

MITSUBISHI (OPTICAL DEVICES)

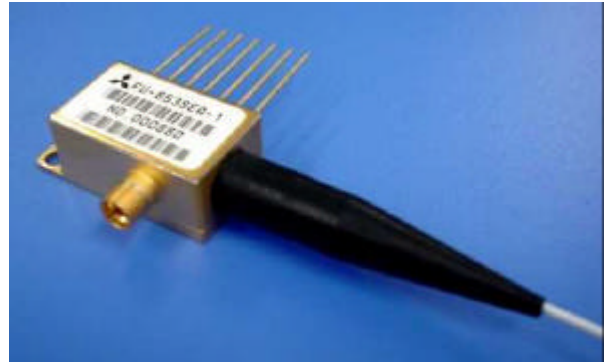
FU-653SEA-1Mx

1.55 μ m EA MODULATOR INTEGLATED DFB-LD MODULE
(7 PIN PACKAGE WITH GPO CONNECTOR, 10GB/s DIGITAL APPLICATION)

DESCRIPTION

Module type FU-653SEA-1Mx is a 1.55 μ m EA modulator integrated DFB-LD module with single-mode optical fiber.

This module is suitable to a light source for use in 10Gb/s digital optical communication systems.



FEATURES

- Input impedance is 50 Ω
- Integrated Electro-absorption Modulator
- Distributed feed-back(DFB) Laser Diode
- Emission wavelength is 1.55 μ m band
- Single mode optical fiber pigtail
- Built-in optical isolator
- Built-in thermoelectric cooler
- 7-pin Butterfly package with GPO connector

APPLICATION

STM-64, OC192 application

ABSOLUTE MAXIMUM RATINGS

Parameter		Symbol	Conditions	Rating	Unit
Laser diode	Optical output power	Pf	CW	6	mW
	Forward current	If	CW	200	mA
	Reverse voltage	Vrl	CW	2	V
Modulator	Reverse voltage	Vrm	-	5	V
	Forward voltage	Vfm	-	1	V
Photodiode for monitoring	Reverse voltage	Vrd	-	20	V
	Forward current	Ifd	-	2	mA
Thermoelectric cooler(Note1)	Current	Ipe	-	1.5	A
	Voltage	Vpe	-	3	V
Operating case temperature		Tc	-	-20~70	°C
Storage temperature		Tstg	-	-40~85	°C

Note)

Even if the thermoelectric cooler (TEC) is operated within the rated conditions, uncontrolled current loading or operation without heat sink 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_{ld}=T_{set}, T_c=25°C unless otherwise noted)

Parameter	Symbol	Conditions(Note2)	Min.	Typ.	Max.	Unit	
Threshold current	I _{th}	CW, V _m =0V	5	-	30	mA	
Operating current	I _{op}	CW, V _m =0V	50	70	100	mA	
Operating voltage	V _{op}	CW, I _f =I _{op} , V _m =0V	-	-	1.7	V	
Input impedance	Z _{in}	I _f =I _{op}	-	50	-	Ω	
Optical output power from fiber end	P _f	(Note 3,4)	-1	-	-	dBm	
Wavelength	λ_c	(Note 3,4)	1530	1550	1565	nm	
Side mode suppression ratio	Sr	(Note 3,4)	35	40	-	dB	
Relative intensity noise	RIN	CW, I _f =I _{op} , V _m =0V, 10GHz	-	-	-135	dB/Hz	
Dispersion penalty	Pp	(Note 3,4), 130ps/nm	-	-	1.0	dB	FU-653SEA-1M1
		(Note 3,4), 800ps/nm	-	-	2.0	dB	FU-653SEA-1M2
		(Note 3,4), 36ps/nm	-	-	1.0	dB	FU-653SEA-1M3
		(Note 3,4), 500ps/nm	-	-	2.0	dB	FU-653SEA-1M4
Extinction ratio	Ex	(Note 3,4)	10	-	-	dB	
Rise/fall time	t _r /t _f	(Note 3,4), 20-80%	-	-	45	ps	
Cutoff frequency	f _c	I _f =I _{op} , V _m =-1V	10	-	-	GHz	
RF return loss	S ₁₁	I _f =I _{op} , V _m =-1V, f $\leq$ 5GHz	10	15	-	dB	
		I _f =I _{op} , V _m =-1V, f $\leq$ 10GHz	5	7	-	dB	
Tracking error	E _r	I _f =I _{op} , T _c =-20~70°C, Note 5	-	0.3	0.5	dB	
Monitor current	I _{mon}	I _f =I _{op} , V _{rd} =-5V	0.1	-	1.5	mA	
Dark current(PD)	I _d	V _{rd} =-5V	-	-	0.1	μ A	
Capacitance(PD)	C _t	V _{rd} =-5V	-	10	-	pF	
Optical isolation	I _{so}	T _c =25°C	35	-	-	dB	
		T _c =-20~70°C	23	-	-	dB	

Note 2 : V_m is EAM bias voltage at CW condition, V_{pp} and V_{off} are EAM amplitude and EAM high level offset voltage respectively at modulation condition.

Note 3 : 9.95328Gbps, NRZ, PRBS2²³-1, I_f=I_{op}, V_{pp}=2.5V, V_{off}=0~ -1.0V

Note 4 : Optical return loss of the connectors should be greater than 40dB in order to get specified performance.

Note 5 : E_r=max|10 $\times$ log(P_f/P_f@25°C)|

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THERMAL CHARACTERISTICS

Parameter	Symbol	Conditions (Note2)	Limits			Unit
			Min.	Typ.	Max.	
Thermistor resistance	Rth	Tc=25°C,	9.5	10	10.5	Ω
B constant of Rth	-	-	-	3950	-	K
Cooler current	Ipe	If=Iop, Tc=70°C	-	0.7	1.2	A
Cooler voltage	Vpe	If=Iop, Tc=70°C	-	1.7	2.5	V

FIBER PIGTAIL SPECIFICATIONS

Parameter	Specification	Unit
Type	SM	-
Mode field diameter	9.5 $\pm$ 1	μ m
Cladding diameter	125 $\pm$ 2	μ m
Secondary coating outer diameter	0.9 $\pm$ 0.1	mm
Connector	See fig.1	-
Optical return loss of connector	40(min)	dB

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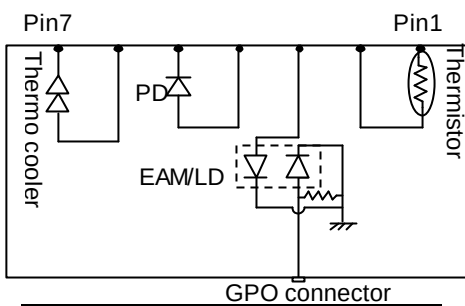
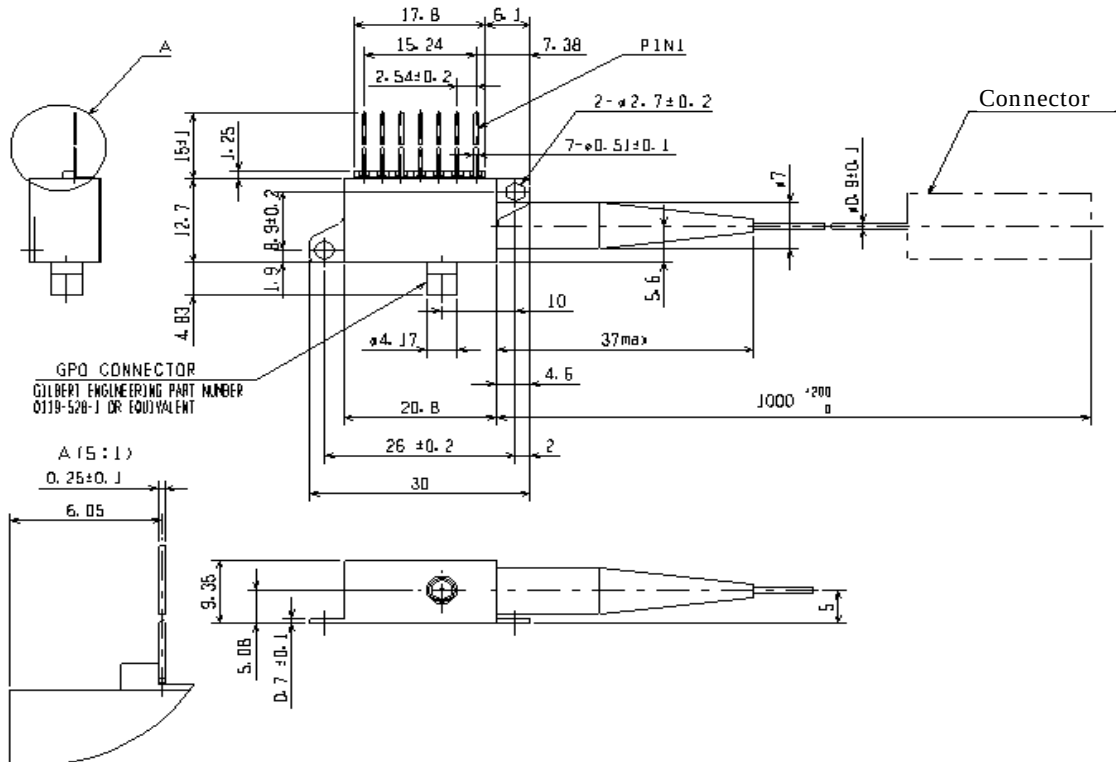
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OUTLINE DIAGRAM

Unit : mm

NOTES 1. TOLERANCES UNLESS NOTED $\pm 0.5\text{mm}$



Pin No.	Function
1	Thermistor
2	Thermistor
3	LD bias (Anode)
4	Monitor PD (Anode)
5	Monitor PD (Cathode)
6	Cooler (Anode)
7	Cooler (Cathode)
Case	Ground

Connector type	Identical type number	Dispersion
No connector	FU-653SEA-1M1	130ps/nm
	FU-653SEA-1M2	800ps/nm
	FU-653SEA-1M3	36ps/nm
	FU-653SEA-1M4	500ps/nm
FC/PC	FU-653SEA-V1M1	130ps/nm
	FU-653SEA-V1M2	800ps/nm
	FU-653SEA-V1M3	36ps/nm
	FU-653SEA-V1M4	500ps/nm
SC/PC	FU-653SEA-W1M1	130ps/nm
	FU-653SEA-W1M2	800ps/nm
	FU-653SEA-W1M3	36ps/nm
	FU-653SEA-W1M4	500ps/nm

FU-653SEA-1M1/-1M2/-1M3/-1M4