

Re: Photodiode wich is fast enough to detect +50Mhz analog (sinus) signal??

Source: <http://sci.tech-archive.net/Archive/sci.electronics.design/2004-07/3158.html>

From: colin (no.spam.for.me_at_ntlworld.com)

Date: 07/20/04

Date: Tue, 20 Jul 2004 14:12:44 GMT

"Yannick" <yannick_de_wit@pandora.be> wrote in message
news:cc50d220.0407200325.25a865c4@posting.google.com...

> > at 50mhz the capacitance of any available pd wil be quite low impedance
at

> > 50mhz, only way to get it up is to tune it with an inductor.

>

> so i have to put an inductor parallel with the photodiode!?

> i was first thinking of using a low load impedance so u still can

> measure signals at these frequenties with relative higher junction

> capacitance, not?

> $f = 1/(2*\pi*Rload * Cj)$

the current in the inductor is 180 out of phase with the current in the capacitor, if you chose the right value inductor it cancels out this curent in the capacitance exactly and hence your impedance whomps up. you dont need a resistor anymore , although you might want to tame its Q slightly, say 100k.

$f=1/(2*\pi*\text{root}(LC))$

for 30mhz ive got a inductor wound on a plastic toroid (made from 2mm dia strimmer wire (plastic) bent round a warm soldering iron tip) it has about 30 turns i think (tuned by trial and error by taking off turn untill its past point of resonance then puting one back on)

i tried a tunable inductor but even with big heavy screens everywhere it still picked up no end of interference.

> soo if i get it right, u use a photodiode in parralell with an

> inductor too increase the impedance in function of the frequentie and

> then u use a high Rload to have a relative high voltage with the very

> low current through the photodiode and this voltage u put on the gate

> of the mosfet. then u use the drain current to make a voltage(with a

> resistor:)) where u do phase measurement with the original oscillator

> sinus wave, right?

sci.electronics.design: Re: Photodiode wich is fast enough to detect +50Mhz analog (sinus) signal??

yes thats about it. u can use an inductor for the mosfet load too, or a curent source, or a higher voltage and a plain old resistor. if you tune the input and the output too much you are prone to oscilation, and of course phase variance, its just one big trade off noise/amplification/filtering versus phase variance. lots of playing around unless your expert at mathematical modelng.

> distance maximum 10m, acuracy as best as possible, i wanted to do
> better then 10mm I have made an algoritm wich calculate the distance
> when many samples of phase measurements (between 0 and 180 degrees)
> are done by different (increasing)frequenties,soo i solved the
> ambuguity problem (sorry for my bad english) and it also minimize phase
> errors because i compare the ideal triangle wave for every distance
> with the measured wave for the distance that has to be calculated, the
> best match is the measured distance. it's a kind of fourier
> transformation but with triangle waves (because phase measurement
> withing intervals of 0 and 180 degrees of increasing frequenties are
> triangles in function of the frequentie).

of course with 10m your going to have more than one cycle of delay with 50mhz, and so you measurment will overflow, good luck with 10mm resolution. returned signal strenght at 10m is going to be oh so low, you wld need i think an APD and not to forget a good lense, and a white target.

i gues you would need to be sure your signals are the precise shape you calculate for. this isnt easy with hi frequency non sinewaves. maybe trial and error and some calibration might be required.

i have two 30mhz signals (32khz apart) going into an xor gate and the signal that comes out looks awfull after the first low pass filter.

> indeed that problem i also have, i am now seperate transmitter and
> receiver completely , this will solve it for now:)

you need to screen things well and seperate power supplys (of course) and also carefull ground planes. if you seperate them to far u then have long signal wires wich can also be problomatic. also your beam has to travel down the center of your line of sight of the PD if you use a lense.

> thats already good, how do you measure phase difference? i am gonne
> use the ad8035 from analog devices. The dual gate mosfet u are using,
> can you give the type nr. ?

wel i cheat a bit at the moment im using a hp 5328 timer counter, wich has sub picosecond average time interval measuring, however i use frequency shifting to lower the frequency down to 32 khz, but keeping the same phase angle so i can multiply the delay by 1000 or even much more, so i only need to measure down to 10ns wich u can easily get modules to measure that, or even just measure the average dc level of the pulse from the edge detector.

Re: Photodiode wich is fast enough to detect +50Mhz analog (sinus) signal??

sci.electronics.design: Re: Photodiode wich is fast enough to detect +50Mhz analog (sinus) signal??

i might even put an on board micro although doubt il have enough enthusiasm left to do that for a while, not sure if it is easy enough to get this to the stage where it could be a viable comercial product, do any such exist ? ive heard of some devices wich use multiple receivers at diferent focus points/angles to detect distance.

the variable bandwidth with amplitude could be an issue if you use this device before the synchronous detector.

im using a 5mw red laser, a ca3209 APD fed into a bf998 dual gate mosfet wich is fed into a an emiter folower and a PIN agc circuit wich goes into a sa605 fm mixer ic although im thinking this is cuasing some problems at the moment. i might go back to the string of ecl diferential amplifiers i used before.

the delay cuased by varying the gain with the PIN is fortunatly in the opesoite direction to the rest of the circuit, ie stronger signal means longer delay, but more atenuation actualy means less delay, unfortunatly its hard to get the two to cancel perfectly, but i live in hope.

i might up the main frequency but first i need to find another two crystals that are 32khz apart wich is dificult. i might change the 32khz to 455khz and use proper IF filters rather than made from discrete wich i think is cuasing a problem, or even have 2 IF frequencies or even lower the frequency still further say 100hz then just do low pass filtering, but then wld need virtualy dc coupled stages.

I had hoped to use a 32khz crystal as a IF filter but this wasnt very good for phase variance, although jitter was non existant. .. sigh..

unfortunatly i cldnt get 455khz filters from RS or farnell, does anyone know where i can get them easily in the UK?

i think you have a very chalenging project. good luck and keep me posted please :)

sory if my english is hard to understand at times too, i have no real excuse for it tho.

Colin =^.^=