HIGH-Q SI-EMBEDDED 3D INDUCTORS
Air coils for power electronics

General description
A CMOS-compatible Si-embedded inductor concept with high-Q factor is available to realize monolithic integration of power converters for portable electronics applications. The buried inductor is fully insulated from the Si-substrate by an oxide layer and can be manufactured with electroplated Cu. The Si-embedded spiral design suggests the highest Q-factor and integration density.

Features
- Fully CMOS-compatible
- Monolithic integration along with active electronics or silicon capacitors or as stand-alone bare die
- Easy design of inductance and Q-factor
- Core less design suitable for operation above 1MHz ($f_{\text{res}} \geq 300\text{MHz}^*$)
- Low parasitic capacitance, e.g. as low as 208fF*

Advantages
- Considerably smaller footprint compared to conventional inductors
- Higher Q-factor ($Q > 200^*$) compared to the planar RF inductors ($Q = 7^*$)
- Lower power consumption of integrated circuits ($DF = 0.0045^*$)
- No polarization losses allow for faster switching under high currents compared to ferrite-based inductors

Benefits
- High-profit due to an innovative product
- Increased market volume from expanded product options
- Reduced assembly effort by monolithic integration

* for a 1µH inductor
Table 1 indicates key geometrical, technological and electrical parameters of different inductor technologies.