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Vertex LCD Inc.

600 S. Jefferson St. Unit K Placentia, CA 92870

TEL: 714-223-7111 FAX: 714-223-7711

FINAL PRODUCT INFORMATION

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

Updated: 9/02/2008

8.4” SVGA High Bright TFT-LCD

LVM084SD-L01

COLOR LIQUID CRYSTAL DISPLAY

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Revision History

Rev	ECN No.	Description of changes	Date	Prepared
0		Initial release	5/11/06	Brian Yi
A		-Change : Operating Temperature Max +55 → +65(P4) : LED Power consumption 5.1W → 4.25W(P5) :Life Time : Typ. TBD → Typ. 20,000Hrs(P5) :Contrast Ratio 60 → 100(P11) : Viewing Angle(P11) x axis, right (⌀=180º) Min. -50 → 50 x axis, left(⌀=270º) Min. -60 → 60 :Bezel area(P12) Vertical 133.1 ± 0.5 mm → 133.2 ± 0.5 mm	5/2/07	Eric Kim
B		-Change : Operating Temperature(P4) -10ºC ~ 65 ºC → -30ºC ~ 80 ºC : Storage Temperature(P4) -25ºC ~ 70 ºC → -30ºC ~ 80 ºC : Brightness 750 cd/m² Typ.→ 1,000 cd/m² Typ.(P4,P11) : Reliability (P15) 1) High temperature storage test Ta = 70 ºC 240h → Ta = 80 ºC 72h 2) Low temperature storage test Ta = -25 ºC 240h → Ta = -30 ºC 72h 3) High temperature Operation test Ta = 65 ºC 240h → Ta = 80 ºC 72h 4) Low temperature Operation test Ta = -10 ºC 240h → Ta = -30 ºC 72h	8/21/07	Eric Kim
C		-Change : Viewing Angle(P11) x axis, right(Ø=0º) θx Min. +50→60, Typ. 55→80 x axis, left(Ø=180º) θx Min. 50→60, Typ. 55→80 y axis, up(Ø=90º) θy Min. 25→40, Typ. 30→45 y axis, down(Ø=270º) θy Min. 60→60, Typ. 65→80	9/02/08	Tom Kim

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1. General Description

LVM084SD-L01 is 8.4" Color Active Matrix Liquid Crystal Display with an integral LED backlight system. The matrix employs Amorphous Silicon Thin Film Transistor as the active element. It is a transmissive type display operating in the normally white mode. This TFT-LCD has 8.4 inch diagonally measured active display area with SVGA resolution (800 horizontal by 600 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 6-bit gray scale signal for each dot, thus presenting a palette of more than 262,144 colors.

The LVM084SD-L01 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 LVM084SD-L01 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	8.4 inches(21.3cm) diagonal 170.4(H) X 127.8(V) mm
Outline dimensions	199.5(H) × 149.5(V) × 11.6(D) mm
Pixel pitch	0.213(H) mm × 0.213(V) mm
Pixel format	800(H) X 600(V) pixels
Color Pixel Arrangement	RGB stripe arrangement
Color depth	6-bit, 262,144 colors
Brightness	1,000 cd/m^2
Power Consumption	Total 5.1 Watt, typ (0.85 Watt @Vcc, 4.25 Watt @backlight)
Weight	300g (typ)
Display operating mode	transmissive mode, normally white
Surface treatments	hard coating(3H), anti-glare treatment
Backlight Unit	White LED

2. Absolute Maximum Rating

Parameter	symbol	Values		Units	Notes
		Min.	Max.		
Input Voltage	V_I	-0.3	Vcc + 0.3	Vdc	Note 1
+3.3V supply voltage	V_{cc}	0	5.5	Vdc	
Operating Temperature	T_{OP}	-30	+80	°C	Note 2
Storage Temperature	T_{ST}	-30	+80	°C	Note 2

Note 1. CK, R0 ~ R5, G0~G5, B0~B5, ENAB,
Note 2. No parameter is allowed to exceed the range.
Note 3. Humidity ≦ 95% RH. at Ta ≤ 40 °C.
Note4. The Panel surface, When backlight is on.(Reference)
Note5. Only operation is guarantied at operating temperature. Contrast, response time, another display quality are evaluated at +25 °C.

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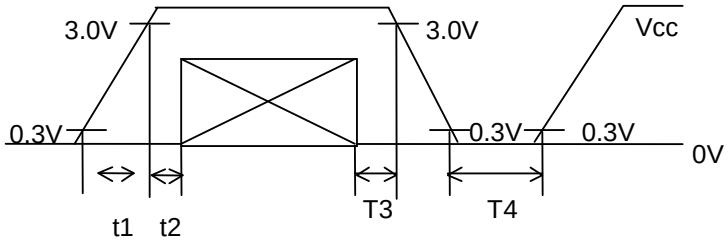
3. Electrical Characteristics

The LVM084SD-L01 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	Symbol	Values			Units	Notes
		Min.	Typ.	Max.		
MODULE:						
Power Supply Input Voltage	V_{CC}	+3.0	+3.3	+3.6	Vdc	Note 1
Power Supply Input Current	I_{CC}	-	0.240	0.360	A	Note 2
Power Consumption	P_c	-	0.85	-	Watts	
Permissive input ripple voltage	V_{RF}	-	-	100	mVp-p	Vcc = +3.3V
Logic Input level, High	V_{IH}	0.7Vcc	-	-	V	
Logic Input level, Low	V_{IL}	-	-	0.3Vcc	V	Note 3
Input current (low)	I_{OL1}	-	-	1.0	μA	V_I = 0V Note 4
	I_{OL2}	-	-	3.0	μA	V_I = 0V Note 5
Input current (High)	I_{OH1}	-	-	1.0	μA	V_I = Vcc Note 6
	I_{OH2}	-	-	100.0	μA	V_I = Vcc Note 7
LED BACKLIGHT:						
Operating Voltage	V_{BL}	-	-	17.7	V_{DC}	
Operating Current	I_{BL}	-	-	0.24	A_{DC}	Note 9
Power Consumption	P_{BL}	-	-	4.25	Watts	
Life Time		10,000	20,000	-	Hrs	Note 8

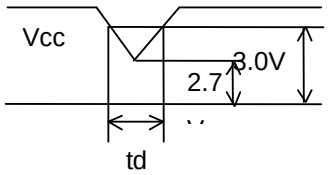
Note 1. Vcc-turn on conditions.

0 < t1 ≤ 15ms
0 < t2 ≤ 80ms
0 < t3 ≤ 1s
t4 > 1s



Vcc-dip conditions.

1) 2.7V ≤ Vcc < 3.0V
td ≤ 10ms
2) Vcc < 2.7V
* Vcc-dip conditions should also follow the Vcc-turn-on conditions



Note 2. Typical current condition: 16 gray scale in bar pattern. 600 line mode. Vcc = +3.3V
Note 3. CK, R0~R5, G-~G5, B0~B5, ENAB
Note 4. CK, R0~R5, G-~G5, B0~B5
Note 5. ENAB
Note 6. CK, R0~R5, G-~G5, B0~B5
Note 7. ENAB,
Note 8. The life time is determined as the time at which brightness of LED is 50% compare to that of initial value at

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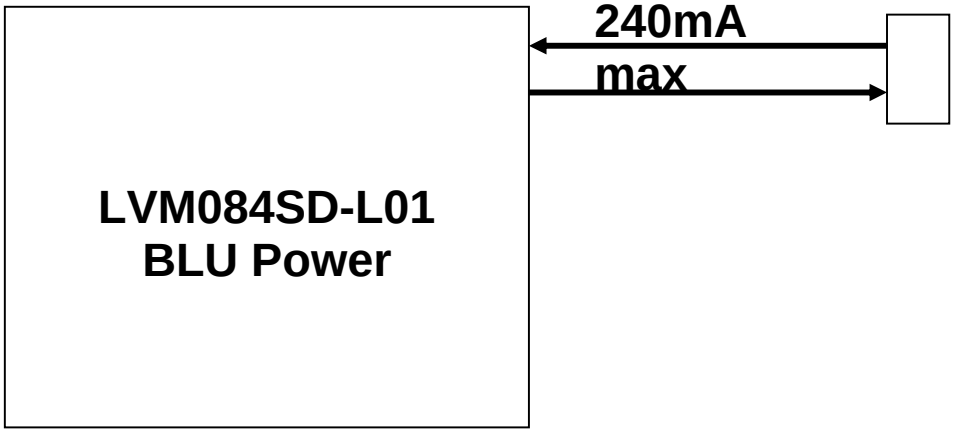
the typical LED current.

Note 9. LVM084SD-L01 load voltage should be about 17.7V at 240mA max current.



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4. Interface Connections

CN 1(interface signal): LVM084SD-L01 uses 30 pin connector for module electronics.
Used connector: DF19G-30P-1H (HIROSE)

Pin	Symbol	Description	Remark
1	GND	Ground	
2	Vcc	Power supply +3.3V	
3	Vcc	Power supply +3.3V	
4	GND	Ground.	
5	ENAB	Compound synchronization	
6	B5	Blue data (MSB)	
7	B4	Blue data	
8	B3	Blue data	
9	B2	Blue data	
10	B1	Blue data	
11	B0	Blue data (LSB)	
12	GND	Ground	
13	G5	Green data (MSB)	
14	G4	Green data	
15	G3	Green data	
16	G2	Green data	
17	G1	Green data	
18	G0	Green data (LSB)	
19	GND	Ground	
20	R5	Red data(MSB)	
21	R4	Red data	
22	R3	Red data	
23	R2	Red data	
24	R1	Red data	
25	R0	Red data (LSB)	
26	GND	Ground	
27	NC	No connection	
28	NC	No connection	
29	CK	Clock signal for sampling each data signal	
30	GND	Ground	

CN 2(backlight): LVM084SD-L01 employs Molex 51004-0200 or equivalent connector for the LED backlight.

Pin	Symbol	Description	Notes
1	V	Lamp power input	
2	Ground	Ground	

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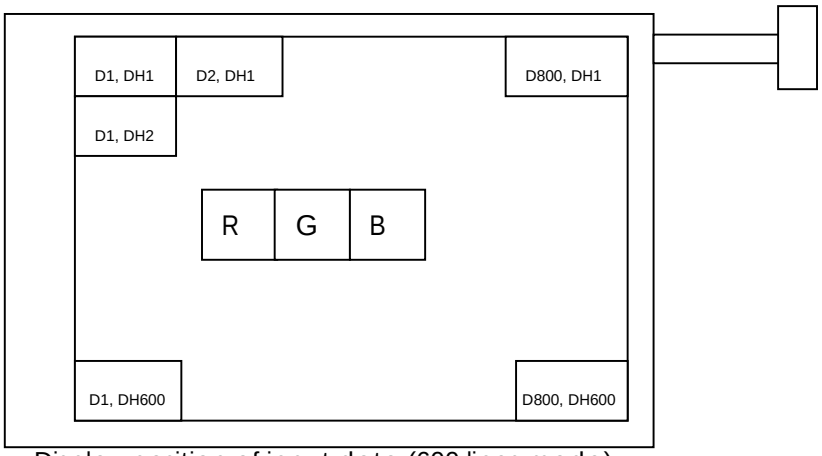
5-1. Timing Characteristics

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Clock	Frequency	1/Tc	-	40	42	MHz	
	High time	Tch	TBD		-	ns	
	Low time	Tcl	TBD	-	-	ns	
	Period		23.8	25		ns	
	Duty	TCH:TCL	40:60	50:50	60:40		
Data	Setup time	Tds	TBD	-	-	ns	
	Hold time	Tdh	TBD	-	-	ns	
ENAB	One line scanning time	TH	944*Tc	1056*Tc	1064*Tc		
			26.3	26.4		μs	
	Horizontal Pulse width	THp	2	800	TH-10	clock	
	Setup time	Tds	TBD			ns	
	Frame period	TV	604*TH	628*TH	677*TH		
				16.58	17.85	ms	
Horizontal display period		THd	800	800	800	clock	
Vertical display period		THc	600	600	600	Line	

* In case of low frequency, the deterioration of display quality, flicker, etc. may occure.

5-2. Input data signals and display position on the screen



Display position of input data (600 lines mode)

R/L=OPEN

U/D=OPEN

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5-3. Timing Characteristics of Input Signals

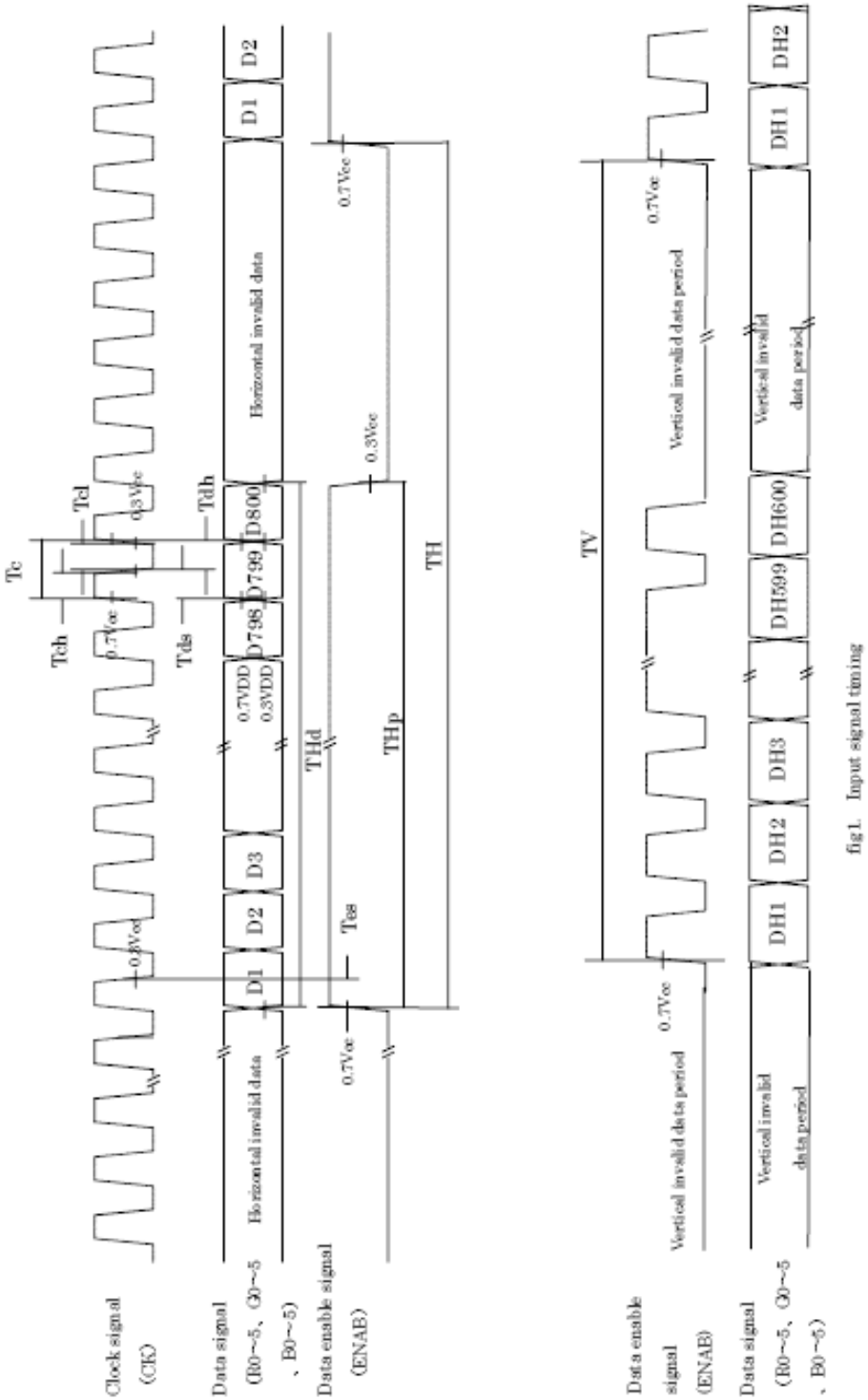

fig1. Input signal timing

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6. Color Input Data Reference

The brightness of each primary color (red, green and blue) is based on the 6-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					
		MSB					LSB	MSB					LSB	MSB					LSB
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	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
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	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
Red	Red(00) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(01)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(02)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63) Bright	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Green	Green(00)Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(01)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(02)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(63)Bright	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Blue	Blue(00) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(01)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(02)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63) Bright	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

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7. Optical Specifications

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes 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	100	-	-		1
Surface Luminance, white	L_{WH}	-	1,000	-	cd/m^2	2
Luminance Variation	δ_{WHITE}	-	1.25	1.45		3
Response Time Rise Time	Tr_R Tr_D	- -	20 40		msec	4
CIE Color Coordinates White	x_W y_W	- -	0.313 0.329	- -		
Viewing Angle x axis, right (ø=0°) x axis, left(ø=180°) y axis, up(ø=90°) y axis, down (ø=270°)	 θ x θ x θ y θ y	 60 60 40 60	 80 80 45 80	 - - -	degree	5

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

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

2. 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.
3. The variation in surface Luminance, δ_{WHITE} is determined by measuring L_{ON} at each test position 1 through 5, and then dividing the maximum L_{ON} of 5 points luminance by minimum L_{ON} of 5 points luminance. For more information see Appendix B.
   δ_{WHITE} = Maximum (L_{ON1}, L_{ON2}, ...L_{ON5}) ÷ Minimum (L_{ON1}, L_{ON2}, ...L_{ON5})
4. Response time is the time required for the display to transition from white to black (Rise Time, Tr_R) and from black to white (Decay Time, Tr_D). For additional information see Appendix C.
5. Viewing angle is the angle at which the contrast ratio is greater than 5. 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.

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8. Mechanical Characteristics

The chart below provides general mechanical characteristics for the model LVM084SD-L01. 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	199.5 ± 0.5 mm
	Vertical	149.5 ± 0.5 mm
	Depth	11.6 ± 0.5 mm
Bezel area:		
	Horizontal	175.2 ± 0.5 mm
	Vertical	133.2 ± 0.5 mm
Active Display area:		
	Horizontal	170.4 mm
	Vertical	127.8 mm
Weight (approximate):		300g

Surface Treatment: Hard coating 3H.
Anti-glare treatment of the front polarizer.

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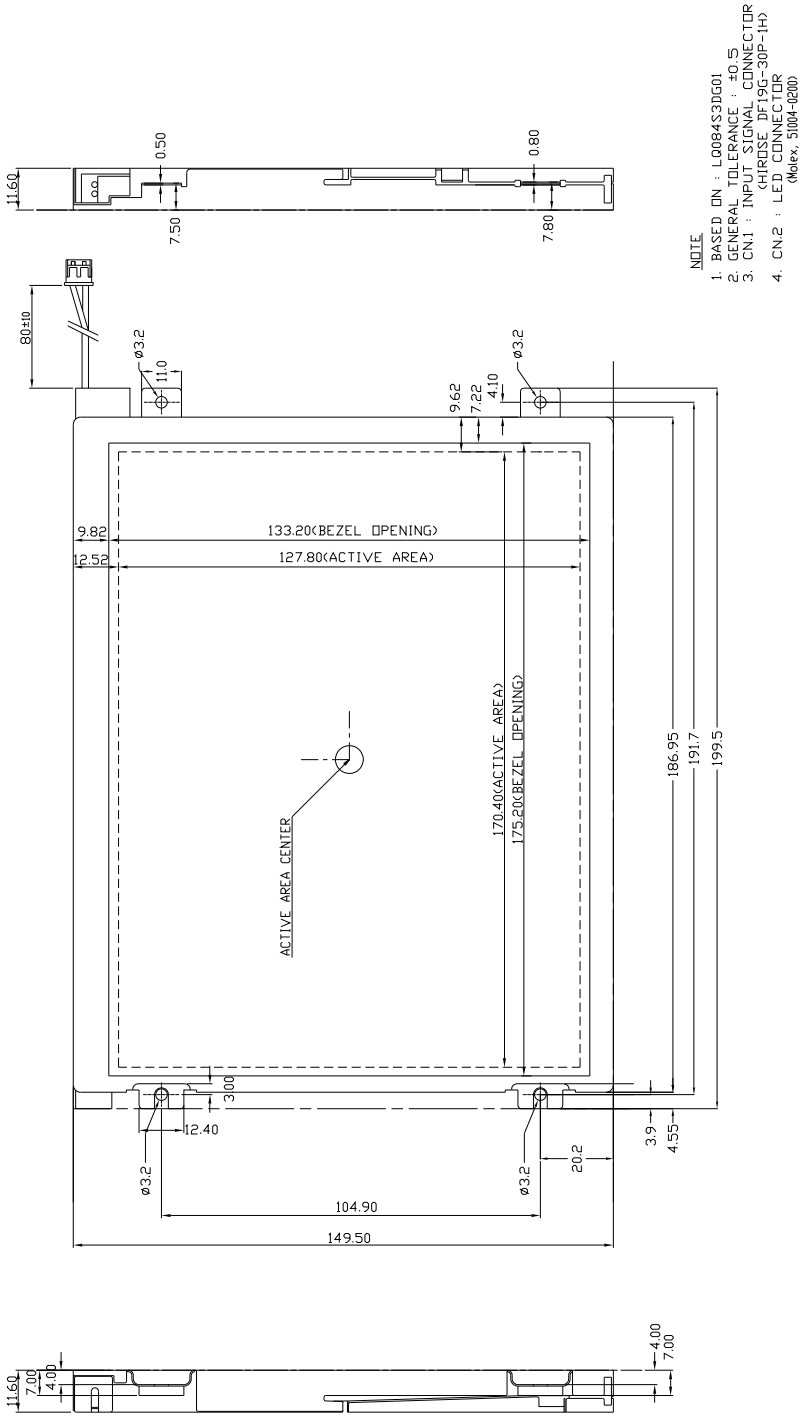
9. Mechanical Specification

< FRONT VIEW >



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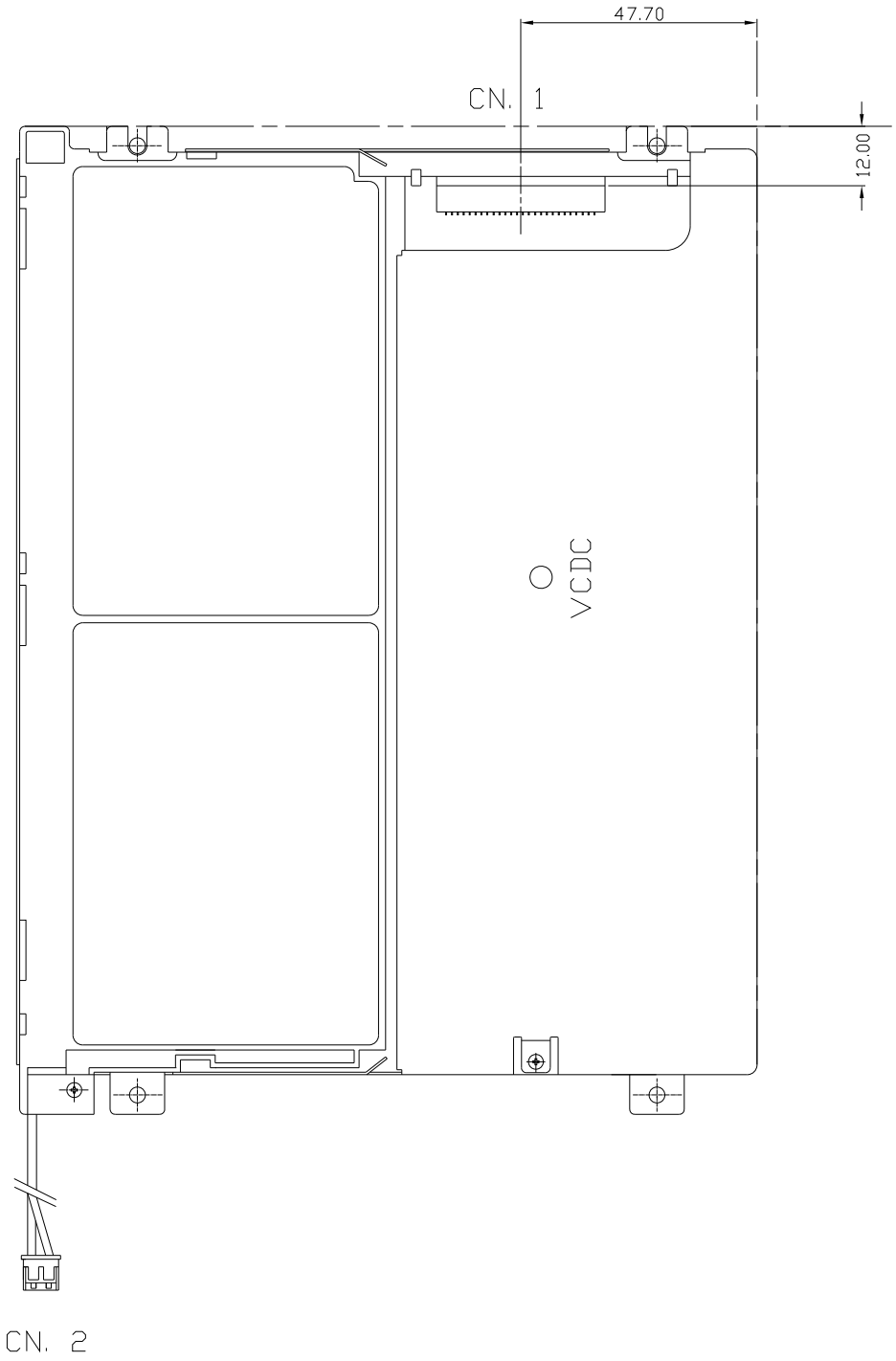
<REAR VIEW>



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10. Reliability

- Environment test condition

No.	Test ITEM	Conditions
1	High temperature storage test	Ta = 80 °C 72h
2	Low temperature storage test	Ta = -30 °C 72h
3	High temperature & high humidity operation test	Ta = 40 °C 95%RH 240h (no condensation)
4	High temperature operation test	Ta = 80 °C 72h
5	Low temperature operation test	Ta = -30 °C 72h
6	Vibration test (non-operating)	- Frequency: 10 ~ 57 Hz/vibration width (one side): 0.075mm - 58 ~ 500 Hz/gravitity: 9.8m/s² - Sweep time: 11 minutes - Test period: 3 hours (1hour for each direction of X, Y,Z)
7	Shock test (non-operating)	- Max. gravity: 490 m/s² - Pulse width: 11ms, 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.

11. Packing Form

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

12. PRECAUTIONS

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

12-1. MOUNTING PRECAUTIONS

(1) You must mount a module using holes arranged in four corners.

(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.

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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.

12-2. OPERATING PRECAUTIONS

(1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage: V = ± 200mV (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.

12-3. 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.

12-4. 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.

12-5. 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.

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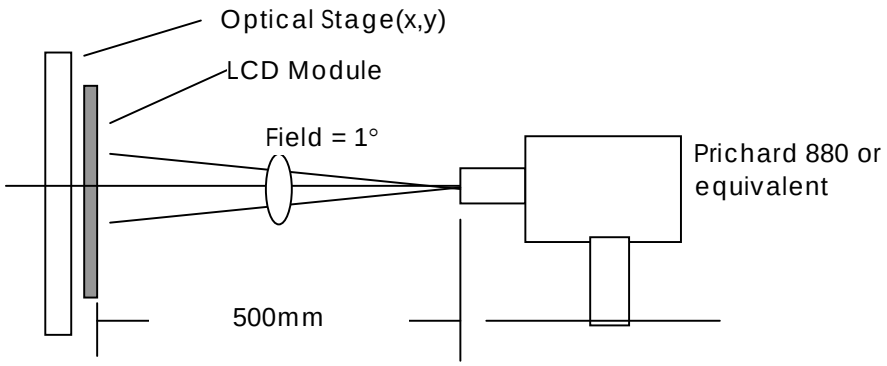
Please carefully peel off the protection film without rubbing it against the polarizer.

(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.

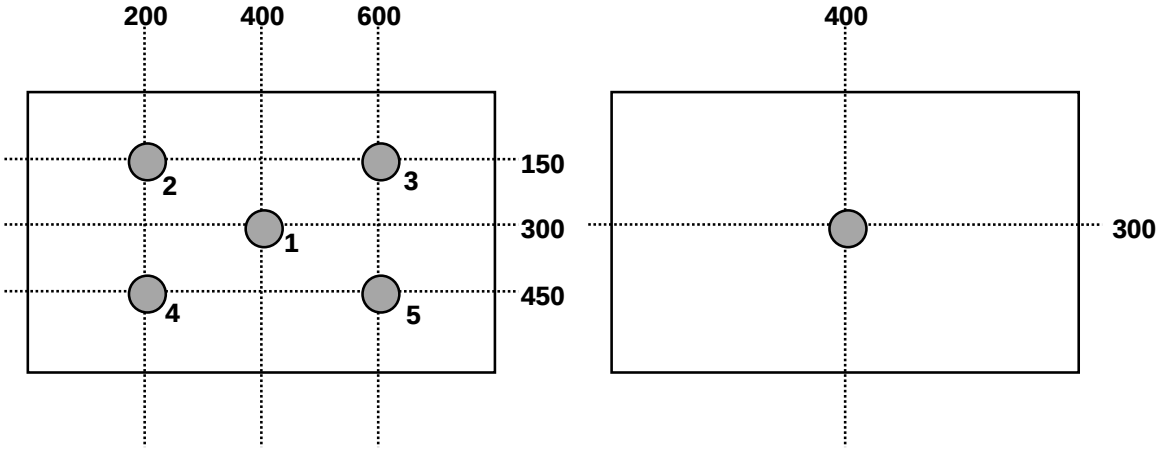
(4) You can remove the glue easily. When the glue remains on the polarizer surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal- hexane.

A. Optical Characteristic Measurement Equipment and Method



B. Luminance

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



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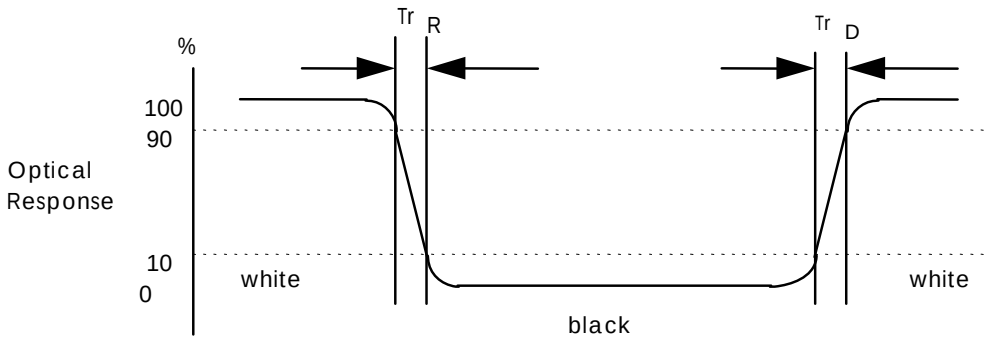
C. Response Time

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>