

## V•I Chips Solve a Noise Problem — And That’s Just for Starters

Scientific Solutions Inc.  
Nashua, New Hampshire

Scientific Solutions, Inc. is a small company of 23 employees located adjacent to Boire Field, a very active General Aviation airport, and Daniel Webster College in Nashua, NH. It characterizes itself as “specializing in rapid prototyping of harsh environment instrumentation and ocean-acoustic research.” Their significant experience making difficult noise and vibration measurements has been applied to diverse uses. One application, for example, is an active sonar that can detect submarines too quiet to be found with passive sonar. Another system detects large marine mammals to prevent their harm in shipping lanes or in high sound pressure zones such as during military exercises.

In that context, Sung Vivathana, Electrical Engineer, was responsible for the power solution for a sonar system that can detect intruders in a particular area – such as for harbor defense. The system transmits and receives signals that can then be interpreted to identify what has been detected, such as a swimmer or a small underwater vehicle.

The prototype system used an older power supply that presented a problem. The sonar system transmits a signal and waits to receive a reflected signal in response. During that portion of transmit and receive, the power supplies are at no load and switching in the same frequency band that the system is looking at, making noise an issue.

“The V•I Chips operate on a fixed higher frequency that switches above the band that we’re interested in, so there is no interfering noise,” Vivathana said, “but the high efficiency, low noise, and small size of the V•I Chips were also very important.”

The complete sonar system is in a cylindrical can in the water and the can is attached to hydrophone transducers. The PRMs and VTMs are connected in a high-power parallel array. The 48 V PRM and VTM array provide control of isolated Point-of-Load (POL) voltages of 48,  $\pm 15$ ,  $\pm 12$ , and 5 V. “Basically, Vivathana said, “the power requirements for the transmit system are pretty hefty (overall about 1 kW). The high density and small size of the V•I Chips are critical because our customers would like the underwater system to be as small as possible.” It is desirable, of course, to ensure that such a defensive system is as unobtrusive and unnoticeable as possible.

The high efficiency of V•I Chips is a particularly valuable attribute for this program because in a can under water there’s no air circulation. “Heat is obviously a concern when you’d like the reliability to be top notch. Taking the heat out of that can and into the water was a big priority. The Chips don’t dissipate much power when they are loaded. We had a requirement to keep the internal temperature in the can at a specific temperature. The Chips being so efficient really helped the cause.”

“The inherent low noise of the V•I Chips is important because we are working at signals that are very low. The received signals are amplified, so any noise present will be amplified as well. Being inherently low noise has helped a lot,” Vivathana said. “Size was definitely important as well because, in addition to the need to be unnoticed, the material used to house all of the electronics is fairly expensive per square foot so the smaller the better.”

“We received very good cooperation from all of the people at Vicor—from customer service reps to sales reps and applications engineers. We received evaluation boards within a day or two of our request. The applications engineer shared his expertise with us in the initial stages of development of a complicated PRM / VTM parallel array and worked closely with us on the PCB layout.”

Vivathana added, “Scientific Solutions has used Vicor products mainly for their reliability. With this particular design, we decided to use V•I Chips because we could not find another power supply that offered the density, noise, and size attributes that were critical to this application.”

Scientific Solutions, Inc., is a small research and engineering firm specializing in developing solutions for civilian and government customers in various fields of advanced technology.