Abstracts

A Temperature-Stable, Fail-Safe, Latching Ferrite TR Switch

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Use of transmitting-receiving (TR) ferrite switches in place of gas-discharge devices improves the noise figure, life, and reliability of radar receivers. This paper describes a TR ferrite switch that employs 180° differential-phase-shift toroids to provide essentially constant isolation and insertion loss over a wide temperature range, independence of isolation with respect to RF power, and full receiver protection in case of driver failure. The ferrite switch is functionally a transfer device that is reciprocal in terms of transmission-coefficient amplitudes but nonreciprocal with respect to transmission phases. An experimental C-band 180° ferrite switch has provided isolation ranging from 38 to 45 dB and an insertion loss of 0.4 dB across a -40°C to +75°C range and a peak power-handling capacity of 130 kW measured at 0.001 duty. The switching energy, not including driver losses, is approximately 150 µJ. The preceding values of isolation and insertion loss compare with 36 and 0.8 to 1.1 dB, respectively, across the above temperature range, for the combination of fixed circulator, limiter, and one switchable circulator.

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