

Lumped-Elements in Microwave Integrated Circuits in the 1-12 GHz Range

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Lumped elements have found increasing use in microwave integrated circuits at low UHF and S-band frequencies. At this laboratory they have been used in various circuits such as filters, quadrature hybrids, and impedance matching networks for high-power transistor amplifiers. Limiting the use of lumped elements has been: (1) the uncertainties of the reactance and Q's of the elements at frequencies above 2.5 GHz, and (2) the difficulty of fabricating the high-Q components necessary for large impedance transformations to low-impedance active devices. The past difficulty in measuring the reactance and Q values above S-band has been the unavailability of a measurement system at high frequencies that is compatible with the size of the element. However, suitable resonant techniques have now been developed for frequencies from 1 to 12 GHz. Lumped inductors and capacitors fabricated at this laboratory have been measured by these new techniques. The results demonstrate that high-Q capacitors have been achieved by recent improvements in thin-film dielectric processing, and that capacitors and single-turn inductors are "truly lumped" through 10 GHz.

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