Automating GDS Generation in Magic

Old Dog, New Tricks





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Open Circuit Design opencircuitdesign.com

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http://opencircuitdesign.com/magic https://github.com/RTimothyEdwards/magic



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(All layout done using the SkyWater 130nm Open PDK)

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Derived Layers

ndiff = (DIFF and NSDM) and-not NWELL

ptap = (DIFF and PSDM) and-not NWELL

ntap = DIFF and NSDM and NWELL

pdiff = DIFF and PSDM and NWELL





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gds write filename



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Catecorner with overlap

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Catecorner without overlap



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Catecorner without overlap



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Catecorner without overlap



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Catecorner without overlap



Catecorner without overlap

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Catecorner without overlap

"BRIDGE" Operator



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"BRIDGE" Operator



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Contact Areas in Magic



Contact as drawn Contact cuts as output in GDS

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Automatic Contact Cut Generation in Magic



Contact cut placement



Substrate guard ring



Automatic Contact Cut Generation in Magic



The algorithm handles cut placement in arbitrary shapes

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Automatic Fill Pattern Generation in Magic





Layout before fill

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Layout after fill

"CLOSE" Operator



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"BLOAT-ALL" Operator



RPM (silicide block) layer (shaded area) created from resistor layer type and using BLOAT-ALL to extend to include the contacts.

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orange region = drawn resistor





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"BOUNDARY" Operator

Boundary matches the abutment box of the standard cell (cell property "FIXED_BBOX")



Generated ID layer (shaded area)

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"GROW-MIN" Operator



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"GROW-MIN" Operator

GROW-MIN algorithm currently works for rectangular shapes.



Non-rectangular shapes, not so much...



"MASK-HINTS" Operator



Auto-generated layer is not best for standard cell abutment

Mask hint makes output better for abutment

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property MASKHINTS_NPC "-10 184 542 266"

Conclusions

Magic's interface depends on automated mask data generation

Magic has useful geometry operators for writing mask data

New operators overcome long-standing issues

New operators extend automation capabilities

The old dog can be taught new tricks!

