Intelligent Low-Voltage Integrated Power Interface



Overview

Intelligent power modules (IPM) | Infineon TechnologiesOur IPMs integrate high-performance MOSFETs, IGBTs, and SiC devices with next-generation gate driver.

Key Takeaways

An Intelligent Low-Voltage Integrated Power Interface combines multi-channel low-voltage power distribution with integrated control and protection, optimizing efficiency, reliability, and compactness for automotive, industrial, and IoT applications.Overview

An Intelligent Low-Voltage Integrated Power Interface is a system that integrates multiple low-voltage power channels, typically around 12 V, with embedded control, protection, and communication features. It often uses MOSFET circuits in parallel to divide power across channels while sharing a central control chip, signal acquisition circuits, and a communication interface, reducing wiring complexity, cost, and weight in applications such as vehicles or industrial equipment .

Key Components and Technologies
• Intelligent Power Modules (IPMs): These modules integrate high-performance MOSFETs, IGBTs, or SiC devices with gate driver ICs for precise switching control. They offer optimized thermal and mechanical designs for improved heat dissipation and reliability .

• Multi-Channel Distribution: Multiple low-voltage channels are managed in parallel, allowing efficient power delivery and battery protection while minimizing external wiring .

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• Control and Monitoring: Centralized control chips and communication interfaces enable real-time monitoring, fault detection, and energy optimization, often compatible with IoT platforms for remote management .

• Compact Integration: The interface is designed to mechanically share a shell and reduce PCB footprint, enabling lightweight and space-efficient solutions for automotive and industrial applications .

Applications

• Automotive: Integrated 12 V power distribution for vehicles with multiple battery packs, reducing harness complexity and improving battery protection .

• Industrial Drives: Motor drives, HVAC systems, and pumps benefit from IPM-based low-voltage interfaces for precise control and energy efficiency .

• IoT and Smart Devices: Ultra-low-voltage ICs powered by energy harvesters can be integrated into sensor networks, enabling compact, low-power operation for connected devices .

• Home Appliances: Washing machines, refrigerators, and air conditioning units use IPMs to drive motors efficiently while reducing energy consumption .

Benefits

• Energy Efficiency: Optimized switching and low conduction losses reduce energy consumption and CO2 emissions .

• Cost and Weight Reduction: Integration of multiple channels and shared hardware reduces component count and wiring complexity .

• Reliability and Protection: Embedded monitoring and control protect batteries and connected devices from overcurrent, short circuits, and thermal stress .

• Scalability: Modular design allows adaptation to different power ranges, from tens of watts to several kilowatts, depending on application requirements .

Conclusion

An Intelligent Low-Voltage Integrated Power Interface represents a modern approach to low-voltage power management, combining multi-channel distribution, integrated control, and high-efficiency power modules. It is particularly valuable in automotive, industrial, and IoT applications where compactness, reliability, and energy efficiency are critical. By integrating power electronics, control logic, and monitoring capabilities, these interfaces simplify system design, reduce costs, and enhance operational performance.

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IED (Intelligent Electronic Device) advanced functions that make

Intelligent electronic devices (IEDs) have been deployed extensively in power automation systems recently, and the

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Interfacing high-voltage applications to low-power controllers

A common requirement of industrial applications is to interface high-voltage potentials, such as signal outputs of sensor switches and

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MNS is ABB''s low-voltage switchgear and controlgear assembly for power distribution and motor control. The MNS design is verified

Intelligent Power Module

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High voltage power modules with integrated gate drivers for consumer, industrial and automotive applications. Offering a large range

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Application Note 5401

A boot-strapping power supply can be derived from either the DC bus voltage or from the low-side power supply VCC_L. For a

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Moreover, an enhanced gate driver integrated current and voltage sensors is designed for monitoring and diagnostics. To achieve a

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