

# HITACHI

Displays, Hitachi, Ltd.  
3300 Hayano, Mobara City  
Chiba Pref. 297-8622 Japan  
TEL : +81-475-25-9005 (Dial In)  
FAX : +81-475-22-5217

液晶之友 电话: 020-33819057  
[Http://www.lcdfriends.com](http://www.lcdfriends.com)

For Messrs : \_\_\_\_\_

Date : Jan. 10, 2001

## CUSTOMER'S ACCEPTANCE SPECIFICATIONS SC09Q002-A

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

Proposed by : \_\_\_\_\_

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RECORD OF REVISIONS

Date	Sheet No.	Summary
Jan.10,2001	3284PS 2703-SC09Q002-A-2 Page 3-1/1	3. GENERAL DATA (3) Dot Size : 0.057×0.211 → 0.067×0.211 (15) Recommended Controller : Added SED1375
	3284PS 2706-SC09Q002-A-2 Page 6-2/4	6.1.2 TRANSMISSIVE MODE Contrast ratio (MIN) : - → (10)
	3284PS 2706-SC09Q002-A-2 Page 6-4/4	6.2 OPTICAL CHARACTERISTICS OF BACKLIGHT TYP MAX    TYP MAX Brightness Uniformity : (±30) - → - (±30)
	3284PS 2707-SC09Q002-A-2 Page 7-1/1	7.BLOCK DIAGRAM Deleted Buffer IC (Correction of error in w riting)
	3284PS 2708-SC09Q002-A-2 Page 8-1/6	8.1 TIMING DIAGRAM FLM : (240+n)×T → 245×T
	3284PS 2709-SC09Q002-A-2 Page 9-1/1	9. DIMENSIONAL OUTLINE Dot size : 0.057×0.211 → 0.067×0.211 Dots area : 73.9×55.42 → 73.91×55.42 Added Note(2)
	3284PS 2712-SC09Q002-A-2 Page 12-2/2	12.2 REVISION Revised

### 3. GENERAL DATA

- (1) Part Name SC09Q002-A
- (2) Module Dimensions 92.1(W) mm × 71.0(H) mm × 7.9 max (D) mm
- (3) Dot Size 0.067(W) mm × 0.211(H) mm
- (4) Dot Pitch 0.077(W) mm × 0.231(H) mm
- (5) Resolution 320 × 3 (R,G,B)(W) × 240 (H) dots
- (6) Duty Ratio 1/245
- (7) LCD Type Transflective Color LCD (negative type)  
The upper polarizer is glare type
- (8) Display Type Passive Matrix Color STN
- (9) View ing Direction 6 O'clock
- (10) Back Light Light Emitting Diode (LED)
- (11) Pow er Consumption 13mW : Back light off  
317mW : Back light on
- (12) Reflectance (25%) : Back light off
- (13) Weight 57g
- (14) Pow er Supply Voltage 3.3V only

(15) Recommended Controller

Type No.	Supplier	Portrait mode operation	Availability
SED1354	Epson	Soft w ise	Available
SED1355	Epson	Hard w ise	Available
SED1374	Epson	Hard w ise	Available
SED1375	Epson	Hard w ise	Available

#### 4. ABSOLUTE MAXIMUM RATINGS

##### 4. 1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS OF LCD

VSS=0V

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD	0	4.0	V	
Contrast Adjustment Voltage	VCON	1	VDD	V	
Input Voltage	V <sub>i</sub>	-0.3	VDD+0.3	V	Note 1
Input Current	i <sub>i</sub>	0	1	A	
Static Electricity	-	-	(±8)	kV	Note 2

Note 1  $\overline{\text{DISP}}\bullet\text{OFF}$ , FLM, CL1, CL2, D0~D7

Note 2 200pF-250Ω, 25°C-70%RH, The Surface of metal bezel and LCD panel are subjected.

#### 4. 2 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>	-	11.76 m/s <sup>2</sup> Note 5	Note 4, 7
Shock	-	29.4 m/s <sup>2</sup>	-	490 m/s <sup>2</sup> Note 5	XYZ directions Note 7
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 for 48h, at 60°C for 168h

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

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

Note 5 The LCM will resume normal operation after finishing the test.

Note 6 The response time will be slower at 5°C.

Note 7 The module has no mounting hole.

It should be fixed by the way of sandwiching-like method. (Fig.1)

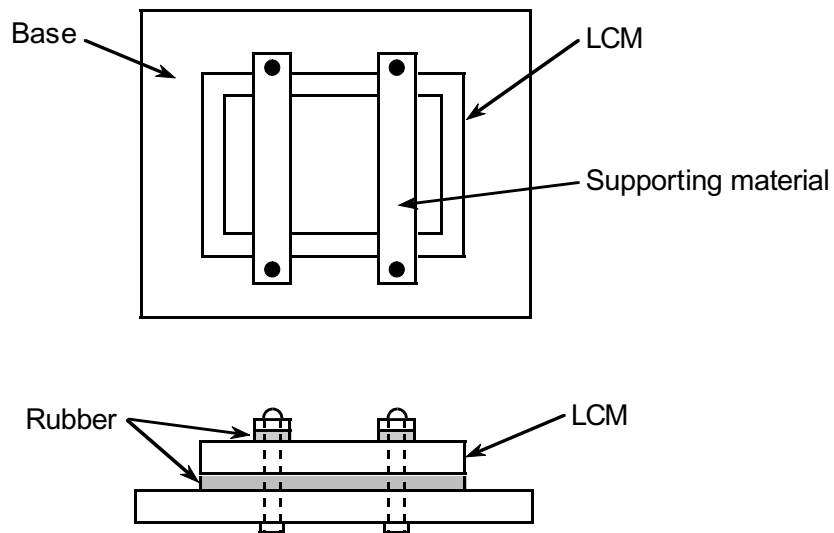


Fig. 1

## 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	-	1	-	VDD-0.3	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	-	4	8	mA
Input Leak Current	I <sub>con</sub> (Note4)	V <sub>con</sub> =1~3V	-	-	±10	μA
	I <sub>in</sub> (Note2)	V <sub>in</sub> =VDDorVSS	-	-	±5.0	
Contrast Adjustment Voltage (Note 5)	V <sub>con</sub>	T <sub>a</sub> = 5°C, φ=0°	-	(2.1)	(2.5)	V
		T <sub>a</sub> =25°C, φ=0°	(1.6)	(2.0)	(2.4)	
		T <sub>a</sub> =40°C, φ=0°	(1.3)	(1.7)	-	
Frame Frequency (Note 6)	fFLM	-	60	70	100	Hz

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

(Note 2) DISP•OFF, FLM, CL1, CL2, D0~D7

(Note 3) fFLM=70Hz, T<sub>a</sub>=25°C, V<sub>con</sub>=2.0V, Pattern used as display pattern : All White.

(Note 4) VCON

(Note 5) fFLM=70Hz, Duty=1/245

The Contrast Adjustment Voltage is specified as (2.0±0.4)V under the condition that optimum contrast is obtained by naked eyes with a "Q" test pattern.

(Note 6) Please set the frame frequency so as to avoid flicker and ripples on the display.

(Note 7) Some points for attention while setting the driving condition of an appliance.

#### (1) Frame Frequency

Please set the frame frequency as the typical value (central value) which is shown in CAS. According to the characteristic of response time of LC material, that setting the frame frequency near the minimum value or under the minimum value shown in CAS will cause a frame with moving phenomenon.

#### (2) Setting value of V<sub>con</sub>

V<sub>con</sub>, adjusted to get the best contrast ratio of LCD module, is adjusted to be distributed within the tolerance ±0.3V of central value in CAS before LCD modules ship the factory. The below items are recommended at customer side.

(i) When designing the appliance, please set the V<sub>con</sub> value as an adjustable value.

(ii) And the V<sub>con</sub> value must be able to be adjusted to match the most suitable V<sub>con</sub> to get the best contrast ratio. A fixed V<sub>con</sub> value is usually a little different from the most suitable V<sub>con</sub> value of LCD module and causes a misjudgment.

(iii) The V<sub>con</sub> adjustment (when D/A [Digital/Analogue] converter is used) is recommended to be set as 50mV at most per step. That one step is more than 50mV may cause the input value to be not able to match the most suitable value.

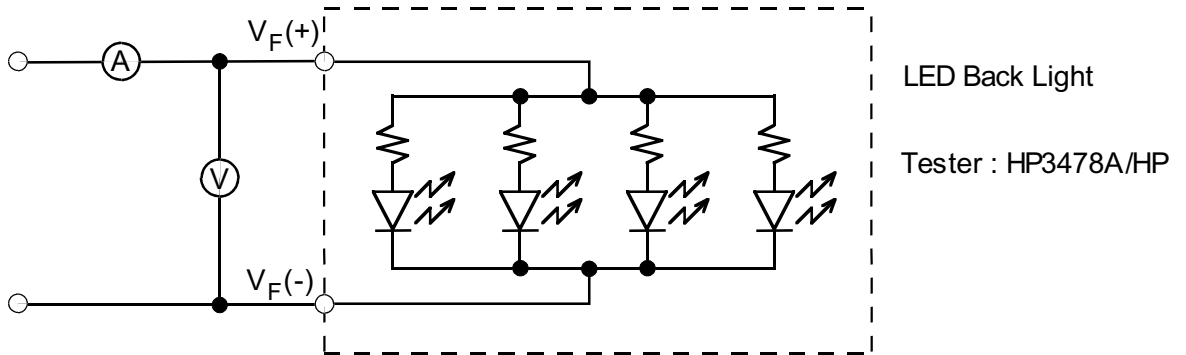
The characteristic of contrast ratio can not present absolutely.

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## 5. 2 ELECTRICAL CHARACTERISTICS OF BACK LIGHT

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LED Power Supply Voltage (Note 1)	V <sub>F</sub>	-	3.8	3.9	V	Ta=25°C
LED Power Supply Current (Note 1)	I <sub>F</sub>	-	80	90	mA	Ta=25°C

(Note 1)



6. OPTICAL CHARACTERISTICS

6.1 OPTICAL CHARACTERISTICS OF LCD

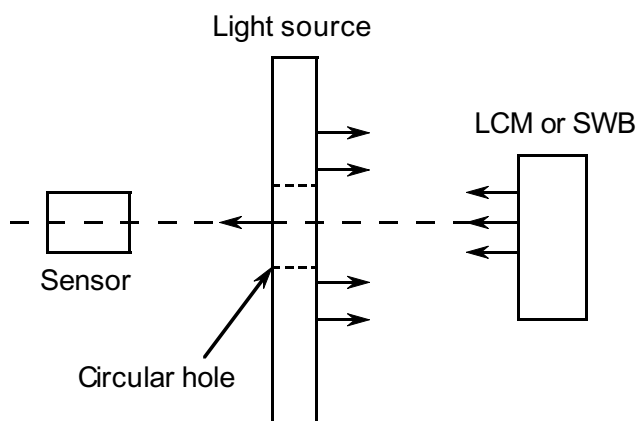
6.1.1 REFLECTION MODE

Ta=25°C

ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	NOTE
Reflectance	R	$\phi=0^\circ, \theta=0^\circ$	-	(25)	-	%	1)
View ing angle	$\phi_2-\phi_1$	$\theta=0^\circ, K\geq 2.0$	-	(60)	-	deg	2),3)
		$\theta=90^\circ, K\geq 2.0$	-	(60)	-		
Contrast ratio	K	$\phi=0^\circ, \theta=0^\circ$	-	(12)	-	-	1),4),6),7)
Response time (rise+fall)	tr+tf	$\phi=0^\circ, \theta=0^\circ$	-	(300)	-	ms	5)
Color tone (Primary Color)	Red	x	$\phi=0^\circ, \theta=0^\circ$	-	T.B.D	-	8),9)
		y		-	T.B.D	-	
	Green	x		-	T.B.D	-	
		y		-	T.B.D	-	
	Blue	x		-	T.B.D	-	
		y		-	T.B.D	-	
	White	x		-	T.B.D	-	
		y		-	T.B.D	-	

(Measurement condition : Hitachi standard)  
Note 2)~9) : Page 6-3/4

Note 1. Definition of Reflectance R



$$R = \frac{BLCM}{BSWB}$$

BLCM : Brightness of LCM at optimum voltage.  
(displaying white pattern)

BSWB : Brightness of SWB.

SWB : Standard white board.



## 6.1.2 TRANSMISSIVE MODE

Ta=25°C

ITEM		SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	NOTE
Viewing angle		$\phi_2-\phi_1$	$\theta=0^\circ, K \geq 2.0$	-	(60)	-	deg	2),3)
			$\theta=90^\circ, K \geq 2.0$	-	(60)	-		
Contrast ratio		K	$\phi=0^\circ, \theta=0^\circ$	(10)	(20)	-	-	4),6),7)
Response time (rise+fall)		tr+tf	$\phi=0^\circ, \theta=0^\circ$	-	(300)	-	ms	5)
Color tone (Primary Color)	Red	x	$\phi=0^\circ, \theta=0^\circ$	-	T.B.D	-	-	8)
		y		-	T.B.D	-	-	
	Green	x		-	T.B.D	-	-	
		y		-	T.B.D	-	-	
	Blue	x		-	T.B.D	-	-	
		y		-	T.B.D	-	-	
	White	x		-	T.B.D	-	-	
		y		-	T.B.D	-	-	

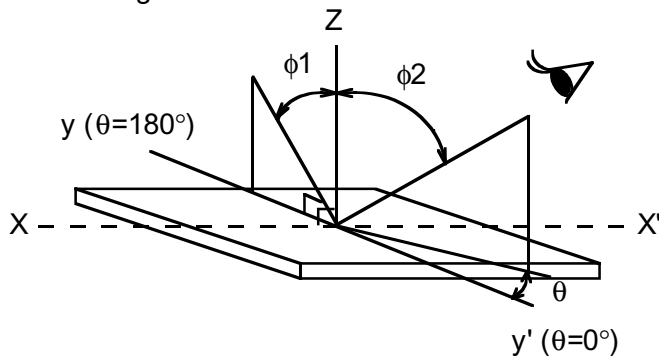
(Measurement condition : Hitachi standard)

Note 2)~8) : Page 6-3/4

Note 2. Definition of  $\theta$  and  $\phi$

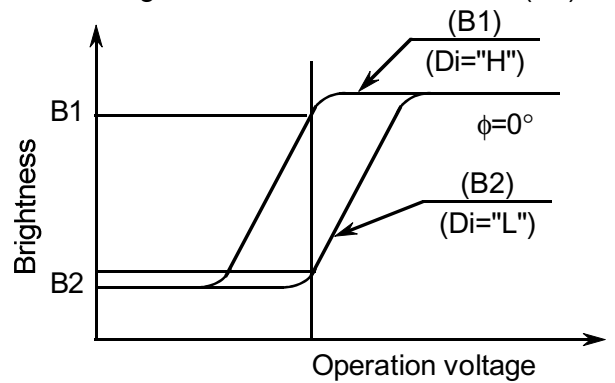
(Normal)

Viewing direction

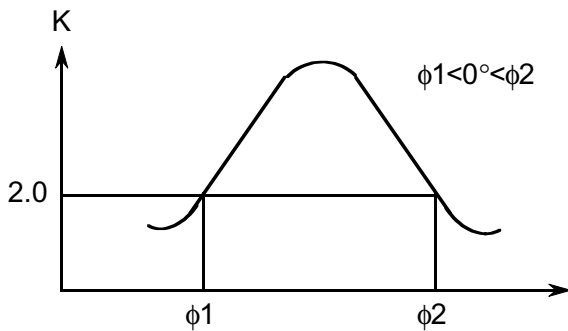


Note 4. Definition of contrast "K"

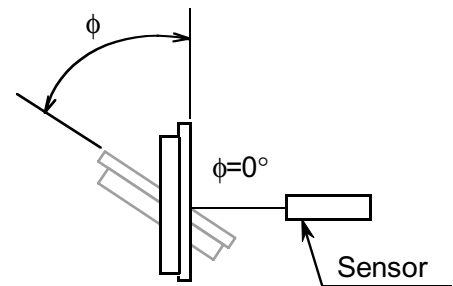
$$K = \frac{\text{Brightness of selected area (B1)}}{\text{Brightness of non-selected area (B2)}}$$



Note 3. Definition of view ing angle  $\phi_1$  and  $\phi_2$

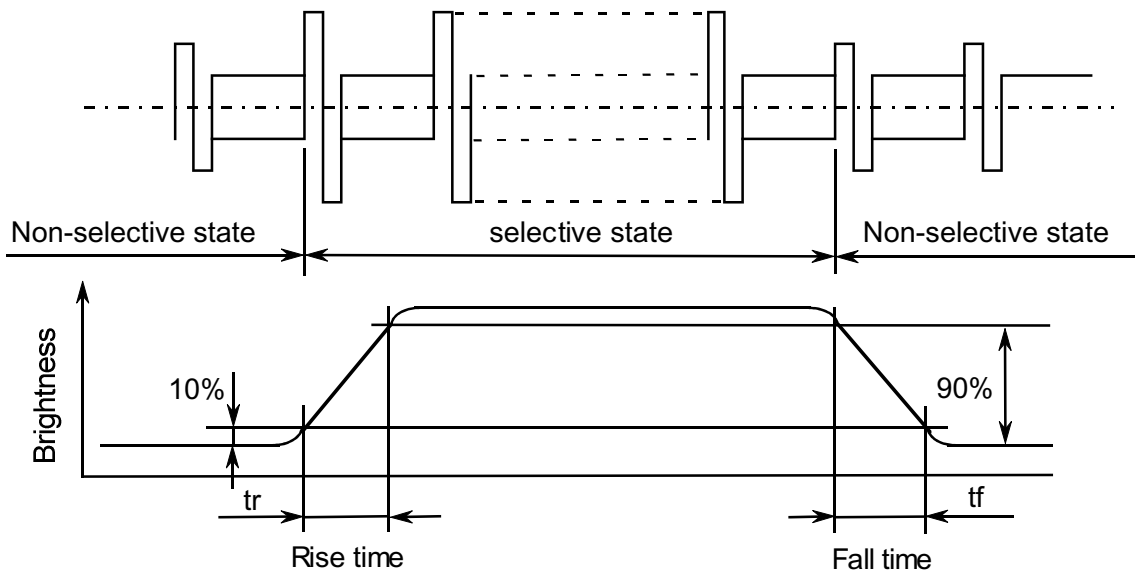


Contrast ratio K vs view ing angle  $\phi$



Sensor : BM-5 or similar equipment

Note 5. Definition of optical response time



Note 6. Minimum value is for reference only.

Note 7. Hitachi will do sampling inspection for minimum value.

Note 8. The LCD driving voltage should be adjusted as to obtain maximum contrast.

Note 9. The color temperature of light source is 5200K.

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## 6.2 OPTICAL CHARACTERISTICS OF BACK LIGHT

ITEM	MIN	TYP	MAX	UNIT	NOTE
Brightness	-	(7)	-	cd/m <sup>2</sup>	IF=80mA Note 1),2)
Brightness Uniformity	-	-	(±30)	%	IF=80mA Note 1)~4)

(Measurement condition : Hitachi standard)

(Note 1) Ta=25°C

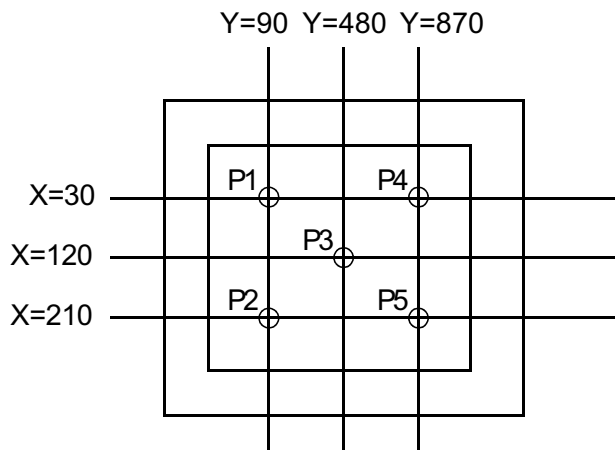
Display data should all be "ON"

The LCD driving voltage should be adjusted so as to obtain maximum contrast when display pattern is all "Q".

(Note 2) Measurement after 5 minutes of LED operating.

Average value of 5 measurement locations (Note 3).

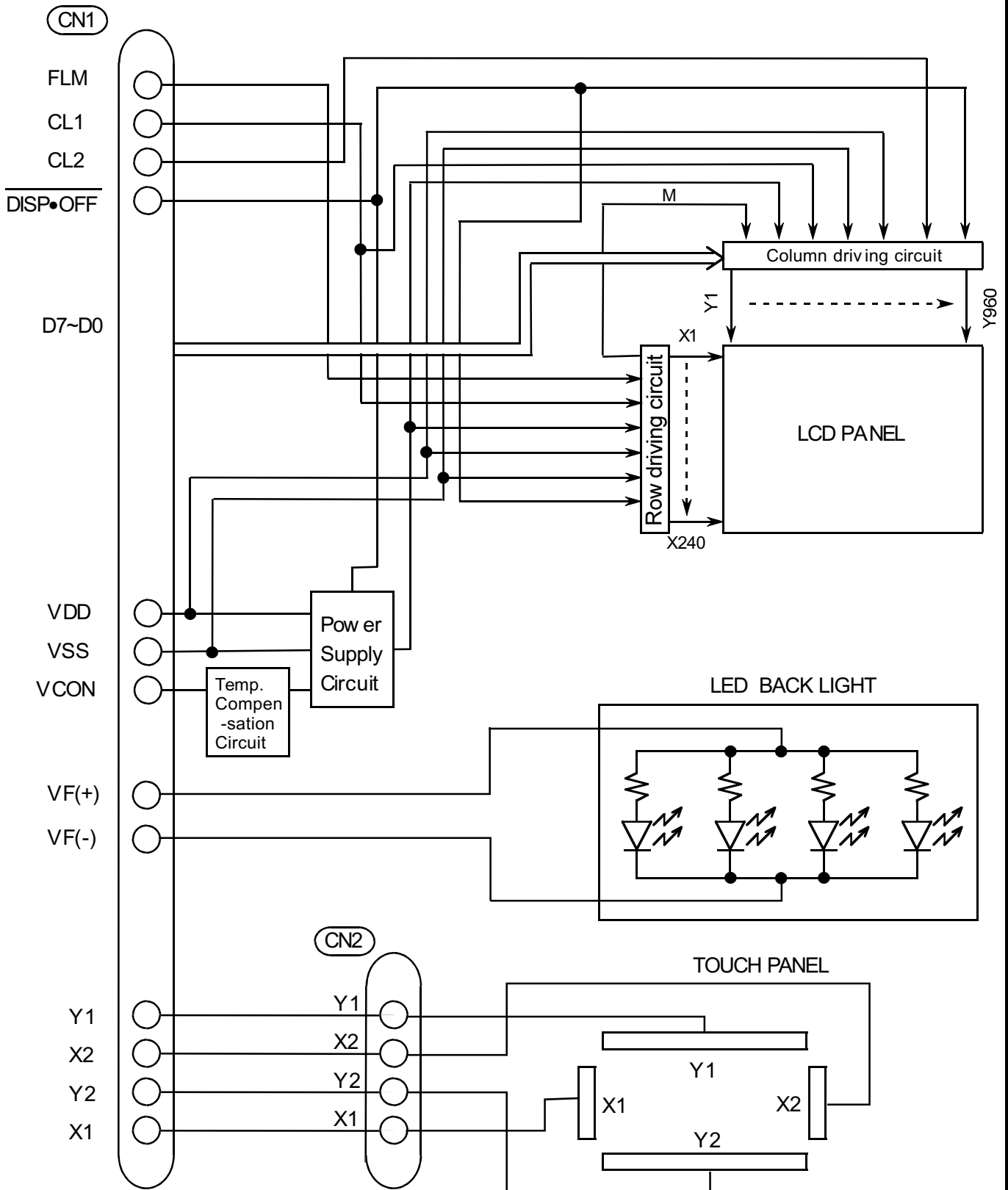
(Note 3) Measurement on the following 5 locations on the display.



(Note 4) Definition of brightness tolerance.

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

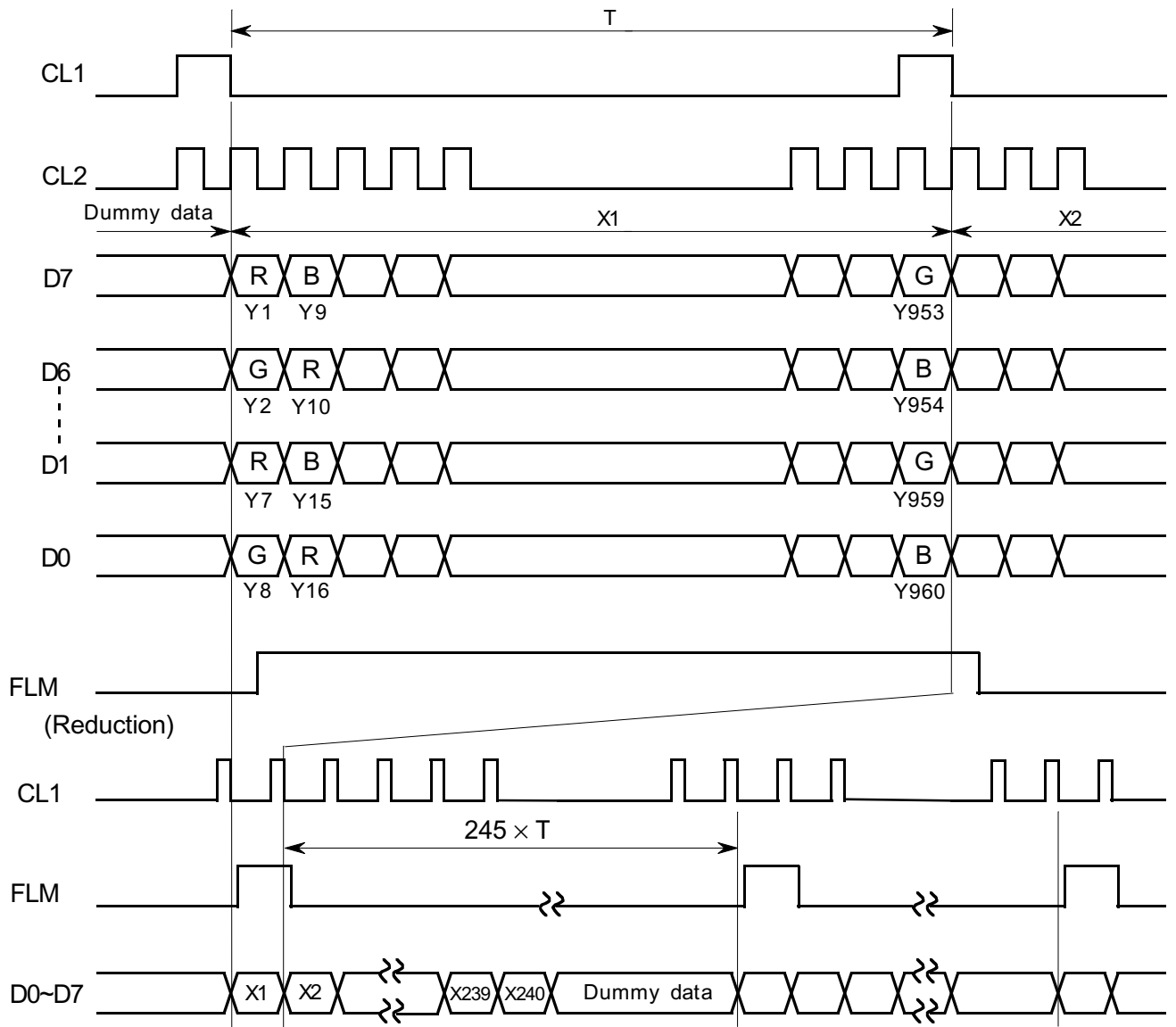
# 7. BLOCK DIAGRAM



\* Reference of touch panel pin connection.

# 8. INTERFACE TIMING DIAGRAM

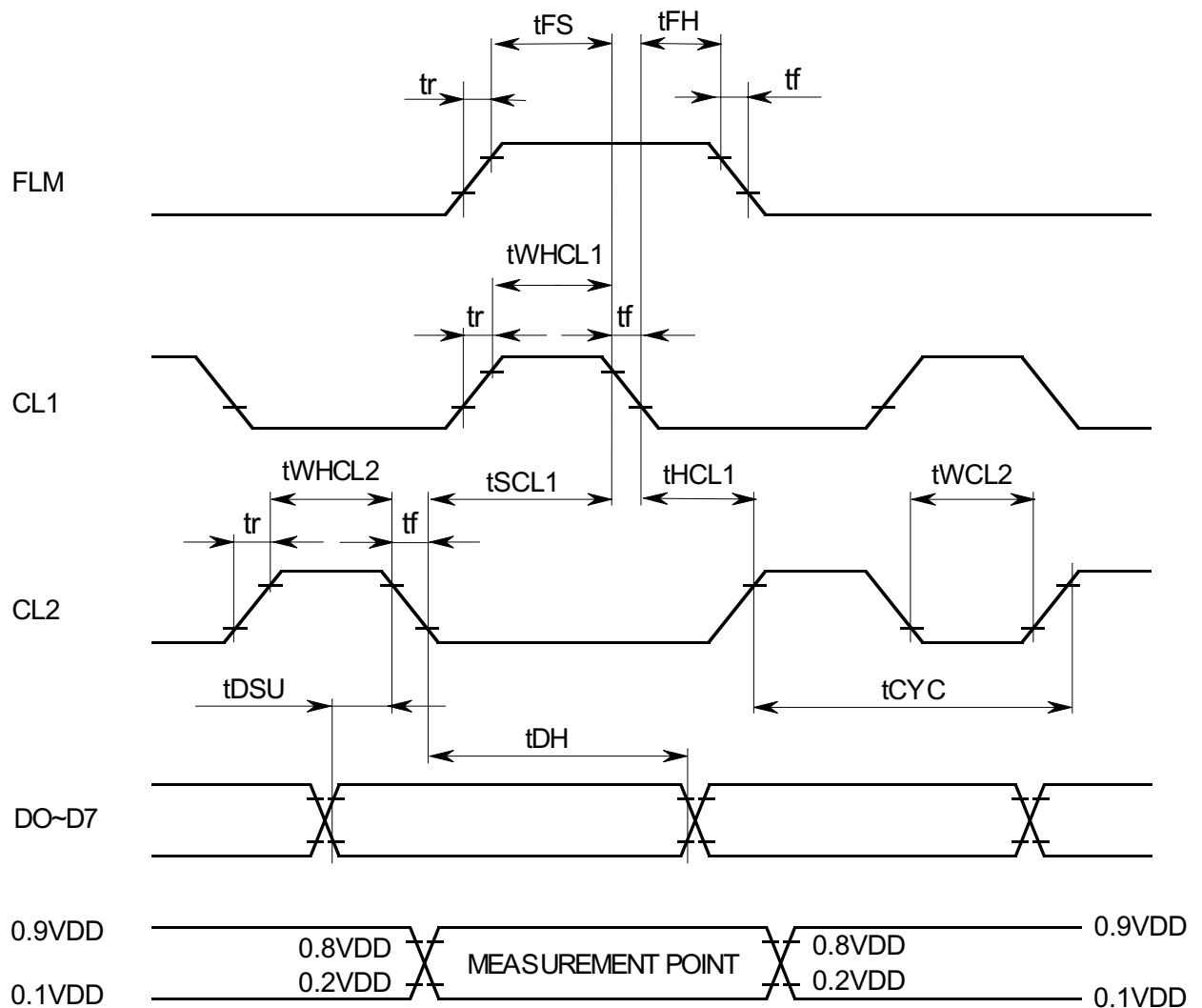
## 8.1 TIMING DIAGRAM



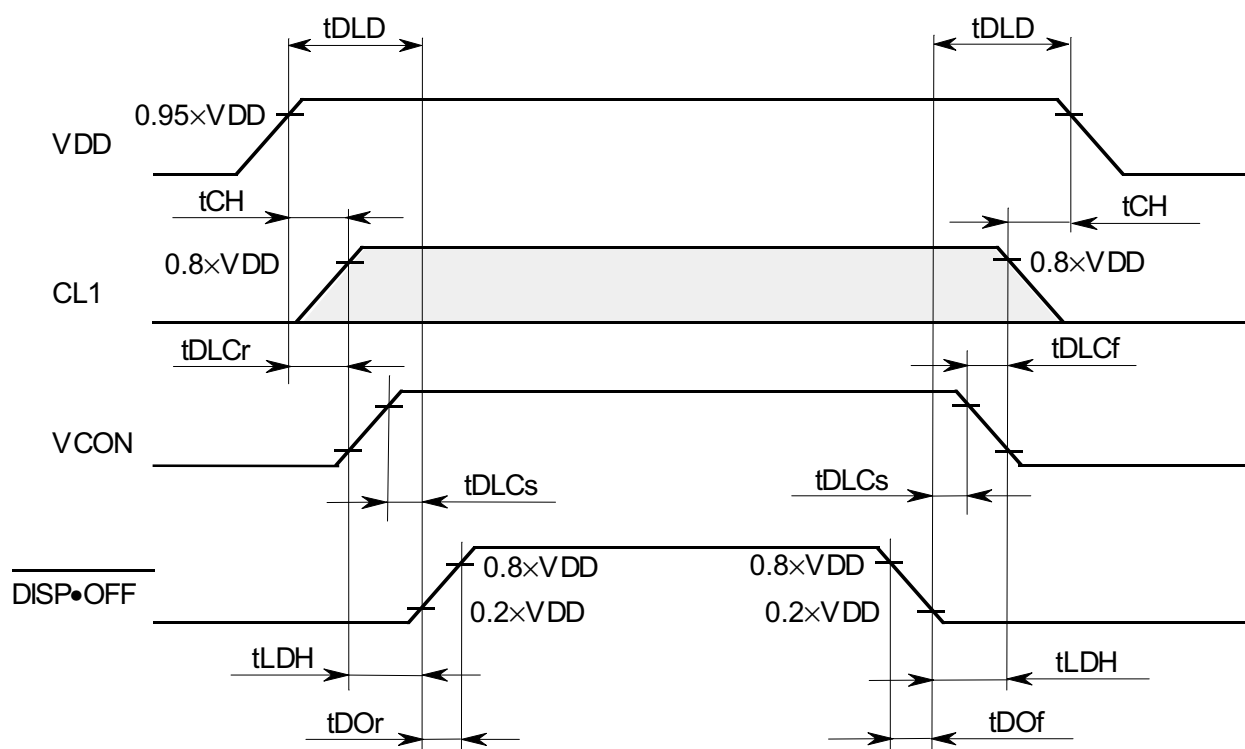
## 8.2 INTERFACE TIMING SPECIFICATION

(VDD=3.3±0.15V, VSS=0V, Vcon=1.0~VDD, Ta=+5°C~+40°C)

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
CL1 pulse width "H"	t <sub>WHCL1</sub>	100	—	—	ns
Clock cycle time	t <sub>CYC</sub>	60	—	—	ns
CL2 pulse width	t <sub>WCL2</sub>	30	—	—	ns
Clock set up time	t <sub>SCL1</sub>	40	—	—	ns
Clock hold time	t <sub>HCL1</sub>	80	—	—	ns
Clock rise fall time	t <sub>r</sub> , t <sub>f</sub>	—	—	30	ns
Data set up time	t <sub>DSU</sub>	20	—	—	ns
Data hold time	t <sub>DH</sub>	20	—	—	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
tDLD	200	—	ms
tCH	0	—	ms
tLDH	20	—	ms
tDOr	—	100	ns
tDOF	—	100	ns
tDLCr	0	—	ms
tDLCf	0	—	ms
tDLCs	20	—	ms

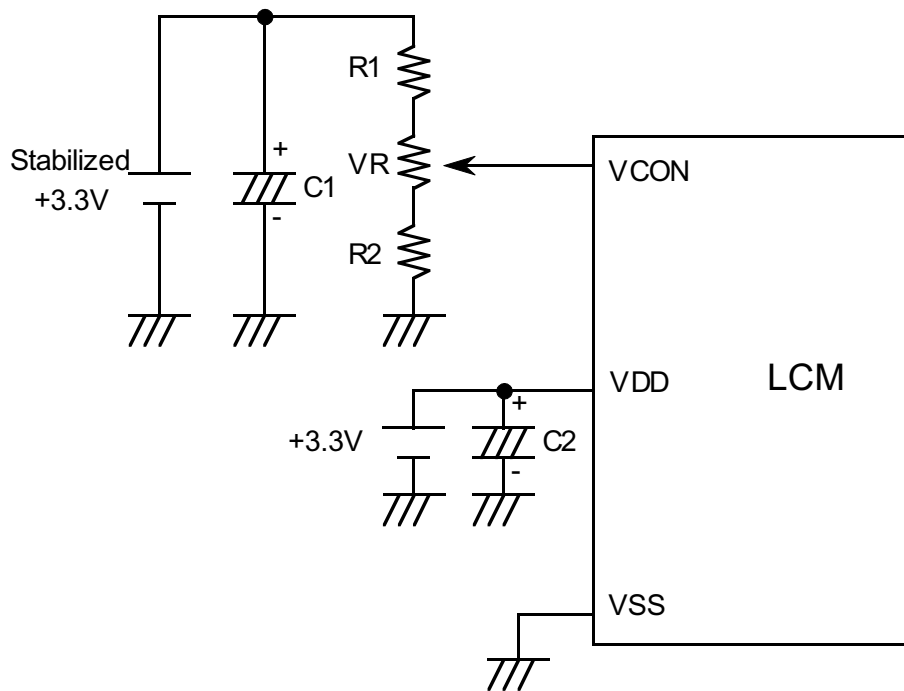
(Note 1) Please keep the specified sequence. Using other than the recommended sequence may cause permanent damage to the LCD panel.

(Note 2) Please use  $\overline{\text{DISP}\bullet\text{OFF}}$  function.

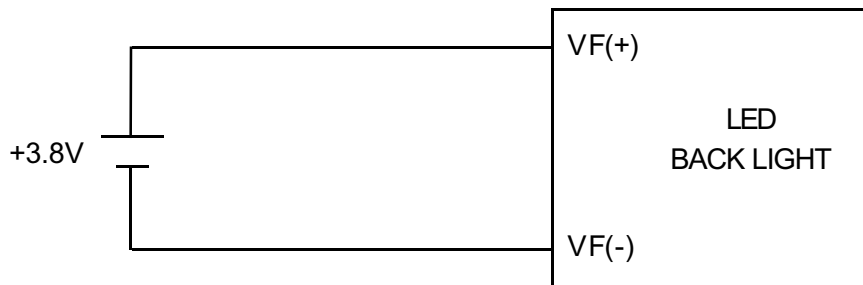
Switching by other than the  $\overline{\text{DISP}\bullet\text{OFF}}$  function may cause display deterioration.

## 8.4 POWER SUPPLY FOR LCM

(Example)



Note 1 :  $R1+VR+R2 \leq 10k\Omega$





### 8.5 INPUT DATA ALLOCATION TABLE

Data Signal	D 7	D 6	D 5	D 4	D 3	D 2	D 1	D 0	D 7	D 6	D 5	D 4	----	D 4	D 3	D 2	D 1	D 0
Y X	1	2	3	4	5	6	7	8	9	10	11	12	----	9 5 6	9 5 7	9 5 8	9 5 9	9 6 0
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
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮		⋮	⋮	⋮	⋮	⋮
138	R	G	B	R	G	B	R	G	B	R	G	B	----	G	B	R	G	B
139	R	G	B	R	G	B	R	G	B	R	G	B	----	G	B	R	G	B
140	R	G	B	R	G	B	R	G	B	R	G	B	----	G	B	R	G	B
141	R	G	B	R	G	B	R	G	B	R	G	B	----	G	B	R	G	B
142	R	G	B	R	G	B	R	G	B	R	G	B	----	G	B	R	G	B
143	R	G	B	R	G	B	R	G	B	R	G	B	----	G	B	R	G	B
144	R	G	B	R	G	B	R	G	B	R	G	B	----	G	B	R	G	B
145	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

R : RED  
 G : GREEN  
 B : BLUE

## 8.6 INTERNAL PIN CONNECTION

CN1 JST : 26FLZ-RSM1-TB (Suitable FPC t0.3±0.03mm, 0.5±0.03mm pitch)

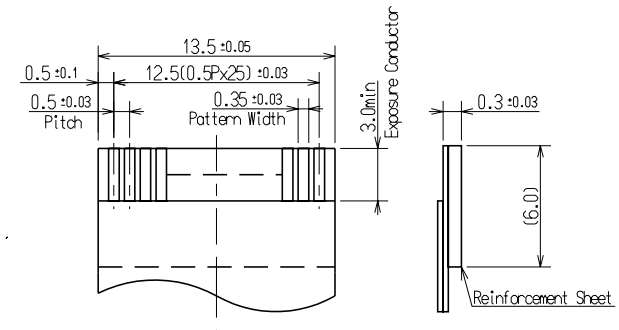
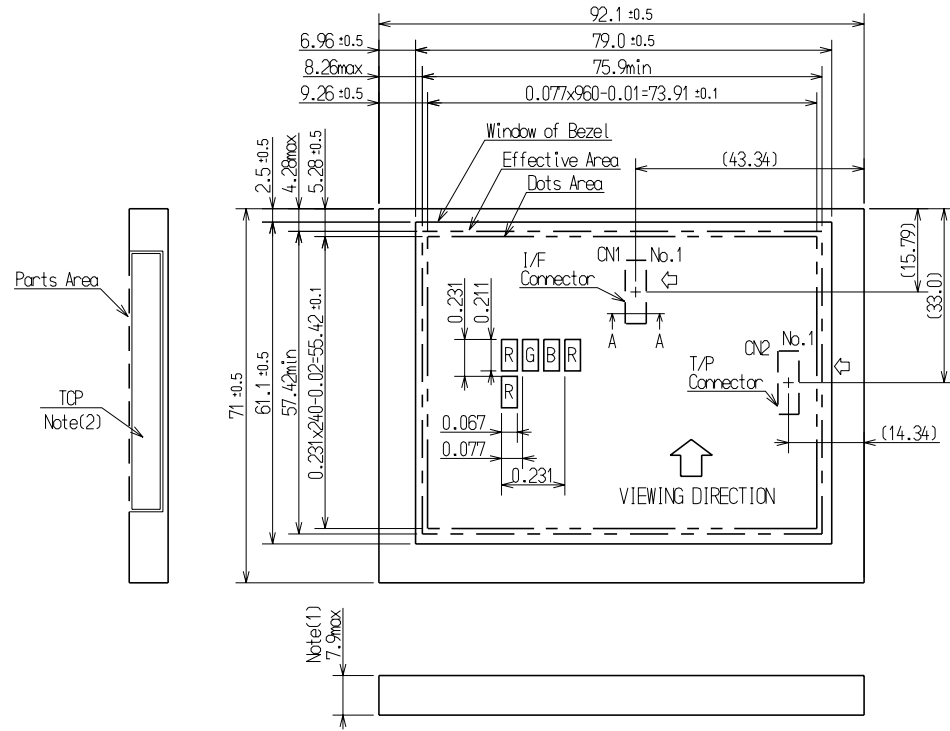
PIN No.	SIGNAL	LEVEL	FUNCTION
1	VF(+)	-	Back Light
2	VF(-)	-	Back Light
3	Y1	-	Analog Signal Touch Panel
4	X1	-	Analog Signal Touch Panel
5	Y2	-	Analog Signal Touch Panel
6	X2	-	Analog Signal Touch Panel
7	VSS	-	GND
8	VCON	-	Contrast Adjustment Voltage
9	VDD	-	Power Supply for Logic
10	$\overline{\text{DISP}}\bullet\text{OFF}$	H / L	H : ON / L : OFF
11	D7	H / L	Display Data
12	D6		
13	D5		
14	D4		
15	VSS	-	GND
16	D3	H / L	Display Data
17	D2		
18	D1		
19	D0		
20	VSS	-	GND
21	VDD	-	Power Supply for Logic
22	CL2	H → L	Data Shift
23	VSS	-	GND
24	CL1	H → L	Data Latch
25	VSS	-	GND
26	FLM	H	First Line Marker

CN2 JST : 04(1.0)09FLZ-SM1-TB (Suitable FPC : t0.3±0.03mm, 1.0±0.03mm pitch)

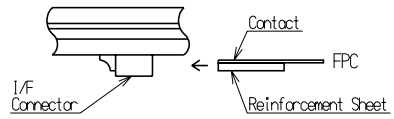
PIN No.	SIGNAL	LEVEL	FUNCTION
1	Y1	-	Analog Signal Touch Panel
2	X2	-	Analog Signal Touch Panel
3	Y2	-	Analog Signal Touch Panel
4	X1	-	Analog Signal Touch Panel

\* Reference of touch panel pin connection.

# 9. DIMENSIONAL OUTLINE



I/F CONNECTOR APPLICABLE FPC DIMENSIONS (REF.)



Detail of A-A

Note(1) Measurement should be done under a pressure of  $9.8 \times 10^4$  Pa at the measurement point.

Note(2) TCP are not covered. Please do not touch the TCP by design and hand.

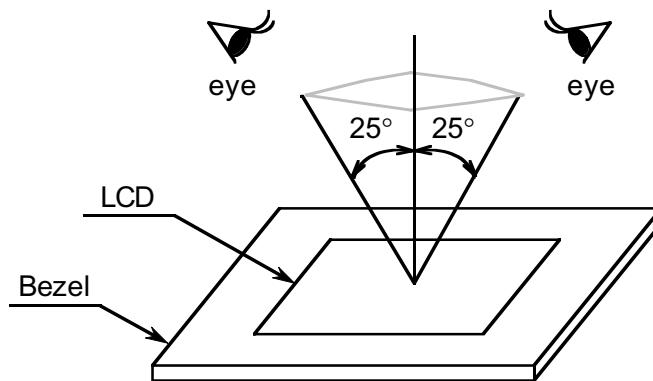
## 10. APPEARANCE STANDARD

### 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.

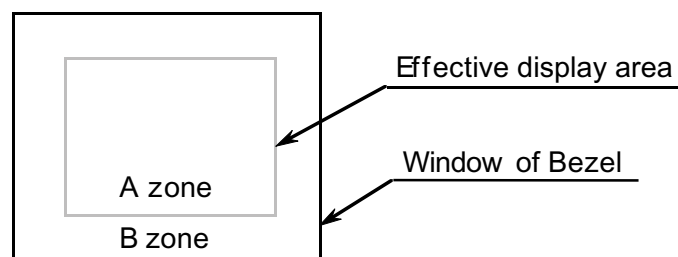
Viewing angle  $\leq 25^\circ$



### 10.2 DEFINITION OF ZONE

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

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

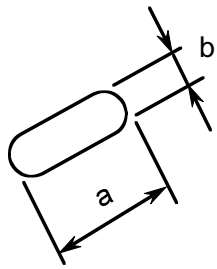
No.	ITEM	CRITERIA			APPLIED ZONE	
L	Scratches	Distinguished one is not acceptable (To be judged by HITACHI STANDARD)			A	
	Dent	Same as above			A	
	Wrinkles in Polarizer	Same as above			A	
	Bubbles	Average diameter D (mm)		Maximum acceptable number		A
		$D \leq 0.2$		ignored		
$0.2 < D \leq 0.3$		12				
$0.3 < D \leq 0.5$		3				
C D	Stains, Foreign materials Dark spot	Filamentous (Line shape)			A	
		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		
	Round (Dot shape)	Average diameter D (mm)	Maximum acceptable number	Minimum space	A	
		$D < 0.2$	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	
		$D \leq 0.25$		ignored	—		
		$0.25 < D \leq 0.35$		To be judged by HITACHI STANDARD	10		20mm
		$0.35 < D \leq 0.5$			4		20mm
		$0.5 < D \leq 0.7$			3		50mm
C	$0.7 < D$	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 whole number		6					
	Rubbing Scratch	To be judged by HITACHI STANDARD				—	

(2) LED BACKLIGHT APPEARANCE

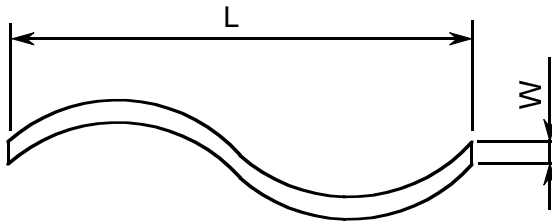
No.	ITEM	CRITERIA			APPLIED ZONE
L E D	Dark spots White spots Foreign materials (Spot)	Average diameter D (mm)	Maximum Acceptable number		A
		$D \leq 0.4$	ignored		
		$0.4 < D$	none		
B A C K L I G H T	Foreign materials (Line)	Width W (mm)	Length L (mm)	Maximum acceptable number	A
		$W \leq 0.2$	$L \leq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

Note (1) Definition of Average diameter (D)



$$D = \frac{a+b}{2}$$

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



## 11. PRECAUTION IN DESIGN

### 11.1 LC DRIVING VOLTAGE (VCON) AND VIEWING ANGLE RANGE

Setting VCON out of the recommended condition will be a cause for a change of viewing angle range.

### 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 wrist 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 ( $3.3 \pm 0.15V$ ).

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

### 11.4 PACKAGING

- (1) No. Leaving products in the place of high humidity for a long period of time for their storage in the place where temperature is 35°C or higher, special care to prevent them from high humidity is required. A combination of high temperature and high humidity may cause them polarization degradation as well as bubble generation and polarizer peel-off. Please keep the temperature and humidity within the specified range for use and storing.
- (2) Since upper polarizers and lower aluminum plates 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.
- (3) As the adhesives used for adhering upper/lower polarizers 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 use chemicals other than the above.
- (4) Lightly wipe to clean the dirty surface with absorbent cotton waste or other soft material like chamois, soaked in the chemicals recommended without scrubbing it hard. 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.
- (5) Immediately wipe off saliva or water drop attached on the display area because its long period adherence may cause deformation or faded color on the spot.

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- (6) Foggy dew deposited on the surface and contact terminals due to coldness will be cause for polarizer damage, stain and dirt on product. When necessary to take out the products from some place at low temperature for test, etc. it is required for them to be warmed up in a container once at the temperature higher than of room.
- (7) Touching the display area and contact terminals with bare hands and contaminating them are prohibited, because the stain on the display area and poor insulation between terminals are often caused by being touched by bare hands.  
(There are some cosmetics detrimental to polarizers.)
- (8) In general the quality of glass is fragile so that it tends to be cracked or chipped in handling, specially on its periphery. Please be careful not to give it sharp shock caused by dropping down, etc.
- (9) Maximum pressure to the surface must be less than  $1.96 \times 10^4$  Pa.  
And if the pressure area is less than  $1\text{cm}^2$ , maximum pressure must be less than 1.96N.
- (10) While handling LCM, please do not press Parts on the back.

#### 11.5 OPERATION PRECAUTION

- (1) It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage than the limit causes the shorter LCD life an electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current driver should be avoided.
- (2) Response time will be extremely delayed at lower temperature than the specified operating temperature range and on the other hand at higher temperature LCD's show s dark blue color in them.  
How ever those phenomena do not mean malfunction or out of order with LCD's which will come back in the specified operating temperature range.
- (3) If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- (4) A slight dew depositing on terminals ia a cause for electrochemical reaction resulting in terminal open circuit. Usage under the relative condition of  $40^\circ\text{C}$  85%RH or less is required.
- (5) Since STN-LCD is sensitive for heat please consider the heat protection from any heat sources like inverter, DC/DC converter, CPU and so on.

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## 11.6 STORAGE

In case of storing for a long period of time (for instance, for years) for the purpose of replacement use, the following ways are recommended.

- (1) Storage in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it, and with no desiccant.
- (2) Placing in dark place where neither exposure to direct sunlight nor light is, keeping temperature in the range from 0°C and 35°C.
- (3) Storing with no touch on polarizer surface by anything else. (It is recommended to store them as they have been contained in the inner container at the time of delivery from us.)

## 11.7 SAFETY

- (1) It is recommendable to crash damaged or unnecessary LCD's into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.
- (2) When any liquid leaked out a damaged glass cell comes in contact with your hands, please wash it. Off well with soap and water.

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12.2 REVISION

REV No.	ITEM	LOT No.	PRODUCTION CONTROL No.
A	Segment LCD Driver : BD66134U		00001~
B	Segment LCD Driver : WFP-7102		00001~

### 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 in the customer site.
- (3) Regarding the treatment for maintenance and repairing, both parties will discuss it in six month 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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