Foreword

SPECIAL ISSUE ON MICROWAVE FIELD-EFFECT TRANSISTORS

FIELD-EFFECT TRANSISTOR TECHNOLOGY is a very dynamic field in microwaves today. Improvements in both low-noise and high-power FET's are being made continuously in many countries around the world. It is the purpose of this Special Issue to introduce this topic with a comprehensive review paper and to highlight advances in the development of microwave FET's and their applications. Authors from Japan, Europe, and North America report recent achievements of ongoing work in this issue. Their contributions reflect the following trends in the direction of developments.

1) There is great interest in decreasing the noise figure and increasing the gain of GaAs FET's with Schottky-barrier gate (MESFET's). Two approaches leading to this objective are discussed in this issue: gate-length reduction and low-temperature operation. Two papers deal with the design, fabrication, and performance of submicron-gate MESFET's, and one paper describes the performance of GaAs MESFET's and amplifiers in the 40–300 K temperature range. Another paper illustrates the application of low-noise MESFET's in *X*-band amplifiers.

2) There is a growing need for microwave FET's and amplifiers with high-power capability. One paper describes a power silicon MOS transistor with a vertical geometry operating at 1.5 GHz. Another paper illustrates the progress in power GaAs MESFET's with increased drain-source breakdown voltage. Three papers are concerned with the application of MESFET's in medium-power amplifiers. The performances of a narrow-band high-power and of very wide-band designs in the 2–12-GHz range are reported.

3) In various laboratories, a great deal of effort is being spent in analyzing failure modes in GaAs MESFET's and improving device reliability. This topic is of great concern to most users, and little has been published so far. In this issue, two papers describe failure modes, burn-out tests, stability problems, and mean-time-to-failure data.

4) In the area of microwave FET applications, most of the work was concentrated on amplifiers. More recently, work on oscillators was also reported. Mixer applications, which were previously neglected, receive a great deal of attention in this issue. Two papers present a theoretical analysis and experimental performance data of *X*-band mixers with GaAs MESFET's. One paper describes a phase regenerator for bi-phase modulated carriers. In this application, a single MESFET simultaneously functions as a mixer, adder, and amplifier.

In the Correspondence Section, one contribution discusses signal feedback in a MESFET with common-lead inductance. Another one deals with the amplification and waveform-shaping of fast pulses.

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Guest Editor

Charles A. Liechti (M'70–SM'75) received the M.S. degree in physics and the Ph.D. degree in electrical engineering both from the Swiss Federal Institute of Technology, Zurich, Switzerland, in 1962 and 1967, respectively.

While at the Swiss Institute of Technology, he was engaged in applied research on microwave solid-state circuits with emphasis on varactor-controlled wide-band phase shifters. In 1968 he joined the Hewlett-Packard Company, Palo Alto, CA, where he has been concerned with the design and development of IMPATT oscillators and frequency converters with Schottky-barrier diodes. Since 1971 he has been in charge of GaAs field-effect transistor devices, microwave amplifiers, and GaAs digital integrated-circuit developments at the Solid State Laboratory.

Dr. Liechti received outstanding contributed paper awards at the International Solid-State Circuits Conference in 1973 and 1974. He also received the Microwave Prize jointly with R. L. Tillman for a paper on GaAs MESFET amplifiers in 1975.