

Approved	Approved	Charged
	<i>T.Nambara</i>	K.Masuda

Specification of wavelength monitor integrated DFB-LD module

Module type: FU-695PDF-V620Mxx

- 8ch for 50GHz spacing, 350GHz range thermally wavelength tunable

PRELIMINARY

A	B	C	D
	x		
Date		Approved	
9.Oct.'01		T.Nambara	

MITSUBISHI ELECTRIC CORPORATION

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MITSUBISHI (OPTICAL DEVICES)

FU-695PDF-V620Mxx

**WAVELENGTH MONITOR INTEGRATED 1.55 μ m DFB-LD MODULE
WITH POLARIZATION MAINTAINING FIBER PIGTAIL
(WAVELENGTH SELECTED, DIGITAL APPLICATION)**

DESCRIPTION

Module type FU-695PDF-V620Mxx is a wavelength monitor integrated 1.55 μ 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 can be prepared in accordance with ITU-T recommendation wavelength channel plan for Dense-WDM transmission.

FEATURES

- Multi quantum wells (MQW) DFB Laser Diode module
- Emission wavelength is in 1.55 μ m band
- Polarization maintaining optical fiber pig-tail
- Built-in optical isolator
- Built-in thermal electric cooler
- Butterfly package
- With 2 photodiodes for wavelength monitor and optical output power monitor
- 350GHz range thermally wavelength tunable

APPLICATION

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

ABSOLUTE MAXIMUM RATINGS (T_{id}=T_{set})

Parameter		Symbol	Conditions	Rating	Unit
Laser diode	Optical output power	Pf	CW	24	mW
	Forward current	If	CW	150	mA
	Reverse voltage	Vrl	-	2	V
Photodiode	Reverse voltage	Vrd	-	20	V
	Forward current	lfd	-	2	mA
Thermo-electric cooler (Note)	Cooler current	lpe	-	3.5	A
	Cooler voltage	Vpe	-	5	V
Operating case temperature		Tc	-	-20 ~ 70	°C
Storage temperature		Tstg	-	-40 ~ 70	°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

(Tld=Tset1, Tset2, Tset3, Tset4, Tset5, Test6, Test7 or Tset8, Tc=25°C unless otherwise noted)

Parameter	Symbol	Test Conditions	Limits			Unit
			Min.	Typ.	Max.	
Threshold current	I _{th}	CW	-	10	25	mA
Operating current	I _{op}	CW, Pf=20mW	-	-	130	mA
Operating voltage	V _{op}	CW, Pf=20mW	-	-	2	V
Light-emission central wavelength	λ_{c1} to 8	CW, Pf=20mW, Tld=Tset1 to 8	(Note 1)			nm
Wavelength drift after 15 years	$\Delta\lambda_c$	CW, Pf=20mW, APC, ATC, AFC (Note 2)	-30	-	30	pm
Laser operating temperature	Tset1 to 8	-	-30	-	35	°C
Spectral line width	Δf	CW, Pf=20mW	-	-	20	MHz
Side mode suppression ratio	Sr	CW, Pf=20mW	33	40	-	dB
Polarization extinction ratio	Ex	CW, Pf=20mW	20	25	-	dB
Relative intensity noise	Nr	CW, Pf=20mW, 0.5~3GHz	-	-155	-145	dB/Hz
Tracking error (Note 3)	Er	Tc=-20~70°C, APC, ATC	-	-	0.5	dB
Differential efficiency	η	CW, Pf=20mW	0.15	-	-	mW/ mA
Power monitor current	I _{pm}	CW, Pf=20mW, Vrd=5V	35	-	700	μA
Wavelength monitor current	I _{wm}	CW, Pf=20mW, Vrd=5V	10	-	1000	μA
Wavelength discriminator slope (Note 4)	Ds	CW, Pf=20mW, Vrd=5V	-	0.15	-	$\mu\text{A}/\text{GHz}$
Optical isolation	Iso	Tc=25°C	35	-	-	dB
		Tc=-20~70°C	23	-	-	
Dark current (PD)	I _d	Vrd=5V, Tc=-20~70°C	-	-	0.1	μA
Capacitance (PD)	Ct	Vrd=5V, f=1MHz	-	-	30	pF

Note 1) See Table 1.

Note 2) Includes case temperature variation and aging.

Note 3) $E_r = \max\{10 \times \log(P_f / P_f@25^\circ\text{C})\}$

Note 4) See Figure 1.

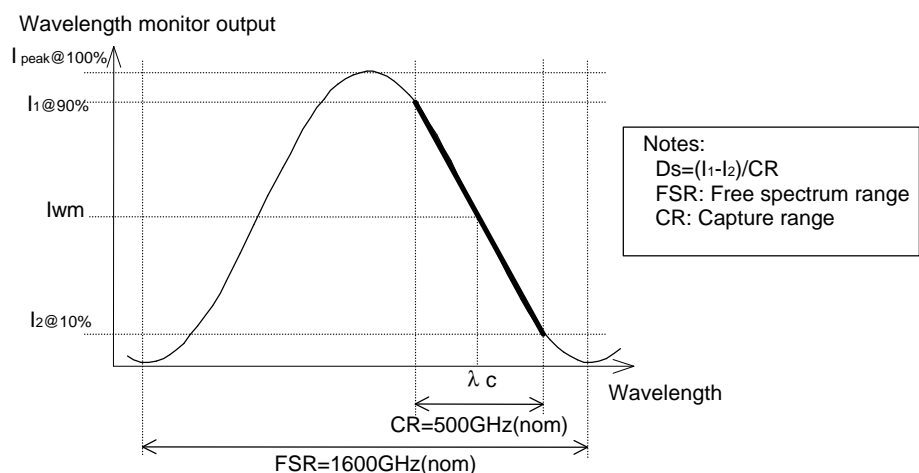


Figure 1. Wavelength discriminator curve

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THERMAL CHARACTERISTICS (T_c=-20~70°C)

Parameter	Symbol	Test Conditions	Limits			Unit
			Min.	Typ.	Max.	
Thermistor resistance	Rth	Tld=25°C	9.5	10	10.5	k Ω
B constant of Rth	B	-	-	3950	-	K
Cooling capacity	ΔT	Pf=20mW, Tc=70°C	100	-	-	°C
Cooler current	Ipe	Pf=20mW, Tc=70°C, Tld=Tset1	-	-	3	A
Cooler voltage	Vpe	Pf=20mW, Tc=70°C, Tld=Tset1	-	-	4	V

FIBER PIGTAIL SPECIFICATIONS

Parameter	Limits	Unit
Type	PM (Note 5)	-
Mode field diameter	10.5 \pm 1	μm
Cladding diameter	125 \pm 3	μm
Secondary coating outer diameter	0.9 \pm 0.1	mm
Polarization axis	slow axis	-
Connector	FC/PC	-
Optical return loss of connector	40 (min)	dB

Note 5) PMF - Sumitomo Panda fiber (PM-155)

DOCUMENTATION

- Fiber output power vs. Laser forward current at Tld=Tset8 and Tc=-20,25,70°C
- Threshold current (Ith) at Tld=Tset8 and Tc=25°C
- Laser forward current (Iop) at Pf=20mW, Tld=Tset8 and Tc=25°C
- Laser forward voltage (Vop) at Pf=20mW, Tld=Tset8 and Tc=25°C
- Laser operating temperature (Tset1 and Tset8) at λ_c (Note 6)
- Power monitor current (Ipm1) at Pf=20mW, Tld=Tset1 and Tc=25°C
- Power monitor current (Ipm8) at Pf=20mW, Tld=Tset8 and Tc=25°C
- Wavelength monitor current (Iwm1) at Pf=20mW, λ_c , Tld=Tset1 and Tc=25°C
- Wavelength monitor current (Iwm8) at Pf=20mW, λ_c , Tld=Tset8 and Tc=25°C
- Thermistor resistance (Rth1) at Tld=Tset1 and Tc=25°C
- Thermistor resistance (Rth8) at Tld=Tset8 and Tc=25°C
- Cooler current (Ipe) at Pf=20mW, Tld=Tset1 and Tc=70°C
- Cooler voltage (Vpe) at Pf=20mW, Tld=Tset1 and Tc=70°C

Note 6) 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.

(Unit: nm)

Type number	λ_{c1}	λ_{c2}	λ_{c3}	λ_{c4}	λ_{c5}	λ_{c6}	λ_{c7}	λ_{c8}
FU-695PDF-V620M06	1528.38	1528.77	1529.16	1529.55	1529.94	1530.33	1530.72	1531.12
FU-695PDF-V620M10	1529.94	1530.33	1530.72	1531.12	1531.51	1531.90	1532.29	1532.68
FU-695PDF-V620M14	1531.51	1531.90	1532.29	1532.68	1533.07	1533.47	1533.86	1534.25
FU-695PDF-V620M18	1533.07	1533.47	1533.86	1534.25	1534.64	1535.04	1535.43	1535.82
FU-695PDF-V620M22	1534.64	1535.04	1535.43	1535.82	1536.22	1536.61	1537.00	1537.40
FU-695PDF-V620M26	1536.22	1536.61	1537.00	1537.40	1537.79	1538.19	1538.58	1538.98
FU-695PDF-V620M30	1537.79	1538.19	1538.58	1538.98	1539.37	1539.77	1540.16	1540.56
FU-695PDF-V620M34	1539.37	1539.77	1540.16	1540.56	1540.95	1541.35	1541.75	1542.14
FU-695PDF-V620M38	1540.95	1541.35	1541.75	1542.14	1542.54	1542.94	1543.33	1543.73
FU-695PDF-V620M42	1542.54	1542.94	1543.33	1543.73	1544.13	1544.53	1544.92	1545.32
FU-695PDF-V620M46	1544.13	1544.53	1544.92	1545.32	1545.72	1546.12	1546.52	1546.92
FU-695PDF-V620M50	1545.72	1546.12	1546.52	1546.92	1547.32	1547.72	1548.11	1548.51
FU-695PDF-V620M54	1547.32	1547.72	1548.11	1548.51	1548.91	1549.32	1549.72	1550.12
FU-695PDF-V620M58	1548.91	1549.32	1549.72	1550.12	1550.52	1550.92	1551.32	1551.72
FU-695PDF-V620M62	1550.52	1550.92	1551.32	1551.72	1552.12	1552.52	1552.93	1553.33
FU-695PDF-V620M66	1552.12	1552.52	1552.93	1553.33	1553.73	1554.13	1554.54	1554.94
FU-695PDF-V620M70	1553.73	1554.13	1554.54	1554.94	1555.34	1555.75	1556.15	1556.55
FU-695PDF-V620M74	1555.34	1555.75	1556.15	1556.55	1556.96	1557.36	1557.77	1558.17
FU-695PDF-V620M78	1556.96	1557.36	1557.77	1558.17	1558.58	1558.98	1559.39	1559.79
FU-695PDF-V620M82	1558.58	1558.98	1559.39	1559.79	1560.20	1560.61	1561.01	1561.42
FU-695PDF-V620M86	1560.20	1560.61	1561.01	1561.42	1561.83	1562.23	1562.64	1563.05
FU-695PDF-V620M90	1561.83	1562.23	1562.64	1563.05	1563.45	1563.86	1564.27	1564.68

All wavelengths are referred to vacuum.

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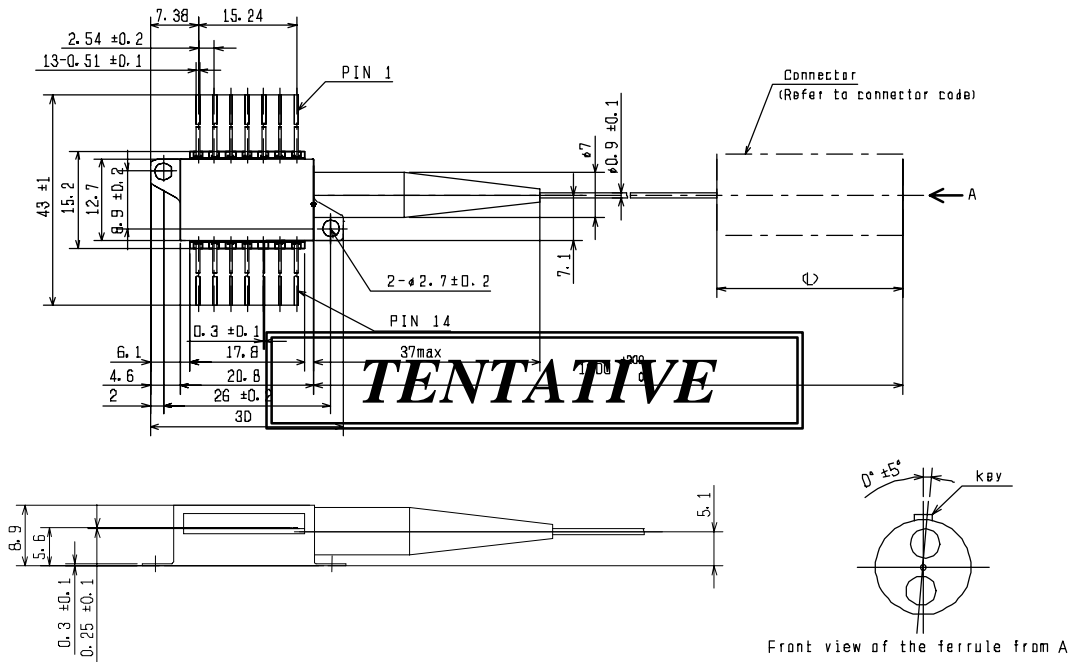
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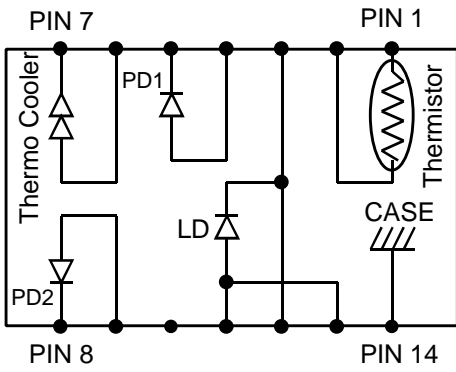
OUTLINE DIAGRAM

(Unit : mm)

NOTE. TOLERANCES UNLESS NOTED ±0.5 (mm)



TENTATIVE



PIN	FUNCTION
1	THERMISTOR
2	THERMISTOR
3	LD CATHODE
4	POWER MONITOR PD1 ANODE
5	POWER MONITOR PD1 CATHODE
6	COOLER ANODE
7	COOLER CATHODE
8	WAVELENGTH MONITOR PD2 CATHODE
9	WAVELENGTH MONITOR PD2 ANODE
10	NC
11	LD ANODE
12	LD CATHODE
13	LD ANODE
14	GND