



Non-Intrusive and contact less procedure to test and characterize RF and mmW integrated analogue circuits with DC or low frequency temperature measurements with applications to failure analysis

A new procedure that is able to test (go-no go) and to characterize (i.e. to extract high frequency figures of merit, such as central frequency, 1dB compression point) high frequency analogue circuits by using off-chip temperature measurement techniques, such as infra-red camera, reflectometry, interferometry, etc... The technique has applications in the field of design debugging or failure analysis. It allows to test and characterize the individual blocks that constitute a complete system (e.g. low noise amplifier, mixer, power amplifier), even when their electrical outputs are not accessible to the classical instrumentation equipment. Partners to further develop the system and/or to establish commercial agreements along with technical cooperation are sought.

The Challenge

The scaling down of CMOS technologies has enabled a whole system to be integrated on a single silicon chip (System on Chip, SoC). The benefits of this are low cost, high reliability and low power consumption. A drawback of SoC integration is the significant loss of observability that it entails, since few nodes are accessible from the outside. As a consequence, the complexity and cost of testing, monitoring and characterizing individual parts of the system increase, specifically in RF front-ends in which the operating frequency is in the range of gigahertz. Nowadays, the characterization and testing of RF integrated circuits (RFIC) SoC is carried out at system level by measuring high level performances such as bit error rate (BER) and error vector magnitude (EVM). However, during the debugging phase of a product, the possibility of characterizing the different blocks individually (Low Noise Amplifier, Mixer, Local Oscillator, etc.) without adding additional electrical outputs is of great help.

The Technology

The present inventions allows to perform either production testing (go - no go) or measurement of specific high frequency electrical figures of merit (e.g. central frequency, 1 dB compression point, efficiency) of the individual blocks that constitute the RFIC SoC by measuring changes of the temperature at the semiconductor surface close to the block to characterize. Temperature measurements are performed either at DC or at low frequency, regardless the circuit under test working frequency. The technology is compatible with any state of the art IC temperature measuring technique used in failure analysis applications.

Innovative advantages

- The technology enhances SoC observability, allowing to extract information about the individual blocks.
- Measurements are done at low frequency regardless the circuit under test working frequency, reducing the cost of the measuring equipment.
- The procedure does not electrically load the circuit under test. Therefore, it does not alter their behaviour.
- Procedure compatible with state of the art off-chip IC temperature measuring techniques.

Current stage of development

Successful tests have been done in RF (1GHz, 2.4GHz) and mmW (62GHz) linear amplifiers.

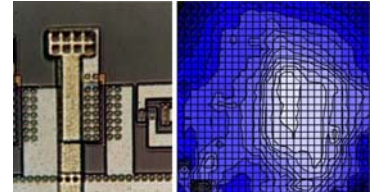
Applications and Target Market

Companies related to: RF and mmW integrated circuit test and characterization for failure analysis or design debugging; companies that design and sell equipments to perform temperature measurements in integrated circuits.

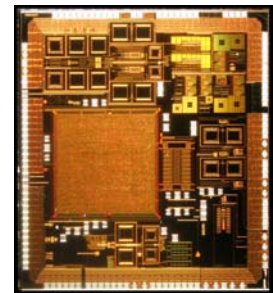
Reference number

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New procedure that allows to measure high frequency characteristics of RF ICs with temperature measurements



High frequency characteristics extracted from DC or low frequency temperature measurements, regardless the IC working frequency



Applications:
Go-no go test.
Electrical characterization.

Business Opportunity
Technology available for licensing with technical cooperation

Patent Status
Set of patent applications

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