Standard Linear and Logic

# PCF8574 and PCF8574A I/O Expanders

O U D O



Texas Instruments' (TI) PCF8574 and PCF8574A are two-wire I<sup>2</sup>C-bus to 8-bit parallel bus I/O expanders from TI's I<sup>2</sup>C 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<sup>2</sup>C address:

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

**Key Features** 

· Pin-to-pin compatible and functionally

equivalent with Philips PCF8574 and

· In addition, TI has package offerings that

are smaller than Philips package options:

- 20-pin TVSOP (23% smaller than

- 20-pin QFN package (62% smaller than

20-pin TSSOP): industry's smallest

PCF8574 and PCF8574A package

• Two-wire I<sup>2</sup>C-bus to 8-bit bidirectional

· Operating supply voltage from 2.5-V to

 Low standby current consumption of 10 mA maximum (F<sub>SCL</sub> =OH<sub>Z</sub>)
 Open-drain interrupt output to signal a

· Latched outputs with high-current

drive capability for driving LEDs

System monitoring

Push button monitoring
8-bit bidirectional expansion

· Addressed by three hardware-address pins

- Temperature sensor monitoring

PCF8574A (PDIP, SOIC and TSSOP)

20-pin TSSOP)

parallel-bus expander

change on an I/O pin

· Top applications:

Fan control
LED driver

6-V V<sub>CC</sub>

- The PCF8574 and PCF8574A have addresses ranging from 0x38 to 0x3F (up to eight PCF8574A devices may be used on the same  $\rm I^2C$  bus).
- A total of 16 PCF8574 and PCF8574A devices may be used on the same I<sup>2</sup>C bus.

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



## PCF8574/A Functional Block Diagram\*



#### Pin Descriptions\*

Symbol	Pin	Description	Symbol	Pin	Description
A0	1	Address Input 0	P4	9	Bi-direction I/0 4
A1	2	Address Input 1	P5	10	Bi-direction I/0 5
A2	3	Address Input 2	P6	11	Bi-direction I/0 6
PO	4	Bi-direction I/O 0	P7	12	Bi-direction I/0 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		Vcc	16	Supply Voltage

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



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## **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<sup>2</sup>C bus.

#### PCF8574 and PCF8574A I<sup>2</sup>C-Bus Slave Address Map

INPUTS			PCF8574 I <sup>2</sup> C-Bus	PCF8574A I <sup>2</sup> C-Bus		
A2	A1	<b>A</b> 0	Slave Address	Slave Address		
L	L	L	20 (hexadecimal)	38 (hexadecimal)		
L	L	Н	21 (hexadecimal)	39 (hexadecimal)		
L	Н	L	22 (hexadecimal)	3A (hexadecimal)		
L	Н	Н	23 (hexadecimal)	3B (hexadecimal)		
Н	L	L	24 (hexadecimal)	3C (hexadecimal)		
Н	L	Н	25 (hexadecimal)	3D (hexadecimal)		
Н	Н	L	26 (hexadecimal)	3E (hexadecimal)		
Н	Н	Н	27 (hexadecimal)	3F (hexadecimal)		
Cor Proces	e		$\begin{array}{c c c c c c c c c c c c c c c c c c c $	V <sub>CC</sub> SDA P0 SCL P1 VT P2 P3 P4 A0 P6 VCC A0 P6 VCC A1 P7 A2 P8 VCC A1 P7 VCC A1 P7 VCC A1 P7 A2 P6 VCC A2 VCC A2 VCC A1 P7 VCC A1 P7 VC		
÷ ÷ ÷ ÷ ÷ ÷ ÷ ÷ ÷ ÷ ÷ PCF8574 PCF8574 PCF8574 PCF8574 address = 0100 000 address = 0100 001 address = 0111 000 address = 011						

#### **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 (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<sup>2</sup>C 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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