

## **Tiny Giant amp**

The Tiny Giant was designed to be a loud amplifier (20 watts into a 4 ohm cabinet) which is simple and inexpensive to build. It's not much more complex than an overdrive pedal. It can be used for guitar, bass, keyboards/synth, or any other electric/electronic instrument. It's designed to be a clean full-range amp without any inherent EQ curve or distortion. This allows you to pair it up with your favorite effects, preamps, and/or equalizers to build your own custom amp. Its small size allows you to build it into just about any case or enclosure you want. It's designed to be powered with a small, inexpensive laptop computer power supply.

### **Features:**

20 watts into a 4 ohm speaker cabinet/12 watts into an 8 ohm speaker cabinet

Volume control

Mute/standby switch (optional)

Speaker and amp are protected if there's a short circuit to ground or across the speaker

Automatic thermal protection

## **Tiny Giant Amp Bill of Materials**

Quantity-part

### **Resistors**

all 1/4 watt

1 - 100k  
1 - 220k  
2 - 1m  
2 - 2.2R [Marked "2R2" on the board - this is 2.2 OHMS]  
1 - 1k  
1 - 120R [120 OHMS]

1 - A10K potentiometer

### **Capacitors**

[cap types are just suggestions - if you prefer something else and you know what you're doing, feel free to substitute]

1 - 10uf electrolytic  
3 - 100n film  
2 - 1uf film  
2 - 220n film  
2 - 22uf electrolytic  
1 - 470uf electrolytic

### **ICs**

1 - TDA7240A [Mouser part #511-TDA7240AV]  
1 - LM338T [can be found easily and cheaply on ebay]  
1 - TL072

A parts kit is available on [musicpcb.com](http://musicpcb.com).

## Selecting a power supply

The Tiny Giant amp is meant to be powered by a laptop computer power supply. The idea here is that these power supplies can put out large power, are small, and can be found very inexpensively because people are always getting rid of old computers.

The important specs are voltage and current capability. You want:

15-20 volts DC  
4 amperes or more

It's better to get a supply with an output voltage closer to 15v, because the more voltage in, the more heat that will need to be dissipated.

A secondary consideration is the shape and size of the output plug of your power supply. If you are building the amp and power supply together into a single case, you can just cut the end off the plug (the DC output side; NEVER cut the AC inlet cord - the one that plugs directly into your wall) and wire it directly to the PCB, paying attention to which wire is ground (it's the mesh that's wrapped around the inner layers) and which is positive voltage (it's the innermost wire).

If you want to have a DC power inlet like you'd have on an effect pedal, and have the power supply sitting outside the amp enclosure, you'll need to either find a power supply with a 2.1mm plug (unlikely) or snip off the plug that's on your supply (the DC output side; NEVER cut the AC inlet cord - the one that plugs directly into your wall) and wire a standard 2.1mm plug (can be purchased at [smallbearelec.com](http://smallbearelec.com)) to it and heat shrink the wires to be insulated from each other.

## Heat Sinking

Both the TDA7240A (power amp chip) and LM338T (regulator chip) need to be connected to a heat sink. The heat sink is simply a piece of metal which wicks heat away from these parts so they don't overheat. If you are building your amp in a metal enclosure, you can use the enclosure itself as the heat sink. Make sure the chips are screwed tightly to the heat sink.

If you aren't using a metal enclosure, you must screw the chips to a standard heat sink with fins. It doesn't need to be huge - anything 2" x 3" x .5" or bigger should be fine for most uses, however you can use something large to be sure you won't overheat if you tend to play for long periods at high volume.

## VERY IMPORTANT

The LM338T's heat sink tab should not be connected to ground! This means that you must use a bushing and mica or silicone spacer to separate the LM338T from the heat sink/enclosure. The kit available at [musicpcb.com](http://musicpcb.com) includes properly-sized screws, bushings, and spacers meant just for this purpose. If you want to avoid the possibility of using the spacer on the wrong chip, just use spacers and bushings on both the TDA7240A and LM338T - extras are included. If you don't use a spacer or your spacer is placed improperly, you could burn up your parts, the PCB, and possibly other things. Make absolutely sure that the LM338T is not making electrical contact with the enclosure by using a multimeter in continuity test mode to be certain there is no connection from the LM338T's heat sink tab to ground, before you power the amp up the first time.

## Speakers

The Tiny Giant will put out 20 watts into a 4 ohm speaker cabinet, and 12 watts into an 8 ohm cabinet. The amp is full-range, suitable for guitar, bass, keyboards and synth equipment. You can pair it with traditional musical instrument

speakers, but to get the most volume, clarity and dispersion from the amp, and if you want to continue the DIY amplification experience all the way through, billfitzmaurice.com has some really nice speaker cabinet designs. I have no affiliation with BFM, but his designs go far beyond the cabs we've become used to, and they are designed to have very high sensitivity (which means more volume with the same amp power), wide dispersion and decreased "beaming" - the problem where you can't hear your highs on stage, but the people right in front of your cab hear them way too strongly). For bass guitar, these cab designs are way beyond the traditional cabs we generally use in terms of flat response, low end, and sensitivity.

### **Before you power the TG up the first time**

- Use your multimeter set to continuity test mode, to verify that neither terminal of the speaker jack is connected to ground.
- Use your multimeter set to continuity test mode, to verify that the heat sink tab of the LM338T is not connected to ground.
- Use your multimeter in voltage mode to test the voltage at pin 8 of the TL072. It should be approximately 11.6 volts.

### **Getting more power**

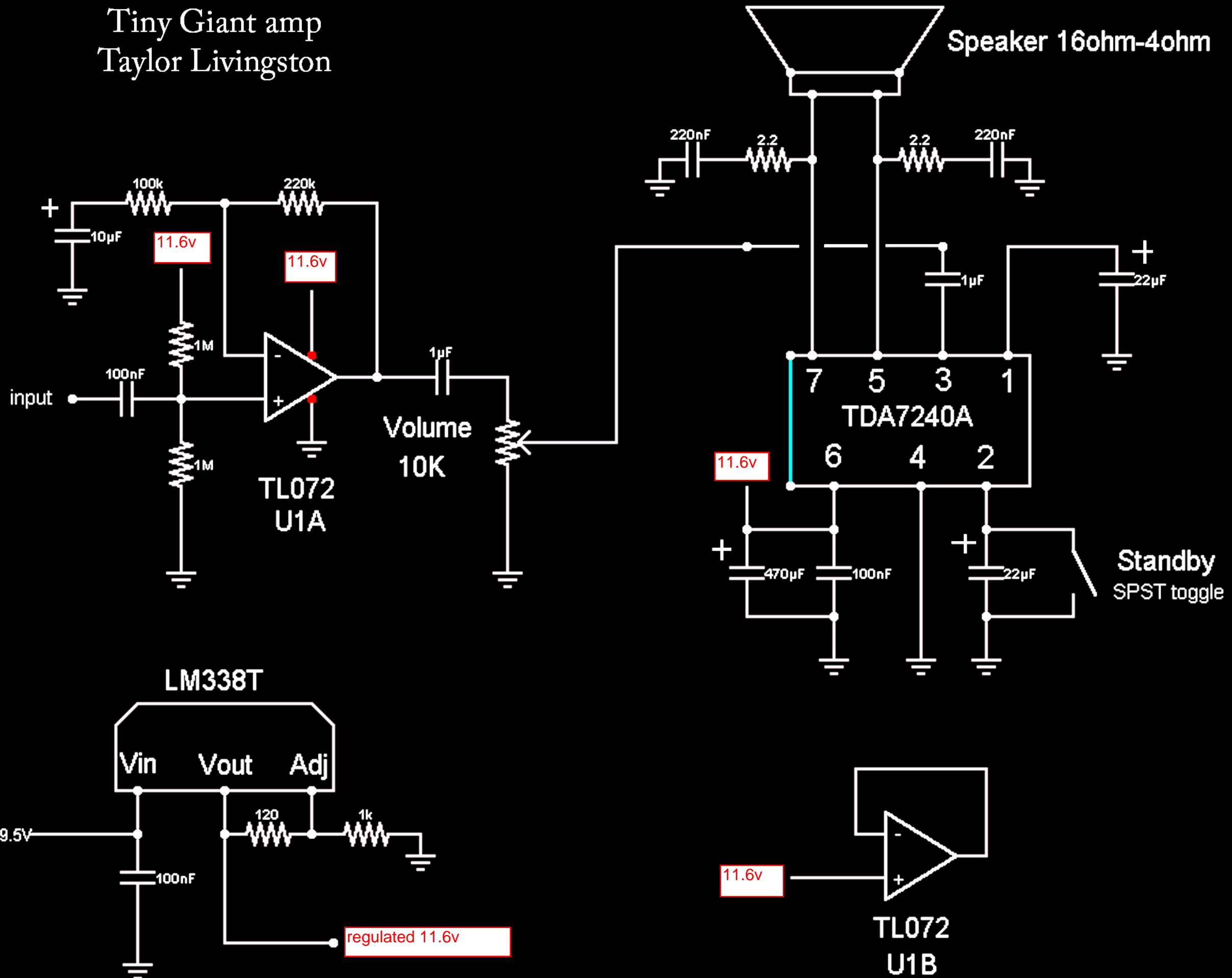
You can get more power out of the amp by raising the supply voltage. The voltage out of the LM338 regulator is controlled by 2 resistors - on the PCB they are 120R (120ohms) and 1k. You can raise the supply voltage by making the 1k resistor larger, according to this chart:

Raise the 1k to:	the output voltage becomes:	the power becomes:
1.2k	13.75v	20w
1.5k	16.88v	24w

Don't go above 1.5k. You'll be putting too much stress on the power amp chip. Obviously, changing the supply voltage will change not only the voltages seen where "11.6v" is marked on the schematic and in this document, but also the bias voltage, which will be approximately half the supply voltage. Keep that in mind when taking voltage readings and comparing them to this document.

# Tiny Giant amp

Taylor Livingston



### Speaker jack

One SPK pad goes to the speaker jack tip, the other goes to the speaker jack sleeve tab. YOU MUST use a plastic speaker jack, and DO NOT connect the sleeve tab to ground as you would in a stompbox.

### Standby SPST latching switch

This switch mutes the amp's output when the pads are connected to each other. If you don't need a mute switch, just leave the pads empty.

Input jack  
This can be a normal metal one.

A10K potentiometer shown from front

power jack

You can take the regulated voltage from here to power your EQ, preamp, etc.

The square pad of the TL072 indicates pin 1.

Place LM338T and TDA7240A with their metal tabs facing the edge of the PCB.

Important note about grounding: in effects pedals, we generally connect all of the grounds (from the jacks, power supply, etc.) together. In this amp, it is very important that the speaker output jack not have either of its terminals connected to ground. So you must use a plastic jack for the speaker to make sure it doesn't ground to the enclosure, and simply connect the offboard interconnects directly to the board as shown - don't connect the jacks together.

