

LDD M SERIES

INSTRUCTION MANUAL

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FEATURES

The LDD M laser diode driver offers many unique features. These include:

- 200 mA Output Current Drive Capacity
- Constant Power Stability < 0.02% typical (24 hours ambient)
- Single supply operation: +5 V to +12 V
- Operates in Constant Current or Constant Power mode
- Isolated, Buffered Current & Power Measurement Outputs
- 12-Turn Trimptot controls Output Current or Power
- Eight Pins solder to PCB
- Output Current slow starts when V+ is applied
- Two Year Warranty
- The 1M and 3M Modules can be operated from a negative supply if the Laser Diode Anode needs to be earth grounded.

The LDD M series of laser diode drivers is designed to operate low power laser diodes in either constant current or constant power mode. It is ideal for applications that require stable CW operation, low cost, and small size.

An on-board twelve-turn trimptot allows precision control of the output current or power. The photodiode and laser diode currents can be monitored through isolated, buffered outputs on the module. A slow start circuit safely ramps the output current to the setpoint when V+ is applied. The ON/OFF input allows you to decrease the output current to a standby condition without removing V+. Standby condition is less than 5mA in constant current mode or equivalent to 5 or 15µA of photodiode current in constant power mode.

Depending on your laser diode and application, various external components can be added to maximize protection of your laser diode. See page 12 for details.

CUSTOMER SERVICE / WARRANTY

If you have any questions or comments, please call our technical staff at (406) 587-4910. Our hours are 8:00 a.m. to 5:00 p.m. MT.

Wavelength warrants this product for 2 years against defects in materials and workmanship when used within published specifications. This warranty extends only to purchaser and not to users of purchaser's products. If Wavelength receives written notice of such defects during the warranty period, we will either repair or replace products which prove to be defective. It is purchaser's responsibility to determine the suitability of the products ordered for their own use. Wavelength makes no warranty concerning the fitness or suitability of its products for a particular use or purpose; therefore, purchaser should thoroughly test any product and independently conclude its satisfactory performance in purchaser's application. No other warranty exists either expressed or implied, and consequential damages are specifically excluded.

All products returned must be accompanied by a Return Material Authorization (RMA) number obtained from the Customer Service Department. Returned product will not be accepted for credit or replacement without our permission. Transportation charges or postage must be prepaid. All returned products must show invoice number, date, and reason for return.

In the United States, the Food & Drug Administration is responsible for monitoring laser products. These products must comply with certain requirements in order to be sold to an end user. The LDD M series has been registered as an OEM product. It does not comply with regulations. You must incorporate it into your system and that system must comply with federal regulations. Wavelength Electronics has experience with the government requirements. We can help you insure that your device is compliant. Please contact us if you have any questions.

LDD M LASER DIODE DRIVER ELECTRICAL SPECIFICATIONS

Model Number	LDD200-1M	LDD200-3M	LDD200-2M
CONSTANT CURRENT			
Output Current Range	0 - 200 mA		0 - 200 mA
Temperature Coefficient	< 100 ppm/°C		< 100 ppm/°C
Current Stability (24 hr.) ❶	< 50 ppm		< 50 ppm
Noise and Ripple (rms) ❷	< 5 µA		< 5 µA
Current Monitor Transfer Function	80 mA / V		80 mA / V
CONSTANT POWER			
Photodiode Range	15 - 2500 µA	5 - 125 µA	15 - 2500 µA
Power Stability (24 hr.) ❶	< 0.02 %		< 0.02 %
Power Monitor Transfer Function	1000 µA / V	50 µA / V	1000 µA / V
POWER SUPPLY			
Power Up Trip Point ❸	4.9 V		4.9 V
Power Down Trip Point ❸	4.2 V		4.2 V
Setpoint vs. Monitor Accuracy	< 5 %		< 5 %

GENERAL SPECIFICATIONS

Power Requirements +5 to +12 VDC (+12.5V MAX)	Storage Temperature -50 to +85°C	Lead Soldering Temperature 260°C (10 sec.)
Supply Current - Pin 8 250 mA	Power Dissipation 2 W Maximum	Weight < 1 oz.
	Operating Temperature 0 to +50°C (guaranteed), -40 to +75°C (typical)	Size (H x W x D) 1.1" x 1.1" x 0.62", 27.9mm x 27.9mm x 15.8mm

❶ Stability tests were performed in an ambient air environment.

❷ Laser diode forward current noise. Test was performed by measuring the ac voltage across a 50 Ω metal film resistor in series with the laser diode.

❸ The LDD M series has internal control circuitry which turns the output on and off depending on the voltage at pin 8 (V+). When the voltage reaches the power up trip point, the module soft starts the laser diode (~100 msec ramp). When the voltage reaches the power down trip point, the module shunts current around the laser diode, powering it down in a controlled fashion.

Keys to Low Noise, Safe Operation:

POWER SUPPLY AND NOISE:

The control electronics are designed for stable, low noise operation. The power supply you select will directly affect the performance of the driver. The supply voltage from pin 8 to pin 4 should be +5 V to +12 V with 250 mA current capacity for proper operation. We recommend using a regulated, linear supply for low noise performance. Depending on your requirements, you may be able to use a switching power supply. Each case must be evaluated independently because a switching power supply will affect noise, transient, and stability performance.

SAFETY ISSUES:

NOTE: Exceeding the maximum specified current ($I_{op\ max}$) will damage your laser diode. Become familiar with the LDD series module operation and the exact specifications of your laser diode before attaching it to the LDD module. Seek assistance from someone with experience working with laser diodes if you have not operated one before.

NOTE: The following instruments may cause momentary opens, shorts, or impedance changes that will damage a laser diode if attached to the output of a laser diode driver.

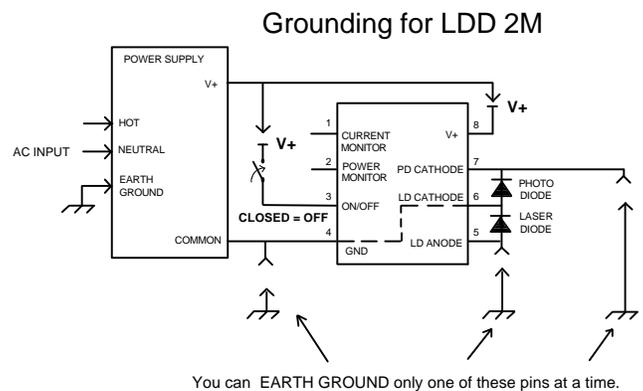
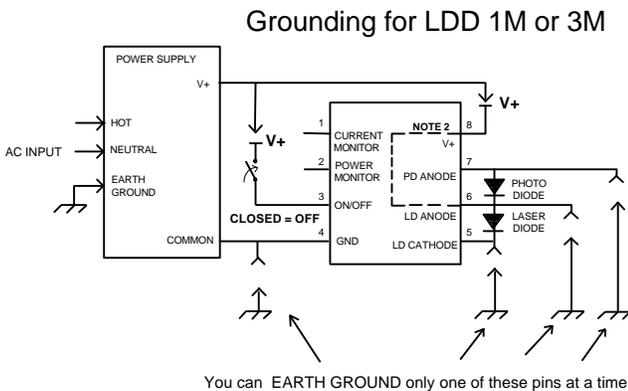
1. A **volt meter** across the laser diode.
2. An **oscilloscope** across the laser diode.
3. A **current meter** in series with the laser diode.

All measurements made with these instruments on the output should be made with a dummy load attached and not a laser diode.

ANSWERS TO FREQUENTLY ASKED QUESTIONS:

GROUNDING:

Improper grounding can damage your laser diode. The following illustrations show points in the system that you might want to earth ground depending on your laser diode assembly. You can earth ground only one pin at a time.



CONSTRUCT A DUMMY LOAD:

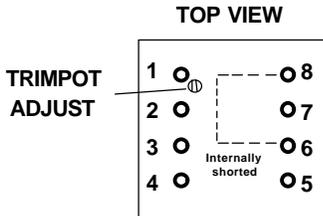
If this is the first time you are using the LDD M series laser driver, we recommend that you attach a dummy load to pins 5 & 6 and operate the module in constant current mode to become familiar with its operation. The dummy load can be a 4 to 10 Ω resistor or as simple as a common LED to simulate the laser diode. Note that most LEDs can be damaged if operated above 40 mA for an extended period of time. Follow operating instructions for constant current mode operation when operating a dummy load.

PIN DESCRIPTIONS for LDD200-1M & LDD200-3M

PLEASE NOTE: These pinouts are only for the 1M and 3M modules. See page 7 for the 2M configuration.

Trimpot Adjustment:

The trimpot adjusts the laser diode forward current setting in constant current mode and the photodiode current setting in constant power mode.



Pin #	LDD 1M & 3M Pin Descriptions
1	Current Monitor
2	Power Monitor [Current Monitor in Constant Current Mode]
3	ON / OFF
4	GND
5	Laser Diode Cathode
6	Laser Diode Anode (common with pin 8)
7	Photodiode Anode
8	V+ (common with pin 6)

Pin 1 Current Monitor

In **Constant Power Mode**, this output is used to monitor the current through the laser diode. The transfer function in constant power mode is 80 mA/Volt.

In **Constant Current Mode**, this pin must be tied to pin 7. Pin 2 then becomes the laser diode current monitor (80 mA/Volt).

Pin 2 Power Monitor

In **Constant Power Mode**, this output is used to monitor the photodiode current. The transfer function for a 1M is 1000 μ A/Volt. For a 3M, the transfer function is 50 μ A/Volt.

In **Constant Current Mode**, this output is used to monitor the laser diode forward current. The laser diode current transfer function is 80 mA/Volt.

Pin 3 ON/OFF

Once power (V+) is applied across pins 8 & 4, pin 3 can be used to enable or disable the laser diode current. The output will be enabled if pin 3 floats or is grounded. If pin 3 is tied to V+, the output will be disabled and the laser diode current will be reduced to a standby state (< 5 mA in constant current mode or the equivalent of 5 μ A or 15 μ A of photodiode current in constant power mode). **Do not disconnect or connect the laser diode to the driver in the standby state.**

Pin 4 GND

This and pin 8 (V+) provide power to the control electronics and laser diode output.

Pin 5 Laser Diode Cathode

Pin 6 Laser Diode Anode This pin is internally shorted to pin 8 (V+).

Do not connect this pin to earth ground when pin 4 (GND) is connected to earth ground. See page 3 for grounding recommendations. Since pin 8 (V+) and pin 6 (LD ANODE) are internally shorted, this will result in shorting out the power supply connected to the LDD M driver. If the laser diode anode and the power supply ground are both required to be earth grounded, you will need to operate the 1M or 3M from a negative power supply. See page 6 for operating instructions.

Pin 7 Photodiode Anode

This pin is attached to the photodiode anode for constant power mode operation. This pin must be shorted to pin 1 (Current Monitor) to operate in constant current mode. Remove any photodiode connections from pin 7 in constant current mode.

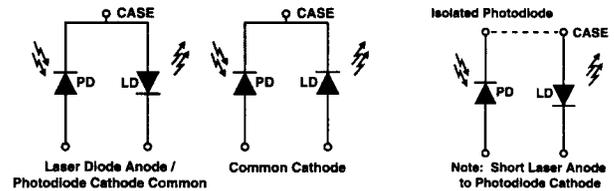
Pin 8 V+ This pin is internally shorted to pin 6 (Laser Diode Anode).

This pin provides power to the control electronics and laser diode output. The LDD M Series has internal control circuitry which turns the output on and off depending on the voltage at pin 8 (V+). When the voltage reaches the power up trip point (4.9 Volts), the module soft starts the laser diode. The soft start ramp is approximately 100 msec. If pin 3 (ON/OFF) is floating or grounded, the output current will be determined by the setting of the adjustment trimpot. When the voltage reaches the power down trip point (4.2 Volts), the module shuts current around the laser diode, powering it down in a controlled fashion.

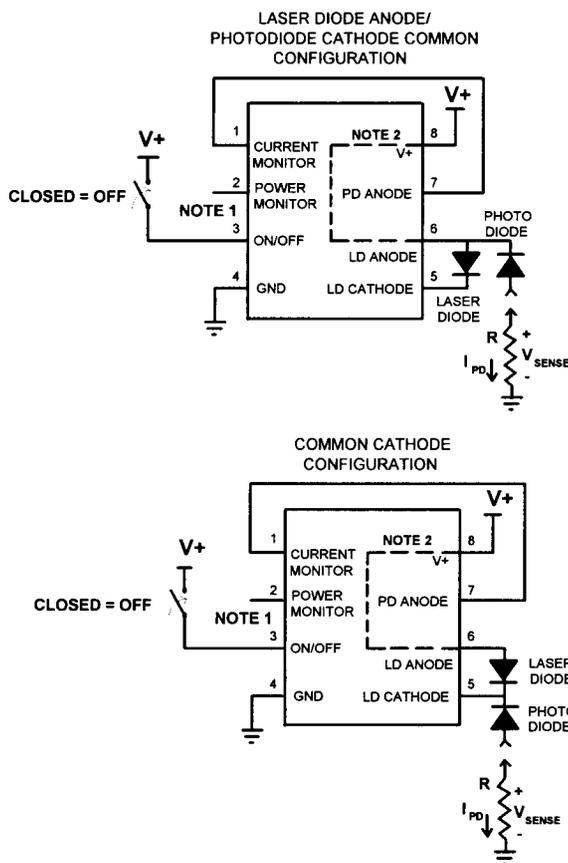
OPERATING INSTRUCTIONS for LDD200-1M or LDD200-3M

Good connections are important for safe and optimum performance of the M series module. Use appropriate ESD practices while handling the laser diode and connecting it to the driver. Three operating modes are discussed in this section - Constant Current Mode, Constant Power Mode, and Operation when the laser diode anode must be earth grounded. Connect your laser diode to the driver as shown in the appropriate connection diagram for your application.

The LDD200-1M or LDD200-3M will operate these laser diode / photodiode configurations:



Constant Current Mode - LDD200-1M or LDD200-3M



NOTE 1: PIN 2 NOW BECOMES THE BUFFERED CURRENT MONITOR.
NOTE 2: PINS 6 & 8 ARE INTERNALLY SHORTED.

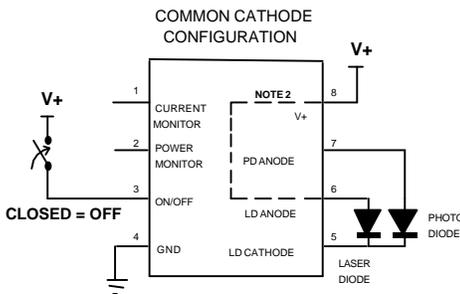
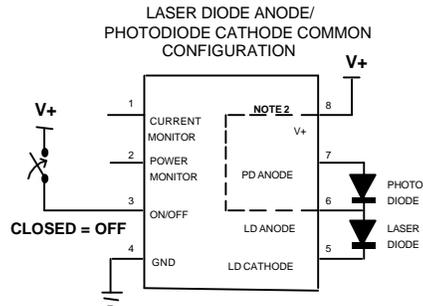
1. Jumper pin 1 & 7 and connect the laser diode or dummy load to pins 5 & 6. The photodiode is optional.

Optional Photodiode - If you need to monitor the photodiode current (I_{PD}) while in constant current mode, attach the photodiode as shown in the connection diagram. For photodiode currents greater than 100 μ A, choose R equal to 1 k Ω . For photodiode currents less than 100 μ A, choose R equal to 10 k Ω . $I_{PD} = V_{sense} / R$

2. Before attaching the power supply to the LDD, preset the supply voltage between +5 and +12V. With the power supply unplugged from AC, attach the power supply output to pins 8 & 4.
3. Either ground pin 3, leave it floating, or use a switch as shown in the diagram. Turn the output current trimpot fully counter clockwise. Do **not** slowly increase the voltage from the power supply; this may damage the Laser Diode and Driver. Apply power to the unit.
4. Use a digital voltmeter to monitor Pin 2. This is the Current Monitor for constant current mode operation. The transfer function is 80 mA/Volt.
5. Exceeding maximum laser diode operating current [I_{op}] will damage your laser diode. Begin with the output adjust trimpot turned fully counter-clockwise. Adjust the output current trimpot **slowly** clockwise until the voltage at pin 2 corresponds to the desired laser diode current (I_{op}). The trimpot rotates through 12 turns between 0 mA and 200 mA.

Constant Power Mode - LDD200-1M or LDD200-3M

1. Attach the Laser Diode to pins 5 & 6. Attach the Photodiode as indicated in the connection diagram for your laser diode / photodiode configuration.
2. Before attaching the power supply to the LDD, preset the supply voltage between +5 and +12V. With the power supply unplugged from AC, attach the power supply output to pins 8 & 4.
3. Either ground pin 3, leave it floating, or use a switch as shown in the diagram. Turn the output current trimpot fully counter clockwise. Do **not** slowly increase the voltage from the power supply; this may damage the Laser Diode and Driver. Apply power to the unit.
4. In constant power mode, the photodiode current remains at the initial setpoint while the laser diode current is changed continually to maintain this power setting. Laser diodes become less efficient as their temperature increases. To maintain power as temperature increases, more laser diode current is required. The laser diode can be damaged by excessive current from the drive circuit as the temperature of the laser diode increases.



NOTE 2: PINS 6 & 8 ARE INTERNALLY SHORTED.

Choose one of the following two methods to setup the LDD M laser diode driver for constant power operation:

A. Set the power via Photodiode Current (I_{PD})

Monitor the current through the photodiode at pin 2. Determine the photodiode current associated with the desired power from data provided by the laser diode manufacturer. Calculate the corresponding voltage at pin 2 from the transfer functions listed below. When the laser current reaches threshold, the photodiode current will change abruptly then rise quickly. Adjust the output current trimpot **slowly** until the voltage at pin 2 corresponds to the desired photodiode current (I_{PD}). The trimpot rotates through 12 turns between 15 μ A and 2500 μ A for the 1M units and 12 turns between 5 μ A and 125 μ A for the 3M units. The transfer function for photodiode current is:

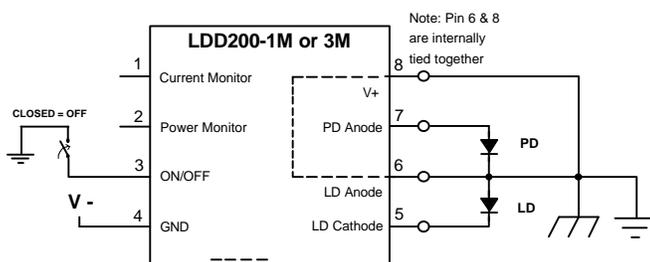
$$\begin{aligned} 1M &\Rightarrow 1000 \mu\text{A/Volt}, \\ 3M &\Rightarrow 50 \mu\text{A/Volt}. \end{aligned}$$

You can measure the laser diode current at pin 1 (Current Monitor) after setting the photodiode current.

B. Set the power via Laser Diode Current (I_{LD})

Monitor the current through the laser diode at pin 1. Determine the laser diode current associated with the desired power from data provided by the laser diode manufacturer. Using the 80 mA/V transfer function of pin 1, calculate the corresponding voltage. Adjust the output current trimpot **slowly** while monitoring pin 1 because abrupt changes happen when the laser diode current reaches the threshold current level. Measure the photodiode current at pin 2 after setting the laser diode current. The laser diode current will vary to maintain this power setting.

Grounding the Laser Diode Anode with the LDD200-1M or LDD200-3M



The voltage difference across pins 8 and 4 must be +5 to +12V. If you use a negative supply on pin 4 and ground pin 8, you can ground the laser diode anode as shown.

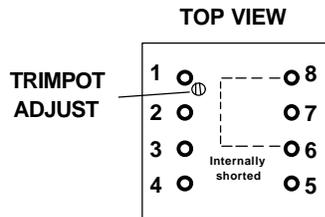
See page 3 for details about earth grounding different points in the circuit.

PIN DESCRIPTIONS for LDD200-2M

PLEASE NOTE: These pinouts are only for the 2M modules. See page 4 for the 1M & 3M configuration.

Trimpot Adjustment:

The trimpot adjusts the laser diode forward current setting in constant current mode and the photodiode current setting in constant power mode.



Pin #	LDD 2M Pin Descriptions
1	Current Monitor
2	Power Monitor [Current Monitor in Constant Current Mode]
3	ON / OFF
4	GND (Common with Pin 6)
5	Laser Diode Anode
6	Laser Diode Cathode (Common with Pin 4)
7	Photodiode Cathode
8	V+

Pin 1 Current Monitor

In **Constant Power Mode**, this output is used to monitor the current through the laser diode. The transfer function in constant power mode is 80 mA/Volt.

In **Constant Current Mode**, this output is tied to pin 7 through a rail to rail opamp (voltage level shifting circuit). Pin 2 then becomes the current monitor (80 mA/Volt).

Pin 2 Power Monitor

In **Constant Power Mode**, this output is used to monitor the photodiode current. The transfer function for a 2M is 1000 μ A/Volt. In **Constant Current Mode**, this output is used to monitor the laser diode forward current. The laser diode current transfer function is 80 mA/Volt.

Pin 3 ON/OFF

Once power (V+) is applied across pins 8 & 4, pin 3 can be used to enable or disable the laser diode current. The output will be enabled if pin 3 floats or is grounded. If pin 3 is tied to V+, the output will be disabled and the laser diode current will be reduced to a standby state (< 5 mA in constant current mode or the equivalent of 15 μ A of photodiode current in constant power mode).

Do not disconnect or connect the laser diode to the driver in the standby state.

Pin 4 GND This pin is internally shorted to pin 6 (Laser Diode Cathode)
This and pin 8 (V+) provide power to the control electronics and laser diode output.

Pin 5 Laser Diode Anode

Pin 6 Laser Diode Cathode This pin is internally shorted to pin 4 (GND).

Pin 7 Photodiode Cathode

This pin is attached to the photodiode cathode for constant power mode operation. This pin must be shorted to pin 1 (Current Monitor) through a rail to rail opamp to shift the current monitor output voltage to the feedback signal voltage level when operated in constant current mode.

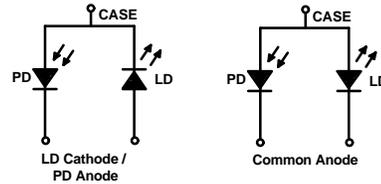
Pin 8 V+

This pin provides power to the control electronics and laser diode output. The LDD M Series has internal control circuitry which turns the output on and off depending on the voltage at pin 8 (V+). When the voltage reaches the power up trip point (4.9 Volts), the module soft starts the laser diode. The soft start ramp is approximately 100 msec. If pin 3 (ON/OFF) is floating or grounded, the output current will be determined by the setting of the adjustment trimpot. When the voltage reaches the power down trip point (4.2 Volts), the module shunts current around the laser diode, powering it down in a controlled fashion.

OPERATING INSTRUCTIONS for LDD200-2M

The LDD200-2M will operate these laser diode / photodiode configurations:

Good connections are important for safe and optimum performance of the M series module. Use appropriate ESD practices while handling the laser diode and connecting it to the driver. Two operating modes are discussed in this section - Constant Current Mode and Constant Power Mode. Connect your laser diode to the driver as shown in the appropriate connection diagram for your application.



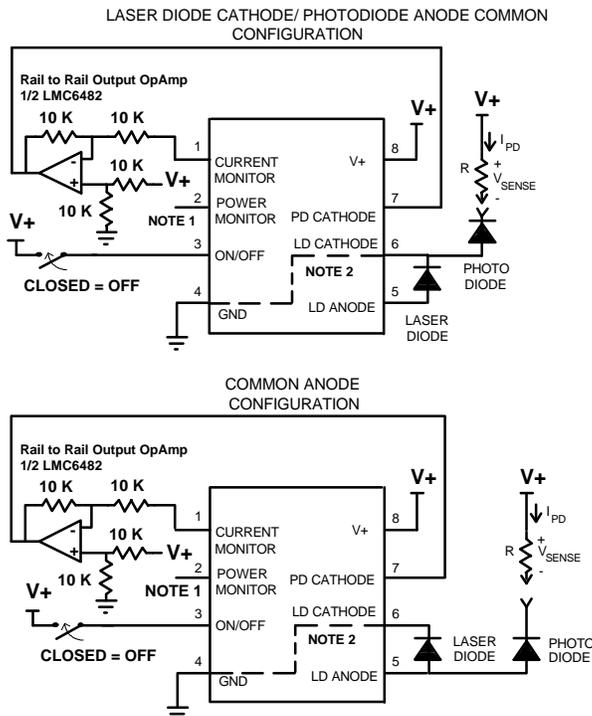
Constant Current Mode - LDD200-2M

1. A Rail to Rail opamp is required to operate the 2M in constant current mode to shift the current monitor voltage to the feedback voltage level. This circuit is available on the LDDPCB-2M evaluation PCB.

2. Connect the Laser Diode or dummy load to pins 5 & 6. The photodiode is optional.

Optional Photodiode - If you need to monitor the photodiode current (I_{PD}) while in constant current mode, attach the photodiode as shown in the connection diagram. For photodiode currents greater than 100 μA , choose R equal to 1 k Ω . For photodiode currents less than 100 μA , choose R equal to 10 k Ω .

$$I_{PD} = V_{sense} / R$$



NOTE 1 - PIN 2 NOW BECOMES THE BUFFERED CURRENT MONITOR
NOTE 2 - PINS 4 & 6 ARE INTERNALLY SHORTED.

3. Before attaching the power supply to the LDD, preset the supply voltage between +5 and +12 V. With the power supply unplugged from AC, attach the power supply output to pins 8 & 4.
4. Either ground pin 3, leave it floating, or use a switch as shown on the diagram. Turn the output current trimpot fully counter clockwise. Do **not** slowly increase the voltage from the power supply; this may damage the Laser Diode and Driver. Apply power to the unit.
5. Use a digital voltmeter to monitor pin 2 (laser diode forward current). The transfer function is 80 mA/Volt.
6. *Exceeding maximum laser diode operating current [I_{OP}] will damage your laser diode.* Adjust the output current trimpot **slowly** clockwise until the voltage at pin 2 corresponds to the desired laser diode current [I_{OP}]. The trimpot rotates through 12 turns between 0 mA and 200 mA.

Constant Power Mode - LDD200-2M

1. Attach the Laser diode to pins 5 & 6. Attach the Photodiode as indicated in the connection diagram for your laser diode / photodiode configuration.
2. Before attaching the power supply to the LDD, preset the power supply voltage between +5 and +12 V. With the power supply unplugged from AC, attach the power supply output to pins 8 & 4.
3. Either ground pin 3, leave it floating, or use a switch as shown in the diagram. Turn the output current trimpot fully counter clockwise. Do **not** slowly increase the voltage from the power supply, this may damage the Laser Diode and Driver. Apply power to the unit.

4. In constant power mode, the photodiode current remains at the initial setpoint while the laser diode current is changed continually to maintain this power setting. Laser diodes become less efficient as their temperature increases. To maintain power as temperature increases, more laser diode current is required. The laser diode can be damaged by excessive current from the drive circuit as the temperature of the laser diode increases.

Choose one of the following two methods to setup the LDD M laser diode driver for constant power operation:

A. Set the power via Photodiode Current (I_{PD})

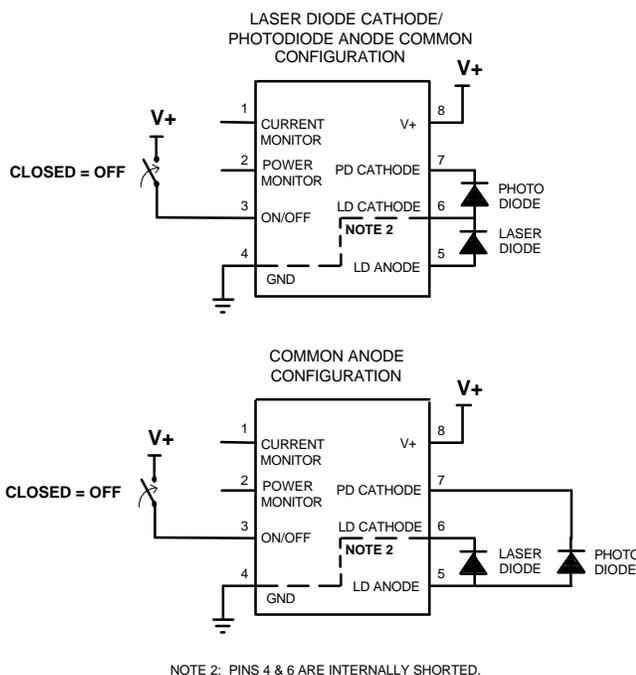
Monitor the current through the photodiode at pin 2. Determine the photodiode current associated with the desired power from data provided by the laser diode manufacturer. Calculate the corresponding voltage at pin 2 from the transfer function listed below. When the laser current reaches threshold, the photodiode current will change abruptly then rise quickly. Adjust the output current trimpot **slowly** until the voltage at pin 2 corresponds to the desired photodiode current (I_{PD}). The trimpot rotates through 12 turns between 15 μ A and 2500 μ A for the 2M unit. The transfer function for photodiode current is:

$$2M \Rightarrow 1000 \mu A/Volt$$

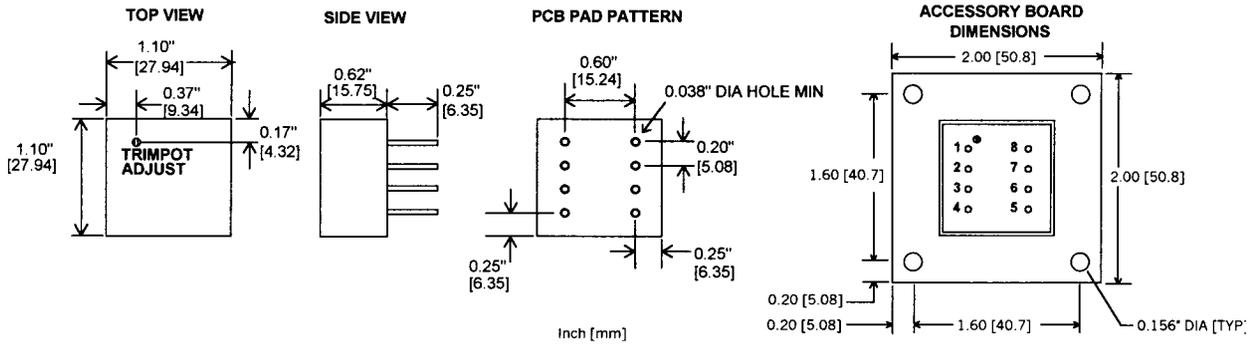
You can measure the laser diode current at pin 1 (Current Monitor) after setting the photodiode current.

B. Set the power via Laser Diode Current (I_{LD})

Monitor the current through the laser diode at pin 1. Determine the laser diode current associated with the desired power from data provided by the laser diode manufacturer. Using the 80 mA / V transfer function of pin 1, calculate the corresponding voltage. Adjust the output current trimpot **slowly** while monitoring pin 1 because abrupt changes happen when the laser diode current reaches the threshold current level. Measure the photodiode current at pin 2 after setting the laser diode current. The laser diode current will vary to maintain this power setting.



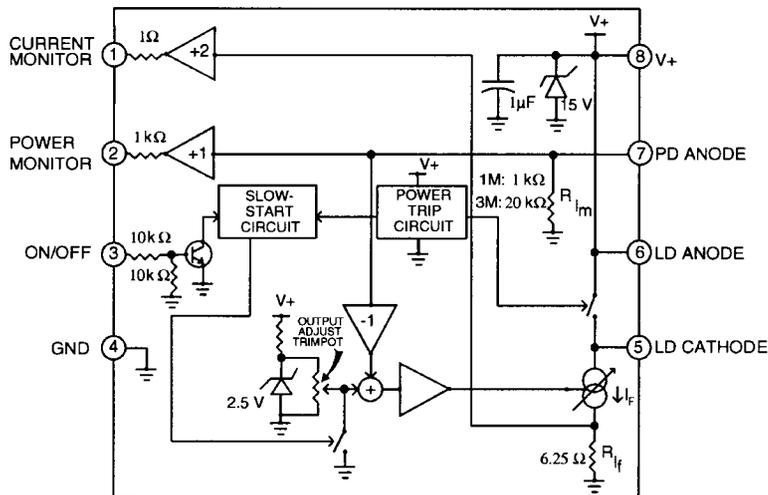
MECHANICAL DIMENSIONS



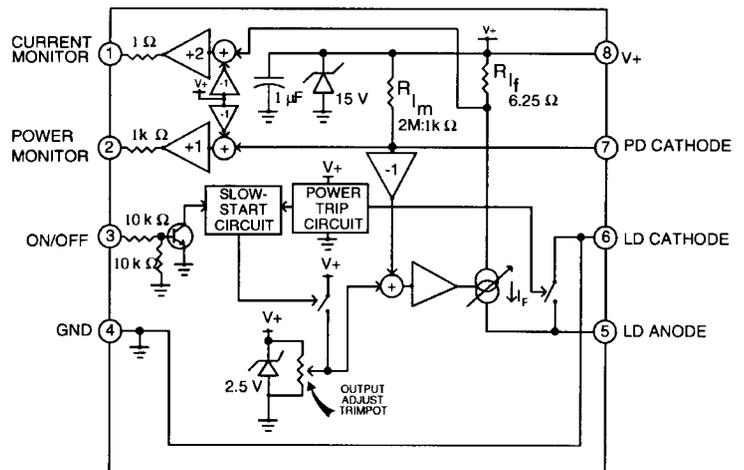
OPTIONAL ACCESSORIES

MODEL	DESCRIPTION
LDDPCB-M	Silkscreened PCB with connection information and four convenient mounting holes.
LDDPCB-1M	LDDPCB-M with B D E & F components mounted. (See page 12 for protection schemes.)
LDDPCB-2M	LDDPCB-M with B D E & F components mounted. (See page 12 for protection schemes.) Components to operate LDD200-2M in constant current mode also loaded.
LDDCAB-25	25 cm cable with three pin Teflon connector
LDDCAB-50	50 cm cable with three pin Teflon connector

LDD 1M AND 3M BLOCK DIAGRAM



LDD 2M BLOCK DIAGRAM

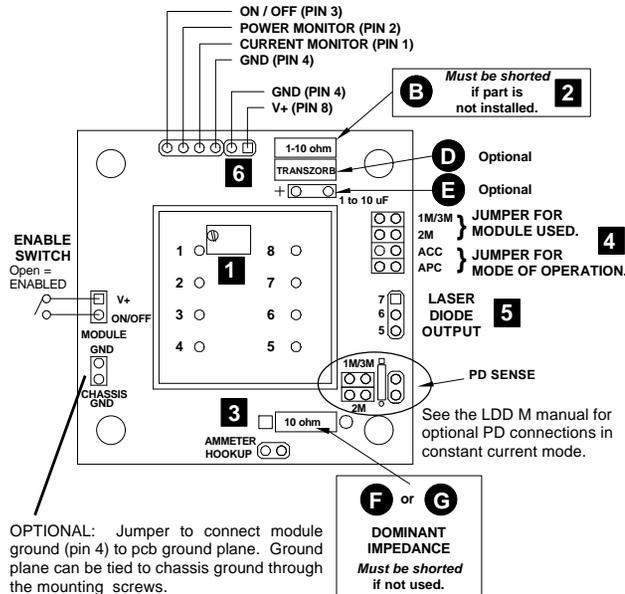


LDDPCB-M

(for any "M" module - no components loaded)

B through **G** refer to Protection Strategies on reverse of page.

1 through **7** refer to Operational Steps.



OPTIONAL: Jumper to connect module ground (pin 4) to pcb ground plane. Ground plane can be tied to chassis ground through the mounting screws.

F or **G**
DOMINANT IMPEDANCE
Must be shorted if not used.

Refer to LDDPCB-1M & LDDPCB-2M drawings for additional information.

Minimum steps for operation:

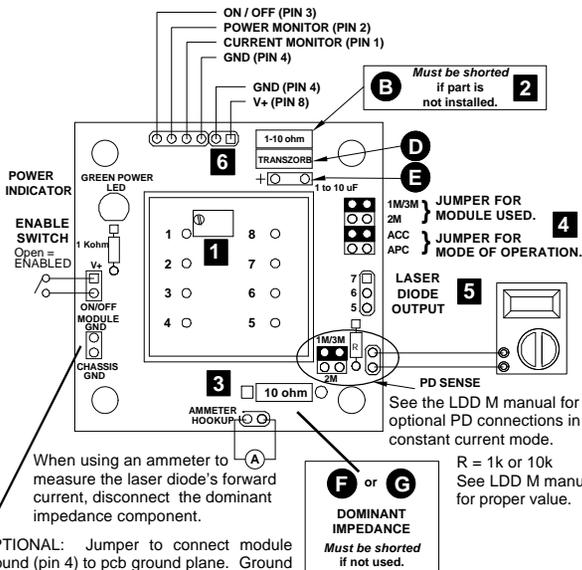
- 1** Install LDD200-XM module with potentiometer as shown.
- 2** At B, install a resistor (1-10Ω) or jumper contacts.
- 3** At F/G install a 10Ω resistor or jumper contacts.
- 4** Jumper for module & mode type.
- 5** Wire laser diode or setup load. See LD Output Hookup.
- 6** Apply DC power.
- 7** Follow operating instructions in LDD M manual.

LDDPCB-1M

(for 1M or 3M modules)

B through **G** refer to Protection Strategies on reverse of page.

1 through **7** refer to Operational Steps.



When using an ammeter to measure the laser diode's forward current, disconnect the dominant impedance component.

F or **G**
DOMINANT IMPEDANCE
Must be shorted if not used.

OPTIONAL: Jumper to connect module ground (pin 4) to pcb ground plane. Ground plane can be tied to chassis ground through the mounting screws.

LDDPCB-1M

This board has been loaded with the following components:

- A power indicator LED and pull-up resistor
- Decoupling resistor, capacitor, and regulation transzorb
- Jumper set for choice of which M series unit is used and mode of operation
- Photodiode sense resistor: R = 1k or 10k, both values are included loose in the bag
- Photodiode sense jumper: Jumper set for choice of which M series unit is used.
- Dominant impedance resistor
- All other points are solder pads.

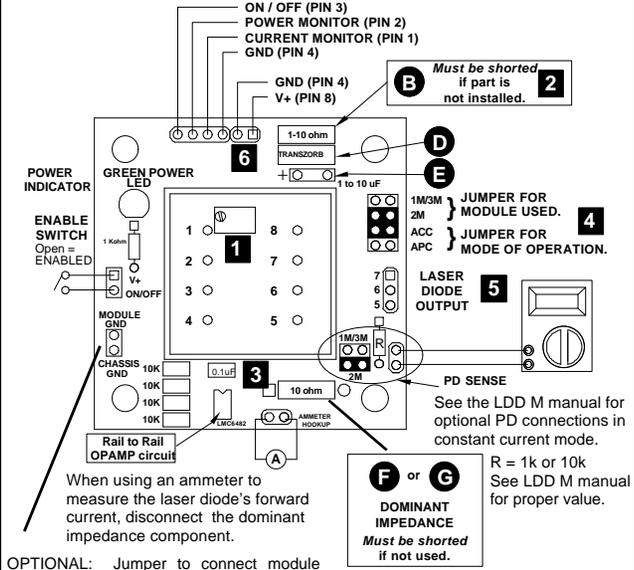
See the LDD M Manual for additional information.

LDDPCB-2M

(for 2M modules)

B through **G** refer to Protection Strategies on reverse of page.

1 through **7** refer to Operational Steps.



When using an ammeter to measure the laser diode's forward current, disconnect the dominant impedance component.

F or **G**
DOMINANT IMPEDANCE
Must be shorted if not used.

OPTIONAL: Jumper to connect module ground (pin 4) to pcb ground plane. Ground plane can be tied to chassis ground through the mounting screws.

LDDPCB-2M

In addition to all the components loaded on the LDDPCB-1M, the rail-to-rail operational amplifier and circuitry are loaded for use in constant current mode.

LASER DIODE OUTPUT HOOKUP

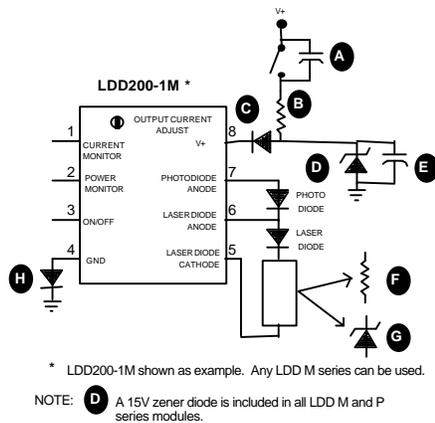
LDD 1M & 3M

- 7 - PD ANODE
- 6 - LD ANODE
- 5 - LD CATHODE

LDD 2M

- 7 - PD CATHODE
- 6 - LD CATHODE
- 5 - LD ANODE

SIMPLE LASER DIODE PROTECTION STRATEGIES



Simple laser diode protection circuits can be added to the LDD series of laser diode drivers. These circuits reduce the chance of damage due to power supply transients and intermittent disconnects between the laser diode and laser diode driver. These protection circuits work with any LDD series laser diode driver.

Laser Diode Protection Circuits

- A)** When powering the LDD series of laser diode drivers on and off using a switch from the DC power supply, add a 0.1 μF capacitor in parallel with the switch. The capacitor reduces switch bounce.
- B)** A 1 to 10 ohm resistor can be used to decouple the power supply from the LDD laser diode driver. This series resistor forms a low pass single pole filter with the capacitance seen from pin 8 to ground. This component is not recommended for V_+ operation below 6 V.
- C)** This diode can be any silicon diode such as a 1N4005. This diode protects the laser diode from any negative transients on the positive supply rail of the power supply. The voltage from pins 8 to 4 must be +5 V minimum.
- D,E)** The zener diode shown is typically referred to as a transzorb. A typical transzorb selected for a 12 V supply would be the PKE15ACT. Later versions of the LDD M Series include this transzorb internally. Select lower voltage transzorbs when using lower supply voltages. The capacitor shown should be a 10 μF tantalum or low ESR electrolytic type. Both of these components shunt regulate the power supply around the LDD laser diode driver. This type of regulation works best when used together with the decoupling resistor shown in **B**.
- F,G)** Either the resistor or zener diode can be added in series with the laser diode. This protection strategy is commonly referred to as the *Dominant Impedance Method*. Both components reduce the voltage across the laser diode in the case of a power supply transient or if the connections to the laser diode are broken and reconnected. When using the resistor to limit the current, select either a metal film power resistor or a non-inductive wire wound resistor. Carbon based resistors add a significant amount of noise and inductive wire wound resistors can damage the laser diode.

Example: Internally, a 6.2 Ω sense resistor is in series with the laser diode. If the power supply voltage (measured from pin 8 to pin 4) is 5 V and the maximum laser diode operating current is 60 mA, and assuming the operating voltage across the laser is 2 V, then select a resistor

$$R = \frac{(5 - 2 - (0.06)(6.2))V}{60\text{mA}} = 43.8\Omega \quad 1/4 \text{ Watt or larger}$$

If using a zener diode, select a zener with a breakdown voltage of 3 V. For 2M models, maintain the correct polarity of the zener diode.

THIS METHOD IS NOT FAILSAFE BECAUSE OF THE TEMPERATURE DEPENDENCE AND SLOPE OF THE LASER DIODE'S V-I CURVE.

- H)** This diode can be any silicon diode such as a 1N4005. This diode protects the laser diode from positive transients on the ground rail of the power supply. The voltage from pins 8 to 4 must be +5 V minimum.

All or none of these protection strategies can be used with the LDD series of laser diode driver. The amount of protection is dictated by the power supply selected and the system environment in which the LDD laser diode driver is being used.