

Product Specification

SPECIFICATION FOR APPROVAL

() Preliminary Specification

(V) Final Specification

Title	20.1" VGA TFT LCD
-------	-------------------

BUYER	
MODEL	-

SUPPLIER	LG.Philips LCD Co., Ltd.
* MODEL	LC201V1
SUFFIX	A3

* When you obtain standard approval,
please use the above model name without suffix.

SIGNATURE	DATE
/	_____
/	_____
/	_____

Please return 1 copy for your confirmation
with your signature and comments.

APPROVED BY	DATE
S.W.Lee /G.Manager	_____
REVIEWED BY	
J.H. Park / Manager	_____
PREPARED BY	
J.H.Park / Manager	_____

Products Engineering Dept.
LG.Philips LCD Co., Ltd.

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RECORDS OF REVISIONS

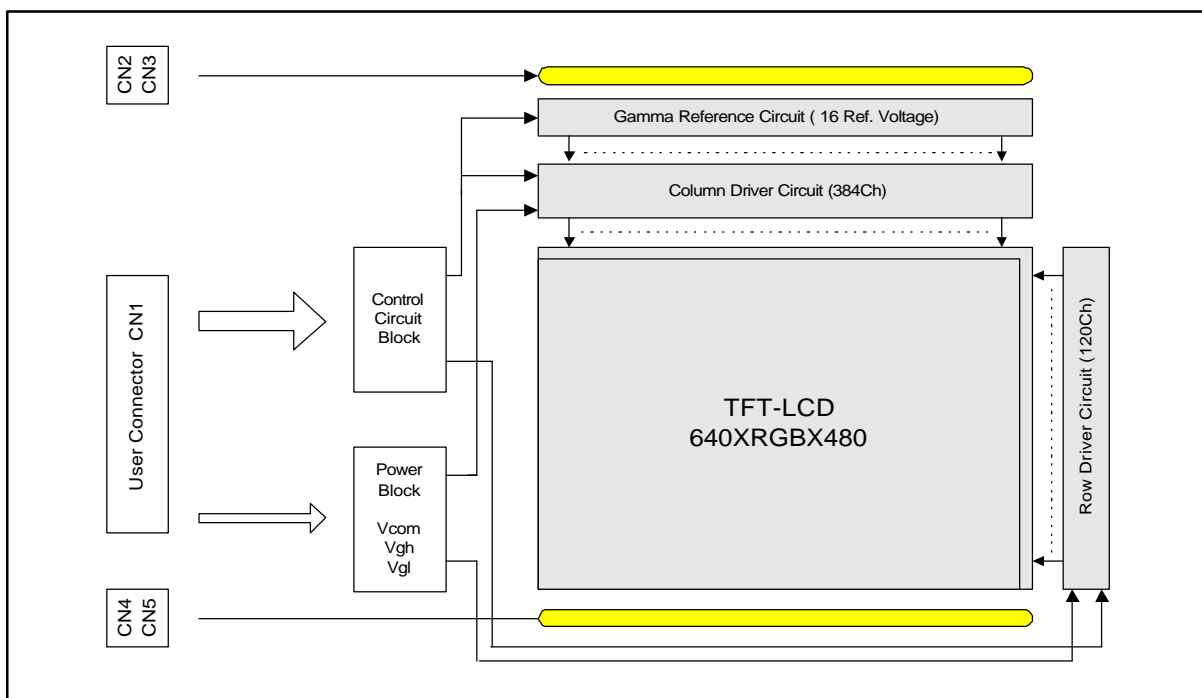
Version No	Date	Page	DESCRIPTION
0.0	Aug. 02. 2000	-	First Draft (Preliminary Specification) - 7/25 Model name changed. LC201V1-A1SO (FAB I) -> LC201V1-A3(FAB III)
0.1	Sep. 20. 2000		1st release
0.2	Nov. 27. 2000		2nd release 1) Lamp wire length changed. 170mm ± 15mm -> 100mm + 20 /- 0mm 2) Optical Specifications are changed. : CR(min 200 to 300) Viewing Angle with CR>5. : General inspection test criteria is appended. (p14)
0.3	Jan. 04. 2001		3rd release 1) Caution and Notes comments are appended : according to Lamp wire, Inverter, Connector and Fuse type
1.0	Jan. 13. 2001		Final draft for customer's acceptance. (Final Specification)
1.0	Aug.27.2001		First draft for Harsper Co., Ltd. (Append Company Name) (Final Specification)

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1. General Description

The LC201V1 is a Color Active Matrix Liquid Crystal Display with an integral Cold Cathode Fluorescent Lamp(CCFL) backlight system. The matrix employs a-Si Thin Film Transistor as the active element. It is a transmissive type display operating in the normally white mode. This TFT-LCD has a 20.1 inches diagonally measured active display area with VGA resolution(480 vertical by 640 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 8-bit gray scale signal for each dot.

The LC201V1 is intended to support applications where thin thickness, low power and fast response time for moving pictures. In combination with the vertical arrangement of the sub-pixels, the LC201V1 characteristics provide an excellent flat panel display for Digital TV and AV amusement.



General Features

Active screen size	20.1 inches(510mm) diagonal
Outline dimensions	450.0(H) × 348.7(V) × 20.0(D) mm (Typ.), 24.0mm(max) :Devices Area
Pixel pitch	0.6375 mm × 0.6375 mm
Pixel format	640 horiz. by 480 vert. pixels
	RGB stripe arrangement
Color depth	8-bit, 16.7M colors
Luminance,White	400 cd/m ² (Typ.) at five points average
Power Consumption	Total 34 Watt(Typ.)
Weight	3200g (Typ.)
Display operating mode	Transmissive mode, normally white
Surface treatments	Hard coating (3H), Anti-glare treatment(12% Haze) of the front polarizer

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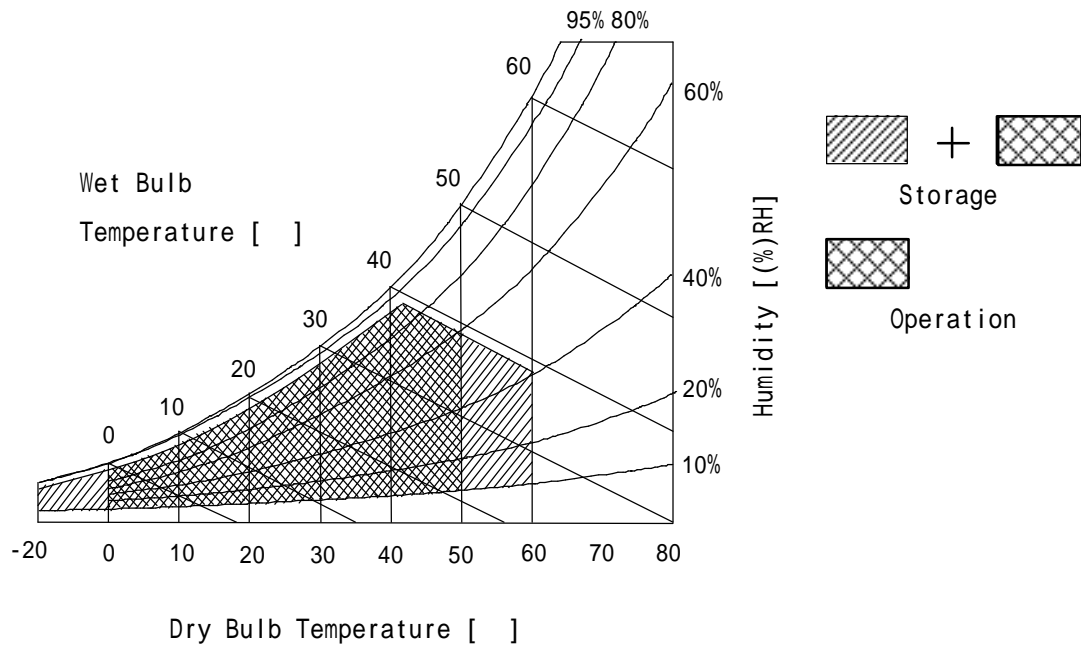
2. Absolute Maximum Ratings

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

Table 1 ABSOLUTE MAXIMUM RATINGS

Parameter	symbol	Values		Units	Notes
		Min.	Max.		
Power Input Voltage	V_{IN}	-0.3	+6.0	Vdc	at 25 ± 5
Logic Input Voltage	$V_{L/H}$	-0.3	+3.6	Vdc	at 25 ± 5
Operating Temperature	T_{OP}	0	50		1
Storage Temperature	T_{ST}	-20	60		1
Operating Ambient Humidity	H_{OP}	10	90	%RH	1
Storage Humidity	H_{ST}	10	90	%RH	1

Note: 1. Temperature and relative humidity range are shown in the figure below.
Wet bulb temperature should be 39 Max, and no condensation of water.



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3. Electrical Specifications

3-1. Electrical Characteristics

The LC201V1 requires two power inputs. One is employed to power the LCD electronics and to drive the TFT array and liquid crystal and the other input which power to the CCFL, is typically generated by an inverter. The inverter is an external unit to the LCD Module.

Table 2 ELECTRICAL CHARACTERISTICS(Module) :

Parameter	Symbol	Values			Unit	Notes.	
		Min.	Typ.	Max.			
Module	Power Supply Input Voltage	V _{CC}	4.5	5.0	5.5	V _{dc}	1
	Power Supply Input current	I _{CC}	-	0.3	0.45	A	1
	Logic High Level Input	V _H	0.7V _{L/H}				3.3V Logic
	Logic Low Level Input	V _L			0.3V _{L/H}		3.3V Logic
	Rush Current	I _{RUSH}			2.0	A	

Notes: 1. The specified current and power consumption are under the condition ; V_{IN} = 5.0V , 25 , 65%RH, f_v = 60Hz and the test pattern is ' 8X6 Mosaic'(black and white).
The variance of the each voltage is ± 10%.

The fuse for protecting the module circuits is '1A fast blow type; 429001' manufactured by Littelfuse.

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The LC201V1 LCD have two CCFL assemblies and a CCFL assembly consist of three CCFLs per assembly. The inverter is an external unit to the LCD.

Table 3 ELECTRICAL CHARACTERISTICS(Lamp) :

Parameter	Symbol	Values			Unit	Notes.	
		Min.	Typ.	Max.			
Lamp	Operating voltage (at $I_L=7mA$)	V_L	684	760	836	Vrms	1
	Operating current (CCFL assembly)	I_L	3.0 (9.0)	7.0 (21.0)	8.0 (24.0)	mA rms mA rms	
	Established Starting Voltage at 25 at 0	V_S			1,080 1,500	Vrms	2
	Operating Frequency	f_L	30	50	80	kHz	3
	Discharge Stabilization Time	T_S			3	minutes	4
	Power Consumption(6 CCFLs)	P_L		31.92	35.1	W	5
	Life Time (at 7mA)		30,000	40,000		Hrs	6

Notes: The design of the inverter must have specifications for the lamp in LCD Assembly. The performance of the Lamp in LCM, for example life time or brightness, is extremely influenced by the characteristics of the DC-AC inverter. 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 unwanted lightning caused by the mismatch of the lamp and the inverter(no lightning, flicker and etc.,) never occurs. When you confirm it, the LCD assembly should be operated in the same condition as installed in your instruments.

1. The variance of the voltage is $\pm 10\%$.
2. The voltage V_S should be applied to the lamps for more than 1 second for start-up. Otherwise, the lamps may not be turned on.
3. The output of the inverter must have symmetrical(negative and positive) voltage waveform and symmetrical current waveform.(Unsymmetrical ratio is less than 10%) Please do not use the inverter which has unsymmetrical voltage and unsymmetrical current and spike wave. Lamp frequency may produce interference with horizontal synchronous frequency and as a result this may caused beat on the display. Therefore lamp frequency shall be apart from the horizontal synchronous frequency and from its harmonics in order to prevent interference.
4. Let's define the brightness of the lamp after being lighted for 5 minutes as 100%. T_S is the time required for the brightness of the center of lamp to be not less than 95%.
5. The lamp power consumption shown above does not include loss of external inverters.
6. The life time is determined as the time at which brightness of lamp is 50% compared to that of initial value at the typical lamp current on condition of continuous operating at 25 ± 2 .
7. Do not attach a electric conduction tape to lamp wire. If the lamp wire attach to a electric conduction tape, TFT-LCD Module has a low luminance and the inverter has abnormal action. Because leakage current is occurred between lamp wire and electric conduction tape.

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3-2. Interface Connections

This LCD employs five interface connections, a 50 pin connector is used for the module electronics and two kinds of four connectors are used for the integrated backlight units.

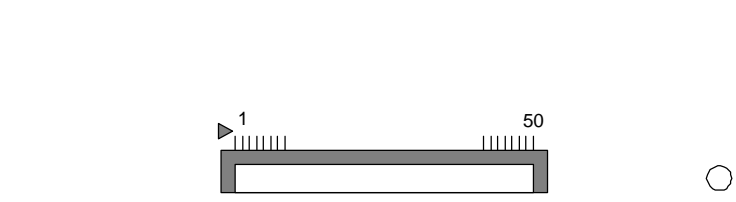
The electronics interface connector is a model FH12-50S-0.5SH manufactured by Hirose Electric Co., Ltd.

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

Table 4 MODULE CONNECTOR PIN CONFIGURATION

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	NC	1)	26	R0	Red Data(LSB)
2	NC		27	GND	
3	NC		28	G7	Green Data(MSB)
4	GND	Ground 2)	29	G6	
5	GND		30	G5	
6	Vcc	Power Input (+5V)	31	G4	
7	Vcc	Power Input (+5V)	32	GND	
8	Vcc	Power Input (+5V)	33	G3	
9	Vcc	Power Input (+5V)	34	G2	
10	GND		35	G1	
11	HSYNC	Horizontal Sync.	36	G0	Green Data(LSB)
12	VSYNC	Vertical Sync.	37	GND	
13	GND		38	B7	Blue Data(MSB)
14	DE	Data Enable	39	B6	
15	GND		40	B5	
16	DCLK	Dot Clock	41	B4	
17	GND		42	GND	
18	R7	Red Data(MSB)	43	B3	
19	R6		44	B2	
20	R5		45	B1	
21	R4		46	B0	Blue Data(LSB)
22	GND		47	GND	
23	R3		48	GND	
24	R2		49	NC	
25	R1		50	NC	

- Notes : 1. All GND(ground) pins should be connected together and the LCD's metal frame.
2. All Vcc(power input) pins should be connected together.



< A placement of user connector : Rear Side >

Caution : The method of inserting the signal FFC or FPC is 1) open the slide by using proper jig or nail, 2) place the FFC or FPC on a connector, 3) push the slide obliquely and downward to prevent the slide from breaking.

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The backlight interface connectors are **BHSR-02VS-1** and **BHR03VS-1** manufactured by **JST**. The mating connectors are **SM02B-BHS-1-TB** and **SM03(4.0)B-BHS-1-TB** manufactured by **JST** or equivalents. And the pin configuration for the connectors are shown in the table below.

Table 5 BACKLIGHT CONNECTOR PIN CONFIGURATION

< CN 2, CN4>

Pin No	SYMBOL	Description	NOTE
1	HV	High voltage (Pink color cable)	-
2	NC		
3	HV	High voltage (Pink color cable)	-

< CN 3, CN5>

Pin No	SYMBOL	Description	NOTE
1	HV	High voltage (Pink color cable)	-
2	LV	Ground (White color cable)	-

Notes: 1. The high voltage side terminal is colored pink. The low voltage side terminal is colored white.



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3-3. Signal Timing Specifications

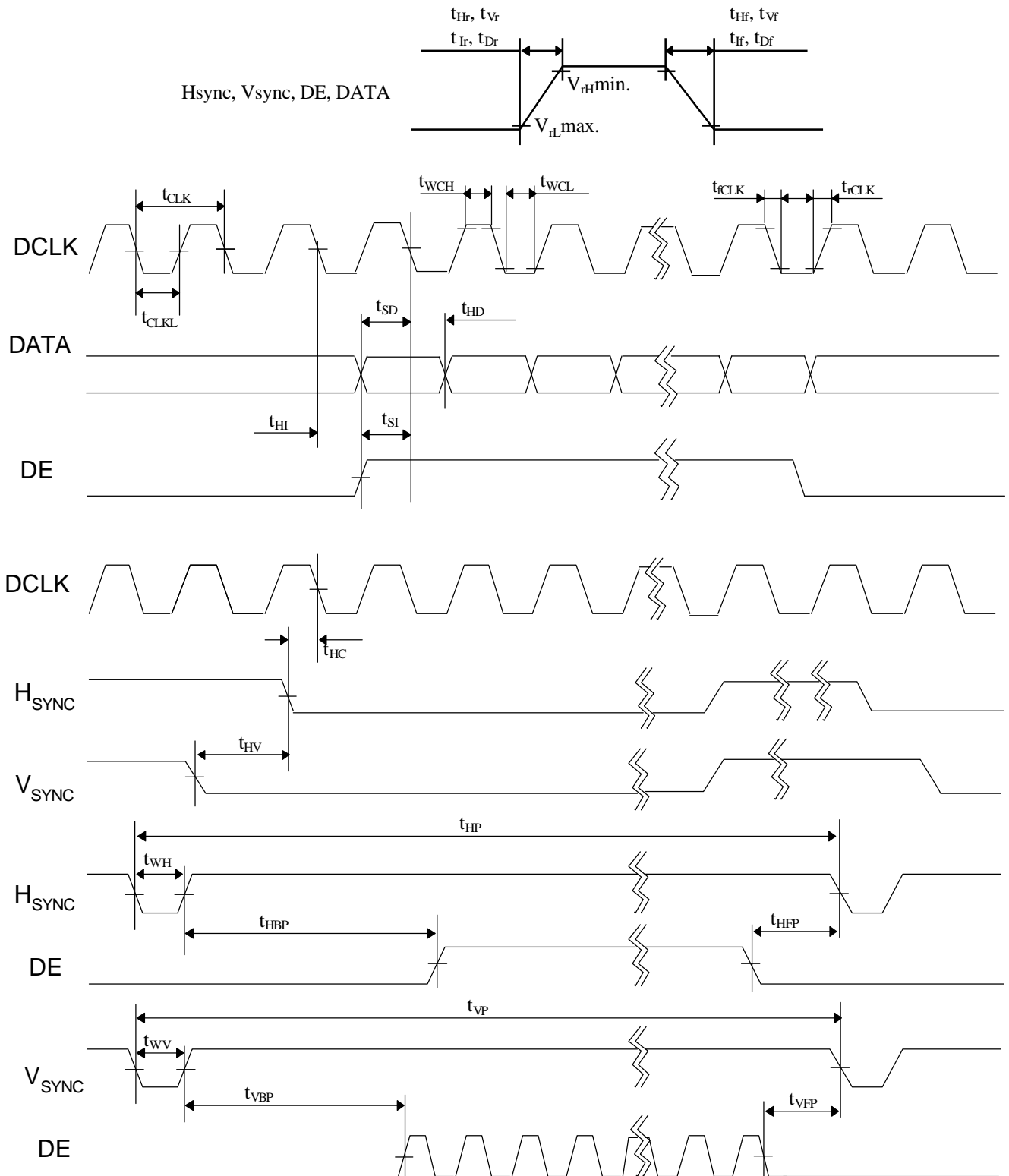
All of the interface signal timing should be satisfied with the following specifications for it's proper operation.

Table 6 Timing Table

ITEM		SYMBOL	MIN	TYP	MAX	Unit	Notes
Dclk	Frequency	$f_{CLK}(=1/t_{CLK})$	20.0	25.0	30.0	MHz	Dclk = 25MHz
	High duration	t_{WCH}	$0.4 t_{CLK}$	$0.6 t_{CLK}$	$0.8 t_{CLK}$	ns	
	Low duration	t_{WCL}	$0.2 t_{CLK}$	$0.4 t_{CLK}$	$0.6 t_{CLK}$	ns	
Data	Setup duration	t_{SD}	5.0	-	-	ns	for f_{CLK}
	Hold duration	t_{HD}	10.0	-	-	ns	
Hsync	Period	t_{HP}	-	31.8	-	?s	-
	Pulse width	t_{WH}	770	800	900	clock	-
Vsync	Period	t_{VP}	-	16.67	-	msec	-
	Pulse width	t_{WV}	515	525	560	lines	-
Data Enable (DE)	Setup duration	t_{SI}	5.0	-	-	ns	for f_{CLK}
	Hold duration	t_{HI}	10.0	-	-	ns	for f_{CLK}
	Horizontal back porch	t_{HBP}	12	48	-	clock	-
	Horizontal Active		640	640	640	clock	-
	Horizontal front porch	t_{HFP}	8	16	-	clock	-
	Vertical back porch	t_{VBP}	1	33	-	lines	-
	Vertical Active		480	480	480	lines	-
	Vertical front porch	t_{VFP}	1	10	-	lines	-
Hsync-clock phase difference		t_{HC}	$t_{CLK}-10$	-	T_{wcl}	ns	-
Hsync-Vsync phase difference		t_{HV}	-	-	$t_{HP}-T_{WH}$	ns	-

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3-4. Signal Timing Waveforms



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3-5. 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.

Table 7 COLOR DATA REFERENCE

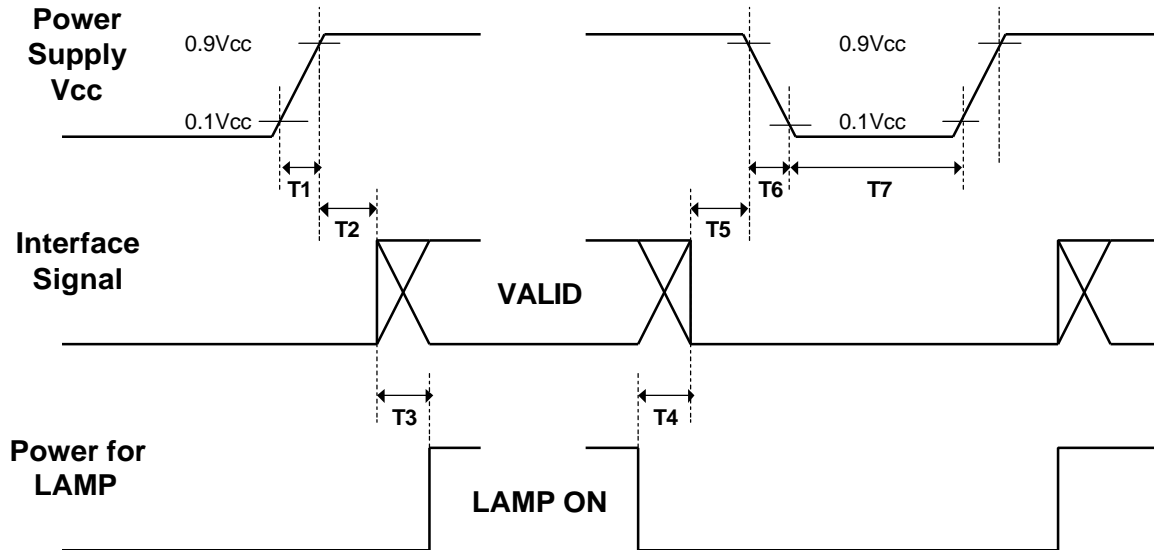
Color		Input Color Data																							
		Red								Green								Blue							
		MSB				LSB				MSB				LSB				MSB				LSB			
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	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	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	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	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	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	1
Red	Red(000)	0	0	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	0	0
	Red(002)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(253)	1	1	1	1	1	1	0	1	0	0	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	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	0
Green	Green(000)	0	0	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	0	0
	Green(002)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	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	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	0
Blue	Blue(000)	0	0	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	0	0	1
	Blue(002)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0

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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	1	1	1
-----------	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

3.6 Power Sequence



Parameter	Value			Unit	Notes
	Min.	Typ.	Max.		
T1	-	-	10	ms	
T2	0	-	50	ms	
T3	200	-	-	ms	
T4	200	-	-	ms	
T5	0	-	50	ms	
T6	-	-	10	ms	
T7	400	-	-	ms	

Notes:

1. Please avoid floating state of interface signal at invalid period.
2. When the interface signal is invalid, be sure to pull down the power supply for LCD V_{cc} to 0V.
3. Lamp power must be turn on after power supply for LCD and interface signals are valid.

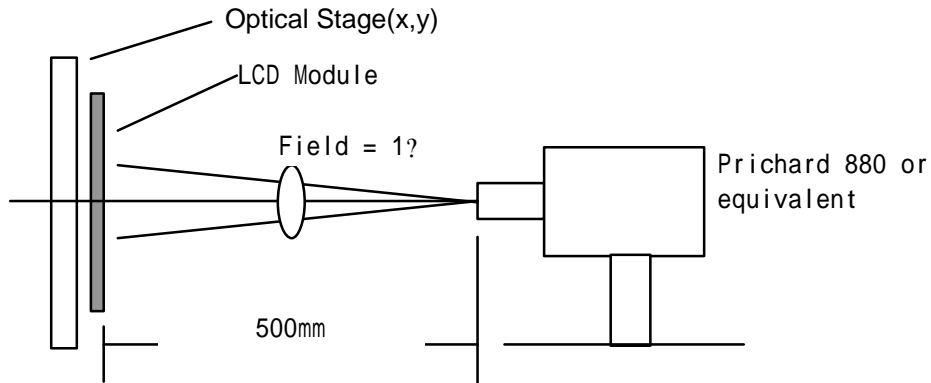
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4. Optical Specifications

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25°. The values specified are at an approximate distance 50cm from the LCD surface at a viewing angle of 0° and 0° equal to 0°.

FIG. 1 presents additional information concerning the measurement equipment and method.

FIG. 1 Optical Characteristic Measurement Equipment and Method



(Ta=25°, VIN=5.0V, fV =60Hz, Dclk=25MHz, IL=7mA x 3)

Table 8 OPTICAL CHARACTERISTICS

Parameter	Symbol	Values			Units	Notes
		Min.	Typ.	Max.		
Contrast Ratio	CR	300	400	-		1
Surface Luminance, white	L _{WH}	360	400	-	cd/m ²	2
Luminance Variation	WHITE	-	-	1.3		3
Response Time	Tr					4
	Rise Time Tr _R	-	7	10	ms	
	Decay Time Tr _D	-	18	20	ms	
CIE Color Coordinates	Red	x _R	0.609	0.639	0.669	
		y _R	0.306	0.336	0.366	
		x _G	0.257	0.287	0.317	
	Green	y _G	0.556	0.586	0.616	
		x _B	0.112	0.142	0.172	
	Blue	y _B	0.053	0.083	0.113	
	White	x _W	0.261	0.291	0.321	
y _W		0.262	0.292	0.322		
Viewing Angle	x axis, right (=0°)	r	60	70	degree	5
	x axis, left(=180°)	l	60	70		
	y axis, up(=90°)	u	45	55		
	y axis, down (=270°)	d	45	65		
Gray Scale		-				6

Notes : The image quality of visual test is determined by practical image, and the distance to determine image qualities is 6~7 times height of an active area. The viewing direction of visual test is defined by 'the front of display'.

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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 an average of the five point across the LCD surface with all pixels displaying white. For more information see FIG. 2.

When $I_{BL}=7mA \times 3$ at each assembly, $L_{WH}= 360cd/m^2$ (Min.) 400cd/m² (Typ.)

Surface luminance of a center point across the LCD surface is might be 450cd/m² (typ.) when an I_{BL} is over 22.0mA at an each assembly.

3. The variation in surface luminance, 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 FIG. 2

$$\text{WHITE} = \text{Maximum} (L_{ON1}, L_{ON2}, \dots, L_{ON5}) \div \text{Minimum} (L_{ON1}, L_{ON2}, \dots, L_{ON5})$$

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 FIG. 3.

5. **The minimum viewing angle is the angle at which the contrast ratio is greater than 10. And the typical 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 FIG. 4

6. Gray scale specification.

n	Gs(S)	Relative Luminance (%)			Note
		Min.	Typ.	Max.	
0	0	0.1	0.2	0.3	
1	15	0.2	0.5	0.8	
2	31	0.6	1.2	2.0	
3	47	1.1	2.2	3.6	
4	63	1.9	3.7	6.0	
5	79	2.8	5.4	8.5	
6	95	4.4	7.9	12.1	
7	111	6.6	11.5	17.2	
8	127	10.2	16.6	24.0	
9	143	14.4	22.1	30.9	
10	159	19.7	28.8	39.2	
11	175	26.8	36.7	47.9	
12	191	35.4	45.8	57.5	
13	207	44.7	54.8	66.3	
14	223	59.9	68.2	77.7	
15	239	78.8	83.8	89.4	

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16	255	100	100	100	
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FIG. 2 Luminance

Measuring points for luminance variation and surface luminance.

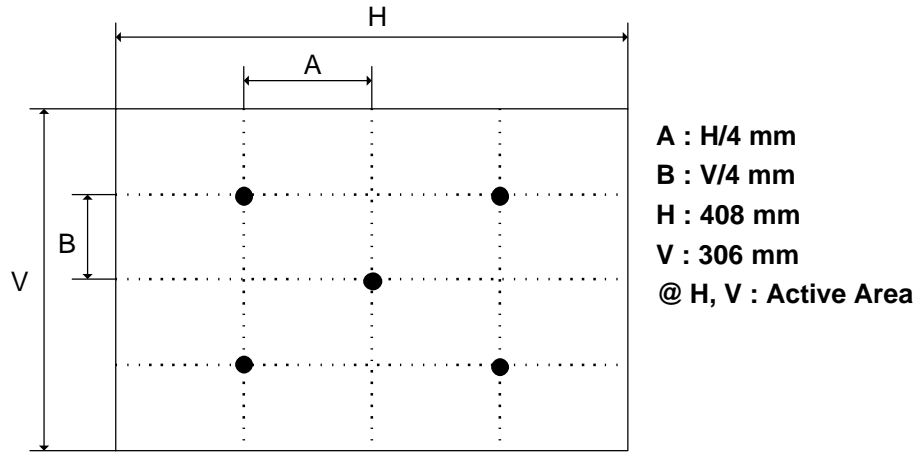


FIG. 3 Response Time

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

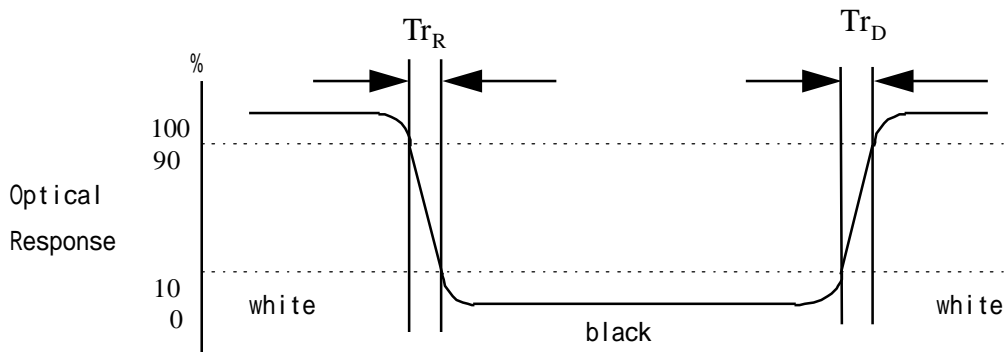
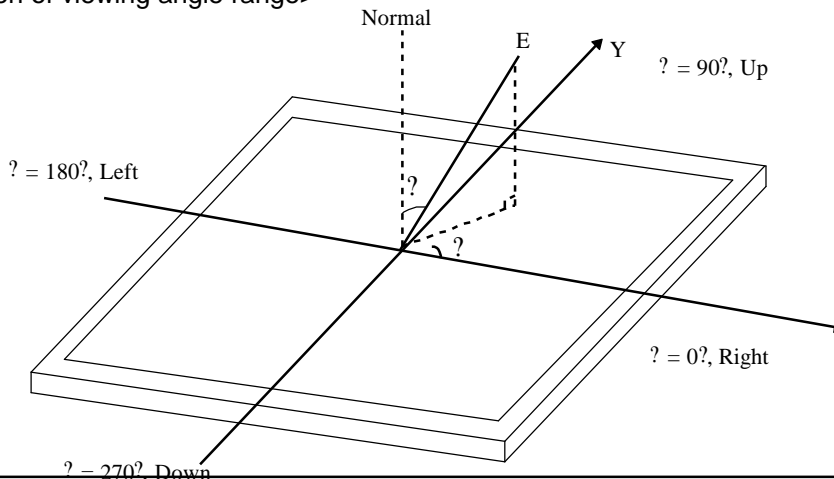


FIG. 4 Viewing angle

<Definition of viewing angle range>



Product Specification

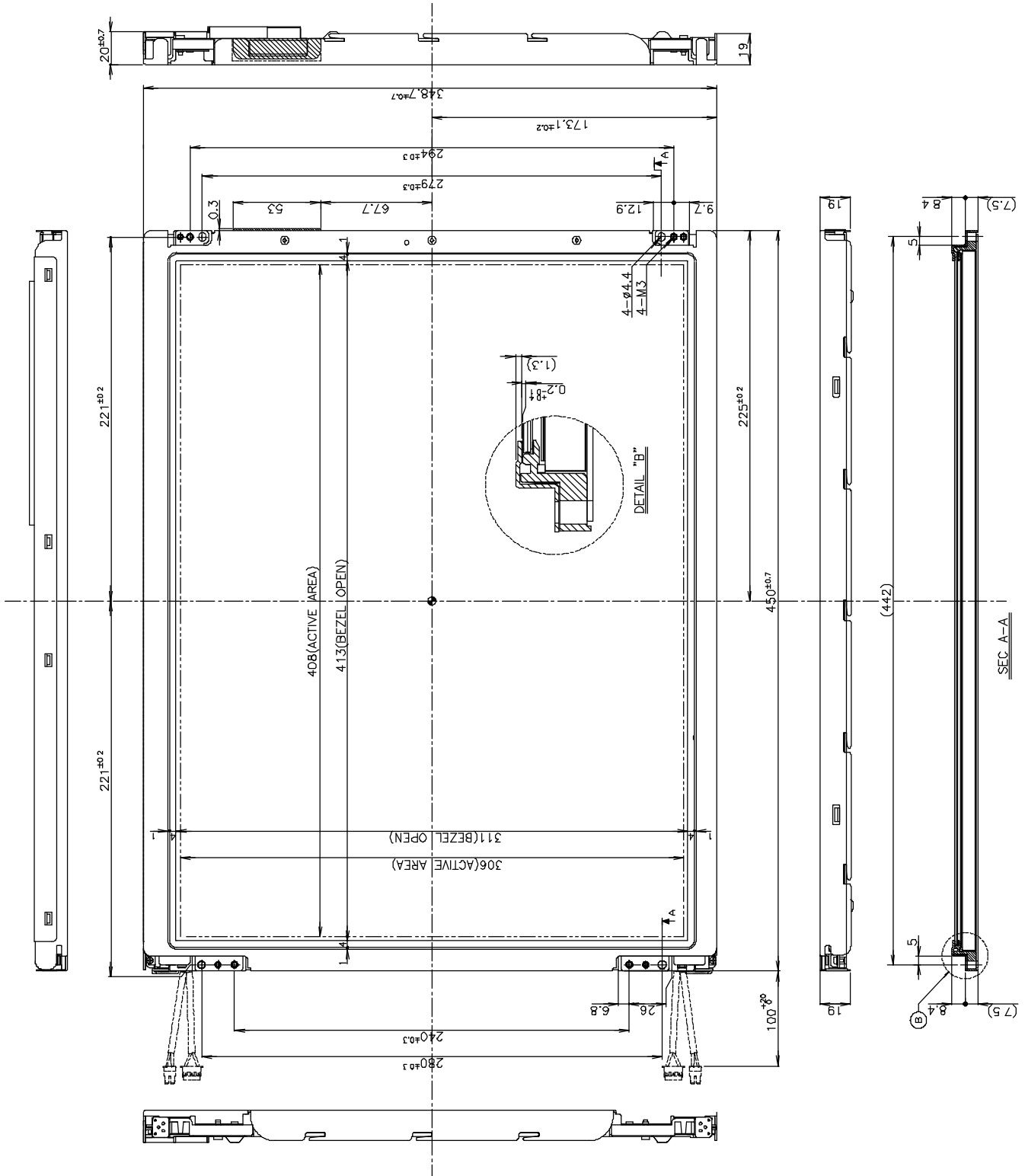
5. Mechanical Characteristics

The contents provide general mechanical characteristics for the model LC201V1 LCD. In addition, the figures in the next page are detailed mechanical drawings of the LCD.

Outline Dimension	Horizontal	450.0 ± 0.7 mm
	Vertical	348.7 ± 0.7 mm
	Depth	20.0 ± 0.7 mm
Bezel Area	Horizontal	413.0 ± 0.5 mm
	Vertical	311.0 ± 0.5 mm
Active Area	Horizontal	408.0 mm
	Vertical	306.0 mm
Weight(Approximate)	3,200 g (Typ.), 3,360 g (Max.)	
Surface Treatment	Hard Coating (3H) Anti-glare treatment of the front polarizer	

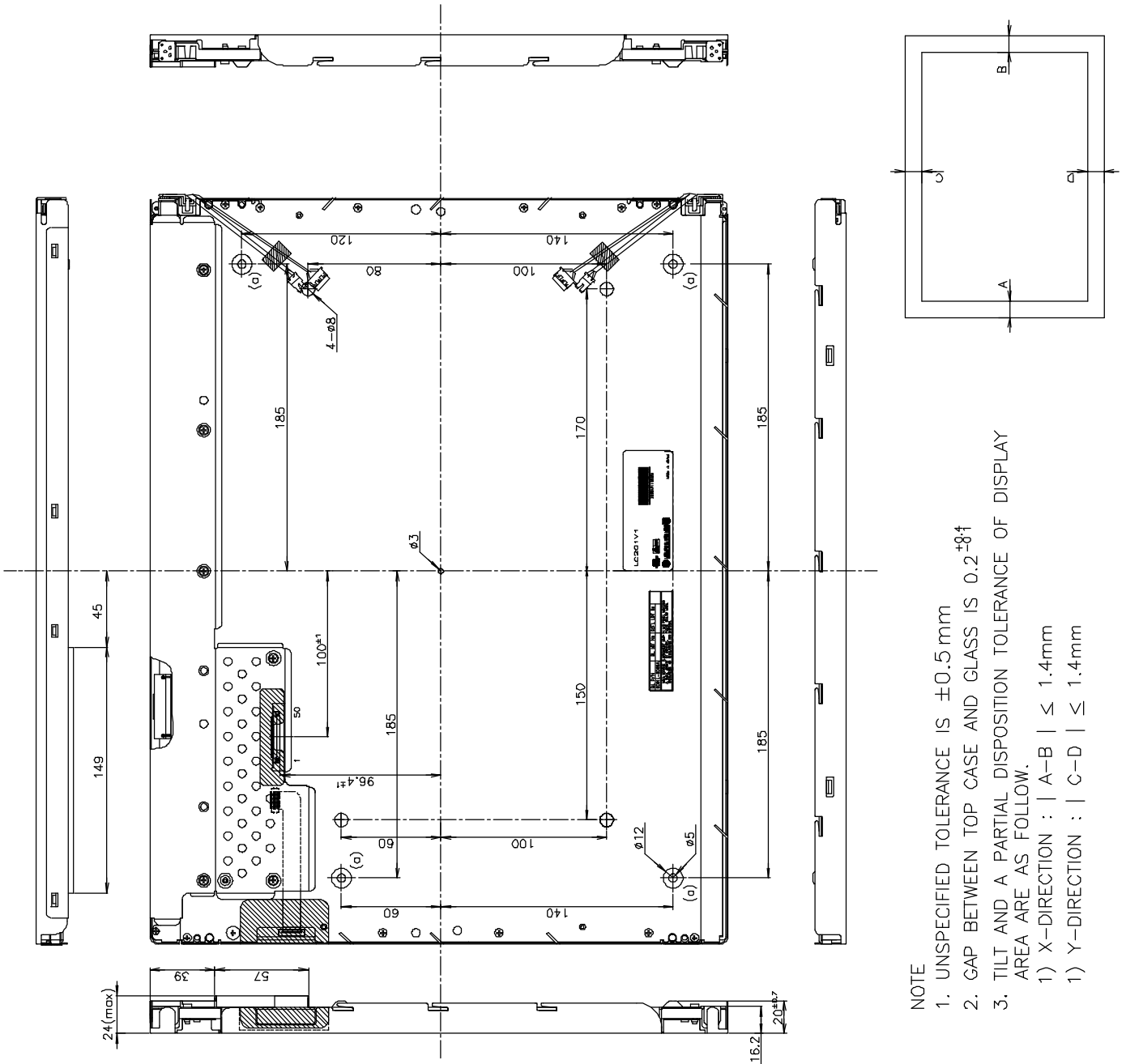
Product Specification

< FRONT VIEW >



Product Specification

< REAR VIEW >



NOTE

1. UNSPECIFIED TOLERANCE IS ± 0.5 mm
2. GAP BETWEEN TOP CASE AND GLASS IS $0.2 \text{ } ^{+0.1}$
3. TILT AND A PARTIAL DISPOSITION TOLERANCE OF DISPLAY AREA ARE AS FOLLOW.
 - 1) X-DIRECTION : | A-B | ≤ 1.4 mm
 - 1) Y-DIRECTION : | C-D | ≤ 1.4 mm

Product Specification

6. Reliability

Environment test condition.

No.	Test Parameters	Test Condition
1	Low temperature Operating	Ta = 0 240h
2	High temperature Operating	Ta = 50 240h
3	Low temperature Storage	Ta = -20 50%RH 240h
4	High temperature Storage	Ta = 60 240h
5	Vibration test (non-operating)	Random wave, 10~500~10Hz, 1.0G 3 axis, 20 min/axis
6	Shock test (non-operating)	Half sine wave, 100G, 2ms, one shock of each six faces (i.e. run 100G 2ms for all six faces.)
7	Humidity	90%(40) / 240Hr , without Film
8	Altitude Operating storage/shipment	15,000 feet 45,000 feet
9	ESD	Panel/Case : ± 12KV (150 Ohm/150pF) Connector : ± 400V (0 Ohm/100pF)

{Result Evaluation Criteria}

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

7. International Standards

7-1. Safety

- a) UL 1950 Third Edition, Underwriters Laboratories, Inc. Jan. 28, 1995. Standard for Safety of Information Technology Equipment Including Electrical Business Equipment.
- b) CAN/CSA C22.2 No. 950-95 Third Edition, Canadian Standards Association, Jan. 28, 1995. Standard for Safety of Information Technology Equipment Including Electrical Business Equipment.
- c) EN 60950 : 1992 + A1 : 1993 + A2 : 1993 + A3 : 1995 + A4 : 1997 + A11 : 1997
IEC 950 : 1991 + A1 : 1992 + A2 : 1993 + A3 : 1995 + A4 : 1996
European Committee for Electrotechnical Standardization (CENELEC)
EUROPEAN STANDARD for Safety of Information Technology Equipment Including Electrical Business Equipment.

7-2. EMC

- a) ANSI C63.4 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz." American National Standards Institute(ANSI),1992.
- b) C.I.S.P.R "Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment." International Special Committee on Radio Interference
- c) EN 55022 "Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment." European Committee for Electrotechnical Standardization (CENELEC),1988

Product Specification

8. Packing

8-1. Designation of Lot Mark

a) Lot Mark

A	B	C	D	E	F	G	H	I	J	K	L	M
---	---	---	---	---	---	---	---	---	---	---	---	---

A, B, C : SIZE
 D : YEAR
 E : MONTH
 F, G : PANEL CODE
 H : ASSEMBLY CODE
 I, J, K, L, M : SERIAL NO.

Note : 1. YEAR

YEAR	97	98	99	2000	2001	2002	2003	2004	2005	2006	2007
Mark	7	8	9	0	1	2	3	4	5	6	7

2. MONTH

MONTH	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Mark	1	2	3	4	5	6	7	8	9	A	B	C

b) Location of Lot Mark

Serial NO. Is printed on the label. The label is attached to the backside of the LCD module.
 This is subject to change without prior notice.

8-2. Packing Form

- a) Package quantity in one box : 3 (pcs)
- b) Box Size : 470mm × 253mm × 573Dmm

9.PRECAUTIONS

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

9.1 MOUNTING PRECAUTIONS

- (1) You must mount a module using holes arranged in four corners or four sides.
- (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 a transparent protective plate to the surface in order to protect the polarizer.

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 causes 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, toluene 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.

9.2 OPERATING PRECAUTIONS

- (1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage :
 $V = ? 200\text{mV}$ (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) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

Product Specification**9.3 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 wrist band etc . And don't touch interface pin directly.

9.4 PRECAUTIONS FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

9.5 STORAGE

When storing modules as spares for a long time, the following precautions are necessary.

(1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5 and 35 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.

9.6 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.