

# **TVS3300 Evaluation Module—Bidirectional Adaptor Board**

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This user's guide describes the characteristics, operation, and use of the TVS3300 Precision Surge Protection Diode Adaptor Board Evaluation Module (EVM). The TVS3300 is a precision clamp that keeps ultra-low and flat clamping voltage during transient over-voltage events like surge. This adaptor board places the ultra-small WCSP package size of the TVS3300YZF into a larger footprint that is designed to fit into industry standard SMA and SMB package types and allow users to test performance in their own systems. This EVM kit allows the user to evaluate two TVS3300's back to back to offer bidirectional surge protection. This user's guide includes setup instructions, schematic diagrams, a bill of materials, and printed-circuit board layout drawings for the EVM.

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## 1 Introduction

Texas Instrument's TVS3300 evaluation module helps designers evaluate the operation and performance of the TVS3300 device. The TVS3300 is a precision clamp that keeps ultra-low and flat clamping voltage during transient over-voltage events like surge. With TI's precision surge technology, the TVS3300s clamping voltage barely changes no matter how high the surge current. The TVS3300 also responds fast to the surge to limit overshoot voltage during clamping. Used in the system, its superior voltage suppression performance ensures a safe environment for downstream protected circuits.

## 2 Board Setup

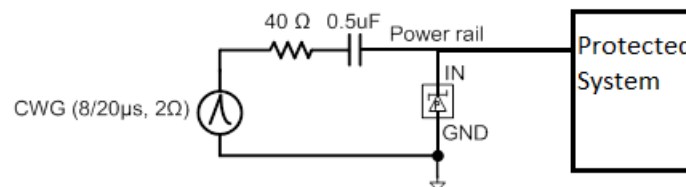
The TVS3300 Adaptor Board EVM is designed to allow the user to evaluate the protection performance of the TVS3300 in their own system without having to make any changes to their existing schematic or layout. The EVM serves as an adaptor board to allow the small size of the WCSP chip to be placed pin for pin in the industry standard SMA and SMB surge protector footprints. Users can easily replace their existing surge solution chip with the TVS3300 EVM to evaluate the component.

There are two options for this EVM: a unidirectional EVM and a bidirectional EVM. Based on their system, the user must use the configuration that best protects their system while having no effect on signal integrity. This EVM offers the bidirectional option that is designed to protect rails that can go both above and below 0 V. If the signal on the protected line stays above 0 V it is recommended to instead use the unidirectional configuration.

To install the EVM, remove the existing surge protection solution and place the adaptor board in the existing footprint. If there is no existing surge protection solution in the system, the EVM can still be tested by soldering the bottom plates of the adaptor board over the protected line and a ground plane. For the bidirectional configuration, the installation direction has no impact. The adaptor board comes with copper edge plating to allow for easy soldering.

### 2.1 Surge Testing

The adaptor provides an easy way to test the TVS3300 surge protection as defined in IEC 6100-4-5. Evaluate the TVS3300 surge protection by exposing the protected line to a surge event. The event must be created by a combinational waveform generator (CWG) in series with a 40- $\Omega$  coupling resistor as shown in [Figure 1](#). Test at different surge current levels and observe that the voltage on the line is clamped to a safe level for the protected system. After the surge event, post-test the system to ensure that no damage or shift in leakage currents occurred.



**Figure 1. Surge Test Setup**

The waveform in [Figure 2](#) shows the TVS3300 Bidirectional adaptor boards response to a 35-A surge waveform created by a similar setup as in [Figure 1](#). Despite the 35 A of current over a IEC 61000-4-5 surge waveform, the TVS3300 holds the voltage on the line to a maximum of 38 V, robustly protecting the downstream components.

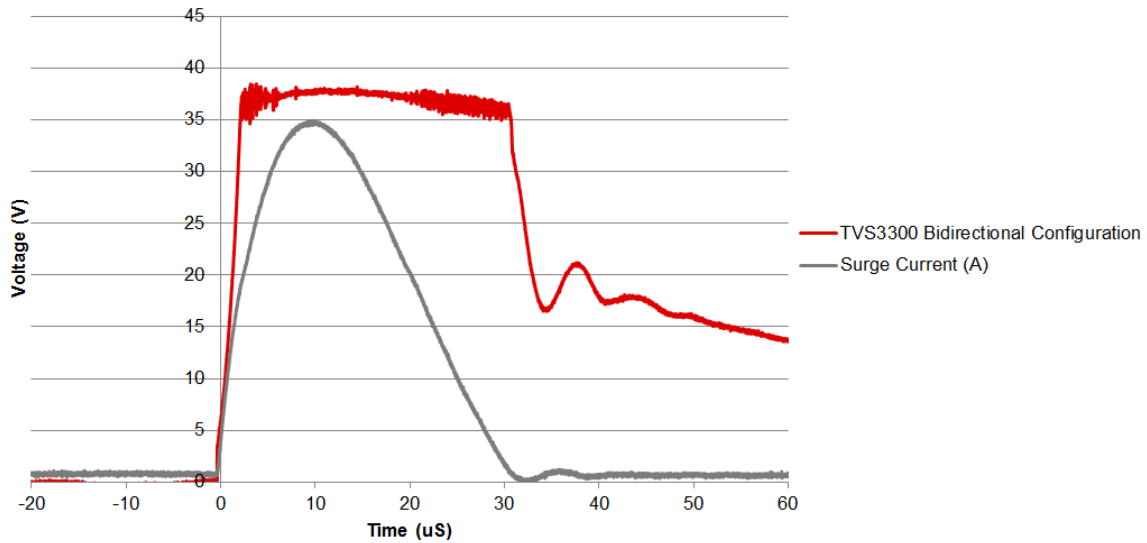


Figure 2. Bidirectional Adaptor Surge Waveform

## 2.2 ESD Testing

The TVS3300 also provides ESD protection up to  $\pm 8$ -kV contact and  $\pm 15$ -kV air gap according to IEC 6100-4-2. After installing the adaptor board into the system, evaluate the ESD protection provided by the TVS3300 by using an ESD simulator to create an ESD event on your protected line. For specific information on ESD testing procedures, see the application report, [IEC 61000-4-x Tests for TI's Protection Devices](#).

Figure 3 shows the bidirectional adaptor.

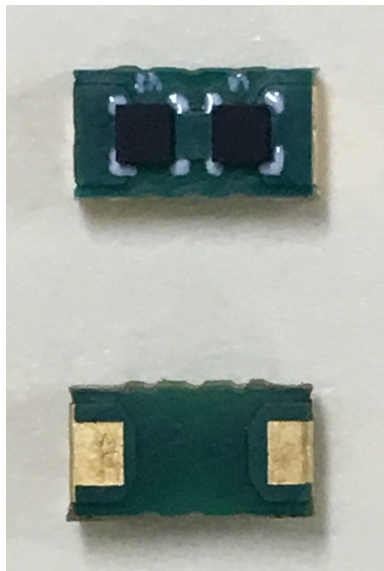


Figure 3. Bidirectional Adaptor

### 3 Schematic

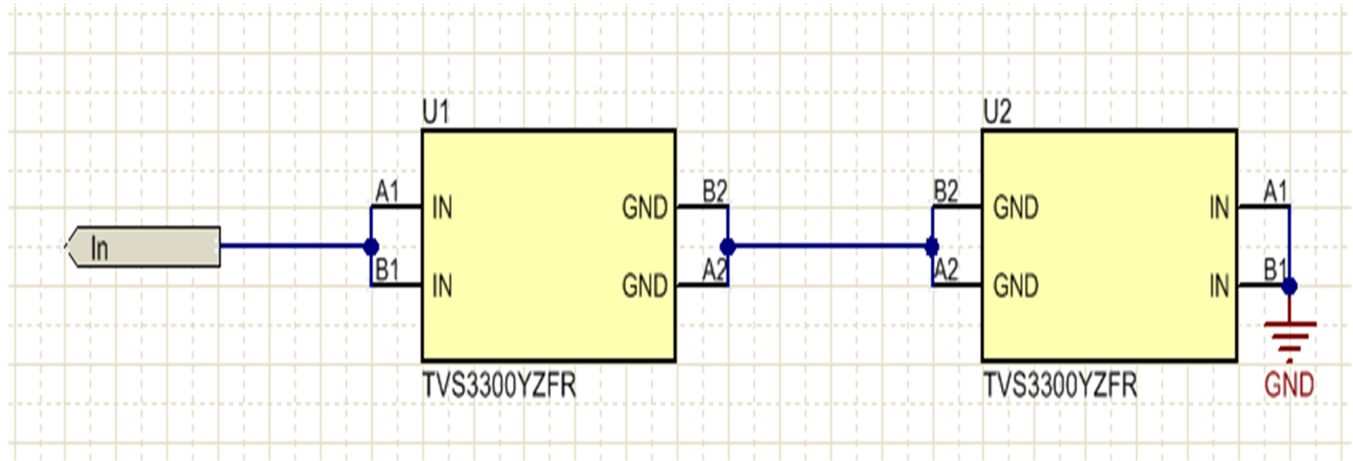


Figure 4. Bidirectional Adaptor Schematic

#### 4 Layout

The TVS3300 Bidirectional Adaptor Board is a two layer 100 mil by 190 mil board with thickness of 23.6 mils of FR-4.

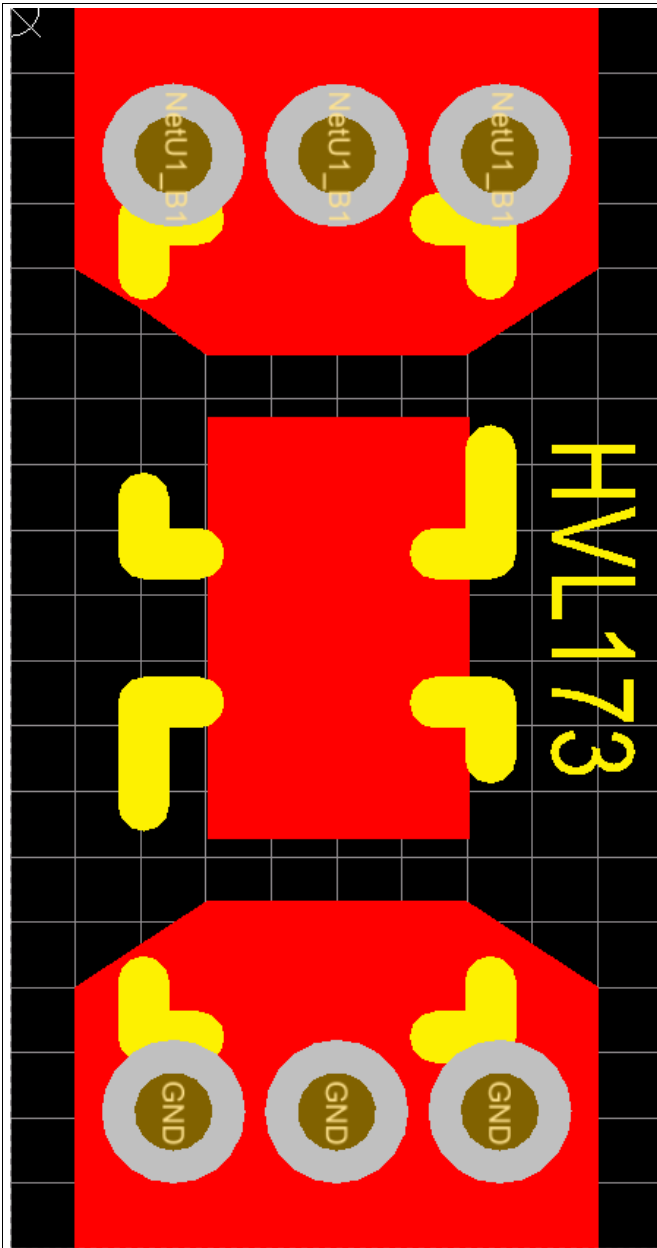


Figure 5. Bidirectional Adaptor Top Layer

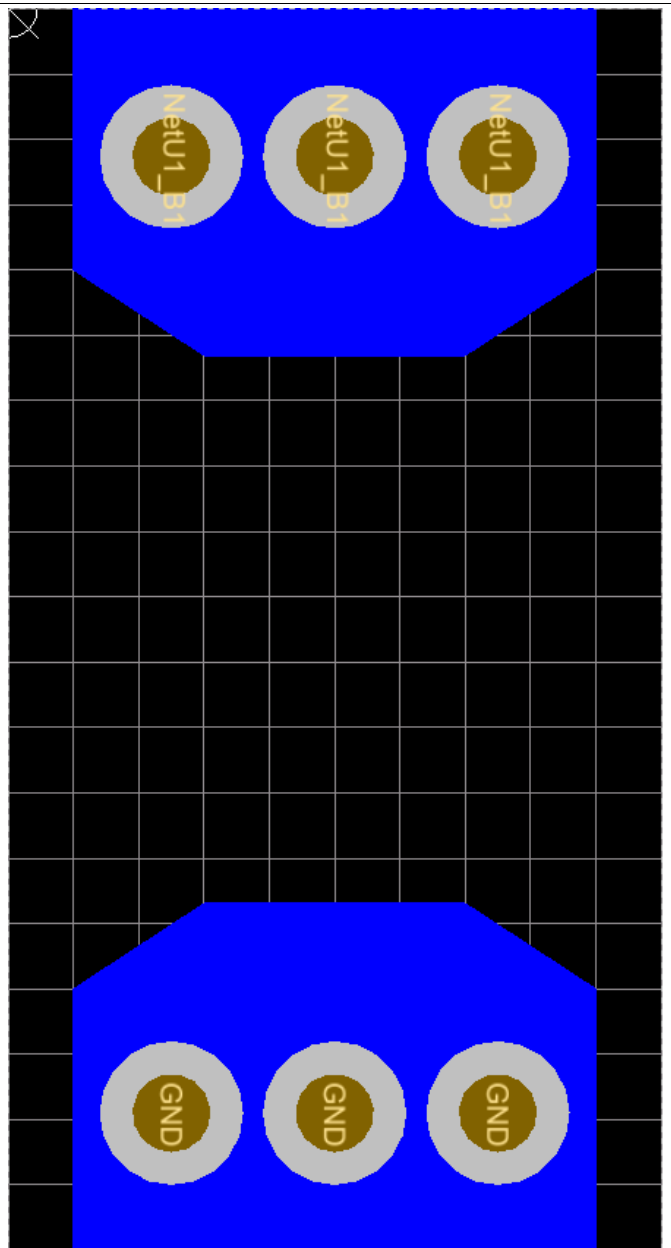


Figure 6. Bidirectional Adaptor Bottom Layer

**5 Bill of Materials****Table 1. Bill of Materials**

<b>Designator</b>	<b>Quantity</b>	<b>Value</b>	<b>Description</b>	<b>Package Reference</b>	<b>Part Number</b>	<b>Manufacturer</b>
U1, U2	2		33-V Precision Surge Protection Clamp, YZF0004AFAH	YZF0004AFAH	TVS3300YZFT	Texas Instruments

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- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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