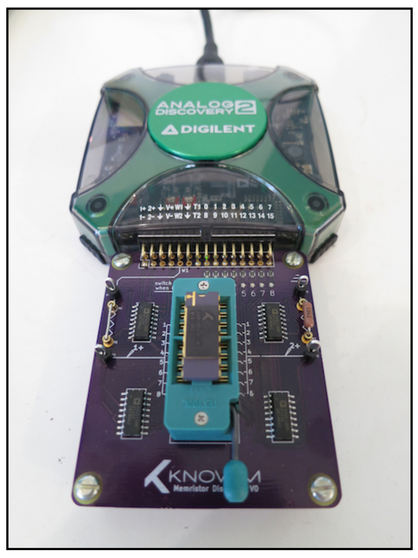
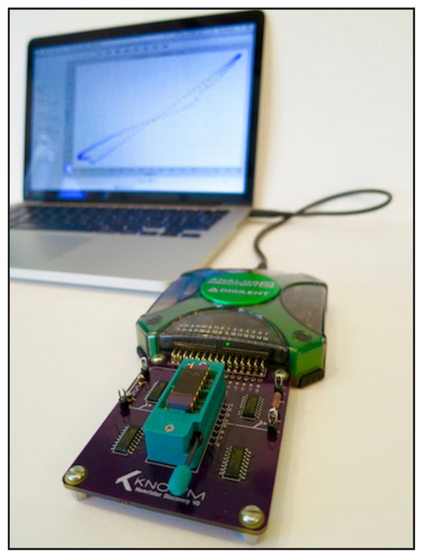
Memristor-Discovery

Memristor Device Fundamentals with Knowm Memristor Discovery Educational Kit

Introduction





Memristor Discovery is a low-cost solution for exploring memristor behavior. The board plugs into the Digilent Analog Discovery 2 USB Oscilloscope. Digital IO channels 0-7 activate analog switches that couple memristors to the AD2 waveform generator and two oscilloscope channels. Easy access test-points and sockets allow for convenient coupling of the circuit to additional measurement equipment and bread-boards. An optional lever-actuated 3M DIP socket provides zero insertion force to prevent handling damage of chip pins.

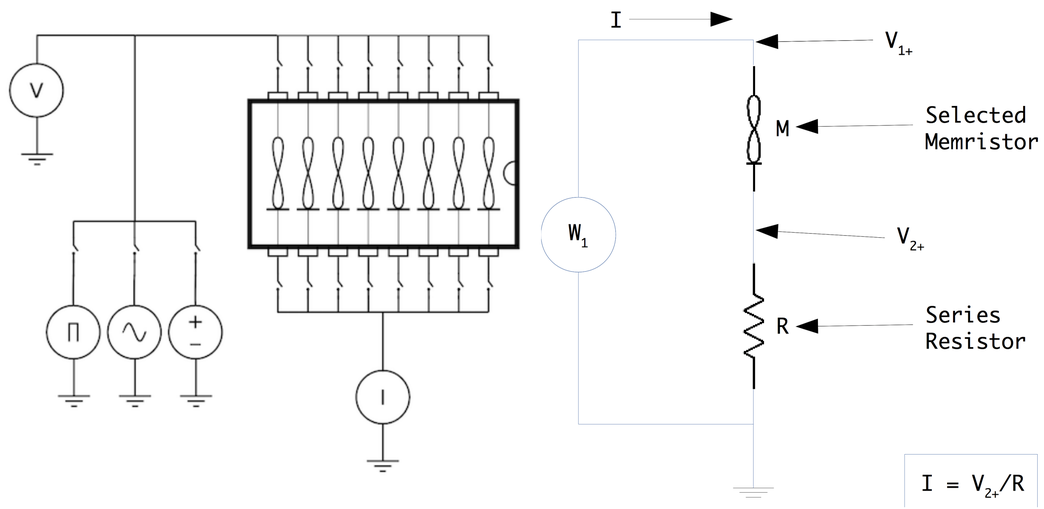
http://knowm.org/product/memristor-discovery

Circuit

The Memristor Discovery board is designed to plug into the Digilent AD2 USB oscilloscope and accept a Knowm 16-pin DIP socket memristor chip. The board couples individual memristors in series with a resistor (used as a current meter) via analog switches. Individual switch access, via the digital I/O channels, allow for single or parallel coupling of memristor devices.

The main connections are:

1. Arbitrary Waveform Generator W_1 (Analog Discovery 2's "W_1" and "gnd" connectors) is connected across the memristor (M) and series resistor (R).
2. Oscilloscope Probe V_{1+} (Analog Discovery 2's "1+" and "1-" connectors) is connected across the memristor (M) and series resistor (R).
3. Oscilloscope Probe V_{2+} (Analog Discovery 2's "2+" and "2-" connectors) is connected across the series resistor (R).



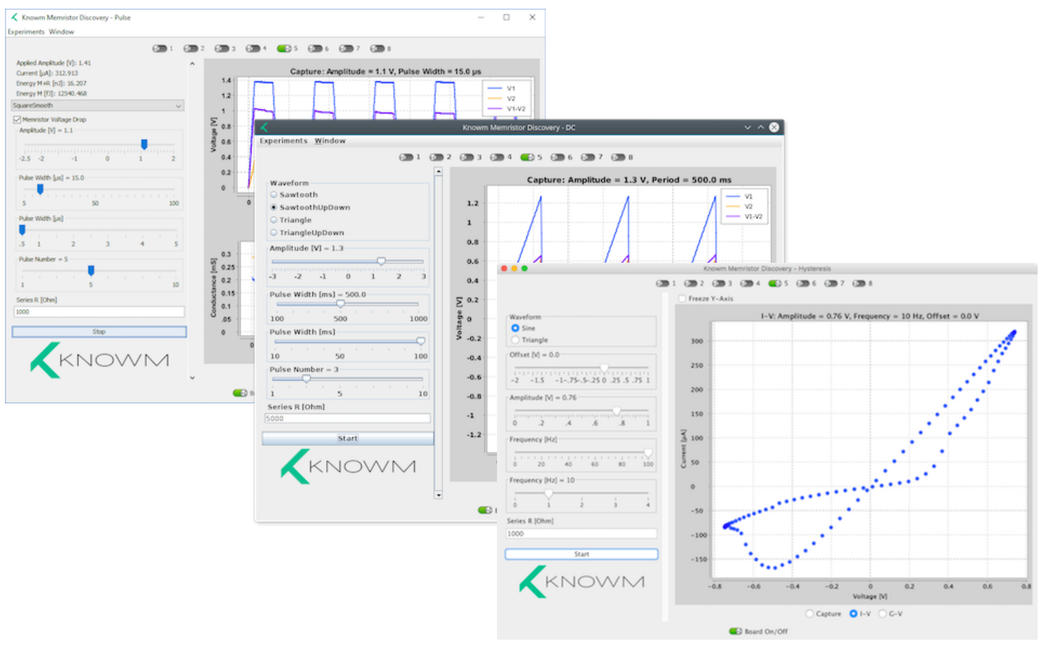
Fall 2017 ECE 497

Boise State University is offering a memristor device characterization laboratory this fall, ECE 497/597 *Memristor Device Fundamentals and Characterization*. In this laboratory course, students will get a hands-on introduction to memristor devices through a series of electrical characterization experiments using Boise State fabricated memristors and the Knowm USB controlled Memristor Discovery board. Measurements will include switching behavior, hysteresis, programmable conductance, voltage-dependent incremental responses, and more. This course will be offered during the fall 2017 semester on Fridays from 12:00 to 3:00 PM.

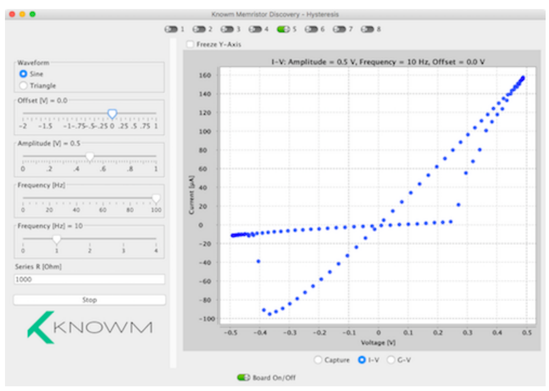
Software

The Memristor-Discovery Application is 100% open-source licensed under the GPL-3 license and hosted on github. Updates to the app will always be free and you can customized the app however you need to. If you need to add new functionality or automate some memristor data-collection experiment, no problem. And it will run on **Windows 10, Linux and MacOS**.

https://github.com/knowm/memristor-discovery



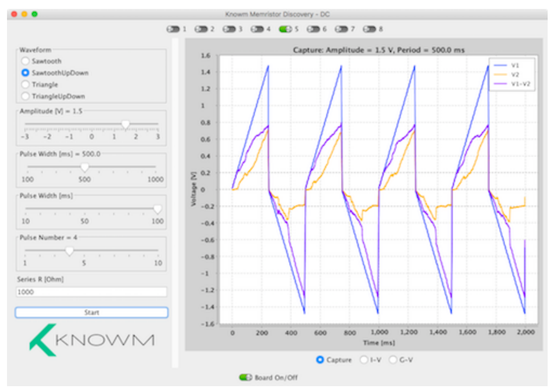
Hysteresis



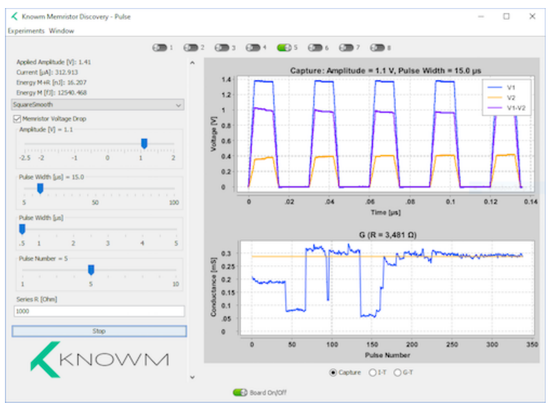
This experiment allows you to drive a memristor in series with a resistor with a sinusoidal or triangle waveform and observe the response as either a time series (V_{1+}/T and V_{2+}/T), I/V or G/V plot, revealing the signature hysteresis behavior of the memristor.

DC

This experiment allows you to drive a memristor in series with a resistor with various ramping functions including sawtooth and triangle. The number of applied ramping signals can be chosen and the response can be observed as either a time series (V_{1+}/T and V_{2+}/T), I/V or G/V plot, revealing the DC behavior of the memristor.



Pulse



This experiment allows you to drive a memristor in series with a resistor with one or more pulse waveforms including square, square-smooth, quarter-sine, triangle and half-sine and observe the dynamic response as either a time series (V_{1+}/T and V_{2+}/T), I-T or G-T plot, revealing the incremental conductance behavior of the memristor. A second plot shows the conductance as measured by a 0.1 V 10 µs read pulse at a 0.5 second interval.

Knowm Inc., Santa Fe, USA
Contact: tim@knowm.org
Web: http://knowm.org