

DESIGN NOTE

Simplified Three-Electrode GDT Coplanarity Solution

INTRODUCTION

[Gas Discharge Tubes \(GDTs\)](#) are typically cylindrical in shape with two or three in-line electrodes. For three-electrode GDTs, contact with PCB solder pads must be made by all three electrodes during reflow soldering. This is understandably more challenging for three-electrode devices than two-electrode devices, as all three electrodes must be perfectly aligned to guarantee contact.

The [Bourns® Model GDT35](#) family employs a creative yet straightforward method to ensure all three contacts are made without the costly, yield-depleting requirement of ensuring a more precise alignment for all three electrodes.

GDT MANUFACTURING PROCESS

During manufacturing, GDTs are placed in a sintering oven where high heat causes the device to expand and contract during heating and cooling cycles. Maintaining perfect center-alignment of all three electrodes during this process is very difficult, and often leads to yield loss and higher manufacturing costs.

An example is illustrated in the image below. It shows that the electrodes on the right-hand side of each GDT are not making contact with the PCB solder trace.

To resolve this issue, Bourns has developed an elegantly simple design solution outlined in this design note.

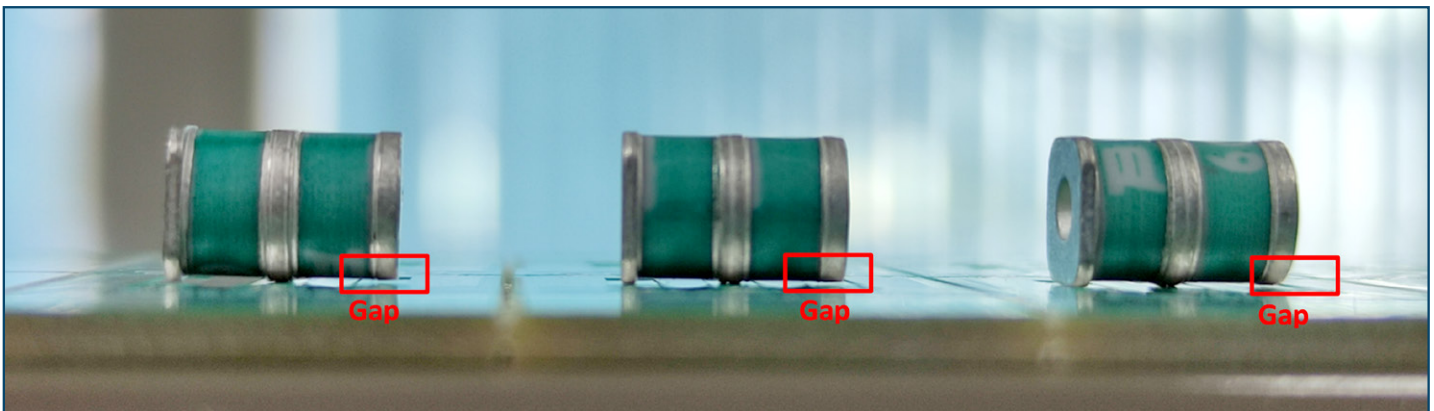


Figure 1 | GDTs placed on PCB board showing gaps

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A SIMPLE SOLUTION

In the Bourns solution, rather than all three electrodes having an equal diameter, the center electrode (square) is made slightly smaller. This allows the GDT to tilt in one direction or the other until part of the center electrode makes contact with the PCB pad.

The cutout diagram below shows the center electrode is slightly smaller than the diameter of the outside electrodes (round).

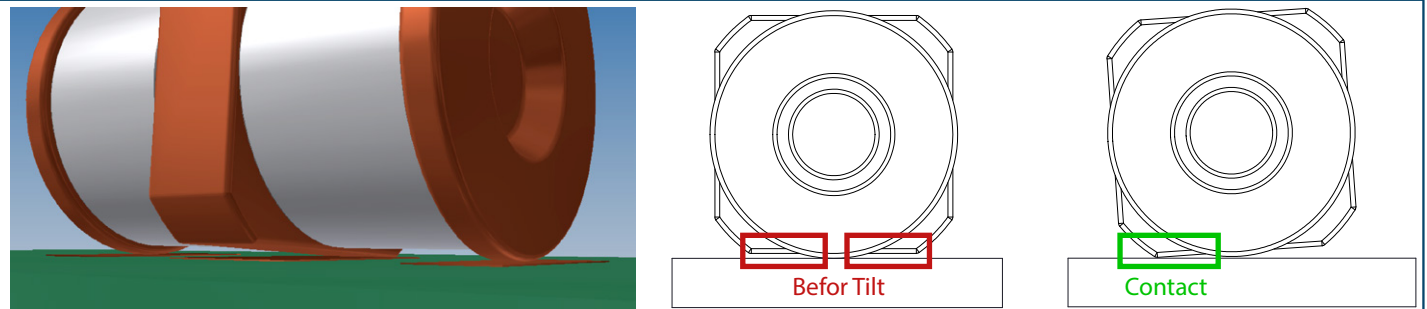


Figure 2 | Images showing the tilt effect, with all three electrodes making contact with their respective PCB solder traces

To clarify this solution, the image below shows all nine electrodes making contact with their respective PCB solder traces. The unit on the left side has the center electrode tilted away from the viewer while the GDTs in the middle and the right side of the picture are tilted toward the viewer.

During the solder reflow process, the capillary effect would level the component, allowing the proper distribution of tin. In the following image, the soldering process shows the GDT is in a level position and all three electrodes are aligned and have contact with the PCB solder pads. This innovative idea should virtually ensure soldering of the three in-line points when using a minimum 0.004-inch-thick stencil.



Figure 3 | All nine electrodes making contact

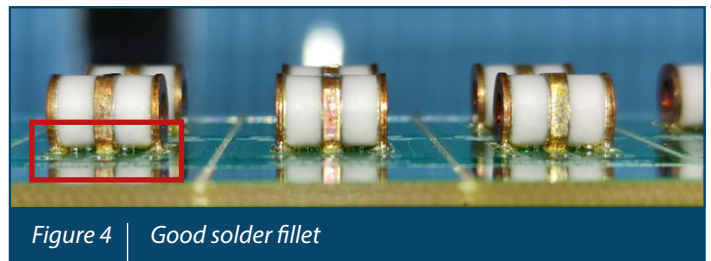


Figure 4 | Good solder fillet

ADDITIONAL RESOURCES

Readers may also be interested in the following engineering resources from Bourns:

- [Bourns® Model GDT35 New Product Brief](#)
- [White Paper: Advancing GDT Technology to Meet Higher Surge and Multi-level Protection Requirements](#)
- [Bourns® GDT Short Form Brochure](#)
- [Bourns® GDT Parametric Search](#)

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