Local Interconnect

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Conventional Standard Cell

Issues

- Printing contacts lithographically challenging
- Metal 1 very complicated (DPL conflicts)
- Limits scaling of standard cells
Standard Cell using local interconnect

• Spreads the complexity of metal 1 and contact layers to three layers: LI, V0 and M1
• Side benefit: Reduces channel strain caused by contacts
• Similarly other uses of contact also replaced by LI layer
Commercial 22nm Cell Layout

Fig. 2a. Conventional Layout

Fig. 2b. Layout with Local Interconnect.

Source: Smayling et. al., SPIE 2010
BEOL stack with local interconnect

- First proposed by TI in 1987 to improve SRAM density
- Requires an additional mask layer
- 10-20% density improvement was reported
- Salicide process was used for creating LI using TiN

Source: Saraswat, EE311 Lecture Notes
LI Manufacturing Steps

- Devices Formed
- Ti and Si deposited on formed devices
- Local Interconnect Mask Exposed
- Annealing to create silicide (TiSi$_2$)

Source: Mann et. al., J. IBM, 1995