

# Diagnosis of Sequence Dependent Chips

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**Bio**

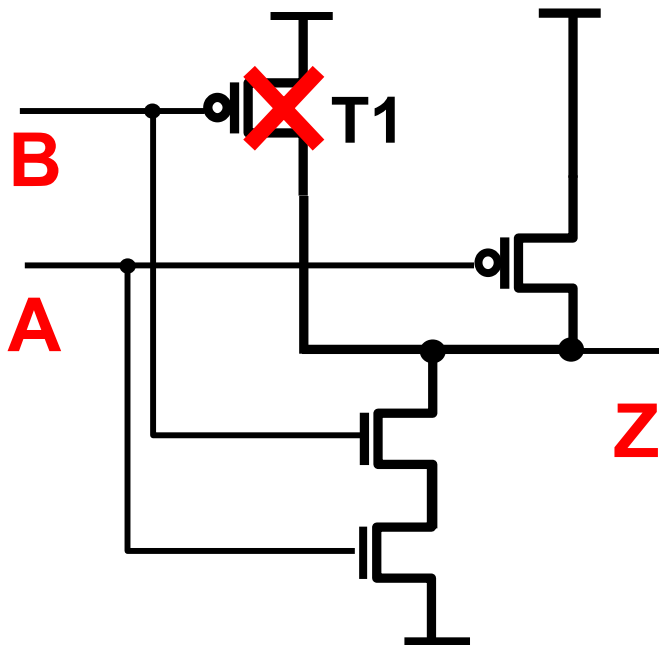
**B.S.E.E., National Taiwan University, 1993.**

**M.S.E.E., Stanford University, 1997.**

**Ph.D. student at CRC since 1998.**

# Sequence Dependence

- Test results depend on test pattern ordering
- NAND with Stuck Open Fault (SOF) T1
  - ◆  $AB=\{00,11,01\}$ ,  $Z=\{1,0,0\}$ , detected
  - ◆  $AB=\{00,01,11\}$ ,  $Z=\{1,1,0\}$ , not detected
    - Charges stored at Z

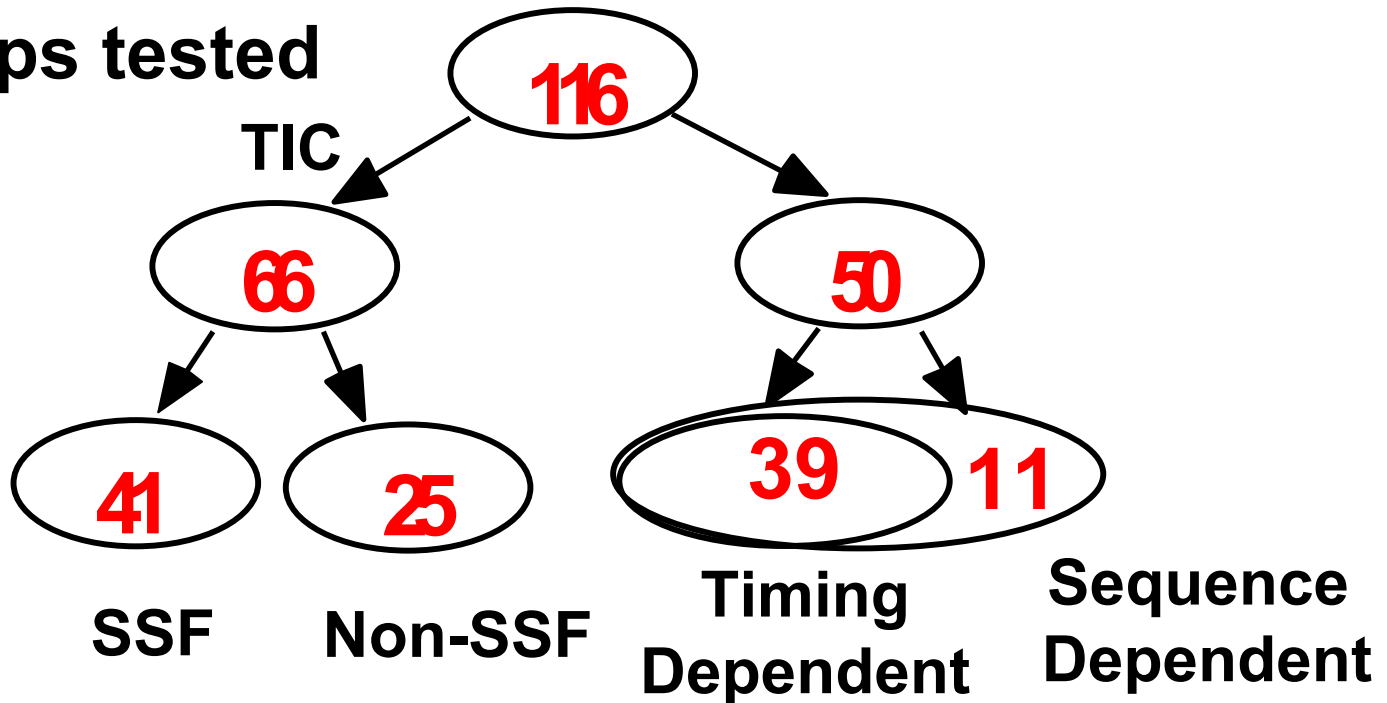


NAND Truth Table

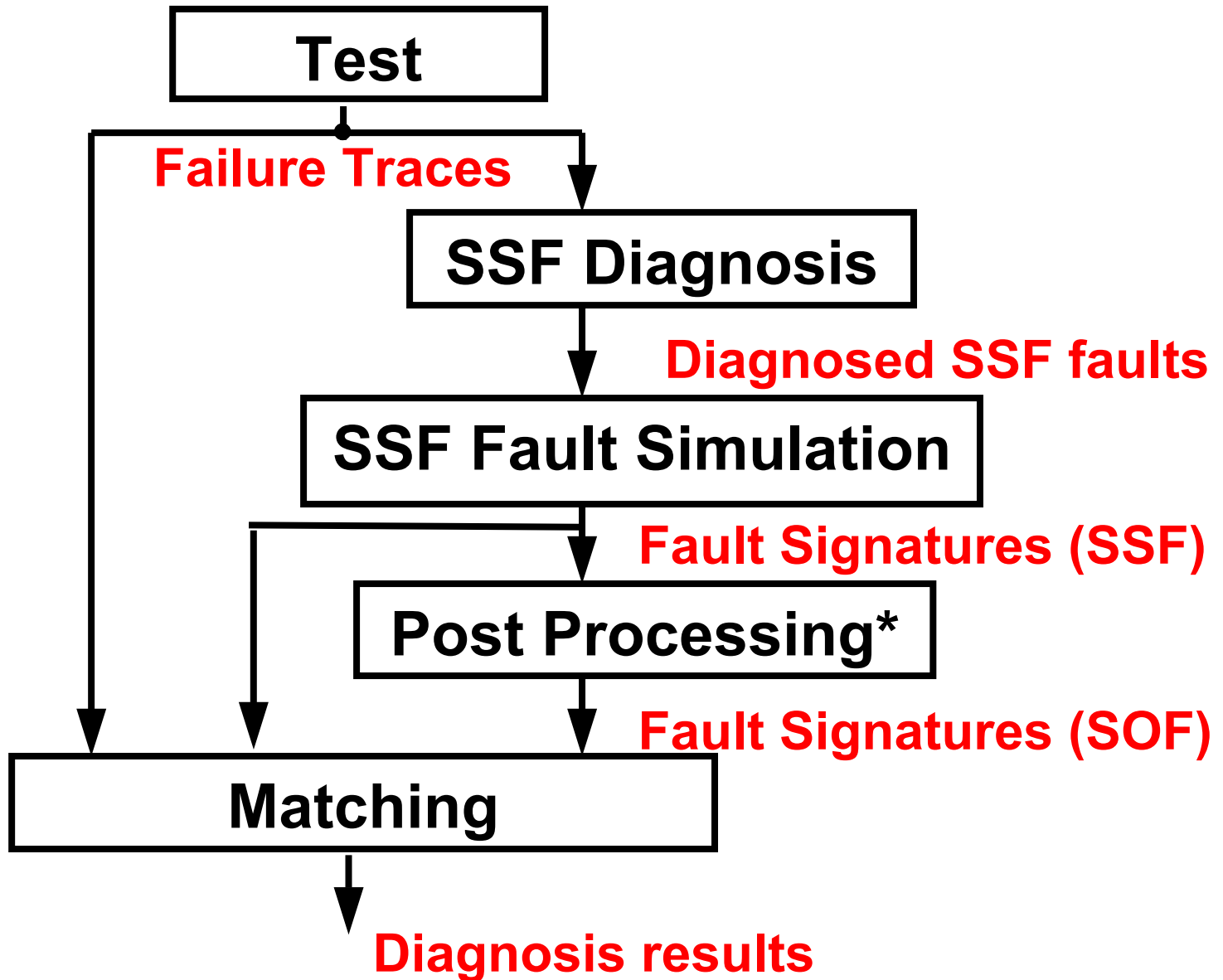
AB	Z
00	1
01	1
10	1
11	0

# The “Murphy Test Chip”

- Test chip description [Franco 95]
  - ◆ 0.7 $\mu$ m technology, 5V nominal  $V_{DD}$
  - ◆ 25K gates, combinational circuits
- 5 designs: 2 data path, 3 control Logic
- 5.5K chips tested



# Diagnosis Flow



# Diagnosis Results

## 11 Sequence Dependent Chips

Chip ID	Perfect match?	Diagnosed faults
SD.1-7	Y	1 SOF
SD.8	Y	1 SSF + 1 SOF
SD.9	N	2 SSF + 1 SOF
SD.10,11	N	unknown

- **Chip #8, 9**
  - ◆ **Clustered defects → multiple faults**
- **Chip #10,11**
  - ◆ **Library cell modeling issue?**

# Summary

- **Stuck open fault**
  - ◆ **Sequence dependence**
- **5.5 K Murphy chips tested**
  - ◆ **116 defective chips**
    - **11 sequence dependent**
      - **7 single stuck-open fault**
      - **2 SSF + stuck-open fault**

# Other Sequence Dependent Chips

- Multiple faults [Li VTS'02]
  - ◆ Clustered defects [Koren 94]

## Wafer map

