Single Mode and Multi Mode Long Wavelength VCSELs for Optical Communications and Sensing

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High Power 1.3 µm 2D VCSEL Arrays

VERTILAS – 20 Years of VCSEL Innovation

Leading supplier of lw VCSELs
(**V**ertical **C**avity **S**urface **E**mitting **L**asers)

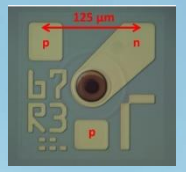
World Wide
Customer Base

Garching
(near Munich),
Germany

Founded in 2001

QMS ISO9001

Spin-Out from
TUM/WSI



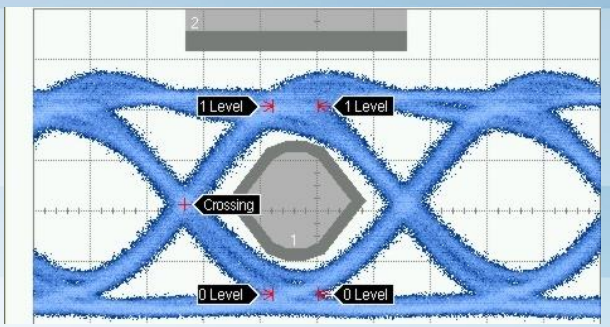
Markets for Single Mode Long Wavelength VCSELs

Optical Communications

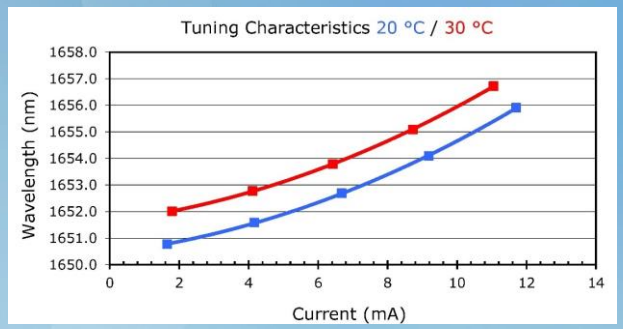
NIR VCSEL

NIR Sensing TDLS

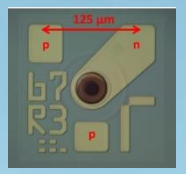
(Tunable Diode Laser Spectroscopy)



10G to 40G VCSELs
1.3 µm to 1.6 µm, O-, C-, L-Band



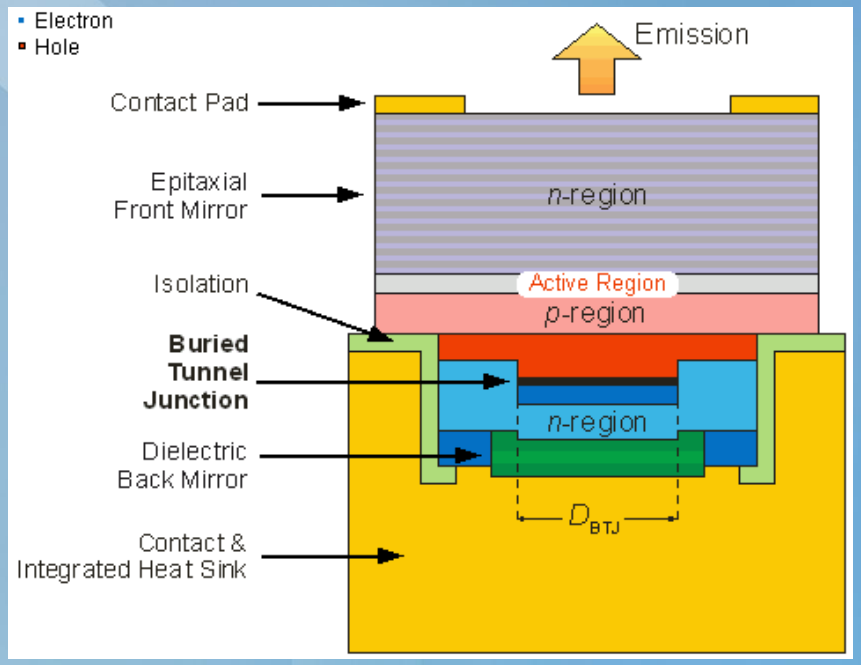
Tunable Lasers
1.3 µm to 2.3 µm



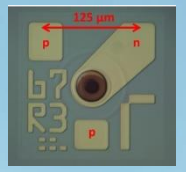
Vertilas InP BTJ VCSEL

InP Technology

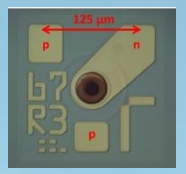
- Same III-V material as DFB
- Passed 25000 hrs accelerated aging
- Current confinement by BTJ (not oxide)
- Robust MBE manufacturing
- Wafer level testing
- Circular Gaussian beam profile



Wavelengths: 1,3 µm to 2.3 µm



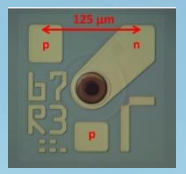
LW InP 2D VCSEL Arrays for 3D Sensing: 1.27 µm to 2 µm



3D Sensing and LW VCSEL Arrays

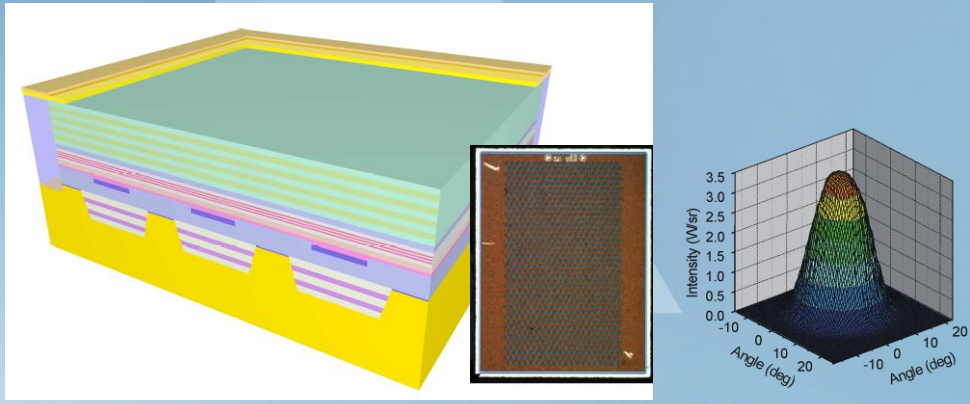
- Target applications
  - Illumination
  - Health care
  - Building Automation
  - Robotics
  - AR/VR
  - Automotive (e.g. LiDAR)
  - Consumer electronics

- Application Scenarios / Requirement for LW VCSEL Arrays
  - Eye safety
  - Reduced sunlight interference
  - Special applications / markets requiring wavelengths > 1 µm

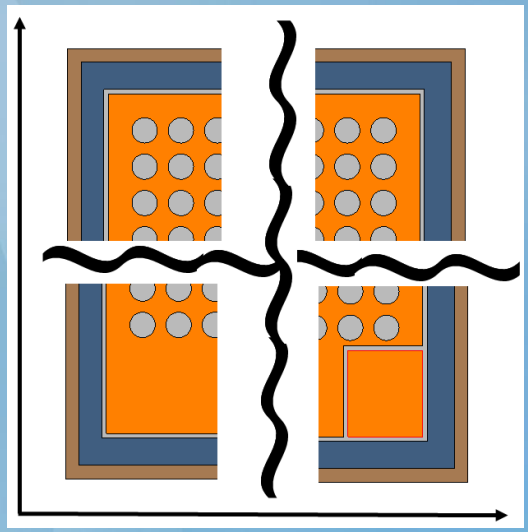


Flexible Technology Platform 2D-Arrays

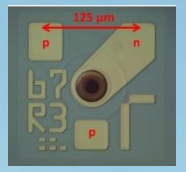
2D Array Cross Section



e.g. 20 x 40 2D Array

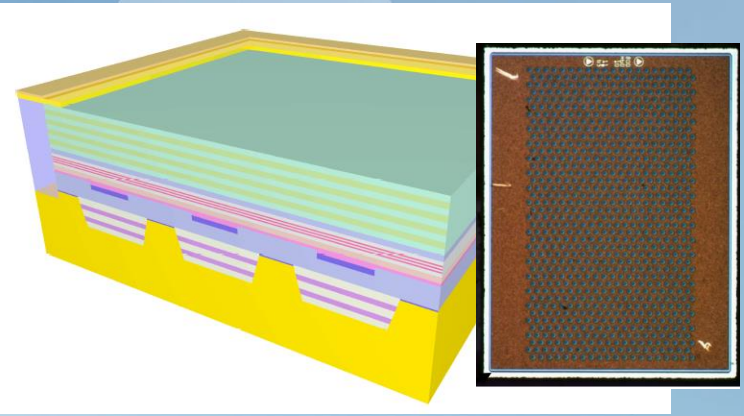


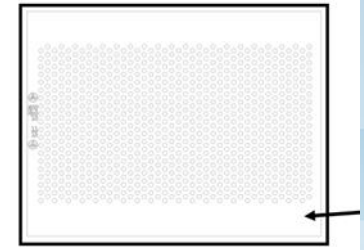
- Array size can be optimized depending on trade off wall plug efficiency vs optical power
- Configurations: SM or MM, # of emitters, pitch, layout



800 Emitter 1.3 µm 2D VCSEL Array

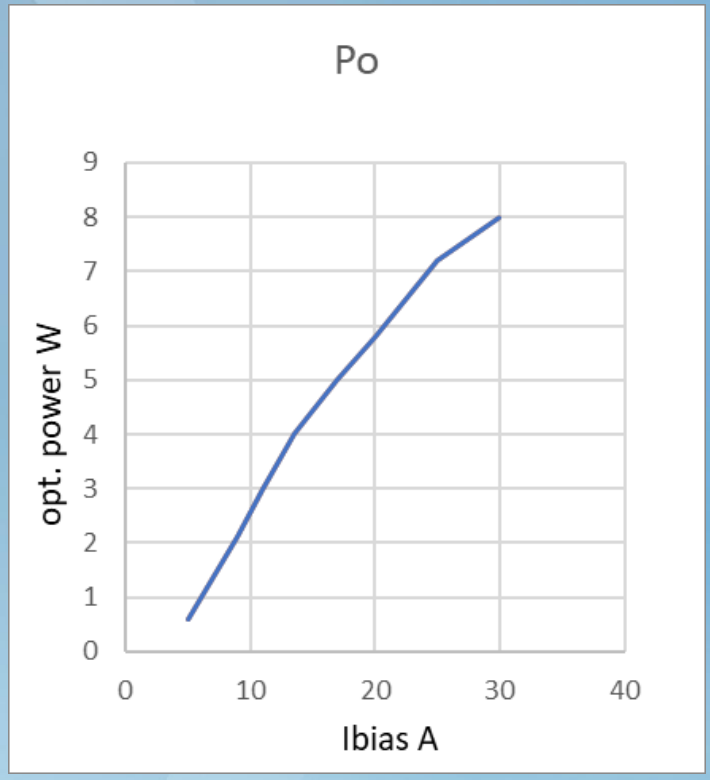
2D VCSEL Array Cross Section



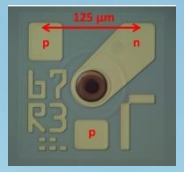


800 emitters

> 8 W optical power (qcw)

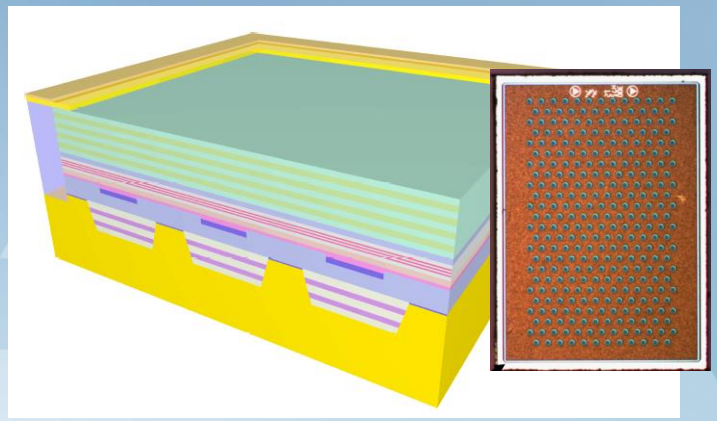


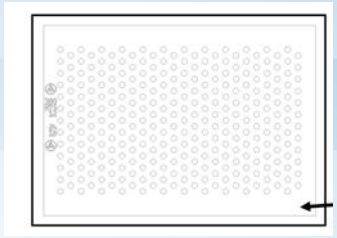
300 µs pulse



300 Emitter 1.3 µm 2D VCSEL Array

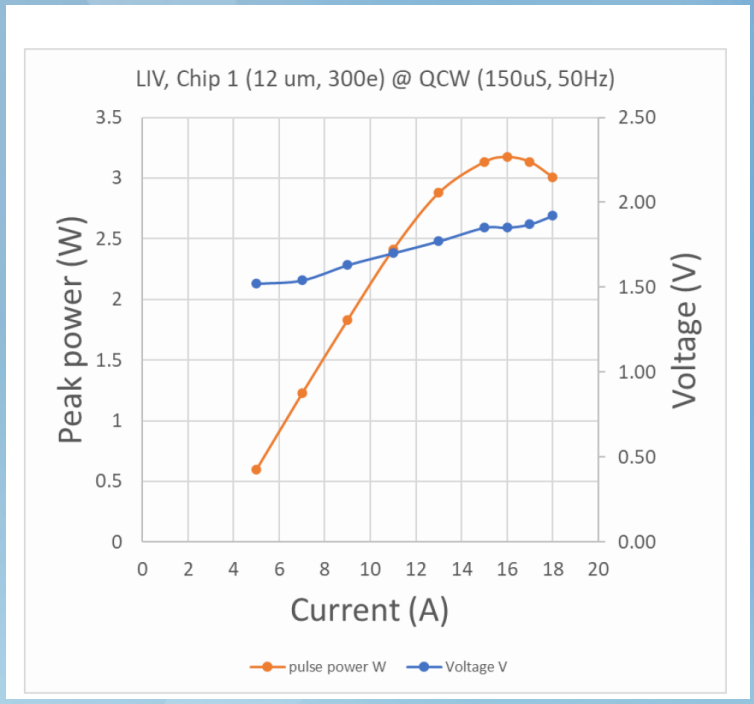
2D VCSEL Array Cross Section

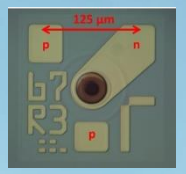




300 emitters

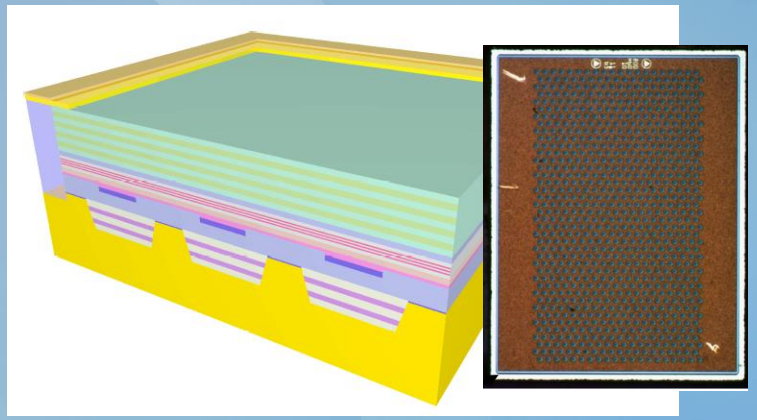
3.2W optical power (qcw)



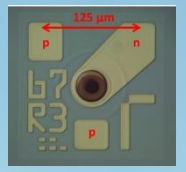


Summary 2D Array Examples 1.3 µm

# of emitters	Po (qcw)
12	0.125 W
24	0.25 W
48	0.5 W
160	1.5 W
300	3 W
480	5 W
800	8 W



- From single emitter to > 1000 emitters
- From few mw to 10s of Watts (pulsed mode)
- Single mode and multi mode versions
- Configurations can be designed per demand



LW InP VCSEL Outlook and Roadmap

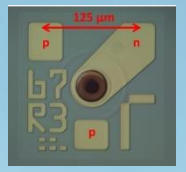
High Power
2D VCSEL Arrays

Wide tunable
VCSEL

Integration with
Silicon Photonics

Wavelengths
> 2.3 µm (GaSb)

10G – 100G
Optical Communications



Thank you

Vertilas Laser Products enable Smart City Systems and Green Photonics