

# IFST 2005 Panel

## *Devices and Technologies for hp32nm and beyond*

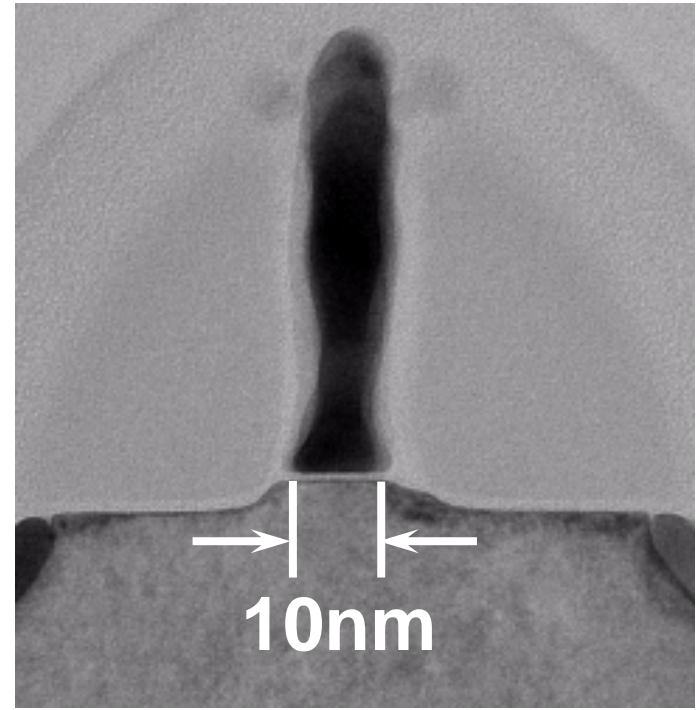
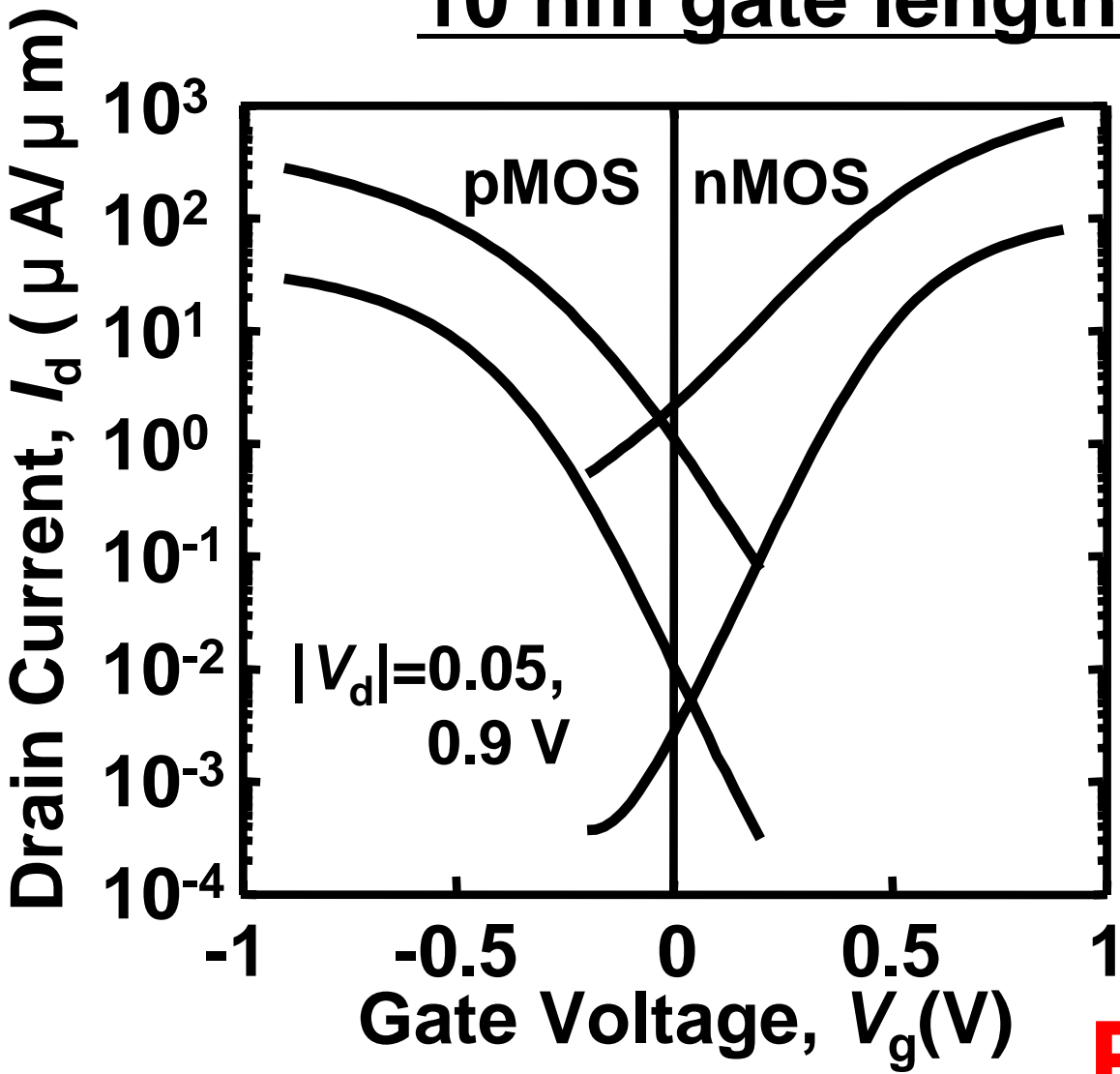
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- **Bulk or planar SOI? When?**
  - *Use bulk as far as possible, at least hp22nm node.*
- **FinFET or tri-gate? When?**
  - *FinFET can be used for memory cell before hp22nm if bulk planar fails.*
- **Global/local strain or others? When?**
  - *Local (already), others (when applicable)*
- **High performance or low power?**
  - *High performance (can manage additional cost)*
- **Si nanowire, CNT-FET, or other new devices?**
  - *Maybe. Combined with conventional CMOS or find their own application.*
  - Polymer/flexible device is also attractive.*

# Bulk or planar SOI? When?

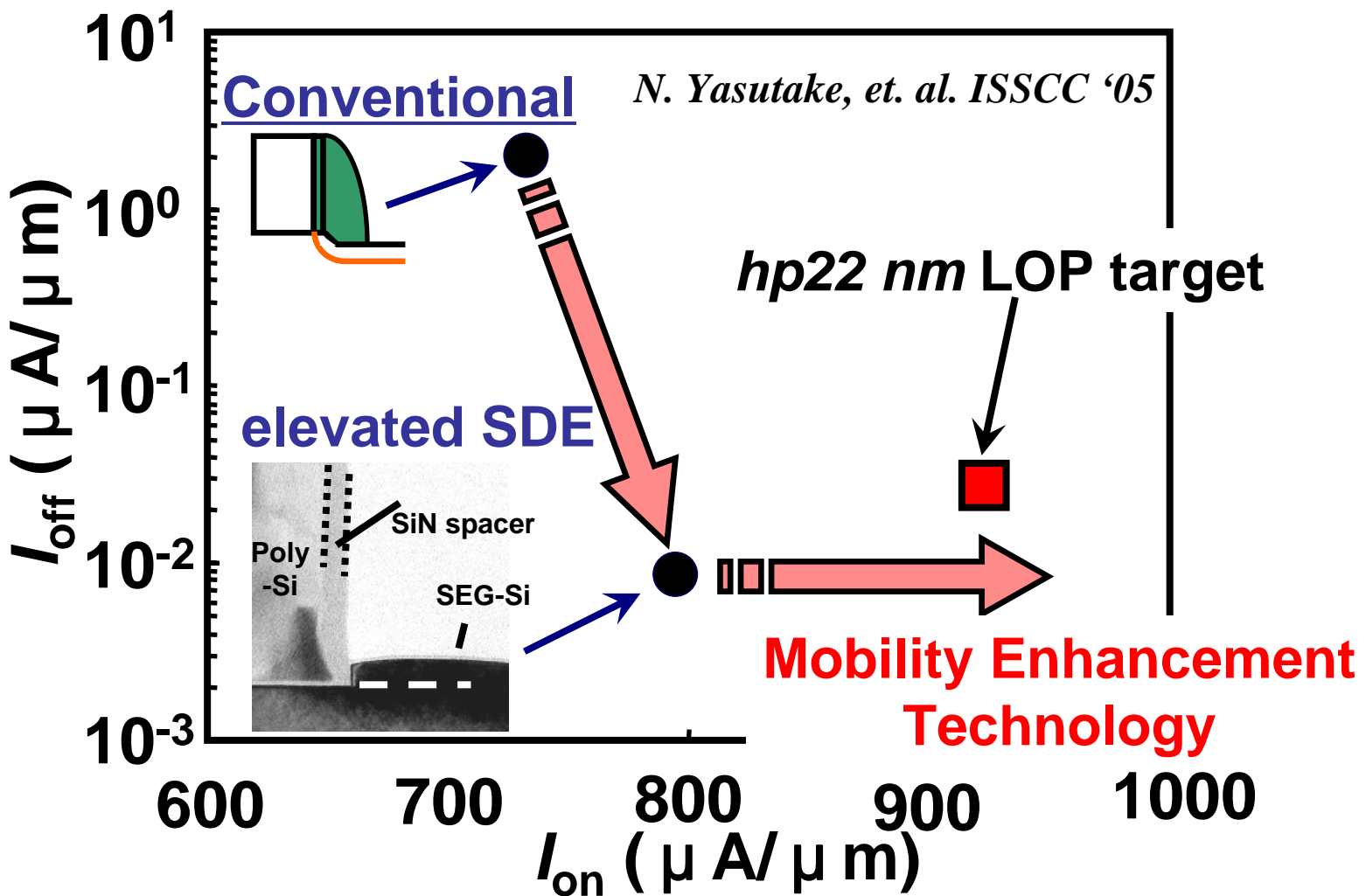
## 10 nm gate length MOSFET



*N. Yasutake, et. al. VLSI '04*

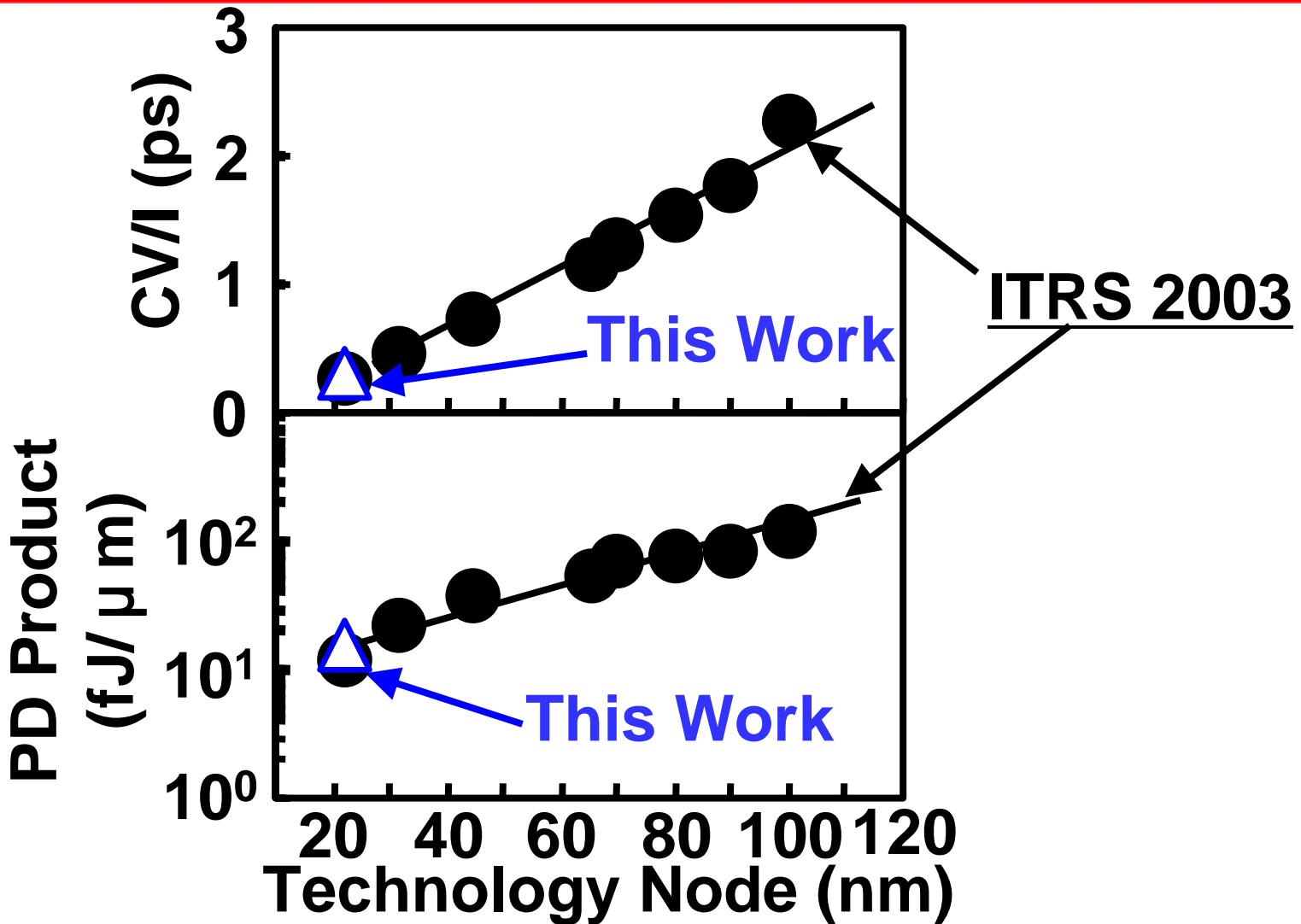
**Bulk works!**

# Improvement Scenario



Planar bulk CMOS technology can be realized  
*hp22 nm* node LOP (if  $V_d=0.9V$  is acceptable)

# Gate delay & power- delay product

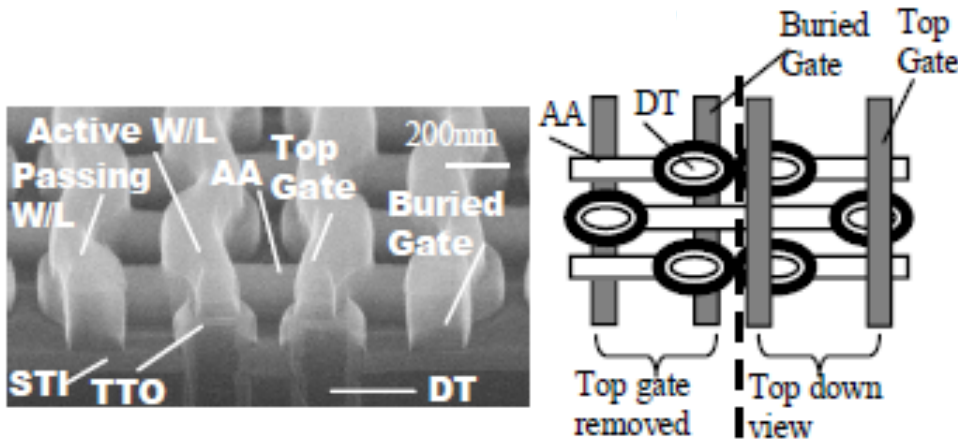
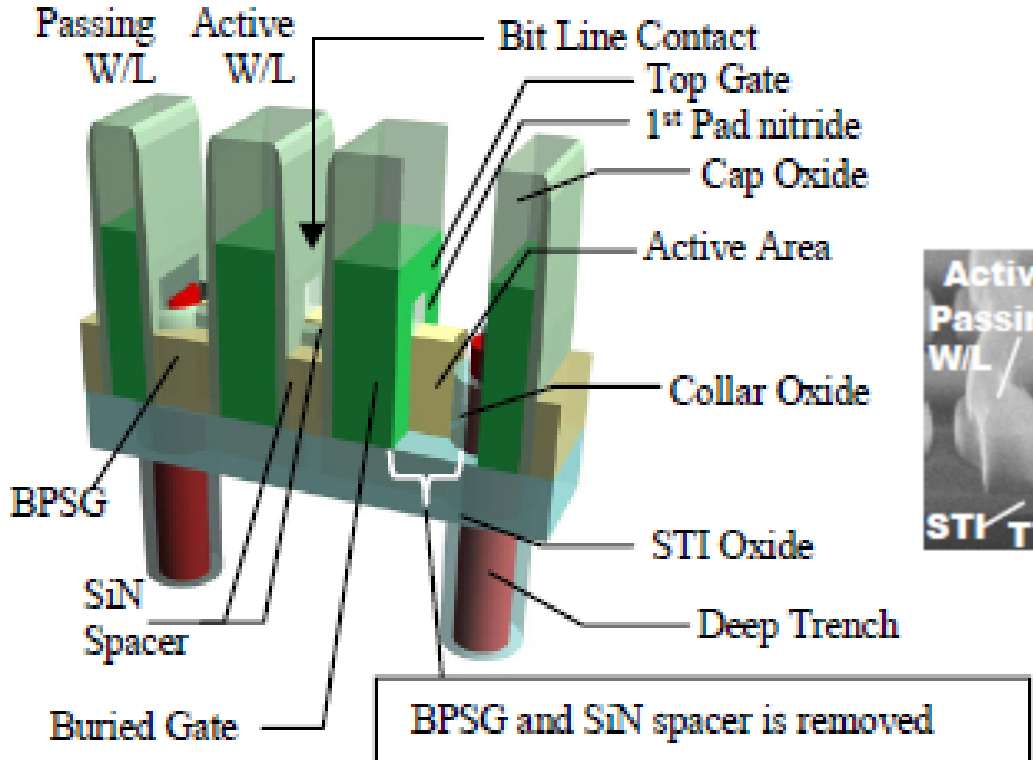


*N. Yasutake, et. al. VLSI '04*

**$V_{dd}=0.9$  V is acceptable at *hp22 nm* node LOP**

# FinFET or Tri-gate? When?

FinFET can be used for memory cell



R. Katsumata, et. al. VLSI '03

Anytime if you want ?

- **Planar SOI**
  - Attractive for **HOT**. Wafer **cost** and circuit **design** are issues.
- **FinFET/tri-gate**
  - **$V_{th}$  control, doping, etching, inspection** - - - - -
  - How to **integrate with planar** (I/O) devices?
- **Global/local strain or others? When?**
  - **Local** strain seems **difficult** for FinFET.
- **High performance or low power?**
  - High performance (can manage additional cost)
- **Si nanowire, CNT-FET, or other new devices?**
  - Si nanowire: Can increase channel width?
  - CNT: Can place where we want?
  - Other: **Compatibility** with conventional CMOS

# VLSI 05 Rump Session

## *Will planar CMOS end? When? Why?*

**Q1. Which generation do we move to non-planar?**

Never	45nm 2008-10?	32nm 2010-13?	22nm 2012-16?	15nm 2014-19?

**Q2. Which platform will introduce non-planar first?**

HP	LOP	LSTP	Memory

**Q3. Which structure are the most promising?**

SON	Tri-gate	Fin	MBC	Other



***Thank you!***