Preface

Active MOSFET devices can be modeled by nonlinear current and charge sources that depend on the device voltages. These nonlinear sources give rise to distortion when driven with a modulated signal. When the input signal driven into the amplifier semiconductor is increased, the output is also increased until a point where distortion products can no longer be ignored. The harmonics and higher order distortion of the output signal are generated by nonlinearities of MOSFET devices.

A highly-linear optical transmitter with fully-integrated broadband design linearization capability is required to address linearity improvements. In response to the need to correct the broadband distributed amplifier (DA)'s nonlinear distortion, a number of DA linearization techniques have been developed. However, most of the published DA linearization methods reported do not provide fully-integrated distortion cancellation techniques with large third-order intermodulation (IM3) distortion reduction.

In this book, we demonstrate a fully-integrated fully-differential linearized CMOS distributed bidirectional amplifier that achieves large IMD3 distortion reduction over broadband frequency range for both RF paths. The proposed linearized bidirectional DA has the drain and gate transmission-lines stagger-compensated. Reducing the DA IM3 distortion by mismatching the gate and drain LC delay-line ladders. The proposed fully-differential linearized DA employs a cross-coupled compensator transconductor to enhance the linearity of the DA gain cell with a nonlinear drain capacitance compensator for wider linearization bandwidth. The proposed linearized CMOS bidirectional DA achieves a measured IM3 distortion reduction of 20 dB with frequency of operation from 0.1 to 9.5 GHz and a two-way amplification of 5 dB in both RF directions. The proposed linearized DA is implemented in 0.13 μm RF CMOS process for use in highly-linear UWB communications.

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