III-Nitride Based VCSEL with Curved Mirror on P-Side of the Aperture

Tech ID: 31857 / UC Case 2019-934-0

BACKGROUND

Conventional planar mirrors used in vertical-cavity surface-emitting lasers (VCSELs) suffer from more diffraction loss the longer they become. However, the length of the cavity that is formed by these mirrors can also provide advantages such as tighter mode spacing and better thermal management. There is a need for devices that can realize the advantages of longer cavities while avoiding the diffraction loss that typically accompanies them.

DESCRIPTION

Researchers at the University of California, Santa Barbara have incorporated a curved mirror formed above the p-side of a III-nitride VCSEL to minimize diffraction loss and extend the lifetime and reliability of the device. When using a curved mirror, the reflected light can be focused back into the center of the aperture, thus minimizing diffraction loss. The curved mirror also affords the use of a long cavity, allowing for better thermal management and significant reduction of thermal rollover, thus increasing lifetime and reliability of the VCSEL. Additionally, the tight mode spacing of this technology allows for a greater tolerance of the cavity length, which increases the yield during device growth and fabrication.

ADVANTAGES

- Minimized diffraction loss
- Longer device lifetime
- Improved device reliability

APPLICATIONS

- VCSELs

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	20220239068	07/28/2022	2019-934

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Eliminating Misfit Dislocations with In-Situ Compliant Substrate Formation

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OTHER INFORMATION

KEYWORDS

mirror, VCSEL, curved

CATEGORIZED AS

- **Optics and Photonics**
  - All Optics and Photonics

RELATED CASES

2019-934-0

- III-Nitride-Based Vertical Cavity Surface Emitting Laser (VCSEL) with a Dielectric P-Side Lens
- Methods to Produce and Recycle Substates for III-Nitride Materials with Electrochemical Etching
- III-Nitride Tunnel Junction with Modified Interface
- Novel Multilayer Structure for High-Efficiency UV and Far-UV Light-Emitting Devices
- A Method To Lift-Off Nitride Materials With Electrochemical Etch
- Activation of P-Type Layers of Tunnel Junctions in Micro-LEDs
- High-Intensity Solid State White Laser Diode
- Nitride Based Ultraviolet LED with an Ultraviolet Transparent Contact
- Epitaxial Light Control Features in Light Emitting Diodes
- High-Efficiency Vertical Cavity Surface Emitting Laser Fabrication
- A Wafer-Scale, Low Defect Density Strain Relaxed Template for III-Nitride-Based High Efficiency and High-Power Devices
- High-Efficiency and High-Power III-Nitride Devices Grown on or Above a Strain Relaxed Template

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