

Approved	Approved	Charged
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Customer	Approved	Approved

SPECIFICATION PROPOSAL  
for  
FU-69PDF-V620Mxx

(8ch, 350GHz range temperature tunable, Tc=-20~70degC)

***PRELIMINARY***

A	B	C	D
	x		
Date		Approved	
27.Sep.'01		T.Nambara	

**PRELIMINARY**

MITSUBISHI (OPTICAL DEVICES)

**FU-69PDF-V620Mxx****1.55  $\mu$ m DFB-LD MODULE WITH POLARIZATION MAINTAINING FIBER PIGTAIL  
(WAVELENGTH SELECTED, BIAS CIRCUIT INTEGRATED, DIGITAL APPLICATION)****DESCRIPTION**

Module type FU-69PDF-V620Mxx is a 1.55 $\mu$ m DFB-LD module with polarization maintaining optical fiber. This module is suitable to a CW light source for external modulator for use in 2.5Gb/s and 10Gb/s digital optical communication systems. This module is prepared in accordance with ITU-T recommendation wavelength channel plan for Dense-WDM transmission.

**FEATURES**

- Multi quantum wells (MQW) DFB Laser Diode module
- Input impedance is 25 $\Omega$
- Emission wavelength is in 1.55 $\mu$ m band
- Polarization maintaining optical fiber pig-tail
- Built-in optical isolator
- Built-in thermal electric cooler
- Butterfly package
- With photodiode for optical output monitor
- Temperature tunable 350GHz

**APPLICATION**

High speed transmission systems (~10Gb/s)  
Dense-WDM systems

**ABSOLUTE MAXIMUM RATINGS** (T<sub>ld</sub>=T<sub>set</sub>)

Parameter		Symbol	Conditions	Rating	Unit
Laser diode	Optical output power	Pf	CW	24	mW
	Forward current	I <sub>f</sub>	CW	150	mA
	Reverse voltage	V <sub>rl</sub>	-	2	V
Photodiode	Reverse voltage	V <sub>rd</sub>	-	20	V
	Forward current	I <sub>fd</sub>	-	2	mA
Thermo-electric cooler (Note)	Cooler current	I <sub>pe</sub>	-	3.5	A
	Cooler voltage	V <sub>pe</sub>	-	5	V
Operating case temperature		T <sub>c</sub>	-	-20 ~ 70	°C
Storage temperature		T <sub>stg</sub>	-	-40 ~ 85	°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.

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**MITSUBISHI (OPTICAL DEVICES)**  
**FU-69PDF-V620Mxx**
**1.55  $\mu\text{m}$  DFB-LD MODULE WITH POLARIZATION MAINTAINING FIBER PIGTAIL  
(WAVELENGTH SELECTED, BIAS CIRCUIT INTEGRATED, DIGITAL APPLICATION)**
**ELECTRICAL/OPTICAL CHARACTERISTICS** ( $T_{\text{ld}}=T_{\text{set1}}, T_{\text{set2}}, T_{\text{set3}}, T_{\text{set4}}, T_{\text{set5}}, T_{\text{set6}}, T_{\text{set7}}, T_{\text{set8}}, T_{\text{c}}=25^{\circ}\text{C}$   
unless otherwise noted)

Parameter	Symbol	Test Conditions	Limits			Unit
			Min.	Typ.	Max.	
Threshold current	$I_{\text{th}}$	CW	-	10	25	mA
Operating current	$I_{\text{op}}$	CW, $P_{\text{f}}=20\text{mW}$	-	-	130	mA
Operating voltage	$V_{\text{op}}$	CW, $P_{\text{f}}=20\text{mW}$	-	-	2	V
Input impedance	$Z_{\text{in}}$	$P_{\text{f}}=20\text{mW}$	-	25	-	$\Omega$
Light-emission central wavelength	$\lambda_{1\sim 8}$	CW, $P_{\text{f}}=20\text{mW}$ , $T_{\text{ld}}=T_{\text{set1}\sim 8}$	(Note 1)			nm
Central wavelength drift with case temp.	$\Delta\lambda_{\text{c}}/\Delta T_{\text{c}}$	$T_{\text{c}}=-20\sim 70^{\circ}\text{C}$	-1	-	0	$\text{pm}/^{\circ}\text{C}$
Laser operating temperature	$T_{\text{set1}\sim 8}$	-	-30	-	35	$^{\circ}\text{C}$
Spectral line width	$\Delta f$	CW, $P_{\text{f}}=20\text{mW}$	-	-	10	MHz
Side mode suppression ratio	$S_{\text{r}}$	CW, $P_{\text{f}}=20\text{mW}$	33	40	-	dB
Cutoff frequency (-1.5dB optical)	$f_{\text{c}}$	$P_{\text{f}}=20\text{mW}$	0.5	-	-	GHz
Polarization extinction ratio	$E_{\text{x}}$	CW, $P_{\text{f}}=20\text{mW}$	20	25	-	dB
Relative intensity noise	$N_{\text{r}}$	CW, $P_{\text{f}}=20\text{mW}$ , 0.5~3GHz	-	-155	-145	dB/Hz
Tracking error (Note 2)	$E_{\text{r}}$	$T_{\text{c}}=-20\sim 70^{\circ}\text{C}$ , APC, ATC	-	-	0.5	dB
Differential efficiency	$\eta$	CW, $P_{\text{f}}=20\text{mW}$	0.15	-	-	mW/ mA
Monitor current	$I_{\text{mon}}$	CW, $P_{\text{f}}=20\text{mW}$ , $V_{\text{rd}}=5\text{V}$	0.2	-	4	mA
Optical isolation	$I_{\text{so}}$	$T_{\text{c}}=25^{\circ}\text{C}$	35	-	-	dB
		$T_{\text{c}}=-20\sim 70^{\circ}\text{C}$	23	-	-	
Dark current (PD)	$I_{\text{d}}$	$V_{\text{rd}}=5\text{V}$ , $T_{\text{c}}=-20\sim 70^{\circ}\text{C}$	-	-	0.1	$\mu\text{A}$
Capacitance (PD)	$C_{\text{t}}$	$V_{\text{rd}}=5\text{V}$ , $f=1\text{MHz}$	-	-	10	pF

Note 1) See Table 1.

Note 2)  $E_{\text{r}}=\max\{10\times\log(P_{\text{f}} / P_{\text{f}}@25^{\circ}\text{C})\}$

**PRELIMINARY**

**mitsubishi (optical devices)**  
**FU-69PDF-V620Mxx**

**1.55  $\mu\text{m}$  DFB-LD MODULE WITH POLARIZATION MAINTAINING FIBER PIGTAIL  
(WAVELENGTH SELECTED, BIAS CIRCUIT INTEGRATED, DIGITAL APPLICATION)**

**THERMAL CHARACTERISTICS (T<sub>c</sub>=-20~70°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	k $\Omega$
B constant of R <sub>th</sub>	B	-	-	3950	-	K
Cooling capacity	$\Delta\text{T}$	P <sub>f</sub> =20mW, T <sub>c</sub> =70°C	100	-	-	°C
Cooler current	I <sub>pe</sub>	P <sub>f</sub> =20mW, T <sub>c</sub> =70°C, T <sub>ld</sub> =T <sub>set1</sub>	-	-	3	A
Cooler voltage	V <sub>pe</sub>	P <sub>f</sub> =20mW, T <sub>c</sub> =70°C, T <sub>ld</sub> =T <sub>set1</sub>	-	-	4	V

**FIBER PIGTAIL SPECIFICATIONS**

Parameter	Limits	Unit
Type	PM (Note 3)	-
Mode field diameter	10.5+/-1	$\mu\text{m}$
Cladding diameter	125+/-3	$\mu\text{m}$
Secondary coating outer diameter	0.9+/-0.1	mm
Polarization axis	slow axis	-
Connector	FC/PC	-
Optical return loss of connector	40 (min)	dB

Note 3) PMF - Sumitomo Panda fiber (PM-155)

**DOCUMENTATION**

- Fiber output power vs. Laser forward current at T<sub>ld</sub>=T<sub>set8</sub> and T<sub>c</sub>=25°C
- Threshold current (I<sub>th</sub>) at T<sub>ld</sub>=T<sub>set8</sub> and T<sub>c</sub>=25°C
- Laser forward current (I<sub>op</sub>) at P<sub>f</sub>=20mW, T<sub>ld</sub>=T<sub>set8</sub> and T<sub>c</sub>=25°C
- Laser forward voltage (V<sub>op</sub>) at P<sub>f</sub>=20mW, T<sub>ld</sub>=T<sub>set8</sub> and T<sub>c</sub>=25°C
- Laser operating temperature (T<sub>set1</sub> and T<sub>set8</sub>) (Note 4)
- Monitor current (I<sub>mon</sub>) at P<sub>f</sub>=20mW, T<sub>ld</sub>=T<sub>set8</sub> and T<sub>c</sub>=25°C
- Thermistor resistance (R<sub>th1</sub>) at P<sub>f</sub>=20mW, T<sub>ld</sub>=T<sub>set1</sub> and T<sub>c</sub>=25°C
- Thermistor resistance (R<sub>th8</sub>) at P<sub>f</sub>=20mW, T<sub>ld</sub>=T<sub>set8</sub> and T<sub>c</sub>=25°C
- Cooler current (I<sub>pe</sub>) at P<sub>f</sub>=20mW, T<sub>ld</sub>=T<sub>set1</sub> and T<sub>c</sub>=70°C
- Cooler voltage (V<sub>pe</sub>) at P<sub>f</sub>=20mW, T<sub>ld</sub>=T<sub>set1</sub> and T<sub>c</sub>=70°C

Note 4) T<sub>set</sub> is attached as a reference data. R<sub>th</sub> should be used in order to tune the wavelength to the specified value accurately.

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MITSUBISHI (OPTICAL DEVICES)

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(WAVELENGTH SELECTED, BIAS CIRCUIT INTEGRATED, DIGITAL APPLICATION)****Table 1.**

Type number	$\lambda_1$ (nm)	$\lambda_2$ (nm)	$\lambda_3$ (nm)	$\lambda_4$ (nm)	$\lambda_5$ (nm)	$\lambda_6$ (nm)	$\lambda_7$ (nm)	$\lambda_8$ (nm)
FU-69PDF-V620M06	1528.38	1528.77	1529.16	1529.55	1529.94	1530.33	1530.72	1531.12
FU-69PDF-V620M10	1529.94	1530.33	1530.72	1531.12	1531.51	1531.90	1532.29	1532.68
FU-69PDF-V620M14	1531.51	1531.90	1532.29	1532.68	1533.07	1533.47	1533.86	1534.25
FU-69PDF-V620M18	1533.07	1533.47	1533.86	1534.25	1534.64	1535.04	1535.43	1535.82
FU-69PDF-V620M22	1534.64	1535.04	1535.43	1535.82	1536.22	1536.61	1537.00	1537.40
FU-69PDF-V620M26	1536.22	1536.61	1537.00	1537.40	1537.79	1538.19	1538.58	1538.98
FU-69PDF-V620M30	1537.79	1538.19	1538.58	1538.98	1539.37	1539.77	1540.16	1540.56
FU-69PDF-V620M34	1539.37	1539.77	1540.16	1540.56	1540.95	1541.35	1541.75	1542.14
FU-69PDF-V620M38	1540.95	1541.35	1541.75	1542.14	1542.54	1542.94	1543.33	1543.73
FU-69PDF-V620M42	1542.54	1542.94	1543.33	1543.73	1544.13	1544.53	1544.92	1545.32
FU-69PDF-V620M46	1544.13	1544.53	1544.92	1545.32	1545.72	1546.12	1546.52	1546.92
FU-69PDF-V620M50	1545.72	1546.12	1546.52	1546.92	1547.32	1547.72	1548.11	1548.51
FU-69PDF-V620M54	1547.32	1547.72	1548.11	1548.51	1548.91	1549.32	1549.72	1550.12
FU-69PDF-V620M58	1548.91	1549.32	1549.72	1550.12	1550.52	1550.92	1551.32	1551.72
FU-69PDF-V620M62	1550.52	1550.92	1551.32	1551.72	1552.12	1552.52	1552.93	1553.33
FU-69PDF-V620M66	1552.12	1552.52	1552.93	1553.33	1553.73	1554.13	1554.54	1554.94
FU-69PDF-V620M70	1553.73	1554.13	1554.54	1554.94	1555.34	1555.75	1556.15	1556.55
FU-69PDF-V620M74	1555.34	1555.75	1556.15	1556.55	1556.96	1557.36	1557.77	1558.17
FU-69PDF-V620M78	1556.96	1557.36	1557.77	1558.17	1558.58	1558.98	1559.39	1559.79
FU-69PDF-V620M82	1558.58	1558.98	1559.39	1559.79	1560.20	1560.61	1561.01	1561.42
FU-69PDF-V620M86	1560.20	1560.61	1561.01	1561.42	1561.83	1562.23	1562.64	1563.05
FU-69PDF-V620M90	1561.83	1562.23	1562.64	1563.05	1563.45	1563.86	1564.27	1564.68

All wavelengths are referred to vacuum.

Tolerance is  $\lambda_c \pm 0.05\text{nm}$ .

**PRELIMINARY**

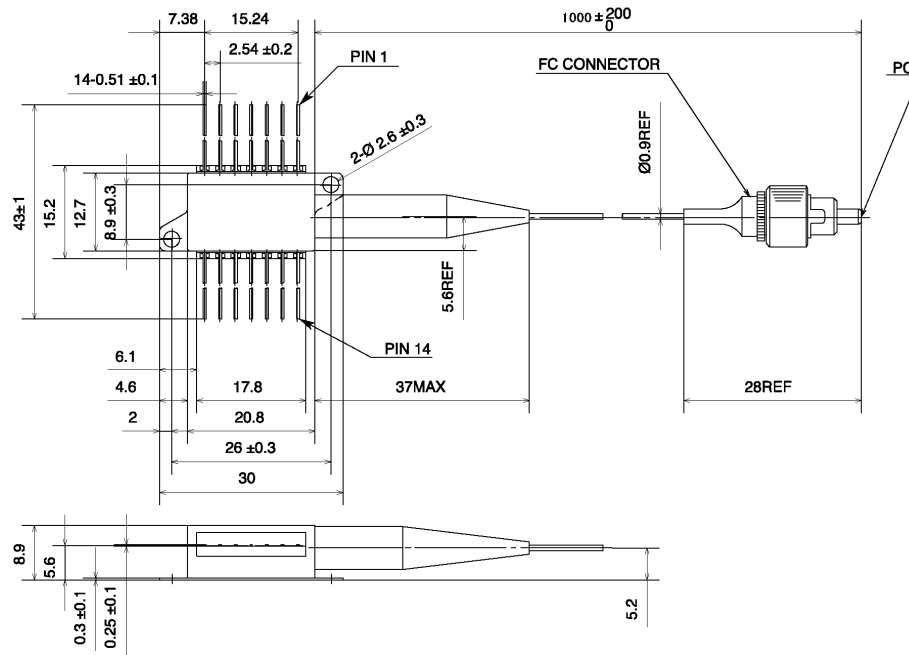
MITSUBISHI (OPTICAL DEVICES)

# FU-69PDF-V620MxxB

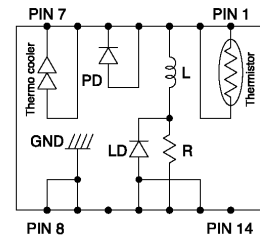
1.55  $\mu$ m DFB-LD MODULE WITH POLARIZATION MAINTAINING FIBER PIGTAIL  
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## OUTLINE DIAGRAM

Unit : mm  
Tolerances unless noted  $\pm 0.5$



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



FU-69PDF-V620Mxx