



Scary Gadgets 4

High-Power Switching

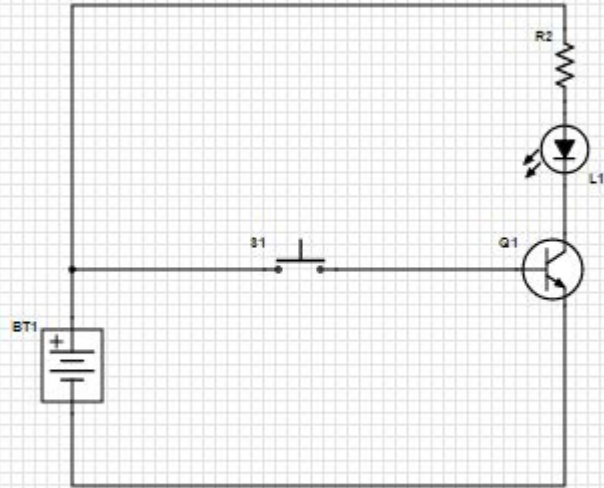
By Phil Gilmore



BJT Transistor Switching

Standard BJT NPN transistor switch circuit.

Allows sensitive sensors to turn on a circuit.

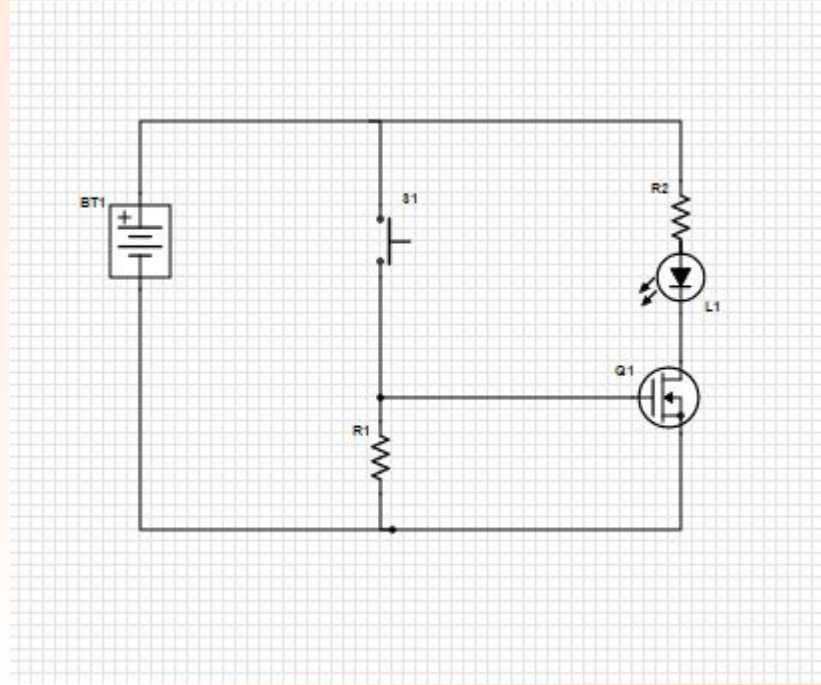




MOSFET Switching

Standard N-channel
MOSFET switch circuit.

Requires pull-down
resistor on the Gate pin to
make it turn off.



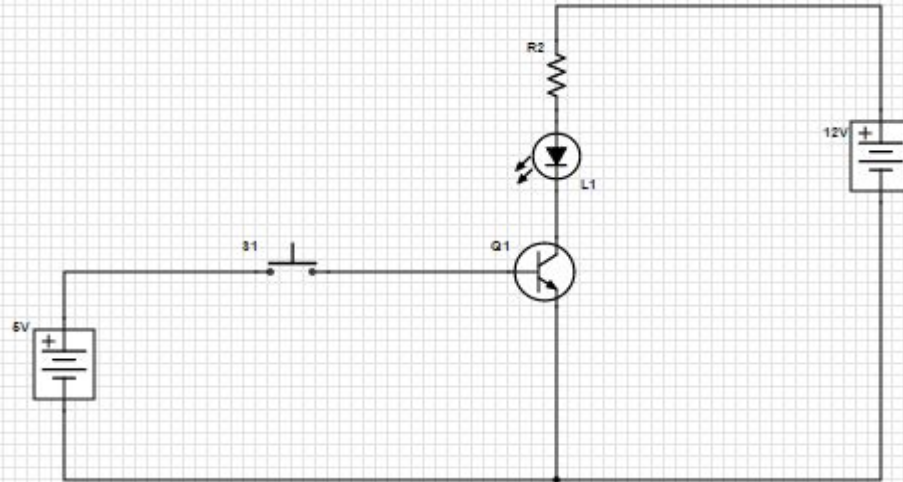


BJT Transistor Switching (dual voltage)

BJT NPN transistor switching with dual voltage.

Transistors switch based on current, not voltage.

Load circuit will never have more voltage than switching circuit.



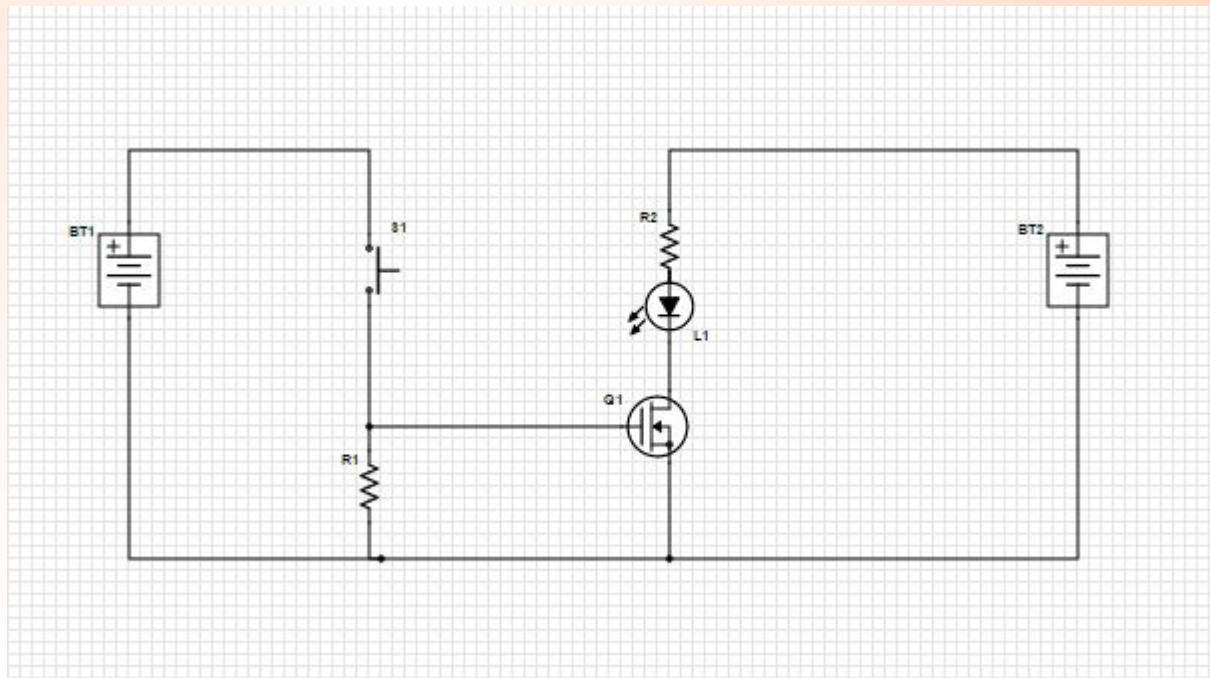


MOSFET Switching (dual voltage)

N-channel MOSFET switching with dual voltage.

Load must be on the correct side of the switch. N-types must switch the ground, so load is on the DRAIN side.

MOSFETS switch based on voltage, not current, so SOURCE and DRAIN can have MUCH higher voltage than GATE.



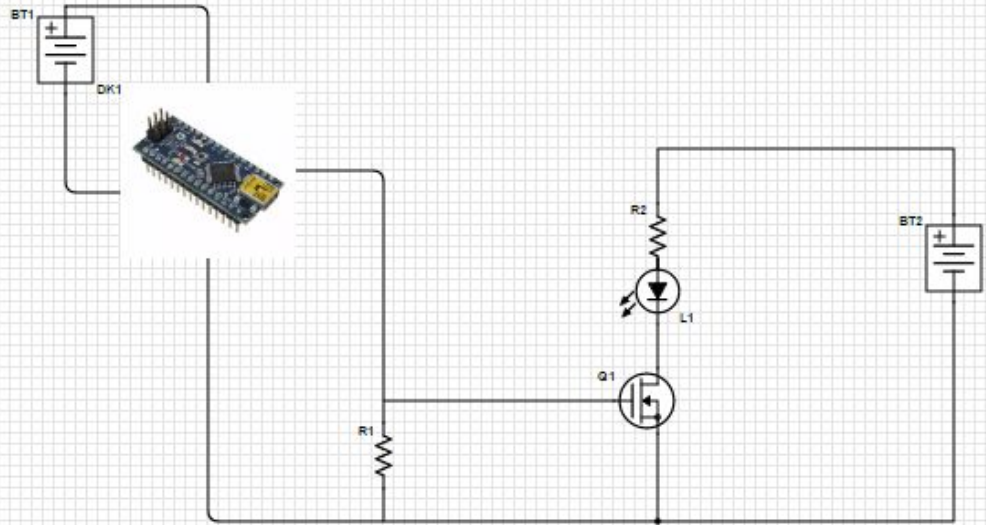


Arduino Switching (dual voltage)

Same as MOSFET dual-voltage circuits, but we swap out the switch and switch power source for an Arduino with its own 5V power source.

Now our switch is computer controlled.

The Arduino can use 5V but still allows our load to have any voltage and amperage it needs.





Other Notes

- Always use a diode across the DRAIN and SOURCE pins of a MOSFET when driving inductive loads. Some MOSFETS have one built-in. Consult your datasheet.
- NPN and N-Channel are the same thing. Their counterpart is PNP or P-Channel. You should seldom or never need to use them for this application.
- Smaller transistors come in a TO-92 package. They work the same but won't handle high current. They will melt. Most MOSFETS are in a TO-220 package which you can screw to a heatsink. For high current applications, add a heatsink. Use the isolating plastic sheet that comes with them to keep them electrically isolated (insulated) from the heatsink, especially if sharing a heatsink between two MOSFETS.
- MOSFETS are fast switches, so you can use them for PWM signals.



Other Notes 2

- MOSFETS can handle many AMPs. Make sure your power supply can handle it. Wall warts can provide voltage, but few amps. Buy a proper power supply and don't exceed breaker capacity! I used a 350 Watt ATX power supply from an old computer.
- I used an HC 06 to control the Arduino using using a phone over Bluetooth. I could also use an ESP8266 to control it using a computer or tablet over WiFi. (\$2.50 @ Ebay).



Parts List

Parts I used:

- Straw-hat LEDs (\$0.05)
- 220, 560, 1k and 2.2k ohm resistors (\$0.03)
- HC 06 Bluetooth module (\$2.50)
- Arduino Uno (Nano is \$2.50)
- Bright outdoor 16ft RGB (multicolor) LED strip (\$11)
- Breadboard and wires

Other parts of interest

- PC power supply- ATX (salvage)
- Garden lighting wire, 12V (Lowes)
- Heatsinks for TO220 components (salvage)
- Soldering iron and 60/40 solder (\$8+5).
- PCB circuit boards with solder pads
- Waterproof project case
- PIR sensor for motion detection (\$1)



Where To Buy

Online:

- Ebay.com (cheapest but slow shipping)
- Amazon.com (if they have it, good shipping)
- Jameco.com (elec. parts)
- Mouser.com (elec. parts)
- Digikey.com (elec. parts)

Salvage everything you can. I used old computer power supplies and parts from broken computer power supplies.

In town:

- Standard Electronics Supply (A local store with some inventory, but they primarily do catalog orders. There are no aisles to browse so know what you want before going. Prices are hit and miss but they have better inventory than Radio Shack.)
- Ra-Elco (This is a junkyard of a store. Prices are hit and miss but they have COOL stuff. Power supplies, heatsinks, motors, more. Store hours are challenging.)
- Radio Shack (only in an emergency)