Abstracts

Analytical model for electrical and thermal transients of self-heating semiconductor devices

Transients of self-heating semiconductor devices are theoretically investigated based on a feedback circuit model, which is composed of three sub-circuits describing the isothermal electrical characteristics, thermal impedance, and temperature dependence of the electrical characteristics of the devices, respectively. Analytical expressions of the frequency and transient responses have been derived for both the electrical and thermal characteristics of self-heating devices, yielding accurate methods to extract the thermal time constant in both the time and frequency domains. The model is verified by the transient electrical-response measurement of a GaInP/GaAs heterojunction bipolar transistor.

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