

## Extended Tuning DFB Source

Alpes Lasers introduces a new class of Extended Tuning DFB, the QC-ET. These QC-ET use a dual current control to extend the mode-hop free tuning to more than 0.4% of the central wavelength ( $>6 \text{ cm}^{-1}$  at  $1270 \text{ cm}^{-1}$ ). While the first laser input allows direct intensity modulation in the same manner as standard DFB lasers, the integrated heater current  $I_T$  allows to offset the wavelength much faster than the temperature change of the heatsink temperature would do.

### Electro-optical Characteristics

QUANTITY	ACRONYM	MIN	TYP.	MAX	UNIT	NOTE
Average power	P	1	—	100	mW	1
Min power tuning range	MPTR	4	6.5	10	$\text{cm}^{-1}$	2
Duty cycle	DC	0	100	100	%	3
Central wavelength	CWL	2325	1270	1000	$\text{cm}^{-1}$	4
Laser current	$I_L$	50	400	600	mA	5
Tuning current	$I_T$	0	600	1000	mA	6
[Laser] Operation Temperature	$T_{\text{opt}}$	0	10	30	C	7
Operation Temperature	$T_{\text{op}}$	-55	15	30	C	8
Max tuning range @ 1kHz	T-1kHz	3	4	5	$\text{cm}^{-1}$	9
Max tuning range @ 10kHz	T-10kHz	1.5	2	2.5	$\text{cm}^{-1}$	10
Max tuning range @ 100kHz	T-100kHz	0.2	0.4	0.6	$\text{cm}^{-1}$	11
Electrical tuning bandwidth	ETB	2	5	10	kHz	12
Full tuning range	FTR	5	10	15	$\text{cm}^{-1}$	13
Full relative tuning range	FRTR	0.4	0.5	0.7	%	14
	Packaging	HHL	—	—	—	15
Package size LxWxH		33x45x19			$\text{mm}^3$	15
TEC current	TECI	1.5	2.0	3.0	A	16
TEC voltage	TECV	9.0	12.0	18.0	V	16
Heatsink cooling capacity	—	25	35	65	W	

### Key features

- Wavelength and power independent control
- Standard DFB tuning
- Extended tuning at constant heat-sink temperature

### Key benefits

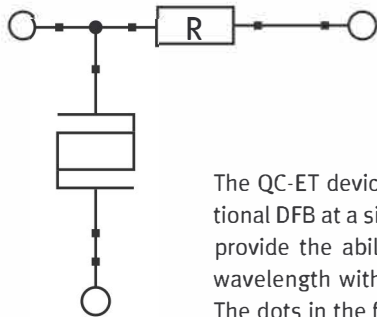
- Increased wavelength scanning span fully electrically (Increased electrical wavelength scan)
- Wavelength dither and ramps as in conventional DFB
- DFB wavelength reproducibility
- DFB linewidth and noise



CLASS 3B LASER PRODUCT

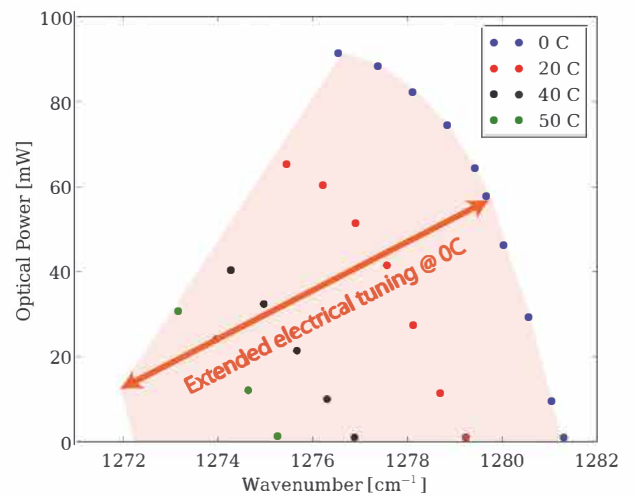
Data presented are valid across the spectral range where QC lasers can be manufactured and the typical values are given for a  $1275 \text{ cm}^{-1}$  laser. These specifications may be changed without further notice.

- Power varies due to the simultaneous change in laser current and wavelength control current necessary to access the full tuning range.
- The MPTR is defined as the attainable wavelength range in which the minimal power of 1 mW is obtained.
- The devices typically operate CW but any type of Laser current modulation is possible within the maximum ratings.
- The extended tuning technology can be applied at any QCL attainable wavelength, please enquire for the lead-time of your wavelength of choice. Presently devices at  $1275 \text{ cm}^{-1}$  are available at the indicated lead-time.
- The laser current is not changed compared to conventional DFB lasers.
- The electrical tuning current acts as a heat-sink heater control, any current below the max can be used.
- The laser operation temperature may be limited if the heatsinking conditions provided to the package are not sufficient. Higher temperatures are possible but the tuning range may be reduced.
- Operation at higher heat-sink temperatures may cause reduced laser performances.
- The T-1kHz is measured at constant laser current and with a heater modulation of 1 kHz and are given for a  $1275 \text{ cm}^{-1}$  laser.
- The T-10 kHz is measured at constant laser current and with a heater modulation of 10 kHz and are given for a  $1275 \text{ cm}^{-1}$  laser.
- The T-100 kHz is measured at constant laser current and with a heater modulation of 100 kHz and are given for a  $1275 \text{ cm}^{-1}$  laser.
- The ETB is the frequency at which the FM modulation obtained by the electrical tuning is reduced by 3dB.
- From the onset of lasing at  $T_{\text{op}}$  to the wavelength at max Laser ( $I_L$ ) and max Tuner ( $I_T$ ) current. This quantity strongly depends on wavelength as the tuning factor is proportional to the central wavelength. The values here are given for a device at  $1275 \text{ cm}^{-1}$ .
- The FRTR provides the proportionality between the FTR and the CWL with  $\text{FTR} = \text{CWL} \cdot \text{FRTR}$ . This value varies for individual devices according to min max specifications.
- Overall dimensions, excluding 20 mm pins. Other configurations may be adapted, please enquire.
- The typical values are obtained in nominal conditions, deviations to these conditions towards cooler environment will reduce the cooling requirement and increase them for higher temperature conditions. A heat dissipation capacity of 10 W/K is recommended to ensure the heatsink temperature does not degrade significantly the cooling capacity.



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The QC-ET devices provide a larger tuning than a conventional DFB at a single heat-sink temperature. These devices provide the ability to tune fully electrically the emission wavelength without changing the heat-sink temperature. The dots in the figure show the power at a given emission wavelength and heat-sink temperature for the device used as a conventional DFB i.e. without wavelength current tuning  $I_T$ . The shadowed area shows the attainable wavelength and power region for various tuner current ( $I_T$ ). This area is attainable without changing the heat-sink temperature, widely increasing the speed at which a region of the spectrum may be scanned. Using proper ramps for the laser and tuner current the whole region may be explored at once with speeds in the 100 Hz to kHz range.



Example of wide scanning of a  $N_2O$  gas cell, with fast  $I_T$  scans and independent  $I_T$  values.

