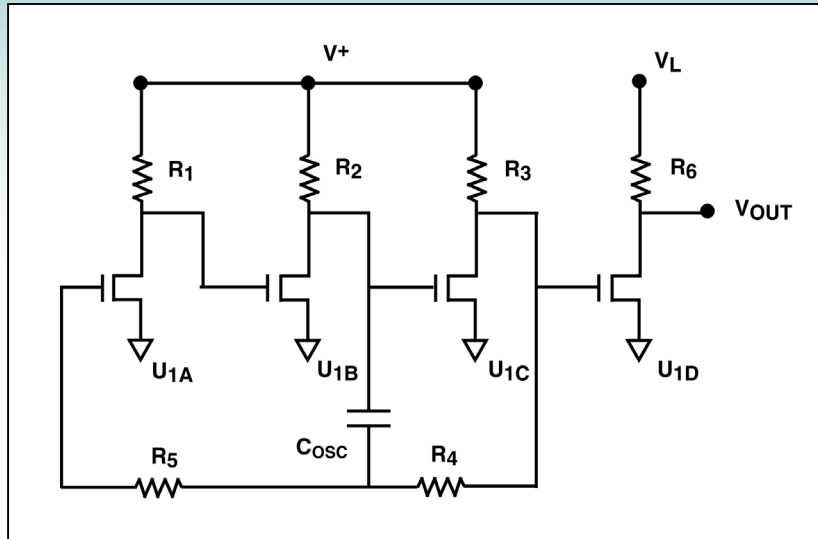




**Ultra Low Voltage RC Oscillator**



**Description**

This circuit is an ultra low supply voltage EPAD MOSFET RC oscillator operating at less than 1V. In this circuit U1A, U1B and U1C form the basic three-stage oscillator with feedback resistor and capacitor network R4, C<sub>osc</sub> and R5. The oscillator operates in low frequency ranging from a few hertz to kilohertz. The output is tapped and buffered with U1D as an output buffer stage. Power to the output stage is supplied by V<sub>L</sub>. V<sub>L</sub> can be either at V<sub>+</sub> or at a different value, depending on the desired output high level. If V<sub>L</sub> is at a different voltage level, then the output buffer also acts as a level shifter.

Using a low threshold enhancement mode EPAD MOSFET such as the ALD110802 (quad with V<sub>GS(TH)</sub>= 0.20V), an example of this oscillator operates on 0.16V supply voltage and at 33nW of power, at a frequency of 10 Hz. Generally capacitor C<sub>osc</sub> and Resistor R5 determine oscillating frequency of the RC oscillator, given by  $f_{osc} = 1 / (2 \pi * R5 * C_{osc})$ . However, the EPAD MOSFET is operating partially or entirely in the sub-threshold region of the MOSFET device. The charging of C<sub>osc</sub> is limited by R3+R4 and the discharging of C<sub>osc</sub> is limited by the current drive of U1C. These factors tend to decrease the actual oscillating frequency significantly. The remaining resistors R1 to R6 determine help determine the power dissipation as well as the oscillating frequency.

**Recommended Components**

EPAD MOSFET: [ALD110802](#); C<sub>osc</sub>: 10 nF; R5: 1.76 MOhm; R1 through R4, R6: 1.6MOhm to 18MOhm

**Other Related Circuit Ideas**