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| PREPARED BY: _____ DATE _____ | <p style="text-align: center;">S H A R P</p> <p style="text-align: center;">TENRI LIQUID CRYSTAL<br/>DISPLAY DEVELOPMENT GROUP<br/>SHARP CORPORATION</p> <p style="text-align: center;">S P E C I F I C A T I O N</p> | SPEC No. LCY-96090B   |
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SPECIFICATION FOR

T F T L C D M O D U L E

MODEL No. \_\_\_\_\_

L Q 6 4 S P 1

☐ CUSTOMER'S APPROVAL

DATE \_\_\_\_\_

BY \_\_\_\_\_

PRESENTED

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MIE LIQUID CRYSTAL DISPLAY  
SHARP CORPORATION

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### 1. Application

This specification applies to a color TFT-LCD module, LQ64SP1.

### 2. Overview

This module is a color active matrix LCD module incorporating amorphous silicon TFTs (Thin Film Transistors). It is composed of a type color TFT-LCD panel, driver ICs, control circuit and power supply circuit. Graphics and texts can be displayed on a 800×3(RGB)×600dots panel with 262,144 colors by supplying 18 bit data signals(6bit/color), four timing signals and +5.0V DC supply voltage for TFT-LCD panel driving.

A backlight unit is not built in this module and the horizontal and vertical display reverse function is available. Therefore, this module can be used for the projection-type instruments.

#### [Features]

- ◎ High transmissive panel.
- ◎ High durability under intensive illuminance
- ◎ Small footprint and thin shape.
- ◎ Light weight.

### 3. Mechanical Specifications

| Parameter  | Specifications   | Unit   |
|--|--|--------|
| Display size                                     | 16 (6.4") Diagonal                                     | cm     |
| Active area                                      | 129.6(H)×97.2(V)                                       | mm     |
| Pixel format                                     | 800(H)×600(V)<br>(1 pixel=R+G+B dots)                  | pixels |
| Pixel pitch                                      | 0.162(H)×0.162(V)                                      | mm     |
| Pixel arrangement                                | R, G, B vertical stripe                                |        |
| Display mode                                     | Normally white   |        |
| Unit outline dimensions *1                       | 175.0(W)×126.5(H)×5.8(D)                               | mm     |
| Mass   | 153  | g      |
| Attached polarizer<br>(Outgoing light side only) | NPF-EG1425DUHC(NITTO DENKO Co., Ltd.)<br>or equivalent |        |

\*1 Note: excluding the electrical components.

The outline dimensions is shown in Fig.1

## 4. Input Terminals

## 4-1. TFT-LCD panel driving

The module-side connector: IL-FPR-40S-HF (JAE)

CN1

The user-side FPC: Shown in Fig. 2

| Pin No. | Symbol          | Function   | Remark  |
|---------|-----------------|--|---------|
| 1       | GND             |  |         |
| 2       | CK              | Clock signal for sampling each data signal       |         |
| 3       | GND             |  |         |
| 4       | GND             |  |         |
| 5       | Hsync           | Horizontal synchronous signal                    | 【Note1】 |
| 6       | Vsync           | Vertical synchronous signal                      | 【Note1】 |
| 7       | GND             |  |         |
| 8       | R0              | RED data signal (LSB)                            |         |
| 9       | R1              | RED data signal                                  |         |
| 10      | R2              | RED data signal                                  |         |
| 11      | R3              | RED data signal                                  |         |
| 12      | R4              | RED data signal                                  |         |
| 13      | R5              | RED data signal (MSB)                            |         |
| 14      | GND             |  |         |
| 15      | GND             |  |         |
| 16      | GND             |  |         |
| 17      | G0              | GREEN data signal (LSB)                          |         |
| 18      | G1              | GREEN data signal                                |         |
| 19      | G2              | GREEN data signal                                |         |
| 20      | G3              | GREEN data signal                                |         |
| 21      | G4              | GREEN data signal                                |         |
| 22      | G5              | GREEN data signal (MSB)                          |         |
| 23      | GND             |  |         |
| 24      | GND             |  |         |
| 25      | GND             |  |         |
| 26      | B0              | BLUE data signal (LSB)                           |         |
| 27      | B1              | BLUE data signal                                 |         |
| 28      | B2              | BLUE data signal                                 |         |
| 29      | B3              | BLUE data signal                                 |         |
| 30      | B4              | BLUE data signal                                 |         |
| 31      | B5              | BLUE data signal (MSB)                           |         |
| 32      | GND             |  |         |
| 33      | GND             |  |         |
| 34      | GND             |  |         |
| 35      | ENAB            | Signal to settle the horizontal display position | 【Note2】 |
| 36      | V <sub>cc</sub> | +5.0V power supply                               |         |
| 37      | V <sub>cc</sub> | +5.0V power supply                               |         |
| 38      | R/L             | Signal to settle the horizontal display reverse  | 【Note3】 |
| 39      | U/D             | Signal to settle the vertical display reverse    | 【Note3】 |
| 40      | GND             |  |         |

※The shielding case is connected with GND in the module.

【Note1】 The polarity of both synchronous signals are negative.

【Note2】 The horizontal display start timing is settled in accordance with a rising edge of ENAB signal. In case ENAB is fixed "Low", the horizontal display start timing is determined as described in 7-2. Do not fix ENAB "High" during operation.

【Note3】

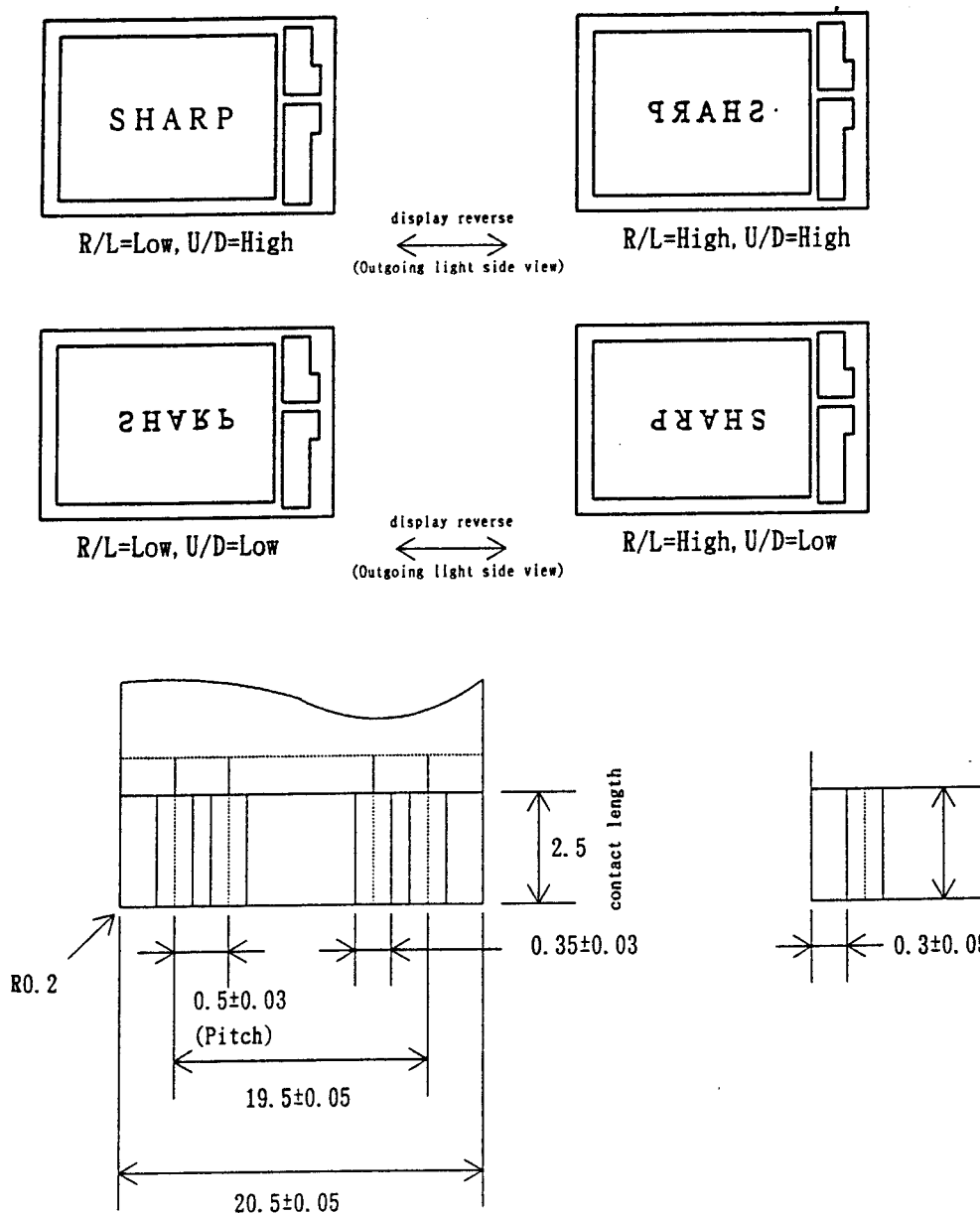


Fig.2 Corresponding FPC dimensions

## 5. Absolute Maximum Ratings

| Parameter                                      | Symbol      | Condition              | Ratings                       | Unit             | Remark     |
|--|-------------|------------------------|-------------------------------|------------------|------------|
| Input voltage                                  | $V_i$       | $T_a=25^\circ\text{C}$ | $-0.3 \sim V_{cc}+0.3$        | V                | 【Note1】    |
| Vcc supply voltage                             | $V_{cc}$    | $T_a=25^\circ\text{C}$ | $0 \sim +6$                   | V                |            |
| Storage temperature                            | $T_{stg}$   | —                      | $-20 \sim +70$                | $^\circ\text{C}$ | 【Note2】    |
| Operating temperature (Ambient)                | $T_{opa}$   | —                      | $0 \sim +60$                  | $^\circ\text{C}$ |            |
| Panel surface temperature                      | $T_p$       | —                      | $0 \sim +60$                  | $^\circ\text{C}$ | 【Note3】    |
| Light source wave length                       | $\lambda_i$ | —                      | $400 \leq \lambda_i \leq 780$ | nm               |            |
| Illumination intensity<br>at the glass surface | $I_i$       | —                      | $\leq 500,000$                | lux              | 【Note4, 5】 |

【Note1】 CK, R0~R5, G0~G5, B0~B5, Hsync, Vsync, ENAB, R/L, U/D

【Note2】 Humidity : 95%RH Max. at  $T_a \leq 40^\circ\text{C}$ .

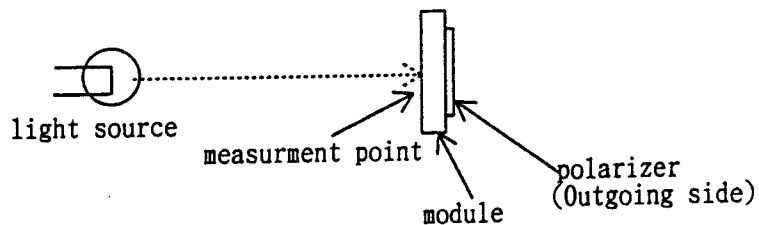
Maximum wet-bulb temperature at  $39^\circ\text{C}$  or less at  $T_a > 40^\circ\text{C}$ .

No condensation.

【note3】 Temperature difference on panel is recommended to be less than  $5^\circ\text{C}$  to avoid the reduction of contrast ratio uniformity.

【Note4】 Measurement point : panel surface of the incident light side.

Light source shall be placed at incident light side.



【Note5】 Illumination intensity from the reverse direction is recommended to be less than 10,000lux, because reverse direction light may reduce the contrast ratio.

## 6. Electrical Characteristics

TFT-LCD panel driving

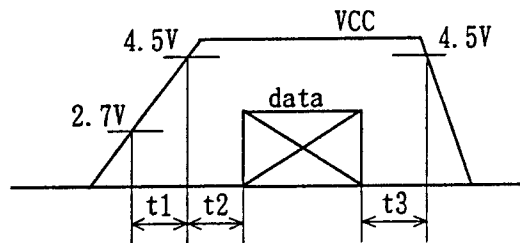
Ta=25℃

| Parameter                       | Symbol           | Min.                | Typ. | Max.                | Unit  | Remark                                    |
|---------------------------------|------------------|---------------------|------|---------------------|-------|---|
| Vcc Supply voltage              | V <sub>cc</sub>  | +4.5                | +5.0 | +5.5                | V     | 【Note1】                                   |
| Supply current                  | I <sub>cc</sub>  | —                   | 220  | 360                 | mA    | 【Note2】                                   |
| Permissive input ripple voltage | V <sub>RP</sub>  | —                   | —    | 100                 | mVp-p | V <sub>cc</sub> =5.0V                     |
| Input voltage (Low)             | V <sub>IL</sub>  | -0.3                | —    | 0.3×V <sub>cc</sub> | V     | 【Note3】                                   |
| Input voltage (High)            | V <sub>IH</sub>  | 0.7×V <sub>cc</sub> | —    | 0.3+V <sub>cc</sub> | V     |   |
| Input current (Low)             | I <sub>IL1</sub> | —                   | —    | 1.0                 | μA    | V <sub>I</sub> =0V, 【Note4】               |
|                                 | I <sub>IL2</sub> | 75                  | —    | 1500                | μA    | ' , 【Note5】                               |
|                                 | I <sub>IL3</sub> | —                   | —    | 5.0                 | μA    | ' , 【Note6】                               |
| Input current (High)            | I <sub>IH1</sub> | —                   | —    | 1.0                 | μA    | V <sub>I</sub> =V <sub>cc</sub> , 【Note4】 |
|                                 | I <sub>IH2</sub> | —                   | —    | 5.0                 | μA    | ' , 【Note5】                               |
|                                 | I <sub>IH3</sub> | 3                   | —    | 60.0                | μA    | ' , 【Note6】                               |

## 【Note1】

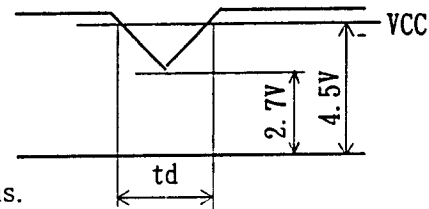
Vcc-turn-on/turn-off conditions should satisfy the following conditions.

- $$0 \leq t_1 \leq 10\text{msec}$$
- $$0 < t_2 \leq 50\text{msec}$$
- $$0 < t_3 \leq 1\text{sec}$$



Vcc-dip conditions:

- 1) if  $2.7\text{V} \leq V_{cc} < 4.5\text{V}$  and  $t_d \leq 10\text{msec}$   
then the operation will continue without failure.
- 2) if  $V_{cc} < 2.7\text{V}$  or if  $V_{cc} < 4.5\text{V}$  and  $t_d \geq 10\text{msec}$   
then restart with the above Vcc-turn-on conditions.



【Note2】 The typical value of I<sub>cc</sub> is measured in the following condition.

64-gray-bar pattern.

All of the timing parameters are typical value.

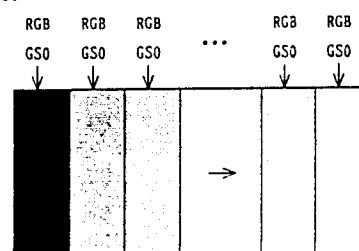
V<sub>cc</sub>=+5.0V

【Note3】 CK, R0~R5, G0~G5, B0~B5, Hsync, Vsync, ENAB, R/L, U/D

【Note4】 CK, R0~R5, G0~G5, B0~B5, Hsync, Vsync

【Note5】 R/L, U/D

【Note6】 ENAB





## 7. Timing Characteristics of input signals

The timing diagrams of the input signals are shown in Fig.3.

### 7-1. Timing characteristics

| Parameter                    |             | Symbol   | Min. | Typ. | Max.         | Unit    | Remark |
|------------------------------|-------------|----------|------|------|--------------|---------|--------|
| Clock                        | Frequency   | $1/T_c$  | 38.0 | 40.0 | 42.0         | MHz     |        |
|                              | High time   | $T_{ch}$ | 9.6  | —    | —            | ns      |        |
|                              | Low time    | $T_{cl}$ | 9.6  | —    | —            | ns      |        |
|                              | Duty ratio  | $T_H/T$  | 40   | 50   | 60           | %       |        |
| Data                         | Setup time  | $T_{ds}$ | 3    | —    | —            | ns      |        |
|                              | Hold time   | $T_{dh}$ | 10   | —    | —            | ns      |        |
| Horizontal sync. signal      | Cycle       | $T_H$    | 20.8 | 26.4 | 32.1         | $\mu s$ |        |
|                              |             |          | 832  | 1056 | 1283         | clock   |        |
|                              | Pulse width | $T_{Hp}$ | 2    | 128  | 200          | clock   |        |
| Vertical sync. signal        | Cycle       | $T_v$    | 628  | 666  | 798          | Hsync   |        |
|                              | Pulse width | $T_{vp}$ | 2    | 4    | 6            | Hsync   |        |
| Horizontal display period    |             | $T_{Hd}$ | 800  | 800  | 800          | clock   |        |
| Hsync-Clock phase difference |             | $T_{Hc}$ | 10   | —    | $T_c-10$     | ns      |        |
| Hsync-Vsync phase difference |             | $T_{vh}$ | 0    | —    | $T_H-T_{Hp}$ | clock   |        |
| Vertical data start position |             | $T_{vs}$ | 23   | 23   | 23           | Hsync   |        |

Note) When operating at frequencies lower than the typical SVGA format, the display quality may deteriorate.

Flicker may also be noticeable due to the sensitive nature of the human eye.

### 7-2. Horizontal display position

The horizontal display position is determined by ENAB signal, and the input data corresponding to the rising edge of ENAB signal is displayed at the left end of the active area.

| Parameter                          |             | Symbol   | Min. | Typ. | Max.     | Unit  | Remark  |
|------------------------------------|-------------|----------|------|------|----------|-------|---------|
| ENAB signal                        | Setup time  | $T_{.s}$ | 5    | —    | $T_c-10$ | ns    |         |
|                                    | Pulse width | $T_{.p}$ | 2    | 800  | $T_H-10$ | clock |         |
| Hsync-ENAB signal phase difference |             | $T_{H.}$ | 58   | 88   | 170      | clock | 【Notel】 |

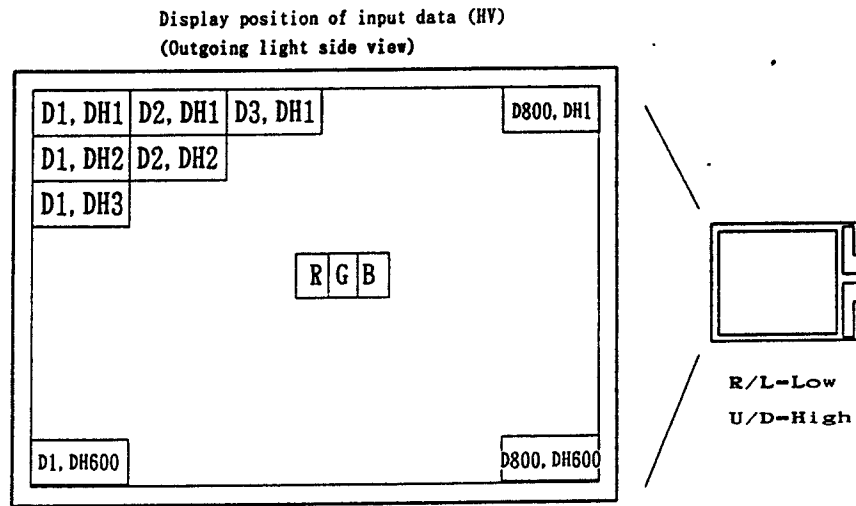
【Notel】 Please do not use under the condition of " $T_{H.}=91$ ".

Note) When ENAB is fixed "Low", the display starts from the data of C88(clock) as shown in Fig.3. The module does not work when ENAB is fixed "High" all the time.

### 7-3. Vertical display position

The vertical display position,  $T_v$ , is fixed "23" (Hsync).

### 7-4. Input Data Signal and Display Position on the screen



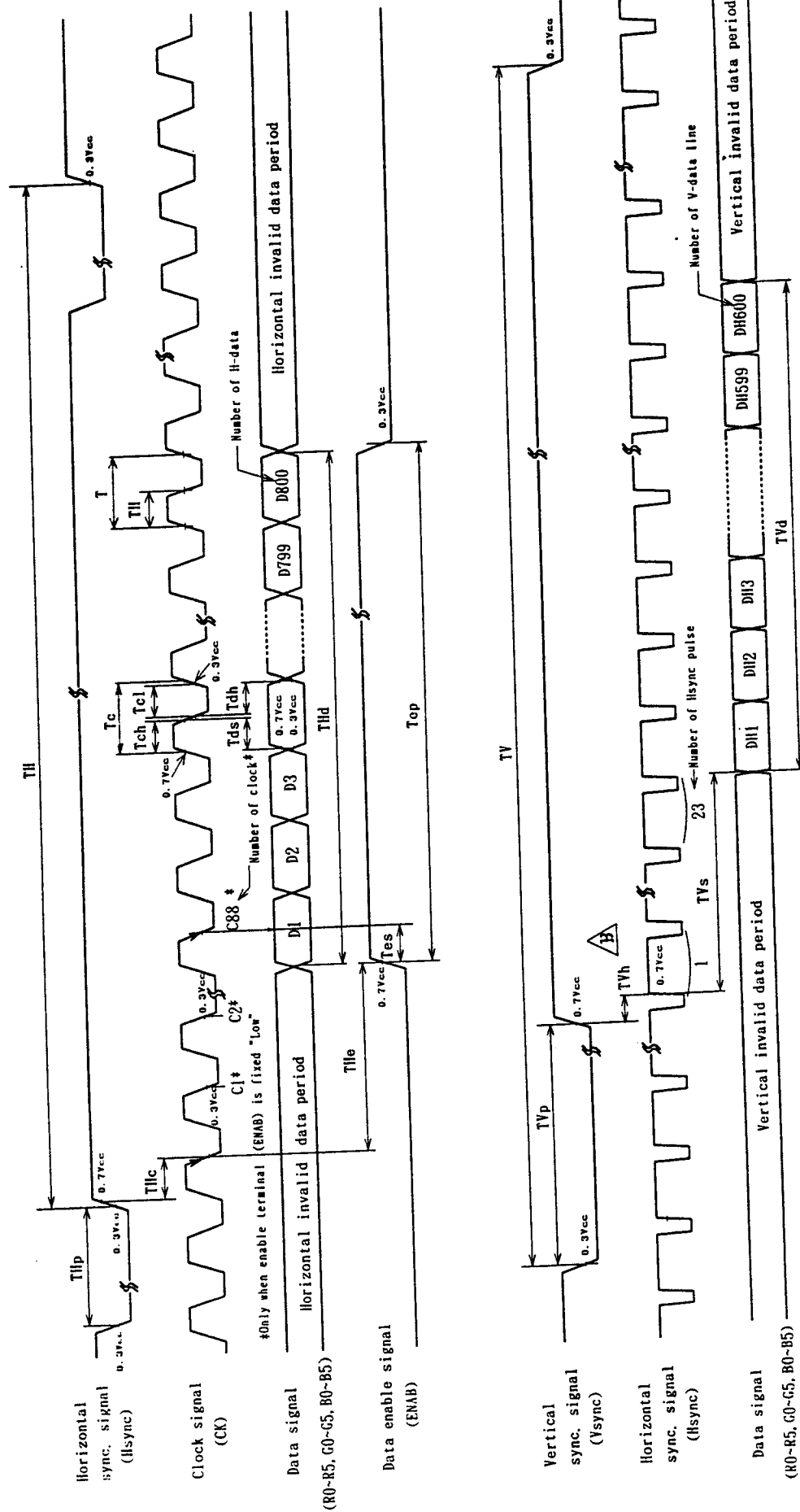


Fig. 3 Input signal timing chart

## 8. Input Signals, Basic Display Colors and Gray Scale of Each Color

|                     | Color & Gray |      | Data signal |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|---------------------|--------------|------|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
|                     | scale (GS)   | GS   | R0          | R1 | R2 | R3 | R4 | R5 | G0 | G1 | G2 | G3 | G4 | G5 | B0 | B1 | B2 | B3 | B4 | B5 |
| Basic color         | Black        | —    | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Blue         | —    | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  |
|                     | Green        | —    | 0           | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Cyan         | —    | 0           | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |
|                     | Red          | —    | 1           | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Magenta      | —    | 1           | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  |
|                     | Yellow       | —    | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | White        | —    | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |
| Gray Scale of Red   | Black        | GS0  | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | ↑            | GS1  | 1           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Darker       | GS2  | 0           | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | ↑            | ↓    |             |    |    | ↓  |    |    |    |    |    | ↓  |    |    |    |    |    | ↓  |    |    |
|                     | ↓            | ↓    |             |    |    | ↓  |    |    |    |    |    | ↓  |    |    |    |    |    | ↓  |    |    |
|                     | Brighter     | GS61 | 1           | 0  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | ↓            | GS62 | 0           | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Red          | GS63 | 1           | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| Gray Scale of Green | Black        | GS0  | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | ↑            | GS1  | 0           | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Darker       | GS2  | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | ↑            | ↓    |             |    |    | ↓  |    |    |    |    |    | ↓  |    |    |    |    |    | ↓  |    |    |
|                     | ↓            | ↓    |             |    |    | ↓  |    |    |    |    |    | ↓  |    |    |    |    |    | ↓  |    |    |
|                     | Brighter     | GS61 | 0           | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | ↓            | GS62 | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Green        | GS63 | 0           | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  |
| Gray Scale of Blue  | Black        | GS0  | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | ↑            | GS1  | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0  |
|                     | Darker       | GS2  | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 0  |
|                     | ↑            | ↓    |             |    |    | ↓  |    |    |    |    |    | ↓  |    |    |    |    |    | ↓  |    |    |
|                     | ↓            | ↓    |             |    |    | ↓  |    |    |    |    |    | ↓  |    |    |    |    |    | ↓  |    |    |
|                     | Brighter     | GS61 | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 1  | 1  | 1  | 1  |
|                     | ↓            | GS62 | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  |
|                     | Blue         | GS63 | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  |

0:Low Level voltage, 1:High level voltage

Each basic color can be displayed in 64 gray scales with 6 bit data signals.

The total combination of 18bits of data signals will give the ability to achieve 262,144 colors on the screen.

## 9. Optical Characteristics

Ta=25℃, Vcc=+5.0V

| Parameter                  | Symbol     | Condition          | Min.   | Typ.  | Max.  | Unit | Remark        |
|----------------------------|------------|--------------------|--------|-------|-------|------|---------------|
| Contrast ratio             | C R        | $\theta = 0^\circ$ | 100    | —     | —     |      | 【Notel, 2】    |
| Response time              | Rise       |                    | —      | 20    | —     | ms   | 【Notel, 3】    |
|                            | Decay      |                    | —      | 40    | —     | ms   |               |
| Chromaticity shift (White) | $\Delta x$ |                    | -0.029 | 0.008 | 0.045 |      | 【Notel, 4】    |
|                            | $\Delta y$ |                    | -0.002 | 0.029 | 0.059 |      |               |
| Transmissivity             | $t_r$      |                    | 10.5   | 13.5  | 17.0  | %    | 【Notel, 5, 6】 |

The characteristics of the backlight for the measurement of these parameter.  
(except transmissivity)

Luminance :  $I \geq 3,500\text{cd/m}^2$

Wave length :  $\lambda \geq 400\text{nm}$

The measurement shall be executed more than 30 minutes after lighting at rating. This optical characteristics shall be measured in a dark room or equivalent state with the method shown in Fig. 4.

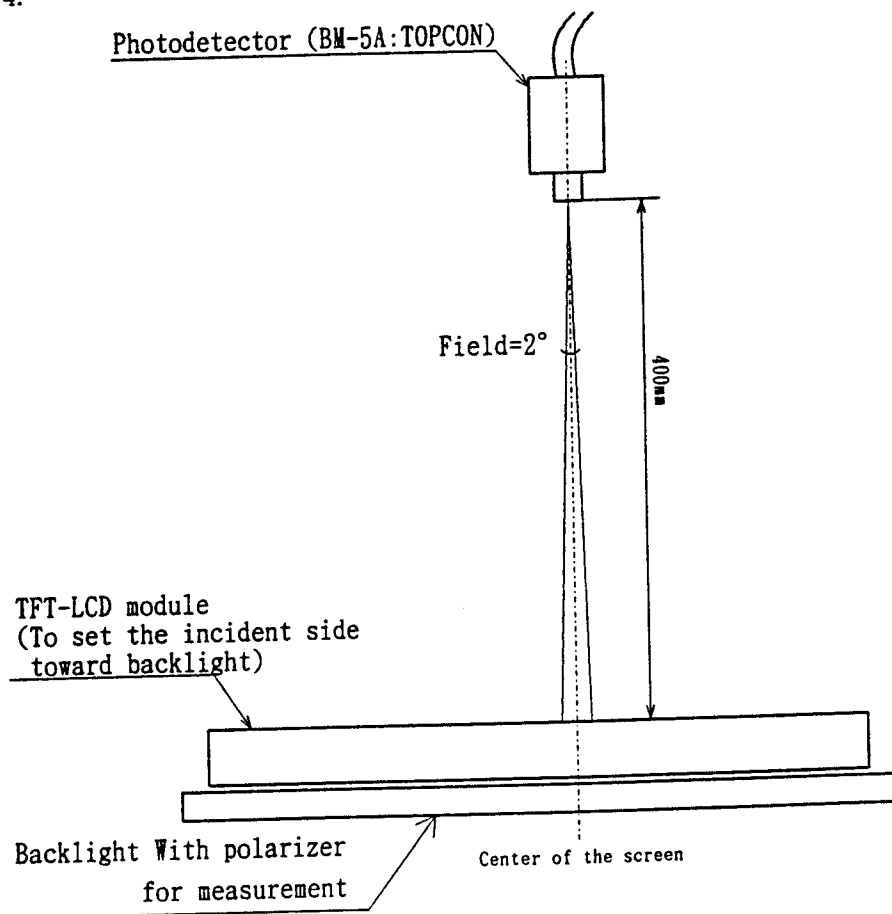
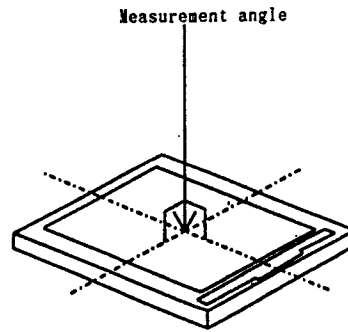


Fig. 4 The optical characteristics measuerment method

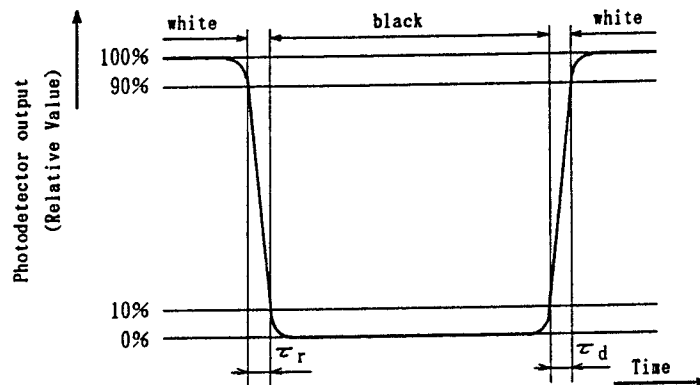
【Note1】 Measurement angle is as follows:



【Note2】 Definition of contrast ratio:

$$\text{Contrast Ratio (CR)} = \frac{\text{Luminance (brightness) with all pixels white}}{\text{Luminance (brightness) with all pixels black}}$$

【Note3】 The response time shall be measured by switching the input signal for "black" and "white".



【Note4】 Chromaticity shift is the chromaticity difference of the light source and the outgoing light from the module.

The light source for the measurement is the standard "C",  $x=0.310$  and  $y=0.316$ .

【Note5】 Definition of transmissivity.

$$\text{Transmissivity}(\%) = \frac{\text{Value of illumination meter at Measurement1}}{\text{Value of illumination meter at Measurement2}} \times 100$$

The measurement system is defined in fig.5.

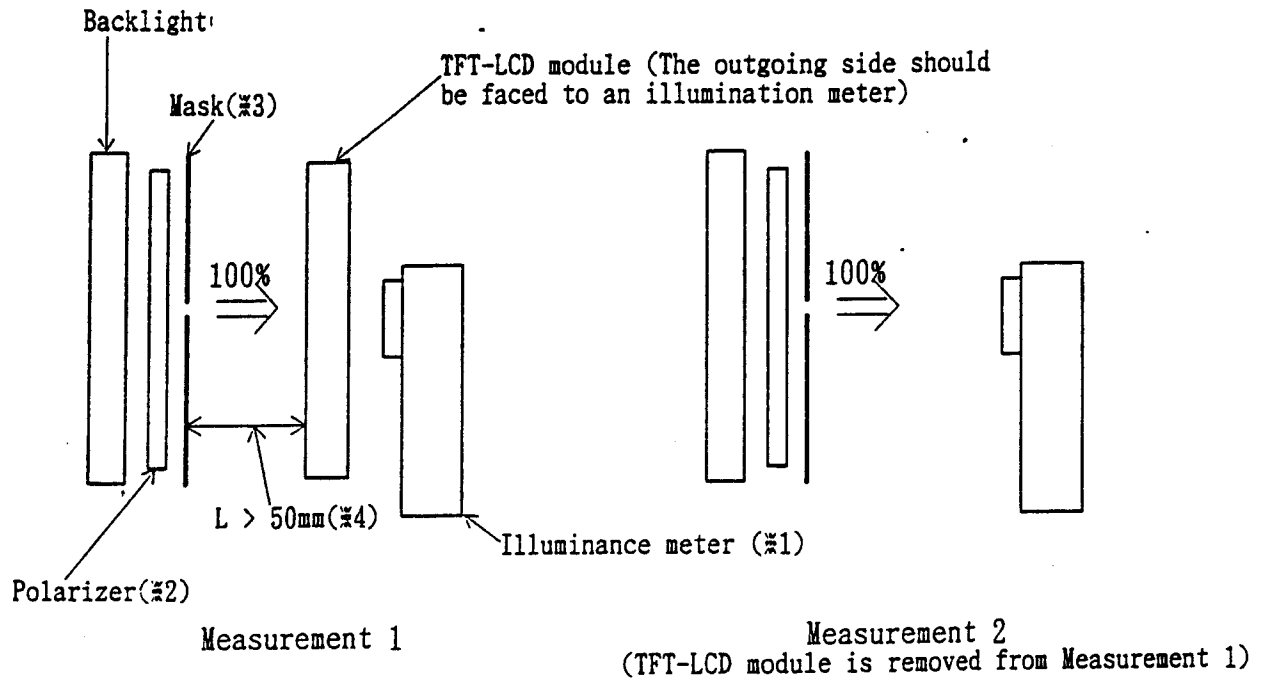
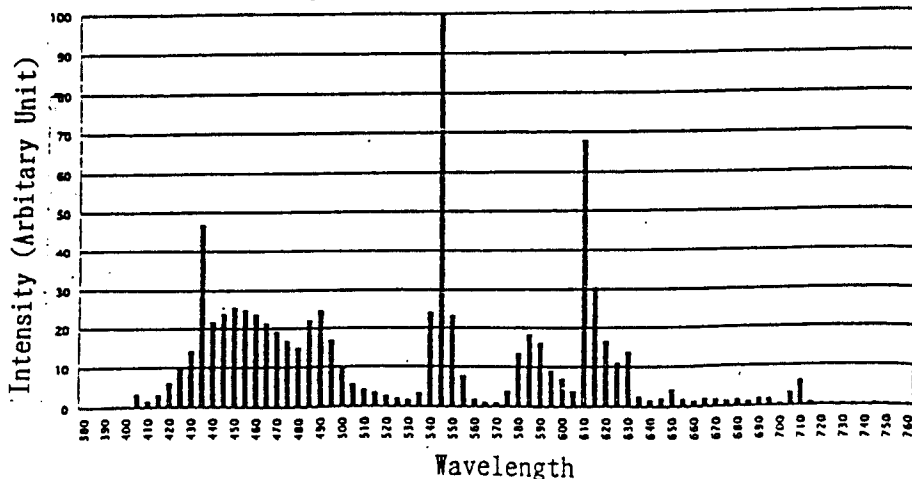


Fig.5 The measurement method of transmissivity

- \*1) Illumination meter should be placed to the position closer to TFT-LCD module.
- \*2) To use polarizer with more than 99% of polarization (for example, to use the same polarizer as that of outgoing light side(Nitto Denko, NPF-EG1425DUHC) for incident light side polarizer).
- \*3) To shut out the light which is outside of measurement area, because the scattering light will be generated.
- \*4) Within the range of  $L < 50\text{mm}$ , measurement error will be caused because of the repeated reflection between TFT module and backlight.

【Note6】 The characteristics of the spectrum distribution for the measurement of transmissivity is shown in the following figure. The measurement shall be executed after more than 30 minutes operating at rating. This optical characteristics shall be measure in a dark room or equivalent state with the method shown in Fig.5



## 10. Display Quality

The display quality of the color TFT-LCD module shall be in compliance with the Incoming Inspection Standard.

## 11. Handling Precautions

11-1. Be sure to turn off the power supply when inserting or disconnecting the cable.

11-2. Precautions in mounting.

- a) When installing the module, be sure to fix the module on the flat plane, taking care not to warp or twist the module.
- b) Since the polarizer is made of soft material, care must be taken not to scratch the surface. Protective laminated film is attached on the outgoing light side surface glass to protect from scratches or dirt. It is recommended that the laminated film is peeled off, just before the use, with strict attention to electrostatic charges.

※Precautions when peeling off the laminated film:

### I) Working environment

When the laminated film is peeled off, there may be cases that some particles like dust are stuck by electrostatic charge, so the following working environment is recommended.

- (i) Floor: Anti-electro-static treatment more than 1MΩ on the tile.
- (ii) Spread an adhesive mat at a doorway in the clean room.
- (iii) Humidity: 50% to 70%, Temperature: 15℃ to 27℃.
- (iv) Worker should wear anti-electro-static shoes, anti-electro-static work wear, anti-electro-static gloves and earth band.

### II) Working way

- (i) Keep the distance between the module and the heated ionized air blower within 20cm.

The module shall be well blown by the air blower. (Fig. 6-①)

- (ii) Attach an adhesive tape to a corner of the laminated film near the heated ionized air blower. (Fig. 6-②)

- (iii) Peel the laminated film, pulling the adhesive tape to your side. It is important to take more than 5 seconds to peel off the laminated film.

- (iv) The way to remove 'dust' from the polarizer ;

• Blow it off by ionized air (or nitrogen gas) gun.

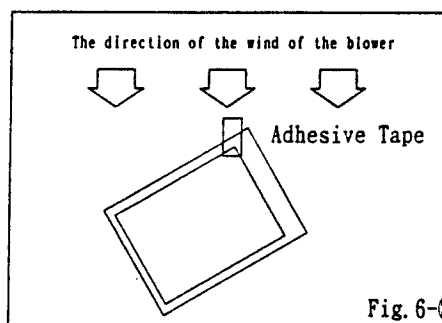
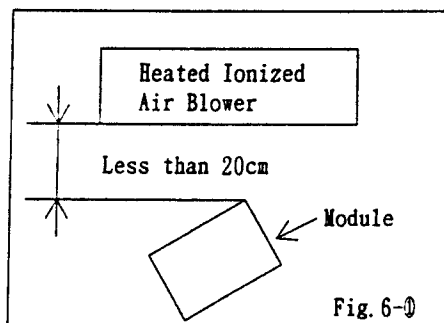
• Since polarizer is scratch sensitive. In unavoidable case, wipe it carefully by the cloth like a wiper for lens, breathing on it.

- 11-3. The thin liquid crystal layer is packed in the TFT panel. This layer may be disturbed by the external force when the panel surface is pushed strongly and this disturbance may cause the transient display non-uniformity. So do not push the panel surface strongly. If the disturbance occurs, keep the power off for a while.



## 11-4. Others

- a) Be sure to design the cabinet so that the module can be installed without any extra stress such as warp or twist.
- b) Since the polarizer is scratch sensitive, pay attention not to scratch it.
- c) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
- d) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
- e) Since CMOS LSIs are used in this module, take care of static electricity and ensure the human earth when handling.
- f) Follow general precautionary requirements in handling components not listed above.



## 12. Reliability test items

| No. | Test item                                       | Conditions   |
|-----|---|--|
| 1   | High temperature storage test                   | Ta=70℃ 240h  |
| 2   | Low temperature storage test                    | Ta=-20℃ 240h   |
| 3   | High temperature & high humidity operation test | Ta=40℃;95%RH 240h<br>(No condensation)   |
| 4   | High temperature operation test                 | Ta=60℃ 240h<br>(The panel temp. must be less than 60℃)   |
| 5   | Low temperature operation test                  | Ta=0℃ 240h   |
| 6   | Vibration test<br>(non-operating)               | Frequency:10~57Hz/Vibration width (one side):0.075mm<br>:58~500Hz/Acceleration:9.8m/s <sup>2</sup><br>Sweep time: 11 minutes<br>Test period: 3 hours<br>(1 hour for each direction of X, Y, Z) |
| 7   | Shock test<br>(non-operating)                   | Max. Acceleration: 490m/s <sup>2</sup><br>Pulse width: 11ms, sine wave<br>Direction: ±X, ±Y, ±Z<br>once for each direction.  |

## 【Evaluation Criteria】

There shall be no change which may affect the practical use of the display under the Display Quality Test conditions.

## 13. Others

## 1) Serial No. Label

|              |               |
|--------------|---------------|
| LQ64SP1      | 6100001       |
| MODEL Number | Serial Number |

- 2) Adjustable volume resistor have been optimized before shipment, so do not change any adjusted value. If adjusted value is changed, the specification value may not be guaranteed.
- 3) Disassembling the module can cause permanent damage and should be strictly avoided.
- 4) If any problem occurs in relation to the description of this specification, it shall be discussed in a good faith.

## 14. Packing form

- 1) Piling number of cartons : MAX. 12
- 2) Package quantity in one carton : MAX. 10
- 3) Carton Size : 384(W)x273(H)x219(D)mm

Packing form is shown in Fig. 7.

Fig. 1 Outline dimensions

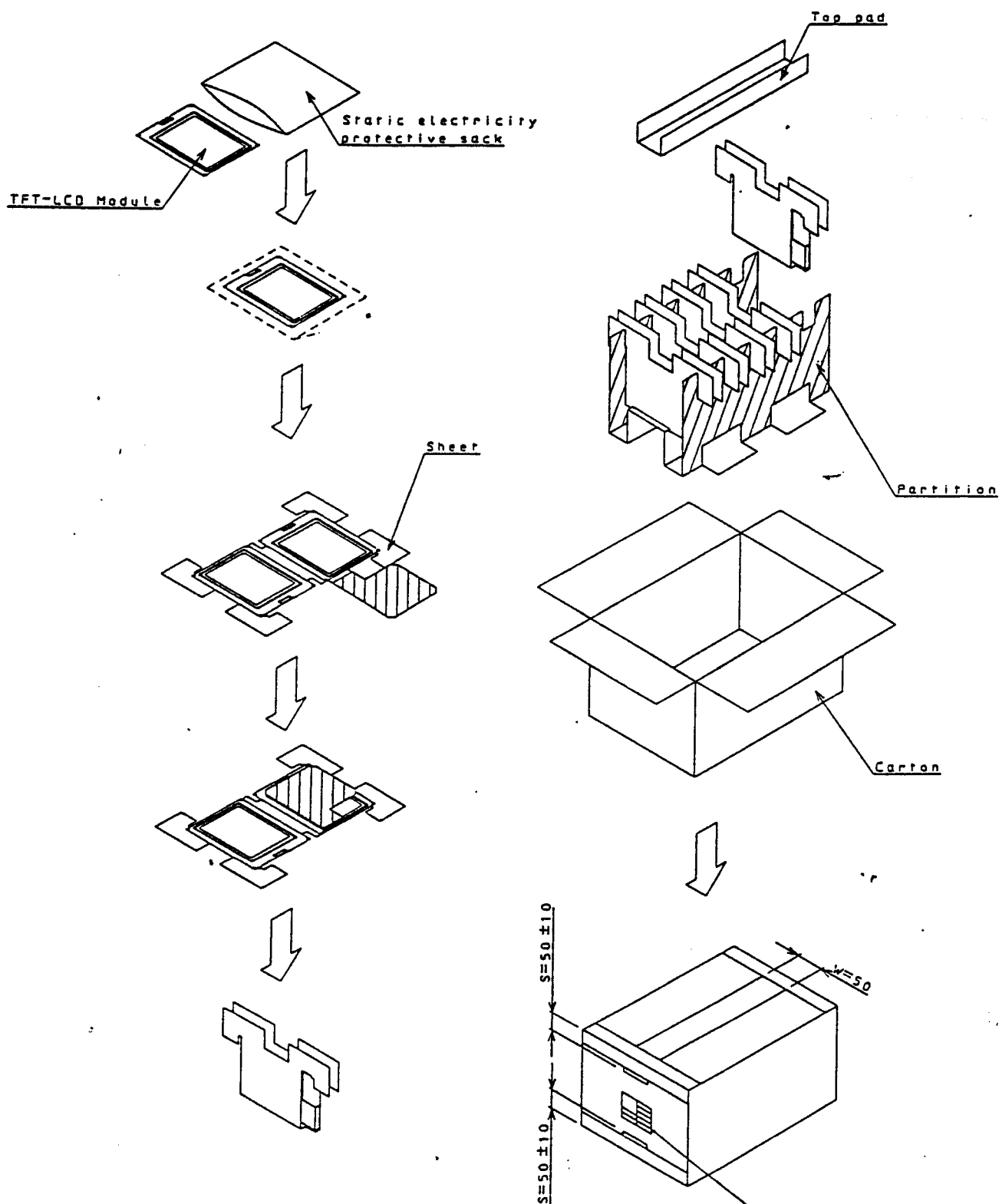


Fig.7 Packing Form

|           |            |
|-----------|------------|
| TYPE      | LQ64SP1    |
| QUANTITY  | 10         |
| LOT(DATE) | 96. **. ** |