Information
and Communication
Networks

Crossbar-current out of CMOS-Ibis-Models

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Overview

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- Motivation
- Definition of Cpd as a measure of I(t)
- New method for Crossbar current I(t) – generation from IBIS
- Comparison with Hspice
- Summary
- Conclusions

Motivation

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- EMC - Standardization Requirements
- EMC - tools for simulation
  - **Output**: E(x,f)
  - **Input**:
    - Current vs. Time
      - Crossbar current
      - Current loops
    - Layout + Device Information

Definition of Cpd

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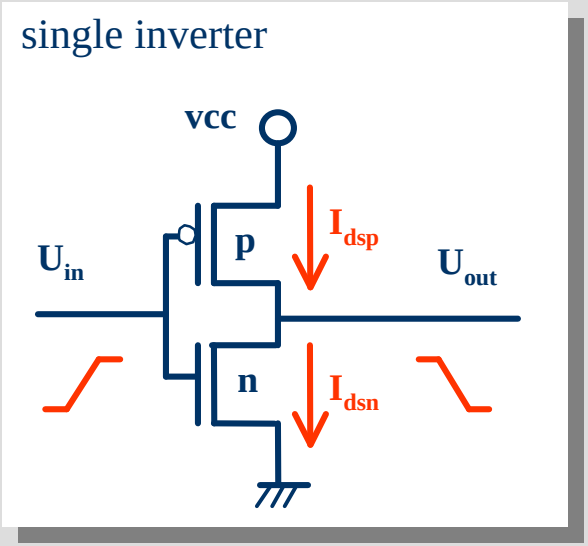
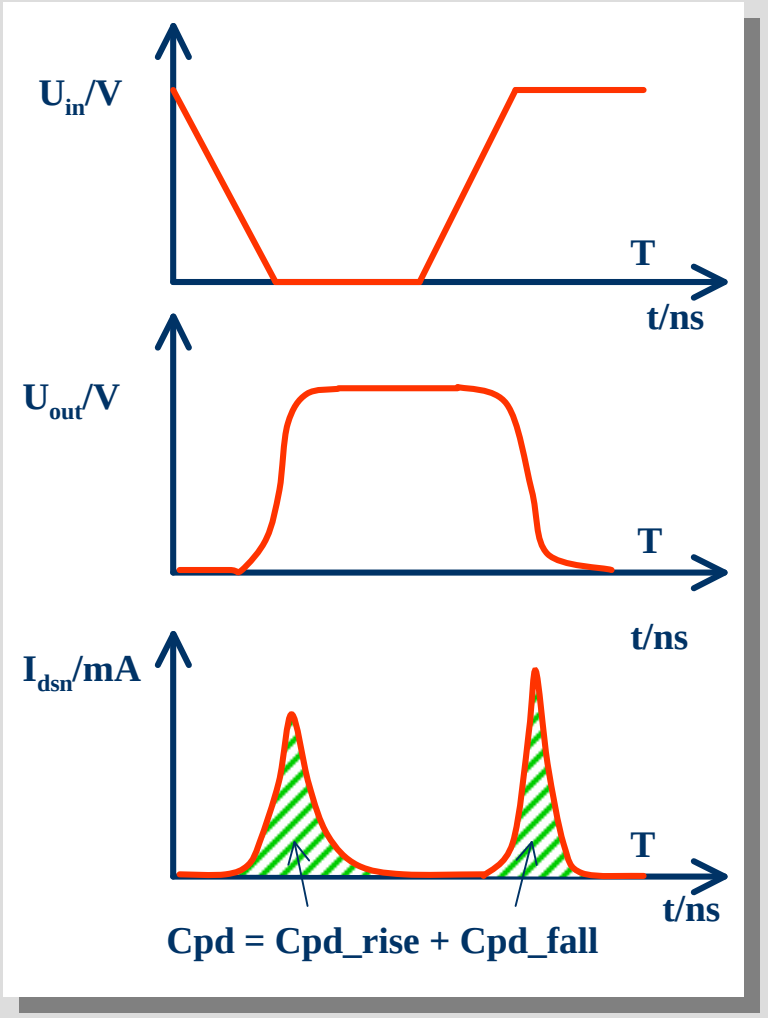
- A virtual **capacitance Cpd** is a measure of the **current** that flows through an open output **from vcc to gnd** during one period T
- Cpd in datasheets





Crossbar I(t)
Geometrical Determination Method (1)

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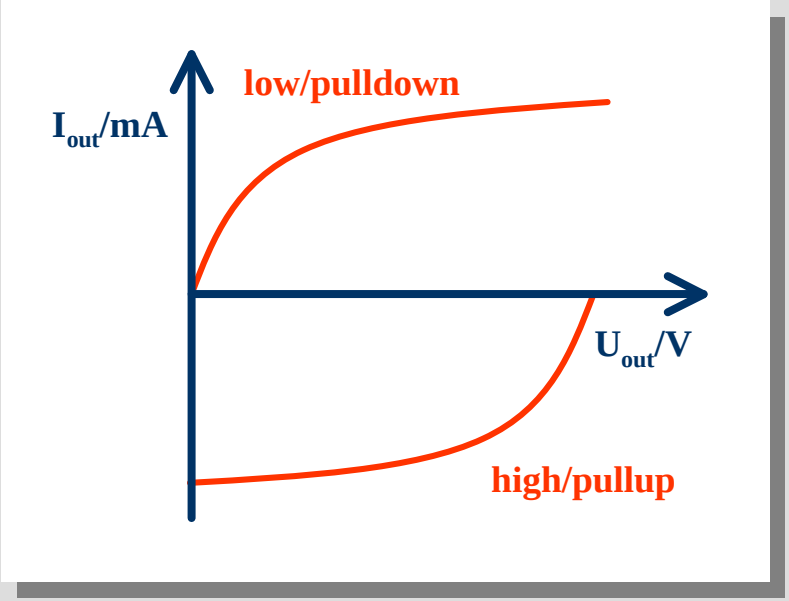
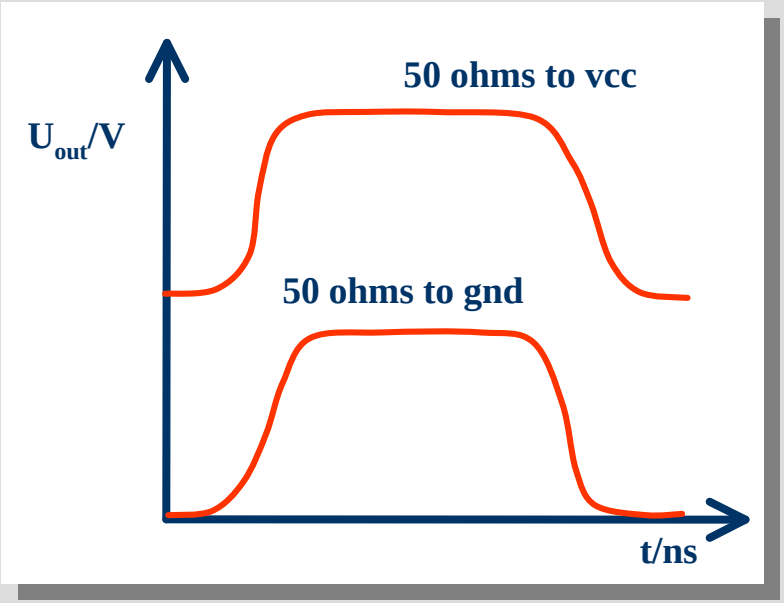
Requirement from IBIS - File:



Static curves I(u)



Dynamic curves u(t)

Crossbar I(t)
Geometrical Determination Method (2)

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Procedure in words:

- Static curves I(u) give the behaviour of each single transistor
- Dynamic curves U(t) with load 50 ohms to gnd and vcc gives a good **approximation** of the **switching of each single transistor**
- At a time **t** you can equal the currents through each transistor $\mathbf{I_{dsn} = I_{dsp}}$ and you will get the crossbar current

Crossbar I(t)
Geometrical Determination Method (3)

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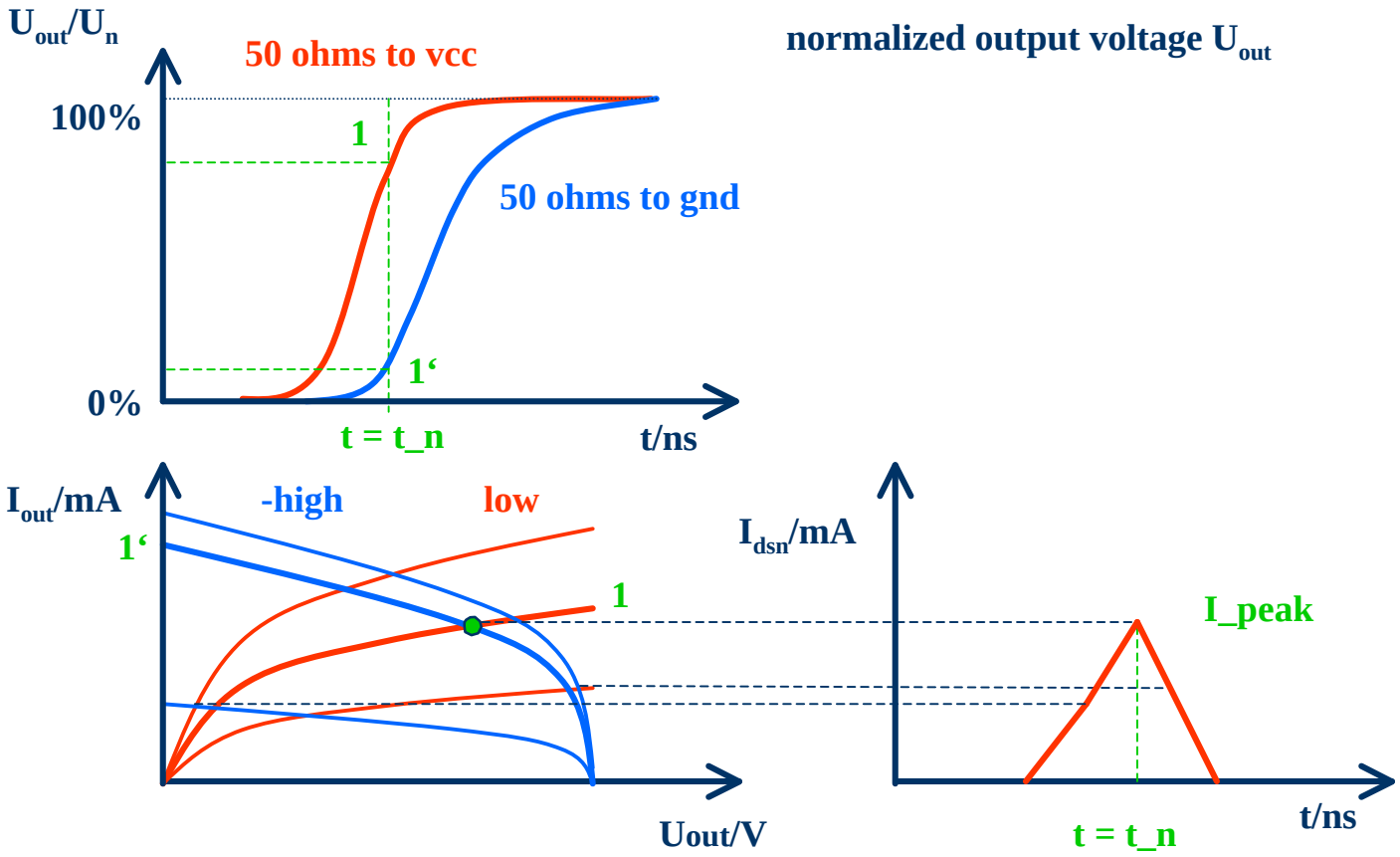
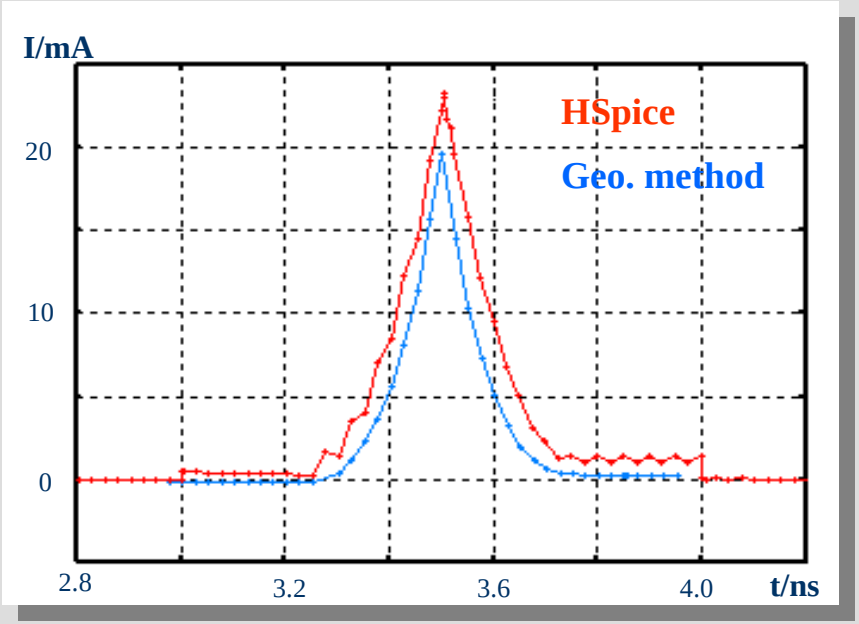
Procedure in grafics:

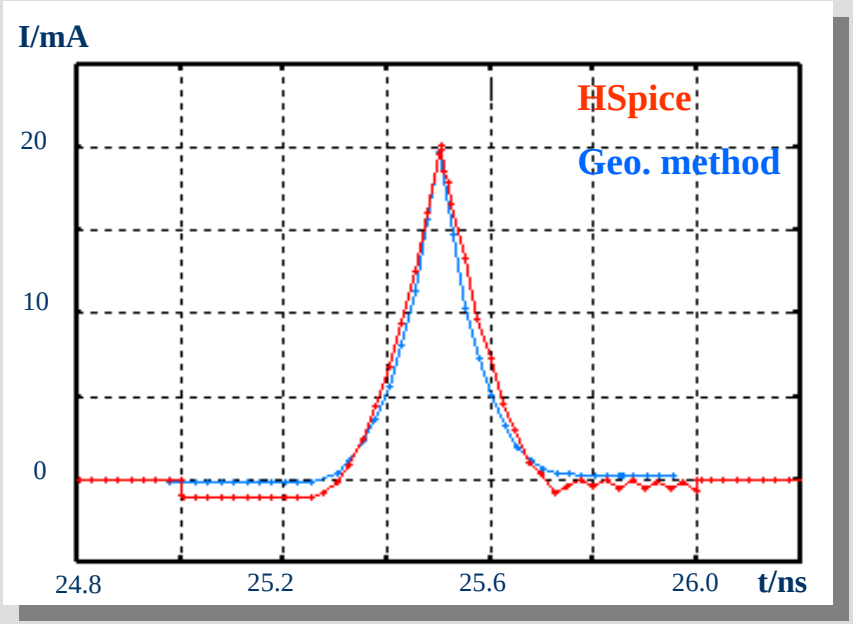


Comparison HSpice / Geometrical Method (1)

- Inverter I_{out} (Vcc=3.3V) = 200mA



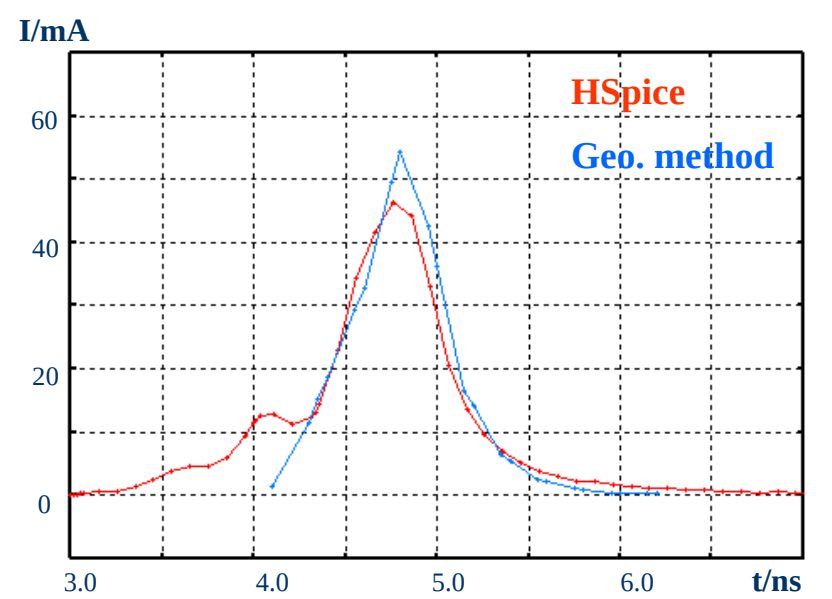
rise



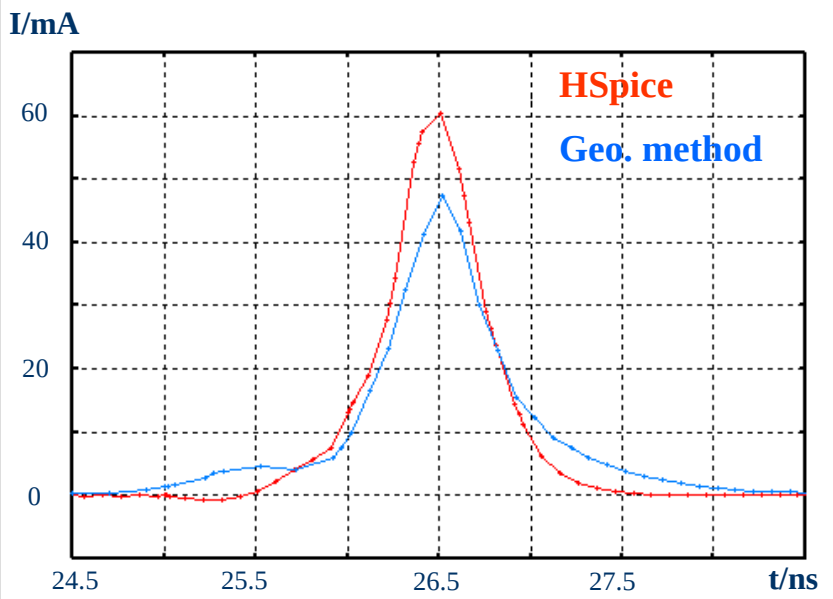
fall

Comparison HSpice / Geometrical Method (2)

- Driver with prestage I_{out} (Vcc=3.3V) = 60mA



rise



fall

Summary

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- For **CMOS** it is possible to generate **I(t) out of IBIS**
  - **more confidential** and **better available** values of Cpd, than from datasheets
  - Pre-stages / core not negligible
  - **Accuracy** of Cpd dependent on:
    - driver strength
    - c_comp
    - slew rate

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Conclusions

- Actual **ICN-practice**:
  - For CMOS: as shown here
  - For Non-CMOS technologies: Default parameters
- Further investigations on accuracy
- **Requirement** for further IBIS-keyword
  - **I(t) - table** or
  - **Cpd_rise /Cpd_fall** and **I_peak** (as in tool)