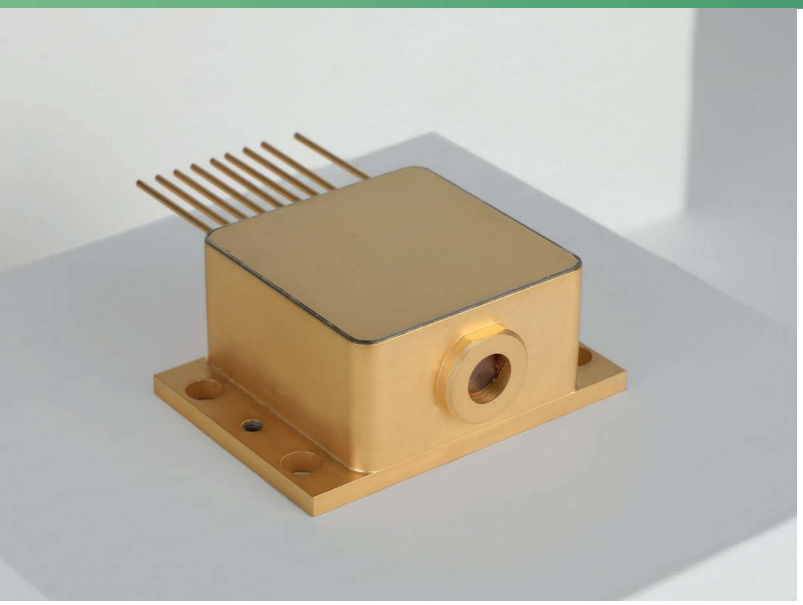
UNIMIR
by mirSense

Single mode DFB CW QCL laser

Rev. 08-2022



Quantum Cascade Lasers from 10µm to 17µm wavelength for spectroscopy

These lasers are DFB Quantum Cascade lasers (QCL) that emit continuous wave (CW) infrared light at room temperature with wavelengths ranging from 10 microns to 17 microns. The lasers are mounted on a thermoelectric cooler inside a sealed High Heat Load (HHL) package integrating a collimation lens and a thermistor to readout the laser chip temperature.

By controlling the chip's operating temperature through the Peltier element inside the laser's package, customers tune the emission wavelength without mode hopping while keeping a longitudinal single-mode operation.

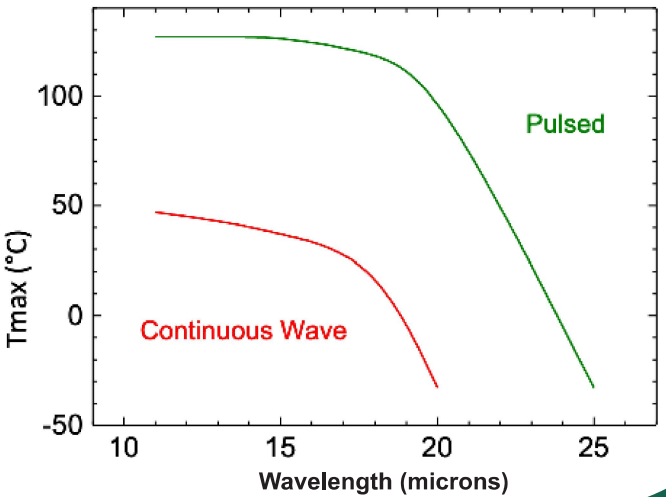
For larger tuning range, pulsed operation is an attractive option because at these long wavelengths, the intrapulse linewidth broadening is relatively smaller than at shorter wavelengths.

Amazing pulsed-operation features

Pulsed operation is an attractive option for Unimir. It means less electrical power consumption of the package, higher temperature operation, larger tunability, access to even longer wavelengths, smaller heatsink and easier integration in systems. A unique feature of the long wavelength Unimir product is its very small spectral chirp during the pulse, typically <0.04 cm-1/100ns. It allows intrapulse spectroscopy without the need of high-speed detection or QCW spectroscopy without a degradation of the spectral resolution (down to 0.01 cm-1) to be implemented. (mirSense can provide a dedicated electronics for pulsed operation.)

Typical laser characteristics

The red curve indicates the maximum chip temperature as a function of the wavelength for CW lasers and the green curve indicates the maximum chip temperature as a function of the wavelength for the pulsed laser.



TECHNICAL DATA

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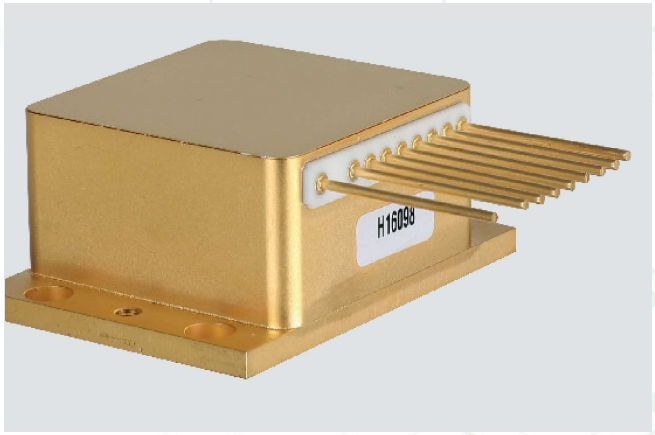

Typical laser characteristics

Laser type	QCL single mode Distributed Feedback lasers (DFB) (1)
Mode of operation	CW or pulsed
Typical Optical Power	5-10mW typical for wavelength under 15 microns 1-5mW typical for wavelength above 15 microns Up to 20mW with a Fabry-Pérot laser (1)
Full accessible wavelength range	~3 cm^{-1} typically
Continuous tuning range	>1 cm^{-1} typically
Side mode suppression ratio	SMSR > 25 dB
Linewidth (FWHM)	< 100 Mhz (free-running with suitable electronics for CW lasers)
Divergence	< 10mrad
Beam quality	TM00
Output beam diameter (window output)	Typically 4 mm
Polarization	Linear vertically polarized

(1) : Fabry-Pérot lasers are also available. They offer larger output power (up to 20 mW), with broader emission spectrum.

TECHNICAL DATA

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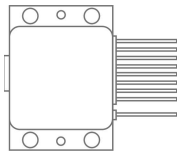
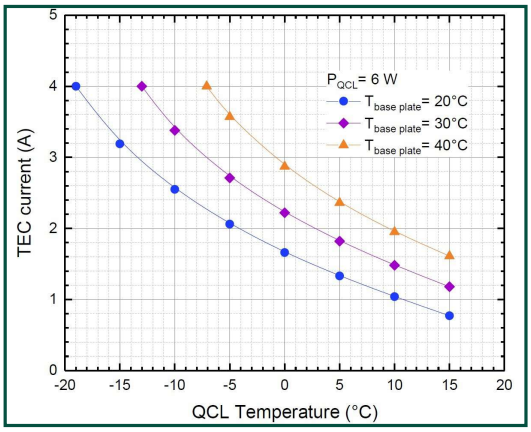


Mechanical and electrical features

Packaging	Sealed inside a High-Heat Load (HHL) package
Operating temperature of the laser HHL casing	+10°C to +50°C(1)
Operating temperature of the QCL chip (for casing temperature of 20°C)	-10°C to +10°C(2)
Storage temperature	+10°C to +50°C
Built-in temperature sensor thermistor	Resistance @ 25°C: 10 kΩ 0/50 °C Beta value: ß =3892 K

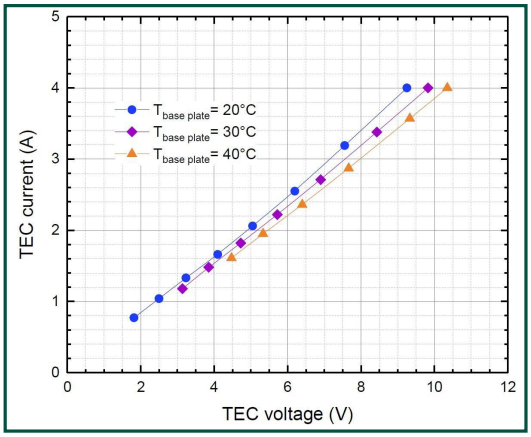
(1) Avoid water condensation
(2) The temperature of the QC-laser when operated is monitored by the built-in thermistor

Data about the built-in TEC



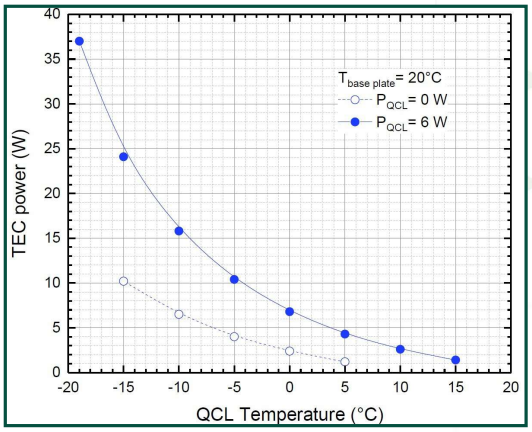
1

TEC current consumption as a function of the wanted QCL chip temperature for different base plate temperatures and for a QCL thermal load of 6 W.



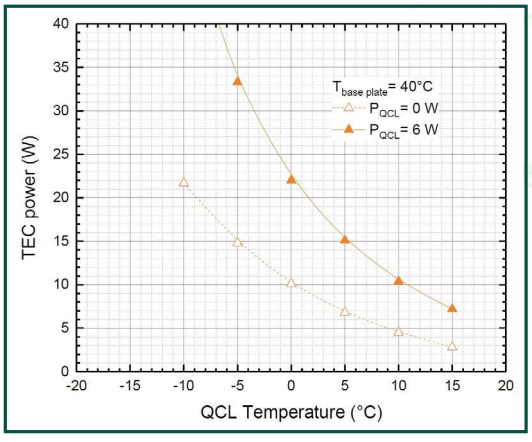
2

Current-voltage characteristics of the built-in TEC for different temperatures of the base plate.



3

Power consumption of the built-in TEC[1] as a function of the QCL chip temperature for a base plate temperature of +20°C, with and without a thermal load in the QCL.



4

Power consumption of the built-in TEC[1] as a function of the QCL chip temperature for a base plate temperature of +40°C, with and without a thermal load in the QCL.

1) The power of the TEC needs to be extracted through the base plate of the HHL, along with the power of the QCL. Typically, one needs to sum the power of the TEC and the power of the QCL to know how much thermal power must be dissipated in the heatsink.

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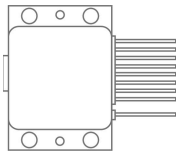


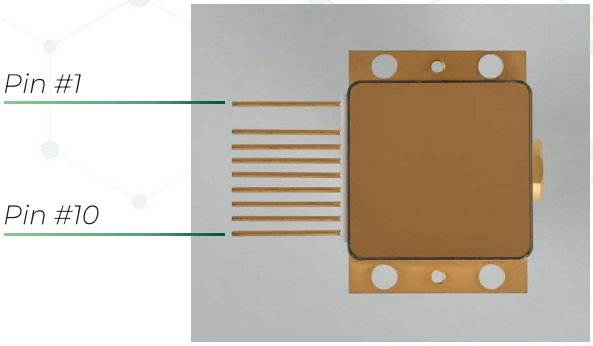
Electrical connections (pinout)

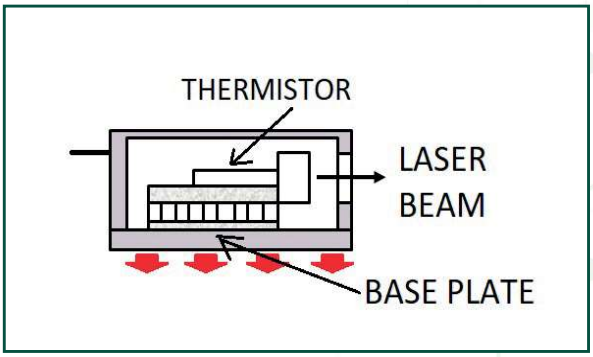
1	TEC (-)
2	no pin
3	Not connected
4	Thermistor (10kΩ)
5	Thermistor (10kΩ)
6	QCL (+)
7	QCL (-)
8	Not connected
9	Not connected
10	TEC (+)

If you are looking for a driver to control this laser (temperature and current), mirSense recommends the Arroyo Instruments and Wavelength Electronics brands.

The part numbers for Wavelength Electronics drivers are : QCL1000 OEM (for OEM chassis mount use) and QCL1000 LAB (for benchtop laboratory use).

The part numbers for Arroyo Instruments are the 6310-QCL controller and 262-06-06-DB9 mount for plug and play operation. Higher thermal capacity systems are available, please contact Arroyo Instruments for more details.





The above HHL-package diagram shows the built-in thermistor that monitors the laser chip temperature. The diagram also shows the base plate that dissipates the heat generated by the TEC and the laser chip.