To :

# Specification of FUJITSU TFT-LCD module

# FLC48SXC8V-02

| Approval |
| --- |
| Date : <br><br> By : |

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. Fujitsu 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.

Specification No. : Tech Bes LCD-00131

Issue Date : May 10, 2002

Issued by : 

T. Naka
Vice General Manager
LCD Technology Div.
LCD Group

FUJITSU LIMITED

# REVISION HISTORY

| Revision | Date | Prepared | Checked | | Approved | Summary |
|---|---|---|---|---|---|---|
| 01A | May 10.2002 | T.Ito | K. Tanaka | | T. Naka | 1st issue<br>With plastic PCB cover. |
| | | | | | | |
| | | | | | | |

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| DESIG. | 20020510 | T.Ito | CHECK | | APPR. K. Tanaka |

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## 1. APPLICATION

This specification is applied to the 19-inch SXGA supported TFT-LCD module.

## 2. PRODUCT NAME AND MODEL NUMBER

2–1 Product Name : **LCD Module**

2–2 Model Name : FLC48SXC8V-02

2-3 Drawing Number : NA19020-C953

## 3. OVERVIEW

This LCD module has a TFT active matrix type liquid crystal panel 1280x1024 pixels, and diagonal size of 48cm(19-inch). This LCD has a LVDS dual interface and can display 16,777,216 colors.

The power supply of this LCD module is +5V DC voltage.

This module has the characteristics for applying TCO'99.

## 4. CONFIGURATION

This LCD module consists of a color TFT-LCD panel that is mounted with TFT driver ICs and a cold-cathode fluorescent tube back-light.
The inverter for the back-light is not included.
Figure 4-1 shows a block diagram of this LCD module.

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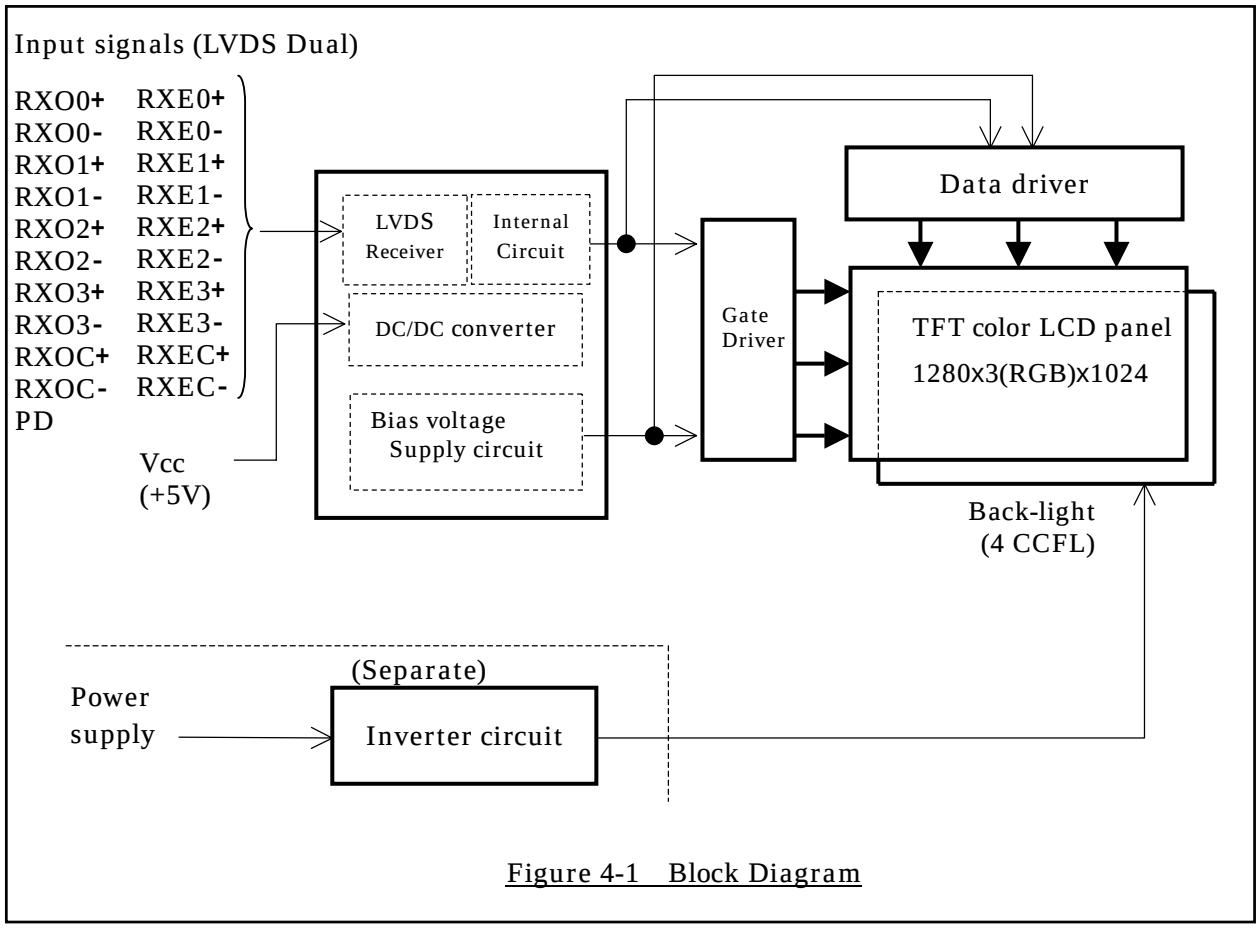


Figure 4-1 Block Diagram

## 5. MECHANICAL SPECIFICATIONS

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

Table 5-1 Mechanical Specifications

| Item | Specifications | Unit | Remark |
|---|---|---|---|
| Dimensions | 414x335x23(TYP.) | mm | Edge type back-light is used. (φ2.6 CCFLx4) |
| Display Resolution | (1280x3)x1024 | — | Without inverter. |
| Display Dot Area | 376.32x301.056 | mm | For details on dimensions, see dimensional outline drawing. (at page 32,33,34:Figure 19-1,2,3) |
| Dot Pitch | (0.098x3)x0.294 | mm | |
| Pixel Aspect Ratio | 1:1 | — | |
| Weight | 3,000 MAX | g | Excluding inverter. |
| FG-SG | Short circuit | — | |

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## 6. ABSOLUTE MAXIMUM RATING

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

Table 6-1 Absolute Maximum Rating

| Item | Symbol | Condition | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| Supply Voltage | $V_{CC}$ | Ta=25ºC | –0.3 | — | 6.0 | V |
| Input Signal Voltage (LVDS signal, PD) | $V_{IN}$ | Ta=25ºC | –0.3 | — | 3.6 | 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(Logic) | | $V_{CC}$ | 4.75 | — | 5.25 | V |
| Ripple Voltage | $V_{CC}$ | $V_{RP}$ | — | — | 0.1 | V |

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## 8. ELECTRICAL SPECIFICATIONS

Table 8-1 shows the electrical specifications of this LCD module. Figure 8-1 shows the measurement circuit. Figure 8-2(A) shows the equivalent circuit of the logic signal input area. Figure 8-2(B) shows the equivalent circuit of the supply voltage Input area.

Table 8-1 Electrical Specifications

| Item | | Symbol | Condition | MIN. | TYP. | MAX. | Unit | Remark |
|---|---|---|---|---|---|---|---|---|
| Differential-input Voltage (Hign) | | $V_{IH}$ | $V_{CM}$=+1.2V | — | — | 100 | mV | |
| Differential-input Voltage (Low) | | $V_{IL}$ | $V_{CM}$=+1.2V | –100 | — | — | mV | |
| Input PD Voltage (High) | | $V_{IHPD}$ | $V_{CC}$=+5.0±0.25V<br>$V_{SS}$=0V<br>DCLK=54MHz<br>Ta=25° C | 2.0 | — | 3.3 | V | |
| Input PD Voltage (Low) | | $V_{ILPD}$ | | 0 | — | 0.8 | V | |
| Supply Current | | $I_{CC}$ | | — | 800 | 1,500 | mA | *1 |
| Supply Rush Current | | $I_{SCC}$ | | — | — | 3.5 | A | *2 |
| Supply Rush Current Duration(1.5A excess) | | $T_{SCC}$ | | — | — | 1 | ms | *2 |
| BACK LIGHT (*3) | CCFL Turn on Voltage | $V_S$ | $f_L$=50kHz,Ta=25°C | — | 1,400 | 1,600 | Vrms | |
| | | | $f_L$=50kHz,Ta=0°C | — | — | 1,600 | Vrms | |
| | Lighting Voltage | $V_L$ | $f_L$=50kHz<br>$I_L$=7mA | — | 750 | — | Vrms | |
| | Lighting Frequency | $f_L$ | $V_L$=750Vrms | 40 | 50 | 60 | kHz | |
| | Tube Current | $I_L$ | $f_L$=50kHz<br>$V_L$=750Vrms | 4 | 7 | 8 | mArms | *4 |

(*1) Typical current situation : Color bar pattern. Vcc=5.0V
Maximum current situation : White pattern. Vcc=4.75V
Without rush current.

(*2) These items prescribe the rush current for starting internal DC/DC.
Charging current to capacitors of Vcc is not prescribed.

(*3) Back-light specifications are valid when using a suitable inverter such as the FLCV-13

(*4) Tube current ($I_L$) shows the value of the current that is consumed at one lamp.
This LCD module has 4 lamps. Each 2 lamps are placed at upper side and lower side of the display.
2 lamps is connected in parallel. Each low voltage terminals are connected with separate cable to Back-light connecter.

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Measurement circuit is based on Figure 8-1.

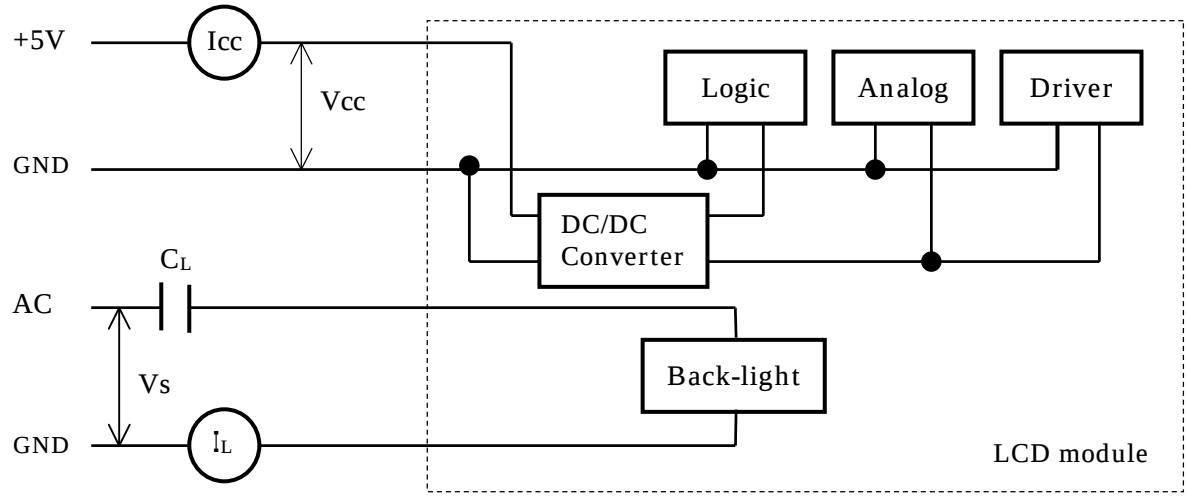
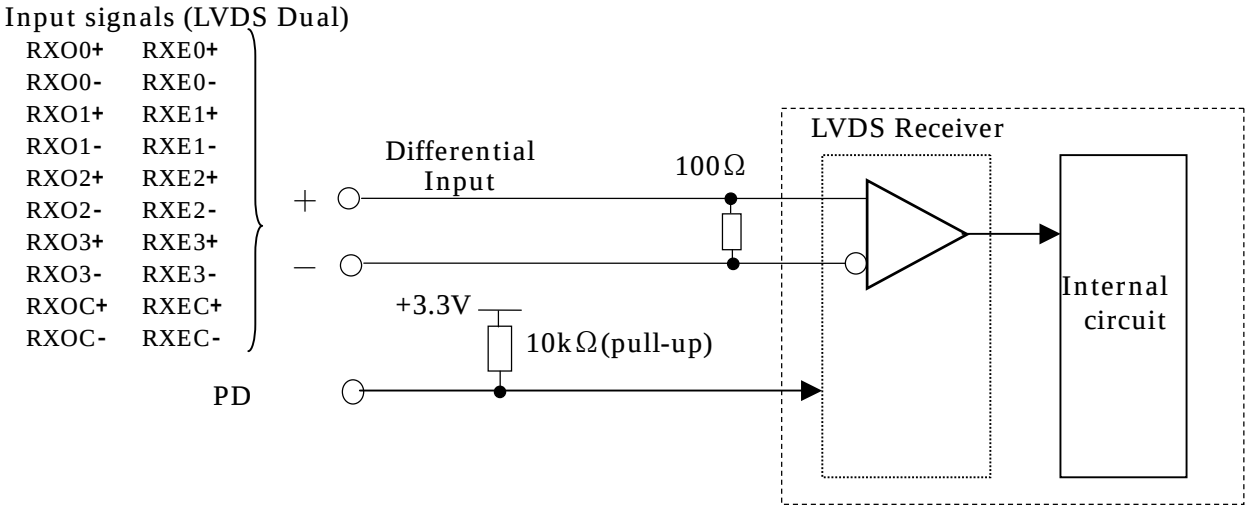
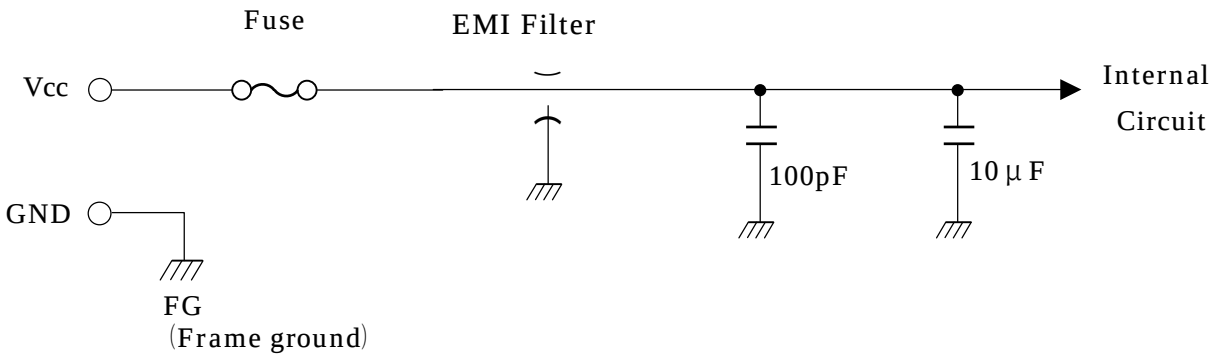



Figure 8-1 Measurement circuit




LVDS Receiver : DS90CF386 (National Semiconductor Corp. or equivalent)

Figure 8-2(A) Equivalent circuit of logic signal Input




Fuse : F0603C3R00FWTRM 3.0A (Kyocera Corp. or equivalent)

EMI Filter : SGM20C1E332 (Sumitomo Metal Inc. or equivalent)

Figure 8-2(B) Equivalent circuit of power supply

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## 9. OPTICAL SPECIFICATIONS

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

Table 9-1 Optical Specifications — Ta=25˚C

| Item | | Symbol | Condition | | Specifications MIN. | Specifications TYP. | Specifications MAX. | Unit | Remark | Note |
|---|---|---|---|---|---|---|---|---|---|---|
| Visual Angle | Horizontal | $\theta_{L,R}$ | CR≧10 | $\theta_{U,D}$=0 ° | 85 | — | — | deg | | (1)(2)(3)(5)(6) |
| | Vertical | $\theta_{U,D}$ | | $\theta_{L,R}$=0 ° | 85 | — | — | deg | | |
| | All Direction | $\theta$ | | | — | 80 | — | deg | | |
| Contrast Ratio | | CR | $\theta_{L,R,U,D}$ =0 ° | | 350 | 500 | — | — | White/ Black | (1)(2)(3)(5) |
| Response Time(ON) (B→W) | | $t_{on}$ | $\theta_{L,R,U,D}$ =0 ° | Ta=25˚C | — | 15 | 30 | ms | | (1)(4)(5) |
| | | | | Ta=0˚C | — | 50 | 100 | ms | | |
| Response Time(OFF) (W→B) | | $t_{off}$ | $\theta_{L,R,U,D}$ =0 ° | Ta=25˚C | — | 10 | 25 | ms | | |
| | | | | Ta=0˚C | — | 50 | 100 | ms | | |
| Brightness | | I | $\theta_{L,R,U,D}$=0 ° $V_{CC}$=5V $I_L$=7mA | | 200 | 250 | | cd/m² | White *1 | (1)(5) |
| Brightness Uniformity | | △I | | | 70 | — | — | % | | (1)(5)(7) |
| Chromaticity | W | x | | | 0.293 | 0.323 | 0.353 | — | | (1)(5) |
| | | y | | | 0.307 | 0.337 | 0.367 | — | | |
| | R | (x, y) | | Red | ( 0.648 , 0.346 ) Typ. | | | | | |
| | G | | | Green | ( 0.292 , 0.602 ) Typ. | | | | | |
| | B | | | Blue | ( 0.150 , 0.130 ) Typ. | | | | | |
| LCD Panel Type | | | | | TFT Color | | | | | |
| Display Mode | | | | | Normaly Black | | | | | |
| Wide Viewing Angle Technology | | | | | MVA | | | | | |
| Optimum Viewing Angle | | | | | — (symmentry) | | | | | (6) |
| Display Color | | | | | 16,777,216 (8-bit color) | | | | | |
| Color of non-display area | | | | | Black | | | | | |
| Surface Treatment | | | | | Anti-glare (Haze value: (25%) , 2H) | | | | | |

(*1) Value at 15～20 minutes after lighting on.

(Note) ･CS-1000 (MINOLTA Co., Ltd.) , BM-5A(Topcon) and the like should be used as a luminance colorimeter.
Field=1 ° , L=500mm
･Back-light current = 7mA, Dark room condition(1 lux or less)

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Note 1) Definition of Viewing Angle (1)

Based on Figure 9-1.

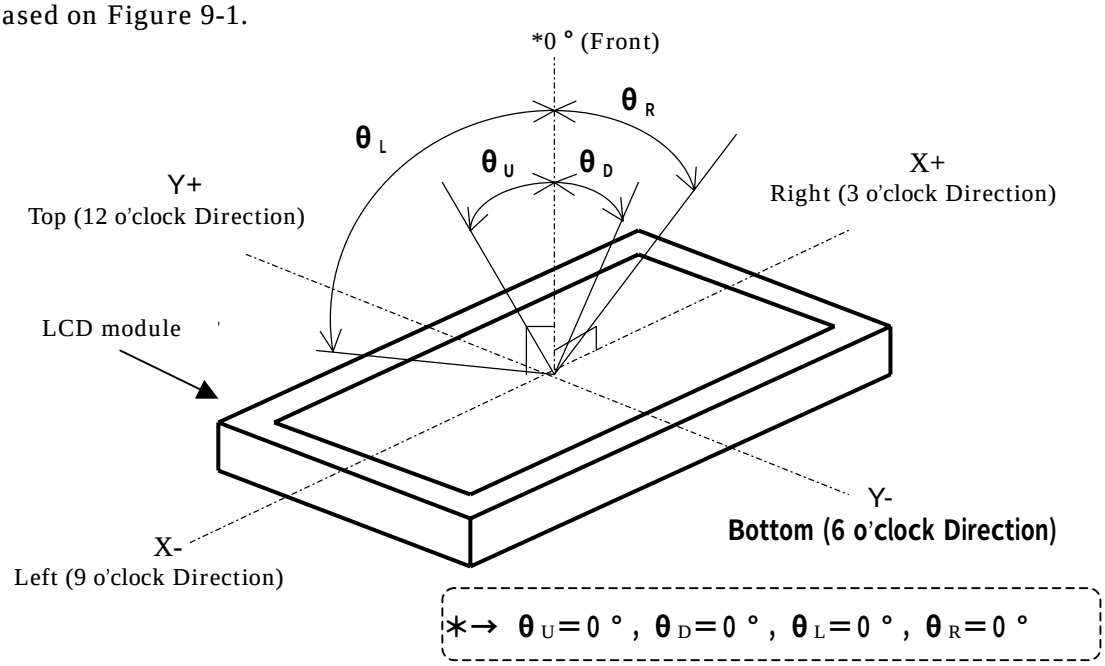


Figure 9-1 Definition of Viewing Angle (1)

Note 2) Definition of Viewing Angle (2)

Based on Figure 9-2.

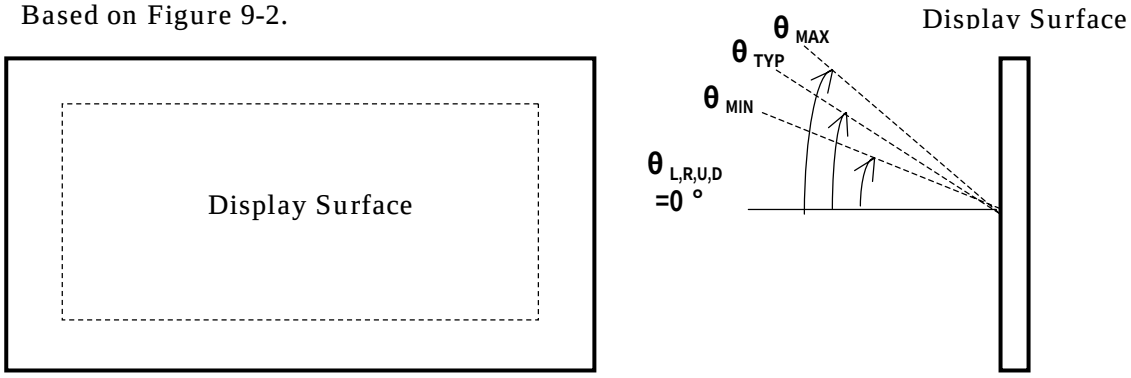


Figure 9-2 Definition of Viewing Angle (2)

Note 3) Definition of Contrast Ratio (CR)

Determined by Formula (1) based on Figure 9-3 Voltage-Brightness characteristics.

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

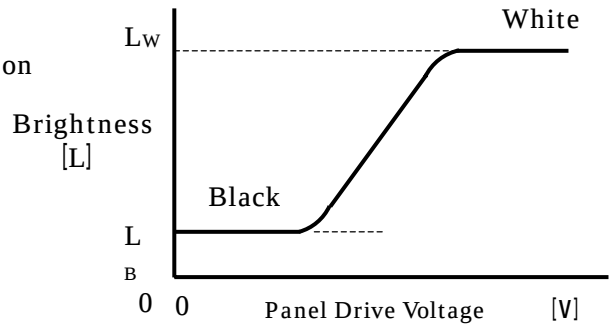


Figure 9-3 Voltage-Brightness Characteristics

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Note 4) Definition of Response Time

Based on Figure 9-4.

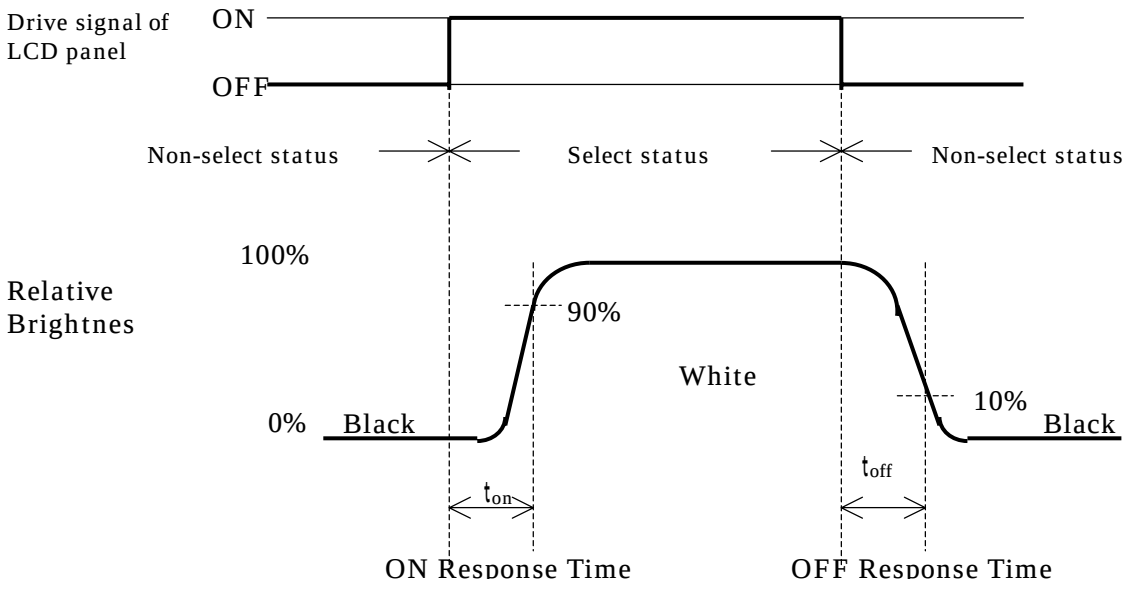


Figure 9-4 Definition of Response Time

Note 5) Contrast Ratio and Response Measurement System

Based on Figure 9-5.

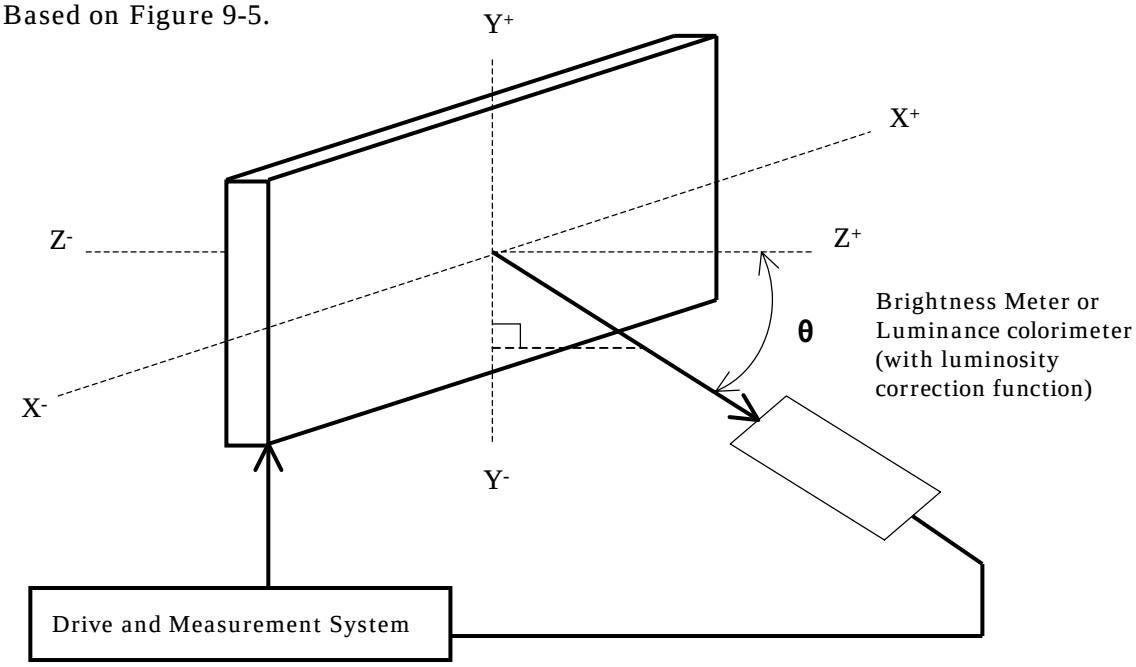


Figure 9-5 Contrast Ratio and Response Time Measurement System

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Note 6) Definition of Optimum Viewing Angle

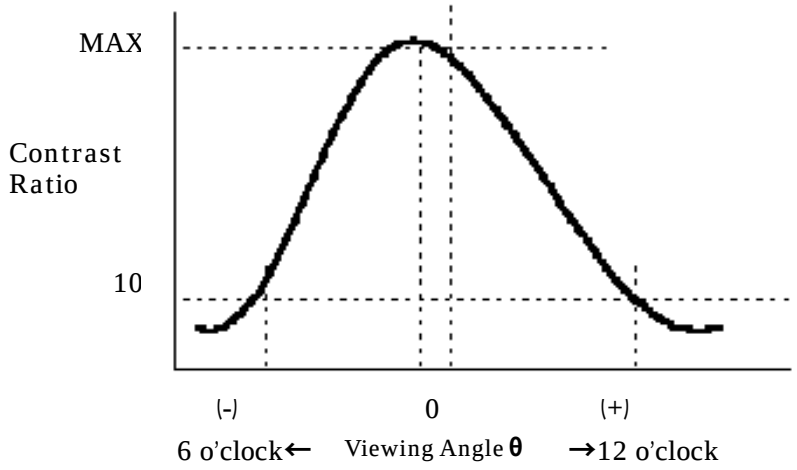


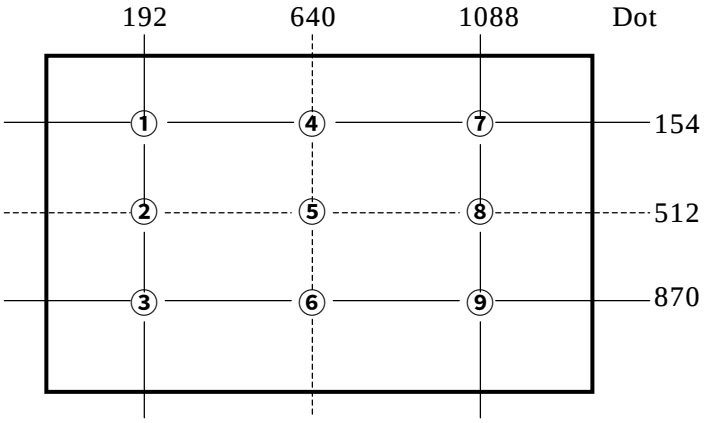

Figure 9-6 Definition of Viewing Angle

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 that is shown in Figure 9-7.

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




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

Figure 9-7 Measurement Points

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## 10. INTERFACE SPECIFICATIONS

10-1 Signal descriptions

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

Table 10-1 Interface signals (CN1)

| Pin No. | Symbol | I/O | Function |
|---|---|---|---|
| 1 | RxO0- | I | Negative differential input |
| 2 | RxO0+ | I | Positive differential input |
| 3 | RxO1- | I | Negative differential input |
| 4 | RxO1+ | I | Positive differential input |
| 5 | RxO2- | I | Negative differential input |
| 6 | RxO2+ | I | Positive differential input |
| 7 | GND | — | Ground |
| 8 | RxOC- | I | Negative differential input |
| 9 | RxOC+ | I | Positive differential input |
| 10 | RxO3- | I | Negative differential input |
| 11 | RxO3+ | I | Positive differential input |
| 12 | RxE0- | I | Negative differential input |
| 13 | RxE0+ | I | Positive differential input |
| 14 | GND | — | Ground |
| 15 | RxE1- | I | Negative differential input |
| 16 | RxE1+ | I | Positive differential input |
| 17 | GND | — | Ground |
| 18 | RxE2- | I | Negative differential input |
| 19 | RxE2+ | I | Positive differential input |
| 20 | RxEC- | I | Negative differential input |
| 21 | RxEC+ | I | Positive differential input |
| 22 | RxE3- | I | Negative differential input |
| 23 | RxE3+ | I | Positive differential input |
| 24 | GND | — | Ground |
| 25 | TST | — | Test pin *1 |
| 26 | PD | I | LVDS Core Power Down |
| 27 | TST | — | Test pin *1 |
| 28 | Vcc | — | +5V power supply |
| 29 | Vcc | — | +5V power supply |
| 30 | Vcc | — | +5V power supply |

Connector : FI-X30S-HF (Japan Aviation Electronics)
User's connector : FI-X30M (FPC type) (Japan Aviation Electronics)
FI-X30H (Wire type)
FI-X30C (Coaxial cable type)

*1: Keep open. (Internal test use only.)

10-2 LVDS Data Assignment

Table 10-2 shows the LVDS Data Assignment.

Table 10-2 LVDS Data Assignment

| Input signal *1 | | Transmitter DS90CF383,C385 | | Interface connector | | | Receiver DS90CF386 | | LCD Control input |
|---|---|---|---|---|---|---|---|---|---|
| | | pin | INPUT | System side | LCD module pin | | pin | OUTPUT | |
| LVDS Odd | RO2 | 51 | TxIN0 | Tx OUT0+ | 2 | RxO0+ | 27 | RxOUT0 | RO2 |
| | RO3 | 52 | TxIN1 | | | | 29 | RxOUT1 | RO3 |
| | RO4 | 54 | TxIN2 | | | | 30 | RxOUT2 | RO4 |
| | RO5 | 55 | TxIN3 | Tx OUT0- | 1 | RxO0- | 32 | RxOUT3 | RO5 |
| | RO6 | 56 | TxIN4 | | | | 33 | RxOUT4 | RO6 |
| | RO7 | 3 | TxIN6 | | | | 35 | RxOUT6 | RO7 |
| | GO2 | 4 | TxIN7 | | | | 37 | RxOUT7 | GO2 |
| | GO3 | 6 | TxIN8 | Tx OUT1+ | 4 | RxO1+ | 38 | RxOUT8 | GO3 |
| | GO4 | 7 | TxIN9 | | | | 39 | RxOUT9 | GO4 |
| | GO5 | 11 | TxIN12 | | | | 43 | RxOUT12 | GO5 |
| | GO6 | 12 | TxIN13 | Tx OUT1- | 3 | RxO1- | 45 | RxOUT13 | GO6 |
| | GO7 | 14 | TxIN14 | | | | 46 | RxOUT14 | GO7 |
| | BO2 | 15 | TxIN15 | | | | 47 | RxOUT15 | BO2 |
| | BO3 | 19 | TxIN18 | | | | 51 | RxOUT18 | BO3 |
| | BO4 | 20 | TxIN19 | Tx OUT2+ | 6 | RxO2+ | 53 | RxOUT19 | BO4 |
| | BO5 | 22 | TxIN20 | | | | 54 | RxOUT20 | BO5 |
| | BO6 | 23 | TxIN21 | | | | 55 | RxOUT21 | BO6 |
| | BO7 | 24 | TxIN22 | Tx OUT2- | 5 | RxO2- | 1 | RxOUT22 | BO7 |
| | RSVD | 27 | TxIN24 | | | | 3 | RxOUT24 | Not use |
| | RSVD | 28 | TxIN25 | | | | 5 | RxOUT25 | Not use |
| | ENAB | 30 | TxIN26 | | | | 6 | RxOUT26 | ENAB |
| | RO0 | 50 | TxIN27 | Tx OUT3+ | 11 | RxO3+ | 7 | RxOUT27 | RO0 |
| | RO1 | 2 | TxIN5 | | | | 34 | RxOUT5 | RO1 |
| | GO0 | 8 | TxIN10 | | | | 41 | RxOUT1 | GO0 |
| | GO1 | 10 | TxIN11 | Tx OUT3- | 10 | RxO3- | 42 | RxOUT11 | GO1 |
| | BO0 | 16 | TxIN16 | | | | 49 | RxOUT16 | BO0 |
| | BO1 | 18 | TxIN17 | | | | 50 | RxOUT17 | BO1 |
| | RSVD | 25 | TxIN23 | | | | 2 | RxOUT23 | Not use |
| | DCLK | 31 | TxCLK IN | TxCLK OUT+<br>TxCLK OUT- | 9<br>8 | RxCLK IN+<br>RxCLK IN- | 26 | RxCLK OUT | DCLK |
| LVDS Even | RE2 | 51 | TxIN0 | Tx OUT0+ | 13 | RxE0+ | 27 | RxOUT0 | RE2 |
| | RE3 | 52 | TxIN1 | | | | 29 | RxOUT1 | RE3 |
| | RE4 | 54 | TxIN2 | | | | 30 | RxOUT2 | RE4 |
| | RE5 | 55 | TxIN3 | Tx OUT0- | 12 | RxE0- | 32 | RxOUT3 | RE5 |
| | RE6 | 56 | TxIN4 | | | | 33 | RxOUT4 | RE6 |
| | RE7 | 3 | TxIN6 | | | | 35 | RxOUT6 | RE7 |
| | GE2 | 4 | TxIN7 | | | | 37 | RxOUT7 | GE2 |
| | GE3 | 6 | TxIN8 | Tx OUT1+ | 16 | RxE1+ | 38 | RxOUT8 | GE3 |
| | GE4 | 7 | TxIN9 | | | | 39 | RxOUT9 | GE4 |
| | GE5 | 11 | TxIN12 | | | | 43 | RxOUT12 | GE5 |
| | GE6 | 12 | TxIN13 | Tx OUT1- | 15 | RxE1- | 45 | RxOUT13 | GE6 |
| | GE7 | 14 | TxIN14 | | | | 46 | RxOUT14 | GE7 |
| | BE2 | 15 | TxIN15 | | | | 47 | RxOUT15 | BE2 |
| | BE3 | 19 | TxIN18 | | | | 51 | RxOUT18 | BE3 |
| | BE4 | 20 | TxIN19 | Tx OUT2+ | 19 | RxE2+ | 53 | RxOUT19 | BE4 |
| | BE5 | 22 | TxIN20 | | | | 54 | RxOUT20 | BE5 |
| | BE6 | 23 | TxIN21 | | | | 55 | RxOUT21 | BE6 |
| | BE7 | 24 | TxIN22 | Tx OUT2- | 18 | RxE2- | 1 | RxOUT22 | BE7 |
| | RSVD | 27 | TxIN24 | | | | 3 | RxOUT24 | Not use |
| | RSVD | 28 | TxIN25 | | | | 5 | RxOUT25 | Not use |
| | RSVD | 30 | TxIN26 | | | | 6 | RxOUT26 | Not use |
| | RE0 | 50 | TxIN27 | Tx OUT3+ | 23 | RxE3+ | 7 | RxOUT27 | RE0 |
| | RE1 | 2 | TxIN5 | | | | 34 | RxOUT5 | RE1 |
| | GE0 | 8 | TxIN10 | | | | 41 | RxOUT10 | GE0 |
| | GE1 | 10 | TxIN11 | Tx OUT3- | 22 | RxE3- | 42 | RxOUT11 | GE1 |
| | BE0 | 16 | TxIN16 | | | | 49 | RxOUT16 | BE0 |
| | BE1 | 18 | TxIN17 | | | | 50 | RxOUT17 | BE1 |
| | RSVD | 25 | TxIN23 | | | | 2 | RxOUT23 | Not use |
| | DCLK | 31 | TxCLK IN | TxCLK OUT+<br>TxCLK OUT- | 21<br>20 | RxCLK IN+<br>RxCLK IN- | 26 | RxCLK OUT | Not use |

*1 ･RSVD (reserved) pin on a transmitter should be connected with Ground.

･Input odd or even data depending on the display position of the LCD module.

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10-3 Color Data Assignment

Table 10-3 shows the Color Data Assignment.

Table 10-3 Color Data Assignment

| Color | | | R Input data | | | | | | | | G Input data | | | | | | | | B Input data | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Odd | | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| | Even | | 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 |
| | ⇧ | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | ⇩ | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Brighter | 253 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ⇩ | 254 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 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 | 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 |
| | ⇧ | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | ⇩ | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | 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 |
| | ⇧ | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | ⇩ | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | 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.
Larger number means brighter level.
Note.2) Data; 1:High, 0:Low

Note 3) Color data consist of 8 bit red, green and blue data of odd and even number pixel data. Total data number is 48 signals. This module is able to display 16,777,216 colors because each red, green and blue data is controlled independently.

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## 10-4 Input Signal Timing

Table 10-4 and Figure 10-1 shows the Input Signal Timing at LVDS transmitter.

Table 10-4 Timing Characteristics (Ta=0~50˚C, Vcc=5±0.25V)

| Item | | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|---|
| DCLK signal (Clock) | Period | Tc | 16.7 | 18.5 | 25.0 | ns | |
| | Frequency | 1/Tc | 40 | 54 | 60 | MHz | |
| | Duty | Tch/Tc | 45 | 50 | 55 | % | |
| | High time | TclkH | 5.0 | — | — | ns | |
| | Low time | TclkL | 5.0 | — | — | ns | |
| DCLK-Data Timing | Setup time | Tset | 3 | — | — | ns | |
| | Hold time | Thold | 5 | — | — | ns | |
| ENAB signal | Horizontal Period | Th | 5500/Tc+450 | 844 | 887 *1 | DCLK | |
| | Hor. Period (1) | Th | 14.0 | 15.6 | — | µs | *4 |
| | Hor. Period (2) | Th | 10.6 | 15.6 | — | µs | *4 |
| | Hor. Display period | Thd | 640 | 640 | 640 | DCLK | *2 |
| | Vertical Period | Tv | 1028 *1 | 1066 | 1088 *1 | Th | 16.67ms |
| | Ver. Frequency | 1/Tv | 50 | 60 | 69 | Hz | |
| | Ver. Display period | Tvd | 1024 | 1024 | 1024 | Th | *2 |
| | Data-ENAB timing | Tdn | — | 0 | — | DCLK | *3 |

*1) • horizontal display position is specified by the rise of ENAB.
The data latched at falling edge of DCLK after rise of ENAB is displayed at the left edge of the display area.
• Vertical display position is specified by the rise of ENAB after low level continuation over 2048 DCLK.
The data latched at the rise of ENAB is displayed at the top line of the display area.

*2) • If the "High" level period of ENAB is less than 640 DCLK or the number of ENAB in a frame period (Tv) is less than 1024, black color is displayed at the rest of the display area.

*3) • If ENAB does not synchronize with the effective display data, the display position does not fit to the display area.

*4) • Hor. Period (2) shows the operating range where internal circuit can work correctly.
• When ENAB signal is out of Hor. Period (1), the display quality may deteriorate.

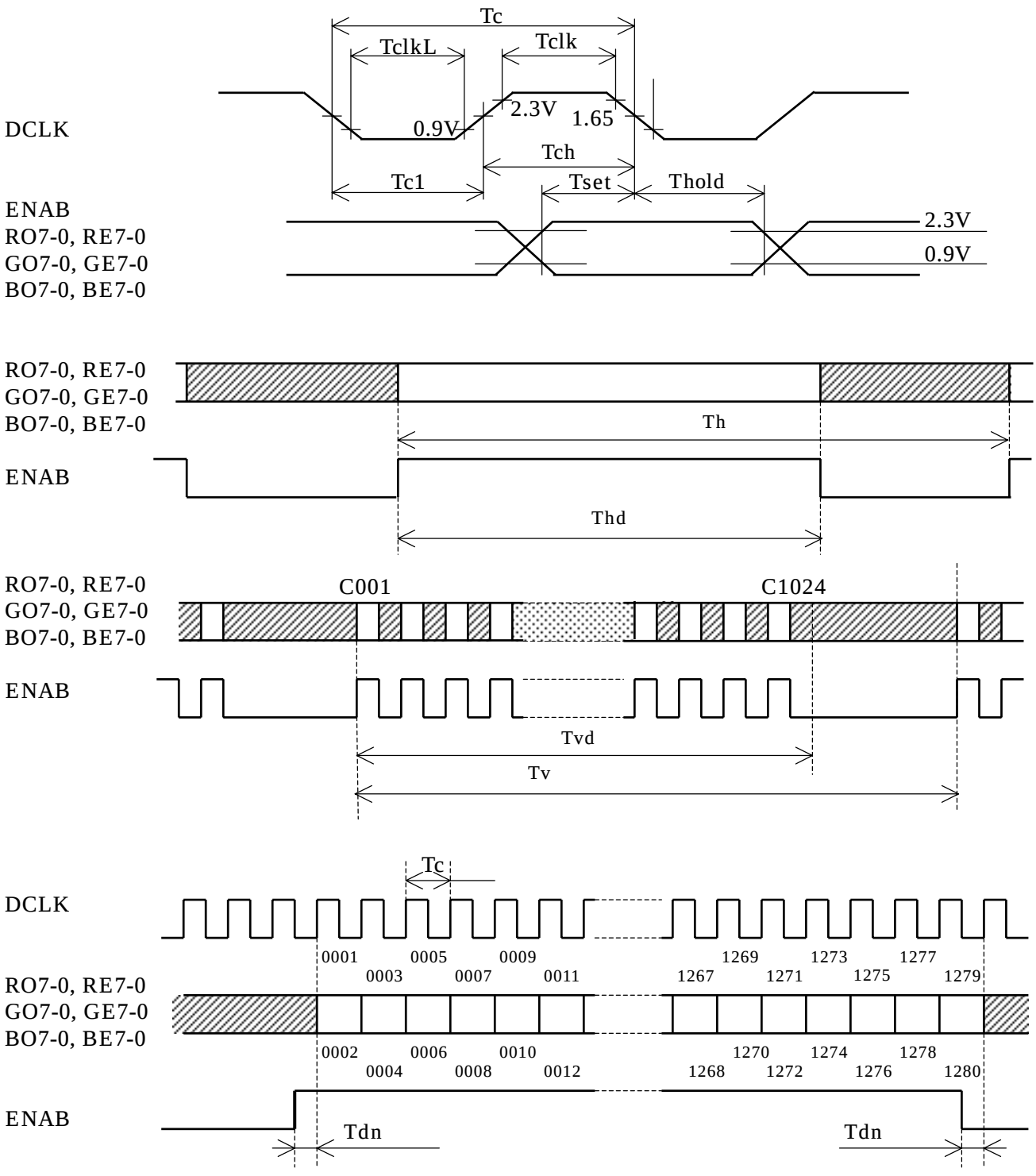


Figure 10-1 Input Signal Timing Chart

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## 10-4 Correspondence between Data and Display Position

Figure 10-2 shows the Correspondence between Data and Display Position.

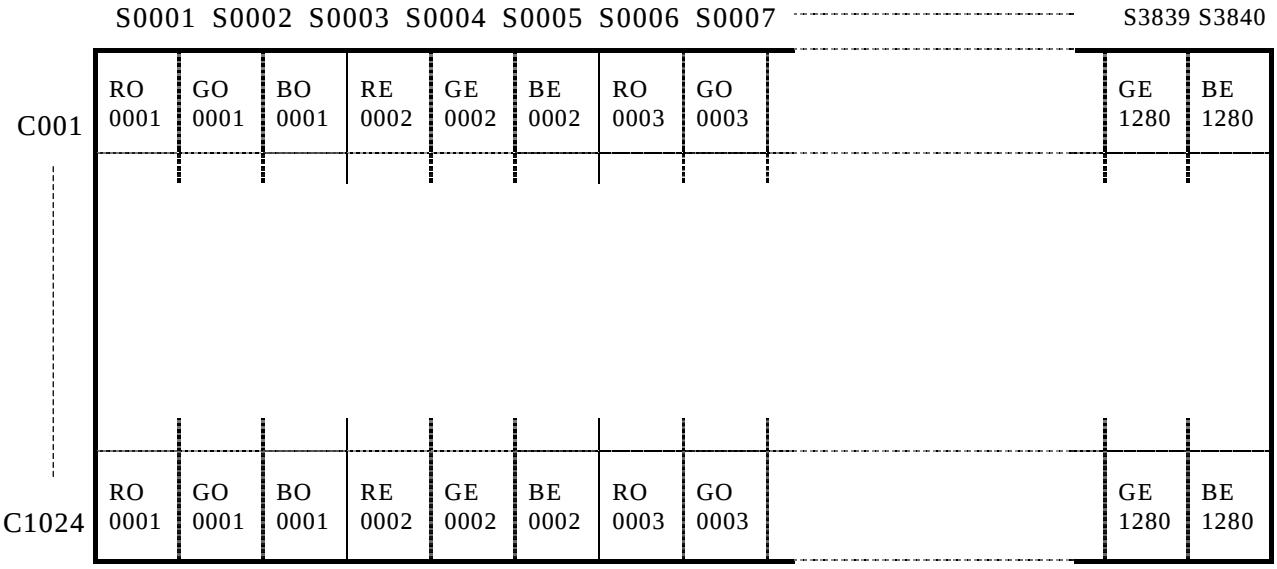
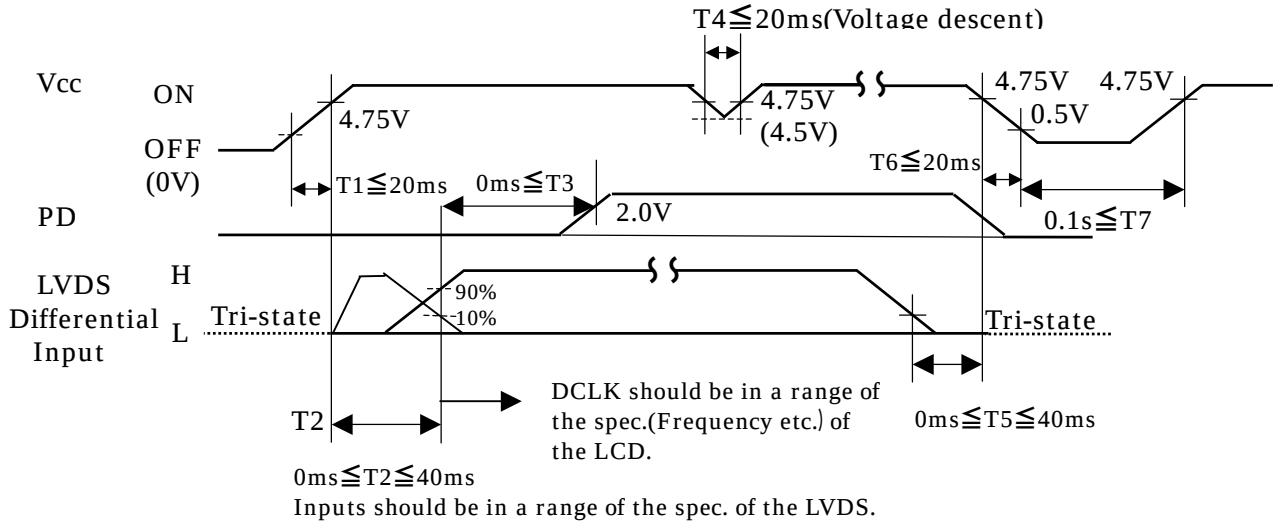



Figure 10-2 Correspondence Data and Display Position

## 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 Figure 10-3 to prevent latch-up of the driver ICs and DC driving of the LCD panel.




*Note : PD input can be set open, if it is not used.

Figure 10-3 Power Supply Sequence

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## 11. BACK-LIGHT SPECIFICATIONS

11-1 Pin configuration for Back-light

Table 11-1 shows the description and Pin assignment of the connectors (CN-A to D) for the Back-light of this LCD module.

Table 11-1 Pin Assignment of CN-A to CN-D

| Pin № | Signal | | | | Function | Cable color |
|---|---|---|---|---|---|---|
| | CN-A | CN-B | CN-C | CN-D | | |
| 1 | $V_{L1}$ | $V_{L2}$ | $V_{L3}$ | $V_{L4}$ | Power supply | Pink |
| 2 | — | — | — | — | — | — |
| 3 | GND | GND | GND | GND | Ground | White or Blue |

Connector : Housing : BHR-03VS-1
Contact : SBH-001T-P0.5
User's Connector : Post with base: SM02(8.0)B-BHS-1-TB
Supplier : Japan Solderless Terminal Trading Company LTD. (J.S.T.)

11-2 CCFL

Supplier: KOWA ELECTRIC CO.LTD , Part No. SS26E3935N8365C3273111

11-3 Life

The life of the back-light is a minimum of 50,000 hours at the following conditions.

(1) Working conditions

①Ambient temperature: 25±5℃
②Tube current ($I_L$) : (7mA or less)

(2) Definition of life

①Brightness becomes 50% or less than the minimum brightness value shown in Table 9-1.
②The lamp cannot be lit by the minimum value of the breakdown voltage(1760Vrms) shown in Table 8-1.
③Flashing.

11-4 Lamp assembly set (for replacement)

Lamp assembly set(with charge)is prepared for replacing old lamp to new one.
This set consists of a upper lamp assembly and a lower lamp assembly.

Type number : FLCL-20

Drawing No. : NA19020-5906

Minimum order qty. unit : 20 pcs.

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## 12. APPEARANCE SPECIFICATIONS

12-1 Appearance

| No. | Item | | Judgment method and standard | | |
|---|---|---|---|---|---|
| 1 | Bright spot (high and Low) | | ≤4 dots | | (Note 1 ) |
| 2 | Bright spot connection (high and low) | | ≤2 pair (2 dot connection in horizontal only) | | (Note 1) |
| 3 | Total of bright spot | | ≤4 dots | | |
| 4 | Dark spot | | ≤8 dots | | (Note 2) |
| 5 | Dark spot connection | | ≤3 pairs | | (Note 2) |
| 6 | Total of dark spot | | ≤8 dots | | (Note 2) |
| 7 | Total of dot defect (bright and dark) | | ≤ 8 dots | | |
| 8 | Distance of bright spot | high-hgh | ≥15mm | | |
| | | others | ≥ 5mm | | |
| 9 | Distance of dark spot | | ≥ 5mm | | |
| 10 | Scratch on polarizer, line shape | | W≤0.03 | ———— | Ignore |
| | | | 0.03<W≤0.05 | L≤6 | Ignore |
| | | | | 6<L≤12 | ≤5 |
| | | | | 12<L | 0 |
| | | | 0.05<W≤0.10 | L≤0.6 | Ignore |
| | | | | 0.6<L | 0 |
| | | | 0.10<W | ———— | 0 |
| 11 | Dent on polarizer, dot shape | | D≤0.3 | | Ignore |
| | | | 0.3<D≤0.4 | | ≤5 |
| | | | 0.4<D | | 0 |
| 12 | Bubble in polarizer | | D≤0.3 | | Ignore |
| | | | 0.3<D≤0.5 | | ≤5 |
| | | | 0.5<D | | 0 |
| 13 | Black white spot (Foreign circular matter) | | D≤0.5 | | ≤5 |
| | | | 0.5<D | | 0 |
| 14 | Light leakage by foreign articles | | D≤0.3 | | Ignore |
| | | | 0.3<D≤0.6 | | ≤4 |
| | | | 0.6<D | | 0 |
| 15 | Lints, black/white line | | W≤0.03 | ———— | Ignore |
| | | | 0.03<W≤0.05 | L≤6 | Ignore |
| | | | | 6<L≤12 | ≤4 |
| | | | | 12<L | 0 |
| | | | 0.05<W≤0.10 | L≤0.6 | Ignore |
| | | | | 0.6<L≤5 | ≤2 |
| | | | | 5<L | 0 |
| | | | 0.10<W | (W+L)/2=D | Conform to No.13 |

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

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## 12-2 Dot defects (Bright spots, Dark spots)

### 12-2-1 Zone

· Inside display dot area (376.32×301.056mm)
· 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.

### 12-2-2 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

### 12-2-3 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.
· Input signal timing should be typical value.

(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) A<1/3 : Not count. Only one of 4 dark connection is allowed.
(b) 1/3≦A<2/3 : Considered as 0.5 dot.
(c) 2/3≦A : Considered as 1 dot.
(A=Dark spot size/dot size)

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## 13. ENVIRONMENTAL SPECIFICATIONS

Table 13-1 show the environmental specifications.

Table 13-1 Environmental specifications

| Item | Condition | | Remark |
|---|---|---|---|
| Temperature | Operation | 0~50ºC | 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, 1octave/ 20minute, 19.6m/s$^2$(2G), 1.5mm max, 1hour each X, Yand Z directions. | For single module without package. |
| Shock *1 | Non-operation | 294m/s$^2$ (30G), 6ms, 1time each ±X, ±Y and ±Z directions. | |

*1) When LCD module is mounted with side mount holes, the shock condition is 196m/s$^2$(20G).

NOTE: Table 13-2 and Figure 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 |

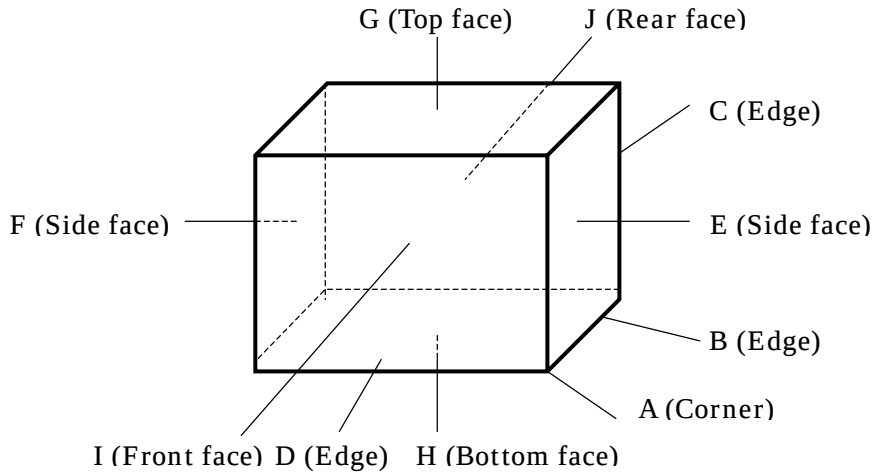


Figure 13-1 Direction to apply shock to package

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## 14. INDICATIONS

This module has the following indications.

(1) Product name : **LCD** unit

(2) Model Number : FLC48SXC8V-02

(3) Product Drawing Number : NA19020-C953

(4) Manufacturing Number : **2 5 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) Manufacturer Country Name : MADE IN JAPAN

(7) Company Name : FUJITSU LIMITED

(8) Disposal method of cold-cathode tubes. (See Figure 14-2)

(9) Caution when changing cold-cathode tubes. (See Figure 14-3)

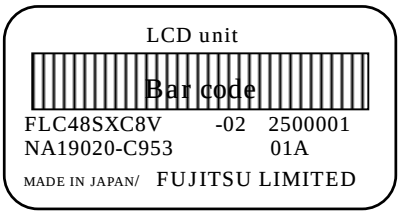


Figure 14-1 Product Label (Example)


Figure 14-2

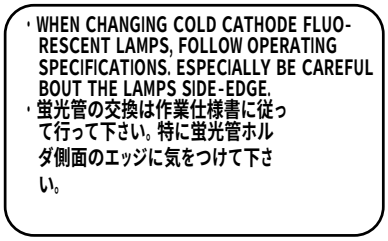


Figure 14-3

## 15. PACKAGING

15-1 Packing specifications

(1) 5 LCD modules/1package.

(2) Weight:approximately 16kg/1package.

(3) Outline dimensions: 534mm (W)x329mm (D)x 480mm (H)

15-2 Packing method

Figure 15-2 show the packing method.

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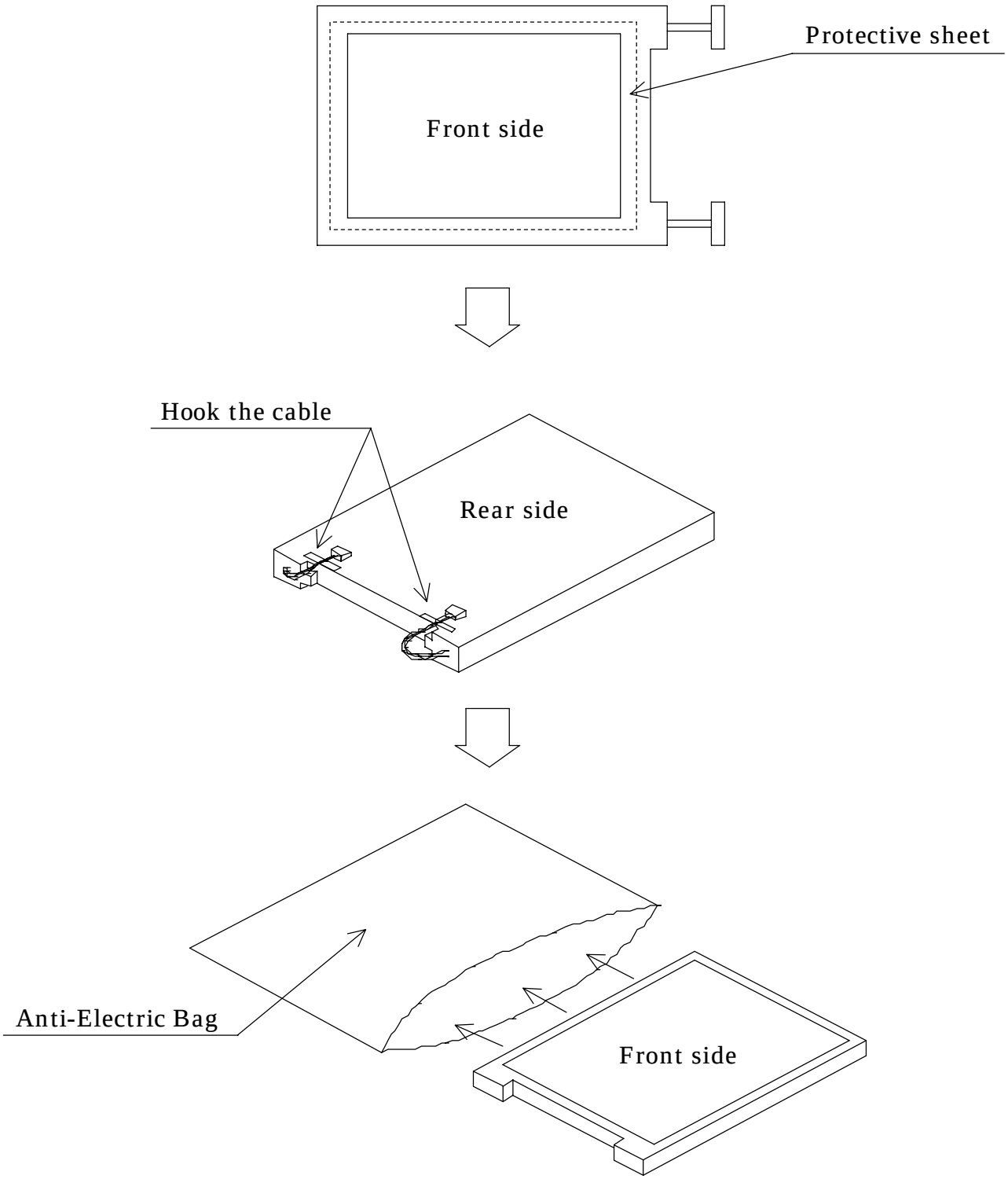


Fig.15-2 (a) Packaging Method

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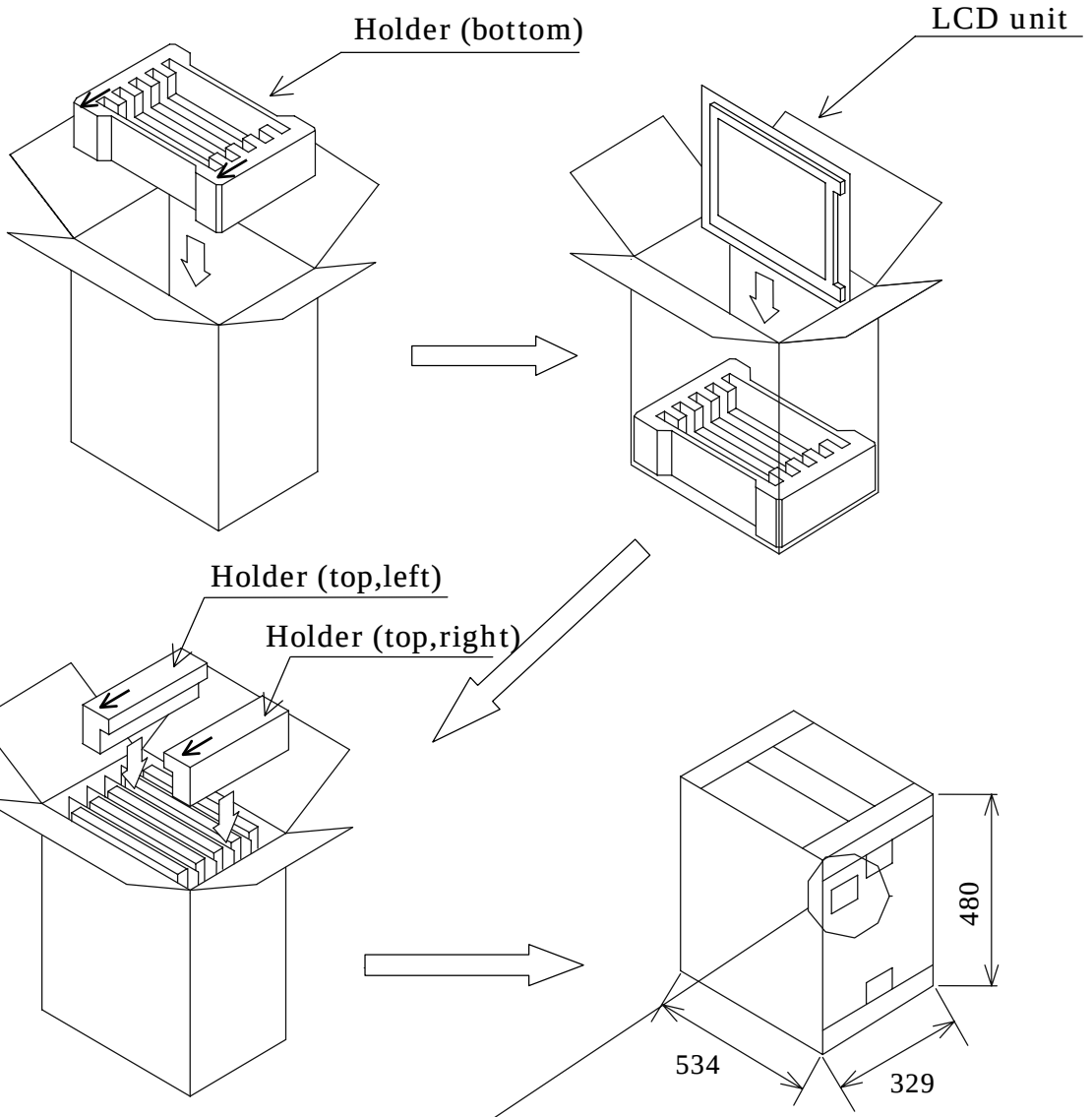


Label (example)

| | | | |
|---|---|---|---|
| 型 格 (TYPE) | FLC48SXC8V | -02 数 量 (QTY.) | 5 |
| 図 番 (DRWG. NO.) | NA19020-C953 | 版 数 (REV. NO.) | 01A |
| Bar code | 2500001 | Bar code | |
| | 2500002 | | |
| | 2500003 | | |
| | 2500004 | | |
| | 2500005 | | |

Bar code

MADE IN JAPAN

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

Fig.15-2 (b) Packaging Method

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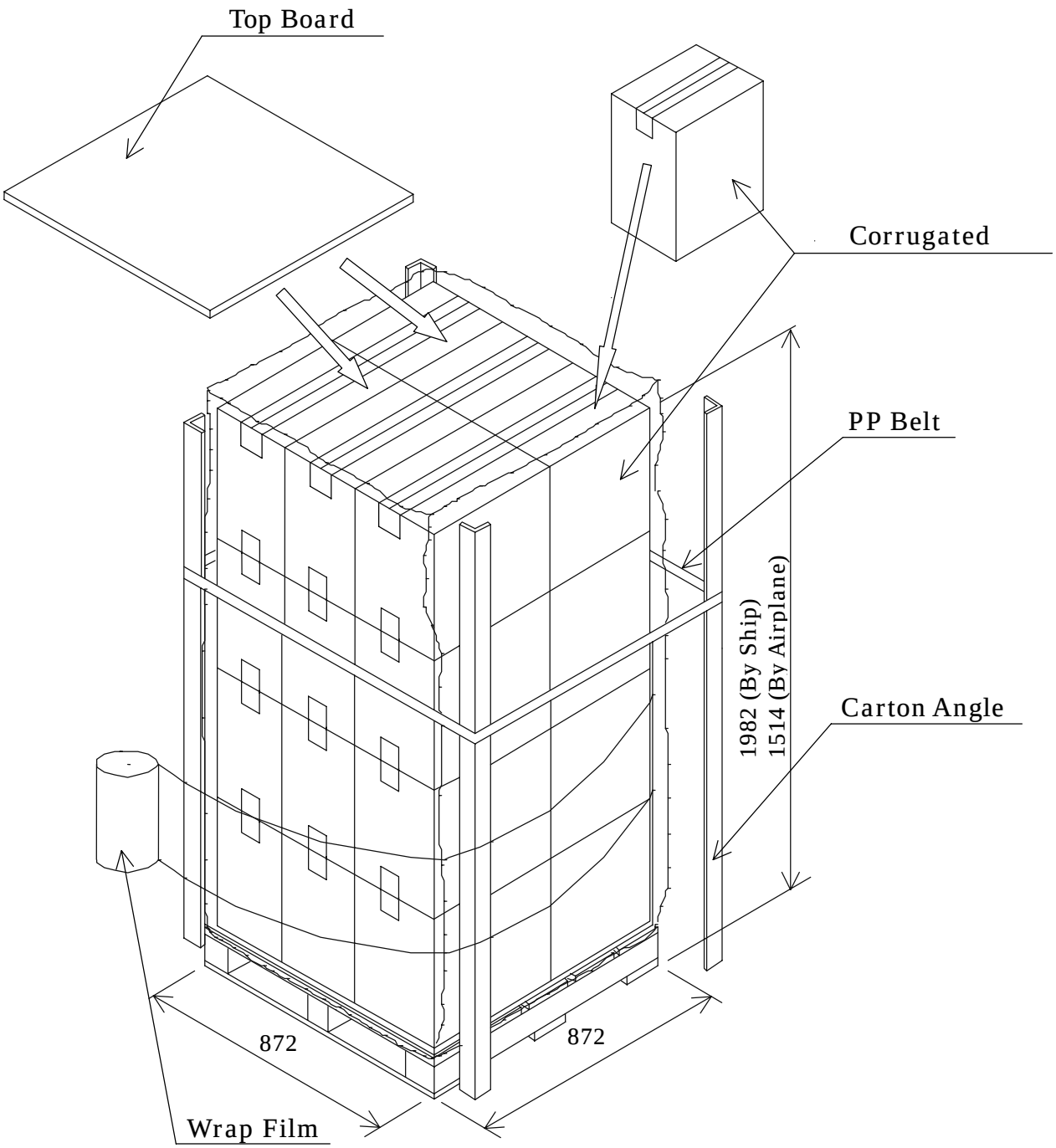


Up and Down : 3 times wrap
Middle : 2 times wrap

Note:1) 4 boxes×4 layers (maximum 16 boxes) : by ship
4 boxes×2 layers (maximum 8 boxes) : by airplane
Note:2) This drawing shows marine transportation specification.

Fig.15-2 (c) Packaging Method

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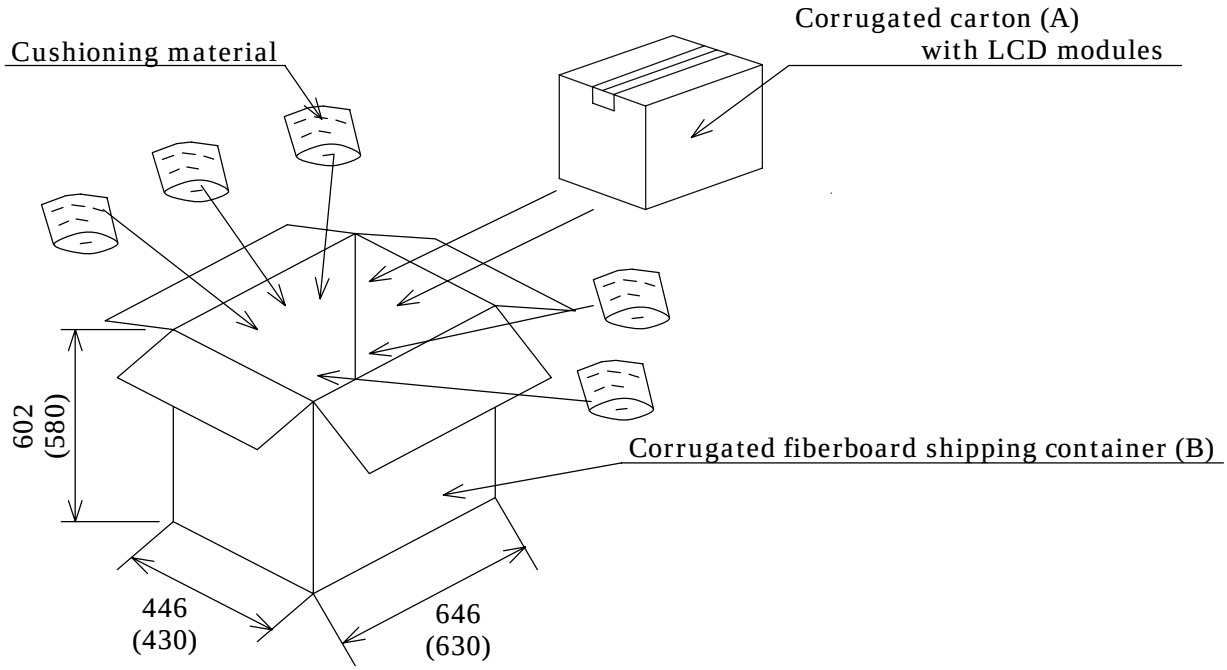


Note 1) The carton (A) should be placed in the middle of the container (B) with enough cushioning materials.

Note2) The figures in ( ) show inside measurements of the container (B).

Figure.15-2 (d) Packing method

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## 16.WARRANTY

The warranty period is one year after shipping. 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 use this LCD module properly.

### (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

**① Do 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.

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

In the LCD panel, the gap between two glass plates is kept perfectly even to maintain display properties and reliability. The hard pressure on the LCD panel may cause the following problems.

① Ununiformity of color
② Disorder of orientation of liquid crystal

Problem ① returns to normal condition after a while. Problem ② returns to normal condition by turning the power off and turning on again.
However these operations should be avoided to insure reliability.

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

・Do not press or rub the display surface with a hard tool, tweezers, etc.
・For handling, use cotton or conductive gloves so that the display surface is not soiled.
・If dust or dirt soils the display surface, clean it as follows with a soft cloth (deerskin, etc.)

[Dust] Wipe off with a soft cloth. (do not rub.)

[Dirt ] Apply clear water to a soft cloth and squeeze hard out of water drops, then lightly wipe off the specified parts. Only if the dirt is hardly wiped off, use isopropyl alcohol or ethanol.

Be careful not to splash the water or the solvents on the edge of polarizer and in the LCD unit.

The polarizer possibly exfoliates due to the solvent and water penetrated between the polarizer and the LCD panel.

Do not use unspecified solvent such as ketone (acetone, etc.) and aromatics (xylene, toluene, etc.)

(Caution) Be careful not to allow the water or solvent to enter the module.

・If saliva or water drops are left for a long period of time, the part may become deformed or discolored.

Wipe off immediately in the same way as for dirt.

・Do not allow oil to adhere to the module since excessive oil is hard to clean.

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

This may make some parts of the LCD module distorted and the quality of display may deteriorate.

### (3) Handling of LCD module

**① Do not pull the cold-cathode tube cable strongly.**

If the cable is pulled with the strength of 2kg or more, the cable may be damaged or may lose reliability.

**② Assemble the module into user's system in a dust free environment.**

Conductive foreign matter adheres to the module may cause failures.

**③ Take anti-electrostatic measures for assembling the module.**

Since the LCD module contains CMOS-ICs, the following points should be observed.

・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, tweezers, etc.).

・Do not take the module out of the conductive bag until the module is assembled.

・Do not assemble the module under low humidity (50%RH or less).

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

**⑤ Do not disassemble or remodel the LCD module.**

Disassembly or remodeling of the LCD module may result in malfunctions or deterioration of the display quality and reliability.

### (4) Precautions in regards of operating the LCD module

**① Adhere to the specified power supply sequence.**

If not followed, the CMOS-IC may cause a latch-up, or DC voltage may be applied to the liquid crystal, which cause a failure or serious deterioration in display quality.

**② Do not operate the LCD module when condensation occurs.**

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 cold environment to warm environment.

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**③ The following troubles occur when the LCD module is not used under recommended temperature.**

・Operation under high temperature(>50℃): Display colors shift to blue.

・Storage under high temperature(>60℃): The polarizer film deteriorates and contrast decreases.

・Operation under low temperature(< 0℃): The response speed decreases considerably.

・Storage under low temperature(<-20℃): The liquid crystal may solidify and become damaged.

**④ Be sure to input the control signals at the correct timing.**
If control signals (DCLK, 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 in regards of designing module mounting**

**① Excessive force should not be applied to the screen or the rear side of the LCD module.**
Excessive pressure on the screen caused by the installation of the LCD module may deteriorate display quality and reliability.
Brightness uniformity and the reliability of CCFL may decrease if the pressure is applied to the backlight module.

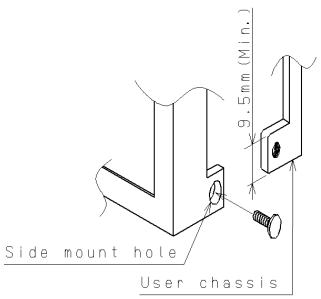
**② Avoid twisting and bending the LCD module.**
Excessive twist and bend may damage display quality and reliability.

**③ Avoid extending the power cable between the LCD module and inverter.**
This may cause the backlight to flicker or not to light.

**④ Keep the backlight cable apart from the metal enclosure of the LCD module.**
When frequency current for backlight driving leak to the metal enclosure, the desired brightness may not be assured.

**⑤ When mounting LCD module with M3 screws (x4), tighten the screws with torque below.**
**User hole : 50N(5kgf) , Side mount hole : 30N(3kgf)**

**⑥ When mounting LCD module with screws for side-mount,**
**the width of the contacting metal should be 9.5mm or more.**

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(6) Storage method

① **Do 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 parts of the module may corrode or deteriorate.

② **Store the LCD module in a Fujitsu package.**
At storing, Fujitsu packages can be stacked up to 3 boxes.
The LCD module is in an anti-static bag. Keep the module in that status.

③ **The LCD module is recommended to be stored in humidity controlled, cool and dark locations.**
Recommended storage environment
- Place : Dark (avoid direct sunlight)
- Temperature : 10～35℃
- Humidity : 50～60%RH

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

(7) Disposal Method

① **LCD module**
The components of this LCD module can be grouped into metal, resin, glass and so on. As the backlight contains CCFL which includes mercury, it must be disposed according to the local ordinance or regulations.

② **Package**
All the packages are made of recyclable papers except the anti-ESD bag.

(8) Others

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

② **Flux residue on the printed circuit board is harmless to the quality and reliability of LCD module.**
Fujitsu has adopted non-wash technology on module assembly process.

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## 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, Fujitsu 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.

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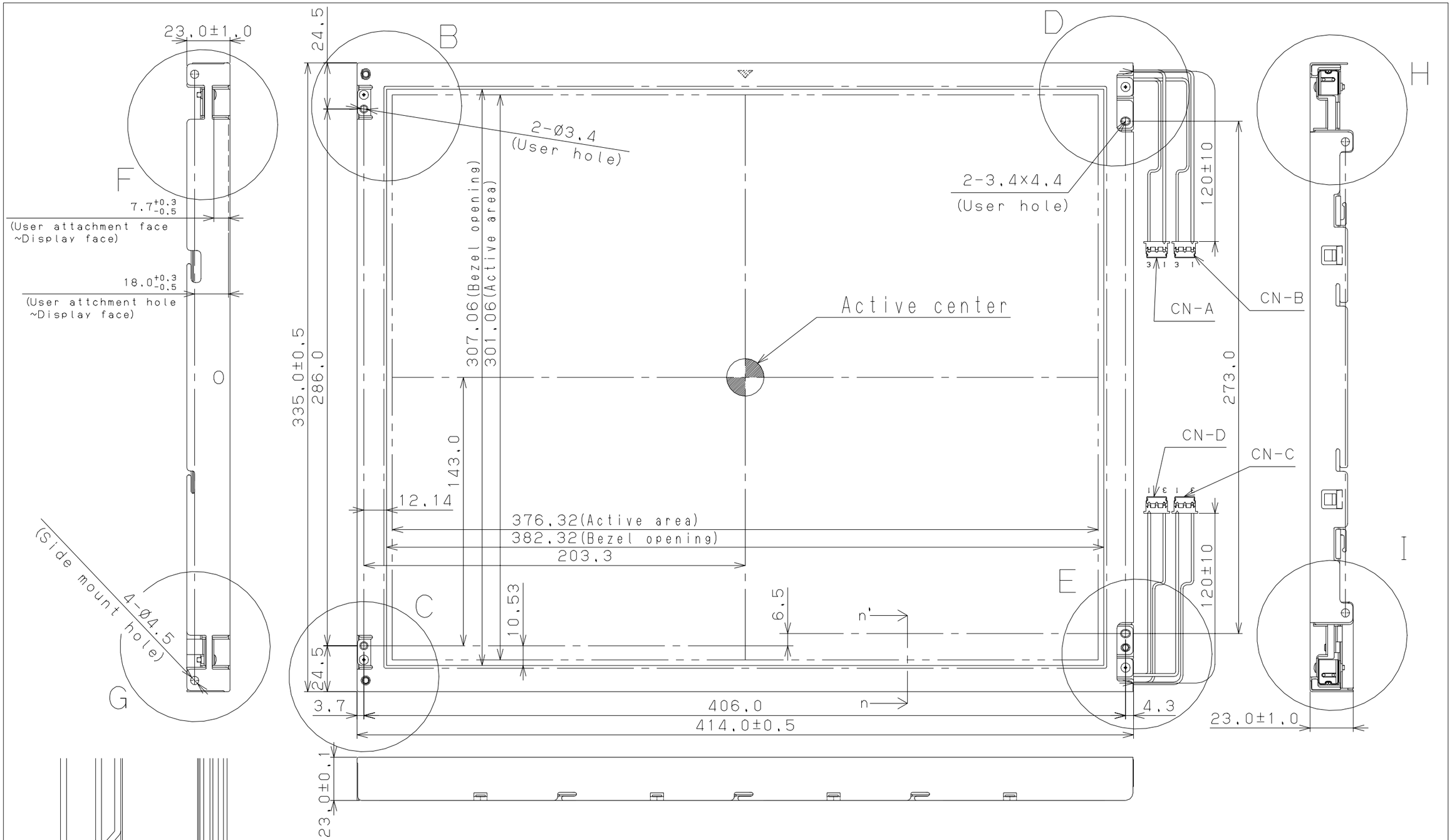
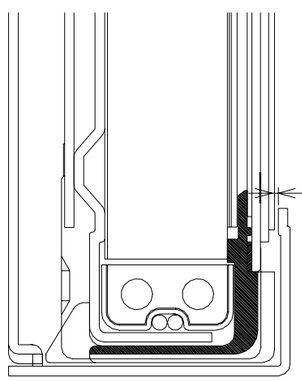



Figure 19-1 Unit outward form (front)




n-n' Cross section

NOTE
1) Unspecified tolerrance to be ±0.5

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TITLE Specification of LCD module

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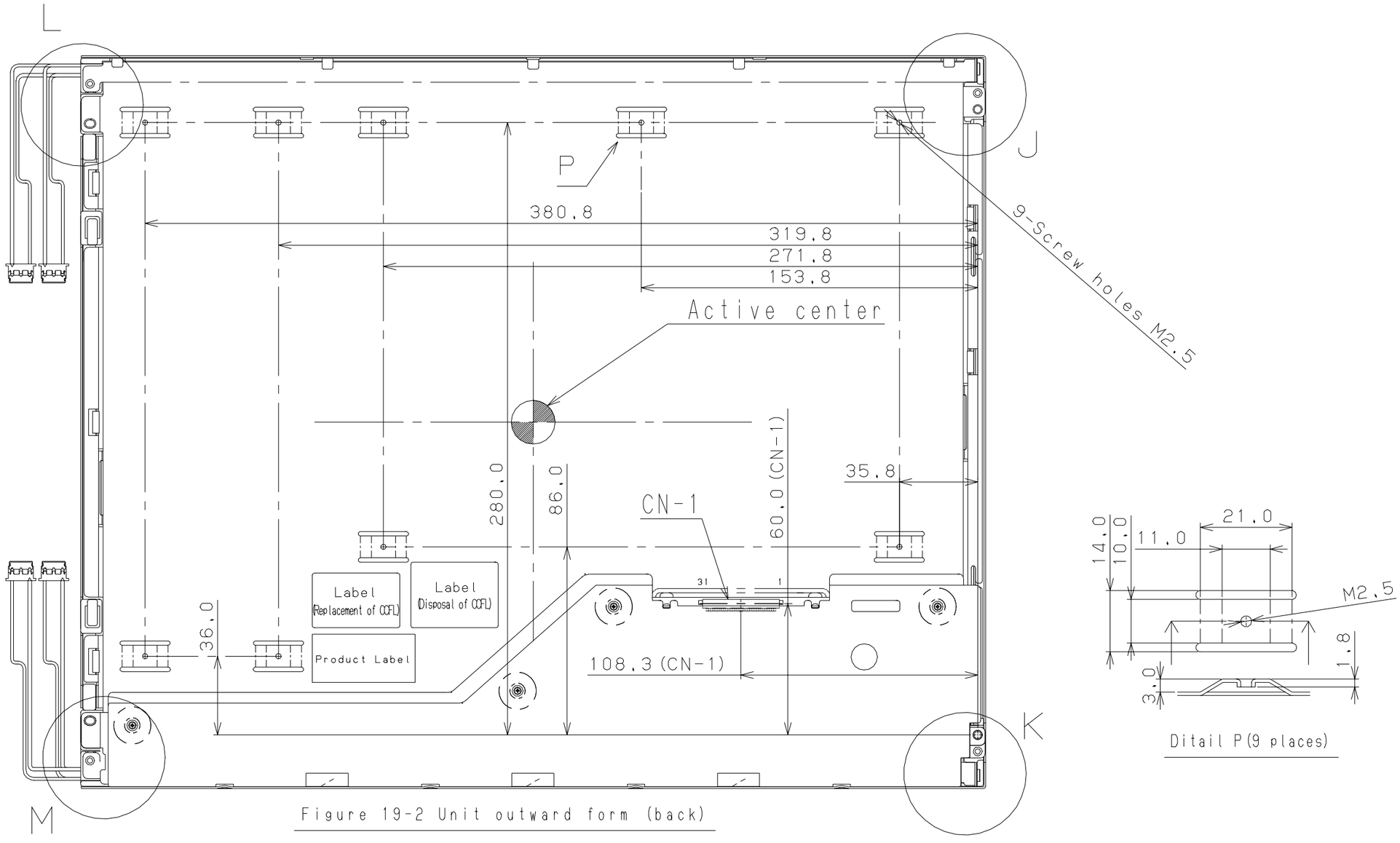


Figure 19-2 Unit outward form (back)

NOTE

2) The height of interface connector does not include that of a counterpart connector.

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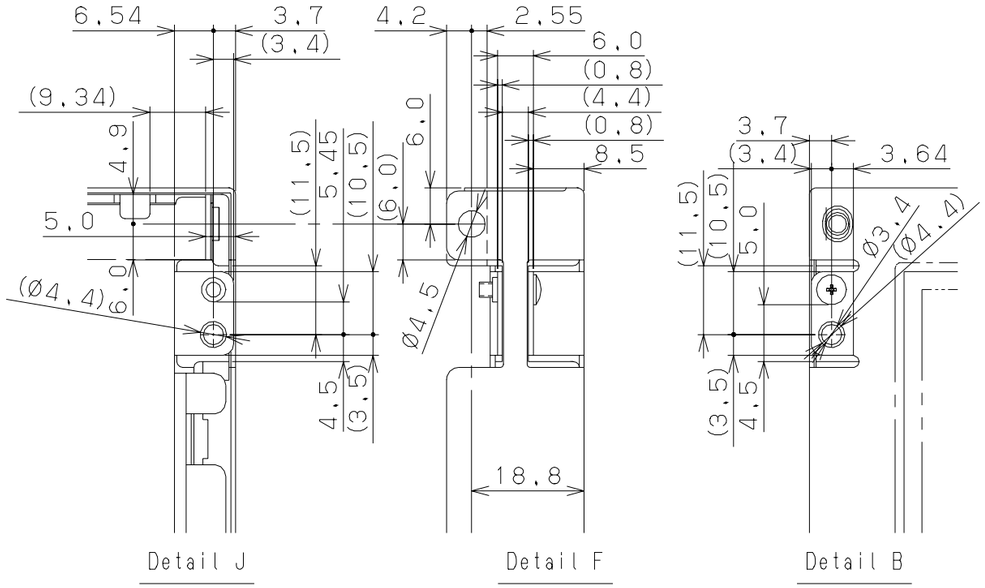


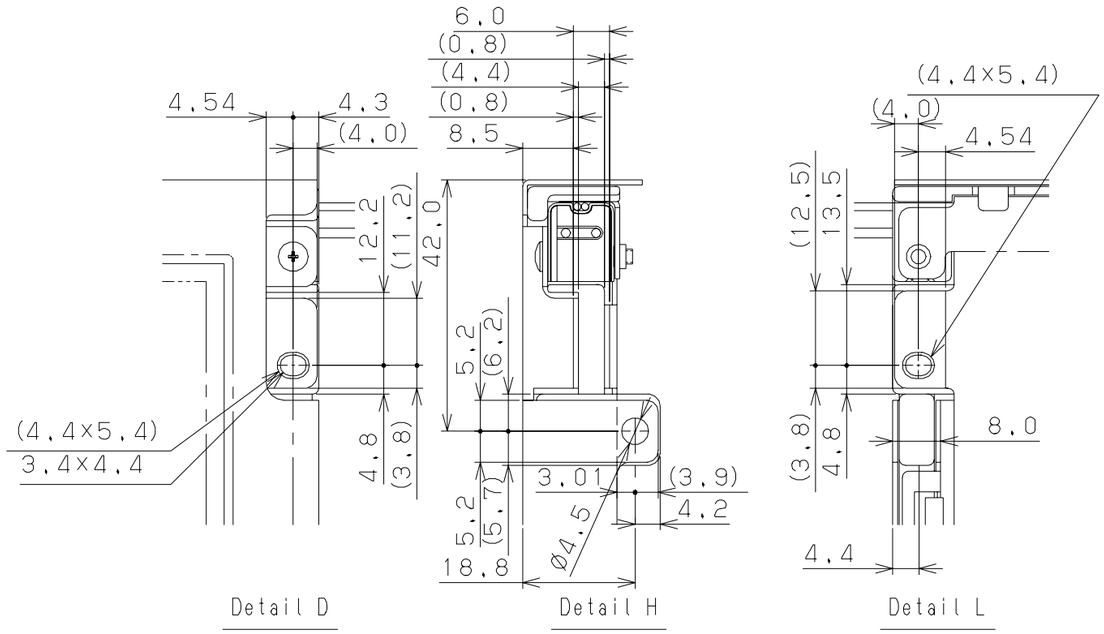


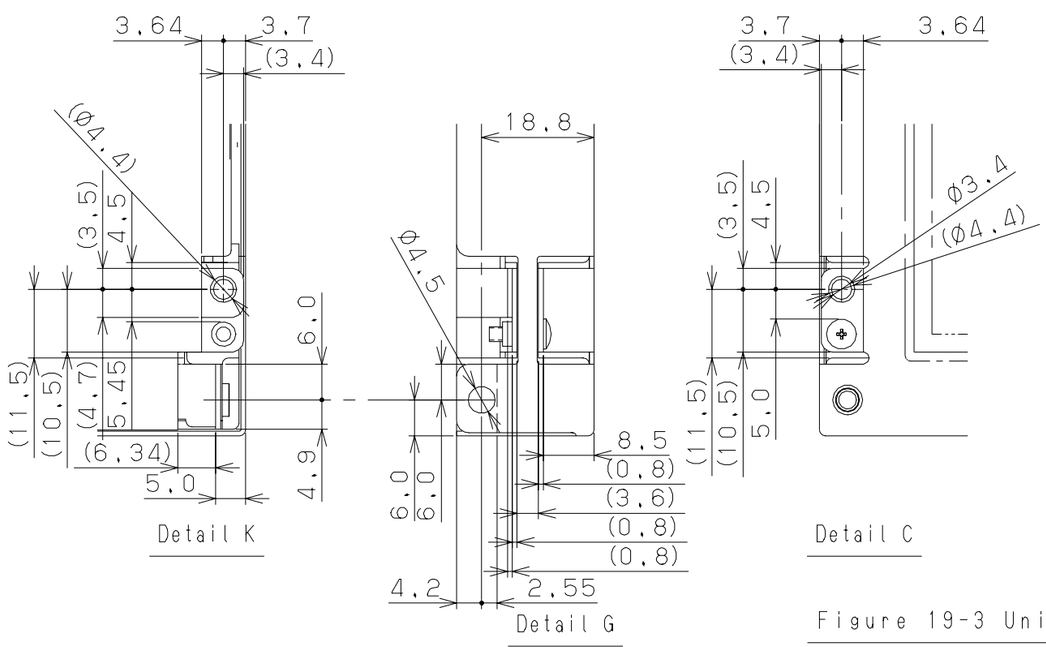


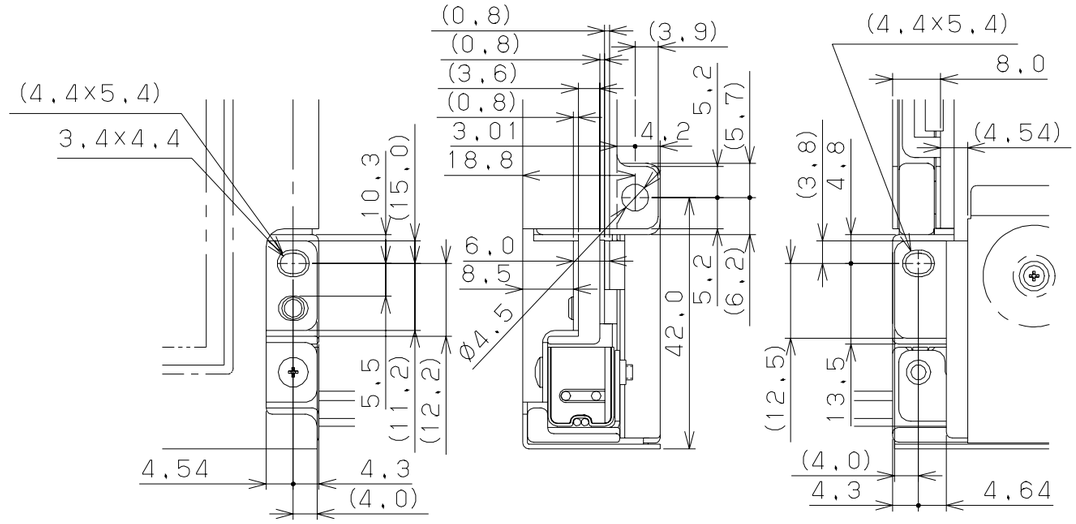


Figure 19-3 Unit outward form (detail)

NOTE
3) This page is referende.
(Not guarantee)

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