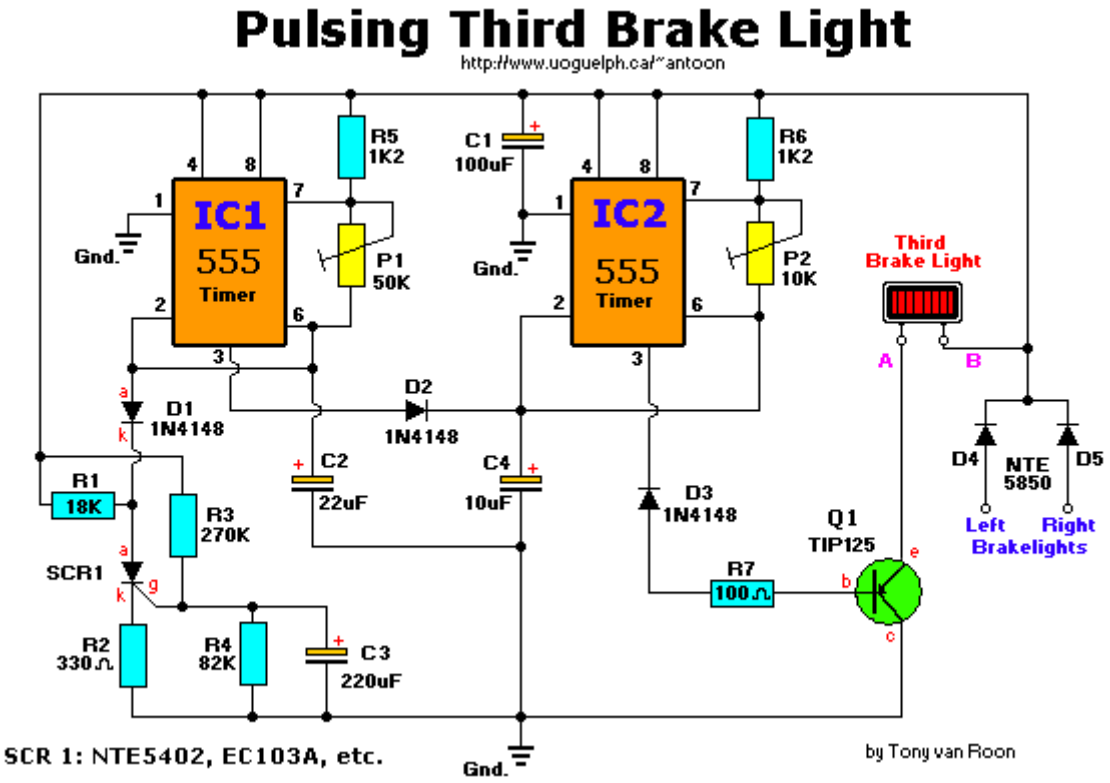


Use in my motorcycle:
Several years ago these flashers were introduced in the automotive industry as part of the third brake light and contained strobe lights (and strobing continuously for the duration of pressing the break pedal) but got abandoned almost immediately sometime later because of the 'strobe' effect it has on some people.
However, there is a major difference between this pulser and the ones from the automotive industry and others. This pulser gives 3 to 8 flashes, at somewhat reduced intensity, and then goes solid. They do not have the 'strobe' effect in any way or form, in my opinion. I have a real concern when driving my motorcycle, to be seen early enough from behind when 'low flying' vehicles are on approach. This circuit seems to do an excellent job!

This circuit is only connected to my foot-brake, the handbrake remains as is. What this means is that if you apply both brakes at the same time, your tail light will not flash but goes on steady. I'm sure you can figure out *why* that is. ;-)

Parts List:

Semiconductors:

```
 IC1,IC2 = LM555 or NE555 Timer/oscillator
    SCR1 = NTE5402, ECG5402, RS #276-1067, EC103A, MCR104, etc.
      Q1 = NTE197, ECG197, SK3083, TIP125, NTE262, or equivalent
D1,D2,D3 = 1N4148, 1N914, NTE519, ECG519, RS #276-1122
   D4,D5 = 1N5400, NTE5850, ECG5850, RS #276-1141, or equivalent
```

Resistors:

All resistors are 1/4W, 5%, unless otherwise indicated

```
      R1 = 18K
      R2 = 330 ohm
      R3 = 270K
```

```
   R4 = 82K
R5,R6 = 1K2 (1.2K)
   R7 = 100 ohm
P1,P2 = 50K, 10-turn trim potentiometer
```

Capacitors:

```
   C1 = 100uF, 25V or better
   C2 = 22uF, 25V or better
   C3 = 220uF, 25V or better
   C4 = 10uF, 25V or better
```

Q1 is a PNP Silicon 'Audio Power Out/Medium Power Switch Transistor', 7A, with a TO-220 case. As long as you have a transistor which is close it will work fine. The SCR is a 100vrm, 0.8A, sensitive gate with a TO-92 case.
Diodes D1, D2 and D3 are standard small signal diodes.
Power diodes D4 and D5 are the 6A, 50prv types, cathode case. The 60vrm type will work as well.
I used for IC1 & IC2 the LM555 type timer/oscillator.
P1 controls the 'on' and pulse-duration, P2 controls the pulse-timing.

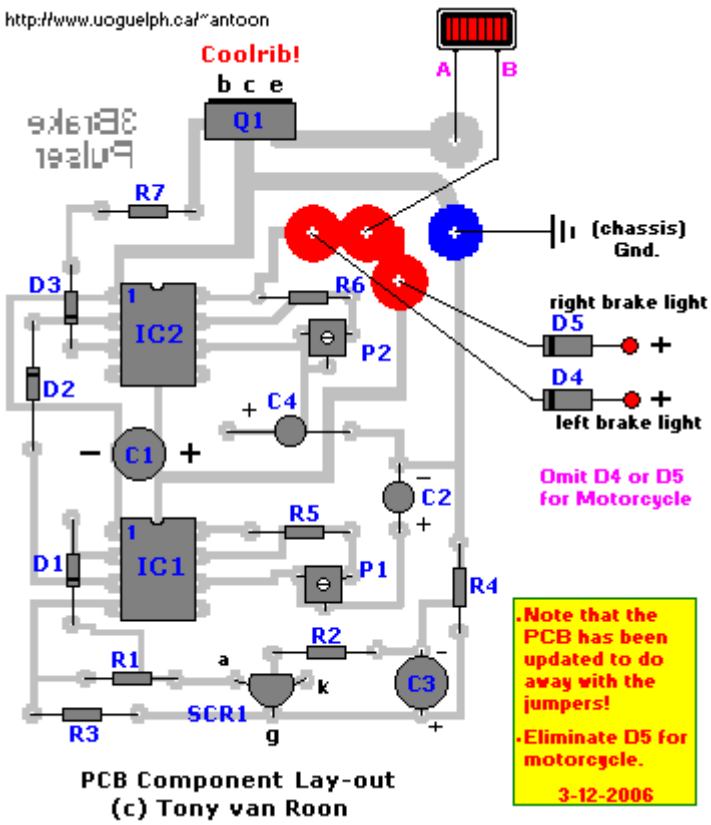
Applying the Brakes: When you first press the brakes, this circuit will turn on your 3rd brake light via the main brake lights. After about a second a series of short pulses occur. The number of pulses can range from approximately 1 to 10, depending on the setting of P1/P2 and when the brake pedal was applied last. After the pulses have been applied the third brake light assumes normal operation. The prototype was set for five flashes which seemed more than enough. Two days later I re-adjusted the trimmer potentiometers for 4 flashes. Looks pretty cool!

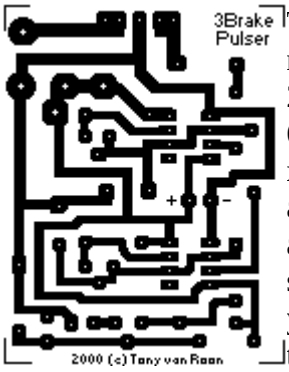
Circuit Description: The schematic consists of two LM555 timer/oscillators in a dual timer configuration both setup in astable mode. When power is applied via the brake pedal, the brake light driver Q1 is switched on via the low-output pin 3 of IC2, and timer IC1 begins its timing cycle. With the output on pin 3 going high, inhibiting IC2's pin 2 (trigger) via D2, charge current begins to move through R3, R4 and C2.
When IC1's output goes low, the inhibiting bias on pin 2 of IC2 is removed and IC2 begins to oscillate, pulsing the third brake light via the emitter of Q1, at the rate determined by P2, R6, and C4. That oscillation continues until the gate-threshold voltage of SCR1 is reached, causing it to fire and pull IC1's trigger (pin 2) low. With its trigger low, IC1's output is forced high, disabling IC2's trigger. With triggering disabled, IC2's output switches to a low state, which makes Q1 conduct turning on the 3rd Brake Light until the brakes are released.
Obviously, removing the power from the circuit at any time will reset the **S**ilicon **C**ontrolled **R**ectifier SCR1, but the RC network consisting of R4 and C2 will not discharge immediately and will trigger SCR1 earlier. So, frequent brake use means fewer flashes or no flashes at all. But I think that's okay. You already have the attention from the driver behind you when you used your brakes seconds before that.
SCR1 is a so-called "sensitive gate" type. The NTE5402 is 100V but the 5401 (60V) or the 5403(150V) also works. Rms-on is 0.8A, Peak Surge on-state is 8A. Save the pdf file for your records.
The collector/emitter voltage drop across Q1 together with the loss over the series fed diodes D4/D5, will reduce the maximum available light output, but if your car's electrical system is functioning normally in the 13 - 14volt range, these losses are not noticeable.

Building Tips: You can easily build this circuit on perfboard or on one of RS/Tandy's experimentors boards (#276-150), or use the associated printed circuit board listed here.

Keep in mind that Q1 will draw most likely 2 or 3 amps and mounting this device on a heat sink is highly recommended. Verify that the scr is the 'sensitive gate' type. In incandescent bulbs, there is a time lag between the introduction of current and peak brightness. The lag is quite noticeable in an automotive bulb, so the duration of a square wave driving such a bulb should be set long enough to permit full illumination. For that reason, and because lamps and car electrical systems vary, adjustment via P1 and P2 is necessary to provide the most effective pulse timing for your particular vehicle.
The reason that the third light is connected to both brake lights is to eliminate the possibility of a very confusing display when you use your turn signal with the brakes applied.
The cathode of D4 and D5 are tied together and go to point 'B' of the third brake light in the component layout diagram. Point 'A' goes to the other leg of the third brake light. Most if not all third brake lights in Canada & USA have two wires, the metal ones also have a ground wire which obviously goes to ground. I don't know the wiring scheme for Australian and European third brake lights.
Don't forget the three jumpers on the pcb; two jumpers underneath IC1/IC2 between pin 4/8 and the one near Q1/R6.
If you use a metal case, don't forget to insulate the D4/D5 diodes. (For motorcycle you can eliminate D5).

Some 90's cars, like a Mercury Sable, have two bulbs inside the third brake light, each bulb is hooked up separately to the left and right brake light for reasons only Ford knows. Click here for a possible 2-bulb hookup. It shows how I modified mine to get it working; and that was easier than I expected. Current draw with the two bulbs was measured at 1.85Amps (1850mA). Even with double the current none of the circuit components were getting hot. I had to re-adjust the two pots to make it flash since the bench testing was done with one bulb.





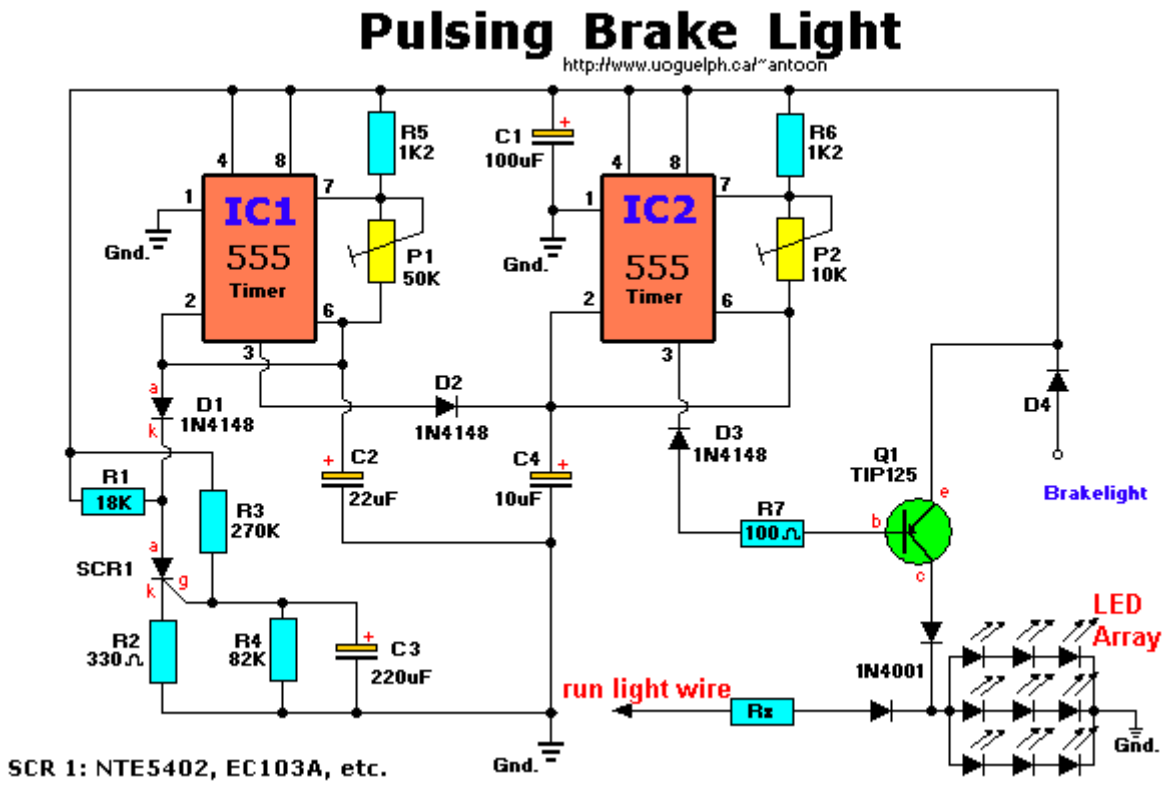
The pcb measures 2 x 2.5 inch (5 x 6.4cm or 170 x 200 pixels) at 2 colors and is shown smaller when you print these pages. If you need a direct, full size copy of the pcb I suggest to load the gif file into a program like Paint Shop Pro or one of the many gif viewers available. The layout is enlarged a bit for a better component view. Note that Q1 is drawn soldered on the pcb but if you have a metal case you can put it anywhere on the metal case (as a coolrib) and use heavy duty wiring between Q1 and the PCB.

Bench Testing: I tested different semiconductors like the 1N5401/1N5404, NTE153, and 4A

type power diodes for D4/D5. All worked very well. As expected, Q1 is getting *very* hot. Current draw was measured between 680 - 735mA with a regular automotive 'headlight' bulb, extra heavy duty to make sure the circuit was safe. I tested several other power transistors including some darlingtons like the TIP125 and the TIP147. I eventually settled for the TIP125 myself because I had it available but anything with 5A or more will do fine.
The actual third brake bulb is a lot smaller. Adjusting the trimpots (P1/P2) may take a bit of patience but really fine-tunes the circuit well.

The circuit I have installed on the brake light of my motorcycle works fine for more than 6 years. There are NO delays for the light to come on or delay between flashes and solid on. When the break pedal is pressed, the light should start to flash immediately; every time!

If you wish to go 'LED', check out the modified circuit below:



Rx is calculated depending on the amount of Led's you use and their current consumption. Q1 is a TIP125, PNP Darlington in a TO-220 case.

Back to Circuits page