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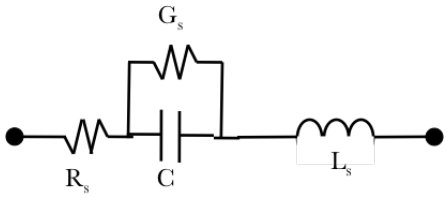
Passive Capacitors & Inductors

Problem 1 :



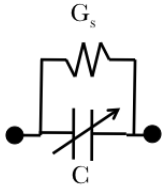
We consider the integrated capacitance whose equivalent scheme is presented above. The value of the capacitance is 1 pF.

The maximum quality coefficient of the capacitor is 100 @ 2 GHz, and its resonant frequency is 10 GHz.

1- Calculate the series equivalent self of the capacitance.

2 - Knowing that the quality coefficient of the capacitor is maximum when the quality coefficient linked to the parasitic conductance of the capacitor is equal to that due to the series resistance, deduce all the elements of the equivalent circuit.

Problem 2 :



We consider the variable capacitance presented above. It is a variable capacitance, semiconductor, the depletion zone of which is varied by applying a reverse bias.

When we do this, we modify both the capacitance, but also the conductance G which bypasses the capacitance. It is considered that the depleted zone of the semiconductor has a resistivity of 1 KOhm.cm and that its thickness varies from 0.5 µm to 1 µm. The permittivity of the semiconductor is 12.

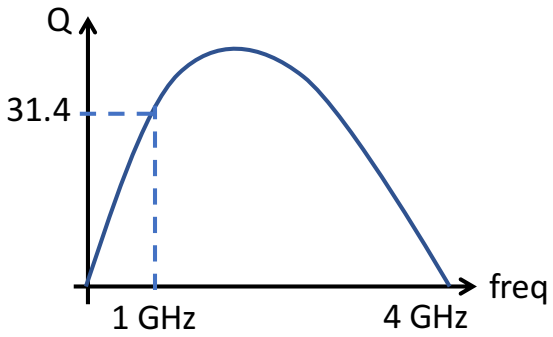
1- What is the maximum capacitance per area of such a diode?

2- What is the conductivity in parallel of this diode?

3- What is the Q of the diode at 1 GHz?

Problem 3 :

A 5 nH integrated inductor has the following measured Q versus frequency curve:



1- Compute the equivalent series resistance of the inductor at low frequencies (<1GHz).

2- Compute the parallel parasitic capacitance of the inductor.