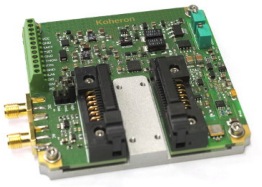
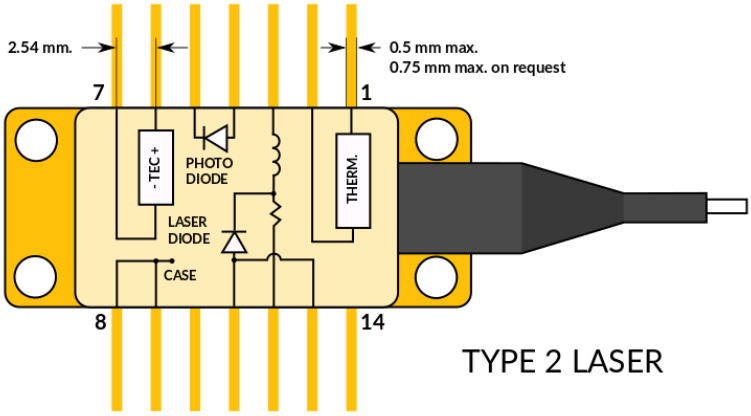
CTL100 - User Guide

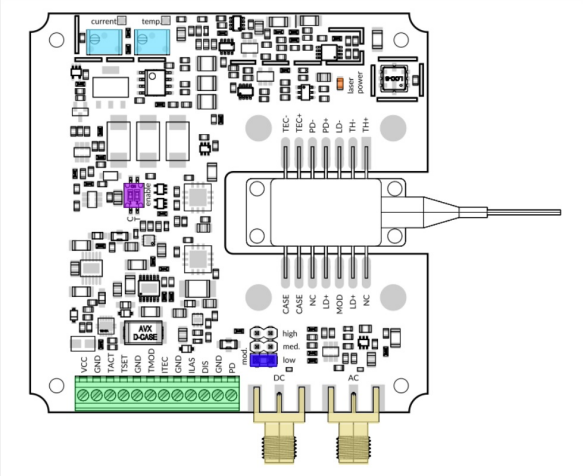


Laser connections

The CTL100 is compatible with **Type 2 butterfly** laser diodes. Note that is is **only compatible with floating diodes**, which means that neither the anode nor the cathode should be connected to the case.



Quickstart



1. Make sure the laser current switch (C) and the TEC current switch (T) are set on OFF position.
2. Plug the laser diode on the ZIF socket.
3. Power the board with 5 V on VCC pin. The power supply must be able to supply at least 2 A.
4. Set the current to 0 mA by turning the laser current trimmer counter-clockwise.

5. Adjust the temperature trimmer to get 2.5 V on the TSET pin.
6. Turn ON the TEC current switch.
7. Check that the voltage between the TSET and TACT pins converges towards zero. The laser temperature is now stabilized at 25 °C.
8. Turn ON the laser current switch.
9. Turn the laser current trimmer clockwise to reach the desired laser current.

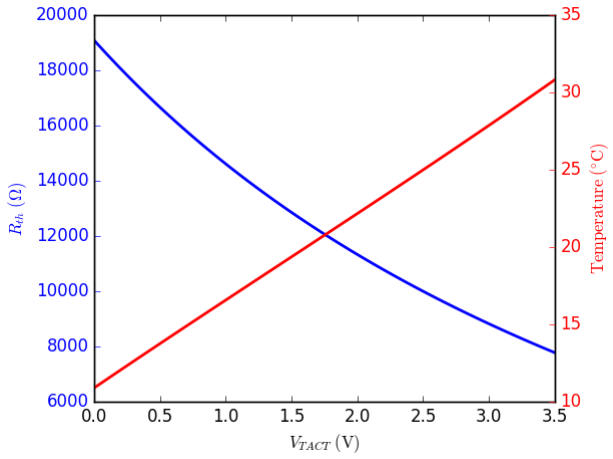
Enable switch (purple)

- 1 ON: Enable laser current.
- 2 ON: Enable TEC current. **Turn off the power supply before changing this switch**.

Terminal block connections

- **VCC**: Connect this pin to a 5V power supply (2 A minimum). The high power supply rejection of the current driver allows the use of a switched power supply with minor degradation of the noise performance. At a laser current of 400 mA, the CTL100 draws 510 mA (TEC current disabled). An eFUSE protects the CTL100 against overvoltage (6.1 V) and overcurrent (2 A).

- **TACT**: Temperature monitoring pin. The thermistor value is given by
  R_{th} = 10 kΩ * (10.5 V - V_{TACT}) / (5.5 V + V_{TACT}).
  The output is current-limited with a 1 kΩ resistor.



- **TSET**: Temperature setpoint monitoring pin.
  V_{TSET} = V_{TREF} + (1 / 10) * V_{TMOD}
  where V_{TREF} is the voltage generated by the temperature trimming potentiometer. The voltage V_{TREF} can be tuned between 0 and 2.5 V and can be measured at test point TP2. V_{TMOD} is the voltage applied at the TMOD pin. The PID controller tries to make the voltage V_{TACT} equal to the setpoint V_{TSET}. The pin output impedance is 1 kΩ.

- **ITEC**: TEC current monitoring pin. The TEC current I_{TEC} is given by
  I_{TEC} = 1 A/V * (V_{ITEC} - 2.5 V)
  where V_{ITEC} is the voltage measured at the ITEC pin. The pin output impedance is 1 kΩ.

- **TMOD**: Temperature modulation pin. Apply a voltage between -3 V and +3V at this pin to control the temperature setpoint externally (see description of the TSET pin).

- **ILAS**: Laser current monitoring pin. The laser current I_{LAS} is given by
  I_{LAS} = 100 mA/V * V_{ILAS}, where V_{ILAS} is the voltage measured at the ILAS pin. The pin output impedance is 1

kΩ.

- **DIS**: ~~Laser disable. Apply a voltage between 2 V and 5 V to disable the laser current.~~ Leave this pin floating.
- **PD**: Output of the transimpedance amplifier that monitors the laser power. This output has 3.9 V/mA gain, a bandwidth from DC to 50 MHz, and is terminated with a 50 Ω resistor. The actual laser power depends on the photodiode integrated in the laser and should be calibrated by the user. The laser power LED brightness is proportionnal to V_{PD}.

Modulation inputs

The CTL100 has two current modulation inputs available on SMA connectors:

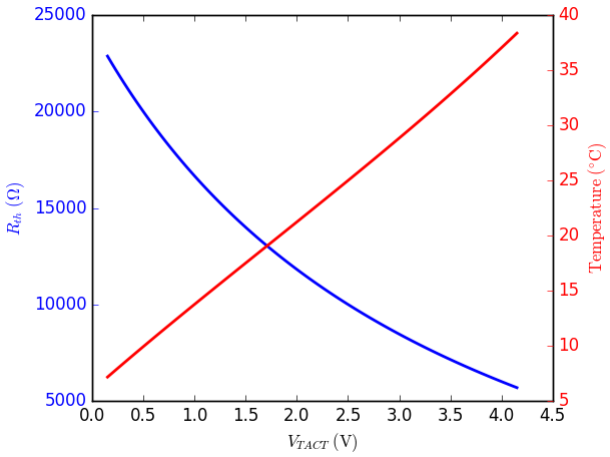
- **DC modulation input** for modulation between DC and 10 MHz. Modulation range is ±1 V. A jumper allows to choose between 3 modulation gains (2 mA/V, 20 mA/V or 200 mA/V).
- **AC modulation input** for modulation above 3 MHz. Modulation gain is 20 mA/V.

Thermal considerations

The temperature controller dissipates a power equal to (5 V - \|V_{TEC}\|) * I_{TEC}. For reliable operation, do not dissipate more than 2.5 W in the temperature controller (derate 400mW per 10 °C above 30 °C). The power dissipation can be a problem for lasers with low resistance Peltier element (e.g. 400 mV at 1A).

Extended temperature option

The CTL100 is also available with an extended temperature range option (7-38 °C instead of 12-25 °C). In this case, the thermistor value is given by R_{th} = 10 kΩ * (8.5 V - V_{TACT}) / (3.5 V + V_{TACT}).



The gain at the TMOD pin is also increased: V_{TSET} = V_{TREF} + (1 / 3) * V_{TMOD}.