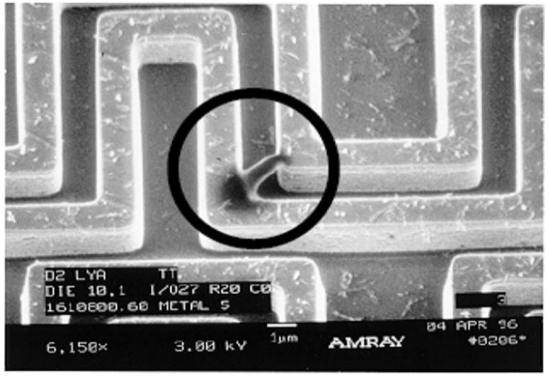
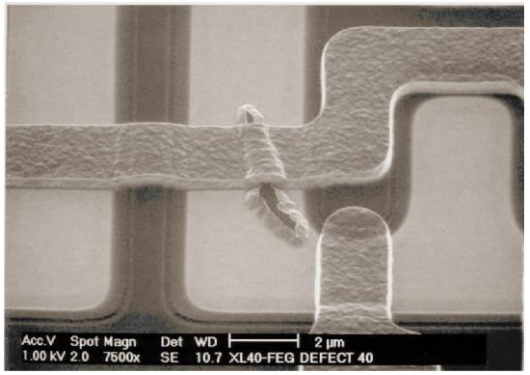
Lab 1: Test Pattern Generation

Stuck-At Faults

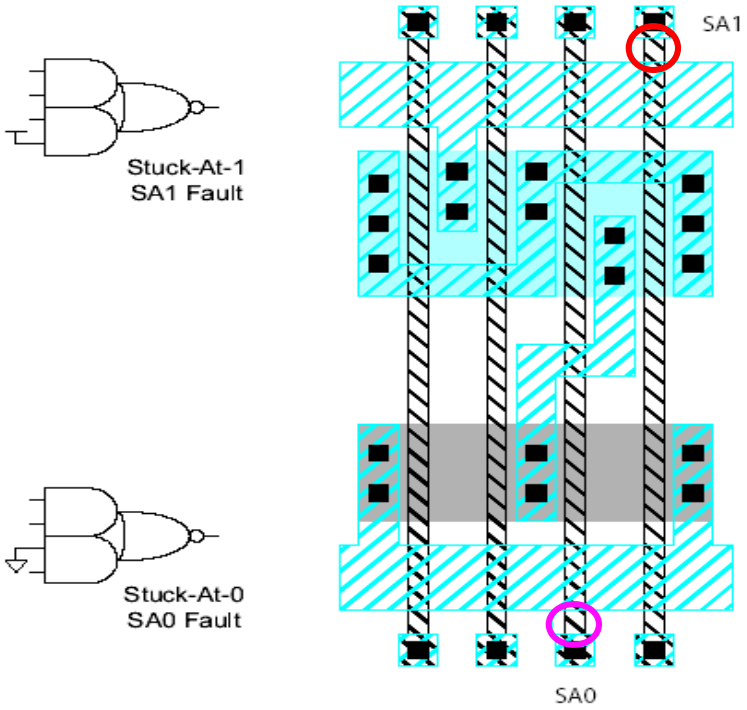
- **How does a chip fail?**
  - Usually failures are shorts between two conductors or opens in a conductor
  - This can cause very complicated behavior
- **A simpler model: *Stuck-At***
  - Assume all failures cause nodes to be "stuck-at" 0 or 1, i.e. shorted to GND or V_{DD}
  - Not quite true, but works well in practice

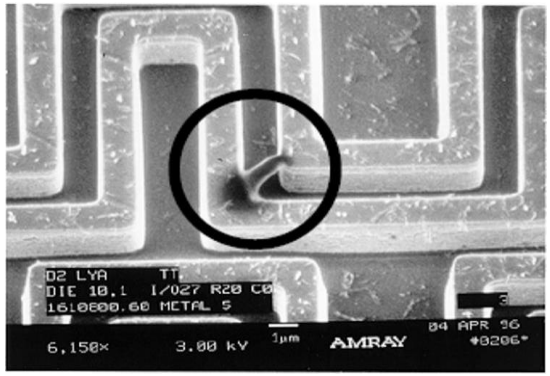




Test Pattern Generation

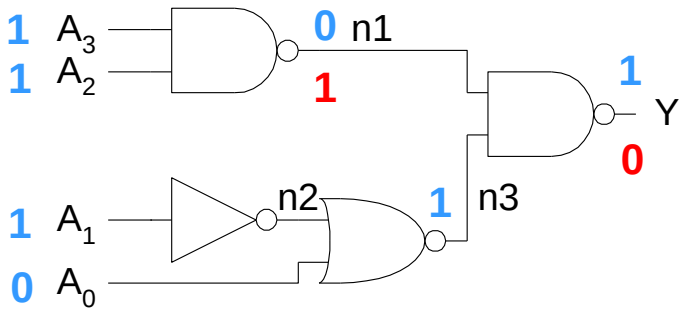
- **Manufacturing test ideally would check every node in the circuit to prove it is not stuck**
- **Apply the smallest sequence of test vectors necessary to prove each node is not stuck**





Test Example (1/2)

	SA1	SA0
A_3	{0110}	{1110}
A_2	{1010}	{1110}
A_1	{0100}	{0110}
A_0	{0110}	{0111}
n1	{1110}	{0110}
n2	{0110}	{0100}
n3	{0101}	{0110}
Y	{0110}	{1110}



- Minimum set: {0100, 0101, 0110, 0111, 1010, 1110}

Test Example (2/2)

{0000} {0001} {0010} {0011} … {1110} {1111}

A3 SA1
A3 SA0
A2 SA1
A2 SA0
A1 SA1
A1 SA0
A0 SA1
A0 SA0
n1 SA1
n1 SA0
n2 SA1
n2 SA0
n3 SA1
n3 SA0
Y SA1
Y SA0

$$K = \{K_1, K_2, \ \ldots \ , K_n\}$$

$$S = \{S_1, S_2, S_3, \ldots, S_m\}$$

		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
S1	A3 SA1							1									
S2	A3 SA0															1	
S3	A2 SA1											1					
S4	A2 SA0															1	
S5	A1 SA1					1											
S6	A1 SA0							1									
S7	A0 SA1							1									
S8	A0 SA0								1								
S9	n1 SA1															1	
S10	n1 SA0							1									
S11	n2 SA1							1									
S12	n2 SA0					1											
S13	n3 SA1						1										
S14	n3 SA0							1									
S15	Y SA1							1									
S16	Y SA0															1	

Lab 1: Test Pattern Generation

- 下載並安裝Dev-C++
- 撰寫Test Example電路的Test Pattern Generation程式並找出Minimum Set
- **Step1**: 寫一個程式找出所有可偵測到A3 SA1(亦即S1)的Input Patterns
- **Step2**: 使用Step1的程式找出每一個Stuck-At Fault (亦即S1~S16)對應的Input Patterns
- **Step3**: 完成上一頁表格的完整內容，撰寫程式找出可偵測到所有Stuck-At Faults的Minimum Test Pattern Set
- 撰寫並繳交實驗報告

實驗報告+程式碼

- 實驗報告及程式碼以壓縮檔繳交，每位同學均須繳交
- 實驗報告壓縮檔請以實驗編號及自己的學號姓名命名，例如：Lab2_M999999999陳小華.rar，於規定時間內上傳至“中山大學網路大學-作業評量區”繳交
- 實驗報告內容包含
  - 實驗主題、實驗日期、學號姓名
  - 實驗內容、過程及結果
    - 實驗內容、程式簡要說明...
    - 實驗畫面、程式執行過程及結果截圖...
    - 實驗結果及分析
  - 實驗心得