

Max realistic efficiency from a HV PWM motor driver

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I have a 3 phase PWM motor driver this is generating too much heat.

Motor phase current peak is 1.5A, Bus voltage is 500Vdc PWM freq is 10Khz.
This is for a sinusoidal drive so all Mosfets are switching all the time.
Variable speed induction motor.

What is the realistic efficiency I can achieve when delivering say 600 watts through this drive to the motor.

I'm shooting for 98% efficient. That leaves 12 watts of heat dissipated by the six mosfets. The current prototype is at 90% and gets really HOT (60 watts of heat) and requires large heatsinks and a fan.

The mosfets are <http://www.st.com/stonline/books/pdf/docs/9572.pdf>

So, $P_{dc} \sim 1.5A^2 * .34 \text{ ohms } R_{ds} = .765 \text{ watts per FET} \times 6 = 4.59 \text{ Watts}$ (worst case). The rest must be AC switching loss. If the $P_{sw} =$ the P_{dc} them I'd reach my goal of dissipating less than 12 watts.

The Fets are currently driven through large pot core gate driver transformers by 1.5A mosfet drivers. They are large due to the relatively low switching frequency. I'm thinking that the transformer leakage inductance is not allowing fast enough switching speed and the switching losses are dominating FET losses. (haven't had a change to put a scope to the thing to see for sure)

I'm looking at using some high side drivers with floating supplies so I can turn the gates on and off very fast.

Using this approach, or a better one, how efficient can I reasonably get this driver.

I realize the EMI will be greater if when the switching edges are faster but I think we can handle this with proper enclosures and shielded wires.

what are your thoughts?

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