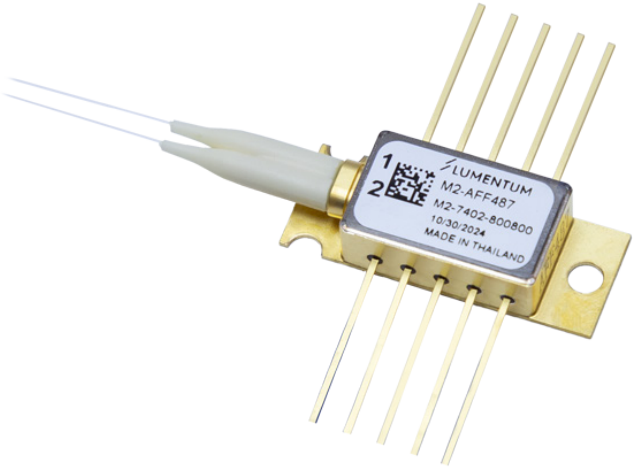
LUMENTUM

2 x 900 mW Fiber Bragg Grating Stabilized 980 nm Pump Modules

M2 Series



The Lumentum M2 Series pump module is dual-chip 980 nm pump modules with each emitter independently controlled. It uses a number of revolutionary design steps to provide high optical power density within a compact space. The M2 Series pump module incorporates the Lumentum high-reliability, high-efficiency 980 nm laser diode in a cooled fiber Bragg grating-stabilized 10-pin low-profile butterfly design. The module meets the stringent requirements of the telecommunications industry, including Telcordia GR-468-CORE for hermetic 980 nm pump modules.

The M2 pump module, which uses fiber Bragg grating stabilization to lock the emission wavelength, provides a noise-free, narrowband spectrum, even under changes in temperature, drive current, and optical feedback. Wavelength selection is available for applications requiring the highest performance in spectrum control with the highest power.

Key Features

- Operating power range from 800 – 1800 mW
- 45°C internal temperature
- Low-profile 10-PIN butterfly package
- Fiber Bragg grating stabilization
- Wavelength selection available
- Integrated thermoelectric cooler, thermistor, and monitor diode
- High dynamic range
- Excellent low-power stability

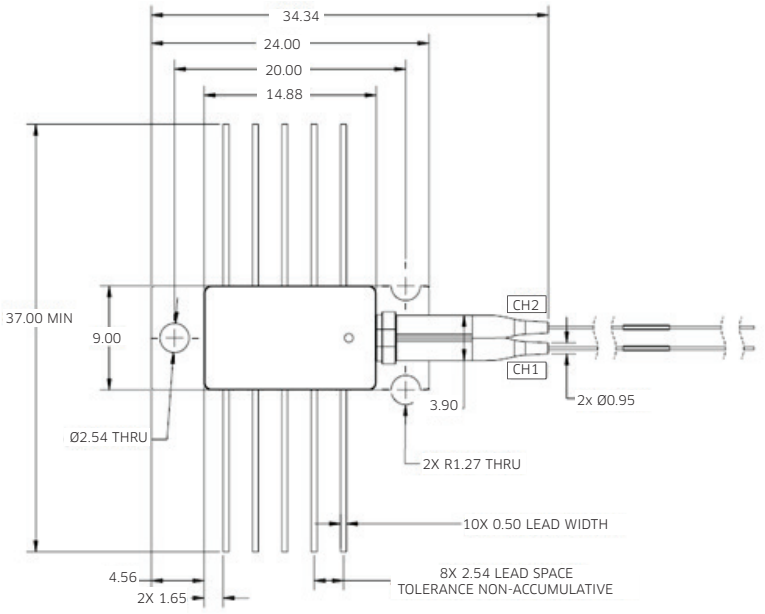
Applications

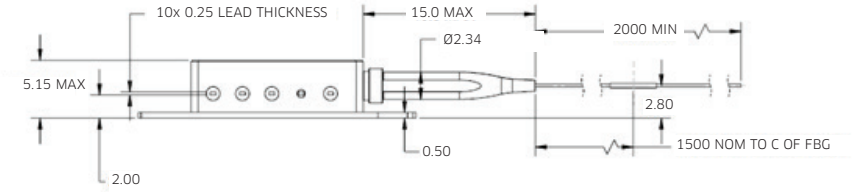
- Dense wavelength division multiplexing (DWDM) EDFAs
- High bit-rate, high channel-count EDFAs
- CATV distribution

Compliance

- Telcordia GR-468-CORE

Dimensions Diagram and Pin Assignment





Pinout

Pin	Description
1	TEC (+)
2	Thermistor
3	Monitor Anode (-)
4	Monitor Cathode (+)
5	Thermistor
6	Laser Anode 1, 2 (+)
7	Laser Cathode 1 (-)
8	Laser Cathode 2 (-)
9	Package ground
10	TEC (–)

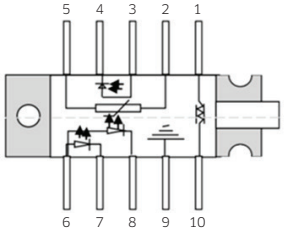


Table 1. Absolute Maximum Ratings

Parameter	Symbol	Test Conditions	Value		Unit
			Minimum	Maximum	
Operating case temperature	T_{op}	–	–5	+75	°C
Storage temperature	T_{stg}	2000 hrs	–40	+85	°C
Laser operating temperature	T_{LD}	–	15	60	°C
LD reverse voltage	V_r	–	–	2	V
M2 LD forward current	I_{f_max}	Unlimited time	–	1900	mA
M2 LD current transient	–	20 µs maximum	–	2000	mA
LD Reverse current	–	–	–	10	µA
PD reverse voltage	V_{PD}	–	–	20	V
PD forward current	I_{PF}	–	–	10	mA
LD electrostatic discharge (ESD)	V_{ESD}	C = 100 pF, R = 1.5 kΩ, HBM	–	1000	V
PD electrostatic discharge (ESD)	V_{ESD}	C = 100 pF, R = 1.5 kΩ, HBM	–	500	V
TEC forward current	I_c	–	–	2	A
TEC reverse current	I_{rc}	–	-1.2	–	A
TEC voltage	V_c	–	–	4.5	V
Axial pull force	–	3X 10 s	–	5	N
Side pull force	–	3X 10 s	–	2.5	N
Fiber bend radius	–	–	16	–	mm
Atmospheric pressure	–	Storage	11	–	kPa
Atmospheric pressure	–	Operating	58	–	kPa
Relative humidity	RH	Non-condensing	5	95	%
Lead soldering time	–	300°C	–	10	s

Absolute maximum ratings are the maximum stresses that may be applied to the module for short periods of time without causing damage. Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. Exposure to absolute maximum ratings for extended periods of time or exposure to more than one absolute maximum rating simultaneously may adversely affect device reliability. Specifications may not necessarily be met under these conditions.

Table 2. Optical and Electrical Characteristics of M2 Pump (Case temperature Tcase= 0°C to 75°C) for different Pop

Product Code	Maximum Operating Power (mW)	Maximum Operating Current (mA)	Minimum Kink-Free Power (mW)	Maximum Kink-Free Current (mA)
M2-xxxx-400400	400	775	440	845
M2-xxxx-500500	500	945	550	1030
M2-xxxx-600600	600	1115	660	1215
M2-xxxx-680680	680	1250	748	1370
M2-xxxx-700700	700	1285	770	1410
M2-xxxx-750750	750	1375	825	1515
M2-xxxx-800800	800	1470	880	1645
M2-xxxx-850850	850	1585	935	1770
M2-xxxx-900900	900	1700	990	1850

Note: xxxx denotes wavelength and tolerance per Table 3 below.

Table 3. Available Peak Wavelength Selection

Product Code	Minimum Peak Wavelength	Maximum Peak Wavelength
M2-7402-xxxxxx	973 nm	975 nm
M2-7602-xxxxxx	975 nm	977 nm
M2-8000-xxxxxx	973 nm	981.5 nm

Note: xxxxxx denotes operating power per Table 2 above.

Table 4. Optical and Electrical Performance (BOL, T_{case}= -5°C to 75°C, P range = 30 mW to P_{max}, -50 dB reflection, unless otherwise noted)

Parameter	Symbol	Test Conditions	Limits		Unit
			Minimum	Maximum	
Threshold current per port	I_{th}-BOL	–	–	100	mA
Operating forward current	I_{op}	–	–	Table 2	mA
Forward voltage	V_f	–	Vmin	2.16	V
Fiber output power range	P_f	–	30 mW	P_{max}per Table 2	mW
Kink-free output power	P_{max}	If = I_{max} , Table 2	P_{max}per Table 2	–	mW
Center emission wavelength	λ_m	Over P_f range,	See Table 3		nm
Power in pump band	P_{pump}	Pump band = λm ±1.5 nm, 60 mW <Pop<P_{max}	90	–	%
Power in pump band	P_{pump}	Pump band = λm ±1.5 nm, 30 <Pop<60 mW	80	–	%
Spectral width	$\Delta\lambda_{rms}$	CW, over P_t range,	–	2.0	nm
Wavelength tuning vs. temperature	Δλ/T	I_f = I_{op}	0	0.01	nm/°C
Laser diode 10%-90% rise/fall time	t_r/t_f	Step response	—	100	ns
Return loss	RL	1480 – 1620 nm	—	9	dB
Optical power cross talk	–	Over P_f and T_{case} range	—	1	mW
Thermal cross talk	–	Over P_f and T_{case} range	—	1	°C
Monitor diode response per LD	I_{BF}	Over P_{op} range	0.5	5	μA/mW
LD operating temperature	T_{LD}	45°C, nominal	43	47	°C
Thermistor resistance	R_{th}	T_{set}= 45°C	9.5	10.5	kΩ
TEC current	TECI	T_{case} -5 to 75C	—	1.43	A
TEC voltage	TECV	T_{case} -5 to 75C	—	3.26	V

Table 5. Total Module Power Consumption at T_{LD}= 45°C (BOL/EOL, T_{CASE}= -5 to 75°C)

Product Code	Total Module Power Consumption Pmax(W) BOL/EOL
M2-xxxx-400400	3.6/4.0 (Typ. 3.1/3.4)
M2-xxxx-500500	4.5/5.0 (Typ. 3.8/4.2)
M2-xxxx-600600	5.6/6.2 (Typ. 4.6/5.1)
M2-xxxx-680680	6.5/7.4 (Typ. 5.3/6.0)
M2-xxxx-700700	6.7/7.7 (Typ. 5.5/6.2)
M2-xxxx-750750	7.4/8.6 (Typ. 6.0/6.9)
M2-xxxx-800800	8.2/9.7 (Typ. 6.6/7.6)
M2-xxxx-850850	9.1/11.3 (Typ. 7.2/8.5)
M2-xxxx-900900	10.3/12.8 (Typ. 7.9/9.4)

Table 6. HI 1060 Fiber Nominal Characteristics and Tolerances

Parameters	Specification
Cutoff wavelength	920 nm
Maximum attenuation at 980 nm	2.1 dB/km
Cladding outside diameter	125 ±1 μm
Coating outside diameter	245 ±10 μm
Core-cladding concentricity	≤0.5 μm
Mode field diameter	5.9 ±0.3 μm

User Safety

Safety and Operating Considerations

The laser light emitted from this laser diode is invisible and may be harmful to the human eye. Avoid looking directly into the fiber when the device is in operation.

CAUTION: THE USE OF OPTICAL INSTRUMENTS WITH THIS PRODUCT INCREASES EYE HAZARD.

Operating the laser diode outside of its maximum ratings may cause device failure or a safety hazard. Power supplies used with this component cannot exceed maximum peak optical power.

CW laser diodes may be damaged by excessive drive current or switching transients. When using power supplies, the laser diode should be connected with the main power on and the output Voltage at zero. The current should be increased slowly while monitoring the laser diode output power and the drive current. Careful attention to heat sinking and proper mounting of this device is required to ensure specified performance over its operating life.

ESD PROTECTION—Electrostatic discharge (ESD) is the primary cause of unexpected laser diode failure. Take extreme precaution to prevent ESD. Use wrist straps, grounded work surfaces, and rigorous antistatic techniques when handling laser diodes

Laser Safety

The Lumentum pump laser module emits hazardous invisible laser radiation.

This component requires provisions of drive and control electronics before emitting laser radiation.

Laser classification depends on the system control circuit and any laser safety features provided.

This diode-pumped laser module is not 21CFR 1040.10 or IEC 60825-1:2014 certified. It is a component intended for system integration. Compliance with 21CFR 1040.10 and/or IEC 60825-1:2014 will need to be determined at the system level.

Lumentum has registered this laser with the FDA/CDRH as an OEM component. Please contact Lumentum for an FDA/CDRH accession number for this laser component.

Due to the small size of the pump module, the box packaging is labeled with the laser radiation hazard symbol and safety warning label shown below.

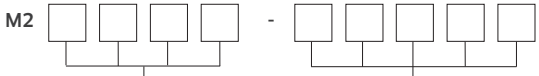
Laser radiation safety warning
Laser classification per IEC 60825-1:2014
Maximum output power 2W per port

Labeling

Clamshell and box label

Ordering Information

For more information on this or other products and their availability, please contact your local Lumentum account manager or Lumentum directly at customer.service@lumentum.com.



Peak Wavelength	Code
973.0 to 975.0 nm	7402
975.0 to 977.0 nm	7602
973.0 to 981.5 nm	8000

Maximum Operating Power	Code
400 mW/400 mW	400400
500 mW/500 mW	500500
600 mW/600 mW	600600
680 mW/680 mW	680680
700 mW/700 mW	700700
750 mW/750 mW	750750
800 mW/800 mW	800800
850 mW/850 mW	850850
900 mW/900 mW	900900

LUMENTUM

Lumentum Operations LLC
1001 Ridder Park Drive
San Jose, CA 95131 USA

www.lumentum.com

North America
Toll Free: 844 810 LITE (5483)

Outside North America
Toll Free: 800 000 LITE (5483)

China
Toll Free: 400 120 LITE (5483)

m2series-ds-oc-ae 30179726 000 0125