DIY Short Circuit (Overcurrent) Protection

by GreatScottLab

In this project I will show you how to create a simple circuit that can interrupt the current flow to a load when the adjusted current limit is reached. That means the circuit can act as an overcurrent or short circuit protection. **Let's get started!**

Step 1: Watch the Video!

The video gives you all the information you need to recreate the protection circuit. In the next steps though I will give you some additional information.

https://youtu.be/7ctPSgaLxbc

Step 2: Order Your Components!

Here you can find a parts list with example seller (affiliate links):

1x Relay (12V one with 2 changeover contacts): https://s.click.aliexpress.com/e/_dXytThh

2x PCB Terminal: https://s.click.aliexpress.com/e/_dYbstfZ

1x LM358 OpAmp: https://s.click.aliexpress.com/e/_d6VP6J1

2x BC547 NPN Transistor: https://s.click.aliexpress.com/e/_dU81lmT

1x 5mm green LED: https://s.click.aliexpress.com/e/_dV63r7D

1x 1N4007 Diode: https://s.click.aliexpress.com/e/_dYR45Bh

1x Tactile Switch (NC): https://s.click.aliexpress.com/e/_dXIIMcP

6x 1k■, 2x 20k■ Resistor: https://s.click.aliexpress.com/e/_dTPpXjt

1x 10k■ Trimmer: https://s.click.aliexpress.com/e/_dTFyPv5

1x 0.1■ Resistor: https://s.click.aliexpress.com/e/_dZKdSGL

Ebay:

1x Relay (12V one with 2 changeover contacts):http://rover.ebay.com/rover/1/711-53200-19255-0/1?...

2x PCB Terminal: http://rover.ebay.com/rover/1/711-53200-19255-0/1?...

1x LM358 OpAmp: http://rover.ebay.com/rover/1/711-53200-19255-0/1?...

2x BC547 NPN Transistor:http://rover.ebay.com/rover/1/711-53200-19255-0/1?...

Aliexpress:

1x 5mm green LED:http://rover.ebay.com/rover/1/711-53200-19255-0/1?...

1x 1N4007 Diode:http://rover.ebay.com/rover/1/711-53200-19255-0/1?...

1x Tactile Switch (NC):http://rover.ebay.com/rover/1/711-53200-19255-0/1?...

6x 1k■, 2x 20k■ Resistor:http://rover.ebay.com/rover/1/711-53200-19255-0/1?...

1x 10k■ Trimmer: http://rover.ebay.com/rover/1/711-53200-19255-0/1?...

1x 0.1■ Resistor: http://rover.ebay.com/rover/1/711-53200-19255-0/1?...

Amazon.de:

1x Relay (12V one with 2 changeover contacts): http://amzn.to/2uK2t8g

2x PCB Terminal: http://amzn.to/2viTnkl

1x LM358 OpAmp: http://amzn.to/2uNMsN6

2x BC547 NPN Transistor: http://amzn.to/2vj6qCy

1x 5mm green LED: http://amzn.to/2vbPfSn

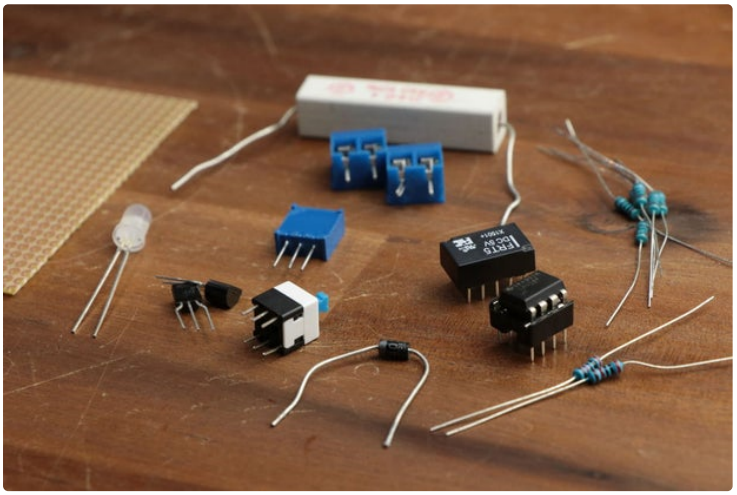
1x 1N4007 Diode:http://amzn.to/2uO2kiL

1x Tactile Switch (NC): -

6x 1k■, 2x 20k■ Resistor: http://amzn.to/2uNJ4BH

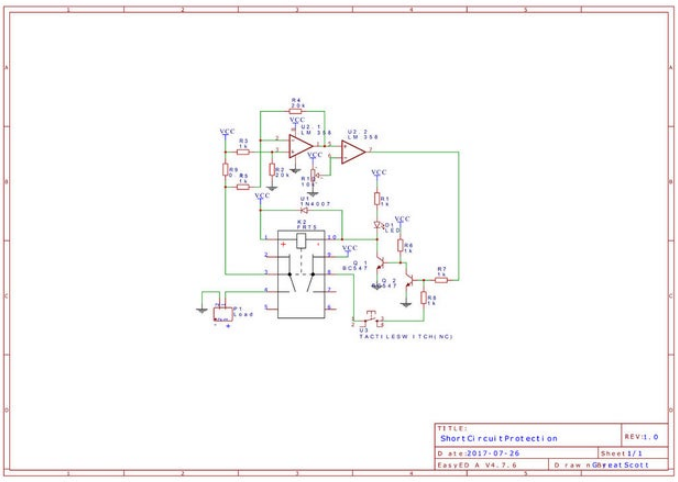
1x 10k■ Trimmer: http://amzn.to/2uKc9j5

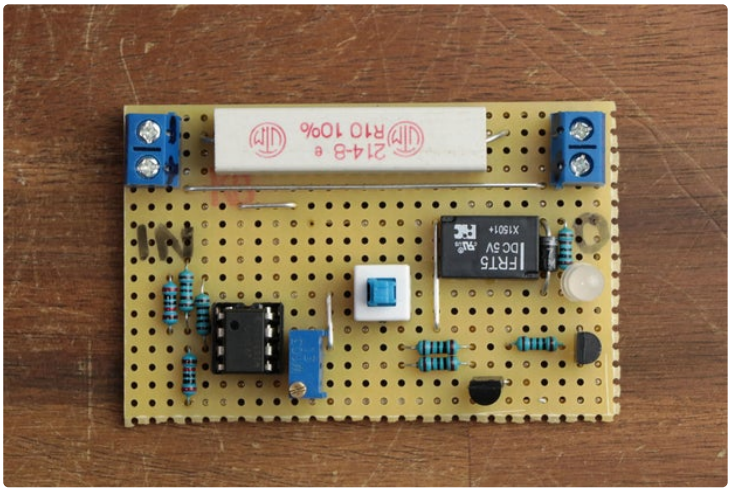
1x 0.1■ Resistor: http://amzn.to/2eY98qa

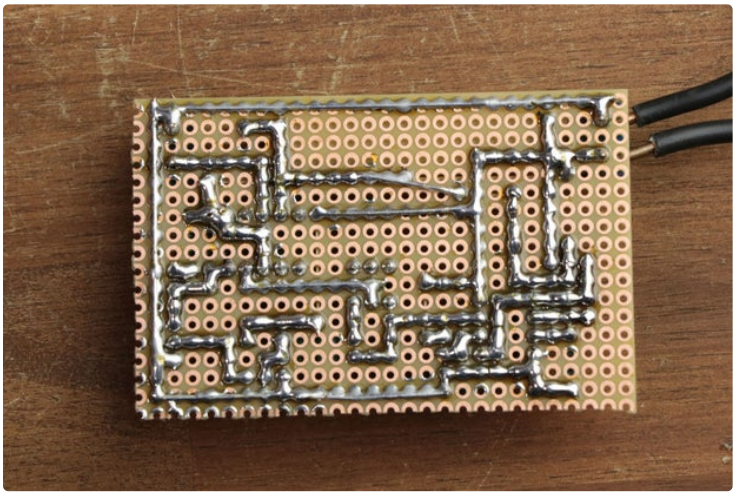


Step 3: Build the Circuit!

Here you can find the schematic of the circuit along with pictures of my finished perfboard layout. Feel free to use them as a reference for your own circuit.







Step 4: Success!

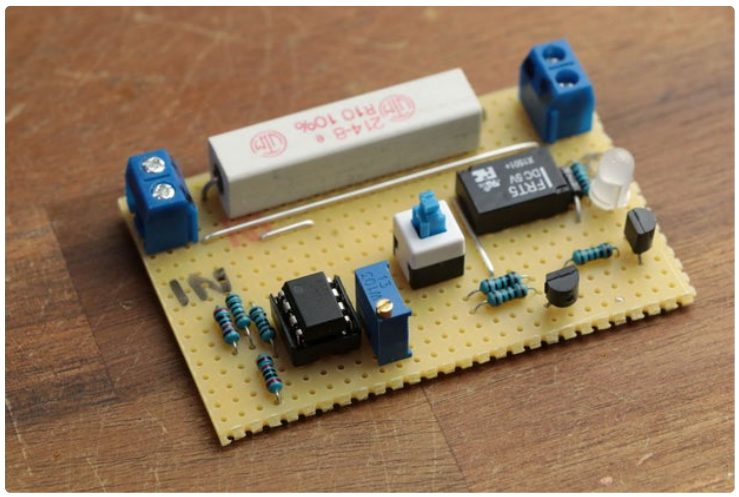
You did it! You just created your own short circuit (overcurrent) protection circuit!

You can also follow me on Facebook, Twitter and Google+ for news about upcoming projects and behind the scenes information:

Feel free to check out my YouTube channel for more awesome projects:

https://twitter.com/GreatScottLab
https://www.facebook.com/greatscottlab

http://www.youtube.com/user/greatscottlab



Hi, I tried to adapt your circuit to 5V. The main problem is that the LM358 requires "head room" of 1.5V to Vcc on its output, which isn't of much concern with 12V but becomes a major issue at 5V.

I ended up putting the 0R1 sense resistor between the load and GND rather than between Vcc and the load, and used a simple non-inverting amplifying configuration for the first op-amp instead of a differential amplifier. This approach should work equally well at higher Vcc, and it even saves a few parts.

Have I missed something? What do you think?

Try using mcp602 opamp as it is rail to rail so its output voltage will be very close to input. It is expensive but will save you from the hassle.

I want to do this project ,but in this project here using relay which is costly as compare to regular relay ,can I use here two regular relay. if yes ...then plz let me know how it I use

What if we don't use 0.1ohm resistance ?

hey scott, i want to adapt this circuit into my lm317 variable power supply, how do i keep the value the same while still being able to change the voltage of my supply??
also how do yo make your circuit's? i tried eagle, fritzing and my head but i can't nice PCB's

I know it has been some times but I will still try to give a reply. From the schematic, there shouldn't be alot of problems, as although the drop across the resistor changes, so does the reference voltage in the comparator(assuming you take the reference voltage from the supply), so the proportion should stay the same, however as I still haven't built this circuit, I maybe wrong, try it on a bread board using a battery and a voltage divider and see if it works at different voltages as well.

If you design a lab psu then you should add current limit feature which will serve you as short circuit limit as well.

Hello Sir
Im a electronics engineering student from philippines. I am currently working on AC short circuit and overload protection circuit. Im looking for possible circuits that will suit for my applications.

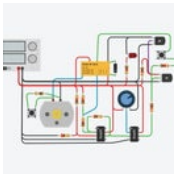
can i use this circuit?

thanks in advance..

Contact me on Devontech1@gmail.com I will assist you

I attempted to create a simulation model of this design in Tinkercad Circuits. I believe I have built the model per the schematic, however, it exhibits some unusual behavior. It is not clear to me if this is a limitation of the modeling software or a problem with the schematic. A review of the model and suggestions on how to fix it would be most welcome.

The simulation can be found here: https://www.tinkercad.com/things/dFuMeg8GPku

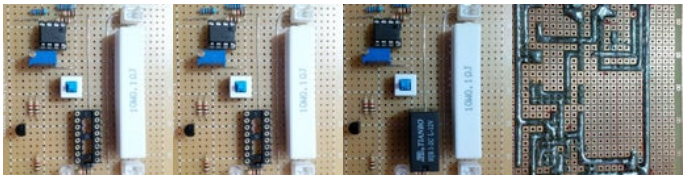


Hello

If you guys made pcb for this circuit please share with us.

Thank you

hello
I make this circuit but it's didn't work I don't know why Because everthing looks okay so please someone look at pictures and tell me why it's not working.
thank you



Could you upload a higher res schematic or one were it is zoomed in a bit. The one up now is a bit hard to read due to pixelation

the differential amplifier circuit on the vcc side does not work with the lm358

hello

Thanks for sharing your awesome project.

I didn't find 10 pin relay but I find this 8 pin.

Could you please tell me how to use it on circuit or send me new schematic with this one?

Thank you

Excellent!! I'm putting this in the To Do list. One question: why do you push the reset button twice? I've been watching the video and still don't understand why you push it twice. Isn't it supposed to be a one-touch reset?

It's because he is using a switch that acts as a toggle switch but as a button so when he presses it once it breaks the connection and stays that way so he has to hit it again to reset the switch back to the closed state which it will keep until he touches it again.

Heheh, you're right. I see now it's a push-on/push-off button. Thanks!

not beyond my capability to make but...

Is this limited to 12vdc? Is it capable of being scaled for use with a 30vdc LED for example.

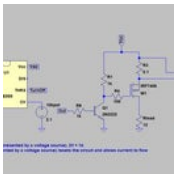
Yes, that is possible. You just need another relay.

Great video and educational too. Keep up the good work, God bless.

You make the best videos, and your circuit drawings are text book perfect. Judging from your accent and penmanship, I would say German. I spent 7 years in Germany. Mannheim, Baden Wuerttemberg to be exact. Best time of my life. Whenever I hear the German language or accent, I'm reminded of that beautiful country. Great work as always.

neat project , coll willbe on my list to do , please some specs for voltage , amps safe ratings

I've been working on something similar, it uses an NE555 timer and a P-channel MOSFET instead of a relay to break and latch the circuit. Thought it might be another way to solve this circuit breaking problem (other than the fixed solution of using a resettable fuse). What do you think?



Thanks.

Im wondering if you can explain the circuit board connections in more detail please. The circuit is fine but where does it all fit on the board?

As always, perfect. Useful and practical circuits. Now we just need to put an Arduino and an LCD to display the current limit and have an adjustable source. Scott congratulations from Spain.

Great Scott ,I have a sugestion for you , could you make a CNC drawing machine!