Approved	Approved	Charged
H. Watanabe	R. Adachi	**M.Sato**

Specification of wavelength monitor integrated DFB-LD module

Module type: FU-699PDF-V720Mxx

- 8ch for 50GHz spacing thermally wavelength tunable

PRELIMINARY

A	B	C	D
	x		
Date		Approved	
12.Nov.'02		H.Watanabe	

MITSUBISHI ELECTRIC CORPORATION

MITSUBISHI (OPTICAL DEVICES)

PRELIMINARY

FU-699PDF-V720Mxx

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

DESCRIPTION

Module type FU-699PDF-V720Mxx is a wavelength monitor integrated 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 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 1.55μm 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
- 8 channels for 50GHz spacing thermally wavelength tunable

APPLICATION

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

ABSOLUTE MAXIMUM RATINGS (Tld=Tset)

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	Ifd	-	2	mA
Thermo-electric cooler (Note)	Cooler current	Ipe	-	2.2	A
	Cooler voltage	Vpe	-	6	V
Operating case temperature		Tc	-	-5 ~ 80	°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.

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ELECTRICAL/OPTICAL CHARACTERISTICS

(Tld=Tset1 to 8, 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=20mW	-	-	130	mA
Operating voltage	Vop	CW, Pf=20mW	-	-	2	V
Light-emission central wavelength	λc1 to 8	CW, Pf=20mW, Tld=Tset1 to 8	(Note 1)			nm
Wavelength drift after 15 years	Δλc	CW, Pf=20mW, APC, ATC, AFC (Note 2)	-20	-	20	pm
Laser operating temperature	Tset1 to 8	-	5	-	55	°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=-5~80°C, APC, ATC	-	-	0.5	dB
Differential efficiency	η	CW, Pf=20mW	0.15	-	-	mW/mA
Power monitor current	Ipm	CW, Pf=20mW, Vrd=5V	20	-	200	μA
Wavelength monitor current	Iwm	CW, Pf=20mW, Vrd=5V	20	-	200	μA
Wavelength discriminator slope (Note 4)	Ds	CW, Pf=20mW, Vrd=5V	-	2	-	%/GHz
Free spectrum range (Note 4)	FSR			50		GHz
Optical isolation	Iso	Tc=25°C	35	-	-	dB
		Tc=-5~80°C	23	-	-	
Dark current (PD)	Id	Vrd=5V, Tc=-5~80°C	-	-	5	nA
Capacitance (PD)	Ct	Vrd=5V, f=1MHz	-	-	30	pF

Note 1) See Table 1 to 4.
Note 2) Includes case temperature variation and aging.
Note 3) Er=max|10×log(Pf / Pf@25°C)|
Note 4) See Figure 1.

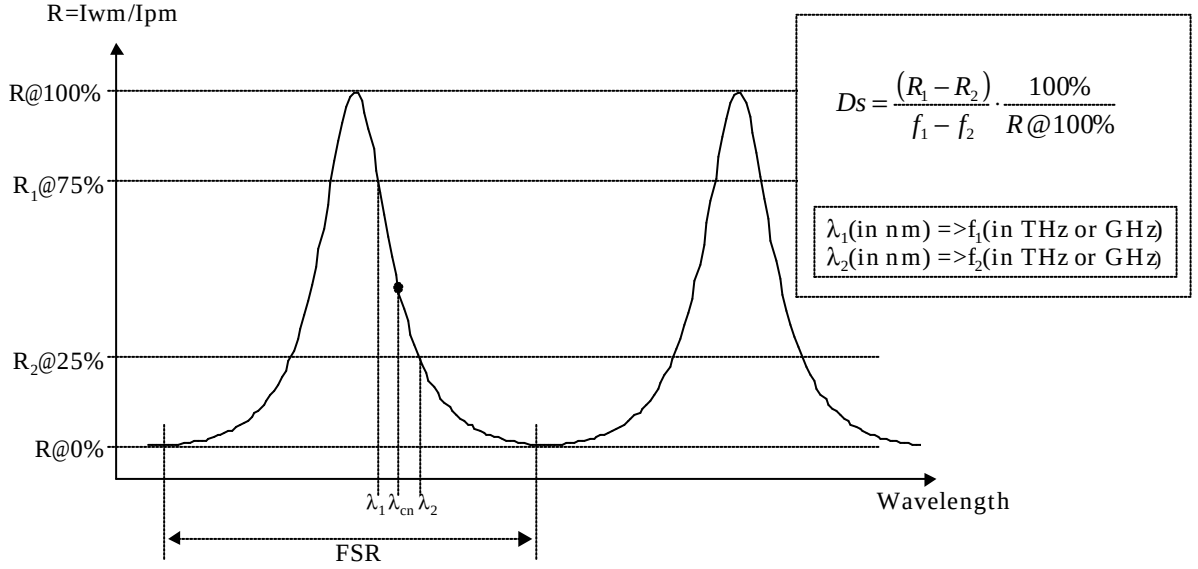

Figure 1. Wavelength discriminator curve

MITSUBISHI (OPTICAL DEVICES)

PRELIMINARY

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

THERMAL CHARACTERISTICS (Tc=-5~80°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=20mW, Tc=80°C	75	-	-	°C
Cooler current	Ipe	Pf=20mW, Tc=80°C, Tld=Tset1	-	-	1.2	A
Cooler voltage	Vpe	Pf=20mW, Tc=80°C, Tld=Tset1	-	-	3.3	V

FIBER PIGTAIL SPECIFICATIONS

Parameter	Limits	Unit
Type	PM (Note 5)	-
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 5) PMF - Sumitomo Panda fiber (PM-155)

DOCUMENTATION

- Fiber output power vs. Laser forward current at Tld=Tset1 and Tc=-5,25,80°C
- Threshold current (Ith) at Tld=Tset1 and Tc=25°C
- Laser forward current (Iop) at Pf=20mW, Tld=Tset1 to 8 and Tc=25°C
- Laser forward voltage (Vop) at Pf=20mW, Tld=Tset1 to 8 and Tc=25°C
- Laser operating temperature (Tset1 to 8) at λc (Note 6)
- Power monitor current (Ipm1 to 8) at Pf=20mW, Tld=Tset1 to 8 and Tc=25°C
- Wavelength monitor current (Iwm1 to 8) at Pf=20mW, λc, Tld=Tset1 to 8 and Tc=25°C
- Thermistor resistance (Rth1 to 8) at Tld=Tset1 to 8 and Tc=25°C
- Cooler current (Ipe) at Pf=20mW, Tld=Tset1 and Tc=80°C
- Cooler voltage (Vpe) at Pf=20mW, Tld=Tset1 and Tc=80°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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WAVELENGTH MONITOR INTEGRATED 1.55 μm DFB-LD MODULE WITH POLARIZATION MAINTAINING FIBER PIGTAIL (WAVELENGTH SELECTED, DIGITAL APPLICATION)

Table 1. (Unit: nm)

	FU-699PDF-V720MZ1 for Sample	FU-699PDF-V720M06	FU-699PDF-V720M10	FU-699PDF-V720M14	FU-699PDF-V720M18	FU-699PDF-V720M22
λc1	-	1528.384	1529.944	1531.507	1533.073	1534.643
λc2	-	1528.773	1530.334	1531.898	1533.465	1535.036
λc3	-	1529.163	1530.725	1532.290	1533.858	1535.429
λc4	-	1529.553	1531.116	1532.681	1534.250	1535.822
λc5	-	1529.944	1531.507	1533.073	1534.643	1536.216
λc6	-	1530.334	1531.898	1533.465	1535.036	1536.609
λc7	-	1530.725	1532.290	1533.858	1535.429	1537.003
λc8	-	1531.116	1532.681	1534.250	1535.822	1537.397

All wavelengths are referred to vacuum.

Table 2. (Unit: nm)

	FU-699PDF-V720M26	FU-699PDF-V720M30	FU-699PDF-V720M34	FU-699PDF-V720M38	FU-699PDF-V720M42	FU-699PDF-V720M46	FU-699PDF-V720M50
λc1	1536.216	1537.792	1539.371	1540.953	1542.539	1544.128	1545.720
λc2	1536.609	1538.186	1539.766	1541.349	1542.936	1544.526	1546.119
λc3	1537.003	1538.581	1540.162	1541.746	1543.333	1544.924	1546.518
λc4	1537.397	1538.976	1540.557	1542.142	1543.730	1545.322	1546.917
λc5	1537.792	1539.371	1540.953	1542.539	1544.128	1545.720	1547.316
λc6	1538.186	1539.766	1541.349	1542.936	1544.526	1546.119	1547.715
λc7	1538.581	1540.162	1541.746	1543.333	1544.924	1546.518	1548.115
λc8	1538.976	1540.557	1542.142	1543.730	1545.322	1546.917	1548.515

All wavelengths are referred to vacuum.

Table 3. (Unit: nm)

	FU-699PDF-V720M54	FU-699PDF-V720M58	FU-699PDF-V720M62	FU-699PDF-V720M66	FU-699PDF-V720M70	FU-699PDF-V720M74	FU-699PDF-V720M78
λc1	1547.316	1548.915	1550.517	1552.122	1553.731	1555.343	1556.959
λc2	1547.715	1549.315	1550.918	1552.524	1554.134	1555.747	1557.363
λc3	1548.115	1549.715	1551.319	1552.926	1554.537	1556.151	1557.768
λc4	1548.515	1550.116	1551.721	1553.329	1554.940	1556.555	1558.173
λc5	1548.915	1550.517	1552.122	1553.731	1555.343	1556.959	1558.578
λc6	1549.315	1550.918	1552.524	1554.134	1555.747	1557.363	1558.983
λc7	1549.715	1551.319	1552.926	1554.537	1556.151	1557.768	1559.389
λc8	1550.116	1551.721	1553.329	1554.940	1556.555	1558.173	1559.794

All wavelengths are referred to vacuum.

Table 4. (Unit: nm)

	FU-699PDF-V720M82	FU-699PDF-V720M86	FU-699PDF-V720M90				
λc1	1558.578	1560.200	1561.826				
λc2	1558.983	1560.606	1562.233				
λc3	1559.389	1561.013	1562.640				
λc4	1559.794	1561.419	1563.047				
λc5	1560.200	1561.826	1563.455				
λc6	1560.606	1562.233	1563.863				
λc7	1561.013	1562.640	1564.271				
λc8	1561.419	1563.047	1564.679				

All wavelengths are referred to vacuum.

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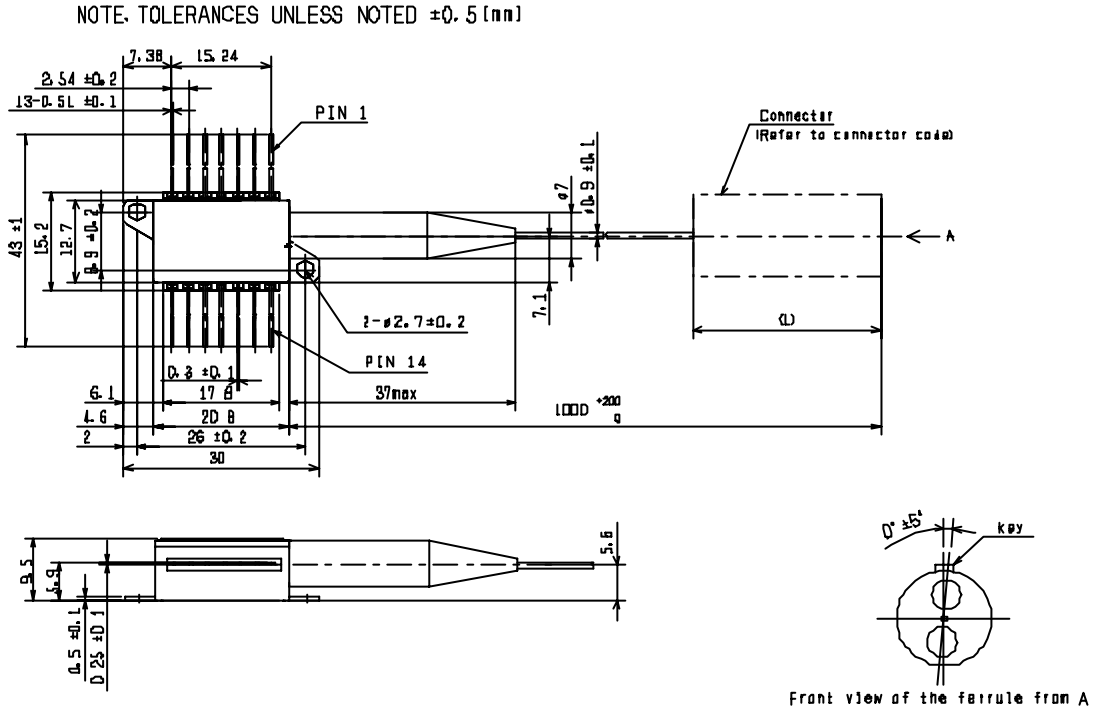
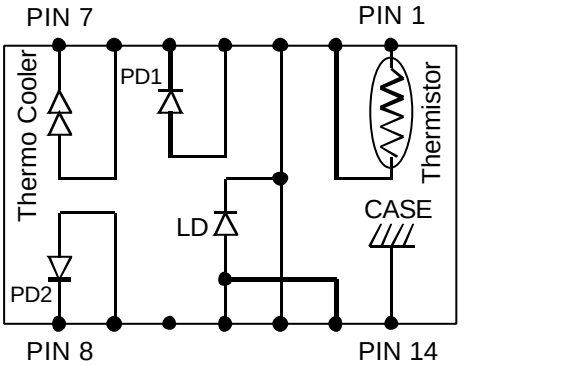
OUTLINE DIAGRAM

(Unit : mm)





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