

DS5202 – Amazingly Adaptable

dSPACE has a new board for hardware-in-the-loop simulation: the DS5202 FPGA Base Board. Its main components are a field programmable gate array (FPGA) and a piggyback module with I/O drivers that can be integrated flexibly. As these components are always tailored to specific applications, according to customers' specifications, this is an extremely flexible new development that considerably broadens the scope of potential applications for dSPACE boards. The first applications are for designing and testing hybrid systems.

Simulating electric motors requires very fast, high-resolution signal conditioning, which up to now was difficult and expensive to achieve in real-time applications. Algorithms that formerly ran on powerful dSPACE processor boards, and whose high sampling rates caused a large load on the processor, can now be shifted to the FPGA.

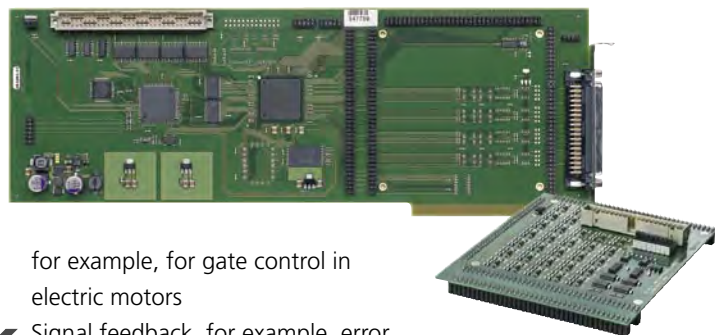
Components

The FPGA module is programmed by dSPACE for each specific application, giving users very fast, high-resolution signal conditioning that precisely fits requirements. The time resolution of the signals depends on how the FPGA is programmed. The resolution can theoretically be increased to a maximum of 280 MHz via digital frequency synthesizer (DFS). Even with complex FPGA algorithms, the typical working range is 40 ... 80 MHz. The piggyback module can be used to integrate I/O drivers flexibly and to implement special combinations of analog/digital inputs/outputs and bus drivers, for example, for a serial peripheral interface (SPI) bus system. The board is connected to the hardware-in-the-loop simulator via a PHS++ bus interface and S-functions, which dSPACE programs in Simulink on a per project basis.

Application Scenarios

The first customer projects are focusing on simulating electric motors. In one case, the DS5202 is simulating engine speed/position sensors for an electrical motor. In another application it is measuring the control signals of an IGBT (Insulated Gate Bipolar Transistor) output stage for an electrical motor. The following features are being implemented:

- Extended pulse width modulation (PWM) measurement for electric motors
- Signal conditioning during PWM evaluation,



- for example, for gate control in electric motors
- Signal feedback, for example, error signals for gate control in electric motors
- Dead time measurement between 2 IGBT control signals
- Error flag when minimum dead time not reached
- Middle-synchronous frequency measurement
- Clock rate recovery, for example, for generating a trigger synchronously with frequency measurement

- **New DS5202 FPGA Base Board**
- **Ideal for simulating electric motors**
- **Customer-specific configuration**

▲ *The DS5202 with piggyback module.*

Glossary

Digital Frequency Synthesizer (DFS) –
Generates a clock rate by multiplying or dividing an input clock rate.

Serial Peripheral Interface (SPI) –
Bus system standard for a synchronous, serial data bus that can be used to interconnect digital circuits.