DS 19: Invited Gardner

Time: Wednesday 14:45–15:30 Location: GER 37

Invited Talk DS 19.1 Wed 14:45 GER 37

Integrated Inductors using Amorphous Magnetic Materials — •Donald S. Gardner[1], Gerhard Schrom[2], Fabrice Paillet[2], Tanay Karnik[2], and Shekhar Borkar[2] — [1]Intel Research, Santa Clara, CA USA — [2]Circuits Research, Intel Corp., Hillsboro, OR USA

On-chip inductors with magnetic material are integrated into a 90 nm CMOS processes. The inductors use copper metallization and amorphous CoZrTa magnetic material. Increases in inductance of up to 30 times corresponding to an inductance density of up to 1.7 μH/mm^2 were obtained, significantly greater than prior values for on-chip inductors. With such improvements, the effects of eddy currents, skin effect, and proximity effect become clearly visible at higher frequencies. The CoZrTa was chosen for its good combination of high permeability, good high-temperature stability (¿250 °C), high saturation magnetization, low magnetostriction, high resistivity, minimal hysteretic loss, and compatibility with silicon technology. The CoZrTa alloy can operate at frequencies up to 9.8 GHz, but trade-offs exist between frequency, inductance, and quality factor. The inductors with thick copper and thicker magnetic films have resistances as low as 0.04 Ω, and quality factors of up to 8 at frequencies as low as 40 MHz.