

# Analog Microcircuit Obsolescence



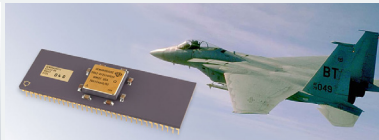
Flight Control System

Communication Systems

Data Acquisition

Cockpit Display Instruments

Flight Control Computer



Gyrocompass

PA System/Ship Horn

Servo Motor Control

Engine Room/Deck Alarms

Missile Seeker



Radar

Power Management

Turret Control

Video/Audio Control

Fire Control System

**Form, Fit, Function,  
Interface, Military  
Grade Class Q  
Microcircuits to  
Replace Your  
Obsolete Parts**

For over thirty years SRI International, in collaboration with the Defense Logistics Agency (DLA), has provided a permanent solution for microcircuit obsolescence through the Generalized Emulation of Microcircuits (GEM) and Advanced Microcircuit Emulation (AME) programs. As an accredited Trusted manufacturer of microcircuits, our flexible foundry provides a continuing source of military quality, Form, Fit, Function, and Interface replacement to non-procurable parts. To date the GEM program has primarily addressed digital components. The Emulation programs are leveraging its existing military-quality manufacturing expertise to cost effectively and efficiently develop a solution for obsolete analog components.

Industry solutions for microcircuit obsolescence have mainly focused on digital components rather than analog. The priority to address digital logic obsolescence was based on the Diminishing Manufacturing Sources and Material Shortages (DMSMS) in the market. However, analog or linear devices started to follow the digital obsolescence trend later in time and are now becoming exceedingly difficult to source representing a higher risk for system readiness. To address this industrial base shortfall, meet weapon-system requirements, and satisfy DLA's wide-ranging needs, a cost-effective, reliable source for analog or linear microcircuits is being implemented with DLA's Emulation programs.

## Analog Obsolescence Solutions

Op Amps

Switches

High Power

Analog-  
to-Digital  
Converters

Digital-  
to-Analog  
Converters

Voltage  
Regulators

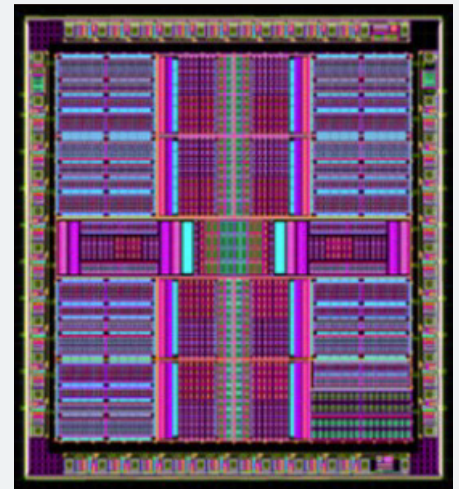
Voltage  
References

## THE EMULATION APPROACH

The DLA Emulation program fabrication process uses split manufacturing, in which wafer lots are processed through the majority of the manufacturing flow and held in inventory. This technology is based on gate arrays fabricated with predefined circuit elements (base wafers) which are interconnected by multiple levels of metal conductors (wafer personalization). This manufacturing approach minimizes the wafer production time for Emulated devices and allows microcircuits which were originally manufactured in diverse technologies to be produced from a managed inventory of standardized base wafers.

The AME program is currently developing a 20V BiCMOS on Silicon on Insulator (SOI) array, optimized for op amps (operational amplifiers) and other analog functions. The op amp is one of the most common linear circuit building blocks in analog electronics. A BiCMOS process was selected as it combines both bipolar and CMOS technologies on the same device. The dual technology has the advantage of the inherent benefits of each technology and offers the greatest flexibility to address several different op amp microcircuits. The analog base array is currently in development. To establish additional solutions, the AME program is evaluating new technology extensions to satisfy higher absolute supply voltages and more complex analog functions.

Technology: BiCMOS on SOI  
Voltage: +20V  
Target: Operational Amplifiers



## BENEFITS

Establishing this new manufacturing source for analog microcircuits will provide a permanent source for Form-Fit-Function-Interface (F3I) analog components for use in Military systems. The Microcircuit Emulation is a cost-effective, long-term solution that provides total life cycle support for weapons systems, averting mission-impaired-capability-awaiting-parts (MICAP) incidence, production shutdowns, and maintaining weapon system readiness levels.

## Our Story

In the late 1980's, DLA recognized that microcircuit obsolescence threatened the readiness of many American defense systems. Numerous systems in the armed forces were designed and developed in the 1960's and 1970's. For example, the U.S. Air Force began flying the F-15 Eagle tactical fighter in 1972, and the U.S. Navy first tested the Aegis phased-array radar at sea in 1973. Because of continued advancements in semiconductor technology, the original suppliers stopped manufacturing the microelectronic components used in these and other systems. In 1987, DLA contracted with SRI to begin research and development on how to best replace obsolete microcircuits with standardized, modern integrated circuits (IC). DLA and SRI collaborated to develop the GEM Program. Using its on-site Trusted semiconductor foundry and deep knowledge of IC design/development, SRI produces on-demand, Class Q microcircuits matching the Form-Fit-Function-Interface (F3I) criteria of the required microcircuit. DLA is developing the next generation of F3I microcircuit Emulation capability through the AME Program to further alleviate growing IC obsolescence issues caused by the continued rapid advancements in technology. The new capabilities developed by AME are utilized by the GEM Program to ensure the Emulation Programs continue to meet weapons systems wide-ranging requirements. SRI's semiconductor foundry is accredited as a Department of Defense (DoD) Trusted Foundry supplier, and our manufacturing processes are qualified to MIL-PRF-38535.

