Simplify and accelerate the tasks of designing and bringing complete power solutions to market.

Allegro’s ClearPower modules overcome design challenges for the most-advanced automotive and industrial power and lighting applications. ClearPower modules are complete synchronous buck switching regulators that provide constant current output to drive high-power LEDs. All the principal elements of a high-performance switching power supply or LED driver are housed within the thermally enhanced 4 mm × 6 mm × 2.1 mm QFN-32 molded interconnect substrate (MIS) package with wettable flanks. Sources of electromagnetic interference (EMI) are located close to the silicon and a flip-chip architecture is implemented with copper pillars, enabling ClearPower modules to dissipate heat more efficiently than wire bonding and to achieve five times less radiated EMI in a 70% smaller footprint than legacy solutions. Compared to highly integrated power management solutions with multiple discrete components, ClearPower modules significantly increase the likelihood of passing stringent CISPR 25 Class 5 or EN 55025 testing on the first design cycle.

Each ClearPower module integrates both high-side and low-side N-channel switches, inductor, high-frequency VIN, and boot capacitors. A true average current is output using a cycle-by-cycle, controlled on-time method. Output current is user-selectable by an external current sense resistor. Output voltage automatically adjusts to the LED string voltage to ensure optimal system efficiency. AEC-Q100 qualified devices are offered that operate over the complete automotive voltage and temperature range.

**Features**

- Supply voltage 4.5 to 36 V, maximum 40 V
- Complete 1.5 A maximum output compact LED driver
- Integrated inductor, VIN, and boot capacitors
- Ultra-low EMI architecture, f_{SW} > 2 MHz
- Spread-spectrum control for improved EMC
- Integrated high-side and low-side MOSFETs: 80 mΩ / 60 mΩ TYP, 90% efficiency at 1 A
- 5 V, 14 mA LDO regulator for peripheral circuits
- Low-power shutdown (1 µA typical)
- LED dimming via direct logic input pulse-width modulation (PWM) signal applied at the PWM pin while EN is enabled
- “Chopped battery” PWM dimming via a PWM signal applied at the EN pin while the PWM pin is high
- Analog dimming input (ADIM) for brightness calibration and implementation of thermal foldback in conjunction with external NTC thermistor
- High side current sense, ±3% accuracy
- Fault flag output
- LED open fault mask setting for low VIN operation
- Undervoltage lockout and thermal shutdown protection
- Robust protection against adjacent pin-to-pin short, pin-to-ground short, and component open/short faults
5x Less Radiated EMI and 70% Smaller Footprint

Applications
- Automotive lighting
  - Daytime running lights
  - Front and rear fog lights
  - Turn/stop lights
  - Map lights
  - Dimmable interior lights
  - Puddle lights
- Industrial, medical, and architectural lighting

Functional Blocks
1. Operates from 4.5 V to 36 V (4 V to 36 V for APM80951)
   - Handles load dump without external components
2. Synchronous buck converter module
   - Integrated inductor and input and boot capacitors
   - Integrated FETs
3. High-side current regulation up to 1.5 A
   - Control LED current
   - Dynamic feedback provided to boost voltage
4. Input signals
   - Enable
   - PWM dimming
   - Analog dimming
5. Output signals
   - Open LED fault reporting

Selection Guide

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Automotive Grade</th>
<th>Internal PWM Generator</th>
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<td>APM80900[1]</td>
<td>Low-EMI, 40 V, 1.5 A, PWM Dimmable Synchronous Buck LED Driver Module</td>
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</table>

[1] AEC-Q100 qualified

To learn more about the Allegro family of products and to explore available design resources, visit allegromicro.com.

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