Smart LED Lighting Solutions

ENABLING A ‘SMART LIFE AND SMART LIFESTYLE’
Complete LED Lighting Solutions from Marvell Semiconductor

LED lighting has moved from being an expensive specialty item to filling the shelves at big-box stores. Consumers are “seeing the light” and upgrading their incandescent and CFL bulbs to experience the benefits of lower energy consumption and an environmentally friendly product.

Furthermore, the lighting industry is starting to deploy Smart Lighting or connected systems that use a combination of WiFi and ZigBee® wireless protocols. These technologies deliver new ease-of-control capabilities for residential and commercial lighting including two-way communication and the ability to regulate lighting remotely through cloud-based applications and mobile devices. Lighting can be manipulated in groundbreaking ways to create never before seen safety, display and mood lighting effects.

Marvell is in a unique position as the only semiconductor supplier to offer a full end-to-end digital-connected lighting solution platform including LED controller chips, ZigBee microcontrollers, WiFi-ZigBee gateway solution and Kinoma UI software.

Marvell is staying on the leading edge of the technology by offering innovative LED driver technology, best-in-class ZigBee and WiFi microcontrollers and an end-to-end smart wireless platform built on top of these technologies. Marvell has also taken leadership in establishing ecosystem support for these products. Marvell has worked with manufacturing partners and system integrators, who provide software integration services, so that OEMs can bring new and exciting lighting and home automation products to market, based on Marvell technology, more quickly.

Beyond connected lighting, the scalable platform also enables this same embedded technology to include sensors that can detect for example, open or closed windows and doors, motion activities throughout the house, water leakages and more, to give end users a lower cost security system that reports directly to mobile devices.

**Marvell Delivers**

Combining dedication to green technology and LED lighting products with its world-class engineering and mixed-signal design expertise, Marvell delivers critical building blocks to its customers, giving them the competitive edge to succeed in today’s dynamic LED lighting market. Using Marvell LED lighting ICs, software and reference designs, OEMs and ODMs can introduce high-performing, energy efficient LED lighting for the residential market and easy-to-install smart commercial lighting systems that provide quick return on investment.

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**SEMICONDUCTORS**

**RF MODULE ODM**

**LAMP AND SENSOR ODM**

**GATEWAY ODM**

**SOFTWARE/SYSTEM INTEGRATOR**

Smart Lighting Ecosystem Developed by Marvell
### AC/DC LED Driver

#### Dimmable AC/DC LED Driver

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Product Highlight</th>
<th>Application</th>
<th>Package</th>
</tr>
</thead>
</table>
| 88EM8183    | • 1st Gen single-stage LED driver  
• Best TRIAC dimmer compatibility  
• 1% deep dimming without flicker  
• Highest efficiency and power factor  
• Highly integrated and lowest BOM | Retrofit Lighting | SOIC-8 |
| 88EM8187    | • 2nd Gen single-stage LED driver  
• Best TRIAC dimmer compatibility  
• 1% deep dimming without flicker  
• Highest efficiency and power factor  
• Highly integrated and lowest BOM  
• Enables single layer PCB design | Retrofit Lighting | SOIC-8 for small form factor SOIC-14 for 1-layer PCB design |

### Smart Lighting: Wireless/ Digital Dimmable AC/DC LED Driver

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| 88EM8189    | • Highest efficiency and power factor  
• I2C control  
• Integrated microcontroller power supply  
• Highly integrated and lowest BOM  
• Low STBY power | Retrofit Lighting | SOIC-16 |

### DC/DC LED Driver

#### Smart Lighting: Wireless/ Digital Dimmable DC/DC LED Driver

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| 88EM8801    | • DC/DC 2-string  
• Independent 2-ch LED control  
• PWM and I2C  
• Color mixing  
• High efficiency up to 97%  
• Up to 20W output | Retrofit Lighting  
Commercial Lighting: Wireless fixture/troffer | QFN-28 |
| 88EM8803    | • DC/DC 2-string  
• Independent 2-ch LED control  
• PWM and I2C control  
• Color mixing  
• High efficiency up to 97%  
• Up to 40W output | Commercial Lighting: Wireless fixture/troffer | SOIC28 |

### Lighting Control

#### Zigbee Microcontroller

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</table>
| 88MZ100     | • Wireless Controls  
• ZigBee Radio, PM, Memory  
• Integrated ARM Cortex-M3 MCU  
• ZigBee Pro; RF4CE; ZHA; ZLL  
• 32 and 48 pins | Retrofit Lighting  
Commercial Lighting  
Lighting Control  
Home Automation |
Smart Lighting and Home Automation Platforms

Marvell’s Smart Lighting and Home Automation Platforms consist of four building blocks:

1. End devices including smart lamps, home automation sensors and controls, with ZigBee or Thread connectivity.
2. Low-cost WiFi/ZigBee gateway.
3. Cloud platform.
4. Mobile apps.
Marvell Reference Designs

To help customers rapidly introduce products into the marketplace, Marvell supplies turn-key manufacturing ready reference designs for OEMs/ODMs looking to develop residential and commercial lighting solutions. These kits include Marvell LED driver boards, design files, test files, optional network communication modules and fixtures. Please contact Marvell sales for availability.

### AC/DC LED Driver

**Dimmable AC/DC LED Driver**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Reference Design</th>
<th>Application</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>88EM8183</td>
<td>10W, Single Stage Flyback LED Driver for Low Line</td>
<td>A-lamp, BR Lamp</td>
<td>TRIAC dimmable</td>
</tr>
<tr>
<td></td>
<td>10W, Single Stage Flyback LED Driver for High Line</td>
<td>A-lamp, BR Lamp</td>
<td>TRIAC dimmable</td>
</tr>
<tr>
<td></td>
<td>15W, Single Stage Flyback LED Driver for Low Line</td>
<td>PAR, BR Lamp</td>
<td>TRIAC dimmable</td>
</tr>
<tr>
<td></td>
<td>15W, Single Stage Flyback LED Driver for High Line</td>
<td>PAR, BR Lamp</td>
<td>TRIAC dimmable</td>
</tr>
<tr>
<td>88EM8187</td>
<td>5W, Single Stage Tapped Buck-Boost for Low Line</td>
<td>GU10, Candle</td>
<td>Small Form Factor, TRIAC dimmable</td>
</tr>
<tr>
<td></td>
<td>10W, Single Stage Buck-Boost LED Driver for Low Line</td>
<td>A-lamp, BR Lamp</td>
<td>TRIAC dimmable, 1-layer PCB</td>
</tr>
<tr>
<td></td>
<td>10W, Single Stage Buck-Boost LED Driver for Low Line</td>
<td>A-lamp, BR Lamp</td>
<td>TRIAC dimmable, 1-layer PCB</td>
</tr>
</tbody>
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**Smart Digital Dimmable AC/DC LED Driver**

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</tr>
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<tbody>
<tr>
<td>88EM8189</td>
<td>10W, Single Stage Flyback LED Driver for Low Line</td>
<td>A-lamp wireless fixture</td>
<td>Wireless dimmable via I2C, low STBY power</td>
</tr>
</tbody>
</table>

**DC/DC LED Driver**

**Dimmable AC/DC LED Driver**

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<td>88EM8801</td>
<td>20 Watt, 2-Stage, 2-Channel LED Driver</td>
<td>Downlight</td>
<td>Supports CCT tuning</td>
</tr>
<tr>
<td>88EM8803</td>
<td>40 Watt, DC-DC 2nd Stage, 2-Channel LED Driver</td>
<td>Wireless fixture</td>
<td>Supports CCT tuning</td>
</tr>
</tbody>
</table>
LED Drivers

The Marvell LED drivers offer OEMs/ODMs best-in-class dimming performance with lowest BOM cost. The 88EM8187 enables low component count along with single layer PCB design. It covers input power range from 5W(candle) to 25W (down light), and it is an ideal platform solution for OEMs/ODMs.

Cost-effective ZigBee Module

Through our ODM partners, we offer a highly cost-effective, integrated ZigBee module based on 88MZ100 chip. It has a miniature form factor which enables adoption in applications with very tight space requirement.
Smart Lamp

Marvell offers the most cost-effective solution for the connected lamp reference design. Inside the lamp the electronics consist of a highly efficient 88EM8189 LED driver and the ZigBee module with best RF performance.

WiFi/ZigBee Gateway

The Marvell® Wi-Fi ZigBee Gateway was developed to enable OEMs/ODMs to manufacture complete Smart Lighting Systems consisting of Connected Lights based on the low-cost, low-power ZigBee standard and to control the lights using the ubiquitous Wi-Fi protocol. The Gateway, developed on Marvell ICs, features the 88MZ100 ZigBee Microcontroller, the 88MC200 Smart Energy Wi-Fi Microcontroller, and the Avastar 88W878x WLAN system-on-a-chip.

3.3V85 to 265VAC AC/DC Power Supply