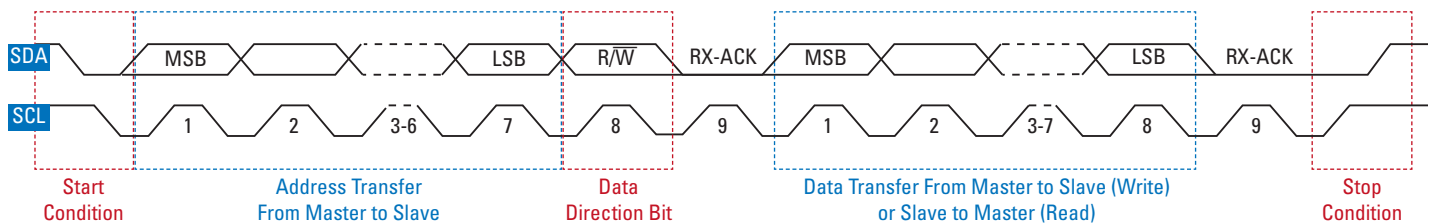# PCF8574 and PCF8574A I/O Expanders

Pb-Free

Texas Instruments' (TI) PCF8574 and PCF8574A are two-wire I^2C-bus to 8-bit parallel bus I/O expanders from TI's I^2C logic portfolio. They are designed to provide a simple and cost-effective method to monitor and control several peripheral signals. The difference between the PCF8574 and PCF8574A is the I^2C address:

- PCF8574 has addresses ranging from 0x20 to 0x27 (up to eight PCF8574 devices may be used on the same I^2C bus).

- The PCF8574 and PCF8574A have addresses ranging from 0x38 to 0x3F (up to eight PCF8574A devices may be used on the same I^2C bus).

- A total of 16 PCF8574 and PCF8574A devices may be used on the same I^2C bus.

The PCF8574 and PCF8574A use the serial clock (SCL) and serial data (SDA) I^2C lines to communicate with the bus controller.

Start Condition	Address Transfer From Master to Slave	Data Direction Bit	Data Transfer From Master to Slave (Write) or Slave to Master (Read)	Stop Condition

Key Features

- Pin-to-pin compatible and functionally equivalent with Philips PCF8574 and PCF8574A (PDIP, SOIC and TSSOP)

- In addition, TI has package offerings that are smaller than Philips package options:
  - 20-pin TVSOP (23% smaller than 20-pin TSSOP)
  - 20-pin QFN package (62% smaller than 20-pin TSSOP); industry's smallest PCF8574 and PCF8574A package

- Two-wire I^2C-bus to 8-bit bidirectional parallel-bus expander

- Operating supply voltage from 2.5-V to 6-V V_{CC}

- Low standby current consumption of 10 mA maximum ($F_{SCL} = OH_Z$)

- Open-drain interrupt output to signal a change on an I/O pin

- Latched outputs with high-current drive capability for driving LEDs

- Addressed by three hardware-address pins

- Top applications:
  - Fan control
  - LED driver
  - System monitoring
  - Temperature sensor monitoring
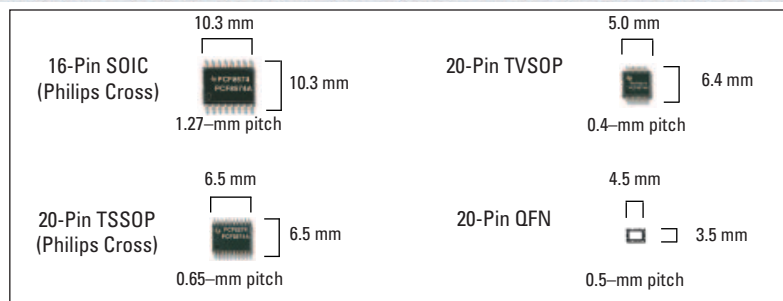 - Push button monitoring
  - 8-bit bidirectional expansion

PCF8574/A Functional Block Diagram*
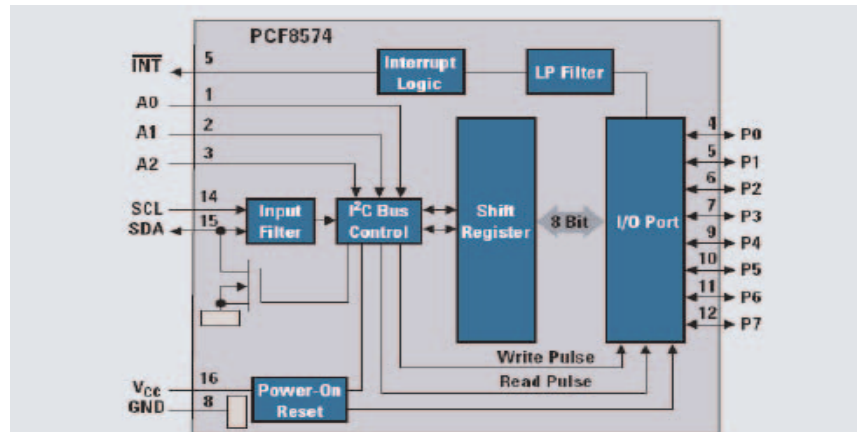
Pin Descriptions*

Symbol	Pin	Description	Symbol	Pin	Description
A0	1	Address Input 0	P4	9	Bi-direction I/O 4
A1	2	Address Input 1	P5	10	Bi-direction I/O 5
A2	3	Address Input 2	P6	11	Bi-direction I/O 6
P0	4	Bi-direction I/O 0	P7	12	Bi-direction I/O 7
P1	5	Bi-direction I/O 1	INT	13	Interrupt Output (Active Low)
P2	6	Bi-direction I/O 2	SCL	14	Serial Clock Line (SCL)
P3	7	Bi-direction I/O 3	SDA	15	Serial Data Line (SDA)
GND	8		V_{CC}	16	Supply Voltage

*All pin numbers shown are for 16-pin SOIC and PDIP packages. See datasheets for 20-pin package options.

|			
16-Pin SOIC (Philips Cross)	10.3 mm / 10.3 mm, 1.27–mm pitch	20-Pin TVSOP	5.0 mm / 6.4 mm, 0.4–mm pitch
20-Pin TSSOP (Philips Cross)	6.5 mm / 6.5 mm, 0.65–mm pitch	20-Pin QFN	4.5 mm / 3.5 mm, 0.5–mm pitch

Applications With Multiple PCF8574 and PCF8574A Devices

The expanders can be configured to have a unique 7-bit address. The first four bits of the PCF8574's 7-bit address are 0100, and those for the PCF8574A are 0111. The lower three bits are the settings on the device pins A2, A1, and A0. This ability to set unique addresses for the expanders makes it possible to have up to eight PCF8574 and eight PCF8574A devices on the same I^2C bus.

PCF8574 and PCF8574A I^2C-Bus Slave Address Map

| INPUTS			PCF8574 I^2C-Bus Slave Address	PCF8574A I^2C-Bus Slave Address
A2	A1	A0		
L	L	L	20 (hexadecimal)	38 (hexadecimal)
L	L	H	21 (hexadecimal)	39 (hexadecimal)
L	H	L	22 (hexadecimal)	3A (hexadecimal)
L	H	H	23 (hexadecimal)	3B (hexadecimal)
H	L	L	24 (hexadecimal)	3C (hexadecimal)
H	L	H	25 (hexadecimal)	3D (hexadecimal)
H	H	L	26 (hexadecimal)	3E (hexadecimal)
H	H	H	27 (hexadecimal)	3F (hexadecimal)
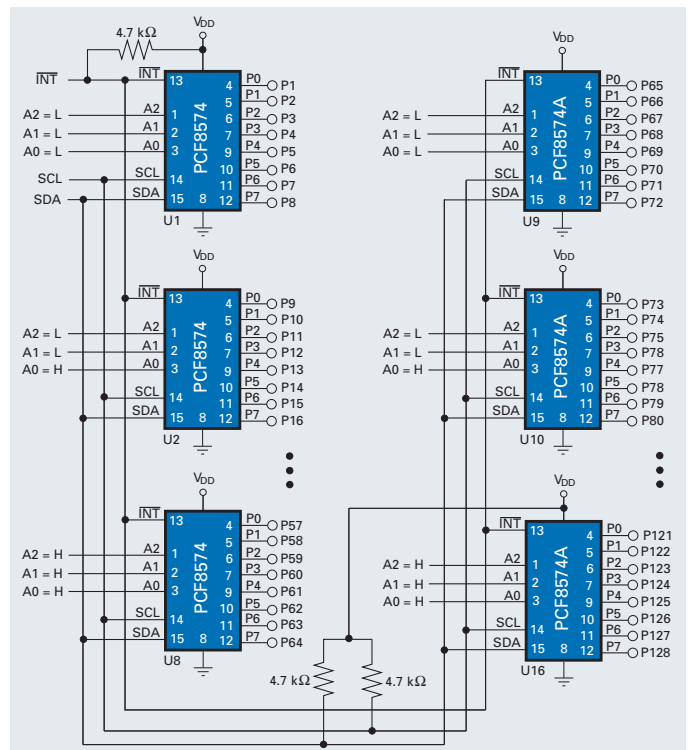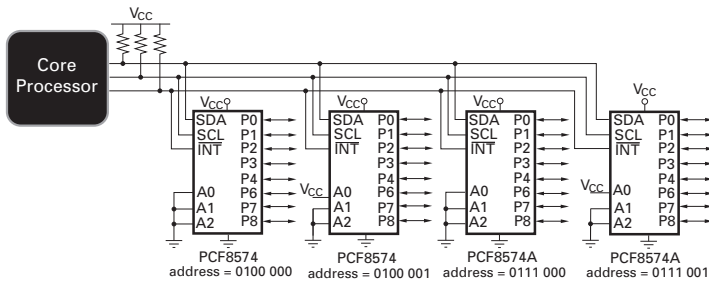
*All pin numbers shown are for 16-pin SOIC and PDIP packages. See datasheets for 20-pin package options.

## Bi-Directional I/O Expander Applications

In the I/O expander application shown here, the PCF8574 or PCF8574A is used with P0 and P1 as inputs and P2 to P7 as outputs. When used in this configuration, during a write, the inputs (P0 and P1) must be written as high so the external devices fully control the input ports. The desired high or low logic levels may be written to the I/Os used as outputs (P2 to P7). During a read, the logic levels of the external devices driving the input ports (P0 and P1) and the previous written logic levels to the output ports (P2 to P7) will be read.

The TI PCF8574 and PCF8574A also have an interrupt line ($\overline{INT}$) that can be connected to the interrupt logic of the microprocessor. By sending an interrupt signal on this line, the remote I/O informs the microprocessor that there is incoming data or a change of data on its ports without having to communicate via the I^2C communication bus.
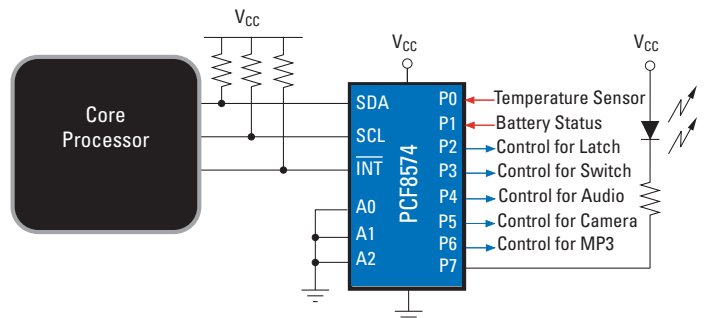
High Current-Drive Load Applications

The PCF8574 and PCF8574A have a maximum sinking current of 25 mA. In applications requiring additional drive, two port pins may be connected together to sink up to 50-mA current.
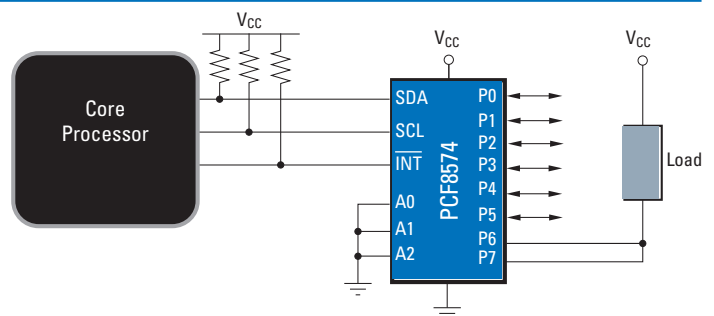
For More Information: www.ti.com/i2c

Product Folders: www.ti.com/sc/device/PCF8574 • www.ti.com/sc/device/PCF8574A

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