ITC 2023 PO 27: Automotive ASIC Test time reduction with Observation Scan Technology (OST)

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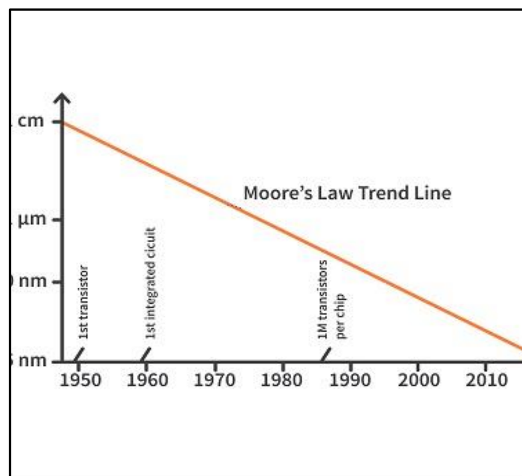
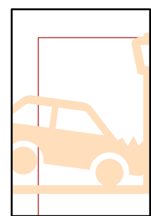
(1) Challenges to Automotive Test



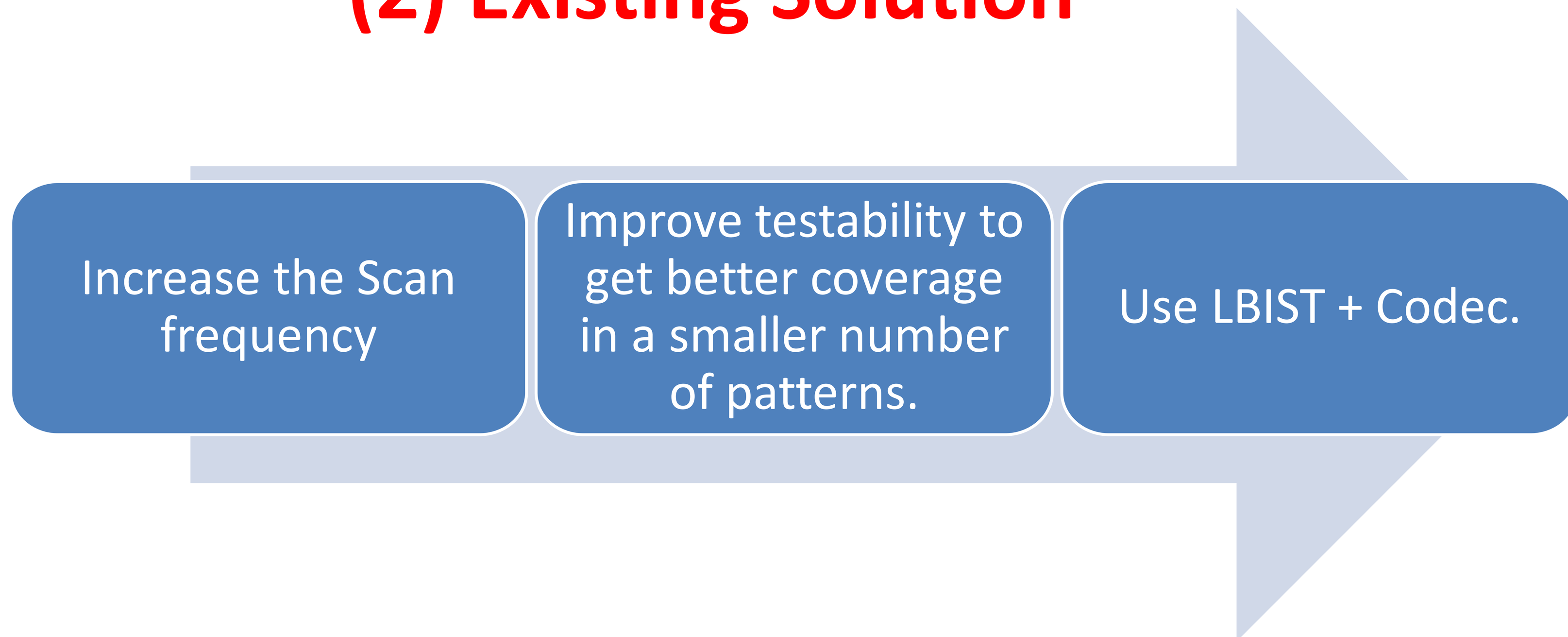
Shrinking Nodes → Design Size and Complexity ↑→ Pin Limited Design, test time ↑

For Automotive class(ISO26262) of designs where we use the POST or on-demand LBIST, the test time requirement for designs are very stringent



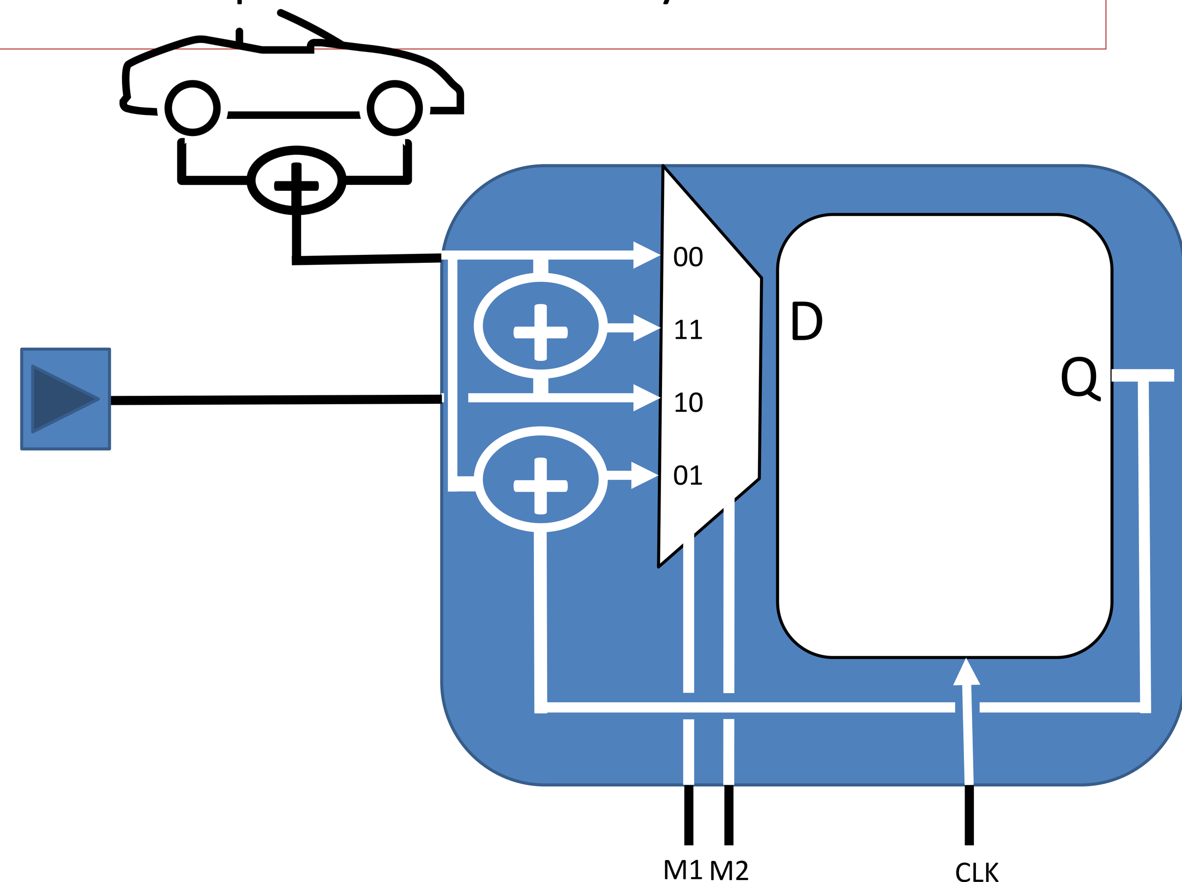
Need to reduce the overall test time for Manufacturing and for In-system testing

(2) Existing Solution



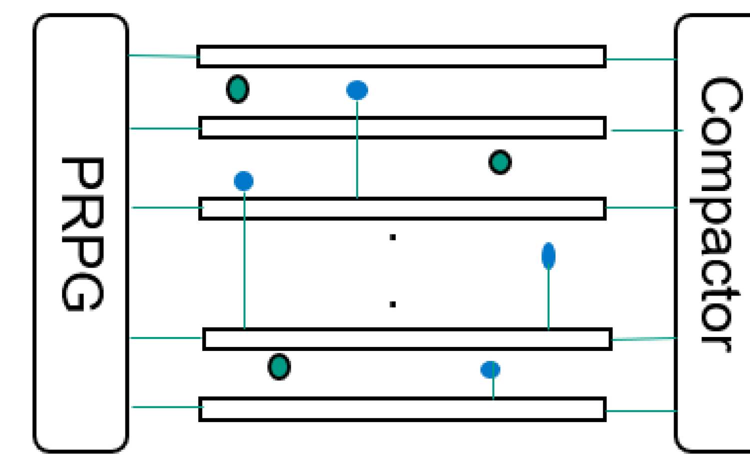
(3) Observation Scan Technology (OST)

Special observe type test points that target design locations with poorer observability



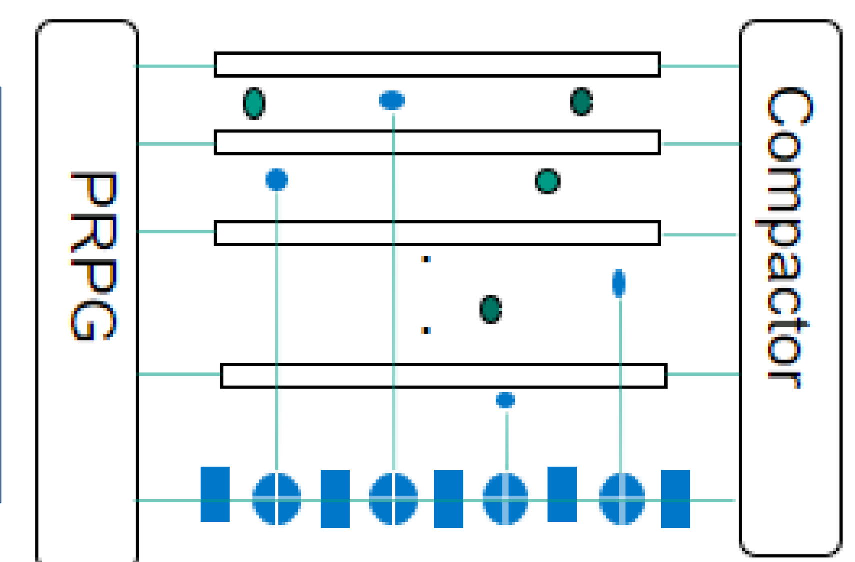
M1	M2	
1	0	Shift
1	1	Shift & Capture
0	0	Capture
0	1	Capture & Accumulate

(4) Integrating OST with LBIST



LBIST With Regular Observation points

- Separate Observation Scan chain
- Capture Observation flop in every cycle
- Less area overhead for test coverage
- Reduced test time



LBIST With OST

(5) Results from OST Implementation (12nm Technology)

Design	# Flops	Chain Length	#TEST POINT	Area (sqmm)	#Test Pattern	Coverage Achieved	Test Time (100MHz)
Without OST	~225K	570	2500	~.23	15000	88.54%	85.65ms
With OST	~225K	570	2500	~.235	3072	90%	17.541ms
Difference	-	-	-	-	~5X reduction	1.5% Better	~5X reduction

Design	Coverage with NCP
Without OST	84.85%(15K pat)
With OST	90%(15K pat)
Difference	5.15% Better

(6) Conclusion

Better test time & Coverage Achieved with OST

Higher Coverage Numbers

Lower Test Times. ~ 5X less.

Very small area overhead compared to regular LBIST