Ultra Low Voltage Nanopower Inverter Circuit

Description

This is an ultra low-voltage nanopower 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 μA at V+ = 200 mV. This inverter can be operated in the subthreshold operating region of the EPAD MOSFET device, resulting in extremely low operating voltages and currents. Powered with a 200mV supply, the average power consumption is about 25 nW(nanoWatt), assuming a 50% duty cycle 1KHz signal, giving VL = 9 mV and VH = 183 mV.

Another configuration example of this inverter circuit uses an ALD110904 device, with VGS(TH) of 0.4V and load resistor of 44MEG Ohm, resulting in an average current drain of 2.3 nA and power dissipation of 0.45 nW, at a supply voltage V+ = 200mV. For single stage inverter applications, the inverter can operate at as low as 50mV single supply. Switching between output voltages of VL=19 mV and VH = 31.5 mV, at a load resistance of 60 MOhm and average supply current of 0.4 nA, a 50mV inverter circuit consumes an average power dissipation P = 0.05 x 0.4 = 0.02nW. For multiple stage applications, a 200mV supply is recommended. A 4-stage 200mV powered inverter circuit has been demonstrated to switch with adequate noise margins.

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