

MITSUBISHI (OPTICAL DEVICES)  
**FU-68SDF-V802MxxB**

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

**DESCRIPTION**

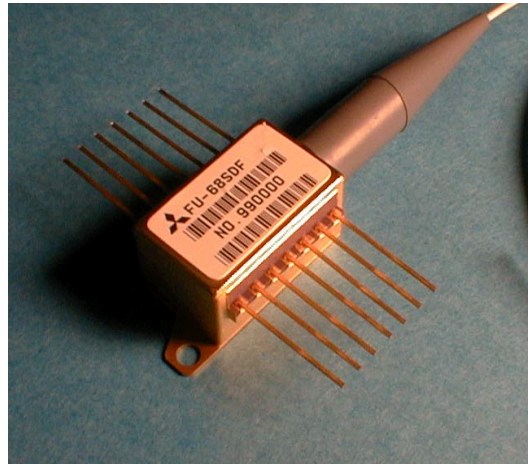
Module type FU-68SDF-V802MxxB is a 1.55 $\mu\text{m}$  DFB-LD module with single-mode optical fiber.

This module is suitable to a directly modulated light source for use in 2.5Gb/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 $\mu\text{m}$  band
- High-speed response
- Built-in optical isolator
- Built-in thermal electric cooler
- Butterfly package
- With photodiode for optical output monitor



**APPLICATION**

High speed transmission systems (~2.5Gb/s)  
Dense-WDM systems

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

Parameter		Symbol	Conditions	Rating	Unit
Laser diode	Optical output power	Pf	CW	6	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>	—	1.3	A
	Cooler voltage	V <sub>pe</sub>	—	3.1	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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**ELECTRICAL/OPTICAL CHARACTERISTICS** (T<sub>ld</sub>=T<sub>set</sub>, 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	-	10	25	mA
Optical output power at threshold current	P <sub>th</sub>	CW, I <sub>f</sub> =I <sub>th</sub>	-	-	100	$\mu$ W
Operating current	I <sub>op</sub>	CW, P <sub>f</sub> =2mW	-	40	65	mA
Operating voltage	V <sub>op</sub>	CW, P <sub>f</sub> =2mW	-	1.3	1.8	V
Input impedance	Z <sub>in</sub>	P <sub>f</sub> =2mW	-	25	-	$\Omega$
Light-emission central wavelength	$\lambda_c$	(Note 1)	(Note 2)			nm
Central wavelength drift with case temp.	$\Delta\lambda_c/\Delta T_c$	T <sub>c</sub> =-20~70°C	-1	-	0	pm/°C
Laser operating temperature	T <sub>set</sub>	-	20	-	35	°C
Spectral width	$\Delta\lambda$	(Note 1), -20dB	-	0.2	0.4	nm
Side mode suppression ratio	S <sub>r</sub>	(Note 1)	33	40	-	dB
Dispersion penalty	P <sub>p</sub>	(Note 1), at 10 <sup>-10</sup> BER, +1800ps/nm	-	-	2	dB
Cutoff frequency (-1.5dB optical)	f <sub>c</sub>	P <sub>f</sub> =2mW	3.5	-	-	GHz
Rise and fall time (10~90%)	t <sub>r</sub> , t <sub>f</sub>	(Note 1)	-	-	150	psec
Relative intensity noise	N <sub>r</sub>	CW, P <sub>f</sub> =2mW, 0.5~3GHz	-	-155	-145	dB/Hz
Tracking error (Note 3)	E <sub>r</sub>	T <sub>c</sub> =-20~70°C, APC, ATC	-	-	0.5	dB
Differential efficiency	$\eta$	CW, P <sub>f</sub> =2mW	0.057	0.07	0.15	mW/ mA
Linearity	$\Delta\eta$	CW, P <sub>f</sub> =0.2~2.4mW, (Note 4)	-20	-	20	%
Monitor current	I <sub>mon</sub>	CW, P <sub>f</sub> =2mW, V <sub>rd</sub> =5V	0.1	-	2	mA
Optical isolation	I <sub>so</sub>	T <sub>c</sub> =25°C	35	-	-	dB
		T <sub>c</sub> =-20~70°C	23	-	-	
Dark current (PD)	I <sub>d</sub>	V <sub>rd</sub> =5V, T <sub>c</sub> =-20~70°C	-	-	0.1	$\mu$ A
Capacitance (PD)	C <sub>t</sub>	V <sub>rd</sub> =5V, f=1MHz	-	-	10	pF

Note 1) 2.48832Gb/s NRZ, 2<sup>23</sup>-1, P<sub>f\_ave</sub>=1mW, Extinction ratio 10dB, optical return loss of the connectors should be greater than 40dB in order to ensure the specified performance.

Note 2) See Table 1.

Note 3) E<sub>r</sub>=max|10×log(P<sub>f</sub> / P<sub>f</sub>@25°C)|

Note 4) Variation of the differential efficiency from the straight line between 0.2mW and 2mW.

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**THERMAL CHARACTERISTICS** (T<sub>ld</sub>=T<sub>set</sub>, 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	$\Delta T$	P <sub>f</sub> =2mW, T <sub>c</sub> =70°C	50	-	-	°C
Cooler current	I <sub>pe</sub>	P <sub>f</sub> =2mW, T <sub>c</sub> =70°C, T <sub>ld</sub> =T <sub>set</sub>	-	0.6	1	A
Cooler voltage	V <sub>pe</sub>	P <sub>f</sub> =2mW, T <sub>c</sub> =70°C, T <sub>ld</sub> =T <sub>set</sub>	-	1.2	2	V

**FIBER PIGTAIL SPECIFICATIONS**

Parameter	Limits	Unit
Type	SM	-
Mode field diameter	9.5 $\pm$ 1	$\mu\text{m}$
Cladding diameter	125 $\pm$ 2	$\mu\text{m}$
Secondary coating outer diameter	0.9 $\pm$ 0.1	mm
Connector	FC/PC	-
Optical return loss of connector	40 (min)	dB

**DOCUMENTATION** (T<sub>ld</sub>=T<sub>set</sub>)

- Fiber output power vs. Laser forward current at T<sub>ld</sub>=T<sub>set</sub> and T<sub>c</sub>=-20,25,70°C
- BER curves at 2.48832Gb/s modulation
- Threshold current (I<sub>th</sub>)
- Laser forward current (I<sub>op</sub>) at P<sub>f</sub>=2mW
- Laser forward voltage (V<sub>op</sub>) at P<sub>f</sub>=2mW
- Laser operating temperature (T<sub>set</sub>) at  $\lambda_c$  (Note 5)
- Monitor current (I<sub>mon</sub>) at P<sub>f</sub>=2mW
- Thermistor resistance (R<sub>th</sub>)
- Cooler current (I<sub>pe</sub>) at P<sub>f</sub>=2mW and T<sub>c</sub>=70°C
- Cooler voltage (V<sub>pe</sub>) at P<sub>f</sub>=2mW and T<sub>c</sub>=70°C

Note 5) 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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**Table 1.**

Type number	$\lambda_c$ (nm)	Type number	$\lambda_c$ (nm)
FU-68SDF-802M9B	1529.55	FU-68SDF-802M53B	1546.92
FU-68SDF-802M11B	1530.33	FU-68SDF-802M55B	1547.72
FU-68SDF-802M13B	1531.12	FU-68SDF-802M57B	1548.51
FU-68SDF-802M15B	1531.90	FU-68SDF-802M59B	1549.32
FU-68SDF-802M17B	1532.68	FU-68SDF-802M61B	1550.12
FU-68SDF-802M19B	1533.47	FU-68SDF-802M63B	1550.92
FU-68SDF-802M21B	1534.25	FU-68SDF-802M65B	1551.72
FU-68SDF-802M23B	1535.04	FU-68SDF-802M67B	1552.52
FU-68SDF-802M25B	1535.82	FU-68SDF-802M69B	1553.33
FU-68SDF-802M27B	1536.61	FU-68SDF-802M71B	1554.13
FU-68SDF-802M29B	1537.40	FU-68SDF-802M73B	1554.94
FU-68SDF-802M31B	1538.19	FU-68SDF-802M75B	1555.75
FU-68SDF-802M33B	1538.98	FU-68SDF-802M77B	1556.55
FU-68SDF-802M35B	1539.77	FU-68SDF-802M79B	1557.36
FU-68SDF-802M37B	1540.56	FU-68SDF-802M81B	1558.17
FU-68SDF-802M39B	1541.35	FU-68SDF-802M83B	1558.98
FU-68SDF-802M41B	1542.14	FU-68SDF-802M85B	1559.79
FU-68SDF-802M43B	1542.94	FU-68SDF-802M87B	1560.61
FU-68SDF-802M45B	1543.73	FU-68SDF-802M89B	1561.42
FU-68SDF-802M47B	1544.53	FU-68SDF-802M91B	1562.23
FU-68SDF-802M49B	1545.32	FU-68SDF-802M93B	1563.05
FU-68SDF-802M51B	1546.12	FU-68SDF-802M95B	1563.86

All wavelengths are referred to vacuum.

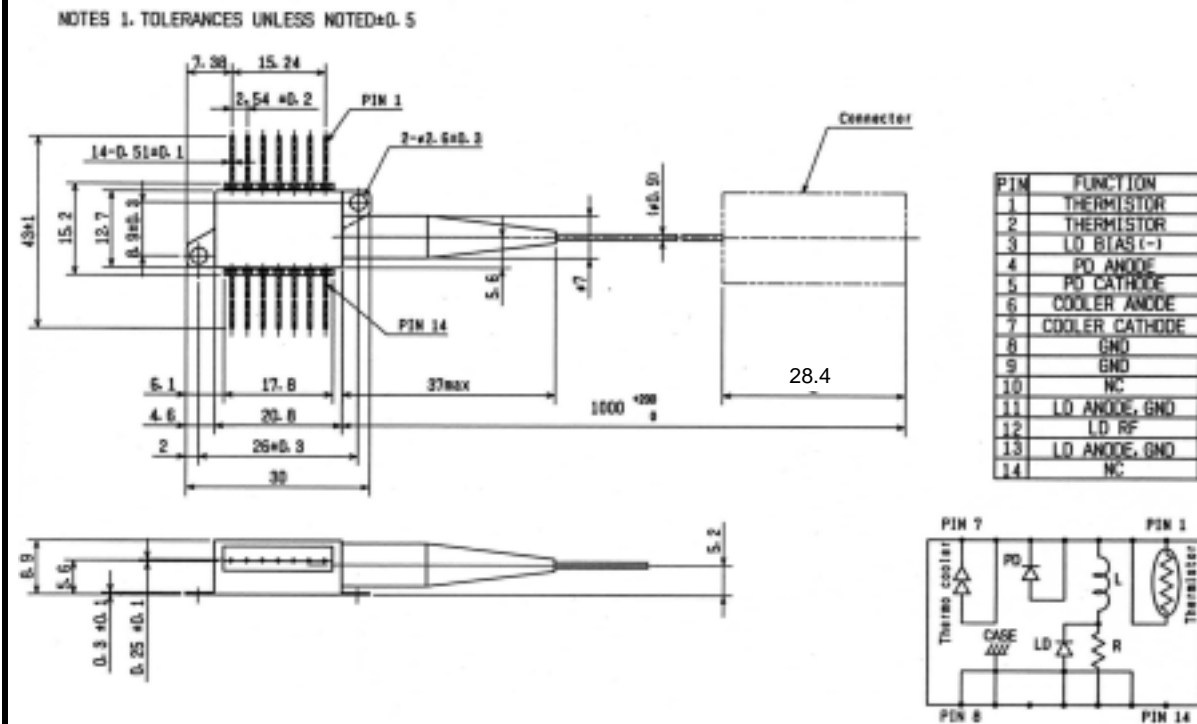
Tolerance is  $\lambda_c \pm 0.05\text{nm}$ .

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OUTLINE DIAGRAM

(Unit : mm)



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