

Ultra Low Voltage N-Channel Analog Switch (Transmission Gate)

Description

An EPAD MOSFET acts as an analog transmission switch when it is turned on with an appropriate gate voltage, where a conducting channel forms between the drain and the source terminals. The on-resistance of the switch depends on the channel-on current as controlled by the gate voltage. The switch can be turned-on with a positive bias voltage applied to the gate terminal of an enhancement mode EPAD MOSFET. The switched signal propagates from the source to the drain terminal, which can be either digital or analog in nature. The user should take into account the input and output impedance levels relative to the channel on-resistance of the analog switch. The analog switch can be turned-off by grounding the gate or by setting a gate voltage at 0.4V or less below the threshold voltage of the MOSFET selected. When turned-on, an analog switch can pass a signal voltage up to the gate voltage minus the $V_{GS(TH)}$. When this circuit is applied using a device chosen from the EPAD MOSFET Array family, the minimum operating voltage of an EPAD MOSFET switch is limited by the off-state drain leakage current allowed. In this case, considering the sub-threshold characteristics, an analog or digital switch could be operated at a minimum supply voltage in the range of 0.4V to 0.2V.

Depletion mode EPAD MOSFETs can also be employed for this application. A depletion mode MOSFET is already turned on when its gate terminal is grounded, which therefore requires a negative voltage on its gate to turn it off. For many applications, an analog switch circuit using a depletion EPAD MOSFET performs a function that is analogous to that of a Form-C relay, with the MOSFET in a normally-ON state without power or gate bias voltage applied to it. An active, negative voltage on the gate terminal can turn this analog switch off. In single supply applications, this analog switch using a depletion mode MOSFET can perform equivalent duty as a high-side switch.

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