Single-Stage LED Drivers Enable Wide Bulb Dimming Range With Lower BOM Cost

To address cost, performance and lifetime issues in dimmable bulb replacement applications, iWatt has launched the iW3606 and iW3608 single-stage, solid state lighting (SSL) LED drivers. Offering flicker free 1% to 100% dimming range, the drivers allow SSL designers to reduce their bill of materials (BOM) cost by 20% to 40%, says iWatt's senior VP of marketing Scott Brown. Plus, adds Brown, they incorporate patented, configurable overtemperature protection (OTP) and derating functionality to provide predictability and reliability of bulb operating life with the ability to keep pop-on current below 5% of light output. The company claims that the pop-on current is the lowest in the industry.

According to iWatt, the dimmable LED drivers are designed for all retrofit bulbs, including candle and GU10 lamp replacements used in existing phase-cut dimmer installations. Because these drivers offer higher dimming performance, eliminate popcorning, improve bulb lifetime and lower cost, they are facilitating adoption of SSL lighting, said iWatt.

Both the drivers meet or exceed global regulations, including European Union IEC61000-3-2, for power quality and efficiency with a high power factor (PF) of >0.92, low total harmonic distortion of <20%, and a high efficiency of >82%. The configurable dimming curves of both parts are compliant with the NEMA SSL 6 dimming standard.

Per Brown's description, the on-chip OTP and derating feature of the LED drivers addresses the thermal issues caused by the high and unpredictable operating temperatures in dimmable SSL applications. The lifetime of many of the components in the LED driver circuit, especially electrolytic capacitors, degrades as temperatures increase, potentially reducing overall bulb lifetime to less than 2,000 hours, well under the expected 30,000 to 50,000 hours for SSL bulbs.

The OTP derating monitors the temperature inside the sealed SSL bulb and when thermal conditions reach a point set by the system designer, the LED drivers automatically reduce the current drive to the LEDs, lowering the power dissipation and resulting in cooler overall operation, says the marketing executive. This helps prevent exceeding the temperature rating of the electrolytic capacitors in the system, helping to ensure a predictable and safer bulb operating life, asserts Brown.

The lower BOM costs are achieved via high levels of integration, including on-board OTP and derating, along with replacing FETs with lower-cost bipolar junction transistors (Fig.1.) A combination of BJTs and valley-mode switching lowers EMI and reduces the need for external EMI filtering components.

Also, the maker's PrimAccurate primary-side control eliminates the need for a secondary-side regulator and optical feedback isolator. Additional savings come from the standard, low-cost 8-lead SOIC package (Fig.2), which can be used in single-layer printed circuit boards for additional cost savings and a smaller design footprint.

While the iW3606 is rated for 8-W output power, the iW3608 delivers 15 W. Both the high-performance ac-dc offline power supply controllers for LED bulbs are now in production, says iWatt. In 1000-piece quantities, iW3606 is priced at $0.46 and iW3608 at $0.51, respectively.

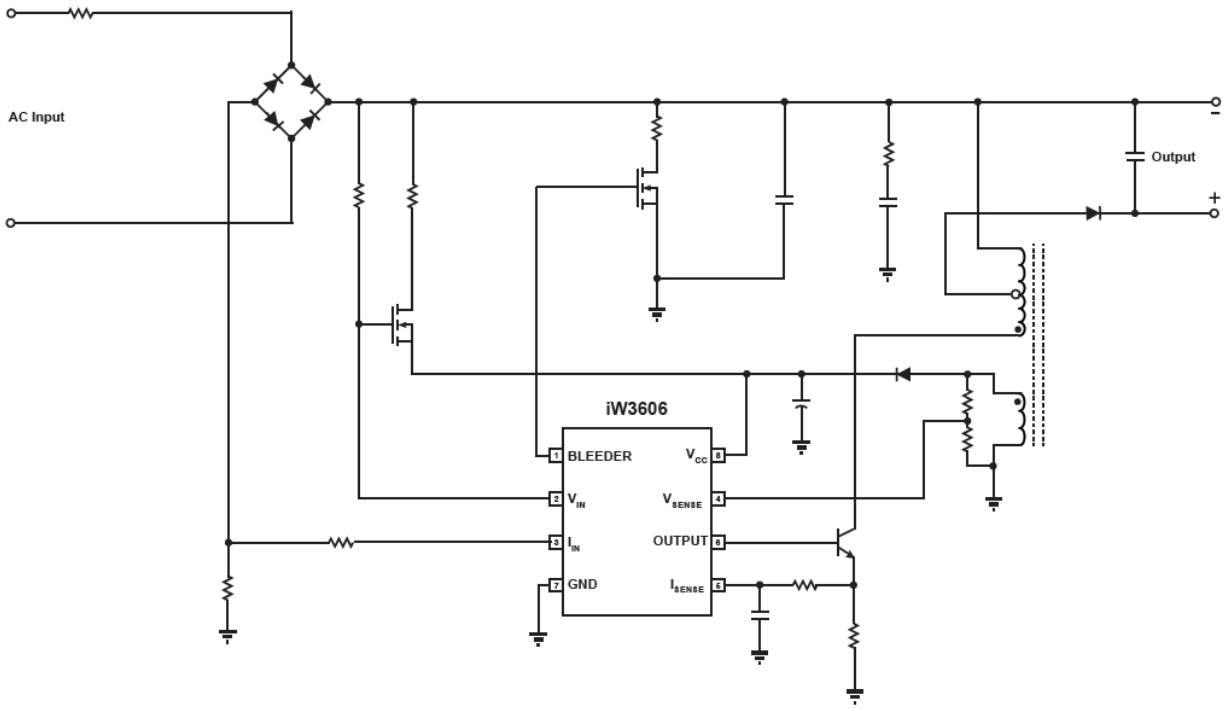

Fig.1 The on-chip overtemperature protection and derating feature of the iW3606 and iW3608 LED drivers provide predictability and reliability of bulb operating life. Plus, these drivers are designed to offer the industry's lowest pop-on current, < 5% of light output.

Fig.2 The single-stage dimmable LED drivers come in low-cost SOIC packages.

—Contributed by Ashok Bindra