CMOS028 FDSOI MODEL FOR SYMMETRICAL HIGH PERFORMANCE LOW HQ INDUCTORS
WITH PATTERNED GROUND SHIELD
(ind_lohq_high_perf_6U1x_2T8x_LB and inddif_lohq_high_perf_6U1x_2T8x_LB)

Developer:
RF Team, October 2017

Maturity:

ind_lohq_high_perf_6U1x_2T8x_LB : Production data
inddif_lohq_high_perf_6U1x_2T8x_LB : Production data

I Measurement and Parameter Extraction/Estimation of Typical Model Parameters:

8ML is silicon based. (Q727126 Wafer 12, MPW 1722)

II. Best/Worst Case:

Statistical and Best/Worst case simulations available.
The criteria is the quality factor.
Some approximations have been made for the definition of Min and Max:
Min defined with: Ls min, Rs max, Cox max.
Max defined with: Ls max, Rs min, Cox min.
FOR ANY FREQUENCY (approximation).
User corners are also available.

III. Simulation with temperature:

Available from -35 to 125 Celsius Degree.

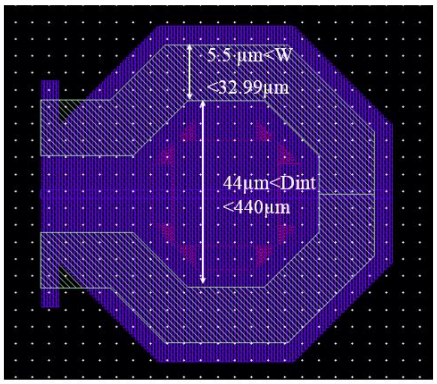
IV. Model Application guidelines:

Layout & Model:

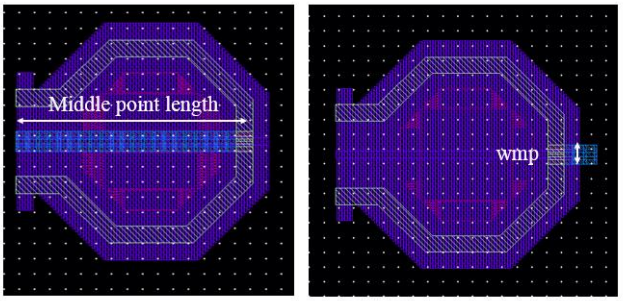
- Octagonal shape
- 6U1x_2T8x_LB option : Coil in Alucap + last metal layer

- Patterned ground shield: Metal 1
- 2 Pi-cell model
- The model takes into account the proximity effects by the use of frequency dependent resistances
- Access to the middle point of the differential inductor : stack M2 to IB
  The middle point access line is only modeled by its DC serial resistance

Model Call:



Single LoHQ inductor



Diff LoHQ inductor with
(a) long middle point (b) short middle point

- Scalable inductor model
- Input parameters for **ind_lohq_high_perf_6U1x_2T8x_LB**:

  d: internal diameter in µm from 44E-6 m to 440 E-6 m
  => the inductance value is computed

  or **ls:** inductance value in H from 0.062E-9 to 1.112E-9
  => the internal diameter is computed

  w: width of coils
  from 5.5E-6 m to 32.99E-6 m

- Input parameters for **inddif_lohq_high_perf_6U1x_2T8x_LB**:

  d: internal diameter in um from 44E-6 m to 440 E-6 m
  => the inductance value is computed

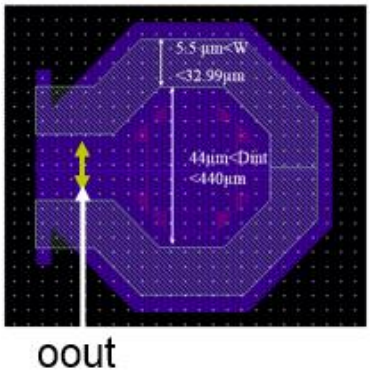
  or **ls:** inductance value in H from 0.062E-9 to 1.112E-9
  => the internal diameter is computed

  w: width of coils
  from 5.5E-6 m to 32.99E-6 m

  mpout: 1 : short middle point
  0 : long middle point

  wmp: - middle point width from 5.5E-6m to d*(sqrt(2)-1) – 4.4e-6 m
  (multifinger approach is used)

Note : oout is fixed to 22µm and no more depending of Dint



Frequency validity:

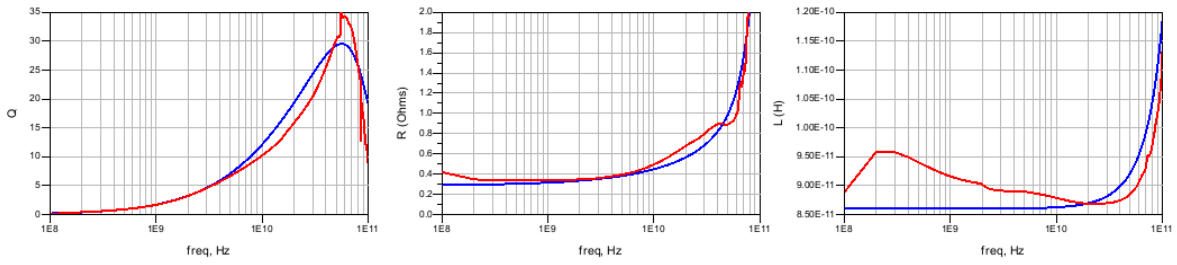
From DC to cut-off frequency Fmax of quality factor (Fmax is the frequency where the quality factor reaches a null value).

Warning:
The differential inductor model is only valid if the inductor is used in differential configuration (no RF signal is driving by the middle point access). The middle point access port is a ground (or a virtual ground) in the RF point of view.

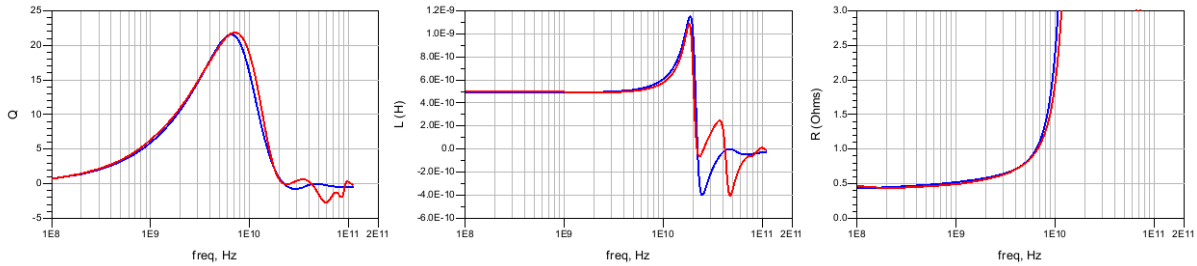
Please note that when using Spectre (version 16.10.387) in Transient and PSS (Periodic Steady State) simulations, the frequency dependency of inductors resistances is ignored, ie only DC resistance (constant) is simulated

V. Model vs Measurements:

ind_lohq_high_perf_6U1x_2T8x_LB, configuration 1: nbturns=1, w=5.5µm, d=44 µm



ind_lohq_high_perf_6U1x_2T8x_LB, configuration 2: nbturns=1, w=19.25µm, d=242 µm



ind_lohq_high_perf_6U1x_2T8x_LB, configuration 3: nbturns=1, w=32.99µm, d=440 µm