

# Design, implementation and verification of 60kW Hub motor driver for electric vehicles

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## ABSTRACT

Due to significant changing in climate and national environmental measures, the efficiency improvement and CO<sub>2</sub> reduction become a very important task for the vehicle industry. Taiwan 's vehicle industry spares no effort to the development of electric cars. Light electric vehicle drive design capabilities and manufacturing has been a small-scale development. It should be pointed out that although the low power BLDC motor driver research and design are already complete, compared the high efficiency type over ten thousand Watts BLDC motor driver research were still few. As everyone knows, the high power motor driver is more complicated for the low power driver of motor system. The difficulties and complications to develop a high power motor driver include the protection circuits design of high power switches, complex manufacture process, high specification test equipment and the strict safety requirements of electric vehicles. Having this in mind, common rules about a high power motor driver are introduced in the thesis. A novel rated 22kW and peaked 60kW hub motor driver is developed. High switching speed gate driver with push-pull output stage is also introduced to modify the switching speed of the high power IGBTs and reduce the switching losses. A snubber is used to provide a low voltage across the IGBTs while the current turns off. In the electric control system, using high performance Texas Instruments TMS320LF2407 digital signal process (DSP) connects various controllers. Moreover, the experimental platform of the high power hub motor driver is already established . The efficiency is close to 99%. By forced air cooling, the average temperature of the driver heatsink is under 35 with very lower power losses. By way of the experimental test, the verification of the high performance driver is completed.

Keywords : Hub motors、 Gate driver、 Permanent magnet DC brushless、 Motor control

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