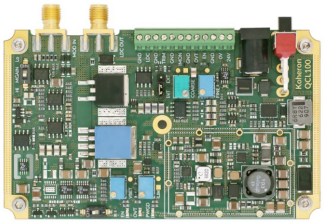
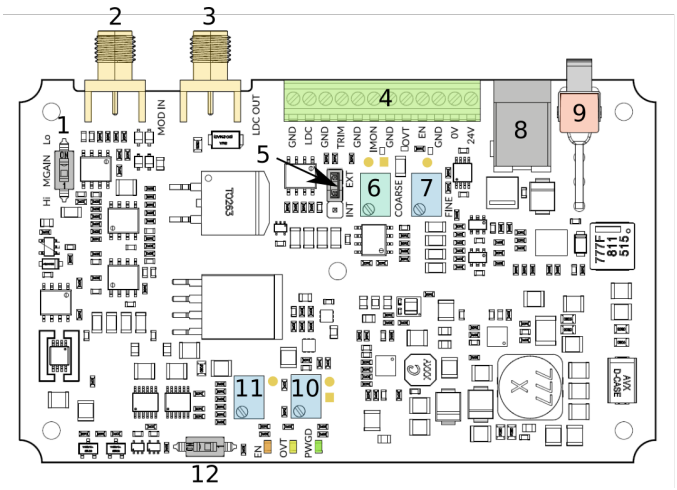
QCL100 - User Guide





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Warning: Make sure you understand this user guide before connecting your valuable laser. Test the QCL100 with a dummy load if needed.

Power supply

The QCL100 can be supplied either from the 2.5 mm DC jack connector or from the 0V and 24V inputs of the screw terminal. The input is protected by an E-fuse which allows voltages between 19 and 26 V. Thanks to its three stages of regulation, the QCL100 can reach its full noise performance with virtually any industrial 24 V power supply. The PWGD LED indicates whether the driver is correctly supplied.

Terminal block connections

- **GND**: Connect this pin to the laser anode.
- **LDC**: Connect this pin to the laser cathode. The laser can also be connected with the LDC OUT SMA output.
- **TRIM**: External current trimming input with 40 mA/V sensitivity and ± 2.4 V permissible voltage swing. Input impedance is 1 kΩ and bandwidth is 10 Hz. The TRIM input only works when the jumper is in EXT position. When the jumper is in INT position, current can be trimmed with the FINE trimming potentiometer.
- **IMON**: Laser current monitoring output with 2 V/A gain and 10 kHz bandwidth.
- **OVT**: Temperature monitoring output (500 mV at 0°C + 10 mV/°C). See thermal management.
- **EN**: Laser Enable pin. Apply a voltage between 2.2 V and 4.5 V to enable the laser current.
- **0V** and **24V**: See power supply.

Trimmers

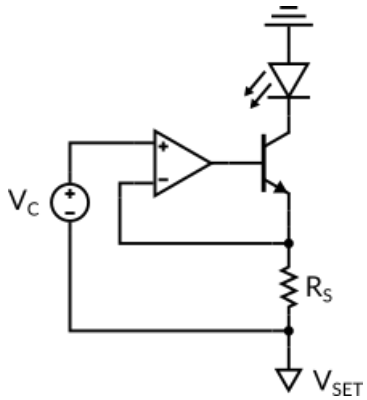
- **COARSE**: Coarse current adjustment trimmer. Sets the current between 0 and 650 mA. Current setpoint is proportional to the voltage between the two COARSE test points (1 V = 160 mA).
- **FINE**: Fine current adjustment trimmer. Adds between 0 and 7.5 mA current when the trim selection jumper in INT position.
- **ILIM**: Current limit adjustment trimmer. Sets the current limit between 0 and 800 mA. Current limit is proportional to the voltage between the two ILIM test points (1 V = 200 mA).
- **VSET**: See Adjusting the compliance voltage.

Modulation input

A 5 MHz modulation input is available on the MOD IN SMA connector. Input impedance is 50 Ω and linear input voltage swing is ±1 V. The MGAIN switch allows to choose between 50 mA/V gain (Hi) and 10 mA/V gain (Lo).

Adjusting the compliance voltage

A simplified architecture of the QCL100 current driver is shown below:



A control loop adjusts the voltage across the transistor V_T to keep the voltage across the sense resistor V_{Rs} equal to the control voltage V_C. The laser current I_L is then equal to V_C/R_S (R_S = 5 Ω for the QCL100-A-500)

The voltage V_{SET} can be adjusted between -9 V and -18.5 V with the VSET trimmer and can be accessed on the VSET testpoint. $|V_{SET}|$ must be chosen sufficiently high to ensure proper current regulation but sufficiently low to minimize the power dissipation in the transistor.

We recommend the following V_{SET} adjustment procedure: * Connect a wire between LDC and GND. * Disable the laser current. * Set V_{SET} to its minimum value of -9 V using the VSET trimmer. * Enable the laser current. * Set the current to the desired setpoint using the COARSE trimmer and the IMON output. * Turn the driver off. * Replace the wire by the laser. * Turn the driver on. * Increase $\|V_{SET}\|$ until the current no longer increases. * Increase $\|V_{SET}\|$ of an additional 0.5 V.

When performing large-signal modulation, it may be necessary to increase $\|V_{SET}\|$ further.

Thermal management

The QCL100 incorporates a temperature sensor located close to the power transistor. When the temperature goes above 85 °C, the OVT LED turns on. Above 103 °C, the laser current is automatically disabled until the temperature goes down to 87 °C.