LPLDD-xA-35V-TP User Manual



This manual covers following Laser Diode Drivers :

LPLDD-0,5A-35V-TP

LPLDD-1,5A-35V-TP

LPLDD-5A-35V-TP

LPLDD-10A-35V-TP

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About the LPLDD-35V-TP Laser Diode Driver

LPLDD-35V-TP Laser Diode Driver is the new version of lite laboratory laser diode driver with user configurable thermal protection which ensures proper work of the laser diode and protects it from overheating. The driver for powering laser diodes has the 4 current output option with maximum current up to 10A, and to modulate the current flowing through the diode with frequency up to 100 kHz. LPLDD-35V-TP driver is capable to power literally every laser diode available on the market up to 5 W - 405 nm, 445 nm, 520 nm, 638 nm, 650 nm, 808 nm, 980 nm.

Features

- Wide input voltage range
- Multiple control options including analog, PWM and combination of both
- Excellent noise figure (i.e. <4mA @ 5A)
- Additional enable input
- High bandwidth
- Short rise and fall time
- Multiple current output versions

- Precise output power control
- Small and easy to assembly with heatsink included

Output current versions

Version	Supply Voltage ¹	Current measurement ratio (shunt)	-3 dB Bandwidth [kHz]	Rise/Fall Time	Noise [mA _{pp}]
0,5A	3,3 - 35V	1V/A	700	<1us	<0,3
1,5A	3,3 - 35V	300mV/A	700	<1us	<0,7
5A	3,3 - 35V	100mV/A	700	<1us	<4
10A	3,3 - 35V	20mV/A	400	<1us	<16

Table 1. Output current versions

¹ Logic supply should be in range 7.5V – 35V

Pinout



	Function	Description	
Pin name			
LD VCC	Laser Diode Supply	Connect positive voltage of PSU	
LD GND	Laser Diode Supply	Connect negative voltage of PSU	
VCC	Control Circuits Supply	Connect positive voltage of control circuits supply while	
		using dual supply option	
LD+	Laser diode Anode (+)	Connect Laser diode anode (Current output)	
LD-	Laser diode Catode (-)	Connect Laser diode cathode	
Analog	Analog control input	Connect 0-5V proportional control	
Toggling	Digital control input	Connect digital control input (input is TTL Level	
		compatible)	
GND Signal	GND for control signals	Connect GND of control signals "Analog" and "Toggling"	
Enable	Enable signal	Tie to GND to disable output	
Enable GND	Enable GND	Reference for enable signal	
Thermistor+	Thermistor input	Connect thermistor terminal	
Thermistor -	Thermistor input	Connect thermistor terminal	
СМ	Current measure output	Measure output current on this pin	
CM GND	Current measure	Reference for current measurement	
	reference		

Table 2. Pin functions

Power Supply

When you are powering both the laser diode and the driver from one power supply in the range of 7.5 - 35V DC the LD VCC jumper should be connected.

In the case of powering a diode with low voltage , i.e 3 V, one should use two power supplies and the VLD jumper should be disconnected.

Note:

- 1. This power supply voltage should be close to the one that laser diode requires.
- 2. While using dual supply please connect GND VCC to LD GND
- 3. DO NOT USE GND Signal, GND Enable or GND CM pins as supply GND connection

The driver has to be powered with voltage in the range of 7.5 - 35 V DC and laser diode has to be connected to the power supply in the range of 3.3 V - 35 V DC

This feature allows you to power your laser diode from low voltage, therefore, lower power can be dissipated by the driver.

The laser diode supply voltage VLD should always be set higher than or equal to 3.3 V. The minimum supply voltage for different diode currents is given by the formula:

VLD = 0.2* Id + Vd or VLD = 0.5+Vd (whichever is greater)

Where: VLD is the supply voltage [V] Vd is the laser diode working voltage [V] Id is the laser diode operating current [A]

Modulation Inputs

Modulation inputs accepts 0-5V signals

Analog modulation means that by using 2.5 V on ANG input you get 50% output power, analogically by using 4 V you get 80% output power, etc.

Toggling input can be use as PWM. This means that using duty cycle 50 % you get 50% output power.

Driver can use 4 modulation options selectable by soldering jumper Signal select

Available modulation options are:

1. Analog 0-5V proportional input.





Analog modulation means that by using 2.5 V on ANG input you get 50% output power, analogically by using 4 V you get 80% output power, etc.

2. PWM input





This input can also be as PWM input; the only requirement is that the base frequency of the PWM signal is in range of 20 kHz.

Input is consistent with TTL logic levels

3. PWM controlled analog





In this mode Analog input controls output current, but its enabled only when Toggling signal is HIGH

4. Always ON 100% with PWM Dimming





In this mode output current is turned on unless Toggling signal is forced LOW (i.e. with open collector input)

5. Always ON proportional to analog input with PWM Dimming



In this mode output current is proportional do Analog input signal, but it is possible to disable output current by forced Toggling signal LOW. (i.e. with open collector input)

Wiring

We recommend the use a cable with minimum cross-section of $0.1^* I \text{ [mm^2]}$, where I is the laser diode operating current [A] for connecting power supply and laser diode.

It is recommended to use twisted wire to minimalize noise and improve transient response of driver

Wires connecting laser diode to driver should be as short as possible and twisted to improve transient response of driver.

When you are powering both the laser diode and the driver from one power supply in the range of 7.5 - 24 V DC the *Supply jumper* should be connected.

Single PSU option wiring



In the case of powering a diode with low voltage, i.e. 3 V, one should use two power supplies.

The driver has to be powered with voltage in the range of 7.5 - 35 V DC and laser diode has to be connected to the power supply in the range of 3.3 V - 35 V DC.

This feature allows you to power your laser diode from low voltage, therefore, lower power can be dissipated by the driver.



Dual PSU option wiring

Note: Power supply voltage should be close to the one that laser diode requires.

Driver output current testing / setup

It is recommended to set maximum output current using dummy load instead of actual Laser Diode.

Dummy load selection

As a dummy load it is possible to use resistor or Zener diode with sufficient power and current rating. It is recommended to use silicone diode in series with resistor. Zenner diode may be better choice as its characteristic is similar to laser diode.

For example :

if you are going to use 3A@5V laser diode

Resistor: resistance should be $<5V/3A=1,6\Omega$ power rating >3A*5V=15Wresistor 1,5 Ω 20W could be used.

Zener diode:

Zener voltage should be close to desired laser diode voltage so 4,7V or 5,1V could be used. Power rating should be >15W

Startup Procedure

- 1. Connect power supply according to selected PSU option.
- 2. Connect thermistor or disable thermal protection.
- 3. Connect load to the driver. It is recommended to use dummy load for first time use to do not damage laser diode in case of improper settings.
- 4. Turn "Maximum Current Trimmer" fully counterclockwise.
- 5. Turn the power supply on
- Feed 5.0V constant voltage to selected control input.
 Use Current Monitor output to measure output current. Current ratio depends on version of driver.
- 7. Turn the "Maximum Current Trimmer" clockwise until desired maximum current has been reached.
- 8. Turn the input signal off.

Thermal protection

Driver has thermal protection system that allow to protect laser diode from overheating.

Thermal protection system is designed to work with NTC 10k Ω , β =3950 thermistor.

Temperature at which the protection operates can be set in range 10 - 50 °C using trimmer. Turning trimmer clockwise will decrease temperature.

When read temperature exceed set temperature driver disable output current until temperature falls below set temperature.



It is possible to disable thermal protection by soldering jumper and turning trimmer fully clockwise.

Current monitoring

It is possible to measure output current on *Current Measure* pins . Measurement ratio depends on current output version. Ratio value is given in *Table 1*.

Enable Input

Enable input allows user to disable output independent from control signal. Tie this pin to driver GND to disable output.

Remarks:

This pin is not meant to be use as control signal. Do not use Enable GND pin as power GND

Electrical Protection

Analog modulation input of the driver is protected by a 5,1V Zener diode. Nevertheless, one should not use a modulation voltage higher than 5 V.

Toggling /PWM input accepts voltages up to 24V and is protected by 5,1V Zener diode.

LD supply includes TVS that protects circuit from overvoltage and transients.

The output of the driver is protected by the Schottky diode which doesn't allow the reverse voltage to appear as well protects from ESD.

Current monitor Output consist 1000hm resistor that protects circuit from external influence.

Mounting instructions

Depending on the used laser diode and PSU, you should assure proper cooling of the MOSFET transistor. The MOSFET must be isolated from the heat sink/plate with the silicon pad as well as the plastic sleeve. A short circuit between MOSFET and heat sink/plate may damage the driver and can be dangerous for the Laser Diode.

Mechanical drawings



Exemplary Test

The test was done using:

- Driver LPLDD-5A-35V-TP
- 6 W silicon diode (at 5A)
- diode soldered directly to driver
- LD supply voltage 4 V
- Logic supply voltage 12V
- Control signal: analog input square 5V @ 10kHz 5% duty cycle



Channel 1: Current output 2A/div Channel 4: Control signal 2V/div Time base 1us/div