

4540 nm DFB Quantum Cascade Laser, 20 mW (Min)

QD4540HH



Description

The QD4540HH 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 operates in continuous wave (CW) mode at room temperature, and the lasing wavelength can be tuned across the wavelength of 4540 nm, making this laser ideal for Nitrous Oxide (N₂O) sensing.

The QD4540HH has a collimated output and offers a standard HHL pinout for electrical and temperature control. Its package is sealed, although the seal is not hermetic. There is no monitor photodiode.

Specifications

Absolute Maximum Ratings (T _{CHIP} = 20 °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 45 °C ^b
Storage Temperature	0 to 85 °C

- 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 at the target wavelength is guaranteed within this range, with individual operating conditions listed on the device datasheet.



Thermistor Characteristics (T _{CASE} = 25 °C)				
	Symbol	Min	Typical	Max
Thermistor Resistance ^a	R _{th}	-	10 kΩ	-
Steinhart-Hart Coefficients	A	-	1.129 × 10 ⁻³ K ⁻¹	-
	B	-	2.341 × 10 ⁻⁴ K ⁻¹	-
	C	-	0.878 × 10 ⁻⁷ K ⁻¹	-

- Thermistor resistance follows the Steinhart-Hart equation:

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

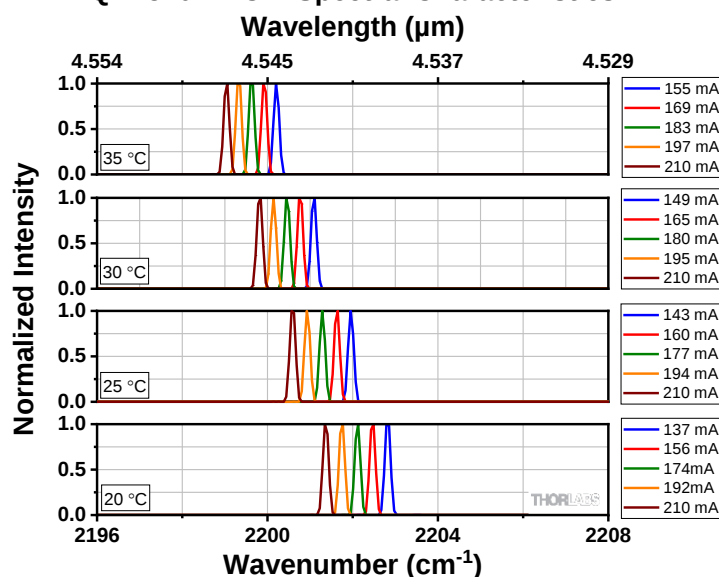
Specifications (Cont.)

Optical Electrical Characteristics (CW Operation)					
	Symbol	Min	Typical	Max	
Center Wavelength	λ	-	4.540 μm	-	
Operating Temperature	T_{op}	15 °C	-	45 °C	
Tuning Range ^a	$\Delta\bar{\nu}$	-	3 cm^{-1}	-	
Temperature Tuning	$\Delta\bar{\nu}/\Delta T$	-	-0.1 $\text{cm}^{-1}/^{\circ}\text{C}$	-	
Side Mode Suppression	SMSR	20 dB	-	-	
Optical Output Power	P_{out}	20 mW	70 mW	-	
Operating Current	I_{op}	-	150 mA	500 mA	
Threshold Current	I_{th}	-	100 mA	-	
Forward Voltage	V_F	-	11 V	15 V	
Beam Pointing	Parallel ^b	-	-0.75°	0°	+0.75°
	Perpendicular ^b	-	-2.75°	-2.0°	-1.25°
Beam Divergence Angle (FWHM)	Parallel ^b	$\theta_{\parallel}$	3 mrad	6 mrad	11 mrad
	Perpendicular ^b	$\theta_{\perp}$	3 mrad	6 mrad	11 mrad
M^2	Parallel ^b	$M^2_{\parallel}$	1.0	1.1	1.3
	Perpendicular ^b	$M^2_{\perp}$	1.0	1.1	1.3
Minimum Beam Diameter (D4 σ Method) ^c	D	0.5 mm	1.5 mm	2.5 mm	

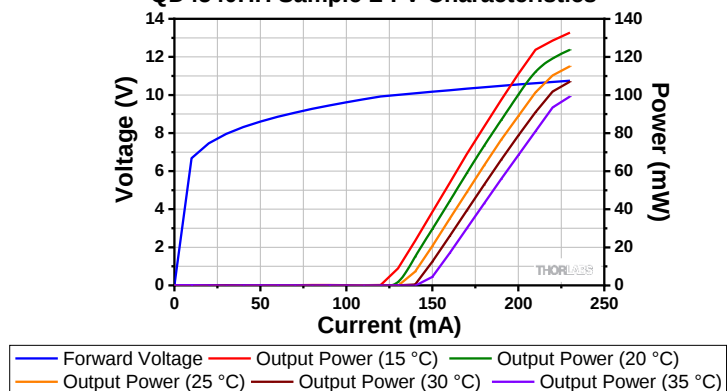
- a. Due to variations in the manufacturing process and operating parameters, the actual specification will vary.
b. For this laser, these terms are defined with respect to the plane of the base plate.
c. Obtained using a Mid-IR beam profiling camera.

Sample Performance Plots

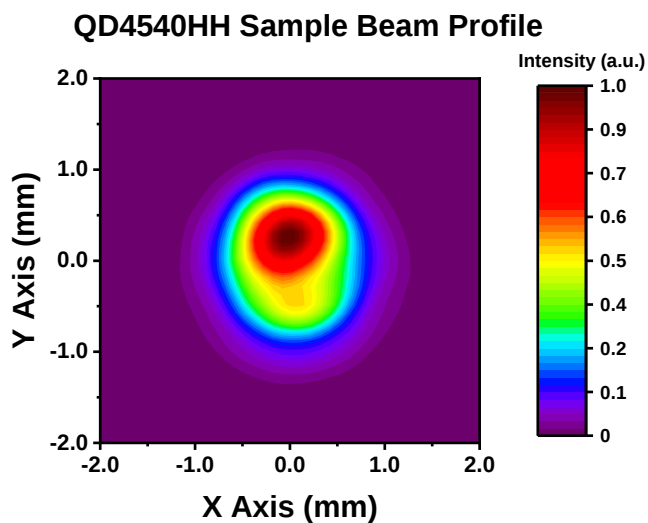
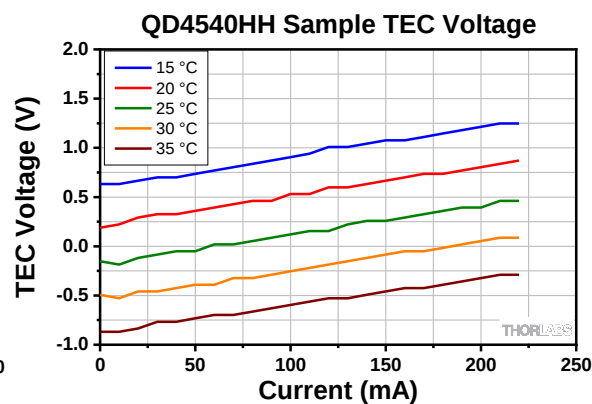
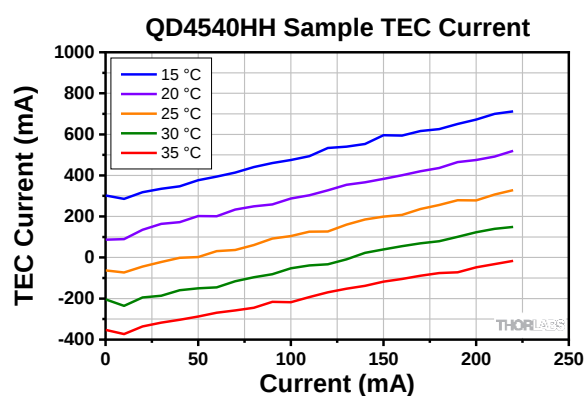
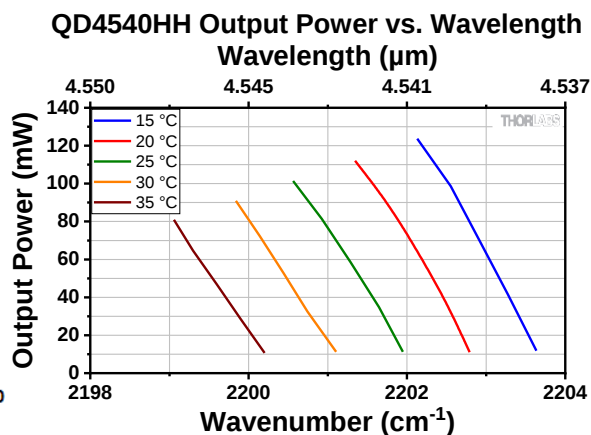
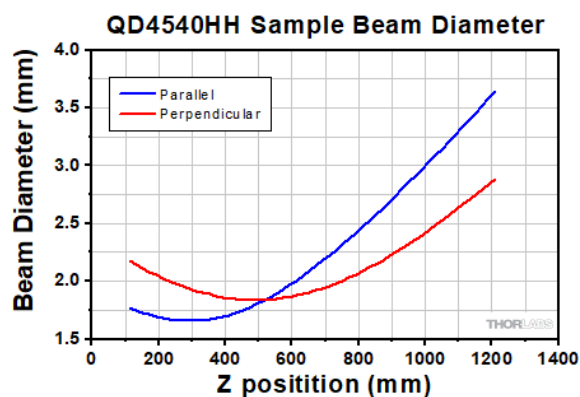
QD4540HH CW Spectral Characteristics



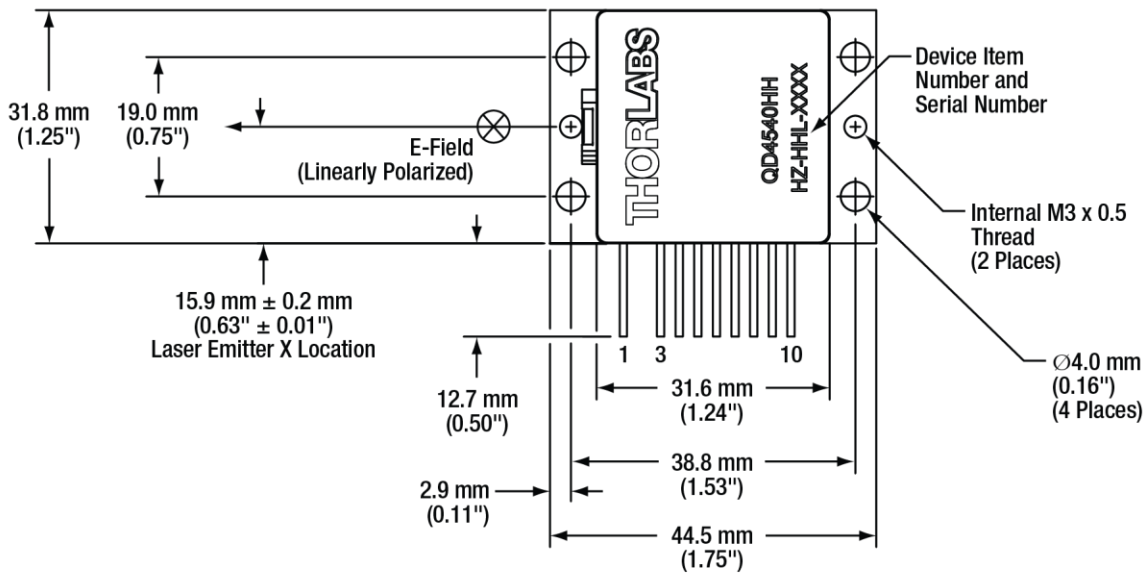
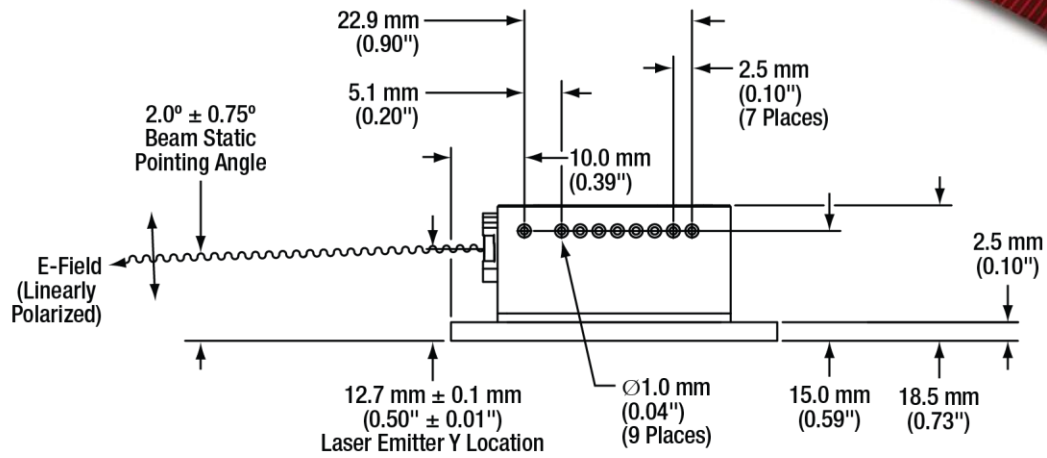
QD4540HH Sample L-I-V Characteristics



Sample Performance Plots (Cont.)



Drawings for QD4540HH



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