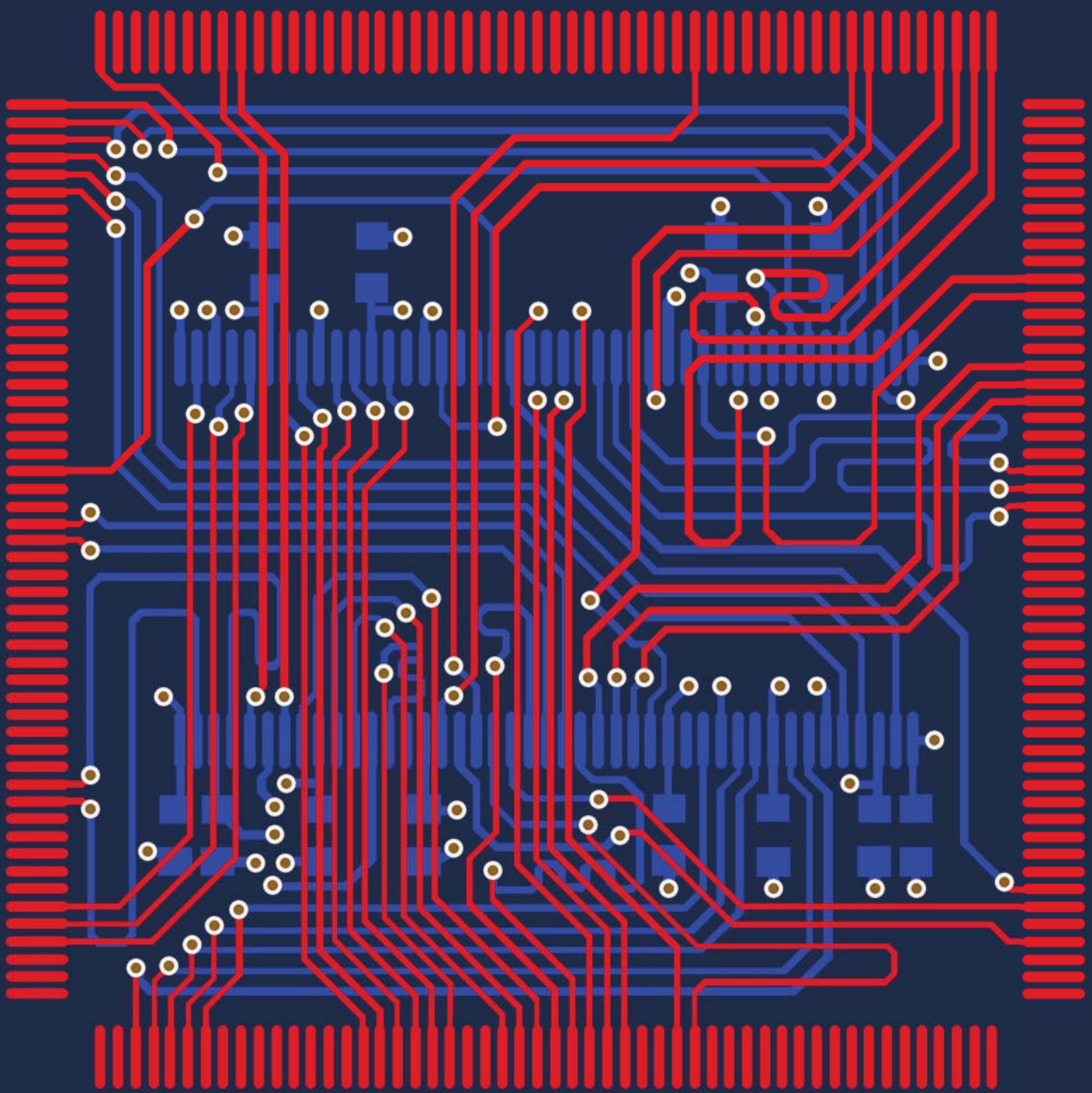


**Altium**<sup>®</sup>

# Using Neck-Down Simplifies BGA Routing



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# USING NECK-DOWN SIMPLIFIES BGA ROUTING

How many times in the routing process have you attempted to route into a BGA only to be prevented by clearance and track width constraints, forcing you to stop the routing process and adjust either your rules or the size of the track widths?

In doing this, you are breaking the streamline process and spending more time adjusting your design constraints accordingly. Since a large portion of your time is spent routing your board, it is especially important to be able to have a continuous process and not force you to stop what you are doing to make adjustments. With this, we introduce neck-downs and the ability to automatically have tracks shrink or expand as they enter specific areas.

## INTRODUCTION

Due to the tight space within a BGA, routing into it becomes fairly difficult just by itself. Combine that with having to change the width of the track and it becomes even more time consuming. To alleviate this problem, neck down is the answer. Neck down is the process of shrinking the track width to a smaller width within the rule constraints to allow for routing in tight clearances. Typically, neck-down is the percentage width change of pad size to a track width size. However, it is also possible to set a size reduction from track-to-track as it enters or leaves an area.

## SETTING THE NECKS

With any design, you have a set of rules in place to constrain the design within defined parameters. One of those rules defines the track width of your routes. This rule, along with a clearance constraint rule, normally restricts the track from entering a BGA. To resolve this, you exit routing mode and change the rules to fit within that BGA. Obviously, this isn't ideal when you're routing and you want a way for the system to modify the track width as it enters the BGA and then reestablish its track width as it exits the BGA. This is where having the tracks neck down comes into play.

The width rules for the design should not be changed just to meet the space constraints of the BGA as this would affect the rest of your design. Instead, width reduction rules should be restricted to just the BGA area. This can be done in Altium Designer® by setting the width rules specifically for a room generated around the BGA, as shown in Figure 1.

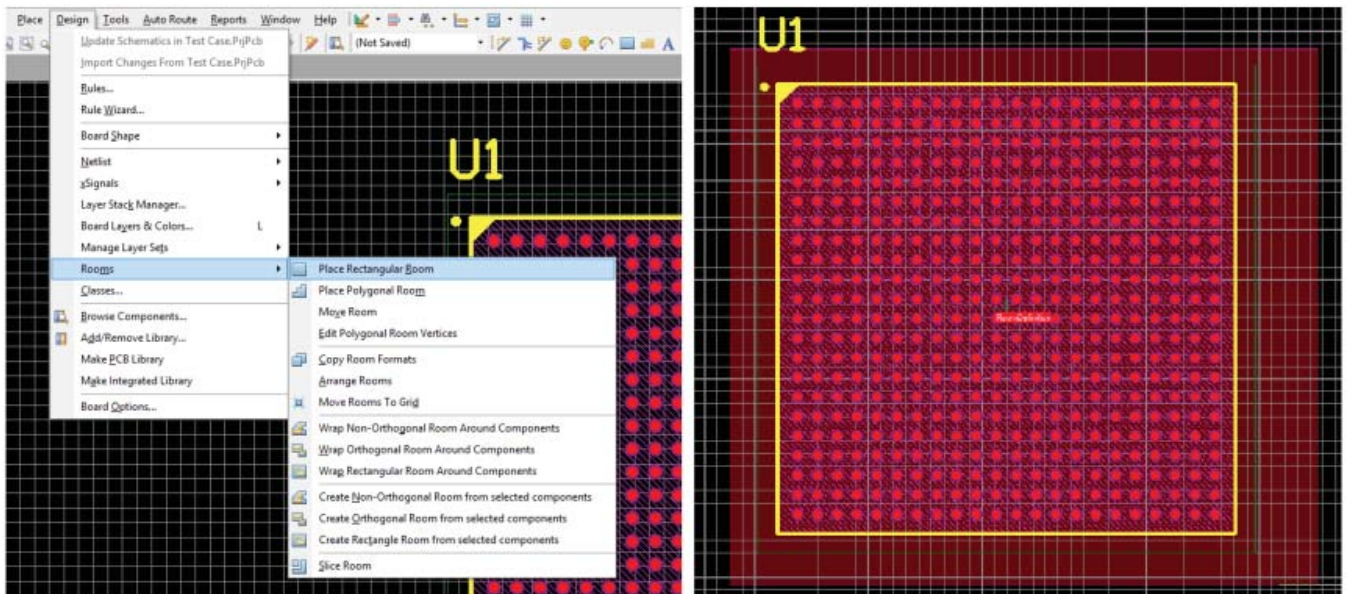


Figure 1: Placing a room around the BGA allows rules to be changed only for that room.

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Once a room placement has been generated around the area that you would want the routing to neck down, a separate width rule would be created that specifies tracks within that area to have a smaller track width than the rule set for the rest of the design. Figure 2 shows how the new rule is defined.

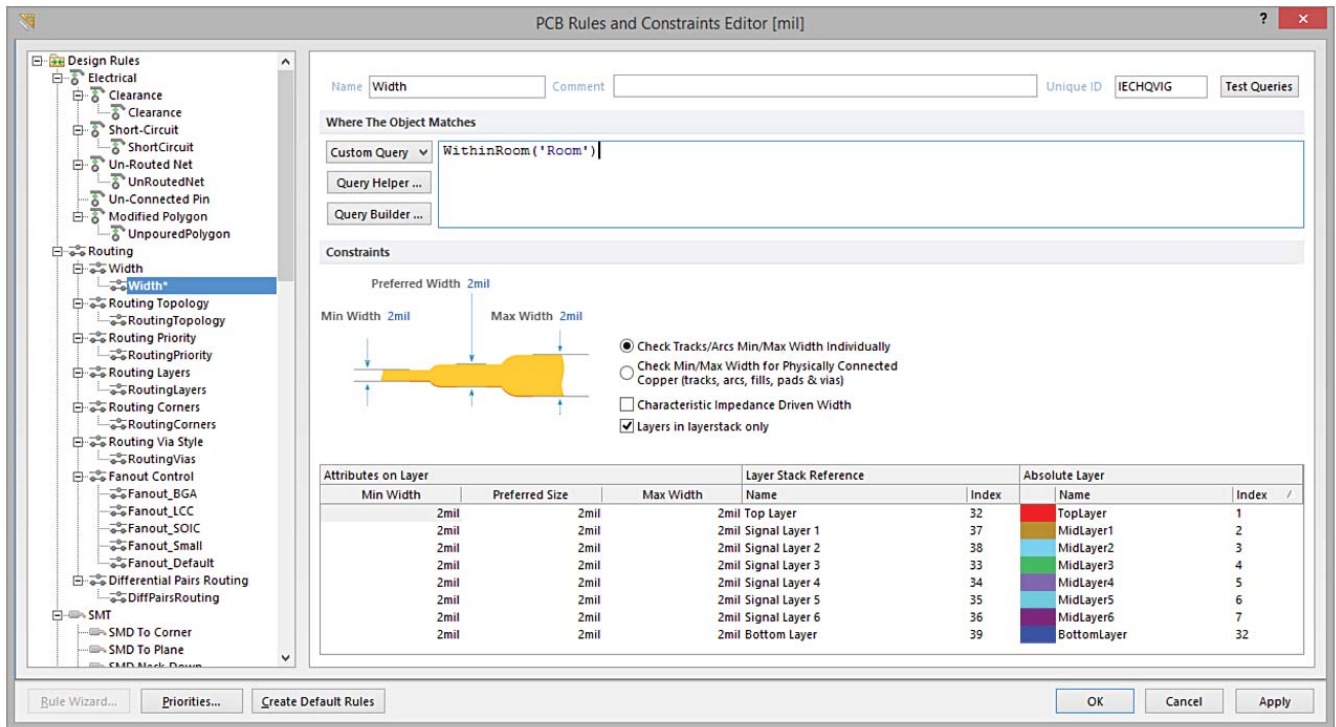


Figure 2: Creating a rule for the just-generated room surrounding the BGA.

Once a rule and room placement has been set, you will see the difference while routing as you enter/exit the BGA, illustrated in Figure 3.

Altium Designer automatically changes the track size based on the rules for that room. So, although the track width of the overall design is fairly large size, as the routing enters the area of the BGA, the width automatically shrinks to match the track width rule for that area. This is especially important when you are routing between several pads of a BGA to connect with an inner pad but the width of the track is too large to reach the pad (Figure 4).

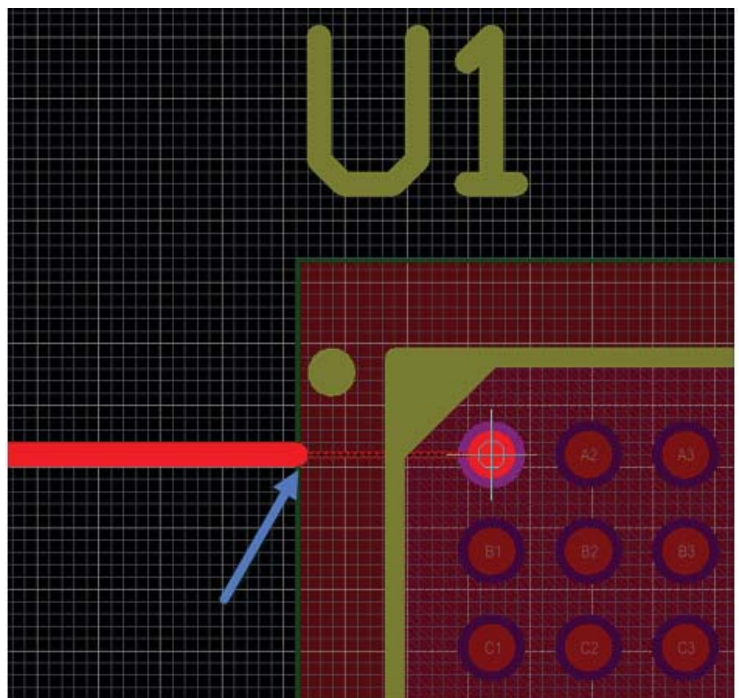


Figure 3: With the new rule for the room, the track automatically narrows to allow easier routing.

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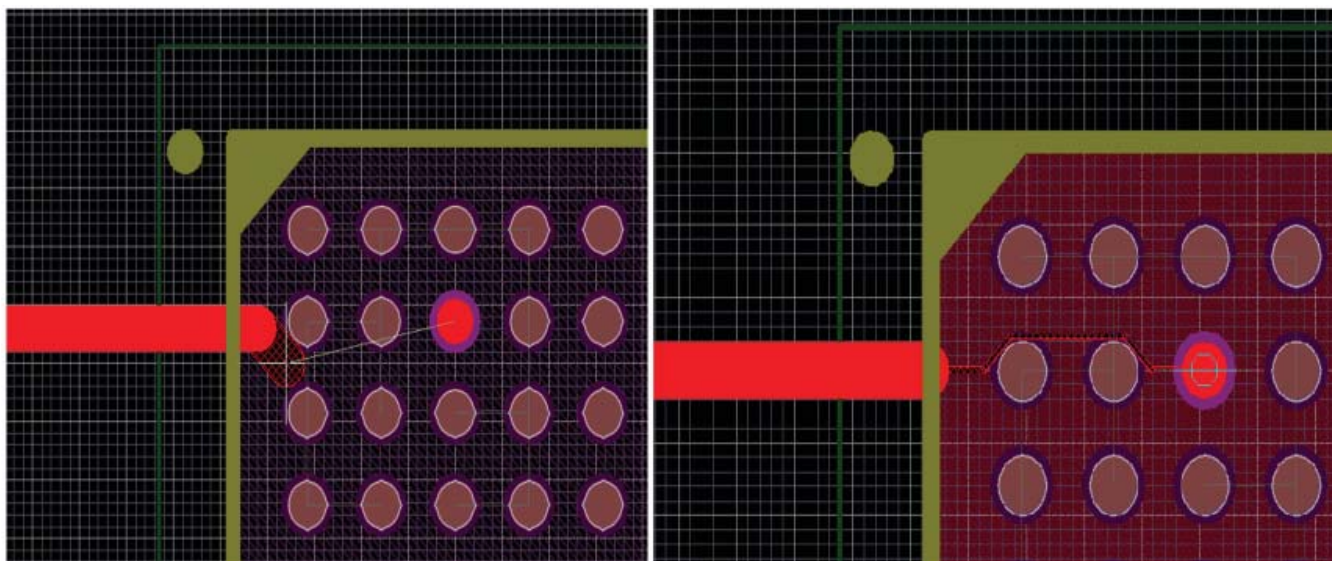


Figure 4: On the left, the track is too wide to go between BGA balls. With neck down, on the right, the track width is shrunk per the design rules for that room.

### CONCLUSION

You can configure Altium Designer to automatically neck down as it enters a pre-defined area. This is a time-saving feature during a routing process because it lets you continuously route your board without stopping and changing the design rules to meet the constraints of the BGA.

### REFERENCE LINKS

These links contain further learning about neck downs.

<http://techdocs.altium.com/display/ADOH/Automatic+Neck-Down>

[http://techdocs.altium.com/display/ADRR/PCB\\_Dlg-SMDNeckDownRule\\_Frame\(\(SMD+Neck-Down\)\)\\_AD](http://techdocs.altium.com/display/ADRR/PCB_Dlg-SMDNeckDownRule_Frame((SMD+Neck-Down))_AD)

<http://www.altium.com/video-easier-neck-down>