

► SchmartBoards

By Ed Simon

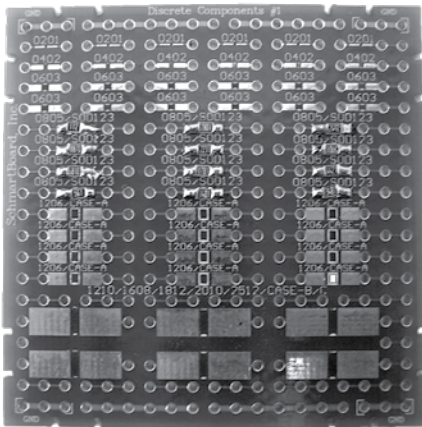


PHOTO 1: SchmartBoard.

Ed Dell asked me whether I would be interested in reviewing the new SchmartBoard prototyping system. What he didn't know is I already was unhappy with my current approach to soldering some of the new IC package formats.

I recently had a chip intended to measure the power of radio signal sources. This chip is only available in a small outline integrated circuit (SOIC) package. I first applied a very small amount of silicone rubber cement to the printed circuit (PC) card. I then jiggled the chip until it was where it needed to be. This was not as easy as it sounds because the PC traces are a bit above the board and the chip leads wanted to slip into the low spots.

Once the chip was in place, it sat alone and untouched for a day to let the cement dry. The next step was to use my built-in

seven diopter magnifier (I took off my glasses) to see what was being soldered. I used the finest tip available for my Weller WLC 100 soldering station and .020" solder so attaching the chip was doable. Adding a few chip resistors and capacitors finished the circuit. This was a large amount of effort for a very small circuit.

A BETTER WAY

SchmartBoard has come up with a series of small 2" square boards on which the solder traces are the low part of the PC card! The solder mask on the side of the traces is thicker than the copper pads—no need to apply glue, jiggle, and wait. The method involves dropping the chip in, and gravity pulls it home. Then they suggest you tape one half down while you solder the other half. There also is a plastic gripper so that you can link multiple boards together to form bigger circuits.

If you do not hold the other side down when you install the chip it is quite possible that as the solder melts to the first lead, the chip will tilt up into the air on the unattached leads.

SOLDERING TIPS

The first issue that may slow many users is that they ask you to first flux the connection before soldering. Liquid non acid flux is the right stuff to use, but most folks probably do not own any. Liquid flux is normally only used with a soldering pot, so I decided to try the

system without using the flux. To make it typical, I used a Radio Shack modular fixed temperature 25W soldering iron with a 1/8" chisel (rectangular) tip.

The important issue when soldering pieces this small is to have a steady hand. The first rule here is to be sure your arm is resting on a solid surface. If you keep your arm in the air and try to keep it steady, you may have too much motion to get a good solder joint.

The Schmart folks recommend you just use the solder already on the board without adding any. They also suggest you use a fine tip to heat only one lead at a time to prevent solder bridges. I made sure my tip was cleaned and then tinned before starting.

For a first try at soldering, I used the side of the tip which was narrow enough to contact only one lead at a time. This kind of worked. Using the wide part of the tip allowed me to solder three leads at a time. After finishing, the chip looked happy. Wondering how to test this, I tried to see whether the chip would move. It fell right off! You could see where the solder on the PC card was melted but did not attach to the chip.

Lesson learned: follow the directions! I applied flux to the SchmartBoard and moved the chip to some new traces and tried again, this time using just a clean tip with no extra tinning. As I applied the soldering iron, smoke arose from each joint as the flux burned off and

cleaned the metal. This time the joints were perfect! The board had beautiful clean solder flows at each lead.

For audio use you probably do not use SOICs very often, but I had wanted to try some of the new chip resistors with astoundingly low temperature coefficients. The price of the best .02% ±5 PPM resistors was more than \$10 each so this was a good reason to experiment with the 0.5% 25 PPM ones.

The SchmartBoard Discrete components #1 seemed to be just right for this test. Placing the resistors on the board yielded the first surprise. This board did not have wells for the components. I used a pair of mild steel tweezers to pick up and place the chips; the plastic ones seemed to be hiding.

Turns out that was a good thing. After I placed the chips, they wanted to stick to the tweezers. The tweezers were magnetized and the chips contained iron.

I had a nice lunch a year ago at the San Francisco AES show with a fellow who designs high-quality microphone preamps. Mentioning to him that I was using Brand H resistors for a project, he replied he had found they were not as good as they used to be because they now stuck to magnets when they previously did not.

His experience and mine is that many components these days use iron or steel in their construction. These parts tend not to work as well for audio. This problem first popped up with film capacitors.

Even though the chip resistors stuck to the tweezers, I decided to go ahead with the experiment. With skill and luck (a small piece of tape helped), I attached the components to the board.

When you buy custom PC boards over the Internet, they charge by the setup and then the area. It is just plain cheaper to buy the entire panel than just one card. Saving up designs and building an order board often leaves small areas that are left over. You can use these to make prototype cards.

COMPARISON

Using a leftover prototype card designed to hold the 0805 size chip resistors gave me a chance to compare the SchmartBoard to a standard card.

The prototype card was tinned with

a lead-free solder. Placing the resistors was sometimes harder because the surface was not as smooth as the SchmartBoard. The custom card had more space, which made up for the rougher surface. The SchmartBoard had a bigger pad size. The end result is that I did not like using either board. Leaded components are still my choice when available. This may change as I become more experienced or SchmartBoard recesses the chip slots.

The SchmartBoard has a ground plane on the backside of the components card. My custom one did not. The SchmartBoard is lead-free, holds more parts, and is off the shelf. In addition, there is a family of boards that you can combine for a larger project.

Dennis Colin could certainly use this system instead of just tacking parts on a too small scrap of PC laminate. If you need to use one of the newer small ICs, the SchmartBoards are a wonderful choice. Be sure to buy some liquid flux when you buy your cards. I hope in the future they extend the technology to include the discrete components.

Manufacturer's response:

We are happy that Mr. Simon had an easy time (when using our instructions), hand soldering an SOIC. This is the experience that most people will have. When soldering small discrete surface mount ICs as in the article, SchmartBoard pads are recessed, but to a smaller degree than the SchmartBoards for the SOICs. Some customers have used plastic tweezers when soldering very small discrete components to avoid the hindrance of dealing with magnetized tweezers. We do have videos of soldering the different types of components on our website www.schmartboard.com/index.asp?page=resources_howto. Readers can also go to our website and request a demo board and chip that will allow them to try the technology before purchasing: www.schmartboard.com/index.asp?page=schmartland_samples

*Neal Greenberg
VP Sales & Marketing
Schmartboard, Inc.*

aX