

IRFP250 MOSFET NOTES

When running the amp at higher voltages there are some known conditions to keep in mind. Remember the IRFP250 is not designed for linear operation, but there is a region within the device that is linear. With the correct gate bias the MOSFET will be linear in a common source configuration. The output circuit is tuned to match the IRFP250 to the 50 ohm out at the maximum output power. When reducing the drive, the output circuit will be out of balance because the impedance of the MOSFET goes higher and output circuit remains constant at 50 ohms. If you drive the amp with low drive with a steady carrier the MOSFET could avalanche. This happens below 50 watts out, at the higher supply voltages (36VDC). To compensate for this just run the amp with full drive but lower the supply voltage to lower the power. The MOSFET will see a matched load under this condition. When using the amp for SSB voice this is not a problem as the MOSFET is being pulsed, not steady carrier. I have not seen this problem running the amp at 25V 100 watts and below. When running the amp at 36 volts this is something you need to consider, but it's not a major problem as long as you understand the operating conditions of the circuit. *See attached pictures for additional information, and notes at the bottom of the page.*

When bringing up a new amp start out with the voltage at 24VDC. 100 watts should be around 5 amps with +25dbm drive. If all looks good increase the voltage up to 36vdc. Power should follow the voltage.

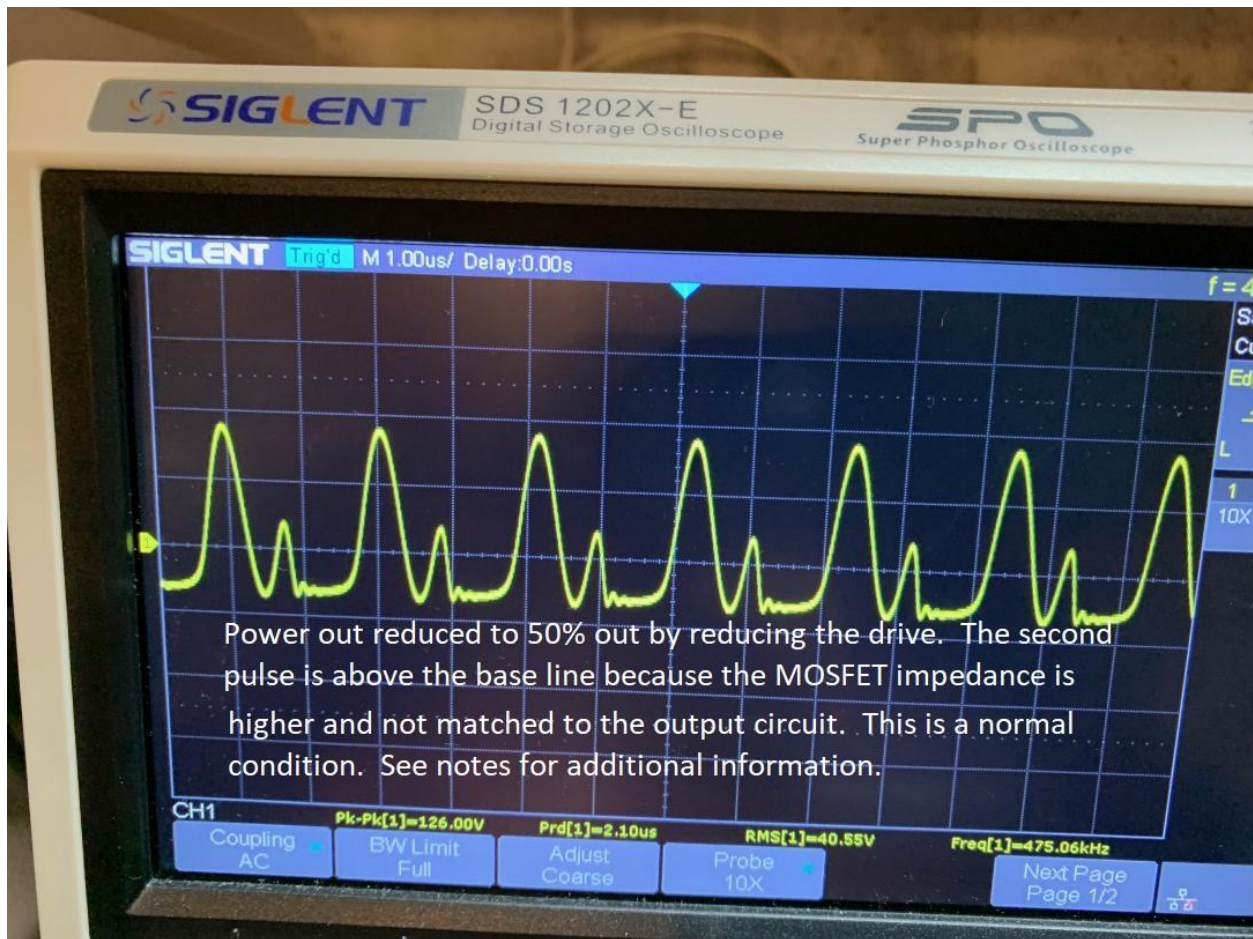
20vdc = 70 watts

24vdc = 100 watts

30vdc = 150 watts

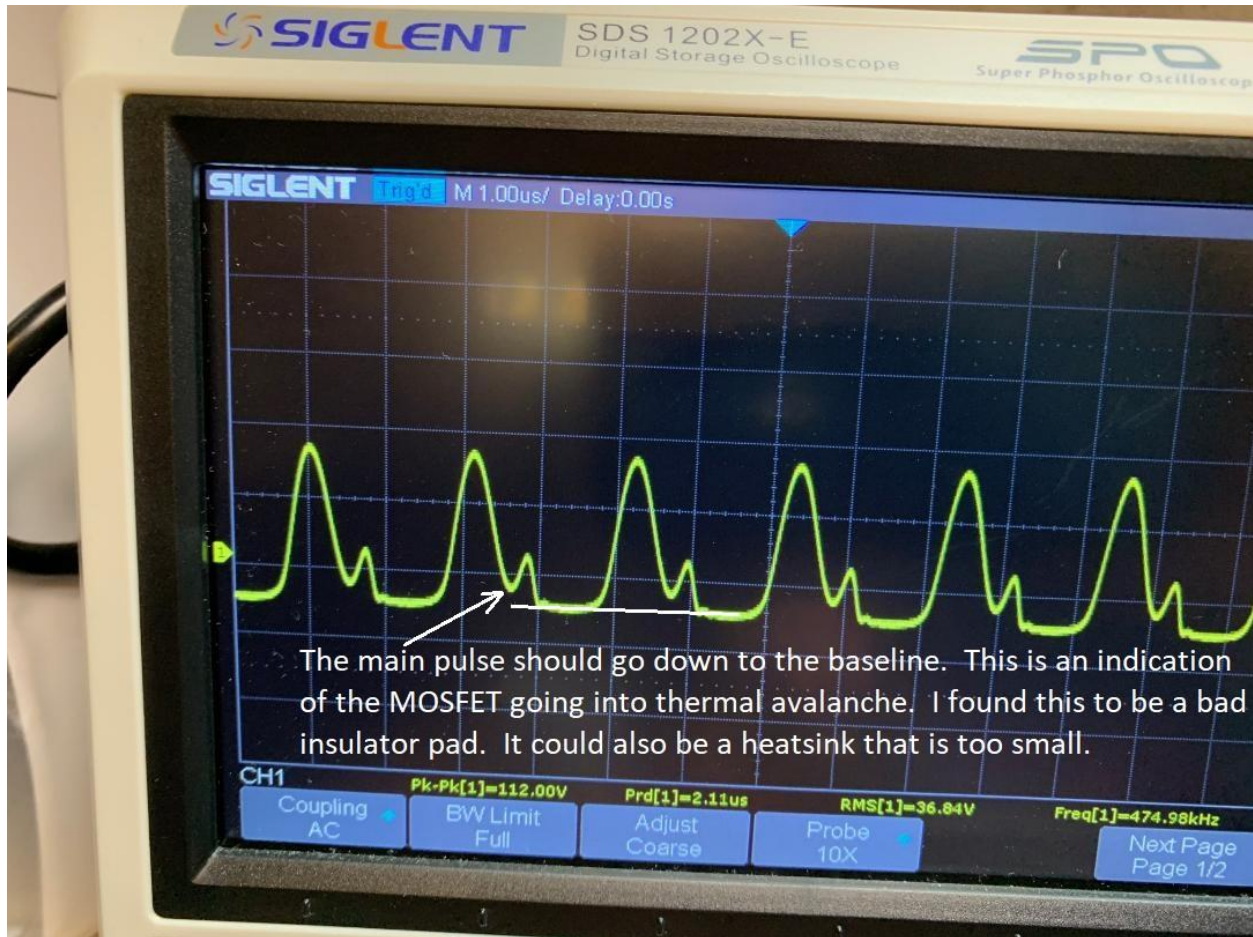
36vdc = 225 watts

See notes on last page



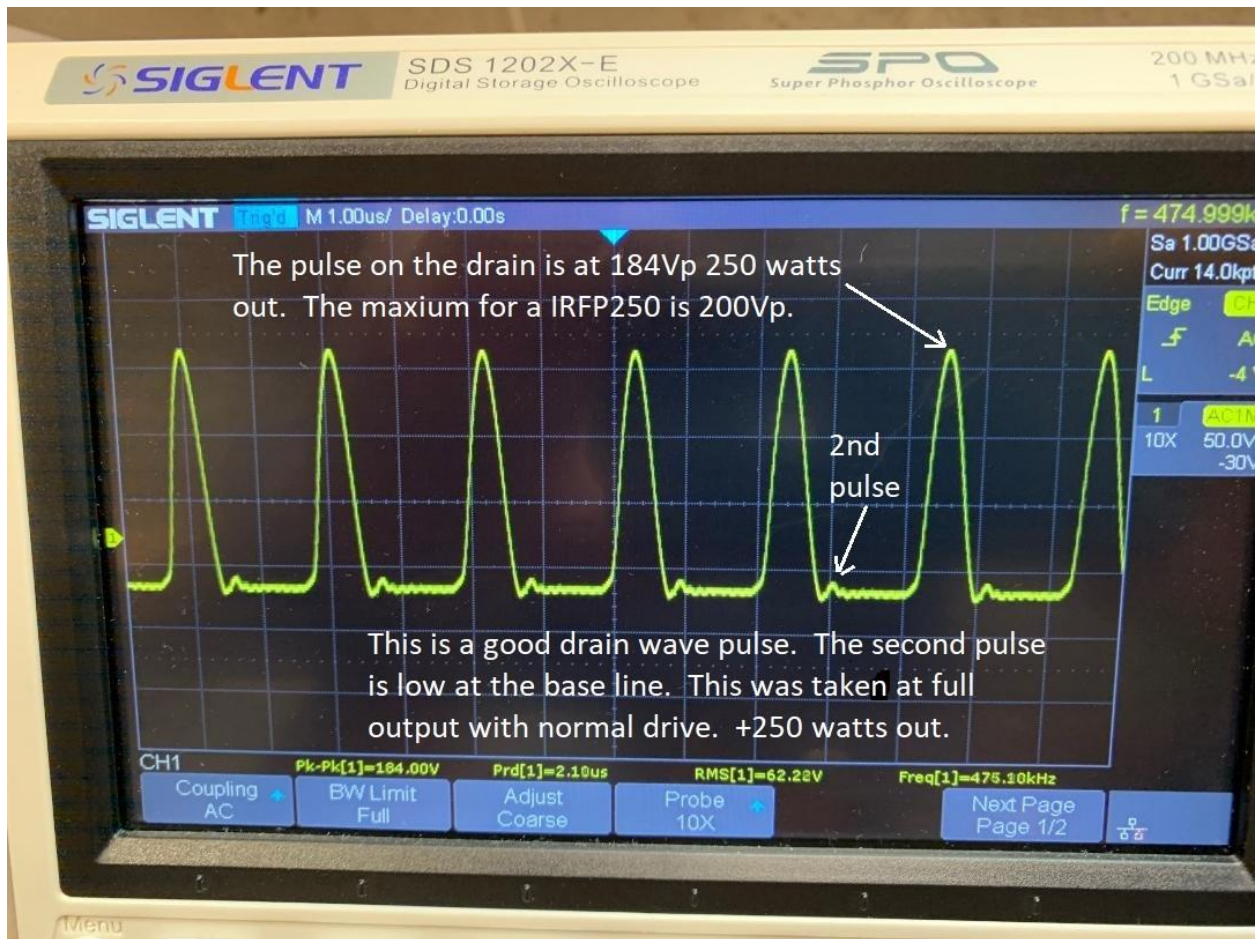
When reducing the output power, it's better to reduce it with the supply voltage and leave the drive at normal drive level. This will keep the second pulse low and the circuit matched for the best efficiency. When operating SSB voice the pulse modulation will be ok. This is only a concern when running a steady carrier or data modes.

During this test the voltage was 36V and the drain current was 3.2 amps. This is 119 watts in at 50 watts out. The MOSFET is having to dissipate almost 70 watts. As you can see this is the reason the MOSFET starts to heat up. At 200 watts out the MOSFET is only dissipating around 25 watts. The bottom line is run the amp at maximum output on any mode. Use the power supply voltage to control the output power, or just stay with a fixed voltage at full output.



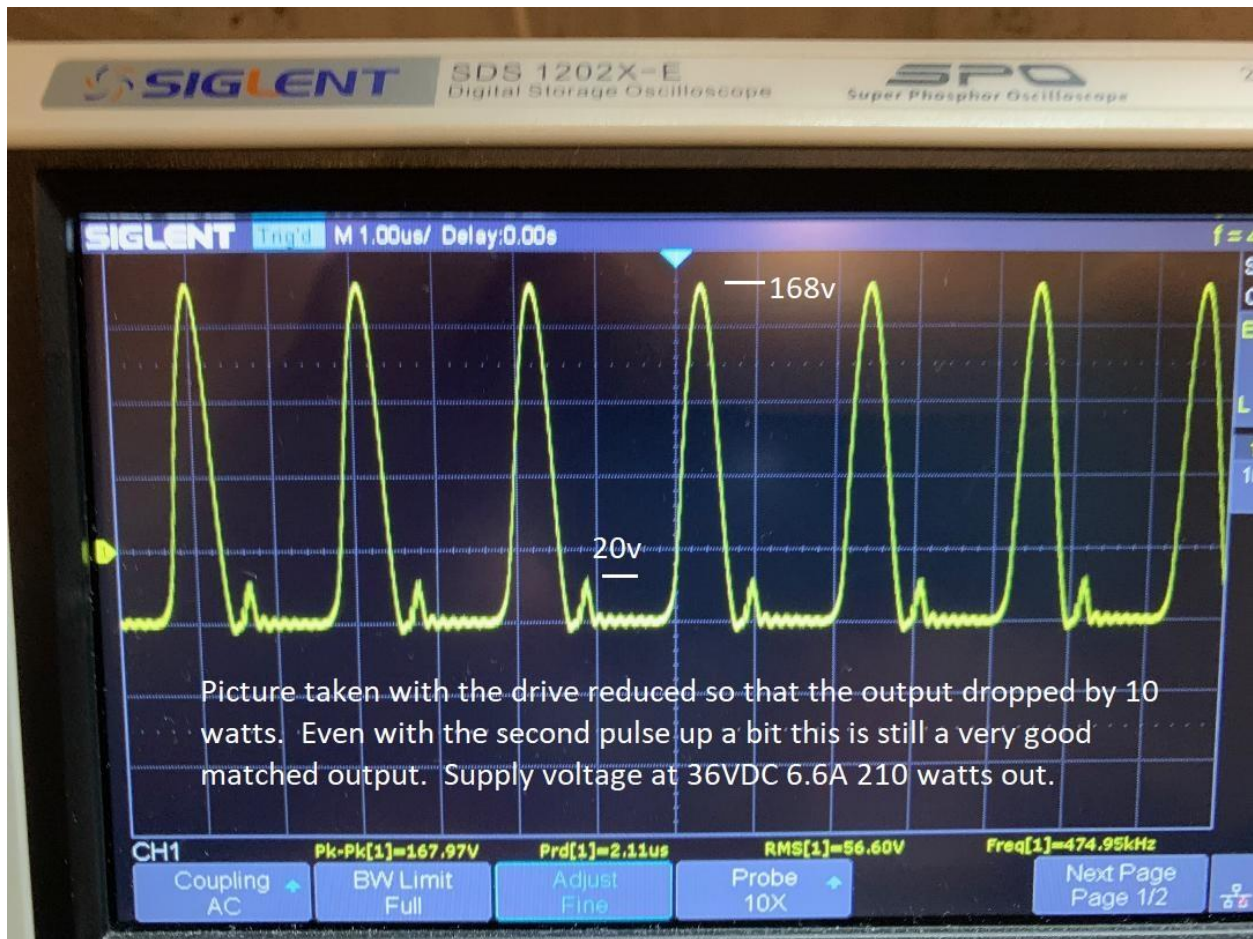
This is bad news when the main pulse does not go always to the base line when the MOSFET turns on. During key down you could see the negative pulse start to rise up from the base line. This is the MOSFET starting to heat up and not able to dissipate the heat into the heatsink quick enough. If not un-keyed the FET will likely avalanche. I had this problem using Silicone insulator pads. **Do not use them.**

Mica pads worked, and 1mm Aluminum Oxide Alumina Ceramic work very well, slightly better than the Mica. This is something you need to be aware of and look out for. This can be easily seen with a scope, on the drain of the MOSFET.



Under full drive the drain should look like this at any supply voltage. Some increase of the second pulse is ok; this amp is very well matched. This amplifier was operated at 38VDC on a bench setup with a 50-ohm load. This is pushing the IRFP250 to the maximum and not recommended.

See the next picture



Notes

- Set the idle current at 250ma for linear operation.
- Be sure to use a Mica insulator under the MOSFET for (quick heat transfer), or 1mm Aluminum Oxide Ceramic work very well, slightly better than the Mica. **DO NOT USE SILICONE RUBBER PADS.**
- Best to stay around 36VDC maximum for a reliable 200-watt amplifier. Above 38V is pushing it to the limit.
- Place a scope on the drain to verify the waveform when testing amplifier.
- T2 should be mounted in a shielded box.

- 10K thermistor is mounted on top of the IRFP25 with JB-Weld epoxy.
- The input tuning is very important. The T2 input circuit should be tuned for best drive level and it also acts as a band pass filter for the driver amp. This can be done by using a scope on the gate of the IRFP250 or using an antenna analyzer connected to J1. Both methods are with no power applied to the amplifier. Changing the value of C2 will change the tuning. If the frequency is low without C2 in the circuit, you may need to remove a couple of turns from the secondary of T2. 25-26 uh should tune ok. Remember that C1 + C2 and T2 make up the Band pass filter. If C1 is out of tolerance the band pass could be off a good bit.