Texas Instruments

PUSHING POWER FURTHER.

Top 5 trends driving change in power management

TI POWER

Power trends

We are in constant pursuit of pushing the limits of power: developing new process, packaging and circuit-design technologies to deliver the best devices for your application. Whether you need to improve power density, extend battery life, reduce electromagnetic interference, preserve power and signal integrity, or maintain safety in the presence of high voltages, we're committed to working alongside you to help solve your power-management challenges. Texas Instruments: Your partner in pushing power further.

1

Power density

Increasing power density to achieve more power in smaller spaces, enhancing system functionality at reduced system costs

2

Low I_Q

Lowering quiescent current to extend battery and shelf life without compromising system performance

3

Low EMI

Minimizing interference to lower system cost and quickly meet EMI standards

4

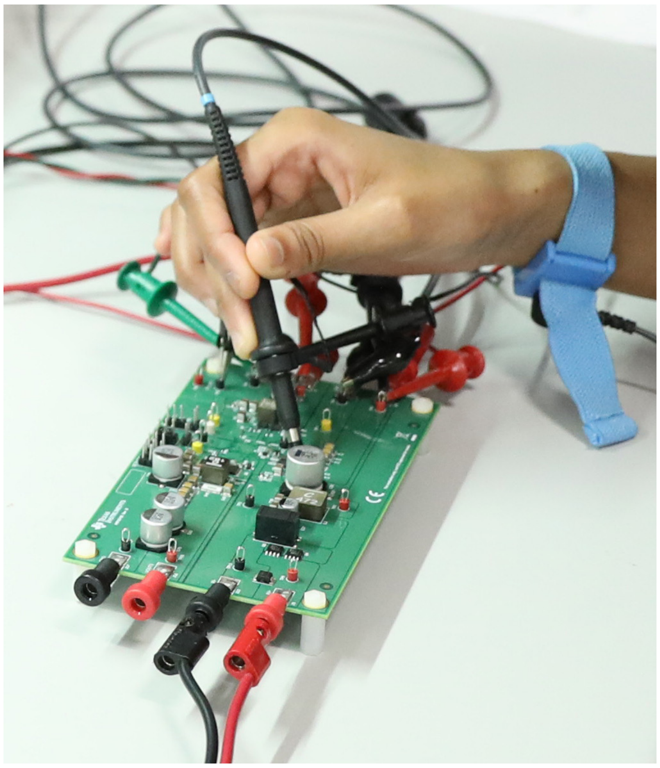
Low noise & precision

Enhancing power and signal integrity to improve system-level protection and accuracy

5

Isolation

Transferring signal and/or power across a high-voltage isolation barrier to increase safety with the highest working voltage and reliability



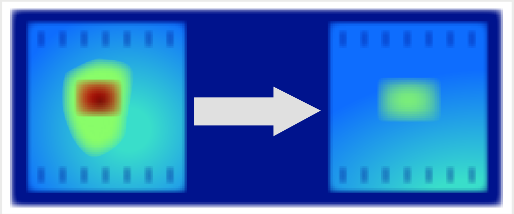
Power density

Achieve more power in smaller spaces, enhancing system functionality at reduced system costs

Board area and height are becoming limiting factors as power demands increase. Power designers must squeeze more circuitry into their applications to differentiate their products while also increasing efficiency and enhancing thermal performance. Higher power levels in smaller form factors are now possible using TI’s advanced process, packaging and circuit-design technologies.

DEVICES GENERATING LESS HEAT

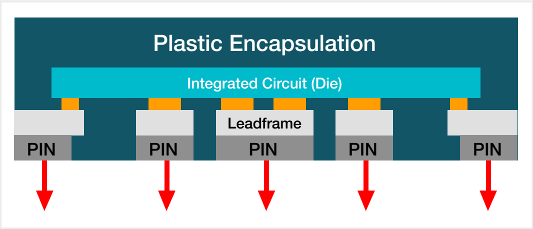
- Industry-leading power process node for <100V
- 600V gallium nitride (GaN) devices for unmatched switching performance



Thermal images comparing the impact of higher efficiency on temperature rise.

PACKAGES REMOVING THE HEAT

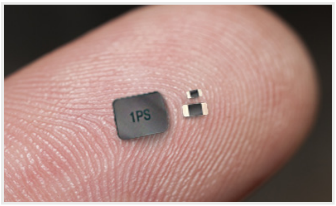
- HotRod™ packaging
- Enhanced HotRod QFN enabling thermal pads



HotRod™ packaging eliminating bond-wires while maintaining excellent thermal performance.

TOPOLOGIES AND CIRCUITS ENABLING SMALLER PASSIVES

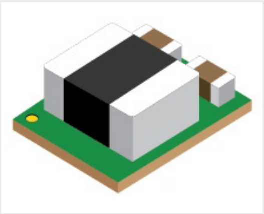
- Multilevel converter topologies
- Advanced power-stage gate drivers



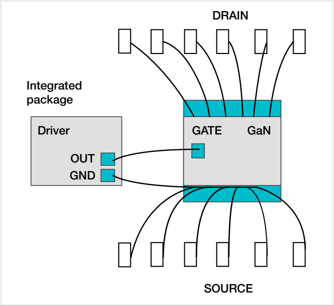
Multilevel topologies enabling much smaller magnetics.

INTEGRATION MINIMIZING PARASITICS AND REDUCING SYSTEM FOOTPRINT

- MicroSiP 3D-module integration
- GaN and driver multichip module (MCM) with low loop inductances



MicroSiP package



GaN + gate driver MCM to reduce parasitics improving power density.

Learn more: www.ti.com/powerdensity

Key product categories for power density: Battery charger ICs, Buck-boost & inverting regulators, Gallium Nitride (GaN) ICs, Isolated bias supplies, Isolated gate drivers, LED drivers, Linear regulators (LDO), Multi-channel ICs (PMIC), Offline & isolated DC/DC controllers & converters, Power switches, Step-down (buck) regulators, Step-up (boost) regulators, USB Type-C & USB Power Delivery ICs

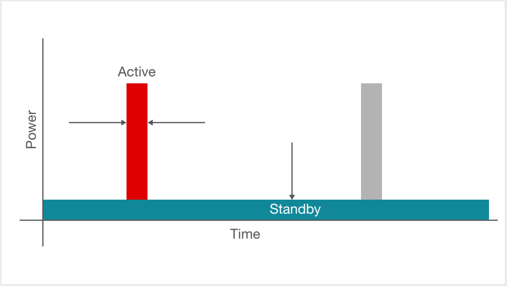
Low quiescent current (I_Q)

Extend battery and shelf life without compromising system performance

In battery-operated systems, the need to achieve high efficiency at no- or light-load conditions requires power solutions to tightly regulate the output while maintaining ultra-low supply current. With TI's portfolio of ultra-low I_Q technologies and products, you can maximize your battery run time and enable low power consumption in your next design.

LOW STANDBY POWER

- Extend battery run time with ultra-low-leakage components and novel control topologies



Fast wake-up and low standby power.

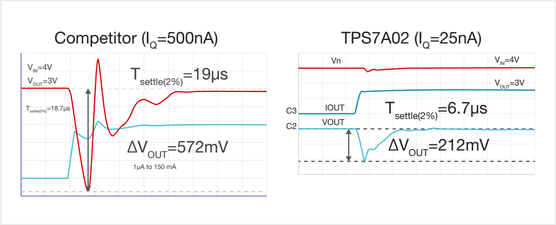
SMALL FORM FACTOR

- Application-enabling die and package size without compromising quiescent power, enabled by TI's patented circuit techniques

Ultra-small packages without compromising I_Q.

FAST RESPONSE TIME

- Enhance system functionality with fast wake-up circuits and adaptive biasing to improve dynamic response time while maintaining ultra-low quiescent power consumption



TI vs. competition demonstrating ultra-low I_Q and excellent transient response.

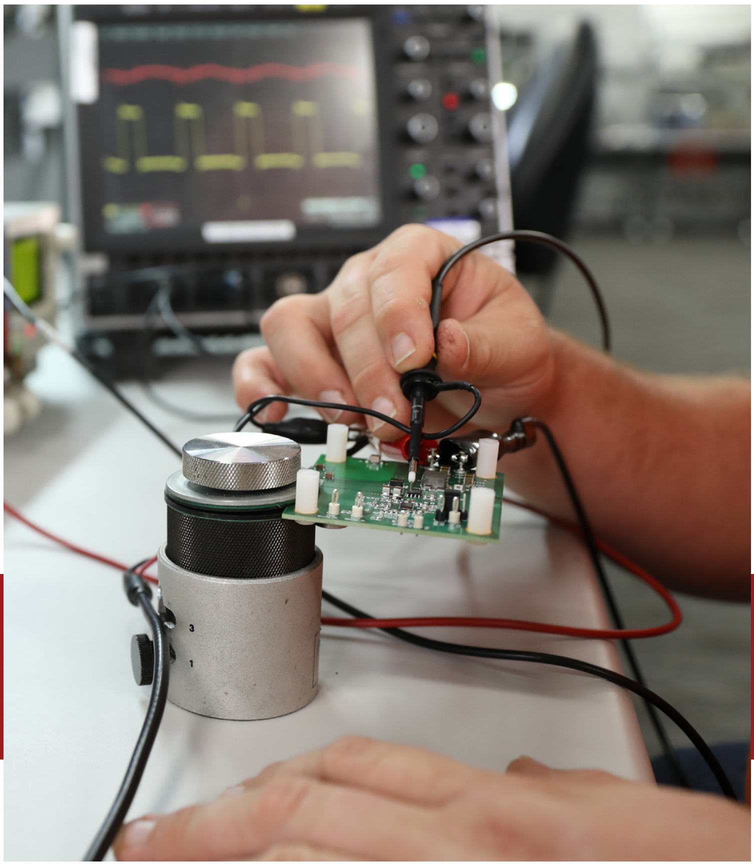
Learn more: www.ti.com/lowiq

Key product categories for low I_Q: Battery charger ICs, Buck-boost & inverting regulators, Linear regulators (LDO), Power switches, Series voltage references, Shunt voltage references, Step-down (buck) regulators, Step-up (boost) regulators, Supervisors & reset ICs

Low EMI

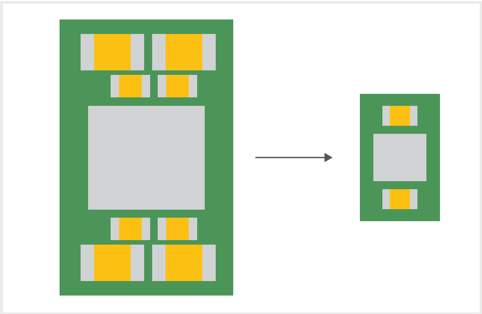
Lower system costs and quickly meet EMI standards by reducing emissions

Electromagnetic interference (EMI) is a key requirement of increasing importance in electronic systems, especially in new applications such as automotive and industrial. Designing for low EMI can save you significant development cycle times while also reducing board area and solution cost. TI offers multiple features and technologies to mitigate EMI in all of the frequency bands of interest.



IMPROVE FILTER SIZE AND COST

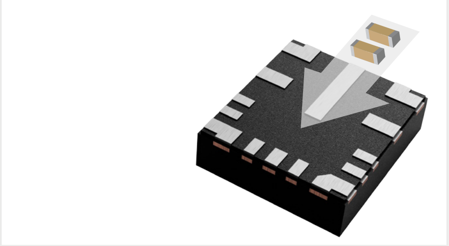
- Mitigate the impact of generated EMI with TI's advanced spread-spectrum techniques



Advanced EMI mitigation techniques to reduce passive filter size.

REDUCE DESIGN TIME AND COMPLEXITY

- Fundamentally reduce generated emissions at the source using low inductance packages, capacitor integration and advanced gate driver techniques



Reducing radiated noise by in-package high-frequency capacitor integration.

Learn more: www.ti.com/lowemi

Key product categories for low EMI: Buck-boost & inverting regulators, Isolated bias supplies, Multi-channel ICs (PMIC), Step-down (buck) regulators, Step-up (boost) regulators

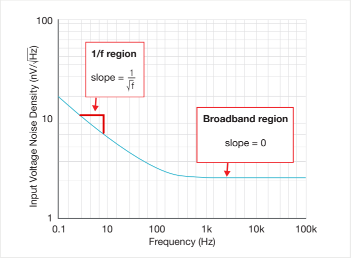
Low noise and precision

Enhance power and signal integrity to improve system-level protection and accuracy

The ability to monitor, condition and process signals in the power chain is critical in order to maximize system performance and reliability. High-precision systems require accurate low-noise references, as well as supply rails with low noise and ripple. TI uses dedicated process components and advanced circuit and test techniques that increase accuracy and minimize distortion.

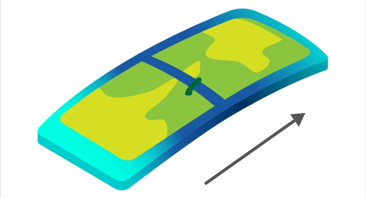
REDUCE AND MITIGATE IC ERROR SOURCES

- Leverage TI's highly optimized low-noise complementary metal oxide semiconductor (CMOS) process to reduce process non-idealities
- Reduce the impact of process non-idealities with advanced circuit and test techniques



Noise vs. frequency plot.

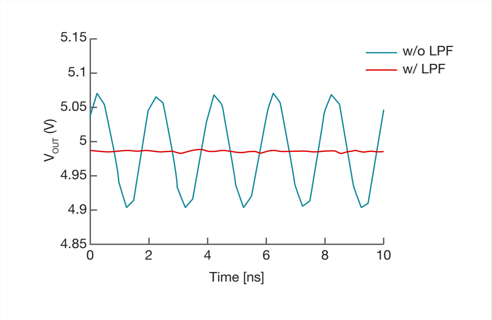
- Advanced capabilities such as ceramic packages and board stress-management techniques



Managing silicon and board stress.

SYSTEM NOISE MITIGATION

- Technology advancements that enable better immunity to system-level disturbances and noise with high power-supply rejection ratio (PSRR) low-dropout regulators (LDOs) and on-chip filtering



High PSRR enable better filtering and lower output noise.

Learn more: www.ti.com/lownoise

Key product categories for low noise & precision: Battery monitors & balancers, Linear regulators (LDO), Multi-channel ICs (PMIC), Series voltage references, Shunt voltage references, Supervisor & reset ICs

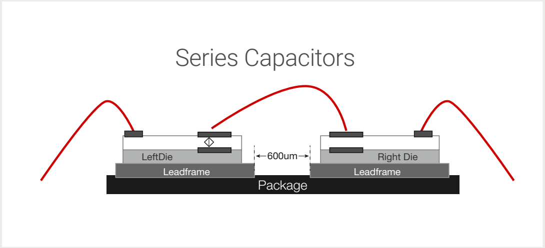
Isolation

Increase safety with the highest working-voltage and reliability

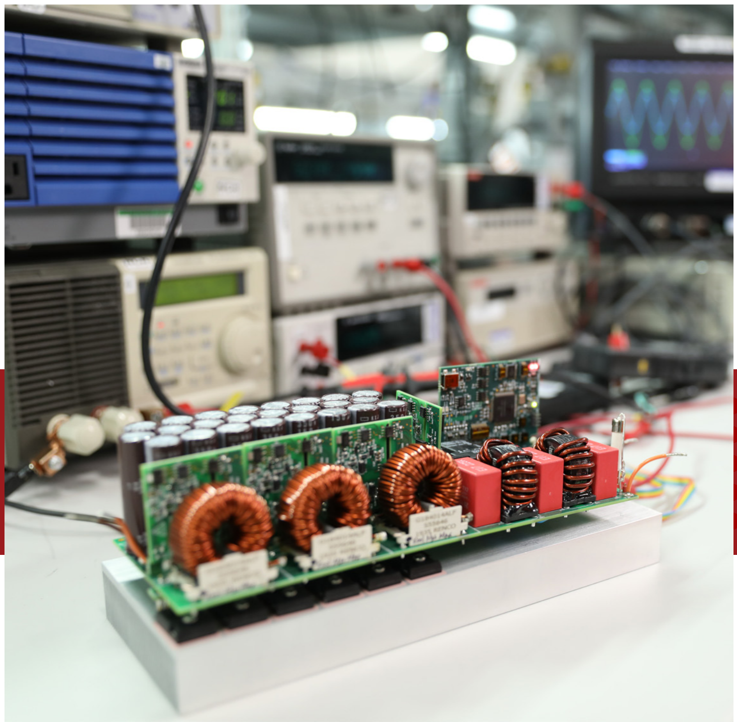
Isolation is about reliable protection in the presence of dangerous high voltages. Galvanic isolation electrically separates two domains, allowing power or signals to transfer across the barrier without compromising human safety, while also preventing ground potential differences and improving noise immunity. TI's portfolio of isolation technologies, including a capacitive SiO2 insulation barrier and integrated transformers, help exceed Verband der Automobilindustrie (VDA), Canadian Standards Association (CSA) and Underwriters Laboratory (UL) standards without compromising performance. To learn more about isolation, see all of our isolation solutions.

TRANSFERRING SIGNALS

- Improve system robustness and reliability with high-quality isolation technology, low-latency data transfer and excellent common-mode transient immunity (CMTI).

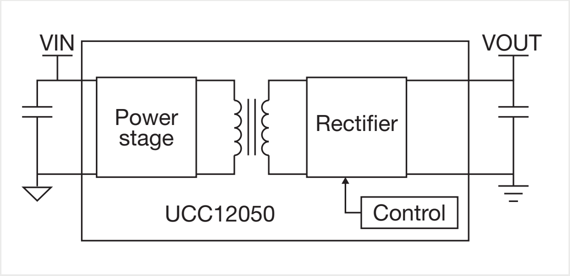


Transferring signals using SiO_2 isolation capacitors.



TRANSFERRING POWER

- Reduce thermal burden and simplify EMI compliance by integrating high-voltage isolation components necessary to transfer power in a single package.



Transferring power efficiently and with low EMI through integrated transformers.

Learn more: www.ti.com/isolationtechnology

Key product categories for isolation: Isolated bias supplies, Isolated gate drivers, Digital isolators, Isolated ADCs, Isolated amplifiers, Isolated interfaces

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TEXAS INSTRUMENTS

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