9/30/23

Gate Driver Notes

Requirements for driver:

1. Roughly 1MHz output capability
2. 5V input
3. Isolation included

* ΔVgs = 6-10V
* Rg = 3.3 Ohms
* So, Ig will be around 1.8-3A without external resistor
* Need an external resistor after driver:
  + Too small: inductive ringing, spikes as it turns on, driver gets too hot
  + Too large: turn-on time is too slow
  + Driver dependent of course, but Rgd should be on the order of a few Ohms
* Want gate voltage to be a little higher than the FETs Vth, but not much

Notes about our transistor:

* [Automotive-grade N-channel 650 V, 0.042 typ., 60 A MDmesh™ DM2 Power MOSFET in a TO-247 Package (st.com)](https://www.st.com/resource/en/datasheet/STW65N65DM2AG.pdf)
* Vgs,th = 4V
  + Want Vgs = 6-7V to get Id high enough
* Rds,on = 50mΩ
* Turn-on delay = 33ns
* Rise time = 13.5ns
* Turn-off delay = 114ns
* Fall time = 11.5ns
* Cin = 5.5nF

[Choose a gate driver for your silicon carbide MOSF... - Infineon Developer Community](https://community.infineon.com/t5/Blogs/Choose-a-gate-driver-for-your-silicon-carbide-MOSFET-in-a-few-steps/ba-p/347830?redirId=197185)



12\*(13.ns+33ns)/120nC - 3.3Ohms = 1.35Ohms

Rext = 1.35Ohms.

Si8239x

<https://www.mouser.com/datasheet/2/472/si8239x_data_sheet-2507466.pdf>

Want 12V output version,

3 Drivers, one is 2.5kV, two others are 5kV

5kV one has dead time of 40-600ns

One

Deglitching capabilities necessary?

[MP1923GR-Z Monolithic Power Systems Inc. | Integrated Circuits (ICs) | DigiKey](https://www.digikey.com/en/products/detail/monolithic-power-systems-inc/MP1923GR-Z/18089800)

Can stand 100V, 8A, 7.2ns rise and 5.5ns fall

But, says 4.5V under-voltage lockout, may be a problem

$2.81

[ZXGD3005E6TA Diodes Incorporated | Integrated Circuits (ICs) | DigiKey](https://www.digikey.com/en/products/detail/diodes-incorporated/ZXGD3005E6TA/2638862)

25V, 10A, looks like it may need load under 100nF, transistor we have Css is 5.5nF

$0.58

[UCC27210DDAR Texas Instruments | Integrated Circuits (ICs) | DigiKey Marketplace](https://www.digikey.com/en/products/detail/texas-instruments/UCC27210DDAR/3137280)

7.2ns rise, 5.5ns fall, 20V 4A rating

$2.38