NXP GPI devices for monitoring 18 V switches PCA9701/03 and PCA9702/04

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 automotive applications.

KEY FEATURES

▸ General-purpose input (GPI) ports tolerant to 18 V

– PCA9701 and PCA9703: 16 input ports

– PCA9702 and PCA9704: 8 input ports

▸ Input leakage current at 14 V and +125 °C <2.5 µA (max)

▸ Open-drain interrupt output (INT)

▸ Interrupt-enable pin (INT_EN), disable INT output

▸ V_{DD} range: 2.5 to 5.5 V (PCA9701/2), 4.5 to 5.5 V (PCA9703/4)

▸ SPI serial interface with speeds up to 5 MHz

▸ 8-kV HBM ESD protection

▸ Operating temperature range of -40 to +125 °C

▸ Package options

– PCA9701/03: TSSOP24

– PCA9702/04: TSSOP16
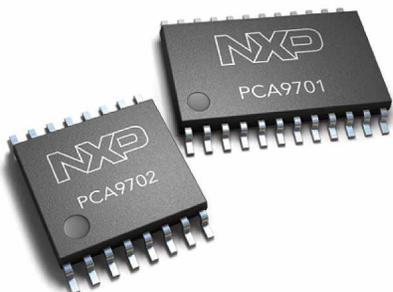
APPLICATIONS

▸ Body Control Module

▸ Seat Control Module

▸ Automated Test Equipment (ATE)

▸ Any switch-monitoring application tolerant to 18 V

The NXP GPI device PCA9701/03 has sixteen inputs, while the NXP GPI device PCA9702/04 has eight. Both are designed to monitor the input status of 18-V switches.

The PCA9703/PCA9704 are newer pin compatible devices for the PCA9701/PCA9702. The PCA9703/PCA9704 have an interrupt masking feature which allows selected inputs to not generate interrupts and also provides higher ground offset of 0.55 X VDD (minimum of 2.5 V at 5 V node) with minimum hysteresis of 0.05 X VDD (minimum of 225 mV at 5 V node).

The 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 VDD and as a LOW when it's less than 0.3 x VDD.

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 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 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.

PCA9701/PCA9702/PCA9703/PCA9704 BLOCK DIAGRAM

Typical application circuit
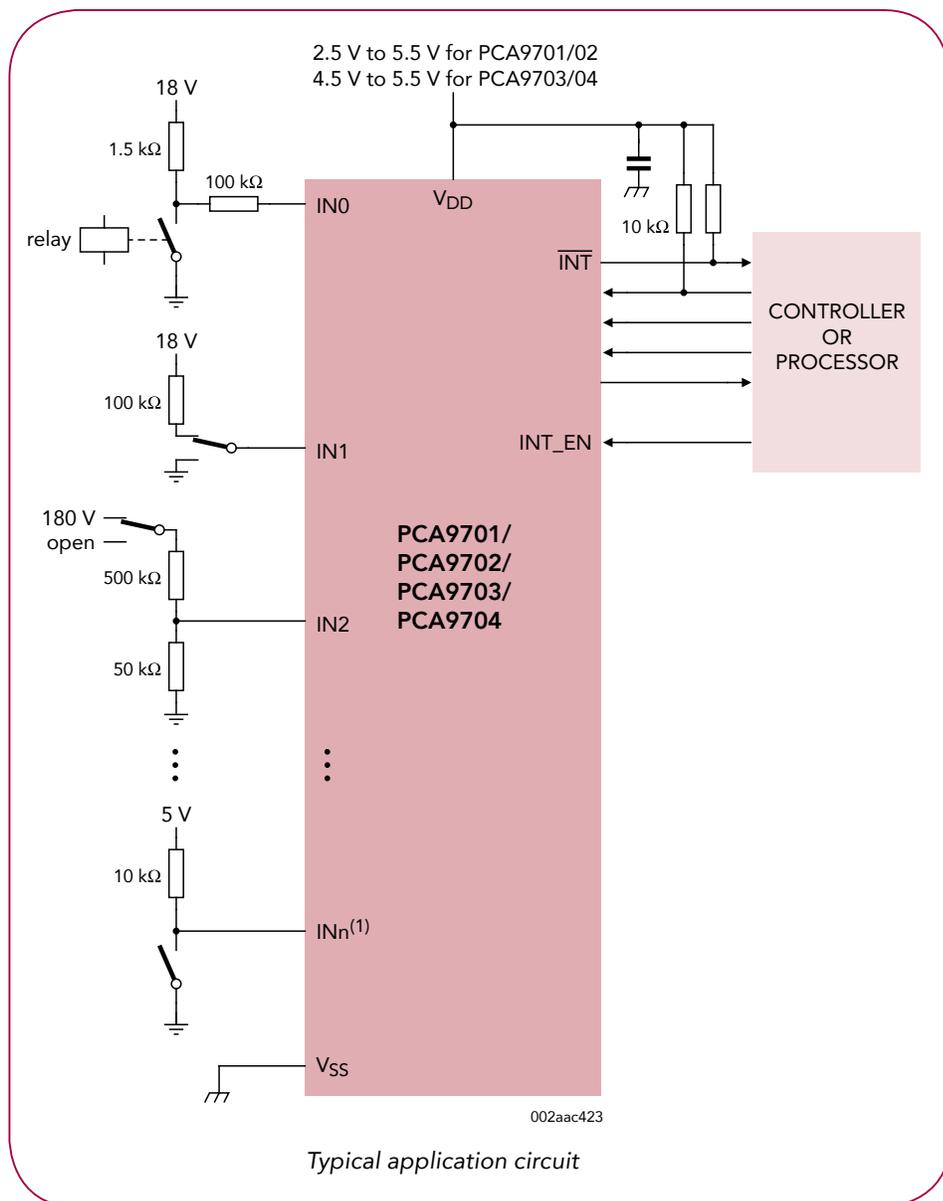
ORDERING INFORMATION

Type number	Number of channels	Package	Number of pins	AEC-Q100
PCA9701PW	16	TSSOP	24	No
PCA9702PW	8	TSSOP	16	No
PCA9703PW	16	TSSOP	24	Yes/Q900
PCA9704PW	8	TSSOP	16	Yes/Q900

Document Number: 939775015808 REV 1