

# 5 ways TI's tiny devices deliver huge innovations to engineers

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As electronic circuits have become smaller, their components have gotten smarter, faster and capable of processing more information – often requiring less power than ever before. “Small size” has been a key semiconductor trend for years, and many tiny devices from TI are helping you overcome design challenges in a multitude of applications. Here are five big reasons to go small.

## 1. Less board space = integrated features

Whether it's in their cars, their home or their hands, consumers are always looking to get the most out of their products. But adding more features often produces larger designs. As power, mixed-signal and embedded processing devices continue shrinking, we can help you save space while upgrading system performance with additional sensors, processors and other devices.

With options measuring as small as 0.64 mm<sup>2</sup>, TI designed the performance of the [TLV9061](#) operational amplifier (op amp) family to meet or exceed common specifications for an all-around op amp. In October, it earned a global “Innovator of the Year” award in the Analog and Power category of the Design & Elektronik awards. Its rail-to-rail input and output range, along with a wide voltage supply, enable a breadth of low-voltage applications. In addition, high-performance features – including high gain bandwidth, low offset voltage and low broadband noise – make it easier for you to find a versatile op amp for your designs. By drastically reducing the size of discrete op amps like the TLV9061, we're enabling engineers to utilize the additional board space to add more sensors, processors and more.

## 2. Less board space = smaller designs

To meet the demanding size constraints of today's shrinking electronics, individual components must be as small as possible without compromising reliability. With devices spanning IO-Link to isolation, TI's interface portfolio offers both small size and robust performance – and empowers you to design miniaturized solutions.

In smart factories, one of the smallest sensors is the cylindrical sensor, which has a printed circuit board (PCB) measuring 17.5 mm by 2.5 mm. These tiny systems require devices that provide robust electrostatic discharge protection and thermal management integrated in the package – and thus drove the development of a new package for [TIOL111](#) and [TIOS101](#) devices, producing two of the smallest, most robust IO-Link transceivers on the market.

When it comes to isolation, package size is just as important as the level of protection from both faults and system noise. These “circuit lifesavers” need to be tiny enough to keep the overall system design small while remaining robust enough to withstand high voltages.

The 8-pin small outline integrated circuit package for TI's isolated [ISO1042](#) and [ISO1042-Q1](#) CAN transceivers is among the smallest reinforced isolated CAN transceivers on the market, yet has one of the industry's highest working voltages: 1 kVrms.

## 3. Less material = less weight

The automotive market is undergoing a technological boom, with LIDAR at the forefront. Next-generation LIDAR requires higher-power laser diode pulses in shorter pulse widths at higher frequencies. Because higher frequencies enable smaller systems, it's possible for you to shrink your system while maintaining high drive performance for long-distance LIDAR.

TI's [LMG1020](#) gallium nitride (GaN) driver enables you to meet the tight propagation delay requirements needed for a higher peak power of the laser diode. The enables optimal power and speed in a laser design that's impossible with a metal-oxide semiconductor field-effect transistor.

The LMG1020 is capable of a 1-ns minimum input pulse width for 60-MHz operation, enabling the higher switching frequencies needed to reduce the size of magnetics and offering one of the highest drive strengths for its small size.

#### 4. Achieve higher performance

TI's operational amplifiers help solve key issues that you're facing when designing compact, portable electronics, such as battery life and recharge time. Today, fast charging is the preferred standard because it enables better charging rates while maintaining cooler battery temperatures. This requires a robust, precision battery-management design to accurately control charging and discharging cycles, maintaining optimum temperatures and maximizing battery life.

The [OPA2333P](#) is the industry's lowest-power, sub-300-kHz, high-precision dual operational amplifier in a micro-sized, 8-pin very,very thin small outline no-lead (WSON) package measuring only 2 mm by 2 mm. This low-voltage, low-power amplifier offers ultra-high DC precision due to [zero-drift](#) technology, enabling designs that can detect high load currents with a wide output voltage range. This device is a good fit for bidirectional current-sensing designs that you might find in mobile devices featuring fast charging modes.

#### 5. Enable applications previously impossible

Historically, medical monitors required multiple cables or large equipment to detect and record a patient's vital signs. Now, blood glucose monitors can fit in the palm of your hand and connect to a smartphone. In the smart home realm, doors and windows have security sensors running off small coin-cell batteries.

Although the creation of smaller-footprint designs has revolutionized the ability to add electronics to virtually any product, it's also generated increasing pressure to continually shrink designs.

TI makes it easier to optimize the area of a design by producing highly integrated devices in tiny packages. One example is the [CC2640R2F](#) SimpleLink™ [Bluetooth®](#) low energy wireless microcontroller, available in a 2.7-mm-by-2.7-mm wafer chip-scale package that is 40% thinner and 23% smaller in area compared to its 4-mm-by-4-mm quad flat no-lead package. By reducing the device area, you can add wireless connectivity to a product without drastically increasing the PCB dimensions and create small-sized, ultra-low-power Bluetooth 5 solutions that were previously unimaginable.

#### Additional resources

Learn more about TI's portfolio of products available in small packages:

- [Power management](#)
- [Amplifiers](#)
- [Digital-to-analog converters](#)
- [Isolation](#)
- [Interface](#)

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