

Product Catalog for Near-IR Gas Analysis

VCSEL Solutions 1340 nm to 2050 nm



VCSEL diodes for near-IR Gas Analysis

- Wide tunability and precision for ppm or ppb sensitivity
- Low power dissipation enables cost effective handheld applications

- Applications for Industrial and Safety, Medical, Environmental and Agriculture, Automotive
- H₂O, H₂S, HCl, CO, CO₂, NH₃, CH₄, Hydrocarbons and many more

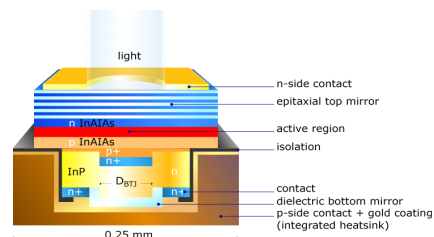
More information: www.vertilas.com

Gases H₂O, NH₃, H₂S, CH₄, CO, CO₂, HCl, and more



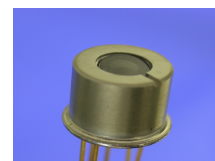
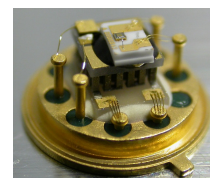
Single-mode VCSEL from 1340 nm to 2050 nm for sensing applications

Gases: H₂O, NH₃, H₂S, CH₄, CO, CO₂, HCl



Key Features

- Long wavelength single mode VCSEL for spectroscopy applications
- Available wavelengths range between 1340 nm and 2050 nm
- Operating temperature: -20 to +70 °C (max.)
- Wide tunability and wavelength accuracy
- Fast performance for current modulation
- Cooled and un-cooled versions available
- Various packaging options (TO, pigtail, hermetically sealed, etc.)
- Low power dissipation and low threshold voltage and current



Description

VERTILAS' long wavelength VCSEL technology offers a wide range of products for various applications applying spectroscopy and gas detection methodologies.

The product line offers several packaging options, ranging from open packages for prototyping to a hermetically sealed packaged with cap and anti reflective coated window. It also includes pigtail solutions and further customer specific options are available on request.

The high performance VERTILAS technology and products enable customers to design and manufacture spectroscopy solutions that offer high sensitivity, low power dissipation, small system size and cost effective manufacturing.

Applications

- Tunable diode laser absorption spectroscopy TDLS
- Near-IR gas analysis
- Safety
- Environmental measurements
- Agriculture and food storage
- Industrial and production control
- Test and measurement
- Consumer applications
- Automotive



Standard Wavelength Product Offering

Product No.	VL-xxxx-1-SE/ST/SQ-y
VL	VCSEL SM
1392 nm 1512 nm 1560 nm 1570 nm 1580 nm 1590 nm 1654 nm 1742 nm 1854 nm 2004 nm, 2012nm	VL-1392-1 VL-1512-1 VL-1560-1 VL-1570-1 VL-1580-1 VL-1590-1 VL-1654-1 VL-1742-1 VL-1854-1 VL-2004-1, VL-2012-1
SE ST SQ	Uncooled TO-46: SE Cooled TO-46: ST Cooled TO-39: SQ
Y (Package)	R4: TO-46, protective ring A4: TO-46, angled cap + window R5: TO-39, protective ring A5: TO-39, cap + angled window H4: TO-46 with SMF pigtail FC/APC

Application Specific Wavelengths
Please contact us.
We can manufacture wavelengths on demand.

Application Specific Packages
Please contact us.
We can offer various packages on demand.

Configuration and operating conditions

	Symbol	Min.	Typ	Max	Unit
Ambient operating case temperature					
SE, ST, SQ Pigtail H4	Top Top	-20 0	-	+70 +70	°C °C
Storage temperature					°C
SE, ST, SQ Pigtail H4	Tstg Tstg	-20 0	-	+80 +70	°C °C °C
Soldering temp.	Stemp	-	-	260	°C
Soldering time	Stime	-	-	3	sec
CW Current	Icw	-	8.0	9.0	mA
Reverse voltage	VR	-	-	1.0	V
Forward Voltage	VF	1.1	1.3	2.0	V

Soldering procedure: Do not use wave or reflow soldering. Solder one pin at a time. Allow for sufficient time (> 10s) for cooling between soldering of individual pins. Package must have thermal contact to heat sink. Use ESD protection and a grounded soldering iron.



VL-1392-1
SM VCSEL 1392 nm

For adjacent wavelengths $\pm 3\text{nm}$
please contact us.

Gases: H2O

Optical and electrical characteristics (T₀=25°C)

Parameter	Condition	Symbol	Units	Ratings		
				Min	Typ	Max
Current at Target Wavelength	1	I _{λ0}	mA	2.0		6.0
Temperature at Target Wavelength	1	T _{λ0}	°C	15		35
Optical Power at Target Wavelength	1	P _{λ0}	mW	0.2		1.2
Maximum Optical Power	T ₀ =25°C, I ≤ I _{max}	P _{max}	mW	0.4		1.5
Threshold Current	T ₀ =25°C	I _{th}	mA	0.4		2.0
Operating Voltage @ P _{max}	T ₀ =25°C	V _{max}	V			2.0
Absolute Maximum Current	T ₀ =25°C	I _{max}	mA			7.0
Current Tuning Coefficient	T ₀ =25°C, f=0Hz ²	Δλ/ΔI	nm/mA	0.2		0.9
Temperature Tuning Coefficient	T ₀ =25°C	Δλ/ΔT	nm/K	0.08		0.2
Maximum Slope Efficiency	T ₀ =25°C	ΔP/ΔI	mW/mA	0.05		0.3
Side Mode Suppression Ratio at Target Wavelength	transverse and polarisation modes	SMSR	dB	25		
Beam Divergence	T ₀ =25°C	FWHM	deg	10		25

Note 1: target wavelength is 1392nm

Spec_1392_V2.0.0

Note 2: higher modulation frequency will decrease tuning range, change <10% with f<10kHz

Packaging options and ordering information

Package Version	Description	Ordering Information
SE-R4	TO-46 with protective ring, uncooled	VL-1392-1-SE-R4
SE-A4	TO-46 with angled cap, AR coated window, uncooled	VL-1392-1-SE-A4
SQ-R5	TO-39 with protective ring, TEC/Thermistor	VL-1392-1-SQ-R5
SQ-A5	TO-39 with cap, AR coated window, TEC/Thermistor	VL-1392-1-SQ-A5
SE-H4	TO-46, SSMF pigtail with FC/APC, uncooled	VL-1392-1-SE-H4
ST-H4	TO-46, SSMF Pigtail with FC/APC, TEC/Thermistor	VL-1392-1-ST-H4

Non-hermetically sealed lasers with TEC: Do not operate at or below 15°C



VL-1512-1
SM VCSEL 1512 nm

For adjacent wavelengths $\pm 3\text{nm}$
please contact us.

Gases: NH₃

Optical and electrical characteristics (T₀=25°C)

Parameter	Condition	Symbol	Units	Ratings		
				Min	Typ	Max
Current at Target Wavelength	1	I _{λ0}	mA	2.0		7.5
Temperature at Target Wavelength	1	T _{λ0}	°C	15		35
Optical Power at Target Wavelength	1	P _{λ0}	mW	0.3		2.0
Maximum Optical Power	T ₀ =25°C, I ≤ I _{max}	P _{max}	mW	0.7		2.5
Threshold Current	T ₀ =25°C	I _{th}	mA	0.4		2.0
Operating Voltage @ P _{max}	T ₀ =25°C	V _{max}	V			2.0
Absolute Maximum Current	T ₀ =25°C	I _{max}	mA			8.0
Current Tuning Coefficient	T ₀ =25°C, f=0Hz ²	Δλ/ΔI	nm/mA	0.2		0.9
Temperature Tuning Coefficient	T ₀ =25°C	Δλ/ΔT	nm/K	0.08		0.2
Maximum Slope Efficiency	T ₀ =25°C	ΔP/ΔI	mW/mA	0.05		0.3
Side Mode Suppression Ratio at Target Wavelength	transverse and polarisation modes	SMSR	dB	25		
Beam Divergence	T ₀ =25°C	FWHM	deg	10		25

Note 1: target wavelength is 1512nm

Spec_1512_V2.0.0

Note 2: higher modulation frequency will decrease tuning range, change <10% with f<10kHz

Packaging options and ordering information

Package Version	Description	Ordering Information
SE-R4	TO-46 with protective ring, uncooled	VL-1512-1-SE-R4
SE-A4	TO-46 with angled cap, AR coated window, uncooled	VL-1512-1-SE-A4
SQ-R5	TO-39 with protective ring, TEC/Thermistor	VL-1512-1-SQ-R5
SQ-A5	TO-39 with cap, AR coated window, TEC/Thermistor	VL-1512-1-SQ-A5
SE-H4	TO-46, SSMF pigtail with FC/APC, uncooled	VL-1512-1-SE-H4
ST-H4	TO-46, SSMF Pigtail with FC/APC, TEC/Thermistor	VL-1512-1-ST-H4

Non-hermetically sealed lasers with TEC: Do not operate at or below 15°C



**VL-1550-1 nm, VL-1560-1 nm
VL-1570-1 nm, VL-1580-1 nm
VL-1590-1 nm**

For adjacent wavelengths ± 5 nm
please contact us.

**SM VCSEL 1550 nm, 1560 nm, 1570 nm, 1580 nm and 1590 nm
Gases: H₂S, CO₂, CO**

Optical and electrical characteristics (T₀=25 °C)

Parameter	Condition	Symbol	Units	Ratings		
				Min	Typ	Max
Current at Target Wavelength	1	I _{λ0}	mA	2.0		7.5
Temperature at Target Wavelength	1	T _{λ0}	°C	15		35
Optical Power at Target Wavelength	1	P _{λ0}	mW	0.3		2.0
Maximum Optical Power	T ₀ =25°C, I ≤ I _{max}	P _{max}	mW	0.7		2.5
Threshold Current	T ₀ =25°C	I _{th}	mA	0.4		2.0
Operating Voltage @ P _{max}	T ₀ =25°C	V _{max}	V			2.0
Absolute Maximum Current	T ₀ =25°C	I _{max}	mA			8.0
Current Tuning Coefficient	T ₀ =25°C, f=0Hz ²	Δλ/ΔI	nm/mA	0.2		0.9
Temperature Tuning Coefficient	T ₀ =25°C	Δλ/ΔT	nm/K	0.08		0.2
Maximum Slope Efficiency	T ₀ =25°C	ΔP/ΔI	mW/mA	0.05		0.3
Side Mode Suppression Ratio at Target Wavelength	transverse and polarisation modes	SMSR	dB	25		
Beam Divergence	T ₀ =25°C	FWHM	deg	10		25

Note 1: target wavelength is 1580nm

Spec_1580_V2.0.0

Note 2: higher modulation frequency will decrease tuning range, change <10% with f<10kHz

Packaging options and ordering information

Package Version	Description	Ordering Information
SE-R4	TO-46 with protective ring, uncooled	VL-15xx-1-SE-R4
SE-A4	TO-46 with angled cap, AR coated window, uncooled	VL-15xx-1-SE-A4
SQ-R5	TO-39 with protective ring, TEC/Thermistor	VL-15xx-1-SQ-R5
SQ-A5	TO-39 with cap, AR coated window, TEC/Thermistor	VL-15xx-1-SQ-A5
SE-H4	TO-46, SSMF pigtail with FC/APC, uncooled	VL-15xx-1-SE-H4
ST-H4	TO-46, SSMF Pigtail with FC/APC, TEC/Thermistor	VL-15xx-1-ST-H4
		xx = 50, 60, 70, 80 or 90

Non-hermetically sealed lasers with TEC: Do not operate at or below 15°C



VL-1654-1
SM VCSEL 1654 nm

For adjacent wavelengths $\pm 5\text{nm}$
please contact us.

Gases: CH₄

Optical and electrical characteristics (T₀=25°C)

Parameter	Condition	Symbol	Units	Ratings		
				Min	Typ	Max
Current at Target Wavelength	1	I _{λ0}	mA	2.0		6.0
Temperature at Target Wavelength	1	T _{λ0}	°C	15		35
Optical Power at Target Wavelength	1	P _{λ0}	mW	0.2		1.2
Maximum Optical Power	T ₀ =25°C, I ≤ I _{max}	P _{max}	mW	0.4		1.5
Threshold Current	T ₀ =25°C	I _{th}	mA	0.4		2.0
Operating Voltage @ P _{max}	T ₀ =25°C	V _{max}	V			2.0
Absolute Maximum Current	T ₀ =25°C	I _{max}	mA			7.0
Current Tuning Coefficient	T ₀ =25°C, f=0Hz ²	Δλ/ΔI	nm/mA	0.2		0.9
Temperature Tuning Coefficient	T ₀ =25°C	Δλ/ΔT	nm/K	0.08		0.2
Maximum Slope Efficiency	T ₀ =25°C	ΔP/ΔI	mW/mA	0.05		0.3
Side Mode Suppression Ratio at Target Wavelength	transverse and polarisation modes	SMSR	dB	25		
Beam Divergence	T ₀ =25°C	FWHM	deg	10		30

Note 1: target wavelength is 1654nm

Spec_1654_V2.0.0

Note 2: higher modulation frequency will decrease tuning range, change <10% with f<10kHz

Packaging options and ordering information

Package Version	Description	Ordering Information
SE-R4	TO-46 with protective ring, uncooled	VL-1654-1-SE-R4
SE-A4	TO-46 with angled cap, AR coated window, uncooled	VL-1654-1-SE-A4
SQ-R5	TO-39 with protective ring, TEC/Thermistor	VL-1654-1-SQ-R5
SQ-A5	TO-39 with cap, AR coated window, TEC/Thermistor	VL-1654-1-SQ-A5
SE-H4	TO-46, SSMF pigtail with FC/APC, uncooled	VL-1654-1-SE-H4
ST-H4	TO-46, SSMF Pigtail with FC/APC, TEC/Thermistor	VL-1654-1-ST-H4

Non-hermetically sealed lasers with TEC: Do not operate at or below 15°C



**VL-1742-1
SM VCSEL 1742 nm**

For adjacent wavelengths $\pm 5\text{nm}$
please contact us.

Gases: HCl

Optical and electrical characteristics (To=25°C)

Parameter	Condition	Symbol	Units	Ratings		
				Min	Typ	Max
Current at Target Wavelength	1	$I_{\lambda 0}$	mA	2.0		6.0
Temperature at Target Wavelength	1	$T_{\lambda 0}$	°C	15		35
Optical Power at Target Wavelength	1	$P_{\lambda 0}$	mW	0.1		0.8
Maximum Optical Power	$T_0=25^\circ\text{C}, I \leq I_{\text{max}}$	P_{max}	mW	0.2		1.0
Threshold Current	$T_0=25^\circ\text{C}$	I_{th}	mA	0.4		2.0
Operating Voltage @ P_{max}	$T_0=25^\circ\text{C}$	V_{max}	V			2.0
Absolute Maximum Current	$T_0=25^\circ\text{C}$	I_{max}	mA			7.0
Current Tuning Coefficient	$T_0=25^\circ\text{C}, f=0\text{Hz}^2$	$\Delta\lambda/\Delta I$	nm/mA	0.2		0.9
Temperature Tuning Coefficient	$T_0=25^\circ\text{C}$	$\Delta\lambda/\Delta T$	nm/K	0.08		0.2
Maximum Slope Efficiency	$T_0=25^\circ\text{C}$	$\Delta P/\Delta I$	mW/mA	0.05		0.3
Side Mode Suppression Ratio at Target Wavelength	transverse and polarisation modes	SMSR	dB	25		
Beam Divergence	$T_0=25^\circ\text{C}$	FWHM	deg	10		30

Note 1: target wavelength is 1742nm

Spec_1742_V2.0.0

Note 2: higher modulation frequency will decrease tuning range, change <10% with $f < 10\text{kHz}$

Packaging options and ordering information

Package Version	Description	Ordering Information
SE-R4	TO-46 with protective ring, uncooled	VL-1742-1-SE-R4
SE-A4	TO-46 with angled cap, AR coated window, uncooled	VL-1742-1-SE-A4
SQ-R5	TO-39 with protective ring, TEC/Thermistor	VL-1742-1-SQ-R5
SQ-A5	TO-39 with cap, AR coated window, TEC/Thermistor	VL-1742-1-SQ-A5
SE-H4	TO-46, SSMF pigtail with FC/APC, uncooled	VL-1742-1-SE-H4
ST-H4	TO-46, SSMF Pigtail with FC/APC, TEC/Thermistor	VL-1742-1-ST-H4

Non-hermetically sealed lasers with TEC: Do not operate at or below 15°C



**VL-1854-1
SM VCSEL 1854 nm**

For adjacent wavelengths $\pm 5\text{nm}$
please contact us.

Gases: H2O

Optical and electrical characteristics (T₀=25°C)

Parameter	Condition	Symbol	Units	Ratings		
				Min	Typ	Max
Current at Target Wavelength	1	I _{λ0}	mA	2.0		6.0
Temperature at Target Wavelength	1	T _{λ0}	°C	15		35
Optical Power at Target Wavelength	1	P _{λ0}	mW	0.1		0.8
Maximum Optical Power	T ₀ =25°C, I ≤ I _{max}	P _{max}	mW	0.2		1.0
Threshold Current	T ₀ =25°C	I _{th}	mA	0.4		2.0
Operating Voltage @ P _{max}	T ₀ =25°C	V _{max}	V			2.0
Absolute Maximum Current	T ₀ =25°C	I _{max}	mA			7.0
Current Tuning Coefficient	T ₀ =25°C, f=0Hz ²	Δλ/ΔI	nm/mA	0.2		0.9
Temperature Tuning Coefficient	T ₀ =25°C	Δλ/ΔT	nm/K	0.08		0.2
Maximum Slope Efficiency	T ₀ =25°C	ΔP/ΔI	mW/mA	0.05		0.3
Side Mode Suppression Ratio at Target Wavelength	transverse and polarisation modes	SMSR	dB	25		
Beam Divergence	T ₀ =25°C	FWHM	deg	10		30

Note 1: target wavelength is 1854nm

Spec_1854_V2.0.0

Note 2: higher modulation frequency will decrease tuning range, change <10% with f<10kHz

Packaging options and ordering information

Package Version	Description	Ordering Information
SE-R4	TO-46 with protective ring, uncooled	VL-1854-1-SE-R4
SE-A4	TO-46 with angled cap, AR coated window, uncooled	VL-1854-1-SE-A4
SQ-R5	TO-39 with protective ring, TEC/Thermistor	VL-1854-1-SQ-R5
SQ-A5	TO-39 with cap, AR coated window, TEC/Thermistor	VL-1854-1-SQ-A5
SE-H4	TO-46, SSMF pigtail with FC/APC, uncooled	VL-1854-1-SE-H4
ST-H4	TO-46, SSMF Pigtail with FC/APC, TEC/Thermistor	VL-1854-1-ST-H4

Non-hermetically sealed lasers with TEC: Do not operate at or below 15°C



**VL-2004-1 and VL-2012-1
SM VCSEL 2004 nm and 2012 nm**

For adjacent wavelengths ± 5 nm
please contact us.

Gases: CO₂

Optical and electrical characteristics (T₀=25 °C)

Parameter	Condition	Symbol	Units	Ratings		
				Min	Typ	Max
Current at Target Wavelength	1	I _{λ0}	mA	2.0		6.0
Temperature at Target Wavelength	1	T _{λ0}	°C	15		35
Optical Power at Target Wavelength	1	P _{λ0}	mW	0.1		0.8
Maximum Optical Power	T ₀ =25°C, I ≤ I _{max}	P _{max}	mW	0.15		1.0
Threshold Current	T ₀ =25°C	I _{th}	mA	0.4		2.0
Operating Voltage @ P _{max}	T ₀ =25°C	V _{max}	V			2.0
Absolute Maximum Current	T ₀ =25°C	I _{max}	mA			7.0
Current Tuning Coefficient	T ₀ =25°C, f=0Hz ²	Δλ/ΔI	nm/mA	0.2		0.9
Temperature Tuning Coefficient	T ₀ =25°C	Δλ/ΔT	nm/K	0.08		0.2
Maximum Slope Efficiency	T ₀ =25°C	ΔP/ΔI	mW/mA	0.05		0.3
Side Mode Suppression Ratio at Target Wavelength	transverse and polarisation modes	SMSR	dB	25		
Beam Divergence	T ₀ =25°C	FWHM	deg	10		30

Note 1: target wavelength is 2004nm

Spec_2004_V2.0.0

Note 2: higher modulation frequency will decrease tuning range, change <10% with f<10kHz

Packaging options and ordering information

Package Version	Description	Ordering Information
SE-R4	TO-46 with protective ring, uncooled	VL-20xx-1-SE-R4
SE-A4	TO-46 with angled cap, AR coated window, uncooled	VL-20xx-1-SE-A4
SQ-R5	TO-39 with protective ring, TEC/Thermistor	VL-20xx-1-SQ-R5
SQ-A5	TO-39 with cap, AR coated window, TEC/Thermistor	VL-20xx-1-SQ-A5
SE-H4	TO-46, SSMF pigtail with FC/APC, uncooled	VL-20xx-1-SE-H4
ST-H4	TO-46, SSMF Pigtail with FC/APC, TEC/Thermistor	VL-20xx-1-ST-H4
		xx = 04 or 12



General notes and recommendations

- This product is a class 1 laser product and emits invisible laser radiation. Do not expose eyes to this laser beam, as it may be harmful to the eye.
- Do not operate or store this product beyond the specified operating or storage conditions. Doing so may damage the product and VERTILAS does not assume any responsibility or warranty in this case.
- Any product that is supplied in a non-hermetically sealed package is subject to limited warranty. A non-hermetically sealed VCSEL is potentially exposed to hazardous conditions, such as moisture, gases, physical damage, in the customer application, that may damage the product or alter its performance. VERTILAS does not assume responsibility in this case.
- Handle and operate this product with care. VCSEL products are sensitive, and can be easily damaged, e.g. by electro-static discharge, supply power peaks, signal peaks, overload and other operating or storage conditions. Failing to prevent these conditions may damage the product and VERTILAS does not assume any responsibility or warranty in this case.
- This specification is subject to change without prior notification. The information is believed to be correct and accurate at the time of printing. However, VERTILAS does not take responsibility for omissions or inaccuracies.
- VERTILAS general terms and conditions apply. They can be viewed on the VERTILAS website at www.vertilas.com or we can send them on request.



www.vertilas.com

