LPLDD-xA-16V-3CH
Operating Manual

Table of content

Product description

LPLDD-xA-16V-3CH Laser Diode Driver is a 3 channel RGB lite LPLDD laser diode driver. The maximum output current is 1A or 5A per channel (depending on version). It was designed for lower power laser diodes in order to assure smooth waveforms, fast-rising/falling time and low ripple.

This is the professional three-channel medium-power driver for laser diodes (e.g. RGB laser systems) with a built-in soft-start feature. The current of each channel can be independently controlled via the analog input of 0 - 5 V with a modulation bandwidth of up to 100 kHz. Each channel has a potentiometer that can be used to set the maximum current.

Each of the controls is labeled on the PCB to make it more intuitive and easier to set.

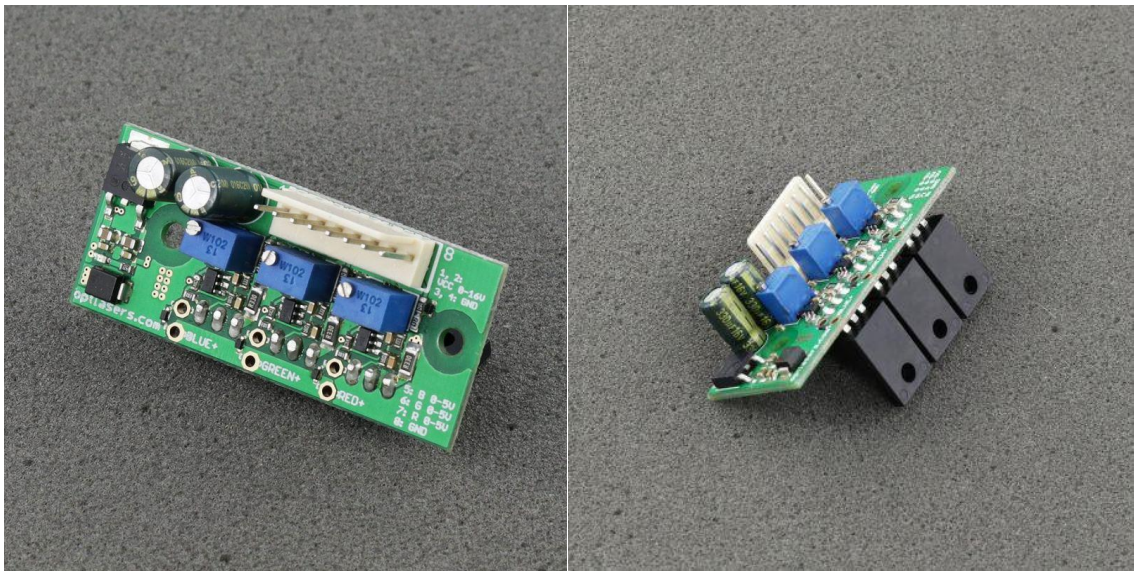
The proper connector is attached to the driver for your use.

This laser controller is provided without a heat sink to allow customers to use their own heatsink. It also reduces the price for those customers who wish to operate it at a low current where a heat sink is not required. It is a fully functioning component ready to be mounted in laser devices.

This manual covers following drivers:

LPLDD-1A-16V-3CH

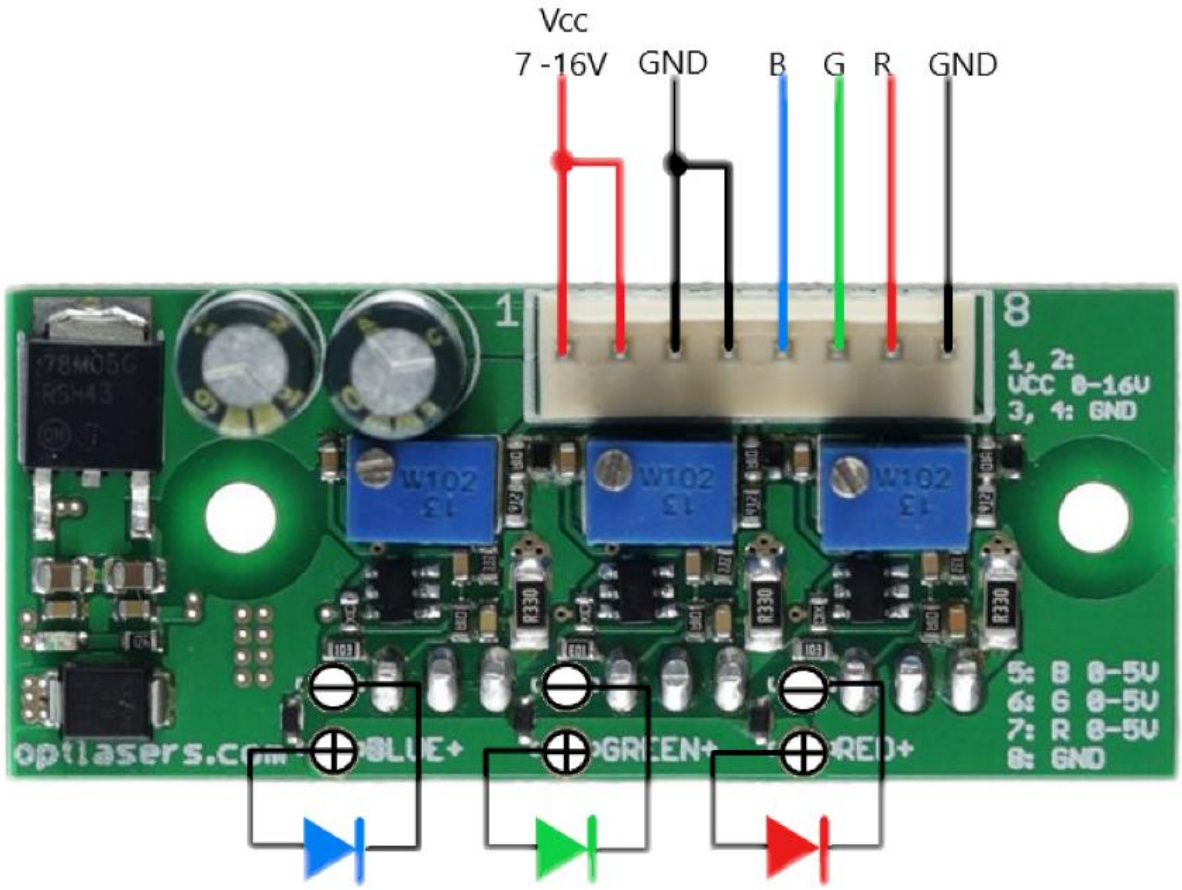
LPLDD-5A-16V-3CH



Technical data

Version	1A	5A
Dimensions	55 x 23,5 mm	55 x 23,5 mm
Input Voltage	7 - 16 V	7 - 16 V
Max. Current per Channel	1 A	5 A
Max. Modulation Frequency	100 kHz	100 kHz
Current Measurement Ratio	330mV/A	100mV/A
Max. Power Dissipation	15W	15W
Modulation Input Voltage Range	0 - 5 V	0 - 5 V
Number Of Channels	3	3
Pre-Set Current Setting	0 mA	0 A
Softstart Time	100 ms	100 ms
Transistor Type Used	N-MOSFET	N-MOSFET
Rise Time	less than 1.5µs	less than 1.5µs
Fall Time	less than 1.5µs	less than 1.5µs
Noise and Ripple (RMS)	4.2 mA	12.5 mA

Connection and pinout



Inputs:

Pin No.	Label	Description
1, 2	Vcc 7-16V	Power supply (7-16V) input
3, 4	GND	GND of power supply
5	B	Control analog input (0-5V) for “blue” channel diode
6	G	Control analog input (0-5V) for “green” channel diode
7	R	Control analog input (0-5V) for “red” channel diode
8	GND	GND of control analog input

Labels on the board showing "R", "G", "B" channels are only the suggestion of how to connect the diodes. It is possible to use any channel to any laser diode.

Outputs:

Name	Description
BLUE+	“Blue” channel output to connect an anode of a laser diode
BLUE-	“Blue” channel output to connect a cathode of a laser diode
GREEN+	“Green” channel output to connect an anode of a laser diode
GREEN-	“Green” channel output to connect a cathode of a laser diode
RED+	“Red” channel output to connect an anode of a laser diode
RED-	“Red” channel output to connect a cathode of a laser diode

Diameter of the output holes is 1.27mm (50mils), what matches to wires with the cross section up to 1mm^2 (AWG 17).

How to power supply LPLDD-xA-16V-3CH

All channels are powered by one common input.

The minimum power supply voltage *Vcc* should be equal or higher than value given by formula below (but not lower than 7V and not higher than 16V).

$$V_{CC} = 0{,}33 \cdot I_{max} + V_{LD}$$

where:

V_{CC} -the supply voltage,

V_{LD} -the diode working voltage (at I_{max}),

I_{max} -the desired maximum current.

When 2 or 3 channels, with different laser diodes, are used, *Vcc* should be calculated for each channel independently. The highest value should be treat as *Vcc*.

We recommend the use of power cables with a cross-section of at least 0,1 mm^2.

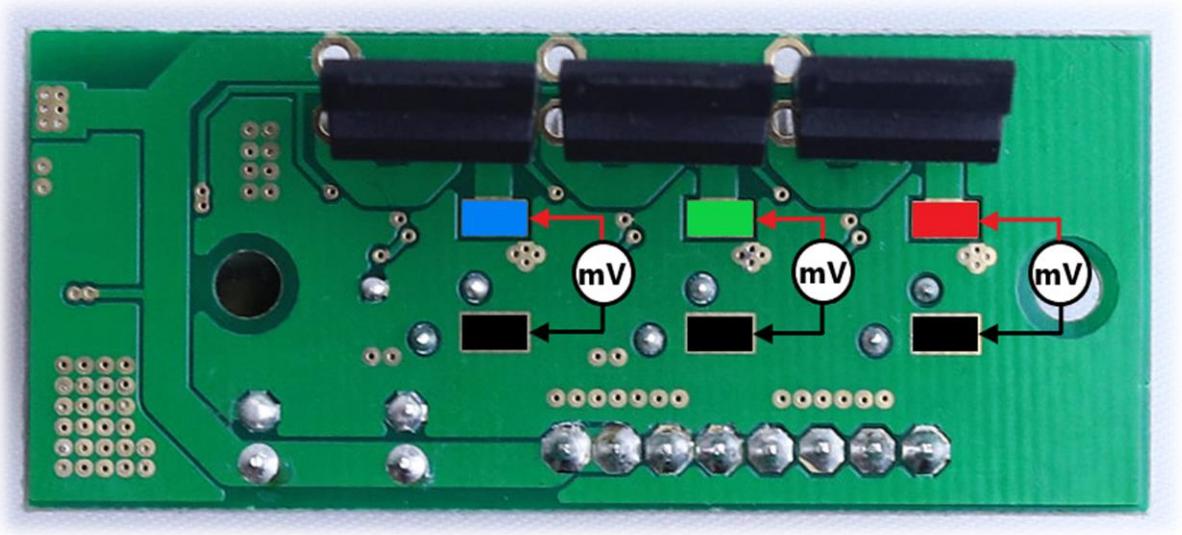
Although each channel is rated to handle a current of 5 A, it is not typically utilized to its full capacity. If you would like to use more than 6 A total (sum from all channels) it is recommended to solder the wires directly to the board since the connector is rated at 3 A CW per each pin

Depending on the used laser diode and PSU, you should monitor and assure proper cooling for MOSFETs. Proper cooling of the power MOSFETs should be provided depending on the used laser diodes and PSU. Without cooling, MOSFETs may be damaged and laser diodes may be burned.

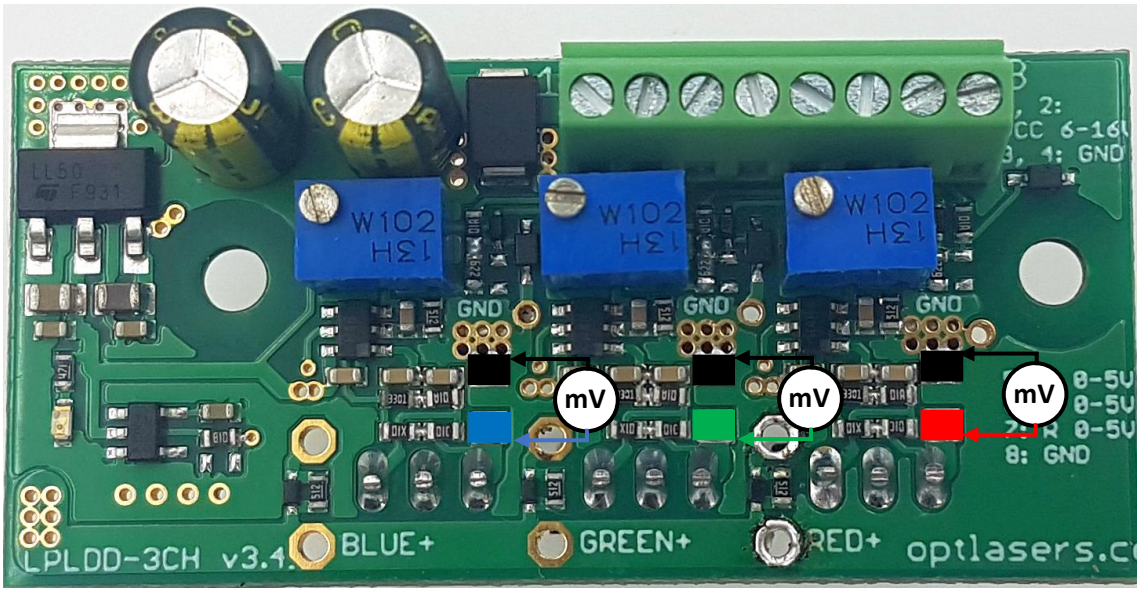
The MOSFET/MOSFETs must be isolated from the heat sink/plate with a silicon pad as well as a plastic sleeve. A short circuit between MOSFET and heat sink/plate can damage the driver and can be dangerous for the laser diode.

Measuring the current

To measure the current of the laser diode or any other load (e.g. test load resistor) connected to one of the outputs, the voltage of the shunt resistor has to be measured. There are 3 shunt resistors, one for each channel. To measure voltage across them, clear pads on the bottom (for 1A version) or top (for 5A version) of the driver can be used.



Measurement points for 1A version



Measurement points for 5A Version

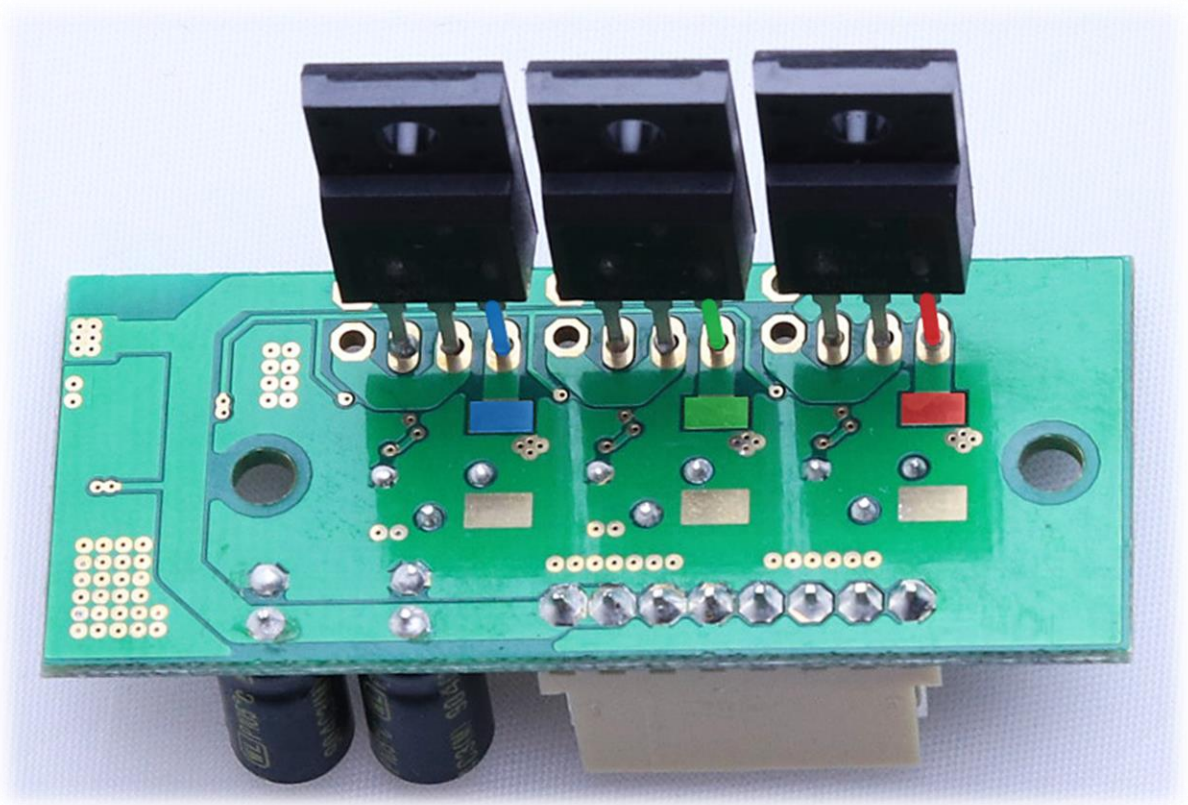
Blue, green and red colors corresponds to “blue”, “green” and “red” channels. GND is common and is marked with black rectangles. GND is also connected with input pins: 3, 4 and 8.

When value of shunt voltage (U_{shunt}) was measured, current (I_{LD}) can be calculated:

1A version : $I_{LD} = \frac{U_{shunt}}{0{,}33}$

5A version : $I_{LD} = \frac{U_{shunt}}{0{,}1}$

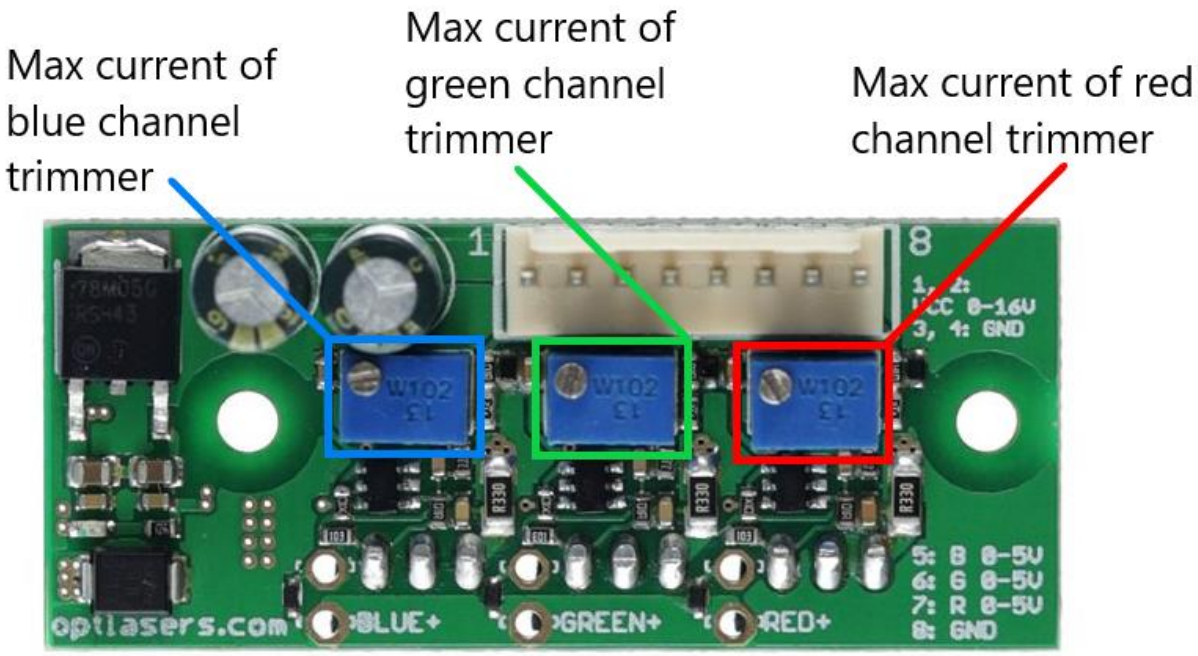
Sometimes, an easier way is to check voltage between GND inputs: either GND of control analog input (pin 8), or GND of power supply (pins 3 and 4), and one of the leg of the transistor that are shown in the pictures below.



Current of the laser diode can be calculated in the same way.

Adjusting the maximum current

Three separate trimmers (one for each channel) are used to set the maximum currents that are supplied to laser diodes connected to driver outputs: BLUE, GREEN and RED.



To set the maximum current:

1. Connect a power supply unit ("+" to 1, 2 input pins and "-" to 3, 4 input pins), but don't turn it on yet.
2. Connect control signal equals +5V to one of pins: 5, 6 or 7 (depending on which channel will be setting) and GND of the control signal to pin 8.
3. Connect load to one of the output: BLUE, GREEN or RED (depending on which channel will be setting). It is better to use test load e.g. a resistor, than laser diode (because it can be easily damaged).
4. Connect a multimeter (set to measure voltage) as it is described in *Measuring the current* section.
5. Calculate voltage value that a multimeter should show (U_{shunt}) when desired current value (I_{max}) will be achieved.

1A version: $U_{shunt} = I_{max} \cdot 0{,}33$

5A version: $U_{shunt} = I_{max} \cdot 0{,}1$

6. Turn on PSU.
7. Turn the trimmer clockwise until the desired U_{shunt}, which corresponds to I_{max}, has been reached.

Current control

The value of voltage which is connected to one of the inputs: B, G or R, specify the portion of maximum current supplied to corresponding outputs (BLUE, GREEN or RED). Those inputs are analog and limited to 5V.This means that any signal, which maximum amplitude (respect to the GND) is equal or less than 5V, can be used (also TTL with its logic levels of 0 V and 5 V) .

Usually, current of a laser diode is proportional to its optical power. Hence, power will be proportional to signal connected to B, G or R inputs.

Example:

Let's say that you set $I_{max} = 400mA$ (see *Adjusting the maximum current* section) and your laser diode gives 500mW at this current.

When you will connect 2,5V to control input, you will get 50% of the I_{max} current (200mA) and 50% of the output power (250mW). Analogically by using 4 V you get 80% of the I_{max} current (320mA) and 80% of the output power (400mW), etc.

When you will connect 5V PWM with 50% duty, you will get 50% of the output power (250mW). Increasing duty to 80% will increase output power to 80% (400mW).

End of example.

Laser diode current will always be equal:

$$I_{LD} = \frac{V_{ANG\_IN\_X}}{5V} \cdot I_{\max\ \_X}$$

where:

$V_{ANG\_IN\_X}$ -voltage (0-5V) on one of the control analog input (X means channel: B, R or G)

I_{max_X} -maximum current (0-1A) set with trimmer (X means channel: B, R or G)

or:

$$I_{LD} = PWM\_duty \cdot I_{\max\ \_X}$$

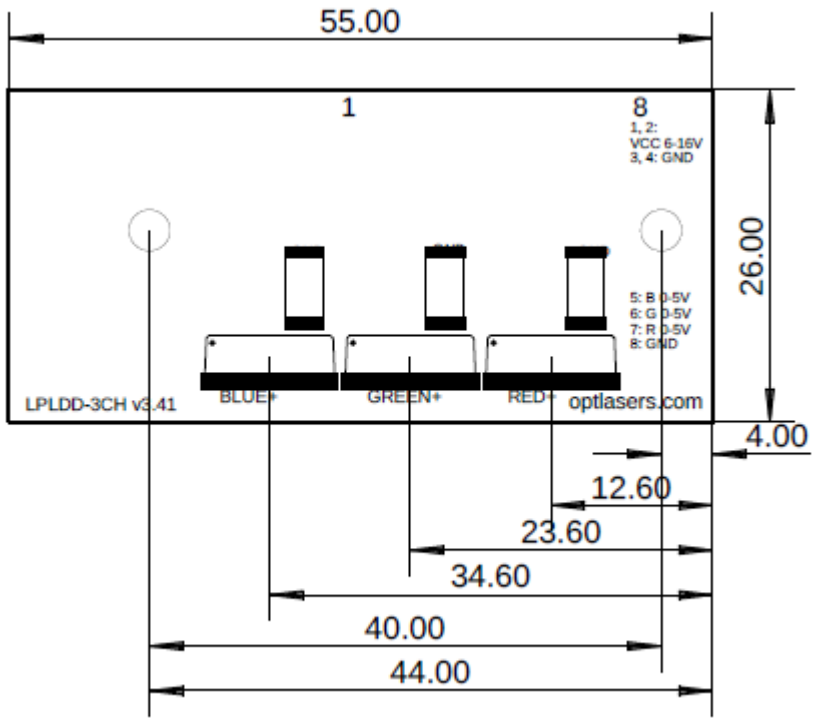
Protection

The analog input is protected by a 5V1 Zener diode on occasion there appears of the voltage higher than 5 V. While this additional protection is offered, the user is still advised not to exceed 5 V on each analog input.

The power supply input is protected against a too high or reverse input voltage by a TVS diode.

The output of each channel of the driver is protected by a Schottky diode that prevents a reverse voltage.

Mechanical drawing



All dimensions in mm

View form the top of controller