Systematic Design Approach of MOSFET based Low Noise Amplifiers for Ultra Wideband Receivers

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For MOSFET based RF and UWB receiver circuits a systematic design approach is presented. The procedure yields all possible circuit topologies with up to three voltage controlled current sources (VCCS) which describe the first order small signal behaviour of MOSFETs. Completely ignoring design heuristics and experience, circuit topologies and their two-port behaviour are determined in four basic steps: non-isomorphic graph generation, filtering circuit topologies with useful signal transfer function, symbolic analysis of the generated circuits and topology selection with a relational database management system (RDBMS). After formulating requirements for a wideband low noise amplifier (LNA), the RDBMS yields two new topologies for two and mostly new 625 topologies with three VCCS. Three examples using three VCCS are chosen and presented.