# #6

*Choosing the Right Laser Diode Mount for Your Application*

# APPLICATION NOTE

ILX Lightwave
Photonic Test and Measurement

## Introduction

The multitude of laser diode packages available today make selecting the correct mount for laboratory, development, or production testing seem a daunting task. This Application Note will help you choose the ILX Lightwave laser diode mount suitable for your application.

## Laser Diode Mounting Considerations

When selecting a laser diode mount, the first concern is to choose a mount that will accommodate the laser package. In some cases, more than one mount can be used. For example, both the LDM-4407 and the LDM-4986 will accept 5.6 mm can-type lasers, but in very different ways.

Temperature control is another consideration. Many laser packages have internal thermoelectric coolers (TEC) to remove heat from the laser junction, so the mount must provide adequate heat-sink capacity. Some applications require a more stable temperature than is provided by the internal TEC or call for testing at different case temperatures. For such applications, the internal TEC is optional in most ILX Lightwave laser diode mounts.

ILX Lightwave also offers high power laser diode mounts that accommodate a wide variety of laser packages. When selecting a mount for high power laser diodes, it is not only important to consider the laser package and temperature control requirements, but also the maximum allowable laser diode current and thermal load requirements.

## Mount Selection Overview

ILX Lightwave laser diode mounts are divided into five basic categories:

(1) **Low power free-space laser diode mounts** for TO-Can, C-block, COC and customer proprietary QCL packages

(2) **High power free-space laser diode mounts** for C-block, CS Bar, HHL, TO-3 and other high power packages

(3) **Low power fiber-coupled laser diode mounts** for DIL, mini-DIL, TO-Can, and butterfly-style telecommunications lasers

(4) **High power fiber-coupled laser diode mounts** for various high power butterfly-style laser diodes and 2-pin modules.

(5) **Modular multi-laser mounts** for DIL and butterfly-style lasers

The following sections identify all ILX Lightwave laser diode mounts. Notes describing the various features of the mount and the options available are below the picture of the device.

## Low Power Free-space Mounts

Table 1 lists the four low power free-space mounts available from ILX Lightwave.

Table 1

| Model | Package Style | Case Temperature Control | Water Cooling Option | Nitrogen Purge Connection | Collimating Lens Option |
|---|---|---|---|---|---|
| LDM-4405 | TO-Can (5.6/9.0 mm) | Standard | No | Yes | No |
| LDM-4407 | TO-Can (5.6/9.0 mm, flanged) | Standard | No | Yes | No |
| LDM-4412 | TO-Can (open heat-sink, TO-3, 5.6/9.0 mm, flanged) | Standard | Yes | Yes | Yes |
| LDM-4990 | TO-Can (5.4/5.6/9.0 mm, flanged) | Standard | Standard | Yes | No |
| LDM-4872[1] | C-Block, COC and customer proprietary QCL packages | Standard | Standard | Yes | Yes |
| LDM-4872P[2] | C-Block, COC and customer proprietary QCL packages | Standard | Standard | Yes | Yes |

1. A QCL mount for CW current only
2. A QCL mount for CW and pulsed current.

**LDM-4405**

The LDM-4405 is an easy-to-use solution for mounting and temperature controlling many TO-Can packages. Devices with up to four pins may be used and the LDM-4405 support 5.6mm and 9mm lasers.


**LDM-4407**

The LDM-4407 is designed for users who run multiple laser diode experiments because of its quick installation and easy release of TO-Can packages. The LDM-4407 supports any TO-Can pin out by user adjustable switches. TO-Can packages supported include 5.6mm, 9mm and flanged packages.

**LDM-4412**

The LDM-4412 is available with five different collimating lens options. The lens can be adjusted in three axes for precise free-space beam adjustment.


**LDM-4990**

The LDM-4990 includes an optional mounting post compatible with ILX OMH-6700 power and wavelength heads. Once the head is attached, simply rotate the head over the device under test and it will lock in place with spring loaded detent pins.

**LDM-4872/LDM-4872P**

The LDM-4872 and LDM-4872P offer convenient mounting for quantum cascade lasers (QCLs) in a vacuum or nitrogen purged environment. While the LDM-4872 is only compatible with CW current, the LDM-4872P integrates the LPB-385 Pulse Board from the LDP-3832 into the LDM-4872 to provide a simpler solution for pulsing QCLs.

## High Power Free-space Mounts

The high power free-space mounts available from ILX Lightwave are listed in Table 2. These mounts can be used with a variety of high power laser packages.

Table 2

| Model | Package Style | Case Temperature Control | Case Temperature Range | Max Power | Max Current | Cooling |
|---|---|---|---|---|---|---|
| LDM-4409 | C-block | Standard | 10°C to 85°C | 10W | 10A | Air/TEC |
| LDM-4415 | CS Bar | Standard | 20°C to 85°C | 100W | 100A | Water/TEC |
| LDM-4442 | HHL, TO-3 and other high power packages | No | ---- | 50W | 7A | Water |

**LDM-4409**

The LDM-4409 provides a compact, easy-to-use solution for mounting and temperature controlling C-mount laser diodes.

**LDM-4415**

The LDM-4415 offers a simple solution for mounting and temperature controlling CS packaged conductively cooled high power laser diodes.

**LDM-4442**

Model LDM-4442 is designed for high power lasers with internal TE modules and has water-cooling fittings on the base. All upright mounts can be bolted to optical tables with the standard hole pattern (¼-20 on 1” centers).

## Low Power Fiber-Coupled Laser Diode Mounts

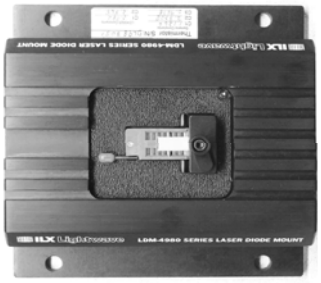
The LDM-4980 Series Laser Diode Mounts in Table 3 can be used with 5.6 mm and 9 mm TO-can, DIL, mini-DIL, various butterfly configurations, and RF-capable laser packages.

Table 3

| Model | Package Style | Case Temperature Control | Bias-T Option |
|---|---|---|---|
| LDM-4982 | DIL | Optional | Yes |
| LDM-4982M | Mini-DIL | Standard | No |
| LDM-4983 | 7-pin or 13-pin butterfly | No | No |
| LDM-4983T | 7-pin or 13-pin butterfly | Standard | No |
| LDM-4984 | 14-pin butterfly | Optional | Yes |
| LDM-4984RF | 14-pin butterfly bias-T modulated | Optional | Standard |
| LDM-4986 | Fiber Coupled TO-Can, Flanged | Standard | No |
| LDM-4989 | 20-pin or 26-pin butterfly | No | No |
| LDM-4989T | 20-pin or 26-pin butterfly | Standard | No |

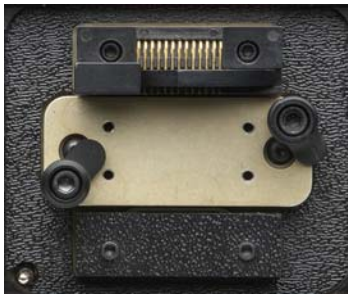

**LDM-4982**

Bias-T circuitry is optional on models LDM-4982 and LDM-4984. This feature allows input current modulation from 10MHz to 800MHz through a 50Ω SMA connector on the mount side with a current voltage transfer function of 20 mA/V.



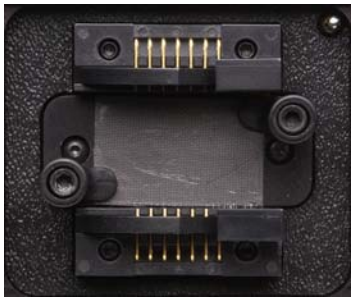
**LDM-4982M**

Compatible with 8-pin mini-DIL laser modules, the LDM-4982M employs a ZIF and comes standard with case temperature control.



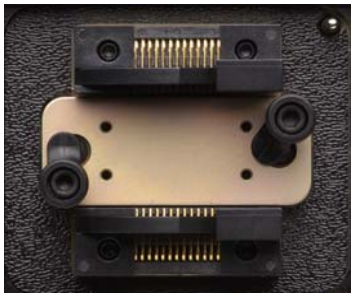
**LDM-4983/LDM-4983T**

The LDM-4983 is designed for “one-sided butterfly” packages that have the modulation input on one side and seven or thirteen pins on the other side.



**LDM-4984**

The LDM-4984 is compatible with 14-pin butterfly laser modules. Optionally, Bias-T circuits can be ordered with Type-A or Type-B configurations. See the LDM-4980 brochure for Type-A and Type-B details.



**LDM-4989/LDM-4989T**

The LDM-4989 can be used with 26-pin, 20-pin, and 14-pin laser diode packages by wiring the configuration header appropriately. Three nine-pin D-sub connectors are pre-wired for a total of 27 electrical inputs.

**LDM-4984RF**

The LDM-4984RF mounts are designed for 14-pin butterfly packaged lasers that have internal modulation circuitry. The RF mount is for lasers with internal bias-T circuitry with 25Ω input impedance on pin 12. The RF input connector on both mounts is a standard 50Ω SMA connector.

**LDM-4984 with LFS-498**

The LFS-498 Fiber spool effortlessly attaches to any of the LDM-498X mounts and provides an easy and inexpensive way to protect fiber pigtails from damage in the laboratory.

**LDM-4986**

The LDM-4986 mount is ideal for production testing fiber-coupled cans and flanged laser packages. Both horizontal and vertical flange packages are easily installed. This mount comes standard with case temperature control.

All LDM-4980 Series mounts include a laser diode cover. This cover provides a grounded electrical shield around the laser package to reduce noise, and provides an additional measure of temperature stability. The cover with machined holes provides an exit for fiber pigtails.

The laser case of the LDM-4980 Series is isolated from the mount chassis and is therefore isolated from earth ground. The LDM-4989 can be configured so the case is floating, connected to ground, or configured to any other electrical potential.

All LDM-4980 Series mounts can be ordered with the TE550 Case Temperature Control option (TE550 is standard on the LDM-4986 and the LDM-4982M). This option allows simultaneous and independent control of laser case temperature, and is ideal for applications requiring extreme temperature stability or range. Maximum power dissipation of the TE550 module is 14 Watts. The base plate on the TE550 Case Temperature Controlled option can be bolted to an optical table with the standard hole pattern (¼-20 on 1” centers) for increased heat sink capacity.

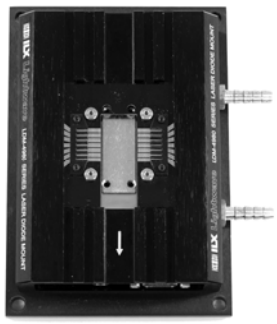
In some cases, one mount can be used with several different telecom laser package styles. Additionally, devices other than laser diodes can be mounted in these mounts. Some amplifiers and VOAs are designed with butterfly-type pin configurations. Using screw-lead electrical configuration headers, all LDM-4980 Series mounts are configurable to any laser package pin out. All mounts come with standard D-sub connectors for seamless integration with ILX products.

## High Power Fiber-Coupled Laser Diode Mounts

The mounts in Table 4 are used with high power fiber-coupled laser packages of various butterfly configurations.

Table 4

| Model | Package Style | Case Temperature Control | Max Power | Max Current |
|---|---|---|---|---|
| LDM-49840 | 6-pin, 8-pin or 14-pin butterfly | No | 60W | 12A |
| LDM-49860 | 2-pin module | No | 40W | 20A |
| LDM-49840T | 6-pin, 8-pin or 14-pin butterfly | Standard (Water/TEC) | 60W | 12A |
| LDM-49860T | 2-pin module | Standard (Water/TEC) | 40W | 20A |



**LDM-49840/LDM-49840T**

The LDM-49840(T) provides convenient mounting for 6-pin, 8-pin, and 14-pin butterfly devices with or without an internal TE module. A water cooled heat sink allows the 49840(T) series to dissipate up to 60W. Terminal blocks accessible from the bottom side allow configuration of the 49840(T) for any butterfly module pin-out.

**LDM-49860/LDM-49860T**

The LDM-49860(T) is designed to support various manufacturers' high power 2-pin modules with or without an internal TE module. A water cooled heat sink allows the 49860(T) series to dissipate up to 40W.

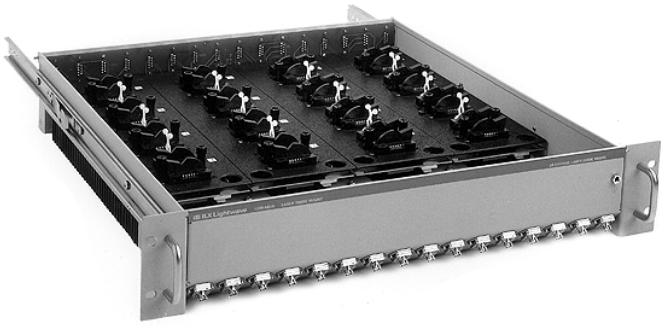
## Modular Laser Mounts

The multi-channel laser diode mounts and modules in Table 5 are used with DIL, DFB or various butterfly laser diode packages.

Table 5

| Model | Description |
|---|---|
| LDM-4600 | Multi-channel, rack mountable chassis<br>Holds up to four modules |
| LDM-4616 | Chassis and four butterfly mount modules |
| LDM-4616DFB | Chassis and four hardwired DFB laser mount modules |
| LDM-4604/DIL | Four DIL laser mounts, right and left versions |
| LDM-4604/BFY | Four butterfly mounts, right and left versions |
| LDM-4604/DFB | Four hardwired DFB butterfly mounts, right and left versions |

The LDM-4600 is a rack mountable, 16-channel mount that accepts up to sixteen DIL, mini-DIL, or butterfly laser diodes packages. An example is shown below. Modular laser mounts are ideal for high-density source bank or burn-in applications.



Up to four LDM-4604 modules are installed in the LDM-4600 chassis. The LDM-4616 and LDM-4616DFB, like the LDM-4600, are also rack mountable, 16-channel mounts, but they come with four LDM-4604/BFY butterfly modules or four LDM-4604/DFB distributed feedback laser modules, respectively. The modules are equipped with four zero-insertion-force (ZIF) sockets for DIL, mini-DIL, or butterfly laser diode packages. If fewer than four modules are installed in the LDM-4600 chassis, the empty space can be used to hold EDFA gain blocks or other devices.

The LDM-4604 modules are designed in right- and left-facing configurations to facilitate heat control of fiber pigtails. Each LDM-4600 chassis holds two right and two left facing mount modules. The LDM-4604 DFB modules are hardwired to the standard DFB pin configuration shown in Table 6. All other modules are user-configurable using screw terminal configuration headers. The LDM-4616DFB option has sixteen ZIF butterfly locations pre-wired to the pin out shown in Table 6.

Table 6
LDM–4600 DFB Pinout

| Pin | Function |
|---|---|
| 1 | Thermistor |
| 2 | Thermistor |
| 3 | Laser Cathode |
| 4 | PD Anode (-) |
| 5 | PD Cathode (+) |
| 6 | TEC (+) |
| 7 | TEC (-) |
| 8-11* | Laser Anode /Case Ground |
| 12 | N/C |
| 13-14* | Laser Anode /Case Ground |

* Most DFB lasers have some combination of these pins connected to the laser anode and/or case. Typical configurations wire the laser anode to the case, so all these pins are tied together in the LDM–4616 DFB mount.

To find out more about ILX Lightwave mounts, or if you have questions about integrating our products into your application, please call us at 1-800-459-9459 (U.S. and Canada) or 406-556-2481 (International Inquiries).

# APPENDIX

## LDM–4442 Laser Diode Mount Technical Details

Table A.1 lists the center-to-center hole spacing for each of the laser mounting kits. The X- and Y- Dimensions correspond to the hole pattern in the laser diode mounting flanges.

Table A.1

| Option Number | Hole Spacing X | Hole Spacing Y |
|---|---|---|
| 444201 | 8-pin max, TO-3 Package | |
| 444202 | 1.52” | 0.75” |
| 444203 | 1.3” | 0.59” |
| 444204 | Blank (customer-machined) | |
| 444205 | 1.52” | 1.52” |

## LDM–4980 Series Telecom Mounts Technical Details

Table A.2 lists the pin count and dimensions for the butterfly-type LDM-4980 Series mounts.

Table A.2

| Mount Model | Number of Pins | Pin Pitch | Pin Width | Pin Span (tip-to-tip) | Module Length | Module Width |
|---|---|---|---|---|---|---|
| LDM–4983 | 7 or 13 | 0.10" or 0.05" | 0.025" max | n/a | 1.50" max | 0.85" max |
| LDM–4984 | 14 | 0.10" | 0.025" max | 1.10" min | 1.50" max | 0.8" max |
| LDM–4984RF/EA | 14 | 0.10" | 0.025" max | 1.05" min | 1.50" max | 0.5" max |
| LDM–4989 | 14, 20, or 26 | 0.10" or 0.05" | 0.025" max | 1.20" min | 1.50" max | 0.8" max |
| Wide-Pin Socket | 7-pin only | 0.10" | 0.038" max | -- | -- | -- |

If your laser package has pins wider than 0.025", request the "wide-pin sockets" when ordering.
The wide-pin socket will fit all the LDM–498X mounts listed above, but it is available in 7-pin version only.

## LDM–4604 Module Mounts Technical Details

Table A.3 lists the pin count and dimensions for the butterfly-type LDM-4604 mounts.

Table A.3

| Mount Model | Number of Pins | Pin Pitch | Pin Width** | Pin Span (tip-to-tip) | Module Length | Module Width |
|---|---|---|---|---|---|---|
| LDM–4604/BFY | 14 | 0.10" | 0.025"max | 1.10" min | 1.50" max | 0.8" max |

** If your laser package has pins wider than 0.025", request the "wide-pin sockets" when ordering. The LDM-4604 butterfly mounts will accommodate 10 Gbit/s lasers with an RF connector on one side and 7 pins on the other side. The customer will have to remove the ZIF sockets from the RF side.

**The following publications are available for download at www.ilxlightwave.com.**

## White Papers

- A Standard for Measuring Transient Suppression of Laser Diode Drivers
- Degree of Polarization vs. Poincaré Sphere Coverage
- Improving Splice Loss Measurement Repeatability
- Laser Diode Burn-In and Reliability Testing
- Power Supplies: Performance Factors Characterize High Power Laser Diode Drivers
- Reliability Counts for Laser Diodes
- Reducing the Cost of Test in Laser Diode Manufacturing

## Technical Notes

- Attenuation Accuracy in the 7900 Fiber Optic Test System
- Automatic Wavelength Compensation of Photodiode Power
- Measurements Using the OMM-6810B Optical Multimeter
- Bandwidth of OMM-6810B Optical Multimeter Analog Output
- Broadband Noise Measurements for Laser Diode Current Sources
- Clamping Limit of a LDX-3525 Precision Current Source
- Control Capability of the LDC-3916371 Fine Temperature Resolution Module
- Current Draw of the LDC-3926 16-Channel High Power Laser Diode Controller
- Determining the Polarization Dependent Response of the FPM-8210 Power Meter
- Four-Wire TEC Voltage Measurement with the LDT-5900 Series Temperature Controllers
- Guide to Selecting a Bias-T Laser Diode Mount
- High Power Linearity of the OMM-6810B and OMH-6780/6790/6795B Detector Heads
- Large-Signal Frequency Response of the 3916338 Current Source Module
- Laser Wavelength Measuring Using a Colored Glass Filter
- Long-Term Output Drift of a LDX-3620 Ultra Low-Noise Laser Diode Current Source
- Long-Term Output Stability of a LDX-3525 Precision Current Source
- Long-Term Stability of an MPS-8033/55 ASE Source
- LRS-9424 Heat Sink Temperature Stability When Chamber Door Opens
- Measurement of 4-Wire Voltage Sense on an LDC-3916 Laser Diode Controller
- Measuring the Power and Wavelength of Pulsed Sources Using the OMM-6810B Optical Multimeter
- Measuring the Sensitivity of the OMH-6709B Optical Measurement Head
- Measuring the Wavelength of Noisy Sources Using the OMM-6810B Optical Multimeter
- Output Current Accuracy of a LDX-3525 Precision Current Source
- Pin Assignment for CC-305 and CC-505 Cables
- Power and Wavelength Stability of the 79800 DFB Source Module
- Power and Wavelength Stability of the MPS-8000 Series Fiber Optic Sources
- Repeatability of Wavelength and Power Measurements Using the OMM-6810B Optical Multimeter
- Stability of the OMM-6810B Optical Multimeter and OMH-6727B InGaAs Power/Wavehead
- Switching Transient of the 79800D Optical Source Shutter
- Temperature Controlled Mini-DIL Mount
- Temperature Stability Using the LDT-5948
- Thermal Performance of an LDM-4616 Laser Diode Mount
- Triboelectric Effects in High Precision Temperature Measurements
- Tuning the LDP-3840 for Optimum Pulse Response
- Typical Long-Term Temperature Stability of a LDT-5412 Low-Cost TEC
- Typical Long-Term Temperature Stability of a LDT-5525 TEC
- Typical Output Drift of a LDX-3412 Loc-Cost Precision Current Source
- Typical Output Noise of a LDX-3412 Precision Current Source
- Typical Output Stability of the LDC-3724B
- Typical Output Stability of a LDX-3100 Board-Level Current Source
- Typical Pulse Overshoot of the LDP-3840/03 Precision Pulse Current Source
- Typical Temperature Stability of a LDT-5412 Low-Cost Temperature Controller
- Using Three-Wire RTDs with the LDT-5900 Series Temperature Controllers
- Voltage Drop Across High Current Laser Interconnect Cable
- Voltage Drop Across High Current TEC Interconnect Cable
- Voltage Limit Protection of an LDC-3916 Laser Diode Controller
- Wavelength Accuracy of the 79800 DFB Source Module

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- App Note 2: Selecting and Using Thermistors for Temperature Control
- App Note 3: Protecting Your Laser Diode
- App Note 4: Thermistor Calibration and the Steinhart-Hart Equation
- App Note 5: An Overview of Laser Diode Characteristics
- App Note 6: Choosing the Right Laser Diode Mount for Your Application
- App Note 8: Mode Hopping in Semiconductor Lasers
- App Note 10: Optimize Testing for Threshold Calculation Repeatability
- App Note 11: Pulsing a Laser Diode
- App Note 12: The Differences between Threshold Current Calculation Methods
- App Note 13: Testing Bond Quality by Measuring Thermal Resistance of Laser Diodes
- App Note 14: Optimizing TEC Drive Current
- App Note 17: AD590 and LM335 Sensor Calibration
- App Note 18: Basic Test Methods for Passive Fiber Optic Components
- App Note 20: PID Control Loops in Thermoelectric Temperature Controllers
- App Note 21: High Performance Temperature Control in Laser Diode Test Applications
- App Note 22: Modulating Laser Diodes
- App Note 23: Laser Diode Reliability and Burn-In Testing
- App Note 25: Novel Power Meter Design Minimizes Fiber Power Measurement Inaccuracies

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