

MicroLED for digital headlighting

High-resolution light source for highly dynamic adaptive beams



Digital headlighting applications call for highly dynamic adaptive-beam control and the highest resolution. Lumileds MicroLED is a high-resolution, 20k pixel, monolithic light source designed for direct-imaging projection systems with small optics and the most 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 (246 × 82) high-resolution (40 μm pixel) monolithic light source for precisely controlled and highly dynamic AFS/ADB light distributions and novel road-projection functionalities
- Small light-emitting area of 32 mm² enables most compact direct-imaging optical system
- 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

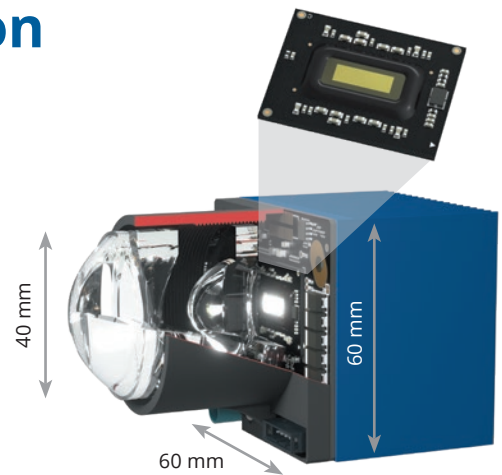
PRIMARY APPLICATIONS

- Adaptive driving beam (ADB)
- Adaptive front-lighting system (AFS) functionality with digital swiveling and leveling of high-beam/low-beam spots
- Driver-assistance road projections

Fulfill your ambitious application needs with Lumileds MicroLED

Reference-system design and performance

- Total flux from light source: 2400 lm for high-beam (HB) drive
- Field of view: $21^\circ \times 7^\circ$, angular resolution: 0.085°
- 3 lenses: 2 × PMMA, 1 × PC; 40 mm outer lens diameter
- Optical efficiency*: 33%
- Due to its small light-emitting area, Lumileds MicroLED also supports smaller optics: For example, a reduction to 30 mm lens height still yields 28% optical efficiency*.



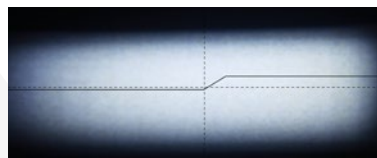
High intensity enables brilliant visibility of digital contents in beam

MicroLED performance:

- Typical HB profile (2.3 mA, 110 °C T_j): 0.36 lm/px and 72 Mcd/m²
- Single-pixel max. rating (3.8 mA, 110 °C T_j): 0.55 lm and 109 Mcd/m²

Beam performance:

- Typical HB profile: $I_{max}^* = 58000$ cd
- Single-pixel max. rating: $I_{max}^* = 87800$ cd



Typical HB profile



Lane marking with max. intensity

Excellent contrast in beam for precise symbol projection and high-resolution ADB

MicroLED characteristic:

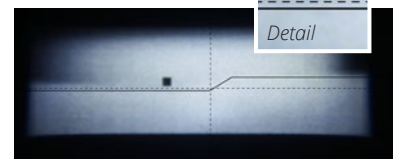
- Single-pixel contrast 1:150 over 80 μm (2 px)

Beam contrast:

- Pixel-center to pixel-center contrast: 1:5
- Smallest hole to fulfill glare level in ADB: 7 × 7 px



Symbol projection



Minimum ADB gap: 7 × 7 pixel

Enhanced image dynamics offer smooth road projections for a better visual experience

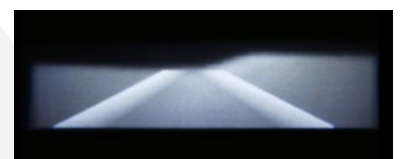
MicroLED dynamics:

- 10-bit pixel dimming (dimnable down to 0.1%)
- Up to 60 frames/s

Flicker-free beam-projection sequences with smooth grayscale



10-bit vs. 8-bit operation

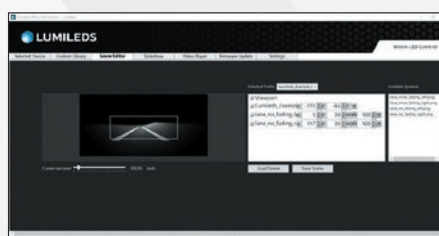


Smooth gradients where desired

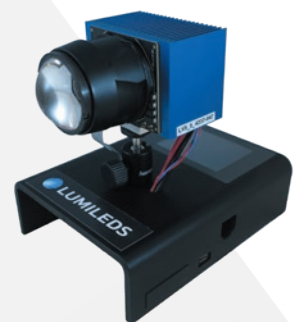
Lumileds MicroLED design-in support for customer systems

Lumileds offers comprehensive design-in support for MicroLED customer systems covering optical design, thermal management, and electronics. We also help with the implementation of both the image interface (parallel, SPI, UART) and control interface (UART, I²C).

Reference designs and laboratory electronics are available upon request.



Control software



* including 15% losses at the cover glass

