

## 4650 nm Fabry-Perot Quantum Cascade Laser, 1.5 W

QF4650HHLH



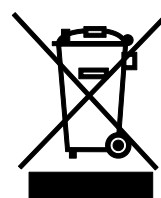
### Description

The QF4650HHLH is a single spatial mode, multi longitudinal mode, Fabry-Perot 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.

The QF4650HHLH 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 ( $T_{\text{chip}} = 25\text{ }^{\circ}\text{C}$ , CW Operation)	
Absolute Max Operating Current	Varies Between Devices <sup>a</sup>
Absolute Max Output Power	2.5 W
LD Reverse Voltage (Max)	1 V
PD Reverse Voltage (Max)	N/A
TEC Current (Max)	6 A
TEC Voltage (Max)	8.6 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 spatial mode performance is tested and guaranteed at 25  $^{\circ}\text{C}$ .

Thermistor Characteristics ( $T_{\text{case}} = 25\text{ }^{\circ}\text{C}$ )				
	Symbol	Min	Typical	Max
Thermistor Resistance <sup>a</sup>	$R_{\text{th}}$	-	10 k $\Omega$	-
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:

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

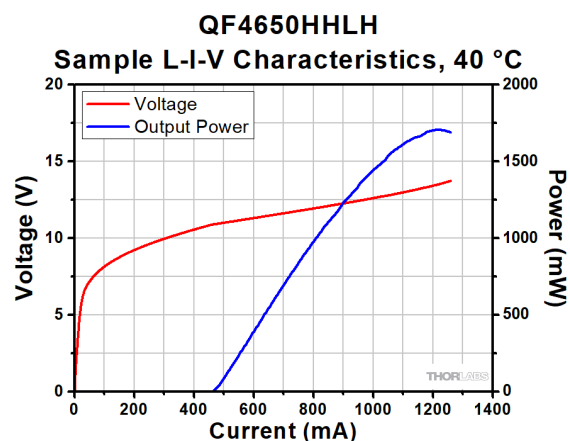
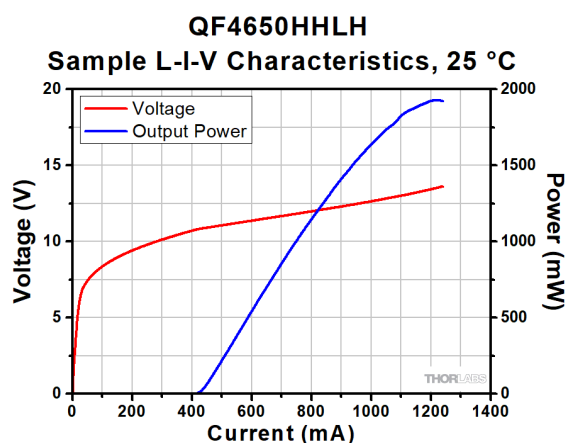
## Specifications (Cont.)

Optical Electrical Characteristics ( $T_{\text{chip}} = 25\text{ }^{\circ}\text{C}$ , CW Operation)				
	Symbol	Min	Typical	Max
Center Wavelength	$\lambda$	4.575 $\mu\text{m}$	4.65 $\mu\text{m}$	4.725 $\mu\text{m}$
Spectral Bandwidth (5 – 95% Integrated Power)	$\Delta\lambda$	-	60 nm	-
Optical Output Power	$P_{\text{out}}$	1.5 W	-	-
Operating Current	$I_{\text{op}}$	-	0.8 A	1.1 A
Threshold Current	$I_{\text{th}}$	-	0.4 A	-
Heat Load	-	-	-	70 W
Forward Voltage	$V_F$	-	12 V	15 V
Beam Pointing	Parallel <sup>a</sup>	-	-0.6 $^{\circ}$	0 $^{\circ}$
	Perpendicular <sup>a</sup>	-	-2.6 $^{\circ}$	-1.4 $^{\circ}$
Beam Divergence Angle (FWHM)	Parallel <sup>a</sup>	$\theta_{\parallel}$	3 mrad	6 mrad
	Perpendicular <sup>a</sup>	$\theta_{\perp}$	3 mrad	6 mrad
$M^2$	Parallel <sup>a</sup>	$M^2_{\parallel}$	1.0	1.1
	Perpendicular <sup>a</sup>	$M^2_{\perp}$	1.0	1.1
Minimum Beam Diameter (D4 $\sigma$ Method) <sup>b</sup>	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.

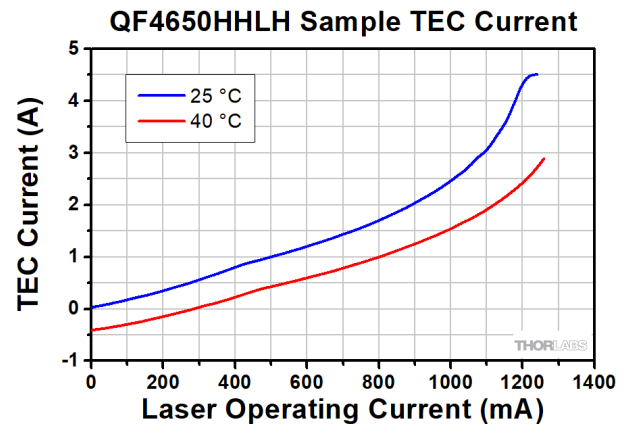
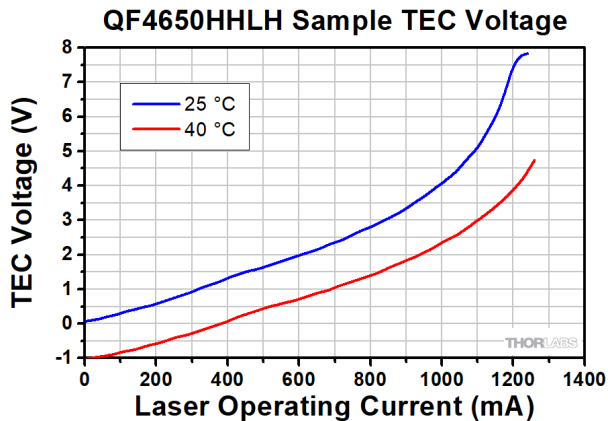
b. Obtained by scanning a razor across the beam and measuring the points where 10% of the total beam intensity and 90% of the total beam intensity are observed.

## Sample Performance Plots

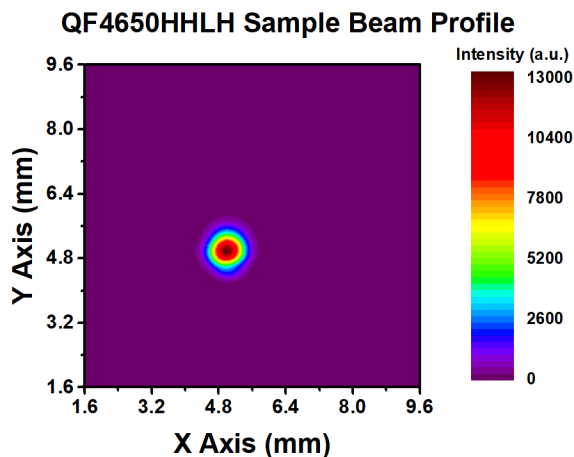
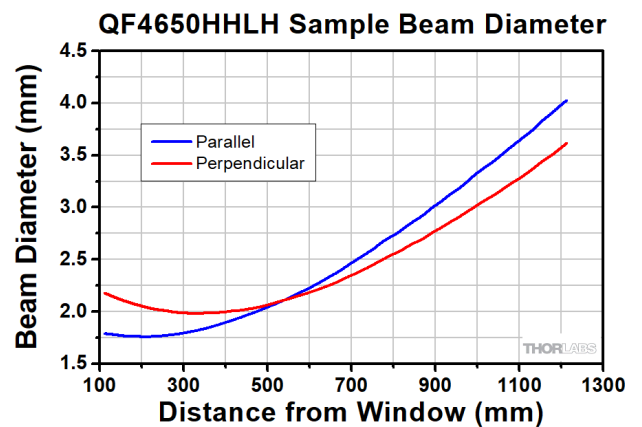
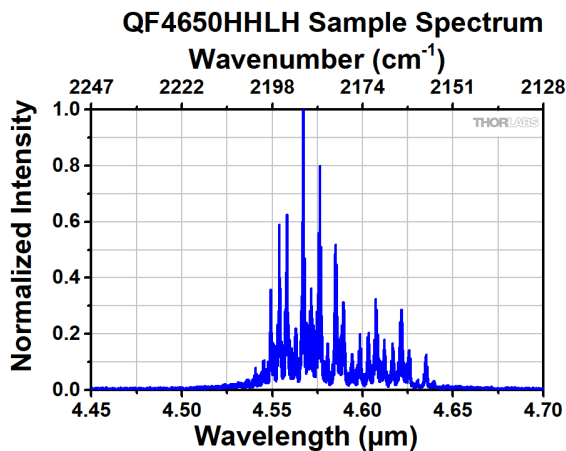


The temperatures given in the graph titles are for the chip.

## Sample Performance Plots (Cont.)

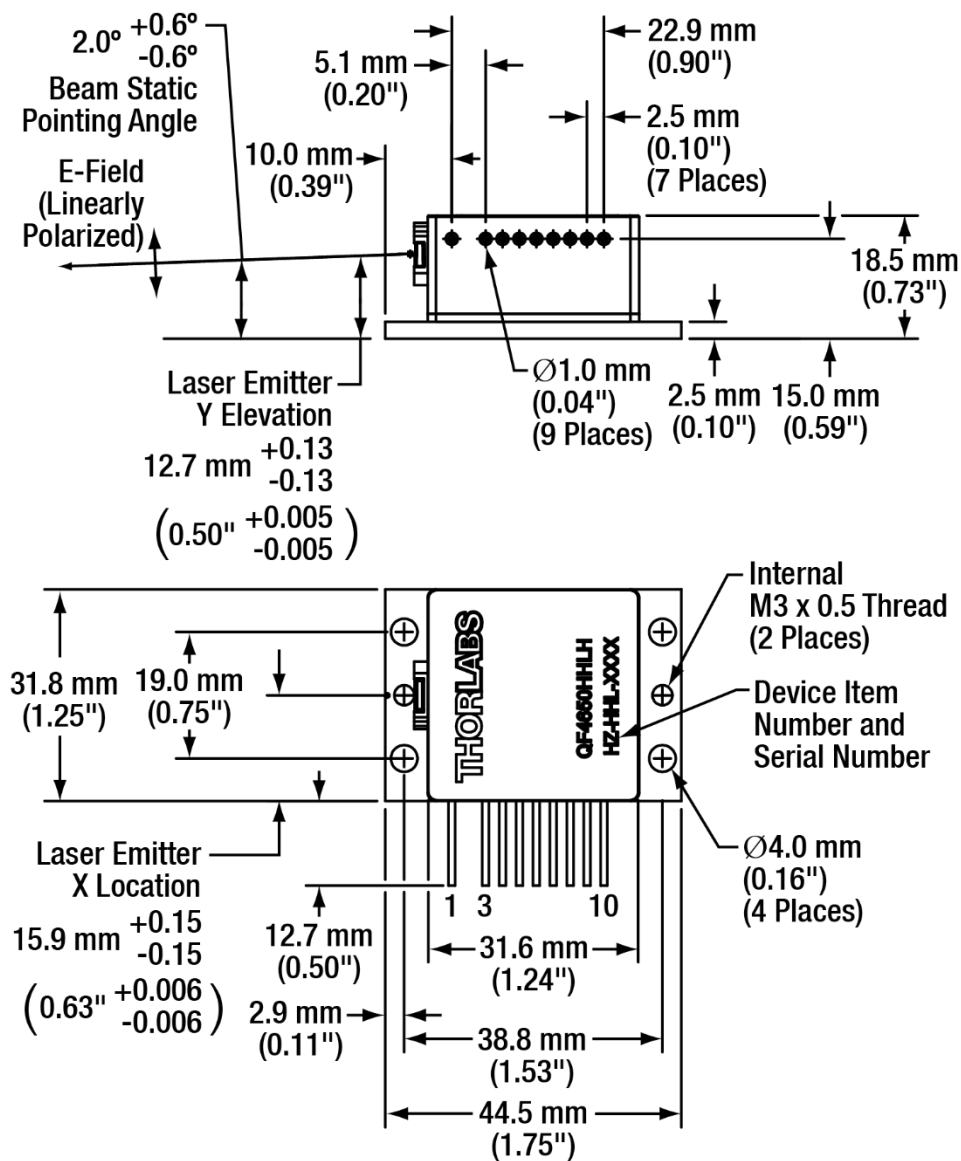


The data above is given at  $T_{CHIP}$ .



The beam profile was taken 310 mm from the sample.

## Drawing for QF4650HHLH



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