

Reconfigurable Amplifiers and Circuit Components for Built-in-Self Testing and Self-Healing in SiGe BiCMOS Technology

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The design of reconfigurable microwave and millimeter-wave circuit components and on-chip testing circuitry are demonstrated. These components are designed to enable the mitigation of process faults, aging, radiation effects, and other mechanisms that lead to performance degradation in circuits and systems. The presented work is primarily based on SiGe HBTs in BiCMOS technology and harnesses the inherent resilience of SiGe to mechanisms that degrade transistor performance. However, CMOS FETs are also used in limited applications, such as in the design of switches, op-amps, and DACs. Individual circuit blocks and circuit systems are characterized with the aim of evaluating their performance under nominal conditions as well as in the context of extreme environments and other deleterious phenomena.