



ELM701

Solid State Mouse

Description

The ELM701 is a fun circuit for creating mouse-like noises. Its very low current consumption makes it an ideal candidate for battery-powered toys and novelty items.

All of the logic required for circuit operation is contained within this 8 pin integrated circuit. Normally only a battery, a piezo element, and a single resistor are all that are needed for a complete circuit, although an on/off switch may be desirable.

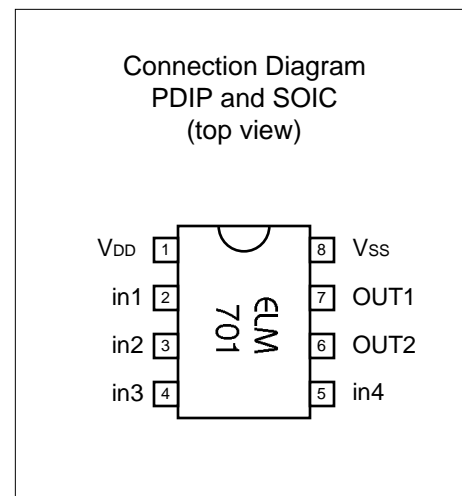
The ELM701 uses pseudo-random number generators to produce from one to four 'chirps' at random intervals of up to about eight seconds. This makes the noises seem more like a real (but fairly active) rodent. Between these series of chirps, the circuit reverts to low power mode in order to conserve battery energy.

Applications

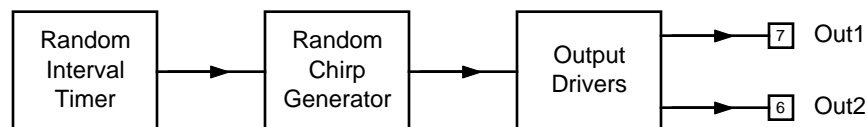
- Mousetrap bait
- Unique power on warning
- Voicing for toys
- Coffee machine or office desk item
- A fun plaything

Features

- Low power CMOS design
- Wide supply range - 3.0 to 5.5 volt operation
- Low power mode between chirps saves batteries
- Pseudo-random intervals for more realistic sounds
- Push-pull piezo drive eliminates the need for an external capacitor while providing high volume
- Only one external resistor required



Block Diagram





Pin Descriptions

V_{DD} (pin 1)

This pin is the positive supply pin, and should always be the most positive point in the circuit. Internal circuitry connected to this pin is used to provide power on reset of the microprocessor, so an external reset signal is not required. Refer to the Electrical Characteristics section for further information.

in1, in2, in3, and in4
(pins 2, 3, 4, and 5 respectively)

These are CMOS input pins that are not used in this design. Due to the nature of CMOS circuitry, however, they can cause severe overheating, and battery consumption is left floating. For this reason all four of these pins must be connected to either V_{SS} or V_{DD}.

OUT1 and OUT2 (pins 6 and 7)

These are the actual output piezo drive pins. Polarity is not important for either the piezo element or for the ELM701, but there must be a series resistor installed in one of the connections. This resistor both limits the volume of the sound produced, and also limits the piezo current on energization. (the piezo element appears as a relatively large capacitive load, so requires a means to limit the charging current). See the Electrical Characteristics for resistor sizes.

V_{SS} (pin 8)

Circuit common is connected to this pin. This is the most negative point in the circuit.

Ordering Information

These integrated circuits are available in either the 300 mil plastic DIP format, or in the 200 mil SOIC surface mount type of package. To order, add the appropriate suffix to the part number:

300 mil Plastic DIP..... ELM701P 200 mil SOIC..... ELM701SM

Absolute Maximum Ratings

- Storage Temperature..... -65°C to +150°C
- Ambient Temperature with Power Applied..... -40°C to +85°C
- Voltage on V_{DD} with respect to V_{SS}..... 0 to +7.5V
- Voltage on any other pin with respect to V_{SS}..... -0.6V to (V_{DD} + 0.6V)

Note:

Stresses beyond those listed here will likely damage the device. These values are given as a design guideline only. The ability to operate to these levels is neither inferred nor recommended.

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Electrical Characteristics

All values are for operation at 25°C and a 3V supply, unless otherwise noted. For further information, refer to note 1 below.

Characteristic	Minimum	Typical	Maximum	Units	Conditions
Supply Voltage, V_{DD}	3.0	3.0	5.5	V	
V_{DD} rate of rise	0.05			V/ms	see note 2
Average Supply Current, I_{DD}		0.60 2	2.0 14	mA μ A	During operation, see note 3 Between chirps
Output Series Resistance	470	4700		Ω	see note 4

Notes:

1. This integrated circuit is produced with a Microchip Technology Inc.'s PIC12C5XX as the core embedded microcontroller. For further device specifications, and possibly clarification of those given, please refer to the appropriate Microchip documentation.
2. This spec must be met in order to ensure that a correct power on reset occurs. It is quite easily achieved using most common types of supplies, but may be violated if one uses a slowly varying supply voltage, as may be obtained through direct connection to solar cells, or some charge pump circuits.
3. Internal integrated circuit current only. This does not include the piezo element currents.
4. A series resistor must be used to limit the current peaks due to the relatively large capacitance (~50nF) of a piezo element. Maximum size is determined by the desired volume level.

Example Application

The ELM701 is usually connected as shown at the right. Pins 2 to 5 are simply connected to the nearest supply pin so that they aren't left floating, and a series resistor is connected in line with one of the piezo connections.

For a permanent type of installation, it would be a good idea to also connect a switch in series with one of the battery leads. Although the chip has a lot of initial appeal, you will probably want to be able to disable it after a while. Making the batteries accessible for easy removal is another method that could be used.

