To :

# Specification of FUJITSU TFT-LCD module

# FLCV-07

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

Specification No. : Tech Bes 99/28900

Issue Date : Feb. 25, 2002

Issued by :

T. Naka

Director
LCD Design Dep.
LCD Technology Div.
LCD Group

FUJITSU LIMITED

# REVISION HISTORY

| Revision | Date | Prepared | Checked | | Approved | Summary |
|---|---|---|---|---|---|---|
| 01A | Aug. 26, 1999 | M.Miyahara | M.Fukuhara | | T.Naka | 1st issue |
| 02B | Jan. 6, 1999 | M.Miyahara | M.Fukuhara | | T.Naka | Change fuses(F1~F3) |
| 03C | June 30, 2000 | M.Miyahara | M.Fukuhara | | T.Naka | Change wire in the transformer from second-class to first-class (T1,T2) |
| 04D | Feb. 25, 2002 | M.Miyahara | M.Fukuhara | | T.Naka | Change frequency of brightness control signal from 290Hz to 271Hz. C3 and R21 are changed in accordance with this change. |

DOCUMENT CONTROL SECTION

DATE

| EDIT | DATE | DESIG. | CHECK | APPR. | DESCRIPTION |
|---|---|---|---|---|---|
| 05 | 20000811 | Miyahara | | Fukuhara | Revised p1 |
| 04 | 20000630 | Miyahara | | Fukuhara | Revised p1,3,6~8 (Add 03C) |
| 03 | 20000106 | Miyahara | | Fukuhara | Revised p1 (Add 02B) |
| 06 | 20020225 | Miyahara | | Fukuhara | Revised p1,2,6 (Add 04D) |
| DESIG. | 19990826 | Hayashimoto | CHECK | Miyahara | APPR. Fukuhara |

FLCV－07

Tech Bes 99/28900

CUST.

FUJITSU LIMITED

SHEET 1/

## ⑥1. APPLICATIONS

This specification is applied to the INVERTER module suited for 15.0-inch TFT-LCD modules shown in Table 1-1.

Table 1-1 Applied Model Number

| No. | Model Number | Product Drawing Number | Inverter Applied Revision | Remark |
|---|---|---|---|---|
| 1 | FLC38XGC6V-05□ | NA19020-C25＊ | 01A~04D all | Panel Construction: Independent Cs Type |
| 2 | FLC38XGC6V-06 | NA19020-C281/C291 | | |
| 3 | FLC38XGC6V-06S | NA19020-C282 | | |
| 4 | FLC38XGC6V-06A | NA19020-C292 | | |
| 5 | FLC38XGC6V-06B | NA19020-C293 | 04D only | Panel Construction: Cs on Gate Type |

## 2. PRODUCT NAME AND MODEL NUMBER

2-1 Product Name : INVERTER
2-2 Model Name : FLCV-07
2-3 Product Drawing Number : NA19002-4225

## 3. OVERVIEW

This INVERTER module can turn on four Cold Cathode Fluorescent Lamps (CCFLs) of the backlight.
This inverter has a function to control ON and OFF state, and regulates brightness levels by applying external signals.
The power supply of this INVERTER module is +12v DC.

## 4. ABSOLUTE MAXIMUM RATINGS

Table 4-1 shows the absolute maximum ratings.

Table 4-1 Absolute Maximum Ratings

| Item | Symbol | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|
| Supply Voltage | Vin | -0.3 | — | 14 | V |
| ON and OFF Controlling Voltage | Vcnt | -0.3 | — | Vin | V |
| Brightness Regulating Voltage | Vvr | -0.3 | — | 4.0 | V |

DOCUMENT CONTROL SECTION
DATE

| EDIT | DATE | DESIG. | CHECK | APPR. | DESCRIPTION |
|---|---|---|---|---|---|
| 06 | 20020225 | | | | Revised 1. |
| 05 | 20000811 | | | | Revised Table1-1 |

DESIG. CHECK APPR.

FLCV－07
Tech Bes 99/28900 CUST.
FUJITSU LIMITED SHEET 2/

## 5. RECOMMENDED OPERATING CONDITIONS

Table 5-1 shows the recommended operating conditions.

Table 5-1 Recommended Operating Conditions

| Item | | Symbol | MIN. | TYP. | MAX. | Unit | Remark |
|---|---|---|---|---|---|---|---|
| Supply Voltage | | Vin | 10.8 | 12.0 | 13.2 | V | |
| ON and OFF Controlling Voltage | ON | Vcnt | 0 | — | 0.8 | V | |
| | OFF | Vcnt | 2.1 | — | Vin | V | |
| Brightness Regulating Voltage | | Vvr | 0 | — | 3.5 | V | (*) |

(*) Brightness is maximum when Vvr=0v
Brightness is minimum when Vvr=3.5v

## 6. ELECTRICAL SPECIFICATIONS

Table 6-1 shows the electrical specifications.

Table 6-1 Electrical Specifications

| Item | Symbol | Condition | MIN. | TYP. | MAX. | Unit | Remark |
|---|---|---|---|---|---|---|---|
| Supply Current | Vin | Vin=12.0v, Vvr=0v | — | 1570 | 1750 | mA | |
| Lighting Frequency | f | Vin=12.0v, Vvr=0v | 40 | 50 | 60 | kHz | |
| Tube Current | Iout | Vin=12.0v, Vvr=0v | 12.0 | 14.0 | 16.0 | mA | |
| (2 tubes total) | | Vin=12.0v, Vvr=3.5v | 6.6 | 7.8 | 9.0 | mA | |
| Output Voltage | Vt | Vin=12.0v | 1500 | 1580 | — | Vrms | |
| Minimum Brightness | — | Vin=12.0v,Vvr=3.5v | — | — | 20 | % | *1 |

*1.Percentage to the maximum brightness (Vvr=0v).

## 7. OUTWARD APPEARANCE

Fig.7-1 shows outward appearance. (see page 8)

④ Frame ground(FG) patterns around fitting hole are connected to signal ground(GND).

DOCUMENT CONTROL SECTION

DATE

| EDIT | DATE | DESIG. | CHECK | APPR. | DESCRIPTION |
|---|---|---|---|---|---|
| 04 | 20000630 | | | | Revised 7. |

DESIG. CHECK APPR.

FLCV－07

Tech Bes 99/28900

CUST.

FUJITSU LIMITED

## 8. INTERFACE CONNECTOR

Table 8-1 and 8-2 shows the name and the pin assignment of interface connector.

Table 8-1 Input Signals [CN1:53261-0890 (Molex)]

| PinNo. | Symbol | Function | Remark |
|---|---|---|---|
| 1 | Vin | Power Supply (+12v) | |
| 2 | Vin | Power Supply (+12v) | |
| 3 | GND | Ground | |
| 4 | GND | Ground | |
| 5 | Vcnt | ON and OFF Controlling Voltage | (*1) |
| 6 | Vvr | Brightness Regulating Voltage | (*2) |
| 7 | N.C. | —— | |
| 8 | N.C. | —— | |

(*1) Backlight is on when Vcnt=Low.
Backlight is off when Vcnt=High.
(*2) Brightness is maximum when Vvr=0.0v.
Brightness is minimum when Vvr=3.5v.

User's Connector
HOUSING : 51021-0800 (Molex)
TERMINAL : 50058-8*00 or 50079-8*00 (Molex)

Table 8-2 Output Signals [CN2,3:SM04(4.0)B-BHS-1-TB]

| PinNo. | Symbol | Function | Remark |
|---|---|---|---|
| 1 | Vout-Hi | Lighting Voltage (High) | |
| 2 | Vout-Hi | Lighting Voltage (High) | |
| 3 | N.C. | —— | |
| 4 | Vout-Lo | Lighting Voltage (Low) | |

DOCUMENT CONTROL SECTION

DATE

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

FLCV－07

Tech Bes 99/28900

CUST.

FUJITSU LIMITED

## 9. ENVIRONMENTAL SPECIFICATIONS

Table 9-1 shows the environmental specifications.

Table 9-1 Environmental Specifications

| Item | Condition | | Remark |
|---|---|---|---|
| Temperature | Operation | 0～50℃ | |
| | Storage | -20～60℃ | |
| Humidity | Operation | 20～85%RH | No condensation |
| | Storage | 5～85%RH | |

## 10. INDICATIONS

This module has the following indications.

(1) Module Number : FLCV-07

② (2) Manufacturing Number: □ □ □ □ (seal)

- □ (4th): Control number(1～9)
- □ (3rd): Manufacturing day (see table 10-1)
- □ (2nd): Manufacturing month (Oct.=A, Nov.=B, Dec.=C)
- □ (1st): Last digit of manufacturing year

Table 10-1 Last Digit of manufacturing day

| Day | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Symbol | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F | G |

| Day | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Symbol | H | K | L | M | N | P | Q | R | S | T | V | W | X | Y | Z |

(3) Version Number: □ □ □ (seal)

- □ (3rd): Functional version
- □ (2nd): Operational version

(4) Company Name: FUJITSU LIMITED

(5) Caution of high-voltage

(6) UL No.

DOCUMENT CONTROL SECTION

DATE

| EDIT | DATE | DESIG. | CHECK | APPR. | DESCRIPTION |
|---|---|---|---|---|---|
| 02 | 19990924 | | | | Corrected 10.(2) |

DESIG. CHECK APPR.

FLCV－07

Tech Bes 99/28900

CUST.

FUJITSU LIMITED

## ④12. PRECAUTIONS

**As this inverter module generates a high voltage, incorrect operation may occur electric shock, smoke, and fire.**

**Please adhere to the following precautions to secure high reliability and safety.**

(1) Make sure that the inverter is protected from the application of abnormal voltage even when the equipment is broken down and operates abnormally.

(2) Transformer and coil generate magnetic flux leakage. Please install the inverter in the right position of the equipment and confirm that it does not cause any error operation, or harm any quality and reliability of the equipment.

(3) Be careful of electric shock, for there stays a high voltage in the internal circuit. Turn off the power supply before pulling in and pulling out the signal connector.

(4) There is no indication to warn you about the high voltage. Make sure that only authorized technician should handle the inverter.
If the equipment is designed so that the inverter is possibly touched by outsider, it is requested to indicate warnings clearly for fear of electric shock and burns.

(5) Please keep the inverter out of water drop and dust because it may give any trouble.

(6) Some trouble may happen if any conductive materials such as metal touch the terminal. Make sure that any conductive material around the inverter doesn't touch the terminal.

(7) When designing equipment, high voltage part of inverter, that is the wiring between transformer and output connector, must keep the distance of 3mm or more from any material. If there are any conductive materials around the inverter, we recommend to insert insulator, even though the conductive material is apart 3mm from the inverter.

(8) Please pick up from the package and incorporate the inverter into the equipment one by one. It may damage inverters to pile them up.
Please touch the edge of printed circuit board only, not electric parts.

(9) Excessive mechanical force to the electric parts and printed circuit board of the inverter may become the cause of any trouble such as pattern exfoliation. Handle this inverter carefully.

(10) Please don't give any shock to the transformer of the inverter or hurt the signal cable. Even rare shortage may become the cause of smoke and fire.

(11) If it is difficult to measure the temperature around the inverter, please consider that the temperature of transformer and inductor should be as follows.
-Transformer(T1,T2):under 95℃
-Inductor(L1,L2):under 100℃

⑥ (12) Interference may be seen depending on the combination of inverter and LCD module. Please refer to Table1-1.

DOCUMENT CONTROL SECTION

DATE

| EDIT | DATE | DESIG. | CHECK | APPR. | DESCRIPTION |
|---|---|---|---|---|---|
| 06 | 20020225 | | | | Added 12(12) |
| 04 | 20000630 | | | | Revised 12. |

DESIG. CHECK APPR.

FLCV－07

Tech Bes 99/28900 CUST.

FUJITSU LIMITED SHEET 6/

## 13. WARRANTY

The warranty period is one year from manufacturing date. Products failed during this period due to the causes other than intentional damaging acts are replaced without charge.

## 14. OTHERS

Specifications of this inverter module are subject to change.

If any doubt about the specification is raised, both parties must make the best efforts to reach agreement.

This inverter is not intended to be used for the equipment which requires extremely high reliability, such as aerospace equipment, nuclear control systems, and medical equipment for life support.

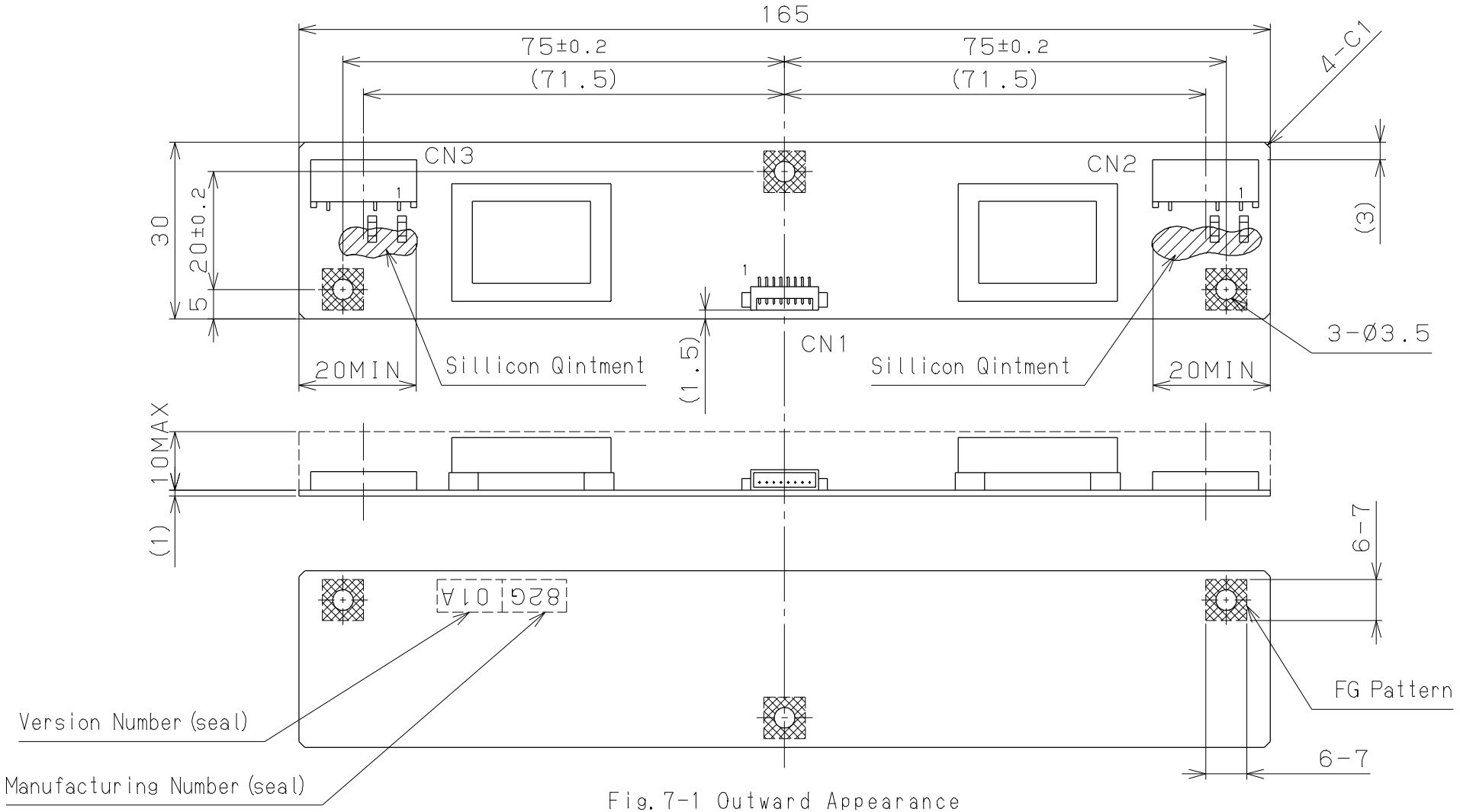


Fig. 7-1 Outward Appearance

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

TITLE FLCV-07

DRAW. NO. Tech Bes 99/28900

SHEET 8 / 8