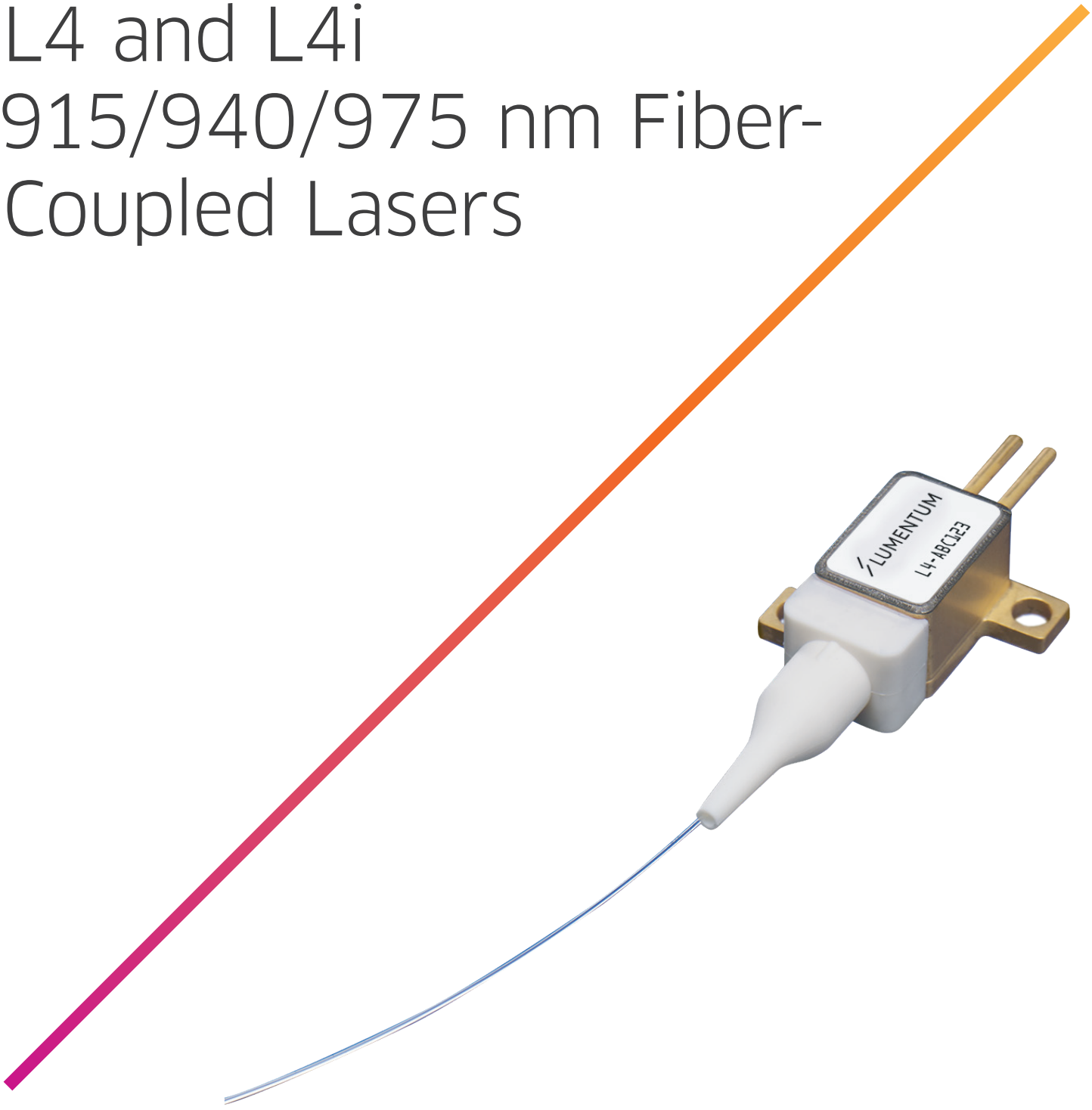
LUMENTUM

# L4 and L4i 915/940/975 nm Fiber-Coupled Lasers



Lumentum L4-series diode lasers offer up to 10 W of power from a 105 μm fiber. The L4 is a revolutionary platform based on a long history of existing fiber-coupled L2 and L3 packages, incorporating a highly reliable design into a scalable commercial product.

L4 multimode pump modules offer high brightness, a small footprint, and simplified thermal management by distributing the diodes (heat sources), allowing the use of either air- or water-cooled architectures with predictable high reliability.

Lumentum leverages existing manufacturing facilities around the world to offer a cost-effective solution with all the necessary and ideal attributes for the laser pump market.

**Key Features**

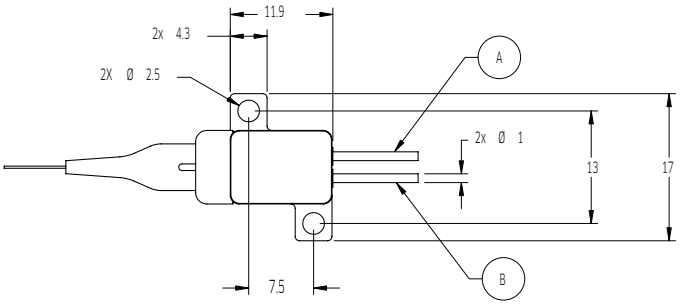
- 10 W output power
- High reliability
- 105 μm aperture
- 0.22 or 0.15 NA
- Isolated electrical contacts
- L4i full-fiber feedback protection

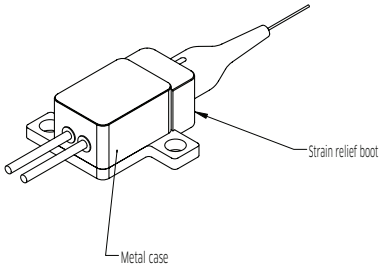
**Applications**

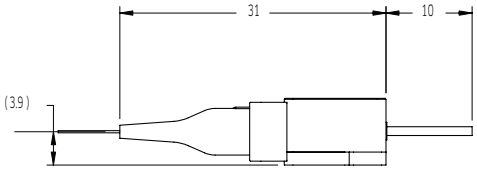
- Fiber laser pumping
- Material processing
- Graphic arts
- Medical
- Remote power generation
- Pyrotechnic ignition

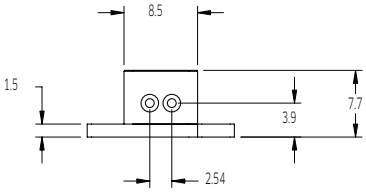
**Dimensions Diagram**
(Specifications in mm unless otherwise noted.)

Standard tolerances
mm: x.x = ±0.5
x.xx = ±0.25




**Pinout**

| Pin | Description |
|---|---|
| A | Laser cathode (–) |
| B | Laser anode (+) |

## Specifications for 0.22NA[1]

| Parameter | Symbol | Minimum | Typical | Maximum |
|---|---|---|---|---|
| ***Laser Characteristics*** | | | | |
| CW output power | $P_O$ | — | — | 10 W |
| Mean wavelength[2] | $\lambda_p$ 915 nm<br>$\lambda_p$ 940 nm<br>$\lambda_p$ 975 nm | 905 nm<br>928 nm<br>963 nm | 917 nm<br>939 nm<br>974 nm | 928 nm<br>950 nm<br>985 nm |
| Spectral width (FWHM) | $\Delta\lambda$ | — | 3 nm | 6 nm |
| Slope efficiency | $\eta_D$ 915 nm<br>$\eta_D$ 940 nm<br>$\eta_D$ 975 nm | —<br>—<br>— | 0.93 W/A<br>0.92 W/A<br>0.90 W/A | —<br>—<br>— |
| Conversion efficiency | $\eta$ | — | 48% | — |
| Threshold current | $I_{th}$ | — | 700 mA | 950 mA |
| Operating current (BOL) | $I_{op}$ 915 nm<br>$I_{op}$ 940 nm<br>$I_{op}$ 975 nm | —<br>—<br>— | 11.4 A<br>11.7 A<br>11.8 A | 12.5 A<br>12.8 A<br>13.0 A |
| Forward voltage | $V_f$ | — | 1.89 V | 2.2 V |
| Series resistance | $R_s$ | — | 0.04 Ω | — |
| Recommended case temperature | $T_c$ | 20°C | 25°C | 40°C |
| Wavelength tuning vs. temperature[3] | $\Delta\lambda/\Delta T$ | — | 0.35 nm/°C | — |
| Wavelength tuning vs. output power | $\Delta\lambda/\Delta P$ | — | 1.0 nm/W | — |
| ***Fiber Characteristics*** | | | | |
| Fiber core diameter | $d_c$ | — | 105 µm | — |
| Fiber numerical aperture | NA | 0.20 | 0.22 | 0.24 |
| Fiber cladding | $d_{cl}$ | — | 125 µm | — |
| Fiber buffer | $d_b$ | — | 250 µm | — |
| Fiber length | $l_f$ | 0.9 m | 1 m | — |

1. All performance data measured at 10 W, 25°C, beginning of life (BOL).
2. Weighted average "center of mass" spectral point at 25°C at $P_O$.
3. Change in $\Delta\lambda$ mean with case temperature over $T_{op}$.

## Specifications for 0.15 NA[1]

| Parameter | Symbol | Minimum | Typical | Maximum |
|---|---|---|---|---|
| ***Laser Characteristics*** | | | | |
| CW output power | $P_O$ | — | — | 10 W |
| Mean wavelength[2] | $\lambda_p$ 915 nm<br>$\lambda_p$ 940 nm<br>$\lambda_p$ 975 nm | 905 nm<br>928 nm<br>963 nm | 917 nm<br>939 nm<br>974 nm | 928 nm<br>950 nm<br>985 nm |
| Spectral width (FWHM) | $\Delta\lambda$ | — | 3 nm | 6 nm |
| Slope efficiency | $\eta_D$ 915 nm<br>$\eta_D$ 940 nm<br>$\eta_D$ 975 nm | —<br>—<br>— | 0.91 W/A<br>0.90 W/A<br>0.90 W/A | —<br>—<br>— |
| Conversion efficiency | $\eta$ | — | 48% | — |
| Threshold current | $I_{th}$ | — | 700 mA | 950 mA |
| Operating current (BOL) | $I_{op}$ 915 nm<br>$I_{op}$ 940 nm<br>$I_{op}$ 975 nm | —<br>—<br>— | 12.0 A<br>12.2 A<br>12.3 A | 13.0 A<br>13.5 A<br>13.5 A |
| Forward voltage | $V_f$ | — | 1.89 V | 2.2 V |
| Series resistance | $R_s$ | — | 0.04 Ω | — |
| Recommended case temperature | $T_c$ | 20°C | 25°C | 40°C |
| Wavelength tuning vs. temperature[3] | $\Delta\lambda / \Delta T$ | — | 0.35 nm/°C | — |
| Wavelength tuning vs. output power | $\Delta\lambda / \Delta P$ | — | 1.0 nm/W | — |
| ***Fiber Characteristics*** | | | | |
| Fiber core diameter | $d_c$ | — | 105 µm | — |
| Fiber numerical aperture | NA | 0.135 | 0.15 | 0.165 |
| Fiber cladding | $d_{cl}$ | — | 125 µm | — |
| Fiber buffer | $d_b$ | — | 250 µm | — |
| Fiber length | $l_f$ | 0.9 m | 1 m | — |

1. All performance data measured at 10 W, 25°C, beginning of life (BOL).
2. Weighted average "center of mass" spectral point at 25°C at $P_O$.
3. Change in $\Delta\lambda$ mean with case temperature over $T_{op}$.

## Fiber Laser Feedback Isolation Specifications

| Wavelength range (nm) | Isolation (dB) | Reflectivity (%) |
|---|---|---|
| 1060 – 1100 | >30 | >99.9% |
| 1050 – 1150 | >25 | >99.7% |

### Absolute Maximum Ratings

| Parameter | Symbol | Minimum | Typical | Maximum |
|---|---|---|---|---|
| Operating current | $I_{op}$ | — | — | 14 A |
| Reverse voltage | $V_{rvs}$ | — | — | 2.0 V |
| Case operating temperature[1] | $T_{op}$ | 15°C | — | 50°C |
| Storage temperature[2] | $T_{stg}$ | –30°C | — | 70°C |
| Lead soldering temperature, 10 s max | $T_{ls}$ | — | — | 300°C |
| Relative humidity, noncondensing, ambient <45°C | RH | — | — | 85% |
| Electrostatic discharge (ESD)[3] | $V_{esd}$ | — | — | 500 V |
| Fiber bend radius (long-term deployment)[4] | | 30 mm | — | — |
| Fiber axial pull force, 15 s | | — | — | 5 N |
| Fiber side pull force, 15 s | | — | — | 2.5 N |

1. Noncondensing, maximum.
2. Noncondensing, 2000 hours.
3. C = 100 pF, R = 1.5 kΩ, human body model, does not damage its LI characteristics or its reliability, I-V curves may change in this ESD environment.
4. Minimum bend radius of 30 mm is for long-term mechanical fiber reliability; however for 0.15 NA some optical loss may occur and a minimum bend radius of 45 mm is recommended for layout with multiple fiber coils.

### 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.

| Wavelength Range | Connector[1] | Fiber NA | Feedback Protection | Product Code |
|---|---|---|---|---|
| 905–928 nm | No | 0.22 | No | L4-9891510-100B |
| 905–928 nm | No | 0.15 | No | L4-9891510-100C |
| 905–928 nm | SMA | 0.22 | No | L4-9891510-100M |
| 905–928 nm | No | 0.22 | Yes | L4-9891510-100E |
| 905–928 nm | No | 0.15 | Yes | L4-9891510-100F |
| 928–950 nm | No | 0.22 | No | L4-9894010-100B |
| 928–950 nm | No | 0.15 | No | L4-9894010-100C |
| 928–950 nm | SMA | 0.22 | No | L4-9894010-100M |
| 928–950 nm | No | 0.22 | Yes | L4-9894010-100E |
| 928–950 nm | No | 0.15 | Yes | L4-9894010-100F |
| 963–985 nm | No | 0.22 | No | L4-9897510-100B |
| 963–985 nm | No | 0.15 | No | L4-9897510-100C |
| 963–985 nm | SMA | 0.22 | No | L4-9897510-100M |
| 963–985 nm | No | 0.22 | Yes | L4-9897510-100E |
| 963–985 nm | No | 0.15 | Yes | L4-9897510-100F |

1. If a connector option is selected, it is always connectorized. All performance data measured at 10 W, 25°C, beginning of life (BOL).

### User Safety

#### *Operating Considerations*

Operating the diode laser outside of maximum ratings may cause device failure or a safety hazard. Power supplies used with the component must be employed such that they do not exceed the maximum peak optical power. Excessive drive current or switching transients can damage CW diode lasers. When using power supplies, connect the diode laser with the main power on and the output voltage set to zero. Increase the current slowly while monitoring the diode laser output power and the drive current.

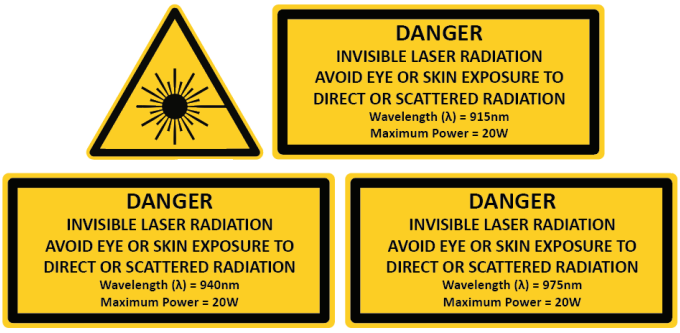
Device degradation accelerates with increased temperature, and thus the case temperature should be minimized.

A proper heat sink for the diode laser on a thermal radiator will greatly enhance laser life. Refer to the product application note for more information regarding heat sinking and mounting the product.

#### *Electrostatic Discharge (ESD) Protection*

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

## Laser Safety




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.

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

## Serial Number Identification Label


LUMENTUM

North America
Toll Free: 844 810 LITE (5483)

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

China
Toll Free: 400 120 LITE (5483)