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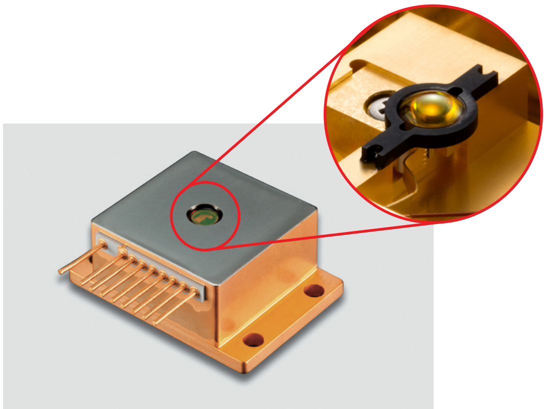
CW Quantum Cascade Laser L12006-1631H-E

Features

- Emission wavelength: 6.13 µm (Typ.)
- Output power: 20 mW (Min.)
- Built-in aspherical colimation lens eliminates the need for optical alignment
- Low-reflectivity beam exit window (ZnSe)

* Please contact a Hamamatsu sales office for the availability of the other wavelength above.



Applications

- Trace gas analysis (NO_2)

Outline

The lens integrated package for DFB-CW type QCL is sealed and collimated housing. Internal lens provides collimated output beam radiation. TEC (peltier) and thermistor for temperature stabilization of QCL-laser chip are inside the housing. The lens integrated package allows to use under good usability without beam alignment of invisible mid-infrared laser.

Absolute maximum rating

$T_{op(qcl)}$ =+20 °C, unless otherwise specified.

Characteristic	Symbol	Rating	Unit
Forward current *1)	$I_{f\,max}$	This product has individual difference.	A
Forward voltage *1)	$V_{f\,max}$	Confirm data sheet attached to a product *2)	V
Reverse voltage *1)	V_r	0.0	V
Rise time of forward current *3)	t_r	>400	µs
Fall time of forward current *4)	t_f	>400	µs
TEC current (cooling mode) *5)	I_c	+3.7	A
TEC current (heating mode) *5)		−1.5	A
TEC voltage	V_c	±13.0	V
Operating temperature (case) *6) *7)	$T_{op(c)}$	+10 to +60	°C
Operating temperature (QCL) *6) *8)	$T_{op(qcl)}$	+5 to +55	°C
Change speed of operating temperature *9)	-	10 *10)	°C/min
Storage temperature *6)	T_{stg}	−20 to +65	°C

*1) Confirm data sheet attached to a product. Sensitive to electrical surges and instability. Reverse current/voltage cause damage in laser specifications and out of warranty.
*2) Necessary specifications of power supply : I_f≥1.3 A, V_f≥16 V
*3) Rise time from sub-threshold to 90 % of the absolute maximum rating of ($I_{f\,max}$).
Using this product when rise time of forward current is faster than 400 µs from sub-threshold to 90 % of the absolute maximum rating of ($I_{f\,max}$) may cause serious and irreparable damage to this product.
*4) Fall time from 90 % of the absolute maximum rating of ($I_{f\,max}$) to sub-threshold.
Using this product when fall time of forward current is faster than 400 µs from 90 % of the absolute maximum rating of ($I_{f\,max}$) to sub-threshold may cause serious and irreparable damage to this product.
*5) Even if TEC current (Ic) is below the absolute maximum, insufficient heat dissipation from this product may cause damage in laser and TEC specifications and out of warranty. Especially there are possibilities of damage, degradation and less reliability when TEC is operated in heating mode since heated-up side (laser chip) is thermally isolated from case of package and ambience.
*6) Avoid water condensation.
*7) Temperatures of case (body) of HHL-package.
*8) Temperatures of QCL-laser when operated; should be monitored by the built-in thermistor for $T_{op(qcl)}$.
*9) Speed when changing the temperature ($T_{op(qcl)}$) controlled by the built-in TEC.
*10) In conditions of temperature range of the ($T_{op(qcl)}$) ≥5 °C.

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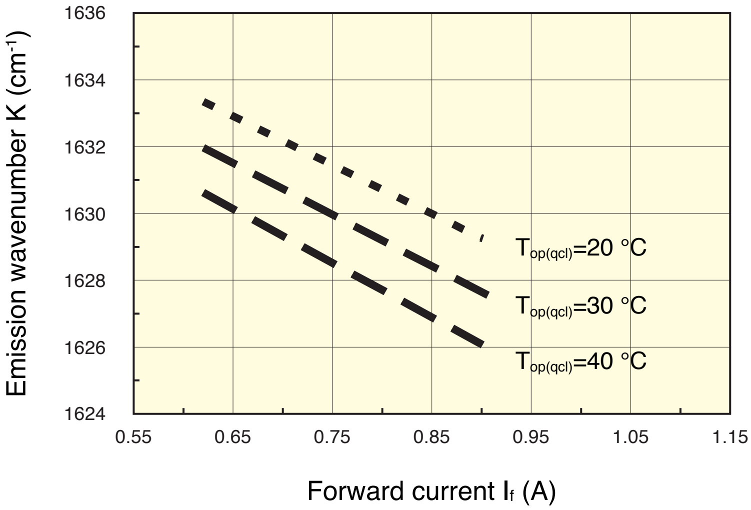
Specification (laser)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating temperature (QCL) *1)	$T_{op(qcl)}$	K *2)=1631 cm^{-1}	+10	-	+50	°C
Spectral linewidth *3)	ΔK_L	K *2)=1631 cm^{-1}	-	-	0.2 *4)	cm^{-1}
Wavenumber tuning range by forward current *5) *6)	ΔK_C	10 °C ≤ $T_{op(qcl)}$ ≤ 50 °C	±0.5	-	-	cm^{-1}
Wavenumber tuning range by operating temperature *5) *7)	ΔK_T	$I_{th} < I_f < I_{f\,max}$	±1.0	-	-	cm^{-1}
Radiant power	ϕ_e	K *2)=1631 cm^{-1}	20	-	-	mW
Threshold current	I_{th}	$T_{op(qcl)}$=+20 °C	-	-	1.0	A
Side mode suppression ratio	SMSR	$T_{op(qcl)}$=+20 °C	25 *4)	-	-	dB

*1) This product is able to emit the target wavenumber at a certain $T_{op(qcl)}$ within the specified temperature range.
*2) K: Emission wavenumber (cm^{-1})
*3) FWHM.
*4) These values are limited by resolution and signal-to-noise ratio of instrument when tested.
*5) Center of the tuning range is the emission wavenumber (K).
*6) At fixed $T_{op(qcl)}$ specified in the condition. Variable range of I_f for tuning: $I_{th} < I_f < I_{f\,max}$.
*7) At fixed I_f specified in the condition. Variable range of $T_{op(qcl)}$ for tuning: 10 °C ≤ $T_{op(qcl)}$ ≤ 50 °C.

Characteristics examples



Characteristic	Symbol	Condition	Typical value
Temperature coefficient of wavenumber *1)	δK_T	I_f fixed	–0.15 cm^{-1}/°C
Current coefficient of wavenumber *1)	δK_C	$T_{op(qcl)}$ fixed	–0.015 cm^{-1}/mA

*1) This product has individual difference. Confirm data sheet attached to a product.

TEC

Characteristic	Symbol	Condition	Specification
Maximum temperature difference	ΔT_{max}	T_h=27 °C, in N_2, Q_c=0, I_c=+3.7 A	>40 °C
Maximum heat pumping capacity	$Q_{c\,max}$	T_h= 27 °C, in N_2, I_c=+3.7 A, ΔT=0	>18 W
AC resistance	ACR	T_h=27 °C, I_c=0.1 mA, 1 kHz	2.0 Ω±0.4 Ω

Note) ΔT: Temperature difference
Q: Heat pumping capacity
I_c: TEC current
T_h: Temperature of TEC's hot side surface (TEC: cooling mode)

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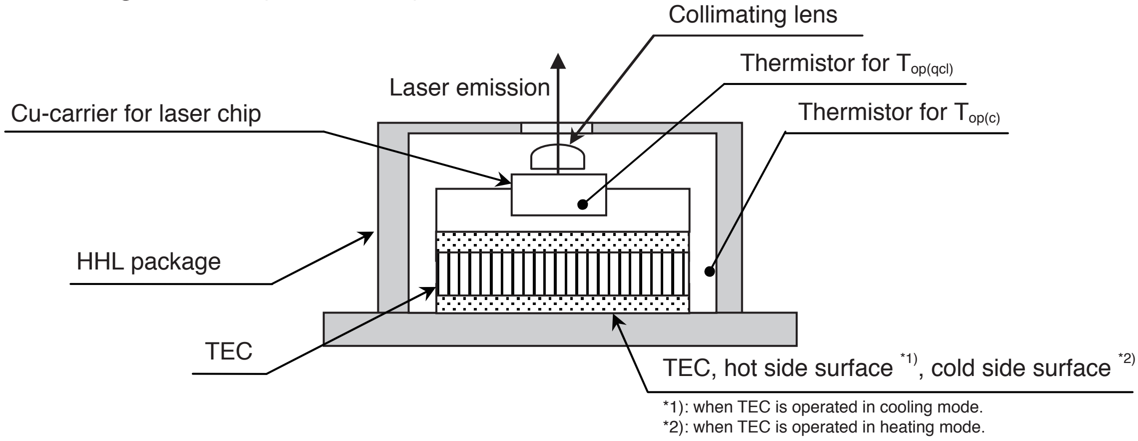
■Thermistor

Characteristic	Symbol	Condition	Specification
Resistance	R_{25}	25 °C	10 kΩ±2.5 %
Beta value	B	0 °C / 100 °C	3450 K

Note) Same specifications for both thermisters of $T_{op(qcl)}$ and $T_{op(c)}$.

■Thermistors configurations (schematic)



■Window of HHL package

Characteristic		Specification
Material		ZnSe, Plano-Plano
Dimension	Clear aperture *1)	ϕ4.4 mm
	Thickness	0.7 mm
Coating	Coating	BBAR, both surface

*1) Mechanical aperture of HHL package

■Output beam

Characteristic	Symbol	Condition	MIn.	Typ.	Max.	Unit
Beam spread angle *1) *2)	θ	$T_{op(qcl)}$=+20 °C	0	3	5	mrad
Beam waist position *1) *3)	Z_{w0}	$T_{op(qcl)}$=+20 °C	50	-	1000	mm
Beam waist width *1) *4)	w_0	$T_{op(qcl)}$=+20 °C	0.5	1.5	3	mm

*1) This product has individual difference. Confirm data sheet attached to a product.
*2) Half angle. Larger spread angle either vertical direction (vertical to pins of package) or horizontal direction (horizontal to pins of package).
*3) From package top surface.
*4) $1/e^2$ beam diameter.

■Necessary specifications of power supply for the laser (QCL)

Characteristic	Specification
Output current	≥1.3 A
Output voltage	≥16 V
Function	Surge protect
	Constant current control

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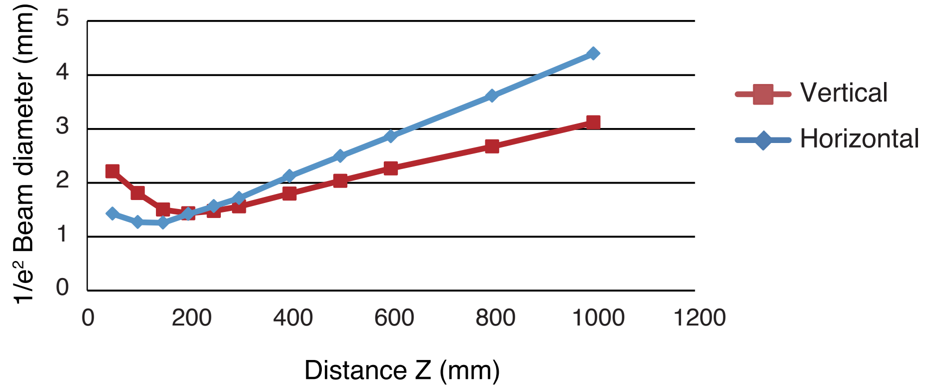
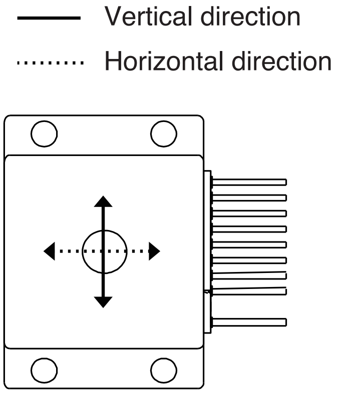
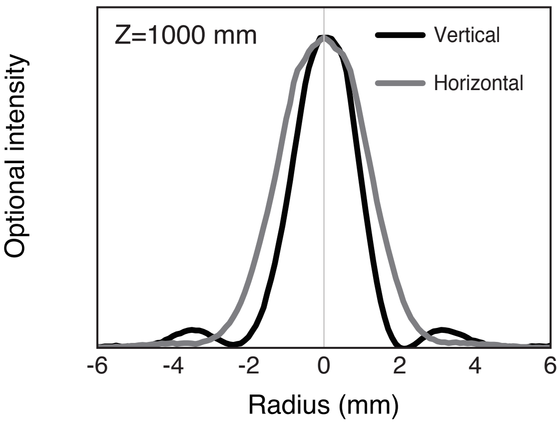
■Example of typical characteristics of beam divergence of output beam

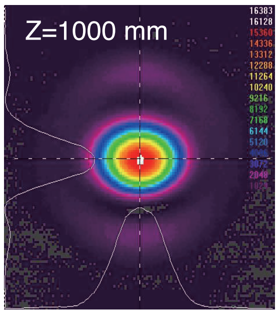




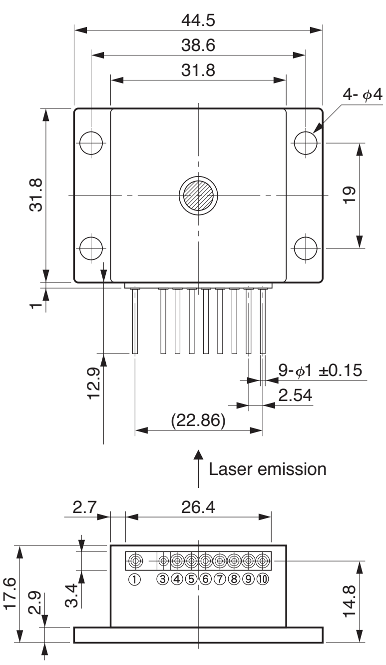
■Example of beam intensity distribution

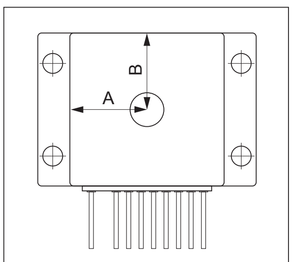


■Example of typical beam profile



■Dimensional outline (unit: mm)





Emitter location
A=B=16.0

*1)Tolerance: ±0.3 mm
(dimension without an indication)

Pin No. *2)	Function
①	TEC cathode (–)
③	N.C.
④	QCL anode (+)
⑤	Thermistor ($T_{op(qcl)}$)
⑥	Thermistor ($T_{op(qcl)}$)
⑦	QCL cathode (–)
⑧	Thermistor ($T_{op(c)}$)
⑨	Thermistor ($T_{op(c)}$)
⑩	TEC anode (+)

*2) Pin of ③ is electrically connected to the case; package body.
Other all pins are floating to the case.

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