Abstracts

Microwave solid-state active devices

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Solid-state devices have had a major impact on the development of microwave and millimeter-wave systems. Starting with development work dating back to the 1940s, a variety of two- and three-terminal device structures have been proposed, fabricated, and found their way into commercial and military applications. These devices have resulted in the realization of numerous systems that would not otherwise be possible. The device development effort has been closely linked to advances in semiconductor materials growth and processing technology. Many of the advanced device concepts can only be implemented with the advent of advanced materials growth technology, such as molecular-beam epitaxy, and fine-line lithography techniques, such as electron-beam lithography. Advanced materials technology has also provided the ability to fabricate heterostructures that permit the advantages of multiple material layers to be optimized for device applications. High-performance diodes and transistors are now available for use from UHF into the millimeter-wave spectrum, approaching terahertz frequencies. The development, operating principles, and state-of-the-art of various diode and transistor structures are reviewed.

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