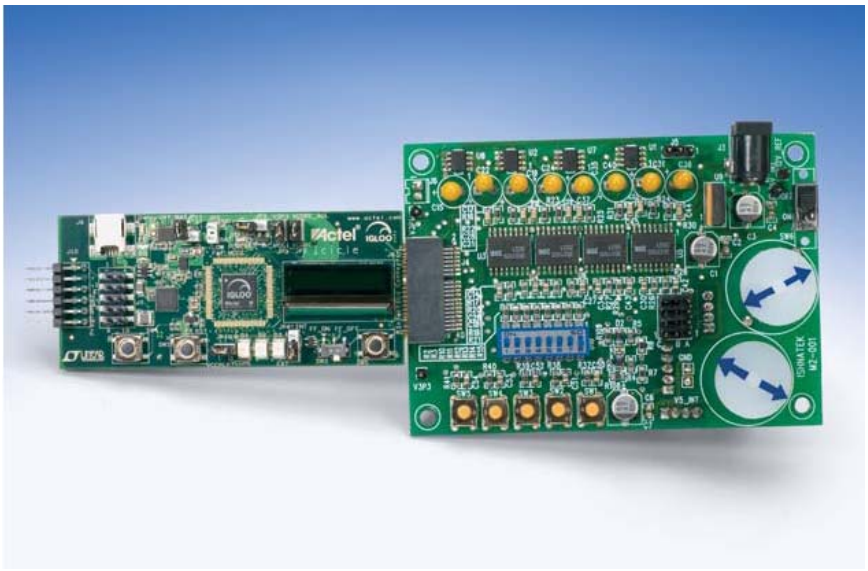
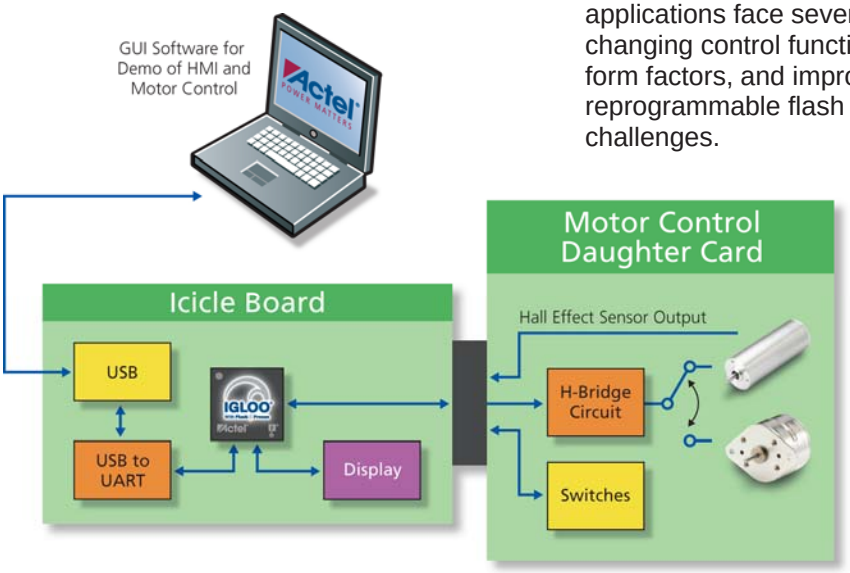
Miniature Motor Control Daughter Card for Icicle Kit

Solution Features

- Works in Conjunction with Actel's IGLOO® Icicle Kit
- Daughter Card Contains Miniature Brushless DC Motor and Stepper Motor
- Powered through USB
- Provision for Connecting External Power Supply
- GUI Software Communicates with IGLOO through USB-to-UART
- Optional Hardware Control with DIP and Toggle Switches
- Demonstrates
  - Brushless DC Motor Control
  - Stepper Motor Control
- Available from Avnet http://em.avnet.com/acteligloomotorcard
- Design Examples can be downloaded from the Actel website



Small brushed and brushless motors are used in portable devices; examples include infusion and volumetric pumps used in the medical industry and battery powered tools used in toys. Stepper motors, servo motors, and actuators are also used in many portable applications that require precise movement. Designers of portable applications face several design challenges, which include rapidly changing control functions such as miniature motor control, smaller form factors, and improved battery life. Actel's line of ultra-low-power, reprogrammable flash FPGAs provides solutions to address these challenges.



Actel flash-based FPGAs provide a multitude of advantages over standard application specific standard products (ASSP) and complex programmable logic devices (CPLD) and are an ideal choice for implementing motor control for miniature motors and other control functions on a single device.

Actel offers a demonstration platform that showcases an IGLOO device as a controller for miniature brushless DC and stepper motors.

The platform contains a miniature motor control daughtercard for Actel's Icicle Kit. The motor control daughtercard has a miniature brushless DC and stepper motor with an associated H-bridge circuit. The figure above shows the block diagram of the Icicle board and miniature motor control daughtercard. Actel provides a software program that runs on a PC to control different functions on the board. This software interfaces with the Icicle board through a USB cable.

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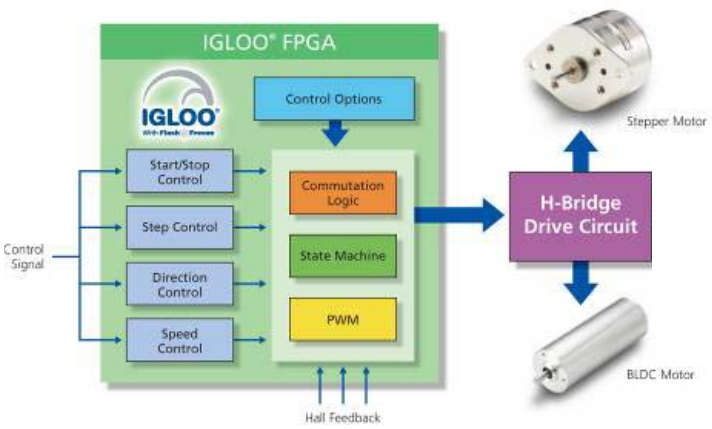

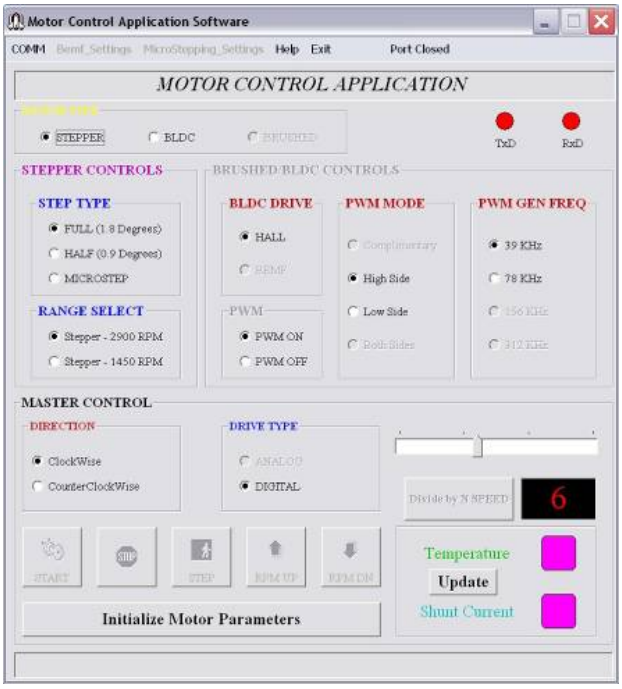

Design Example

The commutation logic within the IGLOO FPGA drives a three-phase BLDC motor and a stepper motor through an H-bridge circuit on the board. A Pulse Width Modulation (PWM) is used to control the speed of the BLDC motor, and feedback on the position of the motor is provided by the Hall effect sensors. The commutation logic controls the stepper motor through a fixed sequence of phase voltages. One winding is powered while the current in the other winding is gradually dropped to zero, reversed, and then ramped up again. The sequence and period will define the speed of commutation. A two-wire serial interface logic on the IGLOO FPGA communicates with the PC through a USB-to-UART interface chip on the Icicle board. This controls all the functions using a Graphical User Interface (GUI) software. The particular design example has been implemented with 1,924 tiles.

Software/Hardware Control and Demonstration

GUI software or a set of DIP and toggle switches can be used to perform different motor control functions on the board. The key functions that can be demonstrated are as follows:

- Start, stop, step (in case of stepper motor) control of motors
- Direction control (clockwise/counterclockwise rotation)
- RPM+/RPM- (increase/decrease RPM) using toggle buttons or slider bar
- PWM mode and frequency options for BLDC motor control

For more information regarding the miniature motor control daughter card or Actel's ultra-low-power reprogrammable flash FPGAs, please contact your local Actel sales representative.

About Ishnatek

Ishnatek offers FPGA Design and hardware prototyping services. Ishnatek offers Design and Verification Services for embedded solutions. Ishnatek also offers intellectual property such as 8031, RTC, Timers, Enhanced PWM, UART/SIO/IrDA, I2C, LED Driver and Key scan, Parallel Port, ECP/EPP, etc., which can be building blocks for your embedded controller solutions.

About Actel

Attacking power consumption from both the chip and the system levels, Actel Corporation's innovative FPGAs and Programmable System Chip (PSC) solutions enable power-efficient design.