

Achieve Seamless Voltage-Level Translation with the Best Possible Noise Margin

Operate well at the 1-volt node and translate from 1 volt to as high as 5 volts.

Highlights

- Provides a simple way to add I/O and voltage-level shifting to your I²C design
- Reduces the cost of development and production
- Allows selection of any downstream branch, even those operating at different voltage levels

Overview

As microprocessors have matured, we've moved from the 5-volt (5V) technology developed in the 1970s, to the 3.3V in the 1990s, the 2.5V in the 2000s, the 1.5V and 1.25V in the past five years, and, most recently, the 1V.

These advantages have led to device innovation, especially in mobile markets. Unfortunately, if you design an architecture using parts that come with different voltages, those parts cannot connect directly because the higher voltage will stress the parts that operate on the lower voltage. Most engineers have encountered this problem when designing mobile device architectures. This leads to delays in production while workarounds are sought because if the problem is not resolved, the mobile device will not function.

What's required: bus buffers that act as voltage-level translators that come with two voltage supplies and that can translate voltage from one to the other and back again. But not just any bus buffers will do because electrical noise can

Formerly known as Philips Semiconductors, NXP Semiconductors is renowned for inventing the Inter-integrated Circuit (I²C) interface more than three decades ago. By replacing complex parallel interfaces with a straightforward yet powerful serial structure, the I²C bus revolutionized chip-to-chip communications. The I²C bus shrinks integrated circuit (IC) footprints by reducing connection count, leading to lower IC costs, which in turn simplifies printed circuit board (PCB) design complexity and reduces system cost. Today, NXP is the No. 1 supplier of I²C solutions in the world.

be an issue if the voltage translation is not seamless. Such noise can interfere with the functioning of the device. You want a voltage-level translator with the highest possible noise margin to prevent this from impacting your design.

NXP: Leading Voltage-Level Translators with Generous Noise Margins

NXP's family of bus buffers are the solution. They simplify interconnection of processors running at one voltage level to I/O devices operating at a different voltage level.

For example, some processors might be at 1V, while other devices on the bus are at 3.3V, while still others are at 5V. NXP voltage-level translators can seamlessly translate from as low as 1V to as high as 5V.

Quick Take: What to Look for in a Voltage-Level Translation Buffer

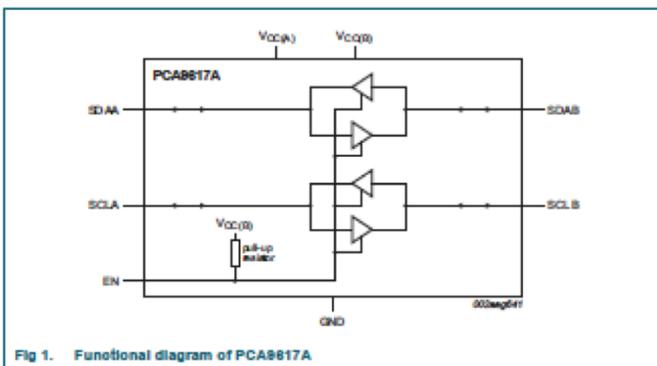
Not all bus buffers offer voltage-level translation. Make sure that you choose the latest two-supply devices to bypass traditional capacitance limitations. Look for the devices that provide seamless voltage-level translation with the best possible noise margin.

I²C Bus Use Beyond 400pF Maximum Capacitive Loading

Bus buffers allow designers to expand use of the I²C bus beyond the 400pF maximum capacitive loading allowed by the I²C specification by dividing the bus into <400pF segments. The bus buffers enable bidirectional communication without a direction pin.

In situations where voltage-level translation is necessary, engineers usually can't use simple FETs (field-effect transistors) because threshold noise margin—that is, the amount of signal that a circuit can withstand—can be a concern at low voltages.

Thanks to innovations at NXP, these challenges have been largely alleviated. Bus buffers from NXP isolate capacitance on the I²C bus and also allow better voltage-level translation. Possessing two supply pins, they actively drive the low-level signals.



These NXP voltage-level translation buffers overcome the previous system capacitance limitation of 400pF, thus allowing designers more freedom to expand the use of the I²C or SMBus. They also support different operating supply voltages or logic voltage levels within one system.

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Applications

- Add more I²C or SMBus devices in the same system.
- Extend the reach of I²C or SMBus over longer distances.
- Isolate an I²C or SMBus segment.
- Translate voltage levels to allow devices with different voltage requirements to work on the same bus.
- Electrically isolate the I²C bus.
- Support multipoint distribution of the I²C bus.

About NXP

NXP Semiconductors N.V. (NASDAQ: NXPI) creates solutions that enable secure connections for a smarter world. Building on its expertise in high-performance mixed-signal electronics, NXP is driving innovation in the automotive, identification and mobile industries and in application areas including wireless infrastructure, lighting, healthcare, industrial, consumer tech and computing. NXP has operations in more than 25 countries and posted revenue of \$4.36 billion in 2012.

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