Abstracts

A Monolithic HEMT Passive Switch with Integrated HBT Standard Logic Compatible Driver for Phased-Array Applications

K.W. Kobayashi, A.K. Oki, L.B. Sjogren, D.K. Umemoto, T.R. Block and D.C. Streit. "A Monolithic HEMT Passive Switch with Integrated HBT Standard Logic Compatible Driver for Phased-Array Applications." 1996 Microwave and Guided Wave Letters 6.10 (Oct. 1996 [MGWL]): 375-377.

We have achieved the first demonstration of a monolithically integrated high electron mobility transistor (HEMT) passive switch with a heterojunction bipolar transistor (HBT) switch-driver circuit that represents key integrated mixed-signal functions. The HEMT-HBT monolithic microwave integrated circuit (MMIC) is fabricated using selective molecular beam epitaxy (MBE). The single HEMT series switch is driven by an HBT circuit that provides both level shifting and wide voltage drive swing to adequately turn the passive HEMT switch device on and off. The MMIC can be made compatible for operation from either standard TTL or CMOS control signals. The series 0.2 x200 μm^2 passive HEMT switch achieves 1.6-2.9 dB insertion loss over a 50 MHz to 12 GHz band when the HEMT is turned on. The corresponding return-losses are >10 dB across the band. When the switch is turned off, the isolation ranges from >40 dB at 1 GHz and decreases to 15 dB at 12 GHz. This integrated HEMT switch and HBT switch driver MMIC represents a basic building block that can be applied to programmable phase shifters used in phased-array antenna applications and can result in a dramatic reduction in size and improvement in performance of these systems.

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