

# NXP 4/8/16-bit I<sup>2</sup>C/SMBus GPIO expanders PCA9536/54/54A/55

## Versatile, easy-to-use GPIO expanders

These I<sup>2</sup>C/SMBus-compatible devices make it easy to add programmable I/O ports to a wide range of applications.

### Key features

- ▶ Compatible with I<sup>2</sup>C-bus and SMBus
- ▶ 4, 8 or 16 programmable GPIO compatible with most processors
  - Input or output
  - Push-pull outputs
  - True bidirectional operation
- ▶ Outputs can drive LEDs directly
  - 25-mA (max) sink and 10-mA (max) source per bit
  - 100-mA (max) capacity per 8-bit register
  - 100 k-Ω internal pull-up resistor
- ▶ Open-drain interrupt output activates when input changes state
- ▶ Low standby current ( $I_{DDH}$ ): 1.5 μA (max)
- ▶ Operating voltage: 2.3 to 5.5 V
- ▶ All I/O tolerant to 5.5 V
- ▶ Temperature range: -40 to +85 °C
- ▶ I<sup>2</sup>C-bus clock frequency: 0 to 400 kHz
- ▶ High-volume CMOS process
- ▶ Package options: DIP, SO, SSOP, TSSOP, HVQFN, bare die

### Applications

- ▶ GPIO expansion to support ACPI power switches, sensors, push-buttons, LEDs, fans, and more

These expanders provide a simple way to add I/O for ACPI power switches, sensors, pushbuttons, LEDs, fans, and functions, in a wide variety of I<sup>2</sup>C-bus and SMBus applications.

The NXP PCA9554 and PCA9554A are 16-pin CMOS devices that provide eight bits of parallel GPIO expansion. They include four 8-bit registers: an 8-bit configuration register for I/O selection, an 8-bit input register, an 8-bit output register, and an 8-bit polarity-inversion register. The system master can enable the I/O as inputs or outputs by writing to the I/O configuration bits. Data for each input or output is kept in the corresponding input or output register. The polarity of the read register can be inverted using the polarity-inversion register. All registers can be read by the system master. The two devices are identical except for a fixed address.

The NXP PCA9555 is a 24-pin CMOS device that provides 16 bits of parallel GPIO expansion. It has two sets of the same 8-bit registers as the PCA9554.

The NXP PCA9536 is an 8-pin CMOS device that provides 4 bits of parallel GPIO expansion. It is identical to the PCA9554 except it uses only 4 bits of the 8-bit register space.



The 8- and 16-bit devices are pin-to-pin and I<sup>2</sup>C-address compatible with the NXP PCF857X, the lower-cost PCA857X, and the Fast-mode Plus, 1-MHz PCA967X series. Various enhancements make software changes necessary (see application note AN469).

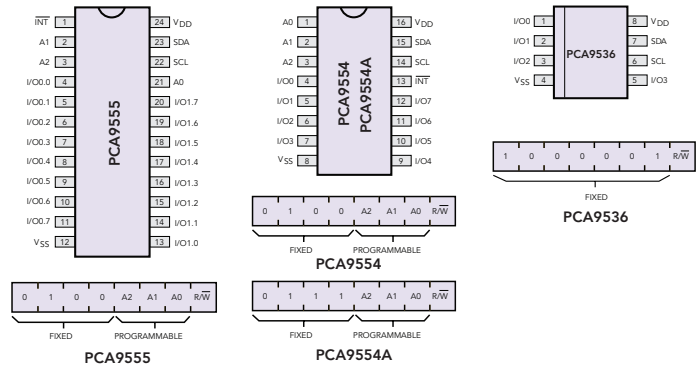
The open-drain interrupt output is activated when any input state differs from its corresponding input port register state. The output notifies the system master when an input state has changed. In applications that require the interrupt and an external hardware reset, the NXP PCA9537, PCA9538, and PCA9539 are recommended alternatives.

Three hardware pins (A0, A1, A2) vary the fixed I<sup>2</sup>C-bus address and allow up to eight devices to share the same I<sup>2</sup>C/SMBus. The fixed I<sup>2</sup>C-bus address in the PCA9554 is different from that of the PCA9554A, allowing up to sixteen of these devices (eight of each type) on the same I<sup>2</sup>C/SMBus. The fixed I<sup>2</sup>C-bus address on the PCA955 is the same as the PCA9554, so up to eight of these devices in any combination can share the same I<sup>2</sup>C/SMBus. The PCA9536 address is fixed.

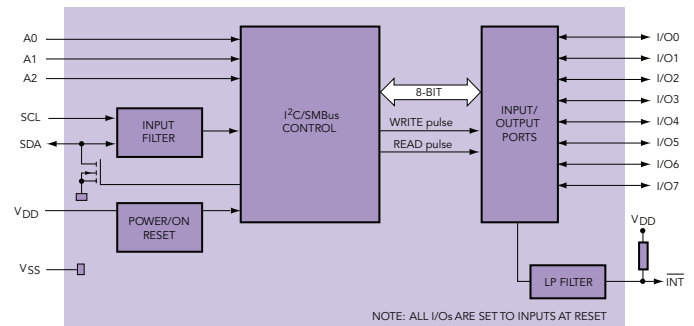
All four devices have push-pull outputs that sink 25 mA and source 10 mA. This is different from the quasi-bidirectional outputs that sink 25 mA with limitations and only source 100 µA. For portable applications, The NXP PCA9534 and PCA9535 are identical to the PCA9554/54A and the PCA9555, but the I/O 100-kΩ internal pull-up resistor is removed to reduce current consumption when the outputs are held low.

The functional diagram and schematic for the PCA9536, PCA9554/54A, and PCA9555 are the same except that the PCA9555 has two 8-bit blocks of I/O and the PCA9536 has half an 8-bit block of I/O.

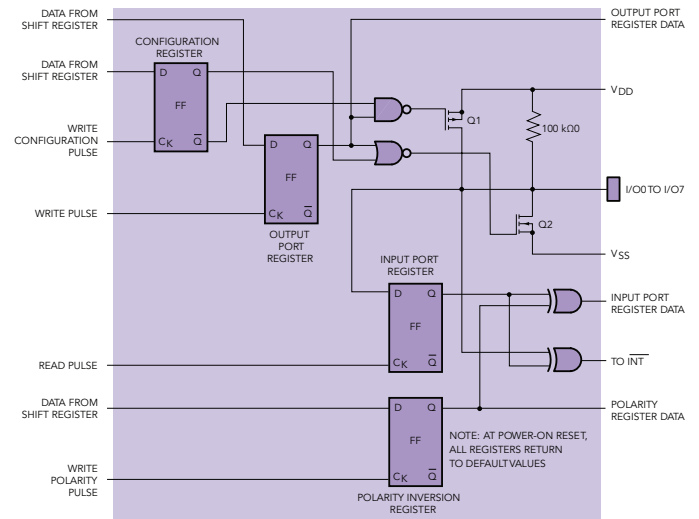
Package	Container	PCA9536	PCA9554	PCA9554A	PCA9555
DIP	Tube	NA	PCA9554N	PCA9554AN	PCA9555N
SO	Tube T & R	PCA9536D PCA9536D-T	PCA9554D PCA9554D-T	PCA9554AD PCA9554AD-T	PCA9555D PCA9555D-T
SSOP	Tube T & R	NA	PCA9554DB PCA9554DB-T	PCA9554ADB PCA9554ADB-T	PCA9555DB PCA9555DB-T
TSSOP	Tube T & R	NA PCA9536DP-T	PCA9554PW PCA9554PW-T	PCA9554APW PCA9554APW-T	PCA9555PW PCA9555PW-T
HVQFN	T & R	PCA9536TK-T	PCA9554BS-T PCA9554BS3-T	PCA9554ABS-T PCA9554ABS3-T	PCA9555BS-T PCA9555HF-T



Pin configurations



Block diagram



Simplified schematic

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