

6.002 Demo# 01 (Load set up Demo#01.set stored in scope)

i-v characteristic of various components

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Fall 00 Lecture 1

Purpose:

This demonstration shows the i-v characteristics of several components, showing both ideal behavior and real limitations. It has been used in the context of an introduction to circuit theory, with particular emphasis on the abstractions made to result in linear, lumped circuits. Simple i-v characteristics of a variety of components that respond to electrical stimuli, non-electrical stimuli, or that produce interesting non-electrical behavior (light, smoke) are shown. The goal is to display to the student the abstractions made for simplicity of analysis, what those abstractions ignore, and when they can break down.

For fun, a high voltage is also applied across a pickled cucumber (it begins to glow and emit a distinctive stink) to show that components can be modeled as lumped elements in so far as their i-v characteristics are concerned. All other behavior, interesting or otherwise, is not modeled.

Also for fun, a high voltage is applied across a small resistor – the resistor sputters and blows up with an audible crack. This to show that in practical systems, abstractions only go so far. The simple R model, for example, does not model power dissipation limits.

Description: Lumped abstraction, relationship to physics, KVL, KCL

**CONNECT EXT1 (BLE) to INPUT OF THE BOX
EXT2 (RED) to OUTPUT OF THE BOX (Using 1 K Resistor)**

For NEG. RESISTANCE, Set switch to Neg. Resistor/Bulb

**For BULB, Set switch to Bulb and change the output resistor to 50 Ohm
Change freq to .1 Hz on FG1 and go to File Load Setup click on 1A**

**Note: Also we have for the first class the “ Burning Cucumber” and also the “ Burning Resistors ”
Use resistors in parallel for more actions.
See schematic on the next page for more detail**

Note: Current is on the Vertical X and Voltage is on the Horizontal X

Oscilloscope Setup

CH	V/DIV	OFFSET	MODE	FUNC	MATH	VERTICAL		HORIZONTAL	
1	off	2	0	DC	off	CH4 ÷ 1k			
2	off				off	CH1 – CH4			
3	off			on	F1 vs F2	2m	0	2	0
4	off	2	0	DC	off				
Horizontal:		2m	Acquisition: AUTO		AUTO	4	Trigger:		CH1

Waveform Generator Setup

Power Supply Setup

UNIT	WAVE	AMP	OFFSET	FREQ	+6	+25	-25	OUTPUT
Fg1 On	SIN	10	0	100				off

Trigger: INT

I-V Characteristic of Various Elements

