



0.2V Supply Voltage N-Channel Transmission Gate

Description

An EPAD MOSFET acts as an analog transmission gate (analog 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 on the gate terminal of an enhancement mode EPAD MOSFET. The analog (or digital) signal propagates from the source to the drain terminal. 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 EPAD MOSFET. When turned-on, this analog switch can pass a signal voltage up to the gate voltage minus the $V_{GS(TH)}$. When this circuit is applied using an EPAD MOSFET, the minimum operating voltage required is limited by the off-state drain leakage current in the device. In this case, considering the sub-threshold characteristics of the EPAD MOSFET, an analog 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 used for this circuit. A depletion mode MOSFET is already turned on when its gate terminal is grounded, which therefore requires a negative voltage applied to the gate to turn it off. For many applications, an analog switch circuit built with a depletion mode EPAD MOSFET performs a function that is analogous to that of a Form-C relay. The EPAD MOSFET is in a normally-ON state without power or gate bias voltage applied. An active, negative voltage on the gate can then 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