

SimElectronics® Release Notes

How to Contact MathWorks



www.mathworks.com
[comp.soft-sys.matlab](mailto:comp.soft-sys.matlab@mathworks.com)
www.mathworks.com/contact_TS.html

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Technical Support



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508-647-7000 (Phone)



508-647-7001 (Fax)



The MathWorks, Inc.
3 Apple Hill Drive
Natick, MA 01760-2098

For contact information about worldwide offices, see the MathWorks Web site.

SimElectronics® Release Notes

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Summary by Version

This table provides quick access to what's new in each version. For clarification, see "Using Release Notes" on page 1.

Version (Release)	New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Latest Version V1.6 (R2011a)	Yes Details	Yes Summary	Bug Reports
V1.5 (R2010b)	Yes Details	No	Bug Reports
V1.4 (R2010a)	Yes Details	Yes Summary	Bug Reports Includes fixes
V1.3 (R2009b)	Yes Details	Yes Summary	Bug Reports
V1.2 (R2009a)	Yes Details	No	Bug Reports
V1.1 (R2008b)	Yes Details	No	Bug Reports Includes fixes
V1.0 (R2008a+)	Yes Details	Not applicable	Bug Reports

Using Release Notes

Use release notes when upgrading to a newer version to learn about:

- New features
- Changes

- Potential impact on your existing files and practices

Review the release notes for other MathWorks® products required for this product (for example, MATLAB® or Simulink®). Determine if enhancements, bugs, or compatibility considerations in other products impact you.

If you are upgrading from a software version other than the most recent one, review the current release notes and all interim versions. For example, when you upgrade from V1.0 to V1.2, review the release notes for V1.1 and V1.2.

What Is in the Release Notes

New Features and Changes

- New functionality
- Changes to existing functionality

Version Compatibility Considerations

When a new feature or change introduces a reported incompatibility between versions, the **Compatibility Considerations** subsection explains the impact.

Compatibility issues reported after the product release appear under Bug Reports at the MathWorks Web site. Bug fixes can sometimes result in incompatibilities, so review the fixed bugs in Bug Reports for any compatibility impact.

Fixed Bugs and Known Problems

MathWorks offers a user-searchable Bug Reports database so you can view Bug Reports. The development team updates this database at release time and as more information becomes available. Bug Reports include provisions for any known workarounds or file replacements. Information is available for bugs existing in or fixed in Release 14SP2 or later. Information is not available for all bugs in earlier releases.

Access Bug Reports using your MathWorks Account.

Documentation on the MathWorks Web Site

Related documentation is available on mathworks.com for the latest release and for previous releases:

- Latest product documentation
- Archived documentation

Version 1.6 (R2011a) SimElectronics Software

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	Yes Summary	Bug Reports

New features and changes introduced in this version are:

- “Thermal Dependency Added to Semiconductor Blocks” on page 4
- “New Demos” on page 5

Thermal Dependency Added to Semiconductor Blocks

Dialog boxes of most of the blocks in the Semiconductors library, and some related blocks, now have a new tab, **Temperature Dependence**, which lets you specify additional parameters to model the temperature dependence during simulation. For details, see reference pages of the following blocks:

- Diode
- Light-Emitting Diode
- N-Channel IGBT
- N-Channel JFET
- N-Channel MOSFET
- NPN Bipolar Transistor
- Optocoupler
- Photodiode
- P-Channel JFET
- P-Channel MOSFET
- PNP Bipolar Transistor

Compatibility Considerations

In NPN and PNP Bipolar Transistor blocks, a new parameter, **Collector-emitter voltage at which h-parameters are defined**, has been added. It serves to increase the accuracy with which equation parameters are calculated from h-parameters, to better capture current gain dependence on temperature. As a result, when you use **Specify** from a datasheet for the **Parameterization** parameter, there is a small change in the resulting transistor gain BF (calculated from the **Forward current transfer ratio h_{fe}** parameter value), compared to the previous version of the block.

New Demos

Demos introduced in this version are:

- Torque Motor
- Schottky Barrier Diode Characteristics
- IGBT Characteristics
- Master-Slave J-K Flip-Flop

Change to an existing demo:

- The Finite Element Parameterized Solenoid demo now includes comparison with the Simscape™ solenoid demo `ssc_solenoid.mdl`, to illustrate the effects of flux saturation.

Version 1.5 (R2010b) SimElectronics Software

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	Bug Reports

New features and changes introduced in this version are:

- “New Thyristor Block” on page 6
- “New Multiplier Block” on page 6
- “Additional Exponential Diode Parameterization Options” on page 6
- “Channel Modulation Parameter Added for MOSFET Blocks” on page 7
- “Changes to the Bipolar Transistor Blocks” on page 7
- “New Demos” on page 7

New Thyristor Block

The new Thyristor block, located in the Semiconductor Devices library, represents a thyristor modeled using an NPN and a PNP transistor. The collector of each device is connected to the base of the other device so as to give the P-N-P-N junction structure of a thyristor.

New Multiplier Block

The new Multiplier block, located in the Integrated Circuits library, represents an integrated circuit multiplier for physical signals. It allows you to multiply and divide signals without switching to Simulink signals and back.

Additional Exponential Diode Parameterization Options

When using the Diode block, with the **Diode model** parameter set to **Exponential**, you now have two additional options under **Parameterization**:

- Use an I-V data point and IS — Specify measured data at a single point on the diode I-V curve in combination with the saturation current.
- Use an I-V data point and N — Specify measured data at a single point on the diode I-V curve in combination with the emission coefficient.

See the block reference page for details.

Channel Modulation Parameter Added for MOSFET Blocks

The N-Channel MOSFET and P-Channel MOSFET blocks now have an additional parameter, **Channel modulation, L**. The default value is 0 1/V. See the respective block reference pages for details.

Changes to the Bipolar Transistor Blocks

The following changes have been implemented in the NPN Bipolar Transistor and PNP Bipolar Transistor blocks:

- The **Junction Capacitance** tab has been renamed to **Capacitance**, and the two existing parameters on it have been renamed:
 - **Base-emitter capacitance** to **Base-emitter junction capacitance**
 - **Base-collector capacitance** to **Base-collector junction capacitance**
- Two new parameters have been added to the **Capacitance** tab:
 - **Total forward transit time**, representing the mean time for the minority carriers to cross the base region from the emitter to the collector
 - **Total reverse transit time**, representing the mean time for the minority carriers to cross the base region from the collector to the emitter
- Default values for ohmic resistances have been changed to $R_B = 1 \Omega$, $R_C = 0.01 \Omega$, and $R_E = 1e-4 \Omega$, to be consistent with the SPICE-compatible library.

New Demos

Demos introduced in this version are:

- Thyristor Static Behavior Validation

- Thyristor Dynamic Behavior Validation
- IC Multiplier Circuits
- Synchronous Buck Converter

Version 1.4 (R2010a) SimElectronics Software

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	Yes—Details labeled as Compatibility Considerations , below. See also Summary	Bug Reports

New features and changes introduced in this version are:

- “New Linear and Rotary Motors Defined in Terms of Flux ” on page 9
- “New Potentiometer Block” on page 9
- “Initial Conditions Tab Added for Logic Blocks” on page 10
- “Changes in Block Parameterization” on page 10
- “New Demos” on page 11
- “Functions and Function Elements Being Removed ” on page 12

New Linear and Rotary Motors Defined in Terms of Flux

Two new blocks represent models of a motor or actuator defined in terms of magnetic flux:

- FEM-Parameterized Linear Actuator block, located in the Translational Actuators library
- FEM-Parameterized Rotary Actuator block, located in the Rotational Actuators library

New Potentiometer Block

The new Potentiometer block, located in the Passive Devices library, represents a potentiometer, where the wiper position is controlled by the input physical signal.

Initial Conditions Tab Added for Logic Blocks

The dialog boxes of blocks in the Logic library now have an additional tab, Initial Conditions, which lets you specify the output initial state (low or high). See the respective block reference pages for details.

Changes in Block Parameterization

The ability to parameterize SimElectronics® blocks by importing circuit data from a SPICE netlist is no longer supported. As a result, using the `netlist2sl` function is no longer recommended. See “Parameterizing Blocks” in the *SimElectronics User’s Guide* for alternative ways of block parameterization. Additional related changes introduced in this version are:

- “Changes to the SPICE-Compatible Blocks” on page 10
- “Changes to the Solar Cell Block” on page 11
- “Compatibility Considerations” on page 11

Changes to the SPICE-Compatible Blocks

The SPICE-compatible blocks have been moved to the Additional Components library. They are organized in sublibraries according to function, for example, the SPICE-Compatible Sources library is now the Sources sublibrary of the Additional Components/SPICE-Compatible Components library. The Resistor block, renamed SPICE Resistor, and the Current-Controlled Switch and Voltage-Controlled Switch blocks have been moved to the Passive Devices sublibrary of the Additional Components/SPICE-Compatible Components library.

Some of the blocks have been renamed so that their names start with the “SPICE” prefix. The following table lists the old and new block names.

Old Name	New Name
Diode (SPICE)	SPICE Diode
NJFET	SPICE NJFET
NMOS	SPICE NMOS
NPN	SPICE NPN

Old Name	New Name
PJFET	SPICE PJFET
PMOS	SPICE PMOS
PNP	SPICE PNP
Resistor	SPICE Resistor

There are no compatibility considerations as a result of renaming the SPICE-compatible blocks and moving them to the Additional Components library. Your existing models will be updated automatically when you open and save them in the new version.

Changes to the Solar Cell Block

In previous versions, the Solar Cell block had the option of using the SPICE Environment Parameters block to set temperature. This is removed in R2010a to eliminate dependency on the SPICE sublibrary. Also, the Solar Cell model now uses the regular Diode block (exponential diode) rather than the SPICE Diode block.

Compatibility Considerations

There is an insignificant change in results, of the order of $1e-12$, in the Solar Cell block because of the diode replacement.

New Demos

Demos introduced in this version are:

- Finite Element Parameterized Solenoid
- Circuit Level Switched Capacitor ADC
- Switching Audio Power Amplifier
- Bridge Configuration Switching Audio Power Amplifier
- Differential Pair Amplifier
- Low-Noise Bipolar Transistor Voltage Amplifier
- Triangle Wave Generator

- LC Transistor Oscillator
- Voltage-Controlled Oscillator with PI Control
- Voltage Regulator
- Band-Pass Filter Using Three Mutually-Coupled Inductors
- Class-E RF Amplifier
- Diode Ring Demodulator
- LC Transmission Line and Test Bridge

Functions and Function Elements Being Removed

Function or Function Element Name	What Happens When you use the Function or Element?	Use This Instead	Compatibility Considerations
netlist2sl	Issues a warning that it is not supported and may be removed in future releases	See “Parameterizing Blocks” in the <i>SimElectronics User’s Guide</i> for alternative ways of block parameterization	See “Changes in Block Parameterization” on page 10

Version 1.3 (R2009b) SimElectronics Software

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	Yes—Details labeled as Compatibility Considerations , below. See also Summary	Bug Reports

New features and changes introduced in this version are organized by these topics:

- “Actuators & Drivers Library Blocks” on page 13
- “New Abstracted Timer Block” on page 14
- “New Demos” on page 14

Actuators & Drivers Library Blocks

New features and changes introduced in this version are:

- “New Generic Rotary Actuator Block” on page 13
- “New Generic Linear Actuator Block” on page 13
- “Improved Servomotor Block” on page 14
- “Compatibility Considerations” on page 14

New Generic Rotary Actuator Block

The Generic Rotary Actuator block models the torque-speed characteristics of a generalized rotary actuator.

New Generic Linear Actuator Block

The Generic Linear Actuator block models the force-speed characteristics of a generalized linear actuator.

Improved Servomotor Block

The Servomotor block now allows for the specification of additional parameters from within the Block Parameters dialog box.

Compatibility Considerations

During simulation, the updated Servomotor block is backwards-compatible with models defined in earlier versions of the software. However, the model generates a warning in this version because the block dialog box supports additional unit options for torque and speed data. To remove the warnings, open the block dialog box and select appropriate units for the torque and speed data.

New Abstracted Timer Block

The new Timer block, located in the Integrated Circuits library, is an abstracted behavioral model of a timer integrated circuit, such as the NE555.

New Demos

Demos introduced in this version are:

- Brushless DC Motor
- ARINC 429 Communications Link
- PNP Bipolar Transistor Characteristics

Version 1.2 (R2009a) SimElectronics Software

This table summarizes what's new in V1.2 (R2009a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	Bug Reports

New features and changes introduced in this version are organized by these topics:

- “Actuators & Drivers Library” on page 15
- “Passive Devices Library” on page 16
- “Sources Library” on page 17
- “SPICE-Compatible Semiconductors Library” on page 17

Actuators & Drivers Library

New features and changes introduced in this version are:

- “New Piezo Motor Blocks” on page 15
- “Enhanced H-Bridge Block” on page 16

New Piezo Motor Blocks

The Actuators & Drivers library now contains blocks for modeling piezoelectric travelling wave motors. The library contains these new blocks:

- The Piezo Rotary Motor models the torque-speed characteristics of a rotary piezoelectric motor.
- The Piezo Linear Motor models the force-speed characteristics of a linear piezoelectric motor.

Enhanced H-Bridge Block

The H-Bridge block now provides the option to dissipate current via two freewheeling diodes when the signal at the PWM port is low. To use this new option, select *Via two freewheeling diodes* for the *Freewheeling mode* parameter.

Passive Devices Library

New features and changes introduced in this version are:

- “New Switch Blocks” on page 16
- “New Resistor Block” on page 16
- “New Crystal Block” on page 16
- “Enhanced Variable Inductor and Variable Capacitor Blocks” on page 16

New Switch Blocks

The Passive Devices library now contains *Current-Controlled Switch* and *Voltage-Controlled Switch* blocks to model electrical switches with hysteresis.

New Resistor Block

The Passive Devices library now contains a *Resistor* block to model a resistor as a function of temperature and process data.

New Crystal Block

The Passive Devices library now contains a *Crystal* block to model the electrical characteristics of a crystal resonator.

Enhanced Variable Inductor and Variable Capacitor Blocks

The *Variable Inductor* and *Variable Capacitor* blocks have the following enhancements:

- The *Variable Inductor* block now provides two options for the relationship between the voltage across the device and the current through the inductor. The new **Equation** parameter lets you select the voltage-current equation that you want.

- The Variable Capacitor block now provides two options for the relationship between the current through the device and the voltage across the capacitor. The new **Equation** parameter lets you select the current-voltage equation that you want.

Sources Library

New features and changes introduced in this version are:

- “Enhanced Solar Cell Block” on page 17
- “New Two-Input Dependent Source Blocks” on page 17

Enhanced Solar Cell Block

The Solar Cell block has the following enhancements:

- The block now provides the option to use an 8-parameter model that includes an additional diode and a parallel resistor.
- The block now models temperature dependence.

New Two-Input Dependent Source Blocks

The SPICE-Compatible Sources library (in the Sources library) contains blocks for modeling dependent sources with two controlling inputs. The library contains these new blocks:

- PCCCS2 — Model polynomial current-controlled current source with two controlling inputs
- PCCVS2 — Model polynomial current-controlled voltage source with two controlling inputs
- PVCCS2 — Model polynomial voltage-controlled current source with two controlling inputs
- PVCVS2 — Model polynomial voltage-controlled voltage source with two controlling inputs

SPICE-Compatible Semiconductors Library

New features and changes introduced in this version are:

Enhanced NMOS and PMOS Blocks

The NMOS and PMOS blocks now provide the option to model the electrical characteristics of SPICE Level-3 MOSFET devices.

Version 1.1 (R2008b) SimElectronics Software

This table summarizes what's new in V1.1 (R2008b):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	Bug Reports

New features and changes introduced in this version are:

- “New CMOS Logic Gate Blocks” on page 19
- “New Piezo Stack Block” on page 20
- “New Relay Block” on page 20
- “New Fuse Block” on page 20
- “New NMOS and PMOS Blocks” on page 20

New CMOS Logic Gate Blocks

The Logic library (in the Integrated Circuits library) contains blocks for modeling CMOS logic gates behaviorally. The library contains these new blocks:

- CMOS AND
- CMOS Buffer
- CMOS NAND
- CMOS NOR
- CMOS NOT
- CMOS OR
- CMOS XOR

New Piezo Stack Block

The Actuators & Drivers library now contains a Piezo Stack block to model the electrical and force characteristics of a piezoelectric stacked actuator.

New Relay Block

The Passive Devices library now contains a Relay block to model the resistive and delay characteristics of a relay controlled by an external physical signal.

New Fuse Block

The Passive Devices library now contains a Fuse block to model the following fuse characteristics:

- Resistance.
- Rated current at which the fuse blows when exceeded for a specified amount of time.

New NMOS and PMOS Blocks

The SPICE-Compatible Semiconductors library (in the Semiconductor Devices library) now contains NMOS and PMOS blocks to model the electrical characteristics of SPICE Level-1 MOSFET devices.

Version 1.0 (R2008a+) SimElectronics Software

This table summarizes what's new in V1.0 (R2008a+):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	Not applicable	Bug Reports

Product Introduction

SimElectronics software is a modeling environment for the engineering design and simulation of electronic and electromechanical systems within the Simulink environment.

Version 1.0 includes these features:

- A library of electronic and electromechanical blocks that model components such as:
 - Sensors
 - Semiconductors
 - Actuators

For these blocks, you enter key parameter values directly from industry datasheets.

For more information about the available blocks, see “SimElectronics Block Libraries”.

- A function, `netlist2s1`, for creating library blocks that represent circuit data in a SPICE netlist.
- Ability to convert SimElectronics models to C code.

For more information about code generation, see “Generating Code” in the Simscape documentation.

- Access to linearization and steady-state solve capabilities in Simscape.

For more information about linearization, see “Linearizing at an Operating Point” in the Simscape documentation.

For more information about how Simscape solves models, see “How Simscape Simulation Works” in the Simscape documentation.

Compatibility Summary for SimElectronics Software

This table summarizes new features and changes that might cause incompatibilities when you upgrade from an earlier version, or when you use files on multiple versions. Details are provided in the description of the new feature or change.

Version (Release)	New Features and Changes with Version Compatibility Impact
Latest Version V1.6 (R2011a)	See the Compatibility Considerations subheading for this new feature or change: <ul style="list-style-type: none"> • “Thermal Dependency Added to Semiconductor Blocks” on page 4
V1.5 (R2010b)	None
V1.4 (R2010a)	See the Compatibility Considerations subheading for this new feature or change: <ul style="list-style-type: none"> • “Changes in Block Parameterization” on page 10
V1.3 (R2009b)	See the Compatibility Considerations subheading for this new feature or change: <ul style="list-style-type: none"> • “Actuators & Drivers Library Blocks” on page 13
V1.2 (R2009a)	None
V1.1 (R2008b)	None
V1.0 (R2008a+)	None