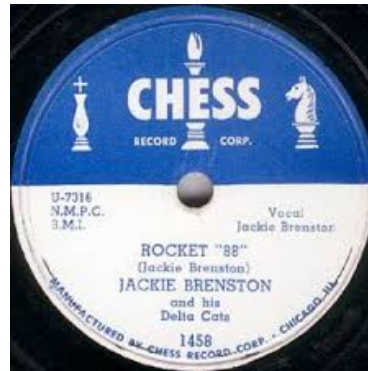


# Build Your Own Fuzz Face

Guitar Pedal Workshop

# History of Distorted Guitar

- Early distortion: mechanical
  - First commercial example: *Rocket 88* 1951



- Speaker abuse: Link Wray *Rumble* 1958



# A Trend Setting Fault

- 1961 Marty Robbins *Don't Worry*

- Blown channel on console
- Becomes a big crossover hit
- Everyone asks for “that sound”



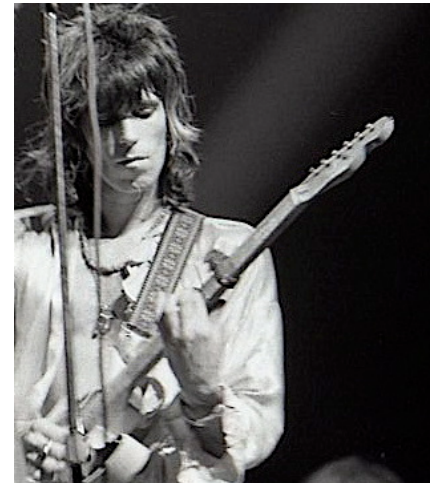
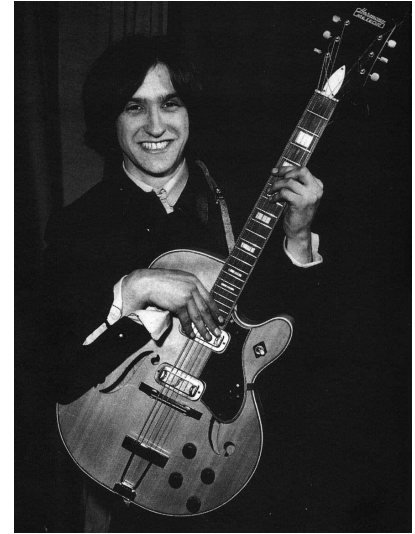
- Maestro Fuzz-Tone

- Engineer Glen Snoddy reverse engineers bad channel
- Gibson sells Snoddy's design as Maestro Fuzz-Tone in 1962



# A few more...

- 1964: The Kinks *You Really Got Me*
  - Dave Davies cuts slits in his speaker
- 1965: Rolling Stones *(I Can't Get No) Satisfaction*
  - Keith Richards used Maestro Fuzz-Tone



# 1966: The Arbiter Fuzz Face



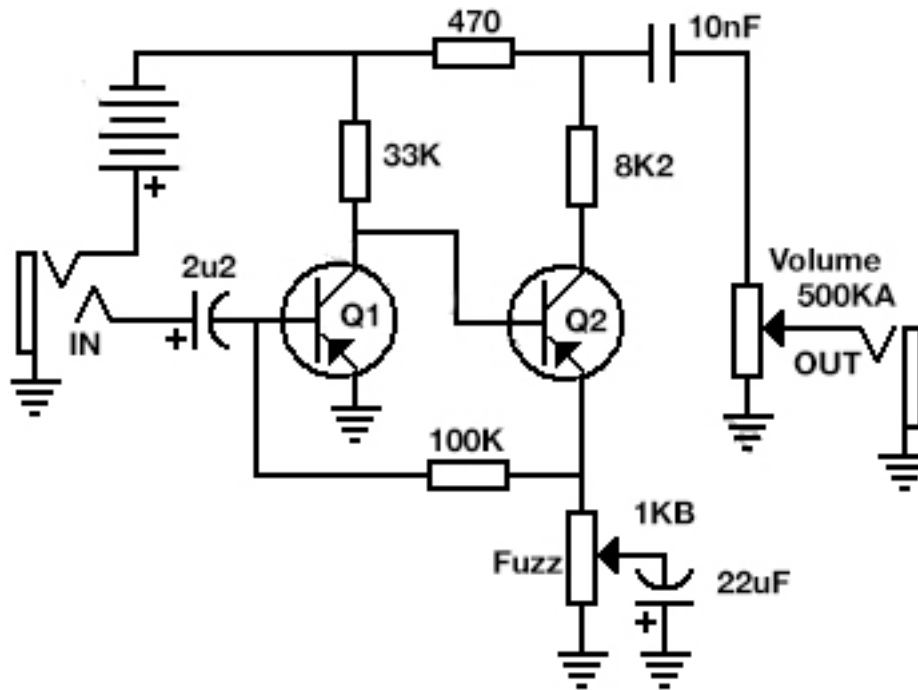
- Designed by Ivor Arbiter in London as a simpler, lower budget Maestro.
- Used Germanium transistors
- No two sounded the same until the switch to silicon transistors
  - Temperature sensitive
  - Wide component variances
- Current silicon version sold by Dunlop

# Jimi Hendrix



# The Fuzz Face Circuit

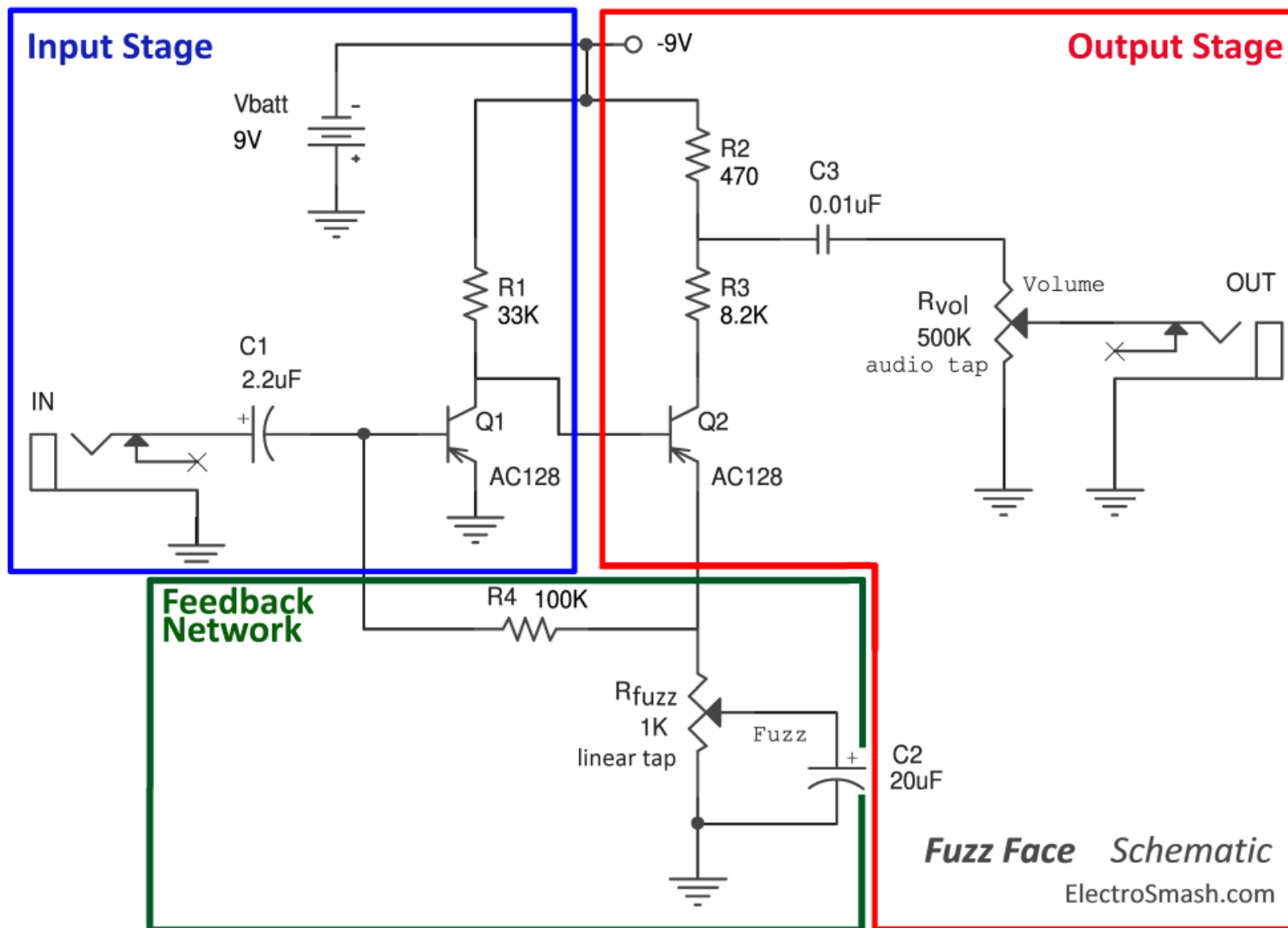
## Original Ge PNP Fuzz Face



# Original PNP FuzzFace

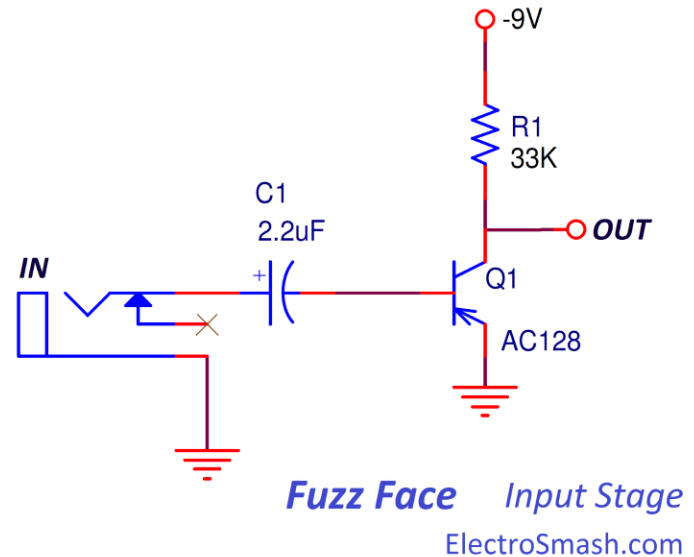
- Germanium transistors
  - Temperature sensitive
  - Leaky
  - “Softer” sound (some say more tube-like)
  - Wide gain variance with one model
- Positive ground circuit
  - No power input...battery only
  - NPN Ge transistors rare and expensive





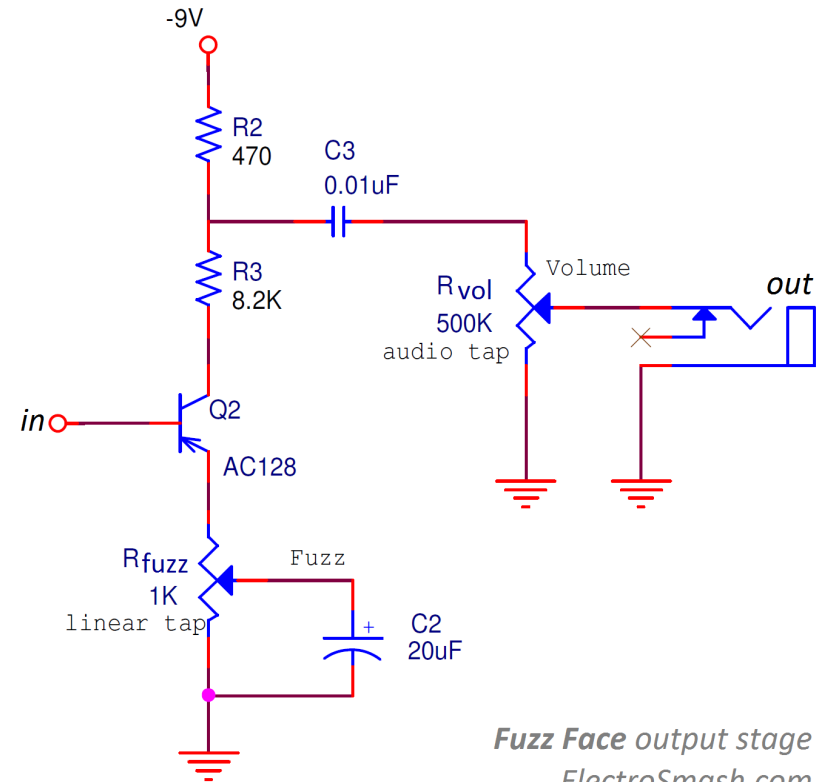
# Input Stage

- Common emitter amplifier
  - Base is input, collector out
  - Emitter is common to both
  - C1 is a DC blocking cap
  - R1 sets collector current
  - Input impedance is between 5-8K
    - Close to average guitar impedance of about 10K
    - Varies based on fuzz pot setting
  - Gain should be 49dB, but limited by feedback network to about 18dB



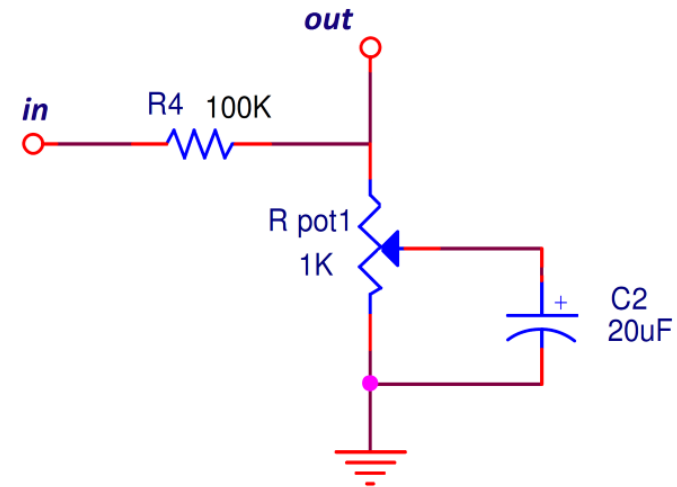
# Output Stage

- Also a common emitter amp
- Difference from input is the feedback stage
- Output impedance is about 500 Ohms
  - Not ideal



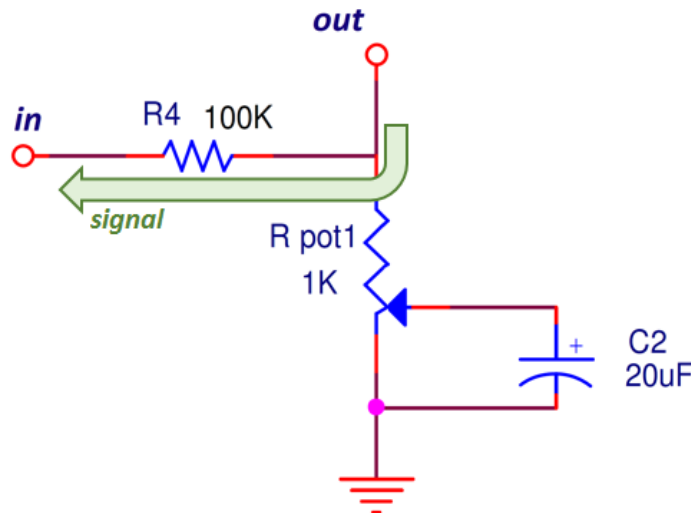
# Feedback Network

- Desensitizes gain & makes it constant
- Reduces noise (rejects unwanted signals)
- Affects input impedance

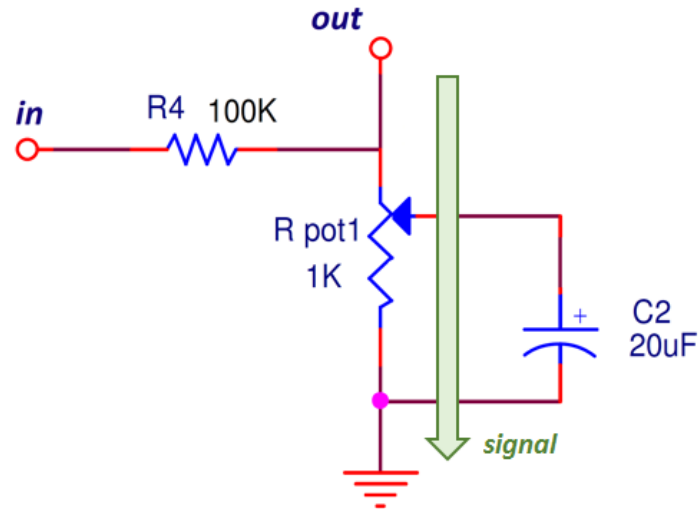


*Fuzz Face feedback network* ElectroSmash.com

# Feedback Network



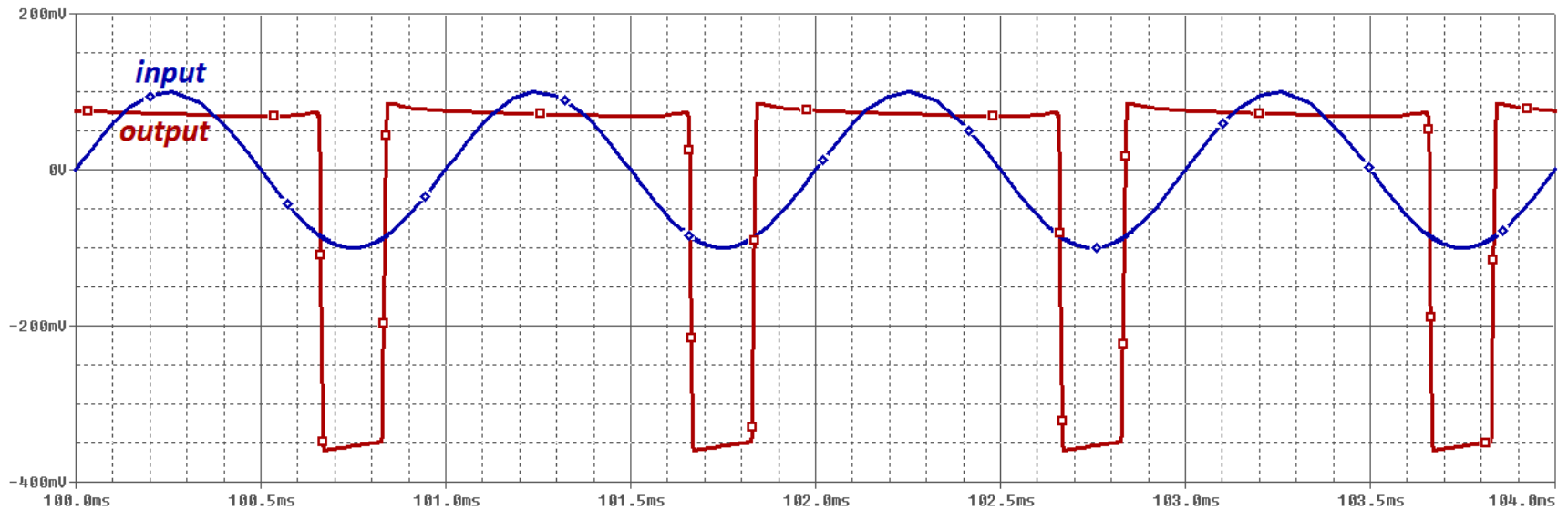
*max feedback = min gain*



*min feedback = max gain*

- Fuzz at minimum
  - Large amount of signal fed back to input, reducing gain with a feedback loop
- Turn up fuzz
  - Gain increases as signal is shunted to ground

# What does the signal look like?



Fuzz Face output signal max gain ElectroSmash.com

RIGOL

T'D

H 200us

1.00GSa/s  
24.0M pts

D

0.00000000ps

T

1 -76.0mV

Horizontal



Period



Freq



Rise Time



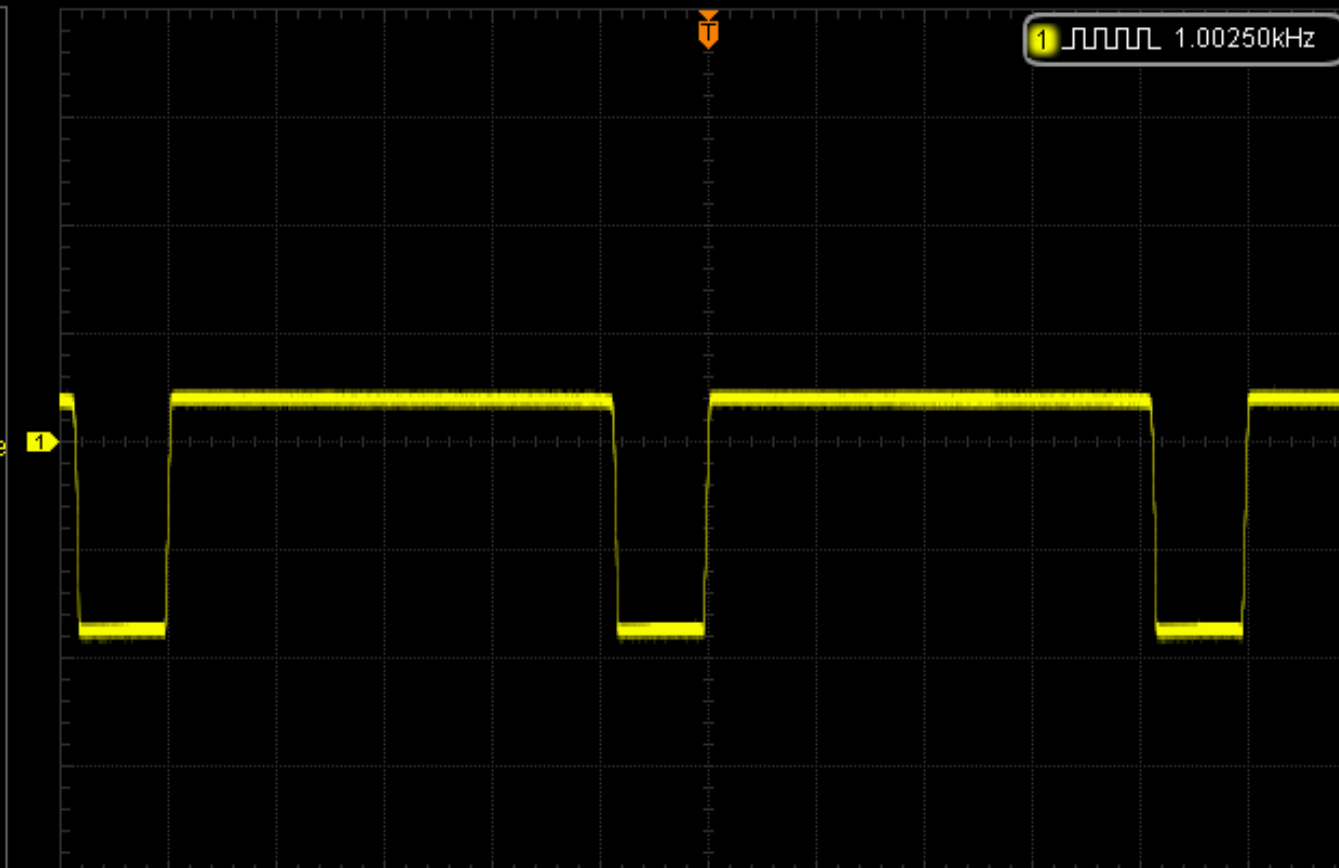
Fall Time



+Width



-Width



Rise<10.00us

Vpp=472mV

1 1.00250kHz

Utility

IO Setting

Sound



Language

English

Pass/Fail

Record

System

1

200mV

2

200mV

3

1.00 V

4

1.00 V



**RIGOL**

T'D

H 200us

1.00GSa/s  
24.0M pts



D

0.00000000ps

T

1 -76.0mV

Horizontal



Period



Freq



Rise Time



Fall Time



+Width



-Width



Rise=296.0us

Vpp=880mV

1

= 200mV

2

= 200mV

3

= 1.00 V

4

= 1.00 V

Utility

IO Setting

Sound



Language

English

Pass/Fail

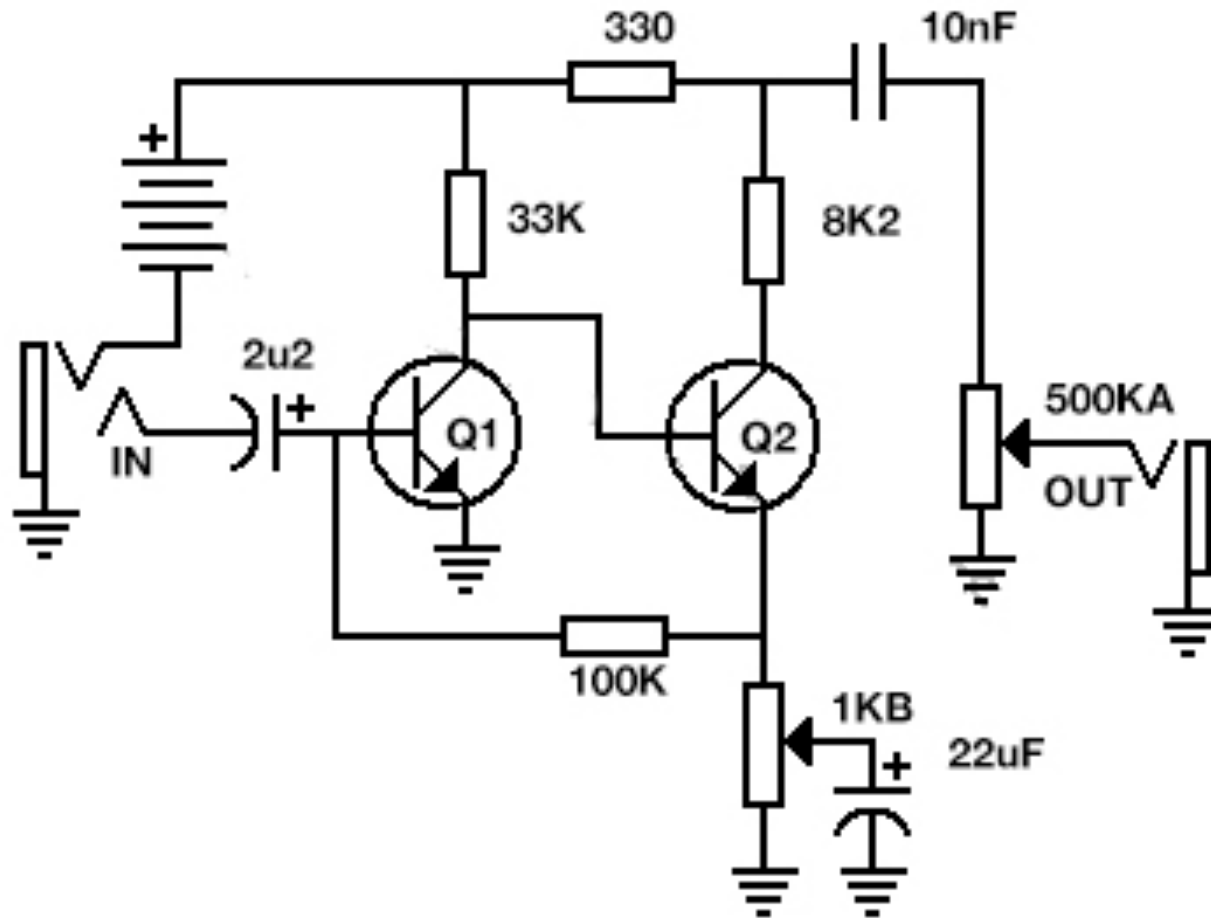
Record

System





# Our silicon NPN Fuzz Face



# Our silicon NPN Fuzz Face

- Negative ground
- 2N3903 transistors
  - Good “all around” fuzz
  - Can try other transistors, and asymmetrical gains
- Slightly different R2 value (330 vs. 470)
- Slightly different C2 value (22uF vs. 20uF)
- Board mounted Pots
  - Try different values for volume pot to get different tonal ranges (pot and C3 act as RC high-pass filter)
- 3PDT true bypass switch
  - Can add an LED if you want

Construction

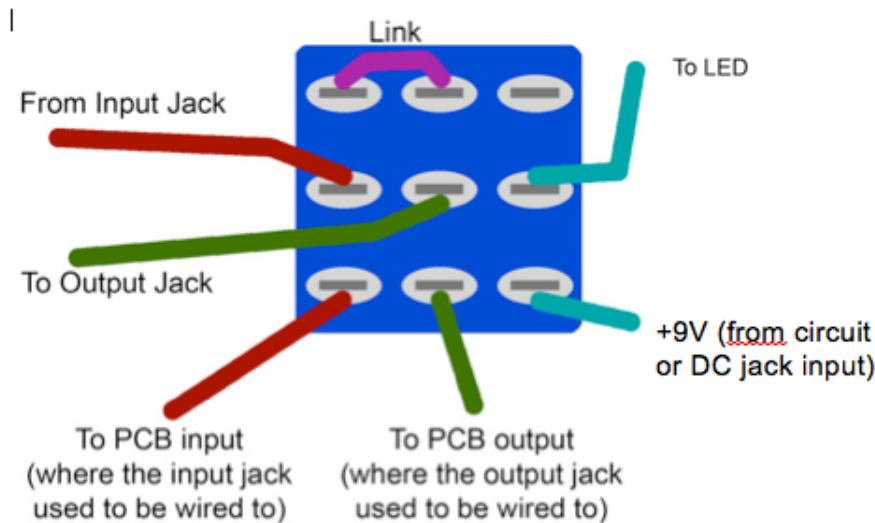
# Tips

- Wires should be about 4 inches each
- Tin your wires
- Mount the pots last
- You don't have to use the 3PDT switch until you're ready to mount everything in a case
- Since this is neg ground, you can put a DC jack in your case and power from a pedal board
- Pots are 16mm shaft if you want to add knobs
- Pay attention to transistor outline on board to get the pinout correct

# Why a stereo input jack?

- Common in guitar pedals
- Tip is signal
- Ring and sleeve act as a switch that only allows the battery to drain when input is plugged
- Connect neg battery terminal to ring or sleeve
- Connect remaining terminal on jack (ring or sleeve you didn't use) to neg terminal on PCB

# 3PDT True Bypass



- In bypass the input and output jack tips are directly connected
- LED: don't forget resistors!

Let's Build It!

# Final Thoughts

- Experiment with this circuit
- <http://diystompboxes.com>
- Several good suppliers of pedal specific components:
  - Small Bear Electronics
  - Bitches Love My Switches
  - Russian Ge transistors on eBay
  - Mouser, Digikey for common stuff