# KTD2061 – A Unique Method of Illumination

In the world of lighting technology, LED drivers play a crucial role in ensuring efficient power management and control for LED lighting systems. The ultra-innovative and feature-rich RGB LED drivers from Kinetic Technologies' provide functional utility, wow factor, and perceived luxury to enhance your product's market appeal, all with the industry's smallest footprints, fewest PCB traces, and lowest firmware overhead. One standout product in this field is Kinetic Technologies' KTD2061 Multi-Channel LED Driver. Incorporating advanced features, such as a unique LED configuration and independent fade engines, this driver offers a major size reduction and an unparalleled level of simplicity and flexibility for RGB lighting applications.

In a typical RGB LED driver, all LEDs are connected to the input voltage in a common-anode configuration, and then the cathode of every LED is routed back to the driver with a separate trace. Thus, it would take 37 individual PCB traces to drive the 36 LEDs for a 12 RGB configuration. Kinetic's unique RGB control scheme uses the LED itself as a multiplexing diode. This innovative arrangement of LEDs is employed with time-division multiplexing for a 3x reduction in PCB traces, requiring only 12 lines to drive all 36 LEDs!

## Unveiling the KTD2061 Multi-Channel LED Driver

The KTD2061, developed by Kinetic Technologies, is a cutting-edge LED driver that stands out due to its innovative LED configuration, which drastically reduces size and simplifies layout. It is intended to drive 12 RGB modules (36 individual LEDs) simultaneously, with 36 independent fade engines for stunning lighting effects. By configuring the LEDs in a clever scheme that uses the diode function of the LEDs to block current when disabled, the part allows for a package that is three times smaller and a layout that uses three times less PCB traces. Because of this, the KTD2061 allows for the smallest and simplest design available in the industry. This unique LED arrangement is an elegant way to achieve a lower cost design that is smaller and easier to implement. The part uses three busses of four wires each, where each bus is time-multiplexed to drive 12 channels (4 RGBs) per bus.

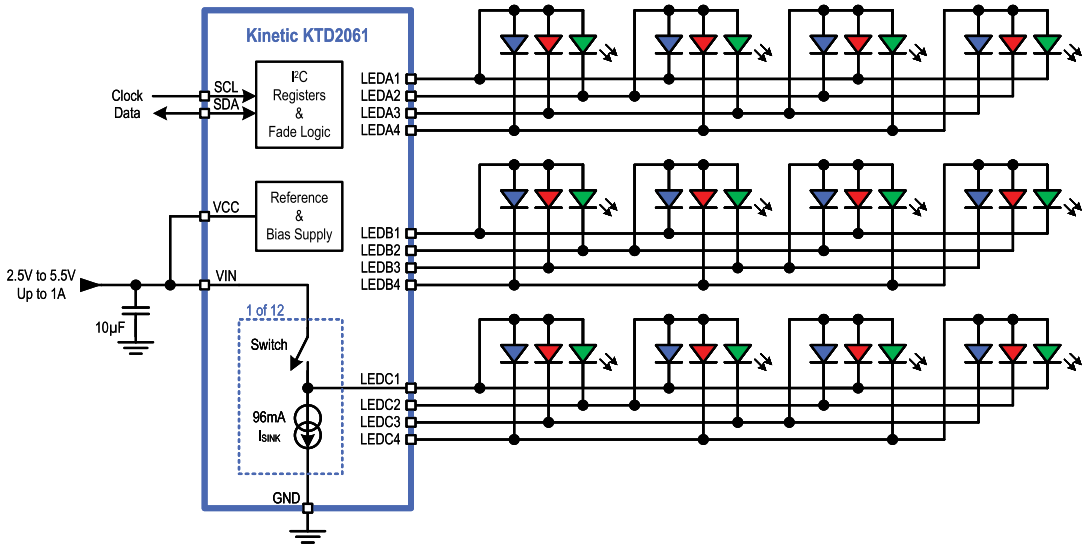


**Figure 1. Typical Application**

## Industry's Smallest Size

Kinetic's customers enjoy reduced size and complexity due to the unique arrangement of LEDs enabled by the KTD2061. The driver circuit does not require an individual pin to drive every LED, as is typical of competing solutions, which dramatically reduces the size of our part. Routing 12 traces, compared with 37 in a normal design, also reduces complexity and may allow for a lower layer-count in the PCB.

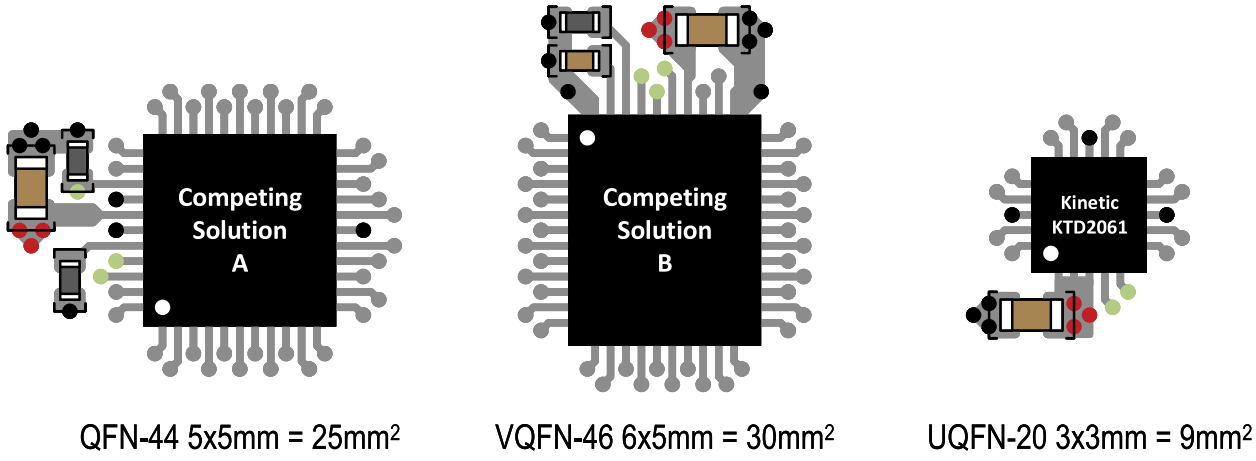


**Figure 2. Kinetic's Solution vs Competing Solutions**

## Unparalleled Flexibility and Control

One of the key advantages of the KTD2061 is that it provides 36 independent fade engines for automated fading and animation effects. The device delivers ultra-smooth 3,072 step fade resolution with a 3-bit programmable fade rate, which dramatically reduces system software complexity. Because the fade engines are exponential, they settle with the same time constant at any given fade rate, regardless of how many steps an individual LED needs to move. This makes it easy to fade from one color to another since each RGB will arrive at the new color at the same time, no matter the starting or ending color coordinates. This reduces firmware complexity by eliminating complex calculations, drastically reduces $I^2C$ writes, and ensures very smooth fading and animation.

There are a wide range of effects, such as a breathing, chasing, stacking, flowing, and comet tail animations, that can be achieved. The internal fade engines operate independently, not requiring external control of the fade ramps. Just set the desired target color and fade rate, then the engines will calculate the steps on the fly. This autonomous operation offloads the system controller from calculating the fade ramps and constantly communicating with the device, as is typical in other RGB drivers on the market.

## Extended Operation

Kinetic's patented BrightExtend™ technology reduces the dropout of the drivers when the input voltage is too low to support the forward voltage of the LEDs. This feature enables a designer to maintain color accuracy in battery-powered applications to extend LED operation as long as possible during the end of a battery discharge cycle. The KTD2061 operating current is lower than other drivers on the market, and boasts a 0.4µA shutdown/standby current, which is ideal for battery powered applications.

Thermal management is a priority in many LED lighting applications. Kinetic's programmable CoolExtend™ technology prevents excessive heat by regulating die temperature when the input voltage, current settings, and/or ambient temperature are high.

## Seamless Integration and Simplified Design

The KTD2061 comes equipped with a comprehensive set of features that make it easy to integrate into a variety of lighting applications. Its compact form factor and efficient power management contribute to simplified system design, reducing the overall complexity and cost of LED lighting solutions. The PCB layout is remarkably simple and elegant.

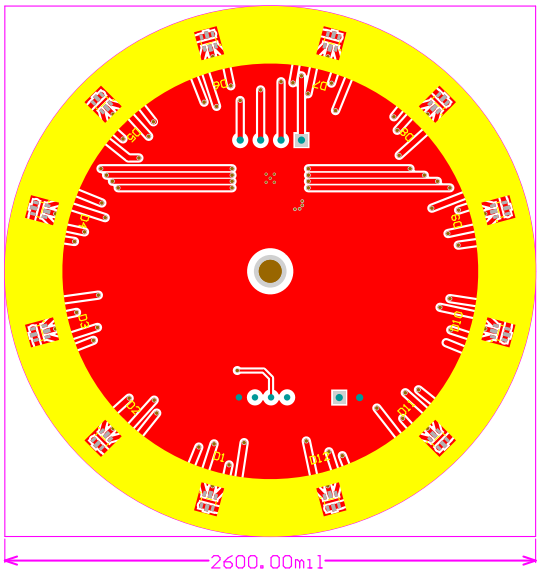


**Figure 3. PCB Layout Top View**

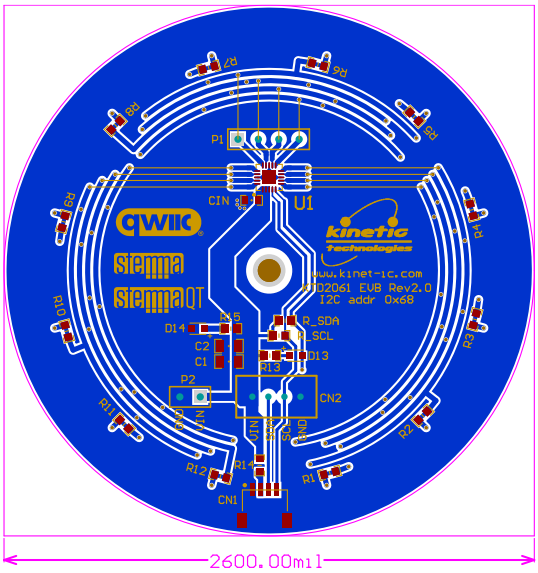


**Figure 4. PCB Layout Bottom View**

## Learn More About the KTD2061

For more detailed information, watch our 3-part video series describing the fundamentals of this exciting technology at:

https://www.kinet-ic.com/design-resources/videos/

Get your hands on an evaluation board! Evaluation kits are available through DigiKey and Mouser so that you can test out these unique products in your lab. Please visit:

DigiKey: https://www.digikey.com/en/products/detail/kinetic-technologies/ktd2061euac-mmev02/21407371

Mouser: https://www.mouser.com/new/kinetic-technologies/kinetic-ktd2061-2-eval-kit/

## Applications and Future Prospects

The Kinetic Technologies KTD2061 Multi-Channel LED Driver finds applications across numerous industries. The product's unprecedented level of flexibility opens a world of creative possibilities for Bluetooth speakers, automotive accent lighting, gaming, VR, conferencing systems and other applications that demand a dynamic and captivating lighting experience. RGB LEDs can make any product or gadget more appealing, and if done well, can increase sales of the end product.

Looking ahead, the KTD2061 sets the stage for further innovation in the realm of LED drivers. As the demand for sophisticated lighting systems continues to grow, the ability to easily control fade patterns in groups of LEDs will become increasingly important. Kinetic Technologies has set a new standard with the KTD2061. The

company offers a variety of products in a family of parts that incorporate 12 channels in the KTD2052, 24 channels in the KTD2064 and 36 channel in the KTD2061, which can be found at:

https://www.kinet-ic.com/display-power/rgb-led-driver-ics/

The Kinetic Technologies KTD2061 36-channel LED driver stands out as a unique method of illumination. Its innovative design and advanced features provide lighting designers with unprecedented flexibility, control, and simplicity. By enabling smooth operation with integrated fade engines and simplifying automated animations, the KTD2061 empowers designers to create captivating lighting effects and patterns. With its efficiency, seamless integration capabilities, and simplified system design, this driver is poised to reshape the landscape of multi-channel LED lighting applications.