Re: Momentary Switch Circuit

Source: http://sci.tech−archive.net/Archive/sci.electronics.design/2005−09/msg02658.html

- *From*: Terry Pinnell <terrypinDELETE@xxxxxxxxxxxxxxxxxxx>
- *Date*: Tue, 13 Sep 2005 09:20:10 +0100

ehsjr <ehsjr@xxxxxxxxxxxxxxxx> wrote:

>Terry Pinnell wrote:
>> ehsjr <ehsjr@xxxxxxxxxxxxxxxx> wrote (to the OP):
>>
>>
>>>I'm curious. Why didn't you try this?
>>>
>>>+Vcc −−−o o−−−+−−−|<−−−− Vout
>>> \ | Zener
>>> o |
>>> | |
>>> [C1] [R1] 220K
>>> | |
>>>Gnd −−−−−−+−−−−−+
>>>
>>>Vzener is slightly below Vcc − eg 4.7 volts if Vcc is
>>>5 V, 11 volts if Vcc is 12 volts etc.
>>>Ed
>>
>>
>> Ed: That looked such an attractively simple circuit that I tried it
>> myself yesterday. I may have missed something but aren't there a
>> couple of downsides to it?
>
>Yes, absolutely.
>
>I don't think the OP specified what sort of
>> pulse he wanted, but my starting assumptions were a clean, +ve, full
>> supply signal.
>
>He's replacing (or using in place of) a momentary switch.
>Both the toggle and the momentary are subjecty to switch
>bounce. Since whatever circuit he's driving will work
>on a momentary, then switch bounce from a toggle is not
>a factor.
>
>But your observation is correct. The circuit will not
>provide a clean, +ve, full signal supply. It is a definite

>downside to the circuit for general use − it is good only
>for use where switch bounce is irrelevant.
>
>
>Your circuit:
>>
>> 1) Delivers only a low amplitude spike, so needs amplifying to get a
>> 'full' pulse.
>
>That's wierd. It should deliver close to Vcc. Your
>Vcc is 14 volts and the zener is 12. It (the zener)
>should conduct until Vcap drops to 12, meaning that
>the pulse amplitude has to be at least 12. Maybe
>you are scoping at the input to the zener? The
>duration depends on the load, and to a lesser extent,
>on the 220K resistor, but primarily on the zener.
>It will be a spike, but it should be a spike whose
>amplitude is over the zener voltage. RC is ~ 9.5 mS
>(way too short) down to ~1/3 vcc − but it is collapsing
>only 2 volts or about 14% (instead of ~ 63%) when the zener
>shuts it off. You need a bigger cap! The circuit "looks at"
>just the top of the cap discharge curve, which is steep.

I think I need a much *smaller* cap! If I make it 10nF instead of 1uf,
then I see Vout as an initial *very* brief spike.

>We disagree on spike amplitude, but that doesn't change
>the fact that the output is another downside, as you
>indicated. You get what amounts to a spike instead of a
>nice robust square wave.

>Using say a simple NPN stage that results in a −ve going
>> pulse, which may then need inverting. (BTW, such amplification would
>> presumably be simplified if the headroom voltage is rather larger than
>> your examples?)
>
>Yes − you need that with a low impedance load, or a long
>duration pulse, or if the pulse must be square. And as long
>as you stuff enough drive current into the base, it drives
>to Vcc minus the transistor Vce. So you can have plenty of
>headroom between the zener and Vcc and still get square wave
>output.
>
>I got way over 40 seconds with a 120(?) ohm relay driven
>that way through a darlington with Hfe > 1000 in a delay
>off circuit I made. Had to add a resitor in parallel with
>the cap to get it down to the ~40 second target in that
>circuit. I don't remember all the values, but I can find
>them if they are of interest.

You've lost me there. Can you draw that circuit please?

>The headroom was to make the pulse voltage unambiguous.
>RC is ~ 63% discharged − the circuit is "looking"
>at the top ~6% of discharge (eg from 5.0 down to 4.7).
>I didn't want the the circuit that is being driven
>to "see" an ambiguous voltage that was not clearly
>either a high or a low. By using the top of the
>discharge curve, the voltage will be at a high
>until the zener cuts it off. It has a wicked slope,
>but all of it will be above the zener V. Also, I picked
>common zener voltages. I run into lots of 11 and 4.7v
>zeners, but rarely a 4.3.
>
>>
>> 2) Transmits switch noise.
>
>Absolutely. As mentioned earlier, I don't think
>that's a factor for the op, but it certainly is
>in many applications.
>
>>
>> I used a 14V supply and a nominal 12V 1W zener, with this circuit:
>> http://www.terrypin.dial.pipex.com/Images/Momentary−Ed1.gif
>>
>> Here are a few screenshots of the results I actually saw:
>
>Thanks for these − they're great! I have a question, inline
>below.
>>
>> Relatively 'clean' switch
>> http://www.terrypin.dial.pipex.com/Images/Toggle−Ed−1.gif
>>
>> Noisy switch
>> http://www.terrypin.dial.pipex.com/Images/Toggle−Ed−3.gif
>>
>> Noisy switch, detail
>> http://www.terrypin.dial.pipex.com/Images/Toggle−Ed−5.gif
>>
>> Noisy switch, detail, after NPN stage
>> http://www.terrypin.dial.pipex.com/Images/Toggle−Ed−8.gif
>
>I'm puzzled by the Vout curves. It should "fall off the cliff"
>at 12V when the zener stops conducting, but the traces all show
>Vout curving down below 12 volts.
>
>I think the output (without the noise, which I can't draw)
>should look like this:
>
>+14 |\
>+12 | \
> | |

> | |
> | |
>0 −−−− −−−−
>
>Can you determine why there is that curve down to 0
>volts? I wonder if your zener doesn't "zen" :−) ?
>
>>
>> BTW, I'm puzzled by the roughly triangular shape of the output. I
>> tried one simulation and got a squarish result:
>>
>> http://www.terrypin.dial.pipex.com/Images/Momentary−Ed−SIM1.gif
>> Maybe it was just the choice of zener?
>>
>>
>
>Regarding the simulation − my guess is that they treat
>the switch as noiseless, no bounce. But they don't
>show the Vout "falling off the cliff" pattern − unless
>the yellow is supposed to be Vout. The green looks
>more like a capacitor discharge curve than the yellow,
>but the green doesn't fall off the cliff. And if the
>yellow is supposed to be Vout, the trailing edge is
>correct and everything before it is wrong. So I'm
>clueless.
>
>Ed

I'm out for rest of day, but I'll get back on the case tonight. I
suspect that 'triangle' I saw for Vout might have been an artifact of
some sort, due to poorly chosen PC−based 'scope settings. All the
simulations I've tried show a square signal, amplitude Vcc−Vz, *apart*
from that initial spike which they now show, following the massive
reduction in the value of C.

−−
Terry Pinnell
Hobbyist, West Sussex, UK
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- ***Follow−Ups***:
  - ♦ ***Re: Momentary Switch Circuit***
    - ◊ *From:* Terry Pinnell

- ***References***:
  - ♦ ***Momentary Switch Circuit***
    - ◊ *From:* kknicker
  - ♦ ***Re: Momentary Switch Circuit***
    - ◊ *From:* amdxjunk

- ***Re: Momentary Switch Circuit***
  - ◊ *From:* kknicker
- ***Re: Momentary Switch Circuit***
  - ◊ *From:* amdx
- ***Re: Momentary Switch Circuit***
  - ◊ *From:* kknicker
- ***Re: Momentary Switch Circuit***
  - ◊ *From:* ehsjr
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  - ◊ *From:* ehsjr

- Prev by Date: ***Re: source for 55Mhz crystal/oscillator***
- Next by Date: ***Re: Why 75 Ohms not 50 Ohms?***
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