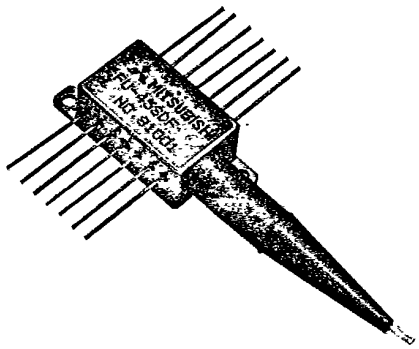
# FU-45SDF-3
# Analog Application
## 1.3μm DFB-LD Module with Singlemode Fiber Pigtail

T-41-07

Module type FU-45SDF-3 has been developed for coupling a singlemode optical fiber and a 1.3μm wavelength InGaAsP LD (Laser diode).

The module is the optimum light source for use in high capacity long haul analog optical communication systems.




FU-45SDF-3

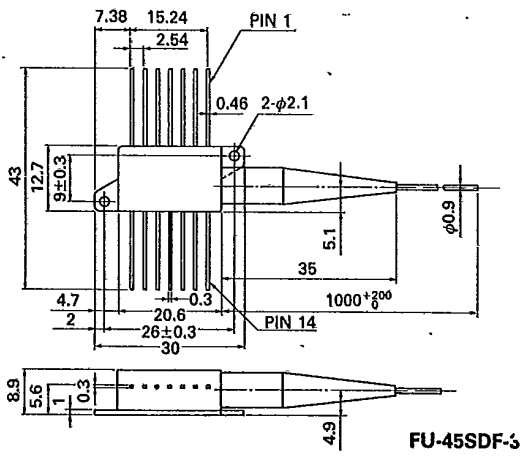
### FEATURES

- Distributed Feedback (DFB) Laser diode
- High-speed response
- Emission wavelength is in 1.3μm band
- With optical isolator
- With thermal electric cooler
- Butterfly package
- With photodiodes for optical output monitor
- Diodes are hermetically sealed

### ABSOLUTE MAXIMUM RATINGS ($T_{LD}$=25°C)

| Items | | Symbols | Conditions | Ratings | Units |
|---|---|---|---|---|---|
| Laser diode | Optical output power from fiber end | $P_F$ | CW | 4 | mW |
| | Reverse Voltage | $V_{RL}$ | — | 2 | V |
| Photodiode for monitoring | Reverse Voltage | $V_{RD}$ | — | 20 | V |
| | Forward Current | $I_{FD}$ | — | 2 | mA |
| Operating case temperature | | $T_C$ | — | −20~65 | °C |
| Storage temperature | | $T_{stg}$ | — | −40~70 | °C |

### OUTLINE DRAWINGS Unit (mm)




FU-45SDF-3

| PIN | FUNCTION |
|---|---|
| 1 | COOLER ANODE |
| 2 | THERMISTER |
| 3 | PD ANODE |
| 4 | PD CATHODE |
| 5 | GND |
| 6 | NC |
| 7 | NC |
| 8 | NC |
| 9 | NC |
| 10 | GND |
| 11 | LD CATHODE |
| 12 | NC |
| 13 | LD ANODE, GND |
| 14 | COOLER CATHODE |



MITSUBISHI ELECTRIC

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## CHARACTERISTICS ($T_C$=25°C, $T_{LD}$=25°C, unless otherwise noted)

| Items | Symbols | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Threshold current | $I_{th}$ | CW | — | 15 | 40 | mA |
| Operating current | $I_{op}$ | CW | — | 46 | 80 | mA |
| Operating voltage | $V_{op}$ | CW, $I_F$=$I_{op}$ (Note 1) | — | 1.3 | 1.8 | V |
| Optical output power from fiber end | $P_F$ | CW, $I_F$=$I_{op}$ | 1 | 2 | — | mW |
| Central wavelenth | $\lambda_C$ | CW, $I_F$=$I_{op}$ | 1290 | 1310 | 1330 | nm |
| Side mode suppression ratio | $S_r$ | CW, $I_F$=$I_{op}$ | 30 | 35 | — | dB |
| Cutoff frequency (−1.5dB) | $f_c$ | $I_F$=$I_{op}$ | 2 | — | — | GHz |
| 2nd order distortion | $D_2$ | 2 tone test (Note 2)<br>$f_1$=244MHz<br>$f_2$=250MHz<br>$\Delta M$=0.35 (each)<br>$I_F$ (average)=$I_{op}$<br>Rmodule >25dB | — | −40 | −30 | dBc |
| 3rd order distortion | $D_3$ | | — | −60 | −45 | dBc |
| Relative intensity noise | $N_r$ | | — | −155 | −150 | dB/Hz |
| Tracking error (Note 3) | $E_t$ | $T_C$=−20~65°C, APC, ATC | — | 0.3 | — | dB |
| Differential efficiency | $\eta$ | — | 0.02 | 0.06 | 0.2 | mW/mA |
| Monitor current | $I_{mon}$ | CW, $I_F$=$I_{op}$, $V_{RD}$=5V | 0.2 | — | — | mA |
| Dark current (Photodiode) | $I_D$ | $V_{RD}$=5V | — | 0.1 | 1 | μA |
| Capacitance (Photodiode) | $C_t$ | $V_{RD}$=5V, f=1MHz | — | 10 | — | pF |

Note 1) $I_F$: Forward current (LD)

Note 2) $f_1$, $f_2$: Modulation frequency
$\Delta M$: Optical modulation depth/Carrier
Rmodule: Optical return loss from fiber to LD module

$$\text{Rmodule} = -10 \cdot \log \frac{P_{FR}}{P_F}$$

where $P_{FR}$: Reflected optical power to LD module

Note 3) $E_r$=MAX $\left| 10 \cdot \log \frac{P_F}{P_F\ (25°C)} \right|$

## THERMAL CHARACTERISTICS ($T_{LD}$=25°C, $T_C$=−20~65°C)

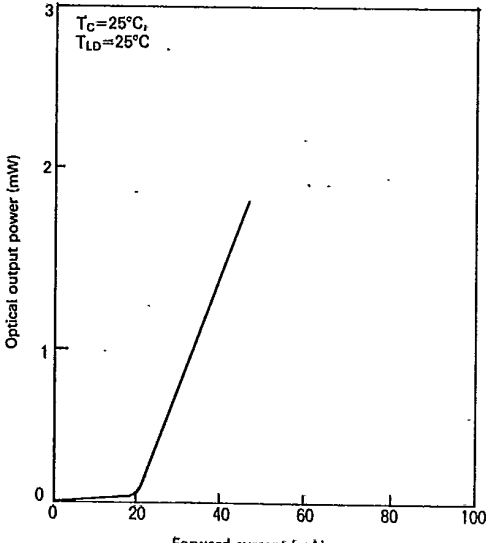
| Items | Symbols | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Thermister resistance | $R_{th}$ | $T_{LD}$=25°C | 9.5 | 10 | 10.5 | kΩ |
| B constant of thermister resistance | B | — | — | 3950 | — | K |
| Cooling capacity | $\Delta T$ | $T_C$=65°C | 40 | — | — | °C |
| Cooler current | $I_{pc}$ | $\Delta T$=40°C | — | 0.6 | 1 | A |
| Cooler voltage | $V_{pc}$ | $\Delta T$=40°C | — | 1.2 | 2 | V |

## FIBER PIGTAIL SPECIFICATIONS

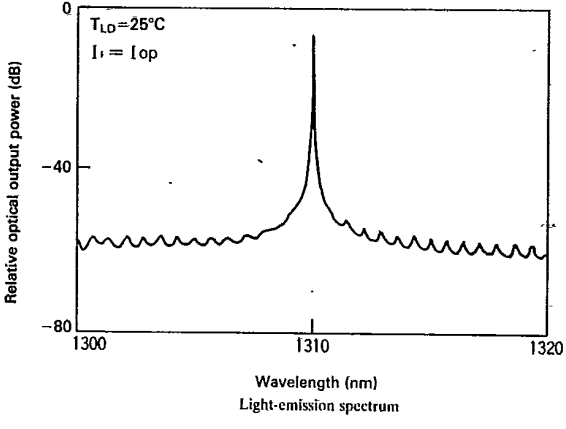
| Items | Specifications | Units |
|---|---|---|
| Type | SM | — |
| Mode-field dia. | 10±1 | μm |
| Cladding dia. | 125±2 | μm |
| Jacket dia. | 0.9 | mm |

T-41-07

## EXAMPLE OF CHARACTERISTICS




Forward current vs. optical output power




Light-emission spectrum