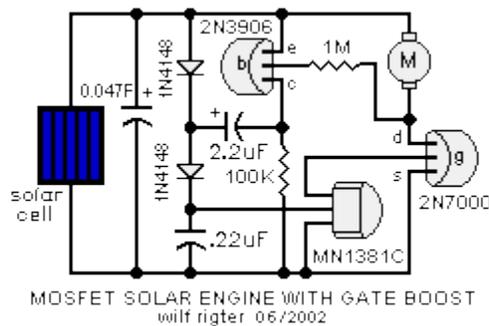


THE GBSE (GATE BOOST SOLAR ENGINE)

The Gate Boost SE uses a 1381, a 2N7000 MOSFET and a 2N3906 with a unique voltage doubler to increase the voltage applied to the gate of the MOSFET. Normally the 2.6V output of a 1381C is barely able to turn on the 2N7000. As a result the "on resistance" of the MOSFET is high and much power is wasted.



The 2N7000 works very well with 5V or 6V gate drive and then has an "on resistance" of a few ohms.

The Gate Boost SE uses a voltage doubler to pump up the voltage of the 0.22 uF capacitor after the 1381C has triggered.

How it works

The action of the triggered 1381 is to internally connect the voltage on the input pin to the output pin. The trigger voltage is actually about 2.8V because of two additional series diode drops. This voltage is applied to the 2N7000 gate and starts to turn on the MOSFET. When the 2N7000 starts to turn on the voltage across the motor increases and the base of the 2N3906 turns on. As the 2N3906 turns on, the voltage on the collector rises to the capacitor voltage $+V$. That voltage rise is capacitively coupled through the 2.2 μ F capacitor to the midpoint of the two diodes. As this point is initially $+V-100\text{mV}$, a step voltage of $+V-100\text{mV}$ is superimposed and turns on the lower diode to charge the .22 μ F capacitor to nearly double the trigger voltage or about 5.6V. Since that capacitor supplies the voltage for the 2N7000 gate, the MOSFET turns on hard and the motor is efficiently powered up. Because of the low leakage current of the 1381 (1 to 5 μ A), the voltage on the .22 μ F capacitor now decays towards the reset level of the 1381 at about 2.5V at which point the MOSFET turns off and the whole SE resets and starts charging the main capacitor again.

The result is an SE that applies a voltage of $2 \times V(\text{trigger})$ to the MOSFET gate when triggered. That gate voltage decays to V (reset) in a few seconds and the cycle repeats.

Compare this with the action of a Miller SE which applies only 1xV(trigger) to the gate which then decays to 0V in a few seconds. According to some reports, a photodiode in series with the gate increases the gate voltage by 0.5V and shows improved performance. But the rapid decay of the gate voltage to 0V make the marriage of a Miller SE and a MOSFET less than a happy one.

Parts list for basic circuit			
Part	Solarbotics	Digikey	Radio Shack
Storage capacitor	various	various	various
2.2 uF capacitor			
0.22 uF capacitor			
Solar cell	various	N/A	N/A
2N7000 MOSFET			
2N3906 Transistor	\$0.15, #TR3906	\$0.26, #2N3906-ND	\$0.07, #900-5457
100 KOhm Resistor			
1 MOhm Resistor			
1N4148 Diode			
1381* IC			

Source: http://www.solarbotics.net/library/circuits/se_t1_gbse.html