

Silicon-Germanium Fast Packet Switch Developed for Communications Satellites

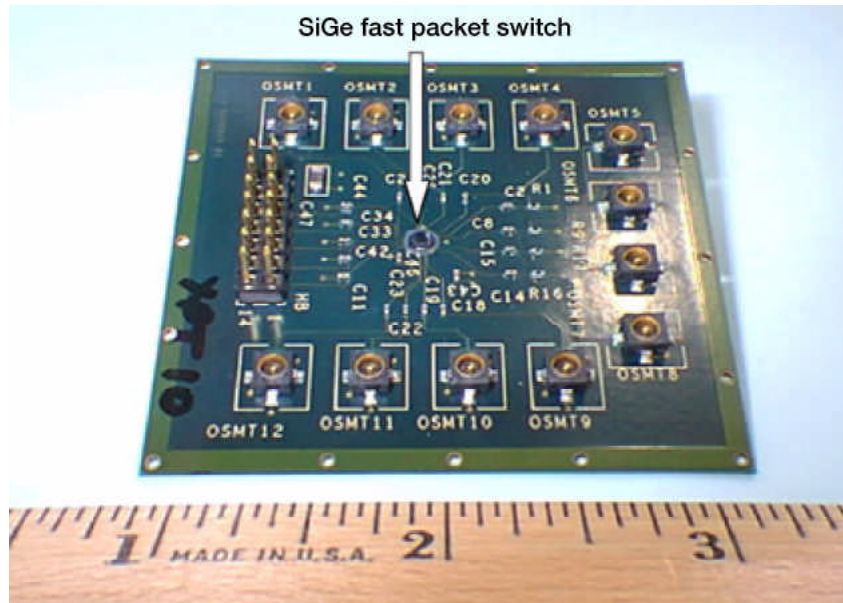
Emerging multimedia applications and future satellite systems will require high-speed switching networks to accommodate high data-rate traffic among thousands of potential users. This will require advanced switching devices to enable communication between satellites. The NASA Lewis Research Center has been working closely with industry to develop a state-of-the-art fast packet switch (FPS) to fulfill this requirement.

Recently, the Satellite Industry Task Force identified the need for high-capacity onboard-processing switching components as one of the "grand challenges" for the satellite industry in the 21st century. In response to this challenge, future generations of onboard processing satellites will require low power and low mass components to enable transmission of services in the 100 gigabit (10^{11} bits) per second (Gbps) range.

Lewis and Sierra Monolithics developed a state-of-the-art 10-Gbps-per-port switch. This promising silicon-germanium (SiGe) technology enables the design of high-speed circuits at very low power consumption. Some of the benefits of this state-of-the-art technology follow:

- U. S. satellite industry competitiveness will be enhanced through the development of high-throughput, low-power onboard components to support the National and Global Information Infrastructures (NII/GII).
- Satellite and terrestrial systems will become fully interoperable.
- Bandwidth efficient systems will improve capacity 100 times over existing satellite architectures for commercial applications.
- The complexity of Earth stations will be reduced.

The SiGe switch is based on a 16-input by 16-output SiGe crossbar switch that can transmit and receive data at 10 Gbps per port with very low power and weight requirements. The switch has a robust contention control that is suitable for satellite onboard processing applications.



Silicon germanium fast packet switch test board.

In 1998, Sierra Monolithics simulated and tested a prototype 4-by-4 SiGe switch with favorable results. The test board, along with the fast packet switch chip, is shown in the photograph. A final 16-by-16 switch is being fabricated and will be tested and delivered to Lewis in 1999 for further evaluation. Lewis envisions this technology as suitable for next-generation satellite systems for NASA missions as well as commercial applications requiring high capacity and higher data rates.

Lewis contacts: Gene Fujikawa, (216) 433-3495, Jorge.A.Quintana@grc.nasa.gov

Author: Jorge A. Quintana

Headquarters program office: OSS

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