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Software Drives FOC Motors Without Shunts Or Sensors, Has Improved GUI

[Power Integrations'](#) MotorXpert v3.0 is the latest release of the company's software suite for configuration, control and sensing of BLDC inverters that utilize the company's BridgeSwitch motor-driver ICs (Fig. 1). It incorporates Power Integrations' shuntless and sensorless technology for field-oriented control (FOC), adding support for advanced modulation schemes and unconditional startup under any load condition, along with significant improvements to the host user interface and debugging tools. Applications include indoor and outdoor air conditioning fans, refrigerator compressors, fluid pumps, washing machine and dryer drums, range hoods, industrial fans and heat pumps.

Cristian Ionescu-Catrina, product marketing manager at Power Integrations said, "MotorXpert simplifies single- and three-phase sensorless motor-drive designs. In this version 3.0 release, we have added a two-phase modulation scheme, which is ideal for applications that work in high temperature environments such as hot-water circulation pumps. The new modulation reduces inverter switching losses by 33%. Version 3.0 also features a five-fold improvement to our waveform visualization tool and an enhanced zoom function, giving developers substantially more information for motor tuning and debugging."

MotorXpert 3.0 comprises three main sections—sophisticated mathematical algorithms, a host-side application that interprets inverter actions, and an easy-to-use control interface. The algorithms resident on the local MCU or DSP construct accurate feedback signals from the BridgeSwitch IC and provide real-time control of the switching patterns. The host-side application interprets inverter actions and displays critical data in actionable format for engineering analysis. The control interface permits development engineers to experiment and quickly converge to a final product (Figs. 2 and 3).

MotorXpert suite is MCU-agnostic and includes a comprehensive porting guide to simplify deployment with a wide range of MCUs. It is implemented in common C language to MISRA standards.

The MotorXpert v3.0 host-side application includes a graphical user interface with Power Integrations' digital oscilloscope visualization tool that makes it easy to design and configure parameters and operation and simplifies debugging (Fig. 4). Parameter tool tips and a tuning assistant improve the development process, and the intuitive parameter list provides easy motor tuning.

The new version also features both V/F and I/F control, which permits motor startup in any load condition. A selectable two-phase modulation scheme allows developers to trade off temperature of the inverter versus torque ripple, which is beneficial in applications such as hot water circulation pumps, reducing heatsinking requirements and enclosure cost.

Development time is greatly reduced by the included single- and three-phase code libraries with sensorless support, reference designs, and other tools such as a power supply design and analysis tool.

The BridgeSwitch IC is a half-bridge motor driver of low $R_{DS(ON)}$ FREDFET switches, controllers and drivers in a thermally efficient package. Sensorless feedback, fault reporting, and self and load protection are also available for applications from 30 W to 1 HP (750 W).

MotorXpert v3.0 is available at no cost with an end-user license agreement. The software suite comes with a quick start guide, software manual, MCU porting guide, single- and three-phase software libraries and a video tutorial.

For further information, see the MotorXpert Suite for BridgeSwitch [page](#). Or contact a Power Integrations sales representative or one of the company's authorized worldwide distributors—[DigiKey](#), [Newark](#), [Mouser](#) and [RS Components](#).



Fig. 1. The MotorXpert suite is a software companion to BridgeSwitch motor-driver ICs that controls and configures high-efficiency single- and three-phase BLDC inverters. Version 3.0 includes the company's shuntless and sensorless technology for field-oriented control, adding support for advanced modulation schemes and unconditional startup under any load condition. It also contains improvements in the host user interface and debugging tools.

Reducing Development Burden With a Software Design Tool optimized for the Motor Engineer

Simplify Design and Optimize Performance

- Intuitive logical graphical interface
- Motion Scope – real time performance view
- Controls each phase of motor operation
- Simple real time updates – fast development
- Default or Expert Modes
- Easily port code across MCUs
- Tool tips provide in-use guidance

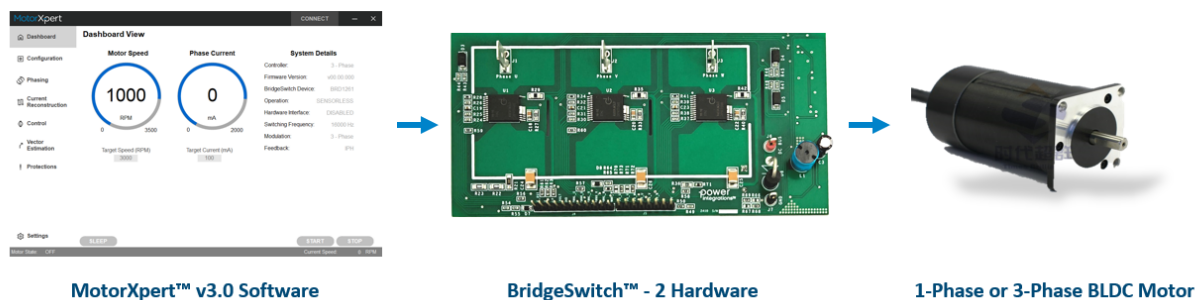
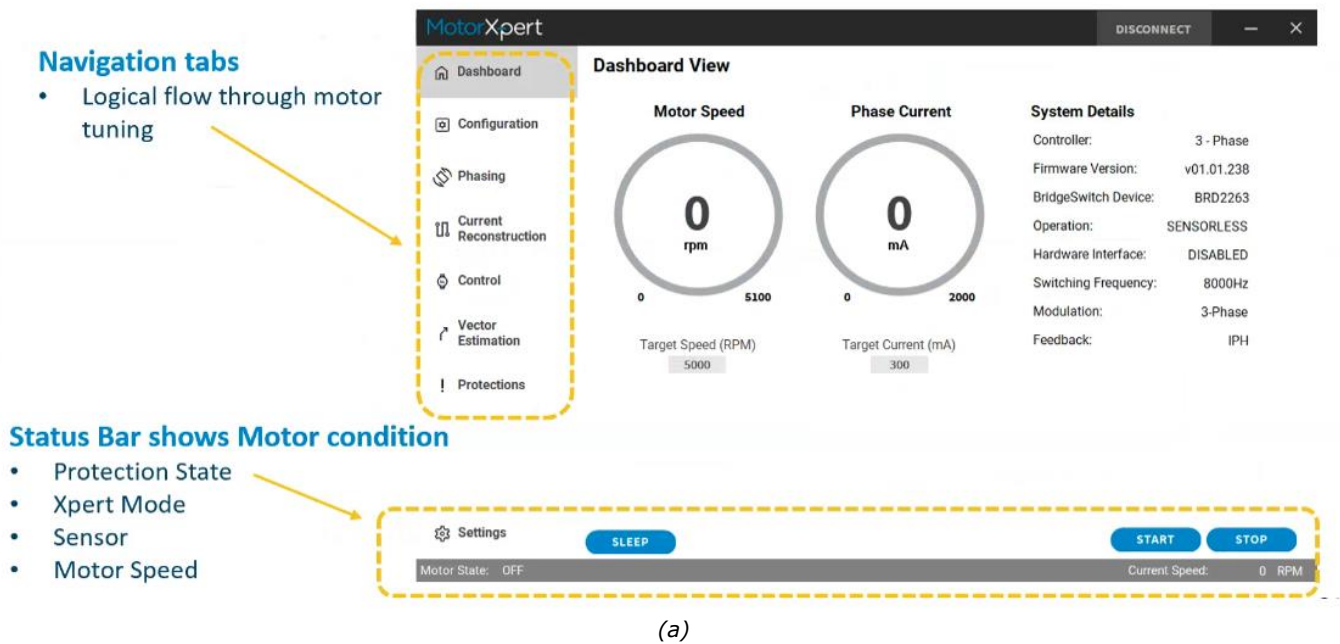


Fig. 2. When using this version of MotorXpert, users can choose between default or expert modes. The default modes will help newer motor drive designers get started (as will the new navigation tabs). Using the default modes, designers only need to specify two motor parameters. Meanwhile the expert modes will allow more experienced motor drive developers to more finely tune their designs for better performance by specifying all four motor parameters. Tool tips help designers to pick optimum parameters and provide possible predefined responses to faults that users can implement without writing code. Meanwhile, a porting guide makes it easier to port code across different MCUs.

Intuitive Interface Means Short Learning Curve



Guides Engineer Through Each Phase of Operation

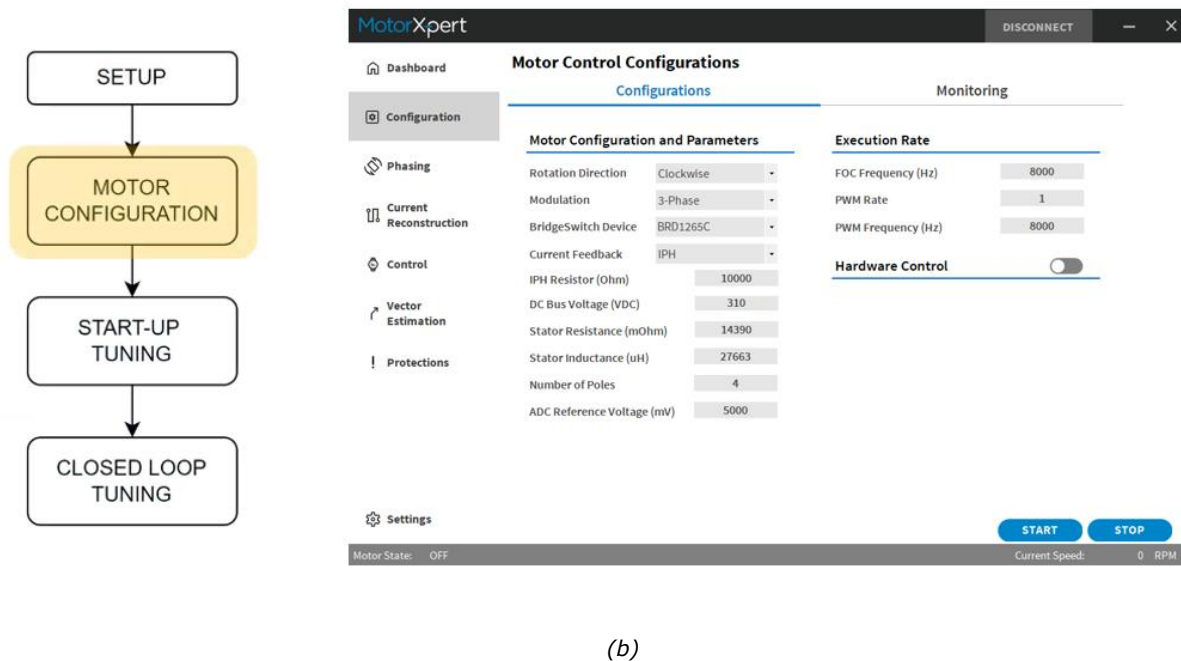


Fig. 3. A new interface allows users to read the actual motor speed and phase current (a). Meanwhile, navigation tabs guide newer motor drive developers through a logical development flow (b). As Ionescu-Catrina observes, the previous version of this interface was not so intuitive.

Motion Scope is a Virtual Oscilloscope Captures and Displays Real-Time Operation

Allows event capture

- State Transitions
- Dynamic & Steady-State Response
- Debug Information

Adjust scale and relative position

- User can adjust to optimize visualization like oscilloscope channels

Data Features

- User can export the data on the Motion Scope into a .csv file for post-processing

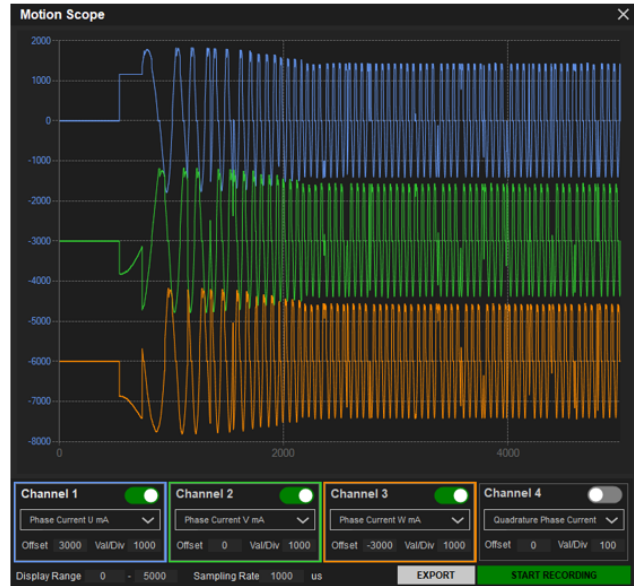


Fig. 4. Motion Scope reads BridgeSwitch signals back through the MCU. Speed, torque and motor angle can all be observed to evaluate system performance.