

# 40 W/60 W Fiber-Coupled Uncooled Multimode Pump Laser Module

49M Series



Lumentum's 49M Series diode lasers offer 40 W/60 W of power through a 105µm fiber. The 49M is a new platform that leverages the well-established and reliable designs of Lumentum's ST Series fiber-coupled diode lasers and the 4900 Series pump lasers.

The 49M multimode pump modules offer high brightness, a compact footprint, and simplified thermal management through the distribution of diodes (heat sources). This allows for the implementation of air- or water-cooled architectures with predictably high reliability. The 49M provides an ideal solution for the vacuum/space EDFA pumping market, offering all the necessary technical attributes within a single platform.

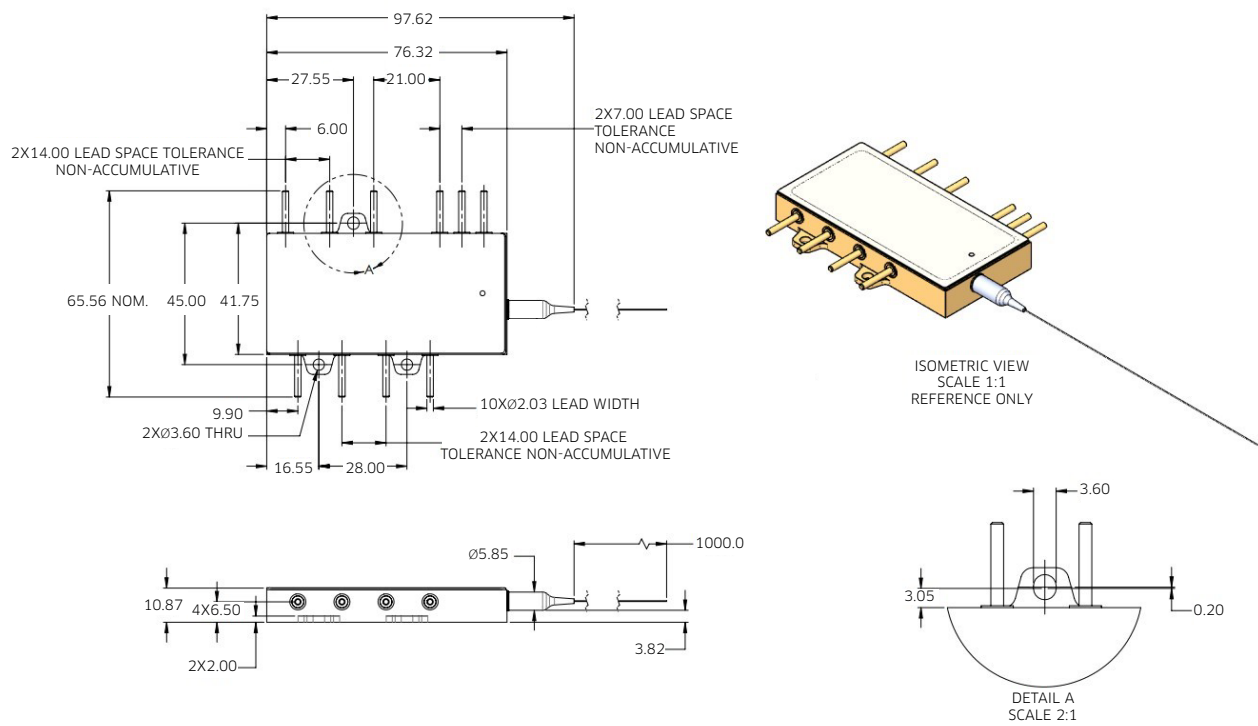
**Key Features**

- 40 W/60 W output power
- High reliability
- 105 µm aperture
- 0.22 NA
- Isolated electrical contacts

**Applications**

- EDFA pumping

Dimensions Diagram



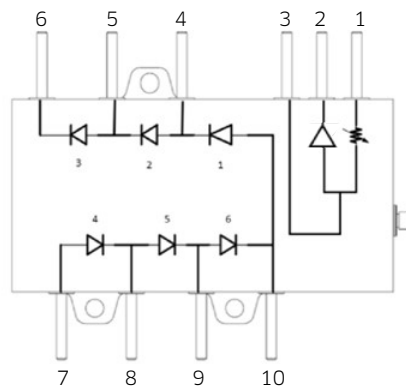
**6E Pin assignment**

| CASE 1: ALL LASER DIODES FUNCTIONING |                                 |     |                         |
|--------------------------------------|---------------------------------|-----|-------------------------|
| PIN                                  | DESCRIPTION                     | PIN | DESCRIPTION             |
| 1                                    | CATHODE (-) OF THERMISTOR       | 6   | LASER DIODE CATHODE (-) |
| 2                                    | CATHODE (-) OF MPD              | 7   | LASER DIODE ANODE (-)   |
| 3                                    | ANODE (+) OF THERMISTOR AND MPD | 8   | OPEN                    |
| 4                                    | OPEN                            | 9   | OPEN                    |
| 5                                    | OPEN                            | 10  | OPEN                    |

| CASE 2: INDIVIDUAL LASER DIODES TESTING |                                 |     |                                |
|-----------------------------------------|---------------------------------|-----|--------------------------------|
| PIN                                     | DESCRIPTION                     | PIN | DESCRIPTION                    |
| 1                                       | CATHODE (-) OF THERMISTOR       | 6   | LASER DIODE CATHODE (-)        |
| 2                                       | CATHODE (-) OF MPD              | 7   | LASER DIODE ANODE (-)          |
| 3                                       | ANODE (+) OF THERMISTOR AND MPD | 8   | LD4 CATHODE (-), LD5 ANODE (+) |
| 4                                       | LD1 CATHODE (-), LD2 ANODE (+)  | 9   | LD5 CATHODE (-), LD6 ANODE (+) |
| 5                                       | LD2 CATHODE (-), LD3 ANODE (+)  | 10  | LD6 CATHODE (-), LD1 ANODE (+) |

6E PIN CONFIGURATION

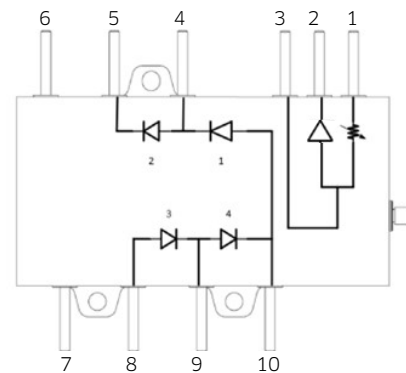
**4E Pin assignment**

| CASE 1: ALL LASER DIODES FUNCTIONING |                                 |     |                       |
|--------------------------------------|---------------------------------|-----|-----------------------|
| PIN                                  | DESCRIPTION                     | PIN | DESCRIPTION           |
| 1                                    | CATHODE (-) OF THERMISTOR       | 6   | OPEN                  |
| 2                                    | CATHODE (-) OF MPD              | 7   | OPEN                  |
| 3                                    | ANODE (+) OF THERMISTOR AND MPD | 8   | LASER DIODE ANODE (+) |
| 4                                    | OPEN                            | 9   | OPEN                  |
| 5                                    | LASER DIODE CATHODE (-)         | 10  | OPEN                  |

| CASE 2: INDIVIDUAL LASER DIODES TESTING |                                 |     |                                |
|-----------------------------------------|---------------------------------|-----|--------------------------------|
| PIN                                     | DESCRIPTION                     | PIN | DESCRIPTION                    |
| 1                                       | CATHODE (-) OF THERMISTOR       | 6   | OPEN                           |
| 2                                       | CATHODE (-) OF MPD              | 7   | OPEN                           |
| 3                                       | ANODE (+) OF THERMISTOR AND MPD | 8   | LASER DIODE 3 ANODE (+)        |
| 4                                       | LD1 CATHODE (-), LD2 ANODE (+)  | 9   | LD3 CATHODE (-), LD4 ANODE (+) |
| 5                                       | LASER DIODE 2 CATHODE (-)       | 10  | LD4 CATHODE (-), LD1 ANODE (+) |

4E PIN CONFIGURATION

**Operating Parameters (data under collecting, preliminary)**

| CW output power (fiber), Pop | Parameter                          | Symbol          | Minimum | Typical | Maximum |
|------------------------------|------------------------------------|-----------------|---------|---------|---------|
| 40 W (4E)                    | Operating current (BOL) 25°C       | I <sub>op</sub> | —       | 11.5 A  | 12.9 A  |
|                              | Operating current (EOL) 25°C       | I <sub>op</sub> |         | 12.8 A  | 14.5 A  |
|                              | Operating current (BOL) 75°C, 33 W | I <sub>op</sub> |         | 13.5 A  | 16.5 A  |
|                              | Forward voltage (BOL) 25°C         | V <sub>f</sub>  | —       | 7.3 V   | 8.0 V   |
| 60 W (6E)                    | Operating current (BOL) 25°C       | I <sub>op</sub> | —       | 11.5 A  | 12.9 A  |
|                              | Operating current (EOL) 25°C       | I <sub>op</sub> |         | 12.8 A  | 14.5 A  |
|                              | Operating current (BOL) 75°C, 50 W | I <sub>op</sub> |         | 13.5 A  | 16.5 A  |
|                              | Forward voltage (BOL) 25°C         | V <sub>f</sub>  | —       | 10.4 V  | 11.5 V  |

**Specifications<sup>1</sup>**

| Parameter                                      | Symbol                        | Minimum        | Typical         | Maximum                |
|------------------------------------------------|-------------------------------|----------------|-----------------|------------------------|
| <b>Laser Characteristics</b>                   |                               |                |                 |                        |
| Mean wavelength, 25°C <sup>2</sup>             | $\lambda_p$                   | 929 nm         | 938 nm          | 951 nm                 |
| Threshold current 25°C                         | I <sub>th</sub>               | –              | 700 mA          | 950 mA                 |
| Series resistance                              | R <sub>s</sub>                | –              | 0.04 $\Omega$   | –                      |
| Monitor diode response at -5V, P <sub>o</sub>  | IBF                           |                | 75 $\mu$ A/W    | 175 $\mu$ A/W          |
| Thermistor resistance, 25°C                    | R <sub>th</sub>               | 9.5 k $\Omega$ | 10.0 k $\Omega$ | 10.5 k $\Omega$        |
| Thermistor constant                            | B                             | 3700 K         |                 | 4100 K                 |
| Recommended case temperature                   | T <sub>c</sub>                | -5°C           | 25°C            | 75°C                   |
| Wavelength tuning vs. temperature <sup>3</sup> | $\Delta\lambda/\Delta T$      | –              | 0.35 nm/°C      | 0.5 nm/°C              |
| Wavelength tuning vs. current                  | $\Delta\lambda/\Delta I_{op}$ | –              | 0.6 nm/A        | 0.7 nm/A               |
| Back reflection isolation 1060-1100 nm         |                               | -30 dB         |                 |                        |
| Back reflection isolation 1030-1150 nm         |                               | -25 dB         |                 |                        |
| NA for 90% power                               | NA                            |                | 0.13            | 0.17                   |
| Hermeticity - He Leak Rate, atm-cc/s           |                               |                |                 | 2.7 x 10 <sup>-8</sup> |
| <b>Fiber Characteristics<sup>4</sup></b>       |                               |                |                 |                        |
| Fiber core diameter                            | d <sub>c</sub>                | 105 $\mu$ m    | 106.5 $\mu$ m   | 108 $\mu$ m            |
| Fiber numerical aperture                       | NA                            | 0.20           | 0.22            | 0.24                   |
| Fiber cladding                                 | d <sub>cl</sub>               | 124 $\mu$ m    | 125 $\mu$ m     | 126 $\mu$ m            |
| Fiber buffer                                   | d <sub>b</sub>                | 230 $\mu$ m    | 245 $\mu$ m     | 260 $\mu$ m            |
| Fiber length                                   | l <sub>f</sub>                | 0.9 m          | 1.0 m           | –                      |

1. All performance data measured at Pop, 25°C, Beginning of Life (BOL).

2. Weighted average "center of mass" spectral point at 25°C at PO

3. Change in  $\Delta\lambda$  mean with case temperature over Top

4. Nufern FUD-4130 (Revision A, MM-S106.5/125-22A-HTA) or equivalent

**Absolute Maximum Ratings**

| Parameter                                             | Symbol           | Minimum | Typical | Maximum |
|-------------------------------------------------------|------------------|---------|---------|---------|
| Operating current                                     | I <sub>op</sub>  |         |         | 17 A    |
| Monitor reverse voltage                               | V <sub>pd</sub>  |         |         | 20 V    |
| Monitor forward current                               | I <sub>pf</sub>  |         |         | 10 mA   |
| Case operating temperature <sup>5</sup>               | T <sub>op</sub>  | -10°C   | –       | 80°C    |
| Storage temperature <sup>6</sup>                      | T <sub>stg</sub> | -40°C   | –       | 85°C    |
| Lead soldering temperature, 10 s max                  | T <sub>ls</sub>  | –       | –       | 300°C   |
| Relative humidity, non-condensing, ambient < 45°C     | RH               | –       | –       | 85%     |
| Electrostatic discharge (ESD) <sup>7</sup>            | V <sub>esd</sub> | –       | –       | 500 V   |
| Fiber bend radius (long term deployment) <sup>8</sup> |                  | 30 mm   |         | –       |
| Fiber axial pull force, 15 s                          |                  | –       | –       | 5 N     |
| Fiber side pull force, 15 s                           |                  | –       | –       | 2.5 N   |

5. Non-condensing, maximum

6. Non-condensing, 2000 hours

7. C = 100pF, R = 1.5k $\Omega$ , human body model, shown to be not damaging to its LI characteristics or its reliability, I-V curves may change in this ESD environment

8. Minimum bend radius of 30mm is for long term mechanical fiber reliability.

**Fiber Pigtail Properties**

| Wavelength range (nm) | Isolation (dB) | Reflectivity (%) |
|-----------------------|----------------|------------------|
| 1060-1100             | >30            | >99.9%           |
| 1040-1150             | >25            | >99.7%           |

**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](mailto:customer.service@lumentum.com).

| Product Code         | Description         |
|----------------------|---------------------|
| 49M-3840-40000-BI-4E | 929 to 951 nm, 40 W |
| 49M-3840-60000-BI-6E | 929 to 951 nm, 60 W |

**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 laser diode or into the collimated beam along its optical axis when the device is in operation.

**CAUTION: THE USE OF OPTICAL INSTRUMENTS WITH THIS PRODUCT WILL INCREASE EYE HAZARD.**

Operating the laser diode outside of its maximum ratings may cause device failure or a safety hazard. Power supplies used with the component must be employed such that the maximum peak optical power cannot be exceeded. CW laser diodes may be damaged by excessive drive current or switching transients.

When power supplies are used, the laser diode should be connected with the main power on and the output voltage at zero. The current should be increased slowly while the laser diode output power and the drive current are monitored.

Device degradation accelerates with increased temperature, and therefore careful attention to minimizing the case temperature is advised. For example, life expectancy will decrease by a factor of four if the case is operated at 50°C rather than 30°C.

A proper heatsink for the laser diode on a thermal radiator will greatly enhance laser life. Firmly mount the laser on a radiator with a thermal impedance of less than 0.5°C/W for increased reliability.

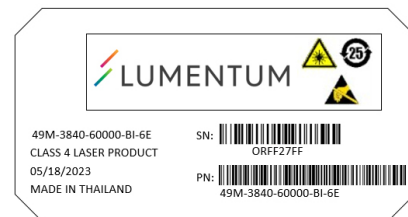
**ESD PROTECTION** - Electrostatic discharge is the primary cause of unexpected laser diode failure. Take extreme precaution to prevent ESD. Use wrist straps, grounded work surfaces, and rigorous antistatic techniques when handling laser diodes.

**Labeling**

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

Laser classification depends on the system control circuit and 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.

**Output Power Danger**

North America  
Toll Free: 844 810 LITE (5483)

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

China  
Toll Free: 400 120 LITE (5483)

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