

Application Bulletin AB-23

NVE Isolators Feature TRUE Eight Millimeter Creepage

Introduction

Eight millimeter creepage is required for 250 V_{RMS} working voltage under IEC 60601, which specifies isolator creepage for medical safety and other equipment. The 8 mm is an absolute minimum and working voltage cannot be prorated for creepage any less than 8 mm.

Sixteen-pin wide-body SOIC isolators are popular isolator packages, but most do not meet the creepage requirement. With most packages, JEDEC tolerances, variability between package molds, and surface metal in the creepage path mean full 8 mm creepage cannot be assured.

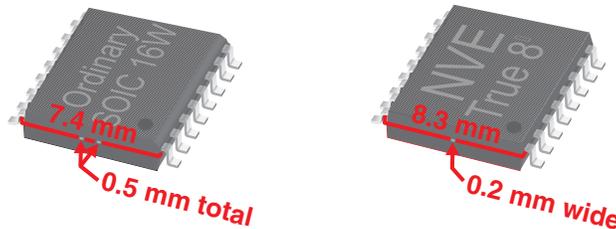
Ordinary Packages

The shortest creepage path is usually around the end of the package from pin 1 to pin 16 or pin 8 to 9. Ordinary JEDEC wide-body packages are nominally 7.4 mm wide, with approximately 8.1 mm between pins around the end before subtracting metal tabs (sometimes called “tie bars”) on the package edge. Tie bars are used in the molding process, and whether internally connected or not, the exposed metal reduces the creepage and must be subtracted under creepage measuring rules. The tie bar subtraction for an ordinary JEDEC package is typically 0.5 mm, bringing typical creepage to only 7.6 mm—not enough for 250 working volt applications, even before allowing for mechanical tolerances.

NVE’s Tight-Tolerance Package

Instead of an ordinary general-purpose package, NVE custom tooled the True 8™ isolator package to meet isolation requirements*. The package is within the JEDEC standard, so no special board layout or handling is needed. The package has much tighter tolerances on package width and pin position, which are critical creepage dimensions.

Additionally, rather than two metal tabs on the edge of the package, the NVE package has just one narrow tab that secures the leadframe during molding, as illustrated below:



Typical Dimensions: An ordinary wide-body package (left) has 7.6 mm typical creepage after subtracting tie-bars; the NVE True 8 isolator package (right) has a single narrow tab and 8.3 mm typical creepage.

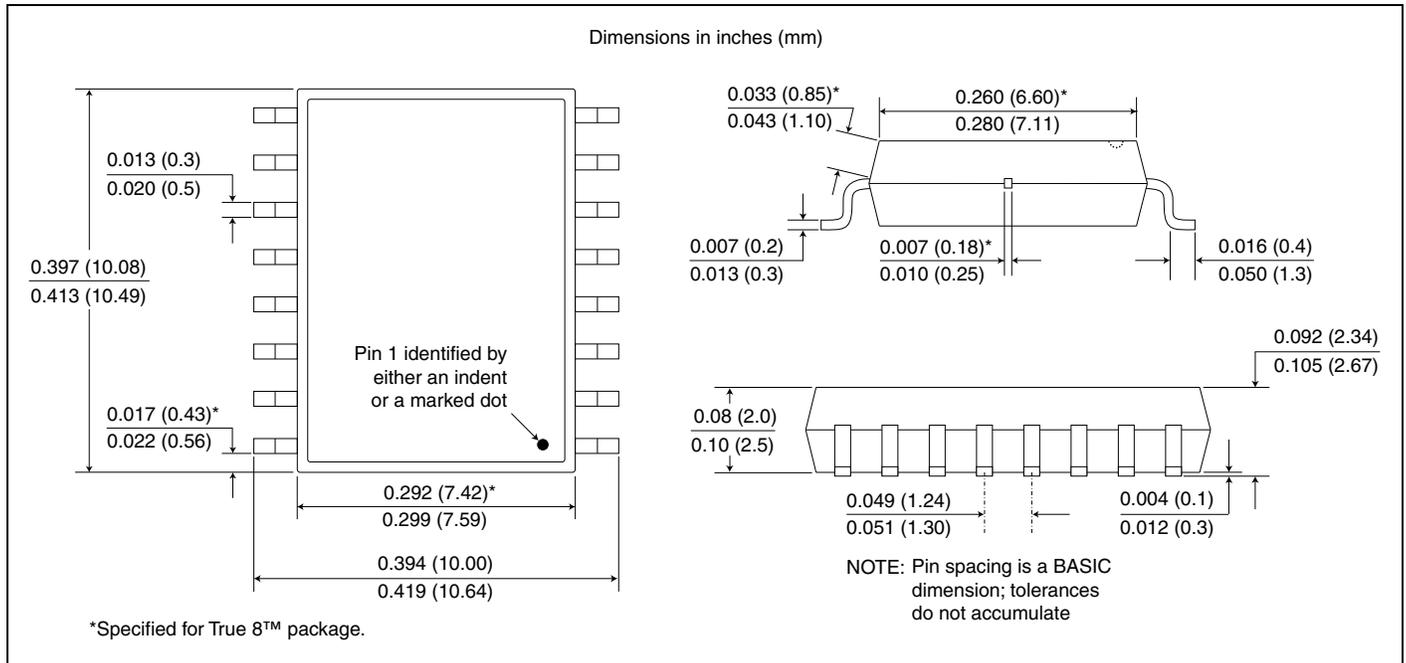
The following table compares typical dimensions for ordinary wide-body packages and the NVE package:

| Package | End Width | Pin-to-end Spacing (total) | Surface Metal Subtraction | Typical Creepage |
|----------------------------|-----------|----------------------------|---------------------------|------------------|
| Ordinary wide-body package | 7.4 mm | 0.7 mm | 0.5 mm | 7.1 mm |
| NVE True 8™ package | 7.5 mm | 1.0 mm | 0.2 mm | 8.3 mm |

*To ensure security of supply NVE may use alternate packages, so be sure to specify the “True 8” package if needed.

Creepage around the end is calculated as the package edge width, plus two pin-to-end spacings, less the surface metal subtraction. Creepage is usually limited by the path around the end of the package, but the path over the top of the package is also specified to ensure 8 mm. Elimination of the outdated pin 1 edge chamfer ensures adequate over-the-top creepage.

Minimum and maximum critical creepage dimensions for the True 8 package are marked by an asterisk in the drawing below, and summarized in the following table:



| NVE True 8 Package | | | | |
|----------------------------|-------------|-------------|-------------|-------|
| Dimension | Worst Case† | Typ. | Best Case | Units |
| Pin to edge | 0.43 | 0.50 | 0.56 | mm |
| Package end width | 7.42 | 7.50 | 7.59 | mm |
| Surface metal subtraction | 0.25 | 0.20 | 0.18 | mm |
| Edge to pin | 0.43 | 0.50 | 0.56 | mm |
| Creepage around end | 8.03 | 8.30 | 8.48 | mm |
| Pin to top surface | 0.85 | 1.00 | 1.10 | mm |
| Package top width | 6.60 | 6.85 | 7.11 | mm |
| Top surface to pin | 0.85 | 1.00 | 1.10 | mm |
| Creepage over top | 8.30 | 8.85 | 9.31 | mm |

†“Worst Case” dimensions are minimum spacing dimensions and maximum surface metal subtraction.

True 8 mm Creepage

As the table shows, even with worst-case package dimensions and pin placement, the unique True 8 package ensures 8.03 mm minimum creepage.