



A New Beginning

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Andrew Brawley, General Manager at Silanna Semiconductor, could not believe it.

It was July 2008 and for over 12 years the chip production plant that he headed had been a captive fab, used as a manufacturing facility for a succession of American semiconductor companies. Now a private investor had acquired the facility and unshackled it from captive fab status. The company was now free to pursue its own vision of becoming a product and technology development centre.

Fast forward to 2011 and a number of chip products are well advanced in the design process, a range of promising technologies are under development and a \$30 million-dollar fab expansion is well advanced and ahead of schedule. Mr. Brawley said, "The acquisition has really invigorated the staff. For many years, they have been limited in their creativity because of the nature of being a captive fab. Now that we are an independent entity, a number of them have blossomed and have really shown what they are capable of."

While many fabs have struggled or even closed down, Silanna has expanded its staff by 25% in the last 18 months. Most of these are young highly skilled chip designers, technologists and device physicists.

The company operates two clean rooms with a third, a Class 1 clean room, under construction at its headquarters in Sydney Olympic Park in Australia.

Besides offering wafer foundry services and doing chip development, the company is working on a range of other technologies that will enable creation of unique device technologies that will further Silanna's growing development reputation.



Silanna in Sydney, Australia

Fast Facts

Headquartered:	Sydney, Australia
Founded:	2006
Employees:	100
Major Markets:	Telecommunications Foundry Defense
Process Run:	0.25 μ m Silicon-on-Sapphire (SoS)
Parametric Testers:	Si-CMOS Reedholm (3)

Accreditation of Trust

Silanna operates under ISO9001 and AS9100 quality systems. In January 2011, Silanna became the first non-US company to receive an Accreditation of Trust from the Defense Microelectronics Activity in California. That means the company has systems in place and personnel clearances to ensure security of defense clients' information. Silanna facilities have also been cleared to a security level of "Secret".

These accreditations will be of great interest to USA defense electronics companies Mr. Brawley said. He went on to say, "For European defense customers our technology is free from ITAR restrictions."

It is no exaggeration to say that parts manufactured by Silanna are spread through our solar system! These parts are found in the Mars Rover and deep space probes. Many satellites launched today use parts manufactured by Silanna. Products manufactured at Silanna have also successfully entered the mobile phone market including components for Nokia, Blackberry (RIM) and iPhone (Apple).

Mr Brawley said, "I have been in the semiconductor industry for almost 40 years, and this is the most exciting project that I have been involved in."

The SOS Advantage

Silicon-on-Sapphire (SoS) processes are the core of Silanna process technologies. Because sapphire is an insulating substrate, parasitic capacitances, which reduce losses at RF frequencies, are eliminated.

The SOS Advantage (Con't)

SoS also provides excellent isolation and allows high linearity transistors to be designed. SoS is ideal for high frequency RF designs and complex mixed signal applications. For many applications SoS is superior to GaAs, SiGe and bulk CMOS processes. The main advantage is the ability to integrate a range of devices such as RF, analog, logic, EEPROM and high Q passives on one chip. This significantly reduces the size and cost of circuit boards by integrating many components into one chip.

Another feature of SoS is that being radiation hard makes it suitable for space and defense applications.

DC Testing Roles

Testers from Reedholm are used for in-line and final wafer parametric testing, process characterization, and reliability studies.

Wafer acceptance testing (WAT) consists of standard process acceptance tests, such as transistor turn-on voltage, transistor drive current, transistor breakdown voltage, and the like.

Process characterization done with the Reedholm equipment consists of mapping parameters such as transistor turn-on voltage across a wafer.

Another use is in a low-volume product line that combines WAT with process characterization for assembly of hybrid circuits from wafers produced at other silicon foundries.



RI-40 System in Action

For acceptable hybrid circuit yield, a resistor with a specific value needs to be selected based on transistor turn-on voltage and installed. Reedholm software makes it easy to determine the voltage and provides an electronic wafer map for resistor installation.

Reliability studies use the Reedholm testers to look at wear out mechanisms such as hot electron effects and oxide wear out.

System Reliability

Since every wafer goes through WAT, any problems with the test system means that finished wafers don't move on. Fortunately, the Reedholm testers have been reliable and require little help from the United States.

According to senior process engineer Barry Goldsmith, who has been at the facility since 1991, "The only failure we've had in a PC board in a Reedholm system was self inflicted." That incident, together with a case of power cables corroded due to a chemical leak in the fab, have been the only times Reedholm testers were brought down, and both failures were easily addressed.

Data Analysis

Once data is taken, particularly WAT data, it is analyzed in a variety of ways. The most common analysis is done using programs and procedures developed by Silanna. Some of these builds upon statistical and graphical capabilities in the standard Reedholm software in which ASCII data files from different lots are combined into one data file for analysis as one data set.

"I can make a monthly histogram of my N-channel V_t 's with a few keystrokes and then look at it with the Reedholm program," said Goldsmith.

These combined data files can also be imported into a spreadsheet for further analysis using trend charts and Cpk analysis.

Overall, the Reedholm test systems are an important part of the tools Silanna uses to maintain its technological freedom and move toward its goal of being a product and technology development center.