EduTek

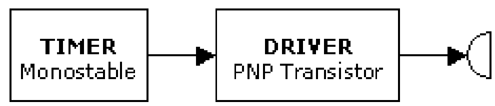
Electronics For Students, Teachers & Engineers

EGG TIMER

Modified:20:45, 22 October 2013

CIRCUIT DESCRIPTION

SINGLE TONE TIMER BLOCK DIAGRAM

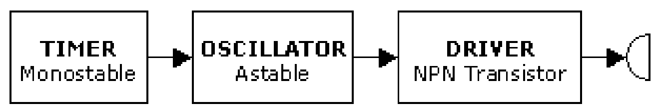


Well it doesn't get much more classic than this for a timer! The 555 monostable is probably one of the most common. It's not the most accurate but it's so simple making it useful as a general purpose timer and accurate enough for say... boiling eggs!

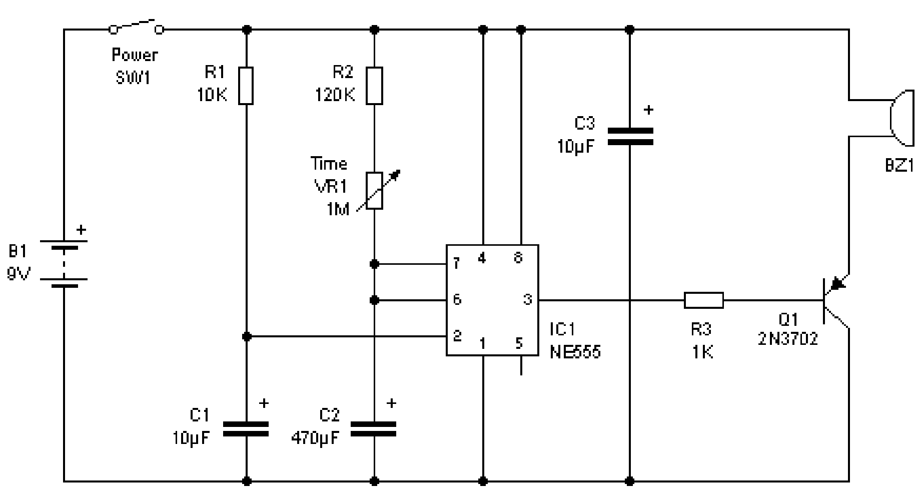
Operation is simple - VR1 varies the time between 1 - 10 minutes. SW1 turns on and starts the circuit timing, when the time has expired the buzzer sounds.

There are 2 versions of this circuit. The first sounds a continuous sound when the time has expired, and the second has the addition of an astable that pulses the buzzer, rather than just constantly on.

PULSED TONE TIMER BLOCK DIAGRAM



CIRCUIT DIAGRAM - Single Tone Type



EXPLANATION

MATHS BIT...

The circuit relies on 2 RC timing networks.

To start the timer, pin 2 must pulse low briefly. This is produced by R1/C1. When power is applied to the circuit, C1 is empty, thus no voltage is across it. This means that for that moment, pin 2 is at 0v, thus triggering it. As C1 charges through R1, the voltage across it increases, thus raising pin 2 to release the trigger. This takes about a second. As soon as timing starts, the output of the timer pin 3, goes high, thus turning off Q1 and silencing the buzzer for the duration of the timing period.

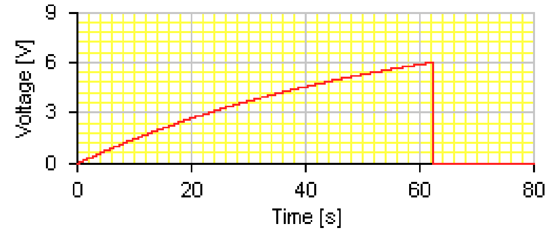
The time duration can be calculated by:

T = 1.1 x C x R

In this case time duration is controlled by R2/VR1/C2. When the timing starts, C2 begins to charge. When the voltage reaches 2/3 of the supply, the time period is over and the output goes low. This causes Q1 to conduct and activates the buzzer.

C3 should be placed as close to the IC as possible.

[Download circuit simulation - Livewire]
[Download circuit simulation - Crocodile Clips]



Graph showing C2 charging up to 6v (2/3 x 9) and then discharging at the end of the period. This is with VR1 at minimum, the values are:

C = 0.00047
R = 120000 + 0

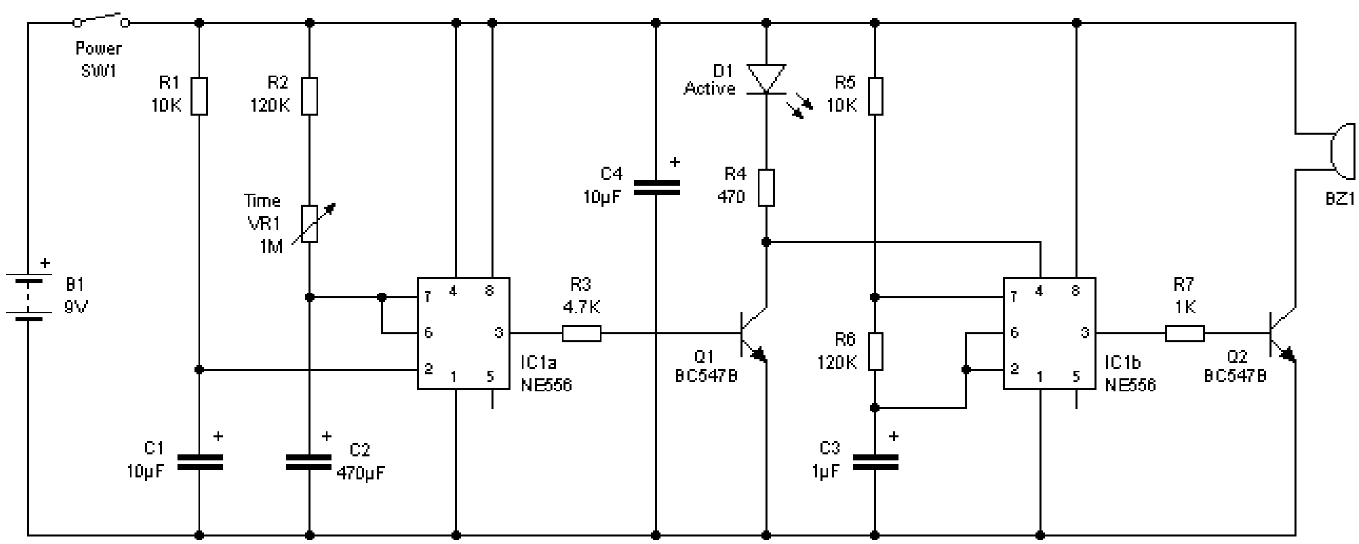
Therefore the time duration is:

= 1.1 x C x R
= 1.1 x 0.00047 x 120000
= 62 seconds

With VR1 at maximum the total R = 120000+1000000 therefore the duration will be:

= 1.1 x 0.00047 x 1120000
= 580 roughly 10 minutes:

CIRCUIT DIAGRAM - Pulsed Tone Type



EXPLANATION

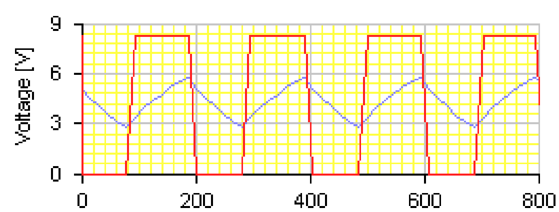
This circuit is based on the first but has an astable connected to the output of the timer (monostable) to produce a pulsed output. So all the timing and function of the monostable are as before.

To make a monostable into an astable just keep repeating monstable pulses. To make this happen, the trigger pin 2, is connected to the threshold input, pin 6. When C3 charges to 6v, the threshold detects this and turns off the output (as in the monstable), but this time when the discharge pin, pin 7 goes low, C3 discharges through R6 until it reaches 3v. This triggers the IC to start timing sending the output high again and the process repeats.

MATHS BIT...

Graph showing C3 charging up to 6v (2/3 x 9) and then discharging back to 3v (1/3 x 9) and repeating.

Blue trace= C3
Red trace = Output (pin 3) of astable



The astable will not work unless pin4 on IC1b is held high. When timing starts, the output of the timer, pin 3, goes high. This turns on Q1 and illuminates the LED, showing it is timing, This means pin 4 of the astable will be low while the timing cycle is running, disabling it. When the timing is over, pin 3 goes low, turning off Q1 and the LED, and sending pin 4 high, thus activating the astable.

The output of the astable turns on Q2 and drives the buzzer. The frequency of the astable is about 5Hz and can be calculated as shown right.

Instead of using 2 555 Timers, I used a 556 dual timer, which is basically 2 timers in one 14pin DIL package, but with different pin numbers - obviously.

[Download circuit simulation - Livewire]

The frequency can be calculated using

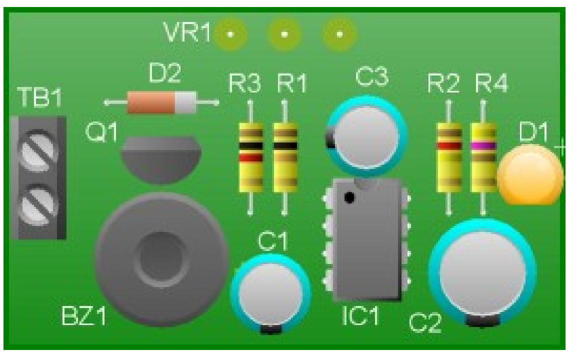
$$f = 1.44 / (R1 + 2R2) \times C$$

In this case R1 is R5 = 10K and R2 is R6 = 120K, so the frequency is:

$$= 1.44 / (10000 + 240000) \times 0.000001$$
$$= 1.44 / 250000 \times 0.000001$$
$$= 1.44 / 0.25$$
$$= 5.76Hz$$

PCB LAYOUTS

SINGLE TONE VERSION

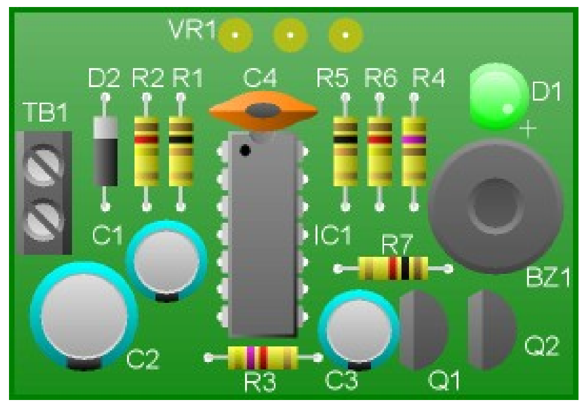


PCB size = 52mm x 32mm

There are 2 addtions on the PCB.

- R4 (470ohm) connects to D1 being an LED which illuminates when power is applied.
- D2 is a silicon diode (1N4001) which protects the circuit from reverse power polarity connection which would destroy the IC.

PULSED TONE VERSION



PCB size = 52mm x 36mm

There is 1 addtion on the PCB.

- D2 is a silicon diode (1N4001) which protects the circuit from reverse power polarity connection which would destroy the IC.

A kit of this timer is available from our [shop]

Designed and Written by Phil Townshend 2008

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