

Category: Special Circuits

## **CIRCUIT IDEAS FOR DESIGNERS**

Schematic no. SPCKT\_10002.0

## **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+(max) = 0.24  $\mu$ A at V+= 200 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 Vol= 9 mV and the output high voltage VoH = 183 mV.

Another example of this inverter circuit uses an ALD110904 device (VGS(TH)=0.4V) 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 mV. For single stage inverter applications, the inverter can operate at 50mV single supply, with Vol=19 mV and VoH= 31.5 mV, at a load resistance of 60 MOhm and average supply current of 0.4 nA and average power dissipation of Pd =  $0.05 \times 0.4 = 0.02$  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

©2005 Advanced Linear Devices, Inc. Information furnished by Advanced Linear Devices, Inc. (ALD) is believed to be accurate and reliable. However, ALD assumes no responsibility for the use of such information nor for any infringement of patent or rights of third parties that may result from its use. No license is granted implication or otherwise under any patent rights of ALD.