



0.2V Supply Voltage Nanopower Inverter Circuit

Description

This is an ultra low-voltage basic inverter circuit using zero threshold (ALD110800) or nanopower (ALD110802 or ALD110804) EPAD MOSFETs. The basic inverter uses one of the MOSFETs in ALD110802, powered with a $V+$ ranging from 50 mV to 200 mV, with $I+(\text{max}) = 0.24 \mu\text{A}$ at $V+ = 200 \text{ mV}$. This inverter operates in the subthreshold operating region of the EPAD MOSFET device, resulting in extremely low operating voltages and currents. With a 200mV supply, the average power consumption is about 25 nW (nanoWatt), assuming a 50% duty cycle signal, and the output low voltage $V_{OL} = 9 \text{ mV}$ and the output high voltage $V_{OH} = 183 \text{ mV}$.

Another example of this inverter circuit uses an ALD110904 device ($V_{GS(\text{TH})} = 0.4\text{V}$) and load resistor of 44MEG Ohm, resulting in an average current of 2.3 nA and power dissipation of 0.45 nW, using supply $V+ = 200 \text{ mV}$. For single stage inverter applications, the inverter can operate at 50mV single supply, with $V_{OL} = 19 \text{ mV}$ and $V_{OH} = 31.5 \text{ mV}$, at a load resistance of 60 MOhm and average supply current of 0.4 nA and average power dissipation of $P_d = 0.05 \times 0.4 = 0.02 \text{ nW}$. For multiple stage applications, a 200mV supply is recommended and a 4 stage inverter circuit has been demonstrated with sufficient noise margins. Switching time of the inverter is a function of the load (resistance/capacitance).

For full schematic diagram and notes, please register and login at aldinc.com