



Foundation_Synopsys_TechnoKit _cmos028FDSOI_6U1x_2T8x_LB

3.3

User Manual

October 2018



**PDK & Foundation Design
Flows**

Technology R&D – T&DP – Design
Platform

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Revision History

Date	Product Version	Comments
10/06/2016	1.0	First version (aligned with DK 2.8.b)
29/07/2016	2.8.c	Addition of ICC2 files & of custom layers in all tech files
11/08/2016	2.8.d	Bug fix: addition of cfg/ directory
11/08/2016	2.8.e	Bug fix: fix vc.bbview drc.switches key
07/10/2016	2.9	Alignment with DK 2.9 (HLVT inclusion for ICC2 + new layers for ICC1) Inclusion of official LIPA-SC files Dedicated layers_setup.tcl offer
13/01/2017	3.0	Inclusion of layers_setup_COT.tcl for ICC2 (as already done previously for ICC1) Replacement of former ICV DRC deck by ICV DRC mini-deck for ECO hotfix in order to be DRC clean (+ bbview updates) Removal of ICV tiling (but preservation of ICV LFD or litho hot-spots detection) Tech file pessimism removal for VxBAR rule 553i TLUPLUS and NXTGRD parasitics regenerated with latest StarRC version Implant layers added (with width/spacing/area parameters) in ICC1 tech file Update/addition of mappings in ICC1 map_out & strmln.map for implant layers Inclusion of "reduced" LEF files in FTK SNPS for usage in SignOff Physical ECO task (using PrimeTime)
02/06/2017	3.1	TLUPLUS & NXTGRD regenerated for alignment with 28NM_STARRCXT_FDSOI_PROTOTYPE 2.3-PRELIM-00 (using star-rcxt m-2016.12-sp1) Addition of LIMA files (for Michel Herment & Rashna Seli's organizations) Addition of new layers from DK mmW 0.9 in ICC1 map files TLUPLUS mapfile clean-up (PDK-DDF&M CodeX reference => [TRC #418066]) Renaming of layers_setup_COT.tcl in layers_setup_alternative.tcl
20/10/2017	3.2	Addition of new layers from DK 28SOI RF mmW 1.0 in ICC1 & LIMA files Removal of wrong DRC rules on PW layer in ICC2 tech TF (TRC CodeX ticket #446586) Addition of LV layer in ICC1 tech TF as requested by LIMA team Inclusion of 2 new files (Milkyway/dummy_layers.lef & Milkyway/lef_layer.map) for read_lef ICC1 data preparation specific mechanism (requested by Zuma thru HelpDesk ticket 86378)

13/07/2018	3.3 PRELIM	<ul style="list-style-type: none"> - Addition of new layers from DK 1.1 in ICC1 and LIMA files - Addition of 504k1 rule coding in ICV mini-deck (not validated yet on testcase) (TRC ticket #462873) - Addition of missing "excludedForPGRRoute" statements for ContactCodes in ICC1 & ICC2 tech TF (TRC ticket #489193) - Alignment of SNPS LEF content with CDN LEF
10/08/2018	3.3 INTERM	<ul style="list-style-type: none"> - TRC #461069 Rule 615: Bad thresholds for V1 - TRC #489192 Missing enclosureTbl & minCutsTbl for W0,W1,YZ,XA,XB,XC & VV - TRC #489194 Rules 551_VxLRG<a d> not coded - TRC #465654 613a_V2_M2 not seen by zroute - Removal of 504k1 coding in ICV mini-deck as currently not working (to be planned for a next release) - ICC2 map_out: addition of metal/via fillOPC purposes mappings for track-based fill
07/10/2018	3.3	<p>Coding of new high-voltage FBB rules in ICC1 & ICC2 tech TF</p> <p>Addition of ICC1/ICC2 define_non_default_rules.tcl file to handle FBB < -0.6V in P&R flow</p> <p>Inclusion of new VH/VL custom layers in ICC2 map_out</p> <p>TRC #497923: Mini-deck ICV fixed with proper inclusion of 504k1 rule</p> <p>615 rule coding update cancelled, reverting back to former code (TRC ticket to be fixed in a later release) which is DRC clean</p>

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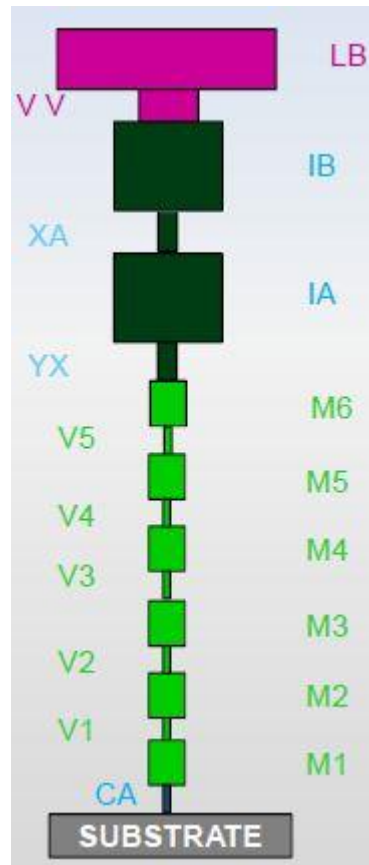
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1.Introduction

Foundation_Synopsys_TechnoKit_cmos028FDSOI_6U1x_2T8x_LB is a TR&D Unicaad product.

This product is aimed at providing technology enablement for CMOS028_FDSOI technology node, for the following metallization choice: 6U1x_2T8x_LB (8 metal levels out of which 6 are thin and 2 are thick).



This Foundation TechnoKit contains **techfiles and map files for P&R** (DRC clean routing) and extraction in Synopsys tools (using default mode), as well as decks for in-design checks. Both **icompiler & icompiler2** are supported.

It also contains **techfiles and map files for SignOff**. LIPA-SC files for library views generation/validation are also included. No flow/automation is included in this product.

2. Module Architecture

Details below will be describing the content of each file included in this Foundation TechnoKit product.

2.1 PnR files:

a. /ICCOMPILER/technology.tf

This is the main technology file, which contains the layers definitions and routing rules (which may be defined inside the layer definition itself or in dedicated DesignRules), as well as density rules.

Dedicated PnR single vias (contact codes) are listed with their parameters (width / spacing / metal enclosure).

Tiles definitions (corresponding to standard cells heights) are also included.

Custom layers (T3, SXCUT, MKR_HSSOI & boundary snap) are also included.

b. /ICCOMPILER/antenna_rules.tcl

This file contains the antenna ratio rules which must be respected in this technology node (separate file as coding cannot be performed inside the technology.tf).

c. /ICCOMPILER/unitTile

This is the standard Synopsys binary file used for rows creation.

d. /ICCOMPILER/map_out

This is the mapping file used for GDS streamOut.

e. /IPPACKAGING/strmln.map

This is the mapping file used in case of GDS streamIn.

f. /ICCOMPILER/layers_setup.tcl

This file defines the metal layers directions in the iccompiler database. This is considering the default orientations regarding PG grid @ ST, where IA is parallel to the layer under it.

g. /ICCOMPILER/layers_setup_alternative.tcl

Alternative TCL file where all metal layers are orthogonal one to the other. You may use the layers_setup.tcl or the layers_setup_alternative.tcl file, depending on your PG grid requirements.

h. /lib/tcl/spacing_label_rule_setup.tcl

This file indicates the intercell spacing constraints. With this kind of rules, standard cells can be placed next to each other only when they do not violate the spacing rules.



i. /TLUPLUS/*

These *.tluplus files are the parasitics used for extraction (binary tables storing RC coefficients). They were generated from the reference ITF files of the considered technology node (the dkdm.info indicates the origin of the reference parasitics files, for informational purpose only). Only Sig parasitics are included.

A mapfile is also included in order to map layer names in the technology file with layer names in the parasitics files (allowing to load the TLUPLUS parasitics in Synopsys tools).

j. /ICV/*

These files (mini-deck) are used for in-design DRC checks and fixes, in the context of the direct launching from an iccompiler session of the ic_validator tool which performs the DRC checks and then allows in an ECO manner to hotfix the remaining violations, which have to be dealt with in this manner as they cannot be coded in the technology.tf, even with pessimism.

The list of considered rules is the following:

```
""GR615* *GR515* *GR505* *GR553q2* *GR506b* *GR501b* *611*"
```

These decks must be used in both ICC1 and ICC2 tools.

Files for ICV LFD (litho hot-spot detection) are also included.

k. /etc/define_redundant_vias.tcl

This file is used to switch in the PnR database the single vias (defined in the technology.tf) with multiple vias in order to match the redundancy vias criteria for this technology node.

On top of sourcing this file during implementation, please make sure to apply the following command right after: *insert_zrt_redundant_vias -effort high*

Please make sure to check with your customer interface how to properly verify this item then at SignOff level (that the minimum ratio of multiple vias is present for manufacturability purposes).

l. /ICCOMPILERII/technology.tf

This is the main technology file for iccompiler2. Its content is almost similar to the ICC1 technology file, the main differences being the presence of implant layers (due to detailed abstracts usage) and the change of some layers number as we are natively in extended mode so a lot of mappings are no longer required (thus reverting to the original layer number from DK).

m. /ICCOMPILERII/antenna_rules.tcl

This file contains the antenna ratio rules for iccompiler2 (identical content than the file for iccompiler)

n. /ICCOMPILERII/map_out

This is the mapping file used for GDS streamOut in icompiler2. Its content is much lighter than for icompiler regarding the fact that the extended mode is natively used. Only labels & mappings for layers with a dedicated function and with a GDS datatype different than 0 are required in this file.

o. /ICCOMPILERII/strmIn.map

This is the mapping file used in case of GDS streamIn in icompiler2. The same remarks as for the map_out file apply.

p. /ICCOMPILERII/spacing_label_rule_setup.tcl

This file indicates the intercell spacing constraints in icompiler2.

q. /ICCOMPILERII/define_optimized_vias.tcl

This file is used to switch in the icompiler2 database the single vias (defined in the technology.tf) with multiple vias in order to match the redundancy vias criteria for this technology node.

r. /ICCOMPILERII/site_definition.tcl

This file defines the different standard-cell heights in the icompiler2 database.

s. /ICCOMPILERII/layers_setup.tcl

This file defines the metal layers directions as well as the offset values in the icompiler2 database. This file combined with the site_definition.tcl is equivalent to the unitTile + tile definition used in icompiler.

t. /ICCOMPILERII/layers_setup_alternative.tcl

Alternative TCL file where all metal layers are orthogonal one to the other. You may use the layers_setup.tcl or the layers_setup_alternative.tcl file, depending on your PG grid requirements. In ODIF flow, the layers_setup.tcl file is used by default.

2.2 SignOff files:

u. /NXTGRD/* .nxtgrd

These files are the parasitics extraction files used in SignOff for StarRC Extraction.

v. /STARRC/map_lefdef.rcxt

This SignOff file is the layer mapping file between LEF/DEF and NXTGRD tech files.

w. /STARRC/map_gds.rcxt

This SignOff file is the layer mapping file between LEF/DEF and GDS.



x. ./LEF/technology.lef

File used for Physical ECO in PrimeTime. Remark: its content has been filtered compared to the file embedded in the FTK CDN product (in order to remove all the LEF58* Cadence proprietary statements).

y. ./LEF/viarule_generate.lef

File used for Physical ECO in PrimeTime.

z. ./LEF/sites.lef

File used for Physical ECO in PrimeTime.

aa. ./LEF/dummy_layers.lef

File used for Physical ECO in PrimeTime.

2.3 LIPA files:

bb. ./IPACKAGING/*fram.abstract.map

Dedicated file for library views generation/validation. Not required for a design.

cc. ./IPACKAGING/*detailedfram.abstract.map

Dedicated file for library views generation/validation. Not required for a design.

dd. ./IPACKAGING/variables.scm

Dedicated file for library views generation/validation. Not required for a design.

ee. ./IPACKAGING/techno.tcl

Dedicated file for library views generation/validation. Not required for a design.

2.4 ICC1 read_lef data preparation files (for Zuma)

ff. Milkyway/dummy_layers.lef

Small LEF file with just the definition of the "OVERLAP" layer

gg. Milkyway/lef_layer.map

Simple mapping file of the "OVERLAP" layer to the 192 layer number (Milkyway layer 192 is the OverlapCheck layer that maps to the Overlap layer in LEF and this layer then acts as the cell boundary)

For IP LEF containing rectilinear boundary on "OVERLAP" layer, you will get it in Milkyway with the following commands:



```
create_mw_lib -technology technology.tf \
-open LIB_overlap
```

```
read_lef -lib_name LIB_overlap \
-tech_lef_files dummy_layers.lef \
-cell_lef_files small_rectilinear_macro.lef \
-cell_boundary_by_overlap_layer \
-layer_mapping lef_layer_map.map
```

2.5 Global files:

hh. Others

The module also contains the standard infrastructure product files (.csh/.info/.ptbl/vc.bbview/documentation).

3. Tips

⇒ Please make sure to use the iccompiler version which was used for validation of these technology files: I-2016.03-sp5-1.

⇒ When creating the library at the beginning of the design phase in iccompiler, the following command must be used: `create_mw_lib -technology $TECH -mw_reference_library $REF`

- \$TECH represents the path of the technology file.
- \$REF should first have listed the unitTile to be loaded, followed then by the respective standard cells PR directories. For instance:

```
mw_reference_library {

<...>/Foundation_Synopsys_TechnoKit_cmos028FDSOI_6U1x_2T8x_LB/ICC
OMPILER/unitTile/\

<Standard Cells FRAM views>

}
```

⇒ You should then choose which is your tile, depending on the standard cells used (8T or 12T):

- `set_fp_strategy -unit_tile_name <Cell Name>`

Where the <Cell Name> may be unit8T or unit12T



4. Contact Information

Please contact [HELPDESK](#) for any problems or suggestions.

