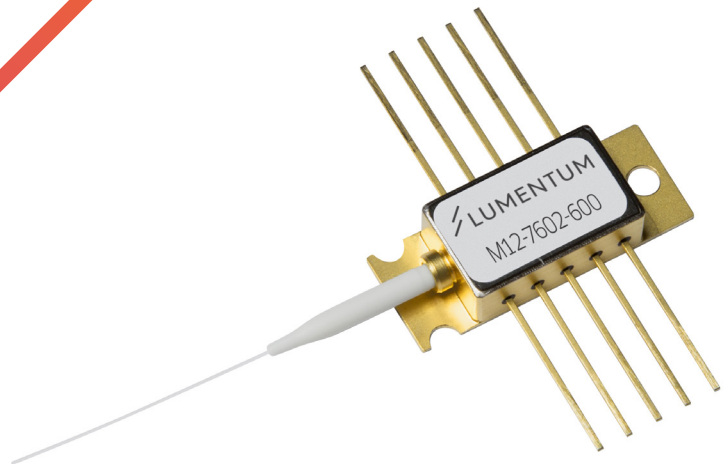


Up to 600 mW Fiber Bragg Grating Stabilized Uncooled Mini-Butterfly 980 nm Pump Laser Modules

M12 Series



The Lumentum uncooled M12 mini butterfly Series 980 nm pump laser module uses a number of revolutionary design steps and the very latest material technologies to significantly improve scalability of the production process. The module meets the stringent requirements of the telecommunications industry, including Telcordia GR-468-CORE for hermetic 980 nm pump modules.

The M12 Series 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 available.

Key Features

- Operating power range from 100 – 600 mW
- Uncooled module, operation temperature: -5°C to 75°C
- Low-profile 10-PIN small form factor (mini-butterfly) package
- Fiber Bragg grating stabilization
- Wavelength selection available
- Integrated monitor diode
- High dynamic range
- Excellent low power stability

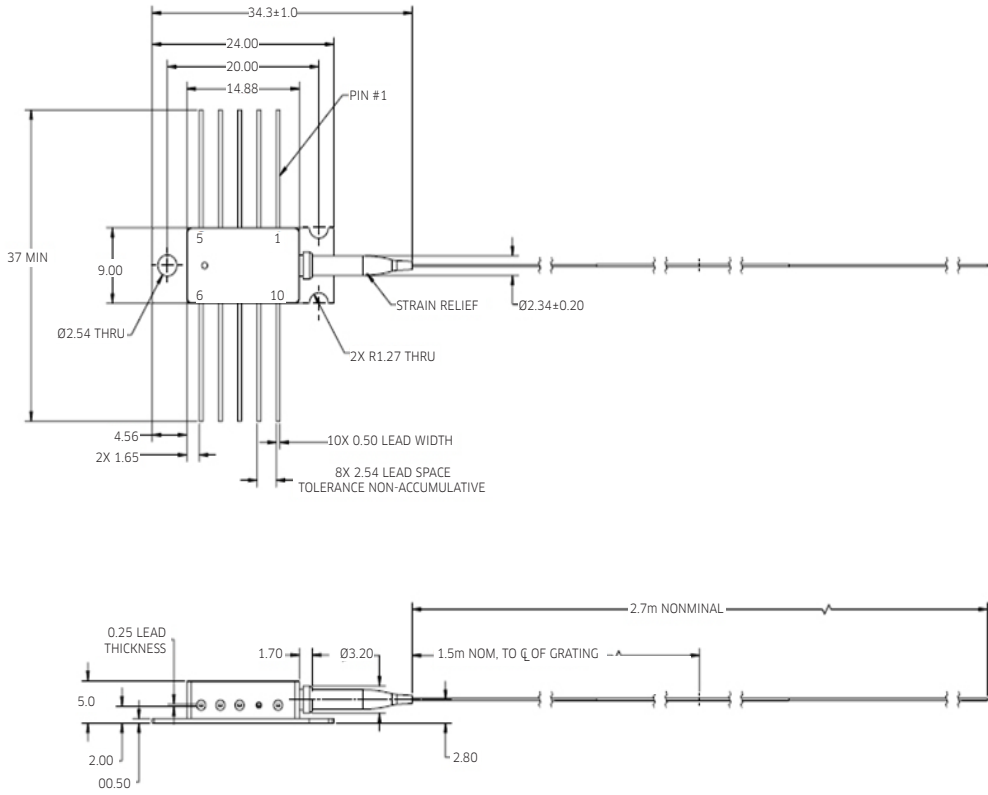
Applications

- Dense wavelength division multiplexing (DWDM) EDFAs for small package designs
- High bit-rate, high channel-count EDFAs
- CATV Distribution

Compliance

- Telcordia GR-468-CORE

Dimensions Diagram



Pin Assignments

Pin	Description
1	NC
2	Thermistor
3	Monitor Anode (-)
4	Monitor Cathode (+)
5	Thermistor
6	Laser Anode (+)
7	Laser Cathode (-)
8	NC
9	Pkg ground
10	NC

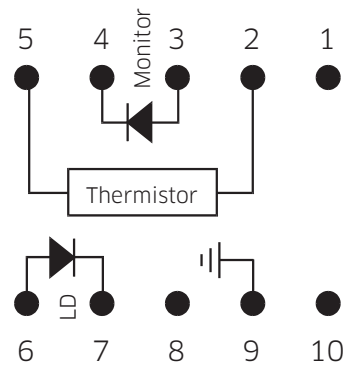


Table 1 Absolute Maximum Rating

Characteristics	Symbol	Test Conditions	Minimum	Maximum
Operating case temperature	T_{op}		-5°C	75°C
Storage temperature	T_{str}	2000 h	-40°C	85°C
Laser operating temperature	T_{LD}		-5°C	75°C
LD reverse voltage	V_r		–	1.2 V
LD forward current	$I_{r,max}$		–	1800 mA
LD Reverse current			–	10 μ A
PD reverse voltage	V_{PD}		–	20 V
PD forward current	I_{PF}		–	10 mA
LD electrostatic discharge (ESD)	V_{ESDLD}	C = 100 pF, R = 1.5 k Ω , HBM		1000 V
PD Electrostatic discharge (ESD)	V_{ESDPD}	C = 100 pF, R = 1.5 k Ω , HBM		500 V
Axial pull force		3X 10 sec.	–	5 N
Side pull force		3X 10 sec.	–	2.5 N
Fiber bend radius			16mm	–
Relative humidity	RH	Non-condensing	5%	95%
Lead soldering time		300°C	–	10 s

Note: 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 Operating Parameters**BOL, $T_{case} = -5$ to 75°C, -50 dB reflection, unless noted otherwise**

Product Code	Maximum Operating Power P_{op} (mW)	Maximum Operating Current I_{op} (mA)	Minimum Kink-Free Power P_{max} (mW)	Kink-Free Current I_{max} (mA) Maximum	Total Module Power Consumption P_{max} (W)
M12-xxxx-100	100	350	110	365	0.59
M12-xxxx-120	120	385	130	415	0.66
M12-xxxx-140	140	425	155	455	0.74
M12-xxxx-160	160	470	175	505	0.83
M12-xxxx-180	180	515	200	555	0.92
M12-xxxx-200	200	560	220	610	1.01
M12-xxxx-220	220	610	240	660	1.11
M12-xxxx-240	240	655	265	715	1.2
M12-xxxx-260	260	705	285	770	1.31
M12-xxxx-280	280	755	310	825	1.42
M12-xxxx-300	300	805	330	875	1.53
M12-xxxx-320	320	850	350	930	1.63
M12-xxxx-340	340	900	375	985	1.74
M12-xxxx-360	360	950	395	1040	1.86
M12-xxxx-380	380	1000	420	1100	1.97
M12-xxxx-400	400	1050	440	1155	2.08
M12-xxxx-420	420	1105	460	1210	2.21
M12-xxxx-440	440	1155	485	1275	2.34
M12-xxxx-460	460	1205	505	1335	2.45
M12-xxxx-480	480	1265	530	1395	2.6
M12-xxxx-500	500	1325	550	1455	2.73
M12-xxxx-520	520	1385	570	1515	2.89
M12-xxxx-540	540	1445	595	1575	3.03
M12-xxxx-560	560	1505	620	1635	3.18
M12-xxxx-580	580	1565	640	1695	3.32
M12-xxxx-600	600	1625	660	1755	3.48

Note: xxxx denotes wavelength per Table 3.

Table 3. Available Peak Wavelength Selection

Product Code	Minimum Center Wavelength	Maximum Center Wavelength
M12-7402-yyy	973.0 nm	975.0 nm
M12-7602-yyy	975.0 nm	977.0 nm
M12-8000-yyy	973.0 nm	981.5 nm

Note: yyy denotes operating power per Table 2.

Table 4 Electro-Optical Performance BOL, $T_{case} = -5^{\circ}C$ to $75^{\circ}C$, $P_f = 30mW$ to P_{max} , -50dB reflection, unless otherwise noted

Parameter	Symbol	Test Conditions	Minimum	Maximum
Threshold current	I_{th-BOL}		–	170mA
Forward voltage	V_f	$I_f = I_{op}$	–	2.6V
Fiber output power range	P_f		30 mW	Pop
Pump power in band	P_{pump}	Pump Band= $\lambda_m \pm 1.5nm$, at Pop	90%	
Spectral width	$\Delta\lambda_{RMS}$	Over P_f Range		2.0 nm
Wavelength tuning vs. temperature	$\Delta\lambda/T$	$I_f = I_{op}$	–	0.01 nm/ $^{\circ}C$
Optical power stability	$\Delta P_{f,t}$	Over P_f range, DC to 50kHz, 50mW - P_{op}	–	2.0%
Tracking ratio	TR	$0.1P_{op} < P_f < P_{op}$	0.4	1.4
Monitor diode response	I_{BF}	-5V bias, at P_{op}	0.5 $\mu A/mW$	10 $\mu A/mW$
Thermistor resistance	R_{th}	$T_{set} = 25^{\circ}C$	9.5 k Ω	10.5 k Ω

Note: The tracking ratio is a measure of the front-to-back tracking when the output power is varied. On a plot of optical power versus back-face photocurrent, a straight line is drawn between the minimum power (30 mW) and the operating power (Pop) points. The tracking ratio is defined as the ratio between measured optical power (shown as data points on the plot) to the value derived from the straight line.

Table 5 HI 1060 Fiber Nominal Characteristics and Tolerances

Parameters	Specification
Cutoff wavelength	920 nm
Maximum attenuation @ 980 nm	2.1 dB/km
Cladding outside diameter	125 $\pm 1 \mu m$
Coating outside diameter	245 $\pm 10 \mu m$
Core-cladding concentricity	$\leq 0.5 \mu m$
Mode field diameter	5.9 $\pm 0.3 \mu m$

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 heatsinking and proper mounting of this device is required to ensure specified performance over its operating life. To maximize thermal transfer to the heatsink, the heatsink mounting surface must be flat to within .001" and the mounting screws must be torqued down to 1.5 in.-lb.

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.

Labeling

The Lumentum pump laser module emits hazardous invisible laser radiation.

Due to the small size of the pump module, the box package is labeled with the laser radiation hazard symbol and safety labels shown.



10-pin module label



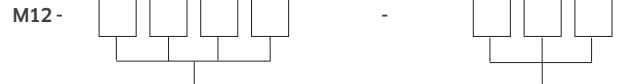
Shipping box label



Output power and laser emission indicator 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
100 mW	100
120 mW	120
140 mW	140
160 mW	160
180 mW	180
200 mW	200
220 mW	220
240 mW	240
260 mW	260
280 mW	280
300 mW	300
320 mW	320
340 mW	340
360 mW	360
380 mW	380
400 mW	400
420 mW	420
440 mW	440
460 mW	460
480 mW	480
500 mW	500
520 mW	520
540 mW	540
560 mW	560
580 mW	580
600 mW	600



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