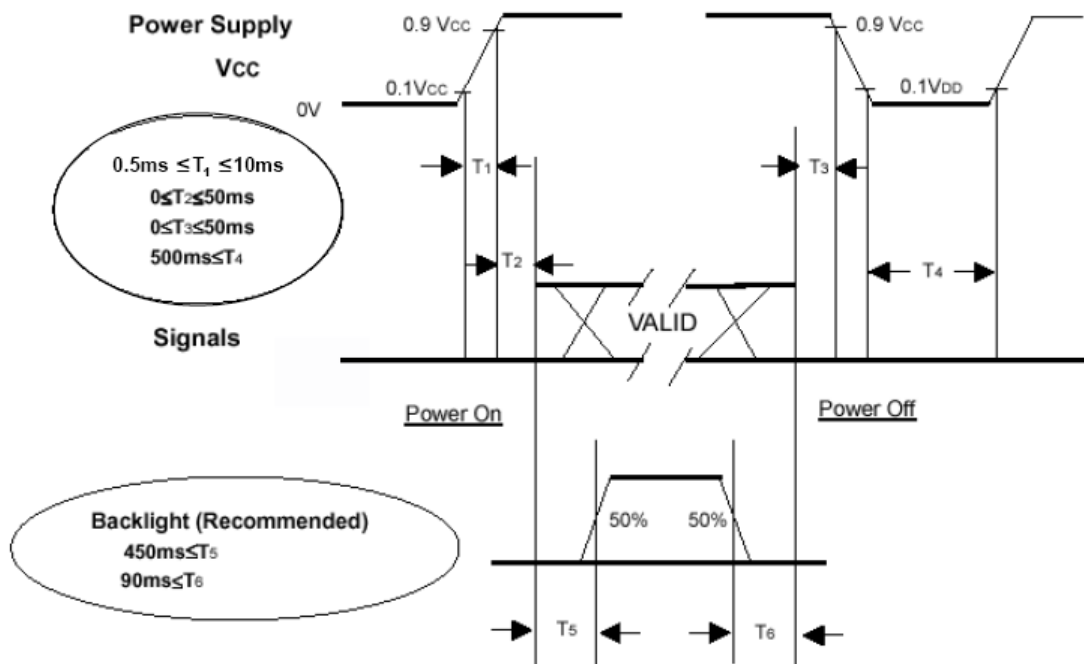
Color		Input Color Data																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Red	Red(000) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Red(001)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0		

	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Red(255) Bright	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Green	Green(000)Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Green(001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0		

	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0		
	Green(255)Bright	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0		
Blue	Blue(000) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Blue(001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1		

	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1		
	Blue(255) Bright	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1		

7. Power Sequence



8. Optical Specifications

Optical characteristics are determined after the unit has been 'ON' and stable in a dark environment at 25°C. The values specified are at an approximate distance 50cm from the LCD surface at a viewing angle of Φ and θ equal to 0°.

Appendix A presents additional information concerning the measurement equipment and method.

Parameter	Symbol	Values			Units	Notes
		Min.	Typ.	Max.		
Contrast Ratio	CR	500	1,000	-		1
Surface Luminance, white	L _{WH}	-	1,000	-	cd/m ²	2
Luminance Variation	δ_{WHITE}	75				3
Response Time						
Rise Time	T _R	-	1.3	2.2	msec	4
Fall Time	T _D	-	3.7	5.8	msec	
CIE Color Coordinates						
Red	X _G	-	TBD	-		
	Y _G	-	TBD	-		
Green	X _B	-	TBD	-		
	Y _B	-	TBD	-		
Blue	X _w	-	TBD	-		
	Y _w	-	TBD	-		
White	X _w	-	0.322	-		
	y _w	-	0.377	-		
Viewing Angle (CR ≥ 10)						
x axis, right ($\phi=0^\circ$)	θ_x	75	85		degree	5
x axis, left ($\phi=180^\circ$)	θ_x	75	85			
y axis, up ($\phi=90^\circ$)	θ_y	75	88			
y axis, down ($\phi=270^\circ$)	θ_y	50	60			

Notes 1. Contrast Ratio (CR) is defined mathematically as:

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

- Surface luminance is the center point across the LCD surface 50cm from the surface with all pixels displaying white. For more information see Appendix B.
- The variation in surface Luminance, δ_{WHITE} is determined by measuring L_{ON} at each test position 1 through 9, and then dividing the minimum L_{ON} of 9 points luminance by maximum L_{ON} of 9 points luminance. For more information see Appendix B.
 $\delta_{\text{WHITE}} = \text{Minimum} (L_{\text{ON}1}, L_{\text{ON}2}, \dots, L_{\text{ON}9}) * 100 / \text{Maximum} (L_{\text{ON}1}, L_{\text{ON}2}, \dots, L_{\text{ON}9})$
- Response time is the time required for the display to transition from white to black (Rise Time, T_R) and from black to white (Decay Time, T_D). For additional information see Appendix C.
- Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x-axis and the vertical or y-axis with respect to the z-axis which is normal to the LCD surface. For more information see Appendix D.

9. Mechanical Characteristics

The chart below provides general mechanical characteristics for the model LVM220WSXSB-L03. In addition, the figure below is a detailed mechanical drawing of the LCD. Note that dimensions are given for reference purposes only.

Outside dimensions:

Horizontal	493.70 ± 0.5 mm
Vertical	320.10 ± 0.5 mm
Depth	16.50 ± 0.5 mm

Bezel opening area:

Horizontal	477.70 ± 0.5 mm
Vertical	300.10 ± 0.5 mm

Active Display area:

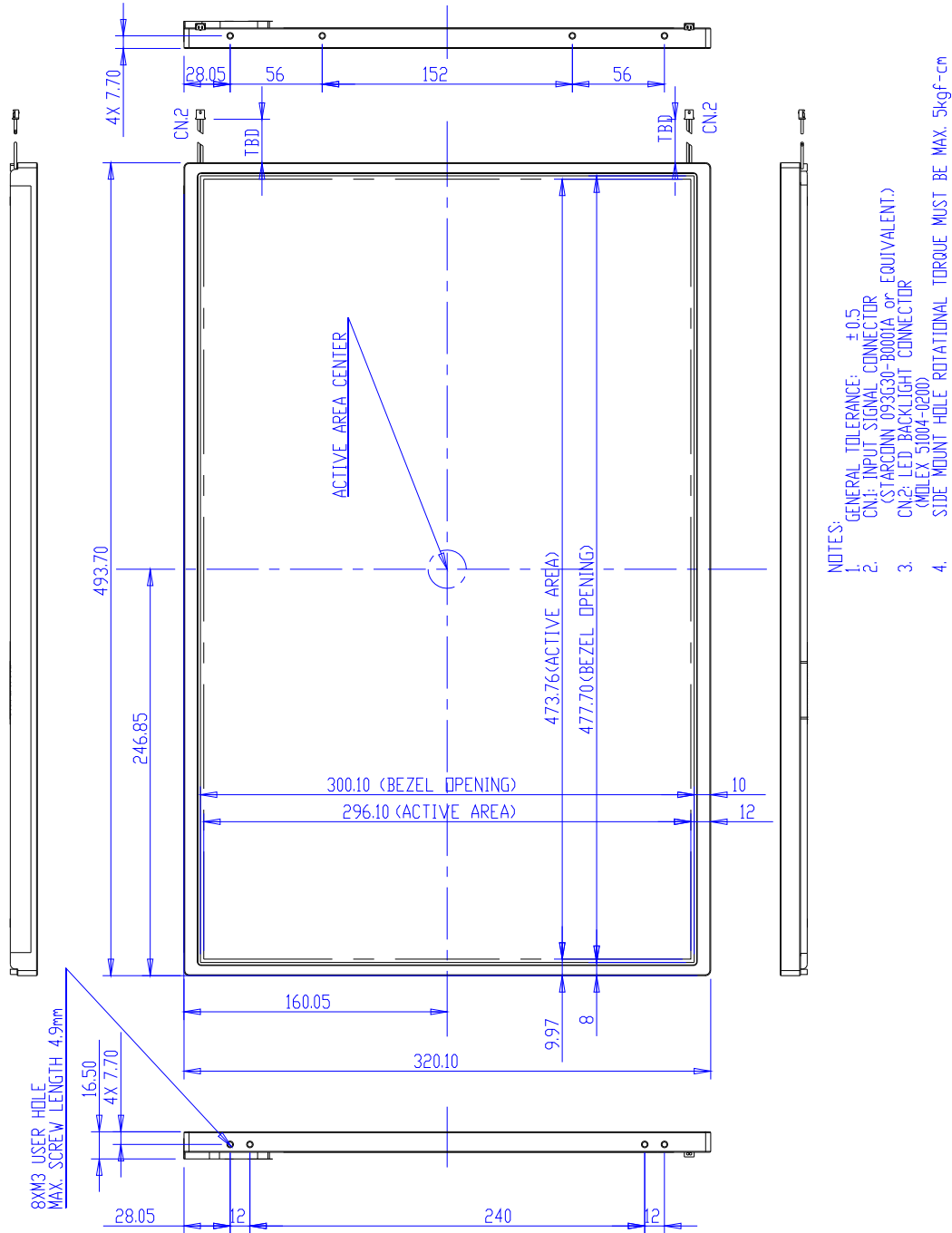
Horizontal	473.76 mm
Vertical	296.10 mm

Weight (approximate): 2700 g

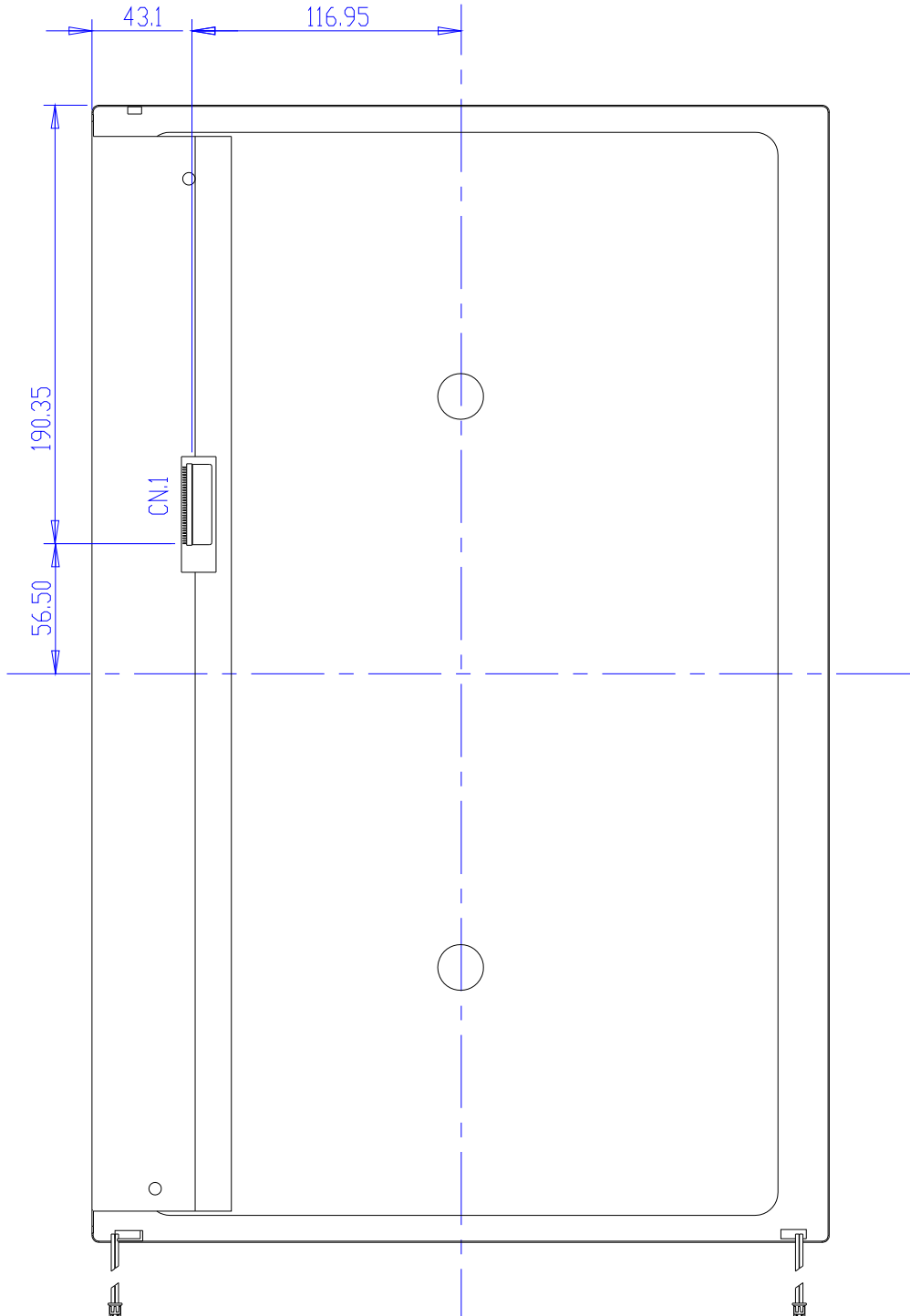
Surface Treatment: Hard coating (3H), Anti-glare

10. Mechanical Specification

<FRONT VIEW>



<BACK VIEW>



11. Reliability

- Environment test condition

No.	Test ITEM	Conditions
1	High temperature storage test	Ta = 60 °C 72h
2	Low temperature storage test	Ta = -20 °C 72h
3	High temperature operation test	Ta = 50 °C 72h
4	Low temperature operation test	Ta = 0 °C 72h
5	Vibration test (non-operating)	Frequency 10~300~10Hz Gravity/AMP: 1.5G Period: X, Y, Z 30 min.
6	Shock test (non-operating)	Max. gravity: 120G Pulse width: 2ms, half sine wave Direction: ± X, ± Y, ± Z once for each direction

Result Evaluation Criteria

There should be no change which might affect the practical display function when the display quality test is conducted under normal operating condition.

12. Packing Form

- a) Package quantity in one box: TBD pcs.
- b) Box Size: TBD (mm)

13. PRECAUTIONS

Please pay attention to the followings when you use this TFT/LCD module.

14-1. MOUNTING PRECAUTIONS

- (1) You must mount a module using holes.
- (2) You should consider the mounting structure so that uneven force (ex. twisted stress) is not applied to the module.
And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
- (3) Please attach the surface with a transparent protective plate in order to protect the polarizer LC cell.
Transparent protective plate should have sufficient strength in order to resist external force.
- (4) You should adopt radiation structure to satisfy the temperature specification.
- (5) Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter cause circuit break by electro-chemical reaction.
- (6) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And Please do not rub with dust clothes with chemical treatment.
Do not touch the surface of polarizer for bare hand or greasy cloth. (Some cosmetics are detrimental to the polarizer.)
- (7) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaked with petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluen and alcohol because they cause chemical damage to the polarizer.
- (8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.

- (9) Do not open the case because inside circuits do not have sufficient strength.

14-2. OPERATING PRECAUTIONS

- (1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage : $V = \pm 200\text{mV}$ (Over and under shoot voltage).
- (2) Response time depends on the temperature. (In lower temperature, it becomes longer.)
- (3) Brightness depends on the temperature. (In lower temperature, it becomes lower.)
And in lower temperature, response time (required time that brightness is stable after turned on) becomes longer.
- (4) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
- (5) When fixed patterns are displayed for a long time, remnant image is likely to occur.
- (6) A module has high frequency circuit. It might be necessary to shield the electromagnetic noise in your integrating system.
- (7) When a Backlight unit is operating, it may make sounds. It might be necessary to shield your integrating system to cut down the noise.

14-3. ELECTROSTATIC DISCHARGE CONTROL

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wristband etc . . And don't touch I/F pin directly.

14-4. STORAGE

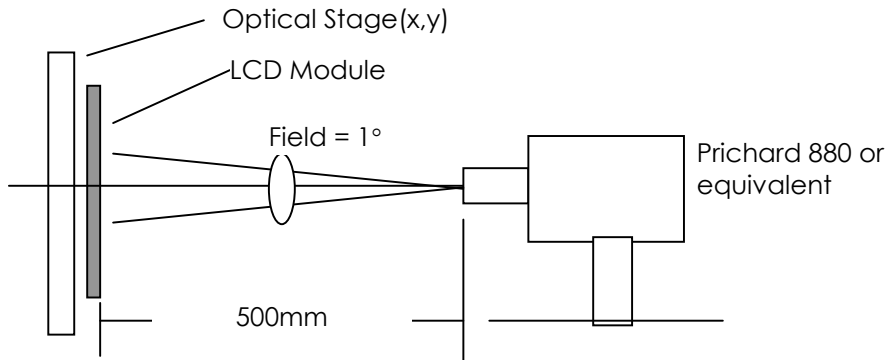
When storing modules for a long time, the following precautions should be followed.

- (1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5°C and 35°C at normal humidity.
- (2) The polarizer surface should not come in contact with any other object.
It is recommended that they be stored in the container in which they were shipped.

14-5. HANDLING PRECAUTIONS FOR PROTECTION FILM

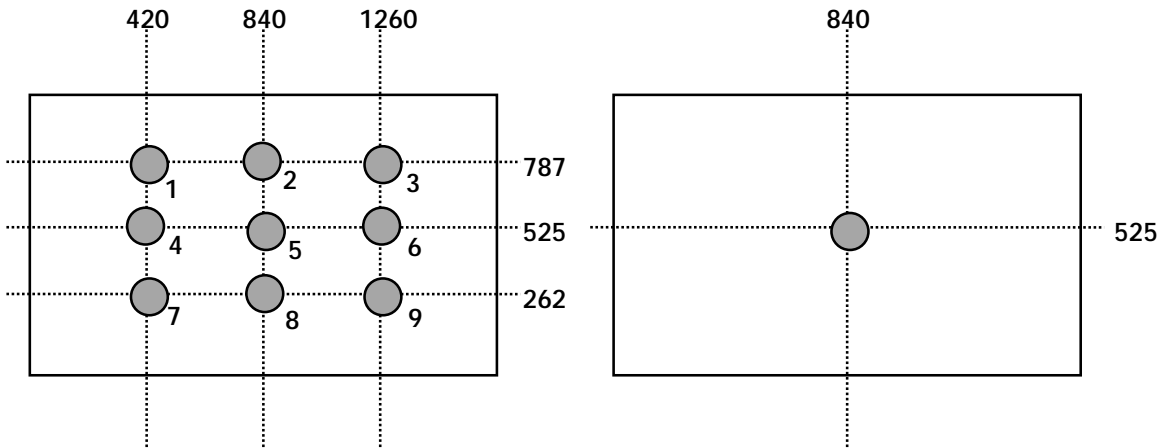
- (1) When the protection film is peeled off, static electricity is generated between the film and polarizer.
This should be peeled off slowly and carefully by people who are electrically grounded and with well ion- blown equipment or in such a condition, etc..
- (2) The protection film is attached to the polarizer with a small amount of glue. If some stress is applied to rub the protection film against the polarizer during the time you peel off the film, the glue is apt to remain on the polarizer.
Please carefully peel off the protection film without rubbing it against the polarizer.
- (3) When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the polarizer after the protection film is peeled off.
- (4) You can remove the glue easily. When the glue remains on the polarizer surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal- hexane.

A. Optical Characteristic Measurement Equipment and Method



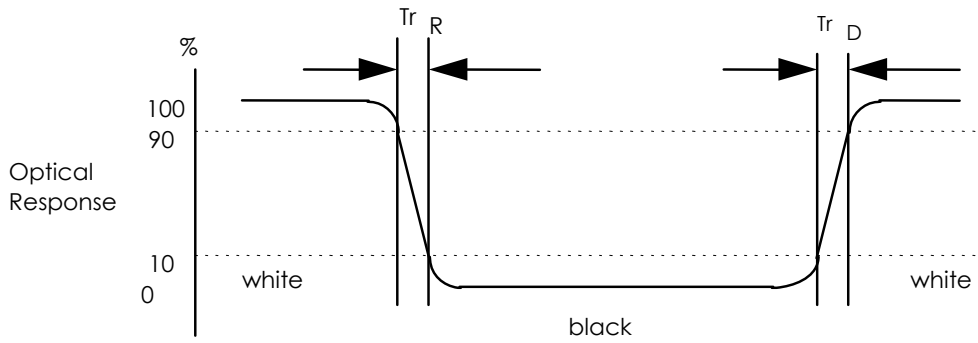
B. Luminance

<measuring point for luminance variation> <measuring point for surface luminance >



C. Response Time

The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".



D. Viewing angle

<Definition of viewing angle range>

