NXP GPI devices for monitoring 18-V switches PCA9701 and PCA9702

Low-cost monitoring of 18-V switches

Available in 8- and 16-channel formats, these efficient, low-power General Purpose Input (GPI) devices are ideally suited to monitoring the 18-V switches commonly found in body- and seat-control applications of automobiles.

Key features

▸ General-purpose input (GPI) ports tolerant to 18 V
  – PCA9701: 16 ports
  – PCA9702: 8 ports
▸ Input leakage current at 14 V and +125 °C <1 µA (max)
▸ Open-drain interrupt output ($\overline{INT}$)
▸ Interrupt-enable pin (INT_EN), disable $\overline{INT}$ output
▸ V_{DD} range: 2.5 to 5.5 V
▸ SPI serial interface with speeds up to 5 MHz
▸ 4-kV HBM ESD protection
▸ Operating temperature range of -40 to +125 °C
▸ Package options
  – PCA9701: SO24, TSSOP24, HVQFN24
  – PCA9702: TSSOP16

Applications

▸ Body Control Module
▸ Seat Control Module
▸ Automated Test Equipment (ATE)
▸ Any switch-monitoring application tolerant to 18 V

The NXP GPI device PCA9701 has sixteen inputs, while the NXP GPI device PCA9702 has eight. Both are designed to monitor the input status of 18-V switches.

The $\overline{INT}$ signal is an open-drain interrupt output and is active LOW. The signal is cleared on the falling edge of CS or when the input port status matches the input status register. The input is recognized as HIGH when it's greater than 0.7 x V_{DD} and as a LOW when it's less than 0.3 x V_{DD}.

The 5-MHz SPI interface uses four signals: chip select (CS), serial clock (SCLK), serial data in (SDIN), and serial data out (SDOUT). To access the device, the controller asserts CS low, and then sends SCLK and SDIN. When reading or writing is complete, the controller de-asserts CS.

When a state change is detected on one or more of the input channels, the GPI device sends an $\overline{INT}$ flag to the microcontroller.

To monitor a large number of switches, the GPI devices can be linked together serially, with the SDOUT of one device connecting to the SDIN of the next device. The SCLK and

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CS signals must be common among all devices, and interrupt outputs can be tied together. Since the interrupt outputs are open drain and function as wired-ANDs, a single 10-kΩ pull-up resistor is all that's needed to tie them together; no external logic is necessary.

Each input port has a 18-V breakdown ESD protection circuit. When used with a 100-kΩ series resistor, the input can connect to a 12-V battery and supports double-battery, reverse-battery, and load-dump conditions. Using the series resistor limits input leakage to <1 µA per channel. Higher voltage can be sensed using a resistor-divider network that limits the voltage at the input pin to 18 V.
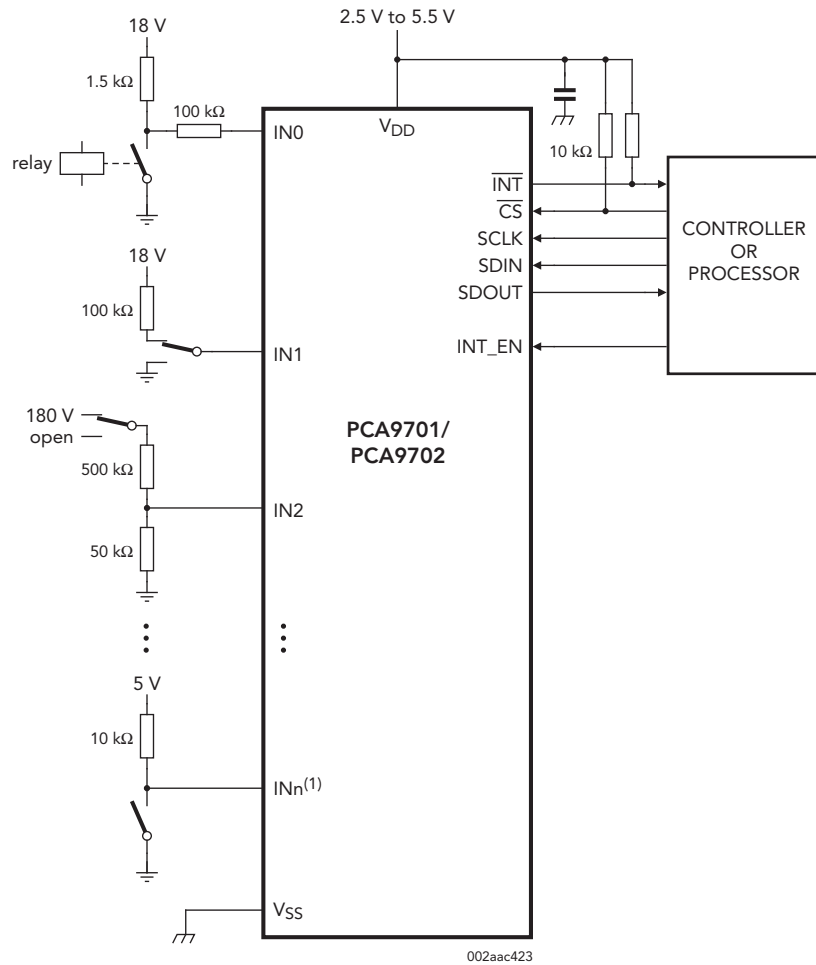
Typical application circuit with PCA9701/2

Ordering information

Type number	Number of channels	Package	Number of pins
PCA9701BS	16	HVQFN	24
PCA9701D	16	SO	24
PCA9701PW	16	TSSOP	24
PCA9702PW	8	TSSOP	16