

Approved	Approved	Charged
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Preliminary*

Specification for 10Gb/s EML module with driver

Module type: FU-193SEA

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	x		
Date		Approved	
12 Feb.2003		H.Watanabe	

FU-193SEA

1.55 μ m EA MODULATOR INTEGRATED DFB-LD MODULE WITH DRIVER
(10Gb/s DIGITAL APPLICATION)

DESCRIPTION

Module type FU-193SEA is a 1.55 μ m EA modulator integrated DFB-LD module with EA driver, and optical output end is receptacle type connected with SC/PC connector.

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
- Built-in EA Driver
- Built-in optical isolator
- Built-in thermoelectric cooler
- Optical output end is SC/PC receptacle type
- Case is floating

ABSOLUTE MAXIMUM RATINGS

Parameter		Symbol	Conditions	Rating	Unit
Laser diode	Forward current	I _f	CW	200	mA
	Reverse voltage	V _{rl}	CW	2	V
Modulator	Reverse voltage	V _{rm}	-	5	V
	Forward voltage	V _{fm}	-	1	V
Photodiode for monitoring	Reverse voltage	V _{rd}	-	20	V
	Forward current	I _{fd}	-	2	mA
Thermoelectric cooler(Note1)	Current	I _{pem}	-	1.5	A
	Voltage	V _{pem}	-	3.2	V
Driver IC	Voltage	V _{EE_m}	-	-6~0	V
	Current	I _{EE_m}	-	500	mA
	EA modulation voltage	V _{MOD_m}	-	-6.5~0	V
	EA offset voltage control Voltage	V _{OF_{Sm}}	-	-6.5~0	V
	Cross point control Voltage	V _{CR_{Sm}}	-	-6~0	V
Operating case temperature		T _c	-	0~75	°C
Storage temperature		T _{stg}	-	-40~85	°C

Note1

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_c=25°C, unless otherwise noted)

Parameter	Symbol	Conditions	Limits			Unit
			Min.	Typ.	Max.	
Threshold current	I _{th}	CW	5	-	30	mA
Operating current	I _{op}	(Note 2,3)	-	-	100	mA
Operating voltage	V _{op}	(Note 2,3)	-	-	1.7	V
Operating power	P _{op}	(Note 2,3)	-1	0	2	dBm
Light emission central wavelength	λ_c	(Note 2,3)	1530	1550	1570	nm
Side mode suppression ratio	S _r	(Note 2,3)	35	-	-	dB
Dispersion penalty	D _p	(Note 2,3), D=800ps/nm	-	-	2.0	dB
Extinction ratio	E _x	(Note 2,3)	9	-	-	dB
Driver IC supply voltage	V _{EE}	-	-5.5	-5.2	-4.9	V
Driver IC supply current	I _{EE}	-	-	250	300	mA
EA modulation voltage control voltage	V _{MOD}	-	V _{EE}	-	V _{EE} +1.0	V
EA offset voltage control voltage	V _{OFS}	-	V _{EE}	-	V _{EE} +2.2	V
Cross point control voltage	V _{CRS}	-	V _{EE} +0.7	-	V _{EE} +2.2	V
Data input voltage	D _{in} , $\bar{D}_{in}$	Differential	0.4	-	1.0	V
Rise/fall time	t _r /t _f	(Note 2,3), 20-80%	-	-	45	ps
RF return loss	S ₁₁	f $\leq$ 10GHz	5	7	-	dB
Tracking error	E _r	(Note 2,3,4), T _c =0-75°C	-	-	1.0	dB
Monitor current	I _{mon}	(Note 2,3), V _{rd} =-5V	0.05	-	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	20	-	-	dB

Note 2 : 10.709225Gb/s, NRZ, PRBS 2³¹-1, P_{ave}=P_{op}, cross point=50%, with 4th BESSEL filter.

Note 3 : Optical return loss of the connectors should be greater than 40dB in order to get specified performance.

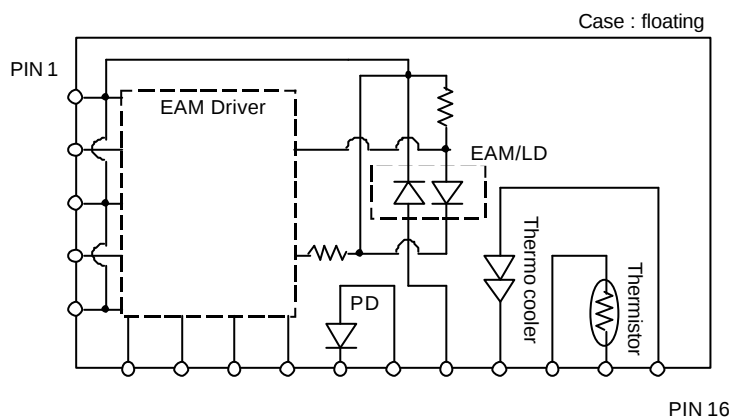
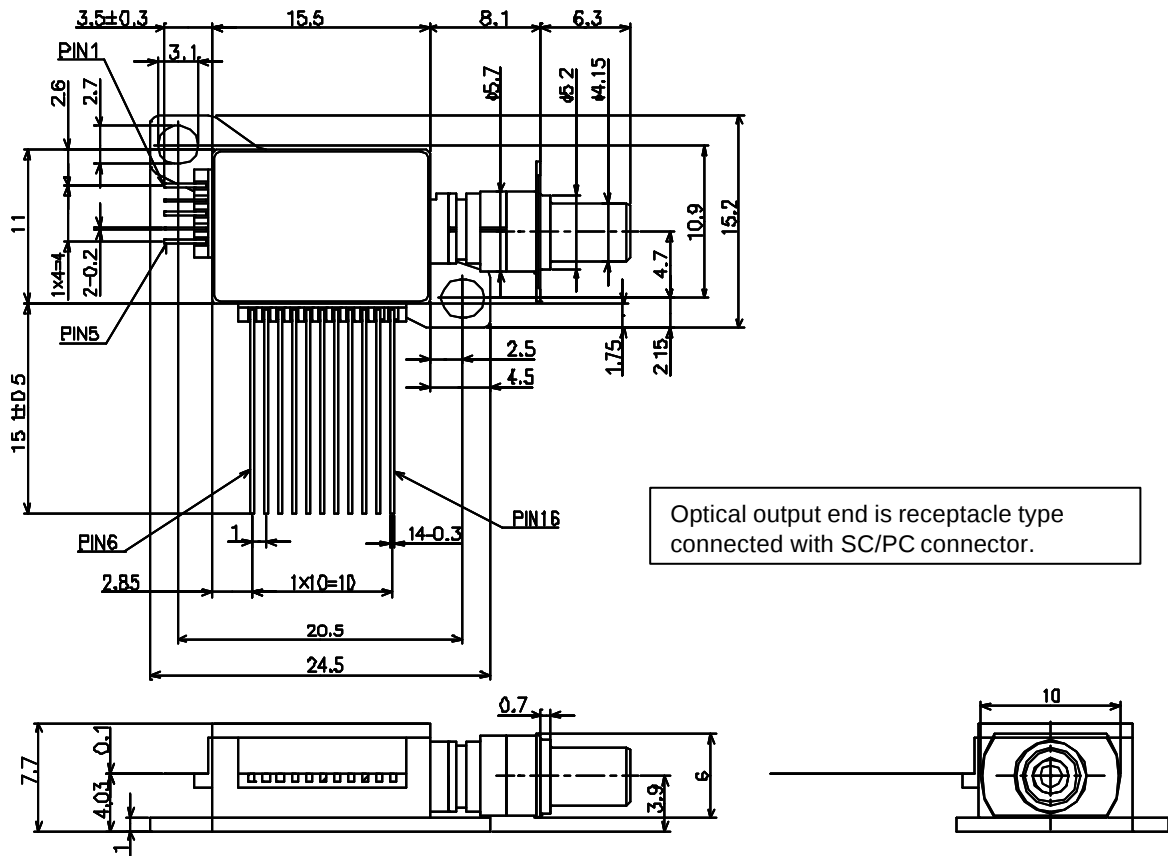
Note 4 : E_r=max | 10 $\times$ log(P_f/P_l@25°C) |.

THERMAL CHARACTERISTICS

Parameter	Symbol	Conditions	Limits			Unit
			Min.	Typ.	Max.	
Thermistor resistance	R _{th}	T _c =T _{ld} =25°C	9.5	10	10.5	k Ω
B constant of R _{th}	B	-	-	3950	-	K
Cooler current	I _{pe}	(Note 2,3), T _c =75°C, T _{ld} =25°C	-	0.9	1.2	A
Cooler voltage	V _{pe}	(Note 2,3), T _c =75°C, T _{ld} =25°C	-	2.8	3.0	V

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Pin	Function	Pin	Function
1	FLOATING GND	9	V_{OFS}
2	DATA	10	MONITOR PD (CATHODE)
3	FLOATING GND	11	MONITOR PD (ANODE)
4	DATA	12	LD BIAS (ANODE)
5	FLOATING GND	13	COOLER (CATHODE)
6	V_{CRS}	14	THERMISTOR
7	V_{EE}	15	THERMISTOR
8	V_{MOD}	16	COOLER (ANODE)