Technical Article

Simple BLDC Motor Spinning 101: Five Key Concerns

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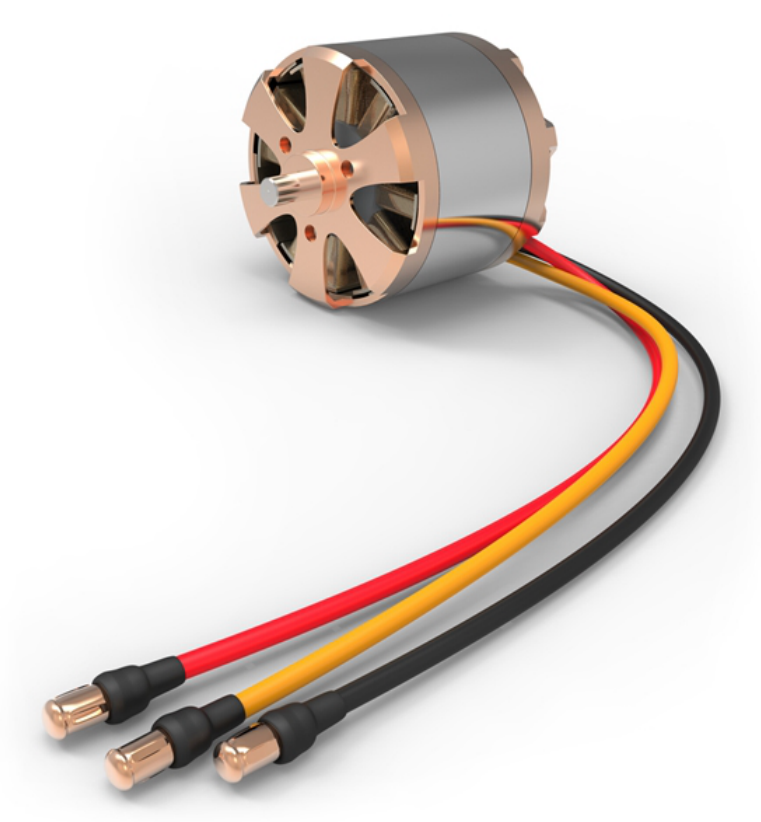
The brushless direct current (BLDC) motor is the newest member of the big motor family that people just can't stop talking about. Unlike a brushed or stepper motor, control techniques for which are very mature and standard, there have been debates on what's the best approach to control a BLDC motor, as well as how to continue improving these technologies. In this three-part blog series, I'll briefly go through a few main BLDC motor control architectures commonly seen in the industry. But before I get there, let's spend a few minutes answering one basic question: What do BLDC motor users expect from a motor controller? Here are my thoughts:



1. Higher Efficiency.

One of the primary reasons people move from a brushed to a brushless motor is that getting rid of the brush improves efficiency. But users obviously won't want to waste the energy saved from the brush on the motor controller. That said, the motor-control algorithm had better use every nanowatt of energy to drive the motor, yet you also don't want the controller to get hot and dissipate too much heat.

2. Lower Noise.

A very important use case for BLDC motors is in indoor environments where people don't want to be disturbed. Imagine you're preparing for a presentation but the noisy fan inside your laptop keeps disturbing you. Another

example would be putting your child to bed, but the noisy washing machine quickly wakes her up. Acoustic noise has always been among the most important things people want to improve with BLDC motor control.

3. Flexibility.

You just spent three hours finding the best operating point for your motor-control system, but suddenly your product manager says that you need to make another completely different motor work for your system. You have to spend another two hours finding the perfect operating point for the new motor, and you probably need to spend even more time to find a point where one setting could work for both motors. Meanwhile, you pray that your product manager doesn't throw a third motor your way. This is a very common scenario in the motor world, not just for BLDC motors but other types of motors as well. A highly dependable solution that can spin motors with different parameters is absolutely the dream of every electrical engineer who works hard to spin motors.

4. Dependability.

Being dependable in the motor realm means being reliable and robust. You need to count on the fact that the motor controller will not be damaged under fault conditions and is able to operate correctly again when the fault condition is removed.

5. Effective Cost Structure.

This is a given. You always want to achieve the best performance with the lowest possible system-level cost.

These are my observations. What do you think users truly appreciate in BLDC motors? Feel free to share your thoughts in the comments section. In my next post, I'll briefly go through typical BLDC motor-control architectures, such as Hall-sensored, sensorless and field-oriented control (FOC), and how they tie back to the four expectations I discussed here. Stay tuned.

Additional Resources:

- Read about convenient ways to drive BLDC motors.
- Visit the Motor Drivers Forum on the TI E2E™ Community, where you can search for solutions and share knowledge with fellow engineers.
- Check out TI's portfolio of BLDC motor drivers.

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