The Dirty Details of White Goods Design

Joe Roy, Americas Motor & Motion FAE, Fairchild Semiconductor

When the first white goods were invented in the 1850s, there was a passion to innovate and design new machines to assist in nearly every room of the house. Now that the typical family has 6-10 major household appliances, a new mantra has emerged in appliance design: do more faster with less energy at a painfully minimal cost. To this end, white goods designers are expected to engineer state-of-the-art motor control solutions with premium efficiencies. After all, no one wants a garbage disposal that uses more than a penny of electricity to convert the dead tree on the front lawn to a few cubic yards of mulch.

Washing 20 pairs of jeans, cleaning dishes for a family of 12 or making a refrigerator withstand the neighbor kid that never closes the door requires a survival guide that includes advanced motor-control engineering. For decades, integrated power modules have been available for driving AC induction motors (ACIM), brushless DC motors (BLDC), and many of their derivatives (PMAC, PMSM, etc.). These modules have traditionally come with a memorable cost penalty thereby excluding them from use in the consumer appliance market.

Designed specifically for consumer appliances and light-industrial applications, today’s highly-integrated power modules offer a myriad of onboard features including: under-voltage protection, thermal protection, over-current protection, EMI mitigation, and integral electrical isolation. These modules provide a fast time-to-market, minimal component count, and high reliability. Fairchild Semiconductor’s broad line of Smart Power Modules (SPM) offers solutions for applications ranging from 5W through 7.5kW. A wide range of power capability in a given footprint and pin-out allows designers to implement platform-based designs with broader applicability. For example, a 1HP motor control can be easily designed to support ¾ or 1½ HP motors by inserting a different module and changing a few discrete values.

For the first time, the cost of implementing power module-based designs can now be comparable with that of discrete solutions. In many designs, the slightly higher module cost combined with increased simplicity of the heat sink, lack of isolation tapes, and decreased hardware can result in significant savings. Using these modern survival tools, today’s appliance designers can focus their efforts on the features their customers desire the most - like ferret detection. I always wanted a washing machine that could detect my daughter’s pet ferret hiding in the laundry.

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