Good as gold

During my career, I worked with a team on medical imaging. Our system had a 400-MHz ADC board behind its large VME backplane. The board employed early ECL (emitter-coupled-logic) technology and used several Siemens SDA8010 flash-ADC ICs, which were unpopular due to their $200 price tag. Along with an arsenal of other ECL parts, several large coils of RG174 coaxial cable acted as precision delay lines for board timing. The design was unpopular but worked well.

One morning, the purchasing manager mentioned that the SDA8010 had become unavailable for purchase. We shared the bad news with the engineering department, and the engineers advised us that they needed several months to design a replacement board. Our interim solution was to buy enough chips for 16 months of production. Given our modest five-systems-per-month requirements, this purchase commitment was not a serious burden.

A few months later, however, we received a large order from an overseas medical distributor. The increase in production would in a few weeks deplete our inventory of SDA8010s. The engineering department had not yet started the board redesign. To make matters worse, Siemens had dismantled the production facility that produced the chips. The only parts remaining were some raw IC wafers that the company intended to destroy.

In a production meeting, someone joked that we could make our own chips. Facing a production stoppage, I decided to turn that joke into a project. Management directed purchasing to obtain the raw wafers from the supplier. We essentially got them for the cost of shipping.

None of us had any idea how to process a silicon wafer into a production-quality IC. We began by locating a wafer-dicing facility and an IC-packaging house. Our only production spec was a working SDA8010 IC, which we used as an ad hoc blueprint. Within a couple of weeks, we had produced ICs that looked like the real deal. I had created some test software to verify performance, and we eagerly tested each of them. Unfortunately, they all suffered missing bits, horrible linearity, and other serious issues. At this point, we were days away from a full-blown production stoppage.

I borrowed a working chip from a system and one from my "bone pile" of useless parts—traditional-looking DIP ceramic parts in 24-pin packages. With the aid of a heat gun, I gingerly removed the top metal lid from one of the bad parts. I could clearly see the IC's die and bond wires. I did the same heat-gun surgery to the good part, and the only difference I could see was that our packaging vendor used bond wires that appeared to be aluminum, whereas the good parts from Siemens had gold-finished wires.

With fingers crossed, we sent off another group of dice to the packaging house with instructions to copy the gold bond-wire material that the working sample used. A few days later, the first articles arrived. To my amazement, every one of them had performance identical to that of the Siemens parts.

The wafers continued to give high yields, and the surplus of ADC chips was a welcome relief. To add to our good fortune, our system's cost decreased by several hundred dollars because our do-it-yourself chips cost us only $22 after processing. About a year later, engineering delivered a completely new ADC-board design that worked better than our old ECL monster. EDN

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