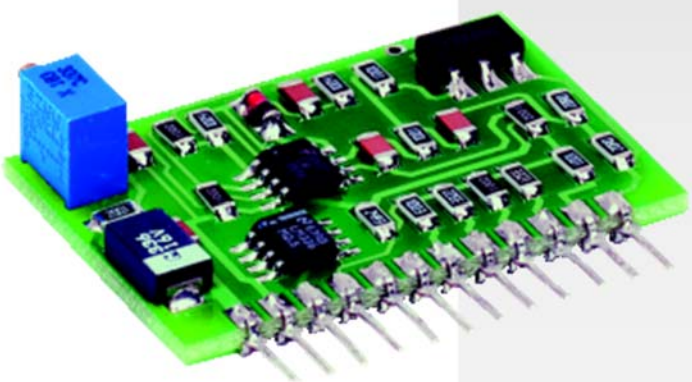
THORLABS

# LD1100, EK1101, EK1102
# Constant Power Laser Driver

## User Guide



# Table of Contents

# Chapter 1 Warning Symbol Definitions

Below is a list of warning symbols you may encounter in this manual or on your device.

| Symbol | Description |
| --- | --- |
|  | Direct Current |
|  | Alternating Current |
|  | Both Direct and Alternating Current |
|  | Earth Ground Terminal |
|  | Protective Conductor Terminal |
|  | Frame or Chassis Terminal |
|  | Equipotentiality |
|  | On (Supply) |
|  | Off (Supply) |
|  | In Position of a Bi-Stable Push Control |
|  | Out Position of a Bi-Stable Push Control |
|  | Caution: Risk of Electric Shock |
|  | Caution: Hot Surface |
|  | Caution: Risk of Danger |
|  | Warning: Laser Radiation |
|  | Caution: Spinning Blades May Cause Harm |

# Chapter 2 Safety

The LD1100 has been designed to provide many hours of trouble-free performance. To ensure proper operation, be sure follow these instructions:

**CAUTION**

**A grounded wrist strap should always be worn when handling laser diodes to prevent electrostatic damage to the laser.**

**CAUTION**

**When installing the LD1100, sound, high-quality solder joints must be used. A cold solder joint or blobs of solder may cause intermittent connections or shorts that can damage the laser and the driver.**

**CAUTION**

**When setting the laser output levels and the gain of the LD1100, be sure to use the actual performance for the diode you have in hand. Many manufacturers' data sheets and brochures specify typical and maximum values and are meant to only be used as a guideline.**

**Where provided, use the actual performance data supplied with the diode. This is usually found on the outside of the diode wrapper or provided on a separate data sheet. If in doubt, please call a Thorlabs engineer and we will be happy to assist you.**

# Chapter 3 Description

The LD1100 is a constant-power laser driver module. Its features include an on-board 12-turn trim pot for continuous laser output adjustment, pin-programmable feedback gain, ON/OFF control input, and a current monitor output for observing the laser drive current. Measuring only 1″ x 1.5″, the LD1100 is a compact module which can be embedded into a custom design. All input and output signals are provided on a 12-pin SIP connector which allows simple integration into a printed circuit design.

The LD1100 can drive lasers up to 250 mA in a constant-power mode. It uses the internal monitor photodiode for a feedback signal into a proportional-integral feedback loop to stabilize the output power to within 0.01%. To accommodate a wide range of laser diodes, the feedback gain can be set by jumpering any combination of the 5 gain setting resistor pins to the power supply common. This allows lasers with monitor currents over a range from 5 µA to 5 mA to be used with a single driver.

The LD1100 supports the following two laser pin configurations:

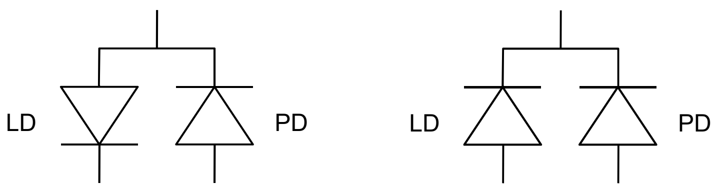



***Figure 1  Laser Packages Supported***

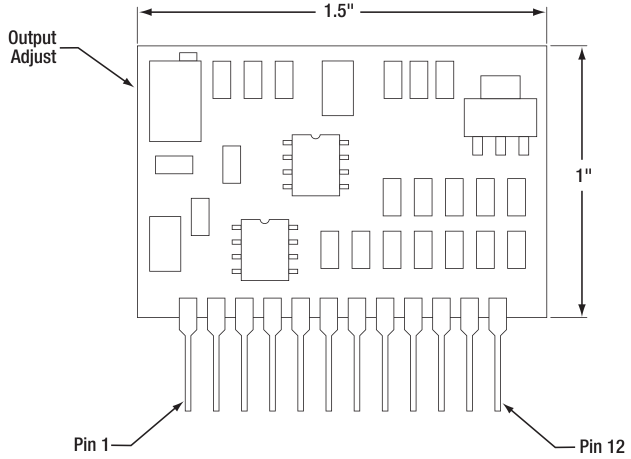



***Figure 2  LD1100 Pinouts***

| Pin | Signal | Description |
|---|---|---|
| **1** | +V | Circuit Power, 8 to 12VDC, 250mA, **NOTE**: Internally tied to Laser Diode Anode, the laser anode must be isolated from the power supply COM. |
| **2** | COM | Circuit ground |
| **3** | $V_{REF}$ | Internal 2.5 V reference |
| **4** | PDA | Photodiode Anode |
| **5** | LDA | Laser Diode Anode [internally tied to +V (pin 1)] |
| **6** | LDC | Laser Diode Cathode |
| **7** | RA | When tied to common puts a 100 kΩ in parallel with 249 kΩ internal gain res. |
| **8** | RB | When tied to common puts a 33.2 kΩ in parallel with 249 kΩ internal gain res. |
| **9** | RC | When tied to common puts a 10 kΩ in parallel with 249 kΩ internal gain res. |
| **10** | RD | When tied to common puts a 3.32 kΩ in parallel with 249 kΩ internal gain res. |
| **11** | RE | When tied to common puts a 1 kΩ in parallel with 249 kΩ internal gain res. |
| **12** | $I_{LD}$ | Laser Diode Current Monitor (10 mV/mA) |

# Chapter 4 Setup

**WARNING**

**Laser Diodes are extremely static sensitive and can be easily damaged by mishandling. Always use a grounded wrist strap and work on an anti-static mat when handling lasers.**

## 4.1. Setting the LD1100 Feedback Gain for a Given Monitor Photocurrent

The LD1100 has a pin-programmable feedback gain to accommodate a wide range of laser monitor photodiode currents. It is important that this gain be matched to the specific laser so that the LD1100 operates properly. Please refer to Figure 1 for identifying LD1100 features. For a detailed description of the feedback circuit as well as instructions on fully optimizing the gain, refer to Appendix.

1. Determine the monitor photodiode feedback current for your laser. This is usually given in the laser manufacturer's data sheet.
2. Using Figure 3, look up the resistor combination that matches the photodiode current. If an exact match is not found, select the combination that yields the next hightest feedback current.
3. Read across Figure 3 to identify the gain resistors that need to be enabled. The resistors that have an "ON" in their respective column need to be enabled by connecting their pin to the power supply common (J1 pin 2). The resistors that are labeled "OFF" should not be connected to any other pin.

**Example**:

Laser is a CQL806/D (Iop = 70 mA, Imon = 400 µA). Looking up Table1, the closest monitor current to that is 770 µA which is set by jumpering RD to the power supply common and leaving RA-RC, & RE open.

In this example, the maximum feedback current of 770 µA occurs when the output adjust pot is turned up to the full 12 turns. However, this particular laser reaches a maximum output at 400 µA which occurs at an output adjust pot setting proportionately lower then 12 turns (400 µA / 770 µA * 12 turns = 6¼ turns). If you turn the output adjust above this point you will overdrive the laser and cause premature laser failure.

**WARNING**

**When using the on-board gain settings, it is possible to overdrive the laser if the output adjust pot is turned completely up. This may be avoided by precisely matching the gain to your laser (see Chapter 6 for more details).**

| Max $I_{mon}$ (mA) | RA 100 kΩ | RB 33 kΩ | RC 10 kΩ | RD 3.3 kΩ | RE 1 kΩ |
|---|---|---|---|---|---|
| **0.010** | OFF | OFF | OFF | OFF | OFF |
| **0.035** | ON | OFF | OFF | OFF | OFF |
| **0.085** | OFF | ON | OFF | OFF | OFF |
| **0.110** | ON | ON | OFF | OFF | OFF |
| **0.260** | OFF | OFF | ON | OFF | OFF |
| **0.285** | ON | OFF | ON | OFF | OFF |
| **0.335** | OFF | ON | ON | OFF | OFF |
| **0.360** | ON | ON | ON | OFF | OFF |
| **0.767** | OFF | OFF | OFF | ON | OFF |
| **0.792** | ON | OFF | OFF | ON | OFF |
| **0.843** | OFF | ON | OFF | ON | OFF |
| **0.868** | ON | ON | OFF | ON | OFF |
| **1.017** | OFF | OFF | ON | ON | OFF |
| **1.042** | ON | OFF | ON | ON | OFF |
| **1.093** | OFF | ON | ON | ON | OFF |
| **1.118** | ON | ON | ON | ON | OFF |
| **2.510** | OFF | OFF | OFF | OFF | ON |
| **2.535** | ON | OFF | OFF | OFF | ON |
| **2.585** | OFF | ON | OFF | OFF | ON |
| **2.610** | ON | ON | OFF | OFF | ON |
| **2.760** | OFF | OFF | ON | OFF | ON |
| **2.785** | ON | OFF | ON | OFF | ON |
| **2.835** | OFF | ON | ON | OFF | ON |
| **2.860** | ON | ON | ON | OFF | ON |
| **3.267** | OFF | OFF | OFF | ON | ON |
| **3.292** | ON | OFF | OFF | ON | ON |
| **3.343** | OFF | ON | OFF | ON | ON |
| **3.368** | ON | ON | OFF | ON | ON |
| **3.517** | OFF | OFF | ON | ON | ON |
| **3.542** | ON | OFF | ON | ON | ON |
| **3.593** | OFF | ON | ON | ON | ON |
| **3.62** | ON | ON | ON | ON | ON |

***Figure 3  Feedback Gain Resistor Settings***

## 4.2. DC Power Supply Connection

A high-quality DC power supply with good turn-on and turn-off transient suppression will offer the best performance and protection for your laser. Avoid using switching supplies which typically have higher transient noise that can couple into the laser output as well as unregulated DC supplies. The LD1100 can also be operated off a battery. The usable lifetime of the battery will be limited to the laser operating current and the battery capacity.

Connect the '+' terminal of the power supply to J1 pin 1. Connect the power supply common to J1 pin 2.

**Note**: The output compliance voltage is determined by the power supply voltage and the laser operating voltage and current and can be determined as follows:

$$V_{COMPLIANCE} = V_{CC} - (V_F + 10I_{LD} + 0.8V)$$

Where: $V_{CC}$ is thepower supply voltage, $V_F$ is the laser forward voltage, and $I_{LD}$ is the laser operating current.

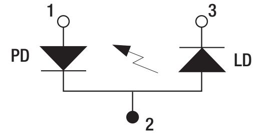
## 4.3. Laser Diode Connection

The LD1100 supports four laser pin configurations (see Figure 2). We recommend using 24 AWG wire from the LD1100 output pins to the laser and keeping the overall wire length to a minimum (1 m max.). Twist the three leads from the driver to the laser to minimize pick-up. If a socket is to be used for the laser, make sure it is a high-quality socket with high-retention force pin sockets (i.e. Thorlabs P/N S8060 (9 mm lasers) or S7060 (5.6 mm lasers).

### 4.3.1. Laser Anode – Photodiode Cathode Common

This configuration is used for most visible laser diodes.

| Laser Pin | J1 Pin |
|---|---|
| PDA | 4 |
| LDA / PDC | 5 |
| LDC | 6 |

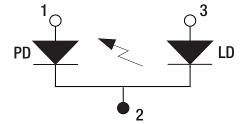


Pin Code A

### 4.3.2. Laser Cathode – Photodiode Cathode Common

This configuration is used for near IR laser diodes.

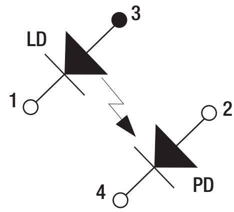
| Laser Pin | J1 Pin |
|---|---|
| PDA | 4 |
| LDA | 5 |
| LDC / PDC | 6 |



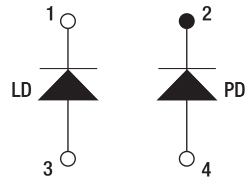
Pin Code B

### 4.3.3. Four Pin Laser Diodes

Four pin laser diodes may be connected to match one of the configurations in 4.3.1 or 4.3.2.




Pin Code D




Pin Code F

## 4.4. Accessories

Thorlabs offers evaluation boards as well as pre-assembled kits for the LD1100 to make set up and testing even easier. Please refer to Chapter 7 for setup and operation of the EB1100, EK1101, EK1102.

# Chapter 5 Operation

## 5.1. Laser Output Adjust

After following the setup procedure in Section 4, the LD1100 should be ready to start driving your laser. Please read and use the following steps to operate the laser:

1. Before turning the laser on for the first time, turn the output adjustment pot down to the minimum setting by turning the adjustment screw counter-clockwise 12 full turns (this control does not have a mechanical stop but by turning it 12 turns assures the pot is at its minimum value).
2. Turn the DC power supply on, at this point you may see a very slight emission from the laser (particularly for lasers with low monitor currents) but it should be well below the lasing threshold.
3. Slowly turn the output adjustment pot clockwise until the output starts to increase. Use a calibrated power meter to precisely set the optical output power. Once the output adjustment has been set, it should not need any further adjustment unless you wish to change the output power.

## 5.2. ON / OFF Control

The LD1100 has an external ON / OFF control (J1, pin 3) which allows the laser output to be set to a reduced level. This function is activated by pulling this pin to 0V using either a mechanical switch or a transistor (open-drain FET or open-collector bipolar). This pin is internally pulled up to VCC through a 2 K resistor and must be allowed to float when the laser is operating. The normal voltage on this pin with the laser operating is 2.5 V.

## 5.3. Monitoring the Laser Operating Current

The laser operating current can be monitored by measuring the voltage on J1 pin 12. This pin has an output of 10 mV/mA (i.e.  J1-12 = 550 mV, laser is operating at 55 mA). Use only a high input impedance device (greater than 1 KΩ) to avoid excessive load of the LD1100 output circuit.

# Chapter 6 Feedback Circuit Operation

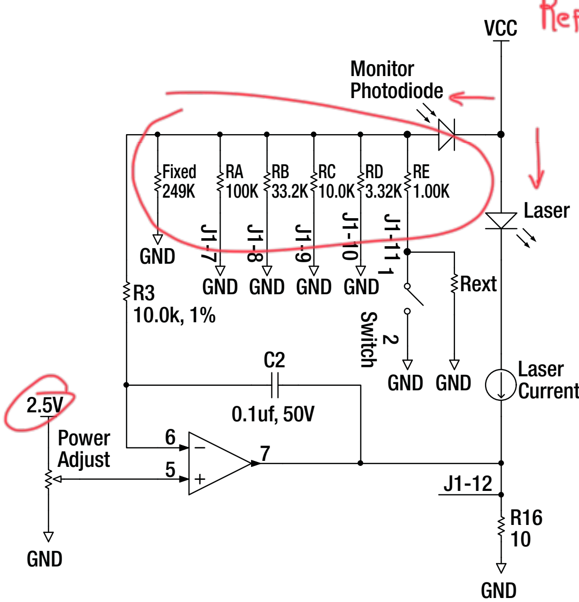
The LD1100 uses a proportional-integral type (PI) feedback circuit to maintain an extremely stable laser output. The laser power is stabilized by varying the laser drive current in response to the monitor photodiode feedback to maintain a constant output power. This compensates for changes in the laser efficiency due to thermal and aging effects.

The feedback circuit converts the monitor photodiode current to a voltage which is compared to an adjustable internal reference to generate the control signal for the laser drive current. A decrease in the photodiode current is sensed as a reduction in the output power and the feedback loop will try to compensate by increasing the drive current to the laser. Likewise, if the photodiode current increases, the feedback loop will reduce the laser drive current to maintain a constant output power.

The LD1100 uses an adjustable 2.5V reference to establish the laser output power. The monitor photodiode current is converted to a voltage through a bank of programmable parallel resistors (see Figure 4) and compared to the internal reference. The programmable resistor bank support a wide range of laser monitor currents. It is important to select the right combination of resistors for proper operation. Ideally, the effective resistance of the parallel combination of resistors should be:

$$R_{eff} = 2.5V / I_{MON}$$

Where $I_{MON}$ is the monitor photodiode current.




$Ref = \frac{Vin}{0{,}7m}$

$\frac{20}{7}$ K

*Figure 4 Feedback Loop Functional Diagram*

The effective resistance is easily calculated by:

$$R_{eff} = \frac{1}{\left(\frac{1}{249\ K} + \frac{1}{RA} + \frac{1}{RB} + \frac{1}{RC} + \frac{1}{RD} + \frac{1}{RE}\right)}$$

Use only resistor values that are jumpered to the supply common in the equation above.

Since it is not possible to match every possible monitor current with the 5 available resistors, a compromise must be made. Figure 3 in Chapter 4 provides a convenient list of all 32 possible resistor combinations. Note that with all five resistors open, the LD1100 still has a 249 K resistor (R6) in the feedback loop. This was set so that the feedback loop will safely saturate before the laser is overdriven for most lasers (assuming the output control is turned down before powering up).

For critical applications, it is possible to set the feedback gain precisely with an external resistance tied to one of the gain setting pins. For these cases, add the external resistance to the resistance of the pin used.

# Chapter 7 EB1100 Evaluation Board, EK1101 & EK1102 Evaluation Kits

Thorlabs offers two options to make setup and operation of the LD1100 Laser Driver easier. The EB1100 is an evaluation printed circuit board that the user can install the LD1100 onto and connect to the laser and power supply using components supplied by the user. The EB1100 requires some assembly and wiring prior to using the LD1100.

The EK1101 and EK1102 are complete evaluation kits which include the LD1100 Laser Driver, the EB1100 Evaluation Board, a 6-position DIP switch for selecting the photo diode feedback gain, a 9V transistor battery connector for the power source, and miscellaneous components. In addition, the EK1101 and EK1102 come pre-assembled. The EK1101 is configured for the *Laser Anode - Photo Diode Cathode Common* package, where as the EK1102 is configured for the *Laser Cathode - Photo Diode Cathode Common* package.

## 7.1. Initial Setup

The EK1101 and EK1102 come pre-assembled. There is only one connection that needs to be made to begin operating these units; the DC input power. This will be described in the next sections.

The EB1100 consists of only the evaluation printed circuit board. The LD1100 is purchased separately. Also, the user must provide any needed components and the required assembly of the PCB.

**WARNING**

**As with all quality electronic equipment, the LD1100 requires high-quality soldered connections to the printed circuit board and the accompanying wiring harnesses. A poor solder joint on the LD1100 connection to the EB1100 or in any of the wiring harnesses or components can result in an intermittent connection that will lead to permanent damage to the laser. Thorlabs does not warrant against any losses caused by poor soldering practices. Be sure to check the quality of all solder joints before turning on the LD1100 power source.**

## 7.2. DC Power Supply Connections

A high quality DC power supply with good turn-on and turn-off transient suppression will offer the best performance and protection for your laser. Avoid using switching power supplies which typically have higher transient noise as well as unregulated power supplies. The EK1101 and EK1102 can also be operated off a battery. The useable lifetime of the battery will be limited to the laser operating current and the battery capacity.

- The EK1101 and EK1102 kits provide a 9V battery connector to supply power to the circuit. Connect the red (+) wire to the pin labeled “+V” and connect the black (-) wire to the pin labeled “COM”.

- If a DC power supply is preferred, connect the positive lead to the pin labeled “+V” and the negative lead (power supply return) to the pin labeled “COM”. Adjust the DC power supply to a voltage between +8 and +12 volts before connecting to the evaluation board to prevent any damage to the circuit.

## 7.3. Power Switch Connection

The EK1101 and EK1102 each have a slide switch that switches the power to the LD1100. Before turning on the power to the laser, make sure that the feedback gain settings are correct and the adjustment potentiometer on the LD1100 is turned to its lowest setting (12 turns counter clockwise).

EB1100 Users: the ON / OFF position on the EB1100 can be used with a single pole, single throw switch. Power to the LD1100 is provided when pin 1 of this connector is jumpered to pin 2.

## 7.4. Laser Diode Connections

The EK1101 and EK1102 kits are provided with a laser diode socket assembly to connect the laser diode to the circuit. The wiring diagram for the socket assembly is shown in figure 2. The EK1100 series supports two laser pin configurations.

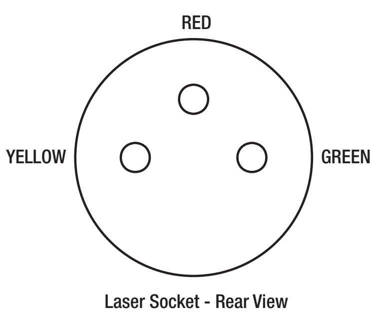
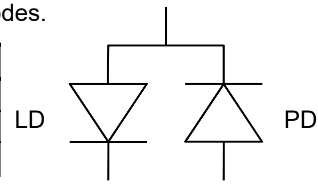



***Figure 5 Laser Socket Wiring Harness***

### 7.4.1. EK1101: Laser Anode – Photodiode Cathode Common

This configuration is used for most visible laser diodes.

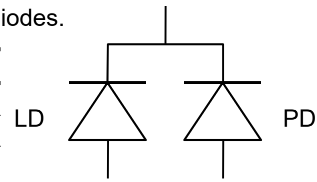
| Laser Pin | J1 Pin (on EB100) | Wire Color |
|---|---|---|
| **PDA** | PD_A | Green |
| **LDA / PDC** | LD_A | Red |
| **LDC** | LD_C | Yellow |




### 7.4.2. EK1102: Laser Cathode – Photodiode Cathode Common

This configuration is used for many near IR laser diodes.

| Laser Pin | J1 Pin (on EB100) | Wire Color |
|---|---|---|
| **PDA** | PD_A | Green |
| **LDA** | LD_A | Yellow |
| **LDC / PDC** | LD_C | Red |




**WARNING**

**The LD1100 places the laser anode and cathode at a voltage above gorund. The laser mount should be electrically isolated form the power supply used to operate the EB1100. For best results use a floating power supply that has outputs isolated from the AC ground to run the EB1100 and connect the laser mout to a suitable earth ground to improve ESD protection.**

## 7.5. Setting the EK1101/EK1102 Feedback Gain for a Given Monitor Current

The EK1101 and EK1102 have a dip switch programmable feedback gain to accommodate a wide range of laser monitor photo diode currents. Please refer to Chapter 4 (Setup) to determine the feedback gain. The gain can now be set by turning on the proper dip switches.

For EB1100 users: the gain may be permanently selected by installing a jumper in place of the switch positions that are designated in the ON position in Figure 3.

## 7.6. Customizing the Feedback Gain

For critical applications, it is possible to set the feedback gain precisely by calculating an external resistance ($R_{EXT}$) and placing it on the evaluation board. Note: REXT is added to the 1 kΩ resistance of RE. The sum of RE and $R_{EXT}$ is in parallel with the internal 249 kΩ resistor. Use the equation below to calculate the required value of $R_{EXT}$.

**To operate in this mode, all of the dip switches should be in the off position.**

$$R_{EXT} = \frac{1}{\left(\frac{1}{R_{eff}} - \frac{1}{249\ K}\right)} - 1\ K$$

Where: $R_{eff}$ is the desired feedback gain. $R_{eff}$ can be calculated from the maximum photo diode monitor current for the laser as follows:

$$R_{eff} = \frac{2.5\ V}{I_{MON}}$$

**WARNING**

**When calculating the desired operating points of laser diodes, it is important that you use the actual performance data for the diode you have in hand. Many manufacturer's data sheets and brochures specify typical and maximum values and are meant to only be used as a guideline.**

**Where provided, use the actual performance data supplied with the diode. This is usually found on the outside of the diode wrapper or provided on a separate data sheet. If in doubt, please call a Thorlabs engineer and we will be happy to assist you.**

## 7.7. EK1101 and EK1102 Operation

The EK1101 or EK1102 must first be set up properly. Please refer to the preceding sections and follow each step completely before attempting to operate a laser.

1. Attach the laser socket to the laser diode. See the note on isolating the laser mount.
2. Adjust the Power ADJ trim pot 12 turns counter-clockwise to set the output power to the minimum level.
3. Verify the gain settings are correctly set for your laser.
4. Turn the power swithch on. At this point it is normal for some light to emit from the diode but it should be well below the lasing threshold.
5. Using a calibrated power meter to monitor the laser output power, slowly adjust the POWER ADJ trim pot to reach the desired operating power of the laser. We recommend that the power meter surface be tilted slightly (approximately 2 degrees) to avoid reflecting the laser light directly back into the laser, which can lead to errors in setting the laser power.

## 7.8. Monitoring the Laser Operating Current

The laser operating current can be monitored by measuring the voltage on J1 pin 1 (ILD) of the evaluation board. This pin has an output of 10 mV/mA.

## 7.9. Troubleshooting the EK1101 and EK1102

The EK1101 and EK1102 are fairly simple device to set up and operate and should provide many hours of trouble-free operation. Should you encounter any problems with the EK1101 or EK1102 during operation we recommend checking the following:

1. Check that the gain settings match the monitor photo diode current of your laser. Be sure to use the actual performance data for your specific laser.
2. Check that the laser socket pin connections match the pinouts of your laser.
3. Check that all solder joints are clean and of high quality. Cold solder joints or blobs of solder can cause shorts and intermittent connections.
4. Check that the power supply voltage is between 8 and 12 V. If using a battery, replace with a new battery.
5. Check that the power switch is ON.

If you still experience problems, please call Thorlabs and an engineer will be happy to assist you.

# Chapter 8 Troubleshooting

Once it is set up, the LD1100 should be easy to operate and provide many hours of use. In case you experience any problems, we've included a few checks to help in troubleshooting the problem. If you have any questions, please call the factory and a Thorlabs engineer will be happy to assist you.

## 8.1. Laser Output Too Low

1. Check that the appropriate gain setting is used for your laser (refer to Chapter 4).
2. Check the output adjust pot. Turning it clockwise should increase the laser output power.
3. Make sure pin J1-3 is floating high and not pulled to ground.
4. Check that DC power supply (should be 8 to 12 VDC).
5. Check the laser for possible damage. A typical healthy laser should have a homogeneous elliptical output beam whereas a damaged laser usually has low output power, a diffused output beam, and sometimes dark striations through the main lobe.

## 8.2. Laser Output Control Too Sensitive

1. Check that the appropriate gain setting is used for your laser (refer to Chapter 4).

# Chapter 9 Specifications

| Performance Specifications | |
|---|---|
| **Operating Mode** | Constant-Power (Photodiode Feedback) |
| **Output Current** | 0 – 250 mA |
| **Output Control** | 12-Turn Potentiometer (On-Board) |
| **Output Stability** | <0.01% |
| **Output Noise** | 0.1 µA (RMS) |
| **Feedback Gain** | On-Board, Pin-Programmable, Also Externally Configurable |
| **Monitor Current Range** | 5 µA – 5 mA |
| **Operating Voltage** | 8 to 12 VDC |
| **Quiescent Current** | 9 mA |
| **Dimensions** | 1″ x 1.5″, 12 Pin SIP Package |
| **ESD Protection** | 100 ms Slow Start |

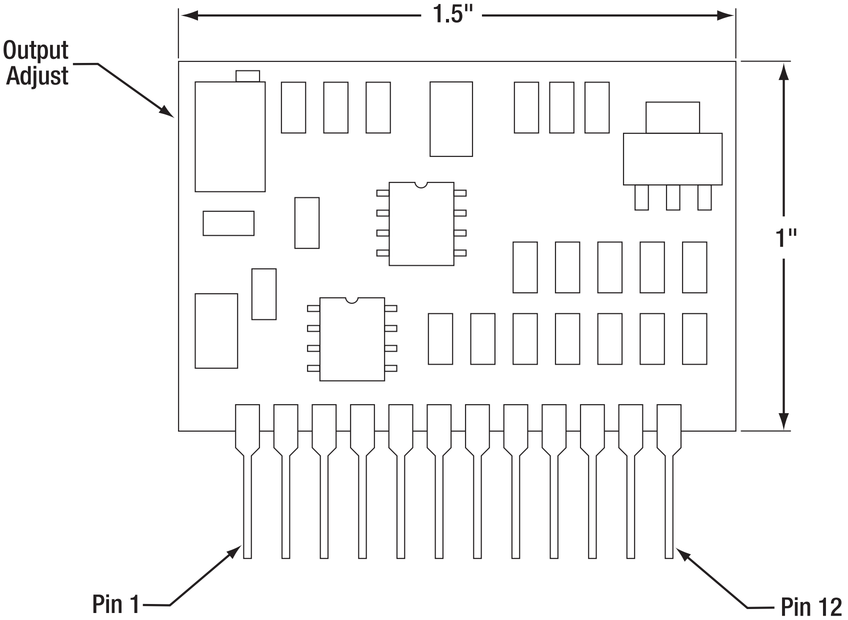



*Figure 6 LD1100 Pinouts*

| Pin | Signal | Description |
|---|---|---|
| **1** | +V | Circuit Power, 8 to 12VDC, 250mA, **NOTE**: Internally tied to Laser Diode Anode, the laser anode must be isolated from the power supply COM. |
| **2** | COM | Circuit ground |
| **3** | $V_{REF}$ | Internal 2.5 V reference |
| **4** | PDA | Photodiode Anode |
| **5** | LDA | Laser Diode Anode [internally tied to +V (pin 1)] |
| **6** | LDC | Laser Diode Cathode |
| **7** | RA | When tied to common puts a 100 kΩ in parallel with 249 kΩ internal gain res. |
| **8** | RB | When tied to common puts a 33.2 kΩ in parallel with 249 kΩ internal gain res. |
| **9** | RC | When tied to common puts a 10 kΩ in parallel with 249 kΩ internal gain res. |
| **10** | RD | When tied to common puts a 3.32 kΩ in parallel with 249 kΩ internal gain res. |
| **11** | RE | When tied to common puts a 1 kΩ in parallel with 249 kΩ internal gain res. |
| **12** | $I_{LD}$ | Laser Diode Current Monitor (10 mV/mA) |

# Chapter 10 Regulatory

As required by the WEEE (Waste Electrical and Electronic Equipment Directive) of the European Community and the corresponding national laws, Thorlabs offers all end users in the EC the possibility to return “end of life” units without incurring disposal charges.

- This offer is valid for Thorlabs electrical and electronic equipment:
- Sold after August 13, 2005
- Marked correspondingly with the crossed out “wheelie bin” logo (see right)
- Sold to a company or institute within the EC
- Currently owned by a company or institute within the EC
- Still complete, not disassembled and not contaminated

***Wheelie Bin Logo***

As the WEEE directive applies to self contained operational electrical and electronic products, this end of life take back service does not refer to other Thorlabs products, such as:

- Pure OEM products, that means assemblies to be built into a unit by the user (e.g. OEM laser driver cards)
- Components
- Mechanics and optics
- Left over parts of units disassembled by the user (PCB’s, housings etc.).

If you wish to return a Thorlabs unit for waste recovery, please contact Thorlabs or your nearest dealer for further information.

## 10.1. Waste Treatment is Your Own Responsibility

If you do not return an “end of life” unit to Thorlabs, you must hand it to a company specialized in waste recovery. Do not dispose of the unit in a litter bin or at a public waste disposal site.

## 10.2. Ecological Background

It is well known that WEEE pollutes the environment by releasing toxic products during decomposition. The aim of the European RoHS directive is to reduce the content of toxic substances in electronic products in the future.

The intent of the WEEE directive is to enforce the recycling of WEEE. A controlled recycling of end of life products will thereby avoid negative impacts on the environment.

# Chapter 11 Thorlabs Worldwide Contacts

For technical support or sales inquiries, please visit us at www.thorlabs.com/contact for our most up-to-date contact information.

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