### Matrix Platform Built to Specification: 3-point tuning with a single channel driver functionality achieved with the Lumileds proprietary wide range CCT tuning technology

**Benefit of 3-Point CCT Tuning**

<table>
<thead>
<tr>
<th>Customer Needs</th>
<th>Integrated Driver Technology</th>
<th>Use Case and Customer Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create the highest possible efficiency</td>
<td>High-Efficiency AC/DC constant current</td>
<td>Customer was able to achieve a &gt;50% reduction in fixture size resulting in well as a BLE mesh control module and an occupancy sensor.</td>
</tr>
<tr>
<td>Solve fixture integration needs</td>
<td>Isolated AC/DC constant voltage</td>
<td>Superior Black Body Line tuning performance in lighting design applications.</td>
</tr>
<tr>
<td>Size reduction of a fixture</td>
<td>DC/DC constant current</td>
<td>Customer was able to create a 94% high efficiency dimmable solution with the Matrix Platform.</td>
</tr>
<tr>
<td>Develop a smart fixture</td>
<td>AC Direct</td>
<td>Achieved a significant reduction in fixture size and a decrease in their bill of materials.</td>
</tr>
</tbody>
</table>

Matrix Platform – BR30 Matrix Platform Advanced Technology

Solving fixture integration needs with application specific driver topologies

- Three-point tuning can be achieved with any three color points and can be implemented with integrated light guides.

### Connectivity, Sensor and Control – Matrix Platform Advanced Technology

- A wide selection of wireless and wired protocols, intelligently integrated per customer requirement.
  - Bluetooth, Wi-Fi, ZigBee, Thread, Z-Wave, proprietary
  - 0-10V, DALI
  - Sensor options enabling energy saving, intelligence and IoT
  - Occupancy detection
  - Daylight sensing
  - And more.

About Lumileds

Companies developing automotive, mobile, IoT and illumination lighting applications need a partner who can collaborate with them to push the boundaries of light. With over 15 years of inventions and industry firsts, Lumileds is a global lighting solutions company that helps customers around the world deliver differentiated solutions to gain and maintain a competitive edge. As the inventor of Xenon short arc technology, a pioneer in halogen lighting and the leader in high performance LEDs, Lumileds builds innovation, quality and reliability into its technology, products and every customer engagement. Together with its customers, Lumileds is making the world safer, better and more beautiful—with light.

To learn more about our lighting solutions, visit lumileds.com.
Luminaire manufacturers often view their design challenges as unique, yet virtually all share a common imperative: to need to get to market fast with highly differentiated lighting solutions capable of outpacing the competition. Fortunately, there’s a proven solution that brings increased agility and next generation designs within reach:

**Matrix Platform from Lumileds.**

The shortest distance from inspiration to innovation.

Matrix Platform challenges status quo manufacturing models by combining industry-leading LUXEON LEDs with the power of proprietary Advanced Technologies—then custom configuring them on substrates to fit manufacturer-specific requirements. The result is a game-changing solution tailored to meet the most demanding design specifications and yield maximum supply value.

**Matrix Platform Advanced Technologies pave the way for design and manufacturing breakthroughs.**

What truly sets Matrix Platform apart is its portfolio of exclusive proprietary Advanced Technologies—then custom configuring them on substrates to fit manufacturer-specific requirements. The result is a game-changing solution tailored to meet the most demanding design specifications and yield maximum supply value.

**Matrix Platform Advanced Technologies optimize Matrix Platform performance, efficiency and predictability.**

An integrated approach to supply chain simplification.

At Lumileds, providing luminaire manufacturers with a pre-assembled system for achieving optimal design and engineering outcomes has always been a priority. Matrix Platform makes this goal more workable by streamlining supply chain efficiencies and leveraging Lumileds' many years of house production expertise—resulting in highest-quality, highest luminance products. The streamlined approach minimizes inventory, dramatically reduces waste and yield loss, and reduces inventory holding requirements. And the benefit can extend to the manufacturer. They can also access to the Lumileds technology roadmap to help to fill a void in the market.

**Matrix Platform delivers tailored, application-specific light engines**

Matrix Platform performance, light distribution that ensure visual comfort and consistency as luminaire form factors become increasingly important end game approaches. These advanced components soften the light for more uniform radiance. These application-specific topologies are designed to address the trend toward smaller form factors. These application-specific topologies are designed to address the trend toward smaller form factors.

**Connectivity and Controls**

This sophisticated functionality allows lighting designs to bring connectivity and controls to the table, fully integrated, driven on board LED drivers. Matrix Platform’s Connectivity and Controls technology enables precise dimming and color tunability, including patented dim to warm circuitry that pairs seamlessly with simple single channel drivers.

**Color Tuning Electronics**

This proprietary technology enables the dimming pattern that is the hallmark of indoor lighting by controlling both a warm and a cool LED with two drivers that can be tailored to unique manufacturer requirements, up-system optimization.

**Matrix Platform Advanced Technologies**

<table>
<thead>
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<th>Feature/Technology</th>
<th>Overview</th>
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<tr>
<td>Oribertan! Obi-Assembly</td>
<td>The proprietary 30A and 60A platform for the LUXEON 2835, 3535, and XR-TX incorporates an electronic driver board that eliminates parasitic components, allowing more components to be packaged on a single board.</td>
</tr>
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<td>Integrated Light Guides</td>
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**Matrix Platform Integrated Light Guide Solutions**

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<tr>
<td>- Outdoor</td>
<td>- Wall Wash</td>
</tr>
<tr>
<td>- Outdoor</td>
<td>- Spec Grade</td>
</tr>
<tr>
<td>- Indoor</td>
<td>- High Bay &amp; Low Bay</td>
</tr>
<tr>
<td>- Indoor</td>
<td>- Adjunctive</td>
</tr>
<tr>
<td>- Commercial</td>
<td>- Area Lighting</td>
</tr>
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**Where to Start?**

- **Outdoor:**
  - 35W, 8400 total output
  - 14.5 inch round
  - LVX1-8400-14p
  - 7% distribution, binning: +0/+4
  - 6000K, 5000K, 4000K
  - Condition: 4A, 4W, 117W, 7+9VDC
  - 500A, 150V

- **Indoor:**
  - 4,200 lumens, 15W LVX
  - 35W, 5,500 lumens

**What is the value of partnering with Lumileds on integrated light guides?**

- Accelerating Time to Market and enabling higher ASP
- Enabling high performance differentiated solutions
- Ultrafast, non-pledged lighting for visual comfort with controllable light distributions

**Design down-select: Performance, light | coupling/integration, architecture/system modeling**

**Prototype builds and model validation: FPC, finalization/optimization, mechanical and associated budgetary proposals**

**Customer requirements and constraints:**

- (Including performance, form factor, integration level, cost, and timing expectations)

**Production & Production Release**

- LVX1-8400-14p
- LVX1-5500-14p
- LVX1-5500-14p
- LVX1-8400-14p
- LVX1-8400-14p
- LVX1-8400-14p
- LVX1-8400-14p
- LVX1-8400-14p

**LUXEON 3535**

**LUXEON XR-TX**

**LUXEON**

**LUXEON XR-SunPlus Line**
Luminaire manufacturers often view their design challenges as unique, yet virtually all share a common imperative: the need to get to market fast with highly differentiated lighting solutions capable of outpacing the competition. Fortunately, there’s a proven solution that brings increased agility and next-generation designs within reach: Matrix Platform from Lumileds.

Matrix Platform Advanced Technologies

**The shortest distance from inspiration to innovation.**

Matrix Platform challenges status quo manufacturing models by combining industry-leading LUXEON LEDs with the power of proprietary Advanced Technologies—in tandem custom-configuring them on substrates to fit manufacturers’ specific requirements. The result is a game-changing solution tailored to meet the most demanding design specifications and yield maximum supply value.

**Matrix Platform Advanced Technologies pave the way for design and manufacturing breakthroughs.**

What truly sets Matrix Platform apart is its portfolio of exclusive Advanced Technologies. Tapping into decades of patents, electrical, mechanical and thermal expertise—as well as global LED design and manufacturing experience—Lumileds has once again raised the bar with its first wave of Advanced Technologies:

- **Oberon Intelligent Assembly** focusing the industry’s most advanced pick-and-place assembly system that guarantees board consistency.
- **Integrated Light Guides** for light management that combines optics on non-planar surfaces and controllable polarized light into a single solution.
- **Integrated Drivers** with application-specific topologies that enable manufacturers to fully integrate, driven on-board LED components—including the all-important power source—into a fully integrated, driven on-board LED system.
- **Connectivity and Controls** for streamlined process for achieving optimal design and future product planning.
- **Color Tuning Electronics** to enhance color capabilities in supported full spectrum of wired and wireless protocols.

**Advanced Technologies optimize Matrix Platform performance, efficiency and predictability.**

An integrated approach to supply chain simplification.

At Lumileds, providing luminaire manufacturers with a proven process for achieving optimal design and engineering outcomes has always been a priority. Matrix Platform is the next step forward by Lumileds. Many years of intense production experience—from substantial production to integrated LED light engines to a single source solution for the highest quality, luminaire level optimization.

The industrial approach to inventory, dynamically minimize waste and yield loss, and improve manufacturing scalability. And the benefit? Lower inventory, lower cost, and higher flexibility.

Manufacturers also have access to the Lumileds technology roadmap to help lay a solid foundation for future product planning.

**Matrix Platform Advanced Technologies optimize**

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The shortest distance from inspiration to innovation.

Matrix Platform challenges status quo manufacturing models by combining industry-leading LUXEON LEDs with the power of proprietary Advanced Technologies™—when custom configuring them on substrates to fit manufacturers’ specific requirements. The result is a game-changing solution tailored to meet the most demanding design specifications and yield maximum supply value.

Matrix Platform Advanced Technologies pave the way for design and manufacturing breakthroughs.

What truly sets Matrix Platform apart is its portfolio of exclusive Advanced Technologies. Tapping into decades of optical, electrical, mechanical, and thermal expertise—as well as global LED design and manufacturing experience—Lumileds has once again raised the bar with its next wave of Advanced Technologies:

• Oberon Intelligent Assembly featuring the industry’s first automated pick and place system that guarantees board-level consistency.
• Integrated Light Guides, incorporating proprietary LEDs, optics, and controls into a single board, providing a new level of flexibility.
• Integrated Drivers with application-specific topologies that allow manufacturers to quickly and cost-effectively adapt to changing product requirements.
• Connectivity and Controls technology, enabling a full spectrum of wired and wireless protocols.
• Color Tuning Electronics, including patented LED selection tools that pair perfectly with single-channel drivers for improved aesthetics and functionality.

Advanced Technologies optimize Matrix Platform performance, efficiency, and predictability.

An integrated approach to supply chain simplification.

At Lumileds, providing luminaire manufacturers with a proven platform for achieving superior design and engineering outcomes has always been a priority. Matrix Platform enables manufacturers to simplify their own manufacturing processes. Countless years of research and development to inventory, dynamically minimize waste and yield loss, and accelerate new product introduction. And the benefits start now. Manufacturers also have access to the Lumileds technology roadmap to help with a solid foundation for future product planning.

By combining the industry’s finest LEDs with proprietary technologies and unparalleled design expertise, Lumileds Matrix Platform delivers a failsafe, application-agnostic design that ensures for installation that luminary assemblies, reducing complexity and accelerating time to market— and time to revenue.

Oberon Intelligent Assembly

The proprietary 3D pick and place system in the luminary’s only assemblies—LED binning technology—guarantees consistent component placement and performance board-to-board.

Integrated Light Guides

Integrated Light Guides enable high intensity LED pools to create a uniform light surface, an ideal guide as luminaires from battens becomes smaller and smaller.

Integrated Drivers

Integrated Drivers dramatically simplify fixture design, reducing space requirements, costs, and electronics of the LED system, manufacturers can quickly and easily extend fixtures with this incremental functionality, allowing for a plug-and-play installation. Additionally, the full driver-on-board capability provides a more uniform distribution of light across the light engine, ensuring more consistent characteristics and performance.

Connectivity and Controls

This sophisticated functionality allows lighting designers to bring their designs to life, coupling across multiple endpoints that can be centrally controlled, using an app or other solution.

Color Tuning Electronics

Color Tuning Electronics includes patented dimming patterns that is the hallmark of LumiPulse by controlling both a warm and a cold LED with two drivers that share common electronic drivers.

Oberon Intelligent Assembly

Oberon Intelligent Assembly is a proprietary, 3D pick and place system utilized in the luminary’s only assemblies—LED binning technology—guarantees consistent component placement and performance board-to-board. Unlike competing manufacturers that mix based on flavor or value of a binned LED, Oberon eliminates lables and selects LEDs based on unique lumicker, color, and lumen output level, giving manufacturers the flexibility to improve the consistency of their output. From outdoor fixtures where uniformity is important—from outdoor light fixtures to indoor retail—Oberon Intelligent Assembly is a game-changing solution tailored to meet the most demanding design specifications and yield maximum supply value.

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What is the value of partnering with Lumileds on integrated light guides? Accelerating time to market.

- Accelerating Time to Market and enabling higher ASP
- Enabling high-performance differentiated solutions
- Ultrabright, non-bleeding light for visual comfort with controllable light distributions

Concept design: Different options considered, including selection of LEDs, PCB or Driverboard, mechanicals, and associated budgetary proposals

Customer requirements and constraints: (including performance, form factor, integration level, cost, and timing expectations)

- Efficacy ~128 lm/W
- Conditions: 2A, 88V, 172W, Tj=85°C
- Flux ~25,000 lumens
- LUXEON 5050 160up 4070

Exceeding DLC Premium Specifications

- High Bay & Low Bay
- 28V, 525mA, 28W
- 4,200 lumens, 150 lm/W
- LUXEON 5050 16up 4070

Performance

- Outdoor LED Luminaire

- Streetlight Outdoor Luminaire

- Performance

- LUXEON 3535L 145up

- ~60% down, ~40% up

- Total output ~4,800 lumens

- LUXEON 3535L 145up

- 14.5 inch round

- Dual Light Distribution

- Surface Mountable

- Recessed Slot Linear

- Production Release

- Finalize Product & Production Release

- Development—SMT, well-trained/technical FAI

- Test, rework, approved, materials and technologies

- Manufacturing—Test, quality control, change management

- Finalize Product & Production Release

- Customer requirements and constraints: (including performance, form factor, integration level, cost, and timing expectations)
Matrix Platform Built to Specification: 3-point tuning with a single channel driver functionality achieved with the Lumileds proprietary wide range CCT tuning technology.

Benefits of 3-Point CCT Tuning

- Matrix Platform Solution with 3-color LUXEON 3030 (2200K, 3000K and 4000K)
- Driven by single-channel constant current LED driver
- Independent dimming and CCT tuning using two 3-10V dimmers
- Superior Black Body Line tuning performance in wider range CCT tuning applications
- Control circuit can be customized to support other protocols, such as DALI
- Alternate geometric shapes can be achieved for differentiated luminaire aesthetics
- Three-point tuning can be achieved with any three color points and can be implemented with integrated light guides.

Typical Application for Color Tunability

- One standalone PCB per fixture for single-channel to triple-channel conversion
- Works with constant current output (PWM current output not supported)
- Ratios between the three channels determined by dedicated LED CCT control
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Benefits of 3-point CCT Tuning

- Matrix Platform Solution with tri-color LUXEON 3030 (3200K, 3000K and 4000K)
- Driven by single-channel constant current LED driver
- Independent dimming and CCT tuning using two 0-10V dimmers
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Matrix Platform – Matrix Platform Advanced Technology
Solving fixture integration needs with application specific driver topologies

Integrated Drivers – Matrix Platform Advanced Technology

- Benefit of 3-Point CCT Tuning
- Functionality achieved with the Lumileds proprietary wide range CCT tuning technology

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- Occupancy detection
- Daylight sensing
- And more.

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To learn more about our lighting solutions, visit lumileds.com.