LUMILEDS

AUTOMOTIVE

Shining a New Light on Digital Headlighting

High-Resolution MicroLED Light Source

Advanced dynamic-beam capability for digital headlighting requires new, high-resolution light sources able to combine multiple functions in a compact system.
Lumileds MicroLED is a 20k pixel monolithic light source designed for high-resolution direct-imaging projection systems with ultra-compact built-in depth. Along with the ability to generate an infinite number of customized light distributions, it offers superior contrast for perfect road projection and sharp cut-off lines.

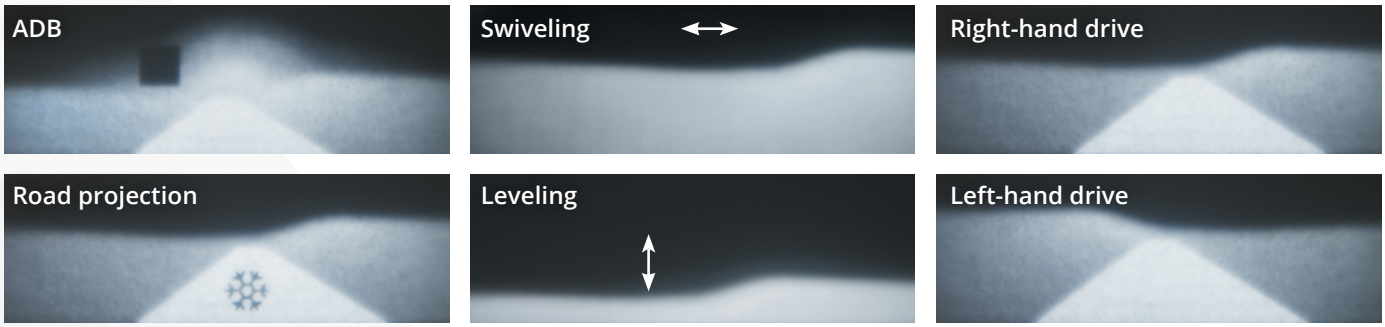
FEATURES AND BENEFITS

- 20k pixel high-resolution monolithic light source enabling advanced digital headlighting applications for ultra-compact designs
- Precisely controlled light distribution allows a variety of enhanced dynamic AFS and ADB beam patterns and novel road-projection functionalities
- Superior contrast level for sharp cut-off lines and perfect road projection
- High optical efficiency from additive MicroLED technology
- Hot flux output of 0.4 lm/px enables high center-beam brightness

PRIMARY APPLICATIONS

- High-resolution adaptive driving beam (ADB)
- Adaptive front-lighting system (AFS) functionality with digital swiveling and leveling of high-beam/low-beam spots
- Road projection
- Electronic predictive leveling

Create Dynamic High-Resolution Light-Distribution Patterns



Real projected images

High-Resolution Full Field-of-View System

Reference Design

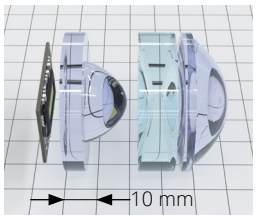
Foreground module with 3 LUXEON NeoExact 1.0 mm² and 2 LUXEON NeoExact 0.5 mm²

ADB module with 1 × 18 LUXEON NeoExact 1.0 mm²

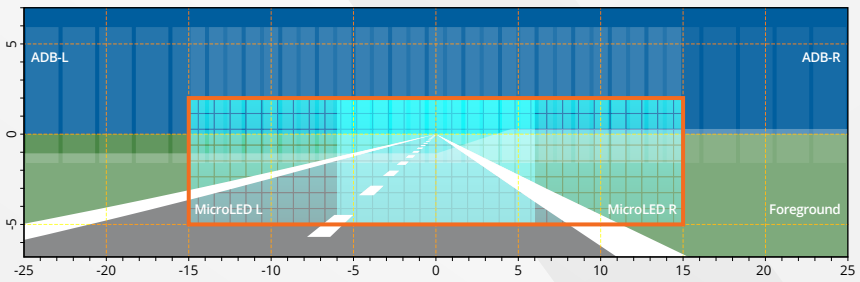
High-resolution MicroLED module

High-Resolution MicroLED Module

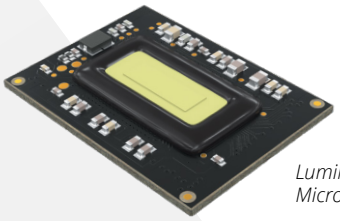
- Total flux from light source: 2400 lm for HB drive
- Field of view: 21° × 7°
- Angular resolution of 0.085°
- 3 lenses: 2 × PMMA, 1 × PC
- 40 mm outer lens diameter
- Optical efficiency: 33% (incl. cover glass losses)



Beam Composition



Beam composition as superimposed from two headlamps (left (L) and right (R)), each with a foreground module, an ADB module and a high-resolution module using Lumileds MicroLED. The high-definition zone is marked in orange.



Lumileds MicroLED

Key Properties of Lumileds MicroLED

Light-source design and performance

- 20k pixel high-resolution digital light source
- Matrix of 82 × 246 pixels (aspect ratio of 1:3)
- Pixel pitch of 40 µm
- Flux output of 0.4 lm/px in hot condition, corresponding to more than 80 cd/mm²
- Single pixel contrast 1:500 over 80 µm (2 pixels)

Digital interface

- 10-bit pixel dimming (dimmable down to 0.1%)
- Up to 60 frames/s
- Image interface options: parallel, SPI, UART
- Integrated temperature sensing
- On-the-fly monitoring of pixel status