

# Startup's partnership opens doors to markets

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Albuquerque startup 3D Glass Solutions Inc. has hitched a ride into the global electronics and communications markets through a new partnership with TE Connectivity Ltd.



3D Glass has created a new process that uses ceramics to build glass circuit boards that can reduce the size of electronics packaging in everything from mobile devices to satellite communications by 70 percent, while using 50 percent less power than circuit boards used in most products today.

TE Connectivity is a \$12 billion public company traded on the New York Stock Exchange. It's a global supplier of components for the electronics and communications industries.

Through the partnership, announced in October, the two companies will work to incorporate 3D Glass Solutions' circuit boards into TE products, said 3D Glass founder and CEO Jeb Flemming.

"TE has many products with different requirements, so we'll tailor our process to meet their demands," Flemming said. "It's a joint development agreement that at the end of the day will lead us into producing products for them here in Albuquerque. It's a very large, well-known company, and we'll now be able to leverage their existing supply chains to get our technology into the marketplace."

3D Glass expects to begin producing circuit boards for TE next year.

That's a huge achievement for a small Albuquerque startup that launched in 2006, said 3D Glass board Chairman Stuart Schoenmann, an investor in the company.

Schoenmann is former CEO of CVI Laser, a homegrown Albuquerque manufacturer of electrooptical devices that was acquired in 2011 by a Chicago-based firm for more than \$400 million.

"TE Connectivity is a multibillion-dollar corporation," Schoenmann said. "This directly connects us with one of the large industry players that is looking for miniaturization and improved performance in their communications and electronics packaging."

3D Glass, which employs 15 people at a 5,000-square-foot facility near the Albuquerque Balloon Fiesta Park, expects to double its workforce next year as manufacturing for TE begins and as more indus-

try customers seek 3D Glass circuit boards.

The company's secret sauce is a proprietary glass ceramic it created dubbed APEXGlass. Its process allows it to etch circuit boards with ceramics directly into a glass plate, or wafer.

Glass has much better properties for conducting electronic and communication tasks than other materials commonly used today, such as silicon, Flemming said. It can also be used to make much smaller features, greatly reducing the size of finished circuit boards.

The industry is now widely looking to replace silicon and other materials traditionally used in semiconductor chips with glass-based circuit boards, positioning 3D Glass as a key player in an emerging market.

"Today's circuit boards have multiple layers with connections running from top to bottom and the whole thing sandwiched in between metal and other materials," Flemming said. "The challenge is the size of it all, because the routing components and metals on the circuit board are just too big. We've used those printed circuit boards since the 1970s and they've continually gotten smaller through technology improvements, but they've reached the end of their innovative cycle."

The 3D Glass process allows it to replace today's sandwiched circuit boards with single-level circuit boards directly etched into a glass wafer. And the metal lines and connections that are woven into the glass are about 90 percent smaller than the same lines woven into traditional circuit boards.

"By shrinking those two features, we can shrink the entire circuit board by 70 percent in size," Flemming said. "And by default, if the circuit board is that much smaller, it consumes much less power — up to 50 percent less."

#### RF filter advancement

3D Glass announced another technology achievement in October when it released a new radio frequency filter it made with its ceramicglass process that could help guide the wireless industry into next-generation 5G mobile communications. RF filters work to absorb unwanted noise so communications devices can function at targeted frequencies.

But even at today's typical 4G wireless levels, traditional filters miss about 20 percent of unwanted noise, allowing only about 80 percent of a signal to actually reach a cell tower. At 5G, only about 20 percent get to the tower with those filters, Flemming said.

In contrast, the company says its new 3D Glass RF filters work efficiently at frequency levels even beyond 5G, because glass is much more conductive than other materials at those higher frequencies.

The company is now working with potential customers in the communications industry and the military to market its new filters, said Roger Cook, 3D Glass managing director of integrated circuit packaging.

"RF filters are basically in every mobile device, and everyone is trying to reduce their size to put more things on mobile phones and tablets," Cook said. "That's where we come in. We can hit the new frequencies the market is looking for."