

Application Bulletin AB-18 *Isolator Endurance Voltage*

The core of isolator functionality is their ability to withstand high voltage between their input and output sides. This bulletin explains three high-voltage isolation specifications: input-to-output isolation voltage, maximum working voltage, and endurance voltage. We will illustrate the importance of endurance, which may be the least well-known high-voltage specification.

Isolator high-voltage test configurations are considered two-port networks with all pins on one side of the device connected to a common point, all pins on the other side connected to a second common point. Figure 1 shows these connections and the voltage source for test:

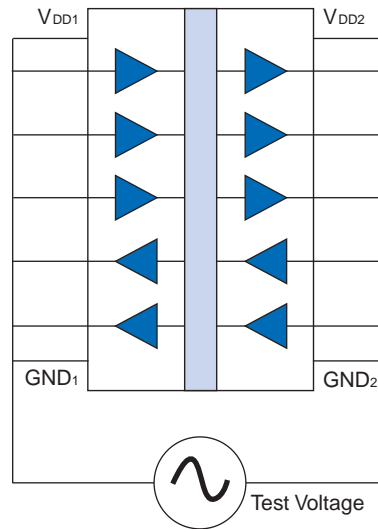


Fig. 1. Isolator high-voltage test configuration.

Input-to-Output Isolation Voltage

The most frequently cited isolation voltage is “input-to-output isolation voltage.” This voltage is related to safety standards and is generally meant to cover line voltage, line voltage variations, and one-time high-voltage transients. It is usually specified as one minute maximum. PDIP- and SOIC-packaged IsoLoop isolators have an input-to-output isolation voltage of 2,500 V_{RMS} for one minute; MSOP packages are rated at 2,300 V_{RMS}.

Maximum Working Voltage

Maximum working voltage is the continuous allowable operating voltage as determined by the safety regulator, and allows for considerable over-voltage and large transients. For example, UL 1577 specifies a working voltage of 120 V_{RMS} for an input-to-output isolation voltage of 2,500 V, one minute.

IEC 061010 further segregates maximum working voltage by package width:

IsoLoop Package	Isolation Voltage		
	2,300 V	2,500 V	3,700 V
0.15" SOIC	150 V	150 V	-
0.3" SOIC	150 V	300 V	400 V

Maximum IEC 061010 working voltage versus package width.

Production testing of 100% of parts at the isolation voltage is required to claim maximum working voltage.

Endurance Voltage

Endurance voltage is the maximum voltage that can be applied between the input and output pins of an isolator indefinitely without damage. Endurance voltage is typically not specified in data sheets but is useful in applications where the isolators are not subject to line voltage transients. The endurance voltage for IsoLoop Isolators has been determined to be 800 V_{RMS} based on qualification testing.

The following circuit, used for measuring the voltage of each battery cell of a DC to AC inverter, illustrates an application where endurance voltage is important:

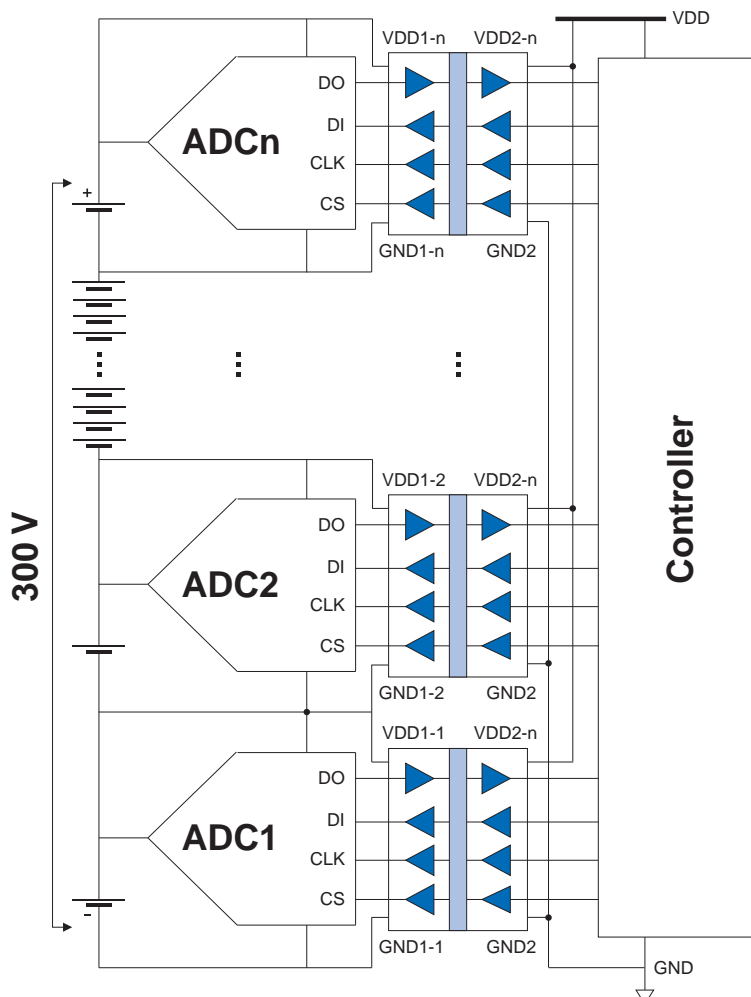


Fig. 2. Endurance voltage illustrative application.

As shown in Figure 2, the last stage of isolation is a full 300 V above the controller ground, so the isolator is subject to 300 V between inputs and outputs.

Because the isolators have an endurance voltage of 800 V_{RMS}, or 1,130 V_{PEAK}, the isolators can be expected to withstand the voltage indefinitely.

The following table summarizes the isolation parameters discussed in this bulletin for IsoLoop Isolators:

IsoLoop Package	MSOP	0.15" SOIC	0.3"SOIC; PDIP
Input-to-output isolation voltage	2,300 V _{RMS}	2,500 V _{RMS}	2,500 V _{RMS}
Maximum working voltage	150 V _{RMS}	150 V _{RMS}	300 V _{RMS}
Endurance voltage	800 V _{RMS}	800 V _{RMS}	800 V _{RMS}

Summary of IsoLoop Isolator high-voltage parameters.