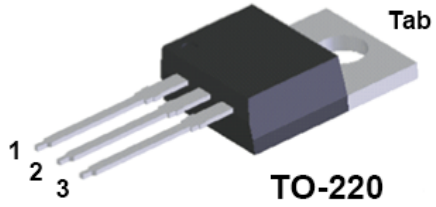
MOSFET Worksheet

MOSFETs are a great transistor to use in most circuits. They can be a little bit complicated to design in. Use this worksheet to find the critical information in the datasheet and to help determine if it can be used in your circuit.

Step 1: Pin-Out

Function	Pin Number
Gate	
Drain	
Source	
Tab (Which pin)	



The tab of the transistor is connected to one of the pins, make sure you note that. Also, verify the orientation of this picture is the same as your datasheet.

Step 2: Threshold Voltage (V_{GS} or V_{TH}) and Max V_{DS}

Function	Value	Comment
V_{GS}		The voltage range necessary to "turn on" the MOSFET
V_{CC}		Voltage of the I/O pin used (V_{GS} must be ***less***)
V_{DS}		The maximum operational voltage for the load side
V_{LOAD}		Voltage of whatever you are trying to control (V_{DS} must be ***more***).

V_{CC} is whatever voltage your circuit I/O runs at, which is probably 3.3V or 5.0V. Make sure this number is bigger than the minimum threshold voltage V_{GS}.

If you're using a battery or external supply for the load, make sure V_{DS} is bigger than that power source.

Step 3: Drain to Source Resistance (R_{DS}-On)

Function	Value	Comment
Max R_{DS}		Rated limit of R_{DS}. (Will vary with V_{GS}.)
Actual R_{DS}		Expected resistance *at your V_{GS}*

Look for the R_{DS}. Keep in mind that R_{DS} will vary with V_{GS}. So the limit (or Max) stated in the description of the MOSFET, may not apply to your circuit.

$$P = Current^2 * R_{DS}$$

Once you know the on-resistance, you can use your load's current to calculate how many watts the MOSFET will dissipate.

Step 4: Calculate Max MOSFET Power

Function	Value	Comment
Max Junction Temp		Should be in the range of 125°C to 175°C. If not stated clearly, use 150°C.
$R_{ØJA}$		Thermal Resistance: Junction-to-Ambient Units should be °C/W

Sometimes the Maximum Junction Temperature isn't clearly stated. If that is the case, just assume 150°C for TJ_{Max}.

$$P_D = \frac{TJ_{Max} - T_{Ambient}}{R_{\Theta JA}}$$

$T_{Ambient}$ is the "air temperature". Room temperature is usually around 25°C.

Make sure that number calculated in Step 3 is less than Step 4. If Step 3 is bigger, you need a heatsink.