High Voltage Solid-State Circuits for Tube Guitar Amplifiers

- The IRF820 MOSFET has a voltage rating of 500v, it should work well in preamp stages of most tube amps.
- The 100 ohm resistor is there to suppress H.F. oscillations. If IRF820 is physically close to the 12AX7 plate, you probably won't need it.
- You can see how the MOSFET is equivalent to a triode: Source = Cathode; Gate = Grid; Drain = Plate
- You cannot use the MOSFET as a direct replacement for a typical tube gain stage. The MOSFET will not "self bias" like a typical cathode-biased tube stage. The MOSFET is an "enhancement device" while a triode is a "depletion" device.
- In this circuit, it is not necessary to use a heatsink on the IRF820. You can if you want.
This circuit is a "cascode". It is capable of high gain, is very linear and is non-microphonic.

A comparison to triode: JFET Source = Cathode; JFET gate = grid; MOSFET Drain = Plate.

The MOSFET is wired as a simple voltage regulator. The 1M resistor, zener and 10uf cap set the reference voltage. Use a 24v or less zener.

A signal applied to the "grid" causes the current through the JFET, MOSFET and 100k "plate" resistor to vary. The output is tapped off the "plate" resistor, like a normal tube gain stage.

Select a value for Rs that sets the "plate" voltage at approximately 50% of the supply voltage. Try typical 12AX7 cathode resistor values. Check the gain. If you want more gain, add bypass cap Cb. If that gives too much gain, put resistor Rb in series with bypass cap. The value of bypass cap can be used for tone shaping.
as in triode stage.

- The "plate" resistor can be varied over a wide range similar to 12AX7. The output cap can be varied for tone shaping purposes.
- This circuit works well as a 1st gain stage, or a reverb return amplifier.
- No heatsink is required for the IRF820 in this configuration.

This is similar to the High Voltage Solid State Preamp stage, with the following exceptions:

- The "plate" load is a standard Fender-style reverb transformer.
- The "cathode" is unbypassed.
- The zener value has been reduced to 4.7V.
- The zener is tied to the "cathode" instead of ground. This allows a fairly large input signal to pass through
- This circuit can be inserted anywhere you would put the standard 12AT7-based circuit.
- A small heatsink is required for the IRF820. Remember that the heatsink is connected to the MOSFET Drain and has high voltage on it.