

# HITACHI

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Date : June 10,'99

## CUSTOMER'S ACCEPTANCE SPECIFICATIONS

### SX21V001-Z4A

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Accepted by : \_\_\_\_\_

Proposed by : N. Aoyan

Displays, Hitachi, Ltd.

Sh.  
No.

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RECORD OF REVISION

Date	Sheet No.	Summary
May 25, '99	3284PS 2712- SX21V001-Z4A-2 Page 12-2/2	12.2 REVISION Added Rev.B
June 10, '99	3284PS 2705- SX21V001-Z4A-3 Page 5-2/3	5.2.2 ELECTRICAL CHARACTERISTICS Revised resistance between terminal X1-X2 : 350~850Ω → 400~800Ω Y1-Y2 : 350~750Ω → 220~700Ω

### 3. MECHANICAL DATA

(1) Part Name	SX21V001-Z4A
(2) Module Size	203.0(W) mm × 142.5(H) mm × 8.0 max (D) mm
(3) Display Size	167.02(W) mm × 125.26(H) mm Diagonal size 21cm (8.2")
(4) Dot Pitch	0.087(W) mm × 0.261(H) mm
(5) Number of Dots	640 × 3 (R,G,B)(W) × 480 (H) dots
(6) Duty	1/240
(7) LCD	Film type (negative type)
(8) Viewing Direction	12 O'clock
(9) Backlight	Cold Cathode Fluorescent Lamp (CFL) × 1
(10) Weight	(310) g typ
(11) Power Supply Voltage	3.3V only
(12) Touch panel	Resistance type

#### 4. ABSOLUTE MAXIMUM RATINGS

##### 4. 1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS (LCM)

VSS=0V:Standard

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	0	6.0	V	
Contrast Adjustment Voltage	VCON-VSS	0	VDD	V	
Input Voltage	$V_i$	-0.3	VDD+0.3	V	Note 1
Input Current	$I_i$	0	1	A	
Static Electricity	-	-	-	-	Note 2

Note 1  $\overline{\text{DISP OFF}}$ , FLM, CL1, CL2, UD0~UD7, LD0~LD7

Note 2 Make certain you are grounded when handling LCM

##### 4. 2 ELECTRICAL ABSOLUTE MAXIMUM RATINGS (TOUCH PANEL)

ITEM	SPECIFICATION	NOTE
Voltage	(7VDC) (MAX)	
Current	(25mA) (max)	

##### 4. 3 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	OPERATING		STORAGE		COMMENT
	MIN	MAX	MIN	MAX	
Ambient Temperature	5°C	40°C	-20°C	60°C	Note 2, 3
Humidity	Note 1		Note 1		Without condensation
Vibration	-	2.45 m/s <sup>2</sup> (0.25G)	-	11.76 m/s <sup>2</sup> (1.2G) Note 5	Note 4
Shock	-	29.4 m/s <sup>2</sup> (3G)	-	490 m/s <sup>2</sup> (50G) Note 5	XYZ directions 11ms
Corrosive Gas	Not Acceptable		Not Acceptable		

Note 1  $T_a \leq 40^\circ\text{C}$  : 85%RH max.

$T_a > 40^\circ\text{C}$  : Absolute humidity must be lower than the humidity of 85%RH at 40°C.

Note 2  $T_a$  at -20°C ----- <48h, at 60°C ----- <168h

Note 3 Background color changes slightly depending on ambient temperature.  
This phenomenon is reversible.

Note 4 5Hz~100Hz (Except resonance frequency)

Note 5 This module should be operated normally after finish the test.

Note 6 When LCM is operated at 5°C, the life time of CFL will be reduced.  
Need to make sure of value of IL and characteristics of inverter.  
Also the response time at 5°C will be slower.

## 5. ELECTRICAL CHARACTERISTICS

### 5.1 ELECTRICAL CHARACTERISTICS OF LCD

VSS=0V

ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
Power Supply Voltage	VDD	VDD-VSS=3.3V	3.15	3.30	3.45	V
Contrast Adjustment Voltage (Note 1)	VCON	-	0.8	-	2.8	V
Input Voltage for Logic Circuits (Note 2)	Vi	"H" level	0.8VDD	-	VDD	V
		"L" level	0	-	0.2VDD	
Power Supply Current (Note 3)	IDD	VDD-VSS=3.3V	-	30	46	mA
Input Leak Current	I <sub>con</sub> (Note5)	V <sub>con</sub> =0.8~2.8V	-	-	(20)	μA
	I <sub>in</sub> (Note2)	V <sub>in</sub> =VDDorVSS	-	-	±1.0	
Contrast Adjustment Voltage (Note 6)	V <sub>con</sub>	T <sub>a</sub> = 5°C, φ=0°	0.8	-	-	V
		T <sub>a</sub> =25°C, φ=0°	-	(1.8)	-	
		T <sub>a</sub> =40°C, φ=0°	-	-	2.8	
Frame Frequency (Note 7)	fFLM	-	100	120	150	Hz

(Note 1) In proportion as the VCON voltage decrease the brightness will increase.

(Note 2) DISP OFF, FLM, CL1, CL2, UD0~UD7, LD0~LD7

(Note 3) fFLM=120Hz, T<sub>a</sub>=25°C, Display pattern:Checker pattern.

(Note 4) Rush Current of Power ON : 2A(PK) × 100μs

(Note 5) VCON

(Note 6) The Contrast Adjustment Voltage fluctuates about ±0.3V by each module.  
(only TYP values)

(Note 7) Need to make sure of flickering and rippling of display when setting the Frame Frequency in your set.

(Note 8) Absolute maximum ratings voltage of CFL cable for this module is as follows.

VCFL side : 2kV

VSS side : 300V

This inverter design shall not exceed the rated voltage.

## 5. 2 ELECTRICAL CHARACTERISTICS OF TOUCH PANEL

### 5.2.1 OPERATING CONDITION

ITEM	SPECIFICATION
Operating Voltage	5VDC
Operating Current	10~25mA

### 5.2.2 ELECTRICAL CHARACTERISTICS

ITEM		SPECIFICATION	NOTE
Resistance betw een terminal	X1-X2	400~800Ω	
	Y1-Y2	220~700Ω	
Insulance Resistance	X-Y	10MΩ min	Operating Voltage
Linearity	X	1.5% max	See Note 1
	Y	1.5% max	
Chattering		10msec max	

### 5.2.3 MECHANICAL CHARACTERISTICS

ITEM	SPECIFICATION	NOTE
Pen input pressure	0.05N~0.5N	
Surface hardness	2H min	JIS K 5400

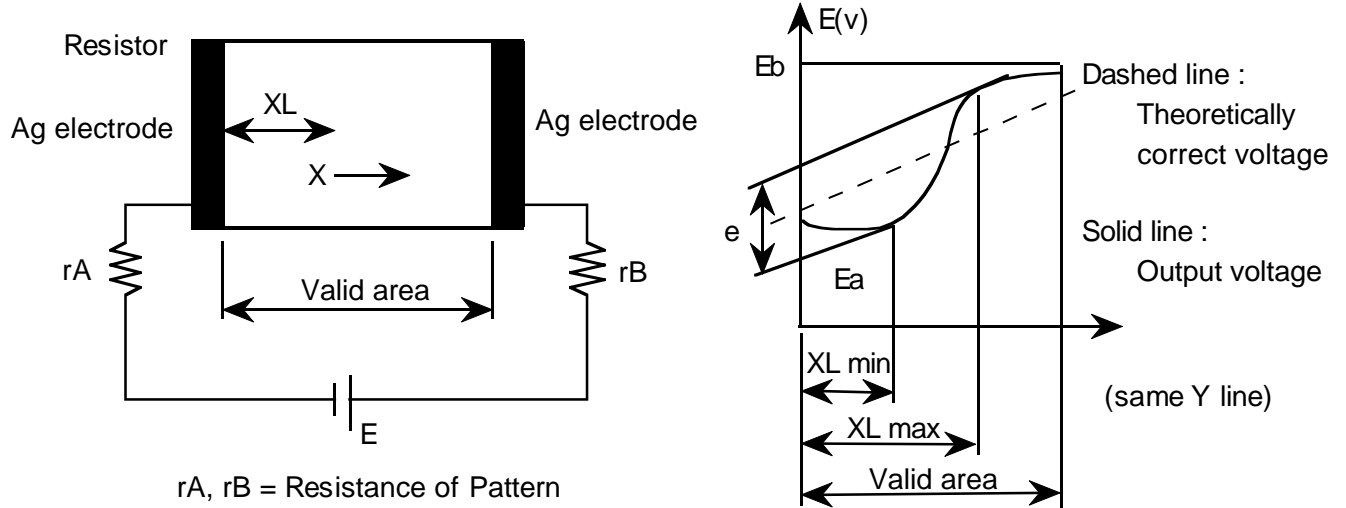
### 5.2.4 OPTICAL CHARACTERISTICS

ITEM	SPECIFICATION	NOTE
Transparency	81% typ	

Note 1 : Test Methode and Conditions

The difference ("e") between the theoretical output voltage and the actual output voltage when pressure is applied to any point within the valid area must be as indicated below .

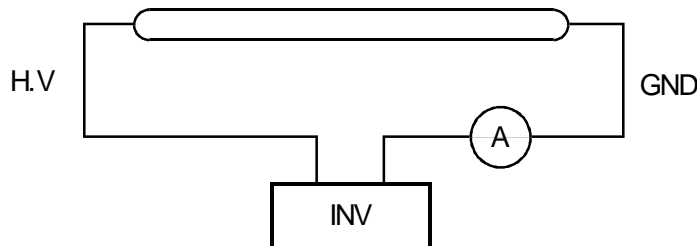
$$e \leq \text{applied voltage} \times 0.03 (\pm 0.015)$$



5. 3 ELECTRICAL CHARACTERISTICS OF BACKLIGHT

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Lamp Voltage	VL	-	(500)	-	Vrms	Ta=25°C
Frequency	fL	-	(60)	-	kHz	
Lamp Current (1Lamp) (Note6)	IL	(1.2) (Note 2)	(1.8)	(2.5) (Note 2)	mA	Ta=25°C
Starting discharge Voltage	VS (Note 2)	(1400)	-	-	Vrms	Ta=5°C

- (Note 1) Please design your lamp driving circuit (inverter) according to the above specifications, and inform Hitachi of it.
- (Note 2) Starting discharge voltage is increased when LCM is operating at lower temperature. Please check the characteristics of your inverter before applying to your set.
- (Note 3) Average life time of CFL will be decreased when LCM is operating at lower temperature.
- (Note 4) Under lower driving frequency of an inverter, a certain backlight system (CFL & CFL reflection sheet) may generate a sound noise. Before designing the inverter, please consider the driving frequency and the noise.
- (Note 5) Under lower temperature, please check CFL characteristics on your inverter.
- (Note 6)



## 6. OPTICAL CHARACTERISTICS

### 6.1 OPTICAL CHARACTERISTICS OF LCD

Ta=25°C (Backlight On)

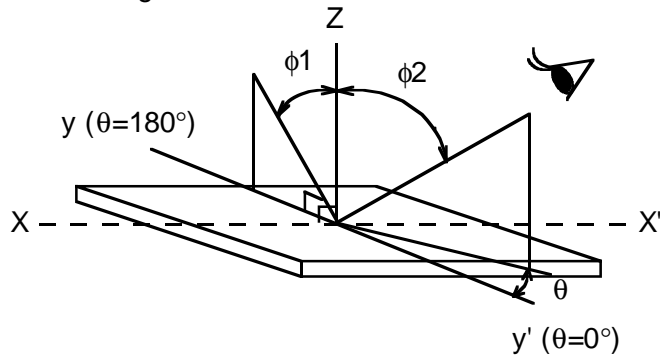
ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	NOTE	
Viewing area	$\phi 2-\phi 1$	$\theta=0^\circ, K \geq 2.0$	-	(40)	-	deg	1),2)	
Contrast ratio	K	$\phi=0^\circ, \theta=0^\circ$	-	(50)	-	-	3),5),6)	
Response time (rise)	tr	$\phi=0^\circ, \theta=0^\circ$	-	(190)	-	ms	4)	
Response time (fall)	tf	$\phi=0^\circ, \theta=0^\circ$	-	(160)	-	ms	4)	
Color tone (Primary Color)	Red	x	$\phi=0^\circ, \theta=0^\circ$	-	(0.54)	-	-	7)
		y		-	(0.33)	-	-	
	Green	x		-	(0.31)	-	-	
		y		-	(0.51)	-	-	
	Blue	x		-	(0.17)	-	-	
		y		-	(0.17)	-	-	
	White	x		-	(0.29)	-	-	
		y		-	(0.31)	-	-	

(Measurement condition : Hitachi standard)

Note 1)~7) : See next page.

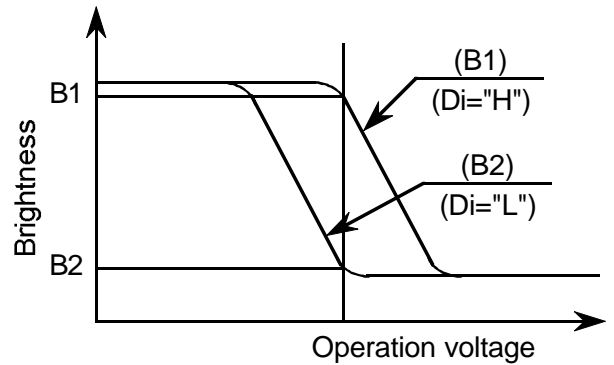


Note 1. Definition of  $\theta$  and  $\phi$   
(Normal)  
Viewing direction

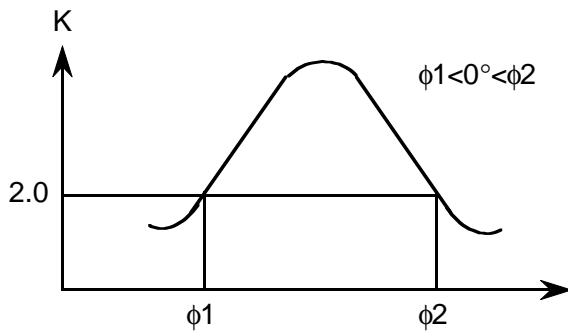


Note 3. Definition of contrast "K"

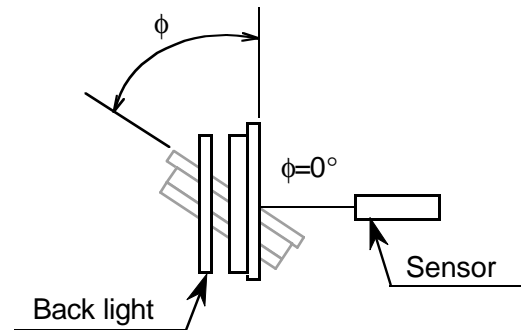
$$K = \frac{\text{Brightness on selected area (B1)}}{\text{Brightness on non-selected area (B2)}}$$



Note 2. Definition of view ing angle  $\phi_1$  and  $\phi_2$

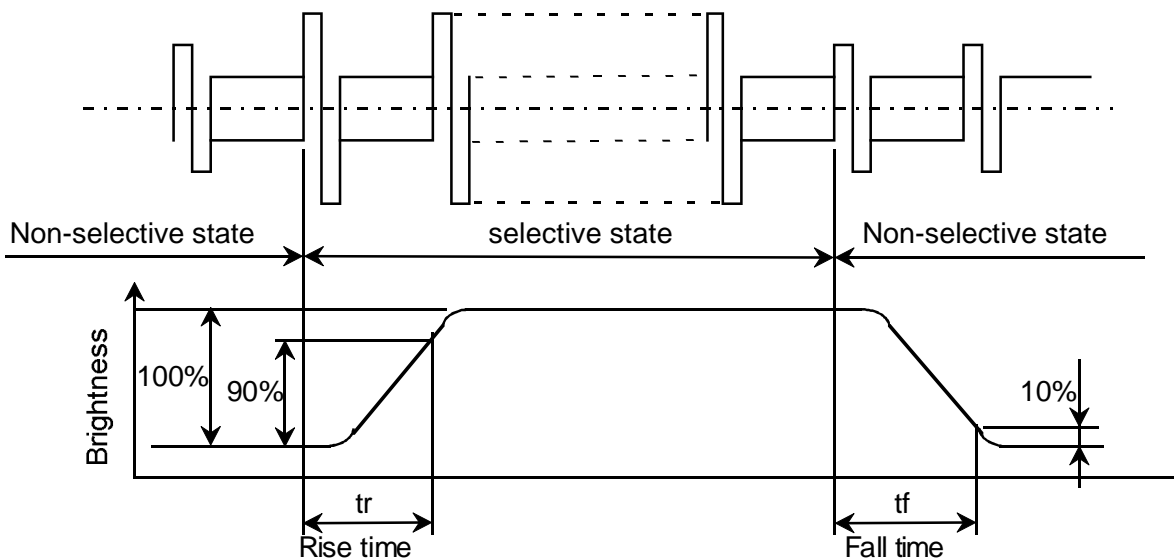


Contrast ratio K vs view ing angle  $\phi$



Sensor : BM-7 or correspondence equipment

Note 4. Definition of optical response time



Note 5. Hitachi will not do 100% inspection for minimum value. Minimum value is for reference.

Note 6. Hitachi will do sampling inspection for minimum value.

Note. 7 The LCD driving voltage should be adjusted at the voltage where the peak contrast is obtained.

## 6.2 OPTICAL CHARACTERISTICS OF BACKLIGHT

ITEM	MIN	TYP	MAX	UNIT	NOTE
Brightness	-	(58)	-	cd/m <sup>2</sup>	IL=1.8mA Note 1),2)
Rise Time	-	5	-	Minute	IL=1.8mA Brightness 80%
Brightness Uniformity	-	-	±30	%	Undermentioned Note 1),4)

Measurement condition : Hitachi standard)

CFL : INITIAL, Ta=25°C

Display data should be all "ON"

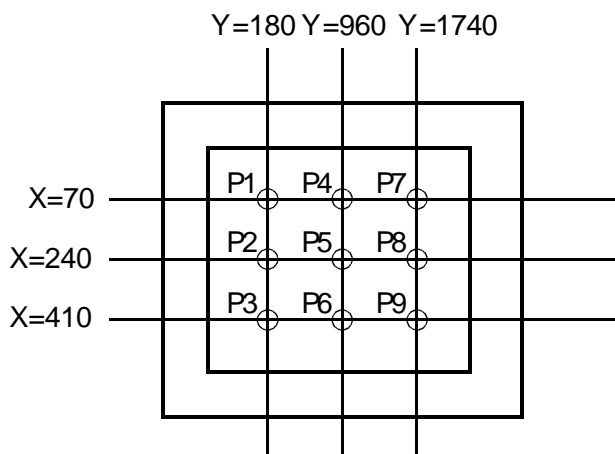
The LCD driving voltage should be adjusted at the voltage where the peak contrast is obtained, when set pattern is all "Q".

(Note 1) Measurement after 10 minutes from CFL operating.

Average value of 9 points (Note 3).

(Note 2) Brightness control : 100%

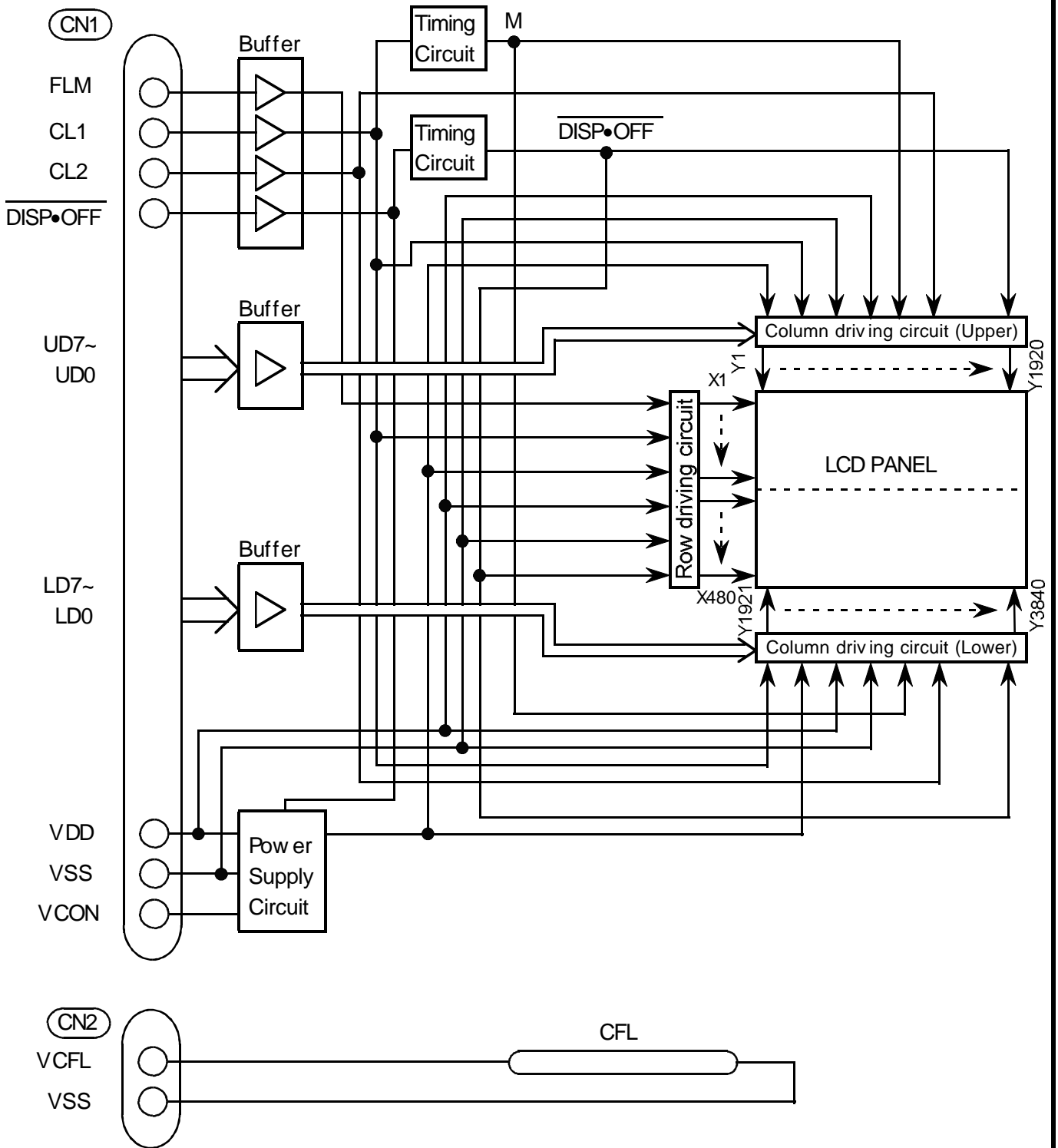
(Note 3) Measurement of the following 9 places on the display.



(Note 4) Definition of the brightness tolerance.

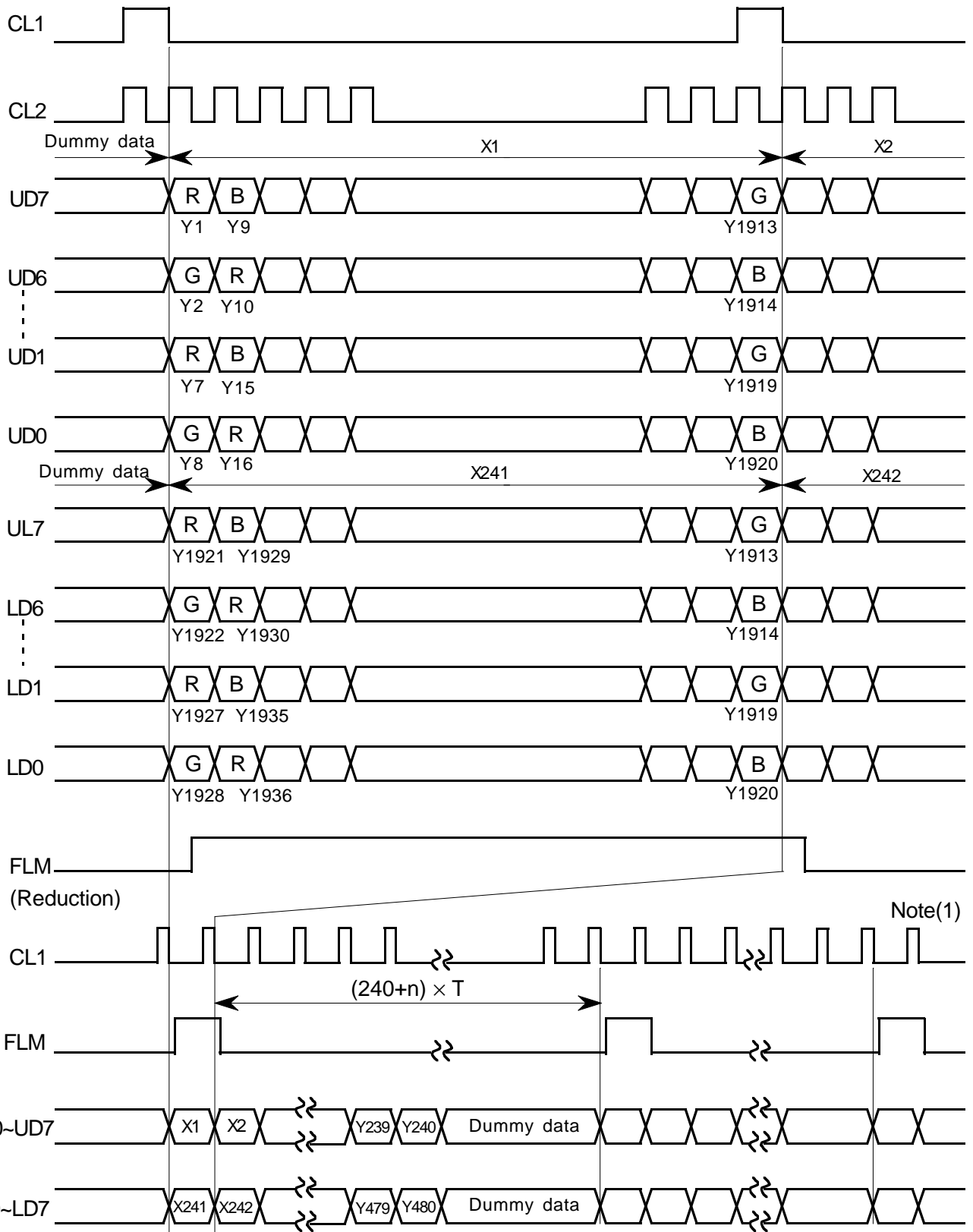
$$\left( \frac{\text{Max brightness or Min brightness} - \text{Average brightness}}{\text{Average brightness}} \right) \times 100$$

### 7. BLOCK DIAGRAM



# 8. INTERFACE TIMING CHART

## 8.1 TIMING CHART

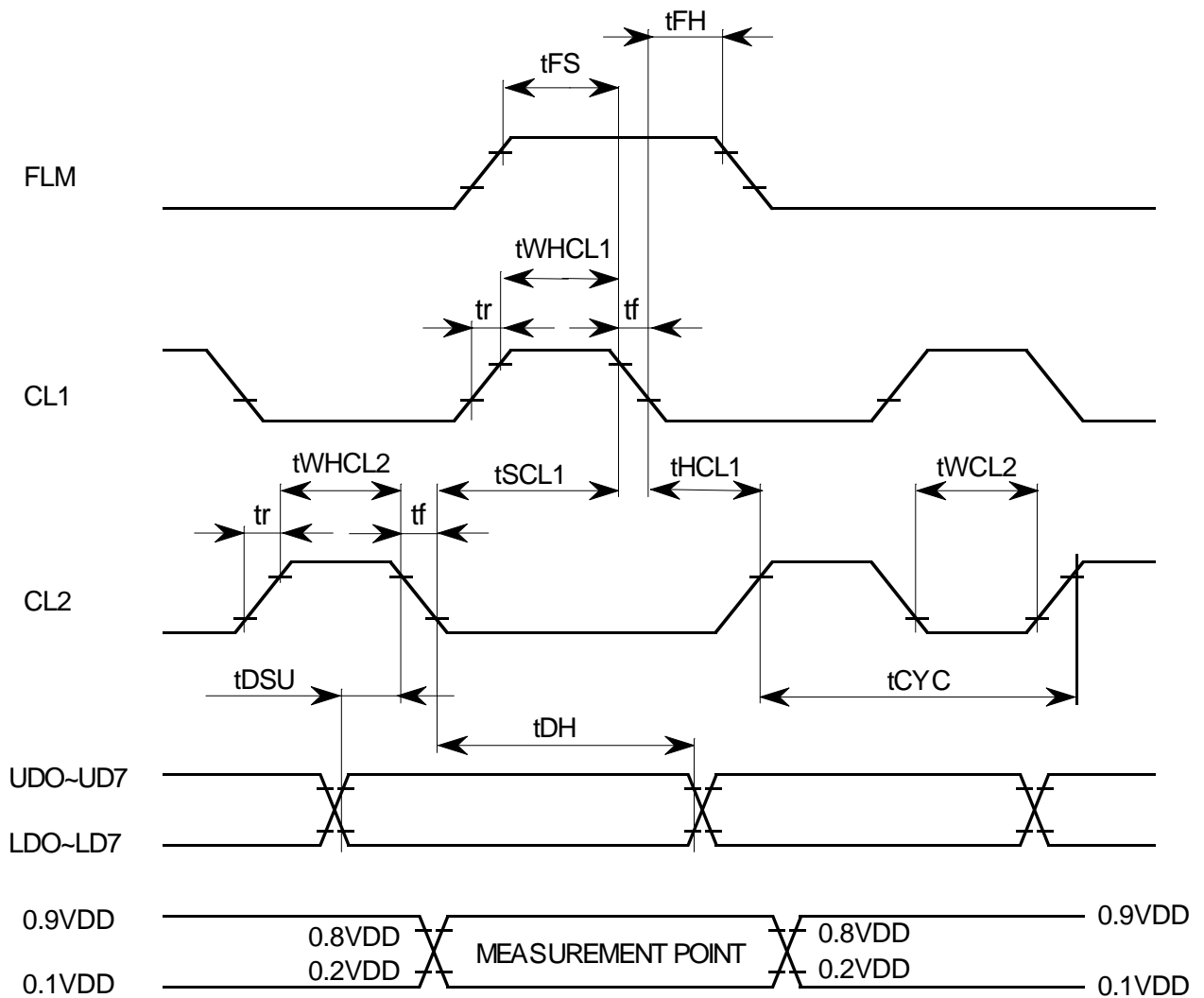


Note(1) : The interval of CL1 pulse must be same including the vertical blanking period.

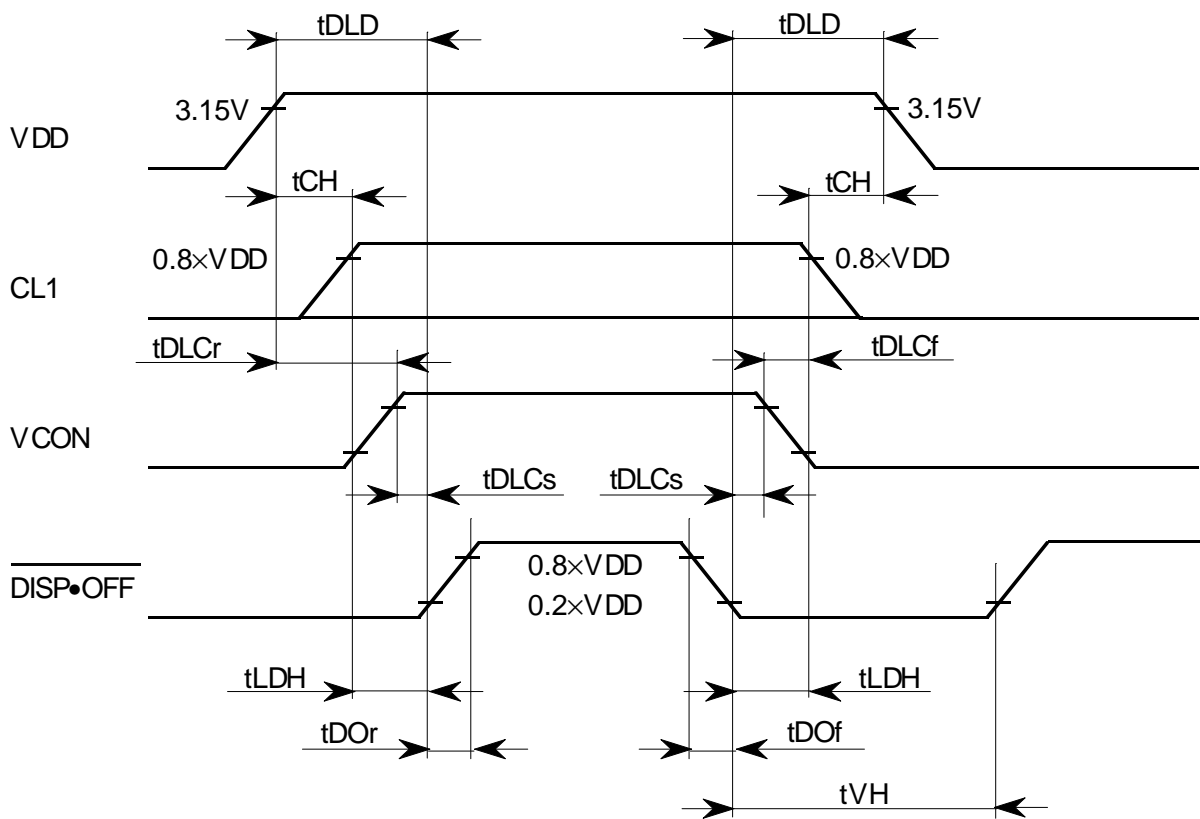
## 8.2 INTERFACE TIMING SPECIFICATION

VDD=3.3±0.15V, VSS=0V, Vcon=0.8~2.8V, Ta=+5°C~+40°C

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
CL1 pulse width "H"	t <sub>WHCL1</sub>	65	—	—	ns
Clock cycle time	t <sub>CYC</sub>	40	—	—	ns
CL2 pulse width	t <sub>WCL2</sub>	15	—	—	ns
Clock set up time	t <sub>SCL1</sub>	20	—	—	ns
Clock hold time	t <sub>HCL1</sub>	50	—	—	ns
Clock rise fall time	t <sub>r</sub> , t <sub>f</sub>	—	—	30	ns
Data set up time	t <sub>DSU</sub>	10	—	—	ns
Data hold time	t <sub>DH</sub>	10	—	—	ns
"FLM" set up time	t <sub>FS</sub>	100	—	—	ns
"FLM" hold time	t <sub>FH</sub>	50	—	—	ns



### 8.3 POWER ON / OFF SEQUENCE

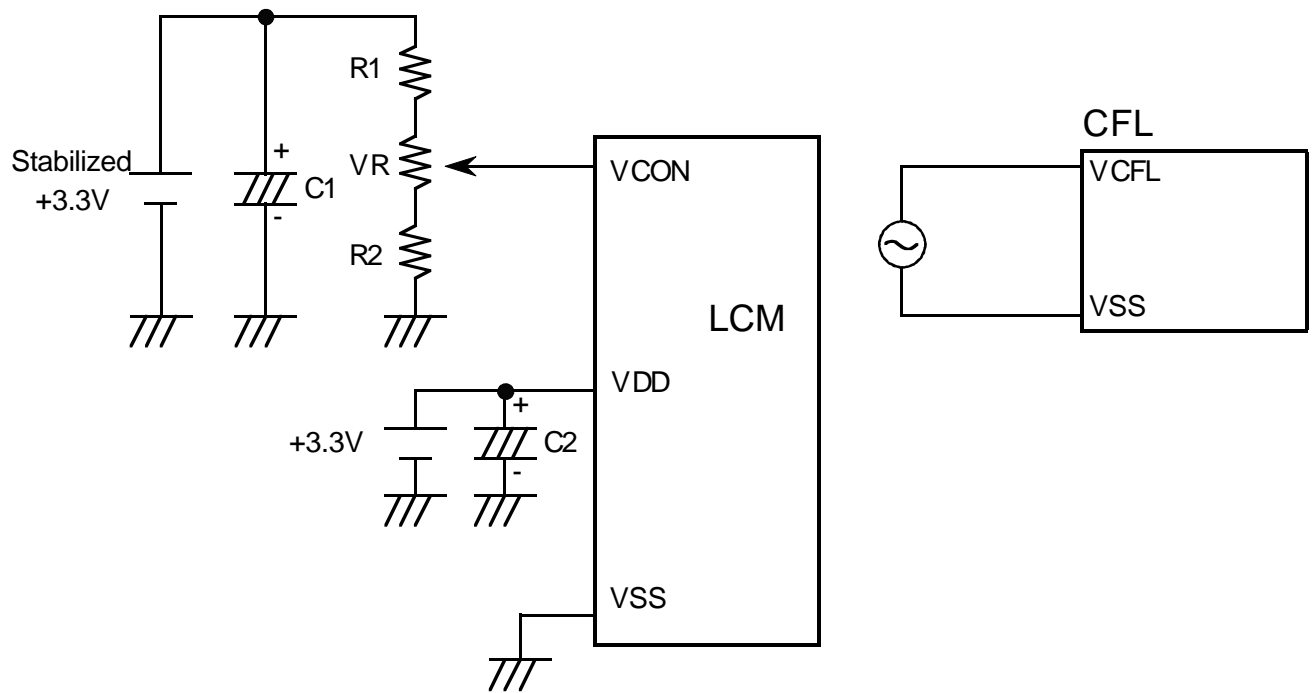


SYMBOL	MIN	MAX	UNIT	COMMENT
$t_{DLD}$	200		ms	(Note 1)
$t_{CH}$	0		ms	
$t_{LDH}$	20		ms	
$t_{DOr}$		100	ns	(Note 2)
$t_{DOf}$		100	ns	
$t_{DLCr}$	0		ms	
$t_{DLCf}$	0		ms	
$t_{DLCs}$	20		ms	
$t_{VH}$	200		ms	

(Note 1) Please keep the specified sequence because wrong sequence may cause permanent damage to the LCD panel.

(Note 2) Hitachi recommends you to use  $\overline{\text{DISP}\bullet\text{OFF}}$  function.  
Display quality may deteriorate if you don't use  $\overline{\text{DISP}\bullet\text{OFF}}$  function.

### 8.4 POWER SUPPLY FOR LCM



8.5 INPUT DATA ALLOCATION TABLE

Data Signal	U D 7	U D 6	U D 5	U D 4	U D 3	U D 2	U D 1	U D 0	U D 7	U D 6	U D 5	U D 4	-----	U D 4	U D 3	U D 2	U D 1	U D 0	
Y	1	2	3	4	5	6	7	8	9	10	11	12	-----	1 9 1 6	1 9 1 7	1 9 1 8	1 9 1 9	1 9 1 0	
X																			
UPPER PANEL	1	R	G	B	R	G	B	R	G	B	R	G	B	-----	G	B	R	G	B
	2	R	G	B	R	G	B	R	G	B	R	G	B	-----	G	B	R	G	B
	3	R	G	B	R	G	B	R	G	B	R	G	B	-----	G	B	R	G	B
	4	R	G	B	R	G	B	R	G	B	R	G	B	-----	G	B	R	G	B
	5	R	G	B	R	G	B	R	G	B	R	G	B	-----	G	B	R	G	B
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮		⋮	⋮	⋮	⋮	⋮
	238	R	G	B	R	G	B	R	G	B	R	G	B	-----	G	B	R	G	B
	239	R	G	B	R	G	B	R	G	B	R	G	B	-----	G	B	R	G	B
	240	R	G	B	R	G	B	R	G	B	R	G	B	-----	G	B	R	G	B
LOWER PANEL	241	R	G	B	R	G	B	R	G	B	R	G	B	-----	G	B	R	G	B
	242	R	G	B	R	G	B	R	G	B	R	G	B	-----	G	B	R	G	B
	243	R	G	B	R	G	B	R	G	B	R	G	B	-----	G	B	R	G	B
	244	R	G	B	R	G	B	R	G	B	R	G	B	-----	G	B	R	G	B
	245	R	G	B	R	G	B	R	G	B	R	G	B	-----	G	B	R	G	B
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮		⋮	⋮	⋮	⋮	⋮
	478	R	G	B	R	G	B	R	G	B	R	G	B	-----	G	B	R	G	B
	479	R	G	B	R	G	B	R	G	B	R	G	B	-----	G	B	R	G	B
	480	R	G	B	R	G	B	R	G	B	R	G	B	-----	G	B	R	G	B
X	1 9 2 1	1 9 2 2	1 9 2 3	1 9 2 4	1 9 2 5	1 9 2 6	1 9 2 7	1 9 2 8	1 9 2 9	1 9 2 0	1 9 3 1	1 9 3 2	-----	3 8 3 6	3 8 3 7	3 8 3 8	3 8 3 9	3 8 4 0	
Y																			
Data Signal	L D 7	L D 6	L D 5	L D 4	L D 3	L D 2	L D 1	L D 0	L D 7	L D 6	L D 5	L D 4	-----	L D 4	L D 3	L D 2	L D 1	L D 0	



## 8.6 INTERNAL PIN CONNECTION

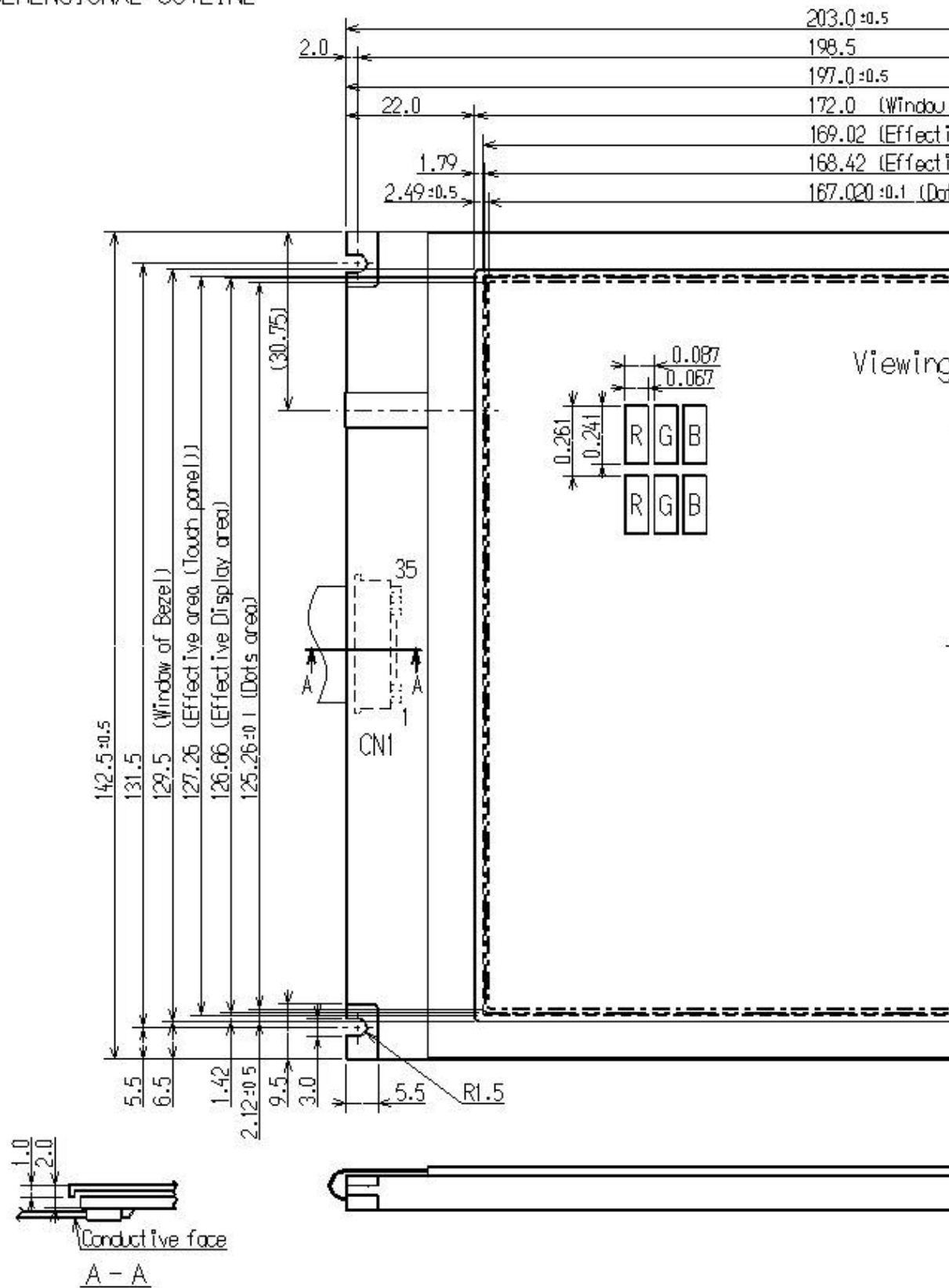
### CN1 MOLEX 54104-3511

PIN No.	SIGNAL	LEVEL	FUNCTION
1	LD0	H / L	Display Data (Lower Column)
2	LD1	H / L	Display Data (Lower Column)
3	LD2	H / L	Display Data (Lower Column)
4	LD3	H / L	Display Data (Lower Column)
5	VSS	-	GND
6	LD4	H / L	Display Data (Lower Column)
7	LD5	H / L	Display Data (Lower Column)
8	LD6	H / L	Display Data (Lower Column)
9	LD7	H / L	Display Data (Lower Column)
10	VSS	-	GND
11	FLM	H	First Line Marker
12	$\overline{\text{DISP}} \bullet \text{OFF}$	H / L	H : ON / L : OFF
13	CL1	H → L	Data Latch
14	VSS	-	GND
15	CL2	H → L	Data Shift
16	VSS	-	GND
17	VDD	-	Power Supply for Logic
18	VDD	-	Power Supply for Logic
19	VCON	-	Contrast Adjust
20	VSS	-	GND
21	VDD	-	GND
22	UD0	H / L	Display Data (Upper Column)
23	UD1	H / L	Display Data (Upper Column)
24	UD2	H / L	Display Data (Upper Column)
25	UD3	H / L	Display Data (Upper Column)
26	VSS	-	GND
27	UD4	H / L	Display Data (Upper Column)
28	UD5	H / L	Display Data (Upper Column)
29	UD6	H / L	Display Data (Upper Column)
30	UD7	H / L	Display Data (Upper Column)
31	VSS	-	GND
32	DIG Y2	-	Touch panel Y2
33	DIG X2	-	Touch panel X2
34	DIG Y1	-	Touch panel Y1
35	DIG X1	-	Touch panel X1

CN2 JST : BHSR-02VS-1 (Suitable Connector : (1) SM02B-BHSS-1-TB or  
or  
(1) housing : BHSMR-02VS-1  
contact pin : SBHSM-002T-P0.5

PIN No.	SIGNAL	LEVEL	FUNCTION
1	VCFL	A C	Power Supply for CFL
2	VSS	-	GND for CFL

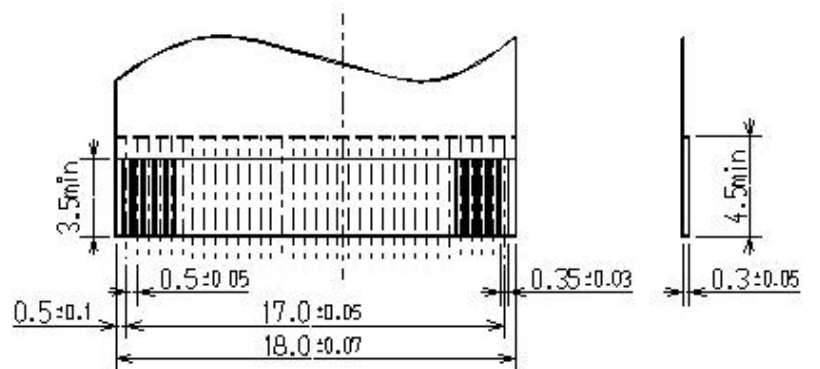
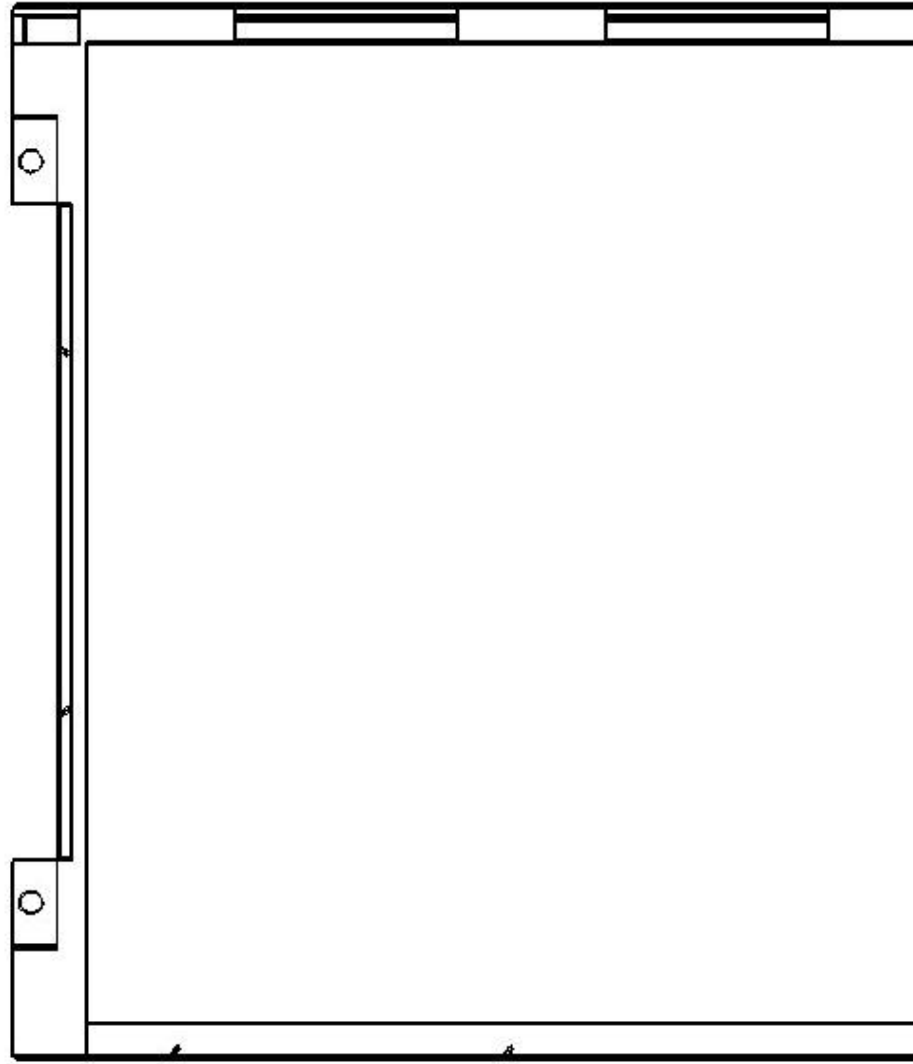
9. DIMENSIONAL OUTLINE  
 9.1 DIMENSIONAL OUTLINE



Mounting screw side. M2.5°

Note(1) Measurement when adding  $9.8 \times 10^4 \text{ Pa}$  ( $1.0 \text{ kgf/cm}^2$ ) at the measuring point

## 9.2 BACK SIDE



Recommended design rule for 1/4 FPC

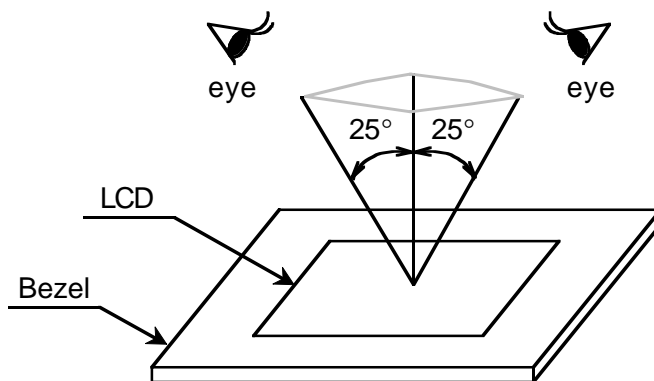
## 10. APPEARANCE STANDARD

### 10.1 APPEARANCE INSPECTION CONDITION

Visual inspection should be done under the following condition.

- (1) The inspection should be done in a dark room.
- (2) The CFL should be lighted with the prescribed inverter.
- (3) The distance between eyes of an inspector and the LCD Module is 25cm.
- (4) The viewing zone is shown in the figure.

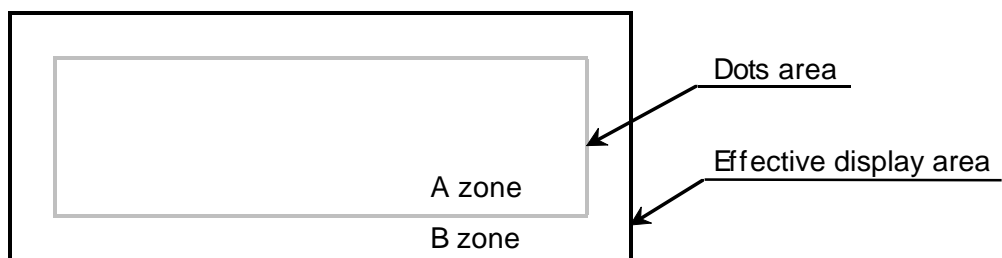
Viewing angle  $\leq 25^\circ$



### 10.2 DEFINITION OF ZONE

A zone : The effective display area specified at page 9-1/2 of this document.

B zone : Area between the window of bezel line and the effective display area (A zone) line specified at page 9-1/2 of this document.



10.3 APPEARANCE SPECIFICATION

(1) LCD APPEARANCE

\*) If the problem related to this section occurs about this item, the responsible persons of both party (Customer and HITACHI) will discuss the matter in detail.

No.	ITEM	CRITERIA		APPLIED ZONE	
L	Scratches	Distinguished one is not acceptable (To be judged by HITACHI STANDARD)		A	
	Dent	Same as above		A	
	Wrinkles in Polarizer	Same as above		A	
	Bubbles	Average diameter D (mm)	Maximum acceptable number	A	
	$D \leq 0.2$	ignored			
	$0.2 < D \leq 0.3$	12			
	$0.3 < D \leq 0.5$	3			
C	Stains, Foreign materials Dark spot	Filamentous (Line shape)		A,B	
		Length L (mm)	Width W (mm)		Maximum acceptable number
		$L \leq 2.0$	$W \leq 0.03$		ignored
		$L \leq 3.0$	$0.03 < W \leq 0.05$		6
		$L \leq 2.5$	$0.05 < W \leq 0.1$		1
D	Stains, Foreign materials Dark spot	Round (Dot shape)		A,B	
		Average diameter D (mm)	Maximum acceptable number		Minimum space
		$D < 0.2$	ignored		—
		$0.2 \leq D < 0.3$	10		10 mm
		$0.3 \leq D < 0.4$	5		30 mm
		$0.4 \leq D$	none		—
		The total number	Filamentous + Round = 10		
		Those wiped out easily are acceptable			
Color tone	To be judged by HITACHI STANDARD		A		
Color uniformity	Same as above		A		

No.	ITEM	CRITERIA				APPLIED ZONE
L	Contrast irregularity (Spot)	Average diameter D (mm)	Contrast	Maximum acceptable number	Minimum space	A
		$D \leq 0.25$	To be judged by HITACHI STANDARD	ignored	—	
		$0.25 < D \leq 0.35$		10	20mm	
		$0.35 < D \leq 0.5$		4	20mm	
		$0.5 < D \leq 0.7$		3	50mm	
$0.7 < D$	none	—				
D	Contrast irregularity (Line) (A pair of scratches)	Width W (mm)	Length L (mm)	Maximum acceptable number	Minimum space	A
		$W \leq 0.25$	$L \leq 1.2$	2	20mm	
		$W \leq 0.2$	$L \leq 1.5$	3	20mm	
		$W \leq 0.15$	$L \leq 2.0$	3	20mm	
		$W \leq 0.1$	$L \leq 3.0$	4	20mm	
		The w hole number		6		
	Rubbing Scratch	To be judged by HITACHI STANDARD				—

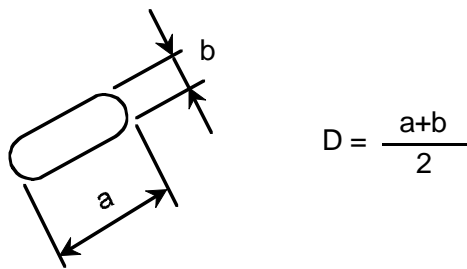
(2) CFL BACKLIGHT APPEARANCE

No.	ITEM	CRITERIA			APPLIED ZONE
C F L	Dark spots White spots Foreign materials (Spot)	Average diameter D (mm)	Maximum Acceptable number		A
		$D \leq 0.4$	ignored		
		$0.4 < D$	none		
B A C K L I G H T	Foreign materials (Line)	Width W (mm)	Length L (mm)	Maximum acceptable number	A
		$W \leq 0.2$	$L \leq 2.5$	1	
			$2.5 < L$	none	
		$0.2 < W$	—	none	
S C R A T C H E S	Scratches	Width W (mm)	Length L (mm)	Maximum acceptable number	A
		$W \leq 0.1$	—	ignored	
		$0.1 < W \leq 0.2$	$L \leq 11.0$	1	
			$11.0 < L$	none	
		$0.2 < W$	—	none	

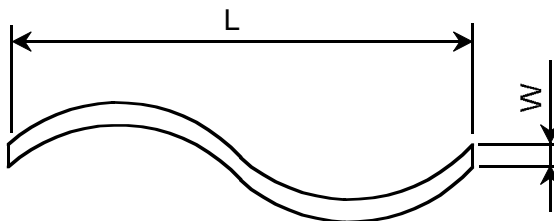
(3) TOUCH PANEL APPEARANCE

No.	ITEM	CRITERIA		APPLIED ZONE
T O U C H P A N E L	Foreign material (Black or White spots)	Average diameter D (mm)	Criteria	A
		$D \leq 0.25$	ignored	
		$0.25 < D \leq 0.35$	6	
		$0.35 < D$	none	
	Foreign material (Line) or Scratches	Width W (mm)	Criteria	A
		$W \leq 0.05$	ignored	
		$0.05 < W \leq 0.1$	$10 \leq L$ : none $L < 10$ : 4	
	Fisheyes on film surface	Average diameter D (mm)	Criteria	A
		$D \leq 0.2$	ignored	
		$0.2 < D \leq 0.35$	6	
		$0.35 < D \leq 0.6$	2	
		$0.6 < D$	none	
Uncleanliness	No conspicuous dirt		A	
Crack in glass plate	No cracks are allowed		A	

Note (1) Definition of Average diameter (D)



Note (2) Definition of Length (L) and Width (W)

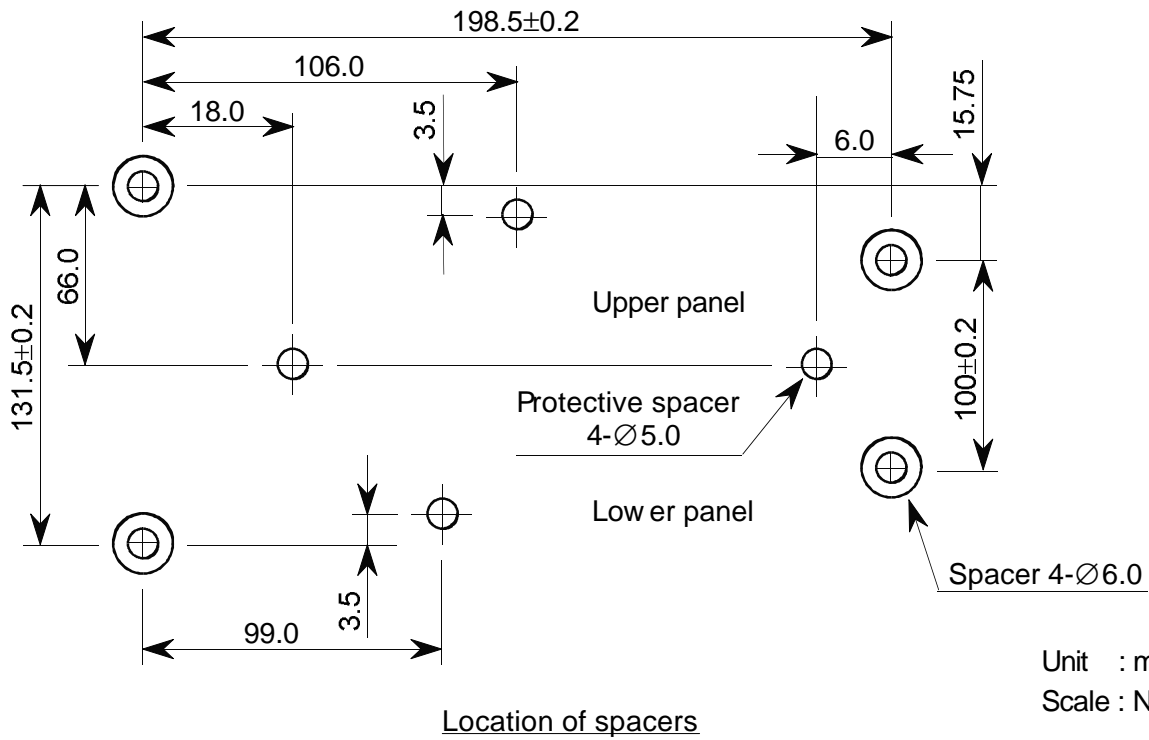
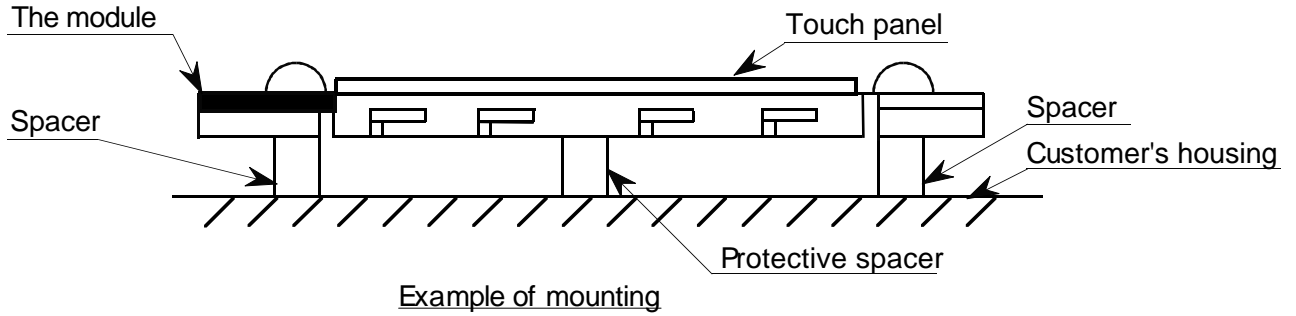




## 11. PRECAUTION IN DESIGN

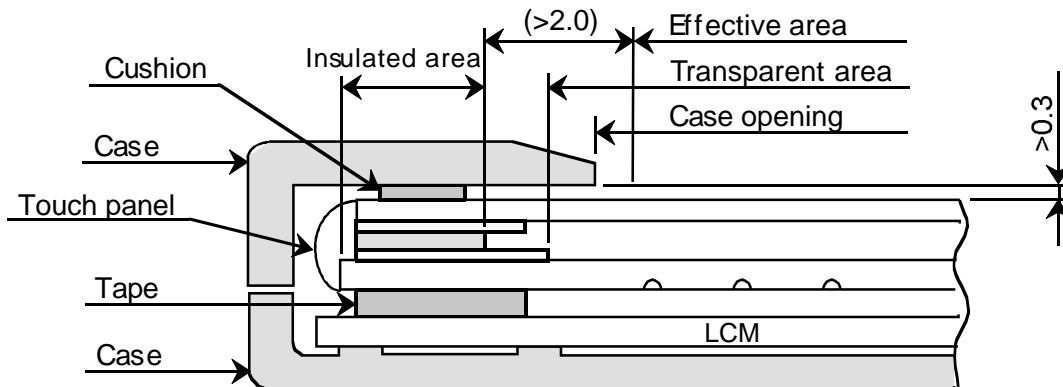
### 11.1 MOUNTING PRECAUTION

Please mount the LCD Module using mounting holes arranged in 4 corners, and please pay attention to the follow ings.



- (1) To prevent the module cover from being pressed, the distance between the module and the fitting plate, which means the length of the spacers, should be shorter than 1.0mm.
- (2) We recommend you to use protective spacers in order to protect the module from any kinds of shocks to your set.
- (3) For the module to be used at upright position, the case shall have a structure where the touch panel screen does not shift with its own weight.

(4) When assembling the touch panel and your case, please refer to the figure below .



(5) The clearance between the touch panel and the case shall be designed so that the case edge never presses the input screen when it is deformed by heat or other causes.

(6) The case shall be designed not to touch the tail portion (FPC for touch panel).

#### 11.2 PRECAUTIONS AGAINST ELECTROSTATIC DISCHARGE

As this module contains C-MOS LSIs, it is not strong against electrostatic discharge. Make certain that the operator's body is connected to the ground through a list band etc. And don't touch I/F pins directly.

#### 11.3 POWER ON SEQUENCE

Input signals should not be applied to LCD module before power supply voltage is applied and reaches to specified voltage ( $3.0 \pm 0.15V$ ).

If the above sequence is not kept, C-MOS LSIs of LCD module may be damaged due to latch up phenomenon.

#### 11.4 HANDLING PRECAUTIONS

(1) Since the polarizer on the top, and the aluminum plate on the bottom tend to be easily damaged, they should be handled with full care so as not to get them touched, pushed or rubbed by a piece of glass, tweezers and anything else which are harder than a pencil lead 3H.

(2) As the adhesives used for adhering upper/lower polarizers and aluminum plate are made of organic substances which will be deteriorated by a chemical reaction with such chemicals as acetone, toluene, ethanol and isopropylalcohol. The following solvents are recommended for use : Normal hexane

Please contact us when it is necessary for you to use chemicals other than the above.

- (3) Lightly wipe to clean the dirty surface with absorbent cotton or other soft material like chamois, soaked in the recommended chemicals without scrubbing it hardly.  
Always wipe the surface horizontally or vertically. Never give a wipe in a circle. To prevent the display surface from damage and keep the appearance in good state, it is sufficient, in general, to wipe it with absorbent cotton.
- (4) Immediately wipe off saliva or water drop attached on the display area because it may cause deformation or faded color.
- (5) Foggy dew deposited on the surface may cause a damage, stain or dirt to the polarizer.  
When you need to take out the LCD module from some place at low temperature for test, etc. It is required to be warmed them up to be temperature higher than room temperature before taking them out.
- (6) Touching the display area or VF pins with bare hands or contaminating them are prohibited, because the stain on the display area and poor insulation between terminals are often caused by being touched with bare hands.  
(Some cosmetics are detrimental to polarizers.)
- (7) In general, the glass is fragile so that it, especially on its periphery, tends to be cracked or chipped in handling. Please do not give the LCD module sharp shocks caused by falling etc.
- (8) Maximum pressure to the surface must be less than  $1.96 \times 10^4$  Pa (0.2kgf/cm<sup>2</sup>).  
And if the pressure area is less than 1cm<sup>2</sup>, maximum pressure must be less than 1.96N (0.2kgf).
- (9) Since the metal width is narrow on these locations (see page 9-1/2), please be careful with handling.
- (10) Top sheets shall be cleaned gently using a soft cloth such as those used for glasses.  
Hard wiping accumulated dust will leave scars on the surface even using a cloth.

#### 11.5 OPERATION PRECAUTION

- (1) Using a LCM module beyond its maximum ratings may result in its permanent destruction. LCM module's should usually be used under recommended operating conditions shown in chapter 5. Exceeding any of these conditions may adversely affect its reliability.
- (2) Response time will be extremely delayed at lower temperature than the specified operating temperature range and on the other hand LCD's shows dark blue color at higher temperature. However those phenomena do not mean defects of the LCD module. Those phenomena will disappear in the specified operating temperature range.
- (3) If the display area is pushed hard during operation, some display patterns will be abnormally displayed.

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- (4) A slight dew depositing on terminals may cause electrochemical reaction which leads to terminal open circuit. Please operate the LCD module under the relative condition of 40°C 85%RH.
- (5) Resistance range : Your controller shall be set up to allow the resistance range of touch panel specified in our CAS.
- (6) Pointed position of touch panel may shift owing to a change in resistance of touch panel depending on the operation condition. To compensate this shift, the set shall be given a calibration function.
- (7) Input shall be made with a stylus pen (polyacetal, R0.8). Chances are very high that use of a metal piece including a ball point pen or sharp edge will impair accuracy.
- (8) The touch panel is an auxiliary input device. The system shall be designed to have other input device.

#### 11.6 STORAGE

In case of storing LCD module for a long period of time (for instance, for years) for the purpose of replacement use, the following precautions necessary.

- (1) Store the LCD modules in a dark place ; do not expose them to sunlight or ultraviolet rays.
- (2) Keep the temperature between 10°C and 35°C at normal humidity.
- (3) Store the LCD modules in the container which is used for shipping from us.
- (4) No articles shall be left on the surface over an extended period of time.

#### 11.7 SAFETY

The LCD modules include Cold Cathode Fluorescent Lamp (CFL). CFL contains a small amount of mercury. Please follow local ordinances or regulations for disposal.

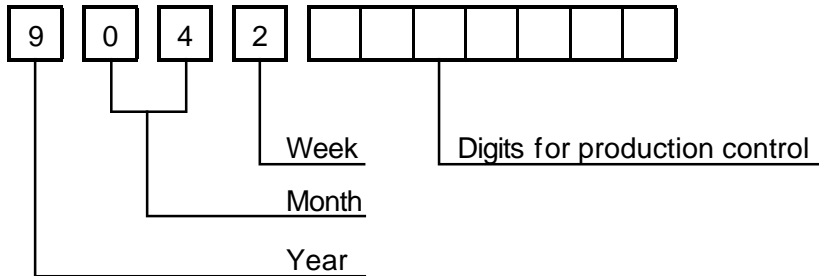
Wear finger cots or gloves whenever handling or assembling a touch panel because its glass edges are sharp.

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## 12. DESIGNATION OF LOT MARK

### 12.1 LOT MARK

Lot mark is consisted of 4 digits for production lot and 6 or 7 digits for production control.



Year	Figure in lot mark
1999	9
2000	0
2001	1
2002	2

Month	Figure in lot mark	Month	Figure in lot mark
Jan.	01	July	07
Feb.	02	Aug.	08
Mar.	03	Sep.	09
Apr.	04	Oct.	10
May	05	Nov.	11
June	06	Dec.	12

Week (day in Calender)	Figure in lot mark
1~7	1
8~14	2
15~21	3
22~28	4
29~31	5

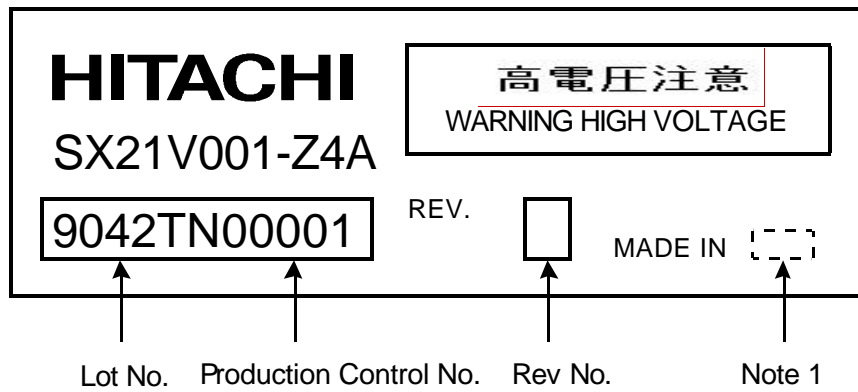
12.2 REVISION

REV No.	ITEM	LOT No.	PRODUCTION CONTROL No.
A			00001~
B	Changed PCB		

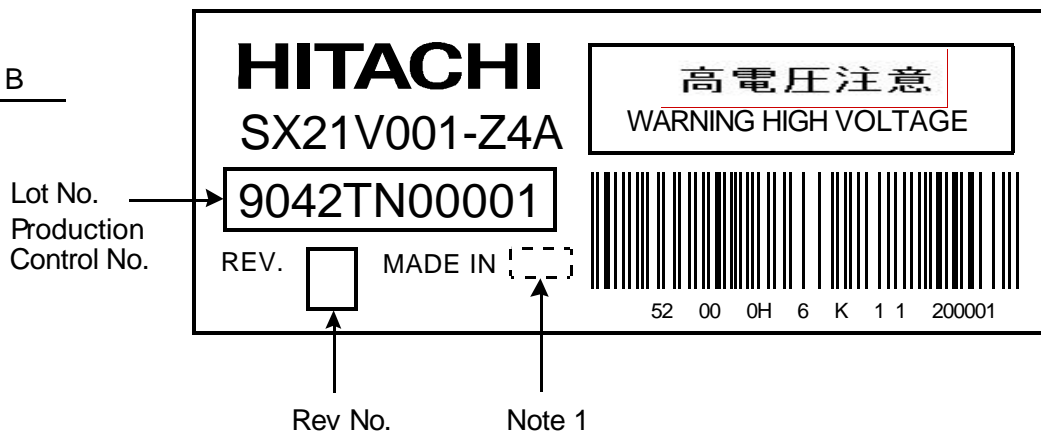
12.3 LOCATION OF LOT MARK

Either Label A or Label B is being attached on the back side of LCM.

Label A



Label B



Note 1 : JAPAN or TAIWAN

### 13. PRECAUTION FOR USE

- (1) A limit sample should be provided by the both parties on an occasion when the both parties agree to its necessity.  
Judgment by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.
- (2) On the following occasions, the handling of the problem should be decided through discussion and agreement between responsible persons of the both parties.
  - (1) When a question is arisen in the specifications.
  - (2) When a new problem is arisen which is not specified in the specifications.
  - (3) When an inspection specification change or operating condition change by customer is reported to HITACHI, and some problem is arisen in the specification due to the change.
  - (4) When a new problem is arisen at the customer's operating set for sample evaluation
- (3) Regarding the treatment for maintenance and repairing, both parties will discuss it in six months later after latest delivery of this product.

The precaution that should be observed when handling LCM have been explained above.  
If any points are unclear or if you have any requests, please contact Hitachi.

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