



Category: FET

CIRCUIT IDEAS FOR DESIGNERS

Schematic no. fet\_11140.0

**Low Power Normally-ON Switch****Description**

This low power Normally-ON switch is controlled by the voltage applied at  $V_{IN}$ . There are two transistors used in this circuit, one zero threshold voltage N-channel precision MOSFET, M1, and one enhancement mode low threshold N-channel precision MOSFET, M2. The input,  $V_{IN}$ , is connected to the gate of M1 and biased by R3 connected to  $V_-$ . If  $V_-$  is grounded,  $V_{IN}$  is grounded and M1 is slightly turned on, causing a drain to source current,  $I_{DS1}$ , across M1. This current flows through R1 causing the drain voltage,  $V_{DS1}$ , of M1 to be pulled to ground. At this point M2 is turned off ( $V_{GS2}=V_{DS1}$ ) with no  $I_{DS2}$  current flow, and giving an output voltage,  $V_{OUT}$  close to the supply voltage,  $V_+$ . If  $V_-$  is connected to a negative supply voltage, M1 is now turned off, and there is very little  $I_{DS1}$  current, resulting in a small voltage drop across R1 and bringing  $V_{DS1}$  up close to  $V_+$ . This large  $V_{DS1}$  in turn causes M2 to turn on, causing an increase in  $I_{DS2}$  and resulting in  $V_{OUT} = V_+ - (I_{DS2} * R2) \approx 0$  volts. This circuit is operational with  $V_+$  and  $V_-$  ranging from +5V to -5V as well as +0.5V to -0.5V. An external  $V_{IN}$  can override the voltage bias set by R3 and  $V_-$  to turn on and turn off this circuit externally.

For full schematic diagram and notes, please register and login at [aldinc.com](http://aldinc.com)