IN THE WORKSHOP – Tip #19

From Altium Designer to Mechanical CAD

Summary

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Things are looking good, you've ported your blood analyzer design from the NanoBoard in the lab, into a neat touch screen-based handheld NanoBoard, and it's selling well around the world. So well, in fact, that the boss has said the volumes justify moving it into custom hardware, and that means you can implement those last few cool user interface ideas that you have.

Even though your role in the product development was designing and coding the user interface, which is primarily a cool GUI operated through a touch screen, you've been given the job of porting the entire design into custom PCB hardware. Once that's done, you'll need to create a three-dimensional definition of the board, so that the new case with those new user-control ideas can be designed.

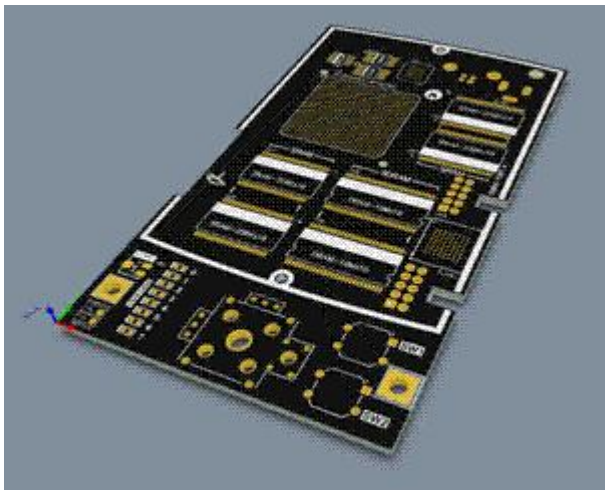
Should be easy! Shouldn't it?

Moving the design to the custom board

Phase one is moving the design to the custom board. Since the bulk of the design is built on standard Altium hardware, the circuit design is off-the-shelf too! Rebuilding the circuit from the library of existing Altium circuit 'chunks', or Device Sheets, only takes a couple of days, including adding a handful of extra components needed for the new user interface controls.

You've looked over Mike's (the board designer) shoulder often enough to have a good idea of how the design moves from the schematic to board layout, and he has just shown you how to import a shape for the board, complete with the necessary cutouts.

Fast forward a week… maybe those guys that tinker with hardware all day do earn their money after all. What you thought would take a day or two has taken a week – but you are close to having a placed and routed board. Time to check it out in 3D, and somehow get it over to Lou (the Industrial Designer) so she can slot it into that cool case she's designing.

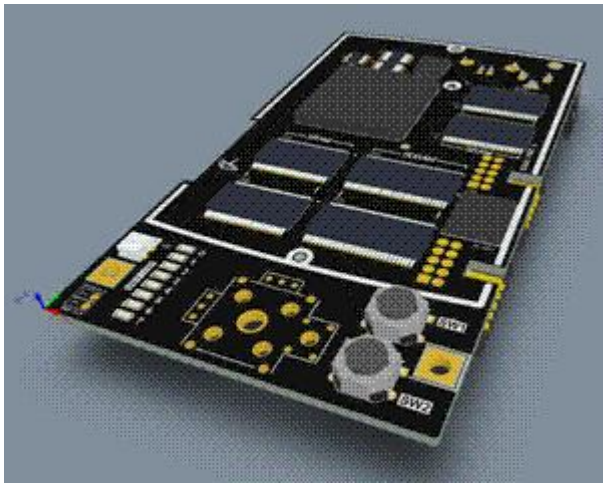


The 3D view mode gives a highly realistic view of the fabricated board.

Time to go 3D

You press the 3 key to display the board in 3D, but it has no components on it! Shuffling through your collection of post-it notes reveals some pointers from Mike about switching to and working in 3D. Press L to show the models and components.

It now actually looks like a real, loaded board. Time to use that fantastic-looking Space Navigator from 3Dconnexion that Mike insisted you get – the practice with Google Earth® is paying off as you role the virtual board over in your virtual hand.

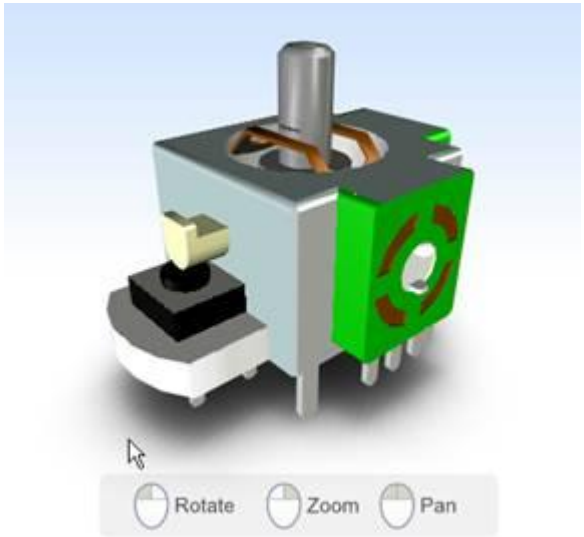


The 3V view can also include the components.

Modeling the components

Most of the design comes from existing Altium hardware, so all of those components have good-looking 3D parts. You only need 3D parts for 6 components, and 3 of those are surface mount resistor packs. Other than component manufacturer's websites, Mike has suggested looking component models on the 3DCentral website, http://www.3dcontentcentral.com.

The additions you've made to the user-interface are focused around an X-Y axis direction controller, just like you have in your favorite gaming station. Searching for that on the website returns nothing, but a search for 'joystick controller' give the exact component you've selected, known as a 'multi-control potentiometer' to its manufacturer, ALPS. You download the STEP model.



STEP models are available from a variety of sources, including component manufacturers and shared resource sites.

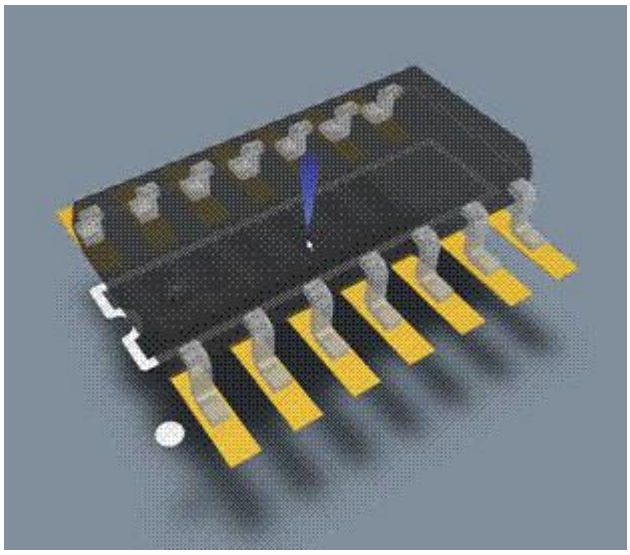
Loading the STEP Models

There was a STEP model for the 14 pin SOIC on the 3D Central website too, so that took care of the two ICs. Time to load the STEP models into the footprint library.

Following Mike's post-it note list of instructions, the loading STEP model for the ICs goes without a hitch:

• Select a mechanical layer and run the Place 3D Body from Step Model command, pop the model down somewhere near the footprint

• Double-click to edit it, and add a Snap Point to the body object at the STEP model origin
• Change to 3D view
• M to Move, M for any object, then click near the model origin to hold it by that point
• J for Jump, and R for footprint reference, and the model and footprint are aligned
• Enter to place it

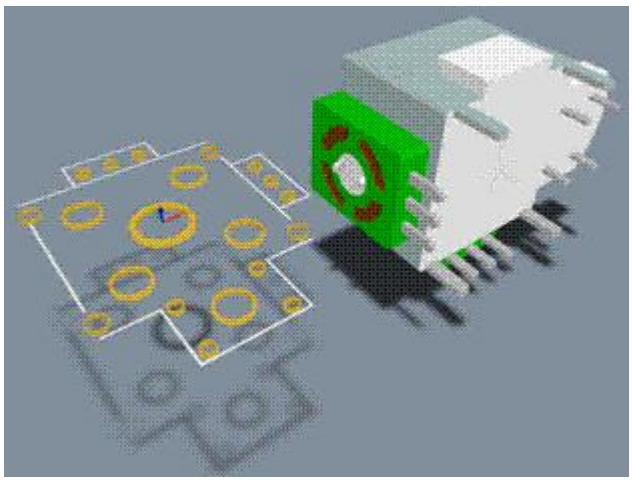


Step models are easily aligned with the footprint in the 3D view.

Now for the joystick controller. Thanks to Mike you already have the footprint, which looks like a sieve with all those holes in it.

You press 3 to display it in 3D, but the STEP model is not sitting on the same X - Y plane as the footprint this time. Bringing up the Shortcuts panel, you can see that as you move the STEP model you need to press the spacebar and the arrow keys on the numeric keypad to rotate the model around each of the axes.

Done. Well almost, you forgot that the resistor networks don't have a three dimensional model yet.



Step models can be rotated around all axes using shortcuts.

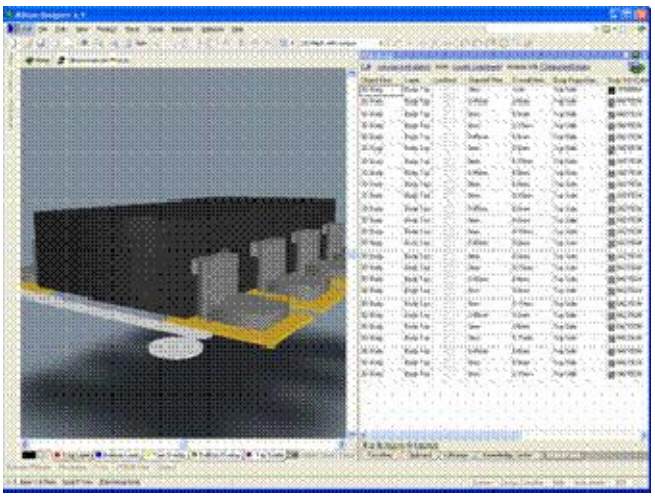
And when there is no STEP Model?

Since you could not find a suitable model for the resistor networks, it was time for another impromptu lesson from Mike on how to create a model in Altium Designer. It took him only five minutes to add component body objects to build up the resistor network, and that included the time he took to explain what he was doing.

He used a single body object to represent the body of the resistor network, and then built up a gull-wing style pin using 3 more body objects. By using the List panel he could easily adjust dimension and color settings.

Once he had one pin looking good, he quickly copied and pasted the 3 body objects onto each pad in the footprint. As he was pasting he pointed out another very handy shortcut, Shift+E. It has 3 modes, and by toggling to the All Layers Electrical Grid mode he could use the pad center as the reference, even though he was currently working on a mechanical layer.

That was it – all the components had 3D representations now, the board was ready to export.



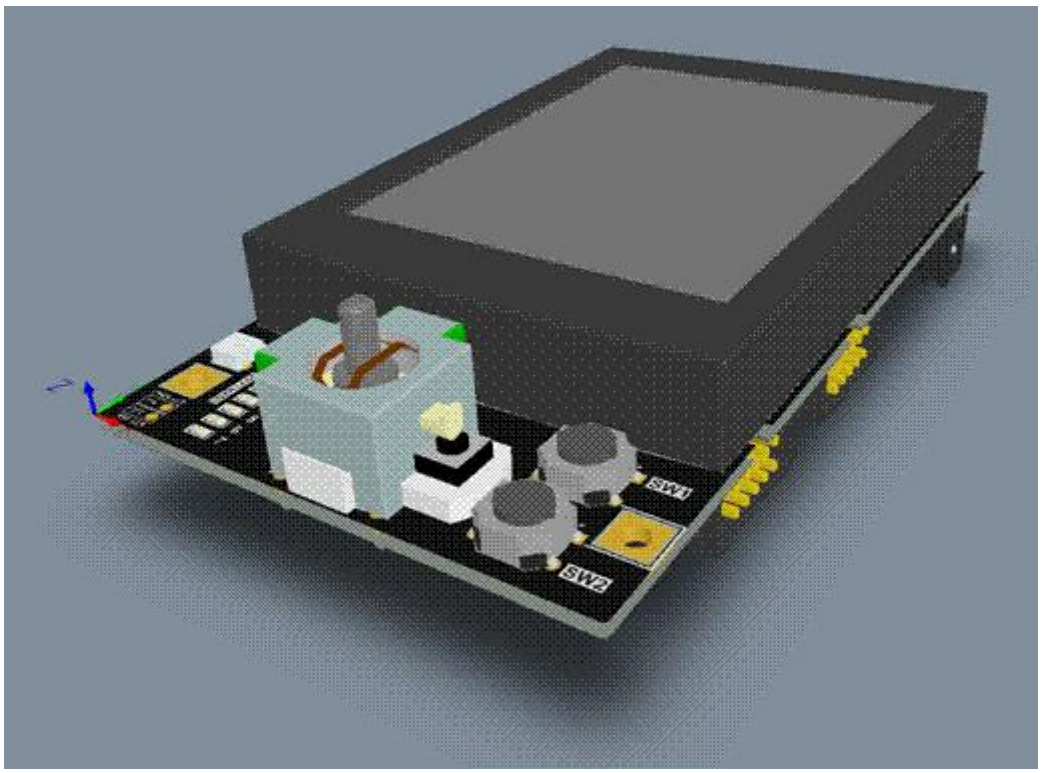
Multiple component body objects can be placed to build up a 3D model of a component.

Exporting the loaded board to MCAD

Exporting the loaded board was easy – just use Save As, select the STEP format, and click the Save button. The file took a while to generate because it was large, and it would have been better to pre-select the mounting holes and only included those in the STEP file. The Industrial Designer had no problems loading it in her mechanical cad tool though, ready for integration into the case design.

The process of adding 3D models to the components was straight forward, and it was good to have the option of either loading a STEP model, or building up the shape with component body objects.

Before doing this design I'd been skeptical about the value of having a 3D display mode in the board design package, but being able to see the board in all its 3D glory certainly made the board design process more enjoyable, as well as its value for transferring to MCAD. So enjoyable in fact, that there could be another board design in me yet ...



STEP is a standard file format, supported by most major mechanical CAD tools.