

# The XC4013E

## A Military “Bottom Line” Solution

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Teamwork, ingenuity, and the unique qualities of Xilinx parts combined to create a surprisingly efficient solution in a recent military project. The military customer, the Xilinx FAE, Hamilton Hallmark, and the design firm Bottom Line Technologies, all worked together in upgrading an older product to current technology, and providing a growth path for the future.

The customer had developed a numerically controlled digital sweep oscillator (NCDSO) in the late 1980s, using custom military gate arrays. Using the technology of the time, they designed with 1.5 micron ASICs that were big and expensive compared to today’s devices and prices. Each circuit board contained three custom gate arrays that each implemented one NCDSO, and six ROMs that converted phase-angle to sinusoidal waveforms. The system worked, but was no longer practical because of cost and component availability. This customer had a dinosaur system on its hands.

Working with the FAEs from Xilinx and Hamilton Hallmark, this military customer created a solution that replaced the outdated custom parts with Xilinx FPGAs. The change to FPGAs guaranteed that the solution would work for today and tomorrow by taking advantage of the ongoing process and price shrinkage that Xilinx has traditionally passed on to its customers. Not only would they have faster, cheaper parts, they would also never again be stuck with outdated, expensive technology.

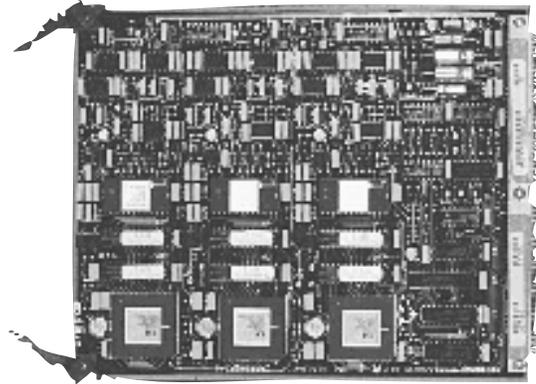
The team’s first solution replaced the three custom gate arrays with three Xilinx parts and continued using the six associated ROMs. A fourth Xilinx device was used to control the others, serving as a microprocessor interface. The design team was happy with the solution, but they did not have the expertise to com-

plete the conversion; additional engineering resources were needed to design the new Xilinx parts.

The FAEs recommended Bottom Line Technologies (BLT), a New Jersey design firm founded by one of the original Xilinx FAEs. Serving clients from Boston to North Carolina, BLT specializes exclusively in Xilinx design, development, and training. The FAEs felt that the expertise and experience of BLT’s engineers would offer the customer a fast and cost effective answer to their dilemma.

BLT proposed an innovative solution. Rather than using the four Xilinx parts and associated ROMs. BLT suggested that they use a unique feature of Xilinx FPGAs to reduce the number of devices needed in the product. By taking advantage of the Dual Port Synchronous RAM, available in Xilinx FPGAs, they could replace the three custom chips with one multi-tasked Xilinx device.

BLT’s final solution incorporated all three NCDSOs, plus the microprocessor interface, into a single Xilinx XC4013E FPGA. The pipeline registers for each of the NCDSOs were implemented in the dual-port synchronous RAM of the Xilinx chip. Data written by the microprocessor was also stored in the dual-port SRAM. By changing the addresses to these RAMs periodically, the data and pipeline registers for each of the NCDSOs became accessible during the corresponding time interval.



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*Continued from  
the previous page*

In this manner, all three sweep oscillators (time multiplexed) fit in the single XC4013E. An added benefit of this multi-tasking was that the six external ROMs of the original design were replaced by two. From old design to new, nine custom parts per board were reduced to just three. The icing on the cake was BLT's use of the phase angle ROMs to store the XC4013E's configuration data. As a result, the customer also saved the cost of a separate configuration ROM.

The customer was thrilled by the new Xilinx design. In the conversion, they had reduced the number of parts needed in the

*“This was  
a slam dunk for Xilinx.*

*We were really  
pleased.”*

product, fully utilized the features of the Xilinx technology, and were guaranteed future price competitiveness provided by Xilinx process migration. The customer also reaped the benefits of the combined knowledge and expertise of the Xilinx and Hamilton Hallmark FAEs working in conjunction with the BLT design team. The customer significantly reduced overall costs and eliminated the threat of another "dinosaur" down the road.

Bottom Line Technologies Inc. is based in Milford, NJ. They can be contacted at 500-447-FPGA, 908-996-0817, or on the Web at <http://www.bottomline.com>. ♦