MEETING LASER REQUIREMENTS
The LDxCHA product family has current levels from 2.5 A up to 15 A. These drivers meet laser compliance requirements from 3 V with a single +5 V supply, and up to 28 V with an additional 30 V power supply, supporting applications such as materials processing, industrial laser cutting, and laser diode bars/stacks. This product family supports A & B type laser diodes.

WORRY-FREE SETUP
The new circuitry in the LDxCHA allows for the laser diode current limit and the laser diode current setpoint to be fine-tuned without output current enabled to the laser. This allows users to set the specific safety and output levels required without risk of overdriving the laser during initial configuration.

FEATURES AND BENEFITS
• Models: 2.5 A, 5 A, 10 A, and 15 A
• Single supply operation at +5 VDC for single emitters (3 V maximum to laser)
• Dual supply operation up to +30 VDC (28 V maximum to laser)
• Constant Current or Constant Power modes
• Safety features protect your laser
  » Adjustable clipping current limit
  » Slow-start and delay circuitry
  » Brownout protection
  » Over-voltage protection
• Bandwidth 280 kHz to 1 MHz in Constant Current mode (model dependent)
• RMS Noise Current as low as 7 μA at 100 kHz

DESIGNED FOR EASY INTEGRATION
The LDxCHA drivers, with their small size and easy mountability, can be attached directly to an optics table or designed into a system. Two trimpots set the current limit and current setpoint, while five spring loaded terminal blocks allow for simple wiring.

LASER SAFETY FEATURES
Built-in safety features ensure robust designs for real world operating conditions: clipping current limit ensures that the output current will never exceed the setpoint; and slow start circuit ramps the output current. Long-term reliability means better up-time, fewer service calls, and more satisfied customers.

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OPERATING INSTRUCTIONS  9
ADDITIONAL TECHNICAL INFORMATION  15
TROUBLESHOOTING  21
MECHANICAL SPECIFICATIONS  23
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ORDERING INFORMATION
<table>
<thead>
<tr>
<th>PART NO</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>LD2.5CHA</td>
<td>2.5 A Laser Diode Driver</td>
</tr>
<tr>
<td>LD5CHA</td>
<td>5 A Laser Diode Driver</td>
</tr>
<tr>
<td>LD10CHA</td>
<td>10 A Laser Diode Driver</td>
</tr>
<tr>
<td>LD15CHA</td>
<td>15 A Laser Diode Driver</td>
</tr>
<tr>
<td>PWRPAK-16A-5V</td>
<td>16 A / 5 V Switching Power Supply</td>
</tr>
<tr>
<td>WCB325</td>
<td>Power Supply Wiring Kit</td>
</tr>
</tbody>
</table>

406-587-4910
www.teamWavelength.com
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Quick Connect Guide

To ensure safe operation of the LDxCHA driver, it is imperative that you determine that the unit will be operating within the internal heat dissipation Safe Operating Area (SOA).

Visit the Wavelength Electronics website for the most accurate, up-to-date, and easy to use SOA calculator: www.teamwavelength.com/support/design-tools/soa-ld-calculator/

Enter your operating voltages and currents to determine if the system will operate robustly or if heatsinking, fan, or lower voltage power supplies are required.

Figure 1 shows the top view of the LDxCHA driver and the locations of the configuration switches, Output Current Setpoint and Current Limit adjust trimpots and terminal block pinouts.

Figure 2 shows a typical wiring diagram for the LDxCHA driver to operate a 3 V maximum Type A or B laser. Refer to page 10 for a higher compliance voltage wiring diagram.

**Figure 1. LDxCHA Component Locator**

- **J3:**
  - J3:1 = SET MON
  - J3:2 = I MON
  - J3:3 = P MON
  - J3:4 = GND

- **J2:**
  - J2:1 = MOD INPUT
  - J2:2 = GND
  - J2:3 = ENABLE
  - J2:4 = LIM MON
  - J2:5 = LD STATUS
  - J2:6 = GND

- **J1:**
  - J1:1 = LDC
  - J1:2 = LDA
  - J1:3 = V+
  - J1:4 = GND

- **J4:**
  - J4:1 = PDC
  - J4:2 = PDA

- **J5:**
  - J5:1 = +5V
  - J5:2 = GND

**Figure 2. Quick Connect Wiring Diagram, Type A & B Laser Diodes**

- **Operating Mode Switch**
  - J3:1 = SET MON
  - J3:2 = I MON
  - J3:3 = P MON
  - J3:4 = GND

- **Photodiode Range Switch**
  - J4:1 = PDC
  - J4:2 = PDA

- **Jumper JP1**
  - Open = OFF
  - Closed = ON

- **Jumper JP2**
  - Onboard JP2 installed

- **Jumper JP3**
  - Onboard JP3 installed*

* JP3 needs to be installed if this connection is not made internally in the laser.

To allow modulation, remove JP1.

To allow dual supply (high voltage) operation, remove JP2. See Dual Supply wiring diagram for details.
**RECOMMENDED TEST LOAD – CONSTANT CURRENT MODE**

For initial setup and configuration, we recommend using a test load with the LDxCHA; refer to **Figure 4**. When using the test load, the actual drive current can be determined by measuring the voltage drop across the resistor. Do not place an ammeter in series with the laser.

<table>
<thead>
<tr>
<th>CURRENT</th>
<th>RESISTOR (R)</th>
<th>DIODE (D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 A</td>
<td>1.0 Ω, 2 W</td>
<td>1N4001 (×2)</td>
</tr>
<tr>
<td>5 A</td>
<td>0.1 Ω, 5 W</td>
<td>80SQ030 (×3)</td>
</tr>
<tr>
<td>15 A</td>
<td>0.05 Ω, 100W</td>
<td>STPS20M100ST (×2)</td>
</tr>
</tbody>
</table>

**Figure 4. Constant Current Mode Laser Test Load (up to 15 A)**
## PIN DESCRIPTIONS

### Table 1. Pin Descriptions

<table>
<thead>
<tr>
<th>PIN</th>
<th>NAME</th>
<th>PIN DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector J1 – Power &amp; Laser Diode Connections</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>LDC</td>
<td>Connect this pin to the Laser Diode Cathode.</td>
</tr>
<tr>
<td>2</td>
<td>LDA</td>
<td>Connect this pin to the Laser Diode Anode. This pin is internally connected to V+.</td>
</tr>
</tbody>
</table>
| 3   | V+            | This pin is the main power supply pin for single and dual supply operation. Allowable voltage input is 5 to 30 V. It is internally connected to the laser diode anode (LDA).  
  *If using a +5 V power supply, you can install jumper JP2 to power the control electronics from the same supply. If using a higher voltage power supply for more compliance voltage to the laser diode, remove JP2.  
  * 
  *  |
| 4   | GND           | Used for high current return. This pin is internally connected to pin J5:2.                                                                    |
| Connector J2 – Status Connections & Modulation Input |
| 1   | MOD INPUT     | Use this pin to allow for modulation. Range is -2 V to +5 V. This signal sums with the onboard trimpot.  
  *If no modulation, install jumper JP1.  
  *  |
| 2   | GND           | This pin is the ground reference for modulation. Not to be used for high current return.                                                    |
| 3   | ENABLE        | TTL compatible input that allows remote enabling and disabling of current to the laser diode. To enable current, the voltage at this pin must be <0.3 V.  
  *To disable current, the voltage at this pin must be >2 V.  
  *The enable circuit uses an internal 10 kΩ pullup resistor.  
  *For the LDxCHA to enable output current to the laser, the ENABLE pin must be configured properly. If the ENABLE pin is not at a voltage <0.3 V, the LDxCHA will not enable current to the laser. The internal pullup resistor will hold this pin high if it is left floating.  
  *  |
| 4   | LIM MON       | Monitors the current limit set by the user. Outputs a voltage proportional to the current limit. See Table 2 for model-specific transfer function. Range is 0 to 2.5 V on monitor. |
| 5   | LD STATUS     | Monitors whether output current is enabled to the laser diode.  
  *If output is enabled, there will be +5 V at this pin.  
  *If output is disabled, there will be 0 V at this pin.  
  *  |
| 6   | GND           | This pin is the ground reference for ENABLE, LIM MON, and LD STATUS. Not to be used for high current return.                                  |
| Connector J3 – Monitor Connections |
| 1   | SET MON       | Monitors the user-defined setpoint. Outputs a voltage proportional to the current setpoint. See Table 2 for model-specific transfer function. Range is 0 to 2.5 V on monitor. |
| 2   | I MON         | Monitors the output current. Outputs a voltage proportional to the current through the laser diode. See Table 2 for model-specific transfer function. Range is 0 to 2.5 V on monitor. |
| 3   | P MON         | Monitors the photodiode output. Outputs a voltage proportional to the current through the photodiode. See Table 2 for model-specific transfer function. Range is 0 to 2.5 V on monitor. |
| 4   | GND           | This pin is the ground reference for the monitors on connector J3. Not to be used for high current return.                                   |
| Connector J4 – Photodiode Connections |
| 1   | PDC           | Connect this pin to the Photodiode Cathode.  
  *The photodiode must be connected to the laser diode. See jumper JP3.  
  *  |
| 2   | PDA           | Connect this pin to the Photodiode Anode.                                                                                                                                                             |
| Connector J5 – Control Electronics Connections |
| 1   | +5V           | Connect +5 VDC to this pin to power control electronics. Do not exceed 5.5 V at this pin.  
  *If single +5 V supply operation is used, install JP2 and only connect the power supply to J1.  
  *  |
| 2   | GND           | This pin is the ground reference for +5V. Not to be used for high current return. This pin is internally connected to pin J1:4.                                                                 |

* For more details regarding jumpers, see Table 3 on page 5 and “Install or Remove Jumpers” on page 12.
Table 2. Current Output Monitor, Limit Monitor, Photodiode Current Monitor, and Modulation Input Transfer Functions

<table>
<thead>
<tr>
<th>FUNCTION</th>
<th>MODE</th>
<th>LABEL</th>
<th>LD2.5CHA</th>
<th>LD5CHA</th>
<th>LD10CHA</th>
<th>LD15CHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>I LIM MON, Current Limit Setpoint Monitor*</td>
<td>CC / CP</td>
<td>V_{ILIMMON}</td>
<td>1 A / V</td>
<td>2 A / V</td>
<td>4 A / V</td>
<td>6 A / V</td>
</tr>
<tr>
<td>I SET MON, Current Setpoint Monitor</td>
<td>CC</td>
<td>V_{ISETMON}</td>
<td>1 A / V</td>
<td>2 A / V</td>
<td>4 A / V</td>
<td>6 A / V</td>
</tr>
<tr>
<td>I MON, Output Current Monitor</td>
<td>CC / CP</td>
<td>V_{IMON}</td>
<td>1 A / V</td>
<td>2 A / V</td>
<td>4 A / V</td>
<td>6 A / V</td>
</tr>
<tr>
<td>Modulation Input, CC-Mode</td>
<td>CC</td>
<td>0.5 A / V</td>
<td>1 A / V</td>
<td>2 A / V</td>
<td>3 A / V</td>
<td></td>
</tr>
<tr>
<td>P MON, Photodiode Current Monitor (500 μA setting)</td>
<td>CP</td>
<td>V_{PMON}</td>
<td>200 μA / V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P MON, Photodiode Current Monitor (5 mA setting)</td>
<td>CP</td>
<td>V_{PMON}</td>
<td>2 mA / V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P MON, Photodiode Current Monitor (100 mA setting)</td>
<td>CP</td>
<td>V_{PMON}</td>
<td>40 mA / V</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* The I LIM MON transfer function is accurate above 5% of maximum current available from the unit.

Table 3. Description of jumper connections and functionality.

<table>
<thead>
<tr>
<th>JUMPER</th>
<th>CONNECTS</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>JP1</td>
<td>MOD INPUT to GND (J2:1 to J2:2)</td>
<td>If installed, ties modulation input to ground, disabling modulation functionality and minimizing output current noise. Remove this jumper if external modulation is required. Unit ships with JP1 installed.</td>
</tr>
<tr>
<td>JP2</td>
<td>V+ to +5V (J1:3 to J5:1)</td>
<td>If installed, ties V+ to +5V, allowing for operation from a single +5 V supply. Maximum voltage to the laser diode in this case is 3 V. If uninstalled, allows for high compliance operation from two separate power supplies: one at +5 V to power control electronics, and one from +5 V to +30 V for higher voltage to the laser diode. Maximum voltage to the laser diode in this case is 28 V (using a +30 V supply). Unit ships with JP2 installed.</td>
</tr>
<tr>
<td>JP3</td>
<td>PDC to LDA (J4:1 to J1:2)</td>
<td>If installed, ties Photodiode Cathode to Laser Diode Anode for Constant Power operation. TYPE B: This jumper must be installed to operate a Type B (Isolated Photodiode) laser diode in Constant Power Mode. TYPE A: This jumper must be removed to operate a common Photodiode Cathode/Laser Diode Cathode Type A laser diode in Constant Power Mode. If operating a common Photodiode Cathode/Laser Diode Anode Type A laser in Constant Power Mode, the jumper must be removed. Consult the laser manual to determine if this connection is already made internally. Unit ships with JP3 installed.</td>
</tr>
</tbody>
</table>
# Electrical Specifications

## Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Value</th>
<th>Unit</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Electronics Voltage (J5:1)</td>
<td>+5V</td>
<td>4.8 to 5.5</td>
<td>VDC</td>
<td>Undervoltage trip is 4 V. Overvoltage trip is 8 V.</td>
</tr>
<tr>
<td>Supply Voltage, (J1:3)</td>
<td>V+</td>
<td>5 to 30</td>
<td>VDC</td>
<td></td>
</tr>
<tr>
<td>Current Limit Range</td>
<td>LIM</td>
<td>0.05 to Maximum</td>
<td>A</td>
<td>Maximum current is model specific</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>T_{opr}</td>
<td>0 to 40</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>Storage Temperature Range</td>
<td>T_{stg}</td>
<td>-55 to 125</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td></td>
<td>4</td>
<td>oz</td>
<td>113 grams</td>
</tr>
<tr>
<td>Size</td>
<td></td>
<td>1.125 x 2.1 x 4.5</td>
<td>in</td>
<td>28.6 mm x 53.3 mm x 114.3 mm</td>
</tr>
</tbody>
</table>

## Model

<table>
<thead>
<tr>
<th>Parameter</th>
<th>LD2.5CHA</th>
<th>LD5CHA</th>
<th>LD10CHA</th>
<th>LD15CHA</th>
<th>Unit</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Internal Power Dissipation (No Airflow)</td>
<td>25</td>
<td>25</td>
<td>50</td>
<td>60</td>
<td>W</td>
<td>25°C ambient</td>
</tr>
<tr>
<td>Max Internal Power Dissipation (With Airflow)</td>
<td>35</td>
<td>35</td>
<td>70</td>
<td>85</td>
<td>W</td>
<td>25°C ambient, 5.5 CFM: 2.5, 5 A models 12 CFM: 10, 15 A models</td>
</tr>
<tr>
<td>Max Output Current</td>
<td>2.5</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Compliance Voltage¹</td>
<td>3 V max with 5 V power supply input</td>
<td>3 V max with 30 V power supply input</td>
<td>V</td>
<td>Compliance Voltage is always 2 V less than power supply voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short Term Stability, 1 hour</td>
<td>&lt; 200</td>
<td>ppm</td>
<td>Constant Current Mode</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RMS Noise Current</td>
<td>7</td>
<td>9</td>
<td>22</td>
<td>35</td>
<td>μA</td>
<td>At 100 kHz, with 500 mA output current</td>
</tr>
<tr>
<td>Noise Current Density</td>
<td>20</td>
<td>35</td>
<td>95</td>
<td>100</td>
<td>nA / √Hz</td>
<td>At 500 mA output current</td>
</tr>
<tr>
<td>Quiescent Current</td>
<td>130</td>
<td></td>
<td>mA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leakage Current</td>
<td>0</td>
<td></td>
<td>μA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature Coefficient</td>
<td>100</td>
<td></td>
<td>ppm / °C</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Photodiode Feedback

| Ranges                                         | 500 μA, 5 mA, or 100 mA | Set by PD RANGE DIP switches |                      |
|                                               |                        | At 200 μA photodiode range, simulated load |                      |

## External Modulation

| Modulation Input Damage Threshold              | V_{mod} ≤ -3 or V_{mod} ≥ 8 | V |                      |
| Modulation Input Range                         | -2 to +5                   | V |                      |
| Modulation Input Pin Impedance                 | 2.5                        | kΩ |                      |
| -3 dB Bandwidth at Half Current, Constant Current Mode | 580       | 600   | 530       | 390       | kHz | Sine wave input |
| -3 dB Bandwidth at Full Current, Constant Current Mode | 1080      | 1000  | 660       | 600       | kHz | Sine wave input |
| Bandwidth at 90% Depth of Modulation at Half Current | 1000     | 430   | 360       | 280       | kHz | Constant Current Mode Square wave input |
| Bandwidth at 90% Depth of Modulation at Full Current | 680       | 580   | 480       | 400       | kHz | Constant Current Mode Square wave input |
| Output Rise Time (Full Current)                | 0.8                       | 0.8  | 1.4       | 1.4       | μsec | At 10 kHz |
| Output Fall Time (Full Current)                | 0.76                      | 0.78 | 1.2       | 1.2       | μsec | At 10 kHz |

1. Compliance voltage depends on power supply voltage. In high-compliance mode, up to 30 VDC can be input at V+ to achieve up to 28 V (compliance voltage) across the laser diode. A separate 5 VDC power supply is then required for the +5V control electronics pin. A 5 VDC power supply input at V+ results in 3 V compliance voltage.
# ELECTRICAL SPECIFICATIONS (CONTINUED)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>LD2.5CHA</th>
<th>LD5CHA</th>
<th>LD10CHA</th>
<th>LD15CHA</th>
<th>UNIT</th>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TIMING CHARACTERISTICS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warm Up Time</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>hour</td>
<td></td>
</tr>
<tr>
<td>Slow Start Delay</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td>sec</td>
<td>CDRH compliant</td>
</tr>
<tr>
<td>Slow Start Ramp</td>
<td></td>
<td>20</td>
<td></td>
<td></td>
<td>msec</td>
<td>To full scale</td>
</tr>
<tr>
<td>Disable Fall Time</td>
<td></td>
<td>640</td>
<td></td>
<td></td>
<td>µsec</td>
<td></td>
</tr>
<tr>
<td>Turn Off Ramp</td>
<td></td>
<td>260</td>
<td></td>
<td></td>
<td>µsec</td>
<td></td>
</tr>
<tr>
<td><strong>MONITOR ACCURACY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitor Voltage vs. Expected</td>
<td>0.27</td>
<td>0.64</td>
<td>0.52</td>
<td>0.75</td>
<td>% of Full Scale</td>
<td></td>
</tr>
<tr>
<td>Output based on transfer function</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SAFETY INFORMATION

SAFE OPERATING AREA – DO NOT EXCEED INTERNAL POWER DISSIPATION LIMITS

Before attempting to operate the LDxCHA driver, it is imperative that you first determine that the unit will operate within the Safe Operating Area (SOA). Operating outside of the SOA may damage the laser and the LDxCHA. Operating outside of the SOA will void the warranty.

To determine if the LDxCHA driver will be operating in a safe range, follow the instructions for calculating the Safe Operating Area online with your system’s voltages and current requirements:

www.teamwavelength.com/support/design-tools/soa-ld-calculator/

SOA charts are included in this datasheet for quick reference (page 19), but we recommend you use the online tools instead.

If you have any questions about the Safe Operating Area calculator, call the factory for free and prompt technical assistance.

HEAT SINK TEMPERATURE

For single supply, 5 V operation of the LD15CHA, the MULTI-HTSK-HI with recommended airflow is adequate up to 15 A operation. However, when using a second power supply to allow higher voltage operation, the MULTI-HTSK-HI heatsink temperature can exceed 50°C. If operating the LD15CHA under these conditions, a user supplied higher capacity heatsink is required for safe operation.

THEORY OF OPERATION

The LDxCHA Series drivers are voltage controlled current sources: they deliver the current commanded by the setpoint. The control system continually monitors the actual output current, compares it to the setpoint, and adjusts the current if there is a difference between the two signals.

It may be useful to remember that you do not directly set the drive current setpoint; instead, you adjust a voltage signal that represents the output current. The voltage and output current are related by a transfer function that varies by driver model number and maximum current.

The setpoint voltage is adjusted with the onboard trimpot or by an external modulation input that sums with the onboard setpoint. The adjustable current limit is set using an onboard trimpot.

As current is driven through the load, there is a voltage drop across the load because of its impedance. As the current increases, the voltage drop may increase to the point that it reaches the Compliance Voltage limit of the current source. Once that occurs, the current source is no longer able to increase the current driven to the load even if you increase the setpoint.

The LDxCHA driver includes features that help protect your laser and make the driver more versatile in a wide array of applications:

• The user-adjustable clipping current limit protects the laser from over-current situations by never allowing the output current to exceed the user-set limit. If the setpoint is greater than the limit, the LDxCHA will hold the output current at the limit.
• Both the current setpoint and the current limit can be set prior to enabling current to the laser diode.
• Output current switches on after a 2 second delay from the time the enable signal is applied, meeting CDRH requirements.
• Output slow-start ramps the current to setpoint over 20 msec.
• The ENABLE pin must be held low in order to have current enabled from the laser diode. If this pin is left floating, an internal pullup circuit will hold the pin high, disabling current output.
• Over/Under voltage shutdown protection ensures that output current will not be enabled if proper voltage is not supplied.
• Low noise: down to 7 μA RMS noise current at 100 kHz.
OPERATING INSTRUCTIONS

The LDxCHA requires no external electronic components.

These instructions first configure the driver for local control in order to set the drive current limit. Then the driver can be configured to your application.

We recommend using a test load until you are familiar with operation of the driver. Refer to page 3 for a test load schematic.

NECESSARY EQUIPMENT

The following equipment is the minimum necessary to configure the LDxCHA for basic operation:

• LDxCHA controller
• Digital voltmeter, 4-½ digit resolution recommended
• Test load for configuring the driver
• Laser diode, mount, and optional temperature control system
• Recommended heat sink
  » For LD2.5CHA and LD5CHA, use the MULTI-HTSK
  » For the LD10CHA and LD15CHA, use the MULTI-HTSK-HI
• Connecting wires
• Power supply (see below)

POWER SUPPLY REQUIREMENTS

Linear-regulated or low-noise switching power supplies can be used. We recommend using power supplies with noise specifications suitable for your application.

For single-supply operation:

• 5 VDC power supply rated for 1.1-times the maximum laser diode current, plus 150 – 250 mA for the electronics

For dual supply operation to drive a high compliance laser diode, laser diode bar, or laser diode stack:

• 5 VDC power supply rated for 250 mA for electronics
• AND a power supply to drive the laser, rated for 1.1-times the maximum laser diode drive current and 2 V greater than the compliance voltage required by the laser, up to 30 V.

PREVENT DAMAGE FROM ELECTROSTATIC DISCHARGE

Before proceeding, it is critical that you take precautions to prevent electrostatic discharge (ESD) damage to the driver and your laser. ESD damage can result from improper handling of sensitive electronics, and is easily preventable with simple precautions.

For more information on ESD, see Application Note AN-LDTC06: Basics: Electrostatic Discharge (ESD).

We recommend that you always observe ESD precautions when handling the LDxCHA driver and your laser diode.

Note: The LDxCHA case is isolated from electrical ground.

WIRE THE LDxCHA LASER DRIVER

There are two possible wiring configurations for the LDxCHA, one for single supply operation, and one for dual supply operation. The figures on the next page serve as a guide for these two configurations. For setup and initial configuration, use a test load (see Figure 4).

Each of the terminal blocks on the LDxCHA are spring loaded terminal blocks. To attach the necessary wires to the unit, simply push the top button down, insert the wire into the proper slot, and then release the button to securely fasten the wire to the LDxCHA.

For the power supply and laser diode connections (J1), it is recommended to use stranded 18 gauge wire for currents up to 5 A. For current levels greater than 5 A, stranded 14 gauge wire is recommended. The largest size that will fit into the J1 terminal block is 12 gauge.

For the remaining terminal blocks (J2 - J5), Wavelength recommends using 24 gauge solid core wire.
WIRING THE LDxCHA FOR SINGLE SUPPLY OPERATION

If no modulation, install JP1.

JP2 removed
JP1 removed to allow modulation

OPTIONAL Modulation

JP3 needs to be installed if this connection is not made internally in the laser.

* JP3 needs to be installed if this connection is not made internally in the laser.

Figure 5. Type A & B Laser Diode, Single 5 VDC Power Supply, 3 V compliance maximum to the laser diode. All jumpers shown are either installed or uninstalled on the LDxCHA board.

WIRING THE LDxCHA FOR DUAL SUPPLY OPERATION

If no modulation, install JP1.

JP2 removed

* JP3 needs to be installed if this connection is not made internally in the laser.

Figure 6. Type A & B Laser Diode, High Compliance Dual Supply Operation, up to 28 V compliance to the laser diode. All jumpers shown are either installed or uninstalled on the LDxCHA board.
ONBOARD ADJUSTMENTS AND CONTROLS

Onboard controls are on the top of the LDxCHA and must be set according to the operation mode. The controls are illustrated in Figure 7.

**SET THE CONTROL MODE**

Choosing between Constant Current (CC) Mode and Constant Power (CP) Mode is done by using the upper set of DIP switches on the LDxCHA (as seen above in Figure 7). Constant Power mode operation requires a photodiode.

Do not switch the control mode while the output is enabled and driving a laser diode. The laser diode may be damaged or destroyed.

To properly configure the LDxCHA for Constant Current operation, the left-most switch must be in the upper position, with the next two being in the lower position. The “ON” label and arrow (as seen on the switch itself) are shown for orientation. See Figure 8 below.

To properly configure the LDxCHA for Constant Power operation, the left-most switch must be in the lower position, with the next two being in the upper position. The “ON” label and arrow (as seen on the switch itself) are shown for orientation. See Figure 8 below.

**SET THE PHOTODIODE RANGE – CONSTANT POWER MODE ONLY**

In Constant Power Mode only, three photodiode feedback current ranges are available on the LDxCHA drivers. Choosing one of these photodiode ranges is done by using the lower set of DIP switches (as seen above in Figure 7). Reference the datasheet for your laser diode to find the nominal photodiode current, and set the PD RANGE switch as follows:

- 500 µA (down, down, down) = PD current 0 – 500 µA
- 5 mA (down, down, up) = PD current 500 µA – 5 mA
- 100 mA (up, up, up) = PD current 5 mA – 100 mA

Parentheses indicate switch positions, from left to right (see Figure 9). Do not switch the PD Range while the output is enabled and driving a laser diode. The laser diode may be damaged or destroyed.

Note that the switches must be configured properly for minimum errors between the PD monitor (P MON) and the actual photodiode current.
INSTALL OR REMOVE JUMPERS

There are three jumpers located on the circuit board, labeled JP1, JP2, and JP3 (see also Figure 7). They are all two position jumpers, so they are either installed, or uninstalled. The LDxCHA ships with all jumpers installed by the factory. Jumper functionality is described in Table 3 on page 5.

DISABLE CURRENT

The LDxCHA allows for the user to set the current limit, output current setpoint, and modulation input without current flowing to the laser. In order to set these values with current disabled, ensure that the ENABLE pin (J2:3) is held high (voltage greater than 2 V), or leave this pin floating.

Once these values are set to the desired levels, current to the laser can be enabled by holding the ENABLE pin low (voltage less than 0.3 V).

CALCULATE THE MONITOR VOLTAGES

**OUTPUT CURRENT LIMIT:**

Refer to the datasheet for your laser to determine the maximum forward current, and calculate the current limit monitor voltage ($V_{ILIMMON}$) using this equation and the transfer function found in Table 2 on page 5:

$$V_{ILIMMON} = \frac{I_{LIMIT}}{\text{Transfer Function}}$$

**OUTPUT CURRENT SETPOINT:**

In Constant Current Mode, determine your desired current level and calculate the current setpoint monitor voltage ($V_{ISETMON}$) using the transfer function found in Table 2:

$$V_{ISETMON} = \frac{I_{SET}}{\text{Transfer Function}}$$

*Note:* In Constant Power Mode, the output current setpoint is dependent on the photodiode response.

**CONSTANT CURRENT MODE:**

If you are using the LDxCHA in Constant Current mode, calculate the monitor voltage for the drive current setpoint. Refer to the datasheet for your laser to determine the nominal forward current, and calculate the $I_{MON}$ voltage using the transfer function found in Table 2:

$$V_{IMON} = \frac{I_{LD}}{\text{Transfer Function}}$$

**CONSTANT POWER MODE:**

If you are using the LDxCHA in Constant Power mode, calculate the photodiode current monitor voltage, $P_{MON}$. Refer to the laser diode datasheet to determine the nominal photodiode current at the desired operating point. Choose the correct photodiode range configuration using the DIP switches for this photodiode range. Calculate the $P_{MON}$ voltage using the transfer function found in Table 2:

$$V_{PMON} = \frac{I_{PD}}{\text{Transfer Function}}$$

APPLY POWER TO THE LDxCHA

In order to monitor these set values, the chosen power supply must be properly wired to the unit and turned on. See Figure 5 and Figure 6 for single and dual supply operation, respectively.

SET THE CURRENT LIMIT

The current limit on the LDxCHA can be set without enabling current to the laser. In order to monitor the set current limit, connect the positive lead of the digital multimeter to the LIM MON pin (J2:4), and the negative lead to the GND terminal (J2:2). Use the transfer function listed in Table 2 to determine the current limit proportional to the monitor voltage.

The onboard LIM trimpot is the only method of setting and adjusting the current limit. This is a 12-turn trimpot that increases with clockwise adjustments, and decreases with counter-clockwise adjustments. Prior to initial adjustment, turn the trimpot 12 full turns counter-clockwise to zero the trimpot.

Reference Figure 7 for control locations on the LDxCHA:

- Disable output current, either by holding the ENABLE pin high, or allowing it to float.
- Switch on the +5 V power supply to the LDxCHA. (If dual-supply operation is being used, switch on both power supplies.)
- If the LIM trimpot has not previously been set to zero, do this by turning it at least 12 full turns counter-clockwise.
- Set the current limit by turning the LIM trimpot clockwise until the voltage displayed on the multimeter matches the value calculated for $V_{ILIMMON}$ to the left.
- Switch off the power supply/supplies.

The LDxCHA controllers utilize a clipping current limit, ensuring that the output current will never exceed the limit set by the LIM trimpot. If the current approaches the limit that is set, the controller will clamp the output at the limit, until the setpoint is backed down below the limit.
ADJUST THE OUTPUT CURRENT SETPOINT – ONBOARD CONTROL

The output current setpoint on the LDxCHA can be set without enabling current to the laser. In order to monitor the output current setpoint, connect the positive lead of the digital multimeter to the SET MON pin (J3:1), and the negative lead to the GND terminal (J3:4). Use the transfer function listed in Table 2 to determine the output current from the monitor voltage.

The onboard SET trimpot can be used to adjust the current setpoint either alone, or in conjunction with the MOD INPUT pin. If no modulation is necessary, install jumper JP1 to disable modulation input and minimize noise. In this scenario, the SET trimpot is the only method of setting the current setpoint. This is a 12-turn trimpot that increases with clockwise adjustments, and decreases with counter-clockwise adjustments. Prior to initial adjustment, turn the trimpot 12 full turns counter-clockwise to zero the trimpot.

Reference Figure 7 for control locations on the LDxCHA:

- Disable output current, either by holding the ENABLE pin high, or allowing it to float.
- Switch on the +5 V power supply to the LDxCHA. (If dual-supply operation is being used, switch on both power supplies.)
- If the SET trimpot has not been previously set to zero, do this by turning at least 12 full turns counter-clockwise.
- **Constant Current Mode:** Set the current limit by turning the SET trimpot clockwise until the voltage displayed on the multimeter matches the value calculated for \( V_{SETMON} \) on page 12.
- **Constant Power Mode:** Wavelength recommends leaving the SET trimpot at zero until current is enabled, and the power output can be monitored by the P MON pin (J3:3), or by an external power meter. See page 14 for further instructions if operating in Constant Power Mode.
- Switch off the power supply/supplies.

ADJUST THE OUTPUT CURRENT SETPOINT – MODULATION INPUT

The modulation input to the LDxCHA can be set without enabling current to the laser. To use MOD INPUT (pin J2:1) to adjust the output current, refer to Pin Descriptions on page 4 for specifications. The modulation input signal can either sum with the onboard trimpot value, or provide the output current setpoint alone. If using the modulation input as the single source of setting the output current setpoint, the onboard SET trimpot must be set to zero. If the SET trimpot is not set to zero, the value of the modulation input will sum with the value of the onboard trimpot.

JP1 connects the modulation input to ground. In order to utilize modulation input to adjust the output current setpoint in either scenario, JP1 must be removed. Driving the external modulation input with this jumper installed will drive the input signal directly to ground, and may damage the signal source or function generator being used.

The modulation input signal can be used whether the driver is operating in Constant Current or Constant Power mode. Refer to Table 2 on page 5 for the transfer function for Constant Current mode. For Constant Power mode, the LDxCHA's response to modulation input is dependent on the photodiode response. Wavelength recommends waiting to modulate until current is enabled, and the power output can be monitored by the P MON pin (J3:3), or by an external power meter. See page 14 for further instructions if operating in Constant Power Mode.

Refer to the External Setpoint Circuit on page 15 for an example analog input circuit. Other circuits, a DAC signal, or function generator may be used.

COMBINING THE ONBOARD SETPOINT AND ANALOG INPUT

The MOD INPUT voltage signal on J2:1 sums with the onboard trimpot setpoint, provided that JP1 is removed. This configuration allows the driver to be configured so that the laser current or power modulates around a DC setpoint.

If the sum of the two signals causes the LDxCHA to attempt to drive the output current past the limit, the output will clip at the limit, providing limit current until the sum of the two signals drops below the set limit.

To avoid driving the current to the limit, first set the onboard trimpot to produce the Constant Current level. Then connect the modulation source to the MOD INPUT pin and slowly increase the modulation amplitude. Monitor the output current using the I MON pin, or by measuring the voltage across the test load. Do not monitor the voltage across a laser diode—measurement transients may damage the laser diode.
ENABLE CURRENT

Once the operating parameters are set to the desired levels, current to the laser can be enabled by holding the ENABLE pin (J2:3) low (voltage less than 0.3 V).

USING THE LD STATUS MONITOR PIN

Also on the Status Connections header (J2) is the LD STATUS monitor pin. This pin gives a high voltage (+5 V) when current is enabled to the laser, and a low voltage (0 V), when current is disabled.

To utilize the LD STATUS pin, connect the positive lead of the voltmeter to the LD STATUS pin (J2:5), and the negative lead to the GND terminal (J2:6).

ENABLE LED

In addition the the LD STATUS pin going high when current is enabled, the LDxCHA has an Enable LED, that will light when output current is enabled.

MONITOR THE ACTUAL OUTPUT CURRENT

Once output is enabled to the laser, the I MON pin (J3:2) can be used to monitor the actual output current that is reaching the laser.

To monitor the actual output current, connect the positive lead of the multimeter to the I MON pin, with the negative lead connected to GND (J3:4). Use the corresponding transfer function in Table 2 to relate this monitor voltage to actual current.

MONITOR THE PHOTODIODE CURRENT – CONSTANT POWER MODE

If the photodiode is connected to the LDxCHA and Constant Power Mode is chosen, the photodiode current can be monitored by connecting the positive lead of a multimeter to the P MON pin (J3:3), with the negative lead on the GND pin (J3:4), and reading the voltage. Refer to Table 2 on page 5 for the transfer function to convert the P MON voltage to PD current. Ensure that the DIP switches are properly oriented for the photodiode range to minimize errors between monitor and actual photodiode currents.

Due to the fact that the output current setpoint cannot be accurately set prior to enabling output current in Constant Power Mode, Wavelength recommends starting with the SET trimpot at zero, then enabling output current and slowly increasing the setpoint until the desired power is reached.

MONITOR THE MODULATION INPUT – CONSTANT POWER MODE

In Constant Power Mode, after enabling current, Wavelength recommends inputting a low depth of modulation signal, and slowly increasing the modulation towards the desired level, while monitoring the results.
ADDITIONAL TECHNICAL INFORMATION

This section includes useful technical information on these topics:

- External Setpoint Circuit
- Important Information on Grounding
- Cable Lengths and High Current
- Add Laser Diode Protection for Long Cables
- Additional Noise Filtering
- Product Variations
- Clipping Current Limit
- Square Wave Response
- Power Supplies and Noise
- Maximizing The Resolution of the Photodiode Feedback Circuit
- Using the Enable Pin
- Choosing the Proper Heatsink
- Using the Modulation Input Pin with TTL Signals
- Safe Operating Area Calculation

EXTERNAL SETPOINT CIRCUIT

An external trimpot circuit can be used to adjust the laser current setpoint; refer to Figure 10.

\[ V_{5V} \]
\[ \text{R1} \]
\[ \text{D1} \]
\[ \text{R2} \]
\[ \text{Modulation Input Pin J2:1} \]
\[ \text{GND Pin J2:2} \]

\[ V_{5V} = \text{Supply voltage (5 to 30 V)} \]
\[ \text{D1} = \text{Bandgap reference* (ex: LM4040)} \]
\[ \text{R1} = 2.2 \text{ kΩ, 1 W resistor} \]
\[ \text{R2} = \text{Trimpot, 10 kΩ to 100 kΩ} \]

* \[ V_{5V} \] must be at least 1 volt greater than the voltage value of D1.

Figure 10. Trimpot Circuit for Analog Input

IMPORTANT INFORMATION ON GROUNDING

Some laser diodes connect the laser anode or cathode to the case. In such cases special attention must be paid to grounding to ensure safe operation of the LDxCHA and laser.

It is critical that the LDxCHA Driver is properly grounded. If the LDxCHA Driver is used with a Wavelength Electronics Temperature Controller, you may need to use two separate power supplies that float independently of each other.

If the laser anode is connected to the laser case, it is possible that the anode will be connected to earth ground when the laser is installed in a benchtop mount or in your laser system. In situations where the laser diode is connected to the case, it is critical that the negative terminal of the power supply remain isolated from earth ground.

CABLE LENGTHS AND HIGH CURRENT

The length and gauge of cable from the power supply or to the laser diode can impact performance. The resistance and inductance of the wire can reduce bandwidth or cause the voltage to the LDxCHA to droop.

ADD LASER DIODE PROTECTION FOR LONG CABLES

With a cable longer than two feet, add a Schottky diode across the laser diode, see Figure 11.

Figure 11. Long Cable Laser Protection

ADD LATERAL DIODE PROTECTION FOR LONG CABLES
ADDITIONAL NOISE FILTERING

The LDxCHA drivers provide low-noise current to the laser diode, but in some cases additional filtering may be needed. Refer to Figure 12 for a simple and effective filter.

![Figure 12. LDxCHA Output Filter](image)

CLIPPING CURRENT LIMIT

The LDxCHA features a clipping current limit. This style of current limit means that the output current will never exceed the limit set by the user. If the current approaches the limit, the unit will force the output current to the value set by the limit. This feature is shown below in Figure 13 and Figure 14, for a sine wave and square wave input, respectively.

![Figure 13. Clipping Current Limit with a 100 kHz sine wave input at half current.](image)

![Figure 14. Clipping Current Limit with a 50 kHz square wave input at half current.](image)

PRODUCT VARIATIONS

We design and manufacture our products in-house, and that gives us the unique ability to modify our drivers and controllers to suit your application. Our Product Variation service allows us to quickly and cost-effectively address your design requests, from prototype quantities to long-term high-volume manufacturing.

Examples of Product Variations include:

- Replacing the terminal blocks with pin headers, allowing for cables with sockets to be plugged in.
- Modifying the start delay time.
- Changing the photodiode range.
- Changing the photodiode transfer function.
- Changing the modulation transfer function.
- Changing the output current (from 50 mA up to a maximum of 15 A).

Contact Sales for information on how a Product Variation can be applied in your situation.
**SLOW START RAMP**

The slow start ramp on the LDxCHA is shown below in Figure 15.

![Figure 15. LDxCHA Slow Start Ramp](image)

**SQUARE WAVE RESPONSE**

The square wave response of the LDxCHA models varies, depending on output current. See Figure 16 through Figure 19 for results of a square wave input at full current.

![Figure 16. LD2.5CHA response to a 50 kHz square wave input at current setpoint of 2.5 A.](image)

![Figure 17. LD5CHA response to a 50 kHz square wave input at current setpoint of 5 A.](image)

![Figure 18. LD10CHA response to a 50 kHz square wave input at current setpoint of 10 A.](image)

![Figure 19. LD15CHA response to a 50 kHz square wave input at current setpoint of 15 A.](image)
POWER SUPPLIES AND NOISE

The LDxCHA drivers deliver stable current with low noise, but the chosen power supply will directly influence the noise performance of the driver.

We recommend using a regulated linear supply for the best noise performance, but depending on the application requirements, a switching power supply may be acceptable. Each case must be evaluated, because a switching power supply will affect noise, transient, and stability performance.

Wavelength offers several switching power supplies that may be appropriate.

<table>
<thead>
<tr>
<th>MODEL</th>
<th>MAX VOLTAGE</th>
<th>MAX CURRENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWRPAK-13A-5V</td>
<td>5 V</td>
<td>13 A</td>
</tr>
<tr>
<td>PWRPAK-11A-12V</td>
<td>12 V</td>
<td>11 A</td>
</tr>
<tr>
<td>PWRPAK-16A-5V</td>
<td>5 V</td>
<td>16 A</td>
</tr>
</tbody>
</table>

Table 4. Available power supplies.

If the PWRPAK-16A-5V is used, there is a cable set available (WCB325) to simplify wiring.

For the ultimate in power supply performance at high currents, Wavelength recommends using a power supply with remote sensing leads. The remote sensing leads should connect to the V+ and GND pins on J1.

MAXIMIZING THE RESOLUTION OF THE PHOTODIODE FEEDBACK CIRCUIT

The three options for the photodiode range feedback (set by the PD Range switches on the unit) should be chosen such that the current that the photodiode provides uses the most dynamic range possible.

For example, if the photodiode is providing 500 μA of current, the 5 mA range choice would be poor, because the photodiode current to the LDxCHA is 10% of the full scale. On the other hand, the 500 μA range choice would allow the LDxCHA circuitry to resolve that signal the best, with more sensitivity to variations in the photodiode current.

USING THE ENABLE PIN

The ENABLE pin on the LDxCHA is designed to be TTL compatible. Thus, for current to be enabled, it must be held at a voltage less than 0.3 V. For current to be disabled, it must be held at a voltage greater than 2 V. Any values in between these limits are, by definition, undefined. As such, if this pin is held at a voltage of 1.5, there is no guarantee as to whether current is enabled or disabled.

CHOOSING THE PROPER HEATSINK

Proper operation of the LDxCHA series of laser drivers requires heatsinking, to ensure that the unit stays within the Safe Operating Area (SOA). See the table below for the Wavelength recommended heatsink.

<table>
<thead>
<tr>
<th>MODEL</th>
<th>RECOMMENDED HEATSINK</th>
</tr>
</thead>
<tbody>
<tr>
<td>LD2.5CHA</td>
<td>MULTI-HTSK</td>
</tr>
<tr>
<td>LD5CHA</td>
<td>MULTI-HTSK</td>
</tr>
<tr>
<td>LD10CHA</td>
<td>MULTI-HTSK-HI</td>
</tr>
<tr>
<td>LD15CHA</td>
<td>MULTI-HTSK-HI*</td>
</tr>
</tbody>
</table>

Table 5. Wavelength recommended heatsinks, by model.

These recommendations are based on room-temperature (~25°C) operation.

To ensure that the operating parameters used will allow the unit to stay within the SOA, use the online SOA Calculator for Laser Diode Drivers tool.

* For single supply, 5 V operation of the LD15CHA, the MULTI-HTSK-HI with recommended airflow is adequate up to 15 A operation. However, when using a second power supply to allow higher voltage operation, the MULTI-HTSK-HI heatsink temperature can exceed 50°C. If operating the LD15CHA under these conditions, a user supplied higher capacity heatsink is required for safe operation.

USING THE MODULATION INPUT PIN WITH TTL SIGNALS

The modulation input pin on the LDxCHA can be used with TTL signals, with a range of 0 to +5 V. This can be used as a method of pulsing the signal. Ensure that the current limit is properly set up prior to using TTL signals at the modulation input. When a high TTL signal is input to the modulation input pin, it will drive the LDxCHA’s current output to the limit set by the user.
SAFE OPERATING AREA CALCULATION

The Safe Operating Area of the LDxCHA driver is determined by the amount of power that can be dissipated within the output stage of the driver. If that power limit is exceeded, permanent damage can result.

**DO NOT OPERATE THE LDxCHA DRIVER OUTSIDE OF THE SAFE OPERATING AREA CURVE.**

**OPERATING THE LDxCHA DRIVER OUTSIDE OF THE SOA voids the warranty.**

Refer to the Wavelength Electronics website for the most up-to-date SOA calculator for our products. The online tool is fast and easy to use, and also takes into consideration operating temperature.

[www.teamwavelength.com/support/design-tools/soa-ld-calculator](http://www.teamwavelength.com/support/design-tools/soa-ld-calculator)

SOA charts are included in this datasheet for quick reference, however we recommend you use the online tools instead.

Follow these steps to determine if the driver will be operating within the SOA.

1. Refer to the laser diode datasheet to find the maximum voltage \( V_{\text{MAX}} \) and current \( I_{\text{MAX}} \) specifications
2. Calculate the voltage drop across the controller: \( V_{\text{DROP}} = V_S - V_{\text{MAX}} \) (\( V_S \) is the power supply voltage)
3. Mark \( V_{\text{DROP}} \) on the X-axis, and extend a line upward
4. Mark \( I_{\text{MAX}} \) on the Y-axis, and extend a line to the right until it intersects the \( V_{\text{DROP}} \) line.
5. On the X-axis, mark value of \( V_S \)
6. Extend a diagonal line from \( V_S \) to the intersection of the \( V_{\text{DROP}} \) and \( I_{\text{MAX}} \) lines; this is the Load Line
7. If the Load Line crosses the Safe Operating Area line at any point, the configuration is not safe

If the SOA Calculator indicates the LDxCHA will be outside of the Safe Operating Area, the system must be changed so that less power is dissipated within the driver. See Wavelength Electronics Application Note [AN-LDTC01: The Principle of the Safe Operating Area](http://www.teamwavelength.com/support/design-tools/soa-ld-calculator) for information on shifting the Load Line.

After changing any of the operating parameters, recalculate the SOA to make sure the driver will operate safely. If you have questions, or run into difficulties calculating the SOA, contact Wavelength Electronics for assistance.

For single supply, 5 V operation of the LD15CHA, the MULTI-HTSK-HI with recommended airflow (see **Figure 23**) is adequate up to 15 A operation. However, when using a second power supply to allow higher voltage operation, the MULTI-HTSK-HI heatsink temperature can exceed 50°C. If operating the LD15CHA under these conditions, a user supplied higher capacity heatsink is required for safe operation.
## Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Potential Causes</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driver will not switch on</td>
<td>Improperly configured power supply</td>
<td>Carefully check the wiring diagram according to page 10.</td>
</tr>
<tr>
<td>Output will not enable</td>
<td>ENABLE pin not held low</td>
<td>Refer to the ENABLE pin specifications in Table 1 and make sure this pin is held at a voltage less than 0.3 V.</td>
</tr>
<tr>
<td>Over- or under-voltage protection has disabled output</td>
<td>The LDxCHA drivers have over- and under-voltage protection to protect the laser diode. Ensure that the voltage at the +5V pin (J5:1) is above 4 V, and below 6 V.</td>
<td></td>
</tr>
<tr>
<td>Laser output power too low in Constant Current mode</td>
<td>Laser current setpoint too low</td>
<td>Increase the setpoint either by adjusting the SET trimpot clockwise, or by increasing the signal voltage on MOD INPUT (pin J2:1).</td>
</tr>
<tr>
<td>Laser current limit too low</td>
<td>Refer to page 12 for instructions on setting the laser driver current limit.</td>
<td></td>
</tr>
<tr>
<td>Laser driver is compliance limited</td>
<td>Check the laser diode specifications to determine the forward voltage (V_f). Make sure that the LDxCHA is not compliance limited. Refer to the Electrical Specifications table on page 6. If the driver is compliance limited, V+ may need to be increased. <strong>Verify that the LDxCHA will be operating within the Safe Operating Area if V+ is increased.</strong></td>
<td></td>
</tr>
<tr>
<td>Laser does not reach desired output in Constant Power mode</td>
<td>Photodiode feedback current is out of range for the LDxCHA</td>
<td>Refer to the laser diode datasheet to determine the approximate photodiode (PD) current at the desired output power level. If the PD current exceeds the chosen LDxCHA photodiode current range, set the PD Range switch to a higher range; see page 11.</td>
</tr>
<tr>
<td>Modulation is not working</td>
<td>JP1 is not removed</td>
<td>The LDxCHA will not allow modulation signals to be passed through to the laser if JP1 is installed. To enable modulation, ensure that JP1 is removed.</td>
</tr>
<tr>
<td>Cannot zero the trimpots</td>
<td></td>
<td>The trimpots that are installed on the LDxCHA are 12-turn trimpots. This means that after 12 full turns counterclockwise, they will be set to zero, even though they will turn continuously.</td>
</tr>
<tr>
<td>Photodiode feedback is inaccurate</td>
<td>Improperly configured PD Range switch</td>
<td>If the switches for the PD Range are configured improperly, the LDxCHA will continue to operate, but the values that are returned will be less accurate. Ensure that these switches are oriented as shown in Figure 9 for the desired range.</td>
</tr>
<tr>
<td>Transfer functions are inaccurate</td>
<td>Improperly configured CC/CP Mode switch</td>
<td>If the CC/CP Mode switches are improperly configured, this can lead to inaccuracies in the transfer functions. Ensure that these switches are oriented as shown in Figure 8 for the desired operation mode.</td>
</tr>
<tr>
<td>Dual supplies are not working properly</td>
<td>JP2 is not removed</td>
<td>If dual supply operation is desired, ensure that JP2 is removed from the board. If JP2 is still installed, this can lead to issues with the power supplies.</td>
</tr>
</tbody>
</table>
CABLING SPECIFICATIONS

WCB308: POWER / LD CABLE (NOT INCLUDED)

2.00”
BLACK / RED TWISTED PAIR; 14 AWG
WHITE / BLUE TWISTED PAIR; 14 AWG

OVERALL LENGTH 24” ± 1” AFTER TWISTING

WCB325: LD15CHA SWITCHING POWER SUPPLY CABLES (NOT INCLUDED)

Black / White Twisted Pair
14 AWG
Overall length 24” ± 1”
BLACK = AC (Live)
WHITE = AC (Neutral)

Black / Red Twisted Pair
14 AWG
Overall length 24” ± 1”
BLACK = GND (J1:4)
RED = V+ (J1:3)

Black
24 AWG
Overall length 10”
BLACK = Safety Ground
MECHANICAL SPECIFICATIONS

Figure 24. LDxCHA Driver Mechanical Dimensions

All Tolerances ±5%; units in inches [mm]
CERTIFICATION AND WARRANTY

CERTIFICATION

Wavelength Electronics, Inc. (Wavelength) certifies that this product met its published specifications at the time of shipment. Wavelength further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology, to the extent allowed by that organization’s calibration facilities, and to the calibration facilities of other International Standards Organization members.

WARRANTY

This Wavelength product is warranted against defects in materials and workmanship for a period of one (1) year from date of shipment. During the warranty period, Wavelength will, at its option, either repair or replace products which prove to be defective.

WARRANTY SERVICE

For warranty service or repair, this product must be returned to the factory. An RMA is required for products returned to Wavelength for warranty service. The Buyer shall prepay shipping charges to Wavelength and Wavelength shall pay shipping charges to return the product to the Buyer upon determination of defective materials or workmanship. However, the Buyer shall pay all shipping charges, duties, and taxes for products returned to Wavelength from another country.

LIMITATIONS OF WARRANTY

The warranty shall not apply to defects resulting from improper use or misuse of the product or operation outside published specifications. No other warranty is expressed or implied. Wavelength specifically disclaims the implied warranties of merchantability and fitness for a particular purpose.

EXCLUSIVE REMEDIES

The remedies provided herein are the Buyer’s sole and exclusive remedies. Wavelength shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory.

REVERSE ENGINEERING PROHIBITED

Buyer, End-User, or Third-Party Reseller are expressly prohibited from reverse engineering, decompiling, or disassembling this product.

NOTICE

The information contained in this document is subject to change without notice. Wavelength will not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this material. No part of this document may be translated to another language without the prior written consent of Wavelength.

SAFETY

There are no user-serviceable parts inside this product. Return the product to Wavelength Electronics for service and repair to ensure that safety features are maintained.

LIFE SUPPORT POLICY

This important safety information applies to all Wavelength electrical and electronic products and accessories:

As a general policy, Wavelength Electronics, Inc. does not recommend the use of any of its products in life support applications where the failure or malfunction of the Wavelength product can be reasonably expected to cause failure of the life support device or to significantly affect its safety or effectiveness. Wavelength will not knowingly sell its products for use in such applications unless it receives written assurances satisfactory to Wavelength that the risks of injury or damage have been minimized, the customer assumes all such risks, and there is no product liability for Wavelength. Examples of devices considered to be life support devices are neonatal oxygen analyzers, nerve stimulators (for any use), auto-transfusion devices, blood pumps, defibrillators, arrhythmia detectors and alarms, pacemakers, hemodialysis systems, peritoneal dialysis systems, ventilators of all types, and infusion pumps as well as other devices designated as “critical” by the FDA. The above are representative examples only and are not intended to be conclusive or exclusive of any other life support device.

REVISION HISTORY

DOCUMENT NUMBER: LD15CHA-00400

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<th>DATE</th>
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