The Engine Behind Today's Must-Have Applications

A Quarter Century of Knowledge

Take a trip back in time to 1985. On the political front, Ronald Reagan is starting his second term as president, and Mikhail Gorbachev is the newest ruling leader of the Soviet Union. On the business front, savvy PC users are excited about Version 1 of Windows and the first .com name is registered for the Internet. On the communications front, Bell Systems ceased to exist the year before, breaking up into a bunch of baby Bells. Calls were the domain of landline phones, and modern airports utilized the phone bank, even though the cell phone was born a year earlier.

Against this backdrop, a group of talented engineers founded TriQuint as a spin off of Tektronix to research and develop the use of gallium arsenide (GaAs) for high performance wireless applications. A few years later in 1991—GaAs pioneers Gazelle Microcircuits, Gigabit Logic, and TriQuint merged under the TriQuint Semiconductor name.

And what became of this entity? If you tore apart virtually any communication device, the odds are good that they contain GaAs modules from TriQuint—the engine that drives today's modern applications.

TriQuint combines many tiny components into "modules" that are simpler and faster for electronics manufacturers to install than trying to assemble and test many small communications parts from different manufacturers into cell phones crammed with features. And they make the modules at a competitive price.

Figure 1 - TriQuint Headquarters in Hillsboro, OR

Fast Facts

Headquarters:	Hillsboro, OR
Founded:	1985
Sales:	$890M (2010)
Employees:	2,800
Major Markets:	Telecommunications Mobile & Computers Foundry
Major Processes:	FET, pHEMT, mHEMT, MESFET, BiHEMT
Parametric Testers:	Reedholm (5)

Furthermore, TriQuint cut out competing product offerings by integrating them. As a result, revenues are rising.

Most of these products are built at the corporate campus in Hillsboro, OR. This 160,000 square foot complex includes a 150mm wafer fabrication clean room capable of Class 10 operation. Another state-of-the-art TriQuint fab is in Richardson, Texas.

Dominating Communications Market

TriQuint dominates the modern communications market like smart phones and plans to have the same impact with laptops. Better than Trident gum, its Copper Flip technology products are recommended and used by 4 out of 5 mobile phone OEM's, by 3 of the top data card suppliers, 3 out of 5 of the top smart phone mfg's, and the #1 wireless reading device.

TriQuint products enable faster data exchange rates, extended battery life, and better amplification of weak signal. These green friendly devices are base station amplifiers that increase network capacity, while consuming less power.

TriQuint is also # 1 in foundry sales—helping turn designs into products. Low noise and high power capabilities make it ideal for high performance wireless applications. Advanced manufacturing techniques result in smaller die size and more cost competitive solutions. GaAs materials save battery life and increase output power of high frequency wireless circuits. GaAs is the critical component of today's must have applications—mobile phones, WLAN's, cable TV, and automotive radar.

Implementation Benefits

TriQuint was at a crossroads—it was running highly advanced processes on aging, unsupported parametric testers. An evaluation of parametric testers was made, and Reedholm was selected. One reason was that TriQuint could continue to use the EG2001 prober—the workhorse of the GaAs community, whereas the latest offerings from others would have required an investment in new probers to support the large test head.

While gearing up for the installation, TriQuint's Thorsten Saeger found other benefits from using Reedholm testers in production.

Battle of TD & Production for Tester Time

Historically, TD and Production shared (4) aging parametric testers. Things came to a head one weekend when TD was promised tester time. But test times were so long, at 7 hours per wafer, that those running the testers were not able to change back over to production mode that weekend. In a nutshell, wafers were not shipped on schedule.

Figure 2 - RI-EG System

With the change to Reedholm, test times were reduced from 7 hours to less than 1 hour per wafer. There is no longer a battle over tester time.

One Right Answer—HBT Correlation

When a new system is brought in, one of the first orders of business is to find out how the results match to the system it will replace. Early on, there was a major difference in HBT results. But was the historic answer the right one?

In this case, the historic systems were significantly slower than the Reedholm systems. The built-in curve tracer software proved the Reedholm testers were taking data so much faster that the transistor was still in an oscillatory state—thereby requiring a longer delay. With the delay added to the test, the results overlaid—as they should with such pieces of metrology.

100% Better than Sample Probing

Historic bottlenecks and slow test times prompted TriQuint engineers to devise complex probing strategies to enable sample probing for critical parameters.

Changing to Reedholm testers dramatically increased throughput, allowing TriQuint to probe 9 sites per wafer on every wafer instead of having to sample probe wafer lots.

Easy Global Changes

One attribute of having everything accessible in an SQL database is that it makes it simple to make global changes. More than once, TriQuint engineers have realized that a simple change is needed to a value contained in virtually every test plan. With SQL, a simple script enables the change to be made in seconds, which allows engineers like Thorsten to get more done.

Figure 3 - TriQuint's Thorsten Saeger Enjoying a Conference

Reliability Assessment Applications

Another Reedholm system is used in reliability assessments where hundreds of intradie are tested per die, some of which use self-heated structures. TriQuint does Vramp and constant voltage TDDB testing at the wafer level of nitride capacitors, involving breakdown measurements up to 200V. There is no shortage of testing here, as up to 15 new devices are introduced in a given week, all of which require a reliability assessment.