NXP 2-channel I²C-bus repeaters PCA9515x and 5-channel I²C-bus hubs PCA9516x

Extend the I²C-bus with advanced repeaters and hubs

Designed for systems that need longer bus lengths or require more than the usual number of devices, these advanced repeaters and hubs let you add devices, combine devices with different voltages, or extend the I²C-bus beyond it's 400-pF maximum.

Features

PCA9515 and PCA9515A 2-channel I²C-bus repeaters

- Creates two I²C branches of 400 pF each
- Operating voltage ranges
  - PCA9515: 3.0 to 3.6 V
  - PCA9515A: 2.3 to 3.6 V
- 8-pin SO and TSSOP packages
  - SO in tube (D) or tape-and-reel (D-T)
  - TSSOP in tape-and-reel (DP-T)

PCA9516 and PCA9516A 5-channel I²C-bus hubs

- Separates I²C-bus into five 400-pF segments (total capacitance of 2000 pF)
- Operating voltage range
  - PCA9516: 3.0 to 3.6 V
  - PCA9516A: 2.3 to 3.6 V
- 16-pin SO and TSSOP packages
  - SO narrow in tube (D) or tape-and-reel (D-T)
  - TSSOP in tube (PW) or tape-and-reel (PW-T)

Applications

- Extend the use of the I²C-bus beyond the 400-pF maximum
- Add more I²C-bus devices
- Combine devices with different voltages

The PCA9515x and PCA9516x extend the I²C/SMBus in systems requiring capacitance loads greater than the specified protocol maximum of 400 pF. They both operate at up to 400 kHz within a temperature range of between -40 and +85 °C. The PCA9515 is a two-channel repeater that supports two I²C-bus branches of 400 pF each. The PCA9516 is a five-channel hub that separates the I²C-bus into five 400 pF segments each, for a total I²C/SMBus capacitance of 2000 pF.

Channel isolation

Each repeater channel has an enable/disable feature that electrically isolates that segment of the I²C-bus. This can be used, for example, to isolate a 100-kHz system from the rest of the 400-kHz system to support mixed operation at 100/400 kHz. The enable/disable feature can also be used with the PCI management bus to provide up to (or more than) eight PCI slots. Or, it can isolate the SMBus for hot plugging PCI slots or allow the main SMBus to drive multiple system boards.

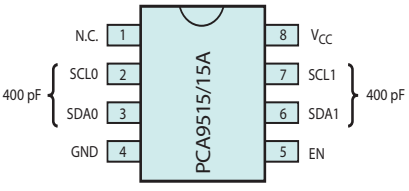
I²C BUS

NXP founded by Philips

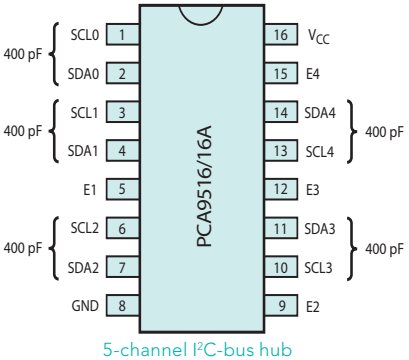
Voltage translation

In systems that use the I²C/SMBus at different voltages, the PCA9515x and the PCA9516x can extend the life of older 5-V circuits by combining them with newer 2.5- and 3.3-V devices that improve system performance. The PCA9515x and the PCA9516x work with clock frequencies up to 400 kHz and are suitable for use in multi-master I²C/SMBus environments.

The I²C/SMBus system uses static level offset, which allows bidirectional transfers without a direction pin. As a result, there is a limit of one hub or repeater per system. I²C drivers isolate the I²C-bus capacitance of each segment. The repeaters support bus arbitration and clock stretching with only one repeater delay between segments. The I²C pins are tolerant to 5.5 V, and accept, on individual segments, pull-up resistors to 2.5 ("A" versions only), 3.3, or 5.0 V.



I²C-bus repeater

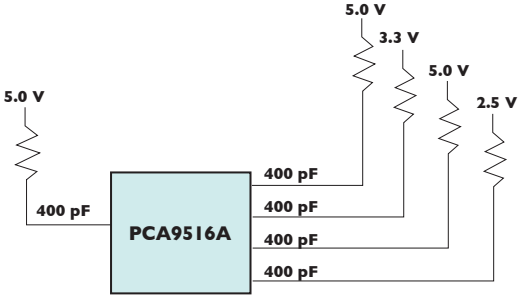


5-channel I²C-bus hub

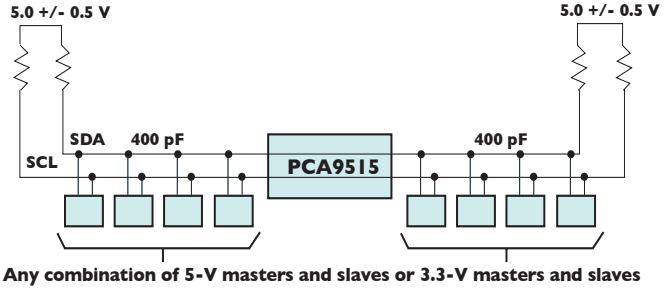
Pinout diagrams

Alternatives are recommended to support special conditions. For systems with very low voltage (down to 0.9 V), use the PCA9508/09/17A/19. For systems with up to 1500 pF, use the PCA9507, which has a rise-time accelerator. For systems larger than four segments, use the PCA9518A. For systems with repeaters in series, use the PCA9510A/11A/12A/13A/14A. For long-distance wire transmission, use the P82B715 or the PCA9600.

The PCA9515 and PCA9516 are the original devices and are manufactured in a BiCMOS process. The PCA9515A and PCA9516A are newer and manufactured in a CMOS process. Both process will be supported to accommodate existing/new customers and to also provide alternate sources for each other at the 3.3V node.



Channel isolation using PCA9515



Channel isolation using PCA9515

	PCA9515	PCA9515A	PCA9516	PCA9516A
Supply voltage range (V_{cc})	3.0 to 3.6 V	2.3 to 3.6 V	3.0 to 3.6 V	2.3 to 3.6 V
Nominal logic levels supported	Vcc to 5.5 V	Vcc to 5.5 V	Vcc to 5.5 V	Vcc to 5.5 V
I²C bus logic level shifting	3.0 V to 5.5 V	2.3 V to 5.5 V	3.0 V to 5.5 V	2.3 V to 5.5 V
Interconnecting I²C buses (each 400 pF)	2	2	5	5
Multimaster bus capacitance (max)	800 pF	800 pF	2000 pF	2000 pF
I²C clock speed	400 kHz	400 kHz	400 kHz	400 kHz
Typical propagation delay (excluding contention)	100 nsec	70 nsec	120 nsec	75 nsec
Maximum I/O voltage above V_{cc}	5.5 V	5.5 V	5.5 V	5.5 V
Supply current (typical)	2 mA	1 mA	7 mA	2 mA
Packages	TSSOP/SO8	TSSOP/SO8	TSSOP/SO16	TSSOP/SO16

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