

7.00 to 8.00 μm DFB Quantum Cascade Laser, 50 mW

QD7500HHLH



Description

The QD7500HHLH is a single spatial mode, single longitudinal mode, distributed feedback quantum cascade laser contained in a high heat load (HHL) package, designed and manufactured by Thorlabs. This laser is a serialized item: the optical characteristics of each serial-numbered device can be viewed on its serial-number-specific data sheet. QD7500HHLH lasers have a well-defined center wavelength between 7.00 and 8.00 μm and can be tuned over a narrow wavelength range.

The QD7500HHLH operates in continuous wave (CW) mode at room temperature. It has a collimated output and offers a standard HHL pinout for electrical and temperature control. This laser's package is sealed, although the seal is not hermetic. There is no monitor photodiode.

Specifications

Absolute Maximum Ratings ($T_{\text{chip}} = 20\text{ }^{\circ}\text{C}$, CW Operation)	
Absolute Max Operating Current	Varies Between Devices ^a
Absolute Max Output Power	300 mW
LD Reverse Voltage (Max)	1 V
PD Reverse Voltage (Max)	N/A
TEC Current (Max)	4.5 A
TEC Voltage (Max)	6.5 V
Operating Temperature	15 to 40 $^{\circ}\text{C}^{\text{b}}$
Storage Temperature	-40 to 85 $^{\circ}\text{C}^{\text{b}}$

- The absolute maximum current is determined on a device-by-device basis and is listed on the device's data sheet.
- Non-condensing environment. Single mode performance is tested and guaranteed at 20 $^{\circ}\text{C}$.

Thermistor Characteristics ($T_{\text{case}} = 25\text{ }^{\circ}\text{C}$)				
	Symbol	Min	Typical	Max
Thermistor Resistance ^a	R_{th}	-	10 k Ω	-
Steinhart-Hart Coefficients ($T_{\text{case}} = 25\text{ }^{\circ}\text{C}$)	A	-	$1.129 \times 10^{-3}\text{ K}^{-1}$	-
	B	-	$2.341 \times 10^{-4}\text{ K}^{-1}$	-
	C	-	$0.878 \times 10^{-7}\text{ K}^{-1}$	-

- Thermistor resistance follows the Steinhart-Hart equation:

$$\frac{1}{T} = A + B(\ln R_{\text{th}}) + C(\ln R_{\text{th}})^3$$

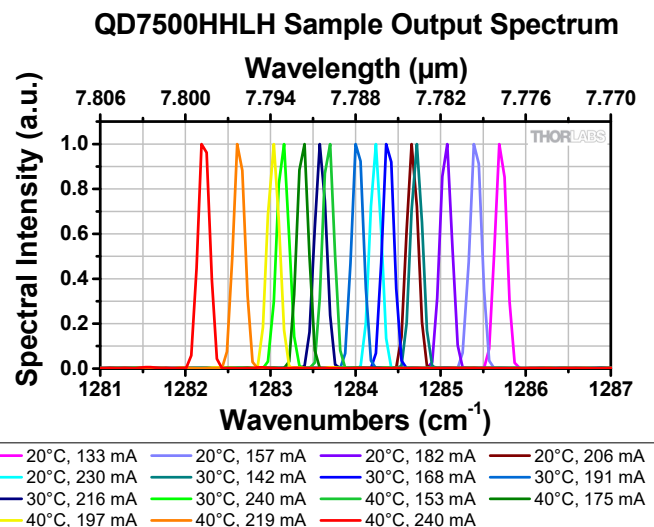
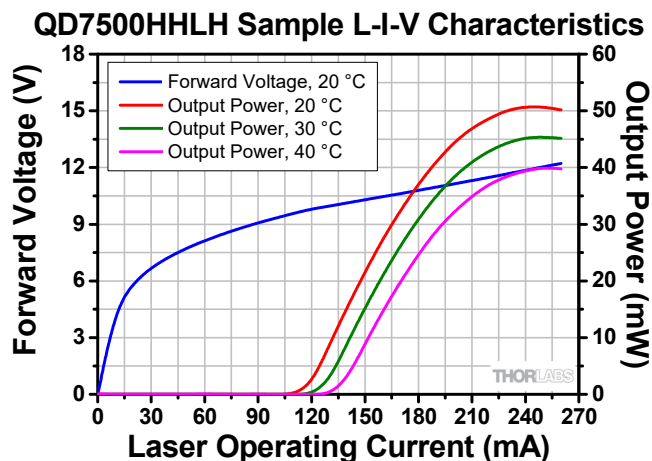


Specifications (Cont.)

Optical Electrical Characteristics ($T_{\text{chip}} = 20\text{ }^{\circ}\text{C}$, CW Operation)				
	Symbol	Min	Typical	Max
Center Wavelength	λ	7.00 μm	-	8.00 μm
Tuning Range	$\Delta\bar{\nu}$	-	3 cm^{-1}	-
Temperature Tuning	$\Delta\bar{\nu}/\Delta T$	-	-0.08 $\text{cm}^{-1}/^{\circ}\text{C}$	-
Side Mode Suppression	SMSR	20 dB	-	-
Optical Output Power	P_{out}	20 mW	50 mW	-
Operating Current	I_{op}	-	-	700 mA
Threshold Current	I_{th}	-	200 mA	-
Forward Voltage	V_F	-	12 V	-
Beam Pointing	Parallel ^a	-	-0.75 $^{\circ}$	0 $^{\circ}$
	Perpendicular ^a	-	-2.75 $^{\circ}$	-2.0 $^{\circ}$
Beam Divergence Angle (FWHM)	Parallel ^a	$\theta_{\parallel}$	3 mrad	6 mrad
	Perpendicular ^a	$\theta_{\perp}$	3 mrad	6 mrad
M^2	Parallel ^a	$M^2_{\parallel}$	1.0	1.1
	Perpendicular ^a	$M^2_{\perp}$	1.0	1.1
Minimum Beam Diameter (D4 σ Method) ^b	D	0.5 mm	1.5 mm	2.5 mm

- a. For this laser, these terms are defined with respect to the plane of the base plate.
b. Obtained by scanning a razor across the beam and measuring the points where 10% of the total beam intensity and 90% of the total beam intensity are observed.

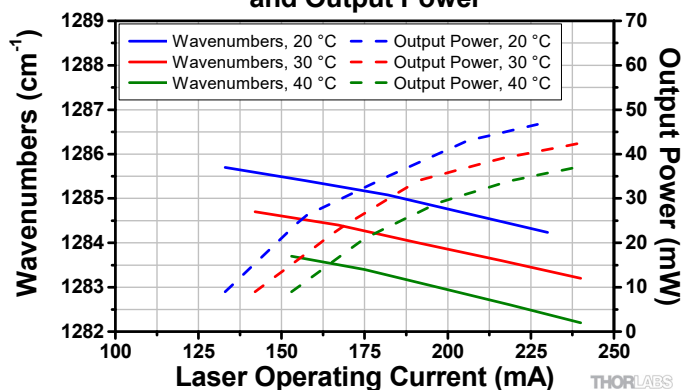
Sample Performance Plots



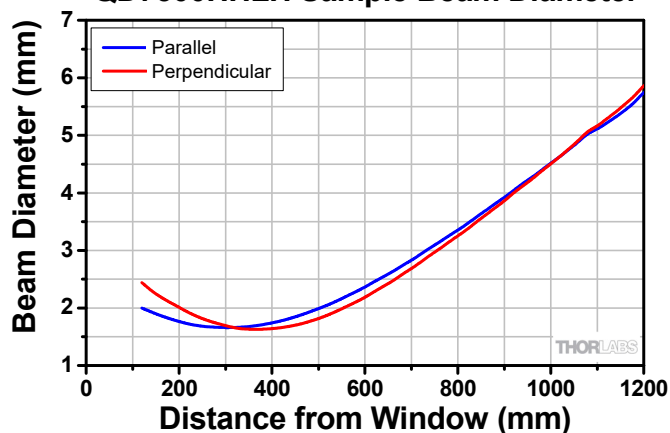
Note: The intensity has been normalized at each current step and is therefore not comparable between steps. The apparent linewidth is limited by the measurement resolution, which is 0.125 cm^{-1} (3.75 GHz).

Sample Performance Plots (Cont.)

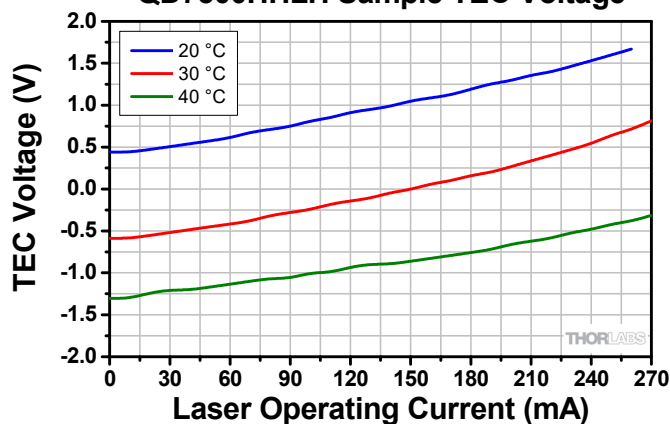
QD7500HHLH Sample Wavenumbers and Output Power



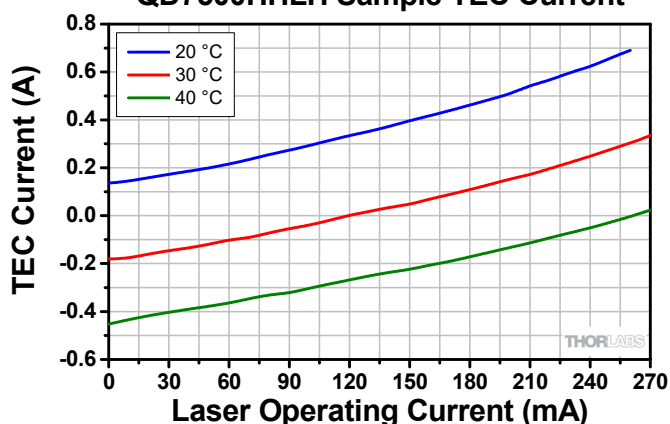
QD7500HHLH Sample Beam Diameter



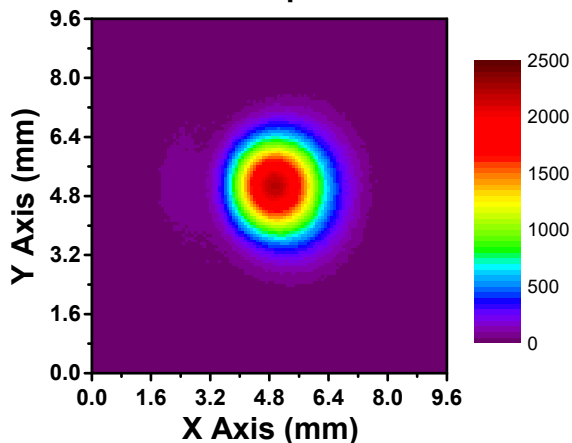
QD7500HHLH Sample TEC Voltage



QD7500HHLH Sample TEC Current

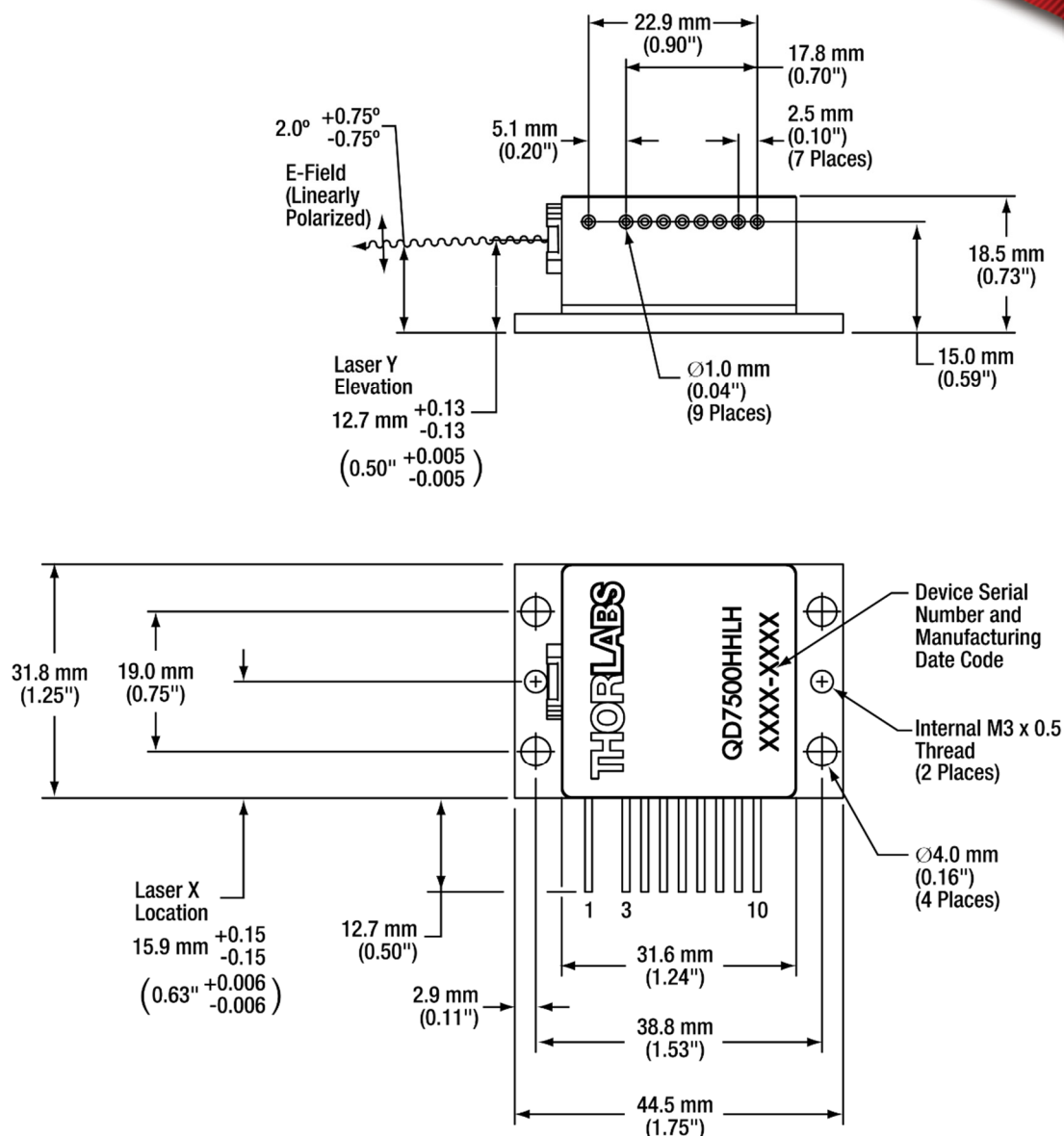


QD7500HHLH Sample Beam Profile



Note: The beam profile to the left was measured at a distance of 310 mm from the laser window with a pyroelectric camera that had 100 μm square pixels.

Drawing for QD7500HHLH



Pin	Description
1	TEC (-)
2	Not Present
3	No Connection
4	Laser Anode
5	TEC Control Thermistor, 10 k Ω
6	TEC Control Thermistor, 10 k Ω
7	Laser Cathode
8	No Connection
9	No Connection
10	TEC (+)