

What's New with LTspice IV?

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New Blog Video: "LTspice: SOAtherm Tutorial" by Dan Eddleman
www.linear.com/solutions/5445

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BLOG BY ENGINEERS, FOR ENGINEERS

Check out the LTspice blog (www.linear.com/solutions/LTspice) for tech news, insider tips and interesting points of view regarding LTspice.

New Video: "LTspice: SOAtherm Tutorial" by Dan Eddleman
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This video shows how to use the new SOAtherm models distributed with LTspice. SOAtherm models can be used to verify that the MOSFET maximum die temperature is not exceeded, even in the Spirito region, where allowable current falls off exponentially at high drain-to-source voltages. SOAtherm reports the temperature of the hottest point on the MOSFET die; SOAtherm models do not influence the electrical behavior of the circuit simulation.

What is LTspice IV?

LTspice® IV is a high performance SPICE simulator, schematic capture and waveform viewer designed to speed the process of power supply design. LTspice IV adds enhancements and models to SPICE, significantly reducing simulation time compared to typical SPICE simulators, allowing one to view waveforms for most switching regulators in minutes compared to hours for other SPICE simulators.

LTspice IV is available free from Linear Technology at www.linear.com/LTspice. Included in the download is a complete working version of LTspice IV, macro models for Linear Technology's power products, over 200 op amp models, as well as models for resistors, transistors and MOSFETs.

SELECTED DEMO CIRCUITS

For a complete list of example simulations utilizing Linear Technology's devices, please visit www.linear.com/democircuits.

Buck Regulators

- **LT8302:** Negative to negative buck converter (–18 to –42V, –12V 1.8A) www.linear.com/LT8302
- **LT6110/LT3976:** Buck regulator with cable/wire voltage drop compensation (5V–40V to 3.3V at 5A) www.linear.com/LT6110
- **LTC3639:** High efficiency, 150V synchronous buck converter (4V–150V to 3.3V at 100mA) www.linear.com/LTC3639
- **LTC3774:** High efficiency 2-phase buck converter with discrete MOSFET drivers (7V–14V to 1.2V at 60A) www.linear.com/LTC3774
- **LTC3838-1:** High current, dual output synchronous buck converter (4.5V–14V to 1.5V & 1.2V at 20A) www.linear.com/LTC3838-1
- **LTC3869:** high efficiency dual 1.5V/1.2V buck converter using DCR current sensing (4.5V–14V to 1.5V & 1.2V at 15A) www.linear.com/LTC3869
- **LTM4634:** Triple 5A/5A/4A μ Module buck regulator (4.8V–28V to 1.0V, 3.3V at 5A & 12.0V at 4A) www.linear.com/LTM4634
- **LTM4639:** High efficiency 20A μ Module buck regulator (2.4V–7V to 1.2V at 20A) www.linear.com/LTM4639

Boost Regulators

- **LT3048-15:** Low noise bias voltage generator from single cell Li-ion battery (2.7V–4.8V to 15V at 24mA) www.linear.com/LT3048-15
- **LTC3872:** High efficiency 5V input, 24V output boost converter (3V–9.8V to 24V at 1A) www.linear.com/LTC3872

Buck-Boost Converter

- **LT8302:** Negative to positive buck-boost converter (–4 to –42V V_{IN} to 12V V_{OUT} at 1.3A) www.linear.com/LT8302

Isolated Converters

- **LT8310:** 72W isolated nonsynchronous forward converter with opto feedback (36V–72V to 12V at 6A) www.linear.com/LT8310
- **LTM8058:** Series-connected low noise isolated μ Module regulators (5V–28V to 10V at 300mA) www.linear.com/LTM8058

SCAP Charger

- **LTC3625:** Solar powered SCAP charger with MPPT www.linear.com/LTC3625

Hot Swap Controller

- **LTC4226:** Dual 12V, 7.6A dual ideal diode and Hot Swap controller www.linear.com/LTC4226
- **LTC4232:** 12V, 5A Hot Swap controller with auto-retry www.linear.com/LTC4232

VOLTAGE CONTROLLED SWITCHES

LTspice includes a large number of excellent FET models, but sometimes you need to simulate a simple switch that opens and closes at specific times or under certain conditions.

To insert and configure a switch in LTspice... (This example is available in LTspice at \LTspice\examples\Educational\Vswitch.asc)

1. Insert the symbol for the voltage-controlled switch in your schematic (press F2 and type "sw" in the search field of the symbol library).

2. Insert a SPICE directive (press S) and define the SW model's parameters using this example:

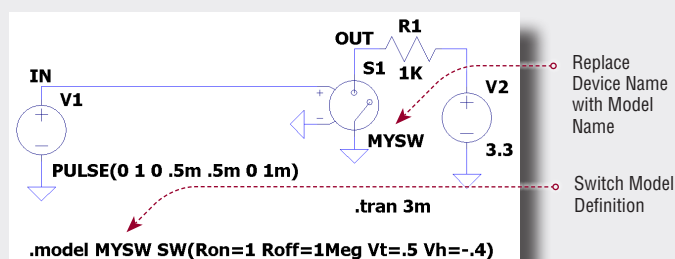
```
.model MYSW SW(Ron=1 Roff=1Meg Vt=.5 Vh=-.4)
```

where "MYSW" is the unique model name, Ron and Roff are the on and off resistances and Vt and Vh are the trip and hysteresis voltages. The switch trips at $(V_t - V_h)$ and $(V_t + V_h)$.

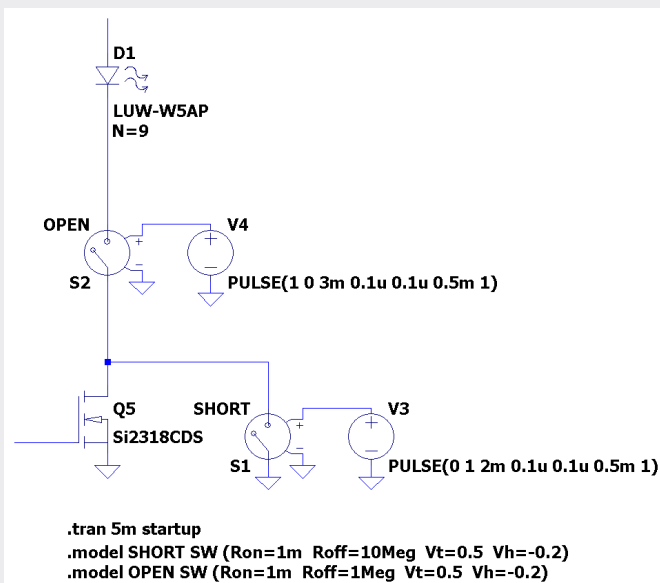
LTspice Help (press F1) contains more about the SW model parameters.

3. Assign the MYSW model to the switch symbol S1: right-click "SW" and enter the unique model name, "MYSW".

4. Control the switch with a voltage source connected to the positive terminal of the switch and ground the negative terminal. In this example a PULSE function source is used to generate a 0V–1V triangle waveform with a 1ms period.



One classic application of voltage-controlled switches is simulating open-circuit and short-circuit conditions. In the example shown, two switches simulate a short- and open-circuit condition on an LED string.



Happy simulations!

Power User Tip

SELECT MODELS

To search the LTspice library for a particular device model, choose Component from the Edit menu or press F2. LTspice is updated often with new models, so be sure to keep your installation of LTspice current by choosing Sync Release from the Tools menu. LTspice's changelog.txt file (in the root installation directory) lists the LTspice revision history.

Buck Regulators

- **LTC3637:** 76V, 1A step-down regulator www.linear.com/LTC3637
- **LTM4639:** Low V_{IN} 20A DC/DC μ Module step-down regulator www.linear.com/LTM4639

Boost Regulators

- **LTC3124:** 15V, 5A 2-phase synchronous step-up DC/DC converter with output disconnect www.linear.com/LTC3124

Buck-Boost Regulators

- **LT3790:** 60V synchronous 4-switch buck-boost controller www.linear.com/LT3790

Forward Controllers

- **LT3752-1:** Active clamp synchronous forward controllers with internal housekeeping controller www.linear.com/LT3752

Battery Management/Chargers

- **LT8584:** 2.5A monolithic active cell balancer with telemetry interface www.linear.com/LT8584

- **LTC4054-4.2:** Standalone linear Li-ion battery charger with thermal regulation www.linear.com/LTC4054-4.2
- **LTC4079:** 60V, 250mA linear charger with low quiescent current www.linear.com/LTC4079

Precision Amplifiers

- **LT6017:** Quad 3.2MHz, 0.8V/ μ s low power, Over-The-Top® precision op amp www.linear.com/LT6017
- **LTC6268/LTC6269:** Single/dual 500MHz ultralow bias current FET input op amp www.linear.com/LTC6268

High Speed Comparators

- **LT6752:** 280MHz, 2.9ns comparator family with rail-to-rail inputs and CMOS outputs www.linear.com/LTC6752 ■