VIPower™ M0-7SPI
New fully integrated, compact high-side drivers with SPI

Introduction

Managing analog power with Serial Peripheral Interface for enhanced programming, control and diagnostics

ST's family of high-side SPI switches are devices made using STMicroelectronics® VIPower™ technology. They are intended for driving resistive or inductive loads directly connected to ground. The devices are protected against voltage transient on V_{CC} pin.

An 8-bit short frame access to output control registers is provided allowing PWM control through SPI with high granularity.
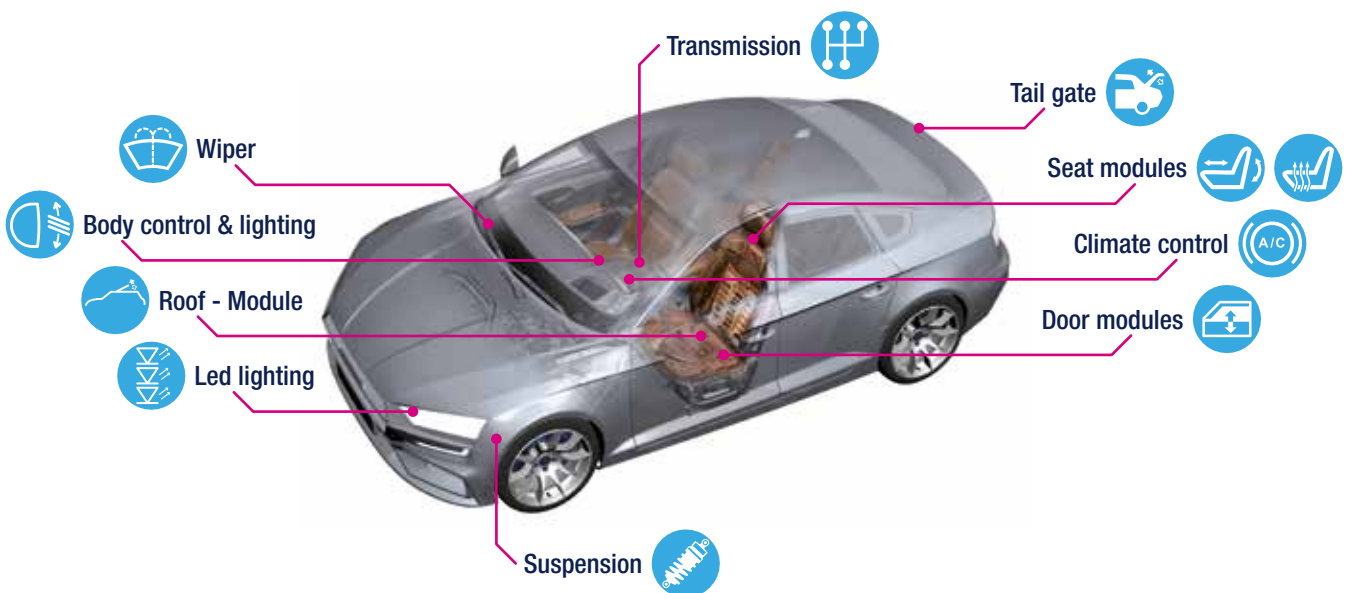
An analog current feedback for each channel is connected to the CURRENT-SENSE pin via a multiplexer. The device detects open-load in OFF-state conditions.

Real time diagnostic is available through the SPI bus (open-load, output short to V_{CC}, overtemperature, communication error, power limitation or latch off).

Output current limitation protects the device in an over load condition. The device can limit the dissipated power to a safe level up to thermal shutdown intervention. Thermal shutdown can be configured as latched off or programmable time limited auto restart.

The device enters a limp home mode in case of loss of digital supply (V_{DD}), reset of digital memory or watchdog monitoring time-out event. In this mode states of channels are respectively controlled by dedicated direct pins. Programmable BULB/LED mode through SPI for perfect load type matching.

- **Saves** cost and space thanks to higher power integration
- **Improves** design by reducing overall interconnections
- **Enhances** diagnostics and safety capability

Transmission

Tail gate

Wiper

Seat modules

Body control & lighting

Climate control

Roof - Module

Door modules

Led lighting

Suspension

MO-7SPI VIPower™ family

GENERAL CHARACTERISTICS

- 4 MHz,16-bit SPI with 8-bit option for fast switching
- Programmable Bulb/LED mode (channel dependency)
- CMOS-compatible parallel input pins for four channels
- MCU-controlled outputs: PWM via SPI or direct inputs
- Limp-Home functionalities
- Slew rate adjustment
- Very low stand-by current
- EMC compliance & AEC-qualified

DIAGNOSTICS

- Analog current sense monitoring on each channel
- Current sense ratio configurable for LEDs or bulbs
- Digital/Analog Diagnostic Interface
- Overload, over-temperature and short-to-GND feedback
- Short-to-battery and open load in Off state with integrated pull-up
- Programmable case over-temperature warning indicator
- Diagnosis with low PWM duty cycle

PROTECTIONS

- Two-level load current limitation
- Self limiting of fast thermal transients
- Power-limitation and over-temperature shutdown
- Short-circuit protection,
- Programmable latching-off, auto-restart, time-limited and auto-restart features
- Undervoltage shutdown
- Overvoltage clamp
- Load-dump protected
- Loss-of-ground and loss-of-battery protection
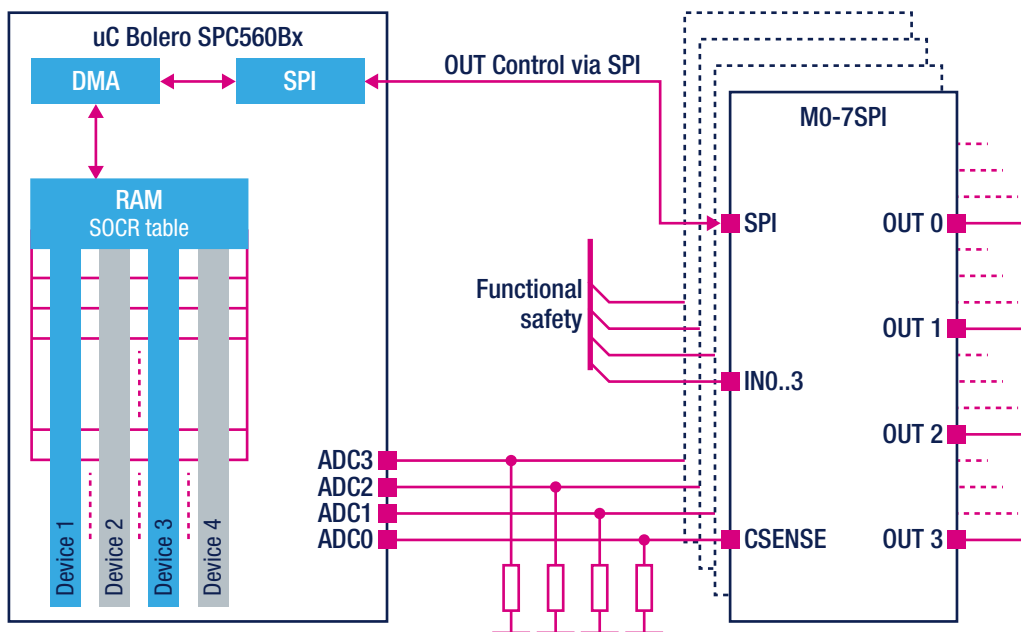- Reverse battery protection (with external components)

SAFETY FEATURES

- Direct input read-back status register
- Watchdog
- Direct input OR with SPI
- ST-SPI pin FMEA
- Robust fail-safe system by advanced limp-home functionalities

VNQ7003SY BLOCK DIAGRAM
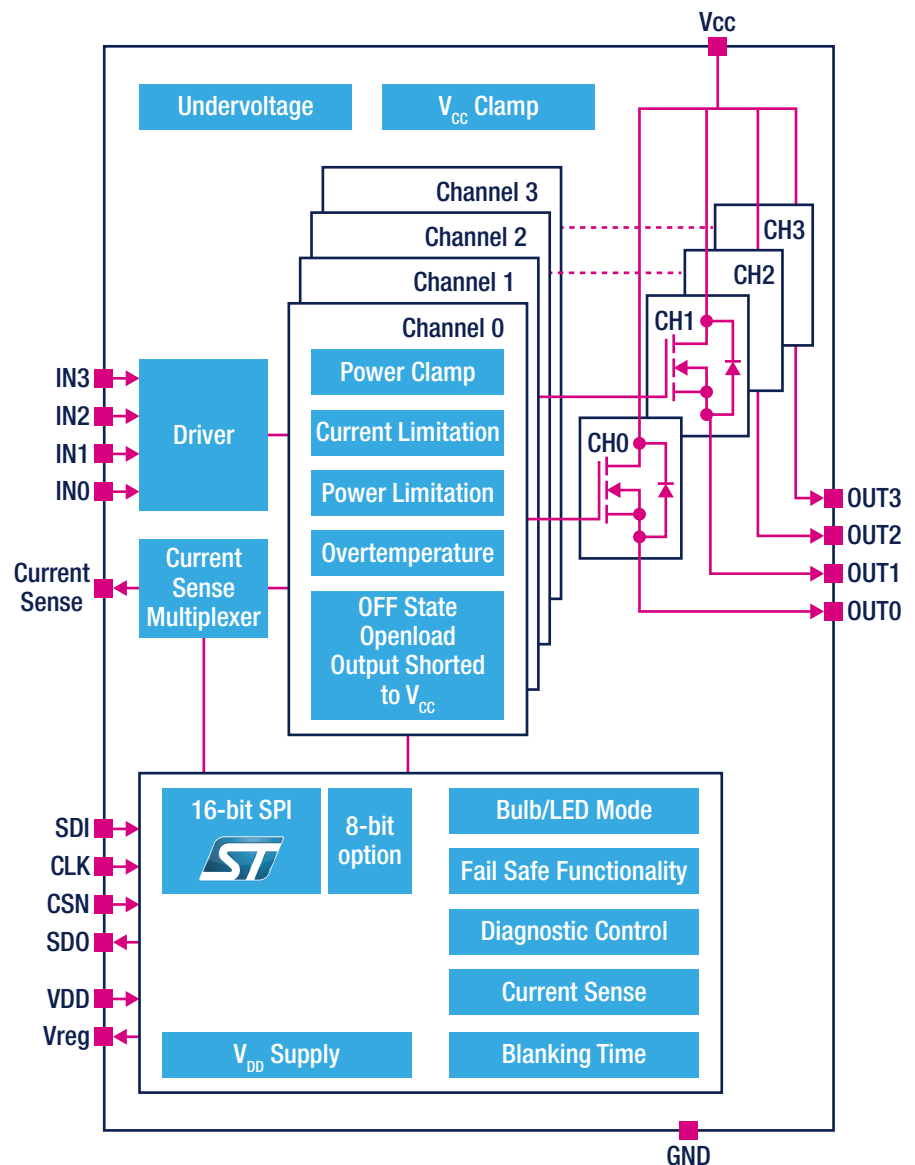
TYPICAL APPLICATION

M0-7SPI PRODUCT FAMILY

Part number	Package	Number of channels	Channels	Typ. R_{ON} (mΩ)	Current limitation	Application (typical)	LED mode
VNQ7003SY	PowerSSO-36	4	Ch0, Ch1	25	35 A	Front Light Underhood	2 channels
			Ch2, Ch3	7	80 A		
VNQ7004SY	PowerSSO-36	4	Ch0, Ch1	35	35 A	Front Light	2 channels
			Ch2, Ch3	9	80 A		
VNP7008SY(*)	PowerSSO-36	5	Ch0, … Ch4	40	34 A	Rear Light	5 channels

(*). In development

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