25 September, 2002

Approved	Approved	Charged
T.Nambara	H. Kiyosue	Fujinawa

SPECIFICATION PROPOSAL
Wavelength-Selected DFB-LD Module with PMF
FU-68PDF-V510MxxB

A	B	C	D
	x		
Date		Approved	
26 Sep.'02		T.Nambara	

MITSUBISHI ELECTRIC CORPORATION

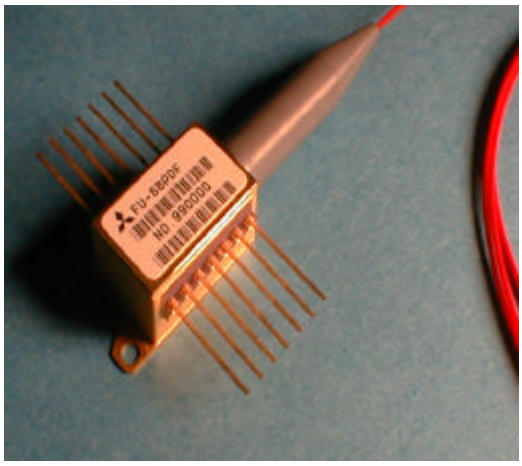
MITSUBISHI (OPTICAL DEVICES)

FU-68PDF-V510MxxB

1.55 μm DFB-LD MODULE WITH POLARIZATION MAINTAINING FIBER PIGTAIL (WAVELENGTH SELECTED, BIAS CIRCUIT INTEGRATED, DIGITAL APPLICATION)

DESCRIPTION

Module type FU-68PDF-V510MxxB is a 1.55μm DFB-LD module with polarization maintaining optical fiber.
This module is suitable to a CW light source for external modulator for use in high speed digital optical communication systems.
This module is prepared in accordance with ITU-T recommendation wavelength channel plan for Dense-WDM transmission.



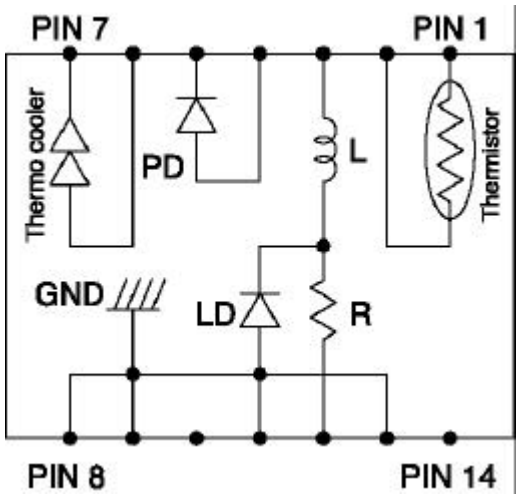
FEATURES

- Input impedance is 25Ω
- Multi quantum wells (MQW) DFB Laser Diode module
- Emission wavelength is in full C and L 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
Dense-WDM systems

PIN INFORMATION



PIN	FUNCTION
1	Thermistor
2	Thermistor
3	LD DC Bias (Cathode)
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 Input (Cathode)
13	LD Anode, GND
14	NC

MITSUBISHI (OPTICAL DEVICES)

FU-68PDF-V510MxxB

1.55 μm DFB-LD MODULE WITH POLARIZATION MAINTAINING FIBER PIGTAIL (WAVELENGTH SELECTED, BIAS CIRCUIT INTEGRATED, DIGITAL APPLICATION)

ABSOLUTE MAXIMUM RATINGS (Tld=Tset)

Parameter		Symbol	Conditions	Rating	Unit
Laser diode	Optical output power	Pf	CW	15	mW
	Forward current	If	CW	150	mA
	Reverse voltage	Vrl	-	2	V
Photodiode	Reverse voltage	Vrd	-	20	V
	Forward current	Ifd	-	2	mA
Thermo-electric cooler (Note)	Cooler current	Ipe	-	1.3	A
	Cooler voltage	Vpe	-	3.1	V
Operating case temperature		Tc	-	-20 ~ 70	°C
Storage temperature		Tstg	-	-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.

ELECTRICAL/OPTICAL CHARACTERISTICS (Tld=Tset, Tc=25°C unless otherwise noted)

Parameter	Symbol	Test Conditions	Limits			Unit
			Min.	Typ.	Max.	
Threshold current	Ith	CW	-	10	25	mA
Operating current	Iop	CW, Pf=10mW	-	-	100	mA
Operating voltage	Vop	CW, Pf=10mW	-	-	1.8	V
Input impedance	Zin	Pf=10mW	-	25	-	Ω
Light-emission central wavelength	λc	CW, Pf=10mW	See Ordering Information and Table 1			nm
Central wavelength drift with case temp.	Δλc/ΔTc	Tc=-20~70°C	-1	-	0	pm/°C
Laser operating temperature	Tset	-	20	-	35	°C
Spectral line width	Δf	CW, Pf=10mW	-	2.5	10	MHz
Side mode suppression ratio	Sr	CW, Pf=10mW	33	40	-	dB
Cutoff frequency (-1.5dB optical)	fc	Pf=10mW	2	-	-	GHz
Polarization extinction ratio	Ex	CW, Pf=10mW	20	25	-	dB
Relative intensity noise	Nr	CW, Pf=10mW, 0.5~3GHz	-	-155	-145	dB/Hz
Tracking error (Note 1)	Er	Tc=-20~70°C, APC, ATC	-	-	0.5	dB
Differential efficiency	η	CW, Pf=10mW	0.1	-	-	mW/mA
Monitor current	Imon	CW, Pf=10mW, Vrd=5V	0.2	-	2	mA
Optical isolation	Iso	Tc=25°C	35	-	-	dB
		Tc=-20~70°C	23	-	-	
Dark current (PD)	Id	Vrd=5V, Tc=-20~70°C	-	-	0.1	μA
Capacitance (PD)	Ct	Vrd=5V, f=1MHz	-	-	10	pF

Note 1) Er=max|10×log(Pf / Pf@25°C)|

MITSUBISHI (OPTICAL DEVICES)

FU-68PDF-V510MxxB

1.55 μm DFB-LD MODULE WITH POLARIZATION MAINTAINING FIBER PIGTAIL (WAVELENGTH SELECTED, BIAS CIRCUIT INTEGRATED, DIGITAL APPLICATION)

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	kΩ
B constant of Rth	B	-	-	3950	-	K
Cooling capacity	ΔT	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	PM (Note 2)	-
Mode field diameter	10.5+/-1	μm
Cladding diameter	125+/-3	μm
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 2) PMF - Sumitomo Panda fiber (PM-155)

DOCUMENTATION (Tld=Tset)

- Fiber output power vs. Laser forward current at Tld=Tset and Tc=25°C
- Threshold current (Ith)
- Laser forward current (Iop) at Pf=10mW
- Laser forward voltage (Vop) at Pf=10mW
- Laser operating temperature (Tset) at λc (Note 3)
- 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 3) Tset is attached as a reference data. Rth should be used in order to tune the wavelength to the specified value accurately.

ORDERING INFORMATION

FU-68PDF-V510M__B

l **Code (See Table 1)**

MITSUBISHI (OPTICAL DEVICES)

FU-68PDF-V510MxxB

1.55 μm DFB-LD MODULE WITH POLARIZATION MAINTAINING FIBER PIGTAIL
(WAVELENGTH SELECTED, BIAS CIRCUIT INTEGRATED, DIGITAL APPLICATION)

Table 1.

f [THz]	λc [nm]	λ code	f [THz]	λc [nm]	λ code	f [THz]	λc [nm]	λ code	f [THz]	λc [nm]	λ code
196.30	1527.22	3	193.70	1547.72	55	191.10	1568.77	107	188.50	1590.41	159
196.25	1527.60	4	193.65	1548.11	56	191.05	1569.18	108	188.45	1590.83	160
196.20	1527.99	5	193.60	1548.51	57	191.00	1569.59	109	188.40	1591.26	161
196.15	1528.38	6	193.55	1548.91	58	190.95	1570.01	110	188.35	1591.68	162
196.10	1528.77	7	193.50	1549.32	59	190.90	1570.42	111	188.30	1592.10	163
196.05	1529.16	8	193.45	1549.72	60	190.85	1570.83	112	188.25	1592.52	164
196.00	1529.55	9	193.40	1550.12	61	190.80	1571.24	113	188.20	1592.95	165
195.95	1529.94	10	193.35	1550.52	62	190.75	1571.65	114	188.15	1593.37	166
195.90	1530.33	11	193.30	1550.92	63	190.70	1572.06	115	188.10	1593.79	167
195.85	1530.72	12	193.25	1551.32	64	190.65	1572.48	116	188.05	1594.22	168
195.80	1531.12	13	193.20	1551.72	65	190.60	1572.89	117	188.00	1594.64	169
195.75	1531.51	14	193.15	1552.12	66	190.55	1573.30	118	187.95	1595.06	170
195.70	1531.90	15	193.10	1552.52	67	190.50	1573.71	119	187.90	1595.49	171
195.65	1532.29	16	193.05	1552.93	68	190.45	1574.13	120	187.85	1595.91	172
195.60	1532.68	17	193.00	1553.33	69	190.40	1574.54	121	187.80	1596.34	173
195.55	1533.07	18	192.95	1553.73	70	190.35	1574.95	122	187.75	1596.76	174
195.50	1533.47	19	192.90	1554.13	71	190.30	1575.37	123	187.70	1597.19	175
195.45	1533.86	20	192.85	1554.54	72	190.25	1575.78	124	187.65	1597.62	176
195.40	1534.25	21	192.80	1554.94	73	190.20	1576.20	125	187.60	1598.04	177
195.35	1534.64	22	192.75	1555.34	74	190.15	1576.61	126	187.55	1598.47	178
195.30	1535.04	23	192.70	1555.75	75	190.10	1577.03	127	187.50	1598.89	179
195.25	1535.43	24	192.65	1556.15	76	190.05	1577.44	128	187.45	1599.32	180
195.20	1535.82	25	192.60	1556.55	77	190.00	1577.86	129	187.40	1599.75	181
195.15	1536.22	26	192.55	1556.96	78	189.95	1578.27	130	187.35	1600.17	182
195.10	1536.61	27	192.50	1557.36	79	189.90	1578.69	131	187.30	1600.60	183
195.05	1537.00	28	192.45	1557.77	80	189.85	1579.10	132	187.25	1601.03	184
195.00	1537.40	29	192.40	1558.17	81	189.80	1579.52	133	187.20	1601.46	185
194.95	1537.79	30	192.35	1558.58	82	189.75	1579.93	134	187.15	1601.88	186
194.90	1538.19	31	192.30	1558.98	83	189.70	1580.35	135	187.10	1602.31	187
194.85	1538.58	32	192.25	1559.39	84	189.65	1580.77	136	187.05	1602.74	188
194.80	1538.98	33	192.20	1559.79	85	189.60	1581.18	137	187.00	1603.17	189
194.75	1539.37	34	192.15	1560.20	86	189.55	1581.60	138	186.95	1603.60	190
194.70	1539.77	35	192.10	1560.61	87	189.50	1582.02	139	186.90	1604.03	191
194.65	1540.16	36	192.05	1561.01	88	189.45	1582.44	140	186.85	1604.46	192
194.60	1540.56	37	192.00	1561.42	89	189.40	1582.85	141	186.80	1604.88	193
194.55	1540.95	38	191.95	1561.83	90	189.35	1583.27	142	186.75	1605.31	194
194.50	1541.35	39	191.90	1562.23	91	189.30	1583.69	143	186.70	1605.74	195
194.45	1541.75	40	191.85	1562.64	92	189.25	1584.11	144	186.65	1606.17	196
194.40	1542.14	41	191.80	1563.05	93	189.20	1584.53	145	186.60	1606.60	197
194.35	1542.54	42	191.75	1563.45	94	189.15	1584.95	146	186.55	1607.04	198
194.30	1542.94	43	191.70	1563.86	95	189.10	1585.36	147	186.50	1607.47	199
194.25	1543.33	44	191.65	1564.27	96	189.05	1585.78	148	186.45	1607.90	200
194.20	1543.73	45	191.60	1564.68	97	189.00	1586.20	149	186.40	1608.33	201
194.15	1544.13	46	191.55	1565.09	98	188.95	1586.62	150	186.35	1608.76	202
194.10	1544.53	47	191.50	1565.50	99	188.90	1587.04	151	186.30	1609.19	203
194.05	1544.92	48	191.45	1565.90	100	188.85	1587.46	152	186.25	1609.62	204
194.00	1545.32	49	191.40	1566.31	101	188.80	1587.88	153	186.20	1610.06	205
193.95	1545.72	50	191.35	1566.72	102	188.75	1588.30	154	186.15	1610.49	206
193.90	1546.12	51	191.30	1567.13	103	188.70	1588.73	155	186.10	1610.92	207
193.85	1546.52	52	191.25	1567.54	104	188.65	1589.15	156	186.05	1611.35	208
193.80	1546.92	53	191.20	1567.95	105	188.60	1589.57	157	186.00	1611.79	209
193.75	1547.32	54	191.15	1568.36	106	188.55	1589.99	158			

All wavelengths are referred to vacuum. Tolerance is λc+/-0.05nm.

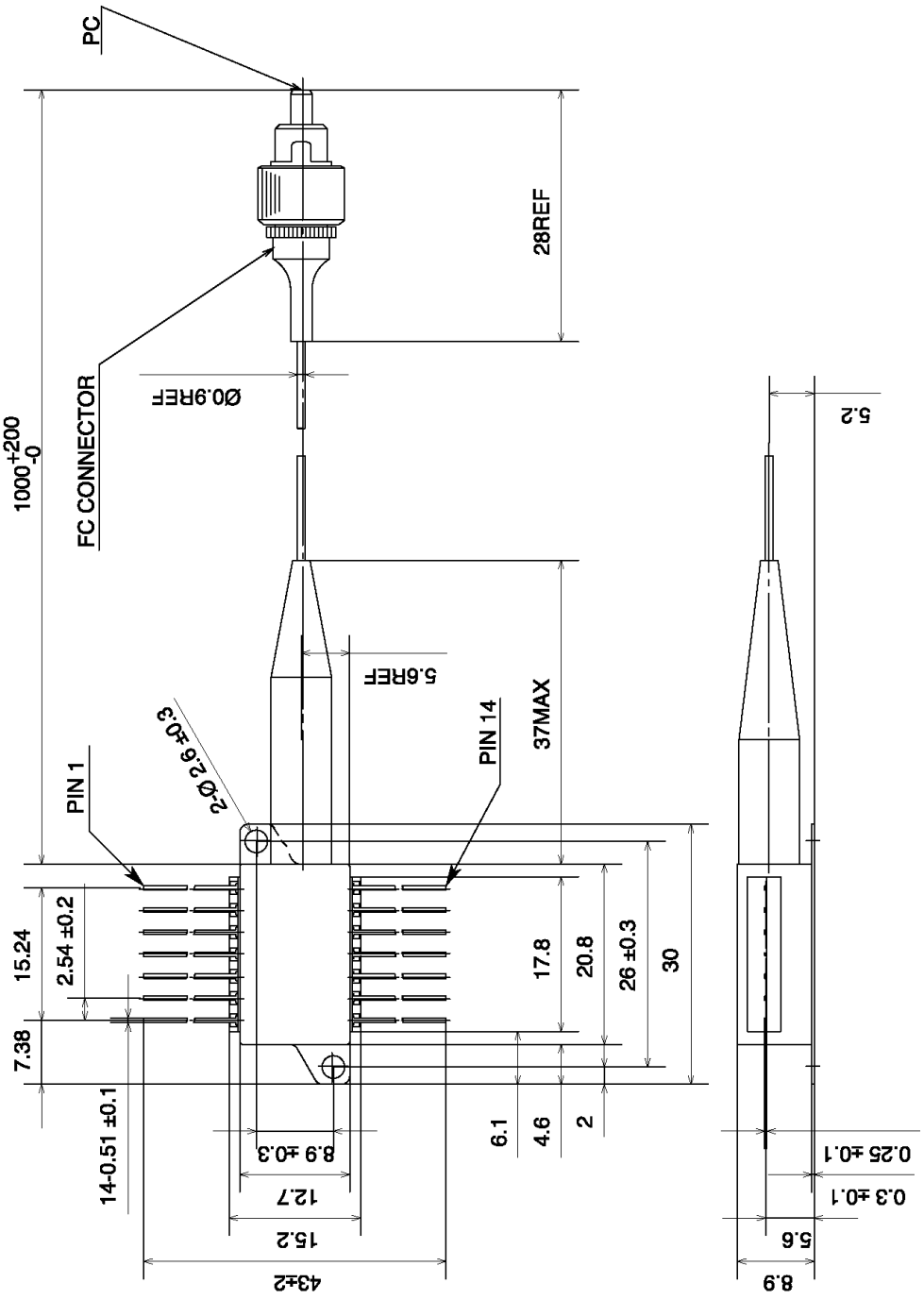
MITSUBISHI (OPTICAL DEVICES)

FU-68PDF-V510MxxB

1.55 μm DFB-LD MODULE WITH POLARIZATION MAINTAINING FIBER PIGTAIL (WAVELENGTH SELECTED, BIAS CIRCUIT INTEGRATED, DIGITAL APPLICATION)

OUTLINE DIAGRAM

Unit : mm
Tolerances unless noted ±0.5



FU-68PDF-V510MxxB