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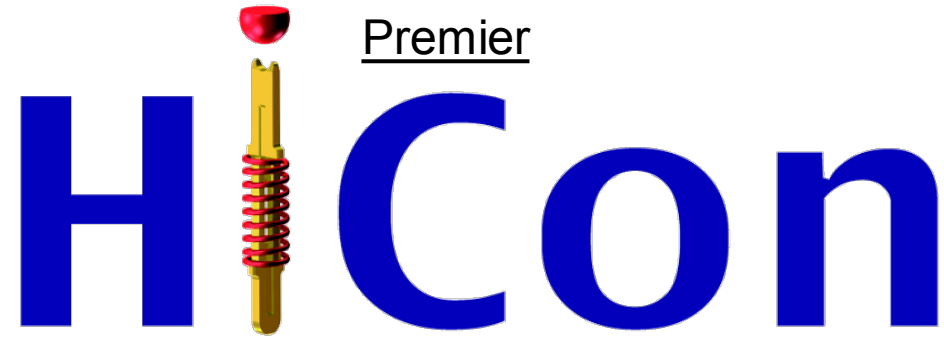
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March 5-8, 2023

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Future of Test Connectivity

Panchami Phadke
TechInsights



TestConX 2023

Contents

- Semiconductor Forecast
- Demand Drivers
 - Memory vs. Non-Memory
- Forecast
- Top 5 Socket Suppliers



Future of Test Connectivity

2 **2023**

TestConX 2023

Macro Events Shaping Semiconductor Demand

POSITIVES

- Demand has shifted from Goods to Services
- Industries are shifting due to technological advancements
 - Automotive & industrial markets
- Layoffs are accelerating
 - Intel, GF, Micron, and others
 - Companies are being proactive to moderate the downturn
- CAPEX cuts are reducing capacity

NEGATIVES

- Inflation...Feds increasing rates
 - Reducing money supply & demand
- China's Macro problems from COVID-19 policies
 - Permanent damage to supply chain reliability/security
- War in Europe
 - Energy shortage in the short-term
 - Mis-directing resources away from growth-driving initiatives/industries
- U.S Export Controls to China
 - Advanced chips and equipment



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3 **2023**

TechInsights' Forecast Summary

TechInsights' Current Forecast										
Forecast as of February 2023:	1Q22	2Q22	3Q22	4Q22	2022	1Q23	2Q23	3Q23	4Q23	2023
Semi Equipment (\$B):	\$ 31.7	\$ 33.2	\$ 35.6	\$ 34.9	\$ 135.3	\$ 31.0	\$ 28.3	\$ 27.9	\$ 31.0	\$ 118.1
Sequential Change	-5.3%	5.0%	7.0%	-2.0%	6.6%	-11.2%	-8.7%	-1.1%	10.8%	-12.7%
Capacity Utilization:	95.4%	96.5%	94.9%	88.5%	93.8%	82.4%	81.7%	84.6%	88.7%	84.4%
ICs (\$B):	\$137.4	\$137.7	\$125.1	\$112.0	\$ 512.3	\$ 107.5	\$ 113.9	\$ 123.8	\$ 128.3	\$ 473.5
Sequential Change	1.7%	0.2%	-9.2%	-10.4%	4.0%	-4.1%	6.0%	8.7%	3.6%	-7.6%
IC Units (BU):	\$102.4	\$104.6	\$101.9	\$ 96.2	\$ 405.1	\$ 93.9	\$ 97.9	\$ 103.0	\$ 105.2	\$ 400.0
Sequential Change	-0.5%	2.1%	-2.6%	-5.6%	2.7%	-2.4%	4.3%	5.3%	2.1%	-1.2%
Electronics (\$B) :	\$647.6	\$595.9	\$618.0	\$694.2	\$ 2,556	\$ 586.3	\$ 577.8	\$ 607.4	\$ 728.4	\$ 2,500
Sequential Change	-15.7%	-8.0%	3.7%	12.3%	-0.7%	-15.5%	-1.5%	5.1%	19.9%	-2.2%

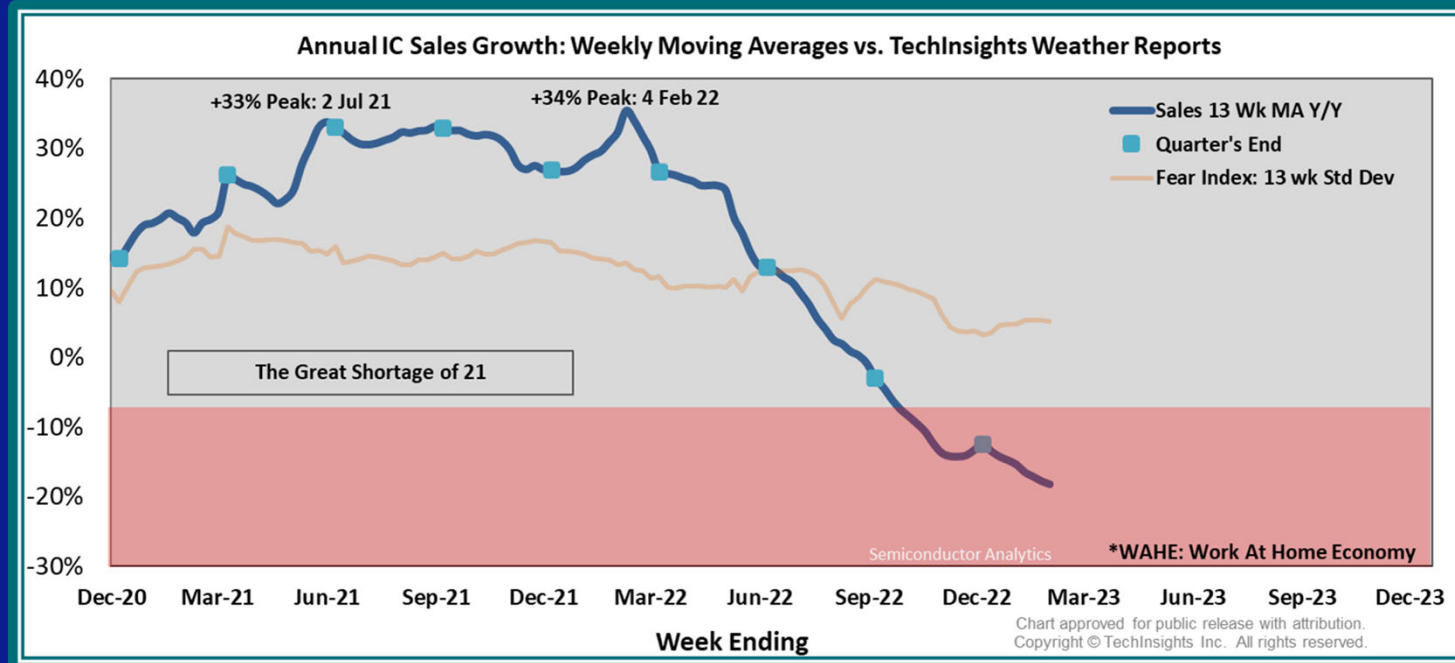
	2022	2023
Equipment	Downgraded from 8% to 7%	Upgraded from -15% to -13%
IC Sales	Unchanged	Unchanged
IC Units	Upgraded from 3% to 4%	Upgraded from -3% to -1%
Electronics	Unchanged	Unchanged



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4 **2023**

IC Sales Growth



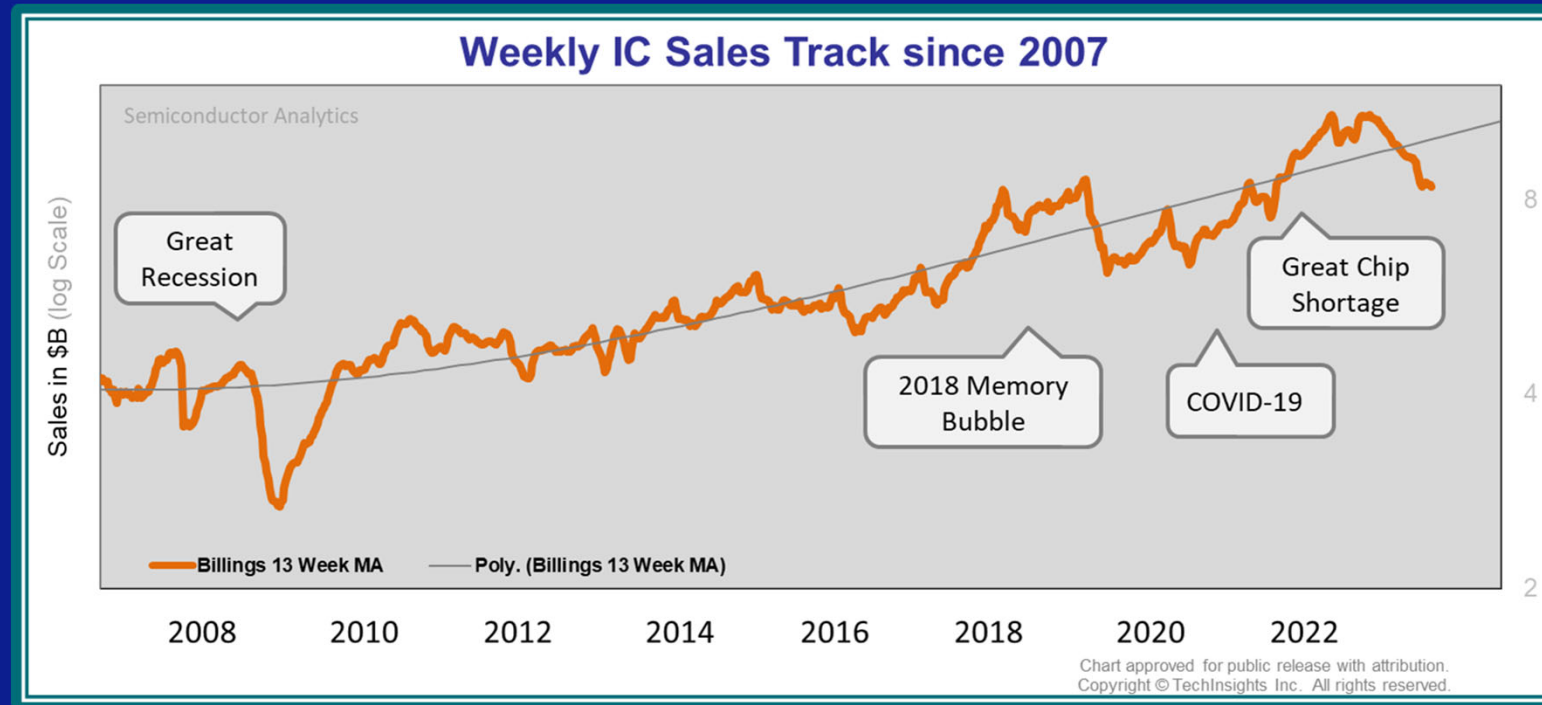
Overheated
or
Underheated



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5 **2023**

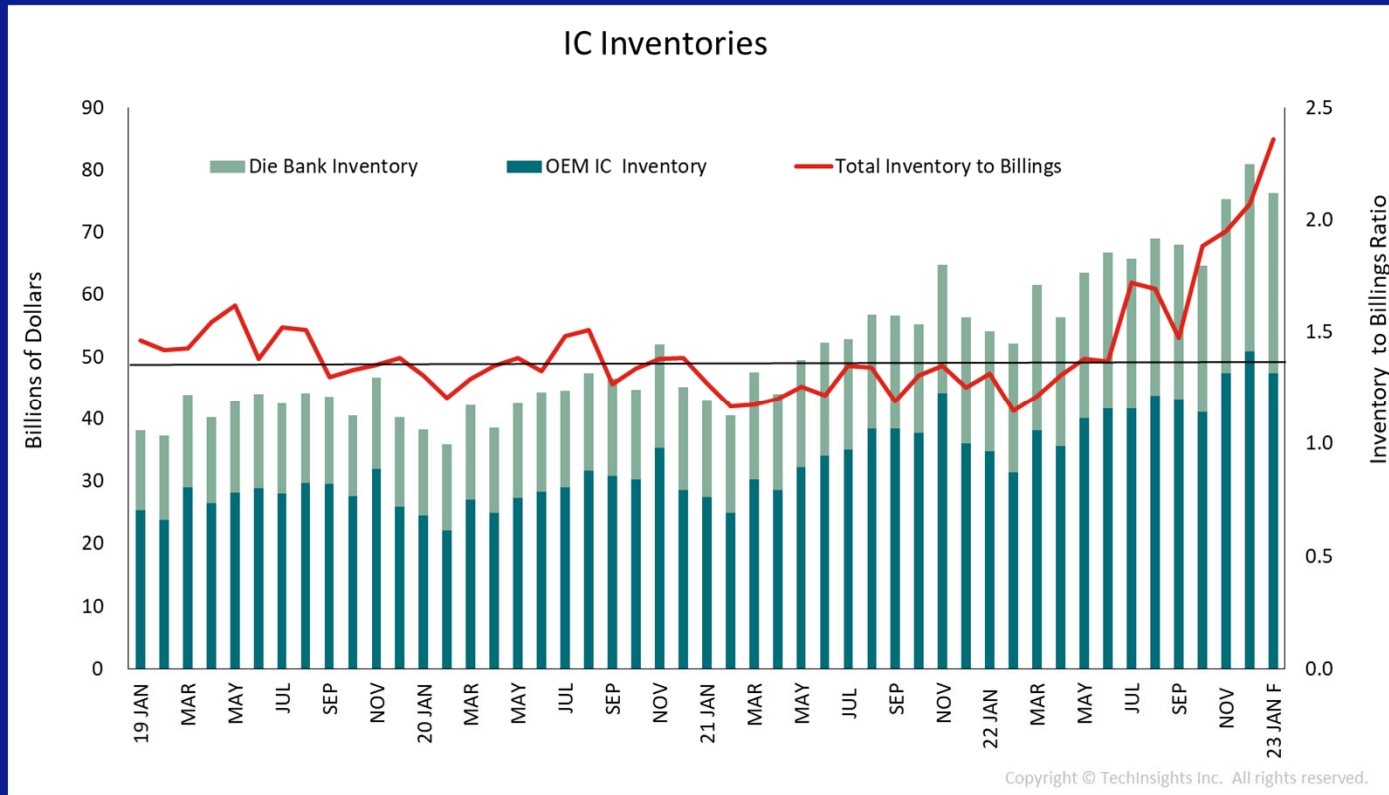
IC Sales Track



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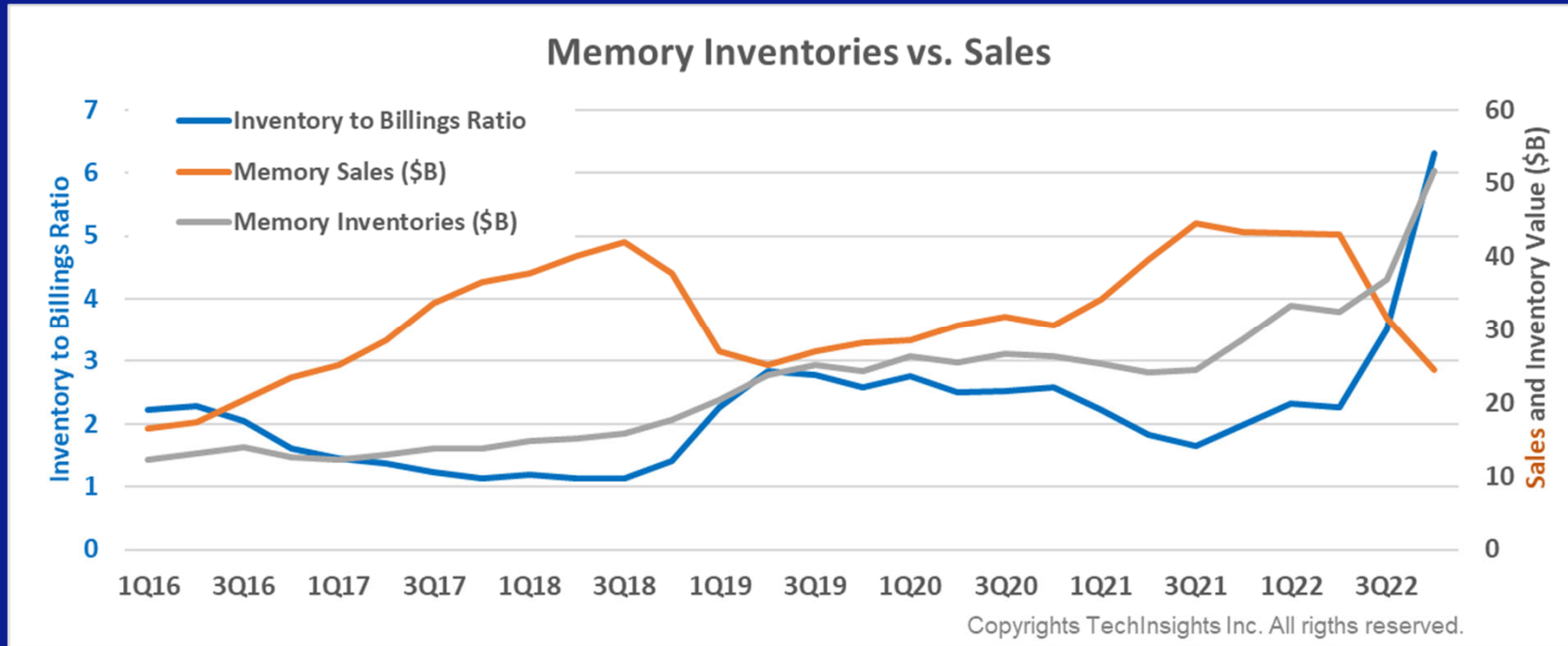
6 **2023**

IC Inventories



Inventory to Billings Ratio is Above 2

Memory Inventories – Wild Ride



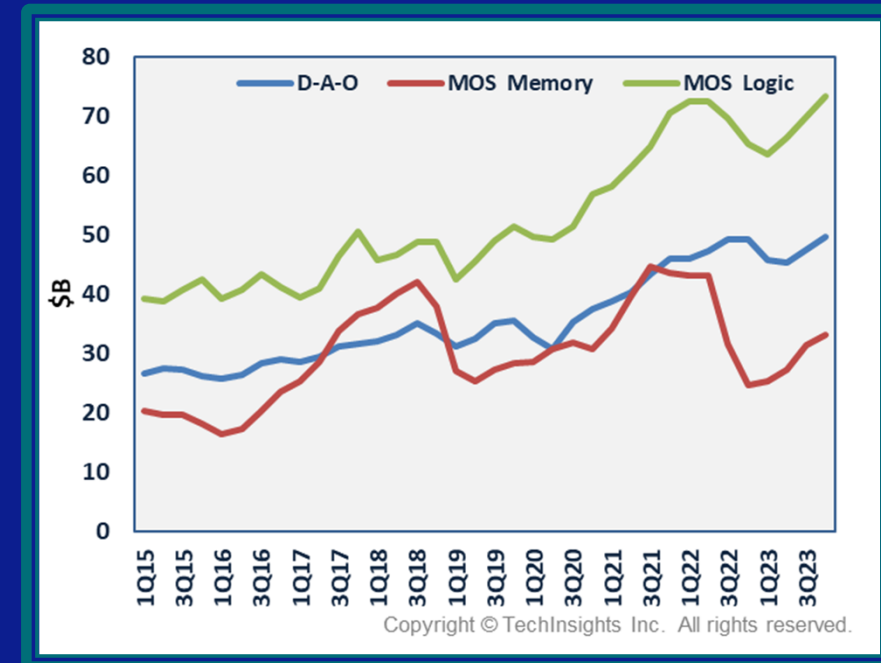
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8 **2023**

Diversified Semiconductor Markets

- Demand behaviors are different between Logic, Memory, and D-A-O*
- Overall bottom for demand is expected ~2Q23
- Faster recovery for Logic and D-A-O
 - HPC, Edge Computing, Automotive, & Industrial are key drivers
- Slower recovery for Memory

*Discrete, Analog & Other



Semiconductor Sales

SEMICONDUCTOR SALES

(worldwide sales, \$B, calendar year)

	2020	2021	2022	2023	2024
Analog	58	76	91	92	99
	3%	30%	20%	2%	8%
DRAM	67	96	84	69	79
	7%	42%	-12%	-18%	15%
NAND	50	61	54	44	52
	24%	21%	-12%	-17%	17%
MPU	62.4	68.0	62.6	59.1	66.2
	11%	9%	-8%	-6%	12%
Other Logic	145	187	217	214	232
	9%	29%	16%	-2%	8%
Discrete, Opto & Other	82	98	105	110	118
	1%	19%	8%	4%	8%
Total Semiconductor	465	585	614	588	647
	8%	26%	5%	-4%	10%

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SEMICONDUCTOR SHIPMENTS

(worldwide sales, B units, calendar year)

	2020	2021	2022	2023	2024
Analog	176	219	239	231	247
	6%	25%	9%	-3%	7%
DRAM	19	22	19	18	20
	12%	13%	-12%	-9%	15%
NAND	12	14	12	11	13
	5%	14%	-14%	-8%	17%
MPU	0.7	0.7	0.6	0.6	0.7
	9%	10%	-10%	-7%	12%
Other Logic	93	120	122	122	134
	9%	28%	2%	0%	10%
Discrete, Opto & Other	637	761	711	747	816
	0%	20%	-7%	5%	9%
Total Semiconductor	938	1137	1103	1129	1231
	2%	21%	-3%	2%	9%

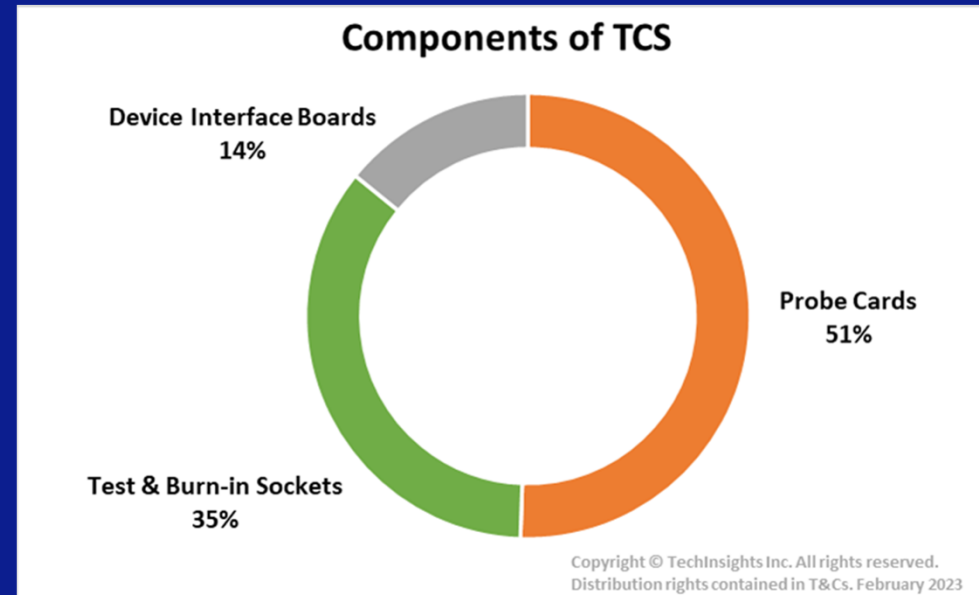
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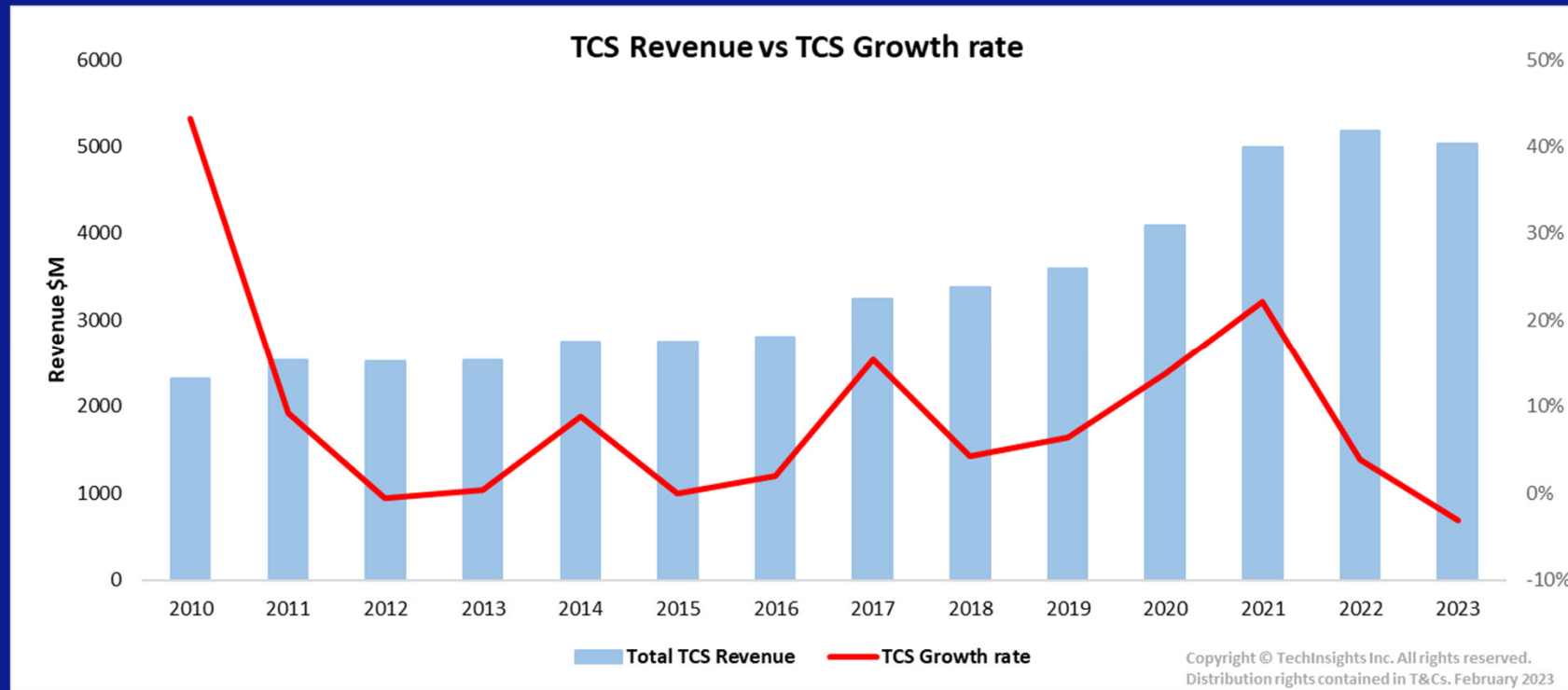
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10 **2023**

Test Connectivity Systems



Historical Perspective; It is a risky proposition to forecast downturn for Test Connectivity Systems

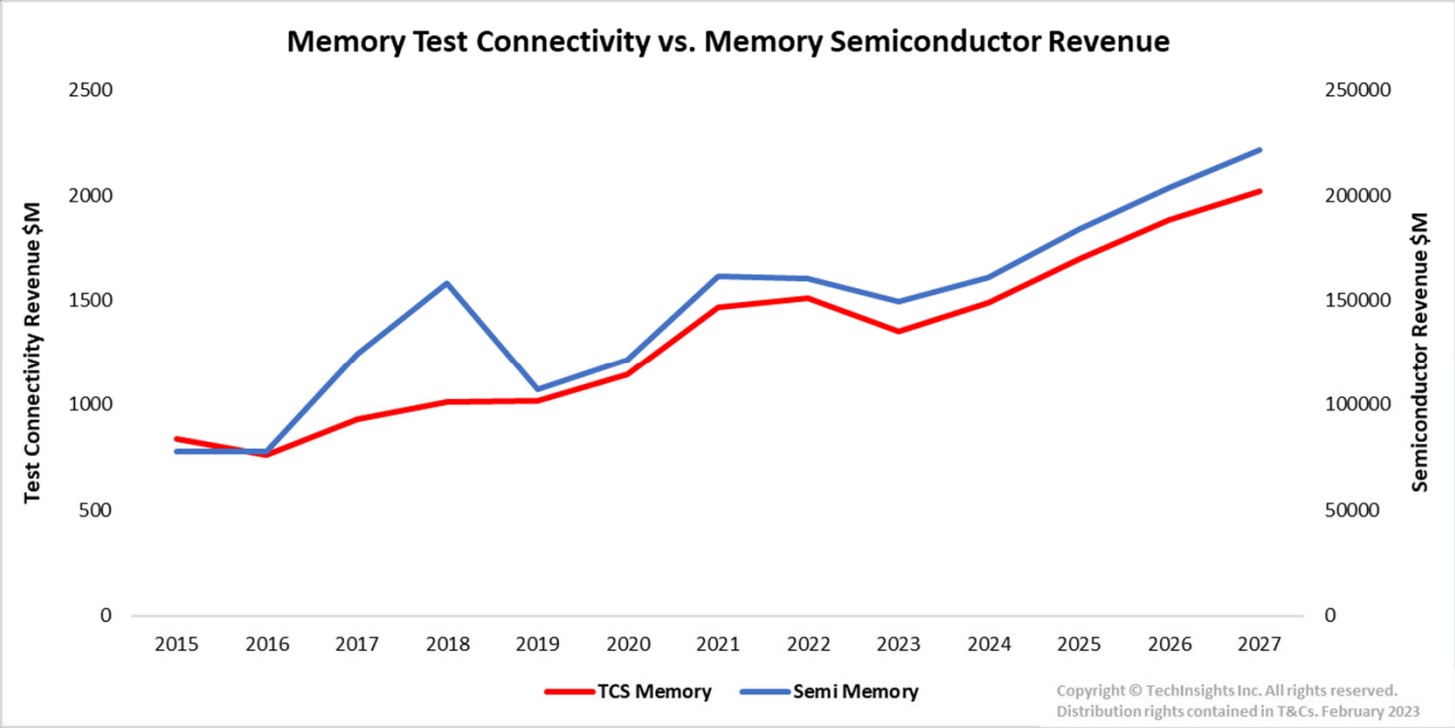


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12 **2023**

TestConX 2023

Welcome to the Memory World; Downturns do happen

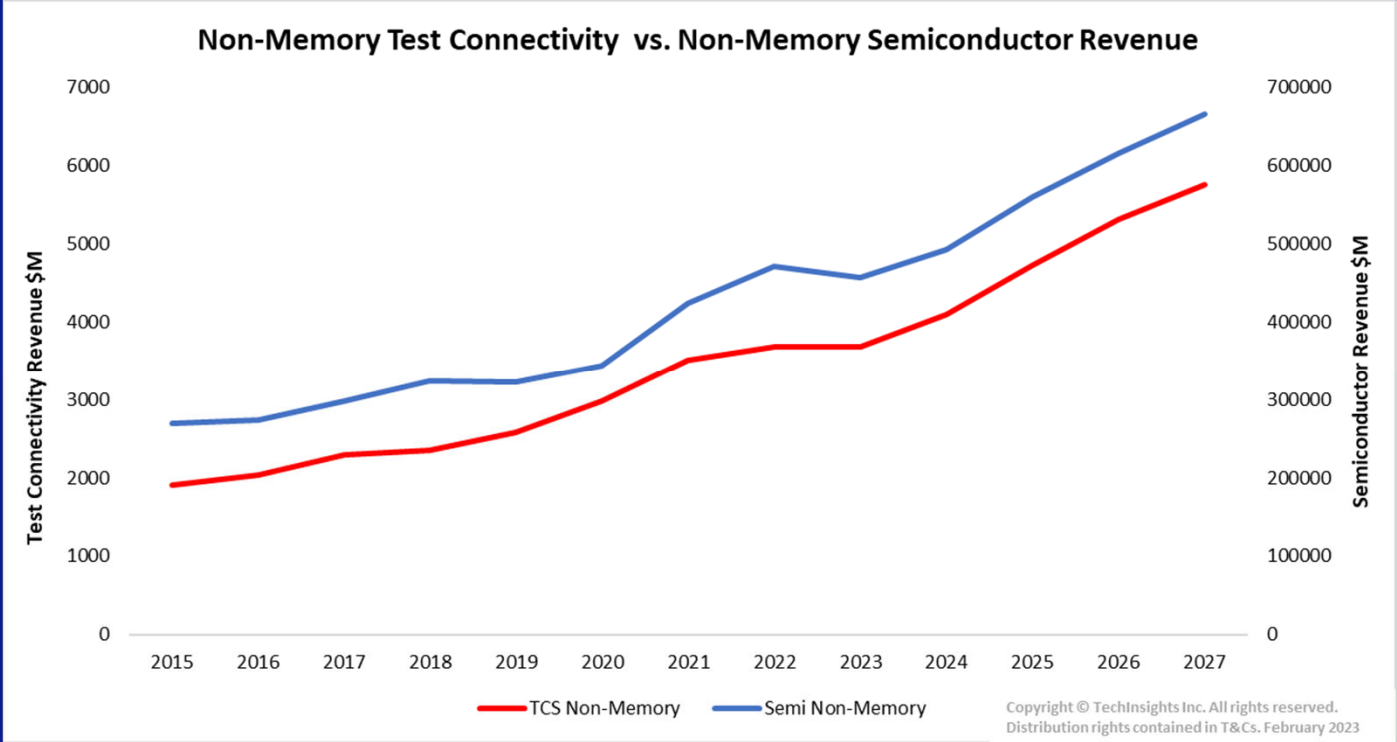


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13 **2023**

TestConX 2023

Non-Memory Test Connectivity Demand is not likely to decline in 2023



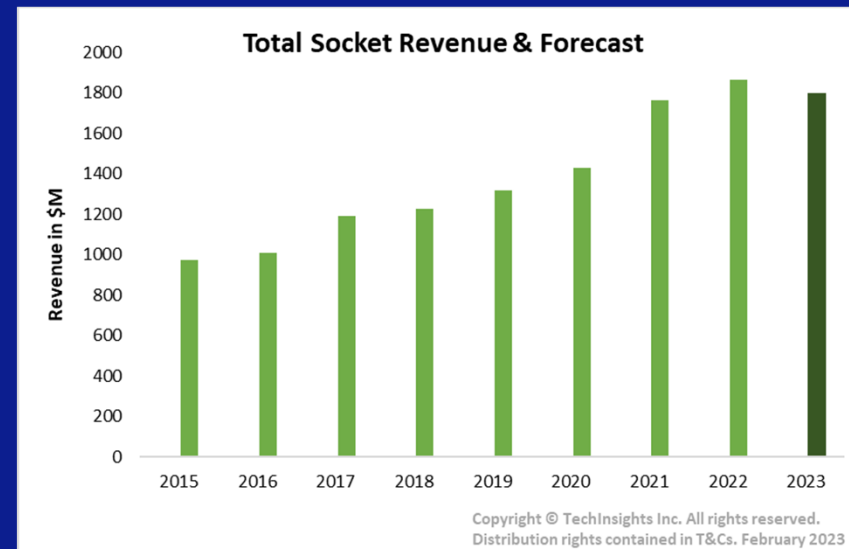
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14 **2023**

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Test & Burn-in Sockets Revenue

- Total sockets includes Test and Burn-in sockets
- Socket Revenue in 2022 was \$1.82 B with a y-o-y growth of 3%
- Test socket was \$1.29 B
Burn-in socket was \$0.5 B
- Forecasted revenue for 2023 is \$1.76 B with y-o-y of -3%

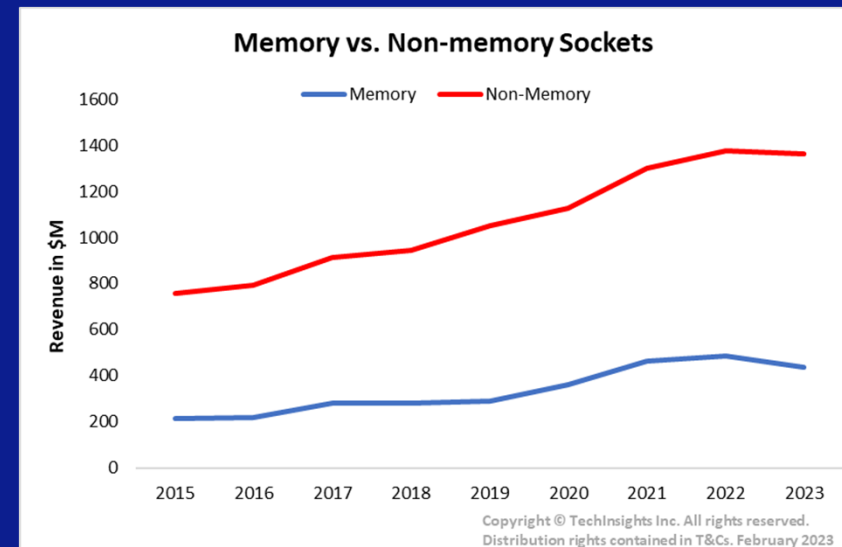


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15 **2023**

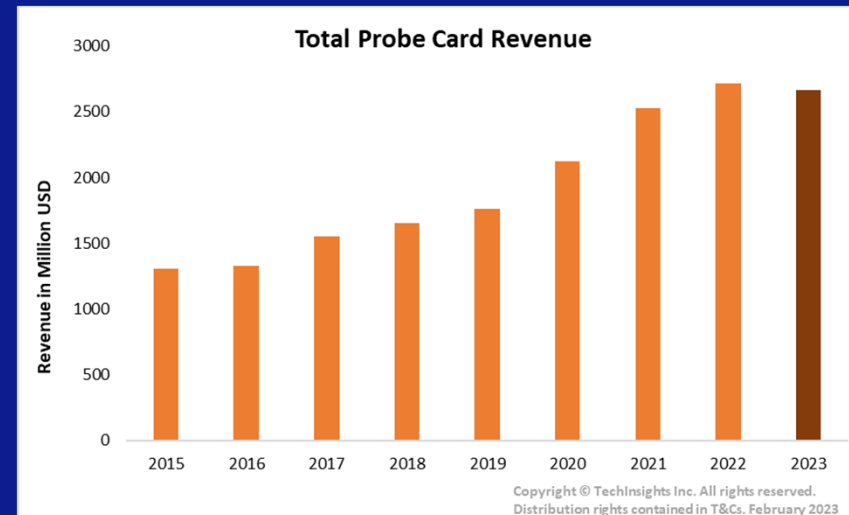
Test & Burn-in Sockets Revenue

- Non-memory sockets represents 72% of the market and drives the growth
 - Memory did match even at 2021/22 cycle.
 - Memory sockets also has higher volatility
 - Less growth/higher risk



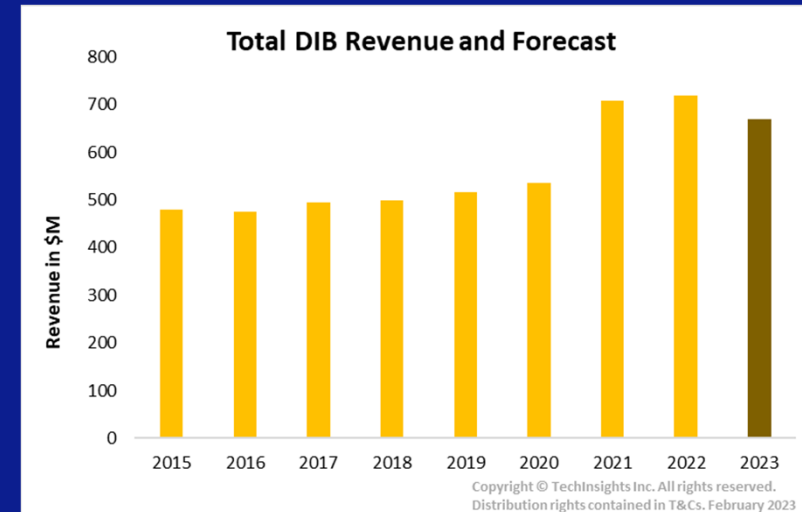
Probe Card Market

- Probe Card revenue in 2022 was \$2.64 B
- Advanced Probe cards grew y-o-y at 5.1%
- Non-memory Probe cards are 65% and memory Probe cards are 35% of the market



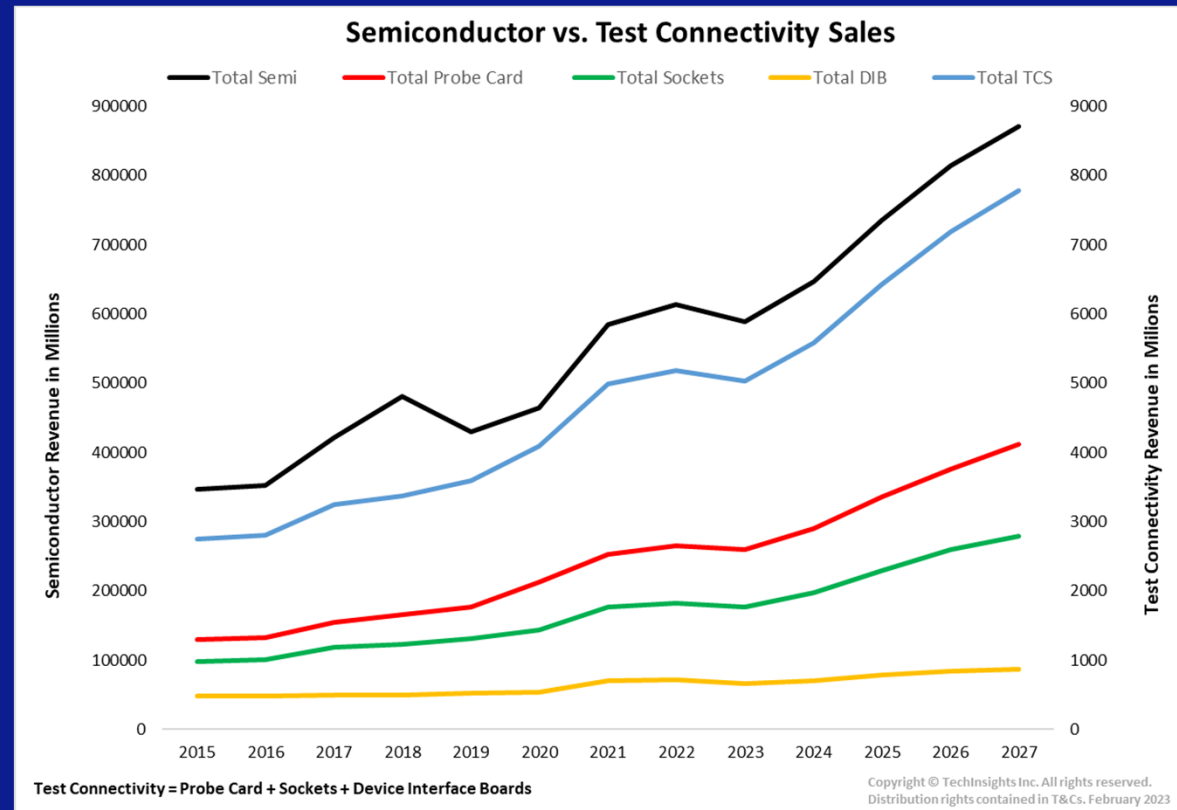
Device Interface Board Revenue

- DIB revenue for 2022 was \$0.7 B
- Huge jump in 2021, this strong momentum has slowed for this cycle

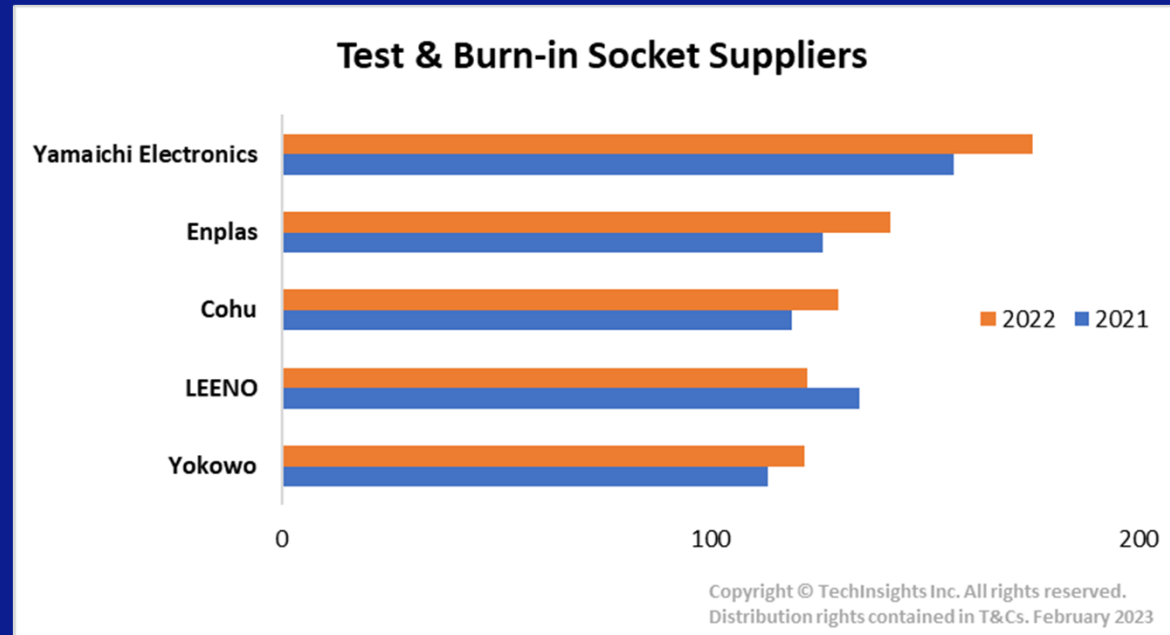


Semiconductor vs Test Connectivity

- Strong correlation between Semiconductor Sales and Test Connectivity demand
 - Especially after removing the memory cycles impact



Sockets Top 5 suppliers - Preliminary



TechInsights View

- Test Connectivity Systems are critical for enabling technology
- Demand continues to outpace semiconductors
 - It is almost as large as the whole ATE market (\$5B vs. \$5.6B)
- Criticality is higher in non-memory segments
- Memory is a problematic business case
 - Lower growth, higher risk...invest less...or increase prices to compensate for higher risk
 - Memory risk is also showing in 2022 rankings

