

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

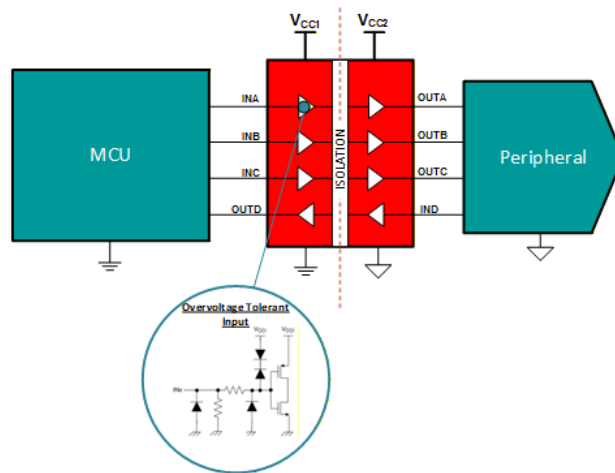


Figure 1. Overvoltage Tolerant Input

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 V_{CC}.

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

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
ISOW6441	ISOW64xx-Q1	2.25 to 5.5V	Yes	100kV/µs (min.) CMTI Reinforced digital isolator with integrated DC/DC Low emissions

Trademarks

E2E™ is a trademark of Texas Instruments.

All trademarks are the property of their respective owners.

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you fully indemnify TI and its representatives against any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#), [TI's General Quality Guidelines](#), or other applicable terms available either on [ti.com](https://www.ti.com) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products. Unless TI explicitly designates a product as custom or customer-specified, TI products are standard, catalog, general purpose devices.

TI objects to and rejects any additional or different terms you may propose.

Copyright © 2026, Texas Instruments Incorporated

Last updated 10/2025