Semiconductor WEEK:

January 13, 2023

An overview of results and conclusions from recent reports at TechInsights

Chip Market Research Services

Roads are icy as fog clouds visibility

- Order activity for semiconductor equipment held at a chilly 50 degrees
- Capacity Utilization Rates

Semiconductor Analytics

Last Week in the Semiconductor Market:

Semiconductor sales started the year 19% higher than the last week of 2022. However, they were down 20% from a year ago. The IC weather warmed 3°F to Cool conditions. Zooming in on DRAM this week, the 13-wk MA growth held at -41.3%. TechInsights forecasts DRAM sales will reach \$69B in 2023 with a Y/Y decline of 18%, coming off a 12% decrease in 2022. DRAM's 13-wk MA hasn't been this low since March 2020. TechInsights' IC Supply/Demand held in Balanced conditions. More Moore Foundry went to back to Saturated from Glut, as More than Moore Foundry went from Loose to Balanced. OSAT tightened up from Balanced to Tight. Unchanged were DRAM, NAND, IDM, Foundry, Analog & Power, and Auto IC. Electronics' Retail Prices peaked before the holidays.

Critical Subsystems

Commodity Ceramics Components Updated Driving Forces Device Forecast

Chip History Center

Mark Bohr: It's 2002... Intel will become the first to crack 90nm, making semiconductors the first nanotechnology industry of scale. Paul Magliocco: ATE was undergoing major change in the early 2000s as IC densities on SoC semiconductors had passed the point where they could be economically and effectively tested functionally.

The Chip Insider

Strategy and Tactics: The Chip Insider's Strategic Forecast.

Semiconductor Stocks

- TechInsights' Semiconductor Stock Indices soared this week
- Semiconductor Stock Index soared
 - SkyWater Technology was this week's biggest winner
- Semiconductor Equipment Stock Index surged
- EDA Stock Index soared
- Electronics Materials Stock Index was led up by Entegris
- Hottest Stocks: SkyWater Technology, ASM International, ASM Pacific Technology, NVIDIA, Amkor, and Entegris

TechInsights

The Chip Insider®'s Graphics File





January 2023

Roads are icy as fog clouds visibility

- Order activity for semiconductor equipment held at a chilly 50 degrees
- Memory continues at freezing levels as Chipmakers continue to digest the capacity binge from the last couple of years
- TechInsights' Chip Price Performance Index increased for the first time in over ten months

Forecast as of December 2022:	2022	2023			
Semi Equipment (\$B):	\$ 136.9	\$ 118.1			
Sequential Change	7.9%	-13.7%			
Capacity Utilization:	95.0%	84.4%			
ICs (\$B):	\$ 513.6	\$ 483.8			
Sequential Change	4.3%	-5.8%			
IC Units (BU):	409.2	398.2			
Sequential Change	3.8%	-2.7%			
Electronics (\$B):	\$ 2,556	\$ 2,453			
Sequential Change	-0.7%	-4.1%			

Contact us to access more details

The Chip Insider® Graphics

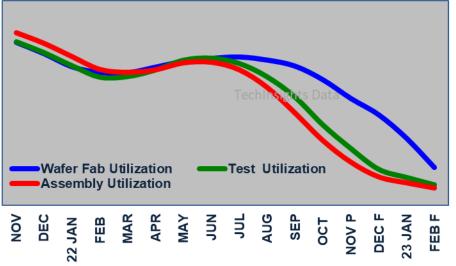
Capacity Utilization Rates:

Utilization rates are falling across the board

Capacity Utilization Rates: chart gives rolling averages for semiconductor wafer fab, test, and assembly

CAPACITY UTILIZATION RATES

(chip production/manufacturing capacity, 13 wk MA in %)



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Insights Interview:

Workforce Development Solutions...

with Ajit Manocha of SEMI



What the conversation is about:

- Labor shortages have become the echo pandemic from the ravages COVID has had on the economy.
- This is no truer than in the semiconductor industry, where Workforce Development has long been on the To-Do lists of many.
- Most industry efforts appear to be more about lobbying others to do something about workforce development.
- It's really hard to do something substantive about it but SEMI is.

Click here to watch online



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with a Y/Y decline of 18%, coming off a 12% decrease in 2022. DRAM's 13-wk MA hasn't been this low since March 2020. TechInsights' IC Supply/Demand held in Balanced conditions. More Moore Foundry went to back to Saturated from Glut, as More than Moore Foundry went from Loose to Balanced. OSAT tightened up from Balanced to Tight. Unchanged were DRAM, NAND, IDM, Foundry, Analog & Power, and Auto IC.







IC Weather Measures Order Activity S/D Measures Pricing Power



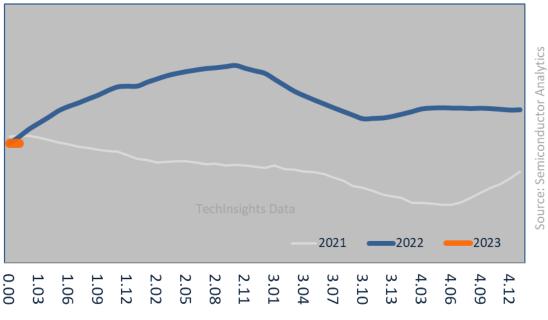
Electronics Retail Pricing Trends:

for PC notebooks Tablets Smartphones Cell phones Digital Cameras Appliances TVs

Electronics' Retail Prices peaked before the holidays.

Electronics Pricing Barometer

indexed 13 week moving average



Quarter.Week

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The Chip Insider® Strategy & Tactics



Strategy and Tactics: The Chip Insider's Strategic

Forecast.



Summaries:

The Chip Insider's Strategic Forecast for 2023: Here's what I believe the important strategic issues will be this year in the supply chain. These are the areas where you need to find positions for yourself and company for customers and investors.

Dan's Book Shelf: Chip War: The Fight for the World's Most Critical Technology: by Chris Miller

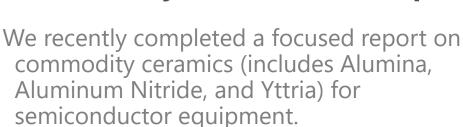
This book has received plenty of accolades. Many asked me to read it and provide a review. It has a really good story line and takes the uninitiated down the, obvious to us, premise that semiconductors are critical to our futures. But ...

"When everything seems to be going against you ... remember that the airplane takes off against the wind" — Henry Ford



Critical Sub-systems

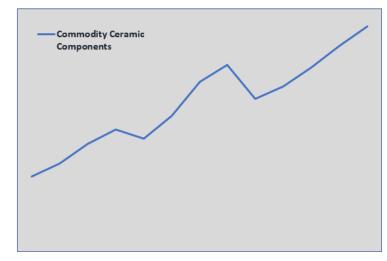
Commodity Ceramics Components



Commodity ceramics revenues have been estimated to reach \$2.3B in 2022 and will surpass \$2.7B in 2027.

Largest vendors include CoorsTek, Kyocera, NGK Insulators, and Ferrotec.

Commodity Ceramic Components for Semi Eqpt



2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027

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Contact us to get the full report and more

Critical Sub-systems

Updated Driving Forces Device Forecast



Last week an updated electronics and semiconductor device forecast was uploaded to the platform.

2023 is looking to be a down year driven primarily by the memory market's inventory correction.

Logic is not safe either however and is expecting to see slowdowns from excess inventory and a slowing demand in the second half of 2023.

Semiconductor Sales, \$M





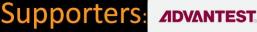
www.chiphistory.org

Mark Bohr: It's 2002... Intel will become the first to crack 90nm, making semiconductors the first nanotechnology industry of scale. These integrated circuits or ICs were well past the 100-nanometer border that defines where nanotechnology starts. Thus, Intel was leading the industry from microchips to nanochips. It would take a lot of manufacturing breakthroughs for the team of engineers and scientists at Intel to pull this off, including SiGe. In doing so, it would raise Intel TMG into the pantheon of legendary solid-state research centers. Mark Bohr, Intel Fellow, Director of Process Architecture and Integration discusses the launch of Intel's then new P1262 90nm Process in this historic interview. Intel at 90nm



Paul Magliocco: ATE was undergoing major change in the early 2000s as IC densities on SoC semiconductors had passed the point where they could be economically and effectively tested functionally. Tester prices and test times had exploded. Two great debates ensued over: 1) a move by chip makers to commoditize testers with an open standard and 2) structural test versus functional test. Originally taped in 2003, Paul Magliocco discusses how he saw these issues and how they would affect his start-up, Nextest. The company would later be bought by Teradyne in what would prove to be a very fruitful merger, due in part to the architectural decisions Nextest was making in the early 2000s. New Reality for Test Structural vs Functional Test Open ATE Architecture: ATE **Executive View**





















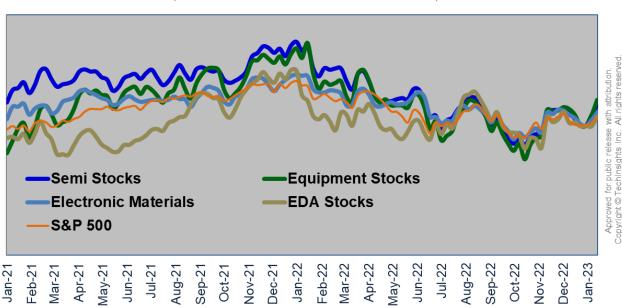
semiStockVEEK: TechInsights' Semiconductor Stock Indices soared this week

with semiconductor equipment stocks hitting a new yearly high.



Semiconductor Industry Stock Performance Indices

(Stock Prices Indexed to 100 in last week of 2022)



TechInsights' Stock Indices:

Semiconductors +5.5% Equipment +7.9% Electronic Materials +4.0% EDA +5.3%

Semiconductor Stocks:

Weekly Growth and Forward P/E Ratios by Company

Weekly Gains 1/13/2023									
Semiconductor Stocks	Price Change	Forward P/E	Semiconductor Stocks	Price Change	Forward P/E				
IDM			Fab-lite to Fabless						
Intel	4.8%	15	AMD	11.0%	18				
Micron	0.3%	29	Analog Devices	2.1%	16				
ON Semiconductor	4.3%	14	Broadcom	-1.6%	14				
Samsung Electronics	3.1%	_	IBM	1.5%	15				
SK hynix	3.1%		Infineon	5.7%	14				
STMicroelectronics 8.0		10	MagnaChip Semiconductor	7.7%	37				
Western Digital	0.1%	12	MaxLinear	8.8%	9				
Foundry & OSAT			MediaTek	5.2%	_				
Amkor	13.3%	10	NVIDIA	13.7%	34				
ASE	5.7%	8	Panasonic	3.1%	11				
GLOBALFOUNDRIES	12.1%	23	Qualcomm	4.2%	9				
JCET	9.5%	14	Silicon Laboratories	5.4%	39				
SkyWater Technology	25.3%	-	Skyworks	6.5%	9				
SMIC	1.7%	13	Texas Instruments	2.2%	22				
TSMC	11.2%	13							
UMC	7.2%	9							

TechInsights' Semiconductor Stock Index soared this week. SkyWater
Technology is the biggest winner as it
more than quadrupled its growth from last
week. NVIDIA and Amkor also had a
strong week.

IDM +3.4% Foundry & OSAT +10.8% Fabless & Fablite +5.4%

AMD AMD Analog Devices ADI Amkor AMKR ASE ASX Broadcom AVGO GLOBALFOUNDRIES GFS IBM IBM Infineon IFNNY.PK Intel INTC JCET 600584.SS Micron Technology MU On Semiconductor ON Panasonic PC MagnaChip Semiconductor MX MaxLinear MXL MediaTek 2454.TW NVIDIA NVDA Qualcomm QCOM Samsung Electronics 005930.KS Silicon Laboratories SLAB SkyWater Technology SKYT Skyworks SMIC SMI STMicroelectronics STM Texas Instruments TXN TSMC TSM UMCUMC Western Digital WDC



Chip Equipment & Related Stocks: Weekly Growth and Forward P/E Ratios by Company

Weekly Gains 1/13/2023										
Equipment Stocks	Price Change	Forward P/E	Equipment Stocks	Price Change	Forward P/E					
Wafer Fab:			Test:							
Applied Materials	5.5%	15	Advantest	5.3%	_					
ASM International	15.3%	24	Teradyne	6.8%	23					
ASML	10.7%	30	FormFactor	4.4%	29					
KLA	5.6%	21								
Lam Research	6.4%	16	Assembly:							
Onto Innovation	4.8%	_	BESI	8.8%	_					
Nikon	3.0%	_	Kulicke & Soffa	9.2%	13					
TEL	9.5%	_	ASM Pacific Technology	14.5%						
Veeco Instruments	5.1%	14								

TechInsights' Semiconductor Equipment Stock Index surged this week. ASM International came out on top followed closely by ASM Pacific, ASML, TEL, and Kulicke & Soffa.

WFE +7.3% Test +5.5% Assembly +10.8%

Top 4-6

Above Ava

Top 1-3

Applied Materials AMAT Advantest ATEYY
ASM International ASMIY
ASM Lithography ASML ASM Pacific 0522.HK
BE Semiconductor BESIY.PK
FormFactor FORM KLA KLAC
Kulicke & Soffa KLIC Lam Research LRCX
Onto Innovation ONTO Nikon 7731 Teradyne
TER Tokyo Electron Limited 8035 Veeco
VECO



Electronic Materials Stocks:

Weekly Growth and Forward P/E Ratios by Company

Top 4-6

Above Avg

Top 1-3

Weekly Gains					1/13/2023	
EDA & Electronic Materials Stocks	Price Change	Forward P/E	EDA & Electronic Materials Stocks	Price Change	Forward P/E	
EDA			DNP	-1.2%	_	
Cadence	6.0%	34	DuPont de Nemours	3.7%	5	
Synopsys	3.9%	27	JSR	4.0%	_	
Ansys	6.1%	28	Shin-Etsu	3.2%	_	
Electronic Materials			SOITEC	4.9%	_	
BASF	1.6%	2	Tokyo Ohka	2.3%	_	
Entegris	13.2%	21				

Index was led up by Entegris. All companies increased their growth this week with the exception of DNP.

TechInsights' Electronic Materials Stock

TechInsights' EDA Stock Index soared

Ansys, Inc. ANSS BASF BASFY Entegris ENTG Cadence CDNS DNP 7912 DuPont DD JSR 4185 Shin-Etsu 4063 SOITEC^{SOI.PA} Synopsys SNPS Tokyo Ohka 4186



The Prior	TechInsights' Indices of Chip Industry Stocks				Weekly Growth			nies	owth	Growth panies own	Growth	th of	00	th 1	
Week's Close	Semi Stocks	Equipment Stocks	Materials Stocks	EDA Stocks	Semi Stocks	Equipment Stocks	Materials Stocks	EDA Stocks	Companies Up	Max Gro	Companies Down	Min Gro	Range of Growth	S&P 500	S&P 500 Growth
10-Jun-22	113.2	109.6	115.4	95.9	-5.2%	-5.7%	-2.5%	-6.5%	6	9.7%	-49	-11.9%	21.6%	101.6	-5.1%
17-Jun-22	104.7	98.0	105.1	92.4	-7.5%	-10.6%	-8.9%	-3.6%	2	4.0%	-53	-17.3%	21.3%	95.7	-5.8%
24-Jun-22	105.5	102.3	104.7	101.0	0.8%	4.3%	-0.3%	9.3%	41	12.8%	-14	-19.4%	32.2%	101.9	6.4%
01-Jul-22	97.7	92.0	101.3	95.4	-7.3%	-10.1%	-3.3%	-5.6%	3	6.1%	-52	-20.1%	26.2%	99.6	-2.2%
08-Jul-22	102.8	94.4	102.8	100.6	5.2%	2.7%	1.5%	5.5%	47	20.5%	-7	-4.8%	25.3%	101.6	1.9%
15-Jul-22	104.3	97.1	102.6	98.4	1.4%	2.8%	-0.2%	-2.2%	32	10.1%	-21	-9.1%	19.2%	100.6	-0.9%
22-Jul-22	108.9	105.9	108.5	105.8	4.4%	9.1%	5.7%	7.5%	52	66.7%	-3	-8.3%	75.0%	103.2	2.5%
29-Jul-22	111.4	109.4	110.8	115.3	2.4%	3.3%	2.1%	9.0%	39	12.4%	-16	-9.9%	22.3%	107.6	4.3%
05-Aug-22	114.8	113.6	108.7	116.9	3.1%	3.8%	-1.9%	1.5%	47	33.8%	-8	-17.1%	50.9%	108.0	0.4%
12-Aug-22	115.2	112.9	110.9	118.5	0.3%	-0.6%	1.9%	1.3%	33	22.3%	-22	-17.4%	39.7%	111.5	3.3%
19-Aug-22	111.1	109.2	108.7	114.2	-3.6%	-3.3%	-1.9%	-3.6%	9	17.4%	-46	-8.1%	25.5%	110.1	-1.2%
26-Aug-22	106.3	104.9	106.2	108.9	-4.3%	-3.9%	-2.3%	-4.7%	2	1.1%	-53	-17.8%	18.9%	105.7	-4.0%
02-Sep-22	100.6	97.0	101.7	103.0	-5.4%	-7.5%	-4.1%	-5.4%	1	2.1%	-54	-16.1%	18.2%	102.2	-3.3%
09-Sep-22	103.8	101.8	106.4	107.4	3.2%	4.9%	4.6%	4.2%	50	13.1%	-5	-9.5%	22.6%	105.9	3.6%
16-Sep-22	99.3	95.5	100.6	100.0	-4.3%	-6.2%	-5.4%	-6.9%	4	2.3%	-50	-24.2%	26.5%	100.9	-4.8%
23-Sep-22	93.8	90.3	97.1	96.6	-5.5%	-5.5%	-3.5%	-3.4%	3	1.6%	-52	-15.8%	17.4%	96.2	-4.6%
30-Sep-22	90.2	86.3	92.6	96.2	-3.9%	-4.4%	-4.7%	-0.4%	5	4.7%	-49	-11.7%	16.4%	93.4	-2.9%
07-Oct-22	93.5	90.2	96.2	95.0	3.7%	4.6%	3.9%	-1.3%	46	9.8%	-7	-7.8%	17.6%	94.8	1.5%
14-Oct-22	89.2	81.6	93.7	87.5	-4.6%	-9.5%	-2.6%	-7.9%	8	5.8%	-47	-16.1%	21.9%	93.3	-1.6%
21-Oct-22	93.6	89.5	96.2	93.2	4.9%	9.6%	2.8%	6.5%	45	21.9%	-10	-5.2%	27.1%	97.7	4.7%
28-Oct-22	95.3	93.3	98.6	92.8	1.8%	4.3%	2.5%	-0.5%	42	11.5%	-13	-24.7%	36.2%	101.6	4.0%
04-Nov-22	96.2	94.3	96.3	87.8	0.9%	1.0%	-2.4%	-5.3%	32	20.3%	-23	-21.5%	41.8%	98.2	-3.3%
11-Nov-22	107.8	108.4	107.2	104.5	12.1%	15.0%	11.3%	18.9%	53	37.4%	-2	-8.0%	45.4%	104.0	5.9%
18-Nov-22	108.3	107.5	106.2	101.9	0.5%	-0.8%	-0.9%	-2.5%	24	12.4%	-31	-22.2%	34.6%	103.3	-0.7%
25-Nov-22	108.5	108.1	108.7	103.4	0.2%	0.5%	2.4%	1.5%	36	5.6%	-19	-3.8%	9.4%	104.9	1.5%
02-Dec-22	108.7	109.9	108.2	107.6	0.1%	1.7%	-0.5%	4.0%	38	9.2%	-16	-7.5%	16.7%	106.0	1.1%
09-Dec-22	106.9	108.9	105.9	101.4	-1.7%	-0.9%	-2.1%	-5.7%	15	7.2%	-38	-8.5%	15.7%	102.5	-3.4%
16-Dec-22	103.6	105.8	104.1	101.7	-3.1%	-2.9%	-1.7%	0.3%	10	4.0%	-45	-10.6%	14.6%	100.3	-2.1%
23-Dec-22	100.4	100.0	100.9	99.7	-3.1%	-5.4%	-3.1%	-2.0%	3	1.2%	-51	-10.8%	12.0%	100.1	-0.2%
30-Dec-22	100.0	100.0	100.0	100.0	-0.4%	0.0%	-0.9%	0.3%	20	7.9%	-33	-5.3%	13.2%	100.0	-0.1%
06-Jan-23	105.6	105.5	103.1	99.6	5.6%	5.5%	3.1%	-0.4%	46	17.8%	-8	-4.3%	22.1%	101.4	1.4%
13-Jan-23	111.4	113.8	107.1	104.9	5.5%	7.9%	4.0%	5.3%	53	25.3%	-2	-1.6%	26.9%	104.2	2.7%



Links to **Conference Call** Transcripts

January 13th

NVIDIA Corporation (NVDA) 41st Annual J.P. Morgan Healthcare Conference (Transcript)

Taiwan Semiconductor Manufacturing Company Limited (TSM) Q4 2022 Earnings Call Transcript

January 6th and before

Micron Technology, Inc. (MU) J.P. MORGAN 21ST ANNUAL TECH/AUTO FORUM (Transcript)

Marvell Technology, Inc. (MRVL) J.P. Morgan 21st Annual Tech/Auto Forum Conference (Transcript)

Skyworks Solutions, Inc. (SWKS) Presents at J.P. Morgan 21st Annual Tech/Auto Forum (Transcript)

NVIDIA Corporation (NVDA) J.P. Morgan 21st Annual Tech/Auto Forum Conference (Transcript)

ON Semiconductor Corporation (ON) CEO Hassane El-Khoury presents at J.P. Morgan CES Tech/Auto Forum (Transcript)

Micron Technology, Inc. (MU) Q1 2023 Earnings Call Transcript

Western Digital Corporation (WDC) CEO David Goeckeler Presents at Barclays 2022 Global Technology, Media and

Telecommunications Conference (Transcript)

Analog Devices, Inc. (ADI) Presents at Barclays 2022 Global Technology, Media and Telecommunications Brokers

Conference (Transcript)

Marvell Technology, Inc. (MRVL) Arete Tech Conference (Transcript)

Western Digital Corporation (WDC) UBS Global TMT Conference Transcript

Advanced Micro Devices, Inc. (AMD) Arete Tech Conference (Transcript)



Links to **Conference Call** Transcripts

ASML Holding N.V. (ASML) Presents at UBS 2022 Global TMT Conference (Transcript)

NXP Semiconductors N.V. (NXPI) Presents at Nasdaq 47th Investor Conference (Transcript)

ON Semiconductor Corporation (ON) NASDAQ 47th Investor Conference (Transcript)

NVIDIA Corporation (NVDA) Management Presents at Arete Tech Conference 2022 Conference (Transcript)

Western Digital Corporation (WDC) Arete Tech Conference (Transcript)

Marvell Technology, Inc. (MRVL) Q3 2023 Earnings Call Transcript

DuPont de Nemours, Inc. (DD) Presents at Credit Suisse's 10th Annual Global Industrials Brokers Conference (Transcript)

Semtech Corporation (SMTC) Q3 2023 Earnings Call Transcript

Synopsys, Inc. (SNPS) Q4 2022 Earnings Call Transcript

NXP Semiconductors N.V. (NXPI) 6th Annual Wells Fargo TMT Summit

Applied Materials, Inc. (AMAT) Presents at Wells Fargo 6th Annual TMT Summit Conference (Transcript)

NVIDIA Corporation (NVDA) Credit Suisse 26th Annual Technology Conference (Transcript)

Advanced Micro Devices, Inc. (AMD) Presents at Wells Fargo 6th Annual 2022 TMT Summit (Transcript)

Intel Corporation (INTC) Credit Suisse 26th Annual Technology Conference (Transcript)

Honeywell International Inc. (HON) Management Presents at Credit Suisse 10th Annual Global Industrials Conference (Transcript)

Western Digital Corporation (WDC) Credit Suisse 26th Annual Technology Conference (Transcript)

Micron Technology, Inc. (MU) 6th Annual Wells Fargo TMT Summit Conference (Transcript)



Links to **Conference Call** Transcripts

ON Semiconductor Corporation (ON) Management Presents At Credit Suisse 26th Annual Technology Conference (Transcript)

Analog Devices, Inc. (ADI) Management Presents at Credit Suisse 26th Annual Technology Conference

NXP Semiconductors N.V. (NXPI) Credit Suisse 26th Annual Technology Conference (Transcript)

Qorvo, Inc. (QRVO) Presents at 6th Annual Wells Fargo TMT Summit

Lam Research Corporation (LRCX) Presents at Credit Suisse 26th Annual Technology Conference (Transcript)

Texas Instruments Incorporated (TXN) Credit Suisse 26th Annual Technology Conference (Transcript)

International Business Machines Corporation (IBM) Management Presents at Credit Suisse 26th Annual Technology Conference Call Transcript

Analog Devices Inc. (ADI) Q4 2022 Earnings Call Transcript

Agilent Technologies, Inc. (A) Q4 2022 Earnings Call Transcript

Applied Materials, Inc. (AMAT) Q4 2022 Earnings Call Transcript

Camtek LTD. (CAMT) Q3 2022 Earnings Call Transcript

Kulicke and Soffa Industries, Inc. (KLIC) Q4 2022 Earnings Call Transcript

NVIDIA Corporation (NVDA) Q3 2023 Earnings Call Transcript

Infineon Technologies AG (IFNNY) Q4 2022 Earnings Call Transcript

GLOBALFOUNDRIES Inc. (GFS) Q3 2022 Earnings Call Transcript

Veeco Instruments, Inc. (VECO) Q3 2022 Earnings Call Transcript



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- Silicon Demand V22.09
- Advanced Packaging V22.07
- Packaging Demand V22.06

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 - Yearly V22.05
 - Quarterly V22.12
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- Supplier Shares V22.03

Test Connectivity Reports:

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 - Quarterly Report: V22.12
- Probe Card Report: V22.05
 - Quarterly Report: V22.12
- Device Interface Board Report: V22.08
 - Quarterly Report: V22.12



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