L99LD21

Smart high-power driver for automotive LED string

High-efficiency boost and buck DC-DC converters with flexible SPI interface for scalable, safe automotive LED lighting control.

The L99LD21 integrates a dual-phase boost controller and two buck converters to regulate high-power automotive LED strings. Featuring a flexible SPI interface, it enables precise current and dimming control without external components. Robust safety functions such as load dump protection, timeout watchdog, and limp-home mode ensure reliable operation in harsh environments. Ideal for front lighting applications including low/high beams, daytime running lights, and fog lights, the L99LD21 combines efficiency, flexibility, and safety in a compact solution.

KEY FEATURES

- Input overcurrent and output overvoltage protection
- Buck output short-circuit and open-load detection
- Battery undervoltage and overtemperature shutdown
- Timeout watchdog supervising SPI communication
- On-board OTP memory supporting ASIL B safety standards
- Flexible dimming via internal PWM or direct input pin
- Phase shift and clock distribution programmable via SPI

KEY APPLICATIONS

- High-power LED modules in automotive lighting
- Front lighting systems requiring functional safety
- Applications demanding scalable and programmable LED drivers

Advanced LED current regulator for automotive lighting

Functionality

The L99LD21 offers a wide range of advanced functionalities to meet the demands of current automotive lighting systems:

Boost controller

- Fixed frequency architecture, programmable via SPI
- Peak current mode control with input current limitation
- Soft-start and constant voltage regulation up to 60 V
- Supports dual-phase, interleaved operation for enhanced power handling
- Reverse polarity protection on battery input
- Boost output powers the IC supply, enabling operation during cold cranking

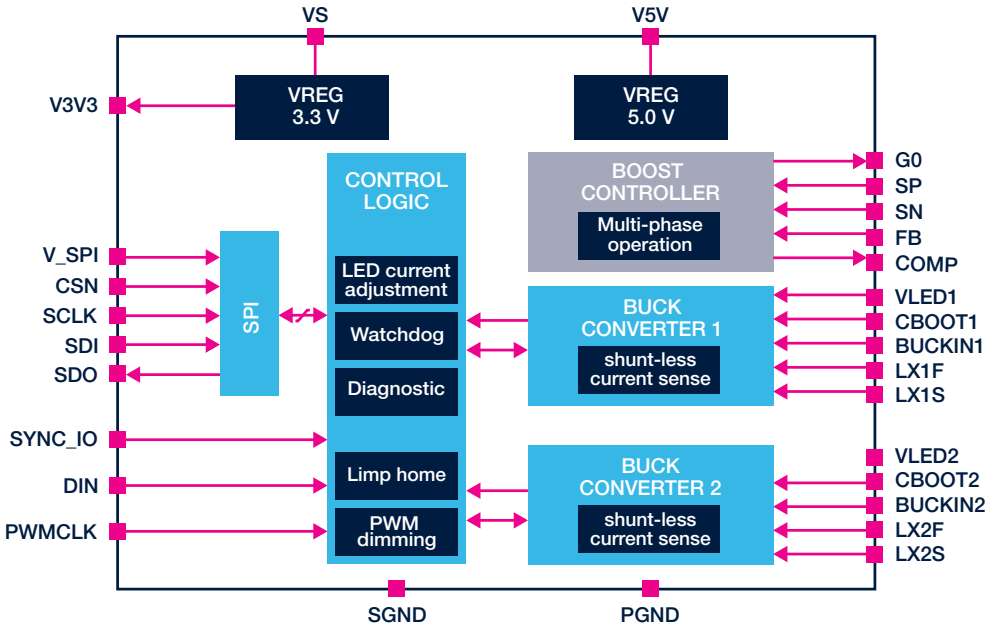
Buck converters

- Integrated N-channel MOSFETs with bootstrap circuit
- Constant VLED x TOFF architecture for precise LED current control
- Integrated PWM generation for dimming control
- Peak and ripple current adjustable via SPI
- Supports external buck converters for flexible system design

Safety and protection

- Full system-level protections:
  - Input overcurrent, output overvoltage, open feedback, overtemperature, and power unbalancing between phases
  - Buck outputs short-circuit and open load protection
  - Battery undervoltage protection
- Timeout watchdog supervising SPI bus communication
- On-board OTP (one-time programmable memory) to preserve operation in limp home mode, supporting ASIL B regulations
- Temperature warning with two thresholds and overtemperature shutdown

Block diagram



L99LD21 product information

Order code	Package	Evaluation board	Operating temperature range	Output current (A)	Supply voltage (V)
L99LD21Q6TR	VFQFPN 40L (6X6)	AEK-LED-21DISM1	-40 to 150°C	up to 1.7 A	5.5 to 24 V (operative range) 40 V (absolute max ratings), 60 V (Buck1&Buck2 inputs)