

Eliminating Back-Powering in Digital Isolators With Over-Voltage Tolerant Inputs

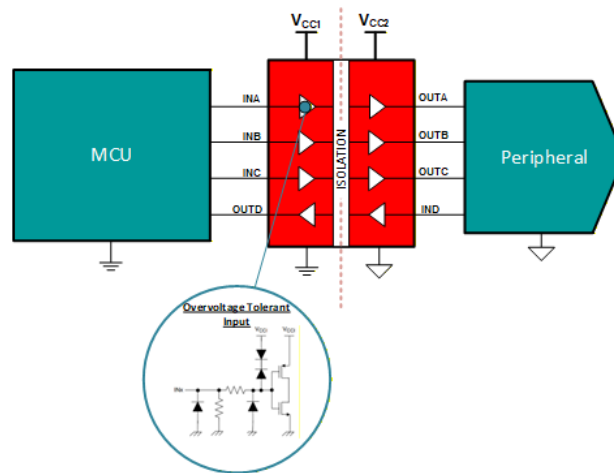


Figure 1. Overvoltage Tolerant Input

Overview

Overvoltage-tolerant inputs are digital isolator input pins that accept logic signals at voltages higher than the isolator input-side supply, within specified datasheet limits, without causing latch-up or back-feeding current into that input-side supply. This allows for signals to be applied when the digital isolator is powered off, without damaging the digital isolator.

This is achieved with internal protection structures (such as reverse-protection diodes and clamp circuitry) that prevent current from flowing into the device supply rail when the input is driven above VCC.

This allows the digital isolator to remain undamaged when a signal is applied while powered down and to interface directly with higher-voltage logic standards or other overvoltage conditions, while still meeting the absolute maximum ratings.

Overvoltage-tolerant inputs of a digital isolator, such as the ISO6441, allow a low-voltage isolated domain (for example, 3.3V) to receive signals from a higher-voltage domain (for example, 5V) without requiring extra level-shifting ICs, thereby simplifying the design and reducing component count.

Overvoltage tolerant inputs are especially helpful in:

- Industrial I/O
- PLC modules
- motor drives
- power-electronics gate-driver interfaces

In such applications, overvoltage tolerant inputs help with field-side logic levels or fault conditions that momentarily exceed the isolator's supply, while also providing robust isolation, noise immunity, and compliance with safety standards.

Additional Resources

- Texas Instruments, [\[FAQ\] What are overvoltage tolerant inputs of digital isolators?](#) TI E2E™, support forums.
- Texas Instruments, [\[FAQ\] Can a digital isolator signal voltage be different from its power supply voltage?](#) TI E2E™, support forums.
- Texas Instruments, [Digital Isolator Design Guide](#), application note.
- Texas Instruments, [Top design questions about digital isolators](#), technical article.
- Texas Instruments, [Enhance Design Performance using Integrated Power and Digital Isolation Design](#), technical article.
- Texas Instruments, [Achieving Best EMC Performance for Signal Isolators with Integrated Power.](#), technical article.

Table 1. Recommended Parts

Commercial Devices	Automotive Devices (AEC-Q100)	Supply Voltage (VCC) Range	Integrated DC/DC	Features
ISO6041	-	1.71 to 5.5V	-	Highest bandwidth: 200Mbps, 1.2ns (max.) PWD and channel to channel skew Low power (ICC) per Mbps (635µA/ch max. at 1Mbps) Reinforced isolation Small footprint package options
ISO6441	ISO64xx-Q1	2.25 to 5.5V	-	200kV/µs (min.) CMTI 150Mbps Reinforced and basic isolation Small footprint package options
ISOW64xx	ISOW64xx-Q1	2.25 to 5.5V	Yes	200kV/µs (Typ.) CMTI Reinforced digital isolator with integrated DC/DC Power Best EMC performance in the industry
ISOW3080	-	2.25 to 5.5V	Yes	200kV/µs (Typ.) CMTI RS485 with integrated DC/DC Power Best EMC performance in the industry
ISOW1050	-	2.25 to 5.5V	Yes	200kV/µs (Typ.) CMTI CAN with integrated DC/DC Power Best EMC performance in the industry

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Last updated 10/2025