OzIC OZARK INTEGRATED CIRCUITS INC

Ozark Integrated Circuits Success Story

The Situation

Ozark Integrated Circuits, Inc. is rapidly making a name for itself among the small number of companies able to create complex integrated circuits and electronic systems capable of surviving in extreme environments. The semiconductor company, which is headquartered at the Arkansas Research and Technology Park, spun out of research led by University of Arkansas Distinguished Professor Alan Mantooth and was supported by the National Science Foundation Established Program to Stimulate Competitive Research (EPSCoR). The company's expertise consists of designing analog and mixed-signal integrated circuits for extreme environments, including high and low temperatures — from the freezing point of gasoline to the melting point of aluminum — humidity, vibration, high voltage, radiation, etc.

The Problem/Challenge

In 2015, the National Aeronautics and Space Agency (NASA) wanted a reliable ultraviolet imager to study the environment on Venus. NASA aims to outperform probes from Russia, which only lasted a few hours on Venus before failing due to the extremely high temperatures.

The Solution

Ozark Integrated Circuits proposed creating both a microcontroller and an ultraviolet imager using silicon carbide. The two proposals were awarded, totaling $245,000 from the Small Business Innovation Research Program to conduct a feasibility study consisting of a simulation-based design of the products. The ultraviolet imager was then selected for funding with $750,000 and is currently being tested.

The Results

Since acquiring the NASA award for electronics for future Venus missions, Ozark Integrated Circuits won a second award from NASA to create a fabrication process model for the design of complicated circuits that would operate for thousands of hours in very high temperatures. The company has also won three $155,000 grants from the Department of Energy: two to provide integrated circuits on data collection systems in geothermal wells, and the third to develop ultraviolet sensors for high-energy physics (neutrino detectors). Additionally, Ozark Integrated Circuits was awarded a $750,000 award from the U.S. Air Force to work with the University of Arkansas High Density Electronics Center to develop electronics packaging and assembly systems for controls in jet engines that can operate at temperatures up to 300 degrees Celsius. Most recently, Ozark Integrated Circuits received several Phase I and II grants from NASA and the U.S. Department of Energy, totaling at over $1 million in funding.

Ozark Integrated Circuits is a small company doing big things. And, with the help of Arkansas Economic Development Commission's Technology Development Program investments and the Technology Transfer Assistance Grant Program, the company has acquired than 30 Small Business Innovation

Research grants and two Small Business Technology Transfer grants totaling more than $13 million in federal grants from the U.S. Air Force, Department of Energy and NASA. The company attributes its success on its ability to keep and bring electrical engineering graduates from the University of Arkansas back to Fayetteville — a “reversal of the high-tech brain drain,” as Ozark Integrated Circuits CEO Matt Francis said.

The company’s success story began early on thanks to two key decisions. The first decision was to focus on “extreme” integrated circuits. Today, Ozark Integrated Circuits is considered the expert in the field (they even wrote a book about the subject). The second decision was a result of circumstances. In its early stages, there wasn’t much money in the budget to spend on enterprise-class design tools, so they created their own tools by adapting open-source software to fit their needs. The continued cost savings means that Ozark Integrated Circuits can hire more talent, increase productivity, customize tools for their special needs, and allow the small company to compete with larger companies.

In 2017, the company received a $750,000 grant from the U.S. Air Force to develop electronics packaging and assembly systems for controls that can operate in temperatures up to 300 degrees Celsius in jet engines, leading to increased reliability and lower costs.

“We are very excited about this award,” said Francis. “It builds on our long-term relationship with the U of A and enables us to build the missing link for the high-temperature chips we’re developing.”

The award followed a $124,982 grant from NASA to create a fabrication process model for the design of complicated circuits that would operate for thousands of hours in extreme temperatures. The grant also was used to help design an integrated circuit — a general-purpose communication link — to prove the design kit works.

The company previously received two grants from NASA totaling almost $245,000 to design integrated circuits that can operate on the surface of Venus, where the temperature can reach 500 degrees Celsius. The circuits, if chosen, could be used in the design of the proposed Venus Landsailing Rover.

The company has won three $155,000 Small Business Innovation Research awards from the Department of Energy, two of which were to provide integrated circuits on data collection in geothermal wells, and the third of which was to create ultraviolet sensors for high-energy physics. These awards are part of the company’s goal to commercialize its NASA-funded technology. Geothermal energy is an attractive, carbon-free form of energy that could meet 10 percent of America's energy needs. The Department of Energy is interested in exploring the best methods of harnessing energy from these wells. One problem is extreme temperature: the deeper a geothermal well, the hotter the temperature.

“Not only has NASA created an opportunity to transfer the technology, but also in the process NASA has fundamentally changed our company from a purely fabless semiconductor business model to now include a SiC process as part of our IP roadmap,” said Jim Holmes, Ozark Integrated Circuits’ Chief Technology Officer. Their work will improve the functioning of processors, drivers, controllers and other analog and digital circuits used in power electronics, automobiles and aerospace equipment — all of which must perform at high and often extreme temperatures. “This ruggedness allows these circuits to be placed in locations where standard silicon-based parts can't survive,” said Mantooth. “The circuit blocks we designed contributed to superior performance of signal processing, controllers and driver circuitry. We are extremely excited about the results so far.”

The research is critical because one-third of all power produced in the United States passes through some kind of power electronic converter or motor drive before it reaches the end user. Circuits developed by the University of Arkansas team will enable tight integration of control in the tough environmental conditions these applications demand. They will also improve electrical efficiency while simultaneously reducing the overall size and complexity of these systems.

But the company never intended to focus solely on government contracts. Critically, it has used each product it has designed to develop another piece of its product roadmap. The year 2014 was pivotal; that was the year the company developed a healthy consulting business, which was an important step in developing custom electronics for commercial companies.

“Ozark IC’s focus is now on creating high-temperature and UV products that will take advantage of its unique expertise and patented intellectual property,” said Francis.

Francis and Holmes both attribute the company’s success to its ties with the Arkansas Research & Technology Park, operated by the University of Arkansas Technology Development Foundation. Being a part of the research park means that Ozark Integrated Circuits can tap into the talents of the university’s engineering students. Francis and Holmes have both been professors in the department, and the students have helped with the commercial development of several projects.

“Students will try something because they don’t know any better,” Holmes said.

The company now is in a position to reach out to these out-of-the-box thinkers and offer jobs to some of the graduates.

“There’s not a talent shortage in Northwest Arkansas,” Francis told the Northwest Arkansas Business Journal. “I realized there was no reason we couldn’t start a successful integrated-circuit company here. All you need is a computer and the ability,” he said.