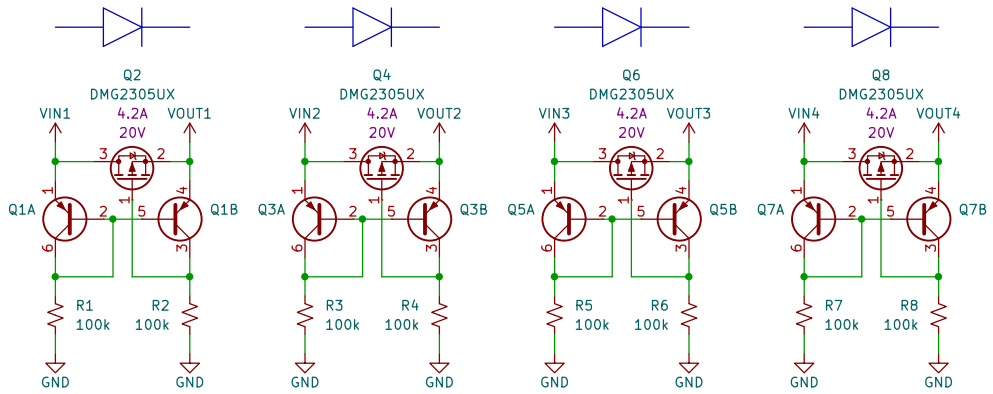
Ideal Diodes



Ratings

Max forward current: 4.2A

This is based on the MOSFET current rating, which depends on various factors. Higher input voltge and higher forward current result in higher gate voltage, which reduces the drain−source resistance, which reduces heat dissipation, allowing for higher current before failure of MOSFET. 4.2A continuous should be achievable with VIN=5V and 25C ambient temperature. See MOSFET dtasheet for more details.

Breakdown voltage: −9.3V

The base−emitter path of the BJTs is effectively a diode, which exhibits breakdown behavior with a large reverse voltage. The BJT datasheet rates this as byeond −5V, however testing shows it occurs closer to −9V. The −9.3V rating of the ideal diode circuit includes the forward voltage drop of the other BJT's base−emitter path. Larger reverse voltages can be tolerated, however this can lead to significant heat and eventually failure of the BJT, so larger reverse voltages (<−10V) should only be applied briefly.

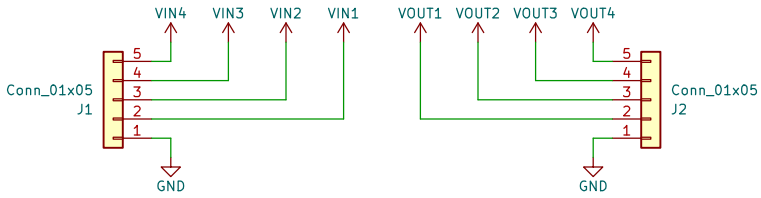
Max input voltage: 20V

The MOSFET gate is pulled down when the ideal diode circuit operates in the forward region. This behavior is analog, so a higher input voltage and higher forward current brings the gate voltage closer to GND. The MOSFET datasheet only rates the gate−source voltage at 8V max, however testing has shown it can tolerate up to 20V before immediate failure, which is the motivation for the max input voltage rating of the ideal diode circuit. Extended operation with the gate−source voltage beyond 8V may result in degradation or failure.

Min input voltage: 1V−1.8V

The threshold gate−source voltage of the MOSFET is typically 0.5V−0.9V according to the datasheet. The gate can only go as low as GND, which is the motivation for the 1V minimum. However the gate does not get pulled all the way to GND, so a low input voltage (1.8V and lower) results in a higher drain−source resistance. This can result in a higher forward voltage drop, and significantly more heating of the MOSFET with high current. Extended operation at low input voltage and high current could cause the MOSFET to fail.

Headers



Typical Characteristics

Forward voltage drop:

8mV (I=0.1A, VIN=20V)
12mV (I=0.1A, VIN=5V)
26mV (I=0.1A, VIN=1.8V)
62mV (I=1A, VIN=20V)
79mV (I=1A, VIN=5V)
120mV (I=1A, VIN=1.8V)
275mV (I=4A, VIN=20V)
350mV (I=4A, VIN=5V)
650mV (I=4A, VIN=1.8V)

On resistance

69mΩ (VIN=20V, I=4A)
62mΩ (VIN=20V, I=1A)
78mΩ (VIN=20V, I=0.1A)
88mΩ (VIN=5V, I=4A)
79mΩ (VIN=5V, I=1A)
120mΩ (VIN=5V, I=0.1A)
160mΩ (VIN=1.8V, I=4A)
120mΩ (VIN=1.8V, I=1A)
260mΩ (VIN=1.8V, I=0.1A)

Reverse leakage current:

−50uA (VIN=1.8V, V_fwd=−1V)
−190uA (VIN=1.8V, V_fwd=−8V)
−110uA (VIN=5V, V_fwd=−1V)
−260uA (VIN=5V, V_fwd=−8V)
−420uA (VIN=20V, V_fwd=−1V)
−560uA (VIN=20V, V_fwd=−8V)

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