To :

# Specification of FUJITSU TFT-LCD module

# FLC43XWC8V-02

| Approval |
| --- |
| Date : |
| By : |



Specification No. : Tech Bes LCD-00149

Issue Date : Apr. 09, 2003

Issued by :

F. Yamada
Director
Products Engineering Dept.
LCD Products Div.

FUJITSU DISPLAY TECHNOLOGIES CORPORATION

# REVISION HISTORY

| Revision | Date | Prepared | Checked | | Approved | Summary |
|---|---|---|---|---|---|---|
| 01A | Jul. 12, 2002 | H. Takahashi | | | F. Yamada | 1st issue |
| 02B | Oct. 11, 2002 | S. Sekido | | | F. Yamada | Change gasket location and constant number of fuse |
| 03B | Oct. 25, 2002 | K. Yonemura | | | F. Yamada | Change gasket location (3 locations) |
| 04B | Nov. 12, 2002 | S. Sekido | | | F. Yamada | Change gasket location (2 locations) |
| 05B | Jan. 17, 2003 | S. Sekido | | | F. Yamada | Add the note about measured point.<br>Change bypass capacities. |
| 06B | Apr.07,2003 | S.Sekido | | | F.Yamada | Change CNT-PCB.<br>Change Timing spec.. |

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|---|---|---|---|---|---|
| 05 | 20030117 | Sekido | | Yamada | Revise p8 |
| 04 | 20021205 | Sekido | Takahashi | Yamada | Revise p2, 6, 7, 8, 16, 21 and add p22 |
| 03 | 20020924 | Takahashi | | Yamada | Revise p3,8,20,21 |
| 06 | 20030407 | Sekido | Takahashi | Yamada | Revise P2,16 |
| DESIG. | 20020712 | Takahashi | CHECK | | APPR. Yamada |

FLC43XWC8V-02

Tech Bes LCD-00149

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SHEET 1 / 35

# TABLE OF CONTENTS



DOCUMENT CONTROL SECTION

DATE

| EDIT | DATE | DESIG. | CHECK | APPR. | DESCRIPTION |
|---|---|---|---|---|---|
| 06 | 20030407 | | | | Total revision |
| 04 | 20021205 | | | | Total revision |

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FLC43XWC8V-02

Tech Bes LCD-00149

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SHEET 2 /

## 1. APPLICATIONS

This specification is applied to the 17.0 in. XGA-WIDE supported TFT-LCD module.

## 2. PRODUCT NAME AND MODEL NAME

2-1. Product Name : LCD Module

2-2. Model Name : FLC43XWC8V-02

## 3. OVERVIEW

This LCD module has a TFT active matrix type liquid crystal panel 1280×768 pixels, and diagonal size of 43cm (17.0-inch). This module supports 1280×768 XGA-WIDE mode (Non-interlace).

This LCD has a XGA-WIDE-capable 1ch-LVDS interface and can display 16 million colors.

By timing control signal, images are displayed on the screen at given value under specified timing.

Control signals to this LCD module are ENAB (Data enable signal), DCLK signal and RGB data signal. Data signal is transmitted with single port. (8 bit for each R, G, B)

The power supply of this LCD module is +5V DC. This module has the characteristics that apply to TCO'99. ③

## 4. CONFIGURATION

This LCD module consists of a color TFT-LCD panel that mounted with TFT driver ICs, a cold-cathode fluorescent tube back-light, a LVDS interface PCB, a structure and a bezel. And these components are integrated in a LCD module.

Cold-cathode fluorescent tube and lamp holder are replaceable.

Fig.4-1 shows a block diagram of this LCD module.

DOCUMENT CONTROL SECTION

DATE

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|---|---|---|---|---|---|
| 03 | 20020924 | | | | Add ③ (application of TCO'99) |

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FLC43XWC8V-02

Tech Bes LCD-00149 CUST.

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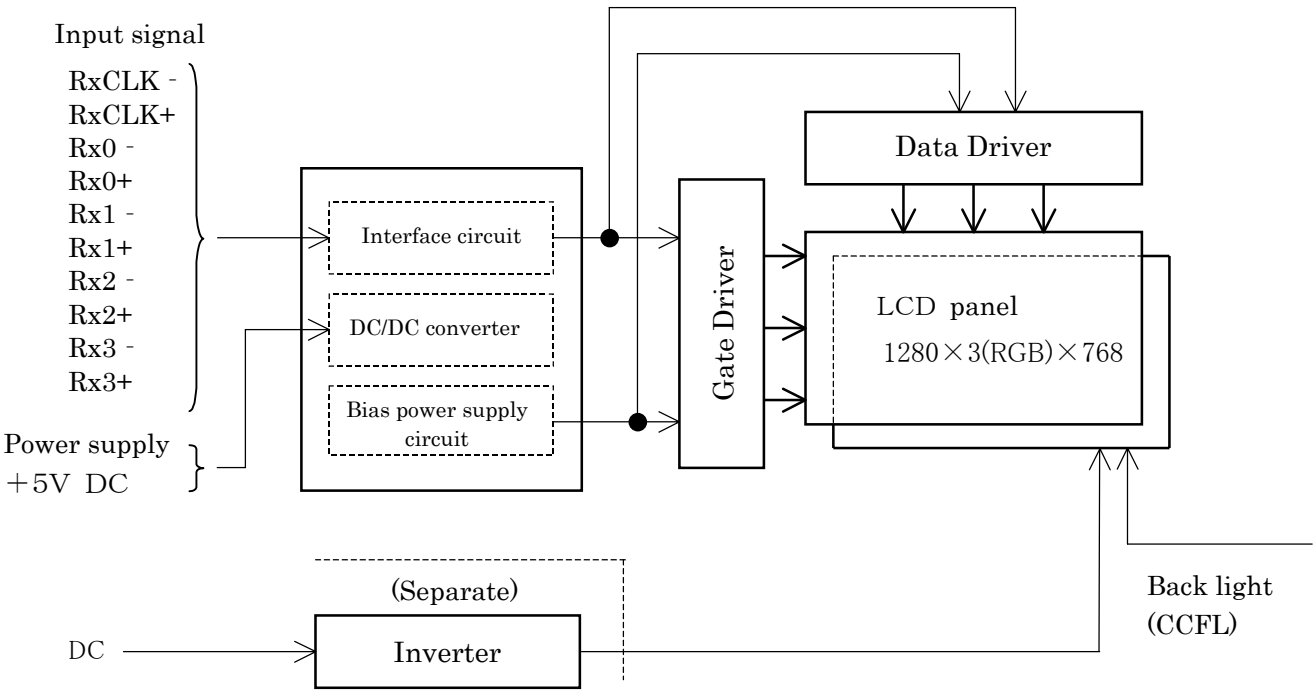


Figure 4-1. Block Diagram

## 5. MECHANICAL SPECIFICATIONS

Table 5-1 shows the mechanical specifications of this LCD module.

Table 5-1. Mechanical Specifications

| Item | Specifications | Unit | Remark |
|---|---|---|---|
| Dimensions | 413.8×263.5×18.4(TYP.) | mm | Edge type backlight is used. (ϕ2.6 CCFL×4)<br>Outward Appearance is shown at page 32 and 33. |
| Display Resolution | (1280×3) ×768 | — | |
| Display Dot Area | 369.6×221.76 | mm | |
| Dot Pitch | (0.09625×3) ×0.28875 | mm | |
| Aspect Ratio | 1 : 1 | — | |
| Weight | 2,000 max | g | |
| FG-SG | Short circuit | — | |

## 6. ABSOLUTE MAXIMUM RATINGS

Table 6-1 shows the absolute maximum rating of this LCD module.

Table 6-1. Absolute Maximum Ratings

| Item | Symbol | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|
| Supply Voltage | $V_{CC}$ | −0.3 | — | 6.0 | V |
| Input Voltage | $V_{IN}$ | −0.3 | — | Vcc+0.3 | V |

## 7. RECOMMENDED OPERATING CONDITIONS

Table 7-1 shows the recommended operating conditions of this LCD module.

Table 7-1. Recommended Operating Conditions

| Item | Symbol | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|
| Supply Voltage | $V_{CC}$ | 4.75 | 5.0 | 5.25 | V |
| Ripple Voltage (Vcc) | $V_{RP}$ | — | — | 100 | mVp-p |

## 8. ELECTRICAL SPECIFICATIONS

Table 8-1 shows the electrical specifications of this LCD module.

Table 8-1. Electrical Specifications

| Item | | Symbol | Condition | MIN. | TYP. | MAX. | Unit | Remark |
|---|---|---|---|---|---|---|---|---|
| Supply Current | | $I_{CC}$ | $V_{CC}$=+5.0±0.25V<br>Vss=0V<br>DCLK=32.498MHz | — | ~~(600)~~<br>680④ | ~~(1000)~~<br>900④ | mA | *1 |
| "H" Level Logic Input Voltage | | $V_{IH}$ | | 0.7×Vcc | — | $V_{CC}$+0.3 | V | *2 |
| "L" Level Logic Input Voltage | | $V_{IL}$ | | GND | — | 0.3×Vcc | V | *2 |
| BACK LIGHT *3 | CCFL Turn on Voltage | $V_S$ | $f_L$=50kHz, Ta=25ºC | — | 1230 | 1600 | Vrms | |
| | | | $f_L$=50kHz, Ta=0ºC | — | — | 1600 | | |
| | Lighting Voltage | $V_L$ | $f_L$=50kHz<br>$I_L$=10.5mA | 590 | 630 | 670 | Vrms | *4 |
| | Lighting Frequency | $f_L$ | $V_L$=~~580~~Vrms<br>630④ | 40 | 50 | 60 | kHz | |
| | Tube Current | $I_L$ | $f_L$=50kHz<br>$V_L$=~~580~~Vrms<br>630④ | 9.5 | 10.5 | 11.0 | mArms | *4 |

(*1) Typical current value is measured when gray scale (vertical 256 levels) is displayed at Vcc=5.0V.
Maximum current value is measured when stripes with respect to each RGB dot are displayed at Vcc=5.0V.
Without rush current.

(*2) Timing control circuit input voltage

(*3) Backlight specifications are valid when using a suitable inverter such as the "FLCV-15" of FDTC.

(*4) Tube current ($I_L$) shows the value of the current and voltage that is consumed at one lamp. (4 tubes/unit)
This LCD module has 4 lamps. Each 2 lamps are placed at upper and lower side of the display.
2 lamps are connected in parallel. Each low voltage terminals (GND side) are bound into 1 line cable.
(See 11-1. Pin configuration for backlight)

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|---|---|---|---|---|---|
| 04 | 20021205 | | | | Change the values of ④ parts |
| 02 | 20020807 | | | | Correct backlight spec. |

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FLC43XWC8V-02

Tech Bes LCD-00149 CUST.

FUJITSU DISPLAY TECHNOLOGIES CORPORATION SHEET 6 /

Note 1) Measurement Circuit

Based on Fig.8-1.

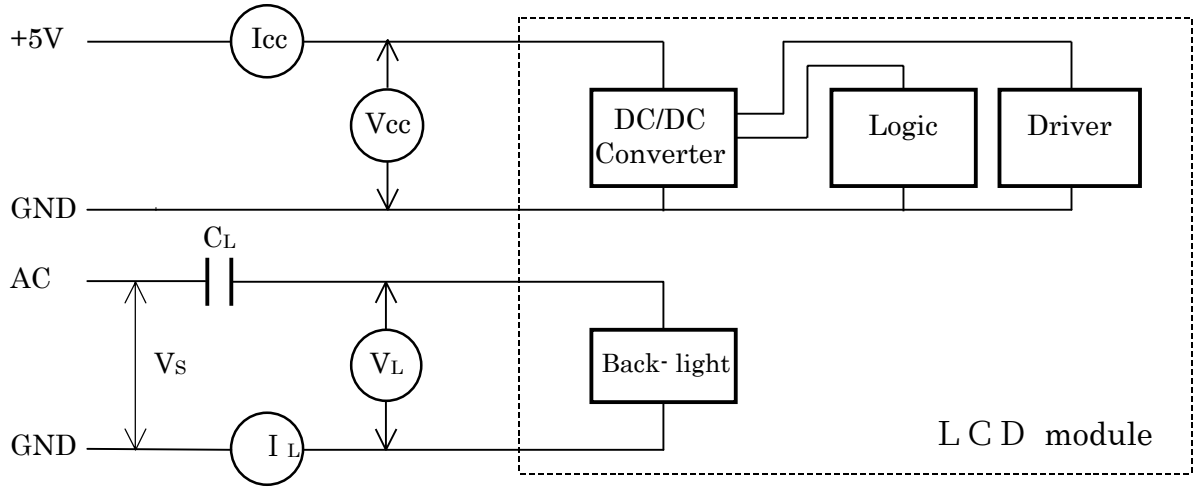



Fig.8-1. Measurement Circuit

Note 2) Equivalent Circuit

Based on Fig.8-2 (a), (b).

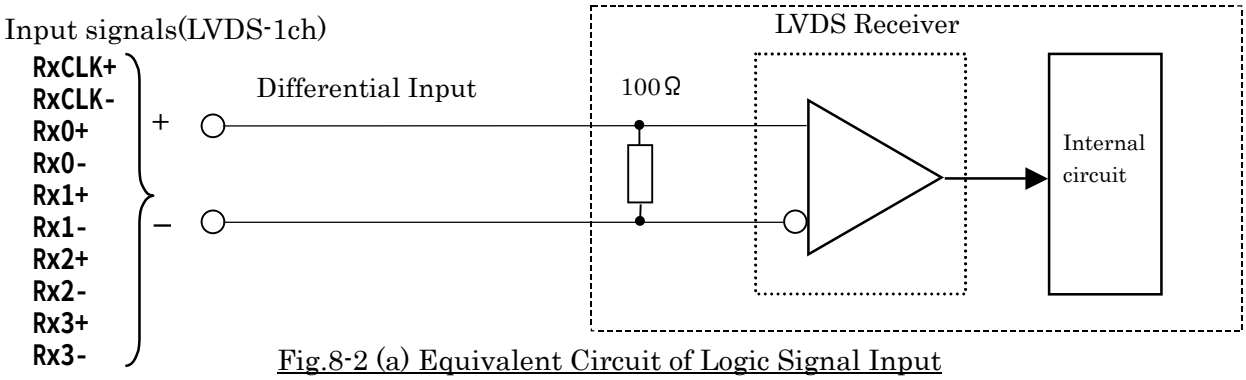
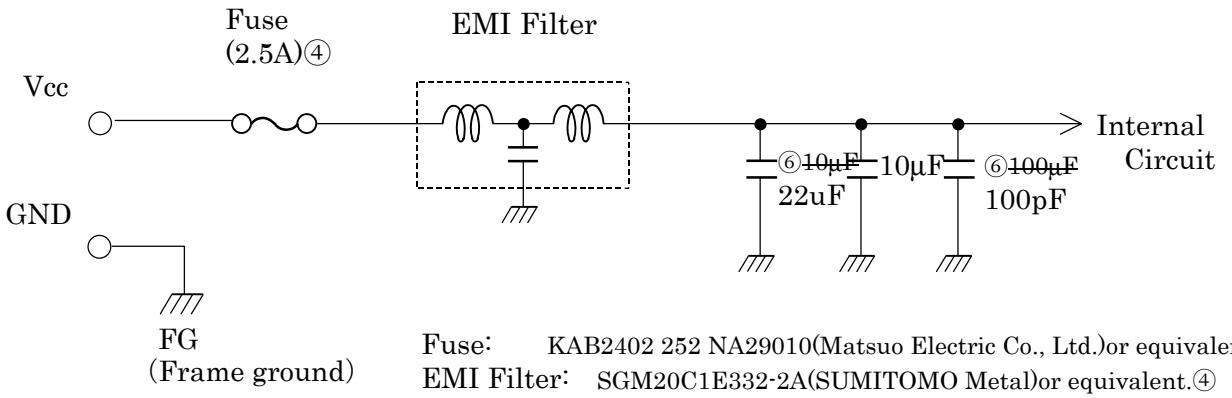



Fig.8-2 (a) Equivalent Circuit of Logic Signal Input




Fuse: KAB2402 252 NA29010(Matsuo Electric Co., Ltd.)or equivalent.④
EMI Filter: SGM20C1E332-2A(SUMITOMO Metal)or equivalent.④

Fig.8-2 (b) Equivalent Circuit of Power Supply

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DATE

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|---|---|---|---|---|---|
| 06 | 20030414 | | | | Change ⑥parts in Fig.8-2(b) |
| 04 | 20021205 | | | | Add ④parts inFig.8-2(b) |

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FLC43XWC8V-02

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FUJITSU DISPLAY TECHNOLOGIES CORPORATION SHEET 7 /

## 9. OPTICAL SPECIFICATIONS

Table 9-1 shows the optical specifications of this LCD module.

Table 9-1. Optical Specifications  Ta=25ºC

| Item | | Symbol | Condition | | Specifications MIN. | Specifications TYP. | Specifications MAX | Unit | Remark | Remark Note |
|---|---|---|---|---|---|---|---|---|---|---|
| Visual Angle | Horizontal | $\theta_{L,R}$ | CR≥10 | $\theta_{U,D}$=0º | 85 | — | — | deg | | (1)(2)(3)(5)(6) |
| | Vertical | $\theta_{U,D}$ | | $\theta_{L,R}$=0º | 85 | — | — | deg | | |
| Contrast Ratio | | CR | $\theta_{L,R,U,D}$=0º | | ~~210~~ 350② | 600 | — | — | White/Black | (1)(2)(3)(5) |
| Response Time(ON) (B→W) | | $t_{on}$ | $\theta_{L,R,U,D}$=0º | Ta=25ºC | — | 15 | 30 | ms | | (1)(4)(5) |
| | | | | Ta=0ºC | — | 50 | 100 | ms | | |
| Response Time(OFF) (W→B) | | $t_{off}$ | $\theta_{L,R,U,D}$=0º | Ta=25ºC | — | 10 | 25 | ms | | |
| | | | | Ta=0ºC | — | 50 | 100 | ms | | |
| Brightness | | I | $\theta_{L,R,U,D}$=0º $V_{CC}$=5V, $I_L$=10.5mA (at maximum brightness) | | ~~400~~ 350③ | ~~500~~ 450③ | — | cd/m² | White *1 | (1)(5) |
| Brightness Uniformity | | ΔI | | | ~~70~~ 75④ | — | — | % | | (1)(5)(7) |
| Chromaticity | W | X | | | 0.283 | 0.313 | 0.343 | — | | (1)(5) |
| | | Y | | | 0.299 | 0.329 | 0.359 | — | | |
| | R | (x, y) | | Red | 0.65, 0.34 Typ. | | | | | |
| | G | | | Green | 0.30, 0.59 Typ. | | | | | |
| | B | | | Blue | 0.15, 0.14 Typ. | | | | | |
| ② γ -curve | | γ | | | 2.4 Typ. | | | | | |
| LCD Panel Type | | | | | TFT Color | | | | | |
| Display Mode | | | | | Normally Black VA | | | | | |
| Wide Viewing Angle Technology | | | | | MVA-Premium | | | | | |
| Optimum Viewing Angle | | | | | — (symmetry) | | | | | (6) |
| Display Color | | | | | 16 million (each 6-bit+2-bit FRC) | | | | | |
| Color of non-display area | | | | | Black | | | | | |
| Surface Treatment | | | | | Anti-glare (Haze value:25%, 3H(at weight of 300g)) | | | | | |

(*1) Specified value is measured in 20~30 minutes after lighting on (LCD module single).
A required value may not be achieved on condition that LCD module is built in the cabinet because of its radiation.
All items without "Brightness Uniformity" are measured at the center of display board.

(Note1) ・CS-1000 (MINOLTA Co., Ltd.) , BM-5A(Topcon) or equivalent luminance colorimeter should be used for the measurement.
Field=2º, L=500mm
・The specified value of viewing angle, contrast, brightness, brightness uniformity and chromaticity are under the dark room condition (1lux or less).

DOCUMENT CONTROL SECTION

DATE

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| 05 | 20030117 | | | | Add the note about measued point |
| 04 | 20021205 | | | | Change value of brightness uniformity |
| 03 | 20020924 | | | | Change spec.of brightness |
| 02 | 20020807 | | | | Change spec.of contrast. Add γ-curve |

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FLC43XWC8V-02

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Note 1) Definition of Viewing Angle (1)

Based on Fig.9-2.

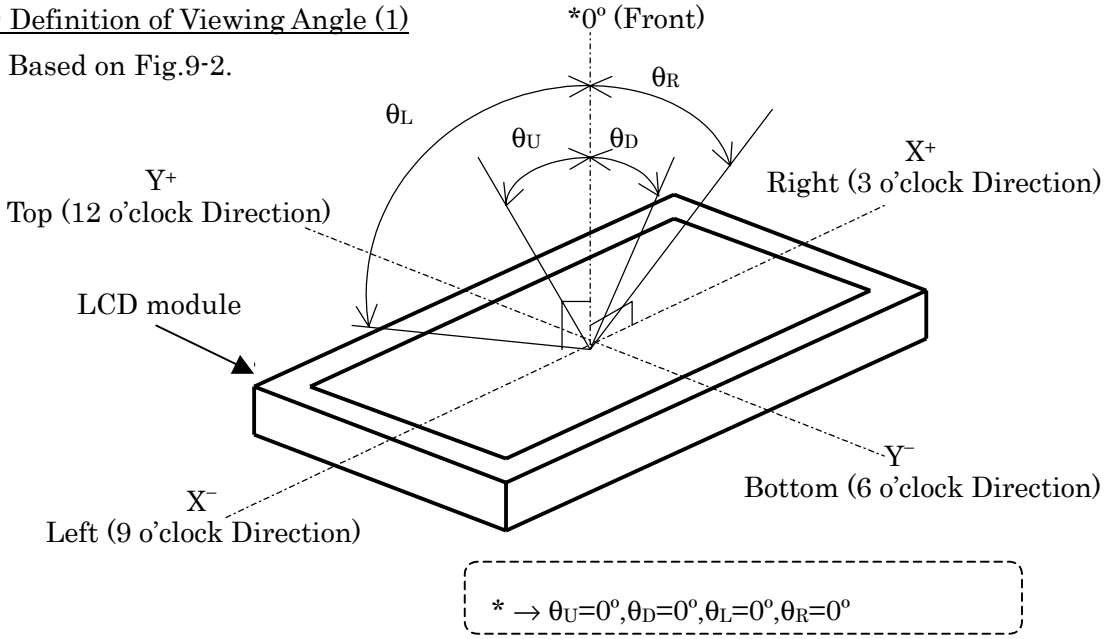


Fig.9-2. Definition of Viewing Angle (1)

Note 2) Definition of Viewing Angle (2)

Based on Fig.9-3.

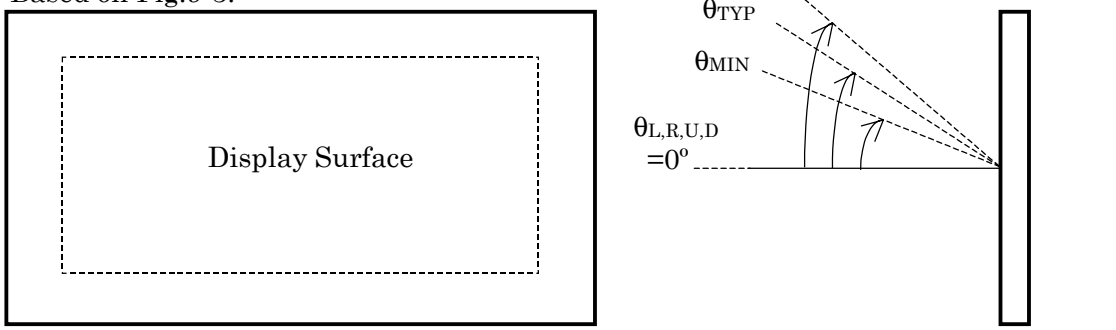


Fig.9-3. Definition of Viewing Angle (2)

Note 3) Definition of Contrast Ratio (CR)

Determined by Formula (1) based on Fig.9-4.Voltage-Brightness Characteristics.

$$= \frac{L_W \text{ (Brightness at white)}}{L_B \text{ (Brightness at black)}} \quad \text{-------- (1)}$$

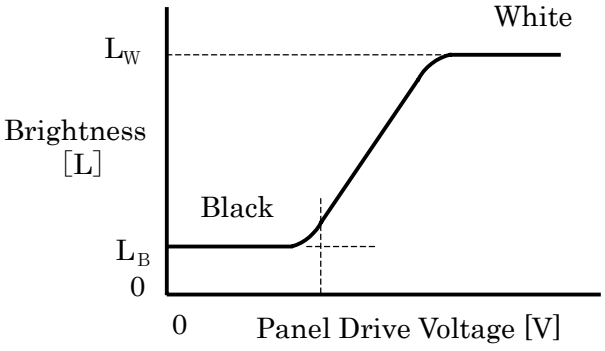


Fig.9-4. Voltage-Brightness Characteristics

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| DESIG. | | | CHECK | | APPR. |

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Note 4) Definition of Response Time

Based on Fig.9-5.

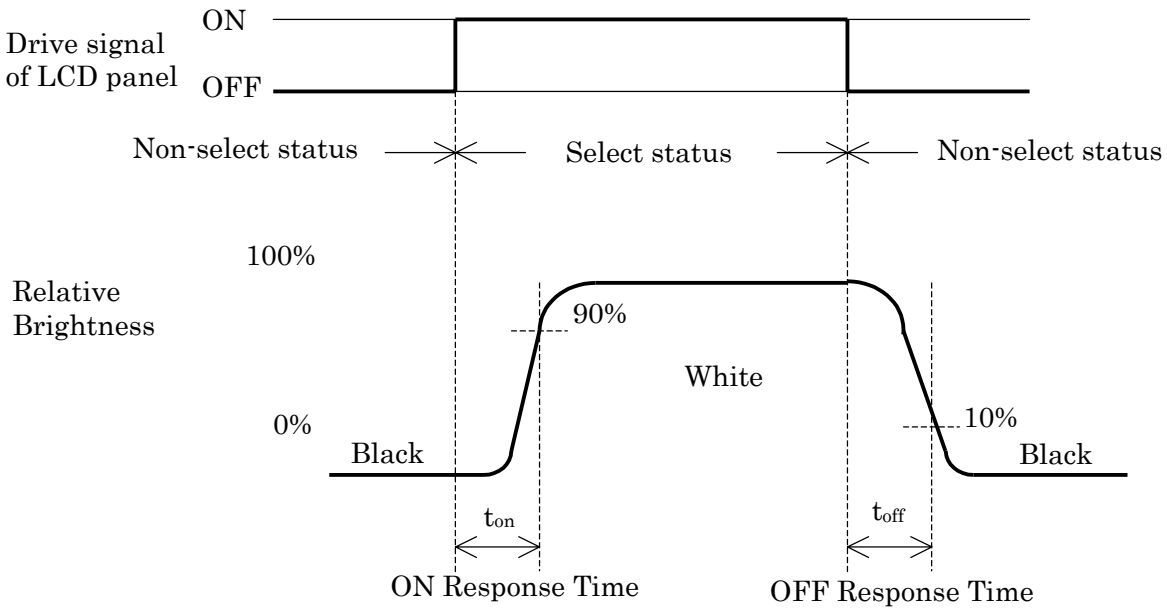


Fig.9-5. Definition of Response Time

Note 5) Contrast Ratio and Response Measurement System

Based on Fig.9-6.

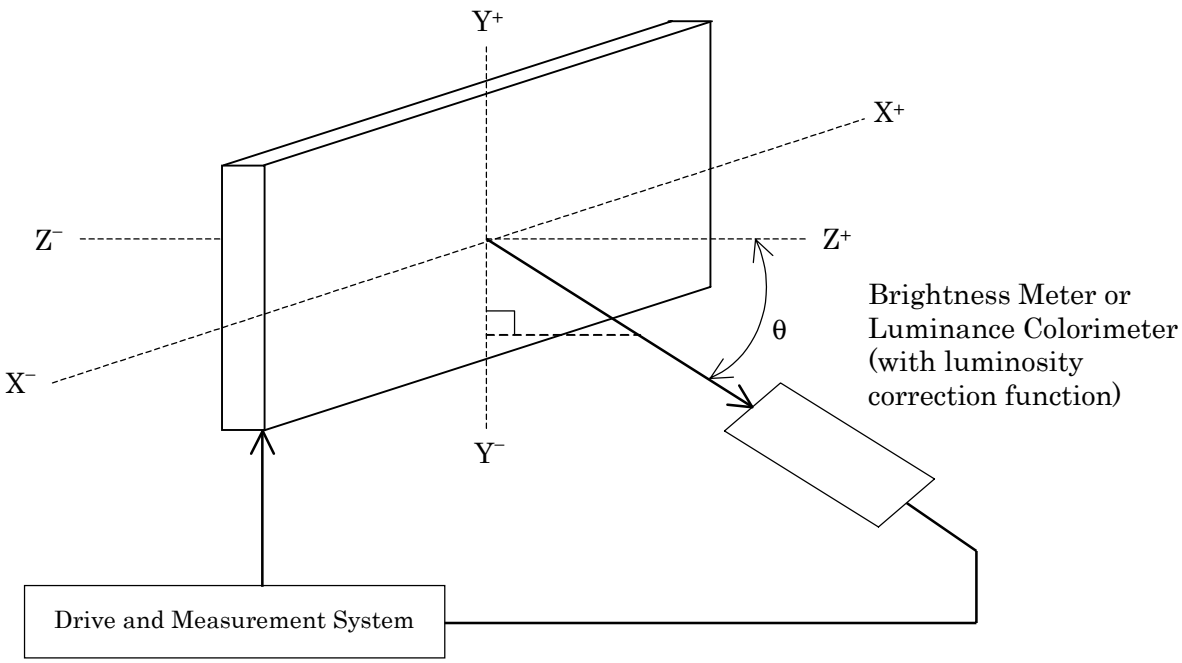


Fig.9-6. Contrast Ratio and Response Time Measurement System

DOCUMENT CONTROL SECTION

DATE

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Note 6) Definition of Optimum Viewing Angle

Based on Fig.9-7.

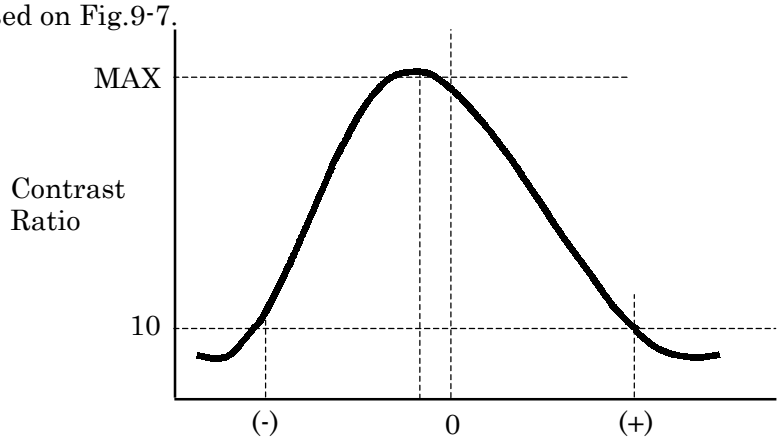
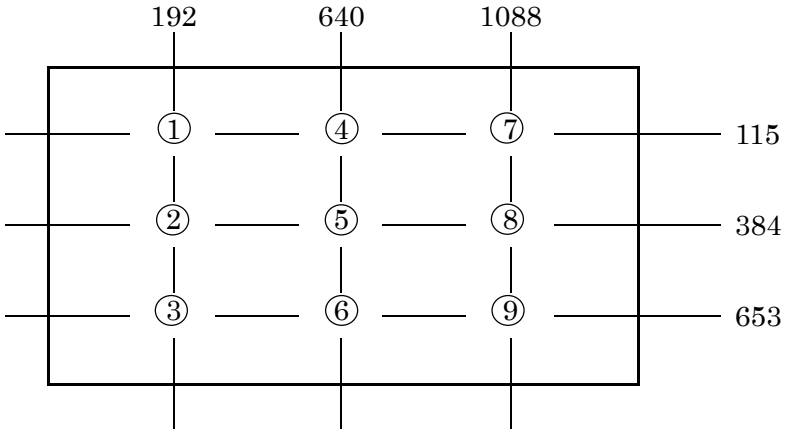



Fig.9-7. Definition of Viewing Angle

Note 7) Definition of Brightness Uniformity

Brightness uniformity is defined by the following formula.
Brightness (I1~I9) art measured at the following 9 points ( ① ~ ⑨ ) on the display area shown in Fig.9-8.

$$\text{Brightness Uniformity } (\Delta L) = \frac{|\text{Min. In}|}{|\text{Max. In}|} \times 100\ (\%),\ n=1 \text{ to } 9$$




Note) Each measurement point ( ① ~ ⑨ ) defines the center spot of Brightness Meter view.
The tolerance of measurement position is ±3mm.

Fig.9-8. Measurement Points

DOCUMENT CONTROL SECTION

DATE

| EDIT | DATE | DESIG. | CHECK | APPR. | DESCRIPTION |
|---|---|---|---|---|---|
| DESIG. | | | CHECK | | APPR. |

FLC43XWC8V-02

Tech Bes LCD-00149

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SHEET 11/

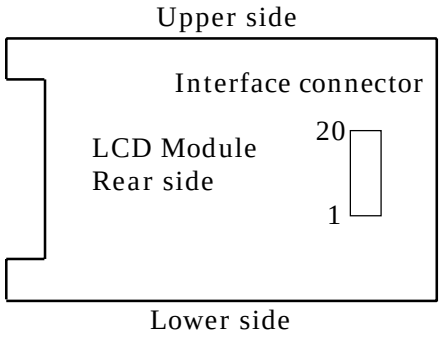
## 10. INTERFACE SPECIFICATIONS

10-1-1. Signal descriptions

Table 10-1 shows the description and configuration of Interface signals (CN1).

Table 10-1-1. Interface signals (CN1)

| Pin No. | Symbol | I/O | Function |
|---|---|---|---|
| 1 | VDD | — | +5V Power suply |
| 2 | VDD | — | +5V Power suply |
| 3 | GND | — | Ground |
| 4 | GND | — | Ground |
| 5 | RX0- | I | LVDS Receiver Signal(-) |
| 6 | RX0+ | I | LVDS Receiver Signal(+) |
| 7 | GND | — | Ground |
| 8 | RX1- | I | LVDS Receiver Signal(-) |
| 9 | RX1+ | I | LVDS Receiver Signal(+) |
| 10 | GND | — | Ground |
| 11 | RX2- | I | LVDS Receiver Signal(-) |
| 12 | RX2+ | I | LVDS Receiver Signal(+) |
| 13 | GND | — | Ground |
| 14 | RXCLK- | I | LVDS Receiver Clock Signal(-) |
| 15 | RXCLK+ | I | LVDS Receiver Clock Signal(+) |
| 16 | GND | — | Ground |
| 17 | RX3- | I | LVDS Receiver Signal(-) |
| 18 | RX3+ | I | LVDS Receiver Signal(+) |
| 19 | GND | — | Ground |
| 20 | Data Mapping Select Input | I | Low : table 10-1-2<br>Open or Hi : table 10-1-3 |




Connector ：D14H-20P-1.25H(HIROSE)

User's connector ：DF14-20S-1.25 (HIROSE)

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DATE

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| 02 | 20020807 | | | | Total revision |

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FLC43XWC8V-02

Tech Bes LCD-00149

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SHEET 12/

10-1-2. LVDS Data Mapping 1

Table 10-1-2 shows the LVDS data mapping 1.(DataMappingSelectInput = Low)

Table 10-1-2. LVDS Data Mapping 1

| Transmitter (DS90CF385) | | Symbol | Interface connector | | | Receiver (DS90CF386) | | LCD Control input |
|---|---|---|---|---|---|---|---|---|
| Pin | INPUT | | System side | Pin | LCD module | Pin | OUTPUT | |
| 51 | TxIN0 | R0 | TxOUT0− / TxOUT0+ | 5 / 6 | RX0− / RX0+ | 27 | RxOUT0 | IR0 |
| 52 | TxIN1 | R1 | | | | 29 | RxOUT1 | IR1 |
| 54 | TxIN2 | R2 | | | | 30 | RxOUT2 | IR2 |
| 55 | TxIN3 | R3 | | | | 32 | RxOUT3 | IR3 |
| 56 | TxIN4 | R4 | | | | 33 | RxOUT4 | IR4 |
| 2 | TxIN5 | R7 | TxOUT3− / TxOUT3+ | 17 / 18 | RX3− / RX3+ | 34 | RxOUT5 | IR7 |
| 3 | TxIN6 | R5 | TxOUT0− / TxOUT0+ | 5 / 6 | RX0− / RX0+ | 35 | RxOUT6 | IR5 |
| 4 | TxIN7 | G0 | | | | 37 | RxOUT7 | IG0 |
| 6 | TxIN8 | G1 | TxOUT1− / TxOUT1+ | 8 / 9 | RX1− / RX1+ | 38 | RxOUT8 | IG1 |
| 7 | TxIN9 | G2 | | | | 39 | RxOUT9 | IG2 |
| 8 | TxIN10 | G6 | TxOUT3− / TxOUT3+ | 17 / 18 | RX3− / RX3+ | 41 | RxOUT10 | IG6 |
| 10 | TxIN11 | G7 | | | | 42 | RxOUT11 | IG7 |
| 11 | TxIN12 | G3 | TxOUT1− / TxOUT1+ | 8 / 9 | RX1− / RX1+ | 43 | RxOUT12 | IG3 |
| 12 | TxIN13 | G4 | | | | 45 | RxOUT13 | IG4 |
| 14 | TxIN14 | G5 | | | | 46 | RxOUT14 | IG5 |
| 15 | TxIN15 | B0 | | | | 47 | RxOUT15 | IB0 |
| 16 | TxIN16 | B6 | TxOUT3− / TxOUT3+ | 17 / 18 | RX3− / RX3+ | 49 | RxOUT16 | IB6 |
| 18 | TxIN17 | B7 | | | | 50 | RxOUT17 | IB7 |
| 19 | TxIN18 | B1 | TxOUT1− / TxOUT1+ | 8 / 9 | RX1− / RX1+ | 51 | RxOUT18 | IB1 |
| 20 | TxIN19 | B2 | TxOUT2− / TxOUT2+ | 11 / 12 | RX2− / RX2+ | 53 | RxOUT19 | IB2 |
| 22 | TxIN20 | B3 | | | | 54 | RxOUT20 | IB3 |
| 23 | TxIN21 | B4 | | | | 55 | RxOUT21 | IB4 |
| 24 | TxIN22 | B5 | | | | 1 | RxOUT22 | IB5 |
| 25 | TxIN23 | RESERVED | TxOUT3− / TxOUT3+ | 17 / 18 | RX3− / RX3+ | 2 | RxOUT23 | Not use |
| 27 | TxIN24 | RESERVED | TxOUT2− / TxOUT2+ | 11 / 12 | RX2− / RX2+ | 3 | RxOUT24 | Not use |
| 28 | TxIN25 | RESERVED | | | | 5 | RxOUT25 | Not use |
| 30 | TxIN26 | ENAB | | | | 6 | RxOUT26 | ENAB |
| 50 | TxIN27 | R6 | TxOUT3− / TxOUT3+ | 17 / 18 | RX3− / RX3+ | 7 | RxOUT27 | IR6 |
| 31 | TxCLKIN | DCLK | TxCLKOUT− / TxCLKOUT+ | 14 / 15 | RXCLK− / RXCLK+ | 26 | RxCLKOUT | DCLK |

DOCUMENT CONTROL SECTION

DATE

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| 02 | 20020807 | | | | Total revision |

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10-1-3. LVDS Data Mapping 2

Table 10-1-3 shows the LVDS data mapping 2.(DataMappingSelectInput = Open or Hi)

Table 10-1-3. LVDS Data Mapping 2

| Transmitter (DS90CF385) | | Symbol | Interface connector | | | Receiver (DS90CF386) | | LCD Control input |
|---|---|---|---|---|---|---|---|---|
| Pin | INPUT | | System side | Pin | LCD module | Pin | OUTPUT | |
| 51 | TxIN0 | R2 | TxOUT0- | 5 | RX0- | 27 | RxOUT0 | IR2 |
| 52 | TxIN1 | R3 | TxOUT0+ | 6 | RX0+ | 29 | RxOUT1 | IR3 |
| 54 | TxIN2 | R4 | | | | 30 | RxOUT2 | IR4 |
| 55 | TxIN3 | R5 | | | | 32 | RxOUT3 | IR5 |
| 56 | TxIN4 | R6 | | | | 33 | RxOUT4 | IR6 |
| 2 | TxIN5 | R1 | TxOUT3- | 17 | RX3- | 34 | RxOUT5 | IR1 |
| | | | TxOUT3+ | 18 | RX3+ | | | |
| 3 | TxIN6 | R7 | TxOUT0- | 5 | RX0- | 35 | RxOUT6 | IR7 |
| 4 | TxIN7 | G2 | TxOUT0+ | 6 | RX0+ | 37 | RxOUT7 | IG2 |
| 6 | TxIN8 | G3 | TxOUT1- | 8 | RX1- | 38 | RxOUT8 | IG3 |
| 7 | TxIN9 | G4 | TxOUT1+ | 9 | RX1+ | 39 | RxOUT9 | IG4 |
| 8 | TxIN10 | G0 | TxOUT3- | 17 | RX3- | 41 | RxOUT10 | IG0 |
| 10 | TxIN11 | G1 | TxOUT3+ | 18 | RX3+ | 42 | RxOUT11 | IG1 |
| 11 | TxIN12 | G5 | TxOUT1- | 8 | RX1- | 43 | RxOUT12 | IG5 |
| 12 | TxIN13 | G6 | TxOUT1+ | 9 | RX1+ | 45 | RxOUT13 | IG6 |
| 14 | TxIN14 | G7 | | | | 46 | RxOUT14 | IG7 |
| 15 | TxIN15 | B2 | | | | 47 | RxOUT15 | IB2 |
| 16 | TxIN16 | B0 | TxOUT3- | 17 | RX3- | 49 | RxOUT16 | IB0 |
| 18 | TxIN17 | B1 | TxOUT3+ | 18 | RX3+ | 50 | RxOUT17 | IB1 |
| 19 | TxIN18 | B3 | TxOUT1- | 8 | RX1- | 51 | RxOUT18 | IB3 |
| | | | TxOUT1+ | 9 | RX1+ | | | |
| 20 | TxIN19 | B4 | TxOUT2- | 11 | RX2- | 53 | RxOUT19 | IB4 |
| 22 | TxIN20 | B5 | TxOUT2+ | 12 | RX2+ | 54 | RxOUT20 | IB5 |
| 23 | TxIN21 | B6 | | | | 55 | RxOUT21 | IB6 |
| 24 | TxIN22 | B7 | | | | 1 | RxOUT22 | IB7 |
| 25 | TxIN23 | RESERVED | TxOUT3- | 17 | RX3- | 2 | RxOUT23 | Not use |
| | | | TxOUT3+ | 18 | RX3+ | | | |
| 27 | TxIN24 | RESERVED | TxOUT2- | 11 | RX2- | 3 | RxOUT24 | Not use |
| 28 | TxIN25 | RESERVED | TxOUT2+ | 12 | RX2+ | 5 | RxOUT25 | Not use |
| 30 | TxIN26 | ENAB | | | | 6 | RxOUT26 | ENAB |
| 50 | TxIN27 | R0 | TxOUT3- | 17 | RX3- | 7 | RxOUT27 | IR0 |
| | | | TxOUT3+ | 18 | RX3+ | | | |
| 31 | TxCLKIN | DCLK | TxCLKOUT- | 14 | RXCLK- | 26 | RxCLKOUT | DCLK |
| | | | TxCLKOUT+ | 15 | RXCLK+ | | | |

10-2. Color Data Assignment

Table 10-2 shows the color data assignment.

Table 10-2. Color Data Assignment

| Color and Brightness | | | Input data (0 : Low level, 1 : High level) | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| Basic Color | Black | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Green | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cyan | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Red | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Magenta | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Yellow | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | White | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Red | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ⇧ | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Darker | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ⇧ | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | ⇩ | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Brighter | 253 | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | ⇩ | 254 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red | 255 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Green | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ⇧ | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Darker | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ⇧ | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | ⇩ | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Brighter | 253 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ⇩ | 254 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green | 255 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Blue | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ⇧ | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | Darker | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | ⇧ | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | ⇩ | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Brighter | 253 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| | ⇩ | 254 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| | Blue | 255 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Note.1) Definition of gray scale : Color (n) ---"n" indicates gray scale level.
The gray scale is brighter as the number is larger.

Note.2) Data; 1: High, 0: Low

Note.3) By inputting 8-bit data signal for each red, green and blue, this module can display 256 gray scale independently for each color.
Therefore, the module is able to display 16 million colors. Color data are 24 lines.

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10-3. Input Signal Timing

Table 10-3 and Fig.10-3 shows the input signal timing.

Table 10-3. Timing Characteristics (T=0~50ºC, Vcc=5±0.25V)

| Item | | | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|---|---|
| DCLK signal (Clock) ② | | Period | Tc | 12.195⑥ | 15.382 | 20.000 | ns | |
| | | Frequency | fc | 50.00 | 65.01 | 82.00⑥ | MHz | fc=1/Tc |
| | | Duty | Tch/Tc | 45 | 50 | 55 | % | *1 |
| | | High time | TclkH | 5.0 | — | — | ns | |
| | | Low time | TclkL | 5.0 | — | — | ns | |
| | | Rise time | Tclkr | — | — | 5.0 | ns | |
| | | Fall time | Tclkf | — | — | 5.0 | ns | |
| DCLK-Data Timing | | Setup time | Tset | 4④ | — | — | ns | |
| | | Hold time | Thold | 4④ | — | — | ns | |
| Data-ENAB timing | Horizontal | Period | Th | 1310⑥ | 1344 | 1688④ | DCLK | |
| | | Frequency | fh | 35.0⑥ | 48.3 | 75.0⑥ | kHz | |
| | | Display period | Thd | 1280 | 1280 | 1280 | DCLK | *2,3 |
| | Vertical | Period | Tv | 776 | 806 | 806④ | Th | 16.67ms |
| | | Frequency | 1/Tv | 50④ | 60 | 75④ | Hz | WXGA mode |
| | | Display period | Tvd | 768 | 768 | 768 | Th | *2,3 |
| | Data-ENAB timing | | Tdn | 0 | 0 | 0 | DCLK | *4 |

*1) DCLK signal input must be valid while power supply is applied.

*2) Display position is specified by the ENAB signal only.

- Horizontal display position is specified by the rise of ENAB signal. The data which is latched by the falling edge of 1st DCLK right after the rise of ENAB, is displayed on the left edge of the screen.
- Vertical display position is specified by the rise of ENAB after a “Low” level period equivalent to eight times of horizontal period. The 1st data corresponding to one horizontal line after the rise of ENAB is displayed at the top line of screen.

*3) If a period of ENAB “High” is less than 1280 DCLK or less than 768 lines, the rest of the screen displays black.

*4) The display position does not fit to the screen if a period of ENAB “High” and the effective data period do not synchronize with each other.

*5) The specifications of all are not provided individually.

It is necessary that all of those specifications are satisfied at the same time.

*6)The display quality is guaranteed by the Typ timing.

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|---|---|---|---|---|---|
| 06 | 20030407 | | | | Change ⑥parts in Table10-3 |
| 04 | 20021205 | | | | Change ④parts in Table10-3 |
| 02 | 20020807 | | | | Correct values of DCLK frequency |

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FLC43XWC8V-02

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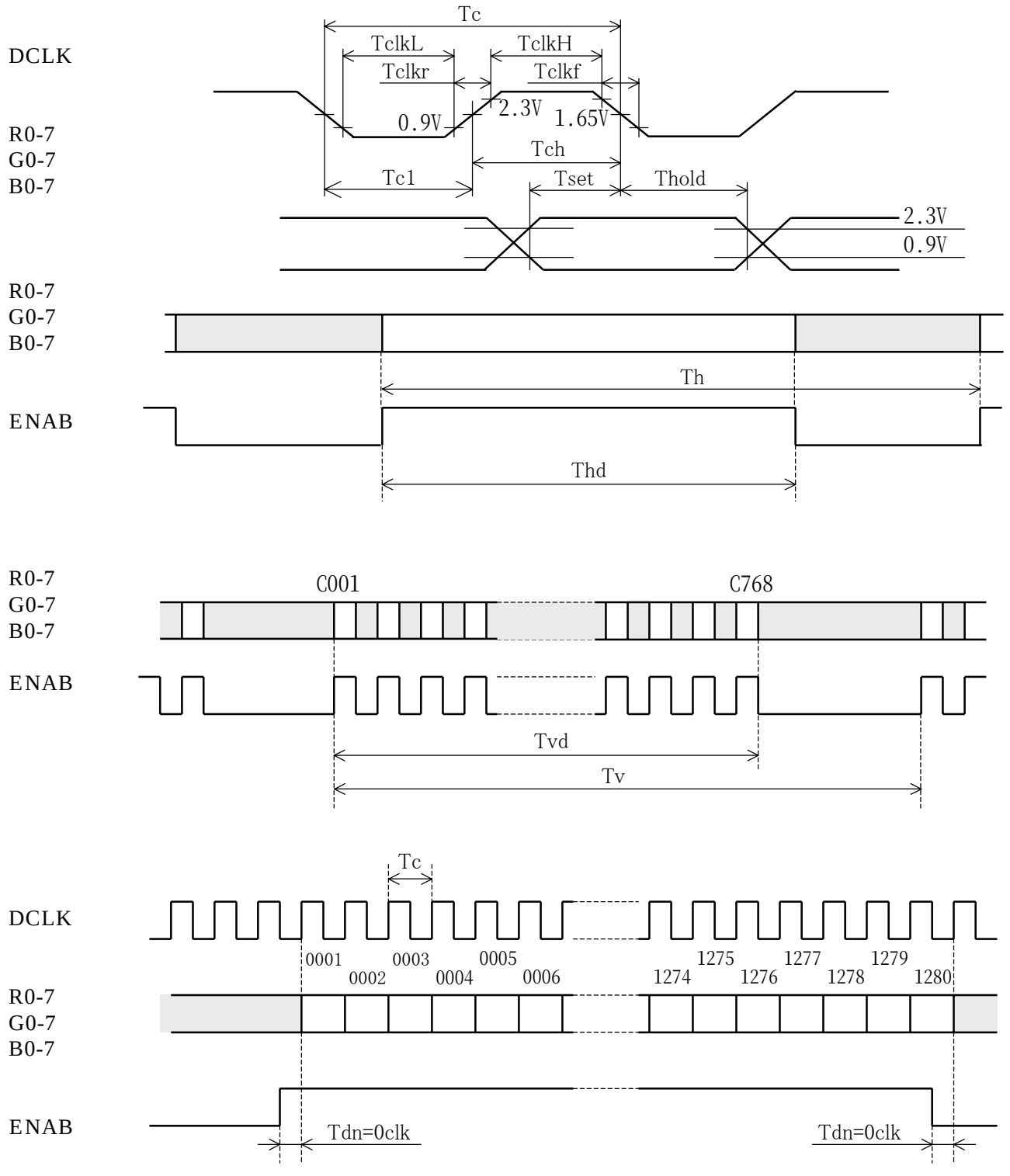


Fig.10-3.Input Signal Timing Chart

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SHEET 17/

10-4. Correspondence between Data and Display Position

Fig.10-4 shows the Correspondence between Data and Display Position.

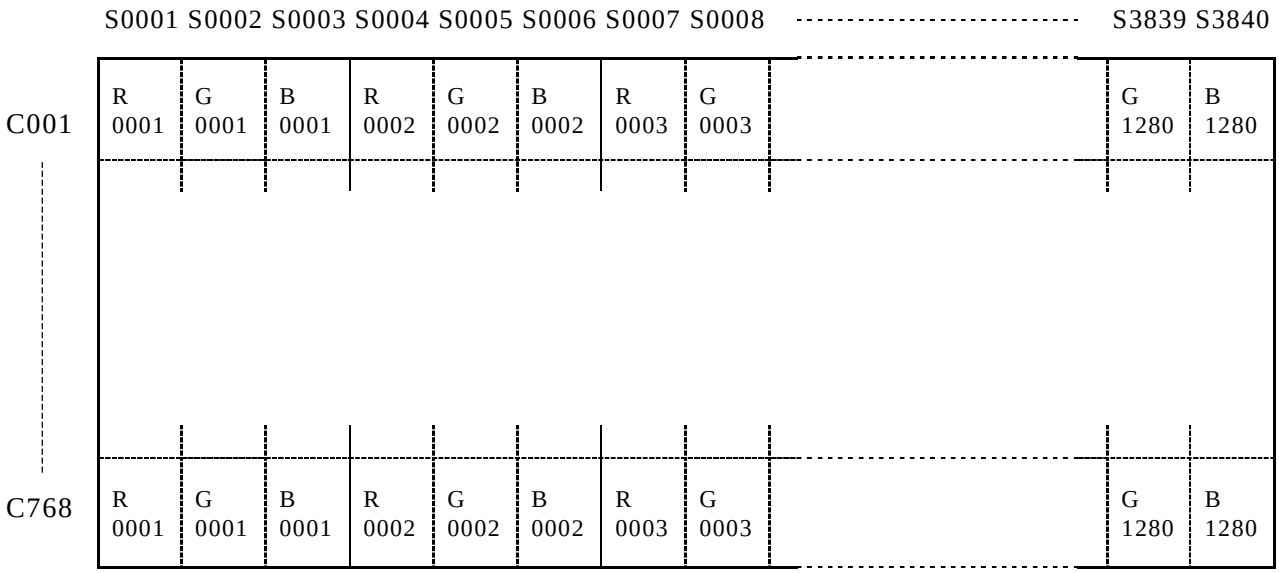


Fig.10-4.Correspondence Data and Display Position

10-5. Power Supply Sequence

The sequence of input signals and On/Off of the power supply of this LCD module should be in the specification shown in Fig.10-5 to prevent latch-up of the driver ICs and DC driving of the LCD panel.

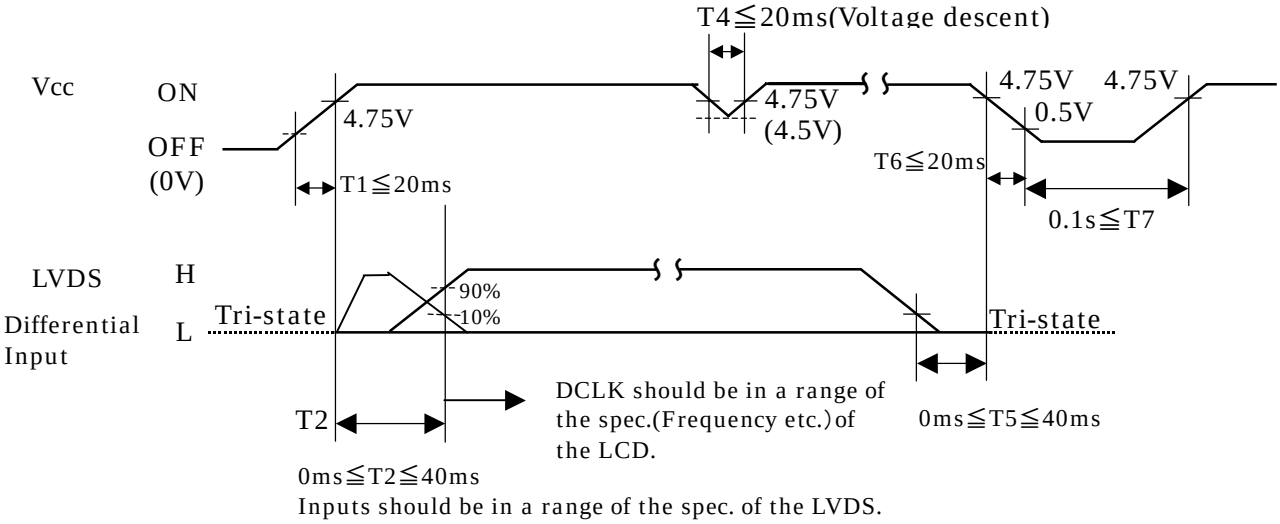


Fig.10-5. Power Supply Sequence

## 11. BACKLIGHT SPECIFICATIONS

### 11-1. Pin Configuration for Backlight

Table 11-1(a) and 11-1(b) shows the description and pin assignment of the connectors (CN-A and B) for the Backlight of this LCD module.

Table 11-1(a) Pin Assignment of CN-A

| Pin № | Signal | Function | Cable color |
|---|---|---|---|
| 1 | $V_L1$ | Power supply for CCFL 1 | Red |
| 2 | $V_L2$ | Power supply for CCFL 2 | Red |
| 3 | NC | —— | — |
| 4 | GND | Ground (for $V_L1$, 2) | White |

Table11-1(b) Pin Assignment of CN-B

| Pin № | Signal | Function | Cable color |
|---|---|---|---|
| 1 | $V_L3$ | Power supply for CCFL 3 | Red |
| 2 | $V_L4$ | Power supply for CCFL 4 | Red |
| 3 | NC | —— | — |
| 4 | GND | Ground (for $V_L3$, 4) | White |

Connector : Housing : BHR-04VS-1
: Contact : SBH-001T-P0.5
User's Connector : Post with base : SM04(4.0)B-BHS-1-TB
Supplier : Japan Solderless Terminal Trading Company LTD. (J.S.T.)

### 11-2. CCFL

Supplier : SANKEN ELECTRIC CO., LTD Part No. SD26E3850E8350B3113000

### 11-3. Life

The life of the backlight is a minimum of 25,000 hours at the following conditions.

(1) Working conditions
① Ambient temperature : 25±5ºC
② Tube current($I_L$) : (10.5mA or less)

(2) Definition of life
① Brightness becomes 50% or below 50% of the minimum brightness value shown in Table 9-1.
② The lamp cannot be lit by the breakdown voltage of 1600Vvms.
③ Lamp is flashing.

### 11-4. Lamp Assembly set (for replacement)

Lamp Assembly set (with charge) is prepared for maintenance.
This set consists of an upper lamp assembly and a lower lamp assembly.

Type number : FLCL-21

## 12. APPEARANCE SPECIFICATIONS

12-1. Zone

- Inside display dot area (369.6× 221.8mm)
- Display dot area means active area.
- One pixel consists of 3 dots (red, green and blue).
- Foreign particle and scratch unharmful to display image, such as the foreign particle under polarizer film but outside of the display area and scratch on metal bezel, backlight module or polarizer film out of the display area, etc., are not counted.

12-2. Bright spots

(1) Bright spots by the defect of TFT.

- Visible under bias of 2% ND filter ..... High bright spot R•G
- Visible under 5% but invisible under 2% ND filter ..... Low bright spot R•G•B
- Invisible under bias of 5% ND filter ..... Not counted

(2) Bright spots by the light passing through tears, breaks, etc in color filter.

- Exceed size of a half dot ..... High bright spot
- A half dot or less ..... Not counted

(3) Bright spots by the light passing through tears, breaks, etc in chromium mask.

- Exceed 50μm ..... High bright spot
- 50μm or less ..... Not counted

12-3. Test condition

- Inspector must observe the LCD screen from the normal direction under the illumination by a single 20W fluorescent lamp. The distance between the LCD screen and the inspector should be a height of 50cm above the worktable.
  The vertical illuminance is 300 to 600lux (reference value).
- Bright spot should be counted under entire black screen.
- Dark spot should be counted under entire white screen.
- Frame frequency should be 60Hz.

12-4. Specifications

Table 12-4 shows the appearance standard.

(Note1) Please do not mistake a single bright spot for a bright spot connection due to Cs(supplemental capacitance) line at the center of each dot.

(Note2) If a pixel is dark partially, it connects into the number of dark spots in accordance with following rule.

(a) $S<1/3$ : Not count. Only one of 4 dark connection is allowed.

(b) $1/3 \leqq S<2/3$ : Considered as 0.5 dot.

(C) $2/3 \leqq S$ : Considered as 1 dot.

(S=Dark spot size/dot size)

③(Note3) Min. distance between foreign particles : 100mm

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| 03 | 20020924 | | | | Add (Note3) |

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SHEET 20/

| No. | Item | | Judgment method and standard | | |
|---|---|---|---|---|---|
| 1 | Bright spot (high and Low) | | ≦3 dots | | (Note 1) |
| 2 | Bright spot connection (high and low) | | ≦1 pair (2 dot connection in horizontal) | | (Note 1) |
| 3 | Total of bright spot | | ≦3 dots | | |
| 4 | Dark spot | | ≦5 dots | | (Note 2) |
| 5 | Dark spot connection | | ≦2 pairs (2 dot connection in horizontal) | | (Note 2) |
| 6 | Total of dark spot | | ≦ 5dots | | (Note 2) |
| 7 | Total of dot defect(bright and dark) | | ≦ 8 dots | | |
| 8 | Distance of bright spot | high-high high | ≧15mm | | |
| | | others | ≧ 5mm | | |
| 9 | Distance of dark spot | | ≧ 5mm | | |
| 10 | Scratch on polarizer | | W≦0.03 | ——— | Not count |
| | | | 0.03＜W≦0.05 | L≦6 | Not count |
| | | | | 6＜L≦12 | ≦5 |
| | | | | 12＜L | 0 |
| | | | 0.05＜W≦0.10 | L≦0.6 | Not count |
| | | | | 0.6＜L≦5 | ≦3 |
| | | | | 5＜L | 0 |
| | | | 0.15＜W≦0.3 | W×L≦0.4 | ≦1 |
| | | | | 0.4＜W×L | 0 |
| | | | 0.10＜W | ——— | 0 |
| 11 | Dent on polarizer | | D≦0.3 | | Not count |
| | | | 0.3＜D≦0.4 | | ≦6 |
| | | | 0.4＜D | | 0 |
| 12 | Bubble in polarizer | | D≦0.3 | | Not count |
| | | | D≦0.5 | | Not count |
| | | | 0.5＜D | | 0 |
| 13 | Spot (black/white) by foreign particle | | D＜0.5 | | ≦5 |
| | | | 0.5≦D | | 0 |
| 14 | Bright spot by fiber foreign particle (under the polarizer. i.e. between the polarizer and the glass) (Note 3 ) | | D≦0.2 | | Not count |
| | | | 0.2＜D≦0.3 | | ≦2 |
| | | | 0.3＜D≦0.35 | | 1 |
| | | | 0.35＜D | | 0 |
| 15 | Line (black /white), scratch by fiber foreign particle | | W≦0.03 | ——— | Not count |
| | | | 0.03＜W≦0.05 | L≦6 | Not count |
| | | | | 6＜L≦12 | ≦5 |
| | | | | 12＜L | 0 |
| | | | 0.05＜W≦0.1 | L≦0.6 | Not count |
| | | | | 0.6＜L≦5 | ≦3 |
| | | | | 5＜L | 0 |
| | | | 0.1＜W | (W+L)/2＝D | Count as spot (black/white) of No.13 |

D:Average diameter [mm], W:Width [mm], L:Length [mm], S=(bright spot size)/(dot size)

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| 03 | 20020924 | | | | Total revision |

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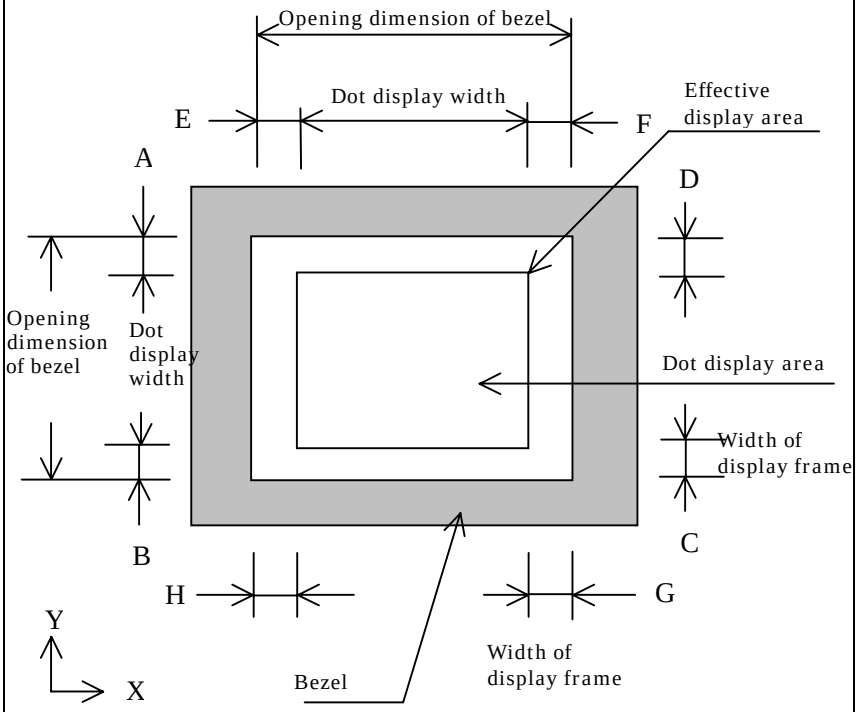
SHEET 21/

| Applied area | Item | Condition | Specification |
|---|---|---|---|
| Display dot area | Display location | Non-lighting | As for the display position in the display dot area, the variation of tolerance between window frame of the upper bezel and dot display area (right, left, up and down) is shown in the following table. |




| Tolerance (X direction) | Tolerance (Y direction) |
|---|---|
| \|E-F\| ≦1.0mm | \|A-B\| ≦1.0mm |
| \|E-H\| ≦0.7mm | \|A-D\| ≦0.7mm |
| \|F-G\| ≦0.7mm | \|B-C\| ≦0.7mm |
| \|G-H\| ≦1.0mm | \|C-D\| ≦1.0mm |

*The dimension of effective display area, dot display area and display frame should follow the dimensions described in each specification.

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SHEET 22/

## 13. ENVIRONMENTAL SPECIFICATIONS

Table 13-1 shows the environmental specifications.

Table 13-1. Environmental Specifications

| Item | Condition | | Remark |
|---|---|---|---|
| Temperature | Operation | 0~57ºC (Note1) | Temperature on surface of LCD panel (display area.) |
| | Storage | -20~60ºC | |
| Humidity | Operation | 20~85%RH | Maximum wet-bulb temperature should not exceed 29ºC. No condensation. |
| | Storage | 5~85%RH | |
| Vibration | Non-operation | 10~500Hz, 1 cycle/20minute, 2G, 1.5mm max, 2hour each X, Y and Z directions | For single module without package.(Note2) |
| Shock | Non-operation | 30G, 6ms, 1time each ±X, ±Y and ±Z directions. | |

Note1: Temperature on surface of LCD panel should be under 57℃.

Note2: Table 13-2 and Fig. 13-1 show the shock resistance standard when module is packaged.

Table 13-2. Shock Resistance Standard when Module is Packaged

| Dropping location | Dropping height | Count |
|---|---|---|
| A ~ J | 60cm | 1 time |

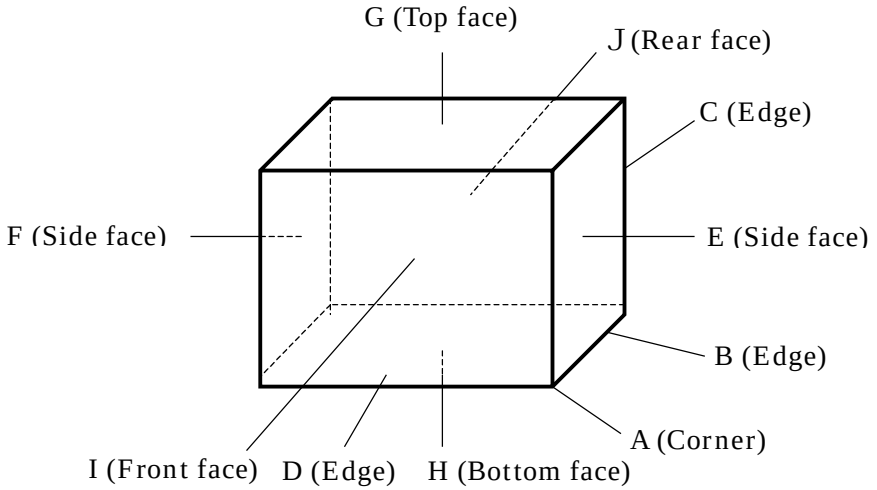


Fig.13-1. Direction to apply shock to package

## 14. INDICATIONS

This module has the following indications.

(1) Product name : LCD unit

(2) Model number : FLC43XWC8V-02

(3) Product drawing number: NA19026-C071

(4) Manufacturing number : 2 Y 0 0 0 0 1

- Serial number (To be reset every month on 1st.)
- Manufacturing month (Oct. = X, Nov. =Y, Dec. =Z)
- Last digit of manufacturing year.

(5) Version number : 01A (Example)
-1st 2 digits “01” means operational version.
-3rd alphabet means functional version.

(6) Country of origin : MADE IN JAPAN

(7) Company name : FUJITSU DISPLAY TECHNOLOGIES CORP.

(8) Caution when changing cold-cathode tubes and disposal method of them. (See Fig. 14-1)

・WHEN CHANGING COLD CATHODE FLUORESCENT LAMPS, FOLLOW OPERATING SPECIFICATIONS. ESPECIALLY BE CAREFUL ABOUT THE LAMP'S SIDE-EDGE.
・蛍光管の交換は作業仕様書に従って行って下さい。特に蛍光管ホルダ側面のエッジに気をつけて下さい。

・THIS TFT COLOR LCD CONTAINS COLD CATHODE FLUORESCENT LAMPS. PLEASE FOLLOW LOCAL ORDINANCES OR REGULATIONS FOR ITS DISPOSAL.
・当該液晶ディスプレイユニットには蛍光管が組み込まれていますので、地方自治体の条例または規則に従って廃棄して下さい。

Fig.14-1

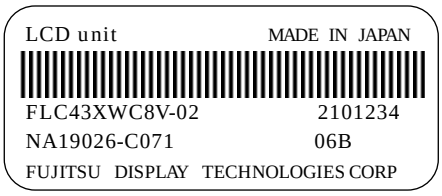


Fig.14-2 Product label (example)

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FUJITSU DISPLAY TECHNOLOGIES CORPORATION

## 15. PACKAGING

Separately specified in packaging specifications.

15-1. Packaging specifications

(1) 5 LCD modules / 1 package.

(2) Weight: approximately 13kg / 1 package.

(3) Outline dimensions : 348mm(W)×328(D)×490mm(H)

15-2. Packaging method

Fig.15-2 (a),(b),(c),(d) show the packing method.

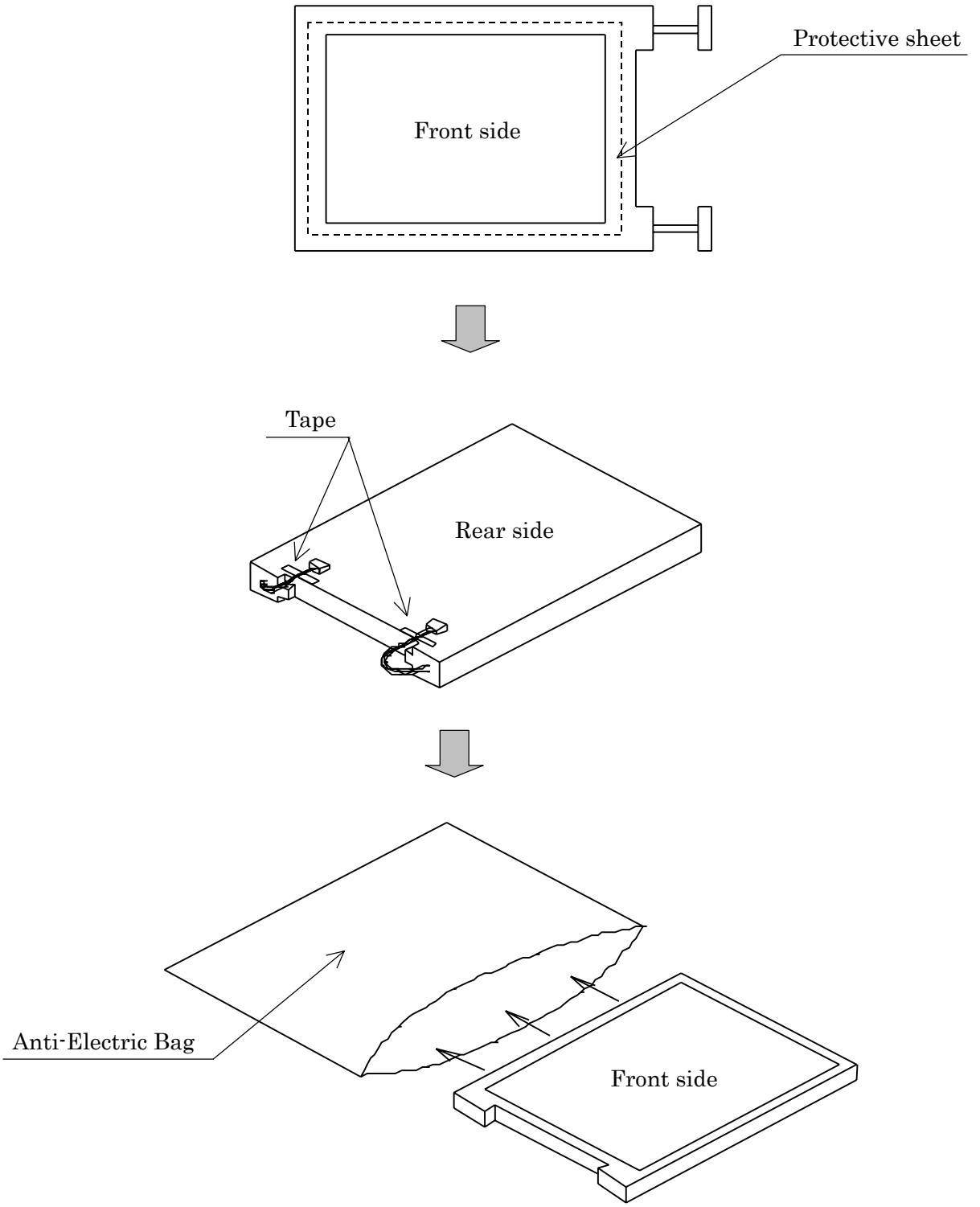
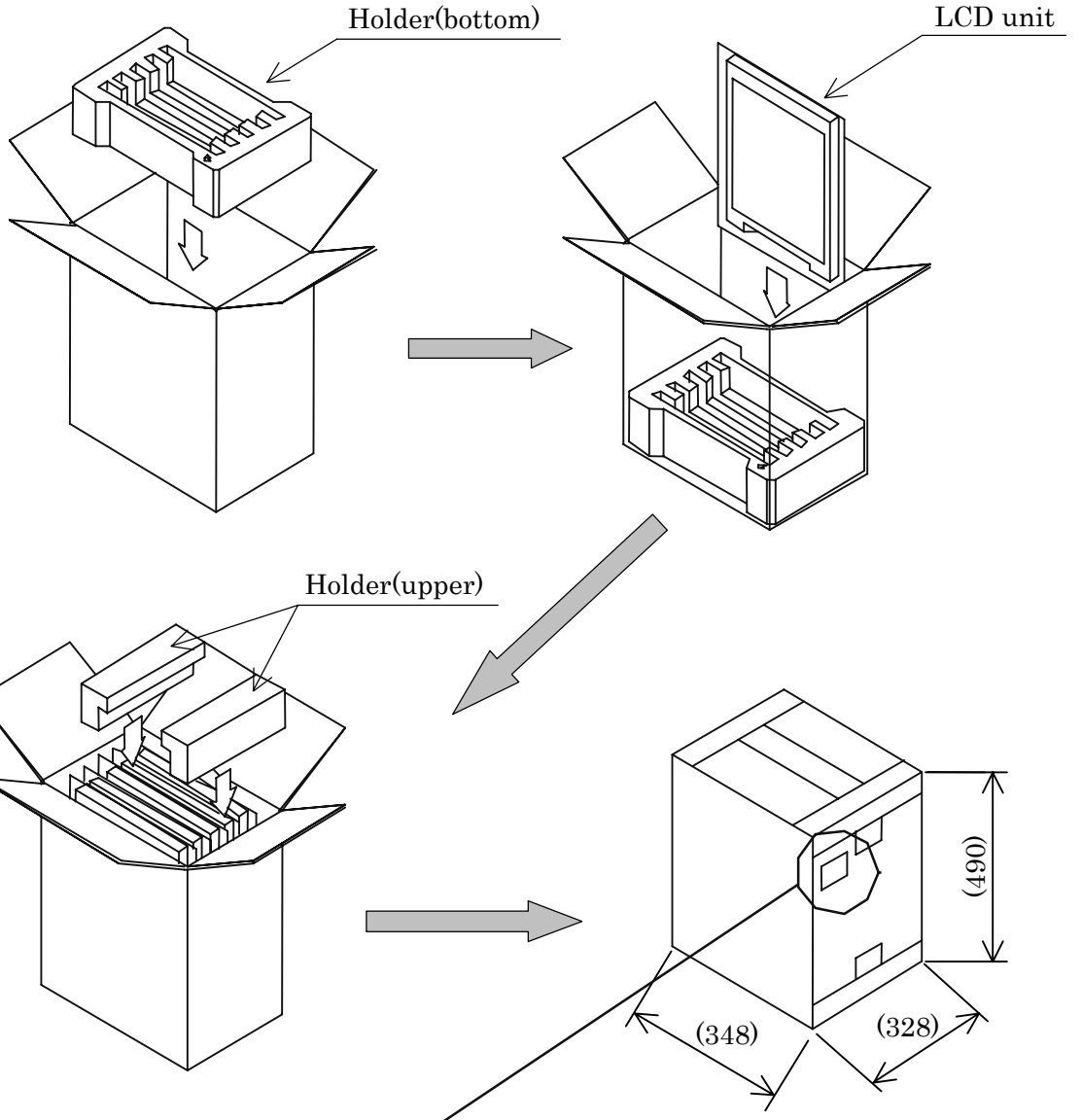



Fig.15-2(a) Packaging Method




Label(example)

| | | | |
|---|---|---|---|
| 型 格 (TYPE) | FLC43XWC8V-02 | 数 量 (QTY.) | 5 |
| 図 番 (DRWG. NO.) | NA19026-C071 | 版 数 (REV. NO.) | 01A |

9X00001
9X00002
9X00003
9X00004
9X00005

バーコード

MADE IN JAPAN

- Taping
  Upper : H or I method
  Bottom : H method
- Upper and bottom holders should be anti-electrostatic type.

Fig.15-2(b) Packaging Method

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Tech Bes LCD-00149

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SHEET 27/

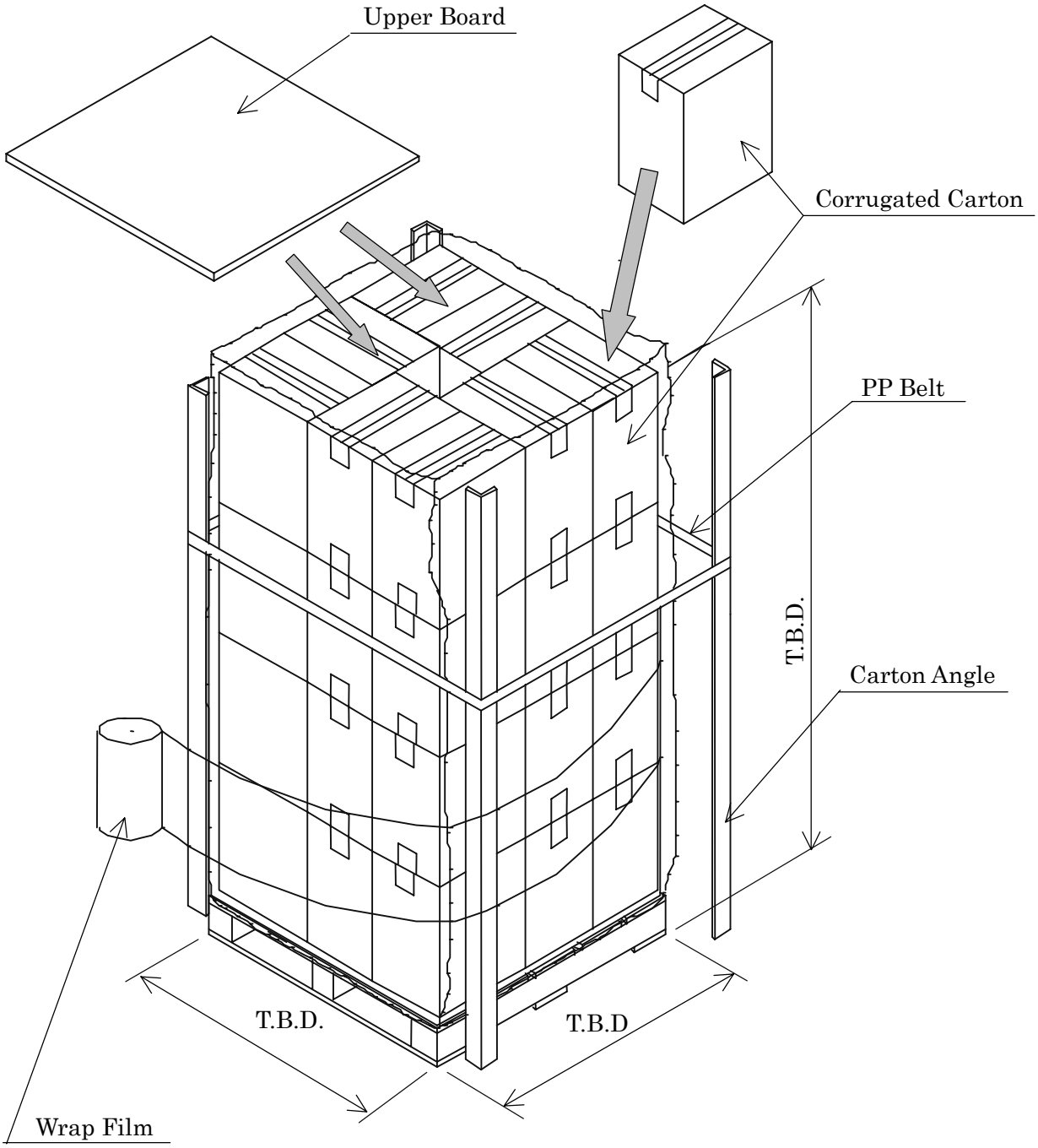
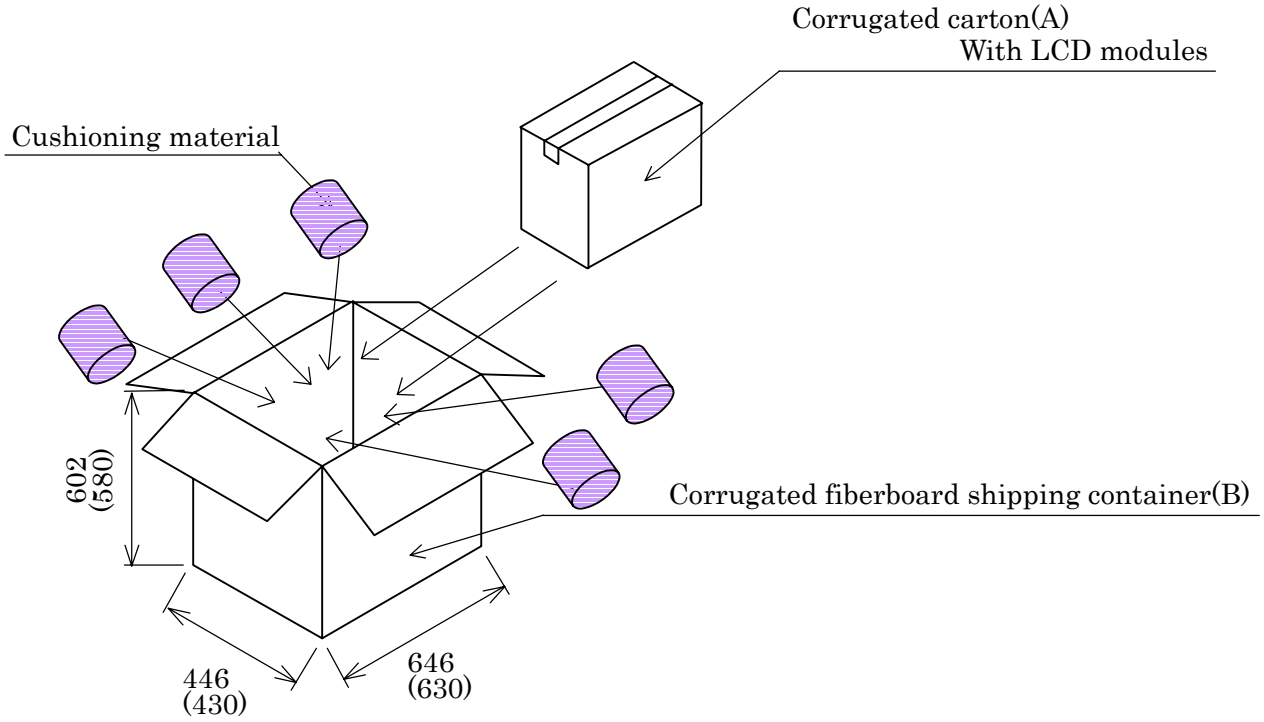



Fig.15-2(c) Packaging Method




Note 1) The carton (A) should be placed in the middle of the container(B) with enough cushioning materials.

Figure.15-2(d) Packaging Method

## 16.WARRANTY

The warranty period is one year after manufacturing. Products which fail during this period are repaired or replaced without charge, unless the failure is caused by user.

## 17.PRECAUTIONS

Adhere to the following precautions to properly use this LCD module.

### (1) Fail safe design

LCD module has an inherent chance of failure. Customers must protect against injury, damage or loss from such failures by incorporating safety design measures into your facility and equipment such as redundancy, fire protection, and prevention of over-current levels and other abnormal operating conditions.

### (2) Handling of LCD panel

**①Do not apply any strong mechanical shock to the LCD panel.**

Since the LCD panel is made of glass, excessive shock may damage the panel or cause a malfunction.

**②Do not press hard on the LCD panel surface.**

In the LCD panel, the gap between two glass plates is kept precisely and uniformly to maintain display's characteristics and reliability. If this panel is pressed hard, the following troubles occurs.

(a) Ununiformity of color
(b) Orientation of liquid crystal becomes disordered

Problem (a) returns to normal after a while. Problem (b) returns to normal if power is shut off once then turned on again.
However these operations should be avoided to insure reliability.

**③Do not scratch the polarizer film on the LCD panel surface.**

- Do not press or rub the display surface with a hard tool, pincet, etc.
- For handling, use cotton or conductive gloves so that the display surface is not stained.
- For If the display surface is stained by dust or dirt, clean it as follows with a soft cloth (deer skin, etc.)

[Dust] Wipe off with a soft cloth. (do not rub.)
[Dirt ] Wipe off lightly with a soft cloth after soaking in the clear water and squeezing hard out of water drops. Only if the dirt is hardly wiped off, use isopropyl alcohol or ethanol.
Be careful not to splash the water or the solvent and water penetrated between the polarizer and the LCD panel.
Do not use solvents such as ketone (acetone, etc.) and aromatics (xylene, toluene, etc.)

- If saliva or water drops are left for long time, it may deform partial deformation or discolored. Wipe off immediately in the same way as for dirt.
- Do not allow oil to adhere to the module, since the cleaning of oil is difficult.

**④ Do not place or contact objects on the display surface for a long period of time.**

That's because this may make some parts of the LCD module distorted and the display quality may decline.

### (3) Handling of LCD module

**①Do not pull the cold-cathode tube cable strongly.**
If the cable is pulled with the loaf of 2kg or more, the cable may be damaged or reliability may decrease.

**②Assemble the module into user's system in a dust free environment.**
If conductive foreign matter adheres to the module, failures may occur.

**③Take anti-static measures for assembling the module.**
Since the LCD module contains CMOS-ICs, the following considerations are necessary.

- For assembling the module, operator should be grounded and wear cotton or conductive gloves.
- Floor of work area and work table to assemble the LCD module should be covered with electrostatic shielding in order to discharge static electricity via an earth wire.
- If necessary, ground operation tools (soldering iron, radio pliers, pincet, etc.).
- Do not take the module out of the conductive bag until the time when the module is assembled.
- Assemble the module under low humidity (50%RH or less).

**④Do not pull the connecting cable on the rear face of the LCD module strongly.**

**⑤Do not disassemble or remodel the LCD module.**
If this LCD module is disassembled or remodeled, it may have some trouble, or the display quality and reliability may not be assured.

### (4) Precautions for operating the LCD module

**① Adhere to the specified power supply sequence.**
If not followed, the CMOS-IC may cause a latch-up, or the DC voltage may be applied the liquid crystal, and a failure or serious deterioration in display quality may occur.

**② Do not operate the LCD module when condensation is present.**
If the LCD module is operated when condensation is on the terminals of the LCD panel, the terminals cause electrochemical reaction, and may reach disconnection. Condensation easily occurs especially when the module is moved from a cold environment to a warm environment.

**③ Trouble that occurs when the LCD module is used at not recommended temperature.**

- Operation at high temperature(>60ºC) :Display colors shift to blue.
- Storage at high temperature(>60ºC) :The polarizer film deteriorates and contras decreases.
- Operation at low temperature(<0ºC) :The response speed decreases considerably.
- Storage at low temperature (<-20ºC) :The liquid crystal may solidify and become damaged.

**④ Always input the control signals at the correct timing.**
If control signals (DCLK, or ENAB) are not input, or if the timing is out of the specified timing, DC voltage may be applied to the liquid crystal and, as a result, cause image sticking or deterioration of contrast.

**(5) Precautions on designing module mounting**

**①Do not press the display surface and bottom face of the LCD module.**
Display quality or reliability may be deteriorated if the installation of the LCD module is inappropriate and, as a result, excessive pressure is applied to the surface of LCD screen. Brightness uniformity or the reliability of CCFL may decrease if the pressure is applied to the backlight module.

**②Consider the module mounting design, so that twisting and bending do not occur to the LCD module.**
Excessive twisting and bending may damage display quality and reliability.

**③The power cable length between the LCD module and inverter should not be extended.**
Otherwise the backlight may not light or flickering may occur.

**④Do not make the power cable of the backlight clung to a metal plate, etc.**
Backlight frequency current for backlight driving may leak to the metal and desired brightness may not be assured.

**⑤When Mounting LCD module with M4 screw(x4) should be screw up under 5.75kgf·cm torque.**

**(6) Storage method**

**①Do not store the LCD module in an atmosphere of organic solvent or corrosive gas.**
In an organic solvent atmosphere, the polarizer film discolors and display quality deteriorates.
In a corrosive gas environment, various problems may occur.

**②Store the LCD module in a Fujitsu package.**
At storing, Fujitsu packages can be stacked up to 4 boxes.
The LCD module is in an anti-static bag. Keep the module in that status.

**③It is recommended that the storage environment should be humidity controlled, cool and dark.**
Recommended storage environment
- Place :Dark (avoid direct sunlight)
- Temperature : 10~35ºC
- Humidity : 50~60%RH

Note) If the module is left in an environment of 60℃ or more for a long period of time, optical characteristics may deteriorate.

**(7) Storage method**

**① If the LCD panel is damaged, do not inhale or allow the liquid crystal to enter the mouth**
If the liquid crystal contacts the body or cloths, wash it off with soap immediately. Follow precautions for regular electronic components.

**② Solder flux on the printed circuit board is harmless to the quality and reliability of LCD module.**
Fujitsu is practicing non-wash technology on module assembly process.

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FLC43XWC8V-02

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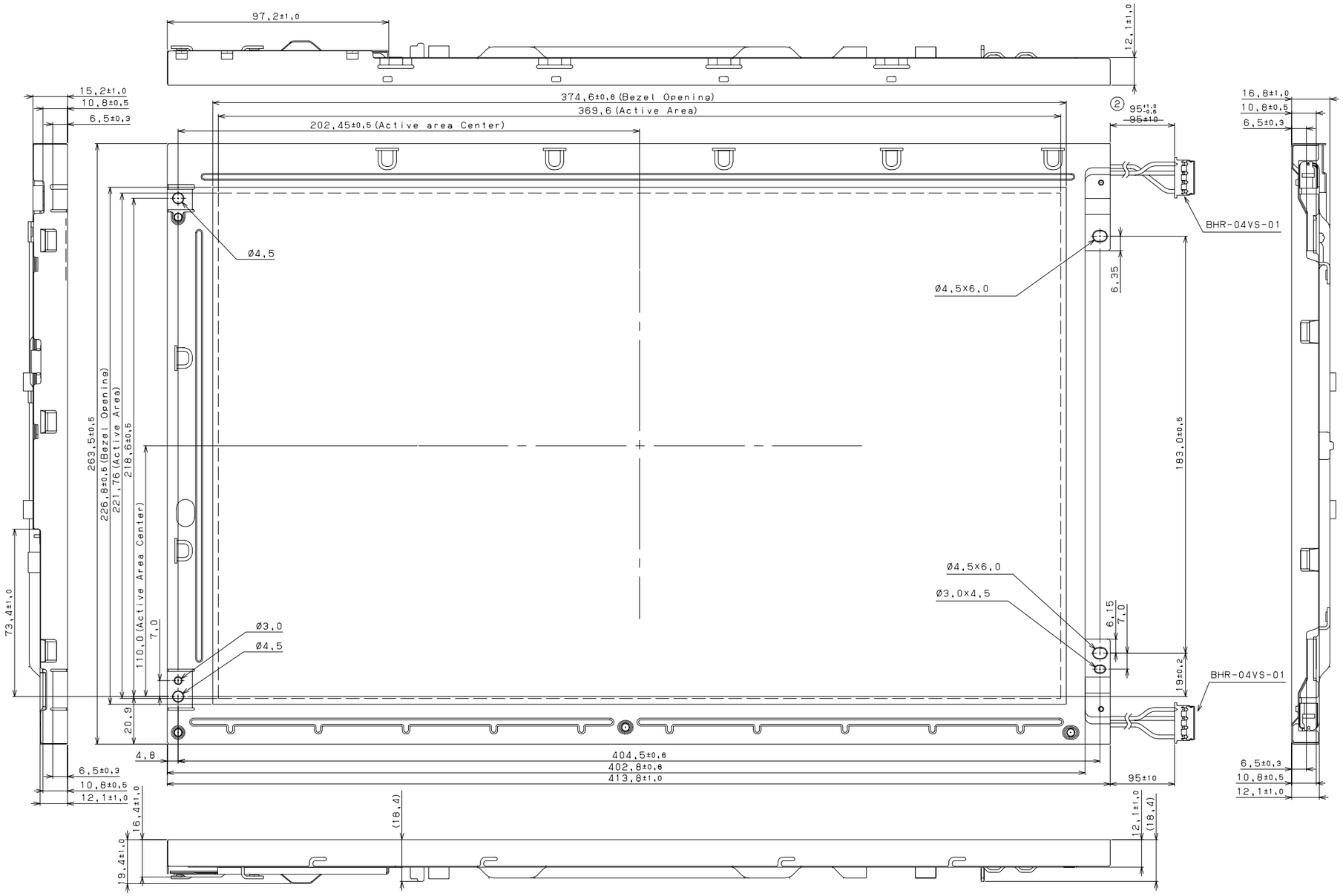
FUJITSU DISPLAY TECHNOLOGIES CORPORATION SHEET 32/

## 18. PRECAUTIONS FOR USE

This Product is designed, developed and manufactured as contemplated for general use, including without limitation, general office use, personal use, household use, and ordinary industrial use, but is not designed, developed and manufactured as contemplated for use accompanying fatal risks or dangers that, unless extremely high safety is secured, could lead directly to death, personal injury, severe physical damage or other loss (hereinafter “High Safety Required Use”), including without limitation, nuclear reaction control in nuclear facility, aircraft flight control, air traffic control, mass transport control, medical life support system, missile launch control in weapon system. If customer’s product possibly falls under the category of High Safety Required Use, please consult with our sales representatives in charge before such use. In addition, FDTC shall not be liable against the customer and/or any third party for any claims or damages arising in connection with the High Safety Required Use of the Product without permission.

## 19. MISCELLANEOUS

Specifications of the TFT-LCD panel and other components used in the LCD module are subject to change. Both parties shall discuss together before change.
If any doubt is raised in the content of the specifications, both parties shall discuss and make best effort for the agreement.




Front View

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| 04 | 20021205 | | | ④changed | |
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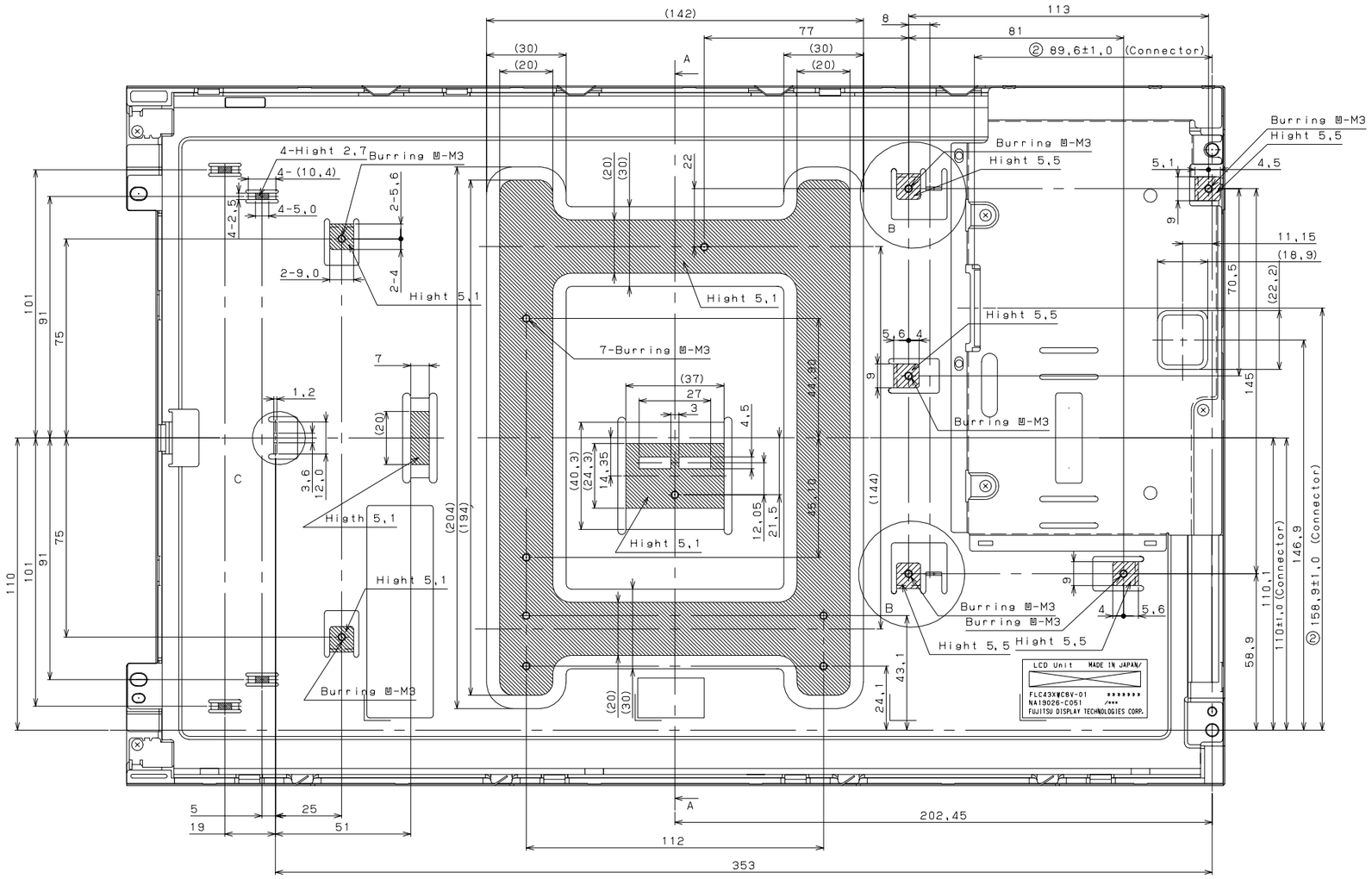
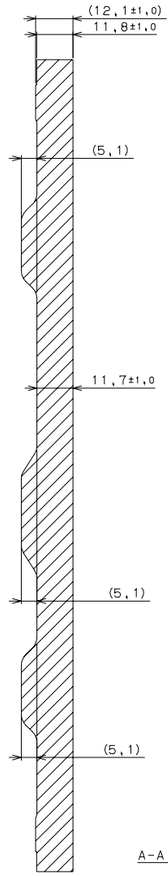
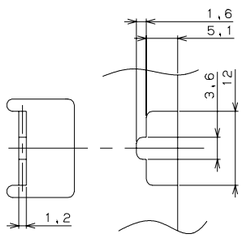



A-A Section

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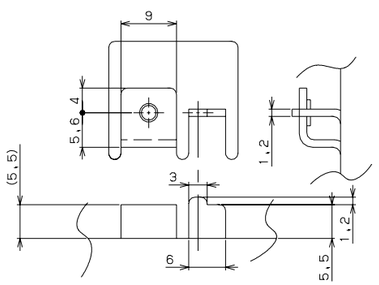


Detail B

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| 02 | 20020807 | | | Connector position changed | | |
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