Preserving Parametrized Cells When Translating Competitors' Layout Database into Expert

Introduction

A parameterized cell (Pcell) is a layout cell generator programmed with a scripting language. Each Pcell has a predefined set of parameters that can be strings, Boolean, or numeric values. Using Pcells in the Expert environment is extremely easy, and enables the quick creation of designs with no DRC violations. Using Pcells greatly reduces the amount of disk space in the case of multiple instancing of a cell with different parameter values. Pcells are a very important part of Process Design Kits (PDKs) and are used to reduce layout effort when Quick TAT (Turn Around Time) of LSI design is required.

However when a layout database is transferred from one EDA vendor to another through GDSII format a Pcell becomes just a flat cell without Pcell function. It is not useful to transfer past layout database if a layout tool is replaced to new one. This application note describes how to translate layout data creating competitor tools into Expert layout editor and preserve Pcell functionality using the GDSII format.

A Current Problem of Layout Database Translation

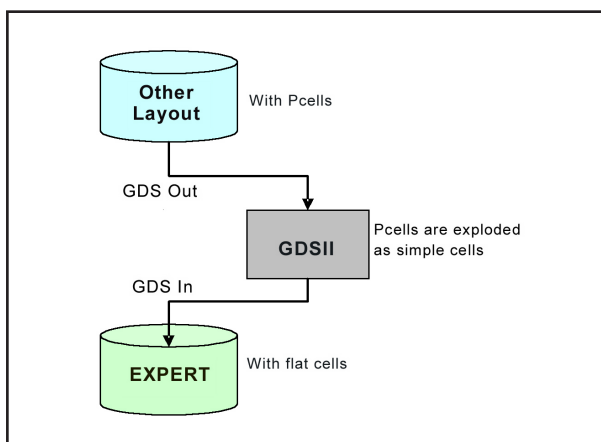In the case of a schematic database, the EDIF 2 0 0 format is used to transfer schematic database from other vendors into the Gateway schematic editor. On the other hand, GDSII format is used to transfer a layout database from other vendors to the Expert layout editor. In this case, a Pcell is treated just as a simple cell without Pcell functionality, since GDSII format does not support Pcell functionality. See Figure 1.

Translation of Layout Database Method into Expert for Keeping Pcells Functionality

Three steps are needed to import a layout database into Expert using GDSII format for preserving Pcell functionality. See Figure 2.

STEP 1 Output a Pcell information file (A) which includes cell names and the parameter value of each Pcell in the GDSII from original layout database when the GDSII is exported.
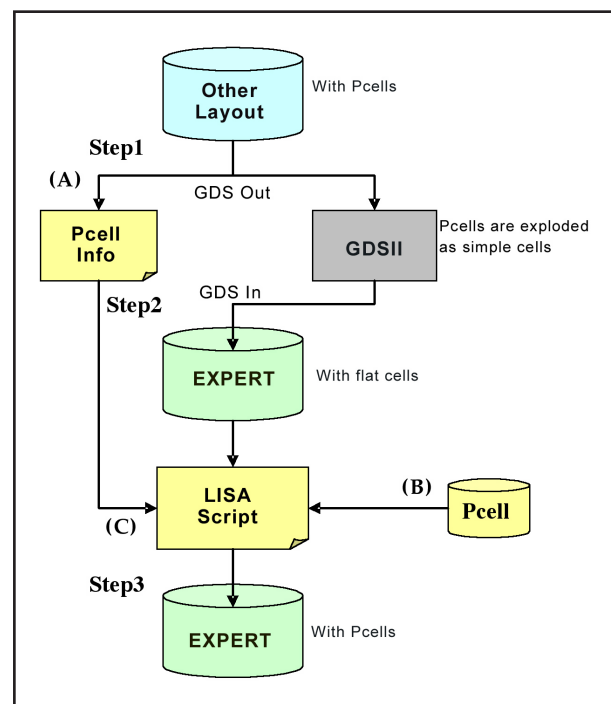
STEP 2 Import the GDSII to Expert.

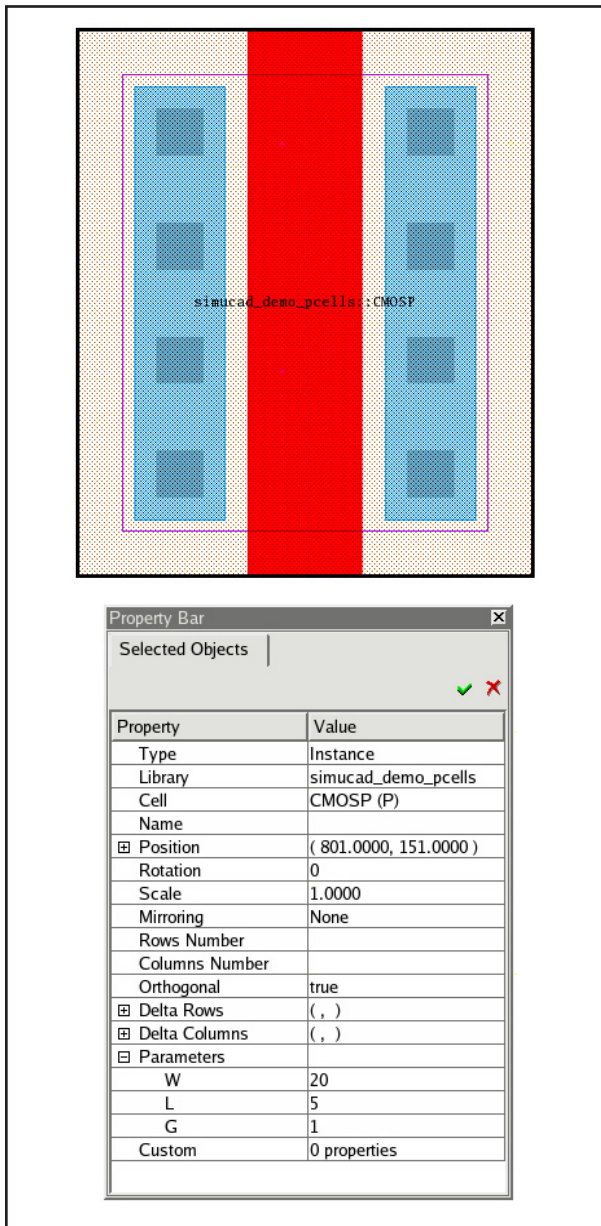Figure 2. Translation flow to preserve Pcell functionality.

Figure 1. Current database translation flow.

Figure 3. Example of Pcell layout

Figure 4. Example of Lisa Pcell script

STEP 3 Run a Lisa script (C) which extracts information of cells and parameter values from Pcell information file (A) generated by Step1 and replaces instantiated cells to Pcells of a prepared Pcell library (B) in Expert.

Unlike the usual GDSII import procedure, the following data is involved in these steps:

(A)   A Pcell information file which includes cell names in GDSII, Pcell names matched for cell names, and Pcell parameter values. A layout tool has the ability to output a file like this as an option of GDSII out. Other layout tools output GDSII with cell names spelled each parameter values. That means it needs information to match the cell name in GDSII and Pcell name with the parameter values.
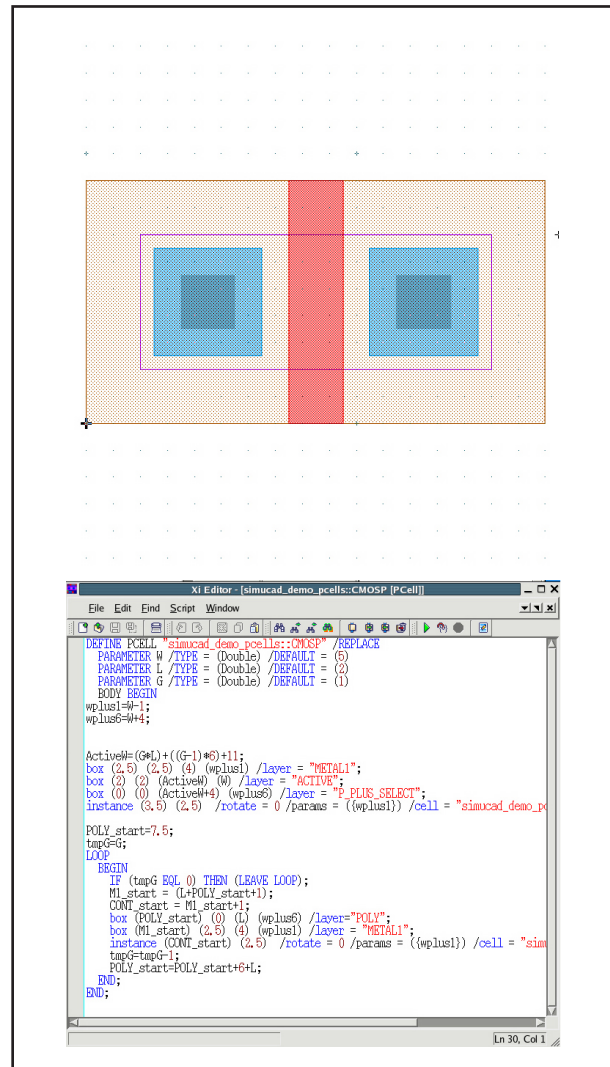
(B)   A parameterized cell library programmed with the Lisa scripting language, compatible with original Pcell code. In general, a Pcell is created by a built-in scripting language on each layout editor. Pcells in Expert are generated using Lisa. See Figure 3, 4. Lisa is able to produce a Pcell script using a minimal number of lines of code.

(C)   A Lisa script to convert cells to Pcells. Lisa can identify mapping cell names in GDSII and Pcell names with parameter values from (A) and automatically replace cell instances with Pcells in Expert. See Figure 5. It is possible to modify the Lisa script against Pcell information from other vendors as needed.

Figure 5. Lisa script that automatically converts cell instances to Pcells.

Translation Result of Layout Data

If a layout database is transferred to Expert using the method previously described, the Pcell will function with Pcell parameters.

Figure 6 shows a layout immediately after importing GDSII into Expert. "silvaco_demo_pcells_CMOSP_50_25_2" cell is supposed to be a Pcell, but the Property Bar shows no parameter in the cell. Figure 7 shows another one after running Step1-3. The Property Bar shows the instance referring to a Pcell named "CMOSP" in the library "silvaco_demo_pcells" and has "W","L" and "G" parameters.

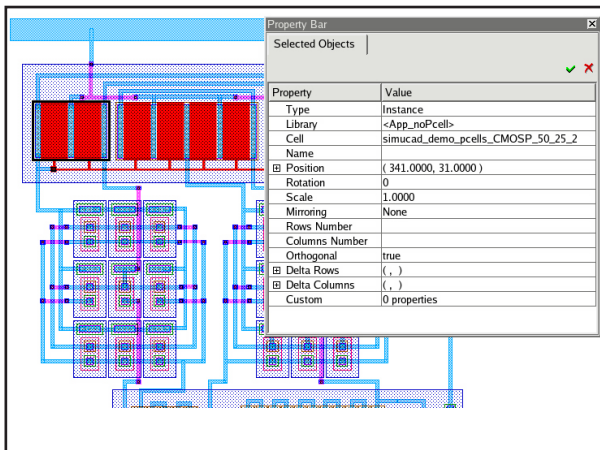(Note) Selecting PMOS device of Finger=2 at the upper left in both Figure 6 and 7.
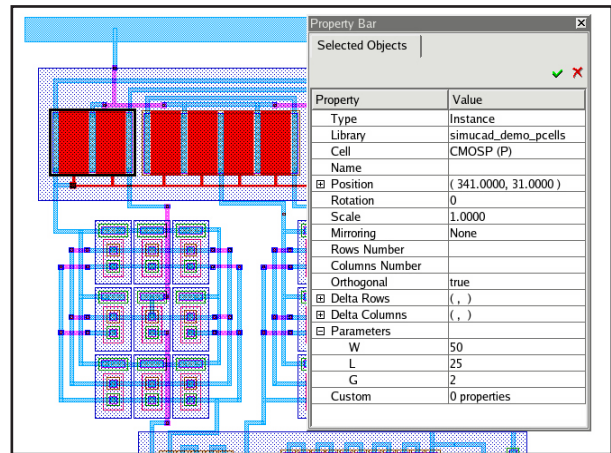

Figure 7. Layout with Pcells after running Lisa script.

PDK Development Service and Technical Support for Translating Database

A customer needs to prepare a Pcell library (B) and Lisa script (C). Silvaco's PDK development service and technical support can overcome the lack of the resources.

Using the development service, Pcells can be developed compatible with other EDA vendors' Pcells in Quick TAT without customer engineering resources. Silvaco has already provided a lot of foundry PDKs with Pcells. In addition Silvaco provides the Lisa script as samples for common translation cases.

Conclusion

A layout database can be imported into Expert preserving Pcell functionality by a Pcell Library on Expert and a Lisa script.

Silvaco can provide training and Lisa scripts to customers if needed.

Figure 6. Imported layout before running Lisa script.