

HITACHI

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For Messrs :

Date : Jan. 10, 2001

CUSTOMER'S ACCEPTANCE SPECIFICATIONS SC09Q002-B

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Accepted by : _____

Proposed by : _____

| | | | | |
|-------------------------|------------|------------------------------|------|-------|
| Displays, Hitachi, Ltd. | Sh. No. | 3284PS 2701 - SC09Q002-B - 2 | Page | 1-1/1 |
|-------------------------|------------|------------------------------|------|-------|

RECORD OF REVISIONS

| Date | Sheet No. | Summary |
|-------------|---|---|
| Jan.10,2001 | 3284PS 2703-SC09Q002-B-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 2705-SC09Q002-B-2 Page 5-2/2 | 5.2 ELECTRICAL CHARACTERISTICS OF BACKLIGHT MIN TYP MAX MIN TYP MAX Lamp Current : (0.8) (1.0) (2.0) → 0.8 1.0 2.0 |
| | 3284PS 2706-SC09Q002-B-2 Page 6-2/4 | 6.1.2 TRANSMISSIVE MODE Contrast ratio (MIN) : - → (10) |
| | 3284PS 2707-SC09Q002-B-2 Page 7-1/1 | 7.BLOCK DIAGRAM Deleted Buffer IC (Correction of error in w riting) |
| | 3284PS 2708-SC09Q002-B-2 Page 8-1/7 | 8.1 TIMING DIAGRAM FLM : (240+n)×T → 245×T |
| | 3284PS 2709-SC09Q002-B-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-B-2 Page 12-2/2 | 12.2 REVISION Revised |
| | | |

3. GENERAL DATA

- (1) Part Name SC09Q002-B
- (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 Cold Cathode Fluorescent Tube
- (11) Pow er Consumption 13mW : Back light off
323mW : 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 _i | -0.3 | VDD+0.3 | V | Note 1 |
| Input Current | i _i | 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 ² | - | 11.76 m/s ² Note 5 | Note 4, 7 |
| Shock | - | 29.4 m/s ² | - | 490 m/s ² 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 not mounting hole.

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

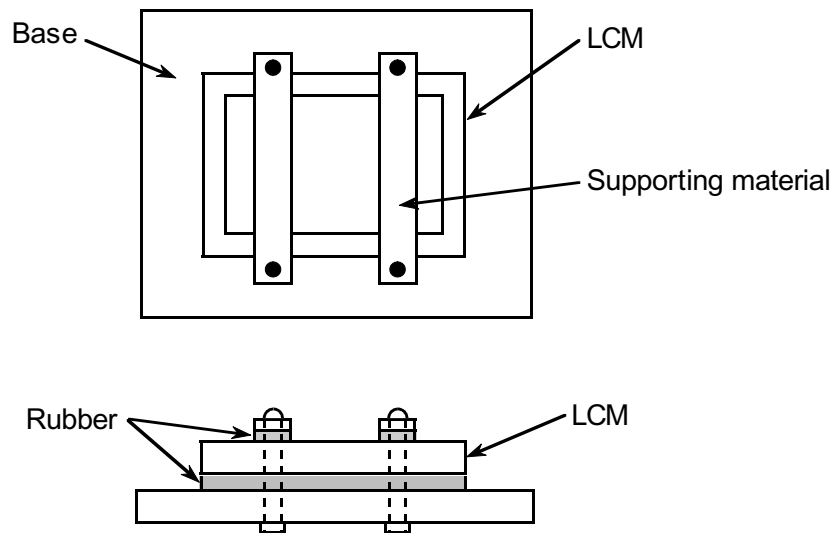


Fig. 1

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 _{con} (Note4) | V _{con} =1~3V | - | - | ±10 | μA |
| | I _{in} (Note2) | V _{in} =VDDorVSS | - | - | ±5.0 | |
| Contrast Adjustment Voltage (Note 5) | V _{con} | T _a = 5°C, φ=0° | - | (2.1) | (2.5) | V |
| | | T _a =25°C, φ=0° | (1.6) | (2.0) | (2.4) | |
| | | T _a =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_a=25°C, V_{con}=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_{con}

V_{con}, 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_{con} value as an adjustable value.

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

(iii) The V_{con} 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.

5. 2 ELECTRICAL CHARACTERISTICS OF BACKLIGHT

| ITEM | SYMBOL | MIN | TYP | MAX | UNIT | NOTE |
|------------------------------|----------------|--------|-------|-----|------|---------|
| Lamp Voltage | VL | - | (310) | - | Vrms | Ta=25°C |
| Frequency | fL | (50) | (60) | - | kHz | |
| Lamp Current (1Lamp) (Note7) | IL | 0.8 | 1.0 | 2.0 | mA | Ta=25°C |
| Starting discharge Voltage | VS (Note 2) | (1000) | - | - | 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) When IL is over 2.0mA, it may cause uneven contrast near CFL location, due to heat dispersion from CFL.
- (Note 6) The brightness of the CFL in this LCM may deteriorate after the long-hour use under ICFL=1.0mA. However, it will recover when the CFL is lighted at ICFL=2.0mA min. 5 minutes or more.
- (Note 7) We recommend to equip protection circuit (To stop output) which works under abnormal operation to the inverter for CFL.

6. OPTICAL CHARACTERISTICS

6.1 OPTICAL CHARACTERISTICS OF LCD

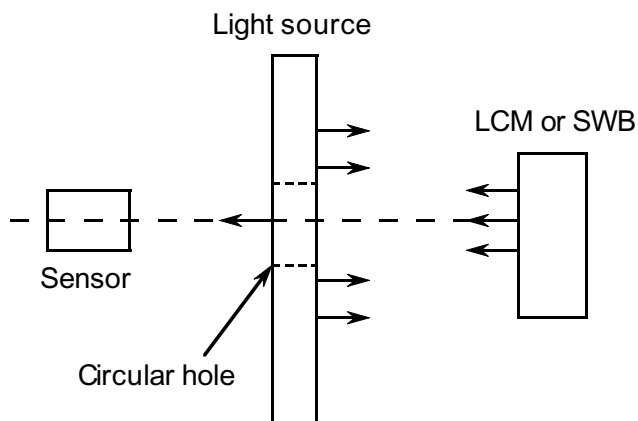
6.1.1 REFLECTION MODE

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 | - | - | |

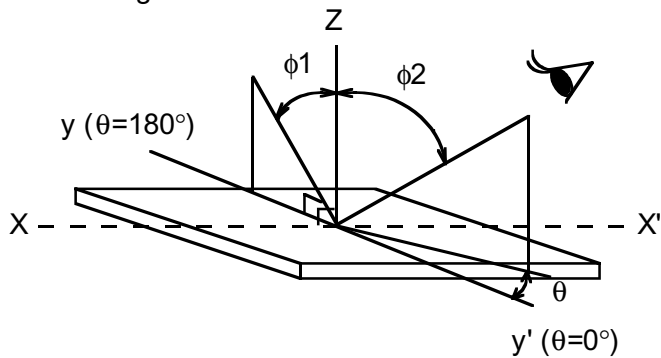
(Measurement condition : Hitachi standard)

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

Note 2. Definition of θ and ϕ

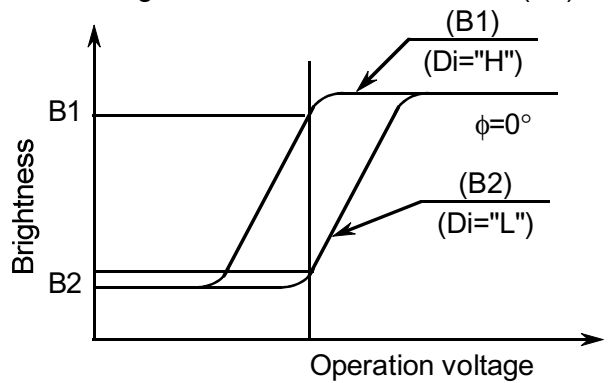
(Normal)

Viewing direction

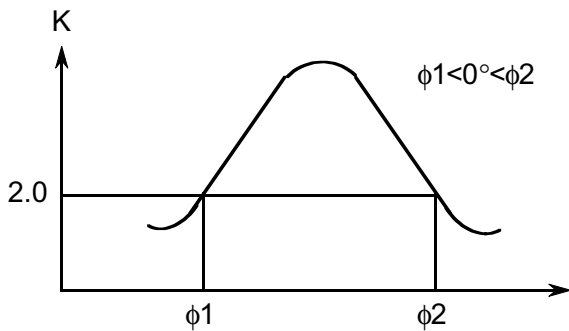


Note 4. Definition of contrast "K"

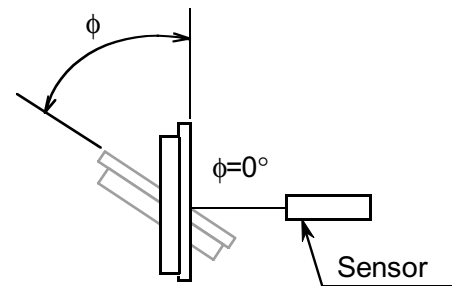
$$K = \frac{\text{Brightness of selected area (B1)}}{\text{Brightness of non-selected area (B2)}}$$



Note 3. Definition of view ing angle ϕ_1 and ϕ_2

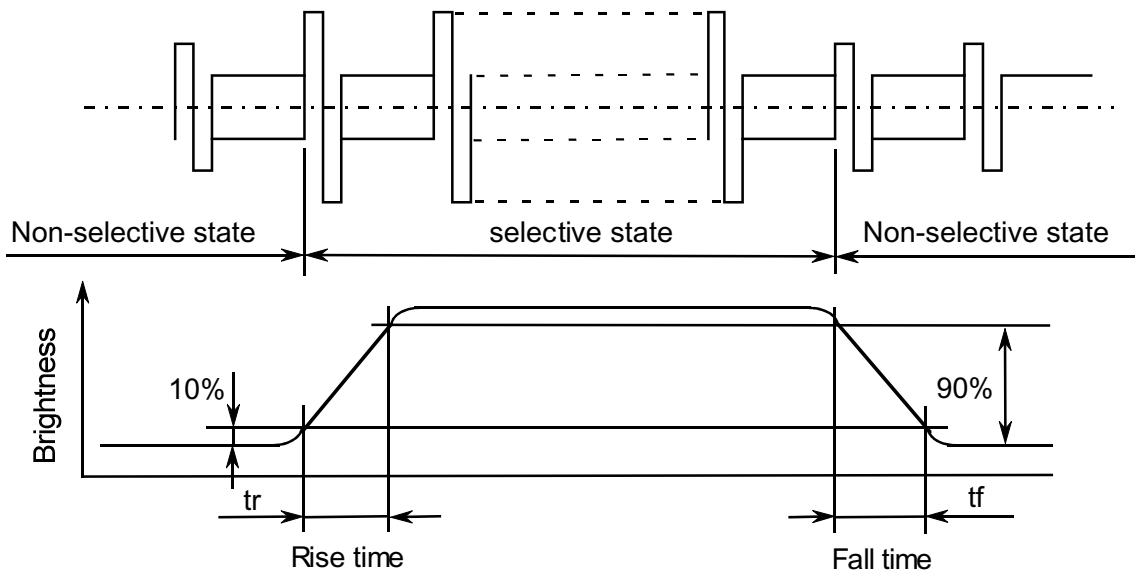


Contrast ratio K vs view ing angle ϕ



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 BACKLIGHT

| ITEM | MIN | TYP | MAX | UNIT | NOTE |
|-----------------------|-----|------|-------|-------------------|------------------------------|
| Brightness | - | (11) | - | cd/m ² | (IL=1.0mA) Note 1),2) |
| Rise Time | - | (3) | - | Minute | IL=1.0mA Brightness 80% |
| Brightness Uniformity | - | - | (±25) | % | Undermentioned Note 1),3) |

Measurement condition : Hitachi standard

CFL : 0h operation, Ta=25°C

Display data should all be "ON"

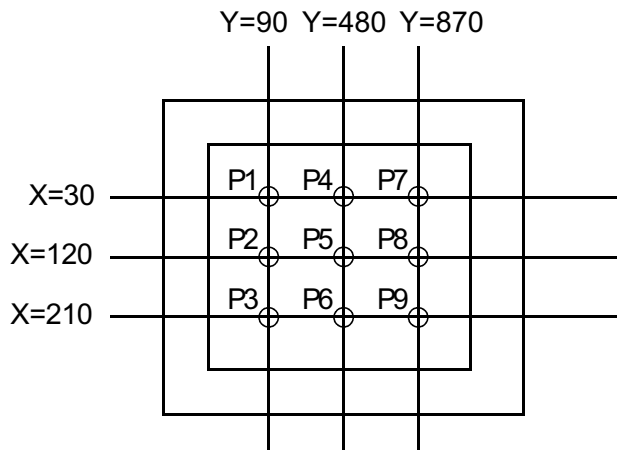
The LCD driving voltage should be adjusted so as to obtain maximum contrast when display pattern is all "Q".

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

Average value of 9 measurement locations. (Note 3)

(Note 2) Brightness control set to 100%

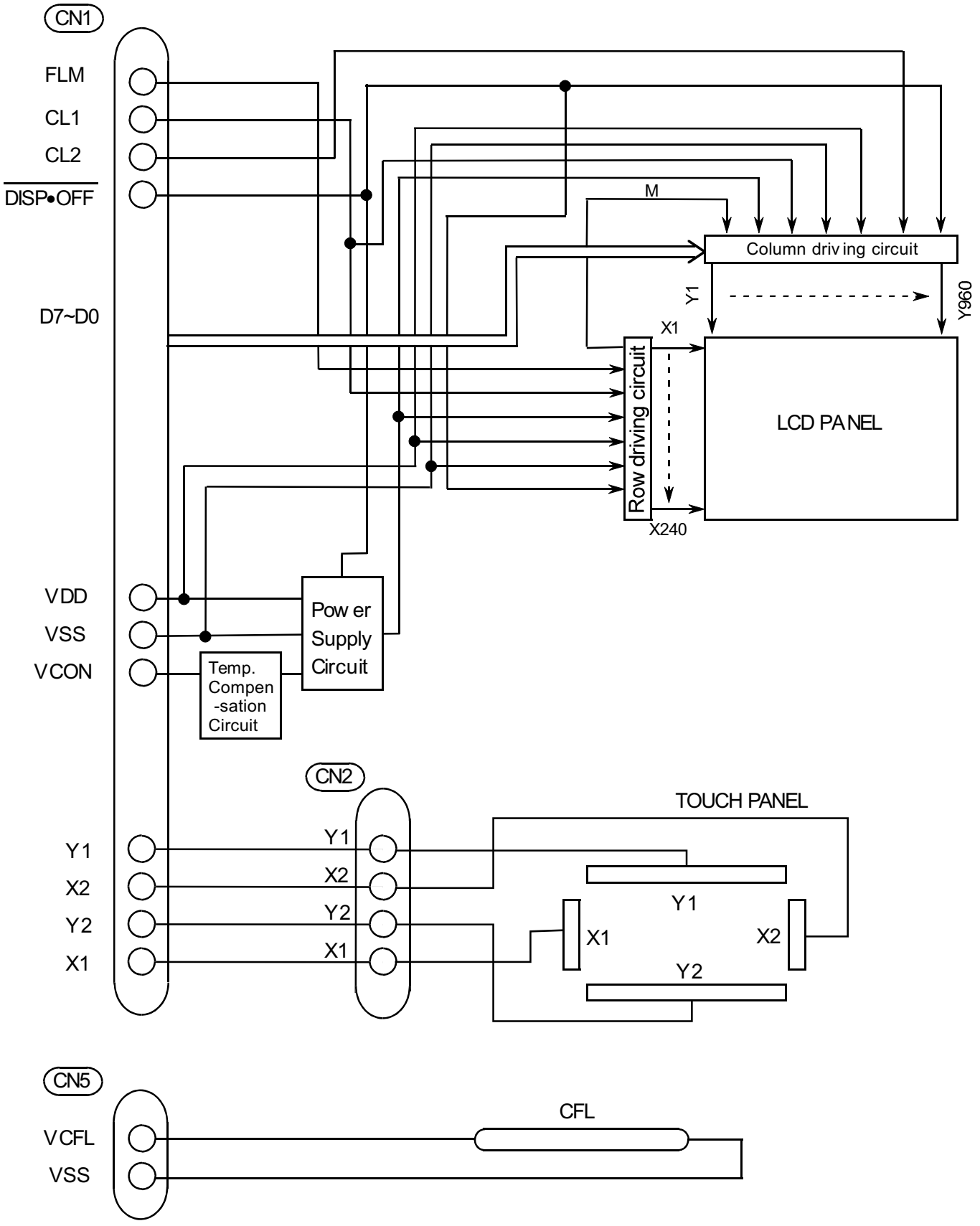
(Note 3) Measurement on the following 9 locations on the display.



(Note 4) Definition of brightness tolerance.

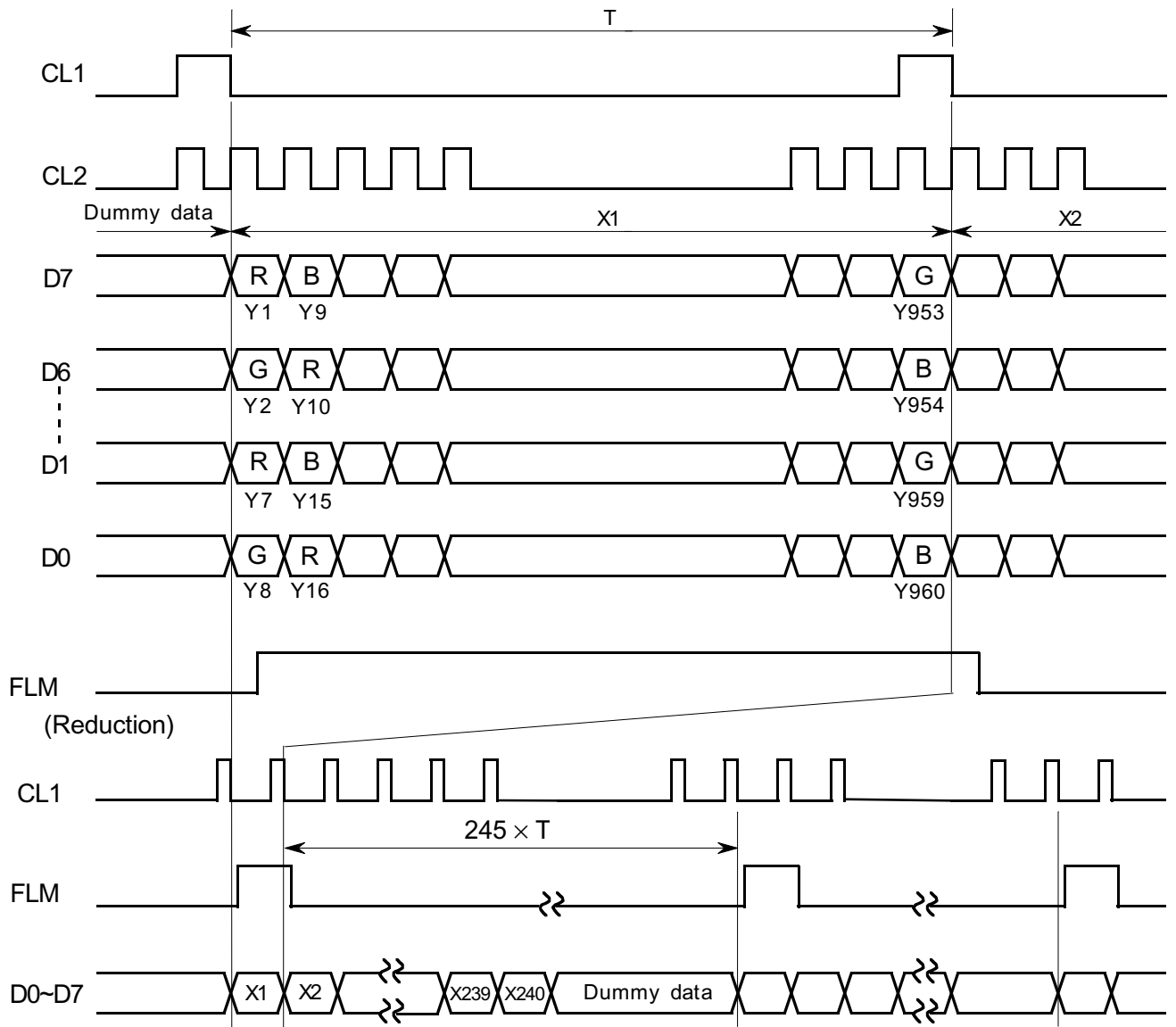
$$\left(\frac{\text{Max brightness or Min brightness} - \text{Average brightness}}{\text{Average brightness}} \right) \times 100$$

7. BLOCK DIAGRAM



8. INTERFACE TIMING DIAGRAM

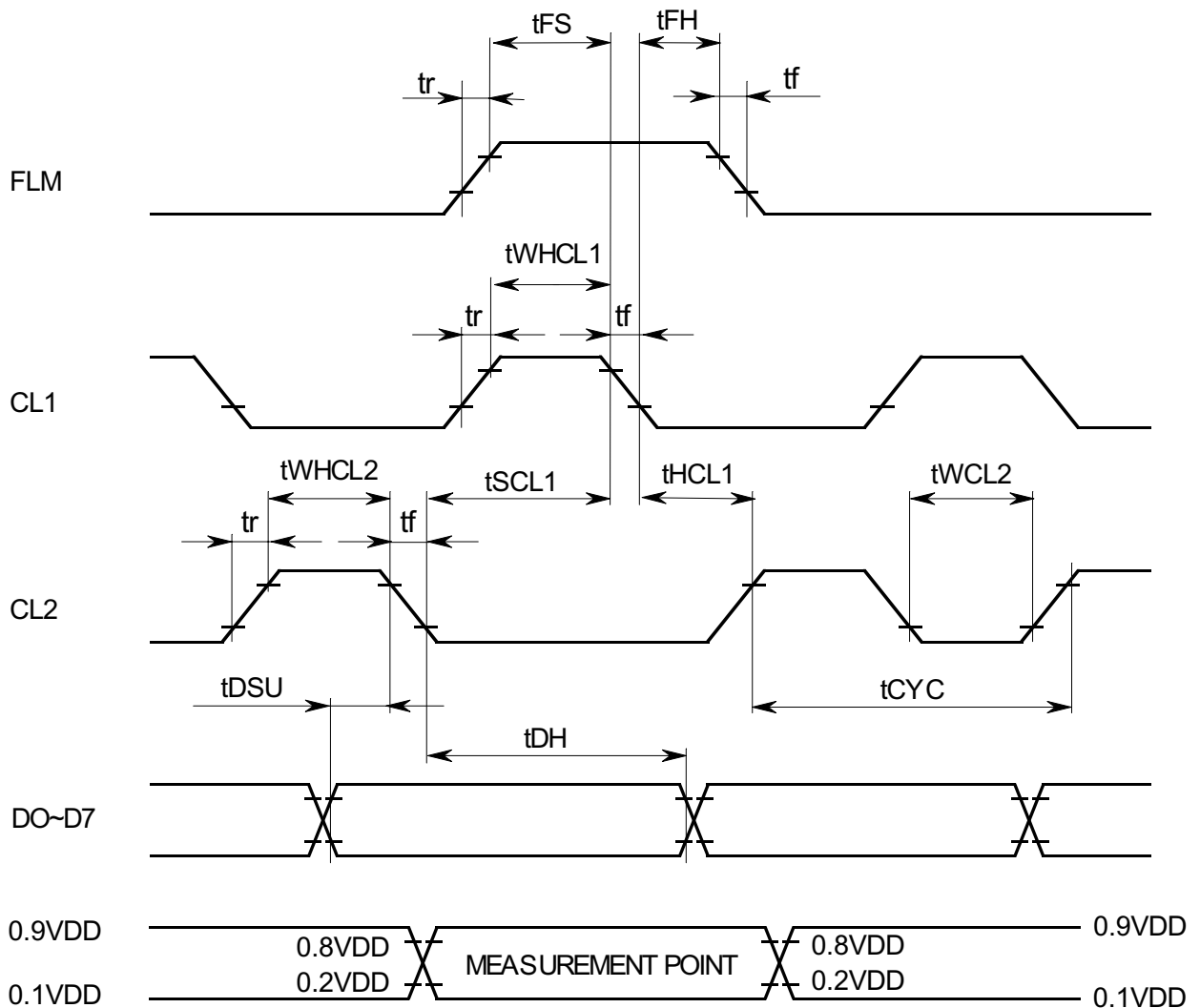
8.1 TIMING DIAGRAM



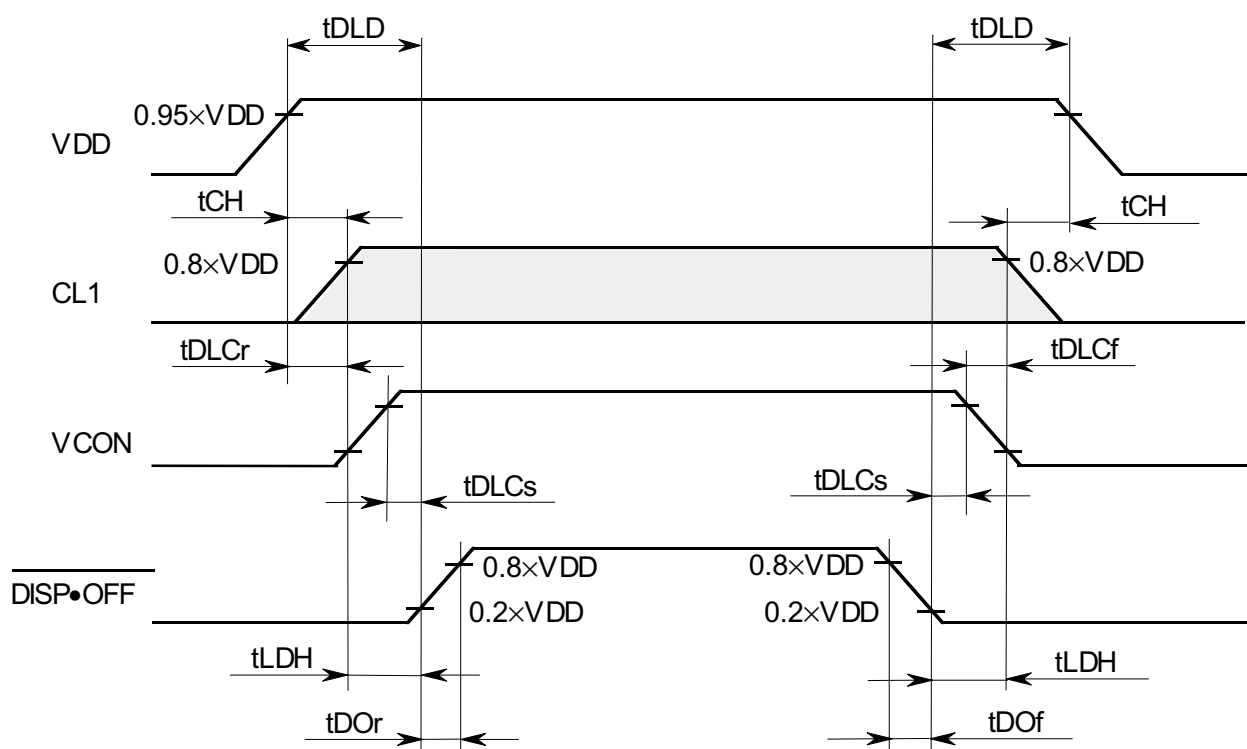
8.2 INTERFACE TIMING SPECIFICATION

(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 _{WHCL1} | 100 | — | — | ns |
| Clock cycle time | t _{CYC} | 60 | — | — | ns |
| CL2 pulse width | t _{WCL2} | 30 | — | — | ns |
| Clock set up time | t _{SCL1} | 40 | — | — | ns |
| Clock hold time | t _{HCL1} | 80 | — | — | ns |
| Clock rise fall time | t _r , t _f | — | — | 30 | ns |
| Data set up time | t _{DSU} | 20 | — | — | ns |
| Data hold time | t _{DH} | 20 | — | — | ns |
| "FLM" set up time | t _{FS} | 100 | — | — | ns |
| "FLM" hold time | t _{FH} | 50 | — | — | ns |



8.3 POWER ON / OFF SEQUENCE



| SYMBOL | MIN | MAX | UNIT |
|------------|-----|-----|------|
| t_{DLD} | 200 | — | ms |
| t_{CH} | 0 | — | ms |
| t_{LDH} | 20 | — | ms |
| t_{DOOr} | — | 100 | ns |
| t_{DOF} | — | 100 | ns |
| t_{DLCr} | 0 | — | ms |
| t_{DLCf} | 0 | — | ms |
| t_{DLCs} | 20 | — | ms |

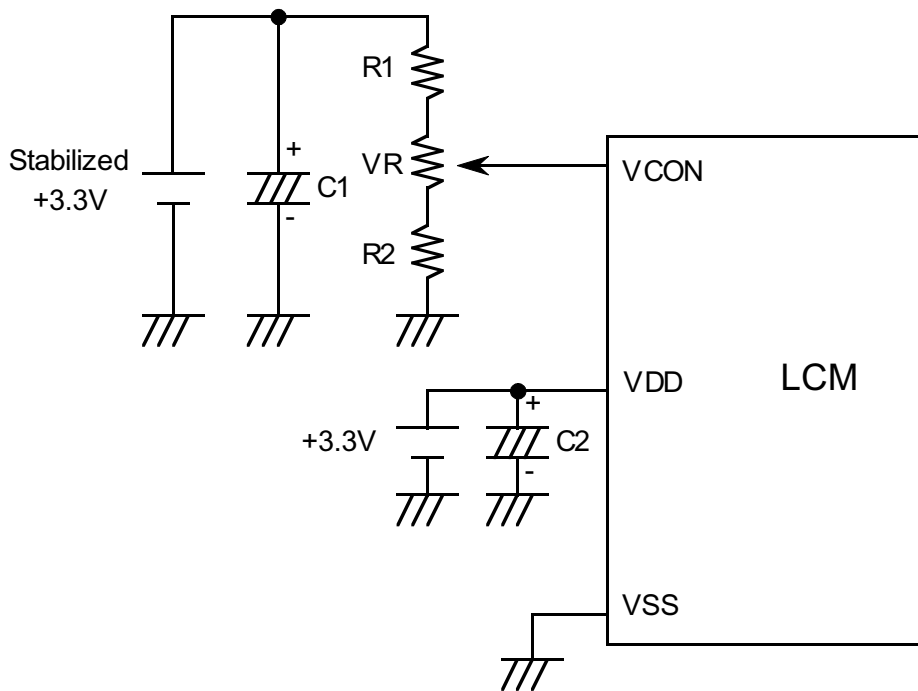
(Note 1) Please keep the specified sequence. Using other than the recommended sequence may cause permanent damage to the LCD panel.

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

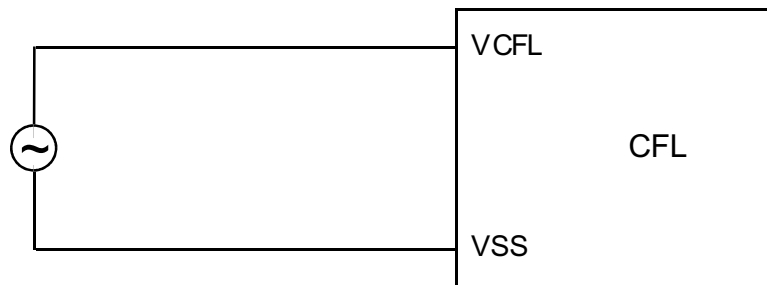
Switching by other than the $\overline{\text{DISP}\bullet\text{OFF}}$ function may cause display deterioration.

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 | N.C. | - | ———— |
| 2 | N.C. | - | ———— |
| 3 | Y1 | - | Analog Signal Touch Panel (Note 1) |
| 4 | X1 | - | Analog Signal Touch Panel (Note 1) |
| 5 | Y2 | - | Analog Signal Touch Panel (Note 1) |
| 6 | X2 | - | Analog Signal Touch Panel (Note 1) |
| 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 |

(Note 1) In case of "without Touch panel", these pins are GND.

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

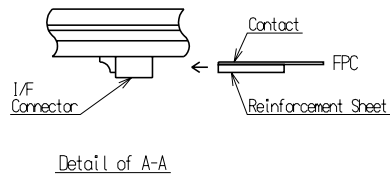
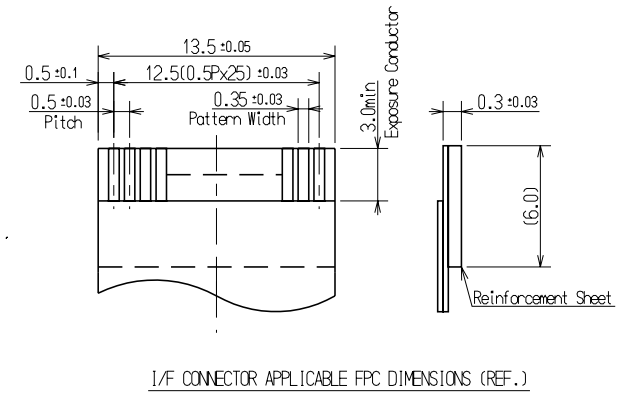
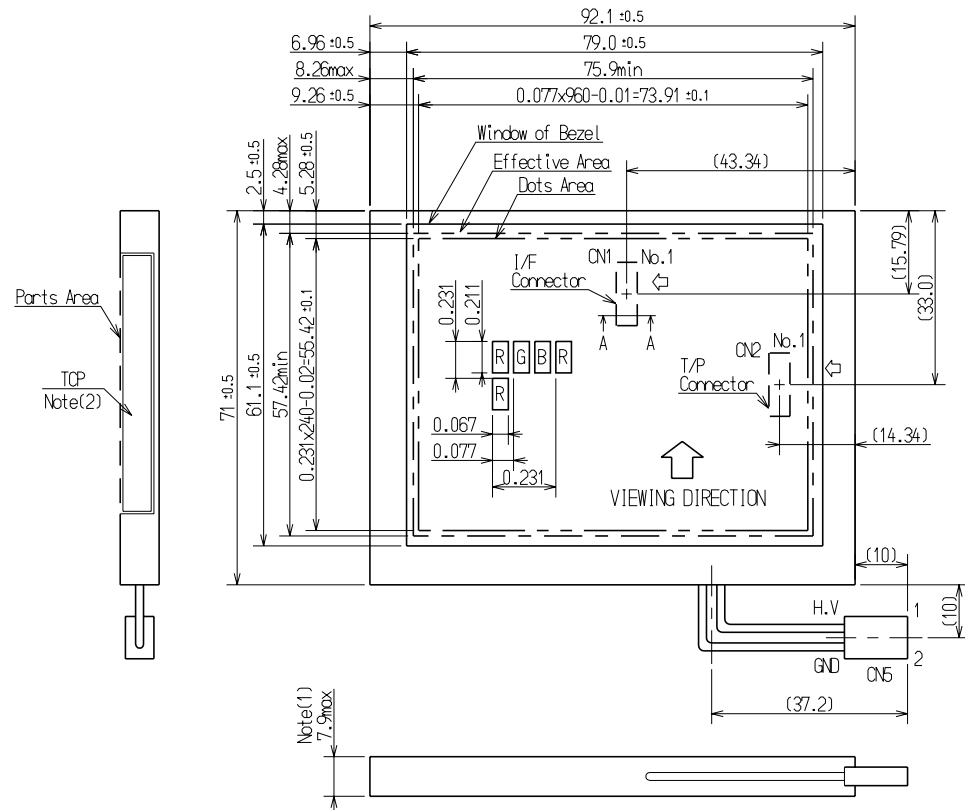
| PIN No. | SIGNAL | LEVEL | FUNCTION |
|---------|--------|-------|---------------------------|
| 1 | Y1 | - | Analog Signal Touch Panel |
| 2 | X2 | - | Analog Signal Touch Panel |
| 3 | Y2 | - | Analog Signal Touch Panel |
| 4 | X1 | - | Analog Signal Touch Panel |

(Note 2) In case of "without Touch panel", above connector is not used.

CN5 JST : housing : BHSR-02VS-1 (Suitable Connector : JST SM02B-BHSS-1)
 contact pin : SBHS-002T-P0.5

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

9. DIMENSIONAL OUTLINE



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

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

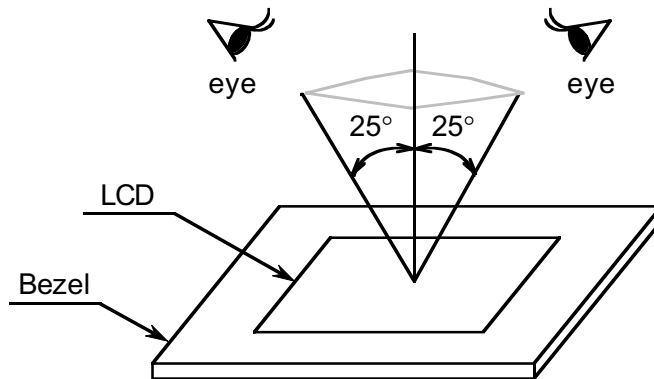
10. APPEARANCE STANDARD

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.

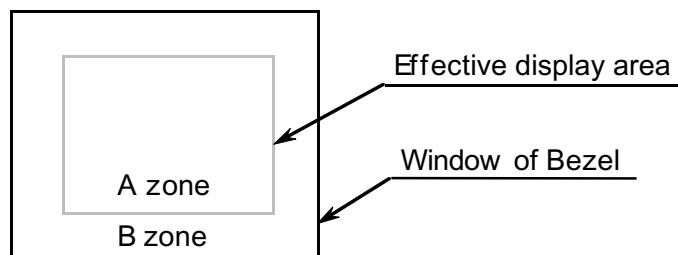
Viewing angle $\leq 25^\circ$



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.

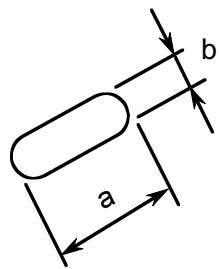
| No. | ITEM | CRITERIA | | | APPLIED ZONE | |
|---------------------------------------|--|---|---------------------------|---------------------------|--------------|---|
| L | Scratches | Distinguished one is not acceptable (To be judged by HITACHI STANDARD) | | | A | |
| | Dent | Same as above | | | 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

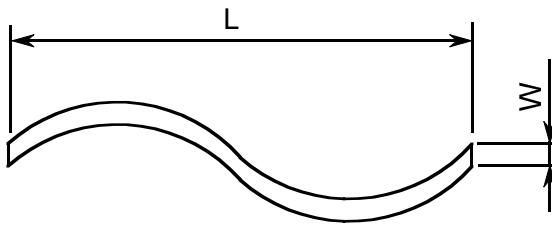
| No. | ITEM | CRITERIA | | | APPLIED ZONE |
|---|---|-------------------------|---------------------------|---------------------------|--------------|
| L E D | Dark spots White spots Foreign materials (Spot) | Average diameter D (mm) | Maximum Acceptable number | | A |
| | | $D \leq 0.4$ | ignored | | |
| | | $0.4 < D$ | 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 ethanole 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 hardly. 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 1.96×10^4 Pa.
And if the pressure area is less than 1cm^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°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

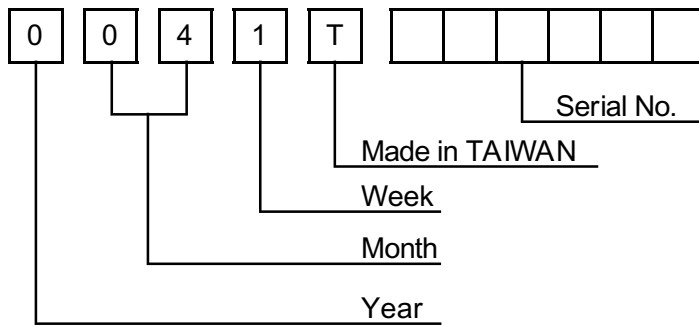
- (1) It is recommendable to crush damaged or unnecessary LCD's into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.
- (2) When any liquid leaked out a damaged glass cell comes in contact with your hands, please wash it. Off well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

| | | | | | | |
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12. 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 |
|------|--------------------|
| 2000 | 0 |
| 2001 | 1 |
| 2002 | 2 |
| 2003 | 3 |

| 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 |

Location of lot mark : On the back side of LCM

0041T*****

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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