

LED backlight driver improves picture quality



iWatt debuted its new 8-channel LED backlight driver designed to deliver better screen performance and lower cost in next-generation 2D and 3D LCD TVs. The iW7019 gives designers a rich set of integrated features to improve picture quality and render a more lifelike viewer experience. These include both head and tail-mode pulse width modulation (PWM) dimming to reduce motion blur, and high-resolution, 12-bit local dimming to improve contrast ratio. The iW7019 also integrates a DC-to-DC boost controller with 10V gate drive, high-voltage current sinks, and iWatt's patented BroadLED digital current regulation technology that eliminates the need for costly LED binning.

The rich features of the iW7019 make it an ideal choice for edge-lit, direct-lit, and segment-edge-lit LED LCD TV designs. It drives up to eight parallel LED strings at 85V (maximum) per channel and can sink up to 200mA per string for 2D and 450mA per string for 3D TV applications. A wide, 9V to 28V input supply voltage range makes the iW7019 compatible with existing TV power systems, so there is no added expense for a separate voltage rail. Comprehensive dimming modes provide maximum flexibility to support both patterned retarder (PR)⁽¹⁾ and shutter glass

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(SG)⁽²⁾ 3D TV technologies, as well as 2D TV with just one IC.

iWatt's BroadLED digital technology lowers system costs by reducing the voltage offset (V_f) between mismatched LED strings. Backlight driver ICs need to drive multiple strings of LEDs, however, each LED has a different forward voltage. This voltage offset has traditionally been managed by "binning," where LEDs are sorted for similar forward voltages, but this adds significant cost. BroadLED technology senses the voltage mismatch between the multiple LED strings and adjusts each string's V_f as needed, enabling the use of loosely binned LEDs to reduce system costs. The difference in string voltages also produces higher power dissipation. BroadLED technology eliminates up to 90% of this wasted power, while maintaining $\pm 2\%$ current matching.

In addition to BroadLED technology, the iW7019 incorporates a number of additional features to reduce system costs. The integrated DC-to-DC boost controller provides a 10V gate drive, enabling the use of lower-cost power FETs (field-effect transistors), while the integrated, high-voltage current sinks eliminate the added cost of external high-voltage FETs. An on-chip frequency synthesizer lowers cost by relaxing the timing accuracy requirements on the video system timing controller. The digital control engine in the iW7019 generates the PWM wave form, manages all fault readouts, and reports faults, removing the need for expensive microcontrollers. Additional savings come from the 85V capability on drain sensing, which eliminates external diodes usually required for LED short-circuit fault management, as well as cascodes or zener clamps typically required for protection.

The iW7019 provides comprehensive and flexible dimming modes, including 16-bit SPI for high-bandwidth PWM local dimming, single direct PWM dimming with configurable phase shift, 8-bit analog dimming, and hybrid dimming. The PWM dimming range is 0% to 100%, with 12-bit resolution. Precise control of the PWM output position and the PWM duty cycle offer the flexibility to support both PR and SG 3D technologies, while hybrid dimming lets users mix PWM and analog dimming modes to maximize system efficiency. Phase-shift dimming allows the use of smaller output capacitors, eliminating audible noise, improving electromagnetic interference (EMI), and lowering cost.

The PLL engine on the iW7019 reduces both motion blur and waterfall noise by synchronizing PWM dimming to the video signal (V_{sync}), supporting both head- and tail-mode dimming. Individual brightness control of each LED string facilitates local dimming, where dark areas of the display can be dimmed or turned off to improve contrast ratio.

Comprehensive, built-in protection features include over-voltage, over-current, and UVLO protection on the boost controller, with open/short fault protection, and over-temperature shutdown for the LED drivers. LED short level fault detection is resistor-programmable via a single pin at four levels: 3V, 6V, 9V, 12V. When a fault is validated, the iW7019 can be programmed to turn off the entire IC or just the LED string associated with the fault.

The iW7019 comes in a 44-pin thin QFP package with an exposed die pad and

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supports 200mA per channel within a 50° temperature rise. It is also available in a 32-pin SOP that supports 175mA per channel within a 50° temperature rise. The pin-outs for both packages are optimized for single-layer PCB layout.

iW7019 key features

- 8-channel LED backlight driver, 85V (max) LED voltage
- Wide input supply voltage: 9V to 28V
- LED current: 2D = 200mA, 3D = 450mA
- Integrated current sinks
- Integrated 10V DC-DC boost controller enables use of low-cost MOSFETs
- Patented BroadLED technology lowers cost for LED binning, maintains $\pm 2\%$ current matching
- Comprehensive dimming control: SPI with 12-bit PWM dimming, single direct PWM with phase shift, 8-bit analog dimming
- Supports head- and tail-mode dimming to reduce motion blur
 - PWM dimming range: 0% to 100%

Pricing, availability

The iW7019 LED driver is available now in production quantities and is priced at \$1.80 in 1,000-piece quantities, for either the 44-lead TQFP or 32-lead SOP package. Product brief is available: [iW7019 Product Brief](#) [1].

<http://www.iwatt.com> [2]

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[1] <http://iwatt.com/wp-content/uploads/2013/06/iW7019-Product-Brief.pdf>

[2] <http://iwatt.com>