HIGH POWER DFB LASERS (120mW)

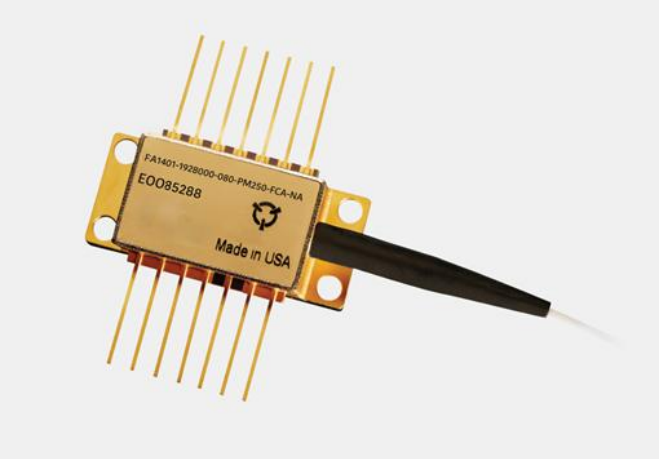
Single frequency lasers in 14-pin butterfly package

PRODUCT DATASHEET

The EM4 high power distributed feedback laser (DFB) is an InGaAs/InP multi-quantum well (MQW) laser diode.

The module is ideal in applications where low relative intensity noise (RIN) and stable polarization-maintaining properties are needed.

The module contains a thermo-electric cooler, thermistor, and monitor detector and is designed and built using EM4's high reliability platform for defense applications.



Key Characteristics

- C-band wavelengths of 1540-1560
- 120 mW ex-fiber output power
- Kink free operation from 20mW to 120mW
- 40dB optical isolation minimum
- High efficiency TEC

Features

- ITU grid wavelengths at 100 GHz spacing
- Low RIN
- PM250 fiber
- Laser welded, hermetically sealed
- Built in thermistor and monitor photodiode
- Strain relief boot standard; no boot option
- FCA connector standard; other options available
- 20°C to 40°C chip temperature range

Applications

- Seed source
- Sensing
- Spectroscopy
- Optical communication

Process Control / Screening Test

The following screening tests shall be implemented during assembly for long term reliability:

- COC Burn-In
- Fine and Gross Leak Test: MIL-STD-883 method 1014.

Performance Characteristics

Tpackage=20-25°C, continuous wave and beginning of life unless otherwise specified

Optical characteristics	Sym	Condition	Min	Typ	Max	Unit
Operating chip temperature	T_{CHIP}		20		40	°C
Output power	P_{op}		120mW			mW
Center frequency	F_{opt}	P=P_{op} ; Frequency accuracy 5THz	See order code			THz
Linewidth[2]	A	Source dependent		650		KHz
Relative intensity noise[2]	RIN	P=P_{op}, peak value	-160	-165		dBc/Hz
Side mode suppression[2]	SMSR	P=P_{op}	30			dB
Optical isolation[2]	ISO	F_{opt} within C-band	40	45	50	dB
Polarization extinction ratio	PER		17	21		dB
Temperature tuning coefficient[2]	Δv/ΔT °C	Chip temperature		-12.5		GHz/°C
Current tuning coefficient[2]	Δv/ΔI °C	For reference only	200	250	400	MHz/mA
Kink screening		No kinks	Ith+50		1.1* I_{op}	mA

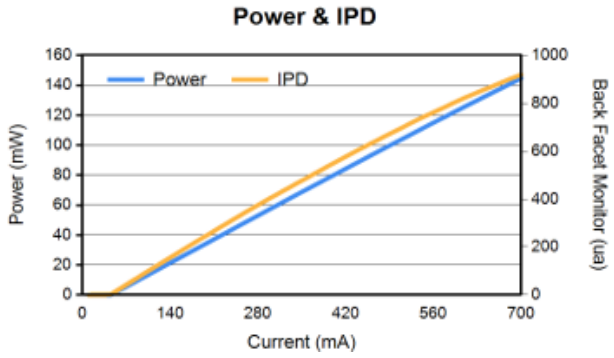
Electrical characteristics	Sym	Condition	Min	Typ	Max	Unit
Threshold current	I_{TH}			50	75	mA
Laser drive current[1]	I_{op}	120 mW ex-facet		600	700	mA
Laser forward voltage	V_F	I=I_{op}, Max no bias-T I=I_{op}, Max with bias-T		1.8 1.9	3 3.0	V V
Monitor photo diode current	I_{PD}	P=P_{OP}	100			µA
Monitor photo diode dark current[2]	I_D	V_{bias}=-5 V			100	nA
TEC current[2]		T_{amb}=25°C for typ T_{amb}=65°C for max[2] P=P_{op}, T_{CHIP}=25°C		0.1	2.2	A
TEC voltage[2]				0.1	6.0	V
Thermistor resistance[2]	R_{TH}	T = 25°C	9500	10000	10500	Ω
Thermistor β coefficient[2]	?	0 / 50°C		3892		
Thermistor Steinhart-Hart coefficients[2]		A = 1.1291e^{-3} B = 2.3413e^{-4} C = 8.7674e^{-8}				

[1] I_{op} and T_{op} to achieve rated power and frequency at factory test defined on device specific test sheet supplied with each unit.

[2] By Design, not tested per serial number

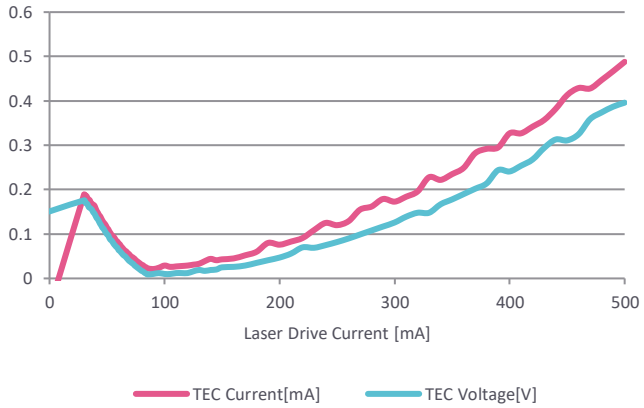
Data Tables

Typical output power and back facet monitor current vs input current

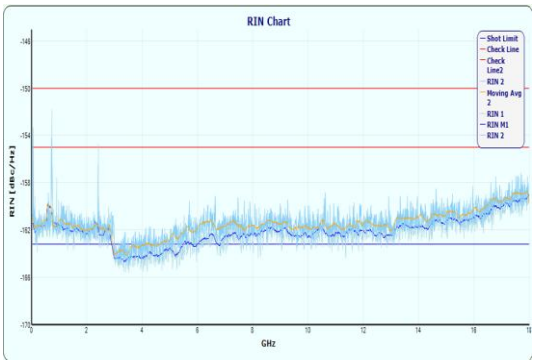


Typical TEC performance

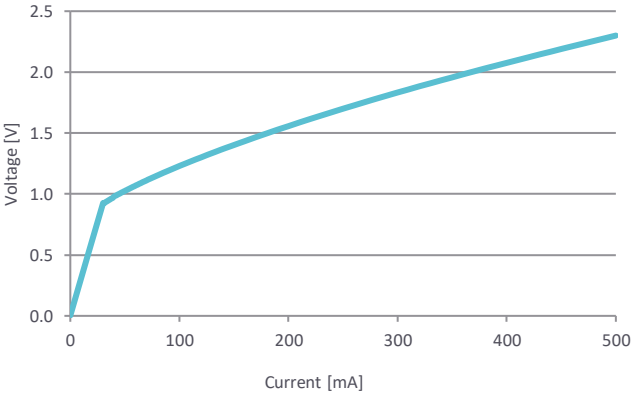
T_c=25°Case

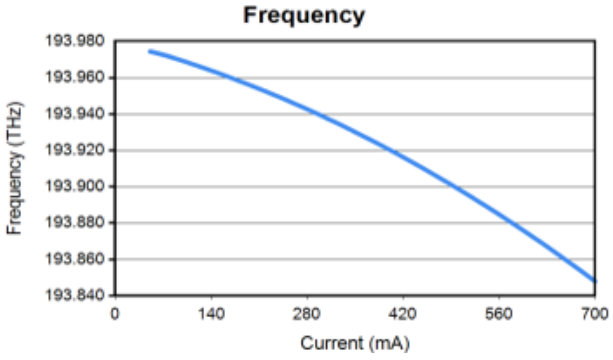


Typical RIN (Relative Intensity Noise)



Typical voltage vs current





Typical current tuning

Fiber Characteristics

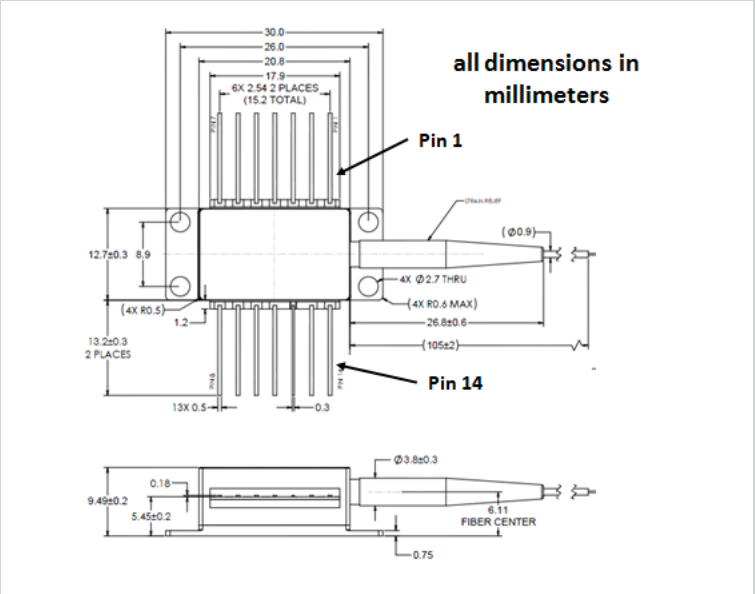
Fiber type	PM
Jacket material[2]	Acrylate
Core / outer / buffer[2] diameters	8 µm / 125 µm / 250 µm
Minimum fiber length	1.0 m
Minimum bend radius	35 mm
Proof strength	100 kPSI
Connector[3], output polarization	FC/APC, polarization parallel to slow axis

[2] Optional additional 900 µm PVDF buffer tube recommended for laboratory use.

[3] Other connector options available, contact sales for more information.

Pinout and Mechanical Drawing

Pin	Description	Pin	Description
1	Thermistor	14	Case
2	Thermistor	13	Laser anode
3	Laser cathode	12	Laser cathode
4	Monitor PD anode	11	Laser anode
5	Monitor PD cathode	10	Case
6	TEC+	9	Case
7	TEC-	8	Case



Note: Option Boot Shown

Absolute Maximum Ratings	Sym	Min	Max	Unit
Storage temperature	T_{STG}	-40	+85	°C
Operating case temperature	T_{OP}	-20	+70	°C
Laser forward current	I_F		750	mA
Laser reverse voltage	V_R		2	V
Photo diode photo current	I_{PD}		10	mA
Photo diode reverse voltage	V_{PD}		20	V
TEC current	I_{TEC}		2.2	A
TEC voltage	V_{TEC}		6	V
Thermistor current			2	mA
Thermistor voltage			5	V
Lead soldering time			10	S
Lead soldering temperature			250	°C
ESD (human body model)			500	V

- Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only and operation of the device at or beyond these conditions is not implied. Exposure to absolute maximum ratings for extended periods of time may affect device reliability.

Ordering information

Example part number: FA1401-193400-120-PM250-FCA-NA

Order code ① ② ③ ④ ⑤ ⑥

F	A	1	4			-						-				-					-				-		

①	Model	Standard				
	Code	01				

②	Wavelength	1545 through 1565 nm [3]
	Code	XXXXXX (Wavelength: based on desired frequency at 100GHz spacing)

③	Power	120 mW
	Code	120

④	Fiber	PM fiber, 250 um tight buffer	PM fiber, 250 um tight buffer No Strain Relief Boot	PM fiber, 900 um loose buffer
	Code	PM250	PM25N	PM900

⑤	Connector[2]	FC/APC[2]
	Code	FCA

⑥	Bias T	None	0 Ω (Low impedance)	25 Ω	50 Ω
	Code	NA	00	25	50

[1] SMSR not specified for lasers without isolators.

[2] Other connector options available, contact sales for more information.

[3] Contact sales to confirm wavelength availability

For further information

EM4
T: +1 781-275-7501
E: em4-sales@luminarsemi.com

EM4photonics.com