

# FU-68PDF-2

1.55 μm DFB-LD MODULE WITH POLARIZATION MAINTAINING FIBER PIGTAIL

## DESCRIPTION

Module type FU-68PDF-2 is a 1.55 μm DFB-LD module with polarization maintaining optical fiber. This module is suitable to a light source for use in communication systems with external modulator.

## FEATURES

- Distributed feedback (DFB) laser diode
- Input impedance is 25Ω
- Emission wavelength is in 1.55 μm band
- Polarization maintaining optical fiber pig-tail
- Built-in optical isolator
- Built-in thermal electric cooler
- Butterfly package
- Narrow spectral line width
- With photodiode for optical output monitor

## APPLICATION

Trunk Line, CATV

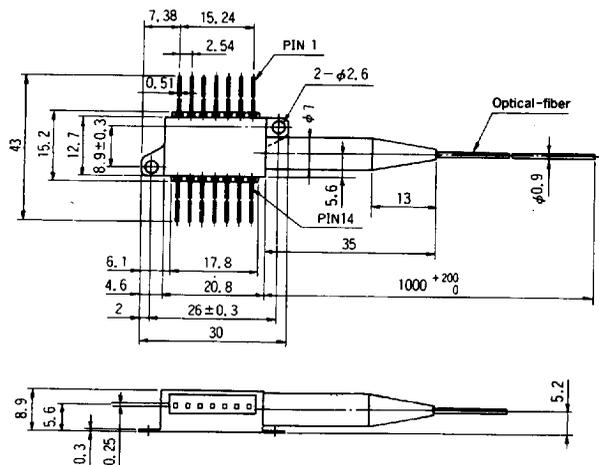
## ABSOLUTE MAXIMUM RATINGS (T<sub>LD</sub> = 25 °C)

Parameter	Symbol	Conditions	Rating	Unit	
Laser diode	Optical output power from fiber end	P <sub>F</sub>	CW	15	mW
	Forward current	I <sub>F</sub>	CW	150	mA
	Reverse voltage	V <sub>RL</sub>	-	2	V
Photodiode for monitoring	Reverse voltage	V <sub>RD</sub>	-	20	V
	Forward current	I <sub>FD</sub>	-	2	mA
Cooler (Note)	Voltage	V <sub>pem</sub>	-	2.4	V
	Current	I <sub>pem</sub>	-	1.2	A
Operating case temperature	T <sub>C</sub>	-	- 20 ~ + 65	°C	
Storage temperature	T <sub>stg</sub>	-	- 40 ~ + 70	°C	

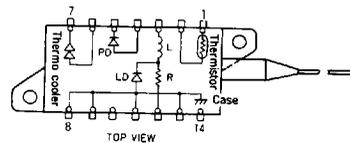
Note. Even if the thermo-electric cooler (TEC) is operated within the rated conditions, uncontrolled current loading or operation without heatsink may easily damage the module by exceeding the storage temperature range. Thermistor resistance should be properly monitored by the feedback circuit during TEC operation to avoid the catastrophic damage.

## OUTLINE DIAGRAM

(Unit : mm)



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



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**ELECTRICAL/OPTICAL CHARACTERISTICS** (T<sub>LD</sub> = 25°C, T<sub>c</sub> = 25°C, unless otherwise noted)

Parameter	Symbol	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
Threshold current	I <sub>th</sub>	CW	-	12	40	mA
Operating current	I <sub>OP</sub>	CW	-	55	90	mA
Operating voltage	V <sub>OP</sub>	CW, I <sub>F</sub> = I <sub>OP</sub> (Note 1)	-	1.3	1.8	V
Input impedance	Z <sub>in</sub>	I <sub>F</sub> = I <sub>OP</sub>	-	25	-	Ω
Optical output power from fiber end	P <sub>F</sub>	CW, I <sub>F</sub> = I <sub>OP</sub>	4	6	-	mW
Light-emission central wavelength	λ <sub>c</sub>	CW, I <sub>F</sub> = I <sub>OP</sub>	1530	1550	1570	nm
Spectral line width	Δf	CW, I <sub>F</sub> = I <sub>OP</sub>	-	20	30	MHz
Side mode suppression ratio	Sr	CW, I <sub>F</sub> = I <sub>OP</sub>	33	40	-	dB
Cutoff frequency (-1.5dB optical)	f <sub>c</sub>	I <sub>F</sub> = I <sub>OP</sub>	2	-	-	GHz
Extinction ratio	Ex	CW, I <sub>F</sub> = I <sub>OP</sub>	20	25	-	dB
Relative intensity noise	Nr	CW, I <sub>F</sub> = I <sub>OP</sub>	-	-155	-145	dB/Hz
Tracking error (Note 2)	Er	T <sub>c</sub> = -20~+65°C, APC, ATC	-	0.3	-	dB
Differential efficiency	η	-	0.09	0.15	0.35	mW/mA
Monitor current	I <sub>mon</sub>	CW, I <sub>F</sub> = I <sub>OP</sub> , V <sub>RD</sub> = 5V	0.1	-	-	mA
Optical isolation	I <sub>so</sub>	-	30	-	-	dB
Dark current (PD)	I <sub>d</sub>	V <sub>RD</sub> = 5V	-	0.1	1	μA
Capacitance (PD)	C <sub>t</sub>	V <sub>RD</sub> = 5V, f = 1MHz	-	10	-	pF

Note 1. I<sub>F</sub>: LD forward current

$$Er = \text{MAX} \left| 10 \cdot \log \frac{P_F}{P_F(25^\circ\text{C})} \right|$$

**THERMAL CHARACTERISTICS** (T<sub>LD</sub> = 25°C, T<sub>c</sub> = -20~+65°C)

Parameter	Symbol	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
Thermistor resistance	R <sub>th</sub>	T <sub>LD</sub> = 25°C	9.5	10	10.5	kΩ
B constant of thermistor resistance	B	-	-	3950	-	K
Cooling capacity	ΔT	T <sub>c</sub> = 65°C	40	-	-	°C
Cooler current	I <sub>pe</sub>	ΔT = 40°C	-	0.6	1	A
Cooler voltage	V <sub>pe</sub>	ΔT = 40°C	-	1.2	2	V

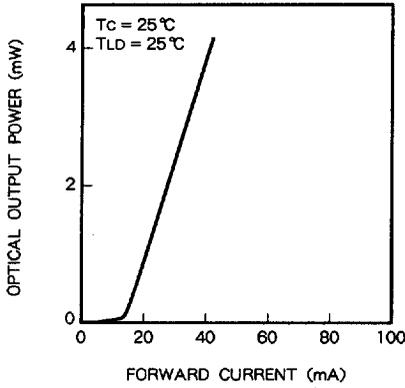
**OPTICAL-FIBER SPECIFICATIONS**

Parameter	Limits	Unit
Type	PM (Note 3)	-
Mode-field dia.	11 ± 1	μm
Cladding dia.	125 ± 3	μm
Jacket dia.	0.9 typ.	mm
Polarization axis	slow axis	-

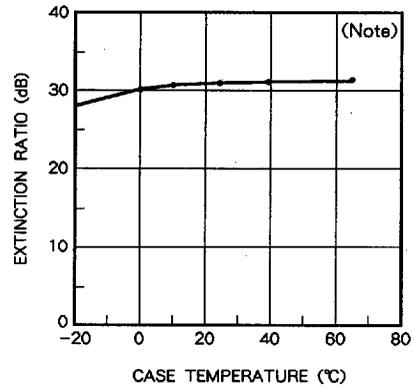
Note 3. Panda fiber (Sumitomo : PM-155)

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TYPICAL CHARACTERISTICS



FORWARD CURRENT VS. OPTICAL OUTPUT POWER



TEMPERATURE DEPENDENCE OF EXTINCTION RATIO

Note. The direction of polarization is set into the slow axis of a fiber.  
 Polarization extinction ratio is the worst value when the polarization interference is caused by bending a fiber.