

## Silicon High-Resistivity-Substrate Millimeter-Wave Technology (Dec. 1986 [T-MTT])

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*J. Buechler, E. Kasper, P. Russer and K.M. Strohm. "Silicon High-Resistivity-Substrate Millimeter-Wave Technology (Dec. 1986 [T-MTT])." 1986 Transactions on Microwave Theory and Techniques 34.12 (Dec. 1986 [T-MTT] (1986 Symposium Issue)): 1516-1521.*

The application of molecular beam epitaxy (MBE) and X-ray lithography for the fabrication of monolithic integrated millimeter-wave devices on high-resistivity silicon has been investigated. Process compatibility and the retention of high-resistivity characteristics were measured using the spreading resistance method and Hall measurements after various process steps. Microstrip resonators of ring and linear geometry were fabricated on 10 000  $\Omega \cdot \text{cm}$  silicon substrates. For linear microstrip resonators, the attenuation was found to be less than 0.6 dB/cm at 90 GHz. A 95-GHz IMPATT oscillator circuit and a planar microstrip antenna array have been fabricated on highly insulating silicon substrates. For the oscillator, a combined monolithic-hybrid integration technique was used to attach the discrete IMPATT diode to the resonator circuit. The oscillator does not require tuning elements. Preliminary experimental results are 8 mW of output power with 0.2 percent efficiency at 95 GHz.

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