



# Projection for Mainstream Cars

Concept Study: Standard LED Light Source for Projection Systems



As LED overtakes halogen to become the dominant technology, appropriate optical-system solutions are needed to cover the full range of applications, from reflection to projection. In addition to cost-effective modular reflector systems, there is a clear desire to differentiate with projection-based solutions. Standardized LED headlighting sources can act as versatile building blocks to create cost-effective LED projection applications.

## ASSESSING A STANDARD LED LIGHT SOURCE FOR COST-EFFECTIVE PROJECTION MODULES

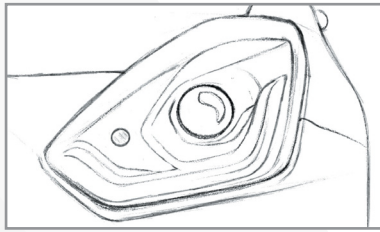
- A standard light source can serve as a building block capable of redeployment across multiple projects to reduce engineering and approval work
- Maximum styling flexibility makes individual optic design possible
- Well-defined mechanical and optical interfaces simplify referencing and assembly during the headlamp manufacturing process
- Fully integrated heat sink fits within a compact footprint
- Module family extensions could enable single- and dual-function systems with either direct or indirect projection
- Cross-platform application brings economies of scale

## PRIMARY APPLICATIONS

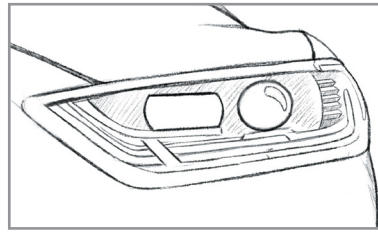
- Low beam and high beam
- Single and dual function
- Direct and indirect projection

# Assessing a Standard LED Light Source for Mainstream Projection Modules

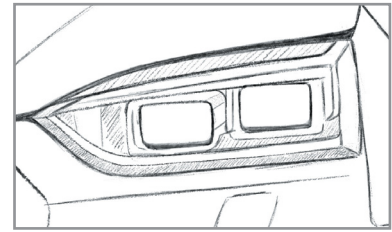
## Application Styling Flexibility



Dual function

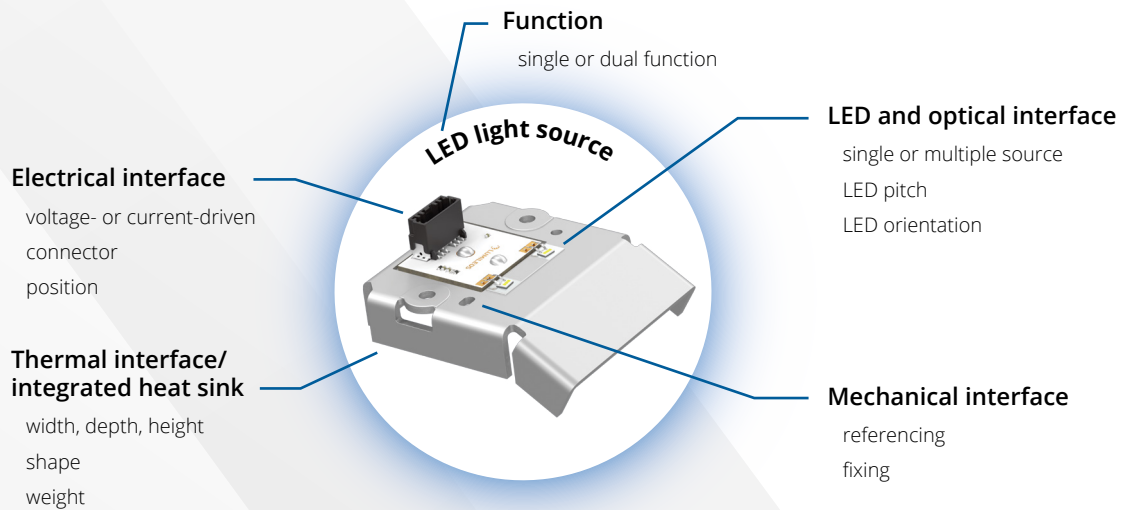


Direct projection



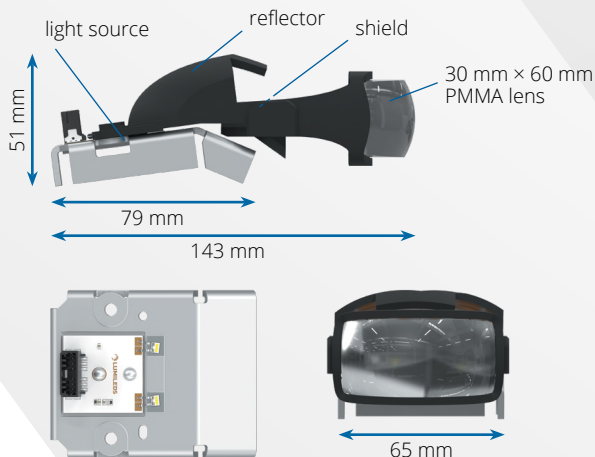
Low beam and high beam

## Exploring Key Requirements for an LED Projection Light Source



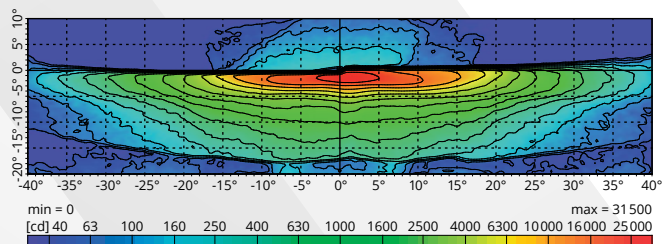
## LED Light Source Concept Applied to a Low-Beam Projection System

### Optical System and Dimensions



### Optical Beam Performance

- 2 × 3 dies
- Input flux in simulation: 2000 lm
- Flux in beam\*: 852 lm
- Optical efficiency\*: 43%



\* including losses at the cover glass

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