Re: Missing Schmitt Gates??

Source: http://sci.tech−archive.net/Archive/sci.electronics.design/2007−12/msg00594.html

- *From*: John Fields <jfields@xxxxxxxxxxxxxxxxxxxx>
- *Date*: Wed, 05 Dec 2007 08:44:43 −0600

On Tue, 04 Dec 2007 21:53:49 −0500, Spehro Pefhany
<speffSNIP@xxxxxxxxxxxxxxxxxxxxxxx> wrote:

> On Tue, 04 Dec 2007 19:54:53 −0600, the renowned John Fields
> <jfields@xxxxxxxxxxxxxxxxxxxx> wrote:
>
> > On Tue, 04 Dec 2007 16:47:14 −0800, John Larkin
> > <jjlarkin@xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx> wrote:
> >
> > > On Tue, 04 Dec 2007 16:45:54 −0700, Jim Thompson
> > > <To−Email−Use−The−Envelope−Icon@xxxxxxxxxxxxxx>
> > > wrote:
> > >
> > > > On Tue, 04 Dec 2007 15:40:47 −0800, D
> > > > from BC
> > > > <myrealaddress@xxxxxxxxx> wrote:
> > > >
> > > > > On Tue, 04 Dec 2007
> > > > > 22:17:36 GMT, Rich Grise
> > > > > <rich@xxxxxxxxxxx>
> > > > > wrote:
> > > > >
> > > > > > On Mon, 03
> > > > > > Dec 2007
> > > > > > 19:07:08
> > > > > > −0800, John
> > > > > > Larkin
> > > > > > wrote:
> > > > > >
> > > > > > > On
> > > > > > > Mon,
> > > > > > > 3
> > > > > > > Dec

2007
17:57:28
−0800,
"Joel
Koltner"

"D
from
BC"
<myrealaddress@xxxxxxxxx>
wrote
in
message

A
crystal
needs
a
good
linear
amp.

Everything
is
linear
if
you
look
closely
enough...

I
am
being
a
little
obtuse
here
−−
the
kind
of
oscillator
I
was
thinking
of
was

your canoncial microcontroller/FPGA clock that doesn't need to be particularly accurate −− it's common to use 50 or even 100ppm rocks in such systems; this is a completely different league of oscillator than those you build for, e.g., fancy RF applications where you're after 2.5ppm or better.

I was

never
able
to
get
the
Schmitts
to
oscillate
anywhere
near
the
supposed
crystal
frequency.

Maybe it's a
little late in
the thread to
bring this
up, but I'd
think that
with the
Schmitt
characteristics
of the input,
the crystal
would have
to be
drastically
overdriven,
just to get
the gate to
notice that
there's a
feedback
signal.

But I
wouldn't
have any
qualms
about an
HCU
inverter or
3. ;−)

Cheers!
Rich

I think Ht for Logic with
Schmitt inputs is about 1V
@ 5V.

A crystal..well... isn't it just
tiny jiggling piece of rock?
Ooops...I might be thinking
piezo..
Damn..forgot all my crystal
theory...cuts, shapes, modes
and all that
jazz.
Anyways.. I can imagine
that one has to be kind to a
tiny piece of
crystal and not bash it with
lots of drive.
However....depends on the
precision required..
As someone posted, for
clocking an uC or CPU
...who cares about some
drift..

D from BC

A crystal oscillator using an inverter with
hysteresis WILL NOT
self−start.

...Jim Thompson

Of course it will self−start. It just won't run anywhere near
the
crystal frequency!

−−−
Nope.

There's no guarantee that it'll self−start because you've only got one delta V (on turn−on) to cause the crystal to ring, and if it doesn't ring hard enough to get to the opposite switching threshold it'll just sit there, squeezed.

> At what input voltage? Of course it's assumed you will also have a high−value bias resistor across the ST inverter.

−−−
OK, but then I think the ST has to be configured to self−oscillate in order to pump the crystal up to where it has enough output to run the ST instead of the ST running itself.
−−−

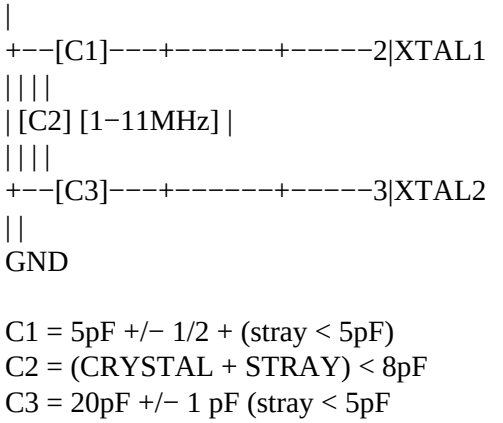
> > The right way to do it is to use an inverter which can be biased so that the input and the output are both at about Vcc/2 and then let noise tickle the crystal until it takes off.
>
> The MCS48 used a ST in the clock oscillator IIRC. It would oscillate at some tens of kHz before the crystal got going. Maybe a "feature" kind of a limp−home thing if the crystal failed (usually, not always, open).

−−−
My 1990 Intel "8−Bit Embedded Controllers" data book states, on page 1−8:

"OSCILLATOR

The on−board oscillator is a high gain parallel resonant circuit with a frequency range of 1 to 11 MHz. The X1 external pin is the input to the amplifier stage while X2 is the output. A crystal or ceramic resonator connected between X1 and X2 provides the feedback and phase shift required for oscillation"

Then, on page 4−28, they show:



C1 = 5pF +/− 1/2 + (stray < 5pF)
C2 = (CRYSTAL + STRAY) < 8pF
C3 = 20pF +/− 1 pF (stray < 5pF

Which looks pretty much like a Pierce oscillator.

Finally, in the figure on page 9, they say: "For XTAL1 and XTAL2 define "high" as voltages above 1.6V and "low" as voltages below 1.6V."

I found no mention of self−oscillation, and with that tightly defined trigger point and no hysteresis, it doesn't seem likely that's a Schmitt trigger.

−−
JF
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