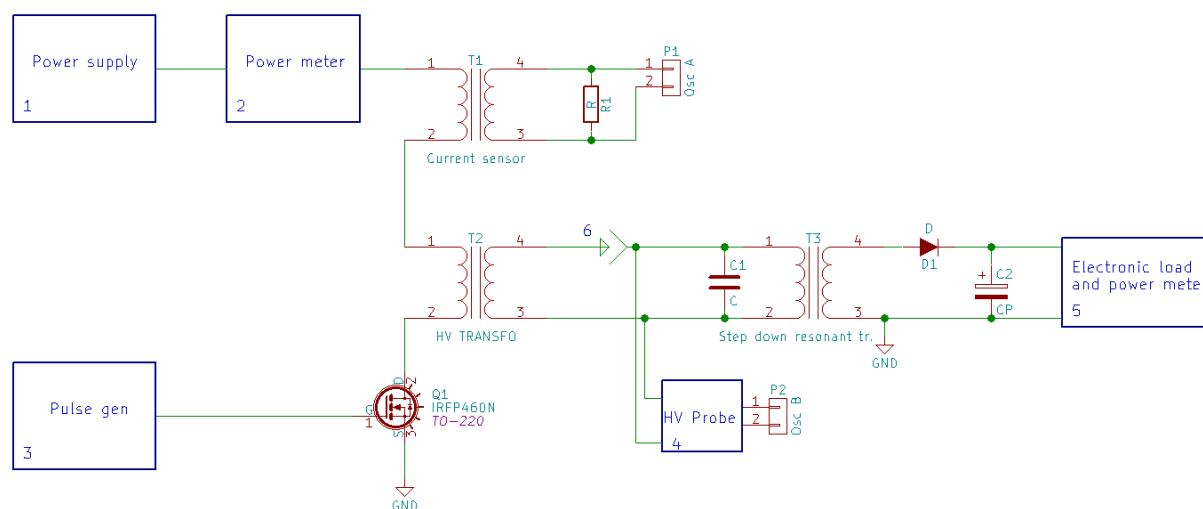
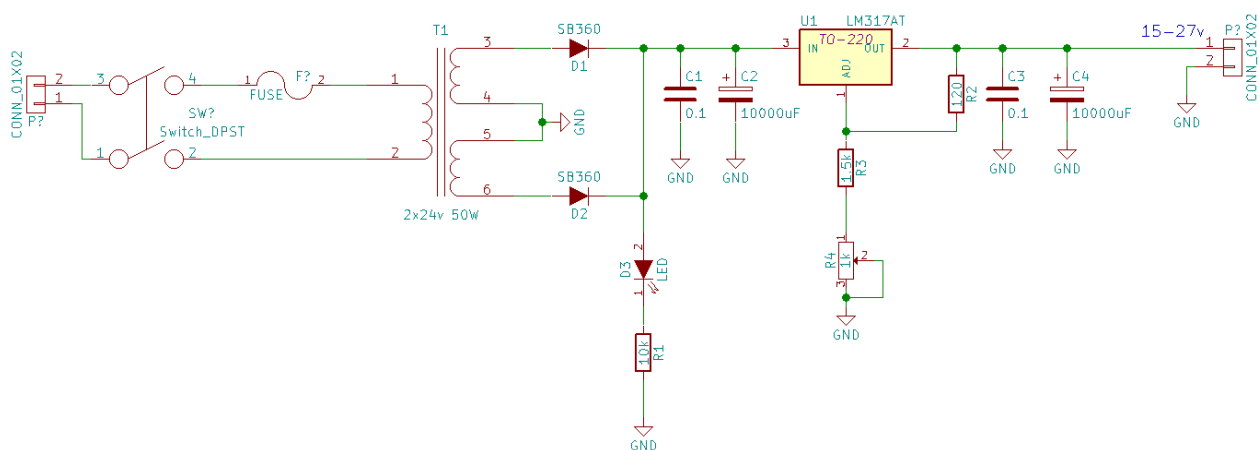


Modular system for experiments with spark gap

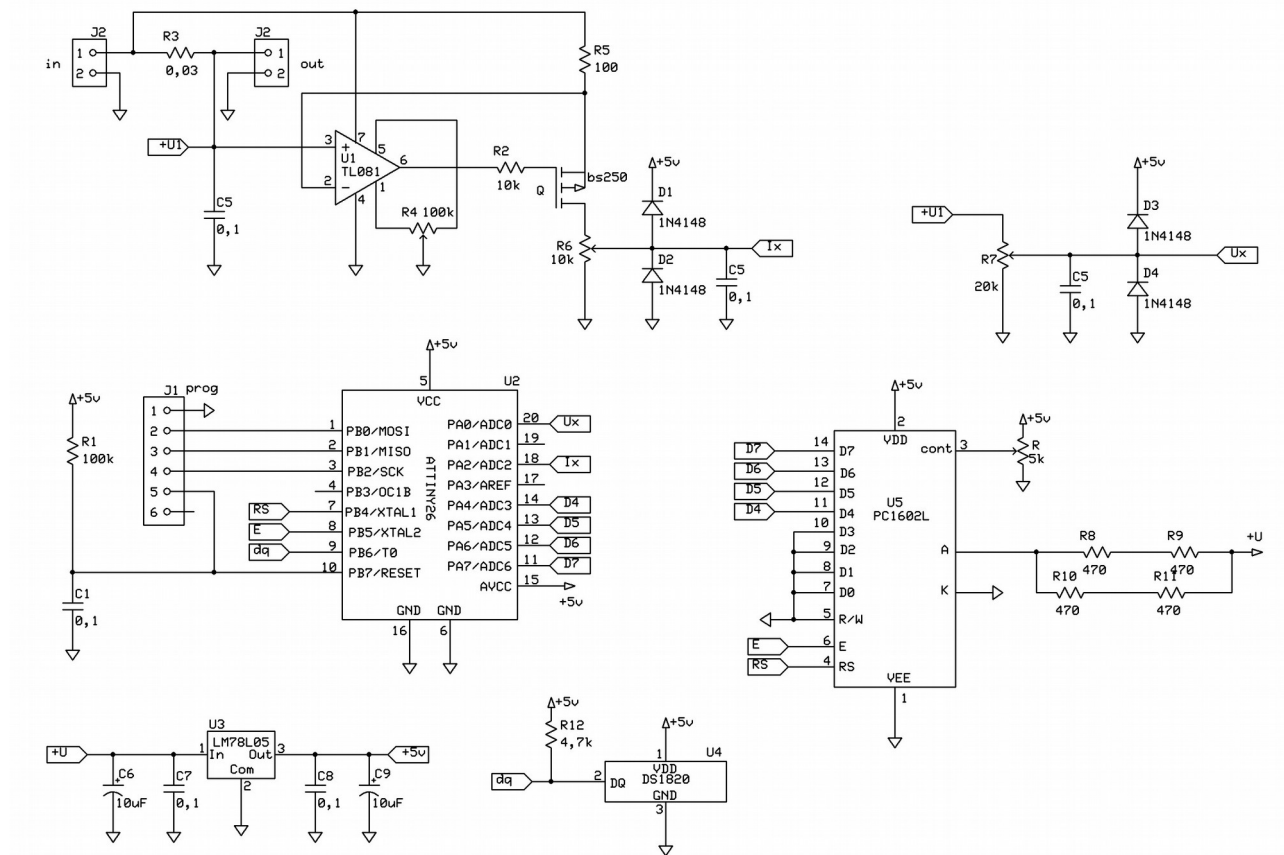


1. Power supply 15-27V 1A
2. Power meter
3. Pulse gen $t=1-20\mu s$ $T=20-100\mu s$ (10-50KHz)
4. HV Probe
5. Electronic load
6. Spark gap
7. C1,T3 Capacitor + step down resonant transformer
8. T1,R1 current probe

- ## 1. Power supply

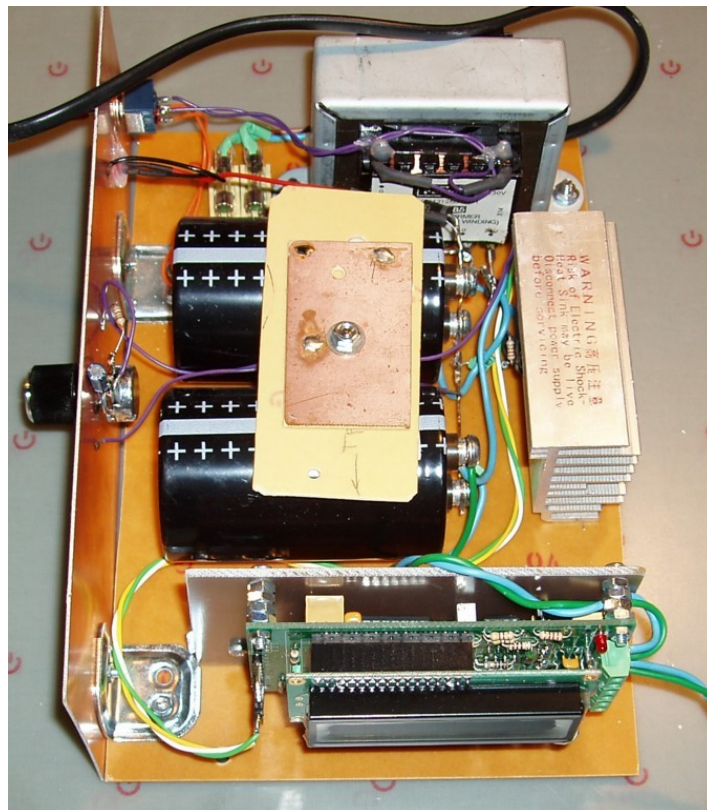


2. Power meter



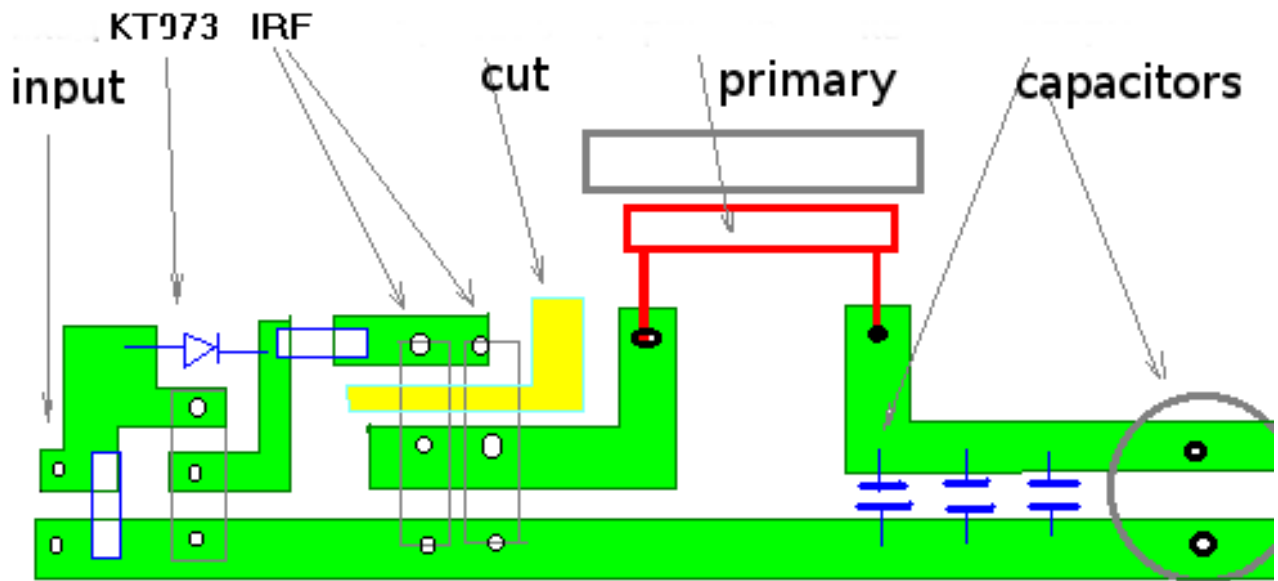
pic. Uiptfg board as power meter and temperature control

source code: https://github.com/vasik041/openlab/tree/master/tools/ui_meter

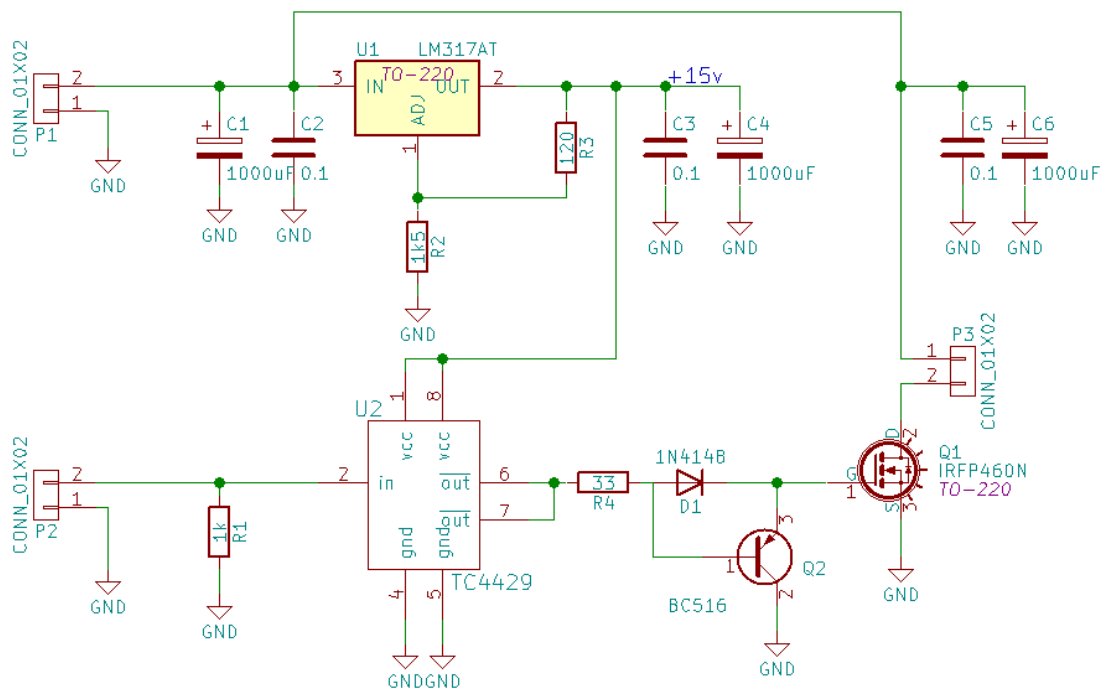


pic. Assembled power supply with power meter

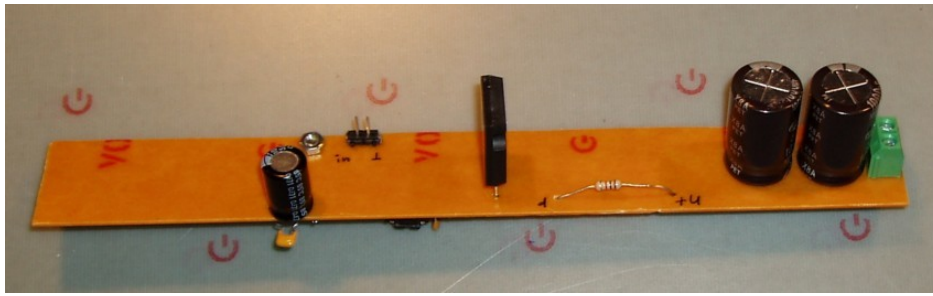
3. MOSFET driver



pic. this picture from skif.biz was taken as a reference



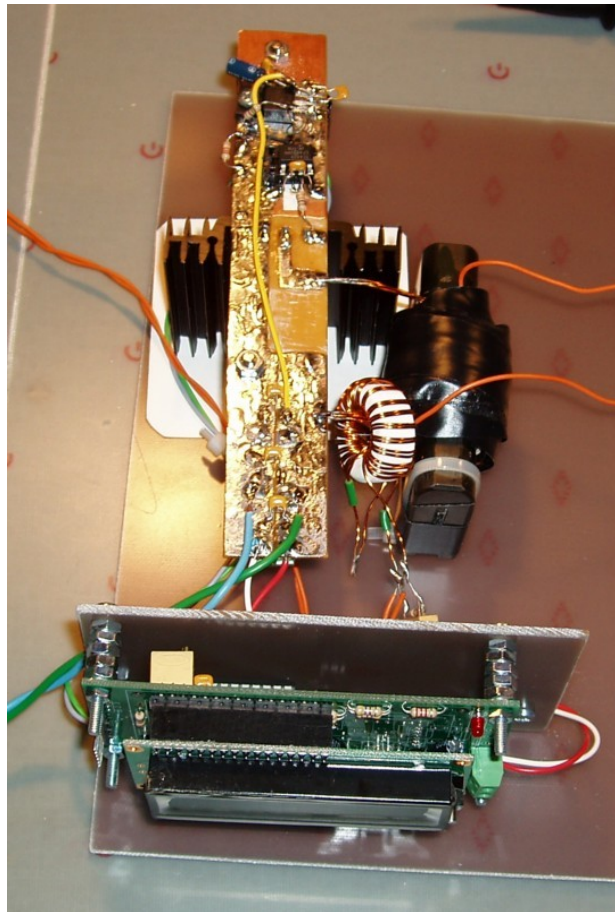
pic. Driver schematic



pic. Assembled driver (top view)



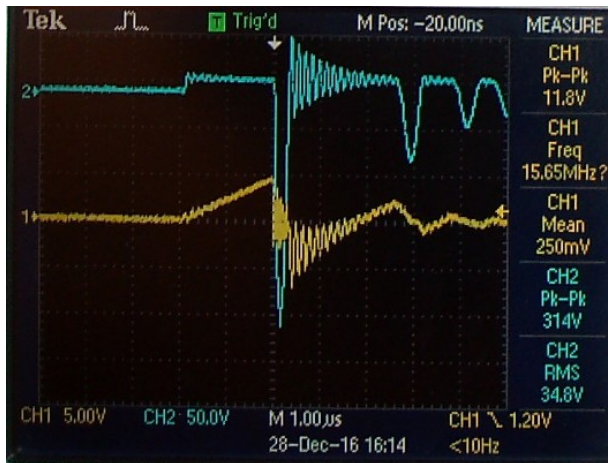
pic. Assembled driver (bottom view)



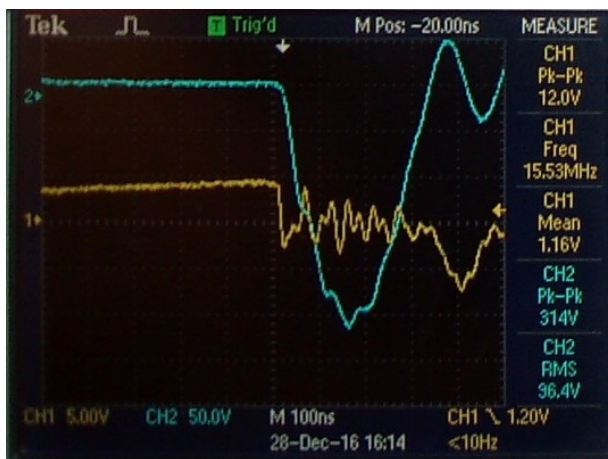
pic. uipfpg board as pulse generator, MOSFET switch, current sensor(trafo), HV trafo

source code: https://github.com/vasik041/openlab/tree/master/tools/pulse_gen_us
and https://github.com/vasik041/openlab/tree/master/tools/pulse_gen_us_n

5. Charging capacitor with sparks

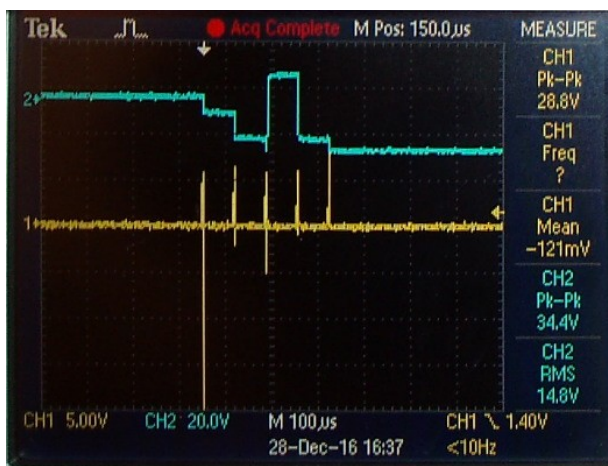


Testing transformer output
top – output windings
bottom – driver current



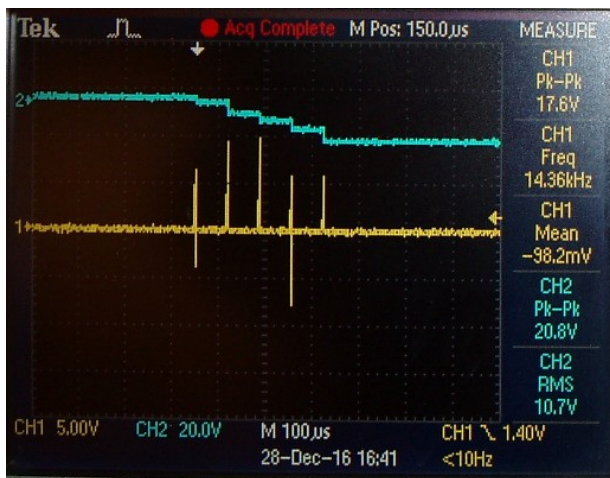
Same but bigger scale

2.8kV
150ns raise time
not really good but lets try

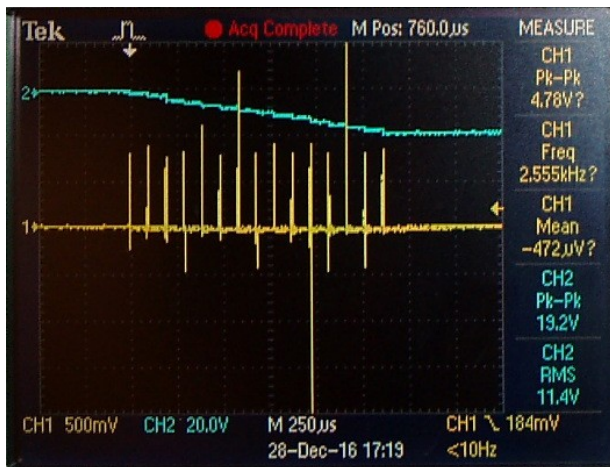


First attempts

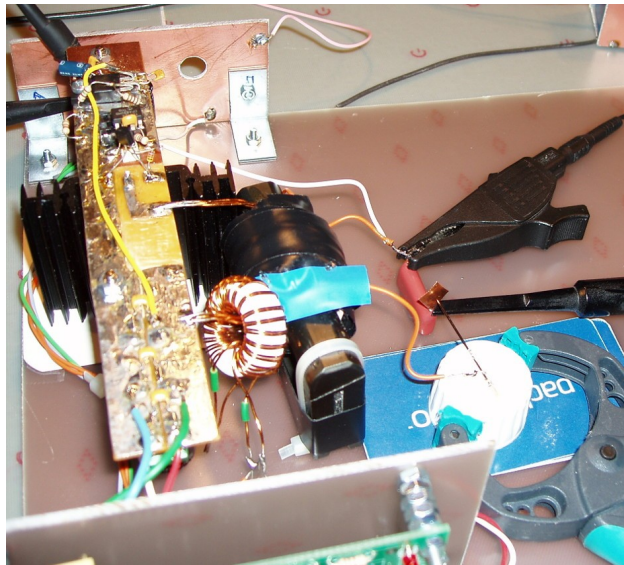
5 sparks
ion discharge after 3rd



After some tuning

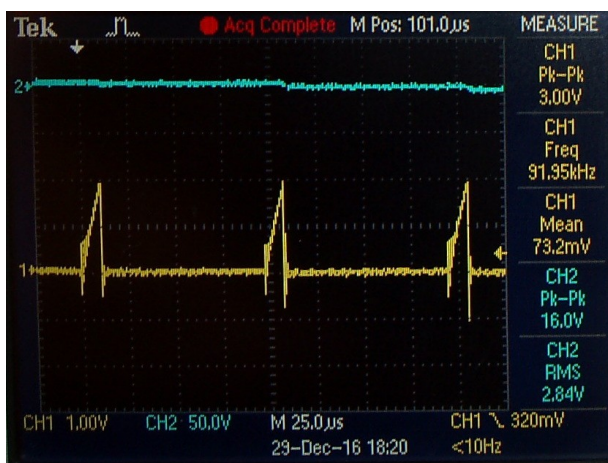


This looks even better ;-)

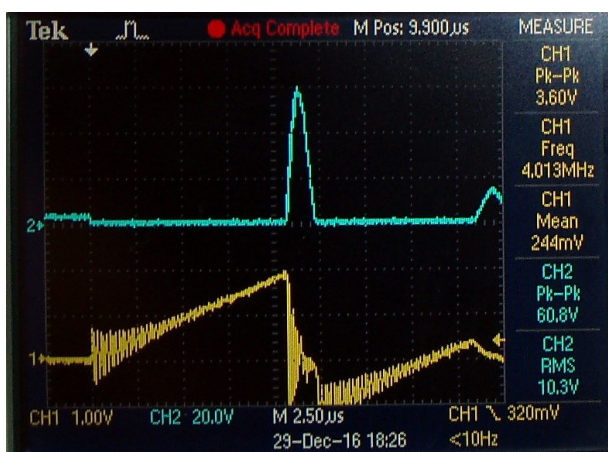


pic. My test setup #1

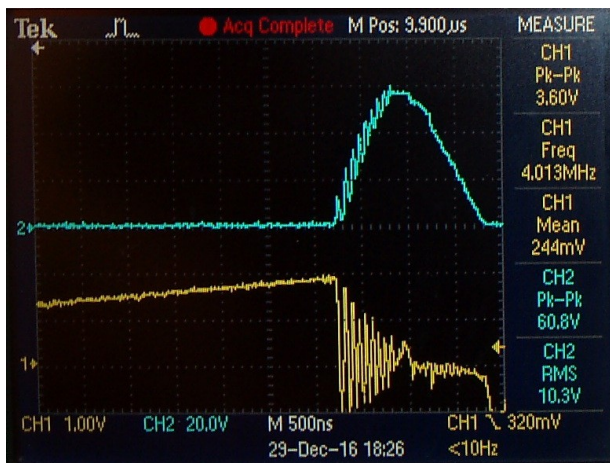
Let's check what happening in the driver



blue – voltage on capacitor
yellow – current 1v = 1a
pulses 10 μ s period 100 μ s

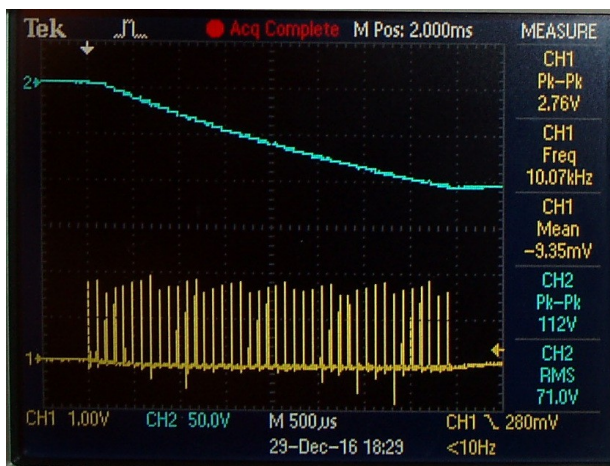


blue – voltage on drain 200v/div
yellow – current 1v = 1a
pulses 12 μ s period 100 μ s



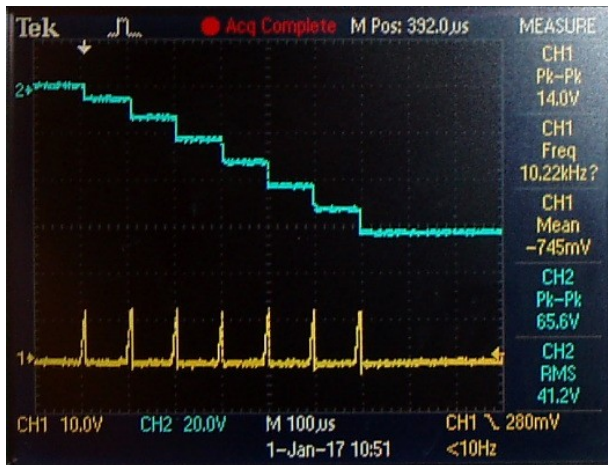
blue – voltage on drain 200v/div
 yellow –current 1v = 1a
 pulses 12 us period 100us

(same as above but bigger scale)



blue – voltage on capacitor 500v/div
 yellow – current 1v = 1a
 pulses 10us period 100us
 41 pulses

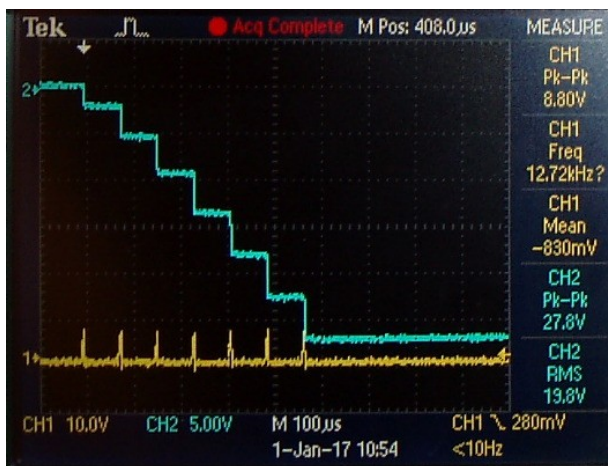
6. Observing negative resistance



When charging capacitor with constant voltage every next “step” should be smaller

When charging capacitor with constant current “steps” should be same

Here clearly visible that every next “step” is *bigger (higher)!*



This can be observed after adding small gap into transformer core (it probably improved slightly rising edge). With faster transformer results should be even better like on picture below

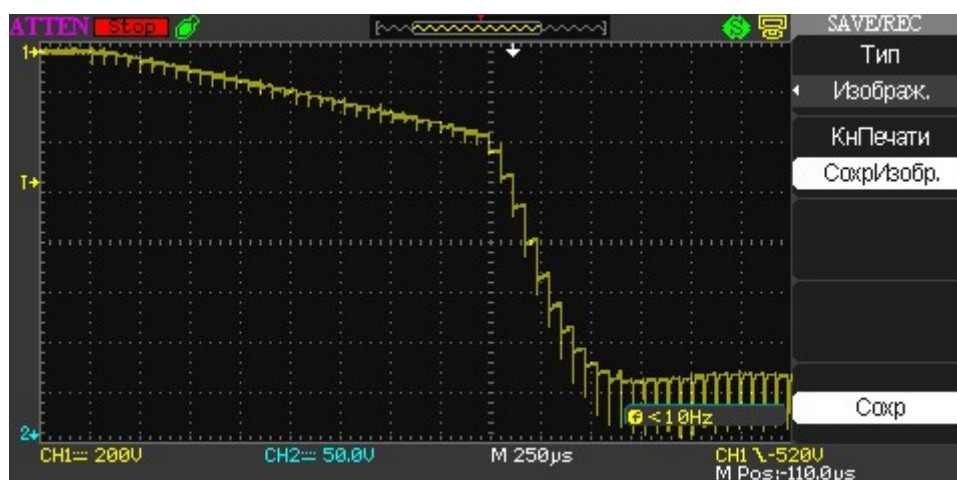


image source: <https://www.skif.biz/index.php?name=Forums&file=viewtopic&p=476088#476088>