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Design of Q-enhanced Class-C VCO with robust start-up and high oscillation stability

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Abstract: A novel topology of Q (quality factor)-enhanced dynamically self-biasing Class-C VCO is proposed in this article. It introduces a bridging capacitor to enhance the quality factor of the oscillator. The enhancement of the quality factor suppresses the squegging phenomenon and the harmonic distortion, and thus improves the phase noise and oscillation stability. The prototype of the proposed circuit was fabricated in SMIC 0.18 µm CMOS process and the measurement results showed a low phase noise of −125 dBc/Hz@1 MHz from 3.331 GHz carrier with a total power consumption of 3.36 mW from a 1.2 V supply. The proposed work exhibited an excellent Figure of Merit (FoM) of −190 dBc/Hz.

Keywords: Class-C VCO, quality factor, phase noise, oscillation stability, squegging phenomenon

Classification: Integrated circuits

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