LC (Colpitts) Oscillator operates on 0.5V to 5V Single Supply

Description

This is a low-voltage LC (Colpitts) oscillator circuit using EPAD MOSFETs that operates on a single supply ranging from 0.5V to 5V. A dual EPAD MOSFET is connected in parallel to provide more low voltage drive current at lower supply voltages.

Oscillator Circuit Performance Data:

- \( V_+ = 0.5V \), \( I_+ = 25\mu A \), \( P_D = 12.5\mu W \), Crystal frequency = 1 MHz.
- \( V_+ = 5.0V \), \( I_+ = 250\mu A \), \( P_D = 1250\mu W \), Crystal frequency = 1 MHz.

The output buffer is powered by \( V_L \) with pull up resistor \( R_{OUT} \), which can be selected to optimize the output voltage swing levels as well as providing adequate output drive currents. \( V_L \) is an output voltage level that can be equal to, higher than or lower than \( V_+ \), depending on desired output voltage swing levels. \( Rout \) must be selected for a selected \( V_L \) and at the same time minimize current drain.

Output Buffer performance Data:

- \( V_L = 0.5V \), \( I_L = 62\mu A \), \( P_D = 31\mu W \), \( V_{OH} = 350mV \), \( V_{OL} = 226mV \).
- \( V_L = 5.0V \), \( I_L = 69\mu A \), \( P_D = 347\mu W \), \( V_{OH} = 4.78V \), \( V_{OL} = 1.47V \)

Recommended Components

EPAD MOSFETs: M1 ALD110800 (dual MOSFET connected in parallel); M2 \( \frac{1}{2} \) ALD114904

\( C_L1 = 10pF; \ C_L2 = 39pF; \ L1 = 1mH; \ R_F = 5.6M\Omega m; \ R_L = 6\ Ohm; \ R_D = 20K\Omega m; \ R_{OUT} = 2.4K\Omega m \)

Other Related Circuit Ideas

Schematic no. osc_42008.0 Nanopower LC (Colpitts) Oscillator Circuit