

MITSUBISHI (OPTICAL DEVICES)

# FU-68PDF-V510MxxxB

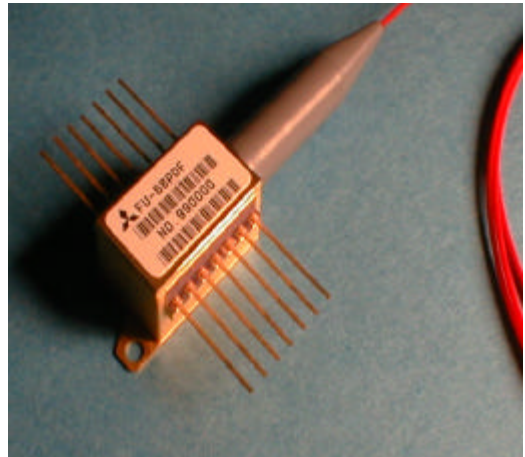
**1.58  $\mu\text{m}$  (L-Band) DFB-LD MODULE WITH POLARIZATION MAINTAINING FIBER PIGTAIL  
(WAVELENGTH SELECTED, BIAS CIRCUIT INTEGRATED, DIGITAL APPLICATION)**

## DESCRIPTION

Module type FU-68PDF-V510MxxxB is a 1.58 $\mu\text{m}$  (L-Band) 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 to expand the wavelength channels into L-Band for Dense-WDM transmission.

## FEATURES

- Input impedance is 25 $\Omega$
- Multi quantum wells (MQW) DFB Laser Diode module
- Emission wavelength is in 1.58 $\mu\text{m}$  band
- Polarization maintaining optical fiber pig-tail
- Built-in optical isolator
- Built-in thermal electric cooler
- Butterfly package
- With photodiode for optical output monitor



## APPLICATION

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

## OPTION

- Wavelength option:

1565nm~1625nm are available

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

Parameter		Symbol	Conditions	Rating	Unit
Laser diode	Optical output power	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	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
Operating current	I <sub>op</sub>	CW, P <sub>f</sub> =10mW	-	-	100	mA
Operating voltage	V <sub>op</sub>	CW, P <sub>f</sub> =10mW	-	-	1.8	V
Input impedance	Z <sub>in</sub>	P <sub>f</sub> =10mW	-	25	-	$\Omega$
Light-emission central wavelength	$\lambda_c$	CW, P <sub>f</sub> =10mW	(Note 1)			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 line width	$\Delta f$	CW, P <sub>f</sub> =10mW	-	-	20	MHz
Side mode suppression ratio	S <sub>r</sub>	CW, P <sub>f</sub> =10mW	33	40	-	dB
Cutoff frequency (-1.5dB optical)	f <sub>c</sub>	P <sub>f</sub> =10mW	2	-	-	GHz
Polarization extinction ratio	E <sub>x</sub>	CW, P <sub>f</sub> =10mW	20	25	-	dB
Relative intensity noise	N <sub>r</sub>	CW, P <sub>f</sub> =10mW, 0.5~3GHz	-	-155	-145	dB/Hz
Tracking error (Note 2)	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	0.1	-	-	mW/ mA
Monitor current	I <sub>mon</sub>	CW, P <sub>f</sub> =10mW, V <sub>rd</sub> =5V	0.2	-	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	$\mu\text{A}$
Capacitance (PD)	C <sub>t</sub>	V <sub>rd</sub> =5V, f=1MHz	-	-	10	pF

Note 1) See Table 1.

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

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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> =10mW, T <sub>c</sub> =70°C	50	-	-	°C
Cooler current	I <sub>pe</sub>	P <sub>f</sub> =10mW, 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> =10mW, 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	PM (Note 3)	-
Mode field diameter	11+/-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 (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
- Threshold current (I<sub>th</sub>)
- Laser forward current (I<sub>op</sub>) at P<sub>f</sub>=10mW
- Laser forward voltage (V<sub>op</sub>) at P<sub>f</sub>=10mW
- Laser operating temperature (T<sub>set</sub>) at  $\lambda_c$  (Note 4)
- Monitor current (I<sub>mon</sub>) at P<sub>f</sub>=10mW
- Thermistor resistance (R<sub>th</sub>)
- Cooler current (I<sub>pe</sub>) at P<sub>f</sub>=10mW and T<sub>c</sub>=70°C
- Cooler voltage (V<sub>pe</sub>) at P<sub>f</sub>=10mW 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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**Table 1.**

Type number	$\lambda_c$ (nm)	Type number	$\lambda_c$ (nm)	Type number	$\lambda_c$ (nm)
FU-68PDF-V510M103B	1567.13	FU-68PDF-V510M139B	1582.02	FU-68PDF-V510M175B	1597.19
FU-68PDF-V510M104B	1567.54	FU-68PDF-V510M140B	1582.44	FU-68PDF-V510M176B	1597.62
FU-68PDF-V510M105B	1567.95	FU-68PDF-V510M141B	1582.85	FU-68PDF-V510M177B	1598.04
FU-68PDF-V510M106B	1568.36	FU-68PDF-V510M142B	1583.27	FU-68PDF-V510M178B	1598.47
FU-68PDF-V510M107B	1568.77	FU-68PDF-V510M143B	1583.69	FU-68PDF-V510M179B	1598.89
FU-68PDF-V510M108B	1569.18	FU-68PDF-V510M144B	1584.11	FU-68PDF-V510M180B	1599.32
FU-68PDF-V510M109B	1569.59	FU-68PDF-V510M145B	1584.53	FU-68PDF-V510M181B	1599.75
FU-68PDF-V510M110B	1570.01	FU-68PDF-V510M146B	1584.95	FU-68PDF-V510M182B	1600.17
FU-68PDF-V510M111B	1570.42	FU-68PDF-V510M147B	1585.36	FU-68PDF-V510M183B	1600.60
FU-68PDF-V510M112B	1570.83	FU-68PDF-V510M148B	1585.78	FU-68PDF-V510M184B	1601.03
FU-68PDF-V510M113B	1571.24	FU-68PDF-V510M149B	1586.20	FU-68PDF-V510M185B	1601.46
FU-68PDF-V510M114B	1571.65	FU-68PDF-V510M150B	1586.62	FU-68PDF-V510M186B	1601.88
FU-68PDF-V510M115B	1572.06	FU-68PDF-V510M151B	1587.04	FU-68PDF-V510M187B	1602.31
FU-68PDF-V510M116B	1572.48	FU-68PDF-V510M152B	1587.46	FU-68PDF-V510M188B	1602.74
FU-68PDF-V510M117B	1572.89	FU-68PDF-V510M153B	1587.88	FU-68PDF-V510M189B	1603.17
FU-68PDF-V510M118B	1573.30	FU-68PDF-V510M154B	1588.30	FU-68PDF-V510M190B	1603.60
FU-68PDF-V510M119B	1573.71	FU-68PDF-V510M155B	1588.73	FU-68PDF-V510M191B	1604.03
FU-68PDF-V510M120B	1574.13	FU-68PDF-V510M156B	1589.15	FU-68PDF-V510M192B	1604.46
FU-68PDF-V510M121B	1574.54	FU-68PDF-V510M157B	1589.57	FU-68PDF-V510M193B	1604.88
FU-68PDF-V510M122B	1574.95	FU-68PDF-V510M158B	1589.99	FU-68PDF-V510M194B	1605.31
FU-68PDF-V510M123B	1575.37	FU-68PDF-V510M159B	1590.41	FU-68PDF-V510M195B	1605.74
FU-68PDF-V510M124B	1575.78	FU-68PDF-V510M160B	1590.83	FU-68PDF-V510M196B	1606.17
FU-68PDF-V510M125B	1576.20	FU-68PDF-V510M161B	1591.26	FU-68PDF-V510M197B	1606.60
FU-68PDF-V510M126B	1576.61	FU-68PDF-V510M162B	1591.68	FU-68PDF-V510M198B	1607.04
FU-68PDF-V510M127B	1577.03	FU-68PDF-V510M163B	1592.10	FU-68PDF-V510M199B	1607.47
FU-68PDF-V510M128B	1577.44	FU-68PDF-V510M164B	1592.52	FU-68PDF-V510M200B	1607.90
FU-68PDF-V510M129B	1577.86	FU-68PDF-V510M165B	1592.95	FU-68PDF-V510M201B	1608.33
FU-68PDF-V510M130B	1578.27	FU-68PDF-V510M166B	1593.37	FU-68PDF-V510M202B	1608.76
FU-68PDF-V510M131B	1578.69	FU-68PDF-V510M167B	1593.79	FU-68PDF-V510M203B	1609.19
FU-68PDF-V510M132B	1579.10	FU-68PDF-V510M168B	1594.22	FU-68PDF-V510M204B	1609.62
FU-68PDF-V510M133B	1579.52	FU-68PDF-V510M169B	1594.64	FU-68PDF-V510M205B	1610.06
FU-68PDF-V510M134B	1579.93	FU-68PDF-V510M170B	1595.06	FU-68PDF-V510M206B	1610.49
FU-68PDF-V510M135B	1580.35	FU-68PDF-V510M171B	1595.49	FU-68PDF-V510M207B	1610.92
FU-68PDF-V510M136B	1580.77	FU-68PDF-V510M172B	1595.91	FU-68PDF-V510M208B	1611.35
FU-68PDF-V510M137B	1581.18	FU-68PDF-V510M173B	1596.34	FU-68PDF-V510M209B	1611.79
FU-68PDF-V510M138B	1581.60	FU-68PDF-V510M174B	1596.76		

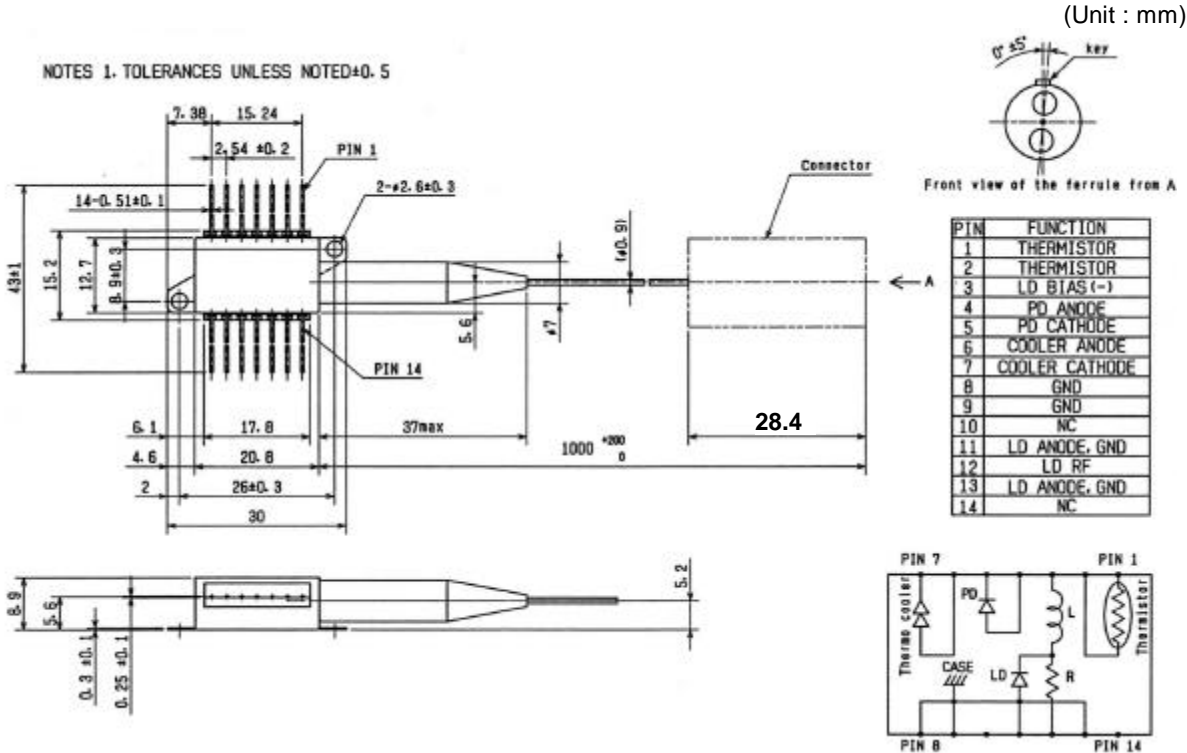
All wavelengths are referred to vacuum.

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

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**OUTLINE DIAGRAM**



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