



aLIGO RFPD

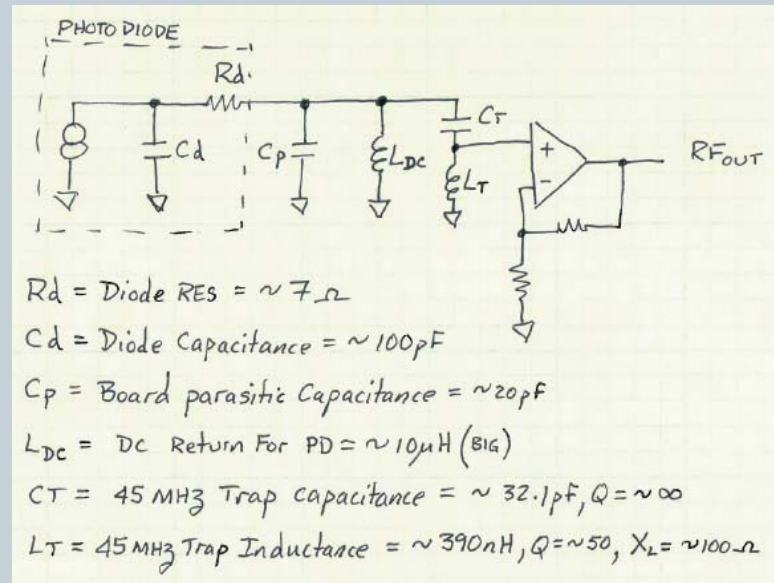
1

**RFPD NOISE MITIGATION
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3 SEPTEMBER, 2010**

Test Setup

2

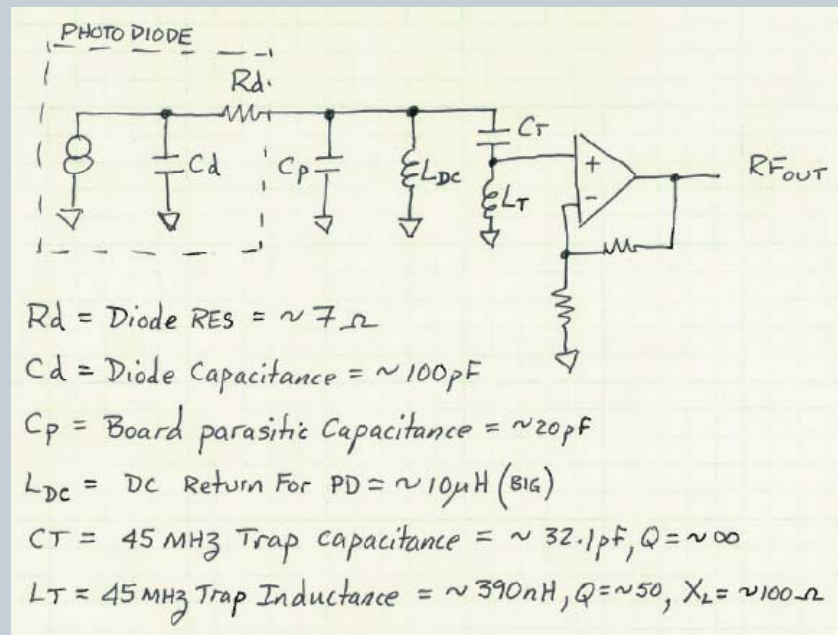
- The output noise of this circuit is influenced by the opamp current noise being converted to voltage noise by the impedance “seen” when looking back from the positive input of the opamp. The top of C_T finds a path to ground through the other capacitances, thus creating a parasitic parallel capacitance just above the series resonance of C_T and L_T .



Means To A Solution

3

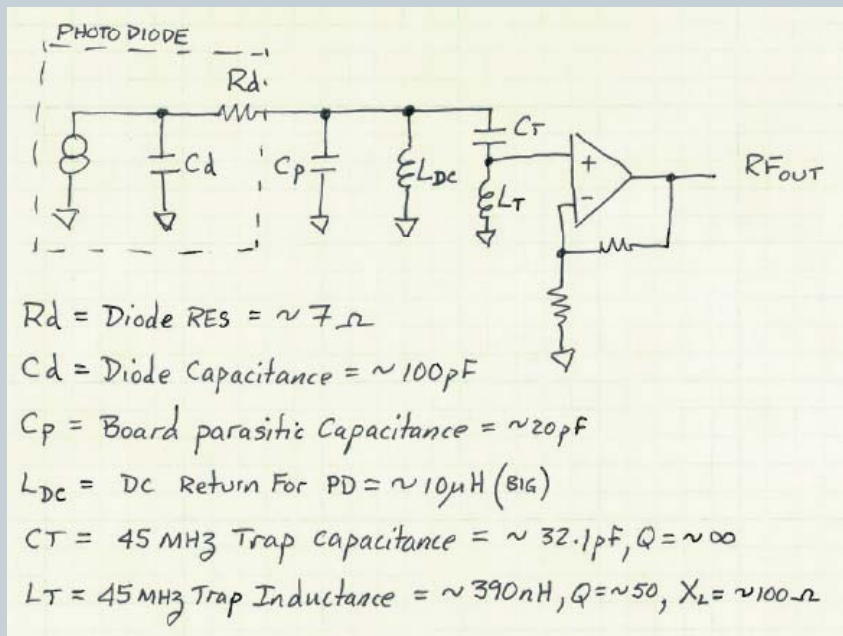
- If it were possible to prevent the top of C_T from finding a low impedance ground path, it ought to be possible to remove the parasitic effect of the parallel resonance.



Solution

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- Use L_{DC} to “resonate” against the parasitic terms (diode and board capacitance) at the operating frequency (45 MHz)



Results

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•The first attempt to implement this yielded the following shot noise limited photocurrents:

- 9MHz = 22mA
- 45MHz = 2.4mA

Fixed the 45 MHz, but shot myself in the foot on 9MHz

•Iterated the value of the resonating inductor to split the noise budget between 45 and 9 MHz, and switched to a different operational amplifier (was MAX4107, is now LMH6624MA)

- 9MHz = 2.3 mA
- 45MHz = 2.2 mA
- Close agreement with SPICE model (~5% error in noise)