

XMB10 MEMS+ PDK: Coventor/ Cadence Design Flow

22 September 2016

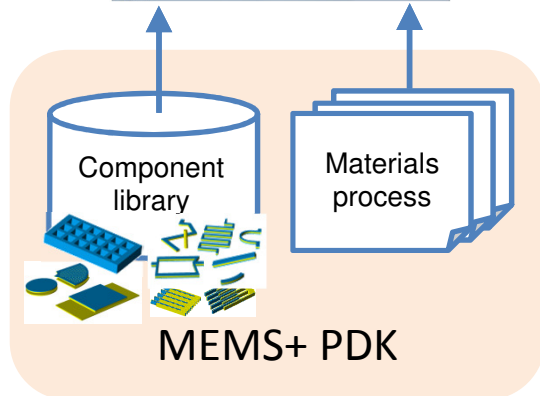
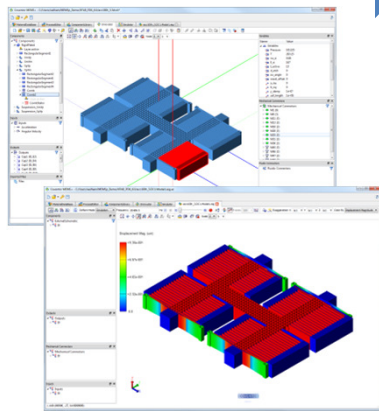
Stephen Breit, VP Engineering
Christine Dufour, MEMS Program Manager

X-FAB XMB10: MEMS+ PDK and design flow overview

COVENTOR

COVENTOR

Design, Model, Simulate
the MEMS device



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COVENTOR

cadence™

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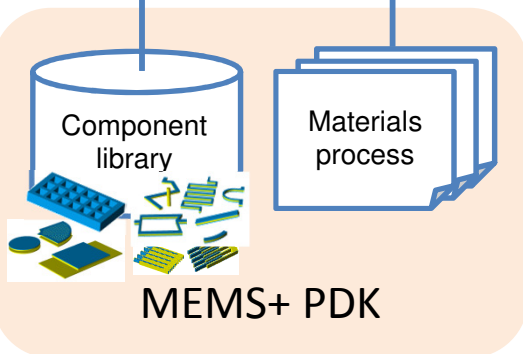
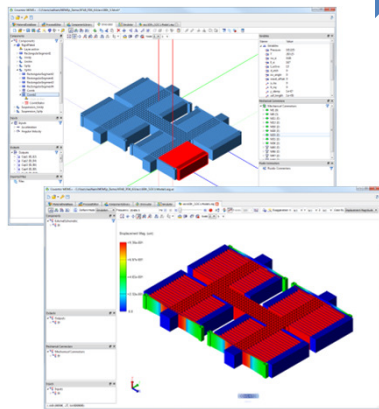
MEMS device + IC cosimulation

MEMS+
Import
interface in
Cadence

Layout

Symbol &
model

```
// MEMS+ device  
// =====  
subckt accelerometer [cdsName] [cdsName]  
  
parameters T=298.15 Pressur  
ProcessSi_recThickness=10 MassCentr  
SuggestScaling=no UseSimulatorTempe
```



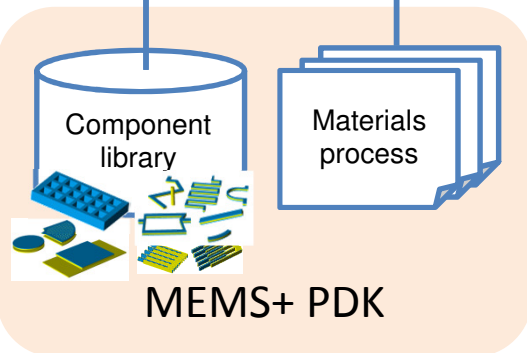
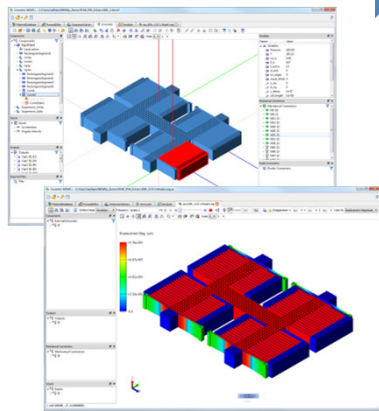
MEMS+ PDK

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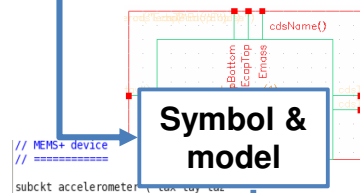


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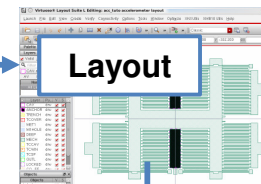
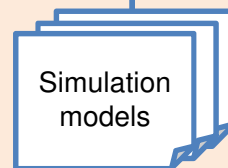
X FAB
MIXED-SIGNAL FOUNDRY EXPERTS

MEMS device + IC cosimulation

MEMS+ Import interface in Cadence

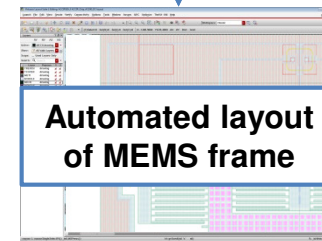


Co-simulation MEMS / CMOS

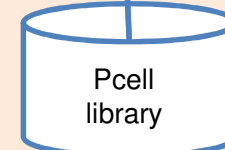


Layout

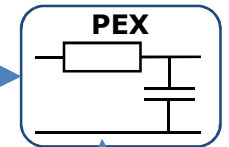
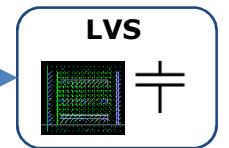
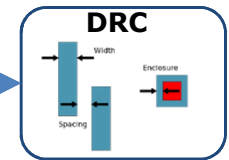
Layout finishing



Automated layout of MEMS frame



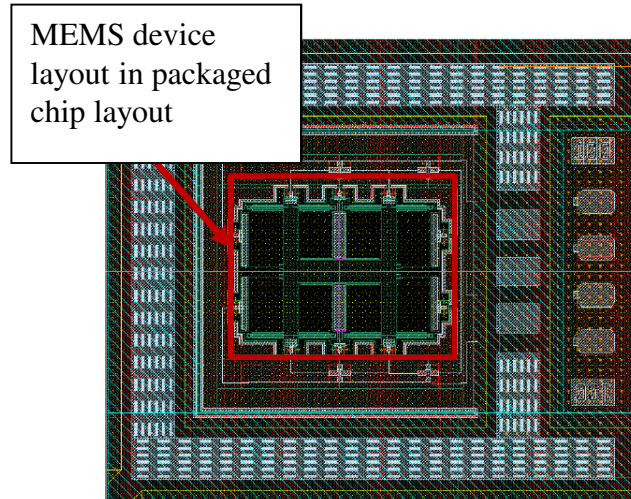
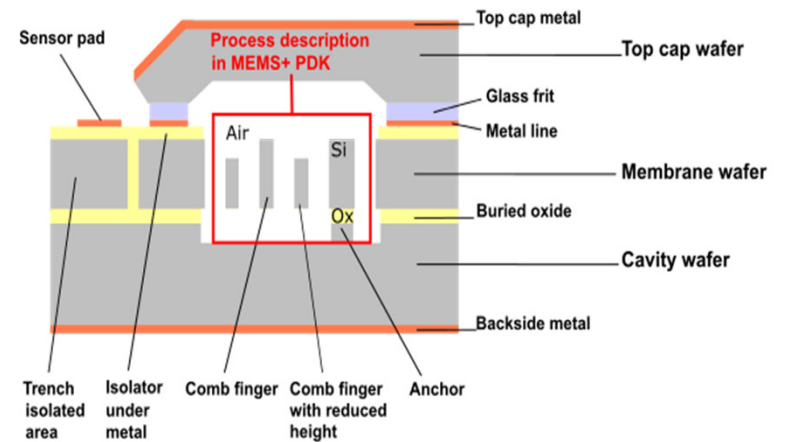
Cadence PDKs



XMB10 MPDK description

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- The MPDK contains the technology information relative to the design of the MEMS device
- Supports the 3 technology variants:
 - MB15, 30, 30B (membrane thickness, SOI/Bulk, cavity pressure)
- Offers a customized Library of components and associated models for XMB10 technology:
 - Rigid Plates, flexible plates, combs, beams, stoppers defined with proper material and layer description
 - Constrained with XMB10 Design rules



MEMS+ interface with Cadence Virtuoso

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- Import interface available in Cadence Library Manager allows to create a parameterized device symbol, netlist and layout using XMB10 technology library

The image displays the MEMS+ interface in Cadence Virtuoso, showing the process of creating a parameterized device symbol, netlist, and layout using XMB10 technology library.

Import options, destination libraries and folders: This dialog box shows the library 'acc_tuto' and cell 'accelerometer'. The 'Layout' checkbox is checked, indicating that a layout will be generated.

Schematic Diagram: The schematic shows the device symbol with various parameters and connections. Parameters include 'tayo', 'cadsName()', 'cadsParam(1)', 'cadsParam(2)', 'cadsParam(3)', 'CapTop', 'CapBottom', 'Emass', 'cadsTop', 'cadsBottom', and 'cadsLeft'. Connections are shown to 'tayo' and 'cadsName()'. The schematic is overlaid on a grid.

3D Layout View: The 3D layout view shows the physical structure of the accelerometer, including the central mass and surrounding electrodes. The mass is highlighted in black, and the electrodes are shown in green. The layout is overlaid on a grid.

Create Instance Dialog: This dialog box shows the parameters for creating an instance of the 'accelerometer' cell. The 'Library' is 'acc_tuto' and the 'Cell' is 'accelerometer'. The 'View' is 'layout'. The 'Names' field is set to '11'. The 'Mosaic' options are 'Rows: 1' and 'Columns: 1'. The 'Delta Y' is '626' and the 'Delta X' is '938'. The 'Halo' checkbox is checked. The 'Physical Only' checkbox is unchecked. The 'Rotate', 'Sideways', and 'Upside Down' buttons are visible. The 'T' field is set to '298.15', 'Pressure' is '800', 'ProcessSI_Thickness' is '15', 'ProcessSI_SWA' is '0', 'ProcessSI_recThickness' is '10', and 'classCenterWidth' is '94'. The 'Scene3DfileBasename' is '3D/accelerometer.3dach'. The 'SuggestScaling' field is set to '00'. The 'Hide', 'Cancel', 'Defaults', and 'Help' buttons are visible.

Variables Table:

Name	Value
T	298.15
Pressure	800
Process	
Mass	
Center	
Width	94

Code Snippet:

```
// MEMS+ device
// =====
subckt accelerometer ( tax
    parameters T=298.15, MassCenterWidth=94, Scene3DfileBasename="./scene3d"
    ProcessSI_recThickness=10, SuggestScaling=no UseSimulatorTemperature=no
```

Accelerometer simulation in MEMS+ and Cadence Virtuoso

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- Simulation of the accelerometer:
 - Y axis displacement of the Mass as a function of the Y axis acceleration
 - Capacitance variation as a function of the Y axis acceleration

