

Re: 74HCU04 LC Osc

Source: <http://sci.tech-archive.net/Archive/sci.electronics.design/2006-10/msg01391.html>

- *From:* "Didi" <dp@xxxxxxxxxxx>
 - *Date:* 8 Oct 2006 18:31:17 -0700
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This triggered a 15+ year old memory... Back then I needed a 110-120 MHz clock generator (TTL levels); I did it using a 74AS00 (or was it 04?...), an inductor I had routed on the PCB, a crystal - I had to locate something suitable to work between 115 and 120 MHz at 5-th, and a tiny trimcap... Obviously each unit had to be trimmed so the LC frequency would match the crystal, the "lock" was easily identifiable on a scope. The footprint was that of a typical metal crystal oscillator (DIP-14 corner pins only style), the height somewhat more. It worked and managed to stay "locked" to the crystal over a pretty wide temperature range (that AS or F chip was quite an oven, especially at about 120 MHz... :-). Just a related memory, hopefully on something mad enough to be worth remembering :-).

Dimiter

Dimiter Popoff Transgalactic Instruments

<http://www.tgi-sci.com>

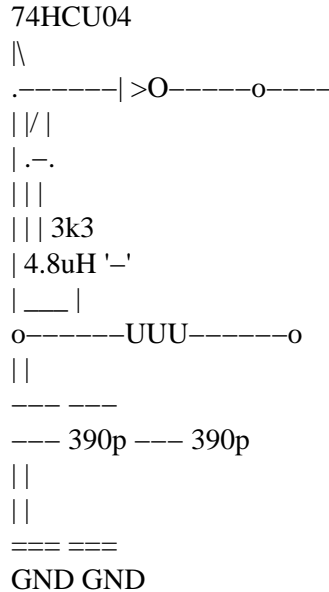
Jim Thompson wrote:

On Mon, 09 Oct 2006 01:05:07 GMT, "John - KD5YI" <groups5MUNGE@xxxxxxxxxxx> wrote:

"Andrew Holme" <andrew@xxxxxxxxxxx> wrote in message [news:egb173\\$fkcs1\\$8300dec7@xxxxxxxxxxxxxxxxxxxxxxxx](mailto:news:egb173$fkcs1$8300dec7@xxxxxxxxxxxxxxxxxxxxxxxx)

Re: 74HCU04 LC Osc

I built this 5 MHz oscillator using a Toko KANK4174 inductor, which is specified as having a Q of 100:



(created by AACircuit v1.28.6 beta 04/19/05
www.tech-chat.de)

Peak-to-peak voltage at the output is about 3V.
Peak-to-peak voltage across either capacitor is about 0.5V

The 3k3 forms a potential divider with the impedance across the capacitor:

$$0.5 / 3 = Z / (3k3 + Z)$$

$$Z = 660 \text{ ohms}$$

Dynamic impedance across the capacitively-tapped tuned circuit = $R_p = 4 * Z$
= 2640 ohms

$$Q = R_p / \omega L = 2640 / (2 * \pi * 5e6 * 4.8e-6) = 17.5$$

Why is my calculated Q so low?

TIA
Andrew

Hi, Andrew –

Is the inductor's Q specified at 5 MHz? Be sure to account for the different

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intrinsic skin effect, if not.

I have played with your circuit in LTSpice but I cannot reproduce your voltages. Inductor Q at 5 MHz may have something to do with it, but also Trise, Tfall, Tdelay of the inverter has a large effect. I used the Philips data sheet to specify those items and then adjusted them to get your values. I assumed Vcc of 3V since the inverter in LTSpice is a behavioral one and your output was 3V. What instrument did you use to measure the voltage? What was the probe impedance?

If you want the LTSpice netlist, let me know. Good luck.

John

In PSpice, assuming QL=100, the effective Q is ~45.

A real 74HCU04 (I have the device-level models) is quite good, and has a barely noticeable effect at 5.2MHz.

...Jim Thompson

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I love to cook with wine. Sometimes I even put it in the food.