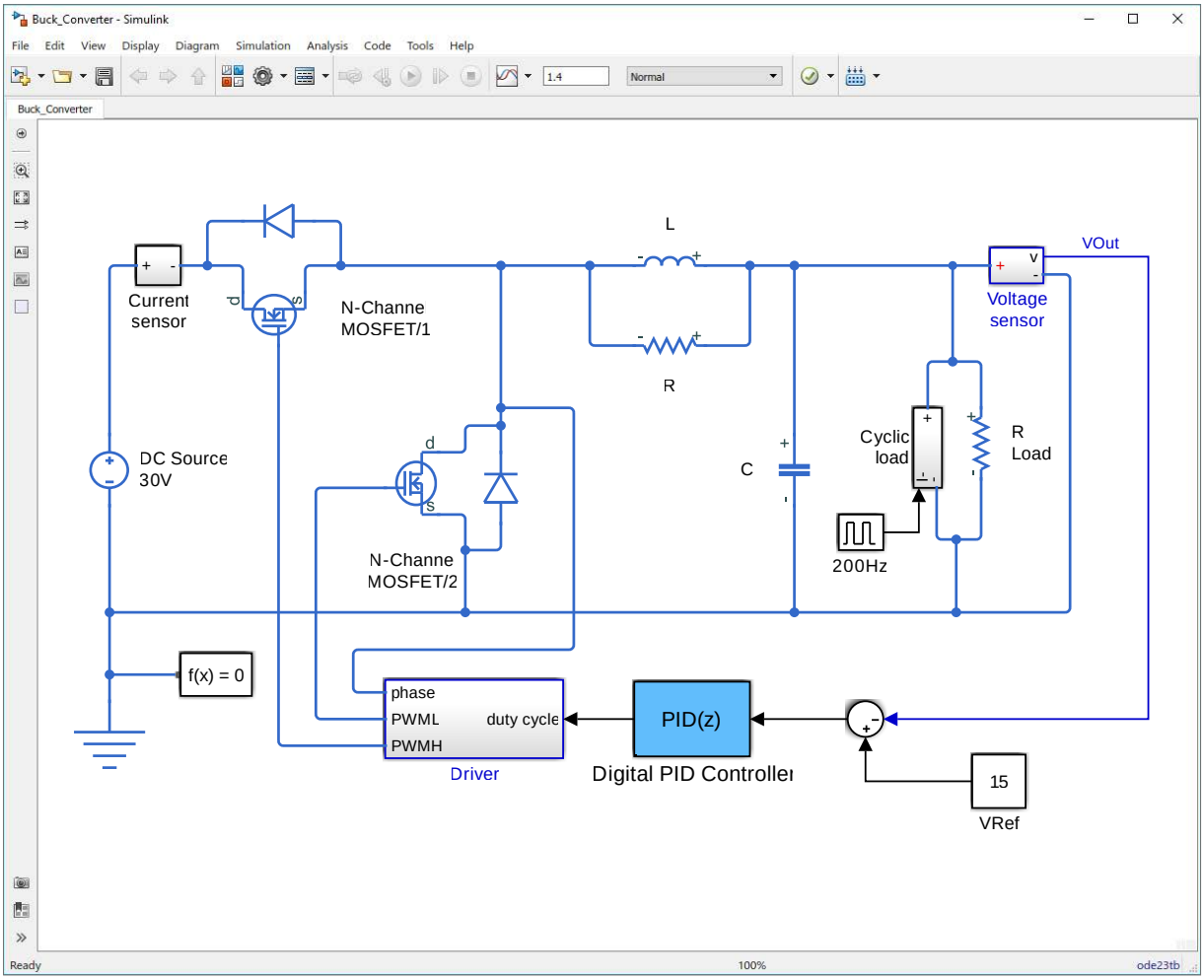
Speed Up Digital Control Development for Motors, Power Converters, and Battery Systems with Simulink

MathWorks®

speedgoat
real-time simulation and testing

Digital Control Design for Power Electronics

Simulink makes it easy to try new ideas, test them, and go to hardware without coding. It includes a deep set of tools and third-party support that let you design and simulate your power electronic controls, test them in real time, and generate code for hardware.



Use system-level models for desktop simulation, real-time simulation, and production code generation. Perform formal model and code verification across the work flow to meet industry standards including AUTOSAR, DO-178C, EN 50128, IEC 61508, IEC 62304 and ISO 26262.

Desktop Simulation

Simulate power electronics control systems on the desktop

Model power sources and loads using hundreds of prebuilt models and third-party simulation tools

- Simulink® and Simscape® electrical libraries of AC and DC components and machines
- Cosimulation with SPICE, PSCAD™, and other electrical simulation environments
- Support for importing magnetic flux linkage data from FEA motor design tools

Choose the right level of fidelity for IGBTs, MOSFETs, and other power electronics components

- Fast ideal switching
- Behavioral
- Physics-based

Develop and verify multi-level feedback and supervisory control algorithms

- Multi-rate, multi-loop feedback design
- Auto-tuning in time and frequency domains
- Fixed-point design support
- State machine support for mode control and fault handling

Real-Time Simulation and Testing

Generate C and HDL code to test digital controller models in real time

Perform real-time simulation using Simulink Real-Time and Speedgoat hardware

- Rapid control prototyping
- Hardware-in-the-loop – 1 MHz sampling using an FPGA
- Floating-point support for FPGAs for easier modeling

Production Code Generation

Generate readable, compact, and fast C and HDL code from any Simulink model

Perform software-in-the-loop (SIL) and processor-in-the-loop (PIL) simulations

- Test your model and generated code for numerical equivalence
- Observe code coverage
- Perform code execution profiling

Target leading microcontrollers, FPGAs, and SoCs

- ARM
- Infineon
- Intel/Altera
- Microchip/Atmel
- Microsemi
- NXP
- STMicroelectronics
- Texas Instruments
- Xilinx

What You Can Do with Simulink

- Try new ideas for power electronic system constructs with thousands of ready-to-use blocks for electrical, mechanical, and thermal systems
- Extend your model with thousands of proven MATLAB functions
- Build custom electrical component models with MATLAB, Simscape language, and C code integration
- Develop and test algorithms for controls, plus signal processing, state logic, and integrated analytics
- Combine discrete, continuous, synchronous, asynchronous behaviors in one model
- Profile and analyze your model by recording signals and single stepping through its execution
- Cosimulate with other electrical simulation environments using S-functions or the FMI standard
- Speed up model testing and parameter tuning using parallel simulations and local and global optimization functions

Learn More

Motor and Power Control Design with Simulink

mathworks.com/motorandpowercontrol

Trial Software

mathworks.com/motor-power-trial

Featured Topics

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- *Battery management systems*
- *Battery modeling*
- *BLDC motor control*
- *Boost converter simulation*
- *Buck converter simulation*
- *Field-oriented control*
- *Motor control design*
- *Motor modeling and simulation*
- *MPPT algorithms*
- *Power electronics simulation*
- *Pulse-width modulation*

Customer References

mathworks.com/motorandpowercontrol-references

> *"MathWorks products considerably reduced application control software development time for the new AC 800PEC controller in comparison with the controller's predecessor. The code generated from the Simulink models can be used directly in the controller, eliminating the need for a separate, costly implementation phase."*
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> — Fritz Wittwer, ABB