

MITSUBISHI (OPTICAL DEVICES)  
**FU-68SDF-V810MxxB**

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

**DESCRIPTION**

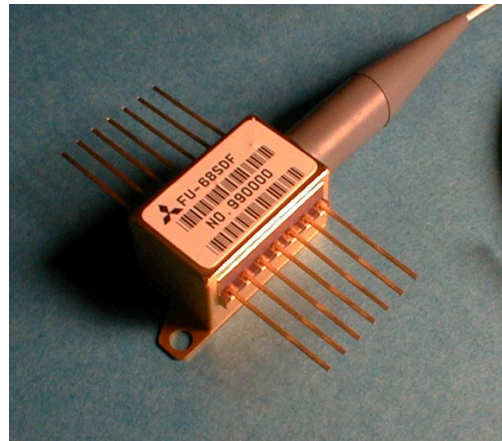
Module type FU-68SDF-V810MxxB is a 1.55 $\mu\text{m}$  DFB-LD module with single-mode optical fiber.

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	15	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>	-	-	150	$\mu$ W
Operating current	I <sub>op</sub>	CW, P <sub>f</sub> =10mW	-	50	95	mA
Operating voltage	V <sub>op</sub>	CW, P <sub>f</sub> =10mW	-	1.3	1.8	V
Input impedance	Z <sub>in</sub>	P <sub>f</sub> =10mW	-	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> =10mW	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> =10mW, 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> =10mW	0.15	0.25	0.35	mW/ mA
Linearity	$\Delta\eta$	CW, P <sub>f</sub> =1~12mW, (Note 4)	-20	-	20	%
Monitor current	I <sub>mon</sub>	CW, P <sub>f</sub> =10mW, V <sub>rd</sub> =5V	0.2	-	3	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>=5mW, 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 1mW and 10mW.

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**THERMAL CHARACTERISTICS** (Tld=Tset, Tc=-20~70°C)

Parameter	Symbol	Test Conditions	Limits			Unit
			Min.	Typ.	Max.	
Thermistor resistance	Rth	Tld=25°C	9.5	10	10.5	k $\Omega$
B constant of Rth	B	-	-	3950	-	K
Cooling capacity	$\Delta T$	Pf=10mW, Tc=70°C	50	-	-	°C
Cooler current	Ipe	Pf=10mW, Tc=70°C, Tld=Tset	-	0.6	1	A
Cooler voltage	Vpe	Pf=10mW, Tc=70°C, Tld=Tset	-	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** (Tld=Tset)

- Fiber output power vs. Laser forward current at Tld=Tset and Tc=-20,25,70°C
- BER curves at 2.48832Gb/s modulation
- Threshold current (Ith)
- Laser forward current (Iop) at Pf=10mW
- Laser forward voltage (Vop) at Pf=10mW
- Laser operating temperature (Tset) at  $\lambda_c$  (Note 5)
- Monitor current (Imon) at Pf=10mW
- Thermistor resistance (Rth)
- Cooler current (Ipe) at Pf=10mW and Tc=70°C
- Cooler voltage (Vpe) at Pf=10mW and Tc=70°C

Note 5) Tset is attached as a reference data. Rth 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-810M9B	1529.55	FU-68SDF-810M53B	1546.92
FU-68SDF-810M11B	1530.33	FU-68SDF-810M55B	1547.72
FU-68SDF-810M13B	1531.12	FU-68SDF-810M57B	1548.51
FU-68SDF-810M15B	1531.90	FU-68SDF-810M59B	1549.32
FU-68SDF-810M17B	1532.68	FU-68SDF-810M61B	1550.12
FU-68SDF-810M19B	1533.47	FU-68SDF-810M63B	1550.92
FU-68SDF-810M21B	1534.25	FU-68SDF-810M65B	1551.72
FU-68SDF-810M23B	1535.04	FU-68SDF-810M67B	1552.52
FU-68SDF-810M25B	1535.82	FU-68SDF-810M69B	1553.33
FU-68SDF-810M27B	1536.61	FU-68SDF-810M71B	1554.13
FU-68SDF-810M29B	1537.40	FU-68SDF-810M73B	1554.94
FU-68SDF-810M31B	1538.19	FU-68SDF-810M75B	1555.75
FU-68SDF-810M33B	1538.98	FU-68SDF-810M77B	1556.55
FU-68SDF-810M35B	1539.77	FU-68SDF-810M79B	1557.36
FU-68SDF-810M37B	1540.56	FU-68SDF-810M81B	1558.17
FU-68SDF-810M39B	1541.35	FU-68SDF-810M83B	1558.98
FU-68SDF-810M41B	1542.14	FU-68SDF-810M85B	1559.79
FU-68SDF-810M43B	1542.94	FU-68SDF-810M87B	1560.61
FU-68SDF-810M45B	1543.73	FU-68SDF-810M89B	1561.42
FU-68SDF-810M47B	1544.53	FU-68SDF-810M91B	1562.23
FU-68SDF-810M49B	1545.32	FU-68SDF-810M93B	1563.05
FU-68SDF-810M51B	1546.12	FU-68SDF-810M95B	1563.86

All wavelengths are referred to vacuum.

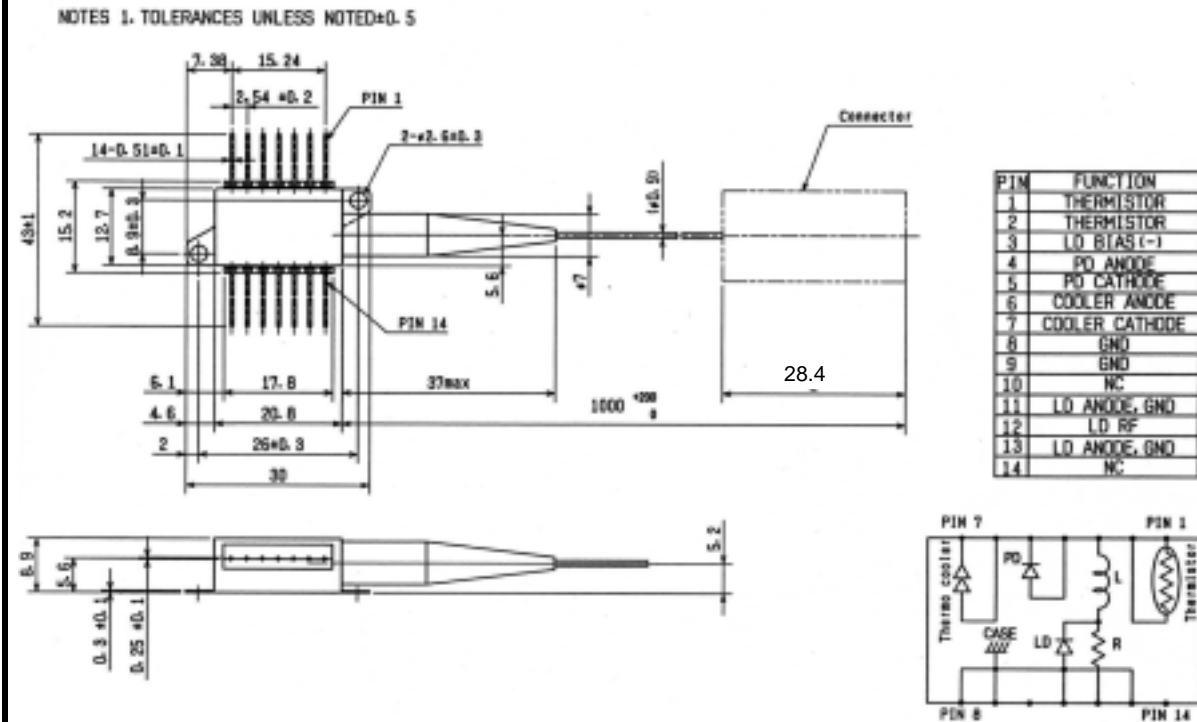
Tolerance is  $\lambda_c \pm 0.05\text{nm}$ .

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OUTLINE DIAGRAM

(Unit : mm)



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