

# HIGH POWER DFB LASERS (80-100mW)

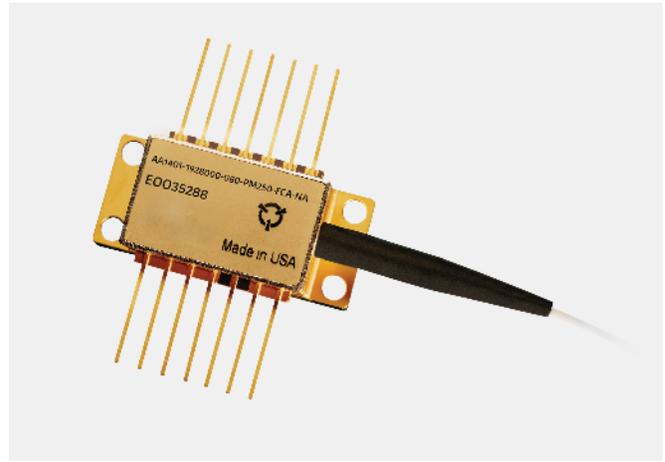
Single frequency lasers in 14-pin butterfly package

## 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 and L-band wavelengths  
1537-1565 and 1565-1617 nm
- 80-100 mW ex-fiber output power options
- 30dB optical isolation
- -155dB RIN

### Features

- ITU grid wavelengths, 100 GHz spacing
- Low RIN
- PM or SM fiber
- High isolation option
- Laser welded, hermetically sealed
- Built in thermistor and monitor photodiode
- Optional Bias-T
- Tested to Telcordia GR-468 Core/MIL-Std 883

### Applications

- Long haul WDM transmission
- RF links
- Seeding
- Pulsing
- Sensing

## Performance Characteristics

$T_c=25^\circ\text{C}$ , continuous wave and beginning of life unless otherwise specified

Optical characteristics	Sym	Condition	Min	Typ	Max	Unit
Operating chip temperature	$T_{\text{CHIP}}$		20		40	$^\circ\text{C}$
Output power	$P_{\text{op}}$		See ordering information			mW
Center frequency	$F_{\text{opt}}$	$P=P_{\text{op}}$	See ordering information			THz
Linewidth	A	Source dependent		1		MHz
Relative intensity noise	RIN	80mW $P=P_{\text{op}}$ , peak value		-153	-148	dBc/Hz
		100mW $P=P_{\text{op}}$ , peak value		-155	-150	dBc/Hz
Side mode suppression <sup>1</sup>	SMSR	$P=P_{\text{op}}$	30			dB
Optical isolation <sup>1</sup>	ISO	$F_{\text{opt}}$ within C-band	30	35		dB
		AA1415-series	50	55		dB
Polarization extinction ratio	PER		17	21		dB
Temperature tuning coefficient	$\Delta\nu/\Delta T$ $^\circ\text{C}$	Chip temperature		-12.5		GHz/ $^\circ\text{C}$
Current tuning coefficient	$\Delta\nu/\Delta I$ $^\circ\text{C}$	For reference only	400		800	MHz/mA
Relaxation oscillation frequency	$F_{\text{relax}}$	For reference only		6		GHz
Kink screening		No kinks	$0.9^* I_{\text{op}}$		$1.1^* I_{\text{op}}$	

Electrical characteristics	Sym	Condition	Min	Typ	Max	Unit
Threshold current	$I_{\text{TH}}$			50	75	mA
Laser drive current <sup>2</sup>	$I_{\text{op}}$	80 mW models		330	450	mA
		100 mW models		410	450	mA
Laser forward voltage	$V_{\text{F}}$	$I=I_{\text{op}}$ , Max			3	V
Monitor photo diode current	$I_{\text{PD}}$	$P=P_{\text{OP}}$	100			$\mu\text{A}$
Monitor photo diode dark current	$I_{\text{D}}$	$V_{\text{bias}}=-5\text{ V}$			100	nA
TEC current		$T_{\text{amb}}=25^\circ\text{C}$ for typ $T_{\text{amb}}=70^\circ\text{C}$ for max		0.1	4.0	A
TEC voltage			$P=P_{\text{op}}$ , $T_{\text{CHIP}}=25^\circ\text{C}$		0.1	4.0
Thermistor resistance	$R_{\text{TH}}$	$T = 25^\circ\text{C}$	9500	10000	10500	$\Omega$
Thermistor $\beta$ coefficient	$\beta$	$0 / 50^\circ\text{C}$		3892		
Thermistor Steinhart-Hart coefficients		$A = 1.1291\text{e}^{-3}$ $B = 2.3413\text{e}^{-4}$ $C = 8.7674\text{e}^{-8}$				

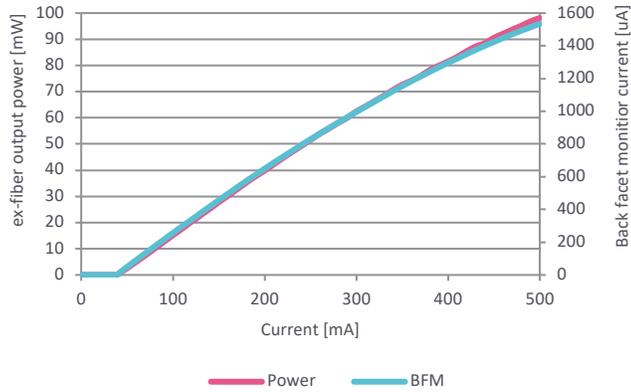
HIGH POWER DFB LASERS – AA1401 SERIES (AA1401/AA1402/AA1406/AA1408/AA1415)

- 1 Reference model number AA1408 for units without internal isolator. SMSR not specified for this model.
- 2 Not all specifications are tested per device, by design only.
- <sup>2</sup>  $I_{op}$  and  $T_{op}$  to achieve rated power and frequency at factory test defined on device specific test sheet supplied with each unit.

## Data Tables (80 mW laser shown)

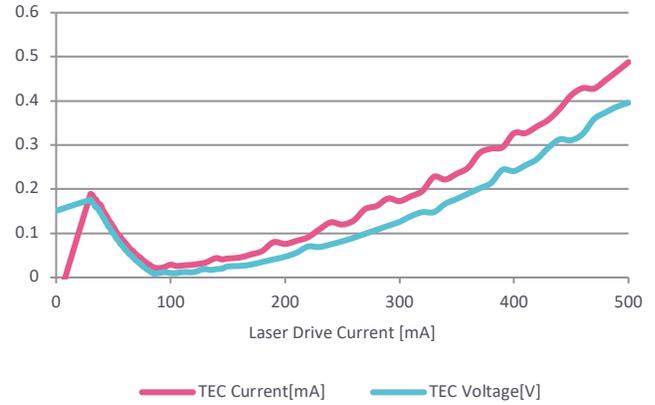
### Typical output power and back facet monitor current

#### vs input current

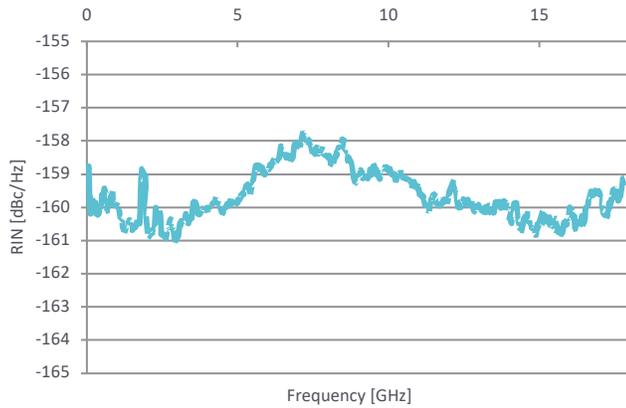


### Typical TEC performance

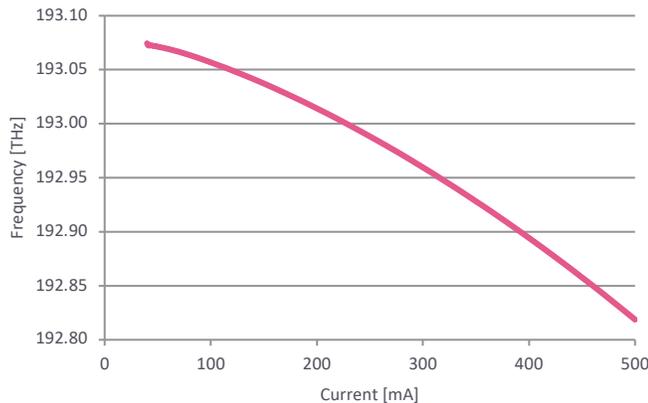
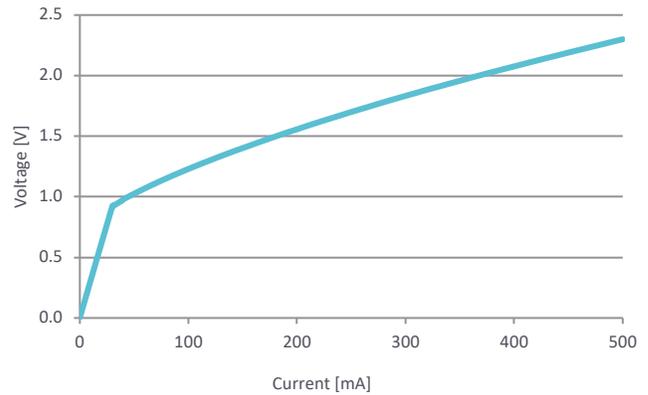
#### $T_c=25^\circ\text{C}$



### Typical RIN (Relative Intensity Noise)



### Typical voltage vs current



HIGH POWER DFB LASERS – AA1401 SERIES (AA1401/AA1402/AA1406/AA1408/AA1415)

Typical current tuning

## Fiber Characteristics

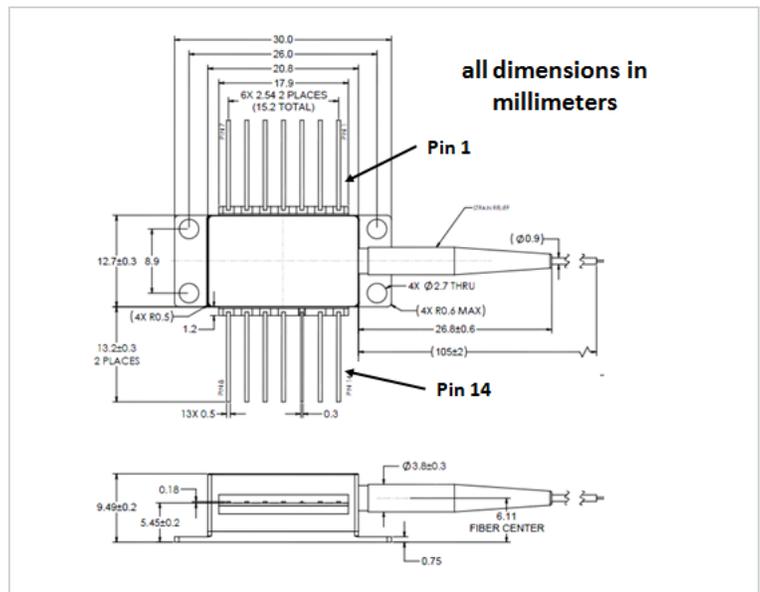
Fiber type	PM single mode fiber
Jacket material <sup>2</sup>	Acrylate
Core / outer / buffer <sup>2</sup> diameters	8 μm / 125 μm / 250 μm
Minimum fiber length	1.0 m
Minimum bend radius	35 mm
Proof strength	100 kPSI
Connector <sup>3</sup> , output polarization	FC/APC, polarization parallel to slow axis

<sup>2</sup> Optional additional 900 μm loose-tube PVDF buffer recommended for laboratory use.

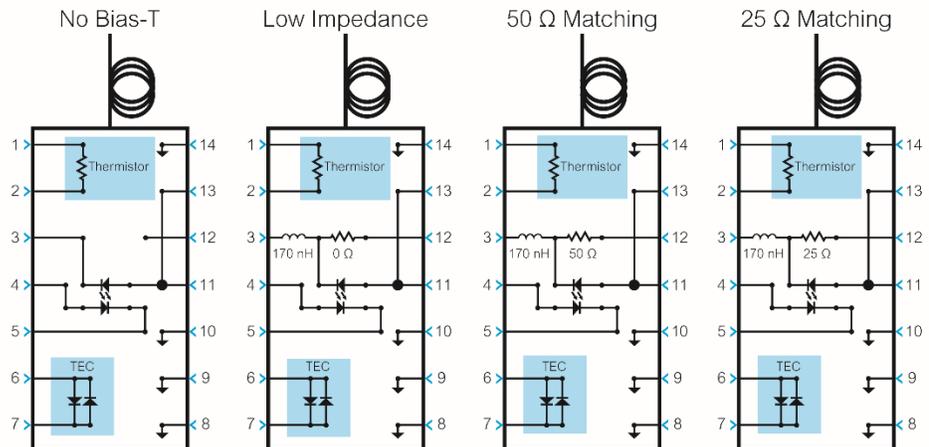
<sup>3</sup> Other connector options available, contact sales for more information.

## Pinout and Mechanical Drawing

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



## Bias-T Options



Absolute Maximum Ratings	Sym	Min	Max	Unit
Storage temperature	T <sub>STG</sub>	-40	+85	°C
Operating case temperature	T <sub>OP</sub>	-20	+70	°C
Laser forward current, 80-100 mW models	I <sub>F</sub>		450	mA
Laser reverse voltage	V <sub>R</sub>		2	V
Photo diode photo current	I <sub>PD</sub>		10	mA
Photo diode reverse voltage	V <sub>PD</sub>		20	V
TEC current	I <sub>TEC</sub>		4	A
TEC voltage	V <sub>TEC</sub>		4	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: AA1401-193500-080-PM250-FCA-NA

<b>Order code</b>		①	②	③	④	⑤	⑥
A	A	1	4			-	

①	Model	Standard	1617 nm	100 mW	No isolation <sup>1</sup>	High isolation
	Code	01	02	06	08	15

②	Wavelength	1509 through 1617 nm <sup>3</sup>				
	Code	XXXXXX (Wavelength: based on desired frequency)				

③	Power	80 mW		100 mW		
	Code	080		100		

④	Fiber	PM fiber, 250 um tight buffer	PM fiber, 900 um loose buffer	SM fiber, 900 um loose buffer		
	Code	PM250	PM900	SM900		

⑤	Connector <sup>2</sup>	FC/APC <sup>2</sup>				
	Code	FCA				

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

<sup>1</sup> SMSR not specified for lasers without isolators.

<sup>2</sup> Other connector options available, contact sales for more information.

<sup>3</sup> Contact sales to confirm wavelength availability

## For further information

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